

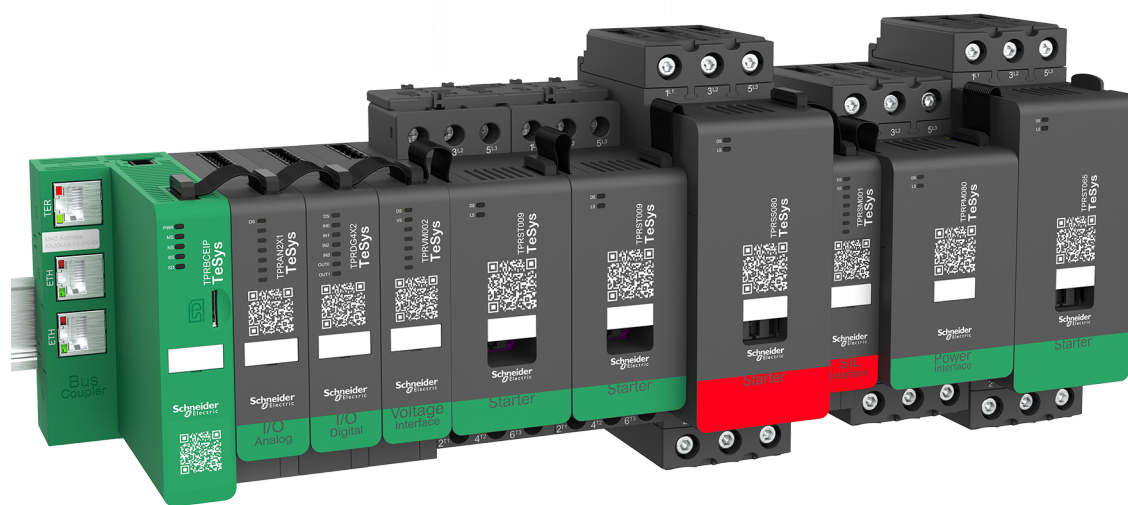
TeSys Active

TeSys™ island – Digital Motor Management Solution

Third Party Function Block Guide

TeSys offers innovative and connected solutions for motor starters.

8536IB1905EN-05
06/2023



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As part of a group of responsible, inclusive companies, we are updating our communications that contain non-inclusive terminology. Until we complete this process, however, our content may still contain standardized industry terms that may be deemed inappropriate by our customers.

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Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified personnel is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

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 guide 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 guide is valid for all TeSys island configurations. The availability of some functions described in this guide 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 EOL, go to www.se.com/green-premium.

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

The technical characteristics presented in this guide 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 guide and online information, use the online information.

Related Documentation

Document title	Description	Document number
TeSys island – System, Installation, and Operation Guide	Describes main functions, mechanical installation, wiring, commissioning of the TeSys island, and how to operate and maintain TeSys island.	DOCA0270EN
TeSys island – EtherNet/IP™ – Quick Start and Function Block Library Guide	Describes how to integrate the TeSys island and the information of TeSys island library used in the Rockwell Software® Studio 5000® EtherNet/IP environment.	DOCA0271EN
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 – 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	Describes constituent materials, recyclability potential, and environmental impact information for the TeSys island.	ENVPEP1904009
TeSys island – Product End of Life Instructions	Contains end of life instructions for the TeSys island.	ENVEOLI1904009
TeSys island – Instruction Sheet, Bus Coupler, TPRBCEIP	Describes how to install the TeSys island Ethernet/IP bus coupler.	MFR44097
TeSys island – Instruction Sheet, Bus Coupler, TPRBCPFN	Describes how to install the TeSys island PROFINET bus coupler.	MFR44098
TeSys island – Instruction Sheet, Bus Coupler, TPRBCPFB	Describes how to install the TeSys island PROFIBUS DP bus coupler.	GDE55148
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 ¹ interface modules.	MFR44100

1. Safety Integrity Level according to standard IEC 61508.

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 personnel 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 personnel must be able to detect possible hazards that may arise from modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified personnel 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, the machine builder, or the 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 adhere 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 guide, 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.

TeSys island Concept

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 (AC1) installed in an electrical control panel.

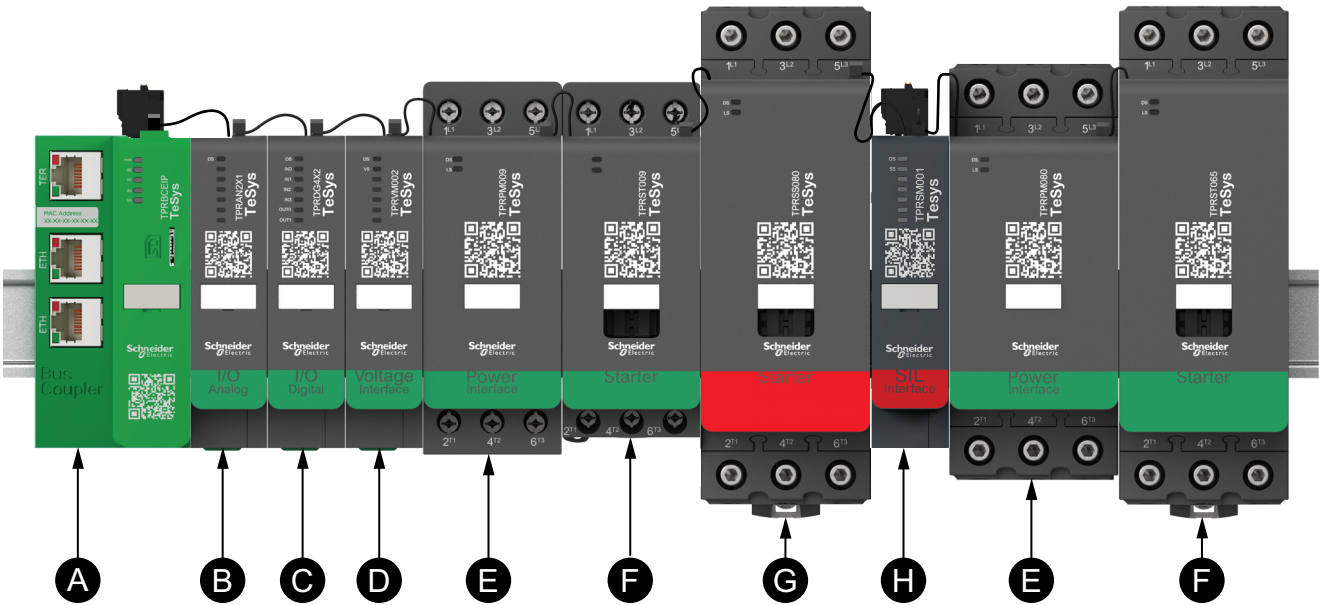
This system is designed around the concept of TeSys avatars. These avatars:

- 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

Master Range: TeSys

TeSys™ is an innovative motor control and management solution from the global market leader. TeSys offers connected, efficient products and solutions for switching and protection of motors and electrical loads in compliance with all major global electrical standards.

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.

There are four types of TeSys avatars:

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.

Standard (non-SIL²) Load avatars provide the following:

- Local control

NOTE: Local control is applicable for all Load avatars (except PIM avatar).
- Local trip reset (to allow an operator to use a local input to trigger the local trip reset on rising edge of the input. When the input changes from 0 to 1, then the trip reset of avatar is executed)

NOTE: Local trip reset is applicable for all Load avatars (except PIM avatar).
- Bypass (to allow an operator to use a local command to temporarily bypass a trip condition and continue the operation of the avatar)
- Process variable monitoring

Application avatars

Represent functions related to specific user applications, such as a pump or conveyor. Application avatars provide the following:

- Local control
- Local trip reset (to allow an operator to use a local input to trigger the local trip reset on rising edge of the input. When the input changes from 0 to 1, then the trip reset of avatar is executed)
- Bypass (to allow an operator to use a local command to temporarily bypass a trip condition and continue the operation of the avatar)
- Manual mode override (to allow an operator to use a local input to override the configured control mode and control the avatar from a local command source)
- Process variable monitoring

2. Safety Integrity Level according to standard IEC 61508.

For example, a Pump avatar includes the following:

- One starter module
- One or more digital I/O modules for local control, local trip, and process variable (PV) switches
- Configurable control logic
- Pre-configuration of the load and electrical functions

PV inputs receive analog values from sensors such as a pressure meter, a flow meter, or a vibration meter. PV switches receive discrete signals from switches such as a flow switch or a pressure switch.

Operational control (Run and Stop command) of the avatar in autonomous mode is configurable for up to two PV inputs or PV switches. It includes settings for the threshold and hysteresis for analog inputs, and positive or negative logic for both analog and digital inputs for the Pump avatar.

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 pre-configuration of the available protection functions.

Information accessible through the avatar includes the following:

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

List of TeSys Avatars

Table 1 - TeSys Avatars

Name	Icon	Description
System avatar		A required avatar that enables a single point of communication to the island.
Device		
Switch		To make or break a power line in an electrical circuit
Switch - SIL Stop, W. Cat 1/2 ³		To make or break a power line in an electrical circuit with Stop Category 0 or Stop Category 1 ⁴ function compliance for Wiring Category 1 and Category 2.
Switch - SIL Stop, W. Cat 3/4 ⁵		To make or break a power line in an electrical circuit with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.

3. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

4. Stop category according to EN/IEC 60204-1.

5. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Table 1 - TeSys Avatars (Continued)

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
Load		
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 ⁶ a motor in one direction
Motor One Direction - SIL Stop, W. Cat 1/2		To manage a motor in one direction, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.
Motor One Direction - SIL Stop, W. Cat 3/4		To manage a motor in one direction, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.
Motor Two Directions		To manage a motor in two directions (forward and reverse)
Motor Two Directions - SIL Stop, W. Cat 1/2		To manage a motor in two directions (forward and reverse), with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2

6. "Manage" in this context encompasses energizing, controlling, monitoring, diagnosing, and protecting the load.

Table 1 - TeSys Avatars (Continued)

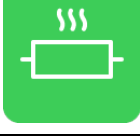
Name	Icon	Description
Motor Two Directions - SIL Stop, W. Cat 3/4		To manage a motor in two directions (forward and reverse), with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4
Motor Y/D One Direction		To manage a wye-delta (star-delta) motor in one direction
Motor Y/D Two Directions		To manage a wye-delta (star-delta) motor in two directions (forward and reverse)
Motor Two Speeds		To manage a two-speed motor and two-speed motor with Dahlander option
Motor Two Speeds - SIL Stop, W. Cat 1/2		To manage a two-speed motor, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2
Motor Two Speeds - SIL Stop, W. Cat 3/4		To manage a two-speed motor, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4
Motor Two Speeds Two Directions		To manage a two-speed motor in two directions (forward and reverse)
Motor Two Speeds Two Directions - SIL Stop, W. Cat 1/2		To manage a two-speed motor in two directions (forward and reverse), with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2
Motor Two Speeds Two Directions - SIL Stop, W. Cat 3/4		To manage a two-speed motor in two directions (forward and reverse), with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4
Resistor		To manage a resistive load

Table 1 - TeSys Avatars (Continued)

Name	Icon	Description
Power Supply		To manage a power supply
Transformer		To manage a transformer
Application		
Pump		To manage a pump
Conveyor One Direction		To manage a conveyor in one direction
Conveyor One Direction - SIL Stop, W. Cat 1/2		To manage a conveyor in one direction, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2
Conveyor Two Directions		To manage a conveyor in two directions (forward and reverse)
Conveyor Two Directions - SIL Stop, W. Cat 1/2		To manage a conveyor in two directions (forward and reverse), with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2

NOTE: For two speed two direction avatar disable current phase reversal trip.

Modbus TCP Third Party Integration

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, Load, and Application 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	—

NOTE:

- 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).
- Modbus TCP manual integration is done without IO Scanning so that each piece of data or command is represented with a single register read/write. To maintain the ability to detect a communication loss and enter Degraded Mode, a heartbeat register is available for use at address 1098 of Unit ID 255. You can write any value to this register periodically within the Communication Loss Timeout period (by default is 2 seconds). If the island does not detect a write, it signifies a communication loss and the system enters Degraded Mode.
- 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 — SIL Stop, W. Cat 1/2 ⁷	—	—	—	—	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

7. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Configure FLA through Modbus TCP/IP

FLA for avatars can be configured through Modbus TCP/IP using Register-9622 and Avatar ID as the Unit ID

TeSys island Modbus TCP Function Block Data

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 [Data Descriptions](#), page 112.

System Avatar

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

Figure 2 - SystemAvatar Function Block

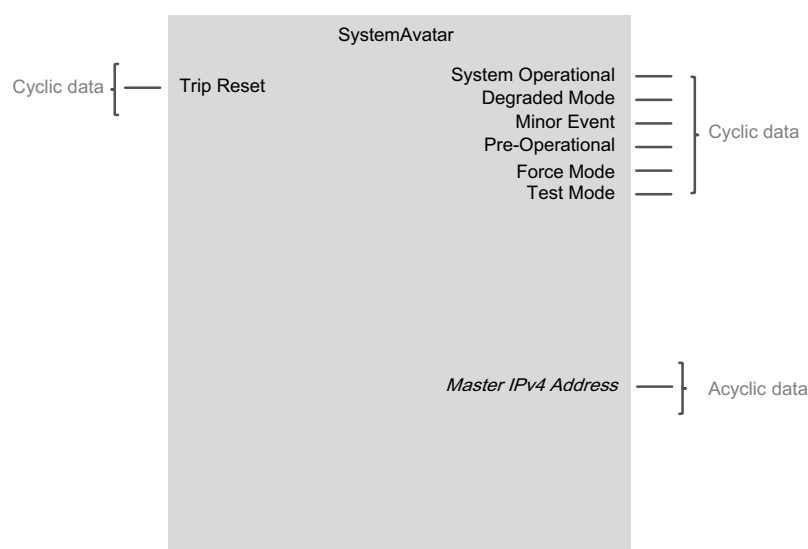


Table 4 - Modbus TCP Inputs—System Avatar

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

Table 5 - 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	64000	0	32

Device Function Blocks

Switch

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

Figure 3 - Switch Function Block

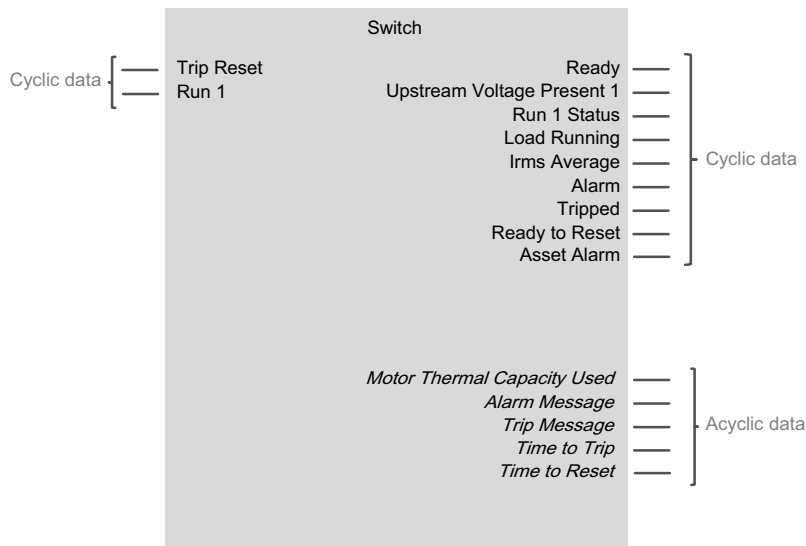


Table 6 - Modbus TCP Inputs—Switch

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

Table 7 - 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
Irms 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 - SIL Stop, W. Cat 1/2

This function block establishes or interrupts a power line in an electrical circuit with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.⁸

Figure 4 - SwitchSILStopCat1and2 Function Block

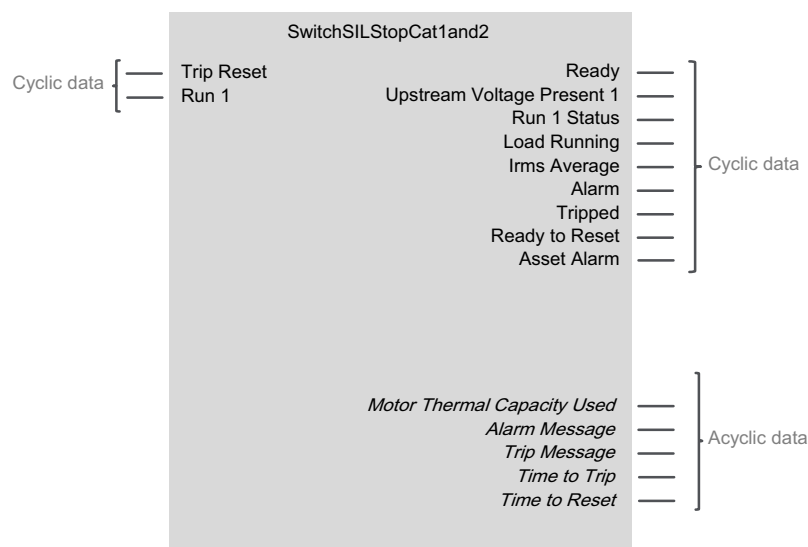


Table 8 - Modbus TCP Inputs—Switch

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

Table 9 - 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

8. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Switch - SIL Stop, W. Cat 3/4

This function block establishes or interrupts a power line in an electrical circuit with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.⁹

