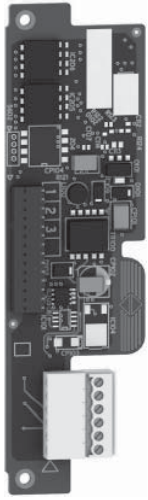# Variable speed drives
Altivar 71
Option: Encoder interface cards

VW3 A3 401

Presentation

Encoder interface cards are used for Flux Vector Control operation with sensor (FVC mode) for asynchronous motors, or, for synchronous motors, Vector Control operation with speed feedback (FSY mode).
It therefore improves drive performance irrespective of the motor load state:
■ Zero speed torque
■ Accurate speed regulation
■ Torque accuracy
■ Shorter response times on a torque surge
■ Improved dynamic performance in transient state

For asynchronous motors, in the other control modes (voltage vector control, voltage/frequency ratio), encoder interface cards improve static speed accuracy.

Depending on the model, encoder interface cards can also be used for machine safety, irrespective of the control type:
■ Overspeed detection
■ Load slipping detection
They can also transmit to the Altivar 71 a reference provided by the encoder input. This use is specific to synchronizing the speed of several drives.

These two functions are available for encoder interface cards VW3 A3 401 to VW3 A3 407 and VW3 A3 411.

The Altivar 71 drive cannot support more than one encoder interface card. It is inserted into a dedicated slot.

Six types of card are available depending on the encoder technology (incremental or absolute):
■ RS 422 compatible differential outputs
■ Open collector outputs (NPN)
■ Push-pull outputs
■ Resolver
■ SinCos, SinCos Hiperface®, EnDat® or SSI
■ RS 422 compatible differential outputs with encoder emulation (RS 422 ESIM)

These last three cards are available only with the following variable speed drives:
■ ATV 71H●●●M3383
■ ATV 71H●●●M3X383
■ ATV 71H●●●N4383

The RS 422 ESIM (Encoder SIMulation) encoder interface card is used to indicate the position and speed of the motor to a motion controller via the ESIM output of the RS 422 interface.
It is also used to establish a master/slave relationship between two Altivar 71 drives.

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Characteristics

Encoder interface cards with RS422 compatible differential outputs

Type of card		VW3 A3 401		VW3 A3 402 *(1)*	
Power Supply (supplied by the card)	Voltage	5 V ⎓ (min. 5 V, max. 5.5 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	200 mA		175 mA	
		Short-circuit and overload protection			
Maximum cable length		50 m		100 m	
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$			
	Impedance	440 Ω			
Number of pulses/encoder revolution	ATV 71H●●●M3, M3X, N4	5000 maximum			
	ATV 71H●●●●●●383	10,000 maximum			
		The maximum high-speed frequency should not exceed 300 kHz.			
Encoder consumption		**100 mA at 4.5 V**	**200 mA at 4.5 V**	**100 mA at 8 V**	**175 mA at 8 V**
Minimum cross-section recommended for the conductors *(2)*	For a maximum cable length of 25 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 50 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 100 m	–	–	0.2 mm² (AWG 24)	
Type of encoder		XCC 1●●●●●●●X, R, RN *(3)*		XCC 1●●●●●●●X *(3)*	

Encoder interface card with open collector outputs

Type of card		VW3 A3 403		VW3 A3 404	
Power Supply (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	175 mA			
		Short-circuit and overload protection			
Maximum cable length		500 m			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$ /AB/A			
	Impedance	1 kΩ			
Number of pulses/encoder revolution	ATV 71H●●●M3, M3X, N4	5000 maximum			
	ATV 71H●●●●●●383	10,000 maximum			
		The maximum high-speed frequency should not exceed 300 kHz.			
Encoder consumption		**100 mA at 10 V**	**175 mA at 10 V**	**100 mA at 10 V**	**175 mA at 10 V**
Minimum cross-section recommended for the conductors *(2)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)	

