

Variable speed drives Altivar 312

For 3-phase motors from 0.18 to 15 kW



Application: packaging



Application: material handling

Presentation

The Altivar 312 drive is a frequency inverter for 200...600 V three-phase asynchronous motors from 0.18 to 15 kW.

The Altivar 312 drive is robust, compact and easy to install. Its integrated functions are particularly suitable for the requirements of applications involving simple industrial machines.

By taking account of constraints on product setup and use right from the design stage, we are able to offer a reliable, cost-effective solution to manufacturers of simple machines and installers.

With its various communication cards that are available as options, the Altivar 312 drive integrates perfectly in the main control system architectures.

Examples of solutions provided:

- Numerous options for loading, editing and saving drive configurations using various tools, such as the SoMove setup software, the SoMove Mobile software for mobile phones, remote display terminals and the Simple Loader and Multi-Loader configuration tools.
- Adaptation to industrial communication buses and networks by simply replacing the drive control I/O card with one of the communication cards
- User interface identical to the Altivar 12 range of variable speed drives, making setup easy and enabling those using it to adapt quickly.

Applications

The Altivar 312 drive incorporates functions that are suitable for the most common applications, including:

- Material handling (small conveyors, hoists, etc.)
- Packing and packaging machines (small bagging machines, labelling machines, etc.)
- Special machines (mixers, kneaders, textile machines, etc.)
- Pumps, compressors, fans

Functions

The Altivar 312 drive has six logic inputs, three analog inputs, one logic/analog output and two relay outputs.

The main functions available are as follows:

- Motor and drive protection
- Linear, S, U or customized acceleration and deceleration ramps
- Local control of the speed reference using the navigation button
- +/- speed
- 16 preset speeds
- PI regulator and references
- 2-wire/3-wire control
- Brake sequence
- Automatic catching a spinning load with speed detection and automatic restart
- Fault configuration and stop type configuration
- Saving the configuration in the drive

Several functions can be assigned to one logic input.

An optimized offer

The Altivar 312 range of variable speed drives covers motor power ratings from 0.18 kW to 15 kW with four types of power supply:

- 200 V...240 V single-phase, 0.18 kW to 2.2 kW (**ATV 312H...M2**)
- 200 V...240 V three-phase, 0.18 kW to 15 kW (**ATV 312H...M3**)
- 380 V...500 V three-phase, 0.37 kW to 15 kW (**ATV 312H...N4**)
- 525 V...600 V three-phase, 0.75 kW to 15 kW (**ATV 312H...S6**)

Several drives can be mounted side by side to save space.

The Altivar 312 drive integrates the Modbus and CANopen communication protocols as standard. The protocols can be accessed via the RJ45 connector on the underside of the drive.

In addition to the Modbus and CANopen protocols that can be accessed as standard, the Altivar 312 drive can be connected to the main industrial communication buses and networks by replacing the drive's control I/O card with one of the communication cards that are available as options: CANopen Daisy chain, DeviceNet and PROFIBUS DP. The Modbus TCP network and the Fipio bus are also accessible via dedicated gateways.

See page 28.

