FREE Advance Logic Controller

Hardware Guide

Original instructions

9MA10291.04
09/2024

eliwell™
by Schneider Electric

Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

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Table of Contents

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 and Eliwell 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.

Qualification of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified person must be familiar with the

standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

Intended Use

The products described or affected by this document, together with software, accessories, and options, are controllers, intended for commercial HVAC machines 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.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety-related measures must be implemented.

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

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.

Prohibited Use

Any use other than that expressed above under Permitted use is strictly prohibited.

The relay contacts supplied are of an electromechanical type and subject to wear. Functional safety protection devices, specified in international or local standards, must be installed externally to this device.

Liability and Residual Risks

The liability of Schneider Electric and Eliwell is limited to the proper and professional use of this product under the guidelines contained in the present and other supporting documents, and does not extend to damages caused by (but not limited to):

- Unspecified installation/use and, in particular, in contravention of the safety requirements of established legislation or specified in this document;
- Use on equipment which does not provide adequate protection against electrocution, water and dust in the actual installation conditions;
- Use on equipment in which dangerous components can be accessed without the use of specific tools;
- Installation/use on equipment which does not comply with established legislation and standards.

Disposal

The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

About the Book

Document Scope

This document describes the FREE Advance Logic controllers, expansion modules, remote displays, and accessories, including installation and wiring information.

NOTE: Read and understand this document and all related documents, page 9 before installing, operating, or maintaining your device.

Validity Note

This document has been updated for the release of FREE Studio Plus V1.5.0.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to https://www.eliwell.com/en/Support/Green-Premium.html.

The technical characteristics of the devices described in the present document also appear online. To access the information online, go to the Eliwell home page www.eliwell.com.

Related Documents

Title of documentation	Reference number
FREE Studio Plus - Operating Guide	9MA10256 (ENG)
FREE Advance 7/18 IO – Instruction Sheet	9IS54609
FREE Advance 28/42 IO – Instruction Sheet	9IS54473
FREE Advance 28/42 IO isolated – Instruction Sheet	9IS54655
FREE EVE6000 / EVE10200 Expansion module – Instruction Sheet	9IS54478
FREE AVP1000 Display Color Touchscreen – Instruction Sheet	9IS54479
FREE AVP1000 Display Color Touchscreen Flush Mounting – Instruction Sheet	9IS54608
FREE AVK1000000500 Monochrome Display – Instruction Sheet	9IS54800
FREE EVS Plugin – Instruction Sheet	9IS54405

You can download these technical publications, the present document and other technical information from our website www.eliwell.com.

Product Related Information

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

This equipment has been designed to operate outside of any hazardous location, and exclusive of applications that generate, or have the potential to generate, hazardous atmospheres. Only install this equipment in zones known to be free, at all times, of hazardous atmospheres.

⚠DANGER

POTENTIAL FOR EXPLOSION

- Install and use this equipment in non-hazardous locations only.
- Do not install and use this equipment in applications capable of generating hazardous atmospheres, such as those applications employing flammable refrigerants.

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

For information concerning the use of control equipment in applications capable of generating hazardous materials, consult your local, regional, or national standards bureau or certification agency.

⚠WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- 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.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Eliwell for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

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

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in the information contained herein, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety, safety function, safe state, fault, fault reset, malfunction, failure, error, error message, dangerous,* etc.

Among others, these standards include:

Standard	Description
IEC 61131–2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849–1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496–1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery — General principles for design — Risk assessment and risk reduction.

EN 60204–1:2006	Safety of machinery — Electrical equipment of machines — Part 1: General requirements.
ISO 14119:2013	Safety of machinery — Interlocking devices associated with guards — Principles for design and selection.
ISO 13850:2015	Safety of machinery — Emergency stop — Principles for design.
IEC 62061:2021	Safety of machinery — Functional safety of safety-related electrical, electronic, and electronic programmable control systems.
IEC 61508–1:2010	Functional safety of electrical/electronic/ programmable electronic safety-related systems: General requirements.
IEC 61508–2:2010	Functional safety of electrical/electronic/ programmable electronic safety-related systems: Requirements for electrical/electronic/ programmable electronic safety-related systems.
IEC 61508–3:2010	Functional safety of electrical/electronic/ programmable electronic safety-related systems: Software requirements.
IEC 61784–3:2021	Industrial communication networks — Profiles — Part 3: Functional safety fieldbuses — General rules and profile definitions.
2006/42/EC	Machine Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines.
IEC 61800 series	Adjustable speed electrical power drive systems.
IEC 61158 series	Digital data communications for measurement and control — Fieldbus for use in industrial control systems.

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive (2006/42/EC)* and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Information on Non-Inclusive Terminology

As part of a group of responsible, inclusive companies, we are updating our communications and products 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.

Overview

What’s in This Part

FREE Advance Range Overview

What's in This Chapter

FREE Advance Logic Controller Offer Overview

General Description

FREE Advance Logic Controller are suitable for customized applications designed to control simple or complex machines:

- Air/water-cooled chiller
- Rooftop unit
- Heat pump
- Compressor rack
- Ventilation unit

The FREE Advance offer is made of:

- Controllers, page 15
- Expansion modules, page 16
- Communication modules, page 18
- Remote displays, page 19
- Accessories, page 20

Programming Software

In association with the controllers hardware, the FREE Studio Plus development tool is available to program and customize applications.

You can download FREE Studio Plus - Programming software for FREE Advance Logic Controller from Schneider-electric web site download centerEliwell web site download center.

The use of several programming languages in accordance with IEC 61131-3 regulations (programming standard for industrial control), makes it possible to develop new algorithms or entire programs easily, which can then be uploaded to the FREE Advance controllers via a PC and a Programming cable, helping to provide confidentiality with appropriate security.

For more information, refer to Connection Types, page 162.

Controller Range Overview

Type Code

Controller type code:

Type code description									
AVD1260060500	AV	D	12	6	0	06	0	5	00
Product family	FREE Advance series								
Physical feature		D = Built-in Display C = Blind							
Number of digital outputs			3 6 8 12						
Number of analog outputs				0 2 4 6					
Digital output type					00: The digital outputs are relay SS: 2 digital outputs are SSR **NOTE:** Only one digit in case of 12 digital outputs.				
Embedded Communication						06 = RS-485 and Ethernet based communication protocols 05 = RS-485 based communication protocols			
Power supply isolation (1)							I: Power Supply Isolated		
Power supply								5 = 24 Vac/dc	
Not relevant									00
(1) Only for 28 and 42 I/O									

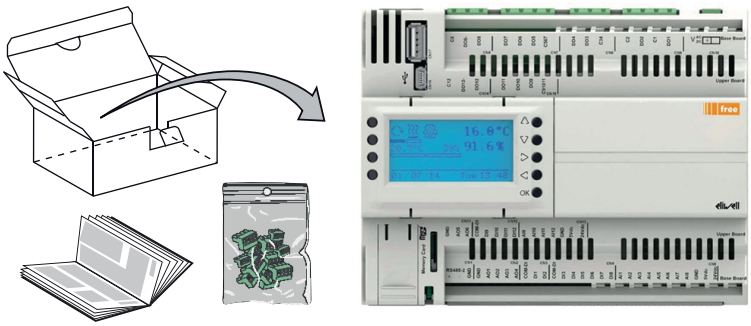
Controllers References

Reference	Complementary product family		Inputs/Outputs					USB		Communication		
		Display	DI	DO	AI	AO	Micro SD card	USB A	USB Mini-B	2 RS-485	1 Ethernet	1 CAN Exp. bus
7 Inputs/Outputs, page 51												
AVC3000060500	/C/L/U(/SSR)(/I)	-	2	3	2	0	✓	✓	✓	✓	✓	✓
AVD3000060500		✓										
18 Inputs/Outputs, page 53												
AVC6200060500	/C/L/U(/SSR)(/I)	-	2	6	8	2	✓	✓	✓	✓	✓	✓
AVD6200060500		✓										
AVD62SS060500				4 + 2 SSR								
AVC6200050500	/C(/I)	-	2	6	8	2	-	-	✓	✓	-	✓

Reference	Complementary product family	Display	Inputs/Outputs				Micro SD card	USB		Communication		
			DI	DO	AI	AO		USB A	USB Mini-B	2 RS-485	1 Ethernet	1 CAN Exp. bus
AVD6200050500		✓										
28 Inputs/Outputs, page 55												
AVC8400060500	/C/L/U(/SSR)(/I)	-	8	8	8	4	✓	✓	✓	✓	✓	✓
AVC840006I500												
AVD8400060500		✓										
AVD840006I500												
AVD84SS060500				6 + 2 SSR								
AVD84SS06I500												
AVC8400050500	/C(/I)	-	8	8	8	4	-	-	✓	✓	-	✓
AVD8400050500		✓										
42 Inputs/Outputs, page 58												
AVC1260060500	/C/L/U(/SSR)(/I)	-	12	12	12	6	✓	✓	✓	✓	✓	✓
AVC126006I500												
AVD1260060500		✓										
AVD126006I500												
AVD126S060500				10 + 2 SSR								
AVD126S06I500												
AVC126005I500	/C(/I)	-	12	12	12	6	-	-	✓	✓	-	✓
AVD126005I500		✓										

The controller runs on 24 Vac/dc power supply.

AV••••••6•500 / AV•••••••5•500 Delivery Content



Expansion Modules Range Overview

Type Code

Expansion module type code:

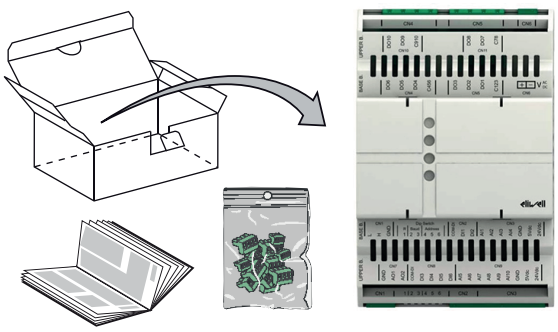
Type code description									
EVE1020000500	E-V	E	10	2	0	00	0	5	00
Product family	FREE Evolution series								
Physical feature		E = Expansion module							
Number of digital outputs			6 10						
Number of analog outputs				0 2					
Digital output type					00: The digital outputs are relay SS: 2 digital outputs are SSR **NOTE:** Only one digit in case of 10 digital outputs.				
Not relevant						00			
Not relevant							0		
Power supply								5 = 24 Vac/dc	
Not relevant									00

Expansion Modules References

Reference	Inputs/Outputs				1 CAN Exp. bus	1 TTL(1)	Compatible controllers
	DI	DO	AI	AO			
12 Inputs/Outputs, page 62							
EVE6000000500	2	6	4	-	✓	✓	AV••••••6•500(2) AV•••••••5•500(2)
28 Inputs/Outputs, page 64							
EVE1020000500	6	10	10	2	✓	✓	AV••••••6•500(2) AV•••••••5•500(2)
(1) For service only. **(2)** Also compatible with FREE Evolution controller range.							

The expansion modules run on 24 Vac/dc power supply.

EVE••••••0500 Delivery Content



Communication Modules Range Overview

Overview

This section presents communication modules.

Communication Modules References

Reference	Description	Terminal type	Compatible controllers
EVS00CA000000	CAN	2 screw terminal blocks	AV••••••6•500 AV•••••••5•500(1)
EVS0LON000000	LonWorks	1 screw terminal block	
EVS00R4000000	Modbus SL (RS-485)	2 screw terminal blocks	
EVS10R2000000	RS-232 serial link, Relay output	1 SUB-D 9 1 screw terminal block	
EVS00BM000000	Modbus SL, and BACnet MS/TP	2 screw terminal blocks	
EVS00ET000000	Ethernet, Modbus TCP, and BACnet/IP	1 RJ45	AV•••••••5•500(1)
EVS00EB000000	Ethernet, Modbus TCP, BACnet/IP, Modbus SL, and BACnet MS/TP	1 RJ45 2 screw terminal blocks	
(1) Also compatible with FREE Evolution controller range.			

For further information about communication modules, refer to the FREE EVS Plugin Instruction Sheet 9IS54405.

Remote Display Range Overview

Type Code

Remote display type code:

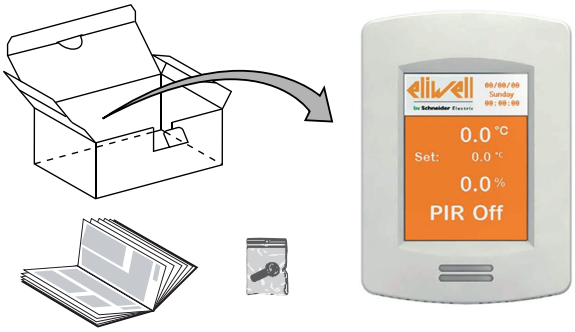
Type code description									
AVP13000W0500	AV	P	1	3	00	0-W	0	5	00
Product family	FREE Advance series								
Complementary product family		P = Remote display with touch interface K = Remote display with keys							
Number of serial connections			1						
Number of embedded sensors				0 = No sensor embedded 1 = Temperature sensor 2 = Temperature and relative humidity sensor 3 = Temperature, relative humidity, and presence sensor (PIR)					
Color					00: No color option available 0G: Gray color 0W: White color				
Mounting type						00 = Vertical mounting 0W = Vertical mounting 0P = Flush mounting			
Not relevant							0		
Power supply								5 = 24 Vac/dc	
Not relevant									00

Remote Displays References

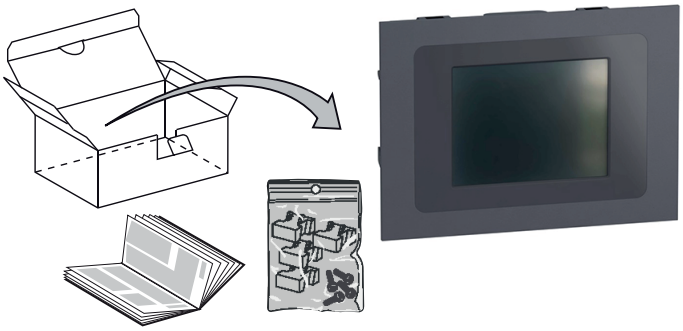
Reference	Embedded sensors			1 RS-485	1 USB Micro-B	1 CAN	Compatible controllers
	Temperature	Humidity	Presence				
AVP11000W0500, page 109	✓	-	-	✓	✓	-	AV••••••6•500
AVP12000W0500, page 109	✓	✓	-	✓	✓	-	AV•••••••5•500
AVP13000W0500, page 109	✓	✓	✓	✓	✓	-	EV•7500
AVP100G0P0500, page 110	-	-	-	✓	✓	-	SMP•••• / SMD•••• /SMC••••
AVP100W0P0500, page 110	-	-	-	✓	✓	-	Third-party Modbus SL devices
AVK1000000500, page 111	-	-	-	-	-	✓	AV••••••6•500 AV•••••••5•500

The remote displays run on 24 Vac/dc power supply.

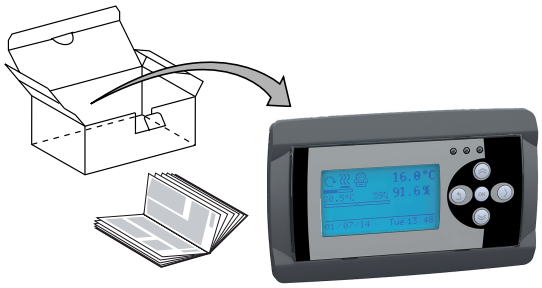
AVP1•000W0500 Delivery Content



AVP100•0P0500 Delivery Content



AVK1000000500 Delivery Content



Accessories

Overview

This section describes the accessories.

Mounting and Wiring Accessories References

Description		Use	Reference
Vertical surface support for display	White	To install a AVP100•0P0500 on a vertical surface	AVA00WMRC0000
	Gray		AVA00WMRC0001

Description		Use	Reference
	White	To install a AVK1000000500 on a vertical surface	EVA00WMRC0000
	Gray		EVA00WMRC0001
12 clips-on lock		To install the AV•••••••••••• controllers and the expansion modules on a panel surface, page 39	AVA00PMCL0000

Global Features

What’s in This Part

Before Starting

What's in This Chapter

Before Starting

Before Starting

Read and understand this chapter before beginning the installation of your system.

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

The use and application of the information contained herein require 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 and 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 any applicable local, regional or national standards and/or regulations.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Ensure that all equipment applied and systems designed comply with all applicable local, regional, and national regulations and standards.

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

Disconnecting Power

All options and modules should be assembled and installed before installing the control system on a mounting rail, onto a mounting plate or in a panel. Remove the control system from its mounting rail, mounting plate or panel before disassembling the equipment.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

Programming Considerations

The products described in this manual have been designed and tested using Eliwell programming, configuration, and maintenance software products.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Eliwell for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

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

Operating Environment

This equipment has been designed to operate outside of any hazardous location, and exclusive of applications that generate, or have the potential to generate, hazardous atmospheres. Only install this equipment in zones known to be free, at all times, of hazardous atmospheres.

⚠DANGER

POTENTIAL FOR EXPLOSION

- Install and use this equipment in non-hazardous locations only.
- Do not install and use this equipment in applications capable of generating hazardous atmospheres, such as those applications employing flammable refrigerants.

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

For information concerning the use of control equipment in applications capable of generating hazardous materials, consult your local, regional, or national standards bureau or certification agency.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Install and operate this equipment according to the conditions described in the Environmental Characteristics.

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

Installation Considerations

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in an enclosure appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.
- Use the sensor and actuator power supplies only for supplying power to the sensors or actuators connected to the module.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions unless the equipment is otherwise designated as functional safety equipment and conforming to applicable regulations and standards.
- Do not disassemble, repair, or modify this equipment.
- Do not connect any wiring to unused connections, or to connections designated as No Connection (N.C.).

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

NOTE: JDYX2 or JDYX8 fuse types are UL-recognized and CSA approved.

The FREE Advance controllers are intended for Top Hat Section Rail (DIN rail) mounting, panel mounting, or wall mounting.

Care must be taken to avoid damage from electrostatic sources when handling this equipment. In particular exposed connectors and, in some cases, exposed printed circuit boards are exceptionally vulnerable to electrostatic discharge.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION DUE TO ELECTROSTATIC DISCHARGE DAMAGE

- Keep equipment in the protective conductive packaging until you are ready to install the equipment.
- Only install equipment in approved enclosures and / or locations that prevent casual access and provide electrostatic discharge protection.
- Use a conductive wrist strap or equivalent field force protective device attached to an earth ground when handling sensitive equipment.
- Always discharge yourself by touching a grounded surface or approved antistatic mat before handling the equipment.

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

For more information about enclosures, refer to the definition found in IEC 1000-4-2.

Wiring Best Practices

What's in This Chapter

Wiring Best Practices

Wiring Best Practices

The following information describes the wiring guidelines and associated best practices to be respected when using a FREE Advance Logic Controller.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

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

⚠WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- 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.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

Wiring Guidelines

The following rules must be applied when wiring FREE Advance offer product range:

- I/O and communication wiring must be kept separate from the power wiring. Route these two types of wiring in separate cable ducting.
- Verify that the operating conditions and environment are within the specification values.
- Use proper wire sizes to meet voltage and current requirements.
- Use copper conductors (required).
- Use twisted pair, shielded cables for analog, and/or fast I/O.
- Use twisted pair, shielded cables for networks, and fieldbus.

Use shielded, properly grounded cables for all analog and high-speed inputs or outputs and communication connections. If you do not use shielded cable for these connections, electromagnetic interference can cause signal degradation. Degraded signals can cause the controller or attached modules and equipment to perform in an unintended manner.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all fast I/O, analog I/O and communication signals.
- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point[1].
- Route communication and I/O cables separately from power cables.

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

[1] Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

NOTE: Surface temperatures may exceed 60 °C (140 °F). Route primary wiring (wires connected to power mains) separately and apart from secondary wiring (extra low voltage wiring coming from intervening power sources). If that is not possible, double insulation is required such as conduit or cable gains.

Rules for Screw Terminal Block

The following table presents the cable types and wire sizes for a 5.08 mm (0.20 in.) or 5.00 mm (0.197 in.) pitch screw terminal block:

mm / in. 7 / 0.28								
mm^2	0.2…2.5	0.2…2.5	0.25…2.5	0.25…2.5	2 x 0.2…1	2 x 0.2…1.5	2 x 0.25…1	2 x 0.5...1.5
AWG	*24…14*	*24…14*	*22...14*	*22...14*	*2 x 24…18*	*2 x 24…16*	*2 x 22…18*	*2 x 20...16*

Ø 3,5 mm (*0.14 in.*)	C
N•m	0.5...0.6
lb-in	*4.42...5.31*

The following table presents the cable types and wire sizes for a 3.81 mm (0.15 in.) or 3.50 mm (0.14 in.) pitch screw terminal block:

mm / in. 9 / 0.35								
mm²	0.14…1.5	0.14…1.5	0.25…1.5	0.25…0.5	2 x 0.08…0.5	2 x 0.08…0.75	2 x 0.25…0.34	2 x 0.5
AWG	*26…16*	*26…16*	*22...16*	*22...20*	*2 x 28…20*	*2 x 28…20*	*2 x 24…22*	*2 x 20*

Ø 2,5 mm (*0.1 in.*)	C	N•m	0.22...0.25
		lb-in	*1.95...2.21*

The use of copper conductors is required.

⚠⚠DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCK

- Tighten connections in conformance with the torque specifications.
- Do not insert more than one wire per connector of the terminal block unless using the cable ends (ferrules) specified above.

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

⚠WARNING

FIRE HAZARD

- Use only the recommended wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output wiring up to 2 A, use conductors of at least 0.5 mm² (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For relay output wiring of 3 A, use conductors of at least 1.5 mm² (AWG 16) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring of 9 A, or relay output wiring greater than 3 A, use conductors of at least 2.0 mm² (AWG 12) with a temperature rating of at least 80 °C (176 °F).

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

Protecting Outputs from Inductive Load Damage

Depending on the load, a protection circuit may be needed for the relay outputs. Inductive loads using DC voltages may create voltage reflections resulting in overshoot that will damage or shorten the life of output devices.

⚠CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

Use an appropriate external protective circuit or device to reduce the risk of inductive direct current load damage.

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

Choose a protection circuit from the following diagrams according to the power supply used. Connect the protection circuit to the outside of the controller or relay output module.

If your controller or module contains relay outputs, these types of outputs can support up to 240 Vac. Inductive damage to these types of outputs can result in welded contacts and loss of control. Each inductive load must include a protection

device such as a peak limiter, RC circuit or flyback diode. Capacitive loads are not supported by these relays.

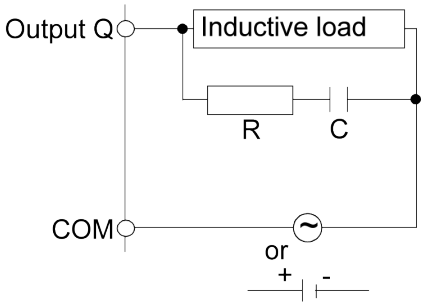
⚠WARNING

RELAY OUTPUTS WELDED CLOSED

- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

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

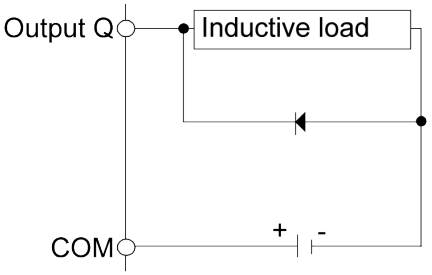
Protective circuit A: this protection circuit can be used for both AC and DC load power circuits.



C Value from 0.1 to 1 µF

R Resistor of approximately the same resistance value as the load

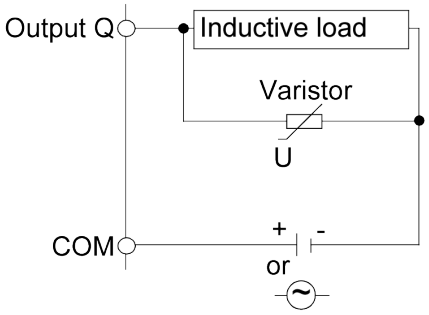
Protective circuit B: this protection circuit can be used for DC load power circuits.



Use a diode with the following ratings:

- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.

Protective circuit C: this protection circuit can be used for both AC and DC load power circuits.



In applications where the inductive load is switched on and off frequently and/or rapidly, verify that the continuous energy rating (J) of the varistor exceeds the peak load energy by 20 % or more.

NOTE: Place protection devices as close to the load as possible.

Special Handling Considerations

Care must be taken to avoid damage from electrostatic sources when handling this equipment. In particular exposed connectors and, in some cases, exposed printed circuit boards are exceptionally vulnerable to electrostatic discharge.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION DUE TO ELECTROSTATIC DISCHARGE DAMAGE

- Keep equipment in the protective conductive packaging until you are ready to install the equipment.
- Only install equipment in approved enclosures and / or locations that prevent casual access and provide electrostatic discharge protection.
- Use a conductive wrist strap or equivalent field force protective device attached to an earth ground when handling sensitive equipment.
- Always discharge yourself by touching a grounded surface or approved antistatic mat before handling the equipment.

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

Analog Inputs-Probes

Temperature probes have no connection polarity and can be extended using a normal bipolar cable.

The extension of the probes wiring influences the electromagnetic compatibility (EMC) of the instrument

Verify the polarity for probes which have a specific connection polarity.

NOTICE

INOPERABLE EQUIPMENT

Verify all wiring connections before applying power.

Failure to follow these instructions can result in equipment damage.

Do not power any connected devices that are externally powered without also applying power to the FREE Advance.

NOTICE

INOPERABLE EQUIPMENT

Ensure that the controller has power applied when applying power to other connected and externally powered devices.

Failure to follow these instructions can result in equipment damage.

Signal leads (probes, digital inputs, communication, and the electronic supply) must be routed separately from power cables.

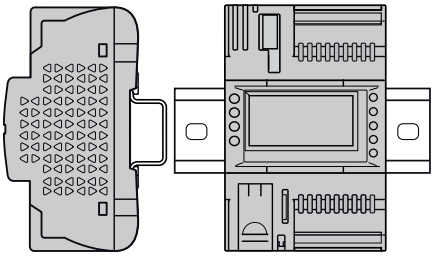
Installation

What's in This Chapter

AV•30••••0500 / AV•62••••0500 Controllers Mounting Positions

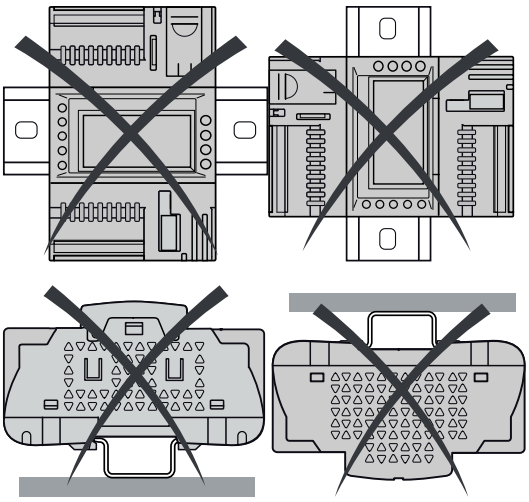
Correct Mounting Position

AV•30••••0500 / AV•62••••0500 controllers must be mounted horizontally on a vertical plane as shown in the figure below:



Incorrect Mounting Position

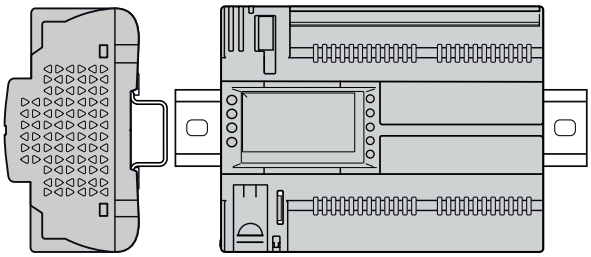
AV•30••••0500 / AV•62••••0500 controllers cannot be mounted neither vertically, nor horizontally backward:



AV•84•••••500 / AV•126••••500 Controllers Mounting Positions

Correct Mounting Position

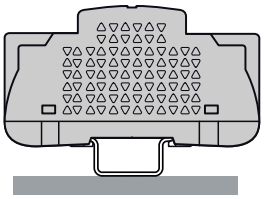
AV•84•••••500 / AV•126••••500 controllers should be mounted horizontally on a vertical plane as shown in the figure below:



Acceptable Mounting Position

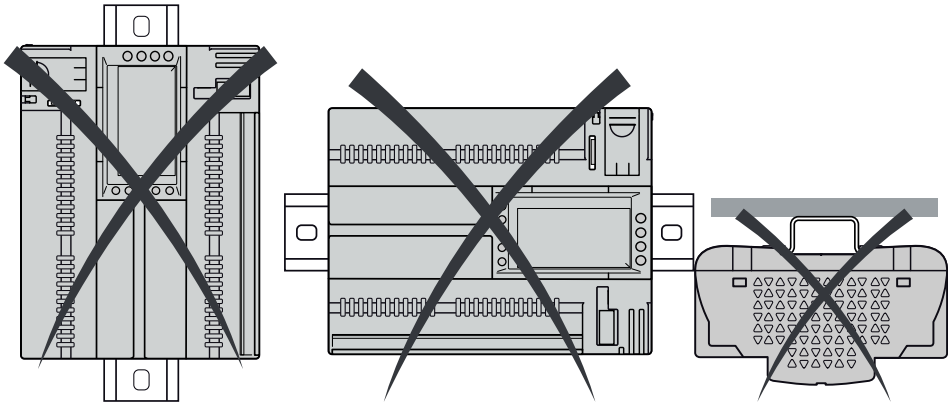
AV•8400•••500 / AV•1260•••500 controllers can be mounted horizontally upward with a temperature derating (maximum ambient temperature: 60 °C (140 °F)).

AVD84SS06I500 / AVD126S06I500 controllers can be mounted horizontally upward with a temperature derating (maximum ambient temperature: 55 °C (131 °F)).

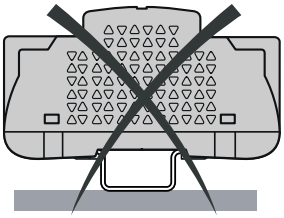


Incorrect Mounting Position

AV•84•••••500 / AV•126••••500 controllers cannot be mounted neither vertically, nor horizontally backward:



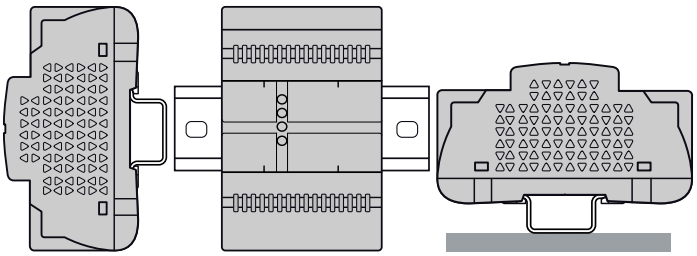
AVD84SS060500 / AVD126S060500 controllers cannot be mounted horizontally upward:



EVE••••••0500 Expansion Modules Mounting Positions

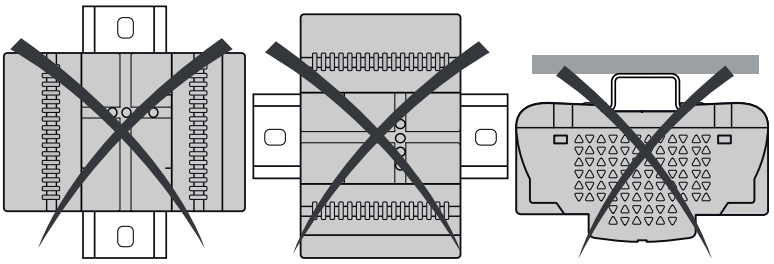
Correct Mounting Position

EVE••••••0500 expansion modules must be mounted horizontally on a vertical plane or horizontally upward as shown in the figure below:



Incorrect Mounting Position

EVE••••••0500 expansion modules cannot be mounted neither vertically, nor horizontally backward:



Controllers and Expansion Modules Clearances

Minimum Clearances

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Place devices dissipating the most heat at the top of the cabinet and ensure adequate ventilation.
- Avoid placing this equipment next to or above devices that might cause overheating.
- Install the equipment in a location providing the minimum clearances from all adjacent structures and equipment as directed in this document.
- Install all equipment in accordance with the specifications in the related documentation.

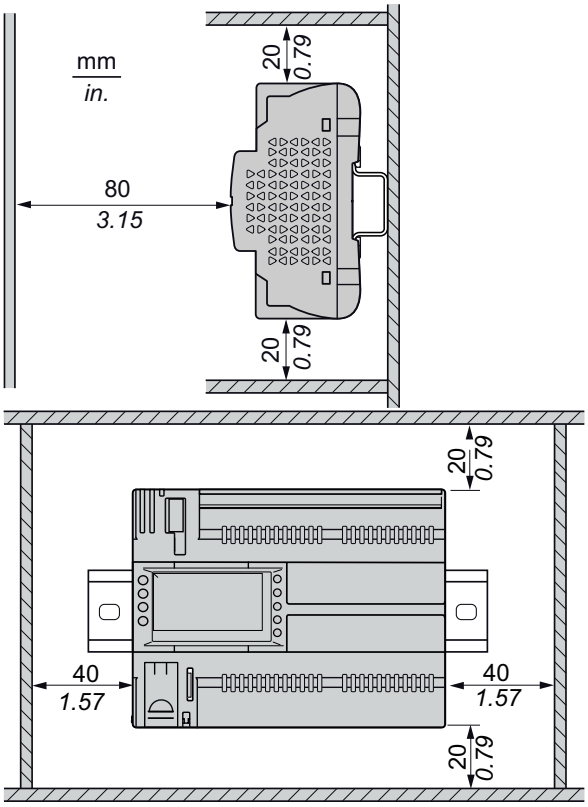
Failure to follow these instructions can result in death, serious injury, or equipment damage.

AV•••••••••••• controllers and expansion modules have been designed as IP20 products and must be installed in an enclosure appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.

There are 3 types of clearances between:

- The FREE Advance device and the sides of the cabinet (including the panel door).
- The FREE Advance device terminal blocks and the wiring ducts. This distance reduces electromagnetic interference between the controller and the wiring ducts.
- The FREE Advance device and other heat generating devices installed in the same cabinet.

The following figure shows the minimum clearances that apply to AV•••••••••••• references:



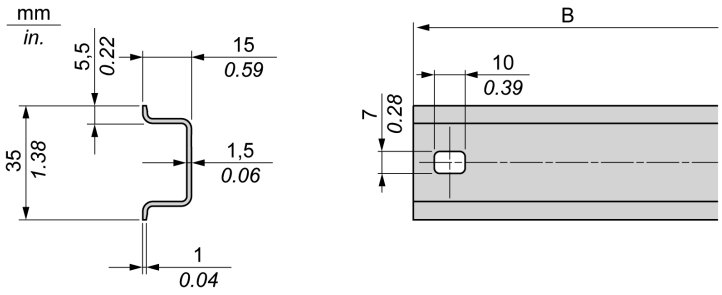
Top Hat Section Rail (DIN Rail)

Dimensions of Top Hat Section Rail (DIN Rail)

You can mount the controller and expansion module on a 35 mm (1.38 in.) top hat section rail (DIN rail). It can be attached to a smooth mounting surface or suspended from a EIA rack or mounted in a NEMA cabinet.

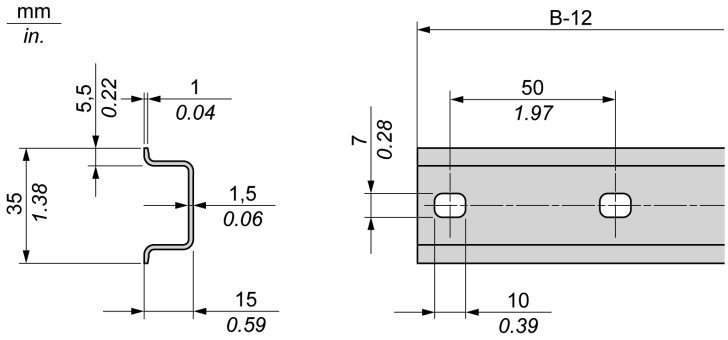
Symmetric Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the top hat section rails (DIN rail) for the wall-mounting range:



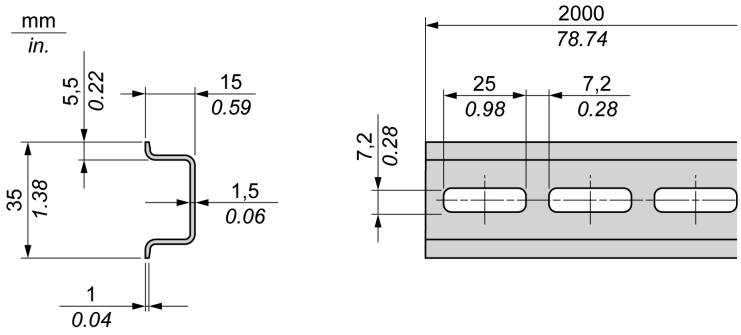
Schneider Electric Reference	Type	Rail length (B)
NSYSDR50A	A	450 mm (17.71 in.)
NSYSDR60A	A	550 mm (21.65 in.)
NSYSDR80A	A	750 mm (29.52 in.)
NSYSDR100A	A	950 mm (37.40 in.)

The following illustration and table show the references of the symmetric top hat section rails (DIN rail) for the metal enclosure range:



Schneider Electric Reference	Type	Rail length (B-12 mm)
NSYSDR60	A	588 mm (23.15 in.)
NSYSDR80	A	788 mm (31.02 in.)
NSYSDR100	A	988 mm (38.89 in.)
NSYSDR120	A	1188 mm (46.77 in.)

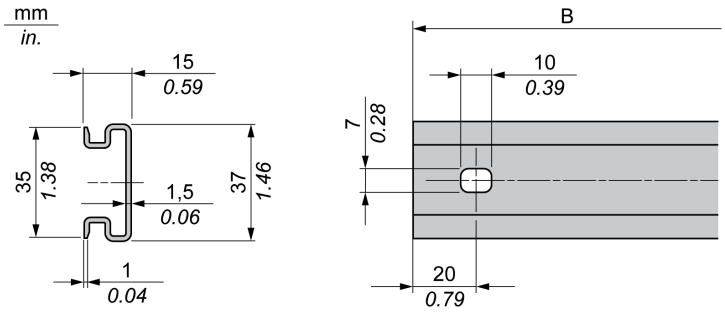
The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



Schneider Electric Reference	Type	Rail length
NSYSDR200[1]	A	2000 mm (78.74 in.)
NSYSDR200D[2]	A	
1 Unperforated galvanized steel **2** Perforated galvanized steel		

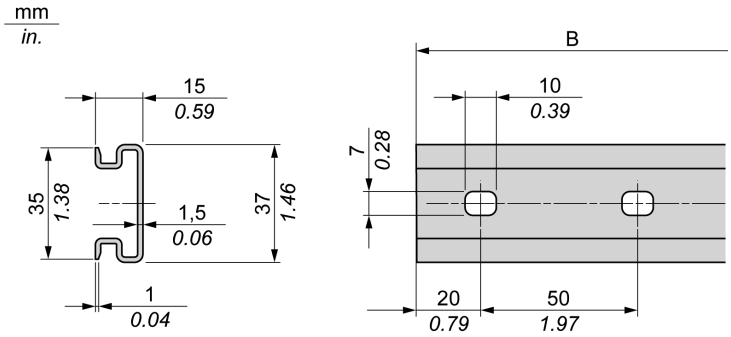
Double-Profile Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the double-profile top hat section rails (DIN rails) for the wall-mounting range:



Schneider Electric Reference	Type	Rail length (B)
NSYDPR25	W	250 mm (9.84 in.)
NSYDPR35	W	350 mm (13.77 in.)
NSYDPR45	W	450 mm (17.71 in.)
NSYDPR55	W	550 mm (21.65 in.)
NSYDPR65	W	650 mm (25.60 in.)
NSYDPR75	W	750 mm (29.52 in.)

The following illustration and table show the references of the double-profile top hat section rails (DIN rail) for the floor-standing range:



Schneider Electric Reference	Type	Rail length (B)
NSYDPR60	F	588 mm (23.15 in.)
NSYDPR80	F	788 mm (31.02 in.)
NSYDPR100	F	988 mm (38.89 in.)
NSYDPR120	F	1188 mm (46.77 in.)

Controllers and Expansion Modules Installation

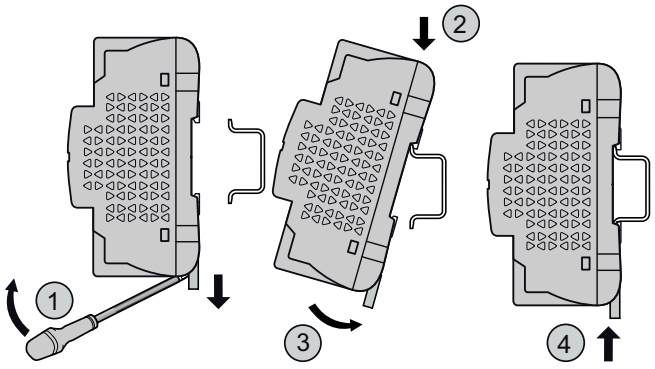
Overview

This section describes how to install and remove a AV•••••••••••• controller or expansion module from a top hat section rail (DIN rail).

Installing on a Top Hat Section Rail (DIN Rail)

The following procedure describes how to install a controller or an expansion module on a top hat section rail (DIN rail):

Step	Action
1	Move the two spring docking devices to their standby position (use a screwdriver to press against the relative compartments).
2	Position the top groove of the controller or the expansion modules on the top edge of the Top Hat Section Rail (DIN rail).
3	Press the assembly against the Top Hat Section Rail (DIN rail).
4	Press the spring docking devices to put them into the locked position.



