Variable speed drives

Altivar 71

Catalogue
March

05

For 3-phase asynchronous motors from 0.37 to 500 kW

a brand of Schneider Electric

Telemecanique

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Variable speed drives for asynchronous motors

Applications			**Speed control for asynchronous motors**	
Application area			**Industry**	
Type of machine			**Simple machines**	
				
Power range for 50…60 Hz supply (kW)			**0.18…2.2**	**0.18…15**
	Single phase 100…120 V (kW)		0.18…0.75	–
	Single phase 200…240 V (kW)		0.18…2.2	0.18…2.2
	Three phase 200…230 V (kW)		0.18…2.2	–
	Three phase 200…240 V (kW)		–	0.18…15
	Three phase 380…460 V (kW)		–	–
	Three phase 380…480 V (kW)		–	–
	Three phase 380…500 V (kW)		–	0.37…15
	Three phase 525…600 V (kW)		–	0.75…15
Drive	Output frequency		0.5…200 Hz	0.5…500 Hz
	Type of control	Asynchronous motor	Sensorless flux vector control	
		Synchronous motor	–	
	Transient overtorque		150…170% of the nominal motor torque	170…200% of the nominal motor torque
Functions				
Number of functions			26	50
Number of preset speeds			4	16
Number of I/O	Analog inputs		1	3
	Logic inputs		4	6
	Analog outputs		–	1
	Logic outputs		1	–
	Relay outputs		1	2
Communication	Embedded		–	Modbus and CANopen
	Available as an option		–	Ethernet TCP/IP, DeviceNet, Fipio, Profibus DP
Cards (available as an option)			–	–
Standards and certification			EN 50178, IEC/EN 61800-3 EN 55011, EN 55022: class B and class A gr.1 CE, UL, CSA, NOM 117, C-Tick	EN 50178, IEC/EN 61800-3 EN 55011, EN 55022: class A, class B with option card CE, UL, C-Tick, N998
References			**ATV 11**	**ATV 31**
Pages			Please consult the “Soft starters and variable speed drives” catalogue	

Building	Industry
Pumps and fans	**Complex, modular machines** **Machines requiring high-performance torque and accuracy at very low speed as well as high dynamics** **High-power machines**
	  
0.75…315	**0.37…500**
–	–
–	0.37…5.5
–	–
–	0.37…75
0.75…315	–
–	0.75…500
–	–
–	–
0.1…500 Hz	0…1000 Hz
Sensorless flux vector control	Flux vector control with or without sensor, voltage/frequency ratio (2 or 5 pulses), ENA System
–	Vector control without speed feedback
110% of nominal motor torque for 60 seconds	220% of nominal motor torque for 2 seconds, 170% for 60 seconds
44	> 150
8	16
2…3	2…4
4…6	6…20
1…2	1…3
0…1	0…8
2	2…4
Modbus	Modbus and CANopen
Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, AS-Interface, Uni-Telway, CANopen, DeviceNet, METASYS N2, Lonworks	Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, Modbus/Uni-Telway, DeviceNet
Pump switching I/O extension cards Programmable "Controller Inside" card	Encoder interface cards I/O extension cards Programmable "Controller Inside" card
EN 50178, IEC/EN 61800-3 EN 55011 class A EN 55022 class B CE, UL, N998	IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2, C1 to C3) EN 55011, EN 55022, IEC/EN 61000-4-2/4-3/4-4/4-5/4-6/4-11 CE, UL, CSA, DNV, C-Tick, NOM 117, GOST
ATV 38	**ATV 71**
Please consult the “Soft starters and variable speed drives” catalogue	18 and 19

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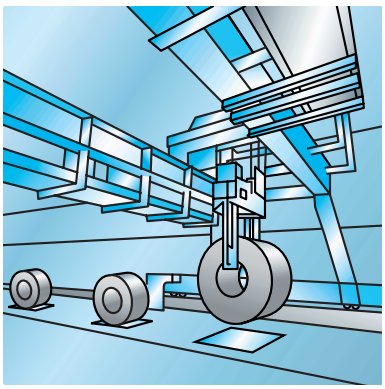

Hoisting application

Applications

The Altivar 71 range of variable speed drives is able to respond to the most exacting requirements thanks to its different types of motor control and numerous onboard functions. It is suitable for the most demanding drives:
- Torque and speed accuracy at very low speeds, high dynamics with Flux Vector Control (with or without sensor)
- Extended frequency range for high-speed motors
- Connection of special motors and drives in parallel thanks to the voltage/frequency ratio
- Static speed accuracy and energy savings for synchronous motors in open loop mode
- Smooth flexibility for unbalanced machines with the ENA System (Energy Adaptation System)

The functionality of the Altivar 71 drive boosts performance and increases a machine's flexibility of use across multiple applications.

Hoisting
- Brake control adapted for translational, hoisting and slewing movements
- Load measurement using weight sensor
- High-speed hoisting
- Brake feedback management
- Limit switch management

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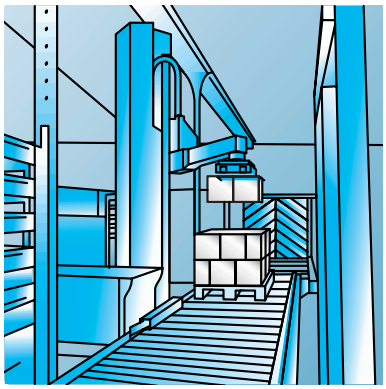

Packing application

Handling
- Very quick response times on transmission of a command: 2 ms (± 0.5 ms)
- Reference via pulse train or differential analog input
- Control via the principal communication networks
- Position control via limit switches with time optimization at low speed
- Multiple parameter-settings via parameter set switching

Packing
- Up to 50 Hz of the bandwidth
- Very quick response times on change of reference: 2 ms (± 0.5 ms)
- Control via integrated CANopen bus
- Position control via limit switches

Textile machinery
- High resolution of the digital speed reference (1/32000)
- Speed accuracy assured by use of synchronous motor, irrespective of the load
- High bandwidth
- Spooling function
- Connection to common DC bus

Wood-working machinery
- Operation up to 1000 Hz
- Fastest possible controlled stop on loss of line supply
- Control via integrated CANopen bus
- Protection of motor against overvoltages

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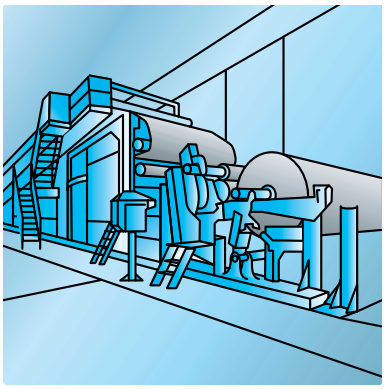

Process machinery application

Process machinery
- PID regulator
- High reference resolution
- Speed or torque control
- Connection to the principal communication networks
- Separate control power supply
- Braking unit via re-injection to the line supply
- Connection to common DC bus

Lifts
- Brake control adapted to suit passenger comfort
- Processing of load measurement by weight sensor
- Conformity of relays to lift safety standard EN 81-13-2-2-3
- Connection to CANopen bus
- Control with integrity check of output contactor
- Lift car clearance function

Characteristics: pages 8 to 13
References: pages 18 and 19
Dimensions: pages 90 to 111
Schemes: pages 112 to 127
Functions: pages 142 to 173

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ATV 71HC28N4,
ATV 71HD37M3X, ATV 71HU22N4

Comprehensive offer

The Altivar 71 range of variable speed drives extends across a range of motor power ratings from 0.37 kW to 500 kW with three types of power supply:
- 200…240 V single phase, from 0.37 kW to 5.5 kW
- 200…240 V three phase, from 0.37 kW to 75 kW
- 380…480 V three phase, from 0.75 kW to 500 kW

The Altivar 71 drive integrates the Modbus and CANopen protocols as standard as well as numerous functions.

These functions can be extended using communication, I/O and encoder interface option cards (see page 7).

The entire range conforms to international standards IEC/EN 61800-5-1, IEC/EN 61800-2, IEC/EN 61800-3, is CE, UL, CSA, DNV, C-Tick, NOM 117 and GOST certified and has been developed to meet the directives regarding protection of the environment (RoHS, WEEE, etc).

The Altivar 71 can be inserted in an installation's safety system. It integrates the "Power Removal" safety function which prohibits any accidental starting of the motor. This function complies with machine standard EN 954-1 category 3, the standard governing electrical installations IEC/EN 61508 SIL2 and the power drive systems standard IEC/EN 61800-5-2.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 71H●●●M3** and **ATV 71H●●●N4** drives and the recognition of EMC requirements simplifies machine installation and provides an economical means of meeting CE marking requirements.
ATV 71H●●●M3X drives are available without EMC filters. The filters are available as an option and can be installed by the user to reduce emission levels (see pages 76 to 79).

Other external options, such as braking resistors, network braking units and filters, are available to complement this offer (see page 7).

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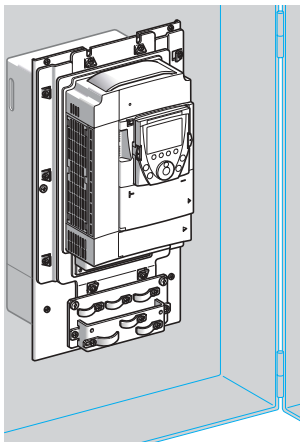

ATV 71HU75N4 flush-mounted

Installation

The Altivar 71 drive has been designed to optimize the size of enclosures (floor-standing, wall-mounted, etc):
- The power part, with IP 54 degree of protection, can be easily mounted outside the enclosure using the kit for flush-mounting in a dust and damp proof enclosure **VW3 A9 5●●**.

This type of mounting can be used to limit the temperature rise inside the enclosure or to reduce the size of enclosure required (see page 21).
- Ambient temperature inside the enclosure:
  - 50°C without derating
  - Up to 60°C using the control card fan kit **VW3 A9 4●●** corresponding to the drive rating and, if necessary, by derating the output current (see page 20)
- Mounting side-by-side (see pages 132 and 134)

The drive can also be wall-mounted in compliance with NEMA type 1 requirements using kit **VW3 A9 2●●**, for IP 21 protection or IP 31 using kit **VW3 A9 1●●** (see pages 22 and 23).

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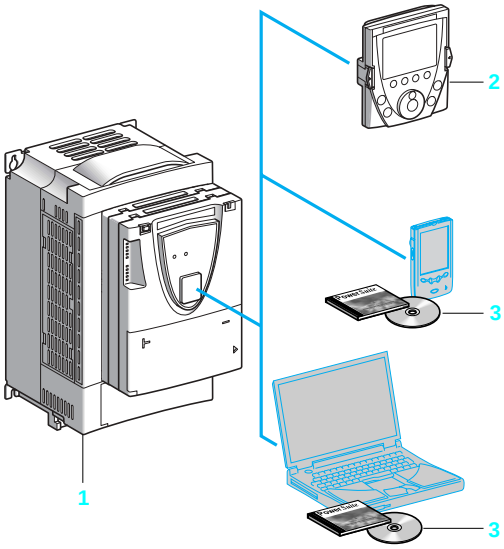

Dialogue tools

The Altivar 71 drive 1 is supplied with a removable graphic display terminal 2 for remote operation:
- The navigation button accesses the drop-down menus quickly and easily.
- The graphic screen displays 8 lines of 24 characters of plain text.
- The advanced functions on the display unit access the more complex drive functions.
- The display screens, menus and parameters can all be customized for the user or the machine.
- Online help screens are available.
- Configurations can be stored and downloaded (four configuration files can be stored).
- The drive can be connected to several other drives via a multidrop link.
- It can be located remotely on an enclosure door with IP 54 or IP 65 degree of protection.
- It is supplied with 6 languages installed as standard (English, French, German, Italian, Spanish and Chinese). Other languages can be loaded to the flash memory.

Up to 15 kW, the Altivar 71 drive can be controlled using an integrated 7-segment display terminal (see pages 18 and 19).

The PowerSuite software workshop 3 can be used to configure, adjust and debug the Altivar 71 in just the same way as all other Telemecanique drives and starters. It can be used via a direct connection, Ethernet, modem or a Bluetooth® wireless connection.

Quick programming

Macro-configuration

The Altivar 71 offers quick and easy programming using macro-configurations corresponding to different applications or uses:
start-stop, material handling, hoisting, general use, connection to communication networks, PID regulator, master/slave. Each of these configurations is still fully modifiable.

“Simply start” menu

The “Simply start” menu can be used to ensure the application operates correctly, obtain maximum motor performance and ensure motor protection.

The architecture, the hierarchical parameter structure and the direct access functions all serve to make programming quick and easy, even for the more complex functions.

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RUN	Term	+50.00Hz	5.4A
1.1 SIMPLY START			
2/3 wire control	:		**2 wire**
Macro-configuration	:		M. handling
Standard mot. Freq.	:		50Hz IEC
Rated motor power	:		2.2kW
Rated motor volt.	:		400V
Code	<<	>>	Quick

“Simply start” menu

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SCF1	Term	+50.00Hz	0.0A
FAULT HISTORY			
Short circuit			
Overcurrent			
External FLT			
Overvoltage			
Undervoltage			
Help			Quick

Fault log

522162

SCF1	Term	+50.00Hz	0.0A
MOTOR SHORT CIRCUIT			
Check the connection cables and the motor insulation.			
Perform the diagnostic test.			
			Quick

Troubleshooting screen

Services

The Altivar 71 has numerous built-in maintenance, monitoring and diagnostic functions:
- Built-in drive test functions with diagnostic screen on the remote graphic display terminal
- I/O maps
- Communication maps for the different ports
- Oscilloscope function that can be viewed using the PowerSuite software workshop
- Management of the drive installed base via processors with flash memory.
- Remote use of these functions by connecting the drive to a modem via the Modbus port
- Identification of all the drive’s component parts as well as the software versions
- Fault logs with display of the value of up to 16 variables on occurrence of a fault
- Display terminal languages loaded in the flash memory
- A message of up to 5 lines of 24 characters can be stored in the drive.

Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Schemes: pages 112 to 127 | Functions: pages 142 to 173

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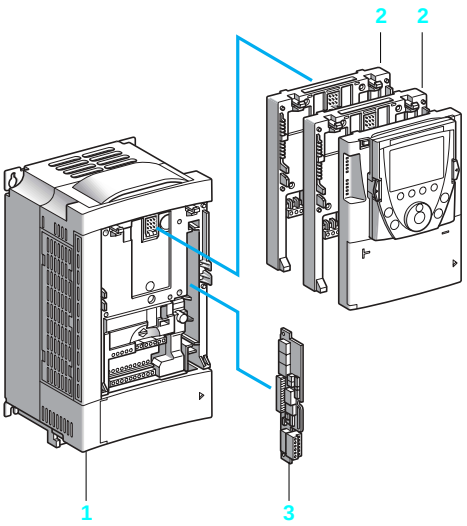
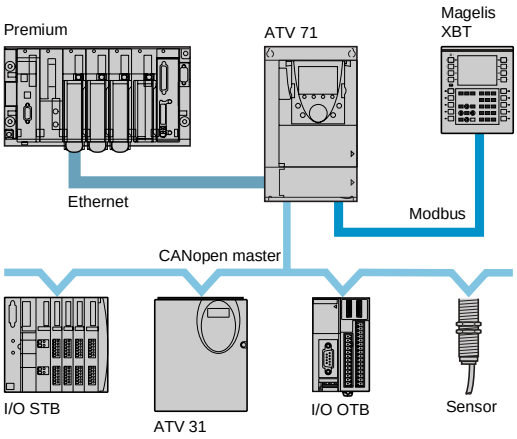


Options

The Altivar 71 drive 1 can integrate a maximum of three option cards simultaneously, of which:
- 2 can be selected from among the following *(1)*:
  - I/O extension cards 2 (see pages 30 and 31)
  - communication cards 2 (Ethernet TCP/IP, Modbus/Uni-Telway, Fipio, Modbus Plus, Profibus DP, DeviceNet, INTERBUS, etc) (see pages 40 to 47)
  - programmable “Controller Inside” card 2. This is used to adapt the drive to specific applications quickly and progressively, by decentralizing the control system functions (programming in IEC 61131-3 compliant languages) (see pages 32 to 39).
- 1 can be an encoder interface card 3 (with RS 422 compatible differential outputs, open collector outputs, push-pull outputs) (see pages 28 and 29).

External options can be associated with the Altivar 71:
- Braking units and resistors (standard or hoist-specific) (see pages 48 to 61)
- Networked braking units (see pages 62 to 65)
- Line chokes, DC chokes and passive filters, to reduce harmonic currents (see pages 66 to 75)
- Motor chokes and sinus filters for long cable runs or to remove the need for shielding (see pages 80 to 85)
- Additional EMC input filters (see pages 76 to 79)

Note: *please refer to the compatibility summary tables to determine which options are available for individual drives (see pages 86 to 89).*



Example of a drive equipped with a communication card and a programmable “Controller Inside” card

Integration into control systems

The Altivar 71 integrates a combined Modbus or CANopen port for quick, accurate motion control, adjustment, supervision and configuration. A second port is available for connecting a Magelis terminal for machine dialogue.

The drive can also be connected to other communication networks using the communication option cards (see pages 40 to 47).

The control part can be powered separately, thus allowing communication (monitoring, diagnostics) to be maintained even if the power part supply fails.

The programmable “Controller Inside” card transforms the drive into an automation island:
- The card integrates its own I/O; it can also manage those of the drive and an I/O extension card.
- It contains onboard application programs developed in IEC 61131-3 compliant languages, which reduce the control system response time.
- Its CANopen master port enables control of other drives and dialogue with I/O modules and sensors.

(1) The Altivar 71 cannot support more than one option card with the same reference. Please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 86 to 89.

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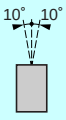
Environmental characteristics

Conformity to standards			Altivar 71 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low voltage, IEC/EN 61800-5-1, IEC/EN 61800-3 (conducted and radiated EMC immunity and emissions).
EMC immunity			IEC/EN 61800-3, environments 1 and 2 IEC/EN 61000-4-2 level 3 IEC/EN 61000-4-3 level 3 IEC/EN 61000-4-4 level 4 IEC/EN 61000-4-5 level 3 IEC/EN 61000-4-6 level 3 IEC/EN 61000-4-11 *(1)*
Conducted and radiated EMC emissions for drives			IEC/EN 61800-3, environments 1 and 2, categories C1, C2, C3
	ATV 71H037M3…HU15M3 ATV 71H075N4…HU40N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2 With additional EMC filter *(2)*: ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 71HU22M3…HU75M3 ATV 71HU55N4…HC50N4		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 71H●●●M3X		With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
CE marking			The drives are marked CE in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives.
Product certifications			UL, CSA, DNV, C-Tick, NOM 117 and GOST
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4		IP 21 and IP 41 on upper part IP 20 without cover plate on upper part of cover IP 21 with accessory VW3 A9 1●●, NEMA type 1 with accessory VW3 A9 2●●, see pages 22 and 23
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		IP 00, IP 41 on the upper part and IP 30 on the front panel and side parts. IP 31 with accessory VW3 A9 1●●, NEMA type 1 with accessory VW3 A9 2●●, see pages 22 and 23
Vibration resistance	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4		1.5 mm peak to peak from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC/EN 60068-2-6
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		1.5 mm peak to peak from 3…10 Hz, 0.6 gn from 10…200 Hz, conforming to IEC/EN 60068-2-6
Shock resistance	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4		15 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC13N4		7 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 71HC16N4…HC50N4		4 gn for 11 ms conforming to IEC/EN 60068-2-27
Maximum ambient pollution	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD18N4		Degree 2 conforming to IEC/EN 61800-5-1
	ATV 71HD18M3X…HD75M3X ATV 71HD22N4…HC50N4		Degree 3 conforming to IEC/EN 61800-5-1
Environmental conditions	ATV 71H●●●M3, H●●●M3X, ATV 71H●●●N4		IEC 60721-3-3 classes 3C1 and 3S2
	ATV 71H●●●M3S337, ATV 71H●●●M3X337, ATV 71H075N4S337… HD75N4S337, ATV 71HD90N4…HC50N4		IEC 60721-3-3 class 3C2
Relative humidity			5…95% without condensation or dripping water conforming to IEC 60068-2-3
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50 without derating Up to 60°C with derating and with the control card fan kit VW3 A9 4●● corresponding to the drive rating (see derating curves on pages 133 and 135 to 137)
	Storage	**°C**	- 25…+ 70
Maximum operating altitude		**m**	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

(1) Drive behaviour according to the drive configurations (see pages 159, 162, 163, 171 and 172).
(2) See table on page 76 to check permitted cable lengths.

Drive characteristics

Output frequency range	ATV 71H●●●M3 ATV 71HD11M3X…HD37M3X ATV 71H075N4…HD37N4	**Hz**	10…1000
	ATV 71HD45M3X…HD75M3X ATV 71HD45N4…HC50N4	**Hz**	10…500
Configurable switching frequency		**kHz**	Adjustable during operation from 1…8, 2.5…8 or from 1…16 according to rating
	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD30N4	**kHz**	4 without derating in continuous operation Above this frequency, see derating curves on pages 133 and 135 to 137
	ATV 71HD18M3X…HD75M3X ATV 71HD37N4…HC50N4	**kHz**	2.5 without derating in continuous operation. Above this frequency, see derating curves on pages 133 and 135 to 137
Speed range			1…1000 in closed loop mode with encoder feedback 1…100 in open loop mode
Speed accuracy	For a torque variation of 0.2 Tn to Tn		± 0.01% of nominal speed, in closed loop mode with incremental encoder feedback ± 10% of nominal slip, without speed feedback
Torque accuracy			± 5% in closed loop mode ± 15% in open loop mode
Transient overtorque			170% of the nominal motor torque (typical value at ± 10%) for 60 s 220% of the nominal motor torque (typical value at ± 10%) for 2 s
Braking torque			30% of motor nominal torque without braking resistor (typical value) Up to 150% with optional braking resistor, see pages 51 and 53
Maximum transient current			150% of the nominal drive current for 60 s (typical value) 165% of the nominal drive current for 2 s (typical value)
Continuous torque at 0 Hz	ATV 71H037M3…HD45M3X ATV 71H075N4…HD75N4		The Altivar 71 drive can continuously supply the peak value of the drive nominal current
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		The Altivar 71 drive can continuously supply 80% of the peak value of the drive nominal current
Motor control profile	Asynchronous motor		Flux Vector Control (FVC) with sensor (current vector) Sensorless Flux Vector Control (FVC) (voltage or current vector) Voltage/frequency ratio (2 or 5 points) ENA (Energy Adaptation) System for unbalanced loads
	Synchronous motor		Vector control without speed feedback
Frequency loop			PI regulator with adjustable structure for a speed response adapted to the machine (accuracy, speed)
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted Not available in voltage/frequency ratio

Electrical power characteristics

Power supply	Voltage	**V**	200 - 15%...240 + 10% single phase for ATV 71H075M3...HU75M3 200 - 15%...240 + 10% 3-phase for ATV 71H●●●M3 and ATV 71H●●●M3X 380 - 15%...480 + 10% 3-phase for ATV 71H●●●N4
	Frequency	**Hz**	50 - 5%...60 + 5%
Signalling			1 red LED: LED lit indicates the presence of drive voltage
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Drive noise level			Conforming to directive 86-188/EEC
	ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4	**dBA**	43
	ATV 71HU22M3…HU40M3 ATV 71H075N4…HU40N4	**dBA**	54.5
	ATV 71HU55M3 ATV 71HU55N4, HU75N4	**dBA**	55.6
	ATV 71HU75M3 ATV 71HD11N4	**dBA**	57.4
	ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4	**dBA**	60.2
	ATV 71HD18M3X, HD22M3X ATV 71HD22N4	**dBA**	59.9
	ATV 71HD30M3X…HD45M3X, ATV 71HD30N4, HD37N4	**dBA**	64
	ATV 71HD45N4…HD75N4	**dBA**	63.7
	ATV 71HD55M3X ATV 71HD90N4	**dBA**	60.5
	ATV 71HD75M3X ATV 71HC11N4	**dBA**	69.5
	ATV 71HC13N4, HC16N4	**dBA**	66
	ATV 71HC20N4…HC28N4	**dBA**	68
	ATV 71HC31N4, HC40N4	**dBA**	70
	ATV 71HC50N4	**dBA**	71
Electrical isolation			Between power and control (inputs, outputs, power supplies)

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Connection cable characteristics

Type of cable for	Mounting in an enclosure		Single-strand IEC cable, ambient temperature 45°C, copper 90°C XLPE/EPR or copper 70°C PVC
	Mounting in an enclosure with an IP 21 or IP 31 kit		3-strand IEC cable, ambient temperature 40°C, copper 70°C PVC
	Mounting in an enclosure with NEMA type 1 kit		3-strand UL 508 cable except for choke (2-strand UL 508 cable), ambient temperature 40°C, copper 75°C PVC

Connection characteristics (terminals for the power supply, the motor, and the DC bus)

Drive terminals			L1/R, L2/S, L3/T	U/T1, V/T2, W/T3	PC/-, PO, PA/+
Maximum connection capacity and tightening torque	ATV 71H037M3…HU40M3 ATV 71H075N4…HU40N4		5 mm², AWG 10 1.3 Nm		
	ATV 71HU55M3 ATV 71HU55N4, HU75N4		8 mm², AWG 8 1.3 Nm		
	ATV 71HU75M3 ATV 71HD11N4		20 mm², AWG 4 2.5 Nm		
	ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		25 mm², AWG 3 4.4 Nm		
	ATV 71HD18M3X, HD22M3X ATV 71HD22N4		4 x 35 mm², 3 x AWG 2 2.5 Nm		
	ATV 71HD30N4, HD37N4		4 x 50 mm², 3 x AWG 1/0 2.5 Nm		
	ATV 71HD30M3X		4 x 70 mm², 3 x AWG 2/0 2.5 Nm		
	ATV 71HD37M3X		4 x 95 mm², 3 x AWG 4/0 2.5 Nm		
	ATV 71HD45M3X		4 x 120 mm², 3 x 250 kcmil 2.5 Nm		
	ATV 71HD45N4		4 x 70 mm², 3 x AWG 2/0 2.5 Nm		
	ATV 71HD55N4		4 x 95 mm², 3 x AWG 4/0 2.5 Nm		
	ATV 71HD75N4		4 x 120 mm², 3 x 250 kcmil 2.5 Nm		
	ATV 71HD55M3X		2 x (3 x 95 mm²), 2 x AWG 3/0 –	2 x (3 x 70 mm²), 2 x AWG 1/0 –	2 x 120 mm², 2 x AWG 4/0 –
	ATV 71HD75M3X		2 x (3 x 95 mm²), 2 x AWG 3/0 –	2 x (3 x 95 mm²), 2 x AWG 3/0 –	2 x 120 mm², 2 x AWG 4/0 –
	ATV 71HD90N4		2 x (3 x 70 mm²), 2 x AWG 1/0 –	1 x (3 x 95 mm²), 2 x AWG 1/0 –	2 x 95 mm², 2 x AWG 3/0 –
	ATV 71HC11N4		2 x (3 x 95 mm²), 2 x AWG 3/0 –	1 x (3 x 120 mm²), 2 x AWG 3/0 –	2 x 120 mm², 2 x AWG 4/0 –
	ATV 71HC13N4		2 x (3 x 95 mm²), 2 x AWG 3/0 –	1 x (3 x 150 mm²), 2 x AWG 3/0 –	2 x 120 mm², 2 x AWG 4/0 –
	ATV 71HC16N4		2 x (3 x 120 mm²), 2 x AWG 4/0 –	2 x (3 x 95 mm²), 2 x AWG 4/0 –	2 x 150 mm², 2 x 300 MCM –
	ATV 71HC20N4		2 x (3 x 185 mm²), 2 x 300 MCM –	2 x (3 x 120 mm²), 2 x 300 MCM –	2 x 240 mm², 3 x 250 MCM –
	ATV 71HC25N4	Motor P 220 kW	2 x (3 x 185 mm²), 2 x 350 MCM –	2 x (3 x 150 mm²), 2 x 350 MCM –	3 x 150 mm², 3 x 250 MCM –
		Motor P 250 kW	3 x (3 x 150 mm²), 3 x 300 MCM –	2 x (3 x 150 mm²), 3 x 300 MCM –	4 x 150 mm², 3 x 350 MCM –
	ATV 71HC28N4		3 x (3 x 150 mm²), 3 x 300 MCM –	2 x (3 x 185 mm²), 3 x 300 MCM –	4 x 150 mm², 3 x 350 MCM –
	ATV 71HC31N4		3 x (3 x 185 mm²), 3 x 350 MCM –	3 x (3 x 150 mm²), 3 x 350 MCM –	4 x 185 mm², 5 x 300 MCM –
	ATV 71HC40N4	Motor P 350 kW	2 x 2 x (3 x 150 mm²), 2 x 2 x 300 MCM –	3 x (3 x 150 mm²), 5 x 300 MCM –	4 x 185 mm², 6 x 300 MCM –
		Motor P 400 kW	2 x 2 x (3 x 185 mm²), 2 x 2 x 300 MCM –	3 x (3 x 185 mm²), 5 x 300 MCM –	4 x 240 mm², 2 x 3 x 350 MCM –
	ATV 71HC50N4		2 x 3 x (3 x 150 mm²), 2 x 3 x 300 MCM –	4 x (3 x 185 mm²), 6 x 300 MCM –	4 x 240 mm², 2 x 3 x 350 MCM –

Electrical control characteristics

Internal supplies available			Short-circuit and overload protection: ■ 1 x 10.5 V ⎓ ± 5% supply for the reference potentiometer (1 to 10 kΩ), max. current 10 mA ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA.
External + 24 V power supply *(1)* (not provided)			24 V ⎓ (min. 19 V, max. 30 V) Power 30 W
Analog inputs	AI1-/AI1+		1 bipolar differential analog input ± 10 V ⎓ (maximum safe voltage 24 V) Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits + 1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI2		1 software-configurable current or voltage analog input: ■ analog voltage input 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	Other inputs		See option cards
Configurable voltage and current analog outputs	AO1		1 analog output configurable for voltage or current: ■ analog voltage output 0...10 V ⎓, minimum load impedance 470 Ω ■ current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2%
	Other outputs		See option cards
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one “N/C” contact and one “N/O” contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	R2A, R2B		1 relay logic output, one “N/O” contact Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	Other outputs		See option cards
Logic inputs LI	LI1...LI5		5 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Max. sampling time: 2 ms ± 0.5 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	LI6		1 logic input, configurable by a switch as a logic input or as an input for PTC probes Logic input, characteristics identical to inputs LI1...LI5 Input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
	Positive logic (Source)		State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)		State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
	Other inputs		See option cards
Safety input	PWR		1 input for the Power Removal safety function: ■ Power supply: 24 V ⎓ (max. 30 V) ■ Impedance: 1.5 kΩ ■ State 0 if < 2 V, state 1 if > 17 V
Maximum I/O connection capacity and tightening torque			2.5 mm² (AWG 14) 0.6 Nm

(1) Please consult our catalogue “Power supplies, splitter blocks and interfaces”.

Electrical control characteristics (continued)

Acceleration and deceleration ramps			Ramp profiles: ■ linear, can be adjusted separately from 0.01 to 9999 s ■ S, U or customized Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking resistor).
Braking to a standstill			By DC injection: ■ by a command on a programmable logic input ■ automatically as soon as the estimated output frequency drops to < 0.1 Hz, period adjustable from 0 to 60 s or continuous, current adjustable from 0 to 1.2 In (in open loop mode only).
Main drive protection and safety features			Thermal protection: ■ against overheating ■ of the power stage Protection against: ■ short-circuits between motor phases ■ input phase breaks ■ overcurrents between output phases and earth ■ overvoltages on the DC bus ■ a break on the control circuit ■ exceeding the limit speed Safety function for: ■ line supply overvoltage and undervoltage ■ input phase loss, in 3-phase
Motor protection (see page 170)			Thermal protection integrated in drive via continuous calculation of I^2t taking speed into account: ■ The motor thermal state is saved when the drive is powered down. ■ Function can be modified via operator dialogue terminals, depending on the type of motor (force-cooled or self-cooled). Protection against motor phase breaks Protection with PTC probes
Dielectric strength	ATV 71●●●M3 ATV 71●●●M3X		Between earth and power terminals: 2830 V ⎓ Between control and power terminals: 4230 V ⎓
	ATV 71●●●N4		Between earth and power terminals: 3535 V ⎓ Between control and power terminals: 5092 V ⎓
Insulation resistance to earth			> 1 MΩ (electrical isolation) 500 V ⎓ for 1 minute
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.024/50 Hz (11 bits)

Operational safety characteristics

Protection	Of the machine		"Power Removal" (PWR) safety function which forces stopping and/or prevents unintended equipment operation, conforming to EN 954-1 category 3 and draft standard IEC/EN 61800-5-2.
	Of the system process		"Power Removal" (PWR) safety function which forces stopping and/or prevents unintended equipment operation, conforming to IEC/EN 61508 level SIL2 and draft standard IEC/EN 61800-5-2.

Communication port characteristics

Modbus protocol

Type of connection		Modbus RJ45 connector port	Modbus RJ45 network port
Structure	Physical interface	2-wire RS 485	
	Transmission mode	RTU	
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: 9600 bps or 19200 bps	Configurable via the display terminal or the PowerSuite software workshop: 4800 bps, 9600 bps, 19200 bps or 38.4 Kbps
	Format	Fixed = 8 bits, even parity, 1 stop	Configurable via the display terminal or the PowerSuite software workshop: - 8 bits, odd parity, 1 stop - 8 bits, even parity, 1 stop - 8 bits, no parity, 1 stop - 8 bits, no parity, 2 stop
	Polarization	No polarization impedances These should be provided by the wiring system (for example, in the master)	
	Address	1 to 247, configurable via the display terminal or the PowerSuite software workshop. 3 addresses can be configured in order to access the drive data, the “Controller Inside” programmable card and the communication card respectively. These 3 addresses are identical for the connector and network ports.	
Services	Message handling	Read Holding Registers (03) 63 words maximum Write Single Register (06) Write Multiple Registers (16) 61 words maximum Read/Write Multiple Registers (23) 63/59 words maximum Read Device Identification (43) Diagnostics (08)	
	Communication monitoring	Can be inhibited. “Time out”, which can be set between 0.1 s and 30 s	
Diagnostics	With LEDs	An activity LED on integrated 7-segment display terminal. One LED for each port.	
	With graphic display terminal	One activity LED Command word received Reference received For each port: ■ Number of frames received ■ Number of incorrect frames	

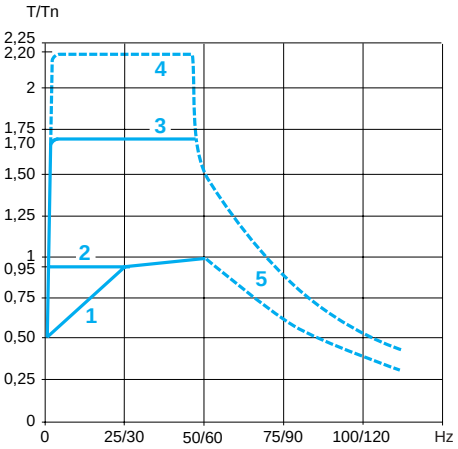
CANopen protocol

Structure	Connector	9-way male SUB-D connector on CANopen adapter. This connects to the Modbus RJ45 network port.
	Network management	Slave
	Transmission speed	20 Kbps, 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps or 1 Mbps
	Address (Node ID)	1 to 127, configurable via the display terminal or the PowerSuite software workshop.
Services	Number of PDOs	3 receive and 3 transmit (PDO1, PDO2 and PDO3)
	PDO modes	Event-triggered, Time-triggered, Remotely-requested, Sync (cyclic), Sync (acyclic)
	PDO linking	Yes
	PDO mapping	Configurable (PDO1 and PDO2)
	Number of SDOs	1 server
	Emergency	Yes
	CANopen application layer	CiA DS 301, V 4.02
	Profile	CiA DSP 402: CANopen “Device Profile Drives and Motion Control”
	Communication monitoring	Node Guarding, Heartbeat
Diagnostics	With LEDs	2 LEDs: “RUN” and “ERROR” on integrated 7-segment display terminal
	With graphic display terminal and PowerSuite software workshop	2 LEDs: “RUN” and “ERROR” Command word received Reference received Display of received PDOs Display of transmitted PDOs State of NMT chart Received PDOs counter Transmitted PDOs counter Reception error counter Transmission error counter
Description file		A single eds file is supplied on the CD-ROM containing the documentation for the whole range. It contains the description of the drive parameters.

Variable speed drives for asynchronous motors
Altivar 71

Torque characteristics (typical curves)

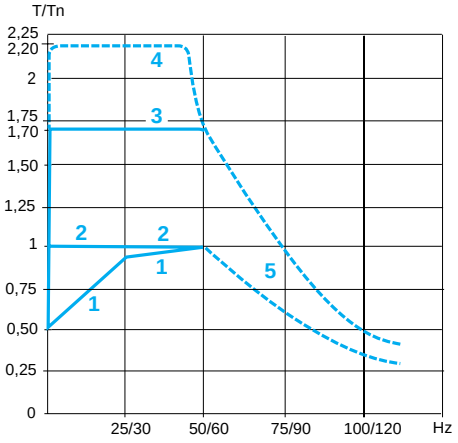
The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.



Open loop applications

Open loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 s maximum
4 Transient overtorque for 2 s maximum
5 Torque in overspeed at constant power *(2)*



Closed loop applications

Closed loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 s maximum
4 Transient overtorque for 2 s maximum
5 Torque in overspeed at constant power *(2)*

Altivar 71 drives are capable of supplying nominal torque continuously at zero speed.

Motor thermal protection

Altivar 71 drives feature thermal protection designed specifically for self-cooled or forced-cooled variable speed motors. The drive calculates the motor thermal state even when it is switched off.

This motor thermal protection is designed for a maximum ambient temperature of 40°C around the motor. If the temperature around the motor exceeds 40°C, thermal protection should be provided directly by thermistor probes (PTC) integrated in the motor. The probes are managed directly by the drive.

(1) For power ratings ⩽250 W, motor derating is 20% instead of 50% at very low frequencies.
(2) The motor nominal frequency and the maximum output frequency can be adjusted from 10 to 500 Hz or 1000 Hz depending on the rating.
Check the mechanical overspeed characteristics of the selected motor with the manufacturer.

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Special uses

Using Altivar 71 drives with synchronous motors

Altivar 71 drives are also suitable for powering synchronous motors (sinusoidal electromotive force) in open loop mode and are used to achieve performance levels comparable to those associated with an asynchronous motor in sensorless Flux Vector Control.
This drive/motor combination makes it possible to obtain remarkable speed accuracy and maximum torque even at zero speed. The design and construction of synchronous motors is such that they offer enhanced power density and speed dynamics in a compact unit. Drive control for synchronous motors does not cause stalling.

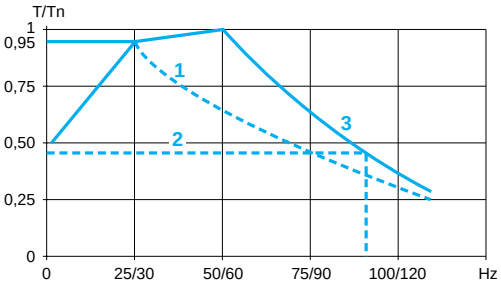
Using high-speed special motors

These motors are designed for constant torque applications with high frequency ranges. The Altivar 71 supports operating frequencies of up to 1000 Hz. By design, this type of motor is more sensitive to overvoltages than a standard motor.
Different solutions are available:
- Overvoltage limitation function
- Output filters

The drive's 5-point voltage/frequency control ratio is particularly well-suited as it avoids resonance.

Using a motor at overspeed

The maximum output frequency can be adjusted from 10 to 1000 Hz for drives rated less than or equal to 37 kW and from 10 to 500 Hz for higher ratings.
When using a standardized asynchronous motor at overspeed, check the mechanical overspeed characteristics of the selected motor with the manufacturer. Above its nominal speed corresponding to a frequency of 50/60 Hz, the motor operates with a decreasing flux and its torque decreases significantly (see the curve opposite).
The application must be able to permit this type of low-torque, high-speed operation.



Using a motor at overspeed

1 Machine torque (degressive torque)
2 Machine torque (low motor torque)
3 Continuous motor torque

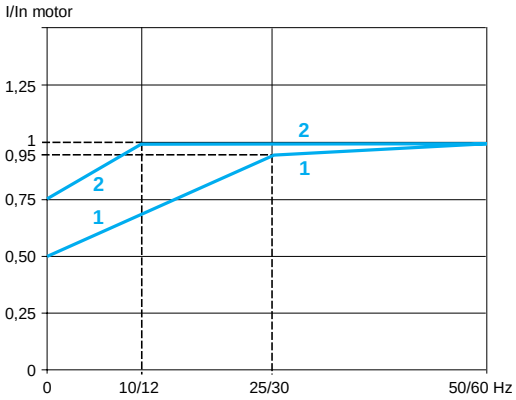
Typical applications: wood-working machinery, broaching machines, high-speed hoisting, etc

Motor power less than drive power

An Altivar 71 drive can power any motor with a rating lower than that for which the drive was designed. This motor/drive combination makes it suitable for applications requiring high, intermittent overtorque.
Typical applications: machines with very high starting torque, grinders, kneaders, etc

Note: *in this case, it is advisable to over-rate the drive to the next standard power rating immediately above that of the motor.*

Example: Use an 11 kW motor with a 15 kW drive.



Power of a self-cooled motor greater than the drive power

Power of a self-cooled motor greater than the drive power

This motor/drive combination makes it possible to use a self-cooled motor for a greater speed range in continuous operation. The use of a motor with a higher power rating than that of the drive is only possible if the current drawn by this motor is less than or equal to the nominal drive current.

Note: *Limit the motor power to the standard rating immediately above that of the drive.*

Example: On a single machine, the use of a 2.2 kW drive combined with a 3 kW motor means that the machine can operate at its nominal power (2.2 kW) at low speed.
1 Motor power = drive power = 2.2 kW
2 2.2 kW drive combined with a 3 kW motor: greater speed range at 2.2 kW.

Variable speed drives for asynchronous motors
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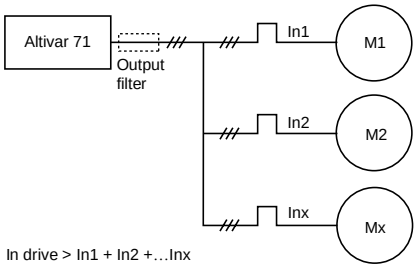
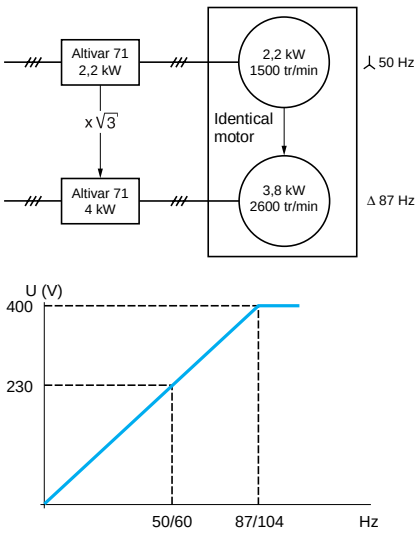


Connecting motors in parallel



Using a motor at constant torque up to 87/104 Hz

Special uses (continued)

Connecting motors in parallel

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, provide external thermal protection for each motor using probes or thermal overload relays. For cable runs over a certain length, taking account of all tap links, it is advisable either to install an output filter between the drive and the motors or to use the overvoltage limitation function.

If several motors are used in parallel, there are 2 possible scenarios:
- The motors have equal power ratings, in which case the torque characteristics will remain optimized after the drive has been configured
- The motors have different power ratings, in which case the torque characteristics will not be optimized for all the motors

Using a motor at constant torque up to 87/104 Hz

A 400 V, 50 Hz motor in ⅄ connection can be used at constant torque up to 87 Hz if it is in Δ connection.
In this particular case, the initial motor power, as well as the power of the first associated drive are multiplied by √3 (it is therefore important to select a drive with a suitable rating).
Example: A 2.2 kW, 50 Hz motor in ⅄ connection supplies 3.8 kW at 87 Hz with a Δ connection.

Note: *Check the motor's overspeed operating characteristics.*

Using special motors

Special brake motors: tapered rotor or flux bypass

The magnetic field releases the brake. This type of operation with the Altivar 71 drive requires application of the voltage/frequency ratio.

Note: *The no-load current may be high, operation at low speed can only be intermittent.*

Resistive rotor asynchronous motors

Different motor control ratios available on the Altivar 71 make it possible to apply specific settings when using high-slip motors.

Variable speed drives for asynchronous motors
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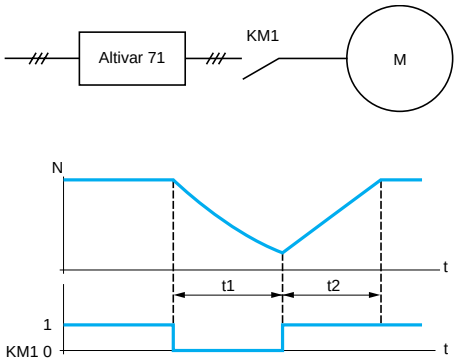

t1: deceleration without ramp (freewheel)
t2: acceleration with ramp

Example of loss of output contactor

Special uses (continued)

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp. This use requires configuration of the automatic catching a spinning load ("catch on the fly") and the motor phase loss on output cut functions.

Typical applications: loss of safety circuit at drive output, bypass function, switching of motors connected in parallel
On new installations, it is recommended that the Power Removal safety function is used.

Test on a low power motor or without a motor

In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss function.

Variable speed drives for asynchronous motors

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Supply voltage 200...240 V 50/60 Hz

533158

ATV 71HU22M3Z

532725

ATV 71H037M3

532724

ATV 71HD37M3X

Motor		Line supply				Altivar 71				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc	Maximum continuous current *(1)*	Max. transient current for		Reference *(3)*	Weight
		200 V	240 V	240 V			60 s	2 s		
kW	*HP*	A	A	kVA	kA	A	A	A		kg
Single phase supply voltage: 200…240 V 50/60 Hz										
0.37	*0.5*	6.9	5.8	2.4	5	3	4.5	4.9	**ATV 71H075M3** *(4)*	3.000
0.75	*1*	12	9.9	4.1	5	4.8	7.2	7.9	**ATV 71HU15M3** *(4)*	3.000
1.5	*2*	18.2	15.7	6.5	5	8	12	13.2	**ATV 71HU22M3** *(4)*	3.000
2.2	*3*	25.9	22.1	9.2	5	11	16.5	18.1	**ATV 71HU30M3** *(4)*	4.000
3	–	25.9	22	9.1	5	13.7	20.6	22.6	**ATV 71HU40M3** *(4)* *(5)*	4.000
4	*5*	34.9	29.9	12.4	5	17.5	26.3	28.8	**ATV 71HU55M3** *(4)* *(5)*	5.500
5.5	*7.5*	47.3	40.1	16.7	22	27.5	41.3	45.3	**ATV 71HU75M3** *(4)* *(5)*	5.500
3-phase supply voltage: 200…240 V 50/60 Hz										
0.37	*0.5*	3.5	3.1	1.3	5	3	4.5	4.9	**ATV 71H037M3** *(4)*	3.000
0.75	*1*	6.1	5.3	2.2	5	4.8	7.2	7.9	**ATV 71H075M3** *(4)*	3.000
1.5	*2*	11.3	9.6	4	5	8	12	13.2	**ATV 71HU15M3** *(4)*	3.000
2.2	*3*	15	12.8	5.3	5	11	16.5	18.1	**ATV 71HU22M3** *(4)*	4.000
3	–	19.3	16.4	6.8	5	13.7	20.6	22.6	**ATV 71HU30M3** *(4)*	4.000
4	*5*	25.8	22.9	9.5	5	17.5	26.3	28.8	**ATV 71HU40M3** *(4)*	4.000
5.5	*7.5*	35	30.8	12.8	22	27.5	41.3	45.3	**ATV 71HU55M3** *(4)*	5.500
7.5	*10*	45	39.4	16.4	22	33	49.5	54.5	**ATV 71HU75M3** *(4)*	7.000
11	*15*	53.3	45.8	19	22	54	81	89.1	**ATV 71HD11M3X** *(4)* *(6)*	9.000
15	*20*	71.7	61.6	25.6	22	66	99	109	**ATV 71HD15M3X** *(4)* *(6)*	9.000
18.5	*25*	77	69	28.7	22	75	112	124	**ATV 71HD18M3X** *(6)*	19.000
22	*30*	88	80	33.3	22	88	132	145	**ATV 71HD22M3X** *(6)*	19.000
30	*40*	124	110	45.7	22	120	180	198	**ATV 71HD30M3X** *(6)*	39.000
37	*50*	141	127	52.8	22	144	216	238	**ATV 71HD37M3X** *(6)*	39.000
45	*60*	167	147	61.1	22	176	264	290	**ATV 71HD45M3X** *(6)*	39.000
55	*75*	200	173	71.9	35	221	332	365	**ATV 71HD55M3X** *(6)* *(7)* *(8)*	59.000
75	*100*	271	232	96.4	35	285	428	470	**ATV 71HD75M3X** *(6)* *(7)* *(8)*	72.000

(1) These values are for a nominal switching frequency of 2.5 or 4 kHz, depending on the rating, for continuous operation. The switching frequency is adjustable from 1…16 kHz up to ATV 71HD45M3X and from 1…8 kHz for ATV 71HD55M3X and ATV 71HD75M3X drives.
Above 2.5 or 4 kHz, depending on the rating, the drive decreases the switching frequency itself in the event of excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current (see derating curves on pages 133 and 135 to 137).

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

*(3) To order a special reinforced version for difficult environmental conditions, add **S337** at the end of the reference (except for ATV 71H●●●M3X). (See the characteristics on page 8).*
*Example: ATV 71H037M3 becomes **ATV 71H037M3S337**.*
*For ATV 71H●●●M3X, add **337** at the end of the reference. Example: ATV 71HD11M3X becomes **ATV 71HD11M3X337**.*
In this case, the drive is supplied with a remote graphic display terminal.

*(4) Drive supplied with a remote graphic display terminal. To receive a drive without a graphic display terminal, add a **Z** at the end of the reference. It will then be equipped with an integrated 7-segment display terminal. This option is not available for drives operating in difficult environmental conditions (3).*
*Example: ATV 71H037M3 without graphic terminal becomes **ATV 71H037M3Z**.*

(5) A line choke must be used (see page 72).

(6) Drive supplied without EMC filters. EMC filters are available as an option (see page 78).

(7) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply.
*For connections to the DC bus, the drive can be ordered without a DC choke by adding **D** at the end of the reference.*
*Example: ATV 71HD55M3X becomes **ATV 71HD55M3XD**.*

(8) Drive supplied without plate for EMC mounting. It is included in the kits for NEMA type 1, IP 21 or IP 31 conformity, to be ordered separately (see pages 22 and 23).

***Note:** please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 86 to 89.*

Variable speed drives for asynchronous motors

Altivar 71

Supply voltage 380..0.480 V 50/60 Hz

532723

ATV 71HU22N4

533158

ATV 71HU40N4Z

533249

ATV 71HC28N4

Motor		Line supply				Altivar 71				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc	Maximum continuous current *(1)*	Max. transient current for		Reference	Weight
		380 V	480 V	380 V			60 s	2 s		
kW	*HP*	A	A	kVA	kA	A	A	A		kg
3-phase supply voltage: 380…480 V 50/60 Hz										
0.75	*1*	3.7	3	2.4	5	2.3	3.5	3.8	**ATV 71H075N4** *(3) (4)*	3.000
1.5	*2*	5.8	5.3	3.8	5	4.1	6.2	6.8	**ATV 71HU15N4** *(3) (4)*	3.000
2.2	*3*	8.2	7.1	5.4	5	5.8	8.7	9.6	**ATV 71HU22N4** *(3) (4)*	3.000
3	–	10.7	9	7	5	7.8	11.7	12.9	**ATV 71HU30N4** *(3) (4)*	4.000
4	*5*	14.1	11.5	9.3	5	10.5	15.8	17.3	**ATV 71HU40N4** *(3) (4)*	4.000
5.5	*7.5*	20.3	17	13.4	22	14.3	21.5	23.6	**ATV 71HU55N4** *(3) (4)*	5.500
7.5	*10*	27	22.2	17.8	22	17.6	26.4	29	**ATV 71HU75N4** *(3) (4)*	5.500
11	*15*	36.6	30	24.1	22	27.7	41.6	45.7	**ATV 71HD11N4** *(3) (4)*	7.000
15	*20*	48	39	31.6	22	33	49.5	54.5	**ATV 71HD15N4** *(3) (4)*	9.000
18.5	*25*	45.5	37.5	29.9	22	41	61.5	67.7	**ATV 71HD18N4** *(3)*	9.000
22	*30*	50	42	32.9	22	48	72	79.2	**ATV 71HD22N4** *(3)*	19.000
30	*40*	66	56	43.4	22	66	99	109	**ATV 71HD30N4** *(3)*	26.000
37	*50*	84	69	55.3	22	79	118.5	130	**ATV 71HD37N4** *(3)*	26.000
45	*60*	104	85	68.5	22	94	141	155	**ATV 71HD45N4** *(3)*	44.000
55	*75*	120	101	79	22	116	174	191	**ATV 71HD55N4** *(3)*	44.000
75	*100*	167	137	109.9	22	160	240	264	**ATV 71HD75N4** *(3)*	44.000
90	*125*	166	134	109.3	35	179	269	295	**ATV 71HD90N4** *(5) (6)*	60.000
110	*150*	202	163	133	35	215	323	355	**ATV 71HC11N4** *(5) (6)*	74.000
132	*200*	239	192	157.3	35	259	388	427	**ATV 71HC13N4** *(5) (6)*	80.000
160	*250*	289	233	190.2	50	314	471	518	**ATV 71HC16N4** *(5) (6)*	110.000
200	*300*	357	286	235	50	387	580	638	**ATV 71HC20N4** *(5) (6)*	140.000
220	*350*	396	320	260.6	50	427	640	704	**ATV 71HC25N4** *(5) (6)*	140.000
250	*400*	444	357	292.2	50	481	721	793		
280	*450*	494	396	325.1	50	550	825	907	**ATV 71HC28N4** *(5) (6)*	140.000
315	*500*	555	444	365.3	50	616	924	1016	**ATV 71HC31N4** *(5) (6)*	215.000
355	–	637	512	419.3	50	671	1006	1107	**ATV 71HC40N4** *(5) (6)*	225.000
400	*600*	709	568	466.6	50	759	1138	1252		
500	*700*	876	699	576.6	50	941	1411	1552	**ATV 71HC50N4** *(5) (6)*	300.000

(1) These values are for a nominal switching frequency of 2.5 or 4 kHz, depending on the rating, for continuous operation. The switching frequency is adjustable from 1…16 kHz up to ATV 71HD75N4 and from 2.5…8 kHz for ATV 71HD90N4…ATV 71HC50N4 drives.
Above 2.5 or 4 kHz, depending on the rating, the drive decreases the switching frequency itself in the event of excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current (see derating curves on pages 133 and 135 to 137).

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

*(3) To order a special reinforced version for difficult environmental conditions, add **S337** at the end of the reference (see the characteristics on page 8).*
*Example: ATV 71H075N4 becomes **ATV 71H075N4S337**.*
In this case, the drive is supplied with a remote graphic display terminal.
ATV 71HD90N4…HC50N4 drives have been specially designed to operate in difficult environmental conditions.

*(4) Drive supplied with a remote graphic display terminal. To receive a drive without a graphic display terminal, add a **Z** at the end of the reference. It will then be equipped with an integrated 7-segment display terminal. This option is not available for drives operating in difficult environmental conditions (3).*
*Example: ATV 71H075N4 without graphic terminal becomes **ATV 71H075N4Z**.*

*(5) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply. For connections to the DC bus, the drive can be ordered without a DC choke by adding **D** at the end of the reference.*
*Example: ATV 71HD90N4 becomes **ATV 71HD90N4D**.*

(6) Drive supplied without plate for EMC mounting. It is included in the kits for NEMA type 1, IP 21 or IP 31 conformity, to be ordered separately (see pages 22 and 23).

***Note:** please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 86 to 89.*

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

Adaptor for 115 V ∿ logic inputs

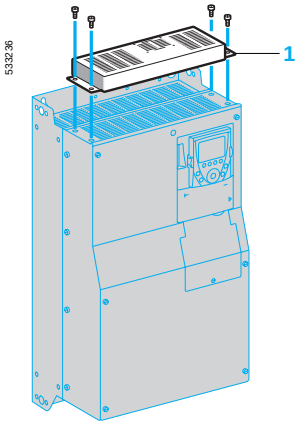
This adaptor is used to connect 115 V ∿ logic signals to the logic inputs on the drive or an I/O extension card.

7 logic inputs with capacitive impedance at 60 Hz of 0.22 µF are available for connecting the logic signals:
- Max. current: 200 mA
- Response time: 5 ms to change from state 0 to state 1, 20 ms to change from state 1 to state 0
- Logic state 0 for a voltage below 20 V, logic state 1 for a voltage between 70 V and 132 V

The power supply must be provided by a 115 V ∿ external power supply (min. 70 V, max. 132 V).

References

Description	Reference	Weight kg
Adaptor for 115 V ∿ logic inputs	**VW3 A3 101**	–



Control card fan kit

This kit is required for ATV 71HD18M3X, HD22M3X and ATV 71HD22N4…HD75N4 drives.
It enables the drive to operate at an ambient temperature of 50°C to 60°C, for example if it is mounted in an IP 54 enclosure. The circulation of air around the electronic cards prevents the formation of hot spots.
Check the derating to be applied to the drive nominal current (see the derating curves on pages 133 and 135 to 137).

The kit 1 is mounted on the upper part of the drive. It is powered by the drive.
It consists of:
- A fan subassembly
- Fixing accessories
- A manual

References

For drives	Reference	Weight kg
ATV 71HD18M3X, HD22M3X ATV 71HD22N4…HD37N4	**VW3 A9 406**	–
ATV 71HD45N4…HD75N4	**VW3 A9 407**	–

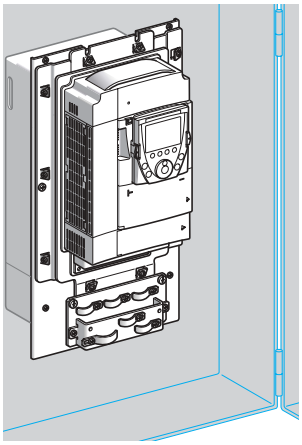
Dimensions:
page 93

Variable speed drives for asynchronous motors

Altivar 71

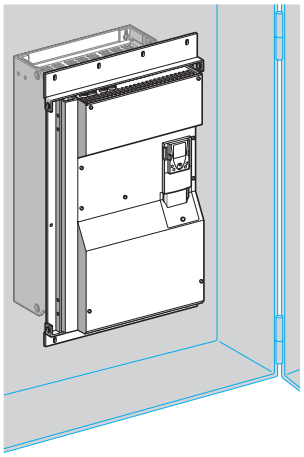
Options: accessories

533254



ATV 71HU75N4 flush-mounted

533255



ATV 71HC28N4D flush-mounted

Kit for flush-mounting in a dust and damp proof enclosure

This kit can be used to mount the power part of the drive outside the enclosure (IP 54 degree of protection), which reduces the power dissipated into the enclosure (see page 138).
With this type of mounting, the maximum internal temperature in the enclosure can then reach 60°C without it being necessary to derate the drive current.
Between 50°C and 60°C, for ATV 71HD18M3X, HD22M3X and ATV 71HD22N4…HD75N4 drives, a control card fan kit must be used to prevent hot spots (see page 20).

The back of the enclosure must be drilled and cut out for this type of mounting.

The kit consists of:
- A metal frame of the right size for the drive rating
- Corner pieces
- Seals
- A fan support (This can be used to move the fans so that they can be accessed from the front of the enclosure.)
- Fixing accessories
- A cutting and drilling template
- A manual

References

For drives		Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4		**VW3 A9 501**	2.700
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4		**VW3 A9 502**	3.100
ATV 71HU55M3 ATV 71HU55N4, HU75N4		**VW3 A9 503**	3.700
ATV 71HU75M3 ATV 71HD11N4		**VW3 A9 504**	4.600
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		**VW3 A9 505**	4.900
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		**VW3 A9 506**	3.900
ATV 71HD30N4, HD37N4		**VW3 A9 507**	4.200
ATV 71HD30M3X…HD45M3X		**VW3 A9 508**	4.900
ATV 71HD45N4…HD75N4		**VW3 A9 509**	5.200
ATV 71HD55M3X ATV 71HD90N4		**VW3 A9 510**	5.100
ATV 71HD75M3X ATV 71HC11N4		**VW3 A9 511**	3.600
ATV 71HC13N4		**VW3 A9 512**	4.300
ATV 71HC16N4		**VW3 A9 513**	4.400
ATV 71HC20N4…HC28N4	Without braking unit	**VW3 A9 514**	4.700
	With braking unit	**VW3 A9 515**	4.700
ATV 71HC31N4, HC40N4		**VW3 A9 516**	5.900
ATV 71HC50N4		**VW3 A9 517**	6.200

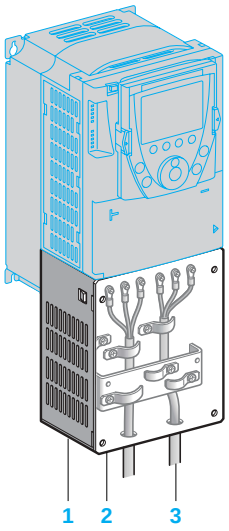
Dimensions:
pages 94 to 96

Variable speed drives for asynchronous motors

Altivar 71

Options: accessories

533324



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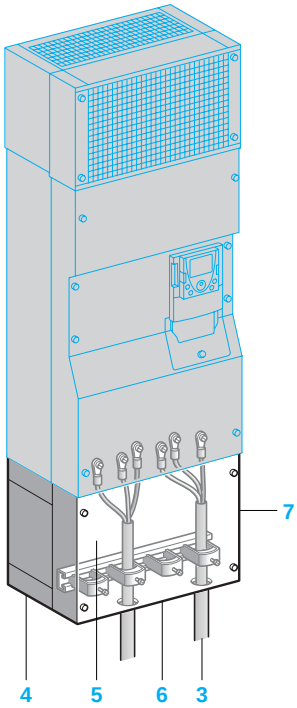

Kit for NEMA type 1 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure NEMA type 1 conformity when connecting the cables with a tube. The shielding is connected inside the kit.

For ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X and ATV 71H075N4...HD75N4 drives, the kit consists of:

- All the mechanical parts 1 including a pre-cut plate 2 for connecting the tubes 3
- Fixing accessories
- A manual

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the kit consists of:

- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power part
- An EMC plate 5
- A NEMA type 1 cover 7
- A pre-drilled plate 6 for connecting the tubes 3
- Fixing accessories
- A manual

References

For drives		Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4		**VW3 A9 201**	1.300
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4		**VW3 A9 202**	1.500
ATV 71HU55M3 ATV 71HU55N4, HU75N4		**VW3 A9 203**	1.800
ATV 71HU75M3 ATV 71HD11N4		**VW3 A9 204**	2.000
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		**VW3 A9 205**	2.800
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		**VW3 A9 206**	4.000
ATV 71HD30N4, HD37N4		**VW3 A9 207**	5.000
ATV 71HD30M3X…HD45M3X ATV 71HD45N4…HD75N4		**VW3 A9 208**	7.000
ATV 71HD55M3X ATV 71HD90N4		**VW3 A9 209**	9.400
ATV 71HD75M3X ATV 71HC11N4		**VW3 A9 210**	11.800
ATV 71HC13N4		**VW3 A9 211**	11.600
ATV 71HC16N4		**VW3 A9 212**	14.600
ATV 71HC20N4…HC28N4	Without braking unit	**VW3 A9 213**	19.500
	With braking unit	**VW3 A9 214**	19.500
ATV 71HC31N4, HC40N4		**VW3 A9 215**	25.000
ATV 71HC50N4		**VW3 A9 216**	35.000

Dimensions:
page 97

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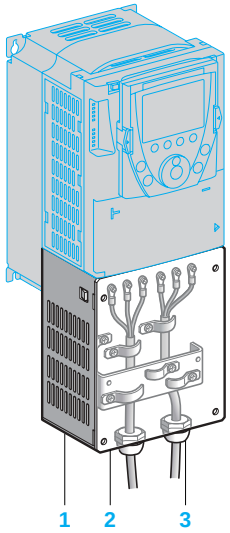
Variable speed drives for asynchronous motors

Altivar 71

Options: accessories

533326



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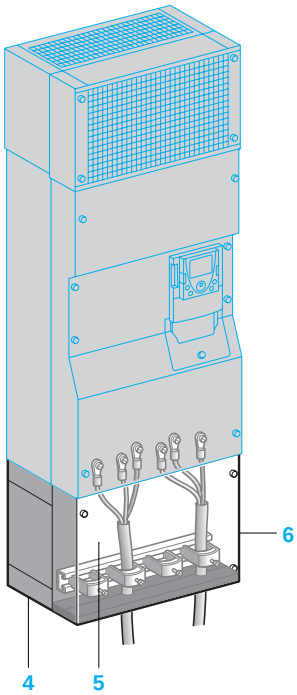


Kits for IP 21 or IP 31 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure conformity with IP 21 or IP 31 degree of protection when connecting the cables with a cable gland.
The shielding is connected inside the kit.

For ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X and ATV 71H075N4...HD75N4 drives, the kit conforms to IP 21 degree of protection.
It consists of:

- All the mechanical parts 1 including a drilled plate 2 for fixing the cable glands 3
- Fixing accessories
- A manual

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4...HC50N4 drives, the kit conforms to IP 31 degree of protection.
It consists of:

- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power part
- An EMC plate with cable clamps 5
- An IP 31 cover 6
- Fixing accessories
- A manual

References

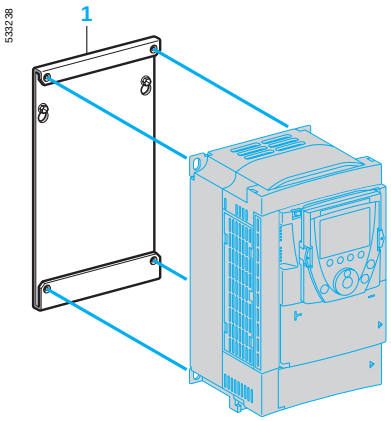
For drives		Degree of protection	Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4		IP 21	**VW3 A9 101**	1.300
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4		IP 21	**VW3 A9 102**	1.500
ATV 71HU55M3 ATV 71HU55N4, HU75N4		IP 21	**VW3 A9 103**	1.800
ATV 71HU75M3 ATV 71HD11N4		IP 21	**VW3 A9 104**	2.000
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		IP 21	**VW3 A9 105**	2.800
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		IP 21	**VW3 A9 106**	4.000
ATV 71HD30N4, HD37N4		IP 21	**VW3 A9 107**	5.000
ATV 71HD30M3X…HD45M3X ATV 71HD45N4…HD75N4		IP 21	**VW3 A9 108**	7.000
ATV 71HD55M3X ATV 71HD90N4		IP 31	**VW3 A9 109**	9.400
ATV 71HD75M3X ATV 71HC11N4		IP 31	**VW3 A9 110**	11.800
ATV 71HC13N4		IP 31	**VW3 A9 111**	11.600
ATV 71HC16N4		IP 31	**VW3 A9 112**	14.600
ATV 71HC20N4…HC28N4	Without braking unit	IP 31	**VW3 A9 113**	19.500
	With braking unit	IP 31	**VW3 A9 114**	19.500
ATV 71HC31N4, HC40N4		IP 31	**VW3 A9 115**	25.000
ATV 71HC50N4		IP 31	**VW3 A9 116**	35.000

Dimensions:
page 97

Variable speed drives for asynchronous motors

Altivar 71

Options: accessories



VW3 A9 304

Substitution kit for Altivar 58 or Altivar 58F drives

This kit **1** is used to fit an Altivar 71 drive in the place of an Altivar 58 or Altivar 58F drive using the same fixing holes. It includes the mechanical adaptors required for mounting.

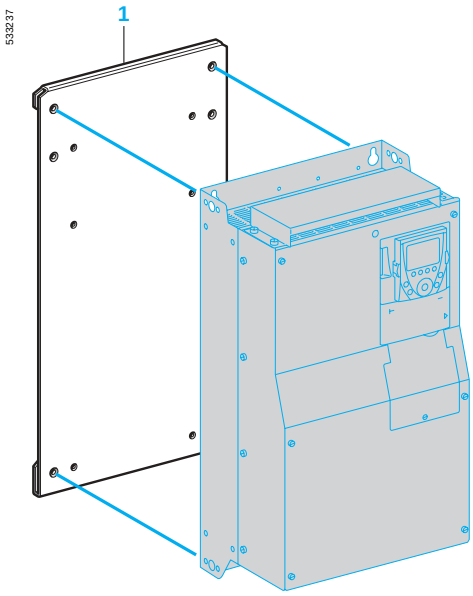
Kits

Old drive	Motor Power		Replaced by	Reference	Weight
	kW	*HP*			kg
Supply voltage 200…240 V single phase High torque application (170% Tn)					
ATV 58HU09M2	0.37	*0.5*	ATV 71H075M3	**VW3 A9 301**	–
ATV 58HU18M2	0.75	*1*	ATV 71HU15M3	**VW3 A9 301**	–
ATV 58HU29M2	1.5	*2*	ATV 71HU22M3	**VW3 A9 303**	–
ATV 58HU41M2	2.2	*3*	ATV 71HU30M3	**VW3 A9 303**	–
ATV 58HU72M2	3	–	ATV 71HU40M3	**VW3 A9 304**	–
ATV 58HU90M2	4	*5*	ATV 71HU55M3	**VW3 A9 306**	–
ATV 58HD12M2	5.5	*7.5*	ATV 71HU75M3	**VW3 A9 306**	–
Supply voltage 200…240 V three-phase High torque application (170% Tn)					
ATV 58HU29M2	1.5	*2*	ATV 71HU15M3	**VW3 A9 302**	–
ATV 58HU41M2	2.2	*3*	ATV 71HU22M3	**VW3 A9 303**	–
ATV 58HU54M2	3	–	ATV 71HU30M3	**VW3 A9 304**	–
ATV 58HU72M2	4	*5*	ATV 71HU40M3	**VW3 A9 304**	–
ATV 58HU90M2	5.5	*7.5*	ATV 71HU55M3	**VW3 A9 306**	–
ATV 58HD12M2	7.5	*10*	ATV 71HU75M3	**VW3 A9 307**	–
ATV 58HD16M2X	11	*15*	ATV 71HD11M3X	**VW3 A9 309**	–
ATV 58HD23M2X	15	*20*	ATV 71HD15M3X	**VW3 A9 309**	–
ATV 58HD28M2X	18.5	*25*	ATV 71HD18M3X	**VW3 A9 312**	–
ATV 58HD33M2X	22	*30*	ATV 71HD22M3X	**VW3 A9 312**	–
ATV 58HD46M2X	30	*40*	ATV 71HD30M3X	**VW3 A9 314**	–
Supply voltage 380…480 V three-phase High torque application (170% Tn)					
ATV 58HU18N4	0.75	*1*	ATV 71H075N4	**VW3 A9 302**	–
ATV 58HU29N4	1.5	*2*	ATV 71HU15N4	**VW3 A9 302**	–
ATV 58HU41N4	2.2	*3*	ATV 71HU22N4	**VW3 A9 303**	–
ATV 58HU54N4	3	–	ATV 71HU30N4	**VW3 A9 304**	–
ATV 58HU72N4	4	*5*	ATV 71HU40N4	**VW3 A9 304**	–
ATV 58HU90N4	5.5	*7.5*	ATV 71HU55N4	**VW3 A9 305**	–
ATV 58HD12N4	7.5	*10*	ATV 71HU75N4	**VW3 A9 306**	–
ATV 58HD16N4	11	*15*	ATV 71HD11N4	**VW3 A9 307**	–
ATV 58HD23N4	15	*20*	ATV 71HD15N4	**VW3 A9 308**	–
ATV 58HD28N4	18.5	*25*	ATV 71HD18N4	**VW3 A9 309**	–
ATV 58HD33N4	22	*30*	ATV 71HD22N4	**VW3 A9 310**	–
ATV 58HD46N4	30	*40*	ATV 71HD30N4	**VW3 A9 311**	–
ATV 58HD54N4	37	*50*	ATV 71HD37N4	**VW3 A9 313**	–
ATV 58HD64N4	45	*60*	ATV 71HD45N4	**VW3 A9 315**	–
ATV 58HD79N4	55	*75*	ATV 71HD55N4	**VW3 A9 315**	–

Variable speed drives for asynchronous motors

Altivar 71

Options: accessories



VW3 A9 315

Kits (continued)

Old drive	Motor Power		Replaced by	Reference	Weight
	kW	*HP*			kg
Supply voltage 200…240 V three-phase Standard torque applications (120% Tn)					
ATV 58HD16M2X	15	*20*	ATV 71HD15M3X	**VW3 A9 309**	–
ATV 58HD23M2X	18.5	*25*	ATV 71HD18M3X	**VW3 A9 310**	–
ATV 58HD28M2X	22	*30*	ATV 71HD22M3X	**VW3 A9 312**	–
ATV 58HD33M2X	30	*40*	ATV 71HD30M3X	**VW3 A9 314**	–
ATV 58HD46M2X	37	*50*	ATV 71HD37M3X	**VW3 A9 314**	–
Supply voltage 380…480 V three-phase Standard torque applications (120% Tn)					
ATV 58HD28N4	22	*30*	ATV 71HD22N4	**VW3 A9 310**	–
ATV 58HD33N4	30	*40*	ATV 71HD30N4	**VW3 A9 311**	–
ATV 58HD46N4	37	*50*	ATV 71HD37N4	**VW3 A9 311**	–
ATV 58HD54N4	45	*60*	ATV 71HD45N4	**VW3 A9 315**	–
ATV 58HD64N4	55	*75*	ATV 71HD55N4	**VW3 A9 315**	–
ATV 58HD79N4	75	*100*	ATV 71HD75N4	**VW3 A9 315**	–

Variable speed drives for asynchronous motors

Altivar 71

Options: dialogue

Remote graphic display terminal

(this display terminal can be supplied with the drive or ordered separately)

This display terminal is attached to the front of the drive. In the case of drives supplied without a graphic display terminal, it covers the integrated 7-segment display terminal.

