CFW701 HVAC

Frequency Inverter

CFW701 HVAC - Frequency Inverter

The CFW701 HVAC is a variable-speed drive intended for use with asynchronous motors for heating, ventilation, air conditioning and refrigeration applications.
Offering excellent cost-effectiveness, the CFW701 HVAC follows the CFW700 topology with plug and play technology, accessories incorporated into the standard version and simple operation.

Grouped in 5 frame sizes A to E with accessories to meet NEMA type1 and IP21 enclosures, power ratings cover 0.5 - 75 HP (0.18 - 55 kW) at 230 V, 0.55 – 110kW at 380V, 0.5 - 150 HP (0.55 - 110 kW) at 460 V and 2 - 150 HP (1.5 - 110kW) at 575 V.

The CFW701 HVAC drive is a perfect fit for fans, exhausters and pumps located in schools, universities, hospitals, commercial buildings, shopping malls and many other applications where speed contol is required giving considerable energy savings. Comprehensive motor protection is included. Using an intelligent thermal management algorithm drive and motor have separate monitoring parameters providing optimised motor and drive protection.

Focusing on meeting both low levels of harmonic distortion and electromagnetic interference (RFI) the CFW701 HVAC drive is factory equipped with RFI filters (C3 level) and symmetrically connected DC link chokes equivalent to a 6% impedance line reactor. Low harmonics and RFI mean low losses, low losses mean less oversizing of circuit components and all of these together lead to high system efficiency. Additionally, the DC link chokes eliminate the minimum impedance requirement needed when installing a VSD.

Illustrative image

Certifications

Technology

Human Machine Interface

Used for controlling, viewing and setting all the parameters of the CFW701 HVAC. It has specific engineering units for HVAC applications and status indicators that simplify its configuration and operation.
It features two operating modes: monitoring and parameterization with optional remote mounting (up to 10 meters).

Vectrue Technology®

Control Technology of WEG Frequency Inverters

- Scalar, V/F linear or adjustable - Motor speed controlled with slip compensation
- VVW - Voltage Vector WEG - Motor speed control with automatic adjustment to load and line varitions

Energy Saving

The future depends on conscious and sustainable actions as the world grows rapidly. For this, modern and automated solutions are required. Technology is already present in our lives, and in order to produce the energy that drives all the innovations, somebody has to foot the bill. What are you doing to grow sustainably?

42% of the energy consumed worldwide today is used by industry.

68% of the energy used in industry is consumed by electric motors.

Save even more energy by using the CFW701 HVAC Frequency Inverters together with the W22 Premium efficiency motors, which have the best efficiency on the market. This solution can help you reduce power consumption by approximately 15%, thus contributing to the sustainable development of our planet.

Use energy in a conscious way

Go Green!

Visit the WEG website to calculate energy savings and investment payback achieved by the use of CFW701 VSD:

Ratings

- Power supply
  - 230 V single-phase:
    Rated output current 6 to 10 A (1.5 to 3 HP - 1.5 to 3 kW).
  - 220 V three-phase:
    Rated output current 7 to 211 A
    (0.5 to 75 HP - 0.18 to 55 kW).
  - 380-480 V three-phase:
    Rated output current 3.6 to 211 A (0.5 to 150 HP - 0.55 to 110 kW).
  - 500-600 V three-phase:
    Rated output current 2.9 to 150 A (2 to 150 HP - 1.5 to 110kW).

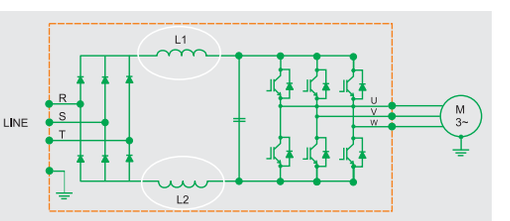
- Compact structure, ideal for installation in confined spaces
- High accuracy and reliability of speed control
- Robust hardware
- Degree of protection IP20 - standard (IP21 and NEMA1 optional)

Hardware Built Into the Product as standard

- RFI filter (for electromagnetic interference mitigation)

- LCD HMI Operating interface with backlight

- Inductors in the DC Link
  - No line reactance required
  - No restrictions for installation, minimum impedance is not required
  - Meets the standard IEC61000-3-12



