Modbus Interface for the SolarEdge TerraMax™ Inverter -Technical Note

Revision History

Version 1.0, May 2024: Initial Version

Contents

Overview

SolarEdge inverters supports the transmission of inverter-level monitoring data directly from the inverter to a local non-SolarEdge device using the SunSpec open protocol for interoperability between devices in renewable energy systems. This option can be used alongside the connection to the SolarEdge monitoring server. This document describes the connection method, protocol and configurations needed to implement this feature.

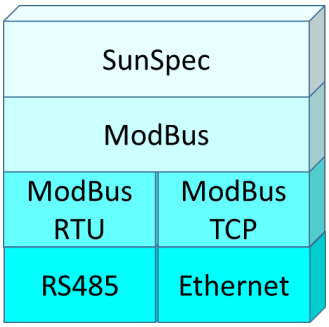
Direct connection to a monitoring device is useful when a network connection is unavailable, when extensive custom data processing is required, or when authorities require direct access to monitoring data.

In many cases, employing the direct connection alongside a SolarEdge Monitoring platform connection is possible- and recommended. Connection to the Monitoring platform enables all the monitoring benefits, primarily:

- Proactive installer maintenance and real-time troubleshooting by SolarEdge support, using the physical mapping available on the Monitoring platform
- Module-level monitoring

Communication technologies

SolarEdge uses an open, industry-standard communications stack to provide efficient messaging between SolarEdge and third-party devices and applications.



The communications stack components are briefly described below:

SunSpec

SunSpec is an application-layer communications protocol designed to achieve interoperability between Distributed Energy Resource (DER) components and smart grid applications.

Modbus

Modbus is a serial communications protocol used to connect data collection terminals to a centralized processing unit. SolarEdge products use Modbus to perform SunSpec messaging over two types of physical or link-layer channels:

- Modbus RTU: Remote Terminal Unit (RTU) Modbus over a serial RS485 connection
- Modbus TCP: Modbus over an Ethernet connection

SolarEdge systems support a single Modbus Leader – either a single Modbus RTU or a single Modbus TCP.

SunSpec support

The SolarEdge TerraMax inverter is SunSpec-supported and can be configured by SetApp.

Use cases for MODBUS over RS485

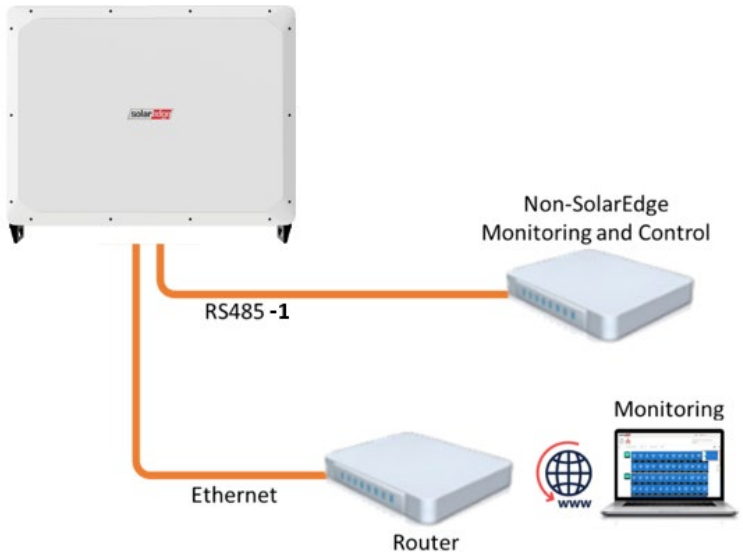
This section describes RS485 options to connect the inverter to a non-SolarEdge monitoring device.

Physical connection

The connection is performed using an RS485 connector with a twisted pair cable. The transmission mode in SolarEdge inverters is set to RTU (binary).
The COM port default properties are: 115200 bps, 8 data bits, no parity, 1 stop bit, no flow control. Baud rate can be changed between 9600bps to 115200bps (supported from CPU version 2.0549).
The RS485 bus can be configured to support connections to a non-SolarEdge monitoring device. For a Leader-Follower connection between TerraMax SolarEdge inverters, CAN-Bus must be used.
The SolarEdge TerraMax inverter with SetApp configuration has one built-in RS485-1 and one CAN-Bus port. The Lead inverter connects to up to 12 follower inverters, through the CAN-Bus Port.

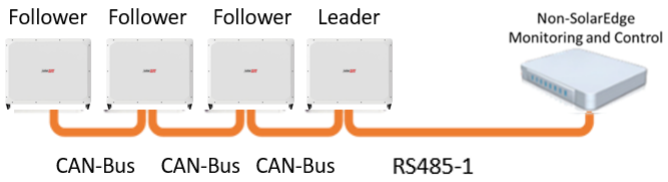
Single inverter connection

Use the RS485 bus for connecting to a non-SolarEdge monitoring device. Use the Ethernet connection or any of the optional wireless connection options to connect to the SolarEdge Monitoring platform.



