

# Product datasheet

Specifications



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

ATV960C45Q4X1

EAN Code: 3606481276100

### 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

<b>Motor recommended cable cross section</b>	4 x (3 x 95 mm <sup>2</sup> ) (heavy duty) 4 x (3 x 150 mm <sup>2</sup> ) (normal duty) 5 x (3 x 120 mm <sup>2</sup> ) (normal duty) 3 x (3 x 150 mm <sup>2</sup> ) (heavy duty)
<b>Option card</b>	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
<b>Safety function</b>	STO (safe torque off), level SIL 3 for <= 100 ms
<b>EMC filter</b>	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
<b>Device application</b>	Industrial application

## Complementary

<b>Discrete input number</b>	10
<b>Protection type</b>	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
<b>Discrete input type</b>	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
<b>Frequency resolution</b>	Display unit: 0.1 Hz Analog input: 0.012/50 Hz
<b>Connector type</b>	2 RJ45 for Ethernet IP/Modbus TCP on the control block 1 RJ45 for Modbus serial on the control block
<b>Discrete input logic</b>	16 preset speeds
<b>Physical interface</b>	2-wire RS 485 for Modbus serial
<b>Transmission frame</b>	RTU for Modbus serial
<b>Discrete output number</b>	2
<b>Transmission rate</b>	10/100 Mbit/s for Ethernet IP/Modbus TCP 4.8, 9.6, 19.2, 38.4 kbit/s for Modbus serial
<b>Exchange mode</b>	Half duplex, full duplex, autonegotiation Ethernet IP/Modbus TCP
<b>Discrete output type</b>	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
<b>Data format</b>	8 bits, configurable odd, even or no parity for Modbus serial
<b>Type of polarization</b>	No impedance for Modbus serial

<b>Analogue input number</b>	3
<b>Number of addresses</b>	1...247 for Modbus serial
<b>Supply</b>	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
<b>Analogue input type</b>	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
<b>Local signalling</b>	LCD display unit front door operation function, status and configuration
<b>Input compatibility</b>	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
<b>Analogue output number</b>	2
<b>Discrete input logic</b>	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)
<b>Sampling duration</b>	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
<b>Analogue output type</b>	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
<b>Accuracy</b>	+/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input +/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output
<b>Linearity error</b>	AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input AQ1, AQ2: +/- 0.2 % for analog output
<b>Relay output number</b>	3
<b>Refresh time</b>	Relay output (R1, R2, R3): 5 ms (+/- 0.5 ms)
<b>Isolation</b>	Between power and control terminals
<b>Relay output type</b>	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
<b>Maximum switching current</b>	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
<b>Minimum switching current</b>	Relay output R1, R2, R3: 5 mA at 24 V DC
<b>Method of access</b>	Slave Modbus TCP
<b>Asynchronous motor control profile</b>	Optimized torque mode Variable torque standard Constant torque standard
<b>Synchronous motor control profile</b>	Permanent magnet motor
<b>Acceleration and deceleration ramps</b>	Linear adjustable separately from 0.01 to 9000 s S, U or customized

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

## Environment

<b>Insulation resistance</b>	> 1 MOhm 500 V DC for 1 minute to earth
<b>Pollution degree</b>	2 conforming to IEC 61800-5-1
<b>Vibration resistance</b>	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
<b>Shock resistance</b>	4 gn for 11 ms conforming to IEC 60068-2-27 3M2 conforming to IEC 60721-3-3
<b>Relative humidity</b>	5...95 % without condensation conforming to IEC 60068-2-3
<b>Operating altitude</b>	< 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
<b>Environmental characteristic</b>	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
<b>Operating position</b>	Vertical +/- 10 degree
<b>Product certifications</b>	ATEX C-Tick EAC
<b>Marking</b>	CE
<b>Standards</b>	IEC 60204-1 IEC 61800-2 IEC 61800-3 IEC 61800-5-1
<b>Maximum THDI</b>	<48 % full load conforming to IEC 61000-3-12

<b>Assembly style</b>	In floor-standing enclosure compact version
<b>Electromagnetic compatibility</b>	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
<b>Overvoltage category</b>	III
<b>Ambient air temperature for operation</b>	-10...0 °C without derating (with option enclosure heating) 0...40 °C without derating 40...50 °C with derating factor
<b>Ambient air temperature for storage</b>	-25...70 °C

