

Advantage 21 – Variable Speed AC drives

The Advantage 21 variable speed AC drive offers just the right features for centrifugal pump applications. Offering unmatched value in installed cost and functionality for HVAC equipment, this new range of drives allows original equipment manufacturers and control panel builders to focus on the essentials.



Features & Benefits

The essential connection between you and your pump applications:

The economical choice

Reduces installation costs by eliminating throttling valves or inlet guide vanes typically used to control flow, and saves time with quick installation and wiring.

Provides energy savings by reducing motor speed for a quick return on investment.

The Advantage 21 drive energy economizing motor algorithm maximizes energy savings.



Communication option board

Simple installation and operation

Parameters are factory configured for immediate start-up.

Features macro-configurations for easy and quick commissioning.

Includes local controls for testing and troubleshooting.

Save and download configuration files

PC software.

Remote keypad/display.

Compact footprint

Small size and side-by-side mounting require less panel space.

Easy integration into building management systems

Internally mounted option cards connect to Lonworks, BACnet, MetaSYS N2 and APOGEE PI FLN networks.

Complies with international standards and certifications: CE, UL, CSA, C-Tick, etc.

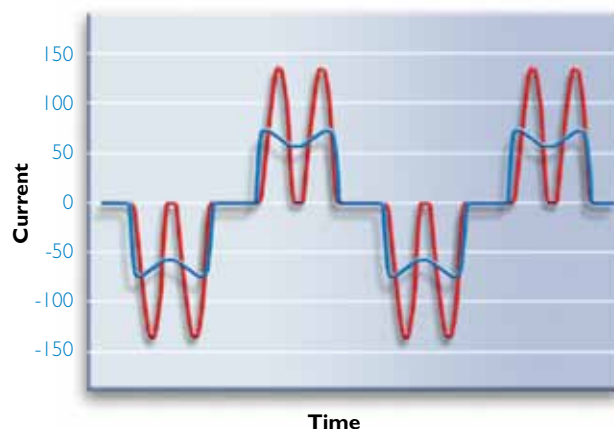
Harmonics mitigating design

Eliminates the need for line reactors and chokes for reducing harmonics: THDI < 30% (IEC61000-3-12 < 48%).



IP54

UL Type I / IP20



Features & Benefits

Onboard and remote mounted keypad and display for configuration and monitoring:

- Four segment LED display with run status LED and unit indicator LED (percent or Hz)
- Run/stop buttons and up/down arrow keys for local speed control
- Run status LED and unit indicator LED (percent or Hz)
- Local/remote button with LED indicators
- Programming buttons include MODE, ENT and up/ down arrows

Remote mount keypad/display additional functions:

- The IP65 rated
- Includes ability to store three (A, B, C) drive configurations



Remote mount keypad/display



Onboard keypad/display



Start up right with PC Soft!

PC Soft is an easy to use software program for commissioning the Advantage 21 drive

Capabilities include:

- Parameter adjustments
- Store and transfer drive configuration files
- 8 channel Oscilloscope function to monitor I/O, drive and motor operation
- Work in either on or/off-line modes

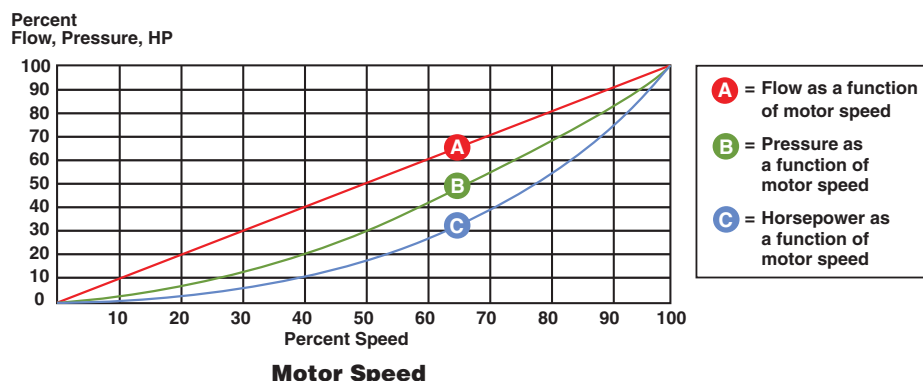
PC Soft can be downloaded at no cost from:

www.taco-hvac.com

Go GREEN

Let the Advantage 21 drives operate your buildings with greater efficiency; using them to control your pumps can significantly reduce energy costs. In many instances, the payback period for installing adjustable frequency drives in place of other flow control methods is less than 12 months.

