TeSys™ island

Third Party Function Block Guide

Instruction Bulletin

This instruction bulletin describes the third party function blocks of TeSys island.

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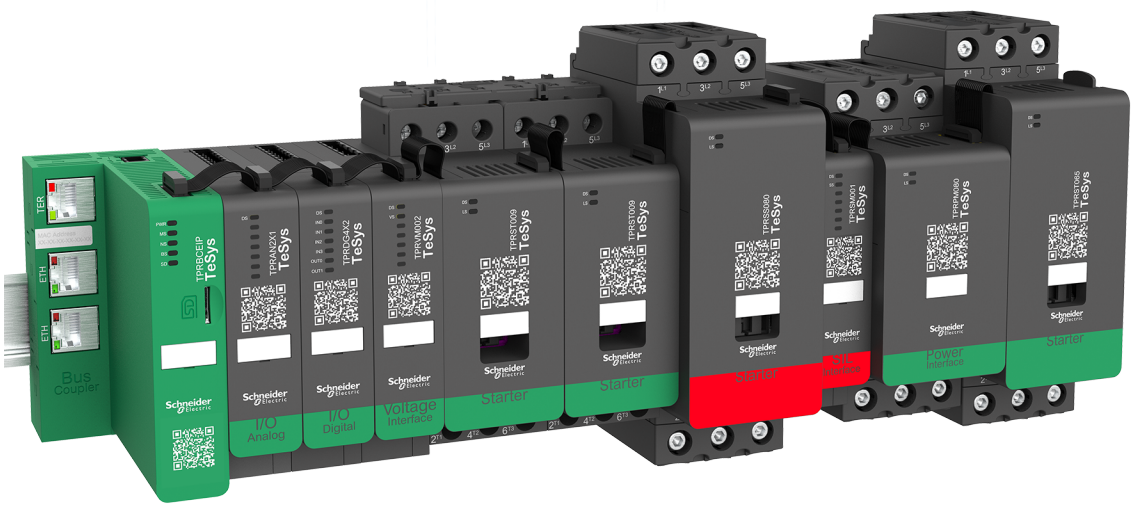


www.schneider-electric.com

Legal Information

Table of Contents

About the Book

Document Scope

Use this document to do the following:

- Create Function Blocks, save them, and use them to program your PLC
- Directly program the PLC from the register map

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand this instruction bulletin and all related documents before installing, operating, or maintaining your TeSys island. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.

Failure to follow these instructions will result in death or serious injury.

Validity Note

This instruction bulletin is valid for all TeSys™ island configurations. The availability of some functions described in this bulletin depends on the communication protocol used and the physical modules installed on the island.

For product compliance with environmental directives such as RoHS, REACH, PEP, and EOLI, go to *www.se.com/green-premium*.

For technical characteristics of the physical modules described in this bulletin, go to *www.se.com*.

The technical characteristics presented in this bulletin should be the same as those that appear online. We may revise content over time to improve clarity and accuracy. If you see a difference between the information contained in this bulletin and online information, use the online information.

Related Documentation

Table 1 - Related Documentation

Document Title	Description	Document Number
TeSys™ island System Guide	Introduces and describes the main functions of TeSys island	8536IB1901
TeSys™ island Installation Guide	Describes the mechanical installation, wiring, and commissioning of TeSys island	8536IB1902
TeSys™ island Operating Guide	Describes how to operate and maintain TeSys island	8536IB1903
TeSys™ island Functional Safety Guide	Describes the Functional Safety features of TeSys island	8536IB1904
TeSys™ island Third Party Function Block Guide	Contains the information needed to create function blocks for third party hardware	8536IB1905
TeSys™ island EtherNet/IP™ Function Block Library Guide	Describes the TeSys island library used in the Rockwell Software® Studio 5000® environment	8536IB1914
TeSys™ island EtherNet/IP™ Quick Start Guide	Describes how to quickly integrate TeSys island into the Rockwell Software Studio 5000 environment	8536IB1906
TeSys™ island DTM Online Help Guide	Describes how to install and use various functions of TeSys island configuration software and how to configure the parameters of TeSys island	8536IB1907
TeSys™ island Product Environmental Profile, Bus Coupler	Describes constituent materials, recyclability potential, and environmental impact information for the TeSys island bus coupler	8536IB1908
TeSys™ island Product Environmental Profile, Starters and Power Interface Modules	Describes constituent materials, recyclability potential, and environmental impact information for the TeSys island starters and power interface modules	8536IB1909
TeSys™ island Product Environmental Profile, Accessories	Describes constituent materials, recyclability potential, and environmental impact information for the TeSys island accessories	8536IB1910
TeSys™ island Product End of Life Instructions, Bus Coupler	Contains end of life instructions for the TeSys island bus coupler	8536IB1911
TeSys™ island Product End of Life Instructions, Starters and Power Interface Modules	Contains end of life instructions for TeSys island starters and power interface modules	8536IB1912
TeSys™ island Product End of Life Instructions, Accessories	Contains end of life instructions for TeSys island accessories	8536IB1913
TeSys™ island Instruction Sheet, Bus Coupler	Describes how to install the TeSys island bus coupler	MFR44097
TeSys™ island Instruction Sheet, Starters and Power Interface Modules, Size 1 and 2	Describes how to install size 1 and 2 TeSys island starters and power interface modules	MFR77070
TeSys™ island Instruction Sheet, Starters and Power Interface Modules, Size 3	Describes how to install size 3 TeSys island starters and power interface modules	MFR77085
TeSys™ island Instruction Sheet: Input/ Output Modules	Describes how to install the TeSys island analog and digital I/O modules	MFR44099
TeSys™ island Instruction Sheet: SIL Interface and Voltage Interface Modules	Describes how to install the TeSys island voltage interface modules and SIL interface modules	MFR44100

Precautions

Read and understand the following precautions before performing any procedures in this guide.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside this equipment.
- Use only the specified voltage when operating this equipment and any associated products.
- Always use a properly rated voltage sensing device to confirm power is off.
- Use appropriate interlocks where personnel and/or equipment hazards exist.
- Power line circuits must be wired and protected in compliance with local and national regulatory requirements.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices per NFPA 70E, NOM-029-STPS, or CSA Z462 or local equivalent.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- For complete instructions about functional safety, refer to the *TeSys™ island Functional Safety Guide*, 8536IB1904.
- Do not disassemble, repair, or modify this equipment. There are no user serviceable parts.
- Install and operate this equipment in an enclosure appropriately rated for its intended application environment.
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ **WARNING:** This product can expose you to chemicals including Antimony oxide (Antimony trioxide), which is known to the State of California to cause cancer. For more information go to *www.P65Warnings.ca.gov*.

Qualified Personnel

Only appropriately trained persons who are familiar with and understand the content of this guide and all other related product documentation are authorized to work on and with this product.

The qualified person must be able to detect possible hazards that may arise from modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

The use and application of the information contained in this guide requires expertise in the design and programming of automated control systems. Only you, the user, machine builder, or integrator, can be aware of all the conditions and factors present during installation, setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used.

When selecting automation and control equipment, and any other related equipment or software, for a particular application, you must also consider applicable local, regional, or national standards and/or regulations.

Pay particular attention to conform to any safety information, electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

Intended Use

The products described in this instruction bulletin, together with software, accessories, and options, are starters for low-voltage electrical loads, intended for industrial use according to the instructions, directions, examples, and safety information contained in this document and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements, and the technical data.

Before using the product, you must perform a hazard analysis and risk assessment of the planned application. Based on the results, appropriate safety-related measures must be implemented.

Since the product is used as a component of a machine or process, you must ensure the safety of persons by means of the overall system design.

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in unanticipated hazards.

Island Concept

TeSys™ island is an innovative digital load management solution—providing data for higher machine efficiency and ease of servicing, and allowing faster time to market.

TeSys island is a modular, multifunctional system providing integrated functions inside an automation architecture, primarily for the direct control and management of low-voltage loads. TeSys island can switch, help protect, and manage motors and other electrical loads up to 80 A (AC3) installed in an electrical control panel.

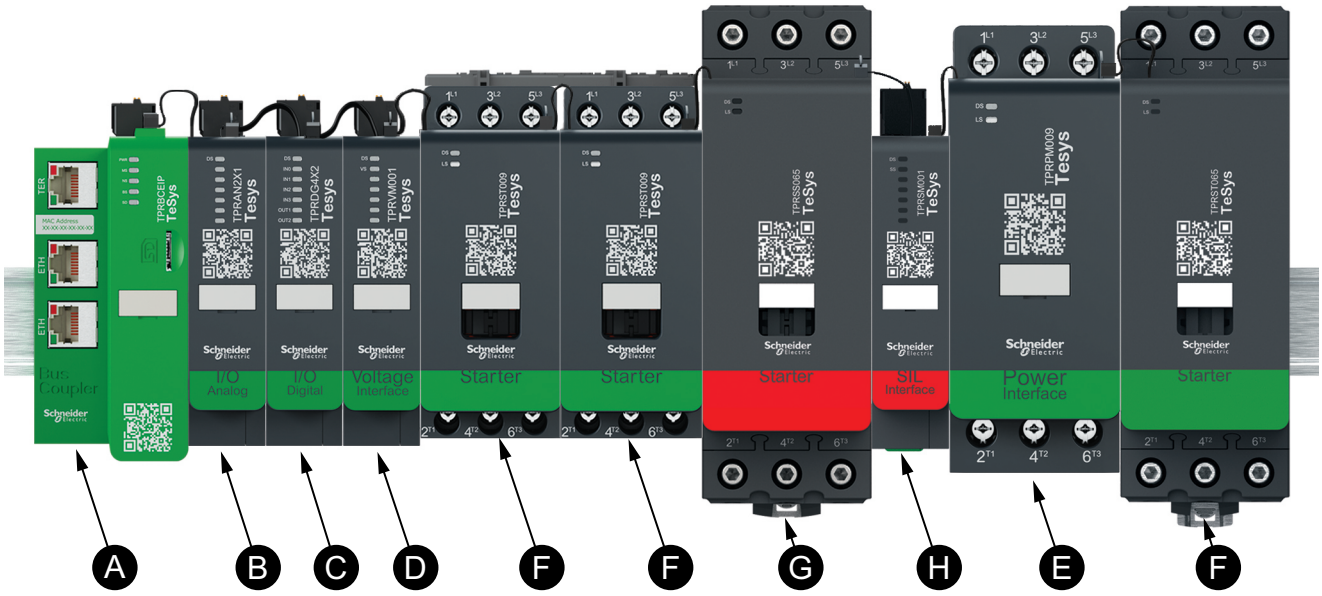
This system is designed around the concept of TeSys Avatars. These Avatars

- Represent both the logical and physical aspects of the automation functions
- Determine the configuration of the island

The logical aspects of the island are managed with software tools, covering all phases of product and application lifecycle: design, engineering, commissioning, operation, and maintenance.

The physical island consists of a set of devices installed on a single DIN rail, and connected together with flat cables providing the internal communication between modules. The external communication with the automation environment is made through a single bus coupler module, and the island is seen as a single node on the network. The other modules include starters, power interface modules, analog and digital I/O modules, voltage interface modules, and SIL (Safety Integrity Level according to standard IEC 61508) interface modules, covering a wide range of operational functions.

Figure 1 - TeSys island Overview



A	Bus Coupler	E	Power Interface Module
B	Analog I/O Module	F	Standard Starter
C	Digital I/O Module	G	SIL Starter
D	Voltage Interface Module	H	SIL Interface Module

Avatar Definition

TeSys™ Avatars bring ready-to-use functions through their predefined logic and associated physical devices. The Avatar logic is executed in the bus coupler. The bus coupler manages data exchanges internally within the island, and also externally with the PLC.

The TeSys Avatars include three types:

System Avatar

Represents the whole island as a system. The system avatar allows setting the network configuration and computes island level data.

Device Avatars

Represent functions performed by switches and I/O modules.

Load Avatars

Represent functions related to specific loads, such as a forward-reverse motor. Load Avatars include the appropriate modules and operating characteristics to serve the load type. For example, a Motor Two Directions Avatar includes two starter modules, accessories, pre-programmed control logic, and a pre-configuration of the available protection functions.

The Avatars installed on the TeSys island are controlled by the island's bus coupler. Each Avatar includes predefined logic for managing its physical modules, while also providing easy data exchange with PLCs through function blocks. Avatars include preconfiguration of the available protection functions. Data exchanges between PLCs and all the Avatars on the island are managed through the bus coupler.

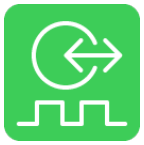
Information accessible through the Avatar includes:

- Control data
- Advanced diagnostics data
- Asset management data
- Energy data

List of TeSys™ Avatars

Name	Icon	Description
System Avatar		A required Avatar that enables a single point of communication to the island.
Switch		To make or break a power line in an electrical circuit
Switch - Safe Stop, W. Cat 1/2[1]		To make or break a power line in an electrical circuit with Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.

1. Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.

Name	Icon	Description
Digital I/O		To provide control of 2 digital outputs and status of 4 digital inputs
Analog I/O		To provide control of 1 analog output and status of 2 analog inputs
Power Interface without I/O (measure)		To monitor current supplied to an external device, such as a solid-state relay, soft starter, or variable speed drive
Power Interface with I/O (control)		To monitor current supplied to and to control an external device, such as a solid-state relay, soft starter, or variable speed drive
Motor One Direction		To manage[2] a motor in one direction
Motor One Direction - Safe Stop, W. Cat 1/2[3]		To manage a motor in one direction, with Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.
Motor Two Directions		To manage a motor in two directions (forward and reverse)
Motor Two Directions - Safe Stop, W. Cat 1/2[3]		To manage a motor in two directions (forward and reverse), with Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.
Motor Y/D One Direction		To manage a wye-delta (star-delta) motor in one direction
Motor Y/D Two Directions		To manage a wye-delta (star-delta) motor in two directions (forward and reverse)

2. “Manage” in this context encompasses energizing, controlling, monitoring, diagnosing, and protecting the load.
3. Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.

