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**

# Contents

# Variable speed drives
# for asynchronous motors
# Altivar 71

# 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 | |
|---|---|---|

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| **Pumps and fans** | **Complex, modular machines**<br>**Machines requiring high-performance torque and accuracy at very low speed as well as high dynamics**<br>**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<br>I/O extension cards<br>Programmable "Controller Inside" card | Encoder interface cards<br>I/O extension cards<br>Programmable "Controller Inside" card |
|---|---|

| EN 50178, IEC/EN 61800-3<br>EN 55011 class A<br>EN 55022 class B<br>CE, UL, N998 | IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2, C1 to C3)<br>EN 55011, EN 55022, IEC/EN 61000-4-2/4-3/4-4/4-5/4-6/4-11<br>CE, UL, CSA, DNV, C-Tick, NOM 117, GOST |
|---|---|

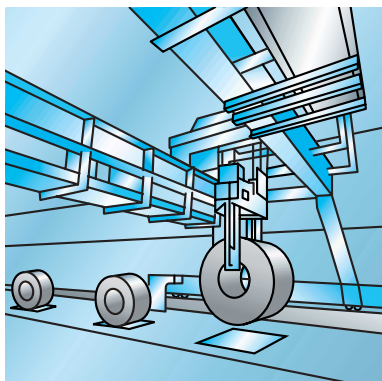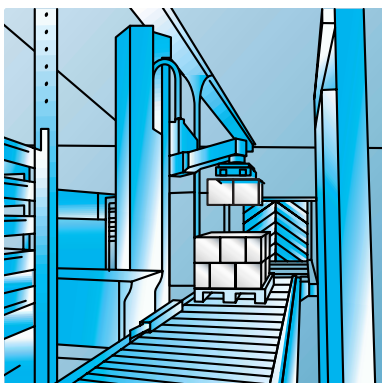| **ATV 38** | **ATV 71** |
|---|---|
| Please consult the "Soft starters and variable speed drives" catalogue | 18 and 19 |

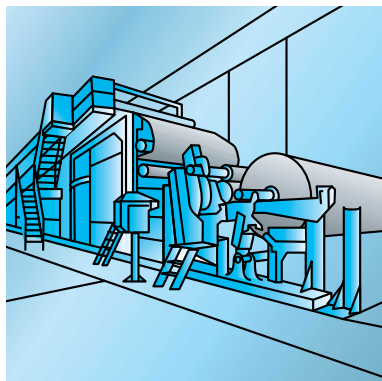# Variable speed drives
# for asynchronous motors
Altivar 71



*Hoisting application*



*Packing application*



*Process machinery 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

### 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

### 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

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# Variable speed drives
# for asynchronous motors
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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).

## Installation



ATV 71HU75N4 flush-mounted

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).

| 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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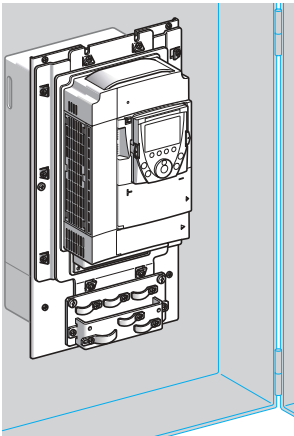
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## Dialogue tools

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.
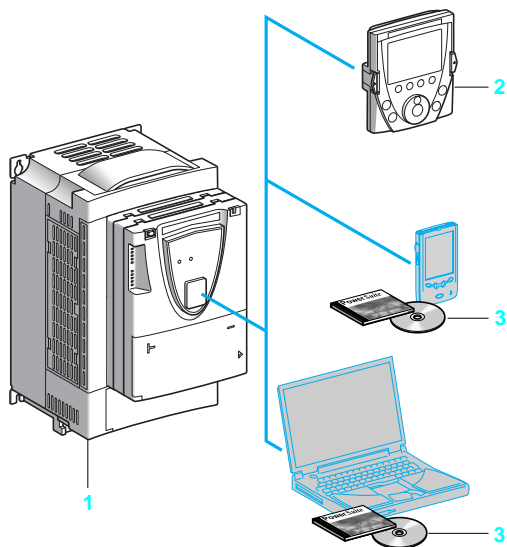■ The advanced functions on the display unit access the more complex drive functions.
■ The display screens, menus and parameters can all be customized for the user or the machine.
■ Online help screens are available.
■ Configurations can be stored and downloaded (four configuration files can be stored).
■ 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.



*"Simply start" menu*

## 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.



*Fault log*



*Troubleshooting screen*

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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).*

### 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.
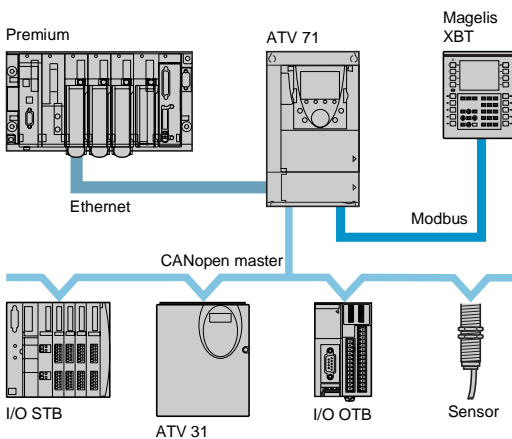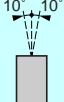


*Example of a drive equipped with a communication card and a programmable "Controller Inside" card*

*(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.*

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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## 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<br>IEC/EN 61000-4-2 level 3<br>IEC/EN 61000-4-3 level 3<br>IEC/EN 61000-4-4 level 4<br>IEC/EN 61000-4-5 level 3<br>IEC/EN 61000-4-6 level 3<br>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<br>ATV 71H075N4…HU40N4 | EN 55011 class A group 1, IEC/EN 61800-3 category C2<br>With additional EMC filter *(2)*:<br>■ EN 55011 class B group 1, IEC/EN 61800-3 category C1 |
| | | ATV 71HU22M3…HU75M3<br>ATV 71HU55N4…HC50N4 | EN 55011 class A group 2, IEC/EN 61800-3 category C3<br>With additional EMC filter *(2)*:<br>■ EN 55011 class A group 1, IEC/EN 61800-3 category C2<br>■ EN 55011 class B group 1, IEC/EN 61800-3 category C1 |
| | | ATV 71H●●●M3X | With additional EMC filter *(2)*:<br>■ EN 55011 class A group 1, IEC/EN 61800-3 category C2<br>■ EN 55011 class B group 1, IEC/EN 61800-3 category C1 |
| **C€ marking** | | | The drives are marked C€ 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<br>ATV 71HD11M3X…HD45M3X<br>ATV 71H075N4…HD75N4 | | IP 21 and IP 41 on upper part<br>IP 20 without cover plate on upper part of cover<br>IP 21 with accessory VW3 A9 1●●, NEMA type 1 with accessory VW3 A9 2●●, see pages 22 and 23 |
| | ATV 71HD55M3X, HD75M3X<br>ATV 71HD90N4…HC50N4 | | IP 00, IP 41 on the upper part and IP 30 on the front panel and side parts.<br>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<br>ATV 71HD11M3X…HD45M3X<br>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<br>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<br>ATV 71HD11M3X…HD45M3X<br>ATV 71H075N4…HD75N4 | | 15 gn for 11 ms conforming to IEC/EN 60068-2-27 |
| | ATV 71HD55M3X, HD75M3X<br>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<br>ATV 71HD11M3X, HD15M3X<br>ATV 71H075N4…HD18N4 | | Degree 2 conforming to IEC/EN 61800-5-1 |
| | ATV 71HD18M3X…HD75M3X<br>ATV 71HD22N4…HC50N4 | | Degree 3 conforming to IEC/EN 61800-5-1 |
| **Environmental conditions** | ATV 71H●●●M3, H●●●M3X,<br>ATV 71H●●●N4 | | IEC 60721-3-3 classes 3C1 and 3S2 |
| | ATV 71H●●●M3S337,<br>ATV 71H●●●M3X337,<br>ATV 71H075N4S337…<br>HD75N4S337,<br>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<br>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<br>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 | | | 10°↙ ↘10° |

*(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.*

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*Characteristics (continued)*

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## Drive characteristics

| Output frequency range | ATV 71H●●●M3<br>ATV 71HD11M3X…HD37M3X<br>ATV 71H075N4…HD37N4 | **Hz** | 10…1000 |
|---|---|---|---|
| | ATV 71HD45M3X…HD75M3X<br>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<br>ATV 71HD11M3X, HD15M3X<br>ATV 71H075N4…HD30N4 | **kHz** | 4 without derating in continuous operation<br>Above this frequency, see derating curves on pages 133 and 135 to 137 |
| | ATV 71HD18M3X…HD75M3X<br>ATV 71HD37N4…HC50N4 | **kHz** | 2.5 without derating in continuous operation.<br>Above this frequency, see derating curves on pages 133 and 135 to 137 |
| Speed range | | | 1…1000 in closed loop mode with encoder feedback<br>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<br>± 10 % of nominal slip, without speed feedback |
| Torque accuracy | | | ± 5 % in closed loop mode<br>± 15 % in open loop mode |
| Transient overtorque | | | 170 % of the nominal motor torque (typical value at ± 10 %) for 60 s<br>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)<br>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)<br>165 % of the nominal drive current for 2 s (typical value) |
| Continuous torque at 0 Hz | ATV 71H037M3…HD45M3X<br>ATV 71H075N4…HD75N4 | | The Altivar 71 drive can continuously supply the peak value of the drive nominal current |
| | ATV 71HD55M3X, HD75M3X<br>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)<br>Sensorless Flux Vector Control (FVC) (voltage or current vector)<br>Voltage/frequency ratio (2 or 5 points)<br>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<br>Not available in voltage/frequency ratio |

## Electrical power characteristics

| Power supply | Voltage | **V** | 200 - 15 %...240 + 10 % single phase for ATV 71H075M3…HU75M3<br>200 - 15 %...240 + 10 % 3-phase for ATV 71H●●●M3 and ATV 71H●●●M3X<br>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<br>ATV 71H075N4…HU22N4 | **dBA** | 43 |
| | ATV 71HU22M3…HU40M3<br>ATV 71H075N4…HU40N4 | **dBA** | 54.5 |
| | ATV 71HU55M3<br>ATV 71HU55N4, HU75N4 | **dBA** | 55.6 |
| | ATV 71HU75M3<br>ATV 71HD11N4 | **dBA** | 57.4 |
| | ATV 71HD11M3X, HD15M3X<br>ATV 71HD15N4, HD18N4 | **dBA** | 60.2 |
| | ATV 71HD18M3X, HD22M3X<br>ATV 71HD22N4 | **dBA** | 59.9 |
| | ATV 71HD30M3X…HD45M3X,<br>ATV 71HD30N4, HD37N4 | **dBA** | 64 |
| | ATV 71HD45N4…HD75N4 | **dBA** | 63.7 |
| | ATV 71HD55M3X<br>ATV 71HD90N4 | **dBA** | 60.5 |
| | ATV 71HD75M3X<br>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 – |

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# Variable speed drives
# for asynchronous motors
Altivar 71

## Electrical control characteristics

| | | |
|---|---|---|
| **Internal supplies available** | | Short-circuit and overload protection:<br>■ 1 x 10.5 V ⎓ ± 5% supply for the reference potentiometer (1 to 10 kΩ), max. current 10 mA<br>■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA. |
| **External + 24 V power supply** *(1)*<br>(not provided) | | 24 V ⎓ (min. 19 V, max. 30 V)<br>Power 30 W |
| **Analog inputs** | AI1-/AI1+ | 1 bipolar differential analog input ± 10 V ⎓ (maximum safe voltage 24 V)<br>Max. sampling time: 2 ms ± 0.5 ms<br>Resolution: 11 bits + 1 sign bit<br>Accuracy: ± 0.6% for a temperature variation of 60°C<br>Linearity: ± 0.15% of the maximum value |
| | AI2 | 1 software-configurable current or voltage analog input:<br>■ analog voltage input 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V)<br>■ analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω<br>Max. sampling time: 2 ms ± 0.5 ms<br>Resolution: 11 bits<br>Accuracy: ± 0.6% for a temperature variation of 60°C<br>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:<br>■ analog voltage output 0...10 V ⎓, minimum load impedance 470 Ω<br>■ current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω<br>Max. sampling time: 2 ms ± 0.5 ms<br>Resolution: 10 bits<br>Accuracy: ± 1% for a temperature variation of 60°C<br>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<br>Minimum switching capacity: 3 mA for 24 V ⎓<br>Maximum switching capacity:<br>■ on resistive load (cos φ = 1): 5 A for 250 V ∼ or 30 V ⎓<br>■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∼ or 30 V ⎓<br>Max. response time: 7 ms ± 0.5 ms<br>Electrical service life: 100,000 operations |
| | R2A, R2B | 1 relay logic output, one "N/O" contact<br>Minimum switching capacity: 3 mA for 24 V ⎓<br>Maximum switching capacity:<br>■ on resistive load (cos φ = 1): 5 A for 250 V ∼ or 30 V ⎓<br>■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∼ or 30 V ⎓<br>Max. response time: 7 ms ± 0.5 ms<br>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<br>Impedance: 3.5 kΩ<br>Maximum voltage: 30 V<br>Max. sampling time: 2 ms ± 0.5 ms<br>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<br>Logic input, characteristics identical to inputs LI1...LI5<br>Input for a maximum of 6 PTC probes mounted in series:<br>■ nominal value < 1.5 kΩ<br>■ trip resistance 3 kΩ, reset value 1.8 kΩ<br>■ 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:<br>■ Power supply: 24 V ⎓ (max. 30 V)<br>■ Impedance: 1.5 kΩ<br>■ State 0 if < 2 V, state 1 if > 17 V |
| **Maximum I/O connection capacity and tightening torque** | | 2.5 mm² (AWG 14)<br>0.6 Nm |

*(1) Please consult our catalogue "Power supplies, splitter blocks and interfaces".*

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*Characteristics (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71

## Electrical control characteristics (continued)

| | | | |
|---|---|---|---|
| **Acceleration and deceleration ramps** | | | Ramp profiles:<br>■ linear, can be adjusted separately from 0.01 to 9999 s<br>■ S, U or customized<br>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:<br>■ by a command on a programmable logic input<br>■ 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:<br>■ against overheating<br>■ of the power stage<br>Protection against:<br>■ short-circuits between motor phases<br>■ input phase breaks<br>■ overcurrents between output phases and earth<br>■ overvoltages on the DC bus<br>■ a break on the control circuit<br>■ exceeding the limit speed<br>Safety function for:<br>■ line supply overvoltage and undervoltage<br>■ 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:<br>■ The motor thermal state is saved when the drive is powered down.<br>■ Function can be modified via operator dialogue terminals, depending on the type of motor (force-cooled or self-cooled).<br>Protection against motor phase breaks<br>Protection with PTC probes |
| **Dielectric strength** | ATV 71●●●M3<br>ATV 71●●●M3X | | Between earth and power terminals: 2830 V ⎓<br>Between control and power terminals: 4230 V ⎓ |
| | ATV 71●●●N4 | | Between earth and power terminals: 3535 V ⎓<br>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. |

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# Variable speed drives
# for asynchronous motors
Altivar 71

## 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. | |

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# 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.
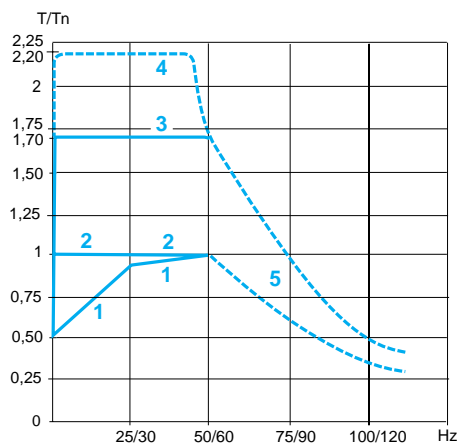
### Open loop applications

**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)*
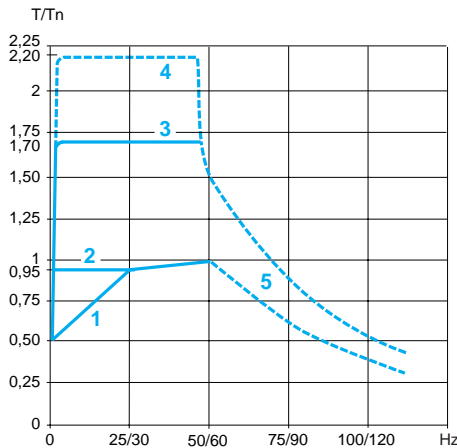
*Open loop applications*

### 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.

*Closed loop applications*

## 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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# Variable speed drives
# for asynchronous motors
Altivar 71

## 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.
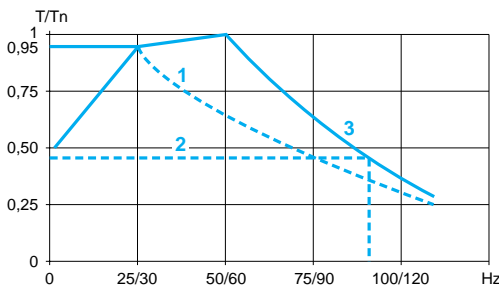
### Using a motor at overspeed

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.

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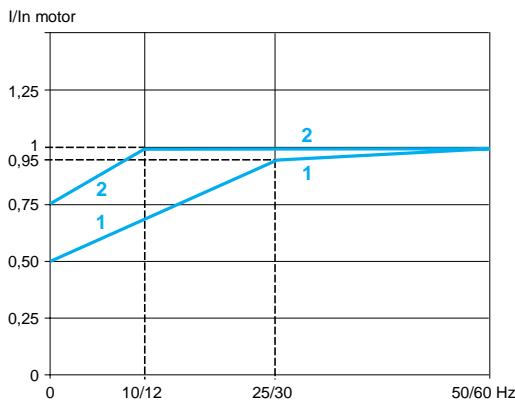
### Power of a self-cooled motor greater than the drive power

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.



*Using a motor at overspeed*



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

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# Variable speed drives
# for asynchronous motors
Altivar 71
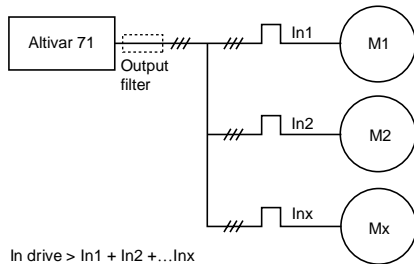


In drive > In1 + In2 +…Inx

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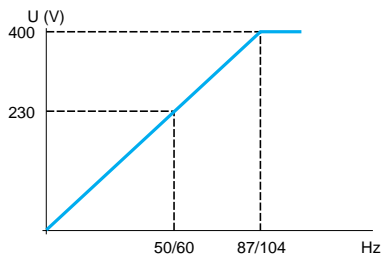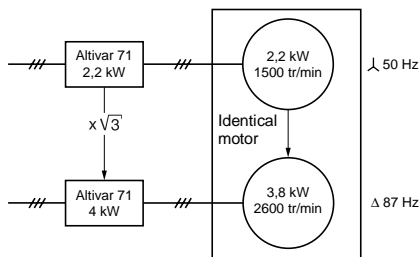In this case, provide external thermal protection for each motor using probes or thermal overload relays. For cable runs over a certain length, taking account of all tap links, it is advisable either to install an output filter between the drive and the motors or to use the overvoltage limitation function.

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 人 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 人 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.

| Presentation:<br>pages 4 to 7 | References:<br>pages 18 and 19 | Dimensions:<br>pages 90 to 111 | Schemes:<br>pages 112 to 127 | Functions:<br>pages 142 to 173 |
| --- | --- | --- | --- | --- |

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# Variable speed drives
# for asynchronous motors
Altivar 71
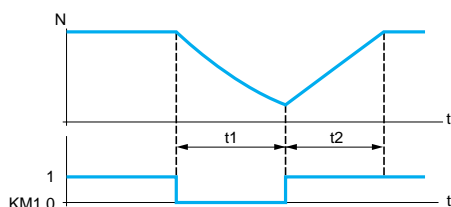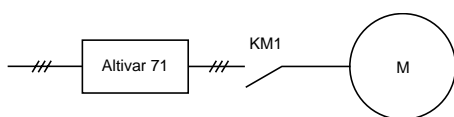


t1: deceleration without ramp (freewheel)
t2: acceleration with ramp

*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.

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# Variable speed drives
# for asynchronous motors
Altivar 71
Supply voltage 200...240 V 50/60 Hz

533158

ATV 71HU22M3Z

532725

ATV 71H037M3

532724

ATV 71HD37M3X

| Motor | | Line supply | | | | Altivar 71 | | | Reference (3) | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Power indicated on plate (1) | | Line current (2) | | Apparent power | Max. prospective line Isc | Maximum continuous current (1) | Max. transient current for | | | |
| | | 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.

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71
Supply voltage 380..0.480 V 50/60 Hz

*ATV 71HU22N4*

*ATV 71HU40N4Z*

*ATV 71HC28N4*

| Motor | | Line supply | | | | Altivar 71 | | | Reference | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Power indicated on plate *(1)* | | Line current *(2)* | | Apparent power | Max. prospective line Isc | Maximum continuous current *(1)* | Max. transient current for | | | |
| | | 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.*

Telemecanique

# 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
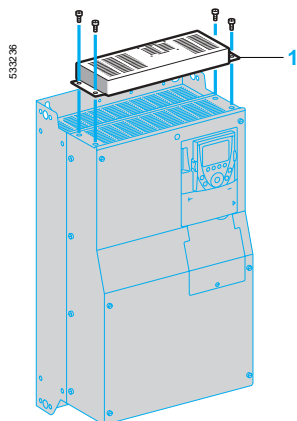on pages 133 and 135 to 137).

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<br>ATV 71HD22N4…HD37N4 | **VW3 A9 406** | – |
| ATV 71HD45N4…HD75N4 | **VW3 A9 407** | – |

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71
Options: accessories



*ATV 71HU75N4 flush-mounted*



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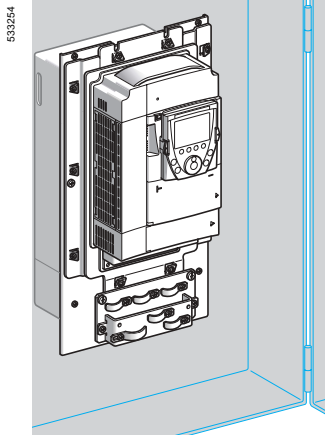
The back of the enclosure must be drilled and cut out for this type of mounting.

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 |
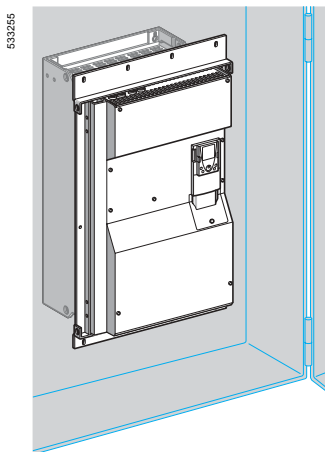
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# Variable speed drives
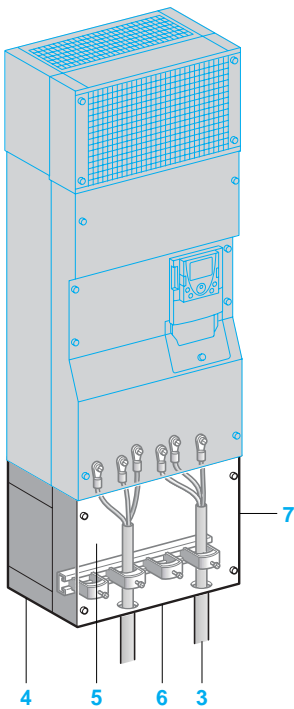# for asynchronous motors
Altivar 71
Options: accessories



**1    2    3**



**4    5    6    3**

## 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 |

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# Variable speed drives
# for asynchronous motors
Altivar 71
Options: accessories
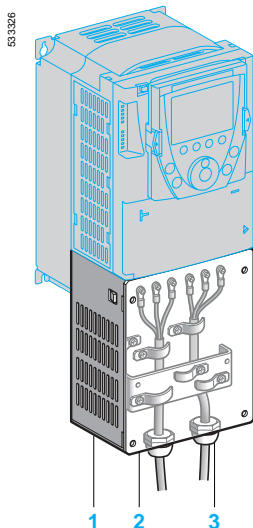
### Kits for IP 21 or IP 31 conformity (mounting outside the enclosure)

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 |

53326

1   2   3

53327

4   5

6

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23
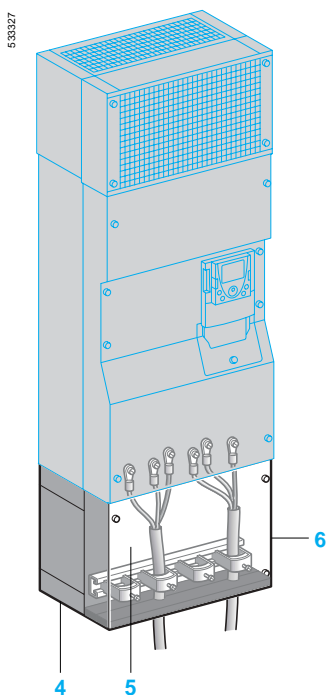
# Variable speed drives
# for asynchronous motors
Altivar 71
Options: accessories
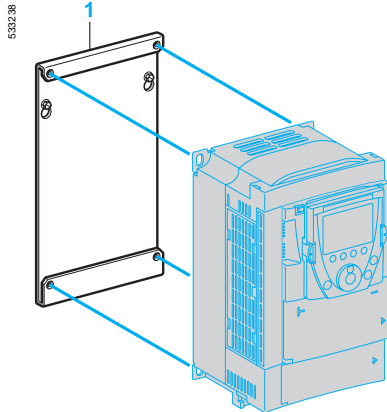


*VW3 A9 304*

## 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** | – |

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71
Options: accessories



1

*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
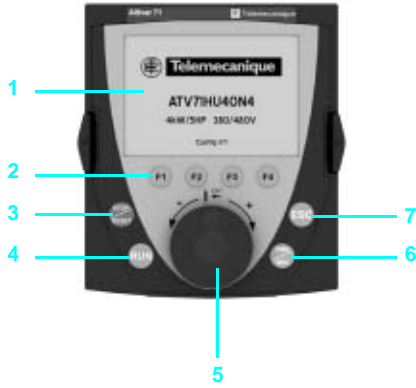


## Remote graphic display terminal
**(this display terminal can be supplied with the drive or ordered separately)**

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 |

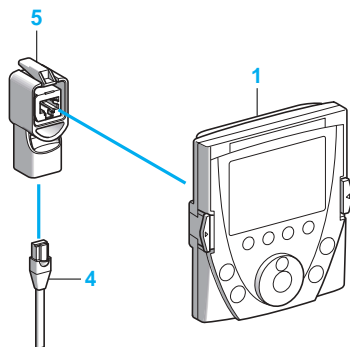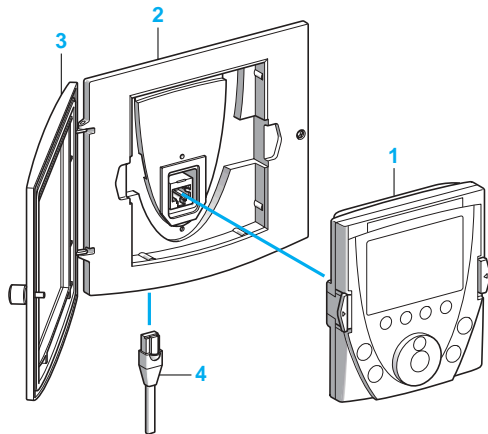## Graphic display terminal accessories

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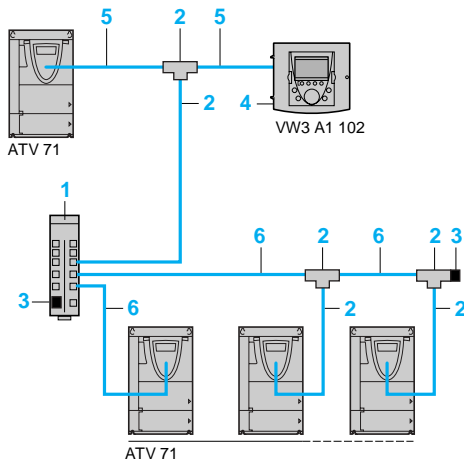*(2) To be mounted on remote mounting kit VW3 A1 102 (for mounting on an enclosure door), which must be ordered separately (see above).*

Telemecanique

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



ATV 71

VW3 A1 102



ATV 71

*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

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.
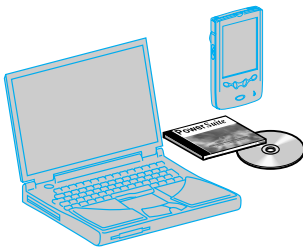


*PowerSuite software workshop*

Telemecanique

27

# Variable speed drives
# for asynchronous motors

Altivar 71

Options: encoder interface cards

## Presentation



*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.*

Telemecanique

# 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.*
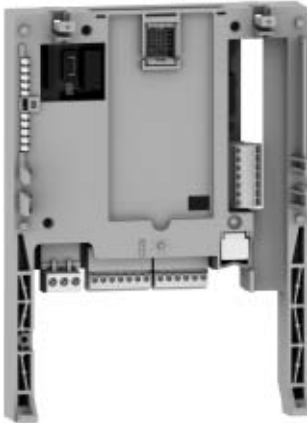
# Variable speed drives
# for asynchronous motors
Altivar 71
Options: I/O extension cards

## Presentation

532728

*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:<br>■ 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<br>■ 1 x - 10.5 V ⎓ supply (± 5%) for the reference potentiometer (1 to 10 k$\Omega$), 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.<br>Minimum switching capacity: 3 mA for 24 V ⎓<br>Maximum switching capacity:<br>■ on resistive load (cos $\varphi$ = 1): 5 A for 250 V ∿ or 30 V ⎓<br>■ on inductive load (cos $\varphi$ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓<br>Electrical service life: 100,000 operations<br>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<br>Impedance 3.5 k$\Omega$<br>Maximum voltage: 30 V<br>Multiple assignment makes it possible to configure several functions on one input<br>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<br>24 V ⎓ internal or 24 V ⎓ external power supply (min. 12 V, max. 30 V)<br>Maximum current: 200 mA<br>Logic output common (CLO) isolated from other signals<br>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:<br>■ nominal value < 1.5 k$\Omega$<br>■ trip resistance 3 k$\Omega$, reset value 1.8 k$\Omega$<br>■ short-circuit protection < 50 $\Omega$ |
| **Maximum I/O connection capacity and tightening torque** | | 1.5 mm$^2$ (AWG 16)<br>0.25 Nm |

# 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:<br>■ 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<br>■ 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<br>Maximum sampling time: 5 ms ± 1 ms<br>Resolution: 11 bits + 1 sign bit<br>Accuracy: ± 0.6% for a temperature variation of 60°C<br>Linearity: ± 0.15% of the maximum value |
| | AI4 | 1 software-configurable current or voltage analog input:<br>■ voltage analog input 0…10 V ⎓, impedance 30 kΩ (maximum safe voltage 24 V)<br>■ X-Y mA current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω<br>Maximum sampling time: 5 ms ± 1 ms<br>Resolution: 11 bits<br>Accuracy: ± 0.6% for a temperature variation of 60°C<br>Linearity: ± 0.15% of the maximum value |
| **Analog outputs** | AO2, AO3 | 2 software-configurable current or voltage analog outputs:<br>■ voltage analog output ± 10 V ⎓, 0…10 V, minimum load impedance 470 Ω<br>■ X-Y mA current analog output by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω<br>Maximum sampling time: 5 ms ± 1 ms<br>Resolution: 10 bits<br>Accuracy: ± 1% for a temperature variation of 60°C<br>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.<br>Minimum switching capacity: 3 mA for 24 V ⎓<br>Maximum switching capacity:<br>■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓<br>■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for 250 V ∿ or 30 V ⎓<br>Electrical service life: 100,000 operations<br>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<br>Impedance 3.5 kΩ<br>Maximum voltage: 30 V<br>Multiple assignment makes it possible to configure several functions on one input<br>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<br>Maximum voltage: 30 V<br>Maximum current: 200 mA<br>Logic output common (CLO) isolated from other signals<br>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:<br>■ nominal value < 1.5 kΩ<br>■ trip resistance 3 kΩ, reset value 1.8 kΩ<br>■ short-circuit protection < 50 Ω |
| **Frequency control input** | RP | Frequency range: 0…30 kHz<br>Cyclic ratio: 50 % ± 10 %<br>Maximum sampling time: 5 ms ± 1 ms<br>Maximum input voltage 30 V, 15 mA<br>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)<br>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)<br>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.*

Telemecanique

# 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 $\overline{\phantom{--}}$ 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



**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 $\overline{\phantom{--}}$ 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 $\overline{\phantom{--}}$ power supply
■ 1 to indicate a program execution fault
■ 2 to indicate the CANopen bus communication status
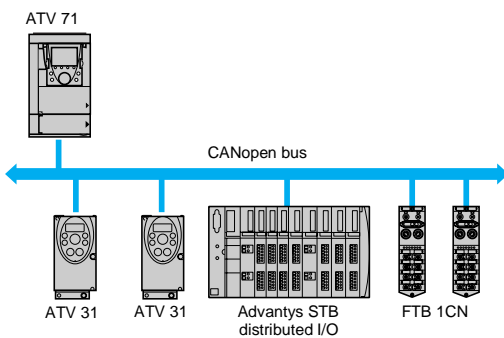■ 1 controlled by the application program
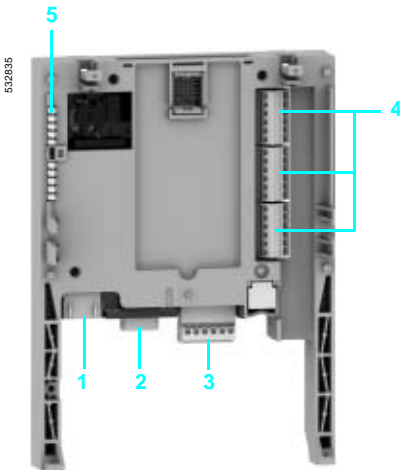
| Characteristics: | Functions: | References: | Schemes: |
|---|---|---|---|
| page 34 | pages 35 to 38 | page 39 | page 121 |

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Telemecanique

# Variable speed drives
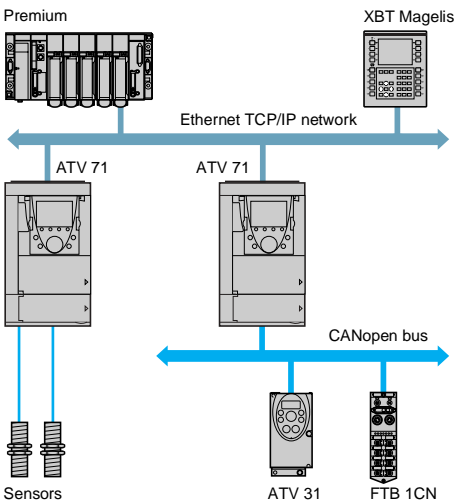# for asynchronous motors
Altivar 71
Option: "Controller Inside" programmable card
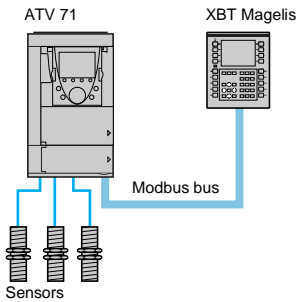


*Independent machine with
multiwire system*



*Independent machine with CANopen bus*



*Modular machine with Ethernet TCP/IP network*

## 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.

## 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.

## 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.

# 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 mm$^2$ |
| | Maximum capacity | **mm$^2$** | 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.*

Telemecanique

*Functions*

# 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.
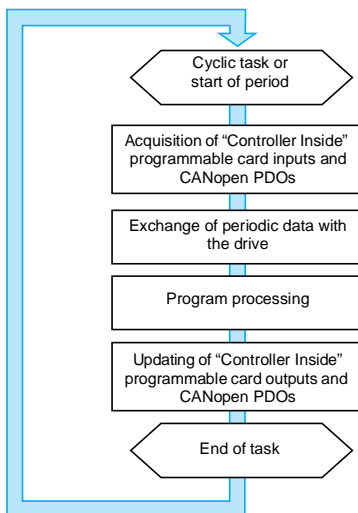


*Example of cycle execution for the "Controller Inside" programmable card connected on a CANopen bus*

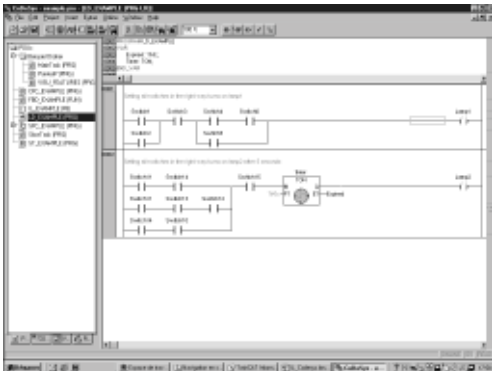# Variable speed drives
# for asynchronous motors
Altivar 71
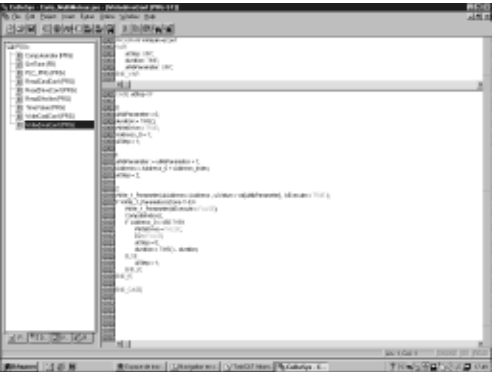Option: "Controller Inside" programmable card

## Programming languages
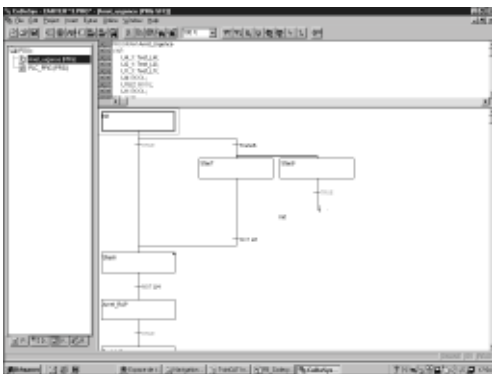
**6 programming languages are available:**
- Ladder language (LD)
- Structured Text language (ST)
- Grafcet language (SFC)
- Instruction List language (IL)
- Function block diagram (FBD)
- Continuous Flow Chart (CFC)



