

# Product data sheet

Specifications



## Variable speed drive, Altivar Process ATV900, ATV930, 2,2 kW, 380...480 V, cabinet Integration, IP20

ATV930U22N4Z

### Main

|                                    |  |
|------------------------------------|--|
| Range of product                   | Altivar Process ATV900   |
| Device application                 | Industrial application   |
| Product or component type          | Variable speed drive   |
| Product destination                | Synchronous motors<br>Asynchronous motors  |
| Product specific application       | Process for industrial   |
| Variant                            | Standard version<br>With braking chopper   |
| Network number of phases           | 3 phases   |
| Mounting mode                      | Cabinet mount  |
| Communication port protocol        | Modbus TCP<br>EtherNet/IP<br>Modbus serial   |
| [Us] rated supply voltage          | 380...480 V - 15...10 %  |
| Motor power kW                     | 2.2 kW for normal duty<br>1.5 kW for heavy duty  |
| Motor power hp                     | 3.0 hp for normal duty<br>2.0 hp for heavy duty  |
| Continuous output current          | 5.6 A at 4 kHz for normal duty<br>4 A at 4 kHz for heavy duty  |
| EMC filter                         | Integrated<br>With EMC plate option  |
| IP degree of protection            | IP21   |
| Option module                      | 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 EtherCAT<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/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<br>communication module for Ethernet Powerlink |
| Discrete input logic               | 16 preset speeds   |
| Asynchronous motor control profile | Constant torque standard<br>Optimized torque mode<br>Variable torque standard  |

|                                   |  |
|-----------------------------------|--|
| Synchronous motor control profile | Permanent magnet motor<br>Synchronous reluctance motor   |
| Maximum output frequency          | 599 Hz   |
| Switching frequency               | 2...16 kHz adjustable<br>4...16 kHz with derating factor   |
| Nominal switching frequency       | 4 kHz  |
| Line current                      | 4.3 A at 380 V (normal duty)<br>3.1 A at 380 V (heavy duty)<br>3.8 A at 480 V (normal duty)<br>2.9 A at 480 V (heavy duty)   |
| Apparent power                    | 3.2 kVA at 480 V (normal duty)<br>2.4 kVA at 480 V (heavy duty)  |
| Maximum transient current         | 6.7 A during 60 s (normal duty)<br>6 A during 60 s (heavy duty)  |
| Network frequency                 | 50...60 Hz   |
| Prospective line Isc              | 50 kA  |
| Complementary                     |  |
| Discrete input number             | 10   |
| Discrete input type               | DI1...DI8 programmable, 24 V DC ( $\leq 30$ V), impedance: 3.5 kOhm<br>DI7, DI8 programmable as pulse input: 0...30 kHz, 24 V DC ( $\leq 30$ V)<br>STOA, STOB safe torque off, 24 V DC ( $\leq 30$ V), impedance: $> 2.2$ kOhm   |
| Discrete output number            | 2  |
| Discrete output type              | Logic output DQ+ 0...1 kHz $\leq 30$ V DC 100 mA<br>Programmable as pulse output DQ+ 0...30 kHz $\leq 30$ V DC 20 mA<br>Logic output DQ- 0...1 kHz $\leq 30$ V DC 100 mA   |
| 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   |
| 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 impedance 500 Ohm, resolution 10 bits   |
| 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 1000000 cycles<br>Configurable relay logic R3: sequence relay NO electrical durability 1000000 cycles   |
| 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 |
| Minimum switching current         | Relay output R1, R2, R3: 5 mA at 24 V DC   |
| Physical interface                | Ethernet<br>2-wire RS 485  |
| Connector type                    | 2 RJ45<br>1 RJ45   |
| Method of access                  | Slave Modbus TCP   |
| Transmission rate                 | 10, 100 Mbits<br>4.8 kbps<br>9600 bit/s<br>19200 bit/s   |
| Transmission frame                | RTU  |
| Number of addresses               | 1...247  |
| Data format                       | 8 bits, configurable odd, even or no parity  |
| Type of polarization              | No impedance   |