Name	Icon	Description
Motor Two Speeds		To manage a two-speed motor
Motor Two Speeds - Safe Stop, W. Cat 1/2[4]		To manage a two-speed motor, with Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.
Motor Two Speeds Two Directions		To manage a two-speed motor in two directions (forward and reverse)
Motor Two Speeds Two Directions - Safe Stop, W. Cat 1/2[4]		To manage a two-speed motor in two directions (forward and reverse), with Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.
Resistor		To manage a resistive load
Power Supply		To manage a power supply
Transformer		To manage a transformer

4. Safe Stop, Wiring Category 1 and Category 2. Safe Stop according to EN 61800-5-2.

Modbus TCP Addressing

TeSys™ island applies the following Unit ID ranges for physical and virtual modularity.

Table 2 - Unit ID Ranges

Item	Unit ID	Comment
Avatars	1–99	Device and Load Avatars
Bus Devices	101–199	Digital I/O Module (DIOM) Analog I/O Module (AIOM) Starters SIL Starters Power Interface Module (PIM) SIL Interface Module (SIM) Voltage Interface Module (VIM)
Bus Coupler / System Avatar	255	—

NOTES:

- Bus devices are numbered sequentially, left to right.
- Avatars are numbered as defined in the Context File.
- Data larger than 16 bits is split into multiple registers, encoded in Big Endian. For example, a 32-bit integer value of decimal 305419896 (or 0x12345678 hexadecimal) is mapped onto two registers, 500 and 501, where register 500 contains the most significant word (0x1234) and register 501 contains the least significant word (0x5678).
- See the table below for examples.

Table 3 - Examples of Device and Avatar Numbering

Order of Avatar in Digital Tool	Avatar Unit ID	Description	Physical Order in island								
			1	2	3	4	5	6	7	8	9
1	255	System	BC			VIM			SIM		
2	1	AIOM		AIOM							
3	2	Motor Two Directions — Safe Stop, W. Cat 1/2[5]					SIL Starter	SIL Starter			
4	3	Motor One Direction								Starter	
5	4	Power Interface with I/O (Control)			DIOM						PIM
Modbus/TCP Physical Device Unit ID			255	101	102	103	104	105	106	107	108

5. Safe Stop according to EN 61800-5-2

EtherNet/IP™ Addressing

Table 4 - EtherNet/IP Addressing

Step	Action
1	Configure your island in the TeSys™ island DTM.
2	In the TeSys island DTM, click on **Device** from the drop-down menu and select the file format you wish to export. You can choose between an EDS file or Rockwell Software® L5X files.
	For L5X: • Click **Export** then **EDS to L5X File Format**. • Click **Save**. The file will be saved as a zip file in the format *island_name.zip*.
	For EDS: • Click **Export** then **EDS File Format**. • Click **Save**. The file will be saved as an eds file in the format *island_name.eds*.
	You will receive a notification that the EDS file has been created. Click **OK**.
3	Consult the *EtherNet/IP™ Quick Start Guide*, document number 8536IB1906, for instructions on importing the L5X files into the Rockwell Software Studio 5000® environment. For instructions on importing the EDS file, consult the documentation provided for the programming environment.

TeSys island Function Block Diagrams

This section contains generic function block diagrams and register data that can be used to assist with PLC programming. For the I/O data and value ranges available at the system and Avatar level, refer to *Third Party Function Block Programming, page 53*.

System Avatar

The SystemAvatar function block returns the status of the System Avatar.

Figure 2 - SystemAvatar Function Block

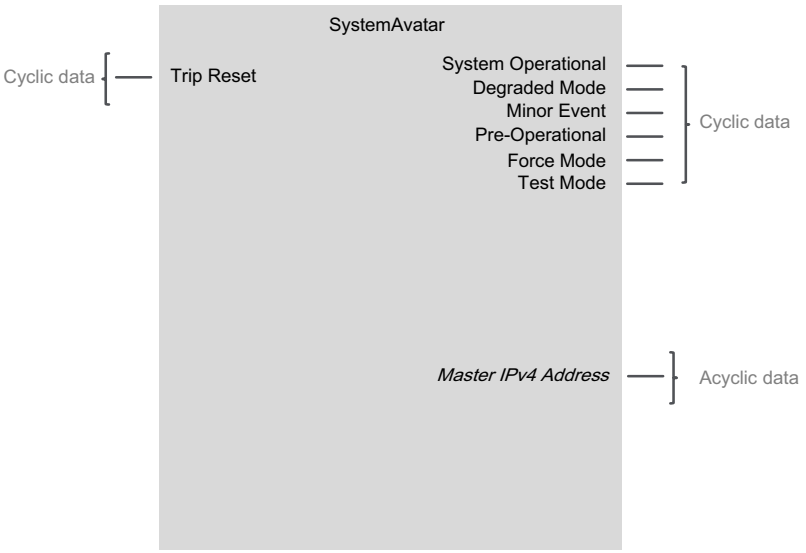


Table 5 - Modbus TCP Inputs—System Avatar

Input Name	Address	Starting Bit	Size (Bits)
Trip Reset	8501	3	1

Table 6 - Modbus TCP Outputs—System Avatar

Input Name	Address	Starting Bit	Size (Bits)
System Operational	3201	1	1
Force Mode	3201	2	1
Minor Event	3201	3	1
Pre-Operational	3201	4	1
Degraded Mode	3201	5	1
Test Mode	3201	6	1
IP Address	64234	0	32

Device Function Blocks

Switch

This function block establishes or interrupts a power line in an electrical circuit.

Figure 3 - Switch Function Block

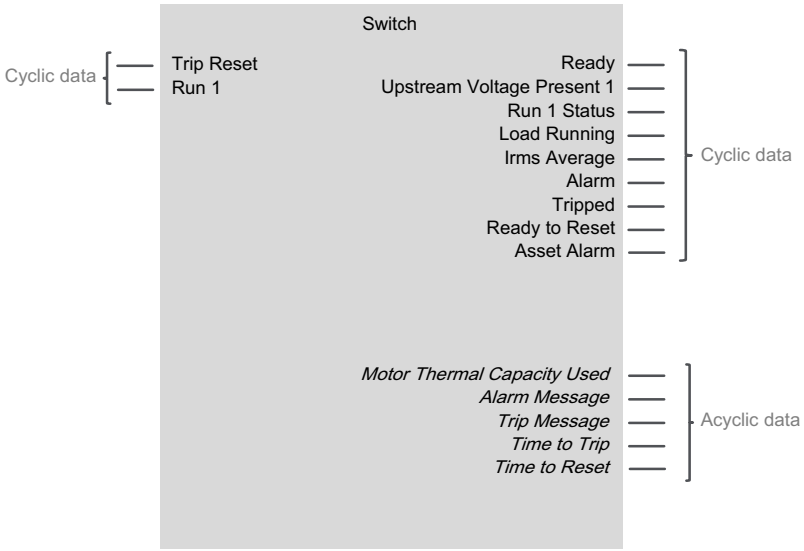


Table 7 - Modbus TCP Inputs—Switch

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1

Table 8 - Modbus TCP Outputs—Switch

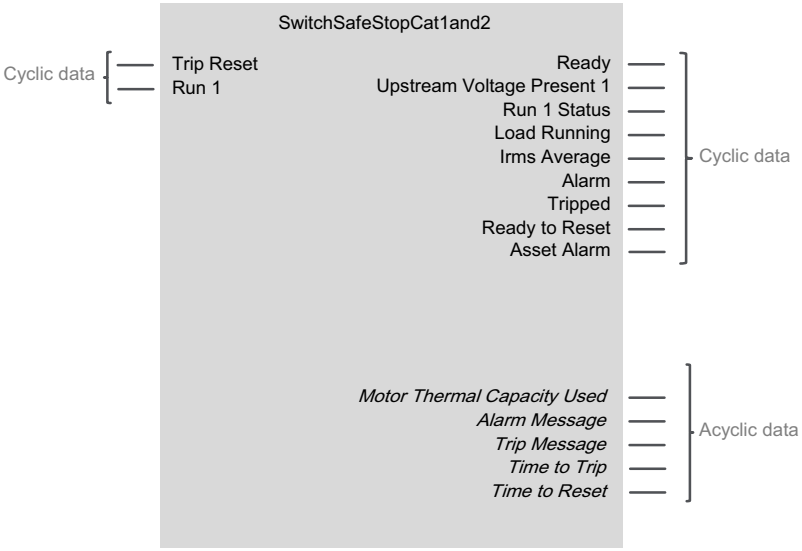
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Run 1 Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Switch - Safe Stop, W. Cat 1/2

NOTE: Safe Stop according to EN 61800-5-2

This function block establishes or interrupts a power line in an electrical circuit with Safe Stop[6] function compliance for Wiring Category 1 and Category 2.

Figure 4 - SwitchSafeStopCat1and2 Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 9 - Modbus TCP Inputs—Switch

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1

Table 10 - Modbus TCP Outputs—Switch

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Run 1 Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

6. Safe Stop according to EN 61800-5-2

Digital I/O

This function block provides information about the Digital I/O Avatar. The Digital I/O Avatar has four inputs and two outputs.

Figure 5 - DigitalIO Function Block

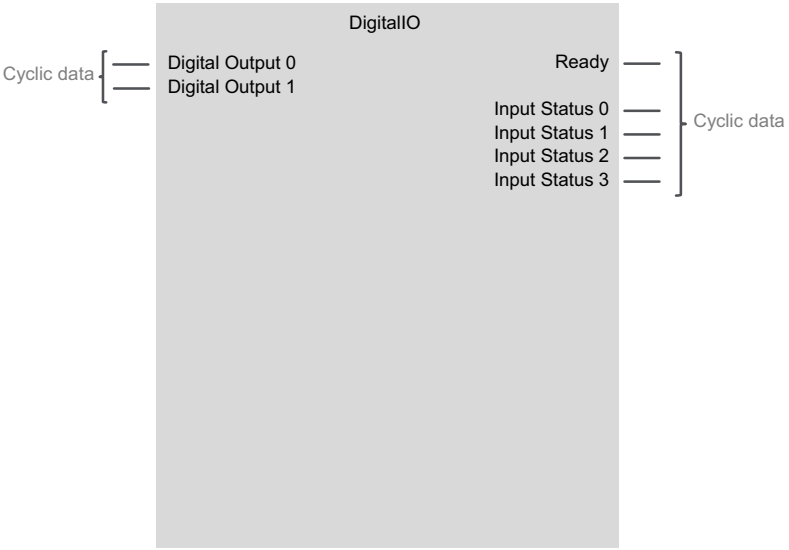


Table 11 - Modbus TCP Inputs—Digital I/O

Input Name	Address	Starting Bit	Size (Bits)
Digital Output 1	8501	8	1
Digital Output 2	8501	9	1

Table 12 - Modbus TCP Outputs—Digital I/O

Output Name	Address	Starting Bit	Size (Bits)
Digital Input 0 Status	3201	4	1
Digital Input 1 Status	3201	5	1
Digital Input 2 Status	3201	6	1
Digital Input 3 Status	3201	7	1

Analog I/O

This function block provides information about the Analog I/O Avatar. The Analog I/O Avatar has two inputs and one output.

Figure 6 - AnalogIO Function Block

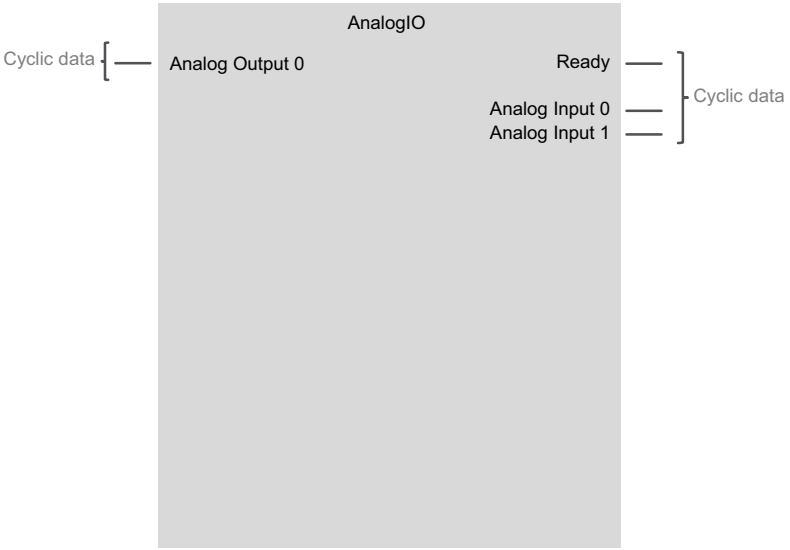


Table 13 - Modbus TCP Inputs—Analog I/O

Input Name	Address	Starting Bit	Size (Bits)
Analog Output 0	8504	0	16

Table 14 - Modbus TCP Outputs—Analog I/O

Output Name	Address	Starting Bit	Size (Bits)
Analog Input 0	3204	0	16
Analog Input 1	3205	0	16

Load Function Blocks

Power Interface Module without I/O (Measure)

This function block is used to monitor current on an external power device, such as a solid-state relay, soft starter, or variable speed drive.

Figure 7 - PowerInterface Function Block

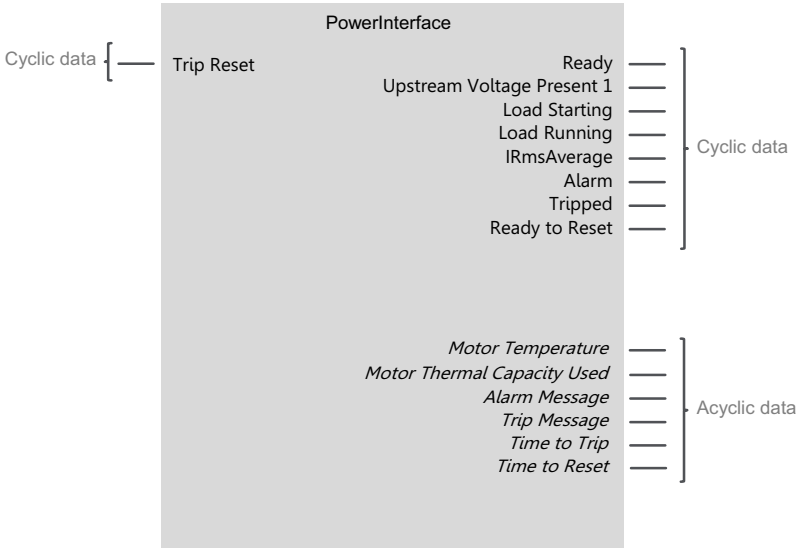


Table 15 - Modbus TCP Inputs—PIM without I/O (Measure)

Input Name	Address	Starting Bit	Size (Bits)
Trip Reset	8501	3	1

Table 16 - Modbus TCP Outputs—PIM without I/O (Measure)

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
Motor Temperature	464	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Power Interface Module with I/O (Control)

This function block is used to monitor current and control an external power device, such as a solid-state relay, soft starter, or variable speed drive.

