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## 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   |
| Mounting mode                      | Wall mount  |
| EMC filter                         | Integrated with 50 m conforming to EN/IEC 61800-3 category C2<br>Integrated with 150 m conforming to EN/IEC 61800-3 category C3 |
| 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          | 380...480 V - 15...10 %   |
| Motor power kW                     | 3 kW (normal duty)<br>2.2 kW (heavy duty)   |
| Motor power hp                     | 3 hp heavy duty   |
| Line current                       | 5.8 A at 380 V (normal duty)<br>5.1 A at 480 V (normal duty)<br>4.5 A at 380 V (heavy duty)<br>4 A at 480 V (heavy duty)        |
| Prospective line I <sub>sc</sub>   | 50 kA   |
| Apparent power                     | 4.2 KVA at 480 V (normal duty)<br>3.3 kVA at 480 V (heavy duty)   |
| Continuous output current          | 7.2 A at 4 kHz for normal duty<br>5.6 A at 4 kHz for heavy duty   |
| Maximum transient current          | 8.6 A during 60 s (normal duty)<br>8.4 A during 60 s (heavy duty)   |
| Asynchronous motor control profile | Variable torque standard<br>Constant torque standard<br>Optimized torque mode   |
| 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             | Automatic whatever the load<br>Not available in permanent magnet motor law<br>Adjustable<br>Can be suppressed  |
| Acceleration and deceleration ramps | Linear adjustable separately from 0.01...9999 s  |
| Braking to standstill               | By DC injection  |
| Protection type                     | Thermal protection: motor<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   |
| Product weight            | 4.6 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 (<= 30 V), impedance: 3.5 kOhm<br>DI7, DI8 programmable as pulse input: 0...30 kHz, 24 V DC (<= 30 V)<br>STOA, STOB safe torque off, 24 V DC (<= 30 V), impedance: > 2.2 kOhm  |
| Input compatibility       | DI1...DI8: discrete input level 1 PLC conforming to 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 <= 30 V DC 100 mA<br>Programmable as pulse output DQ+ 0...30 kHz <= 30 V DC 20 mA<br>Logic output DQ- 0...1 kHz <= 30 V DC 100 mA   |
| Sampling duration         | 2 Ms +/- 0.5 ms (DI1...DI8) - discrete input<br>5 Ms +/- 1 ms (DI7, DI8) - pulse input<br>1 Ms +/- 1 ms (AI1, AI2, AI3) - analog input<br>5 ms +/- 1 ms (AQ1, AQ2) - analog output   |
| Accuracy                  | +/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input<br>+/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output   |
| Linearity error           | AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input<br>AQ1, AQ2: +/- 0.2 % for analog output   |
| 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 (+/- 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 | Food and beverage processing Mixer<br>Food and beverage processing Conveyor<br>Food and beverage processing Shredder<br>Hoisting Process crane<br>Marine Thruster<br>Marine Winch<br>Material working (wood, ceramic, stone, pvc, metal) Press<br>Material working (wood, ceramic, stone, pvc, metal) Extruder<br>Mining mineral and metal Other application<br>Oil and gas Drilling rig<br>Oil and gas Progressive cavity pump<br>Oil and gas Rod pump<br>Oil and gas Swapping pump<br>Oil and gas Compressor for regasification<br>Oil and gas Separator<br>Oil and gas Other application<br>Water and waste water Separator |
| Power range                                | 2.2...3 kW at 380...440 V 3 phases<br>2.2...3 kW at 480...500 V 3 phases   |

