

TeSys Active

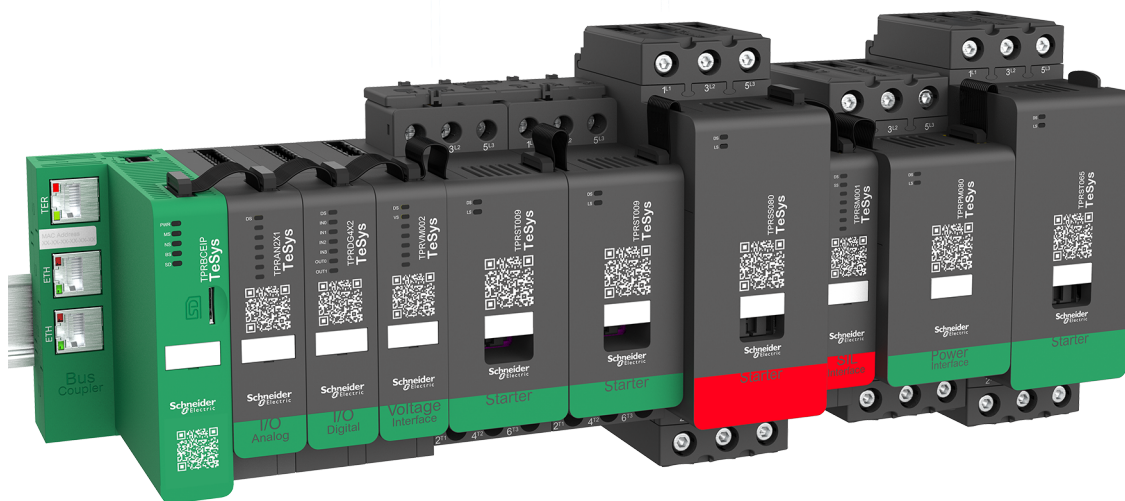
TeSys island – Digital Motor Management Solution

For EtherNet/IP™ Applications

Quick Start and Function Block Library Guide

TeSys offers innovative and connected solutions for motor starters.

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08/2023



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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 person 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

This user guide provides:

- instructions for configuring a TeSys™ island device within the Rockwell Software® Studio 5000® environment.
- add-on instructions for TeSys island and is valid for use with Studio 5000 environment version 30.0 or greater.
- add-on instructions, referred to as function blocks for the Studio 5000 environment, control the Avatar and device modules of a TeSys island.

Library Compatibility: L5X files exported from SoMove software are compatible with Studio 5000 major version 30 or higher. Refer to the Product Compatibility and Downloads page on the Rockwell Automation website to verify that the PLC firmware is compatible with the Studio 5000 version being used. As of the time of publication, this information can be found at <https://compatibility.rockwellautomation.com>.

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 TeSys 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 – PROFINET and PROFIBUS – Quick Start and Function Block Library Guide | Describes how to integrate the TeSys island and the information of TeSys island library used in the Siemens™ TIA Portal environment. | DOCA0272EN |
| 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. | ENVEOL1904009 |
| 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, machine builder, or integrator, can be aware of all the conditions and factors present during installation, setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used when selecting automation and control equipment, and any other related equipment or software, for a particular application. You must also consider applicable local, regional, or national standards and/or regulations.

Pay particular attention to conformance with 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 the present 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 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.

Cybersecurity

Introduction

Cybersecurity is a branch of network administration that addresses attacks on or by PCs and through PC networks that can result in accidental or intentional disruptions. The objective of cybersecurity is to help provide increased levels of protection for information and physical assets from theft, corruption, misuse, or accidents while maintaining access for their intended users.

No single cybersecurity approach is adequate. Schneider Electric recommends a defense-in-depth approach. Conceived by the National Security Agency (NSA), this approach layers the network with security features, appliances, and processes. The basic components of this approach are:

- Risk assessment
- Security plan built on the results of the risk assessment
- Multi-phase training campaign
- Physical separation of the industrial networks from enterprise networks using a demilitarized zone (DMZ) and the use of firewalls and routing to establish other security zones
- System access control
- Device hardening
- Network monitoring and maintenance

This section defines elements that help you configure a system that is less susceptible to cyber attacks. For detailed information on the defense-in-depth approach, refer to the *Recommended Cybersecurity Best Practices* on the Schneider Electric website.

Schneider Electric's Approach on Cybersecurity

Schneider Electric adheres to industries best practice in the development and implementation of control systems. This includes a defense-in-depth approach to secure an industrial control system. This approach places the controllers behind one or more firewalls to restrict access to authorized personnel and protocols only.

⚠ WARNING

UNAUTHENTICATED ACCESS AND SUBSEQUENT UNAUTHORIZED OPERATION

- Evaluate whether your equipment or complete environment are connected to your critical infrastructure and, if so, take appropriate steps in terms of prevention, based on defense-in-depth, before connecting the automation system to any network.
- Limit the number of devices connected to a network inside your company.
- Isolate your industrial network from other networks inside your company.
- Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.
- Monitor activities within your systems.
- Prevent subject devices from direct access or direct link by unauthorized parties or unauthenticated actions.
- Prepare a recovery plan including backup of your system and process information.

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

Cyber Threats

Cyber threats are deliberate actions or accidents that can disrupt the normal operations of PCs and PC networks. These actions can be initiated from within the physical facility or from an external location. Security challenges for the control environment include:

- Diverse physical and logical boundaries
- Multiple sites and large geographic spans
- Adverse effects of security implementation on process availability
- Increased exposure to worms and viruses migrating from business systems to control systems as business-control communications become more open

- Increased exposure to malicious software from USB devices, vendor and service technician laptops, and the enterprise network
- Direct impact of control systems on physical and mechanical systems

Sources of Cyber Attacks

Implement a cybersecurity plan that accounts for various potential sources of cyber attacks and accidents, including:

| Source | Description |
|---|---|
| Internal | <ul style="list-style-type: none">• Inappropriate employee or contractor behavior• Disgruntled employee or contractor |
| External opportunistic (non-directed) | <ul style="list-style-type: none">• Script kiddies⁽¹⁾• Recreational hackers• Virus writers |
| External deliberate (directed) | <ul style="list-style-type: none">• Criminal groups• Activists• Terrorists• Agencies of foreign states |
| Accidental | |
| ⁽¹⁾ Slang term for hackers who use malicious scripts written by others without necessarily possessing a comprehensive understanding of how the script works or its potential impact on a system. | |

A deliberate cyber attack on a control system may be launched to achieve a number of malicious results, including:

- Disrupt the production process by blocking or delaying the flow of information.
- Damage, disable, or shut down equipment to negatively impact production or the environment.
- Modify or disable safety systems to cause intentional harm.

How Attackers Gain Access

A cyber attacker bypasses the perimeter defenses to gain access to the control system network. Common points of access include:

- Dial-up access to remote terminal unit (RTU) devices
- Supplier access points (such as technical support access points)
- IT-controlled network products
- Corporate virtual private network (VPN)
- Database links
- Poorly configured firewalls
- Peer utilities

Reporting and Management

To submit a cybersecurity question, report security issues, or to get the latest news from Schneider Electric, visit our [Schneider Electric website](#).

Introduction to TeSys island

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.

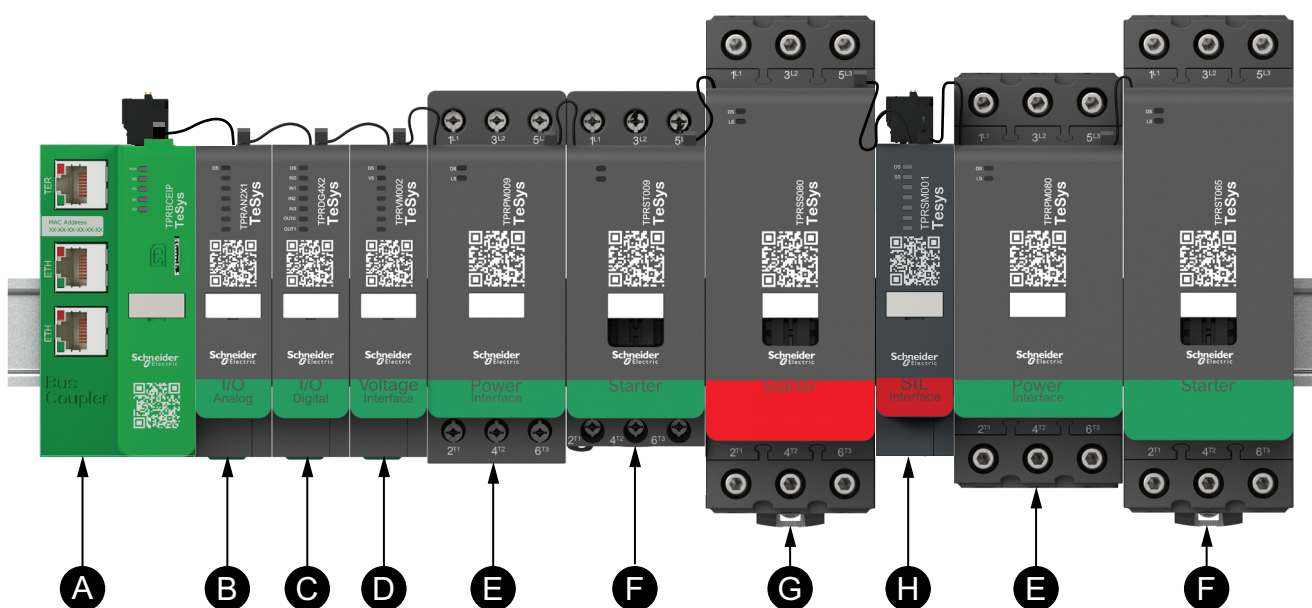
This system is designed around the concept of TeSys avatars. These avatars:

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

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

The physical TeSys 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 TeSys 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.

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.

General Information

TeSys island add-on instructions provide function blocks to support developing applications and to control avatar modules. Avatar modules are digital function objects managed by the TeSys island system. The system interacts with power devices and accessories such as the analog I/O devices. The avatar modules are configured on the TeSys island, and the bus coupler (via the System avatar) manages fieldbus communication with the controller.

The configuration of the TeSys island modules is managed by the TeSys island Device Type Manager (DTM). For further information, refer to the TeSys island DTM Library Online Help.

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 TeSys 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 TeSys 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

2. Safety Integrity Level according to standard IEC 61508.

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

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 TeSys island 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

TeSys Avatars

| Name | Icon | Description |
|---------------|---|---|
| System avatar |  | A required avatar that enables a single point of communication to the TeSys island. |
| Device | | |
| Switch |  | To make or break a power line in an electrical circuit |

TeSys Avatars (Continued)

| Name | Icon | Description |
|--|---|---|
| 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. |
| 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. |

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.








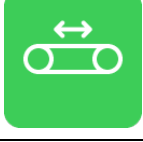
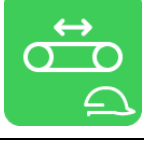
5. Safety Integrity Level according to standard IEC 61508. Wiring Category 3 and Category 4 according to ISO 13849.

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

TeSys Avatars (Continued)

| Name | Icon | Description |
|---|---|---|
| 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 |
| 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 |

TeSys Avatars (Continued)

| Name | Icon | Description |
|---|---|---|
| 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 |
| 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.

Methodology

A TeSys™ island device can be integrated into the Rockwell Software® Studio 5000® environment using the L5X import feature. Based on the TeSys island configuration, SoMove™ software provides L5X files that can be imported into the Studio 5000 environment, exposing the device data via add-on instructions.

NOTE: Due to data referencing, the L5X files must be imported in the order listed below. Follow the instructions provided in this manual.

The following files are generated by SoMove software:

1. Generic Ethernet Module: This file contains a Generic Ethernet AOP representing the TeSys island configuration. It includes comments in the Controller Tag section indicating what each piece of data is referencing. It uses the following naming convention: *{DeviceName}Module.L5X*.
2. Explicit Messages (if acyclic data exists): This file contains the following:
 - subroutines containing explicit messages for calling acyclic data
 - a data buffer used to hold the acyclic data before and after transmission

It uses the following naming convention: *{DeviceName}_Acyclic.L5X*.

NOTE: If a TeSys island configuration does not have acyclic data, this file is not generated.

3. Add-on Instructions (AOI): This file contains the AOIs used for generating function blocks. It must be imported last because the AOIs' reference tags are contained in the other two files. It uses the following naming convention: *{DeviceName}_Aoi.L5X*.

NOTE: If you alter the naming convention for a TeSys island or for pre-existing avatars, then when you integrate configuration changes into a project, all the imported Studio 5000 software entities (tags, AOIs, and generic Ethernet module) must be deleted and the import process repeated for the new configuration. See Frequently Asked Questions (FAQs), page 105.

Obtain the L5X Files

Configure the island in the TeSys™ island DTM according to the TeSys island – System, Installation, and Operation Guide. Then, export the L5X files from the TeSys island DTM according to the following procedure.

1. In the TeSys island DTM, open the TeSys island project you wish to export.
2. From the drop-down menu, click Device.
3. Select Export > EDS to L5X File Format.
4. Click Save.

The file is saved as a zip file in the following format: *island_name.zip*.

5. A notification appears, saying that the L5X files have been created. Click OK.

Integration Procedure

Prerequisites

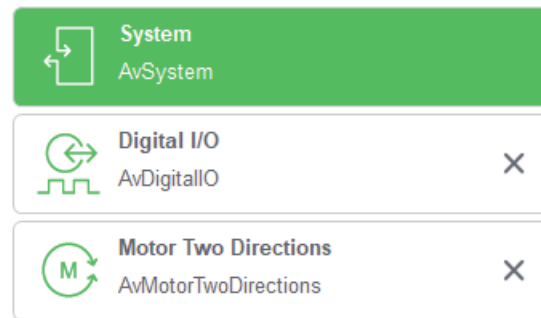
The integration procedure assumes that you have done the following:

- Set up a TeSys™ island device using SoMove™ software
- Obtained the L5X files needed for integration with the Rockwell Software® environment

Example Items

The TeSys island configuration used in this example includes the following items, as shown in the figure below.

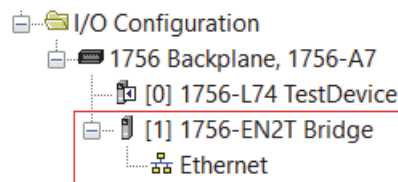
- Digital I/O module named *TeSysIslandDevice*
- Motor Two Directions avatar



Add an Ethernet Bridge

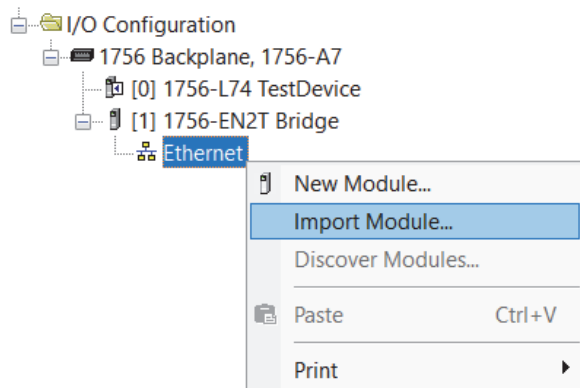
To add an Ethernet bridge:

1. Launch the Studio 5000® software.
2. Click Create > New Project.
A new project opens.
3. Select your PLC from the list of available PLCs.
4. Enter a Name for the PLC. Click Next.
5. Make any changes necessary for the PLC. Click Finish.
Your PLC module is added to the I/O Configuration tree.
6. Add an Ethernet bridge to its backplane.

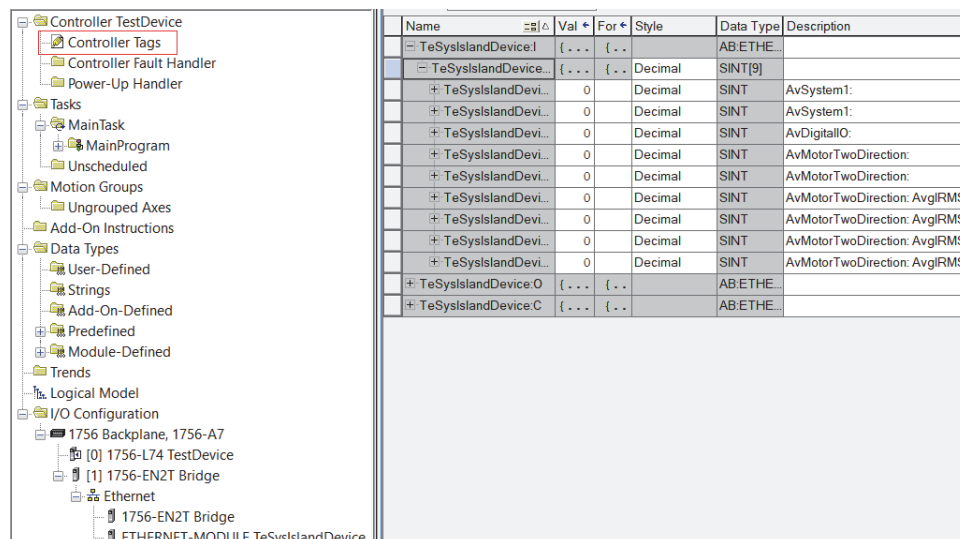


Import the TeSys™ island Module

Import the TeSys island module to the Ethernet bridge. This file uses the following naming convention: *{DeviceName}Module.L5X*.



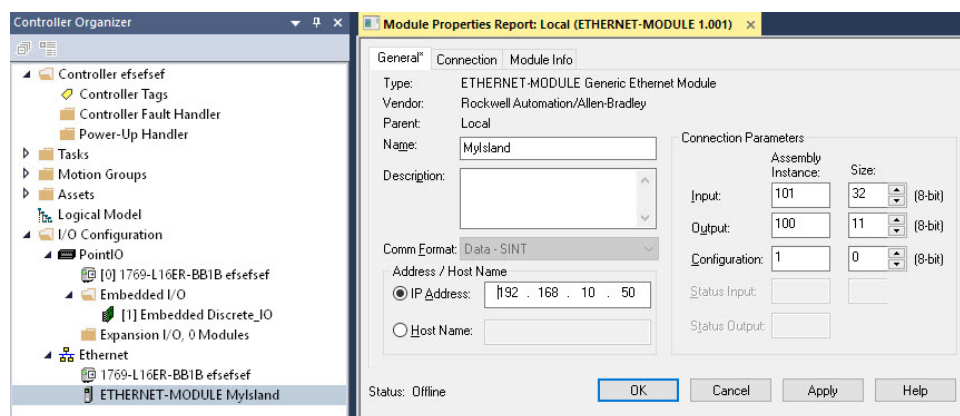
After import, the device shows up in the I/O configuration tree and the Controller Tags section of the project.



Once the module exists, define the target IP address of the device.

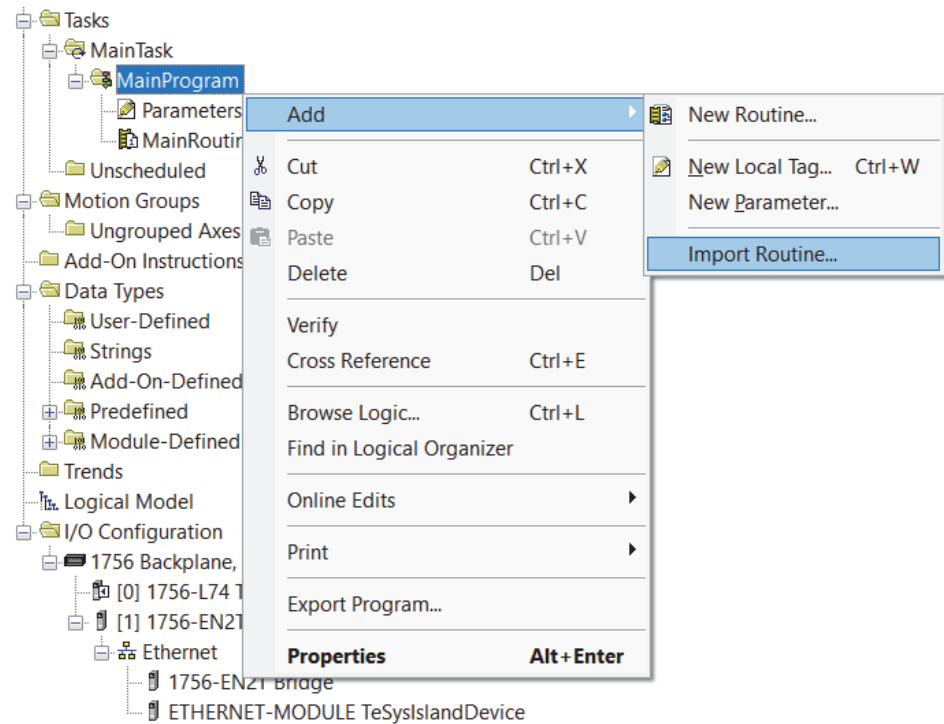
NOTE: If you skip this step before importing the Subroutine and AOI, you will be required to manually set the target communication path for each Acyclic function block.

Define the IP Address



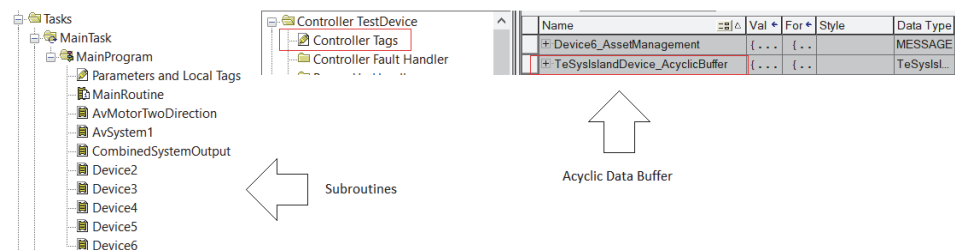
Import the Subroutine

Import the subroutine L5X file containing the acyclic data, if present. This file uses the following naming convention: *{DeviceName}_Acyclic.L5X*.



After import:

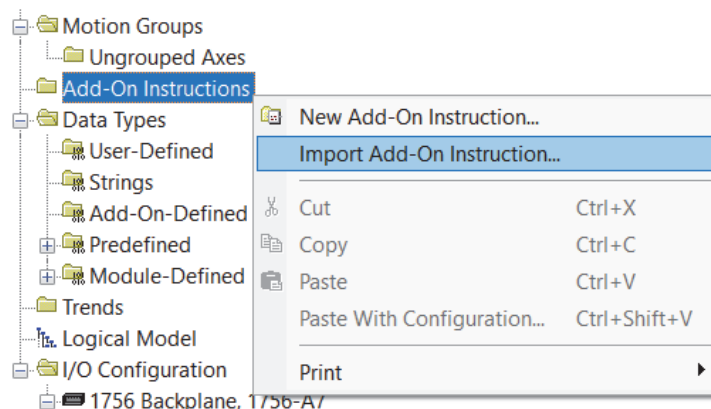
- the subroutines are visible in the Tasks tree
- the acyclic data buffer is visible in the Controller Tags section



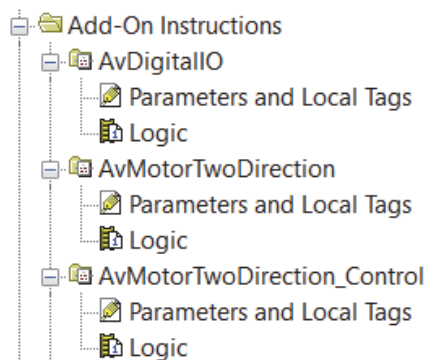
For more information on accessing the device data, see [Data Access Example](#), page 26.

