

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 the standard for safety of machinery N 954-1, category 3
- complies with the standard for functional safety IEC/EN 61508, SIL2 capability (safety control-signalling applied to processes and 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 draft product standard IEC/EN 61800-5-2 for both stop functions:
 - Safe Torque Off (“STO”): response time ≤ 100 ms
 - Safe Stop 1 (“SS1”)

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

This level SIL2 and category 3 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 safety principles	Use of tried and tested components and proven safety principles	Possible loss of safety function, but with a lower probability than in B
2	Selection of components and safety principles	Cyclic testing. The test intervals must be appropriate to both the machine and its application	Fault detected at each test
3	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function ensured, except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected when or before the safety function is next invoked. An accumulation of faults must not result in loss of the safety function.	Safety function always ensured

The machinery 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: mean probability of undetected hazardous 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 (SIL2: mean probability of undetected 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.

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“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 disconnecter 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 signals (e.g. “Power Removal” active); these are Preventa-type safety module outputs which must be integrated into a safety control-signalling circuit.

The schemes on the following pages take into account conformity with standard IEC/EN 60204-1 which defines 3 categories of stop:

- Category 0: stopping by immediate removal of the power from the actuators (e.g. uncontrolled stop)
- Category 1: controlled stop maintaining the power on the actuators until the machine stops, then removal of the power when the actuators stop when the machine stops
- Category 2: controlled stop maintaining the power on the 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 60295/4 and 60295/5 which use a line contactor or a Vario switch disconnecter 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 to monitor the emergency stop circuits.

Machines with short freewheel stopping times (low inertia or high resistive torque, see page 60295/6).

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 60295/7).

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 fault 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”).

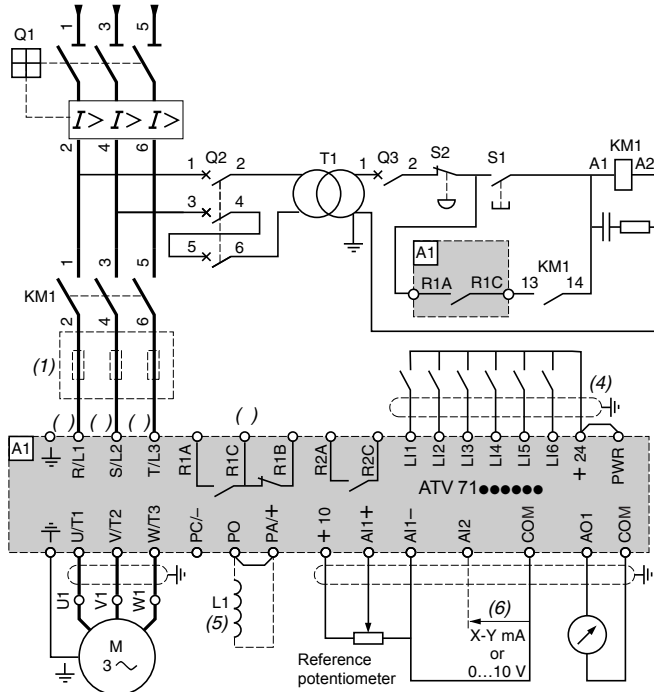
Periodic test

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 the power supply to the motor is not switched off during testing, 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 system process.

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

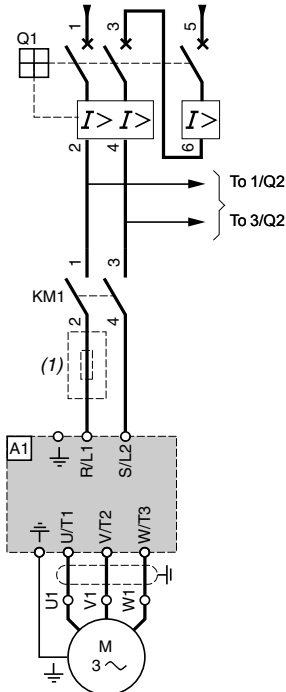
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

3-phase power supply with upstream breaking via contactor



ATV 71H075M3...HU75M3

Power section for single phase power supply



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

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

Reference	Description
A1	ATV 71 drive, see pages 60282/2 to 60282/5
KM1	Contactors, see motor starters pages 60296/2 to 60296/7
L1	DC choke, see page 60289/5
Q1	Circuit-breaker, see motor starters pages 60296/2 to 60296/7
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 60289/8.

(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 60295/8.

(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 60295/9.

(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...D75N4 and ATV 71P●●●N4Z.

Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.

(6) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

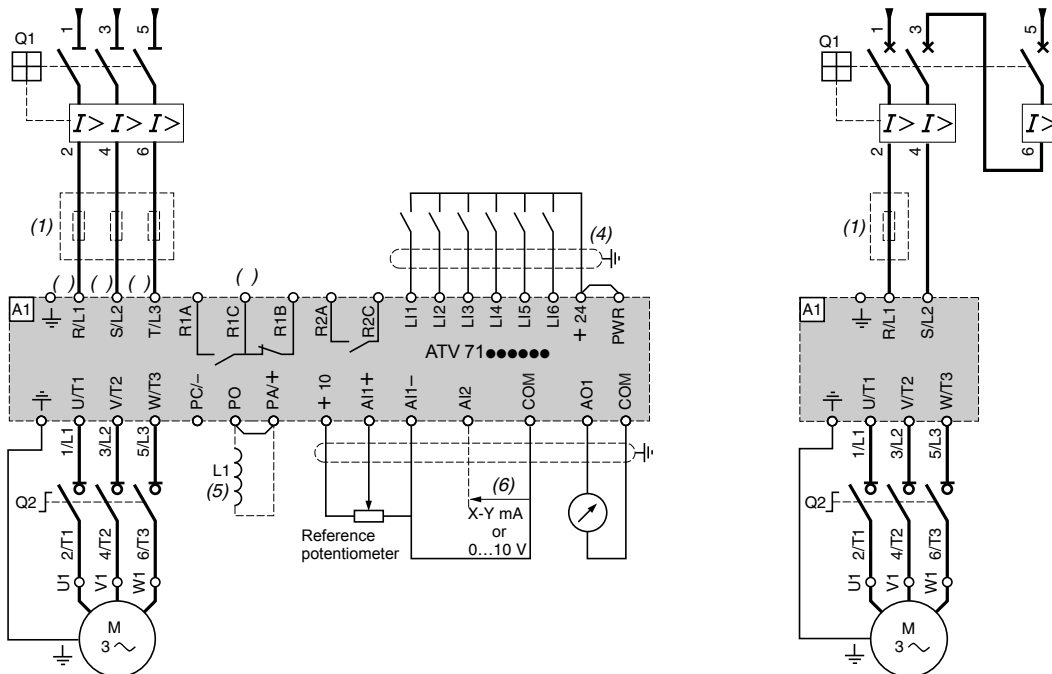
Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 SIL1 capability, in stopping category 0 according to IEC/EN 60204-1 (continued)

ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

3-phase power supply with downstream breaking via switch disconnector

ATV 71H075M3...HU75M3

Power section for single phase power supply



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

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

Reference	Description
A1	ATV 71 drive, see pages 60282/2 to 60282/5
L1	DC choke, see page 60289/5
Q1	Circuit-breaker, see motor starters pages 60296/2 to 60296/7
Q2	Switch disconnector (Vario)

(1) Line choke (single phase or 3-phase), see page 60289/8.

(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 60295/8.

(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 60295/9.

(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...D75N4 and ATV 71P●●●N4Z.