## Environment

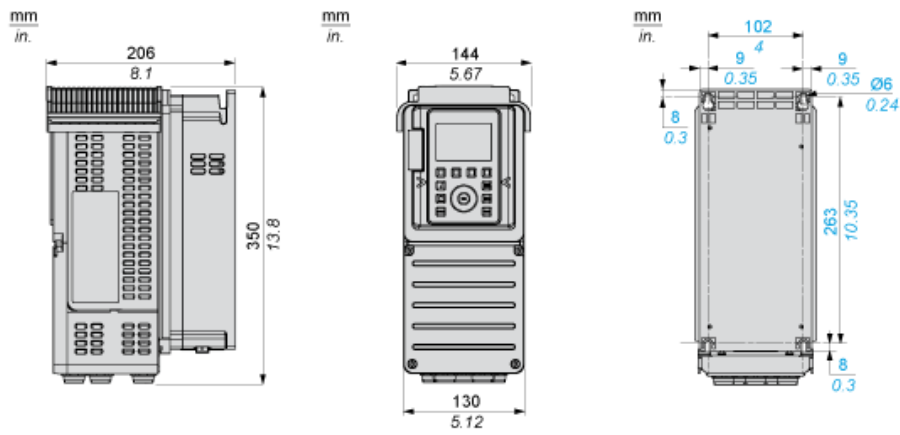
|                                       |  |
|---------------------------------------|--|
| Insulation resistance                 | > 1 MOhm 500 V DC for 1 minute to earth  |
| Noise level                           | 54.5 dB conforming to 86/188/EEC   |
| Power dissipation in W                | Natural convection: 31 W at 380 V, switching frequency 4 kHz<br>Forced convection: 78 W at 380 V, switching frequency 4 kHz  |
| Vibration resistance                  | 1.5 mm peak to peak (f= 2...13 Hz) conforming to IEC 60068-2-6<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)<br>50...60 °C (with derating factor)   |
| Ambient air temperature for storage   | -40...70 °C  |
| Operating altitude                    | <= 1000 m without<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                | TÜV<br>CSA<br>REACH<br>UL  |
| Marking                               | CE   |

## Offer Sustainability

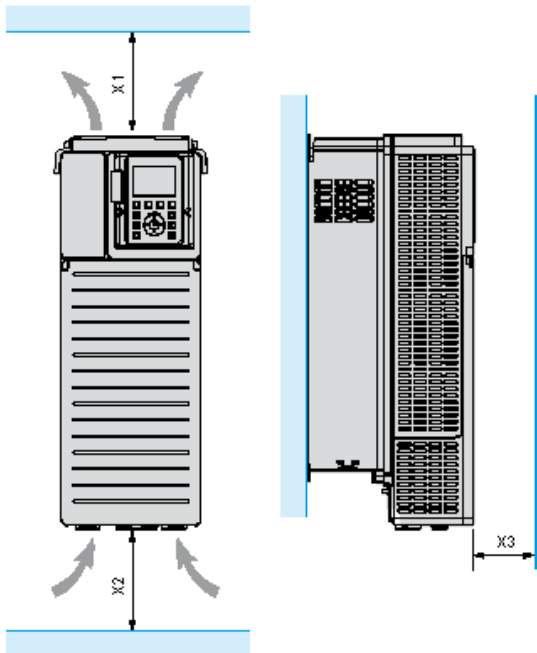
|                            |   |
|----------------------------|---|
| Sustainable offer status   | Green Premium product   |
| REACH Regulation           | <a href="#">REACH Declaration</a>   |
| EU RoHS Directive          | Pro-active compliance (Product out of EU RoHS legal scope) <a href="#">EU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

## Dimensions

Right, Front and Rear View



Clearances

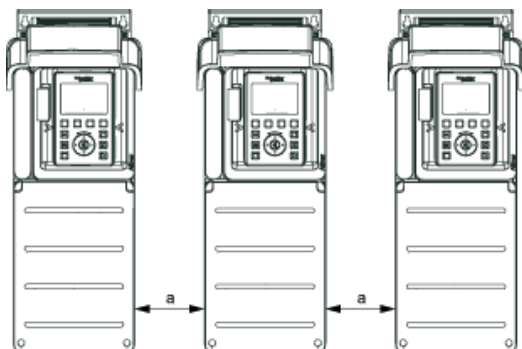


| X1                  | X2                  | X3                 |
|---------------------|---------------------|--------------------|
| ≥ 100 mm (3.94 in.) | ≥ 100 mm (3.94 in.) | ≥ 10 mm (0.39 in.) |

