SUN2000MA
V200R024C00SPC103

# Modbus Interface Definitions(V3.0)

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|---|---|
| **Issue** | 04 |
| **Date** | 2025-04-09 |

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# Preface

## Change History

| Issue | Date | Description |
| --- | --- | --- |
| 04 | 2025-04-09 | This issue is the fourth official release. |
| 03 | 2025-01-18 | This issue is the third official release. |
| 02 | 2024-11-08 | This issue is the second official release. |
| 01 | 2024-09-21 | This issue is the first official release. |

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# 1 Supported Models

## 1.1 Model Description

**Table 1-1** Supported models and firmware versions

| Model | Model ID | Earliest Firm Version |
| --- | --- | --- |
| SUN2000_5K_MAP0 | 1001 | V200R024C00 |
| SUN2000_6K_MAP0 | 1002 | V200R024C00 |
| SUN2000_8K_MAP0 | 1003 | V200R024C00 |
| SUN2000_10K_MAP0 | 1004 | V200R024C00 |
| SUN2000_10K_MAP0_BE | 1005 | V200R024C00 |
| SUN2000_12K_MAP0 | 1006 | V200R024C00 |
| SUN2000_5K_MAP0_ZH | 1007 | V200R024C00 |
| SUN2000_6K_MAP0_ZH | 1008 | V200R024C00 |
| SUN2000_8K_MAP0_ZH | 1009 | V200R024C00 |
| SUN2000_10K_MAP0_ZH | 1010 | V200R024C00 |
| SUN2000_12K_MAP0_ZH | 1011 | V200R024C00 |
| SUN5000_8K_MAP0 | 1012 | V200R024C00 |
| SUN5000_12K_MAP0 | 1013 | V200R024C00 |

The maximum active power ($P_{max}$), maximum reactive power ($Q_{max}$), and rated power ($P_n$) corresponding to each model can be obtained from the register interface. The model ID is the unique code of the model.

  

# 2 Introductory

## 2.1 Terms and Abbreviations

**Table 2-1** Terms and abbreviations

| Name | Description |
| --- | --- |
| Master node | During master-slave communication, the party that initiates a communication request is referred to as the master node. |
| Slave node | During master-slave communication, the party that responds to a communication request is referred to as the slave node. |
| Broadcast address | Fixed to 0. |
| Register address | A register address is recorded in two bytes. |
| U16 | Unsigned integer (16 bits) |
| U32 | Unsigned integer (32 bits) |
| I16 | Signed integer (16 bits) |
| I32 | Signed integer (32 bits) |
| STR | Character string |
| MLD | Multiple bytes |
| Bitfield16 | 16-bit data expressed by bit |
| Bitfield32 | 32-bit data expressed by bit |
| N/A | Not applicable |
| s | Second |
| Epoch seconds | The number of seconds that have elapsed since 1970-01-01 00:00:00 |

  

| Name | Description |
| --- | --- |
| RO | Data that is readable only |
| RW | Data that is readable and writable |
| WO | Data that is writable only |

  

# 3 Register Definitions

## 3.1 Inverter Equipment Register

| No. | Signal Name | Read / Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 1 | Model | RO | STR | | | 30000 | 15 | Nameplate name of the device, which was **Model name** in the earlier version. |
| 2 | SN | RO | STR | | | 30015 | 10 | Device serial number, which comes from the electronic label of the system. |
| 3 | PN | RO | STR | | | 30025 | 10 | Product code |
| 4 | Firmware version | RO | STR | | | 30035 | 15 | Character string reported: initial version VX00R00X (VR version by default); difference in certification registration: VX00R00XD01, VX00R00XD02... (D0X is provided by test and certification personnel); subject to change with country codes. |
| 5 | Software version | RO | STR | | | 30050 | 15 | V200R023C10SPCXXX. The offering name and software version are combined on the display page. |

  

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|---|---|---|---|---|---|---|---|---|
| 6 | Protocol version [Modbus] | RO | U32 | | | 30068 | 2 | High-order characters: main version; upgrade in case of incompatible changes; low-order characters: revision; upgrade in case of compatible changes; baseline version: D8.0; 0x00080000 |
| 7 | Model ID | RO | U16 | | | 30070 | 1 | |
| 8 | Number of PV strings | RO | U16 | | 1 | 30071 | 1 | |
| 9 | Number of MPPTs | RO | U16 | | 1 | 30072 | 1 | |
| 10 | Rated power | RO | U32 | kW | 1000 | 30073 | 2 | Pn |
| 11 | Maximum active power ($P_{max}$) | RO | U32 | kW | 1000 | 30075 | 2 | Read-only interface of 42027 |
| 12 | Maximum apparent power ($S_{max}$) | RO | U32 | kVA | 1000 | 30077 | 2 | Read-only interface of 42025 |
| 13 | Real-time maximum reactive power ($Q_{max}$, fed to the power grid) | RO | I32 | kVar | 1000 | 30079 | 2 | Reported to the monitoring module to indicate the reactive power adjustment range. Except for model differences, feature data is updated when the grid code or derating changes. |

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|---|---|---|---|---|---|---|---|---|
| 14 | Real-time maximum reactive power (–$Q_{max}$, absorbed from the power grid) | RO | I32 | kVar | 1000 | 30081 | 2 | Reported to the monitoring module to indicate the reactive power adjustment range. Except for model differences, feature data is updated when the grid code or derating changes. |
| 15 | Maximum active power ($P_{max\_real}$) | RO | U32 | kW | 1000 | 30083 | 2 | The default maximum active power is fixed on the nameplate of the device and will not change for the device. It is used as the upper limit of the reference range (42027). The relationship is as follows: $0 < P_{max} \leq S_{max} \leq P_{max\_real} \leq S_{max\_real}$ or $0 < P_{max} \leq P_{max\_real} \leq S_{max} \leq S_{max\_real}$. |
| 16 | Maximum apparent power ($S_{max\_real}$) | RO | U32 | kVA | 1000 | 30085 | 2 | The default maximum apparent power is fixed on the nameplate of the device and will not change for the device. It is used as the upper limit of the reference range (42025). The relationship is as follows: $0 < P_{max} \leq S_{max} \leq P_{max\_real} \leq S_{max\_real}$ or $0 < P_{max} \leq P_{max\_real} \leq S_{max} \leq S_{max\_real}$. |
| 17 | Offering name | RO | STR | | | 30089 | 15 | Reported to FusionSolar; empty value for OEM devices; not displayed on the customer UI; used for combination with the software version. |

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|---|---|---|---|---|---|---|---|---|
| 18 | Product sales area | RO | STR | | | 30105 | 2 | XX: two uppercase letters, indicating the sales area or application area of the product. It is related to the AC power system. CN: Chinese Mainland; EU: Europe; JP: Japan; US: North America (United States/ Canada/areas with the same power grid or certification requirements as the United States); UK: United Kingdom; default - CN/EU: all areas where CE certification requirements are applicable. See *Huawei FusionSolar Smart PV Solution and Product Naming Specifications*. |
| 19 | Product software ID | RO | U16 | | | 30107 | 1 | Unique ID of the software release entity; used for processing the compatibility of grid codes. |
| 20 | Product software version | RO | U16 | | | 30108 | 1 | Sequence number of the version released by the software release entity; used for processing the compatibility of grid codes. |
| 21 | Grid code protocol version | RO | U16 | | | 30109 | 1 | Protocol loading and verification are similar to those in CAN1.0 and CAN2.0. |
| 22 | Unique software ID | RO | U16 | | | 30110 | 1 | Unique ID of a software version. Upgrade packages with different IDs cannot be used for upgrade between each other. (Broadcast upgrade feature code) |
| 23 | Quantity of subpackages in the upgrade package | RO | U16 | | 1 | 30111 | 1 | Considering the increasing number of southbound devices to be upgraded, sufficient upgrade packages must be reserved. |

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|---|---|---|---|---|---|---|---|---|
| 24 | Subpackage 1 information | RO | U32 | | | 30112 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 25 | Subpackage 2 information | RO | U32 | | | 30114 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 26 | Subpackage 3 information | RO | U32 | | | 30116 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 27 | Subpackage 4 information | RO | U32 | | | 30118 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 28 | Subpackage 5 information | RO | U32 | | | 30120 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 29 | Subpackage 6 information | RO | U32 | | | 30122 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 30 | Subpackage 7 information | RO | U32 | | | 30124 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 31 | Subpackage 8 information | RO | U32 | | | 30126 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 32 | Subpackage 9 information | RO | U32 | | | 30128 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 33 | Subpackage 10 information | RO | U32 | | | 30130 | 2 | High-order characters: file type ID; low-order characters: device type ID |
| 34 | Software package name | RO | STR | | | 30136 | 30 | FusionSolar_V800R021C10SPCXXX_SUN2000: empty value for OEM devices; not displayed on the customer UI |

  

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|---|---|---|---|---|---|---|---|---|
| 35 | Hardware functional unit configuration ID | RO | Bitfield16 | | | 30206 | 1 | Indicates whether an optional hardware functional unit is configured. 0: no 1: yes |
| 36 | Subdevice support flag | RO | Bitfield32 | | | 30207 | 2 | |
| 37 | Subdevice presence flag | RO | Bitfield32 | | | 30209 | 2 | |
| 38 | Feature code 1 | RO | E16 | | | 30211 | 2 | |
| 39 | Feature code 2 | RO | E16 | | | 30213 | 2 | |
| 40 | Feature code 3 | RO | E16 | | | 30215 | 2 | |
| 41 | Feature code 4 | RO | E16 | | | 30217 | 2 | |
| 42 | Grid code mask 1 | RO | E16 | | | 30219 | 1 | |
| 43 | Grid code mask 2 | RO | E16 | | | 30220 | 1 | |
| 44 | Grid code mask 3 | RO | E16 | | | 30221 | 1 | |
| 45 | Grid code mask 4 | RO | E16 | | | 30222 | 1 | |
| 46 | Grid code mask 5 | RO | E16 | | | 30223 | 1 | |
| 47 | Grid code mask 6 | RO | E16 | | | 30224 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 48 | Grid code mask 7 | RO | E16 | | | 30225 | 1 | |
| 49 | Grid code mask 8 | RO | E16 | | | 30226 | 1 | |
| 50 | Grid code mask 9 | RO | E16 | | | 30227 | 1 | |
| 51 | Grid code mask 10 | RO | E16 | | | 30228 | 1 | |
| 52 | Grid code mask 11 | RO | E16 | | | 30229 | 1 | |
| 53 | Grid code mask 12 | RO | E16 | | | 30230 | 1 | |
| 54 | Grid code mask 13 | RO | E16 | | | 30231 | 1 | |
| 55 | Grid code mask 14 | RO | E16 | | | 30232 | 1 | |
| 56 | Grid code mask 15 | RO | E16 | | | 30233 | 1 | |
| 57 | Grid code mask 16 | RO | E16 | | | 30234 | 1 | |
| 58 | Grid code mask 17 | RO | E16 | | | 30235 | 1 | |
| 59 | Grid code mask 18 | RO | E16 | | | 30236 | 1 | |
| 60 | Grid code mask 19 | RO | E16 | | | 30237 | 1 | |
| 61 | Grid code mask 20 | RO | E16 | | | 30238 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 62 | Grid code mask 21 | RO | E16 | | | 30239 | 1 | |
| 63 | Grid code mask 22 | RO | E16 | | | 30240 | 1 | |
| 64 | Grid code mask 23 | RO | E16 | | | 30241 | 1 | |
| 65 | Grid code mask 24 | RO | E16 | | | 30242 | 1 | |
| 66 | Grid code mask 25 | RO | E16 | | | 30243 | 1 | |
| 67 | Grid code mask 26 | RO | E16 | | | 30244 | 1 | |
| 68 | Grid code mask 27 | RO | E16 | | | 30245 | 1 | |
| 69 | Grid code mask 28 | RO | E16 | | | 30246 | 1 | |
| 70 | Grid code mask 29 | RO | E16 | | | 30247 | 1 | |
| 71 | Grid code mask 30 | RO | E16 | | | 30248 | 1 | |
| 72 | Grid code mask 31 | RO | E16 | | | 30249 | 1 | |
| 73 | Grid code mask 32 | RO | E16 | | | 30250 | 1 | |
| 74 | Feature code 5 | RO | E16 | | | 30282 | 2 | |

  

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|---|---|---|---|---|---|---|---|---|
| 75 | Level-1 parameter mask 1 (monitoring) | RO | E16 | | | 30300 | 1 | |
| 76 | Level-1 parameter mask 2 (monitoring) | RO | E16 | | | 30301 | 1 | |
| 77 | Level-1 parameter mask 3 (monitoring) | RO | E16 | | | 30302 | 1 | |
| 78 | Level-1 parameter mask 4 (monitoring) | RO | E16 | | | 30303 | 1 | |
| 79 | Level-1 parameter mask 5 (monitoring) | RO | E16 | | | 30304 | 1 | |
| 80 | Level-1 parameter mask 6 (monitoring) | RO | E16 | | | 30305 | 1 | |
| 81 | Level-1 parameter mask 7 (monitoring) | RO | E16 | | | 30306 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 82 | Level-1 parameter mask 8 (monitoring) | RO | E16 | | | 30307 | 1 | |
| 83 | Level-1 parameter mask 1 (DSP) | RO | E16 | | | 30308 | 1 | |
| 84 | Level-1 parameter mask 2 (DSP) | RO | E16 | | | 30309 | 1 | |
| 85 | Level-1 parameter mask 3 (DSP) | RO | E16 | | | 30310 | 1 | |
| 86 | Level-1 parameter mask 4 (DSP) | RO | E16 | | | 30311 | 1 | |
| 87 | Level-1 parameter mask 5 (DSP) | RO | E16 | | | 30312 | 1 | |
| 88 | Level-1 parameter mask 6 (DSP) | RO | E16 | | | 30313 | 1 | |
| 89 | Level-1 parameter mask 7 (DSP) | RO | E16 | | | 30314 | 1 | |
| 90 | Level-1 parameter mask 8 (DSP) | RO | E16 | | | 30315 | 1 | |
| 91 | Level-1 parameter mask 9 (DSP) | RO | E16 | | | 30316 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 92 | Level-1 parameter mask 10 (DSP) | RO | E16 | | | 30317 | 1 | |
| 93 | Level-1 parameter mask 11 (DSP) | RO | E16 | | | 30318 | 1 | |
| 94 | Level-1 parameter mask 12 (DSP) | RO | E16 | | | 30319 | 1 | |
| 95 | Level-1 parameter mask 13 (DSP) | RO | E16 | | | 30320 | 1 | |
| 96 | Level-1 parameter mask 14 (DSP) | RO | E16 | | | 30321 | 1 | |
| 97 | Level-1 parameter mask 15 (DSP) | RO | E16 | | | 30322 | 1 | |
| 98 | Level-1 parameter mask 16 (DSP) | RO | E16 | | | 30323 | 1 | |
| 99 | Level-1 parameter mask 9 (monitoring) | RO | E16 | | | 30340 | 1 | |
| 1000 | Level-1 parameter mask 10 (monitoring) | RO | E16 | | | 30341 | 1 | |
| 1001 | Battery parameter mask 1 (monitoring) | RO | E16 | | | 30348 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 102 | PID parameter mask 1 | RO | E16 | | | 30350 | 1 | |
| 103 | Last login time [app]; [administrator, preset, installer] | RO | Epoch seconds | s | 1 | 30352 | 2 | Last successful login time of the admin account on the app. |
| 104 | Last login time [app]; [common user, preset, user] | RO | Epoch seconds | s | 1 | 30354 | 2 | Last successful login time of an advanced user account on the app. |
| 105 | Inverter hardware version | RO | STR | | 1 | 31000 | 15 | |
| 106 | Monitoring board SN | RO | STR | | | 31015 | 10 | Electronic label of the monitoring board |
| 107 | Monitoring software version | RO | STR | | | 31025 | 15 | MCU1 version |
| 108 | Master DSP version | RO | STR | | | 31040 | 15 | MCU2 version |
| 109 | Slave DSP version | RO | STR | | | 31055 | 15 | MCU3 version |
| 110 | CPLD version | RO | STR | | | 31070 | 15 | MCU4 version |
| 111 | AFCI version | RO | STR | | | 31085 | 15 | MCU5 version |
| 112 | Built-in PID | RO | STR | | | 31100 | 15 | MCU6 version |

  

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|---|---|---|---|---|---|---|---|---|
| 113 | AFCI_M4 software version | RO | STR | | | 31145 | 15 | MCU9 version |
| 114 | Registration code | RO | E16 | | | 31200 | 10 | |
| 115 | [Teleindication] Signal-node remote communication | RO | Bitfield16 | | | 32000 | 1 | Reported through IEC 104, merged PCS running status |
| 116 | [Teleindication] Running status (monitor processing) | RO | Bitfield16 | | | 32002 | 1 | |
| 117 | [Teleindication] Running status (power processing) | RO | Bitfield32 | | 1 | 32003 | 2 | |
| 118 | [Teleindication] Alarm 1 | RO | Bitfield16 | | | 32008 | 1 | |
| 119 | [Teleindication] Alarm 2 | RO | Bitfield16 | | | 32009 | 1 | |
| 120 | [Teleindication] Alarm 3 | RO | Bitfield16 | | | 32010 | 1 | |
| 121 | [Teleindication] Alarm 4 | RO | Bitfield16 | | | 32011 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 122 | Device SN feature code | RO | U16 | | | 32015 | 1 | CRC16 value of the SN, which is the key data ID. It is used to prevent the energy yield data from being incorrectly modified due to incorrect energy yield reported by devices with the same address. The CRC value of the SN is added to ensure that the energy yield source is correct. |
| 123 | PV1 voltage | RO | I16 | V | 10 | 32016 | 1 | When bit 9 of power parameter mask 14 is 0, the signal name is PV1 voltage. When bit 9 of power parameter mask 14 is 1, the following logic applies: When DC input display mode 30205 is 0, the signal name is PV1 voltage. When DC input display mode 30205 is 1, the signal name is MPPT1 voltage. |
| 124 | PV1 current | RO | I16 | A | 100 | 32017 | 1 | When bit 9 of power parameter mask 14 is 0, the signal name is PV1 current. When bit 9 of power parameter mask 14 is 1, the following logic applies: When DC input display mode 30205 is 0, the signal name is PV1 current. When DC input display mode 30205 is 1, the signal name is MPPT1 current. |
| 125 | PV2 voltage | RO | I16 | V | 10 | 32018 | 1 | When bit 9 of power parameter mask 14 is 0, the signal name is PV2 voltage. When bit 9 of power parameter mask 14 is 1, the following logic applies: When DC input display mode 30205 is 0, the signal name is PV2 voltage. When DC input display mode 30205 is 1, the signal name is MPPT2 voltage. |