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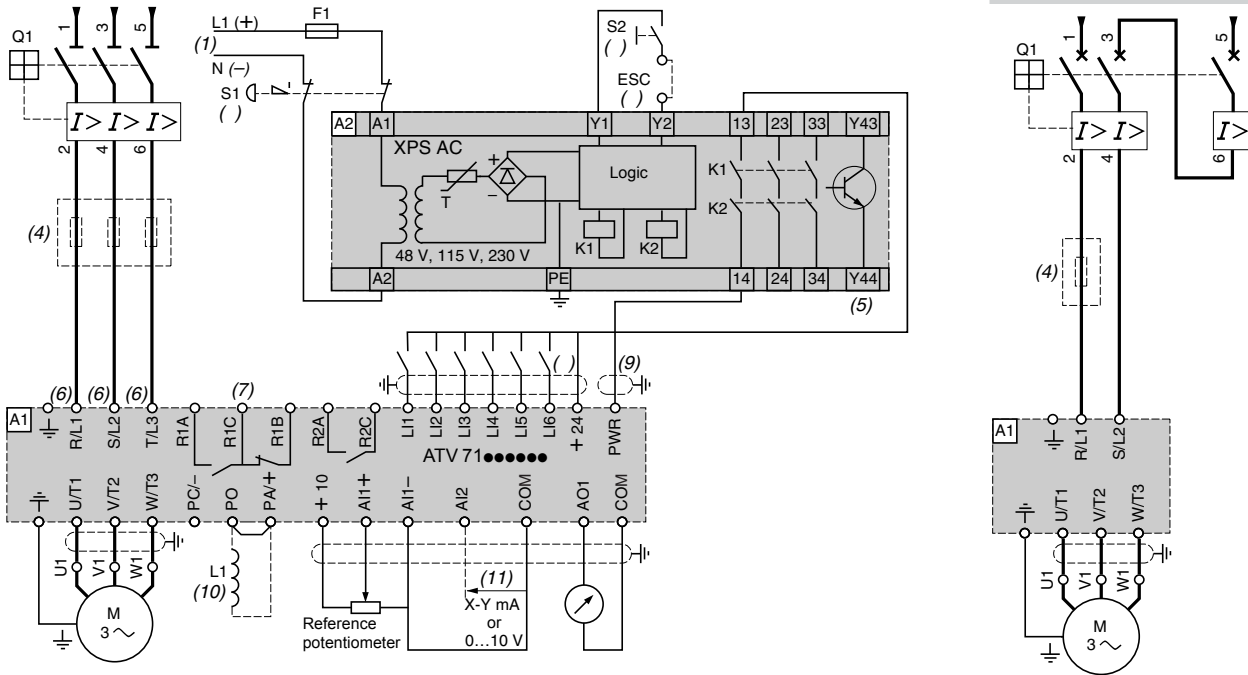
Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1

ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

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 in 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 60282/2 to 60282/5
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. In this case, each drive supplies its own PWR input terminal from its own +24 V via an independent safety contact on the XPS AC module.
F1	Fuse
L1	DC choke, see page 60289/5
Q1	Circuit-breaker, see motor starters pages 60296/2 to 60296/7
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

- (1) Power supply: ☰ or 24 V~, 48 V~, 115 V~, 230 V~.
- (2) S2: resets XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
- (3) Requests freewheel stopping of the movement and activates the “Power Removal” safety function.
- (4) Line choke (single phase or 3-phase), see page 60289/8.
- (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 60295/8.
- (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 60295/9.
- (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 15 m. The cable shielding must be earthed.
- (10) Optional DC choke for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...●D75N4 and ATV 71P●●●N4Z. 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.

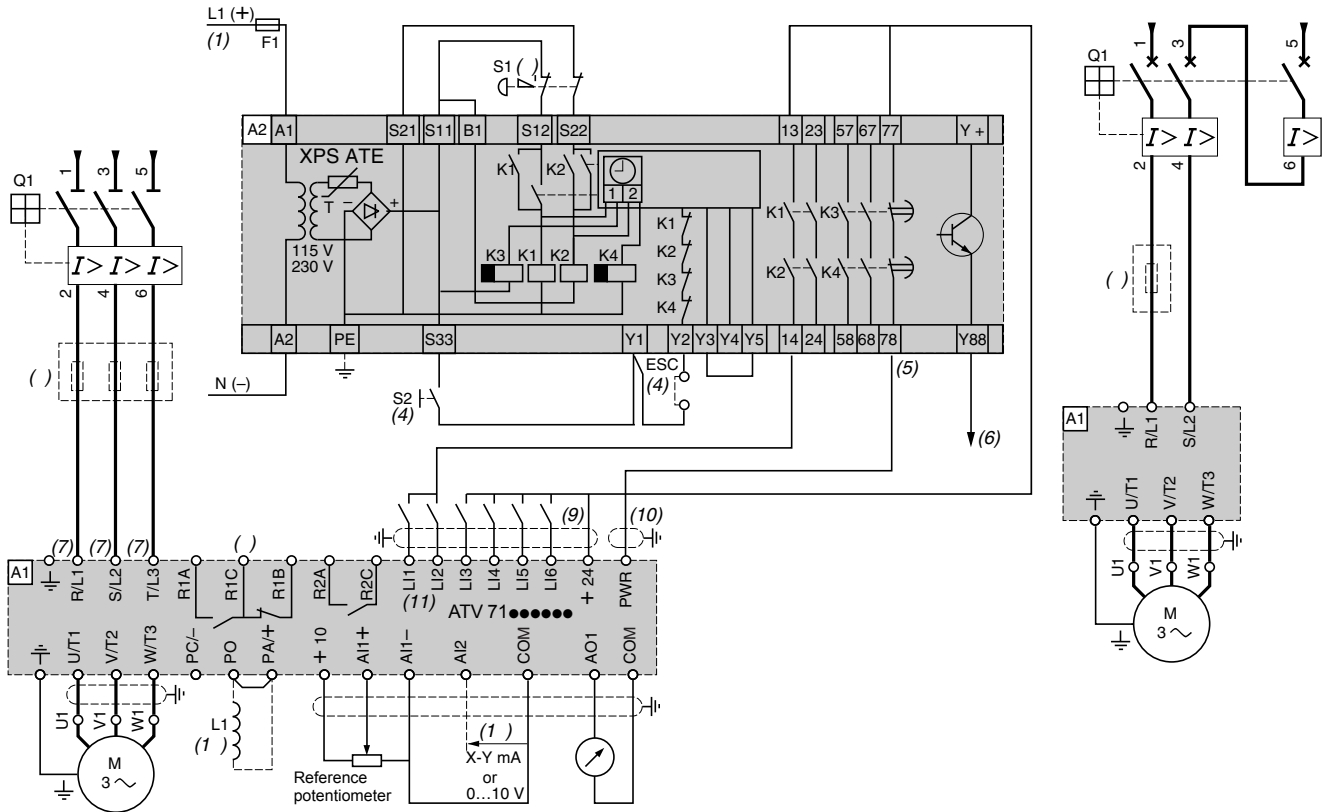
Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 1 according to IEC/EN 60204-1

ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4, ATV 71P●●●N4Z

3-phase power supply, high inertia machine

ATV 71H075M3...HU75M3

Power section for single phase power supply



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

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

Reference	Description
A1	ATV 71 drive, see pages 60282/2 to 60282/5
A2 (5)	Preventa XPS ATE safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" safety function for several drives on the same machine. In this case the time delay must be adjusted on the drive controlling the motor that requires the longest stopping time. In addition, each drive supplies its own PWR input terminal from its own +24 V via an independent safety contact on the XPS ATE module.
F1	Fuse
L1	DC choke, see page 60289/5
Q1	Circuit-breaker, see motor starters pages 60296/2 to 60296/7
S1	Emergency stop button with 2 N/C contacts
S2	Run button

(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 60289/8.

(4) S2: resets XPS ATE module on power-up or after an emergency stop. ESC can be used to set external starting conditions.

(5) 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.

(6) The logic output can be used to signal that the machine is in a safe state.

(7) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 60295/8.

(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 60295/9.

(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 15 m. The cable shielding must be earthed.

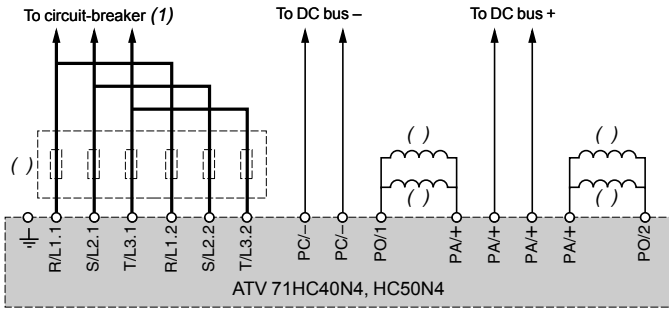
(11) Logic inputs LI1 and LI2 must be assigned to the direction of rotation: LI1 in the forward direction and LI2 in the reverse direction.

(12) Optional DC choke for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...●D75N4 and ATV 71P●●●N4Z.

Connected in place of the strap between the PO and PA+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.

