TOSHIBA

ADJUSTABLE SPEED DRIVES

FS1

Reliability *in motion*®

Now Available With LonWorks® BACnet® & MetasysN2®

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.clrwtr.com - Email: info@clrwtr.com

FS1

Model FLA & Dimensions (in.)/ Weight (lbs.)

VOLTAGE	HP	MODEL NUMBER	FLA	FRAME	Dimensions (in.)			SHIPPING WEIGHT (lbs.)
					H	W	D	
240 V Three-Phase	0.5	VFFS1-2004PM	2.8	A	5.1	4.1	5.9	2.6
	1	VFFS1-2007PM	4.6	A	5.1	4.1	5.9	2.6
	2	VFFS1-2015PM	7.5	A	5.1	4.1	5.9	2.6
	3	VFFS1-2022PM	10.6	A	5.1	4.1	5.9	2.6
	5	VFFS1-2037PM	17.5	B	6.7	5.5	5.9	4.6
	7.5	VFFS1-2055PM	24.2	C	8.7	7.1	6.7	9.5
	10	VFFS1-2075PM	32	C	8.7	7.1	6.7	9.5
	15	VFFS1-2110PM	46.2	D	12.2	9.6	7.5	19
	20	VFFS1-2150PM	61	D	12.2	9.6	7.5	19
	25	VFFS1-2185PM	74.8	D	12.2	9.6	7.5	19.6
	30	VFFS1-2220PM	88	E	16.6	9.5	8.4	36.2
	40	VFFS1-2300PM	117	G	24.8	12.6	11.42	83.8
460 V Three-Phase	0.5	VFFS1-4004PL	1.4	A	5.1	4.1	5.9	3.1
	1	VFFS1-4007PL	2.2	A	5.1	4.1	5.9	3.1
	2	VFFS1-4015PL	3.7	A	5.1	4.1	5.9	3.1
	3	VFFS1-4022PL	5.1	A	5.1	4.1	5.9	3.1
	5	VFFS1-4037PL	9.1	B	6.7	5.5	5.9	5.3
	7.5	VFFS1-4055PL	12	B	6.7	5.5	5.9	5.3
	10	VFFS1-4075PL	16	C	8.6	7.1	6.7	10.4
	15	VFFS1-4110PL	22.5	C	8.6	7.1	6.7	10.4
	20	VFFS1-4150PL	30.5	D	12.2	9.6	7.5	19.8
	25	VFFS1-4185PL	37	D	12.2	9.6	7.5	19.8
	30	VFFS1-4220PL	43.5	E	16.5	9.4	8.4	34
	40	VFFS1-4300PL	58.5	E	6.5	9.4	8.4	34
	50	VFFS1-4370PL	79	F	21.7	9.5	8.4	52
	60	VFFS1-4450PL	94	F	21.7	9.5	8.4	52
	(73.75) 75	VFFS1-4550PL	116	G	24.8	12.6	11.4	88
	100	VFFS1-4750PL	160	G	24.8	12.6	11.4	88

The cost competitive FS1 Bypass Box is the perfect solution for OEMs and HVAC applications. The enclosure makes mounting in narrow places a breeze. The FS1 Bypass Box is offered for all models and may be shipped along with the ASD or ordered separately.

TOSHIBA
FS1

The Economical HVAC Inverter for Fan and Pump Applications has Arrived

The Toshiba FS1 is the ideal adjustable speed drive for the HVAC market, as space-saving and eco-friendly features are included as part of the standard package. The FS1's unique technology is specifically tailored to the needs of the HVAC market. In most applications, the drive's unique technologies allows the user to eliminate costly external options as required by standard drives in order to meet IEEE-519 standards.

Fan and Pump Application Software Integrated

- One-Touch Local or Remote Operation Switching
- Bumpless Function — Seamless Operation Between Local and Remote Operation
- Fire-Speed Override for Emergency Conditions
  (In the event of an emergency, fire-speed control operates at specified frequency. The force operation signal is saved when the signal turns on. The motor does not stop in the event of a soft fault.)
- Auto-Stop Function Enables Speed Reference to Manage On/Off Operation
- Low-Current Detector Detects Broken Belt or Low Load for Pump Applications
- PTC Thermistor Input Included for Added Motor Protection
- Over-Torque Detection Acts as an Electronic "Shear Pin"
- Three Jump Frequencies Available to Avoid Mechanical Resonant Frequencies
- Auto-Restart Used to "Catch" a Spinning Motor
- Nuisance Trips can be Automatically Reset by Retry Function
- On-Board PID Algorithms for Process Control

