ALTIVAR® 16

Variateur de vitesse
pour moteurs asynchrones

Speed controller
for asynchronous motors

Umrichter für Drehstrom-
Asynchronmotoren

Variador de velocidad
para motores asíncronos

Guide d'exploitation
User's manual
Bedienungsanleitung
Guía de explotación

Telemecanique
GROUPE SCHNEIDER

Altivar 16

This speed controller must be installed and implemented in compliance with the international and national standards in force in the premises where it is to be used. It is the responsibility of the integrator to comply with the EMC directive, among others, which concerns the European Community.

Compliance with the essential requirements specified in the EMC directive is dependent on conditioned application of the recommendations provided in the following documents :

– Our catalogue which indicates the accessories to be associated with Speed Controllers, for instance when radio disturbance filtering is needed.

– Standard IEC 1000-5-2, the recommendations of which are repeated in our EMC didactic Manual which describes the installation safety measures to comply.

For any information about these documents, please contact our SCHNEIDER commercial agency.

When the speed controller is powered up, the power components and a number of other control components are connected to the mains supply. *It is extremely dangerous to touch them.*

ATTENTION

After switching the ALTIVAR off, *wait for 1 minute before touching the equipment.* This is the time required for the capacitors to discharge.

The motor can be stopped during operation, by inhibiting the start command or the speed reference, while the speed controller remains switched on. If safety of personnel requires prevention of any sudden restarts, this electronic locking will not be sufficient : *provision must be made for the power circuit to be broken.*

The speed controller incorporates safety devices which can shut down the speed controller and thus the motor in the event of faults. The motor itself may be blocked due to mechanical faults. In addition, voltage variation and mains failures in particular may result in stoppages.

NOTE

The clearance of the causes of a stoppage may cause the motor to restart, entailing danger for certain machines or installations, especially those which conform to safety regulations.

In such cases, therefore, the user must take precautions to avoid restarting, in particular by the use of a speed detector, to disconnect the supply to the speed controller in the event of a non-programmed stop of the motor.

The equipment has been designed to conform to IEC standards.

In general, *power to the speed controller must be switched off* before any electrical or mechanical intervention on the installation or the machine.

The products and materials presented in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.

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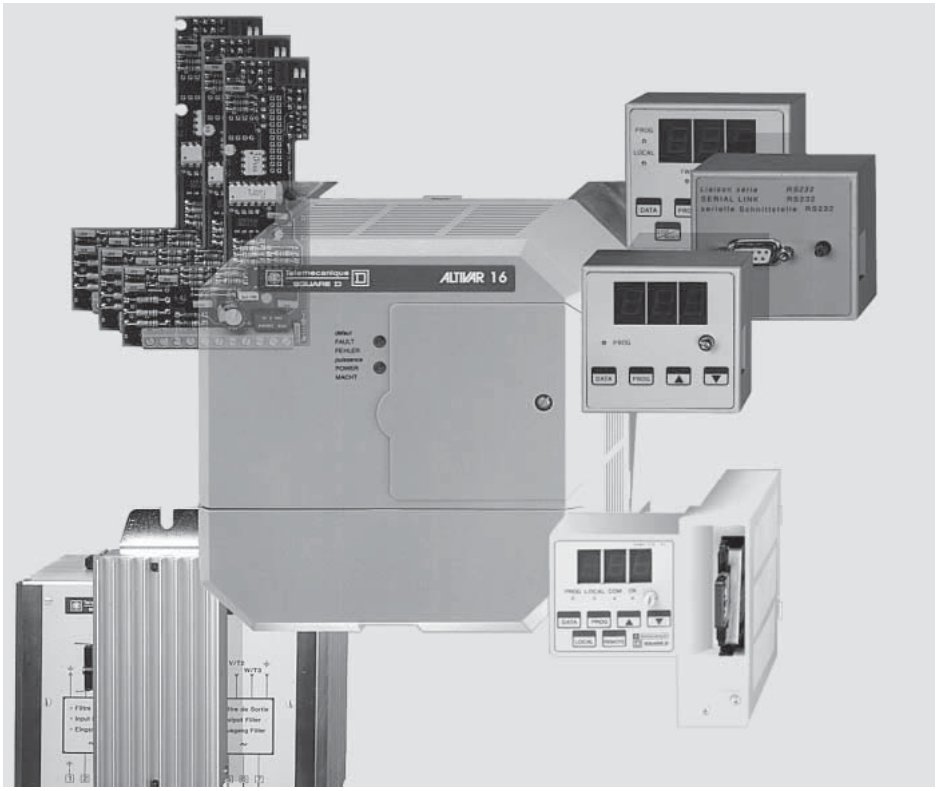
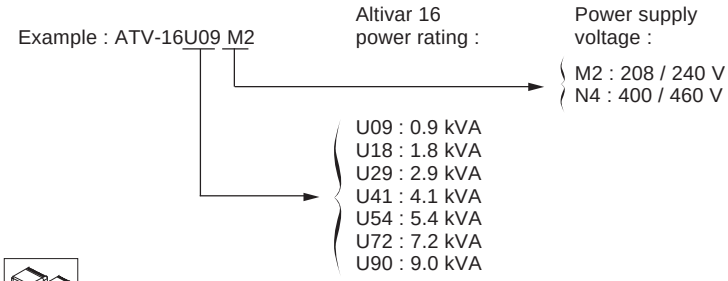