Import the Add-on Instructions

Import the add-on instructions (AOIs) as shown below. This file uses the following naming conventions: *{DeviceName}_Aoi.L5X*



After import, the AOIs are visible in the project tree.



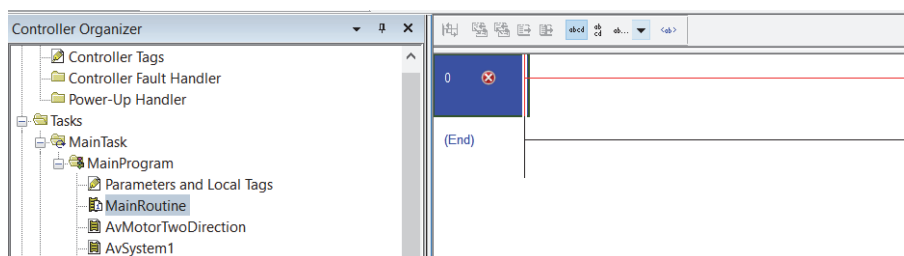
Each AOI contains either cyclic or acyclic data, which is indicated by the following naming convention:

- Cyclic data contains only the name of the avatar.
- Acyclic data contains the name of the avatar followed by an underscore (__) and the name of the acyclic data object.

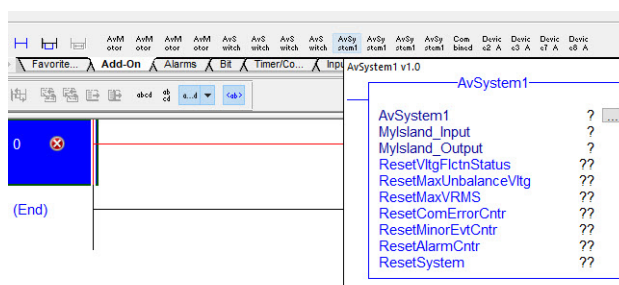
Create Instances of the AOIs

When creating an instance of an AOI, you must reference the module and the acyclic data buffer. Depending on the data present in the AOI (cyclic or acyclic), there are one or two tags to reference.

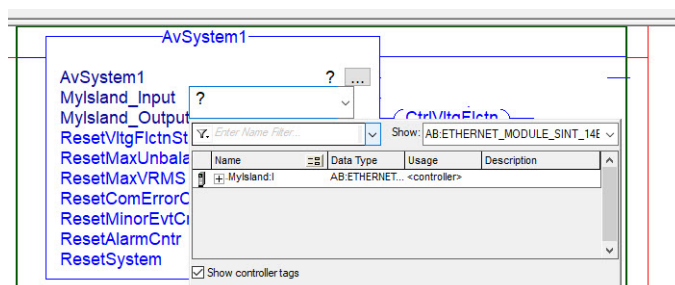
1. Enter the Main Routine by double-clicking it within the Tasks tree.



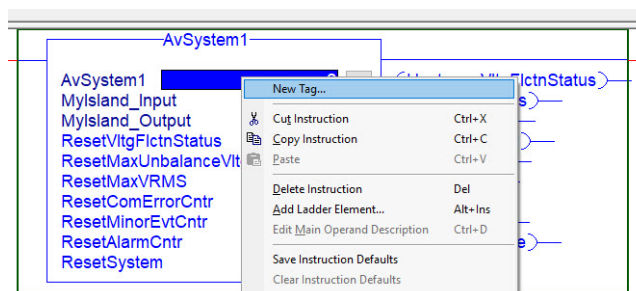
2. Add an AOI from the add-on list.



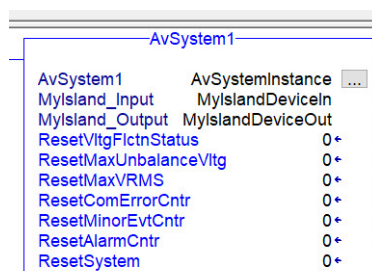
3. Fill in the reference tags for each In/Out parameter. These tags are in the Controller Tags list with names matching the In/Out Parameters.



4. Create an instance of the AOI and name it.

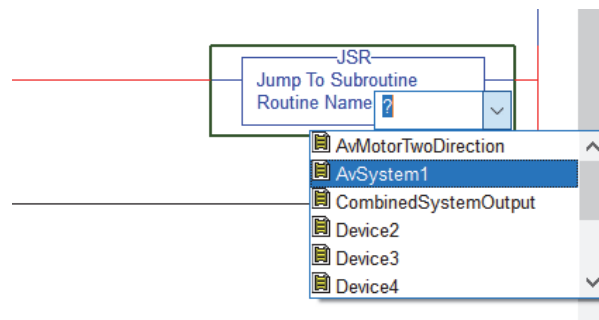


The AOI is now fully configured and ready for use.



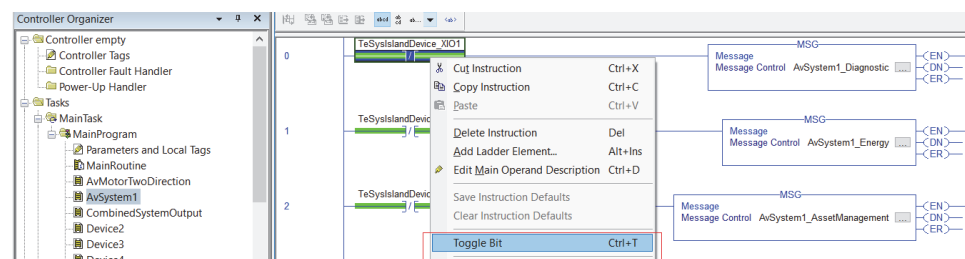
Calling Acyclic Data

When calling acyclic data, you must add a Jump To Subroutine operation to the Main Routine. The subroutine needed for the target AOI matches the associated avatar.



This action pushes or pulls data, depending on the type of data the explicit message is accessing.

1. Open the subroutine.
2. Toggle the Examine If Open bit on the rung containing the message associated with the target AOI.



Data Access Example

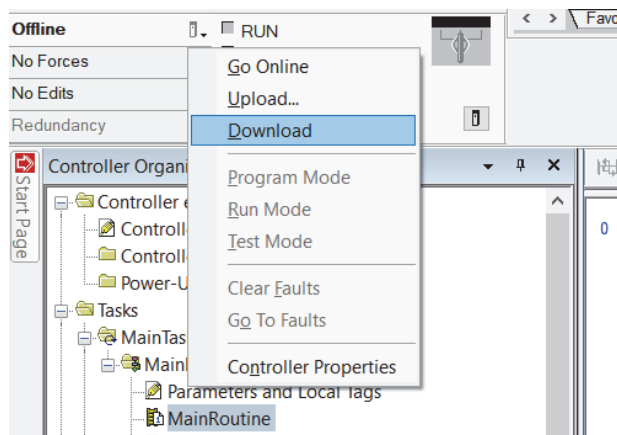
The following section provides an example of how to access data on the TeSys Island. These example AOIs:

- were added to the project using the same process described above
- are the for cyclic system data (AvSystem1), acyclic system diagnostic (AvSystem1_Diagnostic), and acyclic system asset management (AvSystem1_AssetManagement)

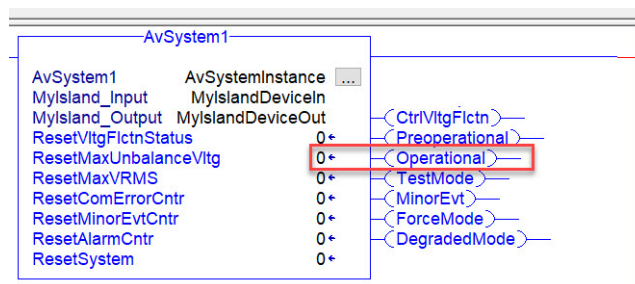
Accessing Data via AOI

After setting up the AOIs you plan to use:

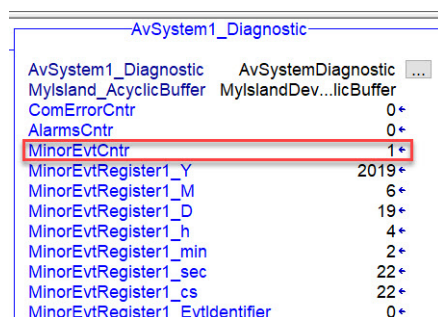
1. Download the program.
2. Set the PLC to Run mode.



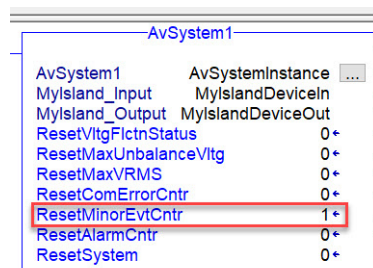
If the device is properly set up, and does not have any trips or other events, the cyclic system AOI should indicate that the system is operational.



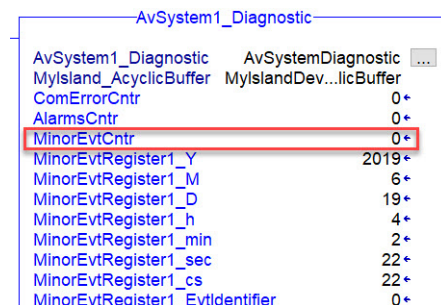
To view acyclic data, the appropriate explicit message must be accessed. See [Calling Acyclic Data](#), page 25. As shown here, the device currently has one Minor Event logged via the System Minor Event Counter within the acyclic system diagnostic AOI.



This value can be reset by flipping the Minor Event Reset bit within the cyclic system AOI.



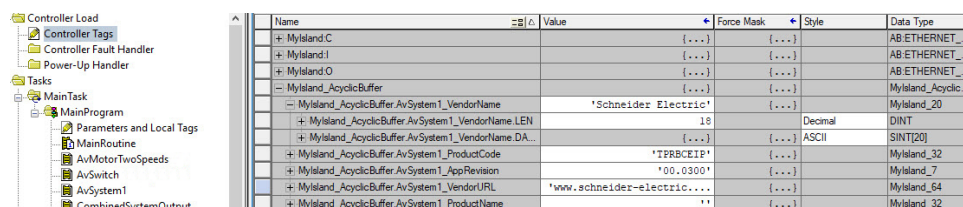
After a refresh of the acyclic system diagnostic data (see [Calling Acyclic Data](#), page 25), the counter returns to 0.



Accessing Data via the Acyclic Buffer

AOIs are capable of exposing only SINT, INT, DINT, REAL, and BOOL data types as Input/Output parameters. Due to this constraint, STRING registers are placed within the acyclic data buffer and can be accessed there.

After you toggle the bit to access the acyclic system asset management data (see [Calling Acyclic Data](#), page 25), the STRING data does not appear in the AOI. Instead, it appears within the acyclic data buffer. This buffer can be found in the Controller Tags list with naming convention `{DeviceName}_AcyclicBuffer`.



The remaining data is accessible within the AOI.



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.

Data Refresh Rates

| Data | Maximum update interval |
|---|-------------------------|
| Input and output status of power devices, digital I/O modules, and SIL ⁷ 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 |

7. Safety Integrity Level according to standard IEC 61508.

Function Blocks

TeSys™ island function blocks integrated with Studio 5000® are fieldbus independent and have no logic instructions. The inputs and outputs of the function blocks are linked to the process image (cyclic data) without any modifications. Inputs and outputs, which are not part of the process image, are exchanged via acyclic communication methods.

Data Types

The following data types are supported by Studio 5000® software. A data type is a definition of the size and layout of the memory allocated for the created tag. Data types define how many bits, bytes, or words of data a tag uses.

Data Types

| Data Type | Abbreviation | Memory Bits | Range |
|----------------|--------------|-------------|---------------------------------|
| Boolean | BOOL | 1 | 0–1 |
| Short Integer | SINT | 8 | –128 to 127 |
| Integer | INT | 16 | –32,768 to 32,767 |
| Double Integer | DINT | 32 | –2,147,483,648 to 2,147,483,647 |
| Real Number | REAL | 32 | ±3.402823E38 to ±1.1754944E-38 |

TeSys™ island supports unsigned data types. However, Studio 5000 software supports only signed data types. These data types use a bit to indicate that the software only handles signed integers. For this reason, the maximum positive value that can be displayed for 32-bit unsigned integers is 2,147,483,647. To enforce this, logic exists within AOIs (add-on instructions) to max out UDINT registers if the sign bit is used. For these TeSys island registers, a flag exists as an exposed parameter to indicate overflow. These flags are data type BOOL with the naming convention *{TagName}_O*.

Overflow Example

| | |
|-----------|------|
| AvgIRMS | DINT |
| AvgIRMS_O | DINT |

Timestamps

Some outputs that are part of a function block—including registers, timestamps, start dates, and stop dates—provide timestamp information such as the date and time when the value was recorded. The function block includes a unique output for each criteria to present the date and timestamp data as shown below:

- **cs**: centisecond
- **D**: day
- **h**: hour
- **M**: month
- **min**: minute
- **sec**: second
- **Y**: year

Example: The following outputs are available for the Voltage DipStartDate1 timestamp:

- VoltageDipStartDate1_cs
- VoltageDipStartDate1_D
- VoltageDipStartDate1_h
- VoltageDipStartDate1_M
- VoltageDipStartDate1_min
- VoltageDipStartDate1_sec
- VoltageDipStartDate1_Y

Registers, timestamps, start dates, and stop dates that provide timestamp information that end in **1** indicate the most recent output and, depending on the number of available outputs, the output with the higher number indicates the least recent entry. So, in the case of the outputs shown as VoltageDipStartDate1 and VoltageDipStartDate5, **1** indicates the most recent entry and **5** indicates the least recent entry.

Avatar Function Blocks

General Description

There are two basic types of function blocks:

- System avatar function blocks
- Standard avatar function blocks

System Avatar Function Blocks

The System avatar is unique in the TeSys island and supported by specific function block implementations, indicated by the string **System** in the function block name.

Standard Avatar Function Blocks

The Standard avatars are supported by two types of function blocks:

- Avatar Cyclic function blocks
- Avatar Acyclic function blocks (read/write)

Each Avatar cyclic function block is supported by its own function block implementation, which can be instantiated for multiple usages of the same avatar type in one TeSys island. Create one function block instance for each avatar in your application.

There is only one implementation for the Avatar acyclic function blocks (read/write). The same set of Diagnostic and Energy acyclic data is available for all avatars, not including the System avatar, Analog I/O, and the Digital I/O. The same set of Asset acyclic data is available for each device on the island. Executing the function block for a non-supported avatar stops the function block with a detected error. For multiple usages of the same function block with different avatars, you have to create an instance of the function block for each avatar. You will need to create an instance of the Asset Management function block for each device on the island.

The function blocks have no logic operations and do not modify or interpret the avatar data. The function blocks copy the values of their inputs into the cyclic output data frame and copy the data of the cyclic input frame to their outputs. If the function block requires acyclic data exchange, the read and write requests are managed by the function block.

The system provides one acyclic connection per TeSys™ island bus coupler. For this reason, the acyclic communication requests must be handled sequentially. A new request can only be sent if the response to the previous request was received.

If a detected error occurs during the execution, the function block stops and provides the detected error information. You cannot stop the function block by the application (for example, cancel input).

Some function blocks provide inputs to reset or preset parameters of the function block. When executing the function block, if one of these inputs is TRUE, the update of the outputs is delayed until the reset or preset command is executed in the avatar.

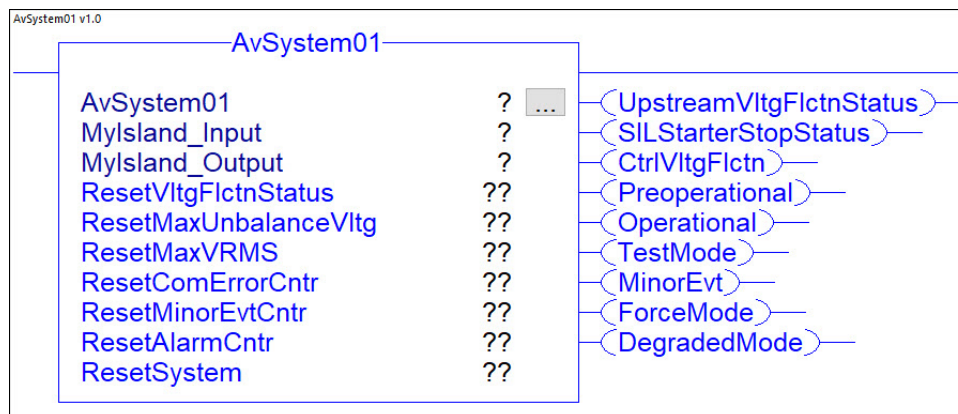
All the data exposed by an AOI exists within the main body, except for data exposed with output parameters of type BOOL. This data exists on the right side of the AOI.

System Function Blocks

System

The **AvSystem** function block returns the status and resets the cyclic diagnostic and energy data of the System avatar.

AvSystem Function Block



AvSystem Input Interface

| Input | Data Type | Description |
|-----------------------|-----------|--|
| ResetVltgFlctnStatus | BOOL | If this input is set to TRUE, the value of the parameter ResetVltgFlctnStatus is reset. |
| ResetMaxUnbalanceVltg | BOOL | If this input is set to TRUE, the value of the parameter ResetMaxUnbalanceVltg is reset. |
| ResetMaxVRMS | BOOL | If this input is set to TRUE, the value of the parameter ResetMaxVRMS is reset. |
| ResetComErrorCntr | BOOL | If this input is set to TRUE, the counter of detected errors for the fieldbus communication is set to 0. |
| ResetMinorEvtCntr | BOOL | If this input is set to TRUE, the counter of detected minor events for the system is set to 0. |
| ResetAlarmCntr | BOOL | If this input is set to TRUE, the counter of detected alarms for the system is set to 0. |
| ResetSystem | BOOL | If this input is set to TRUE, the system is reset. |

AvSystem Output Interface

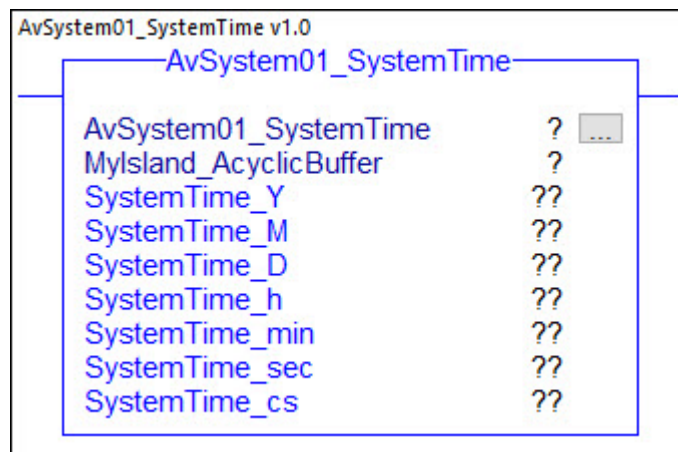
| Output | Data Type | Description |
|-------------------------|-----------|---|
| UpstreamVltgFlctnStatus | BOOL | If this output is set to TRUE, a voltage dip or swell is detected. Can be reset with ResetVltgFlctnStatus. |
| SILStarterStopStatus | BOOL | Status of SIL ⁸ Starter Stop 0 function. If this output is set to FALSE, no SIL group has received a SIL Starter Stop command. |
| CtrlVltgFlctn | BOOL | If this output is set to TRUE, a control voltage fluctuation is detected. |
| Preoperational | BOOL | If this output is set to TRUE, the System avatar is in Preoperational mode. |
| Operational | BOOL | If this output is set to TRUE, the System avatar is in Operational mode. For detailed information on machine states, refer to the TeSys island – System, Installation, and Operation Guide. |
| TestMode | BOOL | If this output is set to TRUE, the System avatar is in Test mode. |
| MinorEvt | BOOL | If this output is set to TRUE, the System avatar is in Minor Event mode. |
| ForceMode | BOOL | If this output is set to TRUE, the System avatar is in Force mode. |
| DegradedMode | BOOL | If this output is set to TRUE, the System avatar is in Degraded mode. |

8. Safety Integrity Level according to standard IEC 61508.

System Time

The AvSystem1_SystemTime function block returns the status of the acyclic system time of the system. The System Time function block only reads the system time—it does not write.