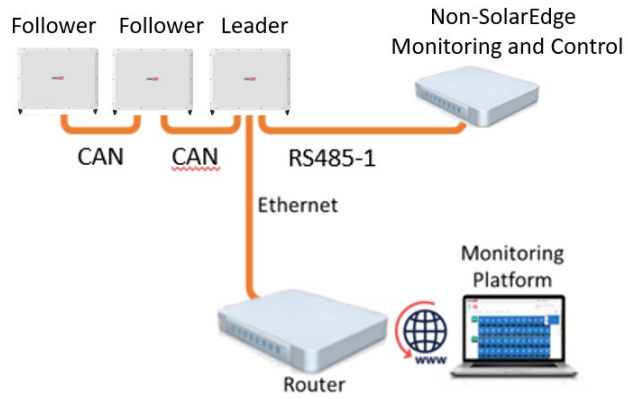
Connection to a non-SolarEdge monitoring device only (without connection to the Monitoring platform)

Use CAN-bus to connect Followers to the Leader and RS485-1 to connect the Leader to a non-SolarEdge monitoring device.
Every inverter in the CAN-Bus should be configured to a different device ID (MODBUS ID).



Connection to a non-SolarEdge monitoring device (with connection to the Monitoring platform)

Use the RS485-1 bus for connection to a non-SolarEdge monitoring device. Every inverter in the Can-Bus should be configured to a different device ID (MODBUS ID). Connect the router to the Leader inverter.

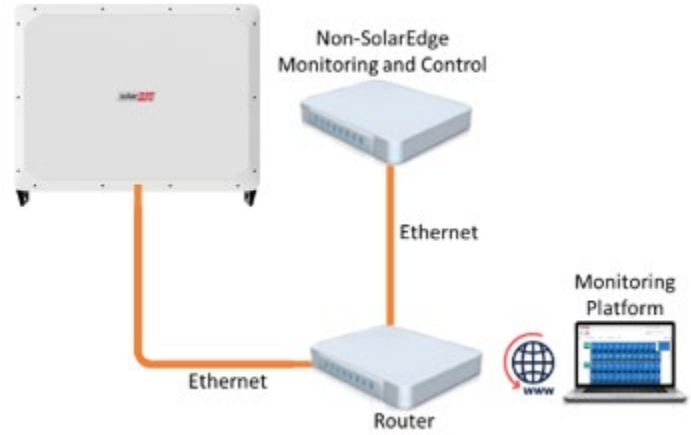


Use cases for MODBUS over TCP

This section describes MODBUS over TCP options, to connect the inverter to a non-SolarEdge monitoring device.

Single inverter connection

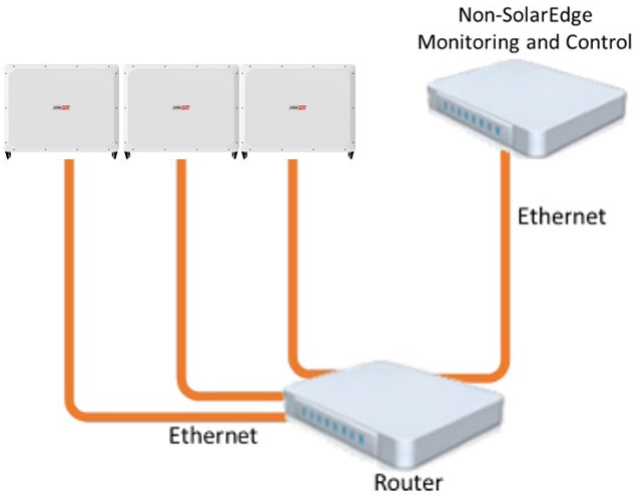
Use Ethernet for connecting to a non-SolarEdge monitoring device.



Multiple inverter connections

Connection to a non-SolarEdge monitoring device only (without connection to the SolarEdge Monitoring platform)

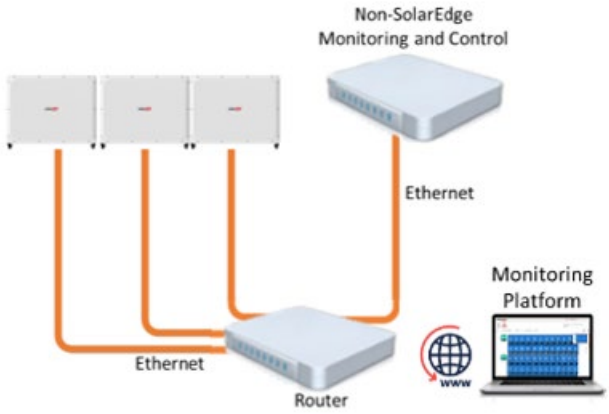
Use Ethernet for connection to a non-SolarEdge monitoring device.