Removing from a Top Hat Section Rail (DIN Rail)

The following procedure describes how to remove a controller or an expansion module from a top hat section rail (DIN rail):

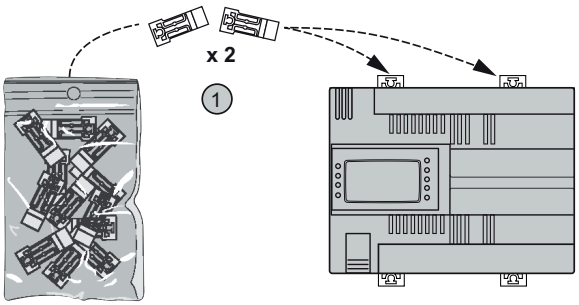
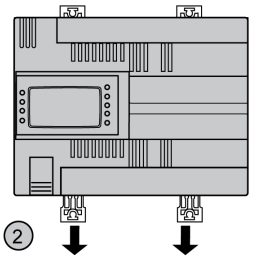
Step	Action
1	Remove the power from the controller or the expansion module.
2	Insert a flat screwdriver into the spring docking devices.
3	Pull down the spring docking device to move it to its standby position.
4	Pull the controller or the expansion module from the top hat section rail (DIN rail) from the bottom.

Panel Installation

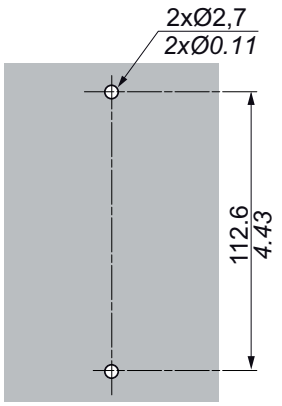
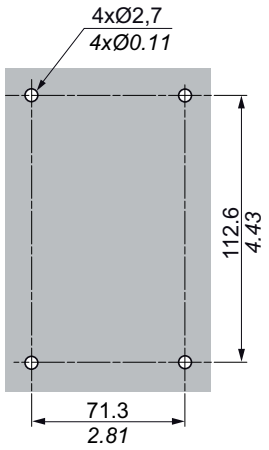
To install the controllers and expansion modules on a panel you must use clip-on locks.

NOTE: Upper clip-on locks are not provided with the logic controllers and must be ordered separately, page 20. Only one additional upper clip-on lock is necessary for AV•30•••60500, AV•62••••0500, and EVE••••••0500.

The following procedure shows how to install a AV•84•••••500 or a AV•126••••500 controller on a panel using the clip-on locks. The same procedure shall be followed for the AV••••••6•500 / AV•••••••5•500 / EVE••••••0500:

Step	Action
1	Install the 2 upper clip-on locks 
2	Move the 2 lower clip-on locks to their standby position 
3	Secure the device in position with 4 screws. Refer to the mounting holes layout, page 40.

Mounting Holes Layout

AV•30••••0500 AV•62••••0500 EVE••••••0500	AV•84•••••500 AV•126••••500
	

AVP1•000W0500 Remote Display Installation

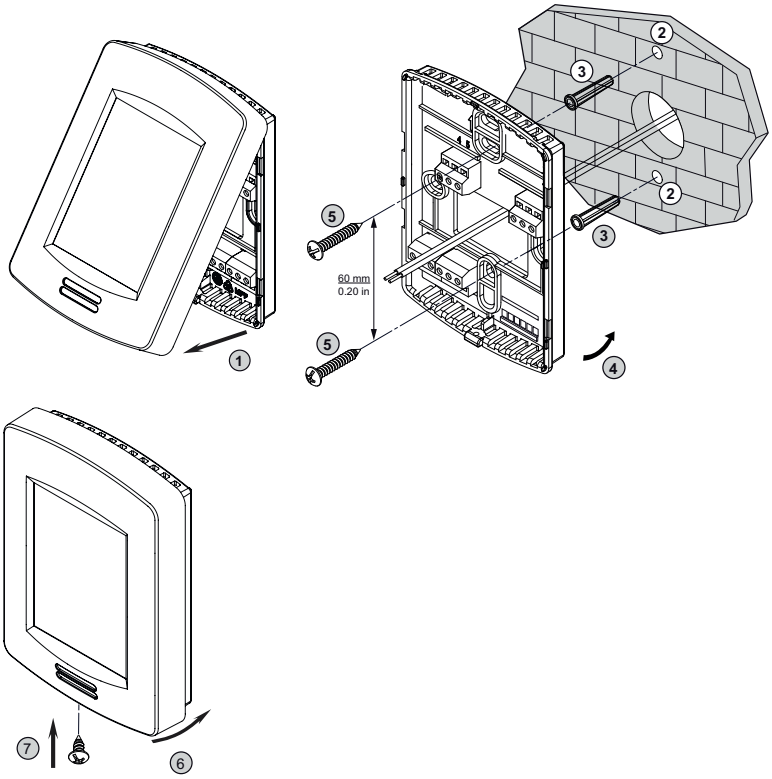
AVP1•000W0500 Panel installation

The AVP1•000W0500 remote display can be mounted horizontally or vertically on a vertical wall.

AVP1•000W0500 display incorporates a temperature sensor. To function correctly, air must circulate through the product to accurately determine the temperature.

NOTICE
INACCURATE TEMPERATURE MEASUREMENT Mount the AVP1•000W0500 in an upright, vertical (portrait) position when using the temperature sensor. **Failure to follow these instructions can result in equipment damage.**

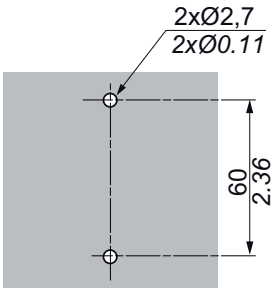
The following graphic and procedure explain how to install AVP1•000W0500 remote display on a wall:



Step	Action
1	Open unit by pulling on bottom side of the display(1)
2	Ensure correct side of base faces up
3	Pull cables 150 mm (5.90 in.) out from wall
4	Align base and mark location of two mounting holes on wall or panel (2)
5	Install anchors in wall (3)
6	Insert cable in central hole of base
7	Place rear cover on the wall and align it with mounting holes (4)
8	Insert screws in mounting holes on each side of base (5)
9	Strip each wire 6 mm (0.24 in.) from end
10	Insert each wire according to wiring chart, page 26
11	Gently push excess wiring back into hole
12	Gently align cover to top of base and snap in place from bottom (6)
13	Install the isolated screw connection for securing the plastic housing (7)

Mounting Holes Layout

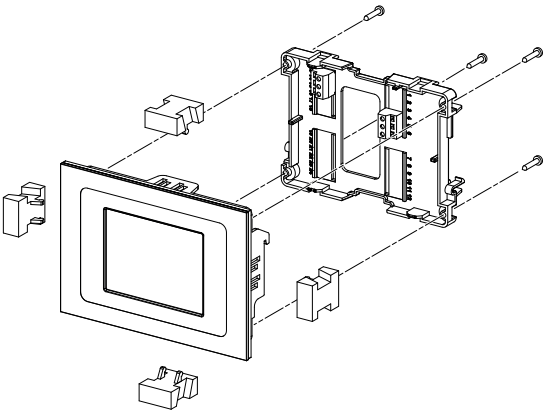
Mounting holes layout for AVP1•000W0500:



AVP100•0P0500 Remote Display Installation

AVP100•0P0500 Wiring

The AVP100•0P0500 remote display must be wired prior to the mounting phase.

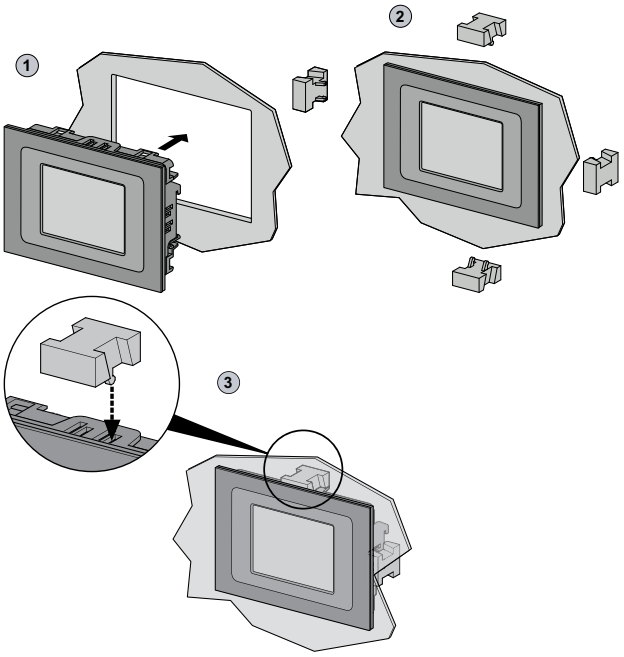


The following procedure explain how to wire a AVP100•0P0500 remote display:

Step	Action
1	Open unit by pulling on bottom side of the display
2	Insert cable in central hole of base
3	Strip each wire 6 mm (0.24 in.) from end
4	Insert each wire according to wiring chart, page 26
5	Gently align cover to top of base and snap in place.
6	Install the 4 isolated screws connection for securing the plastic housing

AVP100•0P0500 Panel Installation

The AVP100•0P0500 remote display can be mounted horizontally or vertically on a vertical panel.

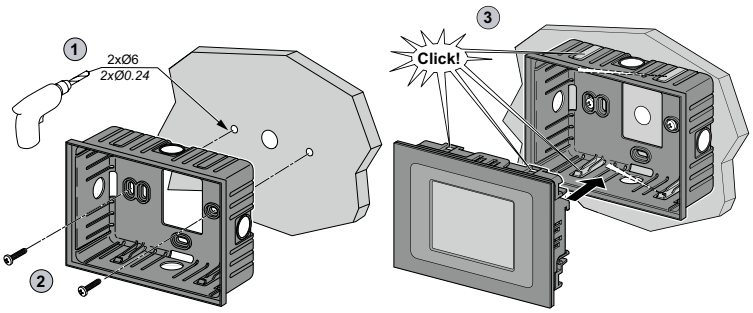


The following procedure explain how to install a AVP100•0P0500 remote display on a panel:

Step	Action
1	Make a hole using the mounting hole layout.
2	Pull cables 150 mm (5.90 in.) out from hole.
3	Wire the unit according to the wiring procedure.
4	Insert the unit in the hole (1).
5	Secure it with 4 panel mounting locks provided (2)(3).

AVP100•0P0500 Vertical Surface Installation

The AVP100•0P0500 remote display can be mounted horizontally or vertically on a vertical surface using AVA00WMRC0001 or AVA00WMRC0000 accessory.

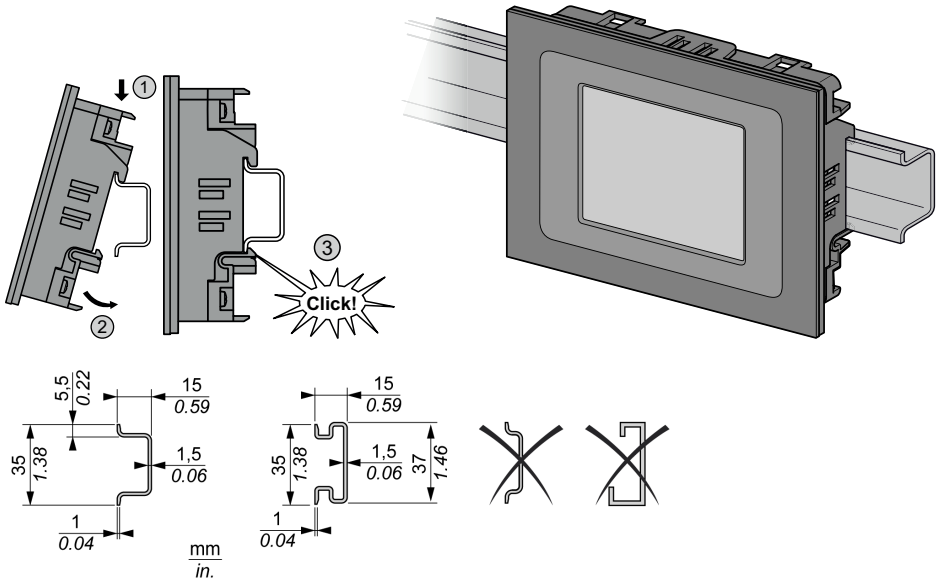


The following procedure explain how to install AVP100•0P0500 remote display on a vertical surface:

Step	Action
1	Place the AVA00WMRC000• accessory.
2	Ensure correct side of AVA00WMRC000• faces up.
3	Pull cables 150 mm (5.90 in.) out from vertical surface if necessary.
4	Align AVA00WMRC000• and mark location of two mounting holes on the vertical surface.
5	Drill holes in the vertical surface (1).
6	Pull cables 150 mm (5.90 in.) out from a hole of AVA00WMRC000•.
7	Place AVA00WMRC000• on the vertical surface and align it with mounting holes.
8	Insert screws in mounting holes on each side of AVA00WMRC000• (2).
9	Wire the unit according to the wiring procedure.
10	Gently push excess wiring back into hole.
11	Gently snap in place AVP100•0P0500 into AVA00WMRC000• (3).

AVP100•0P0500 Top Hat Section Rail (DIN Rail) Installation

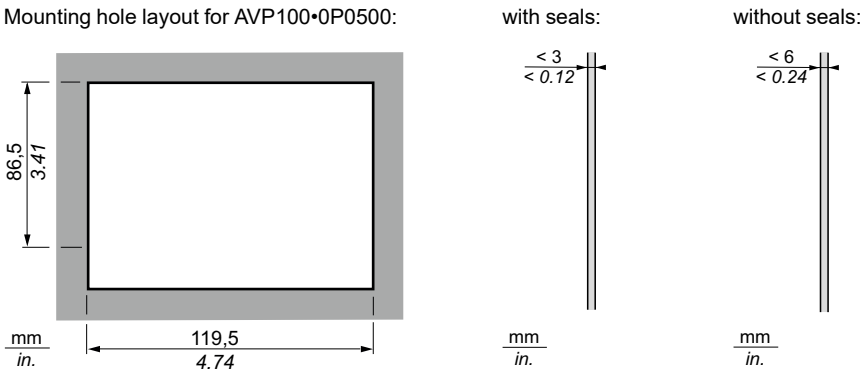
The AVP100•0P0500 remote display can be mounted horizontally on a top hat section rail (DIN rail).



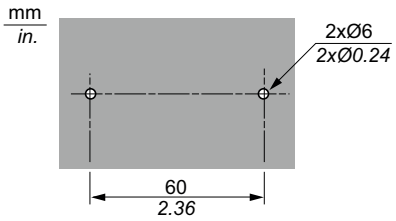
The following procedure describes how to install a AVP100•0P0500 remote display on a top hat section rail (DIN rail):

Step	Action
1	Wire the unit according to the wiring procedure.
2	Position the top groove of the remote display on the top edge of the Top Hat Section Rail (DIN rail) (1).
3	Press the assembly against the Top Hat Section Rail (DIN rail) (2) up to the locked position (3).

Mounting Holes Layout



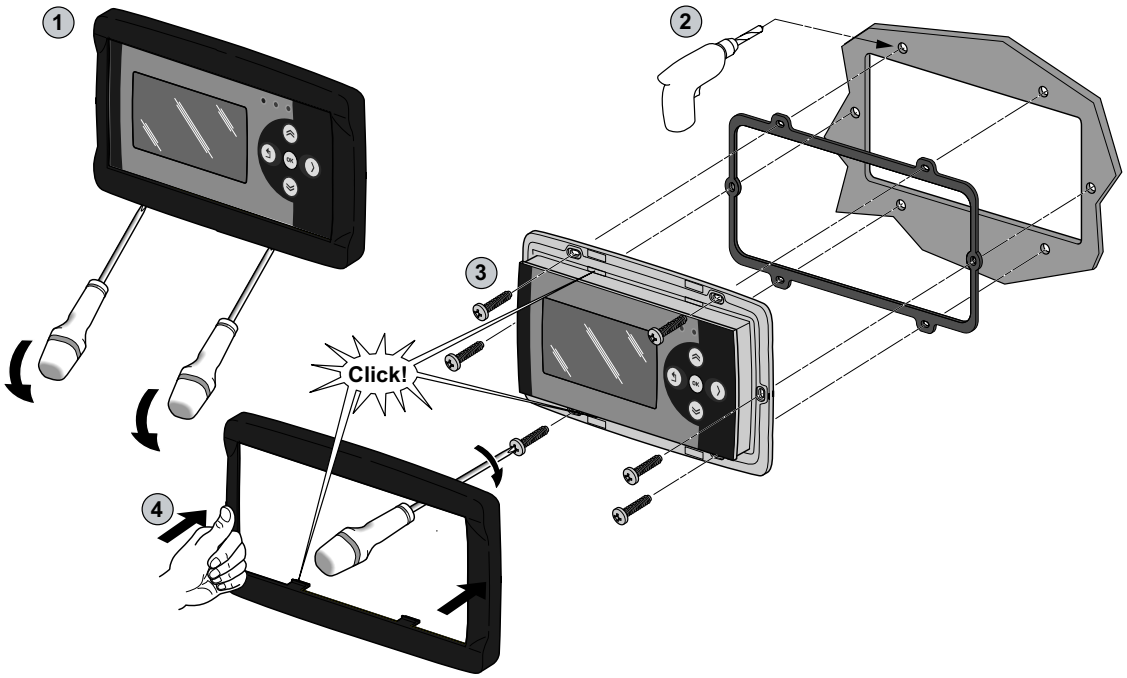
Mounting holes layout for AVA00WMRC0001 or AVA00WMRC0000:



AVK1000000500 Remote Display Installation

AVK1000000500 Panel Installation

The AVK1000000500 remote display can be mounted horizontally on a vertical panel.

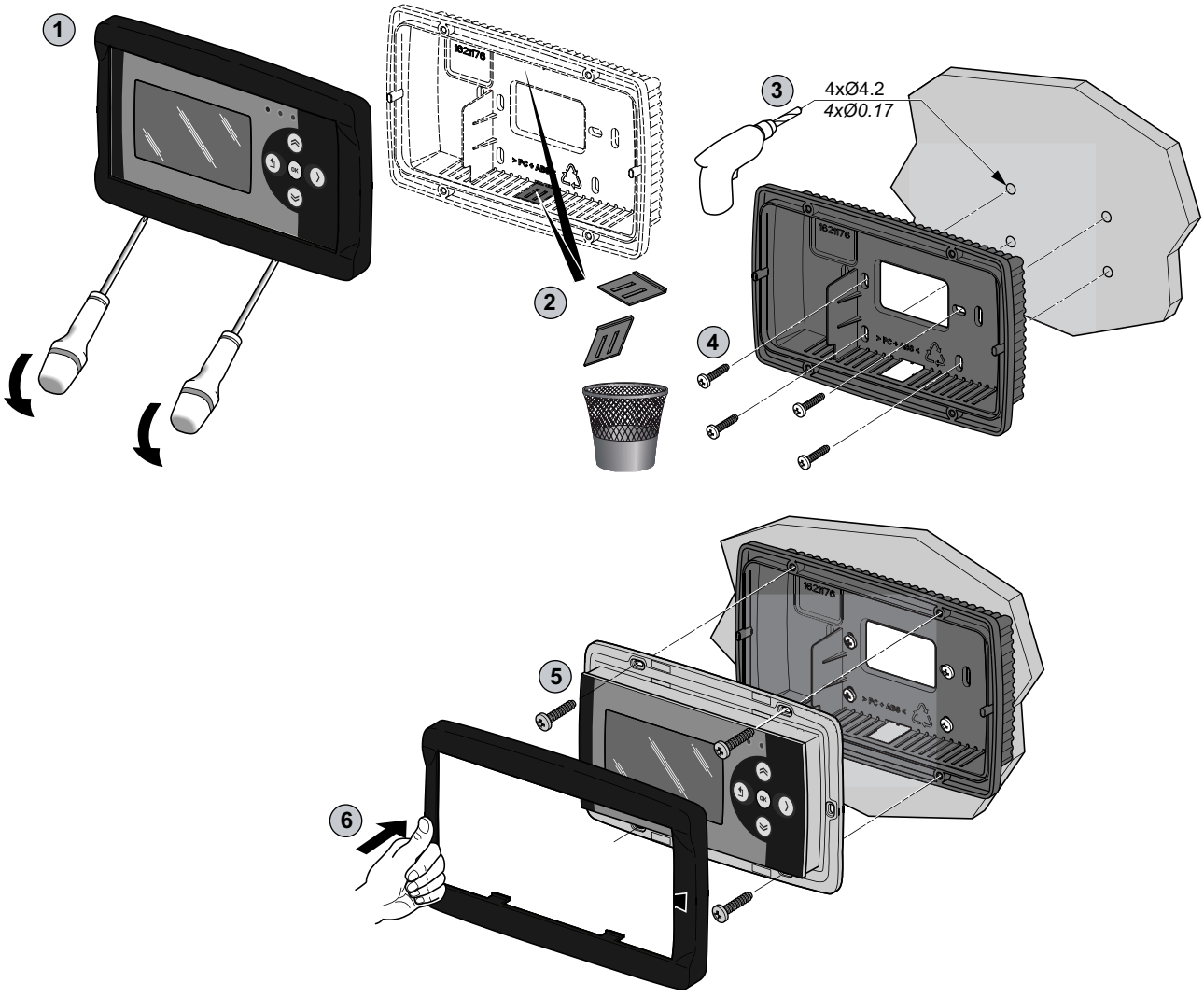


The following procedure explain how to install a AVK1000000500 remote display on a panel:

Step	Action
1	Open unit by pulling on bottom side of the display
2	Make a hole using the mounting hole layout. Drill, at the specified spacing, 6 holes using the mounting hole layout, page 47. Insert cable in central hole of the panel. Strip each wire 6 mm (0.24 in.) from end. Connect each wire according to wiring chart, page 26
3	Place the seal, insert the unit in the hole, and fix it with the 6 screws.
4	Gently align cover to top of base and snap in place.

AVK1000000500 Vertical Surface Installation

The AVK1000000500 remote display can be mounted horizontally on a vertical surface using EVA00WMRC0000 or EVA00WMRC0001 accessory.

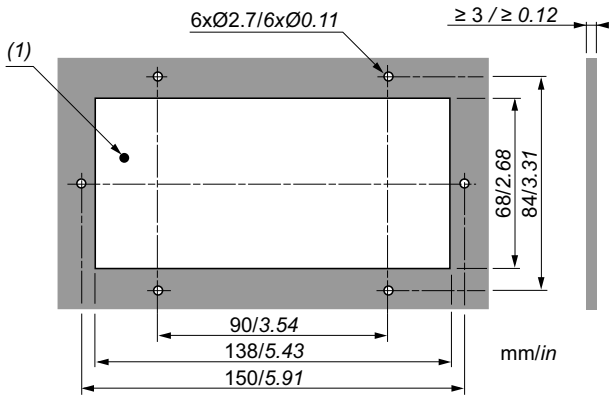


The following procedure explain how to install AVK1000000500 remote display on a vertical surface:

Step	Action
1	Open unit by pulling on bottom side of the display
2	On the AVA00WMRC000• accessory, use the two side slots, one at the bottom and one at the top, under the pre-formatted removable doors, preventing the opening of holes in the wall.
3	Drill, at the specified spacing, 4 holes using the mounting hole layout, page 47.
4	Place the AVA00WMRC000• accessory and fix it with the 4 screws Pull cables 150 mm (5.90 in.) out from AVA00WMRC000• side slots. Strip each wire 6 mm (0.24 in.) from end. Connect each wire according to wiring chart, page 26
5	Insert the AVK1000000500 remote display in the AVA00WMRC000• accessory, and fix it with the 4 screws.
6	Gently align cover to top of base and snap in place.

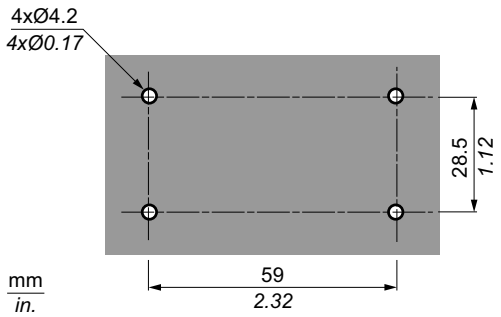
Mounting Holes Layout

Mounting hole layout for AVK1000000500 Panel Installation:



1: Panel cut out

Mounting hole layout for AVK1000000500 Vertical Surface Installation with AVA00WMRC000• accessory:



Controllers and Expansion Modules

What's in This Part

Environmental Characteristics

What's in This Chapter

Environmental Characteristics

Technical Data

The FREE Advance Logic Controller offer components meet European Community (CE) requirements for open equipment. You must install them in an enclosure or other location designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. Use metal enclosures to improve the electromagnetic immunity of your FREE Advance system. This equipment meets CE requirements as indicated in the following tables.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified within this chapter.

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

Controller and Expansion Modules Specifications

Characteristics	Specification	AV•30•••60500	AV•6200060500 / AV•6200050500	AVD62SS060500	AV•840005I500	AVC840006I500 / AVD840006I500	AVD84SS06I500	AV•126005I500	AVC126006I500 / AVD126006I500	AVD126S06I500	AV•8400•60500 / AV•1260•60500	AVD84SS060500 / AVD126S060500	EVE6000000500	EVE1020000500
The product complies with the following harmonized Standards	EN 60730-1 / EN 60730-2-9							✓						
Construction of control	Electronic automatic Incorporated Control							✓						
Purpose of control	Operating control (non-safety-related)							✓						
Mounting	Top Hat Section Rail (DIN rail)							✓						
	Optional panel mounting (with accessories							✓						
Type of action	1.B							✓						
	1.Y	-		✓	-		✓	-		✓	-	✓	-	
Type of disconnection or suspension for each circuit	Micro disconnection							✓						
Pollution degree	2 (normal)							✓						
Over-voltage category	II							✓						

Characteristics	Specification	AV•30•••60500	AV•6200060500 / AV•6200050500	AVD62SS060500	AV•840005I500	AVC840006I500 / AVD840006I500	AVD84SS06I500	AV•126005I500	AVC126006I500 / AVD126006I500	AVD126S06I500	AV•8400•60500 / AV•1260•60500	AVD84SS060500 / AVD126S060500	EVE6000000500	EVE1020000500
Rated impulse voltage	2500 V	✓												
Period of electric stress on the insulating parts	Long period, EN 60730	✓												
Power supply	24 Vac (+/- 10 %) 50 Hz / 60 Hz 20…38 Vdc (non-isolated)	-									✓			
	24 Vac (+/- 10 %) 50 Hz / 60 Hz 20…38 Vdc (isolated)	✓									-			
Power Consumption	20 VA / 10 W	✓	-										✓	-
	21 VA / 11 W	-	✓	-										
	23 VA / 12 W	-			✓			-						
	24 VA / 15 W	-												✓
	25 VA / 14 W	-						✓			-			
	35 VA / 15 W	-									✓		-	
Insulation class	II	✓												
Ambient operating temperature	-20…55 °C (-4…131 °F)	-	✓	-								✓	-	
	-20…60 °C (-4…140 °F)	✓	-				✓ (1)	-		✓ (1)	-			
	-20…65 °C (-4…149 °F)	-			✓ (2)		-	✓ (2)		-	✓ (3)	-	✓	
Ambient operating humidity (non-condensing)	5…95 %	✓												
Ambient storage temperature	-30…70 °C (-22…158 °F)	✓												
Ambient storage humidity (non-condensing)	5…95 %	✓												
Temperature for ball pressure test	125 °C (257 °F)				✓						-		✓	
Insulation material group	IIIa	✓												
Fire-resistance category	D	✓												
Software class and structure	A	✓												
Operating altitude	0...2000 m (0...6560 ft)	✓												
Digital outputs	Refer to the label on the device	✓												
Degree of protection by enclosure	IP20	✓												

(1) Limited to 55°C (131°F), if mounted other than horizontally on vertical plane.

(2) Limited to 60°C (140°F), if mounted other than horizontally on vertical plane.

(3) Limited to 60°C (140°F), if DO8 is active or if mounted other than horizontally on vertical plane.

AV••••••6•500 / AV•••••••5•500 Controllers Description

What's in This Chapter

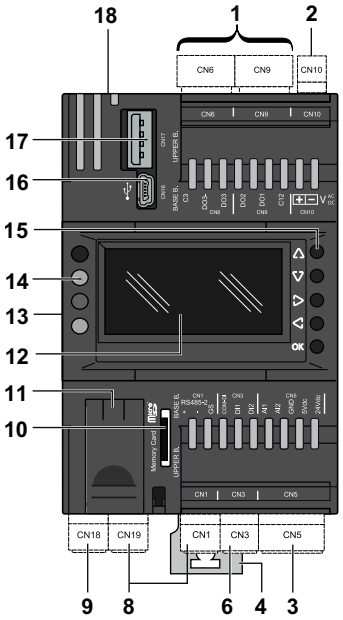
AV•30•••60500

Overview

Reference	Description
AVC3000060500	FREE AVC3000/C/L/U Blind 7 I/Os Isolated
AVD3000060500	FREE AVC3000/C/L/U Display 7 I/Os Isolated

Physical Description

The following illustration presents the AV•30•••60500 controller:



Number	Name	Description	
1	CN6	DO3	High voltage relay digital output 250 Vac 3 A SPDT, page 76
	CN9	DO1…DO2	High voltage relay digital output 250 Vac 3 A SPST, page 73
2	CN10	24 Vac/dc isolated power supply, page 67	
3	CN5	Power out	+24 Vdc power out for analog inputs, max current 100 mA +5 Vdc power out for ratiometric analog inputs, max current 40 mA (2)
		AI1…AI2	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
4	-	Clip-on lock, page 32	

Number	Name	Description	
6	CN3	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, opto-isolated, page 70
8	CN1	RS-485 serial port-2, page 94	
	CN19	RS-485 serial port-1, page 94	
9	CN18	CAN expansion bus master, page 91	
10	-	Micro SD memory card slot, page 101	
11	-	Service battery door, page 103	
12	-	User interface - Display, page 104 (1)	
13	-	Communication module connector, page 18	
14	-	User interface - LEDs, page 104 (1)	
15	-	User interface - Keys, page 104 (1)	
16	CN16	USB type Mini-B female for PC connection, page 97	
17	CN17	USB type A female for a mass storage device (FAT32), page 97	
18	CN20	Ethernet Modbus TCP/IP or BACnet IP, page 98	

(1) Only for AVD•••••••500.

(2) 0-5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 40 mA.

NOTICE

INOPERABLE EQUIPMENT

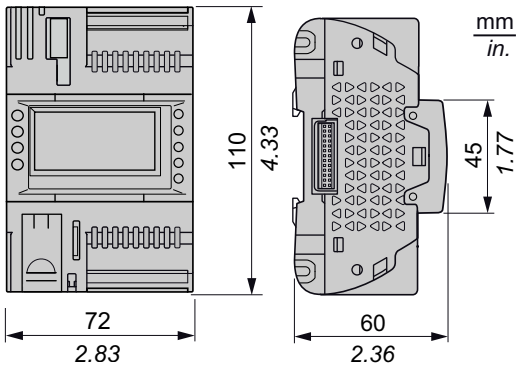
Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

Failure to follow these instructions can result in equipment damage.

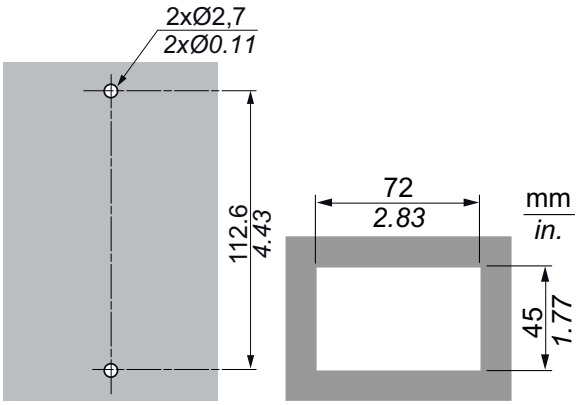
For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

For more information about the wiring, refer to wiring best practices, page 26.

Dimensions



Mounting Holes Layout



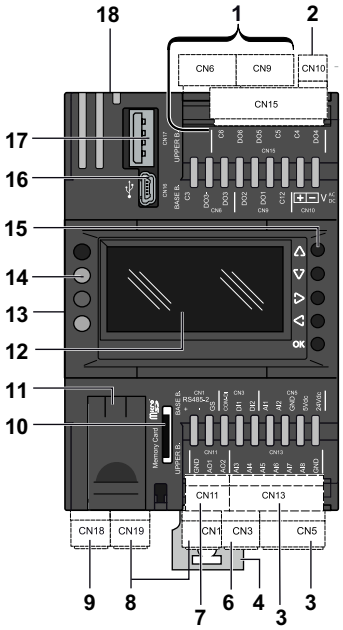
AV•62•••60500 / AV•62•••50500

Overview

Reference	Description
AVC6200060500	AVC6200/C/L/U Blind 18 I/Os Isolated
AVD6200060500	AVD6200/C/L/U Display 18 I/Os Isolated
AVD62SS060500	AVD6200/C/L/U/SSR Display 18 I/Os 2 SSR Isolated
AVC6200050500	AVC6200/C Blind 18 I/Os Isolated
AVD6200050500	AVD6200/C Display 18 I/Os Isolated

Physical Description

The following illustration presents the AV•62••••0500 controller:



Number	Name	Description	
1	CN6	DO3	High voltage relay digital output 250 Vac 3 A SPDT, page 76

Number	Name	Description	
	CN9	DO1…DO2	High voltage relay digital output 250 Vac 3 A SPST, page 73
	CN15	DO5…DO6	• AV••••0•••500: High voltage relay digital output 250 Vac 3 A SPST, page 73 • AVD62SS060500: High voltage SSR digital output 240 Vac 0.2 A, page 75
		DO4	High voltage relay digital output 250 Vac 3 A SPST, page 73
2	CN10	24 Vac/dc isolated power supply, page 67	
3	CN5	Power out	+24 Vdc power out for analog inputs, max current 100 mA +5 Vdc power out for ratiometric analog inputs, max current 40 mA (2)
		AI1…AI2	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
	CN13	AI3…AI8	
4	-	Clip-on lock, page 32	
6	CN3	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, opto-isolated, page 70
7	CN11	AO1…AO2	Low voltage SELV analog outputs, configurable as, page 87: • Current modulation analog output • Current ON/OFF analog output • Voltage modulation analog output • PWM open collector
8	CN1	RS-485 serial port-2, page 94	
	CN19	RS-485 serial port-1, page 94	
9	CN18	CAN expansion bus master, page 91	
10	-	Micro SD memory card slot, page 101 (3)	
11	-	Service battery door, page 103	
12	-	User interface - Display, page 104 (1)	
13	-	Communication module connector, page 18	
14	-	User interface - LEDs, page 104 (1)	
15	-	User interface - Keys, page 104 (1)	
16	CN16	USB type Mini-B female for PC connection, page 97	
17	CN17	USB type A female for a mass storage device (FAT32), page 97 (3)	
18	CN20	Ethernet Modbus TCP/IP or BACnet IP, page 98 (3)	

(1) Only for AVD•••••••500.

(2) 0-5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 40 mA.

(3) Only for AV••••••6•500.

NOTICE

INOPERABLE EQUIPMENT

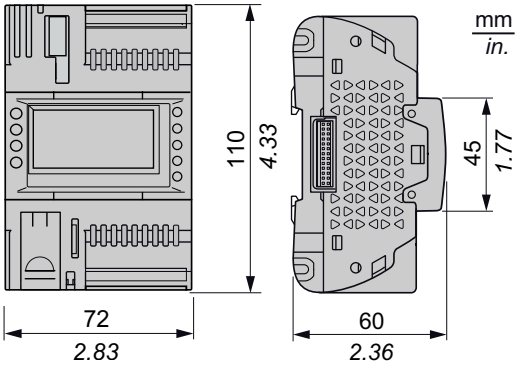
Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

Failure to follow these instructions can result in equipment damage.

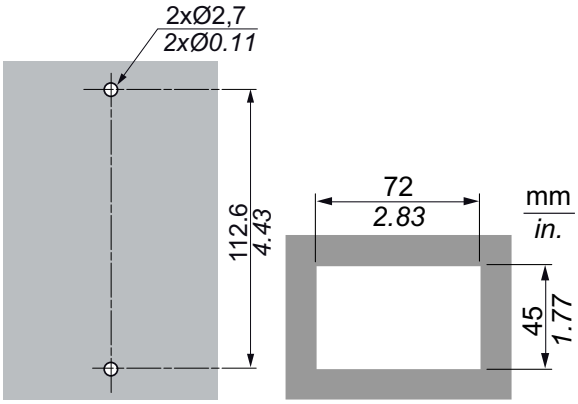
For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

For more information about the wiring, refer to wiring best practices, page 26.

Dimensions



Mounting Holes Layout



AV•84•••6•500 / AV•840005I500

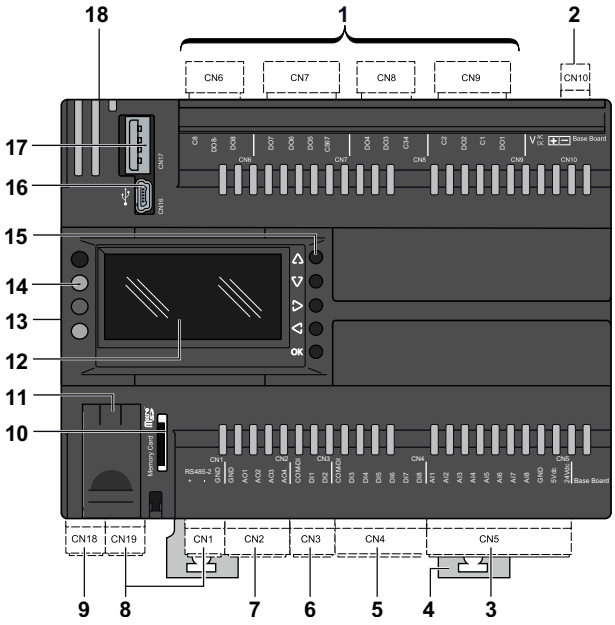
Overview

Reference	Description
AVC8400060500	AVC8400/C/L/U Blind 28 I/Os
AVC840006I500	AVC8400/C/L/U/I Blind 28 I/Os Isolated
AVD8400060500	AVD8400/C/L/U Display 28 I/Os
AVD840006I500	AVD8400/C/L/U/I Display 28 I/Os Isolated
AVD84SS060500	AVD8400/C/L/U/SSR Display 28 I/Os 2 SSR
AVD84SS06I500	AVD8400/C/L/U/SSR/I Display 28 I/Os 2 SSR Isolated
AVC8400050500	AVC8400/C Blind 28 I/Os Isolated
AVD8400050500	AVD8400/C Display 28 I/Os Isolated

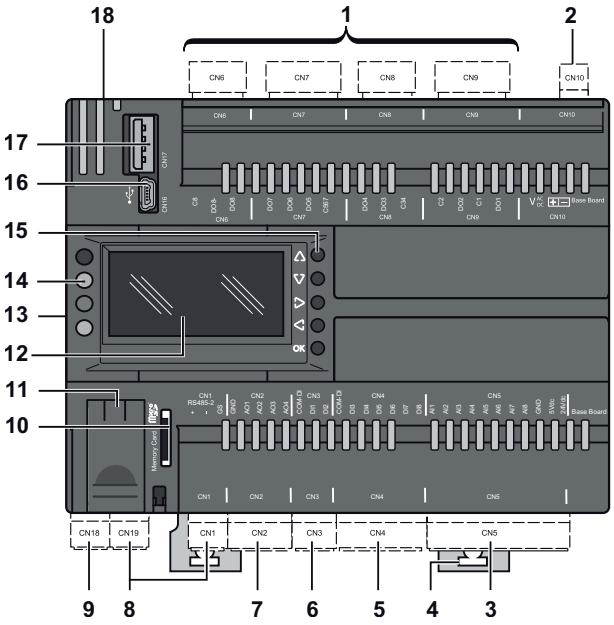
Physical Description

The following illustration presents the AV•84•••6•500 controller:

AV•84•••60500 controller:



AV•84•••6I500 / AV•840005I500 controller:



Number	Name	Description	
1	CN6	DO8	• AV•84•••60500: High voltage relay digital output 250 Vac 1 A SPDT, page 76 • AV•84•••6I500 / AV•840005I500: High voltage relay digital output 250 Vac 3 A SPDT, page 76
	CN7	DO5…DO7	High voltage relay digital output 250 Vac 3 A SPST, page 73
	CN8	DO3…DO4	
	CN9	DO1…DO2	• AV••••0•••500: High voltage relay digital output 250 Vac 3 A SPST, page 73 • AV••••S•••500: High voltage SSR digital output 240 Vac 0.5 A, page 75
2	CN10	24 Vac/dc power supply, page 67	
3	CN5	Power out	+24 Vdc power out for analog inputs, max current 150 mA +5 Vdc power out for ratiometric analog inputs, max current 50 mA (2)
		AI1…AI8	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
4	-	Clip-on lock, page 32	
5	CN4	DI3…DI8	Regular digital input opto-isolated, page 71
6	CN3	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, opto-isolated, page 70
7	CN2	AO1…AO2	Low voltage (SELV) analog outputs 0…10 Vdc, page 89
		AO3…AO4	Low voltage SELV analog outputs, configurable as, page 87: • Current modulation analog output • Current ON/OFF analog output • Voltage modulation analog output • PWM open collector
8	CN1	RS-485 serial port-2, page 94	
	CN19	RS-485 serial port-1, page 94	
9	CN18	CAN expansion bus master, page 91	

Number	Name	Description
10	-	Micro SD memory card slot, page 101 (3)
11	-	Service battery door, page 103
12	-	User interface - Display, page 104 (1)
13	-	Communication module connector, page 18
14	-	User interface - LEDs, page 104 (1)
15	-	User interface - Keys, page 104 (1)
16	CN16	USB type Mini-B female for PC connection, page 97
17	CN17	USB type A female for a mass storage device (FAT32), page 97 (3)
18	CN20	Ethernet Modbus TCP/IP or BACnet IP, page 98 (3)

(1) Only for AVD•••••••500.

(2) 0-5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 50 mA.

(3) Only for AV••••••6•500.

NOTICE

INOPERABLE EQUIPMENT

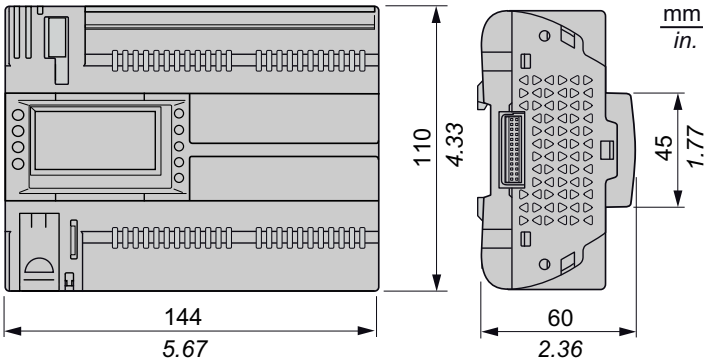
Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

Failure to follow these instructions can result in equipment damage.

