

# ATV930D22N4

variable speed drive, Altivar Process ATV900,  
ATV930, 22kW, 400 to 480V, with braking unit,  
IP21





## 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                      | Wall mount   |
| Communication port protocol        | Modbus serial<br>EtherNet/IP<br>Modbus TCP   |
| [Us] rated supply voltage          | 380...480 V - 15...10 %  |
| Motor power kW                     | 22.0 kW for normal duty<br>18.5 kW for heavy duty  |
| Continuous output current          | 46.3 A at 4 kHz for normal duty<br>39.2 A at 4 kHz for heavy duty  |
| EMC filter                         | Integrated<br>With EMC plate option  |
| IP degree of protection            | IP21   |
| Degree of protection               | UL type 1  |
| 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 | Variable torque standard<br>Optimized torque mode<br>Constant 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                       | 39.6 A at 380 V (normal duty)<br>34.1 A at 380 V (heavy duty)<br>34.4 A at 480 V (normal duty)<br>29.9 A at 480 V (heavy duty)   |
| Apparent power                     | 28.6 kVA at 480 V (normal duty)<br>24.9 kVA at 480 V (heavy duty)  |
| Maximum transient current          | 55.6 A during 60 s (normal duty)<br>58.8 A during 60 s (heavy duty)  |
| Network frequency                  | 50...60 Hz   |
| Prospective line I <sub>sc</sub>   | 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   |
| 4 quadrant operation possible                  | True   |
| Acceleration and deceleration ramps            | Linear adjustable separately from 0.01...9999 s  |
| Motor slip compensation                        | Adjustable<br>Automatic whatever the load<br>Can be suppressed<br>Not available in permanent magnet motor law  |
| Braking to standstill                          | By DC injection  |
| Brake chopper integrated                       | True   |
| Maximum input current                          | 39.6 A   |
| Maximum output voltage                         | 480.0 V  |
| Relative symmetric network frequency tolerance | 5 %  |
| Base load current at high overload             | 39.2 A   |
| Base load current at low overload              | 46.3 A   |
| Power dissipation in W                         | Natural convection: 68 W at 380 V, switching frequency 4 kHz<br>Forced convection: 505 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  | 211 mm   |
| Height   | 545.9 mm   |
| Depth  | 235 mm   |
| Net weight   | 14.3 kg  |
| Electrical connection                                | Control: screw terminal 0.5...1.5 mm <sup>2</sup> /AWG 20...AWG 16<br>Line side: screw terminal 10...16 mm <sup>2</sup> /AWG 8...AWG 6<br>DC bus: screw terminal 10...16 mm <sup>2</sup> /AWG 8...AWG 6<br>Motor: screw terminal 16 mm <sup>2</sup> /AWG 6   |
| 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 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  |
| 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  |
| 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)   |
| 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

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|--|--|
| 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[RETURN]UL[RETURN]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 % from 80...100 % of load conforming to IEC 61000-3-12   |
| Assembly style   | Enclosed   |
| 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/s <sup>2</sup> at 11 ms  |
| Maximum acceleration under vibrational stress (during operation) | 10 m/s <sup>2</sup> 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  | 215 m <sup>3</sup> /h  |
| Overvoltage category   | III  |
| Regulation loop  | Adjustable PID regulator   |
| Insulation resistance  | > 1 MOhm 500 V DC for 1 minute to earth  |
| Noise level  | 59.5 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  | 59.5 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             | 26.0 cm   |
| Package 1 Width              | 73.5 cm   |
| Package 1 Length             | 34.5 cm   |
| Package 1 Weight             | 17.401 kg |
| Unit Type of Package 2       | P06       |
| Number of Units in Package 2 | 4         |
| Package 2 Height             | 90.0 cm   |