Figure 8 - PowerInterfaceIO Function Block

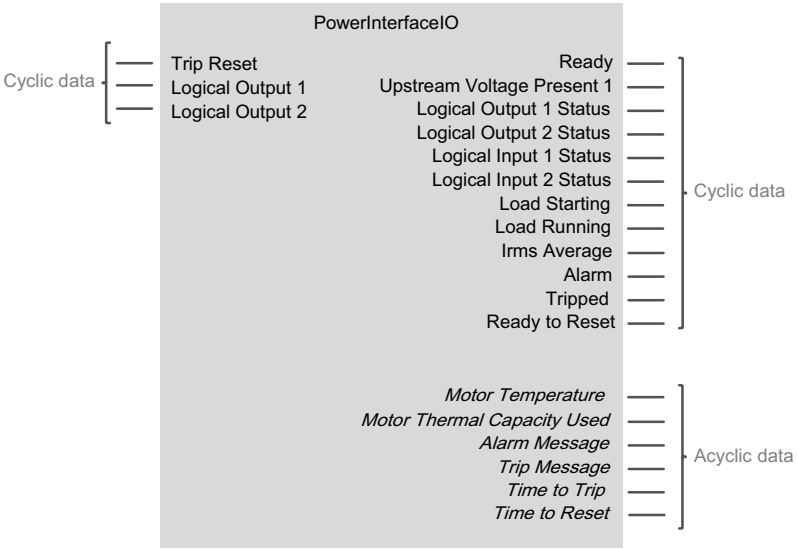


Table 17 - Modbus TCP Inputs—Power Interface Module (PIM) with I/O (Control)

Input Name	Address	Starting Bit	Size (Bits)
Trip Reset	8501	3	1
Logic Output 1	8501	8	1
Logic Output 2	8501	9	1

Table 18 - Modbus TCP Outputs—PIM with I/O (Control)

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
Motor Temperature	464	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Logic Input 1 Status	3201	4	1
Logic Input 2 Status	3201	5	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Logical Output 1 Status	3201	10	1
Logical Output 2 Status	3201	11	1
Load Starting	3201	15	1

Table 18 - Modbus TCP Outputs—PIM with I/O (Control) (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Motor One Direction

This function block is used to manage a motor in one direction.

Figure 9 - MotorOneDirection Function Block

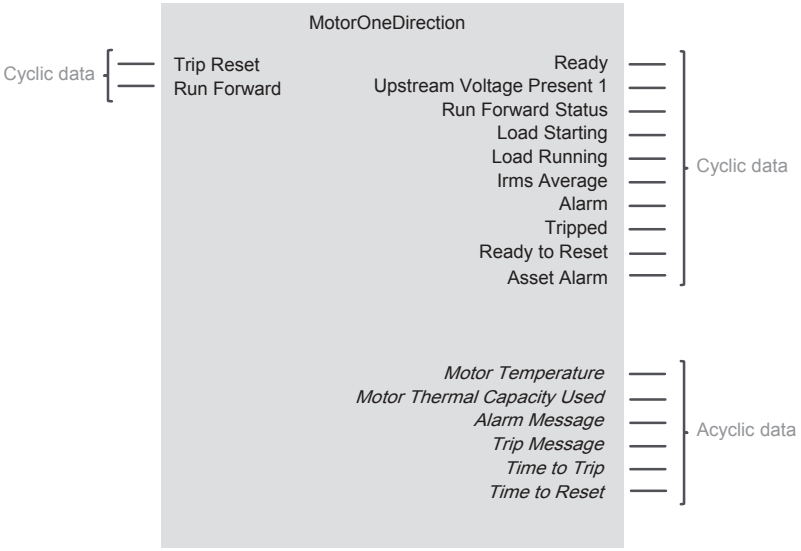


Table 19 - Modbus TCP Inputs—Motor One Direction

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Trip Reset	8501	3	1

Table 20 - Modbus TCP Outputs—Motor One Direction

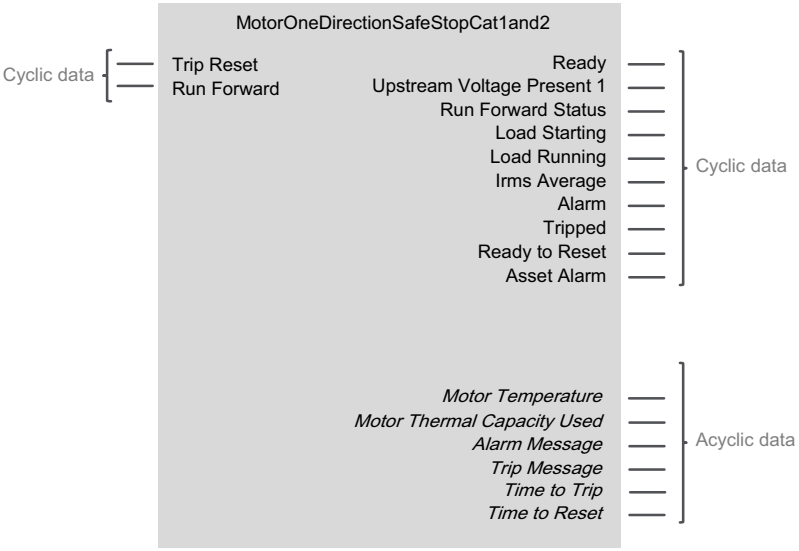
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Motor One Direction - Safe Stop, W. Cat 1/2

NOTE: Safe Stop according to EN 61800-5-2

This function block is used to manage a motor in one direction with Safe Stop[7] function compliance for Wiring Category 1 and Category 2.

Figure 10 - MotorOneDirectionSafeStopCat1and2 Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 21 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Trip Reset	8501	3	1

Table 22 - Modbus TCP Outputs

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1

7. Safe Stop according to EN 61800-5-2

Table 22 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Directions

This function block is used to manage a motor in two directions (forward and reverse).

Figure 11 - MotorTwoDirections Function Block

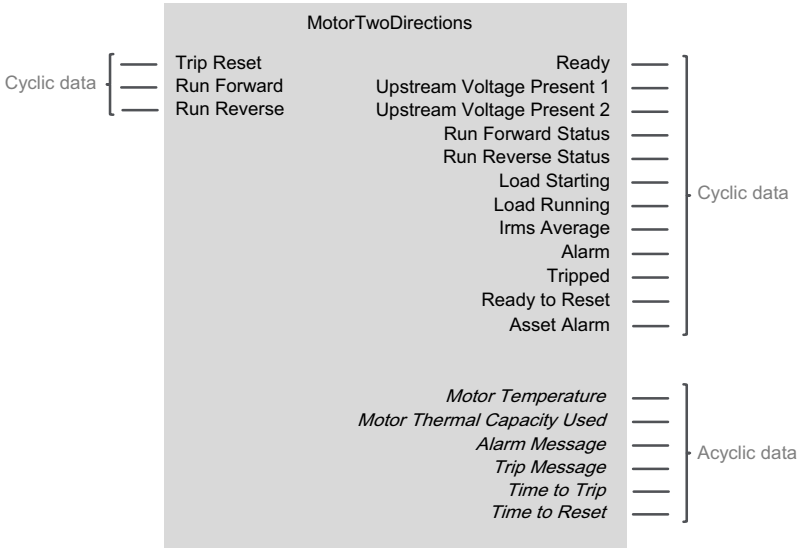


Table 23 - Modbus TCP Inputs—Motor Two Directions

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Run Reverse	8501	1	1
Trip Reset	8501	3	1

Table 24 - Modbus TCP Outputs—Motor Two Directions

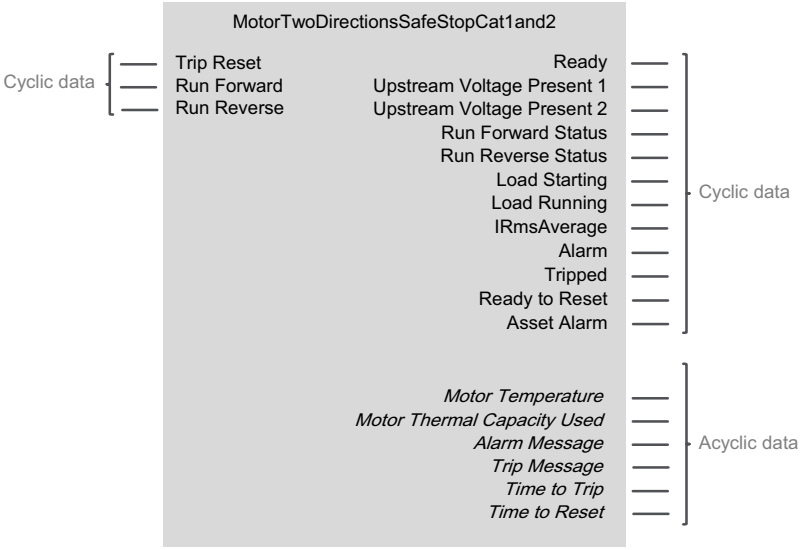
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Load Starting	3201	15	1
Run Reverse Status	3202	1	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Directions - Safe Stop, W. Cat 1/2

NOTE: Safe Stop according to EN 61800-5-2

This function block is used to manage a motor in two directions (forward and reverse) with Safe Stop[8] function compliance for Wiring Category 1 and Category 2.

Figure 12 - MotorTwoDirectionsSafeStopCat1and2 Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 25 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Run Reverse	8501	1	1
Trip Reset	8501	3	1

Table 26 - Modbus TCP Outputs

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Run Reverse Status	3202	1	1

8. Safe Stop according to EN 61800-5-2

Table 26 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Motor Thermal Capacity Used	9630	0	8

Motor Y/D One Direction

This function block is used to manage a wye-delta (star-delta) motor in one direction.

Figure 13 - MotorYDOneDirection Function Block

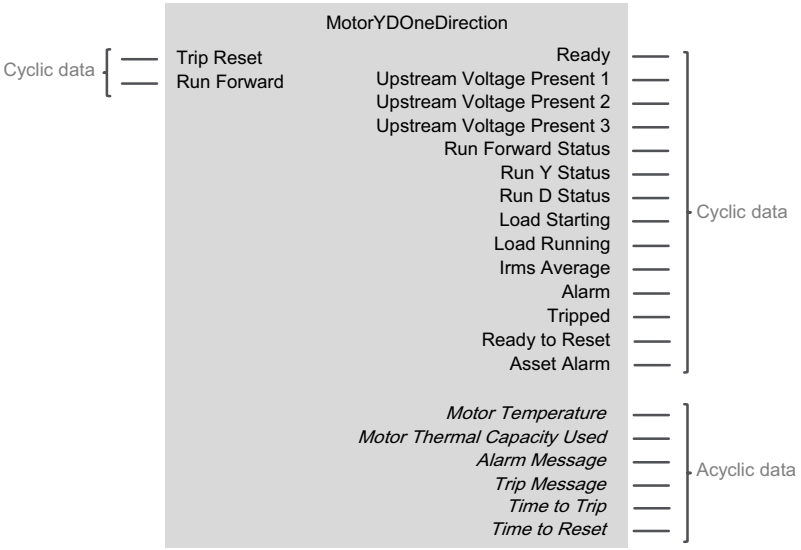


Table 27 - Modbus TCP Inputs—Motor Y/D One Direction

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Trip Reset	8501	3	1

Table 28 - Modbus TCP Outputs—Motor Y/D One Direction

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Y Status	3201	6	1
Run D Status	3201	7	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1

Table 28 - Modbus TCP Outputs—Motor Y/D One Direction (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 3	3202	14	1
Motor Thermal Capacity Used	9630	0	8

Motor Y/D Two Directions

This function block is used to manage a wye-delta (star-delta) motor in two directions (forward and reverse).

Figure 14 - MotorYDTwoDirections Function Block

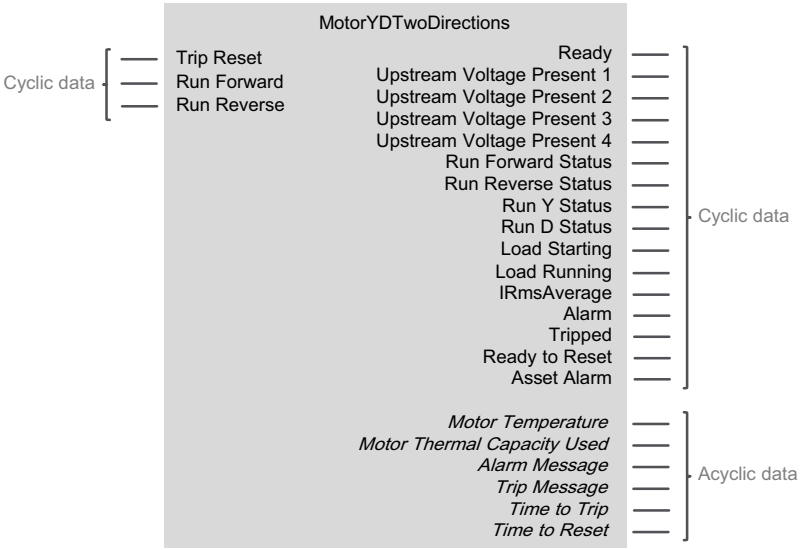


Table 29 - Modbus TCP Inputs—Motor Y/D Two Directions

Input Name	Address	Starting Bit	Size (Bits)
Run Forward	8501	0	1
Run Reverse	8501	1	1
Trip Reset	8501	3	1

Table 30 - Modbus TCP Outputs—Motor Y/D Two Directions

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Run Forward Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Y Status	3201	6	1
Run D Status	3201	7	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Run Reverse Status	3202	1	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

Table 30 - Modbus TCP Outputs—Motor Y/D Two Directions (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 2	3202	13	1
Upstream Voltage Present 3	3202	14	1
Upstream Voltage Present 4	3202	15	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Speeds

This function block is used to manage a two speed motor.