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|---|---|---|---|---|---|---|---|---|
| 126 | PV2 current | RO | I16 | A | 100 | 32019 | 1 | When bit 9 of power parameter mask 14 is 0, the signal name is PV2 current. When bit 9 of power parameter mask 14 is 1, the following logic applies: When DC input display mode 30205 is 0, the signal name is PV2 current. When DC input display mode 30205 is 1, the signal name is MPPT2 current. |
| 127 | PV3 voltage | RO | I16 | V | 10 | 32020 | 1 | |
| 128 | PV3 current | RO | I16 | A | 100 | 32021 | 1 | |
| 129 | PV4 voltage | RO | I16 | V | 10 | 32022 | 1 | |
| 130 | PV4 current | RO | I16 | A | 100 | 32023 | 1 | |
| 131 | PV5 voltage | RO | I16 | V | 10 | 32024 | 1 | |
| 132 | PV5 current | RO | I16 | A | 100 | 32025 | 1 | |
| 133 | PV6 voltage | RO | I16 | V | 10 | 32026 | 1 | |
| 134 | PV6 current | RO | I16 | A | 100 | 32027 | 1 | |
| 135 | Total input power | RO | I32 | kW | 1000 | 32064 | 2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 136 | A-B line voltage of grid | RO | U16 | V | 10 | 32066 | 1 | When the output mode is L/N, the signal name is Grid voltage. When the output mode is L1/L2/N or L1/L2, the signal name is UW grid voltage. |
| 137 | B-C line voltage of grid | RO | U16 | V | 10 | 32067 | 1 | This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2. |
| 138 | C-A line voltage of grid | RO | U16 | V | 10 | 32068 | 1 | This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2. |
| 139 | Phase A voltage of grid | RO | U16 | V | 10 | 32069 | 1 | This parameter is invalid when the output mode is L/N. When the output mode is L1/L2/N or L1/L2, the signal name is UO grid voltage. This parameter is not displayed in off-grid mode. |
| 140 | Phase B voltage of grid | RO | U16 | V | 10 | 32070 | 1 | This parameter is invalid when the output mode is L/N. When the output mode is L1/L2/N or L1/L2, the signal name is WO grid voltage. This parameter is not displayed in off-grid mode. |
| 141 | Phase C voltage of grid | RO | U16 | V | 10 | 32071 | 1 | This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2. |
| 142 | Phase A current of grid | RO | I32 | A | 1000 | 32072 | 2 | When the output mode is L/N, L1/L2/N, or L1/L2, the signal name is Grid current. |
| 143 | Phase B current of grid | RO | I32 | A | 1000 | 32074 | 2 | This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2. |
| 144 | Phase C current of grid | RO | I32 | A | 1000 | 32076 | 2 | This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2. |
| 145 | Today's peak active power | RO | I32 | kW | 1000 | 32078 | 2 | |

  

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|---|---|---|---|---|---|---|---|---|
| 146 | Active power | RO | I32 | kW | 1000 | 32080 | 2 | |
| 147 | Reactive power | RO | I32 | kVar | 1000 | 32082 | 2 | |
| 148 | Power factor | RO | I16 | | 1000 | 32084 | 1 | |
| 149 | Grid frequency | RO | U16 | Hz | 100 | 32085 | 1 | |
| 150 | Inverter efficiency | RO | U16 | % | 100 | 32086 | 1 | Indicates the power generation efficiency when the PCS is used for power generation or the absorption efficiency when the PCS is used for power absorption. |
| 151 | Internal temperature | RO | I16 | °C | 10 | 32087 | 1 | |
| 152 | Insulation resistance | RO | U16 | MΩ | 1000 | 32088 | 1 | |
| 153 | Device status | RO | E16 | | | 32089 | 1 | For details, see the *Inverter Key Signal Extension Description*. |
| 154 | Error code | RO | U16 | | | 32090 | 1 | Fault code corresponding to the alarm with the highest priority. For details, see the Alarm Description sheet. |
| 155 | Startup time | RO | Epoch seconds | s | 1 | 32091 | 2 | Calculated by the monitoring module |

  

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|---|---|---|---|---|---|---|---|---|
| 156 | Shutdown time | RO | Epoch seconds | s | 1 | 32093 | 2 | Calculated by the monitoring module |
| 157 | Total yield | RO | U32 | kWh | 100 | 32106 | 2 | |
| 158 | Total DC input energy | RO | U32 | kWh | 100 | 32108 | 2 | |
| 159 | Statistical time of current energy yield | RO | Epoch seconds | s | 1 | 32110 | 2 | |
| 160 | Energy yield in current hour | RO | U32 | kWh | 100 | 32112 | 2 | |
| 161 | Yield today | RO | U32 | kWh | 100 | 32114 | 2 | |
| 162 | Yield this month | RO | U32 | kWh | 100 | 32116 | 2 | |
| 163 | Yield this year | RO | U32 | kWh | 100 | 32118 | 2 | |
| 164 | Inverter phase-A active power | RO | I32 | kWh | 1000 | 32133 | 2 | |
| 165 | Inverter phase-B active power | RO | I32 | kWh | 1000 | 32135 | 2 | |
| 166 | Inverter phase-C active power | RO | I32 | kWh | 1000 | 32137 | 2 | |

  

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|---|---|---|---|---|---|---|---|---|
| 167 | Alarm clearance SN | RO | U16 | | | 32155 | 1 | After an alarm is cleared locally, the SN increases by 1. After the alarm is inverted, the SN skips 0 and starts from 1. |
| 168 | Statistical time of energy in the previous hour | RO | Epoch seconds | s | 1 | 32156 | 2 | Including generated energy/ absorbed energy |
| 169 | Energy generated in the previous hour | RO | U32 | kWh | 100 | 32158 | 2 | |
| 170 | Statistical time of energy in the previous day | RO | Epoch seconds | s | 1 | 32160 | 2 | Including generated energy/ absorbed energy |
| 171 | Energy yield in the previous day | RO | U32 | kWh | 100 | 32162 | 2 | |
| 172 | Statistical time of energy in the previous month | RO | Epoch seconds | s | 1 | 32164 | 2 | Including generated energy/ absorbed energy |
| 173 | Energy yield in the previous month | RO | U32 | kWh | 100 | 32166 | 2 | |

  

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 174 | Statistical time of energy in the previous year | RO | Epoch seconds | s | 1 | 32168 | 2 | Including generated energy/ absorbed energy |
| 175 | Energy yield in the previous year | RO | U32 | kWh | 100 | 32170 | 2 | |
| 176 | SN of the latest active alarm | RO | U32 | | | 32172 | 2 | When a new active alarm is generated, the SN increases by 1. |
| 177 | SN of the latest historical alarm | RO | U32 | | | 32174 | 2 | When an active alarm is moved to the historical alarm list, the SN of the historical alarm is the same as that of the last active alarm transferred to the historical alarm list. |
| 178 | Total bus voltage | RO | I16 | V | 10 | 32176 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 179 | Highest PV voltage | RO | I16 | V | 10 | 32177 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 180 | Lowest PV voltage | RO | I16 | V | 10 | 32178 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 181 | Average voltage between PV– and ground | RO | I16 | V | 10 | 32179 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 182 | Highest voltage between PV+ and ground | RO | I16 | V | 10 | 32180 | 1 | Reported by the PID module; used in single-stage scenarios. |

  

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|---|---|---|---|---|---|---|---|---|
| 183 | Lowest voltage between PV– and ground | RO | I16 | V | 10 | 32181 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 184 | Inverter-PE withstand voltage | RO | U16 | V | 1 | 32182 | 1 | Reported by the PID module; used in single-stage scenarios. To be compatible with PID2.0, the PCS reports 1502. 0: 1000/1100 V inverter; 1500: HAV1 inverter; 1502: HAV2 inverter. |
| 185 | ISO characteristic information | RO | Bitfield16 | | 1 | 32183 | 1 | Reported by the PID module; used in single-stage scenarios. |
| 186 | Running status of built-in PID | RO | E16 | | | 32190 | 1 | |
| 187 | PV– voltage to ground | RO | I16 | V | 10 | 32191 | 1 | |
| 188 | MPPT 1 DC total yield | RO | U32 | kWh | 100 | 32212 | 2 | Displayed on the management system UI of TD Tech [5 points and 4 lines] |
| 189 | MPPT 2 DC total yield | RO | U32 | kWh | 100 | 32214 | 2 | Displayed on the management system UI of TD Tech [5 points and 4 lines] |
| 190 | MPPT 3 DC total yield | RO | U32 | kWh | 100 | 32216 | 2 | Displayed on the management system UI of TD Tech [5 points and 4 lines] |
| 191 | MPPT 4 DC total yield | RO | U32 | kWh | 100 | 32218 | 2 | Displayed on the management system UI of TD Tech [5 points and 4 lines] |
| 192 | Monitoring alarm 1 | RO | Bitfield16 | | | 32252 | 1 | GroupID: 0xFF00 |

  

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|---|---|---|---|---|---|---|---|---|
| 193 | Monitoring alarm 2 | RO | Bitfield16 | | | 32253 | 1 | GroupID: 0xFF01 |
| 194 | Monitoring alarm 3 | RO | Bitfield16 | | | 32254 | 1 | GroupID: 0xFF02 |
| 195 | [External] Power alarm 1 | RO | Bitfield16 | | | 32255 | 1 | GroupID: 0x0000 |
| 196 | [External] Power alarm 2 | RO | Bitfield16 | | | 32256 | 1 | GroupID: 0x0001 |
| 197 | [External] Power alarm 3 | RO | Bitfield16 | | | 32257 | 1 | GroupID: 0x0002 |
| 198 | [External] Power alarm 4 | RO | Bitfield16 | | | 32258 | 1 | GroupID: 0x0003 |
| 199 | [External] Power alarm 5 | RO | Bitfield16 | | | 32259 | 1 | GroupID: 0x0004 |
| 200 | [External] Power alarm 6 | RO | Bitfield16 | | | 32260 | 1 | GroupID: 0x0005 |
| 201 | [External] Power alarm 7 | RO | Bitfield16 | | | 32261 | 1 | GroupID: 0x0006 |

  

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|---|---|---|---|---|---|---|---|---|
| 202 | [External] Power alarm 8 | RO | Bitfield16 | | | 32262 | 1 | GroupID: 0x0007 |
| 203 | [External] Power alarm 9 | RO | Bitfield16 | | | 32263 | 1 | GroupID: 0x0008 |
| 204 | [External] Power alarm 10 | RO | Bitfield16 | | | 32264 | 1 | GroupID: 0x0009 |
| 205 | [External] Power alarm 11 | RO | Bitfield16 | | | 32265 | 1 | GroupID: 0x000A |
| 206 | [External] Power alarm 12 | RO | Bitfield16 | | | 32266 | 1 | GroupID: 0x000B |
| 207 | [External] Power alarm 13 | RO | Bitfield16 | | | 32267 | 1 | GroupID: 0x000C |
| 208 | Built-in PID alarm | RO | Bitfield16 | | | 32268 | 1 | GroupID: 0x000D |
| 209 | [External] Power alarm 15 | RO | Bitfield16 | | | 32269 | 1 | GroupID: 0x000E |
| 210 | Monitoring alarm 4 | RO | Bitfield16 | | | 32271 | 1 | GroupID: 0xFF03 |

  

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|---|---|---|---|---|---|---|---|---|
| 211 | Monitoring alarm 5 | RO | Bitfield16 | | | 32272 | 1 | GroupID: 0xFF04 |
| 212 | Monitoring alarm 6 | RO | Bitfield16 | | | 32274 | 1 | GroupID: 0xFF05 |
| 213 | MPPT1 total input power | RO | U32 | kW | 1000 | 32324 | 2 | |
| 214 | MPPT2 total input power | RO | U32 | kW | 1000 | 32326 | 2 | |
| 215 | MPPT3 total input power | RO | U32 | kW | 1000 | 32328 | 2 | |
| 216 | MPPT4 total input power | RO | U32 | kW | 1000 | 32330 | 2 | |
| 217 | MPPT 5 total input power | RO | U32 | kW | 1000 | 32332 | 2 | |
| 218 | MPPT 6 total input power | RO | U32 | kW | 1000 | 32334 | 2 | |
| 219 | MPPT 7 total input power | RO | U32 | kW | 1000 | 32336 | 2 | |
| 220 | MPPT 8 total input power | RO | U32 | kW | 1000 | 32338 | 2 | |

  

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|---|---|---|---|---|---|---|---|---|
| 221 | MPPT9 total input power | RO | U32 | kW | 1000 | 32340 | 2 | |
| 222 | PV25 voltage | RO | I16 | V | 10 | 32344 | 1 | |
| 223 | PV25 current | RO | I16 | A | 100 | 32345 | 1 | |
| 224 | PV26 voltage | RO | I16 | V | 10 | 32346 | 1 | |
| 225 | PV26 current | RO | I16 | A | 100 | 32347 | 1 | |
| 226 | PV27 voltage | RO | I16 | V | 10 | 32348 | 1 | |
| 227 | PV27 current | RO | I16 | A | 100 | 32349 | 1 | |
| 228 | PV28 voltage | RO | I16 | V | 10 | 32350 | 1 | |
| 229 | PV28 current | RO | I16 | A | 100 | 32351 | 1 | |
| 230 | Capacitor group runtime | RO | U32 | hour | 10 | 35000 | 2 | Used for inspection data |
| 231 | Internal fan 1 runtime | RO | U32 | hour | 10 | 35002 | 2 | Used for inspection data |
| 232 | Internal fan 2 runtime | RO | U32 | hour | 10 | 35004 | 2 | Used for inspection data |
| 233 | Internal fan 3 runtime | RO | U32 | hour | 10 | 35006 | 2 | Used for inspection data |
| 234 | Internal fan 4 runtime | RO | U32 | hour | 10 | 35008 | 2 | Used for inspection data |

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|---|---|---|---|---|---|---|---|---|
| 235 | Internal alarm | RO | U16 | V | 1 | 35010 | 1 | Stored as R&D data |
| 236 | Internal temperature 1 | RO | I16 | °C | 10 | 35021 | 1 | Temperature of inverter module A; recorded as R&D 5-minute data |
| 237 | Internal temperature 2 | RO | I16 | °C | 10 | 35022 | 1 | Temperature of inverter module B; recorded as R&D 5-minute data |
| 238 | Internal temperature 3 | RO | I16 | °C | 10 | 35023 | 1 | Temperature of inverter module C; recorded as R&D 5-minute data |
| 239 | Internal temperature 4 | RO | I16 | °C | 10 | 35024 | 1 | Sampled temperature of reverse polarity prevention module 1; recorded as R&D 5-minute data |
| 240 | Internal temperature 5 | RO | I16 | °C | 10 | 35025 | 1 | Ambient temperature of the output board relay - highest temperature; recorded as R&D 5-minute data |
| 241 | Internal temperature 6 | RO | I16 | °C | 10 | 35026 | 1 | Sampled temperature of the output board, power board input, and power board inverter – highest temperature; recorded as R&D 5-minute data |
| 242 | Internal temperature 7 | RO | I16 | °C | 10 | 35027 | 1 | Sampled temperature of reverse polarity prevention module 2; recorded as R&D 5-minute data |
| 243 | Internal temperature 8 | RO | I16 | °C | 10 | 35028 | 1 | DC terminal temperature 1/2: highest temperature, recorded as R&D 5-minute data |
| 244 | Internal temperature 9 | RO | I16 | °C | 10 | 35029 | 1 | AC terminal temperature 1/2/3: highest temperature, recorded as R&D 5-minute data |
| 245 | Internal temperature 10 | RO | I16 | °C | 10 | 35030 | 1 | Stored as R&D data |
| 246 | Internal temperature 11 | RO | I16 | °C | 10 | 35031 | 1 | Stored as R&D data |

  

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|---|---|---|---|---|---|---|---|---|
| 247 | Internal temperature 12 | RO | I16 | ℃ | 10 | 35032 | 1 | Stored as R&D data |
| 248 | Phase A DC component DCI | RO | I16 | A | 1000 | 35038 | 1 | Recorded as R&D 5-minute data |
| 249 | Phase B DC component DCI | RO | I16 | A | 1000 | 35039 | 1 | Recorded as R&D 5-minute data |
| 250 | Phase C DC component DCI | RO | I16 | A | 1000 | 35040 | 1 | Recorded as R&D 5-minute data |
| 251 | Leakage current RCD | RO | I16 | mA | 1 | 35041 | 1 | Recorded as R&D 5-minute data |
| 252 | Positive bus voltage | RO | I16 | V | 10 | 35042 | 1 | Recorded as R&D 5-minute data |
| 253 | Negative bus voltage | RO | I16 | V | 10 | 35043 | 1 | Recorded as R&D 5-minute data |
| 254 | Voltage between bus– and ground | RO | I16 | V | 10 | 35044 | 1 | Recorded as R&D 5-minute data |
| 255 | I-V curve scanning status | RO | E16 | | | 35094 | 1 | |
| 256 | I-V curve scanning capability | RO | E16 | | | 35095 | 1 | |
| 257 | Delayed activation status | RO | E16 | | | 35115 | 1 | |
| 258 | Active power adjustment status | RO | MLD | | | 35300 | 4 | For details, see the description of "Structure Data." |

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|---|---|---|---|---|---|---|---|---|
| 259 | Reactive power adjustment status | RO | MLD | | | 35304 | 4 | For details, see the description of "Structure Data." |
| 260 | Meter status | RO | E16 | | | 37100 | 1 | |
| 261 | Grid voltage (grid phase A voltage) | RO | I32 | V | 10 | 37101 | 2 | |
| 262 | Phase B voltage of grid | RO | I32 | V | 10 | 37103 | 2 | |
| 263 | Phase C voltage of grid | RO | I32 | V | 10 | 37105 | 2 | |
| 264 | Grid current (grid phase A current) | RO | I32 | A | 100 | 37107 | 2 | |
| 265 | Phase B current of grid | RO | I32 | A | 100 | 37109 | 2 | |
| 266 | Phase C current of grid | RO | I32 | A | 100 | 37111 | 2 | |
| 267 | Active power | RO | I32 | W | 1 | 37113 | 2 | |
| 268 | Reactive power | RO | I32 | Var | 1 | 37115 | 2 | |
| 269 | Power factor | RO | I16 | | 1000 | 37117 | 1 | |
| 270 | Grid frequency | RO | I16 | Hz | 100 | 37118 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 271 | Positive active power | RO | I32 | kWh | 100 | 37119 | 2 | |
| 272 | Reverse active power | RO | I32 | kWh | 100 | 37121 | 2 | |
| 273 | Cumulative reactive energy | RO | I32 | kVarh | 100 | 37123 | 2 | |
| 274 | Meter type | RO | E16 | | | 37125 | 1 | |
| 275 | A-B line voltage | RO | I32 | V | 10 | 37126 | 2 | |
| 276 | B-C line voltage | RO | I32 | V | 10 | 37128 | 2 | |
| 277 | C-A line voltage | RO | I32 | V | 10 | 37130 | 2 | |
| 278 | Phase A active power | RO | I32 | W | 1 | 37132 | 2 | |
| 279 | Phase B active power | RO | I32 | W | 1 | 37134 | 2 | |
| 280 | Phase C active power | RO | I32 | W | 1 | 37136 | 2 | |
| 281 | Meter type check | RO | E16 | | | 37138 | 1 | |
| 282 | Inverter overall status | RO | Bitfield16 | | | 37518 | 1 | |
| 283 | Inverter overall status support flag | RO | U16 | | 1 | 37519 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 284 | System time [local time] | RW | Epoch seconds | s | 1 | 40000 | 2 | The data is in epoch seconds of the local time. |
| 285 | Q-U characteristic curve mode | RW | E16 | | | 40037 | 1 | |
| 286 | Power percentage for triggering Q-U scheduling | RW | I16 | % | 1 | 40038 | 1 | |
| 287 | Fixed active power derating | RW | U16 | kW | 10 | 40120 | 1 | |
| 288 | Power factor | RW | I16 | | 1000 | 40122 | 1 | |
| 289 | Reactive power compensation (Q/S) [low precision] | RW | I16 | | 1000 | 40123 | 1 | The device converts the value to a fixed value of Q for reactive power control. S indicates $S_{max}$. |
| 290 | Reactive power adjustment time | RW | U16 | s | 1 | 40124 | 1 | Change requirement: The "Reactive power adjustment time" broadcast interface should be added to the delivery UI of the Q-P characteristic curve and cosphi-P characteristic curve, which is the same as the Q-U characteristic curve 20190918. |