It can be:

- Used remotely in conjunction with the appropriate accessories (see below)
- Connected to several drives using multidrop link components (see page 27)

It is used:

- To control, adjust and configure the drive
- To display the current values (motor, input/output values, etc.)
- To save and download configurations; 4 configuration files can be saved.

The terminal's maximum operating temperature is 60°C and it features IP 54 protection.

Description

1 Graphic display:
- 8 lines, 240 x 160 pixels
- Large digits that can be read from 5 m away
- Supports display of bar charts

2 Assignable function keys F1, F2, F3, F4:
- Dialogue functions: direct access, help screens, navigation
- Application functions: "Local Remote", preset speed

3 "STOP/RESET": local control of motor stop/fault reset

4 "RUN": local control of motor operation

5 Navigation button:
- Press: saves the current value (ENT)
- Turn ±: increases or decreases the value, takes you to the next or previous line.

6 "FWD/REV": reverses the direction of rotation of the motor

7 "ESC": aborts a value, a parameter or a menu to return to the previous selection

Note: *Keys 3, 4 and 6 can be used to control the drive directly.*

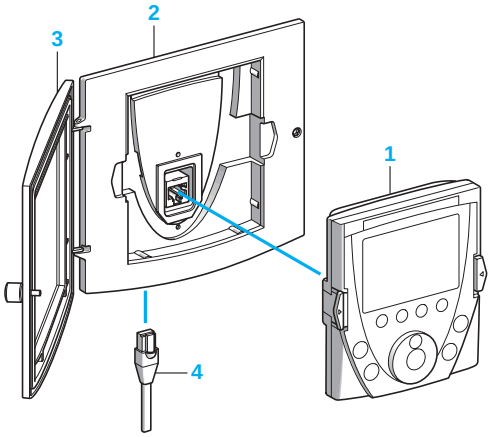
References

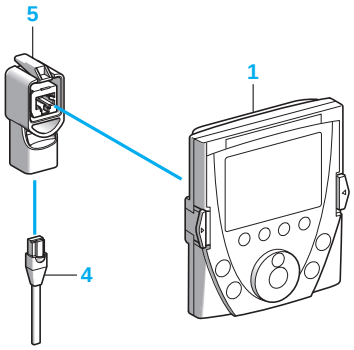
Description	N°	Reference	Weight kg
Remote graphic display terminal	1	**VW3 A1 101**	0.145

Graphic display terminal accessories

The available accessories are:

- A remote mounting kit for mounting on an enclosure door with IP 54 degree of protection. It includes:
  - All the mechanical fittings
  - The screws and bolts
- A transparent door which attaches to the remote mechanics to achieve IP 65 degree of protection
- A cable equipped with two RJ45 connectors so that the graphic display terminal can be connected to the Altivar 71 drive (1, 3, 5 or 10 m lengths available)
- An RJ45 female/female adapter for connecting the VW3 A1 101 graphic display terminal to the VW3 A1 104 R●●● remote cable





References

Description	N°	Length m	Degree of protection	Reference	Weight kg
Remote mounting kit *(1)*	2	–	IP 54	**VW3 A1 102**	0.150
Door *(2)*	3	–	IP 65	**VW3 A1 103**	0.040
Remote cables Equipped with 2 RJ45 connectors	4	1	–	**VW3 A1 104 R10**	0.050
	4	3	–	**VW3 A1 104 R30**	0.150
	4	5	–	**VW3 A1 104 R50**	0.250
	4	10	–	**VW3 A1 104 R100**	0.500
RJ45 female/female adaptor	5	–	–	**VW3 A1 105**	0.010

(1) In this case, use a VW3 A1 104 R●● remote connecting cable, which must be ordered separately (see above).

(2) To be mounted on remote mounting kit VW3 A1 102 (for mounting on an enclosure door), which must be ordered separately (see above).

Dimensions:
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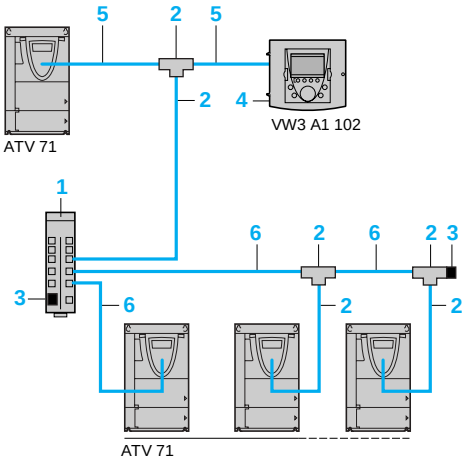
Variable speed drives for asynchronous motors
Altivar 71
Options: dialogue



Example of connection via multidrop link

Multidrop link components

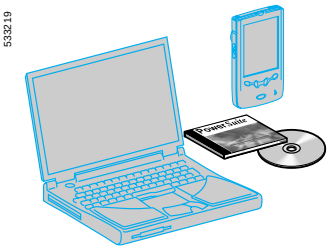
These components enable a graphic display terminal to be connected to several drives via a multidrop link. This multidrop link is connected to the Modbus terminal port on the front of the drive.

Connection accessories

Description			N°	Sold in lots of	Unit reference	Weight kg
Modbus splitter box 10 RJ45 connectors and 1 screw terminal			1	–	**LU9 GC3**	0.500
Modbus T-junction boxes	With integrated 0.3 m cable		2	–	**VW3 A8 306 TF03**	–
	With integrated 1 m cable		2	–	**VW3 A8 306 TF10**	–
Modbus line terminator	For RJ45 connector	R = 120 Ω C = 1 nF	3	2	**VW3 A8 306 RC**	0.010
Remote mounting kit	For the VW3 A1 101 graphic display terminal		4	–	**VW3 A1 102**	0.150

Connecting cables
(equipped with 2 RJ45 connectors)

Used with	N°	Length m	Reference	Weight kg
For remote operation of the Altivar 71 and the VW3 A1 101 graphic display terminal	5	1	**VW3 A1 104 R10**	0.050
		3	**VW3 A1 104 R30**	0.150
		5	**VW3 A1 104 R50**	0.250
		10	**VW3 A1 104 R100**	0.500
Modbus bus	6	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130



PowerSuite software workshop

PowerSuite software workshop

The PowerSuite software workshop offers the following benefits:
- Messages can be displayed in plain text in several languages (English, French, German, Italian and Spanish)
- Work can be prepared in the design office without having to connect the drive to the PC
- Configurations and settings can be saved to floppy disk or hard disk and downloaded to the drive
- Print facility
- Altivar 58 or Altivar 58F files can be converted for transfer to an Altivar 71 drive
- Oscillograms can be displayed

See pages 176 to 179.

Dimensions:
page 98

Variable speed drives for asynchronous motors

Altivar 71

Options: encoder interface cards

Presentation

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VW3 A3 401

Encoder interface cards are used for Flux Vector Control operation with sensor (FVC mode) which improves drive performance irrespective of the state of the motor load:
- Zero speed torque
- Accurate speed regulation
- Torque accuracy
- Shorter response times on a torque surge
- Improved dynamic performance in transient state

In other control modes (voltage vector control, voltage/frequency ratio), the encoder interface card improves static speed accuracy.

Encoder interface cards can also be used for machine safety irrespective of the control type:
- Overspeed detection
- Load veering detection

Encoder interface cards can also transmit an Altivar 71 drive reference provided by the encoder input. This use is specific to synchronizing the speed of several drives.

Three types of card are available depending on the encoder technology:
- RS 422 compatible differential outputs
- open collector outputs (NPN)
- push-pull outputs

The card is inserted into a dedicated slot.

Characteristics

Encoder interface card with RS 422 compatible differential outputs

Type of card		**VW3 A3 401**		**VW3 A3 402**	
Power (supplied by the card)	Voltage	5 V ⎓ (min. 5 V, max. 5.5 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	200 mA		175 mA	
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$			
	Impedance	440 Ω			
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz			
Maximum consumption current of encoder		**100 mA** *(1)*	**200 mA** *(1)*	**100 mA** *(2)*	**200 mA** *(2)*
Minimum recommended cross-section of conductors *(3)*	For a maximum cable length of 25 m	0.2 mm^2 (AWG 24)	0.5 mm^2 (AWG 20)	0.2 mm^2 (AWG 24)	
	For a maximum cable length of 50 m	0.5 mm^2 (AWG 20)	0.75 mm^2 (AWG 18)	0.2 mm^2 (AWG 24)	
	For a maximum cable length of 100 m	0.75 mm^2 (AWG 18)	1.5 mm^2 (AWG 15)	0.2 mm^2 (AWG 24)	
	For a maximum cable length of 1,000 m	–		0.5 mm^2 (AWG 20)	1 mm^2 (AWG 17)

(1) Minimum encoder power supply 4.5 V.
(2) Minimum encoder power supply 8 V.
(3) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.

Schemes:
page 121

Variable speed drives for asynchronous motors

Altivar 71

Options: encoder interface cards

Characteristics (continued)

Encoder interface card with open collector outputs

Type of card		VW3 A3 403		VW3 A3 404	
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	175 mA			
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$			
	Impedance	1 kΩ			
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz			
Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*
Minimum recommended cross-section of conductors *(2)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)	
	For a maximum cable length of 1,000 m	–		0.75 mm² (AWG 18)	1.5 mm² (AWG 15)

Encoder interface card with push-pull outputs

Type of card		VW3 A3 405	VW3 A3 406		VW3 A3 407
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)	15 V ⎓ (min. 15 V, max. 16 V)		24 V ⎓ (min. 20 V, max. 30 V)
	Maximum current	175 mA			100 mA
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$			
	Impedance	1 kΩ			1.6 kΩ
	State 0	If <1.5 V			
	State 1	If > 7.7 V and < 13 V	If > 7.7 V and < 16 V		If > 11.5 V and < 25 V
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz			
Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(2)*
Minimum recommended cross-section of conductors *(3)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)		
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)		
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)		0.2 mm² (AWG 24)
	For a maximum cable length of 1,000 m	–		0.75 mm² (AWG 18)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)

References

Encoder interface cards *(4)*

Description	Voltage V	Reference	Weight kg
Encoder interface cards with RS 422 compatible differential outputs	5	**VW3 A3 401**	0.200
	15	**VW3 A3 402**	0.200
Encoder interface cards with open collector outputs	12	**VW3 A3 403**	0.200
	15	**VW3 A3 404**	0,200
Encoder interface cards with push-pull outputs	12	**VW3 A3 405**	0.200
	15	**VW3 A3 406**	0.200
	24	**VW3 A3 407**	0.200

(1) Minimum encoder power supply 10 V.
(2) Minimum encoder power supply 14 V.
(3) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.
(4) The Altivar 71 cannot support more than one encoder interface card. Please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 86 to 89.

Schemes:
page 121

Variable speed drives for asynchronous motors

Altivar 71

Options: I/O extension cards

Presentation

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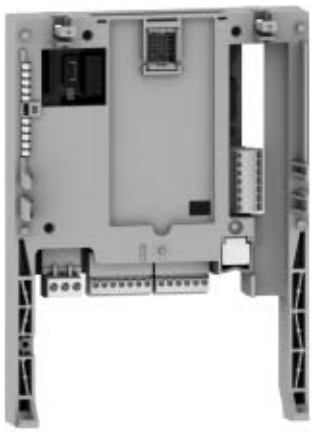


VW3 A3 202

Altivar 71 drives can be specially adapted to particular application areas by installing I/O extension cards.

Two models are available:

■ Card with logic I/O featuring:
- □ 1 relay logic output ("C/O" contact)
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes

■ Card with extended I/O featuring:
- □ 1 differential current analog input (0…20 mA)
- □ 1 software-configurable voltage (0…10 V ⎓) or current (0…20 mA) analog input
- □ 2 software-configurable voltage (± 10 V ⎓, 0…10 V) or current (0…20 mA) analog outputs
- □ 1 relay logic output
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes
- □ 1 frequency control input

Characteristics

Logic I/O card VW3 A3 201

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA for the complete drive and I/O extension card assembly ■ 1 x - 10.5 V ⎓ supply (± 5%) for the reference potentiometer (1 to 10 kΩ), max. current 10 mA
Configurable relay outputs	R3A, R3B, R3C	1 relay logic output, one "N/C" contact and one "N/O" contact with common point. Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 7 ms ± 0.5 ms
Logic inputs	LI7…LI10	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 2 ms ± 0.5 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO1, LO2	2 assignable open collector positive logic (Source) outputs, compatible with level 1 PLC, IEC 65A-68 standard 24 V ⎓ internal or 24 V ⎓ external power supply (min. 12 V, max. 30 V) Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 2 ms ± 0.5 ms. The active state is software-configurable as is a delay for each switching operation
Input for PTC probes	TH1+/TH1-	1 input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
Maximum I/O connection capacity and tightening torque		1.5 mm² (AWG 16) 0.25 Nm

Schemes:
page 120

Variable speed drives for asynchronous motors

Altivar 71

Options: I/O extension cards

Characteristics (continued)

Extended I/O card VW3 A3 202

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), max. current 200 mA for the complete drive and I/O extension card assembly ■ 1 x - 10.5 V ⎓ supply (± 5%) for the reference potentiometer (1 to 10 kΩ), max. current 10 mA
Analog inputs AI	AI3+/AI3-	1 X-Y mA differential current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits + 1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI4	1 software-configurable current or voltage analog input: ■ voltage analog input 0…10 V ⎓, impedance 30 kΩ (maximum safe voltage 24 V) ■ X-Y mA current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
Analog outputs	AO2, AO3	2 software-configurable current or voltage analog outputs: ■ voltage analog output ± 10 V ⎓, 0…10 V, minimum load impedance 470 Ω ■ X-Y mA current analog output by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value
Configurable relay outputs	R4A, R4B, R4C	1 relay logic output, one “N/C” contact and one “N/O” contact with common point. Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 10 ms ± 1 ms
Logic inputs	LI11…LI14	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 5 ms ± 1 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO3, LO4	2 x 24 V ⎓ assignable open collector positive logic (Source) or negative logic (Sink) outputs, compatible with level 1 PLC, IEC 65A-68 standard Maximum voltage: 30 V Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 5 ms ± 1 ms. The active state is software-configurable as is a delay for each switching operation
Input for PTC probes	TH2+/TH2-	1 input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
Frequency control input	RP	Frequency range: 0…30 kHz Cyclic ratio: 50 % ± 10 % Maximum sampling time: 5 ms ± 1 ms Maximum input voltage 30 V, 15 mA Add a resistor if the input voltage is greater than 5 V (510 Ω for 12 V, 910 Ω for 15 V, 1.3 kΩ for 24 V) State 0 if < 1.2 V, state 1 if > 3.5 V
Maximum I/O connection capacity and tightening torque		1.5 mm² (AWG 16) 0.25 Nm

References

I/O extension cards *(1)*

Description	Reference	Weight kg
Logic I/O card	**VW3 A3 201**	0.300
Extended I/O card	**VW3 A3 202**	0.300

(1) The Altivar 71 cannot support more than one I/O card with the same reference. Please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 86 to 89.

Schemes:
page 120

Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Presentation

The “Controller Inside” programmable card is used to adapt the variable speed drive to specific applications by integrating control system functions.

Various predefined configurable applications are sold by Telemecanique and its partners.
The PS 1131 software workshop for PC is used for programming and debugging new applications, quickly and in an open-ended manner (see page 35).
It is not possible to transfer the program from the card to the PC, which enables us to protect our know-how.

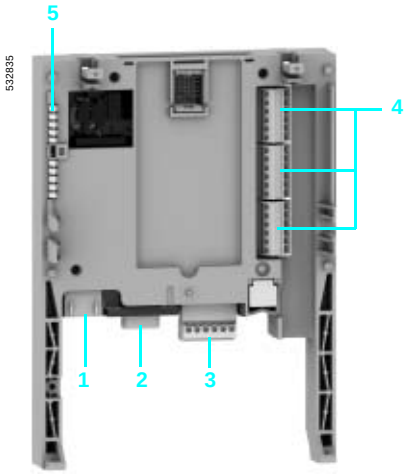
A single “Controller Inside” programmable card can be fitted in the Altivar 71 drive. It can be combined with another option card (I/O extension or communication). Consult the summary tables of possible drive, option and accessory combinations (see pages 86 to 89).

The “Controller Inside” programmable card has:
- 10 logic inputs, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders
- 2 analog inputs
- 6 logic outputs
- 2 analog outputs
- A master port for the CANopen bus
- A PC port for programming with the PS 1131 software workshop

If the power consumption table does not exceed 200 mA, this card can be powered by the drive. Otherwise, an external 24 V ⎓ power supply must be used.

The “Controller Inside” programmable card can also use:
- The drive I/O
- The I/O extension card I/O
- The encoder interface card points counter
- The drive parameters (speed, current, torque, etc)

Description



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1 RJ45 connector for connecting the PS 1131 software workshop via an RS 485 serial link.
Connection to the PC is via a cable and an RS 232/RS 485 converter included in the PowerSuite for PC connection kit, VW3 A8 106.

2 9-way male SUB-D connector for connection to the CANopen bus.

3 Connector with removable screw terminals, 6 contacts at intervals of 3.81 for the 24 V ⎓ power supply and 4 logic inputs.

4 3 connectors with removable screw terminals, 6 contacts at intervals of 3.81 for 6 logic inputs, 6 logic outputs, 2 analog inputs, 2 analog outputs and 2 commons.

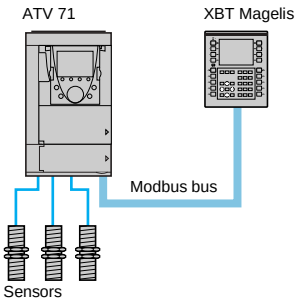
5 5 LEDs, comprising:
- 1 to indicate the presence of the 24 V ⎓ power supply
- 1 to indicate a program execution fault
- 2 to indicate the CANopen bus communication status
- 1 controlled by the application program

Characteristics: page 34 | Functions: pages 35 to 38 | References: page 39 | Schemes: page 121

Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card



Independent machine with multiwire system

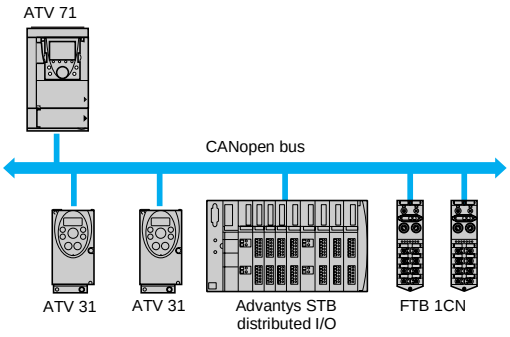
Dialogue

Human-machine dialogue with the application programmed in the “Controller Inside” programmable card is possible using:

- The Altivar 71 graphic display terminal
- A Magelis industrial HMI terminal connected to the drive Modbus port
- A Magelis industrial HMI terminal connected to the Ethernet TCP/IP network (if the drive is equipped with an Ethernet TCP/IP communication card)

A graphic terminal menu is dedicated to the “Controller Inside” programmable card. This menu can be customized by the card program according to the application.

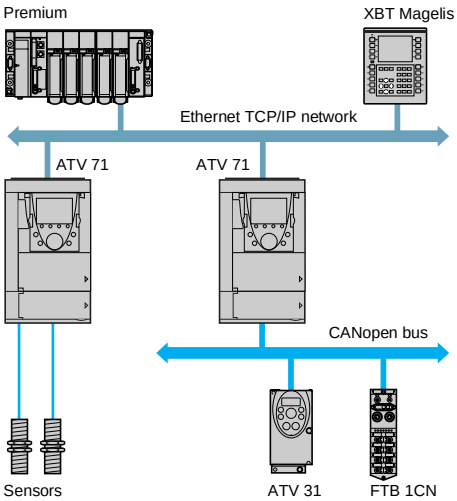
Any industrial HMI terminal which supports the Modbus protocol can be used to display and modify the “Controller Inside” programmable card parameters. The drive Modbus server provides access to 2 Kwords (% MW, etc) in the card.



Independent machine with CANopen bus

Master CANopen communication

The master CANopen port on the “Controller Inside” programmable card can be used to extend the I/O capacity and to control other CANopen slave devices.



Modular machine with Ethernet TCP/IP network

Communication with a PLC

The Altivar 71 drive equipped with a “Controller Inside” programmable card fits easily into complex architectures.
Regardless of which bus or network is being used (Ethernet TCP/IP, Modbus/Uni-Telway, Fipio, Modbus Plus, Profibus DP, INTERBUS, etc), the PLC can communicate with the “Controller Inside” programmable card and the drive. The periodic variables can still be configured as required.

Clock

A clock backed up by a lithium battery makes it possible to have a log of events that have occurred. When the “Controller Inside” programmable card is installed in the drive, the drive faults are automatically time and date-stamped without special programming.

Characteristics: page 34
Functions: pages 35 to 38
References: page 39
Schemes: page 121

Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Electrical characteristics

Power supply	Voltage	**V**	24 ⎓ (min. 19, max. 30)
Power consumption Current	Maximum	**A**	2
	No-load	**mA**	80
	Using logic output	**mA**	200 maximum *(1)*
Analog inputs	AI51, AI52		2 current differential analog inputs 0…20 mA, impedance 250 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Analog outputs	AO51, AO52		2 current analog outputs 0…20 mA, impedance 500 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Logic inputs	LI51…LI60		10 logic inputs, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders Impedance 4.4 kΩ Maximum voltage: 30 V ⎓ Switching thresholds: State 0 if ⩽ 5 V or logic input not wired State 1 if ⩾ 11 V Common point for all the card I/O *(2)*
Logic outputs	LO51…LO56		Six 24 V ⎓ logic outputs, positive logic open collector type (source), compatible with level 1 PLC, standard IEC 65A-68 Maximum switching voltage: 30 V Maximum current: 200 mA Common point for all the card I/O *(2)*
Connection of I/O	Type of contact		Screw, at intervals of 3.81 mm²
	Maximum capacity	**mm²**	1.5 (AWG 16)
	Tightening torque	**Nm**	0.25
Lithium battery	Life		8 years approx.

Characteristics of the application program

Compiled program (saved in “flash” memory)	Maximum size	**Kb**	320
Data	Maximum size	**Kwords**	64
	Saved size (NVRAM)	**Kwords**	4
	Size accessible by Modbus	**Kwords**	2

Characteristics of the CANopen communication port

Structure	Connector	One 9-way male SUB-D connector
	Network management	Master
	Transmission speed	Configurable via the program: 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps or 1 Mbps
	Address (Node ID)	32 slaves maximum
Services	CANopen application layer	DS 301 V4.02
	Profile	DSP 405
	PDO	9 receive and transmit PDOs in total for each slave
	SDO	2 client SDOs per slave (1 read and 1 write). Block transfer
	Error check	Node Guarding, producer and consumer Heartbeat
	Other services	Emergency, Boot-up, Sync
Diagnostics	Using LEDs	2 LEDs: “RUN” and “ ERROR”, conforming to CIA DR303 version 1.0

(1) If the power consumption table does not exceed 200 mA, this card can be powered by the drive. Otherwise, an external 24 V ⎓ power supply must be used.
(2) This common point is also the drive 0 V.

Presentation: page 32 | Functions: pages 35 to 38 | References: page 39 | Schemes: page 121

Variable speed drives for asynchronous motors
Altivar 71
Option: “Controller Inside” programmable card

PS 1131 software workshop

The PS 1131 software workshop conforms to international standard IEC 61131-3, and includes all the functions for programming and setting up the “Controller Inside” programmable card.
It includes the configurator for CANopen.
It is designed for Microsoft Windows® 98, Microsoft Windows® NT 4.0, Microsoft Windows® Millennium, Microsoft Windows® 2000 Professional and Microsoft Windows® XP operating systems.

It benefits from the user-friendly interface associated with these operating systems:
- Pop-up menus
- Function blocks
- Online help

The PS 1131 software workshop is available in both English and German.

The programming and debugging tools can be accessed via the application browser. This provides the user with an overview of the program and quick access to all the application components:
- Program editor
- Function blocks editor
- Variables editor
- Animation tables editor
- Runtime screens editor

Modular structured programming

The PS 1131 software workshop is used to structure an application into function modules consisting of sections (program code), animation tables and runtime screens. Each program section has a name and is programmed in one of the six available languages. To protect know-how or prevent any accidental modification, each section can be write-protected or read/write-protected.

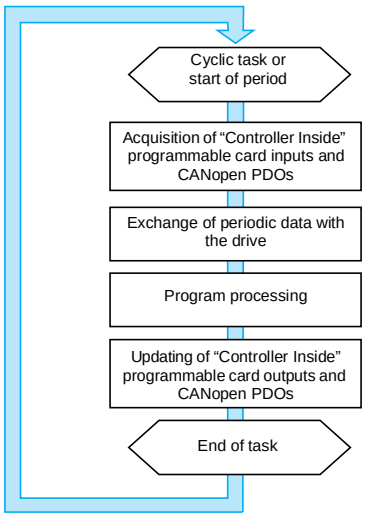
Exporting/importing function modules
It is possible to export all or part of the tree structure in function modules.

Program structure and execution of an application

The program structure is single-task. It consists of several subroutines.
Exchanges with the drive are performed by a function block available in the standard library.
Cycle execution can be either cyclic, or periodic. A software watchdog, which can be configured between 100 and 800 ms by the user, monitors the cycle time.
A task can be synchronized with the drive main task to improve repeat accuracy in motion control applications.

Cyclic execution
Once each cycle ends, execution of a new cycle begins. The cycle execution must last for at least 5 ms.

Periodic execution
The program is executed periodically, and the period can be set by the user between 5 and 100 ms. Cycle execution must last for less than the defined period. Drive response in the event of the cycle time being exceeded can be managed by the program.

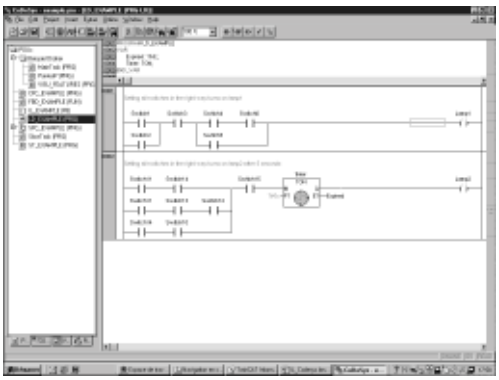


Example of cycle execution for the “Controller Inside” programmable card connected on a CANopen bus

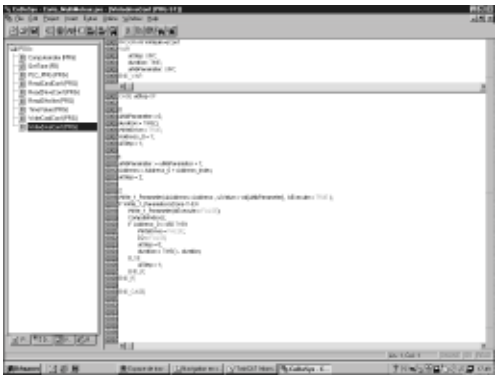
Variable speed drives for asynchronous motors

Altivar 71

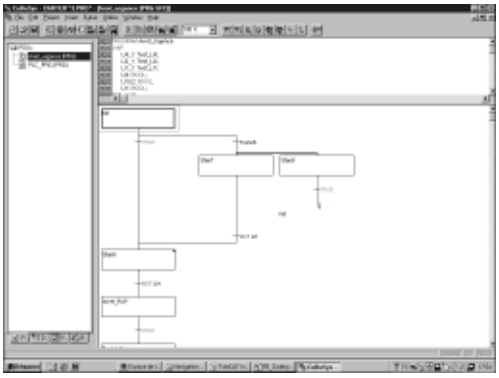
Option: “Controller Inside” programmable card



Example of Ladder language programming



Example of Structured Text language programming



Example of Grafcet language programming

Programming languages

6 programming languages are available:

- Ladder language (LD)
- Structured Text language (ST)
- Grafcet language (SFC)
- Instruction List language (IL)
- Function block diagram (FBD)
- Continuous Flow Chart (CFC)

Ladder Diagram (LD)

A Ladder language program consists of a set of rungs executed sequentially.
A rung consists of several lines.
A line consists of several contacts and a coil.
The language objects can be entered and displayed as symbols or tags as required.
The Ladder language editor enables the immediate call of entry help functions such as access to function libraries and access to the variables editor.

Structured Text (ST)

Structured Text language is a sophisticated algorithmic type language which is particularly well-suited to programming complex arithmetical functions, manipulating tables, message handling, etc.
Structured Text language enables direct transcription of an analysis based on a flow chart, and is organized in statements.

Grafcet language (SFC)

Grafcet language is used to describe the sequential part of the control system in a simple, graphic way. It corresponds to the “Sequential Function Chart” (SFC) language described in standard IEC 61131-3.
Programs written in Grafcet (SFC) language consist of:

- Macro-steps which are the grouping of a set of steps and transitions
- Steps with which the actions to be performed can be associated
- Transitions with which the conditions are associated (transition conditions)
- Directed links connecting the steps and transitions

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Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Example of Instruction List language programming

Example of a function block:
sending the speed reference to the drive.

Programming languages (continued)

Instruction List language (IL)

Instruction List language can be used to write Boolean equations and use all the functions available in the language. It can be used to represent the equivalent of a ladder diagram in text form.
Each instruction consists of an instruction code and a bit or word type operand.
As in Ladder language, instructions are organized in sequences of instructions called statements (equivalent to a rung).

Function block diagram (FBD)

FBD is a graphic language. It consists of function blocks connected by a rung. The program is executed sequentially.
Each block can be a logical or arithmetical expression, a call to another function block, a jump or a return instruction.

Continuous Flow Chart (CFC)

Continuous Flow Chart programming is a graphic language. The rung connecting the various function blocks on the page is not necessarily sequential. The output of a function block may be looped back on its input or on the input of a block already inserted in the rung.

Function blocks

The PS 1131 software workshop has pre-programmed function blocks (standard library) and offers users the option of creating their own function blocks (user library).

Standard library

The standard library contains:
- Logic functions (AND, OR, etc)
- Mathematical functions (Cos, Sin, Exp, etc)
- Function blocks dedicated to drives which simplify data exchanges between the drive and the “Controller Inside” programmable card (example: sending the speed reference)
- Function blocks for managing the CANopen bus
- Graphic terminal display function blocks

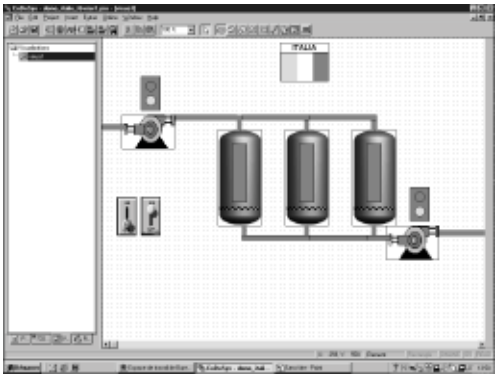
User library

Users have the option of creating their own function blocks in order to structure their applications. This is a means of protecting the know-how contained in the algorithms, as it is possible to lock access to the user function blocks program.

Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card



Example of runtime screen

Debugging

The PS 1131 software workshop offers a complete set of tools for debugging the application.

Program execution for debugging

The main debugging functions are:
- Use of breakpoints
- Step-by-step program execution
- Execution of a single cycle
- Direct access to the subroutines that have been called (call stack)

Realtime program animation

The main functions of realtime animation of the program are:
- Animation of part of the program in any language
- Automatic display of a variables window relating to this part of the program

Animation tables

Tables containing variables for the application to be monitored can be created and saved.

In both these tools, in addition to animating the data, it is possible to:
- Modify and force the value of data of any type
- Change the display format (binary, hexadecimal, etc)

Oscilloscope

The PS 1131 software workshop Oscilloscope function can be used to monitor up to 20 variables in the form of curves.

Runtime screens

A tool integrated in the PS 1131 software workshop can be used to design and use runtime screens for the application:
- Creation of screen backgrounds
- Animation of graphic objects associated with variables
- Display of messages
- Etc

Simulation

The PS 1131 software workshop Simulation function can be used to test the program without having to set up the drive.

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Variable speed drives for asynchronous motors
Altivar 71
Option: “Controller Inside” programmable card

References

Card

Description	Reference	Weight kg
“Controller Inside” programmable card *(1)* equipped with one 9-way male SUB-D connector	**VW3 A3 501**	0.320

Connection accessories

Description	Reference	Weight kg
CANopen connector *(2)* 9-way female SUB-D with line terminator that can be disabled	**VW3 CAN KCDF 180T**	–
Connection kit for PC serial port containing various accessories including: ■ 1 x 3 m cable with 2 RJ 45 connectors ■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and one RJ45 connector	**VW3 A8 106**	0.350

Cables

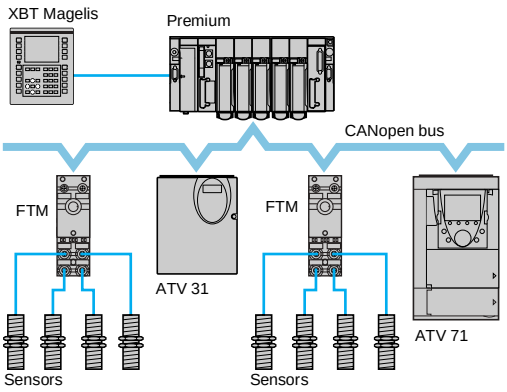
Description	Length m	Reference	Weight kg
CANopen cables EC/LSZH standard	50	**TSX CAN CA 50**	–
	100	**TSX CAN CA 100**	–
	300	**TSX CAN CA 300**	–
CANopen cables UL/C1 standard	50	**TSX CAN CB 50**	–
	100	**TSX CAN CB 100**	–
	300	**TSX CAN CB 300**	–
CANopen cable extra-flexible LSZH	100	**TSX CAN CC 100**	–
CANopen cables high chemical resistance	50	**TSX CAN CD 50**	–
	100	**TSX CAN CD 100**	–
	300	**TSX CAN CD 300**	–

PS 1131 software workshop

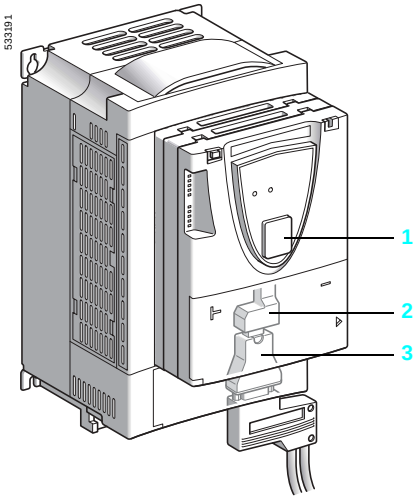
Description	Reference	Weight kg
PS 1131 software workshop supplied on CD-ROM	*(3)*	–

(1) The Altivar 71 drive can only take one “Controller Inside” programmable card. Consult the summary tables of possible drive, option and accessory combinations (see pages 86 to 60293/5).
(2) On drives ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X,ATV 71H075N4... HD18N4, this connector can be replaced by the TSX CAN KCDF 180T connector.
(3) The product reference is provided during the “Controller Inside” programmable card training course. Please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks



Example of configuration on the CANopen bus



Presentation

The Altivar 71 drive is designed to suit all configurations found in communicating industrial installations.

It includes Modbus and CANopen communication protocols as standard.

The Modbus protocol can be accessed directly by means of 2 integrated communication ports (for characteristics, see page 13):
- One RJ45 Modbus terminal port 1, located on the drive front panel, for connecting:
  - the remote graphic display terminal
  - a Magelis industrial HMI terminal
  - the PowerSuite software workshop
- One RJ45 Modbus network port 2, located on the drive control terminals. It is dedicated to control and signalling by a PLC or other type of controller.
It can also be used to connect a terminal or the PowerSuite software workshop.

The CANopen protocol can be accessed from the Modbus network port via the CANopen adaptor 3 (for characteristics, see page 13). In this case, terminal port 1 must be used to access the Modbus protocol.

The Altivar 71 drive can also be connected to other industrial communication buses and networks using one of the communication option cards:
- Ethernet TCP/IP
- Modbus/Uni-Telway. This card can offer functions in addition to those of the integrated ports: Modbus ASCII and 4-wire RS 485
- Fipio
- Modbus Plus
- Profibus DP
- DeviceNet
- INTERBUS

The option of powering the control part separately enables communication to be maintained (monitoring, diagnostics) even if there is no power supply to the power part.

The main Altivar 58 and Altivar 58F drive communication functions are compatible with the Altivar 71 drive *(1)*:
- Connection
- Communication services
- Drive behaviour (profile)
- Control and monitoring parameters
- Standard adjustment parameters

The PowerSuite software workshop can be used to port configurations from Altivar 58 and Altivar 58F drives to the Altivar 71 drive.

(1) Consult the ATV 58(F)/ATV 71 substitution guide supplied on the documentation CD-ROM.

Functions: page 41
Characteristics: pages 42 to 45
References: pages 46 and 47

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks

Functions

All the drive functions can be accessed via the network:
- Controlling
- Monitoring
- Adjustment
- Configuration

When the drive is equipped with the "Controller Inside" programmable card, its variables (% MW, etc.) can be accessed via the Modbus message handling services via the integrated communication ports or the Ethernet TCP/IP communication card.

The speed or torque command and reference may come from different control sources:
- I/O terminals
- Communication network
- “Controller Inside” programmable card
- Remote graphic display terminal

The advanced functions of the Altivar 71 drive can be used to manage switching of these drive control sources according to the application requirements.

It is possible to choose the assignment of the communication periodic variables using:
- The network configuration software (Sycon, etc)
- The Altivar 71 drive communication scanner function

Regardless of the type of network (except DeviceNet), the Altivar 71 drive can be controlled:
- According to the Drivecom profile (CANopen CiA DSP 402)
- According to the I/O profile where control is as simple and adaptable as control via the I/O terminals

The DeviceNet card supports the ODVA standard profile.

Communication is monitored according to criteria specific to each protocol. However, regardless of the protocol, it is possible to configure the drive reaction to a communication fault:
- Freewheel stop, stop on ramp, fast stop or braked stop
- Maintain the last command received
- Fallback position at a predefined speed
- Ignore the fault

A command from the CANopen bus is processed with the same priority as one of the drive terminal inputs. This results in excellent response times on the network port via the CANopen adaptor.

Presentation: page 40
Characteristics: pages 42 to 45
References: pages 46 and 47

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks

Characteristics of the VW3 A3 310 Ethernet TCP/IP card *(1)*

Structure	Connector	One RJ45 connector
	Transmission speed	10/100 Mbps, half duplex and full duplex
	IP addressing	■ Manual assignment via the display terminal or the PowerSuite software workshop ■ BOOTP (IP address dynamic server depending on the IEEE address) ■ DHCP (address dynamic server depending on the Device Name) with automatic reiteration
	Physical	Ethernet 2 (IEEE 802.3 is not supported)
	Link	LLC: IEEE 802.2 MAC: IEEE 802.3
	Network	IP (RFC791) ICMP client for supporting certain IP services such as the “ping” command
	Transport	TCP (RFC793), UDP The maximum number of connections is 8 (port 502)
Transparent Ready services	Class *(2)*	B20
	Web server	HTTP server: simultaneous connection of 8 Internet browsers possible Server factory-configured and modifiable The memory available for the application is approximately 1 Mb The factory-configured server contains the following pages: ■ Altivar viewer: displays the drive status and the state of its I/O, the main measurements (speed, current, etc) ■ Data editor: access to the drive parameters for configuration, adjustment and signalling ■ Altivar chart: simplified oscilloscope function ■ Security: configuration of passwords to access viewing and modification ■ FDR Agent: configuration of the “Faulty Device Replacement” parameters ■ IO Scanner: configuration of periodic variables for controlling and monitoring the drive via the PLC, etc ■ Ethernet statistics: drive identification (IP addresses, version, etc) from the Ethernet transmission statistics
	Messaging	Modbus/TCP: 8 simultaneous connections Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 63 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)
	Periodic variables	I/O scanning service (can be inhibited): ■ 10 control variables which can be assigned by the PowerSuite software workshop or the standard Web server ■ 10 monitoring variables which can be assigned by the PowerSuite software workshop or the standard Web server ■ PKW indexed periodic variable The Global Data service is not supported
	Network management	SNMP
	File transfer	FTP (for FDR and WEB server)
	FDR (Faulty Device Replacement)	Yes
	Communication monitoring	Can be inhibited Time out can be set between 0.5…60 s via the terminal, the PowerSuite software workshop or the standard Web server
Diagnostics	Using LEDs	5 LEDs on the card: “RX” (reception), “TX” (transmission), “FLT” (collision detection) “IP” (IP address) and “10/100” Mbps (speed)
	Using the graphic display terminal	Control word received Reference received Number of frames received Number of incorrect frames Periodic variables (communication scanner)

(1) For Ethernet TCP/IP network, see pages 180 to 185.
(2) Please consult our specialist “Ethernet TCP/IP Transparent Factory” catalogue.

Presentation: page 40 Functions: page 41 References: pages 46 and 47

Characteristics of the VW3 A3 303 Modbus/Uni-Telway card

Structure	Connector	One 9-way female SUB-D connector
	Physical interface	2-wire RS 485, 4-wire RS 485
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: ■ 4800 bps ■ 9600 bps ■ 19200 bps
	Polarization	Type of polarization can be configured by switches on the card: ■ No polarization impedances (supplied by the wiring system, for example, in the master) ■ Two 4.7 kΩ polarization resistors
	Selection of the protocol	Via the display terminal or the PowerSuite software workshop: ■ Modbus RTU ■ Modbus ASCII ■ Uni-Telway
	Address	1 to 247, configurable by switches on the card.
Service	Communication monitoring	Can be inhibited Time out can be set between 0.1…30 s via the terminal or the PowerSuite software workshop
Diagnostics	Using LEDs	2 LEDs on the card: “RUN” (status) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received
Characteristics of the Modbus protocol *(1)*		
Structure	Transmission mode	RTU, ASCII
	Format	Configurable via the display terminal or the PowerSuite software workshop: In RTU mode only: ■ 8 bits, odd parity, 1 stop ■ 8 bits, no parity, 1 stop ■ 8 bits, even parity, 1 stop ■ 8 bits, no parity, 2 stop In RTU and ASCII modes: ■ 7 bits, even parity, 1 stop ■ 7 bits, odd parity, 1 stop ■ 7 bits, even parity, 2 stop ■ 7 bits, odd parity, 2 stop
Service	Messaging	Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 60 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)
Characteristics of the Uni-Telway protocol *(2)*		
Structure	Format	8 bits, odd parity, 1 stop
Service	Messaging	Read word (04h) Write word (14h) Read object (36h), 63 words maximum Write object (37h), 60 words maximum Identification (0Fh) Protocol version (30h) Mirror (FAh) Read error counters (A2h) Reset counters (A4h)

(1) For the Modbus bus, see pages 190 to 193.
(2) For the Uni-Telway bus, see pages 198 and 199.

Characteristics of the VW3 A3 311 and VW3 A3 301 Fipio cards (1)

Type of card		Standard Fipio card VW3 A3 311	Substitution Fipio card VW3 A3 301
Structure	Connector	One 9-way male SUB-D connector	
	Transmission speed	1 Mbps	
	Address	1 to 62, configurable by switches on the card	
	Adjustment using PLC software (Unity, PL7)	No	Yes (limited to ATV 58 or ATV 58F compatibility parameters)
	Profile	FED C 32	Specific to the Altivar 58 or ATV 58F drive (FSD C 8P)
Services	Periodic variables	8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)	5 control variables 8 monitoring variables
	Communication monitoring	Can be inhibited Fixed time out: 256 ms	
Diagnostics	Using LEDs	4 LEDs on the card: “RUN” (status), “ERROR” (fault), “COM” (data exchange) and “I/O” (initialization)	
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)	

Characteristics of the VW3 A3 302 Modbus Plus card (2)

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 64, configurable by switches on the card
Services	Messaging	Yes (Modbus)
	Periodic variables	“Peer Cop”: 8 control variables which can be assigned by communication scanner “Global data”: 8 monitoring variables which can be assigned by communication scanner
	Communication monitoring	Can be inhibited Time out can be set between 0.1…60 s via the terminal or the PowerSuite software workshop.
Diagnostics	Using LEDs	1 LED on the card: “MB+” (status)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)

(1) For the Fipio bus, see pages 186 to 189.
(2) For the Modbus Plus network, see pages 194 to 197.

Characteristics of the Profibus DP card VW3 A3 307

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	9600 bps, 19.2 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps or 12 Mbps
	Address	1 to 126, configurable by switches on the card
Services	Periodic variables	PPO type 5 8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)
	Communication monitoring	Can be inhibited Time out can be set via the Profibus DP network configurator
Diagnostics	Using LEDs	2 LEDs on the card: “ST” (status) and “DX” (data exchange)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)
Description file		A single gsd file supplied on the documentation CD-ROM for the whole range. It does not contain the description of the drive parameters

Characteristics of the VW3 A3 309 DeviceNet card

Structure	Connector	One removable screw connector, 5 contacts at intervals of 5.08
	Transmission speed	125 Kbps, 250 Kbps or 500 Kbps, configurable by switches on the card
	Address	1 to 63, configurable by switches on the card
Services	Periodic variables	ODVA assemblies type 20, 21, 70 and 71 Allen-Bradley® assemblies type 103, 104 and 105 Communication scanner assemblies 100 and 101
	Periodic exchange mode	Inputs: Polled, Change of state, Cyclic Outputs: Polled
	Auto Device Replacement	No
	Communication monitoring	Can be inhibited Time out can be set via the DeviceNet network configurator
Diagnostics	Using LEDs	One two-tone LED on the card: “MNS” (status)
	Using the graphic display terminal	Control word received Reference received
Description file		A single eds file supplied on the documentation CD-ROM for the whole range. It contains the description of the drive parameters

Characteristics of the VW3 A3 304 INTERBUS card

Structure	Connector	2 connectors: One 9-way male SUB-D and one 9-way female SUB-D
	Power supply	The card is powered by the drive. To ensure that the INTERBUS subscriber continues to operate during line supply failures to the power part, fit a separate power supply for the drive control part.
	Drivecom profile	21
Services	Messaging	PCP: ■ Read: read a parameter ■ Write: write a parameter ■ Initiate: initialize the communication relationship ■ Abort: abort the communication relationship ■ Status: drive communication status ■ Get-OV: read an object description ■ Identify: identification of the card
	Periodic variables	2 control variables which can be assigned by communication scanner 2 monitoring variables which can be assigned by communication scanner
	Communication monitoring	Can be inhibited Fixed time out: 640 ms
Diagnostics	Using LEDs	5 LEDs on the card: “U” (power supply), “RC” (bus input), “Rd” (bus output), “BA” (periodic data) and “TR” (messaging)
	Using the graphic display terminal	Control word received Reference received

Presentation: page 40
Functions: page 41
References: pages 46 and 47

Variable speed drives for asynchronous motors

Altivar 71

Communication buses and networks

533192

VW3 A3 311

533193

TSX FP ACC12

533194

490 NAD 911 03

Communication cards *(1)*

Description	Use	Reference	Weight kg
Ethernet Class B20 *(2)*	To be connected on a Hub or Switch using a 490 NTW 000 ●● cable. See pages 184 and 185	**VW3 A3 310**	0.300
Modbus/ Uni-Telway	To be connected on TSX SCA 62 subscriber socket using the VW3 A8 306 2 cable. See pages 191 and 199	**VW3 A3 303**	0.300
Standard Fipio	To be connected using a TSX FP ACC 12 connector with a TSX FP CC●● extension cable or a TSX FP CA●● drop cable. This card should be used for new installations. It is also used to replace an ATV 58 or ATV 58F drive equipped with a VW3 A58 311 card by an ATV 71 drive. To replace an ATV 58 or ATV 58F drive equipped with a VW3 58 301 card by an ATV 71 drive, use the VW3 A3 301 card (substitution). See pages 188 and 189	**VW3 A3 311**	0.300
Substitution Fipio	This card is also used to replace an ATV 58 or ATV 58F equipped with a VW3 A58 301 card by an ATV 71. To replace an ATV 58 or ATV 58F drive equipped with a VW3 A58 311 card by an ATV 71 drive, use the VW3 A3 311 card (standard). See pages 188 and 189	**VW3 A3 301**	0.300
Modbus Plus	To be connected to the 990 NAD 230 00 IP 20 Modbus Plus tap using a 990 NAD 219●0 cable. See pages 196 and 197	**VW3 A3 302**	0.300
Profibus DP	To be connected using a 490 NAD 911●● connector to Profibus cable TSX PBS CA●00 *(3)*	**VW3 A3 307**	0.300
DeviceNet	The card is equipped with removable screw terminals.	**VW3 A3 309**	0.300
INTERBUS	To be connected using cables for installation remote bus, reference 170 MCI ●●●00 *(3)*	**VW3 A3 304**	0.300

(1) The Altivar 71 drive can only take one communication card. Consult the summary tables of possible drive, option and accessory combinations (see pages 86 to 89).
(2) Please consult our specialist "Ethernet TCP/IP Transparent Factory" catalogue.
(3) Please consult our specialist "Modicon Premium Automation Platform - Unity & PL7" catalogue.

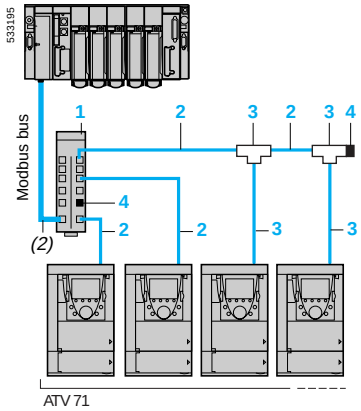
Presentation: page 40 Functions: page 41 Characteristics: pages 42 to 45

Variable speed drives for asynchronous motors

Altivar 71

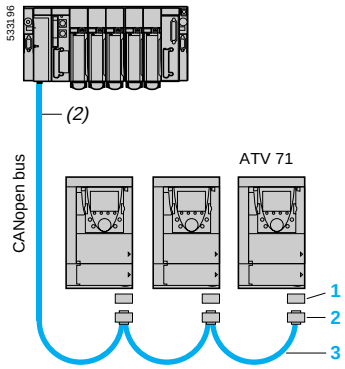
Communication buses and networks

Premium *(1)*



Example of Modbus diagram, connections via splitter blocks and RJ45 connectors

Premium *(1)*



Example of CANopen diagram

VW3 CAN A71

Connection accessories

Description	N°	Length m	Unit reference	Weight kg
Modbus bus				
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block	1	–	**LU9 GC3**	0.500
Cables for Modbus bus equipped with 2 RJ45 connectors	2	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130
Modbus T-junction boxes (with integrated cable)	3	0.3	**VW3 A8 306 TF03**	–
		1	**VW3 A8 306 TF10**	–
Line terminator For RJ45 connector *(3)*	4	–	**VW3 A8 306 RC**	0.010

Description	N°	Length m	Reference	Weight kg
CANopen bus				
CANopen adaptor for mounting on the RJ45 socket in the drive control terminals. The adaptor provides a 9-way male SUB-D connector conforming to the CANopen standard (CIA DRP 303-1).	1	–	**VW3 CAN A71**	–
CANopen connector *(4)* 9-way female SUB-D with line contactor (can be disabled). 180° cable outlet CAN-H, CAN-L, CAN-GND connection	2	–	**VW3 CAN KCDF 180T**	–
CANopen cables *(1)* Standard environments, fixed installation, LSZH (Low Smoke, Zero Halogen)	3	50	**TSX CAN CA 50**	–
		100	**TSX CAN CA 100**	–
		300	**TSX CAN CA 300**	–
CANopen cables *(1)* Standard environments, fixed installation, UL certification, flame retardant (IEC 60332-2)	3	50	**TSX CAN CB 50**	–
		100	**TSX CAN CB 100**	–
		300	**TSX CAN CB 300**	–
CANopen cables *(1)* Harsh environments, mobile installation, LSZH (Low Smoke, Zero Halogen), resistant to chemicals and solder splashes	3	50	**TSX CAN CD 50**	–
		100	**TSX CAN CD 100**	–
		300	**TSX CAN CD 300**	–

(1) Please consult our specialist "Modicon Premium Automation Platform - Unity & PL7" and "Modicon TSX Micro Automation Platform - PL7" catalogues.
(2) Cable depending on the type of controller or PLC.
(3) Sold in lots of 2.
(4) On drives ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X,ATV 71H075N4… HD18N4, this connector can be replaced by the TSX CAN KCDF 180T connector.

Variable speed drives for asynchronous motors

Altivar 71

Options: resistance braking units

Presentation

ATV 71H●●●M3, ATV 71H●●●M3X and ATV 71H075N4…HC16N4 drives have a built-in dynamic brake transistor.

For ATV 71HC20N4…HC50N4 drives, a braking unit must be used. It is controlled by the drive:

■ For ATV 71HC20N4…HC28N4 drives, the braking unit is mounted directly on the left-hand side of the drive, see dimensions page 91.

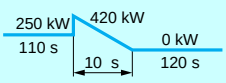
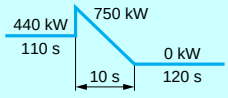
■ For ATV 71HC40N4, HC50N4 drives, the braking unit is an external module, see dimensions page 98.

Resistance braking enables the Altivar 71 drive to operate while braking to a standstill or during "generator" operation, by dissipating the energy in the braking resistor.

Applications

High-inertia machines, machines with cycles and fast cycles, high-power machines performing vertical movements.

Characteristics

Type of braking unit			VW3 A7 101	VW3 A7 102
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50	
	Storage	**°C**	- 25…+ 70	
Degree of protection of enclosure			IP 20	
Degree of pollution			2 according to standard EN 50178	
Relative humidity			Class 3K3 without condensation	
Maximum operating altitude		**m**	2000	
Vibration resistance			0.2 gn	
Nominal line supply voltage and drive supply voltage (rms value)		**V**	∿ 380 - 15%…480 + 10%	
Engage threshold		**V**	⎓ 785 ± 1%	
Maximum DC bus voltage		**V**	850	
Maximum braking power on 400 V ∿ supply	785 V ⎓ *(1)*	**kW**	420	750
Percentage of conduction time at constant power at 785 V ⎓			5% at 420 kW	5% at 750 kW
			15% at 320 kW	15% at 550 kW
			50% at 250 kW	50% at 440 kW
Cycle time		**s**	≤ 240	
Maximum continuous power		**kW**	200	400
Braking power on a vertical movement (values given for a cycle time of 240 s)				
Thermal protection			Integrated, via thermal probe	
Forced ventilation		**m³/h**	100	600
Mounting			Vertical	
Minimum resistance value to be associated with the braking unit		Ω	1.05	0.7

(1) Braking unit engage threshold

References: page 49 | Selection: pages 54 to 59 | Dimensions: pages 91 to 98 | Schemes: pages 118 and 124

Variable speed drives for asynchronous motors

Altivar 71

Options: resistance braking units

Braking units

Supply voltage: 380…480 V 50/60 Hz

For drives	Power		Loss	Cable (drive-braking unit)		Cable (braking unit-resistors)		Reference	Weight
	Continuous	Max.	Continuous power	Cross-section	Max. length	Cross-section	Max. length		
	kW	kW	W	mm^2	m	mm^2	m		kg
ATV 71HC20N4… HC28N4	200	420	550	– Internal connections	–	2 x 95	50	**VW3 A7 101**	30.000
ATV 71HC31N4… HC50N4	400	750	750	2 x 150	1	2 x 150	50	**VW3 A7 102**	80.000

Note: *To increase the braking power, several resistors can be mounted in parallel on the same braking unit. In this case, do not forget to take account of the minimum resistance value on each unit.*

Variable speed drives for asynchronous motors

Altivar 71

Options: braking resistors

Presentation

The braking resistor enables the Altivar 71 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed in any way.
The air must be free of dust, corrosive gas and condensation.

Applications

Inertia machines, machines with cycles.

General characteristics

Type of braking resistor			VW3 A7 701…709	VW3 A7 710…718
Ambient air temperature around the device	Operation	**°C**	0…+ 50	
	Storage	**°C**	- 25…+ 70	
Degree of protection of enclosure			IP 20	IP 23
Thermal protection			Via temperature controlled switch or via the drive	Via thermal overload relay
Temperature controlled switch *(1)*	Tripping temperature	**°C**	120	–
	Max. voltage - max. current		∿ 250 V - 1 A	–
	Min. voltage - min. current		⎓ 24 V - 0.1 A	–
	Maximum contact resistance	**mΩ**	60	–
Operating factor for the dynamic brake transistors			The internal circuits of Altivar 71 drives rated 160 kW or less have a built-in dynamic brake transistor.	
	ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H075N4…HD75N4		The dynamic brake transistor is sized so that it can tolerate: ■ the nominal motor power continuously ■ 150% of the nominal motor power for 60 s	
	ATV 71HD90N4…HC16N4		The dynamic brake transistor is sized so that it can tolerate: ■ 75% of the nominal motor power continuously ■ 150% of the nominal motor power for 10 s	

Connection characteristics

Type of terminal		Drive connection	Temperature-controlled switch
Maximum connection capacity	VW3 A7 701…703	4 mm² (AWG 28)	1.5 mm² (AWG 16)
	VW3 A7 704…709	Bar connection, M6	2.5 mm² (AWG 14)
	VW3 A7 710…718	Bar connection, M10	–

Minimum ohmic value of the resistors to be associated with the Altivar 71 drive, at 20°C *(2)*

Type of drive	ATV 71H	037M3, 075M3	U15M3	U22M3, U30M3	U40M3	U55M3	U75M3
Minimum value	Ω	44	33	22	16	11	8

Type of drive	ATV 71H	D11M3X, D15M3X	D18M3X	D22M3X, D30M3X	D37M3X… D55M3X	D75M3X
Minimum value	Ω	3	4	3.3	1.7	1.3

Type of drive	ATV 71H	075N4… U22N4	U30N4, U40N4	U55N4	U75N4	D11N4	D15N4, D18N4	D22N4, D30N4
Minimum value	Ω	56	34	23	19	12	7	13.3

Type of drive	ATV 71H	D37N4	D45N4, D55N4	D75N4	D90N4	C11N4… C16N4	C20N4… C28N4	C31N4… C50N4
Minimum value	Ω	6.7	5	3.3	2.5	1.9	0.95	0.63

(1) The switch should be connected in the sequence (for use in signalling, or in line contactor control).
(2) In an environment where the temperature is below 20°C, make sure that the minimum ohmic value recommended in the table is observed.

References: page 51 | Selection: pages 54 to 59 | Dimensions: pages 99 and 100 | Schemes: page 118

Variable speed drives for asynchronous motors

Altivar 71

Options: braking resistors

Braking resistors

For drives	Ohmic value at 20°C	Average power available at 50°C *(1)*	Reference	Weight
	Ω	kW		kg
Supply voltage: 200…240 V 50/60 Hz				
ATV 71H037M3, H075M3	100	0.05	**VW3 A7 701**	1.900
ATV 71HU15M3, HU22M3	60	0.1	**VW3 A7 702**	2.400
ATV 71HU30M3, HU40M3	28	0.2	**VW3 A7 703**	3.500
ATV 71HU55M3, HU75M3	15	1	**VW3 A7 704**	11.000
ATV 71HD11M3X	10	1	**VW3 A7 705**	11.000
ATV 71HD15M3X	8	1	**VW3 A7 706**	11.000
ATV 71HD18M3X, HD22M3X	5	1	**VW3 A7 707**	11.000
ATV 71HD30M3X	4	1	**VW3 A7 708**	11.000
ATV 71HD37M3X, HD45M3X	2.5	1	**VW3 A7 709**	11.000
ATV 71HD55M3X	1.8	15.3	**VW3 A7 713**	50.000
ATV 71HD75M3X	1.4	20.9	**VW3 A7 714**	63.000
Supply voltage: 380…480 V 50/60 Hz				
ATV 71H075N4…HU40N4	100	0.05	**VW3 A7 701**	1.900
ATV 71HU55N4, HU75N4	60	0.1	**VW3 A7 702**	2.400
ATV 71HD11N4, HD15N4	28	0.2	**VW3 A7 703**	3.500
ATV 71HD18N4…HD30N4	15	1	**VW3 A7 704**	11.000
ATV 71HD37N4	10	1	**VW3 A7 705**	11.000
ATV 71HD45N4…HD75N4	5	1	**VW3 A7 707**	11.000
ATV 71HD90N4	2.75	25	**VW3 A7 710**	80.000
ATV 71HC11N4, HC13N4	2.1	37	**VW3 A7 711**	86.000
ATV 71HC16N4	2.1	44	**VW3 A7 712**	104.000
ATV 71HC20N4	1.05	56	**VW3 A7 715**	136.000
ATV 71HC25N4, HC28N4	1.05	75	**VW3 A7 716**	172.000
ATV 71HC31N4, HC40N4	0.7	112	**VW3 A7 717**	266.000
ATV 71HC50N4	0.7	150	**VW3 A7 718**	350.000

(1) Operating factor for resistors: The value of the average power that can be dissipated at 50°C from the resistor into the casing is determined for an operating factor during braking that corresponds to the majority of normal applications.
For VW3 A7 701…709:
- 2 s braking with 0.6 Tn braking torque for a 40 s cycle
- 0.8 s braking with 1.5 Tn braking torque for a 40 s cycle
For VW3 A7 710…718:
- 10 s braking with 2 Tn braking torque for a 30 s cycle

Variable speed drives for asynchronous motors

Altivar 71

Options: hoist resistors

Presentation

The hoist resistor is a braking resistor which enables the Altivar 71 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed in any way. The air must be free of dust, corrosive gas and condensation.
They enable maximum transient braking torque.

Applications

Machines performing vertical movements, machines with fast cycles, high-inertia machines.

General characteristics

Type of hoist resistor			VW3 A7 801	VW3 A7 802…A7 808	VW3 A7 809…A7 817
Ambient air temperature around the device	Operation	**°C**	0…+ 50		
	Storage	**°C**	- 25…+ 75		- 25…+ 65
Degree of protection of enclosure			IP 23 if horizontal mounting IP 20 in other cases	IP 23	
Thermal protection			Via thermal overload relay		
Operating factor for the dynamic brake transistors			The internal circuits of Altivar 71 drives rated 160 kW or less have a built-in dynamic brake transistor.		
	ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H075N4…HD75N4		The dynamic brake transistor is sized so that it can tolerate: ■ the nominal motor power continuously ■ 150% of the nominal motor power for 60 s		
	ATV 71HD90N4…HC50N4 *(1)*		The dynamic brake transistor is sized so that it can operate on a 240 s cycle at: ■ 88% of the nominal motor power for 50% of the cycle time ■ 150% of the nominal motor power for 5% of the cycle		

Connection characteristics

Maximum connection capacity	VW3 A7 801		Bar connection, M6	
	VW3 A7 802…817		Bar connection, M10	

Minimum ohmic value of the resistors to be associated with the Altivar 71 drive, at 20°C *(2)*

Type of drive	**ATV 71H**							
Minimum value	Ω	44	33	22	16	11	8	
Type of drive	**ATV 71H**	**D11M3X, D15M3X**	**D18M3X**	**D22M3X, D30M3X**	**D37M3X… D55M3X**	**D75M3X**		
Minimum value	Ω	3	4	3.3	1.7	1.3		
Type of drive	**ATV 71H**	**075N4… U22N4**	**U30N4, U40N4**	**U55N4**	**U75N4**	**D11N4**	**D15N4, D18N4**	**D22N4, D30N4**
Minimum value	Ω	56	34	23	19	12	7	13.3
Type of drive	**ATV 71H**	**D37N4**	**D45N4, D55N4**	**D75N4**	**D90N4**	**C11N4… C16N4**	**C20N4… C28N4**	**C31N4… C50N4**
Minimum value	Ω	6.7	5	3.3	2.5	1.9	0.95	0.63

(1) For ATV 71HC20N4…HC50N4 drives, a braking unit must be used, see page 48.
(2) In an environment where the temperature is below 20°C, make sure that the minimum ohmic value recommended in the table is observed.

References: page 53 | Selection: pages 54 to 59 | Dimensions: page 101 | Schemes: page 118

Variable speed drives for asynchronous motors

Altivar 71

Options: hoist resistors

Hoist resistors

For drives	Ohmic value at 20°C	Average power available at 50°C *(1)*	Reference	Weight
	Ω	kW		kg
Supply voltage: 200…240 V 50/60 Hz				
ATV 71H037M3, H075M3	100	1.6	**VW3 A7 801**	6.000
ATV 71HU15M3	60	5.6	**VW3 A7 802**	21.000
ATV 71HU22M3…HU40M3	24.5	9.8	**VW3 A7 803**	28.000
ATV 71HU55M3, HU75M3	14	22.4	**VW3 A7 804**	54.000
ATV 71HD11M3X, HD15M3X	8.1	44	**VW3 A7 805**	92.000
ATV 71HD18M3X	4.2	62	**VW3 A7 806**	126.000
ATV 71HD22M3X, HD30M3X	3.5	19.5	**VW3 A7 807**	51.000
ATV 71HD37M3X, HD45M3X	1.85	27.4	**VW3 A7 808**	94.000
ATV 71HD55M3X	1.8	30.6	**VW3 A7 809**	103.000
ATV 71HD75M3X	1.4	44	**VW3 A7 810**	119.000
Supply voltage: 380…480 V 50/60 Hz				
ATV 71H075N4…HU22N4	100	1.6	**VW3 A7 801**	6.000
ATV 71HU30N4…HU55N4	60	5.6	**VW3 A7 802**	21.000
ATV 71HU75N4, HD11N4	24.5	9.8	**VW3 A7 803**	28.000
ATV 71HD15N4…HD30N4	14	22.4	**VW3 A7 804**	54.000
ATV 71HD37N4…HD55N4	8.1	44	**VW3 A7 805**	92.000
ATV 71HD75N4	4.2	62	**VW3 A7 806**	126.000
ATV 71HD90N4	2.75	56	**VW3 A7 811**	130.000
ATV 71HC11N4, HC13N4	2.1	75	**VW3 A7 812**	181.000
ATV 71HC16N4	2.1	112	**VW3 A7 813**	250.000
ATV 71HC20N4	1.05	112	**VW3 A7 814**	280.000
ATV 71HC25N4, HC28N4	1.05	150	**VW3 A7 815**	362.000
ATV 71HC31N4, HC40N4	0.7	225	**VW3 A7 816**	543.000
ATV 71HC50N4	0.7	330	**VW3 A7 817**	642.000

(1) Operating factor for hoist resistors: the value of the average power that can be dissipated at 50°C from the resistor is determined by an operating factor during braking.
For VW3 A7 801…808:
- 100 s braking with 1 Tn braking torque for a 200 s cycle
- 20 s braking with 1.6 Tn braking torque for a 200 s cycle
For VW3 A7 809…817:
- 110 s braking with 1.25 Tn braking torque for a 240 s cycle
- 10 s braking with 2 Tn braking torque for a 240 s cycle

Variable speed drives for asynchronous motors
Altivar 71
Options: braking units and resistors

Determining the braking unit and resistor

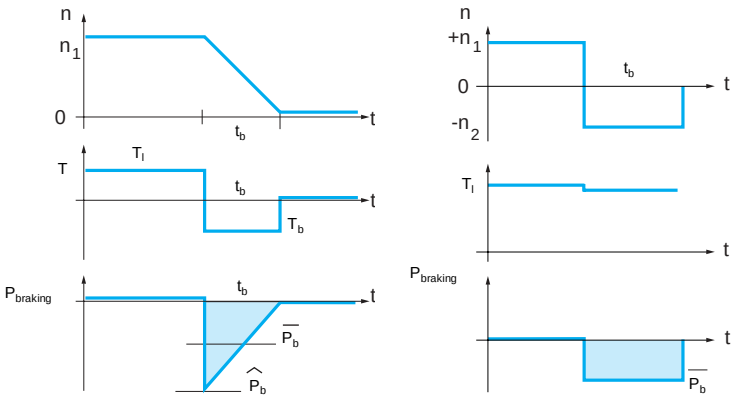
Calculating the various braking powers makes it possible to determine the braking unit and the braking resistor.

Presentation of the two main types of operation: A and B

A The braking power during deceleration is characterized by a peak power P_b obtained at the start of deceleration, which decreases to 0 in proportion with the speed.
Example: Stopping centrifuges, translational movement, change of direction, etc

B Braking power at constant speed n_2.
Example: Vertical downward movement, motor/generator test bench, gravity conveyors, etc.

n_1	Motor speed	[rpm]
n_2	Motor speed during deceleration	[rpm]
T_l	Load torque	[Nm]
T_b	Braking torque	[Nm]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during t_b	[W]
t_b	Braking time	[s]



Note: Both these types of operation can be combined.

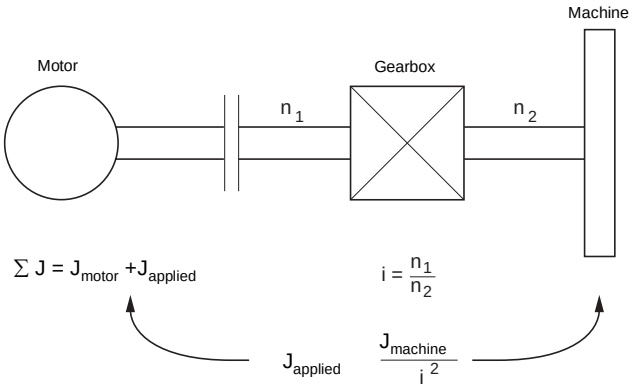
Type A operation

Calculating the braking time from the inertia

$$t_b = \frac{J \cdot \omega}{T_b + T_r} \qquad \omega = \frac{2\pi \cdot n}{60} \qquad T_b = \frac{\Sigma J \cdot (n_1 - n_2)}{9{,}55 \cdot t_b}$$

$$\hat{P}_b = \frac{T_b \cdot n_1}{9{,}55} \qquad \bar{P}_b = \frac{\hat{P}_b}{2}$$

T_b	Motor braking torque	[Nm]
ΣJ	Total inertia applied to the motor	[kgm^2]
n_1	Motor speed ahead of gearbox	[rpm]
n_2	Motor speed after gearbox	[rpm]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during time t_b	[W]
T_r	Resistive torque	[Nm]



Variable speed drives for asynchronous motors

Altivar 71

Options: braking units and resistors

Operating type B

1 Braking power of a load moving horizontally with constant deceleration (eg.: carriage)

W	Kinetic energy	[Joule]
m	Weight	[kg]
v	Speed	[m/s]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during time t_b	[W]
T_b	Braking torque	[Nm]
n	Motor speed	[rpm]

$$W = \frac{m \cdot v^2}{2} \qquad \bar{P}_b = \frac{W}{t_b} \qquad \hat{P}_b = \bar{P}_b \cdot 2$$

2 Braking power for an active load (eg.: test bench)

$$\bar{P}_b = \frac{T_b \cdot n}{9{,}55}$$

g	Acceleration	9.81 m/s²
a	Deceleration	[m/s²]
v	Linear downward speed	[m/s]
J	Moment of inertia	[kgms²]
ω	Angular speed	[rad/s]
t_b	Downward stopping time	[s]

3 Braking power for a downward vertical movement

$$\bar{P}_b = m \cdot g \cdot v \qquad \hat{P}_b = m \cdot (g + a) \cdot v + \frac{J \cdot \omega^2}{t_b} \qquad \omega = \frac{2\pi \cdot n}{60}$$

All the braking power calculations are only true if it is assumed that there are no losses (η = 1) and that there is no resistive torque.
To be even more precise, the following must be considered:
- the losses and the resistive torque of the system, which reduce the necessary braking power
- the driving torque (the wind, for example) which increases the braking power.

The required braking power is calculated as follows:

$\hat{P}_{bR}$	Maximum actual braking power	[W]
$\bar{P}_{bR}$	Continuous actual braking power	[W]
η_{total}	Total efficiency	
P_{load}	Braking power connected with the resistive or driving torque (not taken into account in the calculation). P_{load} can be positive or negative.	[W]
η_{drive}	Drive efficiency = 0.98	
η_{mec}	Mechanical efficiency	
η_{mot}	Motor efficiency	

$$\hat{P}_{bR} = (\hat{P}_b - P_{load}) \times \eta^2 total \qquad \bar{P}_{bR} = (\bar{P}_b - P_{load}) \times \eta^2 total$$

$$\eta_{total} = \eta_{mec} \times \eta_{mot} \times 0{,}98$$

For braking, the value of the braking resistor is selected to match the required power and the braking cycle.

U_{dc}	Braking unit engage threshold	[V]

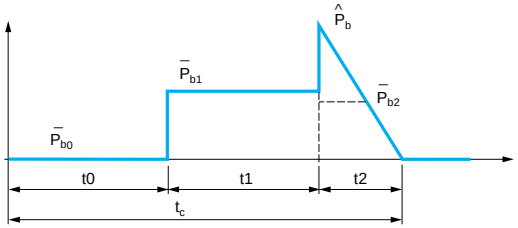
In general:

$$\hat{P}_{bR} = \frac{U^2 dc}{R} \Rightarrow R = \frac{U^2 dc}{\hat{P}_{bR}}$$

T	Cycle time	[s]
$\bar{P}_{b0}$	Upward braking power, therefore zero	[W]
t_0	Rise time	[s]
$\bar{P}_{b1}$	Average braking power during downward movement	[W]
t_1	Downward movement time	[1]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_{b2}$	Average power during braking to a standstill	[W]
t_2	Standstill braking time	[s]

$$P_{continuous} = \frac{\bar{P}_{b0} \times t_0 + \bar{P}_{b1} \times t_1 + \bar{P}_{b2} \times t_2}{T} \quad [W]$$

Continuous power is obtained by taking the operating cycle into account.