A wide range of options and accessories is available for the Altivar 16, to meet the needs of various applications.

Preliminary checks

Remove the Altivar 16 from its packaging and check that it has not been damaged in transit.
Check that the reference of the speed controller on the label is the same as that on the delivery note and corresponds to the order form.

Reference code



Choice of speed controller

Power supply voltage	Reference	Motor power rating		Line current (1)	Sp. contr. rated current (In)	Maximum transient current (2)	Total power dissipated at rated load
		kW	HP	A	A	A	W
208 / 240 V - 10 % + 10 % 50/60 Hz ± 2 Hz Single phase	ATV-16 U09M2	0.37	0.5	4	2.1	3.2	22
	ATV-16 U18M2	0.75	1	7	4	5.4	35
208 / 240 V - 10 % + 10 % 50/60 Hz ± 2 Hz Single/Three phase	ATV-16 U29M2	1.5	2	14 /10 Single/Three	7.1	10	55
	ATV-16 U41M2	2.2	3	18 /14 Single/Three	10	14	65
400 / 460 V - 15 % + 15 % 50/60 Hz ± 2 Hz Three phase	ATV-16 U18N4	0.75	1	3.3	2.3	3.1	35
	ATV-16 U29N4	1.5	2	6	4.1	5.5	50
	ATV-16 U41N4	2.2	3	9	5.8	7.9	70
	ATV-16 U54N4	3	4	12	7.8	11	100
	ATV-16 U72N4	4	5	16	10.5	14.2	135
	ATV-16 U90N4	5.5	7.5	20	13	17.6	185

(1) Line current : the values shown correspond to the current drawn by the speed controllers on a low impedance supply, under rated load and speed conditions of the motor.
(2) Transient current : for 60s.

The Altivar 16 is designed to supply the required power for each of these motor sizes.

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Technical characteristics

Output voltage	Maximum voltage equal to supply voltage.
Frequency range	0.1 Hz to 50 Hz / 60 Hz.
Overtorque	150 % of motor rated torque (typical value ± 5 %, from 5 to 50/60 Hz).
Acceleration ramp **Deceleration ramp**	Linear 3s from 0 to 50 Hz / 60 Hz (automatic adaptation of ramp times when transient torque is exceeded).
Low speed braking to a standstill	By automatic d.c. injection 0.7 In, for 0.5s if the frequency drops to < 0.1Hz.
Speed controller protection	Supply overvoltage / undervoltage. Phase failure : only for ATV-16...N4. Short circuit : between output phases, between output phases and ground, internal control supplies (+10, +24). Overvoltage / Over heating
Motor protection	Thermal : $I^2.t$ if rated motor current = 0.9 In (rated current) of the speed controller
	(from 25/30 to 50/60 Hz).
Degree of protection	NEMA 1, IP 30 (remove cover), for ATV-16U09M2 to U72N4 IP 30 for ATV-16U90N4.
Ambient air temperature	Operating : 0 to 40°C for NEMA 1/ 0 to 50°C for IP 30, for ATV-16U09M2 to U72N4. 0 to 40°C in IP 30 for ATV-16U90N4 – 0 to 50°C in IP 30 with mandatory use of inductance VW3-A66503. Storage : -25°C to + 70°C.
Maximum humidity	93 % without condensation or dripping water (if there is a risk of condensation provide a heating system).
Altitude	Less than 1000 m. Above that, derate power by 3% for each additional 1000 m.
Pollution	Speed controller protected against dust, corrosive gas, water splashes, etc.
Standards /Certification / Recommendation	IEC, VDE, UL, CSA.

