# Product data sheet
## Characteristics

# ATV650U40N4U

## Main

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| 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 | Synchronous motors<br>Asynchronous motors |
| EMC filter | Integrated with 50 m conforming to EN/IEC 61800-3 category C2<br>Integrated with 150 m conforming to EN/IEC 61800-3 category C3 |
| IP degree of protection | IP55 conforming to IEC 61800-5-1<br>IP55 conforming to IEC 60529 |
| Degree of protection | UL type 12 conforming to UL 508C |
| Type of cooling | Forced convection |
| Supply frequency | 50...60 Hz - 5...5 % |
| Network number of phases | 3 phases |
| [Us] rated supply voltage | 380...480 V - 15...10 % |
| Motor power kW | 4 KW (normal duty)<br>3 KW (heavy duty) |
| Motor power hp | 5 Hp normal duty<br>4 Hp heavy duty |
| Line current | 7.6 A at 380 V (normal duty)<br>6.7 A at 480 V (normal duty)<br>6 A at 380 V (heavy duty)<br>5.4 A at 480 V (heavy duty) |
| Prospective line Isc | 50 KA |
| Apparent power | 5.6 KVA at 480 V (normal duty)<br>4.5 KVA at 480 V (heavy duty) |
| Continuous output current | 9.3 A at 4 kHz for normal duty<br>7.2 A at 4 kHz for heavy duty |
| Maximum transient current | 10.8 A during 60 s (heavy duty)<br>10.2 A during 60 s (normal duty) |
| Asynchronous motor control profile | Variable torque standard<br>Optimized torque mode<br>Constant torque standard |
| Synchronous motor control profile | Permanent magnet motor<br>Synchronous reluctance motor |
| Output frequency | 0.0001…0.5 KHz |
| Speed drive output frequency | 0.1…599 Hz |
| Nominal switching frequency | 4 kHz |
| Switching frequency | 2...12 kHz adjustable<br>4...12 kHz with derating factor |
| Safety function | STO (safe torque off) SIL 3 |
| Discrete input logic | 16 preset speeds |

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

## Complementary

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| Output voltage | <= power supply voltage |
| Permissible temporary current boost | 1.1 x In during 60 s (normal duty)<br>1.5 x In during 60 s (heavy duty) |
| Motor slip compensation | Adjustable<br>Automatic whatever the load<br>Not available in permanent magnet motor law<br>Can be suppressed |
| Acceleration and deceleration ramps | Linear adjustable separately from 0.01...9999 s |
| Braking to standstill | By DC injection |
| Protection type | Thermal protection: motor<br>Safe torque off: motor<br>Motor phase break: motor<br>Thermal protection: drive<br>Safe torque off: drive<br>Overheating: drive<br>Overcurrent between output phases and earth: drive<br>Overload of output voltage: drive<br>Short-circuit protection: drive<br>Motor phase break: drive<br>Overvoltages on the DC bus: drive<br>Line supply overvoltage: drive<br>Line supply undervoltage: drive<br>Line supply phase loss: drive<br>Overspeed: drive<br>Break on the control circuit: drive |
| Frequency resolution | Display unit: 0.1 Hz<br>Analog input: 0.012/50 Hz |
| Electrical connection | Control: removable screw terminals0.5...1.5 mm²/AWG 20...AWG 16<br>Line side: screw terminal4...6 mm²/AWG 12...AWG10<br>Motor: screw terminal4...6 mm²/AWG 12...AWG10 |
| Connector type | RJ45 (on the remote graphic terminal) for Ethernet/Modbus TCP<br>RJ45 (on the remote graphic terminal) for Modbus serial |
| Physical interface | 2-wire RS 485 for Modbus serial |
| Transmission frame | RTU for Modbus serial |
| Transmission rate | 10/100 Mbit/s for Ethernet IP/Modbus TCP<br>4.8, 9.6, 19.2, 38.4 kbit/s for Modbus serial |
| Exchange mode | Half duplex, full duplex, autonegotiation Ethernet/Modbus TCP |
| Data format | 8 bits, configurable odd, even or no parity for Modbus serial |
| Type of polarization | No impedance for Modbus serial |
| Number of addresses | 1…247 for Modbus serial |
| Method of access | Slave Modbus TCP |
| Supply | External supply for digital inputs: 24 V DC (19…30 V), <1.25 mA, protection-type: overload and short-circuit protection<br>Internal supply for reference potentiometer (1 to 10 kOhm): 10.5 V D-C +/- 5 %, <10 mA, protection type: overload and short-circuit protection<br>Internal supply for digital inputs and STO: 24 V DC (21…27 V), <200 mA, protection type: overload and short-circuit protection |
| Local signalling | 3 LEDslocal diagnostic:<br>3 LEDs (dual colour)embedded communication status:<br>4 LEDs (dual colour)communication module status:<br>1 LED (red)presence of voltage: |
| Width | 264 Mm |
| Height | 678 Mm |