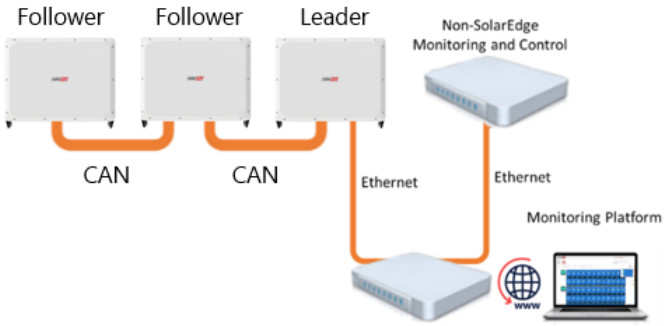
Connection to a non-SolarEdge monitoring device (with connection to the SolarEdge Monitoring platform)

Use Ethernet for connection to a non-SolarEdge monitoring device.

Option 1 (direct connection) – Connect each inverter to the Ethernet router via Ethernet cables.



Option 2 – Connect the Leader only to the Ethernet router via Ethernet cables.



SolarEdge device configuration using SetApp

This section describes how to configure a SolarEdge device to be monitored by a non-SolarEdge monitoring device using SetApp.

NOTE

The actual SetApp configuration procedures may differ from the ones shown in this document.

To reach the main setup menu, access SetApp and tap Commissioning ➔ Site Communication:

Modbus over RS485 configuration

To configure the SolarEdge TerraMax Leader inverter:

1. Under the Site Communication menu, set the following:

- RS485-1 ➔ Protocol ➔ SunSpec (Non-SE Logger)
- RS485-1 ➔ Device ID, and enter the MODBUS address (a unique value 1...247). This sets the register C_DeviceAddress.

2. If needed, set the baud rate to a preferred value: RS485-1 ➔ Baud rate and enter the rate. The default value is 115200.

MODBUS over TCP Support

MODBUS/TCP uses the Ethernet media in physical layers to carry the MODBUS message handling structure and can support many devices in one network; it is easier to integrate into the Local Area Network (LAN) of a company.
Here, it is used for remote 3rd party monitoring and control. MODBUS TCP is agnostic of the server connection. It only works over LAN. When configured, MODBUS TCP does not initiate a connection - the server waits for a client to connect. Only one connection is supported.

NOTE

The MODBUS TCP function is disabled by default. When enabled, it supports TCP port 1502 by default. The port number can be reconfigured.

MODBUS over TCP configuration

To setup MODBUS TCP:

1. Select Site Communication ➔ Modbus TCP ➔ Enable. A new Port menu is added to the screen (the default port is 1502).
2. To modify the TCP port, select Port, set the port number and tap Done.

NOTE

The default device ID of the inverter connected to the Ethernet is 1.

NOTE

The TCP server idle time is 2 minutes. To leave the connection open, the request should be made within 2 minutes. The connection can remain open without any MODBUS requests.

Register mapping monitoring data

This section describes the register mapping for the inverter monitoring data (read-only MODBUS protocol data). SolarEdge inverter mapping for monitoring data is based on the open protocol managed by SunSpec: SunSpec Alliance Interoperability Specification – Inverter Models v1.0. Refer to the SunSpec Alliance Interoperability Specification – Common Models (Elements) document for a detailed protocol description.
The register mapping can be downloaded from the SunSpec Alliance web page:
http://www.sunspec.org/
SolarEdge inverters supports the following mappings:

- SunSpec module ID 101, 1021 and 103 register mappings
- SolarEdge three-phase TerraMax inverter also supports SunSpec module ID 160 register mappings

Common model MODBUS register mappings

The base Register Common Block is set to 40001 (MODBUS PLC address [base 1]) or 40000 (MODBUS Protocol Address [base 0]).
All parameters are defined in the SunSpec Common block definition, except for the C_Options register, which is set to NOT_IMPLEMENTED.