(13) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

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



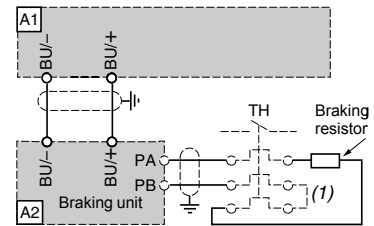
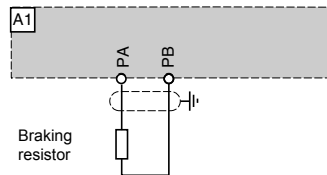
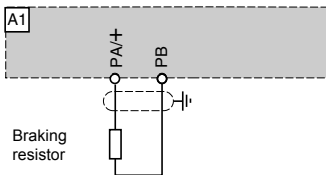
(1) For control section connections, see pages 60295/4 to 60295/7.
 (2) Line choke, see page 60289/8.
 (3) DC chokes supplied as standard with the drive

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

ATV 71H●●M3, ATV 71HD11M3X...HD45M3X,
 ATV 71H075N4...HD75N4,
 ATV 71W●●N4, ATV 71P●●N4Z

ATV 71HD55M3X, HD75M3X,
 ATV 71HD90N4...HC16N4

ATV 71HC20N4...HC50N4



Components for use with the Altivar

Reference	Description
A1	ATV 71 drive, see pages 60282/2 to 60282/5
A2	Braking unit, if using a braking resistor or a hoist resistor, for ATV 71HC20N4...HC50N4, see pages 60288/2 and 60288/3
Braking resistor	See pages 60288/4 and 60288/5

(1) A thermal overload relay can be added.

Examples of recommended schemes

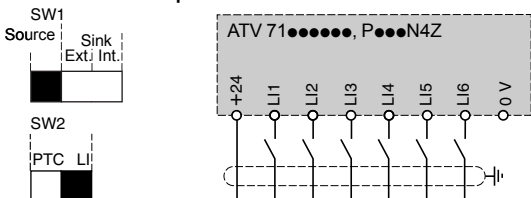
Logic inputs

The SW1 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:

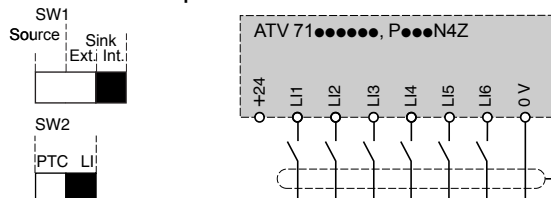
- Position the switch on Source (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

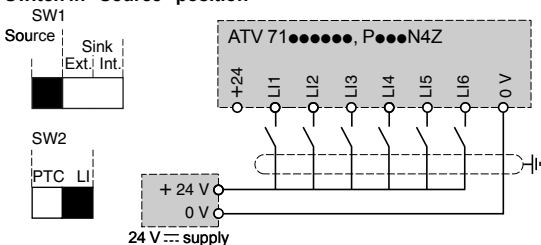


Switch in "Sink Int" position

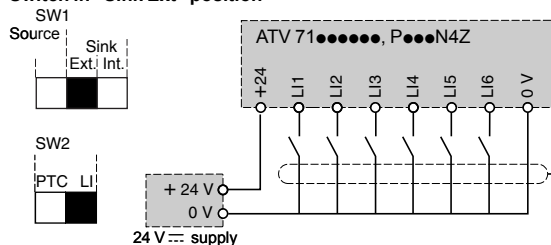


External power supply

Switch in "Source" position



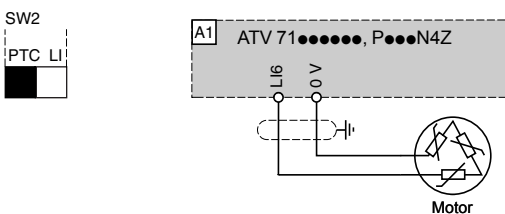
Switch in "Sink Ext" position



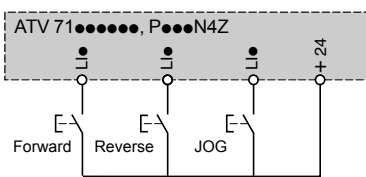
Input for PTC probes

The SW2 switch is used to operate the LI6 input:

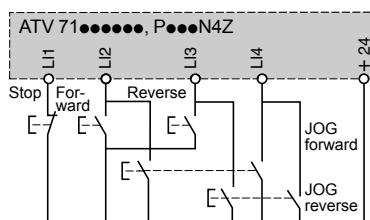
- As a logic input by setting the SW2 switch to LI (factory setting)
- Or for protecting the motor via PTC probes by setting the SW2 switch to PTC



2-wire control and jog operation (JOG)

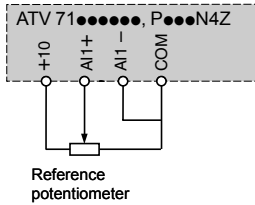


3-wire control and jog operation (JOG)



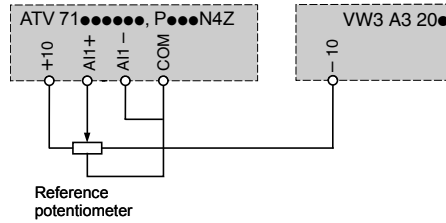
Examples of recommended schemes (continued)

Unipolar speed reference

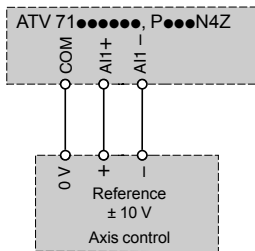


Bipolar speed reference

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

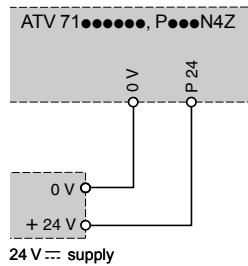


Speed reference using axis control



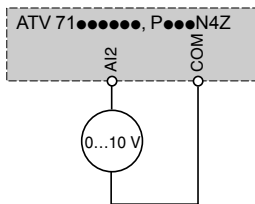
Separate control power supply

The separate control card can be powered by an external 24 V $\overline{\text{---}}$ supply

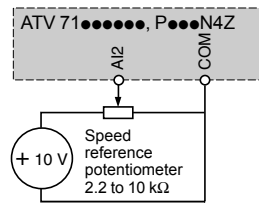


Analog input configured for voltage

External 0...10 V

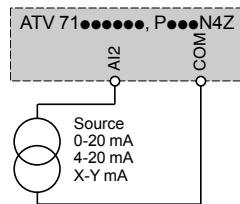


External + 10 V



Analog input configured for current

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



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

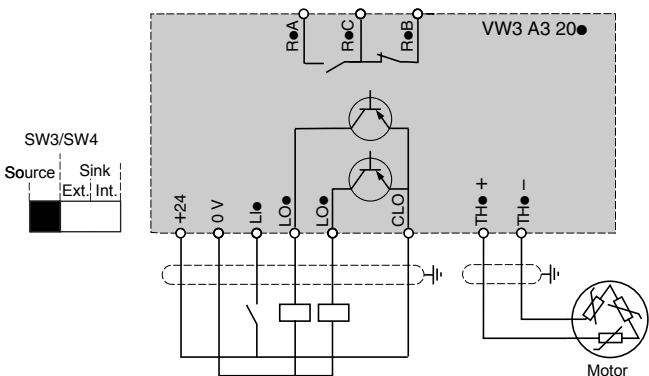
Logic I/O

The SW3 or SW4 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:

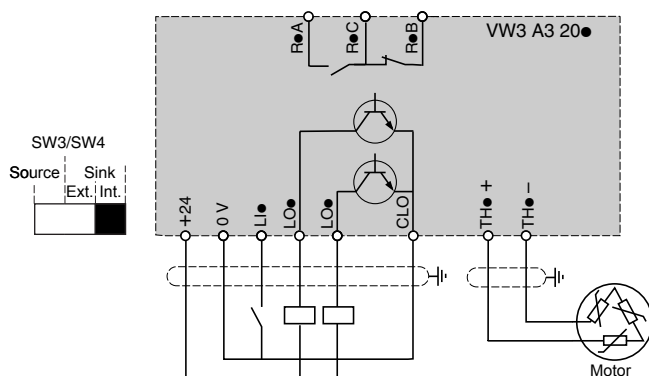
- Position the switch on Source (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