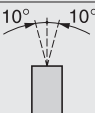


ATV 312H037M3



ATV 312HD15N4

Environmental characteristics

Conformity to standards			Altivar 312 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC), in particular: IEC 61800-5-1 (low voltage), IEC 61800-3 (EMC immunity and conducted and radiated EMC emissions).
EMC immunity			IEC 61800-3, Environments 1 and 2 (EMC requirement and specific test methods) IEC 61000-4-2 level 3 (electrostatic discharge immunity test) IEC 61000-4-3 level 3 (radio-frequency radiated electromagnetic field immunity test) IEC 61000-4-4 level 4 (electrical fast transient/burst immunity test) IEC 61000-4-5 level 3 (surge immunity test)
Conducted and radiated EMC emissions for drives	ATV 312H●●●●●		IEC 61800-3, Environments: 2 (industrial power supply) and 1 (public power supply), restricted distribution
	ATV 312H018M2...HU15M2 ATV 312H037N4...HU40N4		IEC 61800-3 category C2 With additional EMC filter (1): ■ IEC 61800-3 category C1
	ATV 312HU22M2, ATV 312HU55N4...HD15N4		IEC 61800-3 category C3 With additional EMC filter (1): ■ IEC 61800-3 category C2 ■ IEC 61800-3 category C1
	ATV 312H018M3...HD15M3		With additional EMC filter (1): ■ IEC 61800-3 category C2
CE marking			The drives are marked CE in accordance with the European low voltage (2006/95/EC) and EMC (2004/108/EC) directives
Product certification			UL, CSA, NOM, GOST, C-Tick and DNV
Degree of protection			IP 31 and IP 41 on upper part and IP 21 on connection terminals
Vibration resistance	Drive not mounted on rail		Conforming to IEC 60068-2-6: 1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz
Shock resistance			15 gn for 11 ms conforming to IEC 60068-2-27
Maximum ambient pollution Definition of insulation			Degree 2 conforming to IEC 61800-5-1
Environmental conditions Use			IEC 60721-3-3 classes 3C2 and 3S2
Relative humidity		%	5...95 non condensing, no dripping water, conforming to IEC 60068-2-3
Ambient air temperature around the device	Operation	°C	- 10...+ 50 without derating - 10...+ 60 with derating removing the protective cover on top of the drive (see derating curves, page 56)
	Storage	°C	- 25...+ 70
Maximum operating altitude	ATV 312H●●●●●	m	1000 without derating
	ATV 312H●●●●M2	m	Up to 2000 for single-phase supplies and corner grounded distribution networks, derating the current by 1% for each additional 100 m
	ATV 312H●●●●M3 ATV 312H●●●●N4 ATV 312H●●●●S6	m	Up to 3000 metres for three-phase supplies, derating the current by 1% for each additional 100 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position			10° 10° 

(1) See table on page 45 to check the permitted cable lengths.

Drive characteristics				
Output frequency range			Hz	0...500
Switching frequency			kHz	Nominal switching frequency: 4 kHz without derating in continuous operation. Adjustable during operation from 2...16 kHz Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value. See derating curves on page 56
Speed range				1...50
Transient overtorque				170...200% of nominal motor torque (typical value)
Braking torque	With braking resistor	ATV 312H●●●●●		100% of nominal motor torque continuously and up to 150% for 60 s
	Without braking resistor	ATV 312H018M2		150% of nominal motor torque (typical value)
		ATV 312H037M2...H075M2 ATV 312H018M3...H075M3 ATV 312H037N4...H075N4 ATV 312H075S6		100% of nominal motor torque (typical value)
		ATV 312HU11M2, HU15M2 ATV 312HU11M3, HU15M3 ATV 312HU11N4, HU15N4 ATV 312HU15S6		50% of nominal motor torque (typical value)
		ATV 312HU22M2 ATV 312HU22M3...HD15M3 ATV 312HU22N4...HD15N4 ATV 312HU22S6...HD15S6		30% of nominal motor torque (typical value)
Maximum transient current				150% of the nominal drive current for 60 seconds (typical value)
Motor control profiles				<div><div></div> Standard ratio (voltage/frequency)</div> <div><div></div> Performance ratio (sensorless flux vector control)</div> <div><div></div> Pump/fan ratio (Kn² quadratic ratio)</div> <div><div></div> Energy saving ratio (specifically for ventilation)</div>
Frequency loop gains				Factory-set with speed loop stability and gain Possible options for machines with high resistive torque or high inertia, or for machines with fast cycles
Slip compensation				Automatic whatever the load. Can be inhibited or adjusted
Electrical power characteristics				
Power supply	Voltage	V	200 - 15% ... 240 + 10% single-phase for ATV 312●●●●●M2 200 - 15% ... 240 + 10% three-phase for ATV 312●●●●●M3 380 - 15% ... 500 + 10% three-phase for ATV 312●●●●●N4 525 - 15% ... 600 + 10% three-phase for ATV 312●●●●●S6	
	Frequency	Hz	50...60 + 5%	
Prospective short-circuit current I _{sc}	ATV 312●●●●●M2	A	≤ 1000 (I _{sc} at the connection point) for single-phase power supply	
	ATV 312H018M3...HU40M3 ATV 312H037N4...HU40N4 ATV 312H075S6...HU40S6	A	≤ 5000 (I _{sc} at the connection point) for three-phase power supply	
	ATV 312HU55M3...HD15M3 ATV 312HU55N4...HD15N4 ATV 312HU55S6...HD15S6	A	≤ 22000 (I _{sc} at the connection point) for three-phase power supply	
Drive supply voltage and output voltage				<div>Drive supply voltage</div> <div>Drive output voltage for motor</div>
	ATV 312H●●●●●M2	V	200...240 single-phase	200...240 three-phase
	ATV 312H●●●●●M3	V	200...240 three-phase	200...240 three-phase
	ATV 312H●●●●●N4	V	380...500 three-phase	380...500 three-phase
	ATV 312H●●●●●S6	V	525...600 three-phase	525...600 three-phase
Connection characteristics				
(drive terminals for line supply, motor output, DC bus and braking resistor)				
Drive terminals			L1, L2, L3, U, V, W, PC/–, PA/+, PB	
Maximum wire size and tightening torque	ATV 312H018M2...H075M2 ATV 312H018M3...HU15M3		2.5 mm² (AWG 14) 0.8 Nm	
	ATV 312HU11M2...HU22M2 ATV 312HU22M3...HU40M3 ATV 312H037N4...HU40N4 ATV 312H075S6...HU40S6		5 mm² (AWG 10) 1.2 Nm	
	ATV 312HU55M3, HU75M3 ATV 312HU55N4, HU75N4 ATV 312HU55S6, HU75S6		16 mm² (AWG 6) 2.5 Nm	
	ATV 312HD11M3, HD15M3 ATV 312HD11N4, HD15N4 ATV 312HD11S6, HD15S6		25 mm² (AWG 3) 4.5 Nm	
Electrical isolation				Electrical isolation between power and control (inputs, outputs, power supplies)