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| 4 quadrant operation possible                        | True   |
| Acceleration and deceleration ramps                  | Linear adjustable separately from 0.01...9999 s  |
| Motor slip compensation                              | Can be suppressed<br>Not available in permanent magnet motor law<br>Adjustable<br>Automatic whatever the load  |
| Braking to standstill                                | By DC injection  |
| Brake chopper integrated                             | True   |
| Maximum input current                                | 4.3 A  |
| Maximum output voltage                               | 480.0 V  |
| Relative symmetric network frequency tolerance       | 5 %  |
| Base load current at high overload                   | 4.0 A  |
| Base load current at low overload                    | 5.6 A  |
| Power dissipation in W                               | Natural convection: 30 W at 380 V, switching frequency 4 kHz<br>Forced convection: 60 W at 380 V, switching frequency 4 kHz  |
| With safety function Safely Limited Speed (SLS)      | True   |
| With safety function Safe brake management (SBC/SBT) | True   |
| With safety function Safe Operating Stop (SOS)       | False  |
| With safety function Safe Position (SP)              | False  |
| With safety function Safe programmable logic         | False  |
| With safety function Safe Speed Monitor (SSM)        | False  |
| With safety function Safe Stop 1 (SS1)               | True   |
| With sft fct Safe Stop 2 (SS2)                       | False  |
| With safety function Safe torque off (STO)           | True   |
| With safety function Safely Limited Position (SLP)   | False  |
| With safety function Safe Direction (SDI)            | False  |
| 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 |
| Quantity per set                                     | 1  |
| Width  | 130 mm   |
| Height   | 285 mm   |
| Depth  | 196 mm   |

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|--|---|
| Electrical connection                                      | Control: screw terminal 0.5...1.5 mm²/AWG 20...AWG 16<br>Line side: screw terminal 2.5...6 mm²/AWG 14...AWG 10<br>Motor: screw terminal 2.5...6 mm²/AWG 14...AWG 10<br>DC bus: screw terminal 2.5...6 mm²/AWG 14...AWG 10<br><br>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 IP/Modbus TCP<br><br>8 bits, configurable odd, even or no parity for Modbus serial   |
| Type of polarization                                       | No impedance for Modbus serial<br><br>1...247 for Modbus serial   |
| 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)<br>Presence of voltage: 1 LED (red)  |
| Input compatibility  | DI1...DI8: discrete input level 1 PLC conforming to EN/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 EN/IEC 61131-2<br><br>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) |
| 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  |
| Refresh time   | Relay output (R1, R2, R3): 5 ms (+/- 0.5 ms)  |
| Isolation  | Between power and control terminals   |
| Environment  |   |
| Operating altitude   | <= 1000 m without derating<br>1000...4800 m with current derating 1 % per 100 m   |
| Operating position   | Vertical +/- 10 degree  |
| Product certifications                                     | CSA<br>UL<br>TÜV  |
| Marking  | CE  |
| Standards  | UL 508C<br>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  |
| Maximum THDI   | <48 % full load conforming to IEC 61000-3-12  |
| Assembly style   | With heat sink  |
| 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  |
| Environmental class (during operation)                     | Class 3C3 according to IEC 60721-3-3<br>Class 3S3 according to IEC 60721-3-3  |
| Maximum acceleration under shock impact (during operation) | 150 m/s² at 11 ms   |

|  |  |
|--|--|
| Maximum acceleration under vibrational stress (during operation) | 10 m/s² at 13...200 Hz   |
| Maximum deflection under vibratory load (during operation)       | 1.5 mm at 2...13 Hz  |
| Permitted relative humidity (during operation)                   | Class 3K5 according to EN 60721-3  |
| Volume of cooling air  | 38 m3/h  |
| Overvoltage category   | III  |
| Regulation loop  | Adjustable PID regulator   |
| Insulation resistance  | > 1 MOhm 500 V DC for 1 minute to earth  |
| Noise level  | 54.5 dB conforming to 86/188/EEC   |
| 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   |
| 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 |
| Relative humidity  | 5...95 % without condensation conforming to IEC 60068-2-3  |
| Ambient air temperature for operation                            | -15...50 °C (without derating)<br>50...60 °C (with derating factor)  |
| Noise level  | 54.5 dB  |
| Pollution degree   | 2  |
| Ambient air transport temperature                                | -40...70 °C  |
| Ambient air temperature for storage                              | -40...70 °C  |

