Altivar Process Modular Standard

Integration Manual and PVZ Animation

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

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Safety Information

Important Information

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Please Note

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

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

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. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used. All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

Intended Use

This product is intended for industrial use according to this manual.

The product may only be used in compliance with all applicable safety standard and local regulations and directives, the specified requirements and the technical data. The product must be installed outside the hazardous ATEX zone. Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented. Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design). Any use other than the use explicitly permitted is prohibited and can result in hazards.

About the document

Document Scope

The purpose of this document is:

- To give guidance for the mechanical and electrical design of the Altivar Process Modular drive.
- To receive and integrate the parts to build the Altivar Process Modular drive.
- To provide the integrator the required inputs to create his own instructions.

Use this document together with the .PVZ animated sequences files.

The ptc Creo View Express™ free MCAD viewer software is required to play the animated integration sequences. Get it on www.ptc.com , page 152.

Validity Note

This manual is intended only for Partners Qualified by Schneider Electric.

Original instructions and information given in this manual have been written in English (before optional translation).

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

The cabinet characteristics described in this document are based on the Schneider Electric Universal Enclosure PanelSeT SFN (formerly called Spacial SFN).

Product Related Information

Read and understand these instructions before performing any procedure with this device.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this device system.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the device system, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before performing work on the device system:

- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a “Do Not Turn On” label on all power switches related to the device system.
- Lock all power switches in the open position.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Verify the absence of voltage. (1)

Before applying voltage to the device system:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

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

(1) Refer to the Verify the Absence of Voltage section, page 20.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

⚠⚠DANGER

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

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

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

⚠DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

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

Your application consists of a whole range of different interrelated mechanical, electrical, and electronic components, the device being just one part of the application. The device by itself is neither intended to nor capable of providing the entire functionality to meet all safety-related requirements that apply to your application. Depending on the application and the corresponding risk assessment to be conducted by you, a whole variety of additional equipment is required such as, but not limited to, external encoders, external brakes, external monitoring devices, guards, etc.As a designer/manufacturer of machines, you must be familiar with and observe all standards that apply to your machine. You must conduct a risk assessment and determine the appropriate Performance Level (PL) and/or Safety Integrity Level (SIL) and design and build your machine in compliance with all applicable standards. In doing so, you must consider the interrelation of all components of the machine. In addition, you must provide instructions for use that enable the user of your machine to perform any type of work on and with the machine such as operation and maintenance in a safe manner.The present document assumes that you are fully aware of all normative standards and requirements that apply to your application. Since the device cannot provide all safety-related functionality for your entire application, you must ensure that the required Performance Level and/or Safety Integrity Level is reached by installing all necessary additional equipment.

⚠WARNING

INSUFFICIENT PERFORMANCE LEVEL/SAFETY INTEGRITY LEVEL AND/ OR UNINTENDED EQUIPMENT OPERATION

- Conduct a risk assessment according to EN ISO 12100 and all other standards that apply to your application.
- Use redundant components and/or control paths for all critical control functions identified in your risk assessment.
- Implement all monitoring functions required to avoid any type of hazard identified in your risk assessment, for example, slipping or falling loads.
- Verify that the service life of all individual components used in your application is sufficient for the intended service life of your overall application.
- Perform extensive commissioning tests for all potential error situations to verify the effectiveness of the safety-related functions and monitoring functions implemented, for example, but not limited to, speed monitoring by means of encoders, short circuit monitoring for all connected equipment, correct operation of brakes and guards.
- Perform extensive commissioning tests for all potential error situations to verify that the load can be brought to a safe stop under all conditions.

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

Product may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

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

Power Drive Systems (PDS) can generate strong local electrical and magnetic fields. This can cause interference in electromagnetically sensitive devices.

⚠WARNING

ELECTROMAGNETIC FIELDS

- Keep persons with electronic medical implants, such as pacemakers, away from the equipment.
- Do not place electromagnetically sensitive devices in the vicinity of the equipment.

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

⚠WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for 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, 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 the product 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 USA: 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.

The temperature of the products described in this manual may exceed 80 °C (176 ° F) during operation.

⚠WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

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

Fans may continue to run for a certain period of time even after power to the product has been disconnected.

⚠WARNING

RUNNING FANS

Verify that fans have come to a complete standstill before handling them.

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

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

Before switching on and configuring the product, verify that it is approved for the mains voltage.

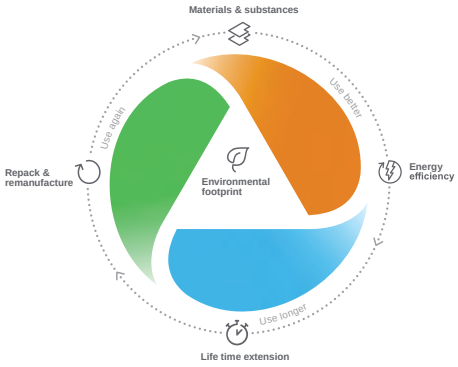
Failure to follow these instructions can result in equipment damage.

Environmental Data

The Environmental Data Program is a framework for how we measure, categorize, and compare the environmental attributes and footprint of our products.

Using a rigorous, fact-based methodology, the program provides environmental data from across the product lifecycle.

Five data categories across the product lifecycle



Use Better: How sustainable a product is, including environmental footprint, materials and substances, packaging, and energy efficiency.

Use Longer: How a product's life time can be effectively extended in terms of repairability and updatability.

Use Again: How a product can be reused, from dismantling and remanufacturing to recyclability and manufacturer take back.

With this transparent, verified data, customers and partners are empowered to make conscious environmental choices and accurately evaluate and report on sustainability performance.

All our hardware offers have an associated environmental data available on se.com product pages.

Refer to Environmental Data Program for more information.

Related Documents for Qualified Partners

We can have different types of Partners and a dedicated website is existing.

Partners	Dedicated Website to use
Panel Builders	https://www.se.com/myschneider/
OEM (Original Equipment Manufacturer)	
System Integrators	

If you need to create an account, select the option on the Partner website. And to have access to the full list of documents, you need to be qualified by Schneider Electric.

To become a Qualified Partner, contact your local Schneider organization.

As qualified Partner, here is the list of documents that are available on the Partner website. You need to log in before clicking the hyper links of this table:

Title of Documentation	Catalog Number
Altivar Process Modular Catalog	DIA2ED2180301EN (English), DIA2ED2180301FR (French)
Altivar Process Modular Selection tool	PHA2457700 (English)
Altivar Process Modular Pricing tool for partners	NNZ2922100 (English)
Altivar Process Modular Handling manual	PHA2451602 (English)
Altivar Process Modular Standard Integration manual	PHA2451702 (English), PHA2451802 (French), PHA2451902 (German), PHA2452002 (Spanish), PHA2452102 (Italian), PHA2452202 (Chinese), PHA2452302 (Portuguese), PHA2452502 (Russian), PHA2452402 (Turkish)
PVZ animation file for 1 Standard Power Module (IP21)	PHA2457200
PVZ animation file for 1 Standard Power Module (IP54)	PHA2457300
PVZ animation file for connection of 3 Standard Power Modules	PHA2457400
PVZ animation file for connection of 5 Standard Power Modules	PHA2457500
Altivar Process Modular Low Harmonic/Regen Integration manual	PHA2452602 (English), PHA2452702 (French), PHA2452802 (German), PHA2452902 (Spanish), PHA2453002 (Italian), PHA2453102 (Chinese), PHA2453202 (Portuguese), PHA2453302 (Turkish), PHA2453402 (Russian)
PVZ animation file for 1 Low Harmonic/Regen Power Module (IP21)	MFR28008
PVZ animation file for 1 Low Harmonic/Regen Power Module (IP54)	MFR28010
PVZ animation file for connection of 2 Low Harmonic/Regen Power Modules	MFR28013
PVZ animation file for connection of 5 Low Harmonic/Regen Power Modules	MFR28017
Altivar Process Modular Optional Braking Unit Integration manual	MFR77831 (English), MFR77834 (French), MFR77833 (German), MFR77835 (Spanish), MFR77836 (Italian), MFR77837 (Chinese), MFR77838 (Portuguese), MFR77840 (Turkish), MFR77839 (Russian)
PVZ animation file for 1 Braking Module (IP21)	MFR9057100
PVZ animation file for 1 Braking Module (IP54)	MFR9057000
PVZ animation file for connection of 2 Braking Modules	MFR9072800
PVZ animation file for connection of the Optional Braking Unit with a Standard Single Drive	MFR9453400
PVZ animation file for connection of the Optional Braking Unit with a Low Harmonic / Regen Single Drive	GDE1083200
Altivar Process Modular Standard Reduced Height Integration manual	GDE53524 (English), GDE53525 (French), GDE53526 (German), GDE53527 (Spanish), GDE53528 (Italian), GDE53529 (Chinese), GDE53530 (Portuguese), GDE71457 (Russian), GDE53531 (Turkish)
PVZ animation file for 1 Standard Power Module Reduced Height (IP21)	GDE9136600
PVZ animation file for 1 Standard Power Module Reduced Height (IP54 with plinth and roof top extension)	GDE9136500

Title of Documentation	Catalog Number
PVZ animation file for 1 Standard Power Module Reduced Height (IP54 with air inlet/outlet on rear side)	GDE9136700
PVZ animation file for connection of 3 Standard Power Modules Reduced Height	GDE9136800
PVZ animation file for connection of 6 Standard Power Modules Reduced Height	GDE9136900
Altivar Process Modular Optional Braking Unit Reduced Height Integration manual	GDE89130 (English), GDE89131 (French), GDE89132 (German), GDE89133 (Spanish), GDE89134 (Italian), GDE89135 (Chinese), GDE89136 (Portuguese), GDE89137 (Russian), GDE89138 (Turkish)
PVZ animation file for 1 Braking Module Reduced Height (IP21)	GDE9948000
PVZ animation file for 1 Braking Module Reduced Height (IP54 with plinth and roof top extension)	GDE9947800
PVZ animation file for 1 Braking Module Reduced Height (IP54 with air inlet/outlet on rear side)	GDE9947900
PVZ animation file for connection of 2 Braking Modules Reduced Height	GDE9948100
PVZ animation file for connection of the Optional Braking Unit with a Standard Single Drive Reduced Height	GDE9948200
Altivar Process Modular – Mechanical and Electrical parts specifications	https://www.se.com/myschneider/
EPLAN - APM Standard ATV600 Control unit - 400 Vac and 690 Vac	PHA4914200
EPLAN - APM Low Harmonic/Regen ATV600 Control unit - 400 Vac and 690 Vac	PHA4914700
EPLAN - APM Standard ATV900 Control Unit - 400 Vac and 690 Vac)	PHA6731600
EPLAN - APM Low Harmonic/Regen ATV900 Control Unit - 400 Vac and 690 Vac	PHA6731800
EPLAN - APM Standard Power unit - 400 Vac	PHA4914300
EPLAN - APM Standard Power module - 400 Vac	PHA6732600
EPLAN - APM Standard Power unit - 690 Vac	PHA6732500
EPLAN - APM Standard Power module - 690 Vac	PHA6732700
EPLAN - APM Standard Reduced Height Power module - 400 Vac	NNZ2543400
EPLAN - APM Standard Reduced Height Power module - 690 Vac	NNZ2543500
EPLAN - APM Low Harmonic/regen Filter Unit - 690 Vac	PHA6732800
EPLAN - APM Low Harmonic/Regen Power Unit - 690 Vac	PHA6732900
EPLAN - APM Mains unit - 400 Vac and 690 Vac	PHA4914400
EPLAN - APM Low Harmonic/Regen Power module - 690 Vac	MFR3973700
EPLAN - APM Standard Reduced Height Mains module 1 Choke - 400/690 Vac	NNZ2543100
EPLAN - APM Standard Reduced Height Mains module 2 Chokes - 400/690 Vac	NNZ2543200
EPLAN - APM Standard Reduced Height Mains module 3 Chokes - 400/690 Vac	NNZ2543300
3D CAD files for Power Modules and Control Units	https://www.se.com/myschneider/

Related Documents for Users

Title of Documentation	Reference number	
Catalog: Altivar Process ATV600 variable speed drives	DIA2ED2140502EN (English)	DIA2ED2140502FR (French)
ATV600 Getting Started	EAV63253 (English)	EAV63257 (Italian)
	EAV63254 (French)	EAV64298 (Chinese)
	EAV63255 (German)	EAV63253PT (Portuguese)
	EAV63256 (Spanish)	EAV63253TR (Turkish)
ATV600 Getting Started Annex (SCCR)	EAV64300 (English)	
Video: Getting Started with Altivar Process ATV600	FA364431 FAQ (English)	
		
ATV630, ATV650 Installation Manual	EAV64301 (English)	EAV64310 (Italian)
	EAV64302 (French)	EAV64317 (Chinese)
	EAV64306 (German)	EAV64301PT (Portuguese)
	EAV64307 (Spanish)	EAV64301TR (Turkish)
ATV600 Programming Manual	EAV64318 (English)	EAV64323 (Italian)
	EAV64320 (French)	EAV64324 (Chinese)
	EAV64321 (German)	EAV64318PT (Portuguese)
	EAV64322 (Spanish)	EAV64318TR (Turkish)
ATV600 Modbus Serial Link Manual (Embedded)	EAV64325 (English)	
ATV600 Ethernet Manual (Embedded)	EAV64327 (English)	
ATV600 Ethernet IP - Modbus TCP Manual (VW3A3720, 721)	EAV64328 (English)	
ATV600 BACnet MS/TP Manual (VW3A3725)	QGH66984 (English)	
ATV600 PROFIBUS DP manual (VW3A3607)	EAV64329 (English)	
ATV600 DeviceNet manual (VW3A3609)	EAV64330 (English)	
ATV600 PROFINET manual (VW3A3627)	EAV64331 (English)	
ATV600 CANopen Manual (VW3A3608, 618, 628)	EAV64333 (English)	
ATV600 POWERLINK manual (VW3A3619)	PHA99690 (English)	
ATV600 Communication Parameters	EAV64332 (English)	
ATV600 Embedded Safety Function manual	EAV64334 (English)	
Drive Systems Installation manual (ATV660, ATV680)	NHA37119 (English)	NHA37130 (Chinese)
	NHA37121 (French)	NHA37124 (Dutch)
	NHA37118 (German)	NHA37126 (Polish)
	NHA37123 (Italian)	NHA37127 (Portuguese)
	NHA37122 (Spanish)	NHA37129 (Turkish)
ATV660 Handbook	NHA37111 (English)	NHA37110 (German)
ATV680 Handbook	NHA37113 (English)	NHA37112 (German)
Application Note: ATV600 Multi-Drives Booster Control Optimized	QGH36060 (English)	
Application Note: ATV600 Multi- Masters Booster Control Pressure Feedback with Service Continuity	QGH36061 (English)	
Application Note: ATV600 Multi-Drives Standard Level Control	QGH36059 (English)	

Title of Documentation	Reference number	
Application Note: ATV600 Multi- Masters with Optimized Level Control	EAV64367 (English)	
Catalog: Variable speed drives Altivar Process ATV900	DIA2ED2150601EN (English)	DIA2ED2150601FR (French)
ATV930, ATV950 Getting Started	NHA61578 (English)	NHA61724 (Italian)
	NHA61579 (French)	NHA61582 (Chinese)
	NHA61580 (German)	NHA61578PT (Portuguese)
	NHA61581 (Spanish)	NHA61578TR (Turkish)
ATV900 Getting Started Annex (SCCR)	NHA61583 (English)	
Video: Getting Started with Altivar Process ATV900	FAQ000240081 FAQ (English)	
		
ATV930, ATV950 Installation manual	NHA80932 (English)	NHA80936 (Italian)
	NHA80933 (French)	NHA80937 (Chinese)
	NHA80934 (German)	NHA80932PT (Portuguese)
	NHA80935 (Spanish)	NHA80932TR (Turkish)
ATV900 Programming manual	NHA80757 (English)	NHA80761 (Italian)
	NHA80758 (French)	NHA80762 (Chinese)
	NHA80759 (German)	NHA80757PT (Portuguese)
	NHA80760 (Spanish)	NHA80757TR (Turkish)
ATV900 Embedded Modbus Serial Link manual	NHA80939 (English)	
ATV900 Embedded Ethernet manual	NHA80940 (English)	
ATV900 PROFIBUS DP manual (VW3A3607)	NHA80941 (English)	
ATV900 DeviceNet manual (VW3A3609)	NHA80942 (English)	
ATV900 PROFINET manual (VW3A3627)	NHA80943 (English)	
ATV900 CANopen manual (VW3A3608, 618, 628)	NHA80945 (English)	
ATV900 EtherCAT manual (VW3A3601)	NHA80946 (English)	
ATV900 POWERLINK manual (VW3A3619)	PHA99693 (English)	
ATV900 Communication Parameters addresses	NHA80944 (English)	
ATV900 DC Bus Sharing Technical Note PHA25028	PHA25028 (English)	
ATV900 Embedded Safety Function manual	NHA80947 (English)	
ATV900 Safety functions manual with Module VW3A3802	NVE64209 (English)	NVE64213 (Italian)
	NVE64210 (French)	NVE64214 (Chinese)
	NVE64211 (German)	NVE64209PT (Portuguese)
	NVE64212 (Spanish)	NVE64209TR (Turkish)
ATV900 Braking unit for Frame Size 6 manual (MFR66979)	MFR66979 (English)	
ATV900 Braking unit for Frame Size 7 manual (VW3A7101)	1757084 (English)	
Drive Systems ATV960 handbook	NHA37115 (English)	NHA37114 (German)
Drive Systems ATV980 handbook	NHA37117 (English)	NHA37116 (German)
Drive Systems ATV990 handbook Multidrive Systems	NHA37145 (English)	NHA37143 (German)
Drive Systems Installation manual	NHA37119 (English)	NHA37124 (Dutch)
	NHA37118 (German)	NHA37126 (Polish)
	NHA37121 (French)	NHA37127 (Portuguese)

Title of Documentation	Reference number
	NHA37122 (Spanish) NHA37123 (Italian) NHA37129 (Turkish) NHA37130 (Chinese)
Altivar Application Note for Hoisting	NHA80973 (English)
ATV600F, ATV900F Installation Instruction sheet	NVE57369 (English)
ATV600, ATV900 ATEX manual	NVE42416 (English)
ATV61-71 to ATV600-900 Migration Manual	EAV64336 (English)
SoMove: FDT	SoMove_FDT (English, French, German, Spanish, Italian, Chinese)
ATV600: DTM	ATV6xx_DTM_Library_EN (English - to be installed first) ATV6xx_DTM_Lang_FR (French) ATV6xx_DTM_Lang_DE (German) ATV6xx_DTM_Lang_SP (Spanish) ATV6xx_DTM_Lang_IT (Italian) ATV6xx_DTM_Lang_CN (Chinese)
ATV900: DTM	ATV9xx_DTM_Library_EN (English - to be installed first) ATV9xx_DTM_Lang_FR (French) ATV9xx_DTM_Lang_DE (German) ATV9xx_DTM_Lang_SP (Spanish) ATV9xx_DTM_Lang_IT (Italian) ATV9xx_DTM_Lang_CN (Chinese)
Recommended Cybersecurity Best Practices	CS-Best-Practices-2019-340 (English)
EcoStruxure Automation Device Maintenance	EcoStruxure Automation Device Maintenance (English)
EcoStruxure Automation Device Maintenance - Altivar User Manual	JYT50472 (English) JYT50482 (German) JYT50474 (French) JYT50476 (Spanish) JYT50478 (Italian) JYT50485 (Portuguese) JYT50484 (Turkish) JYT50483 (Chinese)

To find documents online, visit the Schneider Electric download center (www.se.com/ww/en/download/).

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

Terminology used in this document

The technical terms, terminology, and the corresponding descriptions in this manual normally use the terms or definitions in the relevant standards.

Among others, these standards include:

- ISO 13849: The Foundation of Functional Safety in the Machinery
- IEC 60204-1: Safety of machinery - Electrical equipment of machines – Part 1: General requirements.
- IEC 61010: Safety requirements for electrical equipment for measurement, control, and laboratory use.
- IEC 61158 series: Industrial communication networks - Fieldbus specifications
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/ programmable electronic safety-related.
- IEC 61784 series: Industrial communication networks - Profiles.
- IEC 61784-5-3: Industrial communication networks - Profiles - Part 5-3: Installation of fieldbuses - Installation profiles for CPF 3
- IEC 61800 series: Adjustable speed electrical power drive systems.
- IEC 61918: Industrial communication networks - Installation of communication networks in industrial premises.
- IEC 62443: Security for industrial automation and control systems.

In the area of drive systems this includes, but is not limited to, terms such as **error, error message, failure, fault, fault reset, protection, safe state, safety function, warning, warning message**, and so on.

In addition, the term **zone of operation** is used in conjunction with the description of specific hazards, and is defined as it is for a **hazard zone** or **danger zone** in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

Contact us

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Introduction

What's in This Part

Verifying the Absence of Voltage

Instructions

The DC bus voltage level is determined by measuring the voltage between the DC bus terminals PA/+ and PC/-.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before performing work on the device system:

- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a “Do Not Turn On” label on all power switches related to the device system.
- Lock all power switches in the open position.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Verify the absence of voltage. (1)

Before applying voltage to the device system:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

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

(1) Refer to Verifying the Absence of Voltage, page 20.

⚠WARNING

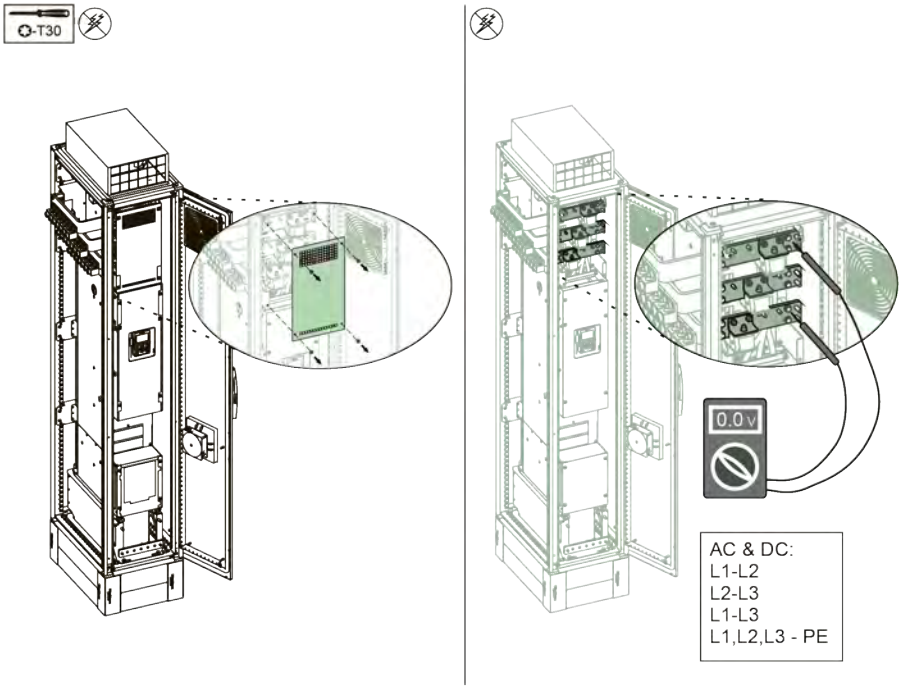
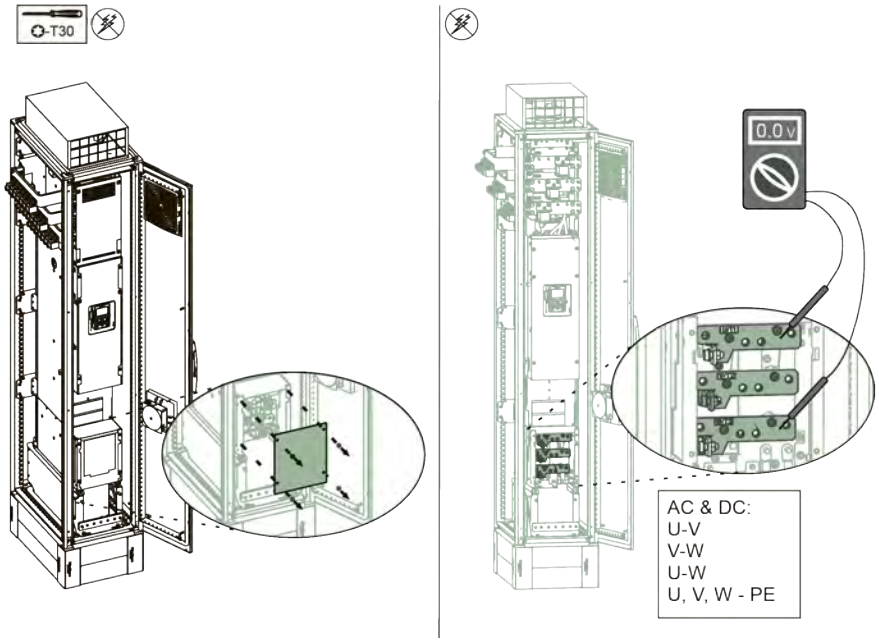
INCORRECT MEASUREMENT VALUES

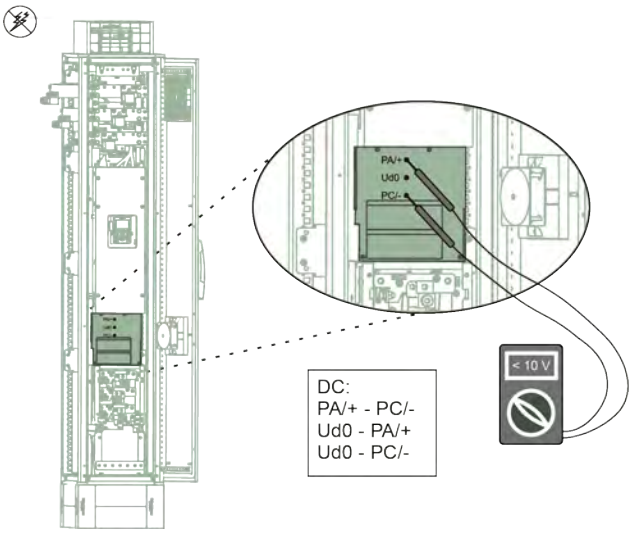
- Before using measuring equipment and tools, verify that the measuring equipment and tools are in proper condition.
- Calibrate and maintain all measuring equipment and tools according to the instructions of the manufacturers of the measuring equipment and tools.

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

Procedure on Standard Single Drives APM6A0••••• and APM9A0•••••

Perform the following actions to verify the absence of voltage.

Step	Action
1	Measure the voltage (in AC mode and DC mode) on the mains input terminals between the phases and between each phase to ground to verify that no hazardous voltage is present. 
2	Measure the voltage (in AC mode and DC mode) on motor output terminals between the phases and between each phase to ground to verify that no hazardous voltage is present. 

Step	Action
3	Measure the voltage on the DC bus between the DC bus terminals (PA/+ and PC/-) to verify that the voltage is less than 10 Vdc. 
4	If there is still voltage present on the terminals or if the DC bus capacitors do not discharge properly, contact your local Schneider Electric representative. Do not repair or operate the product.
5	Verify that no other voltage is present in the drive system.
6	Ground and short-circuit the mains input terminals and the motor output terminals.

Overview of the Altivar Process Modular Standard Offer

Module Overview

Standard Power Module IP00	Front Face Cover for Standard Power Module
	
• Standard Power Module 160 kW - 380...480 V: APM1A0C16N401 • Standard Power Module 200 kW - 500...690 V: APM1A0C20Y6 • Standard Power Module 200 HP - 600 V: APM1A0C20S6 (1)	VW3A97A01

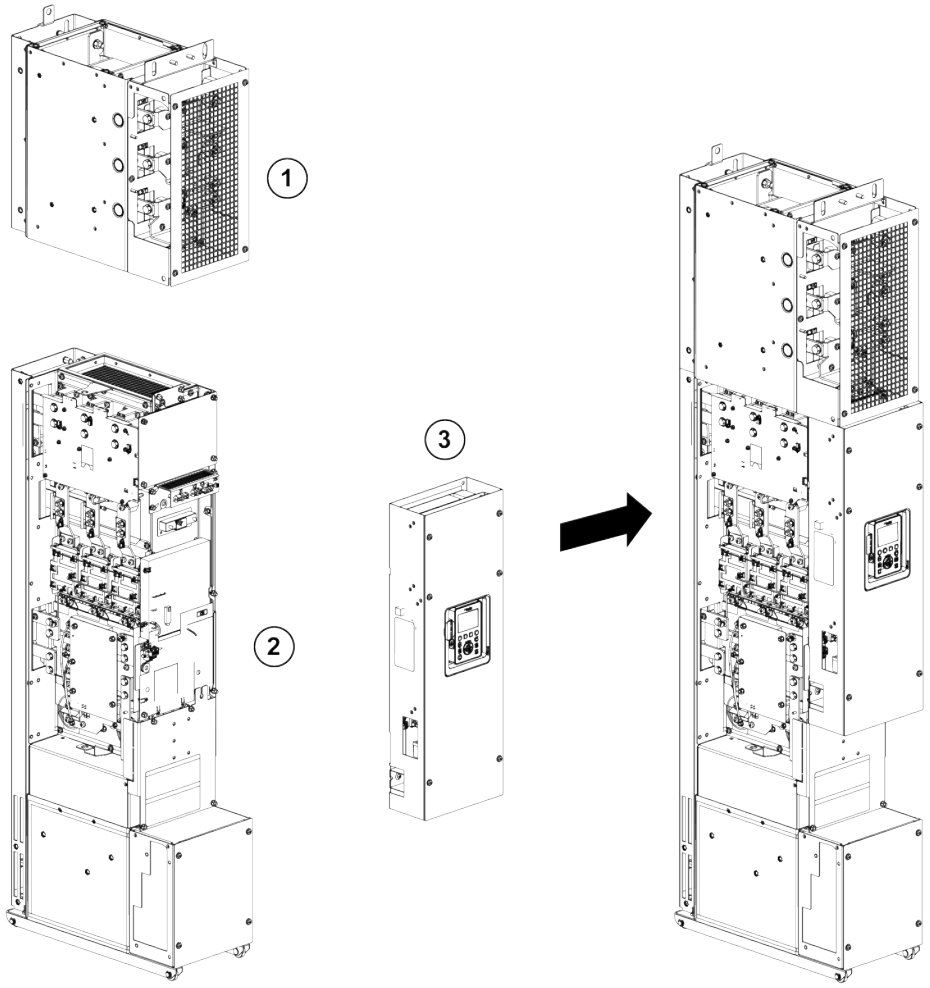
(1) If not explicitly specified, the same data and specifications apply for the Standard Power Module 600 V as for the Standard Power Module 500...690 V consisting of one power module at 600 V mains supply.

Standard Control Unit ATV600	Standard Control Unit ATV900
For Standard Power Module	For Standard Power Module
	
• Standard Control Unit ATV600 - 380...480 V: APM6A0CTLN401 • Standard Control Unit ATV600 - 500...690 V: APM6A0CTLY6	• Standard Control Unit ATV900 - 380...480 V: APM9A0CTLN401 • Standard Control Unit ATV900 - 500...690 V: APM9A0CTLY6

Module Layout

The following drawings show the parts of an Altivar Process Modular Standard Single Drive consisting of one or three power modules.

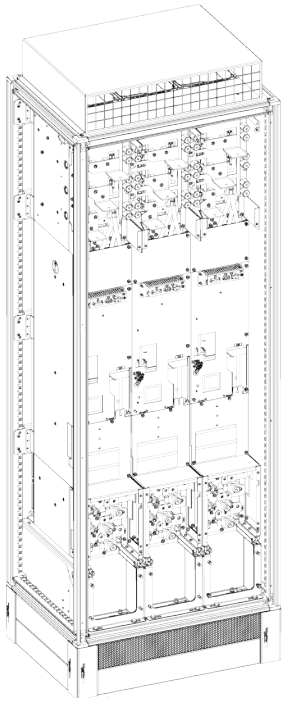
Modular Single Drive with one Power Module



Components of a Standard Single Drive

Number	Description	
①	Standard mains unit	Components of the standard power module
②	Standard power unit	
③	Standard control unit	

Integrated Modular Single Drive with three Power Modules



Catalog Number Description

	ATV	6	A	0	C	16	N4

Product range	
ATV	Altivar Drive
APM	Altivar Process Modules – Sub-assembly

Product type	
1	ATV600 or ATV900 control unit
6	ATV600 control unit
9	ATV900 control unit

Drive type	
A	Standard APM Single Drive
B	Low Harmonic / Regen APM Single Drive
C	Common for APM Single Drive
D	Multi-Drive APM — Upcoming commercialization

Drive solution	
0	Single drive

Factor for power rating	
C	power x 10
M	power x 100
CTL	Control Unit – Sub assembly

Power rating [kW]	
	11 - 13 - 16 - 20 - 25 - 31 -35 - 40 - 45 - 50 - 56 - 63 - 71 - 80 - 10*- 12*
	* Only with M power rating factor.

Power part supply	
N4	380...480 V
Q4	400 V
R4	440 V
T4	480 V
Y6	500...690 V
N6	500 V
T6	600 V (with 500...690 V products)
Q6	690 V
S6	600 V

Standard Single Drives 380...480 V

400 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			kW	kW
ATV6A0C11Q4	ATV9A0C11Q4	1	110	90
ATV6A0C13Q4	ATV9A0C13Q4	1	132	110
ATV6A0C16Q4	ATV9A0C16Q4	1	160	132
ATV6A0C20Q4	ATV9A0C20Q4	2	200	160
ATV6A0C25Q4	ATV9A0C25Q4	2	250	200
ATV6A0C31Q4	ATV9A0C31Q4	2	315	250
ATV6A0C35Q4	ATV9A0C35Q4	3	355	280
ATV6A0C40Q4	ATV9A0C40Q4	3	400	315
ATV6A0C45Q4	ATV9A0C45Q4	3	450	355
ATV6A0C50Q4	ATV9A0C50Q4	3	500	400
ATV6A0C56Q4	ATV9A0C56Q4	4	560	450
ATV6A0C63Q4	ATV9A0C63Q4	4	630	500
ATV6A0C71Q4	ATV9A0C71Q4	5	710	560
ATV6A0C80Q4	ATV9A0C80Q4	5	800	630
ATV6A0M10Q4	ATV9A0M10Q4	6	1000	800

440 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			kW	kW
ATV6A0C11R4	ATV9A0C11R4	1	110	90
ATV6A0C13R4	ATV9A0C13R4	1	132	110
ATV6A0C16R4	ATV9A0C16R4	1	160	132
ATV6A0C20R4	ATV9A0C20R4	2	200	160
ATV6A0C25R4	ATV9A0C25R4	2	250	200
ATV6A0C31R4	ATV9A0C31R4	2	315	250
ATV6A0C35R4	ATV9A0C35R4	3	355	280
ATV6A0C40R4	ATV9A0C40R4	3	400	315
ATV6A0C45R4	ATV9A0C45R4	3	450	355
ATV6A0C50R4	ATV9A0C50R4	3	500	400
ATV6A0C56R4	ATV9A0C56R4	4	560	450
ATV6A0C63R4	ATV9A0C63R4	4	630	500
ATV6A0C71R4	ATV9A0C71R4	5	710	560
ATV6A0C80R4	ATV9A0C80R4	5	800	630
ATV6A0M10R4	ATV9A0M10R4	6	1000	800

480 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			HP	HP
ATV6A0C11T4	ATV9A0C11T4	1	150	125
ATV6A0C13T4	ATV9A0C13T4	1	200	150
ATV6A0C16T4	ATV9A0C16T4	1	250	200
ATV6A0C20T4	ATV9A0C20T4	2	300	250
ATV6A0C25T4	ATV9A0C25T4	2	400	300
ATV6A0C31T4	ATV9A0C31T4	2	500	400
ATV6A0C35T4	ATV9A0C35T4	3	550	450
ATV6A0C40T4	ATV9A0C40T4	3	600	500
ATV6A0C45T4	ATV9A0C45T4	3	650	550
ATV6A0C50T4	ATV9A0C50T4	3	700	600
ATV6A0C56T4	ATV9A0C56T4	4	800	650
ATV6A0C63T4	ATV9A0C63T4	4	900	700
ATV6A0C71T4	ATV9A0C71T4	5	1000	800
ATV6A0C80T4	ATV9A0C80T4	5	1100	900
ATV6A0M10T4 (1)	ATV9A0M10T4 (1)	6	1400	1100
(1) This reference is not available in cULus.				

Standard Single Drives 500...690 V

500 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			kW	kW
ATV6A0C11N6	ATV9A0C11N6	1	75	55
ATV6A0C13N6	ATV9A0C13N6	1	90	75
ATV6A0C16N6	ATV9A0C16N6	1	110	90
ATV6A0C20N6	ATV9A0C20N6	1	132	110
ATV6A0C25N6	ATV9A0C25N6	2	160	132
ATV6A0C31N6	ATV9A0C31N6	2	220	160
ATV6A0C40N6	ATV9A0C40N6	2	280	220
ATV6A0C50N6	ATV9A0C50N6	3	355	280
ATV6A0C63N6	ATV9A0C63N6	3	450	355
ATV6A0C80N6	ATV9A0C80N6	4	560	450
ATV6A0M10N6	ATV9A0M10N6	5	710	560
ATV6A0M12N6	ATV9A0M12N6	6	800	710

600 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			HP	HP
ATV6A0C11T6	ATV9A0C11T6	1	125	100
ATV6A0C13T6	ATV9A0C13T6	1	150	125
ATV6A0C16T6	ATV9A0C16T6	1	175	150
ATV6A0C20T6	ATV9A0C20T6	1	200	175
ATV6A0C25T6	ATV9A0C25T6	2	250	200
ATV6A0C31T6	ATV9A0C31T6	2	350	250
ATV6A0C40T6	ATV9A0C40T6	2	450	350
ATV6A0C50T6	ATV9A0C50T6	3	550	450
ATV6A0C63T6	ATV9A0C63T6	3	650	550
ATV6A0C80T6	ATV9A0C80T6	4	800	650
ATV6A0M10T6	ATV9A0M10T6	5	1000	800
ATV6A0M12T6	ATV9A0M12T6	6	1200	1000

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			HP	HP
ATV6A0C11S6	ATV9A0C11S6	1	125	100
ATV6A0C13S6	ATV9A0C13S6	1	150	125
ATV6A0C16S6	ATV9A0C16S6	1	150	150
ATV6A0C20S6	ATV9A0C20S6	1	200	200

NOTE: If not explicitly specified, the same data and specifications apply for the Standard Power Module 600 V as for the Standard Power Module 500...690 V consisting of one power module at 600 V mains supply.

690 V Mains supply

Modular Single Drive ATV600	Modular Single Drive ATV900	Quantity of Power Modules	Motor Power in Normal Duty	Motor Power in Heavy Duty
			kW	kW
ATV6A0C11Q6	ATV9A0C11Q6	1	110	90
ATV6A0C13Q6	ATV9A0C13Q6	1	132	110
ATV6A0C16Q6	ATV9A0C16Q6	1	160	132
ATV6A0C20Q6	ATV9A0C20Q6	1	200	160
ATV6A0C25Q6	ATV9A0C25Q6	2	250	200
ATV6A0C31Q6	ATV9A0C31Q6	2	315	250
ATV6A0C40Q6	ATV9A0C40Q6	2	400	315
ATV6A0C50Q6	ATV9A0C50Q6	3	500	400
ATV6A0C63Q6	ATV9A0C63Q6	3	630	500
ATV6A0C80Q6	ATV9A0C80Q6	4	800	630
ATV6A0M10Q6	ATV9A0M10Q6	5	1000	800
ATV6A0M12Q6	ATV9A0M12Q6	6	1200	1000

Compatibility and Limitations

Introduction

⚠⚠DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

Verify that only compatible hardware combinations as per compatibility list are used for the drive.

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

This section provides information on the compatibility and the limitations of previous versions of the main components of the Altivar Process Modular offer.

Compatibility List

The previous versions of components listed below must not be combined with the new versions of the components.

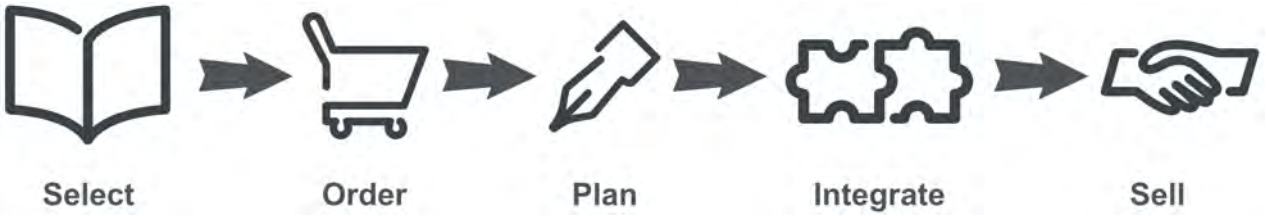
Component	Previous Reference (1)	New Reference
Standard Power Module 160 kW - 380...480 V	APM1A0C16N4 (2)	APM1A0C16N401
Standard Control Unit 380...480V	APM6A0CTLN4	APM6A0CTLN401
	APM9A0CTLN4	APM9A0CTLN401
Power busbar kits	VW3A98ABPC	VW3A98ABPC1
	VW3A98ABPDCE	VW3A98ABPDCE1

(1) These references must not be used for cULus applications. These components must not be used with the optional braking unit.

(2) Standard Power Module with external 48 Vdc power supply.

Steps from Selecting a Single Drive up to Delivery

Procedure



Step	Action	Link
1	Go to the Qualified Partners website https://partner.schneider-electric.com	Related Documents for Qualified Partners, page 12
2	Select the offer on the Catalog	Related Documents for Qualified Partners, page 12
3	Configure your drive with the selection tool and generate your bill of material (BOM)	Related Documents for Qualified Partners, page 12
4	Order the parts you need from Schneider Electric. Define whether parts are “buy” or “Make Yourself”.	Related Documents for Qualified Partners, page 12
5	For “Make yourself”: Download the Parts specifications from your Bill of Material	Related Documents for Qualified Partners, page 12
6	Download E-Plan files and implement them in your electrical diagrams (if needed)	Related Documents for Qualified Partners, page 12
7	Download 2D/3D CAD files and build up your mechanical drawings	Related Documents for Qualified Partners, page 12
8	Receive and verify the delivery of the modules and parts	Handling Instructions, page 33
9	Receive and verify the delivery and/or “Make yourself” the additional parts	Handling Instructions, page 33
10	Download the PTC Creo View Express™ software	Animated Integration Sequences: .PVZ File, page 152
11	Download the.PVZ file to be open with PTC Creo View Express™ software used to display the Sequences for the modules integration	Related Documents for Qualified Partners, page 12
12	Prepare the cabinet	Prepare The Cabinet, page 161
13	Integrate the modules	Mains Unit Integration, page 164
14	Wire and connect the modules	Mains Unit Integration, page 164
15	Install the cooling	Module Cooling, page 175
16	Complete the cabinet assembly	Seals and Covers, page 175
17	Verify the integration	Verifying Integration, page 198
18	Perform the first power-up for final power rating selection and drive registration	First Power Up, page 211
19	Prepare the delivery for the customer	Prepare the Delivery, page 220

Handling Instructions

Inspecting the Product

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

⚠⚠DANGER

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

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

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

Step	Action
1	Verify that the catalog number printed on the nameplate corresponds to the purchase order.
2	Before performing any installation work, inspect the product for visible damage.