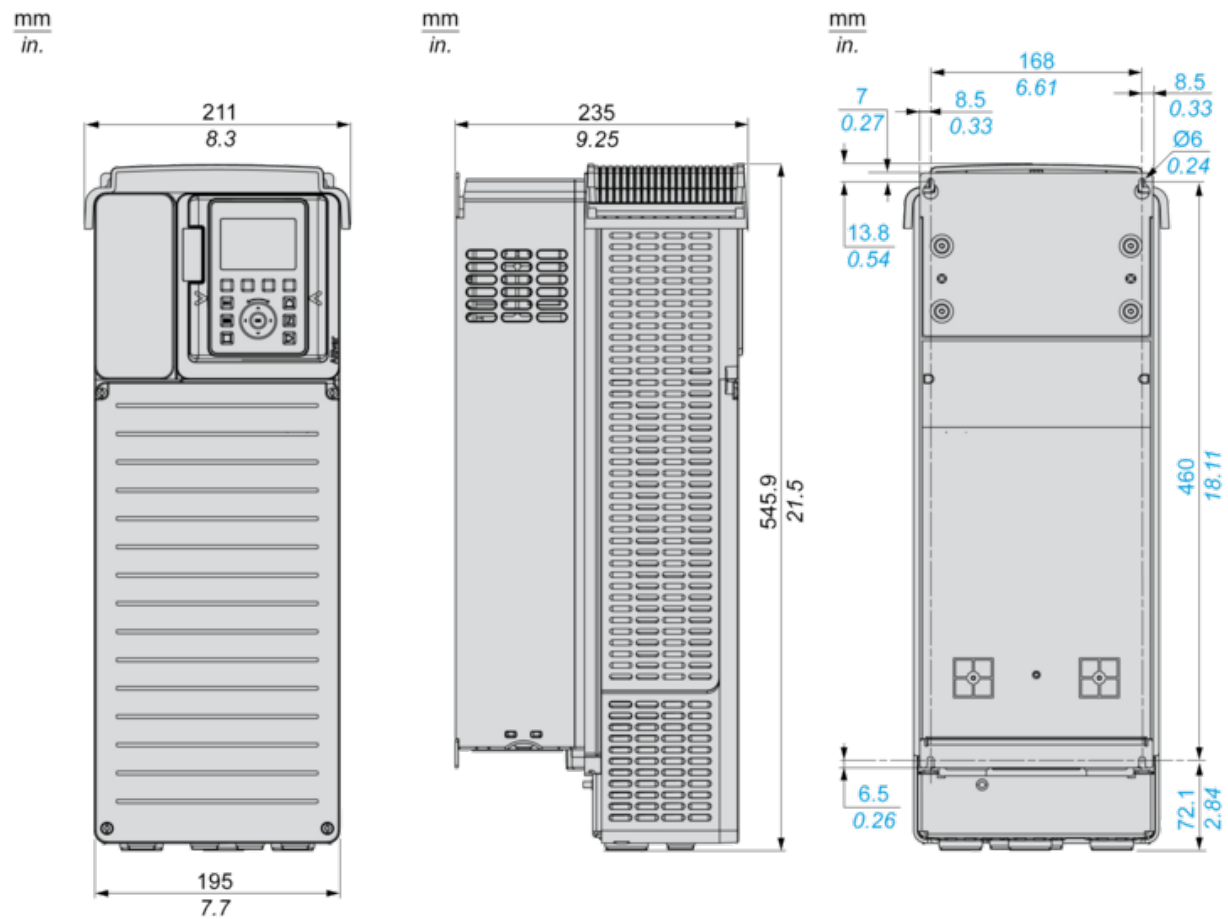
|                  |           |
|------------------|-----------|
| Package 2 Width  | 80.0 cm   |
| Package 2 Length | 60.0 cm   |
| Package 2 Weight | 80.696 kg |