Figure 15 - MotorTwoSpeeds Function Block

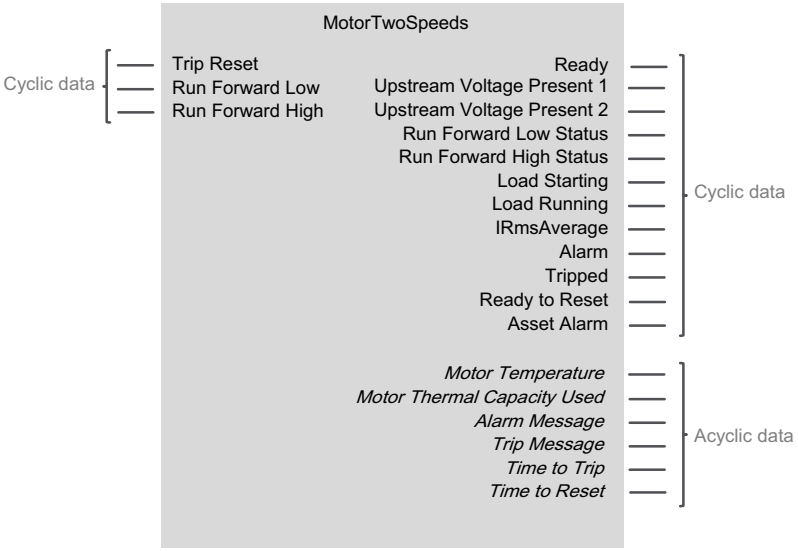


Table 31 - Modbus TCP Inputs—Motor Two Speeds

Input Name	Address	Starting Bit	Size (Bits)
Run Forward High	8501	0	1
Trip Reset	8501	3	1
Run Forward Low	8501	6	1

Table 32 - Modbus TCP Outputs—Motor Two Speeds

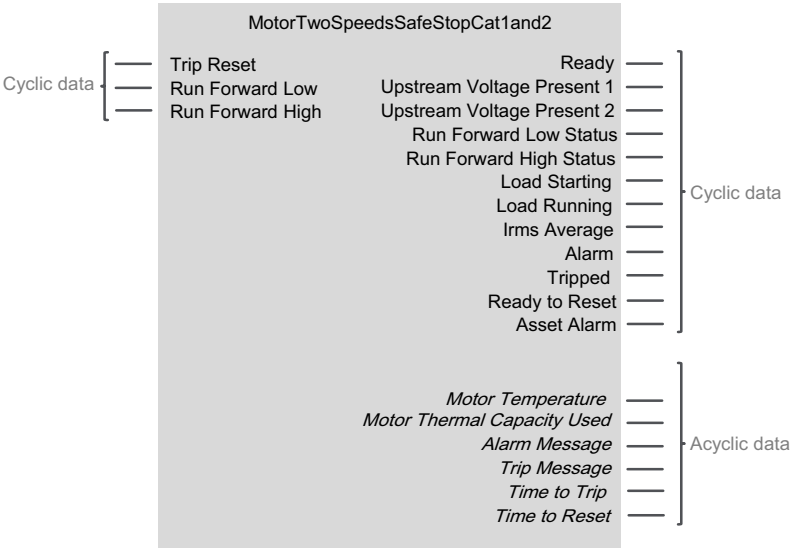
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Forward Low Status	3201	5	1
Run Forward High Status	3201	6	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Speeds - Safe Stop, W. Cat 1/2

NOTE: Safe Stop according to EN 61800-5-2.

This function block is used to manage a two speed motor with Safe Stop[9] function compliance for Wiring Category 1 and Category 2.

Figure 16 - MotorTwoSpeedsSafeStopCat1and2 Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 33 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run Forward High	8501	0	1
Trip Reset	8501	3	1
Run Forward Low	8501	6	1

Table 34 - Modbus TCP Outputs

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Forward Low Status	3201	5	1
Run Forward High Status	3201	6	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1

9. Safe Stop according to EN 61800-5-2

Table 34 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Speeds Two Directions

This function block is used to manage a two speed motor in two directions (forward and reverse).

Figure 17 - MotorTwoSpeedsTwoDirections Function Block

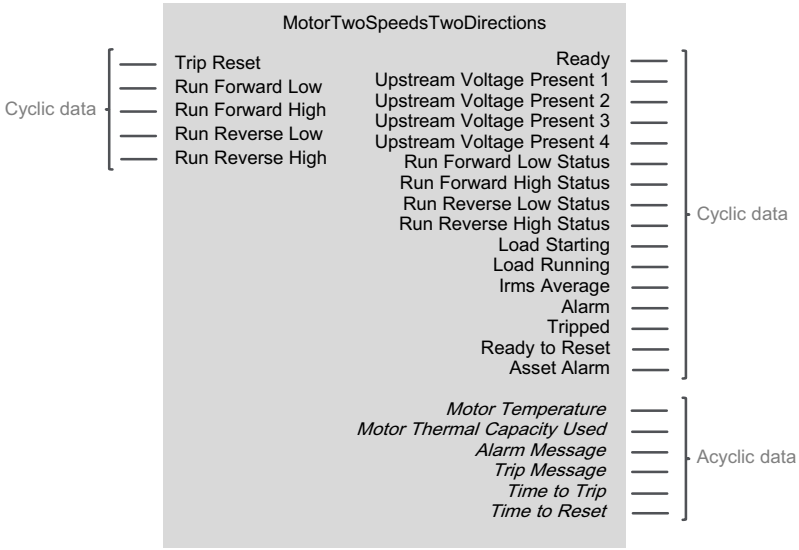


Table 35 - Modbus TCP Inputs—Motor Two Speeds Two Directions

Input Name	Address	Starting Bit	Size (Bits)
Run Forward High	8501	0	1
Run Reverse High	8501	1	1
Trip Reset	8501	3	1
Run Forward Low	8501	6	1
Run Reverse Low	8501	7	1

Table 36 - Modbus TCP Outputs—Motor Two Speeds Two Directions

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Forward Low Status	3201	5	1
Run Forward High Status	3201	6	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Run Reverse Low Status	3201	12	1
Run Reverse High Status	3201	13	1
Load Starting	3201	15	1

Table 36 - Modbus TCP Outputs—Motor Two Speeds Two Directions (Continued)

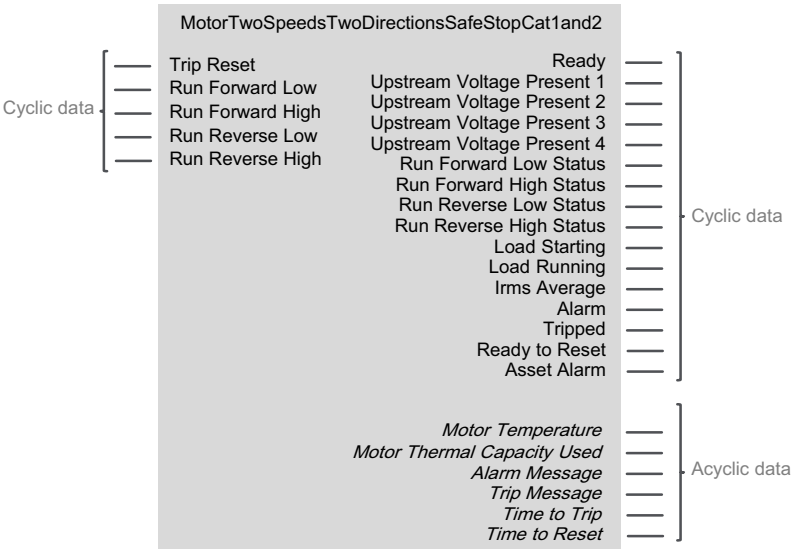
Output Name	Address	Starting Bit	Size (Bits)
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Upstream Voltage Present 3	3202	14	1
Upstream Voltage Present 4	3202	15	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Speeds Two Directions - Safe Stop, W. Cat 1/2

NOTE: Safe Stop according to EN 61800-5-2

This function block is used to manage a two speed motor in two directions (forward and reverse) with Safe Stop[10] function compliance for Wiring Category 1 and Category 2.

Figure 18 - MotorTwoSpeedsTwoDirectionsSafeStopCat1and2 Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 37 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run Forward High	8501	0	1
Run Reverse High	8501	1	1
Trip Reset	8501	3	1
Run Forward Low	8501	6	1
Run Reverse Low	8501	7	1

Table 38 - Modbus TCP Outputs

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Run Forward Low Status	3201	5	1
Run Forward High Status	3201	6	1

10. Safe Stop according to EN 61800-5-2

Table 38 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Load Running	3201	8	1
Ready to Reset	3201	9	1
Run Reverse Low Status	3201	12	1
Run Reverse High Status	3201	13	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Upstream Voltage Present 3	3202	14	1
Upstream Voltage Present 4	3202	15	1
Motor Thermal Capacity Used	9630	0	8

Resistor

This function block is used to manage a resistive load.

Figure 19 - Resistor Function Block

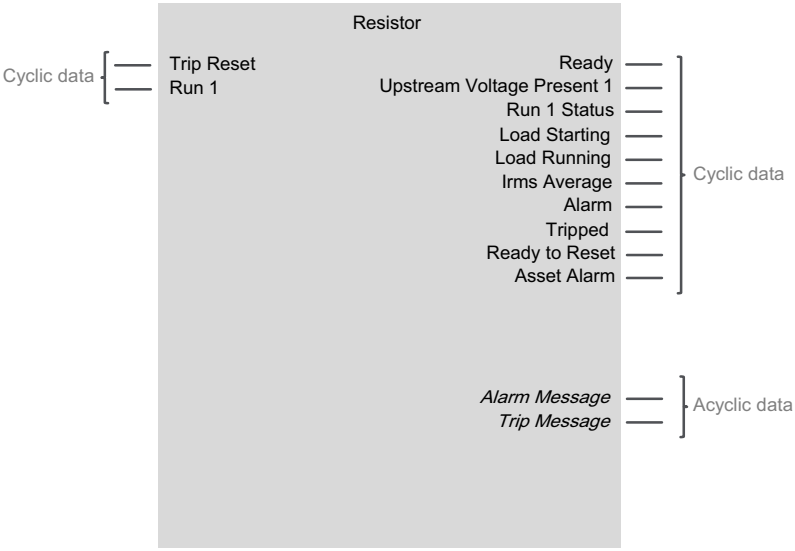


Table 39 - Modbus TCP Inputs—Resistor

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1

Table 40 - Modbus TCP Outputs—Resistor

Output Name	Address	Starting Bit	Size (Bits)
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Ready	3201	0	1
Run 1 Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

Power Supply

This function block is used to manage a power supply.

Figure 20 - Power Supply Function Block

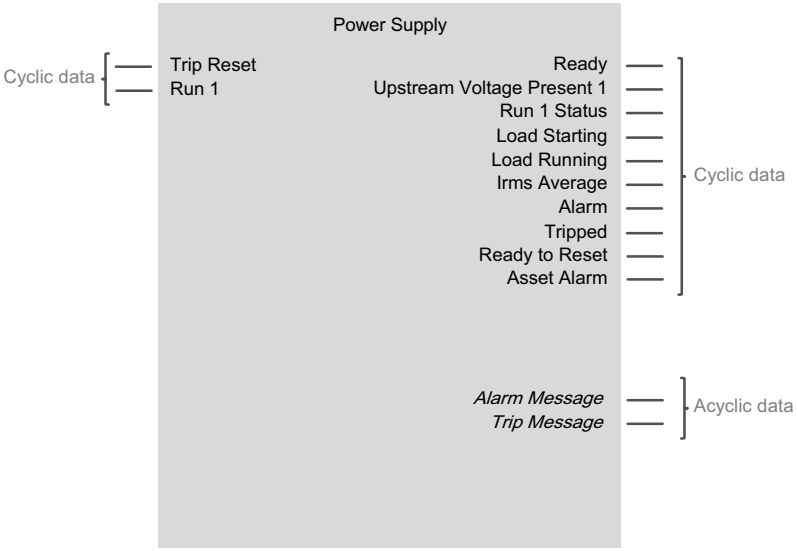


Table 41 - Modbus TCP Inputs—Power Supply

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1

Table 42 - Modbus TCP Outputs—Power Supply

Output Name	Address	Starting Bit	Size (Bits)
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Ready	3201	0	1
Run 1 Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

Transformer

This function block is used to manage a transformer.