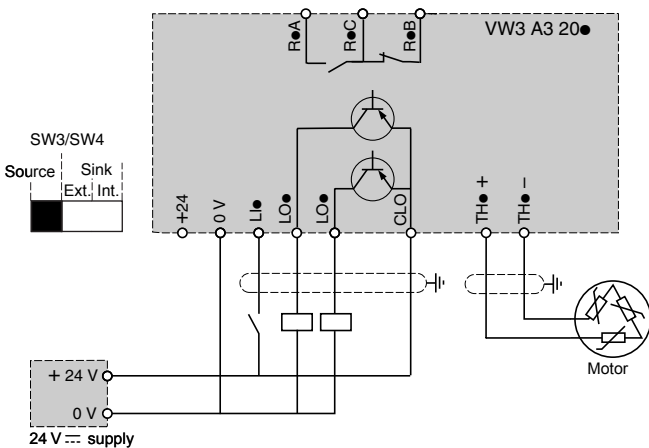


Switch in "Sink Int" position

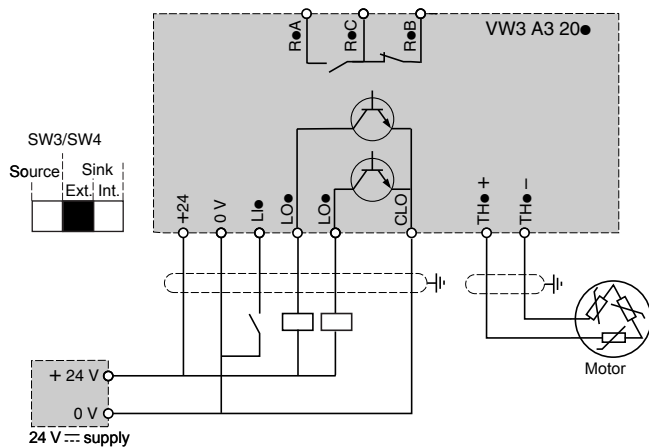


External power supply

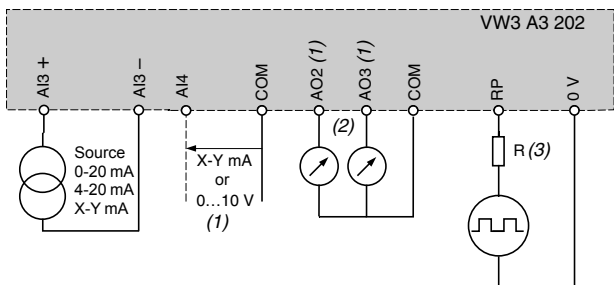
Switch in "Source" position



Switch in "Sink Ext" position



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



(1) Software-configurable current (0-20 mA) or voltage (0...10 V) analog input.

(2) Software-configurable current (0-20 mA) or voltage (± 10 V or 0...10 V) analog outputs, independent selection possible for each output via switch).

(3) R: add a resistor if the input voltage of the pulse train is greater than 5 V.

Recommended values:

Input voltage V	Resistance Ω
12	510
15	910
24	1300

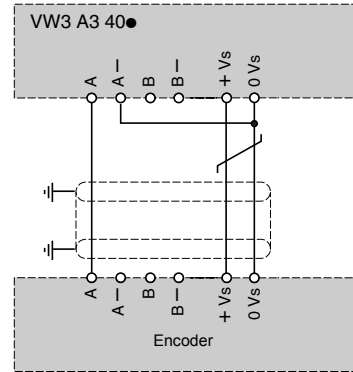
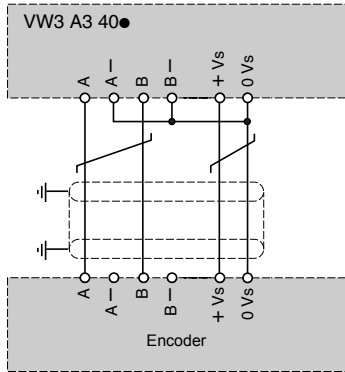
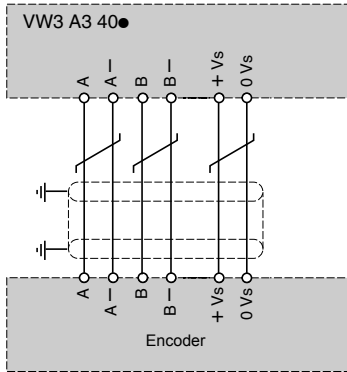
VW3 A3 401 to VW3 A3 407 encoder interface cards

Closed loop control

Wiring of encoders VW3 A3 401...407
A, A-, B, B- signals

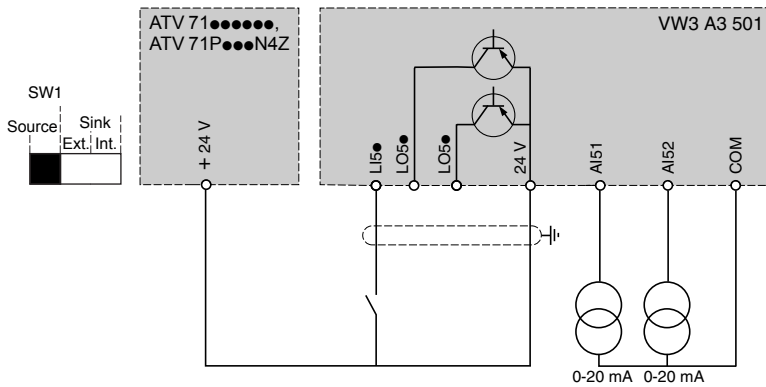
Wiring of encoders VW3 A3 403...407
AB signals

Wiring of encoders VW3 A3 403...407
A signal

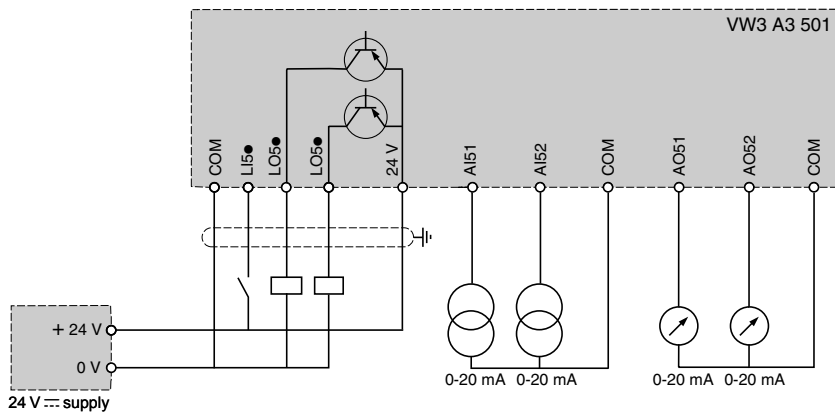


VW3 A3 501 "Controller Inside" programmable card

Card powered by the drive (1)



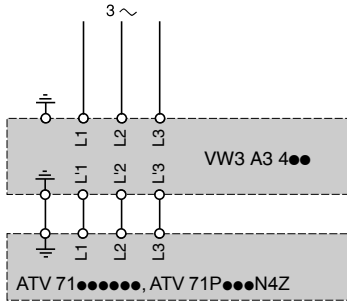
Card powered by external power supply



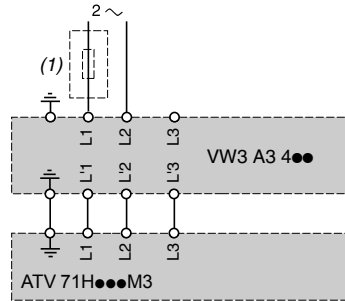
(1) Only if the power consumption is less than 200 mA; otherwise use an external power supply.

VW3 A4 4pp additional EMC input filters

3-phase power supply, 3-phase filter



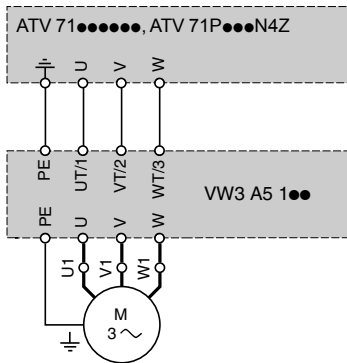
Single phase power supply, 3-phase filter



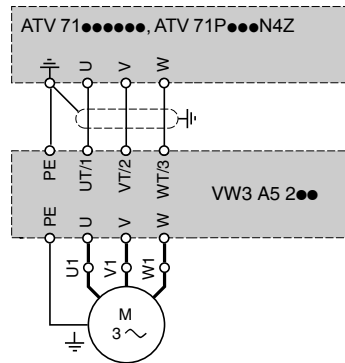
(1) Line choke compulsory for ATV 71HU40M3...HU75M3, see page 60289/8.