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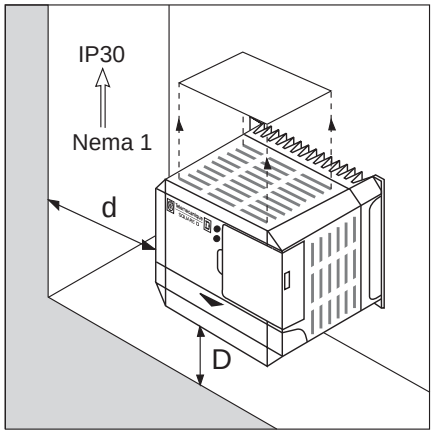
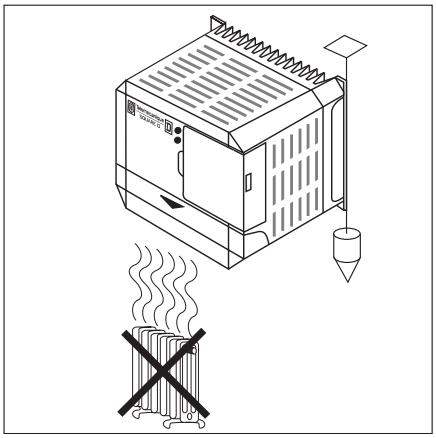
Installation : Mounting recommendations

IP30 : Remove the blanking plate from the top of the cover. Free space is required around the speed controller : D ≥100 mm, d ≥ 50 mm.



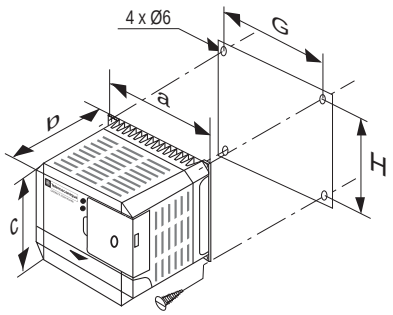
Mount the unit vertically
Avoid placing close to any heating equipment.



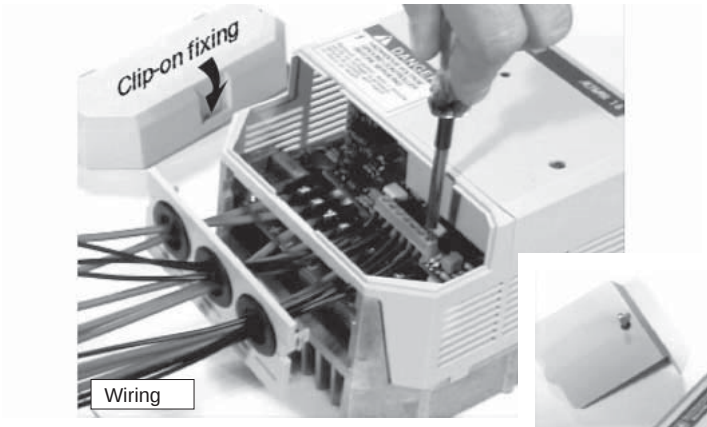
Dimensions

Reference	a mm	b mm	c mm	MOUNTING G mm	MOUNTING H mm	Weight kg
Size 1						
ATV-16U09M2	150	120	160	137	150	1.800
ATV-16U18M2						1.850
Size 2						
ATV-16U29M2	180	144	200	168	190	3.300
ATV-16U18N4						3.400
ATV-16U29N4						3.400
Size 3						
ATV-16U41M2	200	152	230	188	220	4.300
ATV-16U41N4						4.400
ATV-16U54N4						4.400
ATV-16U72N4						5.000
ATV-16U90N4						5.200