Electrical control characteristics

Available internal supplies		Protected against short-circuits and overloads: <ul style="list-style-type: none"> One 10 V \pm (0/+ 8%) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA One 24 V \pm supply (min. 19 V, max. 30 V) for the control logic inputs, maximum current 100 mA
Analog inputs		Sampling time < 8 ms Resolution: 10 bits Accuracy: \pm 4.3% Linearity: \pm 0.2% of the maximum scale value Use: <ul style="list-style-type: none"> 100 m maximum with shielded cable 25 m maximum with unshielded cable
	AI1	One 0...10 V \pm analog voltage input, impedance 30 k Ω , maximum safe voltage 30 V
	AI2	One \pm 10 V bipolar voltage analog input, impedance 30 k Ω , maximum safe voltage 30 V
	AI3	One X-Y mA analog current input, X and Y programmable from 0 to 20 mA, with impedance 250 Ω
Analog voltage outputs or analog current outputs configurable as logic outputs		2 analog outputs: <ul style="list-style-type: none"> 1 analog voltage output (AOV) 1 analog current output (AOC) configurable as a logic output. These 2 analog outputs cannot be used at the same time
	AOV	0...10 V \pm analog voltage output, min. load impedance 470 Ω 8-bit resolution, accuracy \pm 1%, linearity \pm 0.2% of the maximum scale value
	AOC	0...20 mA analog current output, max. load impedance 800 Ω 8-bit resolution, accuracy \pm 1%, linearity \pm 0.2% The AOC analog output can be configured as a 24 V logic output, max. 20 mA, min. load impedance 1.2 k Ω Refresh time < 8 ms
Relay outputs	R1A, R1B, R1C	1 relay logic output, one N/C contact and one N/O contact with common point Minimum switching capacity: 10 mA for 5 V \pm Maximum switching capacity: <ul style="list-style-type: none"> On resistive load ($\cos \varphi = 1$ and L/R = 0 ms): 5 A for 250 V \sim or 30 V \pm On inductive load ($\cos \varphi = 0.4$ and L/R = 7 ms): 2 A for 250 V \sim or 30 V \pm Sampling time < 8 ms Switching: 100,000 operations
	R2A, R2B	1 relay logic output, one N/C contact, contact open on fault. Minimum switching capacity: 10 mA for 5 V \pm Maximum switching capacity: <ul style="list-style-type: none"> On resistive load ($\cos \varphi = 1$ and L/R = 0 ms): 5 A for 250 V \sim or 30 V \pm On inductive load ($\cos \varphi = 0.4$ and L/R = 7 ms): 2 A for 250 V \sim or 30 V \pm Sampling time < 8 ms Switching: 100,000 operations
LI logic inputs	LI1...LI6	6 programmable logic inputs, compatible with PLC level 1, standard IEC/EN 61131-2 Impedance 3.5 k Ω 24 V \pm internal or 24 V \pm external power supply (min. 19 V, max. 30 V) Max. current: 100 mA Sampling time < 4 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic (Source)	State 0 if < 5 V or logic input not wired State 1 if > 11 V
	Negative logic (Sink)	State 0 if > 19 V or logic input not wired State 1 if < 13 V
	CLI position	Connection to PLC output (see diagram on page 54)
Maximum I/O wire size and tightening torque		2.5 mm ² (AWG 14) 0.6 Nm