Most HVAC systems are designed to keep the building cool on the hottest days and warm on the coldest days. Therefore, the HVAC system only needs to work at full capacity on the 10 or so hottest days and the 10 or so coldest days of the year. On the other 345 days, the HVAC system may operate at a reduced capacity. This is where a system with variable frequency drives (VFDs) can be used to match air flow to actual heating and cooling demands. The VFD can reduce the motor speed when full flow is not required, thereby reducing the power required and the electrical energy used.



An example of an energy saving calculation*

A pump with a 20 horsepower motor operates 10 hours a day for 260 days a year and the energy cost is \$0.10 cents per kilowatt-hour.

Cost of running the motor at full speed:

$$20 \text{ HP} \times 0.746 \text{ kW/HP} \times 2600 \text{ hours} \times \$0.10/\text{kWhr} = \$ 3,879.20$$

Assuming the pump does not need to run at full speed for the full 2600 hours, let's use an example where it runs at full speed 25% of the time, at 80% for 50% of the time, and at 60% for the remaining 25% of the time:

Cost of running with an AC drive controlling the motor:

$$20 \text{ HP} \times (1)^3 \times 0.746 \text{ kW/HP} \times 650 \text{ hours} \times \$0.10/\text{kWhr} = \$ 969.80$$

$$20 \text{ HP} \times (0.8)^3 \times 0.746 \text{ kW/HP} \times 1300 \text{ hours} \times \$0.10/\text{kWhr} = \$ 993.08$$

$$20 \text{ HP} \times (0.6)^3 \times 0.746 \text{ kW/HP} \times 650 \text{ hours} \times \$0.10/\text{kWhr} = \$ 209.48$$

$$\text{Total} = \$ 2,172.36$$

$$\text{Annual savings: } \$3,879.20 - \$2,172.36 = \$1,706.84$$

*Actual results may vary.



An HVAC system controlled by VFDs will go a long way in helping a new or existing building achieve greater energy efficiency. Not only will HVAC systems run by VFDs save money, but they also will increase the comfort of the building and reduce equipment maintenance costs and downtime. Plus, meeting the requirements of the Energy Policy Act of 2005 and achieving a more "green" system through LEED certification can offer more money-saving opportunities if the building is eligible for state and local government incentives. Ultimately, more efficient HVAC systems create more energy efficient buildings, which in turn conserves energy resources across the U.S. and the world.

Supply voltage: Three Phase 200-240V IP20

kW	HP	Amps	Reference	Frame size
0.75	1	4.6	ATV 21H075M3XM	1
1.5	2	7.5	ATV 21HU15M3XM	1
2.2	3	10.6	ATV 21HU22M3XM	1
3	4	13.7	ATV 21HU30M3XM	2
4	5	17.5	ATV 21HU40M3XM	2
5.5	7.5	24.2	ATV 21HU55M3XM	3
7.5	10	32.0	ATV 21HU75M3XM	3
11	15	46.2	ATV 21HD11M3XM	4
15	20	61	ATV 21HD15M3XM	4
18.5	25	74.8	ATV 21HD18M3XM	4
22	30	88	ATV 21HD22M3XM	5
30	40	117	ATV 21HD30M3XM	6

