





## Main

|                                    |                                                                                                                          |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Range of product                   | Altivar Process ATV900                                                                                                   |
| Product or component type          | Variable speed drive                                                                                                     |
| Device application                 | Industrial application                                                                                                   |
| Device short name                  | ATV930                                                                                                                   |
| Variant                            | With braking chopper<br>Standard version                                                                                 |
| Product destination                | Asynchronous motors<br>Synchronous motors                                                                                |
| EMC filter                         | Without EMC filter                                                                                                       |
| IP degree of protection            | IP21 conforming to IEC 61800-5-1<br>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          | 200...240 V - 15...10 %                                                                                                  |
| Motor power kW                     | 2.2 KW (normal duty)<br>1.5 kW (heavy duty)                                                                              |
| Motor power hp                     | 3 Hp normal duty<br>2 hp heavy duty                                                                                      |
| Line current                       | 8.4 A at 200 V (normal duty)<br>7.2 A at 240 V (normal duty)<br>6 A at 200 V (heavy duty)<br>5.3 A at 240 V (heavy duty) |
| Prospective line I <sub>sc</sub>   | 50 kA                                                                                                                    |
| Apparent power                     | 3 KVA at 240 V (normal duty)<br>2.2 kVA at 240 V (heavy duty)                                                            |
| Continuous output current          | 11.2 A at 4 kHz for normal duty<br>8 A at 4 kHz for heavy duty                                                           |
| Maximum transient current          | 13.4 A during 60 s (normal duty)<br>12 A 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        | 4 kHz                                                                                                                    |
| Switching frequency                | 2...16 kHz adjustable<br>4...16 kHz with derating factor                                                                 |
| Safety function                    | STO (safe torque off) SIL 3                                                                                              |
| Number of preset speeds            | 16 preset speeds                                                                                                         |

| Communication port protocol | Modbus serial<br>EtherNet/IP<br>Modbus TCP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 |

## Complementary

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output voltage                      | $\leq$ power supply voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Motor slip compensation             | Not available in permanent magnet motor law<br>Can be suppressed<br>Adjustable<br>Automatic whatever the load                                                                                                                                                                                                                                                                                                                                                                                                                |
| Acceleration and deceleration ramps | Linear adjustable separately from 0.01...9999 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Braking to standstill               | By DC injection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 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: screw terminal 0.5...1.5 mm <sup>2</sup> /AWG 20...AWG 16<br>Line side: screw terminal 2.5...6 mm <sup>2</sup> /AWG 14...AWG 10<br>Motor: screw terminal 2.5...6 mm <sup>2</sup> /AWG 14...AWG 10<br>DC bus: screw terminal 2.5...6 mm <sup>2</sup> /AWG 14...AWG 10                                                                                                                                                                                                                                                |
| Connector type                      | 2 RJ45 for Ethernet IP/Modbus TCP on the control block<br>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<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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 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)<br>Presence of voltage: 1 LED (red)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Width                     | 144 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Height                    | 350 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Depth                     | 206 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Net weight                | 4.5 kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 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)                                                                                                                                                                                                                                                                                                                                                   |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Sampling duration         | 2 Ms $\pm 0.5$ ms (DI1...DI8) - discrete input<br>5 Ms $\pm 1$ ms (DI7, DI8) - pulse input<br>1 Ms $\pm 1$ ms (AI1, AI2, AI3) - analog input<br>5 ms $\pm 1$ ms (AQ1, AQ2) - analog output                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Accuracy                  | $\pm 0.6$ % AI1, AI2, AI3 for a temperature variation 60 °C analog input<br>$\pm 1$ % AQ1, AQ2 for a temperature variation 60 °C analog output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Linearity error           | AI1, AI2, AI3: $\pm 0.15$ % of maximum value for analog input<br>AQ1, AQ2: $\pm 0.2$ % for analog output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 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 |
| 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                                                                                                                                                                                                                                                                                                                                                                                                         |
| Refresh time              | Relay output (R1, R2, R3): 5 ms ( $\pm 0.5$ ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Minimum switching current | Relay output R1, R2, R3: 5 mA at 24 V DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Isolation                 | Between power and control terminals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Variable speed drive application selection | Mixer Food and beverage processing<br>Conveyor Food and beverage processing<br>Shredder Food and beverage processing<br>Process crane Hoisting<br>Thruster Marine<br>Winch Marine<br>Press Material working (wood, ceramic, stone, pvc, metal)<br>Extruder Material working (wood, ceramic, stone, pvc, metal)<br>Other application Mining mineral and metal<br>Drilling rig Oil and gas<br>Progressive cavity pump Oil and gas<br>Rod pump Oil and gas<br>Swapping pump Oil and gas<br>Compressor for regasification Oil and gas<br>Separator Oil and gas<br>Other application Oil and gas<br>Separator Water and waste water |
| Power range                                | 2.2...3 kW at 200...240 V 3 phases                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Mounting mode                              | Wall mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Environment