Inductors L1 and L2 built in the standard CFW701 HVAC

- Inputs and outputs (I/O):
  - 8 Isolated digital inputs
  - 3 Differential analog inputs (0-10 V/4-20 mA (2) and 4-20 mA (1))
  - 5 Digital outputs (2 relays with NA contacts, 3 isolated transistors)
  - 2 Non-isolated analog outputs
  - 1 Dedicated input for PTC

- Conformal Coating:
  - Protects electronic boards ensuring better protection against dust, moisture, high temperatures and chemicals that can damage the components
  - According to DIN EN 60068-2-60

- Communication protocols through RS-485 interface: BACnet MS/TP, Metasys N2 and Modbus RTU.

- Intelligent cooling system:
  - Monitoring of the temperature of the Heatsink and the internal air on the electronics boards
  - Monitoring and indication of the fan speed and number of hours of operation
  - Fan is easily removable for cleaning and maintenance.

Accessories and Options

- Operator interface for remote assembly (up to 10 meters)
- Flash memory module (storage capacity of 1 MB)
- Safety stop module - It guarantees the blocking of firing circuit so no power is delivered to the motor. It meets EN 954-1 / EN 13849-1, category 3

Standards compliance:

- EN 61800-5-2:2007, EN ISO 13849-1:2008 + AC:2009, IEC 62061:2005, IEC 61508 Parts 1-7:2010, EN 50178:1997, IEC 60204-1:2005 (in extracts)

Functions

Energy Saving
Depending on the motor speed and load conditions the flux is automatically reduced, decreasing losses and improving efficiency resulting in energy saving.

Fire Mode
This function inhibits the drive internal faults allowing the motor to be run under adverse conditions without stopping the process.

Bypass
For extended full speed operation, the CFW501 HVAC can be used to start the motor direct on line, bypassing the VSD. This improves efficiency and results in energy savings. An external circuit is needed for this operation.

Short Cycle Protection
Prevents excessive starts. Start delay and time is fully user programmable.

Dry Pump
Prevents a pump from running with no load.

SoftPLC Function
Available as standard, this function provides the CFW701 HVAC with the functions of a PLC, enabling custom user programs to be created, ensuring flexibility for most HVAC applications.

Characteristics
- Ladder programming language through free of charge software
- PLC, mathematical and control blocks
- Access to all parameters of the CFW701 HVAC
- 90 user parameters can be individually configured to be shown on the keypad of the CFW701 HVAC, allowing units selection, minimum and maximum values, number of decimal digits and other characteristics may be customised

Free of Charge Software

WLP Software (WEG Ladder Programmer)
Main features
- Communication with the CFW701 HVAC via RS485 interface
- Logical contacts: normally open and closed, coil, negated coil, set and reset coil, positive and negative transition coil
- PLC blocks: timer, incremental counter, comparator and arithmetic, PID and filter
- Monitoring and on-line help

Superdrive G2 Software
- Communication with the CFW701 HVAC via RS485 interface
- Parameterization, control and monitoring
- Monitoring and on-line help

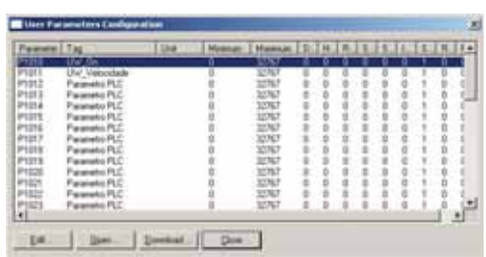
Broken Belt
It monitors motor torque and prevents it from running with no load in case of a broken belt.

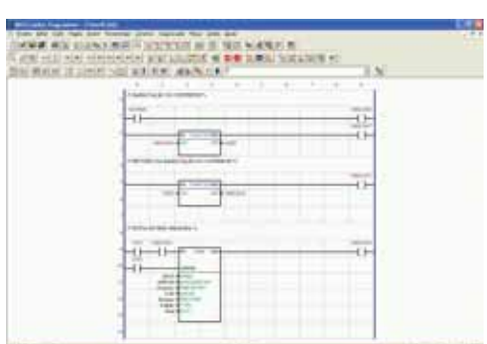
Filter Maintenance Alarm
Provides the user with an alarm when a filter is due for replacement.

