Product data sheet

ATV930D45N4
variable speed drive, ATV930, 45kW, 400/480V, with braking unit, IP21

Main
Range of product Altivar Process ATV900
Product or component type Variable speed drive
Device application Industrial application
Device short name ATV930
Variant Standard version
With braking chopper
Product destination Synchronous motors
Asynchronous motors
Mounting mode Wall mount
EMC filter Integrated with 50 m conforming to EN/IEC 61800-3 category C2
Integrated with 150 m conforming to EN/IEC 61800-3 category C3
IP degree of protection IP21 conforming to IEC 61800-5-1
IP21 conforming to IEC 60529
Degree of protection UL type 1 conforming to UL 508C
Type of cooling Forced convection
Supply frequency 50...60 Hz +/- 5 %
Network number of phases 3 phases
[Us] rated supply voltage 380...480 V - 15...10 %
Motor power kW 45 kW (normal duty)
37 kW (heavy duty)
Motor power hp 60 hp normal duty
50 hp heavy duty
Line current 79.8 A at 380 V (normal duty)
69.1 A at 480 V (normal duty)
67.1 A at 380 V (heavy duty)
59 A at 480 V (heavy duty)
Prospective line Isc 50 kA
Apparent power 57.4 kVA at 480 V (normal duty)
49.1 kVA at 480 V (heavy duty)
Continuous output current 88 A at 4 kHz for normal duty
74.5 A at 4 kHz for heavy duty

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

Nov 3, 2019
### Maximum transient current
- 105.6 A during 60 s (normal duty)
- 111.8 A during 60 s (heavy duty)

### Asynchronous motor control profile
- Constant torque standard
- Optimized torque mode
- Variable torque standard

### Synchronous motor control profile
- Permanent magnet motor
- Synchronous reluctance motor

### Speed drive output frequency
- 0.1...599 Hz

### Nominal switching frequency
- 4 kHz

### Switching frequency
- 2...16 kHz adjustable
- 4...16 kHz with derating factor

### Safety function
- STO (safe torque off) SIL 3

### Number of preset speeds
- 16 preset speeds

#### Communication port protocol
- Ethernet/IP
- Modbus serial
- Modbus TCP

#### Option module
- Slot A: communication module for Profibus DP V1
- Slot A: communication module for Profinet
- Slot A: communication module for DeviceNet
- Slot A: communication module for EtherCAT
- Slot A: communication module for CANopen daisy chain RJ45
- Slot A: communication module for CANopen SUB-D 9
- Slot A: communication module for CANopen screw terminals
- Slot A/slot B/slot C: digital and analog I/O extension module
- Slot A/slot B/slot C: output relay extension module
- Slot B: 5/12 V digital encoder interface module
- Slot B: analog encoder interface module
- Slot B: resolver encoder interface module
- Communication module for Ethernet Powerlink

### Complementary

#### Output voltage
- <= power supply voltage

#### Motor slip compensation
- Automatic whatever the load
- Adjustable
- Not available in permanent magnet motor law
- 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
- 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
- Overvoltage protection: drive
- Line supply overvoltage: drive
- Line supply undervoltage: drive
- Line supply phase loss: drive
- Overspeed: drive
- Break on the control circuit: drive

#### Frequency resolution
- Display unit: 0.1 Hz
- Analog input: 0.012/50 Hz

#### Electrical connection
- Control: screw terminal 0.5...1.5 mm²/AWG 20...AWG 16
- Line side: screw terminal 35...50 mm²/AWG 2...AWG 1
- Motor: screw terminal 50 mm²/AWG 1
- DC bus: screw terminal 35...50 mm²/AWG 3...AWG 1

#### Connector type
- 2 RJ45 for Ethernet IP/Modbus TCP on the control block
- 1 RJ45 for Modbus serial on the control block

#### 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
4.8, 9.6, 19.2, 38.4 kbit/s for Modbus serial

Exchange mode Half duplex, full duplex, autonegotiation Ethernet IP/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
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

Local signalling Local diagnostic: 3 LED (mono/dual colour)
Embedded communication status: 5 LED (dual colour)
Communication module status: 2 LED (dual colour)
Presence of voltage: 1 LED (red)