## Packing Units

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

## Logistical informations

<b>Country of origin</b>	AT
--------------------------	----

## Contractual warranty

<b>Warranty (in months)</b>	18
-----------------------------	----



## 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	<a href="#">Product Environmental Profile</a>

## 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	<a href="#">Compliant By Exemption</a>
REACH Regulation	<a href="#">Reference contains Substances of Very High Concern above the threshold</a>

## Use Longer



### Lifetime extension

Repair	No
Product repair index	<a href="#">A</a>

## Use Again



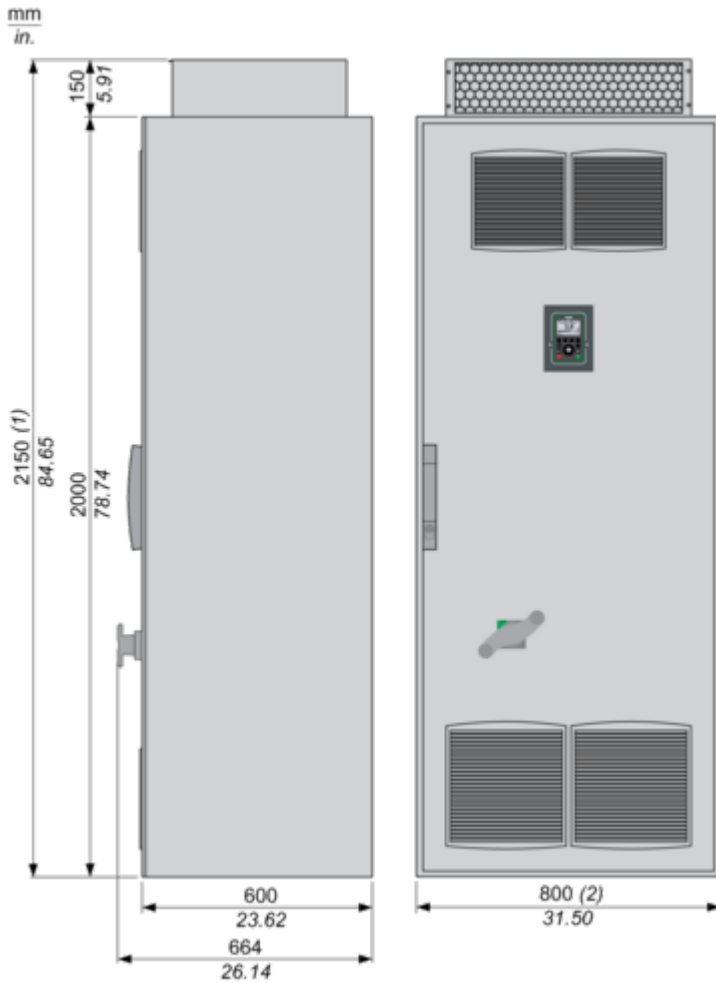
### Repack and remanufacture

End of life manual availability	<a href="#">End of Life Information</a>
Take-back	Nej