Sleep / Wake-Up Mode
Sleep prevents operation of the motor at low speeds. A user selected delay time may be programmed. Wake-up restores the drive to full operation instantaneously when process conditions require operation.

PTC
A PTC input is standard.

Advanced PID
Three PID control loops: One controls the process by itself (the one the motor is running) and two are additional PID loops for use to control independent process variables.
These could be for the control of external processes not related to what the main PID loop is handling. This eliminates the need for an additional PID controller.





Applications

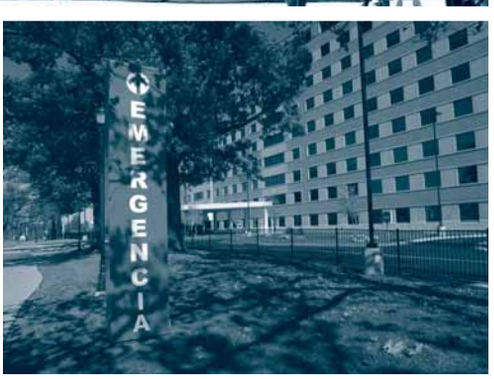
Hospitals

Airports

Business buildings

Hotels

Shopping malls



Clean rooms

Applications for Fans and Pumps

Clean Rooms

Drive Ratings

Normal Duty (ND) Cycle

- 110% for 60 seconds every 10 minutes

Sizing a VFD

The correct way to size a VSD is by matching its rated output current with the motor rated current. However, the tables below present the expected motor power for each VSD model.
The tables below are a guideline only, as motor rated current may vary with number of poles and manufacturer.

Note: Motor power stated in these tables are based on IEC/NEMA standard IV poles motor.

Motor Voltage 220 V and 230 V

Power Supply		Model	Normal Duty (ND)	IEC 50 Hz 220 V 230 V	NEMA 60 Hz 230 V
			A	kW	HP
200-240 V	1Ø	CFW701A06P0S2	6	1.1	1.5
		CFW701A07P0S2	7	1.5	2
		CFW701A10P0S2	10	2.2	3
	1/3Ø	CFW701A06P0B2	6	1.1	1.5
		CFW701A07P0B2	7	1.5	2
	3Ø	CFW701A07P0T2	7	1.5	2
		CFW701A10P0T2	10	2.2	3
		CFW701A13P0T2	13	3	3
		CFW701A16P0T2	16	4	5
		CFW701B24P0T2	24	5.5	7.5
		CFW701B28P0T2	28	7.5	10
		CFW701B33P0T2	33.5	9.2	10
		CFW701C45P0T2	45	11	15
		CFW701C54P0T2	54	15	20
		CFW701C70P0T2	70	18.5	25
		CFW701D86P0T2	86	22	30
		CFW701D0105P0T2	105	30	40
220-230 V	3Ø	CFW701E0142P0T2	142	37	50
		CFW701E0180P0T2	180	55	60
		CFW701E0211P0T2	211	55	75

Motor Voltage 380 V and 460 V

Power supply		Model	Normal Duty (ND)	IEC 50 Hz 380 V 415 V	IEC 60 Hz 440 V 460 V	NEMA 60 Hz 460 V
			A	kW	HP	HP
380-480 V	3Ø	CFW701A03P6T4	3.6	1.5	2	2
		CFW701A05P0T4	5	2.2	3	3
		CFW701A07P0T4	7	3	4	3
		CFW701A10P0T4	10	4	7.5	5
		CFW701A13P5T4	13.5	5.5	10	7.5
		CFW701B17P0T4	17	7.5	12.5	10
		CFW701B24P0T4	24	11	15	15
		CFW701B31P0T4	31	15	20	20
		CFW701C38P0T4	38	18.5	30	25
		CFW701C45P0T4	45	22	30	30
		CFW701C58P5T4	58.5	30	40	40
		CFW701D70P5T4	70.5	37	50	50
		CFW701D88P0T4	88	45	75	60
		CFW701E0105T4	105	55	75	75
		CFW701E0142T4	142	75	100	100
		CFW701E0180T4	180	90	150	150
		CFW701E0211T4	211	110	175	150