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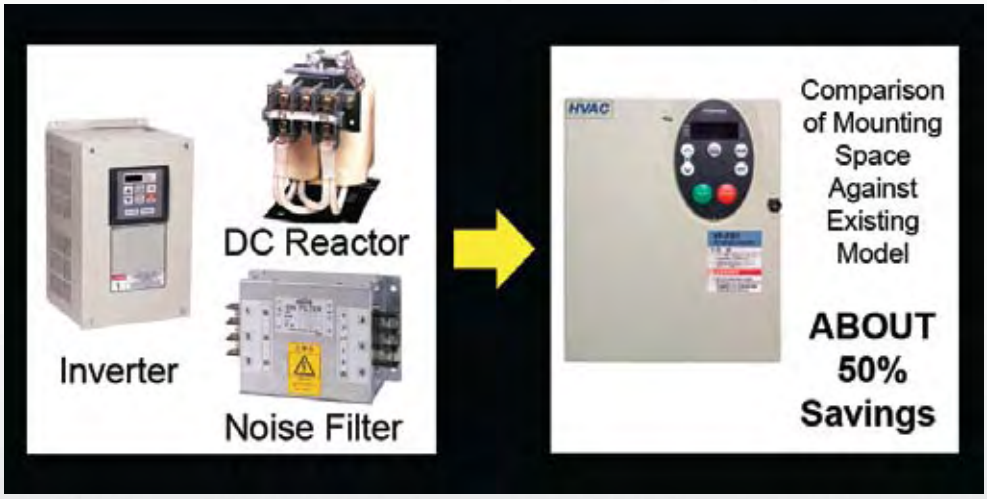
Compact Design, Advanced Technology

Saves Space

Reactor-less, harmonic-suppressing technologies and built-in filter save time, cost of wiring, and reduce installation space by 50 percent.

- In 400 V Class Models, EMI Noise Filter Built-In as Standard (European EMC Directive, IEC/EN618000-3, First Environment, C2 or IEC/EN61800-3, Second Environment, C3.)
- In 200 V Class Models, Basic Noise Filter Built-In as Standard

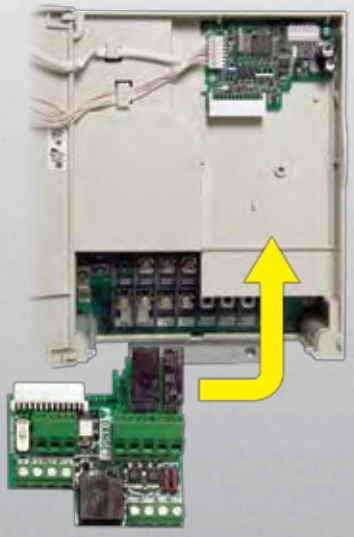


Easy Maintenance

- Alarm Notifies User When Main Circuit Capacitors, Circuit Board Capacitors, or Cooling Fan Require Replacing
- Intelligently Cycled On/Off Control for Extended Fan Life
- Fan can be Easily Removed for Cleaning, Servicing and Replacement
- Removable Terminal Block Allows Inverter Unit to be Replaced Without Disconnecting Control Wiring

15-Year Life Film Capacitors

One-Touch Easily Removable Fan



Removable Terminal Strip

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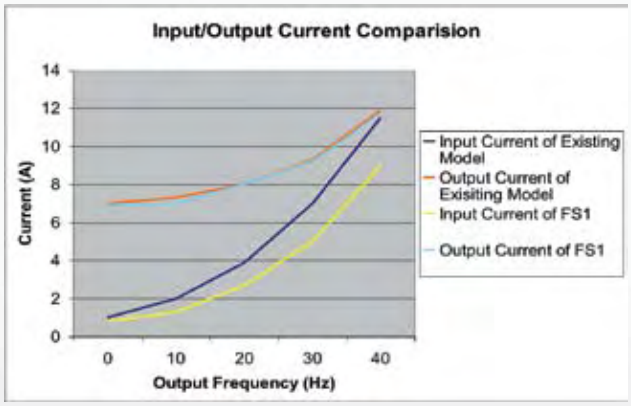
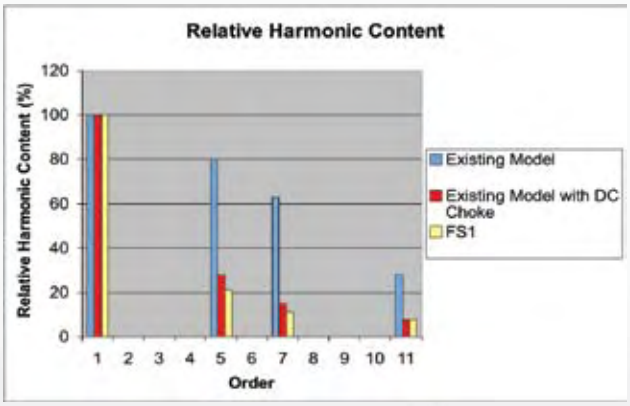
Power System Friendly