Mounting the device



Access to terminal blocks and switches



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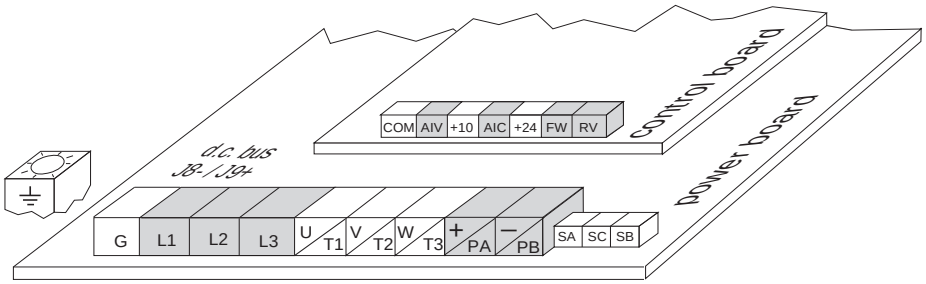
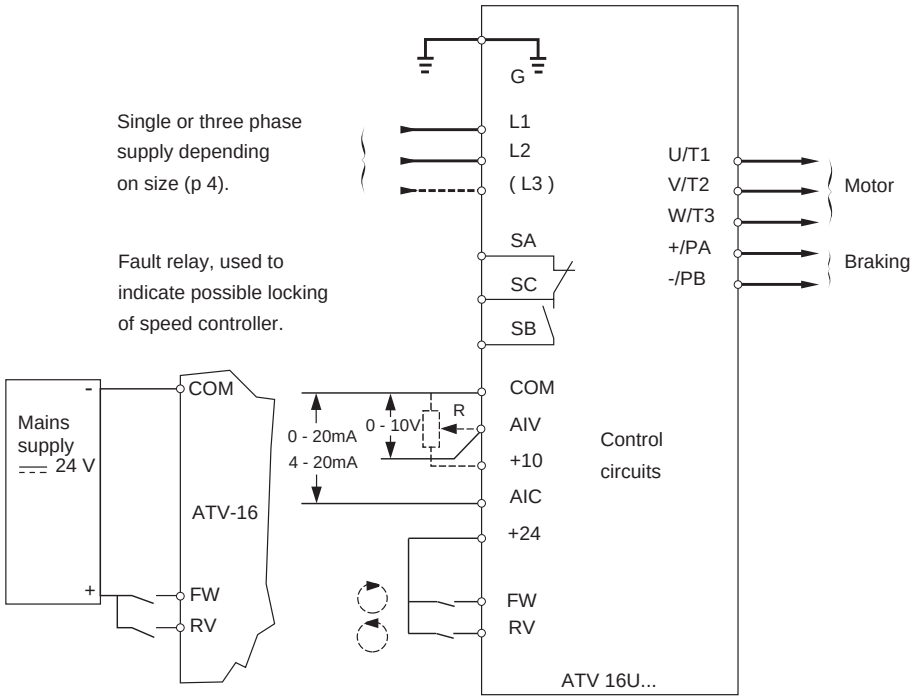
Connections



Terminal label		Function		Characteristics	Terminal size mm²
Size 1	Size 2 and 3				
⏚	⏚	Earth(with heatsink)		Usable up to leakage I > 3.7 mA	10
G	G	Ground			2.5
L1	L1	Power supply		Depending on size and voltage 2 or 3 mains supply terminals (p3)	2.5
L2	L2				
	L3				
U / T1	U / T1	Outputs to motor		230V / 50Hz 400V / 50Hz } M2 } N4 230V / 60Hz 460V / 60Hz	2.5
V / T2	V / T2				
W / T3	W / T3				
+	PA	Size 1	Size 2 and 3	See operator guides VD0C01N906 and VD0C01N907	2.5
—	PB	Option braking module connection	Braking resistance connection ATV-16…M2 R ≥ 50Ω / ATV-16…N4 R ≥ 50Ω		2.5
SA	SA	N/C contact	Safety relay contacts	min : 10mA - ⎓ 24V max : inductive load 1.5A - ∿ 250V 2.5A - ⎓ 30V	1.5
SC	SC	common			
SB	SB	N/O contact			
J9+	J9+	d.c.voltage source input		265 V < U < 370 V 480 V < U < 745 V	
J8-	J8-				
COM	COM	Common for speed reference inputs and control inputs		0 V	1.5
AIV	AIV	Voltage speed reference input		0 - 10 V Z = 30 kΩ	1.5
+10	+10	Speed reference input supply		⎓ 10 V - 10mA max 1 kΩ < R < 10 kΩ	1.5
AIC	AIC	Current speed reference input		0-20 mA/4-20 mA Ze = 250 Ω	1.5
+24	+24	Control input supply		⎓ 24 V (from ⎓ 20V to ⎓ 30V)	1.5
FW	FW	Forward control input		min : 10mA - ⎓ 24V state 1 : U > 11V - I > 6mA state 0 : U < 5V - I < 2.5mA Ze = 1.5 kΩ	1.5
RV	RV	Reverse control input			

The control and reference inputs are electrically isolated from the network.

