NAiS

CE

Matsushita

VF-C Compact

Inverter

- Ultra-compact
- Latest technology
- Cost effective

NEW:

Configurator software
NAiS Motion Control Ver.1.3

VF-C inverter - a new generation

for the 0.25 kW to 4.0 kW power range

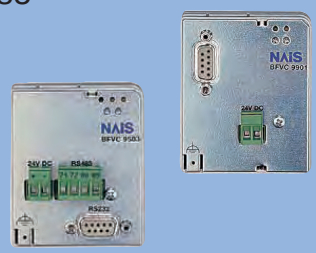
- ultra-compact
- integrated filter with EMC interference to class B
- vector control and V/f control
- up to 1.8 x M_N torque for 60s (M_N = rated load torque)
- multiple interfaces (digital/analog - I/O, RS232/RS485, PROFIBUS)
- operator module with copy function
- international approvals (CE, UL, cUL)
- cost effective
- energy efficient
- types: 1-phase 230 VAC: 0.25 to 2.2 kW (1-phase 115 VAC: 0.12 to 0.18 kW)
  3-phase 400 VAC: 0.75 to 4.0 kW (3-phase 200 VAC: 0.75 to 2.2 kW)

The VF-C inverter has an integrated mains filter as well as 2 user interfaces :

- AIF: Communications interface
- FIF: Standard interface

Communication modules in the AIF :

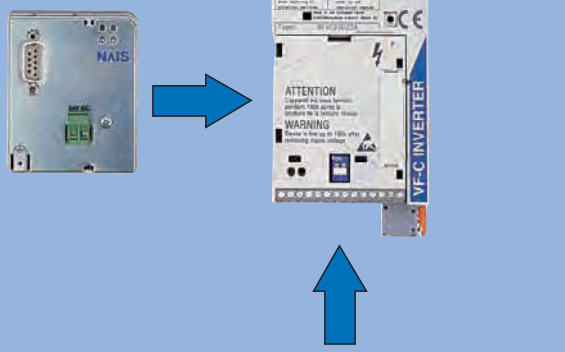
- operator module
- RS232 / RS485
- PROFIBUS



System unit

Standard I/O module in the FIF :

- integrated digital/analog I/O
- PROFIBUS as an alternative



Integrated mains filter
integrated filter with EMC
to class B

The standard I/O module (order number: BFVC90XY) is included in the VF-C inverter. It need not to be ordered separately.

Improved vector control increases efficiency

Due to vector control, the VF-C inverter achieves considerably higher torque in comparison to conventional V/f control (maximum torque = 1.8 x M_N for 60s) and has low level open-circuit power consumption. This function is particularly useful for drives with strong fluctuating loads or high starting inertia, as well as for sensorless speed control of motors requiring slip compensation.

Integrated EMC filter to class B – new for VF-C inverters

VF-C inverters offer a new concept for preventing electrical interference. For the first time ever, the EMC filters are not connected externally in series. Since many small EMC components are located at the points on the printed circuit board where interference is actually generated it can be prevented right at the source. The result is a higher filter performance with lower costs coupled with space saving to make the VF-C inverters even more compact than before.

Overview of types:

Performance	Order no.	Supply voltage (45 – 65 Hz)	(1 ~ 115 VAC / 3 ~ 200 VAC)	Dimensions (h x w x d) in mm
1-phase 230 V AC:				
0.25 kW	**BFVCE0022A**	1 ~ 180 – 264 V AC	(1 ~ 115 VAC : 0.12 kW / 0,16 HP)	120 x 60 x 140
0.37 kW	**BFVCE0032A**	1 ~ 180 – 264 V AC	(1 ~ 115 VAC : 0.18 kW / 0,24 HP)	120 x 60 x 140
0.75 kW	**BFVCE0072A**	1 ~ 180 – 264 V AC	(3 ~ 200 VAC : 0.75 kW / 1 HP)	180 x 60 x 140
1.5 kW	**BFVCE0152A**	1 ~ 180 – 264 V AC	(3 ~ 200 VAC : 1.5 kW / 2 HP)	240 x 60 x 140
2.2 kW	**BFVCE0222A**	1 ~ 180 – 264 V AC	(3 ~ 200 VAC : 2.2 kW / 3 HP)	240 x 60 x 140
3-phase 400 V AC:				
0.75 kW	**BFVCE0074A**	3 ~ 320 – 550 V AC	(1 HP)	180 x 60 x 140
1.5 kW	**BFVCE0154A**	3 ~ 320 – 550 V AC	(2 HP)	240 x 60 x 140
2.2 kW	**BFVCE0224A**	3 ~ 320 – 550 V AC	(3 HP)	240 x 60 x 140
4.0 kW	**BFVCE0404A**	3 ~ 320 – 550 V AC	(5.4 HP)	240 x 100 x 140