Output filters

VW3 A5 1 motor chokes

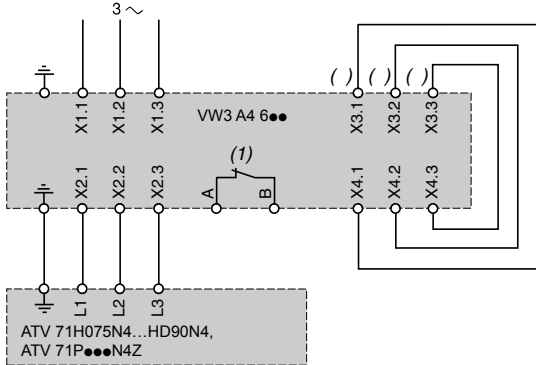


VW3 A5 2 sinus filters



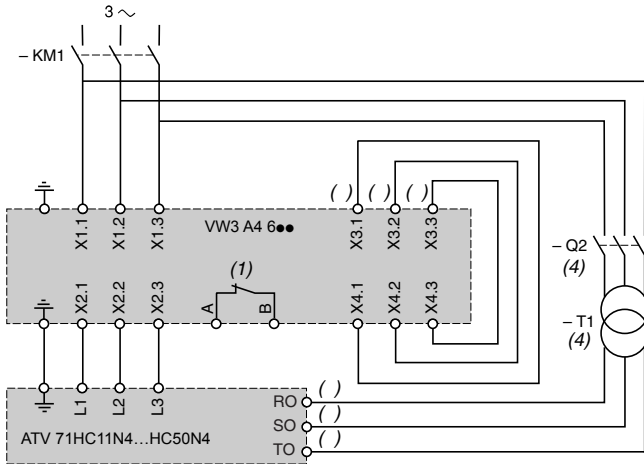
VW3 A4 6pp passive filters

Scheme with 1 passive filter for ATV 71H075N4...HD90N4 and ATV 71P●●●N4Z drives

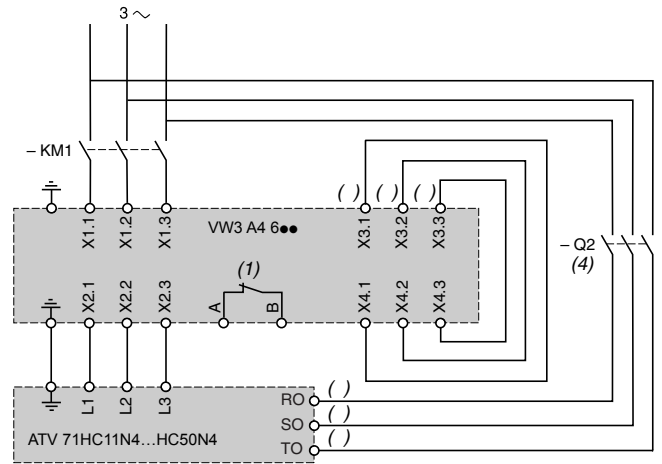


Scheme with 2 passive filters for ATV 71HC11N4...HC50N4 drives

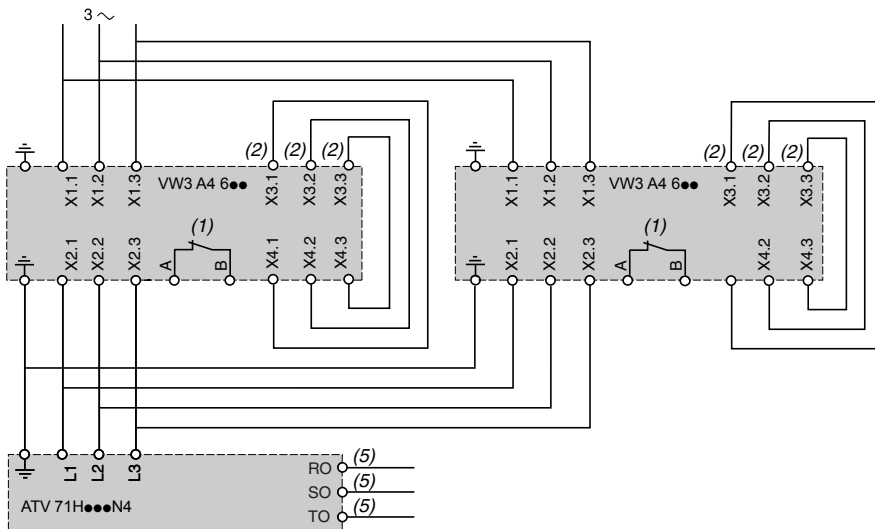
Connection downstream of the line contactor



Connection upstream of the line contactor



Scheme with 2 passive filters for ATV 71H075N4...HD90N4 drives



(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.

(2) Cable supplied.

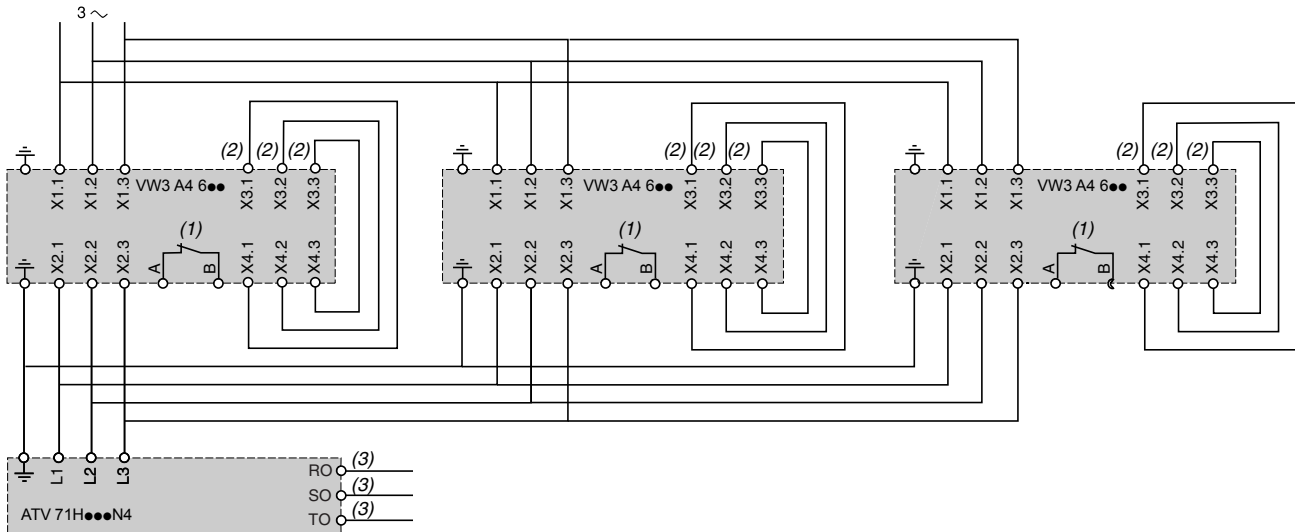
(3) Fan external power supply.

(4) Q2: GV2 RT10 thermal-magnetic circuit-breaker. T1: transformer 400/400 V or 460/460 V.