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|---|---|---|---|---|---|---|---|---|
| 291 | Active power derating by percentage [low precision] | RW | I16 | % | 10 | 40125 | 1 | Interface for fine adjustment of active power |
| 292 | Fixed active power derating | RW | U32 | W | 1 | 40126 | 2 | Scope: [0, $P_{max}$] |
| 293 | Reactive power compensation at night (Q/S) | RW | I16 | | 1000 | 40128 | 1 | The device converts the value to a fixed value of Q for reactive power control. S indicates $S_{max}$. |
| 294 | Fixed nighttime reactive power | RW | I32 | kVar | 1000 | 40129 | 2 | |
| 295 | cosϕ-P/Pn characteristic curve | RW | MLD | | | 40133 | 21 | See the *Inverter Key Signal Extension Description*. |
| 296 | Q-U characteristic curve | RW | MLD | | | 40154 | 21 | See the *Inverter Key Signal Extension Description*. |
| 297 | PF-U characteristic curve | RW | MLD | | | 40175 | 21 | See the *Inverter Key Signal Extension Description*. |
| 298 | [Characteristic curve] Reactive power adjustment time | RW | U16 | s | 1 | 40196 | 1 | Change requirement: The "Reactive power adjustment time" broadcast interface should be added to the delivery UI of the Q-P characteristic curve and cosphi-P characteristic curve, which is the same as the Q-U characteristic curve 20190918. |

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|---|---|---|---|---|---|---|---|---|
| 299 | Apparent power in percentage | RW | U16 | % | 10 | 40197 | 1 | Used for overtemperature derating with the STS |
| 300 | Power percentage for exiting Q-U scheduling | RW | I16 | % | 1 | 40198 | 1 | |
| 301 | Active power percentage control [low precision] | RW | I16 | % | 10 | 40199 | 1 | Used in distributed mode. The active power percentage control interface is delivered to the power software in backflow prevention control to control the upper limit of the output active power during underfrequency-caused power raising. |
| 302 | Startup | WO | E16 | | | 40200 | 1 | |
| 303 | Shutdown | WO | E16 | | | 40201 | 1 | |
| 304 | Reset | WO | E16 | | | 40205 | 1 | After receiving the command, the DSP responds immediately and then resets. After receiving the command, the inverter monitoring module sends the command to the DSP. After receiving a normal response, the inverter monitoring module responds to the northbound port and resets 3s later. The device does not restart if the reply fails. |
| 305 | Q-P characteristic curve | RW | MLD | | | 40354 | 21 | See the *Inverter Key Signal Extension Description*. |

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|---|---|---|---|---|---|---|---|---|
| 306 | Minimum PF of Q-U characteristic curve | RW | U16 | | 1000 | 40375 | 1 | This interface is used to limit the output reactive power of the Q-U curve by limiting the current PF value. For the country codes for which this function is not required, the value is set to 0 by default, indicating that the reactive power output is not limited. EN 50549 requires that the value ranges from 0 to 1 and is 0.9 by default. |
| 307 | Delay for Q-U characteristic curve to take effect | RW | U16 | s | 1 | 40376 | 1 | After the voltage value on the Q-U curve reaches the trigger voltage, the reactive power changes after a delay time. Italy CEI0-16/21 requires that the default value be 3s, indicating that the Q-U curve takes effect 3s after the trigger voltage is reached. The delay can be set on the UI. For other country codes, the default value is 0. |
| 308 | Grid code | RW | U16 | | 1 | 42000 | 1 | CHINA_MV800. For details about the value range, see the *Grid Codes*. |
| 309 | Output mode | RW | E16 | | | 42001 | 1 | Displayed as a read-only signal on the customer UI. Currently, the 8.0 PCS supports only the three-phase three-wire system and the parameter does not need to be set. If the setting is supported, an interface change notification will be sent to each UI involved. |
| 310 | Voltage level | RW | U16 | V | 1 | 42002 | 1 | Vn |
| 311 | Frequency level | RW | U16 | Hz | 1 | 42003 | 1 | Fn |
| 312 | Remote power scheduling | RW | E16 | | | 42014 | 1 | If this parameter is disabled, the inverter is locked. |

  

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| 313 | Reactive power change gradient | RW | U32 | %/s | 1000 | 42015 | 2 | |
| 314 | Active power change gradient | RW | U32 | %/s | 1000 | 42017 | 2 | Limits the speed of power change caused by a power scheduling command. |
| 315 | Schedule instruction valid duration | RW | U32 | s | 1 | 42019 | 2 | The value 0 indicates that the command is valid permanently. |
| 316 | Maximum apparent power | RW | U32 | kVA | 1000 | 42021 | 2 | [Maximum active power, $S_{max}$] |
| 317 | Maximum active power | RW | U32 | kW | 1000 | 42023 | 2 | [0.1,$P_{max}$] |
| 318 | Apparent power baseline | RW | U32 | kVar | 1000 | 42025 | 2 | Sn. Upper limit of the maximum active power ($P_{max}$); also used as the reference for reactive power scheduling (Q/S). |
| 319 | Active power baseline | RW | U32 | kW | 1000 | 42027 | 2 | Lower limit of the maximum apparent power ($S_{max}$); also used as the reference for active scheduling (percentage). |
| 320 | Plant active power gradient | RW | U16 | min/100% | 1 | 42029 | 1 | According to Chinese standards, the active power change caused by irradiance fluctuation must meet certain speed requirements when the device is running properly. |
| 321 | Average active power filtering time | RW | U32 | ms | 1 | 42030 | 2 | |
| 322 | PF-U voltage detection filter time | RW | U16 | s | 10 | 42032 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 323 | Frequency detection filter time | RW | U16 | ms | 1 | 42037 | 1 | |
| 324 | Recovery delay of frequency-based active power derating | RW | U16 | s | 1 | 42040 | 1 | |
| 325 | Execution delay of frequency-based active power derating | RW | U16 | ms | 1 | 42041 | 1 | |
| 326 | Hysteresis of frequency-based active power derating | RW | E16 | | | 42042 | 1 | |
| 327 | Response deadband of frequency-based control | RW | U16 | Hz | 1000 | 42043 | 1 | |
| 328 | On/Off-grid switching mode | RW | E16 | | | 42044 | 1 | |
| 329 | Off-grid mode | RW | E16 | | | 42045 | 1 | |
| 330 | PQ mode | RW | E16 | | | 42046 | 1 | |
| 331 | PV module type | RW | E16 | | | 42047 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 332 | PID compensation direction | RW | E16 | | | 42048 | 1 | |
| 333 | String connection mode | RW | E16 | | | 42049 | 1 | |
| 334 | Isolation settings | RW | E16 | | | 42050 | 1 | Displayed as a read-only signal on the customer UI. Currently, 8.0 PCS supports only "input not grounded, with transformer" and the parameter does not need to be set. If the setting is supported, an interface change notification will be sent to each UI involved. |
| 335 | Power change gradient of frequency-based control | RW | U16 | %/min | 1 | 42051 | 1 | |
| 336 | Power change limit of frequency-based control | RW | U16 | % | 10 | 42052 | 1 | |
| 337 | Delay response time of frequency-based control | RW | U16 | ms | 1 | 42053 | 1 | This parameter is required in Poland and can be set. Initial delay in the frequency sensitive mode |
| 338 | MPPT multi-peak scanning | RW | E16 | | | 42054 | 1 | |
| 339 | MPPT scanning interval | RW | U16 | min | 1 | 42055 | 1 | |
| 340 | Predicted MPPT power | RO | U32 | kW | 1000 | 42056 | 2 | |

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|---|---|---|---|---|---|---|---|---|
| 341 | Auto start upon grid recovery | RW | E16 | | | 42061 | 1 | |
| 342 | Shutdown at 0% power limit | RW | E16 | | | 42062 | 1 | |
| 343 | Shutdown on communication failure | RW | E16 | | | 42063 | 1 | In a parallel system, 8.0 PCS automatically shuts down upon a communication interruption by default. The communication interruption duration is 1 minute. The customer-defined parameters and default power policy priority are determined by the PCS power. All parameters under **Communication disconnection fail-safe** are affected. |
| 344 | Start up array upon communication recovery | RW | E16 | | | 42064 | 1 | |
| 345 | Power quality optimization mode | RW | E16 | | | 42065 | 1 | |
| 346 | RCD enhancing | RW | E16 | | | 42066 | 1 | |
| 347 | Reactive power output at night | RW | E16 | | | 42067 | 1 | |
| 348 | PID protection at night | RW | E16 | | | 42069 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 349 | Apply nighttime reactive power parameters | RW | E16 | | | 42070 | 1 | |
| 350 | Communication disconnection detection time | RW | U16 | s | 1 | 42072 | 1 | This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**. |
| 351 | AFCI | RW | E16 | | | 42073 | 1 | |
| 352 | AFCI detection mode | RW | E16 | | | 42074 | 1 | |
| 353 | Communication disconnection fail-safe | RW | E16 | | | 42075 | 1 | Used to initiate security protection after the northbound communication of the device is interrupted. |
| 354 | Active power mode when communication fails | RW | E16 | | | 42076 | 1 | This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**. |
| 355 | Active power threshold when communication fails [kW] [low precision] | RW | U32 | kW | 10 | 42077 | 2 | This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable** and **Active power mode when communication fails** is set to a fixed value. |

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| 356 | Reactive power mode when communication fails | RW | E16 | | | 42079 | 1 | This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**. |
| 357 | Frequency change rate protection | RW | E16 | | | 42080 | 1 | |
| 358 | Frequency change rate protection threshold | RW | U16 | Hz/s | 10 | 42081 | 1 | |
| 359 | Duration threshold for frequency change rate protection | RW | U16 | s | 10 | 42082 | 1 | |
| 360 | Reactive power limit when communication fails [Q/S] [Low precision] | RW | I16 | | 1000 | 42083 | 1 | (Delivered Q/S value). This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable** and **Reactive power mode when communication fails** is set to **Q/S**. |
| 361 | Maximum grid voltage for grid connection | RW | U16 | V | 10 | 42084 | 1 | Parameter for normal reconnection |

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|---|---|---|---|---|---|---|---|---|
| 362 | Minimum grid voltage for grid connection | RW | U16 | V | 10 | 42085 | 1 | Parameter for normal reconnection |
| 363 | Maximum grid frequency for grid connection | RW | U16 | Hz | 100 | 42086 | 1 | Parameter for normal reconnection |
| 364 | Minimum grid frequency for grid connection | RW | U16 | Hz | 100 | 42087 | 1 | Parameter for normal reconnection |
| 365 | Maximum grid voltage for grid reconnection | RW | U16 | V | 10 | 42088 | 1 | Parameter for reconnection after a fault occurs |
| 366 | Minimum grid voltage for grid reconnection | RW | U16 | V | 10 | 42089 | 1 | Parameter for reconnection after a fault occurs |
| 367 | Maximum grid frequency for grid reconnection | RW | U16 | Hz | 100 | 42090 | 1 | Parameter for reconnection after a fault occurs |
| 368 | Minimum grid frequency for grid reconnection | RW | U16 | Hz | 100 | 42091 | 1 | Parameter for reconnection after a fault occurs |
| 369 | Delay for automatic grid reconnection | RW | U16 | s | 1 | 42092 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 370 | PV module nameplate short-circuit current (STC $I_{sc}$) | RW | U16 | A | 100 | 42093 | 1 | Short-circuit current $I_{sc}$ (STC) on the PV module template |
| 371 | Insulation resistance protection threshold | RW | U16 | MΩ | 1000 | 42097 | 1 | The value range on the customer UI is [0.02, 1.5]. The actual protection is performed by the inverter based on the DC voltage. The value range is [0.02, 1.5] for the 600 V DC inverter, [0.033, 1.5] for the 1000 V DC inverter, and [0.05, 1.5] for the 1500 V DC inverter. |
| 372 | Voltage imbalance protection threshold (%) | RW | U16 | % | 10 | 42098 | 1 | |
| 373 | Phase protection threshold | RW | U16 | ° | 10 | 42099 | 1 | |
| 374 | Soft start time after grid failure | RW | U16 | s | 1 | 42100 | 1 | Power raising gradient when the device is started after the power grid is faulty. |
| 375 | cosϕ-P/Pn trigger voltage | RW | U16 | % | 1 | 42101 | 1 | |
| 376 | cosϕ-P/Pn exit voltage | RW | U16 | % | 1 | 42102 | 1 | |
| 377 | Soft start time | RW | U16 | s | 1 | 42103 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 378 | Grid connection delay after grid recovery | RW | U16 | s | 1 | 42104 | 1 | |
| 379 | Duration for determining short-time grid disconnection | RW | U32 | ms | 1 | 42105 | 2 | This parameter is configurable if **Quick startup after grid fault** is enabled. |
| 380 | Shutdown gradient | RW | U32 | %/s | 1000 | 42107 | 2 | |
| 381 | Line loss compensation | RW | U16 | % | 10 | 42109 | 1 | |
| 382 | Zero-current mode on power grid fault | RW | E16 | | | 42110 | 1 | |
| 383 | Grid voltage trip triggering threshold | RW | U16 | % | 10 | 42111 | 1 | This parameter can be set only for the VDE4120. |
| 384 | HVRT | RW | E16 | | | 42112 | 1 | |
| 385 | HVRT triggering threshold | RW | U16 | V | 10 | 42113 | 1 | |
| 386 | Positive-sequence reactive power compensation factor in HVRT | RW | U16 | | 10 | 42114 | 1 | |

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|---|---|---|---|---|---|---|---|---|
| 387 | Quick startup for short-time grid disconnection | RW | E16 | | | 42116 | 1 | Indicates whether to enable the quick startup function after the power grid recovers from a short-time interruption. If this parameter is set to 0, the function is disabled, that is, the normal startup process is still used after the power grid recovers from a short-time interruption. If this parameter is set to 1, the quick startup process is used after the power grid recovers from a short-time interruption. In that process, some detection items are skipped and the power grid is quickly connected. Whether the power grid experiences a short-time interruption can be identified depending on whether the power grid recovers within the duration for determining short-time grid disconnection. |
| 388 | LVRT active current maintenance coefficient | RW | U16 | | 100 | 42118 | 1 | |
| 389 | LVRT | RW | E16 | | | 42119 | 1 | By default, this function is enabled for the BDEW standard and disabled for other standards. |
| 390 | LVRT triggering threshold | RW | U16 | V | 10 | 42120 | 1 | Specifies the threshold for triggering LVRT. The threshold settings should meet the local grid standard. |
| 391 | Deactivate grid voltage protection during VRT | RW | E16 | | | 42121 | 1 | Specifies whether to shield the voltage protection function during LVRT or HVRT. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 392 | Positive-sequence reactive power compensation factor in LVRT | RW | U16 | | 10 | 42122 | 1 | During LVRT, the device needs to generate positive-sequence reactive power to support the power grid. This parameter is used to set the positive-sequence reactive power generated by the device. For example, if **Positive-sequence reactive power compensation factor in LVRT** is set to **2**, the positive-sequence reactive current generated by the device increases by 20% of the rated current each time the AC voltage decreases by 10% during LVRT. |
| 393 | VRT exit hysteresis threshold | RW | U16 | V | 10 | 42123 | 1 | Specifies the LVRT/HVRT recovery threshold. LVRT recovery threshold = LVRT triggering threshold + VRT exit hysteresis threshold; HVRT recovery threshold = HVRT triggering threshold – VRT exit hysteresis threshold |
| 394 | VRT active current limiting in percentage | RW | U16 | % | 1 | 42124 | 1 | |
| 395 | VRT active power recovery gradient | RW | U16 | %/s | 1 | 42125 | 1 | |
| 396 | Negative-sequence reactive power compensation factor in HVRT | RW | U16 | | 10 | 42126 | 1 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 397 | Negative-sequence reactive power compensation factor in LVRT | RW | U16 | | 10 | 42127 | 1 | During LVRT, the device needs to generate negative-sequence reactive power to support the power grid. This parameter is used to set the negative-sequence reactive power generated by the device. For example, if **Negative-sequence reactive power compensation factor in LVRT** is set to **2**, the negative-sequence reactive current generated by the device increases by 20% of the rated current each time the AC voltage decreases by 10% during LVRT. |
| 398 | Phase angle offset protection | RW | E16 | | | 42128 | 1 | |
| 399 | Active islanding protection | RW | E16 | | | 42129 | 1 | |
| 400 | Passive islanding protection | RW | E16 | | | 42130 | 1 | |
| 401 | OVGR linked shutdown | RW | E16 | | | 42131 | 1 | |
| 402 | Dry contact function | RW | E16 | | | 42132 | 1 | |
| 403 | LVRT reactive current limiting in percentage | RW | U16 | % | 1 | 42133 | 1 | During LVRT, the device needs to limit the reactive current. For example, if **LVRT reactive current limiting in percentage** is set to **50**, the reactive current upper limit of the device is 50% of the rated current during LVRT. |

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|---|---|---|---|---|---|---|---|---|
| 404 | Threshold of LVRT zero-current mode | RW | U16 | V | 10 | 42134 | 1 | If **Zero-current mode on power grid fault** is enabled and the power grid voltage is less than **Threshold of LVRT zero-current mode** during LVRT, the zero current mode is used. Otherwise, the mode set in LVRT mode is used. |
| 405 | LVRT mode | RW | E16 | | | 42135 | 1 | |
| 406 | Voltage rise suppression | RW | E16 | | | 42138 | 1 | |
| 407 | Reactive power adjustment threshold for voltage rise suppression | RW | U16 | % | 10 | 42139 | 1 | **Active power derating threshold for voltage rise suppression** must be greater than that **Reactive power adjustment threshold for voltage rise suppression**. |
| 408 | Active power derating threshold for voltage rise suppression | RW | U16 | % | 10 | 42140 | 1 | **Active power derating threshold for voltage rise suppression** must be greater than that **Reactive power adjustment threshold for voltage rise suppression**. |
| 409 | Frequency-based control | RW | E16 | | | 42141 | 1 | According to the standards of some countries or regions, the power grid frequency may change around the rated value. In this case, the active power output needs to be slightly adjusted based on **Adjustment ratio of frequency-based control** to stabilize the power grid frequency. In this case, set this parameter to **Enable**. Frequency sensitive mode (FSM), which is described in the G99 standard. |

  

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 410 | Adjustment ratio of frequency-based control | RW | U16 | % | 1 | 42142 | 1 | Frequency sensitive mode (FSM) Droop, which is described in the G99 standard |
| 411 | Overfrequency-caused power derating | RW | E16 | | | 42143 | 1 | If this parameter is set to **Enable**, when the power grid frequency exceeds the frequency threshold for triggering overfrequency-caused power derating, the active power of the device is derated based on a certain gradient. |
| 412 | Frequency threshold for stopping overfrequency-caused power derating | RW | U16 | Hz | 100 | 42144 | 1 | Specifies the frequency threshold for stopping overfrequency derating. |
| 413 | Power threshold for stopping overfrequency-caused power derating | RW | U16 | % | 1 | 42145 | 1 | Specifies the power threshold for stopping overfrequency-caused derating. |
| 414 | Frequency threshold for triggering overfrequency-caused power derating | RW | U16 | Hz | 100 | 42146 | 1 | The standards of certain countries and regions require that the output active power of devices be derated when the power grid frequency exceeds a certain value. |