Connection diagram



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Separate the low voltage control circuits from the power circuits.

Control circuits : use a twisted pair cable with a pitch of 25 to 50 mm, or a screened twisted pair cable.

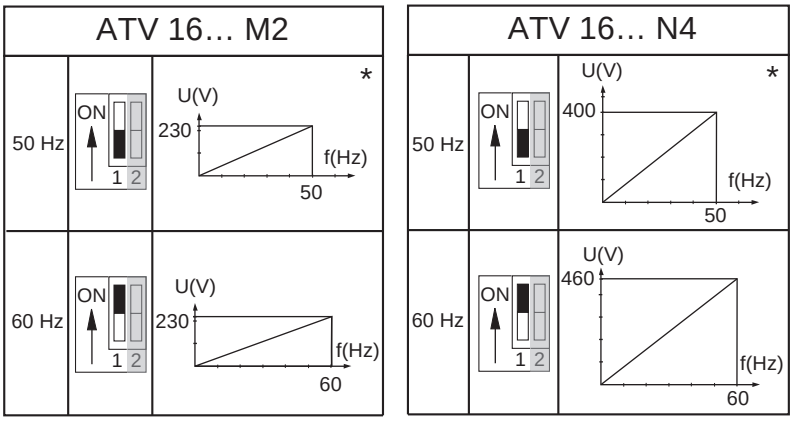
Input output power circuits : cross section defined according to the length of the cable and the rated current data.

+/PA ; -/PB : ATV-16U09M2 and U18M2 wiring for braking module VW3-A16601.

Precautions

Configuration of voltage / frequency ratio

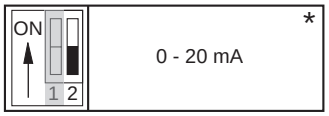
Selection made via switch n° 1 on the speed controller (see page 5).



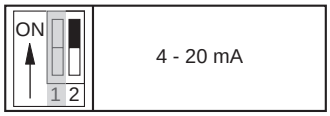
* : factory setting

Configuration of the speed reference input current

Selection made via switch n°2 on the speed controller (see page 5).



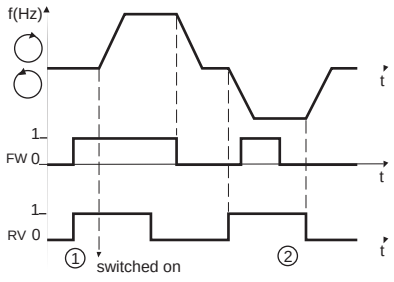
* : Factory setting



With this selection, the voltage setting (AIV) is : 2 - 10V.

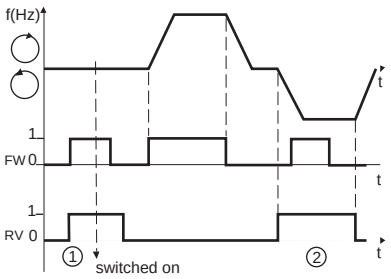
Rotation direction control (speed reference displayed)

No 1 Switch OFF



① If the FW and RV commands are validated, forward operation takes priority when the product is powered up.
② The first directional command selected takes priority.

No 1 Switch ON



① When the product is powered up, the run commands must be inhibited, then validated (FW or RV) so that the motor can start.
② The first directional command selected takes priority.

Motor thermal protection

Motor thermal protection is provided :

- by $I^2.t$ thermal protection of the speed controller if the rated current of the motor is equal to 0.9 times the rated current of the speed controller for use in a frequency range from 25/30 to 50/60 Hz,

- or by using a thermal probe built into the motor, if used with high torque at low speed.

Available torque

Continuous operation :

For self-ventilated motors, motor cooling is linked to speed.