Figure 5 - Switch — SIL Stop, W. Cat 3/4 Function Block

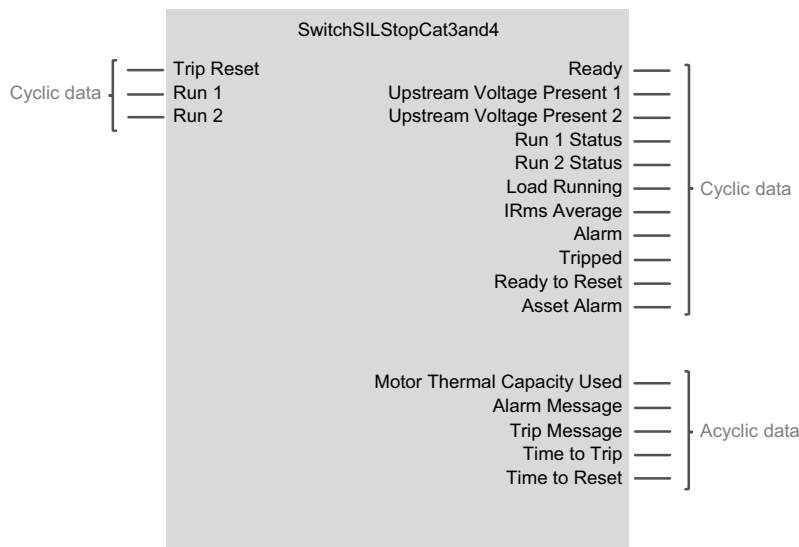


Table 10 - Modbus TCP Inputs — Switch

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1
Run 2	8501	8	1

Table 11 - 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
IRMS 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 1 Status	3201	6	1
Run 2 Status	3201	7	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

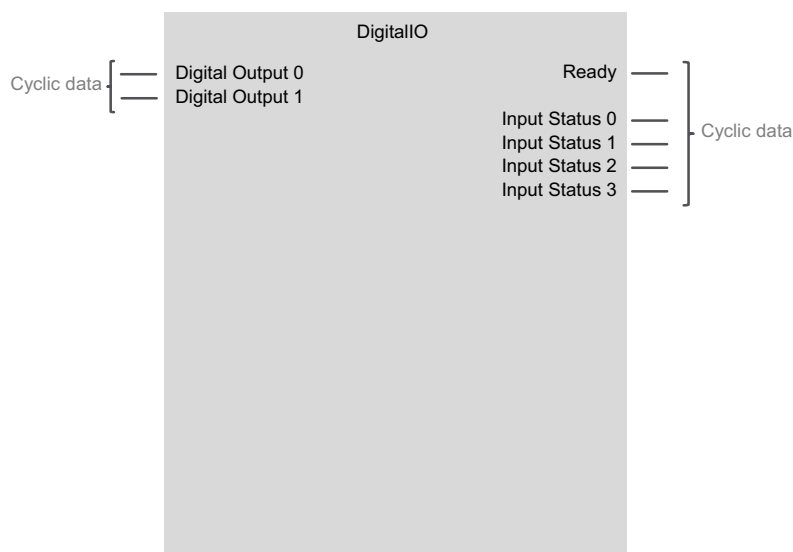
9. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 3 and Category 4 according to ISO 13849.

Table 11 - Modbus TCP Outputs — Switch (Continued)

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

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 6 - DigitalIO Function Block**Table 12 - 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 13 - 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 7 - AnalogIO Function Block

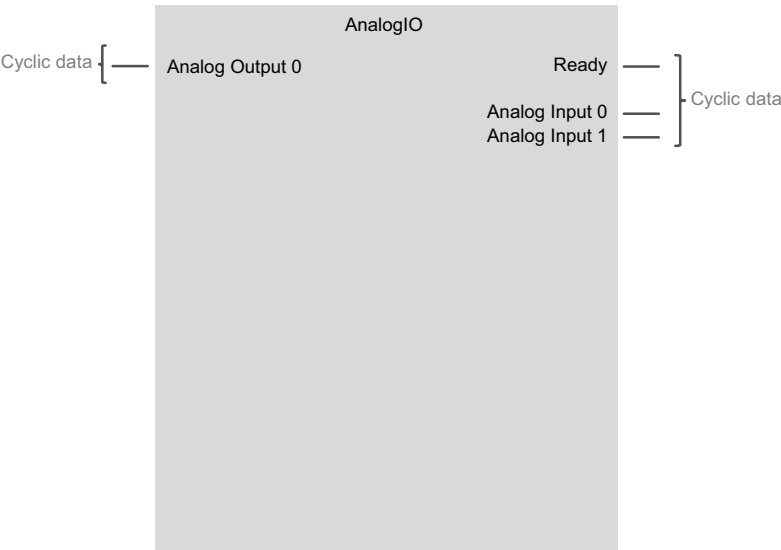


Table 14 - Modbus TCP Inputs—Analog I/O

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

Table 15 - 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 8 - PowerInterface Function Block

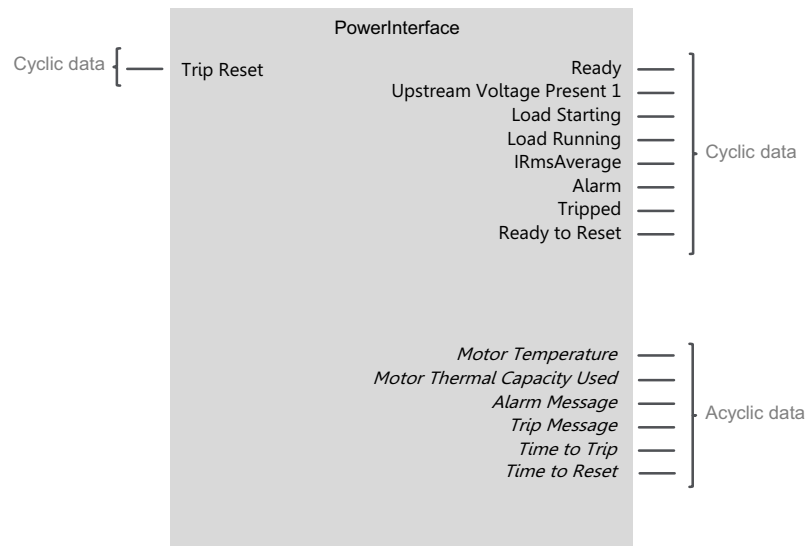


Table 16 - Modbus TCP Inputs—PIM without I/O (Measure)

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

Table 17 - 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 9 - PowerInterfaceIO Function Block

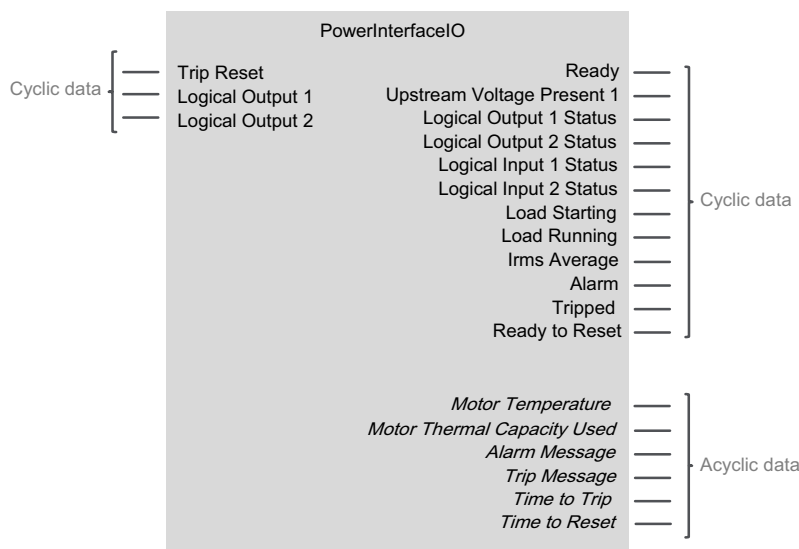


Table 18 - Modbus TCP Inputs—Power Interface Module (PIM) with I/O (Control)

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

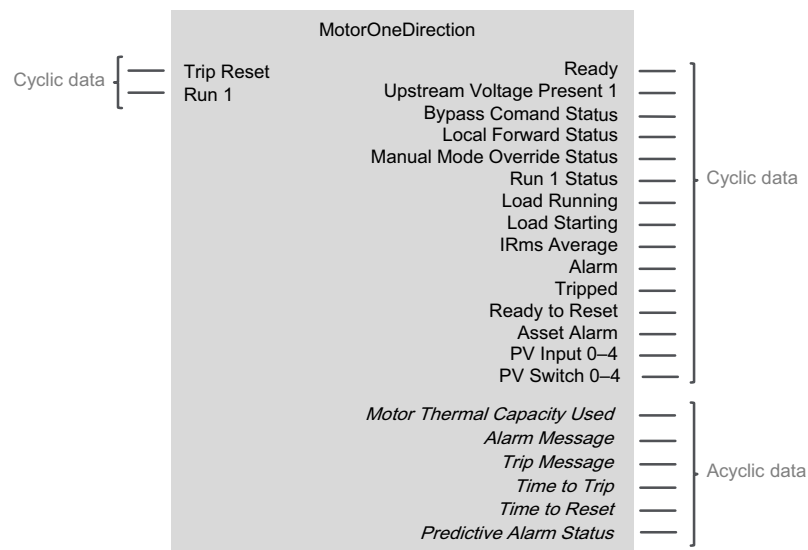
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
Motor Temperature	464	0	16
Irms Average	500	0	32
Thermal Overload Time To 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 19 - 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 10 - MotorOneDirection Function Block**Table 20 - Modbus TCP Inputs—Motor One Direction**

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

Table 21 - Modbus TCP Outputs—Motor One Direction

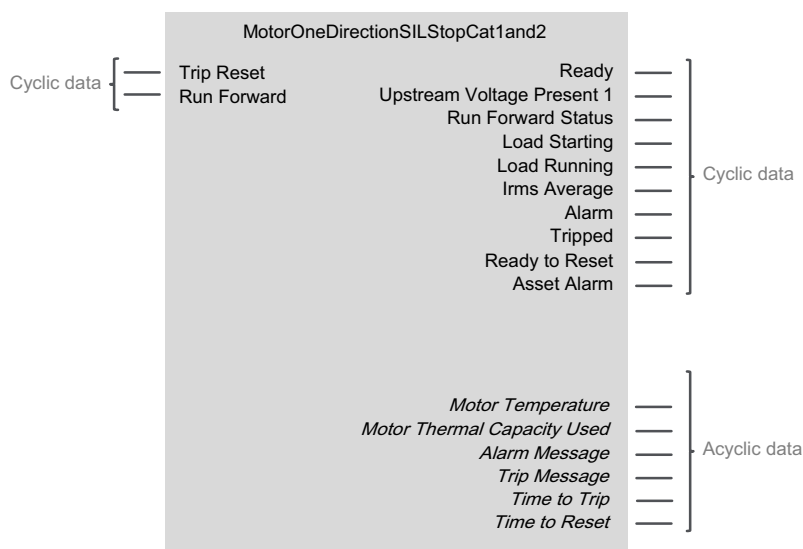
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
IRMS Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	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

Table 21 - Modbus TCP Outputs—Motor One Direction (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

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

This function block is used to manage a motor in one direction with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹⁰

Figure 11 - MotorOneDirectionSILStopCat1and2 Function Block**Table 22 - Modbus TCP Inputs**

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

10. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 23 - 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
Upstream Voltage Present 1	3202	12	1
Motor Thermal Capacity Used	9630	0	8

Motor One Direction - SIL Stop, W. Cat 3/4

This function block is used to manage a motor in one direction with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.¹¹

Figure 12 - MotorOneDirectionSILStopCat3and4 Function Block

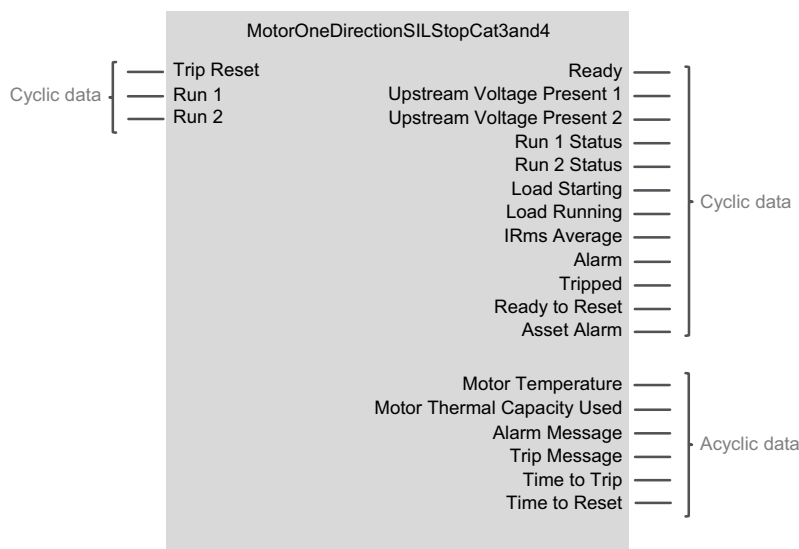


Table 24 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run 1	8501	0	1
Trip Reset	8501	3	1
Run 2	8501	8	1

Table 25 - 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 1 Status	3201	6	1
Run 2 Status	3201	7	1
Load Running	3201	8	1
Ready To Reset	3201	9	1
Asset Alarm	3202	3	1
Upstream Voltage Present 1	3202	12	1

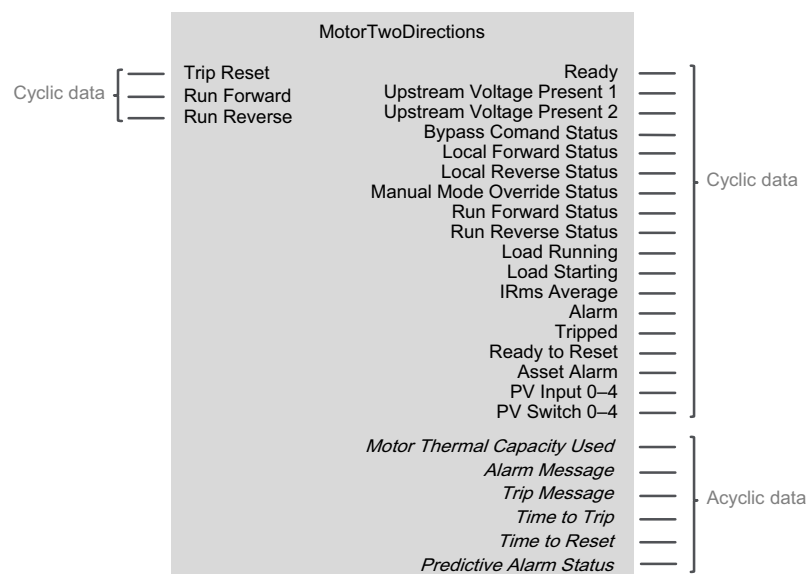
11. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 3 and Category 4 according to ISO 13849.

Table 25 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 2	3202	13	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 13 - MotorTwoDirections Function Block**Table 26 - 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 27 - 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

Table 27 - Modbus TCP Outputs—Motor Two Directions (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Local Reverse Status	3215	2	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

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

This function block is used to manage a motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹²

Figure 14 - MotorTwoDirectionsSILStopCat1and2 Function Block

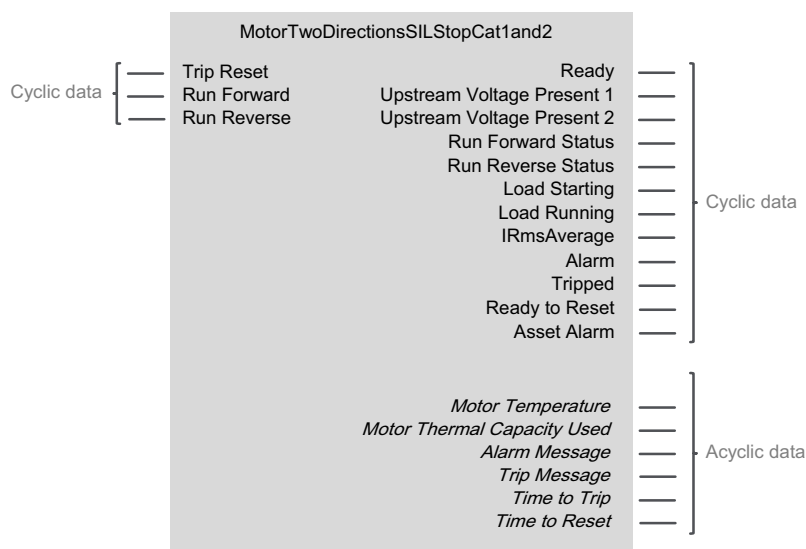


Table 28 - Modbus TCP Inputs

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

Table 29 - 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
Asset Alarm	3202	3	1

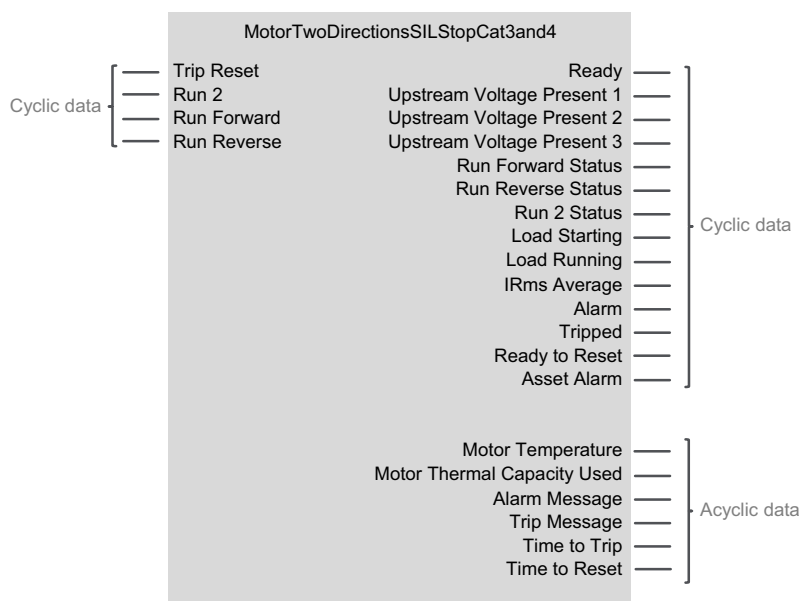
12. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 29 - Modbus TCP Outputs (Continued)

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

Motor Two Directions - SIL Stop, W. Cat 3/4

This function block is used to manage a motor in two directions (forward or reverse) with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.¹³

Figure 15 - MotorTwoDirectionsSILStopCat3and4 Function Block**Table 30 - 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
Run 2	8501	8	1

Table 31 - 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
IRMS Average	500	0	32

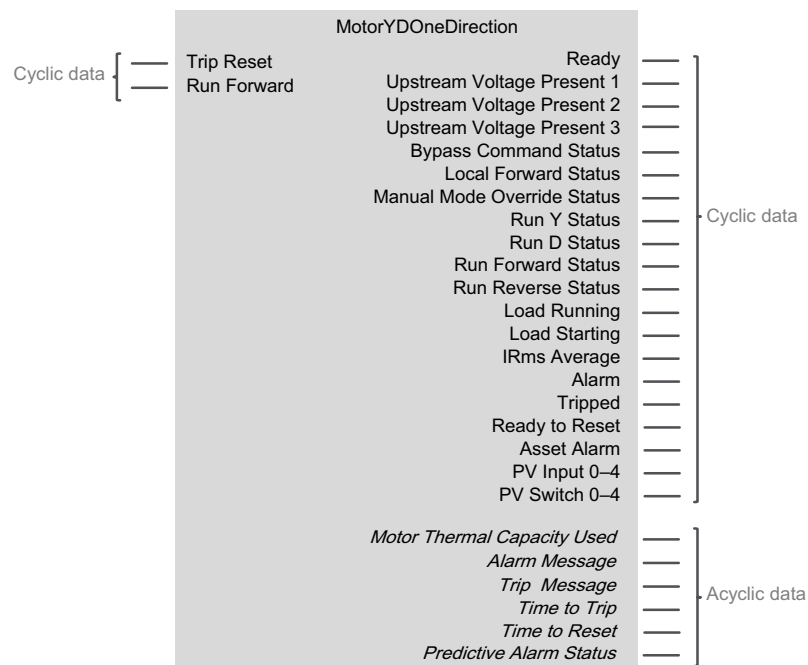
13. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 3 and Category 4 according to ISO 13849.

