

Product datasheet

Specifications



Variable speed drive, Altivar Process ATV900, ATV960 High Performance Drive System, 450/355kW, 400V, CE, IP23

ATV960C45Q4X1

Main

Range of product	Altivar Process ATV900
Product or component type	Variable speed drive
Device short name	ATV960
Product destination	Asynchronous motors Synchronous motors
Provided equipment	Enclosure PanelSeT SFN Graphical operating panel in the enclosure door Frequency inverter Main switch Line choke Terminal block main supply Terminal block motor
Colour of enclosure	Light grey (RAL 7035)
IP degree of protection	IP23 conforming to IEC 61800-5-1
Communication port protocol	EtherNet/IP Modbus TCP Modbus serial
Type of cooling	Forced convection
Supply frequency	50/60 Hz +/- 5 %
[Us] rated supply voltage	380...415 V - 10...6 %
Network number of phases	3 phases
Output voltage	<= power supply voltage
Permissible temporary current boost	1.2 x In during 60 s (normal duty) 1.5 x In during 60 s (heavy duty)
Speed drive output frequency	0.1...599 Hz
Continuous output current	830 A at 2.5 kHz for normal duty 660 A at 2.5 kHz for heavy duty
Energy efficiency ratio	0.98
Power dissipation in W	11520 W, total (normal duty) 8460 W, total (heavy duty) 1270 W, control part (normal duty) 860 W, control part (heavy duty)
Volume of cooling air	280 m3/h for control 1740 m3/h for power
Noise level	71 dB conforming to 86/188/EEC - physical agents (noise) directive
Motor power kW	450 kW for normal duty 355 kW for heavy duty
Prospective line Isc	50 kA for 100 ms

Excluding VAT, FCA Jabal Ali & are subject to change – check with your local distributor.

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Motor recommended cable cross section	4 x (3 x 95 mm²) (heavy duty) 4 x (3 x 150 mm²) (normal duty) 5 x (3 x 120 mm²) (normal duty) 3 x (3 x 150 mm²) (heavy duty)
Option card	Slot A: communication module for Profibus DP V1 Slot A: communication module for PROFINET Slot A: communication module for DeviceNet Slot A: communication module for EtherCAT Slot A: communication module for CANopen daisy chain RJ45 Slot A: communication module for CANopen SUB-D 9 Slot A: communication module for CANopen screw terminals Slot A/slot B/slot C: digital and analog I/O extension module Slot A/slot B/slot C: output relay extension module Slot B: 5/12 V digital encoder interface module Slot B: analog encoder interface module Slot B: resolver encoder interface module
Safety function	STO (safe torque off), level SIL 3 for <= 100 ms
EMC filter	Integrated conforming to IEC 61800-3, category C3, shielded cable with 50 m Integrated conforming to IEC 61800-3, category C4, unshielded cable with 80 m
Device application	Industrial application

Complementary

Discrete input number	10
Protection type	Motor: thermal protection Motor: safe torque off Motor: motor phase break Drive: thermal protection Drive: safe torque off Drive: overheating Drive: overcurrent (between output phases and earth) Drive: overload (output) Drive: short-circuit protection Drive: motor phase break Drive: overvoltage (DC bus) Drive: line supply overvoltage Drive: line supply undervoltage Drive: line supply phase loss Drive: overspeed Drive: break on the control circuit Drive: short-circuit protection with semi-conductor fuse (main supply) Drive: fan monitoring
Discrete input type	DI1...DI8 programmable, 24 V DC (<= 30 V), impedance: 3.5 kOhm DI7, DI8 programmable as pulse input: 0...30 kHz, 24 V DC (<= 30 V) STOA, STOB safe torque off, 24 V DC (<= 30 V), impedance: > 2.2 kOhm
Frequency resolution	Display unit: 0.1 Hz Analog input: 0.012/50 Hz
Connector type	2 RJ45 for Ethernet IP/Modbus TCP on the control block 1 RJ45 for Modbus serial on the control block
Discrete input logic	16 preset speeds
Physical interface	2-wire RS 485 for Modbus serial
Transmission frame	RTU for Modbus serial
Discrete output number	2
Transmission rate	10/100 Mbit/s for Ethernet IP/Modbus TCP 4.8, 9.6, 19.2, 38.4 kbit/s for Modbus serial
Exchange mode	Half duplex, full duplex, autonegotiation Ethernet IP/Modbus TCP
Discrete output type	Logic output DQ+ 0...1 kHz <= 30 V DC 100 mA Programmable as pulse output DQ+ 0...30 kHz <= 30 V DC 100 mA Logic output DQ- 0...1 kHz <= 30 V DC 100 mA
Data format	8 bits, configurable odd, even or no parity for Modbus serial
Type of polarization	No impedance for Modbus serial