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insulation resistance                 | > 1 MOhm 500 V DC for 1 minute to earth                                                                                                                                                                                                                                                                                                                                                                                          |
| Noise level                           | 54.5 dB conforming to 86/188/EEC                                                                                                                                                                                                                                                                                                                                                                                                 |
| Power dissipation in W                | Natural convection: 32 W at 200 V, switching frequency 4 kHz<br>Forced convection: 74 W at 200 V, switching frequency 4 kHz                                                                                                                                                                                                                                                                                                      |
| 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                                                                                                                                                                                                                                                                                                                                                                                     |
| Volume of cooling air                 | 38 m <sup>3</sup> /h                                                                                                                                                                                                                                                                                                                                                                                                             |
| Operating position                    | Vertical +/- 10 degree                                                                                                                                                                                                                                                                                                                                                                                                           |
| Maximum THDI                          | <48 % full load conforming to IEC 61000-3-12                                                                                                                                                                                                                                                                                                                                                                                     |
| 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 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                                                                                                                                                                                                                                                                                     |
| 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 derating)<br>50...60 °C (with derating factor)                                                                                                                                                                                                                                                                                                                                                              |
| Ambient air temperature for storage   | -40...70 °C                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Operating altitude                    | <= 1000 m without derating<br>1000...4800 m with current derating 1 % per 100 m                                                                                                                                                                                                                                                                                                                                                  |
| Standards                             | UL 508C<br>EN/IEC 61800-3<br>Environment 1 category C2 EN/IEC 61800-3<br>Environment 2 category C3 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                                                                                                                                                                                                                               |
| Product certifications                | UL<br>CSA<br>TÜV                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Marking                               | CE                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Packing Units

|                              |          |
|------------------------------|----------|
| Unit Type of Package 1       | PCE      |
| Number of Units in Package 1 | 1        |
| Package 1 Weight             | 5.968 kg |
| Package 1 Height             | 31 cm    |
| Package 1 width              | 19 cm    |

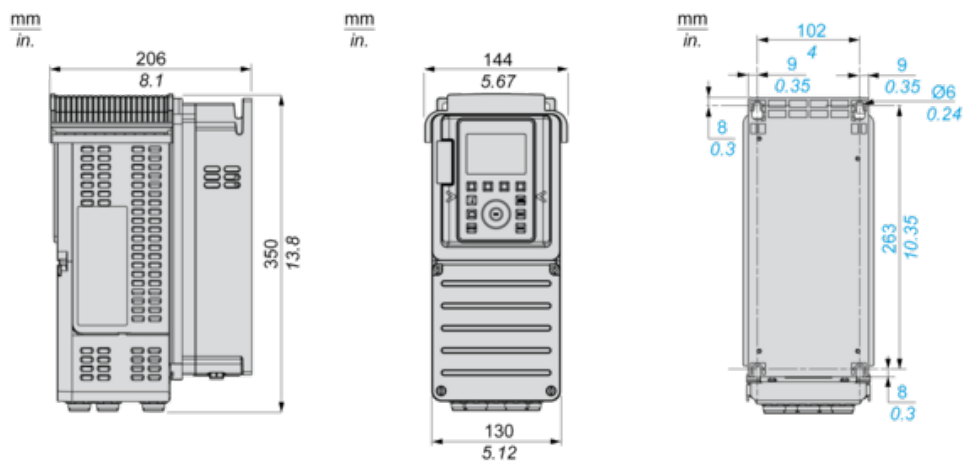
|                              |          |
|------------------------------|----------|
| Package 1 Length             | 41 cm    |
| Unit Type of Package 2       | P06      |
| Number of Units in Package 2 | 6        |
| Package 2 Weight             | 48.81 kg |
| Package 2 Height             | 80 cm    |
| Package 2 width              | 80 cm    |
| Package 2 Length             | 60 cm    |

## Offer Sustainability

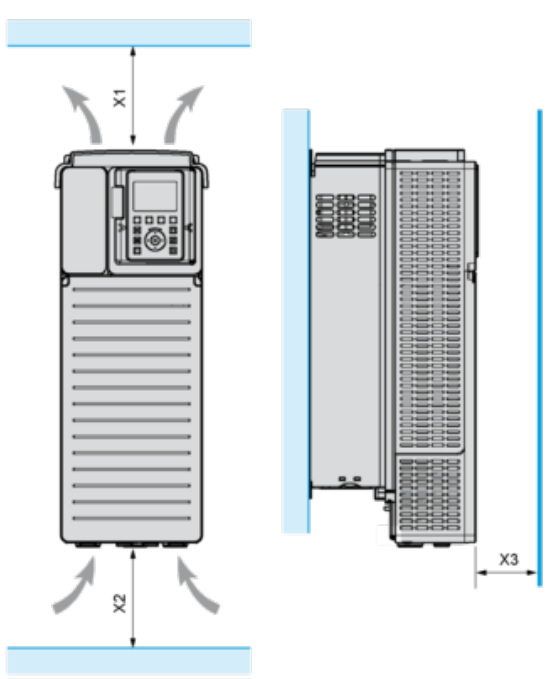
|                            |                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                                                         |
| 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 |
| Upgradeability             | <a href="#">Upgraded Components Available</a>                                                                               |