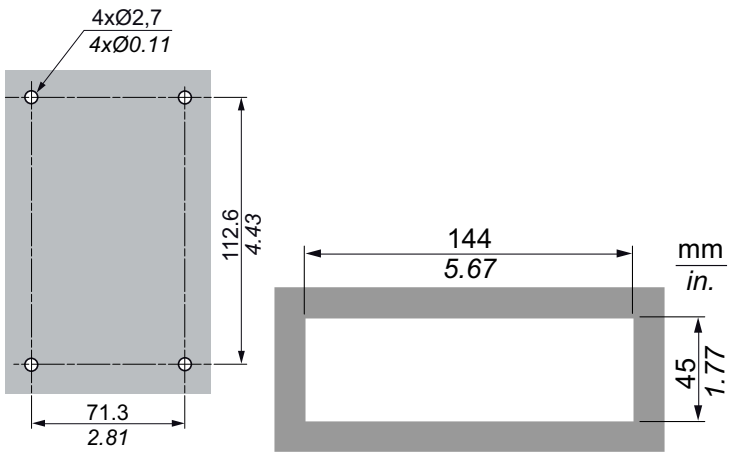
For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

For more information about the wiring, refer to wiring best practices, page 26.

Dimensions



Mounting Holes Layout



AV•12•••6•500 / AV•126005I500

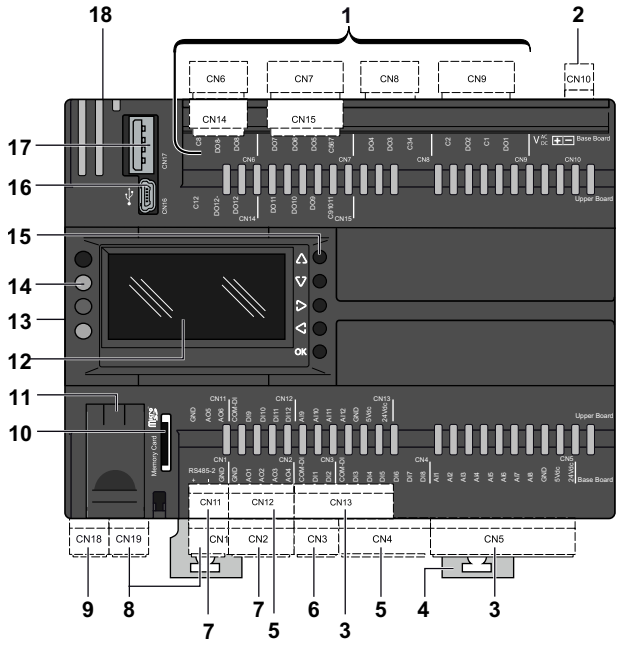
Overview

Reference	Description
AVC1260060500	AVC12600/C/L/U Blind 42 I/Os
AVC126006I500	AVC12600/C/L/U/I Blind 42 I/Os Isolated
AVD1260060500	AVD12600/C/L/U Display 42 I/Os
AVD126006I500	AVD12600/C/L/U/I Display 42 I/Os Isolated
AVD126S060500	AVD12600/C/L/U/SSR Display 42 I/Os 2 SSR
AVD126S06I500	AVD12600/C/L/U/SSR/I Display 42 I/Os 2 SSR Isolated
AVC126005I500	AVC12600/C/I Blind 42 I/Os Isolated
AVD126005I500	AVD12600/C/IDisplay 42 I/Os Isolated

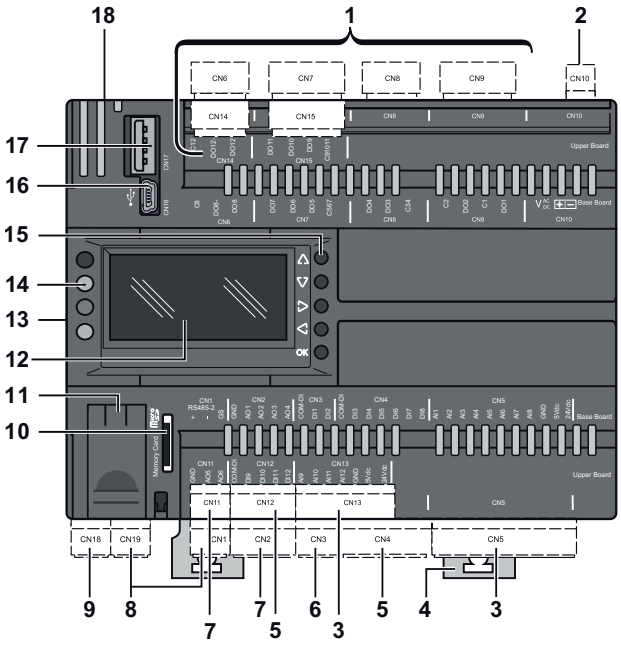
Physical Description

The following illustration presents the AV•126••••500 controller:

AV•126•••0500 controller:



AV•126•••I500 / AV•126005I500 controller:



Number	Name	Description	
1	CN6	DO8	• AV•126•••0500: High voltage relay digital output 250 Vac 1 A SPDT, page 76 • AV•126•••I500 / AV•126005I500: High voltage relay digital output 250 Vac 3 A SPDT, page 76
	CN7	DO5…DO7	High voltage relay digital output 250 Vac 3 A SPST, page 73
	CN8	DO3…DO4	
	CN9	DO1…DO2	• AV••••0•••500: High voltage relay digital output 250 Vac 3 A SPST, page 73 • AV••••S•••500: High voltage SSR digital output 240 Vac 0.5 A, page 75
	CN14	DO12	• AV•126•••0500: High voltage relay digital output 250 Vac 1 A SPDT, page 76 • AV•126•••I500 / AV•126005I500: High voltage relay digital output 250 Vac 3 A SPDT, page 76
	CN15	DO9…DO11	High voltage relay digital output 250 Vac 3 A SPST, page 73
2	CN10	24 Vac/dc power supply, page 67	
3	CN5	Power out	+24 Vdc power out for analog inputs, max current 150 mA (3) +5 Vdc power out for ratiometric analog inputs, max current 50 mA (2)(3)
		AI1…AI8	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
	CN13	AI9…AI12	Identical to CN5.
		Power out	
4	-	Clip-on lock, page 32	
5	CN4	DI3…DI8	Regular digital input opto-isolated, page 71
	CN12	DI9…DI12	
6	CN3	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, opto-isolated, page 70
7	CN2	AO1…AO2	Low voltage (SELV) analog outputs 0…10 Vdc, page 89

Number	Name	Description	
		AO3…AO4	Low voltage SELV analog outputs, configurable as, page 87: • Current modulation analog output • Current ON/OFF analog output • Voltage modulation analog output • PWM open collector
	CN11	AO5…AO6	Low voltage (SELV) analog outputs 0…10 Vdc, page 89
8	CN1	RS-485 serial port-2, page 94	
	CN19	RS-485 serial port-1, page 94	
9	CN18	CAN expansion bus master, page 91	
10	-	Micro SD memory card slot, page 101 (4)	
11	-	Service battery door, page 103	
12	-	User interface - Display, page 104 (1)	
13	-	Communication module connector, page 18	
14	-	User interface - LEDs, page 104 (1)	
15	-	User interface - Keys, page 104 (1)	
16	CN16	USB type Mini-B female for PC connection, page 97	
17	CN17	USB type A female for a mass storage device (FAT32), page 97 (4)	
18	CN20	Ethernet Modbus TCP/IP or BACnet IP, page 98 (4)	

(1) Only for AVD•••••••500.

(2) 0-5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 50 mA.

(3) The maximum current value is the sum between the maximum currents supplied by the corresponding terminals in the CN5 connector and in the CN13 connector.

(4) Only for AV••••••6•500.

NOTICE

INOPERABLE EQUIPMENT

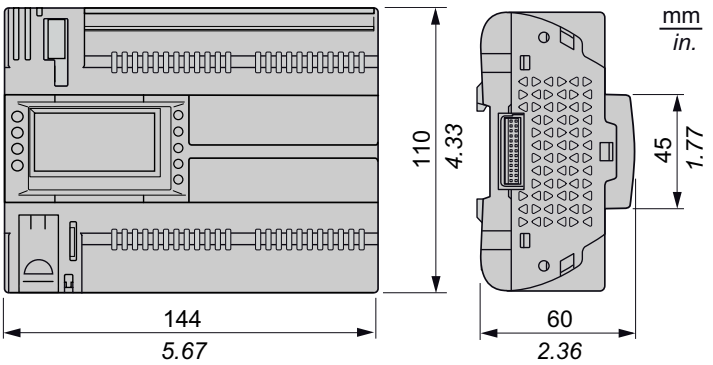
Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

Failure to follow these instructions can result in equipment damage.

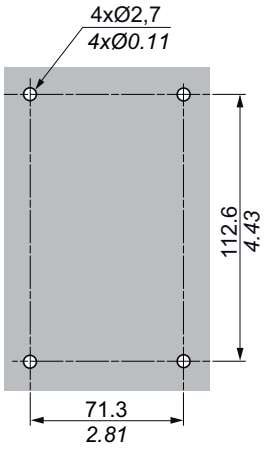
For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

For more information about the wiring, refer to wiring best practices, page 26.

Dimensions



Mounting Holes Layout



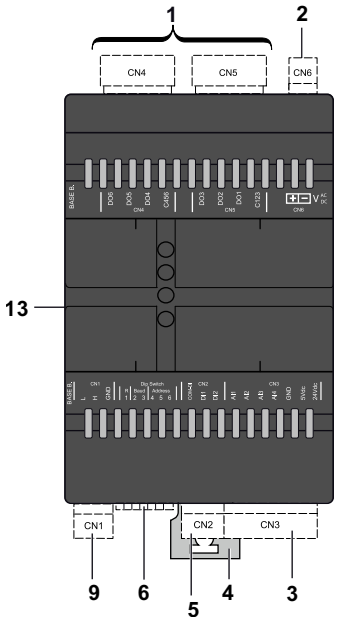
EVE••••••0500 Expansion Modules Description

What's in This Chapter

EVE6000000500

Physical Description

The following illustration presents the EVE6000000500 expansion module:



Number	Name	Description	
1	CN4	DO4…DO6	High voltage relay digital output 250 Vac 3 A SPST, page 73
	CN5	DO1…DO3	
2	CN6	24 Vac/dc non-isolated power supply, page 67	
3	CN3	Power out	+24 Vdc power out for analog inputs, max current 125 mA +5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)
		AI1…AI4	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
4	-	Clip-on lock, page 32	
5	CN2	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, page 70, opto-isolated
6	-	CAN configuration 6-position DIP switches, page 92	
9	CN1	CAN expansion bus slave, page 91	
13	-	TTL Port (Service only)	

(1) 0...5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 50 mA.

NOTICE

INOPERABLE EQUIPMENT

Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

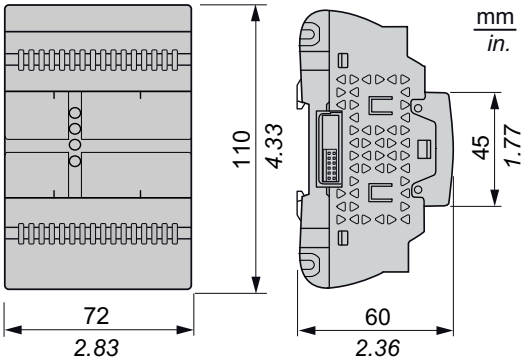
Failure to follow these instructions can result in equipment damage.

For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

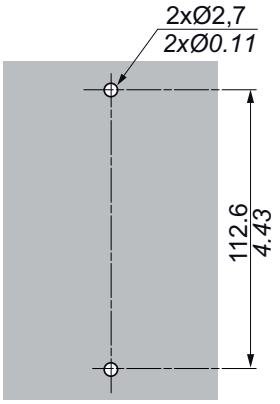
For more information about the wiring, refer to wiring best practices, page 26.

For details about Expansion module troubleshooting, refer to the section EVE••••••0500 Expansion Modules User Interface, page 105.

Dimensions



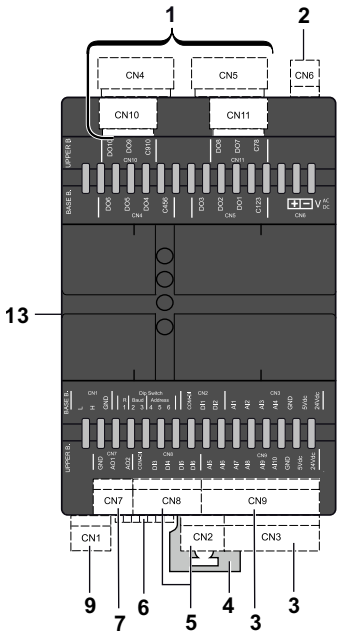
Mounting Holes Layout



EVE1020000500

Physical Description

The following illustration presents the EVE1020000500 expansion module:



Number	Name	Description	
1	CN4	DO4…DO6	High voltage relay digital output 250 Vac 3 A SPST, page 73
	CN5	DO1…DO3	
	CN10	DO9…DO10	
	CN11	DO7…DO8	
2	CN6	24 Vac/dc non-isolated power supply, page 67	
3	CN3	Power out	+24 Vdc power out for analog inputs, max current 125 mA (2) +5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)(2)
		AI1…AI4	Analog inputs are configurable as, page 78: • NTC resistive input or digital input • Current analog input • Voltage analog input • PTC resistive input
	CN9	AI5…AI10	Identical to CN3.
		Power out	
4	-	Clip-on lock, page 32	
5	CN2	DI1…DI2	Fast digital input, pulse/frequency counter up 2 kHz, page 70, opto-isolated
	CN8	DI3…DI6	Regular digital input opto-isolated, page 71
6	-	CAN configuration 6-position DIP switches, page 92	
7	CN7	AO1…AO2	Low voltage SELV analog outputs, configurable as, page 87: • Current modulation analog output • Current ON/OFF analog output • Voltage modulation analog output • PWM open collector
9	CN1	CAN expansion bus slave, page 91	

Number	Name	Description
13	-	TTL Port (Service only)

(1) 0...5 V Ratiometric: ratiometric range is 0.5 V to 4.5 V. Maximum current at +5 Vdc is 50 mA.

(2) The maximum current value is the sum between the maximum currents supplied by the corresponding terminals in the CN3 connector and in the CN9 connector.

NOTICE

INOPERABLE EQUIPMENT

Configure the analog inputs and outputs, and related parameters, according to the physical types of resources connected.

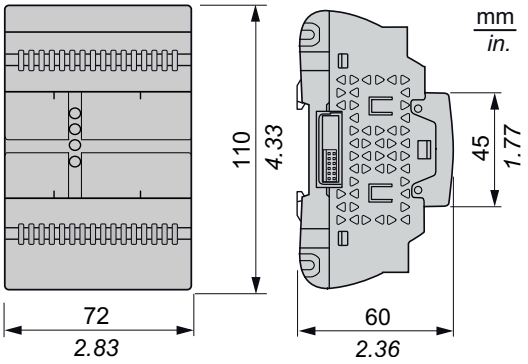
Failure to follow these instructions can result in equipment damage.

For more details, refer to analog inputs configuration, page 78 and analog outputs configuration, page 87.

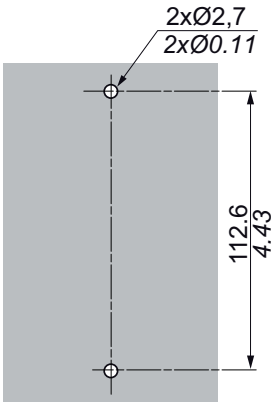
For more information about the wiring, refer to wiring best practices, page 26.

For details about Expansion module troubleshooting, refer to the section EVE••••••0500 Expansion Modules User Interface, page 105.

Dimensions



Mounting Holes Layout



Electrical Characteristics and Wiring Diagrams

What's in This Chapter

From time to time, new input modules, output modules, or other devices are made available that are not documented in the present documentation. For information on new devices, contact your local Eliwell representative.

NOTICE

INOPERABLE EQUIPMENT

Update the controller firmware to the latest version every time you install a newly released Input/Output expansion module or other device to this equipment.

Failure to follow these instructions can result in equipment damage.

NOTE: For more information on how to update the controller firmware, contact your local Eliwell representative.

Applying incorrect current or voltage levels on AV•30•••60500 / AV•62•••60500 / AV•62•••50500 / AV•84•••6I500 / AV•840005I500 / AV•126•••I500 / AV•126005I500 controllers and EVE••••••0500 expansion modules inputs and outputs could damage the electronic circuitry. Further, connecting a current input device to an analog input configured for voltage, and vice versa, could damage the electronic circuitry.

NOTICE

INOPERABLE EQUIPMENT

- Do not apply current above 30 mA to the analog inputs of the expansion module.
- Do not apply voltages above 24 Vdc and less than -7 Vdc to the analog inputs of the expansion module.
- Do not mismatch the applied signal with the analog input configuration.

Failure to follow these instructions can result in equipment damage.

Applying incorrect current or voltage levels on AV•84•••6•500 / AV•12•••6•500 controllers analog inputs and outputs could damage the electronic circuitry. Further, connecting a current input device to an analog input configured for voltage, and vice versa, could damage the electronic circuitry.

NOTICE
INOPERABLE EQUIPMENT • Do not apply voltages above 11 Vdc to the analog inputs of the controller or Input/Output expansion module when analog input is configured as 0-10V input. • Do not apply current above 25 mA to the analog inputs of the controller or Input/Output expansion module when analog input is configured as 0-20 mA or 4-20 mA input. • Do not mismatch applied signal with analog input configuration. **Failure to follow these instructions can result in equipment damage.**

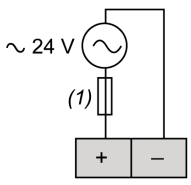
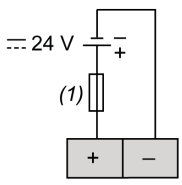
Power Supply

Power Supply

Controllers and Expansion Modules Power Supply

References	Power supply characteristics		Maximum power consumption
AV•30•••60500 controller	Isolated	24 Vac (+/- 10 %) - 50/60 Hz	20 VA
		20…38 Vdc	10 W
AV•62••060500 / AV•6200050500 controllers		24 Vac (+/- 10 %) - 50/60 Hz	21 VA
		20…38 Vdc	11 W
AV•84•••6I500 / AV•840005I500 controllers		24 Vac (+/- 10 %) - 50/60 Hz	23 VA
		20…38 Vdc	12 W
AV•126•••I500 / AV•126005I500 controllers		24 Vac (+/- 10 %) - 50/60 Hz	25 VA
		20…38 Vdc	14 W
AV•84•••60500 / AV•126•••0500 controllers	Non-isolated	24 Vac (+/- 10 %) - 50/60 Hz	35 VA
		20…38 Vdc	15 W
EVE6000000500 expansion module		24 Vac (+/- 10 %) - 50/60 Hz	20 VA
		20…38 Vdc	10 W
EVE1020000500 expansion module		24 Vac (+/- 10 %) - 50/60 Hz	24 VA
		20…38 Vdc	15 W

Power supply wiring diagram:

24 Vac	24 Vdc
	
(1) Type T fuse 2 A.	

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in.)	10 m (32.8 ft)

NOTICE

INOPERABLE EQUIPMENT

Do not connect a power cable longer than 10 m (32.8 ft).

Failure to follow these instructions can result in equipment damage.

For more information about the wiring, refer to Best wiring practices, page 26.

The power supplies for the AV••••••6•500, AV•••••••5•500, and EVE••••••0500 must be rated Safety Extra Low Voltage (SELV) according to IEC 61140. These sources of power are isolated between the electrical input and output circuits of the power supply as well as simple separation from ground (earth), PELV, and other SELV systems.

⚠DANGER

GROUND LOOP CAUSING ELECTRIC SHOCK AND/OR INOPERABLE EQUIPMENT

- Do not connect the 0 V power supply/transformer connection supplying this equipment to any external ground (earth) connection.
- Do not connect any 0 V or ground (earth) of the sensors and actuators connected to this equipment to any external ground connection.
- If necessary, use separate power supplies/transformers to power sensors or actuators isolated from this equipment.

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

In all cases, if the specified voltage range is not maintained, the products may not function as intended. Use appropriate safety interlocks and voltage monitoring circuits.

⚠WARNING

POTENTIAL OF OVERHEATING AND FIRE

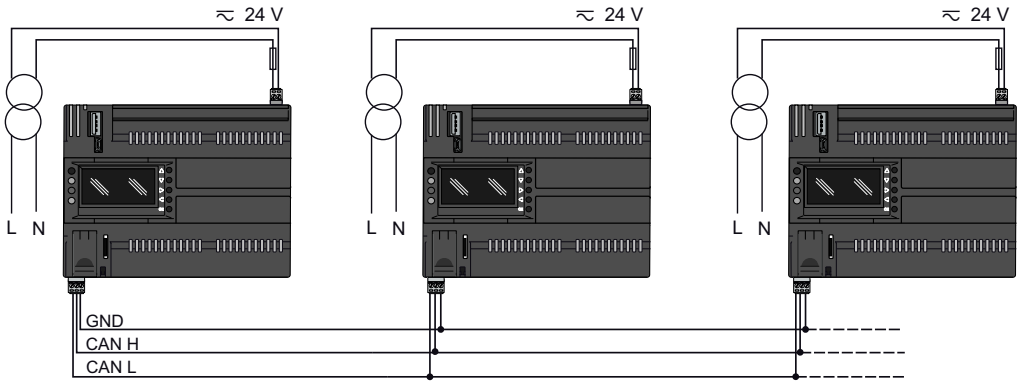
- Do not connect the equipment directly to line voltage.
- Use only isolating SELV, Class 2 power supplies / transformers to supply power to this equipment.

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

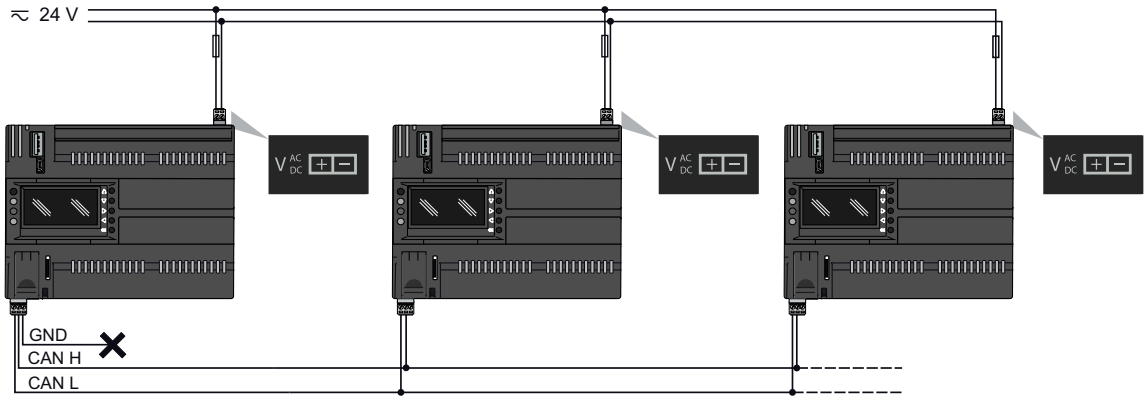
Power Supply and Field bus Wiring Restriction For Non Isolated Controllers and Expansion Modules

AV•84•••60500 / AV•126•••0500 / EVE••••••0500 power supply inputs are not isolated. If you connect the GND connection of the RS-485 network or the CAN expansion bus across multiple controllers, you must use separate, isolated power supplies. Alternatively, if you are interconnecting the equipment to a single power supply, do not connect the RS-485 or CAN GND signal. Pay special attention when connecting serial lines. Miswiring may lead to inoperable equipment.

CAN network example with separate power lines:



CAN network example with common power line and GND signal not connected:



NOTE: AV•30•••60500 / AV•62••••0500 / AV•840005I500 / AV•126005I500 / AV•84•••6I500 / AV•126•••I500 power supply inputs are isolated. GS connection of the RS-485 network or the GND connection of the CAN expansion bus across multiple controllers must be connected regardless of the power supply type and wiring.

Digital Input

Digital Inputs

This table presents the digital inputs of controllers and expansion modules:

Description	AV•30•••60500	AV•62•0••0500	AV•62SS••0500	AV•8400•••500	AV•84SS•••500	AV•1260•••500	AV•126S•••500	EVE600000500	EVE1020000500
Fast digital inputs, page 70	2	2	2	2	2	2	2	2	2
Regular digital inputs, page 71	-	-	-	6	6	10	10	-	4

These devices have analog inputs that can be configured as dry contact digital inputs. For more details, refer to the configuration of analog inputs, page 78.

NOTE: The commons COM_DI are not internally connected together.

Fast Digital Inputs

Overview

If fast digital inputs are used as regular digital inputs, refer to regular digital inputs wiring diagram, page 72.

Characteristics

The table indicates the digital inputs characteristics:

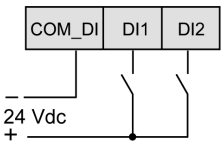
Characteristic	Value	
	Used as fast input	**Used as regular input**
Type	Digital input	
Power draw (maximum)	5 mA	
Working voltage	+0…38 Vdc	+0…38 Vdc 0…24 Vac +/-10 % 50/60 Hz
Pulse detection minimum length	Positive pulse 0.15 ms	Positive or negative pulse: • AV•30•••60500 / AV•62••••0500: 40 ms • AV•84•••••500 / AV•126••••500: 20 ms • EVE1020000500: 40 ms
Maximum frequency measurement	2 kHz	-
Logic type	Digital inputs work in positive logic	Digital inputs work in positive or negative logic
Level 1	+20…38 Vdc	+20…38 Vdc 24 Vac +/-10 % 50/60 Hz
Level 0	+0…4 Vdc	+0…4 Vdc 0…3 Vac 50/60 Hz

Logic type description

Logic type	Active state
Positive logic	Output supplies current (source output) Current flows to the input (sink input)
Negative logic	Output draws current (sink output) Current flows from the input (source input)

Wiring Diagram Example

AV•30••••0500 / AV•62••••0500 / AV•84•••••500 / AV•126••••500 (CN3) fast digital input:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to Best wiring practices, page 26.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector		Label	Description
AV•30••••0500 AV•62••••0500 AV•84•••••500 AV•126••••500	CN3		COM-DI	Common for digital inputs 1…2
			DI1…DI2	Regular digital inputs 1…2
EVE••••••0500	CN2			

Regular Digital Inputs

Characteristics

The table indicates the digital inputs characteristics:

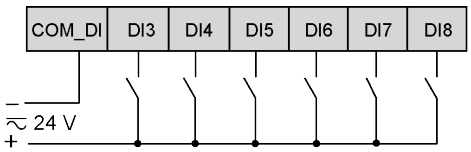
Characteristic	Value
Type	Digital input
Power draw (maximum)	5 mA
Working voltage	+0…38 Vdc 0…24 Vac +/-10 % 50/60 Hz
Pulse detection minimum length	• AV•84•••••500/AV•126••••500 positive or negative pulse ◦ DI3…DI4: 20 ms ◦ DI5…DI8: 40 ms • AV•126••••500 positive or negative pulse ◦ DI9…DI12: 40 ms • EVE1020000500 positive pulse ◦ DI3…DI6: 40 ms
Logic type	Digital inputs work in positive logic • AV•84•••••500/AV•126••••500: Digital inputs work in positive or negative logic • EVE1020000500: Digital inputs work in positive logic
Level 1	+20…38 Vdc 24 Vac +/-10 % 50/60 Hz
Level 0	+0…4 Vdc 0…3 Vac 50/60 Hz

Logic type description:

Logic type	Active state
Positive logic	Output supplies current (source output) Current flows to the input (sink input)
Negative logic	Output draws current (sink output) Current flows from the input (source input)

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN4) regular digital input:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to Best wiring practices, page 26.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector	Label	Description
AV•84•••••500 AV•126••••500	CN4 COM_DI DI3 DI4 DI5 DI6 DI7 DI8	COM-DI	Common for digital inputs 3…8
		DI3…DI8	Regular digital inputs 3…8
AV•126••••500	CN12 COM_DI DI9 DI10 DI11 DI12	COM-DI	Common for digital inputs 9…12
		DI9…DI12	Regular digital inputs 9…12
EV-E1020000500	CN8 COM_DI DI3 DI4 DI5 DI6	COM-DI	Common for digital inputs 3…6
		DI3…DI6	Regular digital inputs 3…6

Digital Output

Digital Output

This table presents the digital outputs of controllers and expansion modules:

Description	AV•30•••60500	AV•62•0••0500	AV•62SS••0500	AV•8400•••500	AV•84SS•••500	AV•1260•••500	AV•126S•••500	EVE6000000500	EVE1020000500
High voltage relay SPST digital output, page 73	2	5	3	7	5	10	8	6	10
High voltage Solid-state relay digital output, page 75	-	-	2	-	2	-	2	-	-
High voltage relay SPDT digital output, page 76	1	1	1	1	1	2	2	-	-

These devices have analog outputs that can be configured as low voltage (SELV), open collector outputs. For more details, refer to the configuration of analog outputs, page 78.

NOTE: The commons C*x* are not internally connected together.

High voltage Relay SPST Digital Output

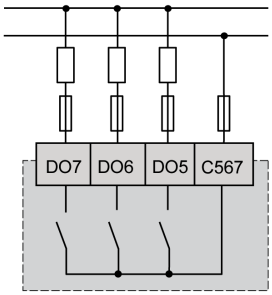
Characteristics

The table indicates the digital outputs characteristics:

Characteristic	Value
Maximum voltage	250 Vac
Maximum current	3 A resistive load, 2 FLA / 12 LRA
Minimum switching capacity	100 mA / 5 Vdc
Electrical durability conforming to UL60730	100 000 cycles, 3 A at 250 Vac

Wiring Diagram Example

AV•84•••••500 (CN7) SPST relay output:

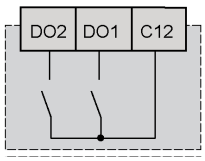
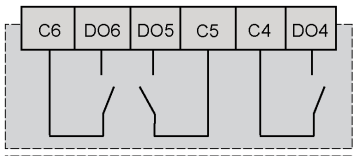
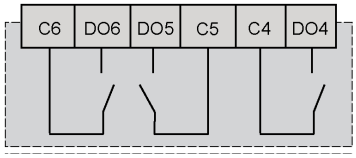
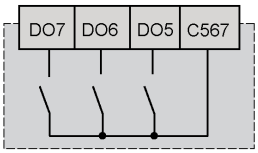
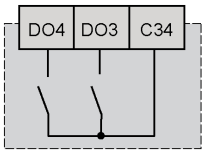
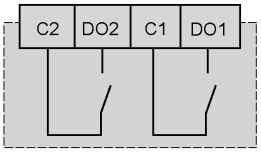
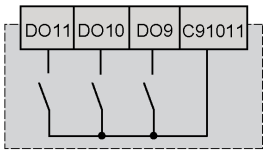
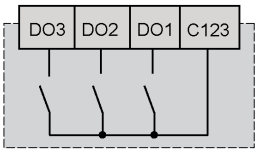
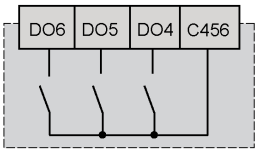


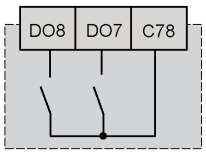
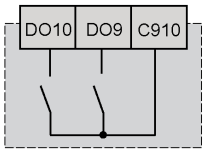
Pitch of the terminal block
5.00 mm (0.197 in)

For more information about the wiring, refer to Best wiring practices, page 26.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector		Label	Description
AV•30••••0500 AV•62••••0500	CN9		C12	Common for output relays 1…2 Maximum current: 6 A
			DO1…DO2	Output relays 1…2
AV•62•0••0500	CN15		C4	Common for output relay 4 Maximum current: 3 A
			C5	Common for output relay 5 Maximum current: 3 A
			C6	Common for output relay 6 Maximum current: 3 A
			DO4…DO6	Output relays 4…6
AV•62SS••0500	CN15		C4	Common for output relay 4 Maximum current: 3 A
			DO4	Output relay 4 **NOTE:** DO5 and DO6 are SSR outputs, page 76.
AV•84•••••500 AV•126••••500	CN7		C567	Common for output relays 5…7 Maximum current: 9 A
			DO5…DO7	Output relays 5…7
	CN8		C34	Common for output relays 3…4 Maximum current: 6 A
			DO3…DO4	Output relays 3…4
AV•8400•••500 AV•1260•••500	CN9		C1	Common for output relay 1 Maximum current: 3 A
			C2	Common for output relay 2 Maximum current: 3 A
			DO1…DO2	Output relays 1…2
AV•126••••500	CN15		C91011	Common for output relays 9…11 Maximum current: 9 A
			DO9…DO11	Output relays 9…11
EVE••••••0500	CN5		C123	Common for output relays 1…3 Maximum current: 9 A
			DO1…DO3	Output relays 1…3
	CN4		C456	Common for output relays 4…6 Maximum current: 9 A
			DO4…DO6	Output relays 4…6

Related Device	Connector		Label	Description
EVE1020000500	CN11		C78	Common for output relays 7…8 Maximum current: 6 A
			DO7…DO8	Output relays 7…8
	CN10		C910	Common for output relays 9…10 Maximum current: 6 A
			DO9…DO10	Output relays 9…10

High Voltage Solid-State Relay Digital Output

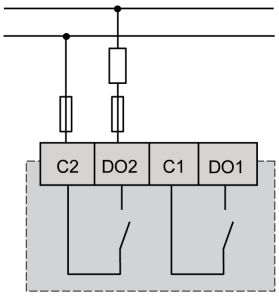
Characteristics

The table indicates the SSR output characteristics:

Characteristic	Value	
	AV•62SS••0500	**AV•84SS•••500** **AV•126S•••500**
Nominal voltage	75…240 Vac	
Maximum current	0.2 A	0.5 A
Switching rate range	45…65 Hz	
Minimum switching capacity	20 mA	

Wiring Diagram Example

AV•84SS•••500 (CN9) SSR output:

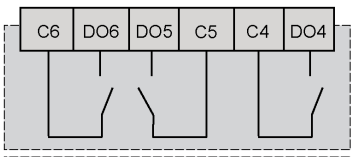
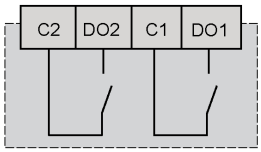


Pitch of the terminal block
5.00 mm (0.197 in)

For more information about the wiring, refer to Best wiring practices, page 26.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector		Label	Description
AV•62SS••0500	CN15		C5	Common for SSR output 5 Maximum current: 0.2 A
			C6	Common for SSR output 6 Maximum current: 0.2 A
			DO5…DO6	SSR Outputs 5…6 **NOTE:** DO4 is not an SSR output., page 74
AV•84SS•••500 AV•126S•••500	CN9		C1	Common for SSR output 1 Maximum current: 0.5 A
			C2	Common for SSR output 2 Maximum current: 0.5 A
			DO1…DO2	SSR Outputs 1…2

High voltage Relay SPDT Digital Output

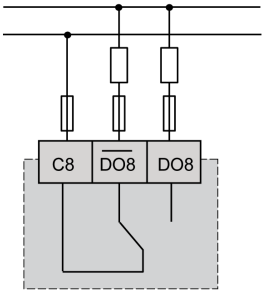
Characteristics

The table indicates the digital outputs characteristics:

Characteristic	Value	
	AV•30••••0500 **AV•62••••0500** **AV•84•••6I500** **AV•126•••I500** **AV•840005I500** **AV•126005I500**	**AV•84•••60500** **AV•126•••0500**
Maximum voltage	250 Vac	240 Vac
Maximum current	3 A resistive load, NO contact: 2.2 FLA / 13.2 LRA	-20…55 °C (-4…131 °F): 3 A resistive load -20…60 °C (-4…140 °F): 1 A resistive load -20…65 °C (-4…149 °F): 1 A resistive load if DO8 is inactive
Minimum switching capacity	300 mA, resistive load	300 mA, resistive load
Electrical durability conforming to UL60730	100 000 cycles	100 000 cycles

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN6) SPDT relay output:

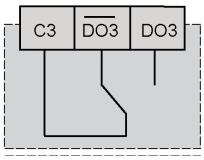
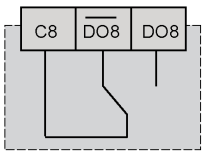
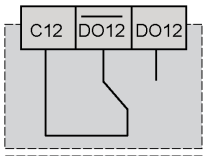


Pitch of the terminal block
5.00 mm (0.197 in)

For more information about the wiring, refer to Best wiring practices, page 26.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector		Label	Description
AV•30••••0500 AV•62••••0500	CN6		C3	Common for output relay 3 Maximum current: 3 A
			DO3	Output relay3 - Normally open
			DO3-	Output relay 3 - Normally closed
AV•84•••••500 AV•126••••500	CN6		C8	Common for output relay 8 Maximum current: 3 A(1)(2)
			DO8	Output relay 8 - Normally open
			DO8-	Output relay 8 - Normally closed
AV•126••••500	CN14		C12	Common for output relay 12 Maximum current: 3 A (1)
			DO12	Output relay 12 - Normally open
			DO12-	Output relay 12 - Normally closed
(1) AV•84•••60500 / AV•126•••0500: The maximum current is limited to 1 A if the ambient temperature exceeds 55 °C (131 °F). **(2)** AV•84•••60500 / AV•126•••0500: The ambient temperature must not exceed 60 °C (140 °F) if DO8 is active.				

Analog Inputs

Analog Inputs

This table presents the analog inputs of controllers and expansion modules:

Description	AV•30•••60500	AV•62•0••0500	AV•62SS••0500	AV•8400•••500	AV•84SS•••500	AV•1260•••500	AV•126S•••500	EVE6000000500	EVE1020000500
Configurable analog inputs or digital input.	2	8	8	8	8	12	12	4	10

Analog Inputs

Overview

Controllers analog inputs are identified as AI1…AI*x*.

The inputs are configurable in pairs, AI1- AI2 is the first pair, AI3-AI4 is the second pair, and so on, up to the last pair. Both AIs of a pair must be configured in order to belong to the same type group.

Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

Type group	*Cfg_Aix*	Description
NTC resistive input, page 81 or Digital input, page 86	0	NTC (NK103), 10 kΩ at 25 °C, BETA value 3977
	1	Digital input
	2	NTC (103AT-2), 10 kΩ at 25 °C, BETA value 3435
	7	hΩ (NTC)(1)
Current input, page 84	3	4…20 mA
	11	0…20 mA
Voltage input 0…10 Vdc, page 85	4	0…10 Vdc
Voltage input 0…5 Vdc, page 85	5	0…5 Vdc Ratiometric
	10	0…5 Vdc
Resistive input, page 82	6	Pt1000
	8	daΩ (Pt1000)(2)
	9	PTC (KTY81-121)

(1) Resistance value read, expressed in 0.1 kΩ, for a resistance applied to the input using the controller in NTC configuration, for example creating a divider with pull-up resistance of 10 kΩ. The resistance range for the hΩ(NTC) configuration is up to 150 kΩ.
(2) Resistance value read, expressed in 0.01 kΩ, for a resistance applied to the input using the controller in Pt1000 configuration, that is, creating a divider with pull-up resistance (1.5 kΩ for AV•30•••60500 / AV•62••••0500, 2 kΩ for other device references). The resistance range for the daΩ (Pt1000) configuration is up to 3 kΩ.

The analog inputs configured as digital inputs are not isolated.

NOTICE

INOPERABLE EQUIPMENT

Only use voltage free type inputs on analog inputs configured as digital inputs.

Failure to follow these instructions can result in equipment damage.

Compatibility in Pairs

Parameters by pair:

Pairs	Parameter Set	
Pair #1	*Cfg_Ai1*	*Cfg_Ai2*
Pair #2	*Cfg_Ai3*	*Cfg_Ai4*
Pair #3	*Cfg_Ai5*	*Cfg_Ai6*
Pair #4	*Cfg_Ai7*	*Cfg_Ai8*
Pair #5	*Cfg_Ai9*	*Cfg_Ai10*
Pair #6	*Cfg_Ai11*	*Cfg_Ai12*

NOTE: The all pairs are available for AV•126••••500. Depending on the analog inputs of the device, not all pairs are available, refer to the Related Devices and Connectors, page 80.

Compatibility table for a pair of AIs:

Example for pair #1			*Cfg_Ai1*											
			0	1	2	3	4	5	6	7	8	9	10	11
			NTC (NK103)	Digital input	NTC (103AT-2)	4…20 mA	0…10 Vdc	0…5 Vdc Ratiometric	Pt1000	hΩ (NTC)	daΩ (Pt1000)	PTC (KTY81-121)	0…5 Vdc	0…20 mA
Cfg_Ai2	0	NTC (NK103)	✓	✓	✓	-	-	-	-	✓	-	-	-	-
	1	Digital input	✓	✓	✓	-	-	-	-	✓	-	-	-	-
	2	NTC (103AT-2)	✓	✓	✓	-	-	-	-	✓	-	-	-	-
	3	4…20 mA	-	-	-	✓	-	-	-	-	-	-	-	✓
	4	0…10 Vdc	-	-	-	-	✓	-	-	-	-	-	-	-
	5	0…5 Vdc Ratiometric	-	-	-	-	-	✓	-	-	-	-	✓	-
	6	Pt1000	-	-	-	-	-	-	✓	-	✓	✓	-	-
	7	hΩ (NTC)	✓	✓	✓	-	-	-	-	✓	-	-	-	-
	8	daΩ (Pt1000)	-	-	-	-	-	-	✓	-	✓	✓	-	-
	9	PTC (KTY81-121)	-	-	-	-	-	-	✓	-	✓	✓	-	-
	10	0…5 Vdc	-	-	-	-	-	✓	-	-	-	-	✓	-
	11	0…20 mA	-	-	-	✓	-	-	-	-	-	-	-	✓

Applying not allowed configuration produces the error number 8003_h on the field value of both probes (unsigned decimal: 32771 / signed decimal: -32765).