Figure 21 - Transformer Function Block

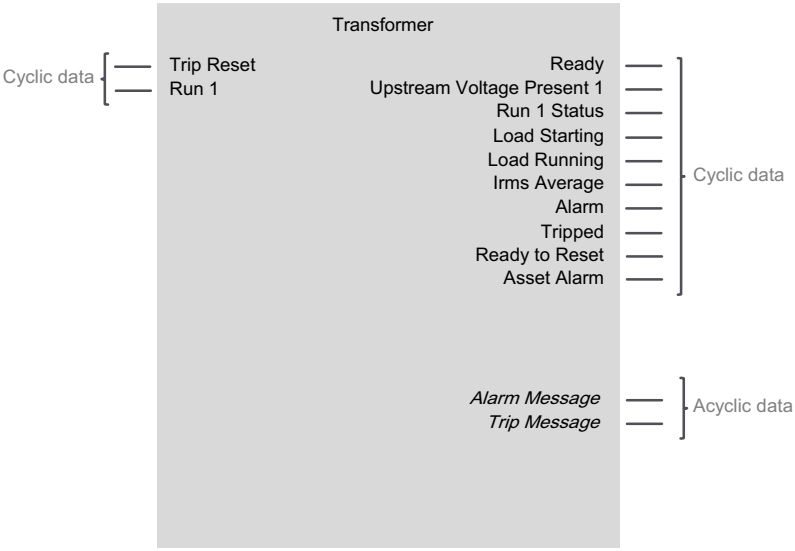


Table 43 - Modbus TCP Inputs—Transformer

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1

Table 44 - Modbus TCP Outputs—Transformer

Output Name	Address	Starting Bit	Size (Bits)
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I_{RMS} Average	500	0	32
Ready	3201	0	1
Run 1 Status	3201	1	1
Tripped	3201	2	1
Alarm	3201	3	1
Load Running	3201	8	1
Ready to Reset	3201	9	1
Load Starting	3201	15	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

System Energy

This function block performs the following functions:

- Returns the energy information of the System Avatar
- Resets the energy registers of the System Avatar
- Sets the energy preset values of the System Avatar

Figure 22 - SystemEnergy Function Block

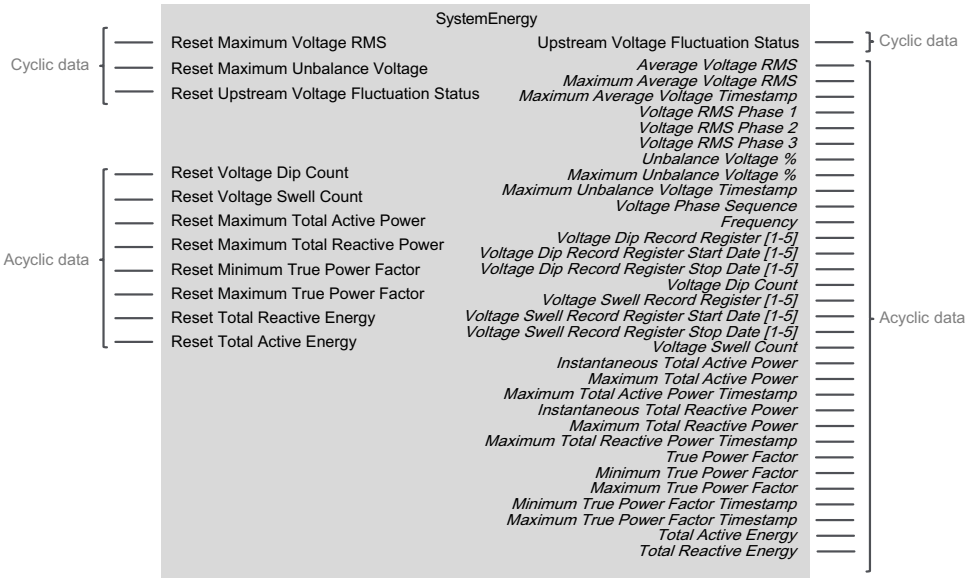


Table 45 - Modbus TCP Inputs—System Energy

Input Name	Address	Starting Bit	Size (Bits)
Reset Maximum Voltage RMS	711	0	1
Reset Maximum Unbalance Voltage	711	1	1
Reset Upstream Voltage Fluctuation Status	711	2	1
Reset Voltage Dip Count	711	8	1
Reset Voltage Swell Count	711	9	1
Reset Maximum Total Active Power	712	0	1
Reset Maximum Total Reactive Power	712	1	1
Reset Minimum True Power Factor	712	8	1
Reset Maximum True Power Factor	712	9	1
Reset Total Active Energy	713	0	1
Reset Total Reactive Energy	713	1	1

Table 46 - Modbus TCP Outputs—System Energy

Output Name	Address	Starting Bit	Size (Bits)
Total Active Energy	143	0	32
Total Reactive Energy	145	0	32
Frequency (Hz)	474	0	8
Average Voltage RMS	476	0	16
Voltage RMS Phase 1 (V)	477	0	16
Voltage RMS Phase 2 (V)	478	0	16
Voltage RMS Phase 3 (V)	479	0	16
Percentage of Unbalance Voltage (%)	480	0	8
True Power Factor	481	0	8
Instantaneous Total Active Power	482	0	32
Instantaneous Total Reactive Power	484	0	32
Voltage Dip Count	1550	0	16
Voltage Swell Count	1551	0	16
Upstream Voltage Fluctuation Status	1553	0	1
Voltage Dip Record Register 1 (most recent)	1600	0	16
Voltage Dip Record 1 Start Date	1601	0	64
Voltage Dip Record 1 Stop Date	1605	0	64
Voltage Dip Record Register 2	1609	0	16
Voltage Dip Record 2 Start Date	1610	0	64
Voltage Dip Record 2 Stop Date	1614	0	64
Voltage Dip Record Register 3	1618	0	16
Voltage Dip Record 3 Start Date	1619	0	64
Voltage Dip Record 3 Stop Date	1623	0	64
Voltage Dip Record Register 4	1627	0	16
Voltage Dip Record 4 Start Date	1628	0	64
Voltage Dip Record 4 Stop Date	1632	0	64
Voltage Dip Record Register 5 (least recent)	1636	0	16
Voltage Dip Record 5 Start Date	1637	0	64
Voltage Dip Record 5 Stop Date	1641	0	64
Voltage Swell Record Register 1 (most recent)	1650	0	16
Voltage Swell Record 1 Start Date	1651	0	64
Voltage Swell Record 1 Stop Date	1655	0	64
Voltage Swell Record Register 2	1659	0	16
Voltage Swell Record 2 Start Date	1660	0	64
Voltage Swell Record 2 Stop Date	1664	0	64
Voltage Swell Record Register 3	1668	0	16
Voltage Swell Record 3 Start Date	1669	0	64
Voltage Swell Record 3 Stop Date	1673	0	64
Voltage Swell Record Register 4	1677	0	16
Voltage Swell Record 4 Start Date	1678	0	64
Voltage Swell Record 4 Stop Date	1682	0	64

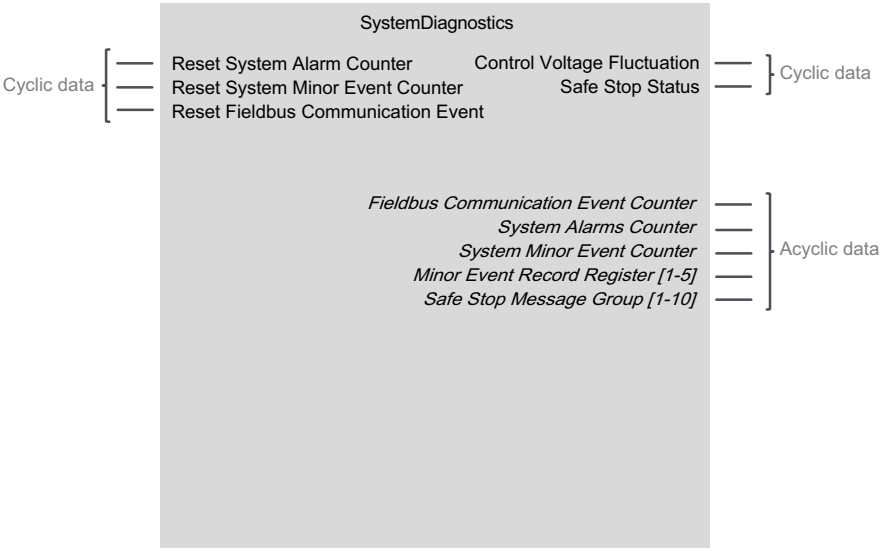
Table 46 - Modbus TCP Outputs—System Energy (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Voltage Swell Record Register 5 (least recent)	1686	0	16
Voltage Swell Record 5 Start Date	1687	0	64
Voltage Swell Record 5 Stop Date	1691	0	64
Maximum Average Voltage Timestamp	2120	0	64
Maximum Average Voltage RMS	2124	0	16
Maximum Unbalance Voltage Timestamp	2128	0	64
Maximum Unbalance Voltage %	2132	0	8
Maximum Total Active Power Timestamp	2140	0	64
Maximum Total Active Power	2144	0	32
Maximum Total Reactive Power Timestamp	2148	0	64
Maximum Total Reactive Power	2152	0	32
Maximum True Power Factor Timestamp	2160	0	64
Maximum True Power Factor	2164	0	8
Minimum True Power Factor Timestamp	2168	0	64
Minimum True Power Factor	2172	0	8
Voltage Phase Sequence (ABC or ACB)	3202	0	1

System Diagnostics

This function block returns and resets the diagnostic information of the System Avatar.

Figure 23 - SystemDiagnostics Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 47 - Modbus TCP Inputs—System Diagnostics

Input Name	Address	Starting Bit	Size (Bits)
Reset System Alarm Counter	8502	0	1
Reset System Minor Event Counter	8502	1	1
Reset Fieldbus Communication Event Counter	8503	2	1

Table 48 - Modbus TCP Outputs—System Diagnostics

Output Name	Address	Starting Bit	Size (Bits)
System Minor Event Counter	90	0	16
Fieldbus Communication Event Counter	91	0	16
System Alarms Counter	92	0	16
Minor Event Record Register 1	300	0	80
Minor Event Record Register 2	310	0	80
Minor Event Record Register 3	320	0	80
Minor Event Record Register 4	330	0	80
Minor Event Record Register 5	340	0	80
Control Voltage Fluctuation	452	5	1
Safe Stop[11] Status	3203	0	1
Safe Stop[11] Message Group 1	3204	0	8
Safe Stop[11] Message Group 2	3205	0	8
Safe Stop[11] Message Group 3	3206	0	8
Safe Stop[11] Message Group 4	3207	0	8
Safe Stop[11] Message Group 5	3208	0	8

11. Safe Stop according to EN 61800-5-2

Table 48 - Modbus TCP Outputs—System Diagnostics (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Safe Stop[12] Message Group 6	3209	0	8
Safe Stop[12] Message Group 7	3210	0	8
Safe Stop[12] Message Group 8	3211	0	8
Safe Stop[12] Message Group 9	3212	0	8
Safe Stop[12] Message Group 10	3213	0	8

12. Safe Stop according to EN 61800-5-2

System Asset Management

This function block returns maintenance and product-specific information of the system device.

Figure 24 - SystemAssetManagement Function Block

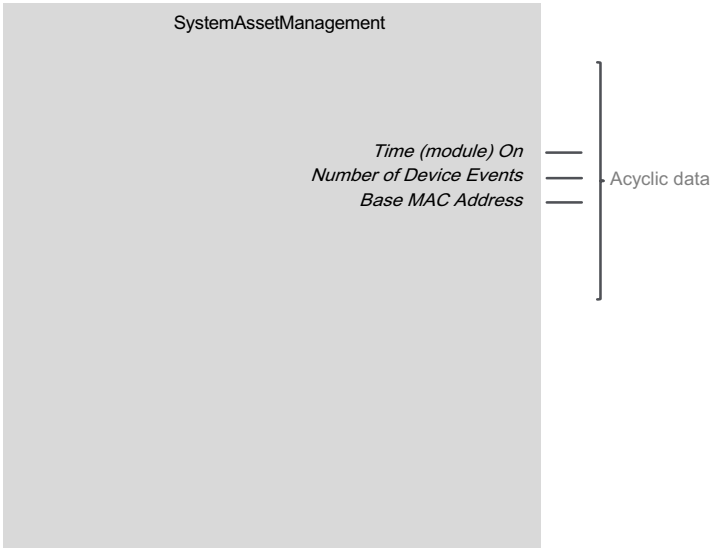


Table 49 - Modbus TCP Outputs—System Asset Management

Output Name	Address	Starting Bit	Size (Bits)
Time (module) On	28	0	32
Number of Device Events	33	0	16
Base MAC Address	64267	0	48

Energy

This function block performs the following functions:

- Returns the energy and power information of the selected Avatar
- Resets the energy registers of the selected Avatar
- Sets the energy preset values of the selected Avatar

Figure 25 - Energy Function Block

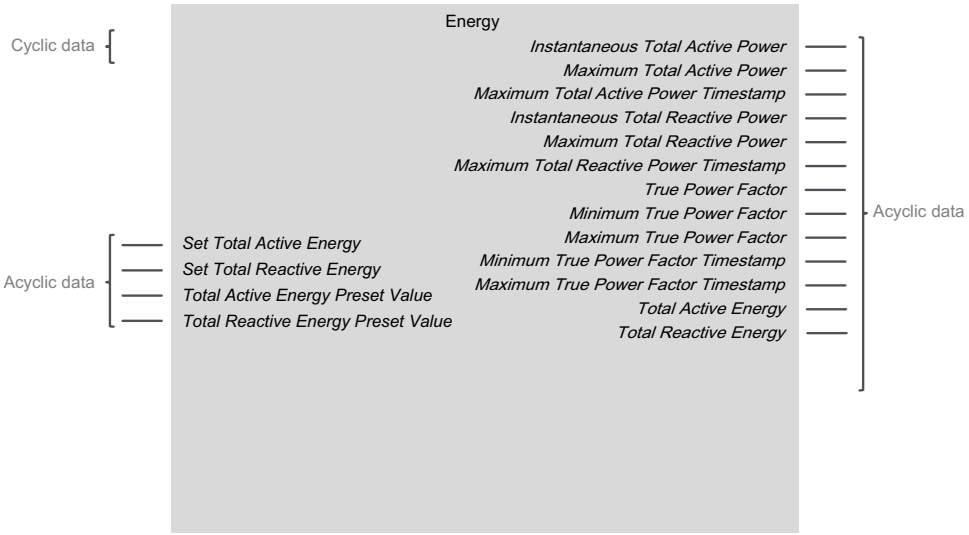


Table 50 - Modbus TCP Inputs—Energy

Input Name	Address	Starting Bit	Size (Bits)
Total Active Energy Preset Value	680	0	32
Total Reactive Energy Preset Value	682	0	32
Set Total Active Energy	713	6	1
Set Total Reactive Energy	713	7	1

Table 51 - Modbus TCP Outputs—Energy

Output Name	Address	Starting Bit	Size (Bits)
Total Active Energy	143	0	32
Total Reactive Energy	145	0	32
True Power Factor	481	0	8
Instantaneous Total Active Power	482	0	32
Instantaneous Total Reactive Power	484	0	32
Maximum Total Active Power Timestamp	2140	0	64
Maximum Total Active Power	2144	0	32
Maximum Total Reactive Power Timestamp	2148	0	64
Maximum Total Reactive Power	2152	0	32
Maximum True Power Factor Timestamp	2160	0	64
Maximum True Power Factor	2164	0	8
Minimum True Power Factor Timestamp	2168	0	64
Minimum True Power Factor	2172	0	8

Diagnostics

This function block performs the following functions for the selected Avatar:

- Returns diagnostic information
- Resets the Maximum I_{RMS} register
- Returns the values of the trip counters and resets all trip counters
- Returns the values of the trip registers
- Returns the values of the alarm counters and resets all alarm counters