The braking unit is selected taking the following into account:
- the continuous power $\bar{P}_{b1}$
- the average braking power during downward movement $\bar{P}_{b2}$
- the peak power $\hat{P}_b$

Depending on these elements, select the braking unit according to the characteristics on page 48.
The braking resistor is selected taking account of the same elements listed above but with the addition of a check to ensure that the resistance value will allow the peak power to be exceeded $\left(R = \frac{U^2 dc}{\hat{P}_b}\right)$.

Note: The resistance value must always be greater than or equal to the values given in the tables on pages 50 and 52.

Variable speed drives for asynchronous motors

Altivar 71

Characteristics curves for resistors

Example of using characteristics curves

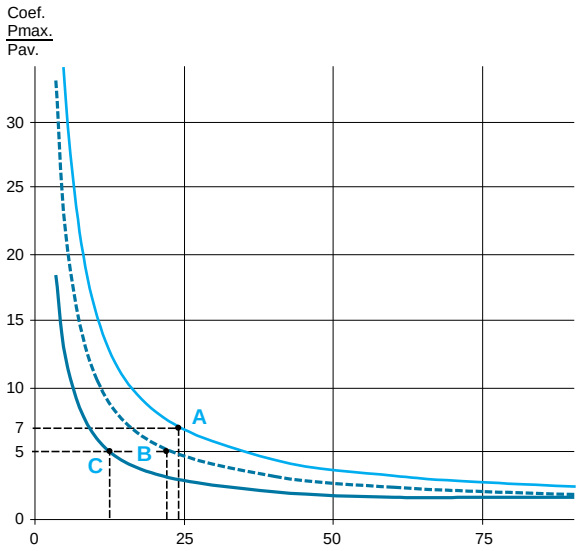
VW3 A7 710 (P continuous = 25 kW) for 2.75 Ω at 20°C

Example of using curves:

Point A For a 200 s cycle, the resistance of 2.75 Ω accepts an overload of 7 x 25 kW (continuous power) for 24 s, ie. braking 175 kW every 200 s.

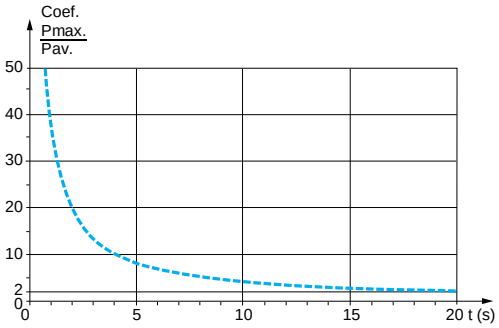
Point B For a 120 s cycle, the resistance of 2.75 Ω accepts an overload of 5 x 25 kW (continuous power) for 20 s, ie. braking 125 kW every 120 s.

Point C For a 60 s cycle, the resistance of 2.75 Ω accepts an overload of 5 x 25 kW (continuous power) for 10 s, ie. braking 125 kW every 60 s.

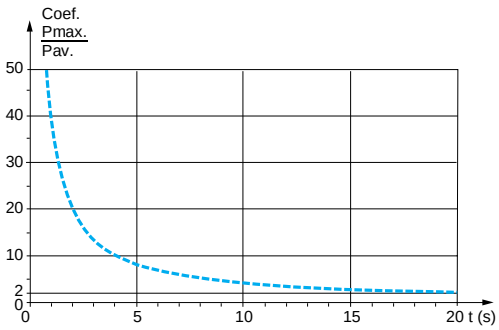


Braking resistors

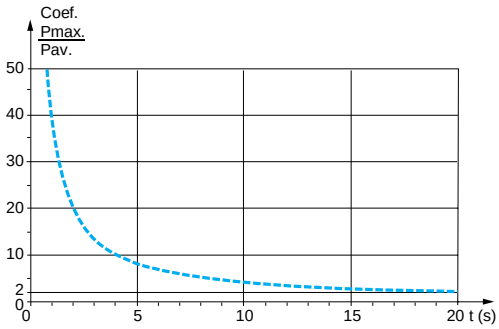
VW3 A7 701 (P continuous = 0.05 kW)



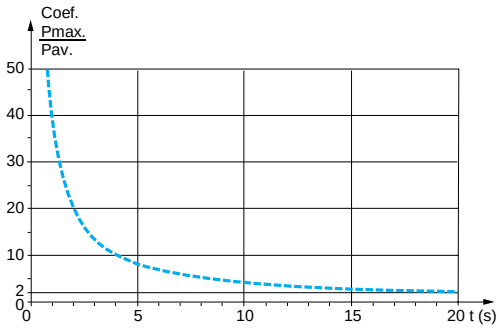
VW3 A7 702 (P continuous = 0.1 kW)



VW3 A7 703 (P continuous = 0.2 kW)



VW3 A7 704…709 (P continuous = 1 kW)



P max/P av (40 s cycle)
P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

Presentation: page 52 | Characteristics: page 52 | References: page 51 | Dimensions: pages 99 and 100 | Schemes: page 118

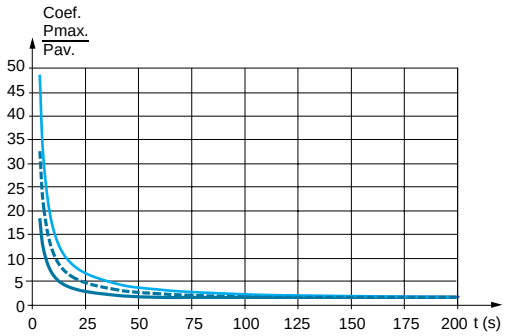
Variable speed drives for asynchronous motors

Altivar 71

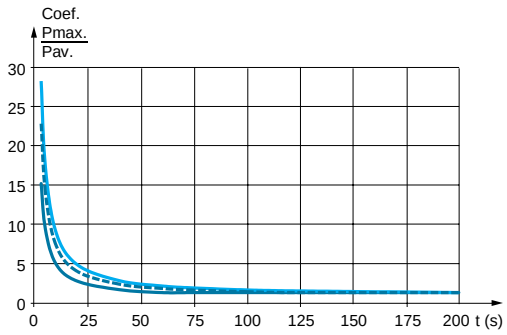
Characteristics curves for resistors

Braking resistors (continued)

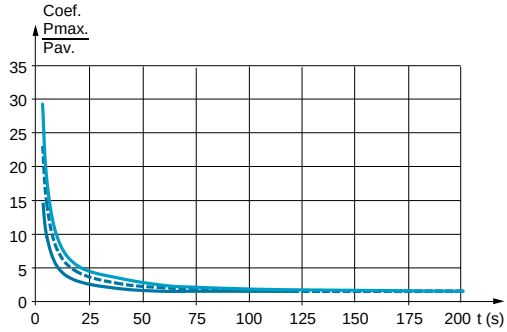
VW3 A7 710 (P continuous = 25 kW)



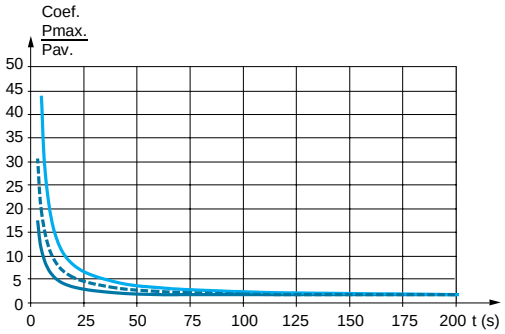
VW3 A7 711 (P continuous = 37 kW)



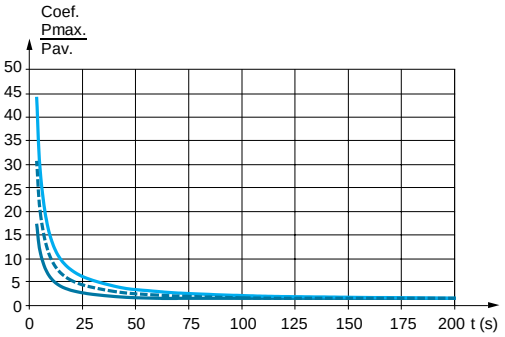
VW3 A7 712 (P continuous = 44 kW)



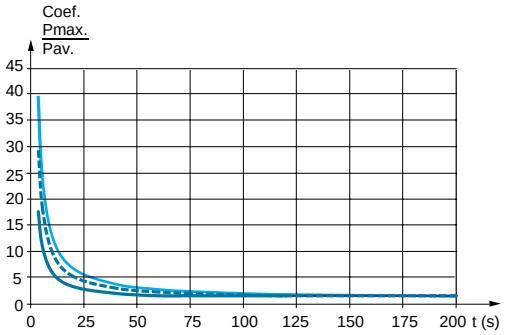
VW3 A7 713 (P continuous = 15.3 kW)



VW3 A7 714 (P continuous = 20.9 kW)



VW3 A7 715 (P continuous = 56 kW)



P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

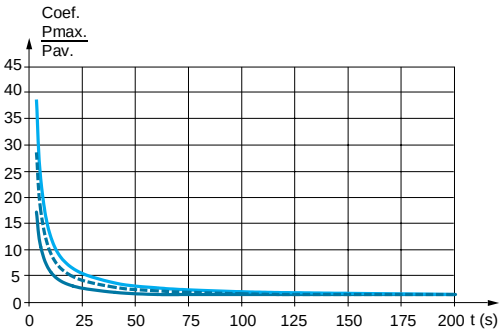
Variable speed drives for asynchronous motors

Altivar 71

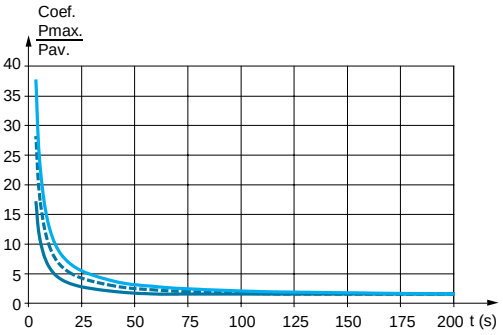
Characteristics curves for resistors

Braking resistors (continued)

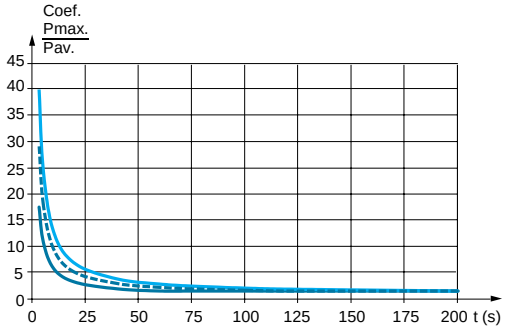
VW3 A7 716 (P continuous = 75 kW)



VW3 A7 717 (P continuous = 112 kW)



VW3 A7 718 (P continuous = 150 kW)



P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

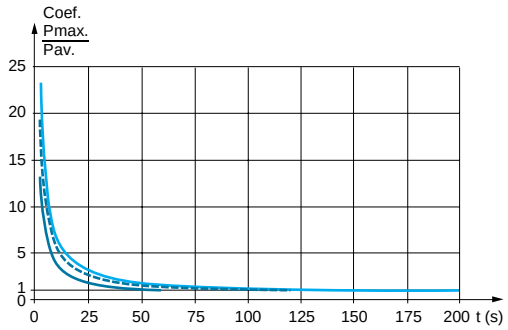
Variable speed drives for asynchronous motors

Altivar 71

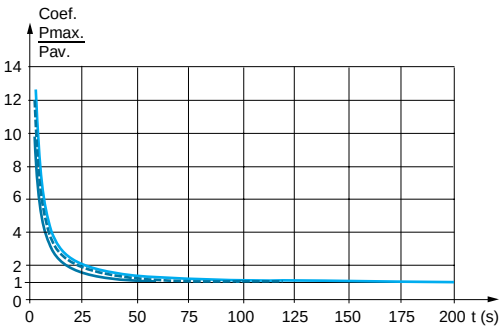
Characteristics curves for resistors

Hoist resistors

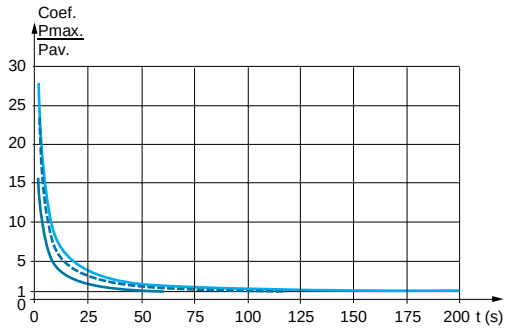
VW3 A7 801 (P continuous = 1.6 kW)



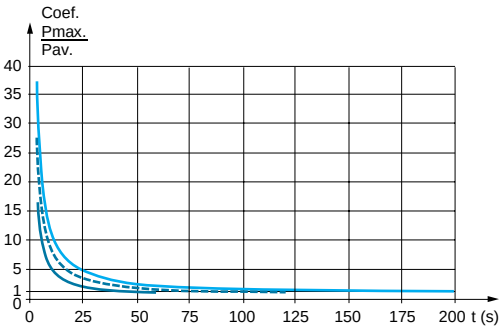
VW3 A7 802 (P continuous = 5.6 kW)



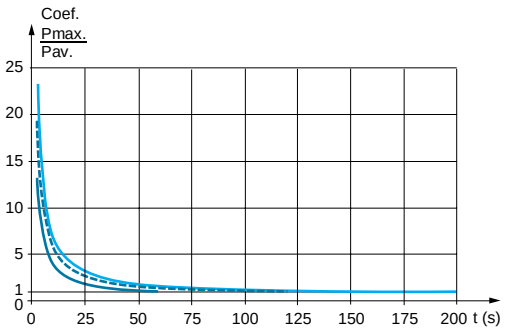
VW3 A7 803 (P continuous = 9.8 kW)



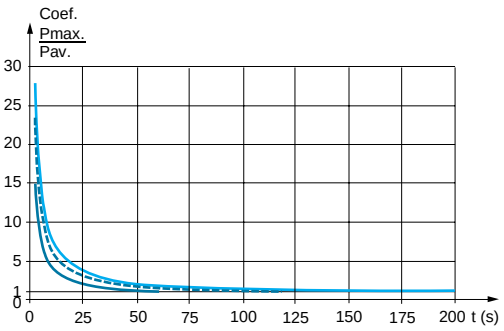
VW3 A7 804 (P continuous = 22.4 kW)



VW3 A7 805 (P continuous = 44 kW)



VW3 A7 806 (P continuous = 62 kW)



P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

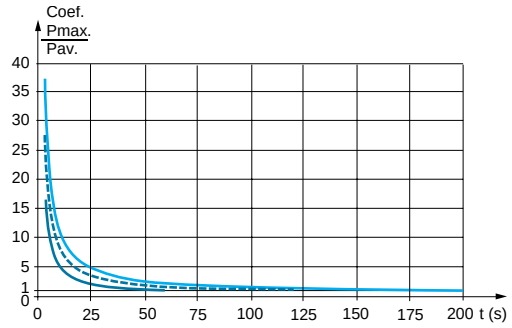
Variable speed drives for asynchronous motors

Altivar 71

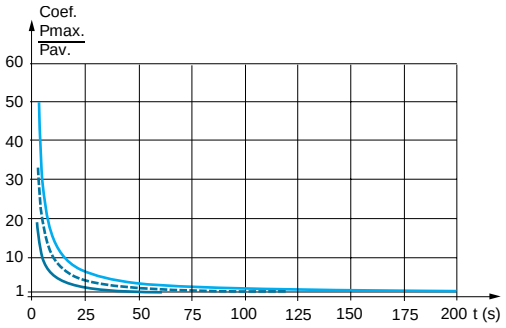
Characteristics curves for resistors

Hoist resistors (continued)

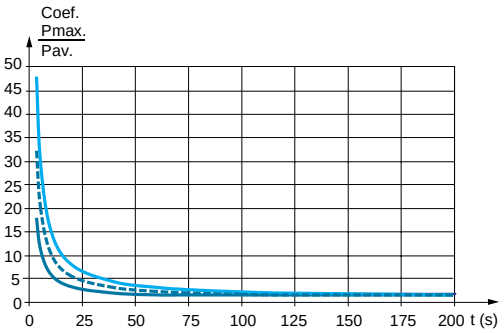
VW3 A7 807 (P continuous = 19.5 kW)



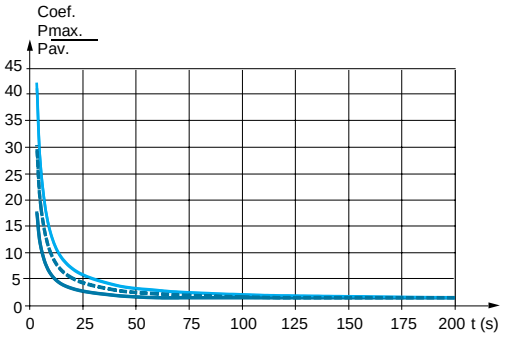
VW3 A7 808 (P continuous = 27.4 kW)



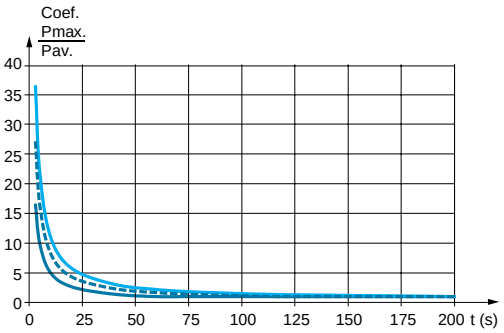
VW3 A7 809 (P continuous = 30.6 kW)



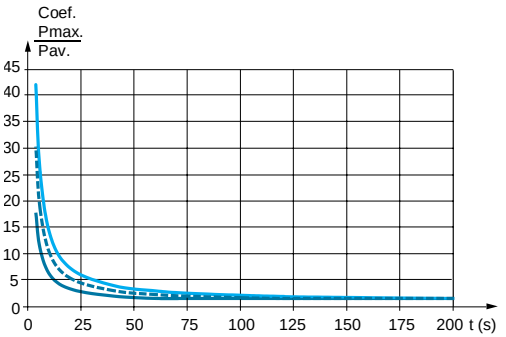
VW3 A7 810 (P continuous = 44 kW)



VW3 A7 811 (P continuous = 56 kW)



VW3 A7 812 (P continuous = 75 kW)



P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

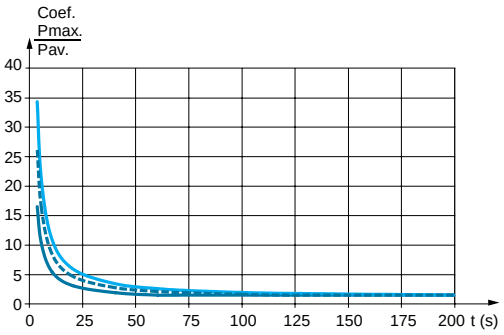
Variable speed drives for asynchronous motors

Altivar 71

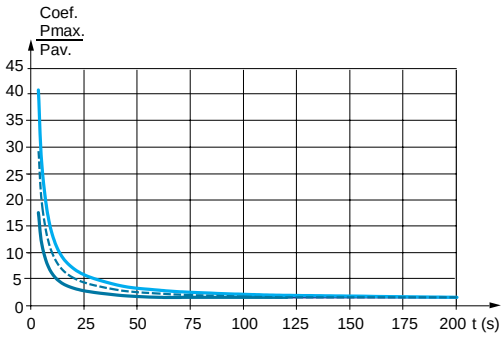
Characteristics curves for resistors

Hoist resistors (continued)

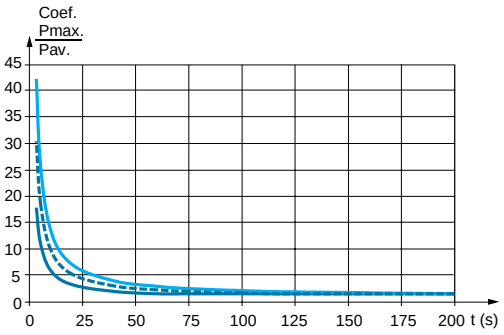
VW3 A7 813 (P continuous = 112 kW)



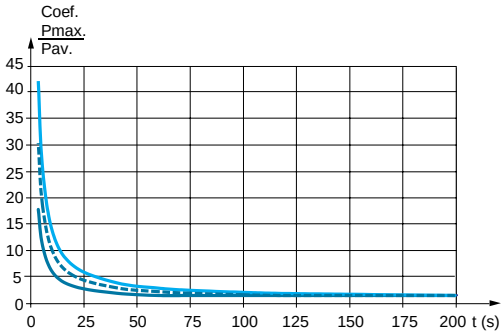
VW3 A7 814 (P continuous = 112 kW)



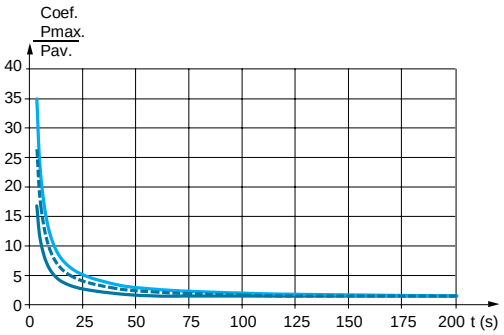
VW3 A7 815 (P continuous = 150 kW)



VW3 A7 816 (P continuous = 225 kW)



VW3 A7 817 (P continuous = 330 kW)



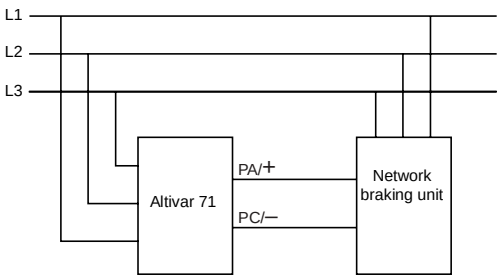
P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

Variable speed drives for asynchronous motors

Altivar 71

Options: network braking units

Presentation



The network braking unit can be used to restore the following to the line supply:
- the energy from the motor
- the energy from the motors controlled by several drives connected on the same DC bus

Applications

Braking on a driving load:
- vertical movements
- escalators
- etc

General characteristics

Degree of protection			IP 20
Maximum relative humidity			Class F humidity without condensation 5…85%
Ambient air temperature around the device	Operation	**°C**	5…+ 40 without derating Up to 55°C with current derating of 3% per °C above 40°C
	Storage	**°C**	- 25…+ 55
Maximum operating altitude		**m**	1000 without derating 1000…4000 derating the current by 5% per additional 1000 m

Electrical characteristics

Type of module		**VW3 A7 201…212**	**VW3 A7 231…241**
Supply voltage	**V**	∿ 400	∿ 460
Nominal voltage ± 10%	**V**	∿ 380…415	∿ 440…480
Operating frequency	**Hz**	40…60 ± 10 %	
Overload capacity	**A**	1.2 x maximum current (Irms)	
Efficiency		97% (3% of thermal losses)	
Power factor		1	
Fundamental frequency component		0.7…0.95	

Connection characteristics

Maximum connection capacity	VW3 A7 201		25 mm², connected on a bar, M5
	VW3 A7 202…205, VW3 A7 231, 232		35 mm², connected on a bar, M6
	VW3 A7 206…209, VW3 A7 233…238		95 mm², connected on a bar, M8
	VW3 A7 210…212, VW3 A7 239…241		150 mm², connected on a bar, M10

References: page 63 | Selection: pages 64 and 65 | Dimensions: pages 102 and 103 | Schemes: page 123

Variable speed drives for asynchronous motors

Altivar 71

Options: network braking units

Line voltage: ∿ 400 V

Maximum current Irms ∿	Maximum current Irms ⎓	Continuous braking power	CL fuses ∿	CL fuses ∿	Reference	Weight
A	A	kW	A	V		kg
11	13	7	20	660	**VW3 A7 201**	20.000
20	24	13	30	690	**VW3 A7 202**	25.000
32	38	11	50	690	**VW3 A7 203**	26.000
48	58	21.5	80	690	**VW3 A7 204**	30.000
65	78	26	100	690	**VW3 A7 205**	32.000
102	123	32	160	660	**VW3 A7 206**	43.000
130	157	38	200	660	**VW3 A7 207**	48.000
195	236	38	315	660	**VW3 A7 208**	52.000
231	279	86	350	660	**VW3 A7 209**	90.000
289	350	120	400	1000	**VW3 A7 210**	100.000
360	433	135	500	1000	**VW3 A7 211**	115.000
500	600	200	630	1000	**VW3 A7 212**	125.000

Line voltage: ∿ 460 V

Maximum current Irms ∿	Maximum current Irms ⎓	Continuous braking power	CL fuses ∿	CL fuses ∿	Reference	Weight
A	A	kW	A	V		kg
28	33	–	50	690	**VW3 A7 231**	26.000
41	50	21.5	80	690	**VW3 A7 232**	30.000
57	69	26	100	690	**VW3 A7 233**	36.000
88	107	32	160	660	**VW3 A7 234**	43.000
113	137	38	200	660	**VW3 A7 235**	48.000
138	166	38	250	660	**VW3 A7 236**	48.000
157	189	38	250	660	**VW3 A7 237**	50.000
176	212	38	315	660	**VW3 A7 238**	90.000
201	243	86	315	660	**VW3 A7 239**	100.000
289	346	120	500	1000	**VW3 A7 240**	105.000
500	600	240	630	1000	**VW3 A7 241**	125.000

Presentation: page 62
Selection: pages 64 and 65
Dimensions: pages 102 and 103
Schemes: page 123

Variable speed drives for asynchronous motors
Altivar 71
Characteristic curves

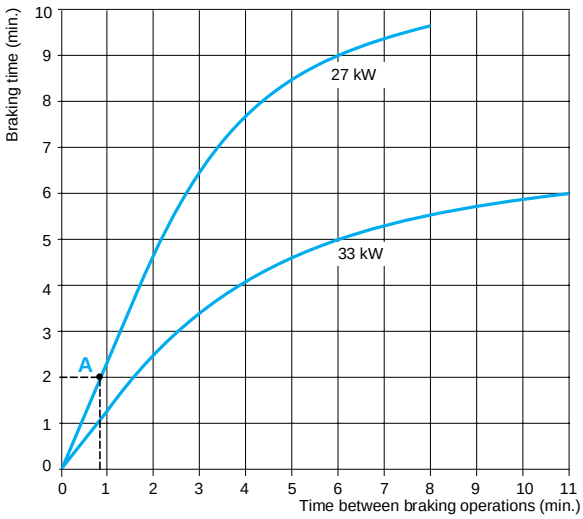
Example of how to use characteristic curves

VW3 A7 204, A7 232 (Continuous braking power = 21.5 kW) *(1)*

Example of how to use the curves:

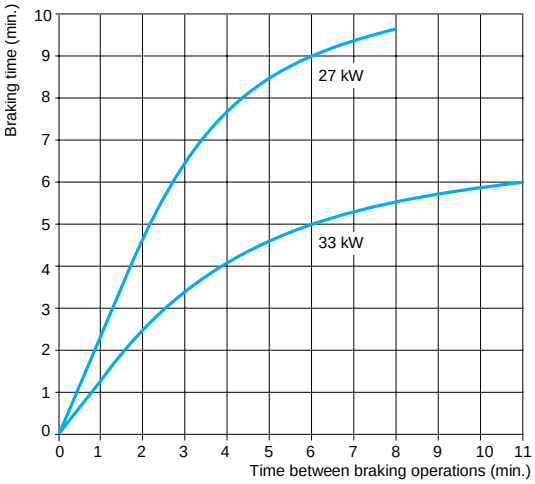
Required braking power of 27 kW.
The intersection point between the braking time and the time between 2 braking operations must be on or below the relevant curve.

*Point **A** For a braking time of 2 minutes, there must be at least 50 seconds between 2 braking operations.*

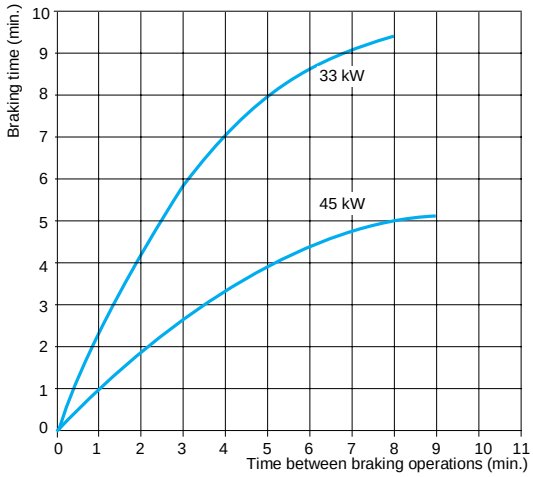


Network braking units

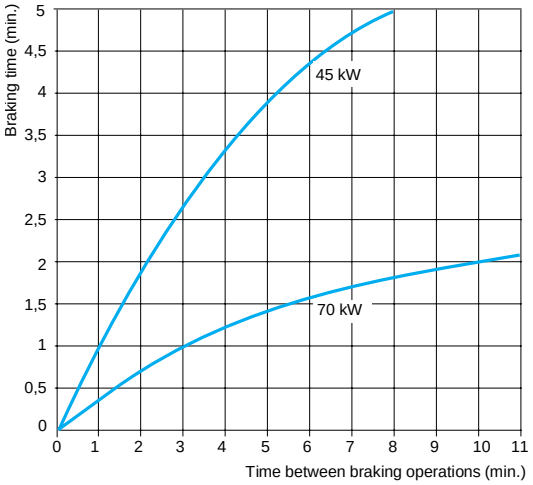
VW3 A7 204, A7 232 (Continuous braking power = 21.5 kW) *(1)*



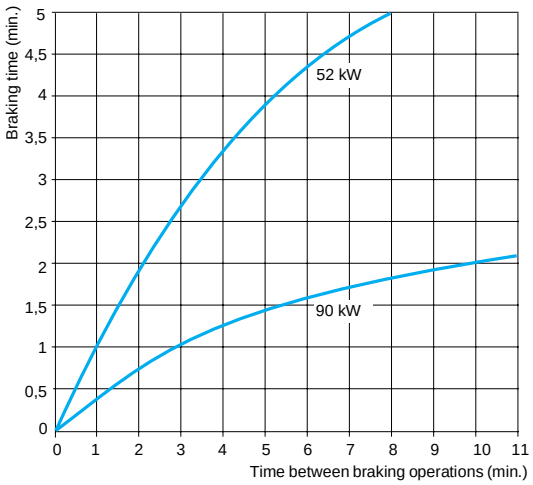
VW3 A7 205, A7 233 (Continuous braking power = 26 kW) *(1)*



VW3 A7 206, A7 234 (Continuous braking power = 32 kW) *(1)*



VW3 A7 207, A7 235 (Continuous braking power = 38 kW) *(1)*



(1) Power indicated for a temperature of 35°C.

Presentation: page 62
References: page 63
Dimensions: pages 102 and 103
Schemes: page 123

Variable speed drives for asynchronous motors

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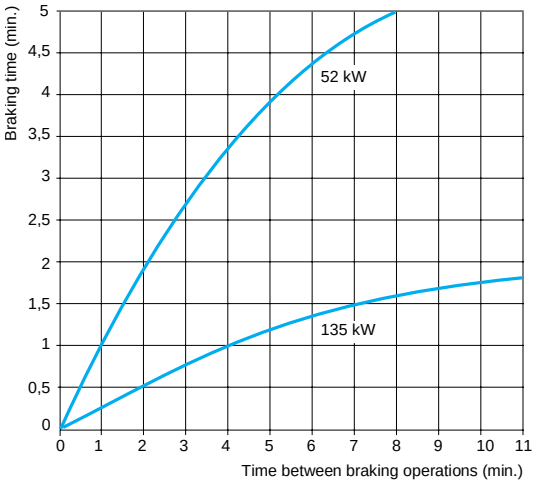
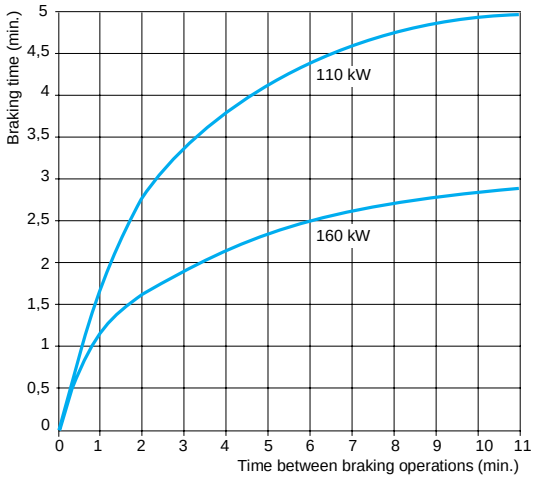
Characteristic curves

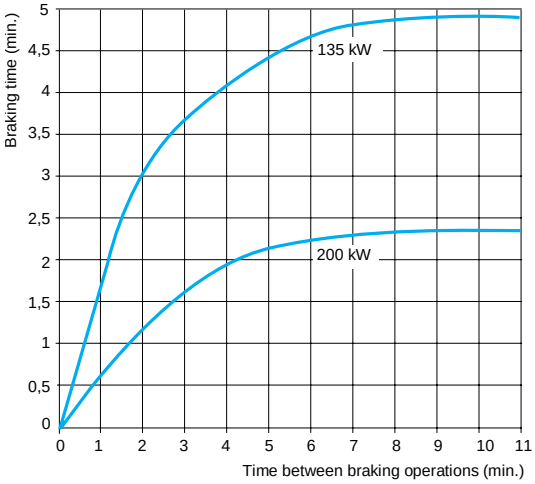
VW3 A7 208 (Continuous braking power = 38 kW) *(1)*



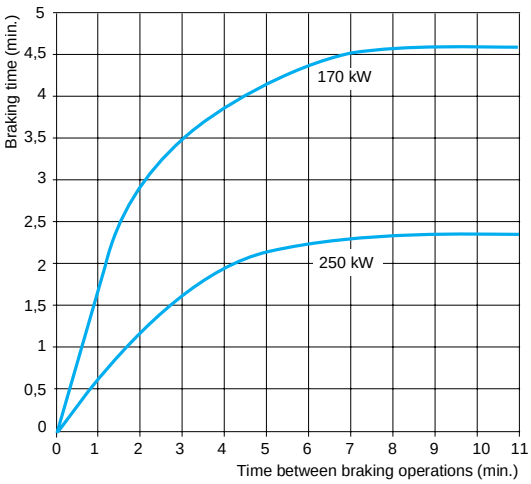
VW3 A7 209, A7 239 (Continuous braking power = 86 kW) *(1)*



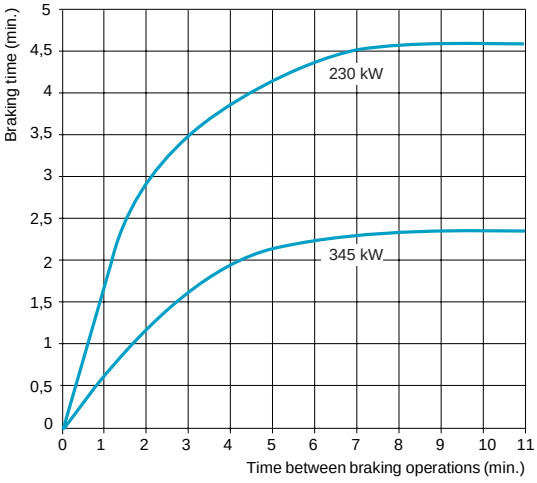
VW3 A7 210, A7 240 (Continuous braking power = 120 kW) *(1)*



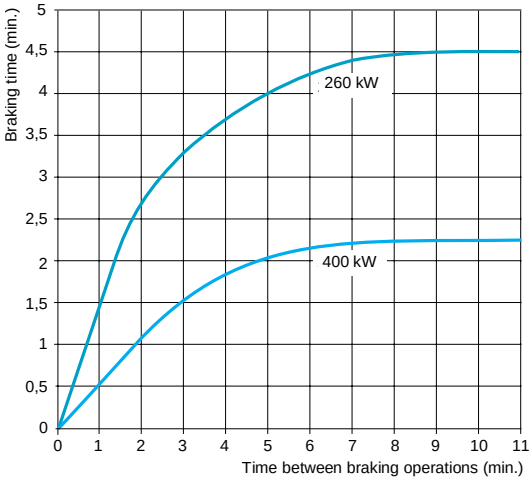
VW3 A7 211 (Continuous braking power = 135 kW)



VW3 A7 212 (Continuous braking power = 200 kW)



VW3 A7 241 (Continuous braking power = 240 kW)



(1) Power indicated for a temperature of 35°C.

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Dimensions: pages 102 and 103
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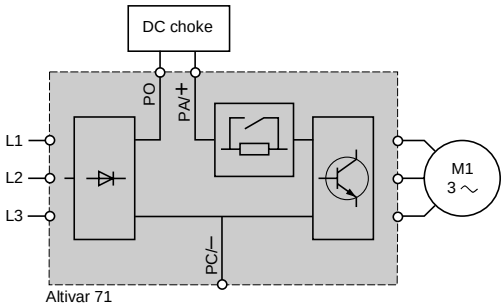
Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: DC chokes



Altivar 71

The main solutions for reducing current harmonics are as follows:
- DC chokes, see below
- Line chokes, see page 70
- 16% and 10% passive filters, see page 73
- Use of passive filters with a DC choke, see page 73

These 4 solutions can be used on the same installation.
It is always easier and less expensive to handle current harmonics at installation level as a whole rather than at the level of each individual unit, particularly when using passive filters and active compensators.

DC chokes

DC chokes are used to reduce current harmonics in order to comply with standard 61000-3-2 for drives in which the line current is more than 16 A and less than 75 A.
Using the DC choke with the drive complies with draft standard IEC/61000-3-12 provided that the RSCE ⩾ 120 *(1)* at the point of connection to the public network.
120 represents the minimum value of RSCE *(1)* for which the values in table 4 of draft standard IEC/61000-3-12 are not exceeded.
It is the responsibility of the installer or the user to ensure that the device is connected correctly to a connection point with an RSCE ⩾ 120.
The choke is connected to the drive power terminals.
The DC choke is supplied as standard with ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives.

Applications

Reduction of current harmonics.
Use with passive filters for greater reduction of current harmonics (see page 73).
Maintaining the motor torque in relation to the AC line choke.

(1) Short-circuit ratio

Characteristics: page 67
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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: DC chokes

Example of current harmonic levels up to harmonic order 49 for a 400 V/50 Hz supply with chokes connected between the PO and PA+ terminals on the Altivar 71.

Motor power		For ATV 71 drives	Line supply		Current harmonic levels																THD
			Line current	Line Isc	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	(1)
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
3-phase supply voltage: 230 V 50 Hz																					
0.37	0.5	H037M3	1.5	5	1.4	26.7	18.4	9.1	7.7	5.8	5.1	4.3	3.8	3.4	3	2.8	2.5	2.4	2.2	2.1	1.9	36.3
0.75	1	H075M3	3.05	5	2.81	31.99	20.91	8.88	7.36	5.6	4.63	4.07	3.42	3.18	2.71	2.59	2.24	2.17	1.91	1.86	1.66	41.27
1.5	2	HU15M3	6.04	5	5.55	33.65	21.59	8.14	6.84	4.97	4.19	3.54	3.08	2.71	2.43	2.17	2.01	1.78	1.7	1.5	1.47	42.4
2.2	3	HU22M3	8.33	5	7.64	34.89	21.11	8.78	6.72	5.36	4.1	3.8	3	2.9	2.37	2.29	1.95	1.85	1.66	1.52	1.44	43.33
3	–	HU30M3	11.12	5	10.19	35.17	20.68	8.71	6.48	5.24	3.94	3.67	2.88	2.76	2.27	2.15	1.87	1.71	1.58	1.37	1.37	43.22
4	5	HU40M3	14.53	5	13.29	36.23	20.51	8.73	6.2	5.2	3.73	3.61	2.71	2.68	2.14	2.06	1.76	1.61	1.49	1.27	1.28	43.91
5.5	7.5	HU55M3	19.2	8	17.9	30.68	17.26	8.75	6.31	5.3	4.03	3.72	2.98	2.79	2.36	2.17	1.94	1.71	1.63	1.36	1.4	38
7.5	10	HU75M3	26.1	15	23.9	35.23	21.09	8.82	6.71	5.38	4.09	3.82	2.98	2.91	2.35	2.31	1.92	1.87	1.63	1.54	1.4	43.96
11	15	HD11M3X	36.6	15	34.2	30.91	17.12	8.86	6.36	5.37	4.08	3.77	3.01	2.82	2.37	2.19	1.94	1.73	1.62	1.37	1.38	38.14
15	20	HD15M3X	48.6	15	55.8	25.51	13.46	8.73	6.32	5.25	4.21	3.6	3.11	2.62	2.42	1.95	1.93	1.47	1.56	1.12	1.26	35.34
18.5	25	HD18M3X	58.7	15	55.8	25.51	13.46	8.73	6.32	5.25	4.21	3.6	3.11	2.62	2.42	1.95	1.93	1.47	1.56	1.12	1.26	32.31
22	30	HD22M3X	70.28	22	65.92	29.81	15.91	8.7	6.15	5.23	3.99	3.63	2.95	2.68	2.32	2.04	1.89	1.57	1.57	1.22	1.32	36.62
30	40	HD30M3X	96.9	22	88.78	36.68	19.42	8.38	5.67	4.86	3.44	3.29	2.52	2.38	1.98	1.77	1.62	1.34	1.34	1.02	1.12	43.51
37	50	HD37M3X	116.1	22	107.9	33.09	16.4	8.59	5.59	4.97	3.54	3.33	2.6	2.36	2.03	1.72	1.63	1.26	1.32	0.94	1.06	39.24
45	60	HD45M3X	138.7	22	130.5	30.15	13.86	8.65	5.38	5.01	3.49	3.33	2.55	2.33	1.96	1.66	1.53	1.2	1.19	0.9	0.9	35.7
3-phase supply voltage: 400 V 50 Hz																					
0.75	1	H075N4	1.77	5	1.61	34.6	23.7	8.9	7.8	5.6	4.8	4.1	3.5	3.2	2.8	2.6	2.3	2.2	1.9	1.9	1.7	44.95
1.5	2	HU15N4	3.34	5	3.03	35.55	23.53	8.95	7.65	5.61	4.74	4.06	3.49	3.16	2.76	2.57	2.28	2.15	1.94	1.83	1.68	45.48
2.2	3	HU22N4	4.83	5	4.4	35.79	22.77	8.7	7.11	5.41	4.36	3.89	3.2	3.01	2.53	2.43	2.09	2.01	1.77	1.7	1.53	45
3	–	HU30N4	6.13	5	5.67	31.61	18.82	9.41	6.82	5.88	4.57	4.24	3.38	3.28	2.67	2.63	2.19	2.16	1.86	1.8	1.6	40.08
4	5	HU40N4	8.24	5	7.51	36.16	21.63	9	8.17	5.52	4.17	3.93	3.05	3	2.4	2.38	1.98	1.93	1.68	1.58	1.45	44.72
5.5	7.5	HU55N4	10.81	22	9.83	34.85	23.08	9.68	4.05	6.12	5.18	4.45	3.83	3.48	3.04	2.85	2.52	2.4	2.14	2.06	1.85	45.19
7.5	10	HU75N4	15.01	10	13.8	34.09	20.49	8.57	6.43	5.28	3.95	3.78	2.89	2.9	2.28	2.32	1.88	1.9	1.59	1.58	1.37	42.25
11	15	HD11N4	21.1	9	19.3	35.22	20.11	8.95	6.5	5.41	4.02	3.8	2.95	2.86	2.32	2.23	1.9	1.77	1.6	1.42	1.37	43.1
15	20	HD15N4	28.2	12	25.8	35.22	20.01	8.98	6.49	5.43	4.02	3.82	2.94	2.88	2.32	2.24	1.9	1.78	1.6	1.43	1.37	43.06
18.5	25	HD18N4	33.9	12	31.9	28.36	15.16	8.85	6.18	5.39	4.04	3.78	2.98	2.83	2.34	2.18	1.9	1.7	1.58	1.33	1.33	35.23
22	30	HD22N4	40.87	22	37.85	32.79	18.73	8.6	6.42	5.28	4.09	3.75	3.03	2.85	2.4	2.25	1.97	1.81	1.67	1.48	1.44	40.4
30	40	HD30N4	54.1	20	50.6	29.97	16.26	8.75	6.27	5.32	4.07	3.73	3.01	2.79	2.37	2.15	1.94	1.69	1.62	1.33	1.38	36.99
37	50	HD37N4	66.43	22	62.6	28.49	15.01	8.63	6.08	5.23	4	3.65	2.97	2.71	2.34	2.07	1.9	1.61	1.58	1.26	1.32	35.13
45	60	HD45N4	83.11	22	75.56	38.31	20.96	8.24	5.81	4.85	3.48	3.33	2.54	2.44	2	1.85	1.64	1.42	1.38	1.1	1.17	45.59
55	75	HD55N4	98.6	22	91.69	32.94	16.76	8.5	5.68	4.98	3.62	3.38	2.67	2.44	2.09	1.81	1.69	1.37	1.39	1.04	1.14	39.29
75	100	HD75N4	134	22	125.9	30.65	14.43	8.4	5.4	4.84	3.52	3.21	2.59	2.25	2	1.61	1.58	1.17	1.25	0.88	0.96	36.2
90	125	HD90N4	158.81	35	145.1	36.72	20.66	8.33	6.19	4.93	3.78	3.43	2.75	2.56	2.13	1.99	1.72	1.59	1.4	1.29	1.16	44.26
110	150	HC11N4	193.81	35	175.7	38.91	21.7	8.24	6.03	4.78	3.56	3.28	2.56	2.42	1.98	1.87	1.58	1.47	1.28	1.19	1.06	46.45
132	200	HC13N4	228.92	35	209.3	37.23	20.02	8.26	5.8	4.76	3.51	3.26	2.52	2.38	1.94	1.82	1.55	1.42	1.24	1.12	1	44.23
160	250	HC16N4	276.22	50	251.7	38.29	20.22	8.19	5.59	4.66	3.32	3.13	2.37	2.26	1.82	1.7	1.43	1.31	1.14	1.02	0.91	45.11
200	300	HC20N4	340.29	50	313.6	36.03	17.85	8.16	5.3	4.59	3.25	3.05	2.32	2.17	1.76	1.6	1.37	1.2	1.05	0.91	0.82	42.07
220	350	HC25N4	378.67	50	344.9	38.91	19.7	8.11	5.22	4.47	3.04	2.93	2.15	2.07	1.63	1.52	1.27	1.14	0.99	0.85	0.78	45.26
250	400	HC25N4	423.72	50	390.1	36.61	17.59	8.11	5.04	4.46	3.04	2.9	2.16	2.02	1.62	1.46	1.24	1.07	0.95	0.78	0.73	42.35
280	450	HC28N4	471.17	50	437.3	34.78	15.9	8.1	4.92	4.44	3.04	2.86	2.16	1.97	1.6	1.4	1.21	1	0.9	0.72	0.67	40.05
315	500	HC31N4	528.66	50	492.2	34.19	15.08	8.03	4.79	4.36	2.98	2.78	2.1	1.88	1.54	1.31	1.14	0.92	0.84	0.65	0.61	39.15
355	–	HC40N4	607.3	50	555.5	38.78	17.83	7.88	4.59	4.14	2.64	2.58	1.84	1.74	1.37	1.21	1.04	0.85	0.78	0.6	0.58	44.12
400	600	HC40N4	675.3	50	623.4	36.78	15.99	7.86	4.43	4.1	2.64	2.53	1.85	1.67	1.35	1.13	0.99	0.78	0.73	0.54	0.53	41.6
500	700	HC50N4	833.84	50	779.9	33.73	13.22	7.82	4.26	3.99	2.63	2.38	1.81	1.5	1.26	0.95	0.88	0.63	0.61	0.44	0.43	37.8

(1) Total harmonic distortion conforming to draft standard IEC 61000-3-12

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics
Options: DC chokes

General characteristics

Degree of protection			IP 20
Maximum relative humidity			95%
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50 without derating Up to 60°C with current derating of 2.2% per °C above 50°C
	Storage	**°C**	- 40…+ 65
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m
Voltage drop			4 to 6%
Maximum current			1.65 x nominal current for 60 seconds

Connection characteristics

Type of terminal			**Earth**	**Power supply**
Maximum connection capacity and tightening torque	VW3 A4 501…505		10 mm² (AWG 6) 1.2…1.4 Nm	2.5 mm² (AWG 12) 0.4…0.6 Nm
	VW3 A4 506		10 mm² (AWG 6) 1.2…1.4 Nm	4 mm² (AWG 10) 0.5…0.8 Nm
	VW3 A4 507		10 mm² (AWG 6) 1.2…1.4 Nm	6 mm² (AWG 8) 0.8…1 Nm
	VW3 A4 508, 509		10 mm² (AWG 6) 1.2…1.4 Nm	10 mm² (AWG 6) 1.2…1.4 Nm
	VW3 A4 510		10 mm² (AWG 6) 1.2…1.4 Nm	35 mm² (AWG 0) 2.5…3 Nm
	VW3 A4 511		– –	Connected on a bar, Ø 9 –
	VW3 A4 512		– –	Connected on a bar, Ø 9 –

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: DC chokes

DC chokes *(1)*

For drives	Inductance value	Nominal current	Loss	Reference	Weight
	mH	A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 71H037M3	18	2.25	7.7	**VW3 A4 501**	0.650
ATV 71H075M3	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 71HU15M3	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 71HU22M3	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 71HU30M3	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 71HU40M3, HU55M3	1.2	44	61	**VW3 A4 508**	4.500
ATV 71HU75M3	0.7	36	30.5	**VW3 A4 509**	2.500
ATV 71HD11M3X, HD15M3X	0.52	84.5	77	**VW3 A4 510**	6.200
ATV 71HD18M3X, HD22M3X	0.22	171.2	86	**VW3 A4 511**	15.500
ATV 71HD30M3X… HD45M3X	0.09	195	73	**VW3 A4 512**	10.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 71H075N4	18	2.25	7.7	**VW3 A4 501**	0.650
ATV 71HU15N4	10	4.3	11	**VW3 A4 502**	1.000
ATV 71HU22N4, HU30N4	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 71HU40N4	3.9	10.7	27	**VW3 A4 504**	1.650
ATV 71HU55N4	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 71HU75N4	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 71HD11N4	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 71HD15N4, HD18N4	1.2	44	57.5	**VW3 A4 508**	4.300
ATV 71HD22N4… HD37N4	0.52	84.5	98.3	**VW3 A4 510**	5.600
ATV 71HD45N4… HD75N4	0.22	171.2	128	**VW3 A4 511**	9.100

(1) With ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the DC choke is supplied as standard with the drive.

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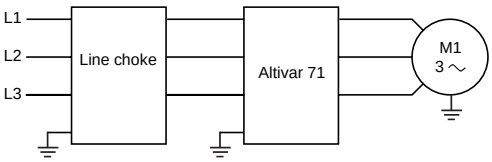
Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: line chokes



Line chokes

A line choke can be used to provide improved protection against overvoltages on the line supply and to reduce harmonic distortion of the current produced by the drive.

Line chokes are compulsory on ATV 71HU40M3…HU75M3 drives supplied with a single phase 200…240 V 50/60 Hz supply voltage.

The recommended chokes are used to limit the line current.
They have been developed in line with standard EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply).

The choke values are defined for a voltage drop between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.
These chokes should be installed upstream of the drive.

Applications

The use of line chokes is recommended in particular under the following circumstances:

- Close connection of several drives in parallel
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases above 1.8% of the nominal voltage
- Drive supplied by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the drive rating)
- Installation of a large number of frequency converters on the same line
- Reducing overloads on the cos φ correction capacitors, if the installation includes a power factor correction unit

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics
Options: line chokes

General characteristics

Type of choke			VW3 A4 551... 553	VW3 A4 554... 555	VW3 A4 556... 560	VW3 A4 561... 567
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply), IEC 60076 (with HD 398)			
Degree of protection	Choke		IP 00			
	Terminals		IP 20	IP 10	IP 00	
Atmospheric pollution			3 C2, 3B1, 3S1 conforming to IEC 721.3.3			
Degree of pollution			2 conforming to EN 50178			
Vibration resistance			1.5 mm from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC 60068-2			
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27			
Maximum relative humidity			95%			
Ambient air temperature around the device	Operation	**°C**	0…+ 45 without derating Up to + 55°C with current derating of 2% per °C above 45°C			
	Storage	**°C**	- 25…+ 70			
Isolation class			F			
Clearance distance in air		**mm**	5.5 conforming to IEC 60664			
Leakage distance in air		**mm**	11.5 conforming to IEC 60664			
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m			
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque			
Maximum current			1.65 x nominal current for 60 seconds			

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A4 551, 552		2.5 mm², (AWG 12) 0.4…0.6 Nm
	VW3 A4 553		6 mm², (AWG 8) 0.8…1 Nm
	VW3 A4 554		16 mm², (AWG 4) 1.2…1.4 Nm
	VW3 A4 555		35 mm², (AWG 0) 2.5…3 Nm
	VW3 A4 556		Connected on a bar, Ø 6.5 mm –
	VW3 A4 557, 558		Connected on a bar, Ø 9 mm –
	VW3 A4 559…561		Connected on a bar, Ø 11 mm –
	VW3 A4 562…567		Connected on a bar, Ø 13 mm –

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: line chokes

Line chokes

For drives		Line supply Line Isc	Line choke Inductance value	Nominal current	Saturation current	Loss	Reference	Weight
		kA	mH	A	A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz								
ATV 71H037M3...H075M3		5	10	4	–	45	**VW3 A4 551**	1.500
ATV 71HU15M3...HU22M3		5	4	10	–	65	**VW3 A4 552**	3.000
ATV 71HU30M3		5	2	16	–	75	**VW3 A4 553**	3.500
ATV 71HU40M3		5	1	30	–	90	**VW3 A4 554**	6.000
ATV 71HU55M3		22	1	30	–	90	**VW3 A4 554**	6.000
ATV 71HU75M3, HD11M3X		22	0.5	60	–	94	**VW3 A4 555**	11.000
ATV 71HD15M3X		22	0.3	100	–	260	**VW3 A4 556**	16.000
ATV 71HD18M3X…HD45M3X		22	0.15	230	–	400	**VW3 A4 557**	45.000
ATV 71HD55M3X		35	0.049	429	855	278	**VW3 A4 562**	50.000
ATV 71HD75M3X		35	0.038	613	1150	307	**VW3 A4 563**	59.000
3-phase supply voltage: 380…480 V 50/60 Hz								
ATV 71H075N4, HU15N4		5	10	4	–	45	**VW3 A4 551**	1.500
ATV 71HU22N4...HU40N4		5	4	10	–	65	**VW3 A4 552**	3.000
ATV 71HU55N4, HU75N4		22	2	16	–	75	**VW3 A4 553**	3.500
ATV 71HD11N4, HD15N4		22	1	30	–	90	**VW3 A4 554**	6.000
ATV 71HD18N4, HD22N4		22	0.5	60	–	94	**VW3 A4 555**	11.000
ATV 71HD30N4…HD55N4		22	0.3	100	–	260	**VW3 A4 556**	16.000
ATV 71HD75N4		22	0.15	230	–	400	**VW3 A4 557**	45.000
ATV 71HD90N4		35	0.155	184	370	220	**VW3 A4 558**	31.000
ATV 71HC11N4		35	0.12	222	445	230	**VW3 A4 559**	35.000
ATV 71HC13N4		35	0.098	264	530	245	**VW3 A4 560**	43.000
ATV 71HC16N4		50	0.066	344	685	258	**VW3 A4 561**	47.000
ATV 71HC20N4		35	0.049	429	855	278	**VW3 A4 562**	50.000
ATV 71HC25N4	Motor P 220 kW	50	0.049	429	855	278	**VW3 A4 562**	50.000
	Motor P 250 kW	50	0.038	509	1025	280	**VW3 A4 563**	59.000
ATV 71HC28N4		50	0.038	613	1150	307	**VW3 A4 564**	73.000
ATV 71HC31N4		50	0.038	613	1150	307	**VW3 A4 564**	73.000
ATV 71HC40N4	Motor P 355 kW	50	0.02	745	1150	335	**VW3 A4 565**	70.000
	Motor P 400 kW	50	0.049	2 x 429	855	278	**VW3 A4 566**	100.000
ATV 71HC50N4		50	0.038	2 x 509	1025	280	**VW3 A4 567**	118.000

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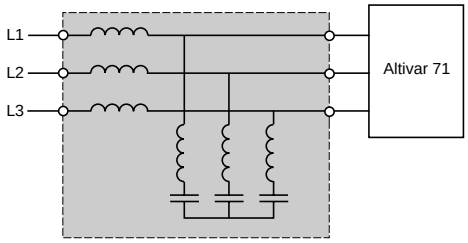
Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: passive filters

Passive filters



Passive filter

The passive filter is used to reduce current harmonics with total harmonic distortion factors of less than 16% or 10%. These ratios may be less than 10% or 5% if used with a DC choke, see page 66.

Applications

Reduction of current harmonics in order to use drives in the first environment.

General characteristics

Degree of protection			IP 20
Maximum relative humidity			Class F humidity without condensation 5%…85%
Ambient air temperature around the device	Operation	**°C**	5…+ 40 without derating Up to 55°C with current derating of 3% per additional °C
	Storage	**°C**	- 25…+ 55
Maximum operating altitude		**m**	1000 without derating 1000…4000 with current derating of 5% per additional 1000 m

Electrical characteristics

Range		**400 V**	**460 V**
Nominal voltage ± 10%	**V**	∿ 380…415	∿ 440…480
Operating frequency		50 ± 5%	60 ± 5%
Overload capacity		1.5 x Irms (A)	
Efficiency		98% (2% of thermal losses)	
THDI (1)	**%**	≤ 16	
Cos φ		At 75% of the line current: 0.85 At 100% of the line current: 0.99 At 150% of the line current: 1	

Connection characteristics

Maximum connection capacity	VW3 A4 601…604		16 mm²
	VW3 A4 605…609		50 mm²
	VW3 A4 610, 611, 614		Connected on a bar, Ø 12.5
	VW3 A4 612, 613, 615…617		Connected on a bar, Ø 16.5
	VW3 A4 621, 622		16 mm²
	VW3 A4 623…627		50 mm²
	VW3 A4 628, 629		Connected on a bar, Ø 12.5
	VW3 A4 630…637		Connected on a bar, Ø 16.5
	VW3 A4 641…644		16 mm²
	VW3 A4 645…648		50 mm²
	VW3 A4 649		Connected on a bar, Ø 12.5
	VW3 A4 650…655		Connected on a bar, Ø 16.5
	VW3 A4 661…663		16 mm²
	VW3 A4 664…666		50 mm²
	VW3 A4 667, 668		Connected on a bar, Ø 12.5
	VW3 A4 669…675		Connected on a bar, Ø 16.5

(1) The total current harmonic distortion (THDI) is indicated for a total voltage harmonic distortion (THDU) < 2% and a short-circuit ratio (RSCE) > 66%. If these conditions are not adhered to, the total current harmonics will be reduced without any guarantee of level.

References: page 74
Dimensions: page 105
Schemes: page 122

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: passive filters

Passive filters: 3-phase power supply 400 V 50/60 Hz

Motor rating		For drives	Line supply Line current	Filter Irms	Reference	Weight
kW	*HP*		A	A		kg
THDI 16% *(1)*						
0.75	*1*	ATV 71H075N4	1.70	6	**VW3 A4 601**	15.000
1.5	*2*	ATV 71HU15N4	3.60	6	**VW3 A4 601**	15.000
2.2	*3*	ATV 71HU22N4	5.10	6	**VW3 A4 601**	15.000
3	–	ATV 71HU30N4	6.90	10	**VW3 A4 602**	19.000
4	*5*	ATV 71HU40N4	9.50	10	**VW3 A4 602**	19.000
5.5	*7.5*	ATV 71HU55N4	13.00	19	**VW3 A4 603**	21.000
7.5	*10*	ATV 71HU75N4	16.50	19	**VW3 A4 603**	21.000
11	*15*	ATV 71HD11N4	25.60	26	**VW3 A4 604**	22.000
15	*20*	ATV 71HD15N4	29.50	35	**VW3 A4 605**	34.000
18.5	*25*	ATV 71HD18N4	38.30	43	**VW3 A4 606**	38.000
22	*30*	ATV 71HD22N4	43.00	43	**VW3 A4 606**	38.000
30	*40*	ATV 71HD30N4	58.90	72	**VW3 A4 607**	56.000
37	*50*	ATV 71HD37N4	71.30	72	**VW3 A4 607**	56.000
45	*60*	ATV 71HD45N4	82.90	101	**VW3 A4 608**	69.000
55	*75*	ATV 71HD55N4	100.00	101	**VW3 A4 608**	69.000
75	*100*	ATV 71 HD75N4	139.50	144	**VW3 A4 609**	97.000
90	*125*	ATV 71HD90N4	156.00	144	**VW3 A4 609**	97.000
110	*150*	ATV 71HC11N4	187.00	180	**VW3 A4 610**	103.000
132	*200*	ATV 71HC13N4	234.00	216	**VW3 A4 611**	112.000
160	*250*	ATV 71HC16N4	287.00	289	**VW3 A4 612**	135.000
200	*300*	ATV 71HC20N4	353.50	370	**VW3 A4 613**	155.000
220	*350*	ATV 71HC25N4	390.00	370	**VW3 A4 613**	155.000
250	*400*	ATV 71HC25N4	445.00	434	**VW3 A4 614**	224.000
280	*450*	ATV 71HC28N4	485.00	578	**VW3 A4 615**	270.000
315	*500*	ATV 71HC31N4	543.00	578	**VW3 A4 615**	270.000
355	–	ATV 71HC40N4	592.00	578	**VW3 A4 615**	270.000
400	*600*	ATV 71HC40N4	670.00	740	**VW3 A4 616**	310.000
500	*700*	ATV 71HC50N4	840.00	867	**VW3 A4 617**	305.000
THDI 10% *(1)*						
0.75	*1*	ATV 71H075N4	1.70	6	**VW3 A4 621**	21.000
1.5	*2*	ATV 71HU15N4	3.60	6	**VW3 A4 621**	21.000
2.2	*3*	ATV 71HU22N4	5.10	6	**VW3 A4 621**	21.000
3	–	ATV 71HU30N4	6.90	10	**VW3 A4 622**	27.000
4	*5*	ATV 71HU40N4	9.50	10	**VW3 A4 622**	27.000
5.5	*7.5*	ATV 71HU55N4	13.00	19	**VW3 A4 623**	28.000
7.5	*10*	ATV 71HU75N4	16.50	19	**VW3 A4 623**	28.000
11	*15*	ATV 71HD11N4	25.60	26	**VW3 A4 624**	40.000
15	*20*	ATV 71HD15N4	29.50	35	**VW3 A4 625**	49.000
18.5	*25*	ATV 71HD18N4	38.30	43	**VW3 A4 626**	52.000
22	*30*	ATV 71HD22N4	43.00	43	**VW3 A4 626**	52.000
30	*40*	ATV 71HD30N4	58.90	72	**VW3 A4 627**	88.000
37	*50*	ATV 71HD37N4	71.30	72	**VW3 A4 627**	88.000
45	*60*	ATV 71HD45N4	82.90	101	**VW3 A4 628**	150.000
55	*75*	ATV 71HD55N4	100.00	101	**VW3 A4 628**	150.000
75	*100*	ATV 71HD75N4	139.50	144	**VW3 A4 629**	167.000
90	*125*	ATV 71HD90N4	156.00	144	**VW3 A4 629**	167.000
110	*150*	ATV 71HC11N4	187.00	180	**VW3 A4 630**	178.000
132	*200*	ATV 71HC13N4	234.00	216	**VW3 A4 631**	224.000
160	*250*	ATV 71HC16N4	287.00	289	**VW3 A4 632**	271.000
200	*300*	ATV 71HC20N4	353.50	370	**VW3 A4 633**	320.000
220	*350*	ATV 71HC25N4	390.00	370	**VW3 A4 633**	320.000
250	*400*	ATV 71HC25N4	445.00	434	**VW3 A4 634**	448.000
280	*450*	ATV 71HC28N4	485.00	578	**VW3 A4 635**	542.000
315	*500*	ATV 71HC31N4	543.00	578	**VW3 A4 635**	542.000
355	–	ATV 71HC40N4	592.00	578	**VW3 A4 635**	542.000
400	*600*	ATV 71HC40N4	670.00	740	**VW3 A4 636**	568.000
500	*700*	ATV 71HC50N4	840.00	867	**VW3 A4 637**	813.000

(1) By adding a DC choke (see page 66), we get:
- THD ≤ 10% with VW3 A4 601…617
- THD ≤ 5% with VW3 A4 621…637
These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE > 66%.

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Options: passive filters

Passive filters: 3-phase power supply 460 V 50/60 Hz

Motor rating		For drives	Line supply Line current	Filter Irms	Reference	Weight
kW	*HP*		A	A		kg
THDI 16% *(1)*						
0.75	*1*	ATV 71H075N4	1.60	6	**VW3 A4 641**	15.000
1.5	*2*	ATV 71HU15N4	3.00	6	**VW3 A4 641**	15.000
2.2	*3*	ATV 71HU22N4	4.20	6	**VW3 A4 641**	15.000
3	–	ATV 71HU30N4	6.20	6	**VW3 A4 641**	15.000
4	*5*	ATV 71HU40N4	6.90	10	**VW3 A4 642**	19.000
5.5	*7.5*	ATV 71HU55N4	10.10	10	**VW3 A4 642**	19.000
7.5	*10*	ATV 71HU75N4	13.10	19	**VW3 A4 643**	23.000
11	*15*	ATV 71HD11N4	19.00	19	**VW3 A4 643**	23.000
15	*20*	ATV 71HD15N4	24.10	26	**VW3 A4 644**	34.000
18.5	*25*	ATV 71HD18N4	31.70	35	**VW3 A4 645**	42.000
22	*30*	ATV 71HD22N4	36.00	35	**VW3 A4 645**	42.000
30	*40*	ATV 71HD30N4	46.40	43	**VW3 A4 646**	45.000
37	*50*	ATV 71HD37N4	58.70	72	**VW3 A4 647**	61.000
45	*60*	ATV 71HD45N4	67.90	72	**VW3 A4 647**	61.000
55	*75*	ATV 71HD55N4	82.60	101	**VW3 A4 648**	75.000
75	*100*	ATV 71 HD75N4	108.00	101	**VW3 A4 648**	75.000
90	*125*	ATV 71HD90N4	158.00	180	**VW3 A4 649**	107.000
110	*150*	ATV 71HC11N4	187.00	180	**VW3 A4 649**	107.000
132	*200*	ATV 71HC13N4	234.00	289	**VW3 A4 650**	145.000
160	*250*	ATV 71HC16N4	287.00	289	**VW3 A4 650**	145.000
200	*300*	ATV 71HC20N4	353.00	370	**VW3 A4 651**	185.000
220	*350*	ATV 71HC25N4	390.00	370	**VW3 A4 651**	185.000
250	*400*	ATV 71HC25N4	444.00	432	**VW3 A4 652**	238.000
280	*450*	ATV 71HC28N4	485.00	578	**VW3 A4 653**	290.000
315	*500*	ATV 71HC31N4	543.00	578	**VW3 A4 653**	290.000
355	–	ATV 71HC40N4	591.80	578	**VW3 A4 653**	290.000
400	*600*	ATV 71HC40N4	669.40	740	**VW3 A4 654**	370.000
500	*700*	ATV 71HC50N4	840.00	867	**VW3 A4 655**	435.000
THDI 10% *(1)*						
0.75	*1*	ATV 71H075N4	1.70	6	**VW3 A4 661**	21.000
1.5	*2*	ATV 71HU15N4	3.60	6	**VW3 A4 661**	21.000
2.2	*3*	ATV 71HU22N4	5.10	6	**VW3 A4 661**	21.000
3	–	ATV 71HU30N4	6.90	6	**VW3 A4 661**	21.000
4	*5*	ATV 71HU40N4	9.50	10	**VW3 A4 662**	27.000
5.5	*7.5*	ATV 71HU55N4	13.00	10	**VW3 A4 662**	27.000
7.5	*10*	ATV 71HU75N4	16.50	19	**VW3 A4 663**	28.000
11	*15*	ATV 71HD11N4	25.60	19	**VW3 A4 663**	28.000
15	*20*	ATV 71HD15N4	29.50	26	**VW3 A4 664**	41.000
18.5	*25*	ATV 71HD18N4	38.30	35	**VW3 A4 665**	49.000
22	*30*	ATV 71HD22N4	43.00	35	**VW3 A4 665**	49.000
30	*40*	ATV 71HD30N4	58.90	43	**VW3 A4 666**	56.000
37	*50*	ATV 71HD37N4	71.30	72	**VW3 A4 667**	80.000
45	*60*	ATV 71HD45N4	82.90	72	**VW3 A4 668**	98.000
55	*75*	ATV 71HD55N4	100.00	101	**VW3 A4 668**	98.000
75	*100*	ATV 71HD75N4	139.50	101	**VW3 A4 668**	98.000
90	*125*	ATV 71HD90N4	156.00	180	**VW3 A4 669**	151.000
110	*150*	ATV 71HC11N4	187.00	180	**VW3 A4 669**	151.000
132	*200*	ATV 71HC13N4	234.00	289	**VW3 A4 670**	215.000
160	*250*	ATV 71HC16N4	287.00	289	**VW3 A4 670**	215.000
200	*300*	ATV 71HC20N4	353.50	370	**VW3 A4 671**	250.000
220	*350*	ATV 71HC25N4	390.00	370	**VW3 A4 671**	250.000
250	*400*	ATV 71HC25N4	445.00	432	**VW3 A4 672**	342.000
280	*450*	ATV 71HC28N4	485.00	578	**VW3 A4 673**	430.000
315	*500*	ATV 71HC31N4	543.00	578	**VW3 A4 673**	430.000
355	–	ATV 71HC40N4	592.00	578	**VW3 A4 673**	430.000
400	*600*	ATV 71HC40N4	670.00	740	**VW3 A4 674**	500.000
500	*700*	ATV 71HC50N4	840.00	867	**VW3 A4 675**	645.000

(1) By adding a DC choke (see page 66), we get:
- THD ≤ 10% with VW3 A4 641…655
- THD ≤ 5% with VW3 A4 661…675
These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE > 66%.

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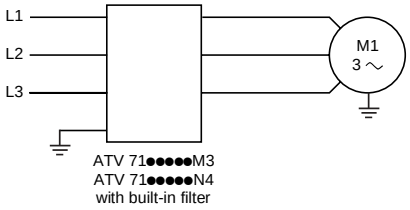
Variable speed drives for asynchronous motors

Altivar 71

Options: additional EMC input filters

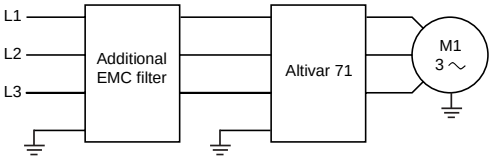


ATV 71●●●●●M3
ATV 71●●●●●N4
with built-in filter

Altivar 71 drives, except for the ATV 71H●●●M3X, have built-in radio interference input filters to meet the EMC standard for variable speed electrical power drive “products” IEC/EN 61800-3, edition 2, category C2 or C3 in environment 1 or 2 and to comply with the European directive on EMC (electromagnetic compatibility).

For drives EN 55011	Maximum length of shielded cable according to class A *(1)*			
	Group 1 *(2)*		Group 2 *(2)*	
	LF *(3)*	HF *(3)*	LF *(3)*	HF *(3)*
	m	m	m	m
ATV 71H037M3…HU22M3	10	5	–	–
ATV 71HU30M3…HU75M3	–	–	10	5
ATV 71H075N4…HU40N4	10	5	–	–
ATV 71HU55N4…HD15N4	–	–	10	5
ATV 71HD18N4…HC50N4	–	–	50	25

For drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 71H●●●M3 ATV 71H075N4…HD30N4	3…4	4.1…16
ATV 71HD37N4…HD75N4	2…2.5	2.6…12
ATV 71HD90N4…HC50N4	2…4	4.1…8



Additional EMC input filters

Applications

Additional EMC input filters can be used to meet more stringent requirements and are designed to reduce conducted emissions on the line supply below the limits of standard EN 55011 group 1, class A or B *(2)*.
These additional filters are mounted under the drives. They can be mounted on the side of the product for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X and ATV 71H075N4...HD75N4 drives. They act as a support for the drives and are fixed to them via tapped holes.

Use according to the type of network

Use of these additional filters is only possible on TN (connected to neutral) and TT (neutral to earth) type networks.

Standard IEC/EN 61800-3, appendix D2.1, states that on IT networks (impedance or isolated neutral), filters can cause permanent insulation monitors to operate in a random manner.
In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and ground, and therefore cannot be predicted.
In the case of a machine which needs to be installed on an IT network, one solution consists of inserting an isolation transformer and placing the machine locally on a TN or TT network.

(1) Maximum lengths for shielded cables connecting motors to drives, for a factory-set switching frequency of 2.5 or 4 kHz depending on the rating (2). If motors are connected in parallel, it is the sum of all cable lengths that should be taken into account.
(2) See page 8.
(3) LF: low switching frequency. HF: high switching frequency. These frequencies depend on the drive rating.