Voltage Analog Inputs or Current Analog Inputs Configuration

According to the physical resources wired (voltage signal or current signal), inputs must be configured using the related parameters.

Analog inputs type can be configured as specified in the following table:

Parameter	Description	Range	Default value
FullScaleMin_AIx	Analog input AI*x* start of scale value	-9999…+9999	0
FullScaleMax_AIx	Analog input AI*x* full scale value	-9999…+9999	1000
Calibration_AIx	Analog input AI*x* differential	-1000…+1000	0

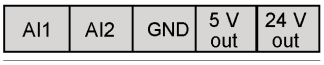
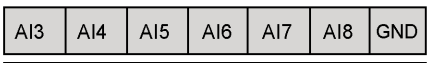
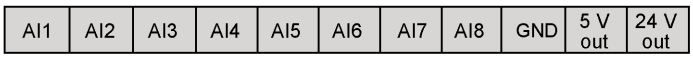
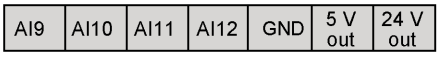
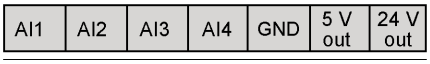
Note:

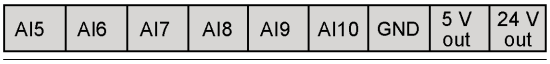
Type of probe configured	Minimum full scale AI*x*	Maximum full scale AI*x*
0/4…20 mA current probe	0/4 mA	20 mA
0…10 Vdc voltage probe	0 Vdc	10 Vdc
0…5 Vdc ratiometric probe	10 % (0.5 Vdc)	90 % (4.5 Vdc)
0…5 Vdc probe	0 Vdc	5 Vdc

For details on the values and characteristics of parameters, refer to the Parameters, page 125.

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector	Label	Description
AV•30••••0500 AV•62••••0500	CN5		
		24 Vdc	+24 Vdc power out for analog inputs, max current 100 mA
		5 Vdc	+5 Vdc power out for ratiometric analog inputs, max current 40 mA
		GND	0 V signal ground
		AI1…AI2	Analog inputs 1… 2 or dry contact digital inputs
AV•62••••0500	CN13		
		GND	0 V signal ground
		AI3…AI8	Analog inputs 3… 8 or dry contact digital inputs
AV•84•••••500 AV•126••••500	CN5		
		24 Vdc	+24 Vdc power out for analog inputs, max current 150 mA (1)
		5 Vdc	+5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)
		GND	0 V signal ground
		AI1…AI8	Analog inputs 1… 8 or dry contact digital inputs
AV•126••••500	CN13		
		24 Vdc	+24 Vdc power out for analog inputs, max current 150 mA (1)
		5 Vdc	+5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)
		GND	0 V signal ground
		AI9…AI12	Analog inputs 9…12 for dry contact digital inputs
EVE••••••0500	CN3		

Related Device	Connector	Label	Description
		24 Vdc	+24 Vdc power out for analog inputs, max current 125 mA (1)
		5 Vdc	+5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)
		GND	0 V signal ground
		AI1…AI4	Analog inputs 1…4 or dry contact digital inputs
EV-E1020000500	CN9		
		24 Vdc	+24 Vdc power out for analog inputs, max current 125mA (1)
		5 Vdc	+5 Vdc power out for ratiometric analog inputs, max current 50 mA (1)
		GND	0 V signal ground
		AI5…AI10	Analog inputs 5…10 or dry contact digital inputs
(1) The maximum current value is the sum between the maximum currents supplied by the corresponding terminals in the base board connector and in the upper board connector.			

AVP1•000W0500 Display Embedded Analog Inputs Parameters

The temperature and humidity sensors analog input are embedded in the display.

The parameters related to the analog inputs are listed in the following table:

Parameter	Description	Range
Temp_UM	Unit of temperature measurement	Value 0: °C Value 1: °F
Calibration_NTC	NTC differential	-18.0…+18.0 Unit: 0.1 °C or °F
Calibration_RH	RH percentage differential	-1000…+1000 Unit: 0.1 %RH

For details on the values and characteristics of parameters, refer to the Parameters, page 153.

NTC Analog Input

Characteristics

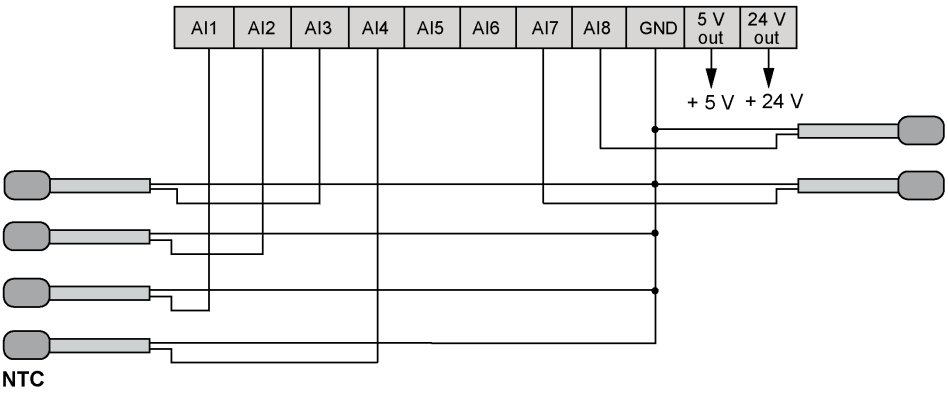
Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

Cfg_Aix	Description	Accuracy Range	Accuracy	Resolution	Input Impedance
0	NTC (NK103) 10 kΩ at 25 °C BETA value 3977	-40…+137 °C (-40…+278.6 °F)			
		-40…+110 °C (-40…+230 °F)	+/-1 °C (+/-1.8 °F)	0.1 °C (0.18 °F)	10 kΩ
		+110…+137 °C (+230…+278.6 °F)	+/-1.9 °C (+/-3.42 °F)		
2	NTC (103AT-2) 10 kΩ at 25 °C	-50…+110 °C (-58…+230 °F)	+/-1 °C (+/-1.8 °F)	0.1 °C (0.18 °F)	10 kΩ

Cfg_Aix	Description	Accuracy Range	Accuracy	Resolution	Input Impedance
	BETA value 3435				
7	hΩ (NTC)	0…150 kΩ			
	AV•30•••60500 AV•62••••0500	0…75 kΩ	+/-0.85 kΩ	0.1 kΩ	10 kΩ
		75…150 kΩ	+/-2.4 kΩ		
	AV•84•••••500 AV•126••••500	0…150 kΩ	+/-0.85 kΩ		
	EVE••••••0500	0…70 kΩ	+/-1 kΩ		
		70…120 kΩ	+/-2.5 kΩ		
		120…150 kΩ	+/-6 kΩ		

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 CN5 NTC input connection:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Resistive Analog Input

Characteristics

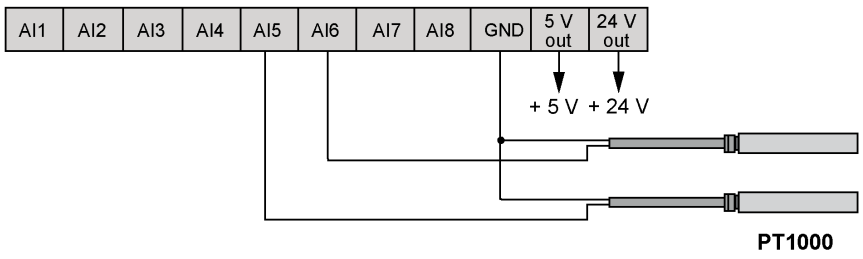
Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

Cfg_Aix	Description	Accuracy Range	Accuracy	Resolution	Input Impedance
6	Pt1000	-200…+850 °C (-328…+1562 °F)			
	AV•30•••60500 AV•62••••0500	-200…0 °C (-328…+32 °F)	+/-2.61 °C (+/-4.70 °F)	0.1 °C (+/-0.18 °F)	1.5 kΩ
	AV•84•••••500 AV•126••••500	0…+80 °C (+32…+176 °F)	+/-3.3 °C (+/-5.94 °F)		AV•30•••60500 AV•62••••0500
		+80…+150 °C (+176…+302 °F)	+/-3.9 °C (+/-7.02 °F)		2 kΩ

Cfg_Aix	Description	Accuracy Range	Accuracy	Resolution	Input Impedance
		+150…+400 °C (+302…+752 °F)	+/-7.6 °C (+/-13.68 °F)		AV•84•••••500 AV•126••••500
		+400…+850 °C (+752…+1562 °F)	+/-17.8 °C (+/-32.04 °F)		
	EVE••••••0500	-200…-100 °C (-328…-148 °F)	+/-5 °C (+/-9 °F)	0.1 °C (+/-0.18 °F)	2 kΩ
		-100…-50 °C (-148…-58 °F)	+/-3 °C (+/-5.4 °F)		
		-50…+200 °C (-58…+392 °F)	+/-1.5 °C (+/-2.7 °F)		
		+200…+600 °C (+392…+1112 °F)	+/-15 °C (+/-27 °F)		
		+600…+850 °C (+1112…+1562 °F)	+/-30 °C (+/-54 °F)		
8	daΩ (Pt1000)	0…3 kΩ	+/-25 Ω	10 Ω	1.5 kΩ AV•30•••60500 AV•62••••0500 2 kΩ AV•84•••••500 AV•126••••500 EVE••••••0500
9	PTC (KTY81-121)	-55…+150 °C (-67…+302 °F)			
	AV•30•••60500 AV•62••••0500 AV•84•••••500 AV•126••••500	-55…+150 °C (-67…+302 °F)	+/-1.1 °C (+/-1.98 °F)	0.1 °C (0.18 °F)	1.5 kΩ AV•30•••60500 AV•62••••0500 2 kΩ AV•84•••••500 AV•126••••500
	EVE••••••0500	-55…+135 °C (-67…+275 °F)	+/-1.1 °C (+/-1.98 °F)	0.1 °C (0.18 °F)	2 kΩ
		+135…+150 °C (+275…+302 °F)	+/-3.1 °C (+/-5.58 °F)		

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 CN5 Pt1000 (AI5 and AI6) inputs connection:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Current Analog Input

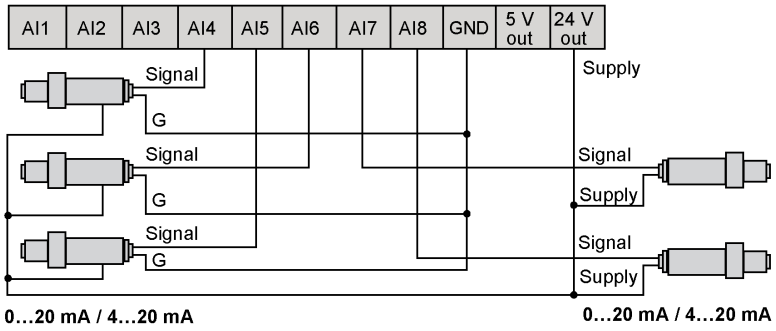
Characteristics

Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

Cfg_Aix	Description	Range	Accuracy Range	Resolution	Input Impedance
3	4…20 mA	-9999…9999 Default: 0…1000	4…20 mA +/-1 % full range + 1 digit	1 digit	<150 Ω
11	0…20 mA		0…4 mA +/-2 % full range + 1 digit		
			4…20 mA +/-1 % full range + 1 digit		

Wiring Diagram Example

AV•84••••500 / AV•126••••500 (CN5) current input connection:



You can power the transducer from the FREE Advance (5 Vdc or 24 Vdc) or with an external supply.

For more information, refer to transducer technical data sheet.

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Voltage Analog Input

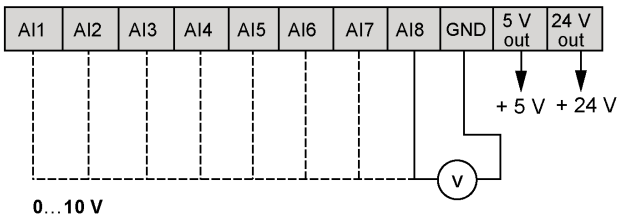
Characteristics

Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

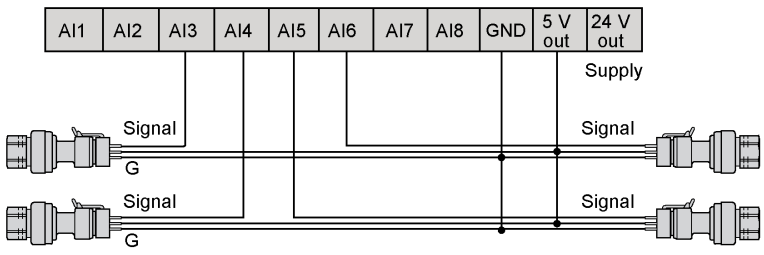
Cfg_Aix	Description	Range	Accuracy Range	Resolution	Input Impedance
4	0…10 Vdc	-9999…9999 Default: 0…1000	0…10 Vdc +/-1 % full range + 1 digit	1 digit	>10 kΩ AV•30••••0500 AV•62••••0500 AV•84•••••500 AV•126••••500 >20 kΩ EVE••••••0500
10	0…5 Vdc	-9999…9999 Default: 0…1000	0…5 Vdc +/-1 % full range + 1 digit	1 digit	>20 kΩ AV•30••••0500 AV•62••••0500 AV•84•••••500 AV•126••••500 >60 kΩ EVE••••••0500
5	0…5 Vdc Ratiometric	-9999…9999 Default: 0…1000	10 % 5 Vdc…90 % 5 Vdc +/-1 % full range + 1 digit	1 digit	>20 kΩ AV•30••••0500 AV•62••••0500 AV•84•••••500 AV•126••••500 >60 kΩ EVE••••••0500

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN5) voltage input connection:



AV•84•••••500 / AV•126••••500 (CN5) 0-5V ratiometric voltage input connection:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Analog Input Used as Digital Input

Characteristics

Using the parameter *Cfg_Aix*, an analog input AI*x* can be configured to acquire a signal by a physical resource (probe, digital input, voltage/current signal) as specified in the following table:

Cfg_Aix	Description	Range	Accuracy Range	Accuracy	Resolution	Input Impedance
1	Digital input(1)	-	-	-	-	10 kΩ
(1) The analog inputs configured as digital inputs are not isolated.						

The use of an external power supply with the dry contact digital inputs can result in equipment damage.

NOTICE

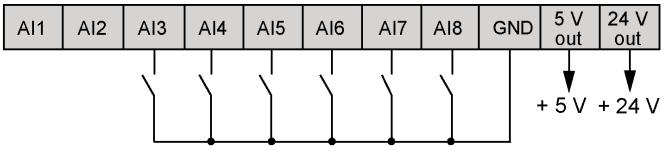
INOPERABLE EQUIPMENT

Do not apply external power supply to the dry contact digital inputs of the device.

Failure to follow these instructions can result in equipment damage.

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN5) analog input used as digital input connection:



Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Analog Outputs

Analog Outputs

This table presents the analog outputs of controllers and expansion modules:

Description	AV•30•••60500	AV•62•0••0500	AV•62SS••0500	AV•8400•••500	AV•84SS•••500	AV•1260•••500	AV•126S•••500	EVE6000000500	EVE1020000500
Low voltage (SELV) analog outputs, or Open Collector PWM outputs	-	2	2	2	2	2	2	-	2
Low voltage (SELV) analog outputs	-	-	-	2	2	4	4	-	-

Analog Outputs

Overview

Analog outputs are identified as AO1…AO*x*.

Analog outputs by device reference:

Device references	Non-configurable analog outputs	Configurable analog outputs
AV•62••••0500	-	AO1, AO2
AV•84•••••500	AO1, AO2	AO3, AO4
AV•126••••500	AO1, AO2, AO5, and AO6	
EVE1020000500	-	AO1, AO2

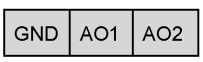
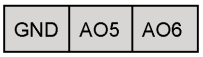
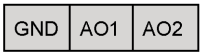
Devices are equipped with low voltage analog output (SELV) 0…10 Vdc, page 89

Using the parameter *Cfg_AOx*, configurable analog outputs AO*x* can be configured to provide a signal to a physical resource as specified in the following table:

Cfg_AOx	Description
0	Current modulation 4…20 mA, page 90
1	Current ON/OFF, page 90
2	Voltage modulation 0…10 Vdc, page 89
3	PWM open collector, page 88

Related Devices and Connectors

The table indicates the related devices and connectors:

Related Device	Connector		Label	Description
AV•62••••0500	CN11		GND	0 V signal ground
			AO1…AO2	Analog outputs 1…2
AV•84•••••500 AV•126••••500	CN2		GND	0 V signal ground
			AO1…AO4	Analog outputs 1…4
AV•126••••500	CN11		GND	0 V signal ground
			AO5…AO6	Analog outputs 5…6
EVE1020000500	CN7		GND	0 V signal ground
			AO1…AO2	Analog outputs 1…2

PWM Open Collector Outputs

Characteristics

PWM open collector (configurable polarity) configurable analog output characteristics:

Analog output	• Frequency • Duty cycle			Maximum Sink Current	Maximum Supplies Voltage
	Range	Accuracy	Resolution		
AO1, AO2	• 0…2000 Hz • 0.0…100.0 %	• 1 Hz • 0.1 %	• 1 Hz • 0.1 %	50 mA	24 Vdc
AV•62••••0500 EVE1020000500					
AO3, AO4					
AV•84•••6I500 AV•126•••I500 AV•840005I500 AV•126005I500					
AO3, AO4				30 mA	
AV•84•••60500 AV•126•••0500					

Analog outputs in PWM mode can be configured as specified in the following table:

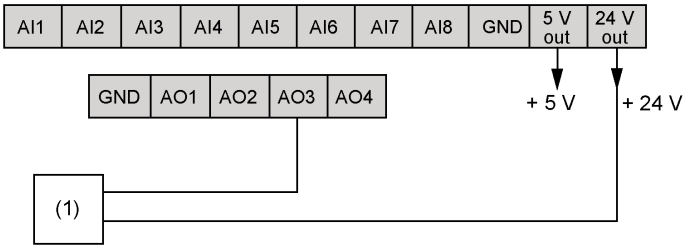
Parameter	Description	Range
PWM_frequency_AO1_AO2	PWM Frequency	0…2000 Hz
PWM_frequency_AO3_AO4		
PWM_polarity_AO1_AO2	PWM Polarity • 0 = Reversed • 1 = Direct	0, 1
PWM_polarity_AO3_AO4		

NOTE: The polarity and the frequency are common for the 2 configurable analog outputs of each device.

For details on the values and characteristics of the parameters, refer to Parameters, page 125.

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN2) open collector PWM analog output (AO3) connection:



(1) Third-party actuator (for example: fan module) or external relay

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Low Voltage (SELV) Analog Outputs

Characteristics

Voltage modulation 0…10 Vdc non-configurable analog output characteristics:

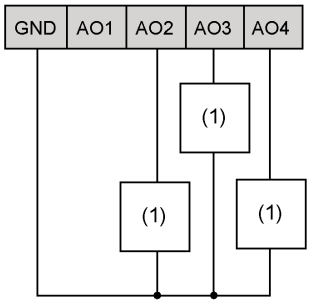
Analog output	Range	Accuracy	Resolution	Load Impedance
AO1, AO2	0…1000	+/-2 % full scale	1 digit	> 700 Ω
AV•84•••••500				
AO1, AO2, AO5, and AO6				
AV•126••••500				

Voltage modulation 0…10 Vdc configurable analog output characteristics:

Analog output	Range	Accuracy	Resolution	Load Impedance
AO1, AO2	0…1000	+/-2 % full scale	1 digit	≥700 Ω
AV•62••••0500 EVE1020000500				
AO3, AO4				
AV•84•••••500 AV•126••••500				

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN2) Low voltage (SELV) analog outputs (AO2, AO3, and AO4) connection:



(1) Third-party actuator (for example: fan module)

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Analog Current Output

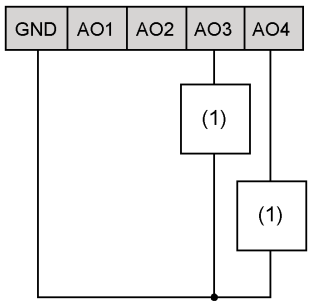
Characteristics

Current modulation 4…20 mA, page 90 configurable analog output characteristics:

Analog output		Range	Accuracy	Resolution	Load Impedance
AO1, AO2		0…1000	+/-2 % full scale	1 digit	≤450 Ω
	AV•62••••0500 EVE1020000500				
AO3, AO4					
	AV•84•••••500 AV•126••••500				

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN2) low voltage (SELV) analog outputs (AO3, and AO4) connection:



(1) Third-party actuator (for example: fan module)

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

Current ON/OFF Current Output

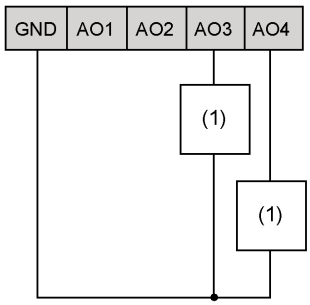
Characteristics

Current ON-OFF configurable analog output characteristics:

Analog output		Current ON	Current OFF
AO1, AO2			
	AV•62••••0500	23 mA	0 mA
	EVE1020000500	20 mA	
AO3, AO4			
	AV•84•••••500 AV•126••••500	23 mA	0 mA

Wiring Diagram Example

AV•84•••••500 / AV•126••••500 (CN2) current ON/OFF analog output (AO3, and AO4) connection:



(1) Third-party actuator (for example: fan module)

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	10 m (32.808 ft)

For more information about the wiring, refer to wiring best practices, page 26.

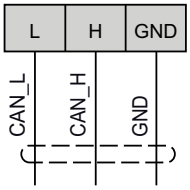
Communication

CAN Expansion Bus Port

Overview

The AV••••••6•500 / AV•••••••5•500 controllers and EVE••••••0500 expansion modules can be connected through the CAN expansion bus.

Connector



Pitch of the terminal block
3.50 mm (0.14 in)

Wiring

Use a twisted pair shielded cable with two conductors with section 0.5 mm^2 (AWG 20), plus a sheath (characteristic impedance 120 Ω) with PVC sleeve, nominal capacity between conductors 36 pF/m, nominal capacity between conductor and shield 68 pF/m.

For laying wires, comply with the indications given in standard EN 50174 on information technology wiring. Extra care must be taken in separating data transmission circuits from power lines.

The network must have a bus daisy chain topology and must have 120 Ω 1/4 W termination resistances between the CAN_H and CAN_L terminals on each of the two ends of the bus or enable those embedded on the expansion modules.

The maximum cable length depends on the communication speed set in baud:

Baud rate	Maximum network length using:	
	Embedded CAN	EVS00CA000000 module
50 kBd	1000 m (3280.83 ft)	1000 m (3280.83 ft)
125 kBd	500 m (1640.41 ft)	500 m (1640.41 ft)
250 kBd	200 m (656.17 ft)	250 m (820.21 ft)
500 kBd	30 m (98.42 ft)	60 m (196.85 ft)

NOTICE

INOPERABLE EQUIPMENT

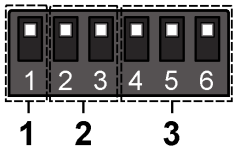
- Do not connect equipment that communicate using RS-485 serial to CAN Expansion Bus terminals.
- Do not connect equipment that communicate using CAN Expansion Bus to RS-485 terminals.

Failure to follow these instructions can result in equipment damage.

EVE••••••0500 Port Configuration Using DIP Switch

The 6-position DIP switches on expansion modules is used to:

- Assert the 120 Ω termination (1)
- Set the CAN baud rate (2)
- Set the CAN address (3)



NOTE: The addressing comprises the sum of parameter *Addr_CAN_OB* (Default value: 1) plus the composite value of the 6-position DIP switches DIP4…DIP6 (8 addresses).

DIP number	1	2	3	4	5	6
	120 Ω	Baud		Address		
Disabled Default value		-				
Enabled						
500 kBd Default value	-			-		
250 kBd						
125 kBd						
50 kBd						
Address *Addr_CAN_OB* Default value	-					
Address *Addr_CAN_OB* + 1						

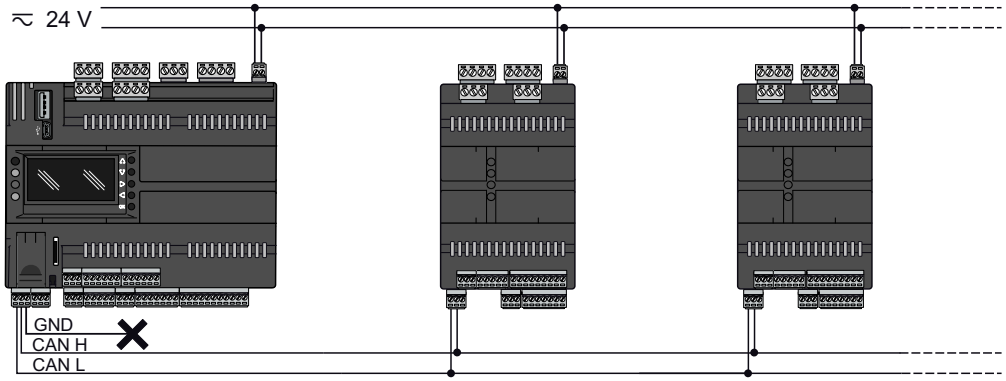
DIP number	1	2	3	4	5	6
	120 Ω	Baud		Address		
Address *Addr_CAN_OB* + 2						
Address *Addr_CAN_OB* + 3						
Address *Addr_CAN_OB* + 4						
Address *Addr_CAN_OB* + 5						
Address *Addr_CAN_OB* + 6						
Address *Addr_CAN_OB* + 7						

CAN Expansion Bus (Field) Network Connection Example

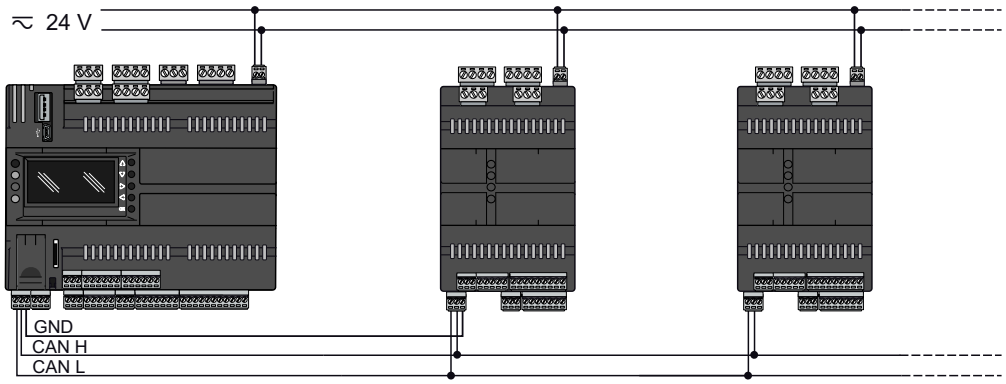
A CAN Expansion Bus (Field) network connection can be constituted by:

- Maximum 1 AV••••••6•500 / AV•••••••5•500 functioning as master
- Maximum 12 EVE••••••0500 functioning as slaves. This number can be reduced, depending on the number of inputs and outputs that the master can control.

Non isolated power supply connection example using a AVD1260060500:



Isolated power supply connection example using a AVD126006I500:

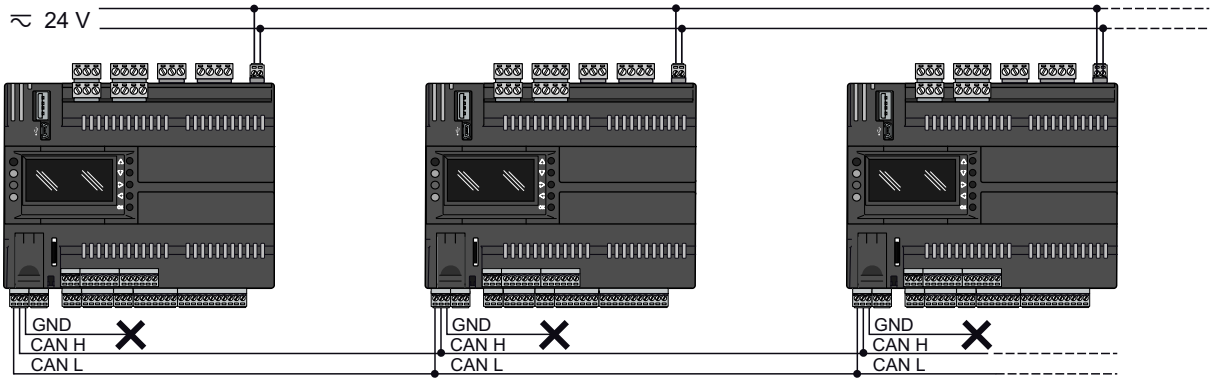


CAN Expansion Bus Connection (Network) Example

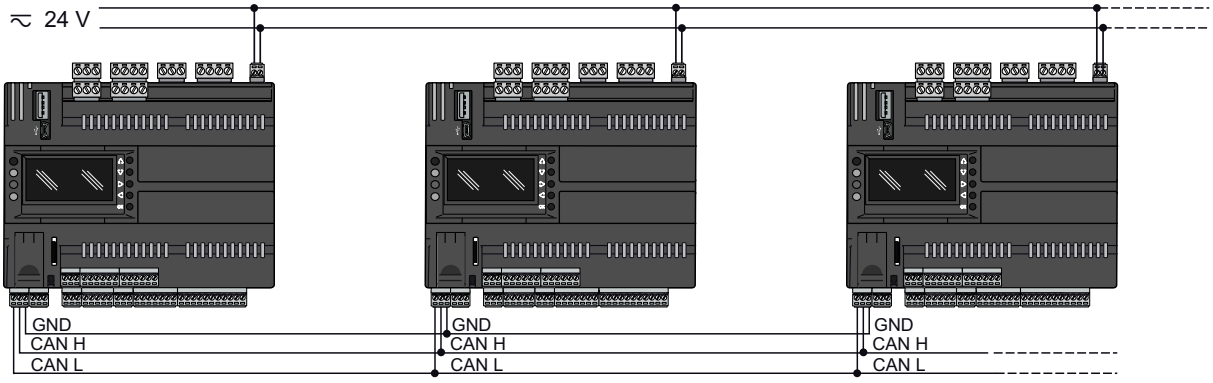
A CAN Expansion Bus (network) connection can be constituted by:

- Maximum 10 AV••••••6•500 / AV•••••••5•500 connected in CAN binding. For more details on binding functionalities, refer to FREE Studio Plus - Operating Guide, page 9.

Non isolated power supply connection example using AVD1260060500:



Isolated power supply connection example using AVD126006I500:



Power Supply Restriction

If you connect the GND connection of the network across multiple devices with power supply inputs that are non-isolated (AV•84•••60500, AV•126•••0500, or EVE••••••0500), use separate, isolated power supplies. Alternatively, if you are interconnecting the equipment to a single power supply, do not connect the GND signal. Pay special attention when connecting serial lines. Miswiring may lead to inoperable equipment.

For more details, refer to Power Supply description, page 68.

RS-485 Serial Ports

Overview

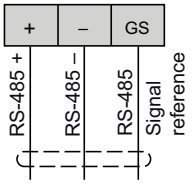
Each AV••••••6•500 / AV•••••••5•500 controller is equipped with 2 RS-485 serial ports.

These ports permit user to communicate between the controller and a device via:

- A Modbus RTU connection when using **RS485-1**(slave) or **RS485-2** (master or slave) communication port
- A BACnet MS/TP (B-AAC profile certified BTL) connection

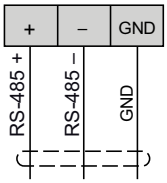
Connector of AV••••••6•500 / AV•••••••5•500 Controllers

The AV•30••••0500 / AV•62••••0500 / AV•840005I500 / AV•126005I500 / AV•84•••6I500 / AV•126•••I500 controllers are equipped with 2 RS-485 terminals:



NOTE: GS of the **RS485-1** and **RS485-2** terminals are internally connected and are isolated from the GND of the device.

The AV•84•••60500 / AV•126•••0500 controllers are equipped with 2 RS-485 terminals:



NOTE: GND of the **RS485-1** and **RS485-2** terminals are internally connected to the GND of the device.

Cables

Use a shielded and "twisted pair" cable with two 0.5 mm^2 section conductors (AWG 20), plus braid (characteristic impedance 120 Ω) with PVC sleeve, nominal capacity between conductors 36 pF/m, nominal capacity between conductor and shielding 68 pF/m.

Alternatively use a shielded and "twisted pair" cable with two 0.5 mm^2 section conductors (AWG 20), plus braid with PVC sleeve, nominal capacity between conductors 89 pF/m, nominal capacity between conductor and shielding 161 pF/m. See EN 50174 standard on IT cabling for indications on how cables must be routed.

Always follow regulations applicable to the routing and connection of cables. Separate data transmission circuits from power lines.

RS-485 network up to 1200 m in length with a maximum of 32 devices can be connected directly to the controller.This length can be extended and the number of devices for each channel increased using appropriate repeater modules.

Single terminal strip with 3 conductors: use the 3 conductors (“+”, “-“ for the signal and “GND” for the braid).

Attach the 120 Ω 1/4 W resistors between the "+" and "-" terminals of the interface and the last controller in each branch of the network.

Maximum settable speed 115200 baud.

RS-485 physical layer can be used for Modbus SL, as well as for BACnet MS/TP communication. Concurrent communication of different protocols on the same serial port is not allowed.

NOTICE
INOPERABLE EQUIPMENT Do not communicate through Modbus SL and BACnet MS/TP concurrently on the same serial port. **Failure to follow these instructions can result in equipment damage.**

NOTICE
INOPERABLE EQUIPMENT • Do not connect equipment that communicate using RS-485 serial to CAN Expansion Bus terminals. • Do not connect equipment that communicate using CAN Expansion Bus to RS-485 terminals. **Failure to follow these instructions can result in equipment damage.**

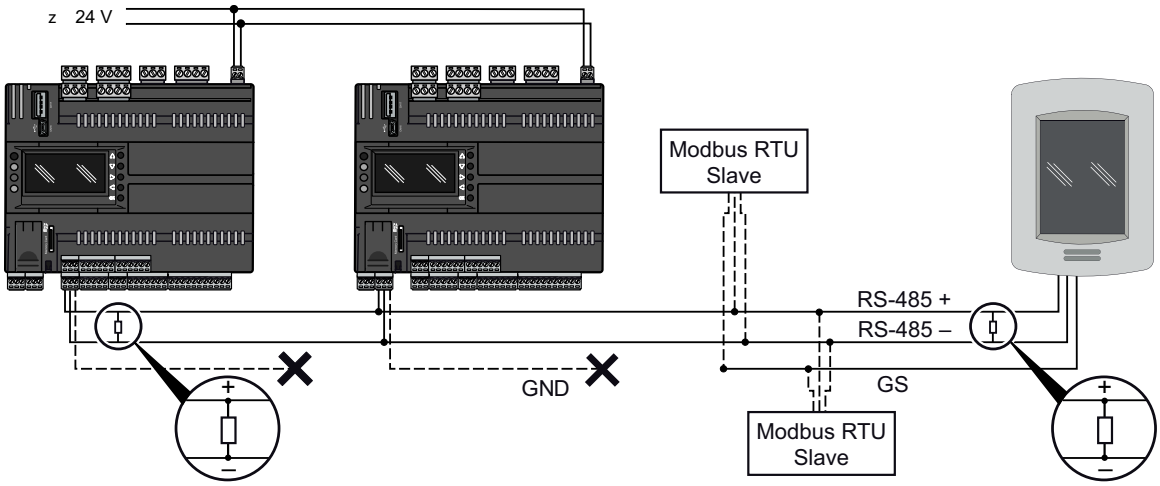
Power Supply Restriction

If you connect the GND connection of the RS-485 network across multiple devices with power supply inputs that are non-isolated (AV•84•••60500, or AV•126•••0500), use separate, isolated power supplies. Alternatively, if you are interconnecting the equipment to a single power supply, do not connect the RS-485 GND signal. Pay special attention when connecting serial lines. Miswiring may lead to inoperable equipment.

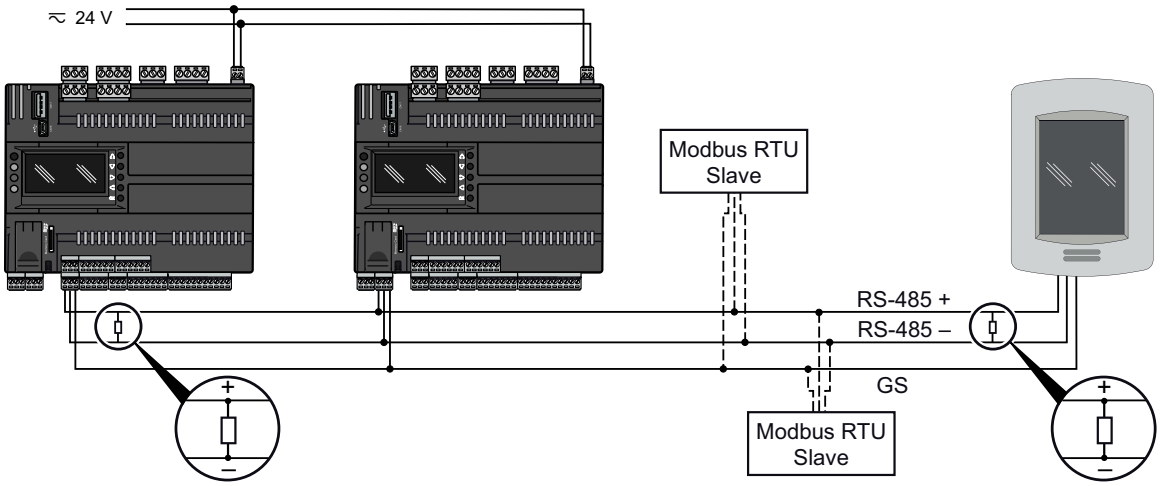
For more details, refer to Power Supply description, page 68.

Wiring Examples

The following diagram shows an RS-485 (field) architecture wiring example with non isolated controllers:



The following diagram shows an RS-485 (field) architecture wiring example with isolated controllers:



Characteristic	Definition
Type of trunk cable	Shielded cable with one twisted pair and at least a third conductor
Maximum length of bus	1000 m (3280.83 ft) at 19200 bps with a shielded and twisted cable (for example: TSXCSA•••)
Maximum number of devices (without repeater)	32 devices that are 31 slaves
Line terminators	120 Ω 1/4 W resistors

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in)	1000 m (3280.83 ft)

USB Serial Ports

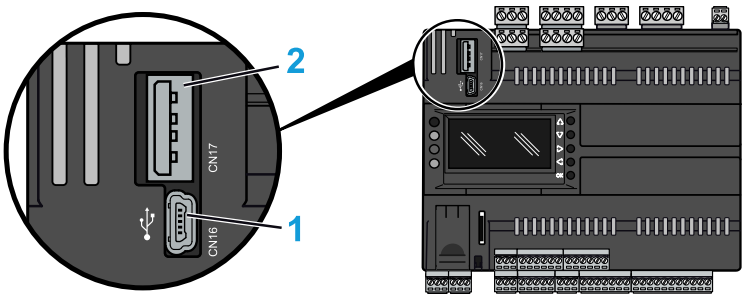
Overview

An USB type Mini-B (DEVICE) connector placed on the top-left side of the front view of the controller is used to connect the controller to a PC via Mini-B/A USB cable for debugging, commissioning, downloading, uploading with FREE Studio Plus.

For AV••••••6•500, an additional USB type A (HOST) connector is used to connect a USB memory key when downloading the application.

For further information, refer to the commissioning part, page 160.

Connector of AV•••••••••••• Controllers



1 USB type Mini-B

2 USB type A (AV••••••6•500 only)

Cabling length
30 cm (11.8 in)

Connection

The cables required for AV••••••6•500 / AV•••••••5•500 controllers USB Mini-B are TCSXCNAMUM3P or BMXXCAUSBH018.

The AV••••••6•500 / AV•••••••5•500 controllers can also be supplied through the Mini-B USB cable with limited functionalities related to debugging, commissioning, downloading and uploading with FREE Studio Plus. For more information, see the FREE Studio Plus, Programming Guide.

NOTE: Do not apply voltage via 24 Vac/dc while the equipment is already connected to a PC via Mini-B USB cable.

Before applying power via 24 Vac/dc power supply connection:

Step	Action
1	Disconnect the Mini-B USB cable.
2	Supply the FREE Advance controller via its 24 Vac/dc supply.
3	Reconnect the Mini-B USB cable.

Compatibility

AV••••••6•500 / AV•••••••5•500 controller is seen as a virtual COM. Serial communication is performed with a CDC profile (USB standard).

Following operating systems are compatible:

- Windows 8 / 8.1 64 bit
- Windows 10 64 bit

The driver is supplied with the FREE Studio Plus.

Ethernet Port

Overview

Each AV••••••6•500 controller is equipped by an RJ45 Ethernet port.

The RJ45 Ethernet port is available as an option for AV•••••••5•500 controller, by adding a Ethernet, Modbus TCP, and BACnet/IP or a Ethernet, Modbus TCP, BACnet/IP, Modbus SL, and BACnet MS/TP communication module, page 18

Description

The Ethernet port permits user to connect the device to:

- Different controllers and/or applications exchanging variables and/or parameters (network).
- A supervision system using Modbus TCP/IP protocol.
- An IEC 61131-3 FREE Studio Plus development system.
- A BACnet/IP network, with B-AAC profile.

Concurrent communication of different protocols using the same Ethernet port is allowed (use of a web browser in addition to another Ethernet Fieldbus connection for example).

Web Functionalities

The AV•••••••6•500 also features Web functionalities, offering makers of machinery and systems integrators remote access. Having a web-based connection in machines reduces support and maintenance by minimizing call-out charges. End users also benefit, as they can monitor their own systems both locally and from distance, using the graphics interface of any browser.

Main Web functionalities:

- Web-based access.
- Remote reading and support.
- Local and remote system control, including alarms management.
- Preventive and predictive maintenance.
- Email alarm alerts.

