

Product data sheet

Characteristics

ATV650D11N4

Variable speed drive, Altivar Process ATV600,
ATV650, 11 kW, 400...480 V, IP55





Main

Range of product	Altivar Process ATV600
Product or component type	Variable speed drive
Product specific application	Process and utilities
Device short name	ATV650
Variant	Standard version
Product destination	Asynchronous motors Asynchronous motors
EMC filter	Integrated with 50 m conforming to EN/IEC 61800-3 category C2
IP degree of protection	IP54 conforming to IEC 60529 IP55 conforming to IEC 61800-5-1
Type of cooling	Forced convection
Supply frequency	50...60 Hz - 5...5 %
[Us] rated supply voltage	380...480 V - 15...10 %
Motor power kW	7.5 KW (heavy duty) 11 kW (normal duty)
Motor power hp	10 Hp heavy duty 15 hp normal duty
Line current	19.8 A at 380 V (normal duty) 17 A at 480 V (normal duty) 14.1 A at 380 V (heavy duty) 12.5 A at 480 V (heavy duty)
Prospective line I _{sc}	50 kA
Apparent power	10.4 KVA at 480 V (heavy duty) 14.1 kVA at 480 V (normal duty)
Continuous output current	16.5 A at 2.5 kHz for heavy duty 23.5 A at 4 kHz for normal duty
Maximum transient current	24.8 A during 60 s (heavy duty) 25.9 A during 60 s (normal duty)
Asynchronous motor control profile	Constant torque standard Optimized torque mode Optimized torque mode
Synchronous motor control profile	Synchronous reluctance motor Permanent magnet motor
Output frequency	0.0001...0.5 kHz
Speed drive output frequency	0.1...599 Hz
Nominal switching frequency	4 kHz
Switching frequency	2...8 kHz adjustable 2...12 kHz adjustable
Safety function	STO (safe torque off) SIL 3
Discrete input logic	16 preset speeds

Communication port protocol	Modbus TCP Ethernet Ethernet
Option card	Slot A: communication module, Profinet Slot A: communication module, DeviceNet Slot A: communication module, Modbus TCP/EtherNet/IP Slot A: communication module, CANopen daisy chain RJ45 Slot A: communication module, CANopen SUB-D 9 Slot A: communication module, CANopen screw terminals Slot A/slot B: digital and analog I/O extension module Slot A/slot B: output relay extension module Slot A: communication module, Ethernet IP/Modbus TCP/MD-Link Communication module, BACnet MS/TP Communication module, Ethernet Powerlink Slot A: communication module, Profibus DP V1

Complementary

Mounting mode	Wall mount
Output voltage	$\leq$ power supply voltage
Permissible temporary current boost	1.5 x I _n during 60 s (heavy duty) 1.1 x I _n during 60 s (normal duty)
Motor slip compensation	Not available in permanent magnet motor law Can be suppressed Automatic whatever the load Can be suppressed
Acceleration and deceleration ramps	Linear adjustable separately from 0.01...9999 s
Braking to standstill	By DC injection
Protection type	Safe torque off: motor Motor phase break: motor Thermal protection: drive Safe torque off: drive Overheating: drive Overcurrent between output phases and earth: drive Overload of output voltage: drive Short-circuit protection: drive Motor phase break: drive Overvoltages on the DC bus: drive Line supply overvoltage: drive Line supply undervoltage: drive Line supply phase loss: drive Overspeed: drive Break on the control circuit: drive Thermal protection: motor
Frequency resolution	Analog input: 0.012/50 Hz Display unit: 0.1 Hz
Electrical connection	Line side: M12 bar - 3 cables 3 x 185 mm ² maximum per phase (normal duty) Line side: M12 bar - 4 cables 3 x 120 mm ² maximum per phase (normal duty) Motor: M12 bar - 3 cables 3 x 185 mm ² maximum per phase (normal duty) Motor: M12 bar - 4 cables 3 x 120 mm ² maximum per phase (normal duty) Line side: M12 bar - 3 cables 3 x 185 mm ² maximum per phase (heavy duty) Line side: M12 bar - 4 cables 3 x 120 mm ² maximum per phase (heavy duty) Motor: M12 bar - 3 cables 3 x 185 mm ² maximum per phase (heavy duty) Motor: M12 bar - 4 cables 3 x 120 mm ² maximum per phase (heavy duty) Line side: M12 bar - 3 cables 3 x 150 mm ² minimum per phase (normal duty) Line side: M12 bar - 4 cables 3 x 95 mm ² minimum per phase (normal duty) Motor: M12 bar - 2 cables 3 x 185 mm ² minimum per phase (normal duty) Motor: M12 bar - 3 cables 3 x 120 mm ² minimum per phase (normal duty) Line side: M12 bar - 2 cables 3 x 185 mm ² minimum per phase (heavy duty) Line side: M12 bar - 3 cables 3 x 95 mm ² minimum per phase (heavy duty) Motor: M12 bar - 2 cables 3 x 185 mm ² minimum per phase (heavy duty) Motor: M12 bar - 3 cables 3 x 120 mm ² minimum per phase (heavy duty) Control: removable screw terminals 0.5...1.5 mm ² /AWG 20...AWG 16
Connector type	RJ45 (on the remote graphic terminal) for Modbus serial RJ45 (on the remote graphic terminal) for Ethernet/Modbus TCP
Exchange mode	Half duplex, full duplex, autonegotiation Ethernet/Modbus TCP
Number of addresses	1...247 for Modbus serial
Method of access	Slave Modbus TCP