Motor Voltage 500 V and 600 V

Power supply		Model	Normal Duty (ND)	IEC 50 Hz 525 V ac	IEC 50 Hz 575 V ac	NEMA 60 Hz 575 V ac
			A	kW	kW	HP
500-600 V	3Ø	CFW701B02P9T5	2,9	1.5	1.5	2
		CFW701B04P2T5	4.2	2.2	2.2	3
		CFW701B07P0T5	7.0	4	4	5
		CFW701B10P0T5	10	5.5	5.5	7.5
		CFW701B12P0T5	12	7.5	7.5	10
		CFW701B17P0T5	17	11	11	15
		CFW701D22P0T5	22	15	15	20
		CFW701D27P0T5	27	18.5	18.5	25
		CFW701D32P0T5	32	22	22	30
		CFW701D44P0T5	44	30	30	40
		CFW701E53P0T5	53	37	37	50
		CFW701E63P0T5	63	45	45	60
		CFW701E80P0T5	80	55	55	75
		CFW701E0107T5	107	75	75	100
		CFW701E0125T5	125	90	90	125
		CFW701E0150T5	150	110	110	150

Dimensions, Weight and Temperature

Model	Frame size	NEMA 1			IP20 / IP21			IP20	NEMA 1 / IP21	Weight kg (lb)	Braking IGBT
		Dimensions mm (in)						Maximum surrounding air temperature with no derating °C (°F) _ ND/HD			
		H	W	D	H	W	D				
CFW701A06P0S2	A	305 (12.02)	145 (5.71)	227 (8.94)	247 (9.73)	145 (5.71)	227 (8.94)	50 (122)_ND	50 (122)_ND	6.3 (13.9)	Standard
CFW701A07P0S2								50 (122)_ND	45 (113)_ND		
CFW701A10P0S2								50 (122)_ND	50 (122)_ND		
CFW701A06P0B2								50 (122)_ND	50 (122)_ND		
CFW701A07P0B2								50 (122)_ND	45 (113)_ND		
CFW701A07P0T2								50 (122)_ND	45 (113)_ND		
CFW701A10P0T2								50 (122)_ND	50 (122)_ND		
CFW701A13P0T2								45 (113)_ND 50 (122)	45 (113)_ND 50 (122)		
CFW701A16P0T2								50 (122)_ND	50 (122)_ND		
CFW701B24P0T2	B	351 (13.82)	190 (7.46)	227 (8.94)	293 (11.53)	190 (7.46)	227 (8.94)	45 (113)_ND	40 (104)_ND	10.4 (22.9)	
CFW701B28P0T2								50 (122)_ND	50 (122)_ND		
CFW701B33P0T2								50 (122)_ND	45 (113)_ND 50 (122)		
CFW701C45P0T2	C	448.1 (17.64)	220 (8.67)	293 (11.52)	378 (14.88)	220 (8.67)	293 (11.52)	50 (122)_ND	50 (122)_ND	20.5 (45.2)	
CFW701C54P0T2								50 (122)_ND	50 (122)_ND		
CFW701C70P0T2								50 (122)_ND	50 (122)_ND		
CFW701D86P0T2	D	550 (21.63)	300 (11.81)	305 (12.00)	504 (19.84)	300 (11.81)	305 (12.00)	50 (122)_ND	50 (122)_ND	32.6 (71.8)	
CFW701D0105P0T2								50 (122)_ND	50 (122)_ND		
CFW701E0142P0T2	E	735 (28.94)	335 (13.2)	358 (14.1)	620 (24.4)	335 (13.2)	358 (14.1)	45 (113)_ND	45 (113)_ND	650 (143.3)	Optional
CFW701E0180P0T2		828.9 (32.63)						45 (113)_ND	45 (113)_ND		
CFW701E0211P0T2								45 (113)_ND	45 (113)_ND		
CFW701A03P6T4	A	305 (12.02)	145 (5.71)	227 (8.94)	247 (9.73)	145 (5.71)	227 (8.94)	50 (122)_ND	50 (122)_ND	6.3 (13.9)	Standard
CFW701A05P0T4								50 (122)_ND	50 (122)_ND		
CFW701A07P0T4								45 (113)_ND 50 (122)	40 (104)_ND 50 (122)		
CFW701A10P0T4								45 (113)_ND	45 (113)_ND		
CFW701A13P5T4								50 (122)_ND	50 (122)_ND		
CFW701B17P0T4	B	351 (13.82)	190 (7.46)	227 (8.94)	293 (11.53)	190 (7.46)	227 (8.94)	50 (122)_ND	50 (122)_ND	10.4 (22.9)	
CFW701B24P0T4								50 (122)_ND	40 (104)_ND 45 (122)		
CFW701B31P0T4								50 (122)_ND	50 (122)_ND		