AvSystem1_SystemTime Function Block



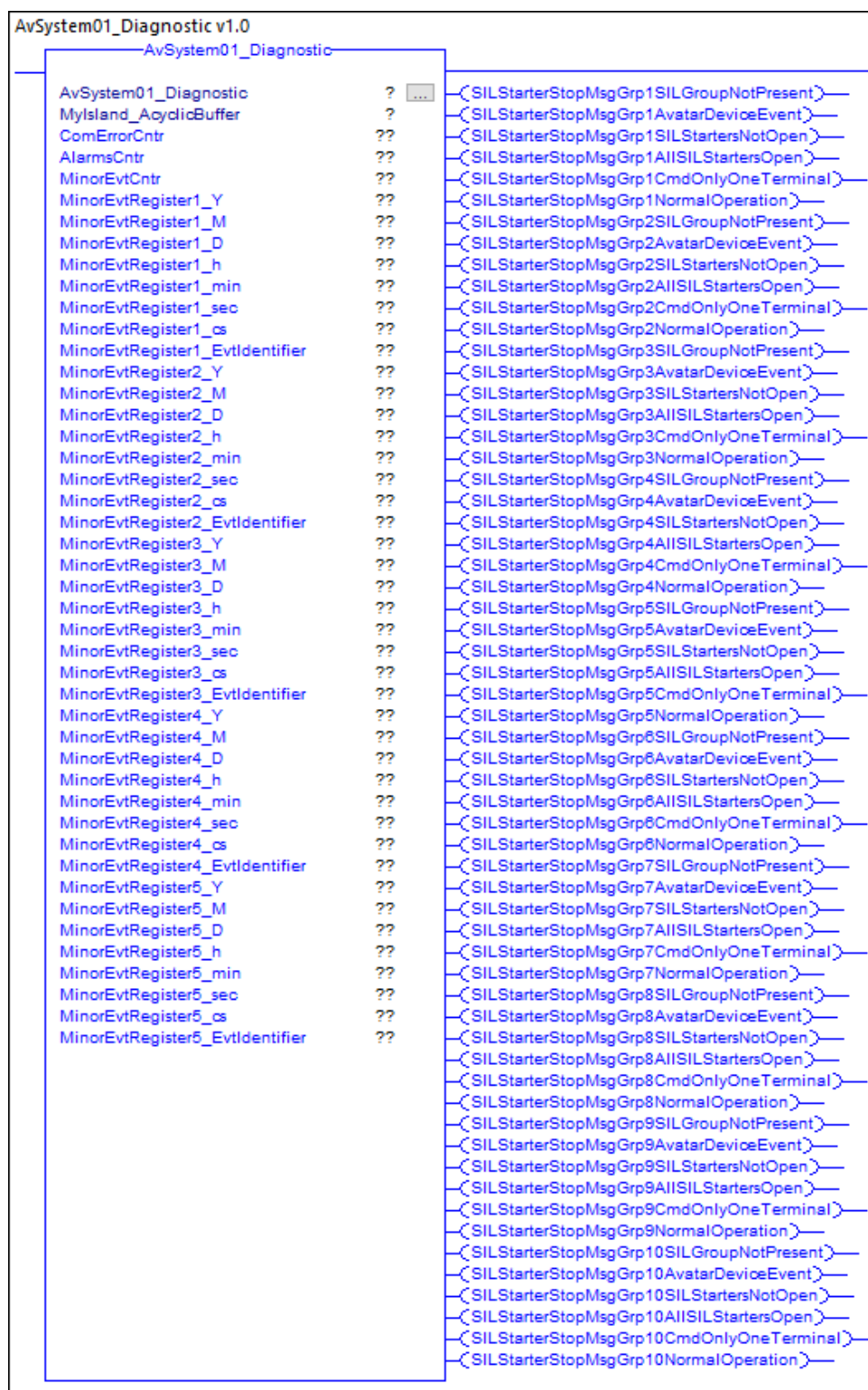
AvSystem1_System Time Output Interface

| Output | Data Type | Description |
|----------------|-----------|---|
| SystemTime_Y | DINT | Date and time of the system (read only) |
| SystemTime_M | SINT | |
| SystemTime_D | SINT | |
| SystemTime_h | SINT | |
| SystemTime_min | SINT | |
| SystemTime_sec | SINT | |
| SystemTime_cs | SINT | |

System Diagnostic

The **AvSystem1_Diagnostic** function block returns the status of the acyclic diagnostic data of the System avatar.

AvSystem1_Diagnostic Function Block



AvSystem1_Diagnostic Output Interface

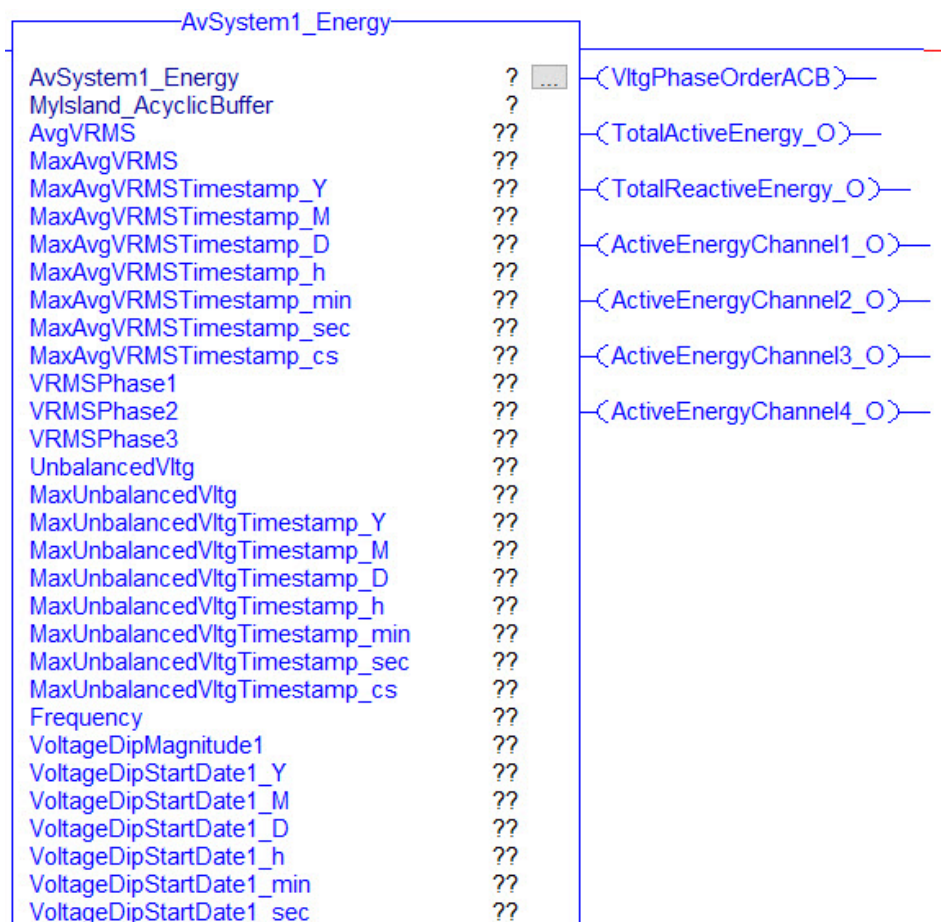
| Output | Data Type | Description |
|--|-----------|---|
| ComErrorCntr | DINT | Number of detected errors for the fieldbus communication. |
| AlarmsCntr | DINT | Number of detected alarms for the system. |
| MinorEvtCntr | DINT | Number of detected minor events for the system. |
| MinorEvtRegister1_Y | DINT | Information on a detected minor event. MinorEvtRegister1_ = most recent. |
| MinorEvtRegister1_M | SINT | |
| MinorEvtRegister1_D | SINT | |
| MinorEvtRegister1_h | SINT | |
| MinorEvtRegister1_min | SINT | |
| MinorEvtRegister1_sec | SINT | |
| MinorEvtRegister1_cs | SINT | |
| MinorEvtRegister1_EventIdentifier | DINT | |
| ... | ... | ... |
| MinorEvtRegister5_Y | DINT | Information on a detected minor event. |
| MinorEvtRegister5_M | SINT | |
| MinorEvtRegister5_D | SINT | |
| MinorEvtRegister5_h | SINT | |
| MinorEvtRegister5_min | SINT | |
| MinorEvtRegister5_sec | SINT | |
| MinorEvtRegister5_cs | SINT | |
| MinorEvtRegister5_EventIdentifier | DINT | |
| SILStarterStopMsgGrp1SILGroupNotPresent | BOOL | Status for SIL ⁹ Groups 1– 10: <ul style="list-style-type: none"> NotPresent = SIL Group not present in system configuration AvatarDeviceEvent = SIL Group impacted by avatar device event SILStartersNotOpen = SIL Group Stop command received; SIL starters not open yet AllStartersNotOpen = SIL Group Stop command successfully issued; all SIL starters are open CmdIssuedOneTerminal = 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 NormalOperation = Normal operation; SIL starters can be open or closed |
| SILStarterStopMsgGrp1AvatarDeviceEvent | BOOL | |
| SILStarterStopMsgGrp1SILStartersNotOpen | BOOL | |
| SILStarterStopMsgGrp1AllSILStartersOpen | BOOL | |
| SILStarterStopMsgGrp1CmdOnlyOneTerminal | BOOL | |
| SILStarterStopMsgGrp1NormalOperation | BOOL | |
| ... | ... | |
| SILStarterStopMsgGrp10SILGroupNotPresent | BOOL | |
| SILStarterStopMsgGrp10AvatarDeviceEvent | BOOL | |
| SILStarterStopMsgGrp10SILStartersNotOpen | BOOL | |
| SILStarterStopMsgGrp10AllSILStartersOpen | BOOL | |
| SILStarterStopMsgGrp10CmdOnlyOneTerminal | BOOL | |
| SILStarterStopMsgGrp10NormalOperation | BOOL | |

9. Safety Integrity Level according to standard IEC 61508.

System Energy Management

The **AvSystem1_Energy** function block returns the status of the acyclic energy data of the System avatar.

AvSystem1_Energy Function Block



AvSystem1_Energy Output Interface

| Output | Data Type | Description |
|------------------------|-----------|--|
| ActiveEnergyChannel1 | DINT | Channel 1: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel1_O | BOOL | Channel 1: ToU (Time of Use) total active energy overflow value. |
| ActiveEnergyChannel2 | DINT | Channel 2 :ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel2_O | BOOL | Channel 2: ToU (Time of Use) total active energy overflow value. |
| ActiveEnergyChannel3 | DINT | Channel 3: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel3_O | BOOL | Channel 3: ToU (Time of Use) total active energy overflow value. |
| ActiveEnergyChannel4 | DINT | Channel 4: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel4_O | BOOL | Channel 4: ToU (Time of Use) total active energy overflow value. |
| AvgVRMS | INT | Average Vrms voltage on three phases (Unit: V) |
| Frequency | INT | Main power voltage frequency (line frequency as measured on phase 1). (Unit: Hz) |
| InstActivePower | DINT | Total active power for the system. (Unit: W) |
| InstReactivePower | DINT | Total reactive power for the system. (Unit: VAR) |
| MaxActivePower | DINT | Maximum value of the active power for the system. (Unit: W) |

AvSystem1_Energy Output Interface (Continued)

| Output | Data Type | Description |
|--------------------------------|-----------|---|
| MaxActivePowerTimestamp_cs | SINT | Date and time when the maximum active power value was recorded. |
| MaxActivePowerTimestamp_D | SINT | |
| MaxActivePowerTimestamp_h | SINT | |
| MaxActivePowerTimestamp_M | SINT | |
| MaxActivePowerTimestamp_min | SINT | |
| MaxActivePowerTimestamp_sec | SINT | |
| MaxActivePowerTimestamp_Y | DINT | |
| MaxAvgVRMS | DINT | Maximum voltage the system measured. (Unit: V) |
| MaxAvgVRMSTimestamp_cs | SINT | Date and time when maximum average voltage value was recorded. |
| MaxAvgVRMSTimestamp_D | SINT | |
| MaxAvgVRMSTimestamp_h | SINT | |
| MaxAvgVRMSTimestamp_M | SINT | |
| MaxAvgVRMSTimestamp_min | SINT | |
| MaxAvgVRMSTimestamp_sec | SINT | |
| MaxAvgVRMSTimestamp_Y | DINT | |
| MaxPowerFactor | SINT | True maximum power factor value. |
| MaxPowerFactorTimestamp_cs | SINT | Date and time when the maximum power factor value was recorded. |
| MaxPowerFactorTimestamp_D | SINT | |
| MaxPowerFactorTimestamp_h | SINT | |
| MaxPowerFactorTimestamp_M | SINT | |
| MaxPowerFactorTimestamp_min | SINT | |
| MaxPowerFactorTimestamp_sec | SINT | |
| MaxPowerFactorTimestamp_Y | DINT | |
| MaxReactivePower | DINT | Maximum value of the reactive power for the system. (Unit: VAR) |
| MaxReactivePowerTimestamp_cs | SINT | Date and time when the maximum reactive power value was recorded. |
| MaxReactivePowerTimestamp_D | SINT | |
| MaxReactivePowerTimestamp_h | SINT | |
| MaxReactivePowerTimestamp_M | SINT | |
| MaxReactivePowerTimestamp_min | SINT | |
| MaxReactivePowerTimestamp_sec | SINT | |
| MaxReactivePowerTimestamp_Y | DINT | |
| MaxUnbalancedVltg | SINT | Maximum unbalance voltage in percent (%). |
| MaxUnbalancedVltgTimestamp_cs | SINT | Date and time of maximum unbalance voltage. |
| MaxUnbalancedVltgTimestamp_D | SINT | |
| MaxUnbalancedVltgTimestamp_h | SINT | |
| MaxUnbalancedVltgTimestamp_M | SINT | |
| MaxUnbalancedVltgTimestamp_min | SINT | |
| MaxUnbalancedVltgTimestamp_sec | SINT | |
| MaxUnbalancedVltgTimestamp_Y | DINT | |
| MinPowerFactor | SINT | True minimum power factor value. |

AvSystem1_Energy Output Interface (Continued)

| Output | Data Type | Description |
|-----------------------------|-----------|---|
| MinPowerFactorTimestamp_cs | SINT | Date and time when the minimum power factor value was recorded. |
| MinPowerFactorTimestamp_D | SINT | |
| MinPowerFactorTimestamp_h | SINT | |
| MinPowerFactorTimestamp_M | SINT | |
| MinPowerFactorTimestamp_min | SINT | |
| MinPowerFactorTimestamp_sec | SINT | |
| MinPowerFactorTimestamp_Y | DINT | |
| PowerFactor | SINT | True power factor value. |
| TotalActiveEnergy | DINT | Total active energy value for all avatars in the system with Energy Monitoring Enabled. (Unit: Watt-hours) |
| TotalActiveEnergy_O | BOOL | Total active energy overflow value for all avatars in the system with Energy Monitoring Enabled. |
| TotalReactiveEnergy | DINT | Total reactive energy value for all avatars in the system with Energy Monitoring Enabled. (Unit: VAR-hours) |
| TotalReactiveEnergy_O | BOOL | Total reactive energy overflow value for all avatars in the system with Energy Monitoring Enabled. |
| UnbalancedVltg | SINT | Unbalance voltage in percent (%). |
| VltgDipCntr | DINT | Voltage dip counter |
| VltgPhaseOrderACB | BOOL | If this output is set to TRUE, the phase order is ACB (FALSE = phase order ABC). |
| VltgSwellCntr | DINT | Voltage swell counter |
| VoltageDipMagnitude1 | DINT | Maximum voltage magnitude for a voltage dip. (Unit: V) |
| ... | ... | ... |
| VoltageDipMagnitude5 | DINT | Maximum voltage magnitude for a voltage dip. (Unit: V) |
| VoltageDipStartDate1_cs | SINT | Start time stamp of the voltage dip. |
| VoltageDipStartDate1_D | SINT | |
| VoltageDipStartDate1_h | SINT | |
| VoltageDipStartDate1_M | SINT | |
| VoltageDipStartDate1_min | SINT | |
| VoltageDipStartDate1_sec | SINT | |
| VoltageDipStartDate1_Y | DINT | |
| ... | ... | ... |
| VoltageDipStartDate5_cs | SINT | Start time stamp of the voltage dip. |
| VoltageDipStartDate5_D | SINT | |
| VoltageDipStartDate5_h | SINT | |
| VoltageDipStartDate5_M | SINT | |
| VoltageDipStartDate5_min | SINT | |
| VoltageDipStartDate5_sec | SINT | |
| VoltageDipStartDate5_Y | DINT | |

AvSystem1_Energy Output Interface (Continued)

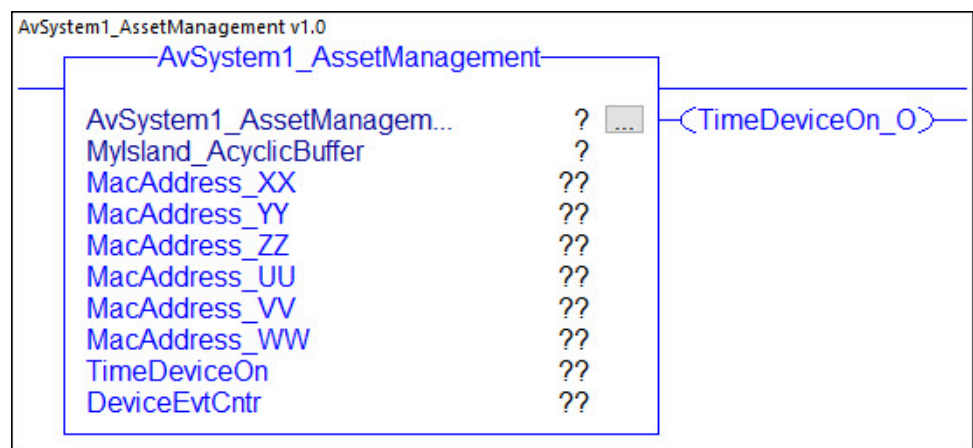
| Output | Data Type | Description |
|----------------------------|-----------|--|
| VoltageDipStopDate1_cs | SINT | Stop time stamp of the voltage dip. |
| VoltageDipStopDate1_D | SINT | |
| VoltageDipStopDate1_h | SINT | |
| VoltageDipStopDate1_M | SINT | |
| VoltageDipStopDate1_min | SINT | |
| VoltageDipStopDate1_sec | SINT | |
| VoltageDipStopDate1_Y | DINT | |
| ... | ... | ... |
| VoltageDipStopDate5_cs | SINT | Stop time stamp of the voltage dip. |
| VoltageDipStopDate5_D | SINT | |
| VoltageDipStopDate5_h | SINT | |
| VoltageDipStopDate5_M | SINT | |
| VoltageDipStopDate5_min | SINT | |
| VoltageDipStopDate5_sec | SINT | |
| VoltageDipStopDate5_Y | DINT | |
| VoltageSwellMagnitude1 | DINT | Maximum voltage magnitude for a voltage swell. (Unit: V) |
| ... | ... | |
| VoltageSwellMagnitude5 | DINT | |
| VoltageSwellStartDate1_cs | SINT | Start time stamp of the voltage swell. |
| VoltageSwellStartDate1_D | SINT | |
| VoltageSwellStartDate1_h | SINT | |
| VoltageSwellStartDate1_M | SINT | |
| VoltageSwellStartDate1_min | SINT | |
| VoltageSwellStartDate1_sec | SINT | |
| VoltageSwellStartDate1_Y | DINT | |
| ... | ... | |
| VoltageSwellStartDate5_cs | SINT | |
| VoltageSwellStartDate5_D | SINT | |
| VoltageSwellStartDate5_h | SINT | |
| VoltageSwellStartDate5_M | SINT | |
| VoltageSwellStartDate5_min | SINT | |
| VoltageSwellStartDate5_sec | SINT | |
| VoltageSwellStartDate5_Y | DINT | |

AvSystem1_Energy Output Interface (Continued)

| Output | Data Type | Description |
|---------------------------|-----------|--|
| VoltageSwellStopDate1_cs | SINT | Stop time stamp of the voltage swell. |
| VoltageSwellStopDate1_D | SINT | |
| VoltageSwellStopDate1_h | SINT | |
| VoltageSwellStopDate1_M | SINT | |
| VoltageSwellStopDate1_min | SINT | |
| VoltageSwellStopDate1_sec | SINT | |
| VoltageSwellStopDate1_Y | DINT | |
| ... | ... | |
| VoltageSwellStopDate5_cs | SINT | |
| VoltageSwellStopDate5_D | SINT | |
| VoltageSwellStopDate5_h | SINT | |
| VoltageSwellStopDate5_M | SINT | |
| VoltageSwellStopDate5_min | SINT | |
| VoltageSwellStopDate5_sec | SINT | |
| VoltageSwellStopDate5_Y | DINT | |
| VRMSPhase1 | DINT | Average Vrms voltage between L1 and neutral. (Unit: V) |
| VRMSPhase2 | DINT | Average Vrms voltage between L2 and neutral. (Unit: V) |
| VRMSPhase3 | DINT | Average Vrms voltage between L3 and neutral. (Unit: V) |

System Asset Management

The **AvSystem1_AssetManagement** function block returns the status of the acyclic asset management data of the System avatar.

AvSystem1_AssetManagement Function Block

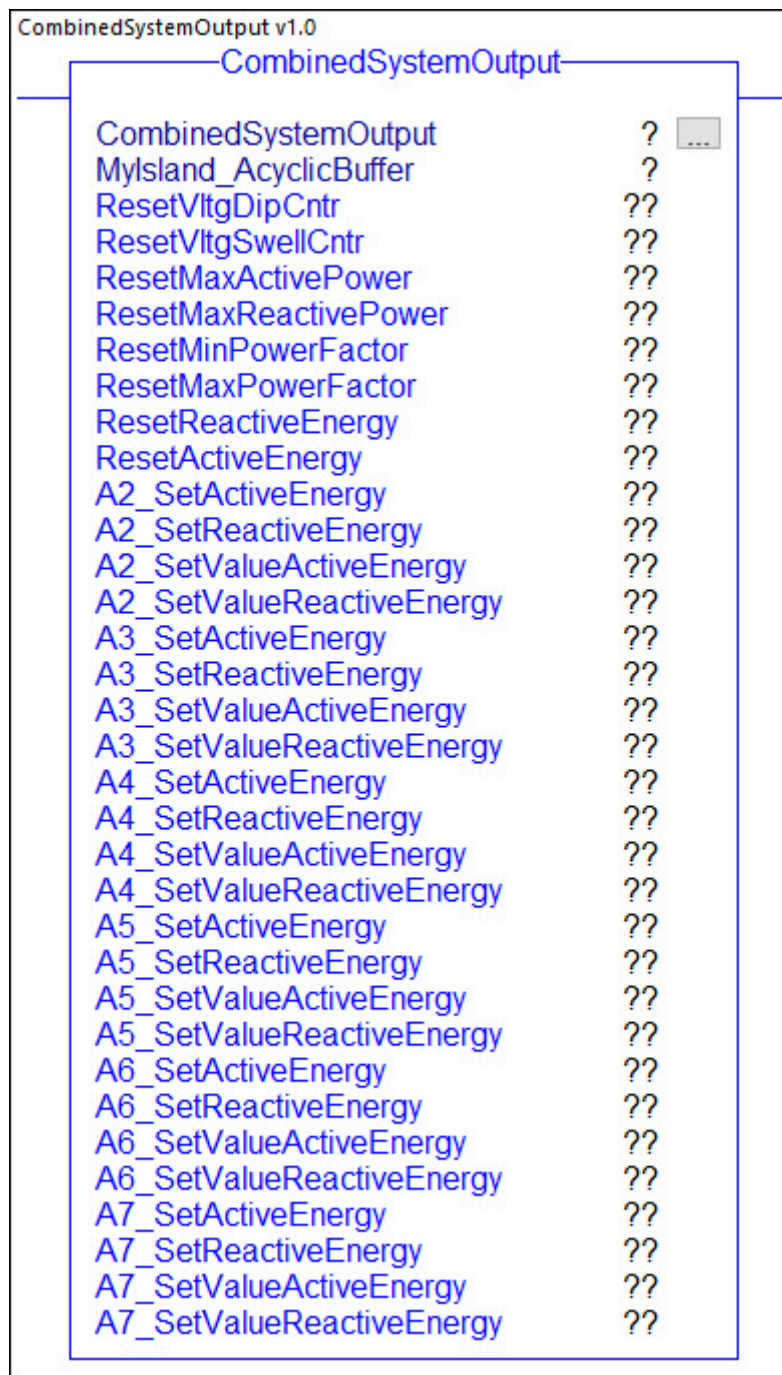
AvSystem1_AssetManagement Output Interface

| Output | Data Type | Description |
|----------------|-----------|---|
| MacAddress_XX | INT | MAC address of the device XX. |
| MacAddress_YY | INT | MAC address of the device YY. |
| MacAddress_ZZ | INT | MAC address of the device ZZ. |
| MacAddress_UU | INT | MAC address of the device UU. |
| MacAddress_VV | INT | MAC address of the device VV. |
| MacAddress_WW | INT | MAC address of the device WW. |
| TimeModuleOn | DINT | This register indicates the time that the module has been powered on in its lifetime (Unit: h). |
| TimeModuleOn_O | BOOL | This register indicates the overflow time that the module has been powered on in its lifetime. |
| EventCntr | DINT | This register indicates number of times this module has experienced a detected device error (Unit: h). This value does not include detected device events which corrupt or prevent the saving of the non-volatile memory. |

System Combined Output

The **CombinedSystemOutput** function block returns the energy information of the System avatar, resets the energy registers of the System avatar, and sets the energy preset values of the avatars (A2, A3, etc.).