Table 31 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	1
Tripped	3201	2	1
Alarm	3201	3	1
Run 2 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
Upstream Voltage Present 2	3202	13	1
Upstream Voltage Present 3	3202	14	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 16 - MotorYDOneDirection Function Block**Table 32 - 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 33 - 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
Upstream Voltage Present 3	3202	14	1
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	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 17 - MotorYDTwoDirections Function Block

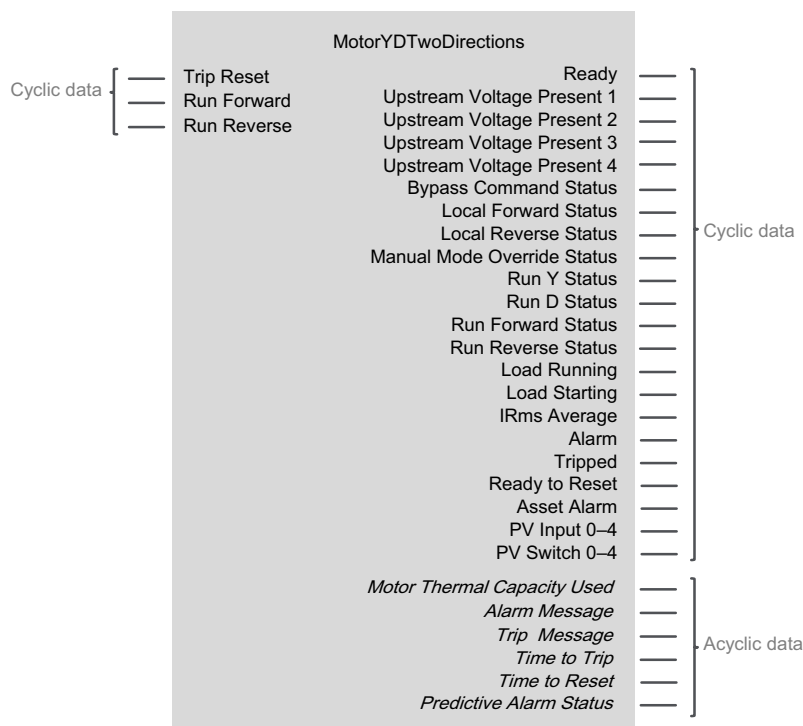


Table 34 - Modbus TCP Inputs—Motor Y/D Two Directions

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

Table 35 - 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

Table 35 - Modbus TCP Outputs—Motor Y/D Two Directions (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
Upstream Voltage Present 3	3202	14	1
Upstream Voltage Present 4	3202	15	1
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Manual Mode Override Status	3215	7	1
Local Reverse Status	3216	1	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

Motor Two Speeds

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

Figure 18 - MotorTwoSpeeds Function Block

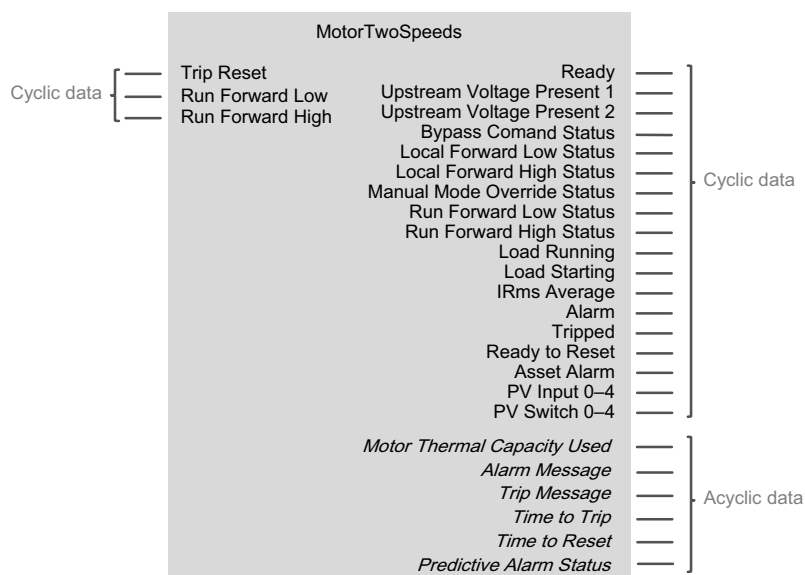


Table 36 - Modbus TCP Inputs—Motor Two Speeds

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 37 - Modbus TCP Outputs—Motor Two Speeds

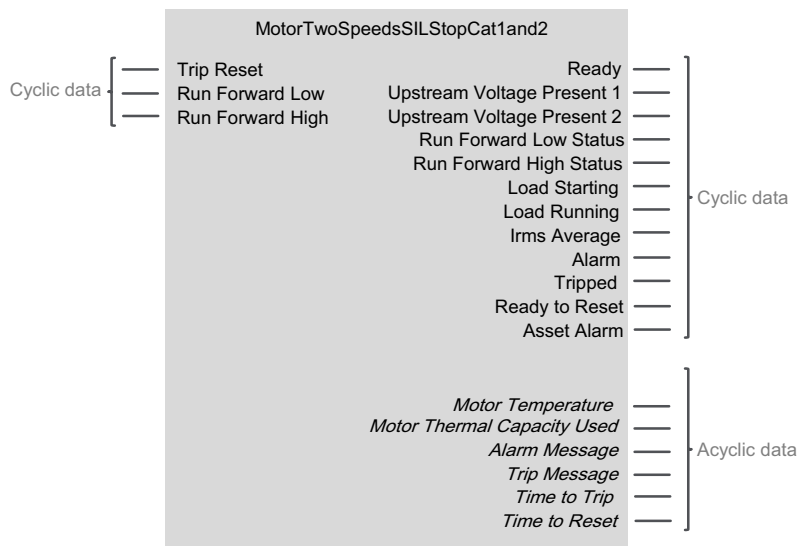
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time to Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
I _{RMS} Average	500	0	32
Thermal Overload Time to Trip	511	0	16
Ready	3201	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

Table 37 - Modbus TCP Outputs—Motor Two Speeds (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Bypass Command Status	3215	0	1
Local Forward Low Speed Status	3215	3	1
Local Forward High Speed Status	3215	4	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

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

This function block is used to manage a two speed motor with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹⁴

Figure 19 - MotorTwoSpeedsSILStopCat1and2 Function Block**Table 38 - 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

14. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 39 - 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
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 - SIL Stop, W. Cat 3/4

This function block is used to manage a two speed motor with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.¹⁵

Figure 20 - MotorTwoSpeedsSILStopCat3and4 Function Block

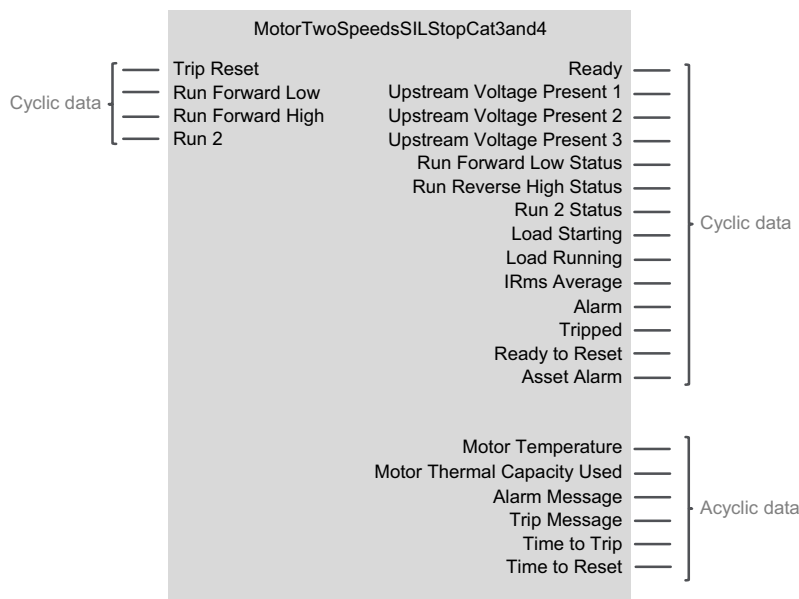


Table 40 - Modbus TCP Inputs

Input Name	Address	Starting Bit	Size (Bits)
Run Forward High	8501	0	1
Trip Reset	8501	3	1
Run Forward Low	8501	6	1
Run 2	8501	8	1

Table 41 - 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
Run 2 Status	3201	7	1
Load Running	3201	8	1

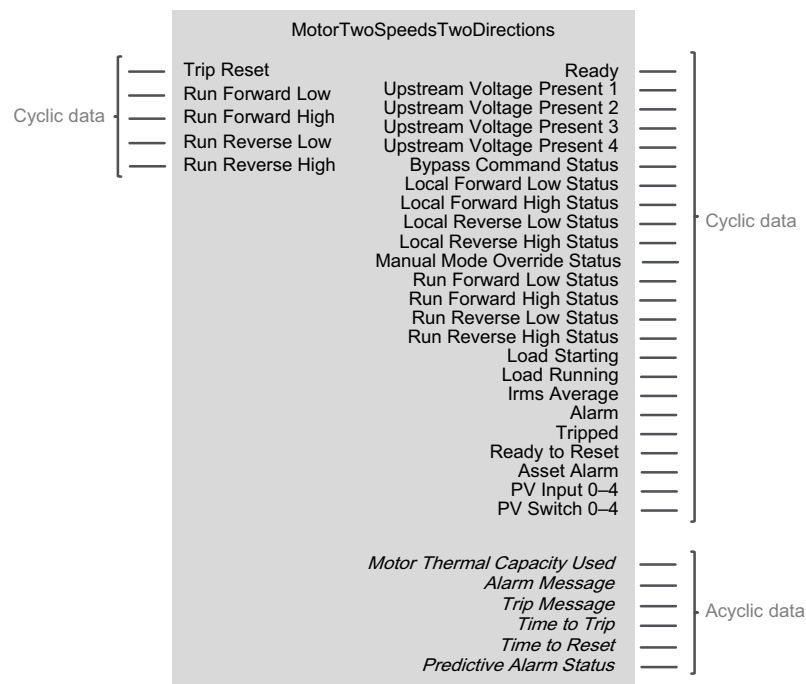
15. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 3 and Category 4 according to ISO 13849.

Table 41 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
Upstream Voltage Present 3	3202	14	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 21 - MotorTwoSpeedsTwoDirections Function Block**Table 42 - 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 43 - 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

Table 43 - Modbus TCP Outputs—Motor Two Speeds Two Directions (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
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
Bypass Command Status	3215	0	1
Local Forward Low Speed Status	3215	3	1
Local Forward High Speed Status	3215	4	1
Local Reverse Low Speed Status	3215	5	1
Local Reverse High Speed Status	3215	6	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

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

This function block is used to manage a two speed motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹⁶

Figure 22 - MotorTwoSpeedsTwoDirectionsSILStopCat1and2 Function Block

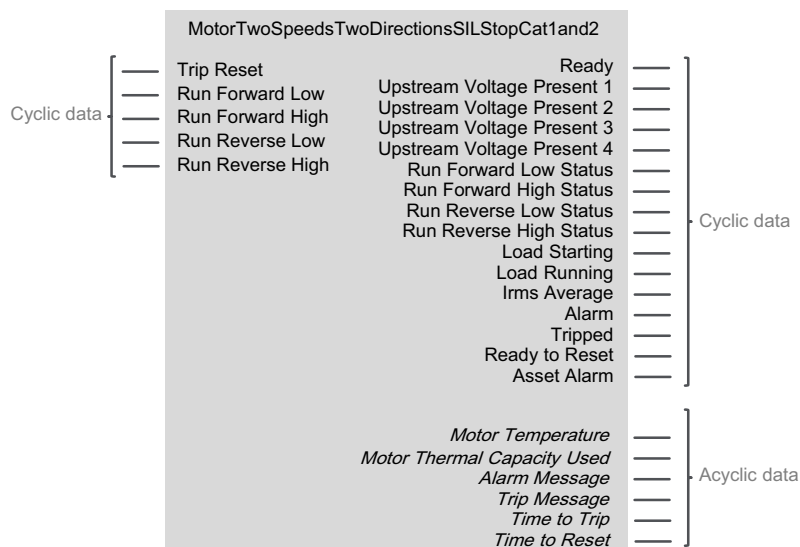


Table 44 - Modbus TCP Inputs

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 45 - 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

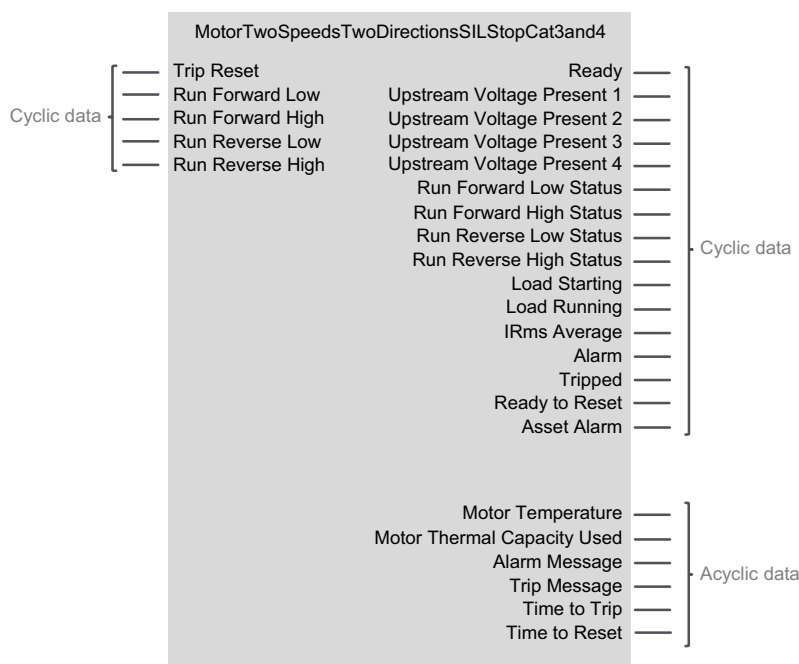
16. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 45 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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

Motor Two Speeds Two Directions - SIL Stop, W. Cat 3/4

This function block is used to manage a two speed motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 3 and Category 4.¹⁷

Figure 23 - MotorTwoSpeedsTwoDirectionsSILStopCat3and4 Function Block**Table 46 - 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

17. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 3 and Category 4 according to ISO 13849.