### Packing Units

|                              |           |
|------------------------------|-----------|
| Unit Type of Package 1       | PCE       |
| Number of Units in Package 1 | 1         |
| Package 1 Height             | 16.5 cm   |
| Package 1 Width              | 25.0 cm   |
| Package 1 Length             | 33.5 cm   |
| Package 1 Weight             | 4.862 kg  |
| Unit Type of Package 2       | P06       |
| Number of Units in Package 2 | 6         |
| Package 2 Height             | 75.0 cm   |
| Package 2 Width              | 80.0 cm   |
| Package 2 Length             | 60.0 cm   |
| Package 2 Weight             | 37.172 kg |

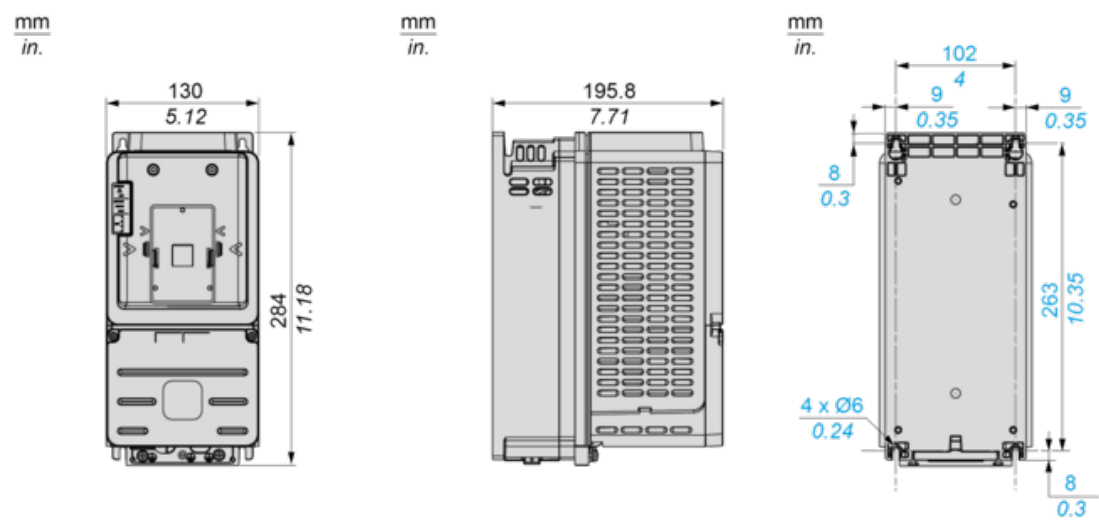
### Offer Sustainability

|                          |   |
|--------------------------|---|
| 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)<br><a href="#">EU RoHS Declaration</a> |
| Mercury free             | Yes   |
| China RoHS Regulation    | <a href="#">China RoHS declaration</a>  |

|                            |   |
|----------------------------|---|
| RoHS exemption information | <a href="#">Yes</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   |
| California proposition 65  | WARNING: This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> |
| Upgradeability             | Upgraded components available   |