Handling

⚠WARNING

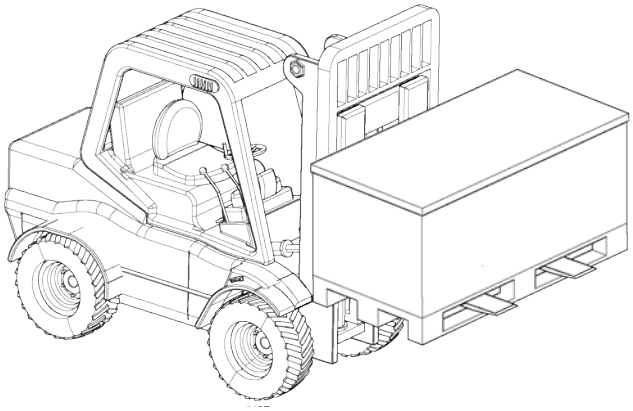
INCORRECT HANDLING

- Lifting and handling must be performed by qualified personnel in accordance with the requirements of the site and in compliance with all pertinent regulations.
- Verify that there are no persons or obstructions in the area of operation of the lifting and handling equipment.
- Use lifting and handling equipment appropriate for the load and take all necessary measures to avoid swinging, inclination, toppling and any other potentially hazardous conditions.
- Follow all handling instructions provided in this manual and in all associated product documentation.
- Take all measures required to avoid damage to the product and other hazards when handling or opening the packaging.
- Handle and store the product in its original packaging.
- Do not handle and store the product if the packaging is damaged or appears to be damaged.

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

To help protect the product before installation, handle and store it in its packaging.

Ensure that the specified ambient conditions are followed.



Keep the modules in the packaging until you start with the integration of the module. For unpacking and integration, refer to the Assembly and Integration chapter, page 148.

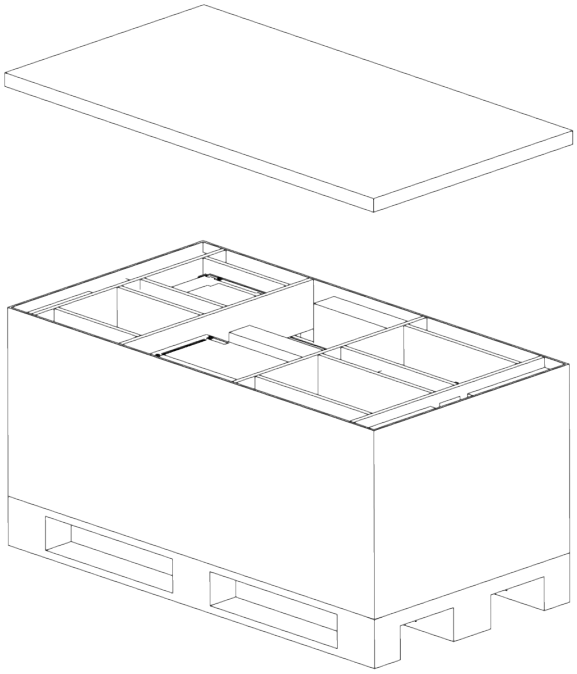
⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

Content of the Delivery



Verify the content of delivery of the Standard Power Module.

Part	Quantity
Standard mains unit	1
Standard power unit	1
Box which contains the following things: • 3x Fuse holders • 6x M8x30 bolts for fuse mounting • 6x M8 nuts (with washer) for fuse mounting • 2x Connection plates • 6x M6 nuts (with washer) for mounting of the connection plates • 2x M6x10 screws for mounting of the connection plate • 1x Safety Label in English and German • 1x Safety Label in English and Spanish • 1x Safety Label in English and Italian • 1x Safety Label in English and Chinese	1
APM Handling instruction sheet (located on the Cardboard)	1

The following parts are also delivered with the Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4) only.

Additional Part	Quantity
48 Vdc Power supply	1
Relay (Part number: RTS3L024) with socket and relay clip for fixation	1

Technical Data

What's in This Part

Environment Data

What's in This Chapter

About This Chapter

All data described in this chapter refer to a standard Sarel SF or Rittal VX25 cabinet.

Temperature Conditions

Climatic Environmental Conditions for Transportation and Storage

The environment during transportation and storage must be dry and free from dust. The following data refers to the conditions outside the cabinet.

Characteristics		
Storage and transportation temperature	°C	-40...70
	°F	-40...158
Relative humidity	%	5...95

Climatic Environmental Conditions for Operation

The maximum permissible ambient temperature during operation depends on the required power. Observe the pertinent instructions in the chapter Mounting Conditions, page 150. The following data refers to the conditions outside the cabinet.

Characteristics		
Temperature without derating	°C	-10...40
	°F	14...104
Temperature with derating of output power (1)	°C	Up to 50
	°F	Up to 122
Relative humidity without condensing (2)	%	5...95

(1) Refer to Derating Curves section, page 62.

(2) Install the Modular Single Drive at locations where special precautions are taken to avoid condensation or install an anti-condensation heating inside the cabinet.

Altitude Conditions

Operating Altitude

380...480 V

Altitude	Supply Electrical Network			Derating
	TT/TN/Genset	IT	Corner-Grounded	
Up to 1,000 m (Up to 3,300 ft)	Yes	Yes	Yes	Without
1,000...2,000 m (3,300...6,600 ft)	Yes	Yes	Yes	With (1)
2,000...4,500 m (6,600...14,760 ft)	Yes	Yes	No (2)	With (1)
4,500...4,800 m (14,760...15,740 ft)	Yes	No (2)	No (2)	With (1)

(1) Derate the nominal current of the drive by 1 % for each additional 100 m (330 ft).

(2) When using an isolation transformer an altitude up to 4,800 m (15,740 ft) is possible.

500...690 V

Altitude	Supply Electrical Network			Derating
	TT/TN/Genset	IT	Corner-Grounded	
Up to 1,000 m (Up to 3,300 ft)	Yes	Yes	No (3)	Without
1,000...2,000 m (3,300...6,600 ft)	Yes	Yes	No (3)	With (1)
2,000...4,500 m (6,600...14,760 ft)	No (2)	No (2)	No (3)	With (1)
4,500...4,800 m (14,760...15,740 ft)	No (2)	No (2)	No (3)	With (1)

(1) Derate the nominal current of the drive by 1 % for each additional 100 m (330 ft).

(2) When using an isolation transformer an altitude up to 4,800 m (15,740 ft) is possible.

(3) The Modular Single Drives 500...690 V cannot be used in corner-grounded networks.

Pollution of Air

Pollution Degree

The power modules are designed for use in a pollution degree 2 environment.

The air channel of the power modules is designed for use in a pollution degree 3 environment to be ready for IP54 separated airflow or UL type 12 integration.

Chemical and Mechanical Conditions

Withstand to harsh environments

- Chemical class 3C3 conforming to IEC/EN 60721
- Mechanical class 3S3 conforming to IEC/EN 60721

Mechanical Data

What's in This Chapter

Dimensions and Weights

About the Drawings

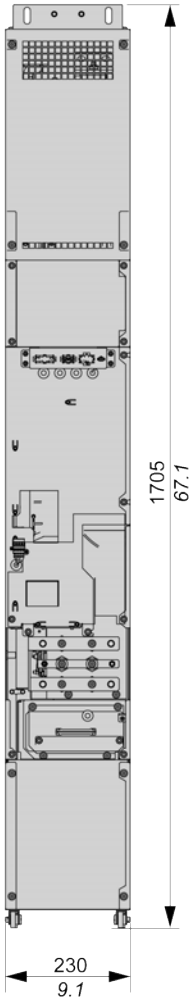
The CAD files can be downloaded on the Qualified Partner websites, page 12.

The cabinet characteristics described in this chapter are based on the Schneider Electric Universal Enclosure PanelSeT SFN (formerly called Spacial SFN).

Power module

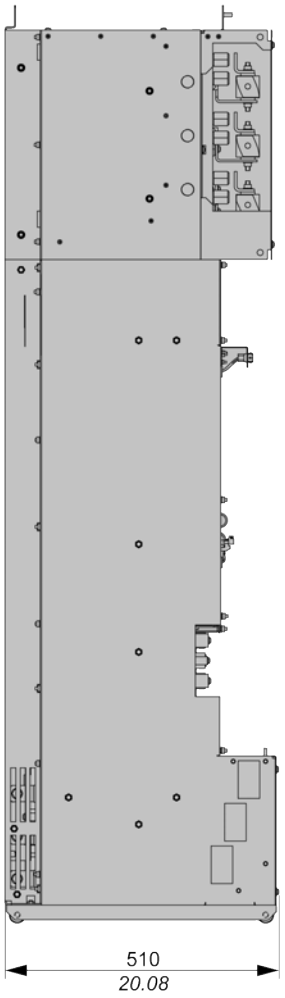
Front view

mm
in.



Side view

mm
in.



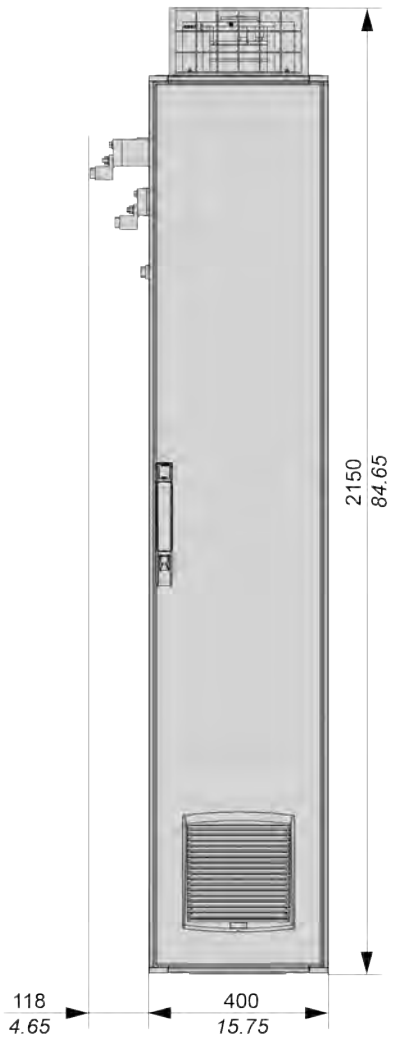
Weight

Power Module	Catalog Number	Weight kg *(lb)*
Standard power module 380...480 V	APM1A0C16N401	155 *(342)*
Standard power module 500...690 V	APM1A0C20Y6	168 *(370)*
Standard power module 600 V	APM1A0C20S6	168 *(370)*

IP21 / UL Type 1 Cabinet With One Power Module

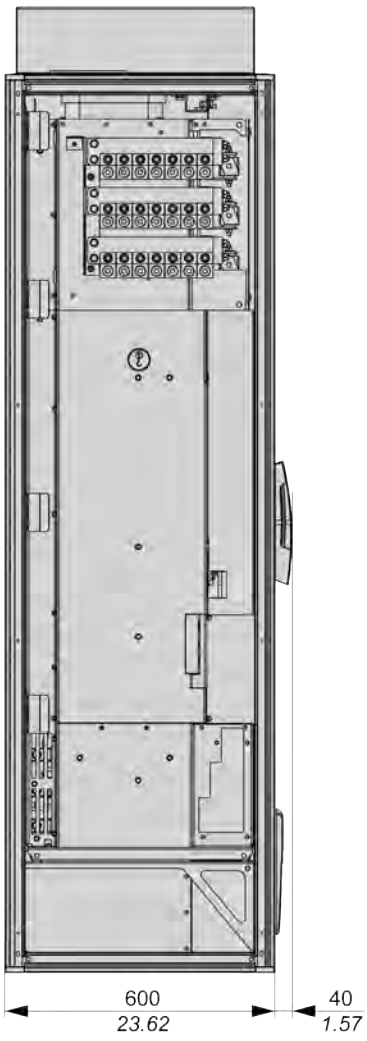
Front view

mm
in.



Side view

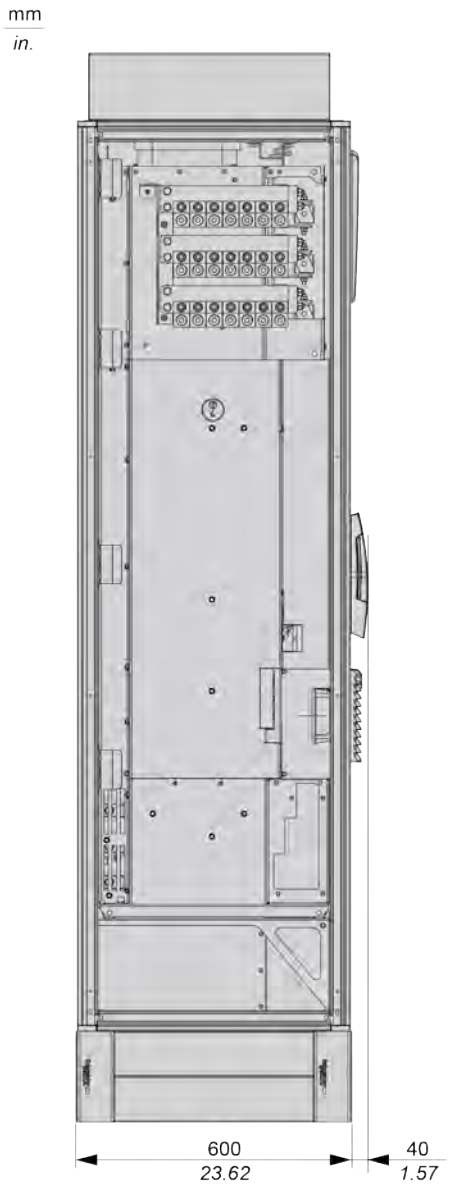
mm
in.



IP54 / UL Type 12 Cabinet With One Power Module

Front view

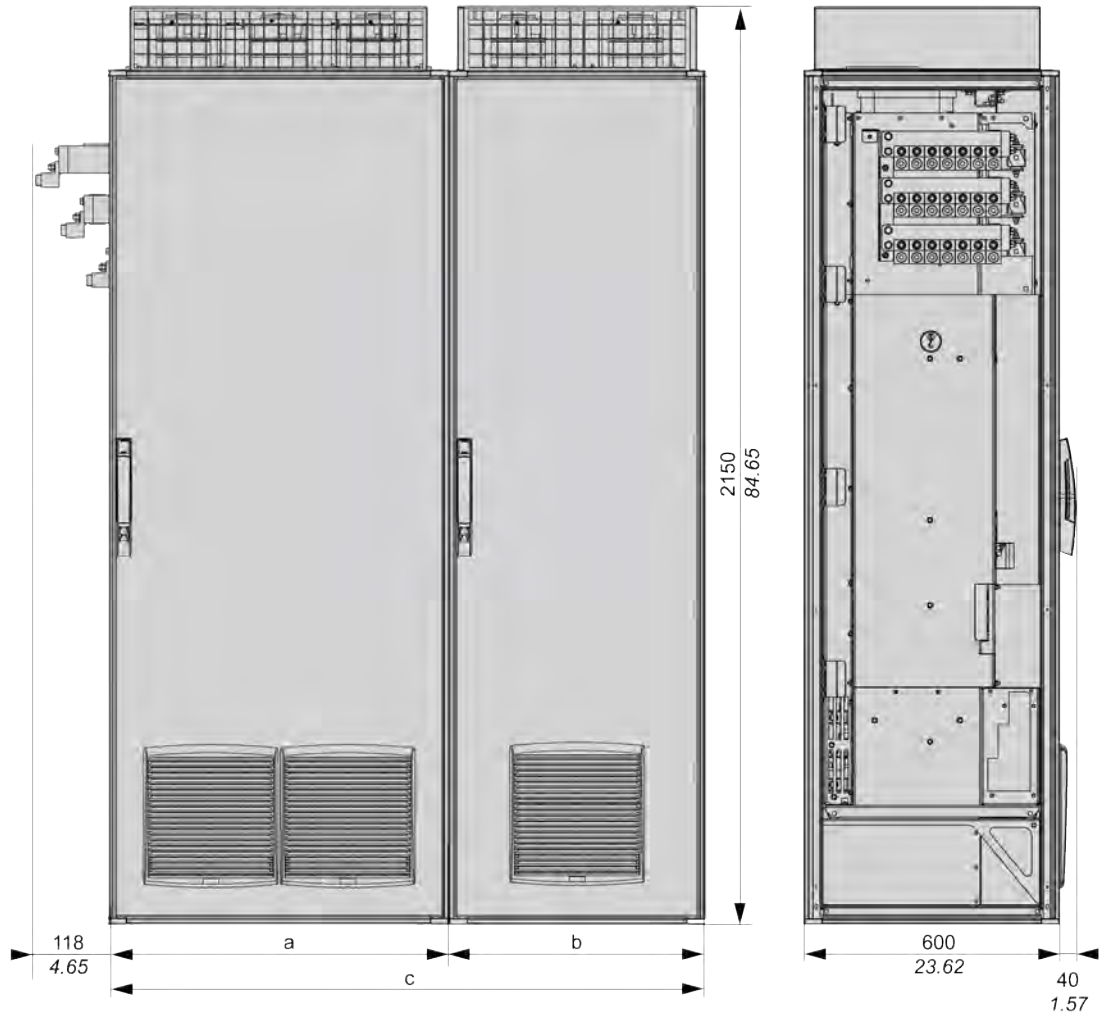
Side view



2 Cabinets IP21 / UL Type 1 With Several Power Modules

Front and Side view

mm
in.



Dimensions and Weight

Quantity of Power Modules (1)	a mm *(in.)*	b mm *(in.)*	c mm *(in.)*	Weight of Modular Single Drive (2) kg *(lb)*	
				380...480 V	500...690 V
1	–	400 (15.75)	–	280 *(617)*	293 *(646)*
2	–	600 *(23.62)*	–	470 *(1,036)*	496 *(1,093)*
3	800 *(31.5)*	–	–	660 *(1,455)*	699 *(1,541)*
4	600 *(23.62)*	600 *(23.62)*	1,200 *(47.24)*	940 *(2,072)*	992 *(2,187)*
5	800 *(31.5)*	600 *(23.62)*	1,400 *(55.12)*	1,130 *(2,491)*	1,195 *(2,635)*
6	800 *(31.5)*	800 *(31.5)*	1,600 *(62.99)*	1,320 *(2,910)*	1,398 *(3,082)*

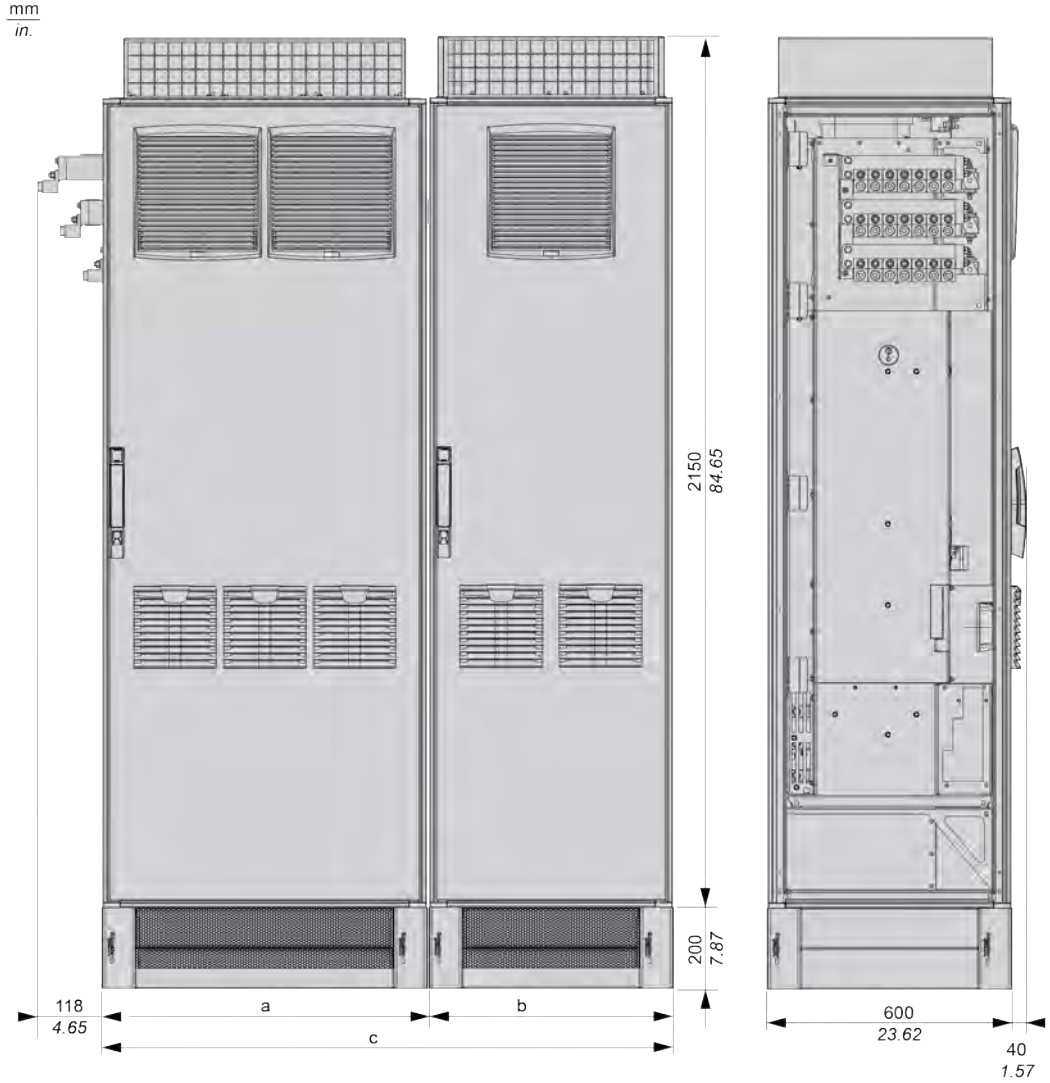
(1) The combination of several modules is not possible with the Standard Power Module 600 V.

(2) The given weight is an approximately value based on the cabinet types for standard integration and does not contain the incoming cabinet, for example.

NOTE: The optional braking unit affects the total dimensions and weight of the Modular Single Drive. Refer to the integration manual of the optional braking unit.

2 Cabinets IP54 / UL Type 12 with Several Power Modules

Front view



Dimensions and Weight

Quantity of Power Modules (1)	a mm *(in.)*	b mm *(in.)*	c mm *(in.)*	Weight of Modular Single Drive (2) kg *(lb)*	
				380...480 V	500...690 V
1	–	400 (15.75)	–	290 *(639)*	303 *(668)*
2	–	600 *(23.62)*	–	485 *(1,069)*	511 *(1,127)*
3	800 *(31.5)*	–	–	680 *(1,499)*	719 *(1,585)*
4	600 *(23.62)*	600 *(23.62)*	1,200 *(47.24)*	970 *(2,138)*	1,022 *(2,253)*
5	800 *(31.5)*	600 *(23.62)*	1,400 *(55.12)*	1,165 *(2,568)*	1,230 *(2,712)*
6	800 *(31.5)*	800 *(31.5)*	1,600 *(62.99)*	1,360 *(2,998)*	1,438 *(3,170)*

(1) The combination of several modules is not possible with the Standard Power Module 600 V.

(2) The given weight is an approximately value based on the cabinet types for standard integration and does not contain the incoming cabinet, for example.

NOTE: The optional braking unit affects the total dimensions and weight of the Modular Single Drive. Refer to the integration manual of the optional braking unit.

Positioning of the Incoming Cabinet

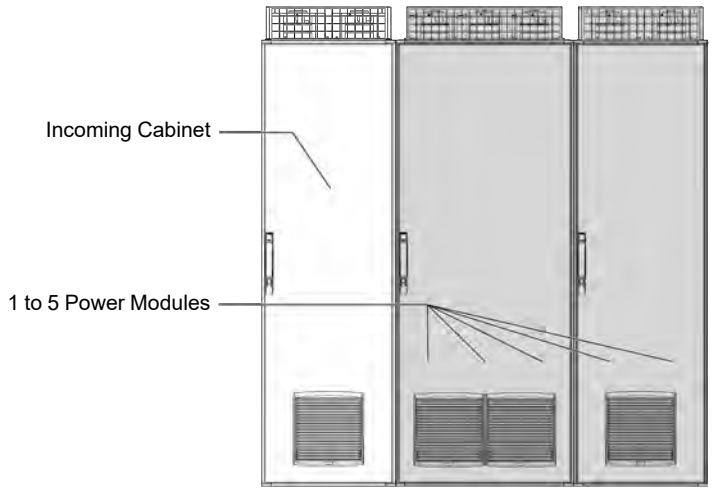
Overview

This chapter shows at which position the incoming cabinet can be placed.

NOTE: This chapter does not show the size of the incoming cabinet and does not show how the incoming cabinet is cooled.

Position with 1 to 5 Power Modules for 380...480 V

The position of the incoming cabinet is on the left side.



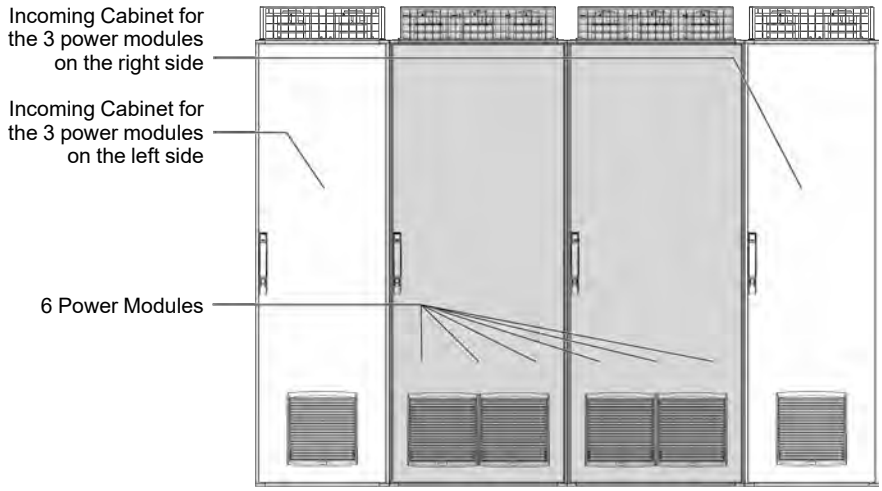
Position with 6 Power Modules for 380...480 V

For the position of the incoming cabinet there are two possibilities:

- **Variant A:**
  An incoming cabinet on the left side for the first 3 modules and an incoming cabinet on the right side for the other 3 modules.

  NOTE: 2 circuit breakers are required. One for each 3 modules.
- **Variant B:**
  An incoming cabinet in the middle with 2 circuit breakers. One circuit breaker is for the left 3 modules and the other for the right 3 modules.

Variant A:

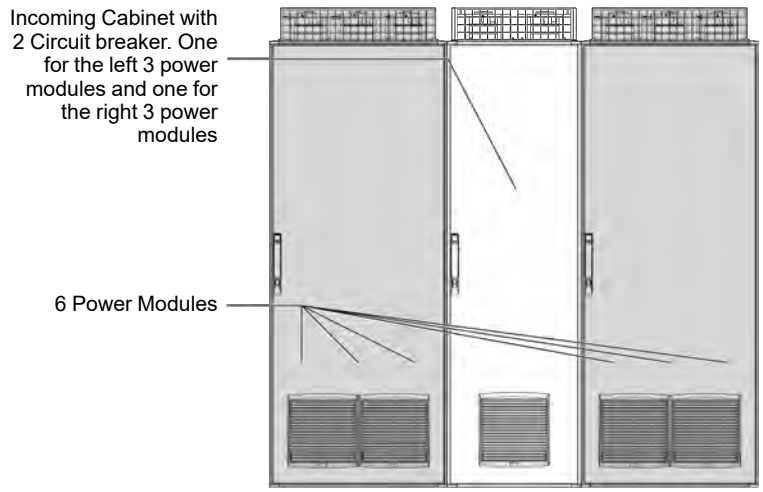


NOTE: The input side (L1/L2/L3) of 3 power modules supplied from the left incoming cabinet has not to be connected to the input side (L1/L2/L3) of the 3 power modules supplied from the right incoming cabinet.

The DC bus of all power modules has to be connected together and the output terminals (U/V/W) of the power modules has to be connected together.

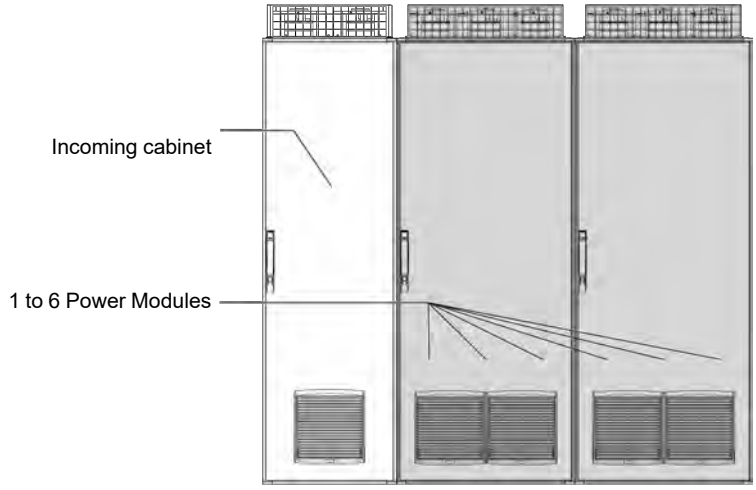
One circuit breaker for each incoming cabinet is required.

Variant B:



Position with 1 to 6 Power Modules for 500...690 V

The position of the incoming cabinet is on the left side.



NOTE: Only one circuit breaker is required. No separation on the input side between the first 3 power modules and the second 3 power modules.

Electrical Data - Drive Ratings

What's in This Chapter

Mains Conditions

Mains Voltage

NOTICE
DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE Before switching on and configuring the product, verify that it is approved for the mains voltage. **Failure to follow these instructions can result in equipment damage.**

The Altivar Process Modular Single Drives are designed for the following mains voltage:

Modular Single Drive	Mains Voltage
ATV•A0•••Q4	3 AC 400 V -15 %, +10 %
ATV•A0•••R4	3 AC 440 V -15 %, +10 %
ATV•A0•••T4	3 AC 480 V -15 %, +10 %
ATV•A0•••N6	3 AC 500 V -10 %, +15 %
ATV•A0•••T6 ATV•A0•••S6	3 AC 600 V -15 %, +10 %
ATV•A0•••Q6	3 AC 690 V -15 %, +10 %

The mains voltage must comply with the requirements according to IEC 60038 and EN 50160:

- Unbalance between phases: < 1 %
- Total harmonic factor THD(v): < 10 %
- Maximum single harmonic: < 5 %

NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains busbars of each power module as well as on the mains terminals.

Power Factor

The power factor cos Phi is superior than 0.99 (at 30...120 % load).

Undervoltage Behavior

In case of short-term mains voltage drops outside the specified tolerance, operation is still possible. If the mains voltage does not return within the specified time, an undervoltage shut-down occurs.

Mains Undervoltage	Restriction
-10 % of nominal voltage	Starting the drive and continuous operation possible (1)
-15 % of nominal voltage	Starting the drive and operation (1) for 10 s per 100 s possible (2)
-20 % of nominal voltage	Operation (1) for less than 1 s possible
-30 % of nominal voltage	Operation (1) for less than 0.5 s possible (2)
(1) With nominal current **(2)** Except ATV•A0•••N6	

Drive Ratings For 380...480 V

Normal Duty - 400 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 400 Vac			ATV600 (2)	ATV900 (3)
	kW	A	kVA	A	A	A
ATV•A0C11Q4	110	198	137	211	232	253
ATV•A0C13Q4	132	233	161	250	275	300
ATV•A0C16Q4	160	278	193	302	332	362
ATV•A0C20Q4	200	352	244	370	407	444
ATV•A0C25Q4	250	432	299	477	525	572
ATV•A0C31Q4	315	538	373	590	649	708
ATV•A0C35Q4	355	611	423	660	726	792
ATV•A0C40Q4	400	681	472	730	803	876
ATV•A0C45Q4	450	764	529	830	913	996
ATV•A0C50Q4	500	846	586	900	990	1,080
ATV•A0C56Q4	560	948	657	1,020	1,122	1,224
ATV•A0C63Q4	630	1,058	733	1,140	1,254	1,368
ATV•A0C71Q4	710	1,192	826	1,260	1,386	1,512
ATV•A0C80Q4	800	1,335	925	1,420	1,562	1,704
ATV•A0M10Q4	1000	1,692	1,172	1,770	1,947	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Heavy Duty - 400 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 400 Vac			ATV600	ATV900
	kW	A	kVA	A	A	A
ATV•A0C11Q4	90	167	116	173	260	260
ATV•A0C13Q4	110	198	137	211	317	317
ATV•A0C16Q4	132	233	161	250	375	375
ATV•A0C20Q4	160	290	201	302	453	453
ATV•A0C25Q4	200	353	245	370	555	555
ATV•A0C31Q4	250	432	299	477	716	716
ATV•A0C35Q4	280	489	339	520	780	780
ATV•A0C40Q4	315	545	378	590	885	885
ATV•A0C45Q4	355	611	423	660	990	990
ATV•A0C50Q4	400	681	472	730	1,095	1,095
ATV•A0C56Q4	450	767	531	830	1,245	1,245
ATV•A0C63Q4	500	849	588	900	1,350	1,350
ATV•A0C71Q4	560	951	659	1,020	1,530	1,530
ATV•A0C80Q4	630	1,061	735	1,140	1,710	1,710
ATV•A0M10Q4	800	1,362	944	1,420	2,130	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Normal Duty - 440 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 440 Vac			ATV600 (2)	ATV900 (3)
	kW	A	kVA	A	A	A
ATV•A0C11R4	110	183	139	211	232	253
ATV•A0C13R4	132	214	163	250	275	300
ATV•A0C16R4	160	255	194	302	332	362
ATV•A0C20R4	200	325	248	370	407	444
ATV•A0C25R4	250	396	302	477	525	572
ATV•A0C31R4	315	493	376	590	649	708
ATV•A0C35R4	355	559	426	660	726	792
ATV•A0C40R4	400	623	475	730	803	876
ATV•A0C45R4	450	697	531	830	913	996
ATV•A0C50R4	500	771	588	900	990	1,080
ATV•A0C56R4	560	865	659	1,020	1,122	1,224
ATV•A0C63R4	630	965	735	1,140	1,254	1,368
ATV•A0C71R4	710	1,087	828	1,260	1,386	1,512
ATV•A0C80R4	800	1,216	927	1,420	1,562	1,704
ATV•A0M10R4	1000	1,542	1,175	1,770	1,947	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Heavy Duty - 440 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 440 Vac			ATV600	ATV900
	kW	A	kVA	A	A	A
ATV•A0C11R4	90	155	118	173	260	260
ATV•A0C13R4	110	183	139	211	317	317
ATV•A0C16R4	132	214	163	250	375	375
ATV•A0C20R4	160	269	205	302	453	453
ATV•A0C25R4	200	325	248	370	555	555
ATV•A0C31R4	250	396	302	477	716	716
ATV•A0C35R4	280	450	343	520	780	780
ATV•A0C40R4	315	501	382	590	885	885
ATV•A0C45R4	355	559	426	660	990	990
ATV•A0C50R4	400	623	475	730	1,095	1,095
ATV•A0C56R4	450	703	536	830	1,245	1,245
ATV•A0C63R4	500	776	591	900	1,350	1,350
ATV•A0C71R4	560	869	662	1,020	1,530	1,530
ATV•A0C80R4	630	968	738	1,140	1,710	1,710
ATV•A0M10R4	800	1,246	950	1,420	2,130	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Normal Duty - 480 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 480 Vac			ATV600 (2)	ATV900 (3)
	HP	A	kVA	A	A	A
ATV•A0C11T4	150	168	140	211	232	253
ATV•A0C13T4	200	218	181	250	275	300
ATV•A0C16T4	250	268	223	302	332	362
ATV•A0C20T4	300	328	273	370	407	444
ATV•A0C25T4	400	427	355	477	525	572
ATV•A0C31T4	500	528	439	590	649	708
ATV•A0C35T4	550	586	487	660	726	792
ATV•A0C40T4	600	634	527	730	803	876
ATV•A0C45T4	650	685	569	830	913	996
ATV•A0C50T4	700	736	612	900	990	1,080
ATV•A0C56T4	800	842	700	1,020	1,122	1,224
ATV•A0C63T4	900	939	781	1,140	1,254	1,368
ATV•A0C71T4	1,000	1,044	868	1,260	1,386	1,512
ATV•A0C80T4	1,100	1,146	953	1,420	1,562	1,704
ATV•A0M10T4 (4)	1400	1,472	1,224	1,770	1,947	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

(4) This reference is not available in cULus.

Heavy Duty - 480 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 480 Vac			ATV600	ATV900
	HP	A	kVA	A	A	A
ATV•A0C11T4	125	145	121	173	260	260
ATV•A0C13T4	150	168	140	211	317	317
ATV•A0C16T4	200	218	181	250	375	375
ATV•A0C20T4	250	280	233	302	453	453
ATV•A0C25T4	300	328	273	370	555	555
ATV•A0C31T4	400	427	355	477	716	716
ATV•A0C35T4	450	486	404	520	780	780
ATV•A0C40T4	500	536	446	590	885	885
ATV•A0C45T4	550	586	487	660	990	990
ATV•A0C50T4	600	634	527	730	1,095	1,095
ATV•A0C56T4	650	690	574	830	1,245	1,245
ATV•A0C63T4	700	740	615	900	1,350	1,350
ATV•A0C71T4	800	846	703	1,020	1,530	1,530
ATV•A0C80T4	900	942	783	1,140	1,710	1,710
ATV•A0M10T4 (3)	1,100	1,268	1,054	1,420	2,130	2,130

(1) The switching frequency is adjustable from 2...8 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

(3) This reference is not available in cULus.

Drive Ratings For 500...690 V

Normal Duty - 500 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 500 Vac			ATV600 (2)	ATV900 (3)
	kW	A	kVA	A	A	A
ATV•A0C11N6	75	110	95	125	138	150
ATV•A0C13N6	90	129	112	145	160	174
ATV•A0C16N6	110	154	133	175	193	210
ATV•A0C20N6	132	183	158	215	237	258
ATV•A0C25N6	160	225	195	275	303	330
ATV•A0C31N6	220	303	262	340	374	408
ATV•A0C40N6	280	380	329	425	468	510
ATV•A0C50N6	355	484	419	520	572	624
ATV•A0C63N6	450	607	526	650	715	780
ATV•A0C80N6	560	756	655	830	913	996
ATV•A0M10N6	710	954	826	1,030	1,133	1,236
ATV•A0M12N6	800	1,070	927	1,230	1,353	1,476

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Heavy Duty - 500 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 500 Vac			ATV600	ATV900
	kW	A	kVA	A	A	A
ATV•A0C11N6	55	83	72	105	158	158
ATV•A0C13N6	75	110	95	125	188	188
ATV•A0C16N6	90	129	112	145	218	218
ATV•A0C20N6	110	154	133	175	263	263
ATV•A0C25N6	132	190	165	215	323	323
ATV•A0C31N6	160	225	195	275	413	413
ATV•A0C40N6	220	303	262	340	510	510
ATV•A0C50N6	280	385	333	425	638	638
ATV•A0C63N6	355	484	419	520	780	780
ATV•A0C80N6	450	610	528	650	975	975
ATV•A0M10N6	560	758	656	830	1,245	1,245
ATV•A0M12N6	710	954	826	1,030	1,545	1,545

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Normal Duty - 600 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 600 Vac			ATV600 (2)	ATV900 (3)
	HP	A	kVA	A	A	A
ATV•A0C11T6	125	112	116	125	138	150
ATV•A0C13T6	150	131	136	145	160	174
ATV•A0C16T6	175	152	158	175	193	210
ATV•A0C20T6	200	172	179	215	237	258
ATV•A0C25T6	250	218	227	275	303	330
ATV•A0C31T6	350	298	310	340	374	408
ATV•A0C40T6	450	379	394	425	468	510
ATV•A0C50T6	550	464	482	520	572	624
ATV•A0C63T6	650	544	565	650	715	780
ATV•A0C80T6	800	670	696	830	913	996
ATV•A0M10T6	1,000	833	866	1,030	1,133	1,236
ATV•A0M12T6	1,200	994	1,033	1,230	1,353	1,476

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 600 Vac			ATV600 (2)	ATV900 (3)
	HP	A	kVA	A	A	A
ATV•A0C11S6	125	112	116	125	138	150
ATV•A0C13S6	150	131	136	145	160	174
ATV•A0C16S6	175	152	158	175	193	210
ATV•A0C20S6	200	172	179	215	237	258

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Heavy Duty - 600 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 600 Vac			ATV600	ATV900
	HP	A	kVA	A	A	A
ATV•A0C11T6	100	92	96	105	158	158
ATV•A0C13T6	125	112	116	125	188	188
ATV•A0C16T6	150	131	136	145	218	218
ATV•A0C20T6	175	152	158	175	263	263
ATV•A0C25T6	200	179	186	215	323	323
ATV•A0C31T6	250	218	227	275	413	413
ATV•A0C40T6	350	298	310	340	510	510
ATV•A0C50T6	450	383	398	425	638	638
ATV•A0C63T6	550	464	482	520	780	780
ATV•A0C80T6	650	547	568	650	975	975
ATV•A0M10T6	800	673	699	830	1,245	1,245
ATV•A0M12T6	1,000	835	868	1,030	1,545	1,545

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 600 Vac			ATV600	ATV900
	HP	A	kVA	A	A	A
ATV•A0C11S6	100	92	96	105	158	158
ATV•A0C13S6	125	112	116	125	188	188
ATV•A0C16S6	150	131	136	145	218	218
ATV•A0C20S6	175	152	158	175	263	263

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Normal Duty - 690 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1)	
		At 690 Vac			ATV600 (2)	ATV900 (3)
	kW	A	kVA	A	A	A
ATV•A0C11Q6	110	118	141	125	138	150
ATV•A0C13Q6	132	138	165	145	160	174
ATV•A0C16Q6	160	163	195	175	193	210
ATV•A0C20Q6	200	200	239	215	237	258
ATV•A0C25Q6	250	255	305	275	303	330
ATV•A0C31Q6	315	316	378	340	374	408
ATV•A0C40Q6	400	394	471	425	468	510
ATV•A0C50Q6	500	495	592	520	572	624
ATV•A0C63Q6	630	615	735	650	715	780
ATV•A0C80Q6	800	776	927	830	913	996
ATV•A0M10Q6	1,000	969	1,158	1,030	1,133	1,236
ATV•A0M12Q6	1,200	1,161	1,388	1,230	1,353	1,476

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 110% of nominal current per a 10 min period.

(3) The drive is designed to run up to 60 s at 120% of nominal current per a 10 min period.

Heavy Duty - 690 V

Modular Single Drive	Nominal Power	Power Part Supply		Drive (output)		
		Input Current	Apparent Power	Nominal Current (1)	Max. Transient current (1) (2)	
		At 690 Vac			ATV600	ATV900
	kW	A	kVA	A	A	A
ATV•A0C11Q6	90	100	120	105	158	158
ATV•A0C13Q6	110	118	141	125	188	188
ATV•A0C16Q6	132	138	165	145	218	218
ATV•A0C20Q6	160	163	195	175	263	263
ATV•A0C25Q6	200	211	252	215	323	323
ATV•A0C31Q6	250	255	305	275	413	413
ATV•A0C40Q6	315	316	378	340	510	510
ATV•A0C50Q6	400	401	479	425	638	638
ATV•A0C63Q6	500	495	592	520	780	780
ATV•A0C80Q6	630	619	740	650	975	975
ATV•A0M10Q6	800	779	931	830	1,245	1,245
ATV•A0M12Q6	1,000	971	1,160	1,030	1,545	1,545

(1) The switching frequency is adjustable from 2...4.9 kHz with a rated value of 2.5 kHz

For operation at switching frequencies higher than the rated value derating must be applied to the drive (output) current. In this case, switching frequency will be reduced if an excessive temperature rise occurs. Refer to Derating Curves, page 62.

(2) The drive is designed to run up to 60 s at 150% of nominal current per a 10 min period.