Encoder interface card with push-pull outputs

Type of card		VW3 A3 405		VW3 A3 406	VW3 A3 407
Power Supply (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)	24 V ⎓ (min. 20 V, max. 30 V)
	Maximum current	175 mA			
		Short-circuit and overload protection			
Maximum cable length		500 m			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$ /AB/A			
	Impedance	1 kΩ			1.6 kΩ
	State 0	If < 1.5 V			
	State 1	If > 7.7 V and < 13 V		If > 7.7 V and < 16 V	If > 11.5 V and < 25 V
Number of pulses/encoder revolution	ATV 71H●●●M3, M3X, N4	5000 maximum			
	ATV 71H●●●●●●383	10,000 maximum			
		The maximum high-speed frequency should not exceed 300 kHz.			
Encoder consumption		**100 mA at 10 V**	**175 mA at 10 V**	**100 mA at 10 V**	**175 mA at 10 V** / **100 mA at 14 V**
Minimum cross-section recommended for the conductors *(2)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)
Type of encoder		XCC 1●●●●●●●Y, K, KN *(3)*			

(1) The VW3 A3 402 card ensures compatibility between Altivar 68F drive applications and Altivar 71 drive applications.
(2) Shielded cable containing 3 twisted pairs with a pitch of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum cross-section recommended for the conductors for a minimum encoder voltage in order to limit line voltage drops.
(3) To obtain the complete reference of the encoder, consult our "Global Detection" catalogue or our website "www.telemecanique.com".

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Option: Encoder interface cards

Characteristics (continued)

Resolver encoder interface card (for drives ATV 71H●●●M3383, ATV 71H●●●M3X383 and ATV 71H●●●N4383)

Type of card	VW3 A3 408		
Excitation voltage	1.25…5.6 V rms with current of 50 mA max.		
Secondary voltage	Set at 1 V rms for an excitation voltage of 1.25…5.6 V rms		
Excitation frequency	4, 8 or 12 kHz, adjustable according to the encoder. By default, 8 kHz		
Speed feedback resolution	12 bits, 2^{12} maximum (4092), for 360 electrical degrees		
Accuracy	± 1 bit		
Number of encoder poles	2, 4, 6 or 8. The number of motor poles must be an integer multiple of the number of encoder poles		
Transformation ratio (Turn ratio)	4:1, 3:1, 2:1 and 1:1; detection of the ratio is automatic		
Number of pulses/encoder revolution	4096 maximum		
Maximum cable length	200 m		

Maximum motor speed according to the number of resolver encoder poles for a resolution of 12 bits

Number of encoder poles	Maximum motor speed	Number of pulses/rev.
2	7500 rpm	4096
4	3750 rpm	4096
6	2500 rpm	4096
8	1875 rpm	4096

Maximum speed of the motor combined with a 2-pole resolver encoder for a resolution of 12 bits

Number of motor poles	Maximum motor speed	Number of pulses/rev.
2	7500 rpm	4096
4	3750 rpm	2048
6	2500 rpm	1024
8	1875 rpm	512

Encoder consumption		30 mA	50 mA
Minimum cross-section recommended for the conductors (1)	For a maximum cable length of 25 m	0.2 mm² (AWG 24)	
	For a maximum cable length of 50 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)
	For a maximum cable length of 100 m	0.5 mm² (AWG 20)	
	For a maximum cable length of 200 m	0.75 mm² (AWG 18)	1 mm² (AWG 16)

Universal encoder interface card with SinCos, SinCos Hiperface®, EnDat® or SSI output (for drives ATV 71H●●●M3383, ATV 71H●●●M3X383 and ATV 71H●●●N4383)

Type of card		VW3 A3 409		
Power Supply (supplied by the card)	Voltage	5 V (min. 5 V, max. 5.5 V)	8 V (min. 8 V, max. 8.5 V)	12 V (min. 12 V, max. 12.5 V)
	Maximum current	200 mA		
		Short-circuit and overload protection		
Maximum cable length		50 m		
Speed feedback resolution		2^{13} maximum (8192)		
Clock frequency		500 kHz fixed		
SinCos output	Number of SinCos lines	10,000 maximum		
SinCos Hiperface® output	Number of SinCos lines	10,000 maximum		
EnDat® output	Type	EnDat 2.1		
	Frame size	25 bits maximum		
	Number of bits per encoder revolution	Autoconfigured		
	Number of bits for the encoder revolution number	Autoconfigured		
SSI output	Coding keys	Gray or binary configurable		
	Parity	Configurable with no parity, odd parity or even parity		
	Frame size	Configurable from 10 to 27 bits		
	Number of bits per encoder revolution	Configurable from 10 to 25 bits		
	Number of bits for the encoder revolution number	Configurable from 0 to 15 bits		