Care must be taken and provisions made for use of this product as a control device to avoid inadvertent consequences of commanded machine operation,

controller state changes, or alteration of data memory or machine operating parameters.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Configure and install the mechanism that enables the remote HMI local to the machine so that local control over the machine can be maintained regardless of the remote commands sent to the application.
- You must have a complete understanding of the application and the machine before attempting to control the application remotely.
- Take the precautions necessary to assure that you are operating remotely on the intended machine by having clear, identifying documentation within the application and its remote connection.

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

Bridge

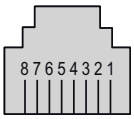
FREE Studio Plus allows monitoring of Modbus/RTU slaves, where AV•••••••6•500 controller is the master Modbus/RTU.

In a FREE Studio Plus project, AV•••••••6•500 controller is used as a Modbus TCP to Modbus/RTU protocol conversion element for Modbus 03_h and 10_h commands.

From FREE Studio Plus, set the connection with the device as Modbus TCP, inserting the AV•••••••6•500 controller IP address and the Modbus/RTU address of the device slave.

Connector

RJ45 Ethernet pin assignment



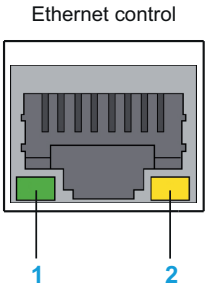
Pin number	Signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

NOTE: The controller supports the MDI/MDIX auto-crossover cable function. It is not necessary to use special Ethernet crossover cables to connect devices directly to this port (connections without an Ethernet hub or switch).

Cabling length
100 m (328 ft)

Status LED

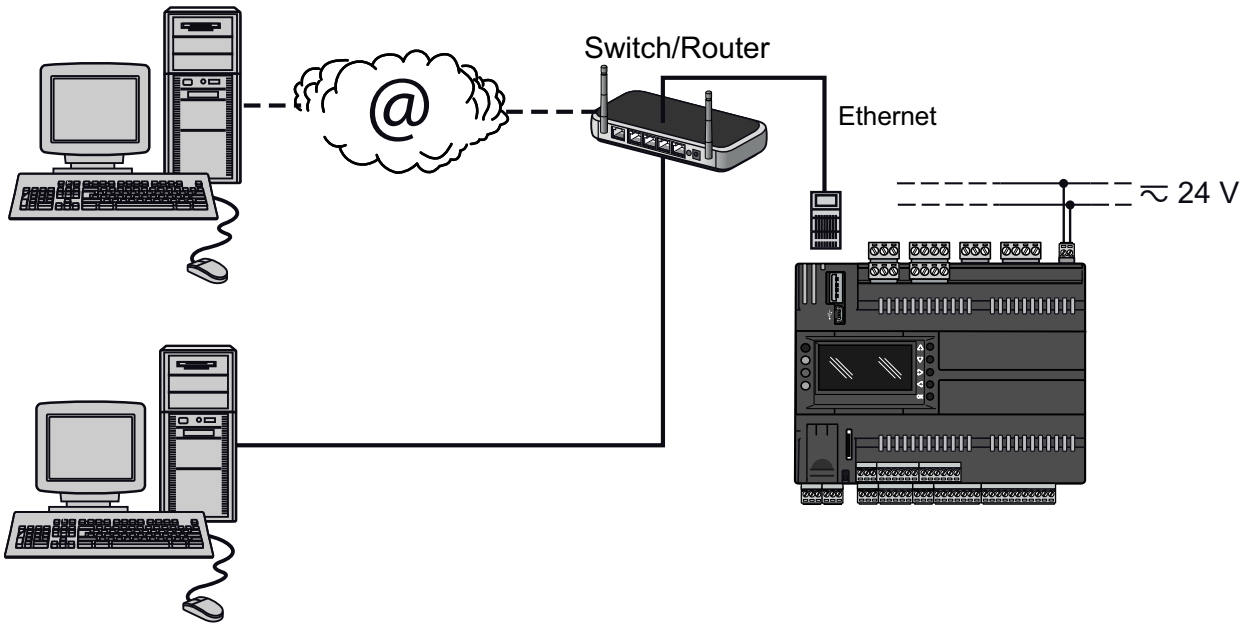
RJ45 Ethernet status LED



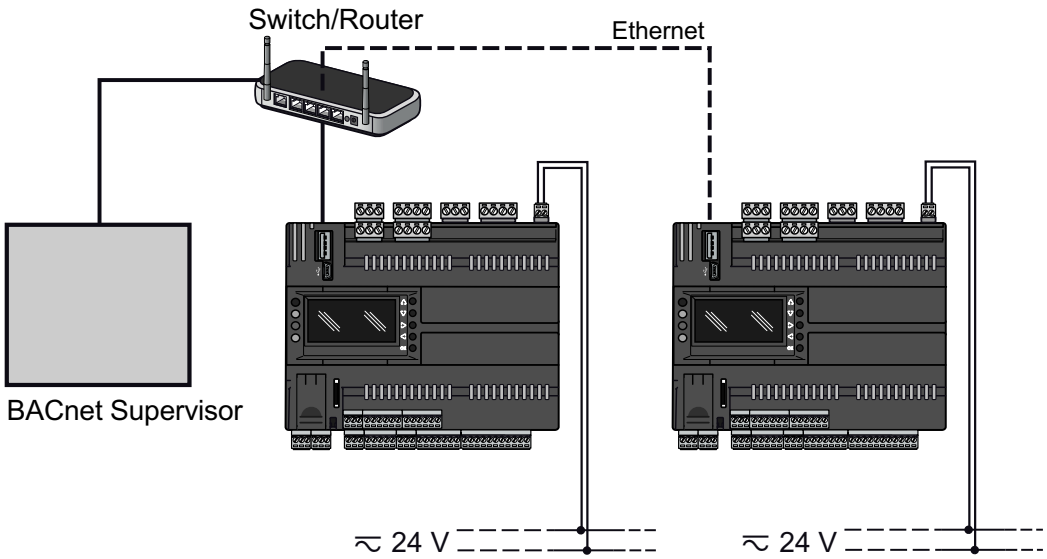
Label	Signal	LED		
		Color	Status	Description
1	Ethernet link	Green/Yellow	Off	No link
			Yellow On	Link at 10 Mb
			Green On	Link at 100 Mb
2	Ethernet activity	Green	Off	No activity
			Flashing	Activity

Architecture Wiring Examples

The following diagram shows an Ethernet architecture wiring example:



The following diagram shows a BACnet/IP architecture wiring example:



Memory

Memory

Overview

The FREE Advance Logic Controller has two different ways for data storing:

- Internal memory
- External memory (through a slot to insert external memory card, AV••••••6•500 only)

Internal Memory

The FREE Advance Logic Controller has the following memory capacities:

Capacity	Type	Description
512 Kb	Flash	BIOS
96 Kb	RAM	BIOS and retain variables
8 Mb	NOR Flash	File System and BIOS
AV•30•••60500 / AV•62•••60500: 16 Mb AV•84•••6•500 / AV•84•••6•500: 32 Mb	SDRAM	Application, HMI, and BIOS

NOTE: A RAM datablock (32 bit DWORD), referred to as retain memory can be addressed through FREE Studio Plus at address *%MD102.0*, and allows data to be permanently stored, as it is with the Flash memory, as long as the RTC battery is active, page 103. There is no limitation in the amount of read and write operations on this block.

External Memory

The FREE Advance Logic Controller (AV••••••6•500) has a Memory Card slot for micro SD cards to, in certain cases, extend internal memory for the File System, page 142.

- Ultra High-Speed Class 1 (UHS-I) compatibility has been tested and validated with a 16 GB memory card.
- Ultra High-Speed Class 2 (UHS-II) memory cards are not supported.

Micro SD card slot characteristics:

Topic	Characteristics	Description
Supported type	Standard Capacity	Micro SD
	High Capacity	Micro SDHC
Global memory	Maximum capacity	32 GB
Speed	Supported classes	4, 6, and 10 Ultra high-speed class 1
Memory organization	Maximum size for files	4 GB
	Maximum number of files	512

When handling the micro SD card, follow the instructions below to help prevent internal data on the micro SD card from being corrupted or lost or a micro SD card malfunction from occurring:

NOTICE

INOPERABLE EQUIPMENT

- Do not store the micro SD card where there is static electricity or probable electromagnetic fields.
- Do not store the micro SD card in direct sunlight, near a heater, or other locations where high temperatures can occur.
- Do not bend the micro SD card.
- Do not drop or strike the micro SD card against another object.
- Keep the micro SD card dry.
- Do not touch the micro SD card connectors.
- Do not disassemble or modify the micro SD card.
- Use only micro SD card formatted using FAT32.

Failure to follow these instructions can result in equipment damage.

The AV••••••6•500 controller does not recognize NTFS formatted micro SD cards. Format the micro SD card on your computer using FAT32.

When using the AV••••••6•500 controller and a micro SD card, observe the following to avoid losing valuable data:

- Accidental data loss can occur at any time. Once data is lost, it cannot be recovered.
- If you forcibly extract the micro SD card, data on the micro SD card may become corrupted.
- Removing a micro SD card that is being accessed could damage the micro SD card, or corrupt its data.
- If the micro SD card is not positioned correctly when inserted into the controller, the data on the card and the controller could become damaged.

NOTICE
LOSS OF APPLICATION DATA • Backup micro SD card data regularly. • Do not remove power or reset the controller, and do not insert or remove the micro SD card while it is being accessed. • Become familiar with the proper orientation of the micro SD card when inserting it into the controller. **Failure to follow these instructions can result in equipment damage.**

RTC (Real-Time Clock)

RTC (Real-Time Clock)

RTC Description

The table indicates the functions of the RTC:

Function	Description
RTC data retention time in the event of a power outage	10 years
Drift value	≤ 30 s/month at 25 °C

Battery

The FREE Advance Logic Controller has a removable flap placed in the lower-left side of the front view. Behind the service door, there is a battery compartment and a 5-pole male connector (reserved). However, to replace the internal battery, contact your local Eliwell representative.

⚠WARNING
NON USER SERVICABLE COMPONENT Do not attempt to replace the battery. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

User Interface

What's in This Chapter

AVD•••••6•500 / AVD•••••5•500 User Interface

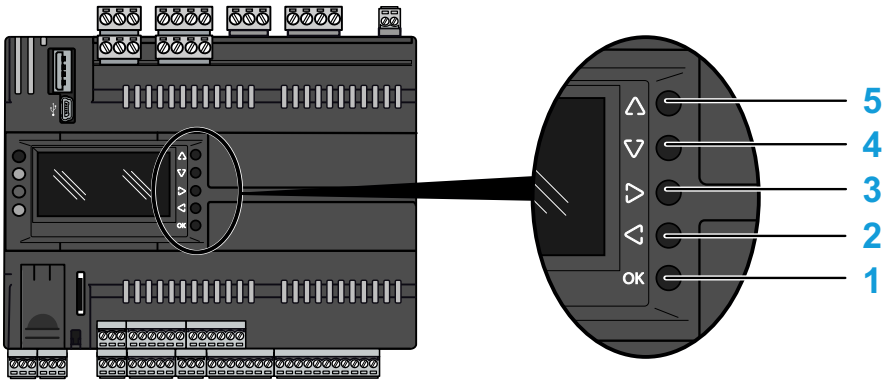
Overview

The user interface of the AVD•••••6•500 / AVD•••••5•500 controllers has 5 keys and 4 LEDs.

The AVC•••••6•500 / AVC•••••5•500 logic controllers have no display. A AVP1•0•••0500 remote display can be used.

Keys

The following indications refer to the AVD•••••6•500 / AVD•••••5•500 user interface.

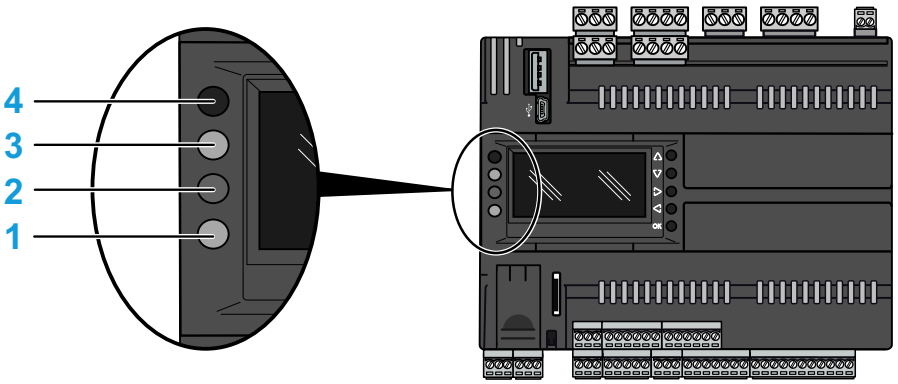


The keys can be programmed from the controller application. The following table describes the keys default setting in Edit Mode (keys are programmable from the controller application).

Description of keys actions:

Number	Key	Press once (press and release)	Press and hold
1	**OK**	• Enter/exit Edit mode • Confirm operation in Edit Mode	-
2	**LEFT**	• Move cursor to left in Edit Mode	• Exit Edit Mode without saving
3	**RIGHT**	• Move cursor to right in Edit Mode	-
4	**DOWN**	• Decrease a value in Edit Mode	-
5	**UP**	• Increase a value in Edit Mode	-

LEDs and Display



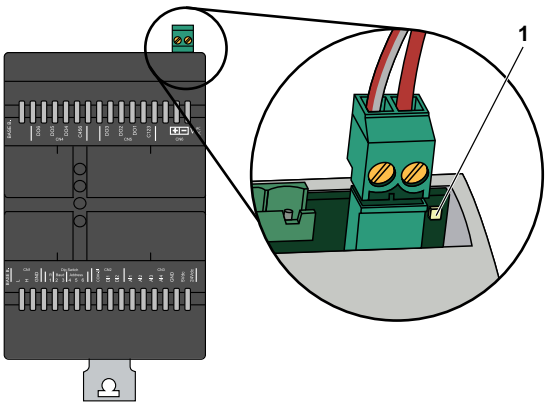
Number	LED	Color	Function
1	C	Green	Programmable from the controller application
2	B	Yellow	
3	A	Red	
4	P	Green	ON when the controller is powered

NOTE: By default, A, B, C LEDs are used for USB management.

EVE••••••0500 Expansion Modules User Interface

User Interface

The EVE••••••0500 expansion modules have an advanced LED:



1: EVE••••••0500 Expansion Module status LED.

LED State	Description
OFF	There is no power or the device CPU is not working
ON	The EVE••••••0500 Expansion Module is powered and device CPU is running.
Flashing	The EVE••••••0500 Expansion Module is powered and Operational. In this state, the transmission of process data via process data objects (PDOs) is possible.
Fast flashing	During a firmware upgrade. **NOTE:** At power-on/reset, the LED first flashing for a while and then stay ON.

Remote Display

What's in This Part

Environmental Characteristics

What's in This Chapter

Environmental Characteristics

Environmental Characteristics

Characteristics	Specification	AVP1•000W0500	AVP100•0P0500	AVK1000000500
The product complies with the following harmonized regulations	EN60950-1:2006+A2:2013 EN55024:2010 EN55022:2010/AC2011	✓	-	-
	EN60730-1 EN60730-2-9	-	✓	✓
Temperature for ball pressure test	125 °C (257 °F)	-	✓	-
Product certifications	CAN/CSA C22.2 No. 24-1993-06 UL 873:2007-11	✓	-	-
Environmental front panel rating	Type 1 enclosure	-	✓	✓
Degree of protection by enclosure	IP20	✓	✓	✓
	IP65 on front panel	-	✓	✓
Construction of control	Electronic automatic Incorporated Control	-	✓	✓
Purpose of control	Operating control (not safety)	✓	✓	✓
Mounting	Vertical surface	✓	✓	✓
	Flush	-	✓	✓
	Top Hat (DIN rail)	-	✓	-
Type of action	1	-	✓	✓
Pollution degree	2 (normal)	-	✓	✓
Insulation material group	IIIa	-	✓	✓
Over-voltage category	I	-	-	✓
	II	-	✓	-
Rated impulse voltage	330 V	-	✓	✓
Period of electric stress on the insulating parts	N/A	-	-	-
Ambient operating temperature	0…50 °C (32…122 °F)	✓	-	-
	-20…60 °C (-4…140 °F)	-	✓	-
	-20…55 °C (-4…131 °F)	-	-	✓
Ambient operating humidity (non-condensing)	0…75 %	✓	✓	-
	5…95 %	-	-	✓
Ambient storage temperature	-30…50 °C (-22…122 °F)	✓	-	-
	-30…60 °C (-22…140 °F)	-	✓	-
	-30…70 °C (-22…158 °F)	-	-	✓

Characteristics	**Specification**	**AVP1•000W0500**	**AVP100•0P0500**	**AVK1000000500**
Ambient storage humidity (non-condensing)	0…75 %	✓	✓	-
	5…95 %	-	-	✓
Power supply	24 Vac +/-15 % 50/60 Hz 24 Vdc +/-10 %	✓	✓	✓
Power consumption	3.2 VA 1.3 W max	✓	✓	-
	3 VA 2 W	-	-	✓
Insulation class	III	-	✓	✓
Fire-resistance category	D	-	✓	-
Software class and structure	A	-	✓	✓
Type of disconnection or suspension for each circuit	N/A	-	-	-

Remote Display Description

What's in This Chapter

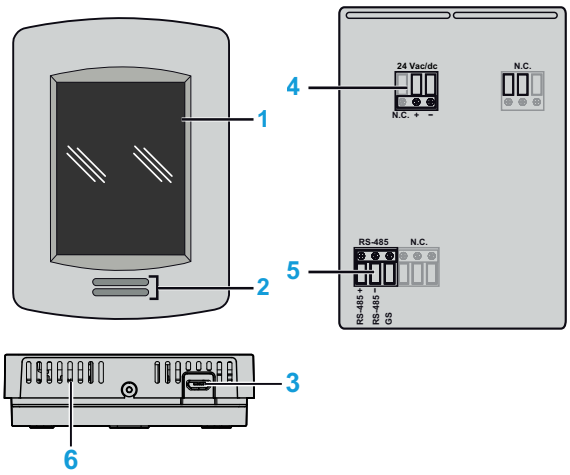
AVP1•000W0500

Overview

Reference	Description
AVP11000W0500	FREE_AVP Color Touchscreen remote display vertical mounting with built-in temperature sensor
AVP12000W0500	FREE_AVP Color Touchscreen remote display vertical mounting with built-in temperature and humidity sensors
AVP13000W0500	FREE_AVP Color Touchscreen remote display vertical mounting with built-in temperature, humidity, and presence (PIR) sensors

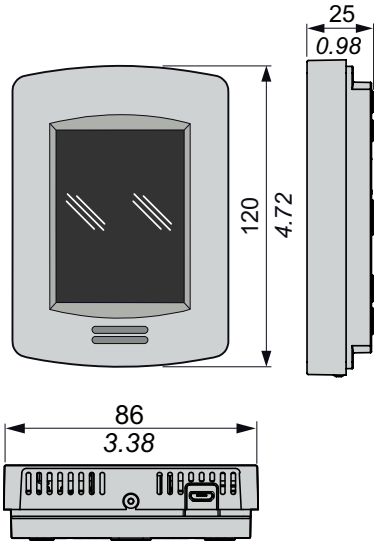
Physical Description

The following illustrations present a AVP1•000W0500 remote display:



Number	Description
1	Touchscreen
2	Holes for PIR detection
3	USB Micro-B port
4	Power supply connector
5	RS-485 Modbus SL connector
6	Holes for temperature measurement

Dimensions



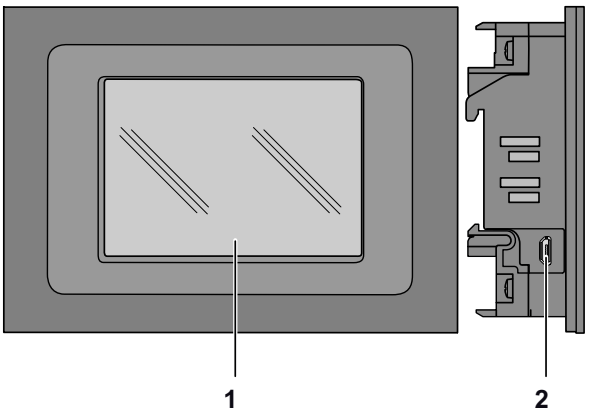
AVP100•0P0500

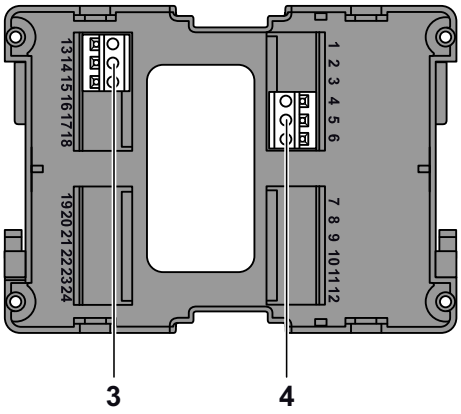
Overview

Reference	Description
AVP100W0P0500	FREE_AVP Color Touchscreen remote display flush mounting gray
AVP100G0P0500	FREE_AVP Color Touchscreen remote display flush mounting white

Physical Description

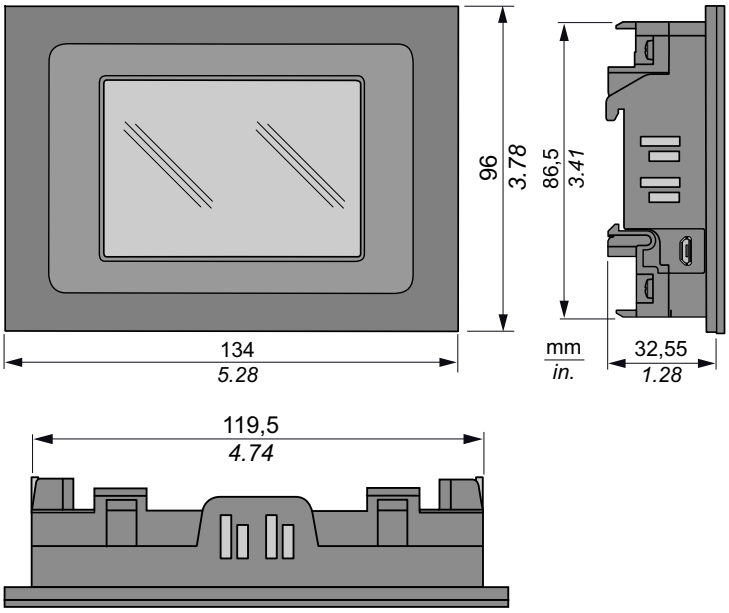
The following illustrations present a AVP100•0P0500 remote display:





Number	Description
1	Touchscreen
2	USB Micro-B port
3	RS-485 Modbus SL connector
4	Power supply connector

Dimensions



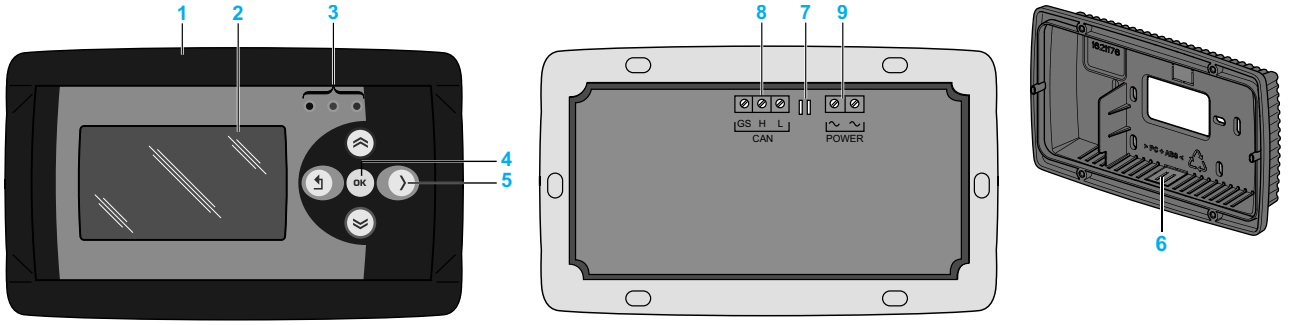
AVK1000000500

Overview

Reference	Description
AVK1000000500	FREE AVK monochrome display graphic

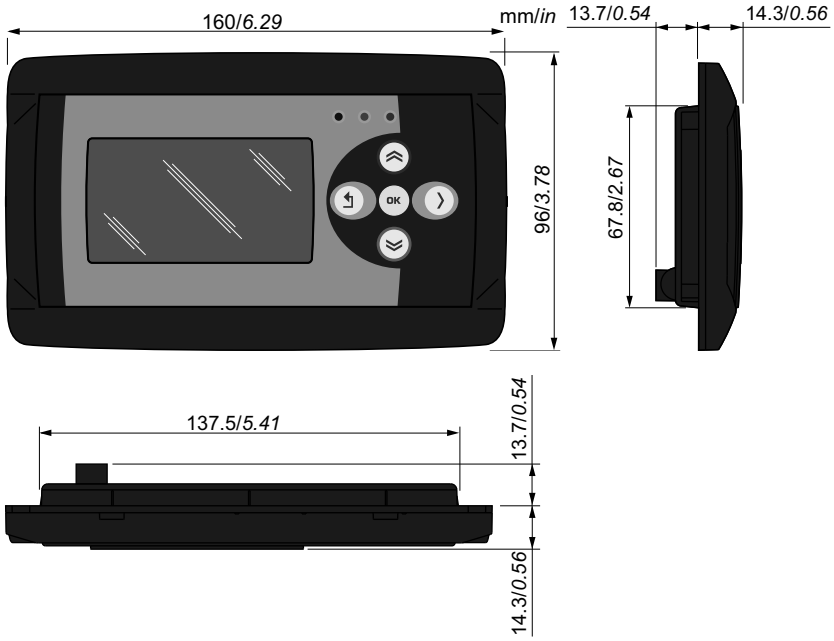
Physical Description

The following illustrations present a AVK1000000500 remote display:



Number	Description
1	Front frame
2	Display
3	Status LEDs
4	Enter key
5	4 navigation keys
6	Cables access of AVA00WMRC000•
7	CAN termination resistors
8	CAN Expansion bus port
9	Power supply

Dimensions



Electrical Characteristics and Wiring Diagrams

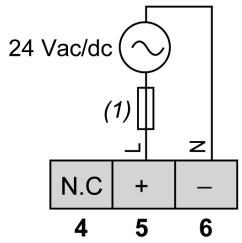
What's in This Chapter

Power Supply

AVP1•0•••0500 Power Supply

References	Power supply characteristics
AVP11000W0500	24 Vac (+/- 15 %) non-isolated - 50/60 Hz
AVP12000W0500	24 Vdc (+/- 10 %) non-isolated
AVP13000W0500	3.2 VA / 1.3 W maximum power consumption
AVP100W0P0500	
AVP100G0P0500	

Power supply wiring diagram:

24 Vac/dc	
	
(1) Type T fuse 500 mA UL recognized	**(1)** Type T fuse 630 mA
AVP100W0P0500 AVP100G0P0500	AVP11000W0500 AVP12000W0500 AVP13000W0500

Pitch of the terminal block	Cabling length
5.00 mm (0.197 in.)	10 m (32.808 ft)

NOTICE

INOPERABLE EQUIPMENT

Do not connect a power cable longer than 10 m (32.8 ft).

Failure to follow these instructions can result in equipment damage.

For more information about the wiring, refer to Best wiring practices, page 26.

The power supplies for the AVP1•0•••0500 must be rated Safety Extra Low Voltage (SELV) according to IEC 61140. These sources of power are isolated between the electrical input and output circuits of the power supply as well as simple separation from ground (earth), PELV, and other SELV systems.

⚠DANGER

GROUND LOOP CAUSING ELECTRIC SHOCK AND/OR INOPERABLE EQUIPMENT

Do not connect the 0 V power supply/transformer connection supplying this equipment to any external ground (earth) connection.

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

In all cases, if the specified voltage range is not maintained, the products may not function as intended. Use appropriate safety interlocks and voltage monitoring circuits.

⚠WARNING

POTENTIAL OF OVERHEATING AND FIRE

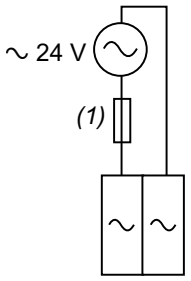
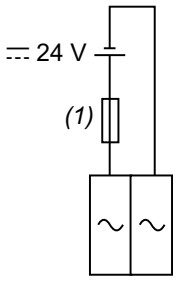
- Do not connect the equipment directly to line voltage.
- Use only isolating SELV, Class 2 power supplies / transformers to supply power to this equipment.

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

AVK1000000500 Power Supply

References	Power supply characteristics
AVK1000000500	24 Vac (+/- 15 %) - 50/60 Hz 24 Vdc (+/- 10 %) 3 VA / 2 W maximum power consumption

Power supply wiring diagram:

24 Vac/dc	
	
(1) Type T fuse 200 mA	

Pitch of the terminal block	Cabling length
3.81 mm (0.15 in.)	10 m (32.808 ft)

NOTICE

INOPERABLE EQUIPMENT

Do not connect a power cable longer than 10 m (32.8 ft).

Failure to follow these instructions can result in equipment damage.

For more information about the wiring, refer to Best wiring practices, page 26.

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POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the equipment directly to line voltage.
- Use only isolating SELV, Class 2 power supplies / transformers to supply power to this equipment.

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

Embedded Sensors

AVP1•000W0500 Embedded Temperature Sensor Characteristics

Characteristic	Value
Type	10 k NTC type 2 thermistor
Resolution	+/- 0.1 °C (+/- 0.2 °F)
Measurement range	-40…+50 °C °C (-40…+122 °F)
Accuracy	+/- 0.5 °C (+/- 0.9 °F) at 21 °C (70 °F) typical calibration

AVP12-AVP13000W0500 Embedded Humidity Sensors Characteristics

Characteristic	Value
Type and calibration	Single point calibrated bulk polymer
Precision	Reading range from 10…90 % R.H. non-condensing 10…20 % precision: 10 % 20…80 % precision: 5 % 80…90 % precision: 10 %
Stability	Less than 1.0 % yearly (typical drift)

AVP1•0•••0500 RS-485 Modbus Serial Port

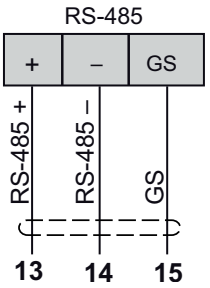
Overview

The AVP1•0•••0500 can be connected to the controller through the RS-485 Modbus.

For details, refer to RS-485 Serial port description of the controller, page 94.

Connector

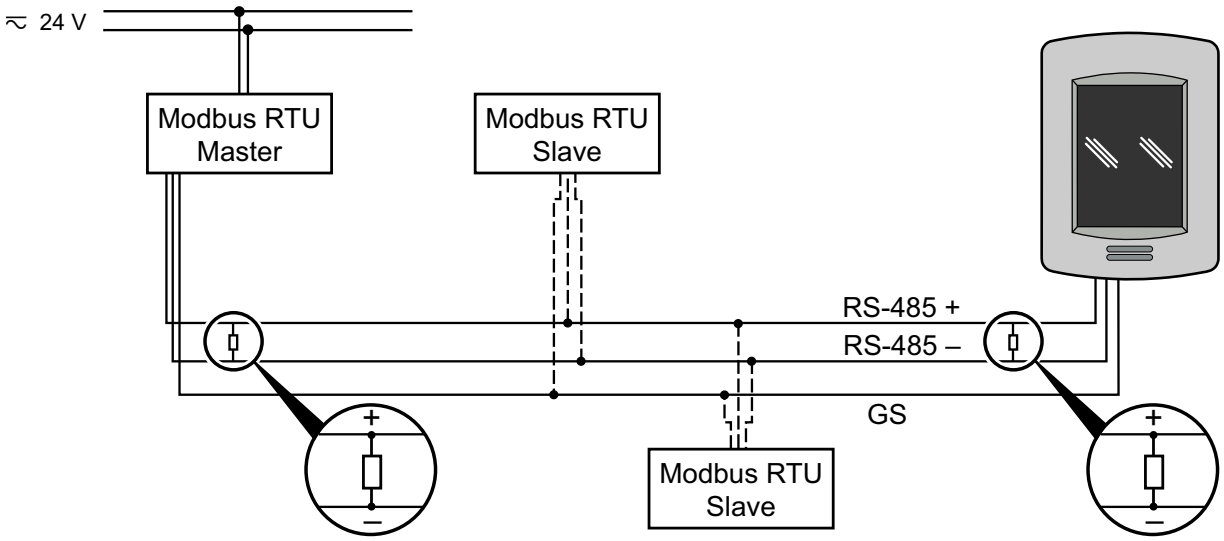
RS-485 connector (CN3):



NOTE: GS of the RS-485 terminal is not internally connected to the "-" of the power supply terminal of the device.

Architecture Wiring Examples

The following diagram shows an RS-485 (field) architecture wiring example:



AVK1000000500 CAN port

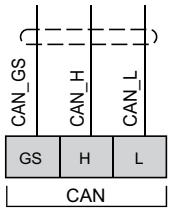
Overview

The AVK1000000500 can be connected to the controller through the CAN port.

For details, refer to CAN port description of the controller, page 91.

Connector

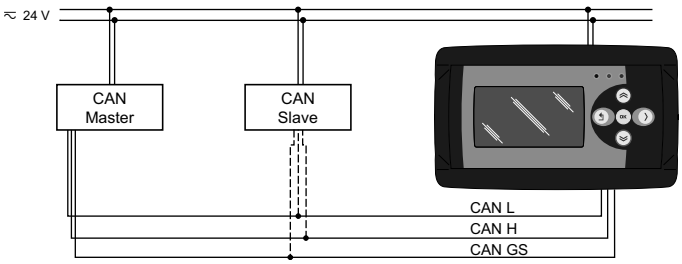
CAN connector :



NOTE: The terminals of power supply connection and the signal reference for CAN Expansion Bus (indicated as GS) are not internally connected. FUNCTIONAL isolation between them.

Architecture Wiring Examples

The following diagram shows a CAN architecture wiring example:



NOTE: Both ends of the CAN expansion bus must be terminated. In AVK1000000500,this is possible via its termination jumpers.

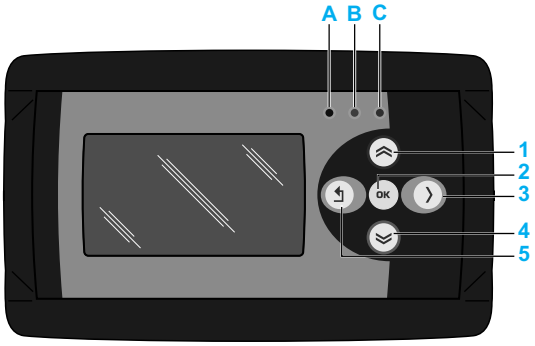
Display User Interface

What's in This Chapter

AVK1000000500 User Interface

Overview

The user interface of the AVK1000000500 remote display has 5 keys and 3 LEDs:



AVK1000000500 remote display can be used with:

- AVD•••••6•500 / AVD•••••5•500 logic controllers that have an embedded display
- AVC•••••6•500 / AVC•••••5•500 logic controllers that have no embedded display

Keys

The following table describes the keys default setting in Edit Mode (keys are programmable from the controller application).

Description of keys actions:

Number	Key	Press once (press and release)	Press and hold
1	**UP**	• Scroll up • Return to previous page • Increase / modify a value in Edit Mode • Go to next label	-
2	**OK**	• Scroll down • Move to next level/menu (open folder, subfolder, parameter, value) • Enter/exit Edit mode • Confirm operation in Edit Mode	-
3	**RIGHT**	• Move cursor to right in Edit Mode	-

Number	Key	Press once (press and release)	Press and hold
4	**DOWN**	• Scroll down • Move to the next page • Decrease / modify a value in Edit Mode • Go to previous label	-
5	**LEFT/ EXIT**	• Exit menu page / go back to previous menu • Move cursor to left in Edit Mode	• Exit Edit Mode without saving

LEDs and Display

LED	Color	Function
C	Green	Programmable from the controller application
B	Yellow	
A	Red	

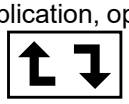
Diagnostic Menu

AVK1000000500 is factory-configured with a default Diagnostic menu that appears when the equipment is powered on.

After uploading an HMI menu from AV••••••6•500 controller, the display consist of this menu. This HMI menu was created with the software FREE Studio Plus and stored in the filesystem of the AV••••••6•500 controller .

In this case, to open the Diagnostic menu, proceed as follows:

Number	Key combination	Press and hold for 3 seconds
4 + 5	LEFT+DOWN	Open Diagnostic menu

To return to the HMI menu of the controller application, open the “HMI Management” page, move the cursor onto the  symbol and press the **OK** key.

First Power On

When the remote display is powered-on for the first time, SYSTEM INFO pages are displayed showing system status.

SYSTEM INFO

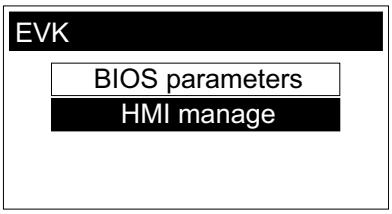
HW : version 1.0
BIOS : Msk476_18
DATE : 04/08/17
BOOT : Msk450_07

If present, the HMI menu from the controller application is displayed. If not present, the diagnostic menu is displayed.

Diagnostic Menu

Overview

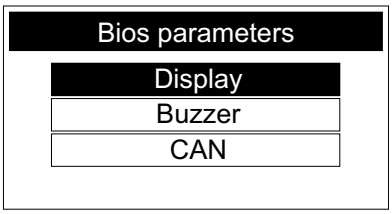
The Diagnostic menu of the AVK1000000500 remote display allows you to manage system parameters (BIOS parameters) and the interface (HMI Management).



The Diagnostic menu is composed by 2 sub-menus:

- BIOS parameters, page 120
- HMI Management, page 121

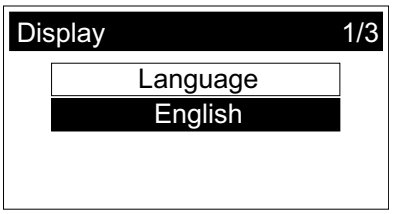
BIOS Parameters



The BIOS parameters menu permits you to:

- configure the display:
  - the language of the Diagnostic menu (Page 1/3),
  - the LCD contrast (Page 2/3),
  - the backlight time (Page 3/3)
- configure the buzzer activation on key press
- configure the CAN settings of the remote display:
  - CAN address (Page 1/2),
  - CAN baud rate (Page 2/2),

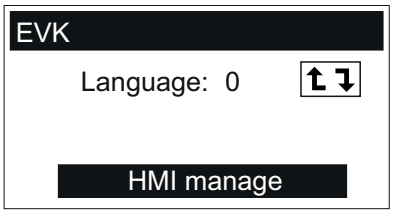
To change the language of the Diagnostic menu:

Step	Action
1	From **BIOS parameters** page, select **Display** and press **OK** key.
2	In **Display page (1/3)**, press **OK** key:  Language is in edit mode.
3	Press **UP**/**DOWN** keys to select the new language. The Diagnostic menu can be displayed in 5 languages: Italian, English, French, German, and Spanish.
4	Press **OK** key to validate the new language.
5	Press **EXIT** key to return to **BIOS parameters** menu.

See parameter HMI Management/**Hmi_Language**, page 158.

HMI Management

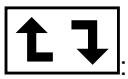
The first HMI Management page shows:



The first HMI Management page permits you to:

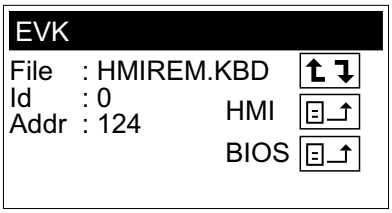
- Change the language of the HMI menu:

Step	Action
1	Select the language number and press **OK** key.
2	Press **UP**/**DOWN** keys to select the new language. The Diagnostic menu can be displayed in 5 languages: 0 = Italian, 1 = English, 2 = French, 3 = German, and 4 = Spanish.
3	Press **OK** key to validate the new language.

-  : Relaunch the HMI menu in the new selected language, page 122.
- **HMI manage**: Go to the Advanced HMI Management page, page 121.

Advanced HMI Management

The Advanced HMI Management page shows the configuration of the remote display:



The Advanced HMI Management page permits you to:

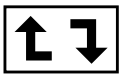
File :	Launch the HMI menu stored in the remote display, if present, page 122.
HMI :	Upload HMI menu from the controller, page 123.
BIOS :	Upload BIOS from the controller, page 123.

NOTE: If the symbol

⚠ CanOpen

appears at the bottom left of the screen, refer to AVK1000000500 Troubleshooting description, page 124.

How to launch the HMI Menu

To launch the HMI menu stored in the remote display, select  and press **OK** in one of the following page:

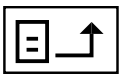
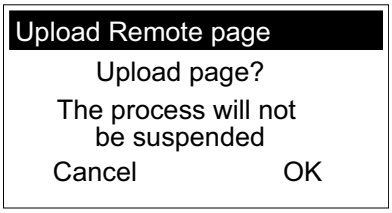
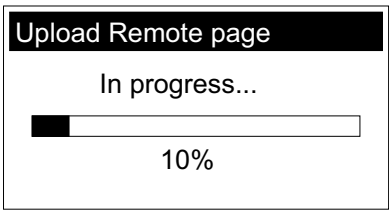
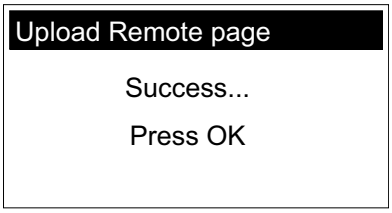
- First HMI Management, page 121
- Advanced HMI Management, page 121

Result: The remote display shows the starting page of the HMI menu (previously uploaded).

NOTE: If the controller is not in RUN state, the variable fields only display “???”.