Electrical control characteristics (continued)

Acceleration and deceleration ramps				<div>Ramp profiles:<ul style="list-style-type: none">■ Linear, can be adjusted separately from 0.1 to 999.9 s■ S, U or customizedAutomatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of a braking resistor)</div>
Braking to a standstill				<div>By DC injection:<ul style="list-style-type: none">■ By a command on a logic input (LI1 to LI6)■ Automatically as soon as the estimated output frequency drops to < 0.5 Hz, period adjustable from 0 to 30 s or continuous, current adjustable from 0 to 1.2 In</div>
Main drive protection and safety features				<div>Thermal protection against overheating Protection against short-circuits between motor phases Input phase loss protection, for three-phase supply Protection against motor phase breaks Overcurrent protection between motor output phases and earth Line supply overvoltage and undervoltage safety features</div>
Motor protection (see page 73)				<div>Thermal protection integrated in the drive by continuous calculation of the I²t</div>
Dielectric strength	Between earth and power terminals	ATV 312H●●●M2		2040 V ---
		ATV 312H●●●M3		
		ATV 312H●●●N4		2410 V ---
		ATV 312H●●●S6		2550 V ---
	Between control and power terminals	ATV 312H●●●M2		2880 V ~
		ATV 312H●●●M3		
		ATV 312H●●●N4		3400 V ~
		ATV 312H●●●S6		3600 V ~
Signalling				<div>Display coded by one 4-digit display (messages, values) and 5 status LEDs (current mode, CANopen bus)</div>
Frequency resolution	Display units	Hz	0.1	
	Analog inputs	Hz	<div>Resolution = ((high speed - low speed)/1024) Min. value = 0.1</div>	
Time constant on a change of reference			ms	5