Analogue input number	3
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 Internal supply for reference potentiometer (1 to 10 kOhm): 10.5 V DC +/- 5 %, <10 mA, protection type: overload and short-circuit protection Internal supply for digital inputs and STO: 24 V DC (21...27 V), <200 mA, protection type: overload and short-circuit protection
Analogue input type	AI1, AI2, AI3 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits AI1, AI2, AI3 software-configurable current: 0...20 mA, impedance: 250 Ohm, resolution 12 bits
Local signalling	LCD display unit front door operation function, status and configuration
Input compatibility	DI1...DI8: discrete input level 1 PLC conforming to IEC 61131-2 DI7, DI8: pulse input level 1 PLC conforming to IEC 65A-68 STOA, STOB: discrete input level 1 PLC conforming to IEC 61131-2
Analogue output number	2
Discrete input logic	Positive logic (source) (DI1...DI8), < 5 V (state 0), > 11 V (state 1) Negative logic (sink) (DI1...DI8), > 16 V (state 0), < 10 V (state 1) Positive logic (source) (DI7, DI8), < 0.6 V (state 0), > 2.5 V (state 1) Positive logic (source) (STOA, STOB), < 5 V (state 0), > 11 V (state 1)
Sampling duration	2 ms +/- 0.5 ms (DI1...DI8) - discrete input 5 ms +/- 1 ms (DI7, DI8) - pulse input 1 ms +/- 1 ms (AI1, AI2, AI3) - analog input 5 ms +/- 1 ms (AQ1, AQ2) - analog output
Analogue output type	Software-configurable voltage AQ1, AQ2: 0...10 V DC impedance 470 Ohm, resolution 10 bits Software-configurable current AQ1, AQ2: 0...20 mA impedance 500 Ohm, resolution 10 bits
Accuracy	+/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input +/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output
Linearity error	AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input AQ1, AQ2: +/- 0.2 % for analog output
Relay output number	3
Refresh time	Relay output (R1, R2, R3): 5 ms (+/- 0.5 ms)
Isolation	Between power and control terminals
Relay output type	Configurable relay logic R1: fault relay NO/NC electrical durability 100000 cycles Configurable relay logic R2: sequence relay NO electrical durability 1000000 cycles Configurable relay logic R3: sequence relay NO electrical durability 1000000 cycles
Maximum switching current	Relay output R1 on resistive load, cos phi = 1: 3 mA at 250 V AC Relay output R1 on resistive load, cos phi = 1: 3 mA at 30 V DC Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 mA at 250 V AC Relay output R1 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 mA at 30 V DC Relay output R2, R3 on resistive load, cos phi = 1: 5 mA at 250 V AC Relay output R2, R3 on resistive load, cos phi = 1: 5 mA at 30 V DC Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 mA at 250 V AC Relay output R2, R3 on inductive load, cos phi = 0.4 and L/R = 7 ms: 2 mA at 30 V DC
Minimum switching current	Relay output R1, R2, R3: 5 mA at 24 V DC
Method of access	Slave Modbus TCP
Asynchronous motor control profile	Optimized torque mode Variable torque standard Constant torque standard
Synchronous motor control profile	Permanent magnet motor
Acceleration and deceleration ramps	Linear adjustable separately from 0.01 to 9000 s S, U or customized