- C_Manufacturer is set to SolarEdge
- C_Model is set to the appropriate inverter model, for example SE5000
- C_Version contains the CPU software version with leading zeroes, for example 0002.0611
- C_SerialNumber contains the inverter serial number
- C_DeviceAddress is the device MODBUS ID

[1] Supported only in split-phase configurations (Japanese grid and 240V grid in North America)

Address (base 0)	Address (base 1)	Size	Name	Type	Description
40000	40001	2	C_SunSpec_ID	uint32	Value = "SunS" (0x53756e53). Uniquely identifies this as a SunSpec MODBUS Map
40002	40003	1	C_SunSpec_DID	uint16	Value = 0x0001. Uniquely identifies this as a SunSpec Common Model Block
40003	40004	1	C_SunSpec_Length	uint16	65 = Length of block in 16-bit registers
40004	40005	16	C_Manufacturer	String(32)	Value Registered with SunSpec = "SolarEdge "
40020	40021	16	C_Model	String(32)	SolarEdge Specific Value
40044	40045	8	C_Version	String(16)	SolarEdge Specific Value
40052	40053	16	C_SerialNumber	String(32)	SolarEdge Unique Value
40068	40069	1	C_DeviceAddress	uint16	MODBUS Unit ID

Inverter Device Status Values

The following I_Status_* values are supported:

Parameter	Value	Description
I_STATUS_OFF	1	Off
I_STATUS_SLEEPING	2	Sleeping (auto-shutdown) – Night mode
I_STATUS_STARTING	3	Grid Monitoring/wake-up
I_STATUS_MPPT	4	Inverter is ON and producing power
I_STATUS_THROTTLED	5	Production (curtailed)
I_STATUS_SHUTTING_DOWN	6	Shutting down
I_STATUS_FAULT	7	Fault
I_STATUS_STANDBY	8	Maintenance/setup

Inverter model MODBUS register mappings

The following table lists the supported MODBUS register values. Unsupported values are indicated by the NOT_IMPLEMENTED value. The base register of the Device Specific block is set to 40070 (MODBUS PLC address [base 1]), or 40069 (MODBUS Protocol Address [base 0]).

- acc32 is a uint32 accumulator that should always increase. Its value is in the range of 0...4294967295.
- **Scale Factors**: As an alternative to a floating point format, values are represented by Integer values with a signed scale factor applied. The scale factor explicitly shifts the decimal point to left (negative value) or right (positive value).

For example, a value "Value" may have an associated value "Value_SF"
Value = "Value" * 10^ Value_SF for example:

- For "Value" = 2071 and "Value_SF" = -2 Value = 2071*10^-2 = 20.71
- For "Value" = 2071 and "Value_SF" = 2 Value = 2071*10^2 = 207100

Address		Size	Name	Type	Units	Description
(base 0)	(base 1)					
40069	40070	1	C_SunSpec_DID	uint16		101 = single phase 102 = split phase 103 = three phase
40070	40071	1	C_SunSpec_Length	uint16	Registers	50 = Length of model block
40071	40072	1	I_AC_Current	uint16	Amps	AC Total Current value
40072	40073	1	I_AC_CurrentA	uint16	Amps	AC Phase A Current value
40073	40074	1	I_AC_CurrentB	uint16	Amps	AC Phase B Current value
40074	40075	1	I_AC_CurrentC	uint16	Amps	AC Phase C Current value
40075	40076	1	I_AC_Current_SF	int16		AC Current scale factor
40076	40077	1	I_AC_VoltageAB	uint16	Volts	AC Voltage Phase AB value
40077	40078	1	I_AC_VoltageBC	uint16	Volts	AC Voltage Phase BC value
40078	40079	1	I_AC_VoltageCA	uint16	Volts	AC Voltage Phase CA value
40079	40080	1	I_AC_VoltageAN [1]	uint16	Volts	AC Voltage Phase A to N value
40080	40081	1	I_AC_VoltageBN [1]	uint16	Volts	AC Voltage Phase B to N value
40081	40082	1	I_AC_VoltageCN [1]	uint16	Volts	AC Voltage Phase C to N value
40082	40083	1	I_AC_Voltage_SF	int16		AC Voltage scale factor
40083	40084	1	I_AC_Power	int16	Watts	AC Power value
40084	40085	1	I_AC_Power_SF	int16		AC Power scale factor
40085	40086	1	I_AC_Frequency	uint16	Hertz	AC Frequency value
40086	40087	1	I_AC_Frequency_SF	int16		Scale factor
40087	40088	1	I_AC_VA	int16	VA	Apparent Power
40088	40089	1	I_AC_VA_SF	int16		Scale factor
40089	40090	1	I_AC_VAR	int16	VAR	Reactive Power
40090	40091	1	I_AC_VAR_SF	int16		Scale factor

[1] Supported only in split-phase configurations (Japanese grid and 240V grid in North America).