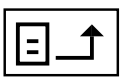
How to Upload HMI menu from the Controller

To upload HMI menu from the controller:

Step	Action
1	From **Advanced HMI Management** page, select **File** and press **OK** key to toggle between: • **HMIREM.KBD**: different HMI menu in remote display and controller • **HMIIEC.COD**: same HMI menu in remote display and controller
2	Select **HMI :**  icon and press **OK** key.
3	 Press **UP**/**DOWN** keys to select **OK** and. press **OK** key to validate.
4	Wait during the upload. 
5	If no error is detected, a confirmation message appears:  Press **OK** key to validate and return to **HMI Management** page.

How to Upload BIOS from the controller

To upload BIOS from the controller:

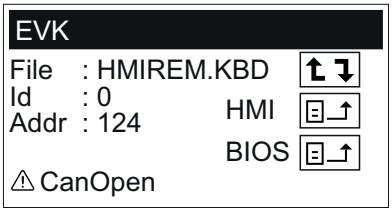
Step	Action
1	From **HMI Management** page, select **BIOS :**  icon and press **OK** key.
2	Press **UP**/**DOWN** keys to select **OK** and press **OK** key to validate.
3	Wait during the upload.
4	If no error are detected, a confirmation message appears. Press **OK** key to validate and return to **HMI Management** page.

AVK1000000500 Troubleshooting

Troubleshooting

In the Diagnostic menu, the HMI Management page shows the configuration of the AVK1000000500 remote display.

If a CAN communication error is detected, a symbol if displayed at the bottom left of the screen:



If occurs, check the communication configuration of the remote display, page 120 and the communication wiring, page 116.

Parameters

What's in This Part

Overview

Overview

Parameters are used to configure a FREE Advance Logic Controller.

They can be modified with:

- Keys on:
  - AVD•••••••500 front panel
  - AVP1•0•••0500 remote displays
- PC with FREE Studio Plus
- Modbus SL communication

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

After any BIOS parameter modification, power cycle the device.

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

Modbus Commands and Data Areas

The following commands are implemented:

Modbus command	Description
3 (3_h)	Read multiple registers on Client side
6 (6_h)	Write single register on Client side
16 (10_h)	Write multiple registers on Client side
43 ($2B_h$)	Read Device Identification: • Vendor name • Product code • Major/minor revision

Parameters Tables

The three following tables list all information required to read, write, and decode all accessible resources in the device.

- Controller Parameter table, page 128
- Expansion Module Parameters table, page 144
- Display Parameter table, page 153

Description of columns:

Column	Description
LABEL	Indicates the label used to display the parameters in the device menu.
ADDRESS	Indicates the address of the Modbus register containing the resource to access.
DATA TYPE	Indicates the size of the data in bits.
CPL	When the field indicates “-1”, the value read by the register requires conversion because the value represents a number with a sign. In the other cases, the value is always positive or null. To carry out the conversion, proceed as follows: • If the value in the register is from 0 to 32767, the result is the value itself (zero and positive values). • If the value in the register is from 32768 to 65535, the result is the value of the register - 65536 (negative values).
RESET	Indicates whether the controller must be rebooted after the parameter has been modified. • Y = the controller must be rebooted to modify the parameter. • Empty "-" = the controller does not need to be rebooted to modify the parameter.
DESCRIP-TION	Description of the parameter usage.
RANGE	Describes the interval of values that can be assigned to the parameter. It can be correlated with other equipment parameters (indicated in the parameter label).
DEFAULT	Indicates the factory setting for the reference of the device.
U.M.	Indicates the unit of measurement for values converted according to the rules indicated in the CPL column. The unit of measurement shown is for example purposes only, as it may change depending on the application (for example, parameters with a U.M. in °C/bar could also have %RH.)

Controller Parameter Table

Folders

NOTE: Not all parameters listed are available depending on the accessible resources in the device.

The following tables present the controller parameters, divided into categories (folders):

Folder label
Acknowledgment, page 128
AI Calibration, page 129
AO Calibration, page 128
Analog Inputs - Base Board, page 134
Analog Inputs - Upper Board, page 136
ON Board **RS485-1**, page 137
ON Board **RS485-2**, page 138
ON Board CAN Expansion bus, page 139
RS-485 Passive Communication Module, page 139
CAN Expansion bus Passive Communication Module , page 140
RS-232 Passive Communication Module, page 140
Ethernet, page 141
Display, page 142
BACnet, page 142
FileSystem, page 142
Miscellaneous, page 143

Acknowledgment Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_TAB	15716	WORD	-	Y	Map code **NOTE:** RW parameter	0…65535	0	Num
Par_POLI	15717	WORD	-	Y	Model code **NOTE:** RW parameter	0…65535	1025	Num
Par_PARMOD	15719	BOOL	-	-	Parameter modified Flag indicating change to default setting: • 0 (false): map not modified • 1 (true): at least one parameter has been modified with respect to the original configuration	0, 1	0	Num

AI Calibration Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_10V_AI1	15527	WORD	-	-	0…10 V Calibration gain AI1	0…65535	32768	Num
Gain_10V_AI10	15590	WORD	-	-	0…10 V Calibration gain AI10	0…65535	32768	Num
Gain_10V_AI11	15597	WORD	-	-	0…10 V Calibration gain AI11	0…65535	32768	Num
Gain_10V_AI12	15604	WORD	-	-	0…10 V Calibration gain AI12	0…65535	32768	Num
Gain_10V_AI2	15534	WORD	-	-	0…10 V Calibration gain AI2	0…65535	32768	Num
Gain_10V_AI3	15541	WORD	-	-	0…10 V Calibration gain AI3	0…65535	32768	Num
Gain_10V_AI4	15548	WORD	-	-	0…10 V Calibration gain AI4	0…65535	32768	Num
Gain_10V_AI5	15555	WORD	-	-	0…10 V Calibration gain AI5	0…65535	32768	Num
Gain_10V_AI6	15562	WORD	-	-	0…10 V Calibration gain AI6	0…65535	32768	Num
Gain_10V_AI7	15569	WORD	-	-	0…10 V Calibration gain AI7	0…65535	32768	Num
Gain_10V_AI8	15576	WORD	-	-	0…10 V Calibration gain AI8	0…65535	32768	Num
Gain_10V_AI9	15583	WORD	-	-	0…10 V Calibration gain AI9	0…65535	32768	Num
Gain_5V_AI1	15526	WORD	-	-	0…5 V Calibration gain AI1	0…65535	32768	Num
Gain_5Vr_AI1	15529	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI1	0…65535	32768	Num
Gain_5V_AI10	15589	WORD	-	-	0…5 V Calibration gain AI10	0…65535	32768	Num
Gain_5Vr_AI10	15592	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI10	0…65535	32768	Num
Gain_5V_AI11	15596	WORD	-	-	0…5 V Calibration gain AI11	0…65535	32768	Num
Gain_5Vr_AI11	15599	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI11	0…65535	32768	Num
Gain_5V_AI12	15603	WORD	-	-	0…5 V Calibration gain AI12	0…65535	32768	Num
Gain_5Vr_AI12	15606	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI12	0…65535	32768	Num
Gain_5V_AI2	15533	WORD	-	-	0…5 V Calibration gain AI2	0…65535	32768	Num
Gain_5Vr_AI2	15536	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI2	0…65535	32768	Num
Gain_5V_AI3	15540	WORD	-	-	0…5 V Calibration gain AI3	0…65535	32768	Num
Gain_5Vr_AI3	15543	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI3	0…65535	32768	Num
Gain_5V_AI4	15547	WORD	-	-	0…5 V Calibration gain AI4	0…65535	32768	Num
Gain_5Vr_AI4	15550	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI4	0…65535	32768	Num
Gain_5V_AI5	15554	WORD	-	-	0…5 V Calibration gain AI5	0…65535	32768	Num
Gain_5Vr_AI5	15557	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI5	0…65535	32768	Num
Gain_5V_AI6	15561	WORD	-	-	0…5 V Calibration gain AI6	0…65535	32768	Num
Gain_5Vr_AI6	15564	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI6	0…65535	32768	Num
Gain_5V_AI7	15568	WORD	-	-	0…5 V Calibration gain AI7	0…65535	32768	Num
Gain_5Vr_AI7	15571	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI7	0…65535	32768	Num
Gain_5V_AI8	15575	WORD	-	-	0…5 V Calibration gain AI8	0…65535	32768	Num
Gain_5Vr_AI8	15578	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI8	0…65535	32768	Num
Gain_5V_AI9	15582	WORD	-	-	0…5 V Calibration gain AI9	0…65535	32768	Num
Gain_5Vr_AI9	15585	WORD	-	-	0…5 $V_{ratiometric}$ Calibration gain AI9	0…65535	32768	Num
Gain_mA_AI1	15528	WORD	-	-	0/4…20 mA Calibration gain AI1	0…65535	32768	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_mA_AI10	15591	WORD	-	-	0/4…20 mA Calibration gain AI10	0…65535	32768	Num
Gain_mA_AI11	15598	WORD	-	-	0/4…20 mA Calibration gain AI11	0…65535	32768	Num
Gain_mA_AI12	15605	WORD	-	-	0/4…20 mA Calibration gain AI12	0…65535	32768	Num
Gain_mA_AI2	15535	WORD	-	-	0/4…20 mA Calibration gain AI2	0…65535	32768	Num
Gain_mA_AI3	15542	WORD	-	-	0/4…20 mA Calibration gain AI3	0…65535	32768	Num
Gain_mA_AI4	15549	WORD	-	-	0/4…20 mA Calibration gain AI4	0…65535	32768	Num
Gain_mA_AI5	15556	WORD	-	-	0/4…20 mA Calibration gain AI5	0…65535	32768	Num
Gain_mA_AI6	15563	WORD	-	-	0/4…20 mA Calibration gain AI6	0…65535	32768	Num
Gain_mA_AI7	15570	WORD	-	-	0/4…20 mA Calibration gain AI7	0…65535	32768	Num
Gain_mA_AI8	15577	WORD	-	-	0/4…20 mA Calibration gain AI8	0…65535	32768	Num
Gain_mA_AI9	15584	WORD	-	-	0/4…20 mA Calibration gain AI9	0…65535	32768	Num
Gain_Ntc_AI1	15524	WORD	-	-	NTC Calibration gain AI1	0…65535	32768	Num
Gain_Ntc_AI10	15587	WORD	-	-	NTC Calibration gain AI10	0…65535	32768	Num
Gain_Ntc_AI11	15594	WORD	-	-	NTC Calibration gain AI11	0…65535	32768	Num
Gain_Ntc_AI12	15601	WORD	-	-	NTC Calibration gain AI12	0…65535	32768	Num
Gain_Ntc_AI2	15531	WORD	-	-	NTC Calibration gain AI2	0…65535	32768	Num
Gain_Ntc_AI3	15538	WORD	-	-	NTC Calibration gain AI3	0…65535	32768	Num
Gain_Ntc_AI4	15545	WORD	-	-	NTC Calibration gain AI4	0…65535	32768	Num
Gain_Ntc_AI5	15552	WORD	-	-	NTC Calibration gain AI5	0…65535	32768	Num
Gain_Ntc_AI6	15559	WORD	-	-	NTC Calibration gain AI6	0…65535	32768	Num
Gain_Ntc_AI7	15566	WORD	-	-	NTC Calibration gain AI7	0…65535	32768	Num
Gain_Ntc_AI8	15573	WORD	-	-	NTC Calibration gain AI8	0…65535	32768	Num
Gain_Ntc_AI9	15580	WORD	-	-	NTC Calibration gain AI9	0…65535	32768	Num
Gain_Pt1000_AI1	15525	WORD	-	-	Pt1000 Calibration gain AI1	0…65535	32768	Num
Gain_Pt1000_AI10	15588	WORD	-	-	Pt1000 Calibration gain AI10	0…65535	32768	Num
Gain_Pt1000_AI11	15595	WORD	-	-	Pt1000 Calibration gain AI11	0…65535	32768	Num
Gain_Pt1000_AI12	15602	WORD	-	-	Pt1000 Calibration gain AI12	0…65535	32768	Num
Gain_Pt1000_AI2	15532	WORD	-	-	Pt1000 Calibration gain AI2	0…65535	32768	Num
Gain_Pt1000_AI3	15539	WORD	-	-	Pt1000 Calibration gain AI3	0…65535	32768	Num
Gain_Pt1000_AI4	15546	WORD	-	-	Pt1000 Calibration gain AI4	0…65535	32768	Num
Gain_Pt1000_AI5	15553	WORD	-	-	Pt1000 Calibration gain AI5	0…65535	32768	Num
Gain_Pt1000_AI6	15560	WORD	-	-	Pt1000 Calibration gain AI6	0…65535	32768	Num
Gain_Pt1000_AI7	15567	WORD	-	-	Pt1000 Calibration gain AI7	0…65535	32768	Num
Gain_Pt1000_AI8	15574	WORD	-	-	Pt1000 Calibration gain AI8	0…65535	32768	Num
Gain_Pt1000_AI9	15581	WORD	-	-	Pt1000 Calibration gain AI9	0…65535	32768	Num
Gain_PTC_AI1	15530	WORD	-	-	PTC Calibration gain AI1	0…65535	32768	Num
Gain_PTC_AI10	15593	WORD	-	-	PTC Calibration gain AI10	0…65535	32768	Num
Gain_PTC_AI11	15600	WORD	-	-	PTC Calibration gain AI11	0…65535	32768	Num
Gain_PTC_AI12	15607	WORD	-	-	PTC Calibration gain AI12	0…65535	32768	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_PTC_AI2	15537	WORD	-	-	PTC Calibration gain AI2	0…65535	32768	Num
Gain_PTC_AI3	15544	WORD	-	-	PTC Calibration gain AI3	0…65535	32768	Num
Gain_PTC_AI4	15551	WORD	-	-	PTC Calibration gain AI4	0…65535	32768	Num
Gain_PTC_AI5	15558	WORD	-	-	PTC Calibration gain AI5	0…65535	32768	Num
Gain_PTC_AI6	15565	WORD	-	-	PTC Calibration gain AI6	0…65535	32768	Num
Gain_PTC_AI7	15572	WORD	-	-	PTC Calibration gain AI7	0…65535	32768	Num
Gain_PTC_AI8	15579	WORD	-	-	PTC Calibration gain AI8	0…65535	32768	Num
Gain_PTC_AI9	15586	WORD	-	-	PTC Calibration gain AI9	0…65535	32768	Num
Offs_Ntc_AI1	15608	WORD	-1	-	NTC Calibration offset AI1	-32768…32767	0	Num
Offs_Pt1000_AI1	15609	WORD	-1	-	Pt1000 Calibration offset AI1	-32768…32767	0	Num
Offs_5V_AI1	15610	WORD	-1	-	0…5 V Calibration offset AI1	-32768…32767	0	Num
Offs_10V_AI1	15611	WORD	-1	-	0…10 V Calibration offset AI1	-32768…32767	0	Num
Offs_mA_AI1	15612	WORD	-1	-	0/4…20 mA Calibration offset AI1	-32768…32767	0	Num
Offs_5Vr_AI1	15613	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI1	-32768…32767	0	Num
Offs_PTC_AI1	15614	WORD	-1	-	PTC Calibration offset AI1	-32768…32767	0	Num
Offs_Ntc_AI2	15615	WORD	-1	-	NTC Calibration offset AI2	-32768…32767	0	Num
Offs_Pt1000_AI2	15616	WORD	-1	-	Pt1000 Calibration offset AI2	-32768…32767	0	Num
Offs_5V_AI2	15617	WORD	-1	-	0…5 V Calibration offset AI2	-32768…32767	0	Num
Offs_10V_AI2	15618	WORD	-1	-	0…10 V Calibration offset AI2	-32768…32767	0	Num
Offs_mA_AI2	15619	WORD	-1	-	0/4…20 mA Calibration offset AI2	-32768…32767	0	Num
Offs_5Vr_AI2	15620	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI2	-32768…32767	0	Num
Offs_PTC_AI2	15621	WORD	-1	-	PTC Calibration offset AI2	-32768…32767	0	Num
Offs_Ntc_AI3	15622	WORD	-1	-	NTC Calibration offset AI3	-32768…32767	0	Num
Offs_Pt1000_AI3	15623	WORD	-1	-	Pt1000 Calibration offset AI3	-32768…32767	0	Num
Offs_5V_AI3	15624	WORD	-1	-	0…5 V Calibration offset AI3	-32768…32767	0	Num
Offs_10V_AI3	15625	WORD	-1	-	0…10 V Calibration offset AI3	-32768…32767	0	Num
Offs_mA_AI3	15626	WORD	-1	-	0/4…20 mA Calibration offset AI3	-32768…32767	0	Num
Offs_5Vr_AI3	15627	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI3	-32768…32767	0	Num
Offs_PTC_AI3	15628	WORD	-1	-	PTC Calibration offset AI3	-32768…32767	0	Num
Offs_Ntc_AI4	15629	WORD	-1	-	NTC Calibration offset AI4	-32768…32767	0	Num
Offs_Pt1000_AI4	15630	WORD	-1	-	Pt1000 Calibration offset AI4	-32768…32767	0	Num
Offs_5V_AI4	15631	WORD	-1	-	0…5 V Calibration offset AI4	-32768…32767	0	Num
Offs_10V_AI4	15632	WORD	-1	-	0…10 V Calibration offset AI4	-32768…32767	0	Num
Offs_mA_AI4	15633	WORD	-1	-	0/4…20 mA Calibration offset AI4	-32768…32767	0	Num
Offs_5Vr_AI4	15634	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI4	-32768…32767	0	Num
Offs_PTC_AI4	15635	WORD	-1	-	PTC Calibration offset AI4	-32768…32767	0	Num
Offs_Ntc_AI5	15636	WORD	-1	-	NTC Calibration offset AI5	-32768…32767	0	Num
Offs_Pt1000_AI5	15637	WORD	-1	-	Pt1000 Calibration offset AI5	-32768…32767	0	Num
Offs_5V_AI5	15638	WORD	-1	-	0…5 V Calibration offset AI5	-32768…32767	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Offs_10V_AI5	15639	WORD	-1	-	0…10 V Calibration offset AI5	-32768…32767	0	Num
Offs_mA_AI5	15640	WORD	-1	-	0/4…20 mA Calibration offset AI5	-32768…32767	0	Num
Offs_5Vr_AI5	15641	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI5	-32768…32767	0	Num
Offs_PTC_AI5	15642	WORD	-1	-	PTC Calibration offset AI5	-32768…32767	0	Num
Offs_Ntc_AI6	15643	WORD	-1	-	NTC Calibration offset AI6	-32768…32767	0	Num
Offs_Pt1000_AI6	15644	WORD	-1	-	Pt1000 Calibration offset AI6	-32768…32767	0	Num
Offs_5V_AI6	15645	WORD	-1	-	0…5 V Calibration offset AI6	-32768…32767	0	Num
Offs_10V_AI6	15646	WORD	-1	-	0…10 V Calibration offset AI6	-32768…32767	0	Num
Offs_mA_AI6	15647	WORD	-1	-	0/4…20 mA Calibration offset AI6	-32768…32767	0	Num
Offs_5Vr_AI6	15648	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI6	-32768…32767	0	Num
Offs_PTC_AI6	15649	WORD	-1	-	PTC Calibration offset AI6	-32768…32767	0	Num
Offs_Ntc_AI7	15650	WORD	-1	-	NTC Calibration offset AI7	-32768…32767	0	Num
Offs_Pt1000_AI7	15651	WORD	-1	-	Pt1000 Calibration offset AI7	-32768…32767	0	Num
Offs_5V_AI7	15652	WORD	-1	-	0…5 V Calibration offset AI7	-32768…32767	0	Num
Offs_10V_AI7	15653	WORD	-1	-	0…10 V Calibration offset AI7	-32768…32767	0	Num
Offs_mA_AI7	15654	WORD	-1	-	0/4…20 mA Calibration offset AI7	-32768…32767	0	Num
Offs_5Vr_AI7	15655	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI7	-32768…32767	0	Num
Offs_PTC_AI7	15656	WORD	-1	-	PTC Calibration offset AI7	-32768…32767	0	Num
Offs_Ntc_AI8	15657	WORD	-1	-	NTC Calibration offset AI8	-32768…32767	0	Num
Offs_Pt1000_AI8	15658	WORD	-1	-	Pt1000 Calibration offset AI8	-32768…32767	0	Num
Offs_5V_AI8	15659	WORD	-1	-	0…5 V Calibration offset AI8	-32768…32767	0	Num
Offs_10V_AI8	15660	WORD	-1	-	0…10 V Calibration offset AI8	-32768…32767	0	Num
Offs_mA_AI8	15661	WORD	-1	-	0/4…20 mA Calibration offset AI8	-32768…32767	0	Num
Offs_5Vr_AI8	15662	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI8	-32768…32767	0	Num
Offs_PTC_AI8	15663	WORD	-1	-	PTC Calibration offset AI8	-32768…32767	0	Num
Offs_Ntc_AI9	15664	WORD	-1	-	NTC Calibration offset AI9	-32768…32767	0	Num
Offs_Pt1000_AI9	15665	WORD	-1	-	Pt1000 Calibration offset AI9	-32768…32767	0	Num
Offs_5V_AI9	15666	WORD	-1	-	0…5 V Calibration offset AI9	-32768…32767	0	Num
Offs_10V_AI9	15667	WORD	-1	-	0…10 V Calibration offset AI9	-32768…32767	0	Num
Offs_mA_AI9	15668	WORD	-1	-	0/4…20 mA Calibration offset AI9	-32768…32767	0	Num
Offs_5Vr_AI9	15669	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI9	-32768…32767	0	Num
Offs_PTC_AI9	15670	WORD	-1	-	PTC Calibration offset AI9	-32768…32767	0	Num
Offs_Ntc_AI10	15671	WORD	-1	-	NTC Calibration offset AI10	-32768…32767	0	Num
Offs_Pt1000_AI10	15672	WORD	-1	-	Pt1000 Calibration offset AI10	-32768…32767	0	Num
Offs_5V_AI10	15673	WORD	-1	-	0…5 V Calibration offset AI10	-32768…32767	0	Num
Offs_10V_AI10	15674	WORD	-1	-	0…10 V Calibration offset AI10	-32768…32767	0	Num
Offs_mA_AI10	15675	WORD	-1	-	0/4…20 mA Calibration offset AI10	-32768…32767	0	Num
Offs_5Vr_AI10	15676	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI10	-32768…32767	0	Num
Offs_PTC_AI10	15677	WORD	-1	-	PTC Calibration offset AI10	-32768…32767	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Offs_Ntc_AI11	15678	WORD	-1	-	NTC Calibration offset AI11	-32768…32767	0	Num
Offs_Pt1000_AI11	15679	WORD	-1	-	Pt1000 Calibration offset AI11	-32768…32767	0	Num
Offs_5V_AI11	15680	WORD	-1	-	0…5 V Calibration offset AI11	-32768…32767	0	Num
Offs_10V_AI11	15681	WORD	-1	-	0…10 V Calibration offset AI11	-32768…32767	0	Num
Offs_mA_AI11	15682	WORD	-1	-	0/4…20 mA Calibration offset AI11	-32768…32767	0	Num
Offs_5Vr_AI11	15683	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI11	-32768…32767	0	Num
Offs_PTC_AI11	15684	WORD	-1	-	PTC Calibration offset AI11	-32768…32767	0	Num
Offs_Ntc_AI12	15685	WORD	-1	-	NTC Calibration offset AI12	-32768…32767	0	Num
Offs_Pt1000_AI12	15686	WORD	-1	-	Pt1000 Calibration offset AI12	-32768…32767	0	Num
Offs_5V_AI12	15687	WORD	-1	-	0…5 V Calibration offset AI12	-32768…32767	0	Num
Offs_10V_AI12	15688	WORD	-1	-	0…10 V Calibration offset AI12	-32768…32767	0	Num
Offs_mA_AI12	15689	WORD	-1	-	0/4…20 mA Calibration offset AI12	-32768…32767	0	Num
Offs_5Vr_AI12	15690	WORD	-1	-	0…5 $V_{ratiometric}$ Calibration offset AI12	-32768…32767	0	Num
Offs_PTC_AI12	15691	WORD	-1	-	PTC Calibration offset AI12	-32768…32767	0	Num

AO Calibration Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_10V_AO1	15692	WORD	-	-	0…10 V Calibration gain AO1	0…65535	3276-8	Num
Gain_10V_AO2	15694	WORD	-	-	0…10 V Calibration gain AO2	0…65535	3276-8	Num
Gain_10V_AO3	15696	WORD	-	-	0…10 V Calibration gain AO3	0…65535	3276-8	Num
Gain_10V_AO4	15698	WORD	-	-	0…10 V Calibration gain AO4	0…65535	3276-8	Num
Gain_10V_AO5	15700	WORD	-	-	0…10 V Calibration gain AO5	0…65535	3276-8	Num
Gain_10V_AO6	15702	WORD	-	-	0…10 V Calibration gain AO6	0…65535	3276-8	Num
Gain_mA_AO1	-	-	-	-	Not used	-	-	-
Gain_mA_AO2	-	-	-	-	Not used	-	-	-
Gain_mA_AO3	15697	WORD	-	-	0/4…20 mA Calibration gain AO3	0…65535	3276-8	Num
Gain_mA_AO4	15699	WORD	-	-	0/4…20 mA Calibration gain AO4	0…65535	3276-8	Num
Gain_mA_AO5	-	-	-	-	Not used	-	-	-
Gain_mA_AO6	-	-	-	-	Not used	-	-	-
Offs_10V_AO1	15704	WORD	-1	-	0…10 V Calibration offset AO1	-32768…32767	0	Num
Offs_mA_AO1	15705	WORD	-1	-	0/4…20 mA Calibration offset AO1	-32768…32767	0	Num
Offs_10V_AO2	15706	WORD	-1	-	0…10 V Calibration offset AO2	-32768…32767	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Offs_mA_AO2	15707	WORD	-1	-	0/4…20 mA Calibration offset AO2	-32768…32767	0	Num
Offs_10V_AO3	15708	WORD	-1	-	0…10 V Calibration offset AO3	-32768…32767	0	Num
Offs_mA_AO3	15709	WORD	-1	-	0/4…20 mA Calibration offset AO3	-32768…32767	0	Num
Offs_10V_AO4	15710	WORD	-1	-	0…10 V Calibration offset AO4	-32768…32767	0	Num
Offs_mA_AO4	15711	WORD	-1	-	0/4…20 mA Calibration offset AO4	-32768…32767	0	Num
Offs_10V_AO5	15712	WORD	-1	-	0…10 V Calibration offset AO5	-32768…32767	0	Num
Offs_mA_AO5	15713	WORD	-1	-	0/4…20mA Calibration offset AO5	-32768…32767	0	Num
Offs_10V_AO6	15714	WORD	-1	-	0…10V Calibration offset AO6	-32768…32767	0	Num
Offs_mA_AO6	15715	WORD	-1	-	0/4…20mA Calibration offset AO6	-32768…32767	0	Num

Analog Inputs - Base Board Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Temp_UM	15725	WORD	-	-	Temperature unit of measurement • 0 = °C • 1 = °F	0, 1	0	Num
Cfg_Ai1	15726	UINT	-	-	Type of analog input Ai1 • 0 = NTC (NK103) • 1 = DI Input • 2 = NTC (103AT) • 3 = 4…20 mA • 4 = 0…10 V • 5 = 0…5 V (Ratiometric) • 6 = Pt1000 • 7 = hΩ (NTC) • 8 = daΩ (Pt1000) • 9 = PTC • 10 = 0…5 V • 11 = 0…20 mA	0…11	2	Num
Cfg_Ai2	15727	UINT	-	-	Type of analog input Ai2 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai3	15728	UINT	-	-	Type of analog input Ai3 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai4	15729	UINT	-	-	Type of analog input Ai4 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai5	15730	UINT	-	-	Type of analog input Ai5 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai6	15731	UINT	-	-	Type of analog input Ai6 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai7	16100	UINT	-	-	Type of analog input Ai7	0…11	2	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					See *Cfg_Ai1*			
Cfg_Ai8	16101	UINT	-	-	Type of analog input Ai8 See *Cfg_Ai1*	0…11	2	Num
FullScaleMin_Ai1	15736	WORD	-1	-	Analog input Ai1 start of scale value **NOTE:** Minimum full scale: for current probes, value at 4 mA, for 0…10 V voltage probes, value at 0 V, for ratiometric probes (0…5 V), value at 10% (corresponding to 0.5 V).	-9999…+9999	0	Num
FullScaleMax_Ai1	15737	WORD	-1	-	Analog input Ai1 full scale value **NOTE:** Maximum full scale for current probes, value at 20 mA, for 0…10 V voltage probes, value at 10 V, for ratiometric probes (0…5 V), value at 90% (corresponding to 4.5 V).	-9999…+9999	1000	Num
FullScaleMin_Ai2	15738	WORD	-1	-	Analog input Ai2 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai2	15739	WORD	-1	-	Analog input Ai2 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai3	15740	WORD	-1	-	Analog input Ai3 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai3	15741	WORD	-1	-	Analog input Ai3 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai4	15742	WORD	-1	-	Analog input Ai4 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai4	15743	WORD	-1	-	Analog input Ai4 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai5	15744	WORD	-1	-	Analog input Ai5 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai5	15745	WORD	-1	-	Analog input Ai5 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai6	15746	WORD	-1	-	Analog input Ai6 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMaxAi6	15747	WORD	-1	-	Analog input Ai6 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai7	16106	WORD	-1	-	Analog input Ai7 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai7	16107	WORD	-1	-	Analog input Ai7 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai8	16108	WORD	-1	-	Analog input Ai8 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMaxAi8	16109	WORD	-1	-	Analog input Ai8 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Calibration_Ai1	15748	WORD	-1	-	Analog input Ai1 differential	-1000…1000	0	Digit
Calibration_Ai2	15749	WORD	-1	-	Analog input Ai2 differential	-1000…1000	0	Digit
Calibration_Ai3	15750	WORD	-1	-	Analog input Ai3 differential	-1000…1000	0	Digit
Calibration_Ai4	15751	WORD	-1	-	Analog input Ai4 differential	-1000…1000	0	Digit
Calibration_Ai5	15752	WORD	-1	-	Analog input Ai5 differential	-1000…1000	0	Digit
Calibration_Ai6	15753	WORD	-1	-	Analog input Ai6 differential	-1000…1000	0	Digit
Calibration_Ai7	16118	WORD	-1	-	Analog input Ai7 differential	-1000…1000	0	Digit
Calibration_Ai8	16119	WORD	-1	-	Analog input Ai8 differential	-1000…1000	0	Digit
Cfg_AO3	15758	WORD	-	-	Type of analog output AO3 • 0 = current modulation • 1 = current ON/OFF • 2 = voltage modulation • 3 = PWM mode	0…3	0	Num
Cfg_AO4	15759	WORD	-	-	Type of analog output AO4 See *Cfg_AO3*	0…3	0	Num
PWM_frequency_AO3_AO4	15769	WORD	-	Y	PWM Frequency for AO3 and AO4 in PWM mode	0…2000	1000	Hz
PWM_polarity_AO3_AO4	15770	WORD	-	-	PWM Polarity for AO3 and AO4 in PWM mode: 1 = direct,0 = reversed	0, 1	1	Num

Analog Inputs - Upper Board Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Cfg_Ai9	16102	UINT	-	-	Type of analog input Ai9 • 0 = NTC (NK103) • 1 = DI Input • 2 = NTC (103AT) • 3 = 4…20 mA • 4 = 0…10 V • 5 = 0…5 V (Ratiometric) • 6 = Pt1000 • 7 = hΩ (NTC) • 8 = daΩ (Pt1000) • 9 = PTC • 10 = 0…5 V • 11 = 0…20 mA	0…11	3	Num
Cfg_Ai10	16103	UINT	-	-	Type of analog input Ai10 See *Cfg_Ai1*	0…11	3	Num
Cfg_Ai11	16104	UINT	-	-	Type of analog input Ai11 See *Cfg_Ai1*	0…11	3	Num
Cfg_Ai12	16105	UINT	-	-	Type of analog input Ai12	0…11	3	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					See *Cfg_Ai1*			
FullScaleMin_Ai9	16110	WORD	-1	-	Analog input Ai9 start of scale value **NOTE:** Minimum full scale: for current probes, value at 4 mA, for 0…10 V voltage probes, value at 0 V, for ratiometric probes (0…5 V), value at 10% (corresponding to 0.5 V).	-9999…+9999	0	Num
FullScaleMax_Ai9	16111	WORD	-1	-	Analog input Ai9 full scale value **NOTE:** Maximum full scale for current probes, value at 20 mA, for 0…10 V voltage probes, value at 10 V, for ratiometric probes (0…5 V), value at 90% (corresponding to 4.5 V).	-9999…+9999	1000	Num
FullScaleMin_Ai10	16112	WORD	-1	-	Analog input Ai10 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai10	16113	WORD	-1	-	Analog input Ai10 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai11	16114	WORD	-1	-	Analog input Ai11 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai11	16115	WORD	-1	-	Analog input Ai11 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
FullScaleMin_Ai12	16116	WORD	-1	-	Analog input Ai12 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Num
FullScaleMax_Ai12	16117	WORD	-1	-	Analog input Ai12 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Num
Calibration_Ai9	16120	WORD	-1	-	Analog input Ai9 differential	-1000…1000	0	Digit
Calibration_Ai10	16121	WORD	-1	-	Analog input Ai10 differential	-1000…1000	0	Digit
Calibration_Ai11	16122	WORD	-1	-	Analog input Ai11 differential	-1000…1000	0	Digit
Calibration_Ai12	16123	WORD	-1	-	Analog input Ai12 differential	-1000…1000	0	Digit

ON Board RS485-1 Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_RS485_OB1	16124	WORD	-	Y	On-board RS-485 serial address	0... 255	1	Num
Proto_RS485_OB1	16125	WORD	-	Y	On-board RS-485 protocol selection • 2 = uNET • 3 = Modbus/RTU	2, 3	3	Num
Databit_RS485_OB1	16126	WORD	-	Y	On-board RS-485 data bit number Fixed setting 8	8	8	Num
Stopbit_RS485_OB1	16127	WORD	-	Y	On-board RS-485 stop bit number	1, 2	1	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					• 1 = 1 stop bit • 2 = 2 stop bit			
Parity_RS485_OB1	16128	WORD	-	Y	On-board RS-485 protocol parity • 0 = NULL • 1 = ODD • 2 = EVEN	0…2	2	Num
Baud_RS485_OB1	16129	WORD	-	Y	On-board RS-485 protocol baudrate • 0 = 9600 baud • 1 = 19200 baud • 2 = 38400 baud • 3 = 57600 baud • 4 = 76800 baud • 5 = 115200 baud	0…5	2	Num

ON Board RS485-2 Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_RS485_OB	15774	WORD	-	Y	On-board RS-485 serial address	0…255	1	Num
Proto_RS485_OB	15775	WORD	-	Y	On-board RS-485 protocol selection • 2 = uNET • 3 = Modbus/RTU	2, 3	3	Num
Databit_RS485_OB	15776	WORD	-	Y	On-board RS-485 data bit number Fixed setting 8	8	8	Num
Stopbit_RS485_OB	15777	WORD	-	Y	On-board RS-485 stop bit number • 1 = 1 stop bit • 2 = 2 stop bit	1, 2	1	Num
Parity_RS485_OB	15778	WORD	-	Y	On-board RS-485 protocol parity • 0 = NULL • 1 = ODD • 2 = EVEN	0…2	2	Num
Baud_RS485_OB	15779	WORD	-	Y	On-board RS-485 protocol baudrate • 0 = 9600 baud • 1 = 19200 baud • 2 = 38400 baud • 3 = 57600 baud • 4 = 76800 baud • 5 = 115200 baud			

ON Board CAN Expansion Bus Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_CAN_OB	15780	WORD	-	Y	On-board CAN Expansion bus serial address	1…127	1	Num
Baud_CAN_OB	15781	WORD	-	Y	On-board CAN Expansion protocol baudrate • 2 = 500 kBd • 3 = 250 kBd • 4 = 125 kBd • 5 = 125 kBd • 6 = 50 kBd	2…6	2	Num

RS-485 Passive Communication Module Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_RS485_PI	15782	WORD	-	Y	RS-485 Passive Communication Module serial address	0…255	1	Num
Proto_RS485_PI	15783	WORD	-	Y	RS-485 Passive Communication Module protocol selection • 2 = uNET • 3 = Modbus/RTU	2, 3	3	Num
Databit_RS485_PI	15784	WORD	-	Y	RS-485 Passive Communication Module data bit number Fixed setting 8	8	8	Num
Stopbit_RS485_PI	15785	WORD	-	Y	RS-485 Passive Communication Module stop bit number • 1 = 1 stop bit • 2 = 2 stop bit	1, 2	1	Num
Parity_RS485_PI	15786	WORD	-	Y	RS-485 Passive Communication Module protocol parity • 0 = NULL • 1 = ODD • 2 = EVEN	0…2	2	Num
Baud_RS485_PI	15787	WORD	-	Y	RS-485 Passive Communication Module protocol baudrate • 0 = 9600 baud • 1 = 19200 baud • 2 = 38400 baud • 3 = 57600 baud • 4 = 76800 baud • 5 = 115200 baud	0…5	2	Num

CAN Expansion Bus Passive Communication Module Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_CAN_PI	15788	WORD	-	Y	CAN Expansion bus Passive Communication Module serial address	1…127	1	Num
Baud_CAN_PI	15789	WORD	-	Y	CAN Expansion bus Passive Communication Module protocol baudrate • 2 = 500 kBd • 3 = 250 kBd • 4 = 125 kBd • 5 = 125 kBd • 6 = 50 kBd	2…6	2	Num

RS-232 Passive Communication Module Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_RS232_PI	15790	WORD	-	Y	RS-232 passive Communication Module serial address	0…255	1	Num
Proto_RS232_PI	15791	WORD	-	Y	RS-232 Passive Communication Module protocol selection • 2 = uNET • 3 = Modbus/RTU	2…3	3	Num
Databit_RS232_PI	15792	WORD	-	Y	RS-232 Passive Communication Module data bit number • 7 = 7 bit • 8 = 8 bit	7…8	8	Num
Stopbit_RS232_PI	15793	WORD	-	Y	RS-232 Passive Communication Module stop bit number • 1 = 1 stop bit • 2 = 2 stop bit	1…2	1	Num
Parity_RS232_PI	15784	WORD	-	Y	RS-232 Passive Communication Module protocol parity • 0 = NULL • 1 = ODD • 2 = EVEN	0…2	2	Num
Baud_RS232_PI	15795	WORD	-	Y	RS-232 Passive Communication Module protocol baudrate • 0 = 9600 baud • 1 = 19200 baud • 2 = 38400 baud • 3 = 57600 baud • 4 = 76800 baud • 5 = 115200 baud	0…5	2	Num

Ethernet Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Port_FTP_PI	15772	WORD	-	Y	FTP Port number Value 0 corresponds to port 21	0…65535	65535	Num
Port_HTTP_PI	15796	WORD	-	Y	HTTP port HTTP communication Port number Default 0 corresponds to port 80	0…65535	0	Num
Port_ETH_PI	15797	WORD	-	Y	Port TCP/IP Modbus communication port.	0…65535	65535	Num
Ip_1_ETH_PI	15798	WORD	-	-	Ethernet passive Plug-in IP address (part 1)	0…255	10	Num
Ip_2_ETH_PI	15799	WORD	-	-	Ethernet passive Plug-in IP address (part 2)	0…255	0	Num
Ip_3_ETH_PI	15800	WORD	-	-	Ethernet passive Plug-in IP address (part 3)	0…255	0	Num
Ip_4_ETH_PI	15801	WORD	-	-	Ethernet passive Plug-in IP address (part 4)	0…255	100	Num
DefGtwy_1_ETH_PI	15802	WORD	-	Y	Default gateway (part 1)	0…255	10	Num
DefGtwy_2_ETH_PI	15803	WORD	-	Y	Default gateway (part 2)	0…255	0	Num
DefGtwy_3_ETH_PI	15804	WORD	-	Y	Default gateway (part 3)	0…255	0	Num
DefGtwy_4_ETH_PI	15805	WORD	-	Y	Default gateway (part 4)	0…255	1	Num
NetMsk_1_ETH_PI	15806	WORD	-	Y	Net mask (part 1)	0…255	255	Num
NetMsk_2_ETH_PI	15807	WORD	-	Y	Net mask (part 2)	0…255	255	Num
NetMsk_3_ETH_PI	15808	WORD	-	Y	Net mask (part 3)	0…255	255	Num
NetMsk_4_ETH_PI	15809	WORD	-	Y	Net mask (part 4)	0…255	0	Num
PriDNS_1_ETH_PI	15810	WORD	-	Y	Primary DNS server (part 1)	0…255	8	Num
PriDNS_2_ETH_PI	15811	WORD	-	Y	Primary DNS server (part 2)	0…255	8	Num
PriDNS_3_ETH_PI	15812	WORD	-	Y	Primary DNS server (part 3)	0…255	8	Num
PriDNS_4_ETH_PI	15813	WORD	-	Y	Primary DNS server (part 4)	0…255	8	Num
SecDNS_1_ETH_PI	15814	WORD	-	Y	Secondary DNS server (part 1)	0…255	8	Num
SecDNS_2_ETH_PI	15815	WORD	-	Y	Secondary DNS server (part 2)	0…255	8	Num
SecDNS_3_ETH_PI	15816	WORD	-	Y	Secondary DNS server (part 3)	0…255	4	Num
SecDNS_4_ETH_PI	15817	WORD	-	Y	Secondary DNS server (part 4)	0…255	4	Num
EnableDHCP_ETH_PI	15818	WORD	-	Y	Enable DHCP 0 = False, 1 = True	0, 1	0	Flag
MAC_1_ETH_PI	16130	WORD	-	Y	MAC address (first part)	0	0	Num
MAC_2_ETH_PI	16131	WORD	-	Y	MAC address (second part)	0…24	24	Num
MAC_3_ETH_PI	16132	WORD	-	Y	MAC address (third part)	0…187	187	Num
MAC_4_ETH_PI	16133	WORD	-	Y	MAC address (fourth part)	0…255	255	Num
MAC_5_ETH_PI	16134	WORD	-	Y	MAC address (fifth part)	0…255	255	Num

Display Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Hmi_Language	15819	WORD	-	Y	Language	0…65535	0	Num
Par_ContrLCD	15723	WORD	-	Y	LCD contrast	0…63	30	Num
Par_BackLightTime	15724	WORD	-	Y	Backlight time	0…3600	10	Sec

BACnet Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Load_BACnet_E2_ Defaults	15766	WORD	-	Y	Load default values for BACnet parameters in EEPROM at next boot	0, 1	1	Flag
Port_BACnet_IP	15768	WORD	-	Y	BACnet/IP Port number. 0 = port 47808 65535 = BACnet stack running only on PLC side	0…65535	65535	Num

FileSystem Volumes

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
HTTP_volume	16136	WORD	-	Y	Volume of HTTP files 0 = NOR Flash 1 = micro SD card	0, 1	0	Num
DAT_volume	16137	WORD	-	Y	Volume of *.DAT and *.RAW files 0 = NOR Flash 1 = micro SD card	0, 1	0	Num
PLC_volume	16139	WORD	-	Y	Volume of PLC file 0 = NOR Flash 1 = micro SD card	0, 1	0	Num
HMI_volume	16140	WORD	-	Y	Volume of HMI file 0 = NOR Flash 1 = micro SD card	0, 1	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
REM_volume	16141	WORD	-	Y	Volume of HMI Remote file 0 = NOR Flash 1 = micro SD card	0, 1	0	Num
PAR_volume	16142	WORD	-	Y	Volume of CONNEC.PAR file 0 = NOR Flash 1 = micro SD card	0, 1	0	Num

Miscellaneous

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
virtualDipSwitch	16143	WORD	-	Y	Numeric prefix for system files name	0…7	0	Num

Expansion Module Parameters Table

Folders

NOTE: Not all parameters listed are available depending on the accessible resources in the device.