Accessories / Interfaces

Type	Description	Order no.:
Operator module	for entering the parameters; with copy function	**BFVC 904C**
Remote-control set with operator module	for flexible manual operation with cable connection	**BFVC 9060**
2m cable for remote-control set		**BFVC 9062**
5m cable for remote-control set		**BFVC 9065**
Standard I/O module	digital and analog inputs/outputs (already integrated)	**BFVC 90XY**
RS232C / RS485 communication module	RS232C and RS485 (multi-drop) for connection to computer or PLC	**BFVC 9503**
Cable RS232C to PC-AT	Connection cable between VF-C RS232C port and computer RS232C port	**BFVC 9503 PCAT**
Cable RS232C to PLC	Connection cable between VF-C RS232C port and PLC RS232C port, SUB-D 9pin	**BFVC 9503 PLC**
PROFIBUS AIF module	PROFIBUS interface for connection on AIF	**BFVC 9901**
PROFIBUS FIF module	PROFIBUS interface for connection on FIF	**BFVC 9902**
Braking resistors	for 1-phase 0.25 kW – 1.5 kW inverter	**BFVC 9161U**
	for 1-phase 2.2 kW inverter	**BFVC 9162U**
	for 3-phase 0.75 kW – 1.5 kW inverter	**BFVC 9164U**
	for 3-phase 2.2 kW inverter	**BFVC 9165U**
	for 3-phase 4.0 kW inverter	**BFVC 9166U**
Swiveling mounting bracket	for side mounting of 1.5 and 2.2 kW inverter	**BFVC 9999**
NAiS Motion Control Software Ver.1.3	Inverter configurator software for the inverters VF-8E/X and VF-CE	**BFVS 29902VC**

The VF-C inverter's interfaces :

1. The standard I/O module :

It provides parallel, direct connection of peripherals such as PLC, sensors etc. and offers a variety of connection possibilities.

Standard I/O module data :

	Number	Voltage	Current	Resolution
Analog input	1	0 … 10 V -10 … +10 V	0/4 … 20 mA	10 bits 10 bits
Analog output	1	0 … 10 V	2 mA	10 bits
Digital inputs	3/4	PLC level		
Frequency input	1/0 (0 … 10 kHz)	0/15V (HTL)		
Digital output	1	0/24 V	10/50 mA	
One relay output (changeover contact) is integrated in to the system unit as standard (AC 240V/3A, DC 24V/2A … 200V/0.18 A)				

The standard I/O module (order number.: **BFVC 90XY**)is included in the VF-C inverter. It need not to be ordered separately.

2. The RS232C / RS485 communication module :

Two serial interfaces are available and permit both communications for the application as well as setting and changing the VF-C parameters.

RS232C interface :

- information message format:
  7 bits ASCII, 1 stop bit, 1 start bit, 1 parity bit (even)
- bit rate: 1.2 / 2.4 / 4.8 / 9.6 / 19.2 kBaud
- access to all parameters
- DC supply: internal (5 V)
- electric isolation from control/power section

RS485 interface :

- information message format:
  7 bits ASCII, 1 stop bit, 1 start bit, 1 parity bit (even)
- bit rate: 1.2 / 2.4 / 4.8 / 9.6 / 19.2 kBaud
- max. distance between 2 stations: 1200 m
- number of stations: max. 90 (with repeater)
- DC supply: internal

3. The PROFIBUS modules :

Two different PROFIBUS modules permit open communication in accordance with the international EN 50170 standard. The PROFIBUS FIF module is used instead of the standard I/O module. If the standard I/O module is necessary in the application, the PROFIBUS AIF module can be used as the automation interface.