Supply voltage: Three Phase 380-480V IP20

kW	HP	Amps	Reference	Frame size
0.75	1	2.2	ATV 21H075N4M	1
1.5	2	3.7	ATV 21HU15N4M	1
2.2	3	5.1	ATV 21HU22N4M	1
3	4	7.2	ATV 21HU30N4M	2
4	5	9.1	ATV 21HU40N4M	2
5.5	7.5	12	ATV 21HU55N4M	2
7.5	10	16	ATV 21HU75N4M	3
11	15	22.5	ATV 21HD11N4M	3
15	20	30.5	ATV 21HD15N4M	4
18.5	25	37	ATV 21HD18N4M	4
22	30	43.5	ATV 21HD22N4M	5
30	40	58.5	ATV 21HD30N4M	5
37	50	79	ATV 21HD37N4M	6
45	60	94	ATV 21HD45N4M	6
55	75	116	ATV 21HD55N4M	7
75	100	160	ATV 21HD75N4M	7

Supply voltage: Three Phase 380-480V IP54

kW	HP	Amps	Reference	Frame size
0.75	1	2.2	ATV 21W075N4M	1
1.5	2	3.7	ATV 21WU15N4M	1
2.2	3	5.1	ATV 21WU22N4M	2
3	4	7.2	ATV 21WU30N4M	2
4	5	9.1	ATV 21WU40N4M	2
5.5	7.5	12	ATV 21WU55N4M	2
7.5	10	16	ATV 21WU75N4M	2
11	15	22.5	ATV 21WD11N4M	3
15	20	30.5	ATV 21WD15N4M	3
18.5	25	37	ATV 21WD18N4M	4
22	30	43.5	ATV 21WD22N4M	5
30	40	58.5	ATV 21WD30N4M	5
37	50	79	ATV21WD37N4M	6
45	60	94	ATV21WD45N4M	6
55	75	116	ATV21WD55N4M	7
75	100	160	ATV21WD75N4M	7

Accessories Guide

User Interface Kits

Description		Catalog Number
Remote Keypad Display Mounting Kit	Includes remote keypad, hardware and cable. IP65 rated	VW3A21101M
PC Soft Test and Commissioning Software	Free for download on Telemecanique.com	VW3A2104M
PC Connection Kit		VW3A8106M

Communication Card Kits

Description	Catalog Number
LONWORKS	VW3A21312M
METASYS N2	VW3A21313M
APOGEE FLN P1	VW3A21314M
BACnet	VW3A21315M

Note: Only logic inputs F and R, analog input VIB, relay output FL, common and 24 V supply terminals and RJ45 Modbus connector are available when a communication option card is installed.

Field Installed Kits

Description	For Drives	Catalog Number
DIN Rail Mount Kit Din Rail Mounting Plate for 35 mm wide din rail	ATV21H075M3X...HU22M3X ATV21H075N4...HU22N4	VW3A31852M
Conduit Entrance Kit for UL Type 1 rating multiple knockout sizes	ATV21H075M3X...HU22M3X ATV21H075N4...HU22N4	VW3A31814M
	ATV21HU30M3X ^o HU40M3X ATV21HU30N4...HU55N4	VW3A31815M
	ATV21HU55M3X, HU75M3X ATV21HU75N4, HD11N4	VW3A31816M
	ATV21HD11M34X...HD18M3X ATV21HD15N4...HD18N4	VW3A31817M
	ATV21HD22M3X ATV21HD22N4, HD30N4	VW3A9206M
	ATV21HD37N4, HD45N4	VW3A9207M
	ATV21HD30M3X ATV21HD55N4, HD75N4	VW3A9208M
RFI Input Filter For compliance with European (CE) conducted emissions standard 55022 Class B		
Three phase supply voltage: 200 to 240 V 50/60 Hz	ATV21H075M3X ATV21HU15M3X ATV21HU22M3X ATV21H075N4 ATV21HU15N4 ATV21HU22N4	VW3A31404M
	ATV21HU30M3X ATV21HU40M3X ATV21HD22M3X	VW3A31406M
	ATV21HU55M3X ATV21HU75M3X	VW3A31407M
	ATV21HD11M3X ATV21HD15M3X ATV21HD18M3X ATV21HD30M3X	VW3A31408M
Three phase supply voltage: 300 to 500 V 50/60 Hz	ATV21H075N4 ATV21HU15N4 ATV21HU22N4	VW3A31404M
	ATV21HU30N4 ATV21HU40N4 ATV21HU55N4 ATV21HD22N4 ATV21HD30N4	VW3A31406M
	ATV21HU75N4 ATV21HD11N4 ATV21HD37N4 ATV21HD45N4	VW3A31407M
	ATV21HD55N4 ATV21HD75N4	VW3A31408M
	ATV21HD15N4 ATV21HD18N4	VW3A31409M