Width 226 mm
Height 673 mm
Depth 274 mm
Net weight 28.7 kg

Analogue input number 3

Analogue input type AI1, AI2, AI3 software-configurable voltage: 0…10 V DC, impedance: 30 kOhm, resolution 12 bits
AI1, AI2, AI3 software-configurable current: 0…20 mA/4…20 mA, impedance: 250 Ohm, resolution 12 bits

Discrete input number 10

Discrete input type DI1…DI8 programmable, 24 V DC (<= 30 V), impedance: 3.5 kOhm
DI7, DI8 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

Input compatibility DI1…DI8: discrete input level 1 PLC conforming to EN/IEC 61131-2
DI7, DI8: pulse input level 1 PLC conforming to IEC 65A-68
STOA, STOB: discrete input level 1 PLC conforming to EN/IEC 61131-2

Discrete input logic Positive logic (source) (DI1…DI8), < 5 V (state 0), > 11 V (state 1)
Negative logic (sink) (DI1…DI8), > 16 V (state 0), < 10 V (state 1)
Positive logic (source) (DI7, DI8), < 0.6 V (state 0), > 2.5 V (state 1)
Positive logic (source) (STOA, STOB), < 5 V (state 0), > 11 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
Software-configurable current AQ1, AQ2: 0…20 mA impedance 500 Ohm, resolution 10 bits

Discrete output number 2

Discrete output type Logic output DQ+: 0…1 kHz <= 30 V DC 100 mA
Programmable as pulse output DQ+: 0…30 kHz <= 30 V DC 20 mA
Logic output DQ-: 0…1 kHz <= 30 V DC 100 mA

Sampling duration 2 ms +/- 0.5 ms (DQ1…DQ8) - discrete input
5 ms +/- 1 ms (DQ1, DQ2) - pulse input
1 ms +/- 1 ms (AI1, AI2, AI3) - analog input
5 ms +/- 1 ms (AQ1, AQ2) - analog output

Accuracy +/- 0.6 % A1, A2, A3 for a temperature variation 60 °C analog input
 +/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output

Linearity error A11, A12, A13: +/- 0.15 % of maximum value for analog input
A1, AQ2: +/- 0.2 % for analog output

Maximum switching current Relay output R1 on resistive load, cos phi = 1: 3 A at 250 V AC
Relay output R1 on resistive load, cos phi = 1: 3 A at 30 V DC
Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC
Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC
Relay output R2, R3 on resistive load, cos phi = 1: 5 A at 250 V AC
Relay output R2, R3 on resistive load, cos phi = 1: 5 A at 30 V DC
Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 250 V AC
Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 A at 30 V DC

Relay output number 3

Relay output type Configurable relay logic R1: fault relay NO/NC electrical durability 100000 cycles
Configurable relay logic R2: sequence relay NO electrical durability 1000000 cycles
Configurable relay logic R3: sequence relay NO electrical durability 1000000 cycles

Refresh time Relay output (R1, R2, R3): 5 ms +/- 0.5 ms
<table>
<thead>
<tr>
<th><strong>Minimum switching current</strong></th>
<th>Relay output R1, R2, R3: 5 mA at 24 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isolation</strong></td>
<td>Between power and control terminals</td>
</tr>
</tbody>
</table>
| **Variable speed drive application selection** | Food and beverage processing Mixer  
Food and beverage processing Conveyor  
Food and beverage processing Shredder  
Hoisting Process crane  
Marine Thruster  
Marine Winch  
Material working (wood, ceramic, stone, pvc, metal) Press  
Material working (wood, ceramic, stone, pvc, metal) Extruder  
Mining mineral and metal Other application  
Oil and gas Drilling rig  
Oil and gas Progressive cavity pump  
Oil and gas Rod pump  
Oil and gas Swapping pump  
Oil and gas Compressor for regasification  
Oil and gas Separator  
Oil and gas Other application  
Water and waste water Separator |
| **Power range**               | 30…50 kW at 380…440 V 3 phases  
30…50 kW at 480…500 V 3 phases |