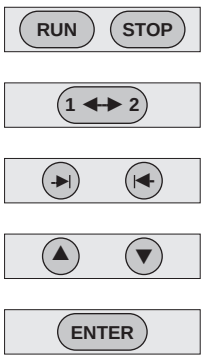
- bit rate: 9.6 kBaud ... 12 MBaud (automatic detection)
- max. cable length: 1.2 km (depend on baudrate and cable)
- number of stations: 32 (with repeater 125)
- PROFIBUS status: Slave
- communication profile: PROFIBUS-DP (DIN 19245, parts 1 and 3)
- drive profile: DRIVECOM Profile 20
- access to all parameters

The VF-C inverter operator module :

The operator module allows entry or changes to the VF-C parameters as well as the display of the current drive parameters.
The VF-C parameters can be saved in to the operator module and simply copied into another VF-C inverter. Time-consuming parameter setting for larger applications is therefore no longer required and errors are reduced accordingly.
The VF-C inverter operator module can be directly plugged in to the VF-CE AIF interface or operated as a remote-control set with a 2m or 5m cable. The remote-control set can also be installed in switch-gear cabinets and operator consoles.

The operator module is not included with the VF-C inverter and is available as an option.

Key functions of the operating module :



Clear or block motor

Jumping within function (1) and (2)

Jumping within function

Selecting codes and changing the parameters

Adopting changed parameters

The remote-control set with operator module (BFVC9060):

The operator module (BFVC904C) is already integrated. The 2m or 5m cables are supplied separately.

1. Hand terminal
To comfortably operate the VF-CE inverters via handheld terminal, a rubber protective holder is included.
It also allows remote programming if the inverter is not easily accessible.

included

2. Assembly kit for control cabinet walls
After removing the rubber protective holder of the remote-control set, the keypad can be mounted in switch-gear cabinets and operator consoles. (cut-out 45.3 x 45.3mm).

Technical data

Control method	V/f control (linear, square), vector control
Operating frequency	Either 2 kHz, 4 kHz, 8 kHz, 16 kHz
Maximum torque	1.8 x M_N for 60 s, if motor rated power = inverter rated power
Torque speed range	1 : 10 (3 … 50 Hz, constant speed)
Sensorless speed control	Min. output frequency 1.0 Hz (0 … M_N) sensorless speed control Speed range 1 : 50 (based on 50 Hz) Accuracy 0.5 % 3 … 50 Hz Smooth running ±0.1 Hz 3 … 50 Hz
Generator operation (monitored internally)	Integrated braking transistor
Filter	Integrated as standard-class B
Skip frequencies	Up to 3 skip frequencies can be set to avoid resonance
Other standard features	Motor parameter adaptation and correction, thermo-couple input for monitoring motor temperature, 1 ms terminal sampling time, linear and S-ramp, fixed speeds, four parameter programs can be switched online, bipolar set-point processing.