## Dimensions

Right, Front and Rear View



Clearances

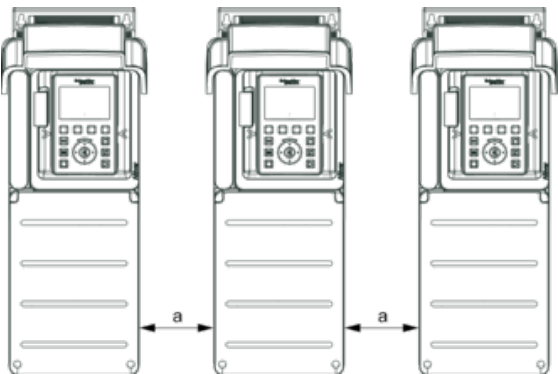


| X1                  | X2                  | X3                 |
|---------------------|---------------------|--------------------|
| ≥ 100 mm (3.94 in.) | ≥ 100 mm (3.94 in.) | ≥ 10 mm (0.39 in.) |

- 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

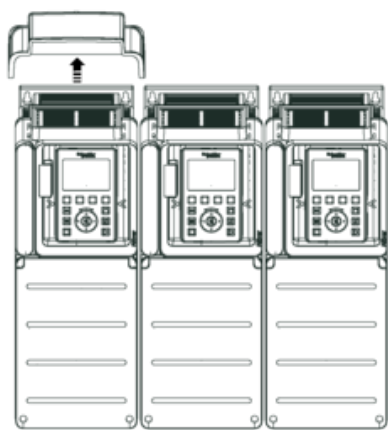
Mounting Type A: Individual IP21



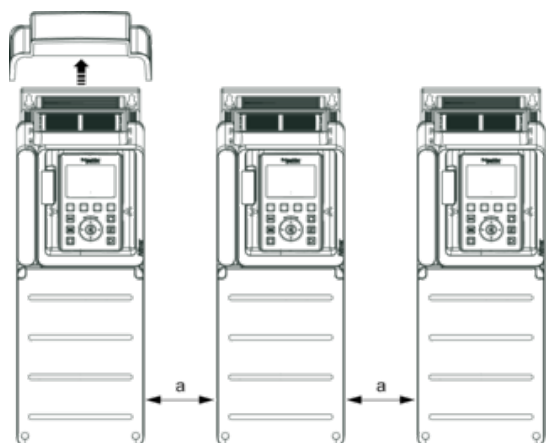
$a \geq 100 \text{ mm (3.94 in.)}$



### Mounting Type B: Side by Side IP20



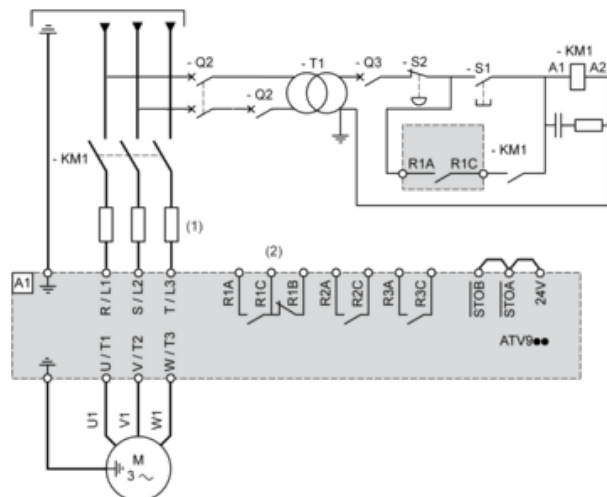
### Mounting Type C: Individual IP20



$a \geq 0$

### 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

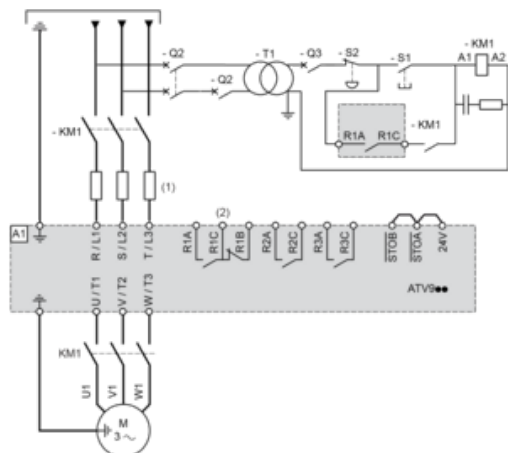
Q2, Q3 : Circuit breakers

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

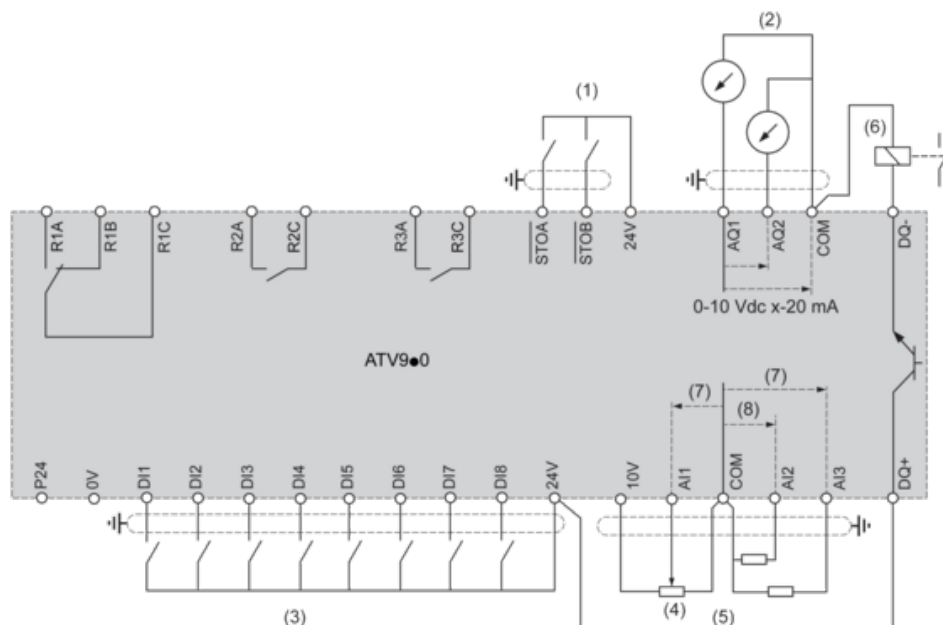


- (1) Line choke if used