Derating Curves

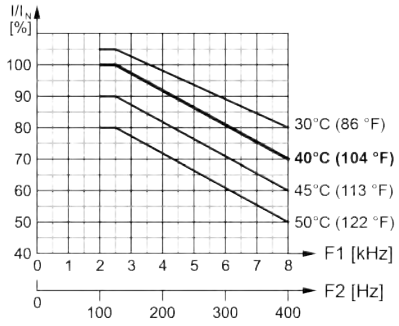
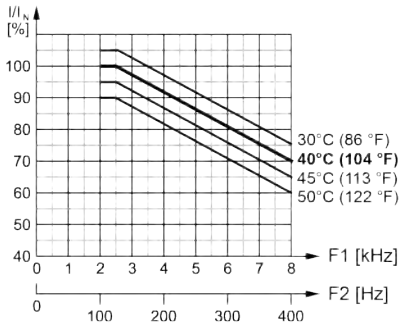
Description

Derating curves for the nominal drive current (In) as a function of temperature and switching frequency.

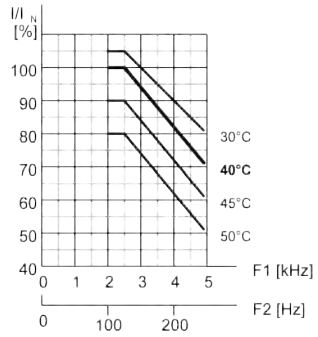
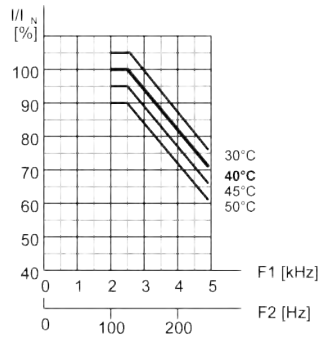
Maximum Ambient Temperature

Depending on the chosen pulse frequency, the maximum ambient temperature and the desired output frequency a derating is necessary. This can be determined by means of the following diagrams.

380...480 V mains voltage

Normal Duty	Heavy Duty
	
F1 Pulse frequency **F2** Output frequency	

500...690 V mains voltage

Normal Duty	Heavy Duty
	
F1 Pulse frequency **F2** Output frequency	

Observe the following guidelines:

- In case of output frequencies higher than 125 Hz the pulse frequency is increased automatically. So the pulse frequency is increased to 4 kHz at 200 Hz output frequency, for example. Consequently, a derating of 8% at max. 40°C (104°F) has to be considered.
- Due to the reduction of the output current also the overload capability of the drive is reduced.
- At higher pulse frequencies the allowed motor cable length is reduced. Refer to Cable Length Instructions, page 118.
- For full shaft power the motor size should not be more than one power rating bigger than the drive.

  NOTE: If the ambient temperature is too high, the pulse frequency is automatically reduced which helps to prevent an overload of the inverter (except in case of operation with sinus-motor-filter).

Derating Curves with usage of Sinus Motor Filter

Description

If a sinus motor filter is in use the derating of the output current for the drive needs to be considered.

NOTE: Use the “nominal output current” located in the Sinus Motor Filter section, page 125.

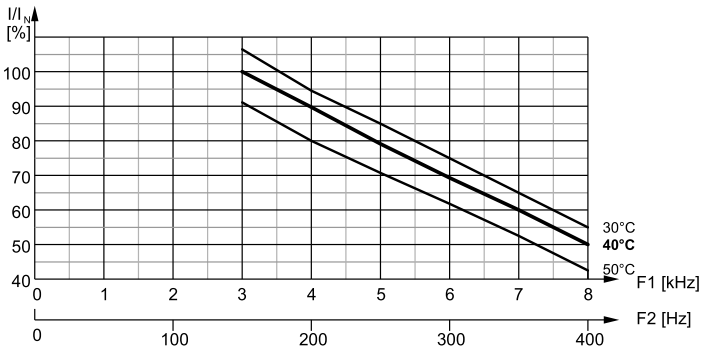
NOTE: This section only gives the derating for the drive due to some changed parameters. There can also be a derating for the used sinus motor filter itself!

Maximum Ambient Temperature

Depending on the chosen pulse frequency and the maximum ambient temperature a derating is necessary. This can be determined by means of the following diagrams.

380...480 V mains voltage

Normal Duty and Heavy Duty

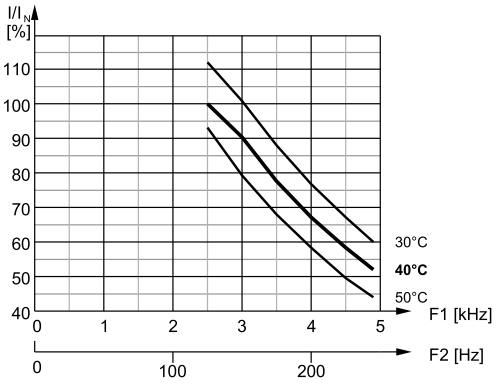


F1 Pulse frequency

F2 Output frequency

500...690 V mains voltage

Normal Duty and Heavy Duty



F1 Pulse frequency

F2 Output frequency

Observe the following guidelines:

- Observe that the minimum switching frequency for 380 to 480 V is at 3kHz and the minimum switching frequency for 500 to 690 V is at 2.5kHz.
- In case of output frequencies higher than 150 Hz for 380 to 480V or 200 Hz for 500 to 690V the pulse frequency is increased automatically. So the pulse frequency is increased to 4 kHz at 200 Hz output frequency, for example. Consequently, a derating of 10% at max. 40°C (104°F) for 380 to 480 V has to be considered.
- Due to the reduction of the output current also the overload capability of the drive is reduced.
- At higher pulse frequencies the allowed motor cable length is reduced. Refer to Cable Length Instructions, page 118.

  NOTE: If the ambient temperature is too high, the pulse frequency is automatically reduced (at maximum down to the minimum switching frequency) to prevent the inverter from being overloaded.

Fuses

Internal Circuit Fuses For Single Drives 380...480 V

The following table gives the required quantity of fast reacting fuses 400 A per Modular Single Drive.

Modular Single Drive	Quantity of Fuses
ATV••0C11•4	3
ATV••0C13•4	3
ATV••0C16•4	3
ATV••0C20•4	6
ATV••0C25•4	6
ATV••0C31•4	6
ATV••0C35•4	9
ATV••0C40•4	9
ATV••0C45•4	9
ATV••0C50•4	9
ATV••0C56•4	12
ATV••0C63•4	12
ATV••0C71•4	15
ATV••0C80•4	15
ATV••0M10•4	18

Only use the fuses specified below:

Part definition	Supplier	Supplier part number
Fast reacting fuse 400 A	COOPER BUSSMANN	170M3419
	COOPER BUSSMANN	170M3469
	MERSEN	PC30UD69V400TF

You can also order a set of three fuses (VW3A98CF4040) from Schneider Electric.

Internal Circuit Fuses For Single Drives 500...690 V

The following table gives the required quantity of fast reacting fuses 315 A per Modular Single Drive.

Modular Single Drive	Quantity of Fuses
ATV••0C11•6	3
ATV••0C13•6	3
ATV••0C16•6	3
ATV••0C20•6	3
ATV••0C25•6	6
ATV••0C31•6	6
ATV••0C40•6	6
ATV••0C50•6	9
ATV••0C63•6	9
ATV••0C80•6	12
ATV••0M10•6	15
ATV••0M12•6	18

Only use the fuses specified below:

Part definition	Supplier	Supplier part number
Fast reacting fuse 315 A	MERSEN	SC30AR69V315TF
	MERSEN	SC30AR69V315TFU

You can also order a set of three fuses (VW3A98CF3169) from Schneider Electric.

Power Supplies

General Information about the 24Vdc Connections

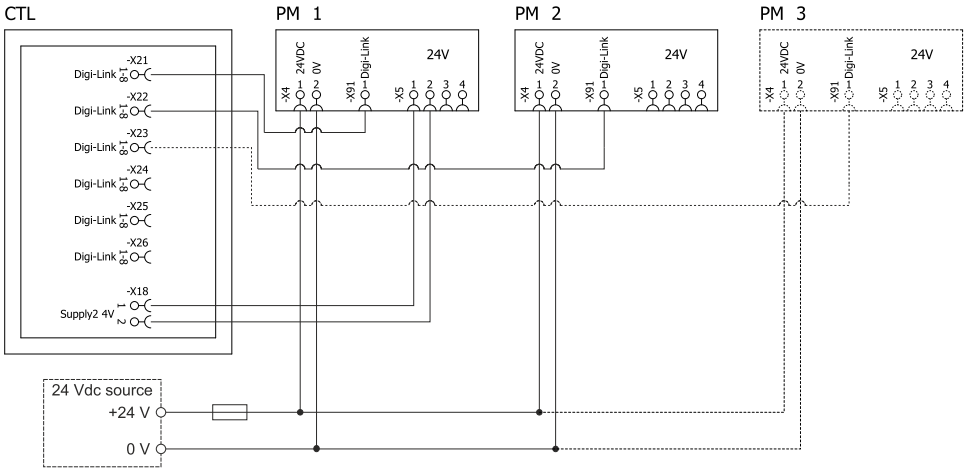
The 24 Vdc supply is used to supply the power module and the control unit. The following connections are necessary:

- Supply each power module with 24 Vdc at terminal X4.
- Supply the control unit via connection X5 of the power module.

The following points have to be observed for the overcurrent protection device of the 24 Vdc supply:

- Protect only the + line of the 24 Vdc supply. According to the total consumption of the devices supplied.
- 0 V of all power supplies have to be connected to each other.

Example with one 24 Vdc Power Supply



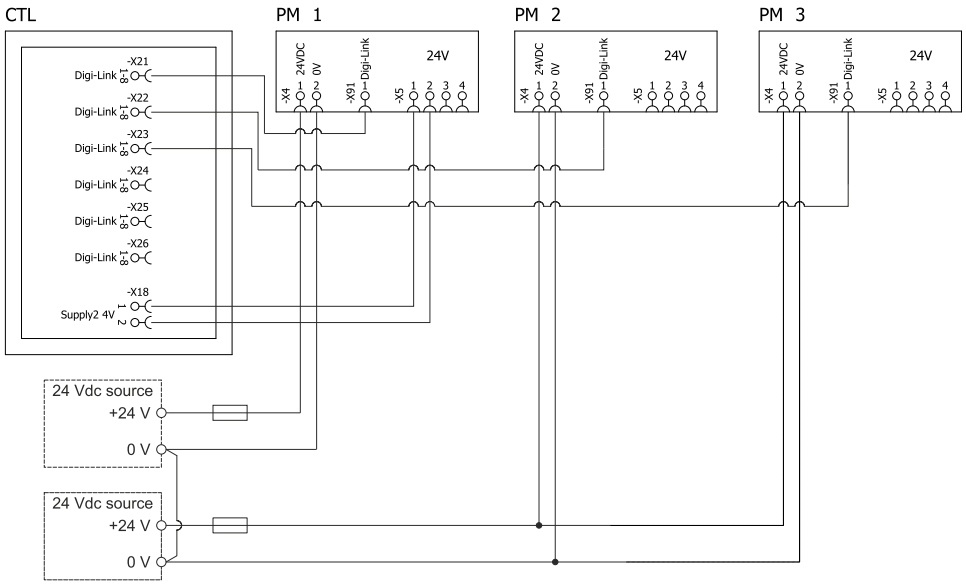
NOTICE

RISK OF DAMAGE TO THE DRIVE

- Ensure that the 24Vdc supplies are switched off before plugging in or unplugging any connectors.
- Do not unplug the highspeed communication cables and the 24 Vdc supplies during the Device Type Setting procedure.

Failure to follow these instructions can result in equipment damage.

Example with two 24 Vdc Power Supplies



NOTICE

RISK OF DAMAGE TO THE DRIVE

- Ensure that the 24Vdc supplies are switched off before plugging in or unplugging any connectors.
- Do not unplug the highspeed communication cables and the 24 Vdc supplies during the Device Type Setting procedure.

Failure to follow these instructions can result in equipment damage.

24 Vdc Power Supply

The control block has to be supplied with a 24 Vdc power supply. The following table gives the technical specifications of the supply unit required.

24 Vdc Power Supply	Characteristics
Nominal output voltage	24 Vdc SELV
Line and load regulation	+/- 3 %
Power consumption for 1 power module including control unit	52 W
Power consumption for each additional power module without control unit	18 W

Additional Power Supplies and Parts

The following parts are required for the Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4) and are delivered with the power module:

- 48 Vdc power supply
- Power relay
- Relay socket

The fan has to be supplied with a 48 Vdc power supply. The following table gives the technical specification of the required power supply.

48 Vdc Power Supply	Characteristics
Ambient Temperature (for operation)	-10...60 °C (14...140 °F)
Humidity (for operation)	20...95 %
Degree of protection	IP20 according to IEC 60529
Input voltage range	180...264 Vac
Input frequency	47...63 Hz
Max input current	< 1.5 A at 230 Vac at nominal load
Max inrush current	< 50 A peak at 240 Vac and nominal load
Nominal output voltage	48 Vdc
Output current	0...4.5 A, at -10...60 °C (14...140 °F)
Dimensions W/H/D	85 mm (3.35 in) / 132 mm (5.2 in) / 112 mm (4.41 in)
Distance to other components (cooling)	30 mm (1.18 in)
Mounting	DIN rail TH 35-15 according to IEC 60715, vertically centered
Input terminals cable cross section	0.2...4 mm^2 (AWG 24...12)
Output terminals cable cross section	0.2...4 mm^2 (AWG 24...12)
Terminal tightening torque	0.4 N·m (3.54 lbf·in)

The following table gives the technical specification of the power relay for the 48 Vdc power supply.

Power Relay	Characteristics
Terminal type	Plug-in
Contact arrangement	1 single NO contact
Rated voltage	250 Vac
Rated current	16 A
Limiting making current, max 20ms	120 A
Breaking capacity	4,000 VA
Contact material	AgSnO2
Insulation between contacts	1,000 Vac RMS
Insulation contacts to coil	5,000 Vac RMS
Clearance / creepage contact to coil	10 mm (0.39 in) / 10 mm (0.39 in)
Coil voltage	24 Vdc
Operate voltage	16.8 V
Release voltage	2.4 V
Rated coil power	400 mW
Coil insulation system UL1446	Class F
Ambient temperature	-40...+85 °C (-40...185 °F)

The following table gives the technical specification of the relay socket.

Relay Socket	Characteristics
Rated voltage / max. switching voltage	240 Vac / 400 Vac
Rated current	2 x 8 A, 16 A
Dielectric strength coil-contact circuit	5,000 Vrms
Open contact circuit	1,000 Vrms
Adjacent contact circuits	2,500 Vrms
Clearance / creepage contact to coil	10 mm (0.39 in) / 10 mm (0.39 in)
Maximum terminal cross section	2.5 mm^2 (AWG 14)
Terminal tightening torque	0.5...0.7 N·m (4.5...6.2 lbf·in)

The 48 Vdc power has to be supplied with 230 Vac. The following table gives the technical specification of the required power supply.

230 Vac Power Supply	Characteristics
Input voltage range	180…264 Vac (OVC II)
Input frequency	47 … 63 Hz
Max input current for 1 Power Module	< 1.5 A @ 230 V input at nominal load
Max inrush current for 1 Power Module	< 50 A peak @ 240 Vac input and nominal load

X6 Relay Output

Description

The X6 relay output can be used to control the cabinet fans. The state of the output is active when the internal power fans of the Modular Single Drive are running.

Element	Characteristics
Type of contact	NO (Normally Open)
Switching Capacity	5 mA for 24 Vdc, minimum
Available switching current on inductive load (L/R = 7 ms)	1.8 A for 24 Vdc (maximum current is 2 A with 0.2 A reserved for power fan relays)
Refresh time	5 ms +/- 0.5 ms
Service life	100,000 operations at maximum switching power

Electrical Data - Upstream Protective Device

What's in This Chapter

Introduction

Overview

⚠⚠DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, apply the instructions given in the section below.

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

General

- The Short Circuit Protective Device (SCPD) rated to the drive will help protect the upstream installation in case of a short-circuit internal to the drive and mitigate the damage to the drive and its surrounding area.
- The SCPD rated to the drive is mandatory to help ensuring the safety of the Power Drive System.

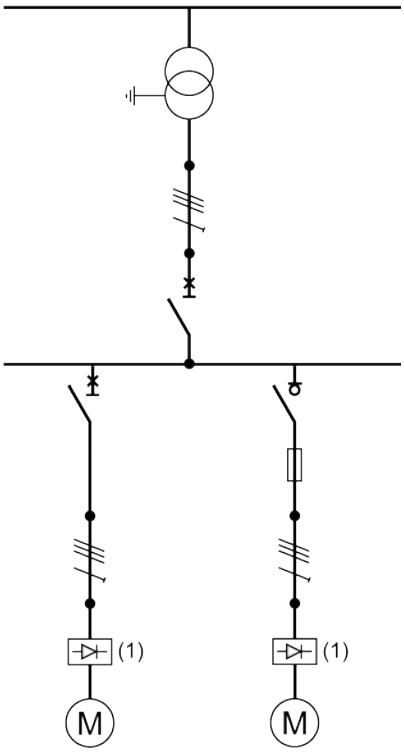
  It comes in addition to the upstream branch circuit protection which is in compliance with the local regulation for electrical installation.
- The SCPD shall mitigate the damage in case of detected error condition such as an internal short-circuit of the drive.
- The SCPD must take into account both following characteristics...
  - a maximum prospective short-circuit current
  - a minimum required prospective short-circuit current (Isc).

If the minimum required prospective short-circuit current (Isc) is not available, increase the power of the transformer or decrease the length of the cables

In other cases, contact your Schneider Electric Customer Care Center (CCC) www.se.com/CCC for specific selection of Short Circuit Protective Device (SCPD).

Wiring Diagram

This diagram shows an example of installation with both SCPD types, Circuit-breaker and Fuse link rated to the drive.



(1) Drive

Prospective Short-Circuit Current

Calculation

The prospective short-circuit current shall be computed at the drive connection points.

We recommend using the Schneider Electric tool Ecodial Advance Calculation  available on www.se.com/en/product-range-presentation/61013-ecodial-advance-calculation/

The following equations allow to estimate the value of the symmetrical three-phase prospective short-circuit current (Isc) at the drive connection points.

$$Xt = \frac{U^2}{Sn} \cdot usc$$

$$Zcc = \sqrt{\left(\rho \cdot \frac{l}{S} + Rf\right)^2 + \left(Xt + Xc.l + Xf\right)^2}$$

$$Isc = \frac{U}{\sqrt{3}} \cdot \frac{1}{Zcc}$$

Isc	Symmetrical three-phase prospective short-circuit current (kA)
Xt	Transformer reactance
U	No-load phase to phase voltage of the transformer (V)
Sn	Apparent transformer power (kVA)
usc	Short-circuit voltage, according to the transformer data sheet (%)
Zcc	Total short-circuit impedance (mΩ)
ρ	Conductor resistivity e.g. Cu: 0.01851 mΩ.mm
l	Conductor length (mm)
S	Conductor cross section (mm^2)
Xc	Conductor lineic reactance (0.0001 mΩ/mm)
Rf, Xf	Resistance and reactance of the line filter (mΩ) , page 77

Example of Calculation with Copper Cable (without line filter)

Transformer 50 Hz	U 400 Vac Usc	Cable Cross Section	Isc depending on cable length in m(ft)							
			10 (33)	20 (66)	40 (131)	80 (262)	100 (328)	160 (525)	200 (656)	320 (1,050)
kVA	%	mm² (AWG)	kA	kA	kA	kA	kA	kA	kA	kA
100	4	2.5 (14)	2.3	1.4	0.8	0.4	0.3	0.2	0.2	0.1
		4 (12)	2.9	2.0	1.2	0.6	0.5	0.3	0.2	0.2
		6 (10)	3.2	2.6	1.6	0.9	0.7	0.5	0.4	0.2
		10 (8)	3.4	3.1	2.3	1.4	1.2	0.8	0.6	0.4
		25 (4)	3.5	3.4	3.1	2.5	2.2	1.6	1.4	0.9
		50 (0)	3.5	3.5	3.3	3.0	2.8	2.3	2.1	1.5
		70 (00)	3.5	3.5	3.4	3.1	2.9	2.6	2.3	1.8
		120 (250 MCM)	3.6	3.5	3.4	3.2	3.1	2.8	2.6	2.1
250	4	6 (10)	5.7	3.4	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	7.1	5.0	2.9	1.5	1.2	0.8	0.6	0.4
		25 (4)	8.4	7.4	5.5	3.4	2.8	1.8	1.5	0.9
		50 (0)	8.6	8.1	7.0	5.2	4.5	3.2	2.7	1.8
		70 (00)	8.6	8.2	7.3	5.8	5.2	3.9	3.3	2.3
		120 (250 MCM)	8.7	8.3	7.6	6.5	6.0	4.8	4.2	3.0
400	4	6 (10)	6.6	3.6	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	9.2	5.6	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	12	9.9	6.5	3.6	2.9	1.9	1.5	1.0
		50 (0)	13	12	9.3	6.1	5.1	3.4	2.8	1.8
		70 (00)	13	12	10	7.2	6.2	4.4	3.6	2.4
		120 (250 MCM)	13	13	11	8.6	7.6	5.7	4.9	3.4
800	6	6 (10)	6.9	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	10	5.8	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	15	11	6.9	3.7	3.0	1.9	1.5	1.0
		50 (0)	17	15	11	6.5	5.4	3.5	2.9	1.8
		70 (00)	17	15	12	7.9	6.7	4.6	3.7	2.4
		120 (250 MCM)	17	16	13	9.8	8.6	6.2	5.2	3.5
1,000	6	6 (10)	7.1	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	11	6.0	3.1	1.5	1.2	0.8	0.6	0.4
		25 (4)	18	12	7.1	3.7	3.0	1.9	1.5	1.0
		50 (0)	21	17	12	6.7	5.5	3.6	2.9	1.8
		70 (00)	21	18	13	8.4	7.0	4.7	3.8	2.4
		120 (250 MCM)	22	19	16	11	9.3	6.5	5.4	3.6

Additional Line Filter Option

If a line input filter option is required for the installation such as a line reactor or a passive harmonic filter, the minimum prospective short-circuit current capability of the source is reduced at the drive connection point and shall be estimated , page 75 with the impedance values given in the table below.

Then, the SCPD type shall be selected according to the drive. If no selection is available, Schneider Electric Customer Care Center (CCC) www.se.com/CCC should be contacted.

EMC filter series have no significant effect on the minimum prospective short-circuit current capability of the main source.

Through the line option, the Isc will be limited to a maximum value independent of the transformer and cable. **Therefore the below equations can be used to estimate the minimum prospective short-circuit current capability.**

$$10\,m\Omega \le Xf \le 400\,m\Omega \quad \Rightarrow \quad Isc_{maxi}\,(kA) = 4.7 - 0.7 \cdot Log\ (Xf)$$

$$400\,m\Omega \le Xf \le 2000\,m\Omega \quad \Rightarrow \quad Isc_{maxi}\,(kA) = 2.05 - 0.26 \cdot \mathrm{Log}\,(Xf)$$

Log: Natural logarithm

Line Choke Filters Impedance Values

Line Choke Filter	Xf in mΩ
VZ1L004M010, VW3A4551	700
VZ1L007UM50, VW3A4552	300
VZ1L018UM20, VW3A4553	100
VW3A4554	70
VW3A4555	30
VW3A4556	20

IEC Circuit Breakers

Preliminary Information

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the instructions given in this manual, National Electrical Code and any additional local codes.

IEC - Specification of Upstream Protection

400 V Normal Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11Q4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C13Q4	50 kA, 100 ms	NSX400N Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C16Q4	50 kA, 100 ms	NSX400N Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C20Q4	50 kA, 100 ms	NSX630N Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C25Q4	50 kA, 100 ms	NSX630N Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C31Q4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C35Q4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C40Q4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C45Q4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C50Q4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C56Q4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C63Q4	50 kA, 100 ms	NS1600N Micrologic 5.0	1,600	3,200 (Setting 2)	4
ATV•A0C71Q4	50 kA, 100 ms	NS1600N Micrologic 5.0	1,600	3,200 (Setting 2)	4
ATV•A0C80Q4	50 kA, 100 ms	MTZ2 20H1 Micrologic 5.0 X	2,000	4,000 (Setting 2)	5
ATV•A0M10Q4 (2)	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	6

(1) Rated instantaneous short-circuit current setting

(2) 2 circuit breakers are required. One circuit breaker each for 3 modules.

400 V Heavy Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11Q4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C13Q4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C16Q4	50 kA, 100 ms	NSX400N Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C20Q4	50 kA, 100 ms	NSX400N Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C25Q4	50 kA, 100 ms	NSX630N Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C31Q4	50 kA, 100 ms	NSX630N Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C35Q4	50 kA, 100 ms	NS630bN Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C40Q4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C45Q4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C50Q4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C56Q4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C63Q4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C71Q4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C80Q4	50 kA, 100 ms	NS1600N Micrologic 5.0	1,600	3,200 (Setting 2)	4
ATV•A0M10Q4 (2)	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	6

(1) Rated instantaneous short-circuit current setting

(2) 2 circuit breakers are required. One circuit breaker each for 3 modules.

440 V Normal Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11R4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C13R4	50 kA, 100 ms	NSX400H Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C16R4	50 kA, 100 ms	NSX400H Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C20R4	50 kA, 100 ms	NSX630H Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C25R4	50 kA, 100 ms	NSX630H Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C31R4	50 kA, 100 ms	NS630bN Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C35R4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C40R4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C45R4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C50R4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C56R4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C63R4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C71R4	50 kA, 100 ms	NS1600N Micrologic 5.0	1,600	3,200 (Setting 2)	4
ATV•A0C80R4	50 kA, 100 ms	NS1600N Micrologic 5.0	1,600	3,200 (Setting 2)	4
ATV•A0M10R4 (2)	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	6

(1) Rated instantaneous short-circuit current setting

(2) 2 circuit breakers are required. One circuit breaker each for 3 modules.

440 V Heavy Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11R4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C13R4	50 kA, 100 ms	NSX250N Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C16R4	50 kA, 100 ms	NSX400H Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C20R4	50 kA, 100 ms	NSX400H Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C25R4	50 kA, 100 ms	NSX630H Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C31R4	50 kA, 100 ms	NSX630H Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C35R4	50 kA, 100 ms	NSX630H Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C40R4	50 kA, 100 ms	NS630bN Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C45R4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C50R4	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C56R4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C63R4	50 kA, 100 ms	NS1000N Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0C71R4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0C80R4	50 kA, 100 ms	NS1250N Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0M10R4 (2)	50 kA, 100 ms	NS800N Micrologic 5.0	800	1,600 (Setting 2)	4

(1) Rated instantaneous short-circuit current setting

(2) 2 circuit breakers are required. One circuit breaker each for 3 modules.

500 V Normal Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11N6	50 kA, 100 ms	NSX160L Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C13N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C16N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C20N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C25N6	50 kA, 100 ms	NSX400L Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C31N6	50 kA, 100 ms	NSX400L Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C40N6	50 kA, 100 ms	NSX630L Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C50N6	50 kA, 100 ms	NS630bH Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C63N6	50 kA, 100 ms	NS800H Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C80N6	50 kA, 100 ms	NS1000H Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0M10N6	50 kA, 100 ms	NS1250H Micrologic 5.0	1,250	2,500 (Setting 2)	3
ATV•A0M12N6	50 kA, 100 ms	NS1600H Micrologic 5.0	1,600	3,200 (Setting 2)	4

(1) Rated instantaneous short-circuit current setting

500 V Heavy Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11N6	50 kA, 100 ms	NSX160L Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C13N6	50 kA, 100 ms	NSX160L Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C16N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C20N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C25N6	50 kA, 100 ms	NSX250L Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C31N6	50 kA, 100 ms	NSX400L Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C40N6	50 kA, 100 ms	NSX400L Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C50N6	50 kA, 100 ms	NSX630L Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C63N6	50 kA, 100 ms	NS630bH Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C80N6	50 kA, 100 ms	NS800H Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0M10N6	50 kA, 100 ms	NS1000H Micrologic 5.0	1,000	2,000 (Setting 2)	3
ATV•A0M12N6	50 kA, 100 ms	NS1250H Micrologic 5.0	1,250	2,500 (Setting 2)	3

(1) Rated instantaneous short-circuit current setting

690 V Normal Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C13Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C16Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C20Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C25Q6	50 kA, 100 ms	NSX400HB1 Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C31Q6	50 kA, 100 ms	NSX400HB1 Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C40Q6	50 kA, 100 ms	NSX630HB1 Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C50Q6	50 kA, 100 ms	NS630bLB Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C63Q6	50 kA, 100 ms	NS800LB Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0C80Q6	50 kA, 100 ms	MTZ2 10H1 Micrologic 5.0 X	1,000	2,000 (Setting 2)	3
ATV•A0M10Q6	50 kA, 100 ms	MTZ2 12H1 Micrologic 5.0 X	1,250	2,500 (Setting 2)	3
ATV•A0M12Q6	50 kA, 100 ms	MTZ2 16H1 Micrologic 5.0 X	1,600	3,200 (Setting 2)	4

(1) Rated instantaneous short-circuit current setting

690 V Heavy Duty

Modular Single Drive	Mains Supply	IEC Upstream Protection Device			
	Maximum I_{SC}	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (1)	Minimum I_{SC} [kA]
ATV•A0C11Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C13Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 160	160	2,400 (Fixed)	5
ATV•A0C16Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C20Q6	50 kA, 100 ms	NSX250HB1 Micrologic 2.2 250	250	3,000 (Fixed)	6
ATV•A0C25Q6	50 kA, 100 ms	NSX400HB1 Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C31Q6	50 kA, 100 ms	NSX400HB1 Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C40Q6	50 kA, 100 ms	NSX400HB1 Micrologic 2.3 400	400	4,800 (Fixed)	9
ATV•A0C50Q6	50 kA, 100 ms	NSX630HB1 Micrologic 2.3 630	600	6,900 (Fixed)	12
ATV•A0C63Q6	50 kA, 100 ms	NS630bLB Micrologic 5.0	630	1,260 (Setting 2)	2
ATV•A0C80Q6	50 kA, 100 ms	NS800LB Micrologic 5.0	800	1,600 (Setting 2)	2
ATV•A0M10Q6	50 kA, 100 ms	MTZ2 10H1 Micrologic 5.0 X	1,000	2,000 (Setting 2)	3
ATV•A0M12Q6	50 kA, 100 ms	MTZ2 12H1 Micrologic 5.0 X	1,250	2,500 (Setting 2)	3

(1) Rated instantaneous short-circuit current setting

cULus Circuit Breakers

Preliminary Information

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the instructions given in this manual, National Electrical Code and any additional local codes.

NOTE: For use in Canada (CSA), branch circuit protection must be provided in accordance with the Canadian Electrical Code, Part I.

cULus – Specification of the Circuit Breaker

480 V Normal Duty

Modular Single Drive	Mains Supply	cUL Upstream Protection Device			
	Maximum I_{SC} (1)	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (2)	Minimum I_{SC} [kA]
ATV•A0C11T4	100 kA	JLL36250U31X	250	500 (Setting 2)	1
ATV•A0C13T4	100 kA	LLL36400U31X	400	800 (Setting 2)	2
ATV•A0C16T4	100 kA	LLL36400U31X	400	800 (Setting 2)	2
ATV•A0C20T4	100 kA	LLL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C25T4	100 kA	LLL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C31T4	100 kA	PLL34080U31A	736	1,600 (Setting 2)	2
ATV•A0C35T4	100 kA	PLL34080U31A	736	1,600 (Setting 2)	2
ATV•A0C40T4	100 kA	PLL34100U44A	920	2,000 (Setting 2)	3
ATV•A0C45T4	100 kA	PLL34100U44A	920	2,000 (Setting 2)	3
ATV•A0C50T4	100 kA	PLL34100U44A	920	2,000 (Setting 2)	3
ATV•A0C56T4	100 kA	PLL34120U44A	1,104	2,400 (Setting 2)	3
ATV•A0C63T4	100 kA	RLF36160U44A	1,472	3,200 (Setting 2)	4
ATV•A0C71T4	100 kA	RLF36160U44A	1,472	3,200 (Setting 2)	4
ATV•A0C80T4	100 kA	RLF36160U44A	1,472	3,200 (Setting 2)	4
ATV•A0M10T4 (3)(4)	100 kA	PLL34100U44A	920	2,000 (Setting 2)	6

(1) kA rms symmetrical amperes

(2) Rated instantaneous short-circuit current setting

(3) 2 circuit breakers are required. One circuit breaker each for 3 modules.

(4) This reference is not available in cULus.

480 V Heavy Duty

Modular Single Drive	Mains Supply	cUL Upstream Protection Device			
	Maximum I_{SC} (1)	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (2)	Minimum I_{SC} [kA]
ATV•A0C11T4	100 kA	JLL36250U31X	250	500 (Setting 2)	1
ATV•A0C13T4	100 kA	JLL36250U31X	250	500 (Setting 2)	1
ATV•A0C16T4	100 kA	LLL36400U31X	400	800 (Setting 2)	2
ATV•A0C20T4	100 kA	LLL36400U31X	400	800 (Setting 2)	2
ATV•A0C25T4	100 kA	LLL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C31T4	100 kA	LLL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C35T4	100 kA	PLL34080U31A	736	1,600 (Setting 2)	2
ATV•A0C40T4	100 kA	PLL34080U31A	736	1,600 (Setting 2)	2
ATV•A0C45T4	100 kA	PLL34080U31A	736	1,600 (Setting 2)	2
ATV•A0C50T4	100 kA	PLL34100U44A	920	2,000 (Setting 2)	3
ATV•A0C56T4	100 kA	PLL34100U44A	920	2,000 (Setting 2)	3
ATV•A0C63T4	100 kA	PLL34120U44A	1,104	2,400 (Setting 2)	3
ATV•A0C71T4	100 kA	PLL34120U44A	1,104	2,400 (Setting 2)	3
ATV•A0C80T4	100 kA	RLF36160U44A	1,472	3,200 (Setting 2)	4
ATV•A0M10T4 (3)(4)	100 kA	PLL34100U44A	920	2,000 (Setting 2)	6

(1) kA rms symmetrical amperes

(2) Rated instantaneous short-circuit current setting

(3) 2 circuit breakers are required. One circuit breaker each for 3 modules.

(4) This reference is not available in cULus.

600 V Normal Duty

Modular Single Drive	Mains Supply	cUL Upstream Protection Device			
	Maximum I_{SC} (1)	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (2)	Minimum I_{SC} [kA]
ATV•A0C11T6	100 kA (65 kA)	HRL36150U31X	150	300 (Setting 2)	1
ATV•A0C13T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C16T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C20T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C25T6	100 kA (65 kA)	LRL36400U31X	400	800 (Setting 2)	2
ATV•A0C31T6	100 kA (65 kA)	LRL36400U31X	400	800 (Setting 2)	2
ATV•A0C40T6	100 kA (65 kA)	LRL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C50T6	65 kA	LRL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C63T6	65 kA	MTZ2 08L Micrologic 3.0 X	736	1,600 (Setting 2)	2
ATV•A0C80T6	65 kA	MTZ2 12L Micrologic 6.0 X	1,104	2,400 (Setting 2)	3
ATV•A0M10T6	65 kA	MTZ2 12L Micrologic 6.0 X	1,104	2,400 (Setting 2)	3
ATV•A0M12T6	65 kA	MTZ2 16L Micrologic 6.0 X	1,472	3,200 (Setting 2)	4

(1) kA rms symmetrical amperes

(2) Rated instantaneous short-circuit current setting

600 V Heavy Duty

Modular Single Drive	Mains Supply	cUL Upstream Protection Device			
	Maximum I_{SC} (1)	Circuit Breaker	Rating [A] @ 50°C (122°F)	I_i (Setting) [A] (2)	Minimum I_{SC} [kA]
ATV•A0C11T6	100 kA (65 kA)	HRL36150U31X	150	300 (Setting 2)	1
ATV•A0C13T6	100 kA (65 kA)	HRL36150U31X	150	300 (Setting 2)	1
ATV•A0C16T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C20T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C25T6	100 kA (65 kA)	JRL36250U31X	250	500 (Setting 2)	1
ATV•A0C31T6	100 kA (65 kA)	LRL36400U31X	400	800 (Setting 2)	2
ATV•A0C40T6	100 kA (65 kA)	LRL36400U31X	400	800 (Setting 2)	2
ATV•A0C50T6	65 kA	LRL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C63T6	65 kA	LRL36600U31X	600	1,200 (Setting 2)	3
ATV•A0C80T6	65 kA	MTZ2 08L Micrologic 3.0 X	736	1,600 (Setting 2)	2
ATV•A0M10T6	65 kA	MTZ2 12L Micrologic 6.0 X	1,104	2,400 (Setting 2)	3
ATV•A0M12T6	65 kA	MTZ2 12L Micrologic 6.0 X	1,104	2,400 (Setting 2)	3

(1) kA rms symmetrical amperes

(2) Rated instantaneous short-circuit current setting

NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains busbars of each power module as well as on the mains terminals.

cULus – Specification of the Additional Line Reactor

Depending on the mains conditions it may be required to install an additional line reactor.

480 V

Modular Single Drive	Inductance of line reactor [µH] depending on the SCCR, minimum values given										
	Max. 0.5% NEMA unbalance			Max. 1 % NEMA unbalance			Max. 2 % NEMA unbalance			I_{therm} RMS	I_{magn} peak
ATV•A0	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	[A]	[A]
C11T4	–	–	–	58	61	65	130	133	137	300	570
C13T4	–	–	–	58	61	65	130	133	137	300	570
C16T4	–	–	–	58	61	65	130	133	137	300	570
C20T4	–	10	15	34	37	41	58	61	65	600	1,140
C25T4	–	10	15	34	37	41	58	61	65	600	1,140
C31T4	–	10	15	34	37	41	58	61	65	600	1,140
C35T4	–	–	–	8	11	15	22	25	29	900	1,710
C40T4	–	–	–	8	11	15	22	25	29	900	1,710
C45T4	–	–	–	8	11	15	22	25	29	900	1,710
C50T4	–	–	–	8	11	15	22	25	29	900	1,710
C56T4	–	–	–	–	5	10	10	13	17	1,200	2,280
C63T4	–	–	–	–	5	10	10	13	17	1,200	2,280
C71T4	–	–	–	–	–	5	5	7	11	1,500	2,850
C80T4	–	–	–	–	–	5	5	7	11	1,500	2,850

600 V

Modular Single Drive	Inductance of line reactor [µH] depending on the SCCR, minimum values given										
	Max. 0.5 % NEMA unbalance			Max. 1 % NEMA unbalance			Max. 2 % NEMA unbalance			I_{therm} RMS	I_{magn} peak
ATV•A0	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	I_{SC} ≤ 50 kA	I_{SC} ≤ 65 kA	I_{SC} ≤ 100 kA	[A]	[A]
C11T6	–	–	–	42	45	51	162	166	171	251	460
C13T6	–	–	–	42	45	51	162	166	171	251	460
C16T6	–	–	–	42	45	51	162	166	171	251	460
C20T6	–	–	–	42	45	51	162	166	171	251	460
C25T6	–	–	–	27	31	36	72	76	81	430	920
C31T6	–	–	–	27	31	36	72	76	81	430	920
C40T6	–	–	–	27	31	36	72	76	81	430	920
C50T6	–	–	–	12	16	n.a.	42	46	n.a.	645	1,380
C63T6	–	–	–	12	16	n.a.	42	46	n.a.	645	1,380
C80T6	–	–	–	–	5	n.a.	27	31	n.a.	860	1,840
M10T6	–	–	–	–	–	n.a.	12	16	n.a.	1,075	2,300
M12T6	–	–	–	–	–	n.a.	5	9	n.a.	1,290	2,760

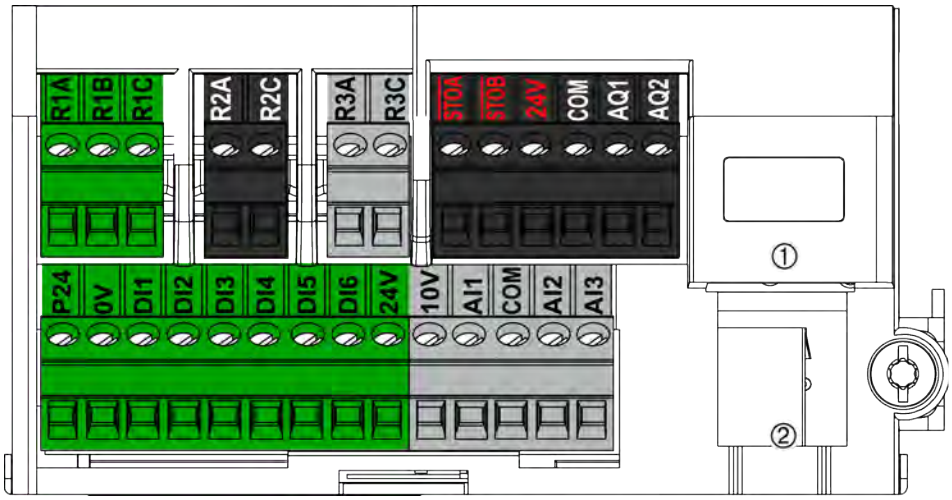
n.a. ... not applicable

Control Terminals

What's in This Chapter

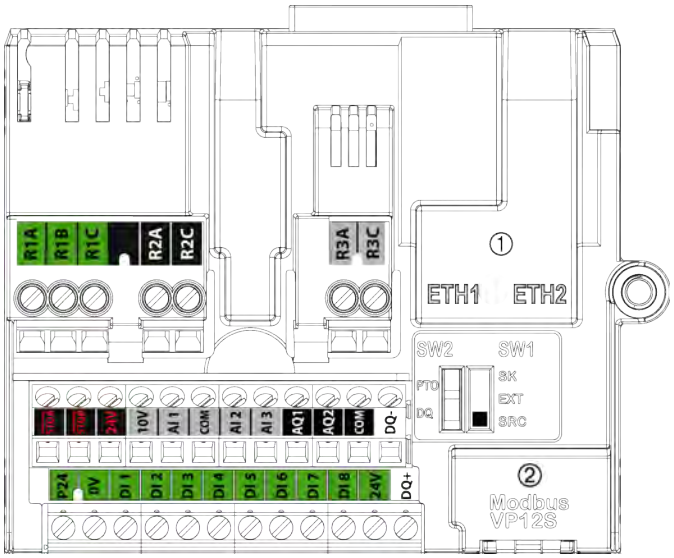
Arrangement and Characteristics of Control Block Terminals and Communication and I/O Ports

ATV600 Control Unit - Terminal Arrangement



① Ethernet Modbus TCP, ② Serial Modbus

ATV900 Control Unit - Terminal Arrangement



① Ethernet Modbus TCP, ② Serial Modbus

Wiring Characteristics

NOTE: Control terminals can accept 1 or 2 wires.

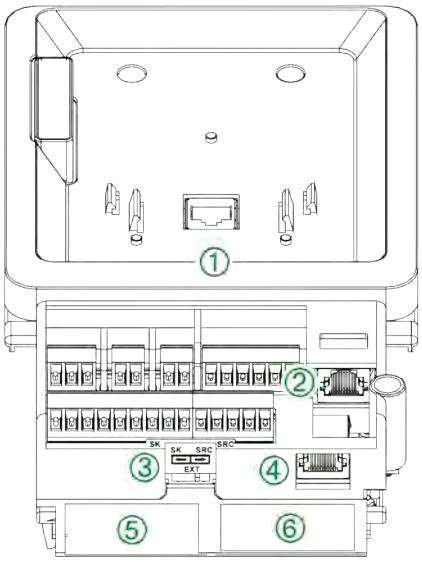
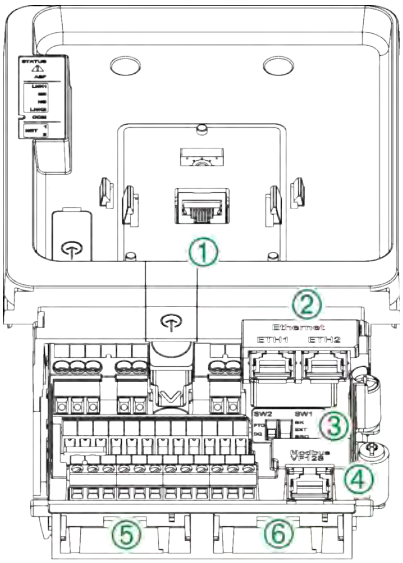
Wire cross sections and tightening torques per wire

Control Terminals	Relay Output Wire Cross Section		Other Wire Cross Section		Tightening Torque
	Minimum (1)	Maximum	Minimum (1)	Maximum	
	mm² (AWG)	mm² (AWG)	mm² (AWG)	mm² (AWG)	N•m (lbf•in)
All terminals	0.75 (18)	1.5 (16)	0.5 (20)	1.5 (16)	0.5 (4.4)
(1) The value corresponds to the minimum permissible cross section of the terminal.					