Address (base 0)	Address (base 1)	Size	Name	Type	Units	Description
40091	40092	1	I_AC_PF	int16	%	Power Factor
40092	40093	1	I_AC_PF_SF	int16		Scale factor
40093	40094	2	I_AC_Energy_WH	acc32	WattHours	AC Lifetime Energy production
40095	40096	1	I_AC_Energy_WH_SF	uint16		Scale factor
40096	40097	1	I_DC_Current	uint16	Amps	DC Current value
40097	40098	1	I_DC_Current_SF	int16		Scale factor
40098	40099	1	I_DC_Voltage	uint16	Volts	DC Voltage value
40099	40100	1	I_DC_Voltage_SF	int16		Scale factor
40100	40101	1	I_DC_Power	int16	Watts	DC Power value
40101	40102	1	I_DC_Power_SF	int16		Scale factor
40103	40104	1	I_Temp_Sink	int16	Degrees C	Heat Sink Temperature
40106	40107	1	I_Temp_SF	int16		Scale factor
40107	40108	1	I_Status	uint16		Operating State
40108	40109	1	I_Status_Vendor	uint16		Vendor-defined operating state and error codes. For error description, meaning and troubleshooting, refer to Troubleshooting Alerts.

MODBUS register mappings

Dynamic power control block

The base register of the dynamic-commands block is set to 0xF300:

- **Enable Dynamic Power Control** on address 0xF300 is disabled (set to 0) by default and should be enabled (set to 1) for dynamic power control functionality.
- **Max Active Power** is the inverter-rated active power. This is a read-only register.

All other settings described for the enhanced dynamic power control block are related to these ratings.

Address	Size	R/W	Name	Type	Value Range	Units
F300	1	R/W	Enable Dynamic Power Control	Uint16	0 or 1	N/A
F304	2	R	Max Active Power	Float32	Inverter rating	W

Enabling dynamic power control mode

To enable dynamic power control:

1. Set the following:
    - Set **AdvancedPwrControlEn** on address 0xF142 to 1 (enable). It is 0 (disabled) by default.
    - Set **ReactivePwrConfig** on address 0xF104 to 4 for either Q or CosPhi control. The default value is 0 (Fixed CosPhi mode).

NOTE

If registers are set to the correct value, do not rewrite them.

2. Issue a **Commit Power Control Settings** command on address 0xF100 (set to 1) to put the settings into effect. This command stops production and restarts the inverter.
3. Initialize the enhanced power control settings on addresses 0xF308–0xF320.
4. Enable **Dynamic Power Control** (set to 1). It is 0 (disabled) by default.

NOTE

Dynamic Power Control should be enabled only after the initialization of the enhanced power control operation in the previous step.

Configurations of this map can also be changed dynamically.

Configure enhanced power control

To configure the enhanced power control, use the following registers:

Non-volatile memory registers

The following registers maintain their value following an inverter restart:

- **Active/Reactive Preference** sets the priority between active and reactive power.
    - When set to 1, active power has higher priority than reactive power: The inverter attempts to reach the active power limit first and then attempts to comply with the reactive power limits.
    - When set to 0, reactive power has higher priority than reactive power.
- **CosPhi/Q Preference** sets whether the reactive power is controlled by CosPhi or by Q:
    - When set to 1, the reactive power is controlled by Q.
    - When set to 0, the reactive power is controlled by CosPhi.
- **Active Power Limit** sets the limits for the dynamic active power control.
- **Command Timeout** sets the timeout interval for dynamic commands. If the inverter doesn't receive one of the dynamic commands within this time frame, it will revert to the fallback settings described in the bullets below. The controller command interval must be at least Command Timeout interval / 2.
- **Fall-back Active Power Limit** sets the fallback limit for the dynamic active power control.
- **Fall-back Reactive Power Limit** sets the fallback limit for the dynamic reactive power control.

- **Fall-back CosPhi** sets the fallback limit for the dynamic CosPhi control.
- **Active Power Ramp-up Rate** controls the ramp-up rate of the dynamic active power change. It is set as the percentage per minute of the inverter's active power limit register setting. A value of -1 indicates that the ramp-up is disabled and that the change is immediate.
- **Active Power Ramp-down Rate** controls the ramp-down rate of the dynamic active power change. It is set as the percentage per minute of the inverter's active power limit register setting. A value of -1 indicates that the ramp-down is disabled and that the change is immediate.
- **Reactive Power Ramp-up Rate** controls the ramp-up rate of the dynamic reactive power change. It is set as the percentage per minute of the inverter's reactive power limit register setting. A value of -1 indicates that the ramp-up is disabled and that the change is immediate.
- **Reactive Power Ramp-down Rate** controls the ramp-down rate of the dynamic reactive power change. It is set as the percentage per minute of the inverter's reactive power limit register setting. A value of -1 indicates that the ramp-down is disabled and that the change is immediate.
- **Phi Change Rate** controls the change rate of the dynamic angle change. It is set in radians per minute.

The properties of the registers described above are detailed in the table below.