Figure 26 - Diagnostics Function Block

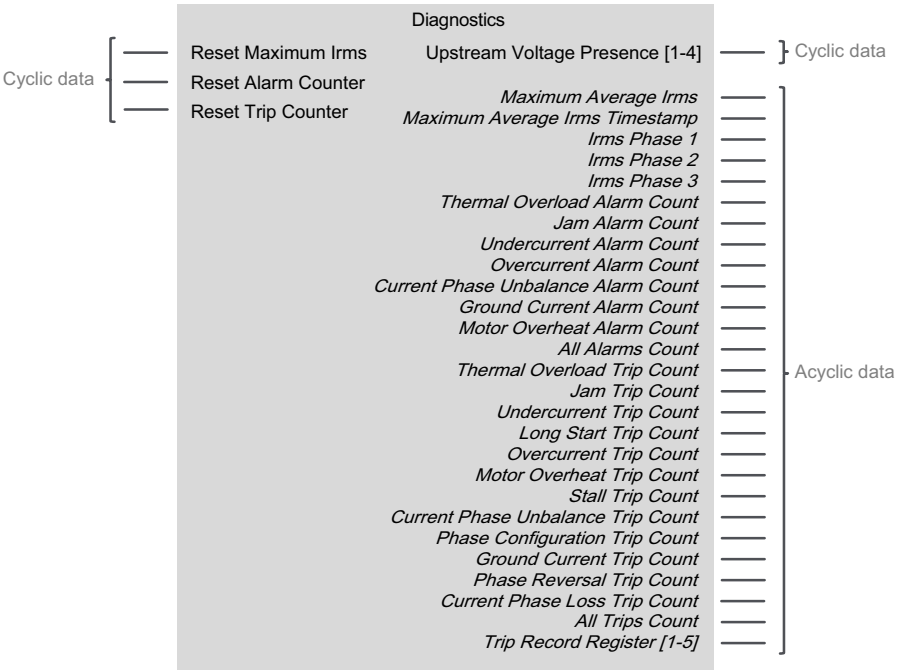


Table 52 - Modbus TCP Inputs—Diagnostics

Input Name	Address	Starting Bit	Size (Bits)
Reset Trip Counter	710	0	1
Reset Alarm Counter	710	1	1
Reset Maximum I_{RMS}	710	2	1

Table 53 - Modbus TCP Outputs—Diagnostics

Output Name	Address	Starting Bit	Size (Bits)
Maximum Average I_{RMS}	32	0	16
Ground Current Trip Count	102	0	16
Thermal Overload Trip Count	103	0	16
Long Start Trip Count	104	0	16
Jam Trip Count	105	0	16
Current Phase Unbalance Trip Count	106	0	16
Undercurrent Trip Count	107	0	16
Thermal Overload Alarm Count	116	0	16
All Trips Count	122	0	16
All Alarms Counter	123	0	16
Stall Trip Count	129	0	16

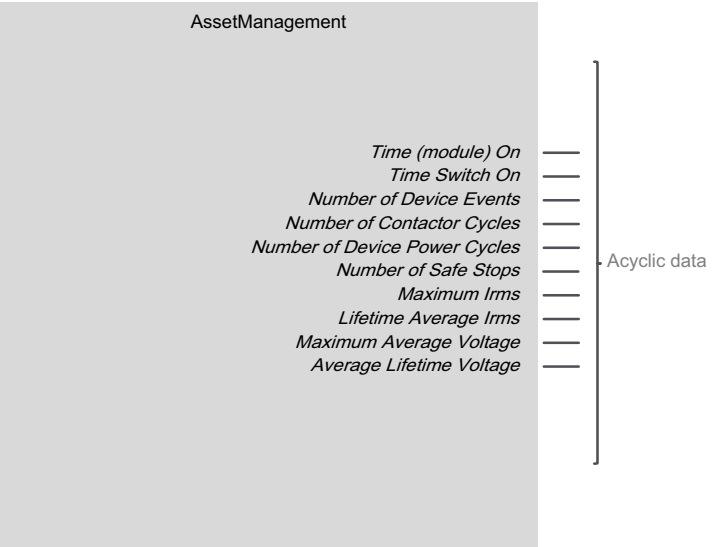
Table 53 - Modbus TCP Outputs—Diagnostics (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Overcurrent Trip Count	130	0	16
Current Phase Loss Trip Count	131	0	16
Motor Overheat Trip Count	132	0	16
Phase Reversal Trip Count	135	0	16
Trip Record Register 1	150	0	80
Trip Record Register 2	180	0	80
Trip Record Register 3	210	0	80
Trip Record Register 4	240	0	80
Trip Record Register 5	270	0	80
I_{RMS} Phase 1	502	0	32
I_{RMS} Phase 2	504	0	32
I_{RMS} Phase 3	506	0	32
Phase Configuration Trip Count	1500	0	16
Ground Current Alarm Count	1502	0	16
Jam Alarm Count	1505	0	16
Current Phase Unbalance Alarm Count	1506	0	16
Undercurrent Alarm Count	1507	0	16
Overcurrent Alarm Count	1530	0	16
Motor Overheat Alarm Count	1532	0	16
Max Average I_{RMS} Time Stamp	2104	0	64
Upstream Voltage Present 1	3202	12	1
Upstream Voltage Present 2	3202	13	1
Upstream Voltage Present 3	3202	14	1
Upstream Voltage Present 4	3202	15	1

Asset Management

This function block returns maintenance and product identification information of the devices.

Figure 27 - AssetManagement Function Block



NOTE: Safe Stop according to EN 61800-5-2

Table 54 - Modbus TCP Outputs—Asset Management

Output Name	Address	Starting Bit	Size (Bits)
Number of Device Power Cycles	24	0	32
Number of Contactor Cycles	26	0	32
Time (module) On	28	0	32
Time Switch On	30	0	32
Lifetime Average I_{RMS}	32	0	32
Maximum I_{RMS}	32	0	16
Number of Device Events	33	0	16
Average Lifetime Voltage	34	0	16
Number of Safe Stops[13]	40	0	32
Maximum Average Voltage	2124	0	16

13. Safe Stop according to EN 61800-5-2

Third Party Function Block Programming

TeSys island I/O Data

TeSys™ island generates and sends advanced data to the PLC to enhance machine efficiency and improve asset management. I/O data is available at the system and the Avatar level. Types of I/O data include control, diagnostics, energy, and asset management. The following tables describe the inputs and outputs available for the Avatars. The following tables can be used to assist in third party PLC function block programming when pre-defined function blocks are not available.

System I/O

The tables in this section describe the inputs and outputs available for the System Avatar.

Control

Table 55 - System Control Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Trip Reset	BOOL	1	1	0, 1	Command to reset an Avatar Trip Event. 0 = Off, 1 = On

Table 56 - System Control Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
System Operational	BOOL	1	1	0, 1	Indicates that the System Avatar is in Operational mode. 0 = Off, 1 = On
Degraded Mode	BOOL	1	1	0, 1	Indicates that the System Avatar is in Degraded mode. 0 = Off, 1 = On
Minor Event	BOOL	1	1	0, 1	Indicates that the System Avatar is in Minor Event mode. 0 = Off, 1 = On
Pre-Operational	BOOL	1	1	0, 1	Indicates that the System Avatar is in Pre-operational mode. 0 = Off, 1 = On
Force Mode	BOOL	1	1	0, 1	Indicates whether the system is in Force mode. 0 = No, 1 = Yes
Test Mode	BOOL	1	1	0, 1	Returns a status indicating that the System Avatar is in Test mode. 0 = Off, 1 = On
IP Address	UDINT	32	—	Max.: 0xFFFFFFFF	IP address of the Bus Coupler controlling the island.

Diagnostics

Table 57 - System Diagnostics Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset System Alarm Counter	BOOL	1	1	0, 1	Resets System Alarm Counter to 0. 0 = Off, 1 = On
Reset System Minor Event Counter	BOOL	1	1	0, 1	Resets System Minor Event Counter to 0. 0 = Off, 1 = On
Reset Fieldbus Communication Event Counter	BOOL	1	1	0, 1	Resets Fieldbus Communication Events Counter to 0. 0 = Off, 1 = On

Table 58 - System Diagnostics Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Control Voltage Fluctuation	BOOL	1	1	0, 1	If this output is set to TRUE, a control voltage fluctuation is detected.
Safe Stop[14] Status	BOOL	1	1	0, 1	0 = All SIL Groups have Safe Stop[14] status 5 (normal operation, no Safe Stop[14] command received) 1 = Any SIL Group has received a Safe Stop[14] command
Fieldbus Communication Event Counter	UINT	16	1	0–65535 in steps of 1	Counts the number of Fieldbus communication events
System Alarms Counter	UINT	16	1	0– 65535 in steps of 1	Counts the number of alarms on the system
System Minor Event Counter	UINT	16	1	0–65535 in steps of 1	Counts the number of minor events on the system
Minor Event Record Register 1	MINEVENTREC	80	—	0, —	Record of most recent Minor Event 1
Minor Event Record Register 2	MINEVENTREC	80	—	0, —	Record of Minor Event 2
Minor Event Record Register 3	MINEVENTREC	80	—	0, —	Record of Minor Event 3
Minor Event Record Register 4	MINEVENTREC	80	—	0, —	Record of Minor Event 4
Minor Event Record Register 5	MINEVENTREC	80	—	0, —	Record of Minor Event 5
Safe Stop[14] Message Group 1	USINT	8	—	0–5	Status for Safe Stop[14] 0 function for SIL Group 1. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[14] command received, SIL starters not open yet 3 = Safe Stop[14] command successfully issued, all SIL starters are open 4 = Safe Stop[14] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[14] Message Group 2	USINT	8	—	0–5	Status for Safe Stop[14] 0 function for SIL Group 2. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[14] command received, SIL starters not open yet 3 = Safe Stop[14] command successfully issued, all SIL starters are open

14. Safe Stop according to EN 61800-5-2

Table 58 - System Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
					4 = Safe Stop[15] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[15] Message Group 3	USINT	8	—	0–5	Status for Safe Stop[15] 0 function for SIL Group 3. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[15] command received, SIL starters not open yet 3 = Safe Stop[15] command successfully issued, all SIL starters are open 4 = Safe Stop[15] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[15] Message Group 4	USINT	8	—	0–5	Status for Safe Stop[15] 0 function for SIL Group 4. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[15] command received, SIL starters not open yet 3 = Safe Stop[15] command successfully issued, all SIL starters are open 4 = Safe Stop[15] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[15] Message Group 5	USINT	8	—	0–5	Status for Safe Stop[15] 0 function for SIL Group 5. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[15] command received, SIL starters not open yet 3 = Safe Stop[15] command successfully issued, all SIL starters are open 4 = Safe Stop[15] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[15] Message Group 6	USINT	8	—	0–5	Status for Safe Stop[15] 0 function for SIL Group 6. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[15] command received, SIL starters not open yet 3 = Safe Stop[15] command successfully issued, all SIL starters are open 4 = Safe Stop[15] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[15] Message Group 7	USINT	8	—	0–5	Status for Safe Stop[15] 0 function for SIL Group 7. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[15] command received, SIL starters not open yet

15. Safe Stop according to EN 61800-5-2

Table 58 - System Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
					3 = Safe Stop[16] command successfully issued, all SIL starters are open 4 = Safe Stop[16] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[16] Message Group 8	USINT	8	—	0–5	Status for Safe Stop[16] 0 function for SIL Group 8. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[16] command received, SIL starters not open yet 3 = Safe Stop[16] command successfully issued, all SIL starters are open 4 = Safe Stop[16] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[16] Message Group 9	USINT	8	—	0–5	Status for Safe Stop[16] 0 function for SIL Group 9. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[16] command received, SIL starters not open yet 3 = Safe Stop[16] command successfully issued, all SIL starters are open 4 = Safe Stop[16] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed
Safe Stop[16] Message Group 10	USINT	8	—	0–5	Status for Safe Stop[16] 0 function for SIL Group 10. 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = Safe Stop[16] command received, SIL starters not open yet 3 = Safe Stop[16] command successfully issued, all SIL starters are open 4 = Safe Stop[16] command issued to only one SIM input channel (jumper or SIM input wiring is causing an issue), but SIL starters did successfully open. 5 = Normal operation, SIL starters can be open or closed

16. Safe Stop according to EN 61800-5-2

Energy

Table 59 - System Voltage Basic Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Maximum Voltage RMS	BOOL	1	1	0, 1	Reset the Max. Voltage RMS value and associated timestamps. 0 = No, 1 = Yes
Reset Maximum Unbalance Voltage	BOOL	1	1	0, 1	Reset Max. Unbalance Voltage to zero, and associated timestamp. 0 = No, 1 = Yes
Reset Upstream Voltage Fluctuation Status	BOOL	1	1	0, 1	Command to reset Voltage Fluctuation Status. 0 = No, 1 = Yes

Table 60 - System Voltage Basic Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Upstream Voltage Fluctuation Status	BOOL	1	1	0, 1	On when a Voltage Dip or Swell has occurred. Reset by command. 0 = Off, 1 = On
Average Voltage RMS	UINT	16	1	0–1,000 in steps of 1	Average RMS Voltage (**V**) on 3 phases
Maximum Average Voltage RMS	UINT	16	1	0–65,535 in steps of 1	Maximum voltage (**V**) measured by the system
Maximum Average Voltage Timestamp	DT	64	—	—	**Date** and **Time** of the maximum average voltage
Voltage RMS Phase 1 (V)	UINT	16	1	0–65,535 in steps of 1	Average RMS voltage (**V**) between L1 and neutral
Voltage RMS Phase 2 (V)	UINT	16	1	0–65,535 in steps of 1	Average RMS voltage (**V**) between L2 and neutral
Voltage RMS Phase 3 (V)	UINT	16	1	0–65,535 in steps of 1	Average RMS voltage (**V**) between L3 and neutral
Percentage of Unbalance Voltage (%)	USINT	8	1	0–100 in steps of 1	**%** of unbalance voltage
Maximum Unbalance Voltage %	USINT	8	1	0–100 in steps of 1	Maximum unbalance voltage in **%**
Maximum Unbalance Voltage Timestamp	DT	64	—	—	**Date** and **Time** of the maximum unbalance voltage
Voltage Phase Sequence (ABC or ACB)	BOOL	1	1	0, 1	Measured voltage phase sequence (ABC or ACB) 0 = Phase order ABC 1 = Phase order ACB
Frequency (Hz)	USINT	8	1	0–255 in steps of 1	Main power voltage frequency (**Hz**). This register returns the line frequency as measured on phase 1.