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|---|---|---|---|---|---|---|---|---|
| 415 | Frequency threshold for exiting overfrequency-caused power derating | RW | U16 | Hz | 100 | 42147 | 1 | Specifies the frequency threshold for exiting overfrequency derating. |
| 416 | Overfrequency-caused derating power recovery gradient | RW | U16 | %/min | 1 | 42148 | 1 | Specifies the power recovery rate for overfrequency-caused power derating. |
| 417 | Underfrequency-caused power raising | RW | E16 | | | 42151 | 1 | The standards of certain countries and regions require that if the power grid frequency is lower than **Frequency threshold for triggering underfrequency-caused power raising**, the device needs to increase the active power output to increase the power grid frequency. In this case, set this parameter to **Enable**. |
| 418 | Gradient of underfrequency-caused power raising | RW | U16 | %/min | 1 | 42152 | 1 | Specifies the power recovery rate for underfrequency-caused power raising. |
| 419 | LVRT characteristic curve | RW | MLD | | | 42155 | 21 | Specifies the low voltage ride-through capability of the device. For details, see the *Key Information Description Table*. The SmartLogger and management system support batch setting and provide a separate UI for users to edit. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 420 | Frequency threshold for stopping underfrequency-caused power raising | RW | U16 | Hz | 100 | 42176 | 1 | Specifies the frequency threshold for stopping underfrequency-caused power raising. |
| 421 | Power threshold for stopping underfrequency-caused power raising | RW | U16 | % | 1 | 42177 | 1 | Specifies the power threshold for stopping underfrequency-caused power raising. |
| 422 | Frequency threshold for triggering underfrequency-caused power raising | RW | U16 | Hz | 100 | 42178 | 1 | Specifies the frequency threshold for triggering underfrequency-caused power raising. |
| 423 | Frequency threshold for exiting underfrequency-caused power raising | RW | U16 | Hz | 100 | 42179 | 1 | Specifies the frequency threshold for exiting underfrequency-caused power raising. |
| 424 | Built-in PID running mode | RW | E16 | | | 42180 | 1 | |
| 425 | PID output voltage | RW | I16 | V | 10 | 42181 | 1 | Fixed output. This interface is reserved. The UI is not open. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 426 | PID | RW | E16 | | | 42182 | 1 | Currently, this parameter is reserved only for testing. |
| 427 | Active power change gradient | RW | U32 | %/s | 1000 | 42192 | 2 | This is a broadcast interface dedicated for the SmartLogger and does not support incremental reporting. It is used in remote output scenarios in Japan. |
| 428 | P-U curve | RW | MLD | | | 42221 | 21 | |
| 429 | P-U curve adjustment time | RW | U16 | s | 100 | 42242 | 1 | |
| 430 | 10-minute overvoltage protection threshold | RW | U16 | V | 10 | 42290 | 1 | Vn: voltage level, which is related to the grid code |
| 431 | 10-minute overvoltage protection duration | RW | U32 | ms | 1 | 42291 | 2 | |
| 432 | Level-1 overvoltage protection threshold | RW | U16 | V | 10 | 42293 | 1 | Vn: voltage level, which is related to the grid code |
| 433 | Level-1 overvoltage protection duration | RW | U32 | ms | 1 | 42294 | 2 | |

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|---|---|---|---|---|---|---|---|---|
| 434 | Level-2 overvoltage protection threshold | RW | U16 | V | 10 | 42296 | 1 | Vn: voltage level, which is related to the grid code |
| 435 | Level-2 overvoltage protection duration | RW | U32 | ms | 1 | 42297 | 2 | |
| 436 | Level-3 overvoltage protection threshold | RW | U16 | V | 10 | 42299 | 1 | Vn: voltage level, which is related to the grid code |
| 437 | Level-3 overvoltage protection duration | RW | U32 | ms | 1 | 42300 | 2 | |
| 438 | Level-4 overvoltage protection threshold | RW | U16 | V | 10 | 42302 | 1 | Vn: voltage level, which is related to the grid code |
| 439 | Level-4 overvoltage protection duration | RW | U32 | ms | 1 | 42303 | 2 | |
| 440 | Level-5 overvoltage protection threshold | RW | U16 | V | 10 | 42305 | 1 | Vn: voltage level, which is related to the grid code |

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|---|---|---|---|---|---|---|---|---|
| 441 | Level-5 overvoltage protection duration | RW | U32 | ms | 1 | 42306 | 2 | |
| 442 | Level-6 overvoltage protection threshold | RW | U16 | V | 10 | 42308 | 1 | Vn: voltage level, which is related to the grid code |
| 443 | Level-6 overvoltage protection duration | RW | U32 | ms | 1 | 42309 | 2 | |
| 444 | Level-1 undervoltage protection threshold | RW | U16 | V | 10 | 42311 | 1 | Vn: voltage level, which is related to the grid code |
| 445 | Level-1 undervoltage protection duration | RW | U32 | ms | 1 | 42312 | 2 | |
| 446 | Level-2 undervoltage protection threshold | RW | U16 | V | 10 | 42314 | 1 | Vn: voltage level, which is related to the grid code |
| 447 | Level-2 undervoltage protection duration | RW | U32 | ms | 1 | 42315 | 2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 448 | Level-3 undervoltage protection threshold | RW | U16 | V | 10 | 42317 | 1 | Vn: voltage level, which is related to the grid code |
| 449 | Level-3 undervoltage protection duration | RW | U32 | ms | 1 | 42318 | 2 | |
| 450 | Level-4 undervoltage protection threshold | RW | U16 | V | 10 | 42320 | 1 | Vn: voltage level, which is related to the grid code |
| 451 | Level-4 undervoltage protection duration | RW | U32 | ms | 1 | 42321 | 2 | |
| 452 | Level-5 undervoltage protection threshold | RW | U16 | V | 10 | 42323 | 1 | Vn: voltage level, which is related to the grid code |
| 453 | Level-5 undervoltage protection duration | RW | U32 | ms | 1 | 42324 | 2 | |
| 454 | Level-6 undervoltage protection threshold | RW | U16 | V | 10 | 42326 | 1 | Vn: voltage level, which is related to the grid code |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 455 | Level-6 undervoltage protection duration | RW | U32 | ms | 1 | 42327 | 2 | |
| 456 | Level-1 overfrequency protection threshold | RW | U16 | Hz | 100 | 42329 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 457 | Level-1 overfrequency protection duration | RW | U32 | ms | 1 | 42330 | 2 | |
| 458 | Level-2 overfrequency protection threshold | RW | U16 | Hz | 100 | 42332 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 459 | Level-2 overfrequency protection duration | RW | U32 | ms | 1 | 42333 | 2 | |
| 460 | Level-3 overfrequency protection threshold | RW | U16 | Hz | 100 | 42335 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 461 | Level-3 overfrequency protection duration | RW | U32 | ms | 1 | 42336 | 2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 462 | Level-4 overfrequency protection threshold | RW | U16 | Hz | 100 | 42338 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 463 | Level-4 overfrequency protection duration | RW | U32 | ms | 1 | 42339 | 2 | |
| 464 | Level-5 overfrequency protection threshold | RW | U16 | Hz | 100 | 42341 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 465 | Level-5 overfrequency protection duration | RW | U32 | ms | 1 | 42342 | 2 | |
| 466 | Level-6 overfrequency protection threshold | RW | U16 | Hz | 100 | 42344 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 467 | Level-6 overfrequency protection duration | RW | U32 | ms | 1 | 42345 | 2 | |
| 468 | Level-1 underfrequency protection threshold | RW | U16 | Hz | 100 | 42347 | 1 | Fn: indicates the frequency level, which is related to the grid code. |

  

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|---|---|---|---|---|---|---|---|---|
| 469 | Level-1 underfrequency protection duration | RW | U32 | ms | 1 | 42348 | 2 | |
| 470 | Level-2 underfrequency protection threshold | RW | U16 | Hz | 100 | 42350 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 471 | Level-2 underfrequency protection duration | RW | U32 | ms | 1 | 42351 | 2 | |
| 472 | Level-3 underfrequency protection threshold | RW | U16 | Hz | 100 | 42353 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 473 | Level-3 underfrequency protection duration | RW | U32 | ms | 1 | 42354 | 2 | |
| 474 | Level-4 underfrequency protection threshold | RW | U16 | Hz | 100 | 42356 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 475 | Level-4 underfrequency protection duration | RW | U32 | ms | 1 | 42357 | 2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 476 | Level-5 underfrequency protection threshold | RW | U16 | Hz | 100 | 42359 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 477 | Level-5 underfrequency protection duration | RW | U32 | ms | 1 | 42360 | 2 | |
| 478 | Level-6 underfrequency protection threshold | RW | U16 | Hz | 100 | 42362 | 1 | Fn: indicates the frequency level, which is related to the grid code. |
| 479 | Level-6 underfrequency protection duration | RW | U32 | ms | 1 | 42363 | 2 | |
| 480 | Delayed upgrade | RW | E16 | | | 42590 | 1 | |
| 481 | Hibernate at night | RW | E16 | | | 42591 | 1 | |
| 482 | Smart string monitoring | RW | E16 | | | 42594 | 1 | |
| 483 | String detection reference asymmetric coefficient | RW | U16 | | 100 | 42595 | 1 | |
| 484 | String detection startup power percentage | RW | U16 | % | 1 | 42596 | 1 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 485 | Communication interruption duration | RW | I16 | min | 1 | 42597 | 1 | |
| 486 | Inspection | WO | E16 | | | 42730 | 1 | Broadcast command interface. Note: The command value range is extended here. The most significant eight bits are used to mask the specified inspection action in the inspection function. This feature improves the inspection efficiency for specific purposes. Shen Yanbai 2019-07-02 |
| 487 | I-V curve scanning | WO | E16 | | | 42779 | 1 | Broadcast command interface |
| 488 | [System time] Year | WO | U16 | | 1 | 43000 | 1 | |
| 489 | [System time] Month | WO | U16 | | 1 | 43001 | 1 | |
| 490 | [System time] Day | WO | U16 | | 1 | 43002 | 1 | |
| 491 | [System time] Hour | WO | U16 | | 1 | 43003 | 1 | |
| 492 | [System time] Minute | WO | U16 | | 1 | 43004 | 1 | |
| 493 | [System time] Second | WO | U16 | | 1 | 43005 | 1 | |
| 494 | [RS485-1] Protocol type | RW | E16 | | | 43018 | 1 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 495 | [RS485-1] Communications address | RW | U16 | | 1 | 43019 | 1 | 0: broadcast address; 1–247: device address; 248–255: reserved |
| 496 | [RS485-1] Baud rate | RW | E16 | | | 43020 | 1 | The baud rate 115200 corresponds to bit 26 of feature code 3. |
| 497 | [RS485-1] Verification mode | RW | E16 | | | 43021 | 1 | |
| 498 | [RS485-1] Port mode | RW | E16 | | | 43022 | 1 | |
| 499 | [RS485-2] Protocol type | RW | E16 | | | 43033 | 1 | |
| 500 | [RS485-2] Communications address | RW | U16 | | 1 | 43034 | 1 | 0: broadcast address; 1–247: device address; 248–255: reserved |
| 501 | [RS485-2] Baud rate | RW | E16 | | | 43035 | 1 | The baud rate 115200 corresponds to bit 27 of feature code 3. |
| 502 | [RS485-2] Verification mode | RW | E16 | | | 43036 | 1 | |
| 503 | [RS485-2] Port mode | RW | E16 | | | 43037 | 1 | |
| 504 | Device name | RW | STR | | | 43349 | 10 | This parameter is left empty by default and is used by customers to change the device name. |
| 505 | [App] First power-on flag | RW | E16 | | | 43359 | 1 | Is the power-on flag needs to be cleared. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 506 | Restore factory settings | WO | E16 | | | 45000 | 1 | |
| 507 | Clear active alarms | WO | MLD | | | 45001 | 2 | |
| 508 | Reset alarms | WO | MLD | | | 45003 | 2 | |
| 509 | Clear alarms | WO | E16 | | | 45005 | 1 | |
| 510 | Mask alarms | WO | E16 | | | 45006 | 1 | |
| 511 | Start AFCI check | WO | U16 | | 1 | 45007 | 1 | Set the data field to 0. It is associated with the AFCI controller in the subdevice presence flag. |
| 512 | Adjust total energy yield | WO | U32 | kWh | 100 | 45008 | 2 | |
| 513 | Clear historical yield | WO | E16 | | | 45010 | 1 | Includes the total energy generated and total energy charged on the power side. |
| 514 | Clear runtime info | WO | E16 | | | 45011 | 1 | Clears information such as the total runtime, total fault duration, and total grid-tied runtime. |
| 515 | Spot-check | WO | E16 | | | 45012 | 1 | |
| 516 | ESN application command | WO | U16 | | 1 | 45015 | 1 | |
| 517 | Information restore | WO | MLD | | 1 | 45016 | 10 | Enter the device ESN in the data field. |
| 518 | Clearing User Data | WO | E16 | | | 45223 | 1 | |

  

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|---|---|---|---|---|---|---|---|---|
| 519 | Phase A active power percentage | RW | I16 | % | 100 | 45235 | 1 | |
| 520 | Phase B active power percentage | RW | I16 | % | 100 | 45236 | 1 | |
| 521 | Phase C active power percentage | RW | I16 | % | 100 | 45237 | 1 | |
| 522 | Three-phase imbalance control | RW | E16 | | | 45238 | 1 | |

**NOTICE**

Signals marked with * are supported only by certain models or standard codes.