Address	Size	R/W	Name	Type	Value Range	Units
F308	1	R/W	Active/Reactive Preference	Uint16	0 or 1	N/A
F309	1	R/W	CosPhi/Q Preference	Uint16	0 or 1	N/A
F310	2	R/W	Command Timeout	Uint32	0-65535	Sec
F312	2	R/W	Fall-back Active Power Limit	Float32	0-100	%
F314	2	R/W	Fall-back Reactive Power Limit	Float32	-100 to +100	%
F316	2	R/W	Fall-back CosPhi	Float32	-1 to 1	N/A
F318	2	R/W	Active Power Ramp-up Rate	Float32	-1*, 0-100	%/min
F31A	2	R/W	Active Power Ramp-down Rate	Float32	-1*, 0-100	%/min
F31C	2	R/W	Reactive Power Ramp-up Rate	Float32	-1*, 0-100	%/min
F31E	2	R/W	Reactive Power Ramp-down Rate	Float32	-1*, 0-100	%/min
F320	2	R/W	Phi Change Rate	Float32	0 - pi	rad/min

Volatile memory registers

The following registers DO NOT maintain their value following an inverter restart and must be re-configured after the inverter restarts.

- **Dynamic Active Power Limit** controls the active power limit of the inverter dynamically. It is set as the percentage of the Active Power Limit register setting. The dynamic active power limit can be sent in Modbus broadcast. In broadcast mode, the leader inverter sends a request to all followers. No response is returned.

The Modbus address space consists of 256 addresses:

0	From 1 to 247	From 248 to 255
Broadcast address	Individual follower inverter addresses	Reserved

- **Dynamic Reactive Power Limit**: This register dynamically controls the reactive power limit of the inverter. It is set as the percentage of the Reactive Power Limit register setting.
- **Dynamic Cos Phi Limit** controls the CosPhi of the inverter dynamically. The sign of CosPhi determines the sign of the expected reactive power.

Address	Size	R/W	Name	Type	Value Range	Units
F322	2	R/W	Dynamic Active Power Limit	Float32	0-100	%
F324	2	R/W	Dynamic Reactive Power Limit	Float32	-100 to +100	%
F326	2	R/W	Dynamic CosPhi Limit	Float32	-1 to 1	N/A

When accessing the registers, note the following:

- Each register contains two bytes in big-endian order (MSB-LSB).
- Each 32-bit value spans over two registers in the little-endian word order (LSB-MSB).
  - If the controller does not support the little-endian word order, another map using the big-endian word order correlating to this one exists at an offset of 0x800 from this map.
  - The two registers must be written together using Modbus function 16.

The following table summarizes all the registers mentioned above, in order of address:

Address	Size	R/W	Name	Type	Value Range	Units
F300	1	R/W	Enable Dynamic Power Control	Uint16	0 or 1	N/A
F304	2	R	Max Active Power	Float32	Inverter rating	W
F308	1	R/W	Active/Reactive Preference	Uint16	0 or 1	N/A
F309	1	R/W	CosPhi/Q Preference	Uint16	0 or 1	N/A
F310	2	R/W	Command Timeout	Uint32	0-65535	Sec
F312	2	R/W	Fall-back Active Power Limit	Float32	0-100	%
F314	2	R/W	Fall-back Reactive Power Limit	Float32	-100 to +100	%
F316	2	R/W	Fall-back CosPhi	Float32	-1 to 1	N/A
F318	2	R/W	Active Power Ramp-up Rate	Float32	-1*, 0-100	%/min
F31A	2	R/W	Active Power Ramp-down Rate	Float32	-1*, 0-100	%/min

Address	Size	R/W	Name	Type	Value Range	Units
F31C	2	R/W	Reactive Power Ramp-up Rate	Float32	-1*, 0-100	%/min
F31E	2	R/W	Reactive Power Ramp-down Rate	Float32	-1*, 0-100	%/min
F320	2	R/W	Phi Change Rate	Float32	0-pi	rad/min
F322	2	R/W	Dynamic Active Power Limit	Float32	0-100	%
F324	2	R/W	Dynamic Reactive Power Limit	Float32	-100 to +100	%
F326	2	R/W	Dynamic CosPhi Limit	Float32	-1 to 1	N/A

VAR (Volt-Amps Reactive) at night block

This block is used to configure reactive power during nighttime hours.
The complete list of VAR at Night registers appears in the following table:

Address	Name	Size	Type	R/W	Range	Units
F1E8	VarAtNightConfig (VAR at Night mode)	1	Int16	R/W	• 0: Disabled • 1: Enabled	
F1E9	FixedReactPwrAtNight (Q value) NOTE: The KVAR value should be set to within ±60% of the kW value printed on the inverter nameplate. For example, if "100 kW" is printed on the inverter, then the value should be set between -60 KVAR and +60 KVAR.	2	Float	R/W	MIN_FLOAT to MAX_FLOAT	KVAR

Appendix A: Encode and decode examples

This appendix describes how to create Modbus commands to communicate with SolarEdge devices and read their response.