CombinedSystemOutput Function Block



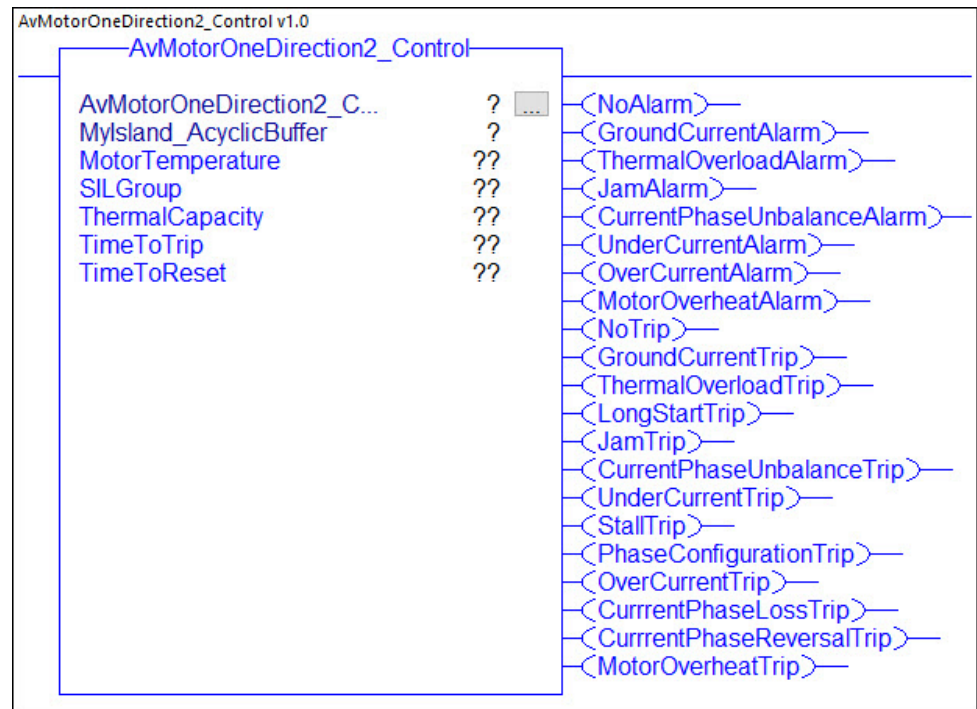
CombinedSystemOutput Input Interface

| Input | Data Type | Description |
|---------------------------|-----------|--|
| ResetVltgDipCntr | BOOL | If this input is set to TRUE, the value of the parameter ResetVltgDipCntr is reset. |
| ResetVltgSwellCntr | BOOL | If this input is set to TRUE, the value of the parameter ResetVltgSwellCntr is reset. |
| ResetMaxActivePower | BOOL | If this input is set to TRUE, the value of the parameter MaxActivePower and the associated time stamp MaxActivePowerTimestamp are reset. |
| ResetMaxReactivePower | BOOL | If this input is set to TRUE, the value of the parameter MaxReactivePower and the associated time stamp MaxReactivePowerTimestamp are reset. |
| ResetMinPowerFactor | BOOL | If this input is set to TRUE: <ul style="list-style-type: none"> The true value of the parameter MinPowerFactor is reset to 1. The associated time stamp MinPowerFactorTimestamp is reset. |
| ResetMaxPowerFactor | BOOL | If this input is set to TRUE: <ul style="list-style-type: none"> The true value of the parameter MaxPowerFactor is reset to 0. The associated time stamp MaxPowerFactorTimestamp is reset. |
| ResetReactiveEnergy | BOOL | If this input is set to TRUE, the value of the parameter ReactiveEnergy is reset. |
| ResetActiveEnergy | BOOL | If this input is set to TRUE, the value of the parameter ActiveEnergy is reset. |
| A2_SetActiveEnergy | BOOL | Command to set the TotalActiveEnergy value to TotalActiveEnergyPreset value. |
| A2_SetReactiveEnergy | BOOL | Command to set the TotalReactiveEnergy value to TotalReactiveEnergyPreset value. |
| A2_SetValueActiveEnergy | DINT | Value to preset the TotalActiveEnergy, will take effect on a TRUE command to SetActiveEnergy (Unit: Watt-hours) |
| A2_SetValueReactiveEnergy | DINT | Value to preset the TotalReactiveEnergy, will take effect on a TRUE command to SetReactiveEnergy (Unit: VAR-hours) |
| ... | ... | ... |
| A7_SetActiveEnergy | BOOL | Command to set the TotalActiveEnergy value to TotalActiveEnergyPreset value. |
| A7_SetReactiveEnergy | BOOL | Command to set the TotalReactiveEnergy value to TotalReactiveEnergyPreset value. |
| A7_SetValueActiveEnergy | DINT | Value to preset the TotalActiveEnergy, will take effect on a TRUE command to SetActiveEnergy (Unit: Watt-hours) |
| A7_SetValueReactiveEnergy | DINT | Value to preset the TotalReactiveEnergy, will take effect on a TRUE command to SetReactiveEnergy (Unit: VAR-hours) |

Avatar Acyclic Function Blocks

The **Avatar_Control** function block returns the status of the acyclic data for the individual avatar. In the example below, the **AvMotorOneDirection_Control** function block is displayed. The same set of acyclic data is available for all avatars, not including the System avatar, analog I/O, and the digital I/O.

AvMotorOneDirection_Control Function Block



Avatar Control Output Interface

| Output | Data Type | Description |
|----------------------------|-----------|---|
| CurrentPhaseUnbalanceTrip | BOOL | The avatar has detected the conditions to cause a current phase unbalance trip event. |
| CurrentPhaseUnbalanceAlarm | BOOL | The avatar has detected the conditions to cause a current phase unbalance event. |
| CurrentPhaseLossTrip | BOOL | The avatar has detected the conditions to cause a current phase loss trip event. |
| CurrentPhaseReversalTrip | BOOL | The avatar has detected the conditions to cause a current phase reversal trip event. |
| GroundCurrentTrip | BOOL | The avatar has detected the conditions to cause a ground current trip event. |
| GroundCurrentAlarm | BOOL | The avatar has detected the conditions to cause a ground current event. |
| JamTrip | BOOL | The avatar has detected the conditions to cause a jam trip event. |
| JamAlarm | BOOL | The avatar has detected the conditions to cause a jam event. |
| LongStartTrip | BOOL | The avatar has detected the conditions to cause a long start trip event. |
| MotorOverheatTrip | BOOL | The motor temperature has increased above the motor overheat trip level. |
| MotorOverheatAlarm | BOOL | The motor temperature has increased above the motor overheat level. |
| MotorTemperature | INT | Indicates the temperature of the motor in 0.1 °C scaling unit. Depending on temperature sensor type, the range is: <ul style="list-style-type: none"> • -200 to +850°C (-328 to +1562°F) (for PT100) • -200 to +600°C (-328 to +1112°F) (for PT1000) • -60 to +180°C (-76 to +356°F) (for NI 100/1000) |
| NoTrip | BOOL | No trip has been detected. |
| NoAlarm | BOOL | No advisory condition has been detected. |
| OverCurrentTrip | BOOL | The avatar has detected the conditions to cause an overcurrent trip event. |
| OverCurrentAlarm | BOOL | The avatar has detected the conditions to cause an overcurrent event. |
| PhaseConfigurationTrip | BOOL | The avatar has detected the conditions to cause a phase configuration trip event. |
| SILGroup | SINT | Indicates the number of the SIL ¹⁰ group. |
| StallTrip | BOOL | The avatar has detected the conditions to cause a stall trip event. |
| ThermalCapacity | INT | Provides the percentage (%) of the thermal capacity of the motor which has been used. |
| ThermalOverloadTrip | BOOL | The avatar thermal capacity has increased above 100%. |
| ThermalOverloadAlarm | BOOL | The avatar thermal capacity has increased above the thermal overload level. |
| TimeToReset | DINT | Estimated time to wait before being able to reset a thermal overload trip. (Unit: s) |
| TimeToTrip | DINT | Estimated time before a thermal overload trip will occur given the current conditions. (Unit: s) |
| UnderCurrentTrip | BOOL | The avatar has detected the conditions to cause an undercurrent trip event. |
| UnderCurrentAlarm | BOOL | The avatar has detected the conditions to cause an undercurrent event. |

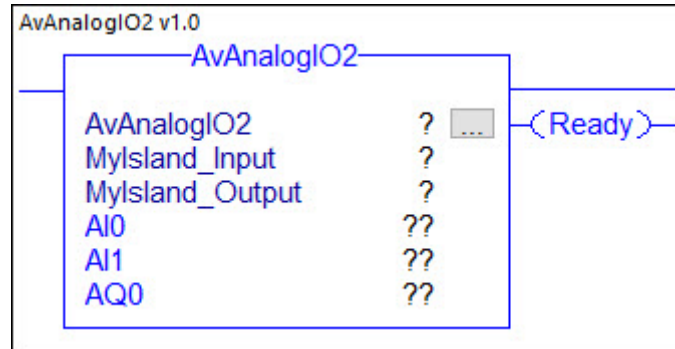
10. Safety Integrity Level according to standard IEC 61508.

Avatar Cyclic Function Blocks

Analog I/O

The **AvAnalogIO** function block provides information about the Analog I/O avatar with two inputs and one output.

AvAnalogIO Function Block



AvAnalogIO Input Interface

| Input | Data Type | Description |
|-------|-----------|--|
| AQ0 | INT | Value to be written to analog output 0. Unit and scaling depends on the analog output type configured. <ul style="list-style-type: none">Type 0 (Unit: mV)Type 1 (Unit: mV)Type 2 (Unit: μA)Type 3 (Unit: μA) |

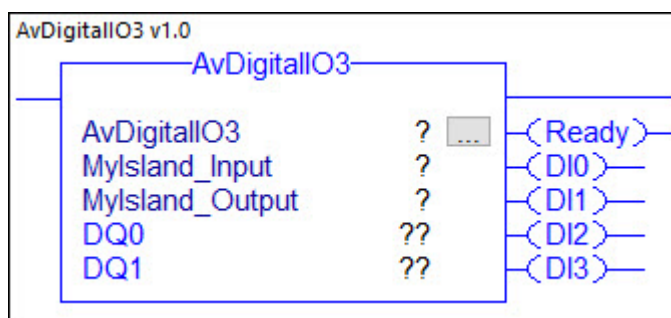
AvAnalogIO Output Interface

| Output | Data Type | Description |
|--------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| AI0 | INT | Indicates the value read from the analog input 0. Unit and scaling depends on the analog output type configured. <ul style="list-style-type: none">Type 0 to 12 (Unit: 0.1 °C)Type 13 (Unit: mV)Type 14 (Unit: mV)Type 15 (Unit: μA)Type 16 (Unit: μA) |
| AI1 | INT | Indicates the value read from the analog input 1. |

Digital I/O

The **AvDigitalIO** function block provides information about the Digital I/O avatar with four inputs and two outputs.

AvDigitalIO Function Block



AvDigitalIO Input Interface

| Input | Data Type | Description |
|-------|-----------|--|
| DQ0 | BOOL | If this input is set to TRUE, the digital output 0 is set to TRUE. |
| DQ1 | BOOL | If this input is set to TRUE, the digital output 1 is set to TRUE. |

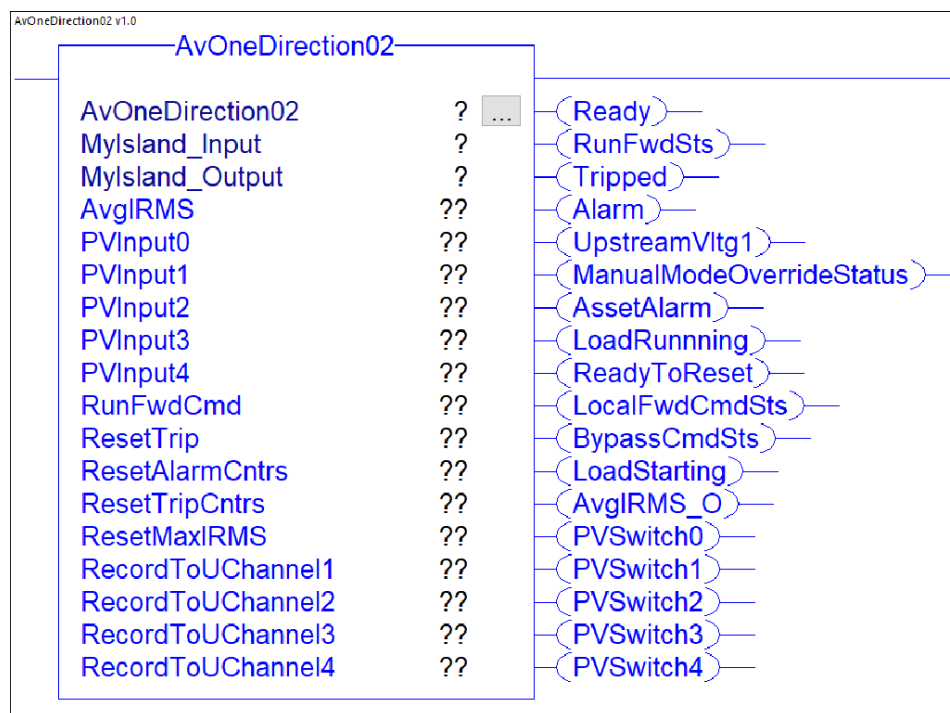
AvDigitalIO Output Interface

| Output | Data Type | Description |
|--------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| DI0 | BOOL | If this output is set to TRUE, the digital input 0 of the Digital I/O avatar is set to TRUE. |
| DI1 | BOOL | If this output is set to TRUE, the digital input 1 of the Digital I/O avatar is set to TRUE. |
| DI2 | BOOL | If this output is set to TRUE, the digital input 2 of the Digital I/O avatar is set to TRUE. |
| DI3 | BOOL | If this output is set to TRUE, the digital input 3 of the Digital I/O avatar is set to TRUE. |

Motor One Direction

The **AvMotorOneDirection** function block is used to manage a motor in one direction.

AvMotorOneDirection Function Block



AvMotorOneDirection Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |

AvMotorOneDirection Output Interface

| Output | Data Type | Description |
|--------------------------|-----------|---|
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ¹¹ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

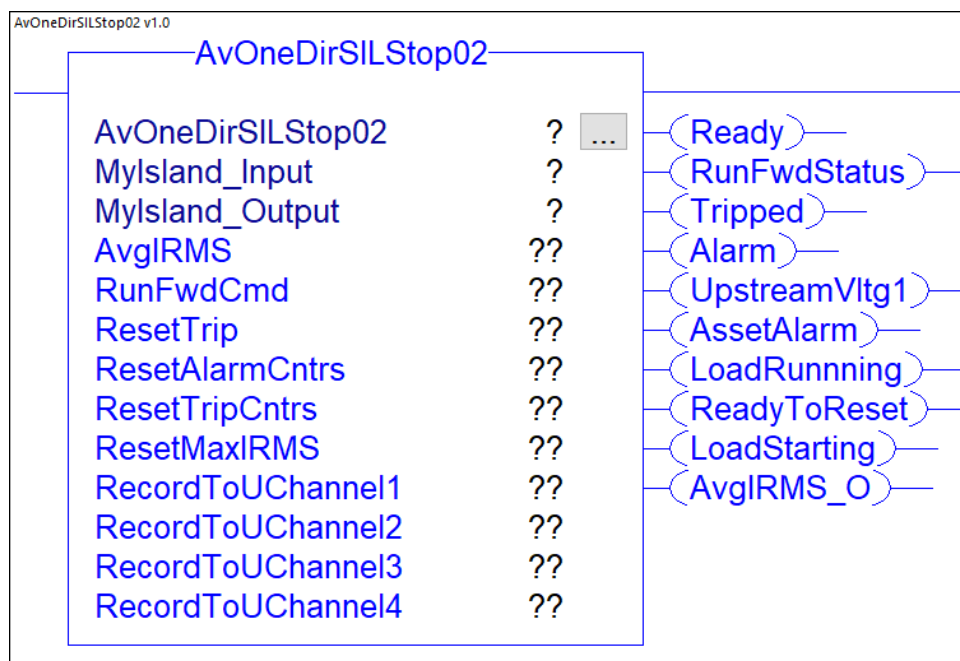
11. Safety Integrity Level according to standard IEC 61508

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

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

The **AvMotorOneDirectionSILStop** function block is used to manage a motor in one direction with Stop Category 0 or Stop Category 1¹² function compliance for Wiring Category 1 and Category 2.

AvMotorOneDirectionSILStop Function Block



AvMotorOneDirectionSILStop Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |

12. Stop categories according to EN/IEC 60204–1.

AvMotorOneDirectionSILStop Output Interface

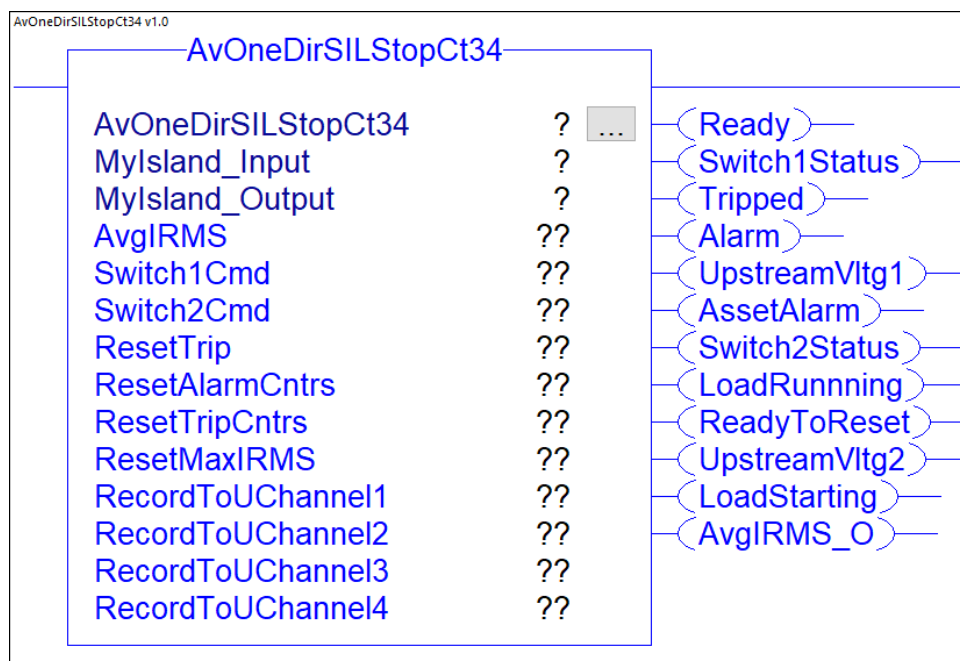
| Output | Data Type | Description |
|---------------|-----------|--|
| AssetAlarm | BOOL | If this output is set to TRUE, a power device within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |

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

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

The **AvMotorOneDirectionSILStopCat34** function block is used to manage a motor in one direction with Stop Category 0 or Stop Category 1¹³ function compliance for Wiring Category 3 and Category 4.

AvMotorOneDirectionSILStopCat34 Function Block



AvMotorOneDirectionSILStopCat34 Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| Switch1Cmd | BOOL | If this input is set to TRUE, the avatar forward primary switch is closed. |
| Switch2Cmd | BOOL | If this input is set to TRUE, the avatar forward redundant switch is closed. |

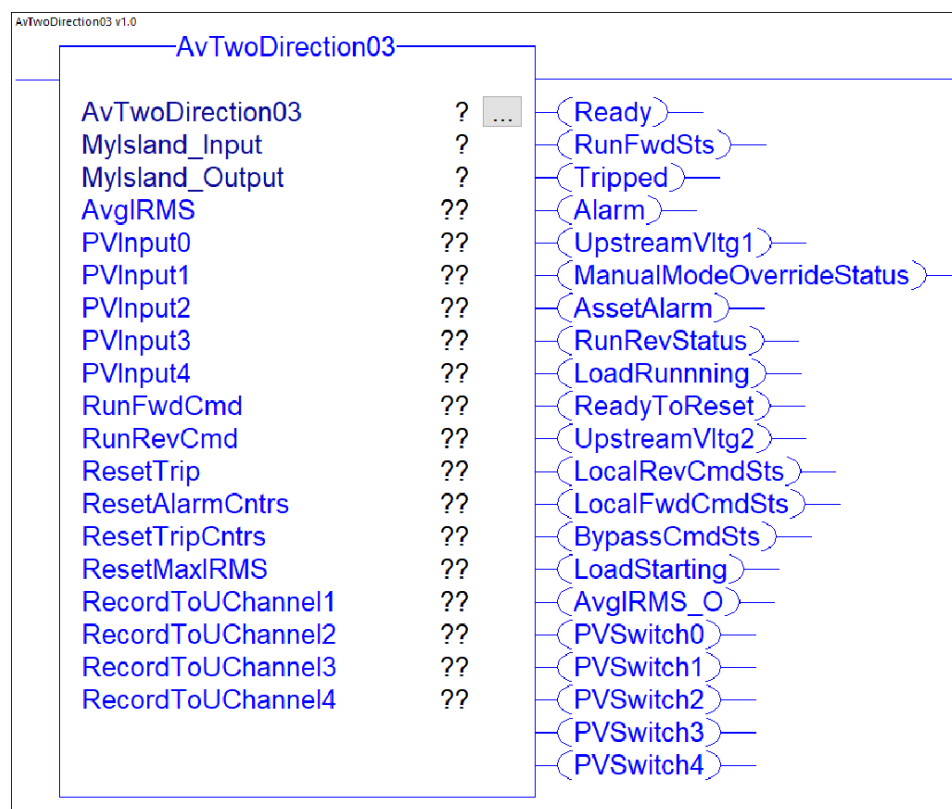
13. Stop categories according to EN/IEC 60204–1.