Dimensions Drawings

Dimensions

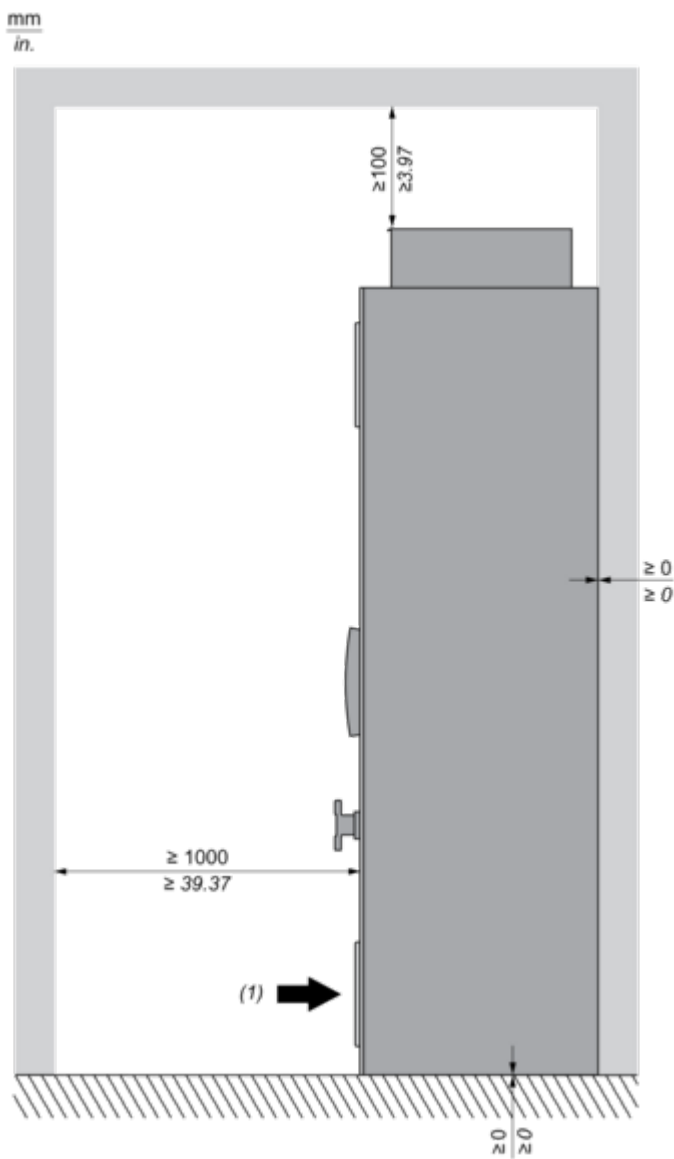
Right and Front Views



- (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

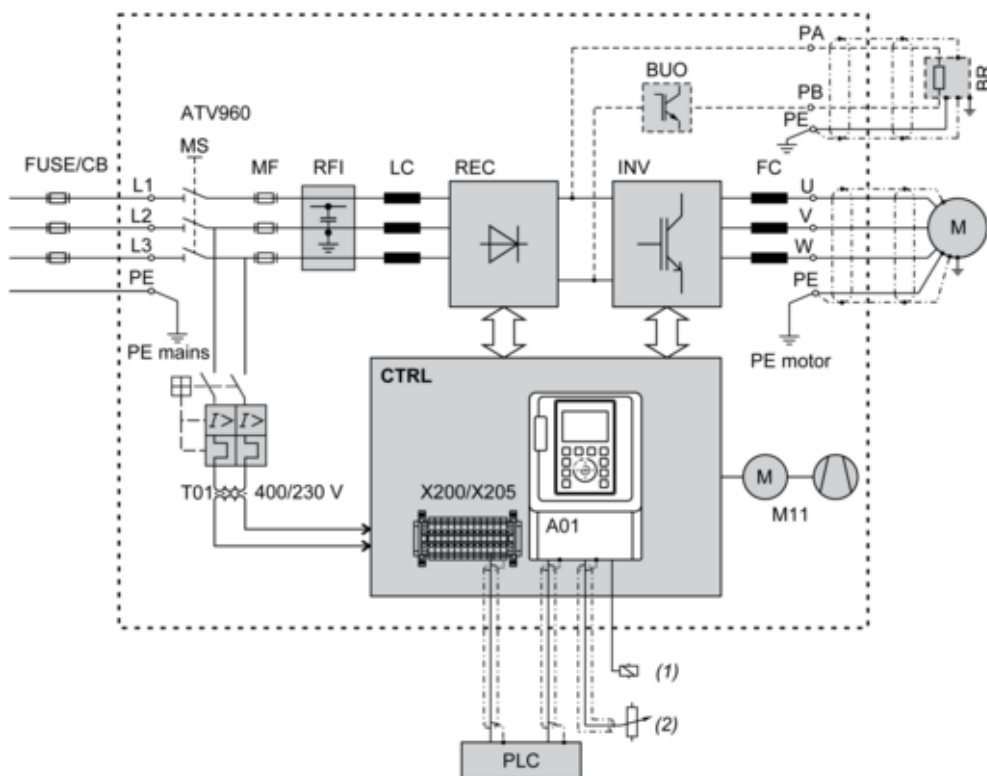
Mounting and Clearance



(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

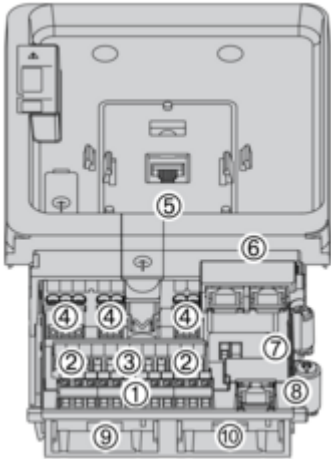
**M11** Fan in enclosure door

**BUO** Braking unit option

**BR** Braking resistor (option)

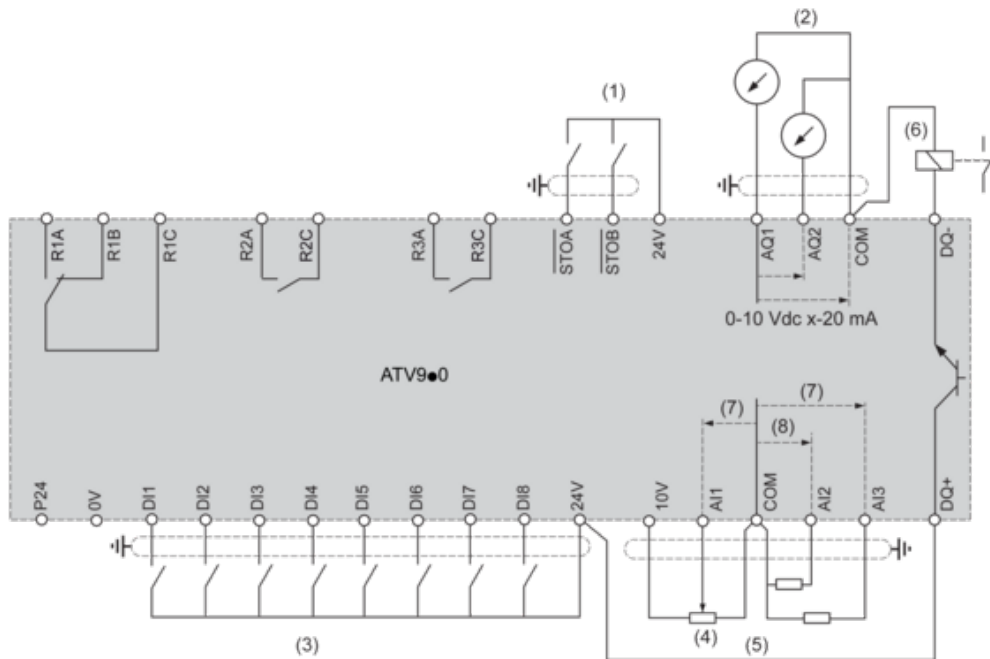
**Structure of the Control Block**

---



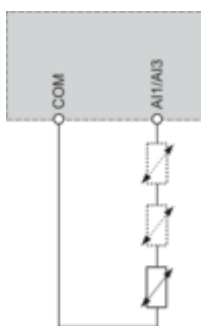
- (1) Control terminals of digital inputs
- (2) Control terminals STO (Safe Torque Off) and analog outputs
- (3) Control terminals of analog inputs
- (4) Control terminals of relay outputs
- (5) RJ45 port for the graphical keypad