Motor slip compensation	Automatic whatever the load Not available in permanent magnet motor law Adjustable Can be suppressed
Switching frequency	2...8 kHz adjustable with derating factor
Nominal switching frequency	2.5 kHz
Braking to standstill	By DC injection
Line current	764 A at 400 V (normal duty) 611 A at 400 V (heavy duty)
Apparent power	529 kVA at 400 V (normal duty) 423 kVA at 400 V (heavy duty)
Maximum transient current	996 A during 60 s per 10 min (normal duty) 990 A during 60 s per 10 min (heavy duty)
Short-circuit protection	Upstream: 1000 A gG fuse (normal duty) Upstream: 800 A gG fuse (heavy duty) Internal: 400 A 3 aR fuse
Electrical connection	Removable screw terminals, clamping capacity: 0.5...1.5 mm² for control M12 bar for main supply M12 bar for motor
cable entry	Bottom
Width	800 mm
Height	2150 mm
Depth	664 mm
Net weight	650 kg

Environment

Insulation resistance	> 1 MOhm 500 V DC for 1 minute to earth
Pollution degree	2 conforming to IEC 61800-5-1
Vibration resistance	1.5 mm peak to peak (f= 3...10 Hz) conforming to IEC 60068-2-6 0.6 gn (f= 10...200 Hz) conforming to IEC 60068-2-6 3M3 conforming to IEC 60721-3-3
Shock resistance	4 gn for 11 ms conforming to IEC 60068-2-27 3M2 conforming to IEC 60721-3-3
Relative humidity	5...95 % without condensation conforming to IEC 60068-2-3
Operating altitude	< 1000 m without derating 1000...2000 m with current derating 1 % per 100 m 2000...3800 m with current derating 1 % per 100 m for TT earthing system 2000...3800 m with current derating 1 % per 100 m for TN earthing system 2000...3800 m with current derating 1 % per 100 m for IT earthing system 3800...4800 m with current derating 1 % per 100 m for TT earthing system 3800...4800 m with current derating 1 % per 100 m for TN earthing system
Environmental characteristic	Chemical pollution resistance class 3C3 conforming to IEC 60721-3-3 Dust pollution resistance class 3S3 conforming to IEC 60721-3-3 Humidity resistant class 3K3 conforming to IEC 60721-3-3
Operating position	Vertical +/- 10 degree
Product certifications	ATEX C-Tick EAC
Marking	CE
Standards	IEC 60204-1 IEC 61800-2 IEC 61800-3 IEC 61800-5-1
Maximum THDI	<48 % full load conforming to IEC 61000-3-12

Assembly style	In floor-standing enclosure compact version
Electromagnetic compatibility	Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2 Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3 Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4 1.2/50 µs - 8/20 µs surge immunity test level 3 conforming to IEC 61000-4-5 Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6
Overvoltage category	III
Ambient air temperature for operation	-10...0 °C without derating (with option enclosure heating) 0...40 °C without derating 40...50 °C with derating factor
Ambient air temperature for storage	-25...70 °C

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Height	236 cm
Package 1 Width	1000 cm
Package 1 Length	90 cm
Package 1 Weight	680 kg

Contractual warranty

Warranty (in months)	18
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Environmental Data

Schneider Electric aims to achieve Net Zero status by 2050 through supply chain partnerships, lower impact materials, and circularity via our ongoing “Use Better, Use Longer, Use Again” campaign to extend product lifetimes and recyclability.