AvMotorOneDirectionSILStopCat34 Output Interface

| Output | Data Type | Description |
|---------------|-----------|--|
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values.(Unit: mA) |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| Switch1Status | BOOL | If this output is set to TRUE, the avatar forward primary switch is closed. |
| Switch2Status | BOOL | If this output is set to TRUE, the avatar forward redundant switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar (breaker closed). |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |

Motor Two Directions

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

AvMotorTwoDirection Function Block

AvMotorTwoDirection Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average I _{rms} current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvMotorTwoDirection Output Interface

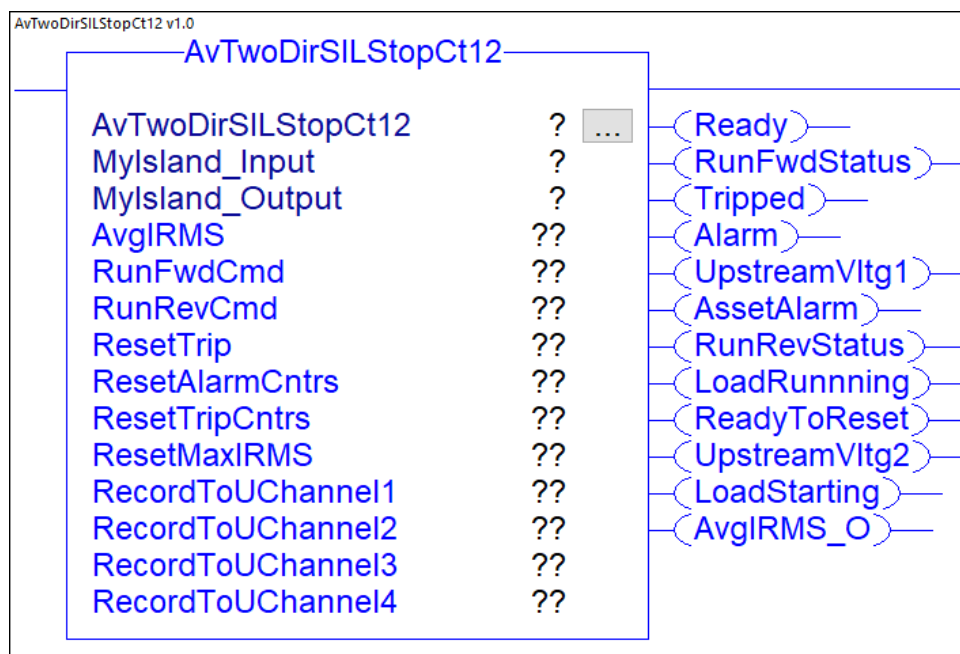
| Output | Data Type | Description |
|--------------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LocalRevCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| ByPassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the starter/power device in this avatar. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

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

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

The **AvMotorTwoDirectionSILStop** function block is used to manage a motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1¹⁴ function compliance for Wiring Category 1 and Category 2.

AvMotorTwoDirectionSILStop Function Block



AvMotorTwoDirectionSILStop Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

14. Stop categories according to EN/IEC 60204–1.

AvMotorTwoDirectionSILStop Output Interface

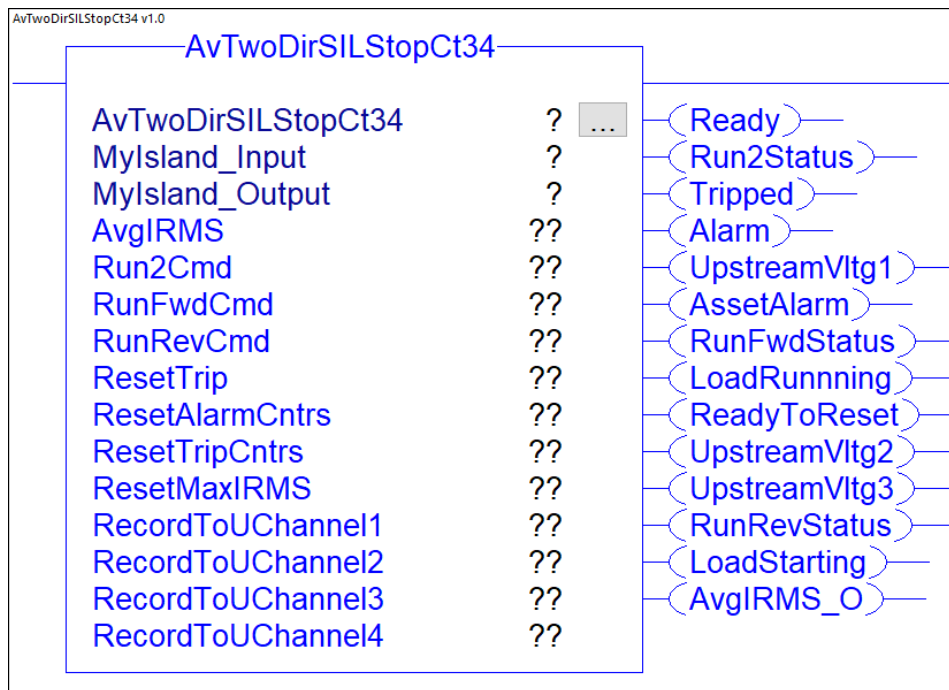
| Output | Data Type | Description |
|---------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

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

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

The **AvMotorTwoDirectionsSILStopCat34** function block is used to manage a motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1¹⁵ function compliance for Wiring Category 3 and Category 4.

AvMotorTwoDirectionsSILStopCat34 Function Block



AvMotorTwoDirectionsSILStopCat34 Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| Run2Cmd | BOOL | If this input is set to TRUE, the avatar forward redundant switch is closed. |
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

15. Stop categories according to EN/IEC 60204–1.

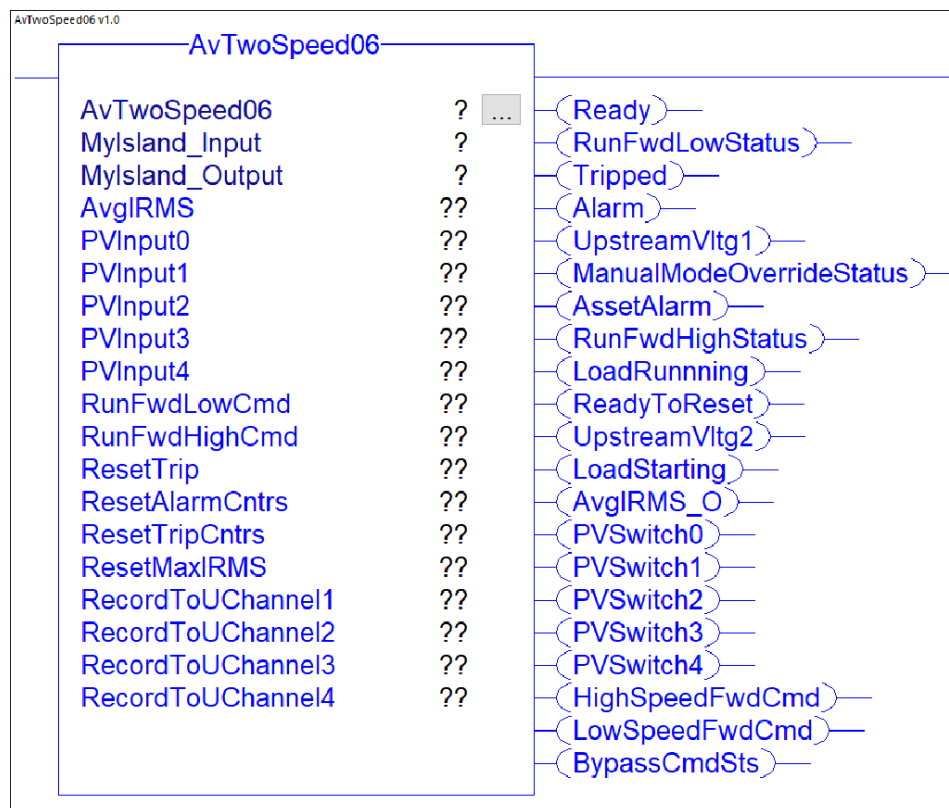
AvMotorTwoDirectionsSILStopCat34 Output Interface

| Output | Data Type | Description |
|---------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| Run2Status | BOOL | If this output is set to TRUE, the avatar forward redundant switch is closed. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar (breaker closed). |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values.(Unit: mA) |

Motor Two Speeds

The **AvMotorTwoSpeeds** function block is used to manage a two speed motor.

AvMotorTwoSpeeds Function Block



AvMotorTwoSpeeds Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvMotorTwoSpeeds Output Interface

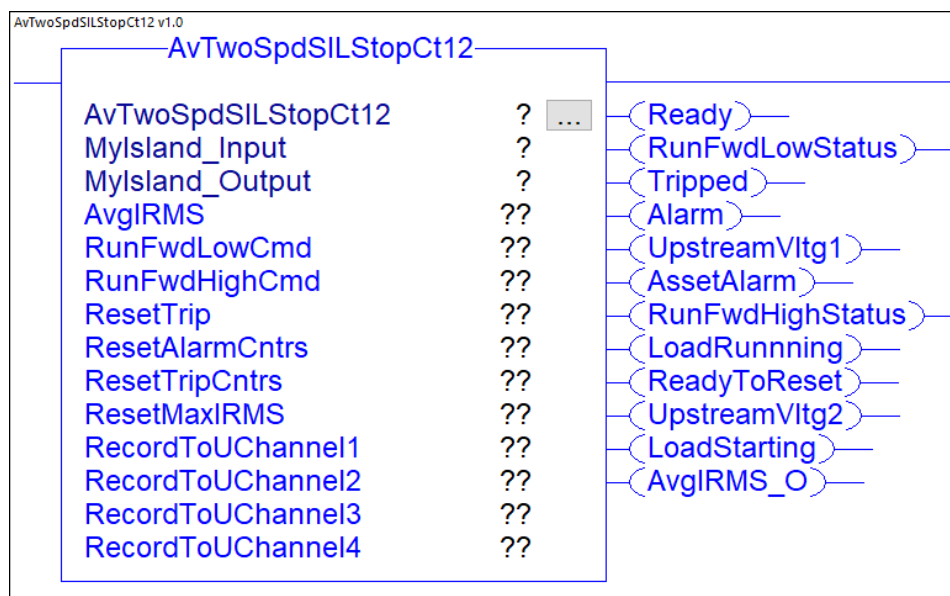
| Output | Data Type | Description |
|--------------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| LocalFwdLowCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalFwdHighCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| ByPassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

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

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

The **AvMotorTwoSpeedsSILStop** function block is used to manage a two speed motor with Stop Category 0 or Stop Category 1¹⁶ function compliance for Wiring Category 1 and Category 2.

AvMotorTwoSpeedsSILStop Function Block



AvMotorTwoSpeedsSILStop Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in the forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in the forward direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

16. Stop categories according to EN/IEC 60204–1.

AvMotorTwoSpeedsSILStop Output Interface

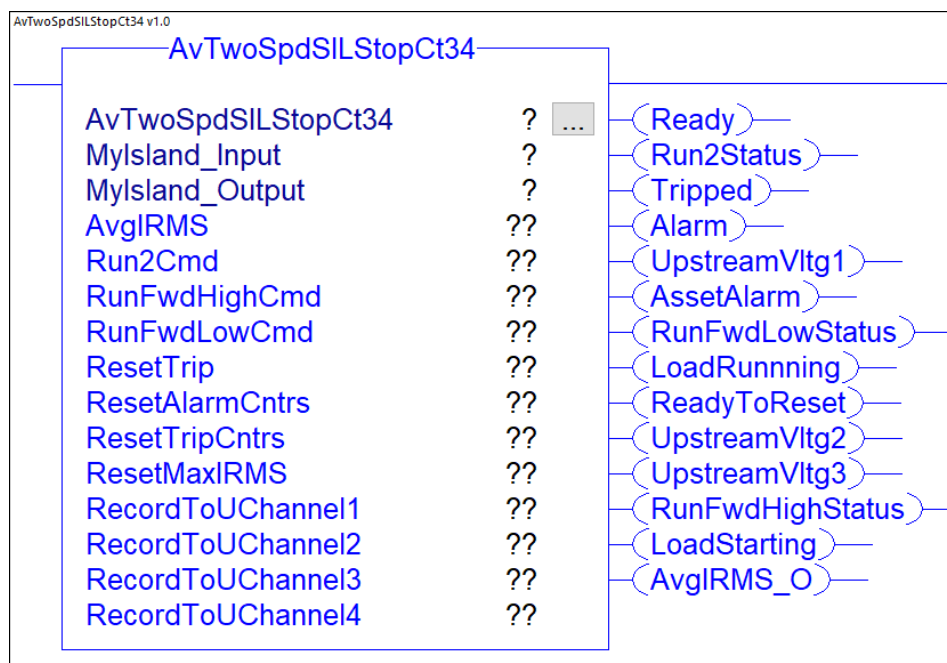
| Output | Data Type | Description |
|------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

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

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

The **AvMotorTwoSpeedsSILStopCat34** function block is used to manage a two speed motor with Stop Category 0 or Stop Category 1¹⁷ function compliance for Wiring Category 3 and Category 4.

AvMotorTwoSpeedsSILStopCat34 Function Block



AvMotorTwoSpeedsSILStopCat34 Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| Run2Cmd | BOOL | If this input is set to TRUE, the avatar forward redundant switch is closed. |
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

17. Stop categories according to EN/IEC 60204–1.

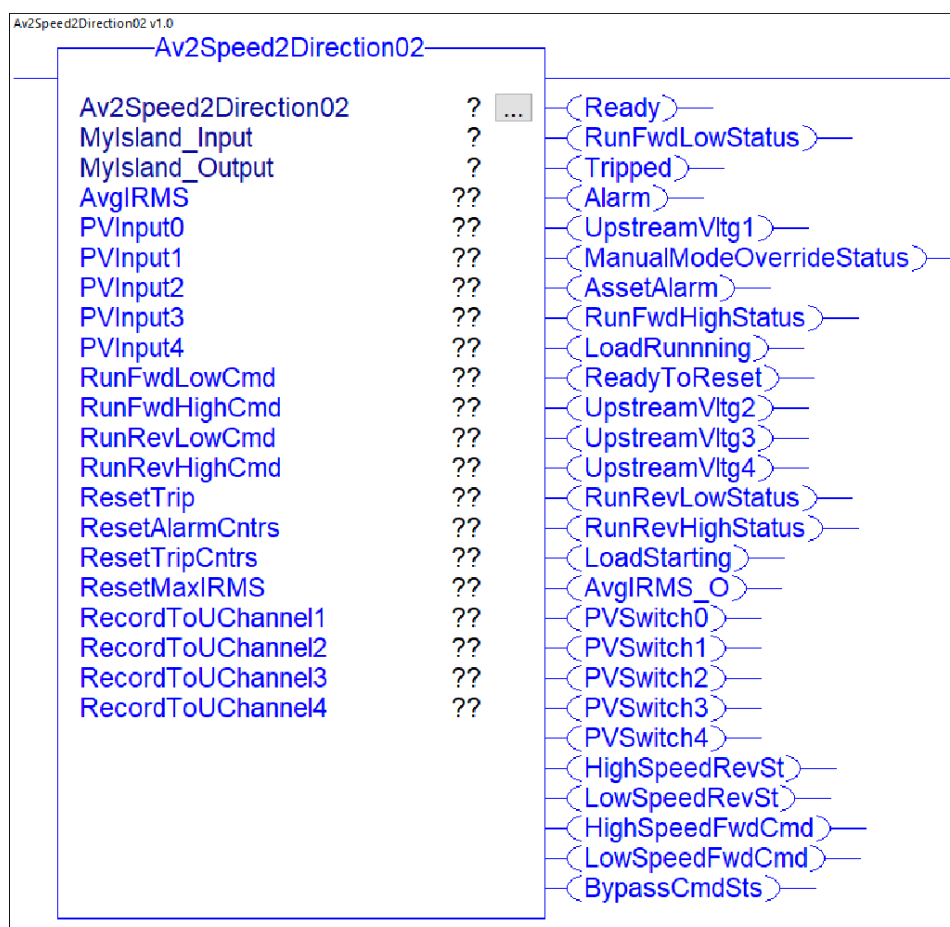
AvMotorTwoSpeedsSILStopCat34 Output Interface

| Output | Data Type | Description |
|------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| Run2Status | BOOL | If this output is set to TRUE, the avatar forward redundant switch is closed. |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

Motor Two Speeds Two Directions

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

AvMotorTwoSpeedsTwo Function Block



AvMotorTwoSpeedsTwo Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with high speed. |
| RunRevLowCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with low speed. |
| RunRevHighCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvMotorTwoSpeedsTwo Output Interface

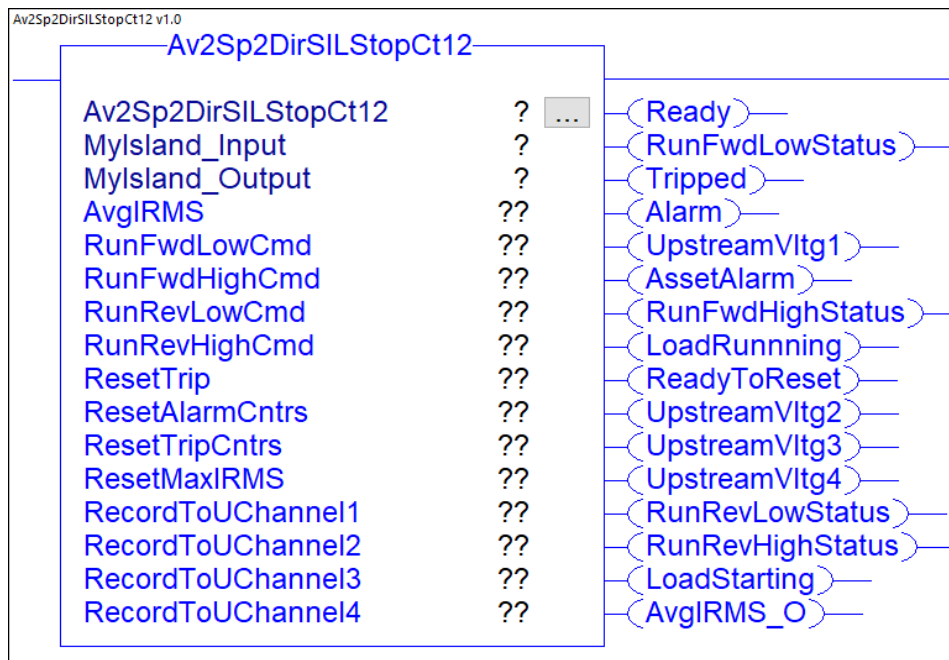
| Output | Data Type | Description |
|--------------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| UpstreamVltg4 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the fourth starter/power device in this avatar. |
| RunRevLowStatus | BOOL | If this output is set to TRUE, the low speed reverser switch is closed. |
| RunRevHighStatus | BOOL | If this output is set to TRUE, the high speed reverser switch is closed. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| LocalFwdLowCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalFwdHighCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalRevLowCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalRevHighCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| ByPassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

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

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

The **AvMotorTwoSpeedsTwoSILStop** function block is used to manage a two speed motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1¹⁸ function compliance for Wiring Category 1 and Category 2.

AvMotorTwoSpeedsTwoSILStop Function Block



AvMotorTwoSpeedsTwoSILStop Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with high speed. |
| RunRevLowCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with low speed. |
| RunRevHighCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

18. Stop categories according to EN/IEC 60204–1.

AvMotorTwoSpeedsTwoSILStop Output Interface

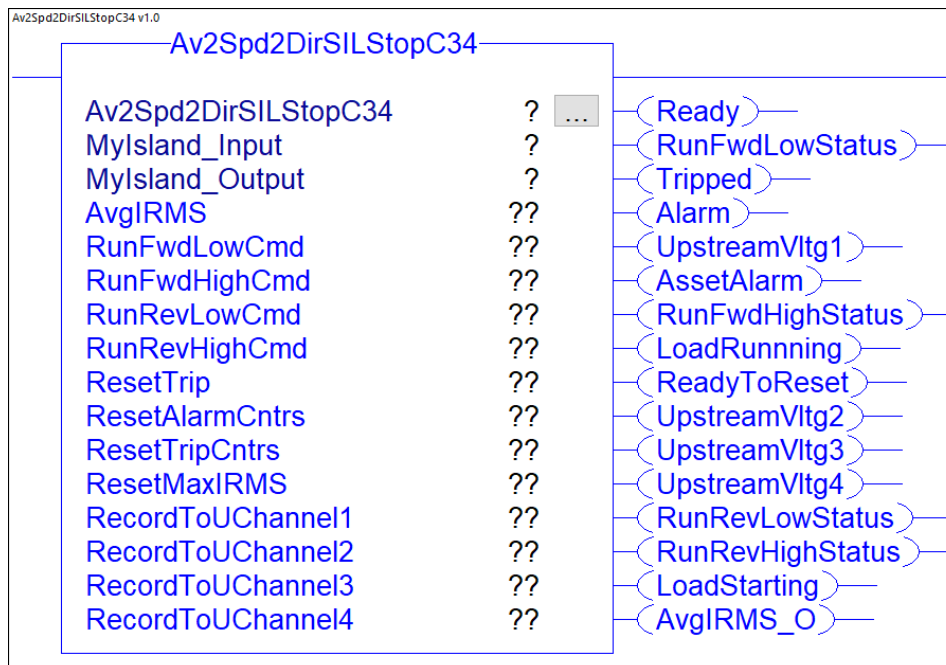
| Output | Data Type | Description |
|------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| UpstreamVltg4 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the fourth starter/power device in this avatar. |
| RunRevLowStatus | BOOL | If this output is set to TRUE, the low speed reverser switch is closed. |
| RunRevHighStatus | BOOL | If this output is set to TRUE, the high speed reverser switch is closed. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

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

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

The **AvMotorTwoSpeedsTwoSILStop** function block is used to manage a two speed motor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1¹⁹ function compliance for Wiring Category 3 and Category 4.