The following tables present the Expansion module parameters, divided into categories (folders):

Folder label
Acknowledgment, page 144
AI Calibration, page 144
AO Calibration, page 148
Analog Inputs - Base Board, page 148
Analog Inputs - Upper Board, page 150
Analog Outputs Upper Board Folder, page 152
ON Board CAN Expansion bus, page 152

Acknowledgment Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_TAB	15716	WORD	-	Y	Map code **NOTE:** read/write parameter	0…65535	0	Num
Par_POLI	15717	WORD	-	Y	Model Code **NOTE:** read/write parameter	0…65535	2049	Num
Par_PCH	15719	BOOL	-	-	Device model **NOTE:** read/write parameter	0…65535	324	Num

AI Calibration Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_10V_AI1	15527	WORD	-	-	0…10 V calibration gain AI1	0…65535	32768	Num
Gain_10V_AI10	15590	WORD	-	-	0…10 V calibration gain AI10	0…65535	32768	Num
Gain_10V_AI2	15534	WORD	-	-	0…10 V calibration gain AI2	0…65535	32768	Num
Gain_10V_AI3	15541	WORD	-	-	0…10 V calibration gain AI3	0…65535	32768	Num
Gain_10V_AI4	15548	WORD	-	-	0…10 V calibration gain AI4	0…65535	32768	Num
Gain_10V_AI5	15555	WORD	-	-	0…10 V calibration gain AI5	0…65535	32768	Num
Gain_10V_AI6	15562	WORD	-	-	0…10 V calibration gain AI6	0…65535	32768	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_10V_AI7	15569	WORD	-	-	0…10 V calibration gain AI7	0…65535	32768	Num
Gain_10V_AI8	15576	WORD	-	-	0…10 V calibration gain AI8	0…65535	32768	Num
Gain_10V_AI9	15583	WORD	-	-	0…10 V calibration gain AI9	0…65535	32768	Num
Gain_5Vr_AI1	15526	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI1	0…65535	32768	Num
Gain_5V_AI1	15529	WORD	-	-	0…5 V calibration gain AI1	0…65535	32768	Num
Gain_5Vr_AI10	15589	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI10	0…65535	32768	Num
Gain_5V_AI10	15592	WORD	-	-	0…5 V calibration gain AI10	0…65535	32768	Num
Gain_5Vr_AI2	15533	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI2	0…65535	32768	Num
Gain_5V_AI2	15536	WORD	-	-	0…5 V calibration gain AI2	0…65535	32768	Num
Gain_5Vr_AI3	15540	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI3	0…65535	32768	Num
Gain_5V_AI3	15543	WORD	-	-	0…5 V calibration gain AI3	0…65535	32768	Num
Gain_5Vr_AI4	15547	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI4	0…65535	32768	Num
Gain_5V_AI4	15550	WORD	-	-	0…5 V calibration gain AI4	0…65535	32768	Num
Gain_5Vr_AI5	15554	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI5	0…65535	32768	Num
Gain_5V_AI5	15557	WORD	-	-	0…5 V calibration gain AI5	0…65535	32768	Num
Gain_5Vr_AI6	15561	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI6	0…65535	32768	Num
Gain_5V_AI6	15564	WORD	-	-	0…5 V calibration gain AI6	0…65535	32768	Num
Gain_5Vr_AI7	15568	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI7	0…65535	32768	Num
Gain_5V_AI7	15571	WORD	-	-	0…5 V calibration gain AI7	0…65535	32768	Num
Gain_5Vr_AI8	15575	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI8	0…65535	32768	Num
Gain_5V_AI8	15578	WORD	-	-	0…5 V calibration gain AI8	0…65535	32768	Num
Gain_5Vr_AI9	15582	WORD	-	-	0…5 $V_{ratiometric}$ calibration gain AI9	0…65535	32768	Num
Gain_5V_AI9	15585	WORD	-	-	0…5 V calibration gain AI9	0…65535	32768	Num
Gain_mA_AI1	15528	WORD	-	-	0/4…20 mA calibration gain AI1	0…65535	32768	Num
Gain_mA_AI10	15591	WORD	-	-	0/4…20 mA calibration gain AI10	0…65535	32768	Num
Gain_mA_AI2	15535	WORD	-	-	0/4…20 mA calibration gain AI2	0…65535	32768	Num
Gain_mA_AI3	15542	WORD	-	-	0/4…20 mA calibration gain AI3	0…65535	32768	Num
Gain_mA_AI4	15549	WORD	-	-	0/4…20 mA calibration gain AI4	0…65535	32768	Num
Gain_mA_AI5	15556	WORD	-	-	0/4…20 mA calibration gain AI5	0…65535	32768	Num
Gain_mA_AI6	15563	WORD	-	-	0/4…20 mA calibration gain AI6	0…65535	32768	Num
Gain_mA_AI7	15570	WORD	-	-	0/4…20 mA calibration gain AI7	0…65535	32768	Num
Gain_mA_AI8	15577	WORD	-	-	0/4…20 mA calibration gain AI8	0…65535	32768	Num
Gain_mA_AI9	15584	WORD	-	-	0/4…20 mA calibration gain AI9	0…65535	32768	Num
Gain_Ntc_AI1	15524	WORD	-	-	NTC calibration gain AI1	0…65535	32768	Num
Gain_Ntc_AI10	15587	WORD	-	-	NTC calibration gain AI10	0…65535	32768	Num
Gain_Ntc_AI2	15531	WORD	-	-	NTC calibration gain AI2	0…65535	32768	Num
Gain_Ntc_AI3	15538	WORD	-	-	NTC calibration gain AI3	0…65535	32768	Num
Gain_Ntc_AI4	15545	WORD	-	-	NTC calibration gain AI4	0…65535	32768	Num
Gain_Ntc_AI5	15552	WORD	-	-	NTC calibration gain AI5	0…65535	32768	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_Ntc_AI6	15559	WORD	-	-	NTC calibration gain AI6	0…65535	32768	Num
Gain_Ntc_AI7	15566	WORD	-	-	NTC calibration gain AI7	0…65535	32768	Num
Gain_Ntc_AI8	15573	WORD	-	-	NTC calibration gain AI8	0…65535	32768	Num
Gain_Ntc_AI9	15580	WORD	-	-	NTC calibration gain AI9	0…65535	32768	Num
Gain_Pt1000_AI1	15525	WORD	-	-	Pt1000 calibration gain AI1	0…65535	32768	Num
Gain_Pt1000_AI10	15588	WORD	-	-	Pt1000 calibration gain AI10	0…65535	32768	Num
Gain_Pt1000_AI2	15532	WORD	-	-	Pt1000 calibration gain AI2	0…65535	32768	Num
Gain_Pt1000_AI3	15539	WORD	-	-	Pt1000 calibration gain AI3	0…65535	32768	Num
Gain_Pt1000_AI4	15546	WORD	-	-	Pt1000 calibration gain AI4	0…65535	32768	Num
Gain_Pt1000_AI5	15553	WORD	-	-	Pt1000 calibration gain AI5	0…65535	32768	Num
Gain_Pt1000_AI6	15560	WORD	-	-	Pt1000 calibration gain AI6	0…65535	32768	Num
Gain_Pt1000_AI7	15567	WORD	-	-	Pt1000 calibration gain AI7	0…65535	32768	Num
Gain_Pt1000_AI8	15574	WORD	-	-	Pt1000 calibration gain AI8	0…65535	32768	Num
Gain_Pt1000_AI9	15581	WORD	-	-	Pt1000 calibration gain AI9	0…65535	32768	Num
Gain_PTC_AI1	15530	WORD	-	-	PTC calibration gain AI1	0…65535	32768	Num
Gain_PTC_AI10	15593	WORD	-	-	PTC calibration gain AI10	0…65535	32768	Num
Gain_PTC_AI2	15537	WORD	-	-	PTC calibration gain AI2	0…65535	32768	Num
Gain_PTC_AI3	15544	WORD	-	-	PTC calibration gain AI3	0…65535	32768	Num
Gain_PTC_AI4	15551	WORD	-	-	PTC calibration gain AI4	0…65535	32768	Num
Gain_PTC_AI5	15558	WORD	-	-	PTC calibration gain AI5	0…65535	32768	Num
Gain_PTC_AI6	15565	WORD	-	-	PTC calibration gain AI6	0…65535	32768	Num
Gain_PTC_AI7	15572	WORD	-	-	PTC calibration gain AI7	0…65535	32768	Num
Gain_PTC_AI8	15579	WORD	-	-	PTC calibration gain AI8	0…65535	32768	Num
Gain_PTC_AI9	15586	WORD	-	-	PTC calibration gain AI9	0…65535	32768	Num
Offs_Ntc_AI1	15608	WORD	-1	-	NTC calibration offset AI1	-32768…32767	0	Num
Offs_Pt1000_AI1	15609	WORD	-1	-	Pt1000 calibration offset AI1	-32768…32767	0	Num
Offs_5V_AI1	15610	WORD	-1	-	0…5 V calibration offset AI1	-32768…32767	0	Num
Offs_10V_AI1	15611	WORD	-1	-	0…10 V calibration offset AI1	-32768…32767	0	Num
Offs_mA_AI1	15612	WORD	-1	-	0/4…20 mA calibration offset AI1	-32768…32767	0	Num
Offs_5V_AI1	15613	WORD	-1	-	0…5 V calibration offset AI1	-32768…32767	0	Num
Offs_PTC_AI1	15614	WORD	-1	-	PTC calibration offset AI1	-32768…32767	0	Num
Offs_Ntc_AI2	15615	WORD	-1	-	NTC calibration offset AI2	-32768…32767	0	Num
Offs_Pt1000_AI2	15616	WORD	-1	-	Pt1000 calibration offset AI2	-32768…32767	0	Num
Offs_5V_AI2	15617	WORD	-1	-	0…5 V calibration offset AI2	-32768…32767	0	Num
Offs_10V_AI2	15618	WORD	-1	-	0…10 V calibration offset AI2	-32768…32767	0	Num
Offs_mA_AI2	15619	WORD	-1	-	0/4…20 mA calibration offset AI2	-32768…32767	0	Num
Offs_5V_AI2	15620	WORD	-1	-	0…5 V calibration offset AI2	-32768…32767	0	Num
Offs_PTC_AI2	15621	WORD	-1	-	PTC calibration offset AI2	-32768…32767	0	Num
Offs_Ntc_AI3	15622	WORD	-1	-	NTC calibration offset AI3	-32768…32767	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Offs_5V_AI3	15624	WORD	-1	-	0…5 V calibration offset AI3	-32768…32767	0	Num
Offs_10V_AI3	15625	WORD	-1	-	0…10 V calibration offset AI3	-32768…32767	0	Num
Offs_mA_AI3	15626	WORD	-1	-	0/4…20 mA calibration offset AI3	-32768…32767	0	Num
Offs_5V_AI3	15627	WORD	-1	-	0…5 V calibration offset AI3	-32768…32767	0	Num
Offs_PTC_AI3	15628	WORD	-1	-	PTC calibration offset AI3	-32768…32767	0	Num
Offs_Ntc_AI4	15629	WORD	-1	-	NTC calibration offset AI4	-32768…32767	0	Num
Offs_Pt1000_AI4	15630	WORD	-1	-	Pt1000 calibration offset AI4	-32768…32767	0	Num
Offs_5V_AI4	15631	WORD	-1	-	0…5 V calibration offset AI4	-32768…32767	0	Num
Offs_10V_AI4	15632	WORD	-1	-	0…10 V calibration offset AI4	-32768…32767	0	Num
Offs_5V_AI4	15634	WORD	-1	-	0…5 V calibration offset AI4	-32768…32767	0	Num
Offs_PTC_AI4	15635	WORD	-1	-	PTC calibration offset AI4	-32768…32767	0	Num
Offs_Ntc_AI5	15636	WORD	-1	-	NTC calibration offset AI5	-32768…32767	0	Num
Offs_Pt1000_AI5	15637	WORD	-1	-	Pt1000 calibration offset AI5	-32768…32767	0	Num
Offs_5V_AI5	15638	WORD	-1	-	0…5 V calibration offset AI5	-32768…32767	0	Num
Offs_10V_AI5	15639	WORD	-1	-	0…10 V calibration offset AI5	-32768…32767	0	Num
Offs_mA_AI5	15640	WORD	-1	-	0/4…20 mA calibration offset AI5	-32768…32767	0	Num
Offs_5V_AI5	15641	WORD	-1	-	0…5 V calibration offset AI5	-32768…32767	0	Num
Offs_PTC_AI5	15642	WORD	-1	-	PTC calibration offset AI5	-32768…32767	0	Num
Offs_Ntc_AI6	15643	WORD	-1	-	NTC calibration offset AI6	-32768…32767	0	Num
Offs_5V_AI6	15645	WORD	-1	-	0…5 V calibration offset AI6	-32768…32767	0	Num
Offs_10V_AI6	15646	WORD	-1	-	0…10 V calibration offset AI6	-32768…32767	0	Num
Offs_mA_AI6	15647	WORD	-1	-	0/4…20 mA calibration offset AI6	-32768…32767	0	Num
Offs_5V_AI6	15648	WORD	-1	-	0…5 V calibration offset AI6	-32768…32767	0	Num
Offs_PTC_AI6	15649	WORD	-1	-	PTC calibration offset AI6	-32768…32767	0	Num
Offs_Ntc_AI7	15650	WORD	-1	-	NTC calibration offset AI7	-32768…32767	0	Num
Offs_Pt1000_AI7	15651	WORD	-1	-	Pt1000 calibration offset AI7	-32768…32767	0	Num
Offs_5V_AI7	15652	WORD	-1	-	0…5 V calibration offset AI7	-32768…32767	0	Num
Offs_10V_AI7	15653	WORD	-1	-	0…10 V calibration offset AI7	-32768…32767	0	Num
Offs_mA_AI7	15654	WORD	-1	-	0/4…20 mA calibration offset AI7	-32768…32767	0	Num
Offs_5V_AI7	15655	WORD	-1	-	0…5 V calibration offset AI7	-32768…32767	0	Num
Offs_PTC_AI7	15656	WORD	-1	-	PTC calibration offset AI7	-32768…32767	0	Num
Offs_Ntc_AI8	15657	WORD	-1	-	NTC calibration offset AI8	-32768…32767	0	Num
Offs_Pt1000_AI8	15658	WORD	-1	-	Pt1000 calibration offset AI8	-32768…32767	0	Num
Offs_5V_AI8	15659	WORD	-1	-	0…5 V calibration offset AI8	-32768…32767	0	Num
Offs_10V_AI8	15660	WORD	-1	-	0…10 V calibration offset AI8	-32768…32767	0	Num
Offs_mA_AI8	15661	WORD	-1	-	0/4…20 mA calibration offset AI8	-32768…32767	0	Num
Offs_5V_AI8	15662	WORD	-1	-	0…5 V calibration offset AI8	-32768…32767	0	Num
Offs_Ntc_AI9	15664	WORD	-1	-	NTC calibration offset AI9	-32768…32767	0	Num
Offs_Pt1000_AI9	15665	WORD	-1	-	Pt1000 calibration offset AI9	-32768…32767	0	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Offs_5V_AI9	15666	WORD	-1	-	0…5 V calibration offset AI9	-32768…32767	0	Num
Offs_10V_AI9	15667	WORD	-1	-	0…10 V calibration offset AI9	-32768…32767	0	Num
Offs_mA_AI9	15668	WORD	-1	-	0/4…20 mA calibration offset AI9	-32768…32767	0	Num
Offs_5V_AI9	15669	WORD	-1	-	0…5 V calibration offset AI9	-32768…32767	0	Num
Offs_PTC_AI9	15670	WORD	-1	-	PTC calibration offset AI9	-32768…32767	0	Num
Offs_Ntc_AI10	15671	WORD	-1	-	NTC calibration offset AI10	-32768…32767	0	Num
Offs_Pt1000_AI10	15672	WORD	-1	-	Pt1000 calibration offset AI10	-32768…32767	0	Num
Offs_5V_AI10	15673	WORD	-1	-	0…5 V calibration offset AI10	-32768…32767	0	Num
Offs_10V_AI10	15674	WORD	-1	-	0…10 V calibration offset AI10	-32768…32767	0	Num
Offs_mA_AI10	15675	WORD	-1	-	0/4…20 mA calibration offset AI10	-32768…32767	0	Num
Offs_5V_AI10	15676	WORD	-1	-	0…5 V calibration offset AI10	-32768…32767	0	Num
Offs_PTC_AI10	15677	WORD	-1	-	PTC calibration offset AI10	-32768…32767	0	Num

AO Calibration Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Gain_10V_AO1	15692	WORD	-	-	0…10 V calibration gain AO1	0…65535	32768	Num
Gain_10V_AO2	15694	WORD	-	-	0…10 V calibration gain AO2	0…65535	32768	Num
Gain_mA_AO1	15693	WORD	-	-	0/4…20 mA calibration gain AO1	0…65535	32768	Num
Gain_mA_AO2	15695	WORD	-	-	0/4…20 mA calibration gain AO2	0…65535	32768	Num
Offs_mA_AO1	15705	WORD	-1	-	0/4…20 mA calibration offset AO1	-32768…32767	0	Num
Offs_10V_AO2	15706	WORD	-1	-	0…10 V calibration offset AO2	-32768…32767	0	Num
Offs_mA_AO2	15707	WORD	-1	-	0/4…20 mA calibration offset AO2	-32768…32767	0	Num

Analog Inputs - Base Board Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Temp_UM	15725	WORD	-	-	Temperature unit of measurement • 0 = °C • 1 = °F	0, 1	0	Num
Cfg_Ai1	15726	WORD	-	-	Type of analog input Ai1 • 0= NTC (NK103) • 1 = DI Input • 2 = NTC (103AT)	0…11	2	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					• 3 = 4…20 mA • 4 = 0…10 V • 5 = 0…5 V (Ratiometric) • 6 = Pt1000 • 7 = hΩ (NTC) • 8 = daΩ (Pt1000) • 9 = PTC • 10 = 0…5 V • 11 = 0…20 mA			
Cfg_Ai2	15727	WORD	-	-	Type of analog input Ai2 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai3	15728	WORD	-	-	Type of analog input Ai3 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai4	15729	WORD	-	-	Type of analog input Ai4 See *Cfg_Ai1*	0…11	2	Num
FullScaleMin_Ai1	15736	WORD	-	-	Analog input Ai1 start of scale value **NOTE:** Minimum full scale: for current probes, value at 4 mA, for 0…10 V voltage probes, value at 0 V, for ratiometric probes (0…5 V),value at 10% (corresponding to 0.5 V).	-9999…+9999	0	Digit
FullScaleMax_Ai1	15737	WORD	-1	-	Analog input Ai1 full scale value **NOTE:** Maximum full scale for current probes, value at 20 mA, for 0…10 V voltage probes, value at 10 V, for ratiometric probes (0…5 V), value at 90% (corresponding to 4.5 V).	-9999…+9999	1000	Digit
FullScaleMin_Ai2	15738	WORD	-1	-	Analog input Ai2 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMax_Ai2	15739	WORD	-1	-	Analog input Ai2 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai3	15740	WORD	-1	-	Analog input Ai3 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMax_Ai3	15741	WORD	-1	-	Analog input Ai3 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai4	15742	WORD	-1	-	Analog input Ai4 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMax_Ai4	15743	WORD	-1	-	Analog input Ai4 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
Calibration_Ai1	15748	WORD	-1	-	Analog input Ai1 differential	-1000…1000	0	Digit
Calibration_Ai2	15749	WORD	-1	-	Analog input Ai2 differential	-1000…1000	0	Digit
Calibration_Ai3	15750	WORD	-1	-	Analog input Ai3 differential	-1000…1000	0	Digit
Calibration_Ai4	15751	WORD	-1	-	Analog input Ai4 differential	-1000…1000	0	Digit
SubCfg_AI1	16010	WORD	-	-	Sub configuration of analog input AI1 • 0= Low Pass filter disabled, analog value in raw points;	0…3	3	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					• 1= Low Pass filter disabled, analog value converted; • 2= Low Pass filter enabled, analog value in raw points; • 3 = Low Pass filter enabled, analog value converted.			
SubCfg_AI2	16011	WORD	-	-	Sub configuration of analog input AI2 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI3	16012	WORD	-	-	Sub configuration of analog input AI3 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI4	16013	WORD	-	-	Sub configuration of analog input AI4 See *SubCfg_Ai1*	0…3	3	Num

Analog Inputs - Upper Board Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Cfg_Ai5	15730	WORD	-	-	Type of analog input Ai5 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai6	15731	WORD	-	-	Type of analog input Ai6 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai7	16100	WORD	-	-	Type of analog input Ai7 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai8	16101	WORD	-	-	Type of analog input Ai8 See *Cfg_Ai1*	0…11	2	Num
Cfg_Ai9	16102	WORD	-	-	Type of analog input Ai9 See *Cfg_Ai1*	0…11	3	Num
Cfg_Ai10	16103	WORD	-	-	Type of analog input Ai10 See *Cfg_Ai1*	0…11	3	Num
FullScaleMin_Ai5	15744	WORD	-1	-	Analog input Ai5 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMax_Ai5	15745	WORD	-1	-	Analog input Ai5 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai6	15746	WORD	-1	-	Analog input Ai6 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMaxAi6	15747	WORD	-1	-	Analog input Ai6 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai7	16106	WORD	-1	-	Analog input Ai7 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
FullScaleMax_Ai7	16107		-1	-	Analog input Ai7 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai8	16108		-1	-	Analog input Ai8 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMaxAi8	16109		-1	-	Analog input Ai8 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
FullScaleMin_Ai9	16110		-1	-	Analog input Ai9 start of scale value **NOTE:** Minimum full scale: current probes, value at 4 mA, for 0…10 V voltage probes, value at 0 V, for ratiometric probes (0…5 V), value at 10% (corresponding to 0.5 V).	-9999…+9999	0	Digit
FullScaleMax_Ai9	16111		-1	-	Analog input Ai9 full scale value **NOTE:** Maximum full scale current probes, value at 20 mA, for 0…10 V voltage probes, value at 10 V, for ratiometric probes (0…5 V), value at 90% (corresponding to 4.5 V).	-9999…+9999	1000	Digit
FullScaleMin_Ai10	16112		-1	-	Analog input Ai10 start of scale value See *FullScaleMin_Ai1*	-9999…+9999	0	Digit
FullScaleMax_Ai10	16113		-1	-	Analog input Ai10 full scale value See *FullScaleMax_Ai1*	-9999…+9999	1000	Digit
Calibration_Ai5	15752		-1	-	Analog input Ai5 differential	-1000…1000	0	Digit
Calibration_Ai6	15753		-1	-	Analog input Ai6 differential	-1000…1000	0	Digit
Calibration_Ai7	16118		-1	-	Analog input Ai7 differential	-1000…1000	0	Digit
Calibration_Ai8	16119		-1	-	Analog input Ai8 differential	-1000…1000	0	Digit
Calibration_Ai9	16120		-1	-	Analog input Ai9 differential	-1000…1000	0	Digit
Calibration_Ai10	16121		-1	-	Analog input Ai10 differential	-1000…1000	0	Digit
SubCfg_AI5	16014		-	-	Sub configuration of analog input AI5 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI6	16015		-	-	Sub configuration of analog input AI6 See SubCfg_Ai1	0…3	3	Num
SubCfg_AI7	16016		-	-	Sub configuration of analog input AI7 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI8	16017		-	-	Sub configuration of analog input AI8 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI9	16018		-	-	Sub configuration of analog input AI9 See *SubCfg_Ai1*	0…3	3	Num
SubCfg_AI10	16019		-	-	Sub configuration of analog input AI10 See *SubCfg_Ai1*	0…3	3	Num

Analog Outputs Upper Board Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Cfg_AO1	15758		-	-	Type of analog output AO1 • 0= Current modulation • 1 = Current ON/OFF • 2 = Voltage modulation • 3 = PWM mode	0…3	0	Num
Cfg_AO2	15759		-	-	Type of analog output AO2 See *Cfg_AO1*	0…3	0	Num
PWM_frequency_AO1_AO2	15769		-	Y	PWM Frequency for AO1 and AO2 in PWM mode	0…2000	1000	Hz
PWM_polarity_AO1_AO2	15770		-	-	PWM Polarity for AO1 and AO2 in PWM mode • 0= Reversed • 1 = Direct	0, 1	1	Num

ON Board CAN Expansion Bus Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_CAN_OB	15780		-	Y	On-board CAN Expansion Bus serial address	1…127	1	Num
SendPeriodFDI1	17000		-	-	Min period of FDI1 transmission: 0 = max frequency	0…65535	65535	ms
SendPeriodFDI2	17001		-	-	Min period of FDI2 transmission: 0 = max frequency	0…65535	65535	ms

Display Color Touchscreen Parameters Table

Folders

NOTE: Not all parameters listed are available depending on the accessible resources in the device.

The following tables present the Display Color Touchscreen parameters, divided into categories (folders):

Folder label
Acknowledgment, page 153
AI Calibration, page 153
Analog Inputs, page 154
ON Board RS-485, page 154
Display, page 155
Remote Slave, page 154

Acknowledgment Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_TAB	8192	WORD	-	Y	Map code **NOTE:** read/write parameter	0…65535	0	Num
Par_POLI	8193	WORD	-	Y	Model Code **NOTE:** read/write parameter	0…65535	0	Num
Par_PARMOD	8194	WORD	-	-	Parameter modified • 0 = False • 1 = True	0, 1	0	Flag

AI Calibration Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
CAL_RH_interne	8195		-	-	Calibration value for RH	-	-	-

Analog Inputs Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Temp_UM	8196	WORD	-	-	Unit of temperature measurement • 0 = °C • 1 = °F	0, 1	0	Num
Calibration_NTC	8197	WORD	-	-	NTC differential	-180…180	0	°C/10 (°F/10)
Calibration_RH	8206	WORD	-	-	RH percentage differential	-1000…1000	0	%/10

ON Board RS-485 Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_RS485_OB	8198	WORD	-	Y	RS-485 On-board address	0…247	1	Num
Proto_RS485_OB	8199	WORD	-	-	Modbus working mode • 0 = Slave • 1 = Master	0, 1	(1)	Num
DataBit_RS485_OB	8200	WORD	-	Y	RS-485 On-board Data bit number	8	8	Num
StopBit_RS485_OB	8201	WORD	-	Y	RS-485 On-board stop bit number	1, 2	1	Num
Parity_RS485_OB	8202	WORD	-	Y	RS-485 On-board parity protocol • 0 = Null • 1 = Odd • 2 = Even	0…2	2	Num
Baud_RS485_OB	8203	WORD	-	Y	RS-485 On-board baud rate protocol • 0 = 9600 • 1 = 19200 • 2 = 38400 • 3 = 57600 • 4 = 115200	0…4	2	Num

(1) AVP1•000W0500: 0, AVP100•0P0500: 1

Remote Slave Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
RemoteSlave1_addr	8254	WORD	-	Y	Remote slave 1 address	0…247	0	Num
RemoteSlave1_32bit_order	8262	WORD	-	Y	Remote slave 1 MSB and LSB order	0…3	0(1)	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
					• 0 = DWORD register not swapped and REAL register not swapped • 1 = DWORD register swapped and REAL register not swapped • 2 = DWORD register not swapped and REAL register swapped • 3 = DWORD register swapped and REAL register swapped			
RemoteSlave2_addr	8255	WORD	-	Y	Remote slave 2 address	0…247	0	Num
RemoteSlave2_32bit_order	8263	WORD	-	Y	Remote slave 2 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave3_addr	8256	WORD	-	Y	Remote slave 3 address	0…247	0	Num
RemoteSlave3_32bit_order	8264	WORD	-	Y	Remote slave 3 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave4_addr	8257	WORD	-	Y	Remote slave 4 address	0…247	0	Num
RemoteSlave4_32bit_order	8265	WORD	-	Y	Remote slave 4 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave5_addr	8258	WORD	-	Y	Remote slave 5 address	0…247	0	Num
RemoteSlave5_32bit_order	8266	WORD	-	Y	Remote slave 5 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave6_addr	8259	WORD	-	Y	Remote slave 6 address	0…247	0	Num
RemoteSlave6_32bit_order	8267	WORD	-	Y	Remote slave 6 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave7_addr	8260	WORD	-	Y	Remote slave 7 address	0…247	0	Num
RemoteSlave7_32bit_order	8268	WORD	-	Y	Remote slave 7 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
RemoteSlave8_addr	8261	WORD	-	Y	Remote slave 8 address	0…247	0	Num
RemoteSlave8_32bit_order	8269	WORD	-	Y	Remote slave 8 MSB and LSB order See *RemoteSlave1_32bit_order*	0…3	0(1)	Num
(1) 0=Word NOT swapped, 1= Word swapped for WORD, 2= Word swapped for REAL, 3= Word swapped								

Display Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_Orientation	8204	WORD	-	Y	Display orientation • 0 = Landscape • 1 = Portrait	0, 1	0	-
Par_Language	8205	WORD	-	-	System Language	0…65535	1	Num

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_BackLightTime	8207	WORD	-	-	Backlight time	0…3600	10	Sec
Par_BackLightMinValue	8250	WORD	-	-	Backlight minimum value	0…100	5%	%

AVK1000000500 Parameters Table

Folders

The following tables present the parameters, divided into categories (folders):

Folder label
Acknowledgment, page 157
HMI Management, page 157
Display, page 158
Buzzer, page 158
CAN, page 158

Acknowledgment Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_TAB	15716	WORD	-	Y	Map code **NOTE:** read/write parameter	0…65535	0	Num
Par_POLI	15717	WORD	-	Y	Model Code **NOTE:** read/write parameter	0…65535	2049	Num
Par_PARMOD	15719	BOOL	-	-	Parameter modified • 0 = False • 1 = True At least one parameter has been modified from the original configuration	0, 1	0	Flag

HMI Management Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Hmi_Language	15989	WORD	-	-	-	0…65535	0	Num
HmiList_Current	15820	WORD	-	-	Current HMI • 0 = HMI remote 1	0…11	0	Num
HmiList_ID	15821	WORD	-	-	HMI remote navigation ID list	0…254	0	Num
HmiList_Res	15833	WORD	-	-	HMI remote navigation resource type • 3 = CAN	1…3	3	Num
HmiList_Addr	15845	WORD	-	-	HMI remote navigation resource address for CAN	0…255	124	Num
HmiList_File	15893	15 byte	-	-	HMI remote navigation file (DOS 8.3 uppercase format)	**********	(1)	String
(1) Default file name: *HMIREM.KBD*								

Display Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Par_Language	15819	WORD	-	-	Display language: • 0 = Italian • 1 = English • 2 = French • 3 = German • 4 = Spanish	0…65535	1	Num
Par_ContrLCD	15723	WORD	-	Y	LCD Contrast Allows adjustment of the LCD display contrast	0…64	40	Num
Par_BackLightTime	15724	WORD	-	-	Backlight time Allows adjustment of LCD display switch-on time.	0…3600	10	Sec

Buzzer Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Buzzer_Mode	15990	WORD	-	-	Buzzer Mode: • 0 = always off • 1 = beep per key • 2 = active on Red LED	0…2	0	Num

CAN Folder

LABEL	ADDRESS	DATA TYPE	CPL	RESET	DESCRIPTION	RANGE	DEFAULT	U.M.
Addr_CAN_OB	15780	WORD	-	Y	On-board CAN serial address.	1…127	127	Num
Baud_CAN_OB	15781	WORD	-	Y	On-board CAN protocol baudrate: • 2 = 500 kBd • 3 = 250 kBd • 4 = 125 kBd • 5 = 125 kBd • 6 = 50 kBd	2…6	2	Num

Commissioning

What's in This Part

FREE Studio Plus

What's in This Chapter

Overview

Components and accessories are described below.

General Description

Overview

The FREE Studio Plus development tool makes it possible to create and customize IEC 61131-3 programs for various types of application. You can download FREE Studio Plus from Eliwell web site download center. It is intended for applications in HVAC&R.

FREE Studio Plus Component

FREE Studio Plus permits to:

- Create and manage libraries, applications, and diagnostics.
- Manage previously developed applications, upload/download applications, and modify device parameters from a serial port.

PC Connection

FREE Advance can be connected to a PC through the USB port and a USB cable:

- Type A USB (HOST). Used to connect a USB memory key drive when downloading the application.
- Type Mini-B USB (DEVICE). Used to connect AV••••••6•500 / AV•••••••5•500 to a PC via Mini-B/A USB cable for debugging,commissioning, downloading, and uploading with FREE Studio Plus.
- Type micro-B USB (DEVICE). Used to connect AVP1•0•••0500 to a PC via micro-B/A USB cable for debugging,commissioning, downloading, and uploading with FREE Studio Plus.

The AV••••••6•500 / AV•••••••5•500 can also be supplied through the USB cable with limited functionalities related to debugging, commissioning, downloading and uploading with FREE Studio Plus. For more information, refer to the FREE Studio Plus Operating Guide.

NOTE: Do not apply voltage via 24 Vac/dc while the equipment is already connected to a PC via Mini-B USB cable (AV••••••6•500 only).

Before applying power via 24 Vac/dc power supply connection:

- Disconnect the Mini-B USB cable.
- Supply the FREE Advance controller via its 24 Vac/dc power supply connector.
- Reconnect the Mini-B USB cable.

NOTE: Inactive connections are not closed automatically. If all connections are open and the cable is disconnected, a reconnect is not possible and the controller must be power cycled.

NOTICE

LOSS OF COMMUNICATION

- Close all open TCP connections between PC and the controller before disconnecting the Ethernet cable.
- Close all open TCP connections before replacing an Ethernet cable.

Failure to follow these instructions can result in equipment damage.

Controller Connection Types

What's in This Chapter

First Commissioning

Overview

There are several processes to connect the PC to the FREE Advance controller:

Protocol	Factory status	Connection with	Connector
Modbus SL	Enabled	USB/RS-485 adapter TSXCUSB485 with cable VW3A83O6D3O.	CN1 / CN19
USB		Mini-B/A USB cable	CN16 / CN17
HTTP		Ethernet cable	CN20
Modbus TCP	Disabled	Ethernet cable	CN20
BACnet IP			CN20
FTP			CN20

For reasons of Internet security, Modbus TCP / BACnet IP / FTP are disabled by default. Therefore you can manually enable Modbus TCP / BACnet IP / FTP.

However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

⚠WARNING

UNAUTHENTICATED ACCESS AND SUBSEQUENT NETWORK INTRUSION

- Observe and respect any and all pertinent national, regional and local cybersecurity and/or personal data laws and regulations when enabling Modbus TCP / BACnet IP / FTP if you wish to communicate to third party devices on an industrial network.
- 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

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

First Connection

Once the first connection between PC and FREE Advance controller starts, FREE Studio Plus asks you to enter the default password of the web-server and to replace it by a new different one.

Lets consider that the FREE Advance controller has 3 scenarios:

Scenario	Description	Firmware Version	
		AV•30•••60500 **AV•62•••60500** **AV•62•••50500**	**AV•84•••6•500** **AV•12•••6•500** **AV•840005I500** **AV•126005I500**
BRAND NEW	Represents a controller just manufactured with default password of the web-server.	668.10 or greater	596.10 or greater
NOT BRAND NEW	Represents a controller already accessed by a user and which default password of the web-server has changed.		
OBSOLETE	Represents a controller already available on the market without default password settings/ restrictions	Lower than 668.10	Lower than 596.10

CyberSecurity Defense-in-Depth

Schneider Electric and Eliwell adhere to industry best practices 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 MACHINE OPERATION

- Evaluate whether your environment or your machines 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 to the minimum necessary.
- 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.

Replace the Default Password

Change the default password upon first use. In addition, consider carefully the implications for giving any access to other people.

⚠WARNING

UNAUTHORIZED DATA ACCESS

- Immediately change any and all default passwords to new, secure passwords.
- Do not distribute passwords to unauthorized or otherwise unqualified personnel.

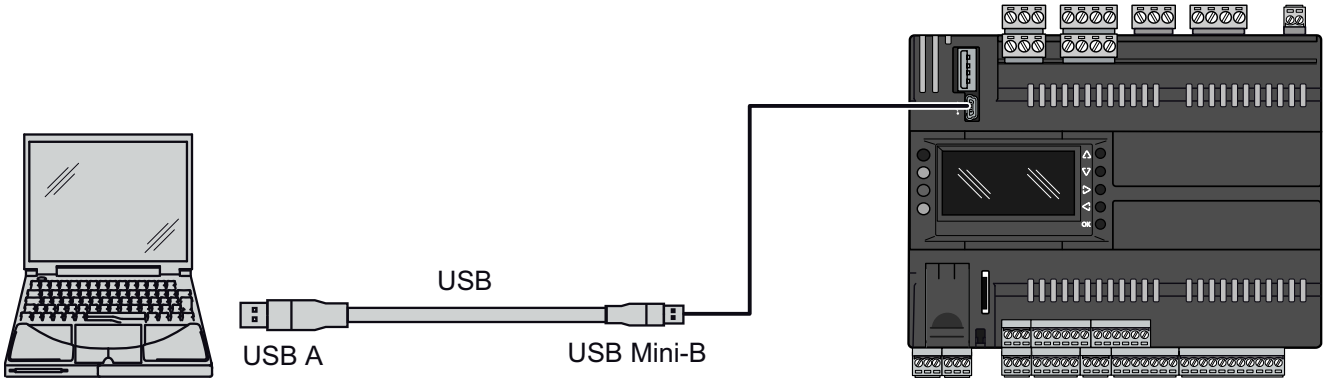
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: A secure password is one that has not been shared or distributed to any unauthorized personnel and does not contain any personal or otherwise obvious information. Further, a mix of upper and lower case letters and numbers offer greater security. You should choose a password length of at least seven characters.

Connection with a PC through Modbus SL/USB

Connecting the PC to the Controller

Direct connection between the PC and the controller:



To connect the PC to the controller, use a type A / type Mini-B USB cable.

Following operations are possible between the PC and the controller in direct USB connection:

Data type	PC → Controller	Controller →PC
Parameters	✓	✓
Controller application	✓	✓
HMI application	✓	✓
Data file	✓	✓
BIOS	✓	-

First Commissioning

FREE Advance first connection via Modbus Serial Line (USB device / RS-485):

Step	Action
1	Connect the PC to a **BRAND NEW** controller.
2	Launch FREE Studio Plus.

Step	Action
3	In the **Configuration** tab, click **On-line > Setup Communication** to configure the communication port.
4	In the **Configuration** tab, click **On-line > Connect** to connect to the controller. **NOTE:** FREE Studio Plus verifies if it is a **BRAND NEW** controller. If it is a **NOT BRAND NEW** or a **OBSOLETE** controller, the connection can be directly established.
5	Enter the default login: “administrator”
6	Enter the default password: “password”.
7	Enter the new password.
8	Click **OK** to validate. **Result:** If the new password is different from the default one, the connection can be directly established. You can now configure the controller and activate the communication port with the dedicated parameters, page 128.

Cybersecurity

After the first connection, you can manually enable Modbus TCP / BACnet IP / FTP.

However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

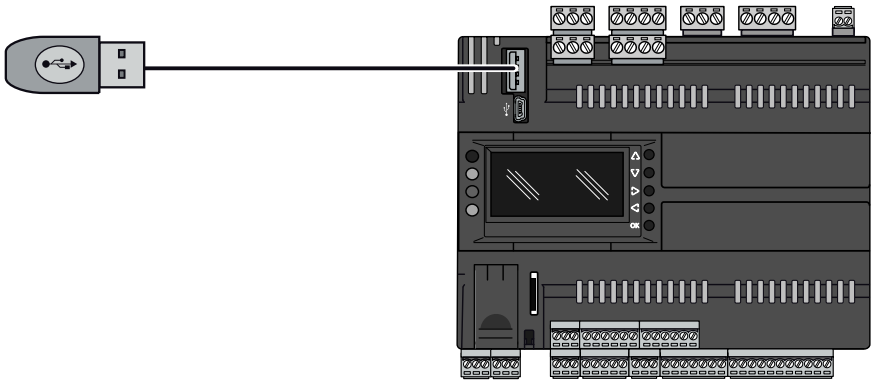
For cybersecurity details, refer to:

- CyberSecurity Defense-in-Depth, page 163.
- Replace the default password, page 163.

Connection with a USB Memory Key

Connecting a USB Memory Key to the Controller

Connection of the USB memory key to the AV••••••6•500 controller:



The USB memory key is connected on the type A USB port of the controller.

Following operations are possible between the USB memory key and the controller in direct USB connection:

Data type	Memory key→ Controller	Controller →Memory key
Parameters	✓	✓
Controller application	✓	✓
HMI application	✓	✓
Data file	✓	✓
BIOS	-	-

First Programming: USB Memory Key→ Controller

In FREE Studio Plus, at each time you select **Create USB programming files**, you must enter a new password for **BRAND NEW** controller only (new password different of the default password of the web-server).