Harmonic Reduction

- Improves Power Factor in All Models
- Toshiba's Unique FS1 Technology Specifically Suppresses Fifth and Seventh Harmonic Currents Affecting Power Sources
- Meets Total Harmonic Distortion (THD) of IEC61000-3-12 Without External Reactor



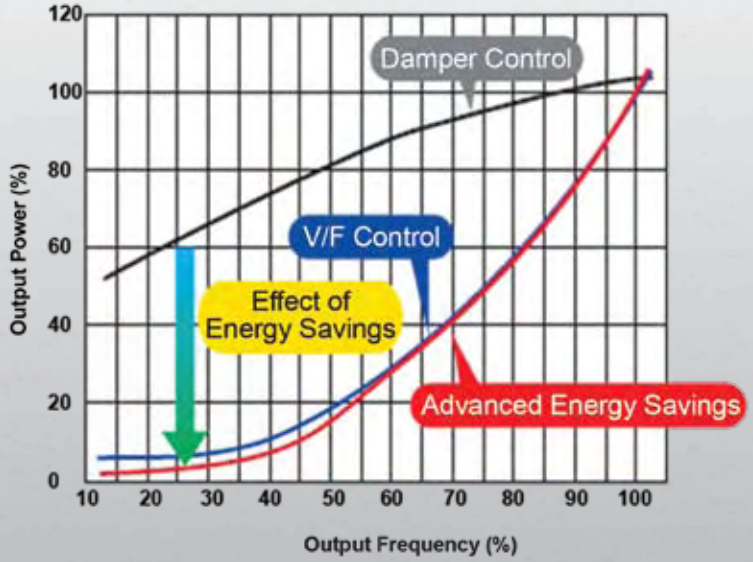


Additional Energy Savings

The advanced energy-saving mode optimizes fan and pump efficiency at normally inefficient low speeds.

Energy savings can be monitored by using the operation panel or through serial communication.

Monitor your savings now!



Output Power	⏶	H75	FE30	The inverter output power (kW) is displayed.
Integral Output Power	⏶	H75	FE77	The integrated amount of power (kW) supplied from the inverter is displayed.

Easy Operation and Versatile

Easy Operation

Wizard function enables the end-user to set the ten most frequently used parameters quickly.

Title	Function
AU1	Automatic acceleration/deceleration
ACC	Acceleration time 1
dEC	Deceleration time 1
LL	Lower limit frequency
UL	Upper limit frequency
tHr	Motor thermal protection
Fn	Meter adjustment
Pt	V/F control mode selection
UL	Base Frequency 1
uLu	Base Frequency voltage 1

Macro Functions Allow One-Step Setup for Settings:

- Coast Stop
- Three-Wire Operation
- External Input Up/Down
- Current Input Operation 4 to 20 mA

History function displays the five last changed parameters during startup or adjustments.

Computer Software

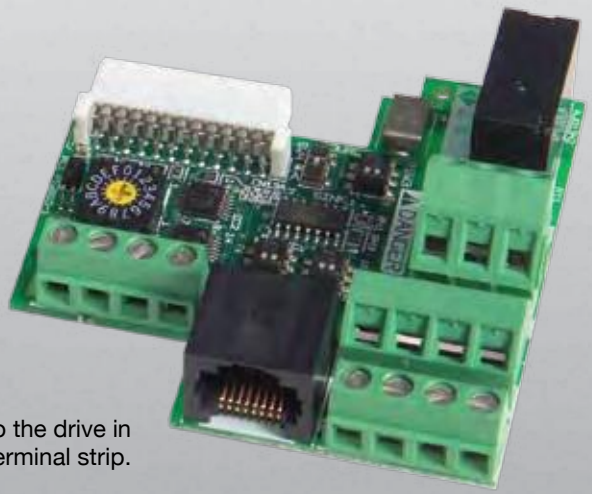
The free PCM001Z communication software allows you to use a PC to edit, monitor, and trace parameter data. This software simplifies data management for commissioning and maintenance.