- 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



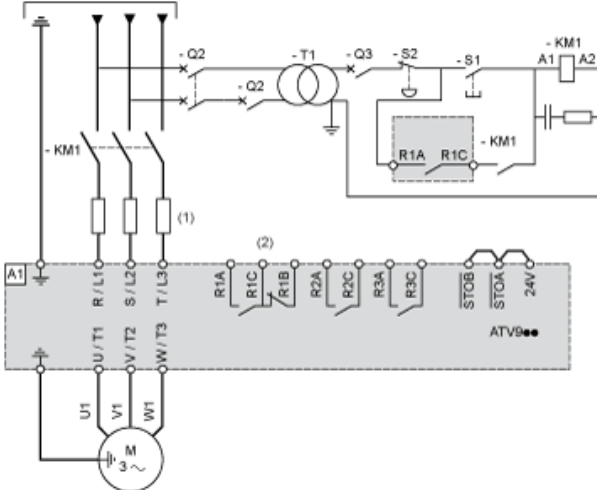
Mounting Type C: Individual IP20



$a \geq 0$

Three-Phase Power Supply with Upstream Breaking via Line Contactor

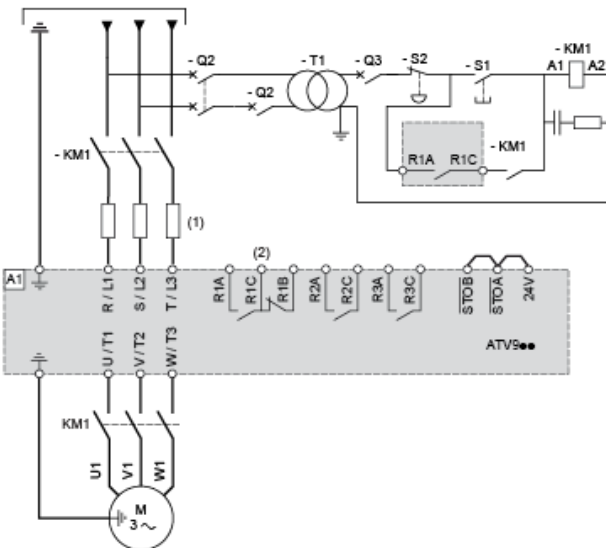
Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



- (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, Circuit breakers
- Q3 :
- S1, Pushbuttons
- S2 :
- 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, Fault relay

R1B,

R1C :

R2A, Sequence relay

R2C :

R3A, Sequence relay

R3C :

## Sensor Connection



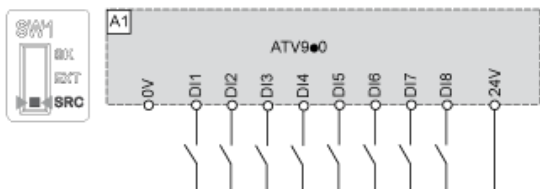
It is possible to connect either 1 or 3 sensors on terminals AI1 or AI3

## Sink / Source Switch Configuration

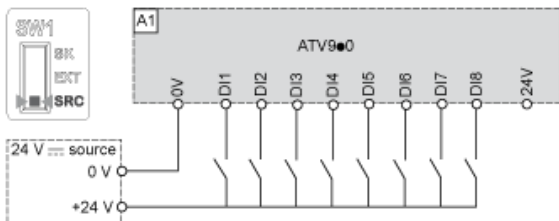
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- 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.

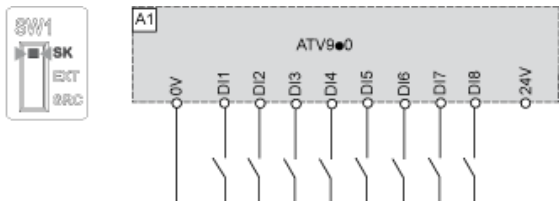
Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



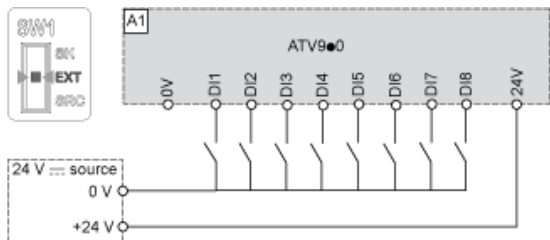
Switch Set to SRC (Source) Position and Use of an External Power Supply for the DIs



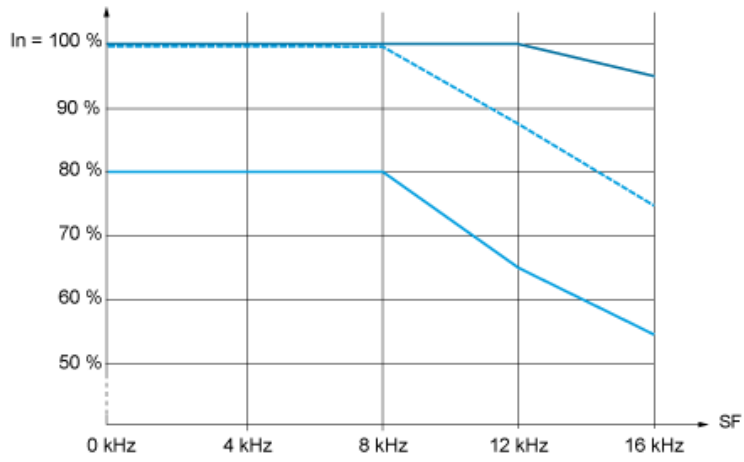
Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



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