Maximum cable length:

- AI•, AQ•, DI•, DQ•: 50 m (164 ft) shielded
- STOA, STOB: 30 m (98 ft) unshielded or 50 m (164 ft) shielded

Control Block Ports

ATV600	ATV900
	
① RJ45 port for Graphic display Terminal	
② RJ45 port for Ethernet embedded	2 x RJ45 ports for Ethernet embedded
③ Sink-Ext-Source switch	Sink-Ext-Source switch and PTO-DQ switch
④ RJ45 port for Modbus embedded	
⑤ Slot B, for I/O modules	Slot B, for encoder interface, and I/O module
⑥ Slot A, for fieldbus and I/O modules	

RJ45 Communication Ports

They allow to connect:

- A PC
  - Using a commissioning software (SoMove, SoMachine..), to configure and monitor the drive
  - To access the drive webserver

- A SCADA system
- A PLC system
- A Graphic display Terminal, using Modbus protocol
- A Modbus fieldbus

NOTE: Verify that RJ45 cable is not damaged prior to connect it to the product otherwise the power supply of the control could be lost.

NOTE: Do not plug Ethernet cable in Modbus plug or vice versa.

Control Terminals Electrical Data

ATV600 Control Block

⚠WARNING

INCORRECT WIRING

- Only PELV circuits are allowed to be connected on the control part (except relays R1, R2 and R3).

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

NOTE:

- For a description of the terminal arrangement, refer to Arrangement and Characteristics of Control Terminals and Communication And I/O Ports, page 88
- For factory setting I/O assignment, refer to the ATV600 Programming manual.

Terminal	Description	I/O Type	Electrical characteristics
R1A	NO contact of relay R1	O	**Output Relay 1** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 3 A for 250 Vac (OVC II) and 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to ac or dc operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99. • Refresh time: 5 ms ± 0.5 ms • Service life: 100,000 operations at maximum switching current
R1B	NC contact of relay R1	O	
R1C	Common point contact of relay R1	O	
R2A	NO contact of relay R2	O	**Output Relay 2** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 5 A for 250 Vac (OVC II) and 3A for 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVCII) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to ac or dc operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99 • Refresh time: 5 ms ± 0.5 ms • Service life: ◦ 100,000 operations at maximum switching current ◦ 1,000,000 operations at 0.5 A
R2C	Common point contact of relay R2	O	

Terminal	Description	I/O Type	Electrical characteristics
R3A	NO contact of relay R3	O	**Output Relay 3** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 5 A for 250 Vac (OVCII) and 3A for 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVCII) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to AC or DC operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99 • Refresh time: 5 ms ± 0.5 ms • Service life: ◦ 100,000 operations at maximum switching current ◦ 1,000,000 operations at 0.5 A
R3C	Common point contact of relay R3	O	
$\overline{\text{STOA}}$, $\overline{\text{STOB}}$	STO inputs	I	**Safety Function STO Inputs** Refer to the Embedded Safety Function Manual (EAV64334) available on www.se.com
24V	Output power supply for digital inputs and safety function STO inputs	O	Use only PELV standard power supply unit. • +24 Vdc • Tolerance: minimum 20.4 Vdc, maximum 27 Vdc • Current: maximum 200 mA for both 24 Vdc terminals • Terminal protected against overload and short-circuit • In Sink Ext position, this supply is powered by external PLC supply
COM	Analog I/O common	I/O	0 V for Analog outputs
AQ1	Analog output	O	AQ: Analog output software-configurable for voltage or current • Voltage analog output 0...10 Vdc, minimum. Minimum load impedance 470 Ω, • Current analog output X-Y mA by programming X and Y from 0...20 mA, maximum load impedance 500 Ω • Sampling time: 10 ms + 1 ms maximum • Resolution 10 bits • Accuracy: ±1 % for a temperature variation of 60 °C (140 °F) • Linearity ±0.2 %
AQ2	Analog output	O	
P24	External input supply	I	External input supply +24 Vdc • Tolerance: minimum 19 Vdc, maximum 30 Vdc • Current: maximum 0.8 A
0V	0 V	I/O	0 V for P24
DI1-DI6	Digital inputs	I	6 programmable logic inputs 24 Vdc, comply with IEC/EN 61131-2 logic type 1 • Positive logic (Source): State 0 if ≤ 5 Vdc or logic input not wired, state 1 if ≥ 11 Vdc • Negative logic (Sink):State 0 if ≥ 16 Vdc or logic input not wired, state 1 if ≤ 10 Vdc • Impedance 3.5 kΩ • Maximum voltage: 30 Vdc • Sampling time: 2 ms + 0.5 ms maximum Multiple assignment makes it possible to configure several functions on one input (example: DI1 assigned to forward and preset speed 2, DI3 assigned to reverse and preset speed 3).
DI5-DI6	Pulse inputs	I	Programmable Pulse input • Comply with level 1 PLC, IEC 65A-68 standard • State 0 if < 0.6 Vdc, state 1 if > 2.5 Vdc • Pulse counter 0...30 kHz • Frequency range: 0…30 kHz • Cyclic ratio: 50 % ±10 % • Maximum input voltage 30 Vdc, < 10 mA • Sampling time: 5 ms + 1 ms maximum

Terminal	Description	I/O Type	Electrical characteristics
10V	Output supply for Analog input	O	Internal supply for the analog inputs • 10.5 Vdc • Tolerance ±5 % • Current: maximum 10 mA • Short circuit protected
AI1-AI2-AI3	Analog inputs	I	Software-configurable V/A : voltage or current analog input • Voltage analog input 0...10 Vdc, impedance 30 kΩ, • Current analog input X-Y mA by programming X and Y from 0...20 mA, with impedance 250 Ω • Sampling time: 5 ms + 1 ms maximum • Resolution 12 bits • Accuracy: ±0.6 % for a temperature variation of 60 °C (140 °F) • Linearity ±0.15 % of maximum value
COM	Analog I/O common	I/O	0 V for Analog inputs
AI2-AI3	Sensor inputs	I	Software-configurable PT100/PT1000 or KTY84 or PTC or Water level sensor • **PT100** ◦ 1 thermal sensor or 3 thermal sensors mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 5 mA ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **PT1000** ◦ 1 thermal sensor or 3 thermal sensors mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **PTC** ◦ 1 thermal sensor or 3 thermal sensors or 6 thermal sensors mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Nominal value: < 1.5 kΩ ◦ Overheat trigger threshold : 2.9 kΩ ± 0.2kΩ ◦ Overheat reset threshold : 1.575 kΩ ± 75Ω ◦ Low impedance detection threshold : 50 Ω -10 Ω / +20 Ω ◦ Open circuit threshold : 100 kΩ ± 10kΩ • **KTY84** ◦ 1 thermal sensor mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **Water Level Sensor** ◦ Sensitivity: 0...1 MΩ, adjustable by software ◦ Water level sensor current: 0.3 mA...1 mA maximum ◦ Adjustable delay: 0...10 s

ATV900 Control Block

⚠WARNING

INCORRECT WIRING

- Only PELV circuits are allowed to be connected on the control part (except relays R1, R2 and R3).

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

NOTE:

- For a description of the terminal arrangement, refer to Arrangement and Characteristics of Control Terminals and Communication And I/O Ports, page 88
- For factory setting I/O assignment, refer to the ATV900 Programming manual.

Terminal	Description	I/O Type	Electrical characteristics
R1A	NO contact of relay R1	O	**Output Relay 1** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 3 A for 250 Vac (OVC II) and 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to AC or DC operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99. • Refresh time: 1 ms ± 0.25 ms • Service life: 100,000 operations at maximum switching current
R1B	NC contact of relay R1	O	
R1C	Common point contact of relay R1	O	
R2A	NO contact of relay R2	O	**Output Relay 2** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 5 A for 250 Vac (OVC II) and 3A for 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to AC or DC operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99. • Refresh time: 1 ms ± 0.25 ms • Service life: ◦ 100,000 operations at maximum switching current ◦ 1,000,000 operations at 0.5 A
R2C	Common point contact of relay R2	O	
R3A	NO contact of relay R3	O	**Output Relay 3** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 5 A for 250 Vac (OVC II) and 3 A for 30 Vdc • Maximum switching current on inductive load (cos ϕ ≥0.4 and L/R ≤ 7 ms): 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge limitation device according to AC or DC operation with total energy dissipation greater than the inductive energy stored in the load. Refer to sections Output Relay with Inductive AC Loads , page 98 and Output Relay with Inductive DC Loads , page 99. • Refresh time: 1 ms ± 0.25 ms • Service life: ◦ 100,000 operations at maximum switching current ◦ 1,000,000 operations at 0.5 A
R3C	Common point contact of relay R3	O	

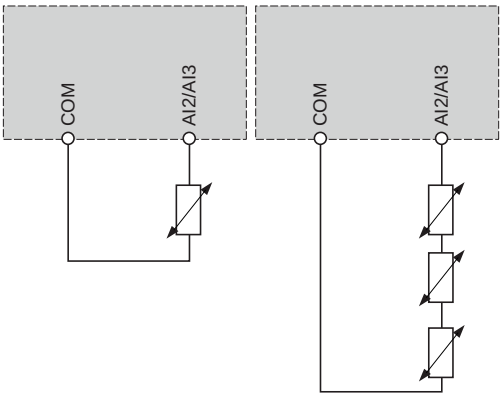
Terminal	Description	I/O Type	Electrical characteristics
$\overline{\text{STOA}}$, $\overline{\text{STOB}}$	STO inputs	I	**Safety Function STO Inputs** Refer to the ATV900 Embedded Safety Function manual NHA80947 available on www.se.com
24V	Output power supply for digital inputs and safety function STO inputs	O	Use only PELV standard power supply unit. • +24 Vdc • Tolerance: minimum 20.4 Vdc, maximum 27 Vdc • Current: maximum 200 mA for both 24 Vdc terminals • Terminal protected against overload and short-circuit • In Sink Ext position, this supply is powered by external PLC supply
10V	Output supply for Analog input	O	Internal supply for the analog inputs • 10.5 Vdc • Tolerance ± 5 % • Current: maximum 10 mA • Short circuit protected
AI1, AI3	Analog inputs and sensor inputs	I	Software-configurable V/A : voltage or current analog input • Voltage analog input 0...10 Vdc, impedance 31.5 kΩ, • Current analog input X-Y mA by programming X and Y from 0...20 mA, with impedance 250 Ω • Sampling time: 1 ms + 1 ms maximum • Resolution 12 bits • Accuracy: ± 0.6 % for a temperature variation of 60 °C (140 °F) • Linearity ± 0.15 % of maximum value Software-configurable thermal sensors or Water level sensor • **PT100** ◦ 1 thermal sensor mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 5 mA maximum ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **PT1000** ◦ 1 thermal sensor mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **KTY84** ◦ 1 thermal sensor mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Range –20...200 °C (–4...392 °F) ◦ Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F). • **PTC** ◦ 1 thermal sensor or 3 thermal sensors or 6 thermal sensors mounted in series (configurable by software) (see Sensor Connection, page 96) ◦ Thermal sensor current: 1 mA ◦ Nominal value: < 1.5 kΩ ◦ Overheat trigger threshold: 2.9 kΩ ± 0.2 kΩ ◦ Overheat reset threshold: 1.575 kΩ ± 75 Ω ◦ Low impedance detection threshold : 50 Ω -10 Ω / +20 Ω ◦ Open circuit threshold : 100 kΩ ± 10kΩ
COM	Analog I/O common	I/O	0 V for Analog outputs
AI2	Analog input	I	Voltage bipolar analog input –10...10 Vdc, impedance 31.5 kΩ • Sampling time: 1 ms + 1 ms maximum • Resolution 12 bits • Accuracy ± 0.6 % for a temperature variation of 60 °C (140 °F). • Linearity ± 0.15 % of maximum value

Terminal	Description	I/O Type	Electrical characteristics
AQ1	Analog output	O	AQ: Analog output software-configurable for voltage or current • Voltage analog output 0...10 Vdc, minimum. Minimum load impedance 470 Ω, • Current analog output X-Y mA by programming X and Y from 0...20 mA, maximum load impedance 500 Ω • Sampling time: 5 ms + 1 ms maximum • Resolution 10 bits • Accuracy: ± 1 % for a temperature variation of 60 °C (140 °F) • Linearity ± 0.2 %
AQ2	Analog output	O	
COM	Digital and analog output Common	I/O	0 V for analog outputs and logic output
DQ–	Digital output DQ1	O	Digital output configurable by switch • Insulated • Maximum voltage: 30 Vdc • Maximum current: 100 mA • Frequency range: 0...1 kHz • Positive/Negative logic is managed by user external wiring.
DQ+		O	
DQ+	Pulse output	O	Pulse train output configurable by switch • Open collector not insulated • Maximum voltage: 30 Vdc • Maximum current: 20 mA • Frequency range: 0...30 kHz
P24	External input supply	I	+24 Vdc external input supply • Tolerance: minimum 19 Vdc, maximum 30 Vdc • Maximum current: 0.8 A
0V	0 V	I/O	0 V of P24
DI1-DI8	Digital inputs	I	8 programmable logic inputs 24 Vdc, comply with IEC/EN 61131-2 logic type 1 • Positive logic (Source): State 0 if ≤ 5 Vdc or logic input not wired, state 1 if ≥ 11 Vdc • Negative logic (Sink):State 0 if ≥ 16 Vdc or logic input not wired, state 1 if ≤ 10 Vdc • Impedance 3.5 kΩ • Maximum voltage: 30 Vdc • Sampling time: 2 ms + 0.5 ms maximum Multiple assignment makes it possible to configure several functions on one input (example: DI1 assigned to forward and preset speed 2, DI3 assigned to reverse and preset speed 3).
DI7-DI8	Pulse inputs	I	Programmable Pulse input • Comply with level 1 PLC, IEC 65A-68 standard • State 0 if < 0.6 Vdc, state 1 if > 2.5 Vdc • Pulse counter 0...30 kHz • Frequency range: 0…30 kHz • Cyclic ratio: 50 % ± 10 % • Maximum input voltage 30 Vdc, < 10 mA • Sampling time: 5 ms + 1 ms maximum

Sensor Connection

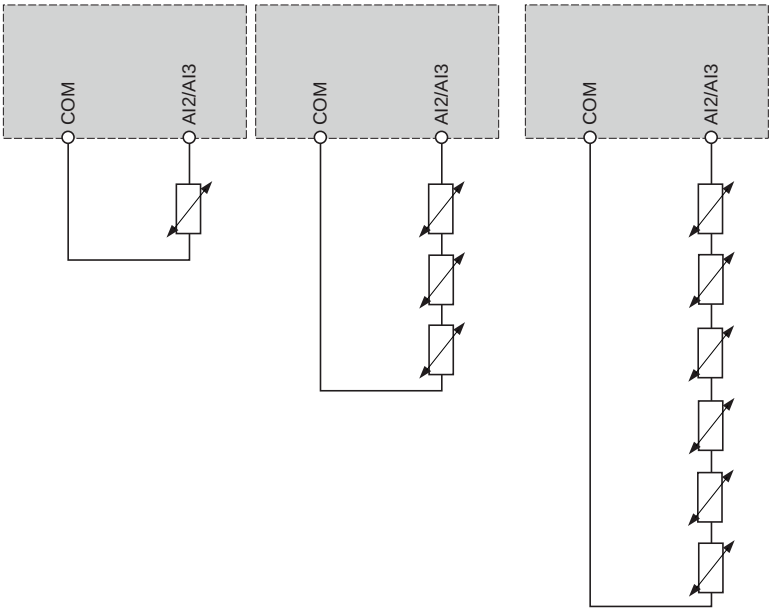
ATV6A0 – PT100 — PT1000 Sensor Connection

It is possible to connect either 1 thermal sensor or 3 thermal sensors on terminals AI2 or AI3.



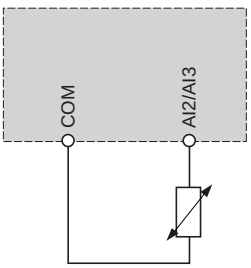
ATV6A0 – PTC Sensor Connection

It is possible to connect either 1 thermal sensor or 3 thermal sensors or 6 thermal sensors on terminals AI2 or AI3.



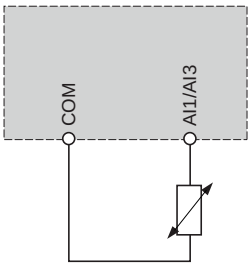
ATV6A0 – KTY Sensor Connection

It is possible to connect 1 thermal sensor on terminals AI2 or AI3.



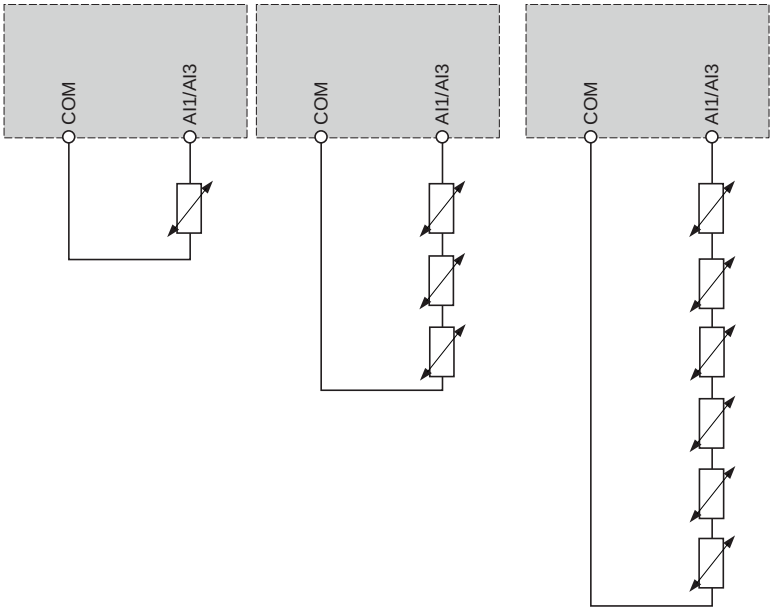
ATV9A0 – KTY — PT100 — PT1000 Sensor Connection

It is possible to connect 1 thermal sensor on terminals AI1 or AI3.



ATV9A0 – PTC Sensor Connection

It is possible to connect either 1 thermal sensor or 3 thermal sensors or 6 thermal sensors on terminals AI1 or AI3.



Output Relay with Inductive AC Loads

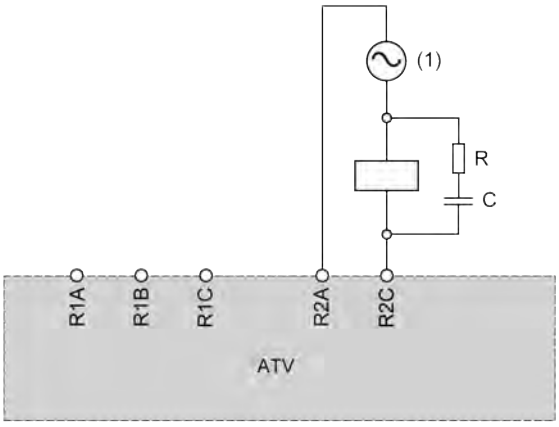
General

The AC voltage source must be of overvoltage category II (OVC II) according to IEC 61800-5-1.

If it is not the case, an isolation transformer must be used.

Contactors with AC Coil

If controlled by a relay, a resistor-capacitor (RC) circuit must be connected in parallel to the coil of the contactor as shown on the diagram below:



(1) AC 250 Vac maximum.

Schneider Electric AC contactors have a dedicated area on the housing to plug easily the RC device. Refer to the Motor control and protection components catalog MKTED210011EN available on se.com to find the RC device to be associated with the contactor used.

Example: With a 48 Vac source, contactors LC1D09E7 or LC1DT20E7 have to be used with LAD4RCE voltage suppression device.

Other Inductive AC Loads

For other inductive AC loads:

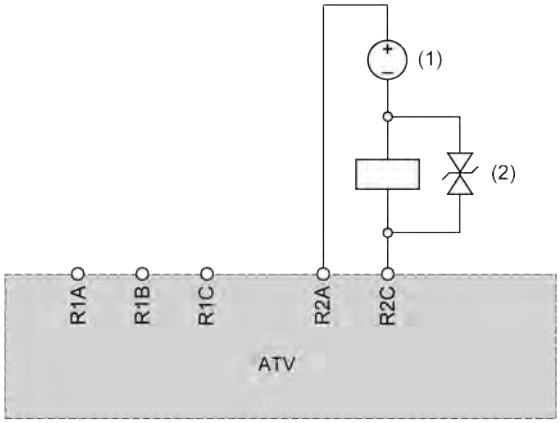
- Use an auxiliary contactor connected on the product to control the load.

  Example: with a 48 Vac source, auxiliary contactors CAD32E7 or CAD50E7 with LAD4RCE voltage suppression device.
- When using a third party inductive AC load, request the supplier to provide information on the voltage suppression device, in order to avoid overvoltage above 375 V during relay opening.

Output Relay with Inductive DC loads

Contactors with DC Coil

If controlled by a relay, a bidirectional transient voltage suppression (TVS) diode, also called transil, must be connected in parallel to the coil of the contactor as shown on the diagram below:



(1) DC 30 Vdc maximum.

(2) TVS diode

Schneider Electric contactors with DC coil include the TVS diode. No additional device is required.

Refer to the Motor control and protection components catalog MKTED210011EN available on se.com for more information.

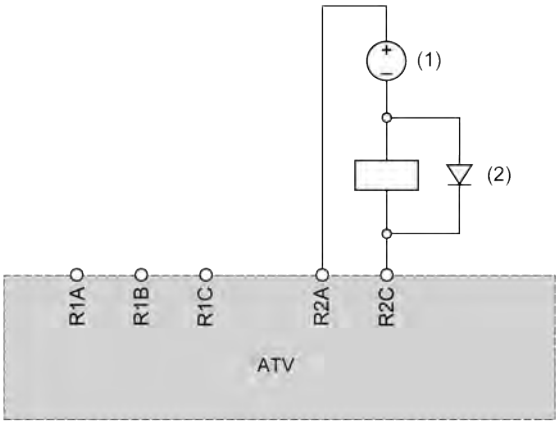
Other Inductive DC Loads

Other inductive DC loads without embedded TVS diode must use one of the following voltage suppression device:

- A bidirectional TVS device as shown on the diagram above, defined by:
  - TVS break-down voltage greater than 35 Vdc,
  - TVS clamping voltage V(TVS) less than 50 Vdc
  - TVS peak power dissipation greater than load rated current, I(load) x V (TVS).

    Example: with I(load) = 0.9 A and V(TVS) = 50 Vdc, TVS peak power must be greater than 45 W
  - TVS average power dissipation greater than the value calculated by the following 0.5 x I(load) x V(TVS) x load time constant x number of operation per second.

    Example: with I(load) = 0.9 A and V(TVS) = 50 Vdc, load time constant = 40 ms (load inductance divided by load resistance) and 1 operation every 3 s, the TVS average power dissipation must be greater than 0.5 x 0.9 x 50 x 0.04 x 0.33 = 0.3 W.
- A fly-back diode as shown in the diagram below:



(1) DC 30 Vdc maxi.

(2) Flyback diode

The diode is a polarized device. The fly-back diode must be defined by:

- a reverse voltage greater than 100 Vdc,
- a rated current greater than two times the load rated current,
- a thermal resistance: junction to ambient temperature (in K/W) less than 90 / (1.1 x I(load)) to operate at maximum 60°C (140°F) ambient temperature.

  Example: with I(load) = 1.5 A, select a 100 V, 3 A rated current diode with a thermal resistance from junction to ambient less than 90 / (1.1 x 1.5) = 54.5 K/W.

Using a flyback diode, the relay opening time will be longer than with a TVS diode.

NOTE: Use diodes with leads for easy wiring and keep at least 1 cm (0.39 in.) of leads on each side of the case of the diode for a correct cooling.

Digital Inputs Wiring Depending on Sink / Source Switch Configuration

About the Switch

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

- If the drive is set to **Sink Int** or **Sink Ext**, do not connect the **0 V** terminal to ground or to protective ground.
- Verify that accidental grounding of digital inputs configured for sink logic, caused, for example, by damage to the signal cables, cannot occur.
- Follow all applicable standards and directives such as NFPA 79 and EN 60204 for proper control circuit grounding practices.

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

The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs. To access the switch, follow the Access to control Terminals procedure of the ATV600 or ATV900 Installation manual.

- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors.
- Set the switch to Ext if using PLC outputs with NPN transistors.

Wiring With Use of the Output Power Supply for the Digital Inputs

Switch set to **SRC** (Source) position

Switch set to **SK** (Sink) position

Wiring With Use of an External Power Supply for the Digital Inputs

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY INCORRECT POWER SUPPLY UNIT

The +24VDC supply voltage is connected with many exposed signal connections in the device.

- Use a power supply unit that meets the PELV (Protective Extra Low Voltage) requirements.

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

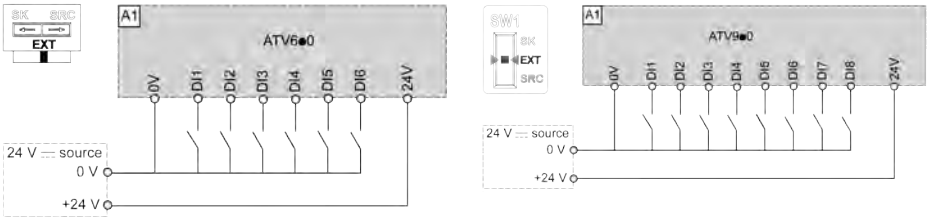
NOTICE

INCORRECT VOLTAGE

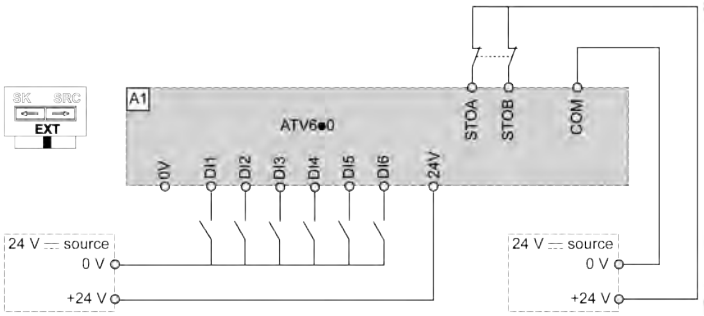
Supply the digital inputs with 24 Vdc only.

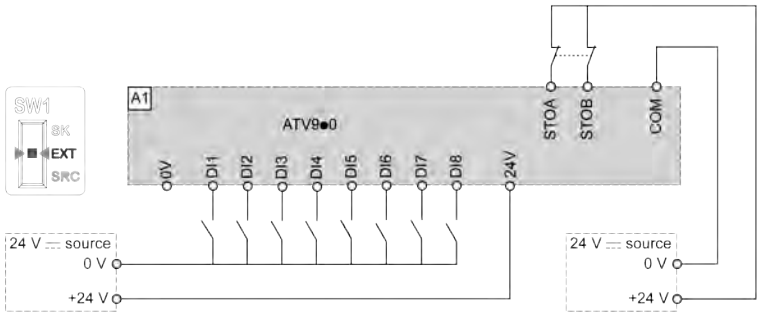
Failure to follow these instructions can result in equipment damage.

Switch set to **EXT** (Sink External) position **without functional isolation** on digital inputs



Switch set to **EXT** (Sink External) position **with functional isolation** on digital inputs. This configuration requires the use of 2 external supply units.

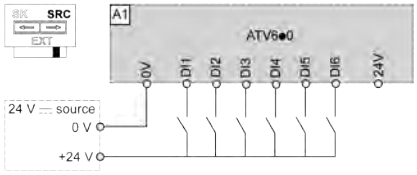


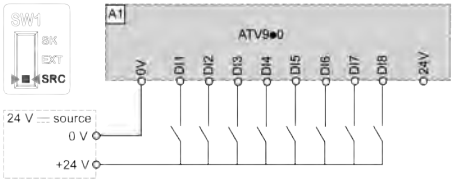


NOTE:

- STO inputs are also connected by default on a 24 Vdc terminal. If the external power supply is switched off, the function STO will be triggered.
- To avoid to trigger the STO function when switching-on the product, the external power supply must be previously switched on.

Switch set to **SRC** (Source) position





Pulse Train Output / Digital Output Switch Configuration

Product Scope

The information of this section only applies to ATV**9**A0 drives.

Purpose

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

- If the device is set to , do not connect the **0 V** terminal to ground or to protective ground.
- Verify that accidental grounding of digital inputs configured for sink logic, caused, for example, by damage to the signal cables, cannot occur.
- Follow all applicable standards and directives such as NFPA 79 and EN 60204 for proper control circuit grounding practices.

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

The SW2 (PTO/DQ) switch is used to configure the DQ+ or DQ- digital outputs.

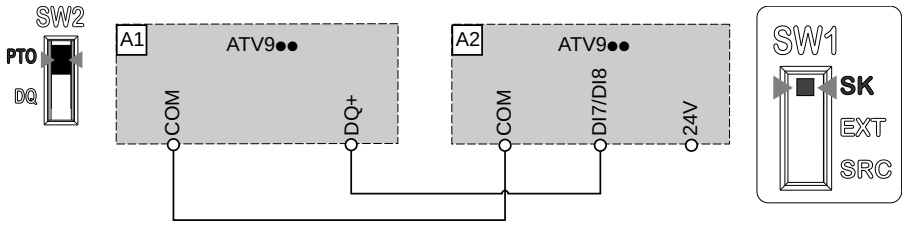
- Set the switch to **PTO (Pulse Train Output)** to configure DQ+ and DQ- outputs as pulse train outputs. This may be used to chain pulse train inputs of another drive, using its DI7 or DI8 pulse inputs.
- Set the switch to **DQ (Digital Output)** to configure DQ+ and DQ- outputs as an assignable logic output.

Access

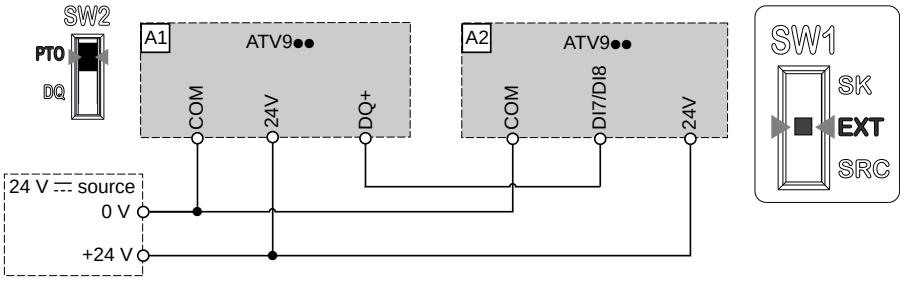
To access the switch, follow the Access to control Terminals procedure of the ATV900 Installation manual.

PTO, Pulse Train Output Configuration

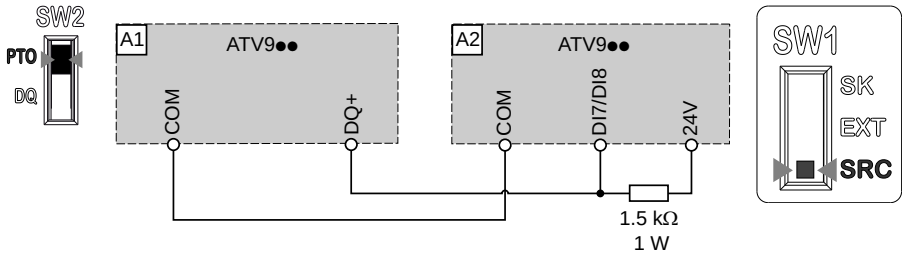
Switches SW1 (A1&A2) Set to SK (Sink mode) Position



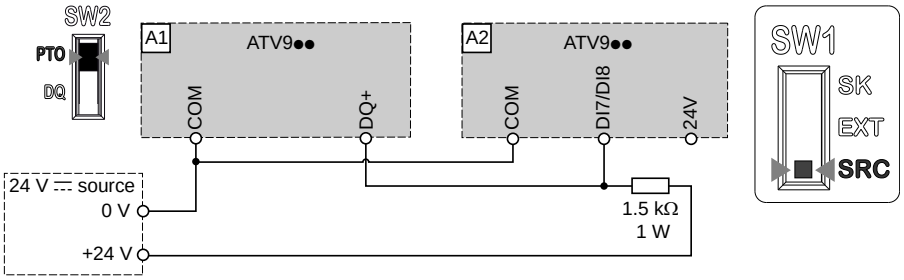
Switches SW1 (A1&A2) Set to EXT (Sink ext mode) Position



Switches SW1 (A1&A2) Set to SRC (Source mode) Position

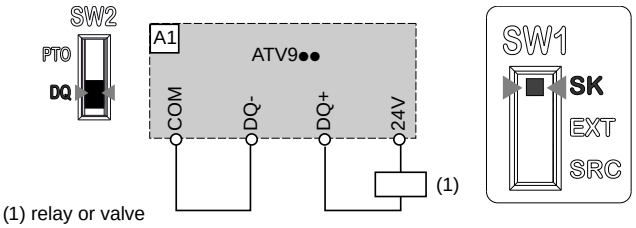


Switches SW1 (A1&A2) Set to SRC (Source ext mode) Position

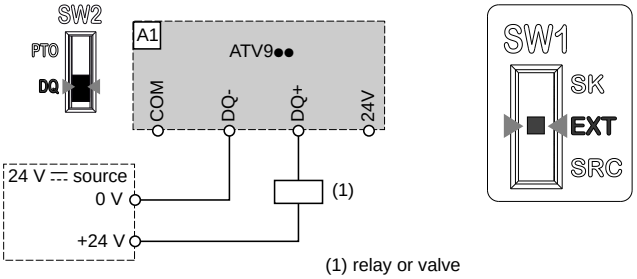


DQ, Digital Output Configuration

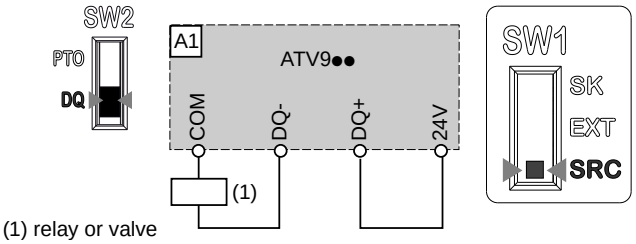
Switch SW1 Set to SK (Sink mode) Position



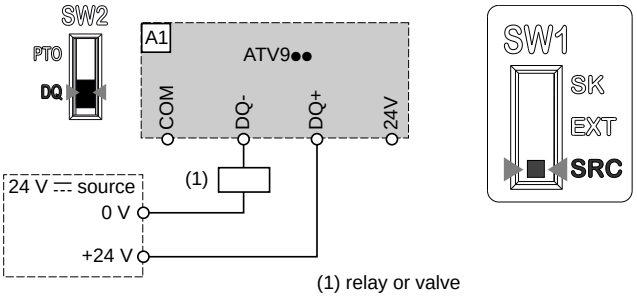
Switch SW1 Set to EXT (Sink ext mode) Position



Switch SW1 Set to SRC (Source mode) Position



Switch SW1 Set to SRC (Source ext mode) Position



Electrical Requirements

What's in This Part

Wiring Instructions

General Instructions

The entire installation procedure must be performed without voltage present.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Verify that the cables are properly installed as specified.
- Ensure protection against contact with live parts in the entire installation, including cables.
- Ensure adequate sealing of the cable entries.
- Before commissioning, verify that the degree of protection specified on the nameplate and in all pertinent product documentation is achieved.

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Verify that the temperature sensors in the motor meet the PELV requirements.
- Verify that the motor encoder meets the PELV requirements.
- Verify that any other equipment connected via signal cables meets the PELV requirements.

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

Signal interference can cause unexpected responses of the device and of other equipment in the vicinity of the device.

⚠WARNING

SIGNAL AND EQUIPMENT INTERFERENCE

- Install the wiring in accordance with the EMC requirements described in this document.
- Verify compliance with the EMC requirements described in this document.
- Verify compliance with all EMC regulations and requirements applicable in the country in which the product is to be operated and with all EMC regulations and requirements applicable at the installation site.

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

Unsuitable settings or unsuitable data or unsuitable wiring may trigger unintended movements, trigger signals, damage parts and disable monitoring functions.

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

- Only start the system if there are no persons or obstructions in the zone of operation.
- Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.
- Do not operate the product with unknown settings or data.
- Verify that the wiring is appropriate for the settings.
- Never modify a parameter unless you fully understand the parameter and all effects of the modification.
- When commissioning, carefully run tests for all operating states, operating conditions and potential error situations.
- Anticipate movements in unintended directions or oscillation of the motor.

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

⚠⚠DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- Wire cross sections and tightening torques must comply with the specifications provided in this document.
- If you use flexible multi-wire cables for a connection with a voltage higher than 25 Vac, you must use ring type cable lugs or wire ferrules, depending on the wire gauge and the specified stripping length of the cable.

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

The product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the product is touched.

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY HIGH LEAKAGE CURRENT

Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system installation.

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

⚠⚠DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, apply the instructions given in the section below.

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

Cable Characteristics

Use a shielded cable to meet the requirements of Category C3 according to the standard IEC 61800-3.

Standard linear capacity cables can be used with Altivar Process. Use of cables with lower linear capacity could increase cable length performances.

The overvoltage limitation function **[Motor surge limit.]** SuL enables you to increase the cable length while decreasing the torque performances (refer to ATV600 or ATV900 Programming manual).

Control Part

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

Verify that the digital and analog inputs and outputs are wired with the shielded, twisted pair cables specified in the present manual.

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

- Do not route 24 V signal cables next to power cables. For digital and analog inputs and outputs, use shielded twisted-pair cables with a pitch length of 25...50 mm (1...2 in.).
- Use wire ferrules, available on www.se.com.

NOTE:

- Use shielded cables for the analog inputs and outputs AIx, Ayx and COM. Each analog input and output has its own COM terminal.
- Each PTC input has its own COM terminal, not shared with other inputs and outputs.
- All digital inputs DIx use one common 24 V potential in source mode or one common COM potential in sink mode. This 24 V or COM potential is used only for DIx.
- Digital output DQ+/DQ- uses a 24 V or COM line which is not shared with other inputs and outputs.
- Use shielded cables and the common 24 V potential for the inputs $\overline{\text{STOA}}$ / $\overline{\text{STOB}}$. This 24 V potential is used only for $\overline{\text{STOA}}$ / $\overline{\text{STOB}}$.

Installation of DigiLink Communication Cables between Control Unit and Power Modules

For correct operation of Functional Safety "SAFE TORQUE OFF" circuit, adherence to the following conditions must be ensured:

1. Only use Schneider-Electric parts or equivalent parts according to Schneider-Electric specification for DigiLink interconnection (GG45 type connection cable).
2. The cables and connectors must not be damaged.
3. Correct contact between connector and socket must be guaranteed.

Residual Current Device

Direct current can be introduced in the protective ground conductor of this drive. If a residual current device (RCD / GFCI) or a residual current monitor (RCM) is used for protection against direct or indirect contact, the following specific types must be used:

⚠WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

- Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters and is sensitive to all types of current.

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

Further conditions for use of a residual current device:

- The drive has an increased leakage current at the moment power is applied. Use a residual current device (RCD / GFCI) or a residual current monitor (RCM) with a response delay.
- High-frequency currents must be filtered.

Due to high leakage current in standard operation, we recommend choosing at least a 300 mA device.

If the installation requires a residual current device less than 300 mA, it can be possible to use a device lower than 300 mA by changing the IT switch position according to the instructions given in the Operation on an IT or Corner Grounded System section, page 123.

If the installation includes several drives, provide one residual current device per drive.

Equipment Grounding

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire device.
- Ground the device before applying voltage.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- Do not consider cable shields to be protective ground conductors.

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

Tighten the grounding bars according to the instructions given in the Motor Cables Connecting and Power Module Grounding section, page 192.

Dimensioning of the Mains Cables

Cable Cross Sections according IEC

The following tables specify the mains cables.

380...480 V

Number of Power Modules (n)	Cross-Section per Phase	Temperature Class
n ≤ 6	Minimum: n x 185 mm² (n x 0.3 in²)	120 °C (248 °F)

500...690 V

Number of Power Modules (n)	Cross-Section per Phase	Temperature Class
n ≤ 6	Minimum: n x 120 mm² (n x 0.2 in²)	120 °C (248 °F)

Cable Cross Sections according cULus

480 V, 600 V

The dimensioning of the mains cables has to be done according to the UL 508A standard with minimum 75 °C (167 °F) copper conductions.

Any listed (ZMVV/7) box lug or compression lug rated for the required cross section can be used to connect the mains cables.

Refer to chapter Electrical Data for the respective input current, page 50.

NOTE: Provide sufficient cooling of the incoming cabinet.

Dimensioning of the Motor Cables

Cable Cross Sections

The recommended values for dimensioning the cable cross sections are reference values for multi-core copper power cables laid in air at a maximum ambient temperature of 40°C (104°F). Observe different ambient conditions and local regulations.

380...480 V according IEC

Modular Single Drive	Typical cable		Terminals per phase on busbar	Maximum cable cross section
	Normal Duty	Heavy Duty		
	mm^2	mm^2		mm^2
ATV••0C11•4	1 x 120 or 2 x 50	1 x 95	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C13•4	1 x 150 or 2 x 70	1 x 120 or 2 x 50	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C16•4	1 x 185 or 2 x 95	1 x 150 or 2 x 70	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C20•4	2 x 120 or 3 x 70	1 x 185 or 2 x 95	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C25•4	2 x 150 or 3 x 95	2 x 120 or 3 x 70	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C31•4	2 x 185 or 3 x 120	2 x 150 or 3 x 95	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C35•4	3 x 150 or 4 x 95	2 x 185 or 3 x 120	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C40•4	3 x 185 or 4 x 120	3 x 120 or 4 x 95	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C45•4	3 x 240 or 5 x 120	3 x 150 or 4 x 95	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C50•4	3 x 240 or 5 x 120	3 x 185 or 4 x 120	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C56•4	4 x 185 or 5 x 120	4 x 150 or 5 x 120	4 x (2 x M10)	4 x (1 x 240 or 2 x 120)
ATV••0C63•4	4 x 240 or 6 x 120	4 x 150 or 5 x 120	4 x (2 x M10)	4 x (1 x 240 or 2 x 120)
ATV••0C71•4	4 x 240 or 5 x 185	4 x 185 or 5 x 150	5 x (2 x M10)	5 x (1 x 240 or 2 x 120)
ATV••0C80•4	5 x 240	5 x 185 or 6 x 120	5 x (2 x M10)	5 x (1 x 240 or 2 x 120)
ATV••0M10•4	6 x 240 or 10 x 120	6 x 185 or 8 x 120	6 x (2 x M10)	6 x (1 x 240 or 2 x 120)

480 V according cULus

Modular Single Drive	Typical cable		Terminals per phase on busbar	Maximum cable cross section
	Normal Duty	Heavy Duty		
	AWG	AWG		AWG
ATV••0C11T4	1 x 300 or 2 x 2/0	1 x 4/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C13T4	1 x 400 or 2 x 3/0	1 x 300 or 2 x 2/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C16T4	1 x 500 or 2 x 250	1 x 400 or 2 x 3/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C20T4	2 x 350 or 3 x 4/0	1 x 500 or 2 x 250	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C25T4	2 x 500 or 3 x 300	2 x 350 or 3 x 4/0	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C31T4	4 x 300	2 x 500 or 3 x 300	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C35T4	5 x 250 or 6 x 3/0	4 x 300	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C40T4	5 x 300 or 6 x 4/0	5 x 250 or 6 x 3/0	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C45T4	6 x 250	5 x 300 or 6 x 4/0	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C50T4	6 x 300	6 x 250	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C56T4	7 x 300 or 8 x 4/0	6 x 300	4 x (2 x M10)	4 x (1 x 500 or 2 x 300)
ATV••0C63T4	8 x 250	7 x 300 or 8 x 4/0	4 x (2 x M10)	4 x (1 x 500 or 2 x 300)
ATV••0C71T4	8 x 300	8 x 250	5 x (2 x M10)	5 x (1 x 500 or 2 x 300)
ATV••0C80T4	10 x 250 (1)	8 x 300	5 x (2 x M10)	5 x (1 x 500 or 2 x 300)
ATV••0M10T4 (2)	12 x 300 (1)	10 x 250 (1)	6 x (2 x M10)	6 x (1 x 500 or 2 x 300)

(1) Separate motor cables in at least two conduit hubs with maximum 24 conductors (3 x 8 x 250 kcmil) each.