Encoder consumption		100 mA at 4.75 V, 7.75 V or 14.75 V	200 mA at 4.75 V, 7.75 V or 14.75 V
Minimum cross-section recommended for the conductors (1)	For a maximum cable length of 25 m	0.5 mm² (AWG 20)	1 mm² (AWG 17)
	For a maximum cable length of 50 m	0.75 mm² (AWG 18)	1.5 mm² (AWG 15)

(1) Shielded cable containing 3 twisted pairs with a pitch of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum cross-section recommended for the conductors for a minimum encoder voltage in order to limit line voltage drops.

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Characteristics (continued)

Encoder interface card with RS 422 compatible differential outputs with encoder emulation (RS 422 ESIM) (for drives ATV 71H●●●M3383, ATV 71H●●●M3X383 and ATV 71H●●●N4383)

Type of card		VW3 A3 411		
Power Supply (supplied by the card)	Voltage	5 V (min. 5 V, max. 5.5 V)		15 V (min. 15 V, max. 16 V)
	Maximum current	200 mA		
		Short-circuit and overload protection		
Maximum cable length		50 m		100 m
Maximum operating frequency		300 kHz		
Input signals (RS 422)		$A, \overline{A}, B, \overline{B}, Z, \overline{Z}$, adjustable by switch		
	Impedance	440 Ω		
Output signals		$A\,\overline{A}/\,A\,\overline{A}\,B\,\overline{B}/A\,\overline{A}\,B\,\overline{B}\,Z\,\overline{Z}$		
	Ratio	1, 1/2, 1/4, 1/8, 1/16, 1/32 or 1/64, adjustable by switch		
Number of pulses/encoder revolution		10,000 maximum		
Consumption of the encoder with 5 V supply		**50 mA at 4.75 V**	**100 mA at 4.75 V**	**200 mA at 4.75 V**
Minimum cross-section recommended for the conductors (1)	For a maximum cable length of 25 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	1 mm² (AWG 17)
	For a maximum cable length of 50 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	1.5 mm² (AWG 15)
	For a maximum cable length of 100 m	0.75 mm² (AWG 18)	1.5 mm² (AWG 15)	–
	For a maximum cable length of 200 m	1.5 mm² (AWG 15)	–	–
Consumption of the encoder with 15 V supply		**50 mA at 14.75 V**	**100 mA at 14.75 V**	**200 mA at 14.75 V**
Minimum cross-section recommended for the conductors (1)	For a maximum cable length of 25 m	0.2 mm² (AWG 24)	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)
	For a maximum cable length of 50 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)
	For a maximum cable length of 100 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	1.5 mm² (AWG 15)
	For a maximum cable length of 200 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	–
	For a maximum cable length of 300 m	1.5 mm² (AWG 15)	–	–

References (2)

Description	Voltage V	Reference	Weight kg
Encoder interface cards with RS 422 compatible differential outputs	5	**VW3 A3 401**	0.200
	15	**VW3 A3 402**	0.200
Encoder interface cards with open collector outputs	12	**VW3 A3 403**	0.200
	15	**VW3 A3 404**	0.200
Encoder interface cards with push-pull outputs	12	**VW3 A3 405**	0.200
	15	**VW3 A3 406**	0.200
	24	**VW3 A3 407**	0.200
Resolver encoder interface card	1.25…5.6	**VW3 A3 408**	0.200
Universal encoder interface card with SinCos, SinCos Hiperface®, EnDat® or SSI output	5, 8 or 12	**VW3 A3 409**	0.200
Encoder interface card with RS 422 compatible differential outputs with encoder emulation (RS 422 ESIM)	5 or 15	**VW3 A3 411**	0.200

(1) Shielded cable containing 3 twisted pairs with a pitch of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum cross-section recommended for the conductors for a minimum encoder voltage in order to limit line voltage drops.
2) The Altivar 71 drive cannot support more than one encoder interface card. Consult the summary tables of possible drive, option and accessory combinations, see pages 176 to 187.