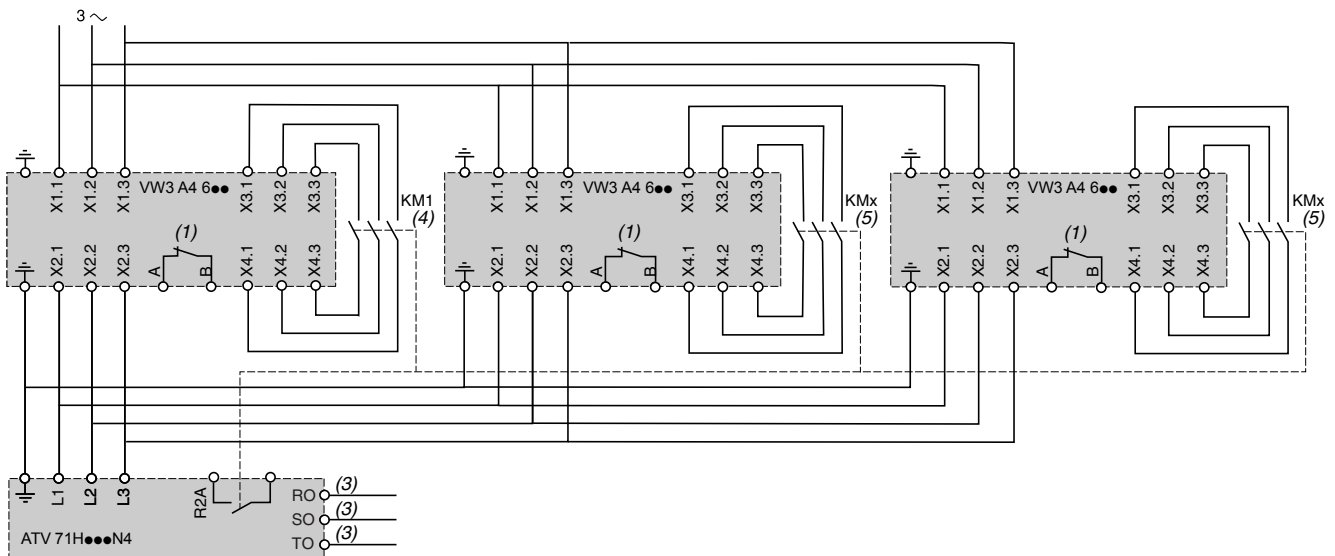
(5) For ATV 71HC11N4...HC50N4 drives, the external power supply for the fan is obligatory, see diagram above with one passive filter.

VW3 A4 6●● passive filters (continued)

Scheme with 3 passive filters for ATV 71H075N4...HD90N drives



Scheme for controlling the filter via the drive according to the load



(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.

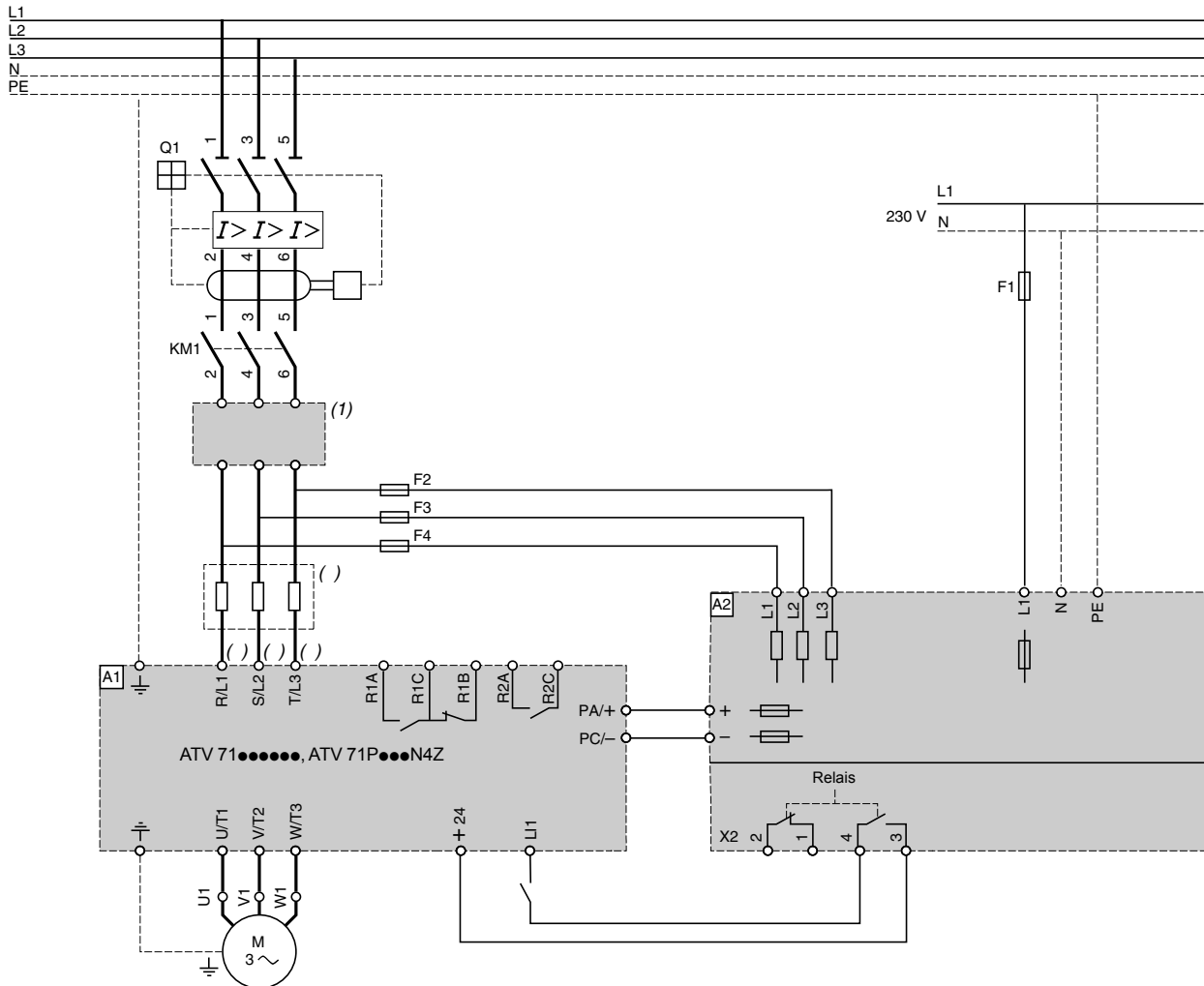
(2) Cable supplied.

(3) For ATV 71HC11N4...HC50N4 drives, the external power supply for the fan is obligatory, see diagram page 60295/14 with one passive filter.

(4) KM1: Category AC1 contactor sized at 50% of the drive nominal current (In).

(5) KMx: Contactor type and sizing identical to KM1. It may be necessary to provide an intermediate relay to control the KMx contactors.

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 60282/2 to 60282/5
A2	Network braking unit, see page 60643/3
F1	2 A fuse, 230 V~
F2...F4	For fuses, see reference tables on page 60643/3.
Q1	Earth fault circuit-breaker 300 mA. Protects against earth leakage faults. Rating: see motor starters on pages 60296/2 to 60296/7

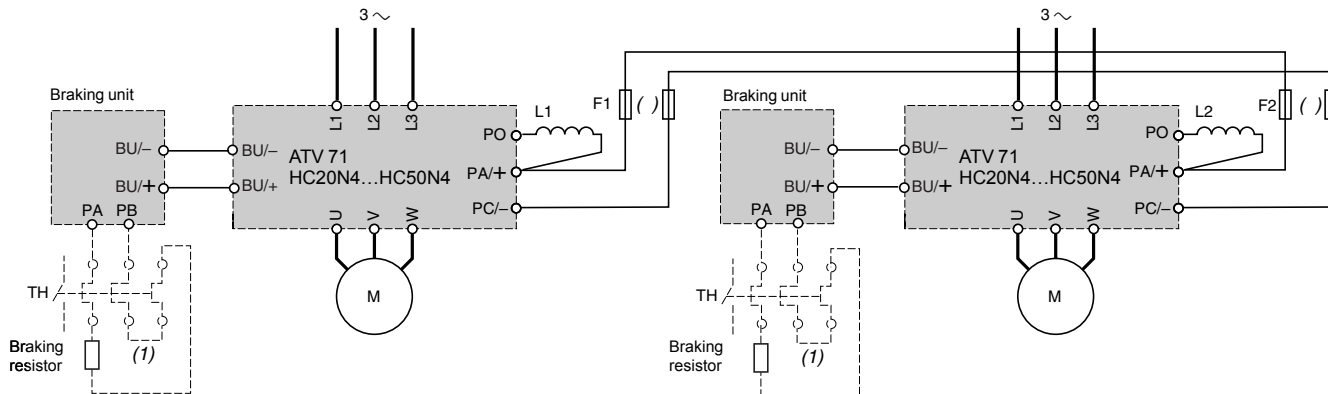
(1) Additional EMC input filter if necessary, see page 60290/4.

(2) Line choke recommended, see page 60289/8.

(3) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 60295/8.