General technical data / Operating conditions

Resistance to vibration	Shock resistance to 2 G
Permissible temperature ranges	Transport -25°C … +70°C Storage -25°C … +60°C Operation -10°C … +40°C without decreased performance +40°C … +55°C with decreased performance
Permissible installation height (h)	h ≤ 1000 m above sea level without decreased performance 1000 m < h ≤ 4000 m above sea level with decreased performance
Decreased performance	+40°C < T_U ≤ +55°C: 2,5 % / K (based on output rated current) 1000 m above sea level < h ≤ 4000 m above sea level: 5% / 1000m
Mounting position	Vertical
Protective measures against	Short-circuit, ground fault, over-voltage, motor becoming unstable, motor overheating (input for thermo-couple)
Total insulation against control-circuits	Safe separation from mains, double basic insulation in accordance with EN 50178
Degree of protection	IP20
Conformity	CE low-voltage guideline (73/23/EWG)
Emitted interference	Requirements as per EN 50081-1 Limiting value class A as per EN 55011 Limiting value class B as per EN 55022
Interference immunity	Requirements as per EN 61800-3 immunity to interference **Requirements** **Standard** **Severity** ESD EN 61000-4-2 3, i.e. 8 kV with air discharge 6 kV with contact discharge HF irradiation (casing) EN 61000-4-3 3, i.e. 10 V / m; 27 … 1000 MHz Colour burst EN 61000-4-4 3/4, i.e. 2 kV / 5 kHZ Surge EN 61000-4-5 3, i.e. 1,2/50 µs, 1 kV phase-phase, 2 kV phase-PE
Insulation resistance	Over-voltage category III in accordance with VDE 0110
Approvals	UL 508 Industrial Control Equipment (in preparation) UL 508C Power Conversion Equipment (in preparation)

Technical data

		Type	BFVCE0022A	BFVCE0032A	BFVCE0072A		BFVCE0152A		BFVCE0222A	
System voltage		U_{mains} [V]	[5] 1 PE AC 100 V – 0% … 264 V + 0%; 45 Hz – 0% … 65 Hz + 0% 3 PE AC 100 V – 0% … 264 V + 0%; 45 Hz – 0% … 65 Hz + 0%							
Alternative DC supply to + U_G -U_G		U_{DC} [V]	not possible		DC 140 V – 0% … 360 V + 0%					
Data for operation at 1 (3) PE AC 240 V			1PE AC [5]	1 PE AC [5]	1PE AC	3 PE AC	1 PE AC	3 PE AC	1 PE AC [3]	3 PE AC
Mains rated current		I_{mains} [A]	3.4	5.0	9.0	5.2	15.0	9.1	18.0	12.4
Motor power (4-pol. ASM)		**P_N [kW]**	**0.25**	**0.37**	**0.75**		**1.5**		**2.2**	
		P_N [hp]	0.34	0.5	1.0		2.0		3.0	
Output power U, V, W		**S_{N8} [kVA]**	**0.68**	**1.0**	**1.6**		**2.8**		**3.8**	
Output power +U_G -U_G [2]		P_{DC} [kW]	DC interconnection not possible		0		0.7		0	
Output rated current	2/4 kHz*	I_{N24} [A]	1.7	2.4	4.0		7.0		9.5	
	8 kHz*	**I_{N8} [A]**	**1.7**	**2.4**	**4.0**		**7.0**		**9.5**	
	16 kHz	I_{N16} [A]	1.1	1.6	2.6		4.6		6.2	
Max. permissible output current for 60s [1]	2/4 kHz*	I_{max24} [A]	2.5	3.6	6.0		10.5		14.2	
	8 kHz*	**I_{max8} [A]**	**2.5**	**3.6**	**6.0**		**10.5**		**14.2**	
	16 kHz*	I_{max16} [A]	1.7	2.3	3.9		6.9		9.3	
Motor voltage		U_M [V]	0 … 3 x U_{mains}/0 Hz … 50 Hz, up to 480 Hz							
Power loss (operation with I_{N8})		P_V [W]	30	40	60		100		130	
Weight		m [kg]	0.65	0.65	0.95		1.4		1.4	