*Example of Ladder language programming*

### 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.



*Example of Structured Text language programming*

### 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.



*Example of Grafcet language programming*

### 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
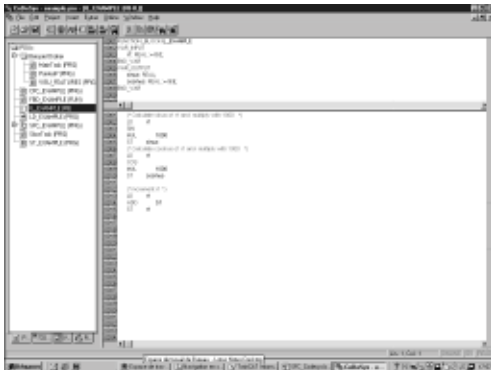


*Example of Instruction List language programming*



*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
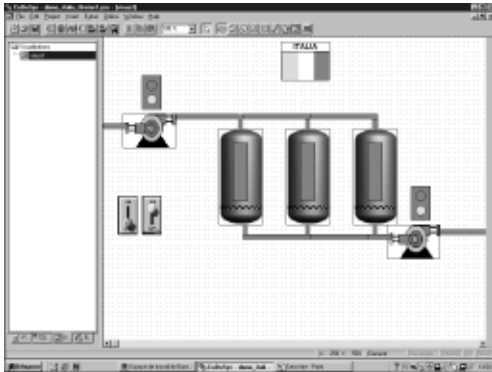


*Example of runtime screen*

## 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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*References*

# 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.*
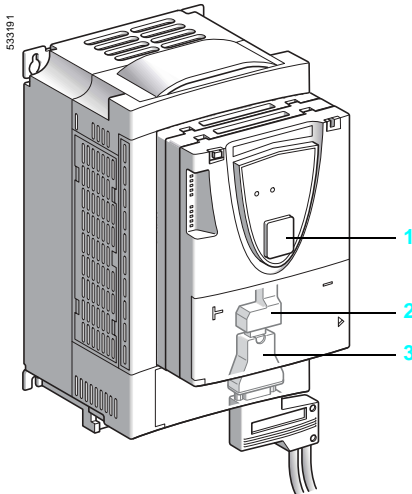
# Variable speed drives
# for asynchronous motors
Altivar 71
Communication buses and networks
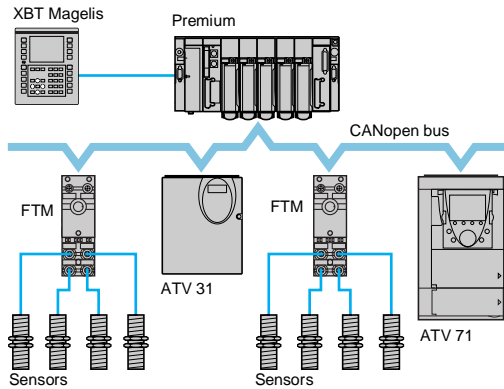
Example of configuration on the CANopen bus

## 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

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*Functions*

# 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.

# 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<br>■ BOOTP (IP address dynamic server depending on the IEEE address)<br>■ 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<br>MAC: IEEE 802.3 |
| | Network | IP (RFC791)<br>ICMP client for supporting certain IP services such as the "ping" command |
| | Transport | TCP (RFC793), UDP<br>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<br>Server factory-configured and modifiable<br>The memory available for the application is approximately 1 Mb<br><br>The factory-configured server contains the following pages:<br>■ Altivar viewer: displays the drive status and the state of its I/O, the main measurements (speed, current, etc)<br>■ Data editor: access to the drive parameters for configuration, adjustment and signalling<br>■ Altivar chart: simplified oscilloscope function<br>■ Security: configuration of passwords to access viewing and modification<br>■ FDR Agent: configuration of the "Faulty Device Replacement" parameters<br>■ IO Scanner: configuration of periodic variables for controlling and monitoring the drive via the PLC, etc<br>■ Ethernet statistics: drive identification (IP addresses, version, etc) from the Ethernet transmission statistics |
| | Messaging | Modbus/TCP: 8 simultaneous connections<br>Read Holding Registers (03), 63 words maximum<br>Read Input Registers (04), 63 words maximum<br>Write Single Register (06)<br>Write Multiple Registers (16), 63 words maximum<br>Read/Write Multiple Registers (23)<br>Read Device Identification (43)<br>Diagnostics (08) |
| | Periodic variables | I/O scanning service (can be inhibited):<br>■ 10 control variables which can be assigned by the PowerSuite software workshop or the standard Web server<br>■ 10 monitoring variables which can be assigned by the PowerSuite software workshop or the standard Web server<br>■ PKW indexed periodic variable<br>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<br>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)<br>"IP" (IP address)  and "10/100" Mbps (speed) |
| | Using the graphic display terminal | Control word received<br>Reference received<br>Number of frames received<br>Number of incorrect frames<br>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.*

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

## 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:<br>■ 4800 bps<br>■ 9600 bps<br>■ 19200 bps |
| | Polarization | Type of polarization can be configured by switches on the card:<br>■ No polarization impedances (supplied by the wiring system, for example, in the master)<br>■ Two 4.7 kΩ polarization resistors |
| | Selection of the protocol | Via the display terminal or the PowerSuite software workshop:<br>■ Modbus RTU<br>■ Modbus ASCII<br>■ Uni-Telway |
| | Address | 1 to 247, configurable by switches on the card. |
| **Service** | Communication monitoring | Can be inhibited<br>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<br>Reference received |

### Characteristics of the Modbus protocol *(1)*

| | | |
|---|---|---|
| **Structure** | Transmission mode | RTU, ASCII |
| | Format | Configurable via the display terminal or the PowerSuite software workshop:<br>In RTU mode only:<br>■ 8 bits, odd parity, 1 stop<br>■ 8 bits, no parity, 1 stop<br>■ 8 bits, even parity, 1 stop<br>■ 8 bits, no parity, 2 stop<br><br>In RTU and ASCII modes:<br>■ 7 bits, even parity, 1 stop<br>■ 7 bits, odd parity, 1 stop<br>■ 7 bits, even parity, 2 stop<br>■ 7 bits, odd parity, 2 stop |
| **Service** | Messaging | Read Holding Registers (03), 63 words maximum<br>Read Input Registers (04), 63 words maximum<br>Write Single Register (06)<br>Write Multiple Registers (16), 60 words maximum<br>Read/Write Multiple Registers (23)<br>Read Device Identification (43)<br>Diagnostics (08) |

### Characteristics of the Uni-Telway protocol *(2)*

| | | |
|---|---|---|
| **Structure** | Format | 8 bits, odd parity, 1 stop |
| **Service** | Messaging | Read word (04h)<br>Write word (14h)<br>Read object (36h), 63 words maximum<br>Write object (37h), 60 words maximum<br>Identification (0Fh)<br>Protocol version (30h)<br>Mirror (FAh)<br>Read error counters (A2h)<br>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 (continued)*

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

## 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<br>8 monitoring variables which can be assigned by communication scanner<br>PKW indexed periodic variable (settings) | 5 control variables<br>8 monitoring variables |
| | Communication monitoring | Can be inhibited<br>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<br>Reference received<br>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<br>"Global data": 8 monitoring variables which can be assigned by communication scanner | |
| | Communication monitoring | Can be inhibited<br>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<br>Reference received<br>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.

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*Characteristics* *(continued)*

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

## 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<br>8 control variables which can be assigned by communication scanner<br>8 monitoring variables which can be assigned by communication scanner<br>PKW indexed periodic variable (settings) |
| | Communication monitoring | Can be inhibited<br>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<br>Reference received<br>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<br>Allen-Bradley® assemblies type 103, 104 and 105<br>Communication scanner assemblies 100 and 101 |
| | Periodic exchange mode | Inputs: Polled, Change of state, Cyclic<br>Outputs: Polled |
| | Auto Device Replacement | No |
| | Communication monitoring | Can be inhibited<br>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<br>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:<br>■ Read: read a parameter<br>■ Write: write a parameter<br>■ Initiate: initialize the communication relationship<br>■ Abort: abort the communication relationship<br>■ Status: drive communication status<br>■ Get-OV: read an object description<br>■ Identify: identification of the card |
| | Periodic variables | 2 control variables which can be assigned by communication scanner<br>2 monitoring variables which can be assigned by communication scanner |
| | Communication monitoring | Can be inhibited<br>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<br>Reference received |

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



*VW3 A3 311*



*TSX FP ACC12*



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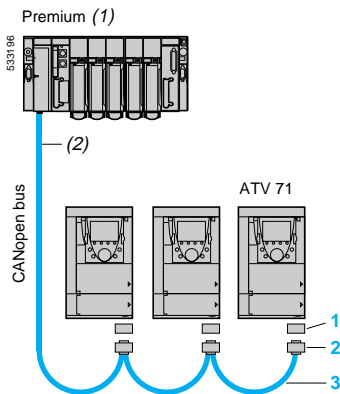
# Variable speed drives
# for asynchronous motors
Altivar 71
Communication buses and networks

Premium *(1)*

533195



Modbus bus

(2)

ATV 71
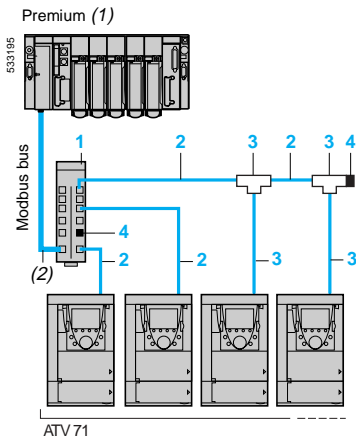
*Example of Modbus diagram, connections via splitter blocks and RJ45 connectors*

Premium *(1)*

533196

(2)

ATV 71

CANopen bus

*Example of CANopen diagram*

533196



*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.*

Telemecanique

# 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 | $\sim$ 380 - 15%…480 + 10% | |
| Engage threshold | | V | ⎓ 785 ± 1% | |
| Maximum DC bus voltage | | V | 850 | |
| Maximum braking power on 400 V $\sim$ 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*

Telemecanique

# 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 | mm² | m | mm² | 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.*

Presentation:
page 48

Characteristics:
page 48

Selection:
pages 54 to 59

Dimensions:
pages 91 to 98

Schemes:
pages 118 and 124

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# 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 | | $\sim$ 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 mm$^2$ (AWG 28) | 1.5 mm$^2$ (AWG 16) |
| | VW3 A7 704…709 | | Bar connection, M6 | 2.5 mm$^2$ (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.*

**Telemecanique**

# 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*

Presentation: page 50 | Characteristics: page 50 | Selection: pages 54 to 59 | Dimensions: pages 99 and 100 | Schemes: page 118

Telemecanique

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# 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 | 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) 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.*

Telemecanique

# 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*

| Presentation: page 52 | Characteristics: page 52 | Selection: pages 54 to 59 | Dimensions: page 101 | Schemes: page 118 |

Ⓔ Telemecanique

53

# 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] |
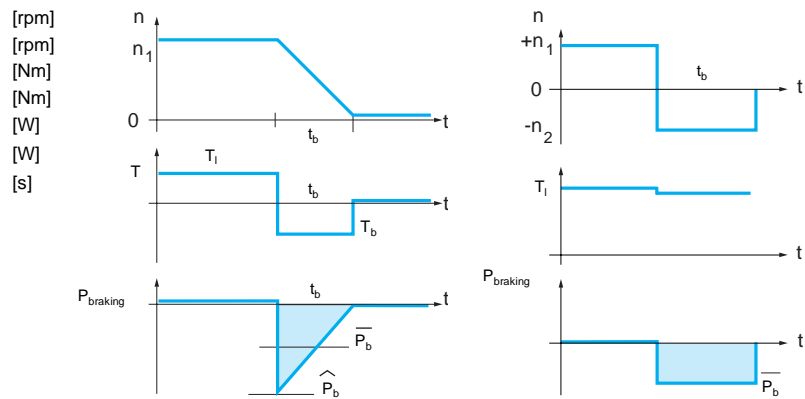
Note: Both these types of operation can be combined.

## Type A operation
Calculating the braking time from the inertia

$$t_b = \frac{J \cdot \omega}{T_b + T_r}$$

$$\omega = \frac{2\pi \cdot n}{60}$$

$$T_b = \frac{\Sigma J \cdot (n_1 - n_2)}{9,55 \cdot t_b}$$

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

$$\bar{P}_b = \frac{\hat{P}_b}{2}$$

| | | |
|---|---|---|
| $T_b$ | Motor braking torque | [Nm] |
| $\Sigma J$ | 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] |
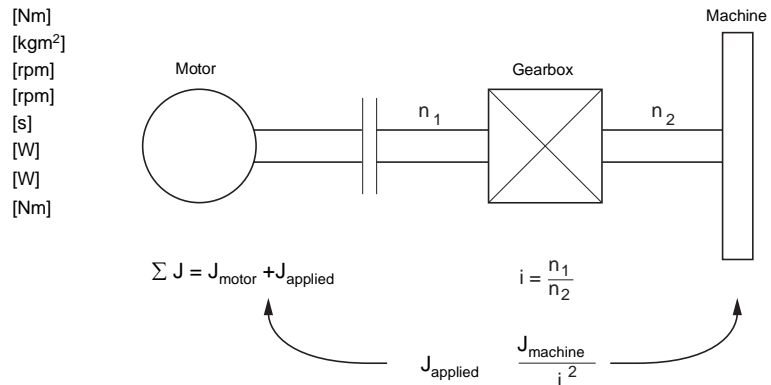
$$\Sigma J = J_{motor} + J_{applied}$$

$$i = \frac{n_1}{n_2}$$

$$J_{applied} \quad \frac{J_{machine}}{i^2}$$

**Telemecanique**

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

| | | |
|---|---|---|
| W | Kinetic energy | [Joule] |
| m | Weight | [kg] |
| v | Speed | [m/s] |
| $t_b$ | Braking time | [s] |
| $\hat{P}_b$ | Peak braking power | [W] |
| $\overline{P}_b$ | Average braking power during time $t_b$ | [W] |
| $T_b$ | Braking torque | [Nm] |
| n | Motor speed | [rpm] |
| | | |
| g | Acceleration | 9.81 m/s$^2$ |
| a | Deceleration | [m/s$^2$] |
| v | Linear downward speed | [m/s] |
| J | Moment of inertia | [kgms$^2$] |
| $\omega$ | Angular speed | [rad/s] |
| | | |
| $t_b$ | Downward stopping time | [s] |

**Operating type B**

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

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

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

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

*3  Braking power for a downward vertical movement*

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

All the braking power calculations are only true if it is assumed that there are no losses ($\eta = 1$) 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.

| | | |
|---|---|---|
| $\hat{P}_{bR}$ | Maximum actual braking power | [W] |
| $\overline{P}_{bR}$ | Continuous actual braking power | [W] |
| $\eta_{total}$ | 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] |
| $\eta_{drive}$ | Drive efficiency = 0.98 | |
| $\eta_{mec}$ | Mechanical efficiency | |
| $\eta_{mot}$ | Motor efficiency | |

**The required braking power is calculated as follows:**

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

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

| | | |
|---|---|---|
| $U_{dc}$ | Braking unit engage threshold | [V] |

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

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

| | | |
|---|---|---|
| T | Cycle time | [s] |
| $\overline{P}_{b0}$ | Upward braking power, therefore zero | [W] |
| $t_0$ | Rise time | [s] |
| $\overline{P}_{b1}$ | Average braking power during downward movement | [W] |
| $t_1$ | Downward movement time | [1] |
| $\hat{P}_b$ | Peak braking power | [W] |
| $\overline{P}_{b2}$ | Average power during braking to a standstill | [W] |
| $t_2$ | Standstill braking time | [s] |
| $P_{continuous}$ | $= \dfrac{\overline{P}_{b0} \times t_0 + \overline{P}_{b1} \times t_1 + \overline{P}_{b2} \times t_2}{T}$ | [W] |

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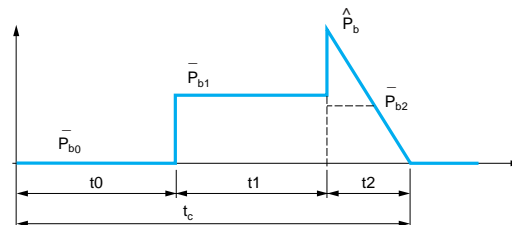


The braking unit is selected taking the following into account:
■ the continuous power $\overline{P}_{b1}$
■ the average braking power during downward movement $\overline{P}_{b2}$
■ the peak power $\hat{P}_b$
Depending on these elements, select the braking unit according to the characteristics on page 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 $\left( R = \dfrac{U^2 dc}{\hat{P}_b} \right)$.

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

Telemecanique

# 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.
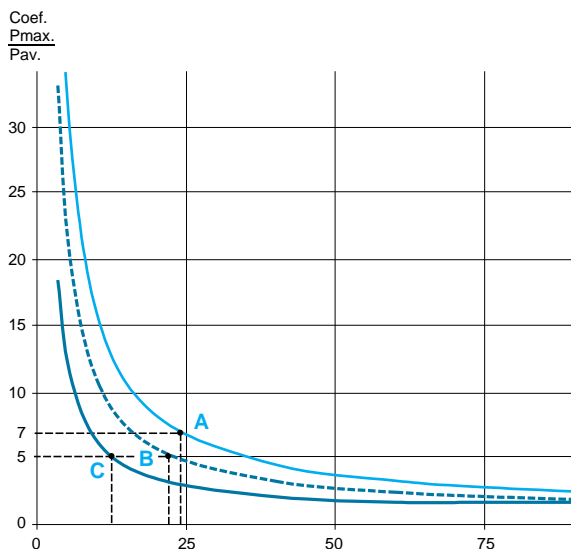
## Braking resistors

### VW3 A7 701 (P continuous = 0.05 kW)

### VW3 A7 702 (P continuous = 0.1 kW)
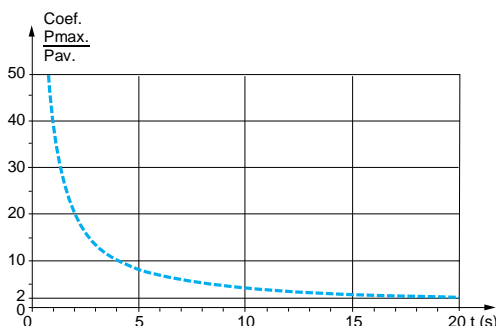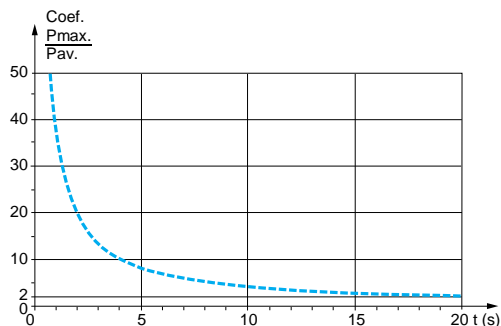
### VW3 A7 703 (P continuous = 0.2 kW)

### VW3 A7 704…709 (P continuous = 1 kW)
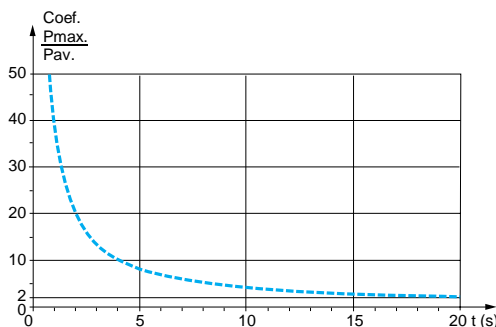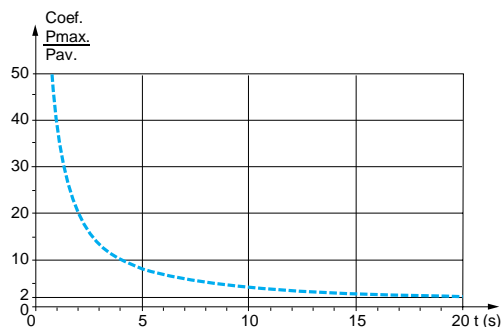
- - - - P max/P av (40 s cycle)
——— P max/P av (60 s cycle)
- - - - P max/P av (120 s cycle)
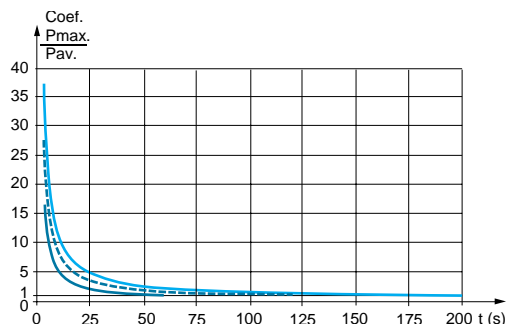——— P max/P av (200 s cycle)

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# Variable speed drives
# for asynchronous motors
Altivar 71
Characteristics curves for resistors

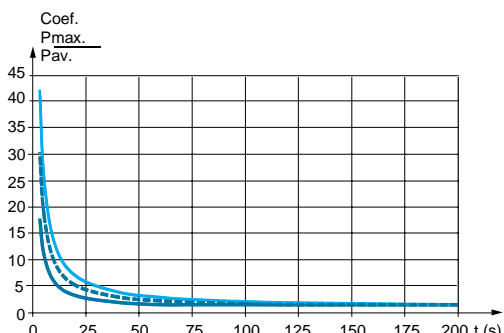## Braking resistors (continued)

### VW3 A7 710 (P continuous = 25 kW)
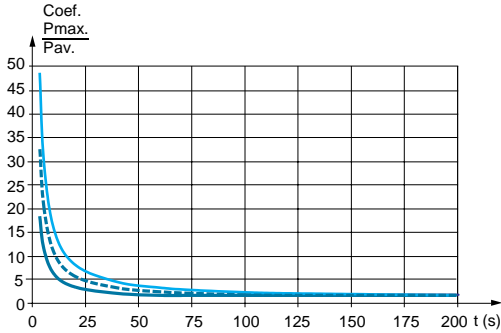


### VW3 A7 711 (P continuous = 37 kW)
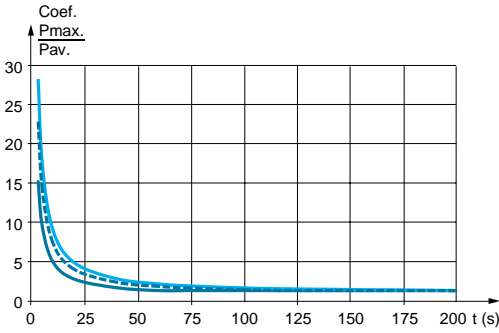


### VW3 A7 712 (P continuous = 44 kW)
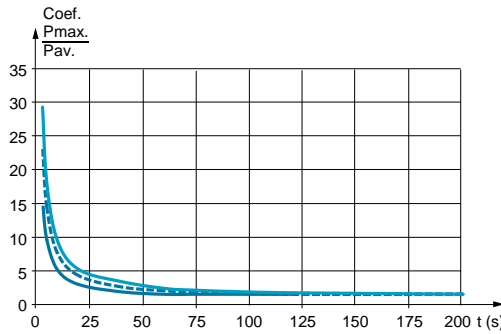


### VW3 A7 713 (P continuous = 15.3 kW)
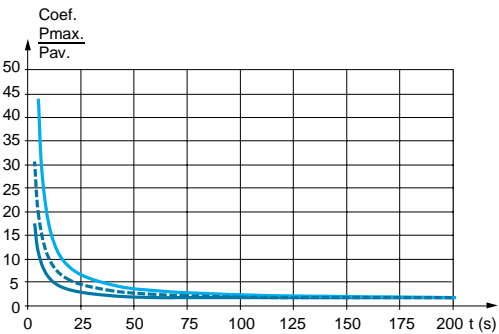


### VW3 A7 714 (P continuous = 20.9 kW)
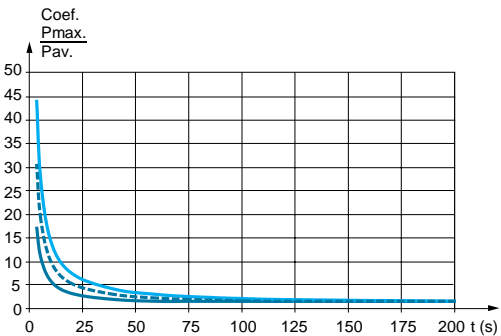


### VW3 A7 715 (P continuous = 56 kW)



— *P max/P av (60 s cycle)*
--- *P max/P av (120 s cycle)*
— *P max/P av (200 s cycle)*

Telemecanique

# 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)
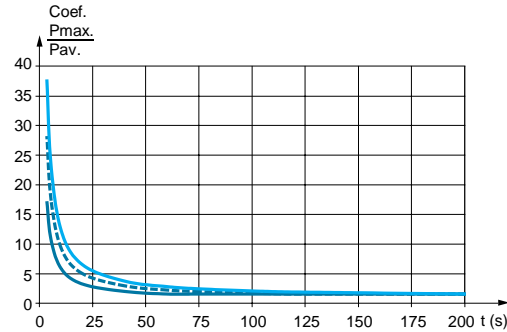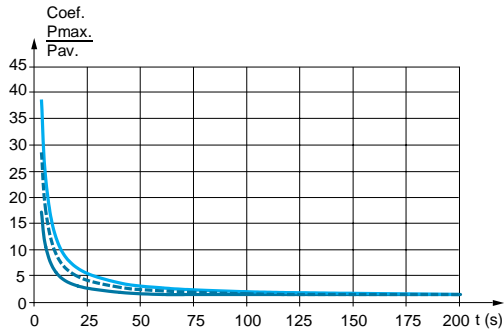


### VW3 A7 718 (P continuous = 150 kW)



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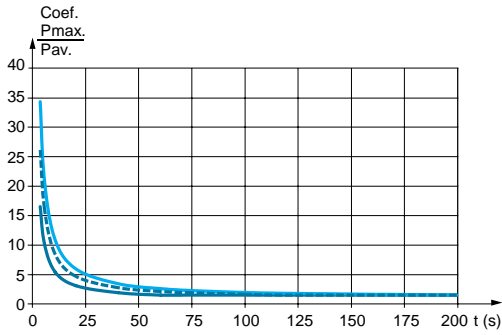——— P max/P av (200 s cycle)

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# Variable speed drives
# for asynchronous motors
Altivar 71
Characteristics curves for resistors

## Hoist resistors

### VW3 A7 801 (P continuous = 1.6 kW)
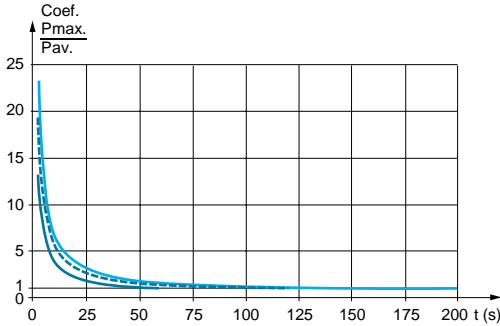


### VW3 A7 802 (P continuous = 5.6 kW)
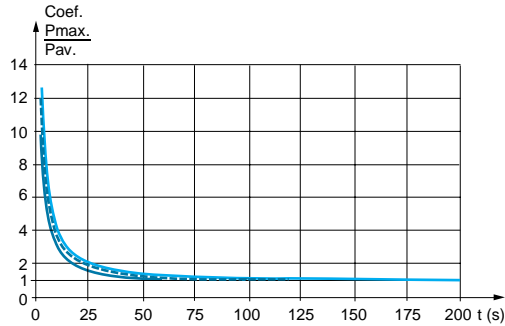


### VW3 A7 803 (P continuous = 9.8 kW)
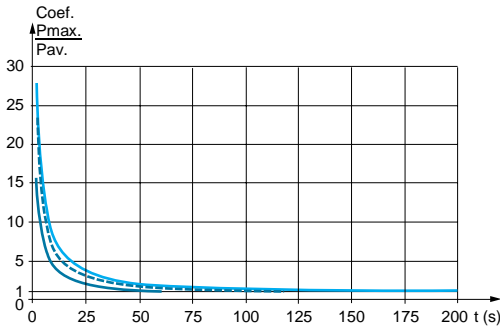


### VW3 A7 804 (P continuous = 22.4 kW)
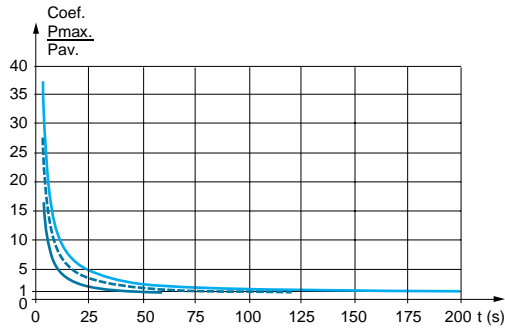


### VW3 A7 805 (P continuous = 44 kW)
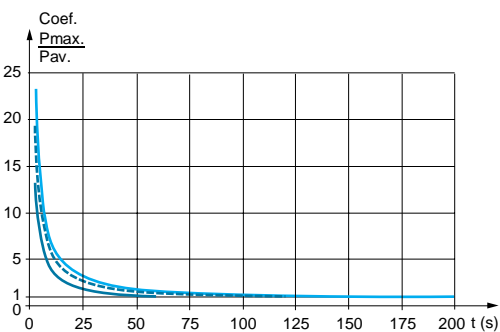


### VW3 A7 806 (P continuous = 62 kW)
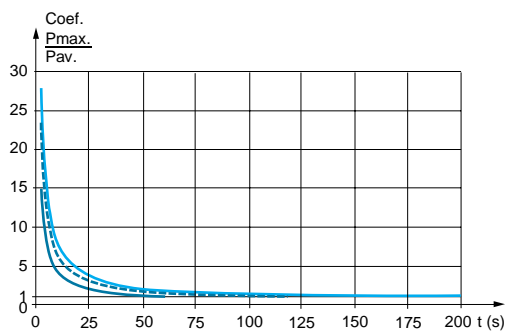


—— P max/P av (60 s cycle)
- - - P max/P av (120 s cycle)
—— P max/P av (200 s cycle)

# Variable speed drives
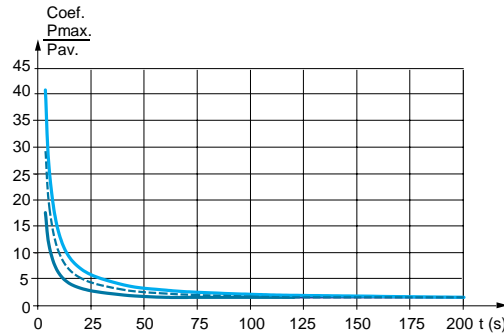# for asynchronous motors
Altivar 71
Characteristics curves for resistors

## Hoist resistors (continued)

### VW3 A7 807 (P continuous = 19.5 kW)

### VW3 A7 808 (P continuous = 27.4 kW)
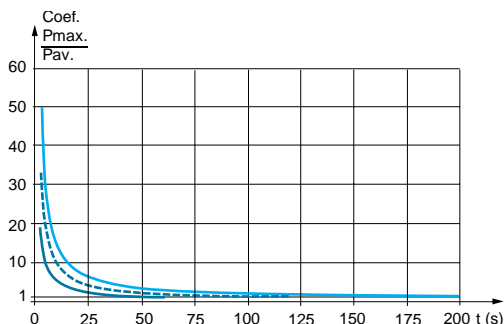
### VW3 A7 809 (P continuous = 30.6 kW)
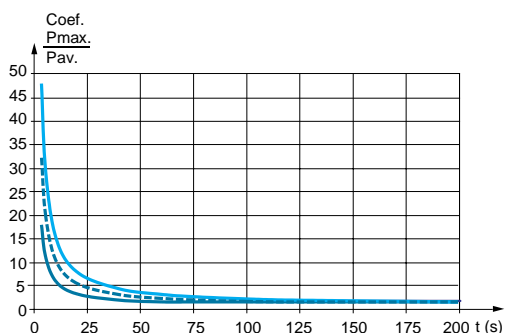
### VW3 A7 810 (P continuous = 44 kW)

### VW3 A7 811 (P continuous = 56 kW)
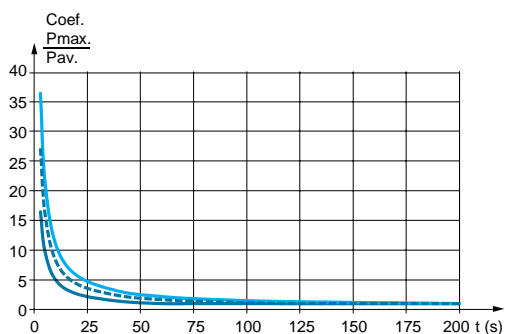
### VW3 A7 812 (P continuous = 75 kW)

——— *P max/P av (60 s cycle)*
- - - *P max/P av (120 s cycle)*
——— *P max/P av (200 s cycle)*

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# Variable speed drives
# for asynchronous motors
Altivar 71
Characteristics curves for resistors

## Hoist resistors (continued)

### VW3 A7 813 (P continuous = 112 kW)
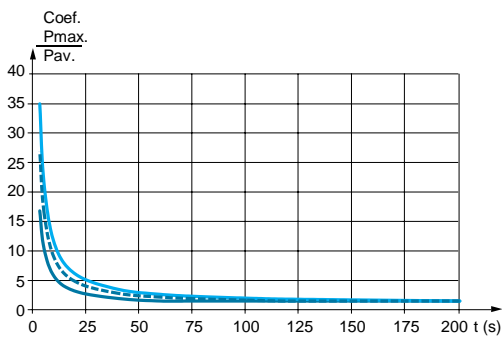


### VW3 A7 814 (P continuous = 112 kW)



### VW3 A7 815 (P continuous = 150 kW)
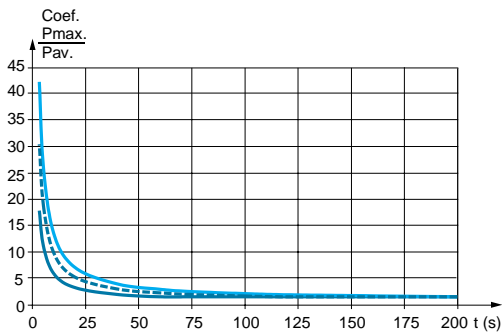


### VW3 A7 816 (P continuous = 225 kW)
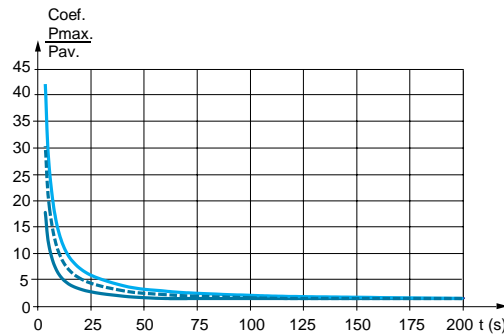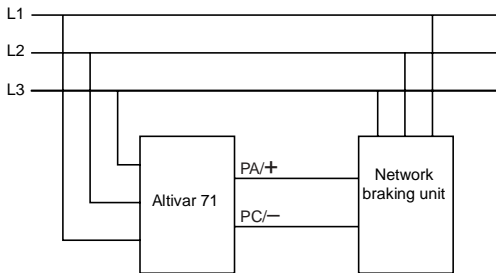


### VW3 A7 817 (P continuous = 330 kW)



——— *P max/P av (60 s cycle)*
- - - - *P max/P av (120 s cycle)*
——— *P max/P av (200 s cycle)*

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# Variable speed drives
# for asynchronous motors
Altivar 71
Options: network braking units

## Presentation

L1
L2
L3

Altivar 71 — PA/+ — Network braking unit — PC/−

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<br>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<br>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 | $\sim$ 400 | $\sim$ 460 |
| Nominal voltage ± 10% | V | $\sim$ 380…415 | $\sim$ 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,<br>VW3 A7 231, 232 | | 35 mm², connected on a bar, M6 |
| | VW3 A7 206…209,<br>VW3 A7 233…238 | | 95 mm², connected on a bar, M8 |
| | VW3 A7 210…212,<br>VW3 A7 239…241 | | 150 mm², connected on a bar, M10 |

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71
Options: network braking units

## Line voltage: ∼ 400 V

| Maximum current Irms | | Continuous braking power | 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 | | Continuous braking power | 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 |

Telemecanique

*Selection*

# Variable speed drives
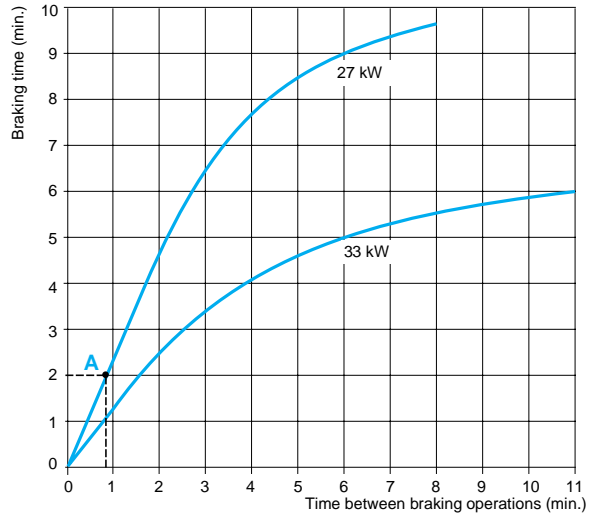# for asynchronous motors
Altivar 71
Characteristic curves