Specifications

Electrical

Input Voltage	200 -15% to 240 +10%, 380 -15% to 480 +10%
Input Frequency	50 Hz -5% to 60 Hz +5%
Drive Input Section	Six pulse bridge rectifier
Drive Output Section	Three Phase, IGBT Inverter with Pulse Width Modulated (PWM) output Maximum voltage equal to input voltage
Galvanic Isolation	Galvanic isolation between power and control (inputs, outputs and power supplies)
Frequency Range of Power Converter	0.5 to 200 Hz
Torque/Overtorque	120% of nominal motor torque for 60 seconds
Current (transient)	110% of controller rated current for 60 seconds, 180% for 2 seconds
Switching Frequency	Selectable from 6 to 16 kHz, 12 kHz nominal rating for 1 HP to 20 HP @ 200/240 V, 380/480 V Selectable: 6 to 16 kHz, 8kHz nominal rating for 30 HP to 40 HP @ 200/240 V, 30 HP to 100 HP @ 380/480 V
Logic Inputs	3 logic inputs (FR,RES) 24 Vdc, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 k Ω , Maximum voltage: 30 Vdc, Max. sampling time: 2 ms \pm 0.5 milliseconds Multiple assignment makes it possible to configure several functions on one input
Speed Reference Inputs	VIa: Voltage analog input 0 to 10 Vdc, impedance 30 k Ω (max. safe voltage: 24 Vdc). Analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω . Can also be configured as a logic input VIb: Voltage analog input, configurable as an analog input or as a PTC probe input. 0-10 Vdc, impedance 30 k Ω (max. safe voltage 24 Vdc)
Analog Reference Resolution	0.0048 Hz (11 bits)
Relay Outputs	FL (FLA,FLB,FLC) 1 N/C contact, and 1 N/O contact with common point R (RY,RC) 1 N/O contact Maximum switching capacity: • On resistive load (cos ϕ = 1): 5 A for 250 Vac or 30 Vdc • On inductive load (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 Vac or 30 Vdc
I/O Sampling Time	2 milliseconds \pm 0.5 milliseconds on analog inputs & outputs, & logic inputs, 7 milliseconds \pm 0.5 milliseconds on relay outputs
Acceleration and Deceleration Ramps	0.1 to 3200 seconds (definition in 0.1 seconds increments)
Skip Frequencies	Three configurable skip frequency/jump frequency bands
Motor Control Profiles	Energy economizer (flux optimization) motor algorithm to maximize energy savings. (Automatically optimizes voltage based on load) or select volts/hertz profile or SLFV (sensorless flux vector)
Speed Range	1:10
Motor Protection	Class 10 electronic overload protection
Keypad/Display Terminal	4 segment, LED display with Run and Units LED indication. Run/ Stop, Local/ remote (with LED indication), and programming buttons. Quick Start, Fault History, I/O mapping. Last-used menus. Status Monitoring and self diagnostics with fault messages and status such as: Power on time, elapsed time, motor run time, line voltage, motor current, ready to run, running, motor speed, etc.
Compliance	RoHS
Codes and Standards	UL, CSA, NOM 117, DNV, CE, C-Tick, HPST, UL 1995 Plenum rated