**Environment**

| **Insulation resistance** | > 1 MOhm 500 V DC for 1 minute to earth |
| **Noise level**           | 71.5 dB conforming to 86/188/EEC |
| **Power dissipation in W** | Natural convection: 121 W at 380 V, switching frequency 4 kHz  
Forced convection: 943 W at 380 V, switching frequency 4 kHz |
| **Vibration resistance**  | 1.5 mm peak to peak (f= 2…13 Hz) conforming to IEC 60068-2-6  
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 |
| **Volume of cooling air** | 240 m³/h |
| **Operating position**    | Vertical +/- 10 degree |
| **Maximum THDI**          | <48 % from 80…100 % of load conforming to IEC 61000-3-12 |

**Electromagnetic compatibility**

| **Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2** |
| **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** |

**Environmental characteristic**

| **Chemical pollution resistance class 3C3 conforming to EN/IEC 60721-3-3** |
| **Dust pollution resistance class 3S3 conforming to EN/IEC 60721-3-3** |
| **Pollution degree 2 conforming to EN/IEC 61800-5-1** |
| **Relative humidity 5…95 % without condensation conforming to IEC 60068-2-3** |
| **Ambient air temperature for operation** |
| -15…50 °C (without)  
50…60 °C (with derating factor) |
| **Ambient air temperature for storage** |
| -40…70 °C |
| **Operating altitude** |
| <= 1000 m without  
1000…4800 m with current derating 1 % per 100 m |

**Standards**

| **UL 508C** |
| **EN/IEC 61800-3** |
| **Environment 1 category C2 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** |

**Product certifications**

| **CSA** |
| **UL** |
| **REACH** |
| **TÜV** |

**Marking**

<p>| <strong>CE</strong> |</p>
<table>
<thead>
<tr>
<th>Offer Sustainability</th>
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</thead>
<tbody>
<tr>
<td>Sustainable offer status</td>
</tr>
<tr>
<td>REACh Regulation</td>
</tr>
<tr>
<td>EU RoHS Directive</td>
</tr>
<tr>
<td>Mercury free</td>
</tr>
<tr>
<td>RoHS exemption information</td>
</tr>
<tr>
<td>China RoHS Regulation</td>
</tr>
<tr>
<td>Environmental Disclosure</td>
</tr>
<tr>
<td>Circularity Profile</td>
</tr>
<tr>
<td>WEEE</td>
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</tbody>
</table>
Dimensions

Front, Left and Rear View
Clearances

<table>
<thead>
<tr>
<th>X1</th>
<th>X2</th>
<th>X3</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 100 mm (3.94 in.)</td>
<td>≥ 100 mm (3.94 in.)</td>
<td>≥ 10 mm (0.39 in.)</td>
</tr>
</tbody>
</table>

- Mount the device in a vertical position (±10°). This is required for cooling the device.
- Do not mount the device close to heat sources.
- Leave sufficient free space so that the air required for cooling purposes can circulate from the bottom to the top of the drive.
Mounting Types

Mounting Type A: Individual IP21

Mounting Type B: Side by Side IP20 (Possible, 2 Drives Only)

Mounting Type C: Individual IP20

\[ a \geq 110 \text{ mm (4.33 in.)} \]
Three-Phase Power Supply with Upstream Breaking via Line Contactor

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

(1) Line choke if used
(2) Use relay R1 set to operating state Fault to switch Off the product once an error is detected.

A1: Drive
KM1: Line Contactor
Q2, Q3: Circuit breakers
S1, S2: Pushbuttons
T1: Transformer for control part
Three-Phase Power Supply with Downstream Breaking via Contactor

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

(1) Line choke if used
(2) Use relay R1 set to operating state Fault to switch Off the product once an error is detected.

A1 : Drive
KM1 : Contactor
Control Block Wiring Diagram

(1) Safe Torque Off
(2) Analog Output
(3) Digital Input
(4) Reference potentiometer
(5) Analog Input
(6) Digital Output
(7) 0-10 Vdc, x-20 mA
(8) 0-10 Vdc, -10 Vdc...+10 Vdc

R1A, R1BF Relay
R2A, R2C Sequence relay
R3A, R3C Sequence relay

Sensor Connection

It is possible to connect either 1 or 3 sensors on terminals Al1 or Al3
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) - Mounting type A, B and C
50 °C (122 °F) - Mounting type A, B and C
60 °C (140 °F) - Mounting type B and C

In : Nominal Drive Current
SF : Switching Frequency