Supply	Internal supply for reference potentiometer (1 to 10 kOhm): 10.5 V DC +/- 5 %, <10 mA, protection type: overload and short-circuit protection Internal supply for digital inputs and STO: 24 V DC (21...27 V), <200 mA, protection type: overload and short-circuit protection External supply for digital inputs: 24 V DC (19...30 V), <1.25 mA, protection type: overload and short-circuit protection
Local signalling	3 LEDs (dual colour) for embedded communication status 4 LEDs (dual colour) for communication module status 1 LED (red) for presence of voltage 3 LEDs for local diagnostic
Width	264 mm
Height	678 mm
Depth	299 mm
Net weight	13.7 kg
Analogue input number	3
Analogue input type	AI1, AI2, AI3 software-configurable current: 0...20 mA/4...20 mA, impedance: 250 Ohm, resolution 12 bits AI1, AI2, AI3 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits
Discrete input number	8
Discrete input type	DI5, DI6 programmable as pulse input: 0...30 kHz, 24 V DC (<= 30 V) STOA, STOB safe torque off, 24 V DC (<= 30 V), impedance: > 2.2 kOhm DI1...DI6 programmable, 24 V DC (<= 30 V), impedance: 3.5 kOhm
Input compatibility	DI5, DI6: discrete input level 1 PLC conforming to IEC 65A-68 STOA, STOB: discrete input level 1 PLC conforming to EN/IEC 61131-2 DI1...DI6: discrete input level 1 PLC conforming to EN/IEC 61131-2
Discrete input logic	Negative logic (sink) (DI1...DI6), > 16 V (state 0), < 10 V (state 1) Positive logic (source) (DI5, DI6), < 0.6 V (state 0), > 2.5 V (state 1) Positive logic (source) (STOA, STOB), < 5 V (state 0), > 11 V (state 1) Positive logic (source) (DI1...DI6), < 5 V (state 0), > 11 V (state 1)
Analogue output number	2
Analogue output type	Software-configurable current AO1, AO2: 0...20 mA, resolution 10 bits Software-configurable voltage AO1, AO2: 0...10 V DC impedance 470 Ohm, resolution 10 bits
Sampling duration	5 Ms +/- 1 ms (DI5, DI6) - discrete input 5 Ms +/- 0.1 ms (AI1, AI2, AI3) - analog input 10 Ms +/- 1 ms (AO1) - analog output 2 ms +/- 0.5 ms (DI1...DI4) - discrete input
Accuracy	+/- 1 % AO1, AO2 for a temperature variation 60 °C analog output +/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input
Linearity error	AO1, AO2: +/- 0.2 % for analog output AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input
Relay output number	3
Relay output type	Configurable relay logic R2: sequence relay NO electrical durability 100000 cycles Configurable relay logic R3: sequence relay NO electrical durability 100000 cycles Configurable relay logic R1: fault relay NO/NC electrical durability 100000 cycles
Refresh time	Relay output (R1, R2, R3): 5 ms (+/- 0.5 ms)
Minimum switching current	Relay output R1, R2, R3: 5 mA at 24 V DC
Maximum switching current	Relay output R1, R2, R3 on resistive load, cos phi = 1: 3 A at 30 V DC Relay output R1, R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC Relay output R1, R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC Relay output R1, R2, R3 on resistive load, cos phi = 1: 3 A at 250 V AC
Isolation	Between power and control terminals