# 3.2 Battery Equipment Registe

**Table 3-1** Battery Equipment Registe definitions

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 1 | [Energy storage unit 1] [1] Running status | RO | UINT16 | N/A | 1 | 37000 | 1 | 0: offline<br>1: standby<br>2: running<br>3: fault<br>4: sleep mode |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 2 | [Energy storage unit 1] Charge and discharge power | RO | INT32 | W | 1 | 37001 | 2 | > 0: charging<br>< 0: discharging |
| 3 | [Energy storage unit 1] Bus voltage | RO | UINT16 | V | 10 | 37003 | 1 | Energy storage module output voltage |
| 4 | [Energy storage unit 1] Battery SOC | RO | UINT16 | % | 10 | 37004 | 1 | Battery's state of capacity |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 5 | [Energy storage unit 1] Working mode | RO | UINT16 | N/A | 1 | 37006 | 1 | 0:none<br>1:Forcible charge/ discharge<br>2:Time of Use<br>3:Fixed charge/ discharge<br>4:Maximise self consumption<br>5:Fully fed to grid<br>6:Time of Use(LUNA2000)<br>7: remote scheduling-maximum self-use<br>8: remote scheduling - full Internet access<br>9: remote scheduling - TOU<br>10: AI energy management and scheduling<br>11: Remote scheduling - AI energy management scheduling<br>12: third-party scheduling |
| 6 | [Energy storage unit 1] Rated charge power | RO | UINT32 | W | 1 | 37007 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 7 | [Energy storage unit 1] Rated discharge power | RO | UINT32 | W | 1 | 37009 | 2 | - |
| 8 | [Energy storage unit 1] Fault ID | RO | UINT16 | N/A | 1 | 37014 | 1 | - |
| 9 | [Energy storage unit 1] Current-day charge capacity | RO | UINT32 | kWh | 100 | 37015 | 2 | - |
| 10 | [Energy storage unit 1] Current-day discharge capacity | RO | UINT32 | kWh | 100 | 37017 | 2 | - |
| 11 | [Energy storage unit 1] Bus current | RO | INT16 | A | 10 | 37021 | 1 | Energy storage module output current |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 12 | [Energy storage unit 1] battery temperature | RO | INT16 | ℃ | 10 | 37022 | 1 | - |
| 13 | [Energy storage unit 1] Remaining charge/ discharge time | RO | UINT16 | mins | 1 | 37025 | 1 | [0,1440] |
| 14 | [Energy storage unit 1] DCDCversion | RO | STRING | N/A | 1 | 37026 | 10 | eg. 7kW-V1.3 |
| 15 | [Energy storage unit 1] BMSversion | RO | STRING | N/A | 1 | 37036 | 10 | eg. 001. 002. 003. 004 |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 16 | [Energy storage]Maximum charge power | RO | UINT32 | W | 1 | 37046 | 2 | The value is the smaller value of the sum of the maximum charge and discharge capability of the solar inverter and the charge and discharge capability of the connected energy storage unit (ESU). |
| 17 | [Energy storage] Maximum discharge power | RO | UINT32 | W | 1 | 37048 | 2 | The value is the smaller value of the sum of the maximum charge and discharge capability of the solar inverter and the charge and discharge capability of the connected ESU. |
| 18 | [Energy storage unit 1] SN | RO | STRING | N/A | 1 | 37052 | 10 | - |
| 19 | [Energy storage unit 1] Total charge | RO | UINT32 | kWh | 100 | 37066 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 20 | [Energy storage unit 1] Total discharge | RO | UINT32 | kWh | 100 | 37068 | 2 | - |
| 21 | [Energy storage unit 2] SN | RO | BYTES | N/A | 1 | 37700 | 10 | - |
| 22 | [Energy storage unit 2] Battery SOC | RO | UINT16 | % | 10 | 37738 | 1 | Battery's state of capacity |
| 23 | [Energy storage unit 2] Running status | RO | UINT16 | N/A | 1 | 37741 | 1 | 0: offline<br>1: standby<br>2: running<br>3: fault<br>4: sleep mode |
| 24 | [Energy storage unit 2] Charge and discharge power | RO | INT32 | W | 1 | 37743 | 2 | > 0: charging<br>< 0: discharging |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 25 | [Energy storage unit 2] Current-day charge capacity | RO | UINT32 | kWh | 100 | 37746 | 2 | - |
| 26 | [Energy storage unit 2] Current-day discharge capacity | RO | UINT32 | kWh | 100 | 37748 | 2 | - |
| 27 | [Energy storage unit 2] Bus voltage | RO | UINT16 | V | 10 | 37750 | 1 | - |
| 28 | [Energy storage unit 2] Bus current | RO | INT16 | A | 10 | 37751 | 1 | - |
| 29 | [Energy storage unit 2] Battery temperature | RO | INT16 | ℃ | 10 | 37752 | 1 | |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 30 | [Energy storage unit 2] Total charge | RO | UINT32 | kWh | 100 | 37753 | 2 | - |
| 31 | [Energy storage unit 2] Total discharge | RO | UINT32 | kWh | 100 | 37755 | 2 | - |
| 32 | [Energy storage]Rated capacity | RO | UINT32 | Wh | 1 | 37758 | 2 | |
| 33 | [Energy storage]SOC | RO | UINT16 | % | 10 | 37760 | 1 | [0.0,100.0] |
| 34 | [Energy storage]Running status | RO | UINT16 | N/A | 1 | 37762 | 1 | 0: offline<br>1: standby<br>2: running<br>3: fault<br>4: sleep mode |
| 35 | [Energy storage]Bus voltage | RO | UINT16 | V | 10 | 37763 | 1 | - |
| 36 | [Energy storage]Bus current | RO | INT16 | A | 10 | 37764 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 37 | [Energy storage]Charge/ Discharge power | RO | INT32 | W | 1 | 37765 | 2 | - |
| 38 | [Energy storage]Total charge | RO | UINT32 | kWh | 100 | 37780 | 2 | Life-cycle accumulation |
| 39 | [Energy storage]Total discharge | RO | UINT32 | kWh | 100 | 37782 | 2 | Life-cycle accumulation |
| 40 | [Energy storage] Current-day charge capacity | RO | UINT32 | kWh | 100 | 37784 | 2 | Current-day accumulation |
| 41 | [Energy storage] Current-day discharge capacity | RO | UINT32 | kWh | 100 | 37786 | 2 | Current-day accumulation |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 42 | [Energy storage unit 2] software version | RO | STRING | N/A | 1 | 37799 | 15 | - |
| 43 | [Energy storage unit 1] software version | RO | STRING | N/A | 1 | 37814 | 15 | - |
| 44 | [Energy storage unit 1] [Battery pack1 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37920 | 1 | |
| 45 | [Energy storage unit 1] [Battery pack2 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37921 | 1 | |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 46 | [Energy storage unit 1] [Battery pack3 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37922 | 1 | |
| 47 | [Energy storage unit 2] [Battery pack1 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37923 | 1 | |
| 48 | [Energy storage unit 2] [Battery pack2 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37924 | 1 | |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 49 | [Energy storage unit 2] [Battery pack3 ]SOH Calibration Status | RO | UINT16 | N/A | N/A | 37925 | 1 | |
| 50 | SOH Calibration Status | RO | UINT16 | N/A | 1 | 37926 | 1 | |
| 51 | SOH Calibration Release the lower discharge limit of the SOC | RO | UINT16 | N/A | 10 | 37927 | 1 | |
| 52 | SOH Calibration Enable the backup power SOC. | RO | UINT16 | N/A | 10 | 37928 | 1 | |
| 53 | [Energy storage unit 1] [Battery pack1 ]SN | RO | STRING | N/A | N/A | 38200 | 10 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 54 | [Energy storage unit 1] [Battery pack1 ]Firmware version | RO | STRING | N/A | N/A | 38210 | 15 | - |
| 55 | [Energy storage unit 1] [Battery pack1 ]Working status | RO | UINT16 | N/A | N/A | 38228 | 1 | - |
| 56 | [Energy storage unit 1] [Battery pack1 ]SOC | RO | UINT16 | % | 10 | 38229 | 1 | - |
| 57 | [Energy storage unit 1] [Battery pack1 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38233 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 58 | [Energy storage unit 1] [Battery pack1 ]Voltage | RO | UINT16 | V | 10 | 38235 | 1 | - |
| 59 | [Energy storage unit 1] [Battery pack1 ]Current | RO | INT16 | A | 10 | 38236 | 1 | - |
| 60 | [Energy storage unit 1] [Battery pack1 ]Total charge | RO | UINT32 | kWh | 100 | 38238 | 2 | - |
| 61 | [Energy storage unit 1] [Battery pack1 ]Total discharge | RO | UINT32 | kWh | 100 | 38240 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 62 | [Energy storage unit 1] [Battery pack2 ]SN | RO | STRING | N/A | N/A | 38242 | 10 | - |
| 63 | [Energy storage unit 1] [Battery pack2 ]Firmware version | RO | STRING | N/A | N/A | 38252 | 15 | - |
| 64 | [Energy storage unit 1] [Battery pack2 ]Working status | RO | UINT16 | N/A | N/A | 38270 | 1 | - |
| 65 | [Energy storage unit 1] [Battery pack2 ]SOC | RO | UINT16 | % | 10 | 38271 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 66 | [Energy storage unit 1] [Battery pack2 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38275 | 2 | - |
| 67 | [Energy storage unit 1] [Battery pack2 ]Voltage | RO | UINT16 | V | 10 | 38277 | 1 | - |
| 68 | [Energy storage unit 1] [Battery pack2 ]Current | RO | INT16 | A | 10 | 38278 | 1 | - |
| 69 | [Energy storage unit 1] [Battery pack2 ]Total charge | RO | UINT32 | kWh | 100 | 38280 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 70 | [Energy storage unit 1] [Battery pack2 ]Total discharge | RO | UINT32 | kWh | 100 | 38282 | 2 | - |
| 71 | [Energy storage unit 1] [Battery pack3 ]SN | RO | STRING | N/A | N/A | 38284 | 10 | - |
| 72 | [Energy storage unit 1] [Battery pack3 ]Firmware version | RO | STRING | N/A | N/A | 38294 | 15 | - |
| 73 | [Energy storage unit 1] [Battery pack3 ]Working status | RO | UINT16 | N/A | N/A | 38312 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 74 | [Energy storage unit 1] [Battery pack3 ]SOC | RO | UINT16 | % | 10 | 38313 | 1 | - |
| 75 | [Energy storage unit 1] [Battery pack3 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38317 | 2 | - |
| 76 | [Energy storage unit 1] [Battery pack3 ]Voltage | RO | UINT16 | V | 10 | 38319 | 1 | - |
| 77 | [Energy storage unit 1] [Battery pack3 ]Current | RO | INT16 | A | 10 | 38320 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 78 | [Energy storage unit 1] [Battery pack3 ]Total charge | RO | UINT32 | kWh | 100 | 38322 | 2 | - |
| 79 | [Energy storage unit 1] [Battery pack3 ]Total discharge | RO | UINT32 | kWh | 100 | 38324 | 2 | - |
| 80 | [Energy storage unit 2] [Battery pack1 ]SN | RO | STRING | N/A | N/A | 38326 | 10 | - |
| 81 | [Energy storage unit 2] [Battery pack1 ]Firmware version | RO | STRING | N/A | N/A | 38336 | 15 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 82 | [Energy storage unit 2] [Battery pack1 ]Working status | RO | UINT16 | N/A | N/A | 38354 | 1 | - |
| 83 | [Energy storage unit 2] [Battery pack1 ]SOC | RO | UINT16 | % | 10 | 38355 | 1 | - |
| 84 | [Energy storage unit 2] [Battery pack1 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38359 | 2 | - |
| 85 | [Energy storage unit 2] [Battery pack1 ]Voltage | RO | UINT16 | V | 10 | 38361 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 86 | [Energy storage unit 2] [Battery pack1 ]Current | RO | INT16 | A | 10 | 38362 | 1 | - |
| 87 | [Energy storage unit 2] [Battery pack1 ]Total charge | RO | UINT32 | kWh | 100 | 38364 | 2 | - |
| 88 | [Energy storage unit 2] [Battery pack1 ]Total discharge | RO | UINT32 | kWh | 100 | 38366 | 2 | - |
| 89 | [Energy storage unit 2] [Battery pack2 ]SN | RO | STRING | N/A | N/A | 38368 | 10 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 90 | [Energy storage unit 2] [Battery pack2 ]Firmware version | RO | STRING | N/A | N/A | 38378 | 15 | - |
| 91 | [Energy storage unit 2] [Battery pack2 ]Working status | RO | UINT16 | N/A | N/A | 38396 | 1 | - |
| 92 | [Energy storage unit 2] [Battery pack2 ]SOC | RO | UINT16 | % | 10 | 38397 | 1 | - |
| 93 | [Energy storage unit 2] [Battery pack2 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38401 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 94 | [Energy storage unit 2] [Battery pack2 ]Voltage | RO | UINT16 | V | 10 | 38403 | 1 | - |
| 95 | [Energy storage unit 2] [Battery pack2 ]Current | RO | INT16 | A | 10 | 38404 | 1 | - |
| 96 | [Energy storage unit 2] [Battery pack2 ]Total charge | RO | UINT32 | kWh | 100 | 38406 | 2 | - |
| 97 | [Energy storage unit 2] [Battery pack2 ]Total discharge | RO | UINT32 | kWh | 100 | 38408 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 98 | [Energy storage unit 2] [Battery pack3 ]SN | RO | STRING | N/A | N/A | 38410 | 10 | - |
| 99 | [Energy storage unit 2] [Battery pack3 ]Firmware version | RO | STRING | N/A | N/A | 38420 | 15 | - |
| 100 | [Energy storage unit 2] [Battery pack3 ]Working status | RO | UINT16 | N/A | N/A | 38438 | 1 | - |
| 101 | [Energy storage unit 2] [Battery pack3 ]SOC | RO | UINT16 | % | 10 | 38439 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 102 | [Energy storage unit 2] [Battery pack3 ]Charge/ Discharge power | RO | INT32 | kW | 1000 | 38443 | 2 | - |
| 103 | [Energy storage unit 2] [Battery pack3 ]Voltage | RO | UINT16 | V | 10 | 38445 | 1 | - |
| 104 | [Energy storage unit 2] [Battery pack3 ]Current | RO | INT16 | A | 10 | 38446 | 1 | - |
| 105 | [Energy storage unit 2] [Battery pack3 ]Total charge | RO | UINT32 | kWh | 100 | 38448 | 2 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 106 | [Energy storage unit 2] [Battery pack3 ]Total discharge | RO | UINT32 | kWh | 100 | 38450 | 2 | - |
| 107 | [Energy storage unit 1] [Battery pack1 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38452 | 1 | - |
| 108 | [Energy storage unit 1] [Battery pack1 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38453 | 1 | - |
| 109 | [Energy storage unit 1] [Battery pack2 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38454 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 110 | [Energy storage unit 1] [Battery pack2 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38455 | 1 | - |
| 111 | [Energy storage unit 1] [Battery pack3 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38456 | 1 | - |
| 112 | [Energy storage unit 1] [Battery pack3 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38457 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 113 | [Energy storage unit 2] [Battery pack1 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38458 | 1 | - |
| 114 | [Energy storage unit 2] [Battery pack1 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38459 | 1 | - |
| 115 | [Energy storage unit 2] [Battery pack2 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38460 | 1 | - |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 116 | [Energy storage unit 2] [Battery pack2 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38461 | 1 | - |
| 117 | [Energy storage unit 2] [Battery pack3 ]Maximum temperature | RO | INT16 | ℃ | 10 | 38462 | 1 | - |
| 118 | [Energy storage unit 2] [Battery pack3 ]Minimum temperature | RO | INT16 | ℃ | 10 | 38463 | 1 | - |
| 119 | [Parallel system] Rechargeable power | RO | UINT32 | KW | 1000 | 38904 | 2 | |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 120 | [Parallel system] Dischargeable power | RO | UINT32 | kW | 1000 | 38906 | 2 | |
| 121 | [Parallel system] Heating pre-requested power | RO | UINT16 | W | 1 | 38908 | 1 | |
| 122 | [Parallel system] Dehumidification request power | RO | UINT16 | W | 1 | 38909 | 1 | |
| 123 | [Parallel system] Battery charge/ discharge request | RO | MLD/ Bytes | N/A | N/A | 38910 | 3 | Byte0: request type. 0: no request (default) 1: charging first 2: emergency charging 3: forcible charging 4: discharge first 5: forced discharge Byte1 - Byte 4 Maximum charge/ discharge power (unit: W, gain 1) |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 124 | [Parallel system] Energy storage preheating needs time | RO | UINT16 | min | N/A | 38913 | 1 | Value range: 0 to 1440 |
| 125 | [Parallel system] Battery health check event | RO | ENUM16 | N/A | N/A | 38914 | 1 | 0: initial 1: start event 2: end event 3: reminder event |
| 126 | [Parallel system] Battery health check status | RO | ENUM16 | N/A | N/A | 38915 | 1 | 0: to be detected 1: automatic detection 2: manual detection 3: The detection is successful. 4: check failed |
| 127 | [Energy storage unit 1] Product mode | RW | UINT16 | N/A | 1 | 47000 | 1 | 0：None<br>1: LG-RESU<br>2：HUAWEI-LUNA2000 |
| 128 | [Energy storage] Time-of-use electricity price periods | RW | MULTIDATA | N/A | 1 | 47028 | 41 | For details, see5.4 |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 129 | [Energy storage]Maximum charging power | RW | UINT32 | W | 1 | 47075 | 2 | [0, Upper threshold]<br>Default value: 3500; |
| 130 | [Energy storage]Maximum discharging power | RW | UINT32 | W | 1 | 47077 | 2 | [0, Upper threshold]<br>Default value: 3500; |
| 131 | [Energy storage]Charging cutoff capacity | RW | UINT16 | % | 10 | 47081 | 1 | [90,100]<br>Default value:100 |
| 132 | [Energy storage]<br>Discharge cutoff capacity | RW | UINT16 | % | 10 | 47082 | 1 | [12,20]<br>Default value:15 |
| 133 | [Energy storage]Forced charging and discharging period | RW | UINT16 | mins | 1 | 47083 | 1 | [0,1440]<br>The value is not stored. |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 134 | [Energy storage]Forced charging and discharging power | RW | INT32 | W | 1 | 47084 | 2 | [- "Maximum discharge power", "Maximum charge power"]<br>Forced charge/ discharge power ≤ Maximum charge/ discharge power ≤ Rated charge/ discharge power<br>Do not store |
| 135 | [Energy storage]Working mode settings | RW | UINT16 | N/A | 1 | 47086 | 1 | 0:Adaptive(Fixed charge/ discharge/ Maximise self consumption);<br>1:Fixed charge/ discharge;<br>2:Maximise self consumption;<br>3:Time Of Use;<br>4:Fully fed to grid;<br>5:Time Of Use(Luna) |
| 136 | [Energy storage] Charge from grid Function | RW | UINT16 | N/A | 1 | 47087 | 1 | 0: Disable<br>1: Enable |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 137 | [Energy storage] Grid charge cutoff SOC | RW | UINT16 | % | 10 | 47088 | 1 | [20,100]<br>Default: 50 |
| 138 | [Energy storage unit 2] Product model | RW | UINT16 | N/A | 1 | 47089 | 1 | 0: none<br>1: LG-RESU<br>2: HUAWEI-LUNA2000 |
| 139 | [Energy storage] Forcible charge/ discharge | RW | UINT16 | N/A | 1 | 47100 | 1 | 0: Stop<br>1: Charge<br>2: Discharge |
| 140 | [Energy storage] Target SOC | RW | UINT16 | % | 10 | 47101 | 1 | [0,100] |
| 141 | [Energy storage] Backup power SOC | RW | UINT16 | % | 10 | 47102 | 1 | Definition: Reseved energy storage capacity in backup mode<br>Setting range: [0,100]<br>Execution range:<br>Luna: [0,100], Default value: 0 |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 142 | [Energy storage] Product model | RW | UINT16 | N/A | 1 | 47106 | 1 | 0:none<br>1:LG-RESU<br>2:HUAWEI-LUNA2000 |
| 143 | [Energy storage unit 1] No. | RW | UINT16 | N/A | 1 | 47107 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 144 | [Energy storage unit 2] No. | RW | UINT16 | N/A | 1 | 47108 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 145 | Energy storage preheating | WO | ENUM16 | N/A | N/A | 47112 | 1 | 0: disabled 1: enabled |
| 146 | [Energy storage]<br>Fixed charging and discharging periods | RW | MULTIDATA | N/A | 1 | 47200 | 41 | For details, see5.4 |
| 147 | [Energy storage] Power of charge from grid | RW | UINT32 | kW | 1000 | 47242 | 2 | [0，maximum power of charge from grid] |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 148 | [Energy storage]Maximum power of charge from grid | RW | UINT32 | kW | 1000 | 47244 | 2 | Default:2000 |
| 149 | [Energy storage]Forcible charge/discharge setting mode | RW | UINT16 | N/A | 1 | 47246 | 1 | 0：Duration |
| 150 | [Energy storage] Forcible charge power | RW | UINT32 | kW | 1000 | 47247 | 2 | [0,maximum charge power] |
| 151 | [Energy storage] Forcible discharge power | RW | UINT32 | kW | 1000 | 47249 | 2 | [0,maximum discharge power] |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 152 | [Energy storage]Time of Use charging and discharging periods | RW | Bytes | N/A | 1 | 47255 | 43 | For details, see5.4 |
| 153 | [Energy storage] Excess PV energy use in TOU | RW | UINT16 | N/A | 1 | 47299 | 1 | 0: Fed to grid<br>1: Charge<br>Note: Bound with the grid code.<br>Japan: Fed to grid<br>Other countries: Charge |
| 154 | Three-party scheduling energy storage charge and discharge power | RW | INT32 | W | 1 | 47321 | 2 | > 0: charging; < 0: discharging; 0: not charging or discharging |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 155 | Active power control mode | RW | UINT16 | N/A | 1 | 47415 | 1 | 0: Unlimited (default)<br>1: DI active scheduling<br>5: Zero power grid connection<br>6: Power-limited grid connection (kW)<br>7: Power-limited grid connection (%) |
| 156 | Maximum Feed Grid Power (kW) | RW | INT32 | Kw | 1000 | 47416 | 2 | [-1000,Plant Capacity]<br>default:0 |
| 157 | Maximum Feed Grid Power (%) | RW | INT16 | % | 10 | 47418 | 1 | [0,100]<br>default:0 |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 158 | Charging and discharging remote control mode | RW | ENUM16 | N/A | N/A | 47589 | 1 | 0: near-end control 1: remote control-maximum self-consumption 2: remote control-full Internet access 3: remote control--TOU 4: Remote control-intelligent energy management 5: remote control-three-party scheduling |
| 159 | [Dongle] [Plant]maximum charge-from-grid power | RW | UINT32 | Kw | 1000 | 47590 | 2 | [0,30] |
| 160 | [Backup]Switch to off-grid | RW | UINT16 | N/A | 1 | 47604 | 1 | 0：Switch from grid-tied to off-grid |
| 161 | [Backup] Voltage in independent operation | RW | UINT16 | V | 1 | 47605 | 1 | 0: 101V<br>1: 202V |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 162 | [Energy storage unit 1] [Battery pack1 ]No. | RW | UINT16 | N/A | N/A | 47750 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 163 | [Energy storage unit 1] [Battery pack2 ]No. | RW | UINT16 | N/A | N/A | 47751 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 164 | [Energy storage unit 1] [Battery pack3 ]No. | RW | UINT16 | N/A | N/A | 47752 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 165 | [Energy storage unit 2] [Battery pack1 ]No. | RW | UINT16 | N/A | N/A | 47753 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 166 | [Energy storage unit 2] [Battery pack2 ]No. | RW | UINT16 | N/A | N/A | 47754 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |

| No. | Signal Name | Read/ Write | Type | Unit | Gain | Address | Quantity | Scope |
|---|---|---|---|---|---|---|---|---|
| 167 | [Energy storage unit 2] [Battery pack3 ]No. | RW | UINT16 | N/A | N/A | 47755 | 1 | [0,65534]<br>Default: 0. Which means no equipment. |
| 168 | [Parallel system ] Manual battery health check | RW | ENUM16 | N/A | N/A | 48219 | 1 | 0: stop 1: start |

**NOTICE**

[1]Two sets of energy storage devices at most can be connected to one inverter. If the inverter is connected to only one set of energy storage devices, the energy storage unit(ESU) corresponds to [Energy storage unit 1]. If two ESUs are connected, the second ESU corresponds to [Energy storage unit 2]. Two sets of HUAWEI-LUNA2000 can be connected.

# 4 Customized Interfaces

## 4.1 Obtaining the System Information of Optimizers

Data synchronization mechanism: The host is driven to refresh the system information of optimizers by the change of the serial number (SN).

Synchronization process: For details, see **6.3.7.1 Uploading Files**.

