
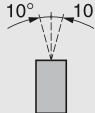


Environmental characteristics			
Conformity to standards			Altivar 12 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), in particular: IEC/EN 61800-5-1 (low voltage), IEC/EN 61800-3 (conducted and radiated EMC immunity and emissions).
EMC immunity			IEC/EN 61800-3, Environments 1 and 2 (EMC requirements and specific test methods) IEC/EN 61000-4-2 level 3 (electrostatic discharge immunity test) IEC/EN 61000-4-3 level 3 (radiated, radio-frequency, electromagnetic field immunity test) IEC/EN 61000-4-4 level 4 (electrical fast transient/burst immunity test) IEC/EN 61000-4-5 level 3 (surge immunity test) IEC/EN 61000-4-6 level 3 (immunity to conducted disturbances, induced by radio-frequency fields) IEC/EN 61000-4-11 (voltage dips, short interruptions and voltage variations immunity tests)
Conducted EMC emissions for drives		ATV 12●●●●F1 ATV 12H018M3 ATV 12●037M3...●U22M3	With additional EMC filter: ■ IEC/EN 61800-3, Environment 1 (public network) in restricted distribution: □ Category C1, from 4 to 12 kHz for a shielded motor cable length ≤ 5 m (except ATV 12●018M3...●075M3) □ Category C2, from 4 to 12 kHz for a shielded motor cable length ≤ 20 m ■ IEC/EN 61800-3, Environment 2 (industrial network): □ Category C3, from 4 to 12 kHz for a shielded motor cable length ≤ 20 m
		ATV 12●●●●M2	■ IEC/EN 61800-3, Environment 1 (public network) in restricted distribution: □ Category C1, at 2, 4, 8, 12 and 16 kHz for a shielded motor cable length ≤ 5 m □ Category C2: ATV 12H018M2...●075M2, from 2 to 12 kHz for a shielded motor cable length ≤ 5 m and at 2, 4, 16 kHz for a shielded motor cable length ≤ 10 m □ Category C2: ATV 12HU15M2...HU22M2, from 4 to 16 kHz for a shielded motor cable length ≤ 5 m and at 2, 4, 8, 12 and 16 kHz for a shielded motor cable length ≤ 10 m
Radiated EMC emissions for drives		ATV 12●●●●●●	With additional EMC filter: ■ IEC/EN 61800-3, Environment 1 (public network) in restricted distribution: □ Category C1, from 4 to 12 kHz for a shielded motor cable length ≤ 20 m □ Category C2, from 4 to 12 kHz for a shielded motor cable length ≤ 50 m ■ IEC/EN 61800-3, Environment 2 (industrial network): □ Category C3, from 4 to 12 kHz for a shielded motor cable length ≤ 50 m ■ IEC/EN 61800-3, Environment 1 (public network) in restricted distribution: □ Category C2, from 2 to 16 kHz for a shielded motor cable
CE marking			The drives are marked CE according to the European low voltage (2006/95/EC) and EMC (2004/108/EC) directives
Product certifications			UL, CSA, NOM, GOST and C-Tick
Degree of protection			IP 20
Vibration resistance		Drive not mounted on rail 	According to IEC/EN 60068-2-6: □ 1.5 mm peak from 3 to 13 Hz □ 1 gn from 13 to 200 Hz
Shock resistance			15 gn for 11 ms according to IEC/EN 60068-2-27
Maximum ambient pollution Definition of insulation			Degree 2 according to IEC/EN 61800-5-1
Environmental conditions Use			IEC 60721-3-3 classes 3C3 and 3S2
Relative humidity		%	5...95 non condensing, no dripping water, according to IEC 60068-2-3
Ambient air temperature around the device	Operation	ATV 12H018F1, H037F1 ATV 12H018M2...H075M2 ATV 12H018M3...H075M3 ATV 12P●●●●●●	°C - 10...+ 40 without derating (1) Up to + 60, with the protective blanking cover removed (1) and current derating of 2% per additional degree (2)
		ATV 12H075F1 ATV 12HU15M2, HU22M2 ATV 12HU15M3...HU40M3	°C - 10...+ 50 without derating Up to + 60, with the protective blanking cover removed (1) and current derating of 2% per additional degree (2)
	Storage	ATV 12●●●●●●	°C - 25...+ 70
Maximum operating altitude		ATV 12●●●●●●	m 1000 without derating
		ATV 12●●●●F1 ATV 12●●●●M2	m Up to 2000 for single-phase networks and corner grounded distribution networks, with current derating of 1% per additional 100 m
		ATV 12●●●●M3	m Up to 3000 meters for three-phase networks, with current derating of 1% per additional 100 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position			10° 

(1) See the possible mounting types on page 60403/5.