FREE Advance first programming via USB memory key:

Step	Action
1	Connect the USB memory key to a **BRAND NEW** controller.
2	• USB content is downloaded into the controller: yellow LED flashes during download. • When the download is completed, green LED flashes twice and switch ON to confirm successful download. **NOTE:** • If the password file does not exist in the USB memory key, the download is not executed into a **BRAND NEW** controller. • If it is a **NOT BRAND NEW** or a **OBSOLETE** controller, USB content can be directly downloaded into the controller. • If it is a **OBSOLETE** controller, the file related to the password changed must be removed.
3	Remove USB memory key.

NOTE: The USB memory key contains the default login and default password in clear text, you must pay particular attention to protect these informations.

Cybersecurity

After the first connection, you can manually enable Modbus TCP / BACnet IP / FTP.

However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

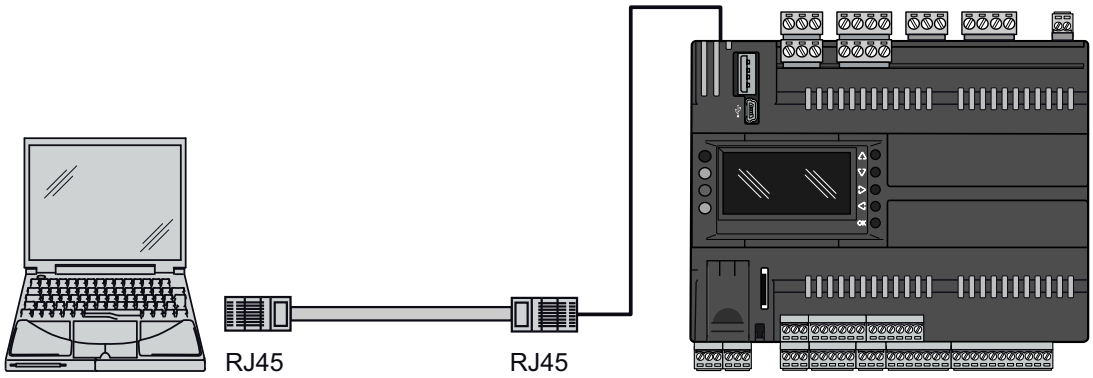
For cybersecurity details, refer to:

- CyberSecurity Defense-in-Depth, page 163.
- Replace the default password, page 163.

Connection with a PC through Ethernet

Connecting the PC to the Controller

Direct connection between the PC and the AV••••••6•500 controller:



To connect the PC to the controller, use a RJ45 Ethernet cable.

Following operations are possible between the PC and the controller in direct Ethernet connection:

Data type	PC → Controller	Controller →PC
Parameters	✓	✓
Controller application	✓	✓
HMI application	✓	✓
Data file	✓	✓
BIOS	✓	-

First Commissioning

FREE Advance first connection via RJ45 Ethernet cable:

Step	Action
1	Connect the PC to a **BRAND NEW** controller.
2	Launch FREE Studio Plus.
3	In the **Configuration** tab, click **On-line > Setup Communication** to configure the communication port. The Modbus TCP protocol must be selected. The default IP address for a **BRAND NEW** controller is: `10.0.0.100`
4	In the **Configuration** tab, click **On-line > Connect** to connect to the controller. **NOTE:** FREE Studio Plus verifies if it is a **BRAND NEW** controller. If it is a **NOT BRAND NEW** or **OBSOLETE** controller: • If Modbus TCP enabled, the connection can be directly established. • If Modbus TCP disabled and HTTP disabled, the connection is not established. • If Modbus TCP disabled and HTTP enabled, FREE Studio Plus redirects to the webpage.
5	Enter the default login: “administrator”
6	Enter the default password: “password”.
7	Enter the new password.
8	Click **OK** to validate. **Result:** If the new password is different from the default one, the connection can be directly established. You can now configure the controller and activate the communication port with the dedicated parameters, page 128.

Cybersecurity

After the first connection, you can manually enable Modbus TCP / BACnet IP / FTP.

However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

For cybersecurity details, refer to:

- CyberSecurity Defense-in-Depth, page 163.
- Replace the default password, page 163.

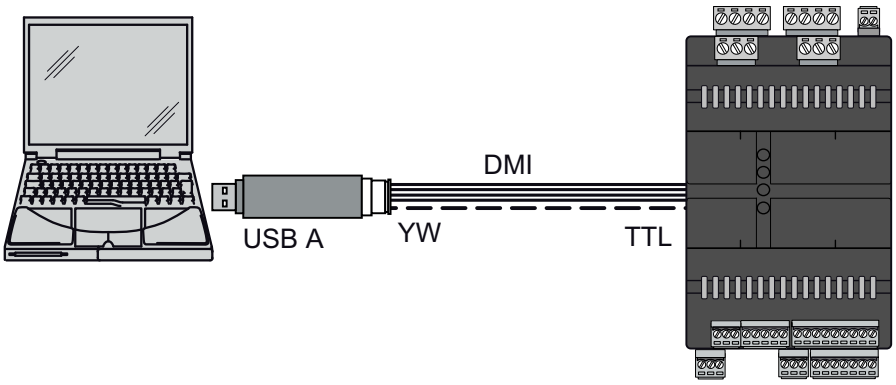
Expansion and Remote Display Connection Types

What's in This Chapter

Connection for Expansion Module and Remote display

Connecting The PC to an Expansion Module

Direct connection between the PC and an expansion module:



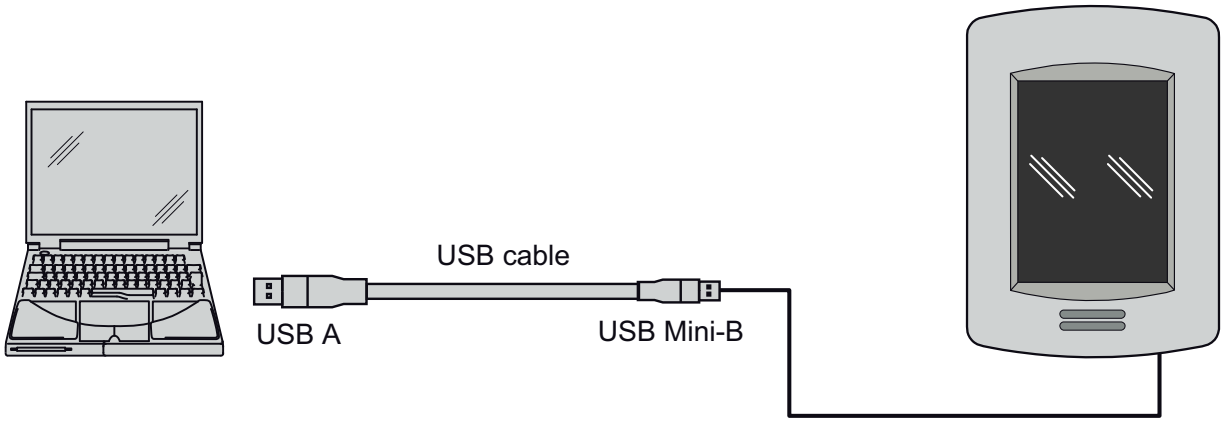
To connect the PC to the expansion module, use a DMI programming cable (Yellow) on the TTL port of the device.

Following operations are possible between the PC and the Expansion Module:

Data type	PC → Expansion module	Expansion module →PC
Parameters	✓	✓
Controller application	-	-
HMI application	-	-
Data file	-	-
BIOS	✓	-

Connecting the PC to the AVP1•0•••0500 Remote Display

Direct connection between the PC and the AVP1•0•••0500 remote display:



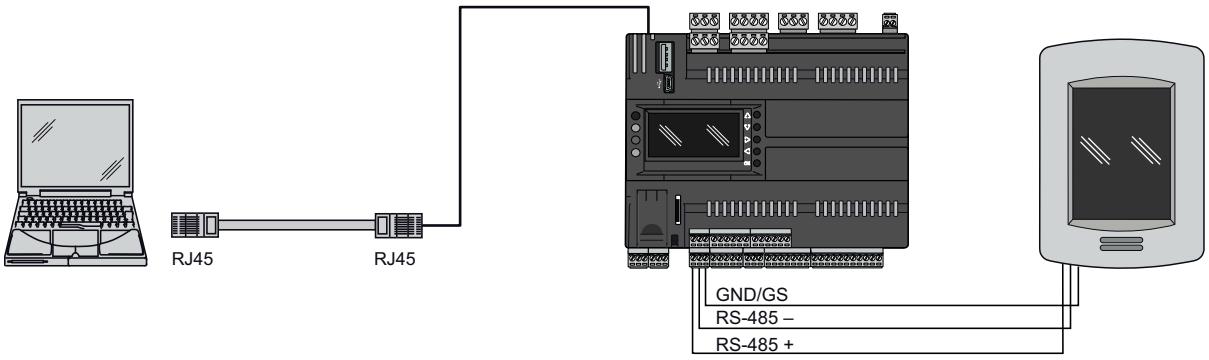
To connect the PC to the remote display, use a type A / type micro-B USB cable.

Following operations are possible between the PC and the controller in direct USB connection:

Data type	PC → Remote display	Remote display →PC
Parameters	✓	✓
Controller application	✓	-
HMI application	✓	-
Data file	-	-
BIOS	✓	-

Connecting the PC to AVP1•0•••0500 the Remote Display through a Controller

Connection between the PC and the AVP1•0•••0500 remote display through a controller:



To connect the PC to the AVP1•0•••0500 remote display trough a controller, use:

- A RJ45 Ethernet cable between the PC and the controller.
- An RS-485 connection between the controller and the remote display

NOTE: Bridge function must be enabled in the AV••••••6•500 / AV•••••••5•500 controller, AVP1•0•••0500 run as Slave Modbus/RTU.

Following operations are possible between the PC and the remote display connected through the controller:

Data type	PC → Remote display	Remote display →PC
Parameters	✓	✓
Controller application	✓	-
HMI application	✓	-
Data file	-	-
BIOS	✓	-

Connecting the AVK1000000500 Remote Display

For commissioning, the AVK1000000500 remote display can only be connected to a controller. You can upload HMI pages and upload BIOS.

Following operations are possible between the controller and the AVK1000000500 remote display:

Data type	Controller → Remote display	Remote display → Controller
Parameters	-	-
Controller application	-	-
HMI pages	✓	-
Data file	-	-
BIOS	✓	-

For more details, refer to Diagnostic Menu, page 120.

BIOS Update

What's in This Chapter

BIOS Update

Overview

There are several ways to update the FREE Advance controller, FREE Advance Expansion and FREE Advance Display Color Touchscreen BIOS:

- Downloading into the FREE Advance Logic Controller from USB memory key
- Downloading into the FREE Advance Logic Controller from PC with FREE Studio Plus
- Downloading into the FREE EVE Expansion Module from PC with FREE Studio Plus
- Downloading into theFREE AVP Display Color Touchscreen from PC with FREE Studio Plus

If you remove power to the device, or there is a power outage or communication interruption during the transfer of the application, your device may become inoperative. If a communication interruption or a power outage occurs, reattempt the transfer. If there is a power outage or communication interruption during a firmware update, or if an invalid firmware is used, your device will become inoperative. In this case, use a valid firmware and reattempt the firmware update.

NOTICE

INOPERABLE EQUIPMENT

- Do not interrupt the transfer of the application program or a firmware change once the transfer has begun.
- Re-initiate the transfer if the transfer is interrupted for any reason.
- Do not attempt to place the device into service until the file transfer has completed successfully.

Failure to follow these instructions can result in equipment damage.

Download Controller BIOS from USB Memory Key

Steps to download controller BIOS from USB memory key:

Step	Action
1	Trace the BIOS file (it has the file extension .bin) in one of the following ways: • If you have FREE Studio Plus installed on your PC, BIOS is available in the following: `<C:\Programs>\Eliwell\free Studio\Catalog\FreeAdvance \Firmware_XXX` • Download `.bin` file from website - Firmware Update section.
2	Copy this file into a USB memory key (for example, `mskxxx_yy.bin`)
3	Connect USB memory key to FREE Advance Logic Controller, page 165. • BIOS is downloaded into FREE Advance Logic Controller: yellow LED flashes during download. • When the download is completed, green LED flashes twice and switch ON to confirm successful download.
4	Remove USB memory key. • FREE Advance Logic Controller automatically resets and restarts. • If a SYSTEM FAULT message appears, it is related to a watchdog time-out that occurred while updating the BIOS and, in this case, can be ignored. BIOS update has been completed successfully.

FREE Advance Logic Controller does not download a non-compliant BIOS (for example you cannot download BIOS for FREE Smart Logic Controller into an FREE Advance Logic Controller and vice versa).

Download Controller BIOS from PC with FREE Studio Plus software

Steps to download Controller BIOS from PC:

Step	Action
1	Connect the FREE Advance Logic Controller via USB, page 164, RS-485, or Ethernet, page 167 to the PC.
2	Open FREE Studio Plus software.
3	Open a existing project or create a new one.
4	Select the **Commissioning** tab.
5	In the menu, select **Target > Setup communication**.
6	Click **Connect**.
7	Click on the controller name in the **Commissioning** window.
8	Click **BIOS download**.
9	Select the `.bin` file you want to download, located in: • `<C:\Programs>\Eliwell\free Studio\Catalog\FreeAdvance \Firmware_XXX`
10	Click **Download** button. The operation may take a few minutes. If the download terminates successfully, a confirmation is displayed.
11	Disconnect the device from the PC.

Download BIOS of Controller, Expansion Module, or Touchscreen Remote Display from PC with FREE Studio Plus Installer software

Steps to download BIOS from PC:

Step	Action
1	Connect the FREE Advance Logic Controller, the FREE EVE Expansion Module or the FREE AVP Display Color Touchscreen to the PC.
2	Open FREE Studio Plus Installer software.
3	Use the **Network Scan** or add the device you want to update from the **Catalog** to the **Tree**.
4	Click **Connect**.
5	Right-click on the device name in the **Tree**.
6	Select **BIOS download**.

7	Select the `.bin` file you want to download:
	• For FREE Advance Logic Controller, the BIOS files are located in:
	`<C:\Programs>\Eliwell\free Studio\Catalog\FreeAdvance \Firmware_XXX`
	• For FREE EVE Expansion Module, the BIOS files are located in:
	`<C:\Programs>\Eliwell\free Studio\Catalog\TM172E\Firmware_ XXX`
	• For FREE AVP Display Color Touchscreen, the BIOS files are located in:
	`<C:\Programs>\Eliwell\free Studio\Catalog\TM172DC\Firmware_ XXX`

8	Click **Download**. The operation may take a few minutes. If the download terminates successfully, a confirmation is displayed.
9	Disconnect the device from the PC.

Download BIOS of AVK1000000500

To download BIOS, connect the remote display to the controller, page 171 and download the BIOS via the DIAGNOSTIC Menu, page 120.

Appendices

What's in This Part

Appendices

What's in This Chapter

NTC 10k beta 3435 Resistance Temperature Table

Celsius

T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)
-40	187 400	-13	48 590	14	15 270	41	5 630	68	2 366	95	1 108
-39	177 500	-12	46 410	15	14 680	42	5 440	69	2 296	96	1 080
-38	168 200	-11	44 350	16	14 110	43	5 257	70	2 229	97	1 052
-37	159 400	-10	42 390	17	13 570	44	5 081	71	2 164	98	1 025
-36	151 100	-9	40 500	18	13 050	45	4 912	72	2 101	99	999.0
-35	143 400	-8	38 700	19	12 560	46	4 750	73	2 040	100	973.7
-34	136 100	-7	37 000	20	12 090	47	4 594	74	1 981	101	949.0
-33	129 200	-6	35 380	21	11 630	48	4 444	75	1 925	102	925.0
-32	122 800	-5	33 850	22	11 200	49	4 300	76	1 870	103	901.8
-31	116 700	-4	32 390	23	10 780	50	4 162	77	1 817	104	879.3
-30	110 900	-3	31 000	24	10 380	51	4 027	78	1 766	105	857.4
-29	105 400	-2	29 690	25	10 000	52	3 897	79	1 716	106	836.3
-28	100 100	-1	28 440	26	9 633	53	3 773	80	1 669	107	815.7
-27	95 220	0	27 250	27	9 281	54	3 653	81	1 622	108	795.8
-26	90 570	1	26 100	28	8 945	55	3 537	82	1 577	109	776.4
-25	86 180	2	25 000	29	8 623	56	3 426	83	1 534	110	757.6
-24	82 040	3	23 960	30	8 314	57	3 319	84	1 492	111	739.2
-23	78 130	4	22 970	31	8 016	58	3 216	85	1 451	112	721.4
-22	74 440	5	22 030	32	7 730	59	3 117	86	1 412	113	704.1
-21	70 940	6	21 130	33	7 456	60	3 022	87	1 374	114	687.3
-20	67 640	7	20 280	34	7 193	61	2 929	88	1 337	115	671.0
-19	64 440	8	19 460	35	6 941	62	2 839	89	1 301	116	655.2
-18	61 420	9	18 690	36	6 700	63	2 753	90	1 266	117	639.8
-17	58 570	10	17 950	37	6 468	64	2 670	91	1 233	118	624.8
-16	55 870	11	17 230	38	6 246	65	2 589	92	1 200	119	610.3
-15	53 310	12	16 550	39	6 033	66	2 512	93	1 169	120	596.1
-14	50 880	13	15 900	40	5 829	67	2 438	94	1 138		

Fahrenheit

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-40.0	187 400	8.6	48 590	57.2	15 270	105.8	5 630	154.4	2 366	203.0	1 108
-38.2	177 500	10.4	46 410	59.0	14 680	107.6	5 440	156.2	2 296	204.8	1 080
-36.4	168 200	12.2	44 350	60.8	14 110	109.4	5 257	158.0	2 229	206.6	1 052

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-34.6	159 400	14.0	42 390	62.6	13 570	111.2	5 081	159.8	2 164	208.4	1 025
-32.8	151 100	15.8	40 500	64.4	13 050	113.0	4 912	161.6	2 101	210.2	999.0
-31.0	143 400	17.6	38 700	66.2	12 560	114.8	4 750	163.4	2 040	212.0	973.7
-29.2	136 100	19.4	37 000	68.0	12 090	116.6	4 594	165.2	1 981	213.8	949.0
-27.4	129 200	21.2	35 380	69.8	11 630	118.4	4 444	167.0	1 925	215.6	925.0
-25.6	122 800	23.0	33 850	71.6	11 200	120.2	4 300	168.8	1 870	217.4	901.8
-23.8	116 700	24.8	32 390	73.4	10 780	122.0	4 162	170.6	1 817	219.2	879.3
-22.0	110 900	26.6	31 000	75.2	10 380	123.8	4 027	172.4	1 766	221.0	857.4
-20.2	105 400	28.4	29 690	77.0	10 000	125.6	3 897	174.2	1 716	222.8	836.3
-18.4	100 100	30.2	28 440	78.8	9 633	127.4	3 773	176.0	1 669	224.6	815.7
-16.6	95 220	32.0	27 250	80.6	9 281	129.2	3 653	177.8	1 622	226.4	795.8
-14.8	90 570	33.8	26 100	82.4	8 945	131.0	3 537	179.6	1 577	228.2	776.4
-13.0	86 180	35.6	25 000	84.2	8 623	132.8	3 426	181.4	1 534	230.0	757.6
-11.2	82 040	37.4	23 960	86.0	8 314	134.6	3 319	183.2	1 492	231.8	739.2
-9.4	78 130	39.2	22 970	87.8	8 016	136.4	3 216	185.0	1 451	233.6	721.4
-7.6	74 440	41.0	22 030	89.6	7 730	138.2	3 117	186.8	1 412	235.4	704.1
-5.8	70 940	42.8	21 130	91.4	7 456	140.0	3 022	188.6	1 374	237.2	687.3
-4.0	67 640	44.6	20 280	93.2	7 193	141.8	2 929	190.4	1 337	239.0	671.0
-2.2	64 440	46.4	19 460	95.0	6 941	143.6	2 839	192.2	1 301	240.8	655.2
-0.4	61 420	48.2	18 690	96.8	6 700	145.4	2 753	194.0	1 266	242.6	639.8
1.4	58 570	50.0	17 950	98.6	6 468	147.2	2 670	195.8	1 233	244.4	624.8
3.2	55 870	51.8	17 230	100.4	6 246	149.0	2 589	197.6	1 200	246.2	610.3
5.0	53 310	53.6	16 550	102.2	6 033	150.8	2 512	199.4	1 169	248.0	596.1
6.8	50 880	55.4	15 900	104.0	5 829	152.6	2 438	201.2	1 138		

NTC 10k-2 beta (25/50) 3977 Resistance Temperature Table

Celsius

T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)
-39.44	323 839	-18.33	88 090	2.78	28 365	23.89	10 501	45.00	4 367	66.11	2 003
-38.33	300 974	-17.22	82 670	3.89	26 834	25.00	10 000	46.11	4 182	67.22	1 927
-37.22	279 880	-16.11	77 620	5.00	25 395	26.11	9 526	47.22	4 006	68.33	1 855
-36.11	260 410	-15.00	72 911	6.11	24 042	27.22	9 078	48.33	3 838	69.44	1 785
-35.00	242 427	13.89	68 518	7.22	22 770	28.33	8 653	49.44	3 679	70.56	1 718
-33.89	225 809	12.78	64 419	8.33	21 573	29.44	8 251	50.56	3 525	71.67	1 655
-32.78	210 443	11.67	60 592	9.44	20 446	30.56	7 866	51.67	3 380	72.78	1 594
-31.67	196 227	10.56	57 017	10.56	19 376	31.67	7 505	52.78	3 242	73.89	1 536
-30.56	183 068	9.44	53 647	11.67	18 378	32.78	7 163	53.89	3 111	75.00	1 480
-29.44	170 775	8.33	50 526	12.78	17 437	33.89	6 838	55.00	2 985	76.11	1 427
-28.33	159 488	7.22	47 606	13.89	16 550	35.00	6 530	56.11	2 865	77.22	1 375
-27.22	149 024	6.11	44 874	15.00	15 714	36.11	6 238	57.22	2 751	78.33	1 326
-26.11	139 316	5.00	42 317	16.11	14 925	37.22	5 960	58.33	2 642	79.44	1 279
-25.00	130 306	3.89	39 921	17.22	14 180	38.33	5 697	59.44	2 538	80.56	1 234
-23.89	121 939	2.78	37 676	18.33	13 478	39.44	5 447	60.56	2 438	81.67	1 190

T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)
-22.78	114 165	1.67	35 573	19.44	12 814	40.56	5 207	61.67	2 343	82.78	1 149
-21.67	106 939	0.56	33 599	20.56	12 182	41.67	4 981	62.78	2 252	83.89	1 109
-20.56	100 218	0.56	31 732	21.67	11 590	42.78	4 766	63.89	2 165	85.00	1 070
-19.44	93 909	1.67	29 996	22.78	11 030	43.89	4 561	65.00	2 082	86.11	1 034

Fahrenheit

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-39	323 839	-1	88 090	37	28 365	75	10 501	113	4 367	151	2 003
-37	300 974	1	82 670	39	26 834	77	10 000	115	4 182	153	1 927
-35	279 880	3	77 620	41	25 395	79	9 526	117	4 006	155	1 855
-33	260 410	5	72 911	43	24 042	81	9 078	119	3 838	157	1 785
-31	242 427	57	68 518	45	22 770	83	8 653	121	3 679	159	1 718
-29	225 809	55	64 419	47	21 573	85	8 251	123	3 525	161	1 655
-27	210 443	53	60 592	49	20 446	87	7 866	125	3 380	163	1 594
-25	196 227	51	57 017	51	19 376	89	7 505	127	3 242	165	1 536
-23	183 068	49	53 647	53	18 378	91	7 163	129	3 111	167	1 480
-21	170 775	47	50 526	55	17 437	93	6 838	131	2 985	169	1 427
-19	159 488	45	47 606	57	16 550	95	6 530	133	2 865	171	1 375
-17	149 024	43	44 874	59	15 714	97	6 238	135	2 751	173	1 326
-15	139 316	41	42 317	61	14 925	99	5 960	137	2 642	175	1 279
-13	130 306	39	39 921	63	14 180	101	5 697	139	2 538	177	1 234
-11	121 939	37	37 676	65	13 478	103	5 447	141	2 438	179	1 190
-9	114 165	35	35 573	67	12 814	105	5 207	143	2 343	181	1 149
-7	106 939	33	33 599	69	12 182	107	4 981	145	2 252	183	1 109
-5	100 218	33	31 732	71	11 590	109	4 766	147	2 165	185	1 070
-3	93 909	35	29 996	73	11 030	111	4 561	149	2 082	187	1 034

Pt1000 Resistance Temperature Table

Celsius

T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)
-100	602.56	-49	807.03	2	1007.81	53	1205.52	104	1400.22	155	1591.91
-99	606.61	-48	811.00	3	1011.72	54	1209.36	105	1404.00	156	1595.64
-98	610.66	-47	814.97	4	1015.62	55	1213.21	106	1407.79	157	1599.37
-97	614.71	-46	818.94	5	1019.53	56	1217.05	107	1411.58	158	1603.09
-96	618.76	-45	822.90	6	1023.43	57	1220.90	108	1415.36	159	1606.82
-95	622.80	-44	826.87	7	1027.33	58	1224.74	109	1419.14	160	1610.54
-94	626.84	-43	830.83	8	1031.23	59	1228.58	110	1422.93	161	1614.27
-93	630.88	-42	834.79	9	1035.13	60	1232.42	111	1426.71	162	1617.99
-92	634.92	-41	838.75	10	1039.03	61	1236.26	112	1430.49	163	1621.71
-91	638.96	-40	842.71	11	1042.92	62	1240.09	113	1434.26	164	1625.43
-90	643.00	-39	846.66	12	1046.82	63	1243.93	114	1438.04	165	1629.15

T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)	T (°C)	R (Ω)
-89	647.03	-38	850.62	13	1050.71	64	1247.77	115	1441.82	166	1632.86
-88	651.06	-37	854.57	14	1054.60	65	1251.60	116	1445.59	167	1636.58
-87	655.09	-36	858.53	15	1058.49	66	1255.43	117	1449.37	168	1640.30
-86	659.12	-35	862.48	16	1062.38	67	1259.26	118	1453.14	169	1644.01
-85	663.15	-34	866.43	17	1066.27	68	1263.09	119	1456.91	170	1647.72
-84	667.17	-33	870.38	18	1070.16	69	1266.92	120	1460.68	171	1651.43
-83	671.20	-32	874.32	19	1074.05	70	1270.75	121	1464.45	172	1655.14
-82	675.22	-31	878.27	20	1077.94	71	1274.58	122	1468.22	173	1658.85
-81	679.24	-30	882.22	21	1081.82	72	1278.40	123	1471.98	174	1662.56
-80	683.25	-29	886.16	22	1085.70	73	1282.23	124	1475.75	175	1666.27
-79	687.27	-28	890.10	23	1089.59	74	1286.05	125	1479.51	176	1669.97
-78	691.29	-27	894.04	24	1093.47	75	1289.87	126	1483.28	177	1673.68
-77	695.30	-26	897.98	25	1097.35	76	1293.70	127	1487.04	178	1677.38
-76	699.31	-25	901.92	26	1101.23	77	1297.52	128	1490.80	179	1681.08
-75	703.32	-24	905.86	27	1105.10	78	1301.33	129	1494.56	180	1684.78
-74	707.33	-23	909.80	28	1108.98	79	1305.15	130	1498.32	181	1688.48
-73	711.34	-22	913.73	29	1112.86	80	1308.97	131	1502.08	182	1692.18
-72	715.34	-21	917.67	30	1116.73	81	1312.78	132	1505.83	183	1695.88
-71	719.34	-20	921.60	31	1120.60	82	1316.60	133	1509.59	184	1699.58
-70	723.35	-19	925.53	32	1124.47	83	1320.41	134	1513.34	185	1703.27
-69	727.35	-18	929.46	33	1128.35	84	1324.22	135	1517.10	186	1706.96
-68	731.34	-17	933.39	34	1132.21	85	1328.03	136	1520.85	187	1710.66
-67	735.34	-16	937.32	35	1136.08	86	1331.84	137	1524.60	188	1714.35
-66	739.34	-15	941.24	36	1139.95	87	1335.65	138	1528.35	189	1718.04
-65	743.33	-14	945.17	37	1143.82	88	1339.46	139	1532.10	190	1721.73
-64	747.32	-13	949.09	38	1147.68	89	1343.26	140	1535.84	191	1725.42
-63	751.31	-12	953.02	39	1151.55	90	1347.07	141	1539.59	192	1729.10
-62	755.30	-11	956.94	40	1155.41	91	1350.87	142	1543.33	193	1732.79
-61	759.29	-10	960.86	41	1159.27	92	1354.68	143	1547.08	194	1736.48
-60	763.28	-9	964.78	42	1163.13	93	1358.48	144	1550.82	195	1740.16
-59	767.26	-8	968.70	43	1166.99	94	1362.28	145	1554.56	196	1743.84
-58	771.25	-7	972.61	44	1170.85	95	1366.08	146	1558.30	197	1747.52
-57	775.23	-6	976.53	45	1174.70	96	1369.87	147	1562.04	198	1751.20
-56	779.21	-5	980.44	46	1178.56	97	1373.67	148	1565.78	199	1754.88
-55	783.19	-4	984.36	47	1182.41	98	1377.47	149	1569.52	200	1758.56
-54	787.17	-3	988.27	48	1186.27	99	1381.26	150	1573.25		
-53	791.14	-2	992.18	49	1190.12	100	1385.06	151	1576.99		
-52	795.12	-1	996.09	50	1193.97	101	1388.85	152	1580.72		
-51	799.09	0	1000.00	51	1197.82	102	1392.64	153	1584.45		
-50	803.06	1	1003.91	52	1201.67	103	1396.43	154	1588.18		

Fahrenheit

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-148.0	602.56	-56.2	807.03	35.6	1007.81	127.4	1205.52	219.2	1400.22	311.0	1591.91
-146.2	606.61	-54.4	811.00	37.4	1011.72	129.2	1209.36	221.0	1404.00	312.8	1595.64

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-144.4	610.66	-52.6	814.97	39.2	1015.62	131.0	1213.21	222.8	1407.79	314.6	1599.37
-142.6	614.71	-50.8	818.94	41.0	1019.53	132.8	1217.05	224.6	1411.58	316.4	1603.09
-140.8	618.76	-49.0	822.90	42.8	1023.43	134.6	1220.90	226.4	1415.36	318.2	1606.82
-139.0	622.80	-47.2	826.87	44.6	1027.33	136.4	1224.74	228.2	1419.14	320.0	1610.54
-137.2	626.84	-45.4	830.83	46.4	1031.23	138.2	1228.58	230.0	1422.93	321.8	1614.27
-135.4	630.88	-43.6	834.79	48.2	1035.13	140.0	1232.42	231.8	1426.71	323.6	1617.99
-133.6	634.92	-41.8	838.75	50.0	1039.03	141.8	1236.26	233.6	1430.49	325.4	1621.71
-131.8	638.96	-40.0	842.71	51.8	1042.92	143.6	1240.09	235.4	1434.26	327.2	1625.43
-130.0	643.00	-38.2	846.66	53.6	1046.82	145.4	1243.93	237.2	1438.04	329.0	1629.15
-128.2	647.03	-36.4	850.62	55.4	1050.71	147.2	1247.77	239.0	1441.82	330.8	1632.86
-126.4	651.06	-34.6	854.57	57.2	1054.60	149.0	1251.60	240.8	1445.59	332.6	1636.58
-124.6	655.09	-32.8	858.53	59.0	1058.49	150.8	1255.43	242.6	1449.37	334.4	1640.30
-122.8	659.12	-31.0	862.48	60.8	1062.38	152.6	1259.26	244.4	1453.14	336.2	1644.01
-121.0	663.15	-29.2	866.43	62.6	1066.27	154.4	1263.09	246.2	1456.91	338.0	1647.72
-119.2	667.17	-27.4	870.38	64.4	1070.16	156.2	1266.92	248.0	1460.68	339.8	1651.43
-117.4	671.20	-25.6	874.32	66.2	1074.05	158.0	1270.75	249.8	1464.45	341.6	1655.14
-115.6	675.22	-23.8	878.27	68.0	1077.94	159.8	1274.58	251.6	1468.22	343.4	1658.85
-113.8	679.24	-22.0	882.22	69.8	1081.82	161.6	1278.40	253.4	1471.98	345.2	1662.56
-112.0	683.25	-20.2	886.16	71.6	1085.70	163.4	1282.23	255.2	1475.75	347.0	1666.27
-110.2	687.27	-18.4	890.10	73.4	1089.59	165.2	1286.05	257.0	1479.51	348.8	1669.97
-108.4	691.29	-16.6	894.04	75.2	1093.47	167.0	1289.87	258.8	1483.28	350.6	1673.68
-106.6	695.30	-14.8	897.98	77.0	1097.35	168.8	1293.70	260.6	1487.04	352.4	1677.38
-104.8	699.31	-13.0	901.92	78.8	1101.23	170.6	1297.52	262.4	1490.80	354.2	1681.08
-103.0	703.32	-11.2	905.86	80.6	1105.10	172.4	1301.33	264.2	1494.56	356.0	1684.78
-101.2	707.33	-9.4	909.80	82.4	1108.98	174.2	1305.15	266.0	1498.32	357.8	1688.48
-99.4	711.34	-7.6	913.73	84.2	1112.86	176.0	1308.97	267.8	1502.08	359.6	1692.18
-97.6	715.34	-5.8	917.67	86.0	1116.73	177.8	1312.78	269.6	1505.83	361.4	1695.88
-95.8	719.34	-4.0	921.60	87.8	1120.60	179.6	1316.60	271.4	1509.59	363.2	1699.58
-94.0	723.35	-2.2	925.53	89.6	1124.47	181.4	1320.41	273.2	1513.34	365.0	1703.27
-92.2	727.35	-0.4	929.46	91.4	1128.35	183.2	1324.22	275.0	1517.10	366.8	1706.96
-90.4	731.34	1.4	933.39	93.2	1132.21	185.0	1328.03	276.8	1520.85	368.6	1710.66
-88.6	735.34	3.2	937.32	95.0	1136.08	186.8	1331.84	278.6	1524.60	370.4	1714.35
-86.8	739.34	5.0	941.24	96.8	1139.95	188.6	1335.65	280.4	1528.35	372.2	1718.04
-85.0	743.33	6.8	945.17	98.6	1143.82	190.4	1339.46	282.2	1532.10	374.0	1721.73
-83.2	747.32	8.6	949.09	100.4	1147.68	192.2	1343.26	284.0	1535.84	375.8	1725.42
-81.4	751.31	10.4	953.02	102.2	1151.55	194.0	1347.07	285.8	1539.59	377.6	1729.10
-79.6	755.30	12.2	956.94	104.0	1155.41	195.8	1350.87	287.6	1543.33	379.4	1732.79
-77.8	759.29	14.0	960.86	105.8	1159.27	197.6	1354.68	289.4	1547.08	381.2	1736.48
-76.0	763.28	15.8	964.78	107.6	1163.13	199.4	1358.48	291.2	1550.82	383.0	1740.16
-74.2	767.26	17.6	968.70	109.4	1166.99	201.2	1362.28	293.0	1554.56	384.8	1743.84
-72.4	771.25	19.4	972.61	111.2	1170.85	203.0	1366.08	294.8	1558.30	386.6	1747.52
-70.6	775.23	21.2	976.53	113.0	1174.70	204.8	1369.87	296.6	1562.04	388.4	1751.20
-68.8	779.21	23.0	980.44	114.8	1178.56	206.6	1373.67	298.4	1565.78	390.2	1754.88
-67.0	783.19	24.8	984.36	116.6	1182.41	208.4	1377.47	300.2	1569.52	392.0	1758.56
-65.2	787.17	26.6	988.27	118.4	1186.27	210.2	1381.26	302.0	1573.25		
-63.4	791.14	28.4	992.18	120.2	1190.12	212.0	1385.06	303.8	1576.99		

T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)	T (°F)	R (Ω)
-61.6	795.12	30.2	996.09	122.0	1193.97	213.8	1388.85	305.6	1580.72		
-59.8	799.09	32.0	1000.00	123.8	1197.82	215.6	1392.64	307.4	1584.45		
-58.0	803.06	33.8	1003.91	125.6	1201.67	217.4	1396.43	309.2	1588.18		

Glossary

A

analog input:

Converts received voltage or current levels into numerical values. You can store and process these values within the logic controller.

analog output:

Converts numerical values within the logic controller and sends out proportional voltage or current levels.

application:

A program including configuration data, symbols, and documentation.

AWG:

(*American wire gauge*) The standard that specifies wire section sizes in North America.

B

BIOS:

(*basic input output system*) Part of the firmware used during the booting process.

BOOL:

(*boolean*) A basic data type in computing. A `BOOL` variable can have one of these values: 0 (`FALSE`), 1 (`TRUE`). A bit that is extracted from a word is of type `BOOL`.

C

controller:

Automates industrial processes (also known as programmable logic controller or programmable controller).

COP:

(*Coefficient Of Performance*) It is a ratio of cooling provided to work required.

D

digital I/O:

(*digital input/output*) An individual circuit connection at the electronic module that corresponds directly to a data table bit. The data table bit holds the value of the signal at the I/O circuit. It gives the control logic digital access to I/O values.

E

EEPROM:

(*electrically erasable programmable read-only memory*) A type of non-volatile memory to store required data even when power is removed.

EIA:

(*electronic industries alliance*) The trade organization for establishing electrical/electronic and data communication standards (including RS-232 and RS-485) in the United States.

EMC:

(*electromagnetic compatibility*)

EN:

EN identifies one of many European standards maintained by CEN (*European Committee for Standardization*), CENELEC (*European Committee for Electrotechnical Standardization*), or ETSI (*European Telecommunications Standards Institute*).

expansion bus:

An electronic communication bus between expansion I/O modules and a controller.

F

firmware:

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

FLA:

(Full-Load Amperes) Amount of current drawn by the motor at rated load and rated voltage.

flash memory:

A non-volatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

H

HVAC&R:

(*heating, ventilation, and air conditioning and refrigeration)*

I

I/O:

(*input/output*)

ID:

(*identifier/identification*)

IEC 61131-3:

Part 3 of a 3-part IEC standard for industrial automation equipment. IEC 61131-3 is concerned with controller programming languages and defines 2 graphical and 2 textual programming language standards. The graphical programming languages are ladder diagram and function block diagram. The textual programming languages include structured text and instruction list.

IP20:

(*ingress protection*) The protection classification according to IEC 60529 offered by an enclosure, shown by the letter IP and 2 digits. The first digit indicates 2 factors: helping protect persons and for equipment. The second digit indicates helping protect against water. IP20 devices help protect against electric contact of objects larger than 12.5 mm, but not against water.

L

LAN:

(*local area network*) A short-distance communications network that is implemented in a home, office, or institutional environment.

LCD:

(*liquid crystal display*) Used in many HMI devices to display menus and messages to machine operators.

LED:

(*light emitting diode*) An indicator that illuminates under a low-level electrical charge.

LRA:

(Locked-Rotor Amperes) Amount of current drawn by the motor at rated voltage while its rotor is locked. This provides an indication of the inrush current during start-up.

M

Modbus SL:

(*Modbus serial line*) Implementation of the protocol over a RS-232 or RS-485 serial connection.

Modbus:

The protocol that allows communications between many devices connected to the same network.

ms:

(*millisecond*)

N

NC:

(*normally closed*) A contact pair that closes when the actuator is de-energized (no power is applied) and opens when the actuator is energized (power is applied).

NEMA:

(*national electrical manufacturers association*) The standard for the performance of various classes of electrical enclosures. The NEMA standards cover corrosion resistance, ability to help protect from rain, submersion, and so on. For IEC member countries, the IEC 60529 standard classifies the ingress protection rating for enclosures.

network:

A system of interconnected devices that share a common data path and protocol for communications.

NO:

(*normally open*) A contact pair that opens when the actuator is de-energized (no power is applied) and closes when the actuator is energized (power is applied).

NTC:

(*Negative Temperature Coefficient*)

P

PLC:

(*programmable logic controller*) An industrial computer used to automate manufacturing, industrial, and other electromechanical processes. PLCs are different from common computers in that they are designed to have multiple input and output arrays and adhere to more robust specifications for shock, vibration, temperature, and electrical interference among other things.

power supply terminals:

The power supply is connected to these terminals to provide power to the controller.

protocol:

A convention or standard definition that controls or enables the connection, communication, and data transfer between 2 computing system and devices.

Pt1000:

(*platinum 1000*) Resistance thermometers, also referred to as resistance temperature detectors, are sensors used to measure temperature by correlating electrical resistance with temperature. As the temperature changes, the resistance to an electrical current passing through them predictably changes likewise. They are characterized by their nominal resistance R0 at a temperature of 0 °C.

- Pt1000 (R0 = 1 kΩ)

PTC:

(*Positive Temperature Coefficient*)

PWM:

(*pulse width modulation*) A fast output that oscillates between off and on in an adjustable duty cycle, producing a rectangular wave form (though you can adjust it to produce a square wave). The PWM is well adapted to simulate or approximate an analog output in that it regulates the voltage of the output over its period making it useful in light dimming or speed control applications, among others.

R

RS-485:

A standard type of serial communication bus, based on 2 wires (also known as EIA RS-485).

RTC:

(*real-time clock*) A battery-backed time-of-day and calendar clock that operates continuously, even when the controller is not powered for the life of the battery.

S

SELV:

(*safety extra low voltage*) A system that follows IEC 61140 guidelines for power supplies is protected in such a way that voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for class 1 equipment) does not exceed a specified value under normal conditions or under inoperable conditions.

sink input:

A wiring arrangement in which the device provides current to the input electronic module. A sink input is referenced to 0 Vdc.

SL:

(*serial line*)

SPDT:

(*single-pole, double-throw*)

SPST:

(*single-pole, single-throw*)

SSR:

(*solid-state relay*)

T

terminal block:

(*terminal block*) The component that mounts in an electronic module and provides electrical connections between the controller and the field devices.

U

UL:

(*underwriters laboratories*) A US organization for product testing and safety certification.

W

WORD:

A type encoded in a 16-bit format.

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9MA10291.04