Table 47 - 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
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 24 - Resistor Function Block

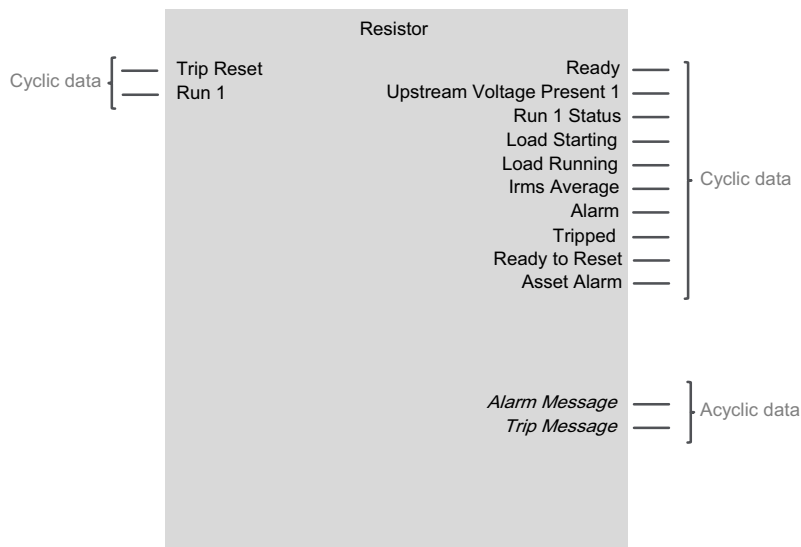


Table 48 - Modbus TCP Inputs—Resistor

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

Table 49 - 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 25 - Power Supply Function Block

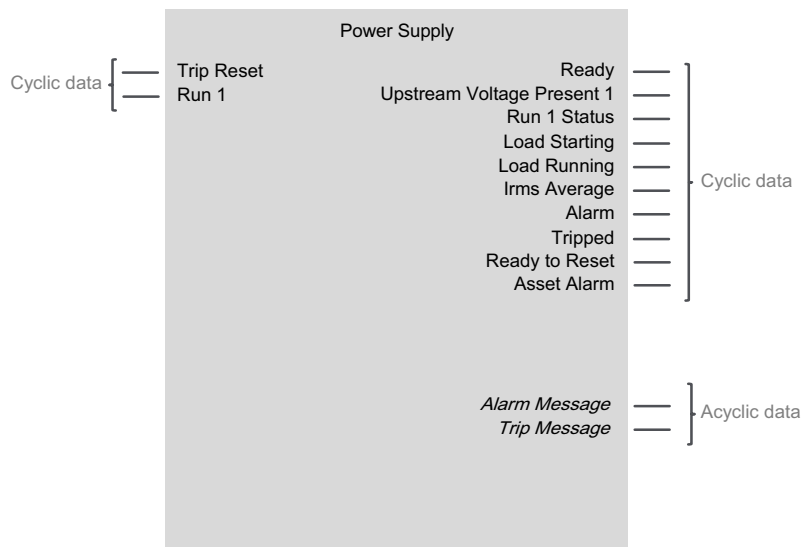


Table 50 - Modbus TCP Inputs—Power Supply

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

Table 51 - 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 26 - Transformer Function Block

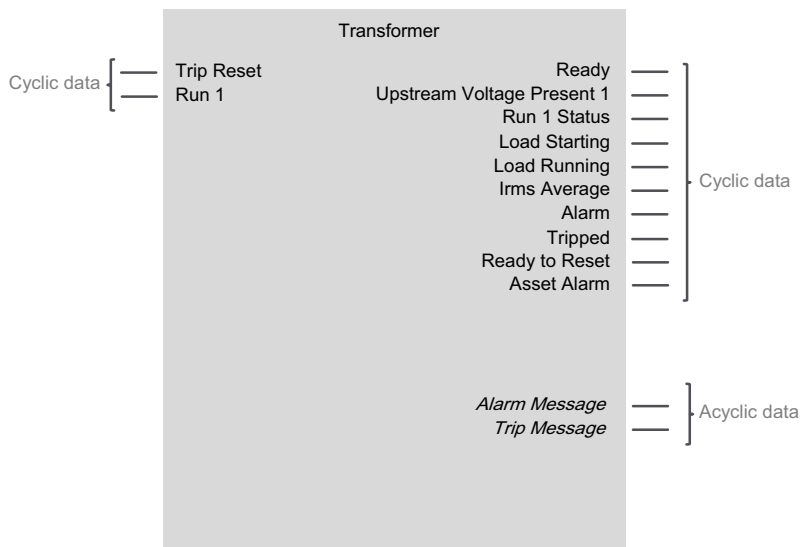


Table 52 - Modbus TCP Inputs—Transformer

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

Table 53 - 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

Application Function Blocks

Pump

This function block is used to manage a pump.

Figure 27 - Pump Function Block

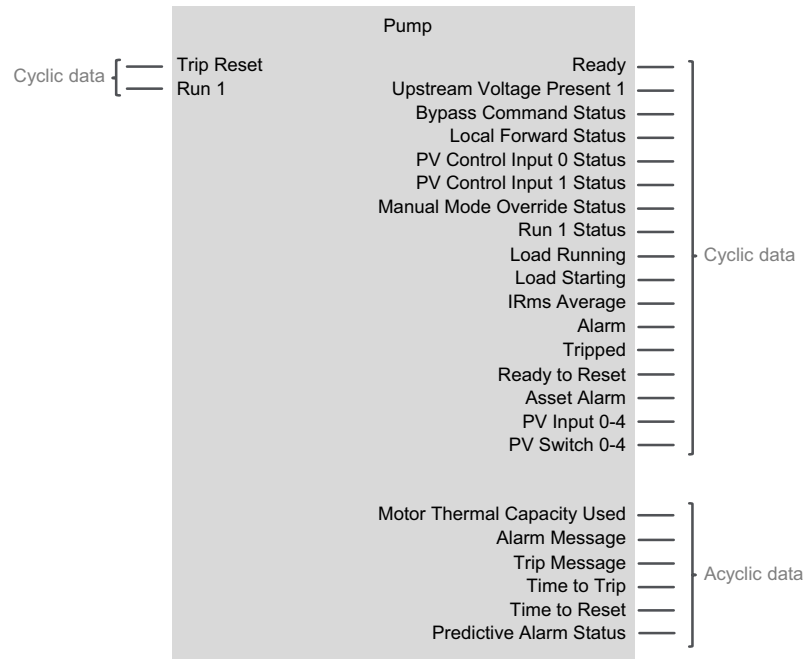


Table 54 - Modbus TCP Inputs — Pump

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

Table 55 - Modbus TCP Outputs — Pump

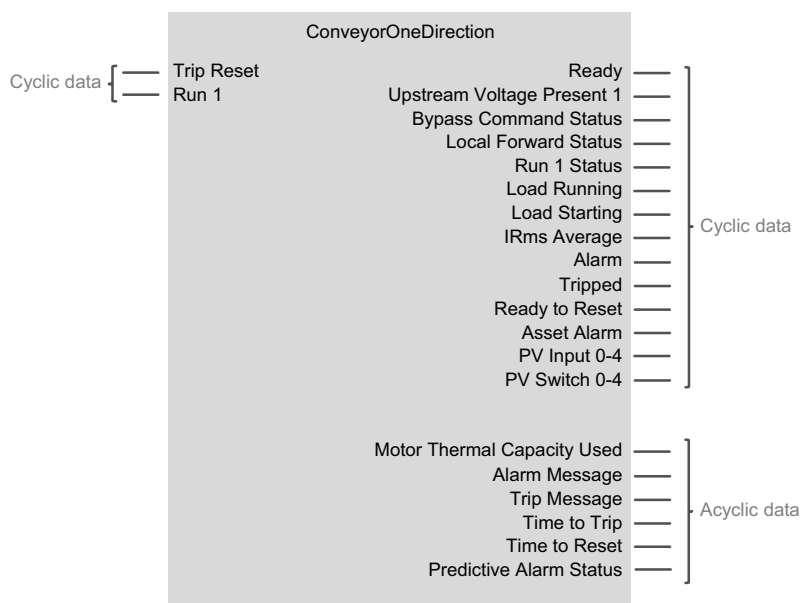
Output Name	Address	Starting Bit	Size (Bits)
Thermal Overload Time To Reset	450	0	16
Protection Trip Message 1	452	0	16
Protection Trip Message 2	453	0	16
Protection Alarm Message 1	461	0	16
Protection Alarm Message 2	462	0	16
IRMS Average	500	0	32
Thermal Overload Time To Trip	511	0	16
Ready	3201	0	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
Load Starting	3201	15	1
Asset Alarm	3202	3	1

Table 55 - Modbus TCP Outputs — Pump (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 1	3202	12	1
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
PV Control Input 0 Status	3215	5	1
PV Control Input 1 Status	3215	6	1
Manual Mode Override Status	3215	7	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

Conveyor One Direction

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

Figure 28 - Conveyor One Direction Function Block**Table 56 - Modbus TCP Inputs — Conveyor One Direction**

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

Table 57 - Modbus TCP Outputs — Conveyor 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 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
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

Conveyor One Direction - SIL Stop, W. Cat 1/2

This function block is used to manage a conveyor in one direction, with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹⁸

Figure 29 - Conveyor One Direction — SIL Stop, W. Cat 1/2 Function Block

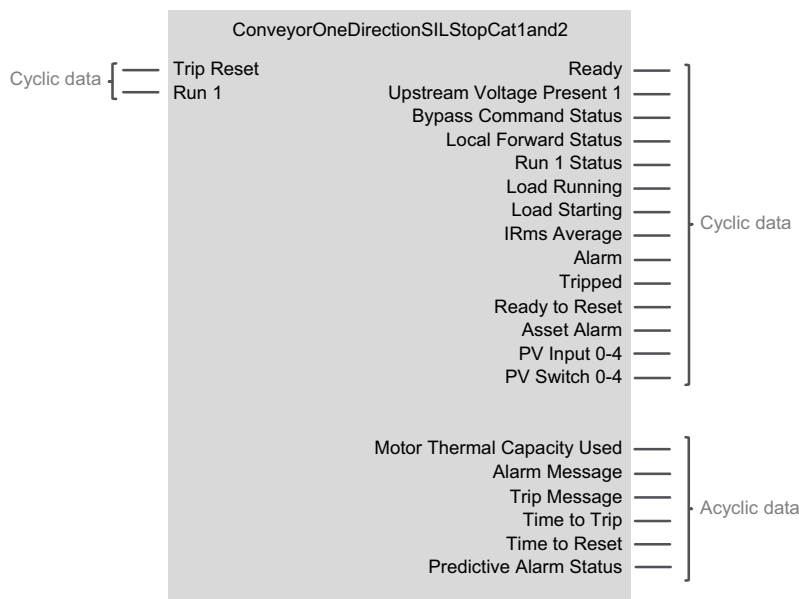


Table 58 - Modbus TCP Inputs

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

Table 59 - 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
IRMS 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
Load Starting	3201	15	1
Asset Alarm	3202	3	1

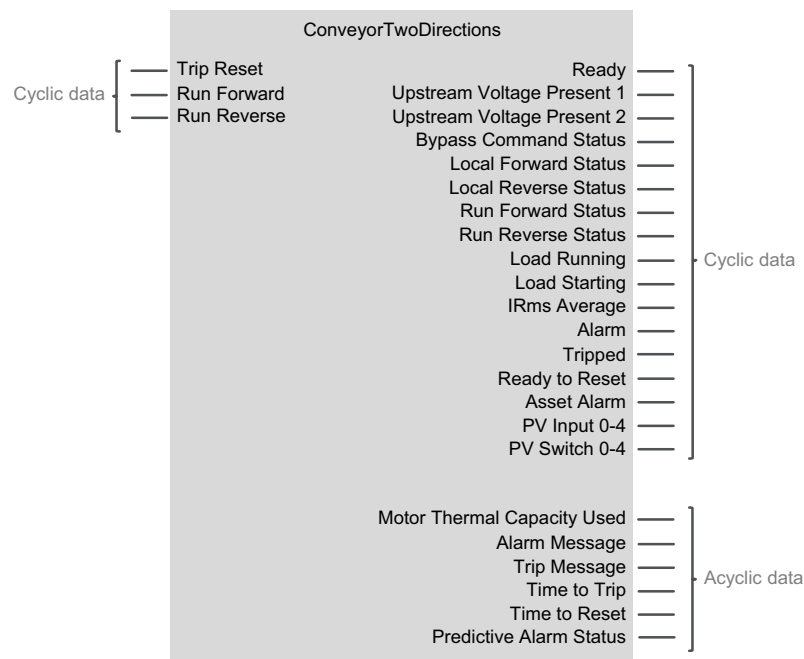
18. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 59 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
Upstream Voltage Present 1	3202	12	1
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

Conveyor Two Directions

This function block is used to manage a conveyor in two directions.

Figure 30 - Conveyor Two Directions Function Block**Table 60 - Modbus TCP Inputs — Conveyor 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 61 - Modbus TCP Outputs — Conveyor 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
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Local Reverse Status	3215	2	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

Conveyor Two Directions - SIL Stop, W. Cat 1/2

This function block is used to manage a conveyor in two directions with Stop Category 0 or Stop Category 1 function compliance for Wiring Category 1 and Category 2.¹⁹

Figure 31 - Conveyor Two Directions — SIL Stop, W. Cat 1/2 Function Block

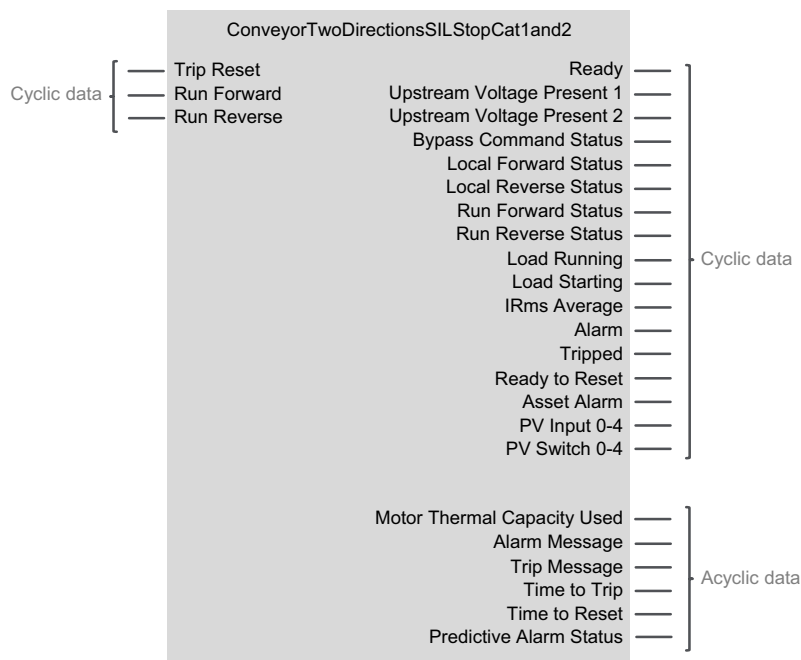


Table 62 - Modbus TCP Inputs

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

Table 63 - 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

19. Safety Integrity Level according to standard IEC 61508. Stop categories according to EN/IEC 60204-1. Wiring Category 1 and Category 2 according to ISO 13849.

Table 63 - Modbus TCP Outputs (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
Bypass Command Status	3215	0	1
Local Forward Status	3215	1	1
Local Reverse Status	3215	2	1
Predictive Alarm Status	3217	0	16
PV Input 0	3224	0	16
PV Input 1	3225	0	16
PV Input 2	3226	0	16
PV Input 3	3227	0	16
PV Input 4	3228	0	16
PV Switch 0	3230	0	1
PV Switch 1	3230	1	1
PV Switch 2	3230	2	1
PV Switch 3	3230	3	1
PV Switch 4	3230	4	1
Motor Thermal Capacity Used	9630	0	8

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 32 - SystemEnergy Function Block

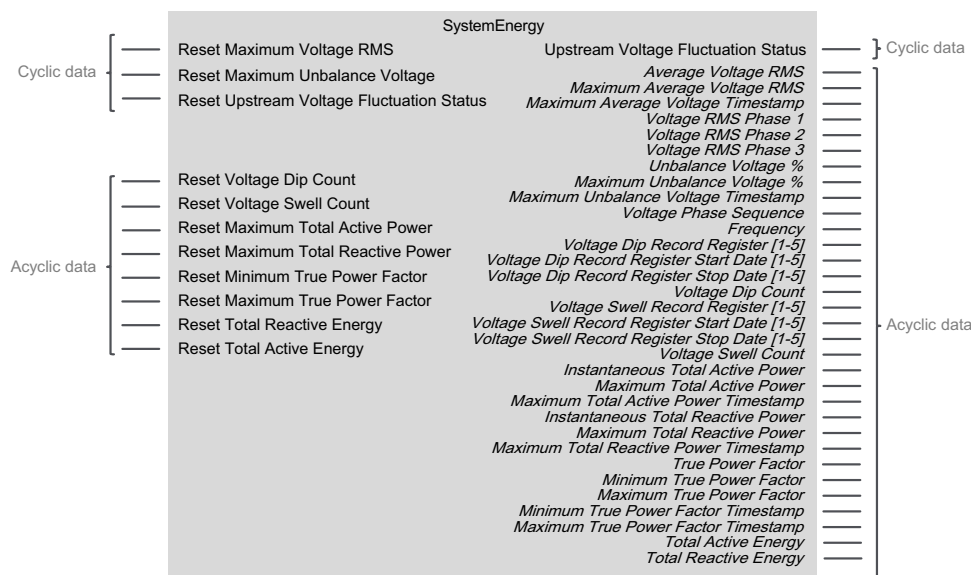


Table 64 - Modbus TCP Inputs—System Energy

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 65 - 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

Table 65 - Modbus TCP Outputs—System Energy (Continued)