Environmental

Temperature	Storage: -13 to +158 °F (-25 to +70 °C) Operation: +14 to +104 °F (-10 to +40 °C) without derating, +14 to +122 °F (-10 to +50 °C) with derating
Humidity	95% with no condensation or dripping water, conforming to IEC 600068-2-3.
Altitude	Up to 3,300 ft (1,000 m) without derating; derate by 1% for each additional 330 ft (100 m) up to 10,000 ft (3,000 m) Limit to 6,600 ft (2,000 m) if supplied by corner grounded distribution system
Enclosure Rating	• NEMA/UL open type (IP20) with top vent cover removed. • NEMA/UL Type 1 with the top vent cover in place and with the Conduit Entry Kit installed • IP21 and IP41 and on top of drive controller
Pollution Degree	1 HP to 25 HP @ 200/240 V, 1 HP to 5 HP @ 380/480 V: Pollution degree 2 per IEC/EN 61800-5-1, 30 HP to 40 HP @ 200/240 V, 30 HP to 100 HP @ 380/480 V: Pollution degree 3 per IEC/EN 61800-5-1
Vibration Resistance	1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz, conforming to IEC/EN 60068-2-6
Shock Resistance	15 gn for 11 ms conforming to IEC/EN 60068-2-27

Submittal Data Information

Advantage 21 – Variable Speed Drives

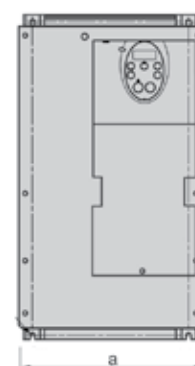
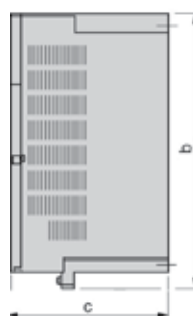
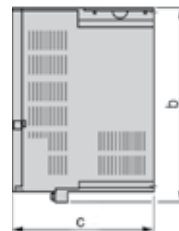
IP20

Frame Size	a Width		b Height		c Depth		Approx. Weight	
	mm	In.	mm	In.	mm	In.	kg	lbs.
1	105	4.13	143	5.63	150	5.91	1.2	2.65
2	140	5.51	184	7.24	150	5.91	2.4	5.29
3	180	7.09	232	9.13	170	6.69	4.7	10.36
4	245	9.65	295	11.61	213	8.39	7	15.44
5	240	9.45	400	15.75	213	8.39	9	19.85
6	240	9.45	550	21.65	244	9.61	38.1	84.01
7	320	12.60	630	24.80	289.9	11.41	55.4	122.16

UL Type 1

b Height with Type 1 Conduit Kit	
mm	in.
211	8.31
252	9.92
328	12.91
394	15.51
460	18.11
686	27.01
833	32.80

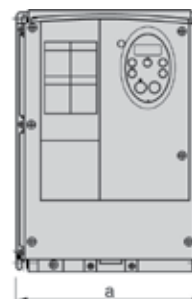
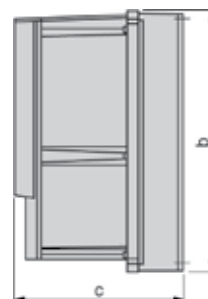
IP20 Drives



IP54

Frame Size	a Width		b Height		c Depth		Appr. Weight	
	mm	In.	mm	In.	mm	In.	kg	lbs.
1	215	8.46	297	11.69	192	7.56	7	15.44
2	230	9.06	340	13.39	208	8.19	9.65	21.28
3	290	11.42	560	22.05	315	12.40	30.3	66.81
4	310	12.20	665	26.18	315	12.40	37.4	82.47
5	284	11.18	720	28.35	315	12.40	49.5	109.15
6	284	11.18	880	34.65	343	13.59	57.4	126.57
7	362	14.25	1000	39.51	364	14.33	61.9	136.49

IP54 Drives



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Notes

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In order to provide the most efficient pump solution to our customers, Taco is now working with Schneider Electric.

This collaboration brings together Taco's pump technology with Schneider Electric Variable Frequency Drives and the drive packaging of Square D enclosures to offer the best overall pumping solution for our customers.



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