CFW701C38P0T4	C	448.1 (17.64)	220 (8.67)	293 (11.52)	378 (14.88)	220 (8.67)	293 (11.52)	50 (122)_ND	50 (122)_ND	20.5 (45.2)	
CFW701C45P0T4								50 (122)_ND	50 (122)_ND		
CFW701C58P5T4								50 (122)_ND	50 (122)_ND		
CFW701D70P5T4	D	550 (21.63)	300 (11.81)	305 (12.00)	504 (19.84)	300 (11.81)	305 (12.00)	50 (122)_ND	50 (122)_ND	32.6 (71.8)	
CFW701D88P0T4								50 (122)_ND	50 (122)_ND		
CFW701E0105T4	E	735 (28.94)	335 (13.2)	358 (14.1)	620 (24.4)	335 (13.2)	358 (14.1)	45 (113)_ND	45 (113)_ND	65.0 (143.3)	Optional
CFW701E0142T4								45 (113)_ND	45 (113)_ND		
CFW701E0180T4		828.9 (32.63)						45 (113)_ND	45 (113)_ND		
CFW701E0211T4								45 (113)_ND	45 (113)_ND		
CFW701B02P9T5	B	351 (13.82)	190 (7.46)	227 (8.94)	293 (11.53)	190 (7.46)	227 (8.94)	50 (122)_ND	50 (122)_ND	10.4 (22.9)	Standard
CFW701B04P2T5								50 (122)_ND	50 (122)_ND		
CFW701B07P0T5								50 (122)_ND	50 (122)_ND		
CFW701B10P0T5								50 (122)_ND	50 (122)_ND		
CFW701B12P0T5								50 (122)_ND	50 (122)_ND		
CFW701B17P0T5								50 (122)_ND	50 (122)_ND		
CFW701D22P0T5	D	550 (21.63)	300 (11.81)	305 (12.00)	504 (19.84)	300 (11.81)	305 (12.00)	50 (122)_ND	50 (122)_ND	32.6 (71.8)	
CFW701D27P0T5								50 (122)_ND	50 (122)_ND		
CFW701D32P0T5								50 (122)_ND	50 (122)_ND		
CFW701D44P0T5								50 (122)_ND	50 (122)_ND		
CFW701E53P0T5	E	735 (28.94)	335 (13.2)	358 (14.1)	620 (24.4)	335 (13.2)	358 (14.1)	45 (113)_ND	45 (113)_ND	65.0 (143.3)	Optional
CFW701E63P0T5								45 (113)_ND	45 (113)_ND		
CFW701E80P0T5								45 (113)_ND	45 (113)_ND		
CFW701E0107T5								45 (113)_ND	45 (113)_ND		
CFW701E0125T5								45 (113)_ND	45 (113)_ND		
CFW701E0150T5								45 (113)_ND	45 (113)_ND		

Note: Weight data is for the VSD as IP20 enclosure, if IP21 and NEMA1 kits are being added the total weight will change. Consult the user manual for additional information.

Coding

Product and series	Model identification				Braking [1]	Degree of protection [1]	Conducted emission level [1]	Safety stop [2]	External power supply for control
	Frame size	Rated current	No. of phases	Rated voltage					
CFW701	A	03P6	T	2 / 4 / 5	NB	20	C3	Y1	W1
CFW701	Check table below								
	NB = Braking IGBT not available DB = Braking IGBT available								
	20 = IP20 21 = IP21 (not available for frame size E) N1 = Nema1 Enclosure * Check table " enclosures " at chapter " Accessories ".								
	C3 = According to category 3 of IEC 61800-3 standard								
	Blank = with no STO function Y1 = with STO function according to EN 954-1 / ISO 13849-1, category 3								
	Blank = with no External Power supply board W1 = Control circuit is supplied through an external 24 V power supply								

(1) All the CFW701s come equipped with RFI filter as standard.
(2)This option is not available for models frame size A with the option for Nema1.