(2) This reference is not available in cULus.

500...690 V according IEC

Modular Single Drive	Typical cable		Terminals per phase on busbar	Maximum cable cross section
	Normal Duty	Heavy Duty		
	mm^2	mm^2		mm^2
ATV••0C11•6	1 x 50	1 x 50	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C13•6	1 x 70	1 x 50	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C16•6	1 x 95	1 x 70	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C20•6	1 x 120 or 2 x 50	1 x 95	1 x (2 x M10)	1 x (1 x 240 or 2 x 120)
ATV••0C25•6	1 x 150 or 2 x 70	1 x 120 or 2 x 50	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C31•6	2 x 95 or 3 x 70	1 x 150 or 2 x 70	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C40•6	2 x 150 or 3 x 95	2 x 95 or 3 x 70	2 x (2 x M10)	2 x (1 x 240 or 2 x 120)
ATV••0C50•6	2 x 185 or 3 x 120	2 x 150 or 3 x 95	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C63•6	3 x 150 or 4 x 95	2 x 185 or 3 x 120	3 x (2 x M10)	3 x (1 x 240 or 2 x 120)
ATV••0C80•6	4 x 150 or 5 x 95	3 x 150 or 4 x 95	4 x (2 x M10)	4 x (1 x 240 or 2 x 120)
ATV••0M10•6	4 x 185 or 5 x 150	4 x 150 or 5 x 95	5 x (2 x M10)	5 x (1 x 240 or 2 x 120)
ATV••0M12•6	5 x 185 or 6 x 150	4 x 185 or 5 x 150	6 x (2 x M10)	6 x (1 x 240 or 2 x 120)

600 V according cULus

Modular Single Drive	Typical cable		Terminals per phase on busbar	Maximum cable cross section
	Normal Duty	Heavy Duty		
	AWG	AWG		AWG
ATV••0C11T6	1 x 2/0	1 x 2/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C13T6	1 x 3/0	1 x 2/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C16T6	1 x 4/0	1 x 3/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C20T6	1 x 300 or 2 x 2/0	1 x 4/0	1 x (2 x M10)	1 x (1 x 500 or 2 x 300)
ATV••0C25T6	1 x 500 or 2 x 4/0	1 x 300 or 2 x 2/0	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C31T6	2 x 300 or 3 x 4/0	1 x 500 or 2 x 4/0	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C40T6	2 x 400 or 3 x 250	2 x 300 or 3 x 4/0	2 x (2 x M10)	2 x (1 x 500 or 2 x 300)
ATV••0C50T6	3 x 350 or 4 x 250	2 x 400 or 3 x 250	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C63T6	5 x 250	3 x 350 or 4 x 250	3 x (2 x M10)	3 x (1 x 500 or 2 x 300)
ATV••0C80T6	4 x 500 or 6 x 250	5 x 250	4 x (2 x M10)	4 x (1 x 500 or 2 x 300)
ATV••0M10T6	5 x 500 or 7 x 300	4 x 500 or 6 x 250	5 x (2 x M10)	5 x (1 x 500 or 2 x 300)
ATV••0M12T6	6 x 500 or 8 x 300	5 x 500 or 7 x 300	6 x (2 x M10)	6 x (1 x 500 or 2 x 300)

Dimensioning of the Motor Cables

⚠⚠DANGER

ELECTRIC SHOCK DUE TO OVERLOAD ON MOTOR CABLES

- Verify that the protective ground conductor complies with the requirements specified in IEC 61439-1.
- Verify compliance of the motor cables with the specification of IEC 60034-25.

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

The motor cables are dimensioned for the maximum continuous current. They apply to 0...100 Hz (up to 300 Hz the cable losses increase about 25 % because of the Skin-effect).

The IGBT modules cause high-frequent interferences which drain off more and more stronger to the ground potential with increasing motor cable length. As a result the line-conducted interferences to the mains increase. In case of too long motor cables the attenuation of the mains filters is not longer sufficient and the permitted interference limits are exceeded.

Types of Motor Cables

Cable Type	Description
	Symmetrically shielded cable with 3 phase conductors, symmetrically arranged PE conductor and a shield. **NOTE:** Verify that the PE conductor complies with the requirements according to IEC 61439-1. Example: 2YSLCY-JB
	Symmetrically shielded cable with 3 phase conductors and a concentric PE conductor as shield. **NOTE:** Verify that the PE conductor complies with the requirements according to IEC 61439-1. Example: NYCY / NYCWY
	Three-phase cable with round conductors and reduced protective conductor. **NOTE:** A separate PE conductor is required if the shield does not fulfill the requirements according to IEC 61439-1.

Cable Length Instructions

Consequences Of Long Cables

When drives are used with motors, a combination of fast switching transistors and long motor cables can even cause peak voltages up to twice the DC link voltage. This high peak voltage can cause premature aging of motor winding insulation which leads to motor breakdown.

The overvoltage limitation function will enable to increase the cable length while decreasing the torque performances.

Length Of Motor Cables

Because of the permitted mains disturbances, the allowed overvoltages at the motor, the occurring bearing currents and the permitted heat losses the distance between inverter and motor(s) is limited.

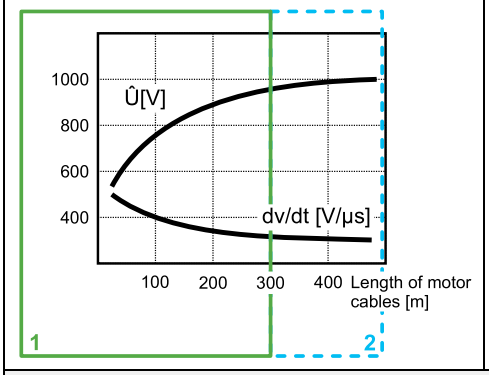
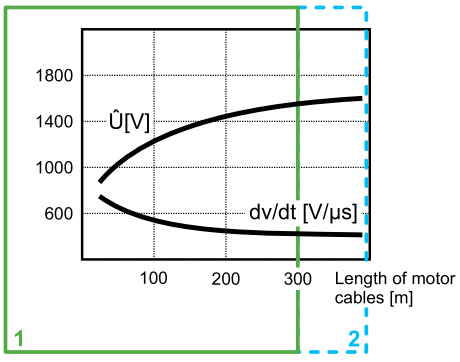
The maximum distance heavily depends on the used motors (insulation material), the type of motor cable used (shielded/unshielded) and the cable laying (cable channel, underground installation...).

Dynamic Voltage Load Of The Motor

Overvoltages at the motor terminals result from reflection in the motor cable. Basically the motors are stressed with measurable higher voltage peaks from a motor cable length of 10 m (33 ft). With the length of the motor cable also the value of overvoltage increases.

The steep edges of the switching impulses at the output side of the frequency inverter lead to a further load of the motors. The slew rate of the voltage is typically over 5 kV/µs but it decreases with the length of the motor cable.

Typical load of the motor

380...480 V	500...690 V
	

Reduced load of the motor by using Altivar Process Modular with integrated dv/dt filter chokes 300m.

1. When using a shielded motor cable

2. When using an unshielded motor cable

The given values are related to the voltage load phase-to-phase. The voltage values phase to ground are approximately 300 V lower, dv/dt is approximately 150 V/µs lower.

NOTICE
OVERVOLTAGE AT THE MOTOR Do not exceed the maximum length of the motor cables as specified in this document. **Failure to follow these instructions can result in equipment damage.**

Corrective Actions Overview

A number of simple measures can be taken to help enhance the motor service life:

- Specification of a motor designed for speed drive applications (IEC TS 60034-25).
- Reduce to a minimum the distance between motor and drive.
- Use unshielded cables.
- Reduce the drive switching frequency.

Maximum lengths of motor cables in second environment (industrial environment)

EMC category (EN 61800-3)	Type of cable	Maximum cable length	
		380...480 V	500...690 V
C3	Shielded	300 m (980 ft)	300 m (980 ft)
C4	Unshielded	500 m (1,640 ft)	500 m (1,640 ft)

NOTE: The specified lengths of motor cables are the limits based on typical motor cables, laying in cables channels, default pulse frequency and maximal output frequency of 100 Hz.

Multiplication Factors

In case of conditions differing from the table specified lengths have to be converted by means of the following factors.

If several factors apply, please multiply them.

Factor		Correction of the maximum cable lengths
The pulse frequency does not correspond to factory setting	at 4 kHz	multiply all values by 0.70
	at 8 kHz	multiply all values by 0.40
Output frequencies higher than 100 Hz.	up to 200 Hz	multiply all values by 0.80
	up to 300 Hz	multiply all values by 0.50
In case of 6-pole motor cabling (e.g. for star/delta starting circuit)		multiply all values by 0.75
In case of parallel motors with a dedicated cable to each motor the inverter values have to be converted in compliance with the number of motors. When a motor choke is used for each motor, the following values in brackets apply.	at 2 motors	multiply all values by 0.40 (0.80)
	at 3 motors	multiply all values by 0.25 (0.60)
	at 4 motors	multiply all values by 0.15 (0.40)

Factor		Correction of the maximum cable lengths
	at 5 motors	multiply all values by 0.10 (0.25)
In case of parallel motors with a common cable to all motors the inverter values have to be converted in compliance with the number of motors:	at 2 motors	multiply all values by 0.80
	at 3 motors	multiply all values by 0.60
	at 4 motors	multiply all values by 0.40
	at 5 motors	multiply all values by 0.25

Additional Information

Further detailed technical information is available in the following white paper *An Improved Approach for Connecting VSD and Electric Motors* (998-2095-10-17-13AR0_EN) available on www.schneider-electric.com.

Electromagnetic Compatibility

Limit Values

This product meets the EMC requirements according to the standard IEC 61800-3 if the measures described in this manual are implemented during installation.

If the selected composition (product itself, mains filter, other accessories and measures) does not meet the requirements of category C1, the following information applies as it appears in IEC 61800-3:

⚠WARNING

RADIO INTERFERENCE

In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

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

EMC requirements for the control cabinet

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact.
Ground the control cabinet, the control cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm^2 (AWG 8).	Reduces emissions.
Fit switching devices such as power contactors, relays or solenoid valves with interference suppression units or arc suppressors (for example, diodes, varistors, RC circuits).	Reduces mutual interference.
Install power components and control components separately.	

Shielded cables

EMC measures	Objective
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Use cable clamps to connect a large surface area of the shields of all shielded cables to the mounting plate at the control cabinet entry.	
Ground shields of digital signal wires at both ends by connecting them to a large surface area or via conductive connector housings	Reduces interference affecting the signal wires, reduces emissions
Ground the shields of analog signal wires directly at the device (signal input); insulate the shield at the other cable end or ground it via a capacitor (for example, 10 nF, 100 V or higher.	Reduces ground loops due to low-frequency interference.
Use only shielded motor cables with copper braid and a coverage of at least 85%, ground a large surface area of the shield at both ends.	Diverts interference currents in a controlled way, reduces emissions.

Cable Installation

EMC measures	Objective
Do not route fieldbus cables and signal wires in a single cable duct together with lines with DC and AC voltages of more than 60 V. (Fieldbus cables, signal lines and analog lines may be in the same cable duct) Recommendation: Use separate cable ducts at least 20 cm (8 in.) apart.	Reduces mutual interference.
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Use equipotential bonding conductors in the following cases: wide-area installations, different voltage supplies and installation across several buildings.	Reduces current in the cable shield, reduces emissions.
Use fine stranded equipotential bonding conductors.	Diverts high-frequency interference currents
If motor and machine are not conductively connected, for example by an insulated flange or a connection without surface contact, you must ground the motor with a ground strap or a ground wire. The conductor cross section must be at least 10 mm^2 (AWG 8).	Reduces emissions, increases immunity.
Use twisted pair for the DC supply. For digital and analog inputs use shielded twisted cables with a pitch of between 25...50 mm (1...2 in).	Reduces interference affecting the signal cables, reduces emissions.

Power Supply

EMC measures	Objective
Operate product on mains with grounded neutral point.	Enables effectiveness of mains filter.
Surge arrester if there is a risk of overvoltage.	Reduces the risk of damage caused by overvoltage.

Operation on an IT or Corner Grounded System

Products Concerned

The Standard Single Drives for 380...480 V can be operated on IT or corner grounded systems.

The Standard Single Drives for 500...690 V can be operated on IT systems.

Definition

IT system: Isolated or impedance grounded neutral. Use a permanent insulation monitoring device compatible with nonlinear loads, such as an XM200 type or equivalent.

Corner grounded system: System with one phase grounded.

Operation

NOTICE
OVERVOLTAGE OR OVERHEATING If the drive is operated via an IT or corner grounded system, the integrated EMC filter must be disconnected as described in the present manual. **Failure to follow these instructions can result in equipment damage.**

Also consider the information about the electrical network, altitude and derating given in the Altitude Conditions section, page 39.

Disconnecting The Built-in EMC Filter

Filter Disconnection

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

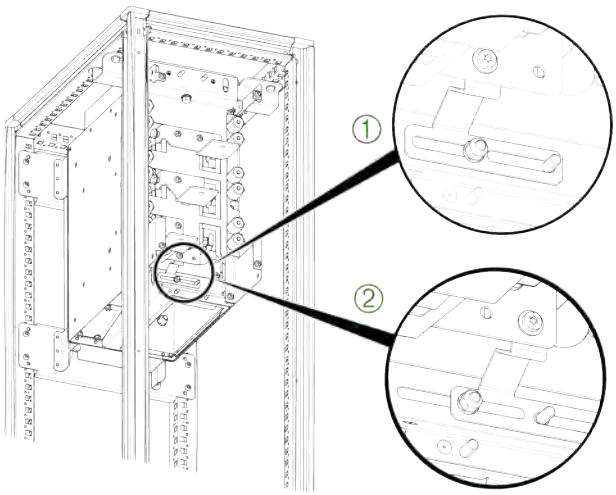
Failure to follow these instructions will result in death or serious injury.

The drives have a built-in EMC filter. As a result they exhibit leakage current to ground. If the leakage current creates compatibility problems with your installation (residual current device or other), then you can reduce the leakage current by disconnecting the built-in filter as shown below. In this configuration the product does not meet the EMC requirements according to the standard IEC 61800-3.

Setting

Apply the following instructions to disconnect the built-in EMC filter.

Step	Action
1	Remove the mains unit cover, if required
2	The EMC filter bracket is factory set to the ⏚ position, as shown on detail ①
3	For operation without the built-in EMC filter (on IT system), move the EMC filter bracket from its position to the ⏚ position, as shown on detail ②
4	Refit the mains unit cover



NOTE: Do not operate the module with the EMC filter bracket removed.

Sinus Motor Filter

Introduction

The selection of the sinus motor filter see the tables below. For information on installation, cooling and other technical information (for example derating), see the documentation from schaffner (www.schaffner.com).

NOTE: The derating in this documentation is only considering the derating for the drive. In addition, observe the derating for the sinus motor filter related to the output frequency and the temperature from the schaffner documentation.

NOTE: With the use of a sinus motor filter the minimum switching frequency is:

- For 380 to 480 V: 3 kHz
- For 500 to 690 V: 2.5 kHz

Selection

400 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV••0C11Q4	211	FN5420-250-99-E0XXT	173	FN5420-180-99-E0XXT
ATV••0C13Q4	241	FN5420-250-99-E0XXT	211	FN5420-250-99-E0XXT
ATV••0C16Q4	241	FN5420-250-99-E0XXT	211	FN5420-250-99-E0XXT
ATV••0C20Q4	370	FN5420-400-99-E0XXT	302	FN5420-400-99-E0XXT
ATV••0C25Q4	477	FN5420-630-99-E0XXT	370	FN5420-400-99-E0XXT
ATV••0C31Q4	482	FN5420-630-99-E0XXT	422	FN5420-480-99-E0XXT
ATV••0C35Q4	660	FN5420-710-99-E0XXT	520	FN5420-630-99-E0XXT
ATV••0C40Q4	723	FN5420-800-99-E0XXT	590	FN5420-630-99-E0XXT
ATV••0C45Q4	723	FN5420-800-99-E0XXT	633	FN5420-710-99-E0XXT
ATV••0C50Q4	723	FN5420-800-99-E0XXT	633	FN5420-710-99-E0XXT
ATV••0C56Q4	964	FN5420-1000-99-E0XXT	830	FN5420-1000-99-E0XXT
ATV••0C63Q4	964	FN5420-1000-99-E0XXT	844	FN5420-1000-99-E0XXT
ATV••0C71Q4	1,205	2x FN5420-630-99-E0XXT	1,020	2x FN5420-630-99-E0XXT
ATV••0C80Q4	1,205	2x FN5420-630-99-E0XXT	1,055	2x FN5420-630-99-E0XXT
ATV••0M10Q4	1,446	2x FN5420-800-99-E0XXT	1,266	2x FN5420-710-99-E0XXT

(1) With a minimum switching frequency of 3 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

440 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11R4	211	FN5420-250-99-E0XXT	173	FN5420-180-99-E0XXT
ATV●●0C13R4	233	FN5420-250-99-E0XXT	205	FN5420-250-99-E0XXT
ATV●●0C16R4	233	FN5420-250-99-E0XXT	205	FN5420-250-99-E0XXT
ATV●●0C20R4	370	FN5420-400-99-E0XXT	302	FN5420-400-99-E0XXT
ATV●●0C25R4	466	FN5420-480-99-E0XXT	370	FN5420-400-99-E0XXT
ATV●●0C31R4	466	FN5420-480-99-E0XXT	410	FN5420-480-99-E0XXT
ATV●●0C35R4	660	FN5420-710-99-E0XXT	520	FN5420-630-99-E0XXT
ATV●●0C40R4	699	FN5420-710-99-E0XXT	590	FN5420-630-99-E0XXT
ATV●●0C45R4	699	FN5420-710-99-E0XXT	615	FN5420-630-99-E0XXT
ATV●●0C50R4	699	FN5420-710-99-E0XXT	615	FN5420-630-99-E0XXT
ATV●●0C56R4	932	FN5420-1000-99-E0XXT	820	FN5420-1000-99-E0XXT
ATV●●0C63R4	932	FN5420-1000-99-E0XXT	820	FN5420-1000-99-E0XXT
ATV●●0C71R4	1,165	2x FN5420-630-99-E0XXT	1,020	2x FN5420-630-99-E0XXT
ATV●●0C80R4	1,165	2x FN5420-630-99-E0XXT	1,025	2x FN5420-630-99-E0XXT
ATV●●0M10R4	1,398	2x FN5420-710-99-E0XXT	1,230	2x FN5420-630-99-E0XXT

(1) With a minimum switching frequency of 3 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

480 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11T4	211	FN5420-250-99-E0XXT	173	FN5420-180-99-E0XXT
ATV●●0C13T4	225	FN5420-250-99-E0XXT	200	FN5420-250-99-E0XXT
ATV●●0C16T4	225	FN5420-250-99-E0XXT	200	FN5420-250-99-E0XXT
ATV●●0C20T4	370	FN5420-400-99-E0XXT	302	FN5420-400-99-E0XXT
ATV●●0C25T4	450	FN5420-480-99-E0XXT	370	FN5420-400-99-E0XXT
ATV●●0C31T4	450	FN5420-480-99-E0XXT	400	FN5420-480-99-E0XXT
ATV●●0C35T4	660	FN5420-710-99-E0XXT	520	FN5420-630-99-E0XXT
ATV●●0C40T4	675	FN5420-710-99-E0XXT	590	FN5420-630-99-E0XXT
ATV●●0C45T4	675	FN5420-710-99-E0XXT	600	FN5420-630-99-E0XXT
ATV●●0C50T4	675	FN5420-710-99-E0XXT	600	FN5420-630-99-E0XXT
ATV●●0C56T4	900	FN5420-1000-99-E0XXT	800	FN5420-1000-99-E0XXT
ATV●●0C63T4	900	FN5420-1000-99-E0XXT	800	FN5420-1000-99-E0XXT
ATV●●0C7T4	1,125	2x FN5420-630-99-E0XXT	1,000	FN5420-1000-99-E0XXT
ATV●●0C80T4	1,125	2x FN5420-630-99-E0XXT	1,000	2x FN5420-630-99-E0XXT
ATV●●0M10T4 (2)	1,350	2x FN5420-710-99-E0XXT	1,200	2x FN5420-630-99-E0XXT

(1) With a minimum switching frequency of 3 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

(2) This reference is not available in cULus.

500 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11N6	125	FN5420-145-99-E0XXT	105	FN5420-110-99-E0XXT
ATV●●0C13N6	145	FN5420-145-99-E0XXT	125	FN5420-145-99-E0XXT
ATV●●0C16N6	175	FN5420-180-99-E0XXT	145	FN5420-145-99-E0XXT
ATV●●0C20N6	175	FN5420-180-99-E0XXT	154	FN5420-180-99-E0XXT
ATV●●0C25N6	275	FN5420-300-99-E0XXT	215	FN5420-250-99-E0XXT
ATV●●0C31N6	340	FN5420-400-99-E0XXT	275	FN5420-300-99-E0XXT
ATV●●0C40N6	350	FN5420-400-99-E0XXT	308	FN5420-400-99-E0XXT
ATV●●0C50N6	520	FN5420-630-99-E0XXT	425	FN5420-480-99-E0XXT
ATV●●0C63N6	525	FN5420-630-99-E0XXT	462	FN5420-480-99-E0XXT
ATV●●0C80N6	700	FN5420-710-99-E0XXT	616	FN5420-630-99-E0XXT
ATV●●0M10N6	875	FN5420-1000-99-E0XXT	770	FN5420-800-99-E0XXT
ATV●●0M12N6	1,050	2x FN5420-630-99-E0XXT	924	FN5420-1000-99-E0XXT

(1) With a minimum switching frequency of 2.5 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

600 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11T6	125	FN5040HV-165-99	105	FN5040HV-115-99
ATV●●0C13T6	145	FN5040HV-165-99	125	FN5040HV-165-99
ATV●●0C16T6	158	FN5040HV-165-99	139	FN5040HV-165-99
ATV●●0C20T6	158	FN5040HV-165-99	139	FN5040HV-165-99
ATV●●0C25T6	275	FN5040HV-300-99	215	FN5040HV-260-99
ATV●●0C31T6	316	FN5040HV-430-99	275	FN5040HV-300-99
ATV●●0C40T6	316	FN5040HV-430-99	278	FN5040HV-300-99
ATV●●0C50T6	474	FN5040HV-530-99	417	FN5040HV-430-99
ATV●●0C63T6	474	FN5040HV-530-99	417	FN5040HV-430-99
ATV●●0C80T6	632	FN5040HV-660-99	556	FN5040HV-660-99
ATV●●0M10T6	790	FN5040HV-940-99	695	FN5040HV-765-99
ATV●●0M12T6	948	FN5040HV-1320-99	834	FN5040HV-940-99

(1) With a minimum switching frequency of 2.5 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

600 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11S6	125	FN5040HV-165-99	105	FN5040HV-115-99
ATV●●0C13S6	145	FN5040HV-165-99	125	FN5040HV-165-99
ATV●●0C16S6	158	FN5040HV-165-99	139	FN5040HV-165-99
ATV●●0C20S6	158	FN5040HV-165-99	139	FN5040HV-165-99

(1) With a minimum switching frequency of 2.5 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

690 V mains voltage

Reference	Normal Duty		Heavy Duty	
	Nominal output current (1) [A]	Schaffner Reference	Nominal output current (1) [A]	Schaffner Reference
ATV●●0C11Q6	125	FN5040HV-165-99	105	FN5040HV-115-99
ATV●●0C13Q6	145	FN5040HV-165-99	125	FN5040HV-165-99
ATV●●0C16Q6	145	FN5040HV-165-99	125	FN5040HV-165-99
ATV●●0C20Q6	145	FN5040HV-165-99	125	FN5040HV-165-99
ATV●●0C25Q6	275	FN5040HV-300-99	215	FN5040HV-260-99
ATV●●0C31Q6	290	FN5040HV-300-99	250	FN5040HV-260-99
ATV●●0C40Q6	290	FN5040HV-300-99	250	FN5040HV-260-99
ATV●●0C50Q6	435	FN5040HV-530-99	375	FN5040HV-430-99
ATV●●0C63Q6	435	FN5040HV-530-99	375	FN5040HV-430-99
ATV●●0C80Q6	580	FN5040HV-660-99	500	FN5040HV-530-99
ATV●●0M10Q6	725	FN5040HV-765-99	625	FN5040HV-660-99
ATV●●0M12Q6	870	FN5040HV-940-99	750	FN5040HV-765-99

(1) With a minimum switching frequency of 2.5 kHz.

For operation at switching frequencies higher than the minimum switching frequency derating must be applied to the drive (output) current. Refer to Derating Curves with usage of Sinus Motor Filter, page 64.

Parameters to Set

For detailed information and further instructions about parameters and programming refer to the programming manual.

Step	Action
1	Set the **OFI** [Sinus Filter Activation] parameter to “Optimized”. **NOTE:** The parameter **OFI** is only limiting the switching frequency to a lower limit (380...480 V = 3kHz / 500...690 V = 2.5kHz). If a fixed switching frequency is required the parameter setting **SFT** = **HF2** is needed.

Passive Filter

Introduction

The selection of the passive filter has been done. For information on installation, cooling and other technical information, see the documentation from schaffner (www.schaffner.com).

Selection

400 V Mains voltage Normal Duty

Reference	Nominal Power	Mains current Ieff	Schaffner Reference
ATV●A0C11●4	110 kW	198 A	FN3416-210-40
ATV●A0C13●4	132 kW	233 A	FN3416-260-99
ATV●A0C16●4	160 kW	278 A	FN3416-320-99
ATV●A0C20●4	200 kW	352 A	2xFN3416-210-40 or FN3440-200-118-E0FAJXX
ATV●A0C25●4	250 kW	432 A	FN3471-250-99-E0XXJXX
ATV●A0C31●4	315 kW	538 A	FN3471-315-99-E0XXJXX
ATV●A0C35●4	355 kW	611 A	FN3471-355-99-E0XXJXX
ATV●A0C40●4	400 kW	681 A	FN3471-400-99-E0XXJXX
ATV●A0C45●4	450 kW	764 A	FN3471-500-99-E0XXJXX
ATV●A0C50●4	500 kW	846 A	FN3471-500-99-E0XXJXX
ATV●A0C56●4	560 kW	948 A	2xFN3471-315-99-E0XXJXX
ATV●A0C63●4	630 kW	1,058 A	2xFN3471-315-99-E0XXJXX
ATV●A0C71●4	710 kW	1,192 A	2xFN3471-355-99-E0XXJXX
ATV●A0C80●4	800 kW	1,335 A	2xFN3471-400-99-E0XXJXX
ATV●A0M10●4	1,000 kW	1,692 A	2xFN3471-500-99-E0XXJXX

400 V Mains voltage Heavy Duty

Reference	Nominal Power	Mains current Ieff	Schaffner Reference
ATV●A0C11●4	90 kW	167 A	FN3416-180-40
ATV●A0C13●4	110 kW	198 A	FN3416-210-40
ATV●A0C16●4	132 kW	233 A	FN3416-260-99
ATV●A0C20●4	160 kW	290 A	FN3416-320-99
ATV●A0C25●4	200 kW	353 A	2xFN3416-210-40 or FN3440-200-118-E0FAJXX
ATV●A0C31●4	250 kW	432 A	FN3471-250-99-E0XXJXX
ATV●A0C35●4	280 kW	489 A	FN3471-315-99-E0XXJXX
ATV●A0C40●4	315 kW	545 A	FN3471-315-99-E0XXJXX
ATV●A0C45●4	355 kW	611 A	FN3471-355-99-E0XXJXX
ATV●A0C50●4	400 kW	681 A	FN3471-400-99-E0XXJXX
ATV●A0C56●4	450 kW	767 A	FN3471-500-99-E0XXJXX
ATV●A0C63●4	500 kW	849 A	FN3471-500-99-E0XXJXX
ATV●A0C71●4	560 kW	951 A	2xFN3471-315-99-E0XXJXX

Reference	Nominal Power	Mains current Ieff	Schaffner Reference
ATV●A0C80●4	630 kW	1,061 A	2xFN3471-315-99-E0XXJXX
ATV●A0M10●4	800 kW	1,335 A	2xFN3471-400-99-E0XXJXX

Parameters to Set

For detailed information and further instructions about parameters and programming refer to the programming manual.

Step	Action
1	Set the **IFI** [Input Filter] parameter to “Yes”. **NOTE:** Only standard & U/F control law available for passive filter application.

Specifying The Cabinet

What's in This Part

General Specification

Layout and Dimensions of the Cabinet

The Altivar Process Modular offer is standardized for:

- IP21 / UL Type 1 Cabinets
- IP54 / UL Type 12 Cabinets

The Altivar Process Modular offer is designed for integration into following standard cabinets:

- Universal Enclosure PanelSeT SFN (formerly called Spacial SFN) from Schneider Electric (see catalog (UEMKCAT012EN) on www.se.com)
- VX25 cabinets from Rittal
- TS8 cabinets from Rittal

Quantity of Power Modules	Dimensions of the Standard Cabinet in mm *(in.)*		
	Width	**Height**	**Depth**
1	400 *(15.75)*	2,000 *(78.74)*	600 *(23.62)*
2	600 *(23.62)*		
3	800 *(31.5)*		
4 or more	Combine the above cabinets		

For more details refer to the Dimensions and Weights section, page 42.

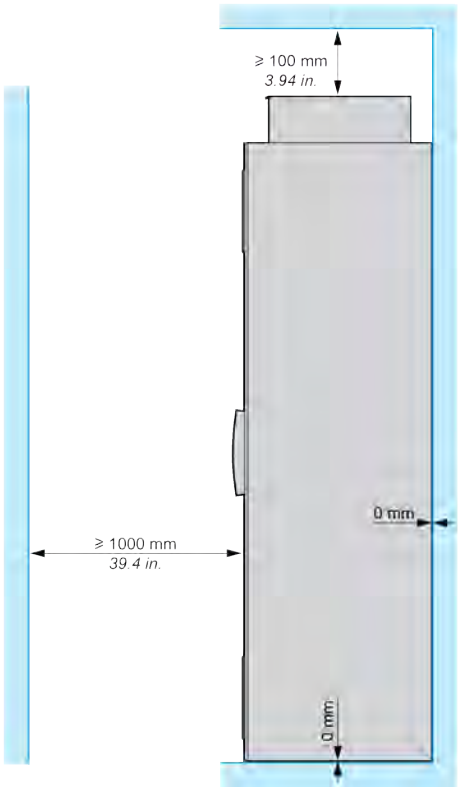
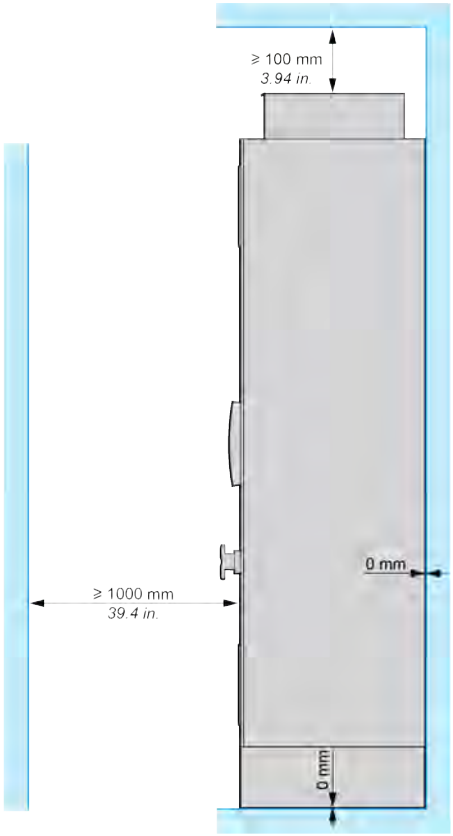
NOTE: The standard PanelSeT SFN D=600mm, W=400mm from Schneider Electric is reusing a 400mm depth x 600mm width cabinet structure that does not fit with the one Power Module architecture in IP54 / UL Type 12 integration. A PanelSeT SFN cabinet with a structure designed for D=600mm, W=400mm and compliant with the one Power Module architecture in IP54 / UL Type 12 integration maybe available on special order to your Universal Enclosure retailer with following references: commercial reference: NSYSFSP plus technical offer number: F18090565BCN/A0

Altivar Process Modular can be integrated in any cabinets with 2 m (78.7 in) height and 600 mm (23.62 in) depth from any other manufacturer. In case of, compliance of each accessories design with the cabinet architecture must be verified from its specification before ordering. If a standard accessory does not fit with integration in the cabinet architecture:

- A design adaptation must be done locally following the specifications and recommendation from Schneider Electric.
- Manufacturing must be done locally.

Free Space

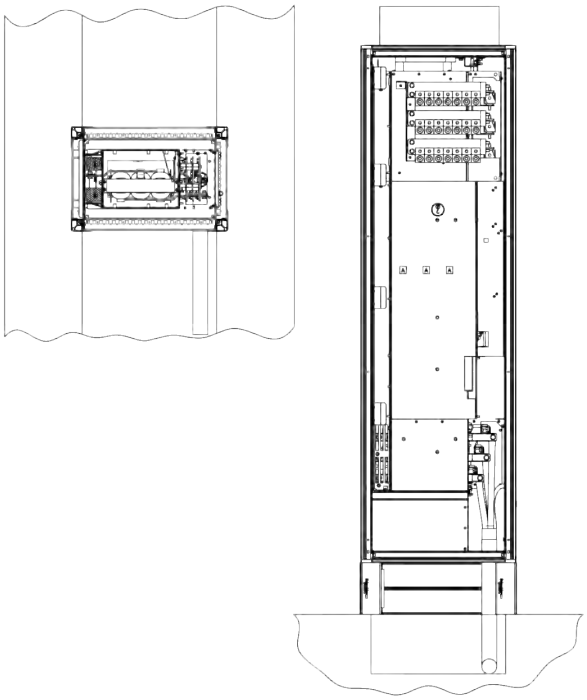
The following diagrams show the free space required around the cabinet:

IP21 / UL Type 1 Cabinets	IP54 / UL Type 12 Cabinets
	

Cabinet Placement on a Cable Channel

Before placing the cabinet on a cable channel, verify that:

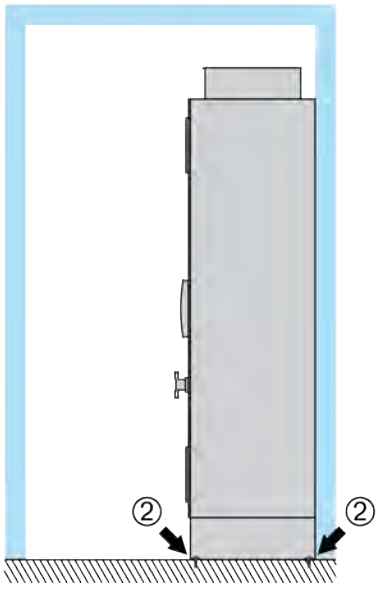
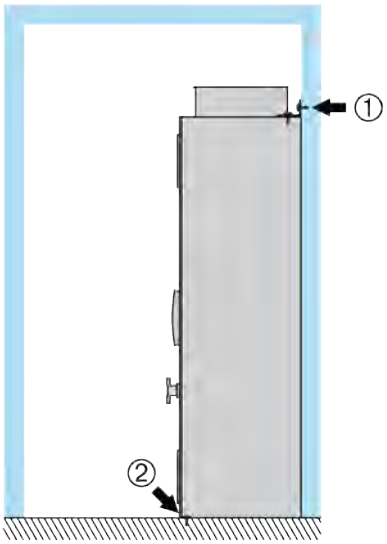
- The cable channel structure is enough robust to carry the cabinet.
- The cabinet base is placed as below.
- The cabinet is equipped with sealed bottom plate and cable lead-throughs to ensure the degree of protection.



Requirements for the Cabinet

Fastening the Cabinet

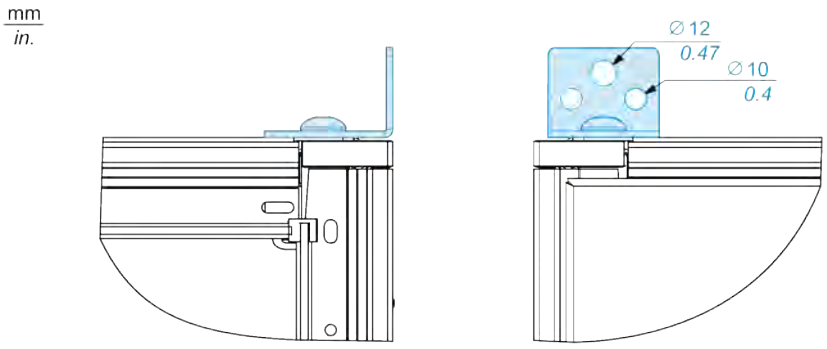
Perform the following to fasten the cabinet

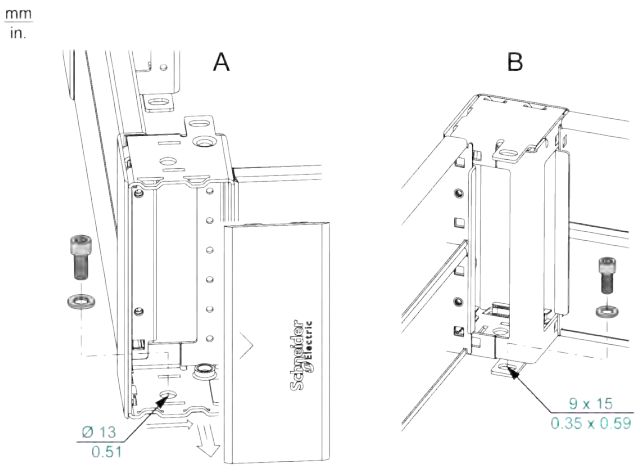
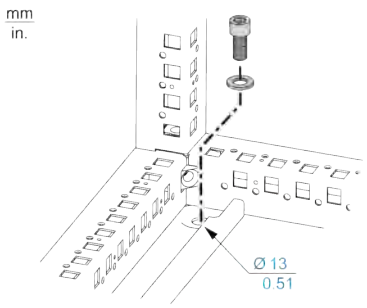
Fastening the Cabinet With Plinth	Fastening the Cabinet Without Plinth
	

① Fastening the cabinet at the wall

② Fastening the cabinet on the floor

Fastening the Cabinet At the Wall ①



Fastening the Cabinet on the Floor ②	
Screw connection of a cabinet with plinth 	Screw connection of a cabinet without plinth 
A Exterior view **B** Interior view	

Grounding Inside the Cabinet

The product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the product is touched.

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY HIGH LEAKAGE CURRENT

Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system installation.

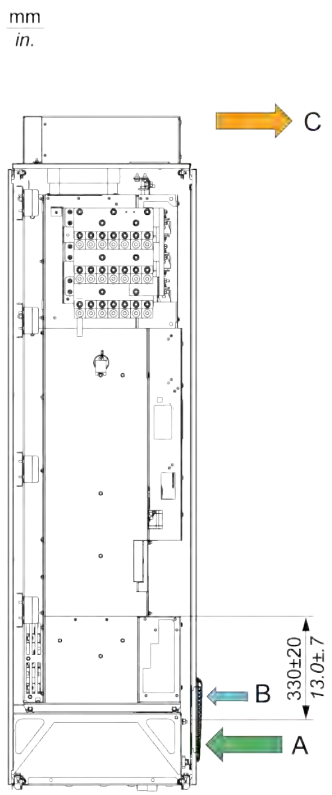
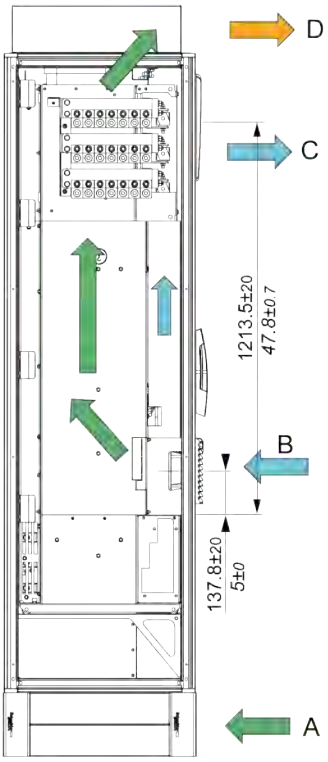
Failure to follow these instructions will result in death or serious injury.

Electromagnetic Compatibility of the Cabinet

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact
Ground the cabinet; the cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm^2 (AWG 8).	Reduces emissions.
Fit switching devices such as power contactors, relays or solenoid valves with interferences suppression units or arc suppressors (for diodes, varistors, RC circuits).	Reduce mutual interference.
Install power components and control components separately.	

Cooling

These diagrams show the cooling air flow.

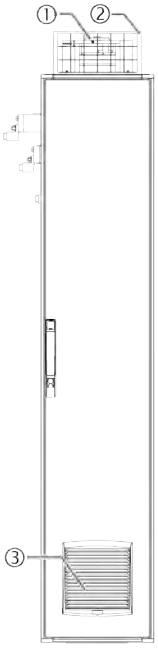
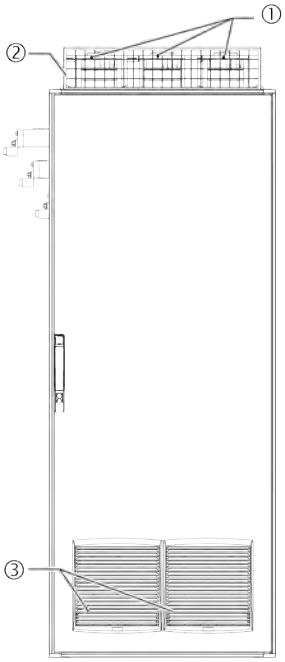
IP21 / UL Type 1 Integration	IP54 / UL Type 12 Integration
	
A Air inlet grid for power part **B** Air inlet for control part **C** Air outlet through metal grid for power part and control part	**A** Air inlet grid for power part **B** Air inlet through door fan for control part **C** Air outlet grid for control part **D** Air outlet through metal grid for power part

Information about the power fan (installed in the power module):

- 1x power fan per power module
- Airflow per power fan is 635 m^3 (374 cfm)

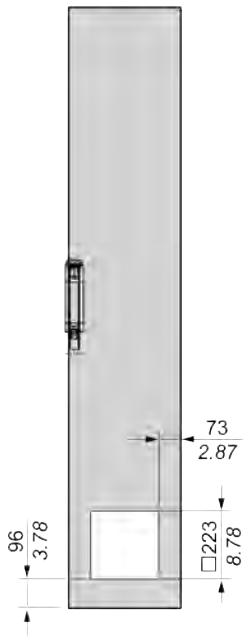
Cooling

These diagrams show the cooling air flow specification for IP21 / UL Type 1 integration.