Table 61 - System Voltage Enhanced Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Voltage Dip Count	BOOL	1	1	0, 1	Command to reset the Voltage Dip counter to 0. 0 = No, 1 = Yes
Reset Voltage Swell Count	BOOL	1	1	0, 1	Command to reset the Voltage Swell counter to 0. 0 = No, 1 = Yes

Table 62 - System Voltage Enhanced Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Voltage Dip Record Register 1 (most recent)	UINT	16	1	0–65,335 in steps of 1	Minimum voltage magnitude (**V**) for Voltage Dip Record 1
Voltage Dip Record Register 2	UINT	16	1	0–65,335 in steps of 1	Minimum voltage magnitude (**V**) for Voltage Dip Record 2
Voltage Dip Record Register 3	UINT	16	1	0–65,335 in steps of 1	Minimum voltage magnitude (**V**) for Voltage Dip Record 3
Voltage Dip Record Register 4	UINT	16	1	0–65,335 in steps of 1	Minimum voltage magnitude (**V**) for Voltage Dip Record 4
Voltage Dip Record Register 5 (least recent)	UINT	16	1	0–65,335 in steps of 1	Minimum voltage magnitude (**V**) for Voltage Dip Record 5
Voltage Dip Record 1 Start Date	DT	64	—	—	Voltage Dip Record Register 1 Start Timestamp (**Date**, **Time**)
Voltage Dip Record 2 Start Date	DT	64	—	—	Voltage Dip Record Register 2 Start Timestamp (**Date**, **Time**)
Voltage Dip Record 3 Start Date	DT	64	—	—	Voltage Dip Record Register 3 Start Timestamp (**Date**, **Time**)
Voltage Dip Record 4 Start Date	DT	64	—	—	Voltage Dip Record Register 4 Start Timestamp (**Date**, **Time**)
Voltage Dip Record 5 Start Date	DT	64	—	—	Voltage Dip Record Register 5 Start Timestamp (**Date**, **Time**)
Voltage Dip Record 1 Stop Date	DT	64	—	—	Voltage Dip Record Register 1 Stop Timestamp (**Date**, **Time**)
Voltage Dip Record 2 Stop Date	DT	64	—	—	Voltage Dip Record Register 2 Stop Timestamp (**Date**, **Time**)
Voltage Dip Record 3 Stop Date	DT	64	—	—	Voltage Dip Record Register 3 Stop Timestamp (**Date**, **Time**)
Voltage Dip Record 4 Stop Date	DT	64	—	—	Voltage Dip Record Register 4 Stop Timestamp (**Date**, **Time**)
Voltage Dip Record 5 Stop Date	DT	64	—	—	Voltage Dip Record Register 5 Stop Timestamp (**Date**, **Time**)
Voltage Dip Count	UINT	16	1	0–65,335 in steps of 1	Voltage Dip counter
Voltage Swell Record Register 1 (most recent)	UINT	16	1	0–65,335 in steps of 1	Maximum voltage magnitude (**V**) for Voltage Swell Record 1
Voltage Swell Record Register 2	UINT	16	1	0–65,335 in steps of 1	Maximum voltage magnitude (**V**) for Voltage Swell Record 2
Voltage Swell Record Register 3	UINT	16	1	0–65,335 in steps of 1	Maximum voltage magnitude (**V**) for Voltage Swell Record 3
Voltage Swell Record Register 4	UINT	16	1	0–65,335 in steps of 1	Maximum voltage magnitude (**V**) for Voltage Swell Record 4
Voltage Swell Record Register 5 (least recent)	UINT	16	1	0–65,335 in steps of 1	Maximum voltage magnitude (**V**) Voltage Swell Record 5
Voltage Swell Record 1 Start Date	DT	64	—	—	Voltage Swell Record Register 1 Start Timestamp (**Date**, **Time**)
Voltage Swell Record 2 Start Date	DT	64	—	—	Voltage Swell Record Register 2 Start Timestamp (**Date**, **Time**)
Voltage Swell Record 3 Start Date	DT	64	—	—	Voltage Swell Record Register 3 Start Timestamp (**Date**, **Time**)
Voltage Swell Record 4 Start Date	DT	64	—	—	Voltage Swell Record Register 4 Start Timestamp (**Date**, **Time**)

Table 62 - System Voltage Enhanced Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Voltage Swell Record 5 Start Date	DT	64	—	—	Voltage Swell Record Register 5 Start Timestamp (**Date**, **Time**)
Voltage Swell Record 1 Stop Date	DT	64	—	—	Voltage Swell Record Register 1 Stop Timestamp (**Date**, **Time**)
Voltage Swell Record 2 Stop Date	DT	64	—	—	Voltage Swell Record Register 2 Stop Timestamp (**Date**, **Time**)
Voltage Swell Record 3 Stop Date	DT	64	—	—	Voltage Swell Record Register 3 Stop Timestamp (**Date**, **Time**)
Voltage Swell Record 4 Stop Date	DT	64	—	—	Voltage Swell Record Register 4 Stop Timestamp (**Date**, **Time**)
Voltage Swell Record 5 Stop Date	DT	64	—	—	Voltage Swell Record Register 5 Stop Timestamp (**Date**, **Time**)
Voltage Swell Count	UINT	16	1	0–65,335 in steps of 1	Voltage Swell counter

Table 63 - System Power Basic Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Maximum Total Active Power	BOOL	1	1	0, 1	Reset the Active Power Max. value and associated timestamp. 0 = No, 1 = Yes
Reset Maximum Total Reactive Power	BOOL	1	1	0, 1	Reset the Reactive Power Max. value and associated timestamp. 0 = No, 1 = Yes
Reset Minimum True Power Factor	BOOL	1	1	0, 1	Reset the true Power Factor Min. value to 1 and associated timestamp. 0 = No, 1 = Yes
Reset Maximum True Power Factor	BOOL	1	1	0, 1	Reset the true Power Factor Max. value to 0 and associated timestamp. 0 = No, 1 = Yes

Table 64 - System Power Basic Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Instantaneous Total Active Power	DINT	32	0.001	–2,147,483,648 to 2,147,483,647 in steps of 1	Returns the total Active Power (**kW**) for the avatar.
Maximum Total Active Power	DINT	32	0.001	–9,999,999 to 9,999,999 in steps of 1	Returns the maximum value of total active power (**kW**) for the avatar.
Maximum Total Active Power Timestamp	DT	64	—	—	Provide **date** and **time** when maximum total Active Power value has been recorded.
Instantaneous Total Reactive Power	DINT	32	0.001	–9,999,999 to 9,999,999 in steps of 1	Returns the total Reactive Power value (**kVAR**) for the avatar.
Maximum Total Reactive Power	DINT	32	0.001	–9,999,999 to 9,999,999 in steps of 1	Returns the maximum value of Reactive Power (**kVAR**) for the avatar.
Maximum Total Reactive Power Timestamp	DT	32	—	—	Provides **date** and **time** when total maximum total Reactive Power value has been recorded
True Power Factor	USINT	8	0.01	0–100 in steps of 1	Returns the true Power factor value.
Minimum True Power Factor	USINT	8	0.01	0–100 in steps of 1	Returns the true Power factor minimum value.

Table 64 - System Power Basic Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Maximum True Power Factor	USINT	8	0.01	0–100 in steps of 1	Returns the true Power factor maximum value.
Minimum True Power Factor Timestamp	DT	64	—	—	Provide **date** and **time** when Minimum Power Factor value has been recorded.
Maximum True Power Factor Timestamp	DT	64	—	—	Provide **date** and **time** when Maximum Power Factor value has been recorded.

Table 65 - System Energy Basic Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Total Reactive Energy	BOOL	1	1	0, 1	Resets System Avatar accumulation of reactive energy to zero, does not affect load or application level energy data. 0 = No, 1 = Yes
Reset Total Active Energy	BOOL	1	1	0, 1	Command to set the Total Active Energy value to Total Active Energy Preset value. 0 = No, 1 = Yes

Table 66 - System Energy Basic Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Total Active Energy	UDINT	32	0.001	0–4,294,967,295 in steps of 1	Returns the Total Active Energy value (kWh).
Total Reactive Energy	UDINT	32	0.001	0–999,999,999 in steps of 1	Returns the Total Reactive Energy value (kVARh).

Asset Management

Table 67 - System Product Data Outputs

I/O Name	Datatype	Size (Bits)	Scale	Unit	Min.	Max.	Step	Description
Base MAC Address	DT_MAC	48	—	—	—	—	—	MAC address of Fieldbus Ethernet port 1.

Table 68 - System Maintenance Data Outputs

I/O Name	Datatype	Size (Bits)	Scale	Unit	Min.	Max.	Step	Description
Time (module) ON	UDINT	32	1	Hour	0	4,294,967,295	1	This register indicates the time that the module has been powered on in its lifetime.
Number of Events (Device Events)	UINT	16	1	—	0	65,535	1	This register attempts to indicate number of times this module has experienced a device event. This value does not include device event which prevent the saving or corruption of the NVM.

Avatar I/O

The tables in this section describe the inputs and outputs available for the avatars.

Control

Table 69 - Avatar Control Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Trip Reset	BOOL	1	1	0, 1	Command to reset an Avatar trip event 0 = Off, 1 = On
Run 1	BOOL	1	1	0, 1	Command to Avatar Forward Switch. 0 = Off, 1 = On
Run Forward	BOOL	1	1	0, 1	Command to Avatar Forward Switch. 0 = Off, 1 = On
Run Reverse	BOOL	1	1	0, 1	Command to close the Reverse switch with Reverser Avatar 0 = Off, 1 = On
Run Forward Low	BOOL	1	1	0, 1	Command to start Motor forward with Low Speed 0 = Off, 1 = On
Run Forward High	BOOL	1	1	0, 1	Command to start Motor forward with High Speed 0 = Off, 1 = On
Run Reverse Low	BOOL	1	1	0, 1	Run Reverse Low Speed command 0 = Off, 1 = On
Run Reverse High	BOOL	1	1	0, 1	Run Reverse High Speed command 0 = Off, 1 = On
Logic Output 1	BOOL	1	1	0, 1	Command to Close Logical output 1 0 = Off, 1 = On
Logic Output 2	BOOL	1	1	0, 1	Command to Close Logical output 2 0 = Off, 1 = On
Digital Output 0	BOOL	1	1	0, 1	Command to close Digital output 0 0 = Off, 1 = On
Digital Output 1	BOOL	1	1	0, 1	Command to close Digital output 1 0 = Off, 1 = On
Analog Output 0	INT	16	1	–32,768 to 32,767 in steps of 1	Value to be written to Analog output 0

Table 70 - Avatar Control Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Ready	BOOL	1	1	0, 1	Avatar is ready to be controlled (all Devices in the Avatar are Ready). 0 = Off, 1 = On
Upstream Voltage Present 1	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its first Device is present (Breaker closed). 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 2	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its second Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 3	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its third Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 4	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its fourth Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Run 1 Status	BOOL	1	1	0, 1	Avatar Forward Switch Feedback, 0 = switch is open, 1 = switch is closed
Run Forward Status	BOOL	1	1	0, 1	Avatar Forward Switch Feedback, 0 = switch is open, 1 = switch is closed
Run Reverse Status	BOOL	1	1	0, 1	Avatar Reverse Switch Feedback, 0 = switch is open, 1 = switch is closed
Status Run Forward: Open/Close Line Status	BOOL	1	1	0, 1	Position of the Line switch for Y/D avatars. 0 = Off, 1 = On
Run Y Status	BOOL	1	1	0, 1	Position of the Y switch for Y/D avatars. 0 = Off, 1 = On
Run D Status	BOOL	1	1	0, 1	Position of the D Switch for Y/D avatars. 0 = Off, 1 = On
Run Forward Low Status	BOOL	1	1	0, 1	Motor is running in Speed1 0 = Motor stopped or in Speed1 1 = Motor running in Speed2
Run Forward High Status	BOOL	1	1	0, 1	Motor is running in Speed2 0 = Motor stopped or in Speed1 1 = Motor running in Speed2
Run Reverse Low Status	BOOL	1	1	0, 1	Position of the Low Speed Reverser switch. 0 = Off, 1 = On
Run Reverse High Status	BOOL	1	1	0, 1	Position of the High Speed Reverser switch. 0 = Off, 1 = On
Logic Output 1 Status	BOOL	1	1	0, 1	Position of the Output 1. 0 = Off, 1 = On
Logic Output 2 Status	BOOL	1	1	0, 1	Position of the Output 2. 0 = Off, 1 = On
Logic Input 1 Status	BOOL	1	1	0, 1	State of Digital Input 1 of Avatar. 0 = Off, 1 = On
Logic Input 2 Status	BOOL	1	1	0, 1	State of Digital Input 1 of Avatar. 0 = Off, 1 = On
Digital Input Status 0	BOOL	1	1	0, 1	State of Digital Input 0 of DIOM Avatar 0 = Off, 1 = On
Digital Input Status 1	BOOL	1	1	0, 1	State of Digital Input 1 of DIOM Avatar 0 = Off, 1 = On
Digital Input Status 2	BOOL	1	1	0, 1	State of Digital Input 2 of DIOM Avatar 0 = Off, 1 = On
Digital Input Status 3	BOOL	1	1	0, 1	State of Digital Input 3 of DIOM Avatar 0 = Off, 1 = On