Frame sizes	output current (ND)	Input	Power supply voltage	Braking	Degree of protection	Conducted emission level
A	06P0 = 6.0 A	B = single/three phase power supply	2 = 200...240 V	DB	20	C3
	07P0 = 7.0 A					
	06P0 = 6.0 A	S = single phase power supply				
	07P0 = 7.0 A					
	10P0 = 10 A					
	07P0 = 7.0 A	S = three phase power supply				
	10P0 = 10 A					
	13P0 = 13 A					
	16P0 = 16 A					
B	24P0 = 24 A					
	28P0 = 28 A					
	33P5 = 33.5 A					
C	45P0 = 45 A					
	54P0 = 54 A					
	70P0 = 70 A					
D	86P0 = 86 A				N1	
	0105 = 105 A					
E	0142 = 142 A		2 = 220...230 V	NB	20	
	0180 = 180 A					
	0211 = 211 A					
A	06P0 = 6.0 A	B = single/three phase power supply	2 = 200...240 V	DB	20	
	07P0 = 7.0 A					
	06P0 = 6 A	S = single phase power supply				
	07P0 = 7.0 A					
	10P0 = 10 A					
	3P6 = 3.6 A	T = three phase power supply	4 = 380...480 V			
	05P0 = 5.0 A					
	07P0 = 7.0 A					
	10P0 = 10 A					
	13P5 = 13.5 A					
B	17P0 = 17 A					
	24P0 = 24 A					
	31P0 = 31 A					
C	38P0 = 38 A					
	45P0 = 45 A					
	58P5 = 58.5 A					
D	70P5 = 70.5 A				N1	
	88P0 = 88 A					
E	0105 = 105 A			NB	20	
	0142 = 142 A					
	0180 = 180 A					
	0211 = 211 A					

Coding

Frame sizes	output current (ND)	Input	Power supply voltage	Braking	Degree of protection	Conducted emission level
B	2P9 = 2.9 A	T = three phase power supply	5 = 500...600 V	DB	20	C3
	4P2 = 4.2 A					
	7P0 = 7 A					
	10P0 = 10 A					
	12P0 = 12 A					
	17P0 = 17 A					
D	22P0 = 22 A			NB	N1	
	27P0 = 27 A					
	32P0 = 32 A					
	44P0 = 44 A					
E	53P0 = 53 A				20	
	63P0 = 63 A					
	80P0 = 80 A					
	0107 = 107 A					
	0125 = 125 A					
	0150 = 150 A					

Options

"Options" mean factory installed hardware, no field installation is possible. Below are the available hardware options:

Dynamic Braking

CFW701 HVAC frame sizes A to D come equipped with braking IGBT in the standard product. For frame size E a specific version has to be chosen, "DB" has to be part of the coding. See page 10.

IP21/ NEMA1 Enclosure

The CFW701 HVAC standard version comes IP20, IP21/NEMA1 are available as optional. See page 10 for coding information.

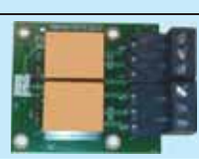
Safety Stop Module

- It prevents accidental operation of the motor
- According to ISO13849-1 and EN954-1 / Category 3
  After the activation of the safety stop function, the PWM pulses in the output of the CFW701 HVAC are blocked and the motor stops by inertia. With this function active, you cannot start the motor or create a rotating magnetic field in it, even if there is an internal fault.
  In order to select the safety module, insert "Y1" in position 9 of the smart code.

24 V dc External Power Supply for Feeding Control Circuitry

This option comes from the factory with a board in the power circuit allowing an external 24VDC control supply to power the VSD control.