[Environmental Data explained >](#)

[How we assess product sustainability >](#)



Environmental footprint

Total lifecycle Carbon footprint	387 ton CO2 eq.
Carbon footprint of the manufacturing phase [A1 to A3]	4 036 kg CO2 eq.
Carbon footprint of the distribution phase [A4]	116 kg CO2 eq.
Carbon footprint of the installation phase [A5]	0 kg CO2 eq.
Carbon footprint of the use phase [B2, B3, B4, B6]	382 ton CO2 eq.
Carbon footprint of the end-of-life phase [C1 to C4]	45 kg CO2 eq.
Environmental Disclosure	Product Environmental Profile

Use Better



Materials and Substances

Packaging made with recycled cardboard	No
Packaging without single use plastic	No
SCIP Number	0e5fd009-2e67-4caa-9200-f008c39b3a95
EU RoHS Directive	Compliant By Exemption
REACH Regulation	Reference contains Substances of Very High Concern above the threshold

Use Longer



Lifetime extension

Repair	No
Product repair index	A

Use Again



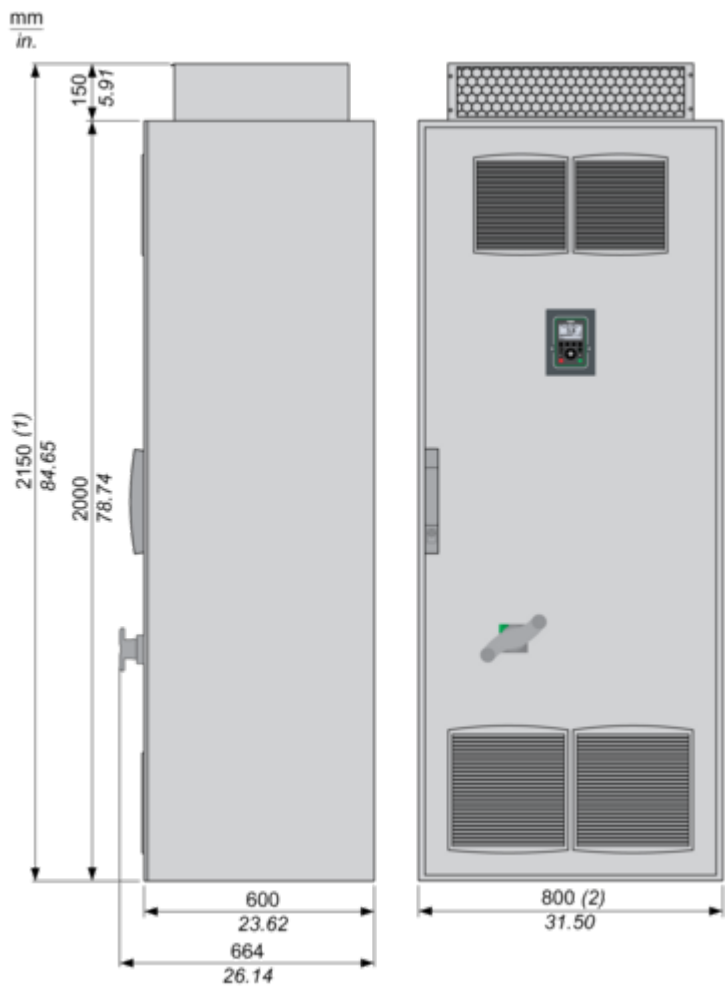
Repack and remanufacture

End of life manual availability	End of Life Information
Take-back	Nej

Dimensions Drawings

Dimensions

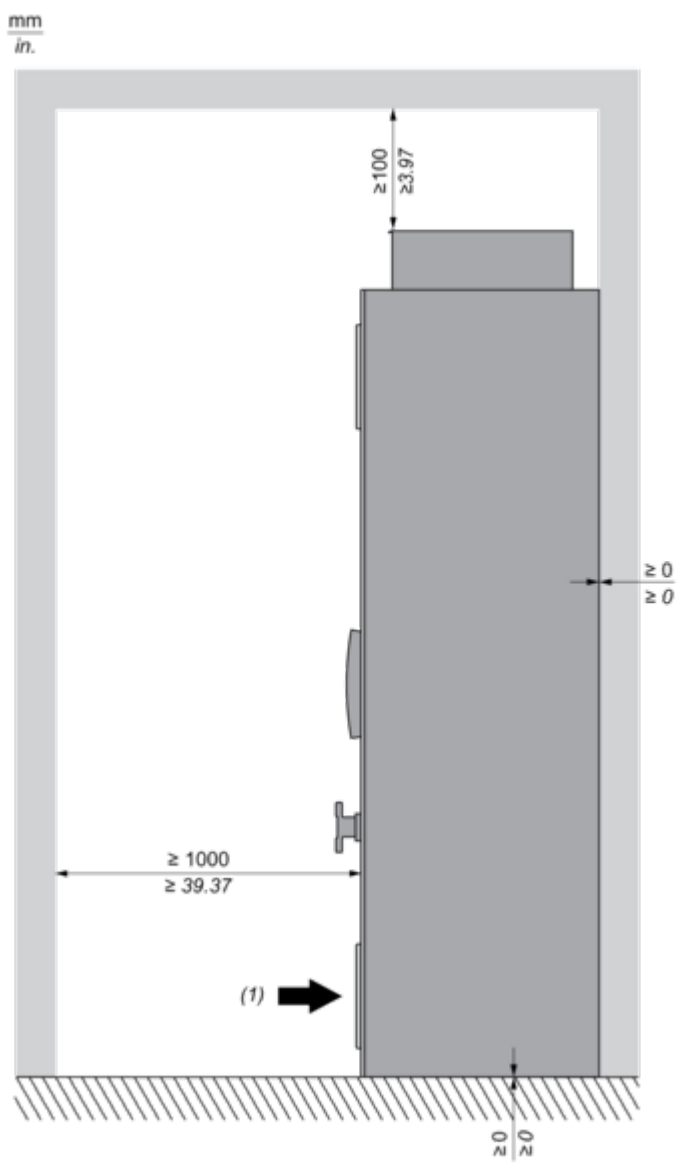
Right and Front Views



(1) + 200 mm / 7.87 in. with option enclosure plinth or increased protection degree IP54
(2) + 600 mm / 23.62 in. with option connection enclosure cable from top/bottom

Mounting and Clearance

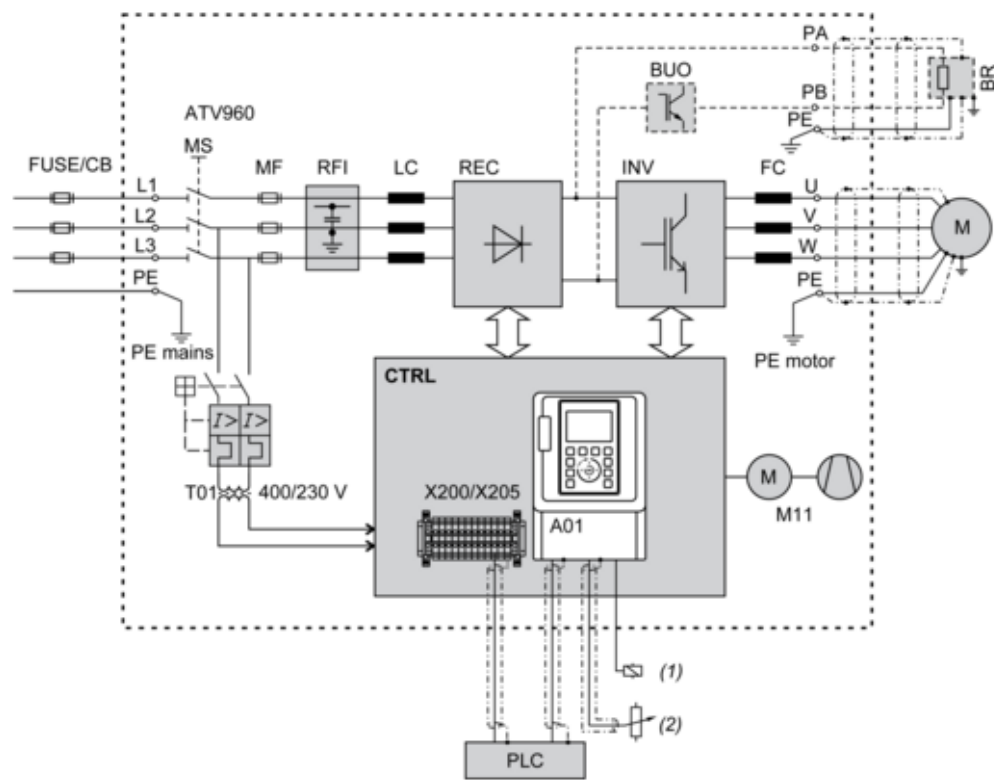
Mounting and Clearance



(1) Air inflow temperature: -10...+50 °C (below 0 °C with option enclosure heating, above +40 °C with derating).