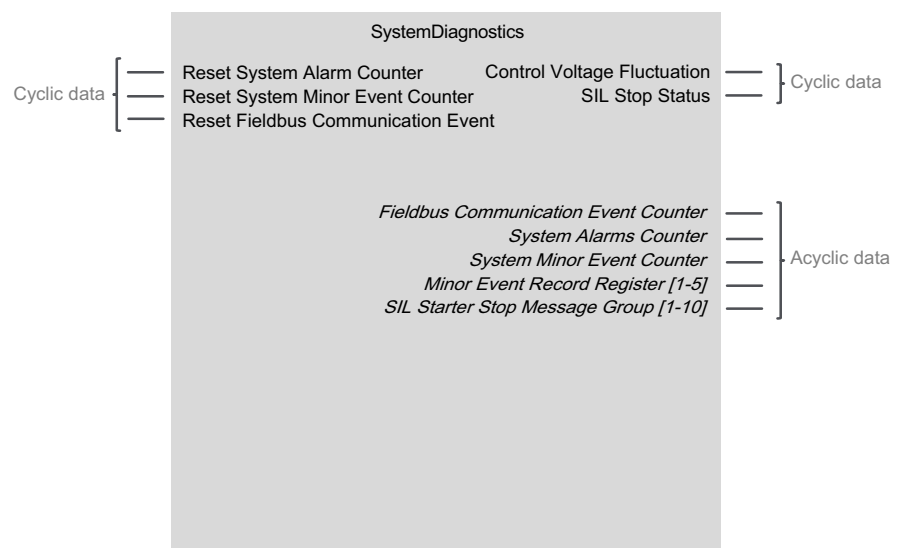
Output Name	Address	Starting Bit	Size (Bits)
Percentage of Unbalance Voltage (%)	480	0	8
True Power Factor	481	0	8
Instantaneous Total Active Power	482	0	32
Instantaneous Total Reactive Power	484	0	32
Voltage Dip Count	1550	0	16
Voltage Swell Count	1551	0	16
Upstream Voltage Fluctuation Status	1553	0	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
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

Table 65 - Modbus TCP Outputs—System Energy (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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 33 - SystemDiagnostics Function Block**Table 66 - 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 67 - Modbus TCP Outputs—System Diagnostics

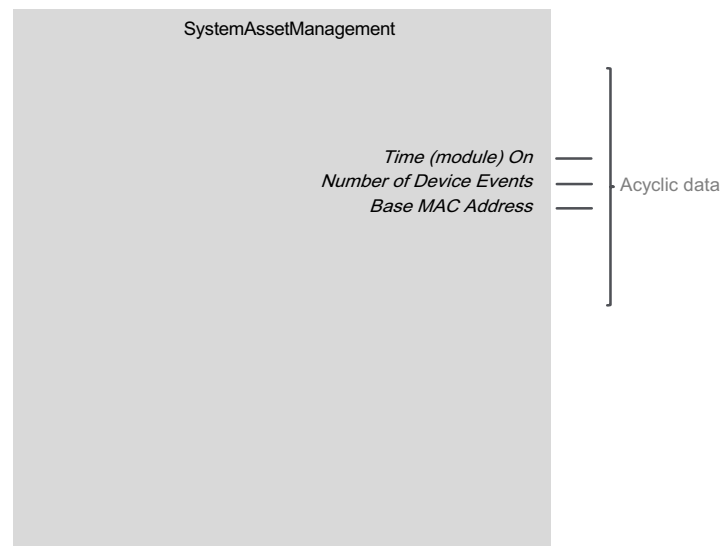
Output Name	Address	Starting Bit	Size (Bits)
System Minor Event Counter	90	0	16
Fieldbus Communication Event Counter	91	0	16
System Alarms Counter	92	0	16
Minor Event Record Register 1	300	0	80
Minor Event Record Register 2	310	0	80

Table 67 - Modbus TCP Outputs—System Diagnostics (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
SIL ²⁰ Starter Stop Status	3203	0	1
SIL Starter Stop Message Group 1	3204	0	8
SIL Starter Stop Message Group 2	3205	0	8
SIL Starter Stop Message Group 3	3206	0	8
SIL Starter Stop Message Group 4	3207	0	8
SIL Starter Stop Message Group 5	3208	0	8
SIL Starter Stop Message Group 6	3209	0	8
SIL Starter Stop Message Group 7	3210	0	8
SIL Starter Stop Message Group 8	3211	0	8
SIL Starter Stop Message Group 9	3212	0	8
SIL Starter Stop Message Group 10	3213	0	8

System Asset Management

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

Figure 34 - SystemAssetManagement Function Block**Table 68 - 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

20. Safety Integrity Level according to standard IEC 61508

System Time

This function block returns the date and time of the system device.

Figure 35 - System Time Function Block

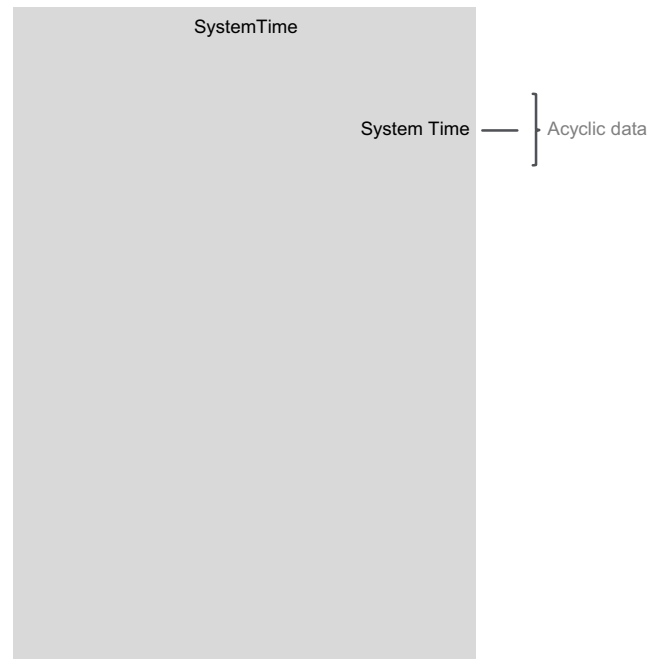


Table 69 - Modbus TCP Outputs — System Time

Output Name	Address	Starting Bit	Size (Bit)
System Time	2100	0	64

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 36 - Energy Function Block

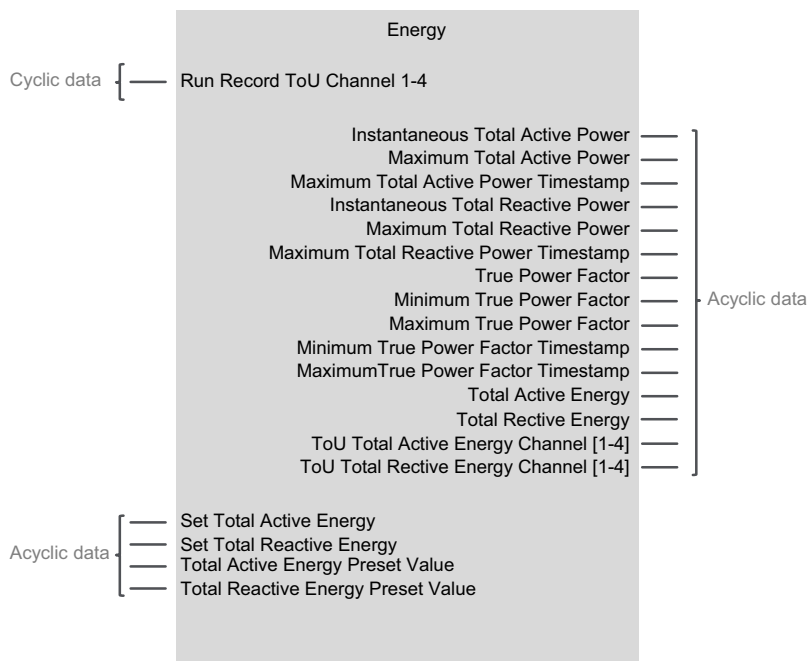


Table 70 - Modbus TCP Inputs—Energy

Input Name	Address	Starting Bit	Size (Bits)
Total Active Energy Preset Value	680	0	32
Total Reactive Energy Preset Value	682	0	32
Run Record ToU Channel 1	713	2	1
Run Record ToU Channel 2	713	3	1
Run Record ToU Channel 3	713	4	1
Run Record ToU Channel 4	713	5	1
Set Total Active Energy	713	6	1
Set Total Reactive Energy	713	7	1

Table 71 - 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

Table 71 - Modbus TCP Outputs—Energy (Continued)

Output Name	Address	Starting Bit	Size (Bits)
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
ToU Total Active Energy Channel 1	2200	0	32
ToU Total Reactive Energy Channel 1	2202	0	32
ToU Total Active Energy Channel 2	2204	0	32
ToU Total Reactive Energy Channel 2	2206	0	32
ToU Total Active Energy Channel 3	2208	0	32
ToU Total Reactive Energy Channel 3	2210	0	32
ToU Total Active Energy Channel 4	2212	0	32
ToU Total Reactive Energy Channel 4	2214	0	32

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

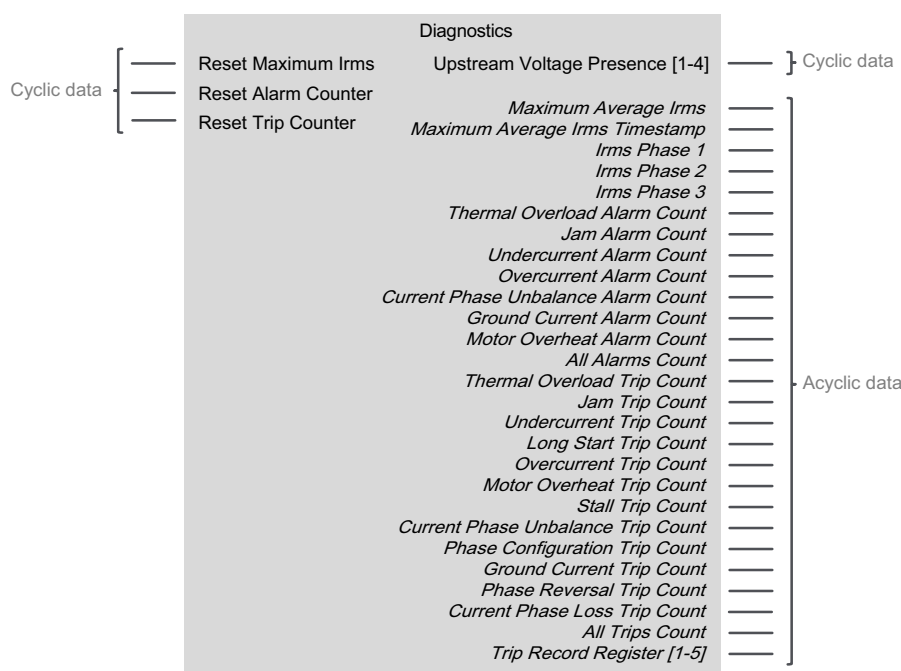
Figure 37 - Diagnostics Function Block

Table 72 - 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 73 - 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
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 38 - AssetManagement Function Block

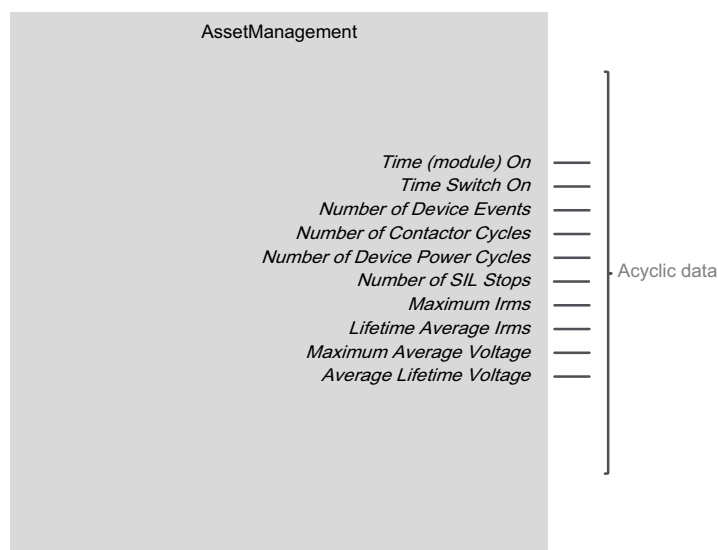


Table 74 - Modbus TCP Outputs—Asset Management

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}	35	0	32
Maximum I_{RMS}	32	0	16
Number of Device Events	33	0	16
Average Lifetime Voltage	34	0	16
Number of SIL ²¹ Starter Stops	40	0	32
Maximum Average Voltage	32	0	16

21. Safety Integrity Level according to standard IEC 61508.

EtherNet/IP Third Party Integration

EtherNet/IP™ Addressing

Table 75 - 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 <i>island_name.zip</i>. For EDS: - Click Export then EDS File Format. - Click Save. The file will be saved as an EDS file in the format <i>island_name.eds</i>. You will receive a notification that the EDS file has been created. Click OK.
3	Consult the <i>EtherNet/IP™ Quick Start Guide</i> , 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 and the following sections for tips on manual EDS file import.

Importing the EDS File into a Programming Tool

After exporting an EDS file, you can import the EDS file into your preferred programming tool. Follow the programming tool instructions to determine how to import and get access to the data. The following sections can also provide some additional information, depending on the application and programming environment used.

Using Multiple TeSys™ island Devices in a Single Programming Tool

The EDS file export output is a file specific for the configured island. It contains information that is unique for the avatars and devices, and the order you chose. If you work with multiple islands on your PC or programming environment, you will have multiple EDS files. Generally, a programming tool will not allow conflicts in the product name or revision of multiple imported devices. For example, you cannot import two different EDS files for TeSys™ island revision 1.1. To work around this and work with multiple island configurations (each island imported as a device in the programming tool), it is recommended that you edit the MinRev and ProdName in the EDS file with either a text editor or EZ-EDS software as shown below.

Figure 39 - EZ-EDS Generated Electronic Data Sheet

```

1  $ EZ-EDS Version 3.25.1.20181218 Generated Electronic Data Sheet
2
3  [File]
4      DescText = "TeSys island EDS file export";
5      CreateDate = 08-19-2019;
6      CreateTime = 09:41:57;
7      ModDate = 08-19-2019;
8      ModTime = 09:41:57;
9      Revision = 1.0;
10
11 [Device]
12     VendCode = 243;
13     VendName = "Schneider Electric";
14     ProdType = 14;
15     ProdTypeStr = "Programmable Logic Controller";
16     ProdCode = 5121;
17     MajRev = 1;
18     MinRev = 102;
19     ProdName = "TeSys_island_MyName1";
20

```

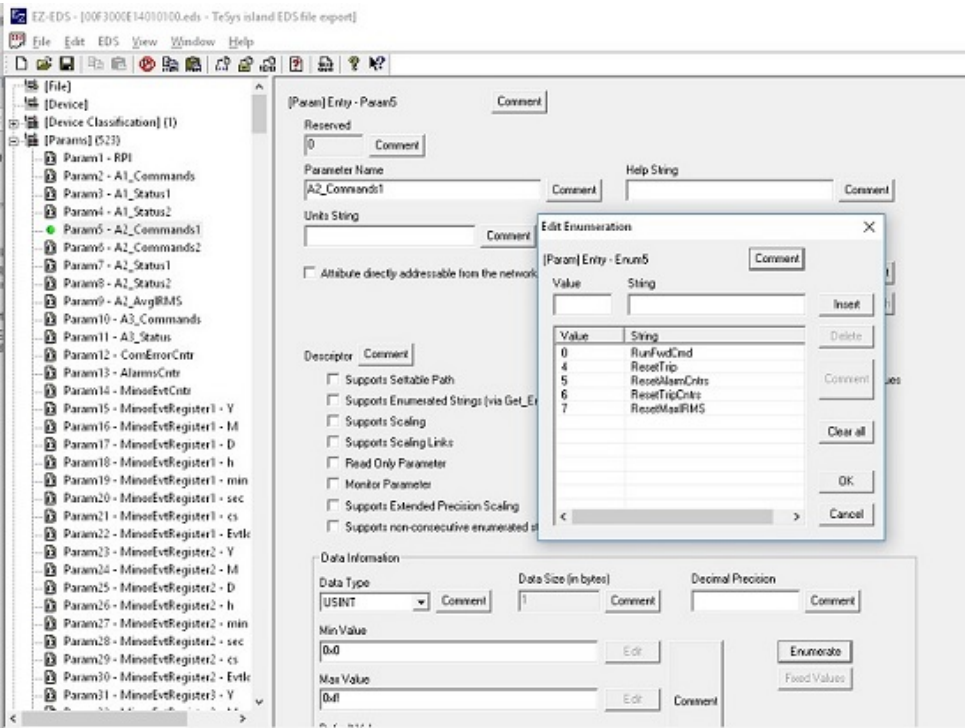
Figure 40 - EZ-EDS TeSys island EDS File Export

Understanding Avatar Command and Status Bits

The EDS file contains details about the data for the various avatar commands and statuses. These are described as A1_Commands (Avatar 1 commands), A2_Commands1 (first set of Avatar 2 commands), A2_Commands2 (last set of Avatar 2 commands), etc.

In many programming tools, the parameters are only described as full bytes. However, the EDS file contains the detailed descriptions of each bit. To access the information if your programming tool does not display it, open the EDS file with an EDS file viewer such as EZ-EDS. If you select the parameter (such as A2_Commands1 shown below) and then select Enumerate, a full description of each bit displays.

Figure 41 - EZ-EDS Enumerate



EtherNet/IP Cyclic Data

The TeSys island has the ability to use a single EtherNet/IP connection to exchange real-time data to/from all avatars with a single Input Cyclic Dataset and a single Output Cyclic Dataset.