Data storage of the solar inverters: After the device search and positioning are complete, the record is updated. The record format is as follows:

File type: 0x45

**Table 4-1** File format(V102)

| Data | Length (Bytes) | Remarks |
| --- | --- | --- |
| File version | 4 | V103 |
| Feature data sequence number | 2 | |
| Length | 2 | |
| Reserved | 1 | The reserved byte 0 is defined as the status.<br>bit0: inverter disconnection status (1=disconnected) |
| | 3 | |
| Number of optimizers | 2 | Total number, including the offline optimizers. |
| Feature data of optimizer 1 | 108 | For details about the data domain definition, see the Optimizer Feature Data Domain Definition. |

| Data | Length (Bytes) | Remarks |
| --- | --- | --- |
| Feature data of optimizer 2 | 108 | |
| Feature data of optimizer… | 108 | |
| Feature data of optimizer N | 108 | |

**Table 4-2** Feature data unit format(V102)

| Data | Length (Bytes) | Remarks |
| --- | --- | --- |
| Optimizer address | 2 | RS485 address |
| Online status | 2 | 0: offline<br>1: online<br>2: disconnected |
| String number | 2 | |
| Position in current string | 2 | relative positive connection starting point |
| SN | 20 | |
| Software version | 30 | |
| Alias | 20 | |
| Model | 30 | |

**Table 4-3** Record format(V101)

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Format version | 4 | V101 |
| SN | 2 | - |
| Length | 2 | - |
| Reserved | 4 | - |
| Number of optimizers | 2 | *n*, including the offline optimizers |
| Feature data of optimizer 1 | 78 | - |

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Feature data of optimizer 2 | 78 | - |
| ... | ... | - |
| Feature data of optimizer *n* | 78 | - |

**Table 4-4** Feature data format (V101)

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Optimizer address | 2 | Logical communication address |
| Status | 2 | 0: offline<br>1: online |
| String number | 2 | - |
| Relative position of the PV string | 2 | 1: near DC wiring terminals of the solar inverters |
| SN | 20 | - |
| Software version | 30 | - |
| Alias | 20 | - |

# 4.2 Obtaining Real-time Data of Optimizers

Data synchronization mechanism: fifteen-minute interval

Synchronization process: uploads the files and synchronizes data according to the time period; uploads the most recent data if there is no filter condition. For details, see **6.3.7.1 Uploading Files**.

Data storage: stores real-time data at five-minute intervals.

File type: 0x44

**Table 4-5** Record format

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| File version | 4 | V101 |
| Reserved | 8 | - |

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Optimizer data unit 1 | N | 12 + 26 x Number of optimizers , For details about the definition of this unit, see the data unit format. |
| Optimizer data unit 2 | N | - |
| ... | - | - |
| Optimizer data unit *n* | N | *n* indicates the number of data records that meet the filter condition. Each piece of data contains all optimizer data for a time node. |

**Table 4-6** Data unit format (V101)

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Time | 4 | Epoch seconds, local time |
| Reserved | 4 | - |
| Length | 2 | - |
| Number of optimizers | 2 | - |
| Real-time data of optimizer 1 | 26 | For details about the definition of this unit, see the real-time data format. |
| Real-time data of optimizer 2 | 26 | - |
| ... | - | - |
| Real-time data of optimizer *n* | 26 | *n* is the number of optimizers. |

**Table 4-7** Real-time data format

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Optimizer address | 2 | Logical communication address |
| Output power | 2 | Gain: 10<br>Unit: W |

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Voltage to ground | 2 | Gain: 10<br>Unit: V |
| Alarm | 4 | Bit00: input overvoltage<br>Bit01: input undervoltage<br>Bit02: output overvoltage<br>Bit04: overtemperature<br>Bit06: output short circuit<br>Bit07: EEPROM fault<br>Bit08: internal hardware fault<br>Bit09: abnormal voltage to ground<br>Bit 10: power-off due to heartbeat timeout<br>Bit 11: fast shutdown<br>Bit 12: request escape alarm<br>Bit 13: version mismatch alarm<br>Bit 16: input overvoltage<br>Bit 17: overtemperature<br>Bit 18: output short circuit<br>Bit 19: internal hardware fault<br>Bit 20: version mismatch alarm<br>Bit 21: backfeed alarm<br>Bit 22: abnormal output voltage<br>Bit 23: upgrade failure<br>Bit 31: alarm display selection, 1=Display bit 16 to bit 30 alarms, 0: Bits 0 to 15 are displayed. |
| Output voltage | 2 | Gain: 10<br>Unit: V |
| Output current | 2 | Gain: 100<br>Unit: A |
| Input voltage | 2 | Gain: 10<br>Unit: V |
| Input current | 2 | Gain: 100<br>Unit: A |
| Temperature | 2 | Gain: 10<br>Unit: °C |

| Data | Length (Byte) | Remarks |
| --- | --- | --- |
| Running status | 2 | 0: offline<br>1: standby<br>3: faulty<br>4: running<br>12: power-off |
| Accumulated energy yield | 4 | Gain: 1000<br>Unit: kWh |

# 5 Interface Instructions

## 5.1 Alarm Information

**Table 5-1** Alarm information

| No. | Alarm | Bit | Alarm Name | Alarm ID | Level |
|---|---|---|---|---|---|
| 1 | Alarm 1 | 0 | High String Input Voltage | 2001 | Major |
| 2 | Alarm 1 | 1 | DC Arc Fault[1] | 2002 | Major |
| 3 | Alarm 1 | 2 | String Reverse Connection | 2011 | Major |
| 4 | Alarm 1 | 3 | String Current Backfeed | 2012 | Warning |
| 5 | Alarm 1 | 4 | Abnormal String Power | 2013 | Warning |
| 6 | Alarm 1 | 5 | AFCI Self-Check Fail.[1] | 2021 | Major |
| 7 | Alarm 1 | 6 | Phase Wire Short-Circuited to PE | 2031 | Major |
| 8 | Alarm 1 | 7 | Grid Loss | 2032 | Major |
| 9 | Alarm 1 | 8 | Grid Undervoltage | 2033 | Major |
| 10 | Alarm 1 | 9 | Grid Overvoltage | 2034 | Major |
| 11 | Alarm 1 | 10 | Grid Volt. Imbalance | 2035 | Major |

| No. | Alarm | Bit | Alarm Name | Alarm ID | Level |
|---|---|---|---|---|---|
| 12 | Alarm 1 | 11 | Grid Overfrequency | 2036 | Major |
| 13 | Alarm 1 | 12 | Grid Underfrequency | 2037 | Major |
| 14 | Alarm 1 | 13 | Unstable Grid Frequency | 2038 | Major |
| 15 | Alarm 1 | 14 | Output Overcurrent | 2039 | Major |
| 16 | Alarm 1 | 15 | Output DC Component Overhigh | 2040 | Major |
| 17 | Alarm 2 | 0 | Abnormal Residual Current | 2051 | Major |
| 18 | Alarm 2 | 1 | Abnormal Grounding | 2061 | Major |
| 19 | Alarm 2 | 2 | Low Insulation Resistance | 2062 | Major |
| 20 | Alarm 2 | 3 | Overtemperature | 2063 | Minor |
| 21 | Alarm 2 | 4 | Device Fault | 2064 | Major |
| 22 | Alarm 2 | 5 | Upgrade Failed or Version Mismatch | 2065 | Minor |
| 23 | Alarm 2 | 6 | License Expired | 2066 | Warning |
| 24 | Alarm 2 | 7 | Faulty Monitoring Unit | 61440 | Minor |
| 25 | Alarm 2 | 8 | Faulty Power Collector[2] | 2067 | Major |
| 26 | Alarm 2 | 9 | Battery abnormal | 2068 | Minor |
| 27 | Alarm 2 | 10 | Active Islanding | 2070 | Major |
| 28 | Alarm 2 | 11 | Passive Islanding | 2071 | Major |
| 29 | Alarm 2 | 12 | Transient AC Overvoltage | 2072 | Major |

| No. | Alarm | Bit | Alarm Name | Alarm ID | Level |
|---|---|---|---|---|---|
| 30 | Alarm 2 | 13 | Peripheral port short circuit[3] | 2075 | Warning |
| 31 | Alarm 2 | 14 | Churn output overload[4] | 2077 | Major |
| 32 | Alarm 2 | 15 | Abnormal PV module configuration | 2080 | Major |
| 33 | Alarm 3 | 0 | Optimizer fault[5] | 2081 | Warning |
| 34 | Alarm 3 | 1 | Built-in PID operation abnormal[6] | 2085 | Minor |
| 35 | Alarm 3 | 2 | High input string voltage to ground. | 2014 | Major |
| 36 | Alarm 3 | 3 | External Fan Abnormal | 2086 | Major |
| 37 | Alarm 3 | 4 | Battery Reverse Connection[7] | 2069 | Major |
| 38 | Alarm 3 | 5 | On-grid/Off-grid controller abnormal[4] | 2082 | Major |
| 39 | Alarm 3 | 6 | PV String Loss | 2015 | Warning |
| 40 | Alarm 3 | 7 | Internal Fan Abnormal | 2087 | Major |
| 41 | Alarm 3 | 8 | DC Protection Unit Abnormal[8] | 2088 | Major |

**NOTICE**

The preceding table lists the alarm information about Huawei solar inverters. Some alarms can be detected only after corresponding functional modules are configured.

NOTE

[1] AFCI functional unit

[2] Power collector or power meter connected to the solar inverters

[3] Detection of the external ports of the solar inverters that provide the 12 V power supply

[4] This item can be detected when a built-in or external on-grid/off-grid functional unit is configured.

[5] This item can be detected when optimizers are configured on the DC side.

[6] This item can be detected when the solar inverters are configured with PID functional units.

[7] This item can be detected when energy storage units (ESUs) are configured.

[8] Some models have DC protection units.

# 5.2 Power Grid Scheduling

This section describes the curve configuration format and precautions for power grid scheduling by curve.

## 5.2.1 cosϕ-P/Pn Characteristic Curve

**Table 5-2** cosϕ-P/$P_n$ characteristic curve definition

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| Number of points | U16 | 1 | N/A | [2, 10] |
| P/$P_n$ value at point 1 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 1 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 2 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 2 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 3 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 3 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 4 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 4 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 5 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 5 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 6 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 6 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| P/$P_n$ value at point 7 | U16 | 10 | % | [0,100] |
| cosϕ value at point 7 | I16 | 1000 | N/A | (–1,–0.8]U[0.8,1] |

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| $P/P_n$ value at point 8 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 8 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $P/P_n$ value at point 9 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 9 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $P/P_n$ value at point 10 | U16 | 10 | % | [0, 100] |
| cosϕ value at point 10 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |

## 5.2.2 Q-U Characteristic Curve

**Table2** Q-U Characteristic Curve definition

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| Number of points | U16 | 1 | N/A | [2, 10] |
| $U/U_n$ value at point 1 | U16 | 10 | % | [80, 136] |
| Q/S value at point 1 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 2 | U16 | 10 | % | [80, 136] |
| Q/S value at point 2 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 3 | U16 | 10 | % | [80, 136] |
| Q/S value at point 3 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 4 | U16 | 10 | % | [80, 136] |
| Q/S value at point 4 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 5 | U16 | 10 | % | [80, 136] |
| Q/S value at point 5 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 6 | U16 | 10 | % | [80, 136] |
| Q/S value at point 6 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 7 | U16 | 10 | % | [80, 136] |
| Q/S value at point 7 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 8 | U16 | 10 | % | [80, 136] |
| Q/S value at point 8 | I16 | 1000 | N/A | [–0.6, 0.6] |

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| $U/U_n$ value at point 9 | U16 | 10 | % | [80, 136] |
| Q/S value at point 9 | I16 | 1000 | N/A | [–0.6, 0.6] |
| $U/U_n$ value at point 10 | U16 | 10 | % | [80, 136] |
| Q/S value at point 10 | I16 | 1000 | N/A | [–0.6, 0.6] |

**NOTICE**

In Italian standards, this curve may be used together with the **Q-U characteristic curve mode**, **Q-U dispatch trigger power (%)**, and **Q-U power percentage to exit scheduling** parameters.

## 5.2.3 PF-U Characteristic Curve

**Table3** PF-U Characteristic Curve definition

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| Number of points | U16 | 1 | N/A | [2, 10] |
| $U/U_n$ value at point 1 | U16 | 10 | % | [80, 136] |
| PF value at point 1 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 2 | U16 | 10 | % | [80, 136] |
| PF value at point 2 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 3 | U16 | 10 | % | [80, 136] |
| PF value at point 3 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 4 | U16 | 10 | % | [80, 136] |
| PF value at point 4 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 5 | U16 | 10 | % | [80, 136] |
| PF value at point 5 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 6 | U16 | 10 | % | [80, 136] |
| PF value at point 6 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 7 | U16 | 10 | % | [80, 136] |
| PF value at point 7 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| $U/U_n$ value at point 8 | U16 | 10 | % | [80, 136] |
| PF value at point 8 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 9 | U16 | 10 | % | [80, 136] |
| PF value at point 9 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |
| $U/U_n$ value at point 10 | U16 | 10 | % | [80, 136] |
| PF value at point 10 | I16 | 1000 | N/A | (–1, –0.8]U[0.8, 1] |