## 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

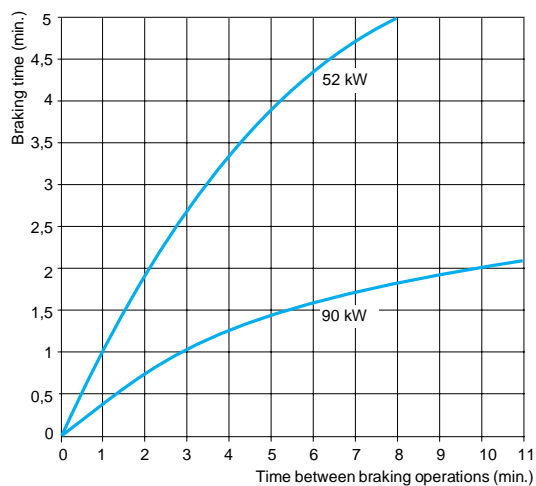**VW3 A7 204, A7 232 (Continuous braking power = 21.5 kW)** *(1)*
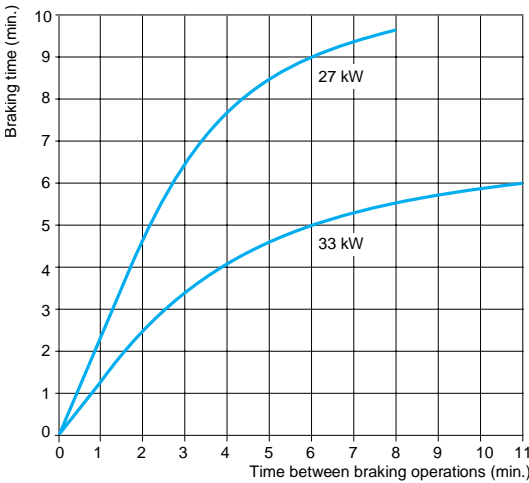
**VW3 A7 205, A7 233 (Continuous braking power = 26 kW)** *(1)*
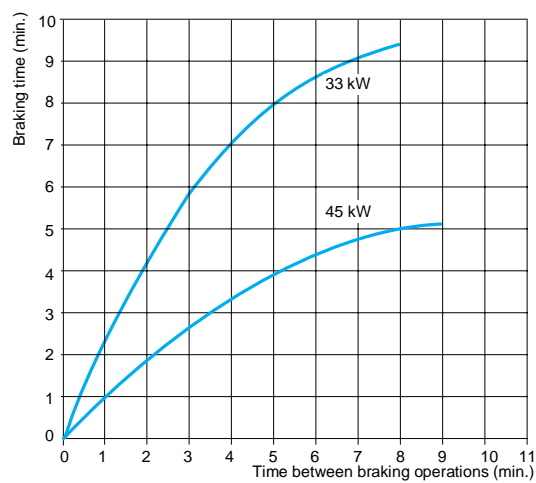
**VW3 A7 206, A7 234 (Continuous braking power = 32 kW)** *(1)*
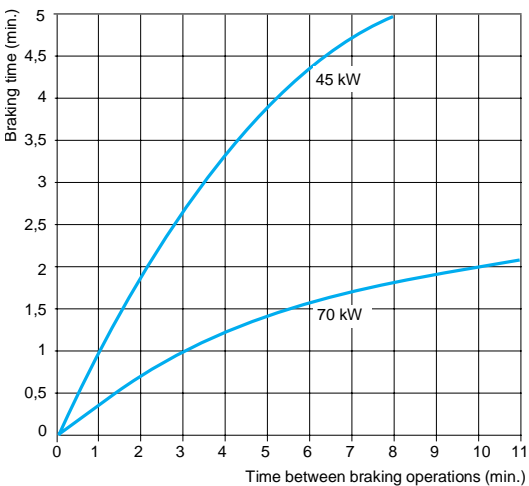
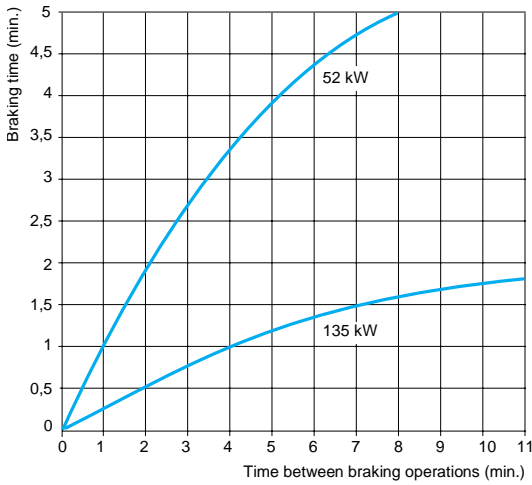**VW3 A7 207, A7 235 (Continuous braking power = 38 kW)** *(1)*
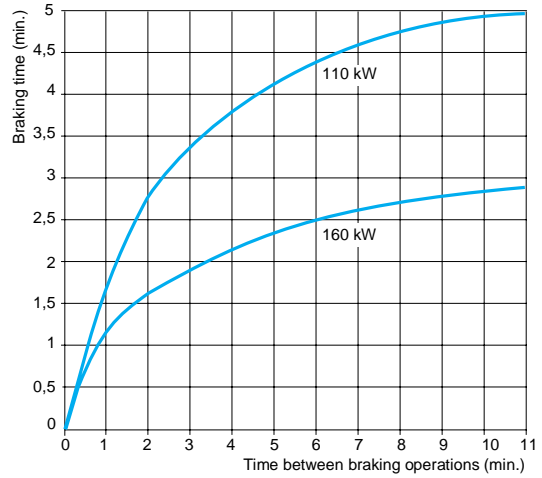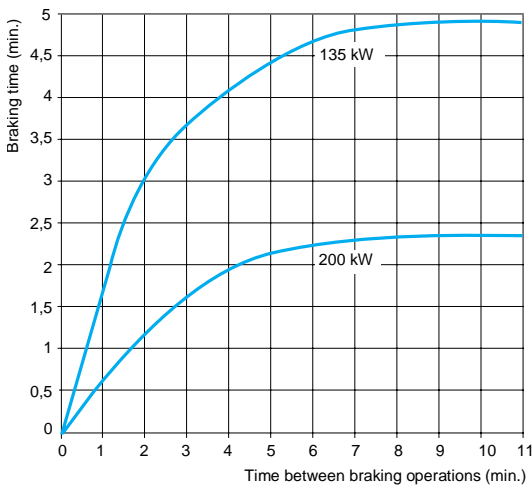
*(1) Power indicated for a temperature of 35°C.*

**Telemecanique**

# Variable speed drives
# for asynchronous motors
Altivar 71
Characteristic curves
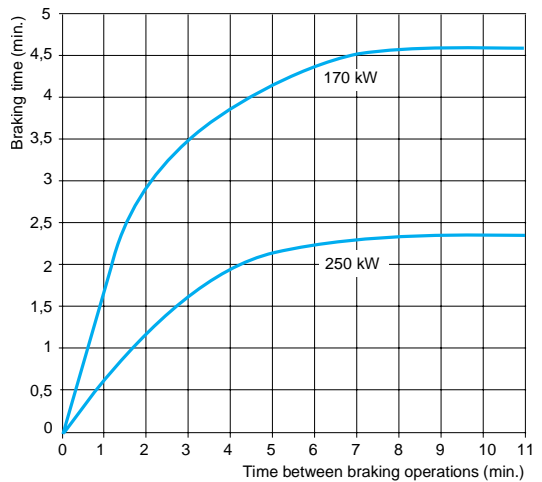
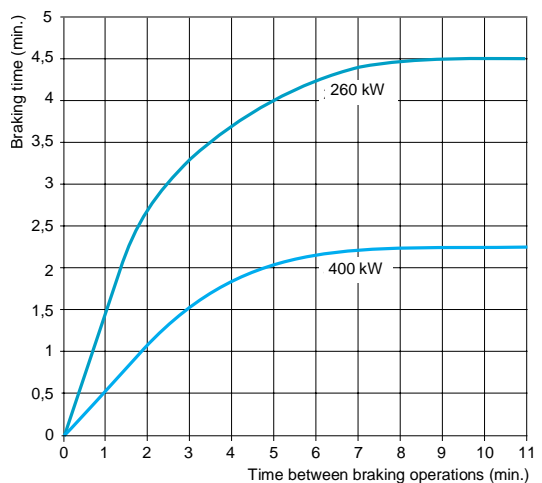**VW3 A7 208 (Continuous braking power = 38 kW)** *(1)*



Braking time (min.)
52 kW
135 kW
Time between braking operations (min.)

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



Braking time (min.)
110 kW
160 kW
Time between braking operations (min.)

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



Braking time (min.)
135 kW
200 kW
Time between braking operations (min.)

**VW3 A7 211 (Continuous braking power = 135 kW)**



Braking time (min.)
170 kW
250 kW
Time between braking operations (min.)

**VW3 A7 212 (Continuous braking power = 200 kW)**



Braking time (min.)
230 kW
345 kW
Time between braking operations (min.)
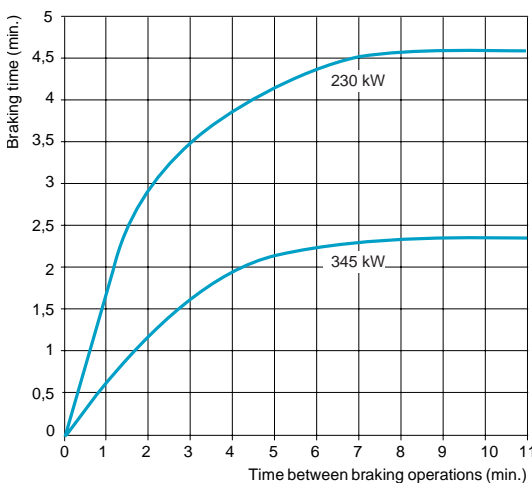
**VW3 A7 241 (Continuous braking power = 240 kW)**



Braking time (min.)
260 kW
400 kW
Time between braking operations (min.)

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

*Presentation*

# Variable speed drives
# for asynchronous motors
Altivar 71: reduction of current harmonics
Options: DC chokes

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.
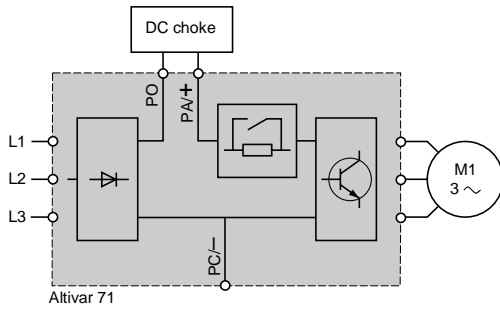
## DC chokes

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*


Altivar 71

Characteristics:
page 67

References:
page 69

Dimensions:
page 104

Schemes:
pages 114 to 117

66          ⊕ **Telemecanique**

# 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 (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Line current | Line Isc | H1 | H5 | H7 | H11 | H13 | H17 | H19 | H23 | H25 | H29 | H31 | H35 | H37 | H41 | H43 | H47 | H49 | |
| 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<br>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<br>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 mm$^2$ (AWG 6)<br>1.2…1.4 Nm | 2.5 mm$^2$ (AWG 12)<br>0.4…0.6 Nm |
| | VW3 A4 506 | | 10 mm$^2$ (AWG 6)<br>1.2…1.4 Nm | 4 mm$^2$ (AWG 10)<br>0.5…0.8 Nm |
| | VW3 A4 507 | | 10 mm$^2$ (AWG 6)<br>1.2…1.4 Nm | 6 mm$^2$ (AWG 8)<br>0.8…1 Nm |
| | VW3 A4 508, 509 | | 10 mm$^2$ (AWG 6)<br>1.2…1.4 Nm | 10 mm$^2$ (AWG 6)<br>1.2…1.4 Nm |
| | VW3 A4 510 | | 10 mm$^2$ (AWG 6)<br>1.2…1.4 Nm | 35 mm$^2$ (AWG 0)<br>2.5…3 Nm |
| | VW3 A4 511 | | – | Connected on a bar, Ø 9<br>– |
| | VW3 A4 512 | | – | Connected on a bar, Ø 9<br>– |

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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.*

# Variable speed drives
# for asynchronous motors

Altivar 71: reduction of current harmonics
Options: line chokes
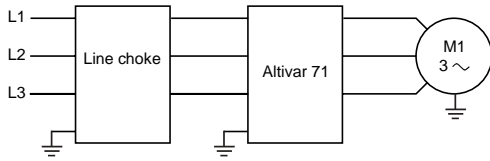


## Line chokes

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 $\varphi$ 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<br>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<br>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)<br>0.4…0.6 Nm |
|---|---|---|---|
| | VW3 A4 553 | | 6 mm², (AWG 8)<br>0.8…1 Nm |
| | VW3 A4 554 | | 16 mm², (AWG 4)<br>1.2…1.4 Nm |
| | VW3 A4 555 | | 35 mm², (AWG 0)<br>2.5…3 Nm |
| | VW3 A4 556 | | Connected on a bar, Ø 6.5 mm<br>– |
| | VW3 A4 557, 558 | | Connected on a bar, Ø 9 mm<br>– |
| | VW3 A4 559…561 | | Connected on a bar, Ø 11 mm<br>– |
| | VW3 A4 562…567 | | Connected on a bar, Ø 13 mm<br>– |

Telemecanique

71

# 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 | | | | Reference | Weight |
|---|---|---|---|---|---|---|---|---|
| | | | Inductance value | Nominal current | Saturation current | Loss | | |
| | | 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 |

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71: reduction of current harmonics
Options: passive filters

## Passive filters
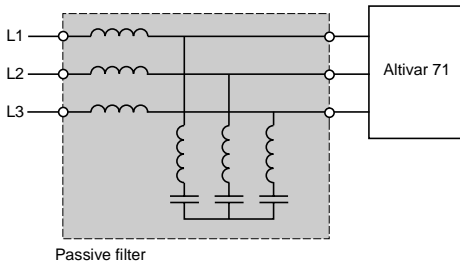


Passive filter

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<br>Up to 55°C with current derating of 3% per additional °C |
| | Storage | °C | - 25…+ 55 |
| Maximum operating altitude | | m | 1000 without derating<br>1000…4000 with current derating of 5% per additional 1000 m |

## Electrical characteristics

| Range | | 400 V | 460 V |
|---|---|---|---|
| Nominal voltage ± 10% | V | $\sim$ 380…415 | $\sim$ 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<br>At 100% of the line current: 0.99<br>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.

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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 400 V 50/60 Hz

| Motor rating | | For drives | Line supply | Filter | Reference | Weight |
|---|---|---|---|---|---|---|
| | | | Line current | Irms | | |
| 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%.*

# Variable speed drives
# for asynchronous motors
Altivar 71
Options: additional EMC input filters



ATV 71●●●●●M3
ATV 71●●●●●N4
with built-in filter
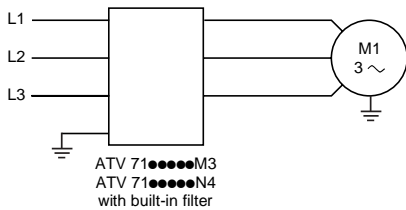
Altivar 71 drives, except for the ATV 71H●●●M3X, have built-in radio interference input filters to meet the EMC standard for variable speed electrical power drive "products" IEC/EN 61800-3, edition 2, category C2 or C3 in environment 1 or 2 and to comply with the European directive on EMC (electromagnetic 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.



Additional EMC filter — Altivar 71

### 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.

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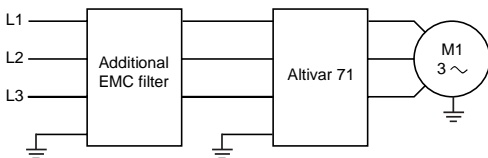
# Variable speed drives
# for asynchronous motors
Altivar 71
Options: additional EMC input filters

## 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 <br> 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 <br> 1000…3000 by derating the current by 1% per additional 100 m <br> 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% <br> 480 + 10% | |

## Connection characteristics

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

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*References*

# 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) | II (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 II (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<br>ATV 71H075N4…HD15N4 | Software function *(1)* | Motor choke | | – | | |
| ATV 71H●●●M3X<br>ATV 71HD18N4…HC50N4 | Software function *(1)* | | Motor choke | – | | |
| **Unshielded cable** | | | | | | |
| ATV 71H037M3...HU15M3<br>ATV 71H075N4…HU22N4 | Software function *(1)* | | Motor choke or sinus filter | – | | |
| ATV 71HU22M3...HU30M3<br>ATV 71HU55N4…HU75N4 | Software function *(1)* | | Motor choke | | Sinus filter | – |
| ATV 71HU40M3…HU75M3<br>ATV 71HU75N4…HD15N4 | Software function *(1)* | | Motor choke | | Sinus filter | |
| ATV 71H●●●M3X<br>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
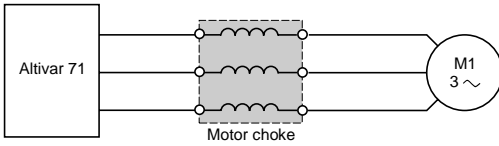


Motor choke

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<br>ATV 71HD11M3X, HD15M3X<br>ATV 71H075N4…HD18N4 | ⩾ 50 | ⩾ 100 |
| ATV 71HD18M3X…HD75M3X<br>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 $\sim$ (rms value)
□ 1150 V to 460 V $\sim$ (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<br>ATV 71HD11M3X, HD15M3X<br>ATV 71H075N4…HD30N4 | kHz | 4 | |
| | ATV 71HD18M3X…HD75M3X<br>ATV 71HD37N4…HC50N4 | kHz | 2.5 | |
| Maximum drive output frequency | | Hz | 100 | |
| Degree of protection | | | IP 00 | IP 00<br>IP 20 with kits VW3 A9 612<br>and VW3 A9 613 |
| Thermal protection | | | By temperature controlled switch | – |
| Temperature controlled switch *(3)* | Tripping temperature | °C | 125 | – |
| | Maximum voltage | V | $\sim$ 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)<br>1.5 Nm |
|---|---|---|---|
| | VW3 A5 103 | | Connected on a bar, Ø 11 mm<br>– |
| | VW3 A5 104 | | Connected on a tag connector, M10<br>– |
| | VW3 A5 105, 106 | | Connected on a tag connector, M12<br>– |
| | VW3 A5 107, 108 | | Connected on a tag connector, 2 x M12<br>– |

*(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).*

# 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** | – |

Presentation:
page 80

Characteristics:
page 81

References:
page 82

Dimensions:
page 109

Schemes:
page 122

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# Variable speed drives
# for asynchronous motors

Altivar 71: output filters
Options: sinus filters

## Sinus filters
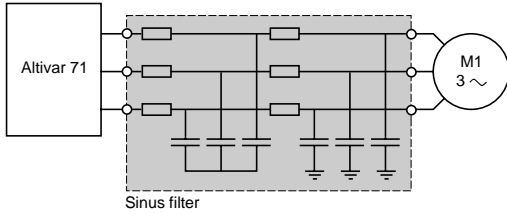


Sinus filter

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<br>From 40...50°C with current derating of 1.5% per additional °C | |
| | Storage | °C | - 40…+ 65 | |
| Maximum operating altitude | | m | 1000 without derating<br>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 | $\sim$ 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)<br>0.6 Nm |
|---|---|---|---|
| | VW3 A5 202 | | 6 mm² (AWG 8)<br>1.5 Nm |
| | VW3 A5 203 | | 10 mm² (AWG 6)<br>1.5 Nm |
| | VW3 A5 204 | | 25 mm² (AWG 2)<br>4 Nm |
| | VW3 A5 205 | | 50 mm² (AWG 0)<br>6 Nm |
| | VW3 A5 206, 207 | | 95 mm² (AWG 4/0)<br>20 Nm |
| | VW3 A5 208, 209 | | Connected on a bar, Ø 11 mm<br>– |
| | VW3 A5 210 | | Connected on a bar, Ø 14 mm<br>– |
| | VW3 A5 211 | | Connected on a bar, 4 x Ø 11 mm<br>– |

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# 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.*

# 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) | | 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) 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

⊕ Telemecanique

| 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 |

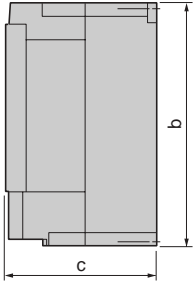| Communication cards (1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ethernet TCP/IP | Modbus/ Uni-Telway | Fipio standard | Substitution Fipio | Modbus Plus | Profibus DP | DeviceNet | INTERBUS |
| VW3 A3 310 | VW3 A3 303 | VW3 A3 311 | VW3 A3 301 | VW3 A3 302 | VW3 A3 307 | VW3 A3 309 | VW3 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

Telemecanique

| 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 |

Telemecanique

# Variable speed drives for asynchronous motors
Altivar 71
Drives

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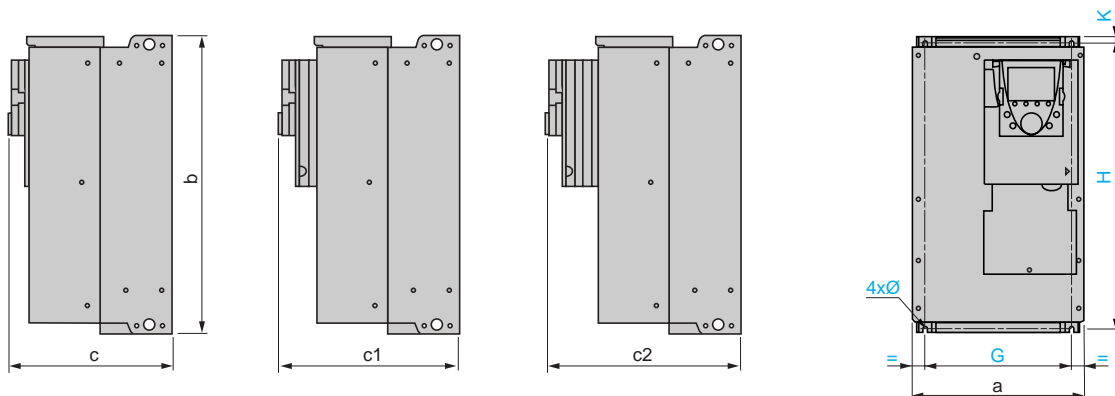
| Without option card | 1 option card *(1)* | 2 option cards *(1)* | Common front view |
|---|---|---|---|



| 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 |
|---|---|---|---|
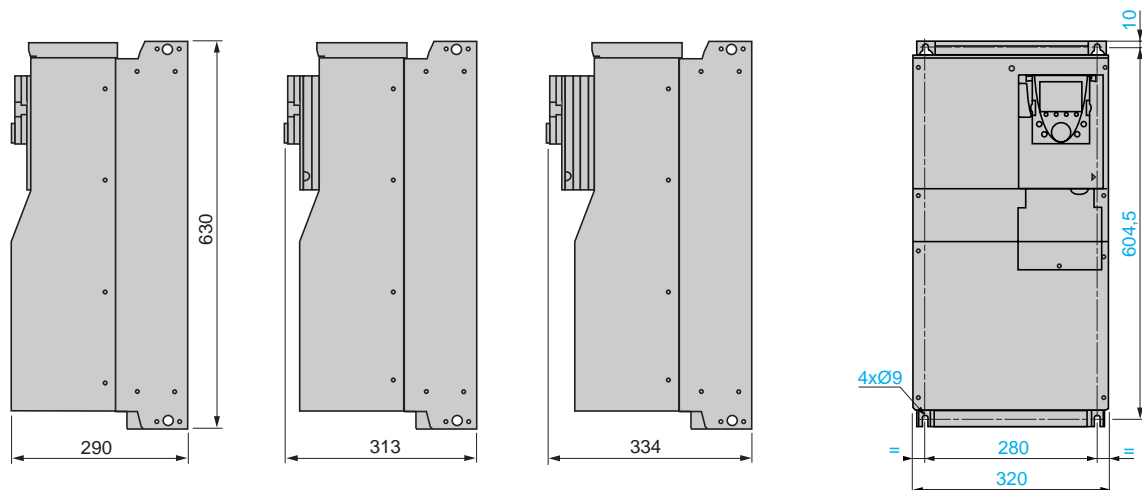


*(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.*

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Telemecanique

*Dimensions (continued)*

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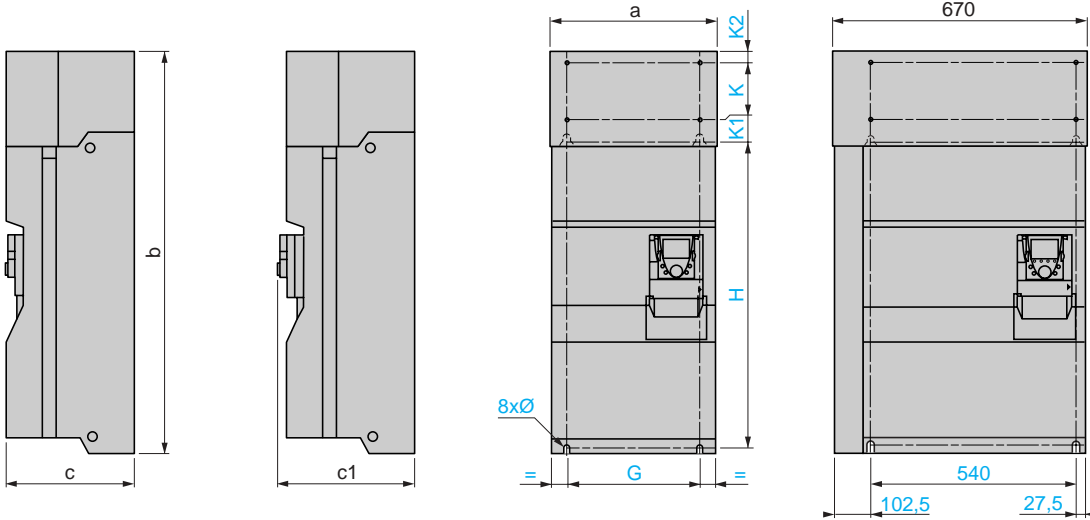
*(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.*

## 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 |
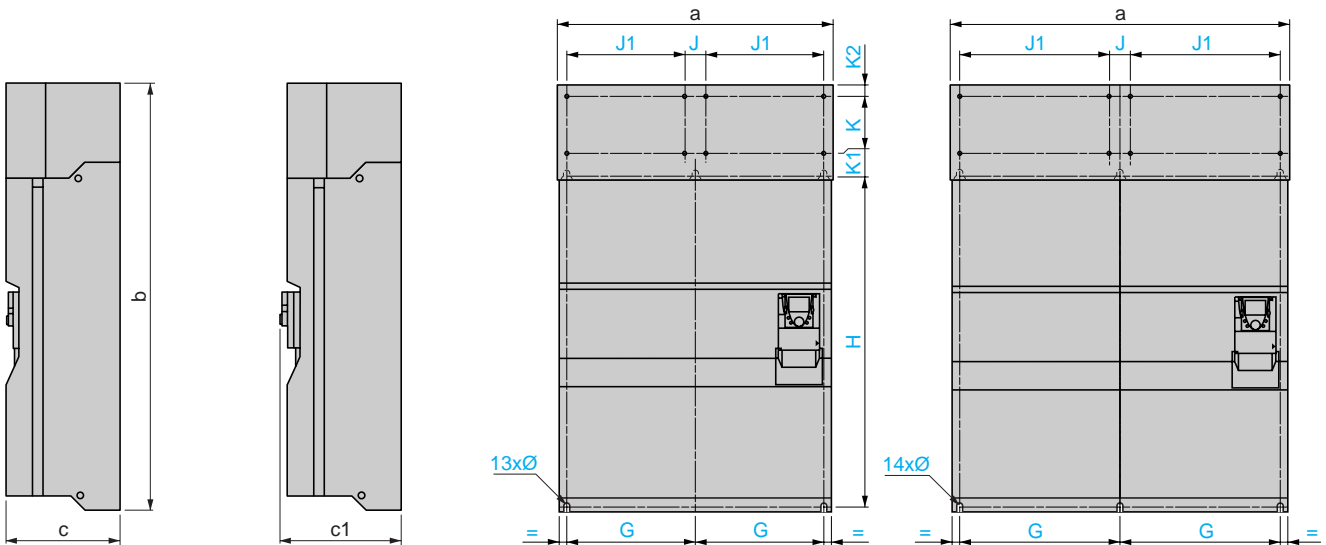
# Variable speed drives for asynchronous motors
Altivar 71
Drives

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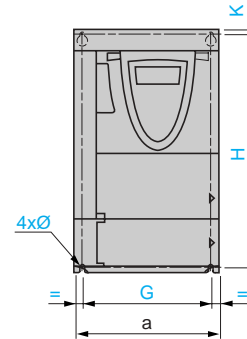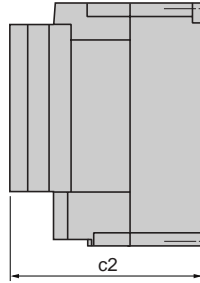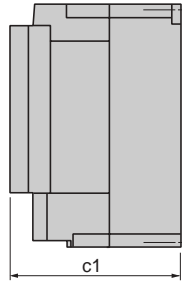
(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

## 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 |
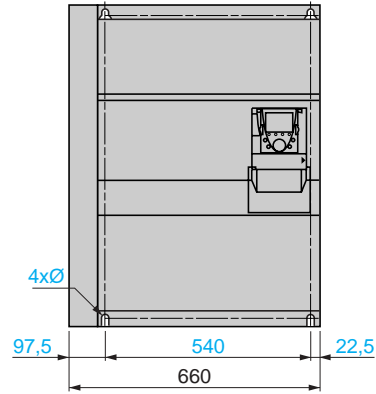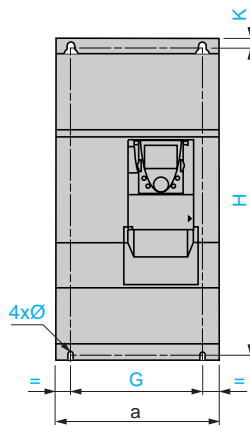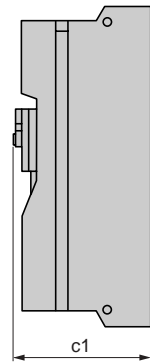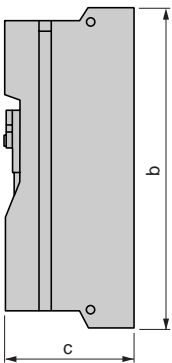
Telemecanique

*Dimensions (continued)*

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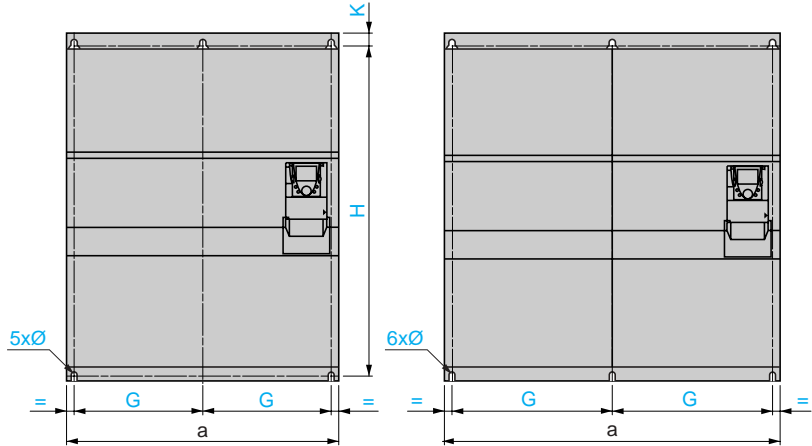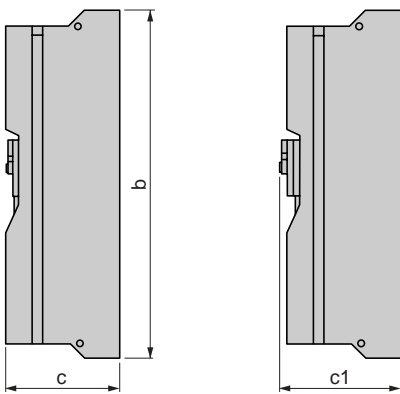
*(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.*

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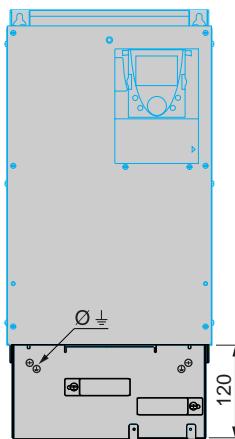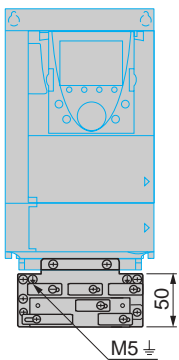
*(1) Supplied with the drive apart from **ATV 71HD55M3X**, **HD75M3X**, **ATV 71HD90N4…HC50N4**. In the case of these drives the mounting plate is supplied with the NEMA Type 1, IP 21 or IP 31 conformity kits, which must be ordered separately, see pages 22 and 23. Dimensions, see page 97.*

### Control card fan kits
VW3 A9 406, 407

**Mounting recommendations**
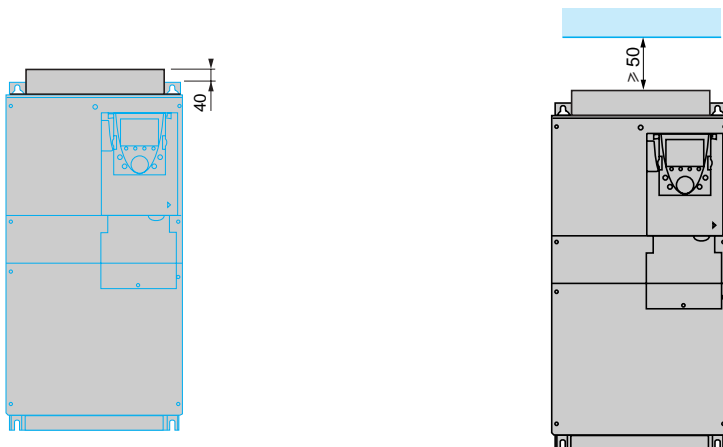
Telemecanique

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*Dimensions (continued)*

# 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**



10xØ3,6(1)

| 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**



12xØ4,5 (1)

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

### VW3 A9 507

**Cut-outs and drill holes**



14xØ4,5 (1)
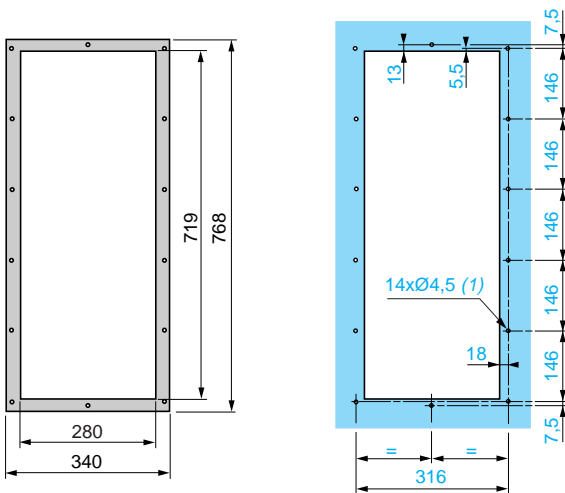
*(1) Ø 4.5 hole for M5 self-tapping screw.*

### VW3 A9 508

**Cut-outs and drill holes**
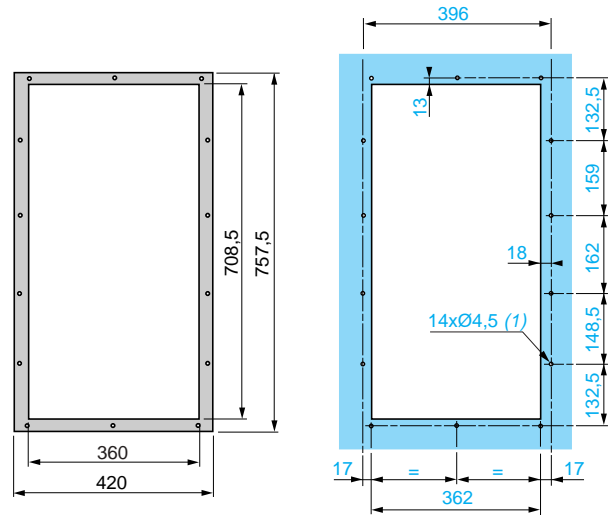


14xØ4,5 (1)

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

Presentation:
page 21

References:
page 21

Functions:
pages 142 to 173

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*Dimensions (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71
Accessories

**Kits for flush-mounting inside dust and damp proof enclosure (continued)**
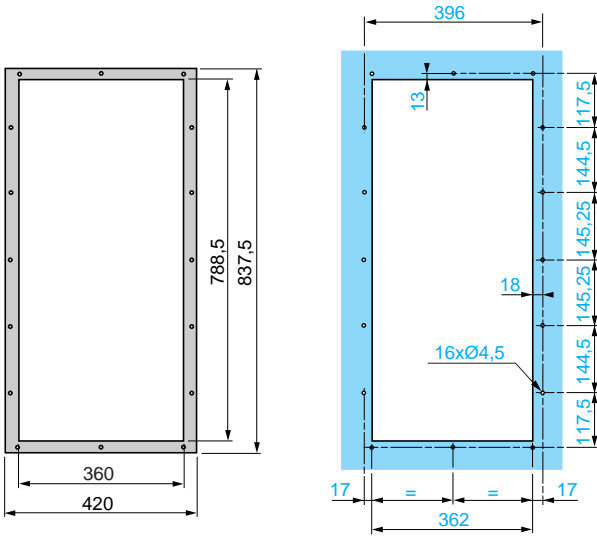
| VW3 A9 509 | VW3 A9 510, 511 |
|---|---|

**Cut-outs and drill holes**



396

13

117.5

144.5

145.25

145.25

145.25

18

144.5

16xØ4,5

117.5

788.5

837.5

360

420

17 = = 17

362

**Cut-outs and drill holes**

a

b2

K b2

G2

b

6xØ10 *(1)*

150

a2 8xØ7x12 a2

a1

H4

H3

6xØ10

H

b1

G1

H

H2

H1

= =

G

*(1)Ø 4.5 hole for M5 self-tapping screw.*
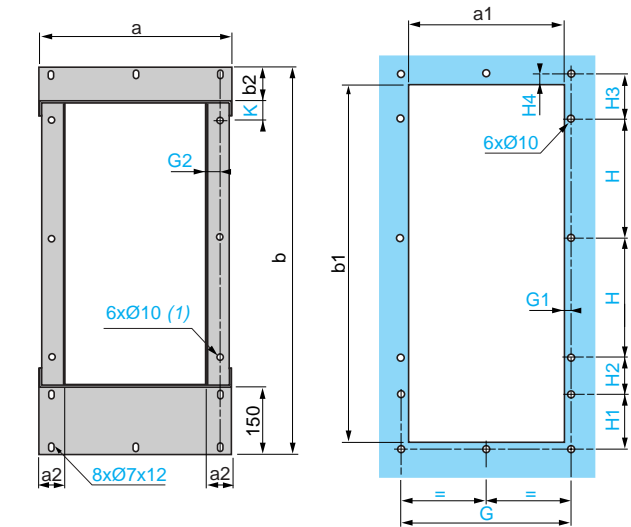
| VW3 | a | a1 | a2 | b | b1 | b2 | G1 |
|---|---|---|---|---|---|---|---|
| A9 510 | 420 | 340 | 55 | 850 | 790 | 80 | 15 |
| A9 511 | 440 | 360 | 45 | 885 | 845 | 66 | 18 |
| VW3 | G2 | H | H1 | H2 | H3 | H4 | K |
| A9 510 | 30 | 260 | 120 | 80 | 100 | 15 | 35 |
| A9 511 | 23 | 310 | 70 | 91.5 | 83.5 | 10 | 27.5 |

