# Product data sheet

Specifications



## variable speed drive APM, ATV900, Low Harmonic/Regen drive, 440 V, 400 kW

ATV9B0C40R4

## Main

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| **Range of product** | Altivar Process ATV900 |
| **Product specific application** | Process and utilities |
| **Product or component type** | Variable speed drive |
| **Device short name** | ATV9B0 |
| **Variant** | Modular version |
| **Product destination** | Synchronous motors<br>Asynchronous motors |
| **Mounting mode** | Cabinet mount |
| **Kit composition** | 1 control unit<br>mechanical mounting kits<br>power connection<br>set of fuses<br>3.0 power module 160 kW<br>2.0 front cover |
| **EMC filter** | Integrated with 300 m conforming to IEC 61800-3 category C3 |
| **IP degree of protection** | IP00 (for IP21 or IP54 cabinet integration) conforming to IEC 61800-5-1<br>IP00 (for IP21 or IP54 cabinet integration) conforming to IEC 60529 |
| **Type of cooling** | Forced convection |
| **Supply frequency** | 50...60 Hz +/- 5 % |
| **Network number of phases** | 3 phases |
| **[Us] rated supply voltage** | 440 V - 15...10 % |
| **Permissible temporary current boost** | 1.2 x In during 60 s (normal duty)<br>1.5 x In during 60 s (heavy duty) |
| **Asynchronous motor control profile** | Optimized torque mode<br>Variable torque standard<br>Constant torque standard |
| **Synchronous motor control profile** | Permanent magnet motor<br>Synchronous reluctance motor |
| **Speed drive output frequency** | 0.1…599 Hz |
| **Nominal switching frequency** | 2.5 kHz |
| **Switching frequency** | 2.5...8 kHz with derating factor<br>2...8 kHz adjustable |
| **Safety function** | STO (safe torque off) SIL 3 |
| **Communication port protocol** | EtherNet/IP<br>Modbus serial<br>Modbus TCP |

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

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| **Option card** | Slot A: communication module for Profibus DP V1<br>Slot A: communication module for PROFINET<br>Slot A: communication module for DeviceNet<br>Slot A: communication module for CANopen daisy chain RJ45<br>Slot A: communication module for CANopen SUB-D 9<br>Slot A: communication module for CANopen screw terminals<br>Slot A: communication module for EtherCAT<br>Slot A/slot B/slot C: digital and analog I/O extension module<br>Slot A/slot B/slot C: output relay extension module<br>Slot B: 5/12 V digital encoder interface module<br>Slot B: analog encoder interface module<br>Slot B: resolver encoder interface module |

## Complementary

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| **Motor power kW** | 400.0 kW at 440 V normal duty<br>315.0 kW at 440 V heavy duty<br>400.0 kW at 440 V normal duty regenerative mode<br>315.0 kW at 440 V heavy duty regenerative mode |
| **Line current** | 563.0 A at 440 V (normal duty)<br>446.0 A at 440 V (heavy duty)<br>489.0 A at 440 V regenerative mode (normal duty)<br>383.1 A at 440 V regenerative mode (heavy duty) |
| **Apparent power** | 429.0 kVA at 440 V normal duty<br>340.0 kVA at 440 V heavy duty<br>372.7 kVA at 440 V normal duty regenerative mode<br>291.9 kVA at 440 V heavy duty regenerative mode |
| **Continuous output current** | 730.0 A at 2.5 kHz normal duty<br>590.0 A at 2.5 kHz heavy duty<br>730.0 A at 2.5 kHz normal duty regenerative mode<br>590.0 A at 2.5 kHz heavy duty regenerative mode |
| **Maximum transient current** | 876.0 A during 60 s (normal duty)<br>885.0 A during 60 s (heavy duty)<br>876.0 A during 60 s regenerative mode (normal duty)<br>885.0 A during 60 s regenerative mode (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<br>S, U or customized |
| **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 terminals 0.5...1.5 mm²/20 AWG...16 AWG<br>Line side: screw terminal<br>Motor: M10 x 2 bars |
| **Connector type** | 2 RJ45 for Ethernet IP/Modbus TCP on terminal<br>1 RJ45 for Modbus serial on terminal |
| **Physical interface** | 2-wire RS 485 for Modbus serial |
| **Transmission frame** | RTU for Modbus serial |