# 5.3 Grid Codes

**Table 5-3** List of grid codes

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 0 | VDE-AR-N-4105 | Germany |
| 1 | NB/T 32004 | China |
| 2 | UTE C 15-712-1(A) | France |
| 3 | UTE C 15-712-1(B) | France |
| 4 | UTE C 15-712-1(C) | France |
| 5 | VDE 0126-1-1-BU | Bulgaria |
| 6 | VDE 0126-1-1-GR(A) | Greece |
| 7 | VDE 0126-1-1-GR(B) | Greece |
| 8 | BDEW-MV | Germany |
| 9 | G59-England | UK |
| 10 | G59-Scotland | UK |
| 11 | G83-England | UK |
| 12 | G83-Scotland | UK |
| 13 | CEI0-21 | Italy |
| 14 | EN50438-CZ | Czech Republic |
| 15 | RD1699/661 | Spain |
| 16 | RD1699/661-MV480 | Spain |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 17 | EN50438-NL | Netherlands |
| 18 | C10/11 | Belgium |
| 19 | AS4777 | Australia |
| 20 | IEC61727 | General |
| 21 | Custom (50 Hz) | Custom |
| 22 | Custom (60 Hz) | Custom |
| 23 | CEI0-16 | Italy |
| 24 | CHINA-MV480 | China |
| 25 | CHINA-MV | China |
| 26 | TAI-PEA | Thailand |
| 27 | TAI-MEA | Thailand |
| 28 | BDEW-MV480 | Germany |
| 29 | Custom MV480 (50 Hz) | Custom |
| 30 | Custom MV480 (60 Hz) | Custom |
| 31 | G59-England-MV480 | UK |
| 32 | IEC61727-MV480 | General |
| 33 | UTE C 15-712-1-MV480 | France |
| 34 | TAI-PEA-MV480 | Thailand |
| 35 | TAI-MEA-MV480 | Thailand |
| 36 | EN50438-DK-MV480 | Denmark |
| 37 | Japan standard (50 Hz) | Japan |
| 38 | Japan standard (60 Hz) | Japan |
| 39 | EN50438-TR-MV480 | Turkey |
| 40 | EN50438-TR | Turkey |
| 41 | C11/C10-MV480 | Belgium |
| 42 | Philippines | Philippines |
| 43 | Philippines-MV480 | Philippines |
| 44 | AS4777-MV480 | Australia |
| 45 | NRS-097-2-1 | South Africa |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 46 | NRS-097-2-1-MV480 | South Africa |
| 47 | KOREA | South Korea |
| 48 | IEEE 1547-MV480 | USA |
| 49 | IEC61727-60Hz | General |
| 50 | IEC61727-60Hz-MV480 | General |
| 51 | CHINA_MV500 | China |
| 52 | ANRE | Romania |
| 53 | ANRE-MV480 | Romania |
| 54 | ELECTRIC RULE NO.21-MV480 | California, USA |
| 55 | HECO-MV480 | Hawaii, USA |
| 56 | PRC_024_Eastern-MV480 | Eastern USA |
| 57 | PRC_024_Western-MV480 | Western USA |
| 58 | PRC_024_Quebec-MV480 | Quebec, Canada |
| 59 | PRC_024_ERCOT-MV480 | Texas, USA |
| 60 | PO12.3-MV480 | Spain |
| 61 | EN50438_IE-MV480 | Ireland |
| 62 | EN50438_IE | Ireland |
| 63 | IEEE 1547a-MV480 | USA |
| 64 | Japan standard (MV420-50 Hz) | Japan |
| 65 | Japan standard (MV420-60 Hz) | Japan |
| 66 | Japan standard (MV440-50 Hz) | Japan |
| 67 | Japan standard (MV440-60 Hz) | Japan |
| 68 | IEC61727-50Hz-MV500 | General |
| 70 | CEI0-16-MV480 | Italy |
| 71 | PO12.3 | Spain |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 72 | Japan standard (MV400-50 Hz) | Japan |
| 73 | Japan standard (MV400-60 Hz) | Japan |
| 74 | CEI0-21-MV480 | Italy |
| 75 | KOREA-MV480 | South Korea |
| 76 | Egypt ETEC | Egypt |
| 77 | Egypt ETEC-MV480 | Egypt |
| 78 | CHINA_MV800 | China |
| 79 | IEEE 1547-MV600 | USA |
| 80 | ELECTRIC RULE NO.21-MV600 | California, USA |
| 81 | HECO-MV600 | Hawaii, USA |
| 82 | PRC_024_Eastern-MV600 | Eastern USA |
| 83 | PRC_024_Western-MV600 | Western USA |
| 84 | PRC_024_Quebec-MV600 | Quebec, Canada |
| 85 | PRC_024_ERCOT-MV600 | Texas, USA |
| 86 | IEEE 1547a-MV600 | USA |
| 87 | EN50549-LV | Ireland |
| 88 | EN50549-MV480 | Ireland |
| 89 | Jordan-Transmission | Jordan |
| 90 | Jordan-Transmission-MV480 | Jordan |
| 91 | NAMIBIA | Namibia |
| 92 | ABNT NBR 16149 | Brazil |
| 93 | ABNT NBR 16149-MV480 | Brazil |
| 94 | SA_RPPs | South Africa |
| 95 | SA_RPPs-MV480 | South Africa |
| 96 | INDIA | India |
| 97 | INDIA-MV500 | India |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 98 | ZAMBIA | Zambia |
| 99 | ZAMBIA-MV480 | Zambia |
| 100 | Chile | Chile |
| 101 | Chile-MV480 | Chile |
| 102 | CHINA-MV500-STD | China |
| 103 | CHINA-MV480-STD | China |
| 104 | Mexico-MV480 | Mexico |
| 105 | Malaysian | Malaysia |
| 106 | Malaysian-MV480 | Malaysia |
| 107 | KENYA_ETHIOPIA | East Africa |
| 108 | KENYA_ETHIOPIA-MV480 | East Africa |
| 109 | G59-England-MV800 | UK |
| 110 | NIGERIA | Nigeria |
| 111 | NIGERIA-MV480 | Nigeria |
| 112 | DUBAI | Dubai |
| 113 | DUBAI-MV480 | Dubai |
| 114 | Northern Ireland | Northern Ireland |
| 115 | Northern Ireland-MV480 | Northern Ireland |
| 116 | Cameroon | Cameroon |
| 117 | Cameroon-MV480 | Cameroon |
| 118 | Jordan-Distribution | Jordan |
| 119 | Jordan-Distribution-MV480 | Jordan |
| 120 | Custom MV600-50 Hz | Custom |
| 121 | AS4777-MV800 | Australia |
| 122 | INDIA-MV800 | India |
| 123 | IEC61727-MV800 | General |
| 124 | BDEW-MV800 | Germany |
| 125 | ABNT NBR 16149-MV800 | Brazil |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 126 | UTE C 15-712-1-MV800 | France |
| 127 | Chile-MV800 | Chile |
| 128 | Mexico-MV800 | Mexico |
| 129 | EN50438-TR-MV800 | Turkey |
| 130 | TAI-PEA-MV800 | Thailand |
| 131 | Philippines-MV800 | Philippines |
| 132 | Malaysian-MV800 | Malaysia |
| 133 | NRS-097-2-1-MV800 | South Africa |
| 134 | SA_RPPs-MV800 | South Africa |
| 135 | Jordan-Transmission-MV800 | Jordan |
| 136 | Jordan-Distribution-MV800 | Jordan |
| 137 | Egypt ETEC-MV800 | Egypt |
| 138 | DUBAI-MV800 | Dubai |
| 139 | SAUDI-MV800 | Saudi Arabia |
| 140 | EN50438_IE-MV800 | Ireland |
| 141 | EN50549-MV800 | Ireland |
| 142 | Northern Ireland-MV800 | Northern Ireland |
| 143 | CEI0-21-MV800 | Italy |
| 144 | IEC 61727-MV800-60Hz | General |
| 145 | NAMIBIA_MV480 | Namibia |
| 146 | Japan (LV202-50 Hz) | Japan |
| 147 | Japan (LV202-60 Hz) | Japan |
| 148 | Pakistan-MV800 | Pakistan |
| 149 | BRASIL-ANEEL-MV800 | Brazil |
| 150 | Israel-MV800 | Israel |
| 151 | CEI0-16-MV800 | Italy |
| 152 | ZAMBIA-MV800 | Zambia |
| 153 | KENYA_ETHIOPIA-MV800 | East Africa |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 154 | NAMIBIA_MV800 | Namibia |
| 155 | Cameroon-MV800 | Cameroon |
| 156 | NIGERIA-MV800 | Nigeria |
| 157 | ABUDHABI-MV800 | Abu Dhabi |
| 158 | LEBANON | Lebanon |
| 159 | LEBANON-MV480 | Lebanon |
| 160 | LEBANON-MV800 | Lebanon |
| 161 | ARGENTINA-MV800 | Argentina |
| 162 | ARGENTINA-MV500 | Argentina |
| 163 | Jordan-Transmission-HV | Jordan |
| 164 | Jordan-Transmission-HV480 | Jordan |
| 165 | Jordan-Transmission-HV800 | Jordan |
| 166 | TUNISIA | Tunisia |
| 167 | TUNISIA-MV480 | Tunisia |
| 168 | TUNISIA-MV800 | Tunisia |
| 169 | JAMAICA-MV800 | Jamaica |
| 170 | AUSTRALIA-NER | Australia |
| 171 | AUSTRALIA-NER-MV480 | Australia |
| 172 | AUSTRALIA-NER-MV800 | Australia |
| 173 | SAUDI | Saudi Arabia |
| 174 | SAUDI-MV480 | Saudi Arabia |
| 175 | Ghana-MV480 | Ghana |
| 176 | Israel | Israel |
| 177 | Israel-MV480 | Israel |
| 178 | Chile-PMGD | Chile |
| 179 | Chile-PMGD-MV480 | Chile |
| 180 | VDE-AR-N4120-HV | Germany |
| 181 | VDE-AR-N4120-HV480 | Germany |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 182 | VDE-AR-N4120-HV800 | Germany |
| 183 | IEEE 1547-MV800 | USA |
| 184 | Nicaragua-MV800 | Nicaragua |
| 185 | IEEE 1547a-MV800 | USA |
| 186 | ELECTRIC RULE NO.21-MV800 | California, USA |
| 187 | HECO-MV800 | Hawaii, USA |
| 188 | PRC_024_Eastern-MV800 | Eastern USA |
| 189 | PRC_024_Western-MV800 | Western USA |
| 190 | PRC_024_Quebec-MV800 | Quebec, Canada |
| 191 | PRC_024_ERCOT-MV800 | Texas, USA |
| 192 | Custom-MV800-50Hz | Custom |
| 193 | RD1699/661-MV800 | Spain |
| 194 | PO12.3-MV800 | Spain |
| 195 | Mexico-MV600 | Mexico |
| 196 | Vietnam-MV800 | Vietnam |
| 197 | CHINA-LV220/380 | China |
| 198 | SVG-LV | Dedicated |
| 199 | Vietnam | Vietnam |
| 200 | Vietnam-MV480 | Vietnam |
| 201 | Chile-PMGD-MV800 | Chile |
| 202 | Ghana-MV800 | Ghana |
| 203 | TAIPOWER | Taiwan |
| 204 | TAIPOWER-MV480 | Taiwan |
| 205 | TAIPOWER-MV800 | Taiwan |
| 206 | IEEE 1547-LV208 | USA |
| 207 | IEEE 1547-LV240 | USA |
| 208 | IEEE 1547a-LV208 | USA |
| 209 | IEEE 1547a-LV240 | USA |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 210 | ELECTRIC RULE NO.21-LV208 | USA |
| 211 | ELECTRIC RULE NO.21-LV240 | USA |
| 212 | HECO-O+M+H-LV208 | USA |
| 213 | HECO-O+M+H-LV240 | USA |
| 214 | PRC_024_Eastern-LV208 | USA |
| 215 | PRC_024_Eastern-LV240 | USA |
| 216 | PRC_024_Western-LV208 | USA |
| 217 | PRC_024_Western-LV240 | USA |
| 218 | PRC_024_ERCOT-LV208 | USA |
| 219 | PRC_024_ERCOT-LV240 | USA |
| 220 | PRC_024_Quebec-LV208 | USA |
| 221 | PRC_024_Quebec-LV240 | USA |
| 222 | ARGENTINA-MV480 | Argentina |
| 223 | Oman | Oman |
| 224 | Oman-MV480 | Oman |
| 225 | Oman-MV800 | Oman |
| 226 | Kuwait | Kuwait |
| 227 | Kuwait-MV480 | Kuwait |
| 228 | Kuwait-MV800 | Kuwait |
| 229 | Bangladesh | Bangladesh |
| 230 | Bangladesh-MV480 | Bangladesh |
| 231 | Bangladesh-MV800 | Bangladesh |
| 232 | Chile-Net_Billing | Chile |
| 233 | EN50438-NL-MV480 | Netherlands |
| 234 | Bahrain | Bahrain |
| 235 | Bahrain-MV480 | Bahrain |
| 236 | Bahrain-MV800 | Bahrain |
| 238 | Japan-MV550-50Hz | Japan |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 239 | Japan-MV550-60Hz | Japan |
| 241 | ARGENTINA | Argentina |
| 242 | KAZAKHSTAN-MV800 | Kazakhstan |
| 243 | Mauritius | Mauritius |
| 244 | Mauritius-MV480 | Mauritius |
| 245 | Mauritius-MV800 | Mauritius |
| 246 | Oman-PDO-MV800 | Oman |
| 247 | EN50438-SE | Sweden |
| 248 | TAI-MEA-MV800 | Thailand |
| 249 | Pakistan | Pakistan |
| 250 | Pakistan-MV480 | Pakistan |
| 251 | PORTUGAL-MV800 | Portugal |
| 252 | HECO-L+M-LV208 | USA |
| 253 | HECO-L+M-LV240 | USA |
| 254 | C10/11-MV800 | Belgium |
| 255 | Austria | Austria |
| 256 | Austria-MV480 | Austria |
| 257 | G98 | UK |
| 258 | G99-TYPEA-LV | UK |
| 259 | G99-TYPEB-LV | UK |
| 260 | G99-TYPEB-HV | UK |
| 261 | G99-TYPEB-HV-MV480 | UK |
| 262 | G99-TYPEB-HV-MV800 | UK |
| 263 | G99-TYPEC-HV-MV800 | UK |
| 264 | G99-TYPED-MV800 | UK |
| 265 | G99-TYPEA-HV | UK |
| 266 | CEA-MV800 | India |
| 267 | EN50549-MV400 | Europe |
| 268 | VDE-AR-N4110 | Germany |

| No. | Standard | Applicable Country or Region |
|---|---|---|
| 269 | VDE-AR-N4110-MV480 | Germany |
| 270 | VDE-AR-N4110-MV800 | Germany |
| 271 | Panama-MV800 | Panama |
| 272 | North Macedonia-MV800 | Nprth Macedonia |
| 273 | NTS | Spain |
| 274 | NTS-MV480 | Spain |
| 275 | NTS-MV800 | Spain |
| 277 | CEA | India |
| 278 | CEA-MV480 | India |
| 279 | SINGAPORE | Singapore |
| 280 | SINGAPORE-MV480 | Singapore |
| 281 | SINGAPORE-MV800 | Singapore |
| 282 | HONGKONG | Hong Kong |
| 283 | HONGKONG-MV480 | Hong Kong |
| 284 | C10/11-MV400 | Belgium |

NOTICE

Set the grid code based on local laws and regulations.

# 5.4 Energy Storage Specifications

**Table 5-4** Format description of parameters for time-of-use electricity price periods

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| Number of periods | U16 | 1 | N/A | [0, 10] |
| Start time of period 1 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| End time of period 1 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Electricity price in period 1 | U32 | 1000 | N/A | N/A |
| Start time of period 2 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| End time of period 2 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Electricity price in period 2 | U32 | 1000 | N/A | N/A |
| ... | ... | ... | ... | ... |
| Start time of period 10 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| End time of period 10 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Electricity price in period 10 | U32 | 1000 | N/A | N/A |

**Table 5-5** Format description of parameters for fixed charging and discharging periods

| Description | Data Type | Gain | Unit | Value Range |
|---|---|---|---|---|
| Number of periods | U16 | 1 | N/A | [0, 10] |
| Start time of period 1 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| End time of period 1 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Charging and discharging power in period 1 | I32 | 1 | W | [Discharging power limit, Charging power limit]. For details, see the description of the supported model. |
| Start time of period 2 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| End time of period 2 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Charging and discharging power in period 2 | I32 | 1 | W | [Discharging power limit, Charging power limit]. For details, see the description of the supported model. |
| ... | ... | ... | ... | ... |
| Start time of period 10 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |

| Description | Data Type | Gain | Unit | Value Range |
| --- | --- | --- | --- | --- |
| End time of period 10 | U16 | 1 | min | [0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time. |
| Charging and discharging power in period 10 | I32 | 1 | W | [Discharging power limit, Charging power limit]. For details, see the description of the supported model. |

# 6 Overview of the Communications Protocol

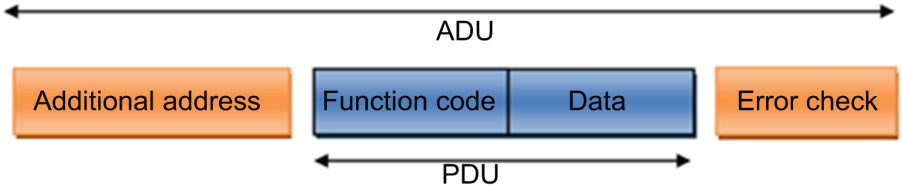
## 6.1 Physical Layer

Huawei solar inverters provide Modbus communication based on physical media such as MBUS, RS485, WLAN, FE, and 4G. MBUS and RS485 comply with the Modbus-RTU format. The communication through the WLAN, FE, and 4G media is based on the TCP link and complies with the Modbus-TCP format.

## 6.2 Data Link Layer

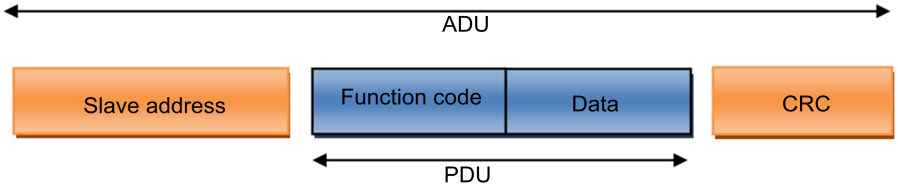
The following figure shows the generic frame structure of the Modbus protocol.

**Figure 6-1** Modbus generic frame format




### 6.2.1 Modbus-RTU

**Figure 6-2** Modbus-RTU frame format




#### 6.2.1.1 ADU Length

The application data unit (ADU) consists of 256 bytes based on the serial bus.

1. Slave address: 1 byte
2. Cyclic redundancy check (CRC): 2 bytes
3. PDU: 253 bytes

### 6.2.1.2 Communications Address

As shown in **Figure 6-2**, Modbus-RTU is usually used for serial communication. Slave address represents the address of a slave solar inverter. The address range is allocated as follows:

**Table 6-1** Serial link address allocation

| Broadcast Address | Slave Node Address | Reserved Address |
| --- | --- | --- |
| 0 | 1–247 | 248–255 |

Reserved addresses are used for access control of the communication extension modules. Huawei reserves the right to allocate the reserved addresses.

### 6.2.1.3 CRC

CRC applies to all bytes in front of the CRC code, which consists of 16 bits. The reference code is as follows:

```
static unsigned char auchCRCHi[] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40
} ;
/*CRC values for the low-order byte*/
static char auchCRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4,
0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD,
0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7,
0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE,
0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,
0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB,
0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,
0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
```

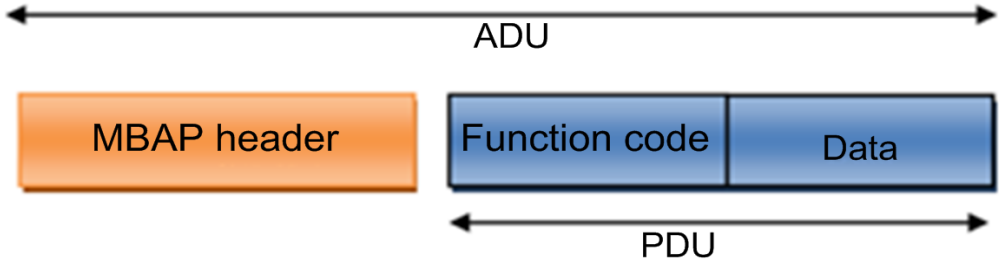
  

```
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88,
0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};
unsigned short CRC16 ( puchMsg, usDataLen ) /* The function returns the CRC as a unsigned short type */
unsigned char *puchMsg ; /* message to calculate CRC upon */
unsigned short usDataLen ; /* quantity of bytes in message */
{
unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */
unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
unsigned uIndex ; /* will index into CRC lookup table */
while (usDataLen--) /* pass through message buffer */
{
uIndex = uchCRCLo ^ *puchMsg++ ; /* calculate the CRC */
uchCRCLo = uchCRCHi ^ auchCRCHi[uIndex] ;
uchCRCHi = auchCRCLo[uIndex] ;
}
return (uchCRCHi << 8 | uchCRCLo) ;
}
```

Code source: *MODBUS over Serial Line Specification and Implementation Guide V1.02*

## 6.2.2 Modbus-TCP

**Figure 6-3** Modbus-TCP frame format




### 6.2.2.1 ADU Length

The recommended frame length is 260 bytes based on the standard. When some extended functions are applied, the data service provider may extend the ADU to a proper length based on the resources it possesses, to improve network transmission efficiency. The ADU length is indicated by the length field in the MBAP packet header.

### 6.2.2.2 MBAP Packet Header

If Modbus is applied to TCP/IP, a dedicated MBAP packet header (Modbus application protocol packet header) is used to identify the Modbus ADU. The Modbus packet header consists of four fields and seven bytes, which are defined as follows.

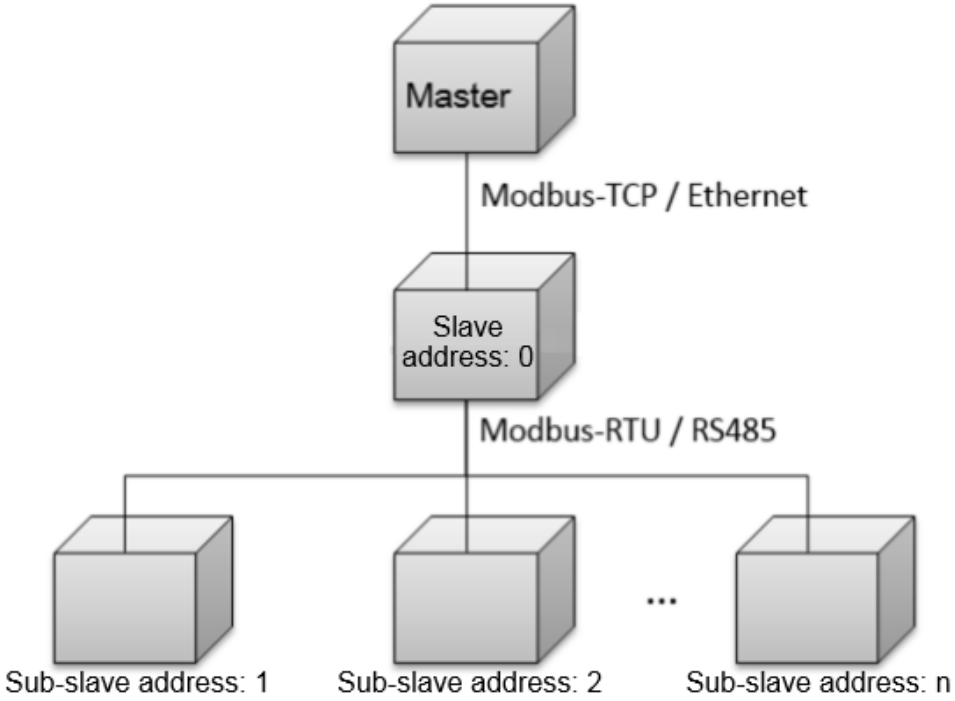
**Table 6-2** MBAP definition

| Data Field | Length (Byte) | Description | Client | Server |
|---|---|---|---|---|
| Transmission identifier | 2 | Matching identifier between a request frame and a response frame | Assigned by the client; better be unique for each data frame | The identifier of the response frame from the server must be consistent with that of the request frame. |
| Protocol type | 2 | 0 = Modbus protocol | Assigned by the client; 0 by default | The identifier of the response frame from the server must be consistent with that of the request frame. |
| Data length | 2 | Follow-up data length | Assigned by the client based on the actual data frame | Assigned by the server based on the actual frame length |
| Logical device ID | 1 | 0 | Assigned by the client based on the actual data frame request | The identifier of the response frame from the server must be consistent with that of the request frame. |

### 6.2.2.3 Communications Address

Based on the TCP communications host, unit 0 is used by default to access the directly connected slave node, and other addresses are used to access the downstream devices of the slave node. The default address of the slave node is 0. The address is adjustable.

**Figure 6-4** Communications address of the three-layer object structure




### 6.2.2.4 TCP Port

In a local area network or VPN environment, the master node may actively initiate TCP socket link establishment to the slave node. The master node can use the 502 port to request data services from the slave node.