*(1) For fixing using an M8 screw min.*

| VW3 A9 512, 513 |
|---|

**Cut-outs and drill holes**



a

a1 15

111

20

120

30

30

280

1062

970

280

280

8xØ10 *(1)*

8xØ10

280

51

60

56 6xØ7x12 56

= =

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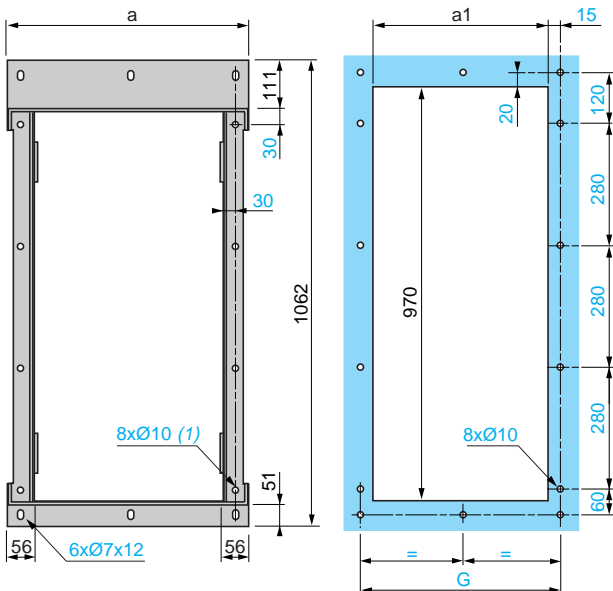
| VW3 | a | a1 | G |
|---|---|---|---|
| A9 512 | 442 | 360 | 390 |
| A9 513 | 542 | 460 | 490 |

*(1) For fixing using an M8 screw min.*

*Dimensions (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71
Accessories

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

**VW3 A9 514, 515**

**Cut-outs and drill holes**
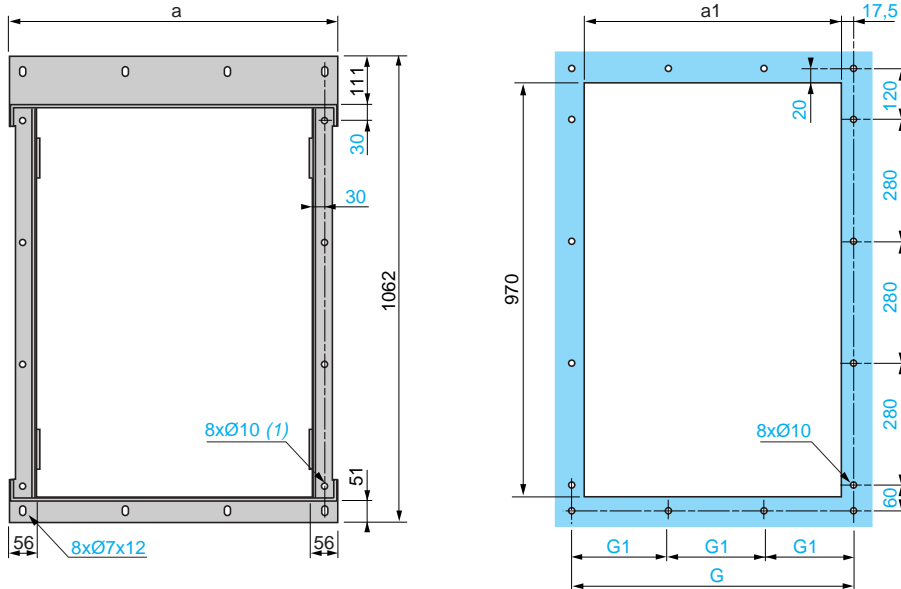
| VW3 | a | a1 | G | G1 |
|---|---|---|---|---|
| A9 514 | 697 | 610 | 645 | 215 |
| A9 515 | 772 | 685 | 720 | 240 |

*(1) For fixing using an M8 screw min.*

**VW3 A9 516, 517**

**Cut-outs and drill holes**
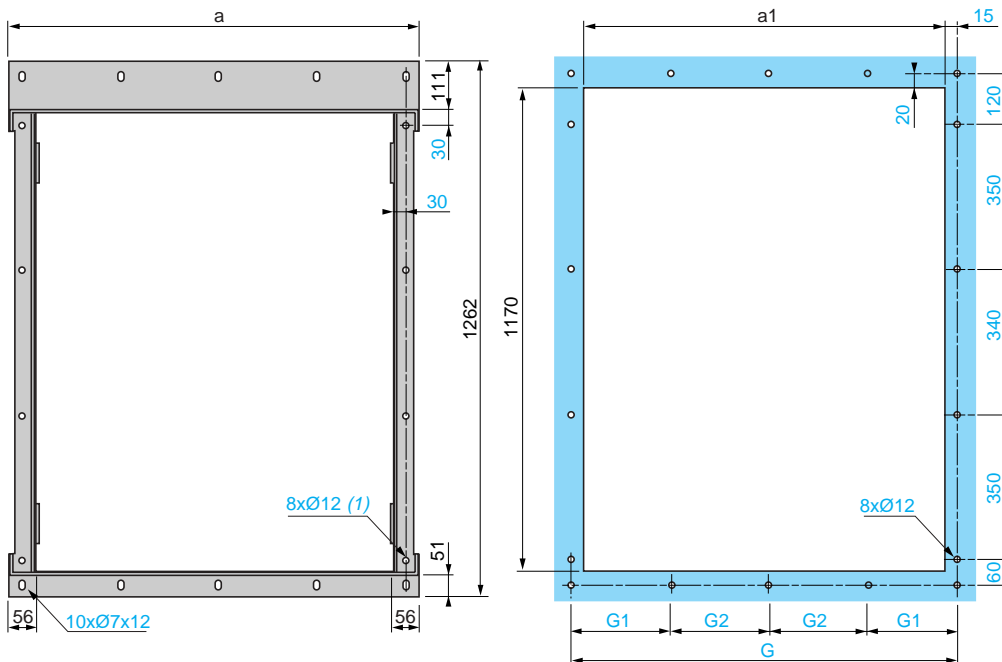
| VW3 | a | a1 | G | G1 | G2 |
|---|---|---|---|---|---|
| A9 516 | 992 | 910 | 940 | 235 | 235 |
| A9 517 | 1222 | 1140 | 1170 | 285 | 300 |

*(1) For fixing using an M10 screw min.*

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# 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 A9 106…108, 206…208 |
|---|---|



| 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 | 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 |
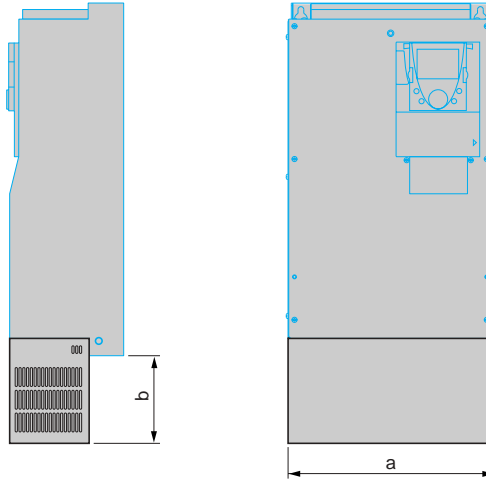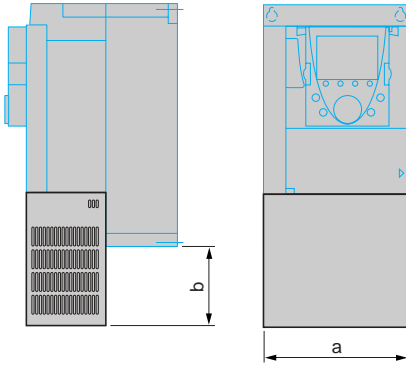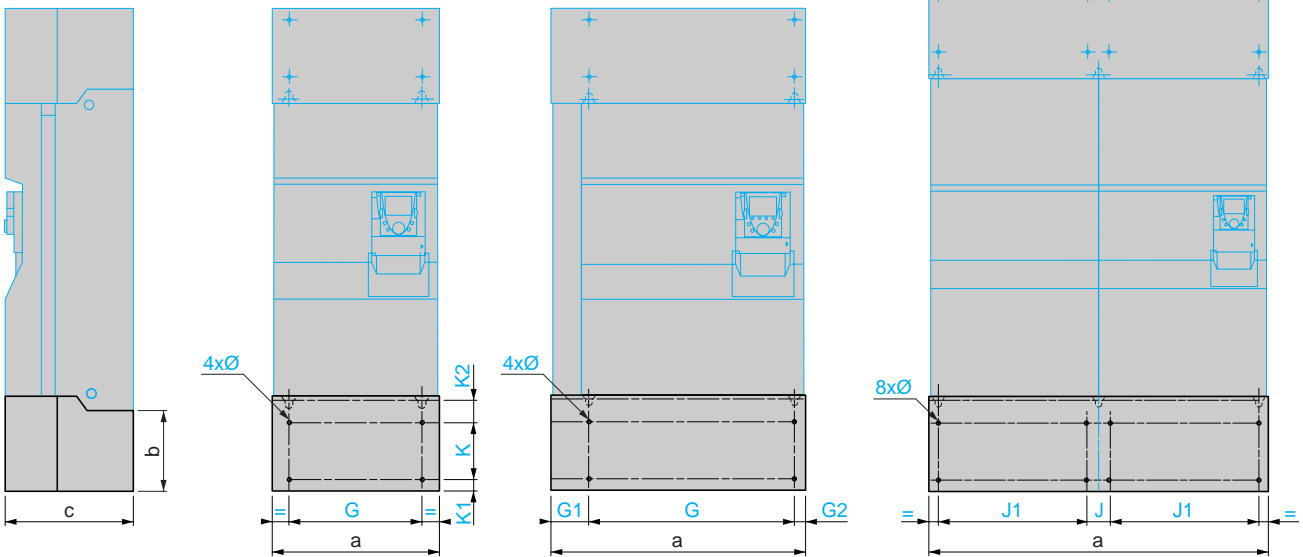
# Variable speed drives
# for asynchronous motors
Altivar 71
Accessories, braking units

**Remote graphic display terminal**

**IP 54 kit VW3 A1 102**
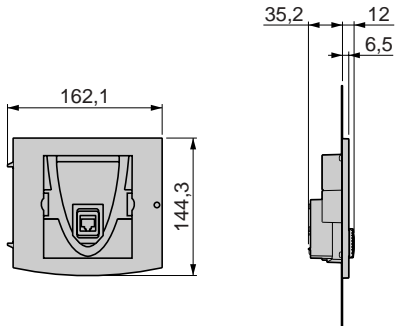
**Cut-outs and drill holes**
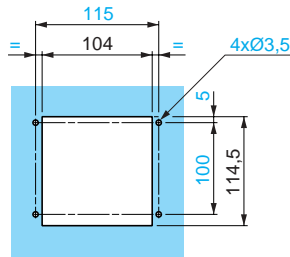
162,1

144,3

35,2    12

6,5

115

104

=    =

4xØ3,5

5

100

114,5

**IP 65 kit VW3 A1 103**

162,1

144,3

35,2    21,6

14,3

**Braking unit VW3 A7 102**

377

4xØ11,5

310

1150

| Presentation: pages 26 and 48 | Characteristics: page 48 | References: pages 26 and 49 | Schemes: pages 118 and 124 | Functions: pages 142 to 173 |

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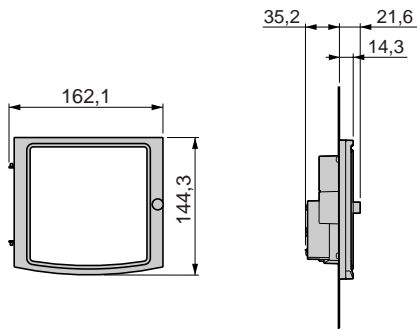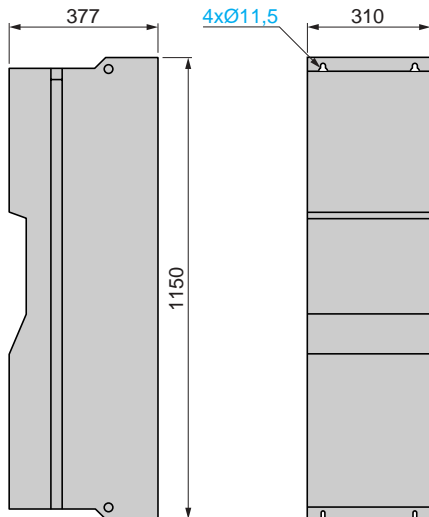
# Variable speed drives
# for asynchronous motors
Altivar 71
Braking resistors

## Braking resistors
### VW3 A7 701…703



**Mounting recommendations**
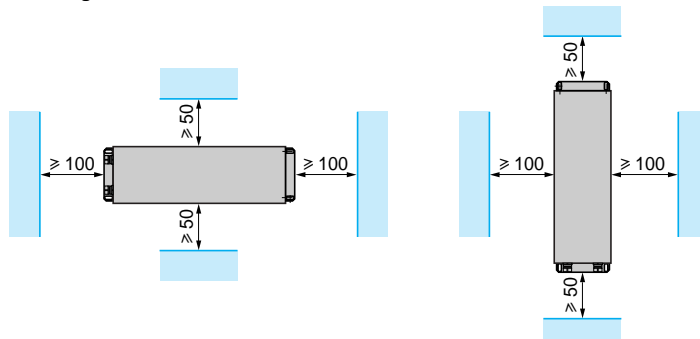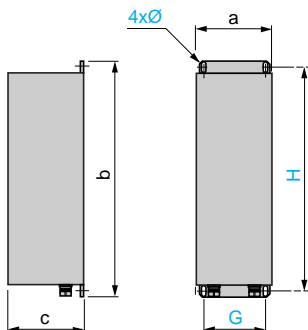


| VW3 | a | b | c | G | H | Ø |
|---|---|---|---|---|---|---|
| **A7 701** | 95 | 293 | 95 | 70 | 275 | 6 x 12 |
| **A7 702** | 95 | 293 | 95 | 70 | 375 | 6 x 12 |
| **A7 703** | 140 | 393 | 120 | 120 | 375 | 6 x 12 |

### VW3 A7 704…709

**Mounting recommendations**

**Braking resistors (continued)**

**VW3 A7 710…712, 715…718** *(1)*

Mounting recommendations
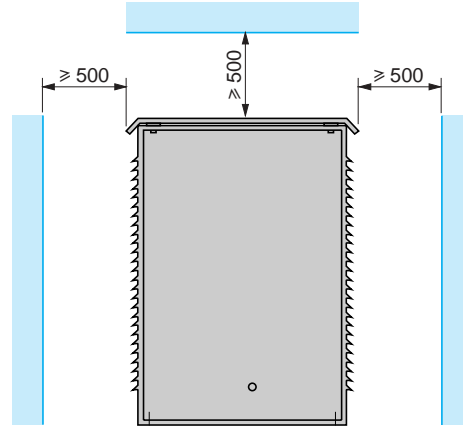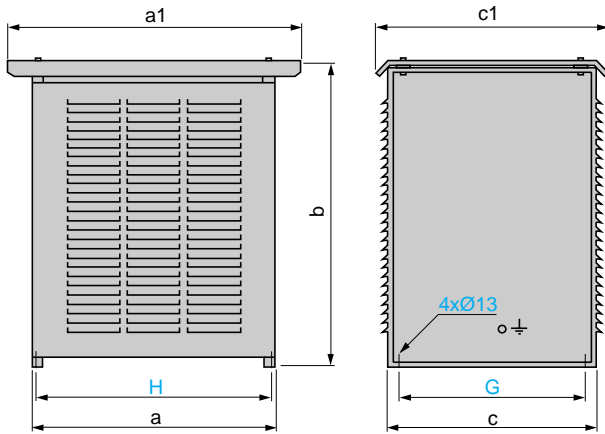


| VW3 | a | a1 | b | c | c1 | G | H |
|---|---|---|---|---|---|---|---|
| **A7 710** | 860 | 1040 | 690 | 480 | 560 | 400 | 832 |
| **A7 711** | 960 | 1140 | 1150 | 380 | 460 | 300 | 932 |
| **A7 712** | 860 | 1040 | 1150 | 540 | 620 | 460 | 832 |
| **A7 715** | 960 | 1140 | 1150 | 540 | 620 | 460 | 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
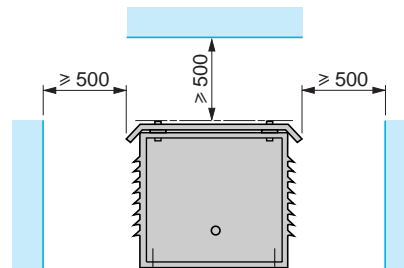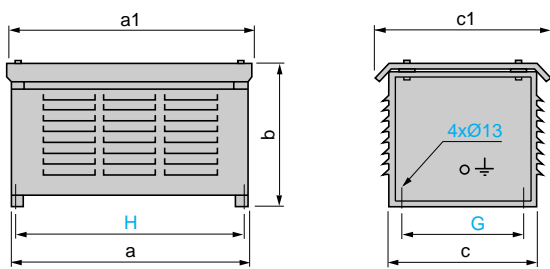


| VW3 | a | a1 | b | c | c1 | G | H |
|---|---|---|---|---|---|---|---|
| **A7 713** | 760 | 790 | 440 | 480 | 540 | 400 | 732 |
| **A7 714** | 960 | 990 | 440 | 480 | 540 | 400 | 932 |

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# Variable speed drives
# for asynchronous motors
Altivar 71
Hoist resistors

## Hoist resistors
**VW3 A7 801…804, 807…809**

Mounting recommendations
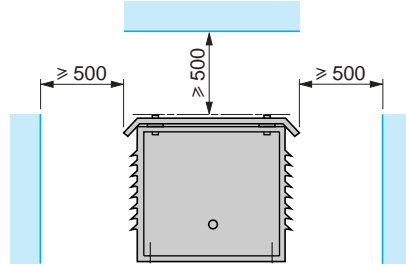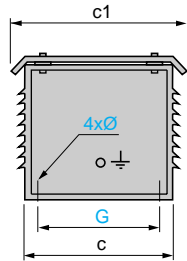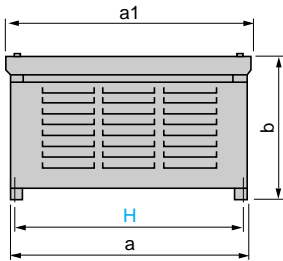


| VW3 | a | a1 | b | c | c1 | G | H | Ø |
|---|---|---|---|---|---|---|---|---|
| **A7 801** | 490 | 452 | 203.5 | 153 | 202 | 95 | 470 | 10 |
| **A7 802** | 420 | 450 | 440 | 480 | 540 | 400 | 392 | 13 |
| **A7 803** | 580 | 610 | 440 | 480 | 540 | 400 | 552 | 13 |
| **A7 804** | 960 | 990 | 440 | 480 | 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
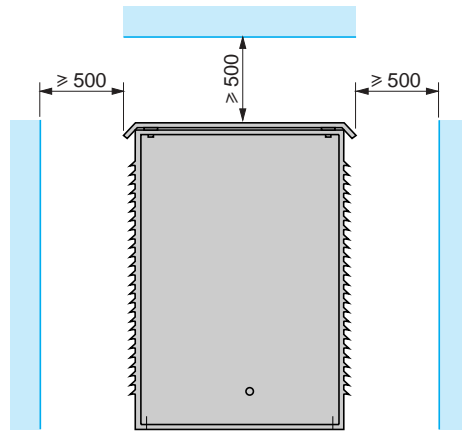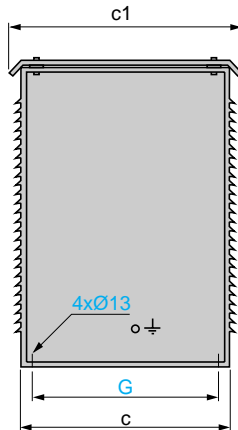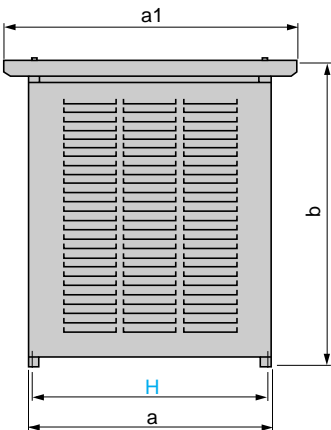


| VW3 | a | a1 | b | c | c1 | G | H |
|---|---|---|---|---|---|---|---|
| **A7 805** | 860 | 1040 | 1150 | 540 | 620 | 460 | 832 |
| **A7 806** | 860 | 1040 | 1150 | 740 | 820 | 660 | 832 |
| **A7 810** | 860 | 1040 | 1150 | 540 | 620 | 460 | 832 |
| **A7 811** | 960 | 1140 | 1150 | 540 | 620 | 460 | 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: | Characteristics: | References: | Schemes: | Functions: |
|---|---|---|---|---|
| page 52 | page 52 | page 53 | page 118 | pages 142 to 173 |

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# Variable speed drives
# for asynchronous motors
Altivar 71
Network braking units

## Network braking units
### VW3 A7 201…205, 231, 232

**Mounting recommendations**
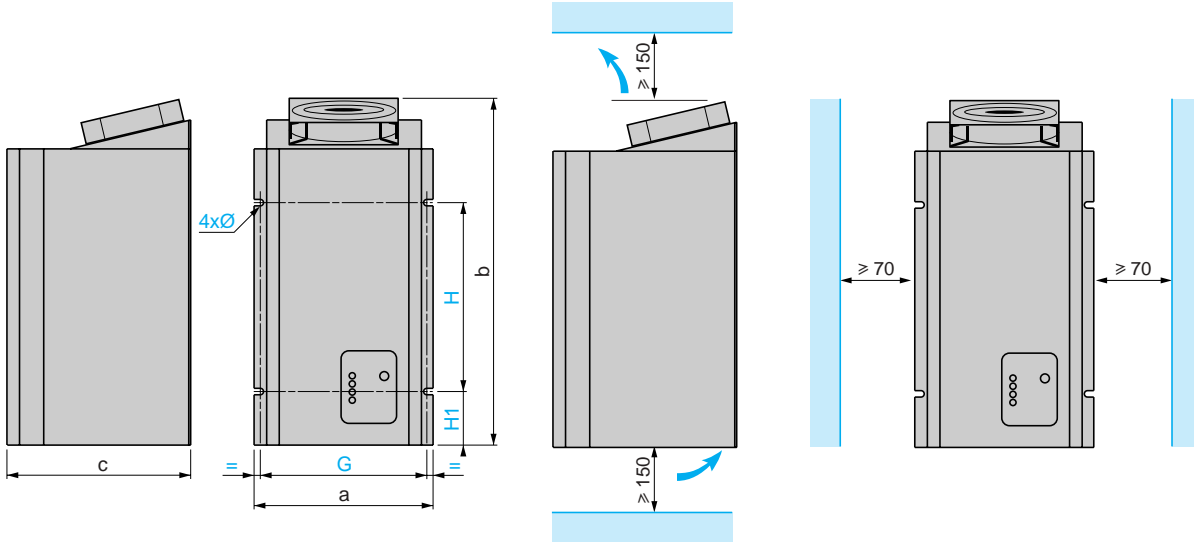


| VW3 | a | b | c | G | H | H1 | Ø |
|---|---|---|---|---|---|---|---|
| **A7 201, 202** | 270 | 500 | 295 | 260 | 260 | 80 | 7 |
| **A7 203…205, A7 231…232** | 270 | 580 | 295 | 260 | 340 | 80 | 7 |

### VW3 A7 206…208, 233…237

**Mounting recommendations**
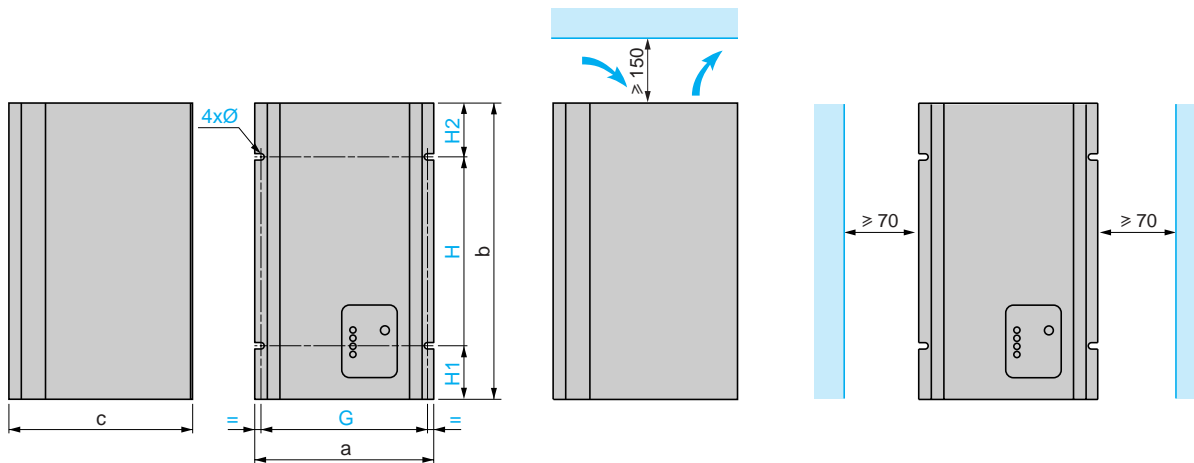


| VW3 | a | b | c | G | H | H1 | H2 | Ø |
|---|---|---|---|---|---|---|---|---|
| **A7 206…208** | 245 | 700 | 272 | 260 | 440 | 80 | 180 | 7 |
| **A7 233…237** | 272 | 700 | 295 | 260 | 440 | 80 | 180 | 7 |

Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71
Network braking units

**Network braking units (continued)**

**VW3 A7 209, 210, 238, 239**

Mounting recommendations
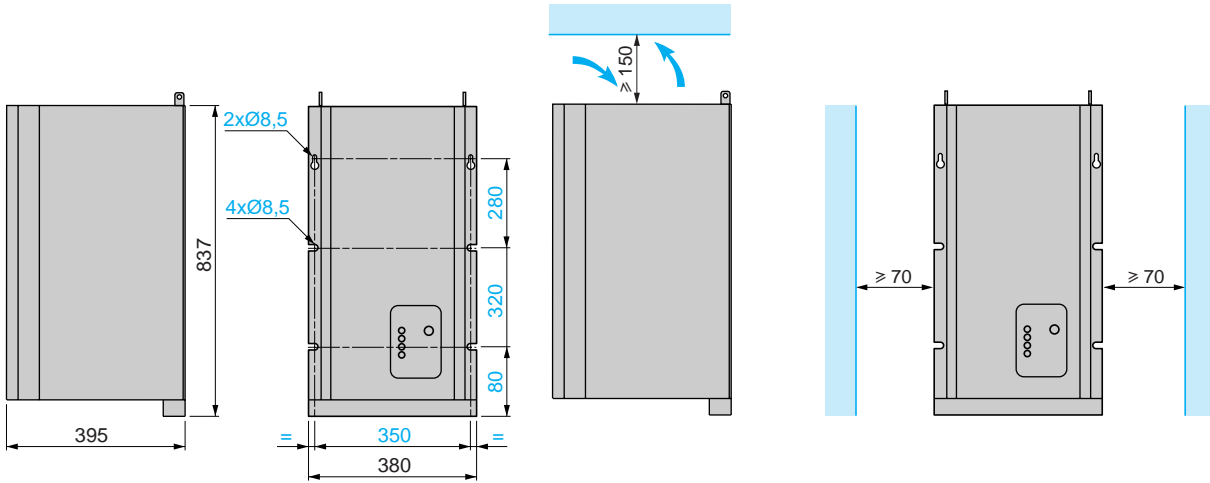


**VW3 A7 211, 212, 240, 241**

Mounting recommendations
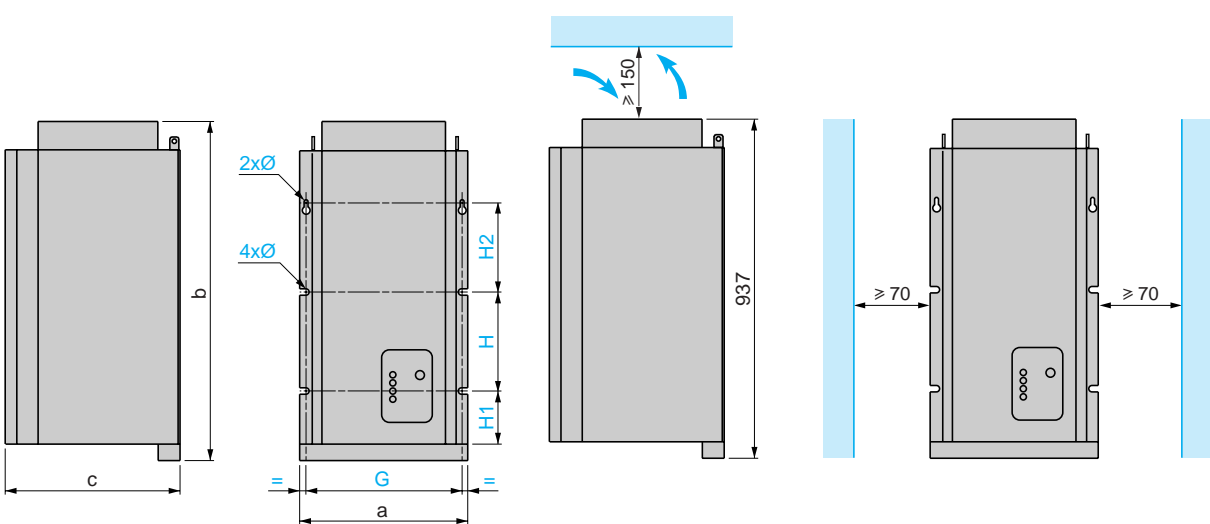


| VW3 | a | b | c | G | H | H1 | H2 | Ø |
|---|---|---|---|---|---|---|---|---|
| A7 211, 240 | 380 | 937 | 395 | 350 | 320 | 80 | 280 | 8.5 |
| A7 212, 241 | 380 | 1037 | 395 | 350 | 320 | 80 | 280 | 8.5 |

# Variable speed drives for asynchronous motors
Altivar 71
DC chokes, line chokes

## DC chokes

### VW3 A4 501…510
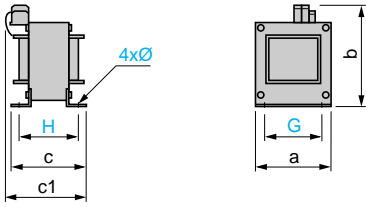


| VW3 | a | b | c | c1 | G | H | Ø |
|---|---|---|---|---|---|---|---|
| A4 501 | 60 | 103 | 60 | 95 | 50 | 51 | 3.5 |
| A4 502 | 60 | 103 | 77 | 118 | 50 | 68 | 3.5 |
| A4 503 | 96 | 134 | 80 | 115 | 80 | 65 | 5.5 |
| A4 504 | 96 | 134 | 79 | 115 | 80 | 64 | 5.5 |
| A4 505 | 96 | 134 | 85 | 120 | 80 | 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
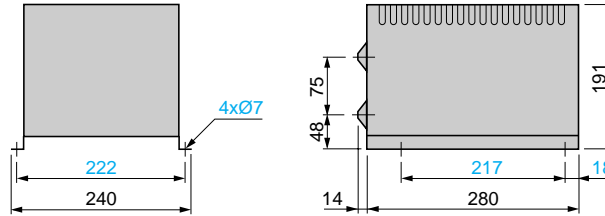


## Line chokes

### VW3 A4 551…555
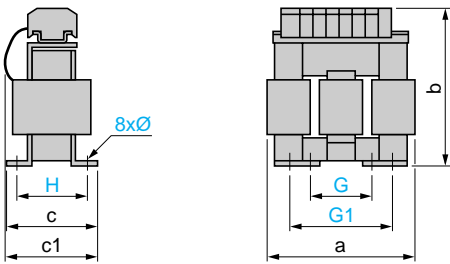


| VW3 | a | b | c | c1 | G | G1 | H | Ø |
|---|---|---|---|---|---|---|---|---|
| A4 551 | 100 | 135 | 55 | 60 | 40 | 60 | 42 | 6 x 9 |
| A4 552, 553 | 130 | 155 | 85 | 90 | 60 | 80.5 | 62 | 6 x 12 |
| A4 554 | 155 | 170 | 115 | 135 | 75 | 107 | 90 | 6 x 12 |
| A4 555 | 180 | 210 | 125 | 165 | 85 | 122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

### VW3 A4 556
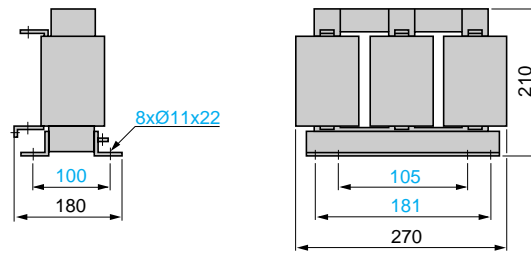


### VW3 A4 557
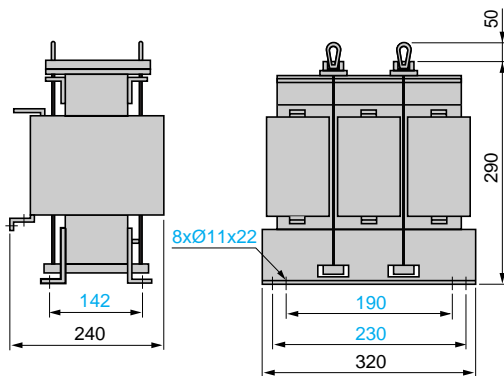


### VW3 A4 558…567 *(1)*
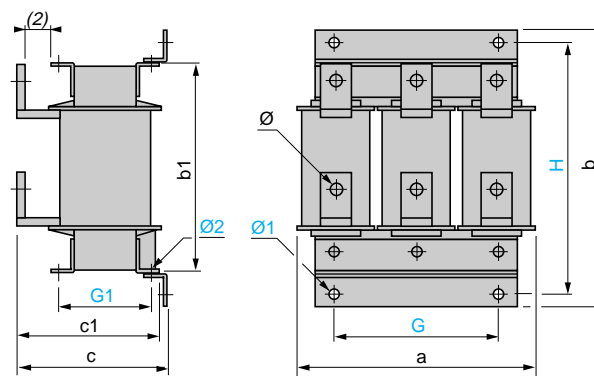


| VW3 | a | b | b1 | c | c1 | G | G1 | H | Ø | Ø1 | Ø2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A4 558 | 280 | 305 | 240 | 210 | 200 | 200 | 125 | 275 | 9 | 9 | 9 |
| A4 559 | 280 | 330 | 260 | 210 | 200 | 200 | 125 | 300 | 11 | 9 | 9 |
| A4 560, 561 | 320 | 380 | 300 | 210 | 200 | 225 | 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.*

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# Variable speed drives
# for asynchronous motors
Altivar 71
Passive filters

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**Passive filters**

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



242 / 135 / 165 / 416 / 440

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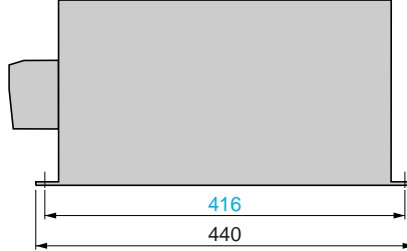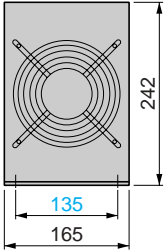
**VW3 A4 605…609, 623…627, 645…648, 664…666**
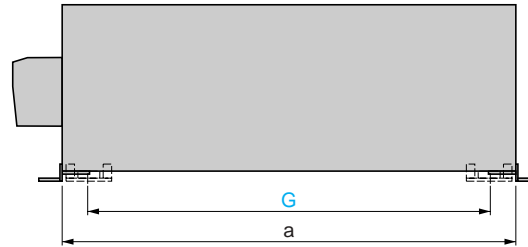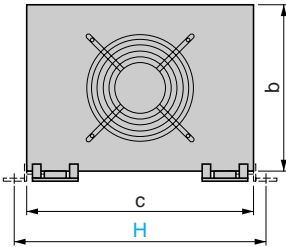


b / c / H / G / a

| 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 |

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



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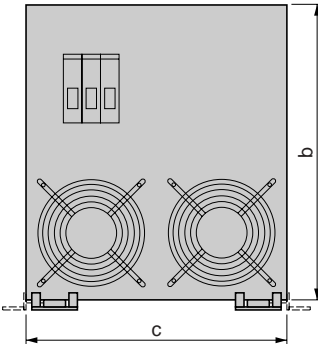
| VW3 | a | b | c |
|---|---|---|---|
| A4 610, 611, 614 *(1)*, 628, 629, 649, 667, 668 | 830 | 390 | 345 |
| A4 612, 615…617 *(1)*, 630, 631, 634 *(1)*, 650, 652 *(1)*, 653 *(1)*, 655 *(1)*, 669 | 900 | 409 | 406 |
| A4 613, 632, 635…637 *(1)*, 651, 654 *(1)*, 670, 672 *(1)*, 673 *(1)*, 675 *(1)* |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

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# Dimensions (continued)

# Variable speed drives
# for asynchronous motors
Altivar 71
Additional EMC input filters

## Additional EMC input filters

### VW3 A4 401…404



### VW3 A4 405, 409
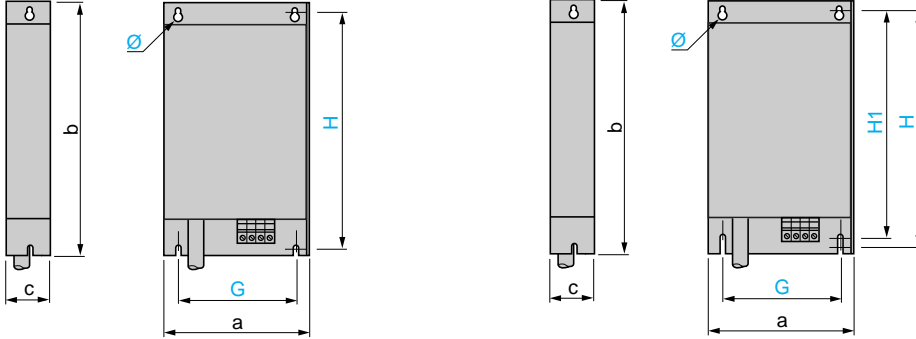


| VW3 | a | b | c | G | H | H1 | Ø |
|---|---|---|---|---|---|---|---|
| A4 401 | 130 | 290 | 40 | 105 | 275 | – | 4.5 |
| A4 402 | 155 | 324 | 50 | 130 | 309 | – | 4.5 |
| A4 403 | 175 | 370 | 60 | 150 | 355 | – | 5.5 |
| A4 404 | 210 | 380 | 60 | 190 | 365 | – | 5.5 |
| A4 405 | 230 | 498.5 | 62 |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

### VW3 A4 406…408
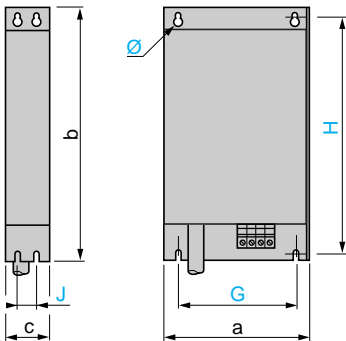


| VW3 | a | b | c | G | H | J | Ø |
|---|---|---|---|---|---|---|---|
| A4 406 | 240 | 522 | 79 | 200 | 502.5 | 40 | 6.6 |
| A4 407 | 240 | 650 | 79 | 200 | 631 | 40 | 6.6 |
| A4 408 | 320 | 750 | 119 | 280 | 725 | 80 | 9 |