- (6) Dual port RJ45 for Ethernet IP or Modbus TCP
- (7) Sink-Ext-Source 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



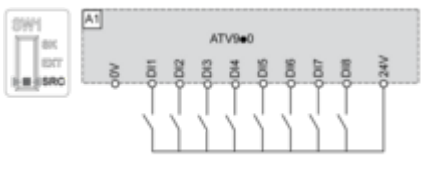
It is possible to connect either 1 or 3 sensors on terminals AI1 or AI3

**Sink / Source Switch Configuration**

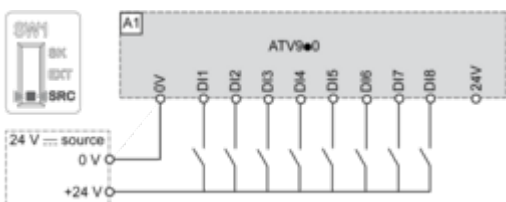
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- 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.

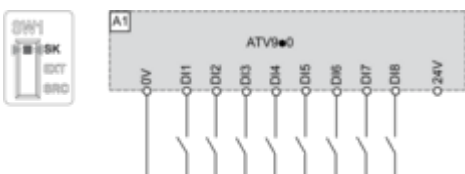
**Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs**



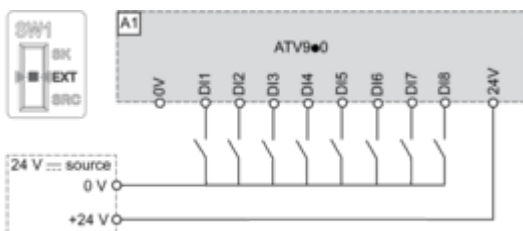
**Switch Set to SRC (Source) Position and Use of an External Power Supply for the DIs**



**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**



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

---