PF090101

ATV 312H075M2

PF090107

ATV 312HU15N4

PF090108

ATV 312HU30N4

PF090108

ATV 312HU75N4

Drives (frequency range from 0.5 to 500 Hz)												
Motor		Line supply				Altivar 312			Reference	Weight		
Power indicated on rating plate (1)		Max. line current (2), (3)	Apparent power		Max. prospective line Isc (4)	Max. continuous output current (In) (1)	Max. transient current for 60 s	Power dissipated at maximum output current (In) (1)				
			at U1	at U2							at U2	
kW	HP	A	A	kVA	kA	A	A	W		kg		
0.18	0.25	3.0	2.5	0.6	1	1.5	2.3	24	ATV 312H018M2	1.500		
0.37	0.5	5.3	4.4	1	1	3.3	5	41	ATV 312H037M2	1.500		
0.55	0.75	6.8	5.8	1.4	1	3.7	5.6	46	ATV 312H055M2	1.500		
0.75	1	8.9	7.5	1.8	1	4.8	7.2	60	ATV 312H075M2	1.500		
1.1	1.5	12.1	10.2	2.4	1	6.9	10.4	74	ATV 312HU11M2	1.800		
1.5	2	15.8	13.3	3.2	1	8	12	90	ATV 312HU15M2	1.800		
2.2	3	21.9	18.4	4.4	1	11	16.5	123	ATV 312HU22M2	3.100		
0.18	0.25	2.1	1.9	0.7	5	1.5	2.3	23	ATV 312H018M3	1.300		
0.37	0.5	3.8	3.3	1.3	5	3.3	5	38	ATV 312H037M3	1.300		
0.55	0.75	4.9	4.2	1.7	5	3.7	5.6	43	ATV 312H055M3	1.300		
0.75	1	6.4	5.6	2.2	5	4.8	7.2	55	ATV 312H075M3	1.300		
1.1	1.5	8.5	7.4	3	5	6.9	10.4	71	ATV 312HU11M3	1.700		
1.5	2	11.1	9.6	3.8	5	8	12	86	ATV 312HU15M3	1.700		
2.2	3	14.9	13	5.2	5	11	16.5	114	ATV 312HU22M3	1.700		
3	—	19.1	16.6	6.6	5	13.7	20.6	146	ATV 312HU30M3	2.900		
4	5	24.2	21.1	8.4	5	17.5	26.3	180	ATV 312HU40M3	2.900		
5.5	7.5	36.8	32	12.8	22	27.5	41.3	292	ATV 312HU55M3	6.400		
7.5	10	46.8	40.9	16.2	22	33	49.5	388	ATV 312HU75M3	6.400		
11	15	63.5	55.6	22	22	54	81	477	ATV 312HD11M3	10.500		
15	20	82.1	71.9	28.5	22	66	99	628	ATV 312HD15M3	10.500		
Three-phase supply voltage: 380...500 V 50/60 Hz, with integrated EMC filter (3) (5) (6)												
0.37	0.5	2.2	1.7	1.5	5	1.5	2.3	32	ATV 312H037N4	1.800		
0.55	0.75	2.8	2.2	1.8	5	1.9	2.9	37	ATV 312H055N4	1.800		
0.75	1	3.6	2.7	2.4	5	2.3	3.5	41	ATV 312H075N4	1.800		
1.1	1.5	4.9	3.7	3.2	5	3	4.5	48	ATV 312HU11N4	1.800		
1.5	2	6.4	4.8	4.2	5	4.1	6.2	61	ATV 312HU15N4	1.800		
2.2	3	8.9	6.7	5.9	5	5.5	8.3	79	ATV 312HU22N4	3.100		
3	—	10.9	8.3	7.1	5	7.1	10.7	125	ATV 312HU30N4	3.100		
4	5	13.9	10.6	9.2	5	9.5	14.3	150	ATV 312HU40N4	3.100		
5.5	7.5	21.9	16.5	15	22	14.3	21.5	232	ATV 312HU55N4	6.500		
7.5	10	27.7	21	18	22	17	25.5	269	ATV 312HU75N4	6.500		
11	15	37.2	28.4	25	22	27.7	41.6	397	ATV 312HD11N4	11.000		
15	20	48.2	36.8	32	22	33	49.5	492	ATV 312HD15N4	11.000		
Three-phase supply voltage: 525...600 V 50/60 Hz, without EMC filter (3) (8)												
0.75	1	2.8	2.4	2.5	5	1.7	2.6	36	ATV 312H075S6	1.700		
1.5	2	4.8	4.2	4.4	5	2.7	4.1	48	ATV 312HU15S6	1.700		
2.2	3	6.4	5.6	5.8	5	3.9	5.9	62	ATV 312HU22S6	2.900		
4	5	10.7	9.3	9.7	5	6.1	9.2	94	ATV 312HU40S6	2.900		
5.5	7.5	16.2	14.1	15	22	9	13.5	133	ATV 312HU55S6	6.200		
7.5	10	21.3	18.5	19	22	11	16.5	165	ATV 312HU75S6	6.200		
11	15	27.8	24.4	25	22	17	25.5	257	ATV 312HD11S6	10.000		
15	20	36.4	31.8	33	22	22	33	335	ATV 312HD15S6	10.000		

(1) These values are given for a nominal switching frequency of 4 kHz, for use in continuous operation.

The switching frequency is adjustable from 2 to 16 kHz. Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value. See derating curves on page 56.

(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no line choke for max. prospective line Isc (4).

(3) Nominal supply voltage, min. U1, max. U2: 200 (U1)...240 V (U2), 380 (U1)...500 V (U2), 525 (U1)...600 V (U2).

(4) If line Isc is greater than the values in the table, add line chokes (see page 43).

(5) Drives supplied with category C2 or C3 integrated EMC filter. This filter can be disconnected.

(6) If a communication card is used, it takes the place of the control I/O card. To reduce installation costs, the drive can be ordered without a control I/O card. To do this, simply add a B at the end of the reference. For example: ATV 312H075N4 becomes ATV 312H075N4B. The communication card must be ordered separately (see page 28).

(0 & 2 OWHU DYDL0DE0H DV DQ RSWLRQ VHH SDJH

(8) Mandatory line choke to be ordered separately (see page 43).