Connections and Schema

Typical Wiring of the Frequency Inverter



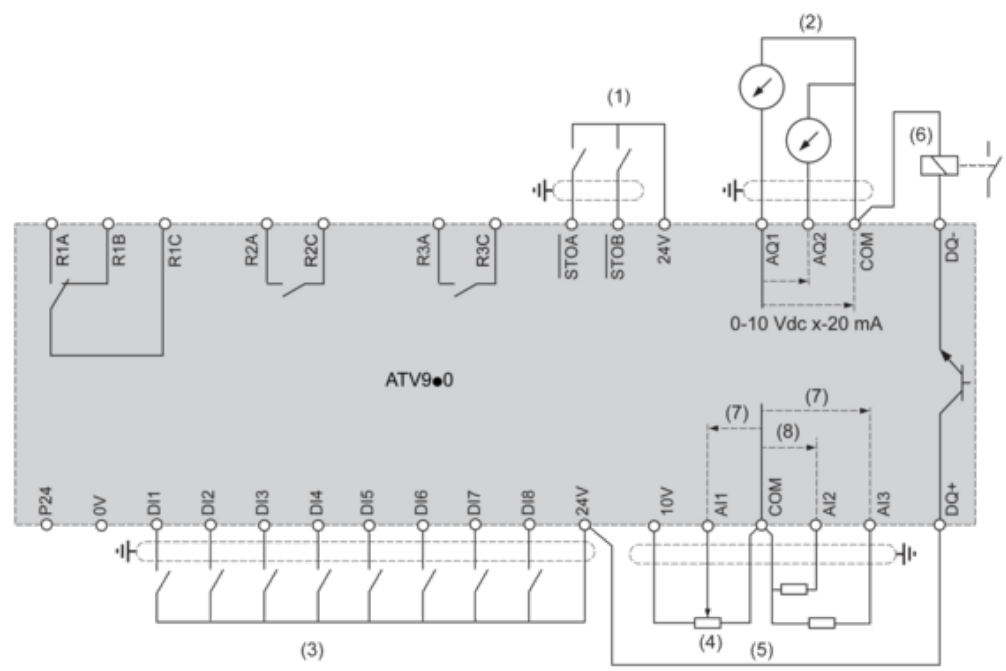
- (1) Relay control
(2) Reference value
- FUSE/CB** External pre-fuse or circuit breaker to protect the main cable
MS Built-in main switch, lockable in open position
T01 Control transformer 400 / 230 V AC
MF aR fuse for short-circuit shut-down if the electronic protective devices do not work properly
Clean Power Filter Clean Power Filter with integrated EMC filter
LC Filter choke
AIC Active Infeed Converter module(s)
INV Inverter module(s)
FC dv/dt filter choke to reduce the voltage load of the motor (at some types a "dv/dt filter choke" is already integrated)
CTRL Control panel with control block and further control components
A01 Control terminals at the control block
X200 / X205 Control terminals at the control panel
M11 Fan in enclosure door
BUO Braking unit option
BR Braking resistor (option)

Structure of the Control Block



- (1) Control terminals of digital inputs
- (2) Control terminals STO (Safe Torque Off) and analog outputs
- (3) Control terminals of analog inputs
- (4) Control terminals of relay outputs
- (5) RJ45 port for the graphical keypad
- (6) Dual port RJ45 for Ethernet IP or Modbus TCP
- (7) Sink-Ext-Source selector switch and PTO/DQ selector switch
- (8) RJ45 port for serial Modbus
- (9) Slot B for I/O expansion card or encoder interface module
- (10) Slot A for communication card or I/O expansion card

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

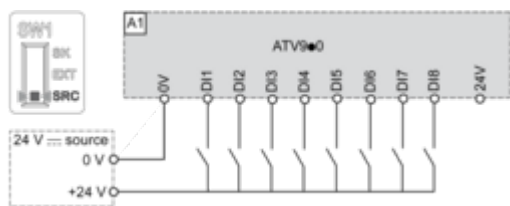
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- 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.