### Mounting the filter under the drive
**Front view**



### Mounting the filter next to the drive
**Front view**
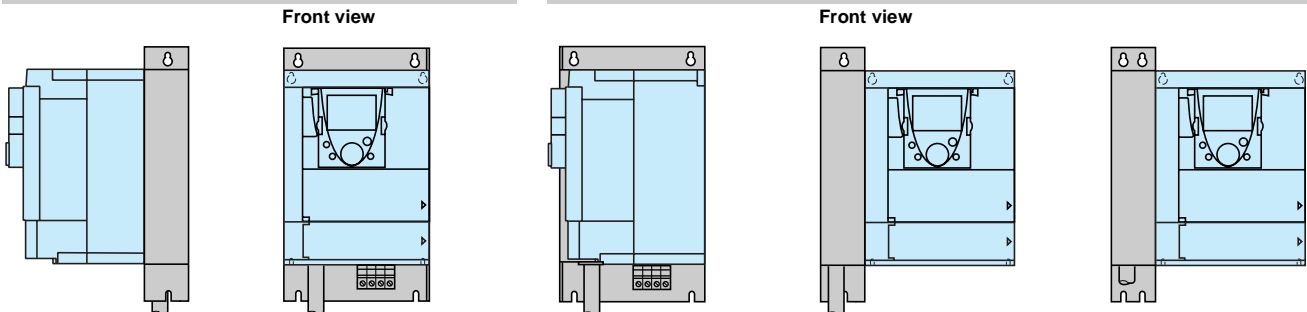
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# Variable speed drives
# for asynchronous motors
Altivar 71
Additional EMC input filters

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**Additional EMC input filters (continued)**

**VW3 A4 410…413**



6xØ12
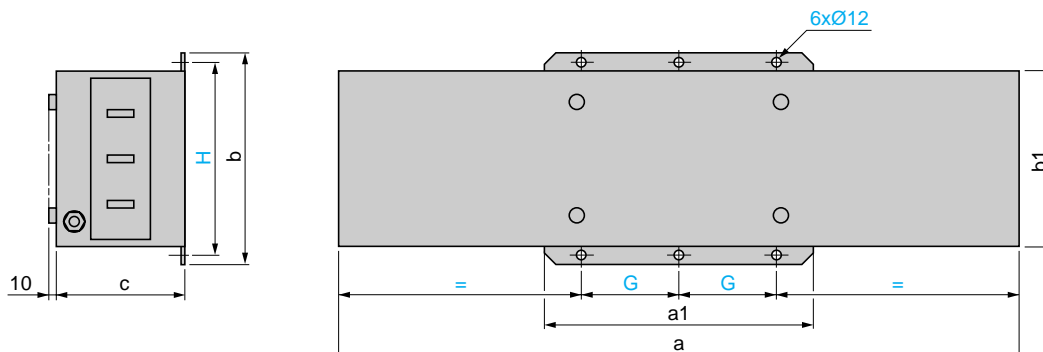
| VW3 | a | a1 | b | b1 | c | G | H |
|---|---|---|---|---|---|---|---|
| **A4 410** | 800 | 302 | 261 | 219 | 139 | 120 | 235 |
| **A4 411** | 800 | 302 | 261 | 219 | 139 | 120 | 235 |
| **A4 412** | 900 | 352 | 281 | 239 | 174 | 145 | 255 |
| **A4 413** | 1000 | 401 | 301 | 259 | 164 | 170 | 275 |

**IP 30 protection kits for filters VW3 A4 410…413**
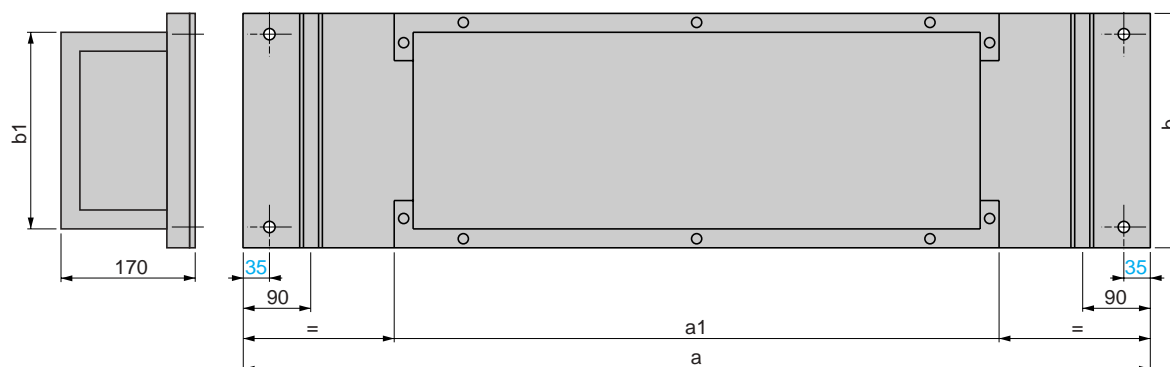


| VW3 | a | a1 | b | b1 |
|---|---|---|---|---|
| **A9 601** | 1200 | 800 | 310 | 270 |
| **A9 602** | 1400 | 1000 | 350 | 310 |

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*Dimensions (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71
Motor chokes

## Motor chokes (1)

### VW3 A5 101, 102

**Mounting recommendations** (2)
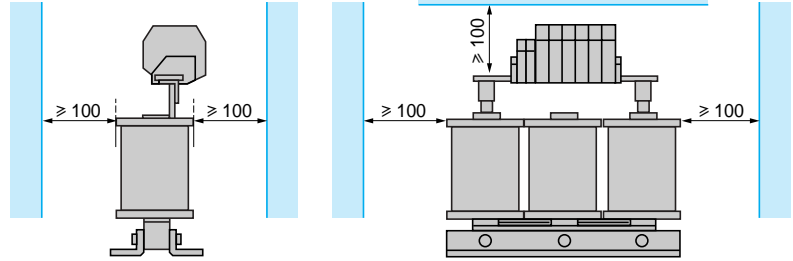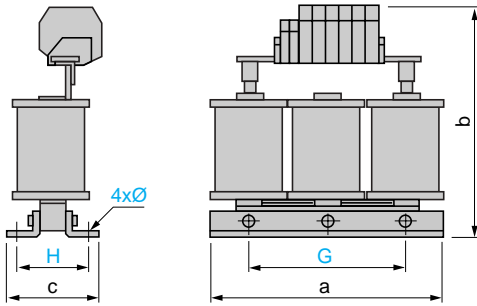
| VW3 | a | b | c | G | H | Ø |
|---|---|---|---|---|---|---|
| **A5 101** | 190 | 210 | 90 | 170 | 45 | 8 x 12 |
| **A5 102** | 200 | 235 | 130 | 170 | 48 | 8 x 12 |

### VW3 A5 103 (3)

**Mounting recommendations** (2)
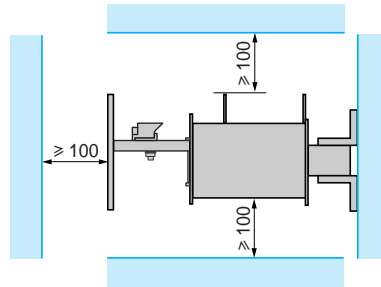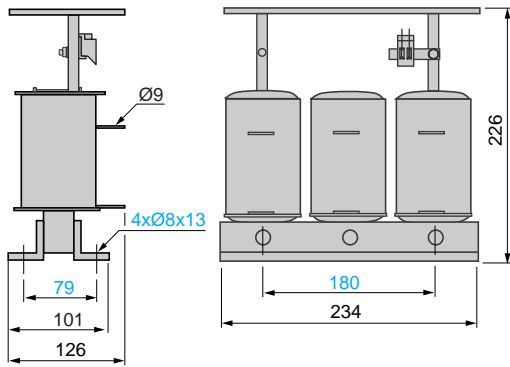
### VW3 A5 104, 105 (4)
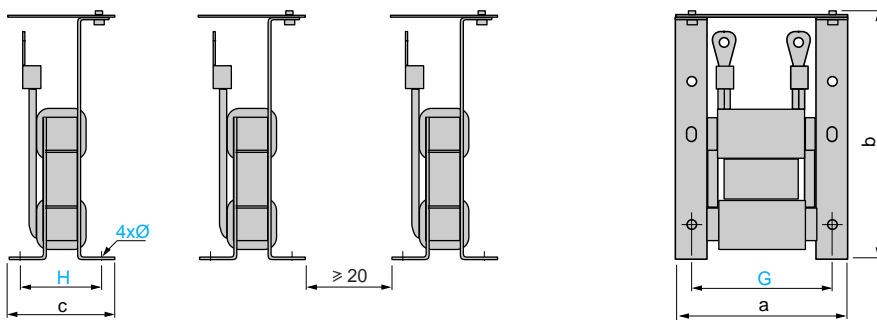
| VW3 | a | b | c | G | H | Ø |
|---|---|---|---|---|---|---|
| **A5 104** | 170 | 250 | 100 | 150 | 75 | 9 |
| **A5 105** | 210 | 250 | 110 | 175 | 75 | 9 x 13 |

(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.

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# Variable speed drives
# for asynchronous motors
Altivar 71
Motor chokes

**Motor chokes (continued)** *(1)*

**VW3 A5 106…108** *(2)*                                                                                                                                            109
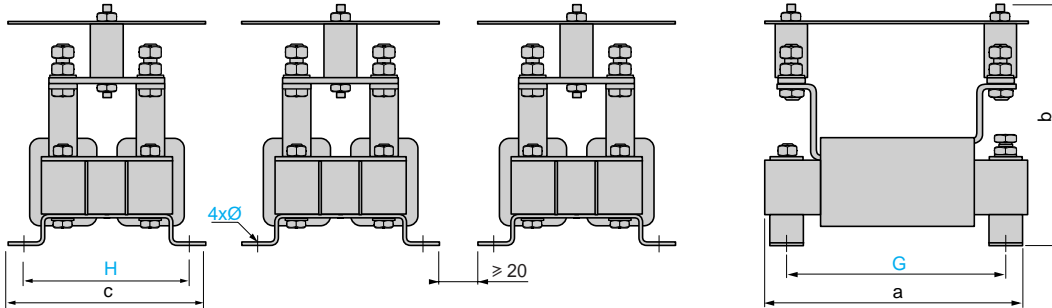


| VW3 | a | b | c | G | H | Ø |
|------|-----|-----|-----|-----|-----|---|
| **A5 106** *(1)* | 245 | 250 | 200 | 225 | 175 | 9 |
| **A5 107** *(1)* | 315 | 250 | 210 | 275 | 175 | 9 |
| **A5 108** *(1)* | 370 | 250 | 230 | 325 | 200 | 9 |

**IP 20 protection kits for chokes VW3 A5 104…108**
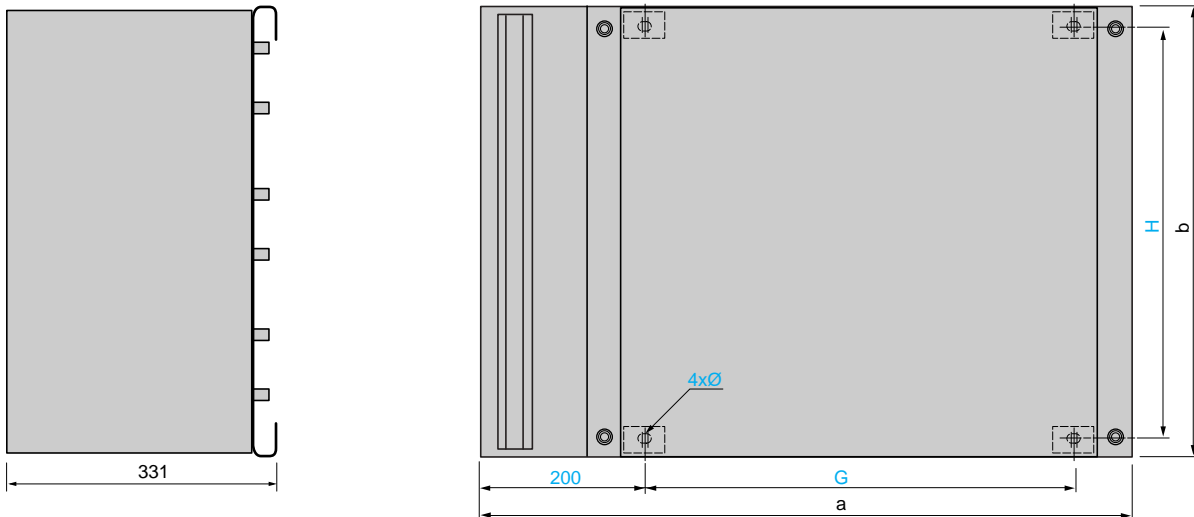


| VW3 | a | b | G | H | Ø |
|------|------|-----|-----|-----|--------|
| **A9 612** | 800 | 600 | 530 | 554 | 10 x 15 |
| **A9 613** | 1200 | 800 | 800 | 757 | 10 x 15 |

*(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.*

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# Variable speed drives for asynchronous motors
Altivar 71
Sinus filters

**Sinus filters** (1)

**VW3 A5 201…206**



**Mounting recommendations**
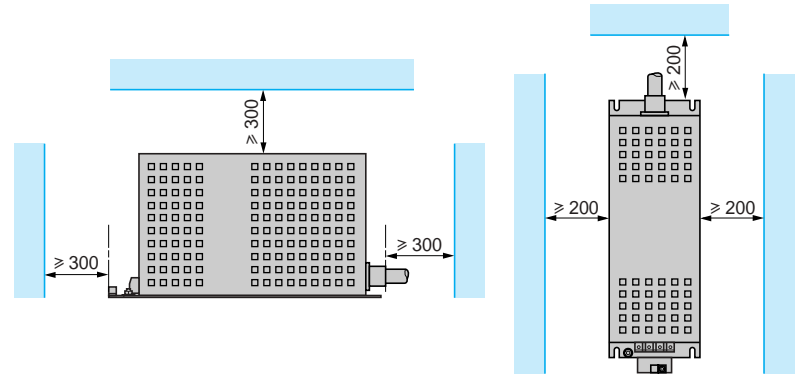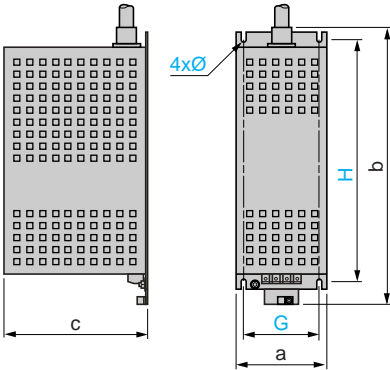


| VW3 | a | b | c | G | H | Ø |
|---|---|---|---|---|---|---|
| **A5 201** | 120 | 335 | 160 | 100 | 280 | 6.6 |
| **A5 202** | 120 | 375 | 190 | 100 | 320 | 6.6 |
| **A5 203** | 150 | 470 | 240 | 120 | 380 | 6.6 |
| **A5 204** | 210 | 650 | 280 | 160 | 530 | 8.6 |
| **A5 205** | 250 | 780 | 360 | 200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

**VW3 A5 207**

**Mounting recommendations**
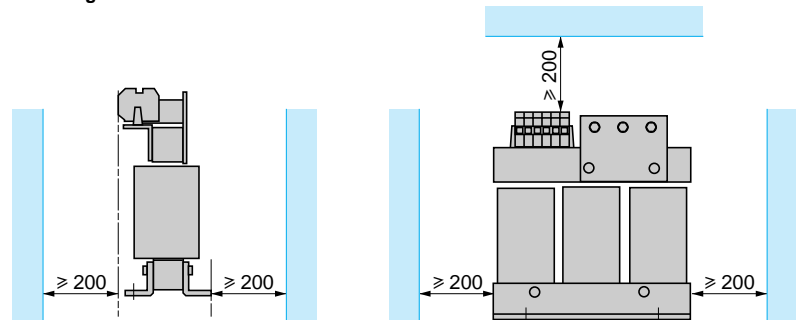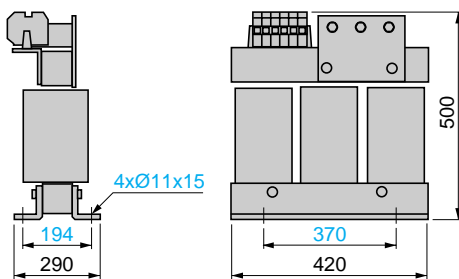


(1) Sinus filters emit considerable heat and must not be placed underneath the drive.

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# Variable speed drives
# for asynchronous motors
Altivar 71
Sinus filters

**Sinus filters** (1)

**VW3 A5 208…211**

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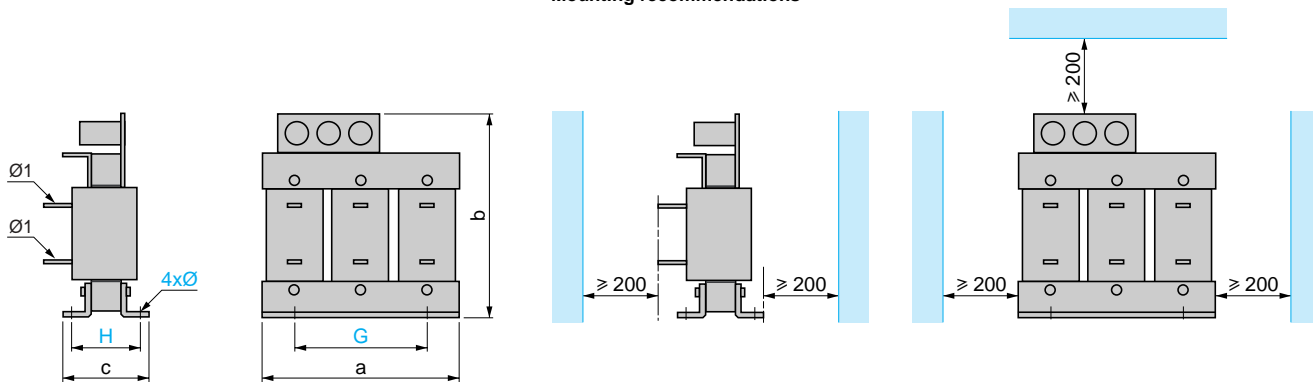
| VW3 | a | b | c | G | H | Ø | Ø1 |
|---|---|---|---|---|---|---|---|
| **A5 208** | 420 | 500 | 345 | 370 | 231 | 11 x 15 | 11 |
| **A5 209** | 480 | 600 | 340 | 430 | 238 | 13 x 18 | 11 |
| **A5 210** | 480 | 710 | 370 | 430 | 258 | 13 x 18 | 14 |
| **A5 211** | 620 | 930 | 500 | 525 | 352 | 13 x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

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

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# 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.*

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |
|---|---|---|---|---|

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⊕ **Telemecanique**

*Schemes (continued)*

# 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.

Presentation: pages 4 to 7   Characteristics: pages 8 to 13   References: pages 18 and 19   Dimensions: pages 90 to 111   Functions: pages 142 to 173

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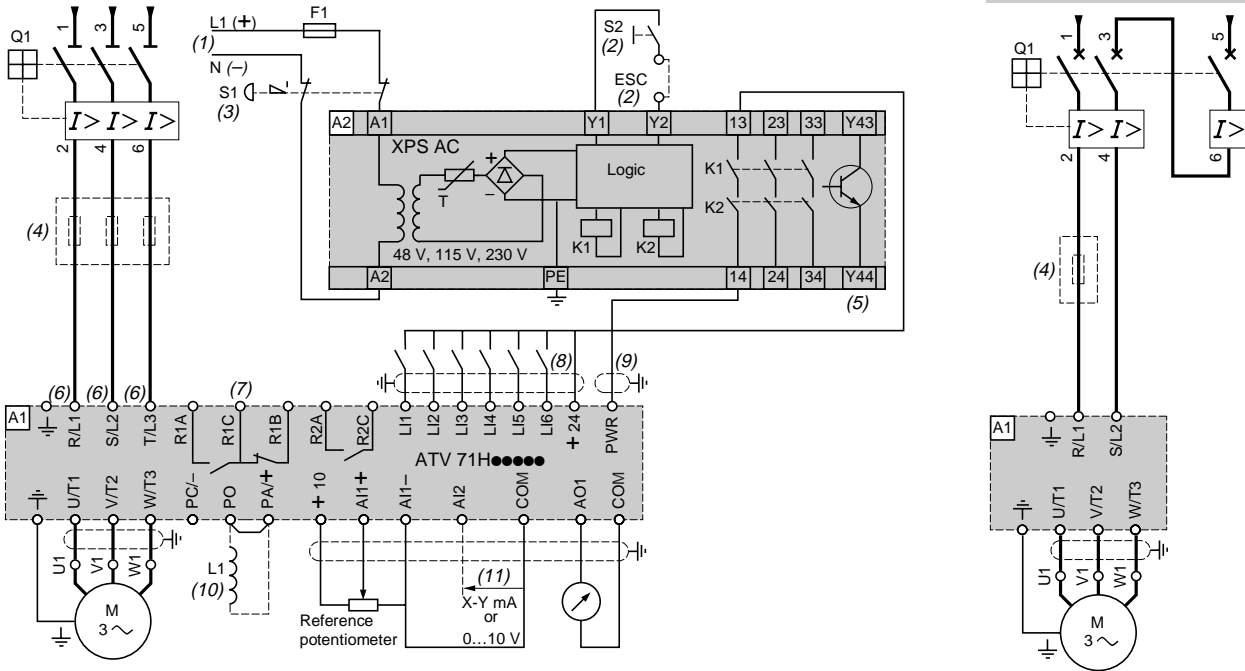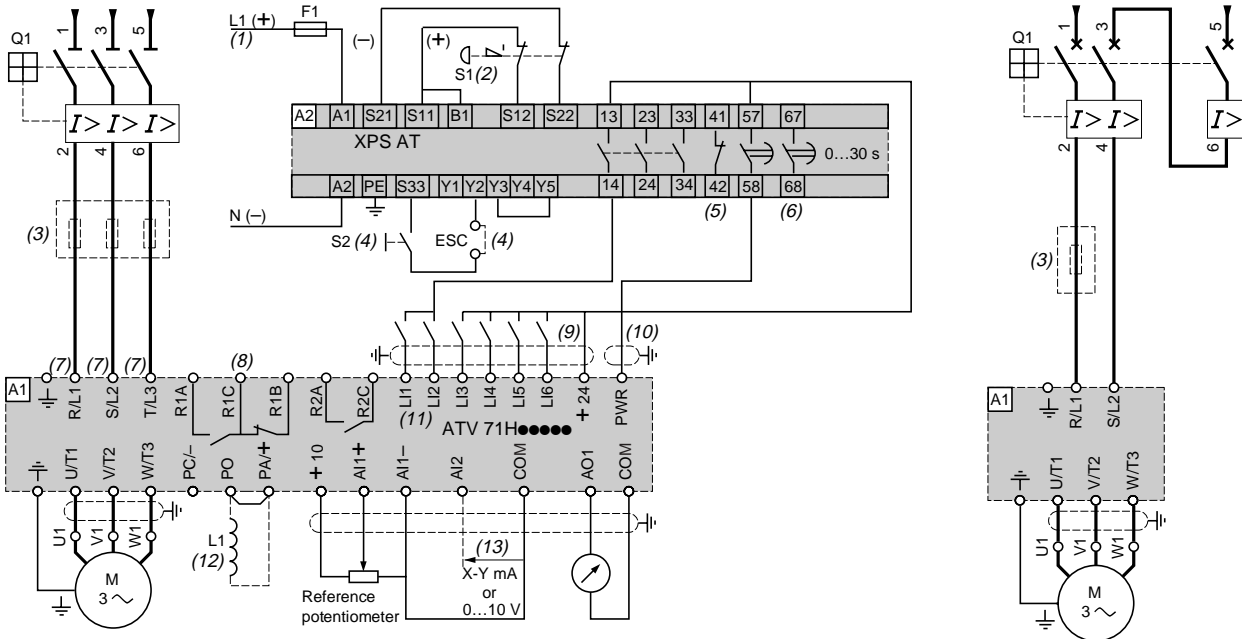# Variable speed drives
# for asynchronous motors
Altivar 71

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**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** | **ATV 71H075M3…HU75M3** |
|---|---|
| **3-phase power supply with upstream breaking via contactor** | **Power section for single phase power supply** |
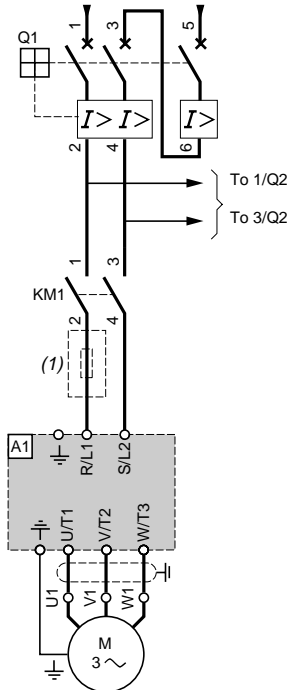
Q1  1  3  5
I> I> I>

Q2 2  T1  1  Q3  2  S2  S1  KM1  A1  A2
3  4 5  6
Q2

A1
R1A  R1C  13  14

KM1  2  4  6

(1)

(2) (2) (2)  (3)  (4)

A1  R/L1  S/L2  T/L3  R1A  R1C  R1B  R2A  R2C  LI1 LI2 LI3 LI4 LI5 LI6  + 24  PWR

ATV 71H●●●●●

U/T1  V/T2  W/T3  PC/–  PO  PA/+  + 10  AI1–  AI1+  AI2  COM  AO1  COM

U1  V1  W1
L1
(5)

Reference potentiometer

(6)  X-Y mA or 0…10 V

M 3∼

Q1  1  3  5
I> I>  I>

To 1/Q2
To 3/Q2

KM1  2  4

(1)

A1  R/L1  S/L2

U/T1  V/T2  W/T3

U1  V1  W1

M 3∼

**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.*

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| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |
|---|---|---|---|---|

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*Schemes* (continued)

# Variable speed drives
# for asynchronous motors
Altivar 71

## 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 | ATV 71H075M3…HU75M3 |
|---|---|
| 3-phase power supply with downstream breaking via switch disconnector | Power section for single phase power supply |
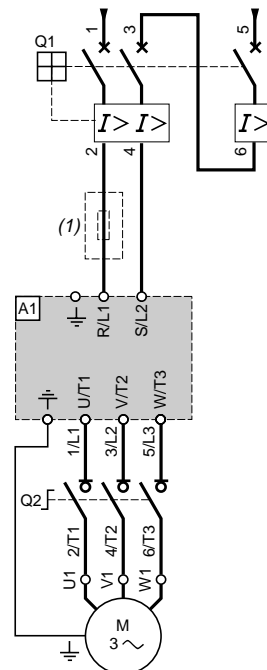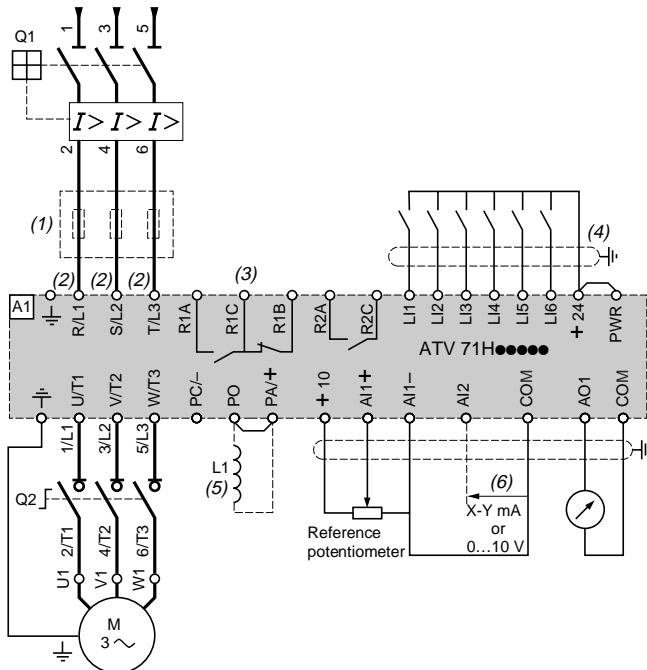


**Note:** *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

**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.*

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |

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# 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 $\sim$ 24 V, $\sim$ 48 V, $\sim$ 115 V, $\sim$ 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.

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |

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*Schemes (continued)*

# 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 | ATV 71H075M3…HU75M3 |
|---|---|
| 3-phase power supply, high inertia machine | 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.

*Schemes* (continued)

# Variable speed drives
# for asynchronous motors
Altivar 71

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

To circuit-breaker *(1)*

(2)    (2)

⏚ L1A L2A L3A    L1B L2B L3B
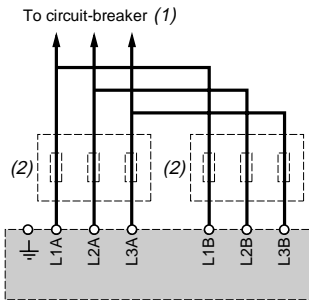
*(1) For control section connections, see pages 114 to 117.*
*(2) Line choke, see page 72.*

## 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 |
|---|---|

A1

PA/+  PB

Braking resistor

A1

PC/–  PO  PA/+

L1

Braking unit    PA    TH    Braking resistor

–    +    PB

A2    *(1)*
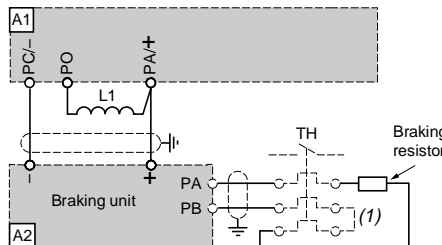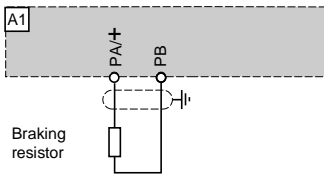
### Components for use with the Altivar

| 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

SW1
Supply  Sink Ext. Int.

SW2
PTC  LI

ATV 71H●●●●●
+24 LI1 LI2 LI3 LI4 LI5 LI6 0 V

Switch on "Int Sink" position

SW1
Supply  Sink Ext. Int.

SW2
PTC  LI

ATV 71H●●●●●
+24 LI1 LI2 LI3 LI4 LI5 LI6 0 V

### External power supply

Switch on "Supply" position

SW1
Supply  Sink Ext. Int.

SW2
PTC  LI

ATV 71H●●●●●
+24 LI1 LI2 LI3 LI4 LI5 LI6 0 V

+ 24 V
0 V
24 V ⎓ supply

Switch on "Ext Sink" position

SW1
Supply  Sink Ext. Int.

SW2
PTC  LI

ATV 71H●●●●●
+24 LI1 LI2 LI3 LI4 LI5 LI6 0 V

+ 24 V
0 V
24 V ⎓ supply

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*Schemes (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71
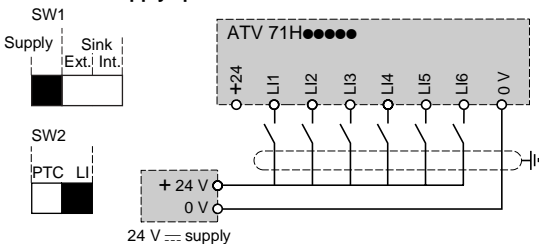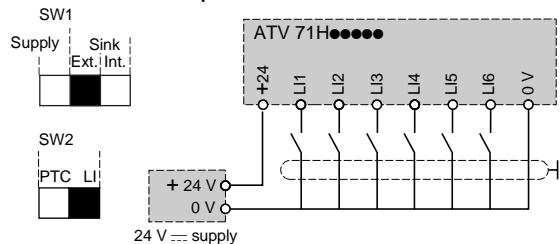
## Examples of recommended schemes (continued)

### 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
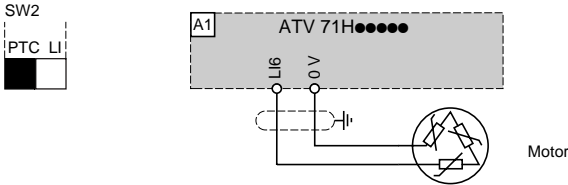


### 2-wire control and jog operation (JOG)
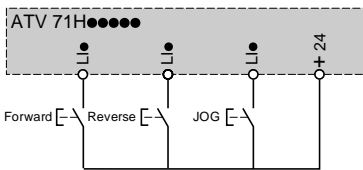


### 3-wire control and jog operation (JOG)
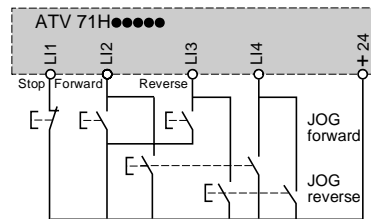


### Unipolar speed reference
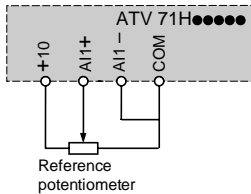


### Bipolar speed reference

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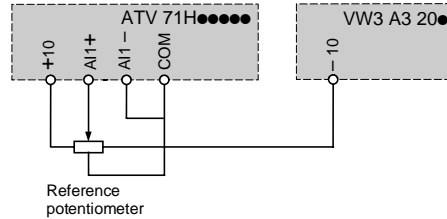


### Speed reference using axis control
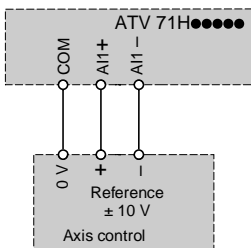


### Separate control power supply

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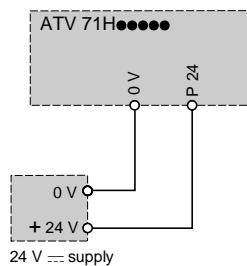


### Analog input configured for voltage

| External 0…10 V | External + 10 V |
|---|---|
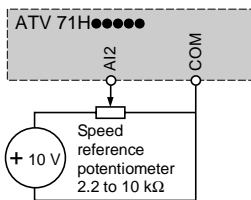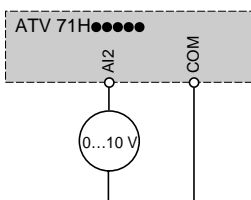


### Analog input configured for current

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

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |
|---|---|---|---|---|

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# Variable speed drives
# for asynchronous motors
Altivar 71
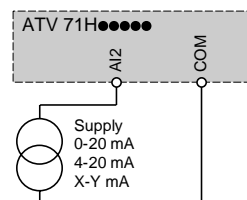
## VW3 A3 201 and VW3 A3 202 I/O extension cards

### 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
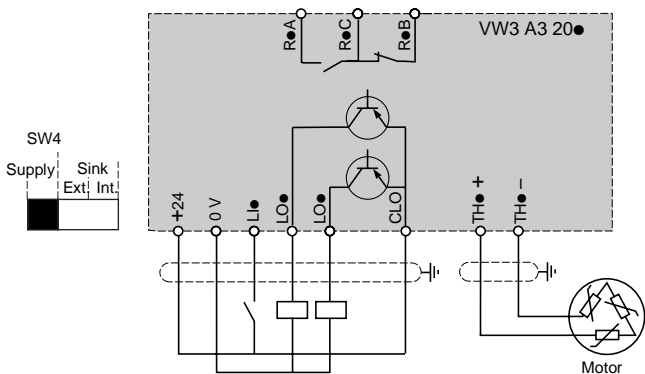
Switch on "Int Sink" position
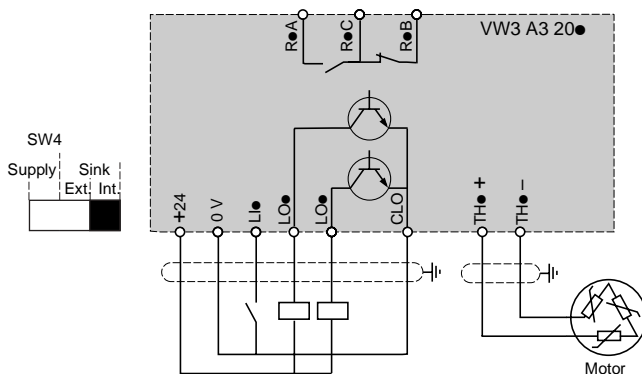
### External power supply

Switch on "Supply" position

Switch on "Ext Sink" position

24 V --- supply

24 V --- supply
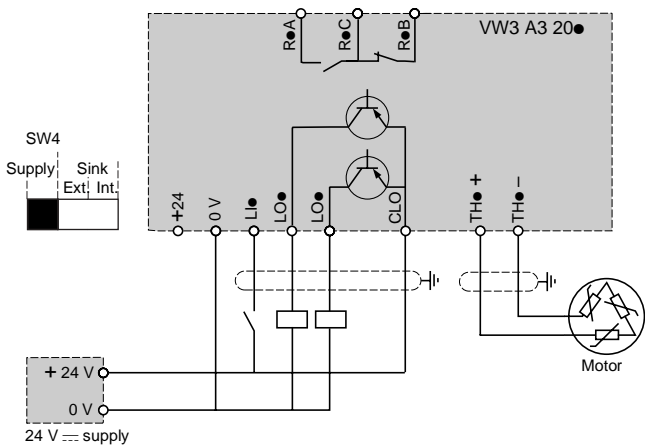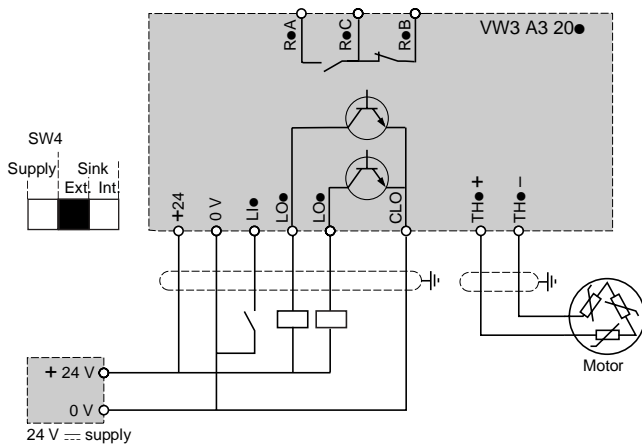
### Analog I/O (only on VW3 A3 202 extended I/O card)

Supply
0-20 mA
4-20 mA
X-Y mA

X-Y mA
or
0…10 V
(1)

(2)