(2) See the derating curves in the User Manual, available on our website at "www.schneider-electric.com".

Drive characteristics		
Output frequency range	Hz	0.5...400
Configurable switching frequency	kHz	Nominal switching frequency: 4 kHz without derating in continuous operation Adjustable during operation from 2 to 16 kHz Above 4 kHz in continuous operation, apply derating to the nominal drive current of: <ul style="list-style-type: none"> ■ 10% for 8 kHz ■ 20% for 12 kHz ■ 30% for 16 kHz Above 4 kHz, the drive will reduce the switching frequency automatically in the event of excessive temperature rise. See the derating curves in the User Manual, available on our website at "www.schneider-electric.com".
Speed range		1...20
Transient overtorque		150...170% of the nominal torque depending on the drive rating and the type of motor
Braking torque		<ul style="list-style-type: none"> ■ Up to 70% of the nominal torque without resistor ■ Up to 150% of the nominal motor torque with braking unit (optional) at high inertia
Maximum transient current		150% of the nominal drive current for 60 seconds
Motor control profiles		<ul style="list-style-type: none"> ■ Standard profile (voltage/frequency ratio) ■ Performance profile (sensorless flux vector control) ■ Pump/fan profile (Kn² quadratic ratio)

Electrical power characteristics															
Power supply	Voltage	V	100 - 15% to 120 + 10% single-phase for ATV 12●●●●F1 200 - 15% to 240 + 10% single-phase for ATV 12●●●●M2 200 - 15% to 240 + 10% three-phase for ATV 12●●●●M3												
	Frequency	Hz	50...60 ± 5%												
	Isc (short-circuit current)	A	≤ 1000 (Isc at the connection point) for single-phase power supply ≤ 5000 (Isc at the connection point) for three-phase power supply												
Drive supply and output voltages			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%;">Drive supply voltage</th> <th style="width: 35%;">Drive output voltage for motor</th> </tr> </thead> <tbody> <tr> <td>ATV 12●●●●F1</td> <td>V</td> <td>100...120 single-phase</td> </tr> <tr> <td>ATV 12●●●●M2</td> <td>V</td> <td>200...240 single-phase</td> </tr> <tr> <td>ATV 12●●●●M3</td> <td>V</td> <td>200...240 three-phase</td> </tr> </tbody> </table>		Drive supply voltage	Drive output voltage for motor	ATV 12●●●●F1	V	100...120 single-phase	ATV 12●●●●M2	V	200...240 single-phase	ATV 12●●●●M3	V	200...240 three-phase
		Drive supply voltage	Drive output voltage for motor												
	ATV 12●●●●F1	V	100...120 single-phase												
	ATV 12●●●●M2	V	200...240 single-phase												
ATV 12●●●●M3	V	200...240 three-phase													
Maximum length of motor cable (including tap links)	Shielded cable	m	50												
	Unshielded cable	m	100												
Drive noise level	ATV 12H018F1, H037F1 ATV 12H018M2...H075M2 ATV 12H018M3...H075M3 ATV 12P●●●●●	dBA	0												
	ATV 12H075F1 ATV 12HU15M2, HU22M2	dBA	45												
	ATV 12HU15M3...HU40M3	dBA	50												
	Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)											