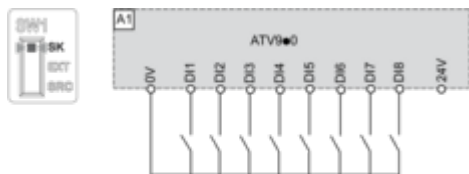
Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



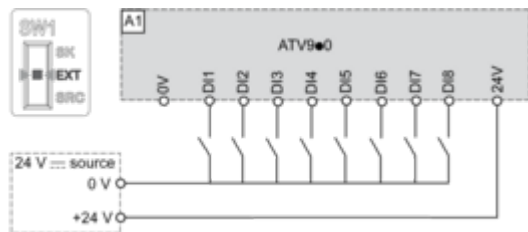
Switch Set to SRC (Source) Position and Use of an External Power Supply for the DIIs



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



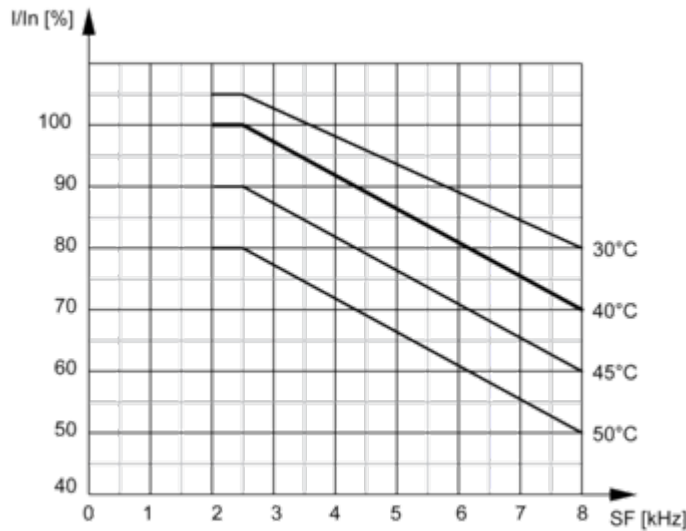
Switch Set to EXT Position Using an External Power Supply for the DIIs



Performance Curves

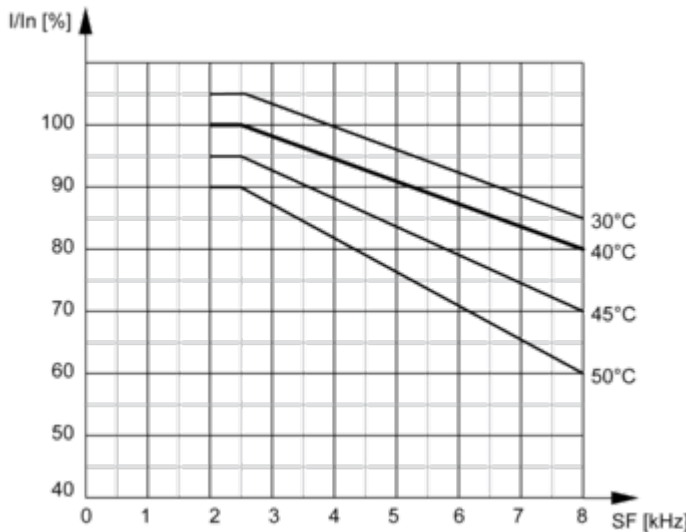
Derating Curves

Normal Duty



In : Nominal Drive Current
SF : Switching Frequency

Heavy Duty



In : Nominal Drive Current
SF : Switching Frequency

Technical Illustration

Dimensions