Table 76 - Output Cyclic Dataset

Avatar 1 Output Dataset	Avatar 2 Output Dataset	Avatar 3 Output Dataset	...	Avatar N Output Dataset
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Table 77 - Input Cyclic Dataset

Avatar 1 Input Dataset	Avatar 2 Input Dataset	Avatar 3 Input Dataset	...	Avatar N Input Dataset
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The avatar dataset order matches the avatar order from the digital tool used to build the island configuration. See below table for example:

Order of Avatar in Digital Tool	Order of Datasets in Input / Output Cyclic Dataset	Avatar (example)
1	1	System
2	2	IOM
3	3	Safe Reversing Starter Cat. 1 & 2
4	4	DOL starter
5	5	DOL conveyor

Table 78 - EtherNet/IP Cyclic Data

Object Name	Object Class ID	Instance
Output Cyclic Dataset	0x04	0x64
Input Cyclic Dataset	0x04	0x65

The TeSys island supports EtherNet/IP class 1 communication with a **cyclic** transport trigger.

EtherNet/IP Acyclic Data

The TeSys™ island supports the following EtherNet/IP objects for Explicit Messaging:

Table 79 - EtherNet/IP Acyclic Data

Object Name	Object Class ID	Instance	Comment
System Diagnostic	0x67	1	System is always 1.
System Energy	0x68	1	
System Asset Management	0x69	1	
System Time	0x70	1	
Control	0x6A	10-99	Each avatar includes its own Control, Energy, and Diagnostic object.
Energy	0x6B	10-99	
Diagnostic	0x6C	10-99	
Asset Management	0x6D	101-199	There is an instance of the Asset Management Object for each device.
System Combined Output	0x6F	1	—

System Diagnostic Object

Table 80 - System Diagnostic Object (0x67, instance 1)

Attribute ID	Name
1	Fieldbus Comm Error Counter
2	All Alarms Count
3	System Minor Event Counter
4	Minor Event Record Register 1
5	Minor Event Record Register 2
6	Minor Event Record Register 3
7	Minor Event Record Register 4
8	Minor Event Record Register 5
9	SIL ²² Starter Stop Msg group 1
10	SIL Starter Stop Msg group 2
11	SIL Starter Stop Msg group 3
12	SIL Starter Stop Msg group 4
13	SIL Starter Stop Msg group 5
14	SIL Starter Stop Msg group 6
15	SIL Starter Stop Msg group 7
16	SIL Starter Stop Msg group 8
17	SIL Starter Stop Msg group 9

22. Safety Integrity Level according to standard IEC 61508.

Table 80 - System Diagnostic Object (0x67, instance 1) (Continued)

Attribute ID	Name
18	SIL Starter Stop Msg group 10
19	Function Block Interface Version

System Energy Object

Table 81 - System Energy Object (0x68, instance 1)

Attribute ID	Description
1	Average Voltage RMS (V)
2	Maximum Average Voltage RMS (V)
3	Maximum Average Voltage Timestamp
4	Voltage RMS Phase 1 (V)
5	Voltage RMS Phase 2 (V)
6	Voltage RMS Phase 3 (V)
7	Voltage RMS L1-L2 (V)
8	Voltage RMS L2-L3 (V)
9	Voltage RMS L3-L1 (V)
10	Percentage of Unbalance Voltage (%)
11	Maximum Unbalance Voltage (%)
12	Maximum Unbalance Voltage Timestamp
13	Phase Sequence (ABC or ACB)
14	Frequency (Hz)
15	Voltage Dip Record register 1 (most recent)
16	Voltage Dip Record register 1 (most recent)
17	Voltage Dip Record register 1 (most recent)
18	Voltage Dip Record register 2
19	Voltage Dip Record register 2
20	Voltage Dip Record register 2
21	Voltage Dip Record register 3
22	Voltage Dip Record register 3
23	Voltage Dip Record register 3
24	Voltage Dip Record register 4
25	Voltage Dip Record register 4
26	Voltage Dip Record register 4
27	Voltage Dip Record register 5 (least recent)
28	Voltage Dip Record register 5 (least recent)
29	Voltage Dip Record register 5 (least recent)
30	Voltage Dip Count
31	Voltage Swell Record register 1 (most recent)
32	Voltage Swell Record register 1 (most recent)
33	Voltage Swell Record register 1 (most recent)

Table 81 - System Energy Object (0x68, instance 1) (Continued)

Attribute ID	Description
34	Voltage Swell Record register 2
35	Voltage Swell Record register 2
36	Voltage Swell Record register 2
37	Voltage Swell Record register 3
38	Voltage Swell Record register 3
39	Voltage Swell Record register 3
40	Voltage Swell Record register 4
41	Voltage Swell Record register 4
42	Voltage Swell Record register 4
43	Voltage Swell Record register 5 (least recent)
44	Voltage Swell Record register 5 (least recent)
45	Voltage Swell Record register 5 (least recent)
46	Voltage Swell Count
47	Instantaneous Total Active Power (kW)
48	Maximum Total Active Power (kW)
49	Maximum Total Active Power Timestamp
50	Instantaneous Total Reactive Power (kVAR)
51	Maximum Total Reactive Power (kVAR)
52	Maximum Total Reactive Power Timestamp
53	True Power Factor
54	Minimum True Power Factor
55	Maximum True Power Factor
56	Minimum True Power Factor Timestamp
57	Maximum True Power Factor Timestamp
58	Total Active Energy (kWh)
59	Total Reactive Energy (kVARh)
60	ToU_TotalActiveEnergyChannel1
61	ToU_TotalActiveEnergyChannel2
62	ToU_TotalActiveEnergyChannel3
63	ToU_TotalActiveEnergyChannel4

System Asset Management Object

Table 82 - System Asset Management Object (0x69, instance 1)

Attribute ID	Description
1	VendorName
2	ProductCode
3	MajorMinorRev
4	VendorURL
5	ProductName
6	ModelName

Table 82 - System Asset Management Object (0x69, instance 1) (Continued)

Attribute ID	Description
7	Base MACAddress
8	SerialNumber
9	Time (module) ON
10	Number of events (Device Status)
11	Configuration Hash Value

System Time Object

NOTE: This object is unique in that it is both readable and writable.

Table 83 - System Time Object (0x70, instance 1)

Attribute ID	Name
1	System Time

Control Object

Table 84 - Control Object (0x6A, instance 10–99)

Attribute ID	Description
1	Motor Temperature
2	SIL Group
3	Motor Thermal Capacity Used
4	Alarm Message
5	Alarm Message
6	Trip Message
7	Trip Message
8	Time To Trip
9	Time To Reset
10	Predictive Alarms Status

Energy Object

Table 85 - Energy Object (0x6B, instance 10–99)

Attribute ID (decimal)	Description (annex 3 data name)
1	Instantaneous Total Active Power (kW)
2	Maximum Total Active Power (kW)
3	Maximum Total Active Power Timestamp
4	Instantaneous Total Reactive Power (kVAR)
5	Maximum Total Reactive Power (kVAR)
6	Maximum Total Reactive Power Timestamp
7	True Power Factor

Table 85 - Energy Object (0x6B, instance 10–99) (Continued)

Attribute ID (decimal)	Description (annex 3 data name)
8	Minimum True Power Factor
9	Maximum True Power Factor
10	Minimum True Power Factor Timestamp
11	Maximum True Power Factor Timestamp
12	Total Active Energy (kWh)
13	Total Reactive Energy (kVARh)
14	ToU_TotalActiveEnergyChannel1
15	ToU_TotalActiveEnergyChannel2
16	ToU_TotalActiveEnergyChannel3
17	ToU_TotalActiveEnergyChannel4
18	ToU_TotalReactiveEnergyChannel1
19	ToU_TotalReactiveEnergyChannel2
20	ToU_TotalReactiveEnergyChannel3
21	ToU_TotalReactiveEnergyChannel4

Diagnostic Object

Table 86 - Diagnostic Object (0x6C, instance 10–99)

Attribute ID	Description
1	Max Avg IRMS
2	Max Avg IRMS TimeStamp
3	IRMS Phase1
4	IRMS Phase2
5	IRMS Phase3
6	Thermal Overload Alarm Count
7	Jam Alarm Count
8	Undercurrent Alarm Count
9	Overcurrent Alarm Count
10	Current Phase Unbalance Alarm Count
11	Ground Current Alarm Count
12	Motor Overheat Alarm Count
13	All Alarms Count
14	Thermal Overload Trip Count
15	Jam Trip Count
16	Undercurrent Trip Count
17	Long Start Trip Count
18	Overcurrent Trip Count
19	Motor Overheat Trip Count
20	Stall Trip Count
21	Current Phase Unbalance Trip Count
22	Phase Configuration Trip Count

Table 86 - Diagnostic Object (0x6C, instance 10–99) (Continued)

Attribute ID	Description
23	Ground Current Trip Count
24	Phase Reversal Trip Count
25	Current Phase Loss Trip Count
26	All Trips Count
27	Trip Record register 1
28	Trip Record register 2
29	Trip Record register 3
30	Trip Record register 4
31	Trip Record register 5

Asset Management Object

Table 87 - Asset Management (0x6D, instance 101–199)

Attribute ID	Name
1	VendorName
2	ProductCode
3	MajorMinorRev
4	VendorURL
5	ProductName
6	ModelName
7	SerialNumber
8	Time (module) ON
9	Time Switch ON
10	Number of event (Device Status)
11	Number of contactor cycles
12	Number of device power cycles
13	Number of SIL Stops ²³
14	Max I RMS
15	Average I RMS
16	Max Average Voltage
17	Average Lifetime Voltage

23. Safety Integrity Level according to standard IEC 61508.

System Combined Output Object

Table 88 - System Combined Output Object (0x6F, instance 1)

Name	Comment
Reset Voltage Dip Count	Data exist once per System.
Reset Voltage Swell Count	
Reset Maximum Total Active Power	
Reset Maximum Total Reactive Power	
Reset Minimum True Power Factor	
Reset Maximum True Power Factor	
Reset Total Reactive Energy	
Reset Total Active Energy	
Set Total Active Energy	Data exist for each avatar.
Set Total Reactive Energy	
Total Active Energy Preset Value	
Total Reactive Energy Preset Value	

PROFINET Third Party Integration

PROFINET Addressing

In PROFINET, the bus coupler is a modular field device. In the PROFINET environment, the system is constructed as a combination of modules and sub-modules defined in a General Station Description (GSD) file, and are assigned to the slots and sub-slots of the system.

PROFINET communications addresses modular field devices using slot and sub-slot addressing. It divides the slot addressing space into two regions, one for avatars and one for devices. Slot 0 is used for the bus coupler and System Avatar. Within each slot, sub-slot values are used to access the different datasets.

The TeSys island PROFINET interface represents the system as one module with multiple slots and sub-slots as follows:

- One Device Access Point (DAP), the bus coupler-This DAP is located in slot 0.
- A set of slots representing the avatars-Sub-slots for datasets associated with each avatar.
- A set of slots representing the devices-Sub-slots for the datasets associated with each device

NOTE: Empty slots also should be filled with empty slot.

After importing the General Station Description Markup Language (GSDML) file into your programming environment, add a TeSys island instance from the hardware catalog. The TeSys island is created with a System Avatar but no other modules.

Follow the instructions for your programming environment to populate the empty slots with avatars and devices using the information in [PROFINET Slot Ranges](#), page 76 below. For example:

1. In CoDeSys v3.5, right click on an empty slot and choose Plug Device.
2. Select the appropriate avatar or device from the catalog.
3. When the island is fully defined, start creating tags for the data you need to access for each avatar.

TeSys island applies the following slot ranges for physical and virtual modularity:

Table 89 - PROFINET Slot Ranges

Item	Slot	Comment
Bus Coupler / System Avatar	0	—
Avatars	1–21	Device, Load, and Application avatars
Bus Devices	101–121	Digital I/O Module (DIOM) Analog I/O Module (AIOM) Starters SIL ²⁴ Starters Power Interface Module (PIM) SIL Interface Module (SIM) Voltage Interface Module (VIM)
Not Applicable	22–100, 122–254	These slots are not used with TeSys island.

24. Safety Integrity Level according to standard IEC 61508.

Table 90 - Example of Avatar Numbering

Order of Avatar in Digital Tool	PROFI-NET Avatar Slot	Description	Physical Order in island								
			1	2	3	4	5	6	7	8	9
1	0	System	BC	—	—	VIM	—	—	SIM	—	—
2	1	AIOM	—	AIOM	—	—	—	—	—	—	—
3	2	Motor Two Directions – SIL Stop, W. Cat 1/ ²⁵	—	—	—	—	SIL Starter	SIL Starter	—	—	—
4	3	Motor One Direction	—	—	—	—	—	—	—	Starter	—
5	4	Power Interface with I/O (Control)	—	—	DIOM	—	—	—	—	—	PIM

Table 91 - Example of PROFINET Physical Device Slots

Physical Order in island	1	2	3	4	5	6	7	8	9
PROFINET Physical Device Slot	0	101	102	103	104	105	106	107	108

A typical PROFINET IO-Controller is a PLC. It provides and consumes I/O (cyclic) data as well as configuration (acyclic) data and is comparable to a PROFIBUS Class 1 client. A PROFINET IO-Supervisor is used for diagnostic purposes and can be a programming device, personal computer, or an HMI device. The IO-Supervisor is comparable to a PROFIBUS Class 2 client.

Write arbitration between multiple clients is specified in PROFINET standard. The IO-Controller (the main client) has the exclusive write access by default. Other clients (by default only) have read access. If not restricted, the other clients (that is, the IO-Supervisor) can request write access on a per module (per avatar) basis. If the IO-Controller allows write access, the write access is transferred to the requesting client until it is released again.

The TeSys island limits the IO-Supervisor application relation (AR) to an IO-Supervisor Device Access AR. This means that only acyclic parameters can be accessed from the IO-Supervisor. Access to the cyclic data is not possible. However, it is possible to view the state of the cyclic process data values in an additional acyclic parameter (for read-only access).

PROFINET Cyclic Data

When importing the General Station Description (GSD) or General Station Description Markup Language (GSDML) file into your programming environment and inserting each avatar into the appropriate slots, the information is displayed with input and output bytes. The following tables define the input and output data for each avatar and define the meaning of each byte.

NOTE:

- Cells or bytes highlighted in grey in the tables are only applicable to firmware versions where the Load Avatars Motor One Direction, Motor Two Direction, etc. have local control modes and PV inputs enabled.
- For firmware versions where the avatars do not have the local control modes and PV inputs features, ignore the cells highlighted in grey.
- If you have doubt, the programming tool will specify how many bytes are expected for each avatar.

25. Wiring Category 1 and Category 2 according to ISO 13849.

- If your avatar expects 6 bytes but the tables below show 17 bytes, ignore bytes 7-17 since they are applicable only to a future firmware version.
- Devices (slots 101 and above) do not allow cyclic data and do not have datasets. Their data is accessed via Acyclic data only.
- In PROFIBUS communication, 16 units is the maximum size you can define in the Configuration Data Unit. For the larger datasets, word alignments must be used. For PROFIBUS only, a padding byte must be added to any datasets with an odd number of bytes.

System Avatar Dataset

Table 92 - System Avatar Dataset Input Data

Byte 0	Reset System	—	6	Reset System Minor Fault Counter	Reset Fieldbus Comm Error Counter	Reset Max VRMS	Reset Max Voltage Unbalance	Reset Upstream Voltage Fluctuation Status
	7	6	5	4	3	2	1	0

Table 93 - System Avatar Dataset Output Data

Byte 0	—	—	—	—	—	Control Voltage Fluctuation	SIL ²⁶ Starter Stop Status	Upstream Voltage Fluctuation Status
	7	6	5	4	3	2	1	0
Byte 1	—	—	Degraded Mode	Forced Mode	Minor Fault	Test Mode	Operational	Pre-Operational
	7	6	5	4	3	2	1	0

Device Datasets

Switch Dataset

Table 94 - Switch Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON / OFF Command
	7	6	5	4	3	2	1	0

Table 95 - Switch Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0

26. Safety Integrity Level according to standard IEC 61508.

Table 95 - Switch Dataset Output Data (Continued)

Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Switch – SIL Stop, W. Cat 1/2 Dataset

Table 96 - Switch – SIL Stop, W. Cat 1/2²⁷ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0

Table 97 - Switch – SIL Stop, W. Cat 1/2 Dataset Output Data

Byte 0	—	Asset Alarm	-	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Switch – SIL Stop, W. Cat 3/4 Dataset

Table 98 - Switch – SIL Stop, W. Cat 3/4²⁸ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Switch 2 Command	ON/OFF Switch 1 Command
	7	6	5	4	3	2	1	0

27. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

28. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Table 99 - Switch – SIL Stop, W. Cat 3/4 Dataset Output Data

Byte 0	Open / Close Switch 2 Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Switch 1 Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Digital I/O Dataset

Table 100 - Digital I/O Dataset Input Data

Byte 0	—	—	—	—	—	—	Output 1 Command	Output 0 Command
	7	6	5	4	3	2	1	0

Table 101 - Digital I/O Dataset Output Data

Byte 0	—	—	—	Input Status 3	Input Status 2	Input Status 1	Input Status 0	Ready
	7	6	5	4	3	2	1	0

Analog IO Dataset

Table 102 - Analog I/O Dataset Input Data

Byte 0	Analog Output 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 1	Analog Output 0 [LSB]							
	7	6	5	4	3	2	1	0

Table 103 - Analog I/O Dataset Output Data

Byte 0	—	—	—	—	—	—	—	Ready
	7	6	5	4	3	2	1	0
Byte 1	Analog Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 2	Analog Input 0 [LSB]							
	7	6	5	4	3	2	1	0

Table 103 - Analog I/O Dataset Output Data (Continued)

Byte 3	Analog Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 4	Analog Input 1 [LSB]							
	7	6	5	4	3	2	1	0

Load Datasets

Power Interface without I/O (Measure) Dataset

Table 104 - Power Interface without I/O (Measure) Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	—
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 105 - Power Interface without I/O (measure) Dataset Output Data

Byte 0	—	—	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	—	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Power Interface with I/O (Control) Dataset