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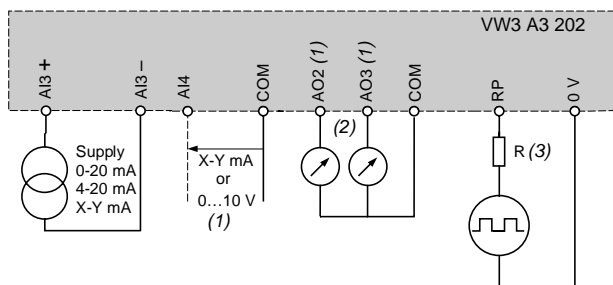
(1) Software-configurable current (0-20 mA) or voltage (0…10 V) analog input.
(2) Software-configurable current (0-20 mA) or voltage (± 10 V or 0…10 V) analog outputs, independent selection possible for each output via switch).
(3) R: add a resistor if the input voltage of the pulse train is greater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

| Input voltage V | Resistance Ω |
|---|---|
| 12 | 510 |
| 15 | 910 |
| 24 | 1300 |

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*Schemes (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71

## VW3 A3 401 to VW3 A3 407 encoder interface cards

### Closed loop control

Wiring the encoder
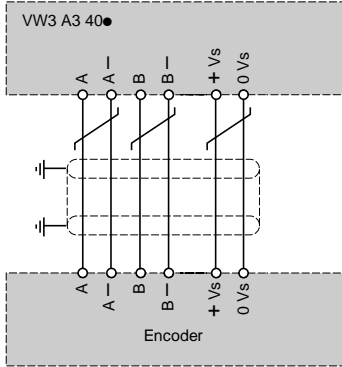


## VW3 A3 501 programmable "Controller Inside" card

### Card powered by the drive *(1)*
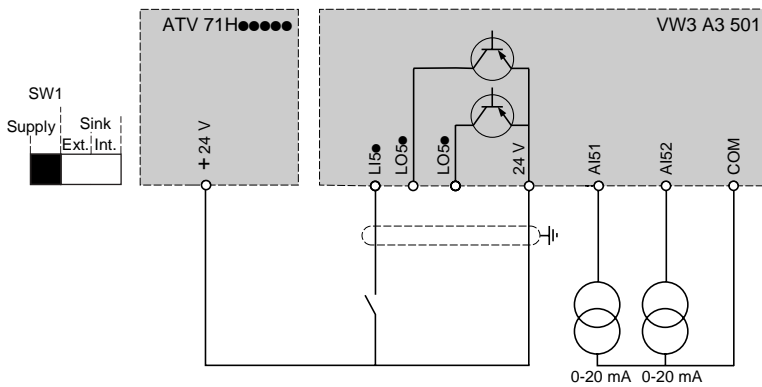


### Card powered by external power supply
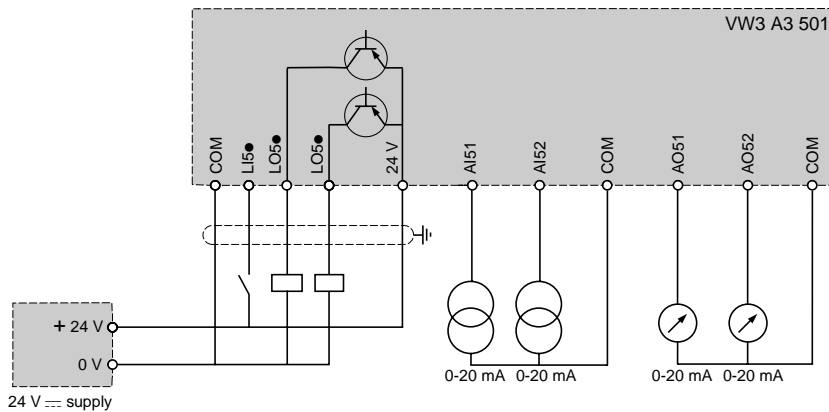


*(1) Only if the power consumption is less than 200 mA; otherwise use an external power supply.*

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |

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# Variable speed drives
# for asynchronous motors
Altivar 71

## VW3 A4 6●● passive filters
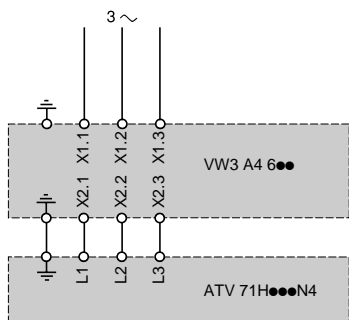


## VW3 A4 4●● additional EMC input filters

**3-phase power supply, 3-phase filter**
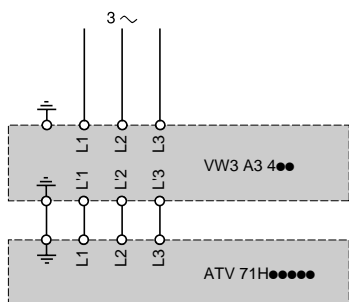


**Single phase power supply, 3-phase filter**
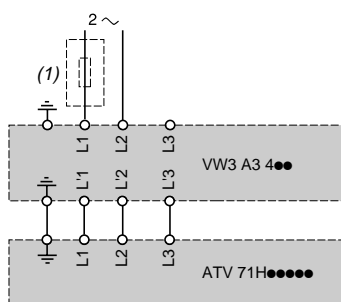


## VW3 A5 ●●● output filters

**VW3 A5 1●● motor chokes**
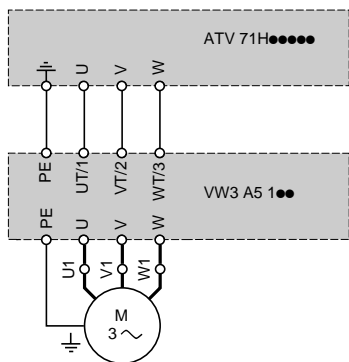


**VW3 A5 2●● sinus filters**
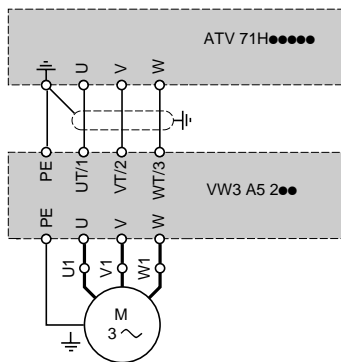


*(1) Line choke compulsory for ATV 71HU40M3X…HU75M3X.*
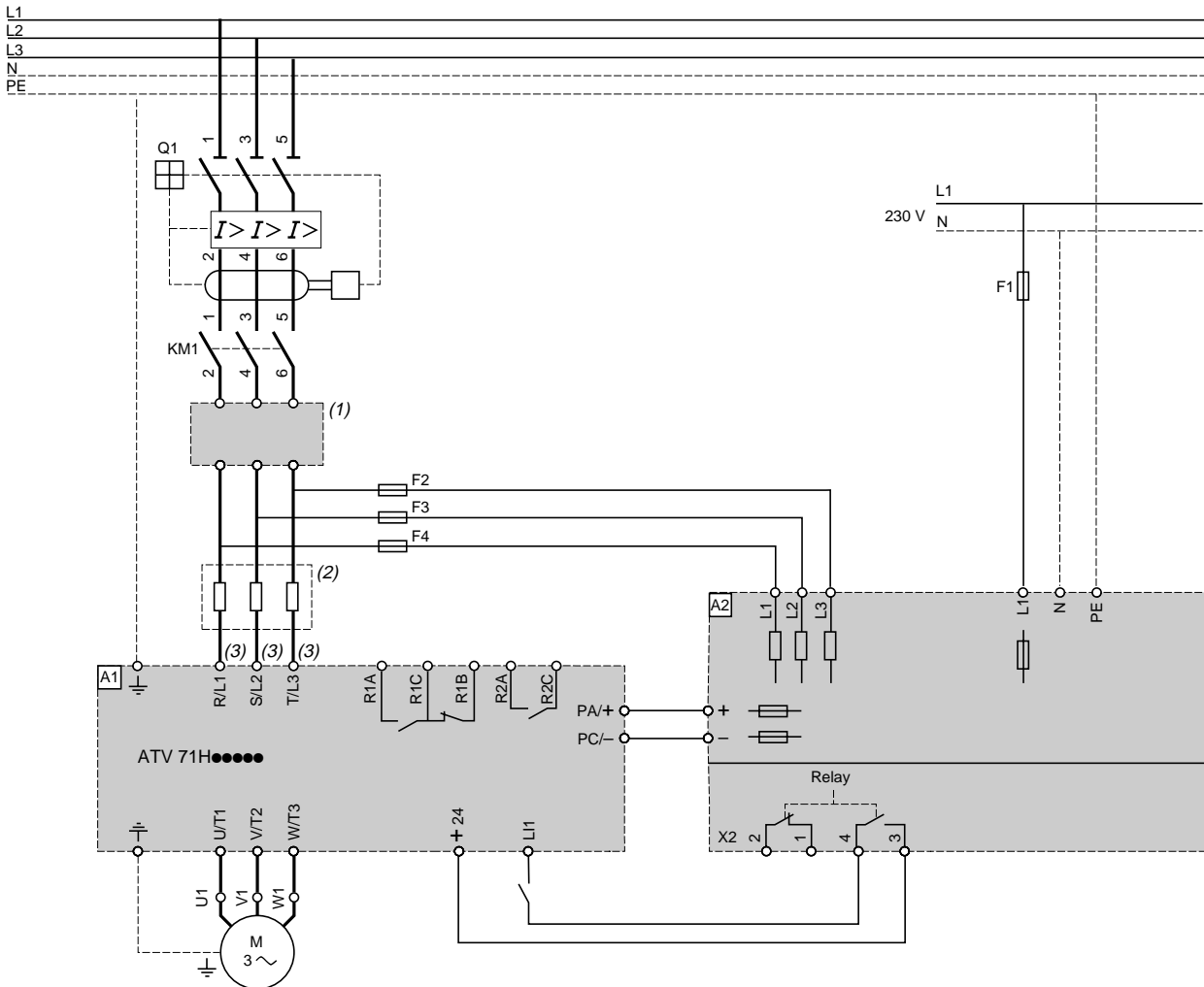
| Presentation: | Characteristics: | References: | Dimensions: | Functions: |
|---|---|---|---|---|
| pages 4 to 7 | pages 8 to 13 | pages 18 and 19 | pages 90 to 111 | pages 142 to 173 |

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*Schemes* (continued)

# 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, $\sim$ 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.*

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |

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# Variable speed drives
# for asynchronous motors
Altivar 71

## Drives combined with a braking unit and wired onto the same DC bus
### ATV 71HC20N4…HC50N4
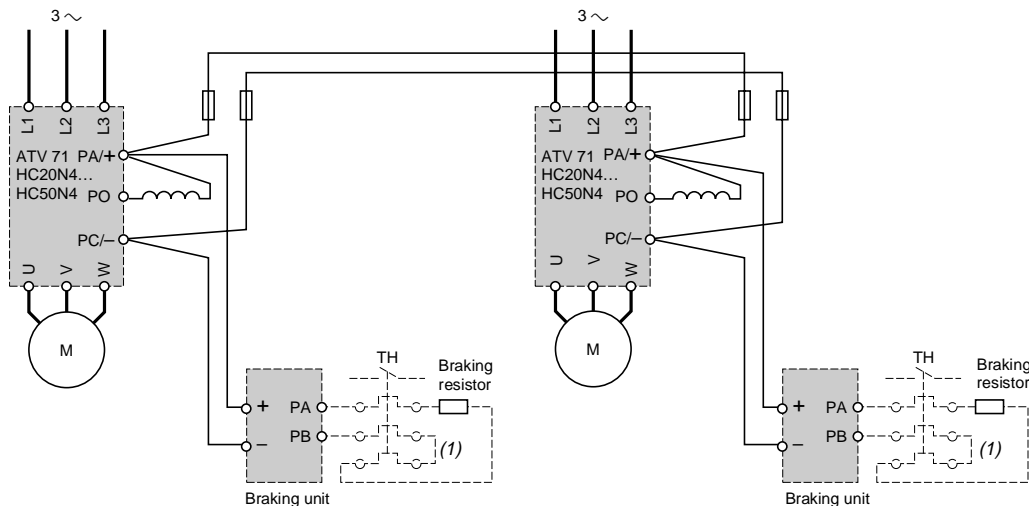


(1) Thermal overload relay if there is no temperature controlled switch in the sequence.

## Drive powered by external DC power supply
### ATV 71HD18M3X…HD45M3X, ATV 71HD22N4…HD75N4
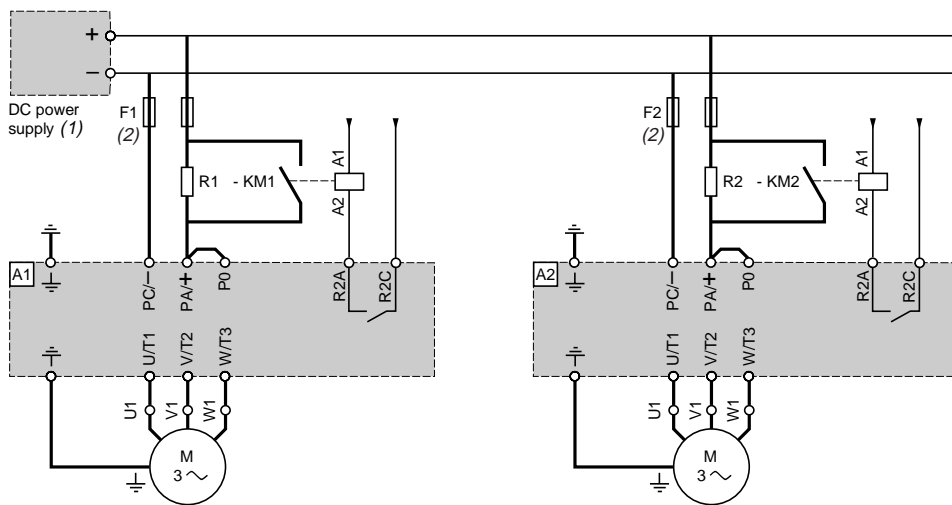


| For drives A1, A2 | DC power supply | Braking resistors R1, R2 | | Contactors (3) KM1, KM2 |
|---|---|---|---|---|
| | | Value | Reference | |
| | A | Ω | | |
| ATV 71HD18M3X | 135 | 5 | VW3 A7 707 | LC1 D32●● |
| ATV 71HD22M3X | 157 | 5 | VW3 A7 707 | LC1 D40●● |
| ATV 71HD30M3X | 200 | 5 | VW3 A7 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.

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# Variable speed drives
# for asynchronous motors
Altivar 71

## Connection diagrams for several drives in parallel on the DC bus

### Drives with different ratings
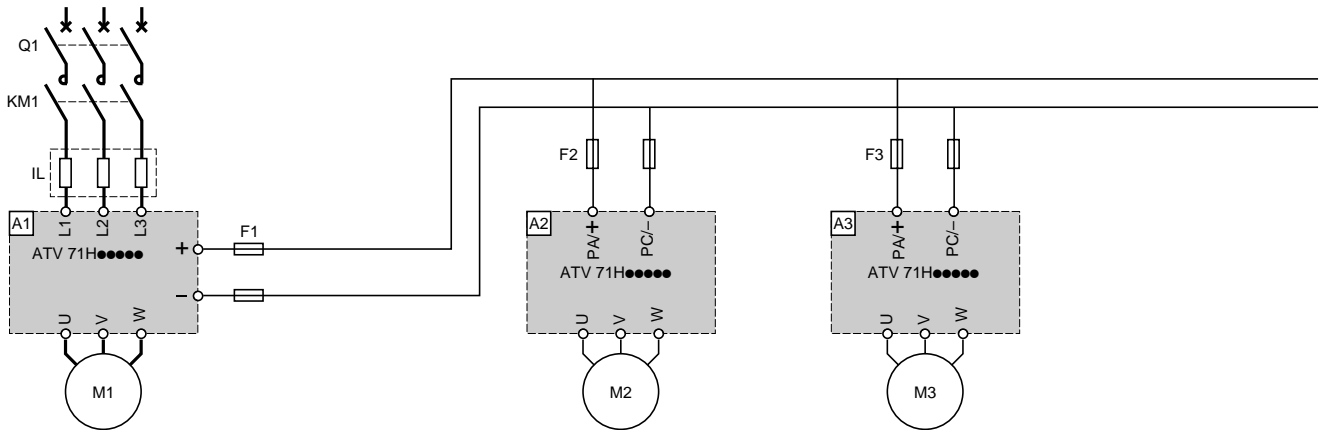


| Reference | Description |
|-----------|-------------|
| A1 | ATV 71 drive, see pages 18 and 19.<br>Drive power = Σ motor power ratings M1 + M2 + M3 + … |
| A2, A3 | ATV 71 drives powered by the DC bus. They must be protected using fast-acting fuses. Contactors on the DC circuit are ineffective as the 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.<br>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
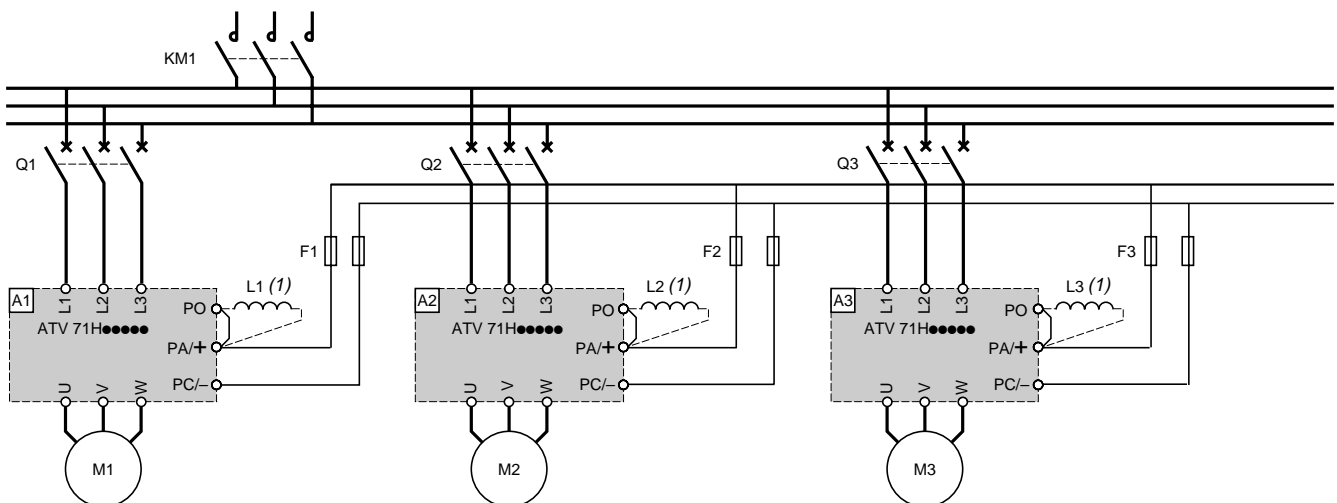


| Reference | Description |
|-----------|-------------|
| A1, A2, A3 | ATV 71 drive, see pages 18 and 19.<br>The power difference between the drives connected in parallel must not exceed any rating. |
| F1, F2, F3 | Fast-acting fuses, see page 126. Drives A1, A2 and A3 powered by the AC supply with an 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).*

*Combinations*

# Variable speed drives
# for asynchronous motors
Altivar 71

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## 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 |

Presentation:
pages 4 to 7

Characteristics:
pages 8 to 13

References:
pages 18 and 19

Dimensions:
pages 90 to 111

Functions:
pages 142 to 173

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⊕ **Telemecanique**

# Variable speed drives for asynchronous motors
Altivar 71
Electromagnetic compatibility
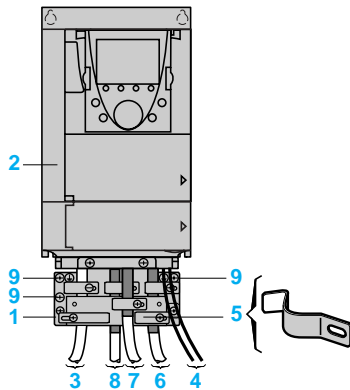


ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X,
ATV 71H075N4…HD18N4
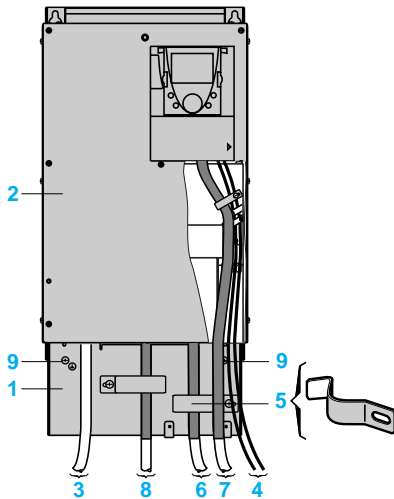


ATV 71HD18M3X…HD45M3X,
ATV 71HD22N4…HD75N4
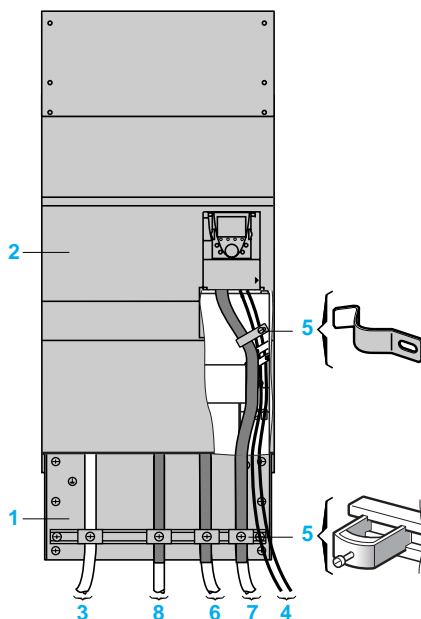


ATV 71HD55M3X, HD75M3X,
ATV 71HD90N4…HC50N4

## 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.

| Presentation: pages 4 to 7 | Characteristics: pages 8 to 13 | References: pages 18 and 19 | Dimensions: pages 90 to 111 | Functions: pages 142 to 173 |

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



## 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.

*GV2 L20*
*+*
*LC1 D25●●*
*+*
*ATV 71HU22M3*

### 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).*

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



NS80HMA50
+
LC1 D40●●
+
ATV 71HU55M3

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

| Motor Power (1) | | Drive Reference | Circuit-breaker Reference (2) | Rating | Im | Line contactor 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



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

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

| Motor Power (1) | | Drive Reference | Circuit-breaker Reference (2) | Rating | Im | Line contactor 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.

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# Variable speed drives
# for asynchronous motors
Altivar 71
Motor starters: supply voltage 440…480 V



NS160HMA
+
LC1 D115●●
+
ATV 71HD55N4

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

| Motor Power (1) | | Drive Reference | Circuit-breaker Reference (2) | Rating A | Im A | Line contactor Reference (3) (4) |
|---|---|---|---|---|---|---|
| kW | HP | | | | | |
| **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
Altivar 71

## 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**
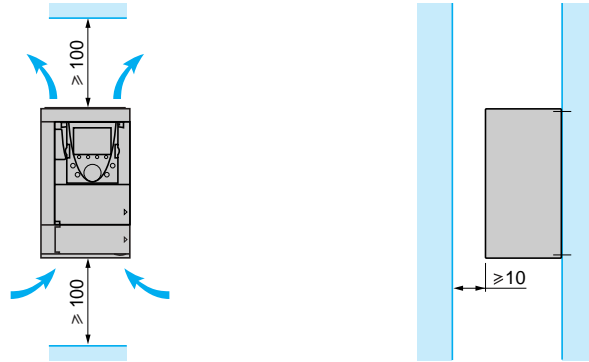


## Mounting types

■ **Mounting A**
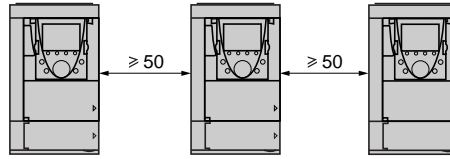


■ **Mounting B**
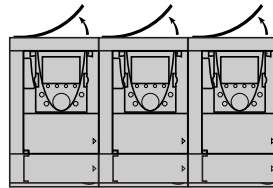


■ **Mounting C**
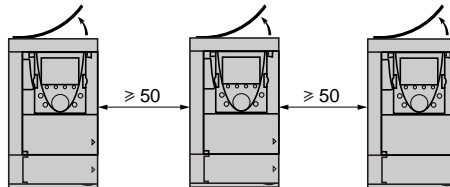


By removing the protective blanking cover from the top of the drive, the degree of protection for the drive becomes IP 20. The protective blanking cover may vary according to the drive model, see opposite.
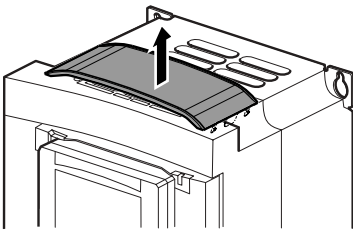


*Removing the protective blanking cover for:*
**ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71HD075N4…HD18N4**
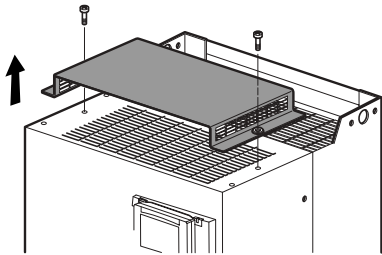


*Removing the protective blanking cover for:*
**ATV 71HD18M3X…HD45M3X, ATV 71HD22N4…HD75N4**

| 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 |

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# Variable speed drives for asynchronous motors
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## 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**
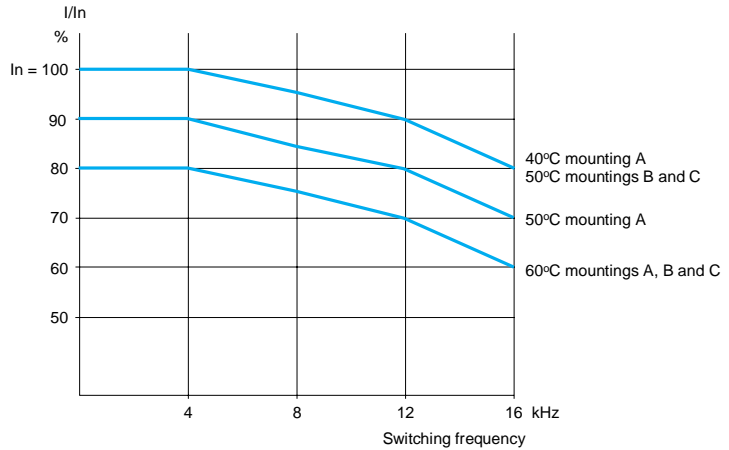


**ATV 71HD22N4 and ATV 71HD30N4** *(1)*
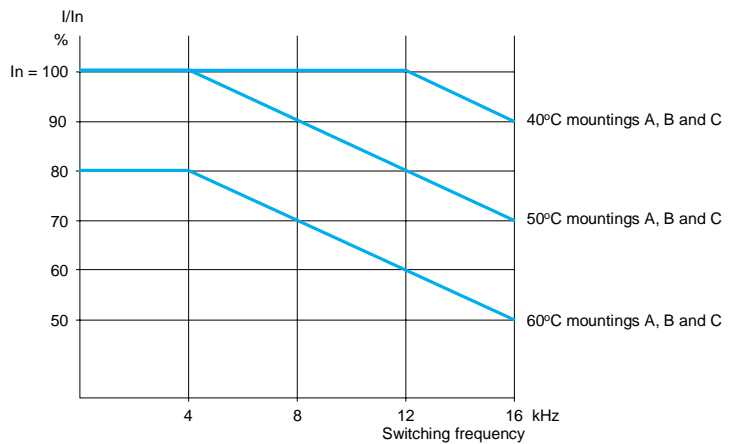


**ATV HD18M3X…HD45M3X and ATV 71HD37N4…HD75N4** *(1)*
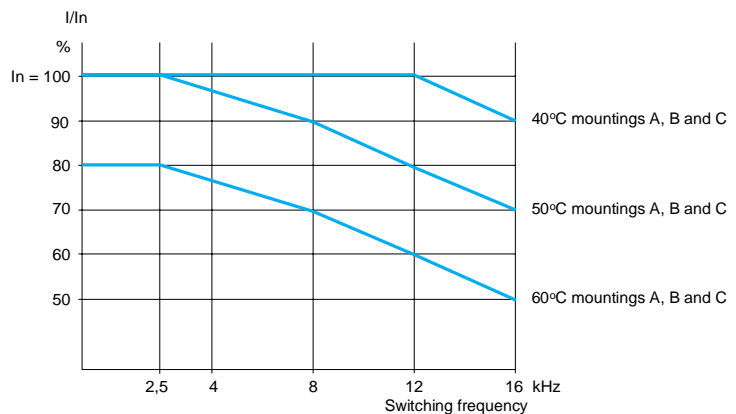


For intermediate temperatures (55°C for example) interpolate between 2 curves.

---

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

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# Variable speed drives for asynchronous motors
Altivar 71

## Mounting recommendations (continued)
**ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4**
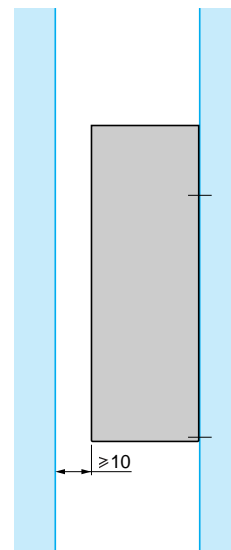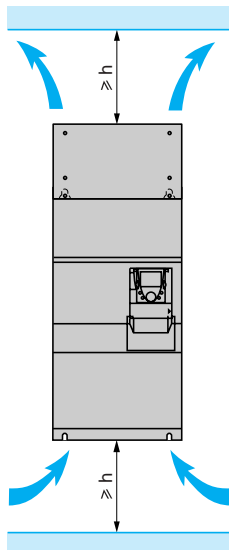


| ATV 71H | h |
|---|---|
| D55M3X, D90N4, C11N4 | 100 |
| HC13N4, HC16N4 | 250 |
| HC20N4…HC28N4 | 300 |
| HC31N4…HC40N4 | 450 |
| HC50N4 | 550 |

These drives can be mounted side by side, observing the following mounting recommendations:
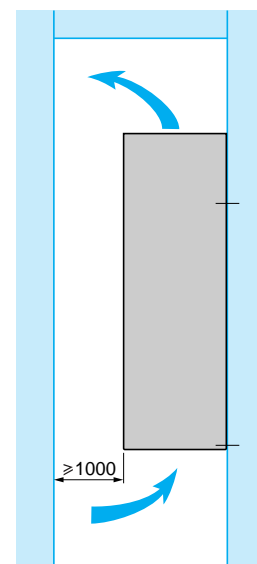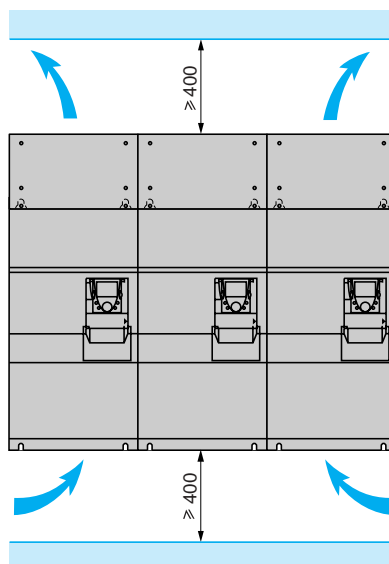
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*Mounting and installation recommendations (continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71

## 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**
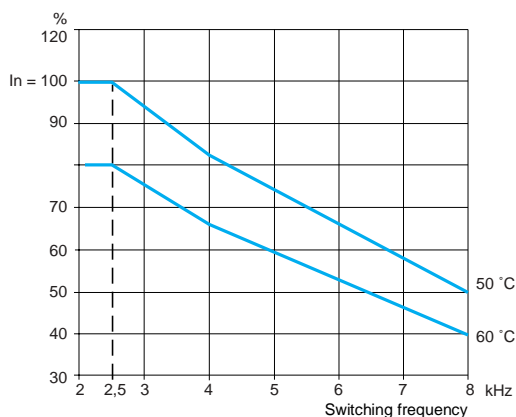


**ATV 71HD90N4**
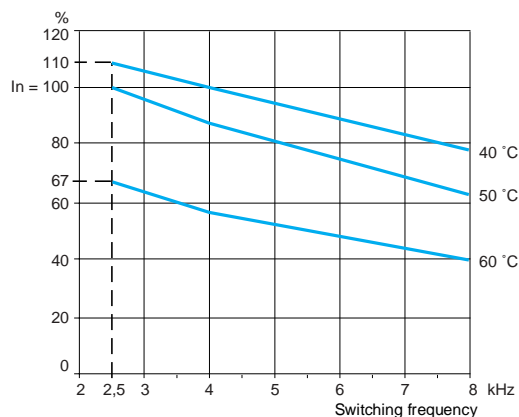


**ATV 71HC11N4**



**ATV 71HC13N4**

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

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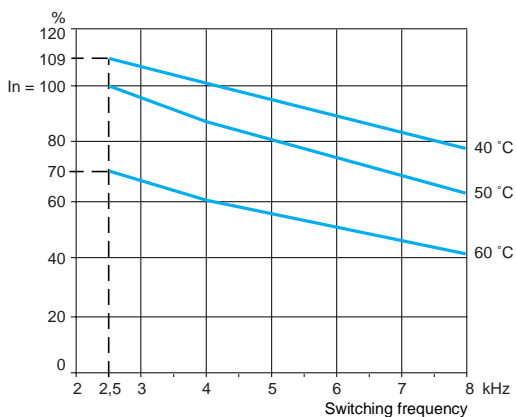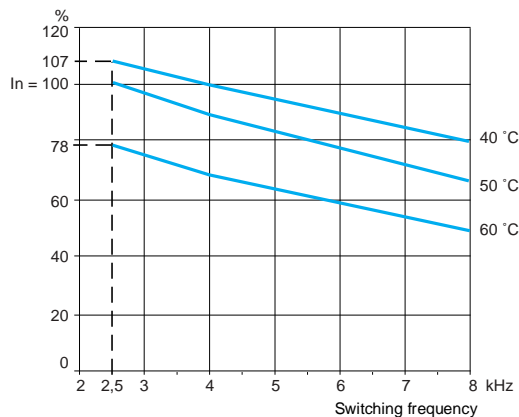
## Mounting recommendations (continued)

### Derating curves

**ATV 71HC16N4**
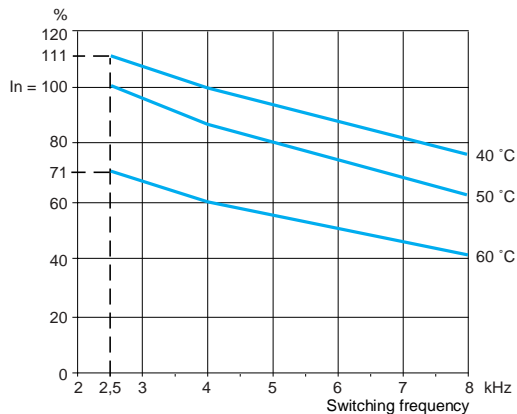


**ATV 71HC20N4**
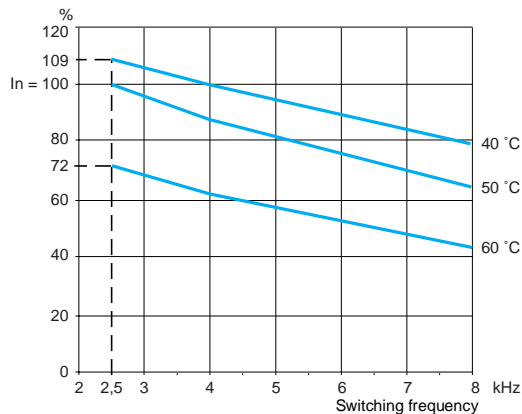


**ATV 71HC25N4 combined with a 220 kW motor**
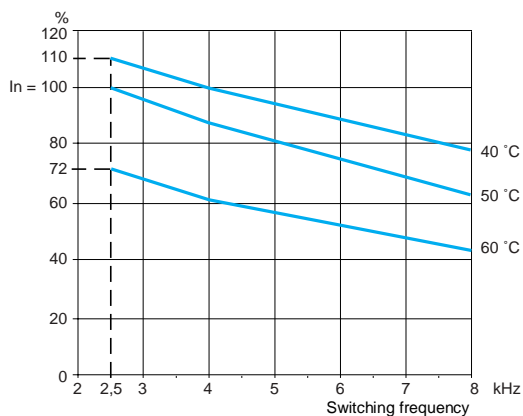


**ATV 71HC25N4 combined with a 250 kW motor**
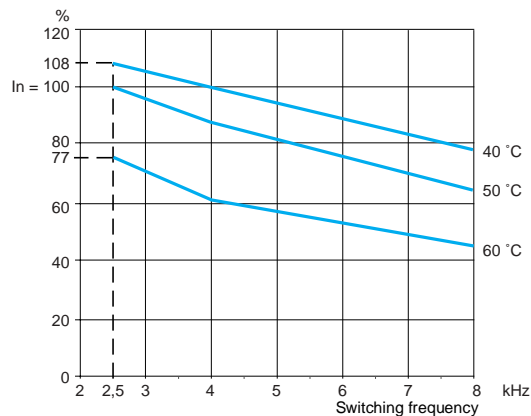


**ATV 71HC28N4**



**ATV 71HC31N4**

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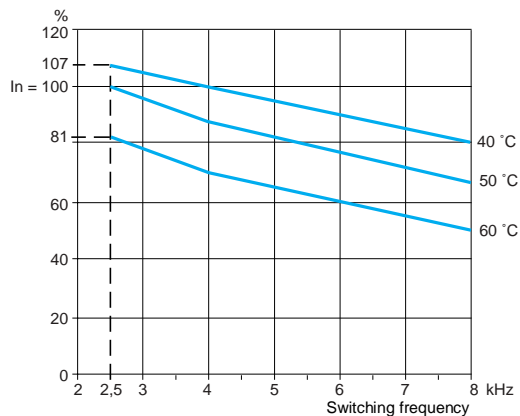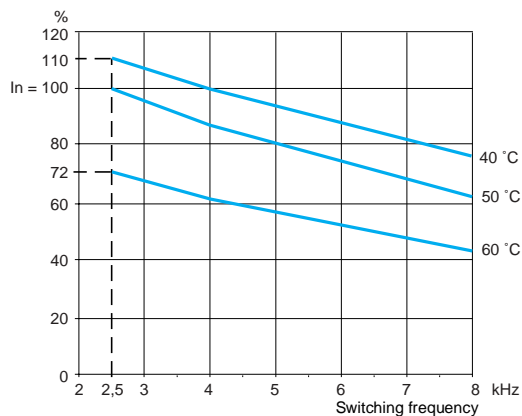
## Mounting recommendations (continued)

### Derating curves

**ATV 71HC40N4 combined with a 355 kW motor**
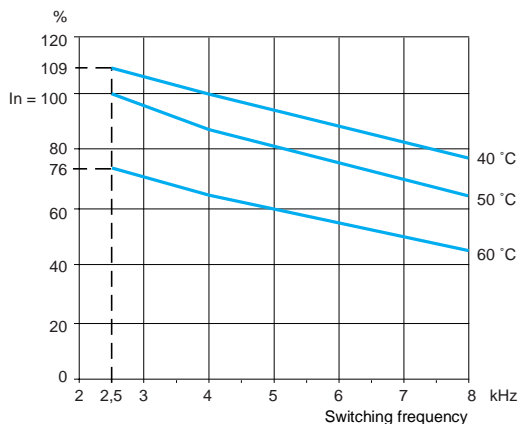


**ATV 71HC40N4 combined with a 400 kW motor**



**ATV 71HC50N4**

# Variable speed drives
# for asynchronous motors
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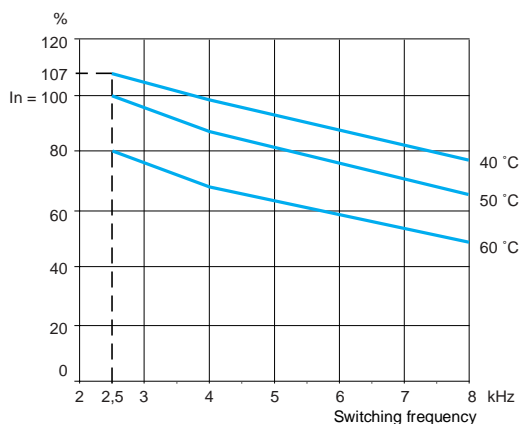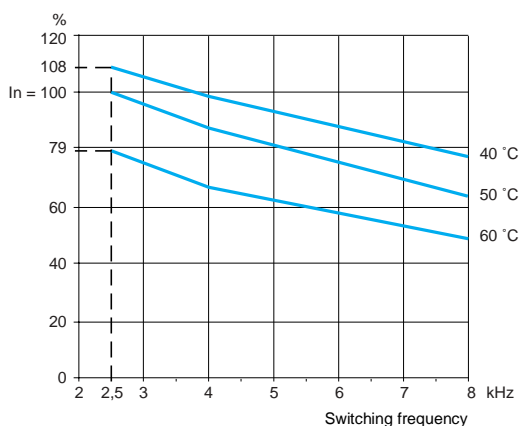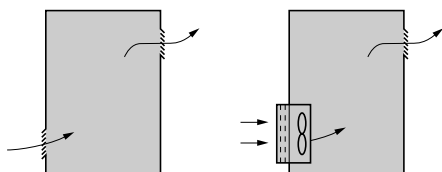


## Specific recommendations for mounting in an enclosure

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.*

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# Variable speed drives
# for asynchronous motors
Altivar 71

## 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)

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

$\theta$ = maximum temperature inside enclosure in °C
$\theta e$ = 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.*

| 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 |

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*Combinations*

# Variable speed drives
# for asynchronous motors
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## 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**

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| 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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|  | ■ | ■ | ■ |  |
|  | ■ | ■ | ■ | ■ |
|  |  | ■ | ■ |  |

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*Functions*

# Variable speed drives
# for asynchronous motors
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## Summary of functions

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

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*Functions*

# Variable speed drives
# for asynchronous motors
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## Summary of functions (continued)
### Application functions (continued)

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

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# Variable speed drives
# for asynchronous motors
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522148



522149



## 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.*

□ **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.