Characteristics: Page 77
References: Pages 78 and 79
Dimensions: Pages 106 and 107
Schemes: Page 122

Variable speed drives for asynchronous motors

Altivar 71

Options: additional EMC input filters

General characteristics

EMC filter			VW3 A4 401…409	VW3 A4 410…414
Conformity to standards			EN 133200	
Degree of protection			IP 20 and IP 41 on upper part	IP 00 IP 30 with VW3 A9 601, 602 kits
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3	
Ambient temperature around the unit	Operation	**°C**	- 10…+ 50	- 25…+ 45
	Storage	**°C**	- 40…+ 65	- 25…+ 85
Maximum operating altitude		**m**	1000 without derating 1000…3000 by derating the current by 1% per additional 100 m Limited to 2000 m for the “Corner Grounded” distribution network	
Vibration resistance			1.5 mm peak to peak from 3…13 Hz, 1 gn peak from 13…150 Hz, in accordance with IEC 60068-2-6	
Shock resistance			15 gn for 11 ms, in accordance with IEC 60068-2-27	
Maximum nominal voltage	50/60 Hz 3-phase	**V**	240 + 10% 480 + 10%	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A4 401		4 mm^2 (AWG 10). 0.6 Nm
	VW3 A4 402		6 mm^2 (AWG 8). 1.5 Nm
	VW3 A4 403		10 mm^2 (AWG 6). 1.5 Nm
	VW3 A4 404		16 mm^2 (AWG 4). 2 Nm
	VW3 A4 405…407		50 mm^2 (AWG 0). 6 Nm
	VW3 A4 408		150 mm^2 (300 kcmil). 25 Nm
	VW3 A4 409		25 mm^2 (AWG 2). 4 Nm
	VW3 A4 410…412		Bar connection, M10 –
	VW3 A4 413		Bar connection, 2 x M12 –

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References: Pages 78 and 79
Dimensions: Pages 106 and 107
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Variable speed drives for asynchronous motors

Altivar 71

Options: additional EMC input filters

Additional EMC input filters

For drives	Maximum length of shielded cable (1)				In (2)	Il (3)	Loss (4)	Reference	Weight
	EN 55011 (5) class A Gr1		EN 55011 (5) class B Gr1						
	LF (6)	HF (6)	LF (6)	HF (6)					
	m	m	m	m	A	mA	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz									
ATV 71H037M3…HU15M3	100	50	50	20	12	4	10	**VW3 A4 401**	2.200
ATV 71HU22M3…HU40M3	100	50	50	20	26	4.4	18	**VW3 A4 402**	4.000
ATV 71HU55M3	100	50	50	20	35	3	24	**VW3 A4 403**	5.800
ATV 71HU75M3	100	50	50	20	46	10	19	**VW3 A4 404**	7.000
ATV 71HD11M3X, HD15M3X	100	50	50	25	72	33	34	**VW3 A4 405**	12.000
ATV 71HD18M3X, HD22M3X	100	50	50	25	90	33	34	**VW3 A4 406**	15.000
ATV 71HD30M3X...HD45M3X	100	50	50	25	180	80	58	**VW3 A4 408**	40.000
ATV 71HD55M3X, HD75M3X	100	50	50	25	273	285	60	**VW3 A4 410**	22.000
3-phase supply voltage: 380…480 V 50/60 Hz									
ATV 71H075N4…HU22N4	100	50	50	20	12	7	5	**VW3 A4 401**	2.200
ATV 71HU30N4, HU40N4	100	50	50	20	26	8	6	**VW3 A4 402**	4.000
ATV 71HU55N4, HU75N4	100	50	50	20	35	7	14	**VW3 A4 403**	5.800
ATV 71HD11N4	100	50	50	20	46	14	13	**VW3 A4 404**	7.000
ATV 71HD15N4 *(7)*, HD18N4	300	200	100	100	72	60	14	**VW3 A4 405**	12.000
ATV 71HD22N4	300	200	100	100	90	60	11	**VW3 A4 406**	15.000
ATV 71HD30N4, HD37N4	300	200	100	100	92	60	30	**VW3 A4 407**	17.000
ATV 71HD45N4…HD75N4	300	200	100	100	180	140	58	**VW3 A4 408**	40.000
ATV 71HD90N4…HC13N4	300	150	50	25	273	500	60	**VW3 A4 410**	22.000
ATV 71HC16N4…HC28N4	300	150	50	25	546	500	125	**VW3 A4 411**	25.000
ATV 71HC31...HC40N4	300	150	50	25	728	500	210	**VW3 A4 412**	25.000
ATV 71HC50N4	300	150	50	25	1456	200	380	**VW3 A4 413**	34.000

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 1 to 16 kHz (5). These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the sum of the cable lengths that should be taken into account.
(2) Filter nominal current.
(3) Maximum earth leakage current at 230 V and at 400 V 50 Hz on a TT network.
(4) Via thermal dissipation.
(5) See page 8.
(6) LF: low switching frequency. HF: high switching frequency. These frequencies depend on the drive rating:

For drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 71H●●●M3 ATV 71H075N4…HD11N4	3…4	4.1…16
ATV 71HD11M3X, HD15M3X ATV 71HD15N4…HD30N4	3.5...4	4.1…12
ATV 71HD18M3X...HD45M3X ATV 71HD37N4...HD75N4	2…2.5	2.6…12
ATV 71HD55M3X, HD75M3X	2…4	4.1…8
ATV 71HD90N4, HC50N4	2…4	4.1…8

(7) It is possible to use a special filter VW3 A4 409 with a leakage current Il (3) of 14 mA which enables a maximum motor cable length of 100 m.

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Variable speed drives for asynchronous motors

Options: additional EMC input filters

IP 30 protection kits

Description	For filters	Reference	Weight kg
Mechanical device consisting of an IP 30 cover and cable clips	VW3 A4 410, 411	**VW3 A9 601**	–
	VW3 A4 412, 413	**VW3 A9 602**	–

Variable speed drives for asynchronous motors
Altivar 71: output filters

The Altivar 71 drive includes as standard a software function used to limit overvoltages at the motor terminals.
Depending on the cable lengths or the type of application, it may be necessary to use output filters:
- Motor chokes used to limit the dv/dt
- Sinus filters that are particularly effective for long cable runs

Cable length *(2)*	10…50 m	50…100 m	100…150 m	150…300 m	300…600 m	600…1000 m
Shielded cable						
ATV 71H●●●M3 ATV 71H075N4…HD15N4	Software function *(1)*	Motor choke		–		
ATV 71H●●●M3X ATV 71HD18N4…HC50N4	Software function *(1)*		Motor choke	–		
Unshielded cable						
ATV 71H037M3...HU15M3 ATV 71H075N4...HU22N4	Software function *(1)*		Motor choke or sinus filter		–	
ATV 71HU22M3...HU30M3 ATV 71HU55N4…HU75N4	Software function *(1)*		Motor choke		Sinus filter	–
ATV 71HU40M3…HU75M3 ATV 71HU75N4…HD15N4	Software function *(1)*		Motor choke		Sinus filter	
ATV 71H●●●M3X ATV 71HD18N4…HC50N4	Software function *(1)*			Motor choke	Sinus filter	

(1) The software function limits the overvoltage at the motor terminals to twice the DC bus voltage.
For any application with braking cycles, the DC bus voltage rises to more than the supply voltage multiplied by √2.
You must check the electrical characteristics of the motor before using this function.
(2) For an application with several motors connected in parallel, the cable length must include all cabling.
Type of recommended cable:
■ Shielded cables: "GORSE" cable, type GUOSTV-LS/LH; "PROTOFLEX" cable, type EMV2YSL CY
■ Unshielded cables: "GORSE" cable, type H07 RN-F4GXX; "BELDEN" cable, type 2950X

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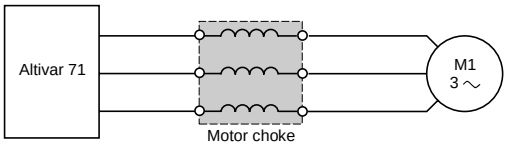
Variable speed drives for asynchronous motors

Altivar 71: output filters

Options: motor chokes

Motor chokes



Above a certain motor cable length, it is advisable to insert a motor choke between the drive and the motor. This maximum length depends on the drive rating and the type of motor cable:

For drives	Maximum length of motor cable *(1)*	
	Shielded cable	Unshielded cable
	m	m
ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD18N4	⩾ 50	⩾ 100
ATV 71HD18M3X…HD75M3X ATV 71HD22N4…HC50N4	⩾ 100	⩾ 200

The choke is used to:
- Limit the dv/dt to 500 V/µs
- Limit overvoltages on the motor terminals to:
  - 1000 V to 400 V ~ (rms value)
  - 1150 V to 460 V ~ (rms value)
- Filter interference caused by opening a contactor placed between the filter and the motor
- Reduce the motor earth leakage current

General characteristics *(2)*

Type of choke			VW3 A5 101…103	VW3 A5 104…108
Drive switching frequency	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD30N4	**kHz**	4	
	ATV 71HD18M3X…HD75M3X ATV 71HD37N4…HC50N4	**kHz**	2.5	
Maximum drive output frequency		**Hz**	100	
Degree of protection			IP 00	IP 00 IP 20 with kits VW3 A9 612 and VW3 A9 613
Thermal protection			By temperature controlled switch	–
Temperature controlled switch *(3)*	Tripping temperature	**°C**	125	–
	Maximum voltage	**V**	~ 250	–
	Maximum current	**A**	0.5	–
Ambient temperature around the unit	Operation	**°C**	- 10…+ 50	
	Storage	**°C**	- 25…+ 70	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 101, 102		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 103		Connected on a bar, Ø 11 mm –
	VW3 A5 104		Connected on a tag connector, M10 –
	VW3 A5 105, 106		Connected on a tag connector, M12 –
	VW3 A5 107, 108		Connected on a tag connector, 2 x M12 –

(1) These values are given for a switching frequency of 2.5 or 4 kHz depending on the rating.
(2) Choke performance is ensured by not exceeding the cable lengths between the motor and the drive given in the table above. For an application with several motors connected in parallel, the cable length must include all cabling. If a cable longer than that recommended is used, the motor chokes may overheat.
(3) The contact should be connected in the sequence (use for signalling or in line contactor control).

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Dimensions: pages 108 and 109
Schemes: page 122

Variable speed drives for asynchronous motors

Altivar 71: output filters

Options: motor chokes

VW3 A5 101

Motor chokes

For drives		Maximum motor cable length		Loss	Nominal current	Reference	Weight
		Shielded	Unshielded				
		m	m	W	A		kg
3-phase supply voltage: 200…240 V 50/60 Hz							
ATV 71H037M3…HU22M3		150	300	150	12	**VW3 A5 101**	5.500
ATV 71HU30M3…HU75M3		200	260	250	48	**VW3 A5 102**	8.000
		300	300	350	90	**VW3 A5 103**	10.000
ATV 71HD11M3X…HD22M3X		150	300	350	90	**VW3 A5 103**	10.000
ATV 71HD30M3X…HD45M3X		150	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HD55M3X, HD75M3X		150	300	475	3 x 314	**VW3 A5 105** *(1)*	29.600
3-phase supply voltage: 380...480 V 50/60 Hz							
ATV 71H075N4…HU40N4		75	90	150	12	**VW3 A5 101**	5.500
		85	95	250	48	**VW3 A5 102**	8.000
		160	200	350	90	**VW3 A5 103**	10.000
ATV 71HU55N4…HD18N4		85	95	250	48	**VW3 A5 102**	8.000
		160	200	350	90	**VW3 A5 103**	10.000
		200	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HD22N4…HD30N4		140	170	350	90	**VW3 A5 103**	10.000
		150	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HD37N4		97	166	350	90	**VW3 A5 103**	10.000
		200	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HD45N4…HD75N4		150	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HD90N4		200	300	430	3 x 215	**VW3 A5 104** *(1)*	17.300
ATV 71HC11N4, HC13N4		150	250	475	3 x 314	**VW3 A5 105** *(1)*	29.600
ATV 71HC16N4…HC20N4		250	300	530	3 x 481	**VW3 A5 106** *(1)*	44.400
ATV 71HC25N4	Motor P 220 kW	250	300	530	3 x 481	**VW3 A5 106** *(1)*	44.400
	Motor P 250 kW	200	250	598	3 x 759	**VW3 A5 107** *(1)*	64.500
ATV 71HC28N4, HC31N4		200	250	598	3 x 759	**VW3 A5 107** *(1)*	64.500
ATV 71HC40N4	Motor P 355 kW	200	250	598	3 x 759	**VW3 A5 107** *(1)*	64.500
	Motor P 400 kW	250	300	682	3 x 1188	**VW3 A5 108** *(1)*	99.200
ATV 71HC50N4		250	300	682	3 x 1188	**VW3 A5 108** *(1)*	99.200

(1) 3 single-phase chokes are included with the drive.

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Variable speed drives for asynchronous motors

Altivar 71: output filters

Options: motor chokes

IP 20 protection kits

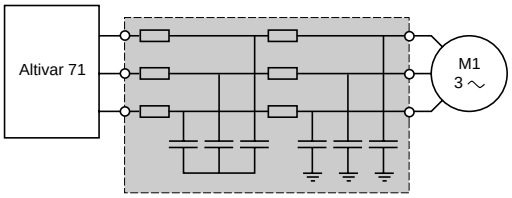
Description	For filters	Reference	Weight kg
Mechanical kit including an IP 20 cover and cable clamps	VW3 A5 104, 105	**VW3 A9 612**	–
	VW3 A5 106…108	**VW3 A9 613**	–

Variable speed drives for asynchronous motors

Altivar 71: output filters

Options: sinus filters

Sinus filters



Sinus filter

Sinus filters allow Altivar 71 drives to operate with longer motor cables (up to 1000 m).
For ATV 71●●●M3, ATV 71H037M3X...HU45M3X, ATV 71H075N4... HD75N4 drives, it also enables the use of unshielded cables while still complying with the standards on radiated EMC emissions (EN55011 class A Gr1).

Applications

Applications requiring:
- Long cable runs
- Mechanical restrictions preventing the use of shielded cables
- An intermediate transformer between the drive and the motor
- Motors connected in parallel

General characteristics

Type of choke			VW3 A5 201…206	VW3 A5 207…211
Degree of protection			IP 20	IP 00
Atmospheric pollution			3C2, 3B1, 3S1 conforming to IEC 721.3.3	
Degree of pollution			2 conforming to standard EN 50178	
Vibration resistance			1.5 mm from 3...13 Hz, 1 gn from 13...200 Hz, conforming to IEC 60068-2	
Shock resistance			15 gn for 11 ms conforming to IEC 60068-2-27	
Maximum relative humidity			95%	
Ambient air temperature around the device	Operation	**°C**	- 10...+ 40 without derating From 40...50°C with current derating of 1.5% per additional °C	
	Storage	**°C**	- 40…+ 65	
Maximum operating altitude		**m**	1000 without derating From 1000…3000 with current derating of 1% per additional 100 m	
Switching frequency		**kHz**	4...8	
Output frequency		**Hz**	0...100	
Voltage drop			< 10%	
Maximum voltage		**V**	~ 500	
Maximum current			1.5 x nominal current for 60 s	
Maximum length of motor cable	Unshielded cable	**m**	600 or 1000 depending on the drive rating, see page 80	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 201		4 mm² (AWG 10) 0.6 Nm
	VW3 A5 202		6 mm² (AWG 8) 1.5 Nm
	VW3 A5 203		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 204		25 mm² (AWG 2) 4 Nm
	VW3 A5 205		50 mm² (AWG 0) 6 Nm
	VW3 A5 206, 207		95 mm² (AWG 4/0) 20 Nm
	VW3 A5 208, 209		Connected on a bar, Ø 11 mm –
	VW3 A5 210		Connected on a bar, Ø 14 mm –
	VW3 A5 211		Connected on a bar, 4 x Ø 11 mm –

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Dimensions: pages 110 and 111
Schemes: page 122

Variable speed drives for asynchronous motors

Altivar 71: output filters

Options: sinus filters

Sinus filters

For drives		Nominal current	Loss at 100 Hz	Reference	Weight
		A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 71H037M3...HU15M3 *(1)*		11	50	**VW3 A5 201**	8.000
ATV 71HU22M3, HU30M3		16	70	**VW3 A5 202**	11.000
ATV 71HU40M3... HU75M3		33	120	**VW3 A5 203**	22.000
ATV 71HD11M3X, HD15M3X		66	180	**VW3 A5 204**	45.000
ATV 71HD18M3X, HD22M3X		95	250	**VW3 A5 205**	60.000
ATV 71HD30M3X... HD45M3X		180	400	**VW3 A5 206**	120.000
ATV 71HD55M3X, HD75M3X		300	1360	**VW3 A5 208**	165.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 71H075N4...HU40N4 *(1)*		11	50	**VW3 A5 201**	8.000
ATV 71HU55N4		16	70	**VW3 A5 202**	11.000
ATV 71HU75N4...HD15N4		33	120	**VW3 A5 203**	22.000
ATV 71HD18N4... HD30N4		66	180	**VW3 A5 204**	45.000
ATV 71HD37N4, HD45N4		95	250	**VW3 A5 205**	60.000
ATV 71HD55N4, HD75N4		180	400	**VW3 A5 206**	120.000
ATV 71 HD90N4, HC11N4		200	945	**VW3 A5 207**	130.000
ATV 71 HC13N4, HC16N4		300	1360	**VW3 A5 208**	165.000
ATV 71 HC20N4		400	1900	**VW3 A5 209**	190.000
ATV 71 HC25N4	Motor P 220 kW	400	1900	**VW3 A5 209**	190.000
	Motor P 250 kW	600	2370	**VW3 A5 210**	260.000
ATV 71 HC28N4, HC31N4		600	2370	**VW3 A5 210**	260.000
ATV 71 HC40N4	Motor P 355 kW	600	2370	**VW3 A5 210**	260.000
	Motor P 400 kW	1200	5150	**VW3 A5 211**	600.000
ATV 71 HC50N4		1200	5150	**VW3 A5 211**	600.000

(1) For ATV 71H037M3…HU15M3 and ATV 71H075N4…HU22N4 drives, it is advisable to use a lower category of motor with a sinus filter.

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Variable speed drives for asynchronous motors
Altivar 71

Table showing possible combinations of Altivar 71 drive options

Motor		Drive	Options				
			DC choke	Line choke	Additional EMC input filter	Motor choke	IP 20 motor choke kit
kW	*HP*						
Single phase supply voltage: 200…240 V 50/60 Hz							
0.37	*0.5*	**ATV 71H075M3**	VW3 A4 503	VW3 A4 551	VW3 A4 401	VW3 A5 101	–
0.75	*1*	**ATV 71HU15M3**	VW3 A4 505	VW3 A4 552	VW3 A4 401	VW3 A5 101	–
1.5	*2*	**ATV 71HU22M3**	VW3 A4 506	VW3 A4 552	VW3 A4 402	VW3 A5 101	–
2.2	*3*	**ATV 71HU30M3**	VW3 A4 507	VW3 A4 553	VW3 A4 402	VW3 A5 102, 103	–
3	–	**ATV 71HU40M3**	VW3 A4 508	VW3 A4 554	VW3 A4 402	VW3 A5 102, 103	–
4	*5*	**ATV 71HU55M3**	VW3 A4 508	VW3 A4 554	VW3 A4 403	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 71HU75M3**	VW3 A4 509	VW3 A4 555	VW3 A4 404	VW3 A5 102, 103	–
3-phase supply voltage: 200…240 V 50/60 Hz							
0.37	*0.5*	**ATV 71H037M3**	VW3 A4 501	VW3 A4 551	VW3 A4 401	VW3 A5 101	–
0.75	*1*	**ATV 71H075M3**	VW3 A4 503	VW3 A4 551	VW3 A4 401	VW3 A5 101	–
1.5	*2*	**ATV 71HU15M3**	VW3 A4 505	VW3 A4 552	VW3 A4 401	VW3 A5 101	–
2.2	*3*	**ATV 71HU22M3**	VW3 A4 506	VW3 A4 552	VW3 A4 402	VW3 A5 101	–
3	–	**ATV 71HU30M3**	VW3 A4 507	VW3 A4 553	VW3 A4 402	VW3 A5 102, 103	–
4	*5*	**ATV 71HU40M3**	VW3 A4 508	VW3 A4 554	VW3 A4 402	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 71HU55M3**	VW3 A4 508	VW3 A4 554	VW3 A4 403	VW3 A5 102, 103	–
7.5	*10*	**ATV 71HU75M3**	VW3 A4 509	VW3 A4 555	VW3 A4 404	VW3 A5 102, 103	–
11	*15*	**ATV 71HD11M3X**	VW3 A4 510	VW3 A4 555	VW3 A4 405	VW3 A5 103	–
15	*20*	**ATV 71HD15M3X**	VW3 A4 510	VW3 A4 556	VW3 A4 405	VW3 A5 103	–
18.5	*25*	**ATV 71HD18M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	VW3 A5 103	–
22	*30*	**ATV 71HD22M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	VW3 A5 103	–
30	*40*	**ATV 71HD30M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
37	*50*	**ATV 71HD37M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
45	*60*	**ATV 71HD45M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
55	*75*	**ATV 71HD55M3X**	–	VW3 A4 562	VW3 A4 401	VW3 A5 105	VW3 A9 612
75	*100*	**ATV 71HD75M3X**	–	VW3 A4 563	VW3 A4 401	VW3 A5 105	VW3 A9 612
Pages		18	69	72	78	82	83

Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adaptor ∿ 115 V	I/O cards *(1)*		Programmable "Controller Inside" card	Remote graphic display terminal	Encoder interface cards			PowerSuite software workshop for PC and Pocket PC
		Logic	Extended			RS 422 compatible differential outputs	Open collector outputs	Push-pull outputs	
ATV 71H●●●●●	VW3 A3 101	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A8 104, 105
Pages	20	31	31	39	26	29	29	29	179

(1) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Communication VW3 A3 3●●	Programmable "Controller inside" VW3 A3 501	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202
Communication VW3 A3 3●●				
Programmable "Controller inside" VW3 A3 501				
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				

Possible to combine

Not possible to combine

Sinus filter	Braking resistor	Hoist resistor	Flush-mounting kit (inside dust and damp proof enclosure)	NEMA Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Control card fan kit
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 702	VW3 A7 802	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 202	VW3 A7 702	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 702	VW3 A7 802	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 202	VW3 A7 702	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 204	VW3 A7 705	VW3 A7 805	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	VW3 A7 706	VW3 A7 805	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 205	VW3 A7 707	VW3 A7 806	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 406
VW3 A5 205	VW3 A7 707	VW3 A7 807	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 406
VW3 A5 206	VW3 A7 708	VW3 A7 807	VW3 A9 508	VW3 A9 208	VW3 A9 108	–
VW3 A5 206	VW3 A7 709	VW3 A7 808	VW3 A9 508	VW3 A9 208	VW3 A9 108	–
VW3 A5 206	VW3 A7 709	VW3 A7 808	VW3 A9 508	VW3 A9 208	VW3 A9 108	–
VW3 A5 208	VW3 A7 713	VW3 A7 809	VW3 A9 510	VW3 A9 209	VW3 A9 109	–
VW3 A5 208	VW3 A7 714	VW3 A7 810	VW3 A9 511	VW3 A9 210	VW3 A9 110	–
85	51	53	21	22	23	20

Communication cards *(1)*							
Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio standard	Substitution Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
46 and 184	46, 191 and 199	46 and 188	46 and 188	46 and 196	46	46	46

Variable speed drives for asynchronous motors
Altivar 71

Table showing possible combinations of Altivar 71 drive options

Motor		Drive	Option						
			DC choke	Line choke	Passive filter *(1)*	Additional EMC input filter	IP 30 EMC filter kit	Motor choke	IP 20 motor choke kit
kW	*HP*								
3-phase supply voltage: 380…480 V 50/60 Hz									
0.75	*1*	**ATV 71H075N4**	VW3 A4 501	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
1.5	*2*	**ATV 71HU15N4**	VW3 A4 502	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
2.2	*3*	**ATV 71HU22N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
3	–	**ATV 71HU30N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●2	VW3 A4 402	–	VW3 A5 10●	–
4	*5*	**ATV 71HU40N4**	VW3 A4 504	VW3 A4 552	VW3 A4 6●2	VW3 A4 402	–	VW3 A5 10●	–
5.5	*7.5*	**ATV 71HU55N4**	VW3 A4 505	VW3 A4 553	VW3 A4 6●3	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
7.5	*10*	**ATV 71HU75N4**	VW3 A4 506	VW3 A4 553	VW3 A4 6●3	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
11	*15*	**ATV 71HD11N4**	VW3 A4 507	VW3 A4 554	VW3 A4 6●4	VW3 A4 404	–	VW3 A5 10●	VW3 A9 612
15	*20*	**ATV 71HD15N4**	VW3 A4 508	VW3 A4 554	VW3 A4 6●5	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
18.5	*25*	**ATV 71HD18N4**	VW3 A4 508	VW3 A4 555	VW3 A4 6●6	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
22	*30*	**ATV 71HD22N4**	VW3 A4 510	VW3 A4 555	VW3 A4 6●6	VW3 A4 406	–	VW3 A5 10●	VW3 A9 612
30	*40*	**ATV 71HD30N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
37	*50*	**ATV 71HD37N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
45	*60*	**ATV 71HD45N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
55	*75*	**ATV 71HD55N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
75	*100*	**ATV 71HD75N4**	VW3 A4 511	VW3 A4 557	VW3 A4 6●9	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
90	*125*	**ATV 71HD90N4**	–	VW3 A4 558	VW3 A4 6●9	VW3 A4 410	VW3 A9 601	VW3 A5 104	VW3 A9 612
110	*150*	**ATV 71HC11N4**	–	VW3 A4 559	VW3 A4 6●0	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
132	*200*	**ATV 71HC13N4**	–	VW3 A4 560	VW3 A4 6●1	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
160	*250*	**ATV 71HC16N4**	–	VW3 A4 561	VW3 A4 6●2	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
200	*300*	**ATV 71HC20N4**	–	VW3 A4 562	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
220	*350*	**ATV 71HC25N4**	–	VW3 A4 562	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
250	*400*	**ATV 71HC25N4**	–	VW3 A4 563	VW3 A4 6●4	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
280	*450*	**ATV 71HC28N4**	–	VW3 A4 564	VW3 A4 6●5	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
315	*500*	**ATV 71HC31N4**	–	VW3 A4 564	VW3 A4 6●5	VW3 A4 412	VW3 A9 602	VW3 A5 107	VW3 A9 613
355	–	**ATV 71HC40N4**	–	VW3 A4 565	VW3 A4 6●5	VW3 A4 412	VW3 A9 602	VW3 A5 107	VW3 A9 613
400	*600*	**ATV 71HC40N4**	–	VW3 A4 566	VW3 A4 6●6	VW3 A4 412	VW3 A9 602	VW3 A5 108	VW3 A9 613
500	*700*	**ATV 71HC50N4**	–	VW3 A4 567	VW3 A4 6●7	VW3 A4 413	VW3 A9 602	VW3 A5 108	VW3 A9 613
Pages		18	69	72	74	78	79	82	83

Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adaptor ∿ 115 V	I/O cards *(2)*		Program-mable "Controller Inside" card	Remote graphic display terminal	Encoder interface cards			PowerSuite software workshop for PC and Pocket PC
		Logic	Extended			RS 422 compatible differential outputs	Open collector outputs	Push-pull outputs	
ATV 71H●●●●●	VW3 A3 101	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A8 104, 105
Pages	20	31	31	39	26	29	29	29	179

(1) There are special passive filters for a ∿ 460 V supply , see page 75.
(2) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Communication VW3 A3 3●●	Programmable "Controller inside" VW3 A3 501	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202
Communication VW3 A3 3●●				
Programmable "Controller inside" VW3 A3 501				
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				

Possible to combine

Not possible to combine

Sinus filter	Resistance braking unit	Braking resistor	Hoist resistor	Flush-mounting kit (inside dust and damp proof enclosure)	NEMA Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Control card fan kit
VW3 A5 201	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 802	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 802	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	–	VW3 A7 702	VW3 A7 803	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	–	VW3 A7 702	VW3 A7 803	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	–	VW3 A7 703	VW3 A7 803	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 203	–	VW3 A7 703	VW3 A7 804	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 406
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 507	VW3 A9 207	VW3 A9 107	VW3 A9 406
VW3 A5 205	–	VW3 A7 705	VW3 A7 805	VW3 A9 507	VW3 A9 207	VW3 A9 107	VW3 A9 406
VW3 A5 205	–	VW3 A7 707	VW3 A7 805	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 206	–	VW3 A7 707	VW3 A7 805	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 206	–	VW3 A7 707	VW3 A7 806	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 207	–	VW3 A7 710	VW3 A7 811	VW3 A9 510	VW3 A9 209	VW3 A9 109	–
VW3 A5 207	–	VW3 A7 711	VW3 A7 812	VW3 A9 511	VW3 A9 210	VW3 A9 110	–
VW3 A5 208	–	VW3 A7 711	VW3 A7 812	VW3 A9 512	VW3 A9 211	VW3 A9 111	–
VW3 A5 208	–	VW3 A7 712	VW3 A7 813	VW3 A9 513	VW3 A9 212	VW3 A9 112	–
VW3 A5 209	VW3 A7 101	VW3 A7 715	VW3 A7 814	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 209	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816	VW3 A9 516	VW3 A9 215	VW3 A9 115	–
VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816	VW3 A9 516	VW3 A9 215	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 717	VW3 A7 816	VW3 A9 516	VW3 A9 215	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 718	VW3 A7 817	VW3 A9 517	VW3 A9 216	VW3 A9 116	–
85	49	51	53	21	22	23	20

Communication cards *(2)*							
Ethernet TCP/IP	**Modbus/ Uni-Telway**	**Fipio standard**	**Substitution Fipio**	**Modbus Plus**	**Profibus DP**	**DeviceNet**	**INTERBUS**
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
46 and 184	46, 191 and 199	46 and 188	46 and 188	46 and 196	46	46	46

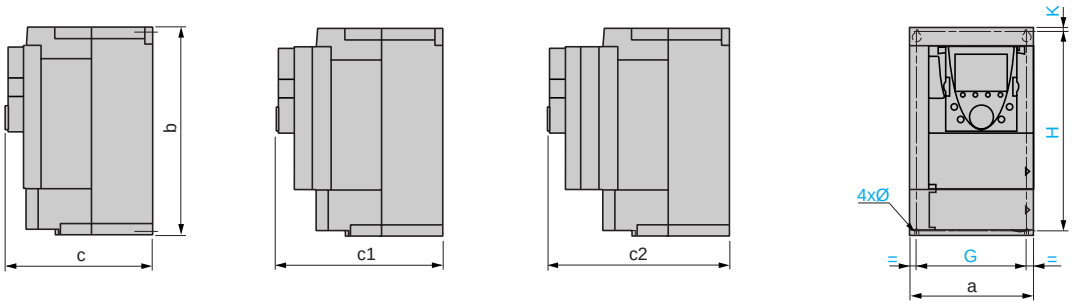
Variable speed drives for asynchronous motors

Altivar 71

Drives

ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4...HD18N4

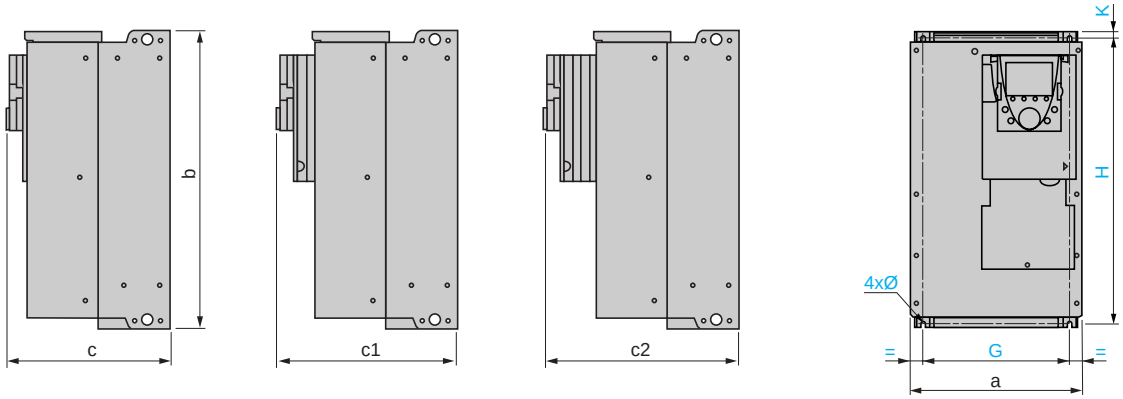
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 71H	a	b	c	c1	c2	G	H	K	Ø
037M3...U15M3, 075N4...U22N4	130	230	175	198	221	113.5	220	5	5
U22M3...U40M3, U30N4, U40N4	155	260	187	210	233	138	249	4	5
U55M3, U55N4, U75N4	175	295	187	210	233	158	283	6	6
U75M3, D11N4	210	295	213	236	259	190	283	6	6
D11M3X, D15M3X, D15N4, D18N4	230	400	213	236	259	210	386	8	6

ATV 71HD18M3X…45M3X, ATV 71HD22N4…HD37N4

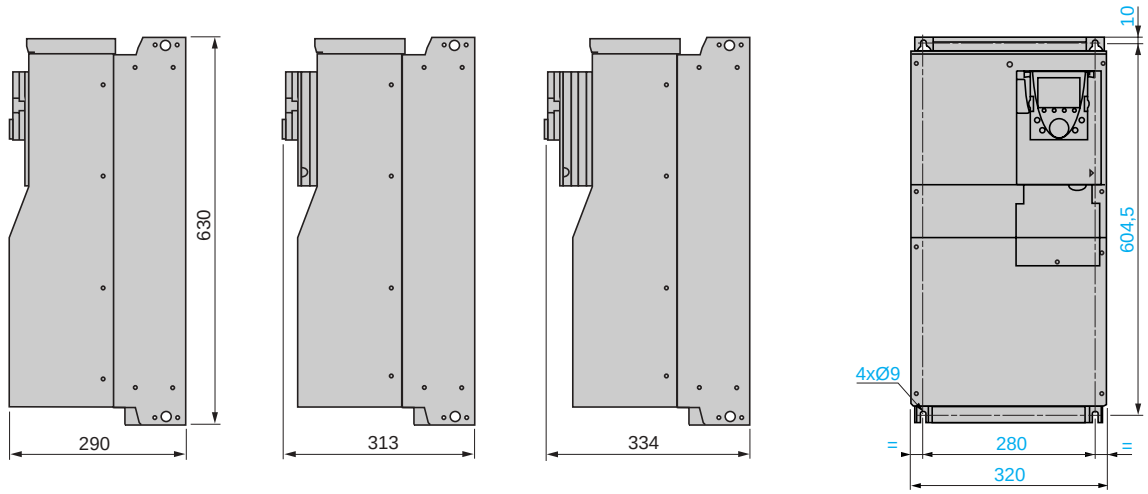
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 71H	a	b	c	c1	c2	G	H	k	Ø
D18M3X, D22M3X, D22N4	240	420	236	259	282	206	403	8.5	6
D30N4, D37N4	240	550	266	289	312	206	529	10	6
D30M3X…D45M3X	320	550	266	289	312	280	524.5	10	9

ATV 71HD45N4...HD75N4

Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Schemes: pages 112 to 127 | Functions: pages 142 to 173

Variable speed drives for asynchronous motors

Altivar 71

Drives

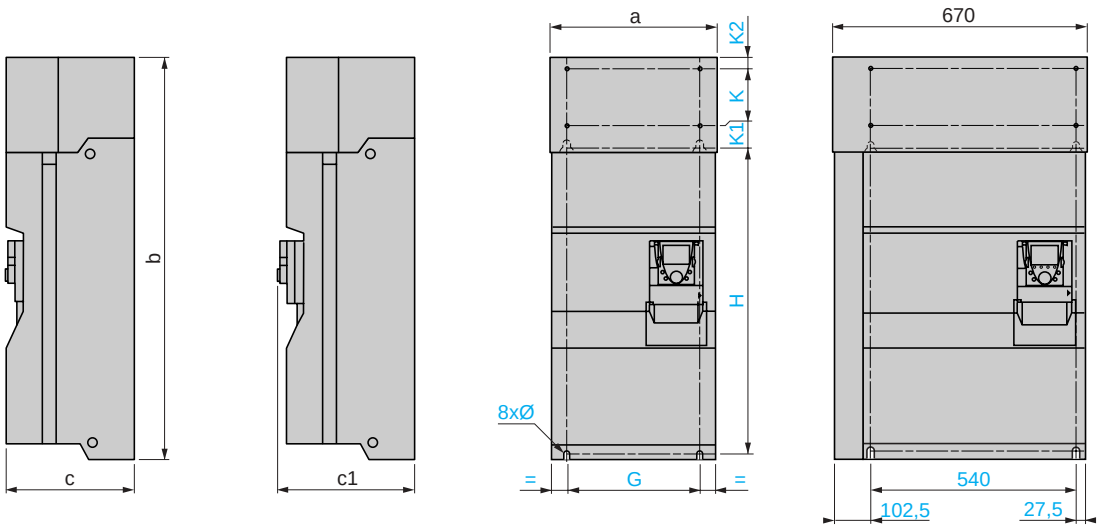
ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC28N4

With or without 1 option card *(1)*

2 option cards *(1)*

Common front view

ATV 71HC20N4...HC28N4 with braking unit VW3 A7 101



ATV 71H	a	b	c	c1	G	H	K	K1	K2	Ø
D55M3X, D90N4	320	920	377	392	250	650	150	75	30	11.5
D75M3X, C11N4	360	1022	377	392	298	758	150	75	30	11.5
C13N4	340	1190	377	392	285	920	150	75	30	11.5
C16N4	440	1190	377	392	350	920	150	75	30	11.5
C20N4...C28N4	595	1190	377	392	540	920	150	75	30	11.5

(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

ATV 71HC31N4...HC50N4

With or without 1 option card *(1)*

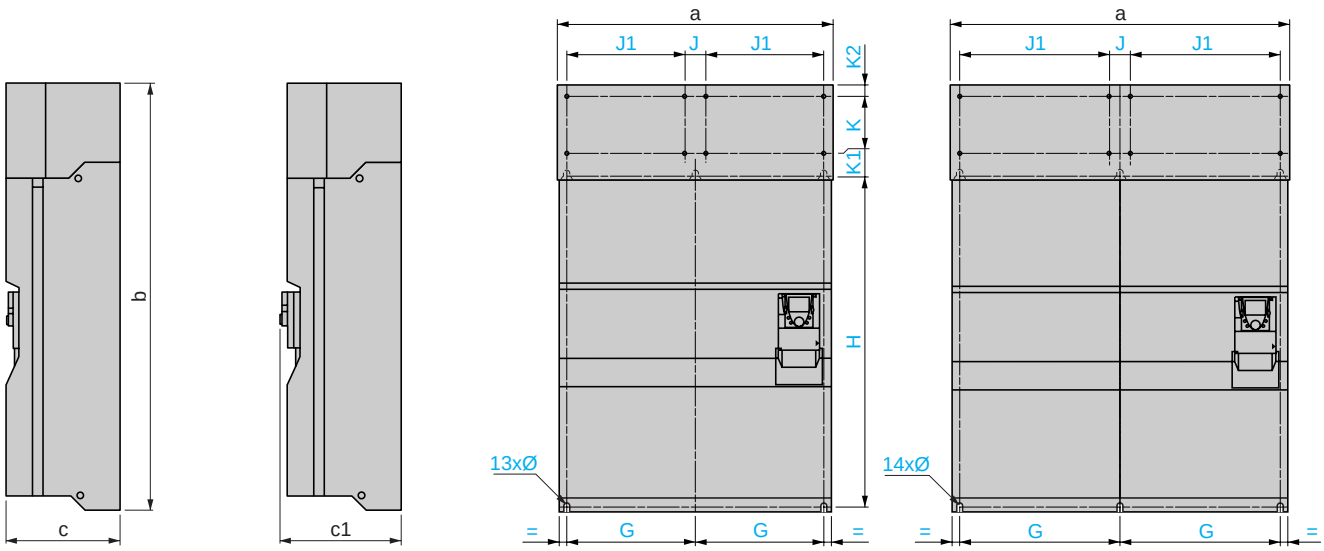
2 option cards *(1)*

ATV 71HC31N4, HC40N4

Front view

ATV 71HC50N4

Front view

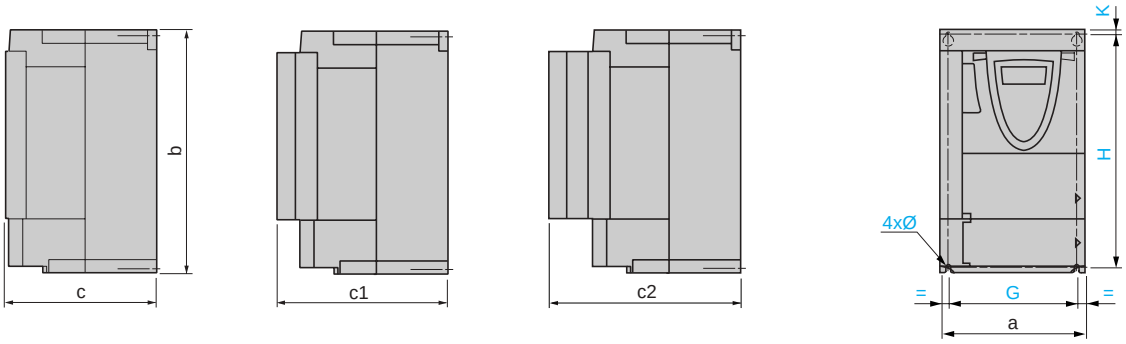


ATV 71H	a	b	c	c1	G	J	J1	H	K	K1	K2	Ø
C31N4, C40N4	890	1390	377	392	417.5	70	380	1120	150	75	30	11.5
C50N4	1120	1390	377	392	532.5	70	495	1120	150	75	30	11.5

Variable speed drives for asynchronous motors
Altivar 71
Drives

ATV 71H●●●M3Z, ATV 71HD11M3XZ, HD15M3XZ, ATV 71H075N4Z...HD15N4Z

Without option card *(1)* | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**

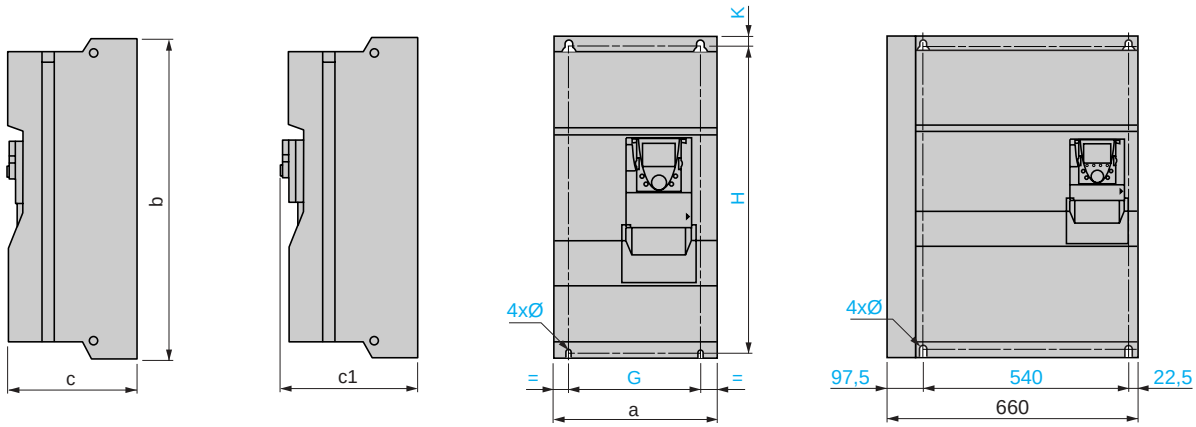


ATV 71H	a	b	c	c1	c2	G	H	K	Ø
037M3Z...U15M3Z, 075N4Z...U22N4Z	130	230	149	172	195	113.5	220	5	5
U22M3Z...U40M3Z, U30N4Z, U40N4Z	155	260	161	184	207	138	249	4	5
U55M3Z, U55N4Z, U75N4Z	175	295	161	184	207	158	283	6	6
U75M3Z, D11N4Z	210	295	187	210	233	190	283	6	6
D11M3XZ, D15M3XZ D15N4Z	230	400	187	210	233	210	386	8	6

(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

ATV 71HD55M3XD, HD75M3XD, ATV 71HD90N4D...HC28N4D

With or without 1 option card *(1)* | **2 option cards** *(1)* | **Common front view** | **ATV 71HC20N4D...HC28N4D with braking unit VW3 A7 101**



ATV 71H	a	b	c	c1	G	H	K	Ø
D55M3XD, D90N4D	310	680	377	392	250	650	15	11.5
D75M3XD, C11N4D	350	782	377	392	298	758	12	11.5
C13N4D	330	950	377	392	285	920	15	11.5
C16N4D	430	950	377	392	350	920	15	11.5
C20N4D...C28N4D	585	950	377	392	540	920	15	11.5

Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Schemes: pages 112 to 127 | Functions: pages 142 to 173

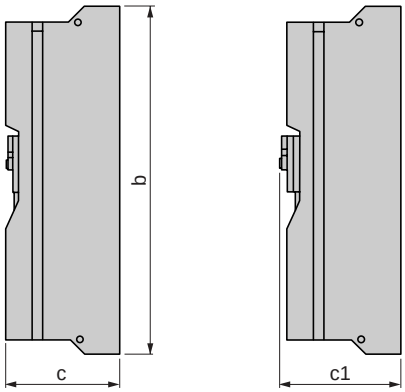
Variable speed drives for asynchronous motors

Altivar 71

Drives, accessories

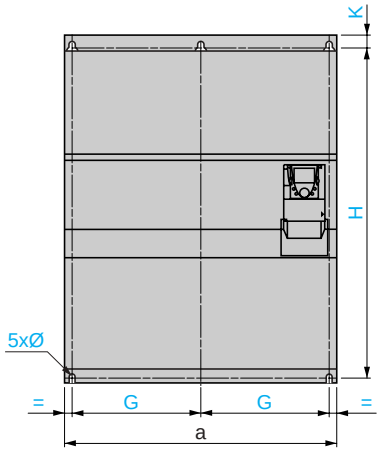
ATV 71HC31N4D…HC50N4D

With or without 1 option card *(1)* | **2 option cards** *(1)*



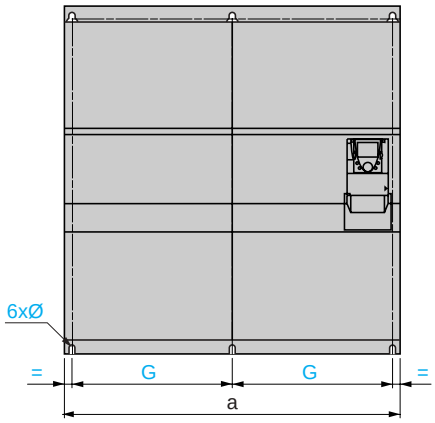
ATV 71HC31N4D, HC40N4D

Front view



ATV 71HC50N4D

Front view

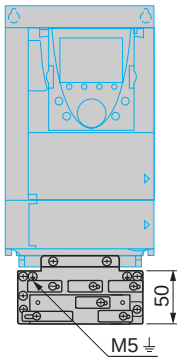


ATV 71H	a	b	c	c1	G	H	K	Ø
C31N4D, C40N4D	880	1150	377	392	417.5	1120	15	11.5
C50N4D	1110	1150	377	392	532.5	1120	15	11.5

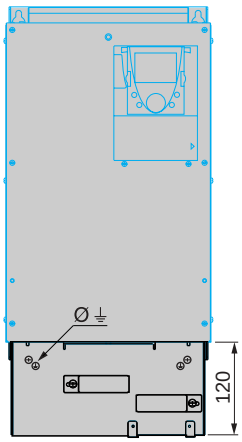
(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

EMC mounting plates *(1)*

For ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD18N4



For ATV 71HD18M3X…HD45M3X, ATV 71HD22N4…HD75N4

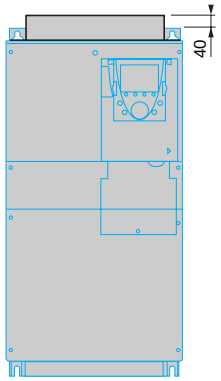


For ATV 71H	Ø
D18M3X, 22M3X, D22N4…D37N4	M5
D30M3X…D45M3X D45N4…D75N4	M8

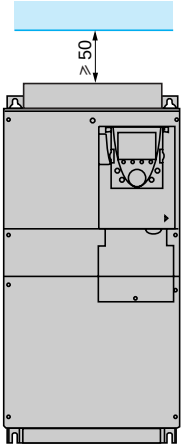
*(1) Supplied with the drive apart from **ATV 71HD55M3X**, **HD75M3X**, **ATV 71HD90N4**…**HC50N4**. In the case of these drives the mounting plate is supplied with the NEMA Type 1, IP 21 or IP 31 conformity kits, which must be ordered separately, see pages 22 and 23. Dimensions, see page 97.*

Control card fan kits

VW3 A9 406, 407



Mounting recommendations



Variable speed drives for asynchronous motors

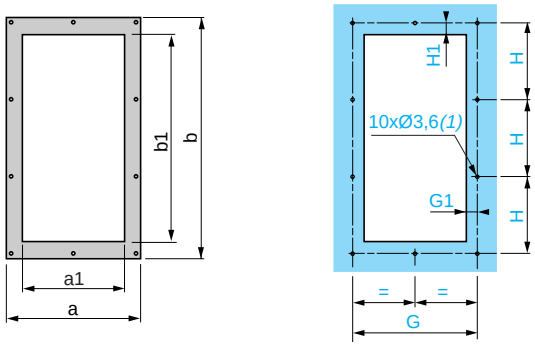
Altivar 71

Accessories

Kits for flush-mounting inside dust and damp proof enclosure

VW3 A9 501...505

Cut-outs and drill holes

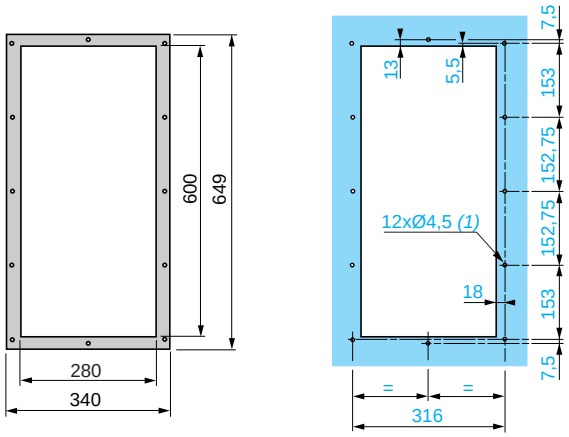


VW3	a	a1	b	b1	G	G1	H	H1
A9 501	222	169	398.8	342	206	18.5	127	19.5
A9 502	247	194	425.5	368	230	18	136	20
A9 503	267	214	463	406	250	18	149	20.5
A9 504	302	249	463.9	407	286	18.5	149	20
A9 505	322	269	566.8	510	304	17.5	183	19.5

(1) Ø 3.6 hole for M4 self-tapping screw.

VW3 A9 506

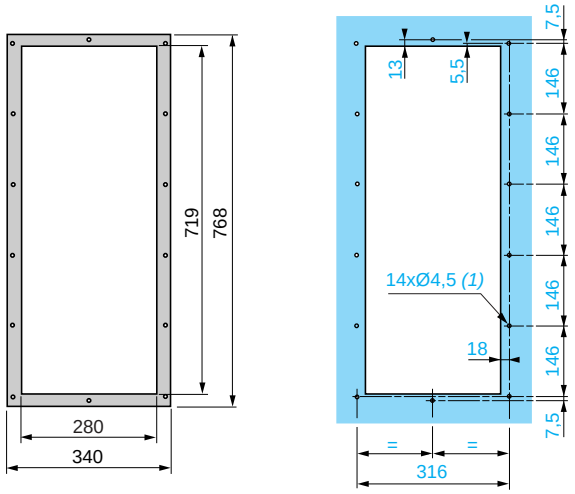
Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 507

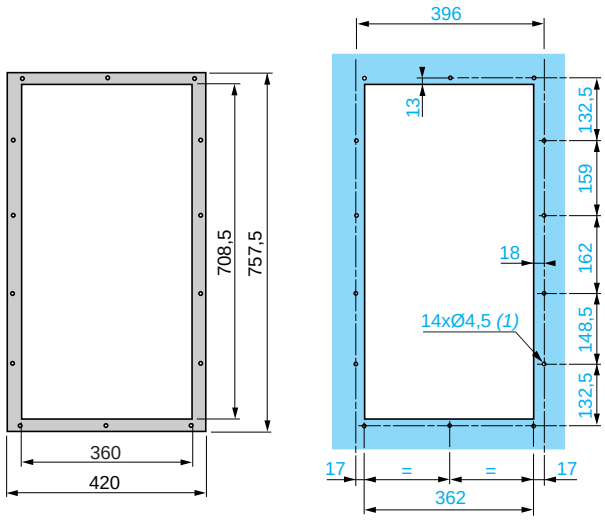
Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 508

Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

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Variable speed drives for asynchronous motors

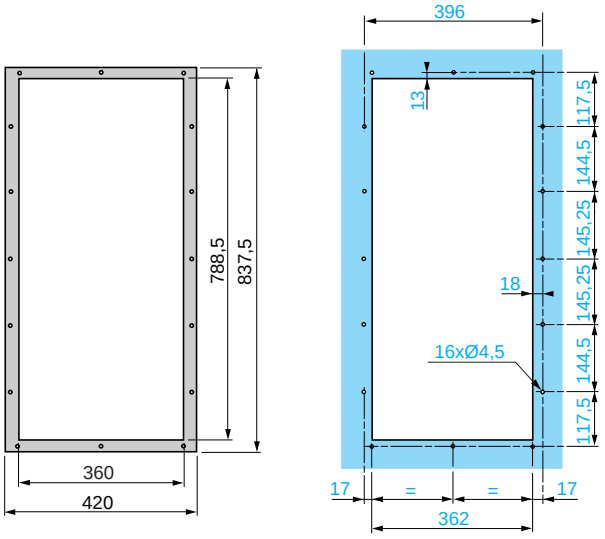
Altivar 71

Accessories

Kits for flush-mounting inside dust and damp proof enclosure (continued)

VW3 A9 509

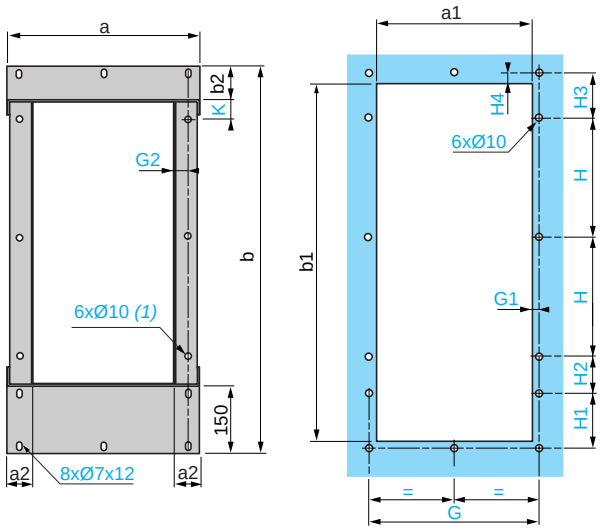
Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 510, 511

Cut-outs and drill holes

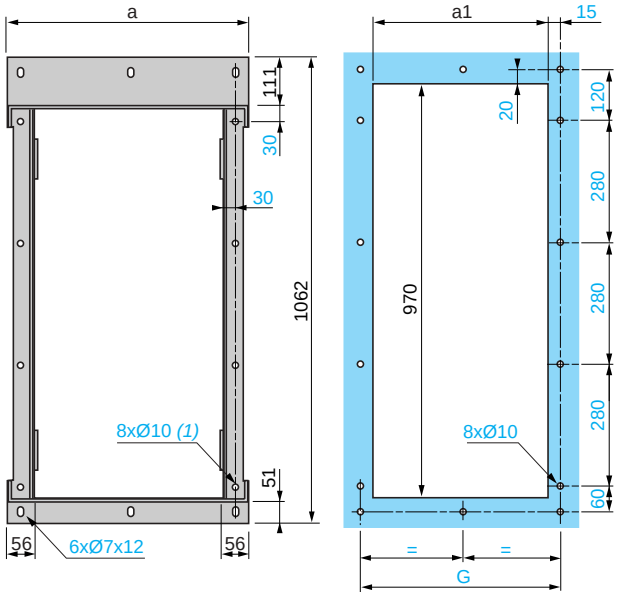


VW3	a	a1	a2	b	b1	b2	G1
A9 510	420	340	55	850	790	80	15
A9 511	440	360	45	885	845	66	18
VW3	**G2**	**H**	**H1**	**H2**	**H3**	**H4**	**K**
A9 510	30	260	120	80	100	15	35
A9 511	23	310	70	91.5	83.5	10	27.5

(1) For fixing using an M8 screw min.

VW3 A9 512, 513

Cut-outs and drill holes



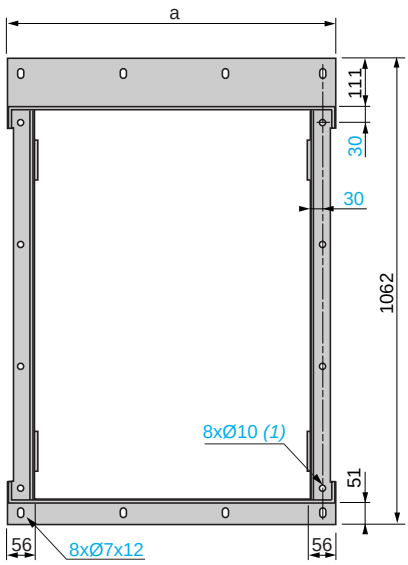
VW3	a	a1	G
A9 512	442	360	390
A9 513	542	460	490

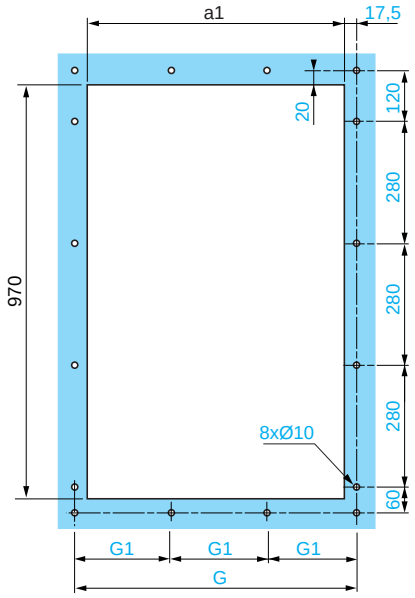
(1) For fixing using an M8 screw min.

Kits for flush-mounting inside dust and damp proof enclosure (continued)

VW3 A9 514, 515

Cut-outs and drill holes



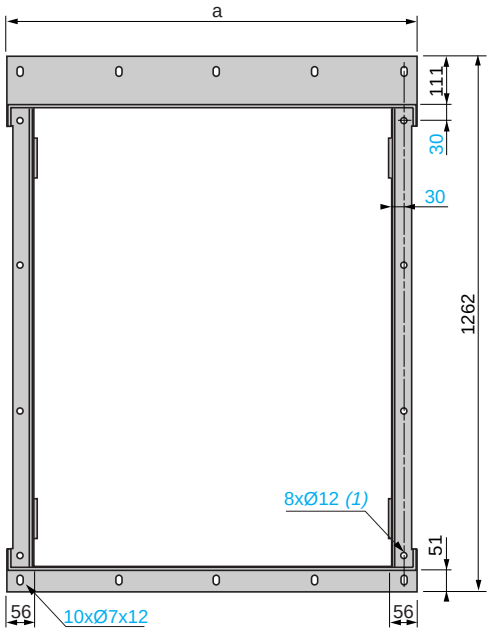


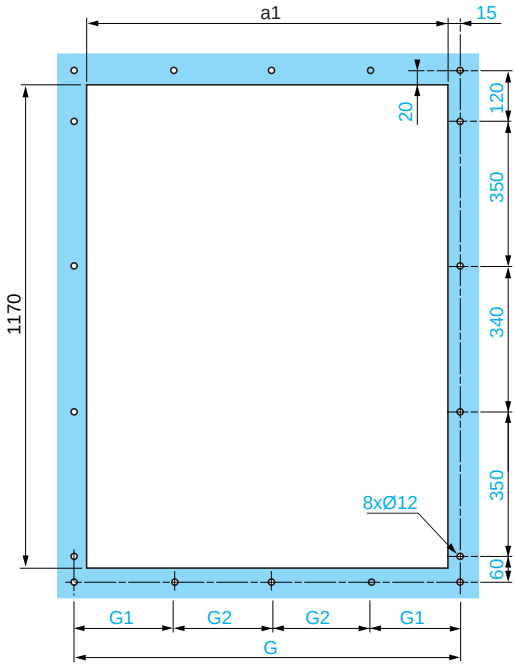
VW3	a	a1	G	G1
A9 514	697	610	645	215
A9 515	772	685	720	240

(1) For fixing using an M8 screw min.

VW3 A9 516, 517

Cut-outs and drill holes





VW3	a	a1	G	G1	G2
A9 516	992	910	940	235	235
A9 517	1222	1140	1170	285	300

(1) For fixing using an M10 screw min.

Presentation:
page 21

References:
page 21

Functions:
pages 142 to 173

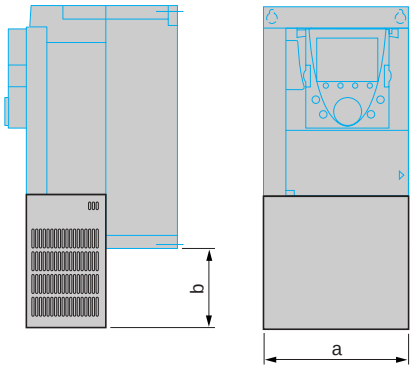
Variable speed drives for asynchronous motors

Altivar 71

Accessories

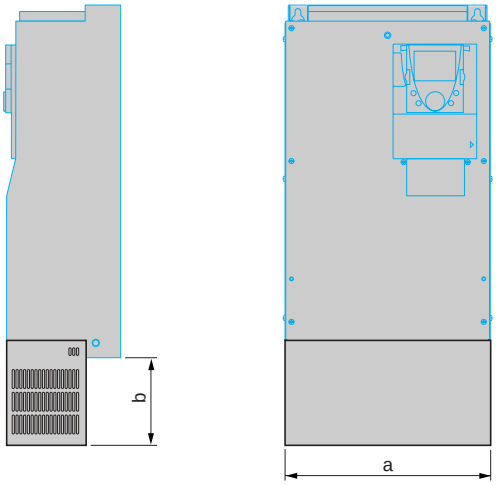
NEMA Type 1, IP 21 (VW3 A9 2●●) or IP 31 (VW3 A9 1●●) conformity kits

VW3 A9 101…105, 201…205



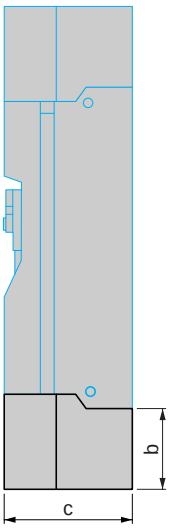
VW3	a	b
A9 101, 201	130	113
A9 102, 202	155	103
A9 103, 203	175	113
A9 104, 204	210	113
A9 105, 205	230	108

VW3 A9 106…108, 206…208

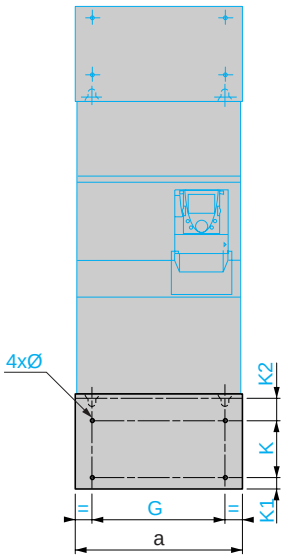


VW3	a	b
A9 106, 206	240	185
A9 107, 207	240	180
A9 108, 208	320	178

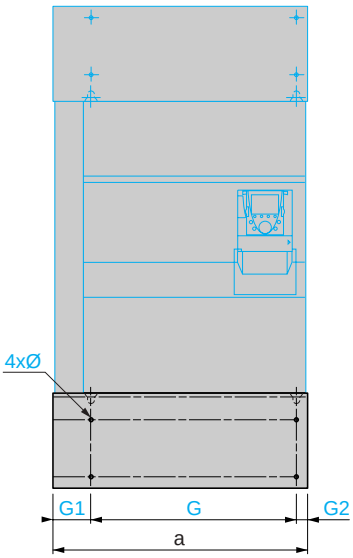
VW3 A9 109…116, VW3 A9 209…216



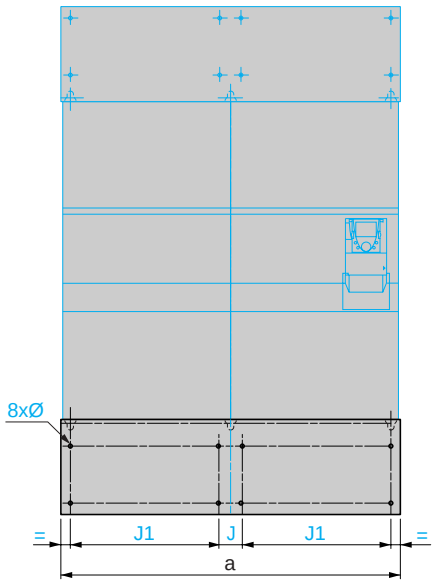
VW3 A9 109…113, 115, VW3 A9 209…213, 215



VW3 A9 114, 214



VW3 A9 116, 216



VW3	a	b	c	G	G1	G2	K	K1	K2	Ø	J	J1
A9 109, 209	320	220	377	250	–	–	95	65	75	11.5	–	–
A9 110, 210	360	300	377	298	–	–	172	65	75	11.5	–	–
A9 111, 211	340	315	377	285	–	–	250	65	75	11.5	–	–
A9 112, 212	440	375	377	350	–	–	250	65	75	11.5	–	–
A9 113, 213	595	375	377	540	–	–	250	65	75	11.5	–	–
A9 114, 214	670	375	377	540	102.5	27.5	250	65	75	11.5	–	–
A9 115, 215	890	475	477	835	–	–	350	65	75	11.5	–	–
A9 116, 216	1120	475	477	–	–	–	350	65	75	11.5	70	495

Presentation: pages 22 and 23
Characteristics: pages 8 to 13
References: pages 22 and 23
Schemes: pages 112 to 127
Functions: pages 142 to 173

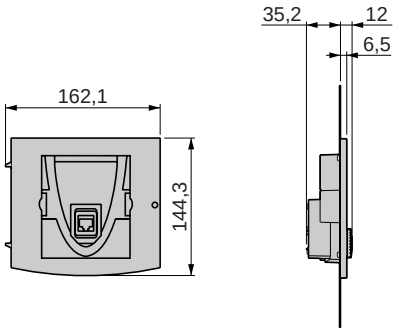
Variable speed drives for asynchronous motors

Altivar 71

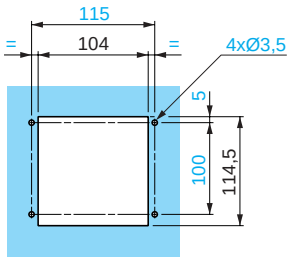
Accessories, braking units

Remote graphic display terminal

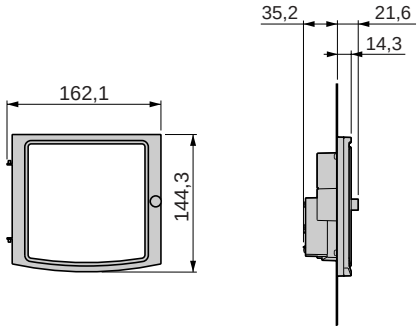
IP 54 kit VW3 A1 102



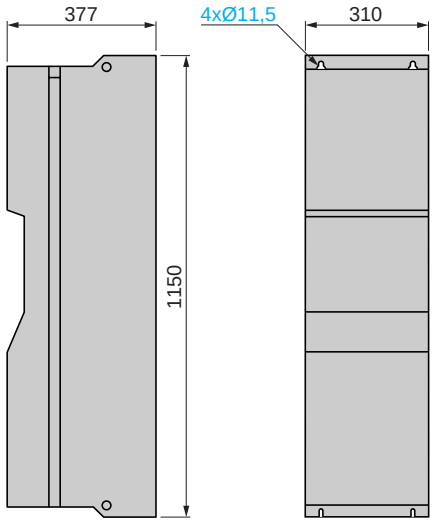
Cut-outs and drill holes



IP 65 kit VW3 A1 103



Braking unit VW3 A7 102



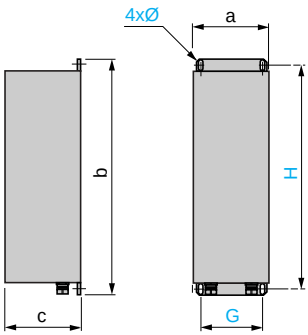
Variable speed drives for asynchronous motors

Altivar 71

Braking resistors

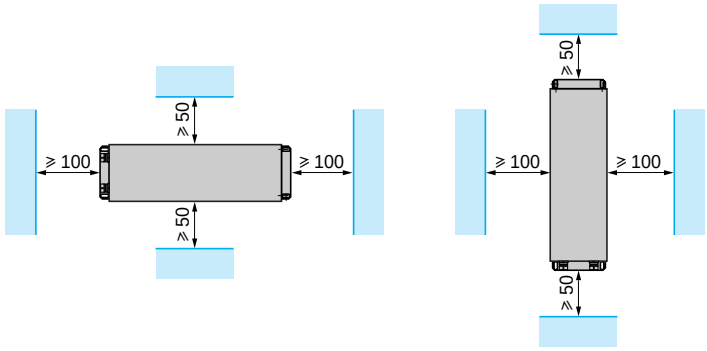
Braking resistors

VW3 A7 701...703

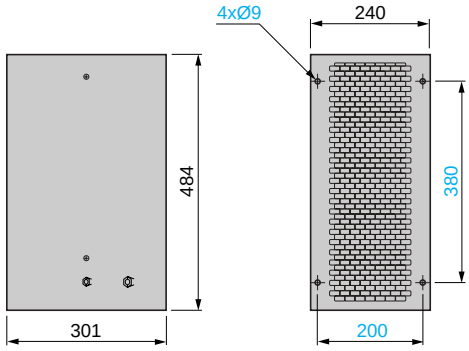


VW3	a	b	c	G	H	Ø
A7 701	95	293	95	70	275	6 x 12
A7 702	95	293	95	70	375	6 x 12
A7 703	140	393	120	120	375	6 x 12

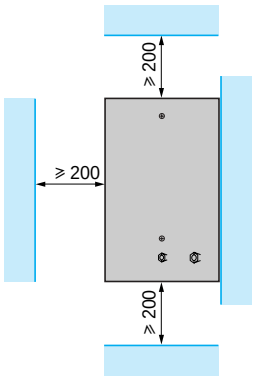
Mounting recommendations



VW3 A7 704...709



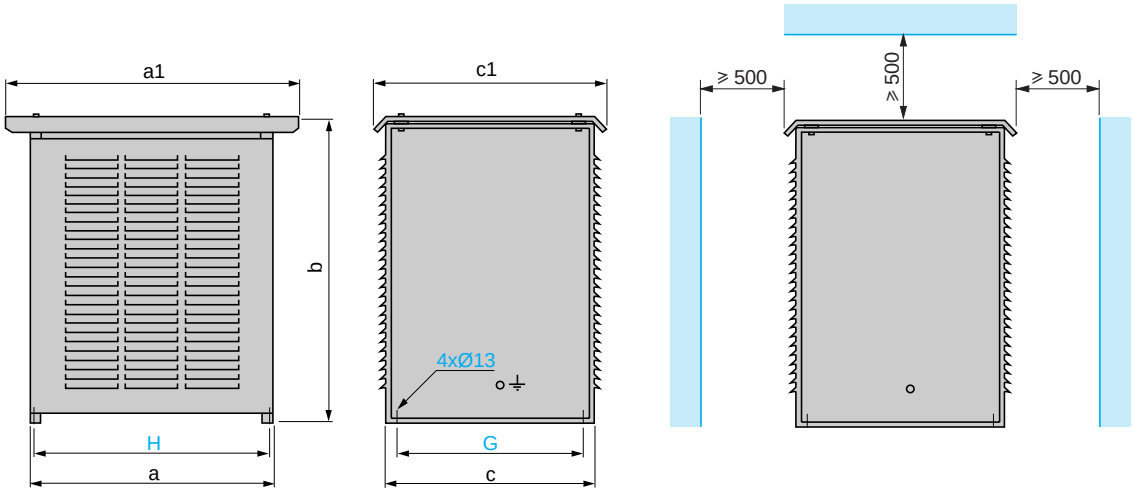
Mounting recommendations



Braking resistors (continued)

VW3 A7 710...712, 715...718 *(1)*

Mounting recommendations

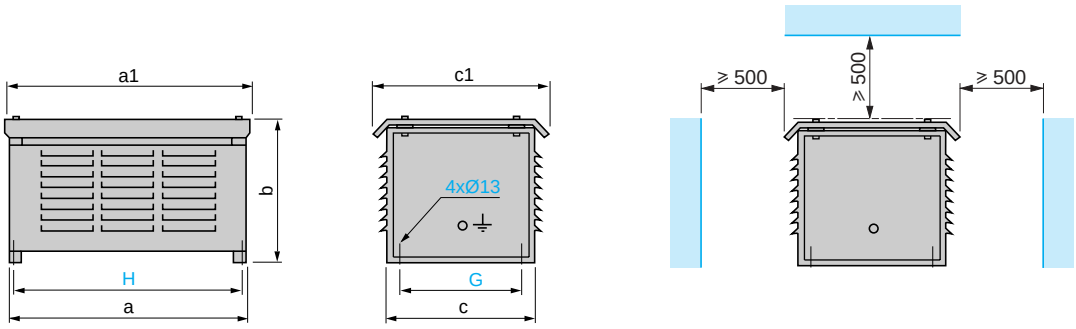


VW3	a	a1	b	c	c1	G	H
A7 710	860	1040	690	480	560	400	832
A7 711	960	1140	1150	380	460	300	932
A7 712	860	1040	1150	540	620	460	832
A7 715	960	1140	1150	540	620	460	932
A7 716	960	1140	1150	740	820	660	932
A7 717 *(1)*	960	1140	1150	540	620	460	932
A7 718 *(1)*	960	1140	1150	740	820	660	932

(1) The dimension is given for 1 component. References VW3 A7 717 and 718 consist of two components; all components must be taken into account to determine the overall dimensions. A space of 300 mm must be left between each component.