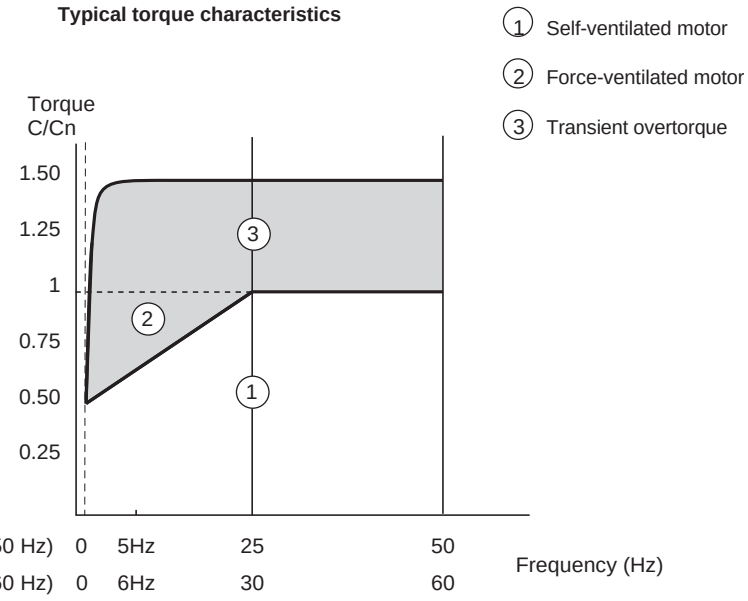
Derating occurs at speeds of less than half rated speed.

For fractional power motors of ≤ 250 W, derating may be less (for example : 20 % instead of 50 % at very low frequency).

Transient operation :

The possibility of overtorque depends on the maximum transient current which the speed controller can provide.

Typical torque characteristics



Operational assistance

Before performing any operation on the speed controller, switch off the power circuits and check that the capacitors are discharged (about 1 mn after switching off).

ATTENTION

The d.c. voltage at the terminals marked +/PA and -/PB and the terminals J9 + and J8, can reach 385 Volts for the ATV-16 ...M2 when under load and 790 Volts for the ATV-16 ... N4.

If there is a problem at set-up or during operation, check first of all that the recommendations concerning environment, mounting and connection have been followed.

The Altivar 16 does not require preventive maintenance, but we recommend regular :

. checks of the state and tightness of connections.
. checks that the temperature around the unit remains at an acceptable level.
. removal of dust from the speed controller if necessary.

Maintenance assistance

The light emitting diodes (LEDs) on the front panel of the product can assume different states :

red LED on : fault.

green LED off : ATV-16 switched off.

green LED on : ATV-16 switched on, voltage ≥ 50 V on d.c. power supply.

Monitoring faults :

The first fault detected is monitored as long as the supply voltage is maintained.
The fault relay is tripped.

Clearing memorized faults :

. Switch off the power supply to the speed controller.
. Find the cause of the fault before resetting.
. Reconnect the power supply, which will erase the recorded fault if it has disappeared.

Note : the VW3-A16101 and VW3-A16102 display / adjustment options enable fault codes to be displayed.

Documentation

- Product designation	Product reference	Document reference	Document number
- Speed controller	ATV-16	VD0C01Q301	N° 52533
- Adjustment and display	VW3-A16101	VD0C01Q302	N° 52534
- Local control adjustment and display	VW3-A16102	VD0C01Q302	N° 52534
- Remote display option	VW3-A16103	VD0C01N901	N° 99471
- PC connection	VW3-A16104	VD0C01N902	N° 99488
- Braking module	VW3-A16601	VD0C01N906	N° 99474
- Braking resistance	VW3-A16701-04	VD0C01N907	N° 99475
- Attenuating filters	VW3-A16401-07	VD0C01N904	N° 99472
- Inductances	VW3-A16501-04	VD0C01N905	N° 99473
- IP 54	VW3-A16801-02	VD0C01N908	N° 99476

- SERIAL LINK CONNECTION OPTIONS

– Interface for PCMCIA communication card	VW3-A16303	VD0C01B320	N°62821
– PCMCIA card for UNITELWAY, MODBUS, JBUS, SY/MAX PNIM protocol	VW3-A66301		
– User's manual : PCMCIA communication card protocols UNITELWAY, MODBUS, JBUS		VD0C01B311	N°54749
– FIPIO protocol kit which includes :	TSX FPV16 V6M		
• two diskettes for integration under XTEL-CONF,	TXT L FPV16V5		
• an installation manual for the ATV16 on FIPIO		TSX DM FPV16V6M	N°56698
• a PCMCIA communication card	TSX FPP 10		
• a junction box	TSX FP ACC4		

- DEDICATED BOARDS

- General usage/material handling	VW3-A16201	VD0C01Q303	N° 52553
- Variable torque	VW3-A16202	VD0C01Q304	N° 52554
- High speed motors	VW3-A16203	VD0C01Q305	N° 52555

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