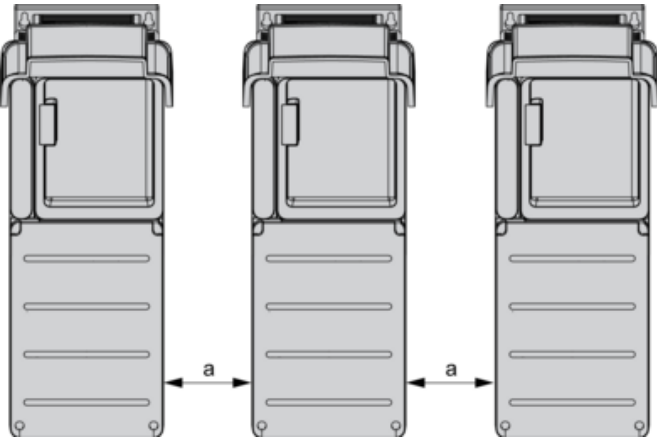
Dimensions

Front, Left and Rear Views



Mounting Types

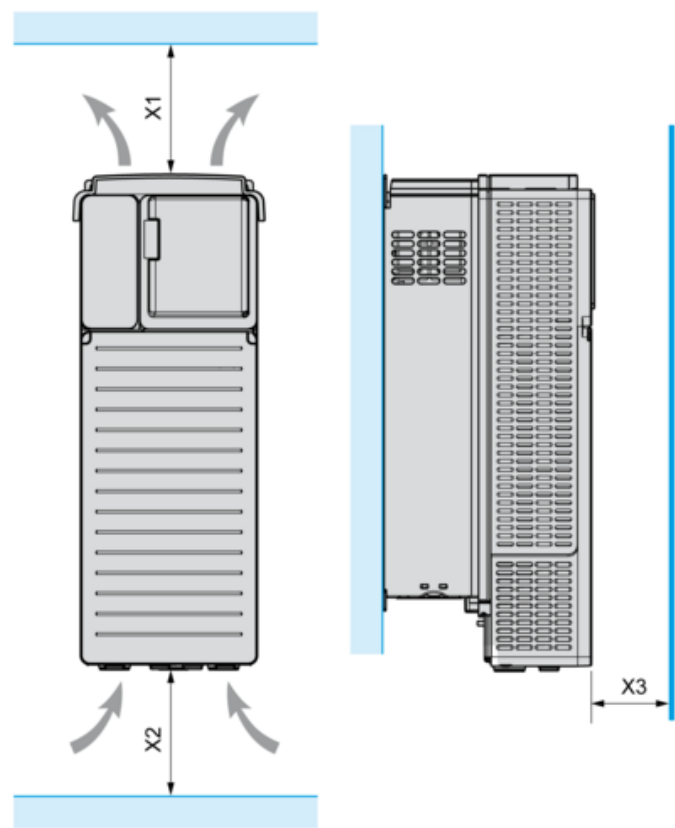
Mounting Type A : Individual IP21 and IP55



Frame sizes 1, 2, 3, 3S and 5S:  $a \geq 100\text{ mm}$  (3.9 in.)  
Frame sizes 4, 5 and 6:  $a \geq 110\text{ mm}$  (4.33 in.)



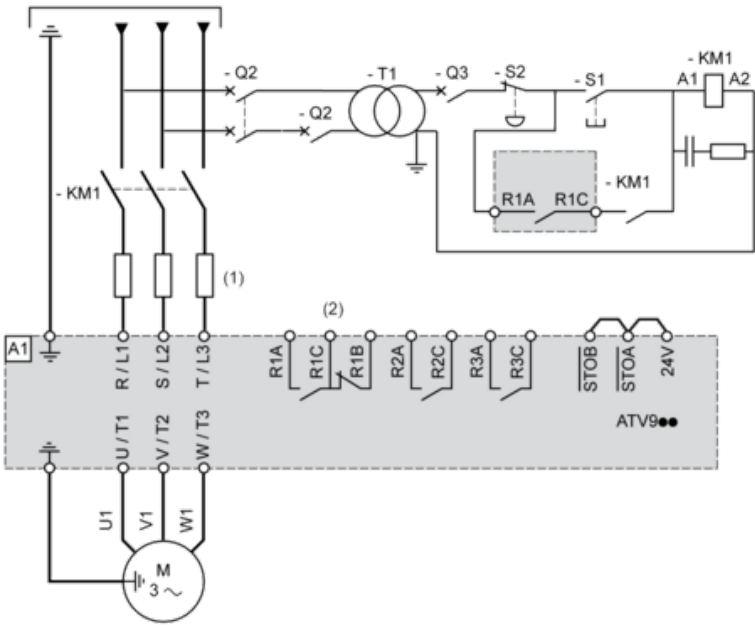
Clearance



| Frame Size | X1    |        | X2    |        | X3    |        |
|------------|-------|--------|-------|--------|-------|--------|
|            | mm    | in.    | mm    | in.    | mm    | in.    |
| 1...5      | ≥ 100 | ≥ 3.94 | ≥ 100 | ≥ 3.94 | ≥ 10  | ≥ 0.39 |
| 6          | ≥ 250 | ≥ 10   | ≥ 250 | ≥ 10   | ≥ 100 | ≥ 3.94 |