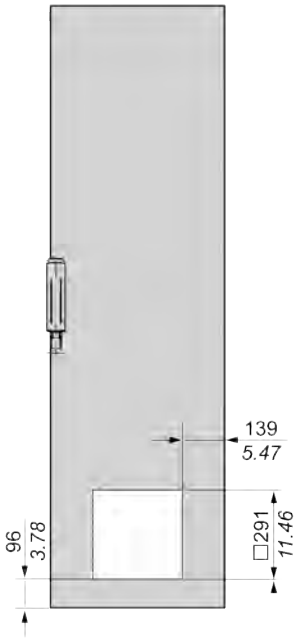
Description	1 module	2 modules	3 modules
			
1 Roof Fan	1 x 960 m³/h (33,900 ft³/h), 200 Pa (0.03 psi) Qualified for an operating temperature of at least +65 °C (149 °F) 1 x EBM/PAPST K2E225-RA92-01	2 x 960 m³/h (33,900 ft³/h), 200 Pa (0.03 psi) Qualified for an operating temperature of at least +65 °C (149 ° F) 2 x EBM/PAPST K2E225-RA92-01	3 x 960 m³/h (33,900 ft³/h), 200 Pa (0.03 psi) Qualified for an operating temperature of at least +65 °C (149 °F) 3 x EBM/PAPST K2E225-RA92-01
2 Roof extension	Minimum: 150 mm x 310 mm (5.9 in x 12.2 in) 80 % free cross section	Minimum: 150 mm x 560 mm (5.9 in x 22.05 in) 80 % free cross section	Minimum: 150 mm x 695 mm (5.9 in x 27.34 in) 80 % free cross section
3 Inlet Grid	Schneider: 1 x NSYCAG223LPF filter removed RITTAL: 1 x SK 3240.200 filter removed Or Similar	Schneider: 1 x NSYCAG291LPF filter removed RITTAL: 1 x SK 3243.200 filter removed Or Similar	Schneider: 2 x NSYCAG291LPF filter removed RITTAL: 2 x SK 3243.200 filter removed Or Similar

Cut-outs Drawings for IP21 / UL Type 1 Integration into Standard Cabinets

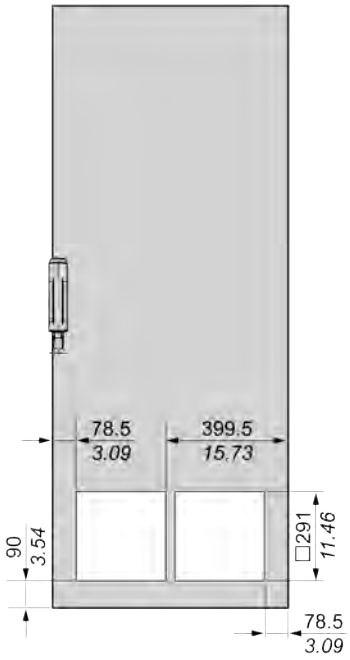
mm
in.



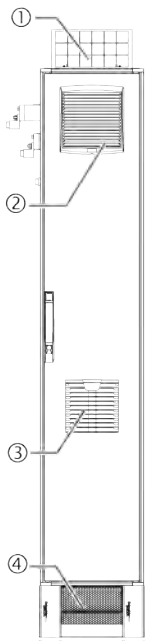
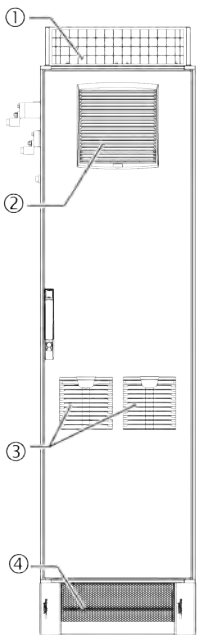
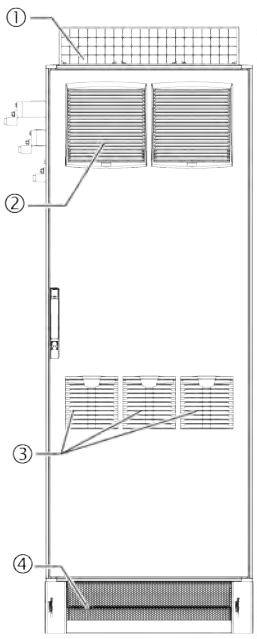
mm
in.



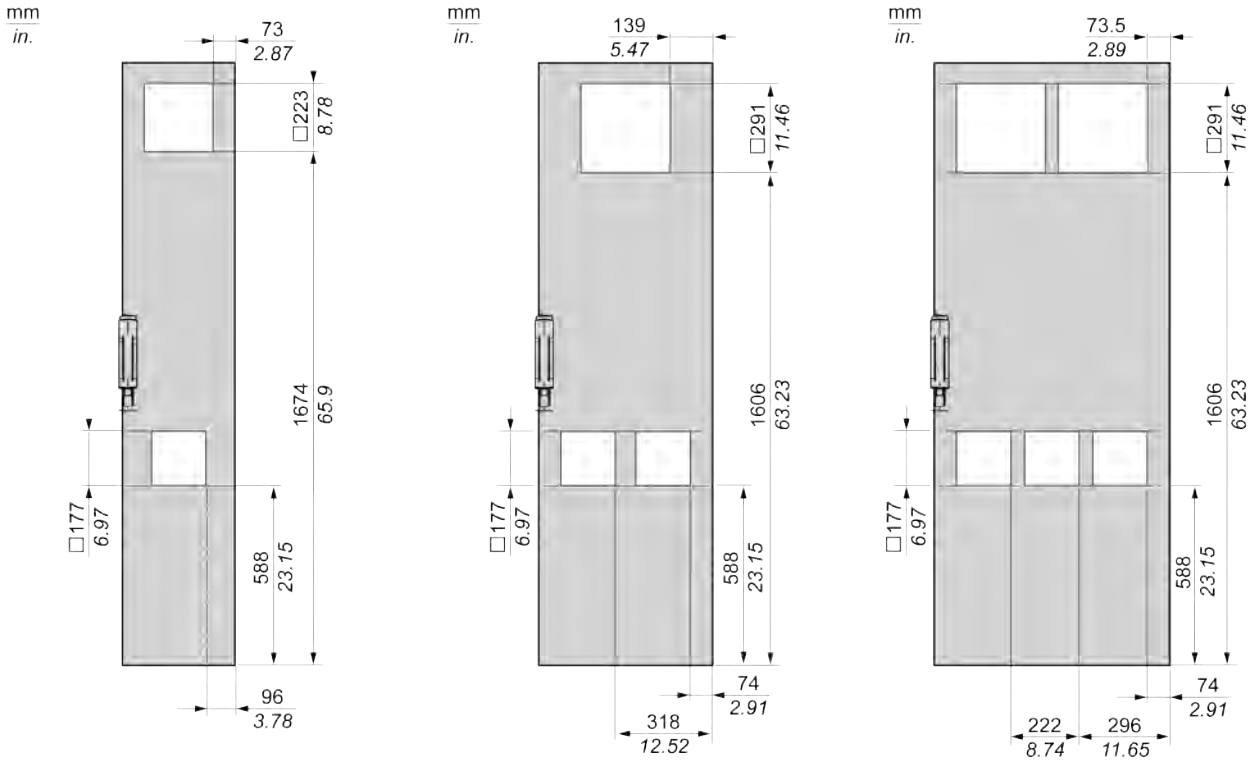
mm
in.



These diagrams show the cooling air flow specification for IP54 / UL Type 12 integration.

Description	1 module	2 modules	3 modules
			
1 - Roof extension	Minimum: 150 mm x 310 mm (5.9 in x 12.2 in) 80 % free cross section	Minimum: 150 mm x 560 mm (5.9 in x 22.05 in) 80 % free cross section	Minimum: 150 mm x 695 mm (5.9 in x 27.34 in) 80 % free cross section
2 - Electronic cooling	Schneider: 1 x NSYCAG223LPF with filter G2 RITTAL: 1 x SK 3240.200 with filter G2 Or Similar	Schneider: 1 x NSYCAG291LPF with filter G2 RITTAL: 1 x SK 3243.200 with filter G2 Or Similar	Schneider: 2 x NSYCAG291LPF with filter G2 RITTAL: 2 x SK 3243.200 with filter G2 Or Similar
3 - Door fan	1 x Minimum: 65 m^3/h (2,296 ft^3/h, 10 Pa (0.00145 psi) Minimum door cut-out: 177 mm x 177 mm (6.97 in x 6.97 in) RITTAL: 1 x 3239.1xy with G3 filter	2 x Minimum: 65 m^3/h (2,296 ft^3/h, 10 Pa (0.00145 psi) Minimum door cut-out: 2 x 177 mm x 177 mm (2 x 6.97 in x 6.97 in) RITTAL: 2 x 3239.1xy with G3 filter	3 x Minimum: 65 m^3/h (2,296 ft^3/h, 10 Pa (0.00145 psi) Minimum door cut-out: 3 x 177 mm x 177 mm (3 x 6.97 in x 6.97 in) RITTAL: 3 x 3239.1xy with G3 filter
4 - Plinth with anti-dust grid	Minimum: 150 mm x 240 mm (5.9 in x 9.45 in) 80 % free cross section	Minimum: 150 mm x 440 mm (5.9 in x 17.32 in) 80 % free cross section	Minimum: 150 mm x 640 mm (5.9 in x 25.2 in) 80 % free cross section

Cut-outs Drawings for IP54 / UL Type 12 Integration into Standard Cabinets



Heat Losses

The following table gives the maximum heat losses of the Modular Single Drives at nominal load which are considered in the specification of the cooling air flow and cut-outs.

The given mains terminal losses are relevant for dimensioning the cooling of the incoming cabinet. Also take all other heat losses of the incoming cabinet into account, e.g. circuit breaker, cables,...

380...480 V

Modular Single Drive	Heat Losses at Normal Duty [W]						Heat Losses at Heavy Duty [W]						Mains Terminal Losses
	Power Section			Electronic Area			Power Section			Electronic Area			
	400 V	440 V	480 V	400 V	440 V	480 V	400 V	440 V	480 V	400 V	440 V	480 V	[W]
ATV•A0C11•4	2,540	2,510	2,450	310	300	280	1,990	1,990	1,950	250	250	230	4
ATV•A0C13•4	3,200	3,140	3,180	390	370	370	2,250	2,520	2,460	310	300	280	4
ATV•A0C16•4	4,150	4,050	4,160	530	480	490	3,200	3,140	3,180	390	370	370	4
ATV•A0C20•4	4,360	4,320	4,360	480	470	450	3,410	3,410	3,460	370	380	370	14
ATV•A0C25•4	5,980	5,870	6,080	650	600	620	4,380	4,330	4,370	480	470	450	14
ATV•A0C31•4	8,100	7,890	8,180	930	850	900	5,980	5,870	6,080	650	600	620	14
ATV•A0C35•4	8,120	7,960	8,170	850	790	800	6,020	5,950	6,160	630	610	610	36
ATV•A0C40•4	9,350	9,130	9,270	960	910	920	7,010	6,900	7,130	720	690	690	36
ATV•A0C45•4	11,120	10,820	10,850	1,230	1,090	1,080	8,120	7,960	8,170	840	790	790	36
ATV•A0C50•4	13,630	12,230	12,140	1,340	1,310	1,270	9,350	9,130	9,270	1,000	920	920	36
ATV•A0C56•4	13,270	12,920	12,930	1,430	1,290	1,260	10,020	9,830	9,860	1,000	960	930	55
ATV•A0C63•4	15,530	15,070	15,080	1,740	1,570	1,490	11,260	10,990	10,930	1,190	1,100	1,050	55
ATV•A0C71•4	16,450	15,980	15,930	1,840	1,660	1,610	12,290	12,040	12,050	1,280	1,210	1,160	94
ATV•A0C80•4	19,420	19,120	18,620	2,250	2,030	1,910	14,230	13,890	13,910	1,520	1,380	1,350	94
ATV•A0M10•4	27,260	24,460	24,240	2,680	2,620	2,540	18,700	18,260	18,540	2,000	1,840	1,840	72

(1) In case of reduced height integration the mains terminal losses are already considered in the specification of the cooling air flow and cut-outs.

500...690 V

Modular Single Drive	Heat Losses at Normal Duty [W]						Heat Losses at Heavy Duty [W]						Mains Terminal Losses (1) [W]
	Power Section			Electronic Area			Power Section			Electronic Area			
	500 V	600 V	690 V	500 V	600 V	690 V	500 V	600 V	690 V	500 V	600 V	690 V	
ATV•A0C11•6	1,900	2,000	1,900	190	190	200	1,600	1,700	1,600	180	180	170	2
ATV•A0C13•6	2,200	2,300	2,200	210	210	220	1,900	2,000	1,900	190	190	200	2
ATV•A0C16•6	2,700	2,800	2,700	240	240	250	2,200	2,300	2,200	210	210	220	2
ATV•A0C20•6	3,300	3,500	3,400	290	280	310	2,700	2,800	2,700	240	240	250	2
ATV•A0C25•6	4,000	4,200	4,100	360	360	380	3,300	3,500	3,400	290	280	310	7.5
ATV•A0C31•6	5,100	5,400	5,100	440	440	460	4,000	4,200	4,100	360	360	380	7.5
ATV•A0C40•6	6,600	6,900	6,600	560	560	580	5,100	5,400	5,100	440	440	460	7.5
ATV•A0C50•6	7,900	8,300	8,000	690	660	700	6,600	6,900	6,600	560	560	580	19
ATV•A0C63•6	10,300	10,700	10,400	890	820	900	7,900	8,300	8,000	690	660	700	19
ATV•A0C80•6	12,900	13,100	13,000	1,200	1,100	1,200	10,300	10,700	10,400	890	820	900	30
ATV•A0M10•6	16,000	16,200	16,200	1,500	1,300	1,500	12,900	13,100	13,000	1,200	1,100	1,200	50
ATV•A0M12•6	18,800	19,400	19,300	1,700	1,600	1,800	16,000	16,200	16,200	1,500	1,300	1,500	71

(1) In case of reduced height integration the mains terminal losses are already considered in the specification of the cooling air flow and cut-outs.

Specific Requirements for Marine Applications

General Information

For marine type approval it is required to integrate the Altivar Process Modular offer into cabinets with sufficient mechanical strength and equipped with vibration dampers to withstand the strains.

Install the Modular Single Drive at locations where special precautions are taken to avoid condensation or install an anti-condensation heating inside the cabinet.

The Altivar Process Modular offer described in this manual has been certified for DNV-GL.

DNV-GL Certification	Class
Humidity	Class A
Temperature	Class A (machinery space, control room)
EMC	Class A - All except bridge and open deck (1)
Vibration	Class A (machinery space, control room)
(1) Converters with conducted and radiated emission above the DNV GL required limits can be installed in "special power distribution zone" and "general power distribution zone", in accordance with IEC 60533 provided measures are taken to attenuate these effects on the distribution system, so the safe operation is assured. Planned EMC measures shall be submitted for approval prior to installation onboard.	

NOTE: According to DNVGL-RU-SHIP-Part 4 Chapter 8 the assembly has been successfully tested and approved (report C3637) as the distances of the mains busbars are lower than the specified values. This is also mentioned inside the marine certificate.

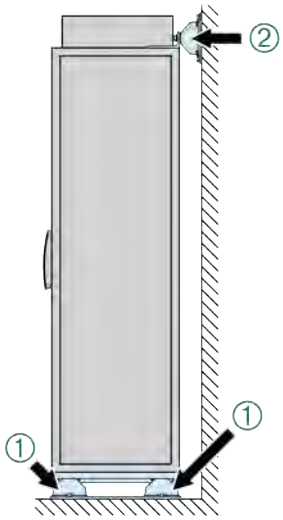
NOTE: In case of an ambient temperature higher than 40 °C (104 °F) refer to the information given in chapter Maximum Ambient Temperature, page 62.

NOTE: Refer to the recommended circuit breakers given in section Motor starters in the Altivar Process for Cabinet Integration catalog DIA2ED2180301EN.

NOTE: In case of 690 V the Modular Single Drive may trigger a warning message if the mains voltage exceeds +10 % , page 51.

Vibration Dampers

Installation of vibration dampers



① Vibration damper - journal bearing

② Vibration damper - stabilizer

Use the vibrations dampers BFC*xx* from SOCITEC recommended in the table below or any other vibration dampers with equivalent characteristics.

Modular Single Drive	Recommended vibration dampers from SOCITEC		
Weight (1)	**Type**	**Amount of journal bearings**	**Amount of stabilizers**
280...450 kg *617...992 lb*	BFC13	4	2
420...650 kg *926...1,433 lb*	BFC14	4	2
600...900 kg *1,323...1,984 lb*	BFC15	4	2
900...1,400 kg *1,984...3,086 lb*	BFC15	6	3
1,200...1,800 kg *2,646...3,968 lb*	BFC15	8	4
1,300...2,100 kg *2,866...4,630 lb*	BFC16	6	3
1,900...2,800 kg *4,189...6,173 lb*	BFC16	8	4

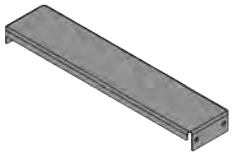
(1) Total weight of the whole drive including incoming cabinet.

NOTE: For more details refer to the specifications of the manufacturer of vibration dampers.

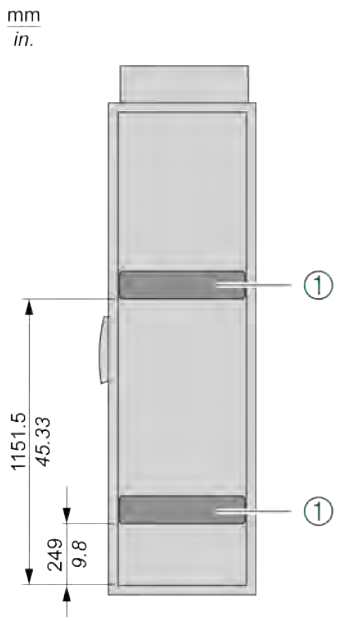
Mechanical Reinforcement

Part specification GDE48895 specifies the additional supports to be installed into standard cabinets of different width to increase the mechanical strength.

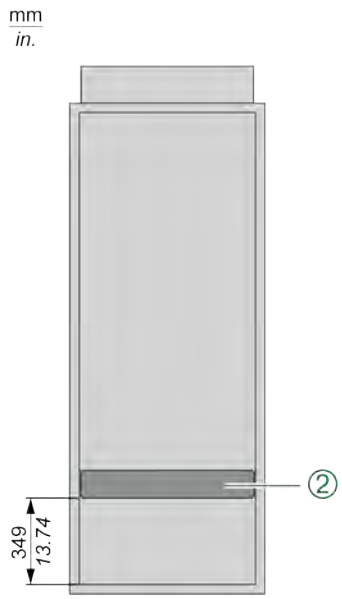
Installation of additional supports



Side view



Front view



① Additional support for the left and right side

② Additional supports for the front side

NOTE: Mount the additional supports after successful integration of the modules as described in the Integration of a Module in IP21 or IP54 Cabinet section, page 160. Install 4 M8x16 bolts for each additional support and tighten to 13.5 N·m (119.5 lbf·in).

Assembly and Integration

What's in This Part

About this part

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK OR FIRE

Only use parts approved by Schneider-Electric.

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

This part describes:

- the integration of 1 power module, IP21 / UL Type 1 and IP54 / UL Type 12 cabinet cases,
- the connection of 3 power modules,
- the connection of 5 modules in 2 separated cabinets,
- wiring the motor cables, IP21 / UL Type 1 and IP54 / UL Type 12 cabinet cases.

The integration process is shown in detail in the Animated Integration Sequences, page 152.

Preliminary Information

What's in This Chapter

Mounting Conditions

Before You Begin

⚠⚠DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- The open type product does not provide comprehensive mitigation for fire hazards and protection against direct contact to hazardous live parts.
- Install the product inside a supplementary enclosure which provides appropriate protection against spread of fire and electric shock.

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

Conductive foreign objects, dust or liquids or damaged parts may cause parasitic voltage.

⚠⚠DANGER

ELECTRIC SHOCK CAUSED BY FOREIGN OBJECTS OR DAMAGE

- Do not use damaged products.
- Keep foreign objects such as chips, screws or wire clippings from getting into the product.
- Verify correct seat of seals and cable entries in order to avoid deposits and humidity.

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

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

⚠WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

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

Power Drive Systems (PDS) can generate strong local electrical and magnetic fields. This can cause interference in electromagnetically sensitive devices.

⚠WARNING

ELECTROMAGNETIC FIELDS

- Keep persons with electronic medical implants, such as pacemakers, away from the equipment.
- Do not place electromagnetically sensitive devices in the vicinity of the equipment.

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

⚠CAUTION

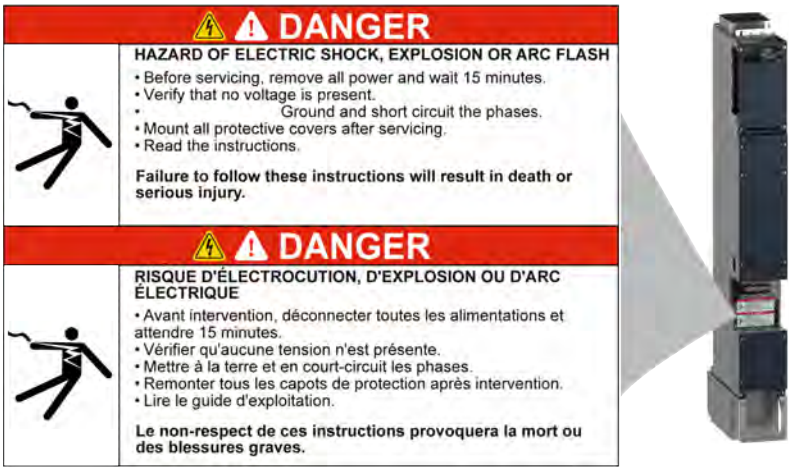
SHARP EDGES

Use all necessary personal protective equipment (PPE) such as gloves when removing the components from the pallet.

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

Attaching A Label With Safety Instructions

A label kit is provided with the drive.

Step	Action
1	Observe the safety regulations in the target country
2	Select the label suitable for the target country
3	Attach the label to the front of the device so that it is clearly visible. 

General Mounting Instructions

- Mount the device in a vertical position. This is required for cooling the device.
- The use of washers is required with all mounting screws.
- Tighten the fixation screws.
- Do not mount the device close to heat sources.
- Avoid environmental effects like high temperatures and high humidity as well as dust, dirt and conductive gases.
- Adhere to the minimum installation distances for required cooling.
- Do not mount the device on flammable materials.
- Install the Cabinet on a solid, vibration-free ground.

Screw Sizes and Tightening Torques

Screw Size	Tightening Torque	
	N·m	lbf·in
M3	0.8	7.1
M4	1.2	10.6
M5	3.3	29.2
M6	5.5	48.7
M8	13.5	119.5
M10	27	239
M12	45.0	398.3

Animated Integration Sequences: .PVZ File

Introduction

Use this Integration manual together with animated 3D CAD files (.pvz file format). Using Creo View Express™ software you can play the sequence steps to help you understand the integration process.

Download Creo View Express™ software

Creo View
Simple But Powerful

You can use this software free of charge.

Step	Action
1	Go to www.ptc.com
2	Search the Creo View Express™ download page
3	Download the software.
4	Install it on your computer

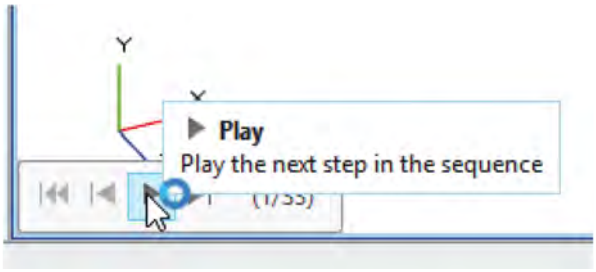
Download The .PVZ file

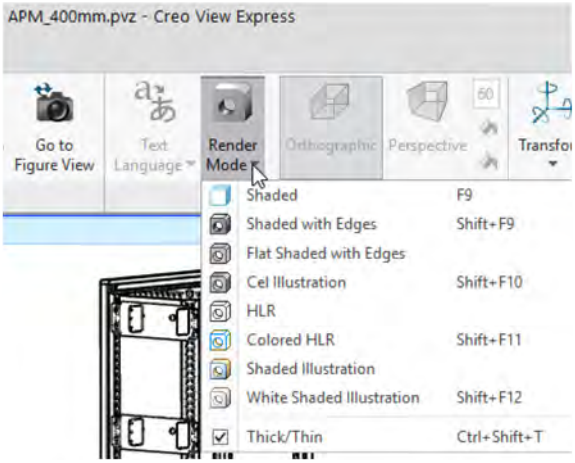
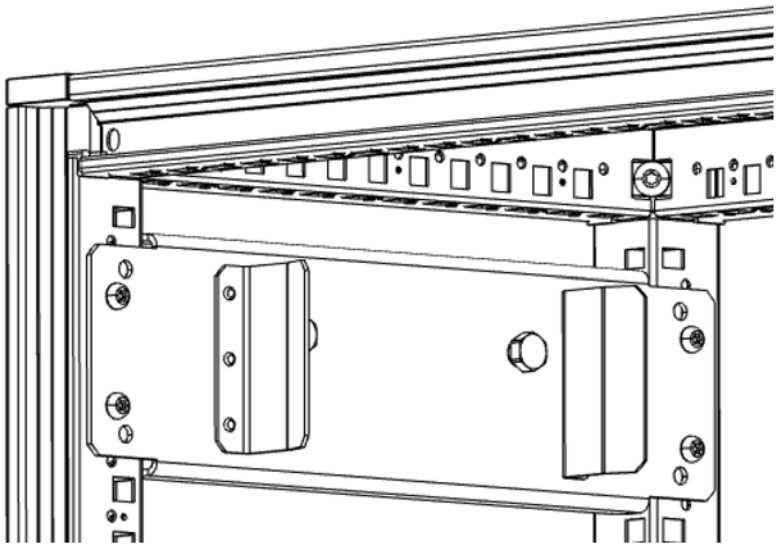
For the Altivar Process Modular integration 3D animations

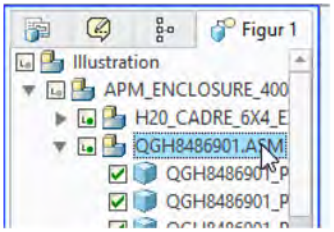
Step	Action
1	Go to the Related Documents for Qualified Partner section
2	Search the  .pvz file corresponding to your project
3	Download the .pvz file on your computer.

Creo View Express™ software Introduction

The table below shows few features you can use to customize the display of parts:

Step	Action
1	Open Creo View Express.
2	Open the XXXXX  .pvz file.
3	Use the control buttons located on the left down part of the screen to start display the sequence steps. 
4	Press and hold on the mouse wheel to move the parts displayed in any axis. The cursor becomes as indicated below.

Step	Action
	
5	Select the rendering mode you want. 
6	Turn the mouse wheel forward and backward to zoom in or out to get the accurate view you need. 

Step	Action
7	Use the left side panel to select a part or sub-assembly. This panel displays the part specification number. Check/uncheck the box to display or hide the selection. Click the part or sub-assembly name to select it. Right-click the mouse to access the contextual menu. 
8	Press F1 to access the online help for other available tools and features description.

Parts and Tools Required

Required Drive Parts - Example for Standard Power Module 380...480 V

The following parts are required to build a Modular Single Drive consisting of 3 power modules:

Name of the Part	Catalog number	Quantity	Description
Standard Power Module 160 kW - 380...480 V - IP00	APM1A0C16N401	3	
Standard Control Unit - 380...480 V	APM6A0CTLN401 or APM9A0CTLN401	1	ATV600 or ATV900 control unit with graphical display terminal and cables. **NOTE:** Connect only one control unit per Modular Single Drive.
Front Face Cover for one Standard Power Module	VW3A97A01	2	Metallic front face cover for each power module that does not integrate the control unit.

Additional Required Parts For The Drive

The following table gives the required additional parts to build a Modular Single Drive consisting of 3 power modules:

Name of the Part	Quantity	Description
24 Vdc Power Supply	1	Power Supply for control unit. Further information is given in the Power Supplies section, page 68.

Required Parts For Cabinet Integration IP21 / UL Type 1

The following table gives the list of the required parts to build a Modular Single Drive consisting of 3 power modules in an IP21 / UL Type 1, 800 mm (31.5 in) wide and 600 mm (23.62 in) depth cabinet:

Name of the Part	Catalog number	Specification (1)	Quantity	Description
Mounting kit for integration of 3x standard power modules in a 800 mm width cabinet	VW3A99ACFEC	Yes	1	The mounting kit is composed of: • 4 Rear plates with metallic lateral guidance of the power module • 1 Top fixing & lifting bar of the line choke box
Bottom support for integration in IP21 / UL Type 1 cabinet	VW3A99ACA01	Yes	3	One bottom support for each standard power module in an IP21 / UL Type 1 cabinet
Roof Top Extension for APM architectures in 800mm width cabinet column	-	Yes	1	Specification of the Roof Top Extension of the cabinet for the air cooling outlet that is a dedicated design for the APM drive integration.
Roof Plate for APM architectures in 800mm width cabinet column	-	Yes	1	Specification of the cabinet roof plate adaptation for the Roof Top Extension assembly.
Roof Fan	-	Yes	3	To manage the required cooling air flow through the control unit and mains fuses, an additional Roof Fan is mandatory for each Standard Power Module in an IP21 / UL Type 1 integration type.
Air Inlet Grid	-	No	2	Further information is given in the Cooling section, page 139.
(1) You can order the part from Schneider Electric or make it yourself according to the provided specification.				

Required Parts For Cabinet Integration IP54 / UL Type 12

The following table gives the list of the required parts to build a Modular Single Drive consisting of 3 power modules in an IP54 / UL Type 12, 800 mm (31.5 in) wide and 600 mm (23.62 in) depth cabinet:

Name of the Part	Catalog number	Specification (1)	Quantity	Description
Mounting kit for integration of 3x standard power modules in an 800 mm width cabinet	VW3A99ACFEC	Yes	1	The mounting kit is composed of: • 4 Rear plates with metallic lateral guidance of the power module • 1 Top fixing & lifting bar of the line choke box
Bottom support for integration in IP54 / UL Type 12 cabinet	VW3A99ACA02	Yes	3	One bottom support for each standard power module in an IP54 / UL Type 12 cabinet
Roof Top Extension for APM architectures in 800mm width cabinet column	-	Yes	1	Specification of the Roof Top Extension of the cabinet for the air cooling outlet that is a dedicated design for the APM drive integration.
Bottom inlet air duct for an IP54 / UL Type 12 integration	VW3A99BCA02	Yes	2	1 x Inlet Power Cooling Air Duct for each Low Harmonic/Regen Power Module of the single drive architecture.
Top outlet cooling air duct for an IP54 / UL Type 12 integration	VW3A99BCA03	Yes	3	Outlet power cooling air duct for each Standard power module or braking module.
Bottom air flow separation plate for an IP54 / UL Type 12 integration	QGH26953	Yes	1	1 metal sheet plate to close the bottom of a 600 mm width IP54 cabinet in front of the bottom support of a standard power module
Roof Plate for APM architectures in 800mm width cabinet column	-	Yes	1	Specification of the cabinet roof plate adaptation for the Roof Top Extension assembly.
Door Fan	-	Yes	3	To manage the required cooling air flow through the control unit and mains fuses, an additional Door Fan is mandatory for each Standard Power Module in an IP54 / UL Type 12 integration type.
Air Outlet Grid	-	No	2	Further information is given in the Cooling section, page 139.
(1) You can order the part from Schneider Electric or make it yourself according to the provided specification.				

Required Parts for the Power Connections

The following table gives the required parts for the power connection of 3 modules in an IP54 / UL Type 12, 800 mm (31.5 in) wide and 600 mm (23.62 in) depth cabinet:

Name of the Part	Catalog number	Specification (1)	Quantity	Description
Mains busbar kit to connect 3 standard power in an 800 mm (31.5 in) width cabinet	VW3A98ABMCAC	Yes	1	Kit of bars with holes to build the mains busbar of a single drive architecture with 3 side by side standard power modules. Mains entrance can be from the left or right side of the cabinet.
Mains busbar fixation kit to be added in each cabinet column of the APM Single Drive architecture	VW3A98CTM01	Yes	1	1 x sheet metal with 6 stand-offs and screws for fixation of the 3 x bars of the mains bus on the first Power Module on the left inside each cabinet column. Designed for PanelSeT SFN, VX25 or TS8.
Mains Terminal Kit for Single Drive architectures	VW3A98CTM02	Yes	1	Kit of 3 x Terminal bars to connect the Mains line to the Mains Busbar of a Single Drive from 1 to 6 Power Modules architectures.
Mains Terminal Extension Kit for Single Drives with UL certification	VW3A98CTM03	Yes	1	Kit including: • 3 Extension copper plates • 1 Sheet metal support • Set of screws

Name of the Part	Catalog number	Specification (1)	Quantity	Description
Power Busbar kit to connect 2 side by side standard power modules & braking modules	VW3A98ABPC1	Yes	2	Kit including: • 3 DC-Busbar connection with screws • 3 Motor-Busbar connection with screws
DigiLink cable 2m	VW3A83CDG020	Yes	2	For control network between a control unit and the power module
Fuses 400A - 380...480V	VW3A98CF4040	Yes	3	Set of 3 x fuses 400A, UL certified for 1 x power module 380...480 V
(1) You can order the part from Schneider Electric or make it yourself according to the provided specification.				

List of Required Tools

The following tools are needed for the integration:

- set of screw drivers (Torx and Pozidriv),
- set of metric magnetic, hexagon sockets,
- torque wrench,
- scissor-type lifting table,
- removable support for standard power module Integration (VW3A99AR01) or equivalent part manufactured locally.

List of Additional Mounting Material

If you order the parts from Schneider Electric, the related screws, nuts and lock washers for all internal electrical connections are already included in delivery. They are also described in the provided specification, if you make the parts by yourself.

In addition, you may also need the mounting materials listed below.

Screws

Type of screw	Tightening torque
DIN 6921 M8x16	13.5 N·m (119.5 lbf·in)
ISO 4017 M10x20	27 N·m (239 lbf·in)
ISO 4017 M10x40	27 N·m (239 lbf·in)

Nuts

Nut	Size	Tightening torque
	M6 ISO 4032 with integrated lock washer DIN 6908	5.5 N·m (48.7 lbf·in)
	Cage nut Schneider Electric NSYCNM8	–
	Special integration nut VX 4164.500 for Rittal VX25	–

Nut	Size	Tightening torque
	Snap on nut (cage nut) Rittal TS8 TS 8800.808 M8	–
	Rittal TS8 TS4165.000 M8	-

Lock washers

Type	Tightening torque
Lock washer 10 mm NFE25-511M	–

IP21 or IP54 Integration of 1 Module in a 400 mm Cabinet

What's in This Chapter

Prepare The Cabinet

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

 Launch the PVZ file, page 12:

- PHA2457200 for integration in an IP21 / UL Type 1 cabinet,
- PHA2457300 for integration in an IP54 / UL Type 12 cabinet.

NOTE: The parts shown in the PVZ files may differ slightly in detail from your parts to integrate due to the different cabinet types or further development.

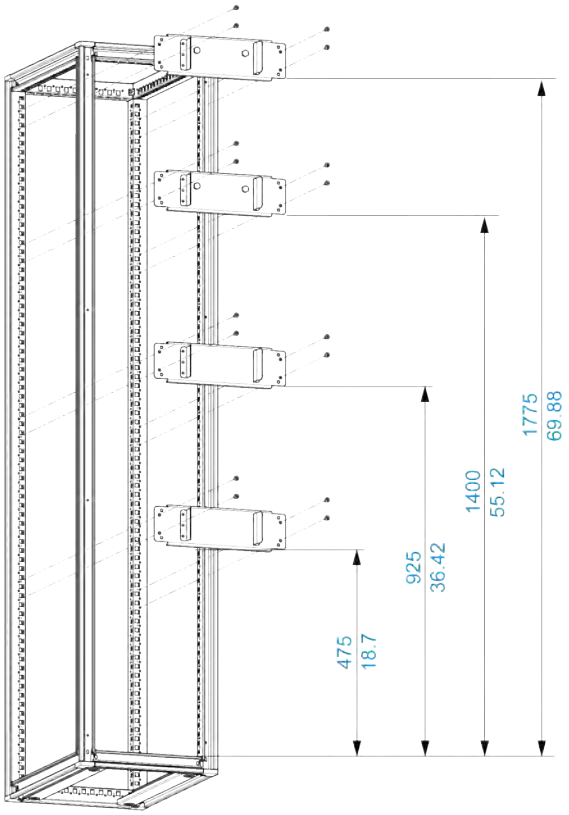
For specification of the cabinet, refer to General specification in chapter Specifying The Cabinet, page 132.

Prepare the cabinet before starting the integration of the power module. The procedure is illustrated in the steps 1 to 3. Make sure you have all the needed parts regarding the dimensions and the protection degree of the cabinet.

Sequence Step 1

Mount the upper two rear cross rails on the rear side of the cabinet using cage nuts. Tighten the 8 M8x16 bolts to 13.5 N·m (119.5 lbf·in).

Mount the bottom two rear cross rails on the rear side of the cabinet aligned to the upper rear cross rails using cage nuts. Tighten the 8 M8x16 bolts to 13.5 N·m (119.5 lbf·in).



Sequence Step 2

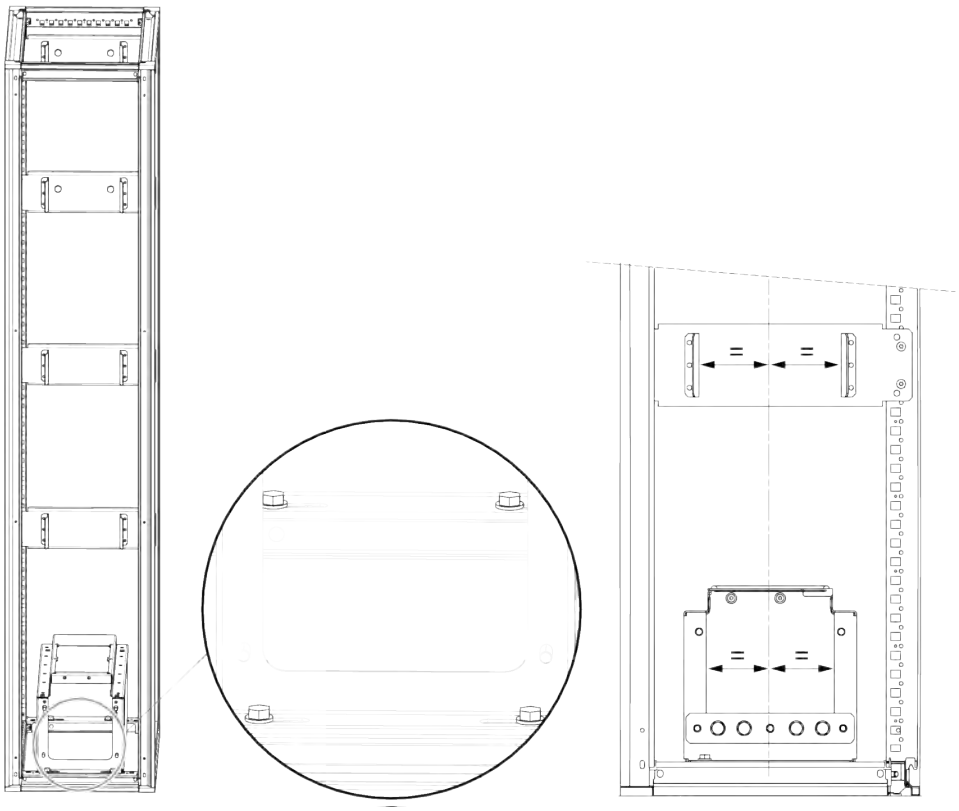
Install the bottom air flow separation plate in the cabinet. This part is only required for IP54 / UL Type 12 integration.

For IP21 you can use a standard bottom plate according to your cabinet brand.

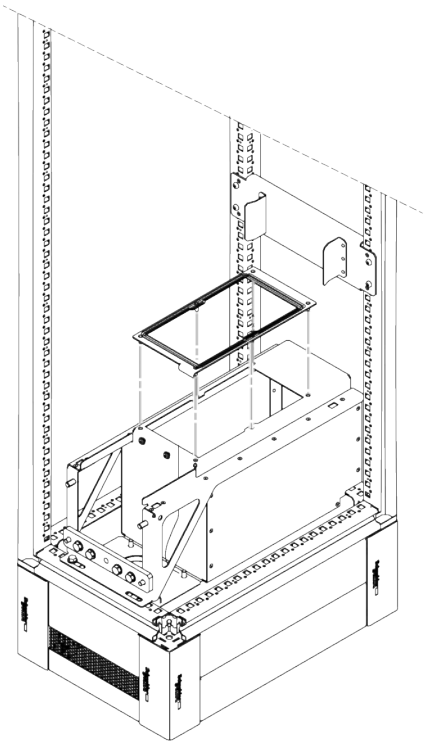
Ensure proper sealing between the bottom air flow separation plate and the cabinet.

Sequence Step 3

Install the bottom support using cage nuts. Ensure proper alignment with equal distance from the left and right side of the cabinet. Tighten the M8 x 16 bolts to 13.5 N·m (119.5 lbf·in).



Integration in IP54 / UL Type 12 cabinet: Install the gasket support plate.



Mains Unit Integration

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

Unpack and prepare the air outlet unit before starting the integration in the cabinet. The procedure is illustrated in the steps 4 to 9 of the sequence. Make sure you have all the needed parts to carry on the integration procedure.

Sequence Step 4 - Prepare the Mains Unit Integration

⚠WARNING

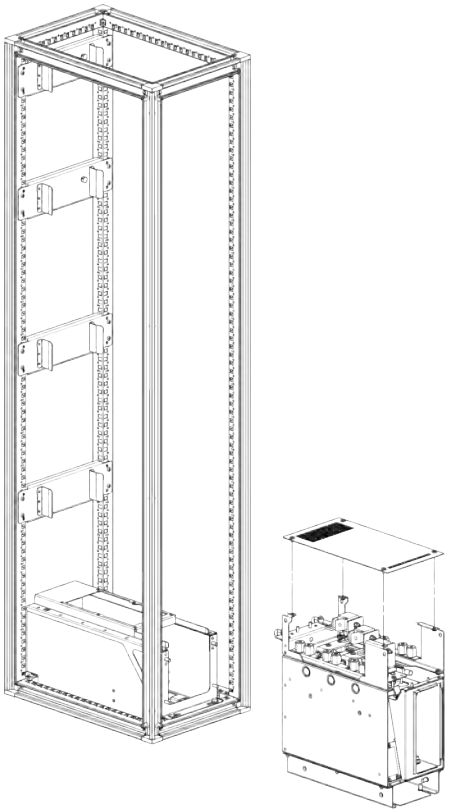
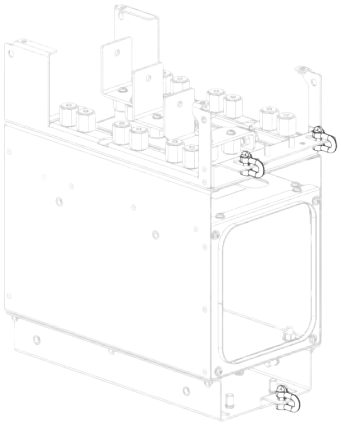
FIRE AND INSUFFICIENT HEAT DISSIPATION

Verify that all bags with drying agent are removed.