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

ATV 71HC20N4...HC50N4

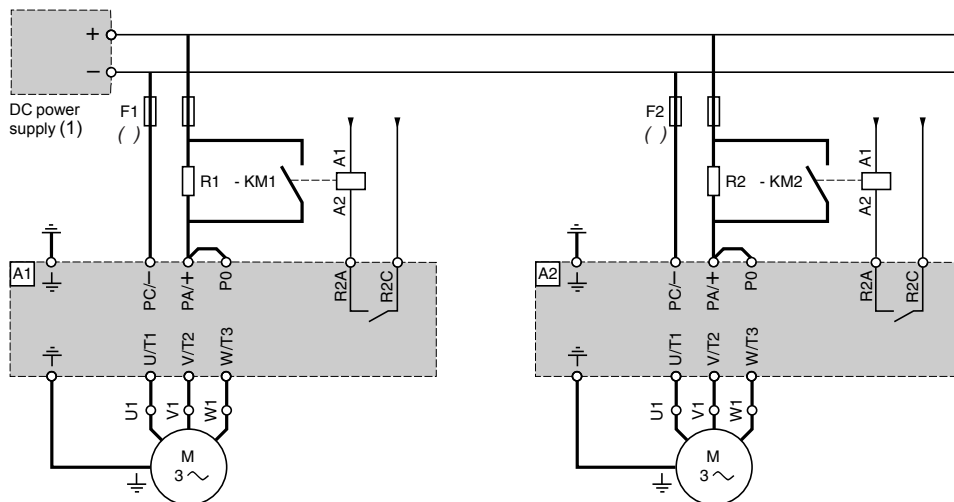


(1) A thermal overload relay can be added.

(2) Fast-acting semi-conductor fuses, see page 60295/19. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.

Drives powered by external DC power supply

ATV 71HD18M3X...HD45M3X, ATV 71D22N4...D75N4



For drives A1, A2	Braking resistors R1, R2		Contactors (3) KM1, KM2
	Value Ω	Reference	
ATV 71HD18M3X	5	VW3 A7 707	LC1 D32●●
ATV 71HD22M3X	5	VW3 A7 707	LC1 D40●●
ATV 71HD30M3X	5	VW3 A7 707	LC1 D65●●
ATV 71HD37M3X	5	VW3 A7 707	LC1 D80●●
ATV 71HD45M3X	5	VW3 A7 707	LC1 D80●●
ATV 71HD22N4, WD22N4	5	VW3 A7 707	LC1 D25●●
ATV 71HD30N4, WD30N4	5	VW3 A7 707	LC1 D32●●
ATV 71HD37N4, WD37N4	5	VW3 A7 707	LC1 D38●●
ATV 71HD45N4, WD45N4	5	VW3 A7 707	LC1 D40●●
ATV 71HD55N4, WD55N4	5	VW3 A7 707	LC1 D50●●
ATV 71HD75N4, WD75N4	5	VW3 A7 707	LC1 D80●●

(1) DC power supply not included.

(2) Fast-acting semi-conductor fuses, see page 60295/19. 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.

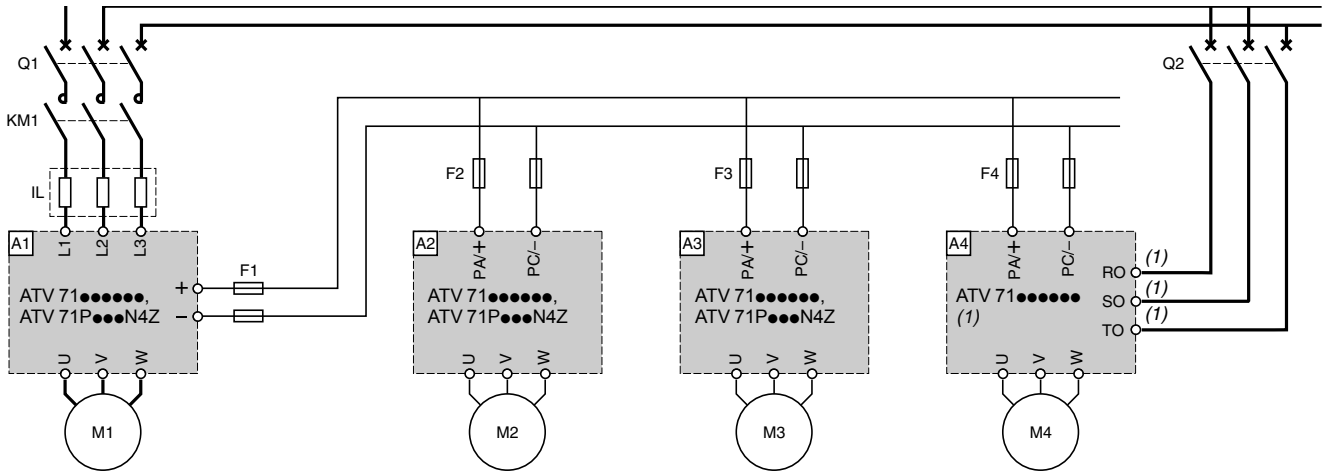
Note: ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71●075N4...●D18N4 and ATV 71P●●●N4Z drives have an integrated pre-charge circuit. This is used to connect the DC power supply directly to the drive without the need for an external pre-charge circuit.

Variable speed drives for asynchronous motors

Altivar 71

Connection diagrams for several drives in parallel on the DC bus

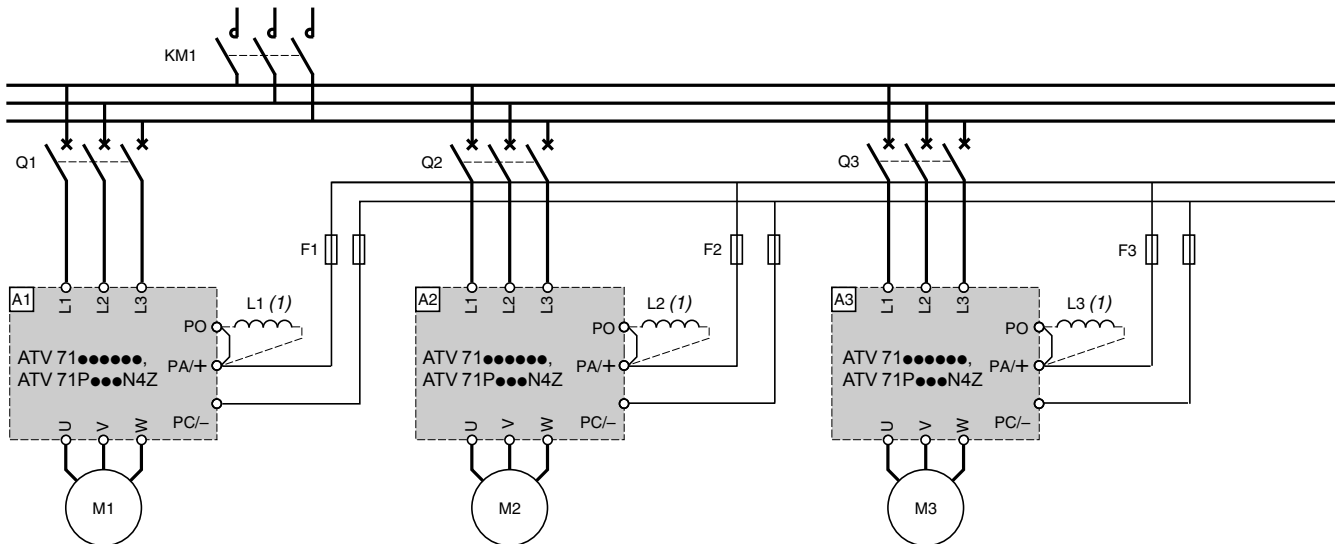
Drives with different ratings



Reference	Description
A1	ATV 71 drive, see pages 60282/2 to 60282/5. Drive power = \sum motor power ratings M1 + M2 + M3 + M4 + ...
A2, A3, A4	ATV 71 drives powered by the DC bus. They must be protected using fast-acting semi-conductor 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 semi-conductor fuses, see page 60295/19. Drive A1 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
F2, F3, F4	Fast-acting semi-conductor fuses, see page 60295/19. Drives A2, A3 and A4 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.

(1) For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4...HC50N4 drives, provide the fan power supply connection.