AvMotorTwoSpeedsTwoSILStopCat34 Function Block



AvMotorTwoSpeedsTwoSILStopCat34 Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdLowCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with low speed. |
| RunFwdHighCmd | BOOL | If this input is set to TRUE, the motor starts in forward direction with high speed. |
| RunRevLowCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with low speed. |
| RunRevHighCmd | BOOL | If this input is set to TRUE, the motor starts in reverse direction with high speed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

19. Stop categories according to EN/IEC 60204–1.

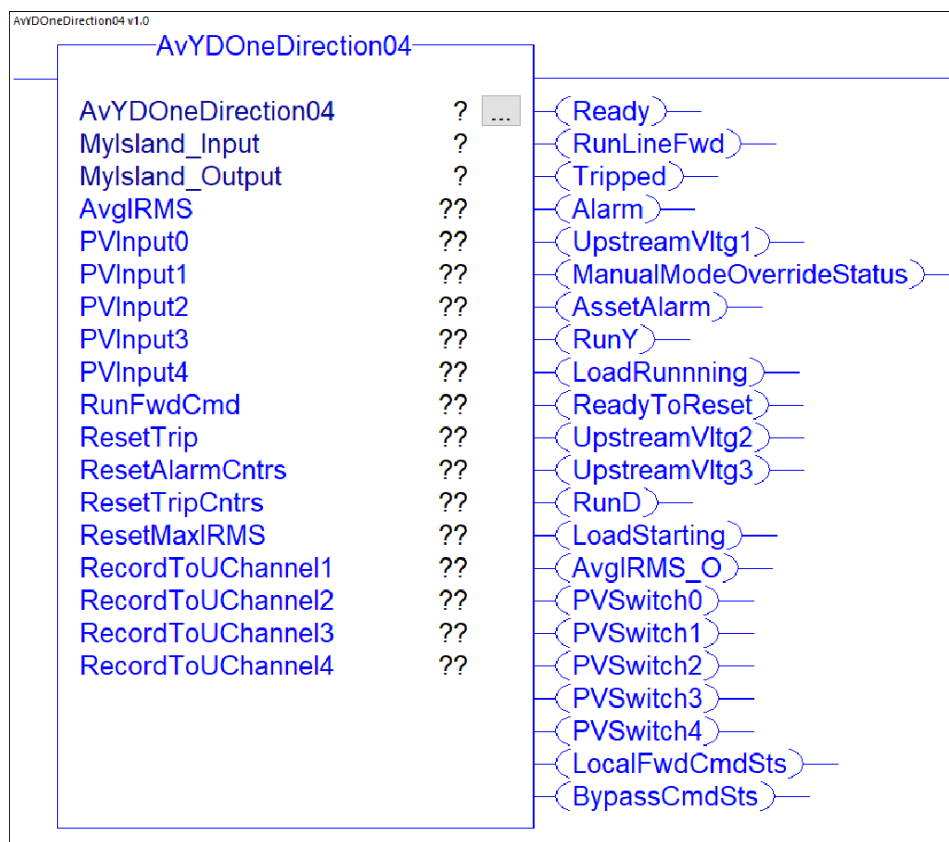
AvMotorTwoSpeedsTwoSILStopCat34 Output Interface

| Output | Data Type | Description |
|------------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdLowStatus | BOOL | If this output is set to TRUE, the motor is running in low speed. If this output is set to FALSE, the motor is stopped or is running in high speed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunFwdHighStatus | BOOL | If this output is set to TRUE, the motor is running in high speed. If this output is set to FALSE, the motor is stopped or is running in low speed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| UpstreamVltg4 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the fourth starter/power device in this avatar. |
| RunRevLowStatus | BOOL | If this output is set to TRUE, the low speed reverser switch is closed. |
| RunRevHighStatus | BOOL | If this output is set to TRUE, the high speed reverser switch is closed. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

Motor Y/D One Direction

The **AvMotorYDOneDirection** function block is used to manage a wye/delta (star/triangle) motor in one direction.

AvMotorYDOneDirection Function Block



AvMotorYDOneDirection Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvMotorYDOneDirection Output Interface

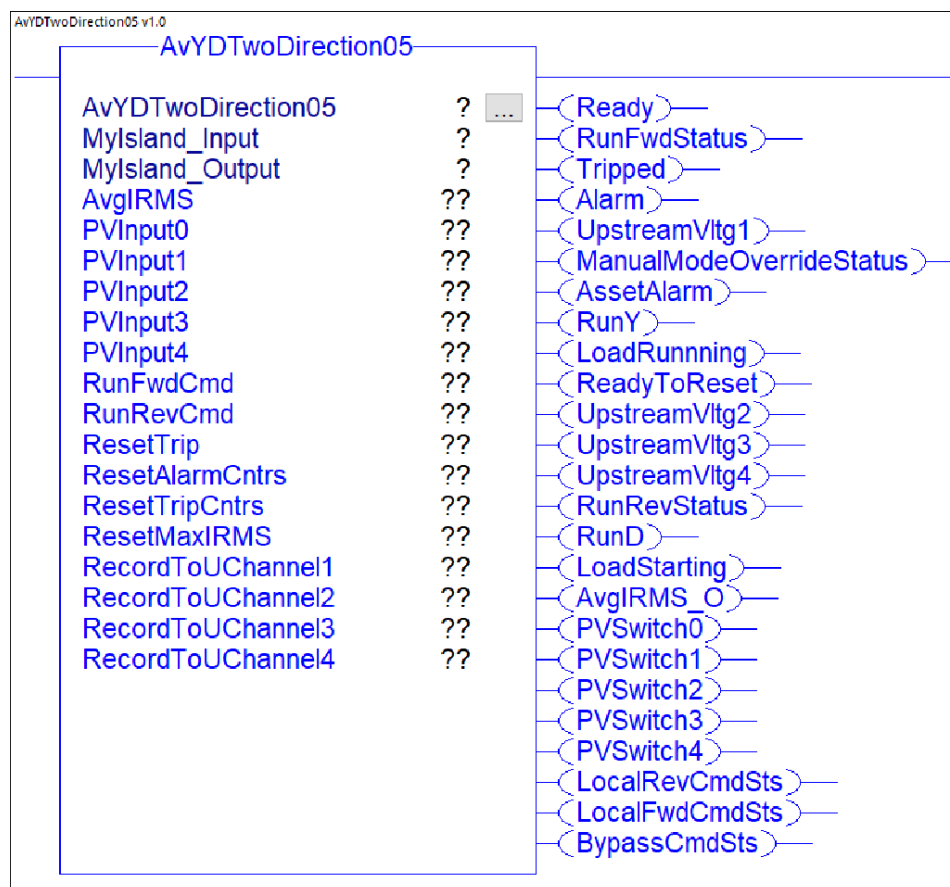
| Output | Data Type | Description |
|--------------------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunLineFwd | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²⁰ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunY | BOOL | If this output is set to TRUE, the Y switch for Motor Y/D avatar is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| RunD | BOOL | If this output is set to TRUE, the D switch for Motor Y/D avatar is closed. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| ByPassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

20. Safety Integrity Level according to standard IEC 61508.

Motor Y/D Two Directions

The **AvMotorYDTwoDirection** function block is used to manage a wye/delta (star/triangle) motor in two directions (forward and reverse).

AvMotorYDTwoDirection Function Block



AvMotorYDTwoDirection Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvMotorYDTwoDirection Output Interface

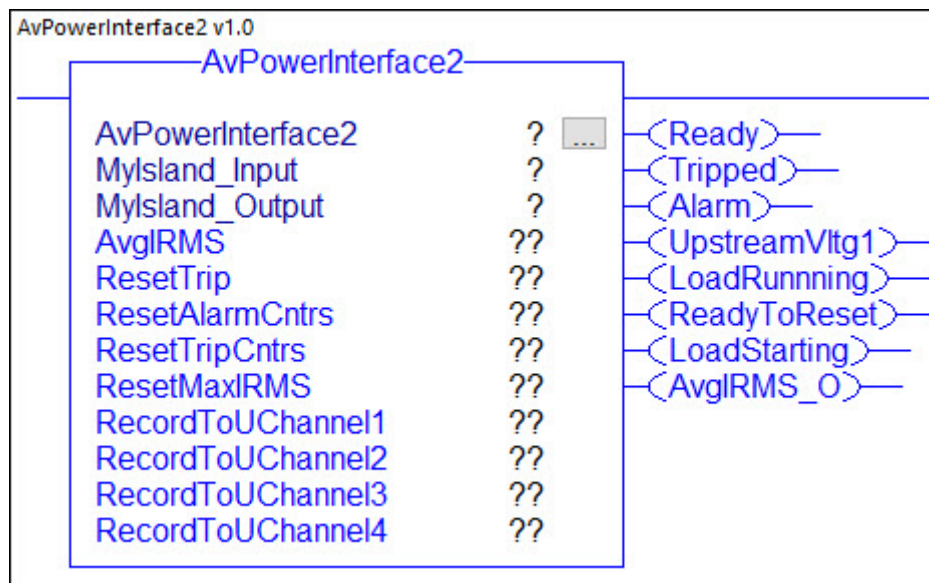
| Output | Data Type | Description |
|--------------------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²¹ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunY | BOOL | If this output is set to TRUE, the Y switch for Motor Y/D avatars is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar. |
| UpstreamVltg3 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the third starter/power device in this avatar. |
| UpstreamVltg4 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the fourth starter/power device in this avatar. |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| RunD | BOOL | If this output is set to TRUE, the D switch for Motor Y/D avatars is closed. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalRevCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| ByPassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

21. Safety Integrity Level according to standard IEC 61508.

Power Interface without I/O (Measure)

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

AvPowerInterface Function Block



AvPowerInterface Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

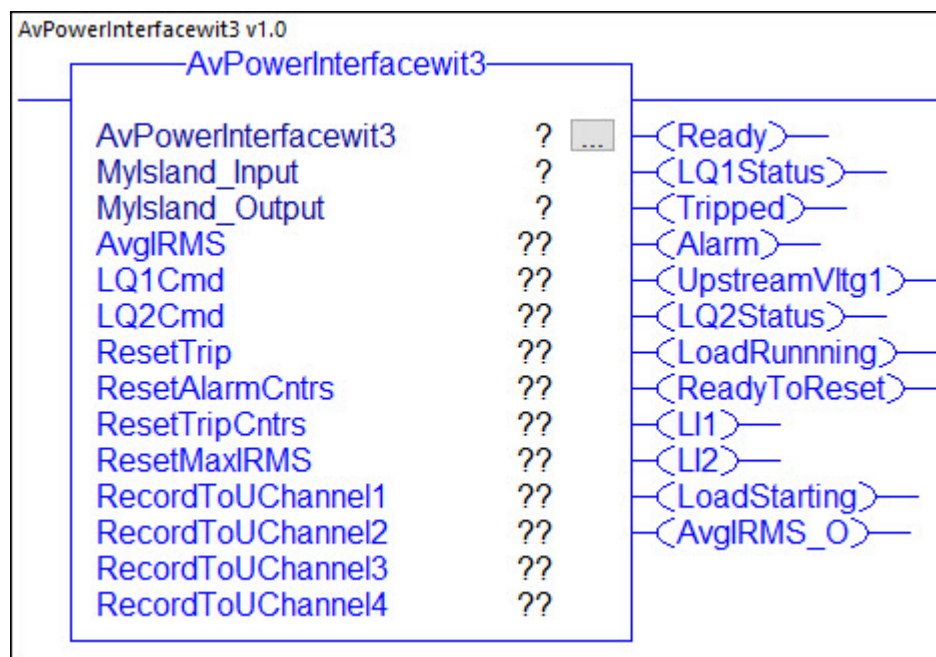
AvPowerInterface Output Interface

| Output | Data Type | Description |
|---------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

Power Interface with I/O (Control)

The **AvPowerInterfacewit** 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.

AvPowerInterfacewit Function Block



AvPowerInterfacewit Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| LQ1Cmd | BOOL | If this input is set to TRUE, the logical output 1 is set to TRUE. |
| LQ2Cmd | BOOL | If this input is set to TRUE, the logical output 2 is set to TRUE. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

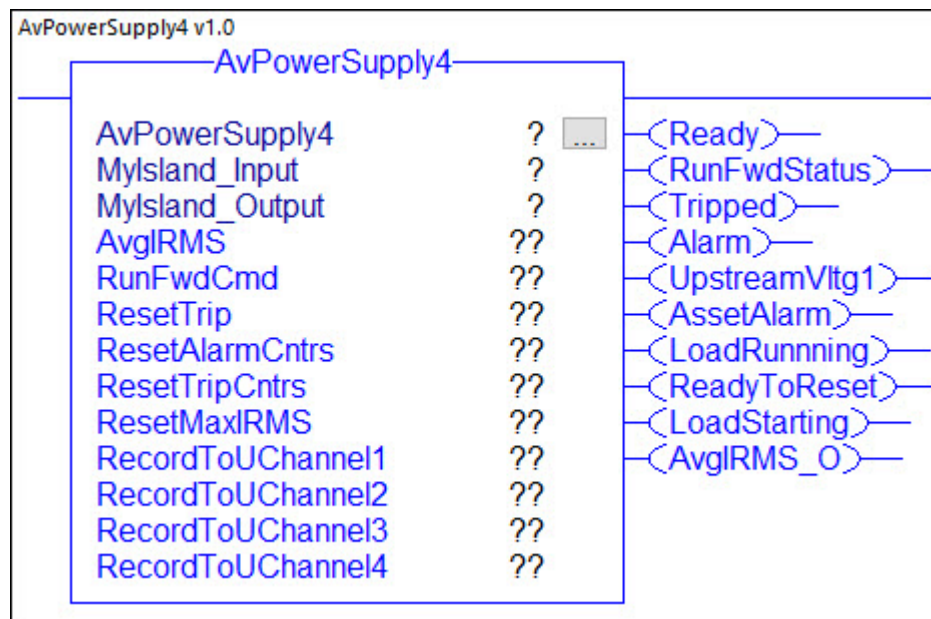
AvPowerInterfacewit Output Interface

| Output | Data Type | Description |
|---------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| LQ1Status | BOOL | If this output is set to TRUE, the logical output 1 is set to TRUE. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| LQ2Status | BOOL | If this output is set to TRUE, the logical output 2 is set to TRUE. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LI1 | BOOL | If this output is set to TRUE, the logical input 1 of the avatar is set to TRUE. |
| LI2 | BOOL | If this output is set to TRUE, the logical input 2 of the avatar is set to TRUE. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values.(Unit: mA) |

Power Supply

The **AvPowerSupply** function block is used to manage a power supply.

AvPowerSupply Function Block



AvPowerSupply Input Interface

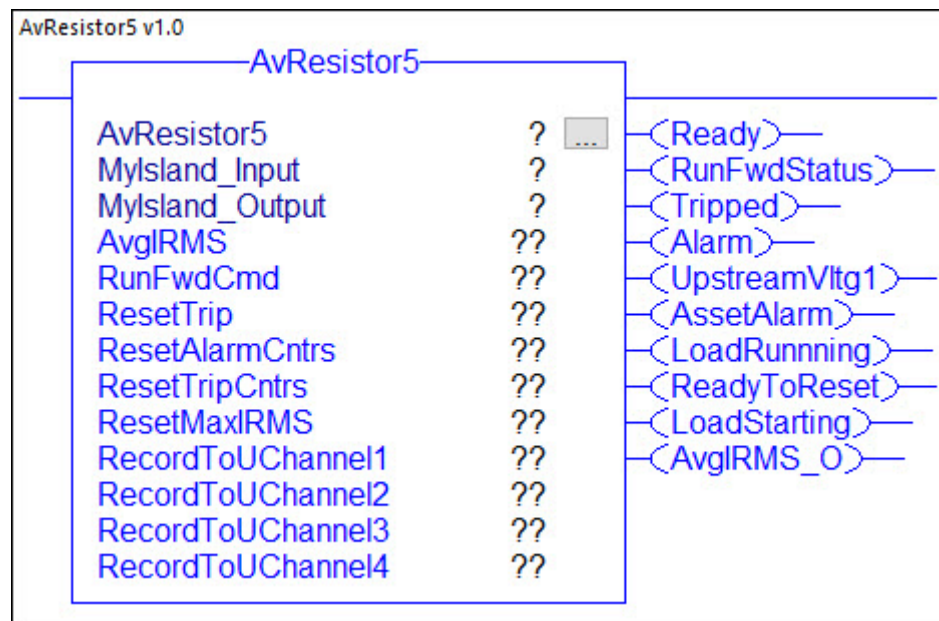
| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvPowerSupply Output Interface

| Output | Data Type | Description |
|---------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²² starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values.(Unit: mA) |

Resistor

The **AvResistor** function block is used to manage a resistive load.

AvResistor Function Block

22. Safety Integrity Level according to standard IEC 61508.

AvResistor Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvResistor Output Interface

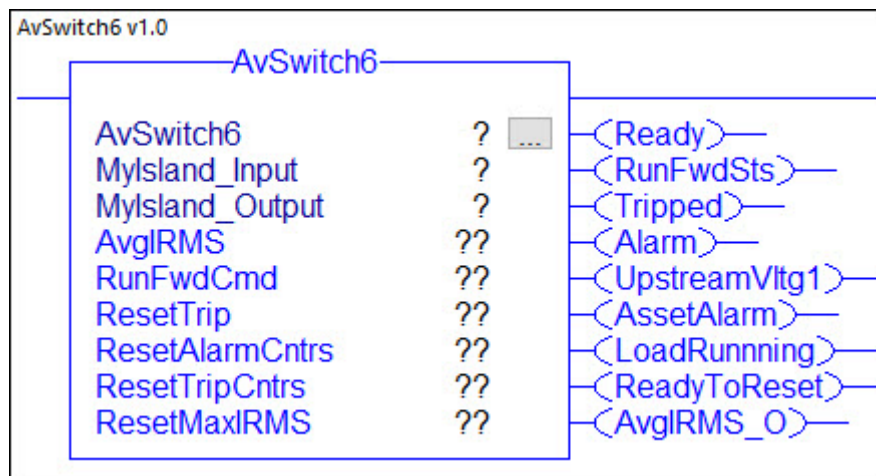
| Output | Data Type | Description |
|---------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²³ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

23. Safety Integrity Level according to standard IEC 61508.

Switch

The **AvSwitch** function block establishes or interrupts a power line in an electric circuit.

AvSwitch Function Block



AvSwitch Input Interface

| Input | Data Type | Description |
|----------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |

AvSwitch Output Interface

| Output | Data Type | Description |
|---------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²⁴ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

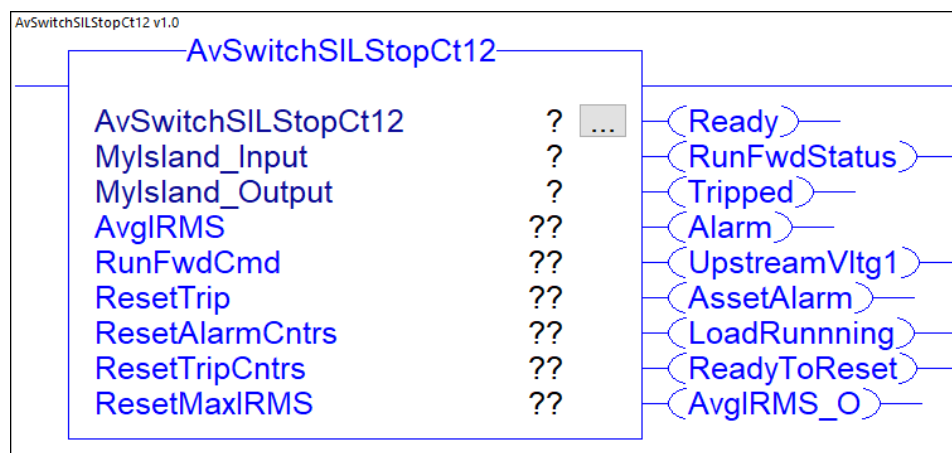
24. Safety Integrity Level according to standard IEC 61508.

Switch - SIL Stop, W. Cat 1/2

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

The **AvSwitchSILStopCat** function block establishes or interrupts a power line in an electric circuit with Stop Category 0 or Stop Category 1²⁵ function compliance for Wiring Category 1 and Category 2.

AvSwitchSILStopCat Function Block



AvSwitchSILStopCat Input Interface

| Input | Data Type | Description |
|----------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |

AvSwitchSILStopCat Output Interface

| Output | Data Type | Description |
|---------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

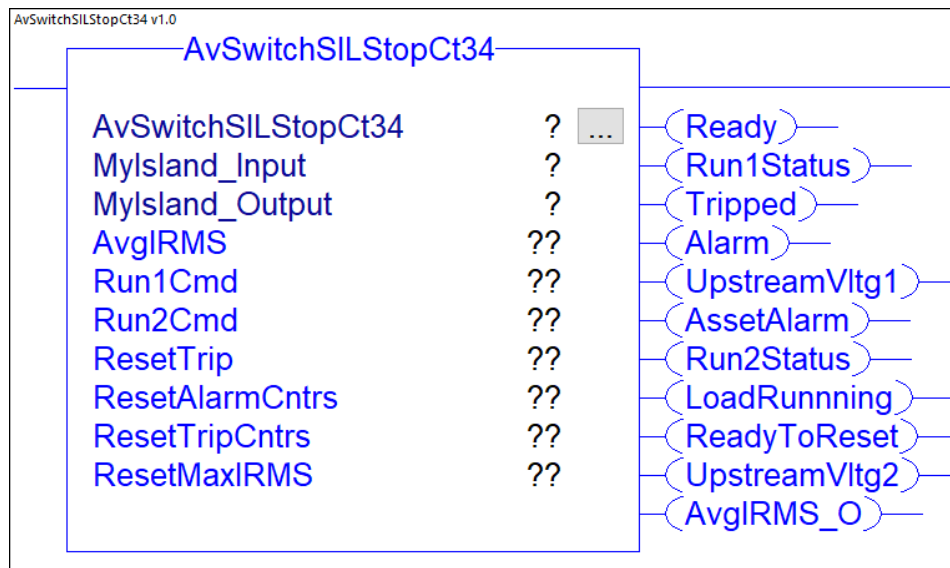
25. Stop categories according to EN/IEC 60204–1.

Switch - SIL Stop, W. Cat 3/4

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

The **AvSwitchSILStopCat34** function block establishes or interrupts a power line in an electric circuit with Stop Category 0 or Stop Category 1²⁶ function compliance for Wiring Category 3 and Category 4.