VW3 A7 713, 714

Mounting recommendations



VW3	a	a1	b	c	c1	G	H
A7 713	760	790	440	480	540	400	732
A7 714	960	990	440	480	540	400	932

Variable speed drives for asynchronous motors

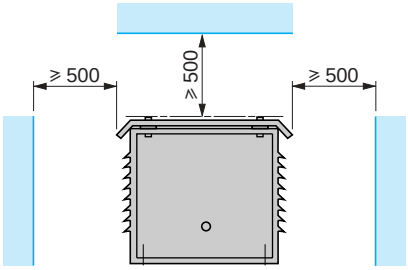
Altivar 71

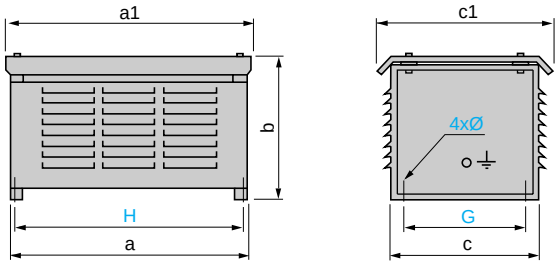
Hoist resistors

Hoist resistors

VW3 A7 801…804, 807…809

Mounting recommendations

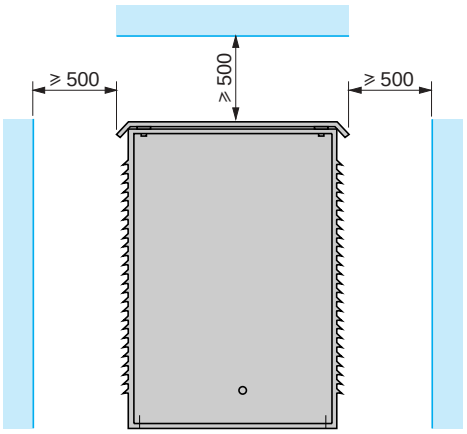


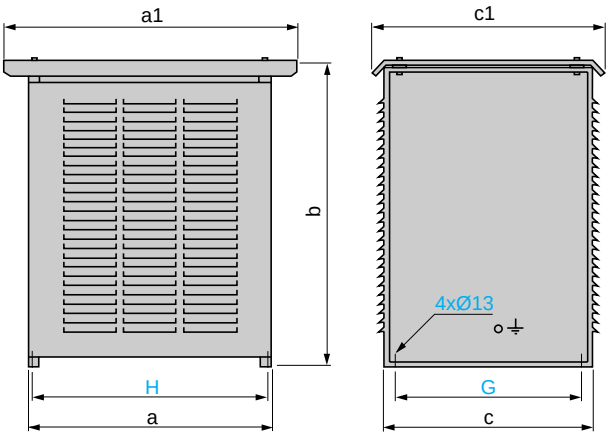


VW3	a	a1	b	c	c1	G	H	Ø
A7 801	490	452	203.5	153	202	95	470	10
A7 802	420	450	440	480	540	400	392	13
A7 803	580	610	440	480	540	400	552	13
A7 804	960	990	440	480	540	400	932	13
A7 807	860	890	440	480	540	400	832	13
A7 808	860	890	690	480	540	400	832	13
A7 809	860	890	690	480	450	400	832	13

VW3 A7 805, 806, 810…817 *(1)*

Mounting recommendations





VW3	a	a1	b	c	c1	G	H
A7 805	860	1040	1150	540	620	460	832
A7 806	860	1040	1150	740	820	660	832
A7 810	860	1040	1150	540	620	460	832
A7 811	960	1140	1150	540	620	460	932
A7 812	960	1140	1150	740	820	660	932
A7 813 *(1)*	960	1140	1150	540	620	460	932
A7 814 *(1)*	960	1140	1150	540	620	460	932
A7 815 *(1)*	960	1140	1150	740	820	660	932
A7 816 *(1)*	960	1140	1150	740	820	660	932
A7 817 *(1)*	960	1140	1700	740	820	660	932

(1) The dimension is given for 1 component.
References VW3 A7 813…815 consist of 2 components and references VW3 A7 816 and 817 consist of 3 components; all components must be taken into account to determine the overall dimensions. A space of 300 mm must be left between each component.

Presentation: page 52 | Characteristics: page 52 | References: page 53 | Schemes: page 118 | Functions: pages 142 to 173

Variable speed drives for asynchronous motors

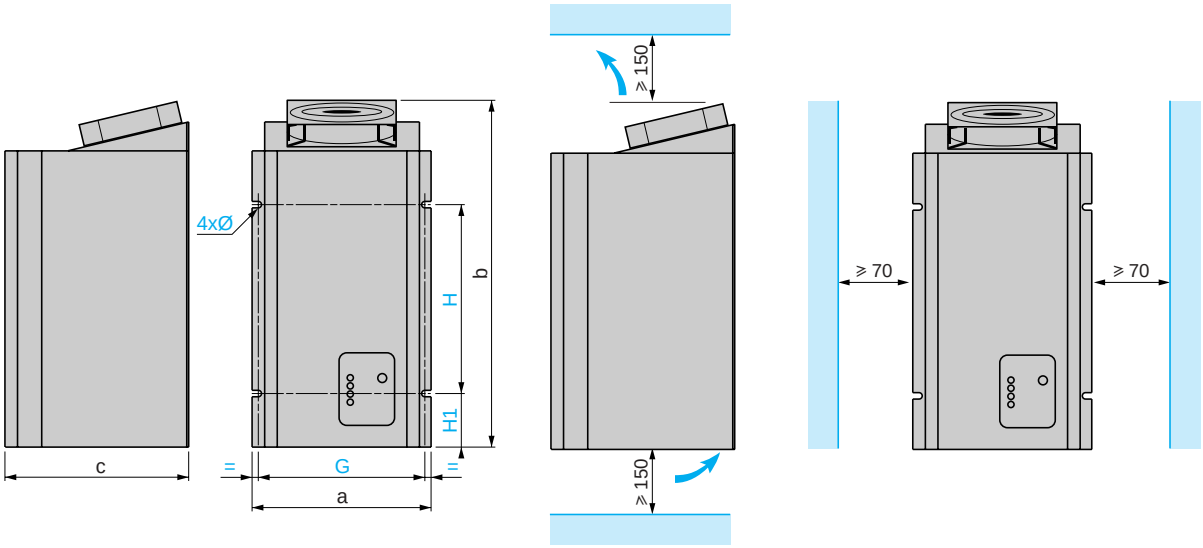
Altivar 71

Network braking units

Network braking units

VW3 A7 201...205, 231, 232

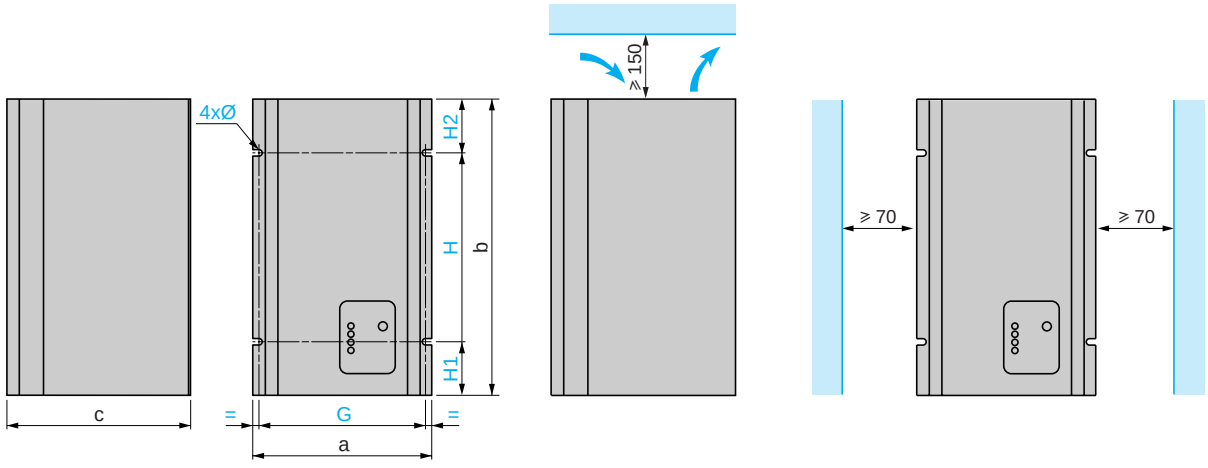
Mounting recommendations



VW3	a	b	c	G	H	H1	Ø
A7 201, 202	270	500	295	260	260	80	7
A7 203...205, A7 231...232	270	580	295	260	340	80	7

VW3 A7 206...208, 233...237

Mounting recommendations



VW3	a	b	c	G	H	H1	H2	Ø
A7 206...208	245	700	272	260	440	80	180	7
A7 233...237	272	700	295	260	440	80	180	7

Variable speed drives for asynchronous motors

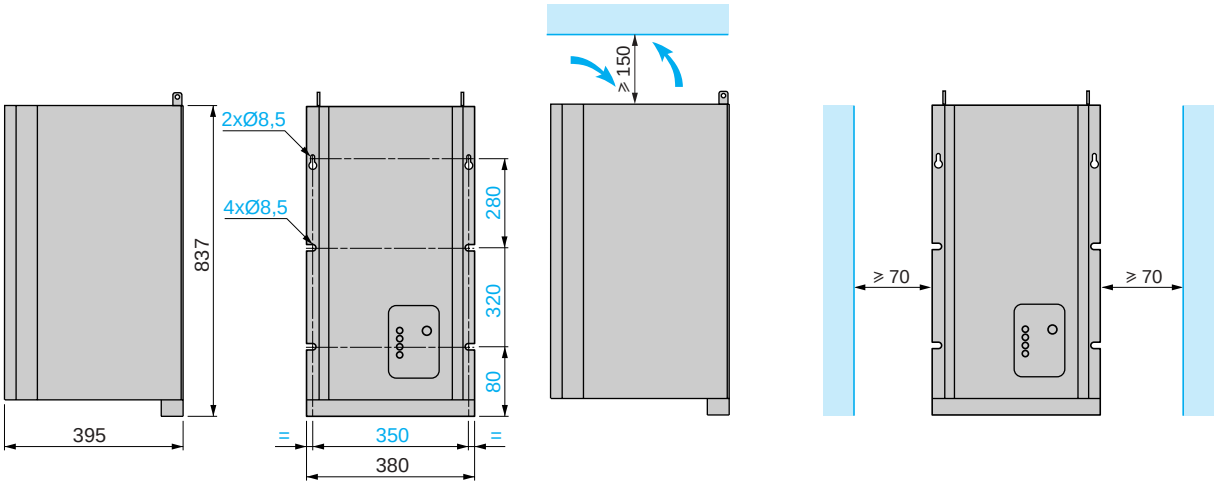
Altivar 71

Network braking units

Network braking units (continued)

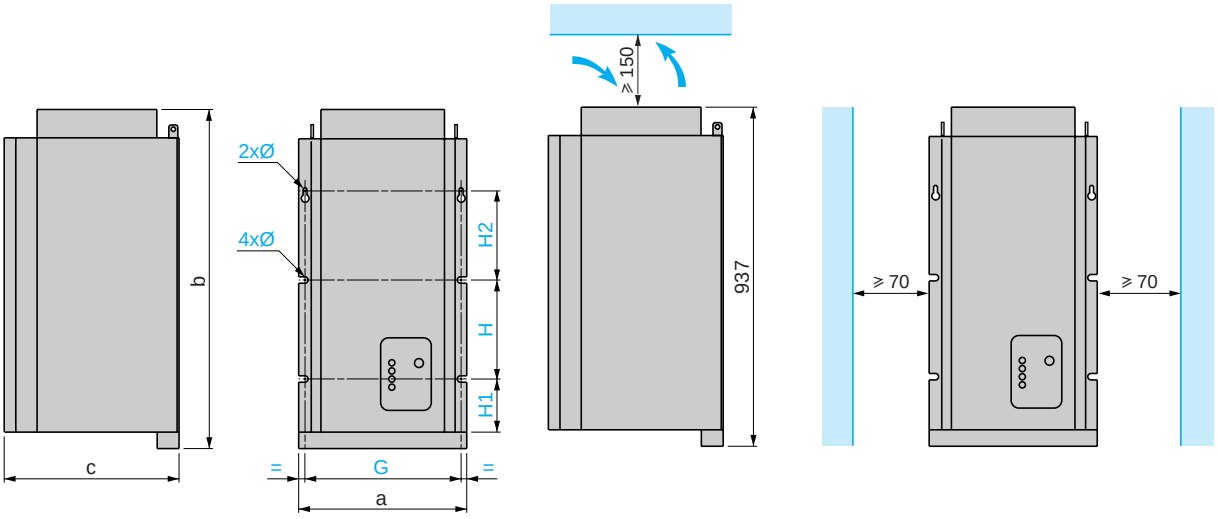
VW3 A7 209, 210, 238, 239

Mounting recommendations



VW3 A7 211, 212, 240, 241

Mounting recommendations



VW3	a	b	c	G	H	H1	H2	Ø
A7 211, 240	380	937	395	350	320	80	280	8.5
A7 212, 241	380	1037	395	350	320	80	280	8.5

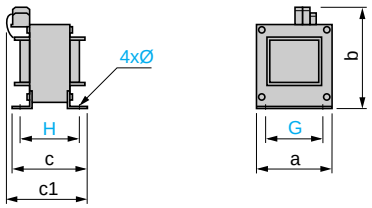
Variable speed drives for asynchronous motors

Altivar 71

DC chokes, line chokes

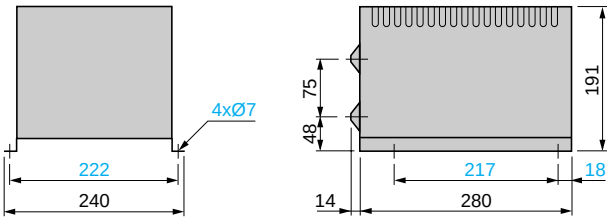
DC chokes

VW3 A4 501...510



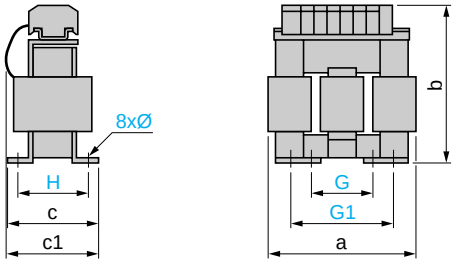
VW3	a	b	c	c1	G	H	Ø
A4 501	60	103	60	95	50	51	3.5
A4 502	60	103	77	118	50	68	3.5
A4 503	96	134	80	115	80	65	5.5
A4 504	96	134	79	115	80	64	5.5
A4 505	96	134	85	120	80	70	5.5
A4 506	96	134	89	120	80	74	5.5
A4 507	96	134	99	130	80	84	5.5
A4 508	108	142	112	145	90	97	5.5
A4 509	96	134	89	120	80	74	5.5
A4 510	126	171	120	170	105	103	7

VW3 A4 511, 512



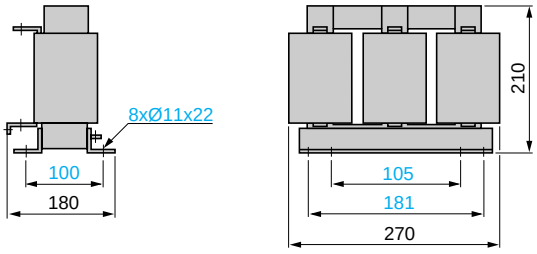
Line chokes

VW3 A4 551...555

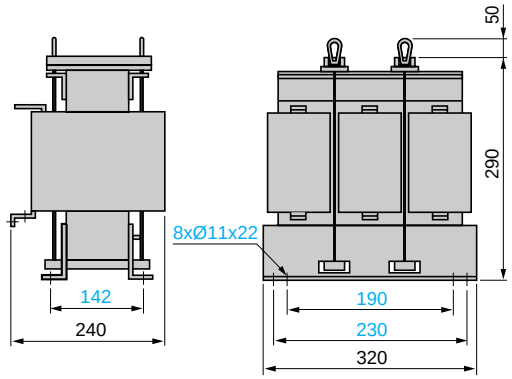


VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552, 553	130	155	85	90	60	80.5	62	6 x 12
A4 554	155	170	115	135	75	107	90	6 x 12
A4 555	180	210	125	165	85	122	105	6 x 12

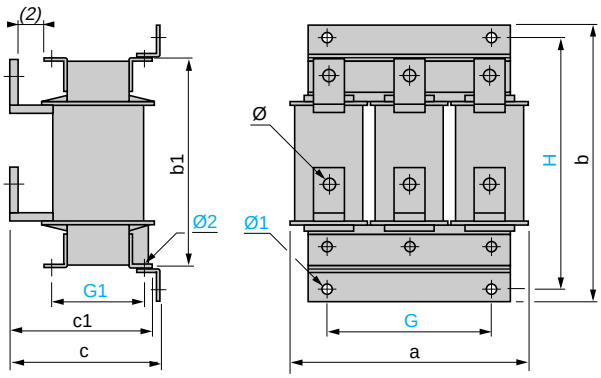
VW3 A4 556



VW3 A4 557



VW3 A4 558...567 *(1)*



VW3	a	b	b1	c	c1	G	G1	H	Ø	Ø1	Ø2
A4 558	280	305	240	210	200	200	125	275	9	9	9
A4 559	280	330	260	210	200	200	125	300	11	9	9
A4 560, 561	320	380	300	210	200	225	150	350	11	9	9
A4 562...564	320	380	300	250	230	225	150	350	13	11	11
A4 565	385	440	340	275	250	300	125	400	2 x Ø 13	13	13
A4 566, 567 *(1)*	320	380	300	250	230	225	150	350	13	11	11

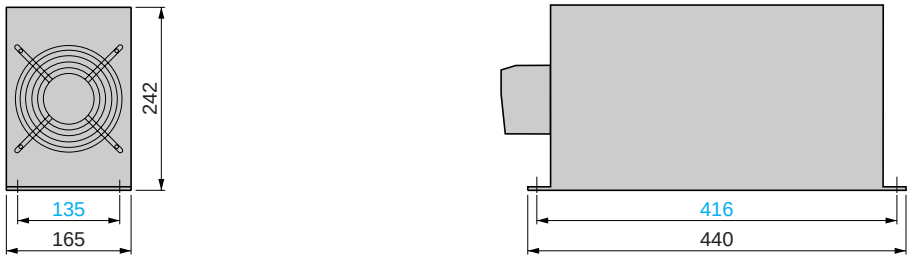
(1) The dimension is given for 1 component. References VW3 A4 566 and 567 consist of two components; all components must be taken into account to determine the overall dimensions.

(2) 25 mm minimum.

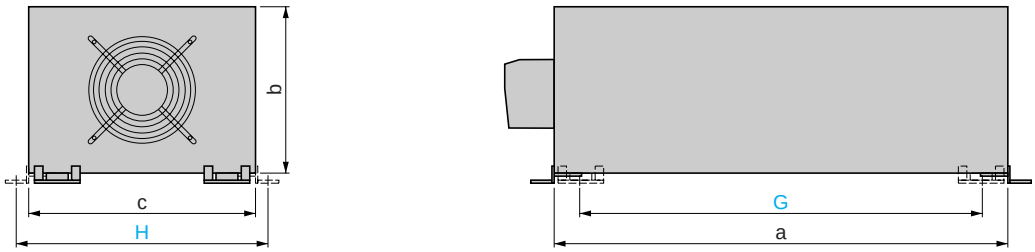
Presentation: pages 66 and 70
Characteristics: pages 68 and 71
References: pages 69 and 72
Schemes: pages 114 to 117
Functions: pages 142 to 173

Passive filters

VW3 A4 601…604, 621, 622, 641…644, 661…663

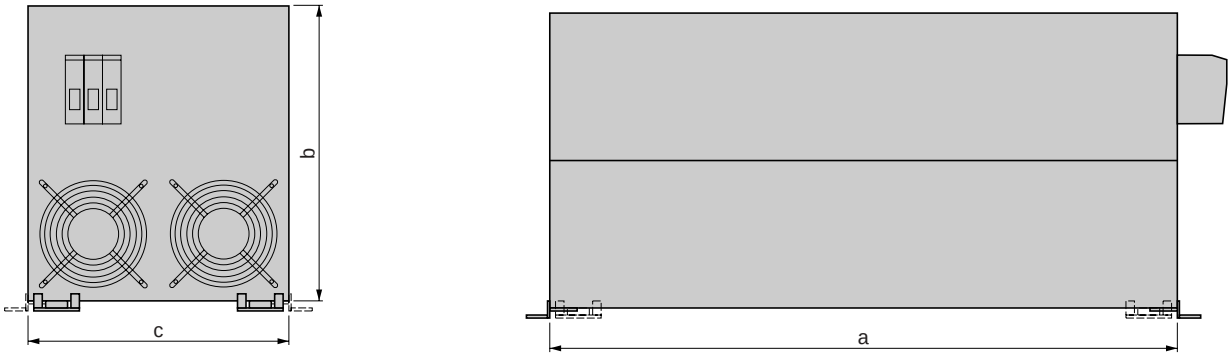


VW3 A4 605…609, 623…627, 645…648, 664…666



VW3	a	b	c	H	G
A4 605, 606, 623…625, 645, 646, 664, 665	600	220	302	333.5	532.5
A4 607…609, 626, 627, 647, 648, 666	840	220	302	333.5	772.5

VW3 A4 610…617, 628…637, 649…655, 667…675 *(1)*



VW3	a	b	c
A4 610, 611, 614 *(1)*, **628, 629, 649, 667, 668**	830	390	345
A4 612, 615…617 *(1)*, **630, 631, 634** *(1)*, **650, 652** *(1)*, **653** *(1)*, **655** *(1)*, **669**	900	409	406
A4 613, 632, 635…637 *(1)*, **651, 654** *(1)*, **670, 672** *(1)*, **673** *(1)*, **675** *(1)*	1070	409	406
A4 633, 671, 674 *(1)*	1100	409	474

(1) The dimension is given for 1 component.
References VW3 A4 614…616, 634…636, 652…654 and 672…674 consist of 2 components and references VW3 A4 617, 637, 655 and 675 consist of 3 components;
all components must be taken into account to determine the overall dimensions.

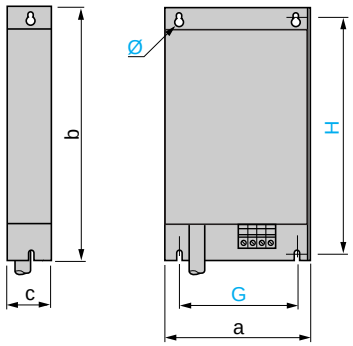
Variable speed drives for asynchronous motors

Altivar 71

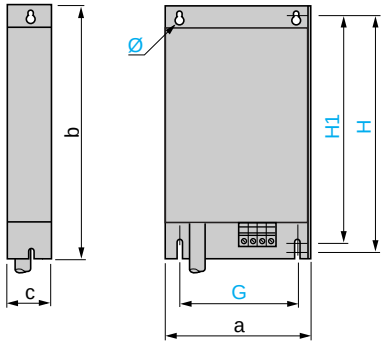
Additional EMC input filters

Additional EMC input filters

VW3 A4 401...404

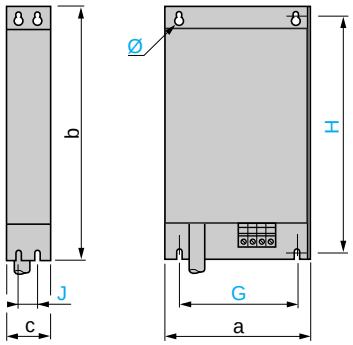


VW3 A4 405, 409



VW3	a	b	c	G	H	H1	Ø
A4 401	130	290	40	105	275	–	4.5
A4 402	155	324	50	130	309	–	4.5
A4 403	175	370	60	150	355	–	5.5
A4 404	210	380	60	190	365	–	5.5
A4 405	230	498.5	62	190	479.5	460	6.6
A4 409	230	498.5	62	190	479.5	460	6.6

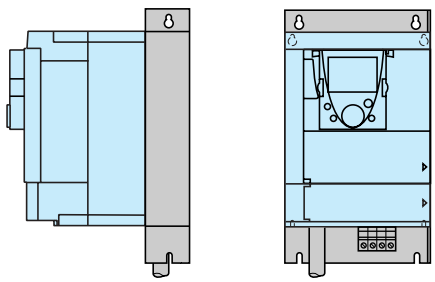
VW3 A4 406...408



VW3	a	b	c	G	H	J	Ø
A4 406	240	522	79	200	502.5	40	6.6
A4 407	240	650	79	200	631	40	6.6
A4 408	320	750	119	280	725	80	9

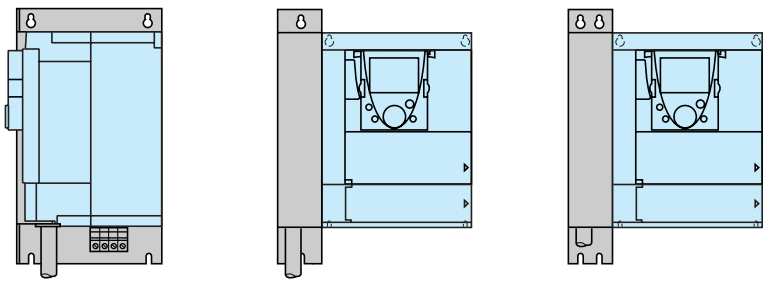
Mounting the filter under the drive

Front view



Mounting the filter next to the drive

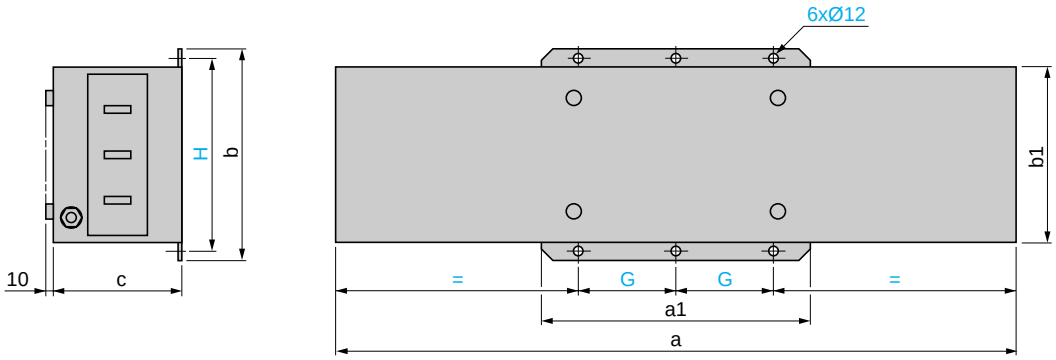
Front view



Presentation: page 76 | Characteristics: page 77 | References: pages 78 and 79 | Schemes: page 122 | Functions: pages 142 to 173

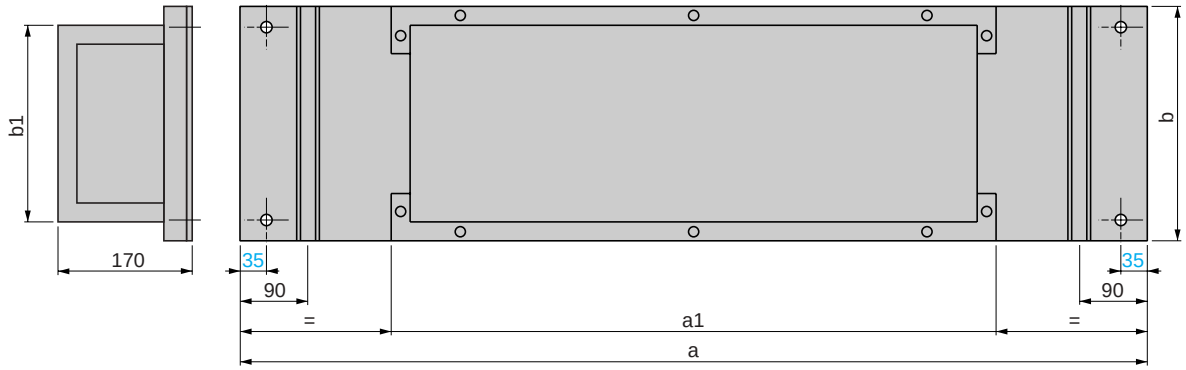
Additional EMC input filters (continued)

VW3 A4 410…413



VW3	a	a1	b	b1	c	G	H
A4 410	800	302	261	219	139	120	235
A4 411	800	302	261	219	139	120	235
A4 412	900	352	281	239	174	145	255
A4 413	1000	401	301	259	164	170	275

IP 30 protection kits for filters VW3 A4 410…413



VW3	a	a1	b	b1
A9 601	1200	800	310	270
A9 602	1400	1000	350	310

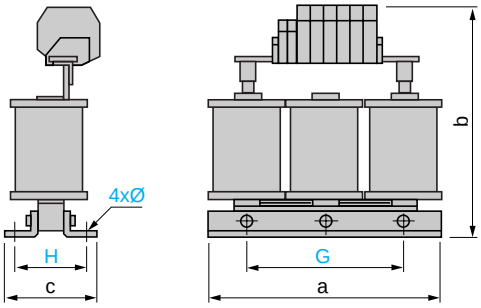
Variable speed drives for asynchronous motors

Altivar 71

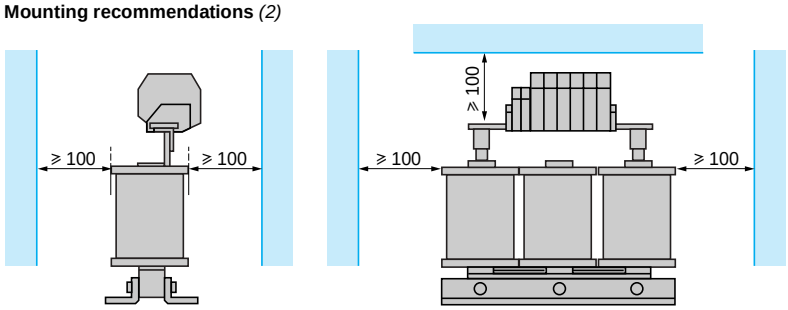
Motor chokes

Motor chokes *(1)*

VW3 A5 101, 102



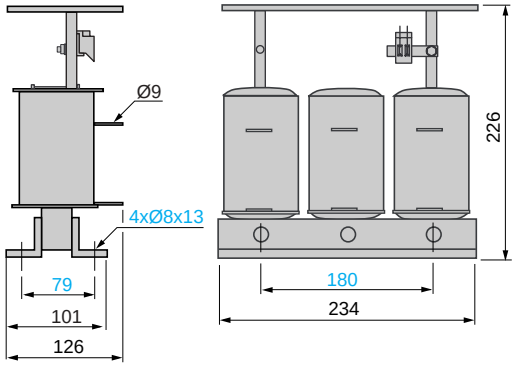
Mounting recommendations *(2)*

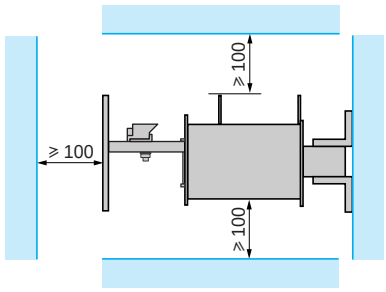


VW3	a	b	c	G	H	Ø
A5 101	190	210	90	170	45	8 x 12
A5 102	200	235	130	170	48	8 x 12

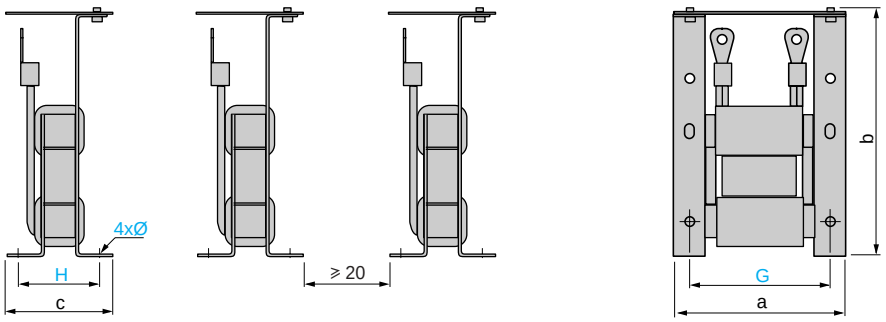
VW3 A5 103 *(3)*

Mounting recommendations *(2)*





VW3 A5 104, 105 *(4)*



VW3	a	b	c	G	H	Ø
A5 104	170	250	100	150	75	9
A5 105	210	250	110	175	75	9 x 13

(1) It is absolutely essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) Because of the magnetic field, it is very important to follow the mounting recommendations provided.
(3) Because of heat dissipation, this choke must be mounted vertically.
(4) References VW3 A5 104 and 105 consist of 3 components.

Presentation: pages 80 and 81 | Characteristics: page 81 | References: pages 82 and 83 | Schemes: page 122 | Functions: pages 142 to 173

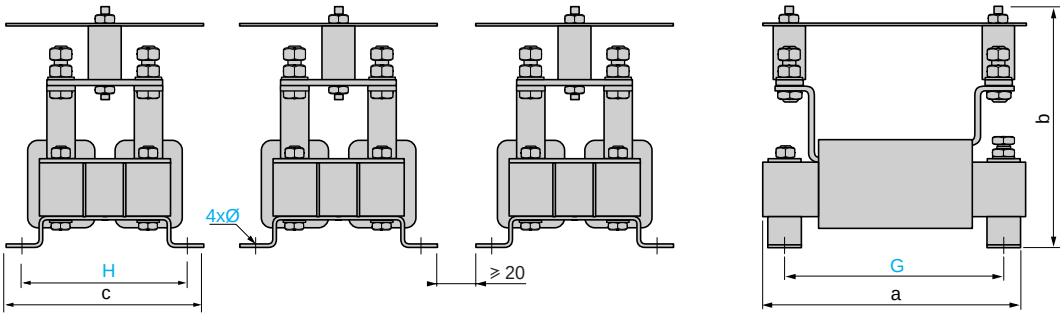
Variable speed drives for asynchronous motors

Altivar 71

Motor chokes

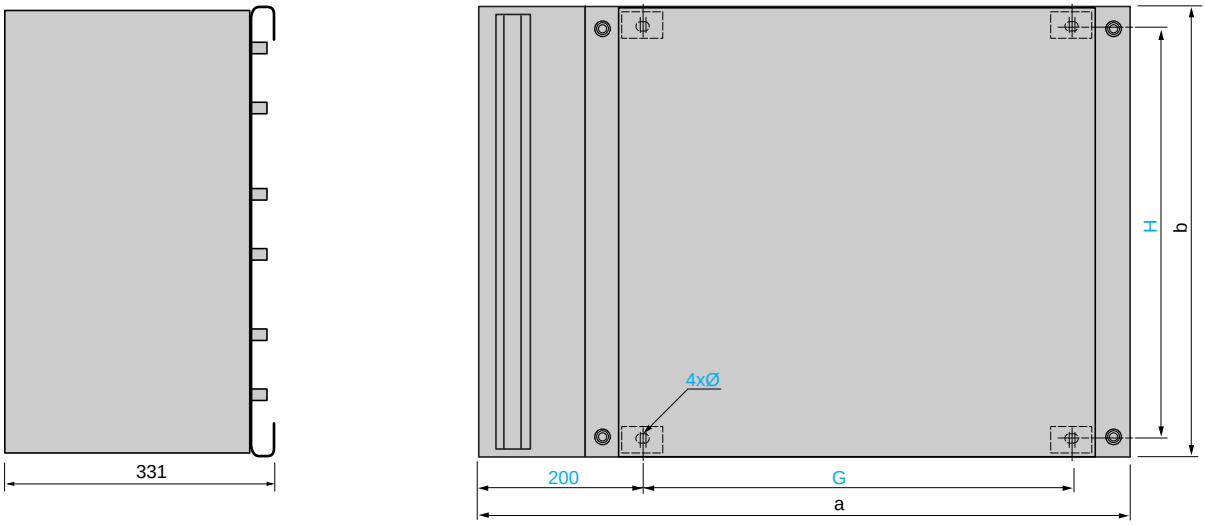
Motor chokes (continued) *(1)*

VW3 A5 106…108 *(2)*



VW3	a	b	c	G	H	Ø
A5 106 *(1)*	245	250	200	225	175	9
A5 107 *(1)*	315	250	210	275	175	9
A5 108 *(1)*	370	250	230	325	200	9

IP 20 protection kits for chokes VW3 A5 104…108



VW3	a	b	G	H	Ø
A9 612	800	600	530	554	10 x 15
A9 613	1200	800	800	757	10 x 15

(1) It is absolutely essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) References VW3 A5 106…108 consist of 3 components.

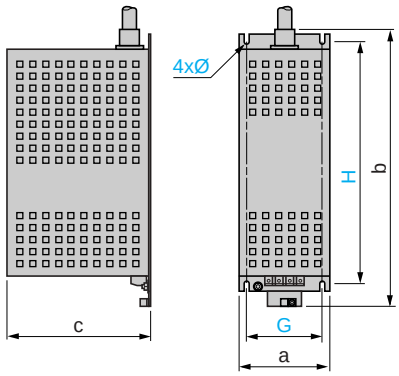
Variable speed drives for asynchronous motors

Altivar 71

Sinus filters

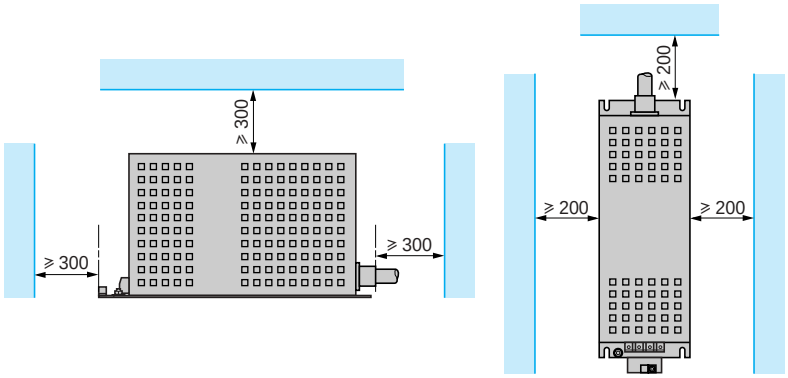
Sinus filters *(1)*

VW3 A5 201...206



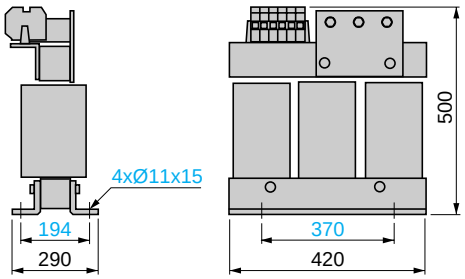
VW3	a	b	c	G	H	Ø
A5 201	120	335	160	100	280	6.6
A5 202	120	375	190	100	320	6.6
A5 203	150	470	240	120	380	6.6
A5 204	210	650	280	160	530	8.6
A5 205	250	780	360	200	650	8.6
A5 206	300	930	415	220	780	11

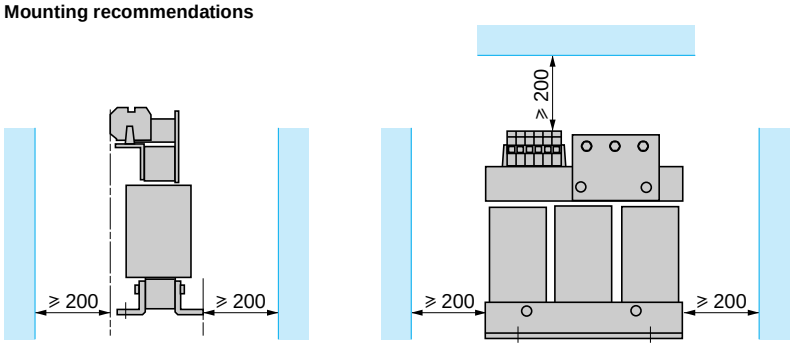
Mounting recommendations



VW3 A5 207

Mounting recommendations



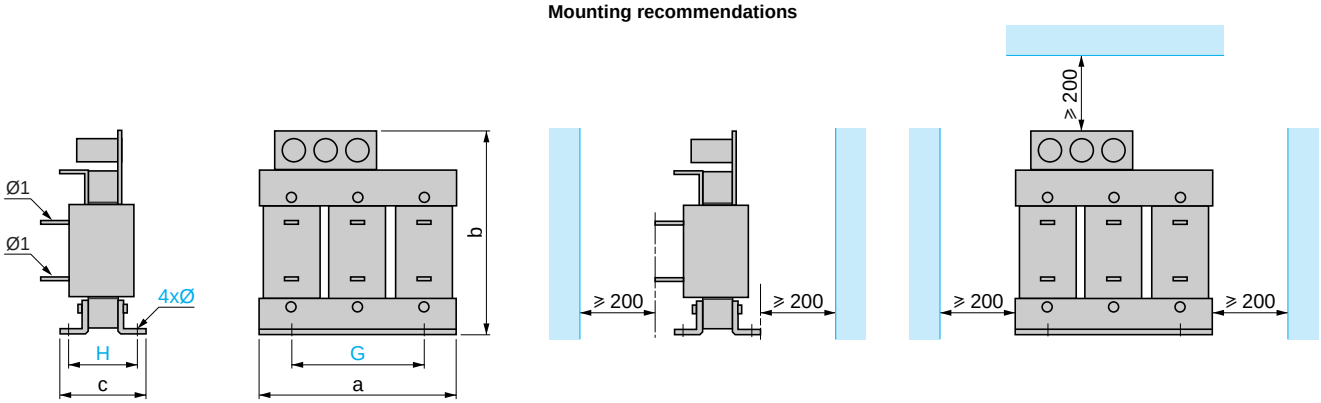


(1) Sinus filters emit considerable heat and must not be placed underneath the drive.

Sinus filters *(1)*

VW3 A5 208...211

Mounting recommendations



VW3	a	b	c	G	H	Ø	Ø1
A5 208	420	500	345	370	231	11 x 15	11
A5 209	480	600	340	430	238	13 x 18	11
A5 210	480	710	370	430	258	13 x 18	14
A5 211	620	930	500	525	352	13 x 22	4 x Ø 11

(1) Sinus filters emit considerable heat and must not be placed underneath the drive.

Variable speed drives for asynchronous motors
Altivar 71
Safety requirements

“Power Removal” safety function

The Altivar 71 drive integrates the “Power Removal” safety function which prohibits unintended equipment operation. The motor no longer produces torque.

This safety function:
- complies with standard for safety of machinary EN 954-1, category 3
- complies with standard for functional safety IEC/EN 61508, SIL2 capability (Functional safety of electrical/electronic/programmable electronic safety-related systems)

The SIL (Safety Integrity Level) capability depends on the connection diagram for the drive and for the safety function. Failure to observe the setup recommendations could inhibit the SIL capability of the “Power Removal” safety function.
- complies with definition of the draft product standard IEC/EN 61800-5-2 for both stop functions:
  - Safe Torque Off (“STO”)
  - Safe Stop 1 (“SS1”)

The “Power Removal” safety function has a redundant electronic architecture *(1)* which is monitored continuously by a diagnostics function.

This SIL2 and category 3 level of safety function is certified as conforming to these standards by the INERIS certification body under a program of voluntary certification.

Categories relating to safety according to EN 954-1

Categories	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that conform to relevant standards.	Control in accordance with good engineering practice.	Possible loss of safety function.
1	Selection of components and basic safety principles.	Use of tried and tested components and proven safety principles.	Possible loss of safety function, but with less probability of this than with **B**
2	Selection of components and basic safety principles.	Cyclic testing. The test intervals must be suited to the machine and its applications.	Fault detected at each test.
3	Structure of the safety circuits.	A single fault must not cause loss of the safety function. This single fault must be detected if reasonably practicable.	Safety function ensured, except in the event of an accumulation of faults.
4	Structure of the safety circuits.	A single fault must not cause loss of the safety function. This fault must be detected at or before the next demand on the safety function. An accumulation of faults must not cause loss of the safety function.	Safety function always ensured.

The machinary manufacturer is responsible for selecting the safety category. The category depends of the level of risk factors given in standard EN 954-1.

Safety Integrity Levels (SIL) according to standard IEC/EN 61508

SIL1 according to standard IEC/EN 61508 is comparable with category 1 according to EN 954-1 (SIL1: means probability of undetected dangerous failure per hour between 10^{-5} and 10^{-6}).
SIL2 according to standard IEC/EN 61508 is comparable with category 3 according to EN 954-1 (SIL1: means probability of undetected dangerous failure per hour between 10^{-6} and 10^{-7}).

(1) Redundant: consists of mitigating the effects of failure of one component by means of the correct operation of another, assuming that faults do not occur simultaneously on both.

Variable speed drives for asynchronous motors
Altivar 71
Safety requirements

“Power Removal” safety function considerations

The “Power Removal” safety function cannot be considered as a means of electrical disconnection of the motor (no electrical isolation); if necessary, a Vario switch disconnector must be used.
The “Power Removal” safety function is not designed to overcome any malfunction in the drive process control or application functions.
The output signals available on the drive must not be considered as safety related signals (e.g. “Power Removal” active); these are Preventa-type safety module outputs which must be integrated into a safety related control/command circuit.

The schemes on the following pages take into account conformity with standard IEC/EN 60204-1 which defines three categories of stops:
- Category 0: stopping by immediate removal of the power from the machine actuators (i.e. an uncontrolled stop).
- Category 1: a controlled stop with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved.
- Category 2: a controlled stop with power left available to the machine actuators.

Connection diagrams and applications

Conformity with category 1 of standard EN 954-1 and level SIL1 according to standard IEC/EN 61508

Use of the connection diagrams on pages 114 and 115 which use a line contactor or a Vario switch disconnector between the drive and the motor. In this case, the “Power Removal” safety function is not used and the motor stops in accordance with category 0 of standard IEC/EN 60204-1.

Conformity with category 3 of standard EN 954-1 and level SIL2 according to standard IEC/EN 61508

The connection diagrams use the “Power Removal” safety function of the Altivar 71 drive combined with a Preventa safety module which monitors the Emergency stop circuits.

Machines with short freewheel stopping times (low inertia or high resistive torque, see page 116).
When the activation command is given on the PWR input with the controlled motor, the motor power supply is immediately switched off and the motor stops according to category 0 of standard IEC/EN 60204-1.
Restarting is not permitted even when the activation command is given after the motor has come to a complete stop (“STO”).
This safe stop is maintained while the PWR input remains activated.

This diagram must also be used for hoisting applications.
On a “Power Removal” command, the drive requires the brake to be engaged, but a Preventa safety module contact must be inserted in series in the brake control circuit to engage it safely when a request is made to activate the “Power Removal” safety function.

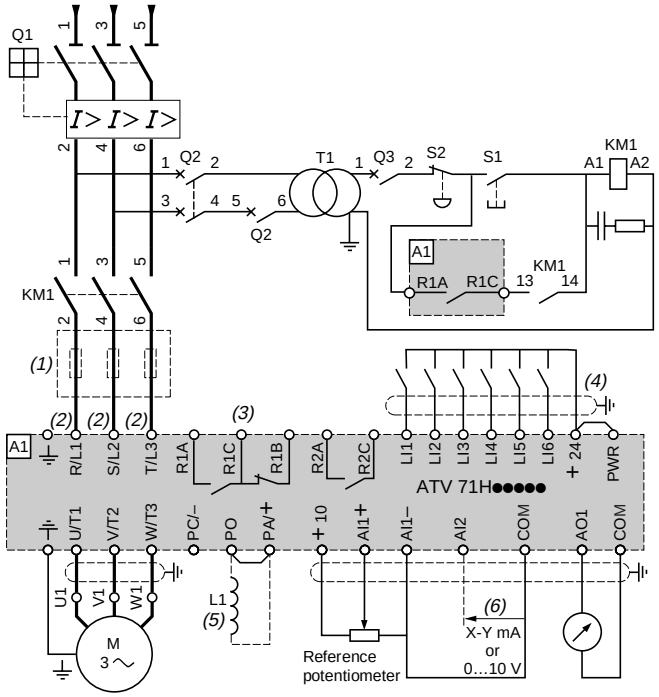
Machines with long freewheel stopping times (high inertia or low resistive torque, see page 117).
When the activation command is given, deceleration of the motor controlled by the drive is first requested, then, following a time delay controlled by a Preventa-type safety relay which corresponds to the deceleration time, the “Power Removal” safety function is activated by the PWR input. The motor stops according to category 1 of standard IEC/EN 60204-1 (“SS1”).

Periodic test
The “Power Removal” safety input must be activated at least once a year for preventive maintenance purposes. The drive must be switched off before preventive maintenance takes place, and then powered up again. If during testing the power supply to the motor is not switched off, safety integrity is no longer assured for the “Power Removal” safety function. The drive must therefore be replaced to ensure the operational safety of the machine or of the process system.

Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 SIL1 capability, in stopping category 0 according to IEC/EN 60204-1

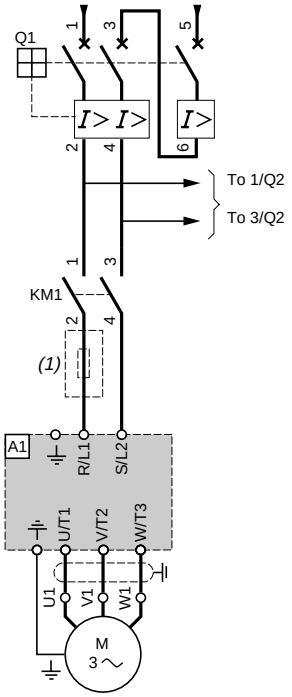
ATV 71●●●●M3, ATV 71●●●●M3X, ATV 71●●●●N4

3-phase power supply with upstream breaking via contactor



ATV 71H075M3…HU75M3

Power section for single phase power supply



Note: *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

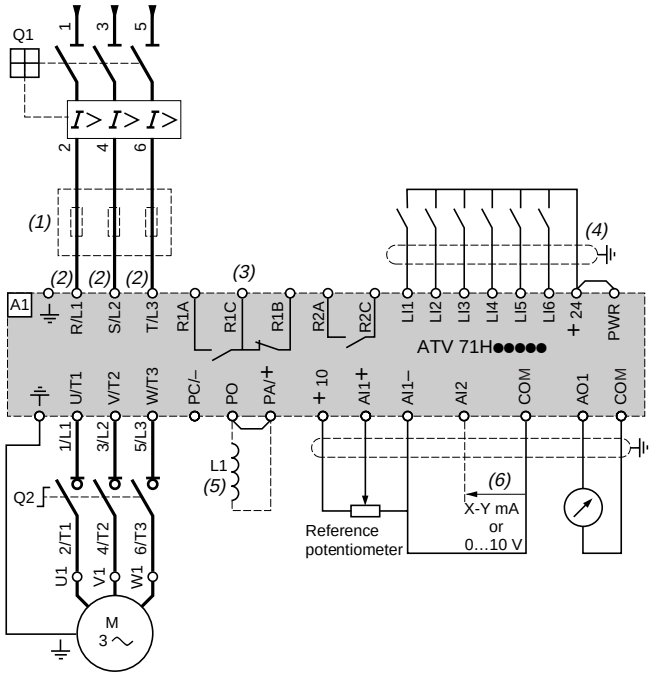
Reference	Description
A1	ATV 71 drive, see pages 18 and 19
KM1	Contactor, see motor starters pages 128 to 131
L1	DC choke, see page 69
Q1	Circuit-breaker, see motor starters pages 128 to 131
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05
S1, S2	XB4 B or XB5 A pushbuttons
T1	100 VA transformer 220 V secondary

(1) Line choke (single phase or 3-phase), see page 72.
(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 118.
(3) Fault relay contacts. Used for remote signalling of the drive status.
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 118.
(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(6) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 SIL1 capability, in stopping category 0 according to IEC/EN 60204-1 (continued)

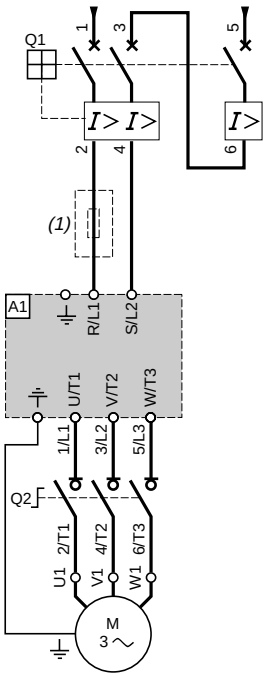
ATV 71●●●●M3, ATV 71●●●●M3X, ATV 71●●●●N4

3-phase power supply with downstream breaking via switch disconnector



ATV 71H075M3...HU75M3

Power section for single phase power supply



Note: *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

Reference	Description
A1	ATV 71 drive, see pages 18 and 19
L1	DC choke, see page 69
Q1	Circuit-breaker, see motor starters pages 128 to 131
Q2	Switch disconnector (Vario)

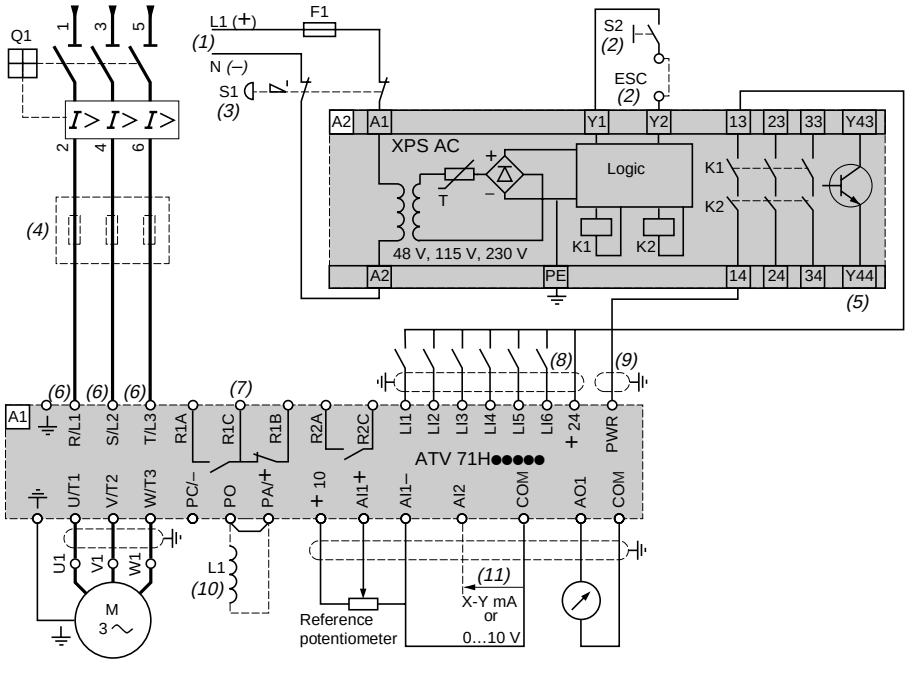
(1) Line choke (single phase or 3-phase), see page 72.
(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 118.
(3) Fault relay contacts. Used for remote signalling of the drive status.
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 118.
(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71H075N4...HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(6) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

Variable speed drives for asynchronous motors
Altivar 71

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1

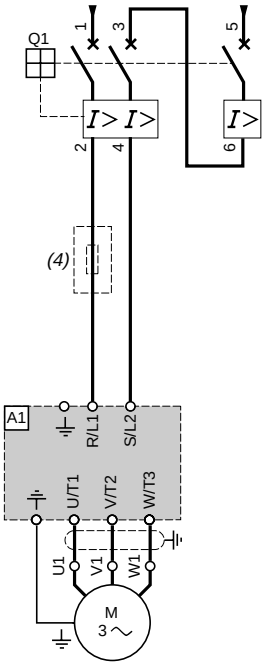
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4

3-phase power supply, low inertia machine, vertical movement



ATV 71H075M3...HU75M3

Power section for single phase power supply



Note: *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

Reference	Description
A1	ATV 71 drive, see pages 18 and 19
A2	Preventa XPS AC safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" function for several drives on the same machine.
F1	Fuse
L1	DC choke, see page 69
Q1	Circuit-breaker, see motor starters pages 128 to 131
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

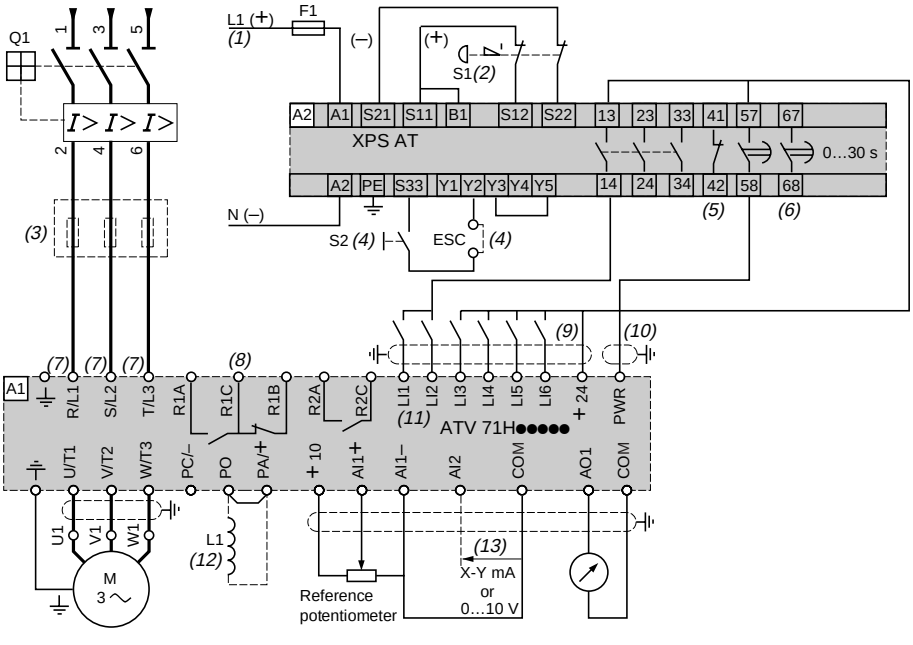
(1) Power supply: ⎓ or ∿ 24 V, ∿ 48 V, ∿ 115 V, ∿ 230 V.
(2) S2: resets XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(3) Requests freewheel stopping of the movement and activates the "Power Removal" safety function.
(4) Line choke (single phase or 3-phase), see page 72.
(5) The logic output can be used to signal that the machine is in a safe stop state.
(6) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 118.
(7) Fault relay contacts. Used for remote signalling of the drive status.
(8) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 118.
(9) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 2 m. The cable shielding must be earthed.
(10) Optional DC choke for ATV 71H●●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(11) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

Variable speed drives for asynchronous motors
Altivar 71

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 capability SIL2, in stopping category 1 according to IEC/EN 60204-1

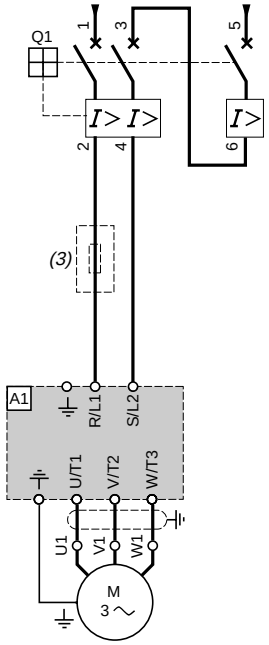
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4

3-phase power supply, high inertia machine



ATV 71H075M3…HU75M3

Power section for single phase power supply



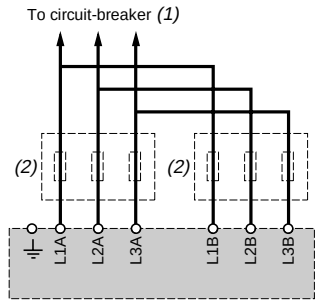
Note: *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

Reference	Description
A1	ATV 71 drive, see pages 18 and 19
A2 *(6)*	Preventa XPS AT safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" function for several drives on the same machine, but the time delay must be adjusted on the drive controlling the motor that requires the longest stopping time.
F1	Fuse
L1	DC choke, see page 69
Q1	Circuit-breaker, see motor starters pages 128 to 131
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

(1) Power supply: ⎓ or ∿ 24 V, ∿ 115 V, ∿ 230 V.
(2) Requests controlled stopping of the movement and activates the "Power Removal" safety function.
(3) Line choke (single phase or 3-phase), see page 72.
(4) S2: resets XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(5) The "N/C" contact can be used to signal that the machine is in a safe stop state.
(6) For stopping times requiring more than 30 seconds in category 1, use a Preventa XPS AV safety module which can provide a maximum time delay of 300 seconds.
(7) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 118.
(8) Fault relay contacts. Used for remote signalling of the drive status.
(9) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 118.
(10) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 2 m. The cable shielding must be earthed.
(11) Logic inputs LI1 and LI2 must be assigned to the direction of rotation: LI1 in the forward direction and LI2 in the reverse direction.
(12) Optional DC choke for ATV 71H●●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(13) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

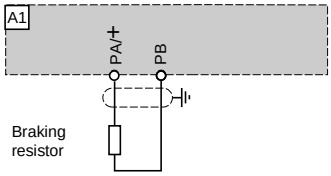
Power terminal connections for ATV 71HC40N4 combined with a 400 kW motor and ATV 71HC50N4



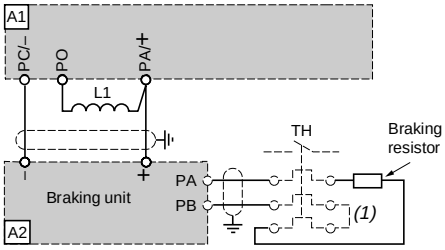
(1) For control section connections, see pages 114 to 117.
(2) Line choke, see page 72.

VW3 A7 7●● braking resistors or VW3 A7 8●● hoisting resistors, VW3 A7 1●● braking units

ATV 71H●●●M3, H●●●M3X, ATV 71H075N4…HC16N4



ATV 71HC20N4…HC50N4



Components for use with the Altivar	
Reference	**Description**
A1	ATV 71 drive, see pages 18 and 19
A2	Braking unit, if using a braking resistor or a hoisting resistor, for ATV 71HC20N4…HC50N4, see pages 48 and 49
L1	DC choke provided as standard with the drive
Braking resistor	See pages 50 to 53

(1) Thermal overload relay if there is no temperature controlled switch in the sequence.

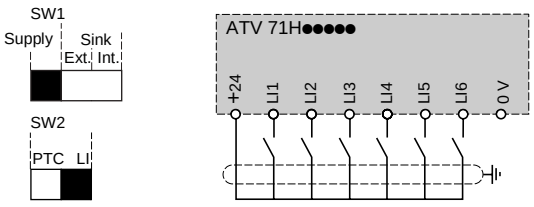
Examples of recommended schemes

Logic inputs

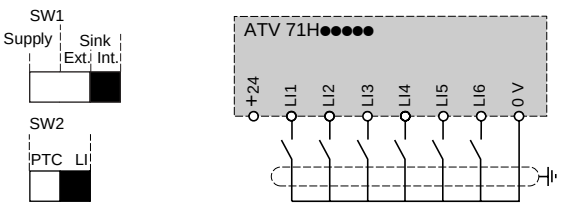
The SW1 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:
- Position the switch on Supply (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Int Sink or Ext Sink if using PLC outputs with NPN transistors

Internal power supply

Switch on “Supply” position

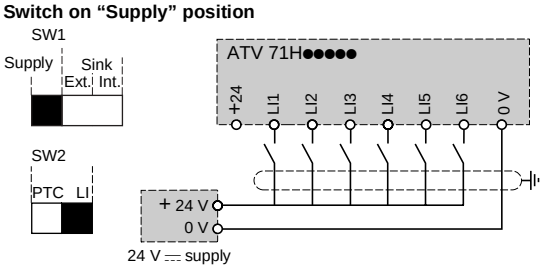


Switch on “Int Sink” position

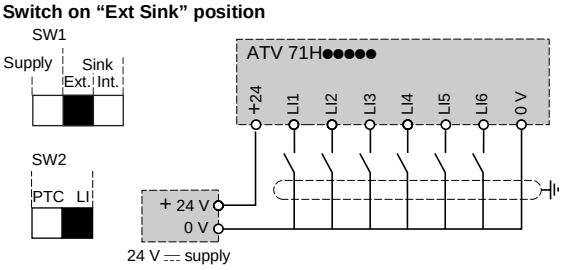


External power supply

Switch on “Supply” position



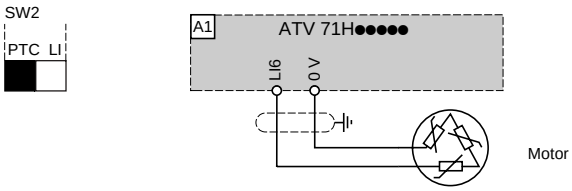
Switch on “Ext Sink” position



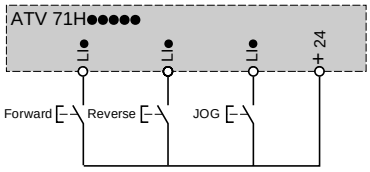
Examples of recommended schemes (continued)

Input for PTC probes

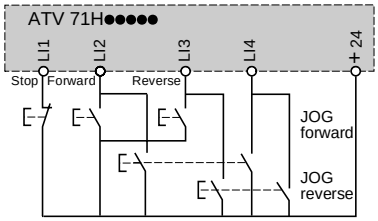
The SW2 switch is used to operate the LI6 input:
- As a logic input by setting the SW2 switch to LI (factory setting)
- Or for protecting the motor via PTC probes by setting the SW2 switch to PTC



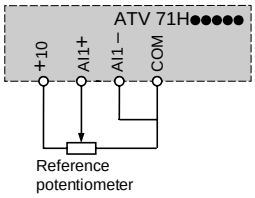
2-wire control and jog operation (JOG)



3-wire control and jog operation (JOG)

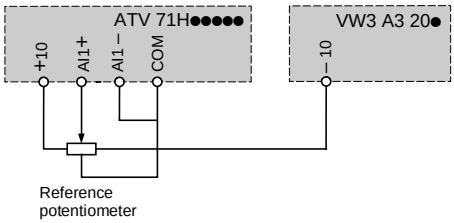


Unipolar speed reference

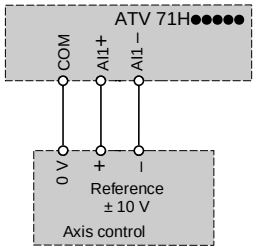


Bipolar speed reference

Requires a VW3 A3 201 or VW3 A3 202 I/O extension card

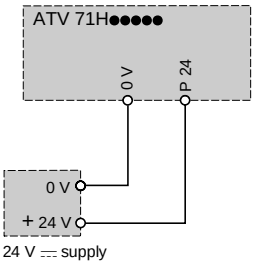


Speed reference using axis control



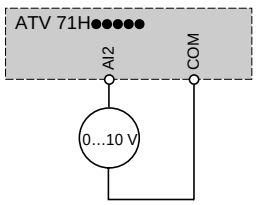
Separate control power supply

The separate control card can be powered by an external 24 V ⎓ supply

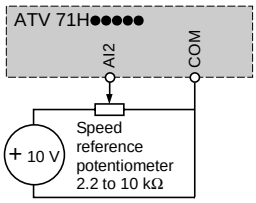


Analog input configured for voltage

External 0…10 V

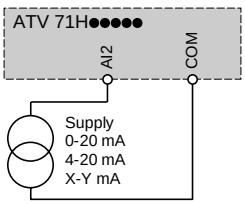


External + 10 V



Analog input configured for current

0-20 mA, 4-20 mA, X-Y mA



VW3 A3 201 and VW3 A3 202 I/O extension cards

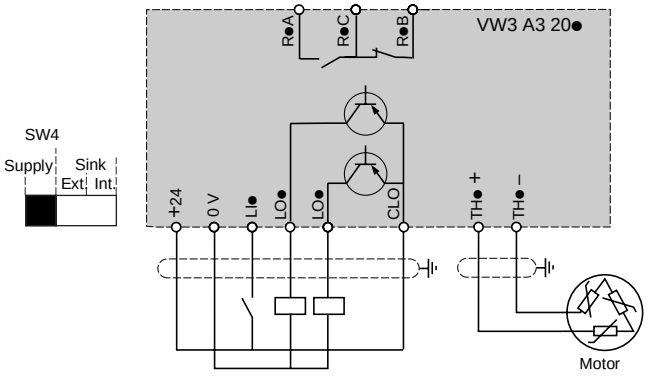
Logic I/O

The SW4 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:

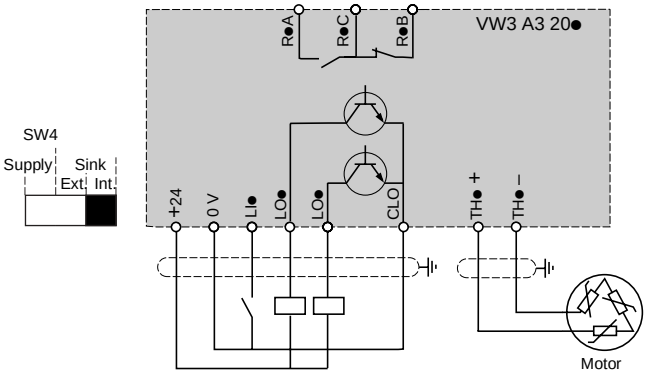
- Position the switch on Supply (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Int Sink or Ext Sink if using PLC outputs with NPN transistors

Internal power supply

Switch on "Supply" position

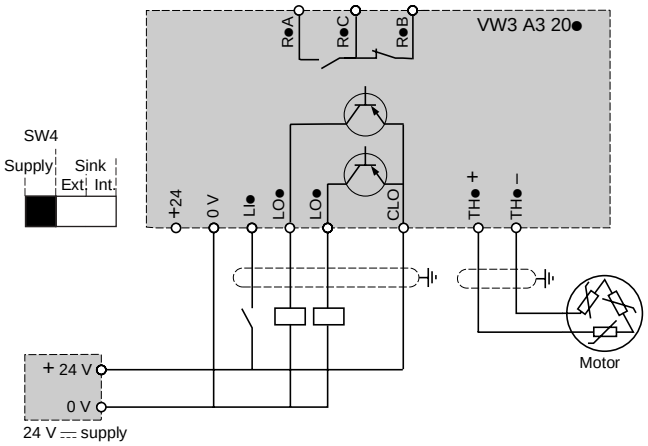


Switch on "Int Sink" position

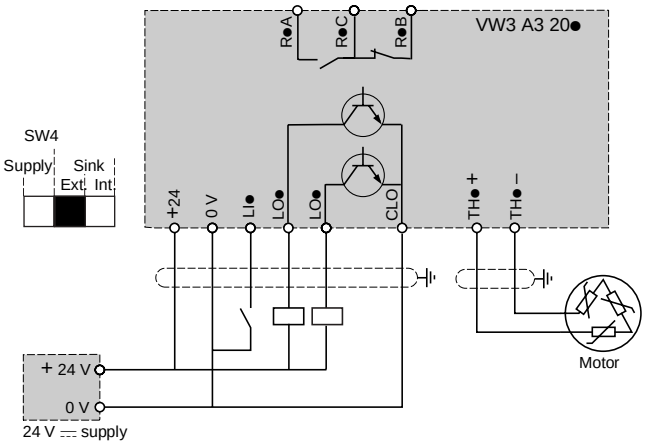


External power supply

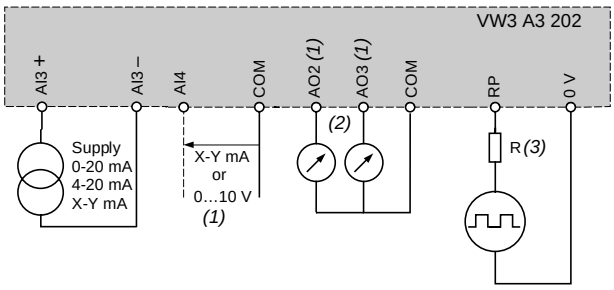
Switch on "Supply" position



Switch on "Ext Sink" position



Analog I/O (only on VW3 A3 202 extended I/O card)



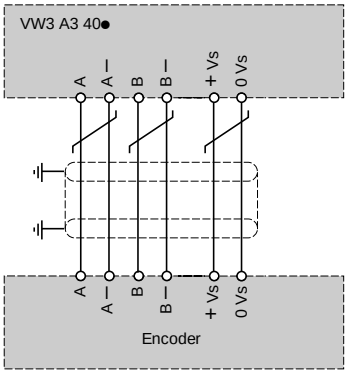
(1) Software-configurable current (0-20 mA) or voltage (0…10 V) analog input.
(2) Software-configurable current (0-20 mA) or voltage (± 10 V or 0…10 V) analog outputs, independent selection possible for each output via switch).
(3) R: add a resistor if the input voltage of the pulse train is greater than 5 V.
Recommended values:

Input voltage V	Resistance Ω
12	510
15	910
24	1300

VW3 A3 401 to VW3 A3 407 encoder interface cards

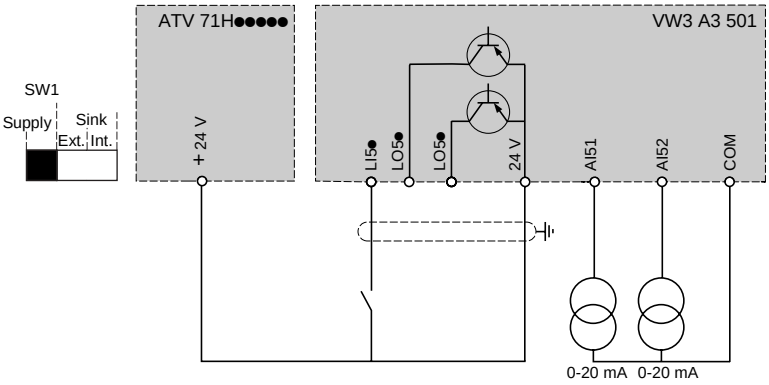
Closed loop control

Wiring the encoder

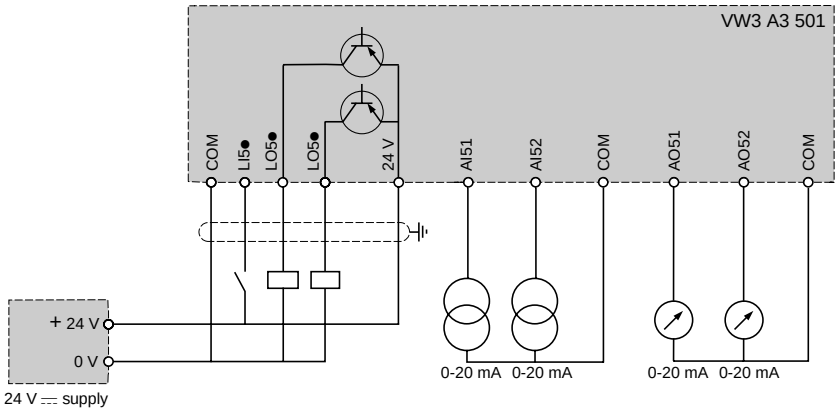


VW3 A3 501 programmable “Controller Inside” card

Card powered by the drive *(1)*



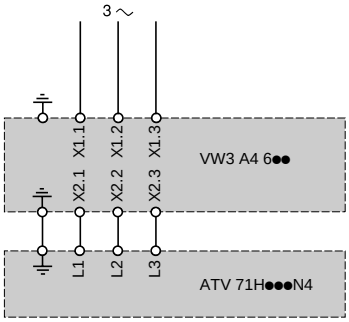
Card powered by external power supply



(1) Only if the power consumption is less than 200 mA; otherwise use an external power supply.