Variable speed drive application selection	Other application Food and beverage processing Fan Mining mineral and metal Pump Mining mineral and metal Fan Oil and gas Other application Water and waste water Screw compressor Building - HVAC Pump Food and beverage processing Fan Food and beverage processing Atomization Food and beverage processing Electro submersible pump (ESP) Oil and gas Water injection pump Oil and gas Jet fuel pump Oil and gas Compressor for refinery Oil and gas Centrifuge pump Water and waste water Positive displacement pump Water and waste water Electro submersible pump (ESP) Water and waste water Screw pump Water and waste water Lobe compressor Water and waste water Screw compressor Water and waste water Compressor centrifugal Water and waste water Fan Water and waste water Conveyor Water and waste water Mixer Water and waste water Compressor centrifugal Building - HVAC
Motor power range AC-3	250...500 KW at 480...500 V 3 phases 7...11 kW at 380...440 V 3 phases

Environment

Insulation resistance	> 1 MOhm 500 V DC for 1 minute to earth
Noise level	52 dB conforming to 86/188/EEC
Power dissipation in W	5700 W, switching frequency 2.5 kHz (heavy duty)
Operating position	Vertical +/- 10 degree
Maximum THDI	<48 % from 80...100 % of load conforming to IEC 61000-3-12
Electromagnetic compatibility	Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3 Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4 1.2/50 µs - 8/20 µs surge immunity test level 3 conforming to IEC 61000-4-5 Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6 Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2
Pollution degree	2 conforming to EN/IEC 61800-5-1
Vibration resistance	1 gn (f= 13...200 Hz) conforming to IEC 60068-2-6 1.5 mm peak to peak (f= 2...13 Hz) conforming to IEC 60068-2-6
Shock resistance	15 gn for 11 ms conforming to IEC 60068-2-27
Relative humidity	5...95 % without condensation conforming to IEC 60068-2-3
Ambient air temperature for operation	40...50 °C (with derating factor) -15...40 °C (without derating)
Ambient air temperature for storage	-40...70 °C
Operating altitude	1000...4800 m with current derating 1 % per 100 m <= 1000 m without derating
Standards	EN/IEC 61800-3 Environment 2 category C3 EN/IEC 61800-3 EN/IEC 61800-5-1 IEC 61000-3-12 IEC 60721-3 IEC 61508 IEC 13849-1 UL 508C
Product certifications	ATEX zone 2/22 CSA ATEX INERIS TÜV
Marking	CE

Packing Units

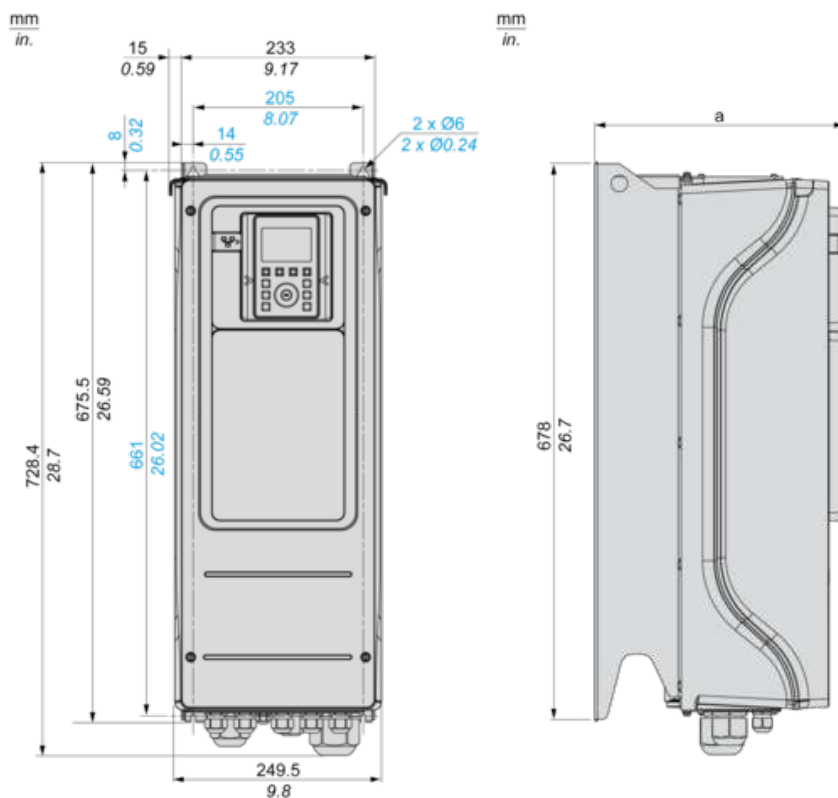
Package 1 Weight	21.000 kg
Package 1 Height	5.400 dm
Package 1 width	3.920 dm
Package 1 Length	8.000 dm