Table 70 - Avatar Control Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Analog Input 0	INT	16	1	–32,768 to 32,767 in steps of 1	Value read from the Analog input 0
Analog Input 1	INT	16	1	–32,768 to 32,767 in steps of 1	Value read from the Analog input 1
Load Starting	BOOL	1	1	0, 1	Returns 1 if the load is in start phase. 0 = Off, 1 = On
Load Running	BOOL	1	1	0, 1	Set to 1 when a Run or Close command has been executed and current is flowing in the poles (equivalent to Motor Running but also for non-motor avatars). 0 = Off, 1 = On
Motor Temperature	INT	16	1	–200 to 850 in steps of 1	Returns the motor temperature in **°C**. Depending on the Temperature Sensor type, the range is: • –200 to 850 °C for PT100 • –200 to 600 °C for PT1000 • –60 to 180 °C for NI 100/1000
I_{RMS} Average	UDINT	32	0.001	0–4,294,967,295 in steps of 1	Calculate the average of the most recent phase current RMS values (**A**).
Alarm	BOOL	1	1	0, 1	Avatar has detected a protection alarm event. 0 = Off, 1 = On
Tripped	BOOL	1	1	0, 1	Avatar has detected a trip event. 0 = Off, 1 = On
Ready to Reset	BOOL	1	1	0, 1	0 = Off, 1 = On
Asset Alarm	BOOL	1	1	0, 1	Triggered when a Power Device or SIM references within the Avatar has reached or exceeded 90% of expected durability (per Avatar Parameter). 0 = Off, 1 = On
Motor Thermal Capacity Used	USINT	8	1	0–255 in steps of 1	Returns the percentage (**%**) of the motor's thermal capacity which has been used.
Protection Alarm Message 1	UINT	16	—	0 to max. 0xFFFF	1st Modbus register protection alarm bits: Bit 2: Ground Current Alarm Bit 3: Thermal Overload Alarm Bit 5: Jam Alarm Bit 6: Current Phase Unbalance Alarm Bit 7: Undercurrent Alarm
Protection Alarm Message 2	UINT	16	—	0 to max. 0xFFFF	2nd Modbus register protection alarm bits: Bit 3: Overcurrent Alarm Bit 6: Motor Overheat Alarm
Protection Trip Message 1	UINT	16	—	0 to max. 0xFFFF	1st Modbus register protection trip bits: Bit 2: Ground Current Trip Bit 3: Thermal Overload Trip Bit 4: Long Start Trip Bit 5: Jam Trip Bit 6: Current Phase Unbalance Trip Bit 7: Undercurrent Trip Bit 8: Stall Trip
Protection Trip Message 2	UINT	16	—	0 to max. 0xFFFF	2nd Modbus register protection trip bits: Bit 2: Phase Configuration Trip Bit 3: Overcurrent Trip

Table 70 - Avatar Control Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
					Bit 4: Current Phase Loss Trip Bit 5: Current Phase Reversal Trip Bit 6: Motor Overheat Trip
Thermal Overload Time To Trip	UINT	16	1	0–65535 in steps of 1	Estimated time (in **seconds**) before a Thermal Overload trip.
Thermal Overload Time To Reset	UINT	16	1	0–65535 in steps of 1	Estimated time (in **seconds**) to wait before a reset could acknowledge a Thermal Overload trip.

Energy

Table 71 - Avatar Power Outputs

I/O Name	Datatype	Size (Bits)	Scale	Unit	Minimum	Maximum	Step	Description
Instantaneous Total Active Power	DINT	32	0.001	kW	-2,147,483,648	2,147,483,647	1	Returns the total Active Power for the Avatar.
Maximum Total Active Power	DINT	32	0.001	kW	-9,999,999	9,999,999	1	Returns the maximum value of total active power for the Avatar.
Maximum Total Active Power Timestamp	DT	64	—	Date, Time	—	—	—	Provide date and time when maximum total active Power value has been recorded.
Instantaneous Total Reactive Power	DINT	32	0.001	kVAR	-9,999,999	9,999,999	1	Returns the total Reactive Power value for the Avatar.
Maximum Total Reactive Power	DINT	32	0.001	kVAR	-9,999,999	9,999,999	1	Returns the maximum value of Reactive Power for the Avatar.
Maximum Total Reactive Power Timestamp	DT	32	—	Date, Time	—	—	—	Provide date and time when total maximum total Reactive Power value has been recorded
True Power Factor	USINT	8	0.01	—	0	100	1	Returns the true Power factor value.
Minimum True Power Factor	USINT	8	0.01	—	0	100	1	Returns the true Power factor minimum value.
Maximum True Power Factor	USINT	8	0.01	—	0	100	1	Returns the true Power factor maximum value.
Minimum True Power Factor Timestamp	DT	64	—	Date, Time	—	—	—	Provide date and time when Minimum Power Factor value has been recorded.
Maximum True Power Factor Timestamp	DT	64	—	Date, Time	—	—	—	Provide date and time when Maximum Power Factor value has been recorded.

Table 72 - Avatar Energy Inputs

I/O Name	Data-type	Size (Bits)	Scale	Unit	Minimum	Maximum	Step	Description
Set Total Active Energy	BOOL	1	1	-	0	1	1	Command to set the Total Active Energy value to Total Active Energy Preset value. 0 = no, 1 = yes
Set Total Reactive Energy	BOOL	1	1	-	0	1	1	Command to set the Total Reactive Energy value to Total Reactive Energy Preset value. 0 = no, 1 = yes
Total Active Energy Preset Value	UDINT	32	0.001	kWh	0	4,294,967,295	1	Preset the Total Active Energy value.
Total Reactive Energy Preset Value	UDINT	32	0.001	kVARh	0	4,294,967,295	1	Preset the Total Reactive Energy value.

Table 73 - Avatar Energy Outputs

I/O Name	Datatype	Size (Bits)	Scale	Unit	Minimum	Maximum	Step	Description
Total Active Energy	UDINT	32	0.001	kWh	0	4,294,967,295	1	Returns the Total Active Energy value.
Total Reactive Energy	UDINT	32	0.001	kVARh	0	999,999,999	1	Returns the Total Reactive Energy value

Diagnostics

Table 74 - Avatar Diagnostics Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Max I_{RMS}	BOOL	1	1	0, 1	Command to reset the Maximum Average I_{RMS} current value and Time Stamp. 0 = Off, 1 = On

Table 75 - Avatar Diagnostics Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Upstream Voltage Present 1	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its first Device is present (Breaker closed). 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 2	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its second Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 3	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its third Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Upstream Voltage Present 4	BOOL	1	1	0, 1	Avatar has detected that Upstream main power of its fourth Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected
Max Average I_{RMS}	UINT	16	0.1	0–65,535 in steps of 1	Indicates the maximum current (**A**) measured by the device in its lifetime.
Max Average I_{RMS} Time Stamp	DT	64	—	—	Provides the **date** and **time** when Maximum average I_{RMS} current value has been recorded.
I_{RMS} Phase 1	UDINT	32	0.001	0 to 4,294,967,295 in steps of 1	Phase L1 I_{RMS} value (**A**)
I_{RMS} Phase 2	UDINT	32	0.001	0 to 4,294,967,295 in steps of 1	Phase L2 I_{RMS} value (**A**)
I_{RMS} Phase 3	UDINT	32	0.001	0 to 4,294,967,295 in steps of 1	Phase L3 I_{RMS} value (**A**)

Table 76 - Avatar Read Alarm Counters Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Alarm Counter	BOOL	1	1	0, 1	Resets all alarm counters to 0. 0 = Off, 1 = On

Table 77 - Avatar Read Alarm Counters Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Thermal Overload Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Thermal Overload protection.
Jam Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Jam protection.
Undercurrent Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Undercurrent protection.
Overcurrent Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Overcurrent protection.

Table 77 - Avatar Read Alarm Counters Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Current Phase Unbalance Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Phase Unbalance protection.
Ground Current Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of alarms related to Ground Current protection.
Motor Overheat Alarm Count	UINT	16	1	0–65,535 in steps of 1	Counter of Motor Overheat Alarm events.
All Alarms Count	UINT	16	1	0–65,535 in steps of 1	Counter of all alarms related to protections.

Table 78 - Avatar Read Trip Counters Inputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Reset Trip Counter	BOOL	1	1	0, 1	Reset all trip counters. 0 = Off, 1 = On

Table 79 - Avatar Read Trip Counters Outputs

I/O Name	Datatype	Size (bits)	Scale	Value	Description
Thermal Overload Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Thermal Overload protection.
Jam Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Jam protection.
Undercurrent Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Undercurrent protection.
Long Start Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Long Start protection.
Overcurrent Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Overcurrent protection.
Motor Overheat Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of Motor Overheat trip events.
Stall Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Stall protection.
Current Phase Unbalance Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Phase Unbalance protection.
Phase Configuration Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Phase Configuration protection.
Ground Current Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Ground Current protection.
Phase Reversal Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Phase Reversal protection.
Current Phase Loss Trip Count	UINT	16	1	0–65,535 in steps of 1	Counter of trips related to Phase Loss protection.
All Trips Count	UINT	16	1	0–65,535 in steps of 1	Counter of all trips related to protections.

Table 80 - Avatar Trip Register Outputs

I/O Name	Datatype	Size (bits)	Scale	Value	Description
Trip Record Register 1	TRIPREC	80	—	0, —	Date and Trip reason record 1
Trip Record Register 2	TRIPREC	80	—	0, —	Date and Trip reason record 2
Trip Record Register 3	TRIPREC	80	—	0, —	Date and Trip reason record 3

Table 80 - Avatar Trip Register Outputs (Continued)

I/O Name	Datatype	Size (bits)	Scale	Value	Description
Trip Record Register 4	TRIPREC	80	—	0, —	Date and Trip reason record 4
Trip Record Register 5	TRIPREC	80	—	0, —	Date and Trip reason record 5

Asset Management

Table 81 - Avatar Maintenance Data Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Time (module) On	UDINT	32	1	0 to 4,294,967,295 in steps of 1	Indicates the time that the module has been powered on in its lifetime (in **hours**).
Time Switch On	UDINT	32	1	0 to 4,294,967,295 in steps of 1	Indicates the time (in **hours**) that the contactor has been in the closed state.
Number of Events (Device Events)	UINT	16	1	0 to 65,535 in steps of 1	Indicates the number of times this module has experienced a device event. This value does not include device events which corrupt or prevent the saving of the non-volatile memory.
Number of Contactor Cycles	UDINT	32	1	0 to 4,294,967,295 in steps of 1	Indicates number of times the contactor has been commanded to the closed state from the open state.
Number of Device Power Cycles	UDINT	32	1	0 to 4,294,967,295 in steps of 1	Indicates number of times the device has been powered on.
Number of Safe Stops[17]	UDINT	32	1	0 to 4,294,967,295 in steps of 1	Indicates the number of mirror relay operations.
Max. I_{RMS}	UINT	16	0.1	0 to 65,535 in steps of 1	Indicates maximum current (**A**) the device has measured in its lifetime.
Lifetime Average I_{RMS}	UDINT	32	0.001	0 to 4,294,967,295 in steps of 1	Lifetime average current (**A**) measured by the device (Total Current / Time Current ON).
Max. Average Voltage	UINT	16	1	0 to 65,535 in steps of 1	Indicates maximum voltage (**V**) the device has measured in its lifetime.
Average Lifetime Voltage	UNIT	16	1	0 to 65,535 in steps of 1	Indicates average lifetime voltage (**V**) measured.

17. Safe Stop according to EN 61800-5-2.

Data Definitions

Data types are in conformance with IEC 61131-3.

Table 82 - Data Definitions

Keyword	Description	Size (Bits)	Value Range
BOOL	Boolean	1	Range [0,1], where [0,1] represents [False, True] or [Off, On]
INT	Integer	16	Range [-32768, 32767]
DINT	Double Integer	32	Range [-2^{31}, $2^{31}-1$]
USINT	Unsigned Short Integer	8	Range [0, 255]
UINT	Unsigned Integer	16	Range [0, 65535]
UDINT	Unsigned Double Integer	32	Range [0, $2^{32}-1$]
STRING	Variable-length (N) single-byte Character	8*N	—
DT	Date and Time of Day	64	Format: YYYYMMDDhhmmsscc, where: • YYYY: Year coded on a UINT • MM: Month coded on a USINT, Range [1, 12] • DD: Day coded on a USINT, Range [1, 31] • hh: hour coded on a USINT, Range [0, 23] • mm: minute coded on a USINT, Range [0, 59] • ss: second coded on a USINT, Range [0, 59] • cc: hundredth of second coded on a USINT, Range [0,99]
TRIPREC	Record for a trip event	80	Format YYYMMDDhhmmssccTTTT, where • YYYY: Year coded on a UINT • MM: Month coded on a USINT, Range [1, 12] • DD: Day coded on a USINT, Range [1, 31] • hh: hour coded on a USINT, Range [0, 23] • mm: minute coded on a USINT, Range [0, 59] • ss: second coded on a USINT, Range [0, 59] • cc: hundredth of second coded on a USINT, Range [0,99] • TTTT = Trip event identifier. See following list for values. And where TTTT=Trip event identifier: • TTTT = 0000 No Event • TTTT = 0001 Thermal Overload • TTTT = 0002 Motor Overheat • TTTT = 0003 Jam • TTTT = 0004 Undercurrent • TTTT = 0005 Long Start • TTTT = 0006 Overcurrent • TTTT = 0007 Stall • TTTT = 0008 Ground Current • TTTT = 0009 Current Phase Reversal • TTTT = 0010 Phase Configuration • TTTT = 0011 Current Phase Unbalance • TTTT = 0012 Current Phase Loss

Table 82 - Data Definitions (Continued)

Keyword	Description	Size (Bits)	Value Range
DT_MAC	MAC Address	48	Format XXYYZZUUVVWW, where: • XX = 0x00 • YY = 0x80 • ZZ = 0xF4 • UU = Product MAC address high byte • VV = Product MAC Address middle byte • WW = Product MAC address low byte
MINEVENTREC	Record for a Minor Event	80	Format YYYMMDDhhmmssccFFFF, where: • YYYY: Year coded on a UINT • MM: Month coded on a USINT, Range [1, 12] • DD: Day coded on a USINT, Range [1, 31] • hh: hour coded on a USINT, Range [0, 23] • mm: minute coded on a USINT, Range [0, 59] • ss: second coded on a USINT, Range [0, 59] • cc: hundredth of second coded on a USINT, Range [0,99] • TTTT = Trip event identifier. See following list for values. And where FFFF=Minor Event event identifier • FFFF = 0000 No Minor Event • FFFF = 0001 No module in the island • FFFF = 0002 Number of physical devices detected in the island is beyond the limit allowed • FFFF = 0003 Modules mismatch • FFFF = 0004 Island control power supply voltage fluctuation

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