		Type	BFVCE0074A		BFVCE0154A		BFVCE0224A		BFVCE0404A	
System voltage		U_{mains} [V]	3 PE AC 320 V – 0% … 550 V + 0%; 48 Hz – 0% … 62 Hz + 0%							
Alternative DC supply to + U_G -U_G		U_{DC} [V]	DC 450 V – 0% … 770 V + 0%							
Data for operation at 3 PE AC			400 V	500 V	400 V	500 V	400 V	500 V	400 V	500 V
Mains rated current		I_{mains} [A]	3.3	2.6	5.5	4.4	7.3	5.8	12.3	9.8
Motor power (4-pol. ASM)		**P_N [kW]**	**0.75**		**1.5**		**2.2**		**4.0**	
		P_N [hp]	1.0		2.0		3.0		5.4	
Output power U, V, W		**S_{N8} [kVA]**	**1.7**		**2.7**		**3.9**		**6.6**	
Output power +U_G -U_G [2]		P_{DC} [kW]	0		1,5		0.8		–	
Output rated current	2/4 kHz*	I_{N24} [A]	2.4	1.9	3.9	3.1	5.6	4.5	9.5	7.6
	8 kHz*	**I_{N8} [A]**	**2.4**	**1.9**	**3.9**	**3.1**	**5.6**	**4.5**	**9.5**	**7.6**
	16 kHz*	I_{N16} [A]	1.6	1.4 [4]	2.5	2.3	3.6	3.4	6.2	4.9
Max. permissible output current for 60s [1]	2/4 kHz*	I_{max24} [A]	3.6	3.6	5.9	5.9	8.4	8.4	14.2	–
	8 kHz*	**I_{max8} [A]**	**3.6**	**3.6**	**5.9**	**5.9**	**8.4**	**8.4**	**14.2**	**–**
	16 kHz*	I_{max16} [A]	2.4	2.2	3.9	3.5	5.6	5.0	9.3	–
Motor voltage		U_M [V]	0 … 3 x U_{mains}/0 Hz … 50 Hz, up to 480 Hz							
Power loss (operation with I_{N8})		P_V [W]	60		100		130		180	
Weight		m [kg]	0.95		1.4		1.4		2.3	

Bold type = data for operation with 8 kHz switching rate (pre-set in factory)

[1] Current for periodic load alternation with 1 minute of excess current with I_{max} and 2 minutes of base load with 75 % I_{Nx}

[2] For operation with performance-adapted motor in addition to the performance drawn from the intermediate circuit

[3] Operation only permitted with a.c. reactor/mains filter

[4] Max. permissible motor rating length: 10m shielded

* Power inverter switching rate

[5] For 1-phase 115 VAC use at BFVCE0022A and BFVCE0032A there is a derating of max. 0.75 x I_N.
The parameter CO22 has to be set to 75%.

NAiS Motion Control Ver.1.3 – The configuration software for Matsushita inverters

NAiS Motion Control is the parameter setting software from Matsushita that allow for integrated communications with all inverters, which are equipped with RS232C or RS485 serial communication interfaces including the Matsushita inverters VF-8E, VF-8X and VF-CE.

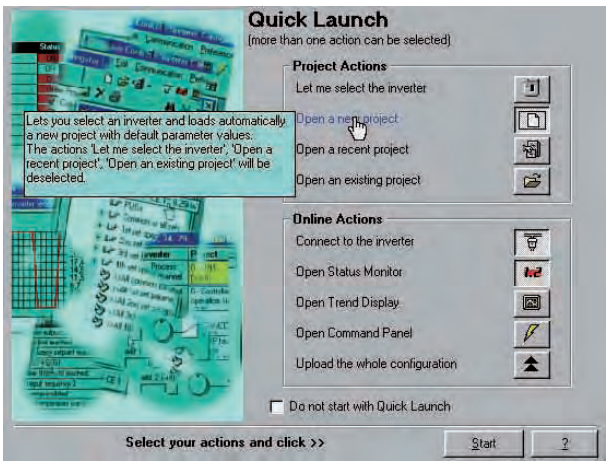
Functionality:
- parameter entry
- test operation (Start/Stop, Forward/Reverse, Acceleration/Deceleration, etc.)
- drive monitoring
- saving and documenting the settings

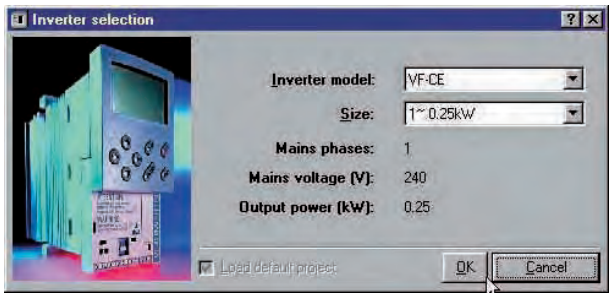
To operate NAiS Motion Control, requirements:
- a personal computer with min. 486DX4 100MHz processor and 8MB RAM (better Pentium 133MHz, 16MB RAM)
- a video card with 640x480 resolution (better 800x600)
- MS Windows 95®/98®/MS Windows NT®
- a Matsushita inverter

The Quick Launch Window

The Quick Launch Window is the starting point for the configuration environment.