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| Depth | 272 Mm |
| Net weight | 10.6 Kg |
| Analogue input number | 3 |
| Analogue input type | AI1, AI2, AI3 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits<br>AI1, AI2, AI3 software-configurable current: 0...20 mA/4...20 mA, impedance: 250 Ohm, resolution 12 bits |
| Discrete input number | 8 |
| Discrete input type | DI1...DI6 programmable, 24 V DC (<= 30 V), impedance: 3.5 kOhm<br>DI5, DI6 programmable as pulse input: 0…30 kHz, 24 V DC (<= 30 V)<br>STOA, STOB safe torque off, 24 V DC (<= 30 V), impedance: > 2.2 kOhm |
| Input compatibility | DI1...DI6: discrete input level 1 PLC conforming to EN/IEC 61131-2<br>DI5, DI6: discrete input level 1 PLC conforming to IEC 65A-68<br>STOA, STOB: discrete input level 1 PLC conforming to EN/IEC 61131-2 |
| Discrete input logic | Positive logic (source) (DI1...DI6), < 5 V (state 0), > 11 V (state 1)<br>Negative logic (sink) (DI1...DI6), > 16 V (state 0), < 10 V (state 1)<br>Positive logic (source) (DI5, DI6), < 0.6 V (state 0), > 2.5 V (state 1)<br>Positive logic (source) (STOA, STOB), < 5 V (state 0), > 11 V (state 1) |
| Analogue output number | 2 |
| Analogue output type | Software-configurable voltage AO1, AO2: 0...10 V DC impedance 470 Ohm, resolution 10 bits<br>Software-configurable current AO1, AO2: 0...20 mA, resolution 10 bits |
| Sampling duration | 2 Ms +/- 0.5 ms (DI1...DI4) - discrete input<br>5 Ms +/- 1 ms (DI5, DI6) - discrete input<br>5 Ms +/- 0.1 ms (AI1, AI2, AI3) - analog input<br>10 Ms +/- 1 ms (AO1) - analog output |
| Accuracy | +/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input<br>+/- 1 % AO1, AO2 for a temperature variation 60 °C analog output |
| Linearity error | AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input<br>AO1, AO2: +/- 0.2 % for analog output |
| Relay output number | 3 |
| Relay output type | Configurable relay logic R1: fault relay NO/NC electrical durability 100000 cycles<br>Configurable relay logic R2: sequence relay NO electrical durability 100000 cycles<br>Configurable relay logic R3: sequence relay NO 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 250 V AC<br>Relay output R1, R2, R3 on resistive load, cos phi = 1: 3 A at 30 V DC<br>Relay output R1, R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC<br>Relay output R1, R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC |
| Isolation | Between power and control terminals |
| Mounting mode | Wall mount |

## Environment

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| Insulation resistance | > 1 MOhm 500 V DC for 1 minute to earth |
| Noise level | 52 DB conforming to 86/188/EEC |
| Operating position | Vertical +/- 10 degree |
| Maximum THDI | <48 % full load conforming to IEC 61000-3-12 |
| Electromagnetic compatibility | Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2<br>Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3<br>Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4<br>1.2/50 µs - 8/20 µs surge immunity test level 3 conforming to IEC 61000-4-5<br>Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6 |
| Pollution degree | 2 conforming to EN/IEC 61800-5-1 |
| Vibration resistance | 1.5 mm peak to peak (f= 2…13 Hz) conforming to IEC 60068-2-6<br>1 gn (f= 13…200 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 | -15…40 °C (without)<br>40…50 °C (with derating factor) |
| Ambient air temperature for storage | -40…70 °C |

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| Operating altitude | <= 1000 m without<br>1000...4800 m with current derating 1 % per 100 m |
| Environmental characteristic | Chemical pollution resistance class 3C3 conforming to EN/IEC 60721-3-3<br>Dust pollution resistance class 3S3 conforming to EN/IEC 60721-3-3 |
| Standards | UL 508C<br>EN/IEC 61800-3<br>Environment 1 category C2 EN/IEC 61800-3<br>Environment 2 category C3 EN/IEC 61800-3<br>EN/IEC 61800-5-1<br>IEC 61000-3-12<br>IEC 60721-3<br>IEC 61508<br>IEC 13849-1 |
| Product certifications | REACH<br>Bureau Veritas<br>TÜV<br>DNV-GL<br>ATEX INERIS<br>ABS<br>UL<br>CSA |
| Marking | CE |

## Offer Sustainability

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|---|---|
| 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 |

Product Life Status : Commercialised