

# ATV650D18N4U

variable speed drive, Altivar Process ATV600,  
ATV650, 18.5kW, 400...480V, 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<br>Synchronous motors                                                                                      |
| EMC filter                         | Integrated with 50 m conforming to IEC 61800-3 category C2<br>Integrated with 150 m conforming to IEC 61800-3 category C3      |
| IP degree of protection            | IP55 conforming to IEC 60529<br>IP55 conforming to IEC 61800-5-1                                                               |
| [Us] rated supply voltage          | 380...480 V                                                                                                                    |
| Degree of protection               | UL type 12 conforming to UL 508C                                                                                               |
| Type of cooling                    | Forced convection                                                                                                              |
| Supply frequency                   | 50...60 Hz - 5...5 %                                                                                                           |
| [Us] rated supply voltage          | 380...480 V - 15...10 %                                                                                                        |
| Motor power kW                     | 15 KW (heavy duty)<br>18.5 kW (normal duty)                                                                                    |
| Motor power hp                     | 20 Hp heavy duty<br>25 hp normal duty                                                                                          |
| Line current                       | 28.9 A at 480 V (normal duty)<br>27.7 A at 380 V (heavy duty)<br>24.4 A at 480 V (heavy duty)<br>33.4 A at 380 V (normal duty) |
| Prospective line Isc               | 50 kA                                                                                                                          |
| Apparent power                     | 20.3 KVA at 480 V (heavy duty)<br>24 kVA at 480 V (normal duty)                                                                |
| Continuous output current          | 31.7 A at 4 kHz for heavy duty<br>39.2 A at 4 kHz for normal duty                                                              |
| Asynchronous motor control profile | Variable torque standard<br>Constant torque standard<br>Variable torque standard                                               |
| Synchronous motor control profile  | Synchronous reluctance motor<br>Permanent magnet motor                                                                         |
| Speed drive output frequency       | 0.1...500 Hz                                                                                                                   |
| Nominal switching frequency        | 4 kHz                                                                                                                          |
| Switching frequency                | 4...12 kHz with derating factor<br>2...12 kHz adjustable                                                                       |
| Safety function                    | STO (safe torque off) SIL 3                                                                                                    |
| Discrete input logic               | 16 preset speeds                                                                                                               |

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| Communication port protocol | Modbus serial<br>Modbus TCP<br>Ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Option card                 | 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<br>Slot A: communication module, Profibus DP V1 |