It supplies the necessary tools for:
- creating new projects or opening projects from archives.
- setting up and establishing communicaiton with the drive(s).
- monitoring a drive's operation
- sending commands to a drive
- providing on-line help





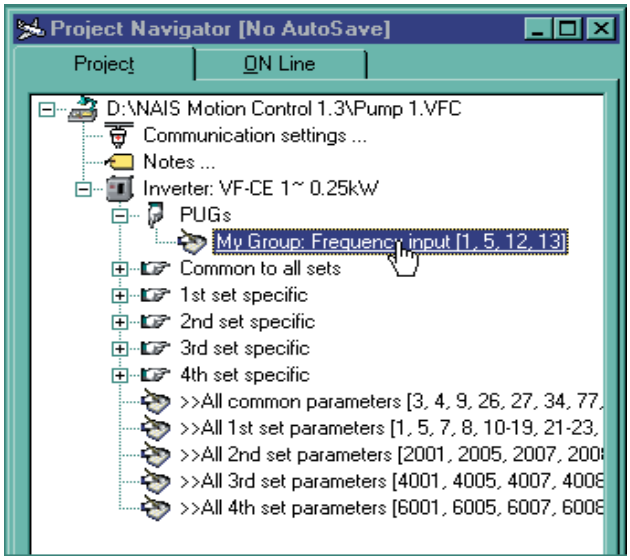
Drive Selection

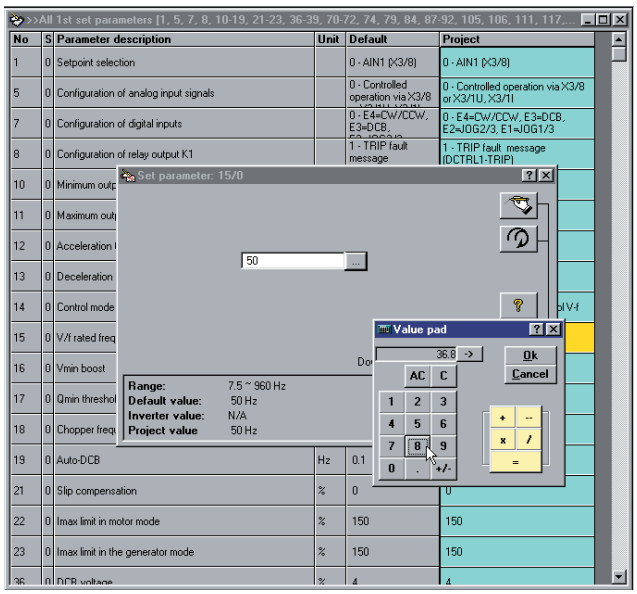
After clicking on 'Let me select the inverter' or 'Open a new project' from the Quick Launch window, an inverter selection window opens which lists all Matsushita VF-8E, VF-8X and VF-CE drives. Selecting a drive automatically opens the Project Navigator window and loads the default parameter settings for the selected drive.

Project Navigator

Project Navigator is the active project managment window. By double-clicking on the tree branches, it is possible to:

- have access to the communication settings in order to establish communication with the drive(s)
- have access to edit the parameters (parameters are grouped by common theme)
- make one's own parameter groups with the PUG Wizard (Parameter User Groups) based on application / user needs.