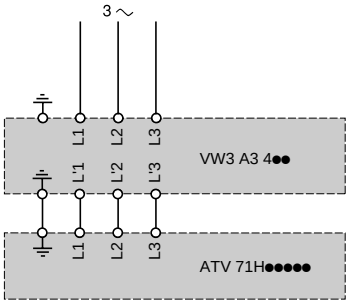
Variable speed drives for asynchronous motors
Altivar 71

VW3 A4 6●● passive filters

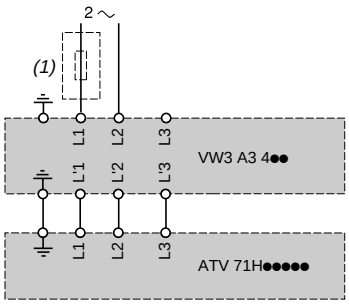


VW3 A4 4●● additional EMC input filters

3-phase power supply, 3-phase filter

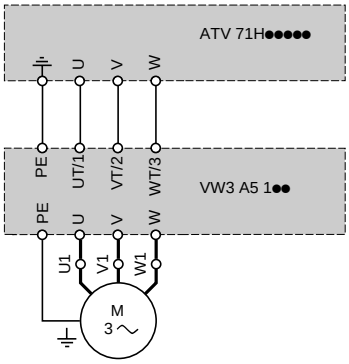


Single phase power supply, 3-phase filter

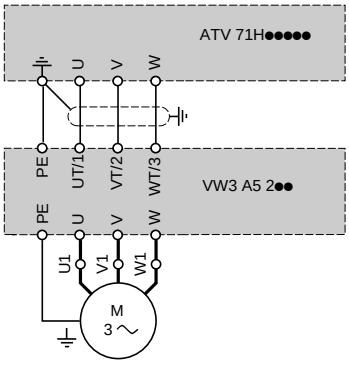


VW3 A5 ●●● output filters

VW3 A5 1●● motor chokes



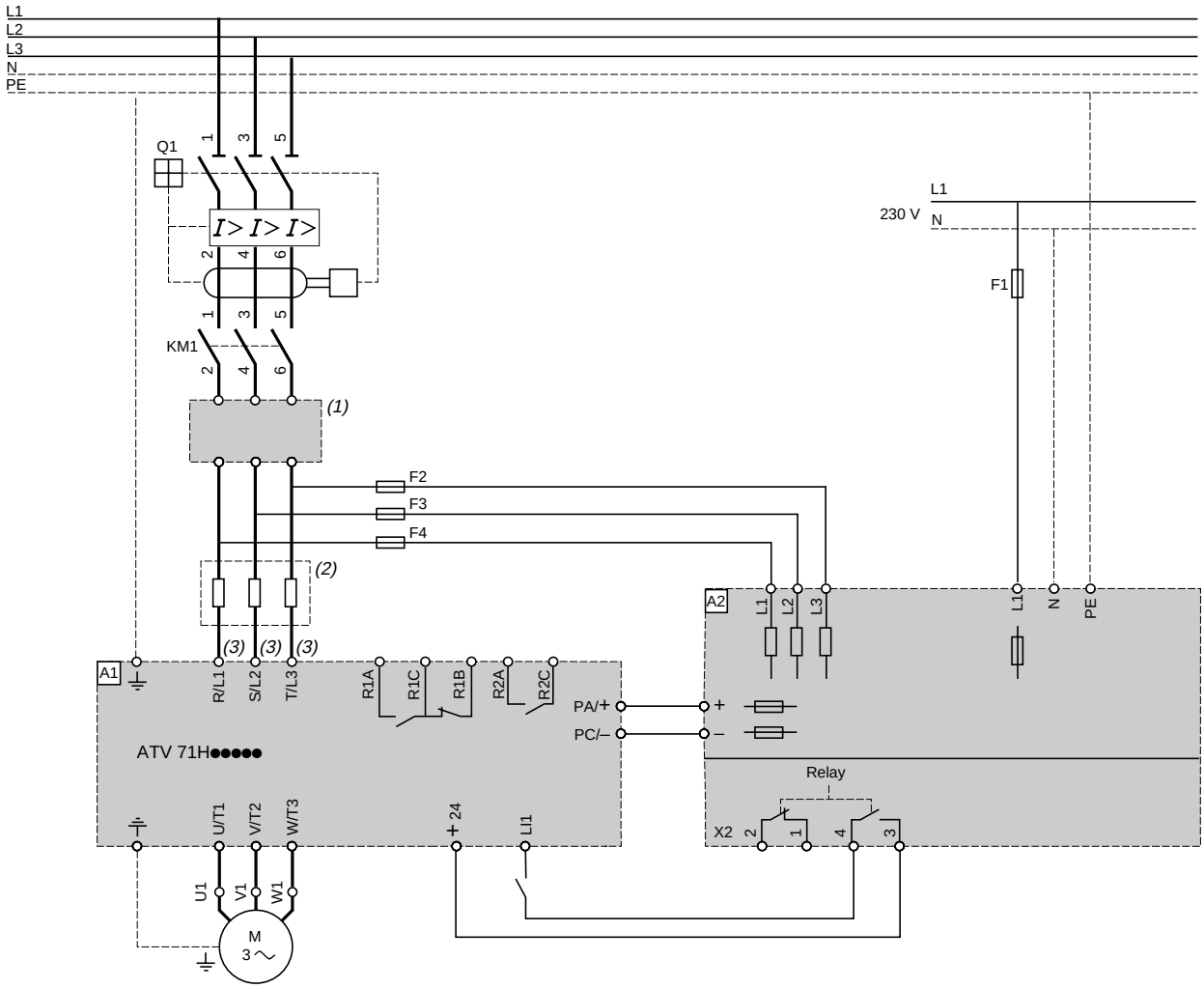
VW3 A5 2●● sinus filters



(1) Line choke compulsory for ATV 71HU40M3X…HU75M3X.

Variable speed drives for asynchronous motors
Altivar 71

Network braking unit



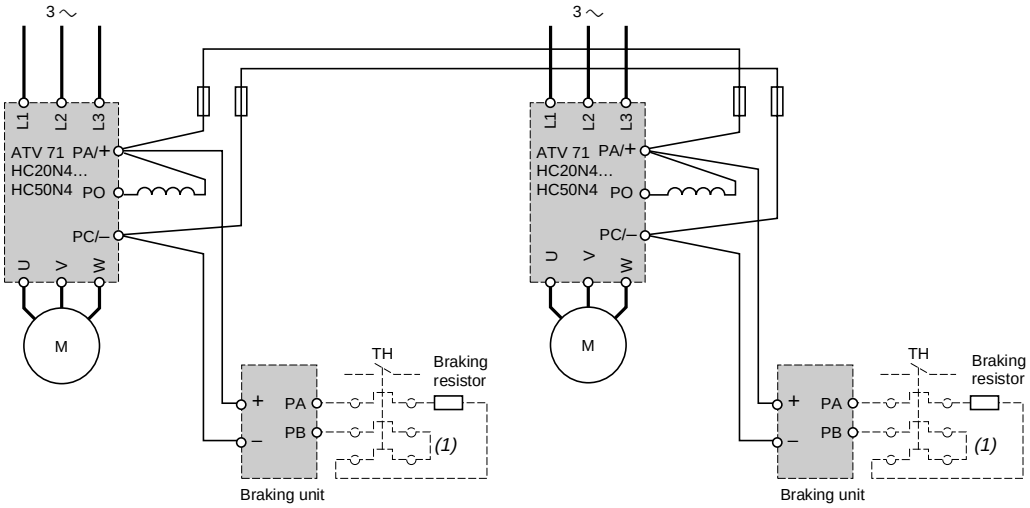
Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

Reference	Description
A1	ATV 71 drive, see pages 18 and 19
A2	Network braking unit (see page 62)
F1	2 A fuse, ∿ 230 V
F2…F4	For fuses, see reference tables on pages 63 and 64.
Q1	Circuit-breaker DDR 300 mA. Protects against earth leakage faults. Rating: see motor starters on pages 128 to 131

(1) Additional EMC input filter if necessary, see page 78.
(2) Line choke recommended, see page 72.
(3) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 118.

Drives combined with a braking unit and wired onto the same DC bus

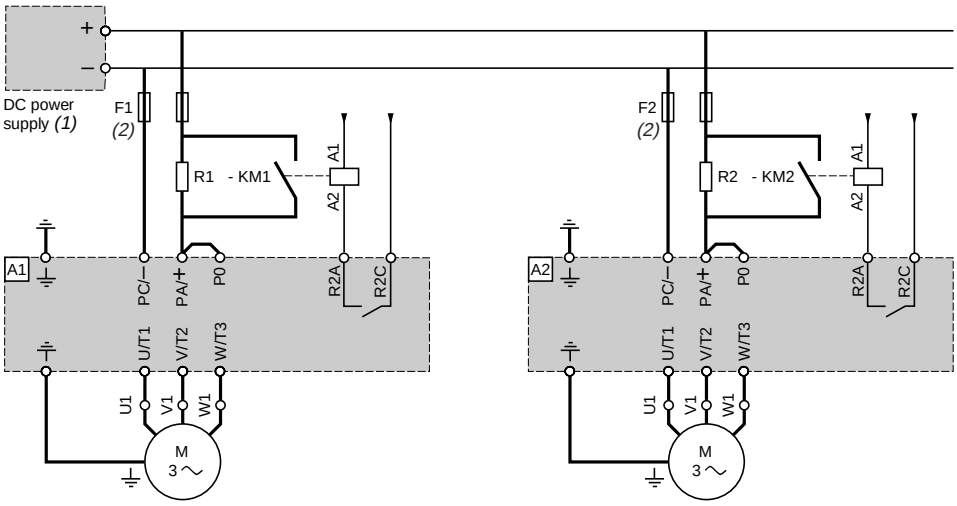
ATV 71HC20N4...HC50N4



(1) Thermal overload relay if there is no temperature controlled switch in the sequence.

Drive powered by external DC power supply

ATV 71HD18M3X...HD45M3X, ATV 71HD22N4...HD75N4



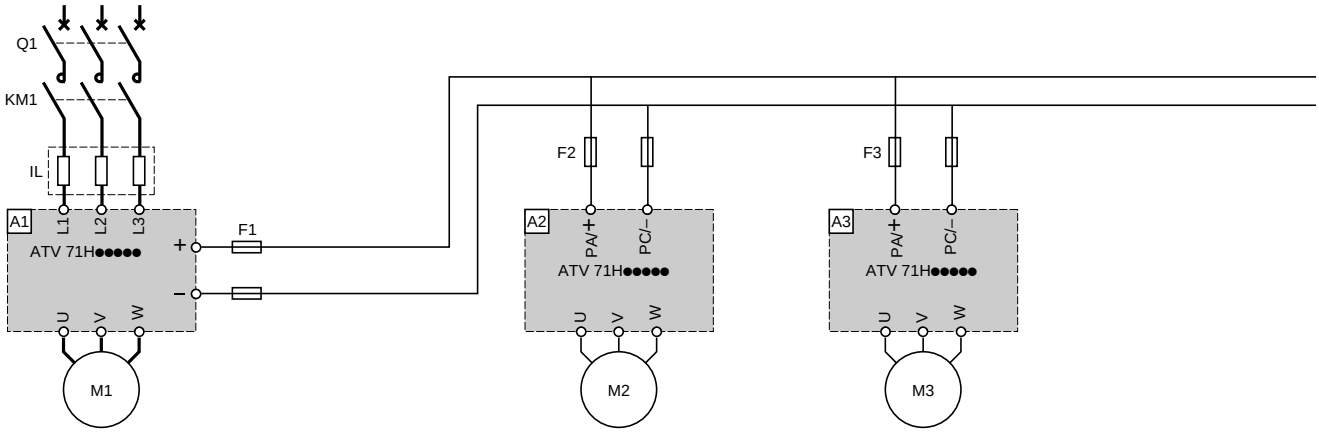
For drives A1, A2	DC power supply	Braking resistors R1, R2		Contactors (3) KM1, KM2
		Value	Reference	
	A	Ω		
ATV 71HD18M3X	135	5	VW3 A7 707	LC1 D32●●
ATV 71HD22M3X	157	5	VW3 A7 707	LC1 D40●●
ATV 71HD30M3X	200	5	VW3 A7 707	LC1 D65●●
ATV 71HD37M3X	237	5	VW3 A7 707	LC1 D80●●
ATV 71HD45M3X	279	5	VW3 A7 707	LC1 D80●●
ATV 71HD22N4	93	5	VW3 A7 707	LC1 D25●●
ATV 71HD30N4	118	5	VW3 A7 707	LC1 D32●●
ATV 71HD37N4	139	5	VW3 A7 707	LC1 D38●●
ATV 71HD45N4	163	5	VW3 A7 707	LC1 D40●●
ATV 71HD55N4	189	5	VW3 A7 707	LC1 D50●●
ATV 71HD75N4	244	5	VW3 A7 707	LC1 D80●●

(1) DC power supply not included.
(2) Fast-acting fuses, see page 126. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.
(3) See our "Motor starter solutions. Power control and protection components" specialist catalogue.

***Note:** ATV 71H●●●M3, ATV 71HD11M3X, H015M3X and ATV 71H075N4…HD18N4 drives have an integrated pre-charge circuit. This is used to connect the DC power supply directly to the drive without the need for an external pre-charge circuit.*

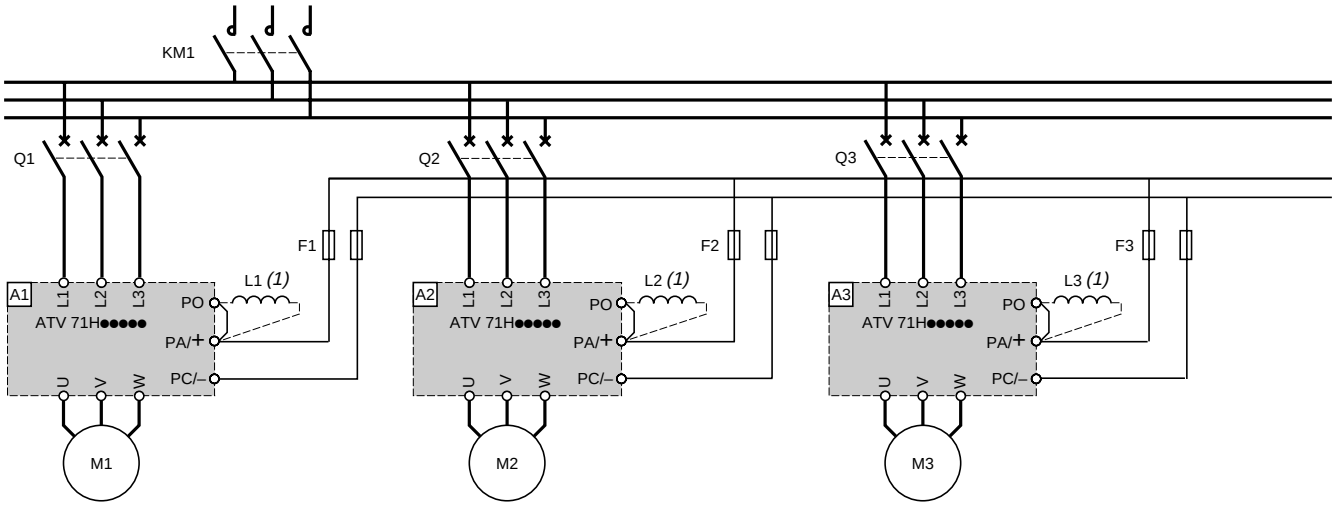
Connection diagrams for several drives in parallel on the DC bus

Drives with different ratings



Reference	Description
A1	ATV 71 drive, see pages 18 and 19. Drive power = ∑ motor power ratings M1 + M2 + M3 + …
A2, A3	ATV 71 drives powered by the DC bus. They must be protected using fast-acting fuses. Contactors on the DC circuit are ineffective as the switching action may cause the fuses to blow owing to the high load current.
F1	Fast-acting fuses, see page 126. Drive A1 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
F2, F3	Fast-acting fuses, see page 126. Drives A2 and A3 are powered by their DC bus and are not connected to the AC input. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.

Drives with equivalent ratings



Reference	Description
A1, A2, A3	ATV 71 drive, see pages 18 and 19. The power difference between the drives connected in parallel must not exceed any rating.
F1, F2, F3	Fast-acting fuses, see page 126. Drives A1, A2 and A3 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
KM1	When using a common line contactor, all the Altivar 71 drive load circuits operate in parallel and cannot therefore be overloaded.
L1, L2, L3	DC chokes, see page 69.
Q1, Q2, Q3	Circuit-breakers on the line supply side to protect drives against overloads. Use trip contacts on the “external fault” logic input or the line contactor. The line contactor must only be activated if all three circuit-breakers are closed, as otherwise there is a risk of damage to the drives.

(1) DC chokes compulsory except for ATV 71HD11M3X…HD45M3X and ATV 71HD18N4…HD75N4 (these drives include a DC choke as standard).

Variable speed drives for asynchronous motors
Altivar 71

Size of DC bus fuses (F1, F2, F3) depending on the drive rating

For drives	Fast-acting fuses *(1)*
	A
ATV 71H037M3…HU15M3	25
ATV 71HU22M3…HU40M3	50
ATV 71HU55M3, HU75M3	100
ATV 71HD11M3X…HD18M3X	160
ATV 71HD22M3X, HD30M3X	250
ATV 71HD37M3X, HD45M3X	350
ATV 71HD55M3X	500
ATV 71HD75M3X	630
ATV 71H075N4…HU22N4	25
ATV 71HU30N4, HU40N4	50
ATV 71HU55N4…HD11N4	80
ATV 71HD15N4…HD22N4	100
ATV 71HD30N4, HD37N4	160
ATV 71HD45N4	200
ATV 71HD55N4	250
ATV 71HD75N4	350
ATV 71HD90N4	315
ATV 71HC11N4, HC13N4	400
ATV 71HC16N4	500
ATV 71HC20N4	630
ATV 71HC25N4, HC28N4	800
ATV 71HC31N4	1000
ATV 71HC40N4, HC50N4	1250

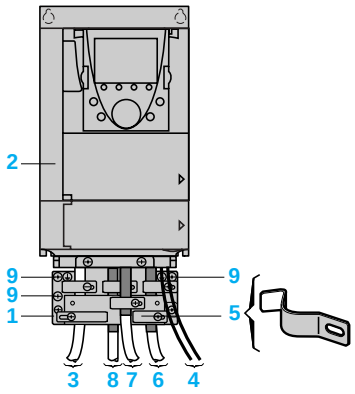
(1) Nominal voltage of fast-acting fuse:

Line voltage	Nominal voltage of fast-acting fuse
∼ V	V
230	690
400	690
440	800
460	800
480	800

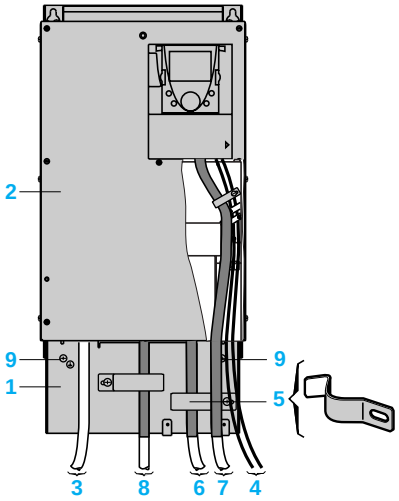
Variable speed drives for asynchronous motors

Altivar 71

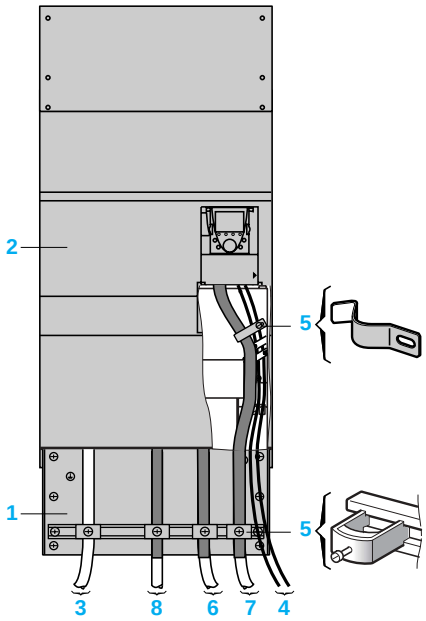
Electromagnetic compatibility



ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD18N4



ATV 71HD18M3X…HD45M3X, ATV 71HD22N4…HD75N4



ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4

Connections for ensuring conformity to EMC standards

Principle

■ Grounds between drive, motor and cable shielding must have “high frequency” equipotentiality.
■ Use shielded cables with shielding connected to ground over 360° at both ends for the motor cable, the braking resistor cable and the control-signalling cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in the continuity of the earth connections.
■ Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram for ATV 71H●●●●● drives

1 Steel plate *(1)*, to be fitted on the drive (machine ground).
2 Altivar 71 drive.
3 Unshielded power supply wires or cable.
4 Unshielded wires for the output of the fault relay contacts.
5 Fix and earth the shielding of cables 6, 7 and 8 as close as possible to the drive:
- strip the shielding.
- fix the cable to the plate 1 by attaching the clamp to the stripped part of the shielding.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
6 Shielded cable for connecting the motor.
7 Shielded cable for connecting the control/signalling wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor.
6, 7, 8 the shielding must be connected to ground at both ends.
The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
9 Ground screw.

Note: *The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.*
If using an additional EMC input filter, it should be mounted beneath the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is via the filter output cable.

(1) Plate supplied for ATV 71H●●●M3, ATV 71HD11M3X, HD45M3X and ATV 71H075N4…HD75N4 drives.
For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the plate is supplied with the NEMA type 1 conformity kit or the IP 21 or IP 31 conformity kit, to be ordered separately, see pages 22 and 23.

Variable speed drives for asynchronous motors

Altivar 71

Motor starters: supply voltage 200…240 V

533367

103282_18

533431

GV2 L20
+
LC1 D25●●
+
ATV 71HU22M3

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The type of circuit-breaker/contactor coordination selected can reduce maintenance costs in the event of a motor short-circuit by minimizing the time required to make the necessary repairs and the cost of replacement equipment. The suggested combinations provide type 1 or type 2 coordination depending on the drive rating.

Type 2 coordination: A motor short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. Welding of the contactor contacts is permissible if they can be separated easily.

Type 1 coordination: The electrical isolation provided by the circuit-breaker will not be affected by the incident and no other elements apart from the contactor are damaged as a result of the motor short-circuit.

The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection. If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

Single phase supply voltage 200…240 V 50/60 Hz

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
Type 2 coordination						
0.37	*0.5*	**ATV 71H075M3**	**GV2 L10**	6.3	–	**LC1 D18●●**
0.75	*1*	**ATV 71HU15M3**	**GV2 L14**	10	–	**LC1 D18●●**
1.5	*2*	**ATV 71HU22M3**	**GV2 L20**	18	–	**LC1 D25●●**
2.2	*3*	**ATV 71HU30M3**	**GV2 L22**	25	–	**LC1 D25●●**
3	–	**ATV 71HU40M3** *(5)*	**GV2 L22**	25	–	**LC1 D25●●**
4	*5*	**ATV 71HU55M3** *(5)*	**NS80HMA50**	50	300	**LC1 D40●●**
5.5	*7.5*	**ATV 71HU75M3** *(5)*	**NS80HMA50**	50	300	**LC1 D50●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA: product sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 240 V
GV2 L	50
NS80HMA	100

(3) Composition of contactors:
LC1 D18 to LC1 D50: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.
(5) A line choke must be added (see page 72).

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 200…240 V

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533344

NS80HMA50
+
LC1 D40●●
+
ATV 71HU55M3

3-phase supply voltage 200…240 V 50/60 Hz

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
Type 2 coordination						
0.37	*0.5*	**ATV 71H037M3**	**GV2 L08**	4	–	**LC1 D09●●**
0.75	*1*	**ATV 71H075M3**	**GV2 L14**	10	–	**LC1 D09●●**
1.5	*2*	**ATV 71HU15M3**	**GV2 L14**	10	–	**LC1 D18●●**
2.2	*3*	**ATV 71HU22M3**	**GV2 L16**	14	–	**LC1 D18●●**
3	–	**ATV 71HU30M3**	**GV2 L20**	18	–	**LC1 D25●●**
4	*5*	**ATV 71HU40M3**	**GV2 L22**	25	–	**LC1 D25●●**
5.5	*7.5*	**ATV 71HU55M3**	**NS80HMA50**	50	300	**LC1 D40●●**
7.5	*10*	**ATV 71HU75M3**	**NS80HMA50**	50	300	**LC1 D50●●**
11	*15*	**ATV 71HD11M3X**	**NS80HMA80**	80	480	**LC1 D65●●**
15	*20*	**ATV 71HD15M3X**	**NS100NMA80**	80	480	**LC1 D65●●**
18.5	*25*	**ATV 71HD18M3X**	**NS100NMA100**	100	600	**LC1 D80●●**
22	*30*	**ATV 71HD22M3X**	**NS100NMA100**	100	600	**LC1 D80●●**
30	*40*	**ATV 71HD30M3X**	**NS160NMA150**	150	1350	**LC1 D115●●**
37	*50*	**ATV 71HD37M3X**	**NS160NMA150**	150	1350	**LC1 D150●●**
45	*60*	**ATV 71HD45M3X**	**NS250NMA220**	220	1980	**LC1 D150●●**
55	*75*	**ATV 71HD55M3X**	**NS250NMA220**	220	1980	**LC1 F225●●**
75	*100*	**ATV 71HD75M3X**	**NS400NSTR43ME**	320	2880	**LC1 F265●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA, NS●●●N: products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 240 V
GV2 L08…L20	100
GV2 L22	50
NS80HMA	100
NS●●●NMA	85

(3) Composition of contactors:
LC1 D09 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 380…415 V

533345

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533368

NS160HMA●●●
+
LC1 D115●●
+
ATV 71HD45N4

3-phase supply voltage 380…415 V 50/60 Hz

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
Type 2 coordination						
0.75	*1*	**ATV 71H075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71HU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71HU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71HU30N4**	**GV2 L16**	14	–	**LC1 D18●●**
4	*5*	**ATV 71HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71HU55N4**	**GV2 L22**	25	–	**LC1 D25●●**
7.5	*10*	**ATV 71HU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	*15*	**ATV 71HD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 71HD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 71HD18N4**	**NS80HMA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 71HD22N4**	**NS80HMA80**	80	480	**LC1 D65●●**
30	*40*	**ATV 71HD30N4**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 71HD37N4**	**NS100●MA100**	100	800	**LC1 D80●●**
45	*60*	**ATV 71HD45N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
55	*75*	**ATV 71HD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 71HD75N4**	**NS250●MA150**	150	1350	**LC1 D150●●**
90	*125*	**ATV 71HD90N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
110	*150*	**ATV 71HC11N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
132	*200*	**ATV 71HC13N4**	**NS400●STR43MEF**	320	2880	**LC1 F265●●**
160	*250*	**ATV 71HC16N4**	**NS400●STR43MEF**	320	2880	**LC1 F265●●**
200	*300*	**ATV 71HC20N4**	**NS400●STR43MEF**	320	2880	**LC1 F400●●**
220	*350*	**ATV 71HC25N4**	**NS630●STR43MEF**	500	4500	**LC1 F400●●**
250	*400*	**ATV 71HC25N4**	**NS630●STR43MEF**	500	4500	**LC1 F500●●**
280	*450*	**ATV 71HC28N4**	**NS630●STR43MEF**	500	4500	**LC1 F500●●**
315	*500*	**ATV 71HC31N4**	**NS630●STR43MEF**	500	4500	**LC1 F500●●**
Type 1 coordination						
355	–	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
400	*600*	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*800*	**ATV 71HC50N4**	**NS1000 MicroLogic 2 or 5 (LR OFF)**	1000	2000	**LC1 F800●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA, NS●●●●, NS800, NS1000: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L08…L14	100	–	–	–
GV2 L16…L22	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA, NS160●MA, NS250●MA	–	36	70	150
NS400●, NS630●, NS800, NS1000	–	50	70	150

(3) Composition of contactors:
LC1 D18 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F115…F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265…F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F800	40…400 Hz (LX1 coil)	**–**	**–**	**FE7**	**P7**	**P7**	**P7**

For other voltages available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 71

Motor starters: supply voltage 440…480 V

533345

105517_18

533346

NS160HMA
+
LC1 D115●●
+
ATV 71HD55N4

3-phase supply voltage 440…480 V 50/60 Hz

Motor Power (1) kW	HP	Drive Reference	Circuit-breaker Reference (2)	Rating In A	Im A	Line contactor Reference (3) (4)
Type 2 coordination						
0.75	1	**ATV 71H075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	2	**ATV 71HU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	3	**ATV 71HU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71HU30N4**	**GV2 L14**	10	–	**LC1 D18●●**
4	5	**ATV 71HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	7.5	**ATV 71HU55N4**	**NS80HMA50**	50	300	**LC1 D25●●**
7.5	10	**ATV 71HU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	15	**ATV 71HD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	20	**ATV 71HD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	25	**ATV 71HD18N4**	**NS100●MA50**	50	300	**LC1 D50●●**
22	30	**ATV 71HD22N4**	**NS100●MA50**	50	300	**LC1 D65●●**
30	40	**ATV 71HD30N4**	**NS100●MA100**	100	600	**LC1 D65●●**
37	50	**ATV 71HD37N4**	**NS100●MA100**	100	600	**LC1 D80●●**
45	60	**ATV 71HD45N4**	**NS160●MA100**	100	600	**LC1 D115●●**
55	75	**ATV 71HD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	100	**ATV 71HD75N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	125	**ATV 71HD90N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
110	150	**ATV 71HC11N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
132	200	**ATV 71HC13N4**	**NS250●MA220**	220	1980	**LC1 F225●●**
160	250	**ATV 71HC16N4**	**NS400●STR43ME**	320	2880	**LC1 F265●●**
200	300	**ATV 71HC20N4**	**NS400●STR43ME**	320	2880	**LC1 F330●●**
220	350	**ATV 71HC25N4**	**NS400●STR43ME**	320	2880	**LC1 F400●●**
250	400	**ATV 71HC25N4**	**NS630●STR43ME**	500	4500	**LC1 F400●●**
280	450	**ATV 71HC28N4**	**NS630●STR43ME**	500	4500	**LC1 F500●●**
315	500	**ATV 71HC31N4**	**NS630●STR43ME**	500	4500	**LC1 F500●●**
355	–	**ATV 71HC40N4**	**NS630●STR43ME**	500	4500	**LC1 F630●●**
Type 1 coordination						
400	600	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	800	**ATV 71HC50N4**	**NS1000 MicroLogic 2 or 5 (LR OFF)**	1000	2000	**LC1 F800●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS800HMA, NS●●●●, NS800, NS1000: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 L08, GV2 L10	100	–	–	–
GV2 L14	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA, NS160●MA, NS250●MA	–	35	65	130
NS400●, NS630●	–	42	65	130
NS800, NS1000	–	50	65	130

(3) Composition of contactors:
LC1 D18 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F115…F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265…F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F800	40…400 Hz (LX1 coil)	**–**	**–**	**FE7**	**P7**	**P7**	**P7**

For other voltages available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
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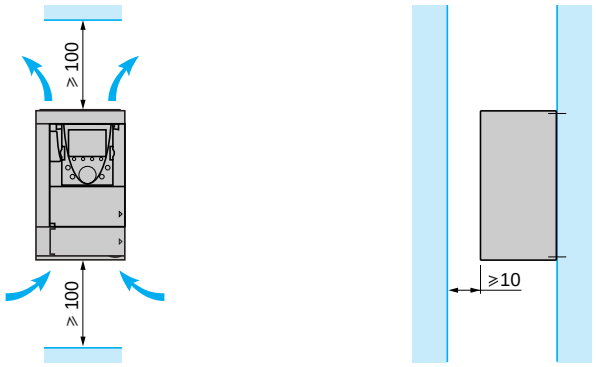
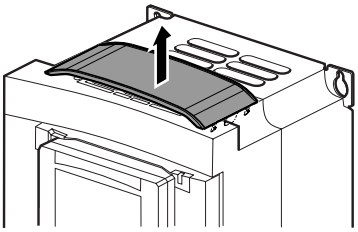
Mounting recommendations

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71H075N4...HD75N4

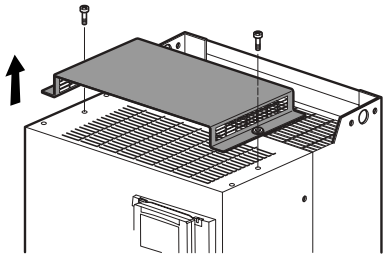


522085



Removing the protective blanking cover for:
ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71HD075N4...HD18N4

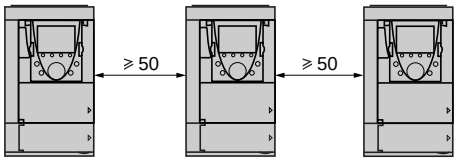
564510



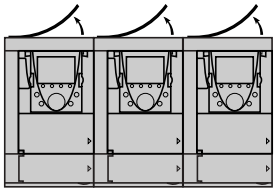
Removing the protective blanking cover for:
ATV 71HD18M3X...HD45M3X, ATV 71HD22N4...HD75N4

Mounting types

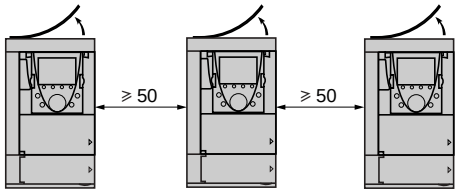
■ **Mounting A**



■ **Mounting B**



■ **Mounting C**



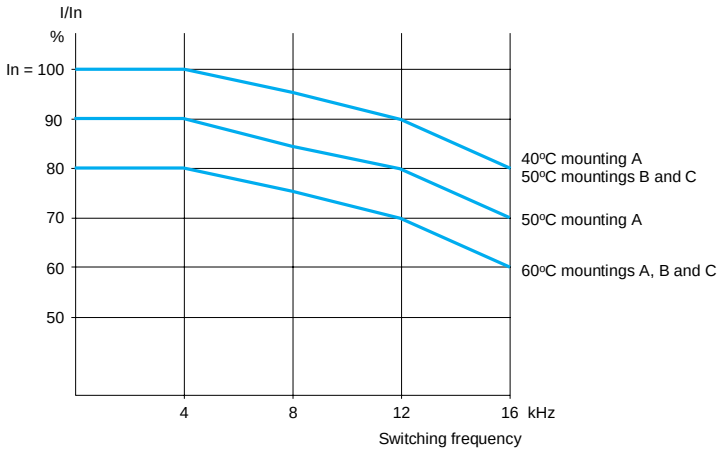
By removing the protective blanking cover from the top of the drive, the degree of protection for the drive becomes IP 20. The protective blanking cover may vary according to the drive model, see opposite.

Mounting recommendations (continued)

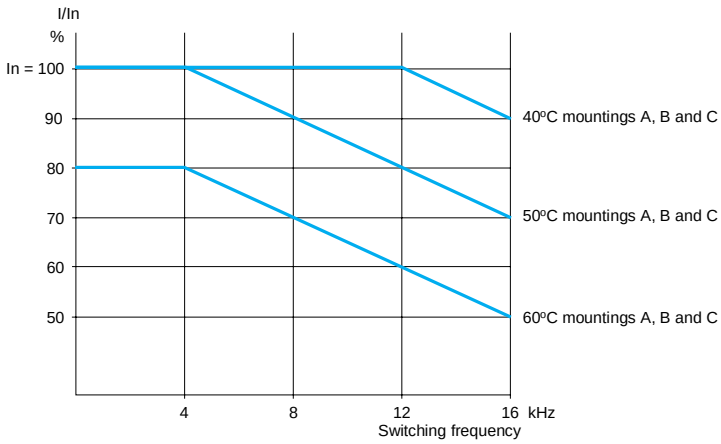
Derating curves

The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

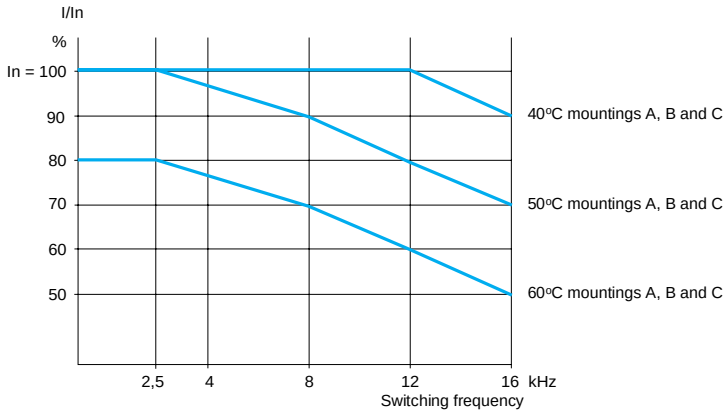
ATV 71H037M3...HD15M3X and ATV 71H075N4...HD18N4



ATV 71HD22N4 and ATV 71HD30N4 *(1)*



ATV HD18M3X...HD45M3X and ATV 71HD37N4...HD75N4 *(1)*

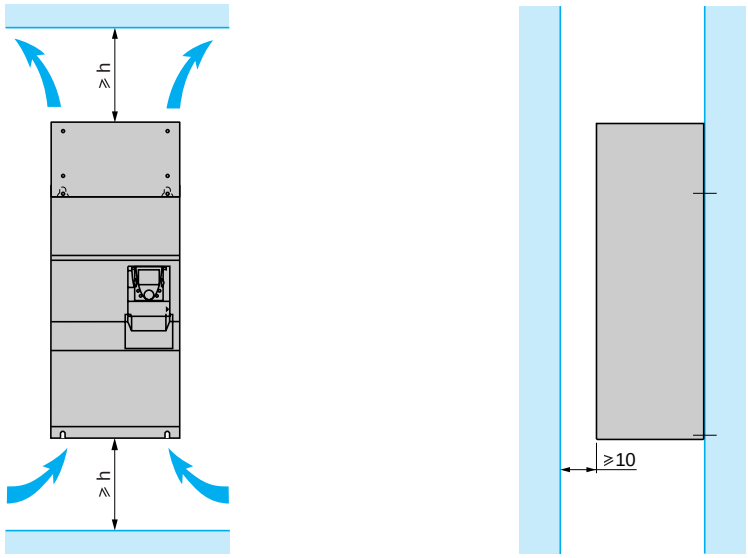


For intermediate temperatures (55°C for example) interpolate between 2 curves.

(1) Above 50°C, ATV 71HD18M3X, HD22M3X, ATV 71HD30N4…HD75N4 drives should be fitted with a control card fan kit. See page 20.

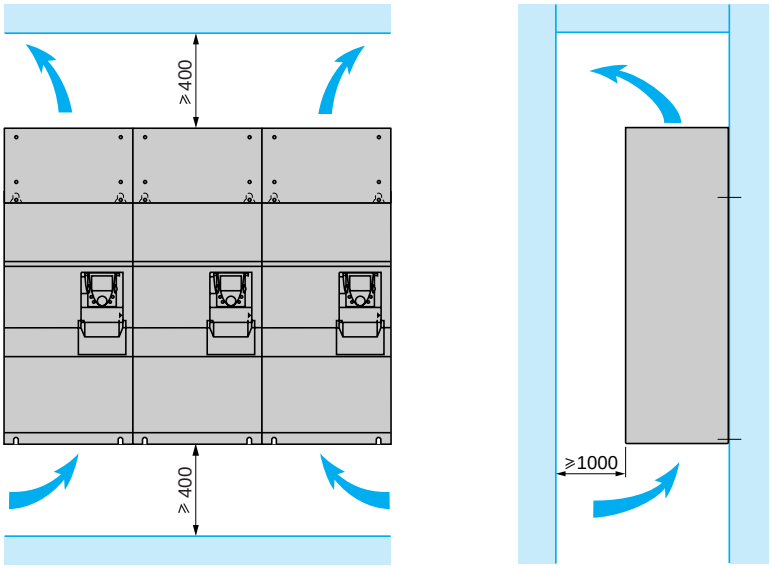
Mounting recommendations (continued)

ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4



ATV 71H	h
D55M3X, D90N4, C11N4	100
HC13N4, HC16N4	250
HC20N4...HC28N4	300
HC31N4...HC40N4	450
HC50N4	550

These drives can be mounted side by side, observing the following mounting recommendations:



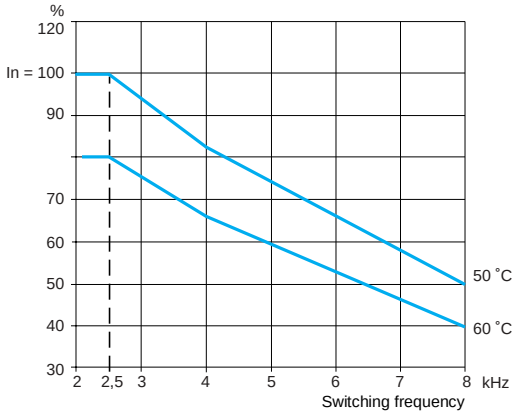
Mounting recommendations (continued)

Derating curves

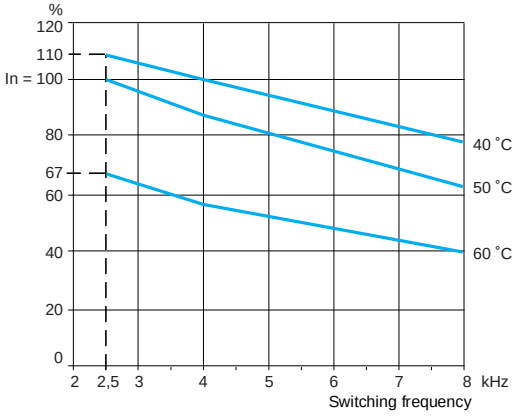
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (55°C for example), interpolate between 2 curves.

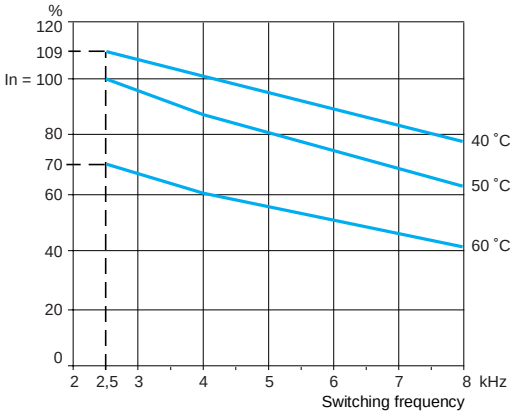
ATV 71HD55M3X, HD75M3X



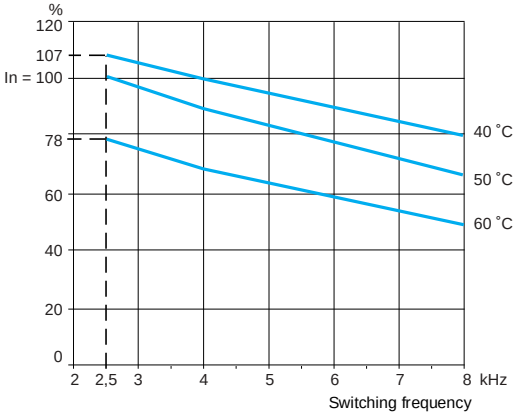
ATV 71HD90N4



ATV 71HC11N4



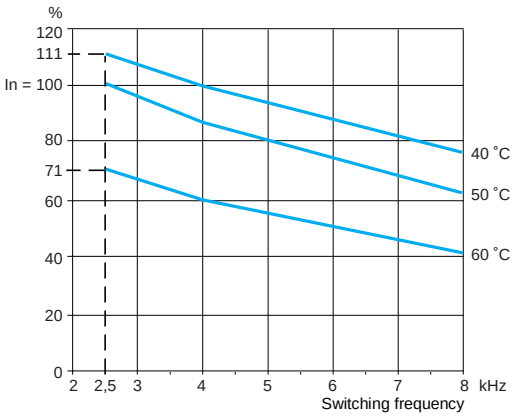
ATV 71HC13N4



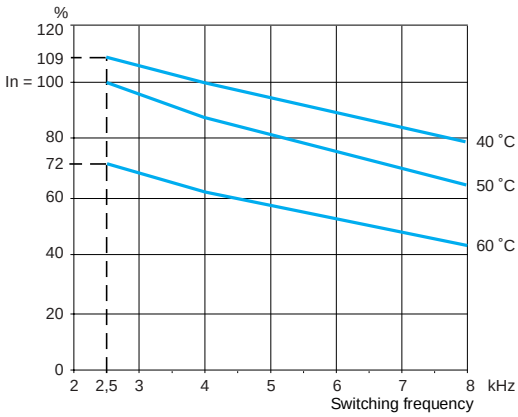
Mounting recommendations (continued)

Derating curves

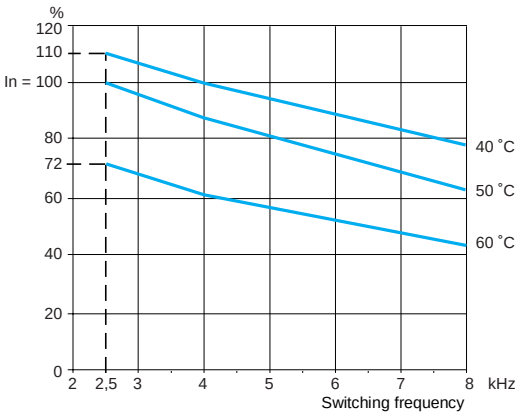
ATV 71HC16N4



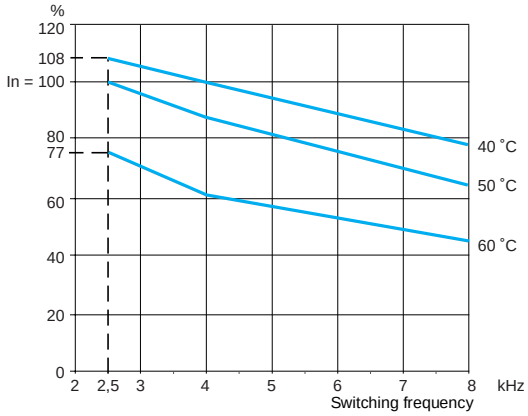
ATV 71HC20N4



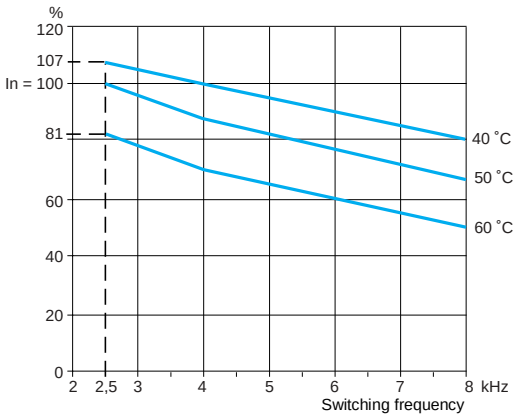
ATV 71HC25N4 combined with a 220 kW motor



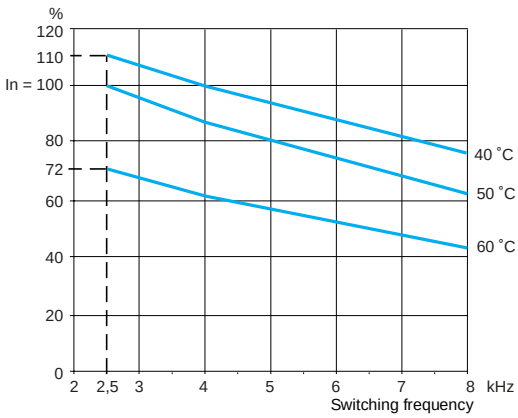
ATV 71HC25N4 combined with a 250 kW motor



ATV 71HC28N4



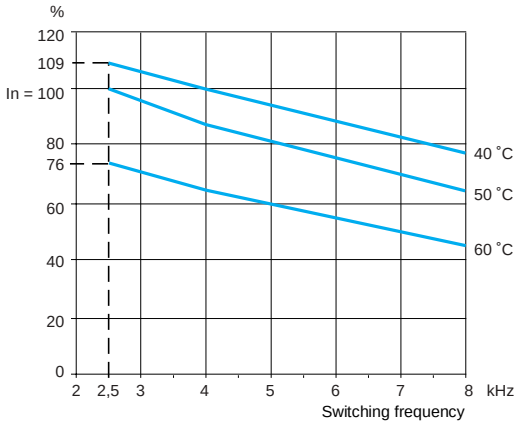
ATV 71HC31N4



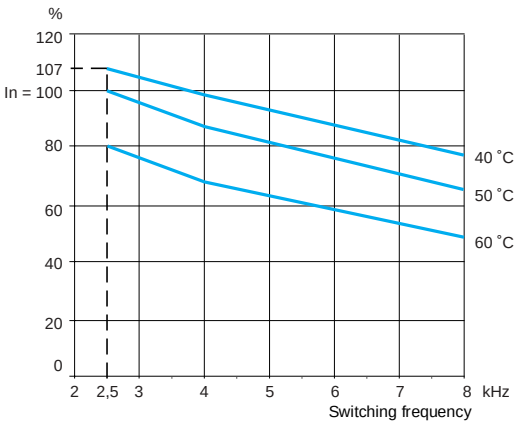
Mounting recommendations (continued)

Derating curves

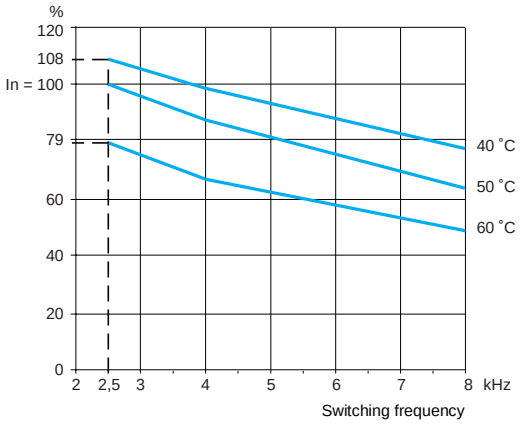
ATV 71HC40N4 combined with a 355 kW motor

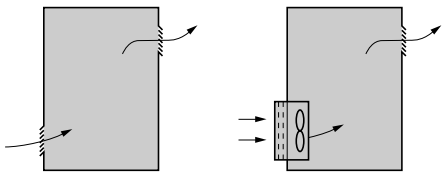


ATV 71HC40N4 combined with a 400 kW motor



ATV 71HC50N4





Specific recommendations for mounting in an enclosure

Observe the mounting recommendations described on pages 132 to 137.
To ensure proper air circulation in the drive:

- Fit ventilation grilles
- Ensure that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see page 139)
- Use special filters with IP 54 protection
- Remove the blanking cover from the top of the drive (see page 132)

Power dissipated inside the enclosure

For drives	Dissipated power *(1)*	
	Mounted in the enclosure	Dust and damp proof flush-mounted
	W	W
3-phase supply voltage: 200…240 V 50/60 Hz		
ATV 71H037M3	46	25
ATV 71H075M3	66	28
ATV 71HU15M3	101	30
ATV 71HU22M3	122	38
ATV 71HU30M3	154	38
ATV 71HU40M3	191	42
ATV 71HU55M3	293	52
ATV 71HU75M3	363	60
ATV 71HD11M3X	566	73
ATV 71HD15M3X	620	76
ATV 71HD18M3X	799	119
ATV 71HD22M3X	865	124
ATV 71HD30M3X	1134	157
ATV 71HD37M3X	1337	166
ATV 71HD45M3X	1567	184
ATV 71HD55M3X	1715	154
ATV 71HD75M3X	2204	154
3-phase supply voltage: 380…480 V 50/60 Hz		
ATV 71H075N4	44	26
ATV 71HU15N4	64	28
ATV 71HU22N4	87	30
ATV 71HU30N4	114	35
ATV 71HU40N4	144	40
ATV 71HU55N4	178	50
ATV 71HU75N4	217	55
ATV 71HD11N4	320	65
ATV 71HD15N4	392	86
ATV 71HD18N4	486	86
ATV 71HD22N4	717	110
ATV 71HD30N4	976	135
ATV 71HD37N4	1174	137
ATV 71HD45N4	1360	165
ATV 71HD55N4	1559	178
ATV 71HD75N4	2326	225
ATV 71HD90N4	2403	237
ATV 71HC11N4	2726	261
ATV 71HC13N4	3191	296
ATV 71HC16N4	3812	350
ATV 71HC20N4	4930	493
ATV 71HC25N4	5873	586
ATV 71HC28N4	6829	658
ATV 71HC31N4	7454	772
ATV 71HC40N4	9291	935
ATV 71HC50N4	11345	1116

(1) This value is given for operation at nominal load and for a switching frequency of 2.5 or 4 kHz depending on the rating.
Add 7 W to this value for each additional option card.

Fan flow rate depending on the drive rating	
For drive	**Flow rate m³/hour**
ATV 71H037M3…HU15M3, ATV 71H075N4…HU22N4	17
ATV 71HU22M3…HU40M3, ATV 71HU30N4, HU40N4	56
ATV 71HU55M3, ATV 71HU55N4, HU75N4	112
ATV 71HU75M3, ATV 71HD11N4	163
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4	252
ATV 71HD18M3X, HD22M3X, ATV 71HD22N4	203
ATV 71HD30N4, HD37N4	203
ATV 71HD30M3X…HD45M3X	406
ATV 71HD45N4…HD75N4	406
ATV 71HD55M3X, ATV 71HD90N4	402
ATV 71HD75M3X, ATV 71HC11N4	774
ATV 71HC13N4	745
ATV 71HC16N4	860
ATV 71HC20N4… HC28N4	1260
ATV 71HC31N4, HC40N4	2100
ATV 71HC50N4	2400

Sealed metal enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof casing in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature reaches 50°C.

Calculating the enclosure dimensions

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by drive: see page 138 (mounting in an enclosure or flush-mounting in an enclosure).
Add the power dissipated by the other equipment components.

Useful heat dissipation surface of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = enclosure thermal resistance per m²

For a metal enclosure:
- K = 0.12 with internal fan
- K = 0.15 without fan

Note: *Do not use insulated enclosures, as they have a poor level of conductivity.*

Variable speed drives for asynchronous motors
Altivar 71

Compatible combinations of functions and applications

Applications	Hoisting	Lift	Material handling
Machines	**Cranes, overhead cranes, gantries (vertical hoisting, translation, slewing), lifting platforms**	**Retrofit lifts up to 1.2 ms**	**Palletizers/depalletizers, carton packers, labelling machines, conveyors, roller tables**
			
Motor control functions			
Flux vector control with and without sensor	■	■	■
2-point vector control	■		
Open-loop synchronous motor			
ENA system			
Voltage/frequency ratio			■
Output frequency 1000 Hz			
Motor overvoltage limiting	■	■	■
Application functions			
Differential bipolar reference	■		■
Reference delinearization (magnifying glass effect)	■		■
Frequency control input			
Operations on the references (summing, subtraction, multiplication)			■
Brake control	■	■	■
Brake feedback via contact	■		
High-speed hoisting	■		
Load measurement	■	■	
Load sharing	■		■
Limit switch management	■	■	■
S ramp	■	■	■
Current limiting			
Output contactor command		■	
Integrity check of output contactor		■	
Rescue following power failure		■	
Stop on thermal alarm		■	
Torque control			■
Torque limit			■
Motor fluxing	■		■
Parameter set switching	■	■	■
Motor switching	■		■
Position control via limit switches			■
Uncontrolled output cut			■
Detection of current or torque limit			■
PID regulator			
Auto/man			
Reference storage			
+/- speed, single action button			
+/- speed, double action button	■		
+/- speed around a reference			
Traverse control			
Automatic catching a spinning load with speed detection (catch a spinning load)			
Undervoltage management			
Fastest possible stop			

■ **Frequent or necessary use**

Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 105 | Schemes: pages 112 to 127

(For other functions that can be used for all applications, see pages 152 to 173)

Packing	Textiles	Wood	High inertia	Process
Palletizers/depalletizers, carton packers, labelling machines	Weaving looms, carding frames, washing machines, spinners, drawing frames	Automatic lathes, saws, milling	Centrifuges, mixers, unbalanced machines (beam pumps, presses)	Sectional production lines (speed < 500 m/min) Example: building materials
				
■	■	■	■	■
	■			
	■			
			■	
		■	■	
	■	■		
■	■	■	■	■
■				
	■			■
■	■			■
	■	■	■	
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	■	■	■	■
		■	■	

Variable speed drives for asynchronous motors
Altivar 71

Summary of functions

Variable speed drives for asynchronous motors
Altivar 71

Summary of functions (continued)

Application functions (continued)

Variable speed drives for asynchronous motors
Altivar 71

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Remote graphic display terminal functions

This display terminal is attached to the front of the drive. It includes the integrated 7-segment display terminal for drives supplied without a graphic display terminal.

■ **Description**

□ **Description of graphic display terminal**

1 Graphic display unit:
- 8 lines, 240 x 160 pixels
- large digit display that can be read from 5 m away
- bar chart display

2 Assignable functions keys F1, F2, F3, F4:
- dialogue functions: direct access, help screens, navigation
- application functions: Local/Remote, preset speed.

3 STOP/RESET key: local control of motor stopping/fault clearing

4 RUN key: local control of motor operation

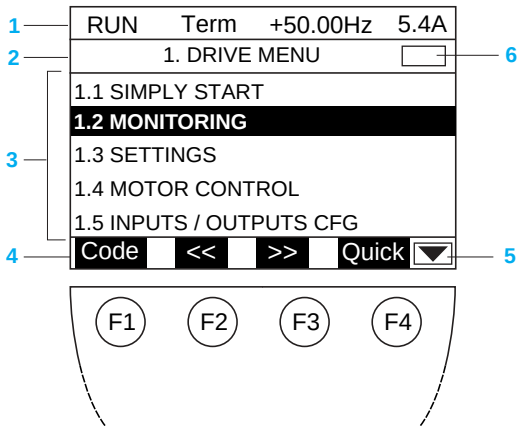
5 Navigation button:
- Press to save the current value (ENT)
- Turn ± to increase or decrease the value, go to the next or previous line

6 FWD/REV key: reverses the direction of rotation of the motor

7 ESC key: aborts a value, parameter or menu to return to the previous option.

Note: *Keys 3, 4 and 6 can be used to control the drive directly.*

522149



□ **Description of graphic display unit**

1 Display line. Its content can be configured; the factory settings show:
- the drive status (e.g. RUN)
- the active control channel (e.g. “Term”: terminals)
- the frequency reference
- the current in the motor

2 Menu line. Indicates the current menu or submenu.

3 Area displaying menus, submenus, parameters, values, bar charts, in the form of a scrolling window, with a maximum of 5 lines.
The line or value selected using the navigation button is displayed in reverse video (see opposite).

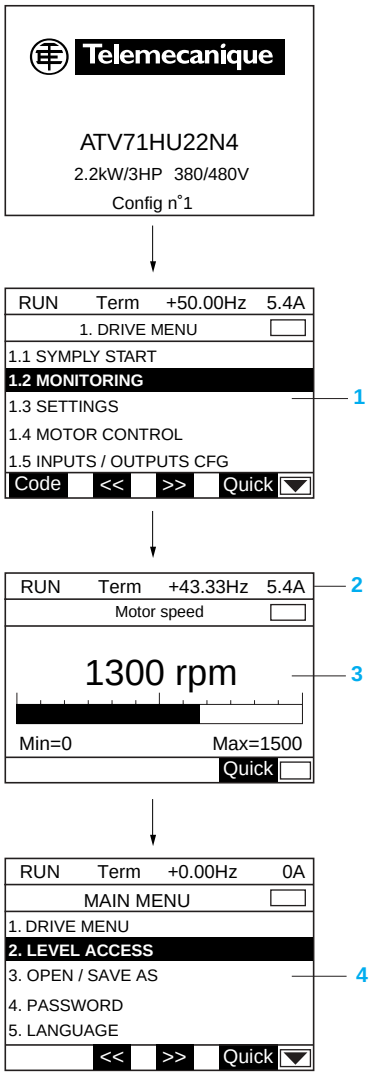
4 Section displaying the functions assigned to the keys F1 to F4 and aligned with them, for example:
- >> : Horizontal scrolling to the right, or proceeding to the next menu or submenu, or, in the case of a value, decreasing the value, displayed in reverse video (see example opposite)
- << : Horizontal scrolling to the left, or proceeding to the next menu or submenu, or, in the case of a value, increasing the value, displayed in reverse video
- Quick: Rapid access to a parameter from any screen when the Quick function is displayed above the F4 key
- HELP: Contextual help
- Code: Displays the selected parameter code
- Other functions (application functions) can be assigned to these keys via the 1.6 COMMAND menu.

5 ▭ : Means that this display window does not scroll further down.
▼ : Means that this display window can scroll further down.

6 ▲ : Means that this display window can scroll further up.
▭ : Means that this display window does not scroll further up.

Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Schemes: pages 112 to 127

Variable speed drives for asynchronous motors
Altivar 71



Remote graphic display terminal functions (continued)

■ **Navigation: accessing menus and parameters**

Structure of main menus:

1 Drive menu:

Menu type	Function
1.1 SIMPLY START	Simplified menu for a quick start-up
1.2 MONITORING	Displays current values for motor, inputs/outputs and communication (command words, status words, etc.)
1.3 SETTINGS	Accesses the adjustment parameters, which can be modified during operation
1.4 MOTOR CONTROL	Accesses the motor parameters, including adjustment of motor control profiles
1.5 INPUTS/OUTPUTS CFG	Configures the I/O and transforms signals
1.6 COMMAND	Configures the command and reference channels
1.7 APPLICATION FUNCT.	Configures the application functions (preset speeds, PID regulator, etc.)
1.8 FAULT MANAGEMENT	Configures the fault management process
1.9 COMMUNICATION	Configures the communication networks
1.10 DIAGNOSTICS	Provides diagnostics for motor and drive, integrated test procedures, fault log
1.11 IDENTIFICATION	Identifies the drive and the internal options
1.12 FACTORY SETTINGS	Restores factory settings (completely or by parameter group)
1.13 USER MENU	Accesses the parameters selected by the user
1.14 PROGRAMMABLE CARD	Accesses the parameters for the Controller Inside programmable card

2 Display line

3 Display screen: Displays values in the form of bar charts or digital values, depending on the extent of customization.

4 Main menu:

Menu type	Function
1. DRIVE MENU	See above (1 Drive menu)
2. ACCESS LEVEL	4 access levels: basic, limited, advanced, expert
3. OPEN/SAVE AS	Transfers files between the graphic display terminal and the drive
4. PASSWORD	Provides password protection for the configuration
5. LANGUAGE	Choice of 6 languages available (English, German, Spanish, French, Italian and Chinese)
6. MONITORING CONFIG.	Customizes the display line 2 and the display screen 3 (bar charts, digital values)
7. DISPLAY CONFIG.	Configures how parameters are displayed: customization, selection for User menu, visibility, accessibility

■ **Password**

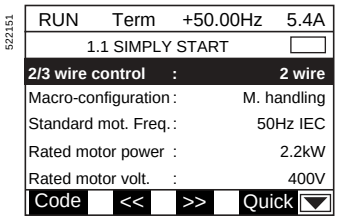
Altivar 71 drives allow individual parameters to be selected for password protection. Rights can be set for save operations and for loading the configuration.

Integrated 7-segment display terminal

ATV 71●●●●●M3, ATV 71HD11M3X, HD15M3X and ATV 71H075N4…HD15N4 drives can be supplied without a graphic display terminal. In this case, they are equipped with an integrated 7-segment display terminal. This can be used to:
- Display status and faults
- Access and modify parameters

Start-up

The Altivar 71 drive is supplied ready for use for most applications.
When the drive is switched on, the menus for setting the language and access level appear automatically.



Simply start menu

■ Simply start menu

By accessing the Simply start menu directly it is possible to:
- Pre-program the drive for an application:
  - Select the relevant macro-configuration
  - 2-wire/3-wire control
- Benefit from optimum motor performance:
  - Enter data from the motor rating plate
  - Auto-tuning.
- Protect the motor by setting the drive's integrated electronic thermal overload relay

Variable speed drives for asynchronous motors
Altivar 71

Start-up (continued)

■ **Programming using macro-configurations**

Programming using macro-configurations offers the choice of seven options corresponding to the various business areas and applications:

- Start/stop
- Material handling
- General use
- Hoisting
- PID regulation
- Communication network connectivity
- Master/slave applications

Choosing one of these macro-configurations automatically assigns the functions, parameters and I/O, even in the case of option cards. Although the configuration is preset, it can still be modified, if necessary.

The Start/stop macro-configuration is set as the factory configuration.
The preset functions for each macro-configuration are given in the table below.

Type of macro-configuration		Start/stop	Material handling	General use	Hoisting	PID regulation	Communication network connectivity	Master/slave application
Altivar 71 drive I/O								
AI1		Ref. 1 channel	Ref. 1 channel	Ref. 1 channel	Ref. 1 channel	PID reference	Ref. 2 channel Ref. 1 channel by bus	Ref. 1 channel
AI2		Not assigned	Sum ref. 2	Sum ref. 2	Not assigned	PID feedback	Not assigned	Torque ref. 2 channel
AO1		Motor freq.	Motor freq.	Motor freq.	Motor freq.	Motor freq.	Motor freq.	Signed torque
2-wire	**LI1**	Forward	Forward	Forward	Forward	Forward	Forward	Forward
	LI2	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
	LI3	Not assigned	2 preset speeds	JOG	Fault reset	PID integral reset	Ref 2 switch	Trq/spd switching
	LI4	Not assigned	4 preset speeds	Fault reset	Ext fault	PID 2 preset ref.	Fault reset	Fault reset
	LI5	Not assigned	8 preset speeds	Torque limit	Not assigned	PID 4 preset ref.	Not assigned	Not assigned
	LI6	Not assigned	Fault reset	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI1**	Stop	Stop	Stop	Stop	Stop	Stop	Stop
	LI2	Forward	Forward	Forward	Forward	Forward	Forward	Forward
	LI3	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
	LI4	Not assigned	2 preset speeds	JOG	Fault reset	PID integral reset	Ref 2 switch	Trq/spd switching
	LI5	Not assigned	4 preset speeds	Fault reset	Ext fault	PID 2 preset ref.	Fault reset	Fault reset
	LI6	Not assigned	8 preset speeds	Torque limit	Not assigned	PID 4 preset ref.	Not assigned	Not assigned
R1		Faulty	Faulty	Faulty	Faulty	Faulty	Faulty	Faulty
R2		Not assigned	Not assigned	Not assigned	Brk control	Not assigned	Not assigned	Not assigned
I/O extension card I/O								
2-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LI8 to LI14		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LO1 to LO4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
R3/R4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AI3, AI4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
RP		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AO2		Motor current	Motor current	Motor current	Motor current	Motor current	Motor current	Motor current
AO3		Not assigned	Signed torque	Not assigned	Signed torque	PID error	Not assigned	Motor freq.
Graphic display terminal keys								
F1 key		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Control via graphic display terminal	Not assigned
F2, F3, F4 keys		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned

Variable speed drives for asynchronous motors
Altivar 71

Start-up (continued)

■ **MONITORING menu**

The MONITORING menu can be used to display commands, the operation of the motor and application through the drive of its I/O or of the communication network connections.

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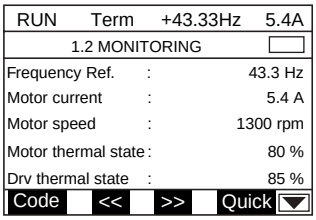
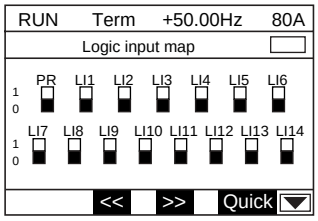
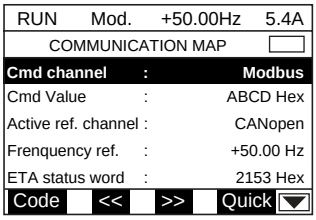


Displaying physical values



Logic input map

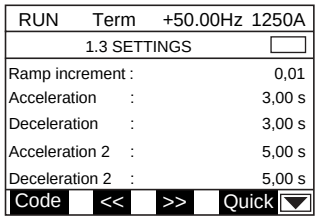


Communication map

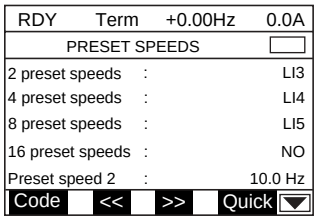
Configuration and settings

The SETTINGS menu can be used to configure all the drive's settings. Activating a function automatically provides access to the related settings on the same screen (the application functions are described on pages 152 to 173).

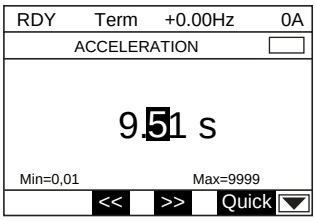
522154



Settings screen



Setting a function



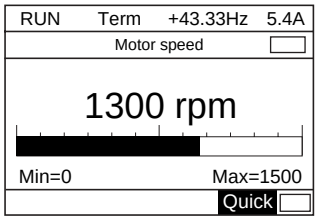
Configuring a value

Operation

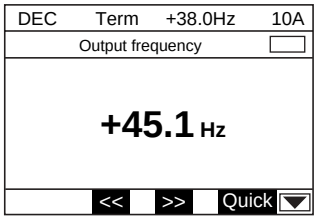
The display screen appears automatically every time the drive is turned on. There are different possible scenarios:

- One or two bar charts are displayed.
- One, two or five digital values are displayed.

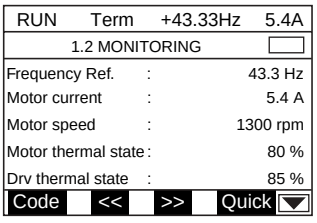
533525



1 bar chart

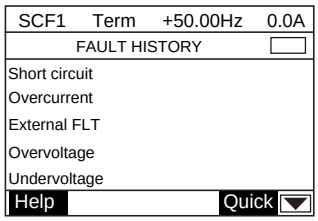


1 digital value



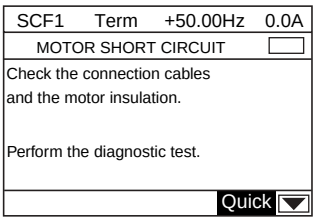
5 digital values

533523.



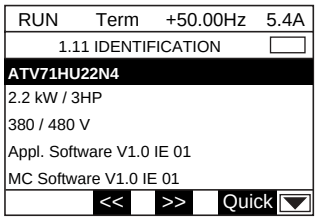
Fault log

522162



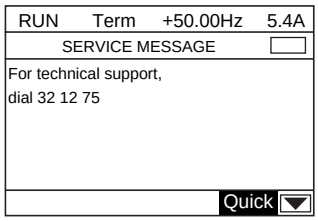
Troubleshooting screen

522163



Identification screen

522157



Example of a customized message

Maintenance, diagnostics

New functions have been added to the Altivar 71 drive to enable it to provide quick and simple maintenance, ultimately boosting productivity:

■ Response to faults or alarms

It is possible to use the alarm management or drive operation configuration functions to take corrective measures before stopping the machine.

■ Fault log and help

When a fault occurs, a help screen is available to quickly identify the cause of the fault.
As soon as the fault occurs, values such as speed, current, thermal state, timer are saved and restored in the fault log.
The last 8 faults are stored.