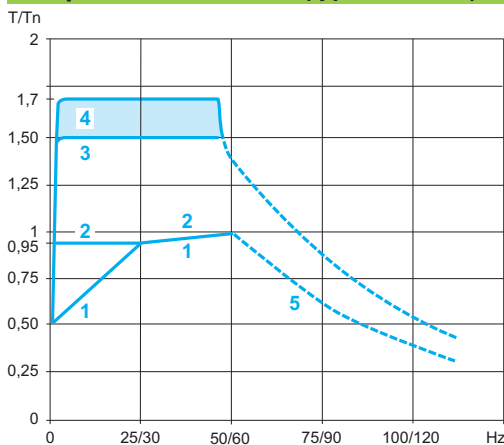
Connection characteristics (drive terminals for the line supply, the motor output and the braking unit)			
Drive terminals		R/L1, S/L2/N, T/L3, U/T1, V/T2, W/T3, PA/+, PC/-	
Maximum wire size and tightening torque	ATV 12H018F1, H037F1 ATV 12H018M2...H075M2 ATV 12H018M3...H075M3 ATV 12P037F1 ATV 12P037M2...P075M2 ATV 12P037M3, P075M3		3.5 mm ² (AWG 12) 0.8 Nm
	ATV 12H075F1 ATV 12HU15M2, HU22M2 ATV 12HU15M3...HU40M3 ATV 12PU15M3...PU40M3		5.5 mm ² (AWG 10) 1.2 Nm

Electrical characteristics (control)		
Available internal supplies		Protected against short-circuits and overloads: <ul style="list-style-type: none"> ■ One 5 V $\overline{\text{---}}$ supply ($\pm 5\%$) for the reference potentiometer (2.2 to 10 kΩ), maximum data rate 10 mA ■ One 24 V $\overline{\text{---}}$ supply ($-15\%/+20\%$) for the control inputs, maximum data rate 100 mA
Analog input	AI1	1 software-configurable voltage or current analog input: <ul style="list-style-type: none"> ■ Voltage analog input: 0...5 V $\overline{\text{---}}$ (internal power supply only) or 0...10 V $\overline{\text{---}}$, impedance 30 kΩ ■ Analog current input: X-Y mA by programming X and Y from 0...20 mA, impedance 250 Ω Sampling time: < 10 ms Resolution: 10 bits Accuracy: $\pm 1\%$ at 25°C Linearity: $\pm 0.3\%$ of the maximum scale value Factory setting: Input configured as voltage type
Analog output	AO1	1 software-configurable voltage or current analog output: <ul style="list-style-type: none"> ■ Analog voltage output: 0...10 V $\overline{\text{---}}$, minimum load impedance 470 Ω ■ Analog current output: 0 to 20 mA, maximum load impedance 800 Ω Update time: < 10 ms Resolution: 8 bits Accuracy: $\pm 1\%$ at 25°C
Relay outputs	R1A, R1B, R1C	1 protected relay output, 1 N/O contact and 1 N/C contact with common point Response time: 30 ms maximum Minimum switching capacity: 5 mA for 24 V $\overline{\text{---}}$ Maximum switching capacity: <ul style="list-style-type: none"> ■ On resistive load ($\cos \varphi = 1$ and L/R = 0 ms): 3 A at 250 V \sim or 4 A at 30 V $\overline{\text{---}}$ ■ On inductive load ($\cos \varphi = 0.4$ and L/R = 7 ms): 2 A at 250 V \sim or 30 V $\overline{\text{---}}$
LI logic inputs	LI1...LI4	4 programmable logic inputs, compatible with PLC level 1, standard IEC/EN 61131-2 24 V $\overline{\text{---}}$ internal power supply or 24 V $\overline{\text{---}}$ external power supply (min. 18 V, max. 30 V) Sampling time: < 20 ms Sampling time tolerance: ± 1 ms Factory-set with 2-wire control in "transition" mode for machine safety reasons: <ul style="list-style-type: none"> ■ LI1: forward ■ LI2...LI4: not assigned Multiple assignment makes it possible to configure several functions on one input (for example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3) Impedance 3.5 k Ω
	Positive logic (Source)	Factory setting State 0 if < 5 V, state 1 if > 11 V
	Negative logic (Sink)	Software-configurable State 0 if > 16 V or logic input not wired, state 1 if < 10 V
Logic output	LO+, LO-	One 24 V $\overline{\text{---}}$ logic output assignable as positive logic (Source) or negative logic (Sink) open collector type, compatible with level 1 PLC, standard IEC/EN 61131-2 Maximum voltage: 30 V Linearity: $\pm 1\%$ Maximum current: 10 mA (100 mA with external power supply) Impedance: 1 k Ω Update time: < 20 ms
Maximum I/O wire size and tightening torque		1.5 mm ² (AWG 14) 0.5 Nm
Acceleration and deceleration ramps		Ramp profile: <ul style="list-style-type: none"> ■ Linear from 0 to 999.9 s ■ S ramp ■ U ramp Automatic adaptation of deceleration ramp time if braking capacities exceeded, although this adaptation can be disabled (use of braking unit)
Emergency braking		By DC injection: automatically as soon as the estimated output frequency drops to < 0.2 Hz, period adjustable from 0.1 to 30 s or continuous, current adjustable from 0 to 1.2 I _n
Main drive protection features		Thermal protection against overheating Protection against short-circuits between motor phases Overcurrent protection between motor phases and earth Protection in the event of line overvoltage and undervoltage Input phase loss protection, in three-phase
Motor protection		Thermal protection integrated in the drive by continuous calculation of the I ² t
Frequency resolution		Display unit: 0.1 Hz Analog inputs: 10-bit A/D converter
Time constant on a change of setpoint	ms	20 \pm 1 ms