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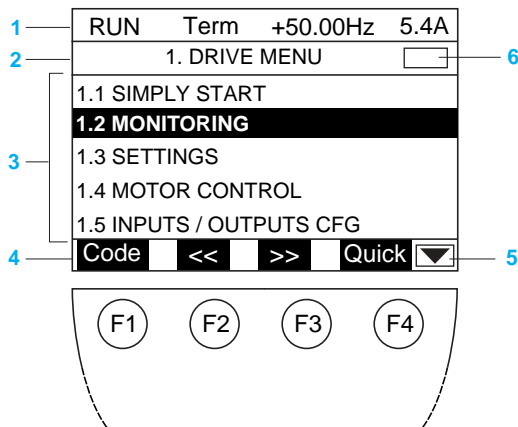
# Variable speed drives
# for asynchronous motors
Altivar 71
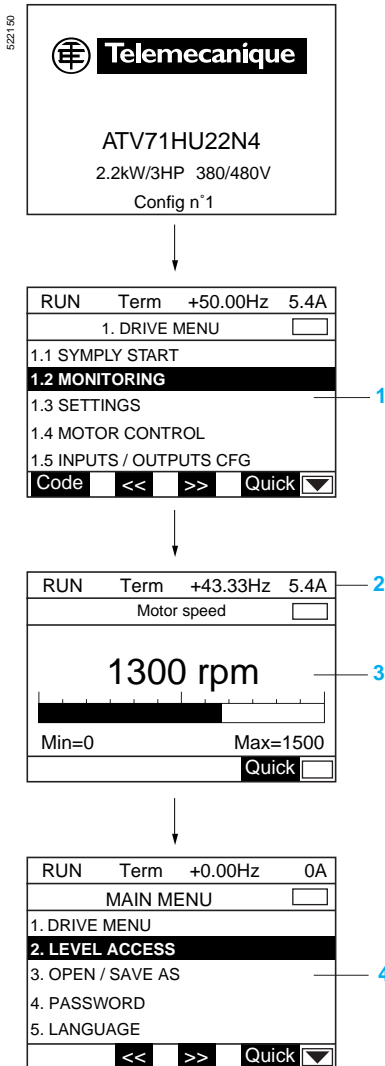
## Remote graphic display terminal functions (continued)

■ **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.

| 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 |

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# Variable speed drives
# for asynchronous motors
Altivar 71

## 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**
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

| 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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*Functions (continued)*

# 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 |

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## 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.
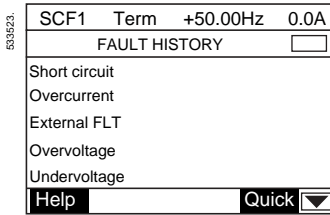
| RUN | Term | +43.33Hz | 5.4A |
|---|---|---|---|
| 1.2 MONITORING | | | ☐ |
| Frequency Ref. | : | | 43.3 Hz |
| Motor current | : | | 5.4 A |
| Motor speed | : | | 1300 rpm |
| Motor thermal state : | | | 80 % |
| Drv thermal state | : | | 85 % |
| Code | << | >> | Quick ▼ |

*Displaying physical values*

| RUN | Term | +50.00Hz | 80A |
|---|---|---|---|
| Logic input map | | | |

```
      PR  LI1 LI2 LI3 LI4 LI5 LI6
1
0     ■   ■   ■   ■   ■   ■   ■
      LI7 LI8 LI9 LI10 LI11 LI12 LI13 LI14
1
0     ■   ■   ■   ■    ■    ■    ■    ■
```

| | << | >> | Quick ▼ |

*Logic input map*

| RUN | Mod. | +50.00Hz | 5.4A |
|---|---|---|---|
| COMMUNICATION MAP | | | ☐ |
| **Cmd channel** | **:** | | **Modbus** |
| Cmd Value | : | | ABCD Hex |
| Active ref. channel : | | | CANopen |
| Frenquency ref. | : | | +50.00 Hz |
| ETA status word | : | | 2153 Hex |
| Code | << | >> | Quick ▼ |

*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).

| RUN | Term | +50.00Hz | 1250A |
|---|---|---|---|
| 1.3 SETTINGS | | | ☐ |
| Ramp increment : | | | 0,01 |
| Acceleration | : | | 3,00 s |
| Deceleration | : | | 3,00 s |
| Acceleration 2 | : | | 5,00 s |
| Deceleration 2 | : | | 5,00 s |
| Code | << | >> | Quick ▼ |

*Settings screen*

| 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 ▼ |

*Setting a function*

| RDY | Term | +0.00Hz | 0A |
|---|---|---|---|
| ACCELERATION | | | ☐ |

### 9.51 s

| Min=0,01 | | Max=9999 |
|---|---|---|
| | << | >> | Quick ▼ |

*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.

| RUN | Term | +43.33Hz | 5.4A |
|---|---|---|---|
| Motor speed | | | ☐ |

### 1300 rpm

| Min=0 | | Max=1500 |
|---|---|---|
| | | | Quick ☐ |

*1 bar chart*

| DEC | Term | +38.0Hz | 10A |
|---|---|---|---|
| Output frequency | | | ☐ |

### +45.1 Hz

| | << | >> | Quick ▼ |

*1 digital value*

| RUN | Term | +43.33Hz | 5.4A |
|---|---|---|---|
| 1.2 MONITORING | | | ☐ |
| Frequency Ref. | : | | 43.3 Hz |
| Motor current | : | | 5.4 A |
| Motor speed | : | | 1300 rpm |
| Motor thermal state : | | | 80 % |
| Drv thermal state : | | | 85 % |
| Code | << | >> | Quick ▼ |

*5 digital values*

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# Variable speed drives
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---

```
533523
┌─────────────────────────────────┐
│ 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*

```
522163
┌─────────────────────────────────┐
│ RUN    Term   +50.00Hz    5.4A  │
│     1.11 IDENTIFICATION   ▭      │
│ ATV71HU22N4                     │
│ 2.2 kW / 3HP                    │
│ 380 / 480 V                     │
│ Appl. Software V1.0 IE 01       │
│ MC Software V1.0 IE 01          │
│   <<      >>       Quick ▼      │
└─────────────────────────────────┘
```
*Identification screen*

```
522157
┌─────────────────────────────────┐
│ RUN    Term   +50.00Hz    5.4A  │
│     SERVICE MESSAGE       ▭      │
│ For technical support,          │
│ dial 32 12 75                   │
│                                 │
│                                 │
│                                 │
│                    Quick ▼      │
└─────────────────────────────────┘
```
*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.

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# Variable speed drives
# for asynchronous motors
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## 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

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## 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
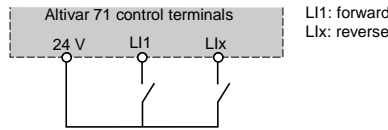Altivar 71

## 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



LI1: forward
LIx: reverse

*Wiring diagram for 2-wire control*

### ■ 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.



LI1: Stop
LI2: Forward
LIx: Reverse
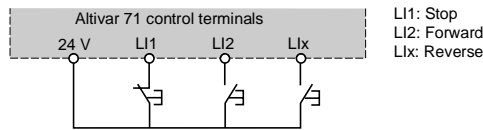
*Wiring diagram for 3-wire control*
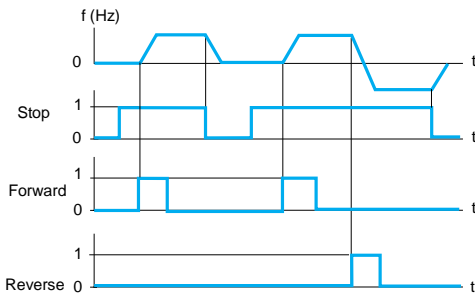


*Example of 3-wire control operation*

### ■ Phase rotation

This function can be used to reverse the direction of rotation without modifying the drive wiring.
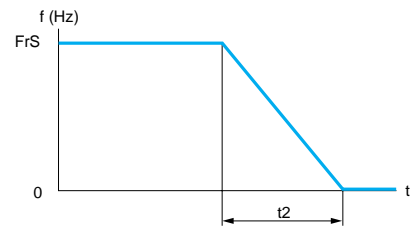
### ■ Ramps
#### □ Acceleration and deceleration ramp times

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

| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| | RAMP | | |
| Ramp shape | : | | Linear |
| Ramp increment | : | | 0.01 |
| Acceleration | : | | 3.92 s |
| Deceleration | : | | 0.54 s |
| Ramp 2 threshold | : | | 0.0 Hz |
| Code | | Quick | ▼ |

*Ramp settings*
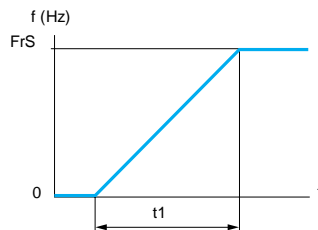


*Linear acceleration ramp*



*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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# Variable speed drives
# for asynchronous motors
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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 | U ramps | Customized ramps |
|---|---|---|
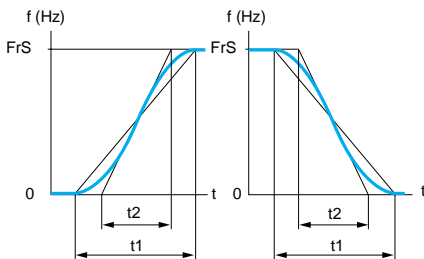


FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.
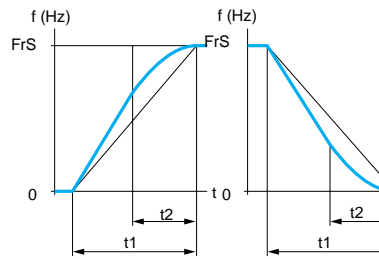
FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.
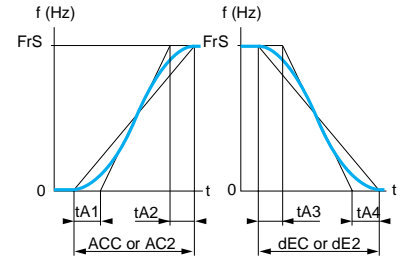
FrS: Nominal motor frequency
tA1: Can be set between 0 and 100% (of ACC or AC2)
tA2: Can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: Can be set between 0 and 100% (of dEC or dE2)
tA4: Can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: Acceleration ramp 1 time
AC2: Acceleration ramp 2 time
dEC: Deceleration ramp 1 time
dE2: Deceleration ramp 2 time
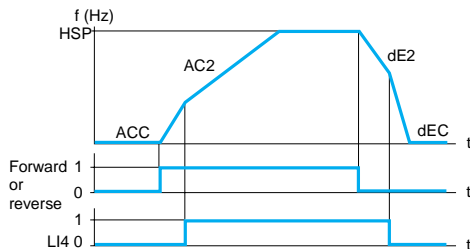


*Example of switching using logic input LI4*

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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# Variable speed drives
# for asynchronous motors
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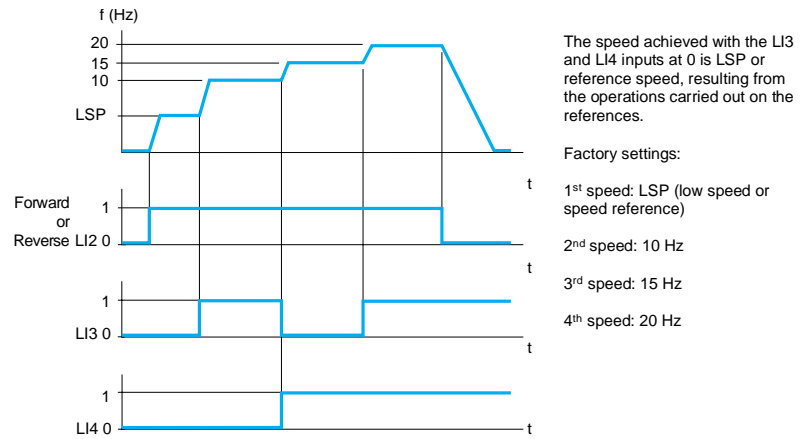*Preset speed settings*

■ **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.
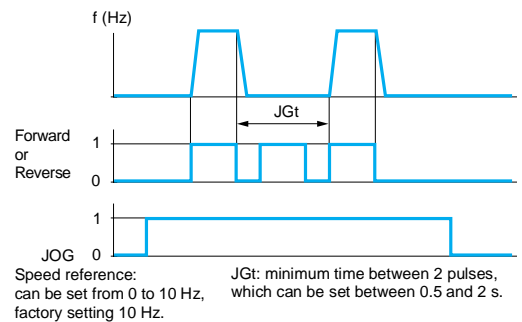


The speed achieved with the LI3 and LI4 inputs at 0 is LSP or reference speed, resulting from the operations carried out on the references.

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.

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# Variable speed drives
# for asynchronous motors
Altivar 71

■ **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 control**
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).

*Functions* (continued)

# Variable speed drives
# for asynchronous motors
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■ **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.

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## ■ 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.
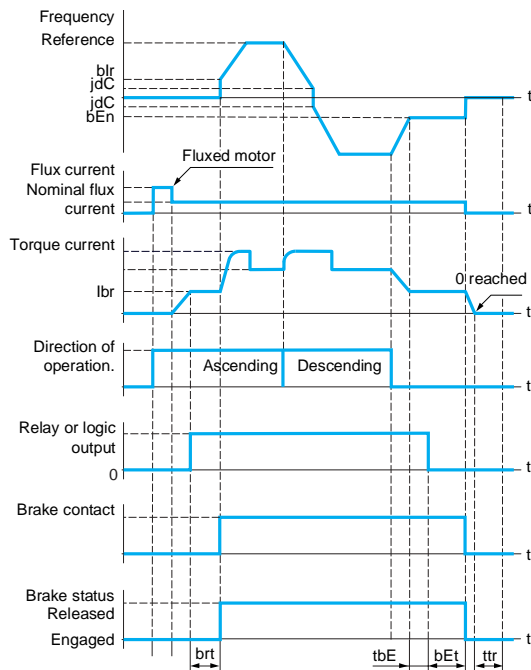


*Open loop vertical movement*

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.*

# Variable speed drives
# for asynchronous motors
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■ **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.
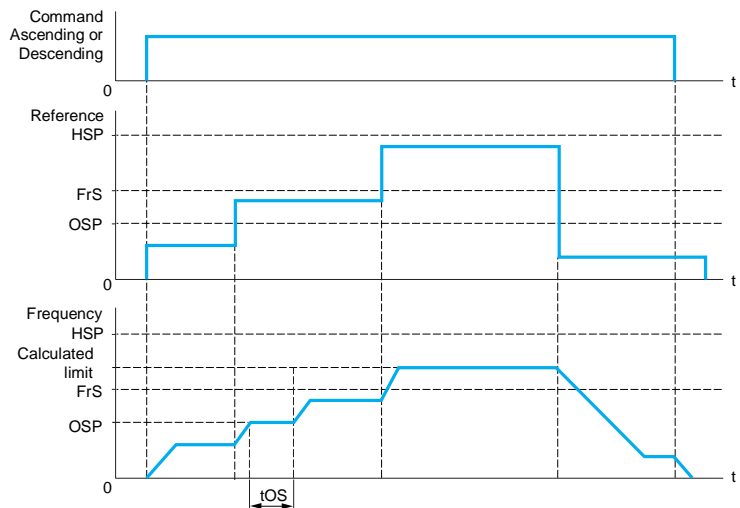


*Speed reference mode*

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.
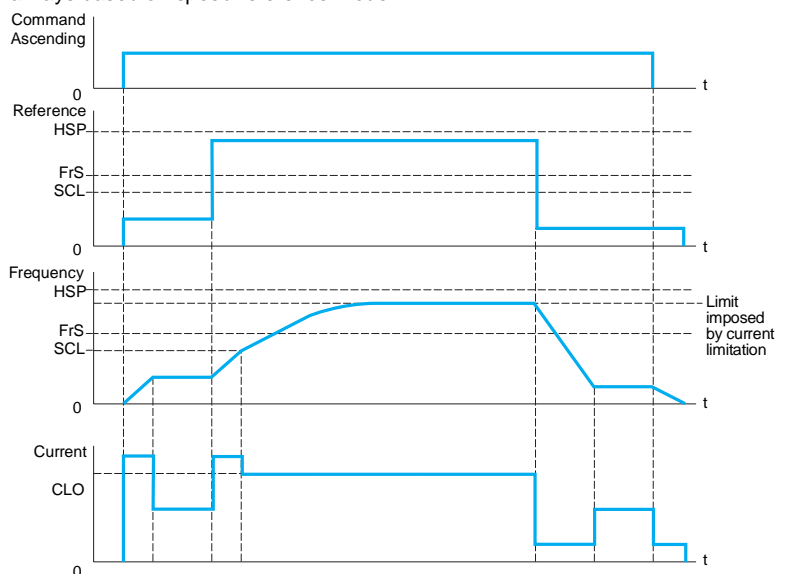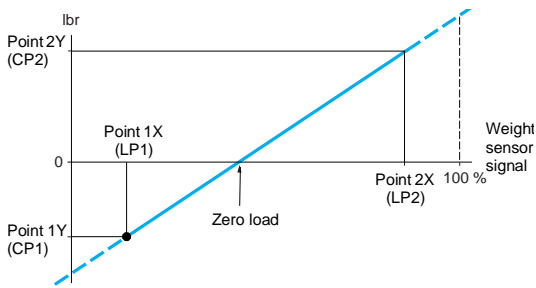


*Current limiting mode*

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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# Variable speed drives
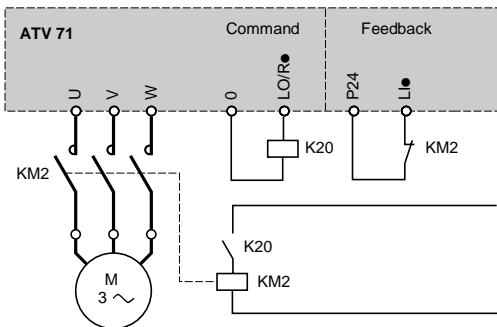# for asynchronous motors
Altivar 71



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.*
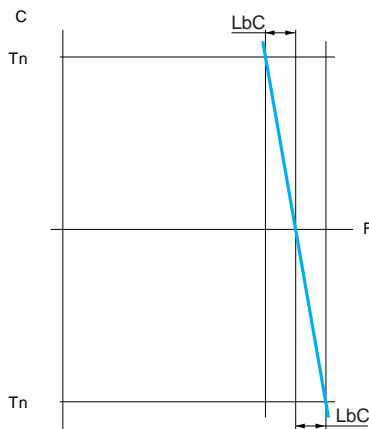


LbC: Load correction (Hz)

*Load sharing*



*Control and integrity check of output contactor*

■ **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 (lbr) 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 (lbr) is adapted according to the curve opposite.

■ **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.

■ **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 $\backsim$, 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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# Variable speed drives
# for asynchronous motors
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■ **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.
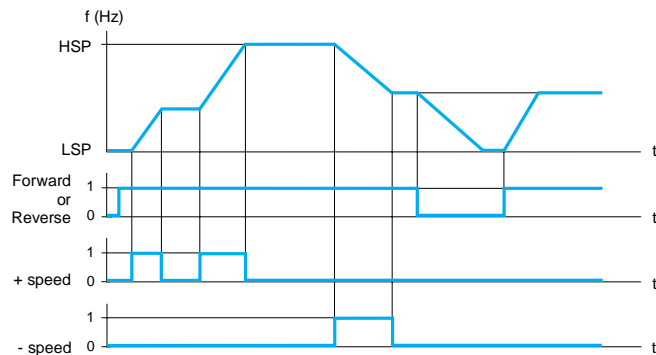
■ **+/- speed**

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).



```
RDY      Term    +0.00Hz    0.0A
         +/- SPEED          □
+ speed assign.:            LI3
- speed assign. :           LI4
Ref. saved    :             RAM