■ IDENTIFICATION menu

The IDENTIFICATION menu can be used to display the relevant serial numbers and software versions, thereby helping to manage the equipment base. This information, also available from the PowerSuite software workshop, can be exported to other database-type software applications.

■ Test functions

The Altivar 71 drive includes the following test functions:
□ Identifying any motor short-circuit before start-up
□ Running, via the graphic display terminal or PowerSuite software workshop, automatic procedures during maintenance operations aimed at testing:
- the motor
- the drive power components

The test results are shown on the graphic display terminal or using the PowerSuite software workshop.
It is also possible to write and read messages in the drive using the graphic display terminal or the PowerSuite software workshop.

■ Oscilloscope function

The Altivar 71 drive has an oscilloscope function, which produces traces that can be viewed using the PowerSuite software workshop.
The PowerSuite software workshop can also be used to carry out remote diagnostics via modem.

Controlling the drive

■ **Via the drive I/O**

Control signals are transmitted via cable to the I/O. Functions are assigned to logic inputs, analog inputs, etc.
A logic input can be assigned to more than one function. This means that two functions can be controlled using a single signal, thereby limiting the number of inputs required.

The Altivar 71 drive I/O can be configured independently from each other. For instance,
□ A time delay can be applied when it comes to reading the logic inputs, so as to avoid any bounce-back from certain switches.
□ Transforming incoming signals on the analog inputs can help the drive fully adapt to the control devices and applications:
- minimum and maximum values for the input signal
- input filtering in order to eliminate unwanted interference from the signals received
- magnifying glass effect through delinearizing the input signal in order to increase the precision with small amplitude signals
- Pedestal and Deadband functions for signals in order to prevent low speed operations which can have an adverse effect on the application
- Mid-point function, which can be used from a unipolar input signal to obtain a bipolar output signal to control the speed and direction of rotation

□ Transforming analog outputs which transfer information sent by the drive to other devices (display units, drives, PLCs, etc.):
- voltage or current output signal
- minimum and maximum values for the output signal
- output signal filtering

Logic outputs can be delayed on activation and deactivation. The output state can also be configured when the signal is active.
The frequency control signals are also transformed by the drive:
□ signal frequency minimum and maximum values (30 kHz on the extended I/O card's RP input, 300 kHz maximum on the encoder interface card input).

■ **Via the remote graphic display terminal**

The rotation commands and references (torque, speed or PID) can be controlled via the graphic display terminal. Some application functions can also be assigned to the function keys F1, F2, F3 and F4 on the graphic display terminal. It is possible to manage a change in command and/or reference source (bumpless function) in different ways.
For example, two options are offered when switching control from via the terminals to via the graphic display terminal:
□ stop the Altivar 71 drive, or
□ continue operation with a copy of the direction of rotation and reference

Controlling the drive (continued)

■ **Via a communication network**

□ **I/O profile**

The I/O profile, which is easy and quick to use, can be used to control the Altivar 71 drive via the communication network, in the same way as via the I/O terminals.
When commands are sent via a network they are written in a command word. This word behaves like virtual terminals containing logic inputs.
Application functions can be assigned to the bits of this word. More than one function can be assigned to the same bit.

The commands and references can come from different sources, such as the terminals, graphic display terminal or communication networks.
Each source can be set or switched individually using logic inputs or command word bits.

The I/O profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **CiA DSP 402 profile (CANopen Device Profile Drives and Motion Control)**

This profile from the organization CiA (CAN in Automation) describes standard functions, parameters and operation for variable speed drives.
This standard is an extension of the DRIVECOM profile. The Altivar 71 drive complies with the CiA DSP 402 standard and it supports the following 2 modes in this profile: separate and not separate.

Separate mode

The Start/Stop commands and references can come for different sources.
For example, the speed reference is transmitted by the Ethernet TCP/IP network and the Start/Stop commands by the logic signals wired on the terminals.

Each source can be set or switched individually using logic inputs or command word bits.

Not separate mode

The Start/Stop commands and references (speed, torque, PID, etc.) come from the same source (e.g. CANopen bus).

It is possible to replace this source by another one, using a logic input or command word bit.

The CiA DSP 402 profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **ODVA profile**

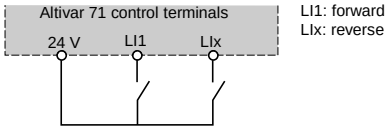
The ODVA profile is supported by the DeviceNet communication card.

Variable speed drives for asynchronous motors
Altivar 71

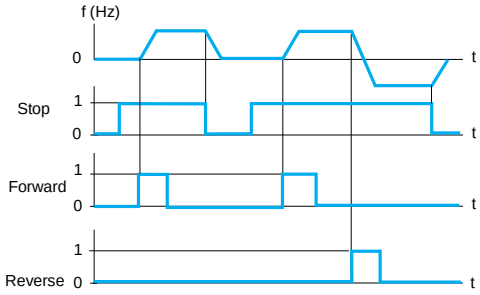
Application functions

■ 2-wire control
This can be used to control the direction of operation by means of a stay-put contact.
It is enabled by means of 1 or 2 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
- □ detection of the state of the logic inputs
- □ detection of a change in state of the logic inputs
- □ detection of the state of the logic inputs with forward operation always having priority over reverse



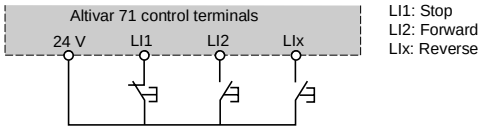
Wiring diagram for 2-wire control



Example of 3-wire control operation

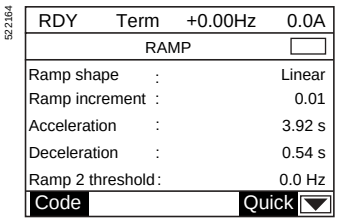
■ 3-wire control
This can be used to control the operating and stopping direction by means of pulsed contacts.
It is enabled by means of 2 or 3 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.



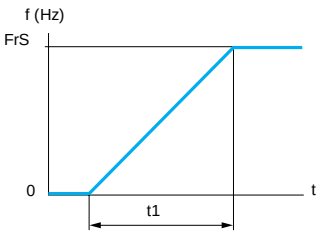
Wiring diagram for 3-wire control

■ Phase rotation
This function can be used to reverse the direction of rotation without modifying the drive wiring.

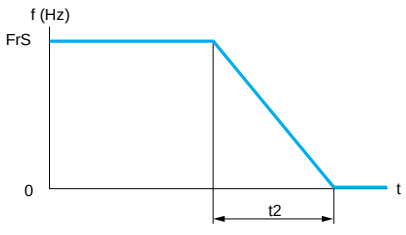


Ramp settings

■ Ramps
□ Acceleration and deceleration ramp times
This can be used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



Linear deceleration ramp

FrS: Nominal motor frequency
t1: Acceleration time
t2: Deceleration time
t1 and t2 can be set independently from 0.01 to 9999 s (according to one of the following ramp increments: 0.01 s, 0.1 s or 1 s)
Factory setting: 3 s.

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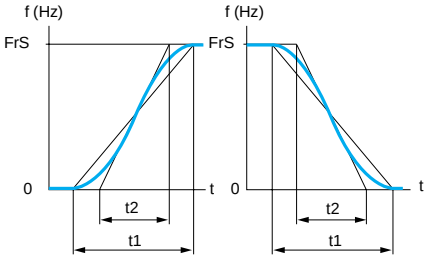
◻ Acceleration and deceleration ramp profile

This can be used to gradually increase the output frequency starting from a speed reference, following a linear profile or a preset profile.

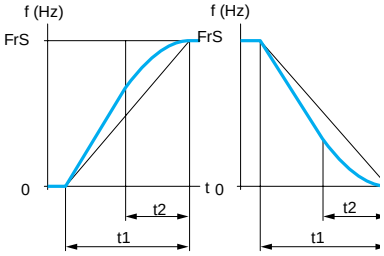
In the case of applications involving handling, packaging and passenger transport, the use of S ramps takes up mechanical play and eliminates jolts and also limits “non-following” of speed during rapid transient operation of high-inertia machines. Selecting “linear”, “S”, “U” or customized profiles assigns both the acceleration and deceleration ramps.

S ramps



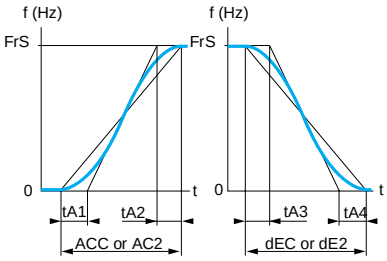
FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

U ramps

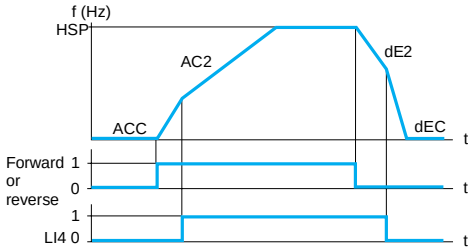


FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

Customized ramps



FrS: Nominal motor frequency
tA1: Can be set between 0 and 100% (of ACC or AC2)
tA2: Can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: Can be set between 0 and 100% (of dEC or dE2)
tA4: Can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: Acceleration ramp 1 time
AC2: Acceleration ramp 2 time
dEC: Deceleration ramp 1 time
dE2: Deceleration ramp 2 time



Example of switching using logic input LI4

Acceleration 1 (ACC) and deceleration 1 (dEC):
- adjustment 0.01 to 9999 s
- factory setting 3 s

Acceleration 2 (AC2) and deceleration 2 (dE2):
- adjustment 0.01 to 9999 s
- factory setting 5 s

HSP: high speed.

◻ Ramp switching

This can be used to switch 2 acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
- a logic input
- a frequency threshold
- a combination of the logic input (or a command word bit) and the frequency threshold
- a command word bit

Function suitable for:
- material handling with smooth starting and approach
- machines with fast steady state speed correction

◻ Automatic adaptation of deceleration ramp

This can be used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function prevents the drive from locking in the event of an overbraking fault.
When this function is active and a short deceleration time has been set, the drive optimizes the motor power supply in order to achieve a high braking torque.

Function suitable for all applications which do not need to stop at a precise moment and do not use braking resistors.

Automatic adaption must be disabled for machines with a stop position on a ramp and using a braking resistor. This function is automatically disabled if the brake sequence is configured.

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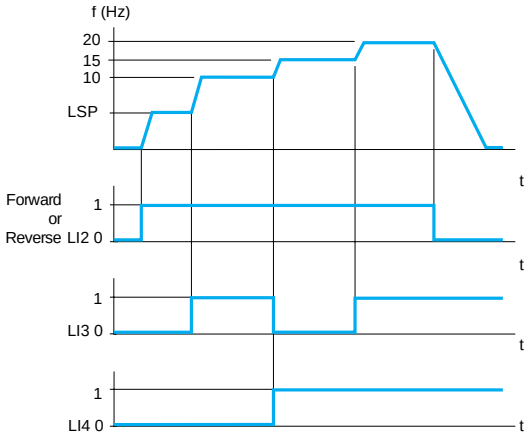
RDY	Term	+0.00Hz	0.0A
PRESET SPEEDS			
2 preset speeds	:		LI3
4 preset speeds	:		LI4
8 preset speeds	:		LI5
16 preset speeds	:		NO
Preset speed 2	:		10.0 Hz
Code	<<	>>	Quick

Preset speed settings

■ Preset speeds

This can be used to switch preset speed references.
2, 4, 8 or 16 preset speeds can be selected.
It is enabled by means of 1, 2, 3 or 4 logic inputs.
Preset speeds can be set in increments of 0.1 Hz, from 0 Hz to 500 Hz or 1000 Hz, depending on the rating.

Function suitable for material handling and machines with several operating speeds.



The speed achieved with the LI3 and LI4 inputs at 0 is LSP or reference speed, resulting from the operations carried out on the references.

Factory settings:

1st speed: LSP (low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

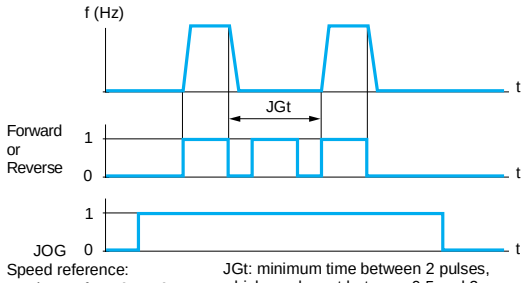
4th speed: 20 Hz

Example of operation with 4 preset speeds and 2 logic inputs

■ Jog operation

This can be used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
It is enabled by 1 logic input and pulses given by the operating direction command.

Function suitable for machines with product insertion in manual mode
(e.g. gradual movement of the mechanism during maintenance operations).



Speed reference:
can be set from 0 to 10 Hz, factory setting 10 Hz.

JGt: minimum time between 2 pulses, which can be set between 0.5 and 2 s.

Example of jog operation

■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.

Function suitable for automatic Stops/Starts.

■ **Motor control types**

□ **Flux vector control with sensor (FVC)**
This control type can be used to obtain the best static and dynamic torque performance.

□ **Sensorless flux vector contro**l
In voltage mode, this control type can be used with a single motor or motors connected in parallel.
In current mode, this profile performs better than the previous type, but it cannot supply power to motors connected in parallel.

□ **2-point vector control**
The zone for operating at constant power can be optimized by defining an additional point in the control profile.
This function should be used with motors offering a two-part defluxing zone.
It can be used to limit the voltage at the motor terminals when the motor is being powered by a high line supply.

□ **Voltage/frequency ratio**
This control type is particularly suitable for special motors (high-speed motors, synchronized asynchronous motors, etc.). The ratio can be adjusted by 2 or 5 points and used to achieve output frequencies of up to 1000 Hz.

□ **ENA system**
This profile is reserved for unbalanced machines (presses, etc.). It can be used to reduce mechanical stress, power consumption and avoid the use of braking resistors.

□ **Synchronous motor**
This control type is exclusively reserved for controlling open loop synchronous permanent magnet motors with sinusoidal electromotive force (EMF).

■ **Using an incremental encoder**
The Altivar 71 drive uses encoder feedback to:
□ Operate in FVC closed loop control mode. In addition to the torque performance and speed accuracy it provides, the speed feedback can also be used to manage overspeed and slipping protection.
□ Improve the steady state speed accuracy and/or manage overspeed and slipping protection in the other control types (FVC open loop control mode and U/f ratio)
□ Manage only overspeed and slipping protection

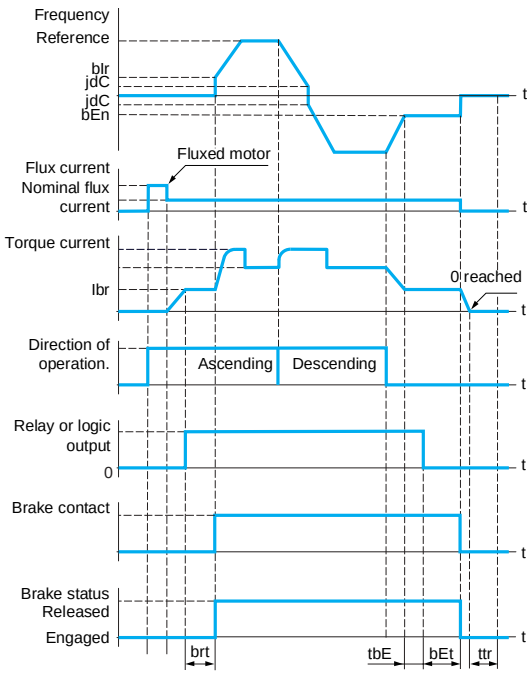
■ **Encoder tests**
The Altivar 71 drive can detect encoder signal loss, as well as a mechanical break in the coupling between encoder and motor.

■ **Limiting motor overvoltage**
The Altivar 71 drive inverter bridge control can be used to limit overvoltage in the motor terminals, which is double the voltage level in the DC bus (Stressless PWM). This function is useful in cases where long lengths of cabling, rewound motors or motors in a low isolation class are involved.

■ **Auto-tuning**
Auto-tuning can be performed:
□ using a dialogue tool (graphical display terminal, PowerSuite software workshop, integrated 7-segment display terminal)
□ via a communication network
□ automatically every time the drive is switched on
□ by enabling a logic input

Auto-tuning can be used to enhance application performance.
In Flux Vector Control mode (FVC closed loop and FVC open loop with current control), certain parameters are measured periodically.
Saving the motor thermal state can help to compensate exactly for the motor resistors, even after the drive has been switched off.

■ **Switching frequency, noise reduction**
By controlling the switching frequency, it is possible to reduce the noise generated by the motor for any application requiring a low level of noise.
The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.
High frequency switching of the intermediate DC voltage can be used to supply the motor with a current wave that has a lower harmonic distortion.
The switching frequency can be adjusted during operation to reduce the noise generated by the motor.
Value: 1 to 16 kHz; factory setting 2.5 or 4 kHz, depending on the rating.



Open loop vertical movement

bEn: Brake engage frequency
bEt: Brake engage time
blr: Initialization of ramp once the "brake release" time (brt) has expired
brt: Brake release time
Ibr: Brake release current
JdC: Reverse jump
tbE: Brake engage time
ttr: Restart time

Note: *in open loop mode, feedback from an incremental encoder can be connected to the drive in order to directly detect overspeed and slipping.*

■ Motor fluxing

This can be used to obtain rapid high torque on start-up; magnetic flux needs to be already established in the motor.
There is a choice between open loop or closed loop operation.

In continuous mode, the drive automatically establishes the flux when it is powered up.

In non-continuous mode:
□ If a logic input or command word bit is assigned to the motor fluxing command, flux is established when the command is confirmed.
□ If an input logic or command word bit has not been assigned, or if the latter are not active when a run command is given, fluxing occurs when the motor starts.

Fluxing is accelerated if a higher current than the nominal motor current is applied, then it is set to the value of the motor no-load current.

■ Brake control

This can be used to manage control of an electromagnetic brake in synchronization with starting and stopping the motor to avoid jolts and load slipping.
The brake control sequence is managed by the drive.

□ Movement type

The Altivar 71 drive adapts the brake control operation to the type of movement, whether vertical or horizontal, in order to achieve maximum torque performance and eliminate jolts.

□ Brake feedback via contact

By connecting a brake contact to the drive, it is possible to detect brake faults. If the brake status does not match the relevant control (the contact must be open for a released brake), the drive locks when a fault occurs.

□ Brake release pulse

This can be used to set the torque for brake release when ascending (forward) or two release thresholds (one for ascending and the other for descending).

This function is only available for vertical movements.

□ Brake engage on reversal of operating direction

To prevent the speed from passing through zero when reversing the direction of rotation, the drive firstly requires the brake to be engaged at the end of deceleration and then for it to be released before accelerating in the other direction of rotation.

□ Brake engage request time delay

In the case of slewing movements, this function can be used, at the end of deceleration, to control how the brake is engaged when the torsional stress being exerted on the machine structure is zero.

□ Automatic DC injection

In the case of a horizontal movement, the DC injection at the end of deceleration can be used to prevent jolting when the brake is being engaged.

This function is only available for horizontal movements.

■ Limit switch management

This can be used to manage the operation of one or two limit switches (non-reversing or reversing).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as a stop on ramp, freewheel or fast stop.
Following a stop, the motor is permitted to restart in the opposite direction only.

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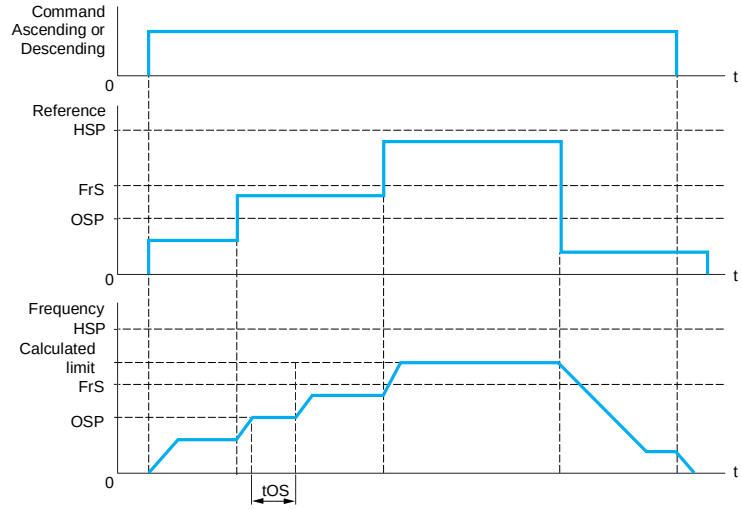
Altivar 71

■ **High-speed hoisting**
This can be used to optimize cycle times for hoisting movements when the load is zero or small.
It allows operation at constant power (motor defluxing beyond the nominal motor frequency) in order to achieve a higher speed than the nominal speed, without exceeding the nominal motor current and thereby preventing the motor from overheating.

There are 2 possible operating modes:

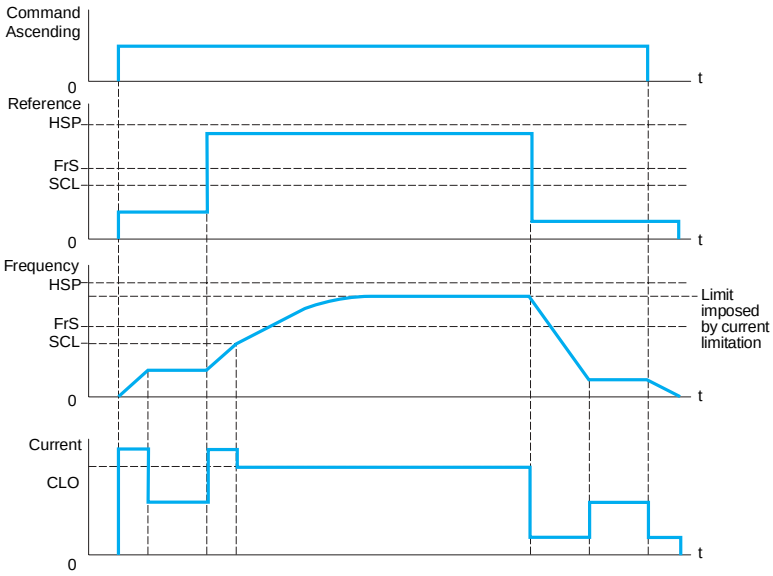
□ Speed reference mode: The maximum permitted speed is calculated by the drive at an imposed speed step so that the drive can measure the load.



Speed reference mode

FrS: Nominal motor frequency
HSP: High speed parameter
OSP: Adjustable speed step for load measurement
tOS: Load measuring time
Two parameters can be used to reduce the speed calculated by the drive, for ascending and descending.

□ Current limiting mode: The maximum permitted speed is the speed at which the current is limited in the motor quadrant, ascending only. For descending, operation is always based on speed reference mode.



Current limiting mode

CLO: Current limitation for high speed-function
FrS: Nominal motor frequency
HSP: High speed parameter
SCL: Adjustable speed threshold above which current limitation is active

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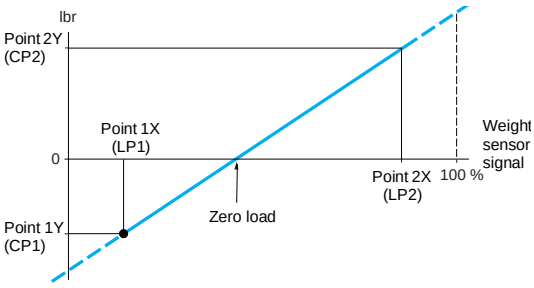
Altivar 71



CP1, CP2, LP1, LP2: weight sensor calibration points

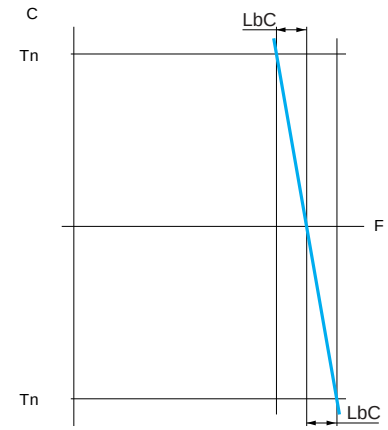
This curve can represent a weight sensor on a lift winch, where a zero load is exerted on the motor when the load in the cabin is not zero.

■ External weight measurement

This function uses the information supplied by a weight sensor via an analog input (usually a 4-20 mA signal) to adapt the current (Ibr) of the Brake logic control function.

Function suitable for applications involved in:
- □ measuring the total weight of a hoisting winch and its load
- □ measuring the total weight of a lift winch, the cabin and counterweight.

The current (Ibr) is adapted according to the curve opposite.



LbC: Load correction (Hz)

Load sharing

■ Load sharing

This function can be used for applications where several motors are mechanically linked in order to share the loads of the different motors by adjusting the speed according to the torque on each motor.

■ Control and integrity check of output contactor

□ Control

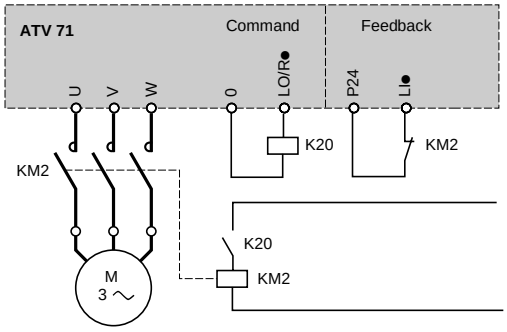
This allows the drive to control a contactor located between the drive and the motor. The request to close the contactor is made when a run command appears. The request to open the contactor is made when there is no current in the motor.

Note: *If a DC injection braking function has been configured it should not be left operating too long in stop mode, as the contactor only opens at the end of braking.*

□ Integrity check

This check is carried out by connecting a volt-free contact on each contactor to one of the drive's logic inputs.
The corresponding logic input should be at 1 when there is no run command and at 0 during operation.
When there is any inconsistency, the drive locks in fault mode if the output contactor does not close (LIx = 1) or gets stuck (LIx = 0). The time delay for when the drive locks in fault mode can be adjusted.

These sequences are commonly used in lift applications.
In order to enhance the level of security and reduce the amount of maintenance work, it is recommended that the Altivar 71 drive's integrated "Power Removal" safety function is used.



Control and integrity check of output contactor

■ Stop on thermal alarm

This can be used to:
- □ Allow a movement to end before examining a thermal fault. There are two adjustable thresholds used to define the thermal state level which, when exceeded, makes a machine stop;
- □ Prevent a new run command from being accepted as long as the drive and motor temperatures are not less than 100%.

Function suitable for lift applications: it can prevent people getting trapped if a lift gets stuck between two floors.

■ Evacuation following power failure

This can be used to control the reduced speed engine with a reduced voltage supply (220 V ≂, for example: uninterruptible power supply (UPS)), by preserving torque performance.

Function suitable for lift applications: When there is a power failure, it facilitates the evacuation of people trapped in a lift stuck between two floors.

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RDY	Term	+0.00Hz	0.0A
+/- SPEED			
+ speed assign. :			LI3
- speed assign. :			LI4
Ref. saved :			RAM
Code			Quick

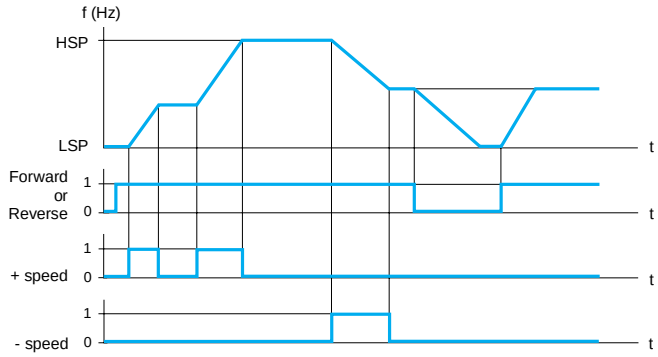
+/- speed function settings

■ **Uncontrolled output cut**
It is possible to configure output phase loss protection, which will allow the drive or motor circuit to be broken without the drive becoming locked in fault mode and facilitate a smooth restart after the motor has been reconnected. The output phase loss may also lock the drive, depending on the configuration.

■ **+/- speed**
This can be used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function).
This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a handling crane pendant control station with two operating directions.

Two types of operation are available:
□ Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).
□ Use of double action buttons: only 1 logic input assigned to + speed is required.

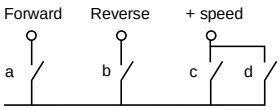
Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).



LSP: low speed, HSP: high speed
Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

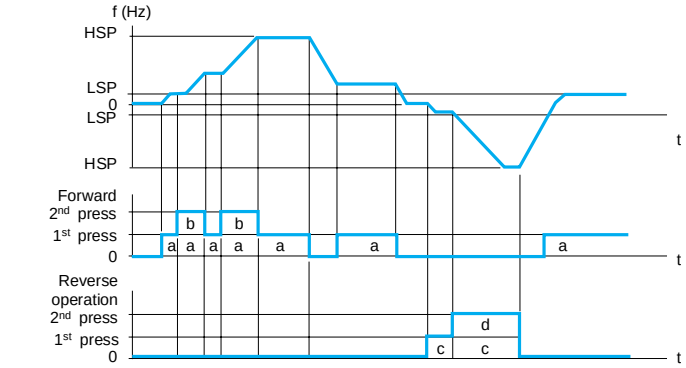
Use of double action buttons: only 1 logic input assigned to + speed is required.

Logic inputs:



a and b: 1st press
c and d: 2nd press

	Released (- speed)	1st press (speed maintained)	2nd press (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d



LSP: low speed, HSP: high speed
Example with double action buttons and 1 logic input
Note: *This type of +/- speed control is incompatible with 3-wire control.*

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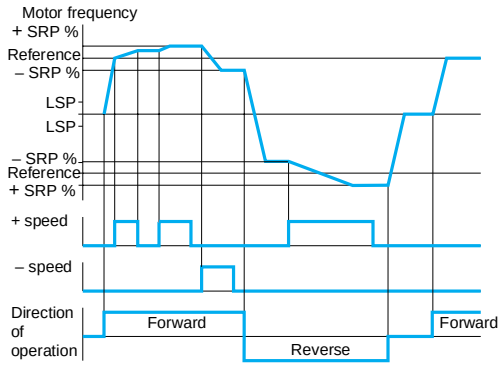


Example of +/- speed around a 2-wire control reference

□ Reference saving

This function is associated with +/- speed control.

This can be used for reading and saving the last speed reference prior to the loss of the run command or line supply. The reference saved is applied the next time a run command is received.

□ +/- speed around a reference

The reference is given by Fr1 or Fr1b, including, if relevant, the summing, subtraction and multiplication functions, as well as the preset speeds.

During the run command the drive goes to the reference, following the acceleration and deceleration ramps (pressing +/- speed makes the speed vary around this reference according to acceleration ramp 2 and deceleration ramp 2).

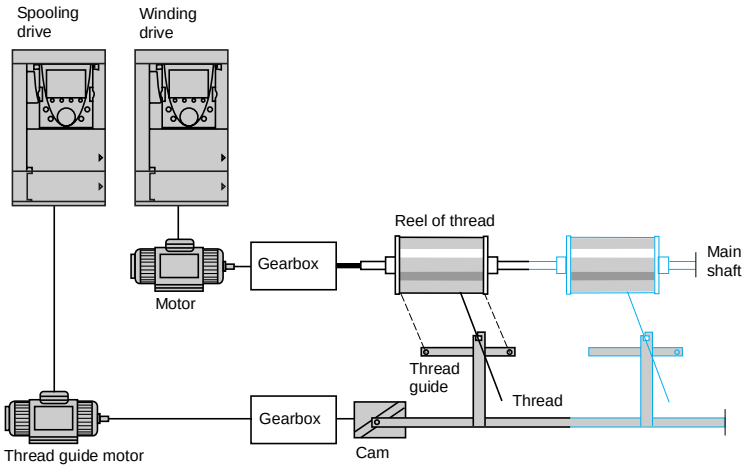
+ or - speed variation around the reference is limited to a percentage of the reference (SRP parameter). When operation has stopped, the amended reference is not saved.

The maximum total reference is always limited by high speed (HSP parameter) and the minimum reference (LSP parameter).

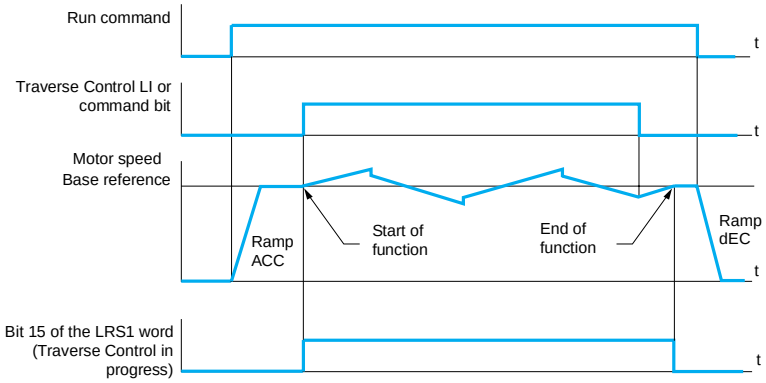
■ Spooling

□ Traverse control

Function for winding reels of thread (in textile applications)

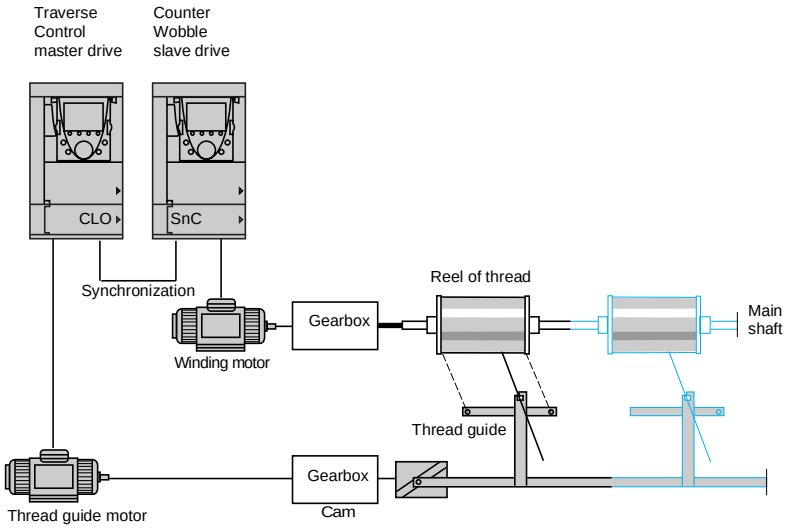


The cam rotation speed must follow a precise profile to ensure a steady, compact, linear reel is obtained.

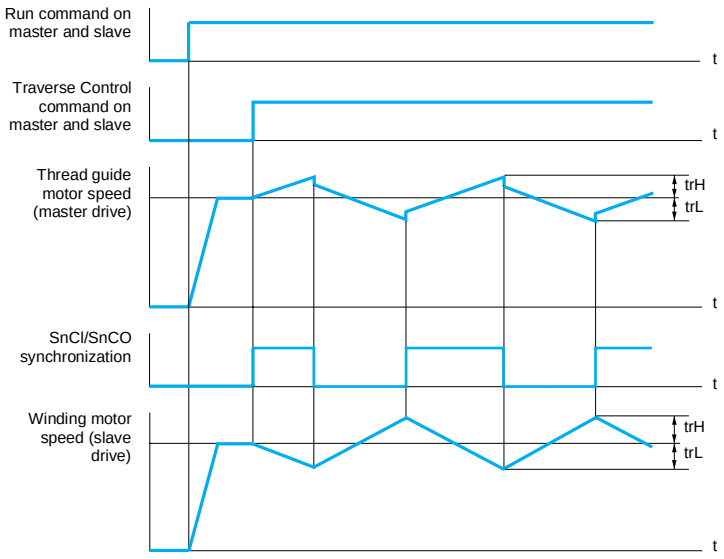


A function can also be used to reduce the base reference as the reel gets larger.

□ Counter Wobble



The Counter Wobble function is used in certain applications to obtain a constant thread tension when the Traverse Control function is producing considerable variations in speed on the thread guide motor.
The master drive controls the speed of the thread guide, while the slave drive controls the winding speed. The function assigns the slave a speed profile which is in antiphase to the master's. This means that synchronization is required, using one of the master's logic outputs and one of the slave's logic inputs.



■ **Automatic catching of a spinning load with speed detection** ("catch on the fly")
This function can be used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel stop.

Once the event is over, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed. The speed detection time can reach 0.5 s.
This function is automatically disabled if the brake sequence is configured.
It is suitable for machines which suffer low motor speed loss during a power failure (high-inertia machines such as centrifuges, etc.).

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■ **Undervoltage management**
Depending on the application, it is possible to configure the Altivar 71's response to undervoltages or power failures.
If undervoltage occurs:
□ The Altivar 71 drive can continue operating with undervoltage levels up to -50% (adjustable threshold)
□ If the drive locks as a result, management of the fault relay can be configured (open or not). If the fault relay does not open an alarm is shown.

The Altivar 71 drive can also be configured to prevent the drive locking (using an alarm):
□ Controlled stop according to the type of stop configured
□ Deceleration based on a ramp which it automatically adapts to maintain the DC bus voltage, thereby preventing the drive from locking in fault mode
□ Instant IGBT (inverter bridge) loss followed by power supplied to the motor as soon as the line voltage has reappeared. This function can be used to prevent the Altivar 71 drive being reinitialized.

■ **Braking balance**
When several drives are connected on a common DC bus, this function can be used to adjust the braking thresholds in order to balance the braking powers among the various drives or braking units.

■ **Braking resistor thermal protection**
The Altivar 71 drive incorporates thermal protection for braking resistors if it is not fitted with a thermal switch. If the resistor thermal state is too high an alarm can be assigned to the logic output or the drive may lock in fault mode, depending on how the function is programmed.

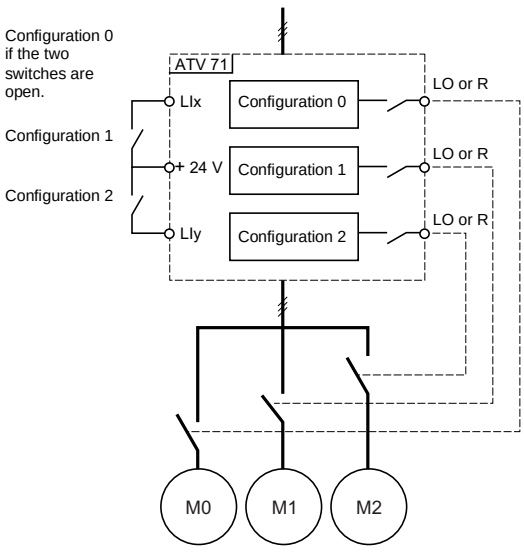
■ **Parameter set switching (multi-parameter)**
This can be used to switch 3 sets of 15 parameters maximum when the motor is running.
Each set can contain a different value for each of the parameters. The sets are switched using 1 or 2 logic inputs or command word bits.

Function suitable for machines involving 2 or 3 manufacturing processes.

■ **Motor or configuration switching (multi-motor or multi-configuration)**

The Altivar 71 drive can have 3 configurations, which can be activated remotely, allowing it to adapt to:
□ 2 or 3 different motors or mechanisms in multi-motor mode. In this instance, the thermal state for all the motors is calculated and saved. This means that each motor is protected thermally.
□ 2 or 3 configurations for the same motor in multi-configuration mode. This function can also be used to save the current configuration in another memory zone, which it can be retrieved from.
Switching is carried out using 1 or 2 logic inputs, depending on the number of motors or configurations chosen (2 or 3).

Multi-motor and multi-configuration modes cannot be used together.



Schematic diagram for multi-motor mode

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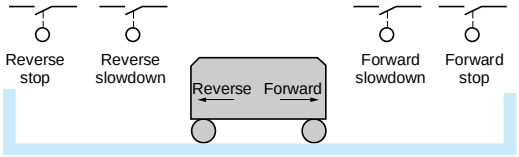
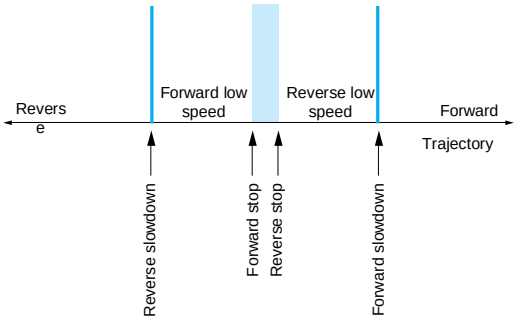
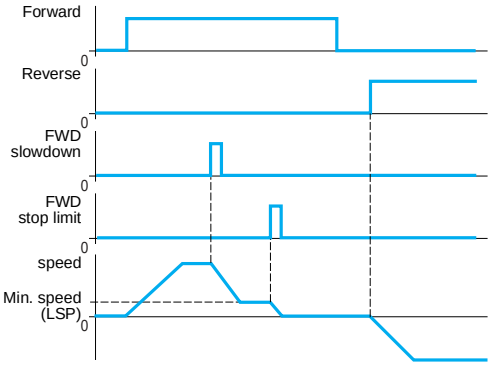


***Example 1**: limit switch positioning*
Slowdown and stopping occur when the sensor is changing state (open contact). It is possible to assign a command word bit or a logic input to disable the function in order to be able restart or not stop on the position.



***Example 2**: positioning on a target zone*
The disable contact can be used to restart in order to get past the target.

■ Positioning on limit switches or position sensors
This can be used to manage positioning based on limit switches or position sensors.

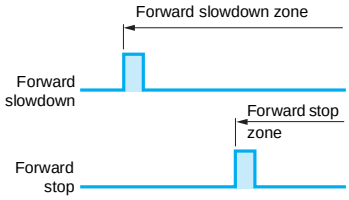


Activating the slowdown contact or stop contact allows the device to start in the other direction, even at high speed.

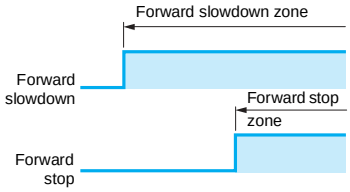
Slowdown mode can be configured:
- ☐ The drive uses the validated ramp time
- ☐ The drive calculates a ramp time according to the actual speed when the request to slow down is made. This calculation can be used to optimize the cycle time by limiting the time spent operating at low speed.

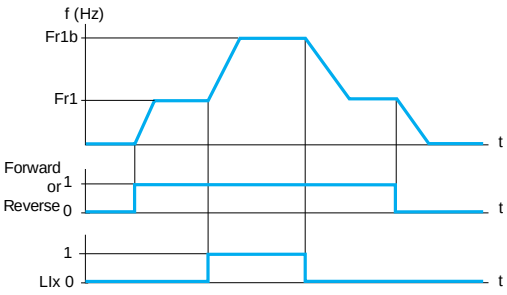
The stop type can also be configured:
- ☐ stop on ramp
- ☐ freewheel stop
- ☐ fast stop

■ Short and long cam operation
☐ Short cams
In this instance, when operating for the first time or after restoring the factory settings, the drive must initially be started outside the slowdown and stop zones in order to initialize the function.

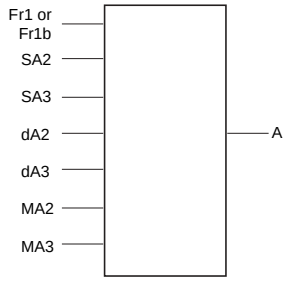


☐ Long cams
In this instance, there is no restriction, which means that the function is initialized across the whole trajectory.





Example of reference switching



A: drive reference
SA2, SA3: summed inputs
dA2, dA3: subtraction inputs
MA2, MA3: multiplication inputs.

■ **Reference switching**
Switching between two references (speed, torque, PID, etc.) can be enabled by:
□ a logic input
□ a command word bit
Reference 1 (Fr1) is active if the logic input (or command word bit) is at 0; reference 2 (Fr1b) is active if the logic input (or command word bit) is at 1.
References can be switched with the motor running.

Reference Fr1b, like Fr1, can originate from:
□ an analog input (AI)
□ a frequency control input (RP)
□ the graphic display terminal
□ the Modbus or CANopen bus
□ a communication card
□ the Controller Inside programmable card

■ **Operations on references (summing, subtraction, multiplication)**
Summing, subtraction and multiplication inputs can be activated simultaneously.

The drive reference is thus:
□ reference of drive A = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

□ **Summing inputs**
They can be used to add 2 to 3 references from different sources to Fr1 or Fr1b (see “Reference switching”).
The references to be added together are selected from all the possible types of reference.

For example,
Reference Fr1 or Fr1b from AI1
Reference SA2 from CANopen
Reference SA3 from a communication card
Reference of drive A = Fr1 or Fr1b + SA2 + SA3.

□ **Subtraction inputs**
They can be used to subtract 2 to 3 references from different sources from Fr1 or Fr1b (see “Reference switching”).
The references to be subtracted are selected from all the possible types of reference.

For example,
Reference Fr1 or Fr1b from AI1
Reference dA2 from CANopen
Reference dA3 from a communication card
Reference of drive A = Fr1 or Fr1b - dA2 - dA3.

□ **Multiplication inputs**
They can be used to multiply 2 to 3 references from different sources by Fr1 or Fr1b (see “Reference switching”).
The references to be multiplied are selected from all the possible types of reference.

For example,
Reference Fr1 or Fr1b from AI1
Reference MA2 from CANopen
Reference MA3 from a communication card
Reference of drive A = Fr1 or Fr1b x MA2 x MA3.

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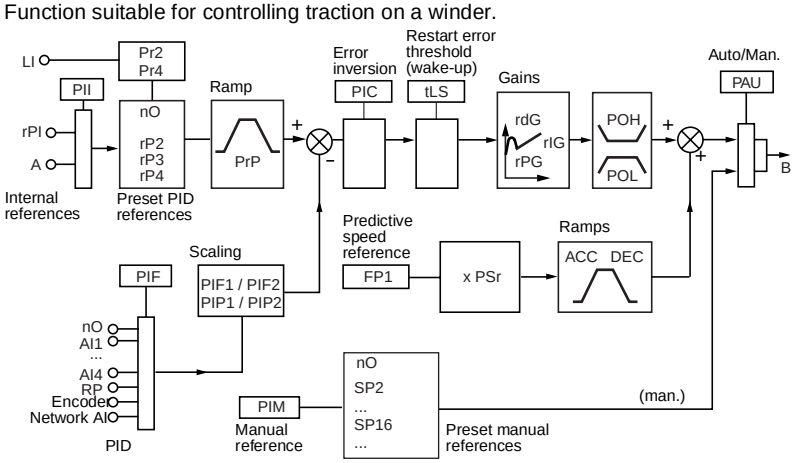
■ PID regulator
This can be used to regulate a process with a reference and feedback given by a sensor.
Function suitable for controlling traction on a winder.



ACC: Acceleration, DEC: Deceleration, LI: Logic inputs, B: Speed reference.

□ Internal references
- rPI: reference transmitted by the graphic display terminal or a communication network.
- A: reference given by Fr1 or Fr1b with the summing, subtraction and multiplication functions, as appropriate.

The “PII” parameter is used to choose between these two references.

□ Preset PID references
2 or 4 PID references are available. Table showing combinations of selected PID references:

LIx (Pr4)	LIy (Pr2)	Reference
0	0	rPI or A
0	1	rP2
1	0	rP3
1	1	rP4

□ PID feedback
PID feedback can be assigned to one of the analog inputs (AI1 to AI4), the frequency control input (RP) or the encoder, depending on the option cards present. It can also be transmitted by a communication network (AI network).

□ Predictive speed reference
This reference can come from the terminals (analog inputs, encoders, etc.), the graphic display terminal or a communication network.
This speed input gives an initial reference for starting.

□ Auto/Man.
This can be used to switch from speed regulation mode (Man.) to PID regulation mode (Auto). A logic input or command word bit is used for switching.

Speed regulation mode (Man.)
The manual reference is transmitted via the terminals (analog inputs, encoder, preset speeds, etc.).
With manual switching, the speed reference changes according to the ramp times ACC and DEC.

PID regulation mode (Auto)
In automatic mode it is possible to:
- adapt the references and feedback to the process (transformation)
- correct a PID inversion
- adjust the proportional, integral and derivative gains (Kp, Ki and Kd)
- shunt the integral
- use the “alarm” on the logic output or display it on the graphic display terminal, if the threshold is exceeded (Max. feedback, Min. feedback and PID error)
- display the PID reference, PID feedback, PID error and PID output on the graphic display terminal and assign them to an analog output
- apply a ramp (time = PrP) to the PID reference.

The motor speed is limited to between LSP and HSP.
It is displayed as process values.

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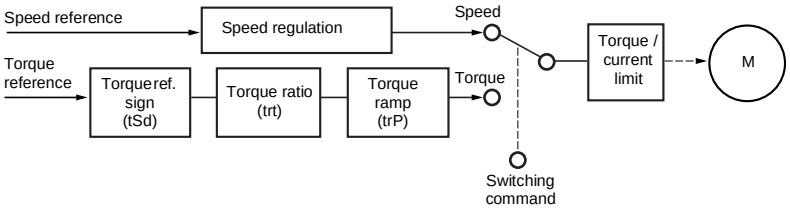
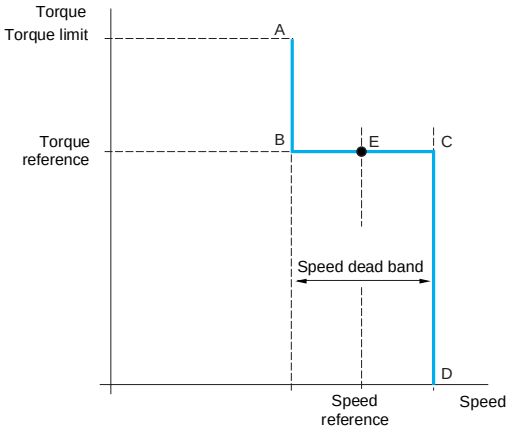
■ **Torque control**
This supports torque control or speed regulation mode.
These two types of mode can be switched using a logic input or command word bit.

Function suitable for applications requiring traction control.



The torque reference is signed and has its own ramp. A torque ratio can be used to scale the reference. It can be transmitted via an analog input, frequency control input (RP input or encoder) or communication network.
The torque sign and value can be output to a logic output and an analog output.

In torque control mode the speed may vary within an adjustable dead band. When it has reached the lower or upper limit, the drive automatically switches to speed regulation mode (fallback position).
The regulated torque is no longer maintained, in which case two scenarios can occur:
□ The speed falls within the dead band; the torque takes the required value.
□ The torque does not return to the required value at the end of an adjustable time; the drive switches to fault or alarm mode, depending on the configuration.



The stop in torque control mode can be configured:
□ automatic switch to speed regulation mode
□ freewheel stop
□ stop at zero torque but still maintaining the flux in the motor for an adjustable period of time.

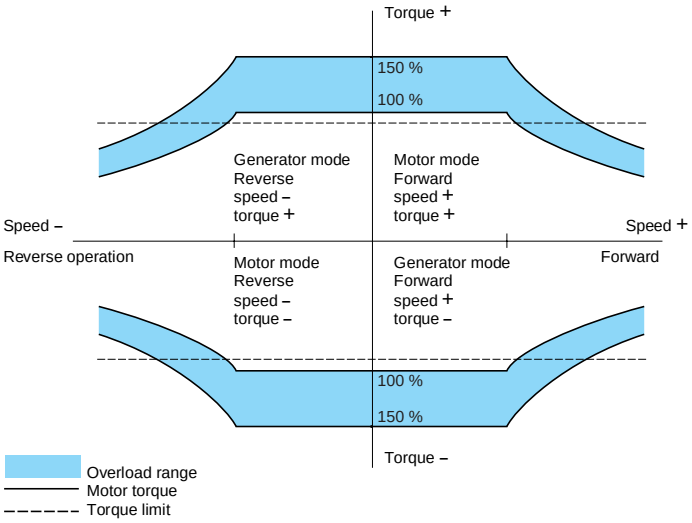
■ Torque limit

This can be used to limit the torque in the motor and generator quadrants using separate settings.

There are two types of torque limit:
- one with a value set by a parameter
- the other with a value given by an analog input, frequency control input or encoder.

When both torque limit types are enabled it is the lowest value which is read. They can be switched using a logic input or command word bit.

This function is not available for voltage/frequency ratio.



The torque limit operates in both directions of rotation in motor or generator mode.

■ Torque or current limit detection

This function can be used to detect when the current or torque limit has been reached. Depending on the configuration, it is possible to:
- use an alarm to signal this
- lock the drive after an adjustable period of time.

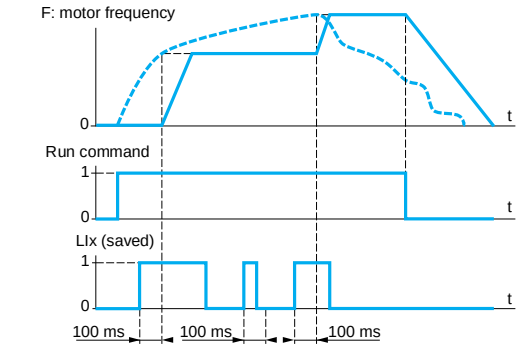
■ Current limit

A 2nd current limit can be configured between 0 and 1.65 times the drive nominal current and it can be used to limit the rise in motor temperature and the torque. Switching between 2 current limits can be enabled via:
- a logic input
- a command word bit

522170

RDY	Term	+0.00Hz	0.0A
2nd CURRENT LIMIT.			☐
I Limit. 2 activ.	:		LI6
I Limit. 2 value	:		6.4 A
Current limitation	:		7.9 A
Code			Quick

Configuring current switching



Example of how reference saving works

■ **Reference saving**

This can be used to:

□ Read and save the speed reference value of the analog input using a logic input when the command lasts longer than 0.1 s

□ Control the speed of several drives alternately via a single analog reference and a logic input for each drive

□ Enable via a logic input a line reference (serial link) on several drives in order to synchronize movements by eliminating variations when the reference is sent

The reference is acquired 100 ms after the rising edge of the request.

A new reference is not then acquired until a new request is made.

522142

RDY	Term	+0.00Hz	0.0A
STOP CONFIGURATION			
Type of stop	:	Ramp stop	
Freewheel assign.	:	NO	
Fast stop assign.	:	LI4	
Ramp divider	:	0	
DC inject. assign.	:	NO	
Code		Quick	

Configuring stop types

■ **Stop types**

□ **Freewheel stop**

This can be used to stop the motor by resistive torque only if the supply to the motor is removed.

A freewheel stop is achieved:

- by configuring a normal stop command as a freewheel stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

□ **Fast stop**

This can be used to achieve a braked stop with an acceptable deceleration ramp time (divided by an adjustable coefficient from 0 to 10) for the drive/motor unit to avoid locking in the event of an overbraking fault. If the coefficient is equal to 0 the motor decelerates as fast as possible.

This is used for conveyors with emergency stop electrical braking.

A fast stop is achieved:

- by configuring a normal stop as a fast stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

□ **Fastest possible stop**

If the ramp divider coefficient is equal to 0 the motor decelerates as fast as possible.

□ **DC injection stop**

This can be used to brake high-inertia machines at low speed or maintain torque on stopping.

A DC injection stop is achieved:

- by configuring a normal stop as a DC injection stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

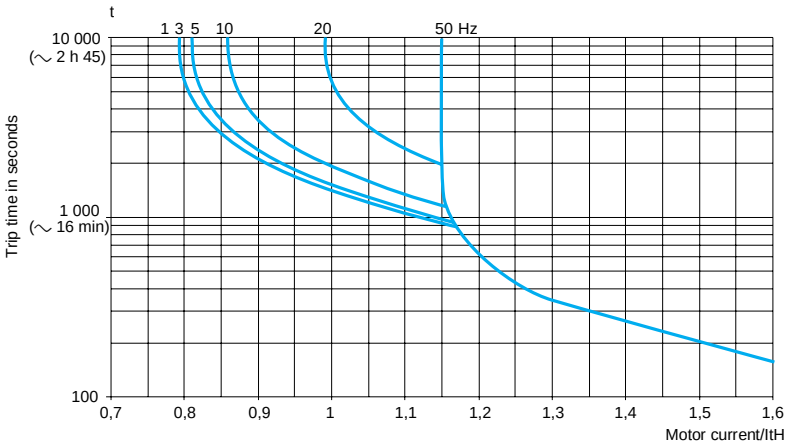
The DC value and the standstill braking time are adjustable.

■ **Motor thermal protection**
Motor thermal protection is provided by the drive:
□ directly, through PTC probes located in the motor windings
□ indirectly, via the integrated thermal relay. Indirect thermal protection is implemented via continuous calculation of its theoretical temperature rise.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:
□ the operating frequency
□ the current taken by the motor
□ the operating time
□ the maximum ambient temperature around the motor (40°C)
□ the type of motor ventilation (self-cooled or force-cooled)

Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current. It must be adjusted to the nominal current indicated on the motor rating plate.

Note: *The motor thermal state memory returns to zero when the drive control part is switched off.*



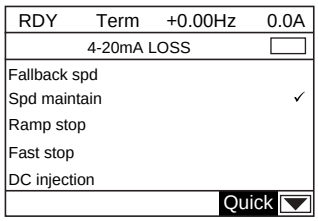
Motor thermal protection curves

□ Self-cooled motors:
The tripping curves vary with the motor frequency.

□ Force-cooled motors:
Only the 50 Hz tripping curve should be considered, whatever the motor frequency.

■ **Drive thermal protection**
The drive's thermal protection is provided by a PTC probe fitted on the heatsink or integrated with the power module.

■ **IGBT thermal protection**
The drive manages the switching frequency intelligently according to the IGBT temperature.
If the drive's current rating is exceeded (e.g. current higher than the nominal drive current for a zero stator frequency), an alarm is displayed and a timer increases for as long the alarm is present.



Configuration of the drive's fault response

■ **Configuring the drive's fault response (fault management)**
Different responses can be configured for the drive in the event of a resettable fault occurring:
- freewheel stop
- drive switches to the fallback speed
- drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- fast stop
- DC injection stop
- no stop (alarm activated)

List of resettable faults:
- external fault
- speed feedback loss
- overspeed
- slipping
- output phase loss
- auto-tuning fault
- brake contactor feedback fault
- encoder coupling
- loss of 4-20mA
- PTC probe
- drive overheating
- motor overload if the thermal state is less than 100%
- line overvoltage
- overbraking
- current/torque limit
- IGBT overheating
- communication faults (Modbus, CANopen and other communication networks)

■ **Resetting resettable faults**
This can be used to remove the last fault using a logic input, command word bit or the STOP/RESET key on the graphic display terminal.
The restart conditions after a reset to zero are the same as those of a normal power-up.
List of resettable faults, see "Configuring the drive's fault response".
Line supply undervoltage and input phase loss faults are reset automatically when the line supply is restored.

Function suitable for applications where drives are difficult to access, for example, a drive placed on a moving part.

■ **General reset (disables all faults)**
This function can be used to disable all faults, including thermal protection (forced operation) and may cause irreparable damage to the drive.

Function suitable for applications where restarting may be crucial (conveyor in an oven, smoke extraction system, machines with solidifying products to be discarded).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ⊥ of the logic input.

Note: *Use of this function invalidates the guarantee.*

■ **Automatic restart**
This enables the drive to be restarted automatically after it has locked in fault mode if the relevant fault has disappeared and the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The options for the restart process's duration are 5, 10 and 30 min., 1, 2, 3 hours and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been switched off and on again.

The faults which allow the drive to be restarted in this way are:
- line overvoltage
- motor thermal overload
- drive thermal overload
- DC bus overvoltage
- line phase failure
- external fault
- loss of 4-20mA
- PTC probe
- serial link
- current or torque limit
- output phase loss
- line voltage too low. For this fault, the function is always active, even if it is not configured.
- fault caused by CANopen, Modbus or other commmunication networks. These faults are reset automatically as soon as the command word or frequency reference is sent to the drive.

For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and operating direction must be maintained for this function.

This function is suitable for machines or installations which are in continuous operation or unmonitored, and where a restart will not endanger equipment or personnel in any way.

■ **PTC probe protection**
The probes can be connected directly to the drive's control card or to the I/O option cards.
The way in which a temperature fault is recorded by the drive can be configured:
- permanent record
- only recorded when the drive's power section is switched on
- only recorded when the motor is running

■ **IGBT testing**
When enabled, this function tests every IGBT and the motor connections in order to detect a short-circuit or an open circuit. This test is run every time the drive is powered on and before each motor start.

This function must not be enabled with machines with fast cycles in order to preserve the time for recording run commands.

■ **Resetting operating time to zero**
The drive's operating and power-up time can be reset.

■ **External fault**
This function can lead to the drive locking if a fault occurs in the machine. This fault is flagged on the drive display unit. The fault is flagged if the signal is at 1 or 0, according to the function's configuration.

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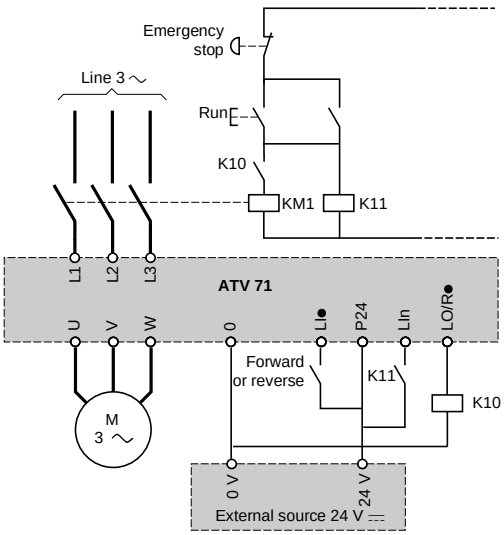
■ **Line contactor control**
This can be used on each run command to close the line contactor and open it when the motor is no longer on. The drive's control section must be powered without fail by an external 24 V ⎓ source.

This function must be used for simple sequences with a low number of Start/Stop operations (Start/Stop cycle longer than 60 seconds).



After a run command, if the line contactor is not closed the drive will lock after an adjustable period of time.

■ **Forced local mode**
Forced local mode imposes control via the terminals or graphic display terminal and disables all other control modes.
Switching to forced local mode may be activated via:
- a logic input
- a function key on the graphic display terminal

The following references and commands are available for forced local mode:
- references AI1, AI2, etc. and command via logic inputs
- reference and command via the graphic display terminal

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Function compatibility table

■ **Configurable I/O**

Functions which are not listed in this table are fully compatible.
Stop functions have priority over run commands.
The selection of functions is limited:
- By the number of drive I/O which can be reassigned: if necessary, add an I/O extension card.
- By the incompatibility of certain functions with one another.

Functions	Operation on the references	+/- speed *(3)*	Limit switch management	Preset speeds	PID regulator	Traverse control	Jog operation	Brake control
Operation on the references				↑	⊖		↑	
+/- speed *(3)*						⊖	⊖	
Limit switch management					⊖			
Preset speeds	←						↑	
PID regulator	⊖		⊖			⊖	⊖	⊖
Traverse control		⊖			⊖		⊖	
Jog operation	←	⊖		←	⊖	⊖		⊖
Brake control					⊖		⊖	
Automatic catching a spinning load with speed detection (catch on the fly)								⊖
Control and integrity check of output contactor								⊖
DC injection stop								⊖
Fast stop								
Freewheel stop								
+/- speed around a reference					⊖	⊖	⊖	
High-speed hoisting					⊖	⊖	⊖	
Torque control	⊖ *(1)*	⊖ *(1)*		⊖ *(1)*	⊖ *(1)*	⊖ *(1)*	⊖ *(1)*	⊖ *(1)*
Load sharing					⊖			
Position control via limit switches					⊖			

(1) Torque control and the speed reference functions are only incompatible if torque control mode is active.
(2) Priority is given to the first of these two stop modes to be activated.
(3) Excluding special use with reference channel Fr2.

⊖ Incompatible functions
Compatible functions
N/A

Priority functions (functions which cannot be active at the same time)
← The arrow indicates which function has priority.
↑ Example: The "Freewheel stop" function has priority over the "Fast stop" function.

Automatic catching a spinning load with speed detection (catch on the fly)	Control and integrity check of output contactor	DC injection stop	Fast stop	Freewheel stop	+/- speed around a reference	High-speed hoisting	Torque control	Load sharing	Position control via limit switches
							(1)		
							(1)		
							(1)		
							(1)		
							(1)		
							(1)		
							(1)		
							(1)		
			(2)						
		(2)							
							(1)		
(1)					(1)				(1)
						(1)			

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PowerSuite software workshop

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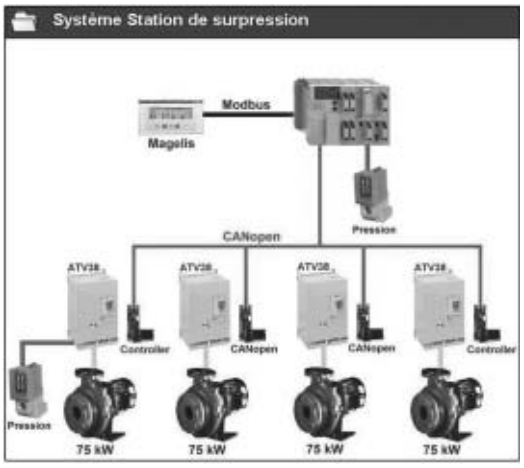
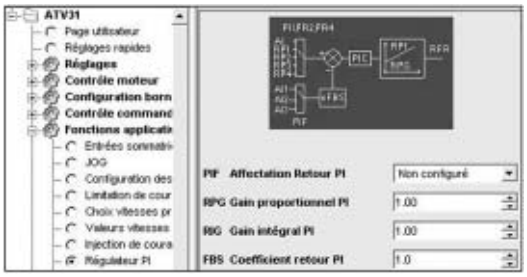


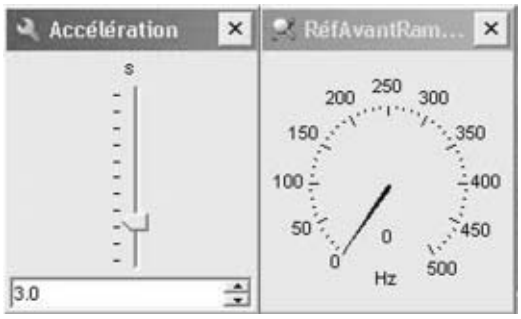
PowerSuite screen on PC
Management of the installed base

533181



PowerSuite screen on PC
View of PI regulator function parameters

533182



PowerSuite screen on PC
Monitoring control panel (cursor, gauge)

Presentation

The PowerSuite software workshop is a user-friendly tool designed for setting up control devices for the following Telemecanique brand motors:
- TeSys model U controller-starters
- Altistart soft start/soft stop units
- Altivar variable speed drives

It includes various functions designed for setup phases such as:
- Preparing configurations (for PC)
- Start-up (for PC and Pocket PC)
- Maintenance (for PC and Pocket PC)

In order to simplify the start-up and maintenance phases, the PowerSuite software workshop can use the Bluetooth® wireless link.

PowerSuite software workshop for PC

Functions *(1)*

Preparing configurations

The PowerSuite software workshop can be used on its own to generate the device configuration. It can be:
- Saved, printed and exported to office automation software
- Exchanged between a PC and a Pocket PC using standard synchronization software such as Microsoft ActivSync®

The PowerSuite software workshop can also be used to convert:
- An Altivar 28 drive configuration to an Altivar 31 drive configuration
- An Altivar 58 or Altivar 58F drive configuration to an Altivar 71 drive configuration

Setup

When the PC is connected to the device, the PowerSuite software workshop can be used to:
- Transfer the generated configuration
- Adjust
- Monitor: This option has been enhanced with new functions such as:
  - The oscilloscope
  - The high speed oscilloscope (minimum time base: 2 ms)
  - Display of communication parameters
- Control
- Save the final configuration

Maintenance

In order to simplify maintenance operations, the PowerSuite software workshop can be used to:
- Compare the configuration of a device currently being used with a saved configuration
- Manage the user's installed base of equipment, in particular:
  - Organize the installed base into folders (electrical equipment, machinery, workshops, etc)
  - Store maintenance messages
  - Simplify Ethernet connection by storing the IP address

User interface

The PowerSuite software workshop can be used to:
- Present the device parameters arranged by function in the form of illustrated views of diagrams or simple tables
- Customize the parameter names
- Create:
  - A user menu (choice of particular parameters)
  - Monitoring control panels with graphic elements (cursor, gauges)
- Perform sort operations on the parameters
- Display text in five languages (English, French, German, Italian and Spanish). The language changes immediately and there is no need to restart the program.

It also has online contextual help:
- On the PowerSuite tool
- On the device functions by direct access to the user's manuals.

(1) Some functions are not available for all devices. See the table of function availability, page 177.

References:
page 179

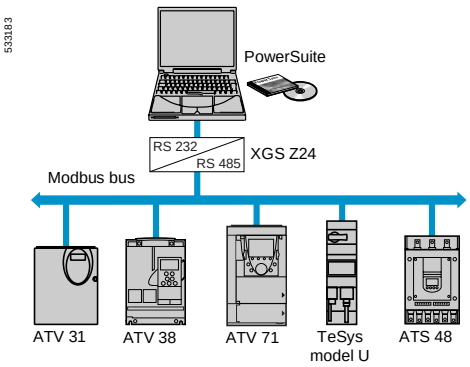
PowerSuite software workshop

Availability of functions for the PowerSuite software workshop for PC

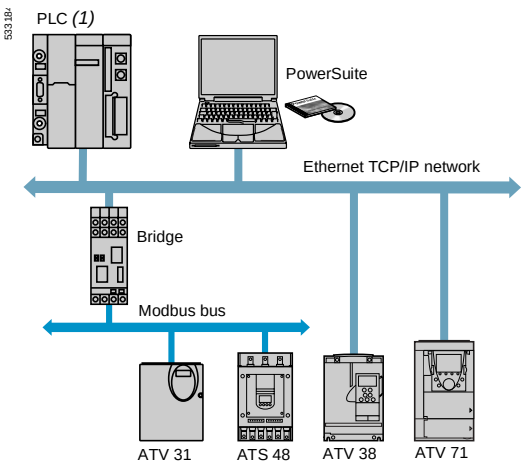
Functions not listed in the table are available for all devices.

Function available with devices	Controller-starter	Soft start/ soft stop unit	Drives					
	TeSys model U	ATS 48	ATV 11	ATV 31	ATV 38	ATV 58 ATV 58F	ATV 68	ATV 71
Monitoring	■	■	□	■	■	■	■	■
Oscilloscope	□	□	□	■	□	□	■	■
High speed oscilloscope	□	□	□	□	□	□	□	■
Display of communication parameters	□	□	□	□	□	□	□	■
Control	■	■	□	■	■	■	■	■
Customization of parameter names	□	□	■	■	□	□	□	■
Creation of a user menu	□	□	■	■	□	□	□	■
Creation of monitoring control panels	□	□	□	■	□	□	□	■
Sort operation on parameters	□	□	■	■	□	□	□	■

■ Functions available
□ Functions not available



Modbus multidrop connection



Ethernet connection

Connections

Modbus communication bus

The PowerSuite software workshop for PC can be connected directly to the device terminal port or Modbus network port via the serial port on the PC.

Two types of connection are possible:
- With a single device (point-to-point connection)
- With a number of devices (multidrop connection)

Note: *The Altivar 68 drive uses a specific protocol for point-to-point connection. Multidrop connection is not available.*

Ethernet TCP/IP communication network

The PowerSuite software workshop for PC can be connected to an Ethernet network (see pages 180 to 185). In this case, the devices can be accessed:
- Using a 174 CEV 300 20 Ethernet-Modbus bridge
- Using a VW A3 310 communication card for the Altivar 71 drive
- Using a VW3 A58 310 communication card for the Altivar 38, 58 and 58F drives

Bluetooth® wireless link *(2)*

The PowerSuite software workshop for PC can communicate via a Bluetooth® radio link with a device equipped with a Bluetooth® - Modbus VW3 A8 114 adaptor. The adaptor plugs into the device terminal port or Modbus network port, and has a range of 10 m (class 2).

If the PC does not have Bluetooth® technology, use the VW3 A8 115 USB-Bluetooth® adaptor.

Remote maintenance

Using a simple Ethernet connection, the PowerSuite software workshop can be used for remote monitoring and diagnostics.
When devices are not connected to the Ethernet network, or it is not directly accessible, various remote transmission solutions may be possible (modem, teleprocessing gateway, etc). Please consult your Regional Sales Office.

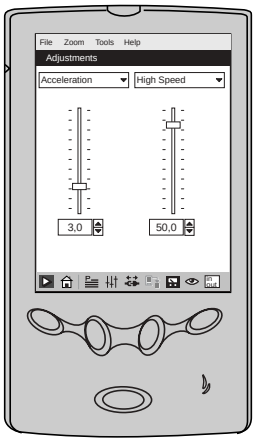
Hardware and software environments

The PowerSuite software workshop for PC can operate in the following PC environments and configurations:
- Microsoft Windows® 98 SE, Microsoft Windows® 2000, Microsoft Windows® XP
- Pentium III, 800 MHz, hard disk with 300 Mb available, 128 Mb RAM
- SVGA or higher definition monitor

(1) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro - PL7 software" catalogues.
(2) Not available for Altivar 11 and Altivar 68 drives.

Presentation: page 176
References: page 179

533185



PowerSuite screen on Pocket PC
Adjustments

PowerSuite software workshop for Pocket PC *(1)*

Functions

Start-up

When the Pocket PC is connected to the device, the PowerSuite software workshop can be used to:

- Transfer the configuration
- Adjust
- Monitor *(2)*
- Control *(2)*
- Save the final configuration

Maintenance

It can be used to compare the configuration of a device currently being used with a saved configuration.

User interface

The PowerSuite software workshop for Pocket PC can be installed in a single language selected from the five available (English, French, German, Italian and Spanish).

Connections

Modbus communication bus

The PowerSuite software workshop for Pocket PC can be connected directly to the device terminal port or Modbus network port via the serial port on the Pocket PC.