Client request and server response register

To create a Modbus command to communicate with SolarEdge devices, use the following fields to structure and parse your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	sizeof (modbusID) + SizeOf(functionCode) + SizeOf(Data)	0x0000
Modbus ID	Identifies a device in a network	0x00

Function code	Executes commands from the leader device to follower devices Main functions: ▰ 0x03 – Read holding register ▰ 0x06 – Preset single register ▰ 0x10 – Preset multiple registers	0x00
Data	Numerical value	0x000000

NOTE

- When Modbus connection is over UDP, the Server Response Register has two extra bytes for CRC.
- When encoding the registers, note the following:
  - Some commands require two registers. You must write the two registers together using Modbus function 16.
  - Each register contains two bytes in Big-Endian order from the most significant byte to the least significant byte (MSB-LSB).
  - Each 32-bit value spans over two registers in the Little-Endian word order from the least significant byte to the most significant byte (MSB-LSB).
  - If the controller does not support the Little-Endian word order, there is another linked map using the Big-Endian word order at an offset of 0x800.

Modbus broadcast

Modbus Broadcast Write command sends data to all devices on the bus; the client does not receive a response.

For example:

Broadcast write 1 to address 0xF300 in all followers.

Client request register

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 06	0x06
Modbus ID	Identifies a device in a network.	0x00
Function code	Preset single register	0x06
Data	Numerical values	F3 00 00 01 (F300 address of starting point, with additional 1)

Read single or multiple register data

Create a Read command of Single or Multiple Register Data to read data from the inverter using Modbus.

For example:

From Inverter with Modbus ID 1 requested to read Dynamic Reactive Power Limit Float) two registers: 0xF324, 0xF325.

Client request register

Use the following fields to structure your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof (modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 06	0x06
Modbus ID	Identifies a device in a network	0x01
Function code	Read holding register	0x03
Data	Numerical values	F3 24 00 01 (F324 address of starting point, with additional 1)

Server response register

Use the following fields to parse your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 5) = 07	0x07
Modbus ID	Identifies a device in a network	0x01
Function code	Read holding register	0x03
Data	Numerical values	04 00 00 00 32 (04 is the data length – 00 32 response for F324, 00 00 response for F325)

Write single register data

Modbus Write command sends data to a single register. The server sends a response after it finishes processing the command.
To perform the Write command, enable the Dynamic Power Control Mode.
The following is an example of writing to a single register:

Inverter with Modbus ID 1, Enable dynamic Power control. Write 1 to F300.

Client request register

Use the following fields to structure your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 06	0x06
Modbus ID	Identifies a device in a network	0x01
Function code	Preset single rigester	0x06
Data	Numerical values	0xF3 00 00 01. (write 1 to F300)

For example:

Write 600ms to Q filter time in register D21E.

Use the following fields to structure your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 06	0x06
Modbus ID	Identifies a device in a network	0x01
Function code	Preset multiple rigester	0x10
Data	Numerical values	0xD2 1E 00 02 04 00 00 02 58. (write 600 to 0xD21E)

Write multiple register data

Modbus Write command sends to a range of registers. The server sends a response after it finishes processing the command.

For example:

Inverter with Modbus ID 1, Set Dynamic Reactive Power Limit *to 100. Write 0x64 to F324.*

Client request register

Use the following fields to structure your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 08	0x08
Modbus ID	Identifies a device in a network	0x01
Function code	Preset multiple registers = 0x10	0X10
Data	Numerical values	F3 24 00 00 00 64

Write multiple register data – Big-Endian

Similar to the previous example, to use a big-endian notation, add an offset of 0x800 to the register address.

For example:

Inverter with Modbus ID 1, Set Dynamic Reactive Power Limit to 100. Write 0x64 FB24.

Client request register

Use the following fields to structure your command:

Field	Description	Range (Hexadecimal)
Transaction processing identifiers	Client identifier. The user cannot change this parameter.	XXXX
Length of the following fields	(sizeof(modbusID) = 1 + SizeOf(functionCode) = 1 + SizeOf(Data) = 4) = 08	0x08
Modbus ID	Identifies a device in a network	0x01
Function code	Preset multiple registers = 0x10	0X10
Data	Numerical values	FB 24 64 00 00 00

Abnormal response data

If you input abnormal data in the Modbus, the leader/follower device returns the following errors and messages:

Error	Message
Wrong address in Read/Write command	Illegal data address
Incorrect value	Follower/leader device failure