Offer Sustainability

Sustainable offer status	Green Premium product
REACH Regulation	 REACH Declaration
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope)  EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	 Yes
China RoHS Regulation	 China RoHS Declaration
Environmental Disclosure	 Product Environmental Profile
Circularity Profile	 End Of Life Information
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins
Upgradeability	 Upgraded Components Available

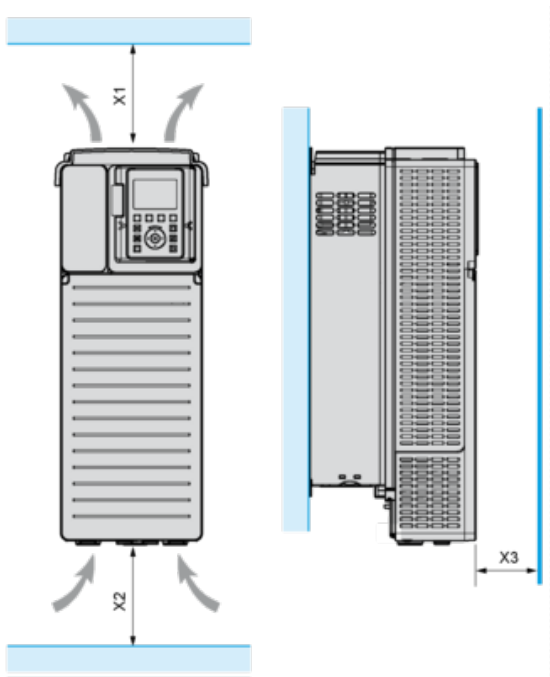
Dimensions

Front and Left Views



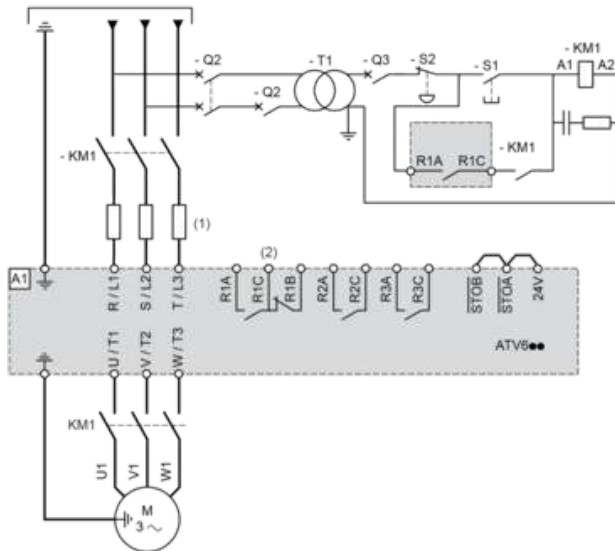
(a) = 299 mm (11.8 in.)

Clearances



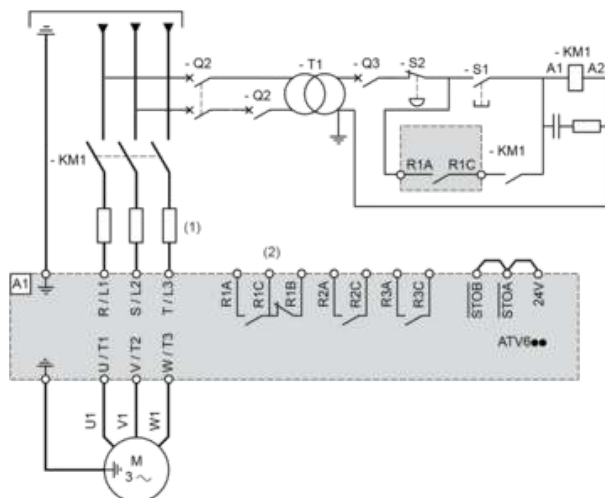
X1	X2	X3
≥ 100 mm (3.94 in.)	≥ 100 mm (3.94 in.)	≥ 10 mm (0.39 in.)