AvSwitchSILStopCat34 Function Block



AvSwitchSILStopCat34 Input Interface

| Input | Data Type | Description |
|----------------|-----------|--|
| Run1Cmd | BOOL | If this input is set to TRUE, the avatar forward primary switch is closed. |
| Run2Cmd | BOOL | If this input is set to TRUE, the avatar forward redundant switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |

26. Stop categories according to EN/IEC 60204–1.

AvSwitchSILStopCat34 Output Interface

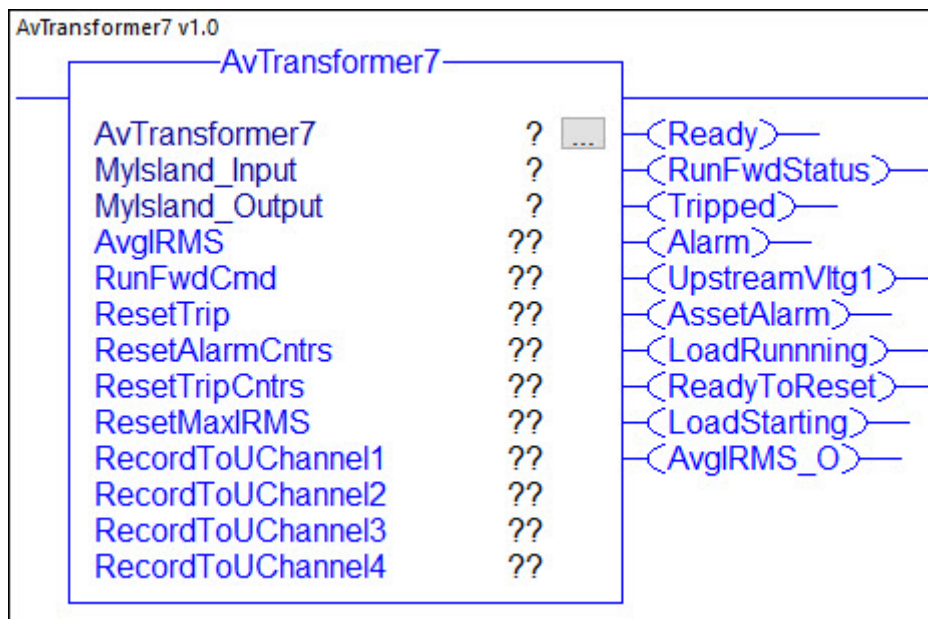
| Output | Data Type | Description |
|---------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| Run1Status | BOOL | If this output is set to TRUE, the avatar forward primary switch is closed. |
| Run2Status | BOOL | If this output is set to TRUE, the avatar forward redundant switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²⁷ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

27. Safety Integrity Level according to standard IEC 61508.

Transformer

The **AvTransformer** function block is used to manage a transformer.

AvTransformer Function Block



AvTransformer Input Interface

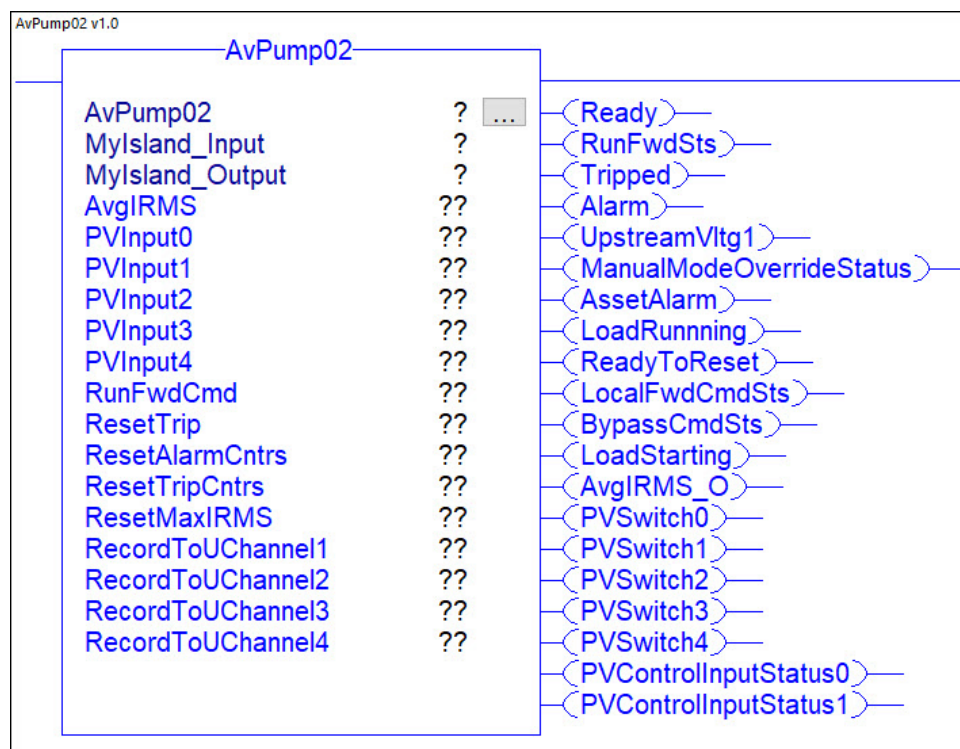
| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvTransformer Output Interface

| Output | Data Type | Description |
|---------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²⁸ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |

Pump

The **AvPump** function block is used to manage a pump.

AvPump Function Block

28. Safety Integrity Level according to standard IEC 61508.

AvPump Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvPump Output Interface

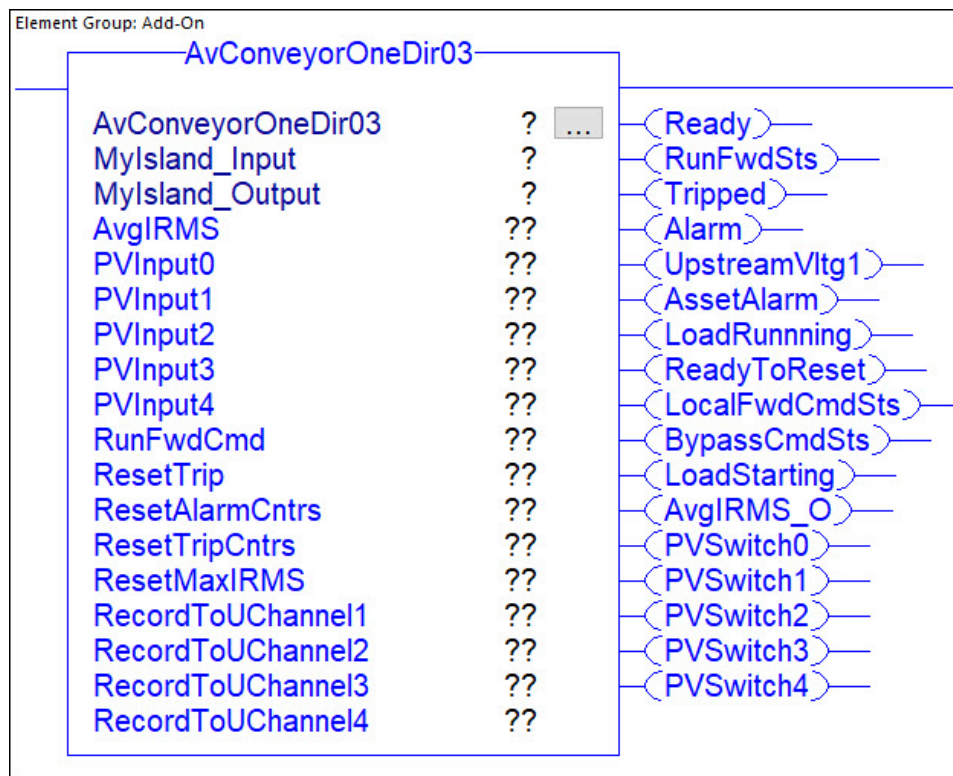
| Output | Data Type | Description |
|--------------------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ²⁹ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| ManualModeOverrideStatus | BOOL | If this output is set to TRUE, the avatar is controlled by local command and PV control when in manual mode. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PVInput4 | INT | |
| PVSwitch0 | BOOL | 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. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |
| PVControlInputStatus0 | BOOL | If this output is set to TRUE, a command has been sent to the avatar from a PV Control Input. |
| PVControlInputStatus1 | BOOL | If this output is set to TRUE, a command has been sent to the avatar from a PV Control Input. |

29. Safety Integrity Level according to standard IEC 61508.

Conveyor One Direction

The **AvConveyorOneDir** function block is used to manage a conveyor in one direction.

AvConveyorOneDir Function Block



AvConveyorOneDir Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvConveyorOneDir Output Interface

| Output | Data Type | Description |
|----------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ³⁰ starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PvInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

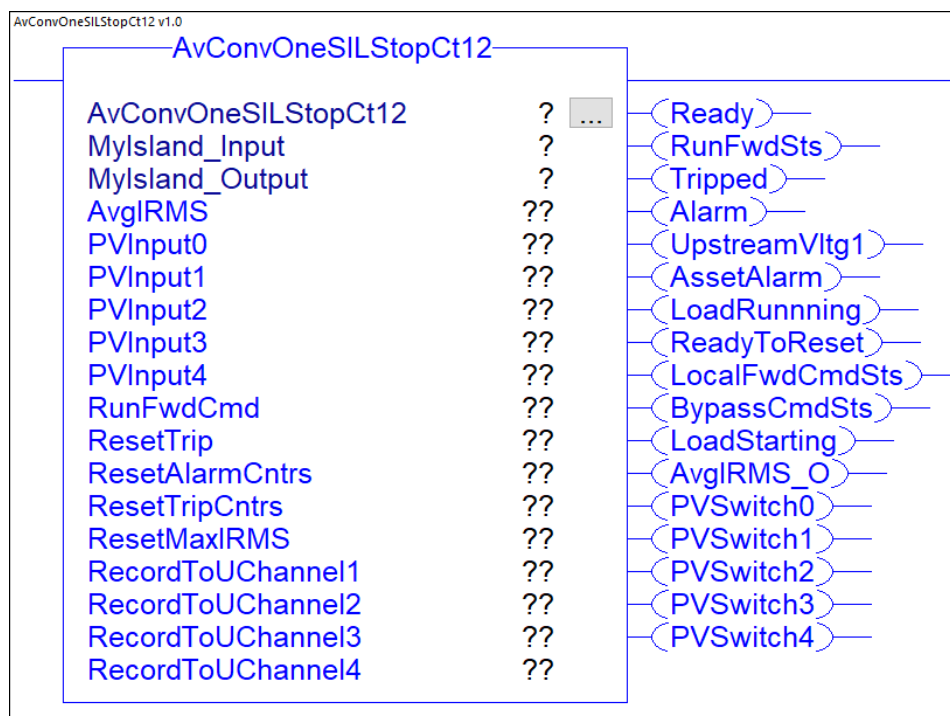
30. Safety Integrity Level according to standard IEC 61508.

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

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

The **AvSILStopConveyorOne** function block is used to manage a conveyor in one direction with Stop Category 0 or Stop Category 1³¹ function compliance for Wiring Category 1 and Category 2.

AvSILStopConveyorOne Function Block



AvSILStopConveyorOneDir Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

31. Stop categories according to EN/IEC 60204–1.

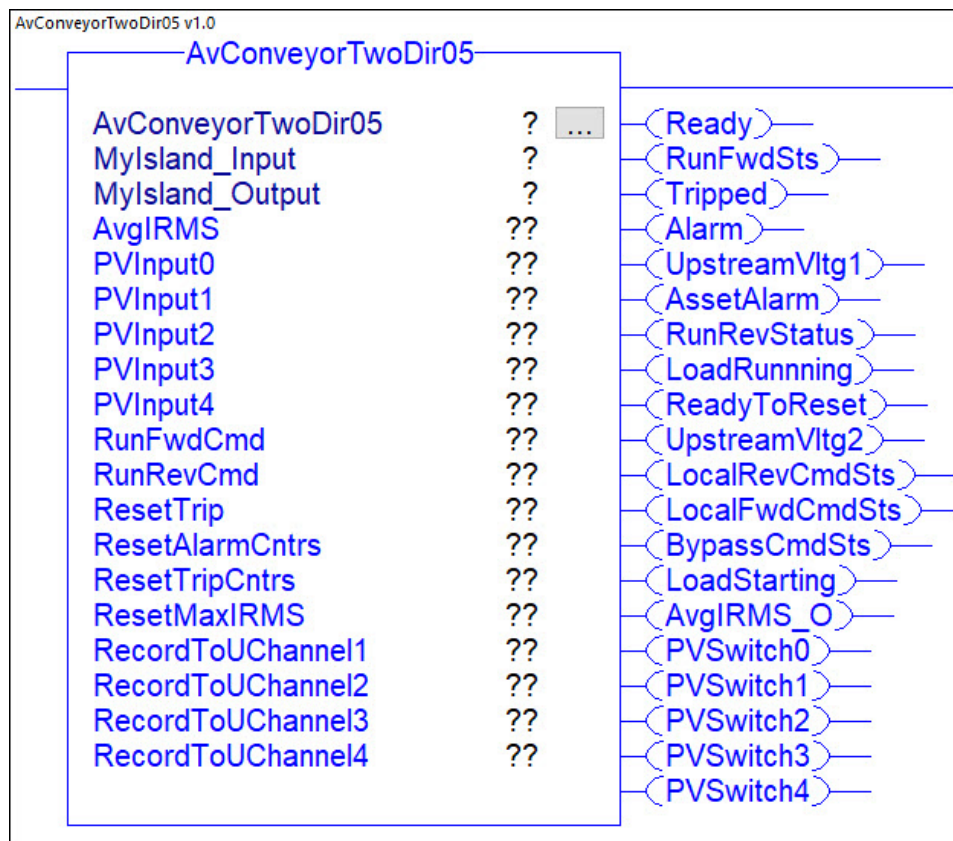
AvSILStopConveyorOneDir Output Interface

| Output | Data Type | Description |
|----------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PvInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

Conveyor Two Directions

The **AvConveyorTwoDir** function block is used to manage a conveyor in two directions (forward and reverse).

AvConveyorTwoDir Function Block



AvConveyorTwoDir Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

AvConveyorTwoDir Output Interface

| Output | Data Type | Description |
|----------------|-----------|---|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL ³² starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar (breaker closed). |
| LocalRevCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PvInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

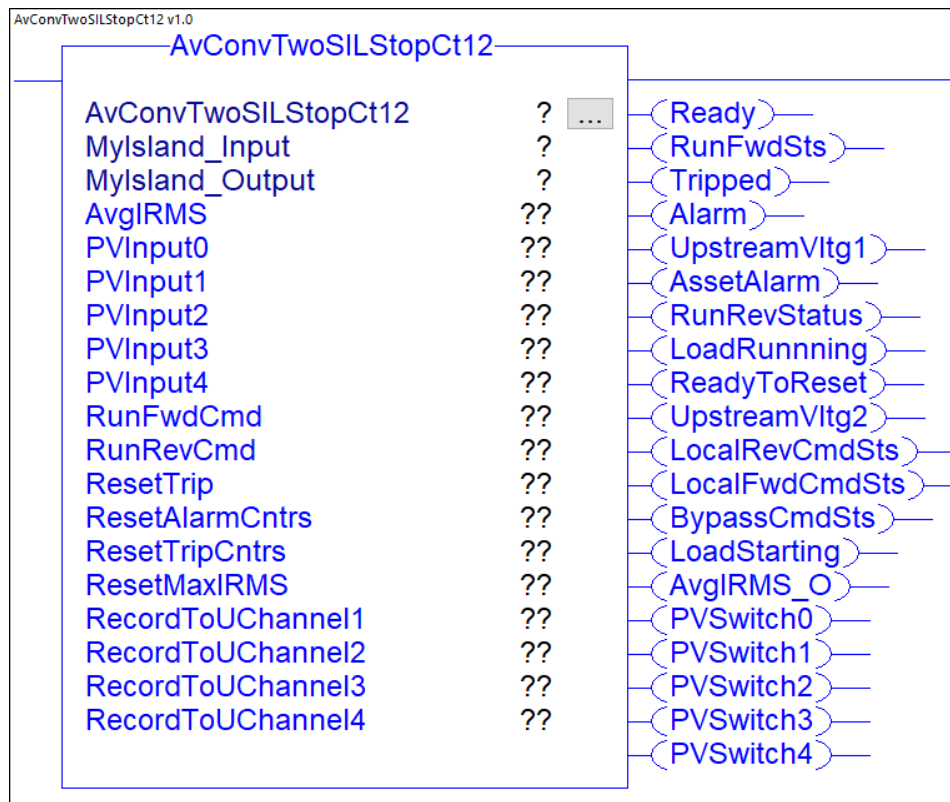
32. Safety Integrity Level according to standard IEC 61508.

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

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

The **AvSILStopConveyorTwoDir** function block is used to manage a conveyor in two directions (forward and reverse) with Stop Category 0 or Stop Category 1³³ function compliance for Wiring Category 1 and Category 2.

AvSILStopConveyorTwoDir Function Block



AvSILStopConveyorTwoDir Input Interface

| Input | Data Type | Description |
|-------------------|-----------|--|
| RunFwdCmd | BOOL | If this input is set to TRUE, the avatar forward switch is closed. |
| RunRevCmd | BOOL | If this input is set to TRUE, the avatar reverse switch is closed. |
| ResetTrip | BOOL | If this input is set to TRUE, detected trips whose trip reset conditions have been met will reset for this avatar. |
| ResetAlarmCnts | BOOL | If this input is set to TRUE, all alarm counters are reset for this avatar. |
| ResetTripCnts | BOOL | If this input is set to TRUE, all trip counters are reset for this avatar. |
| ResetMaxIRMS | BOOL | If this input is set to TRUE, the maximum average Irms current value and the timestamp are reset. |
| RecordToUChannel1 | BOOL | If this input is set to TRUE, the corresponding Time of Use Channel increments, based on measured energy for the selected avatar. This ToU recording continues for the enabled channels until they are disabled. |
| RecordToUChannel2 | BOOL | |
| RecordToUChannel3 | BOOL | |
| RecordToUChannel4 | BOOL | |

33. Stop categories according to EN/IEC 60204–1.

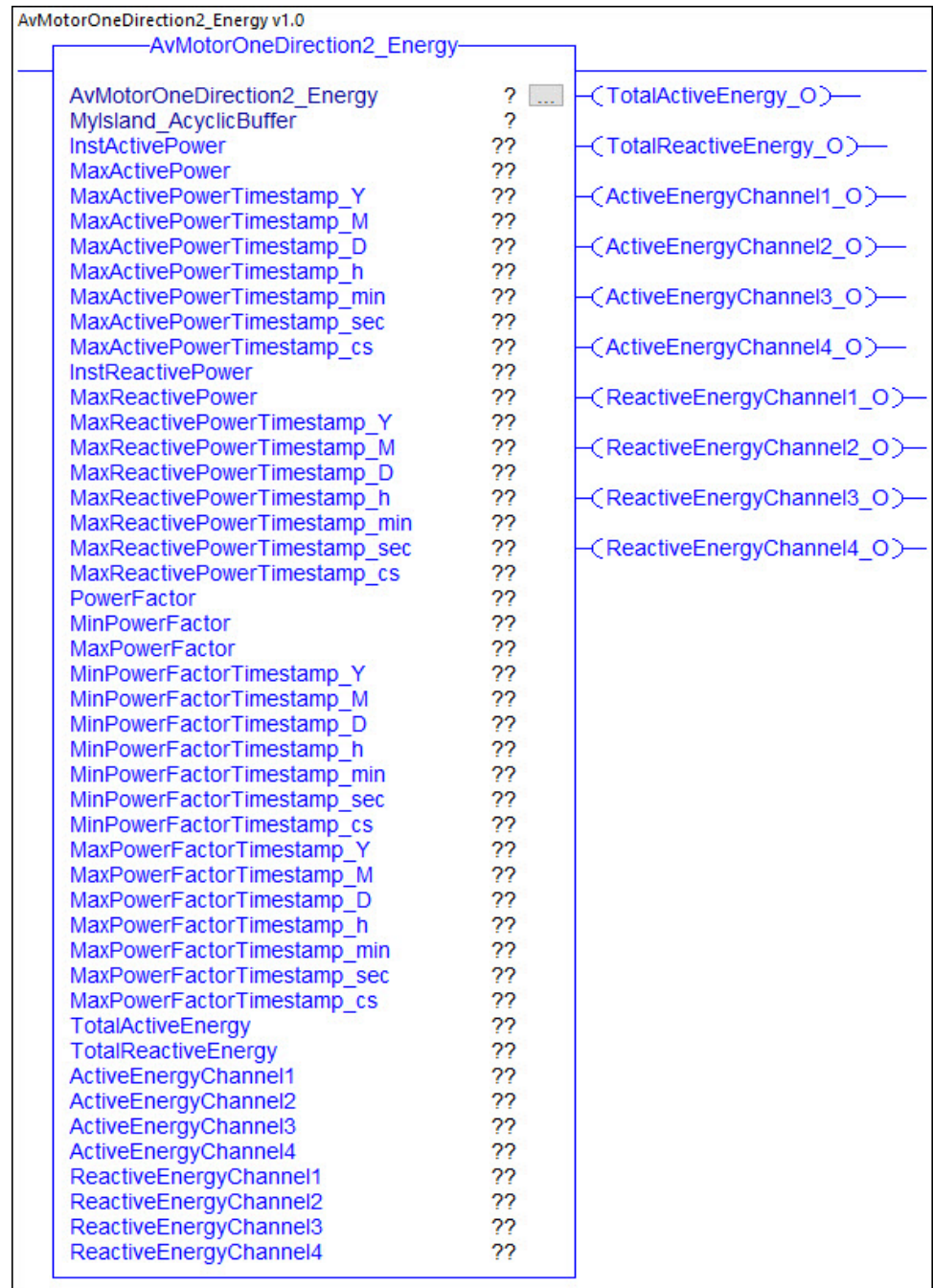
AvSILStopConveyorTwoDir Output Interface

| Output | Data Type | Description |
|----------------|-----------|--|
| Ready | BOOL | Indicates TRUE if the function block is ready to receive an execute command. |
| RunFwdStatus | BOOL | If this output is set to TRUE, the avatar forward switch is closed. |
| Tripped | BOOL | If this output is set to TRUE, a protection trip event has been detected by the avatar. |
| Alarm | BOOL | If this output is set to TRUE, a protection alarm has been detected by the avatar. |
| UpstreamVltg1 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the first starter/power device in this avatar (breaker closed). |
| AssetAlarm | BOOL | If this output is set to TRUE, a power device or SIL starter within the avatar has reached or exceeded 90% of the expected durability (per avatar parameter). |
| RunRevStatus | BOOL | If this output is set to TRUE, the avatar reverse switch is closed. |
| LoadRunning | BOOL | If this output is set to TRUE, 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). |
| ReadyToReset | BOOL | If this output is set to TRUE, the avatar meets the trip reset conditions and can be reset with a trip reset command. |
| UpstreamVltg2 | BOOL | If this output is set to TRUE, the avatar has detected that upstream main power is present for the second starter/power device in this avatar (breaker closed). |
| LocalRevCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| LocalFwdCmdSts | BOOL | If this output is set to TRUE, the avatar logic is controlled by commands received on digital inputs, and PLC commands are ignored. |
| BypassCmdSts | BOOL | If this output is set to TRUE, the avatar will continue operation and not stop due to a trip. |
| LoadStarting | BOOL | If this output is set to TRUE, the motor is in start phase. |
| AvgIRMS | DINT | Indicates the average of the most recent phase current Irms values. (Unit: mA) |
| AvgIRMS_O | DINT | Indicates the average of the most recent phase current Irms overflow values. (Unit: mA) |
| PVInput0 | INT | Returns the measured value of the PV Input. |
| PVInput1 | INT | |
| PVInput2 | INT | |
| PVInput3 | INT | |
| PvInput4 | INT | |
| PVSwitch0 | BOOL | If this output is set to TRUE, the PV Switch represents an ON command. |
| PVSwitch1 | BOOL | |
| PVSwitch2 | BOOL | |
| PVSwitch3 | BOOL | |
| PVSwitch4 | BOOL | |

Energy

The **Avatar_Energy** function block returns the status of the acyclic energy data of the specified avatar.