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

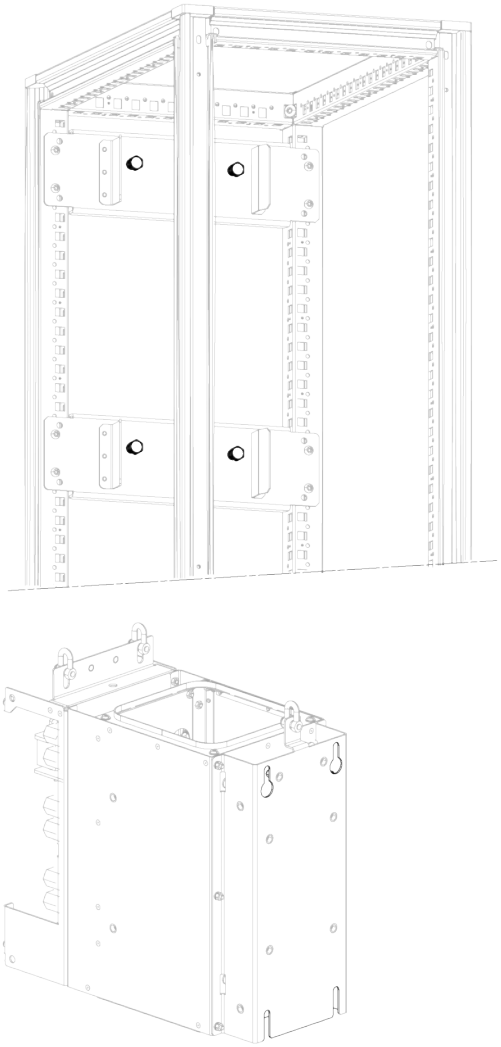
Perform the following actions to integrate the mains unit into the cabinet:

Step	Action
1	Remove the bags with drying agent.
2	Remove the screws holding the mains unit on the pallet.
3	Securely mount the cabinet.

Step	Action
4	Remove the front cover of the mains unit. 
5	Integration into IP54 / UL Type 12 cabinet: Install the top air duct at the top of the mains unit.
6	Install the 3 lifting lugs (not supplied). 

Sequence Step 5 - Lift the Mains Unit

Use a hoist to lift the mains unit into the cabinet. Keep the mains unit suspended until it is mounted at its final position.



Sequence Step 6 - Position the Mains Unit

Hang up the mains unit on the upper rear plates by positioning the lower screws in the mains unit and then the upper screws.

Sequence Step 7 - Remove the Lifting Lugs

Remove the 3 lifting lugs from the mains unit.

Sequence Step 8 - Install the Top Support Bar of the Mains Unit

Install the top support bar of the mains unit on the cabinet.

Install the 4 M8x16 bolts using cage nuts and washers. Do not totally tighten.

Sequence Step 9 - Set the Mains Unit Lifting Bolt

Install the M10x40 lifting bolt and screw it to lift the unit to the upper position.

Tighten the 4 M8x16 screws of the top support bar to 13.5 N·m (119.5 lbf·in).

Power Unit Integration

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

NOTE: The power unit is equipped with lifting lugs on left and right sides and with 4 wheels at the bottom to ease handling. Do not use the wheels to transport or to move the power unit.

Sequence Step 10 - Prepare the Power Unit Integration - Scissor-type lifting table

⚠WARNING

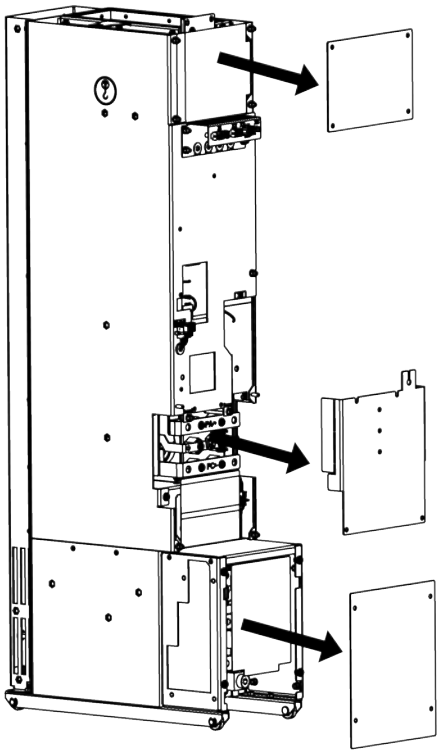
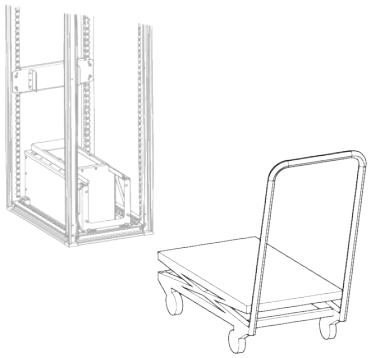
FIRE AND INSUFFICIENT HEAT DISSIPATION

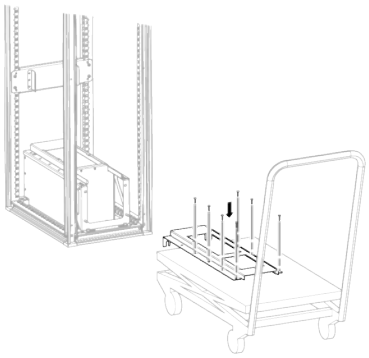
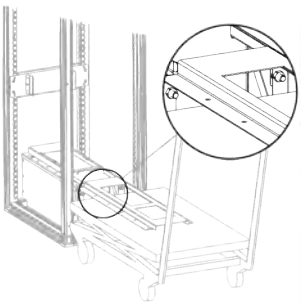
Verify that all bags with drying agent are removed.

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

Perform the following actions to prepare the handling:

Step	Action
1	Remove the bags with drying agent.
2	Remove the screws holding the power unit on the pallet.

Step	Action
3	Remove the front covers. 
4	Grease the sealing of the bottom support with vaseline.
5	Verify that the cabinet is securely mounted.
6	Place a properly rated and approved scissor-type lifting table (not included with the product) in front of the cabinet. 

Step	Action
7	Mount the platform with the rails to the scissor-type lifting table. The platform with rails can be ordered from Schneider Electric (VW3A99AR01) or built by yourself according to the drawings available from Schneider Electric. 
8	Attach the platform to the cabinet, using 2 x M10 bolts, washers and nuts. Tighten to 27 N·m (239 lbf·in). 

Sequence Step 11 - Hoist the Power Unit and Position it on the Support

Slowly lower the power unit onto the platform with the rails and verify that the wheels of the power unit are properly positioned into the rails. Keep the power unit suspended until it is mounted at its final position.

Sequence Step 12 - Slide the Power Unit Into the Cabinet

Push the power unit into the cabinet as far as possible without removing the belts of the hoist, applying the pushing forces at the marked positions.

Sequence Step 13 - Remove the Lifting Lugs

Sequence Step 14 - Slide the Power Unit to its Final Location

Perform the following actions to integrate the unit into the cabinet

Step	Action
1	Remove the belts of the hoist and push the power unit all the way into the cabinet until the wheels are blocked into the notches.
2	Perform a visual inspection of the sealing between the bottom support and the power unit.

Sequence Step 15 - Remove the Scissor-type Lifting Table

Sequence Step 16 - Join Mains Unit and Power Unit

Perform the following actions to adjust the mains unit on the power unit.

Step	Action
1	Gently unscrew the M10x40 lifting bolt to lower the mains unit.
2	While doing this, make sure that both units are well positioned one on the other with no distance on sides.
3	Verify the sealing between the mains and power units.
4	Remove the M10 lifting screw.

Sequence Step 17 - Fix the Mains Unit

Perform the following actions to adjust the mains unit on the power unit.

Step	Action
1	Install the 2 M10x20 screws with 10 mm washers for the mains unit fixation.
2	Tighten the screws with washers to fix the mains unit to the top support. Tightening torque 27 N·m (239 lbf·in).

Sequence Step 18 - Install the Upper Connection Plate

Attach the upper connection plate joining mains and power units. The plate is supplied with the mains unit. Tighten the 4 M6 nuts to 5.5 N·m (48.7 lbf·in).

Sequence Step 19 - Install the Lower Connection Plate

Attach the lower connection plate joining the power units to its support. The plate is supplied with the mains unit. Tighten the 2 M6 nuts and the 2 M6x16 "ecosyn-fix" bolts to 5.5 N·m (48.7 lbf·in).

Sequence Step 20 - Connect the Mains Unit Input Cables

Attach the mains unit input cables to the power unit. The cables are already prewired into the mains unit. Tighten the 3 M10x20 nuts with washers to 27 N·m (239 lbf·in).

Sequence Step 21 - Install the 3 Mains Busbars

The busbars are part of the kit or may be ordered separately.

Attach the 3 mains busbars without tightening.

NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains busbars. Tighten the 6 x M8 screws to 13.5 N·m (119.5 lbf·in)

Sequence Step 22 - Fuses Installation

⚠⚠DANGER

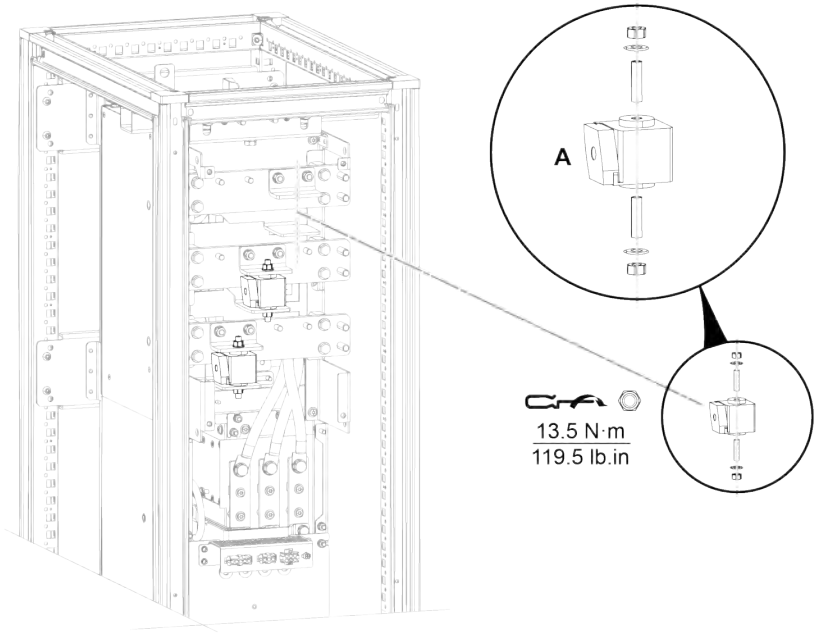
INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, apply the instructions given in the section below.

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

NOTE: Fuses specifications, page 66

Perform the following actions to install the fuses. Do not tighten the upper fuse holder at this step.

Step	Action
1	Install the upper fuse holder. Keep the nuts loose.
2	Install the fuses in their location **NOTE:** Install the fuse according to the position shown on the figure below: blowing indicator **A** on the left-hand or right-hand side. 
3	Install the lower bolt into the fuse, install the washer, then the nut. Keep the nut loose.
4	Install the upper bolt into the fuse, install the washer, then the nut. Keep the nut loose.
5	Start to fix the fuses with the upper and lower M8 nut, then both nuts on the upper fuse holder and finally the mains busbars on the standoffs with the M8 screws. Tighten to 13.5 N·m (119.5 lbf·in).

Sequence Step 23 - Install the Mains Terminal Kit

Perform the following actions to install the mains terminal kit on the left side of the Modular Single Drive.

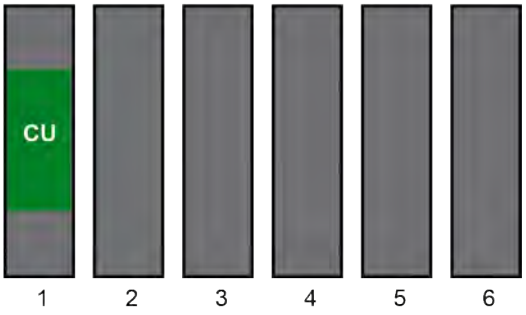
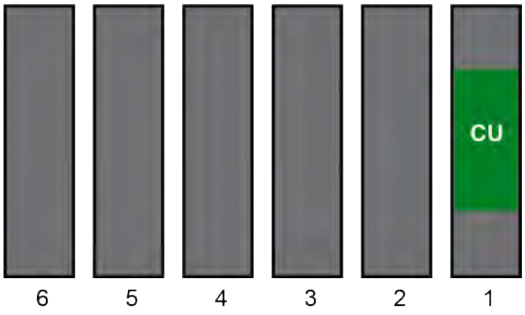
Step	Action
1	Mount the fixation plate on the power module with the 2 x M5x15 screws. Tighten to 3.3 N·m (29.2 lbf·in).
2	Screw the 6 insulation standoffs on the fixation plate.
3	Mount the three mains terminal bars using the 6 x M6x16 screws. Tighten to 5.5 N·m (48.7 lbf·in).
4	Install the 6 x M10 nuts and tighten them to 27 N·m (239 lbf·in).

NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains terminal kit. Tighten the 6 x M8 screws to 13.5 N·m (119.5 lbf·in).

Control Unit Integration

Introduction

The control unit has to be installed on the left or right power unit.

If the control unit is on the left-hand side then the module numbers are...	If the control unit is on the right-hand side then the module numbers are...
	

NOTE: Connect only one control unit per APM Single Drive.

Sequence Step 24 - Fold back the Insulation Sheet To Access the High-Speed Communication Port

Sequence Step 25 - Install the High-Speed Communication Cable

Perform the following actions to install the Communication cable:

Step	Action
1	Plug one end of the cable to the High-Speed Communication Port.
2	Route the cable through the cable supports.
3	At this step, keep the second cable end unplugged.

Sequence Step 26 - Install the Covers

Perform the following actions to install the control unit:

Step	Action
1	Install the mains cables cover with the lower two nuts only.
2	Install the fan and DC terminal cover.
3	Install the motor terminal cover.

Sequence Step 27 - Install the Control Unit and Front Face Cover Substitutes

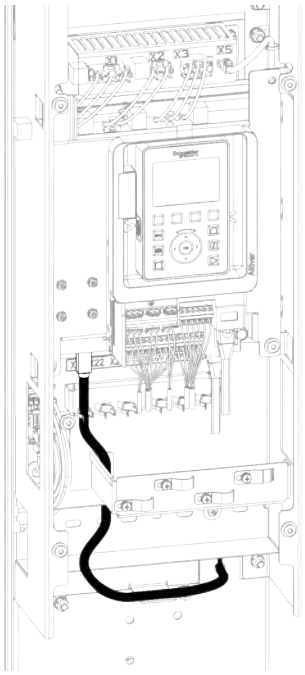
Sequence Step 28 - High-Speed Communication Cable

For correct operation of Functional Safety "SAFE TORQUE OFF" (STO) circuit, adherence to the following conditions must be ensured:

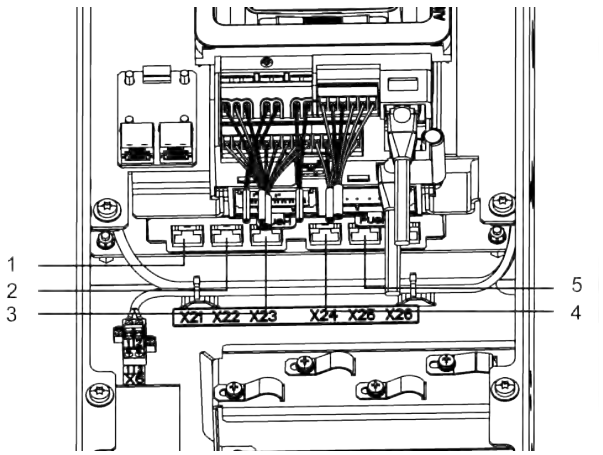
- Only use Schneider Electric parts or equivalent parts according to Schneider Electric specification for DigiLink interconnection.
- The cables and connectors must be not damaged.
- Correct contact between connector and socket must be guaranteed.

Connect the other end of the communication cable to the power board CMP6 of the control unit.

Laying of Communication Cable



Module Number	Connector
1	X21
2	X22
3	X23
4	X24
5	X25



Sequence Step 29 - 24 Vdc (and 48 Vdc) Supply

Connect the 24 Vdc supply to X4.

NOTE: For the Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4), also connect the 48 Vdc power supply to X4.

Sequence Step 30 - Fan supply

Connect the fan control to X6.

Connect the 4 connectors X1, X2, X3 and X5 between the power unit and control unit.

Module Cooling

Introduction

Make sure you have all the needed parts to prepare the cabinet regarding the dimensions and the protection degree of the cabinet.

Sequence Step 31 - Install the Cabinet Top Cover

Install the cover on the top of the cabinet with proper cut-out for the air outlet.

NOTE: Only use the covers provided by the Panel Manufacturer (Rittal or PanelSet SFN).

Sequence Step 32 - Install the Top Fan / Top Air Duct

IP21 Integration: Install the top fan on the top of the cabinet.

IP54 / UL Type 12 Integration: Install the top air duct on the top of the cabinet.

Seals and Covers

Sequence Step 33 - Install the Roof

Install the roof on the top of the cabinet.

Sequence Step 34 - Install the Mains Unit Cover

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 35 - Install the Control Unit Cover

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 36 - Install the Walls and the Front Door

Add the walls and the front door with the required ventilation openings. (These parts are different for IP21 / UL Type 1 and IP54 / UL Type 12).

The ventilation openings depend on the cabinet integration type:

- IP21 / UL Type 1: inlet grid (filter removed)
- IP54 / UL Type 12: door fan and inlet grid (including filter)

Integration of a 3 Module Combination in a 800 mm Cabinet

What's in This Chapter

Integration of a 3 Module Combination

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

Follow the integration steps for preparing the cabinet and integrating the mains unit and power unit as described in the Integration of a Module in IP21 or IP54 Cabinet section, page 160.

 Launch the PVZ file, page 12:

- PHA2457400 for connection of 3 modules.

  NOTE: The parts shown in the PVZ files may differ slightly in detail from your parts to integrate due to the different cabinet types or further development.

For specification of the cabinet, refer to General specification in chapter Specifying The Cabinet, page 132.

NOTE: Separation of the modules up to 2 m (6.5 ft) is possible under the responsibility of the panel builder (except cULus installations).

Sequence Step 1 - Install the Mains Busbar Bar Fixation Kit

Install the mains busbar fixation kit on the very left mains module. Install the 2 washers and nuts. Tighten to 5.5 N·m (48.7 lbf·in).

Sequence Step 2 - Install the Mains Busbars

The mains busbars are part of the kit or may be ordered separately.

Attach the 3 mains busbars designed for 3 parallel modules. Keep the nuts loose.

NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains busbars of each power module. Tighten the 6 x M8 screws to 13.5 N·m (119.5 lbf·in).

Sequence Step 3 - Install the Upper Fuse Holders

In the same way as described for 1 single module architecture, install the 9 upper fuse holders. Keep the nuts loose.

Sequence Step 4 - Install the Fuses

⚠⚠DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, apply the instructions given in the section below.

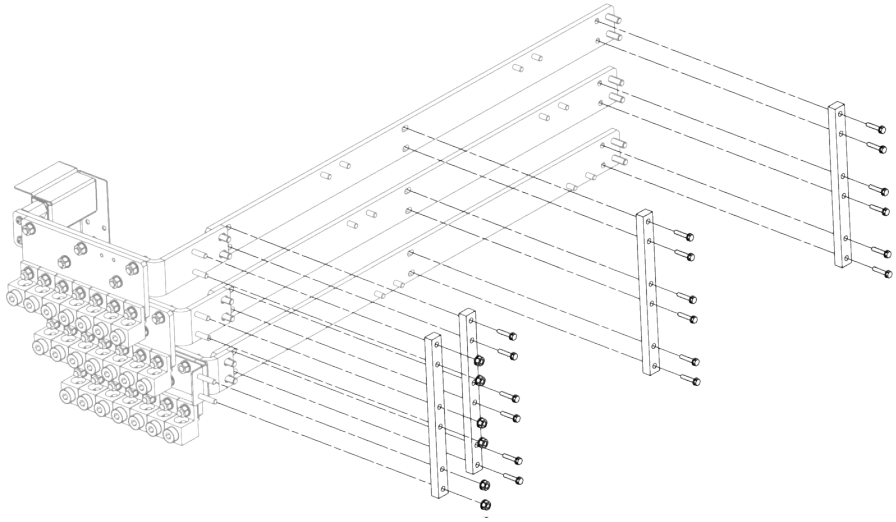
Failure to follow these instructions will result in death or serious injury.

Install the fuses and tighten all screws/nuts as described in the Integration of a Module in IP21 or IP54 Cabinet section, page 171.

Sequence Step 5 - Install the Mains Terminal Kit

In the same way as described for 1 single module architecture, install the mains terminal kit.

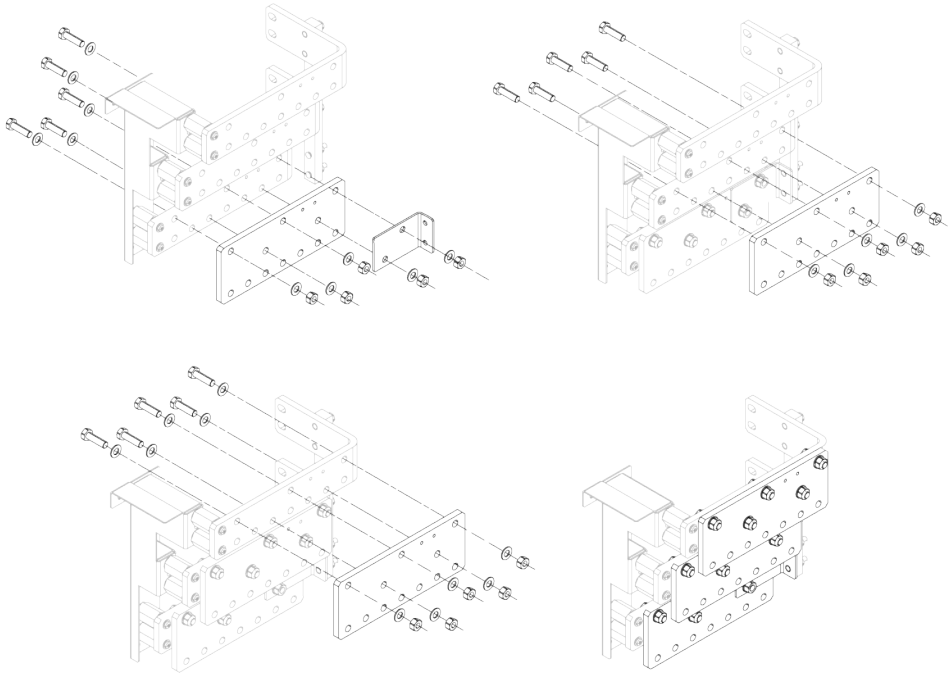
NOTE: If the mains short-circuit current is higher than 50 kA, it is required to install the mains bar insulation support (VW3A98CTM04) on the mains terminal kit. Tighten the 6 x M8 screws to 13.5 N·m (119.5 lbf·in).



Mains Terminal Extension Kit

NOTE: In case of cUL, also mount the mains terminal extension kit (VW3A98CTM03) when integrating 3 or more power modules into an IP54 / UL Type 12 cabinet.

Install the 3 plates using the 3 x 5 M10x35 screws, washers and 3 x 5 M10 nuts. Tighten to 27 N·m (239 lbf·in).



Sequence Step 6 - Remove the 3 Fan and DC Terminals Covers

Sequence Step 7 - Install the 6 DC Bus Connections

- Install the 2 upper and the 2 lower bars. Install the lock washers and tighten the 4 x 4 bolts to 27 N·m (239 lbf·in).
- Install the 2 middle bars. Install the lock washers and tighten the 2 x 2 screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 8 - Refit the 3 Fan and DC Terminals Covers

Sequence Step 9 - Install the 6 Motor Busbar connections

Install the 6 motor busbar connections. Install the 3 x 2 washers and bolts. Tighten to 27 N·m (239 lbf·in).

Sequence Step 10 - Install the 3 High-Speed Communication Cables

For correct operation of Functional Safety "SAFE TORQUE OFF" (STO) circuit, adherence to the following conditions must be ensured:

- Only use Schneider Electric parts or equivalent parts according to Schneider Electric specification for DigiLink interconnection.
- The cables and connectors must be not damaged.
- Correct contact between connector and socket must be guaranteed.

Perform the following actions to install the Communication cables:

Step	Action
1	Plug one end of each cable to the High-Speed Communication Port of each power unit.
2	Route the cable through the cable supports.
3	At this step, keep the second cable end unplugged.

Sequence Step 11 - Install the Control Unit and Front Face Cover Substitutes

Sequence Step 12 - Connect High-Speed Communication Cables to the Control Unit

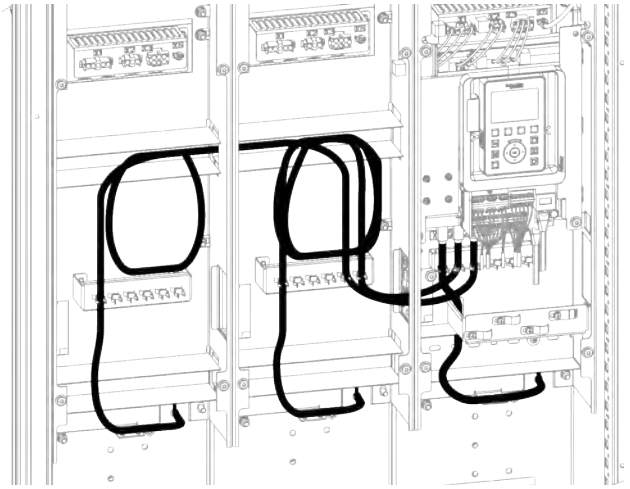
For correct operation of Functional Safety "SAFE TORQUE OFF" (STO) circuit, adherence to the following conditions must be ensured:

- Only use Schneider Electric parts or equivalent parts according to Schneider Electric specification for DigiLink interconnection.
- The cables and connectors must be not damaged.
- Correct contact between connector and socket must be guaranteed.

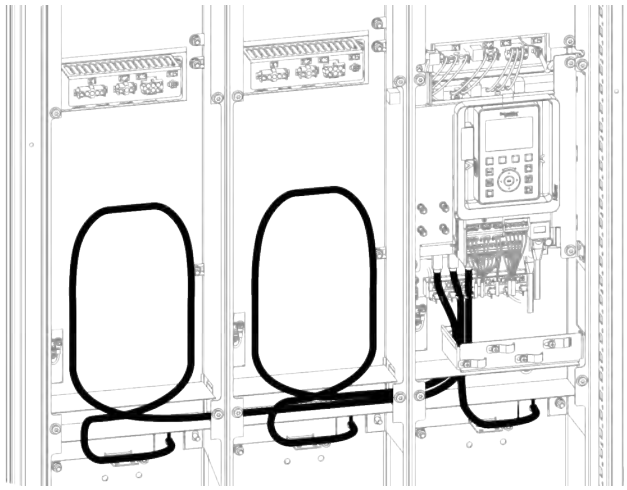
Laying of Communication Cables

For Standard Power Module

- 380...480 V (APM1A0C16N401)
- 500...690 V

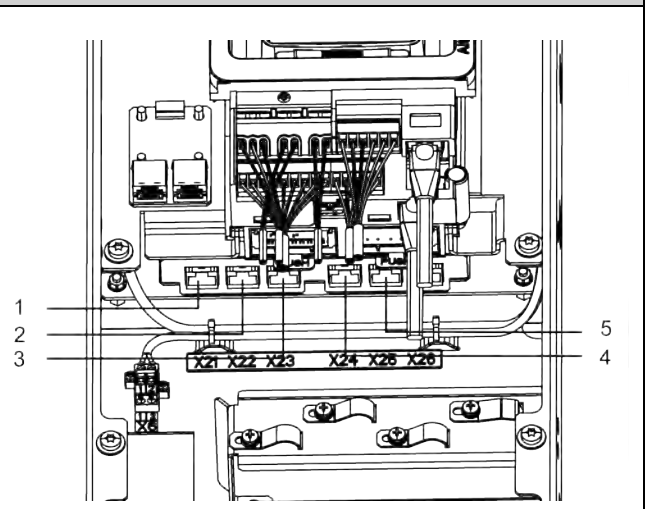


For Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4)



Perform the following actions with the high-speed communication cables:

Step	Action
1	Connect the communication cable of the module fitted with control unit (module number 1) to the X21 port.
2	Connect the other communication cables to ports X22 and X23.
3	Connect the 24 Vdc supply to X4. **NOTE:** For the Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4), also connect the 48 Vdc power supply to X4.
4	Connect the fan control to X6. Connect the 4 connectors X1, X2, X3 and X5 between the power unit and control unit.

Module number	Connector	
1	X21	
2	X22	
3	X23	
4	X24	
5	X25	

Sequence Step 13 - Install the Mains Unit Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 14 - Install the Control Unit Cover and Front Face Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 15 - Install the Motor Terminal Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Association of a 5 Module Combination, in 800 and 600 mm Cabinets

What's in This Chapter

Association of the 2 Cabinets

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

Follow the integration steps for preparing the cabinet and integrating the mains unit and power unit as described in the Integration of a Module in IP21 or IP54 Cabinet section, page 160.

 Launch the PVZ file, page 12:

- PHA2457500 for connection of 5 modules.

  NOTE: The parts shown in the PVZ files may differ slightly in detail from your parts to integrate due to the different cabinet types or further development.

For specification of the cabinet, refer to General specification in chapter Specifying The Cabinet, page 132.

NOTE: Separation of the modules up to 2 m (6.5 ft) is possible under the responsibility of the panel builder (except cULus installations).

Sequence Step 1 - Install the 3 Mains Busbar Connections Between Cabinets

Install the 3 mains busbar connection plates between both cabinets. Install the 4 x 3 washers and nuts. Tighten to 27 N·m (239 lbf·in).

Sequence Step 2 - Install the 3 DC Busbar Connections Between Both Cabinets

- Install the upper and lower bar. Install the lock washers and tighten the 2 x 4 bolts to 27 N·m (239 lbf·in).
- Install the middle bar. Install the lock washers and tighten the 2 screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 3 - Install the 3 Motor Busbar Connections Between Both Cabinets

Install the 3 motor terminal connection bars. Install the 3 x 2 washers and bolts. Tighten to 27 N·m (239 lbf·in).

Sequence Step 4 - Install the 5 High-Speed Communication Cables

For correct operation of Functional Safety "SAFE TORQUE OFF" (STO) circuit, adherence to the following conditions must be ensured:

- Only use Schneider Electric parts or equivalent parts according to Schneider Electric specification for DigiLink interconnection.
- The cables and connectors must be not damaged.
- Correct contact between connector and socket must be guaranteed.

Perform the following actions to install the Communication cables:

Step	Action
1	Plug one end of each cable to the High-Speed Communication Port of each power unit.
2	Route the cable through the cable supports.
3	At this step, keep the second cable end unplugged.

Sequence Step 5 - Install the Control Unit and Front Face Cover Substitutes

Sequence Step 6 - Connect the 5 High-Speed Communication Cables

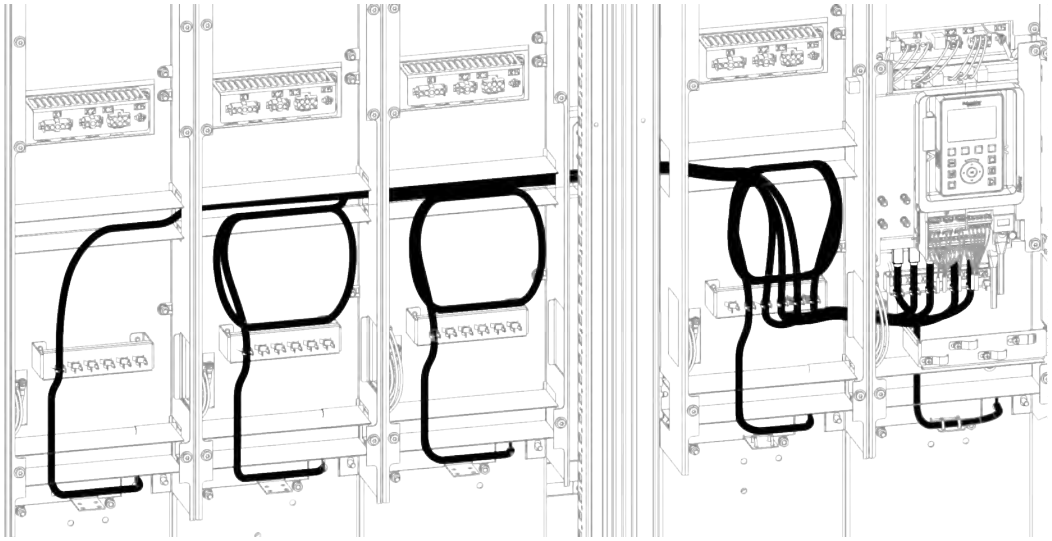
For correct operation of Functional Safety "SAFE TORQUE OFF" (STO) circuit, adherence to the following conditions must be ensured:

- Only use Schneider Electric parts or equivalent parts according to Schneider Electric specification for DigiLink interconnection.
- The cables and connectors must be not damaged.
- Correct contact between connector and socket must be guaranteed.

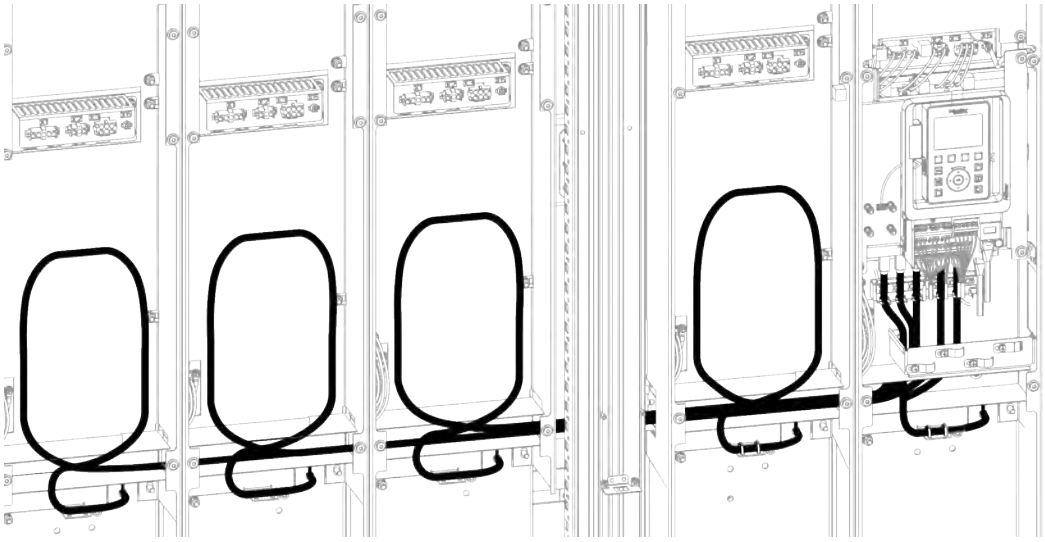
Laying of Communication Cables

For Standard Power Module

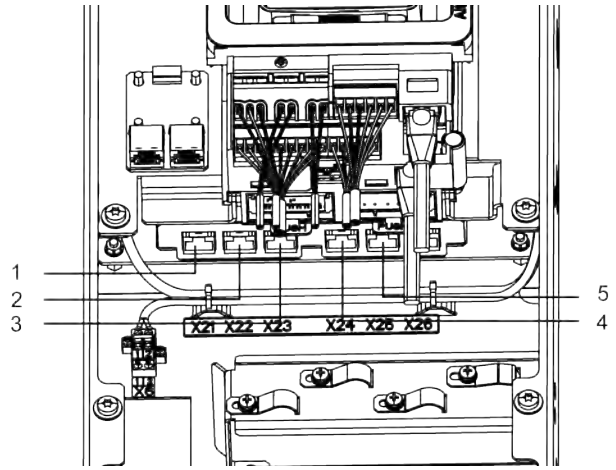
- 380...480 V (APM1A0C16N401)
- 500...690 V



For Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4)



Step	Action
1	Connect the communication cable of the module fitted with control unit (module number 1) to the X21 port.
2	Connect the other communication cables to ports X22...X25.
3	Connect the 24 Vdc supply to X4. **NOTE:** For the Standard Power Module 380...480 V with external 48 Vdc power supply (APM1A0C16N4), also connect the 48 Vdc power supply to X4.
4	Connect the fan control to X6. Connect the 4 connectors X1, X2, X3 and X5 between the power unit and control unit.

Module Number	Connector	
1	X21	
2	X22	
3	X23	
4	X24	
5	X25	

Sequence Step 7 - Install the Mains Unit Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 8 - Install the Control Unit Cover and Front Face Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Sequence Step 9 - Install the Motor Terminal Covers

Tighten the screws to 5.5 N·m (48.7 lbf·in).

Integration of a 6 Module Combination for 380...480 V

What's in This Chapter

General Information

For the integration of the power modules and the association between the power modules, see the other PVZ files and descriptions in this manual.

The main description in this section contains the following information:

- how to install the mains terminals on the right side of a power module
- how to connect the DC bus link and the motor bus link

Integration for Incoming on Left and Right Side

Introduction

⚠WARNING

TOPPLING, SWINGING, OR FALLING EQUIPMENT

- Take all measures necessary to keep the equipment from swinging, toppling and falling.
- Follow the instructions provided to remove the equipment from the packaging and to mount it at its final position.

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

NOTE: The parts shown in this section may differ slightly in detail from your parts to integrate due to the different cabinet types or further development.

For specification of the cabinet, refer to General specification in chapter Specifying The Cabinet, page 132.

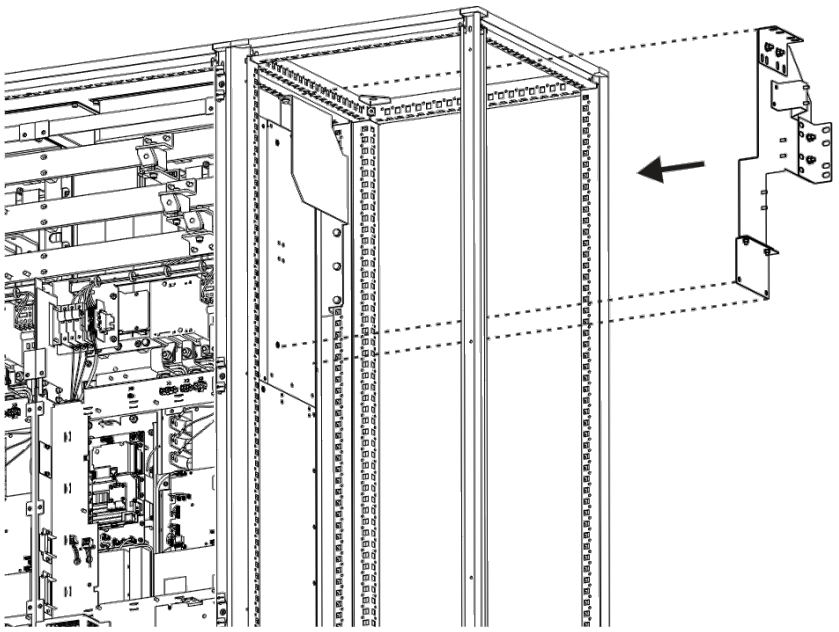
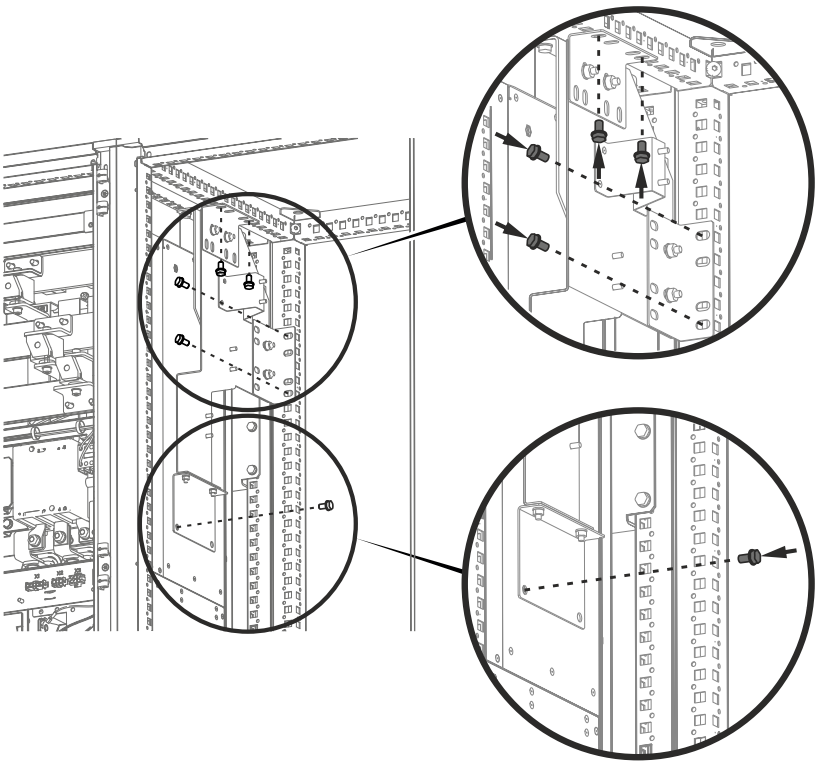
Installing the Mains Terminal Kit on the Left Side of a Power Module

In the same way as described for 1 single module architecture, install the mains terminal kit on the left side of the power module. Refer to the section Sequence Step 23 - Install the Mains Terminal Kit, page 172 in the chapter IP21 or IP54 Integration of 1 Module in a 400 mm Cabinet, page 160.

Installing the Mains Terminal Kit on the Right Side of a Power Module

To install the mains terminal kit on the right side of the power module a additional metallic support is needed (local manufactured). Refer to the specification GEX1628602.

Perform the following actions to mount the metallic support on the right side of the power module:

Step	Action
1	Position the metallic support on the right side of the power module. 
2	Mount the metallic support with 4 M8x16 screws to the incoming cabinet using cage nuts and tighten to 13.5 N·m (119.5 lbf in). Then fix the metallic support with 1 M8x16 screw to the power module and tighten to 13.5 N·m (119.5 lbf in). 
3	For mounting the insulation standoffs and the three mains terminal bars do it in the same way as described for 1 single module architecture, install the mains terminal kit on the left side of the power module. Refer to the section Sequence Step 23 - Install the Mains Terminal Kit, page 172 in the chapter IP21 or IP54 Integration of 1 Module in a 400 mm Cabinet, page 160.

Connection of the DC Bus Bar Link and the Motor Bus Bar Link

For connection of the DC bus bar link and the motor bus bar link refer to the specification GEX1999200.

Motor Cables Connecting and Power Module Grounding

What's in This Chapter

IP21 / UL Type 1 Cabinet Integration

Preliminary Steps

- Follow the integration steps described in the Integration of a Module in IP21 or IP54 Cabinet section.