Table 106 - Power Interface with I/O (Control) Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	Logical Output 2 ON/OFF Command	Logical Output 1 ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 107 - Power Interface with I/O (control) Dataset Output Data

Byte 0	Logical Output 2 ON/OFF Status	—	—	Upstream Voltage Present	Alarm	Tripped	Logical Output 1 ON/OFF Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Logical Input 2 Status	Logical Input 1 Status	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor One Direction Dataset

Table 108 - Motor One Direction Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 109 - Motor One Direction Dataset Output Data

Byte 0	—	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0

Table 109 - Motor One Direction Dataset Output Data (Continued)

Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Motor One Direction SIL Stop, W. Cat 1/2 Dataset

Table 110 - Motor One Direction SIL Stop, W. Cat 1/2²⁹ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 111 - Motor One Direction SIL Stop, W. Cat 1/2 Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0

29. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Table 111 - Motor One Direction SIL Stop, W. Cat 1/2 Dataset Output Data (Continued)

Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor One Direction – SIL Stop, W. Cat 3/4 Dataset

Table 112 - Motor One Direction SIL Stop, W. Cat 3/4³⁰ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Switch 2 Command	ON/OFF Switch 1 Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 113 - Motor One Direction SIL Stop, W. Cat 3/4 Dataset Output Data

Byte 0	Open / Close Switch 2 Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Switch 1 Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor Two Directions Dataset

Table 114 - Motor Two Directions Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Reverse	ON/OFF Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

30. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Table 115 - Motor Two Directions Dataset Output Data

Byte 0	Open / Close Reverse Status	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	Local Reverse Command Status	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Motor Two Directions – SIL Stop, W. Cat 1/2 Dataset

Table 116 - Motor Two Directions SIL Stop, W. Cat 1/2³¹ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Reverse	ON/OFF Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 117 - Motor Two Directions SIL Stop, W. Cat 1/2 Dataset Output Data

Byte 0	Open / Close Reverse Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor Two Directions – SIL Stop, W. Cat 3/4 Dataset

Table 118 - Motor Two Directions SIL Stop, W. Cat 3/4³² Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	On / Off Reverse	On / Off Forward	On / Off Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 119 - Motor Two Directions SIL Stop, W. Cat 3/4 Dataset Output Data

Byte 0	Open / Close Forward Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	Open / Close Reverse Status	—	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0

31. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

32. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Table 119 - Motor Two Directions SIL Stop, W. Cat 3/4 Dataset Output Data (Continued)

Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor Y/D One Direction Dataset

Table 120 - Motor Y/D One Direction Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 121 - Motor Y/D One Direction Dataset Output Data

Byte 0	Open / Close Y Status	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Line Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Open / Close D Status	—	—	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0

Table 121 - Motor Y/D One Direction Dataset Output Data (Continued)

Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	Bypass Command Status	Local Forward Command Status	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Motor Y/D Two Directions Dataset

Table 122 - Motor Y/D Two Directions Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Reverse	ON/OFF Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 123 - Motor Y/D Two Directions Dataset Output Data

Byte 0	Open / Close Y Status	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Open / Close D Status	Open / Close Reverse Status	Upstream Voltage Present (Device 4)	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0

Table 123 - Motor Y/D Two Directions Dataset Output Data (Continued)

Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	Bypass Command Status	Local Forward Command Status	Local Reverse Command Status	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Motor Two Speeds Dataset

Table 124 - Motor Two Speeds Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF High Speed	ON/OFF Low Speed
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 125 - Motor Two Speeds Dataset Output Data

Byte 0	Open / Close High Speed Status	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Low Speed Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0

Table 125 - Motor Two Speeds Dataset Output Data (Continued)

Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	7	4	7	2	7	0
Byte 7	PV Input 0 [LSB]							
	7	6	7	4	7	2	7	0
Byte 8	PV Input 1 [MSB]							
	7	6	7	4	7	2	7	0
Byte 9	PV Input 1 [LSB]							
	7	6	7	4	7	2	7	0
Byte 10	PV Input 2 [MSB]							
	7	6	7	4	7	2	7	0
Byte 11	PV Input 2 [LSB]							
	7	6	7	4	7	2	7	0
Byte 12	PV Input 3 [MSB]							
	7	6	7	4	7	2	7	0
Byte 13	PV Input 3 [LSB]							
	7	6	7	4	7	2	7	0
Byte 14	PV Input 4 [MSB]							
	7	6	7	4	7	2	7	0
Byte 15	PV Input 4 [LSB]							
	7	6	7	4	7	2	7	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0
Byte 17	Bypass Command Status	Local Low Speed Forward Command Status	Local High Speed Forward Command Status	—	—	—	—	—
	7	6	5	4	3	2	1	0

Motor Two Speeds – SIL Stop, W. Cat 1/2 Dataset

Table 126 - Motor Two Speeds SIL Stop W. Cat 1/2³³ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF High Speed	ON/OFF Low Speed
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

33. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Table 127 - Motor Two Speeds SIL Stop W. Cat 1/2 Dataset Output Data

Byte 0	Open / Close High Speed Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Low Speed Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Motor Two Speeds – SIL Stop, W. Cat 3/4 Dataset

Table 128 - Motor Two Speeds SIL Stop W. Cat 3/4³⁴ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	ON/OFF Low Speed	ON/OFF High Speed	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 129 - Motor Two Speeds SIL Stop W. Cat 3/4 Dataset Output Data

Byte 0	Low Speed Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	High Speed Status	—	—	Upstream Voltage Present (Device 3)	Upstream Voltage present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

34. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Motor Two Speeds Two Directions Dataset

Table 130 - Motor Two Speeds Two Directions Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	ON/OFF High Speed Reverse	ON/OFF Low Speed Reverse	ON/OFF High Speed Forward	ON/OFF Low Speed Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 131 - Motor Two Speeds Two Directions Dataset Output Data

Byte 0	High Speed Forward Status	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present (Device 1)	Alarm	Tripped	Low Speed Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	High Speed Reverse Status	Low Speed Reverse Status	Upstream Voltage Present (Device 4)	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0

Table 131 - Motor Two Speeds Two Directions Dataset Output Data (Continued)

Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0
Byte 17	Bypass Command Status	Local Low Speed Forward Command Status	Local High Speed Forward Command Status	Local Low Speed Reverse Command Status	Local High Speed Reverse Command Status	—	—	—
	7	6	5	4	3	2	1	0

Motor Two Speeds Two Directions – SIL Stop, W. Cat 1/2 Dataset

Table 132 - Motor Two Speeds Two Directions SIL Stop W. Cat 1/2³⁵ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	ON/OFF High Speed Reverse	ON/OFF Low Speed Reverse	ON/OFF High Speed Forward	ON/OFF Low Speed Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 133 - Motor Two Speeds Two Directions SILStop W. Cat 1/2 Dataset Output Data

Byte 0	High Speed Forward Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Low Speed Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	High Speed Reverse Status	Low Speed Reverse Status	Upstream Voltage Present (Device 4)	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

35. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Motor Two Speeds Two Directions – SIL Stop, W. Cat 3/4 Dataset

Table 134 - Motor Two Speeds Two Directions SIL Stop W. Cat 3/4³⁶ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	ON/OFF High Speed Reverse	ON/OFF Low Speed Reverse	ON/OFF High Speed Forward	ON/OFF Low Speed Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 135 - Motor Two Speeds Two Directions SIL Stop W. Cat 3/4 Dataset Output Data

Byte 0	High Speed Forward Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Low Speed Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	High Speed Reverse Status	Low Speed Reverse Status	Upstream Voltage Present (Device 4)	Upstream Voltage Present (Device 3)	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Power Supply Dataset

Table 136 - Power Supply Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 137 - Power Supply Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0

36. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

Table 137 - Power Supply Dataset Output Data (Continued)

Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Resistor Dataset

Table 138 - Resistor Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 139 - Resistor Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Transformer Dataset

Table 140 - Transformer Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 141 - Transformer Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	—	—	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0

Application Datasets

Pump Dataset

Table 142 - Pump Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 143 - Pump Dataset Output Data

Byte 0	—	Asset Alarm	Manual Mode Override Status	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0

Table 143 - Pump Dataset Output Data (Continued)

Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	PV Control Input 1 Status	PV Control Input 0 Status	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Conveyor One Direction Dataset

Table 144 - Conveyor One Direction Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 145 - Conveyor One Direction Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage Present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0

Table 145 - Conveyor One Direction Dataset Output Data (Continued)

Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Conveyor One Direction – SIL Stop, W. Cat 1/2

Table 146 - Conveyor One Direction SIL Stop W. Cat 1/2³⁷ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	—	ON/OFF Command
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

37. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Table 147 - Conveyor One Direction SIL Stop W. Cat 1/2 Dataset Output Data

Byte 0	—	Asset Alarm	—	Upstream Voltage present 1	Alarm	Tripped	Open / Close Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	—	—	—	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Conveyor Two Directions Dataset

Table 148 - Conveyor Two Directions Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Reverse	ON/OFF Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 149 - Conveyor Two Directions Dataset Output Data

Byte 0	Open / Close Reverse Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	Local Reverse Command Status	—	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0
Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0

Table 149 - Conveyor Two Directions Dataset Output Data (Continued)

Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

Conveyor Two Directions – SIL Stop, W. Cat 1/2 Dataset

Table 150 - Conveyor Two Directions SIL Stop W. Cat 1/2³⁸ Dataset Input Data

Byte 0	Reset Max IRMS	Reset Trip Counter	Reset Alarm Counter	Trip Reset	—	—	ON/OFF Reverse	ON/OFF Forward
	7	6	5	4	3	2	1	0
Byte 1	—	—	—	—	Run TOU Channel 4	Run TOU Channel 3	Run TOU Channel 2	Run TOU Channel 1
	7	6	5	4	3	2	1	0

Table 151 - Conveyor Two Directions SIL Stop W. Cat 1/2 Dataset Output Data

Byte 0	Open / Close Reverse Status	Asset Alarm	—	Upstream Voltage Present (Device 1)	Alarm	Tripped	Open / Close Forward Status	Ready
	7	6	5	4	3	2	1	0
Byte 1	Load Starting	Bypass Command Status	Local Forward Command Status	Local Reverse Command Status	-	Upstream Voltage Present (Device 2)	Ready to Reset	Load Operating
	7	6	5	4	3	2	1	0
Byte 2	Irms Average [MSB]							
	7	6	5	4	3	2	1	0
Byte 3	Irms Average							
	7	6	5	4	3	2	1	0
Byte 4	Irms Average							
	7	6	5	4	3	2	1	0
Byte 5	Irms Average [LSB]							
	7	6	5	4	3	2	1	0
Byte 6	PV Input 0 [MSB]							
	7	6	5	4	3	2	1	0
Byte 7	PV Input 0 [LSB]							
	7	6	5	4	3	2	1	0
Byte 8	PV Input 1 [MSB]							
	7	6	5	4	3	2	1	0
Byte 9	PV Input 1 [LSB]							
	7	6	5	4	3	2	1	0
Byte 10	PV Input 2 [MSB]							
	7	6	5	4	3	2	1	0
Byte 11	PV Input 2 [LSB]							
	7	6	5	4	3	2	1	0
Byte 12	PV Input 3 [MSB]							
	7	6	5	4	3	2	1	0

38. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

Table 151 - Conveyor Two Directions SIL Stop W. Cat 1/2 Dataset Output Data (Continued)

Byte 13	PV Input 3 [LSB]							
	7	6	5	4	3	2	1	0
Byte 14	PV Input 4 [MSB]							
	7	6	5	4	3	2	1	0
Byte 15	PV Input 4 [LSB]							
	7	6	5	4	3	2	1	0
Byte 16	—	—	—	PV Switch 4	PV Switch 3	PV Switch 2	PV Switch 1	PV Switch 0
	7	6	5	4	3	2	1	0

PROFINET Acyclic Data

Acyclic communication in PROFINET is handled as a low priority, typically one request at a time, while there is no cyclic communication on the bus coupler. If server device is not able to process an acyclic request right away, it signals the client that the response is delayed. The client waits for the response for a limited duration until the server has been able to process the request. This way, the server can reduce the number of requests it receives, if necessary.

TeSys™ island supports the following sub-slot and index ranges for PROFINET acyclic dataset exchange.

Table 152 - PROFINET Acyclic Data

Dataset	Slot	Sub-slot	Index
System Diagnostic	0	3	1
System Energy 1	0	3	2
System Energy 2	0	3	3
System Asset Management	0	3	4
System Combined Output	0	3	5
System Time	0	3	6
Control	1–21	3	0
Energy	1–21	3	1
Diagnostic	1–21	3	2
Asset Management	101–121	3	0

The following sections provide the acyclic datasets supported by TeSys™ island and applies to both PROFINET and PROFIBUS.

System Combined Output Dataset

Table 153 - System Combined Output Dataset

Length (bytes)	Name	Comment
1	Reset Voltage Dip Count	Dataset exist once per System
1	Reset Voltage Swell Count	
1	Reset Maximum Total Active Power	
1	Reset Maximum Total Reactive Power	
1	Reset Minimum True Power Factor	
1	Reset Maximum True Power Factor	
1	Reset Total Reactive Energy	
1	Reset Total Active Energy	
1	Set Total Active Energy	Data exist for each avatar
1	Set Total Reactive Energy	
4	Total Active Energy Preset Value	
4	Total Reactive Energy Preset Value	
...	For each additional avatar, add another instance of the data with the comment "Data exist for each avatar".	

System Time Dataset

Table 154 - System Time Dataset

Length (bytes)	Name
12	System Date and Time

System Diagnostic Dataset

Table 155 - System Diagnostic Dataset

Length (bytes)	Name
2	Fieldbus Comm Error Counter
2	All Alarms Count
2	System Minor Event Counter
14	Minor Event Record Register 1
14	Minor Event Record Register 2
14	Minor Event Record Register 3
14	Minor Event Record Register 4
14	Minor Event Record Register 5
1	SIL Starter Stop ³⁹ Msg group 1
1	SIL Starter Stop Msg group 2
1	SIL Starter Stop Msg group 3
1	SIL Starter Stop Msg group 4

39. Safety Integrity Level according to standard IEC 61508.

Table 155 - System Diagnostic Dataset (Continued)

Length (bytes)	Name
1	SIL Starter Stop Msg group 5
1	SIL Starter Stop Msg group 6
1	SIL Starter Stop Msg group 7
1	SIL Starter Stop Msg group 8
1	SIL Starter Stop Msg group 9
1	SIL Starter Stop Msg group 10

System Energy 1 Dataset

Table 156 - System Energy 1 Dataset

Length (bytes)	Name
2	Average Voltage RMS (V)
2	Maximum Average Voltage RMS (V)
12	Maximum Average Voltage Timestamp
2	Voltage RMS Phase 1 (V)
2	Voltage RMS Phase 2 (V)
2	Voltage RMS Phase 3 (V)
2	Voltage RMS L1-L2 (V)
2	Voltage RMS L2-L3 (V)
2	Voltage RMS L2-L1 (V)
1	Percentage of Unbalance Voltage (%)
1	Maximum Unbalance Voltage (%)
12	Maximum Unbalance Voltage Timestamp
1	Phase Sequence (ABC or ACB)
1	Frequency (Hz)
2	Voltage Dip Record register 1 (most recent)
12	Voltage Dip Record register 1 (most recent)
12	Voltage Dip Record register 1 (most recent)
2	Voltage Dip Record register 2
12	Voltage Dip Record register 2
12	Voltage Dip Record register 2
2	Voltage Dip Record register 3
12	Voltage Dip Record register 3
12	Voltage Dip Record register 3
2	Voltage Dip Record register 4
12	Voltage Dip Record register 4
12	Voltage Dip Record register 4
2	Voltage Dip Record register 5 (least recent)
12	Voltage Dip Record register 5 (least recent)

Table 156 - System Energy 1 Dataset (Continued)

Length (bytes)	Name
12	Voltage Dip Record register 5 (least recent)
2	Voltage Dip Count

System Energy 2 Dataset

Table 157 - System Energy 2 Dataset

Length (bytes)	Name
2	Voltage Swell Record register 1 (most recent)
12	Voltage Swell Record register 1 (most recent)
12	Voltage Swell Record register 1 (most recent)
2	Voltage Swell Record register 2
12	Voltage Swell Record register 2
12	Voltage Swell Record register 2
2	Voltage Swell Record register 3
12	Voltage Swell Record register 3
12	Voltage Swell Record register 3
2	Voltage Swell Record register 4
12	Voltage Swell Record register 4
12	Voltage Swell Record register 4
2	Voltage Swell Record register 5 (least recent)
12	Voltage Swell Record register 5 (least recent)
12	Voltage Swell Record register 5 (least recent)
2	Voltage Swell Count
4	Instantaneous Total Active Power (kW)
4	Maximum Total Active Power (kW)
12	Maximum Total Active Power Timestamp
4	Instantaneous Total Reactive Power (kVAR)
4	Maximum Total Reactive Power (kVAR)
12	Maximum Total Reactive Power Timestamp
1	True Power Factor
1	Minimum True Power Factor
1	Maximum True Power Factor
12	Minimum True Power Factor Timestamp
12	Maximum True Power Factor Timestamp
4	Total Active Energy (kWh)
4	Total Reactive Energy (kVARh)
4	ToU_TotalActiveEnergyChannel1
4	ToU_TotalActiveEnergyChannel2
4	ToU_TotalActiveEnergyChannel3
4	ToU_TotalActiveEnergyChannel4

System Asset Management Dataset

Table 158 - System Asset Management Dataset

Length (bytes)	Name
20	VendorName
32	ProductCode
7	MajorMinorRev
64	VendorURL
32	ProductName
20	ModelName
6	Base MACAddress
20	SerialNumber
4	Time (module) ON
2	Number of events (Device Status)