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| **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 |
| **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 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 |
| **Local signalling** | Local diagnostic: 3 LED (mono/dual colour)<br>Embedded communication status: 5 LED (dual colour)<br>Communication module status: 2 LED (dual colour) |
| **Analogue input type** | AI1, AI3 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits<br>AI1, AI3 software-configurable current: 0...20 mA/4...20 mA, impedance: 250 Ohm, resolution 12 bits<br>AI2 software-configurable voltage: +/- 10 V DC, impedance: 30 kOhm, resolution 12 bits<br>AI2 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits |
| **Discrete input type** | DI1...DI8 programmable, 24 V DC (<= 30 V), impedance: 3.5 kOhm<br>DI7, DI8 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...DI8: discrete input level 1 PLC conforming to IEC 61131-2<br>DI7, DI8: pulse input level 1 PLC conforming to IEC 65A-68<br>STOA, STOB: 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)<br>Positive logic (source) (DI7, DI8), < 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 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 impedance 500 Ohm, resolution 10 bits |
| **Discrete output type** | Logic output DQ+ 0…1 kHz <= 30 V DC 100 mA<br>Programmable as pulse output DQ+ 0…30 kHz <= 30 V DC 20 mA<br>Logic output DQ- 0…1 kHz <= 30 V DC 100 mA |
| **Sampling duration** | 2 ms +/- 0.5 ms (DI1...DI8) - discrete input<br>5 ms +/- 1 ms (DI7, DI8) - pulse input<br>1 ms +/- 1 ms (AI1, AI2, AI3) - analog input<br>5 ms +/- 1 ms (AQ1, AQ2) - analog output |
| **Accuracy** | +/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input<br>+/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output |
| **Linearity error** | AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input<br>AQ1, AQ2: +/- 0.2 % for analog output |
| **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 1000000 cycles<br>Configurable relay logic R3: sequence relay NO electrical durability 1000000 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 |

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| **Maximum switching current** | Relay output R1 on resistive load, cos phi = 1: 3 A at 250 V AC<br>Relay output R1 on resistive load, cos phi = 1: 3 A at 30 V DC<br>Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC<br>Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC<br>Relay output R2, R3 on resistive load, cos phi = 1: 5 A at 250 V AC<br>Relay output R2, R3 on resistive load, cos phi = 1: 5 A at 30 V DC<br>Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC<br>Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC |
| **Insulation resistance** | > 1 MOhm at 500 V DC, 1 min, earth |

## Environment

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| **Noise level** | 75 dB conforming to 86/188/EEC |
| **Maximum THDI** | <5 % full load conforming to IEEE 519 |
| **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 IEC 61800-5-1 |
| **Vibration resistance** | 1.5 mm peak to peak (f= 2…13 Hz) conforming to IEC 60068-2-6<br>0.5 gn (f= 13…200 Hz) conforming to IEC 60068-2-6 |
| **Shock resistance** | 4 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** | -5…40 °C without derating<br>40…50 °C with derating factor |
| **Ambient air temperature for storage** | -40…70 °C |
| **Operating altitude** | 0...4800 m with current derating above 1000m |
| **Environmental characteristic** | Chemical pollution resistance class 3C3 conforming to IEC 60721-3-3<br>Dust pollution resistance class 3S3 conforming to IEC 60721-3-3 |
| **Standards** | IEC 61800-3<br>IEC 61800-5-1<br>IEC 61000-3-12<br>IEC 60721-3<br>IEC 61508<br>IEC 13849-1 |
| **Product certifications** | TÜV |
| **Marking** | CE |

## Contractual warranty

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| **Warranty (in months)** | 18 |