 Code                Quick ▼
```
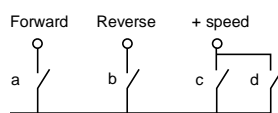*+/- speed function settings*



LSP: low speed, HSP: high speed
*Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving*

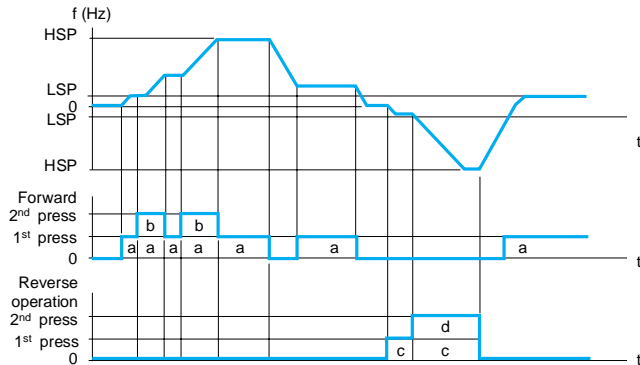**Use of double action buttons**: only 1 logic input assigned to + speed is required.

Logic inputs:



Forward    Reverse    + speed

a          b          c    d

a and b: 1st press
c and d: 2nd press

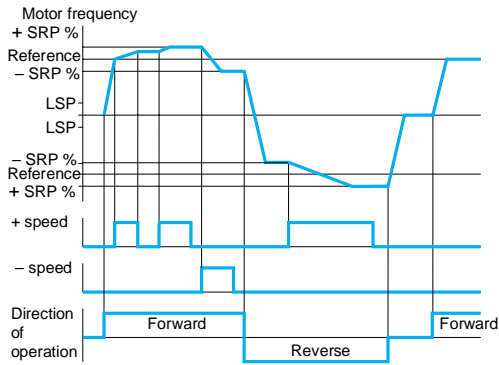|  | **Released** (- speed) | **1st press** (speed maintained) | **2nd press** (+ speed) |
|---|---|---|---|
| Forward button | – | a | a and b |
| Reverse button | – | c | c and d |



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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*Functions* (continued)

# Variable speed drives
# for asynchronous motors
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□ **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).



*Example of +/- speed around a 2-wire control reference*

■ **Spooling**
□ **Traverse control**
Function for winding reels of thread (in textile applications)
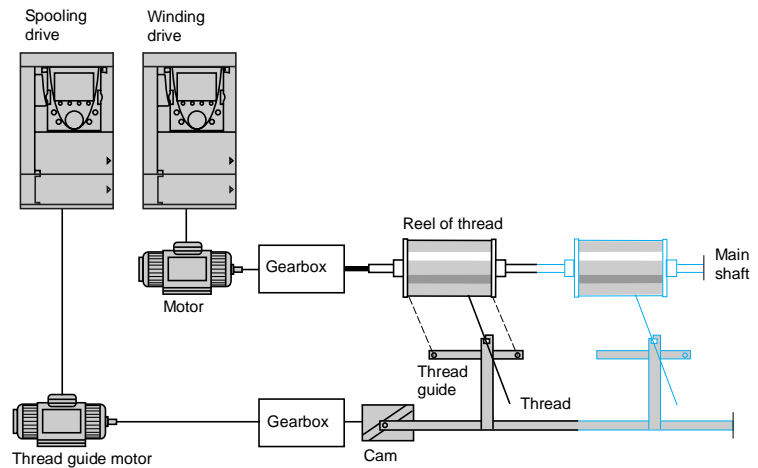


The cam rotation speed must follow a precise profile to ensure a steady, compact,
linear reel is obtained.



A function can also be used to reduce the base reference as the reel gets larger.

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*Functions* (continued)
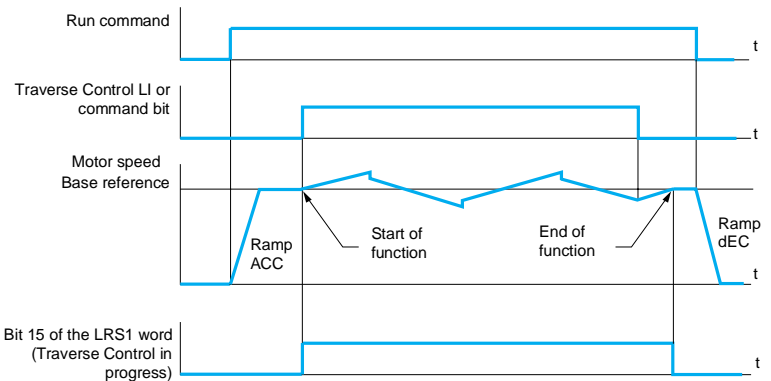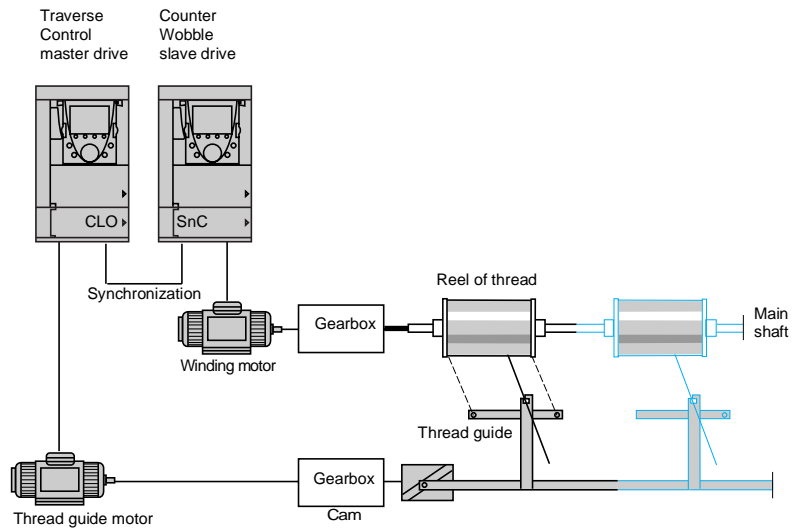
# Variable speed drives
# for asynchronous motors
Altivar 71

□ **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.
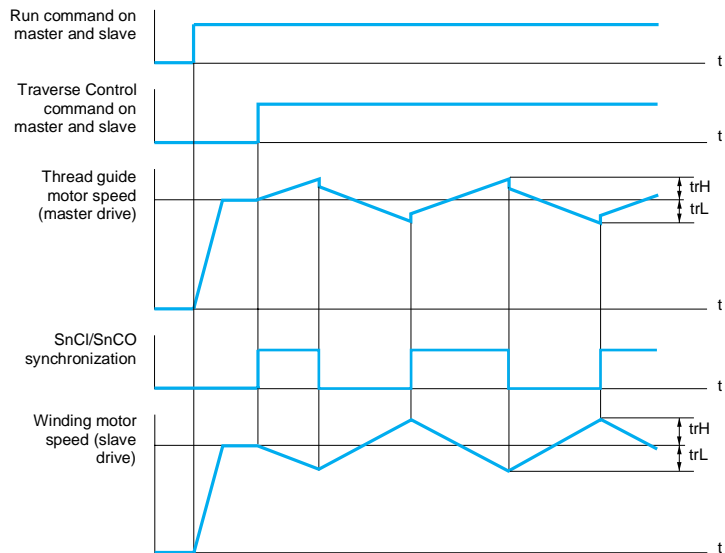


■ **Automatic catching of a spinning load with speed detection** ("catch on the fly")
This function can be used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel 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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# Variable speed drives
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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.

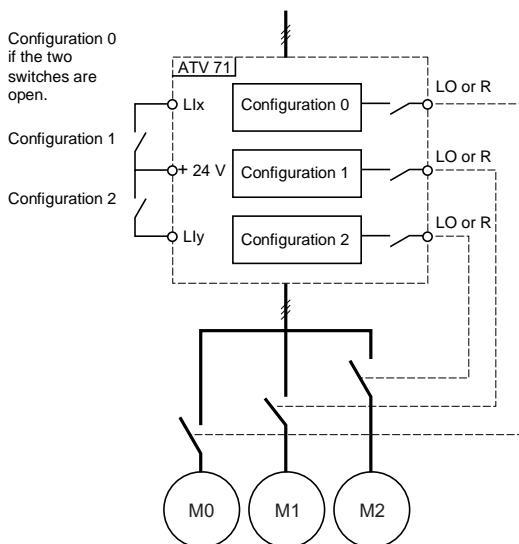Function suitable for machines involving 2 or 3 manufacturing processes.

■ **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.

Configuration 0
if the two
switches are
open.

Configuration 1

Configuration 2

*Schematic diagram for multi-motor mode*

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*Functions* (continued)

# Variable speed drives
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## ■ Positioning on limit switches or position sensors
This can be used to manage positioning based on limit switches or position sensors.



**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.
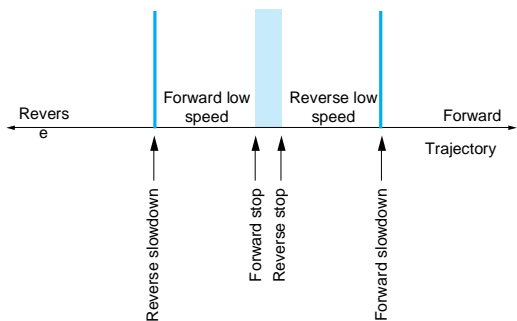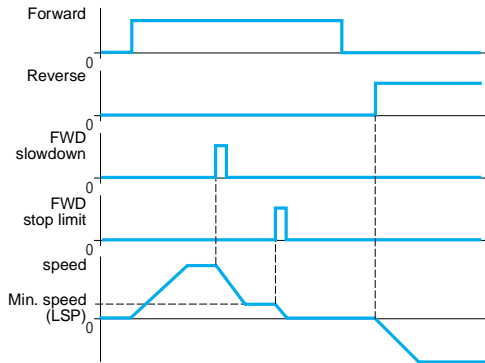


**Example 2**: *positioning on a target zone*
The disable contact can be used to restart in order to get past the target.

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.
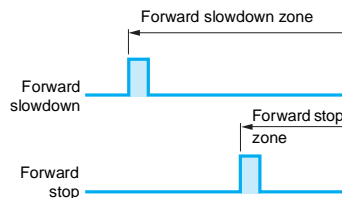


### ☐ Long cams
In this instance, there is no restriction, which means that the function is initialized across the whole trajectory.

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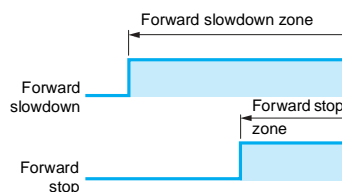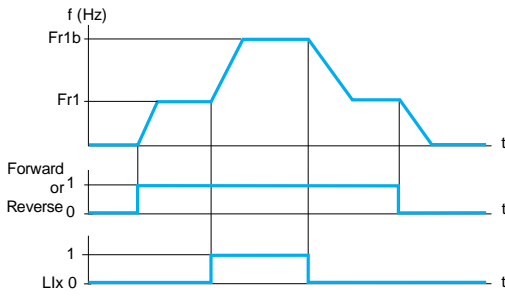
*Example of reference switching*



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").
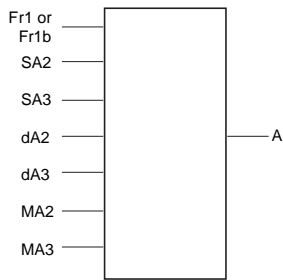The references to be added together are selected from all the possible types of reference.

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.
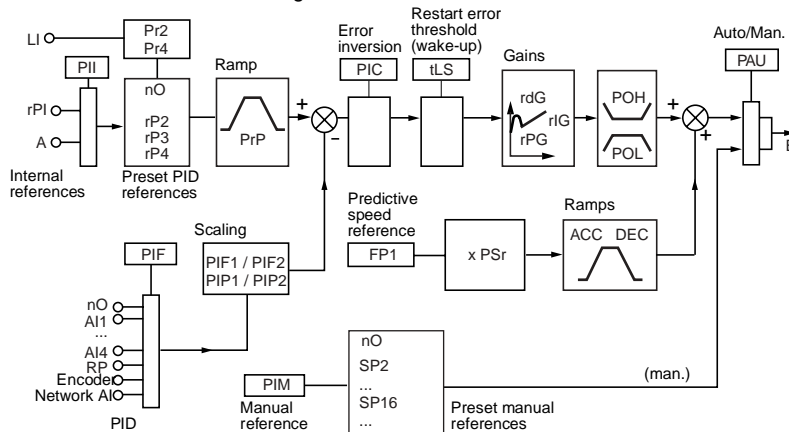


ACC: Acceleration, DEC: Deceleration, LI: Logic inputs, B: Speed reference.

### □ 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.

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

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Ⓣ Telemecanique

# Variable speed drives
# for asynchronous motors
Altivar 71

■ **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.
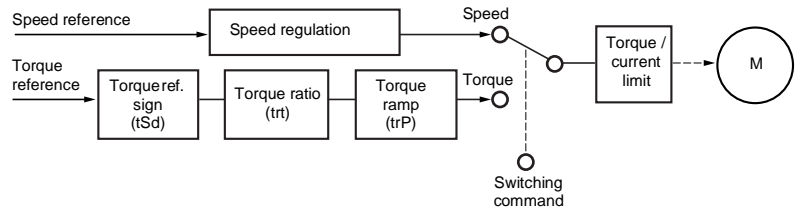


The torque reference is signed and has its own ramp. A torque ratio can be used to scale the reference. It can be transmitted via an analog input, frequency control input (RP input or encoder) or communication network.
The torque sign and value can be output to a logic output and an analog output.

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.



AB and CD: Fallback position
BC: Torque control zone
E: Ideal operating point
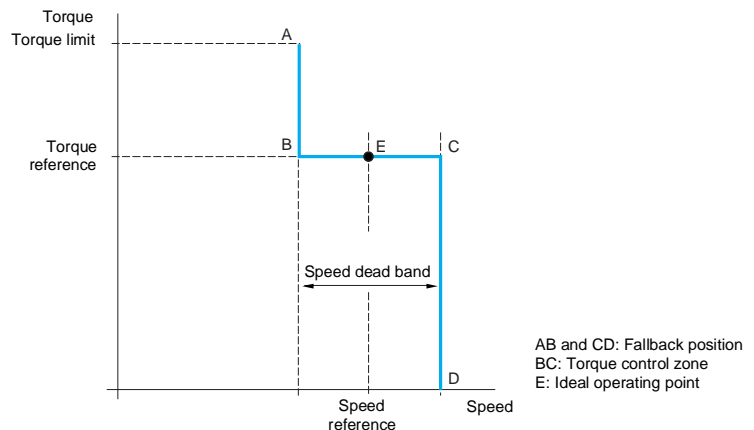
The stop in torque control mode can be configured:
□ automatic switch to speed regulation mode
□ freewheel stop
□ stop at zero torque but still maintaining the flux in the motor for an adjustable period of time.

*Functions* (continued)

# Variable speed drives
# for asynchronous motors
Altivar 71

■ **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.
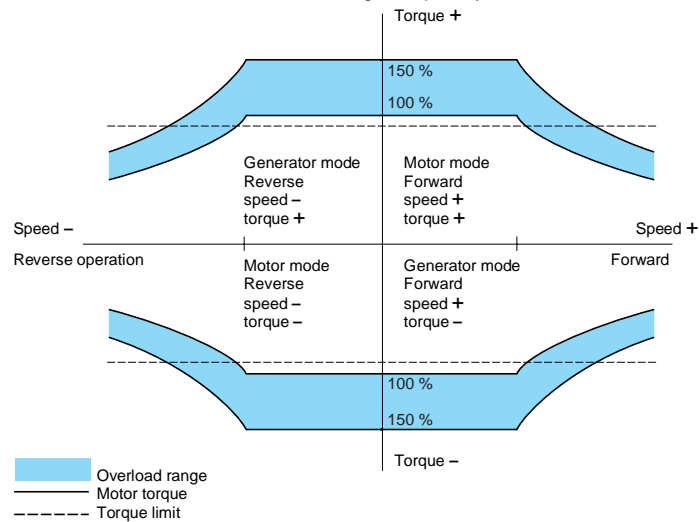


The torque limit operates in both directions of rotation in motor or generator mode.

■ **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



*Configuring current switching*

| 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 |

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# Variable speed drives
# for asynchronous motors
Altivar 71
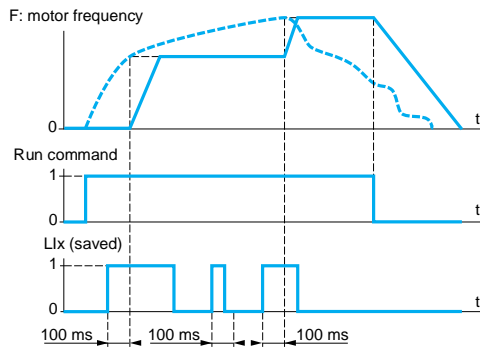


-------- Analog reference

*Example of how reference saving works*



*Configuring stop types*

## ■ 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.

## ■ 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.

| 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 |

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# Variable speed drives
# for asynchronous motors
Altivar 71

■ **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.*
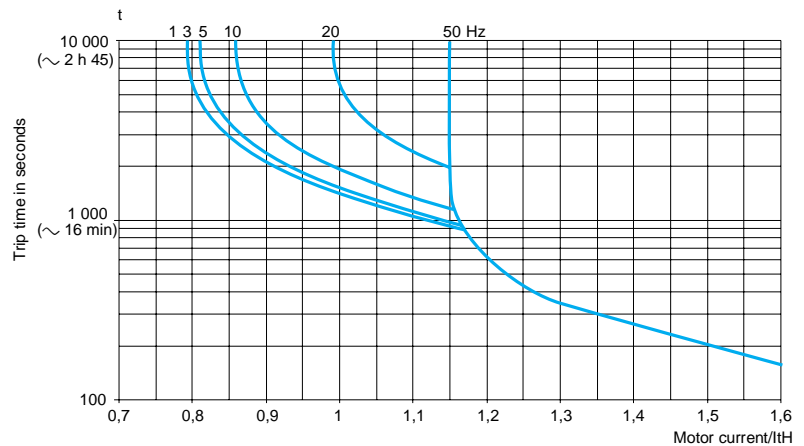


*Motor thermal protection curves*

□ 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.

| Presentation: | Characteristics: | References: | Dimensions: | Schemes: |
|---|---|---|---|---|
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*Functions* (continued)

# Variable speed drives
# for asynchronous motors
Altivar 71

| RDY | Term | +0.00Hz | 0.0A |
|---|---|---|---|
| | 4-20mA LOSS | | |
| Fallback spd | | | |
| Spd maintain | | | ✓ |
| Ramp stop | | | |
| Fast stop | | | |
| DC injection | | | |
| | | Quick ▼ | |

*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.*

| 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 |
|---|---|---|---|---|

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*Functions* *(continued)*

# Variable speed drives
# for asynchronous motors
Altivar 71

■ **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.

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

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# Variable speed drives
# for asynchronous motors
Altivar 71

## ■ 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).
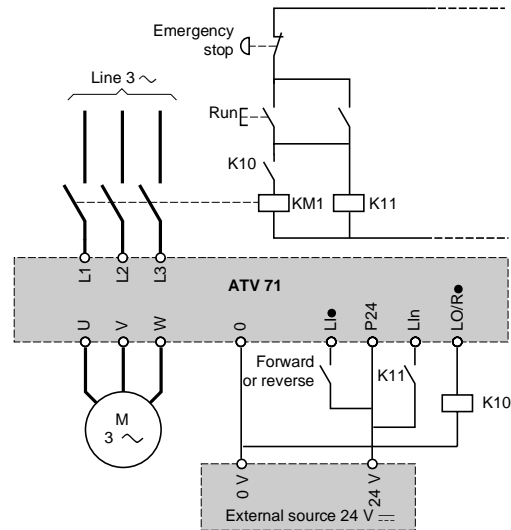


After a run command, if the line contactor is not closed the drive will lock after an adjustable period of time.

## ■ 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

| Presentation: | Characteristics: | References: | Dimensions: | Schemes: |
|---|---|---|---|---|
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# Variable speed drives
# for asynchronous motors
Altivar 71

## 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. |

⊕ **Telemecanique**

| 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) | ⊖ | | |

*PowerSuite screen on PC*
*Management of the installed base*

## 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



*PowerSuite screen on PC*
*View of PI regulator function parameters*

**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



*PowerSuite screen on PC*
*Monitoring control panel (cursor, gauge)*

**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.*

## 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.
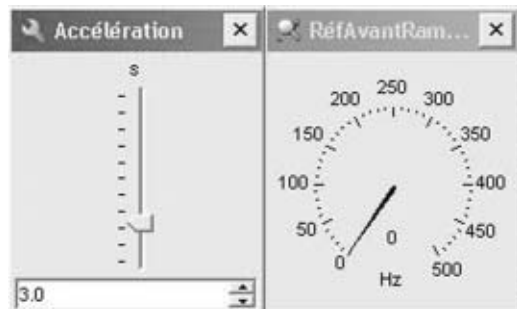When devices are not connected to the Ethernet network, or it is not directly accessible, various remote transmission solutions may be possible (modem, teleprocessing gateway, etc). Please consult your Regional Sales Office.

## 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:
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# Functions *(continued)* — PowerSuite software workshop

off
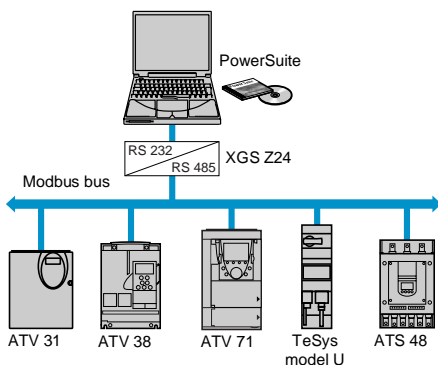


*PowerSuite screen on Pocket PC Adjustments*

## 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**

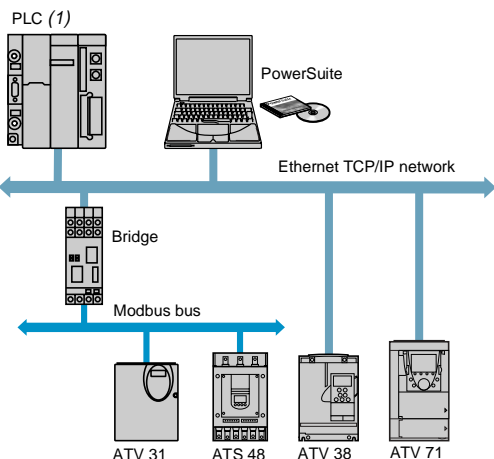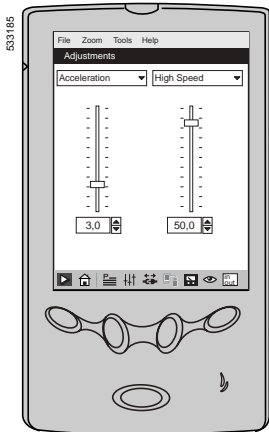The PowerSuite software workshop for Pocket PC can be connected directly to the device terminal port or Modbus network port via the serial port on the Pocket PC.

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.

## References

533187



*VW3 A8 104*

533188



*VW3 A8 114*

### PowerSuite software workshop for PC or Pocket PC

| Description | Composition | Reference | Weight kg |
|---|---|---|---|
| **PowerSuite CD-ROM** | ■ 1 program for PC and for Pocket PC in English, French, German, Italian and Spanish<br>■ Technical documentation<br>■ 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<br>■ 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<br>■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and one RJ 45 connector<br>■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 38/58/58F drives<br>■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 68 drives<br>■ 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<br>■ 1 RS 232/RS 485 converter with one 9-way male SUB-D connector and one RJ 45 connector<br>■ 1 RJ45/9-way SUB-D adaptor for connecting ATV 38/58/58F drives<br>■ 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<br>■ 1 x 0.1 m cable with 2 RJ 45 connectors for PowerSuite<br>■ 1 x 0.1 m cable with 1 RJ 45 connector and 1 mini DIN connector, for TwidoSoft<br>■ 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 |
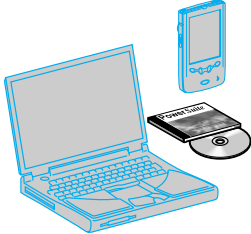
*(1) Updates a version ≥ V1.40 with the latest available version. For versions < V1.40, you should order the PowerSuite CD-ROM, VW3 A8 104.*
*(2) This kit connects to the serial synchronization cable, which must be ordered separately from the supplier of the Pocket PC.*
*(3) Can also be used to communicate 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

# 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.

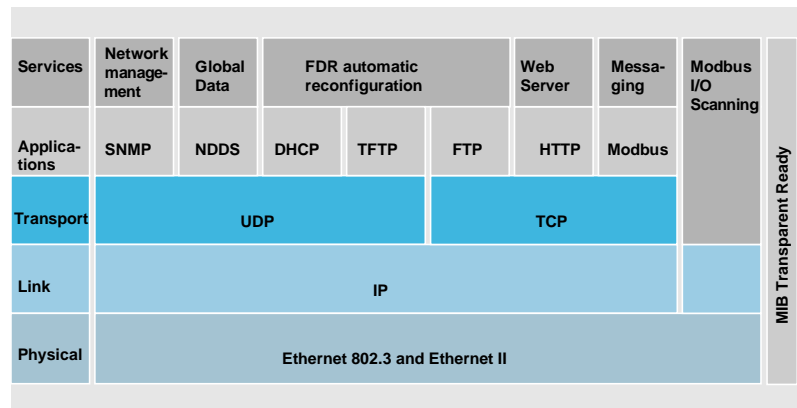Web servers embedded in the network components and control system devices can be used to:
■ Access configuration data transparently
■ Perform remote diagnostics
■ Incorporate simple human/machine interface functions

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 | Network manage-ment | Global Data | FDR automatic reconfiguration | | Web Server | Messa-ging | Modbus I/O Scanning | |
|---|---|---|---|---|---|---|---|---|
| Applica-tions | SNMP | NDDS | DHCP | TFTP | FTP | HTTP | Modbus | |
| Transport | UDP | | | | TCP | | | |
| Link | IP | | | | | | | |
| Physical | Ethernet 802.3 and Ethernet II | | | | | | | |

*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).

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# 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 $\Omega$ ± 15 $\Omega$ 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.*

# 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
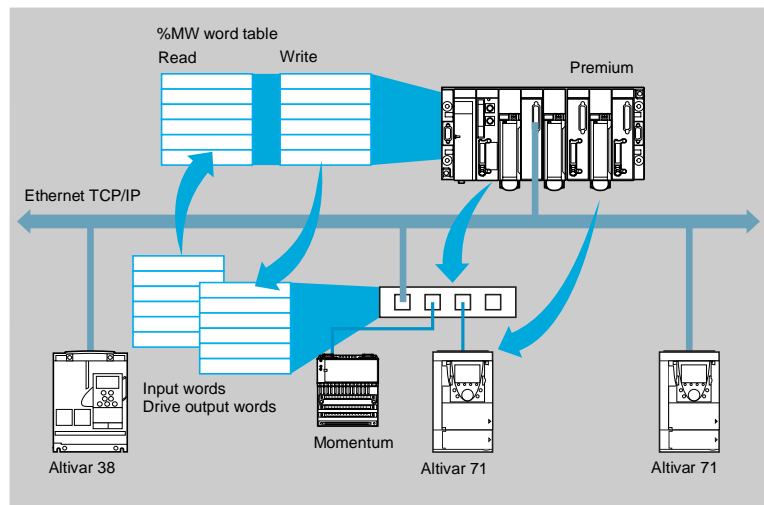


The Altivar 38 and Altivar 71 drives accept the I/O scanning service generated by:
■ The following automation platforms:
□ Premium equipped with a TSX ETY 410/5101 module
□ Quantum
□ Momentum M1E
■ A PC equipped with Modbus communication software with the I/O scanner function
This service is used to 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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# Starters, drives and communication
## Ethernet TCP/IP network
Transparent Ready concept

## 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.
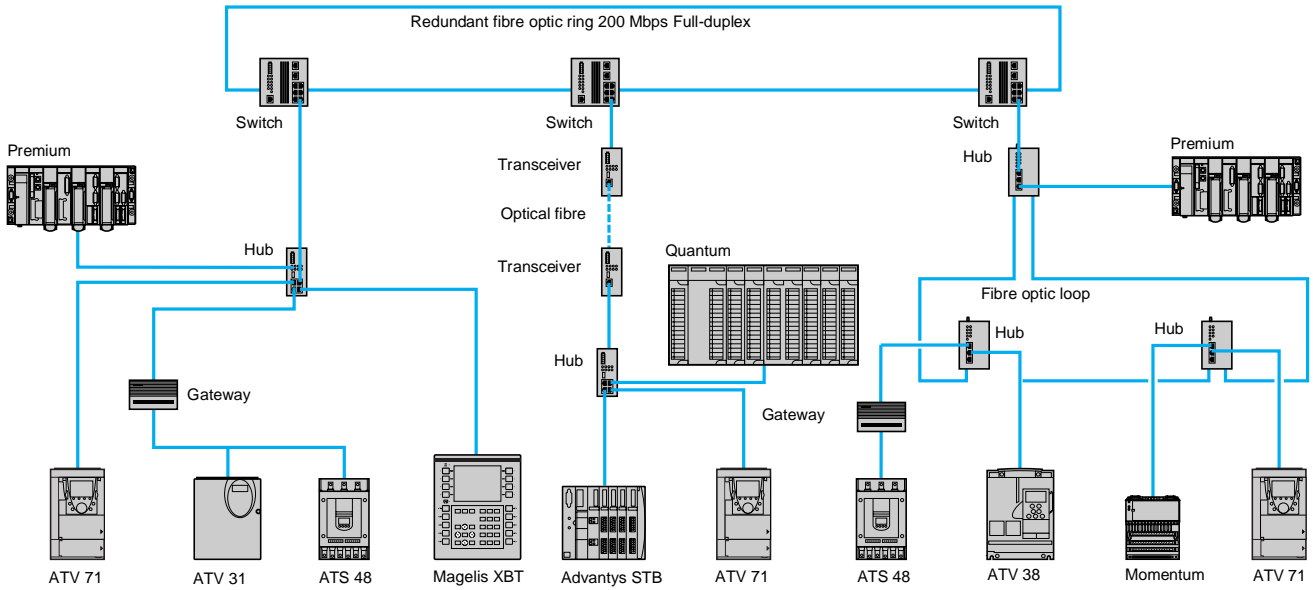
The standard Web server provides access to the following functions:
■ Altivar Viewer
■ Data Editor
■ Ethernet Statistics
■ Security
■ Etc

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.

*Connections,
references*

# Starters, drives
# and communication
Ethernet TCP/IP network
Transparent Ready concept

## Connections



Redundant fibre optic ring 200 Mbps Full-duplex

Switch · Switch · Switch · Hub · Premium · Premium · Transceiver · Optical fibre · Transceiver · Quantum · Hub · Hub · Hub · Fibre optic loop · Hub · Gateway · Gateway

ATV 71 · ATV 31 · ATS 48 · Magelis XBT · Advantys STB · ATV 71 · ATS 48 · ATV 38 · Momentum · ATV 71

## 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 |

*174 CEV 300 20*

### Connecting cables

| Description | Used | | Length | Reference *(3)* | Weight kg |
|---|---|---|---|---|---|
| | **From** | **To** | **m** | | |
| **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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page 181

Functions:
pages 181 to 183

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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<br>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<br>2 x 100BASE-TX ports | **499 NES 171 00** | 0.460 |
| | | 5 x 10BASE-T/100BASE-TX ports<br>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.*

## Presentation
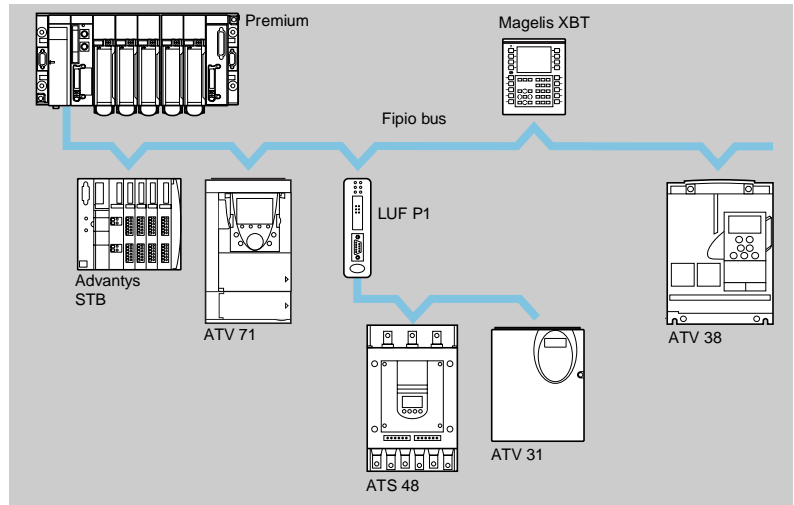


The Fipio fieldbus is a standard means of communication between control system components, and conforms to the World FIP standard.
A Premium PLC (bus manager) can control 127 devices (agents) over a maximum distance of 15 km.
The Fipio bus manager is integrated in the PLC processor.

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.*

# Starters, drives
# and communication
Communication via Fipio bus

## Characteristics

| Structure | Topology | Industrial bus conforming to the World FIP standard<br>Subscribers linked via daisy-chain or tap junctions |
|---|---|---|
| | Access method | Producer/consumer principle<br>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.<br>Optical fibre 62.5/125 with the use of electrical/fibre optic repeaters |
| | Number of subscribers | 32 maximum per segment<br>1 manager + 127 agents maximum over all segments<br>The number of Fipio agents is limited by the memory capacity of Premium processors<br>(62 Altivar drives maximum) *(1)* |
| | Number of segments | Unlimited in tree or star architectures<br>Limited to 5 cascaded segments<br>The link between 2 subscribers may cross 4 electrical or electrical/fibre optic repeaters maximum |
| | Length of bus | 15,000 m maximum<br>1,000 m maximum without repeater for an electrical segment<br>5,000 m maximum for 5 electrical segments<br>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<br>(communication scanner) |
| **Monitoring** | 26 configurable words *(2)* | 8 predefined words | 8 configurable words<br>(communication scanner) |
| **Configuration and adjustment** | 1 indexed word<br>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
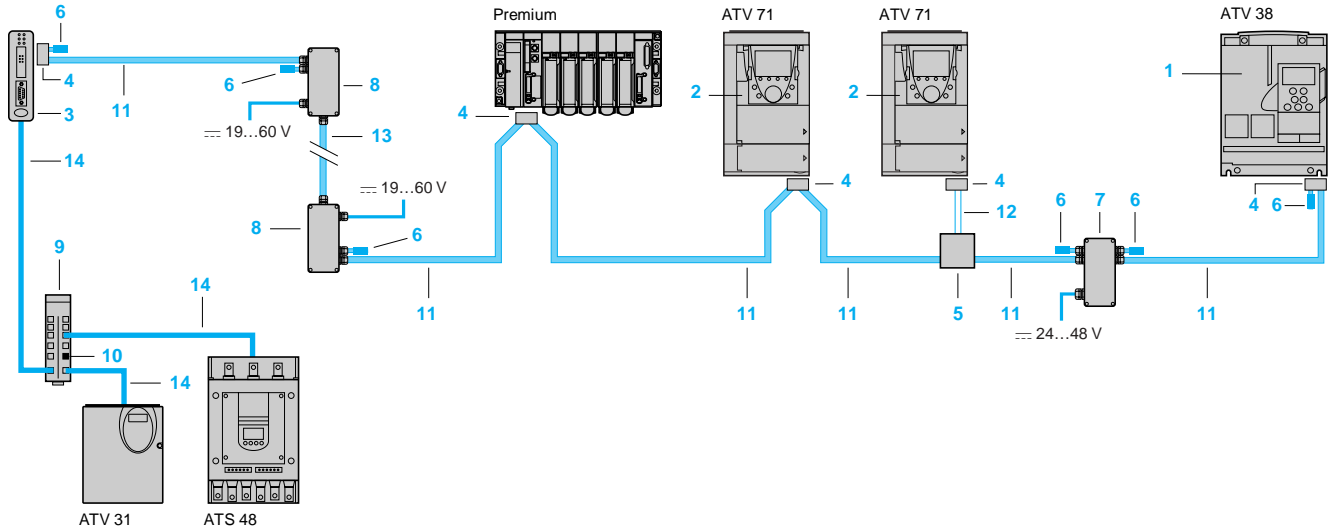


## Elements for connecting the Fipio bus and a Premium PLC *(1)*

### 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 |

*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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# 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 From | To | Code | Length m | Reference | Weight 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*

# Starters, drives and communication
Communication via Modbus bus

## Presentation
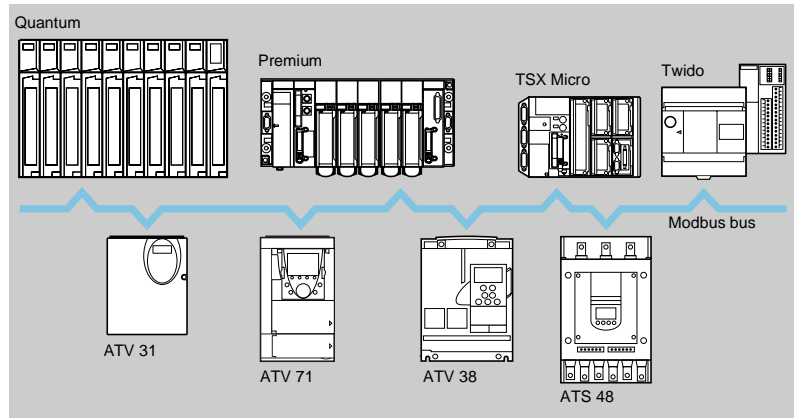


Modbus is a master/slave protocol.

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.*

⊕ **Telemecanique**

# 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 k$\Omega$** | **With polarization 470 $\Omega$** |
| **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 $\Omega$, C = 1 nF). |
| | **With polarization 4.7 k$\Omega$** | Uni-Telway type configuration 27 slaves. Length of bus: 1,000 m Tap link: 20 m maximum. RC line terminators (R =120 $\Omega$, C = 1 nF). | Mixed configuration 18 slaves. Length of bus: 1,000 m Tap link: 20 m maximum. RC line terminators (R =120 $\Omega$, C = 1 nF). |

## 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 $\Omega$ C = 1 nF | **3** | **VW3 A8 306 RC** | 0.200 |
| | R = 150 $\Omega$ | **3** | **VW3 A8 306 R** | 0.010 |

### 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 |
| | 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 | | 3 | **VW3 A8 306 R30** | 0.130 |
| **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 |

*(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.*
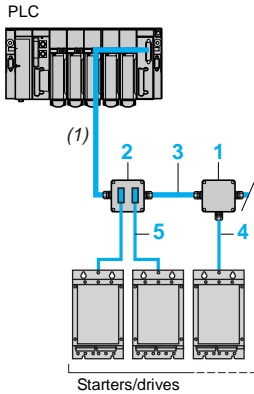*(3) Sold in lots of 2.*

PLC

*(2)*

Starters/drives

522184

*LU9 GC3*

532174

*VW3 A8 306 TF●●*

PLC

*(1)*

Starters/drives

533178

*TSX SCA 50*

533179
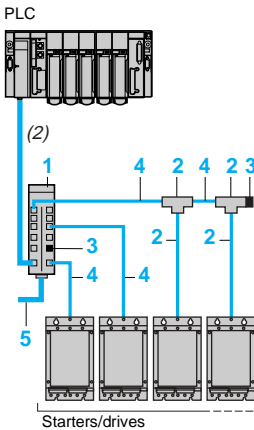
*TSX SCA 62*

## Connection elements using tap junctions

### Kit

| Description | Used with | For protocol | Reference | Weight kg |
|---|---|---|---|---|
| **Communication kit** comprising:<br>■ 1 communication card equipped with one 9-way female SUB-D connector<br>■ 1 x 3 m cable equipped with:<br>□ One 9-way male SUB-D connector for connection to the communication card<br>□ One 15-way male SUB-D connector for connection to a TSX SCA 62 subscriber socket<br>■ 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 |

### Cables

| Description | Used From | To | Code | Length m | Reference | Weight 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.*

# Starters, drives and communication
## Communication via Modbus bus

### Connection elements using tap junctions (continued)

#### Cables

| Description | Used | | For | Reference | Weight |
| --- | --- | --- | --- | --- | --- |
| | From | To | protocol | | kg |
| **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 |
| --- | --- | --- | --- | --- | --- |
| | From | To | m | | kg |
| **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.*

## Presentation
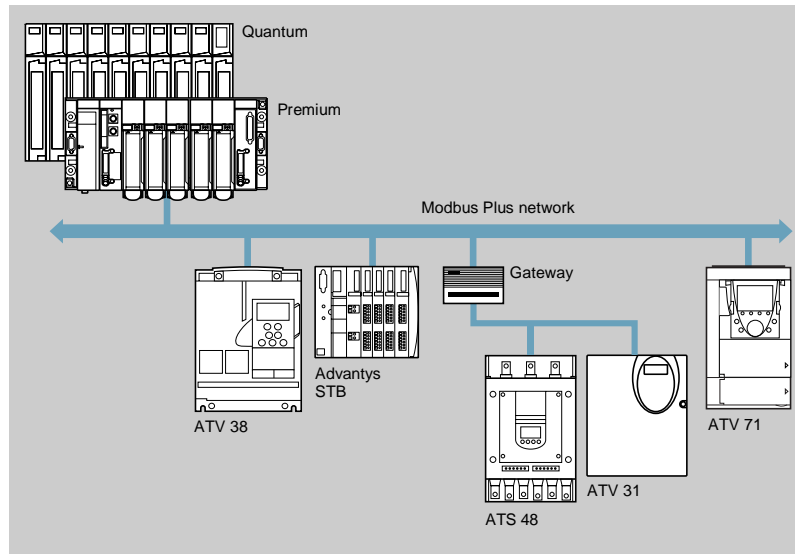


The Modbus Plus network is a high-performance industrial local area network which can be used to meet the needs of client/server type extended architectures, combining a high data rate (1 Mbps), simple low-cost transmission media and numerous messaging services.

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
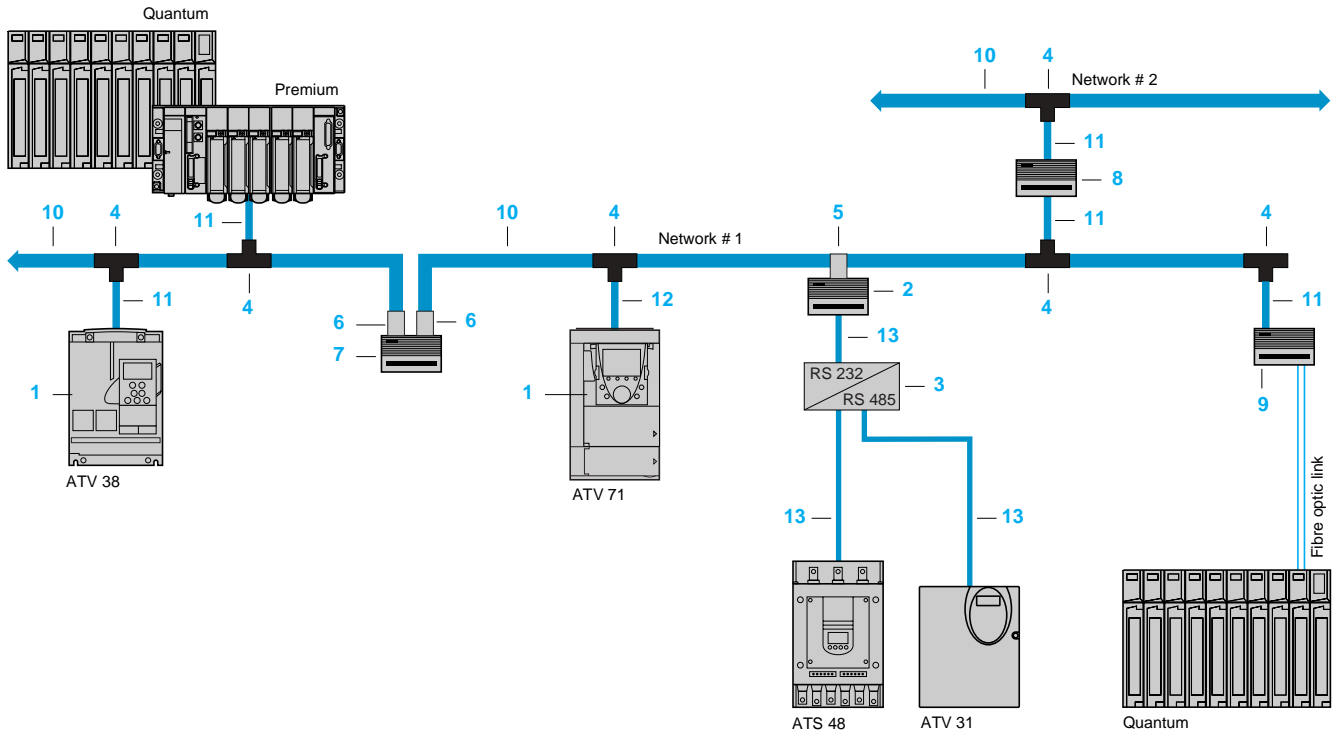■ The "Global data" service for monitoring the drive

Other parameters, which are used less frequently, can be accessed by the Modbus messaging service.

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# 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<br>Optical fibre |
| | Number of subscribers per network | 32, without repeater<br>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<br>1800 m maximum with 3 electrical repeaters<br>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<br>Cyclic exchange of 32 broadcast words<br>Limited to one network<br>This service does not cross bridges |
| | "Peer Cop" dialogue | Point-to-point or broadcast message<br>Limited to one network<br>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"<br>32 predefined words maximum | "Peer Cop"<br>8 configurable words maximum (communication scanner) |
| **Monitoring** | "Modbus messaging" | "Global Data"<br>32 predefined words maximum | "Global Data"<br>8 configurable words maximum (communication scanner) |
| **Configuration and adjustment** | "Modbus messaging" | "Modbus messaging"<br>Read/write access to all drive parameters | |

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## Modbus Plus wiring system

Quantum

Premium

Network # 2

Network # 1

RS 232
RS 485

ATV 38

ATV 71

ATS 48

ATV 31

Quantum

Fibre optic link

## 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.

Presentation:
page 194

Characteristics:
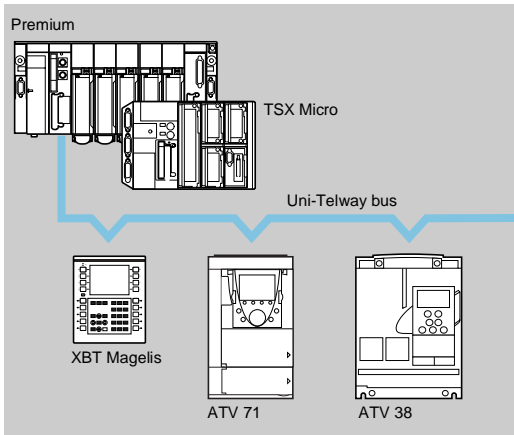page 195

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# Starters, drives and communication
## Communication via Modbus Plus network

| **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.*

*Presentation,*
*characteristics,*
*connections,*

# 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
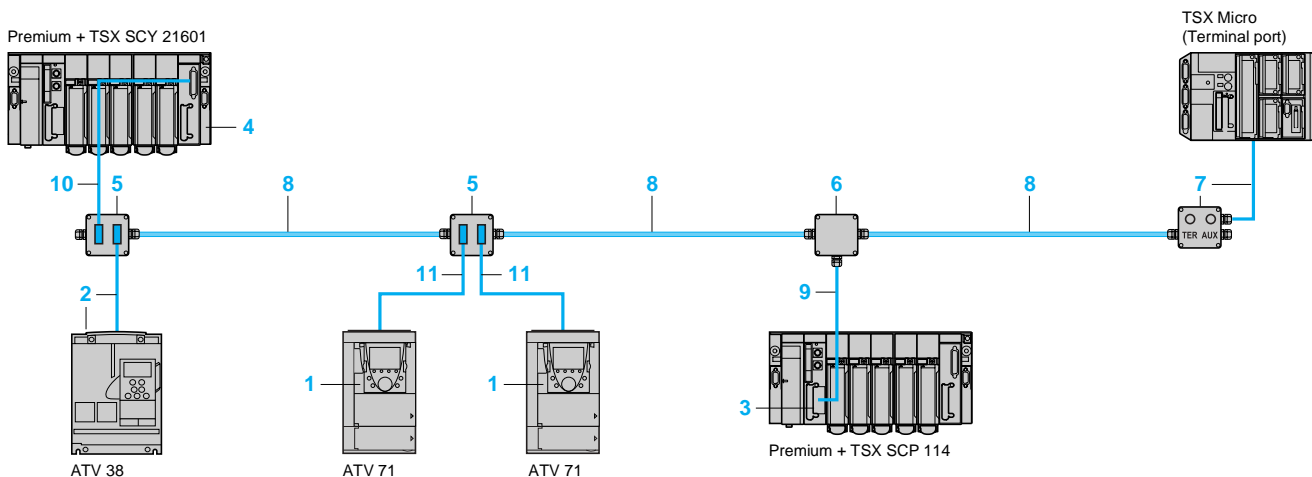


*(1) Limited to 128 bytes with the Premium and TSX Micro PLC terminal port.*

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## 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 |

### 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 |

### Cables

| Description | Used From | 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 21601 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.*

533153

*TSX SCA 62*

533155

*TSX SCA 50*

533154

*TSX P ACC 01*

# Starters, drives
# and communication
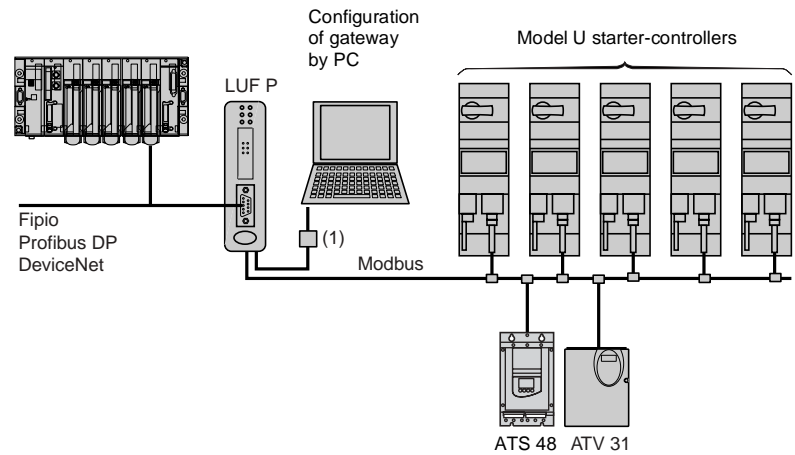Communication gateways LUF P

## 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.
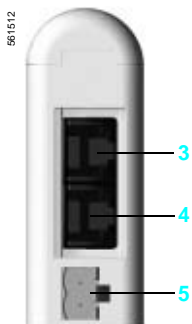
### Underside of product

**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.

Telemecanique

# Starters, drives
# and communication
Communication gateways LUF P

## 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

| | Description | For use with | Length m | Connectors | Reference | Weight kg |
|---|---|---|---|---|---|---|
| 822631 *TSX FP ACC 12* | **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 |
| 822713 | **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** | – |
| *490 NAD 911 03* | | 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

120

75

27

*Presentation,*
*description,*
*setting-up*
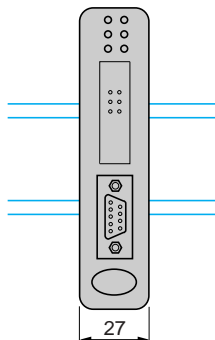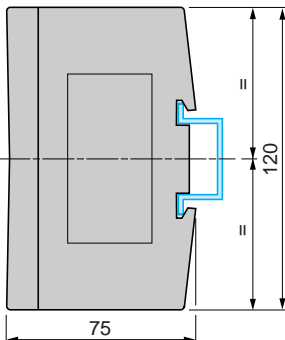
# Starters, drives
# and communication
Communication gateway LA9 P307

## 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
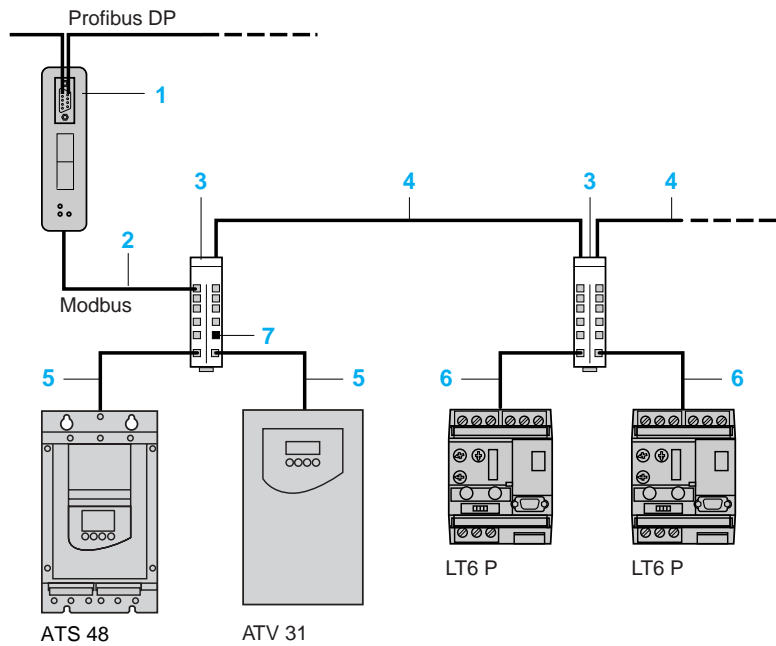


**1** Gateway LA9 P307,
**2** Tap-off cable VW3 P07 306 R10,
**3** Modbus splitter box LU9 GC3,
**4** Cable TSX CSA ●00,
**5** Tap-link cable VW3 A8 306 R●●,
**6** Tap-link cable VW3 A8 306 D30,
**7** Line end adapter VW3 A8 306 RC.

## 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** $\underline{\underline{\phantom{--}}}$ 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.

Characteristics, references :
page 203

Dimensions :
page 203

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◈ Telemecanique

*Characteristics,*
*references,*
*dimensions*

# Starters, drives
# and communication
Communication gateway LA9 P307
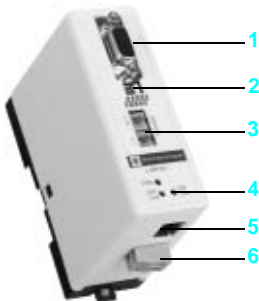
## Characteristics

| | | | |
|---|---|---|---|
| **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



*LA9 P307*



*490 NAD 911 03*

| Description | For use with | 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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Design: Schneider Electric
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ART. 805984

03 / 2005