NOTE

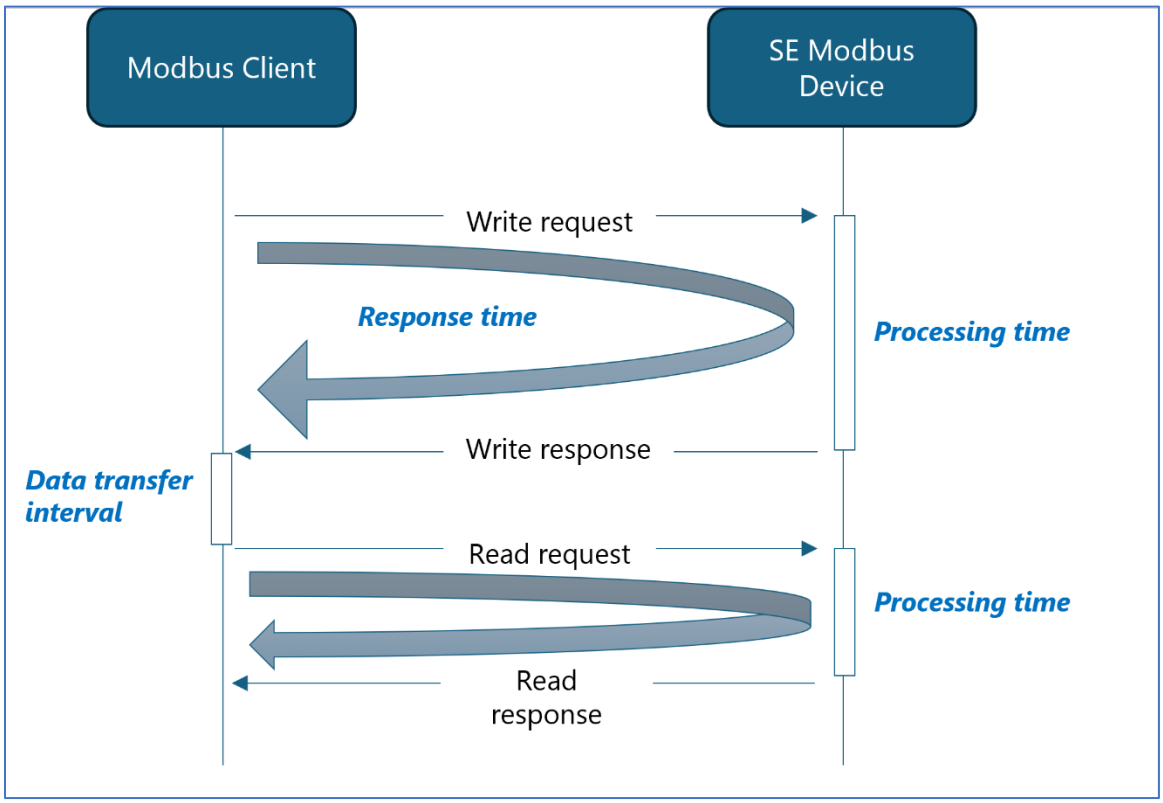
The adjustable parameters in Modbus registers are intended for long-term storage. Periodic changes in this parameter may damage the flash memory.

Appendix B: Response time information

This appendix displays typical and max data processing and the reaction time of the Modbus

interface.

Timing definitions



Type of Time	Definition
Processing time of setpoint	This is the time required by SolarEdge products to process the incoming setpoint Modbus command.
Reaction time of setpoint	This is the time between the changing of the setpoint until it comes into effect.
Response time	The is the time between the query and its acknowledgment.
Data transfer interval	For system stability, this is the time separation period between data transfers.

Timing performance

Command type	Timing Definitions		Time [s]
Read	Response time (includes Processing time)		< 0.5 s
Write	Response time (includes Processing time)		< 0.5 s
	Reaction time of setpoint (dynamic)	Active Power (P)	< 1 s
		Reactive Power (Q)	< 4 s
	Commit		< 1.5 s[1]

Timing Definitions	time [s]
Data transfer interval	< 0.1 s

NOTE

- Changing the number of follower devices, or performing single/multiple read/write commands has a minor effect on response time.
- Adding a Communication Commercial Gateway (CCG) as an interface may cause longer response times.

To optimize the reaction time, set the following register in the table below to 600ms. This also requires a commit command:

Address		Name	Size	Type	Units
(base 0)	(base 1)				
D21E	D21F	QFilterTime	2	uint32	ms

[1]Static write command needs to be followed by a commit. This may cause a longer response time.

Support contact information

If you have technical problems concerning SolarEdge products, please contact us:

https://www.solaredge.com/service/support

Before contacting us, please make sure you have the following information at hand:

- The model and serial number of the product in question.
- The error indicated on the product SetApp mobile application LCD screen or on the Monitoring platform or by the LEDs, if there is such an indication.
- The system configuration information, including the type and number of modules connected and the number and length of strings.
- The communication method to the SolarEdge server if the site is connected.
- The product's software version as it appears in the ID status screen.