- (2) Use relay R1 set to operating state Fault to switch Off the product once an error is detected.

A1 : Drive

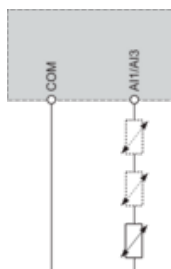
KM1 : Contactor

## 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



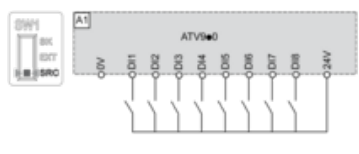
It is possible to connect either 1 or 3 sensors on terminals AI1 or AI3

## Sink / Source Switch Configuration

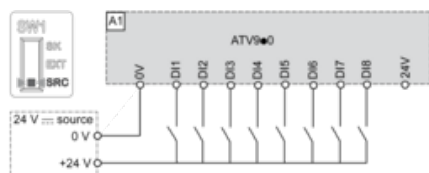
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- 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.

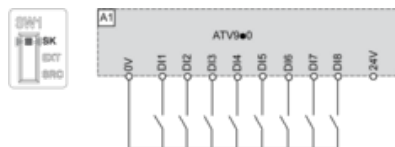
## Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



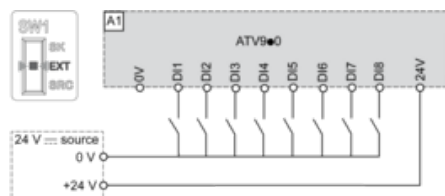
## Switch Set to SRC (Source) Position and Use of an External Power Supply for the DI8



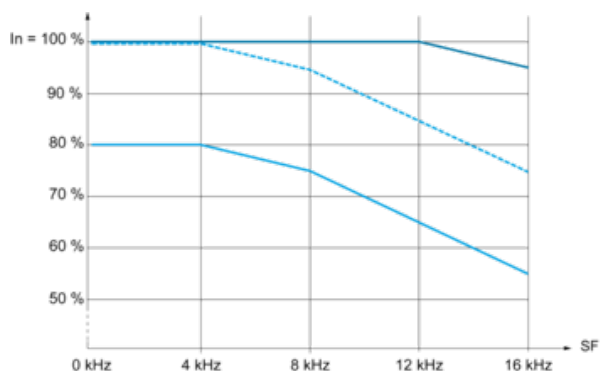
## Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



## Switch Set to EXT Position Using an External Power Supply for the DI8



## 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