### Offer Sustainability

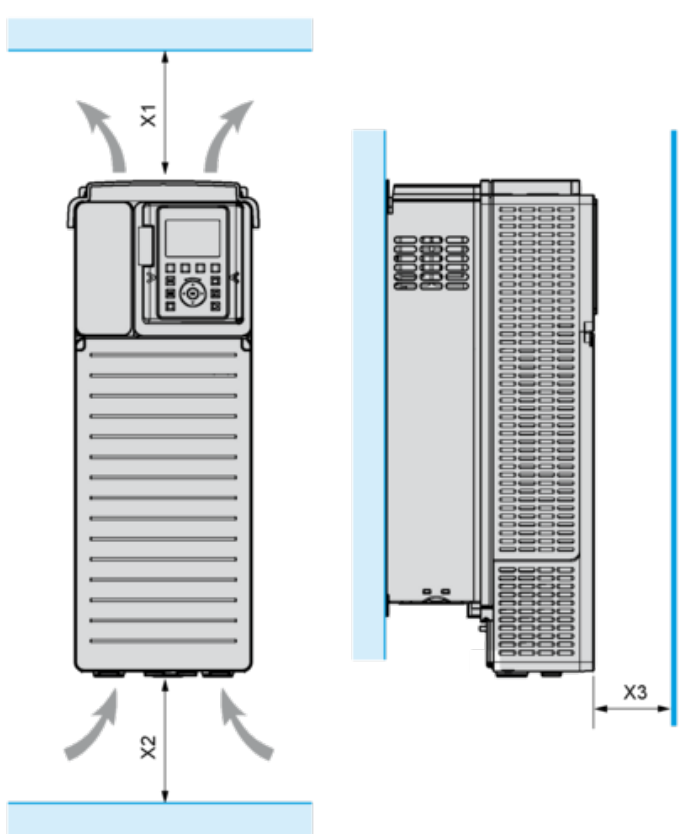
|                            |   |
|----------------------------|---|
| Sustainable offer status   | Green Premium product   |
| REACH Regulation           | <a href="#">REACH Declaration</a>   |
| EU RoHS Directive          | Pro-active compliance (Product out of EU RoHS legal scope) <a href="#">EU 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 |
| Upgradeability             | Upgraded components available   |

Dimensions

Front, Left and Rear View



Clearances

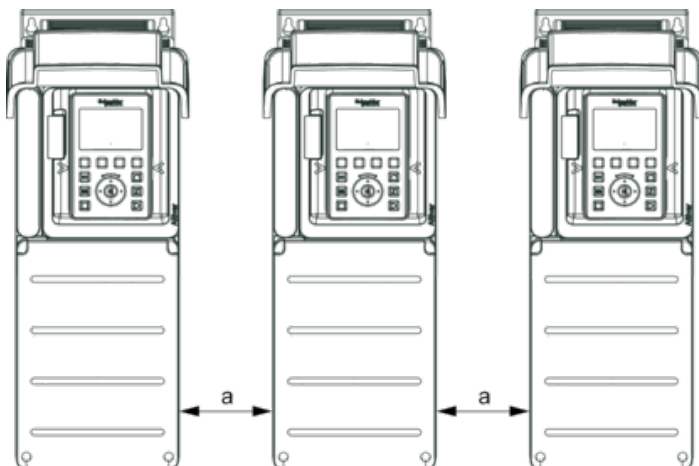


| X1                  | X2                  | X3                 |
|---------------------|---------------------|--------------------|
| ≥ 100 mm (3.94 in.) | ≥ 100 mm (3.94 in.) | ≥ 10 mm (0.39 in.) |

- Mount the device in a vertical position ( $\pm 10^\circ$ ). 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