Drives with equivalent ratings



Reference	Description
A1, A2, A3	ATV 71 drives, see pages 60282/2 to 60282/5. The power difference between the drives connected in parallel must not exceed one rating.
F1, F2, F3	Fast-acting semi-conductor fuses, see page 60295/19. 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 60289/5.
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 71HD55M3X, HD75M3X and ATV 71HD90N4...HC50N4 drives which include a DC choke as standard.

Variable speed drives for asynchronous motors

Altivar 71

Size of DC bus fuses (F1, F2, F3 and F4) depending on the drive rating

For drives	Fast-acting semi-conductor 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 71W075N4...WU22N4	
ATV 71P075N4Z...PU22N4Z	
ATV 71HU30N4, HU40N4	50
ATV 71WU30N4, WU40N4	
ATV 71PU30N4Z, PU40N4Z	
ATV 71HU55N4...HD11N4	80
ATV 71WU55N4...WD11N4	
ATV 71PU55N4Z, PU75N4Z	
ATV 71HD15N4...HD22N4	100
ATV 71WD15N4...WD22N4	
ATV 71HD30N4, HD37N4	160
ATV 71WD30N4, WD37N4	
ATV 71HD45N4	200
ATV 71WD45N4	
ATV 71HD55N4	250
ATV 71WD55N4	
ATV 71HD75N4	350
ATV 71WD75N4	
ATV 71HD90N4	315
ATV 71HC11N4, HC13N4	400
ATV 71HC16N4	500
ATV 71HC20N4	630
ATV 71HC25N4, HC28N4	800
ATV 71HC31N4	1000
ATV 71HC40N4, HC50N4	1250

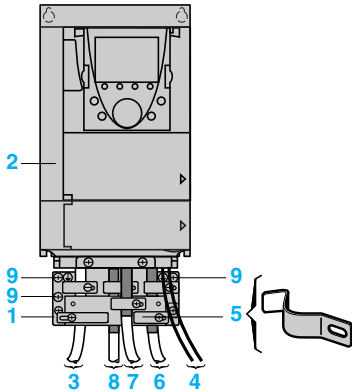
(1) Nominal voltage of fast-acting fuse:

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

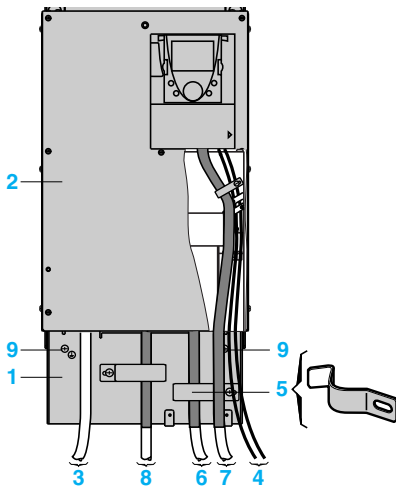
Variable speed drives for asynchronous motors

Altivar 71

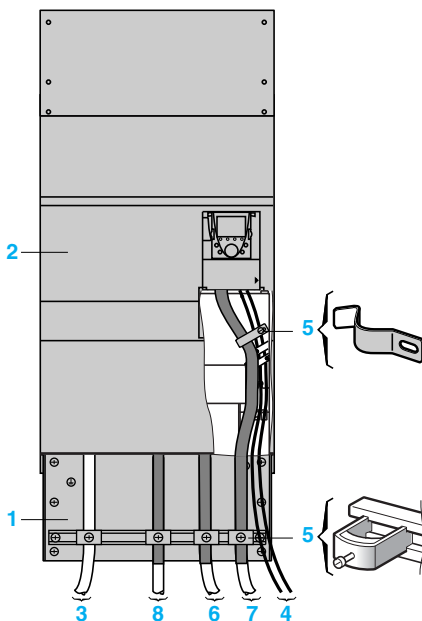
Electromagnetic compatibility



ATV 71HpppM3, ATV 71HD11M3X, HD15M3X,
ATV 71H075N4...HD18N4, ATV 71P075N4Z...
PU75N4Z



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



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

Connections for ensuring conformity to EMC standards

Principle

- Earths between drive, motor and cable shielding must have "high frequency" equipotentiality.
- Use shielded cables with shielding connected to earth 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●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4 and ATV 71P●●●N4Z drives

- 1 Steel plate (1), to be mounted on the drive (earthed casing).
- 2 Altivar 71 UL Type 1/IP 20 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/signal wiring.
 - For applications requiring several conductors, use cables with a small cross-section (0.5 mm²).
- 8 Shielded cable for connecting the braking resistor 6, 7, 8, the shielding must be connected to earth at both ends.
 - The shielding must be continuous, and if intermediate terminals are used, they must be placed in EMC shielded metal boxes.
- 9 Earth screw.

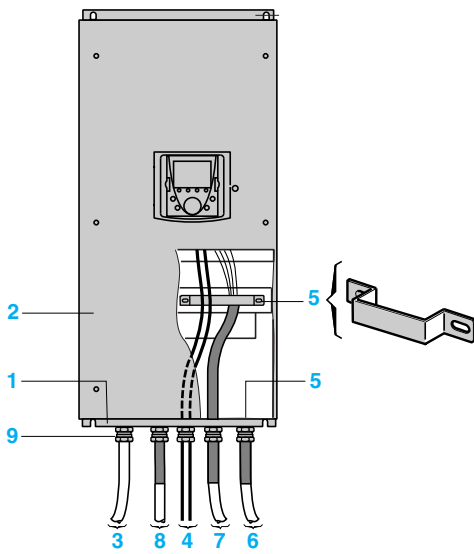
Note: The HF equipotential earth connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.

If using an additional EMC input filter, it should be mounted beside or beneath the drive, depending on the rating, and connected directly to the line supply via an unshielded cable. Link 3 on the drive is via the filter output cable.

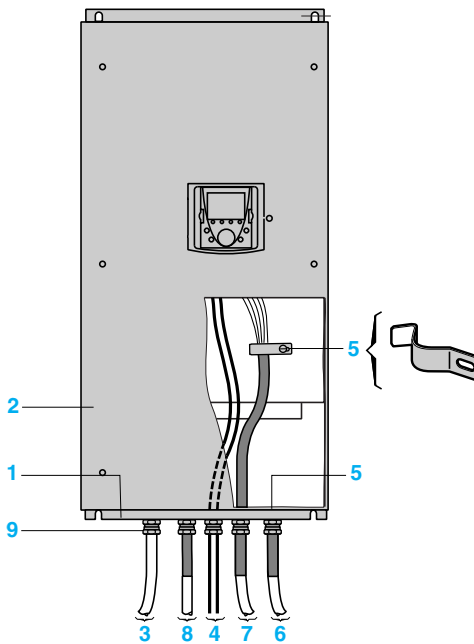
(1) Plate supplied for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71H075N4...HD75N4 and ATV 71P075N4Z...PU75N4Z drives.
For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4...HC28N4 drives, the plate is supplied with the UL Type 1 conformity kit or the IP 31 conformity kit.
For ATV 71HC31N4...HC50N4 drives, the plate is supplied with the IP 31 conformity kit.
For ATV 71P075N4Z...PU75N4Z drives, the plate is supplied with the UL Type 1 conformity kit or the IP 21 conformity kit.
These kits must be ordered separately, see pages 60283/5 et 60283/6.

Connections for ensuring conformity to EMC standards (continued)

Installation diagram for ATV 71W●●●N4 drives



ATV 71W075N4...WD22N4



ATV 71WD30N4...WD75N4

- 1 Steel plate mounted on the drive (earthed casing)
- 2 Altivar 71 UL Type 12/IP 54 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
 - attach the shielded cable to the cable gland 9 ensuring it is fully in contact throughout 360° – fold back the shielding and clamp it between the ring and the body of the cable gland.
 Depending on the drive rating, the shielding of cable 7 can be earthed using a cable gland 9, a clamp 5 or a cable clip 5. 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 mm²).
- 8 Shielded cable for connecting the braking resistor 6, 7, 8, the shielding must be connected to earth at both ends.
 - The shielding must be continuous, and if intermediate terminals are used, they must be placed in EMC shielded metal boxes.
- 9 Metal cable gland (not supplied) for cables 6, 7 and 8.
 - Standard cable gland (not supplied) for cables 3 and 4.

Note: The HF equipotential earth 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 beside the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is via the filter output cable.