## Complementary

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| Mounting mode                       | Wall mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Maximum transient current           | 47.6 A during 60 s (heavy duty)<br>43.1 A during 60 s (normal duty)                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Network number of phases            | 3 phases                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Discrete output number              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Discrete output type                | Relay outputs R1A, R1B, R1C 250 V AC 3000 mA<br>Relay outputs R1A, R1B, R1C 30 V DC 3000 mA<br>Relay outputs R2A, R2C 250 V AC 5000 mA<br>Relay outputs R2A, R2C 30 V DC 5000 mA<br>Relay outputs R3A, R3C 250 V AC 5000 mA<br>Relay outputs R3A, R3C 30 V DC 5000 mA                                                                                                                                                                                                                                                        |
| Output voltage                      | <= power supply voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Permissible temporary current boost | 1.5 x I <sub>n</sub> during 60 s (heavy duty)<br>1.1 x I <sub>n</sub> during 60 s (normal duty)                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Motor slip compensation             | Adjustable<br>Not available in permanent magnet motor law<br>Can be suppressed<br>Can be suppressed                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Acceleration and deceleration ramps | Linear adjustable separately from 0.01...9999 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Physical interface                  | Ethernet<br>2-wire RS 485                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Braking to standstill               | By DC injection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Protection type                     | 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<br>Thermal protection: motor |
| Transmission rate                   | 10, 100 Mbits<br>4800 bps, 9600 bps, 19200 bps, 38.4 Kbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Frequency resolution                | Analog input: 0.012/50 Hz<br>Display unit: 0.1 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Transmission frame                  | RTU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Electrical connection               | Line side: screw terminal 10...16 mm <sup>2</sup><br>Motor: screw terminal 10...16 mm <sup>2</sup><br>Control: removable screw terminals 0.5...1.5 mm <sup>2</sup> /AWG 20...AWG 16                                                                                                                                                                                                                                                                                                                                          |
| Connector type                      | RJ45 (on the remote graphic terminal) for Modbus serial<br>RJ45 (on the remote graphic terminal) for Ethernet/Modbus TCP                                                                                                                                                                                                                                                                                                                                                                                                     |
| Data format                         | 8 bits, configurable odd, even or no parity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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| Type of polarization      | No impedance                                                                                                                                                                                                                                                                                                                                                                                                   |
| 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<br>Internal supply for digital inputs and STO: 24 V DC (21...27 V), <200 mA, protection type: overload and short-circuit protection<br>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<br>4 LEDs (dual colour) for communication module status<br>1 LED (red) for presence of voltage<br>3 LEDs for local diagnostic                                                                                                                                                                                                                           |
| Width                     | 264 mm                                                                                                                                                                                                                                                                                                                                                                                                         |
| Height                    | 678 mm                                                                                                                                                                                                                                                                                                                                                                                                         |
| Depth                     | 299 mm                                                                                                                                                                                                                                                                                                                                                                                                         |
| Net weight                | 20.6 kg                                                                                                                                                                                                                                                                                                                                                                                                        |
| Analogue input number     | 3                                                                                                                                                                                                                                                                                                                                                                                                              |
| Analogue input type       | AI1, AI2, AI3 software-configurable voltage: 0...10 V DC, impedance: 31.5 kOhm, resolution 12 bits<br>AI1, AI2, AI3 software-configurable current: 0...20 mA, impedance: 250 Ohm, resolution 12 bits<br>AI2 voltage analog input: - 10...10 V DC, impedance: 31.5 kOhm, resolution 12 bits                                                                                                                     |
| Discrete input number     | 8                                                                                                                                                                                                                                                                                                                                                                                                              |
| Discrete input type       | DI7, DI8 programmable as pulse input: 0...30 kHz, 24 V DC (<= 30 V)                                                                                                                                                                                                                                                                                                                                            |
| Input compatibility       | DI5, DI6: discrete input level 1 PLC conforming to IEC 65A-68<br>STOA, STOB: discrete input level 1 PLC conforming to IEC 61131-2<br>DI1...DI6: discrete input level 1 PLC conforming to IEC 61131-2                                                                                                                                                                                                           |
| Discrete input logic      | Positive logic (source) (DI1...DI8), < 5 V (state 0), > 11 V (state 1)<br>Negative logic (sink) (DI1...DI8), > 16 V (state 0), < 10 V (state 1)                                                                                                                                                                                                                                                                |
| Analogue output number    | 2                                                                                                                                                                                                                                                                                                                                                                                                              |
| Analogue output type      | Software-configurable voltage AQ1, AQ2: 0...10 V DC impedance 470 Ohm, resolution 10 bits<br>Software-configurable current AQ1, AQ2: 0...20 mA, resolution 10 bits<br>Software-configurable current DQ-, DQ+: 30 V DC<br>Software-configurable current DQ-, DQ+: 100 mA                                                                                                                                        |
| Sampling duration         | 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<br>2 ms +/- 0.5 ms (DI1...DI4) - discrete input                                                                                                                                                                                                                            |
| Accuracy                  | +/- 1 % AO1, AO2 for a temperature variation 60 °C analog output<br>+/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input                                                                                                                                                                                                                                                                     |
| Linearity error           | AO1, AO2: +/- 0.2 % for analog output<br>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<br>Configurable relay logic R3: sequence relay NO electrical durability 100000 cycles<br>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<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<br>Relay output R1, R2, R3 on resistive load, cos phi = 1: 3 A at 250 V AC                                                                       |
| Isolation                 | Between power and control terminals                                                                                                                                                                                                                                                                                                                                                                            |
| Maximum output frequency  | 500 kHz                                                                                                                                                                                                                                                                                                                                                                                                        |
| Maximum input current     | 33.4 A                                                                                                                                                                                                                                                                                                                                                                                                         |
| Quantity per set          | 1                                                                                                                                                                                                                                                                                                                                                                                                              |
| Enclosure mounting        | Wall mounted                                                                                                                                                                                                                                                                                                                                                                                                   |

## Environment

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| Insulation resistance                 | > 1 MOhm 500 V DC for 1 minute to earth                                                                                                                                                                                                                                                                                                                                                                                          |
| Noise level                           | 53.7 dB conforming to 86/188/EEC                                                                                                                                                                                                                                                                                                                                                                                                 |
| 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<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<br>Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2 |
| Pollution degree                      | 2 conforming to IEC 61800-5-1                                                                                                                                                                                                                                                                                                                                                                                                    |
| Vibration resistance                  | 1 gn (f= 13...200 Hz) conforming to IEC 60068-2-6<br>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)<br>-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<br><= 1000 m without derating                                                                                                                                                                                                                                                                                                                                                  |
| Product certifications                | ABS[RETURN]UL[RETURN]DNV-GL[RETURN]Bureau Veritas[RETURN]TÜV[RETURN]CSA[RETURN]DNV-GL                                                                                                                                                                                                                                                                                                                                            |
| Marking                               | CE                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Standards                             | IEC 61800-3 environment 1 category C2<br>EN/IEC 61800-3 environment 2 category C3<br>IEC 61800-5-1<br>IEC 61000-3-12<br>IEC 60721-3<br>IEC 61508<br>IEC 13849-1<br>UL 508C                                                                                                                                                                                                                                                       |
| Overvoltage category                  | III                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Regulation loop                       | Adjustable PID regulator                                                                                                                                                                                                                                                                                                                                                                                                         |
| Noise level                           | 53.7 dB                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Pollution degree                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Offer Sustainability

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