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



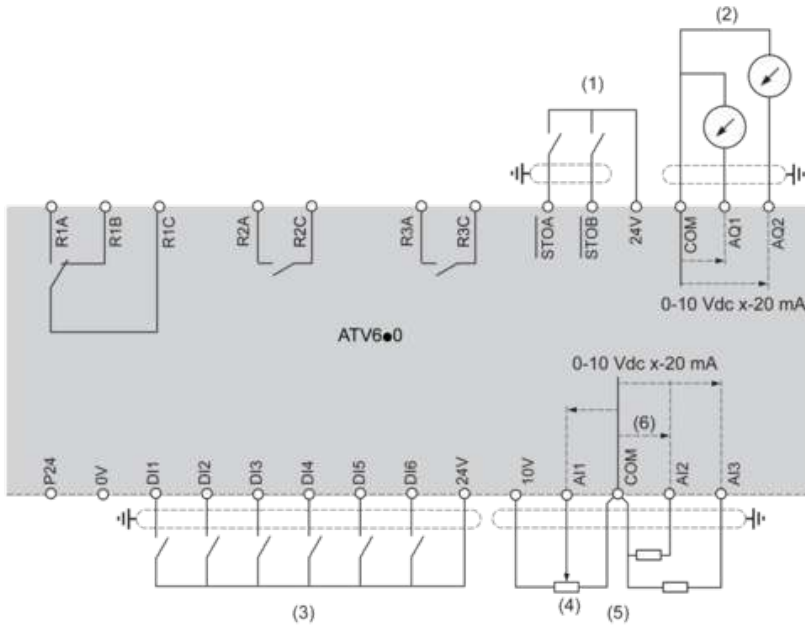
T1 : Transformer for control part

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



KM1 : Contactor

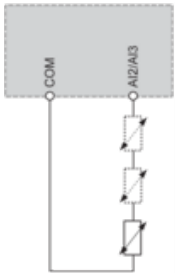
Control Block Wiring Diagram



- (1) Safe Torque Off
 (2) Analog Output
 (3) Digital Input
 (4) Reference potentiometer
 (5) Analog Input
 R1A, R1B, R1C : Fault relay
 R2A, R2C : Sequence relay
 R3A, R3C : Sequence relay

Sensor Connection

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

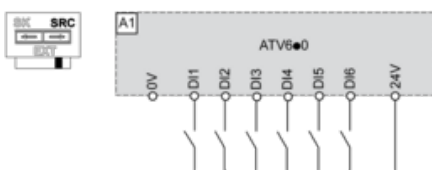


Sink / Source Switch Configuration

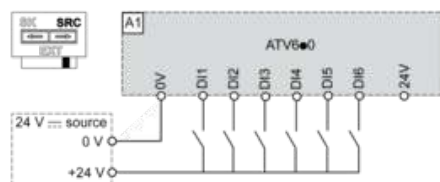
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

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

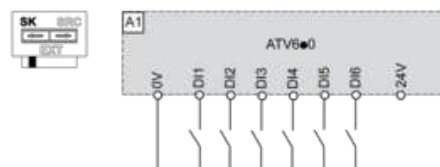
Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



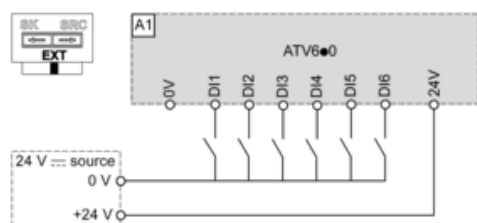
Switch Set to SRC (Source) Position and Use of an External Power Supply for the DIs



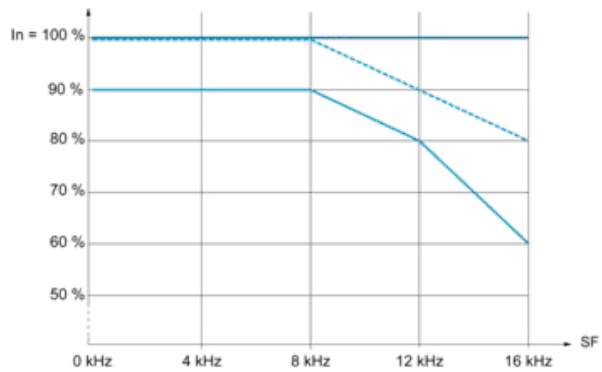
Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



Switch Set to EXT Position Using an External Power Supply for the DIs



Derating Curves



— 40 °C (104 °F)

--- 45 °C (113 °F)

— 50 °C (122 °F)

I_n : Nominal Drive Current

SF : Switching Frequency