The Modbus connection kit is connected via the Pocket PC serial synchronization cable. This cable must be ordered from the supplier of the Pocket PC.
It can only be connected to a single device, in point-to-point connection.

Hardware and software environments

The PowerSuite software workshop version V2.0.0 for Pocket PC is compatible with Pocket PCs equipped with a Microsoft Windows® for Pocket PC 2002 or Microsoft Windows Mobile™ 2003 operating system and an ARM or XSCALE processor.
Performance tests for the PowerSuite software workshop version V2.0.0 have been carried out with the following Pocket PCs:

- Hewlett Packard® IPAQ 2210
- Compaq® IPAQ series 3800 and 3900
- Hewlett Packard® Jornada series 560

(1) The PowerSuite software workshop for Pocket PC is not compatible with the Altivar 68 and Altivar 71 variable speed drives.
(2) Not available for the Altivar 11 variable speed drive.

Presentation:
page 176

References:
page 179

PowerSuite software workshop

References

PowerSuite software workshop for PC or Pocket PC

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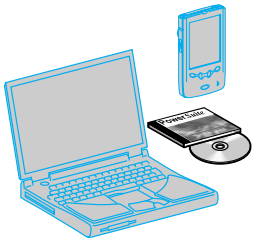

VW3 A8 104

Description	Composition	Reference	Weight kg
PowerSuite CD-ROM	■ 1 program for PC and for Pocket PC in English, French, German, Italian and Spanish ■ Technical documentation ■ ABC configurator program for the LUF P● communication gateways	**VW3 A8 104**	0.100
PowerSuite update CD-ROM *(1)*	■ 1 program for PC and for Pocket PC in English, French, German, Italian and Spanish ■ Technical documentation and ABC configurator program	**VW3 A8 105**	0.100
Connection kit for PC serial port	■ 1 x 3 m cable with 2 RJ 45 connectors ■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and one RJ 45 connector ■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 38/58/58F drives ■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 68 drives ■ 1 converter for the ATV 11 drive, with one 4-way male connector and one RJ45 connector	**VW3 A8 106**	0.350
Connection kit for Pocket PC serial port *(2)*	■ 1 x 0.6 m cable with 2 RJ 45 connectors ■ 1 RS 232/RS 485 converter with one 9-way male SUB-D connector and one RJ 45 connector ■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 38/58/58F drives ■ 1 converter for the ATV 11 drive, with one 4-way male connector and one RJ45 connector	**VW3 A8 111**	0.300
Modbus-Bluetooth® adaptor *(3)*	■ 1 Bluetooth® adaptor (10 m range, class 2) with 1 RJ45 connector ■ 1 x 0.1 m cable with 2 RJ 45 connectors for PowerSuite ■ 1 x 0.1 m cable with 1 RJ 45 connector and 1 mini DIN connector, for TwidoSoft ■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 38/58/58F drives	**VW3 A8 114**	0.155
USB-Bluetooth® adaptor for PC	This adaptor is required for a PC which is not equipped with Bluetooth® technology. It is connected to a USB port on the PC. Range of 10 m (class 2).	**VW3 A8 115**	0.290
RS 232-RS 485 interface	■ 1 Modbus multidrop converter for connection to screw terminals. Requires a 24 V ⎓ (20...30 V), 20 mA power supply *(4)*.	**XGS Z24**	0.105

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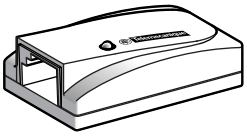

VW3 A8 114

(1) Updates a version ≥ V1.40 with the latest available version. For versions < V1.40, you should order the PowerSuite CD-ROM, VW3 A8 104.
(2) This kit connects to the serial synchronization cable, which must be ordered separately from the supplier of the Pocket PC.
(3) Can also be used to communicate between a Twido PLC and the TwidoSoft software workshop.
(4) Please consult our specialist "Interfaces, I/O splitter box and power supply" catalogue.

Compatibility

Connection	Controller-starter	Soft start/soft stop unit	Drives					
	TeSys model U	ATS 48	ATV 11	ATV 31	ATV 38	ATV 58 ATV 58F	ATV 68	ATV 71
Compatibility of the PowerSuite software workshop for PC with the following devices (minimum version)								
Modbus serial link (ATV 68: specific protocol)	V1.40	V1.30	V1.40	V2.0	V1.40	V1.0	V1.50	V2.2
Ethernet (device equipped with an Ethernet TCP/IP card)					V1.50	V1.50		V2.2
Ethernet via Modbus Ethernet bridge		V1.50		V2.0	V1.50	V1.50		V2.2
Bluetooth®	V2.2	V2.2		V2.2	V2.2	V2.2		V2.2
Compatibility of the PowerSuite software workshop for Pocket PC with the following devices (minimum version)								
Modbus serial link	V1.50	V1.30	V1.40	V2.0	V1.40	V1.20		

Compatibility of the PowerSuite software workshop with Pocket PCs

Connection	Operating system	Performance tested models	PowerSuite software versions			
			V2.0	V1.50	V1.40	V1.30
Modbus serial link	**Windows Mobile™ 2003 for Pocket PC**	Hewlett Packard® IPAQ 2210				
	Windows® for Pocket PC 2002	Compaq® IPAQ series 3800, 3900				
		Hewlett Packard® Jornada series 560				
	Windows® for Pocket PC 2000	Hewlett Packard® Jornada 525, 545, 548				
	Windows® CE	Hewlett Packard® Jornada 420				

Compatible devices and/or software versions
Incompatible devices and/or software versions

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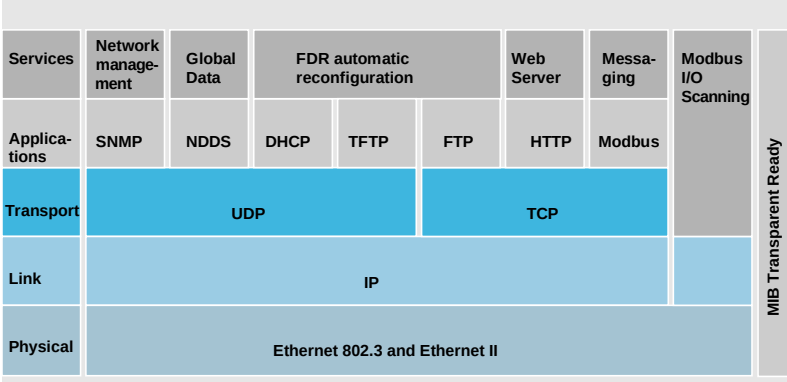
Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Presentation

Introduced by Schneider Electric, the Transparent Ready concept enables transparent communication between control system devices, production and management. Network technologies and the associated new services are used to share and distribute data between sensors, PLCs, workstations and third-party devices in an increasingly efficient manner.
Web servers embedded in the network components and control system devices can be used to:
- Access configuration data transparently
- Perform remote diagnostics
- Incorporate simple human/machine interface functions

This concept is based on the Ethernet TCP/IP industrial standard which proposes a single network that meets most communication requirements fromsensors/actuators through to production management systems.
Where a variety of communication systems are usually required, Transparent Ready standard technologies can result in significant cost savings in the areas of definition, installation, maintenance or training.

Transparent Ready is based on:
- Ethernet TCP/IP-based services meeting control system requirements in terms of functions, performance and quality of services
- Products including several ranges of PLC, distributed I/O, industrial terminals, variable speed drives, gateways and an increasing number of partner products
- The ConneXium range of cabling accessories: hubs, switches, cables adapted to the environment and to the requirements of industrial conditions.



Services based on Ethernet TCP/IP

The following Altivar variable speed drives can be connected to the Ethernet TCP/IP network:
- Altivar 38 drive via a VW3 A58 310 communication card
- Altivar 71 drive via a VW3 A3 310 communication card

These cards are supplied with a standard Web server. It is fully modifiable by the user according to the application (JAVA or FactoryCast development tool).

Characteristics: page 181
Functions: pages 181 to 183
Connections: page 184
References: pages 184 and 185

Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Characteristics

Structure	Topology	Industrial local area network conforming to ANSI/IEEE 802.3 (4th edition 1993-07-08) Star network
	Transmission mode	Manchester baseband. Half-duplex or full-duplex
	Data rate	10/100 Mbps with automatic recognition
	Medium	STP double shielded twisted pair, impedance 100 Ω ± 15 Ω for 10 BASE-T or category 5 Ethernet cable, conforming to standard TIA/EIA-568A
	Length of network	100 m maximum between Hub or switch and a station
Type of device		**ATV 38, ATV 71**
Universal services		HTTP, BOOTP, DHCP, FTP, TFTP, SNMP
Transparent Ready services		Modbus messaging, IO Scanning, FDR

Universal services

HTTP “Hypertext Transfer Protocol” (RFC 1945)

HTTP “Hypertext Transfer Protocol” is a protocol used to transmit Web pages between a server and a browser. HTTP has been used on the Web since 1990.

Web servers embedded in control system devices are at the heart of the Transparent Ready concept and provide easy access to devices anywhere in the world using a standard web browser such as Internet Explorer or Netscape Navigator.

BOOTP/DHCP (RFC 1531)

BOOTP/DHCP is used to supply devices (client) automatically with IP addresses and parameters. This avoids having to manage the addresses of each device individually by transferring their management to a server.
BOOTP identifies the client device by its Ethernet MAC address. This address is unique to each device, and should be entered in the server each time the device is changed.
DHCP “Dynamic Host Configuration Protocol” identifies the client device by a name in plain language (“Device Name”) which is maintained throughout the application (eg: “Conveyor 23”).

Altivar 71 and Altivar 38 drives can be given a name (“Device Name”) by the terminal or the PowerSuite software workshop.
Telemecanique has used the standard BOOTP/DHCP protocols in order to offer the faulty device replacement (FDR) service.

FTP “File Transfer Protocol” (RFCs 959, 2228, and 2640)

FTP (File Transfer Protocol) supplies the standard file sharing elements. The FTP protocol is used by numerous systems to exchange files between devices.

Transparent Ready devices implement FTP in order to transfer certain data from or to devices, especially for downloading firmware or custom Web pages.

SNMP “Simple Network Management Protocol” (RFCs 1155, 1156 and 1157)

The Internet community has developed the SNMP standard to enable management of the various network components by means of a single system. The network management system can exchange data with SNMP agent devices. This function allows the manager to view the status of the network and products, to modify their configuration and to feed back alarms in the event of a fault.

Transparent Ready devices are compatible with SNMP and can be integrated naturally into a network administered via SNMP.

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Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Transparent Ready services

Modbus communication standard

Modbus, the industry communication standard since 1979, has been ported to Ethernet TCP/IP, the backbone of the Internet revolution, to create Modbus TCP/IP, a totally open protocol on Ethernet. There is no need for any proprietary component, nor the purchase of a licence in order to develop a connection to Modbus TCP/IP. This protocol can easily be ported to any device supporting a standard TCP/IP communication stack. The specifications can be obtained free of charge from the web site: www.modbus.org.

Modbus TCP, simple and open

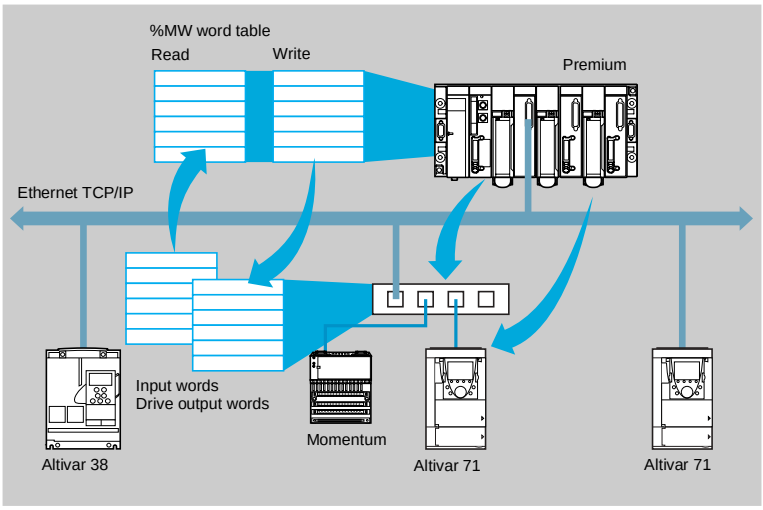
The Modbus application layer is very simple and universally familiar. Thousands of manufacturers are already implementing this protocol. Many have already developed a Modbus TCP/IP connection and numerous products are currently available.
The simplicity of Modbus TCP/IP enables any small field device, such as an I/O module, to communicate on Ethernet without the need for a powerful microprocessor or a large amount of internal memory.

Modbus TCP, high performance

Due to the simplicity of its protocol and the fast data rate of Ethernet 100 Mbps, the performance of Modbus TCP/IP is excellent. This means that this type of network can be used in realtime applications such as I/O Scanning.

I/O Scanning service

Schematic diagram



The Altivar 38 and Altivar 71 drives accept the I/O scanning service generated by:
- The following automation platforms:
  - Premium equipped with a TSX ETY 410/5101 module
  - Quantum
  - Momentum M1E
- A PC equipped with Modbus communication software with the I/O scanner function

This service is used to manage the exchange of remote I/O on the Ethernet network after simple configuration and without the need for special programming.

The drive I/O are scanned transparently by means of read/write requests according to the Modbus master/slave protocol on the TCP/IP profile.

The “I/O Scanning” service can be configured, activated or deactivated by:
- The PowerSuite software workshop
- The standard Web server

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Transparent Ready services (continued)

Faulty Device Replacement (FDR) service

The FDR service uses standard BOOTP, DHCP, file management and TFTP technologies in the aim of simplifying the maintenance of Ethernet devices.
It is used to replace a faulty device with a new product, ensuring its detection, reconfiguration and automatic restarting by the system, without the need for any delicate manual intervention.

The main steps are:
- A device using the FDR service becomes faulty.
- A similar device is taken out of the maintenance reserve base, preconfigured with the “Device_name” of the faulty device, then reinstalled on the network.
- The FDR server (which can be a Quantum or Premium PLC Ethernet module) detects the new arrival, configures it with its IP address and transfers all its configuration parameters to it.
- The substituted device checks that the parameters are fully compatible with its own characteristics, then switches to operational mode.

Web server

The Ethernet cards in Altivar 38 and Altivar 71 drives incorporate a standard Web server, in English.
The functions provided by this Web server require no special configuration or programming of the PC supporting the Internet browser. Using a password, two levels of access can be defined to the web server: read-only or modification.

The standard Web server provides access to the following functions:
- Altivar Viewer
- Data Editor
- Ethernet Statistics
- Security
- Etc

The standard Web server can be adapted or replaced by a customized Web server depending on the requirements of the application. Knowledge of HTTP protocol and JAVA technology is required in order to make modifications.

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Characteristics: page 181
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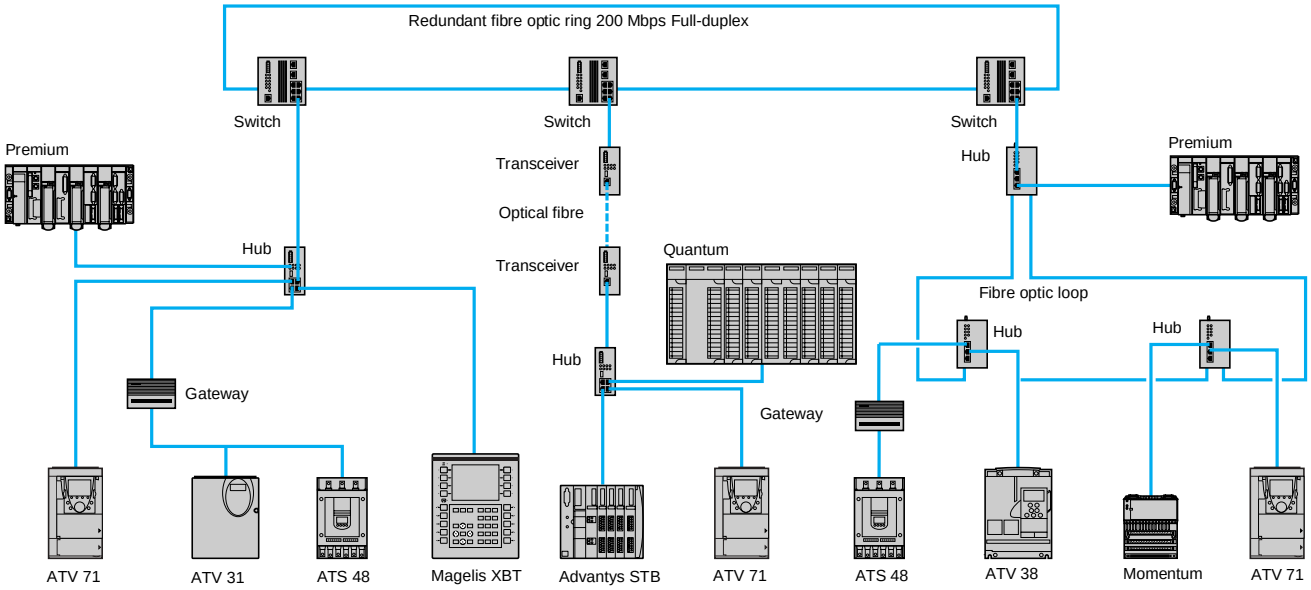
Starters, drives and communication

Ethernet TCP/IP network
Transparent Ready concept

Connections



Ethernet network connection elements

Communication interfaces

Description	For devices	Reference	Weight kg
Communication cards equipped with an RJ45 connector Ethernet Modbus TCP/IP 10/100 Mbps Class B 20	ATV 38 *(1)*	**VW3 A58 310**	0.300
	ATV 71	**VW3 A3 310**	0.300
Ethernet/Modbus bridge with 1 x 10BASE-T/100BASE-TX Ethernet port (RJ45 type)	ATS 48 ATV 31	**174 CEV 300 20** *(2)*	0.500

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174 CEV 300 20

Connecting cables

Description	Used From	Used To	Length m	Reference *(3)*	Weight kg
Straight shielded twisted pair cables 2 RJ45 connectors	ATV 38 (+VW3 A3 310 communication card), ATV 71 (+VW3 A3 310 communication card), Ethernet/Modbus bridge 174 CEV 300 20	499 N●H 1●● 10 hubs, 499 N●S 171 00 switches	2	**490 NTW 000 02**	–
			5	**490 NTW 000 05**	–
			12	**490 NTW 000 12**	–
			40	**490 NTW 000 40**	–
			80	**490 NTW 000 80**	–
Cable for Modbus bus 1 RJ45 connector and one stripped end	ATS 48, ATV 31	Ethernet/Modbus bridge 174 CEV 300 20	3	**VW3 A8 306 D30**	–

*(1) At 100 Mbps, connection of the **VW3 A58 310** communication card on the Ethernet network via a switch only authorizes data exchange in "Half Duplex" mode. It is vital to use the hubs or switches recommended above on which it is possible to configure "Half Duplex" mode.*

(2) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.

*(3) Cable conforming to category 5 EIA/TIA-568 standard and IEC 1180/EN 50 173, class D. For UL and CSA 22.1 approved cables, add the letter **U** at the end of the reference. Example: 490 NTW 000 02 becomes **490 NTW 000 02U**.*

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Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

530141

499 NEH 104 10

530142

499 NES 171 00

Ethernet network connection elements (continued)

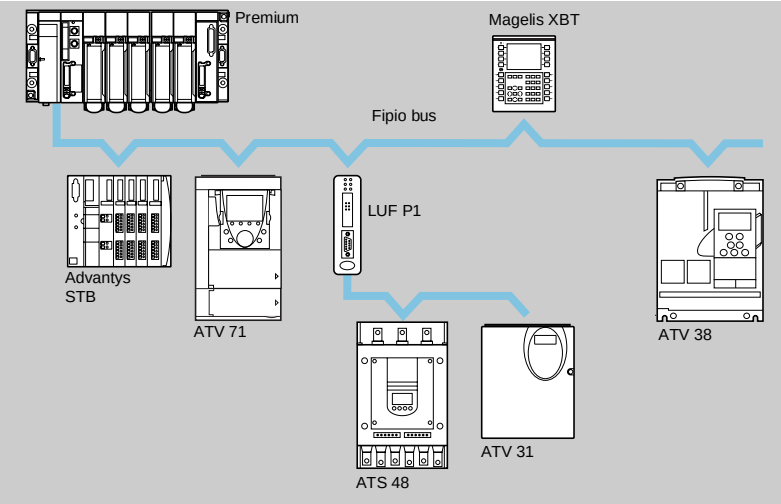
Accessories *(1)*

Description	Type of Ethernet network	Available ports	Reference	Weight kg
Hubs *(2)*	10 Mbps	4 x 10BASE-T ports	**499 NEH 104 10**	0.530
		3 x 10BASE-T ports 2 x 10BASE-FL ports	**499 NOH 105 10**	0.900
	100 Mbps	4 x 100BASE-TX ports	**499 NEH 141 10**	0.240
Switches *(2)*	10/100 Mbps	5 x 10BASE-T/100BASE-TX ports 2 x 100BASE-TX ports	**499 NES 171 00**	0.460
		5 x 10BASE-T/100BASE-TX ports 2 x 100BASE-FX ports	**499 NOS 171 00**	0.460

(1) For Transparent Ready accessories, please consult our specialist "Ethernet TCP/IP, Transparent Factory" catalogue.
(2) At 100 Mbps, connection of the VW3 A58 310 communication card on the Ethernet network via a switch only authorizes data exchange in "Half Duplex" mode. It is vital to use the hubs or switches recommended above on which it is possible to configure "Half Duplex" mode.

Starters, drives and communication
Communication via Fipio bus

Presentation



The Fipio fieldbus is a standard means of communication between control system components, and conforms to the World FIP standard.
A Premium PLC (bus manager) can control 127 devices (agents) over a maximum distance of 15 km.
The Fipio bus manager is integrated in the PLC processor.

The Altistart 48 soft start/soft stop unit and the Altivar 31 variable speed drive can be connected to the Fipio bus via an LUF P1 Fipio/Modbus gateway.

The following Altivar variable speed drives are connected to the Fipio network via a communication card:
- VW3 A58 311 card for the Altivar 38 drive
- VW3 A3 311 card for the Altivar 71 drive

The following devices can also be connected to the Fipio bus:
- TSX Micro *(2)* or Premium Agent function *(1)* PLCs
- The CCX 17 operator panel (2)
- The Magelis XBT-F terminal with graphic screen (3)
- The Magelis *i*PC industrial PC (3)
- Advantys STB IP 20 distributed I/O (4)
- Discrete, analog or application-specific Momentum distributed I/O (5)
- Discrete or analog (IP 20) TBX distributed I/O (1)
- TBX discrete (IP 65) or TSX E●F (IP67) dust and damp proof distributed I/O (1)
- The TBX SAP 10 Fipio/AS-Interface gateway (1)
- The LUF P1 Fipio/Modbus gateway
- A PC terminal
- Partner products in the Collaborative Automation programme

(1) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.
(2) Please consult our specialist "Automation platform Modicon TSX Micro and PL7 software" catalogue.
(3) Please consult our specialist "Human/Machine interfaces" catalogue.
(4) Please consult our specialist "Distributed I/O Advantys STB" catalogue.
(5) Please consult our specialist "Modicon Momentum Automation platform" catalogue.

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Starters, drives and communication
Communication via Fipio bus

Characteristics

Structure	Topology	Industrial bus conforming to the World FIP standard Subscribers linked via daisy-chain or tap junctions		
	Access method	Producer/consumer principle Bus management by a fixed arbitrator (bus manager)		
	Transmission mode	Baseband physical layer on shielded twisted pair, according to standard NF C 46-604		
	Data rate	1 Mbps		
	Medium	Shielded twisted pair 150 Ω. Optical fibre 62.5/125 with the use of electrical/fibre optic repeaters		
	Number of subscribers	32 maximum per segment 1 manager + 127 agents maximum over all segments The number of Fipio agents is limited by the memory capacity of Premium processors (62 Altivar drives maximum) *(1)*		
	Number of segments	Unlimited in tree or star architectures Limited to 5 cascaded segments The link between 2 subscribers may cross 4 electrical or electrical/fibre optic repeaters maximum		
	Length of bus	15,000 m maximum 1,000 m maximum without repeater for an electrical segment 5,000 m maximum for 5 electrical segments 3,000 m maximum for 1 fibre optic segment		
Type of device		**ATS 48, ATV 31**	**ATV 38**	**ATV 71**
Type of interface		**LUF P1**	**VW3 A58 311**	**VW3 A3 311**
Profile		FED C 32P	FED C 32	FED C 32
Control and adjustment		26 configurable words *(2)*	5 predefined words	8 configurable words (communication scanner)
Monitoring		26 configurable words *(2)*	8 predefined words	8 configurable words (communication scanner)
Configuration and adjustment		1 indexed word Read/write access to all functions by the PLC application program		

(1) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.

(2) 26 words in total for control and monitoring. To extend the I/O capacity to 26 control words and 26 monitoring words, use the ABC Configurator software (see page 179).

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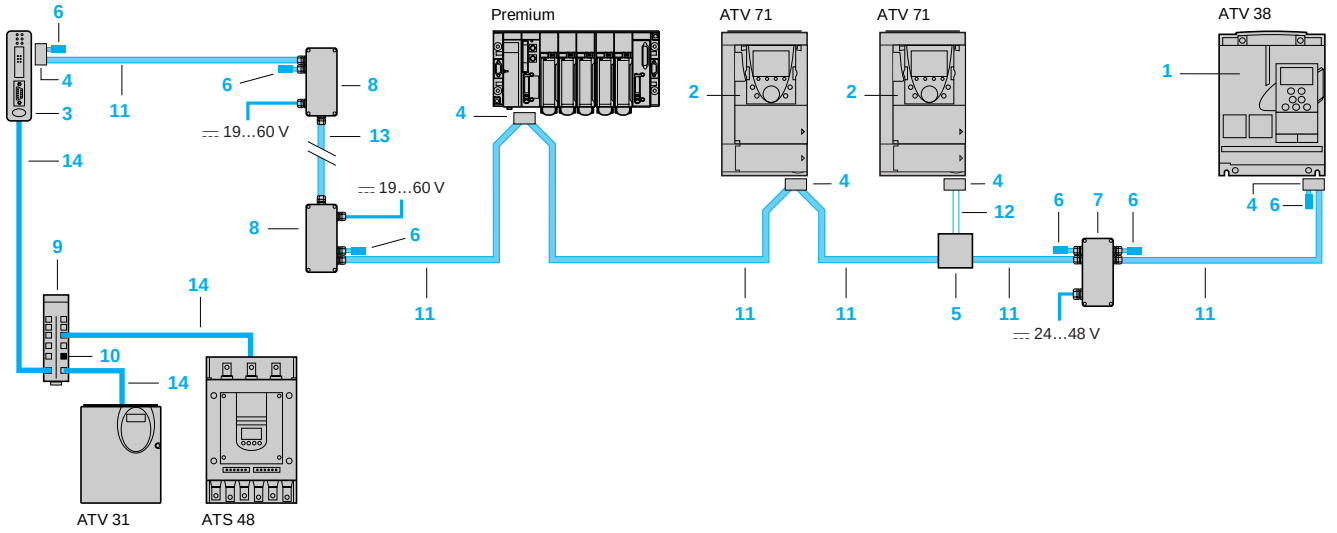
Starters, drives and communication
Communication via Fipio bus

Fipio wiring system



Elements for connecting the Fipio bus and a Premium PLC *(1)*

Cards and gateway

Description	Used for	Code	Reference	Weight kg
Fipio card The card is equipped with a 9-way male SUB-D connector, which can take a TSX FP ACC12 connector with a TSX FP CA●00 trunk cable or TSX FP CC●00 drop cable.	ATV 38	1	**VW3 A58 311**	0.300
Standard Fipio card The card is equipped with a 9-way male SUB-D connector, which can take a TSX FP ACC12 connector with a TSX FP CA●00 trunk cable or TSX FP CC●00 drop cable. This card should be used for new installations. It is also used to replace an ATV 58 or ATV 58F equipped with a VW3 A58 311 card by an ATV 71.	ATV 71	2	**VW3 A3 311**	0.300
Substitution Fipio card The card is equipped with a 9-way male SUB-D connector, which can take a TSX FP ACC12 connector with a TSX FP CA●00 trunk cable or TSX FP CC●00 drop cable. This Fipio communication card is reserved for replacing an ATV 58 or ATV 58F equipped with a VW3 A58 301 card by an ATV 71.	ATV 71	2	**VW3 A3 301**	0.300
Fipio/Modbus gateway The gateway is equipped with: ■ 1 Fipio 9-way male SUB-D connector which will take a TSX FP ACC12 connector for use with a TSX FP CA●00 trunk cable or TSX FPCC●00 drop cable ■ 1 RJ45 connector for Modbus for connection with the VW3 A8 306 R●● cable Fit an external 24 V ⎓ power supply, 100 mA minimum, to be ordered separately *(2)*.	ATS 48 ATV 31	3	**LUF P1**	0.240

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LUF P1

(1) To order other elements for connection to the Fipio bus, please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.
(2) Please consult our specialist "Interfaces, I/O splitter boxes and power supplies" catalogue.

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Characteristics:
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Starters, drives and communication
Communication via Fipio bus

Elements for connecting the Fipio bus and a Premium PLC (continued) (1)

Accessories

Description	Use	Code	Unit reference	Weight kg
Female connector for device with 9-way female SUB-D connector (polycarbonate, IP 20)	Connection via daisy-chain or tap junctions. For ATV 38, ATV 71, LUF P1 gateway and Premium PLC	4	**TSX FP ACC12**	0.040
Tap junction (polycarbonate, IP 20)	Trunk cable tap link	5	**TSX FP ACC14**	0.120
Fipio line terminators (sold in lots of 2)	Connector, tap junction and repeater	6	**TSX FP ACC7**	0.020
Electrical repeater (IP 65) Power supply 24…48 V ⎓, 150 mA *(2)*	Increases the length of the bus while enabling connection of 2 segments of 1000 m maximum	7	**TSX FP ACC6**	0.520
Electrical/fibre optic repeater (IP 65) Power supply 19…60 V⎓, 210 mA *(2)*	Used for connection (via a patch panel) of an electrical segment (1000 m max.) and a fibre optic segment (3000 m max.)	8	**TSX FP ACC8M**	0.620
Modbus splitter block equipped with 10 RJ45 connectors and 1 screw terminal	Used to connect an ATV 31, ATS 48 on the LUP P1 gateway	9	**LU9 GC3**	0.500
Modbus line terminators *(3)*	LU9 GC3 Modbus splitter block	10	**VW3 A8 306 RC**	0.010
FIP wiring test tool	Used to test each section of a network segment	–	**TSX FP ACC9**	0.050

Connecting cables (1)

Description	Used		Code	Length	Reference	Weight
	From	To		m		kg
Trunk cables 8 mm, 1 shielded twisted pair 150 Ω. In standard atmosphere *(4)* and inside buildings	TSX FP ACC12 connector, TSX FP ACC14 junction box, TSX FP ACC6, ACC8M repeaters	TSX FP ACC12 connector, TSX FP ACC14 junction box, TSX FP ACC6 repeater	11	100	**TSX FP CA100**	5.680
				200	**TSX FP CA200**	10.920
				500	**TSX FP CA500**	30.000
Trunk cables 9.5 mm, 1 shielded twisted pair 150 Ω. In harsh environments *(5)*, outside buildings or in mobile installations *(6)*	TSX FP ACC12 connector, TSX FP ACC14 junction box, TSX FP ACC6, ACC8M repeaters	TSX FP ACC12 connector, TSX FP ACC14 junction box, TSX FP ACC6 repeater	11	100	**TSX FP CR100**	7.680
				200	**TSX FP CR200**	14.920
				500	**TSX FP CR500**	40.000
Drop cables 8 mm, 2 shielded twisted pairs 150 Ω. In standard atmosphere *(4)* and inside buildings	TSX FP ACC12 connector	TSX FP ACC14 junction box	12	100	**TSX FP CC100**	5.680
				200	**TSX FP CC200**	10.920
				500	**TSX FP CC500**	30.000
Fibre optic jumper Double optical fibre 62.5/125	TSX FP ACC8M repeater	Patch panel	13	2	**TSX FP JF020**	0.550
Cables for Modbus bus 2 RJ45 connectors	LUF P1 gateway, ATS 48, ATV 31	LU9 GC3 Modbus splitter block	14	0.3	**VW3 A8 306 R03**	0.025
				1	**VW3 A8 306 R10**	0.060
				3	**VW3 A8 306 R30**	0.130

Documentation

The manuals and quick reference guides for starters and variable speed drives, as well as the user manuals for communication gateways, are available on the web site: www.telemecanique.com.

(1) To order other elements for connection to the Fipio bus, please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.
(2) Please consult our specialist "Interfaces, I/O splitter boxes and power supplies" catalogue.
(3) Sold in lots of 2.
(4) Standard environment:
- *no particular environmental constraints*
- *operating temperature between + 5°C and + 60°C*
- *fixed installation*

(5) Harsh environment:
- *withstand to hydrocarbons, industrial oils, detergents, solder splashes*
- *relative humidity up to 100%*
- *saline atmosphere*
- *significant temperature variations*
- *operating temperature between -10°C and +70°C*
- *mobile installation*

(6) Mobile installation: cables in accordance with VDE 472 part 603/H:
- *use on a cable-carrier chain with bending radius 75 mm minimum*
- *use on a gantry, provided that operating conditions such as acceleration, speed, length, etc are adhered to: please consult your Regional Sales Office*
- *unauthorised use on robots, or multi-axis applications*

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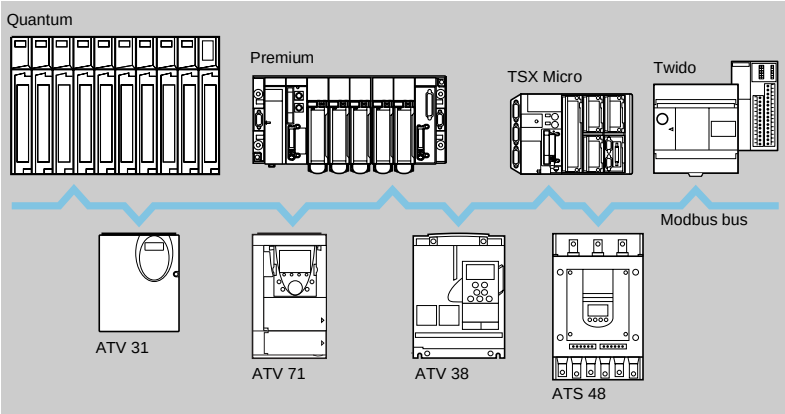
Starters, drives and communication
Communication via Modbus bus

Presentation



Modbus is a master/slave protocol.

Two exchange mechanisms are possible:
■ Request/response: The request from the master is addressed to a given slave. The master then waits for the response from the slave which has been interrogated.
■ Broadcasting: The master broadcasts a request to all the slave stations on the bus, which execute the command without transmitting a response.

The Altistart 48 soft start/soft stop unit, Altivar 31 and Altivar 38 variable speed drives are connected to the Modbus bus via their terminal port.
On the Altivar 38 drive, the terminal port can be freed up for connection of the operator terminal by using a communication card.

The Altivar 71 variable speed drive includes the Modbus protocol as standard.
It can be accessed directly by means of 2 integrated communication ports:
■ A terminal port for connection of the graphic display terminal or an industrial HMI terminal (Magelis type)
■ Modbus network port
As an option, the Altivar 71 drive can also be equipped with a VW3 A3 303 Modbus/Uni-Telway communication card which offers additional characteristics (4-wire RS 485, ASCII mode, etc).

Characteristics

Type of device			**ATS 48**	**ATV 31**	**ATV 38**	**ATV 71**	**ATV 71**	**ATV 38, ATV 71**
Type of connection			**Terminal port**				**Network port**	**Communication card**
Structure	Connector		RJ45	RJ45	9-way female SUB-D	RJ45	RJ45	9-way female SUB-D
	Topology		Bus					
	Physical interface		2-wire RS 485					2-wire or 4-wire RS 485
	Access method		Master/slave					
	Transmission mode		RTU					RTU or ASCII
	Data rate	38.4 Kbps	–	–	–	–	●	–
		19.2 or 9.6 Kbps	●	●	●	●	●	●
		4.8 Kbps	●	●	–	–	●	●
	Medium		Double shielded twisted pair					
	Number of subscribers		18, 27 or 31 slaves, depending on polarization *(1)*					
	Type of polarization		4.7 kΩ pulldown resistors	No pulldown	4.7 kΩ pulldown resistors	No pulldown	No pulldown	Configurable. No pulldown or 4.7 kΩ pulldown resistors
	Length of bus		1000 or 1300 m excluding tap links, depending on polarization *(1)*					
	Tap link		3 or 20 m maximum, depending on polarization *(1)*					

(1) See the configuration table on page 191.

Connections: pages 191 and 192
References: pages 191 to 193

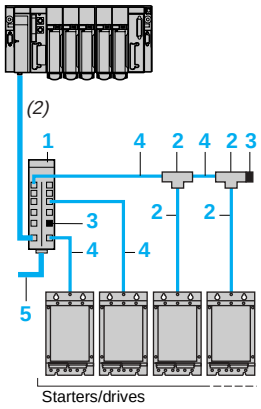
Starters, drives and communication
Communication via Modbus bus

Configuration on the basis of polarization

The specification of the physical layer provided by standard RS 485 is incomplete.
Various polarization diagrams can therefore be applied depending on the environment in which the equipment is to be used.
The Modbus standard specifies the polarization exactly *(1)*.

		Master	
		With polarization 4.7 kΩ	**With polarization 470 Ω**
Slave	**Without polarization**	Configuration not recommended.	Modbus type configuration 31 slaves. Length of bus: 1,300 m Tap link: 3 m maximum. RC line terminators (R =120 Ω, C = 1 nF).
	With polarization 4.7 kΩ	Uni-Telway type configuration 27 slaves. Length of bus: 1,000 m Tap link: 20 m maximum. RC line terminators (R =120 Ω, C = 1 nF).	Mixed configuration 18 slaves. Length of bus: 1,000 m Tap link: 20 m maximum. RC line terminators (R =120 Ω, C = 1 nF).

PLC



Connection elements for RJ45 wiring system

Card

Description	Used with	Reference	Weight kg
Communication card equipped with one 9-way female SUB-D connector	ATV 71	**VW3 A3 303**	0.300

Accessories

Description		Code	Unit reference	Weight kg
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block		1	**LU9 GC3**	0.500
Modbus T-junction boxes	With integrated cable (0.3 m)	2	**VW3 A8 306 TF03**	–
	With integrated cable (1 m)	2	**VW3 A8 306 TF10**	–
Line terminators For RJ45 connector *(3)*	R = 120 Ω C = 1 nF	3	**VW3 A8 306 RC**	0.200
	R = 150 Ω	3	**VW3 A8 306 R**	0.010

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LU9 GC3

Cables

Description	Used From	 To	Code	Length m	Reference	Weight kg
Cables for Modbus bus 2 RJ45 connectors	ATS 48, ATV 31, ATV 71 (connector ports or Modbus network)	LU9 GC3 Modbus splitter block	4	0.3	**VW3 A8 306 R03**	0.025
				1	**VW3 A8 306 R10**	0.060
				3	**VW3 A8 306 R30**	0.130
	VW3 A8 306 TF●● Modbus T-junction box LU9 GC3 Modbus splitter block	VW3 A8 306 TF●● Modbus T-junction box LU9 GC3 Modbus splitter block				
Cables for Modbus bus One 9-way male SUB-D connector and one RJ45 connector	ATV 38 (terminal port) ATV 38 (+VW3 A58 303 kit) ATV 71 (+ VW3 A3 303 communication card)	LU9 GC3 Modbus splitter block	4	1	**VW3 A58 306 R10**	0.080
				3	**VW3 A58 306 R30**	0.150
Double shielded twisted pair cables	LU9 GC3 Modbus splitter block (screw terminals)	LU9 GC3 Modbus splitter block (screw terminals)	5	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000

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VW3 A8 306 TF●●

(1) Standard defined in 2002, available on the web site: www.modbus.org.
(2) The cable for connecting the PLC and the splitter block depends on the type of PLC ; please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software", "Automation platform Modicon Quantum", "Automation platform Modicon TSX Micro and PL7 software" and "Automation and relay functions" catalogues.
(3) Sold in lots of 2.

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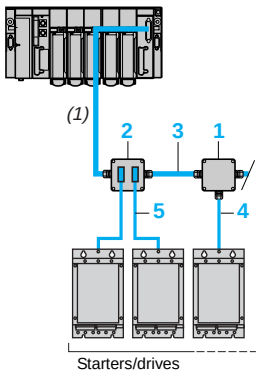
Starters, drives and communication
Communication via Modbus bus

PLC



Connection elements using tap junctions

Kit

Description	Used with	For protocol	Reference	Weight kg
Communication kit comprising: ■ 1 communication card equipped with one 9-way female SUB-D connector ■ 1 x 3 m cable equipped with: □ One 9-way male SUB-D connector for connection to the communication card □ One 15-way male SUB-D connector for connection to a TSX SCA 62 subscriber socket ■ 1 “Modbus, Uni-Telway” user’s manual	ATV 38 with operator terminal	Uni-Telway, Modbus ASCII, Modbus RTU/Jbus	**VW3 A58 303**	0.300

Accessories

Description	Code	Reference	Weight kg
Tap junction 3 screw terminals, RC line terminator	1	**TSX SCA 50**	0.520
Subscriber socket Two 15-way female SUB-D connectors and 2 screw terminals, RC line terminator	2	**TSX SCA 62**	0.570

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TSX SCA 50

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TSX SCA 62

Cables

Description	Used		Code	Length	Reference	Weight
	From	To		m		kg
Double shielded twisted pair cables	TSX SCA 50 junction box, TSX SCA 62 subscriber socket	TSX SCA 50 junction box, TSX SCA 62 subscriber socket	3	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000
Cable for Modbus bus 1 RJ45 connector and one stripped end	ATS 48, ATV 31, ATV 71 (terminal ports or Modbus network)	TSX SCA 50 junction box	4	3	**VW3 A8 306 D30**	0.150
Cable for Modbus bus 1 RJ45 connector and one 15-way male SUB-D connector	ATS 48, ATV 31, ATV 71 (terminal ports or Modbus network)	TSX SCA 62 subscriber socket	5	3	**VW3 A8 306**	0.150
Cable for Uni-Telway and Modbus bus 2 male SUB-D connectors, 9 and 15-way	ATV 71 (+ VW3 A3 303 communication card)	TSX SCA 62 subscriber socket	5	3	**VW3 A8 306 2**	0.150

(1) The cable for connecting the PLC and the splitter block depends on the type of PLC ; please consult our specialist “Automation platform Modicon Premium and Unity - PL7 software”, “Automation platform Modicon Quantum”, “Automation platform Modicon TSX Micro and PL7 software” and “Automation and relay functions” catalogues.

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Connection elements using tap junctions (continued)

Cables

Description	Used		For protocol	Reference	Weight kg
	From	To			
RS 485 connection kit comprising: ■ 1 x 3 m cable equipped with: □ One 9-way male SUB-D connector □ One 15-way male SUB-D connector ■ 1 "RS 485" user's manual ■ 1 "Communication variables" user's manual	ATV 38 without operator terminal (terminal port)	TSX SCA 62 subscriber socket	Modbus RTU	**VW3 A58 306**	0.300

Connection elements using screw terminals

Accessories

Description		Unit reference	Weight kg
Line terminators *(1)* for screw terminals	R = 120 Ω, C = 1 nF	**VW3 A8 306 DRC**	0.200
	R = 150 Ω	**VW3 A8 306 DR**	0.200

Cable

Description	Used		Length	Reference	Weight kg
	From	To	m		
Cable for Modbus 1 RJ45 connector and one stripped end	ATS 48, ATV 31, ATV 71 (terminal ports or Modbus network)	Standard screw terminals, TSX SCA 50 junction box	3	**VW3 A8 306 D30**	0.150

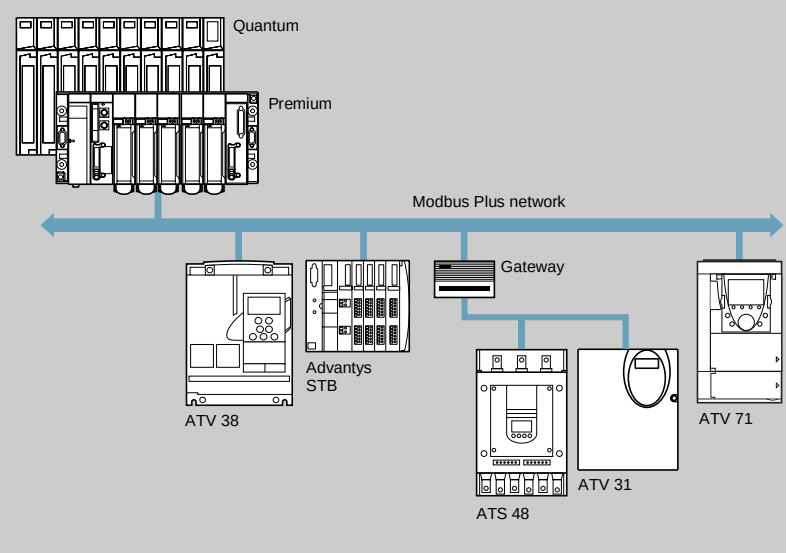
Documentation

The manuals and quick reference guides for starters and variable speed drives, as well as the user manuals for communication gateways, are available on the web site: www.telemecanique.com.

(1) Sold in lots of 2.

Starters, drives and communication
Communication via Modbus Plus network

Presentation



The Modbus Plus network is a high-performance industrial local area network which can be used to meet the needs of client/server type extended architectures, combining a high data rate (1 Mbps), simple low-cost transmission media and numerous messaging services.

The Altistart 48 soft start/soft stop unit and the Altivar 31 variable speed drive can be connected to the Modbus Plus network via an NW BM85000 gateway which has four RS 232 serial ports.

The following Altivar variable speed drives are connected to the Modbus Plus network via a communication card:
- VW3 A58 302 card for the Altivar 38 drive
- VW3 A3 302 card for the Altivar 71 drive

Communication services

The main data exchange services between subscribers connected to the network are:
- The “Modbus messaging” service according to Modbus protocol
- The “Global Data” service: each subscriber makes available 32 words for each of the 63 other network subscribers
- The “Peer Cop” dialogue service: point-to-point transaction of 32 receive or transmit words

The “Global Data” and “Peer Cop” services are restricted to a Modbus Plus network with a maximum of 64 subscribers.

Altivar 38 and Altivar 71 drives are accessed by simple configuration in the PLC using “Peer Cop” and “Global Data” services.
These services enable rapid exchange of the main drive parameters:
- The “Peer Cop” service for controlling and adjusting the drive
- The “Global data” service for monitoring the drive

Other parameters, which are used less frequently, can be accessed by the Modbus messaging service.

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Connections: page 196
References: pages 196 and 197

Starters, drives and communication
Communication via Modbus Plus network

Characteristics

Structure	Topology	Bus		
	Physical interface	RS 485		
	Access method	Token bus		
	Transmission mode	HDLC synchronous		
	Data rate	1 Mbps		
	Medium	Shielded twisted pair 120 Ω Optical fibre		
	Number of subscribers per network	32, without repeater 64, with one or more repeaters		
	Number of networks	4, separated by a maximum of 3 bridges		
	Length of network	450 m maximum without repeater 1800 m maximum with 3 electrical repeaters 3000 m between 2 fibre optic repeaters		
Services	Modbus messaging	Point-to-point requests with confirmation report: 200 bytes maximum, compatible with all Modbus subscribers		
	“Global Data”	4096-byte shared database Cyclic exchange of 32 broadcast words Limited to one network This service does not cross bridges		
	“Peer Cop” dialogue	Point-to-point or broadcast message Limited to one network This service does not cross bridges		
Type of device		**ATS 48, ATV 31**	**ATV 38**	**ATV 71**
Type of interface		**NW BM85000**	**VW3 A58 302**	**VW3 A3 302**
Control		“Modbus messaging”	“Peer Cop” 32 predefined words maximum	“Peer Cop” 8 configurable words maximum (communication scanner)
Monitoring		“Modbus messaging”	“Global Data” 32 predefined words maximum	“Global Data” 8 configurable words maximum (communication scanner)
Configuration and adjustment		“Modbus messaging”	“Modbus messaging” Read/write access to all drive parameters	

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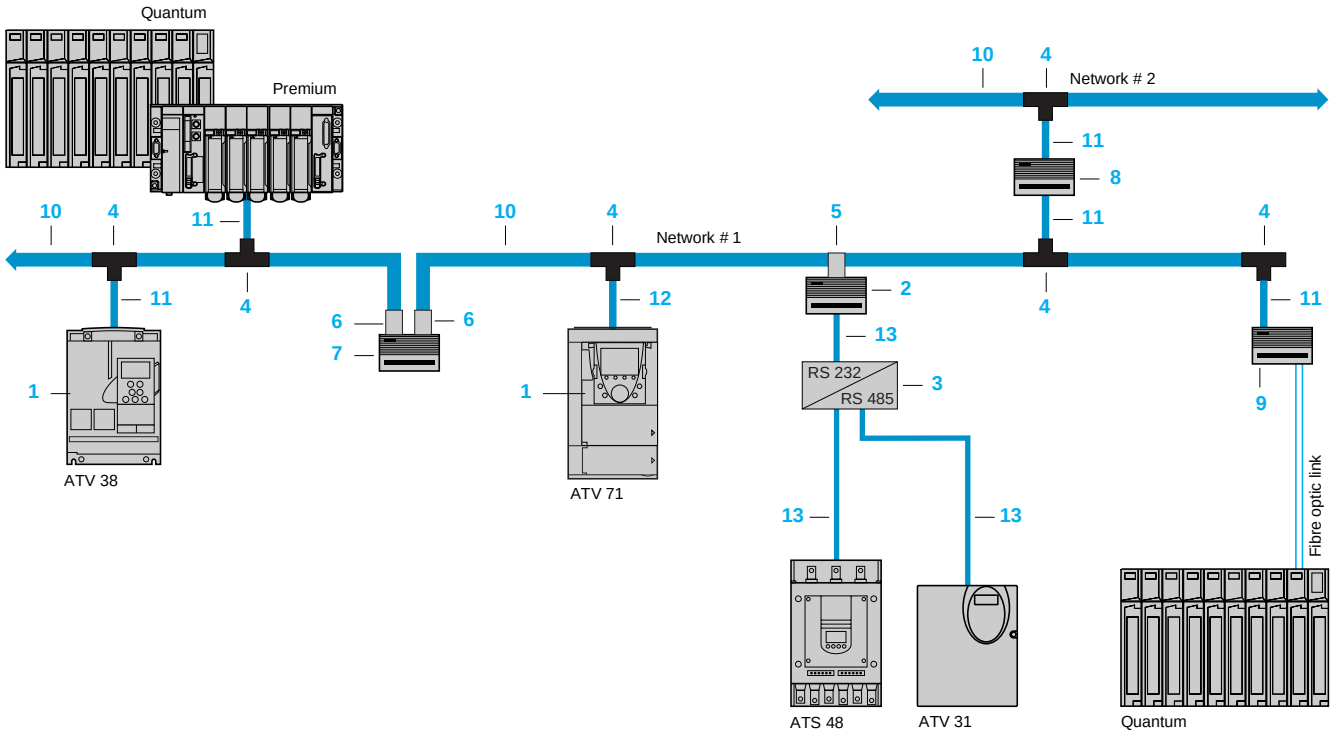
Starters, drives and communication
Communication via Modbus Plus network

Modbus Plus wiring system



Modbus Plus bus connection elements *(1)*

Cards and gateways

Description	Used with	Code	Reference	Weight kg
Communication cards equipped with one 9-way female SUB-D connector	ATV 38	1	**VW3 A58 302**	0.300
	ATV 71	1	**VW3 A3 302**	0.300
Modbus Plus/Modbus gateway 4 RS 232 ports power supply 115…220 V~	ATS 48, ATV 31	2	**NW BM85000**	3.158
RS 232/RS 485 interface power supply 24 V ⎓, 20 mA *(2)*	ATS 48, ATV 31	3	**XGS Z24**	0.105

Connection accessories

Description	Use	Code	Reference	Weight kg
Modbus Plus tap (IP 20)	For connecting via a tap junction	4	**990 NAD 230 00**	0.230
Modbus Plus in-line connector	Gateway, bridge and repeater	5	**AS MBKT 085**	0.035
Connector with Modbus Plus terminator (sold in lots of 2)	Bridge and repeater	6	**AS MBKT 185**	0.260
Modbus Plus electrical repeater	Extension beyond 450 m or up to 64 subscribers	7	**NW RR85 001**	2.677
Modbus Plus bridge with 4 ports	Connection of 4 networks maximum	8	**NW BP85 002**	2.813
Line/station fibre optic repeater	–	9	**490 NRP 254 00**	2.856
Point-to-point fibre optic repeater	Used to connect an electrical segment to the fibre optic segment (3000 m maximum)	–	**NW NRP 253 00**	2.863
Wiring tool	Inserting trunk and drop cables in a 990 NAD 230 00 tap	–	**043 509 383**	3.000

(1) To order other connection elements, please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon Quantum" catalogues.
(2) Please consult our specialist "Interfaces, I/O splitter boxes and power supplies" catalogue.

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Modbus Plus bus connection elements (continued) (1)

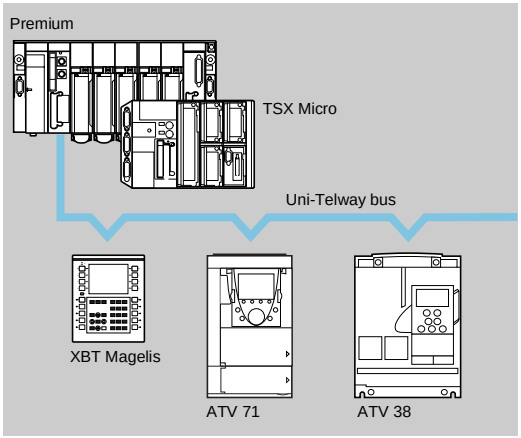
Cables

Description	Used		Code	Length	Reference	Weight
	From	To		m		kg
Trunk cables for Modbus Plus	990 NAD 230 00 Modbus Plus tap	990 NAD 230 00 Modbus Plus tap, AS MBKT 085 Modbus Plus in-line connector, Modbus Plus connector with terminators AS MBKT 185	10	30.5	**490 NAA 271 01**	1.833
				152.5	**490 NAA 271 02**	10.135
				305	**490 NAA 271 03**	18.940
				457	**490 NAA 271 04**	30.000
				1525	**490 NAA 271 06**	112.950
Drop cables One 9-way male SUB-D connector and one stripped end	ATV 38 (+VW3 A58 302 communication card), Premium, Quantum PLCs, NW BP85 002 Modbus Plus bridge with 4 ports, 490 NRP 253 00 line/ station fibre optic repeater	990 NAD 230 00 Modbus Plus tap	11	2.4	**990 NAD 211 10**	0.169
				6	**990 NAD 211 30**	0.459
	ATV 71 (+ VW3 A3 302 communication card)	990 NAD 230 00 Modbus Plus tap	12	2.4	**990 NAD 219 10**	0.142
				6	**990 NAD 219 30**	0.465
Cable for Modbus 1 RJ45 connector and one stripped end	ATS 48, ATV 31, NW BM85000 Modbus Plus/ Modbus gateway	RS 232/RS 485 interface	13	3	**VW3 A8 306 D30**	0.115

(1) To order other connection elements, please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon Quantum" catalogues.

Starters, drives and communication
Communication via Uni-Telway bus

Presentation



The Uni-Telway bus is a standard means of communication between control system components (PLCs, HMI terminals, supervisors, variable speed drives, numerical controllers, etc).

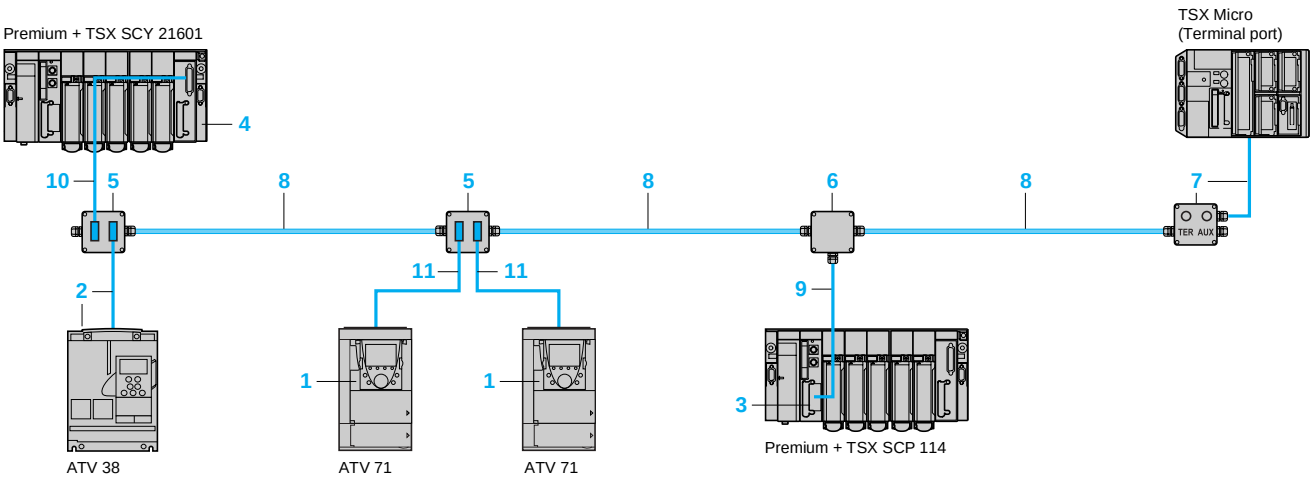
The Uni-Telway bus requires a master station (Premium, TSX Micro PLCs) which manages the allocation of bus access rights to the various connected slave stations (HMI terminals, variable speed drives, etc). The slave stations can communicate with one another without programming the master station.
An industrial HMI terminal (Magelis type) can be connected directly to the bus and can be used to adjust drives without developing applications specific to the PLC.

The following Altivar variable speed drives can be connected to the Uni-Telway bus via:
- A VW3 A58 303 communication kit for the Altivar 38 drive
- A VW3 A3 303 communication card for the Altivar 71 drive

Characteristics

Structure	Topology	Bus
	Physical interface	RS 485 isolated
	Link	Multidrop
	Access method	Master/slave type
	Transmission mode	Asynchronous transmission in baseband
	Data rate	4.8…19.2 Kbps
	Medium	Double shielded twisted pair
	Number of stations	28 maximum
	Length of bus	1000 m maximum excluding tap links
	Tap links	20 m maximum
Services	UNI-TE	Request/response of up to 240 bytes *(1)* initiated by any connected station. Unsolicited point-to-point data of up to 240 bytes *(1)* without confirmation report, initiated by any connected station. Broadcast messages of up to 240 bytes *(1)* initiated by the master station.
	Other functions	Transparent communication, via the master station, with any X-WAY architecture. Diagnostics, debugging, adjustment, programming of PLCs.
	Security	Check character on each frame, acknowledgement and, if required, repetition of messages ensure security of transmission.
	Monitoring	The bus status table, transmission error counters and station status can be accessed on each station.

Uni-Telway bus wiring system



(1) Limited to 128 bytes with the Premium and TSX Micro PLC terminal port.

Starters, drives and communication
Communication via Uni-Telway bus

Uni-Telway bus connection elements *(1)*

Cards, kit and module

Description	Used with	Code	Protocol	Reference	Weight kg
Communication card card equipped with a 9-way female SUB-D connector	ATV 71	1	Uni-Telway, Modbus	**VW3 A3 303**	0.300
Communication kit comprising: ■ 1 communication card equipped with a 9-way female SUB-D connector ■ 1 x 3 m cable equipped with 2 male SUB-D connectors: □ 9-way for connection to the VW3 A3 303 communication card □ 15-way for connection to the TSX SCA 62 subscriber socket	ATV 38	2	Uni-Telway, Modbus	**VW3 A58 303**	0.300
RS 485 type III PCMCIA card (compatible with RS 422) 1.2...19.2 Kbps	Premium, Atrium, TSX Micro PLCs or TSX SCY 21601 module	3	Uni-Telway, Modbus, character mode	**TSX SCP 114**	0.105
Communication module	Premium or Atrium PLCs	4	Uni-Telway, Modbus, character mode	**TSX SCY 21601**	0.360

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TSX SCA 62

Connection accessories

Description	Use	Code	Reference	Weight kg
Subscriber socket Two 15-way female SUB-D connectors and 2 screw terminals	2-channel junction box, trunk cable extension and line terminator	5	**TSX SCA 62**	0.570
Tap junction 3 screw terminals	Junction box, trunk cable extension and line terminator	6	**TSX SCA 50**	0.520
Terminal port connection box with integrated cable of length 1 m	Connection of a TSX Micro or Premium PLC via the PLC terminal port and line terminator	7	**TSX P ACC 01**	0.690

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TSX SCA 50

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TSX P ACC 01

Cables

Description	Used From	Used To	Code	Length m	Reference	Weight kg
Uni-Telway double shielded twisted pair cables	TSX SCA 50 junction box, TSX SCA 62 subscriber socket, TSX P ACC 01 terminal port connection box	TSX SCA 62 subscriber socket, TSX SCA 50 junction box, TSX P ACC 01 terminal port connection box	8	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000
Cables for isolated RS 485 tap link	TSX SCP 114 card	TSX SCA 50 junction box	9	3	**TSX SCP CU 4030**	0.160
		TSX SCA 62 subscriber socket	9	3	**TSX SCP CU 4530**	0.180
	Integrated channel (channel 0) of TSX SCY 2160 1 module	TSX SCA 50 junction box	10	3	**TSX SCP CU 6030**	0.180
		TSX SCA 62 subscriber socket	10	3	**TSX SCY CU 6530**	0.200
Cable for Uni-Telway and Modbus bus 2 male SUB-D connectors, 9 and 15-way	ATV 71 (+VW3 A3 303 communication card)	TSX SCA 62 subscriber socket	11	3	**VW3 A8 306 2**	0.150

(1) To order other elements for connection to the Fipio bus, please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" catalogues.

Starters, drives and communication
Communication gateways LUF P

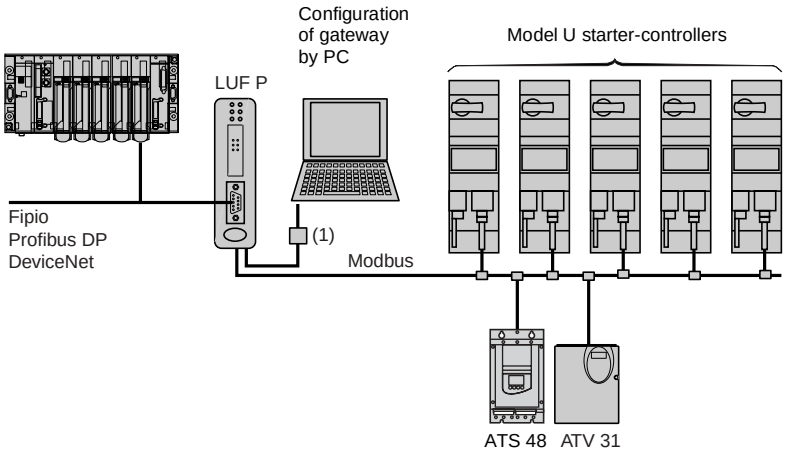
Presentation

Communication gateways LUF P allow connection between Modbus and field buses such as Fipio, Profibus DP or DeviceNet.

After configuration, these gateways manage information which can be accessed by the Modbus bus and make this information available for read/write functions (command, monitoring, configuration and adjustment) on the field buses.

An LUF P communication gateway consists of a box which can be clipped onto a 35 mm omega rail, allowing connection of up to 8 Slaves connected on the Modbus bus.

Example of architecture



(1) Connection kit for PowerSuite software workshop.

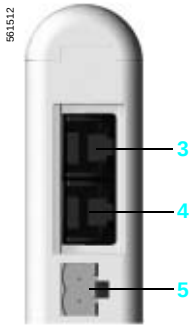
Description

Front panel of the product

1 LED indicating :
- communication status of the Modbus buses,
- gateway status,
- communication status of the Fipio, Profibus DP or DeviceNet bus.

2 Connectors for connection to Fipio, Profibus DP or DeviceNet buses.

Underside of product



3 RJ45 connector for connection on the Modbus bus
4 RJ45 connector for link to a PC
5 ⎓ 24 V power supply

Software set-up

For the Fipio bus, software set-up of the gateway is performed using either PL7 Micro/Junior/Pro software or ABC Configurator software.
For the Profibus DP and DeviceNet buses, software set-up is performed using ABC Configurator.
This software is included:
- in the PowerSuite software workshop for PC (see page 179),
- in the TeSys model U user's manual.

Characteristics, references : page 201
Dimensions : page 201

Characteristics

Bus type			Fipio	Profibus DP	DeviceNet
Environment	Conforming to IEC 60664		Degree of pollution: 2		
Ambient air temperature	Around the device	**°C**	+ 5...+ 50		
Degree of protection			IP 20		
Electromagnetic compatibility	Emission		Conforming to IEC 50081-2: 1993		
	Immunity		Conforming to IEC 61000-6-2: 1999		
Number of Modbus slaves which can be connected			⩽ 8		
Connection	Modbus		By RJ45 connector conforming to Schneider Electric RS485 standard		
	To a PC		By RJ45 connector, with PowerSuite connection kit		
	Field bus		By SUB D9 female connector	By SUB D9 female connector	By 5-way removable screw connector
Supply		**V**	External supply, ⎓ 24 ± 10 %		
Consumption	Max.	**mA**	280		
	Typical	**mA**	100		
Indication/diagnostics			By LED on front panel		
Services	Profile		FED C32 or FED C32P	–	–
	Command		26 configurable words *(1)*	122 configurable words	256 configurable words
	Monitoring		26 configurable words *(1)*	122 configurable words	256 configurable words
	Configuration and adjustment		By gateway mini messaging facility (PKW)		

(1) If the gateway is configured using PL7 and not ABC Configurator, the I/O capacity is limited to a total of 26 words.

References

Description	For use with	With bus type	Reference	Weight kg
Communication gateways	TeSys Model U starter-controllers, Altistart 48, Altivar 31	Fipio/Modbus	**LUF P1**	0.245
		Profibus DP/Modbus	**LUF P7**	0.245
		DeviceNet/Modbus	**LUF P9**	0.245

Connection accessories

TSX FP ACC 12

490 NAD 911 03

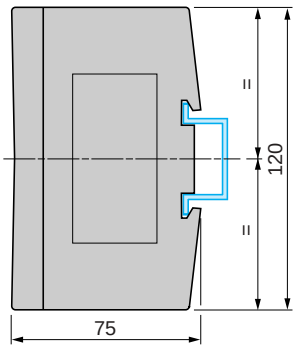
Description	For use with	Length m	Connectors	Reference	Weight kg
Connection cables	Modbus *(2)*	3	1 RJ45 type connector and one end with stripped wires	**VW3 A8 306 D30**	0.150
		0.3	2 RJ45 type connectors	**VW3 A8 306 R03**	0.050
		1	2 RJ45 type connectors	**VW3 A8 306 R10**	0.050
		3	2 RJ45 type connectors	**VW3 A8 306 R30**	0.150
Connectors	Fipio	–	1 SUB-D 9 male connector	**TSX FP ACC12**	0.040
	Profibus mid line	–	1 SUB-D 9 male connector	**490 NAD 911 04**	–
	Profibus line end	–	1 SUB-D 9 male connector	**490 NAD 911 03**	–

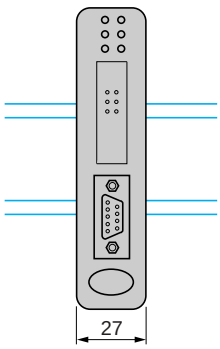
Documentation

Description	Medium	Language	Reference	Weight kg
User's manual for TeSys model U range *(3)*	CD-Rom	Multilingual : English, French, German, Italian, Spanish	**LU9 CD1**	0.022

(2) See pages 190 and 193.
(3) This CD-Rom contains user's manuals for AS-Interface and Modbus communication modules, multifunction control units and gateways, as well as for the gateway programming software, ABC Configurator.

Dimensions





Presentation, description : page 200
Setting-up : page 200

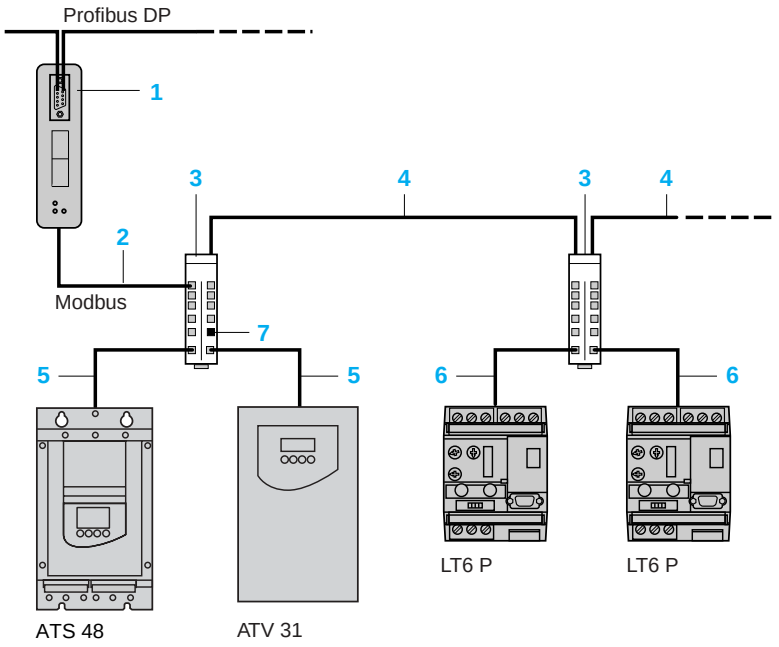
Starters, drives and communication
Communication gateway LA9 P307

Presentation

Communication gateway LA9 P307 provides connection between the Profibus DP and Modbus buses. It is a Slave on the Profibus DP bus and Master on the Modbus bus. It manages information present on the Modbus bus to make it available for read/write functions in the Master PLC on the Profibus DP bus.

Gateway LA9 P307 consists of a box which can be clipped onto a 35 mm omega rail. It manages up to15 Slaves on the Modus bus.

Example of architecture



1 Gateway LA9 P307,
2 Tap-off cable VW3 P07 306 R10,
3 Modbus splitter box LU9 GC3,
4 Cable TSX CSA ●00,
5 Tap-link cable VW3 A8 306 R●●,
6 Tap-link cable VW3 A8 306 D30,
7 Line end adapter VW3 A8 306 RC.

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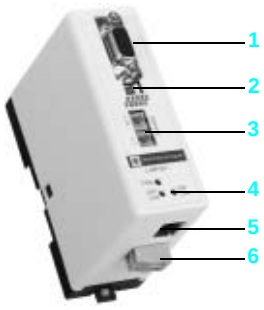

Description

Gateway LA9 P307 comprises :
1 A SUB-D 9-way female connector for connection to the Profibus DP bus,
2 A line end adapter on the Profibus DP bus,
3 Gateway address coding on the Profibus DP bus,
4 Status signalling LED,
5 RJ 45 female connector for connection on the Modbus bus,
6 ⎓ 24 V power supply.

Software set-up

The gateway is configured using the standard software tools for the Profibus bus. For the Premium automation platform, use SYCON configurator software.
The user's manual (.PDF) and the gateway description file (.GSD) are supplied on diskette with the gateway.

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Dimensions : page 203

Starters, drives and communication
Communication gateway LA9 P307

Characteristics

Environment	Conforming to IEC 60664		Degree of pollution: 2
Ambient air temperature	Around the device	**°C**	0...+ 50
Degree of protection			IP 20
Number of Modbus slaves which can be connected			15
Connection on	Modbus		RJ 45 connector
	Profibus		SUB-D 9-way female connector
Supply			External supply, ⎓ 24 V ± 20 %
Consumption		**mA**	150 on ⎓ 24 V
Indication/diagnostics			By LED
Services	Command		16 words
	Monitoring		16 words
	Configuration and adjustment		By gateway mini messaging facility (PKW)

References

562299

LA9 P307

827115

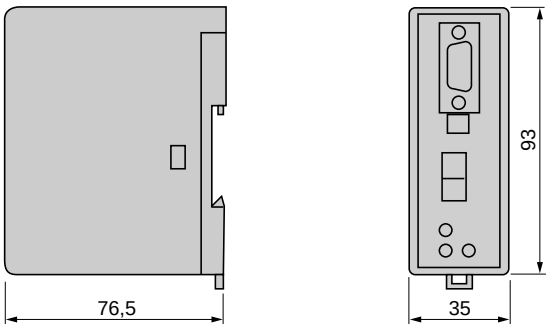
490 NAD 911 03

Description	For use with	Length m	Reference	Weight kg
Profibus DP/Modbus communication gateway	LT6 P ATS 48 ATV 31		**LA9 P307**	0.260

Description	For use with	Length m	Reference	Weight kg
RJ 45 cable with stripped wires	**Screw terminal block** - T-junction box TSX SCA 50 - Y-junction subscriber socket TSX SCA 62 **SUB-D connector** (to be ordered separately) - LT6 P (SUB-D 9 female)	3	**VW3 A8 306 D30**	0.150
RJ 45-RJ 45 cable	ATS 48 ATV 31 Modbus splitter box LU9 GC3	1	**VW3 P07 306 R10**	0.050
Connectors	Profibus mid line	–	**490 NAD 911 04**	–
	Profibus line end	–	**490 NAD 911 03**	–

Dimensions

LA9 P307



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Setting-up : page 202

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