Editing Parameters

The Parameter Edit windows display common groups of parameters with the default values that pertain to the selected drive. From these windows it is possible to:

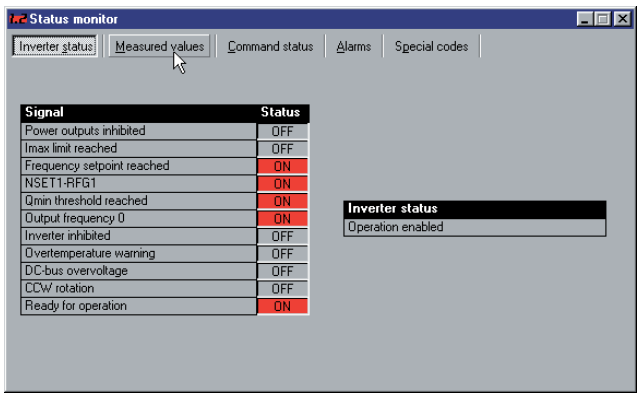
- edit the drive(s) parameters
- upload into one or more drives or download a set of parameters from a drive.
- start a comparison between the current project and the drive, or between two drives regarding the currently selected parameters

Status Monitor

The Status Monitor displays the current drive status, command status, and fault conditions of a drive that is on-line and communicating with the configuration software. Different windows can be selected.

Status Monitor:

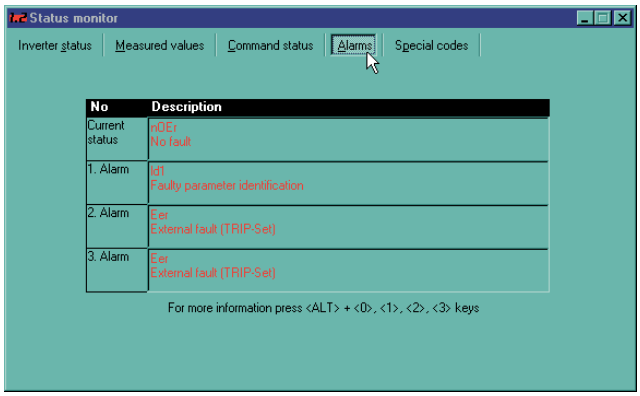
- Monitors the on/off status of the following parameters: Run (inhibited), Forward, Reverse (CCW rotation), Frequency Arrival, Overload Alarm, and others
- Monitors the current values of Output Frequency, Frequency Setting, Output Current, and Output Voltage (Measured values)

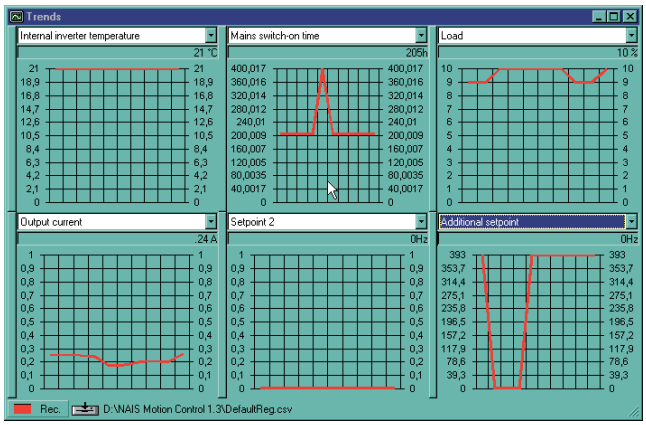


The Status Monitor can be opened by an icon

Fault Screen

The Fault Screen displays the current drive status and a fault history of the last three alarm conditions as read from the drive, with the first fault being the most recent.





Trend Window

The real-time trend graphs provide constantly updated and easy to interpret snapshots of drive operation. They immediately show the relationship between output frequency, voltage, and current, which can be very helpful in confirming proper operation and in troubleshooting performance problems. Further parameters and values are selectable. The Trend Window can be opened by an icon on the toolbar.

Command Panel

The Command Panel allows direct control of the drive from the configuration software. From here it is possible to:

- start and stop the drive
- change motor direction from forward to reverse
- control the drive's frequency setting by drag-rotation of the speed dial with the mouse pointer or by directly entering a value in the frequency display field
- set/reset important parameters.

The Command Window can be opened by an icon on the toolbar.