Three-Phase Power Supply with Upstream Breaking via Line Contactor

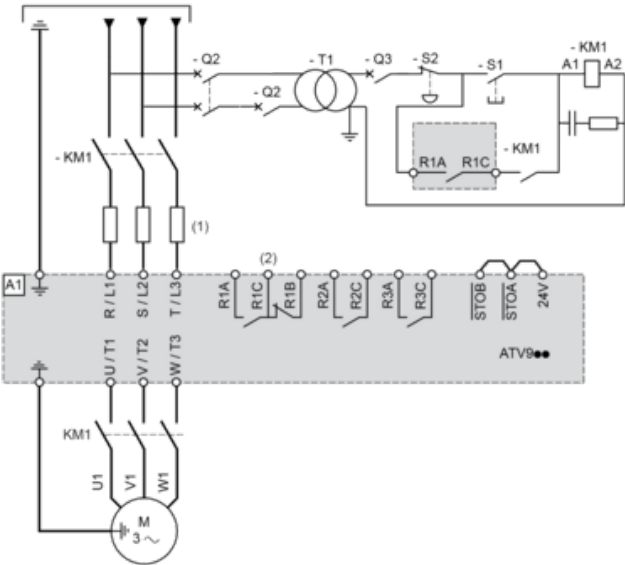
Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



- (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

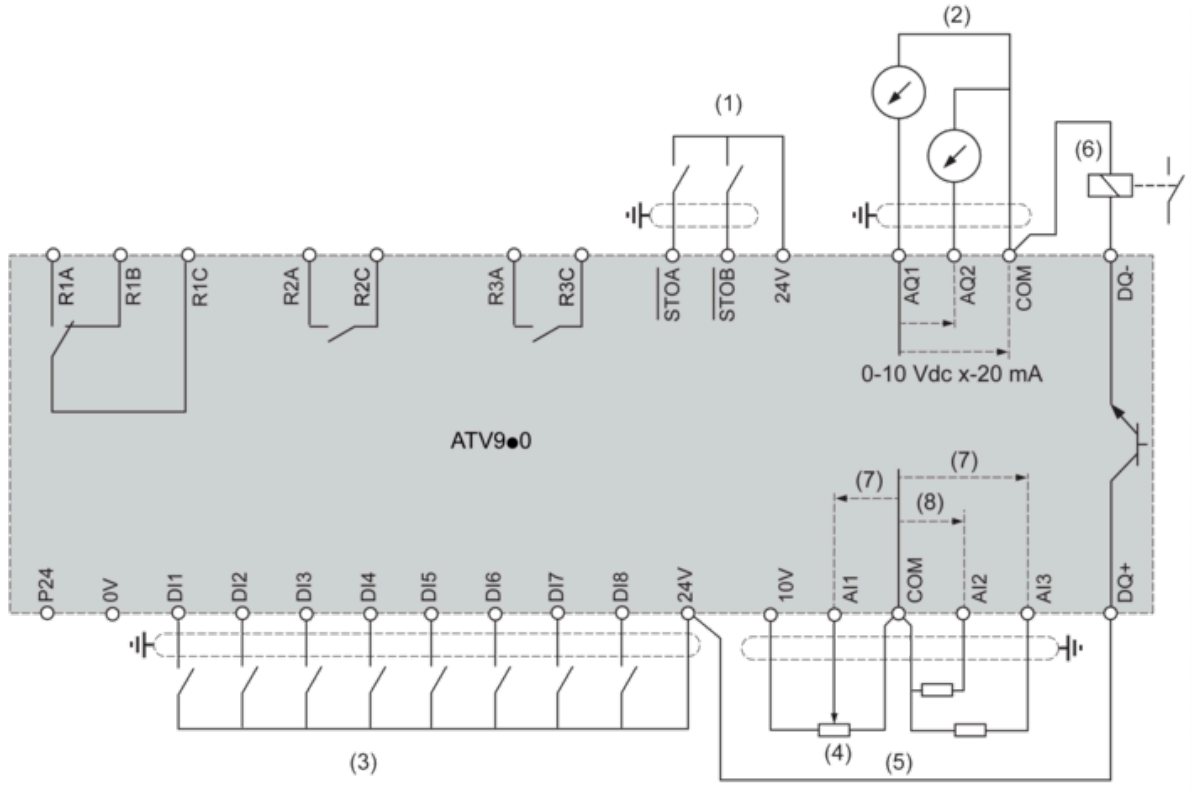
Three-Phase Power Supply with Downstream Breaking via Contactor