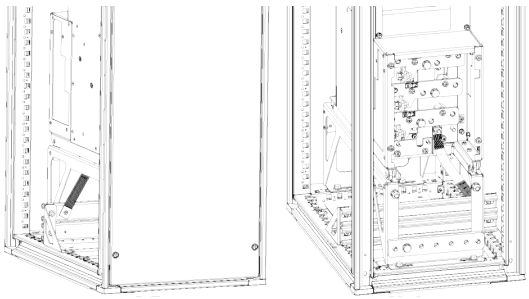
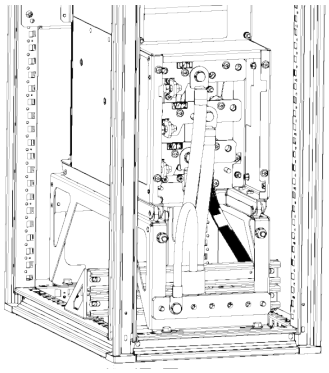
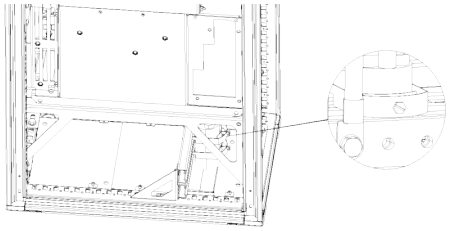
⚠⚠DANGER

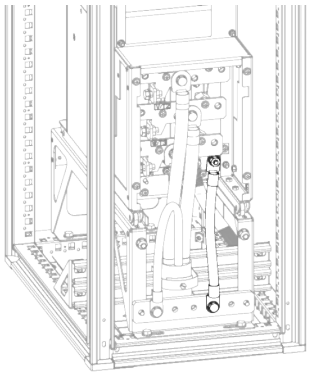
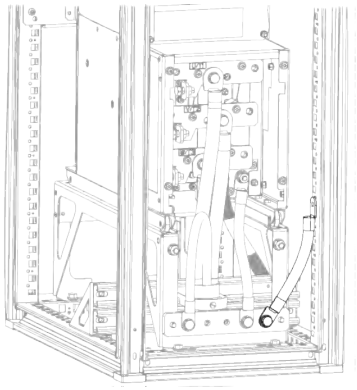
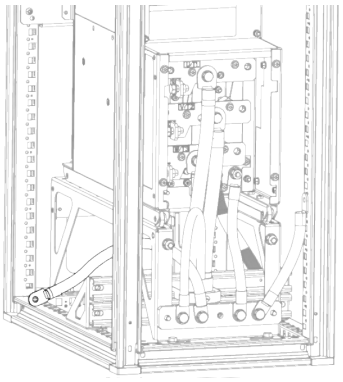
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

Motor Cables Connecting and Power Module Grounding

Step	Action	Comment
1	Install the grounding braid 	Install the shielding braid between the power module and its support using an M10 screw, washer and nut on power module side. Tighten to 27 N·m (239 lbf·in).
2	Connect the motor cables 	Connect the motor cables U/T1, V/T2 and W/T3 terminals and connect the ground cable to the ground bar, using M10 screws, lock washers and nuts. Tighten to 27 N·m (239 lbf·in). The motor cable can be supplied by maximum 2 power modules. If more than 2 power modules are combined, additional motor cables are mandatory.
3	Install the 2 cable clamps 	Connect the motor cables U/T1, V/T2 and W/T3 terminals and connect the ground cable to the ground bar, using M10 screws, lock washers and nuts. Tighten to 27 N·m (239 lbf·in).

Step	Action	Comment
4	Connect the PE cable 	Connect the PE cable between the power module and the ground bar. Tighten to 27 N·m (239 lbf·in).
5	Connect the first grounding cable 	Connect the grounding bar with the cabinet frame according to the local regulations.
6	Connect the second grounding cable 	Connect the motor grounding bar with the incoming grounding bar of the mains according to the local regulations.

NOTE: We recommend that the integrator provides to the customer the screws specified above for connecting the cables. The correct length of the screws depends on the used lugs and the required clearance distance, page 201.

NOTE: In case of cULus, any listed (ZMVV/7) box lug or compression lug rated for the required cross section can be used to connect the motor cables.

IP54 / UL Type 12 Cabinet Integration

Preliminary Steps

- Follow the integration steps described in the Integration of a Module in IP21 or IP54 Cabinet section.

⚠⚠DANGER

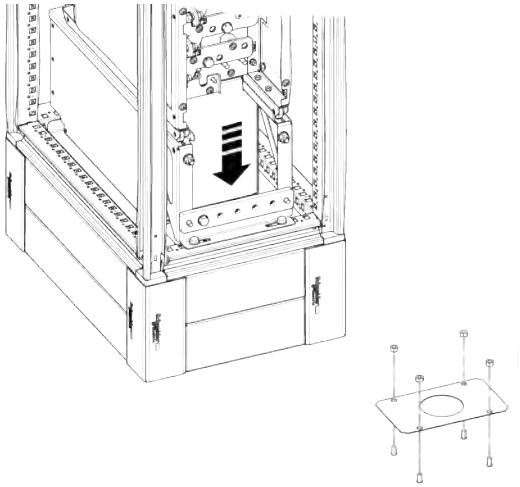
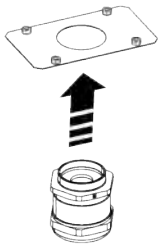
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

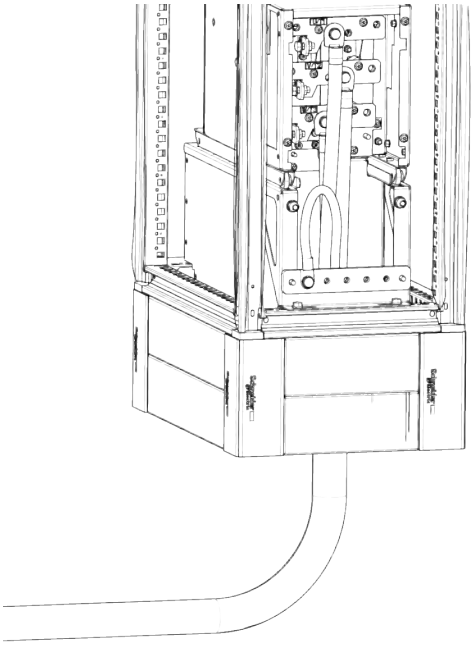
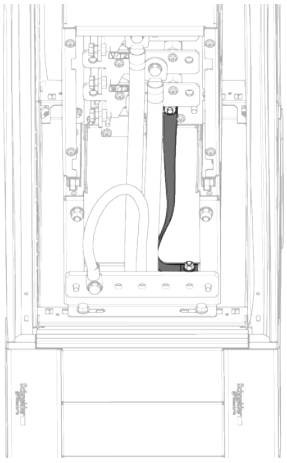
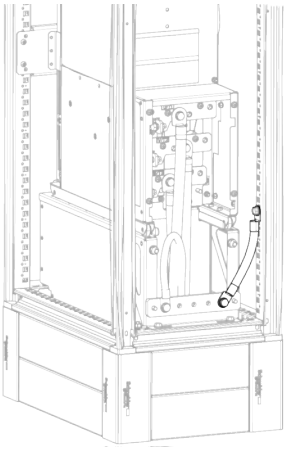
Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

Motor Cables Connecting and Power Module Grounding

NOTE: The procedure described below is also valid for IP54 / UL type 12 integration with air inlet and outlet on rear side but the plinth is not necessary.

Step	Action	Comment
1	Connect the motor cables 	Install the IP54 bottom plate on base of the cabinet chassis using the 4 M8 screws, washers and nuts. Tighten to 13.5 N·m (119.5 lbf·in).
2	Install the cable gland in the plate 	
3	Install the cable in the cable gland	
4	Install the cable gland nut	

Step	Action	Comment
5	Fit the lugs and connect the motor cables U/T1, V/T2 and W/T3 terminals and connect the ground cable to the ground bar, using M10 screws lock washers and nuts. Tighten to 27 N•m (239 lbf·in) 	The motor cable can be supplied by maximum 2 power modules. If more than 2 power modules are combined, additional motor cables are mandatory.
6	Install the shielding braid 	Install the shielding braid between the power module and the cable gland plate using an M8 screw, washer and nut on power module side. Tighten to 13.5 N·m (119 lbf·in).
7	Connect the cabinet grounding cable 	Connect the grounding bar with the cabinet frame according to the local regulations.

Step	Action	Comment
8	Connect the PE cable	Connect the motor grounding bar with the incoming grounding bar of the mains according to the local regulations.
9	Connect the second PE cable	Connect the motor grounding bar with the incoming grounding bar of the mains according to the local regulations.

NOTE: We recommend that the integrator provides to the customer the screws specified above for connecting the cables. The correct length of the screws depends on the used lugs and the required clearance distance, page 201.

NOTE: In case of cULus, any listed (ZMVV/7) box lug or compression lug rated for the required cross section can be used to connect the motor cables.

Verifying Integration

What's in This Part

Visual Inspection

Consistency Between Order, Product and Documentation

The aim of this section is to verify and ensure that the device is compliant with the specification, applicable standards and customer order:

- Mechanical verification
- Certification verification
- Component verification
- Electrical verification
- Standard compliance
- Offer Safety compliance
- Completeness of the customer order
- Documentation to the customer
- Settings and parameter verification
- Nameplate on the device.

Mechanical Cabinet Verification

Verify the cabinet for...	✓
Main cabinet components (door, plinth, walls, …): tight screws, no gaps, correct angles, …	
Damages: scratches, sharp burrs, rust, dents, gaps (not air-tight).	
Clean: no dust, no rust, no glue, no metal swarf, no loose parts (like screws, tools, washer, …)	
Sub-parts: washer ring-nuts on cabinet top, fixations protection covers, …	

Mechanical Functions

Verify the mechanical function of:	✓
Doors and locks: movement range, easy closing, lock and unlock, …	
Graphic display Terminal plug and unplug	

Catalog Numbers of Components

To ensure the right rating and certificate:

Verify the part catalog numbers for...	✓
Main power and protection components like fuses, circuit breaker, relays, cables, insulations…	
Special certified parts like UL, CE, CCC, ATEX, …	

Positioning and Mechanical Mounting of Components

Verify the presence, positioning and mechanical mounting of...	✓
Door components: Graphic display Terminal, buttons, switches, lamps, displays, …	
Control panel components supplies, relays, fuses, …	
Base system components: power terminals, fans, filter, PCBA's, transformer, copper bars, …	
Option components: Sensors, lamps, heater, surge arrestor, … Cabinet: cabinet sequence, …	
IP protections: outlets, filter-mats, grid dimensions, fans, roof extensions…	
Mechanical connections: screws dimension, washer, tightness, gaps, …	
Sub-parts: washer, protection covers, …	

Electrical Connections

Verify...	✓
The grounding connections (Normative requirement).	
The power connections on randomly basis for markings and good tightening.	
The DC bus connection (PA/+, Ud0, PC/-) between each power module for proper tightening.	
The control wiring on randomly basis for their conditions (pull out test, right cable shoes, right color, no tight wiring, …).	
Screws: marking and condition (look for gaps, lock washer, …).	
Crimping: orientation between lug and crimp, cable to cable shoe crimping.	
Tightness: slightly pull out tests, torque tests of dedicated screws if requested.	
Plug (cable) connector and jumper: connectors are fully inside, slightly pull out tests.	

Wiring and Ducting

Verify the...	✓
Cable ducting: presence, no sharp burrs, insulations (cover, tubes), …	
Interconnections: verification on randomly basis. Verify as preventive measure short circuit conditions between all supply/output terminals and ground terminals.	

Cable, Bars and Tapes

Verify and distinguish between ELV, LV, roof, cables insulations.

Verify the...	✓
Catalog numbers, certifications markings.	
Color	
Dimensions, cross-sections	
Insulations voltage ratings	

Clearance Distances

Observe the clearance distances between all devices integrated in the cabinet according to the following standards:

- IEC 61800-5-1 Edition 2.1 August 2016
- UL 61800-5-1 Edition 1 June 2018
- CSA C22.2 N274-17 April 2017

NOTE: Checking the clearance distances is a normative requirement from the switchgear standard IEC 61439-1 / 2011.

Labels, Plates and Warnings

Verify following labels and plates for right placement, content, visible, legible, color and durable.

Verify the...	✓
Nameplate: Verify and compare data with customer order and documentation	
Service label (QR-Code, rated current label): Verify the data are like the nameplate and try the QR-Code.	
Safety and warnings labels	
Notice labels	
External voltage label next to main switch door handle	
Terminal designation: PE, motor (U/V/W), mains (L1/L2/L3), control, supply, fans, terminals, …	
Phase sequence and directions: motor (U/V/W), Fan direction, …	
Device Labels (door): switches, lamps, HMI and push-buttons, …	
Cable/Terminal labels: Verify all cable markings, randomly of the written marking designation	
Proofed signs or markings (if applicable): for build in devices or components.	

Accessories, Documentation

Verify the accessories:	✓
Manuals, protocols, certificates, …	
Customer documentation: drawings, schematics, …	
Cables connector, Graphic display Terminal, …	
Protection cover	

Hardware Settings

Verify the hardware settings of:	✓
Switching positions: circuit breaker, mains switch, …	
Additional build in hardware configuration (eg. Circuit breaker): overcurrent, undervoltage, range setting, interface configuration, …	
Jumper / Terminal connections: transformer voltage, IT/TN-jumper, …	

Ground Continuity Tests

Before You Begin

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

Description

The ground continuity test is a normative test which is required by the standard IEC61800-5-1 as a manufacturing routine test for the APM-related parts.

Furthermore, ground continuity must be ensured for equipotential shields for EMC immunity.

Protective Bonding Routine Test

Mandatory at least for single screwed connections for the Altivar Process Modular related components.

Examples are:

- PE rail connection between two or more cabinets, in case of single cable and fastener.
- Door with T-Circuits and/or A-Circuits, in case of single Tape connection.

The impedance shall not exceed 0.02 Ohm at 10A measurement current to the PE rail.

High Potential (HiPot) Test

Before You Begin

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

Description

A part of the drive is raised up to a high potential against the other parts and ground potential. During this test, the leakage current between these parts are measured. The leakage current must not exceed the value specified in this document.

Equipment Needed

The High Potential test requires the following test devices.

- Digital multimeter
- Insulation tester
- HiPot tester

Preconditions

Verify that the following conditions are met:

- The drive must have been switched off and the DC bus has been discharged. Refer to chapter Verifying the Absence of Voltage, page 20.
- Before to perform the insulation / High Potential test, the diode forward voltage drop has to be measured.
- When measuring the power part, apply the following instructions to help avoid incorrect measurements:
  - Disconnect the mains and motor cables.
  - Measure the diodes, thyristors, and IGBTs with an appropriate measuring device with diode test function.

Terminal Polarity at Measuring Points

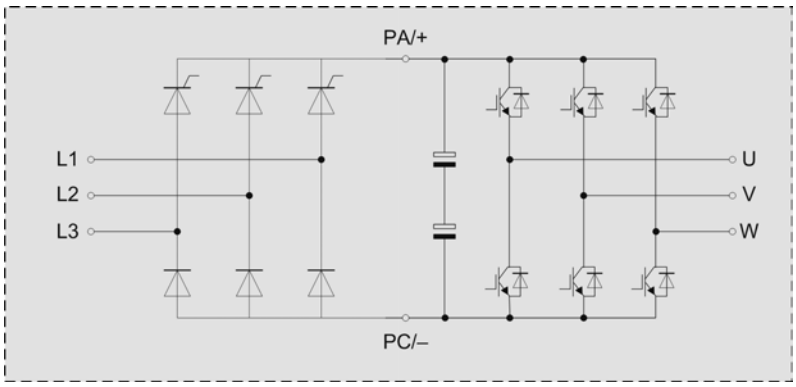
Terminal Polarity (1)		Result Input Terminals
Plus	**Minus**	
PC/-	L3	0.2...0.6 V
PC/-	L2	0.2...0.6 V
PC/-	L1	0.2...0.6 V
L1	PA/+	Open
L2	PA/+	Open
L3	PA/+	Open
(1) The polarity during the test were considered to verify the right orientation of pins and/or connector.		

Terminal Polarity at Measuring Points

Terminal Polarity (1)		Result Output Terminals
Plus	**Minus**	
PC/-	W	0.2...0.6 V
PC/-	V	0.2...0.6 V
PC/-	U	0.2...0.6 V
U	PA/+	0.2...0.6 V
V	PA/+	0.2...0.6 V
W	PA/+	0.2...0.6 V
(1) The polarity during the test were considered to verify the right orientation of pins and/or connector.		

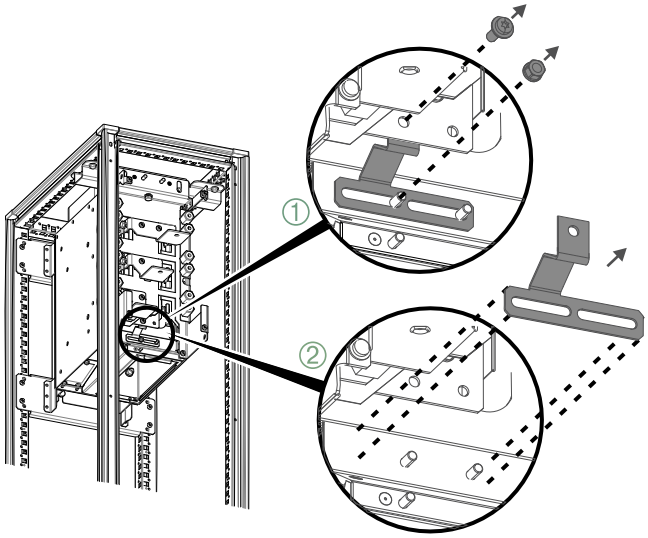
NOTE: The absolute values are not decisive because they depend on the instrument that is used. The consistency of the measured values is the determining factor.

Terminals Polarity at Measuring Points



Preparation for Insulation and High Potential Test

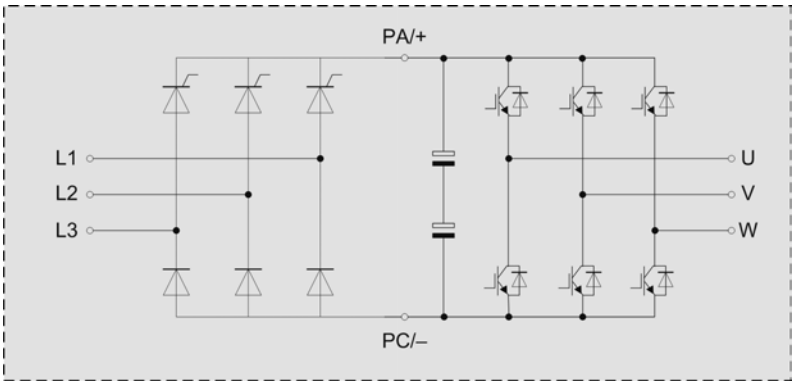
Follow the steps before performing the test:

Steps	✓
Turn off the drive	
Wait for the DC bus to be discharged. Refer to chapter Verifying the Absence of Voltage, page 20.	
Remove the IT/TN slider from the RFI board before performing the test. 1) First remove the screw and nut , as shown on detail ①. 2) After that remove the IT/TN slider, as shown on detail ②. 	

Circuit A Definition

Circuit A describes the power part of the drive.

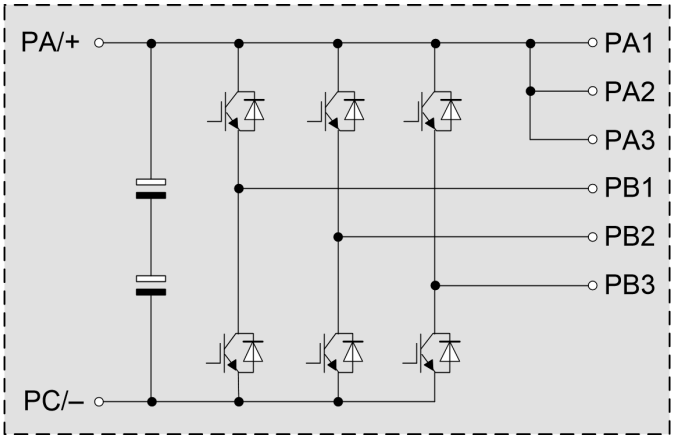
NOTE: Connect all mains, DC and motor terminals L1, L2, L3, U, V, W, PA/+, PC/- to each other.



Power Circuit Terminals: L1, L2, L3, U, V, W, PA/+, PC/-

Circuit A also describes the power part of the optional braking unit.

NOTE: For the optional braking unit connect the terminals PB1, PB2 and PB3 to each other. The terminals PA/+ and PC/- are already considered in the finalized drive.



Power Circuit Terminals: PA/+, PC/-, PA1, PA2, PA3, PB1, PB2, PB3

Circuit M Definition

Circuit M describes the 24 Vdc and 48 Vdc control area of the drive.

NOTE: Connect together the 0 V or COM on the control unit X4 and X6 connectors.

Circuit T Definition

Circuit T describes external supply voltages.

- **T-ext_1**: 230 Vac OVCII control supply
- T-ext_N: Additional circuits

NOTE: Each circuit must be tested against its surroundings.

Circuit X Definition

Circuit X describes all electric passive parts like metal cabinet and ground connections.

High Potential Test

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Use all required personal protective equipment (PPE).
- Before performing the test on the drive system and before each test cycle, follow the instructions given in the chapter “Verifying the Absence of Voltage” in the present manual.
- Connect all terminals of each individual circuit.
- Verify proper connection of the high potential tester to all terminals of the equipment under test before performing the test.
- When the test is running, do not touch any part of the equipment under test or of the testing equipment.

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

Perform the following instructions to execute the test

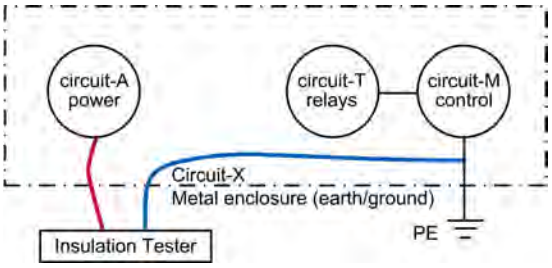
Step	Action
1	The test circuit **T** (external supply voltages) and **M** (control circuits) has to be connected to circuit X (ground)
2	Connect the **Insulation Tester** probes to the device circuit **A** (power circuits) and **X** (metal cabinet connected to ground) 
3	Set the voltage of the insulation tester to the value specified in the table **1** below.

Table **1** - Insulation tester voltage settings

Circuits under test (HV terminal / LOW terminals)	Nominal device voltage (Vac)	Test voltage (Vdc)	Minimal resistance (MΩ)	✓
Circuit X with A	380...480	500	1	
	600	500	1	
	500...690	500	1	

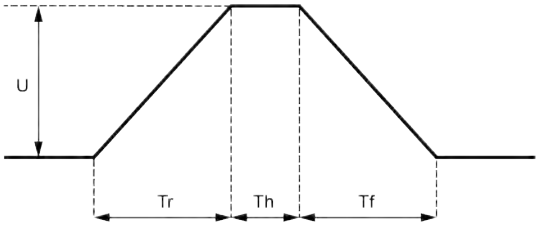
Step	Action
4	Perform the test at least for 1 second to get stable measurements
5	Confirm that the measured value is greater than the minimal resistance defined in the table **1** above. Step 6 of this procedure can only be performed if this test has been passed
6	Set the test voltage on the HiPot tester related to the nominal device voltage according to the table **2**

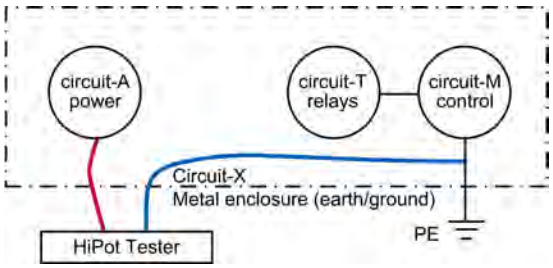
Table **2** HiPot tester voltage settings

Circuits under test (HV terminal / LOW terminals)	Nominal device voltage (Vac)	Test voltage (Vdc)	Maximum current level (mA)	✓
Circuit X with A	380...480	2,590	1	
	600	2,710	1.5	
	500...690	2,710	1.5	

High Potential Test Duration Settings

The voltage rise time (Tr) and the fall time (Tf) should be 2 second. Set the test duration (Th) at least for 1 second



Step	Action
7	Perform the test at least for (Th) 1 second) 
8	Verify that the measured value of the HiPot tester does not exceed the maximum current level specified in the table **2** above

Circuit T to Surrounded Circuits - High Potential Test

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Use all required personal protective equipment (PPE).
- Before performing the test on the drive system and before each test cycle, follow the instructions given in the chapter “Verifying the Absence of Voltage” in the present manual.
- Connect all terminals of each individual circuit.
- Verify proper connection of the high potential tester to all terminals of the equipment under test before performing the test.
- When the test is running, do not touch any part of the equipment under test or of the testing equipment.

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

Perform the following instructions to execute the test

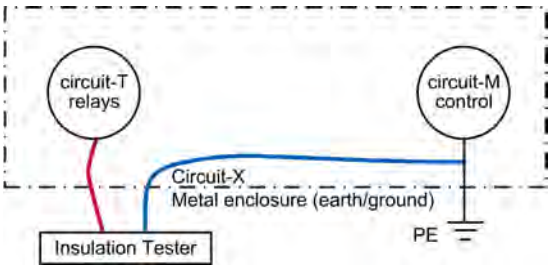
Step	Action
1	The Test circuit **M** (control circuit) has to be connected to ground.
2	Connect the **Insulation Tester** probes to the device circuit **T** (external supply voltage) and circuit **X** (metal cabinet connected to ground and circuit M). 
3	Set the voltage of the insulation tester to the value defined in the table **3** below

Table **3** - Insulation tester voltage settings

Circuits under test (HV terminal / LOW terminals)	Nominal device voltage (Vac)	Test voltage (Vdc)	Minimal resistance (MΩ)	✓
Circuit X with T	380...480	500	1	
	600	500	1	
	500...690	500	1	

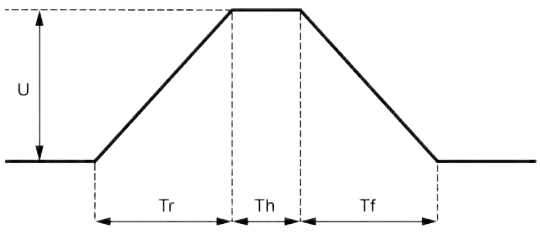
Step	Action
4	Perform the test at least for 1 second to get stable measurements
5	Confirm that the measured value is greater than the minimal resistance defined in the table **3** above. Step 6 of this procedure can only be performed if this test has been passed
6	Set the test voltage on the HiPot tester related to the nominal device voltage according to the table **4** below

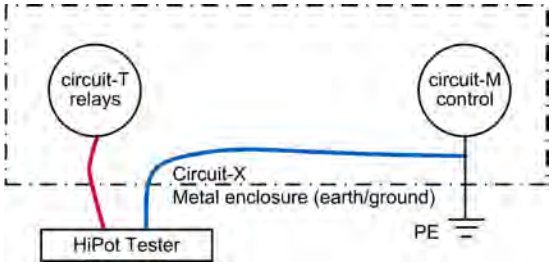
Table **4** Insulation tester voltage settings

Circuits under test (HV terminal / LOW terminals)	Nominal device voltage (Vac)	Test voltage (Vdc)	Maximum current level (mA)	✓
Circuit X with T	240	2,150	2.15	
	120	1,800	1.80	

High Potential Test Duration Settings

The voltage rise time (Tr) and the fall time (Tf) should be 1 second. Set the test duration (Th) at least for 1 second



Step	Action
7	Perform the test at least for (Th) 1 second) 
8	Verify that the measured value of the HiPot tester does not exceed the maximum current level defined in the table **4** above
9	Remove insulation sheets and build in all TN/IT sliders according to customers mains specification.

First Power Up

What's in This Part

Introduction

NOTICE
RISK OF DAMAGE TO THE DRIVE • Ensure that the 24Vdc supplies are switched off before plugging in or unplugging any connectors. • Do not unplug the highspeed communication cables and the 24 Vdc supplies during the Device Type Setting procedure. **Failure to follow these instructions can result in equipment damage.**

SoMove Software

The use of SoMove FDT and Altivar DTM is required to perform the actions described in this chapter.

Use the links below to download these files:

File	Links
SoMove: FDT	SoMove_FDT (English, French, German, Spanish, Italian, Chinese)
ATV600: DTM	ATV6xx_DTM_Library_EN (English - to be installed first), ATV6xx_DTM_Lang_FR (French), ATV6xx_DTM_Lang_DE (German), ATV6xx_DTM_Lang_SP (Spanish), ATV6xx_DTM_Lang_IT (Italian), ATV6xx_DTM_Lang_CN (Chinese)
ATV900: DTM	ATV9xx_DTM_Library_EN (English - to be installed first), ATV9xx_DTM_Lang_FR (French), ATV9xx_DTM_Lang_DE (German), ATV9xx_DTM_Lang_SP (Spanish), ATV9xx_DTM_Lang_IT (Italian), ATV9xx_DTM_Lang_CN (Chinese)

Device Type Setting

Overview

The SoMove **Panel Builder** tab allows you to perform the device creation process including device registration. You can also make a deeper analysis of the drive using special analysis functions for troubleshooting.

NOTE: You have to be trained and qualified for using the SoMove **Panel Builder** tab.

Panel Builder tab allows you to:

- Set the type of the device
- Register the device
- Finalize the creation of the device.

Pre-Condition

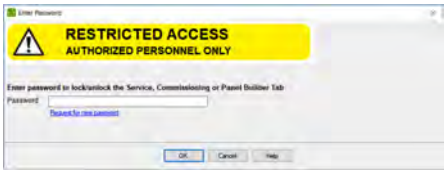
Make sure that SoMove FDT and ATV6xx DTM or ATV9xx DTM are installed on your computer

Access

You can access the **APM Partner** tab only using a valid password.

If you are accessing the **APM Partner** tab for the first time or your password validity is expired, request for a new password.

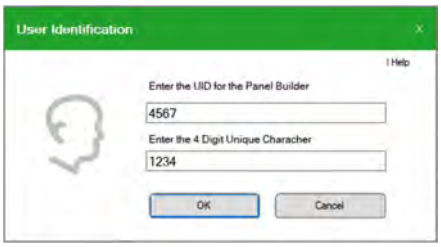
The table below provides the procedure to request a new password.

Step	Action	Comment
1	In the Altivar Process drive, click any tab in the tab area.	
2	Press **Ctrl**, **Alt**, and **P** keys together. **Result**: The **RESTRICTED ACCESS** dialog box is opened.	
3	 In the **RESTRICTED ACCESS** dialog box, click **Request for New Password** **Result**: The **SoMove APM Partner Section** dialog box is opened.	

Step	Action	Comment
4	 In the **SoMove APM Partner Section** dialog box, perform the following actions: • Enter your windows login ID in the **Windows Login Name** box. • Enter your SESA number or surname in the **SESA ID/Partner Name** box. • Enter your company name in the **Company Name** box. • Select the duration for the password validity in **Requested duration** box. • Select your country in the **Country** box. • Select the type of drive from the **Drive Range Type** box. • Click **Send Request (automatically)** or **Save Request (Send Manually)**.	If you click the **Send Request (automatically)** button, opens the default E-mail window, which contains your Windows Login Name, SESA ID/ Partner Name, Company, Password Validity Date, Country Name, and Drive Range. If you click the **Save Request (Send Manually)** button, • You can save your Windows Login Name, SESA ID/Partner Name, Company, Password Validity Date, Country Name, and Drive Range on your computer in a *.txt* format. • Attach the .txt file to the E-mail with the E-mail subject as **SoMove APM Partner Section Password** and E-mail body as **Please send me a password for SoMove APM Partner Section**.
5	Send an E-Mail to at-somove-password@schneider-electric.com.	You will receive an email with a valid password, UID, and 4-digit unique character.

After receiving a valid password, UID, and 4-digit unique character, do the following to access the **APM Partner** tab.

Step	Action	Comment
1	In the Altivar Process drive, click any tab in the tab area.	
2	Press **Ctrl**, **Alt**, and **P** keys together. **Result**: The **RESTRICTED ACCESS** dialog box is opened.	

Step	Action	Comment
3	 In the **RESTRICTED ACCESS** dialog box, • Enter the password in the **Password** box. • Click **OK**. **Result**: The **User Identification** dialog box is opened.	You have to enter the password only if you are accessing the **APM Partner** tab for the first time. **NOTE:** If you have already accessed the **APM Partner** tab once using the valid password, then validity (number of days remaining) of the password is displayed, click **OK** to access the **APM Partner** tab.
4	 In the **User Identification** dialog box, • Enter the UID for the **APM Partner** in the corresponding box. • Enter the 4-digit Unique Character in the corresponding box. • Click **OK**.	You have to enter the UID and 4-digit unique character only if you accessing the **APM Partner** tab for the first time. **NOTE:** If you have already accessed the **APM Partner** tab once using the UID and 4-digit unique character received through email, it will be remembered. You could change the UID and the 4-digit unique character if required. Click **OK** to access the **APM Partner** tab.

Description

To start the device creation, use the 

Help button to access to the APM DTM Partner Manual.

To ensure a seamless setup experience, use the below checklist during registration:

Step	Action	✓
1	Connect via Modbus RTU (Mandatory communication profile, do not use ETH, PN, PB)	
2	Access the “MyDevice”-Tab, press Ctr+Alt+P and enter your Password & User ID	
3	Open “Power Module Position” to define the control unit position	
4	Open “Start Device Creation” to define the drive reference	
5	Click the “Apply”-button to start the rating procedure **ATTENTION** for BUO: Select the MODBUO checkbox before applying	
6	Save the drf-File on your PC	
7	**ATV6B0/ATV9B0/BUO**: Rate each MODAFE / MODBUO module separately **ATTENTION:** Before disconnecting from the CTL click the “Pause”-Button. Do not “Resume” unless you are reconnected to the CTL.	
8	Continue to “Device Registration”, enter all necessary data and click the “Upload” to register the drive	
9	Click “Print”-button in “Device Creation Finalization” to receive your registration label	
10	Click the “Finish”-button to finalize the product rating and registration process	
11	Put the registration label onto the drive	
12	After the power off/on cycle, check the drives identification and drive state on the HMI and “My Device” tab	

Registration Label

Position the label as shown below.

Functional Tests

Introduction

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before applying voltage to and configuring the product, verify that it is properly wired.

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

The major base system functional tests are:

- IGBT transistor test to verify motor power connection and control for each brick for each phase.
- Check for the power fan(s) of each power module:
  - that it is working
  - whether the blow direction is correct
  - the control of the fan (On/Off)
- Check for each door fan:
  - that it is working
  - whether the blow direction is correct
  - the control of the fan (On/Off)
- Basic control functions: Ready/Run state, … To verify the system initialization and the system is operational.

Roof-top Fan Operation and Control

Operation:

- In case of IP21 / UL Type 1 cabinet integration, verify that the roof-top fan is running only when the power fan of the module is running.

  NOTE: Consequently, it must not run when the power fan is off.

  This may apply also in case of IP54 / UL Type 12 cabinet integration, although in this case both fans can run permanently.

The control of the cabinet fans can be done either...

- Preferably with the X6 relay output. Refer to the chapter X6 Relay Output, page 71.
- With a relay output of the control block and according parameter setting to activate in RUN state.

Functional Tests with SoMove

Using the SoMove Panel Builder tab, perform all the tests of the DTM.

Final Motor Test

Perform the following actions to do the final motor test with no load:

Step	Action
1	Check all final delivery settings (default settings and special option settings).
2	If required, do the minimal configuration to run the motor in the default motor control settings. • **Motor nameplate settings**, in case of a required adaptation for the test bench motor. • **Speed ramp** could be increased to limit the current and/or the DC-Bus voltage increase. • **Output phase loss detection**, in case of a big gap between Drive rating and test motor rating.
3	Run the motor with default motor control settings from 0 to Fmax of the test bench motor.
4	Verify the customer interfaces (HMI, switches, button, displays, …). All doors must be closed.
5	Set the motor parameter back to default values.

Finishing and Shipment Settings

Verify the following elements:

- **Switch positions:** mains switch, switches.
- **Lock positions:** key locks, key switches, doors.
- **Customer information's:** test certificate, manuals, drawings, schematics, …
- **Covers and screws:** Verify that all covers and screws are mounted.
- **Protection elements, parking positions.**

Prepare the Delivery

Documentation

A detailed documentation must be provided for the Final Customer by the integrator.

The following topics might be part of this documentation:

- Verifying the absence of voltage,
- Technical data,
- Mechanical installation of the assembled APM single drive,
- Connection of the power and control cables,
- Maintenance of the drive,
- List of manuals
- Specific data of the final solution designed by the Partner,
- ...

Packaging

Ensure a proper packaging of the drive for the shipment. Observe the storage conditions described in this manual.

Maintenance

What's in This Part

Scheduled Servicing

Servicing

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Product Related Information** chapter before performing any procedure in this chapter.

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

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

⚠WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

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

⚠WARNING

INSUFFICIENT MAINTENANCE

Verify that the maintenance activities described below are performed at the specified intervals.

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

Adherence to the environmental conditions must be ensured during operation of the device. In addition, during maintenance, verify and, if appropriate, correct all factors that may have an impact on the environmental conditions.

	Part concerned	Activity	Interval (1)
Overall condition	All parts such as housing, HMI, control block, connections, etc.	Perform a visual inspection	At least every year
Corrosion	Terminals, connectors, screws	Inspect and clean if required	
Dust	Terminals, fans, cabinet air inlets and air outlets, air filters of cabinet	Inspect and clean if required	
	Drives filter mats	Inspect	At least every year
		Change	At least every 4 years
Cooling	Drives fan for power part and enclosure door fan	Replace the fans, see catalog and the instructions sheets on www.schneider-electric.com.	Every 35000 operating hours or every 6 years
Fastening	All screws for electrical and mechanical connections	Verify tightening torques	At least every year

(1) Maximum maintenance intervals from the date of commissioning. Reduce the intervals between maintenance to adapt maintenance to the environmental conditions, the operating conditions of the drive, and to any other factor that may influence the operation and/ or maintenance requirements of the drive.

NOTE: The fan operation depends on the drive thermal state. The drive may be running and the fan not.

Fans may continue to run for a certain period of time even after power to the product has been disconnected.

⚠WARNING

RUNNING FANS

Verify that fans have come to a complete standstill before handling them.

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

Spares and repairs

Serviceable product. Please refer to your Customer Care Center on:

www.se.com/CCC.

Long-term Storage

Capacitor Reforming

If the drive system was not connected to mains for an extended period of time, the capacitors must be restored to their full performance before the motor is started.

NOTICE
REDUCED CAPACITOR PERFORMANCE • Apply mains voltage to the drive system for one hour before starting the motor if the drive system has not been connected to mains for the specified periods of time.(1) • Verify that no Run command can be applied before the period of one hour has elapsed. • Verify the date of manufacture if the drive system is commissioned for the first time and run the specified procedure if the date of manufacture is more than 12 months in the past. **Failure to follow these instructions can result in equipment damage.**

(1) Period of time:

- 12 months at a maximum storage temperature of +50°C (+122°F)
- 24 months at a maximum storage temperature of +45°C (+113°F)
- 36 months at a maximum storage temperature of +40°C (+104°F)

If the specified procedure cannot be performed without a Run command because of internal mains contactor control, perform this procedure with the power stage enabled, but the motor being at a standstill so that there is no appreciable mains current in the capacitors.

Decommissioning

Uninstall the Product

Observe the following procedure when uninstalling the product.

- Switch off all supply voltage. Verify that no voltages are present - refer to Safety Information chapter, page 5.
- Remove all connection cables.
- Uninstall the product.

End of Life

The components of the product consist of different materials which can be recycled and which must be disposed of separately.

- Dispose of the packaging in compliance with all applicable regulations.
- Dispose of the product in compliance with all applicable regulations.

Refer to Environmental Data Program for information and documents on environmental protection such as EoLI (End of Life instruction).

Final Checklist

To ensure a seamless setup experience, use the provided checklist as an essential companion during first power up and registration.

Visual Inspection

Actions	Page in Integration manual for detailed description	✓
Mechanical Cabinet Verification	Mechanical Cabinet Verification, page 199	
Mechanical Functions	Mechanical Functions, page 199	
Catalog Numbers of Components	Catalog Numbers of Components, page 199	
Positioning and Mechanical Mounting of Components	Positioning and Mechanical Mounting of Components, page 200	
Electrical Connections	Electrical Connections, page 200	
Wiring and Ducting	Wiring and Ducting, page 200	
Cable, Bars and Tapes	Cable, Bars and Tapes, page 200	
Clearance Distances	Clearance Distances, page 201	
Labels, Plates and Warnings	Labels, Plates and Warnings, page 201	
Accessories, Documentation	Accessories, Documentation, page 201	
Hardware Settings	Hardware Settings, page 201	

Tests before First Power Up

Actions	Page in Integration manual for detailed description	✓ / Value
Follow the preconditions.	Preconditions, page 203	
Ground Continuity Test/ Protective Bonding Routine Test **Expected Value:** **0.02 Ohm @10A**	Ground Continuity Tests, page 202	
Insulation Test 1 **Circuits connected together:** Test circuit **T** and **M** connected to **X** **Insulation tester probes connection:** To circuit **A** and **X**	For definition see: • Circuit T Definition, page 206 • Circuit M Definition, page 206 • Circuit X Definition, page 206 • Circuit A Definition, page 205 For procedure and measurement values see: • High Potential Test, page 207	
HighPot Test 1 **Circuits connected together:** Test circuit **T** and **M** connected to **X** **HighPot tester probes connection:** To circuit **A** and **X**	For definition see: • Circuit T Definition, page 206 • Circuit M Definition, page 206 • Circuit X Definition, page 206 • Circuit A Definition, page 205 For procedure and measurement values see: • High Potential Test, page 207	

Tests before First Power Up (Continued)

Actions	Page in Integration manual for detailed description	✓ / Value
Insulation Test 2 **Circuits connected together:** Test circuit **M** connected to **X** **Insulation tester probes connection:** To circuit **T** and **X**	For definition see: • Circuit T Definition, page 206 • Circuit M Definition, page 206 • Circuit X Definition, page 206 For procedure and measurement values see: • Circuit T to Surrounded Circuits - High Potential Test, page 208	
HighPot Test 2 **Circuits connected together:** Test circuit **M** connected to **X** **HighPot tester probes connection:** To circuit **T** and **X**	For definition see: • Circuit T Definition, page 206 • Circuit M Definition, page 206 • Circuit X Definition, page 206 For procedure and measurement values see: • Circuit T to Surrounded Circuits - High Potential Test, page 208	

Device Type Setting

Actions	Page in Integration manual for detailed description	✓
Device Rating	Device Rating	

Glossary

A

AC:

Alternating Current

AFE :

Active Front End

APM :

Altivar Process Modular

D

DC:

Direct Current

E

ELV:

Extra-Low Voltage. For more information: IEC 60449

Error :

Discrepancy between a detected (computed, measured, or signaled) value or condition and the specified or theoretically correct value or condition.

F

Factory setting:

Factory settings when the product is shipped

Fault reset:

A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

Fault:

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

G

GP:

General-Purpose

H

HHP:

High Horse Power (75 kW...800 kW)

HiPot test:

High Potential Test.

L

L/R:

Time constant equal to the quotient of inductance value (L) over the resistance value (R).

LHP:

Low Horse Power (< 15 kW)

M

MHP:

Medium Horse Power (15 kW...75 kW)

N

NC contact:

Normally Closed contact

NO contact:

Normally Open contact

O

OEM:

Original Equipment Manufacturer

OVCII:

Overvoltage Category II, according IEC 61800-5-1

P

PA/+:

DC bus terminal

PC/-:

DC bus terminal

PELV:

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

PLC:

Programmable logic controller

Power stage:

The power stage controls the motor. The power stage generates current for controlling the motor.

PRM:

Partner Relationship Management

PTC:

Positive Temperature Coefficient. PTC thermistor probes integrated in the motor to measure its temperature

PVZ:

.PVZ is a Creo View Express™ software file format used to display the integration sequences to build Altivar Process Modular drives

R

REACh:

Registration, Evaluation, Authorisation and restriction of Chemicals regulation

RoHS:

Restriction of Hazardous Substances

S

SCPD:

Short-Circuit Protective Device

STD:

Standard

STO:

Safe Torque Off: No power that could cause torque or force is supplied to the motor

T

TVS Diode:

Transient Voltage Suppression Diode

V

VHP:

Very High Horse Power (> 800 kW)

W

Warning:

If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.

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

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