Avatar_Energy Function Block



Avatar_Energy Output Interface

| Output | Data Type | Description |
|-----------------|-----------|---|
| InstActivePower | DINT | Total active power for the avatar. (Unit: W) |
| MaxActivePower | DINT | Maximum value of the active power for the avatar. (Unit: W) |

Avatar_Energy Output Interface (Continued)

| Output | Data Type | Description |
|-------------------------------|-----------|---|
| MaxActivePowerTimestamp_Y | DINT | Date and time when the maximum active power value was recorded. |
| MaxActivePowerTimestamp_M | SINT | |
| MaxActivePowerTimestamp_D | SINT | |
| MaxActivePowerTimestamp_h | SINT | |
| MaxActivePowerTimestamp_min | SINT | |
| MaxActivePowerTimestamp_sec | SINT | |
| MaxActivePowerTimestamp_cs | SINT | |
| InstReactivePower | DINT | Total reactive power for the avatar. (Unit: VAR) |
| MaxReactivePower | DINT | Maximum value of the reactive power for the avatar. (Unit: VAR) |
| MaxReactivePowerTimestamp_Y | DINT | Date and time when the maximum reactive power value was recorded. |
| MaxReactivePowerTimestamp_M | SINT | |
| MaxReactivePowerTimestamp_D | SINT | |
| MaxReactivePowerTimestamp_h | SINT | |
| MaxReactivePowerTimestamp_min | SINT | |
| MaxReactivePowerTimestamp_sec | SINT | |
| MaxReactivePowerTimestamp_cs | SINT | |
| PowerFactor | SINT | True power factor value. |
| MinPowerFactor | SINT | True minimum power factor value. |
| MaxPowerFactor | SINT | True maximum power factor value. |
| MinPowerFactorTimestamp_Y | DINT | Date and time when the minimum power factor value was recorded. |
| MinPowerFactorTimestamp_M | SINT | |
| MinPowerFactorTimestamp_D | SINT | |
| MinPowerFactorTimestamp_h | SINT | |
| MinPowerFactorTimestamp_min | SINT | |
| MinPowerFactorTimestamp_sec | SINT | |
| MinPowerFactorTimestamp_cs | SINT | |
| MaxPowerFactorTimestamp_Y | DINT | Date and time when the maximum power factor value was recorded. |
| MaxPowerFactorTimestamp_M | SINT | |
| MaxPowerFactorTimestamp_D | SINT | |
| MaxPowerFactorTimestamp_h | SINT | |
| MaxPowerFactorTimestamp_min | SINT | |
| MaxPowerFactorTimestamp_sec | SINT | |
| MaxPowerFactorTimestamp_cs | SINT | |
| TotalActiveEnergy | DINT | Total active energy value for all avatars in the system with Energy Monitoring Enabled. (Unit: Watt-hours) |
| TotalActiveEnergy_O | BOOL | Total active energy overflow value for all avatars in the system with Energy Monitoring Enabled. |
| TotalReactiveEnergy | DINT | Total reactive energy value for all avatars in the system with Energy Monitoring Enabled. (Unit: VAR-hours) |
| TotalReactiveEnergy_O | BOOL | Total reactive energy overflow value for all avatars in the system with Energy Monitoring Enabled. |
| ActiveEnergyChannel1 | DINT | Channel 1: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel1_O | BOOL | Channel 1: ToU (Time of Use) total active energy overflow value. |

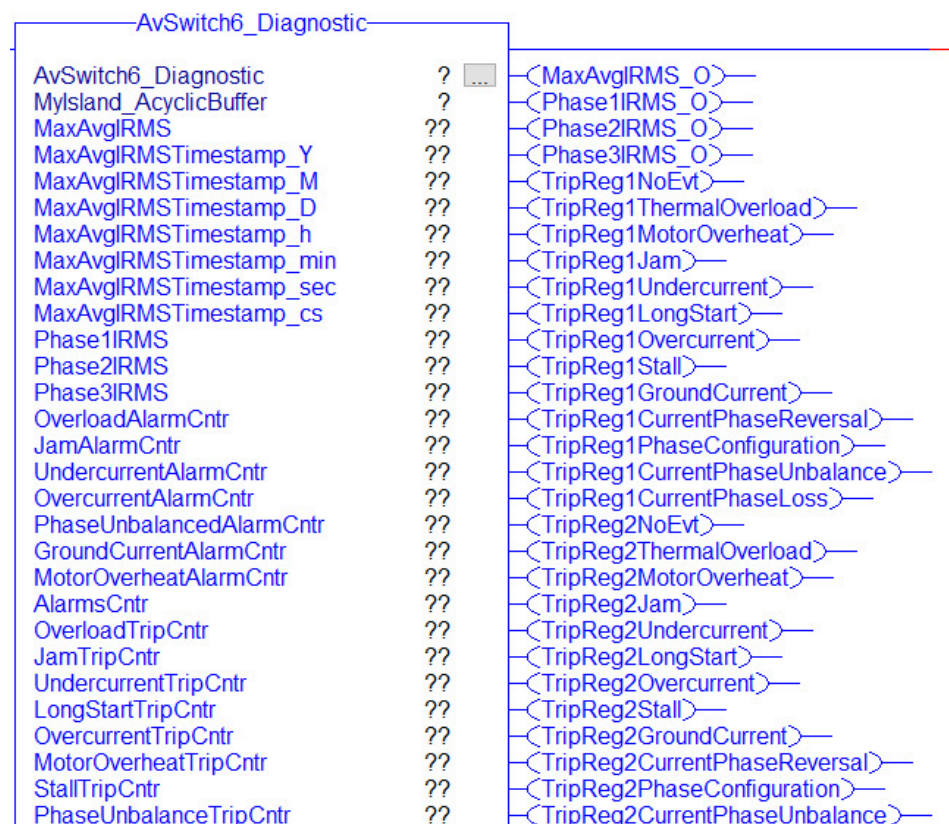
Avatar_Energy Output Interface (Continued)

| Output | Data Type | Description |
|--------------------------|-----------|---|
| ActiveEnergyChannel2 | DINT | Channel 2: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel2_O | BOOL | Channel 2: ToU (Time of Use) total active energy overflow value. |
| ActiveEnergyChannel3 | DINT | Channel 3: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel3_O | BOOL | Channel 3: ToU (Time of Use) total active energy overflow value. |
| ActiveEnergyChannel4 | DINT | Channel 4: ToU (Time of Use) total active energy value. |
| ActiveEnergyChannel4_O | BOOL | Channel 4: ToU (Time of Use) total active energy overflow value. |
| ReactiveEnergyChannel1 | DINT | Channel 1: ToU (Time of Use) total reactive energy value. |
| ReactiveEnergyChannel1_O | BOOL | Channel 1: ToU (Time of Use) total reactive energy overflow value. |
| ReactiveEnergyChannel2 | DINT | Channel 2: ToU (Time of Use) total reactive energy value. |
| ReactiveEnergyChannel2_O | BOOL | Channel 2: ToU (Time of Use) total reactive energy overflow value. |
| ReactiveEnergyChannel3 | DINT | Channel 3: ToU (Time of Use) total reactive energy value. |
| ReactiveEnergyChannel3_O | BOOL | Channel 3: ToU (Time of Use) total reactive energy overflow value. |
| ReactiveEnergyChannel4 | DINT | Channel 4: ToU (Time of Use) total reactive energy value. |
| ReactiveEnergyChannel4_O | BOOL | Channel 4: ToU (Time of Use) total reactive energy overflow value. |

Diagnostic

The **Avatar_Diagnostic** function block returns the status of the acyclic diagnostic data of the specified avatar.

Avatar_Diagnostic Function Block



NOTE: Not all the outputs listed in the following table are captured in the screen shot above.

Avatar_Diagnostic Output Interface

| Output | Data Type | Description |
|-------------------------|-----------|---|
| MaxAvgIRMS | DINT | Maximum average Irms current value. |
| MaxAvgIRMS_O | DINT | Maximum average Irms current overflow value. |
| MaxAvgIRMSTimestamp_Y | DINT | Date and time when the maximum average Irms current value was recorded. |
| MaxAvgIRMSTimestamp_M | SINT | |
| MaxAvgIRMSTimestamp_D | SINT | |
| MaxAvgIRMSTimestamp_h | SINT | |
| MaxAvgIRMSTimestamp_min | SINT | |
| MaxAvgIRMSTimestamp_sec | SINT | |
| MaxAvgIRMSTimestamp_cs | SINT | |
| Phase1IRMS | DINT | Value of the phase L1 Irms. (Unit: mA) |
| Phase1IRMS_O | DINT | Overflow value of the phase L1 Irms. |
| Phase2IRMS | DINT | Value of the phase L2 Irms. (Unit: mA) |
| Phase2IRMS_O | DINT | Overflow value of the phase L2 Irms. |
| Phase3IRMS | DINT | Value of the phase L3 Irms. (Unit: mA) |
| Phase3IRMS_O | DINT | Overflow value of the phase L3 Irms. |
| OverloadAlarmCntr | DINT | Counter of advisories related to thermal overload protection. |

Avatar_Diagnostic Output Interface (Continued)

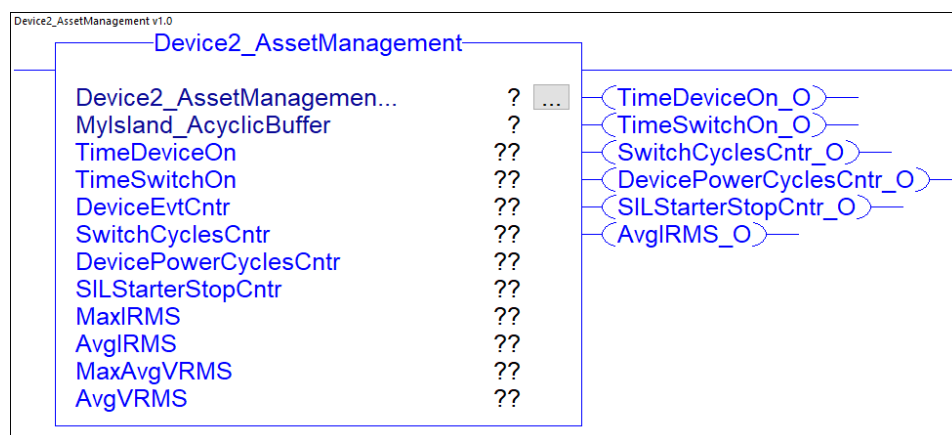
| Output | Data Type | Description |
|-------------------------------|-----------|--|
| JamAlarmCntr | DINT | Counter of advisories related to jam protection. |
| UndercurrentAlarmCntr | DINT | Counter of advisories related to undercurrent protection. |
| OvercurrentAlarmCntr | DINT | Counter of advisories related to overcurrent protection. |
| PhaseUnbalancedAlarmCntr | DINT | Counter of advisories related to phase unbalance protection. |
| GroundCurrentAlarmCntr | DINT | Counter of advisories related to ground current protection. |
| MotorOverheatAlarmCntr | DINT | Counter of motor overheat events. |
| AlarmsCntr | DINT | Counter of advisories related to protections. |
| OverloadTripCntr | DINT | Counter of trips related to thermal overload protection. |
| JamTripCntr | DINT | Counter of trips related to jam protection. |
| UndercurrentTripCntr | DINT | Counter of trips related to undercurrent protection. |
| LongStartTripCntr | DINT | Counter of trips related to long start protection. |
| OvercurrentTripCntr | DINT | Counter of trips related to overcurrent protection. |
| MotorOverheatTripCntr | DINT | Counter of motor overheat trip events. |
| StallTripCntr | DINT | Counter of trips related to stall protection. |
| PhaseUnbalanceTripCntr | DINT | Counter of trips related to phase unbalance protection. |
| PhaseConfigTripCntr | DINT | Counter of trips related to phase configuration protection. |
| GroundCurrentTripCntr | DINT | Counter of trips related to ground current protection. |
| PhaseReversalTripCntr | DINT | Counter of trips related to phase reversal protection. |
| PhaseLossTripCntr | DINT | Counter of trips related to phase loss protection. |
| TripsCntr | DINT | Counter of trips related to protections. |
| TripReg1_Y | DINT | Date and trip reason register 1. |
| TripReg1_M | SINT | |
| TripReg1_D | SINT | |
| TripReg1_h | SINT | |
| TripReg1_min | SINT | |
| TripReg1_sec | SINT | |
| TripReg1_cs | SINT | |
| TripReg1NoEvent | BOOL | Identifier of the detected trip event. |
| TripReg1ThermalOverload | BOOL | |
| TripReg1MotorOverheat | BOOL | |
| TripReg1Jam | BOOL | |
| TripReg1Undercurrent | BOOL | |
| TripReg1LongStart | BOOL | |
| TripReg1Overcurrent | BOOL | |
| TripReg1Stall | BOOL | |
| TripReg1GroundCurrent | BOOL | |
| TripReg1CurrentPhaseReversal | BOOL | |
| TripReg1PhaseConfiguration | BOOL | |
| TripReg1CurrentPhaseUnbalance | BOOL | |
| TripReg1CurrentPhaseLoss | BOOL | |
| ... | ... | ... |

Avatar_Diagnostic Output Interface (Continued)

| Output | Data Type | Description |
|-------------------------------|-----------|--|
| TripReg5_Y | DINT | Date and trip reason register 5. |
| TripReg5_M | SINT | |
| TripReg5_D | SINT | |
| TripReg5_h | SINT | |
| TripReg5_min | SINT | |
| TripReg5_sec | SINT | |
| TripReg5_cs | SINT | |
| TripReg5NoEvent | BOOL | Identifier of the detected trip event. |
| TripReg5ThermalOverload | BOOL | |
| TripReg5MotorOverheat | BOOL | |
| TripReg5Jam | BOOL | |
| TripReg5Undercurrent | BOOL | |
| TripReg5LongStart | BOOL | |
| TripReg5Overcurrent | BOOL | |
| TripReg5Stall | BOOL | |
| TripReg5GroundCurrent | BOOL | |
| TripReg5CurrentPhaseReversal | BOOL | |
| TripReg5PhaseConfiguration | BOOL | |
| TripReg5CurrentPhaseUnbalance | BOOL | |
| TripReg5CurrentPhaseLoss | BOOL | |

Asset Management

The **DeviceX_AssetManagement** function block returns the status of the acyclic asset management data of the specified device.

DeviceX_AssetManagement Function Block

DeviceX_AssetManagement Output Interface

| Output | Data Type | Description |
|------------------------|-----------|--|
| TimeDeviceOn | DINT | This register indicates the time that the module has been powered on in its lifetime. (Unit: h) |
| TimeDeviceOn_O | BOOL | This register indicates the overflow time that the module has been powered on in its lifetime. |
| TimeSwitchOn | DINT | This register indicates the time the contactor has been in the closed state. (Unit: h) |
| TimeSwitchOn_O | BOOL | This register indicates the overflow time the contactor has been in the closed state. |
| EventCntr | DINT | This register indicates number of times this module has experienced a detected device error. This value does not include detected device errors which prevent the saving or corruption of the non-volatile memory. |
| ContactorCycleCntr | DINT | This register indicates the number of times the contactor has been commanded to the closed state from the open state. |
| ContactorCycleCntr_O | BOOL | This register indicates the overflow number of times the contactor has been commanded to the closed state from the open state. |
| DevicePowerCycleCntr | DINT | This register indicates the number of times the device has been powered on. |
| DevicePowerCycleCntr_O | BOOL | This register indicates the overflow number of times the device has been powered on. |
| SILStopCntr | DINT | This value indicates the number of mirror relay operations. |
| SILStopCntr_O | BOOL | This value indicates the overflow number of mirror relay operations. |
| MaxIRMS | DINT | This register indicates the maximum current the device has measured in its lifetime. (Unit: 100 mA) |
| AvgIRMS | DINT | Lifetime average current measured by the device (Total Current/Time Current ON). (Unit: mA) |
| AvgIRMS_O | DINT | Lifetime average current measured by the device (Total Current/Time Current ON) overflow value. (Unit: mA) |
| MaxAvgVRMS | DINT | This register indicates the maximum voltage the device has measured in its lifetime. (Unit: V) |
| AvgVRMS | DINT | Average Vrms voltage on three phases. (Unit: V) |

Appendix

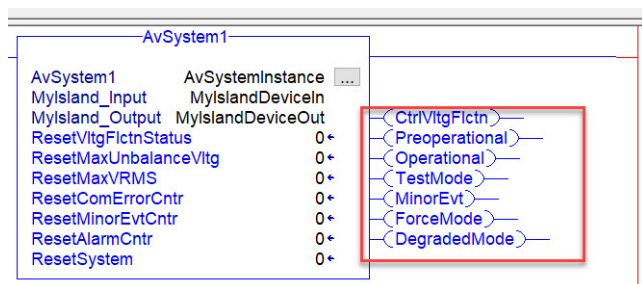
Frequently Asked Questions (FAQs)

Where can STRING data be accessed?

Due to AOI constraints, complex data types cannot be exposed as Input/Output parameters. Refer to [Accessing Data via the Acyclic Buffer](#), page 27 for instructions on accessing STRING data.

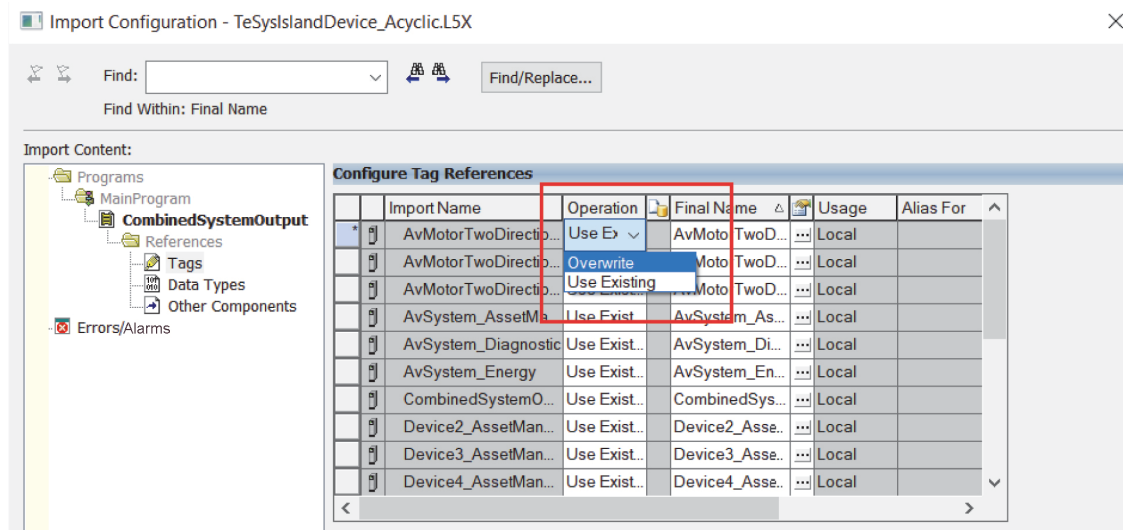
What are the lines attached to the right side of the AOI?

All the data exposed by an AOI exists within the main body, except for data exposed with Output parameters of type BOOL. This data exists on the right side of the AOI, as outlined with the red box in the screenshot below.



How are TeSys™ Island configuration changes integrated into a project?

- If the naming convention has been altered for a TeSys island or pre-existing avatars, all the imported Studio 5000® software entities (tags, AOIs, and generic Ethernet module) must be deleted and the import process repeated for the new configuration.
- If the naming convention has not changed for pre-existing entities, the import process can be repeated without deleting previously imported entities. Change the import Operation from *Use Existing* to *Overwrite*, as shown in the image below.

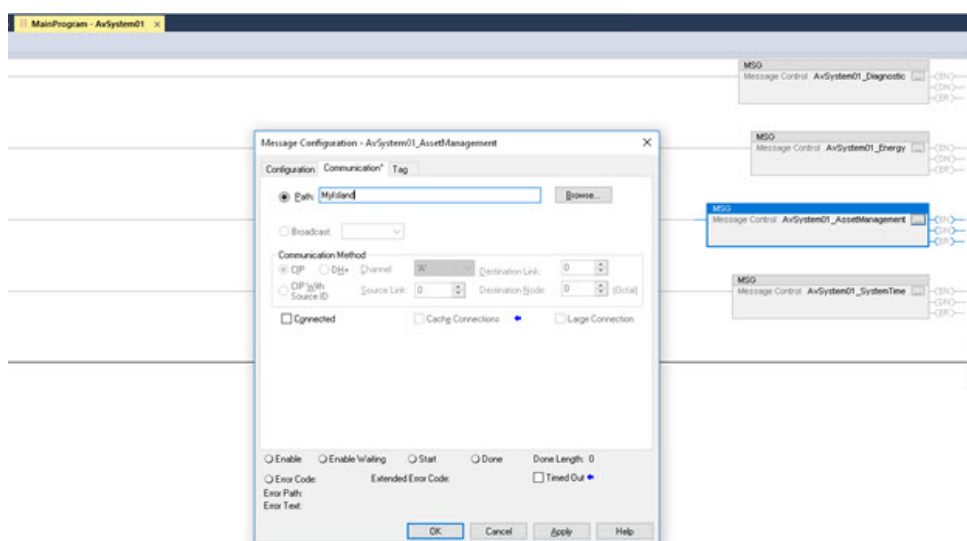


Why do 32-bit unsigned integers have a maximum displayed value of 2,147,483,647?

Rockwell Software® Studio 5000 software only handles signed integers. For this reason, the maximum positive value that can be displayed for 32-bit unsigned integers is 2,147,483,647. To enforce this, logic exists within AOIs to max out UDINT registers if the sign bit is used. For these TeSys island registers, a flag exists as an exposed parameter to indicate overflow. These flags are of type BOOL with the naming convention *{TagName}_O*.

What happens if the Acyclic function blocks return extended error code 0312 "Link address not available"?

This error code will occur if the communication path in the Message Configuration for the function block is not configured. This can happen if the Subroutine and AOI are imported prior to the IP address of the TeSys island instance being defined (see section "Import the TeSys island Module"). To fix this, browse for the TeSys island device in the "Path" setting in the Message Configuration window for *each* Acyclic function block.



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As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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