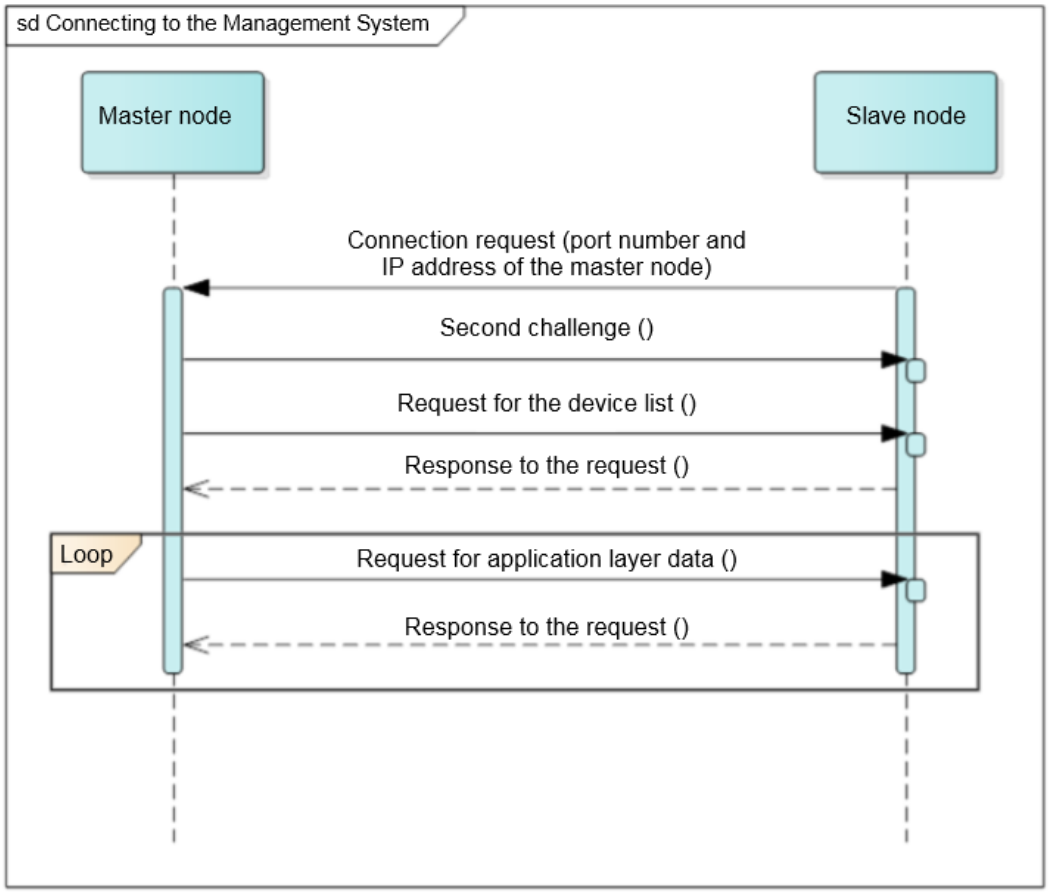
In a non-VPN environment across the public network, the device deployed on the internal network needs to initiate TCP socket link establishment to the master node exposed on the public network. In this case, you need to preset the fixed access port number of the master node on the slave node. To ensure security and reduce traffic, the master node must provide at least one encrypted port and one non-encrypted port.

### 6.2.2.5 TCP Link Establishment Process

This section focuses on the cross-public network application.

The following figure shows the process of connecting a slave node.

**Figure 6-5** Process of establishing a secure TCP connection




# 6.3 Application Layer

## 6.3.1 Function Code List

**Table 6-3** Function code list

| Function Code | Meaning | Remarks |
|---|---|---|
| 0x03 | Read registers. | Continuously reads a single register or multiple registers. |
| 0x06 | Write a single register. | Writes into a single register. |
| 0x10 | Write multiple registers. | Continuously writes into multiple registers. |

## 6.3.2 Exception Code List

The exception codes must be unique for each network element (NE) type. The names and descriptions should be provided in both the Chinese and English NE

interface document. Different versions of the same NE type must be backward compatible. Exception codes in use cannot be assigned to other exceptions.

**Table 6-4** Exception codes returned by an NE (0x00–0x8F are for common exception codes)

| Code | Name | Description |
| --- | --- | --- |
| 0x01 | Illegal function | The function code received in the query is not an allowable action for the server (or slave node). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave node) is in the wrong state to process a request of this type, for example because it is not configured and is being asked to return register values. |
| 0x02 | Illegal data address | The data address received in the query is not an allowable address for the server. More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, the PDU addresses the first register as 0, and the last one as 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 4, then this request will successfully operate (address-wise at least) on registers 96, 97, 98, 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 5, then this request will fail with Exception Code 0x02 "Illegal Data Address" since it attempts to operate on registers 96, 97, 98, 99 and 100, and there is no register with address 100. |
| 0x03 | Illegal data value | The value contained in the query data field is not an allowable value for the server (or slave). The value indicates a fault in the structure of the remainder of a complex request, such as an incorrectly implied length. It specifically does not mean that a data item submitted for storage in a register has a value outside the expectation of the application program since the Modbus protocol is unaware of the significance of any particular value of any particular register. |
| 0x04 | Slave node failure | An error occurred while the server was attempting to perform the requested action. |
| 0x06 | Slave device busy | The server cannot accept a Modbus request PDU. A client application determines whether and when to resend the request. |

| Code | Name | Description |
| --- | --- | --- |
| 0x80 | No permission | An operation is not allowed because of a permission authentication failure or permission expiration. |

## 6.3.3 Reading Registers (0x03)

### 6.3.3.1 Frame Format of a Request from a Master Node

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x03 |
| Register start address | 2 | 0x0000–0xFFFF |
| Number of registers | 2 | 1–125 |

### 6.3.3.2 Frame Format of a Normal Response from a Slave Node

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x03 |
| Number of bytes | 1 | 2 x N |
| Register value | 2 x N | N/A |

N refers to the number of registers.

### 6.3.3.3 Frame Format of an Abnormal Response from a Slave Node

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x83 |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.3.4 Examples

This section takes the Modbus-TCP communications frames as an example. The differences between Modbus-RTU and Modbus-TCP lie in the additional address field and the CRC. Pay attention to the differences when using the Modbus-RTU frames. This also works for the follow-up examples.

The master node sends a query request (register address: 32306/0X7E32) to the slave node (logical device ID: 00).

| Description | | Frame Data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 06 |
| | Logical device ID | 00 |
| Function code | | 03 |
| Data | Register address | 7E |
| | | 32 |
| | Number of registers | 00 |
| | | 02 |

Normal response from the slave node

| Description | | Frame Data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 07 |
| | Logical device ID | 00 |
| Function code | | 03 |
| Data | Number of bytes | 04 |
| | Register data | 00 |
| | | 00 |
| | | 00 |
| | | 01 |

Abnormal response from the slave node

| Description | | Frame data |
|---|---|---|
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 03 |
| | Logical device ID | 00 |
| Function code | | 83 |
| Data | Error code | 03 |

## 6.3.4 Writing a Single Register (0x06)

### 6.3.4.1 Frame Format of a Request from a Master Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x06 |
| Register address | 2 | 0x0000–0xFFFF |
| Register value | 2 | 0x0000–0xFFFF |

### 6.3.4.2 Frame Format of a Normal Response from a Slave Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x06 |
| Register address | 2 | 0x0000–0xFFFF |
| Register value | 2 | 0x0000–0xFFFF |

### 6.3.4.3 Frame Format of an Abnormal Response from a Slave Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x86 |

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.4.4 Examples

A master node sends a command (register address: 40200/0X9D08) to a slave node (address: 00).

| Description | | Frame data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 06 |
| | Logical device ID | 00 |
| Function code | | 06 |
| Data | Register address | 9D |
| | | 08 |
| | Register data | 00 |
| | | 00 |

Normal response from the slave node

| Description | | Frame Data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 06 |
| | Logical device ID | 00 |

| Description | | Frame Data |
|---|---|---|
| Function code | | 06 |
| Data | Register address | 9D |
| | | 08 |
| | Register data | 00 |
| | | 00 |

Abnormal response from the slave node

| Description | | Frame Data |
|---|---|---|
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 03 |
| | Logical device ID | 00 |
| Function code | | 86 |
| Data | Error code | 04 |

## 6.3.5 Writing Multiple Registers (0x10)

### 6.3.5.1 Frame Format of a Request from a Master Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x10 |
| Register start address | 2 | 0x0000–0xFFFF |
| Number of registers | 2 | 0x0000–0x007b |
| Number of bytes | 1 | 2 x N |
| Register value | 2 x N | Value |

N refers to the number of registers.

### 6.3.5.2 Frame Format of a Normal Response from a Slave Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x10 |
| Register address | 2 | 0x0000–0xFFFF |
| Number of registers | 2 | 0x0000–0x007b |

### 6.3.5.3 Frame Format of an Abnormal Response from a Slave Node

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x90 |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.5.4 Examples

The master node sets the register address 40118/0X9CB6 to 2 and the register address 40119/0X9CB7 to 50 for the slave node (address: 00). The request frame format is as follows.

| Description | | Frame Data |
|---|---|---|
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 0B |
| | Logical device ID | 00 |
| Function code | | 10 |
| Data | Register address | 9C |
| | | B6 |
| | Number of registers | 00 |
| | | 02 |
| | Number of bytes | 04 |
| | Register data | 00 |

| Description | | Frame Data |
| --- | --- | --- |
| | | 02 |
| | | 00 |
| | | 32 |

Normal response from the slave node

| Description | | Frame Data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 06 |
| | Logical device ID | 00 |
| Function code | | 10 |
| Data | Register address | 9C |
| | | B6 |
| | Number of registers | 00 |
| | | 02 |

Abnormal response from the slave node

| Description | | Frame Data |
| --- | --- | --- |
| MBAP header | Protocol identifier | 00 |
| | | 01 |
| | Protocol type | 00 |
| | | 00 |
| | Data length | 00 |
| | | 03 |
| | Logical device ID | 00 |
| Function code | | 90 |

| Description | | Frame Data |
|---|---|---|
| Data | Error code | 04 |

## 6.3.6 Reading Device Identifiers (0x2B)

This command code allows reading identifiers and added packets that are relevant to the physical and function description of the remote devices.

Simulate the interface of the read device identifier as an address space. This address space consists of a set of addressable data elements. The data elements are objects to be read, and the object IDs determine these data elements.

A data element consists of three objects:

1. Basic device identifier: All objects of this type are mandatory, such as the vendor name, product code, and revision version.
2. Normal device identifier: Except basic data objects, the device provides additional and optional identifiers and data object description. Define all types of objects according to definitions in the standard, but the execution of this type of objects is optional.
3. Extended device identifier: In addition to the normal data objects, the device provides additional and optional identifiers and special data object description. All the data is related to the device.

**Table 6-5** Reading device identifiers

| Object ID | Object Name or Description | Type | Mandatory or Optional (M/O) | Type |
|---|---|---|---|---|
| 0x00 | Manufacturer name | ASCII character string | M | Basic |
| 0x01 | Product code | ASCII character string | M | |
| 0x02 | Main revision version | ASCII character string | M | |
| 0x03–0x7F | - | - | - | Normal |
| 0x80–0xFF | - | - | - | Expansion |

### 6.3.6.1 Command for Querying Device Identifiers

**Table 6-6** Request frame format

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x2B |
| MEI type | 1 | 0x0E |
| ReadDevId code | 1 | 01 |
| Object ID | 1 | 0x00 |

**Table 6-7** Frame format for a normal response

| Data Field | | | Length (Byte) | Description |
|---|---|---|---|---|
| Function code | | | 1 | 0x2B |
| MEI type | | | 1 | 0x0E |
| ReadDevId code | | | 1 | 01 |
| Consistency level | | | 1 | 01 |
| More | | | 1 | - |
| Next object ID | | | 1 | - |
| Number of objects | | | 1 | - |
| Object list | First object | Object ID | 1 | 0x00 |
| | | Object length | 1 | N |
| | | Object value | N | - |
| | ... | ... | ... | ... |

**Table 6-8** Object list

| Object ID | Object Name or Description | Description | Type |
|---|---|---|---|
| 0x00 | Manufacturer name | HUAWEI | Basic |
| 0x01 | Product code | SUN2000 | |
| 0x02 | Main revision version | ASCII character string, software version | |

**Table 6-9** Frame format for an abnormal response

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0xAB |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.6.2 Command for Querying a Device List

**Table 6-10** Request frame format

| Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x2B |
| MEI type | 1 | 0x0E |
| ReadDevId code | 1 | 03 |
| Object ID | 1 byte | 0x87 |

**Table 6-11** Frame format for a normal response

| Data Field | | | Length (Byte) | Description |
| --- | --- | --- | --- | --- |
| Function code | | | 1 | 0x2B |
| MEI type | | | 1 | 0x0E |
| ReadDevId code | | | 1 | 03 |
| Consistency level | | | 1 | 03 |
| More | | | 1 | - |
| Next object ID | | | 1 | - |
| Number of objects | | | 1 | - |
| Object list | First object | Object ID | 1 | 0x87 |
| | | Object length | 1 | N |
| | | Object value | N | - |
| | ... | ... | ... | ... |

**Table 6-12** Object list

| Object ID | Object Name | Type | Description |
| --- | --- | --- | --- |
| 0x80–0x86 | Reserved | -- | Returns a null object with a length of 0. |
| 0x87 | Number of devices | int | Returns the number of devices connected to the RS485 address. |
| 0x88 | Description about the first device | ASCII character string<br>See the device description definitions. | Returns only description about the first device if a NE allows only one device to be connected to each RS485 address. |
| 0x8A | Description about the second device | - | - |
| - | - | - | - |
| 0xFF | Description about the 120th device | - | - |

### 6.3.6.3 Device Description Definition

Each device description consists of all "attribute=value" character strings.

"Attribute ID=%s;attribute ID=%s;... attribute ID=%s"

For example: "1=SUN2000MA-XXKTL;2=V100R001C00SPC100;3=P1.0-D5.0;4=123232323;5=1;6=1.1"

**Table 6-13** Attribute definition

| Attribute ID | Name | Type | Description |
| --- | --- | --- | --- |
| 1 | Device model | ASCII character string | SUN2000 |
| 2 | Device software version | ASCII character string | - |
| 3 | Port protocol version | ASCII character string | See the interface protocol version definitions. |

| Attribute ID | Name | Type | Description |
|---|---|---|---|
| 4 | ESN | ASCII character string | - |
| 5 | Device ID | int | 0, 1, 2, 3...(assigned by NEs; 0 indicates the master device into which the Modbus card is inserted) |
| 6 | Feature version | ASCII character string | - |

**Table 6-14** Frame format for an abnormal response

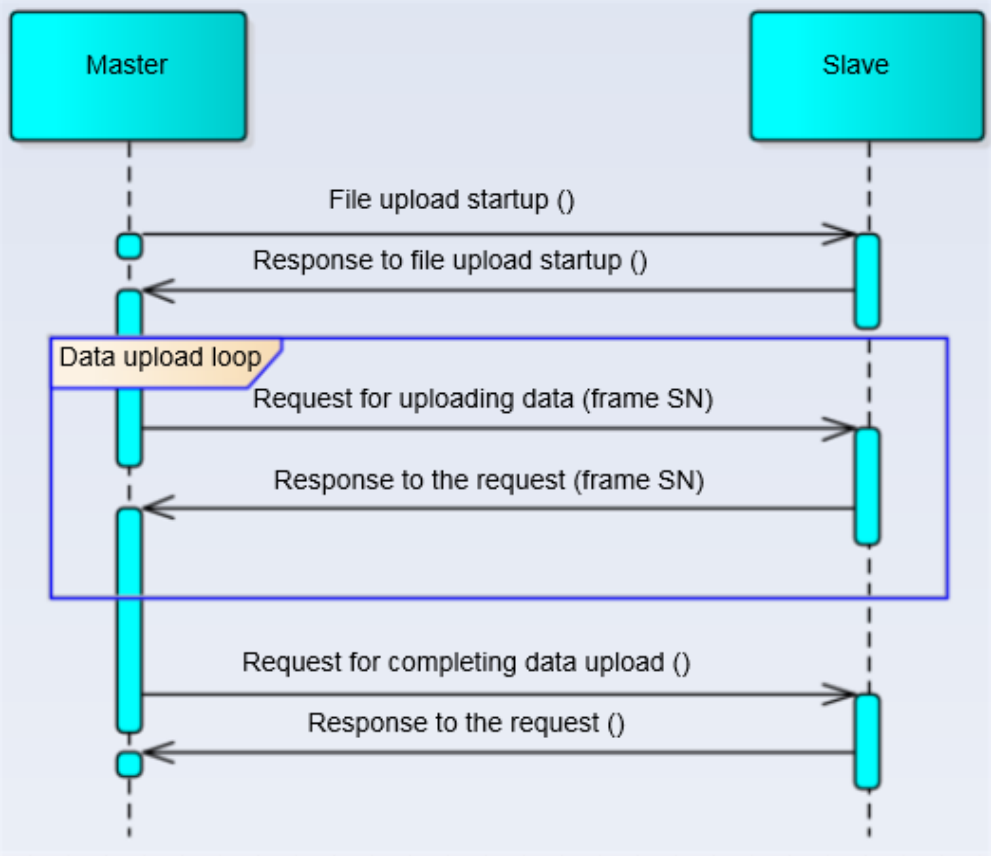
| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0xAB |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

## 6.3.7 Huawei-defined Functions (0x41)

### 6.3.7.1 Uploading Files

Uploading files means uploading them by stream data from a slave node to a master node. The following figure shows the file uploading process.

**Figure 6-6** File uploading process




#### 6.3.7.1.1 Starting the Upload

Frame format of a request from a master node

**Table 6-15** PDU data field of the request frame for starting upload (0x05)

| PDU Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x05 |
| Data length | 1 | 1 + N |
| File type | 1 | Unique ID of a file |
| Customized data | N | - |

**Table 6-16** PDU data field of the response frame for starting upload (0x05)

| Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x05 |
| Data length | 1 | 6 + N |
| File type | 1 | Unique ID of a file |
| File length | 4 | - |
| Data frame length | 1 | - |
| Customized data | N | - |

**Table 6-17** PDU data field in the abnormal response frame of the slave node

| PDU Data Field | Length (Byte) | Description |
|---|---|---|
| Error code | 1 | 0xC1 |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

If the exception code is 0x06, resend the request after 10 seconds. A request can be resent for no more than six times.

#### 6.3.7.1.2 Uploading Data

**Table 6-18** Request frame for uploading data (0x06)

| PDU Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x06 |
| Data length | 1 | 3 |

| PDU Data Field | Length (Byte) | Description |
| --- | --- | --- |
| File type | 1 | Unique ID of a file |
| Frame No. | 2 | 0x0000–0xFFFF |

**Table 6-19** Response frame for uploading data (0x06)

| PDU Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x06 |
| Data length | 1 | 3 + N |
| File type | 1 | - |
| Frame No. | 2 | 0x0000–0xFFFF |
| Frame data | N | - |

**Table 6-20** Abnormal response frame for uploading data

| PDU Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Error code | 1 | 0xC1 |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.7.1.3 Completing the Data Upload

**Table 6-21** Request frame for completing the data upload

| PDU Data Field | Length (Byte) | Description |
| --- | --- | --- |
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x0c |
| Data length | 1 | 1 |
| File type | 1 | - |

**Table 6-22** Response frame for completing the data upload

| PDU Data Field | Length (Byte) | Description |
|---|---|---|
| Function code | 1 | 0x41 |
| Sub-function code | 1 | 0x0c |
| Data length | 1 | 3 |
| File type | 1 | - |
| File CRC | 2 | - |

**Table 6-23** Abnormal response frame for completing the data upload

| Data Field | Length (Byte) | Description |
|---|---|---|
| Error code | 1 | 0xC1 |
| Exception code | 1 | See **6.3.2 Exception Code List**. |

### 6.3.7.1.4 Timeout Processing

**Table 6-24** Processing specifications of sub-process timeout

| Name | Restraints |
|---|---|
| Response timeout period for starting an upload | 10s |
| Response timeout period for uploading data | 10s |
| Number of times of resending a data upload command | 6 |
| Response timeout period for completing a data upload | 10s |

# 7 Reference Document

《Modbus_Application_Protocol_V1_1b3》

《Modbus over serial line specification and implementation guide V1.02》

《Modbus_Messaging_Implementation_Guide_V1_0b》