$a \geq 100 \text{ mm (3.94 in.)}$

### Mounting Type B: Side by Side IP20



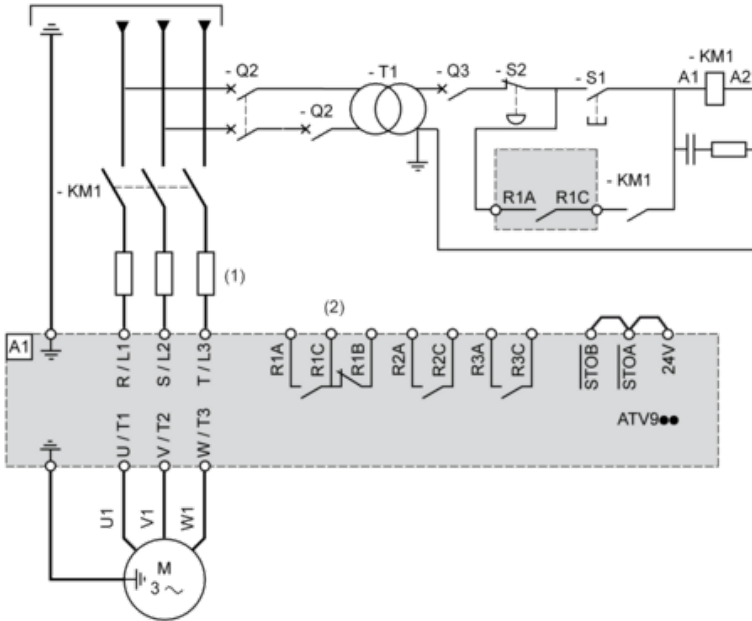
### Mounting Type C: Individual IP20



$a \geq 0$

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

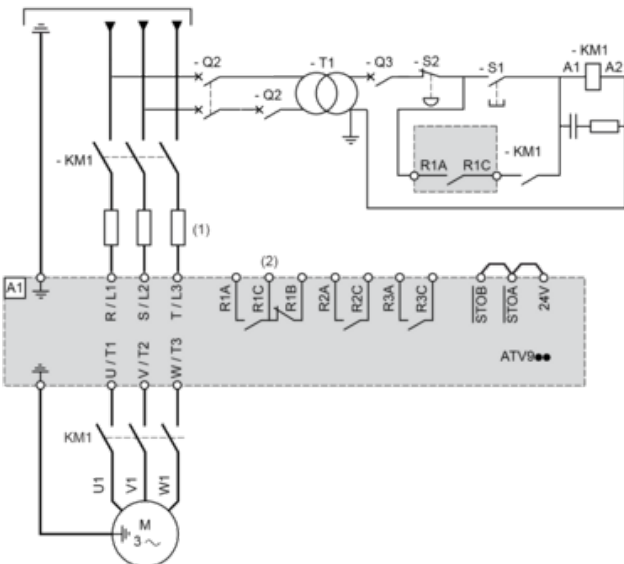
Q2, Q3 : Circuit breakers

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



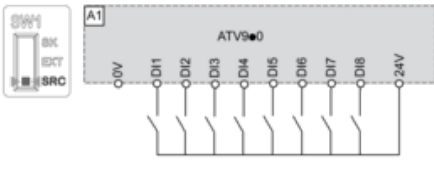
It is possible to connect either 1 or 3 sensors on terminals AI1 or AI3

### 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 DIs



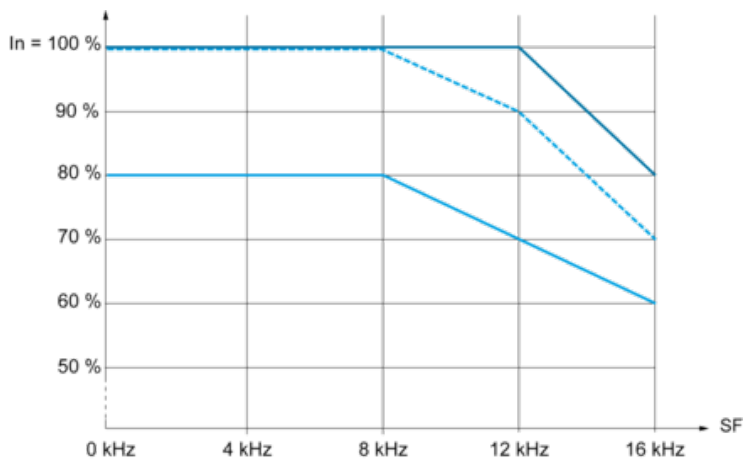
### Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



### 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