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, 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 AI1 or AI3

Sink / Source Switch Configuration

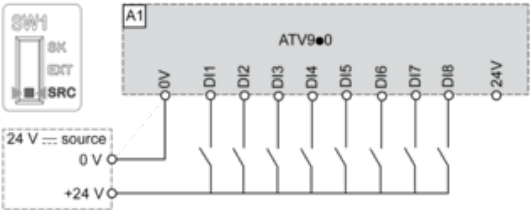
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- 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.

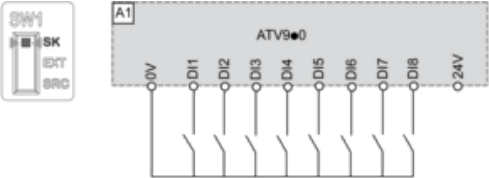
Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



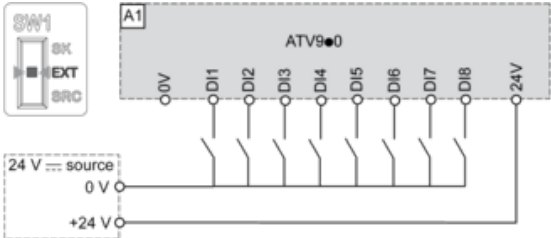
Switch Set to SRC (Source) Position and Use of an External Power Supply for the DI's



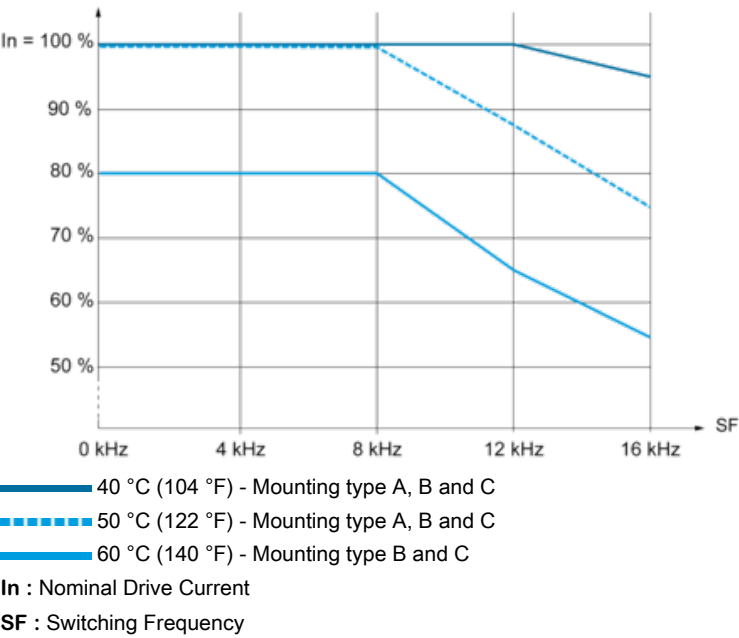
Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



Switch Set to EXT Position Using an External Power Supply for the DI's



Derating Curves



Recommended replacement(s)