Communication port characteristics

Protocol		Modbus
Structure	Connector	1 RJ45 connector
	Physical interface	2-wire RS 485
	Transmission mode	RTU
	Transmission speed	Configurable via the Human-Machine interface, remote display terminal or SoMove setup software: 4800 bps, 9600 bps, 19200 bps or 38400 bps
	Number of subscribers	31 maximum
	Polarization	No polarization impedance. This must be provided by the wiring system (for example, in the master)
	Address	1 to 247, configurable via the Human-Machine interface, remote display terminal or SoMove setup software
Services	Profile	Based on IEC 61800-7-301 (CiA 402 profile)
	Messaging	Read Holding Registers (03) 29 words maximum Write Single Register (06) 29 words maximum Write Multiple Registers (16) 27 words maximum Read/Write Multiple Registers (23) 4/4 words maximum Read Device Identification (43)
	Communication monitoring	Can be inhibited. Time out can be set between 0.1 s and 30 s
Diagnostics	Via the Human-Machine interface or remote display terminal	On display unit

Torque characteristics (typical curves)



The curves opposite define the available continuous torque and transient overtorque for both self-cooled and force-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

- 1 Self-cooled motor: continuous useful torque (1)
- 2 Force-cooled motor: continuous useful torque
- 3 Transient overtorque for 60 s
- 4 Transient overtorque for 2 s
- 5 Torque in overspeed at constant power (2)

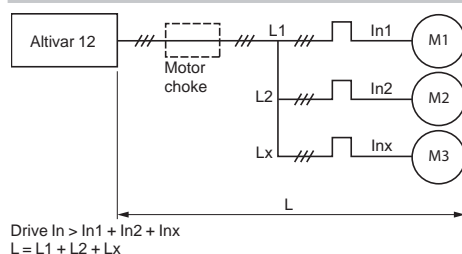
(1) For power ratings ≤ 250 W, derating is 20% instead of 50% at very low frequencies.
(2) The nominal motor frequency and the maximum output frequency can be adjusted from 0.5 to 400 Hz. The mechanical overspeed capability of the selected motor must be checked with the manufacturer.

Special uses

Use with a motor with different power to the drive rating

The device can power any motor which has a lower rating than that for which the drive was designed, provided that the minimum current value is complied with: $I_{th} = 0.2 \times \text{drive } I_n$.
For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Connecting motors in parallel



Connecting motors in parallel

The drive rating must be greater than or equal to the sum of the currents of the motors to be connected to the drive (I_n). In this case, it is necessary to provide external thermal protection for each motor using probes or thermal overload relays.

Use of a motor choke (1) is recommended in the following cases:

- When three or more motors are connected in parallel
- When the motor cable length (L), including all tap links (L1, L2...Lx), is longer than the maximum permitted motor cable length (2)

(1) See References on page 60402/5.

(2) For maximum permitted motor cable length, see page 60401/3.

Motor switching at the drive output

Motor switching is possible with the drive unlocked. The integrated protection in Altivar 12 drives offers better immunity to downstream breaking of the powered motor.