Control Dataset

Table 159 - Control Dataset

Length (bytes)	Name
2	Motor Temperature
1	SIL Group
1	Motor Thermal Capacity Used
2	Alarm Message
2	Alarm Message
2	Trip Message
2	Trip Message
2	Time To Trip
2	Time To Reset
2	Predictive Alarms Status

Energy Dataset

Table 160 - Energy Dataset

Length (bytes)	Name
4	Instantaneous Total Active Power (kW)
4	Maximum Total Active Power (kW)
12	Maximum Total Active Power Timestamp
4	Instantaneous Total Reactive Power (kVAR)
4	Maximum Total Reactive Power (kVAR)
12	Maximum Total Reactive Power Timestamp
1	True Power Factor
1	Minimum True Power Factor
1	Maximum True Power Factor

Table 160 - Energy Dataset (Continued)

Length (bytes)	Name
12	Minimum True Power Factor Timestamp
12	Maximum True Power Factor Timestamp
4	Total Active Energy (kWh)
4	Total Reactive Energy (kVARh)
4	ToU_TotalActiveEnergyChannel1
4	ToU_TotalActiveEnergyChannel2
4	ToU_TotalActiveEnergyChannel3
4	ToU_TotalReactiveEnergyChannel4

Diagnostic Dataset

Table 161 - Diagnostic Dataset

Length (bytes)	Name
4	Max Avg IRMS
12	Max Avg IRMS TimeStamp
4	IRMS Phase1
4	IRMS Phase2
4	IRMS Phase3
2	Thermal Overload Alarm Count
2	Jam Alarm Count
2	Undercurrent Alarm Count
2	Overcurrent Alarm Count
2	Current Phase Unbalance Alarm Count
2	Ground Current Alarm Count
2	Motor Overheat Alarm Count
2	All Alarms Count
2	Thermal Overload Trip Count
2	Jam Trip Count
2	Undercurrent Trip Count
2	Long Start Trip Count
2	Overcurrent Trip Count
2	Motor Overheat Trip Count
2	Stall Trip Count
2	Current Phase Unbalance Trip Count
2	Phase Configuration Trip Count
2	Ground Current Trip Count
2	Phase Reversal Trip Count
2	Current Phase Loss Trip Count
2	All Trips Count
14	Trip Record register 1
14	Trip Record register 2

Table 161 - Diagnostic Dataset (Continued)

Length (bytes)	Name
14	Trip Record register 3
14	Trip Record register 4
14	Trip Record register 5

Asset Management Dataset

Table 162 - Asset Management Dataset

Length (bytes)	Name
20	VendorName
32	ProductCode
7	MajorMinorRev
64	VendorURL
32	ProductName
20	ModelName
20	SerialNumber
4	Time (module) ON
4	Time Switch ON
2	Number of events (Device Status)
4	Number of contactor cycles
4	Number of device power cycles
4	Number of SIL Starter Stops
2	Max I RMS
4	Average I RMS
2	Max Average Voltage
2	Average Lifetime Voltage

PROFIBUS Third Party Integration

PROFIBUS Addressing

In PROFIBUS, the bus coupler is a modular DP server. PROFIBUS addresses modular devices using slot and index addressing. TeSys™ island divides the slot addressing space into two regions, one for avatars and one for devices. Slot 1 is used for the bus coupler and System Avatar. Within each slot, index values are used to access the different datasets.

After importing the General Station Description Markup Language (GSDML) file into your programming environment, add a TeSys island instance from the hardware catalog. The TeSys island is created with a System Avatar but no other modules.

NOTE: Empty slots also should be filled with empty slot.

Follow the instructions for your programming environment to populate the empty slots with avatars and devices using the information in [PROFIBUS Slot Ranges](#), page 109 below. For example:

1. In CoDeSys v3.5, right click on an empty slot and choose Plug Device.
2. Select the appropriate avatar or device from the catalog.
3. When the island is fully defined, start creating tags for the data you need to access for each avatar.

TeSys™ island applies the slot ranges for physical and virtual modularity shown in the following table:

Table 163 - PROFIBUS Slot Ranges

Item	Slot	Comment
Bus Coupler / System Avatar	1	—
Avatars	2–22	Device, Load, and Application avatars
Bus Devices	101–121	Digital I/O Module (DIOM) Analog I/O Module (AIOM) Starters SIL ⁴⁰ Starters Power Interface Module (PIM) SIL Interface Module (SIM) Voltage Interface Module (VIM)
Not Applicable	0, 23–99, 122–254	These slots are not used with TeSys island.

40. Safety Integrity Level according to standard IEC 61508.

Table 164 - Example of Avatar Numbering

Order of Avatar in Digital Tool	PROFI-BUS Avatar Slot	Description	Physical Order in island								
			1	2	3	4	5	6	7	8	9
1	1	System	BC	—	—	VIM	—	—	SIM	—	—
2	2	AIOM	—	AIOM	—	—	—	—	—	—	—
3	3	Motor Two Directions – SIL Stop, W. Cat 1/2 ⁴¹	—	—	—	—	SIL Starter	SIL Starter	—	—	—
4	4	Motor One Direction	—	—	—	—	—	—	—	Starter	—
5	5	Power Interface with I/O (Control)	—	—	DIOM	—	—	—	—	—	PIM

Table 165 - Example of PROFIBUS Physical Device Slots

Physical Order in island	1	2	3	4	5	6	7	8	9
PROFIBUS Physical Device Slot	0	101	102	103	104	105	106	107	108

DPV0 is used for configuration of the PROFIBUS connection, diagnostics related to the PROFIBUS communications, and for cyclic data exchange. DPV1 is used to exchange the acyclic datasets for avatars and devices.

As described in **IEC 61158-5-3 §6.1.3.2.3.2 Module**, slots not used by the configuration of the system are registered as empty slots and assigned Input and Output data lengths of 0, and identifier byte 0x00.

- Each module is addressed by a slot number (1 to 254). Numbering is without gaps, ascending, beginning with 1. If a slot is not occupied with a module, an empty slot is registered under the corresponding slot number in the configuration.
- For each module, a configuration identifier has to be assigned. Numbering is without gaps, ascending, beginning with 0. If a slot is not occupied with a module, a configuration identifier with the Input and Output Data length of 0 has to be assigned in the configuration (empty slot).

The TeSys island PROFIBUS interface recognizes all unused slots as empty, with assigned Input and Output data lengths of 0 and identifier byte value of 0x00.

The following table provide the values for TeSys island PROFIBUS interface MS1 (DPV1) communication protocol (acyclic communication with PROFIBUS Class 1 client (controller)).

Table 166 - PROFIBUS Interface MS1 DPV1 Protocol Values

Service Access Point (SAP)	Name
72	Idle
94	DPV1_Read
95	DPV1_Write

41. Safety Integrity Level according to standard IEC 61508. Wiring Category 1 and Category 2 according to ISO 13849.

PROFIBUS Cyclic Data

When importing the General Station Description (GSD) or General Station Description Markup Language (GSDML) file into your programming environment and inserting each avatar into the appropriate slots, the information is displayed with input and output bytes.

The PROFIBUS cyclic data is structured similar to the PROFINET cyclic data and therefore, share the same input and output data for the avatars listed in the tables in PROFINET Cyclic Data, page 77.

PROFIBUS Acyclic Data

TeSys™ island supports the following slot and index ranges for PROFIBUS acyclic dataset exchange. For PROFIBUS acyclic datasets supported by TeSys island, refer to PROFINET Acyclic Data, page 102 for more information. PROFIBUS and PROFINET share the same acyclic datasets for TeSys™ island.

Table 167 - PROFIBUS Acyclic Data

Dataset	Slot	Index	Comment
(Reserved)	0	—	Reserved in PROFIBUS, not mapped to any avatar or device
	1	—	Index 0 reserved for System Control
System Diagnostic	1	1	—
System Energy 1	1	2	Includes Voltage Basic and Voltage Enhanced
System Energy 2	1	3	Includes Power Basic and Energy Basic
System Asset Management	1	4	—
System Combined Output	1	5	—
System Time	1	6	—
Control	2–22	0	—
Energy	2–22	1	—
Diagnostic	2–22	2	—
Asset Management	101–121	0	—

Data Descriptions

Data Refresh Rates

When choosing the frequency of your fieldbus protocol (such as RPI or repetition rate) or the frequency of updating acyclic data in your PLC program, it is important to understand the frequency of the data updates on the island itself.

For instance, Active Energy data is updated every 100 ms. So it is not useful for the PLC program to update this acyclic data every 10 ms. However, all outputs (starters, digital outputs, analog outputs, trip resets, and other resets or presets) are updated at a frequency of <10 ms. Inputs are updated at various frequencies depending on their importance.

See the table below for more information.

Table 168 - Data Refresh Rates

Data	Maximum update interval
Input and output status of power devices, digital I/O modules, and SIL ⁴² interface modules <i>for example, Run commands, contactor status (RunFwd, Tripped), digital input (DI0, DI1...)</i>	10 ms
Analog measurements of power devices, analog I/O modules, and voltage interface modules <i>for example, phase current (AvgIRMS, PhaseXIRMS), phase voltage (VRMSPhaseX, AvgVRMS), power (InstActivePower, InstReactivePower, PowerFactor), energy (ActiveEnergy, ReactiveEnergy), analog inputs (MotorTemperature, AI0, AI1)</i>	100 ms
Other data <i>for example, asset data: ContactorCycleCntr, TimeModuleOn, AvgIRMS (lifetime)</i>	10 ms

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.

42. Safety Integrity Level according to standard IEC 61508.

Control

Table 169 - 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 170 - 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 171 - 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 172 - 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.
SIL ⁴³ Starter Stop Status	BOOL	1	1	0, 1	0 = All SIL Groups have SIL Starter Stop status 5 (normal operation, no SIL Starter Stop Command received) 1 = Any SIL Group has received a SIL Starter Stop command
Fieldbus Communication Event Counter	UINT	16	1	0–65535 in steps of 1	Counts the number of Fieldbus communication events

43. Safety Integrity Level according to standard IEC 61508.

Table 172 - System Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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
SIL Starter Stop Message Group 1	USINT	8	—	0–5	Status for SIL Group 1 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 2	USINT	8	—	0–5	Status for SIL Group 2 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 3	USINT	8	—	0–5	Status for SIL Group 3 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 4	USINT	8	—	0–5	Status for SIL Group 4 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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

Table 172 - System Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
SIL Starter Stop Message Group 5	USINT	8	—	0–5	Status for SIL Group 5 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 6	USINT	8	—	0–5	Status for SIL Group 6 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 7	USINT	8	—	0–5	Status for SIL Group 7 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 8	USINT	8	—	0–5	Status for SIL Group 8 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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

Table 172 - System Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
SIL Starter Stop Message Group 9	USINT	8	—	0–5	Status for SIL Group 9 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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
SIL Starter Stop Message Group 10	USINT	8	—	0–5	Status for SIL Group 10 0 = SIL Group not present in system configuration 1 = SIL Group impacted by Avatar Device Event 2 = SIL Group Stop Command received, SIL starters not open yet 3 = SIL Group Stop Command successfully issued, all SIL starters are open 4 = SIL Group Stop 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

Energy

Table 173 - 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 174 - 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

Table 174 - System Voltage Basic Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 175 - 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 176 - 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)

Table 176 - System Voltage Enhanced Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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)
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 177 - 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

Table 177 - System Power Basic Inputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 178 - 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	64	—	—	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.
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 179 - 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 180 - 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 181 - 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 182 - 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.

Time

Table 183 - System Time Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
System Time	DT	64	—	—	Provide date and time for the system.

Avatar I/O

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

Control

Table 184 - 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 2	BOOL	1	1	0, 1	Command to Avatar Forward redundant Switch for Wiring Category 3 and Wiring Category 4 avatars. 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

Table 184 - Avatar Control Inputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 185 - Avatar Control Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Ready	BOOL	1	1	0, 1	The 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	The 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	The 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	The 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	The 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	Status of the primary switch for Wiring Category 3 and Category 4. 0 = switch is open, 1 = switch is closed
Run 2 Status	BOOL	1	1	0, 1	Status of the primary switch for Wiring Category 3 and Category 4. 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
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

Table 185 - Avatar Control Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 the avatar. 0 = Off, 1 = On
Logic Input 2 Status	BOOL	1	1	0, 1	State of Digital Input 1 of the 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
Bypass Command Status	BOOL	1	1	0, 1	State of avatar if the bypass command has been issued to continue operation and not stop due to a trip. 0 = Off, 1 = On
Local Forward Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Local Forward Switch Feedback, 0 = switch is open, 1 = switch is closed
Local Reverse Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Reverse Forward Switch Feedback, 0 = switch is open, 1 = switch is closed
Local Forward Low Speed Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Local Forward Low Speed Switch Feedback, 0 = switch is open, 1 = switch is closed
Local Forward High Speed Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Local Forward High Speed Switch Feedback, 0 = switch is open, 1 = switch is closed
Local Reverse Low Speed Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Local Reverse Low Speed Switch Feedback, 0 = switch is open, 1 = switch is closed
Local Reverse High Speed Status	BOOL	1	1	0, 1	The avatar logic is controlled by commands received on digital inputs and PLC commands are ignored during local mode. Avatar Local Reverse High Speed Switch Feedback, 0 = switch is open, 1 = switch is closed

Table 185 - Avatar Control Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Manual Mode Override Status	BOOL	1	1	0, 1	The avatar is controlled by local command and PV control when in manual mode. 0 = Off, 1 = On
PV Control Input 0 Status	BOOL	1	1	0, 1	Status of PV Control Input 0 (command to avatar after input processing). 0 = Off, 1 = On
PV Control Input 1 Status	BOOL	1	1	0, 1	Status of PV Control Input 1 (command to avatar after input processing). 0 = Off, 1 = On
PV Input 0	INT	16	1	–32, 768 to 32,767 in steps of 1	Returns the measured value of the PV input.
PV Input 1	INT	16	1	–32, 768 to 32,767 in steps of 1	
PV Input 2	INT	16	1	–32, 768 to 32,767 in steps of 1	
PV Input 3	INT	16	1	–32, 768 to 32,767 in steps of 1	
PV Input 4	INT	16	1	–32, 768 to 32,767 in steps of 1	
PV Switch 0	BOOL	1	1	0,1	Positive Logic – A PV Switch input ON or a PV Input above the PV Control Level represents an ON command. Negative Logic – A PV Switch input OFF or a PV Input below the PV Control Level represents an ON command. 0 = Off, 1 = On
PV Switch 1	BOOL	1	1	1,0	
PV Switch 2	BOOL	1	1	1,0	
PV Switch 3	BOOL	1	1	1,0	
PV Switch 4	BOOL	1	1	1,0	
Predictive Alarm Status	UINT	16	1	1,0	Predictive Alarms are triggered by combinations of protection functions alarms and PV Input conditions. The avatars support up to 10 Predictive Alarms.
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

Table 185 - Avatar Control Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 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 186 - 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.

Table 186 - Avatar Power Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Unit	Minimum	Maximum	Step	Description
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	64	—	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 187 - 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.
Run Record ToU Channel 1	BOOL	1	1	—	0	1	1	Record Time of Use Channel 1 start command. 0 = no, 1 = yes
Run Record ToU Channel 2	BOOL	1	1	—	0	1	1	Record Time of Use Channel 2 start command. 0 = no, 1 = yes
Run Record ToU Channel 3	BOOL	1	1	—	0	1	1	Record Time of Use Channel 3 start command. 0 = no, 1 = yes
Run Record ToU Channel 4	BOOL	1	1	—	0	1	1	Record Time of Use Channel 4 start command. 0 = no, 1 = yes

Table 188 - Avatar Energy Outputs

I/O Name	Data-type	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
ToU Total Active Energy Channel 1	UDINT	32	0.001	kWh	0	999,999,999	1	Returns the Total Active Energy Value that has been accumulated while the Channel is enabled/ active.
ToU Total Active Energy Channel 2	UDINT	32	0.001	kWh	0	999,999,999	1	
ToU Total Active Energy Channel 3	UDINT	32	0.001	kWh	0	999,999,999	1	
ToU Total Active Energy Channel 4	UDINT	32	0.001	kWh	0	999,999,999	1	
ToU Total Reactive Energy Channel 1	UDINT	32	0.001	kVARh	0	999,999,999	1	Returns the Total Reactive Energy Value that has been accumulated while the Channel is enabled/ active.
ToU Total Reactive Energy Channel 2	UDINT	32	0.001	kVARh	0	999,999,999	1	
ToU Total Reactive Energy Channel 3	UDINT	32	0.001	kVARh	0	4,294,967,295	1	
ToU Total Reactive Energy Channel 4	UDINT	32	0.001	kVARh	0	4,294,967,295	1	

Diagnostics

Table 189 - 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 190 - Avatar Diagnostics Outputs

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Upstream Voltage Present 1	BOOL	1	1	0, 1	The 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	the 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	The avatar has detected that Upstream main power of its third Device (if available) is present. 0 = no voltage presence detected 1 = voltage presence detected

Table 190 - Avatar Diagnostics Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
Upstream Voltage Present 4	BOOL	1	1	0, 1	The 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 191 - 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 192 - 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.
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 193 - 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 194 - 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 195 - 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
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 196 - 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.

Table 196 - Avatar Maintenance Data Outputs (Continued)

I/O Name	Datatype	Size (Bits)	Scale	Value	Description
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 SIL Starter Stops ⁴⁴	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.

Data Types

Data types are in conformance with IEC 61131-3.

Table 197 - Data Types

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]

44. Safety Integrity Level according to standard IEC 61508.

Table 197 - Data Types (Continued)

Keyword	Description	Size (Bits)	Value Range
TRIPREC	Record for a trip event	80	Format YYYYMMDDhhmmssccTTTT, 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
DT_MAC	MAC Address	48	Format XXYZZZUUUVWW, 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 YYYYMMDDhhmmssccFFFF, 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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