Communication Options

In today's competitive manufacturing world, the HVAC market requires field-bus options to communicate with a host controller for centralized control. Toshiba's FS1 comes standard with a RS485 communication port which makes communicating with Toshiba or modbus protocol possible.

Toshiba Offers a Number of Popular Communication Protocols Including:

- LonWorks®
- BACnet®
- Metasys N2®
- APOGEE FLN®



Option cards are installed internally to the drive in place of the terminal strip.

Meets or Exceeds Your Specifications

FS1 Standard Specifications		
Model Range	0.5 to 40 HP	0.5 to 100 HP
Input Voltage Rating	200 to 240 V	380 to 480 V
Input Voltage Tolerance	±10%	±10%
PWM Carrier Frequency	Adjustable 6 to 16 kHz	
Filter	Basic Filter	EMI Filter Class-A
Control Method	Sinusoidal	
V/f Pattern	V/f Constant, Variable Torque, Automatic-Torque Boost, Open-Loop Vector Control, Automatic Energy Savings, PM Motor Control, Auto-Tuning	
Overload Rating	110% for 60 Seconds; 180% for 2 Seconds	
Frequency Setting	Remote Potentiometer (1 to 10 kΩ), 0 to 10 Vdc (Input Impedance: VIA/VIB =30 kΩ, 4 to 20mA (Input Impedance 250 Ω)	
Frequency Precision	Analog Input: ±0.5% of Maximum Frequency; Digital Input: ±0.01% of Maximum Frequency	
Output Frequency Range	0.5 to 200 Hz	
Set Point Control (PID)	Proportional Gain, Integral Gain, Differential Gain Settings, Control Wait Time	
Analog Inputs	Two; One 4 to 20 mA or 0 to 10 Vdc (Determined by Switch Setting) and One 0 to 10 Vdc	
Analog Outputs	One 0 to 20 mAdc (4 to 20 mA) Current Output or 1 mAdc Full-Scale Ammeter/7.5 Vdc (10 Vdc) 1 mA Full-Scale Volt Meter; Voltage or Current Output is Selected by Switch Setting; Output is Programmable to 19 Different Functions	
Input Terminals	Four Discrete Input Terminals Programmable to 57 Functions; Can be Programmed for Sink or Source Logic	
Output Contacts	Two Output Terminals: One Form-A and One Form-C; Programmable to 58 Functions	
Control Board Communication Ports	RS485	
Power Terminals	Input (R/L1, S/L2, T/L3), Output (U/T1, V/T2, W/T3), DC Bus (PA/+ and PC/-)	
Retry	Can Automatically Clear Fault upon Trip; Programmable to 10 Retries with up to 10 Seconds Between Each Retry	
Restart	Able to Restart to Catch a Spinning Motor	
Interface		
EOI (Electronic Operator Interface)	Four-Digit LCD, Seven-Segment Display	
LED Indicators	Run, Monitor, Program, Percentage, Hz, Local/Remote, Up/Down, DC Bus Charge	
Keypad	Local/Remote, Mode, Enter, Run, Stop, Up/Down	
Monitoring	Operation Frequency, Operation-Frequency Command, Forward/Reverse Run, Output Current, DC Voltage, Output Voltage, Torque, Torque Current, Load Factor, Input Power, Output Power, Input/Output Terminal Status, CPU1 and CPU2 Versions, PID Feedback, PID-Computed Frequency Command, Integral Power, Integral Output Power, Rated Current, Output Speed, Communication Counter, Past Four Trips, Parts-Replacement Alarm, Cumulative Run Time	
Selectable Display Units	Completely Configurable Along with Scaling Factor Multiplier; Current Display Selectable Between Amps or Percentage; Voltage Display Selectable Between Voltage or Percentage	
Ambient Conditions		
Ambient Temperature	-10 to 60°C or 14 to 140 °F (Must Derate when Operating Above 40°C or 140 °F)	
Relative Humidity	20 to 93% (Non-Condensing and Vapor-Free)	
Installation	IP20 Enclosed; Addition of Optional Conduit Adaptors Bring Drive into NEMA 1 Compliance	