Accessories

Reference	Description	Slot	
	Control accessories		
USB - RS485/232	UBS / RS485/232 converter kit	-	
	Operating interface and accessories		
HMI-03	Separate standard product operating interface	-	
RHMIF-03	Frame kit for operating interface remote mounting (degree of protection IP56)	-	
HMID-01	Blind cover	-	
HMI cable 1 m	Cable set for serial remote operating interface 1 m	-	-
HMI cable 2 m	Cable set for serial remote operating interface 2 m		
HMI cable 3 m	Cable set for serial remote operating interface 3 m		
HMI cable 5 m	Cable set for serial remote operating interface 5 m		
HMI cable 7.5 m	Cable set for serial remote operating interface 7.5 m		
HMI cable 10.0 m	Cable set for serial remote operating interface 10.0 m		
	Others		
KN1A-02	NEMA conduit kit for size A	-	
KN1B-02	NEMA conduit kit for size B		
KN1C-02	NEMA conduit kit for size C		
KN1E-01	NEMA conduit kit for size E (CFW110142T2 / CFW110142T4 e CFW11105T4)		
KN1E-02	NEMA conduit kit for size E (CFW110180T2, CFW110180T4 / CFW110211T2, CFW110211T4)		
KIP21A-01	IP21 Kit for size A		
KIP21B-01	IP21 Kit for size B		
KIP21C-01	IP21 Kit for size C		
KIP21D-01	IP21 Kit for size D		
PCSA-01	Power cable shield kit for size A	-	
PCSB-01	Power cable shield kit for size B		
PCSC-01	Power cable shield kit for size C		
PCSD-01	Power cable shield kit for size D		
PCSE-01	Power cable shield kit for size E		
CCS-01	Power cable shield kit - included in the standard product	-	-
CONRA-03	Control rack with card CC701.CDE		
DBW-03	Braking module DBW030380D3848SZ		
CCK-01	Output relay module	-	

Technical Specifications

Frequency Inverter CFW701 HVAC		
Control	Method	Imposed voltage Control types - V/F Scalar - VVW: Voltage Vector Control PWM SVM (Space Vector modulation) Current, flux and speed Controllers in software (Full digital) Execution rate - Current controllers: 0.2 ms (5 KHz) - Flux controllers: 0.4 ms (2,5 KHz) - Speed controller / speed measurement: 1.2 ms
	Output frequency	0 to 3.4 x motor rated frequency (P0403). The motor rated frequency is adjustable from 0 Hz to 300 Hz in the V/F and VVW modes and 30 to 120 Hz in the vector mode Maximum output frequency limit considering the switching frequency - 125 Hz (Switching frequency = 1.25 KHz) - 200 Hz (Switching frequency = 2 KHz) - 250 Hz (Switching frequency = 2.5 KHz) - 500 Hz (Switching frequency = 5 KHz)
Performance	Speed control	V/F (Scalar): Control (with slip compensation): 1% of the normal speed . Speed variation range: 1:20 VVW: Control: 1% of the rated speed Speed variation range: 1:30
User's power supply (CC701 board)	REF (XC1:21-24)	Power supply of 10 V + 10% to be used with potentiometer in the analog inputs Maximum output current: 2 mA
	+5 V (XC1:1-8)	Power supply of 5 V + 5% Maximum output current: 160 mA
	+24 V	Power supply of 24 V + 10% to be used with digital inputs and outputs Maximum output current: 500 mA
Inputs (CC701 board)	Analog	3 differential inputs Resolution: 11 bits + signal Input level: (0 to 10) V, (-10 to 10) V, (0 to 20) mA or (4 to 20) mA (1) Impedance: 400 kΩ for voltage input, 500 Ω for current input Maximum voltage allowed in the inputs: +15 V Programmable functions
	Digital	8 isolated digital inputs 24 V dc (High level > 10 V, Low level < 2 V) Maximum inut voltage + 30 V dc Input impedance: 2 kΩ Active high or active low input selectable by jumper (simultaneous selection for all the inputs
Outputs (CC701 board)	Analog	2 non-isolated outputs Output in voltage (0 to 10 V) or current (0/4 mA to 20 mA) Maximum load: RL > 10 kΩ (voltage) or RL < 500 Ω (current). Resolution: 10 bits Programmable functions
	Relay	2 relays with NA contacts Maximum voltage: 240 V / 30 V dc Maximum current: 0.75 A Programmable functions
	Transistor	3 isolated digital outputs open sink (they use the same reference as the 24 V supply) Maximum current: 80 mA Maximum voltage: 30 V dc (2) Programmable functions
Safety	Protection	Overcurrent/short-circuit in the output Power under/overvoltage Phase loss Overtemperature in the heatsink/internal air Overload on the IGTBs Overload on the motor External fault/alarm Fault on the CPU or memory Short-circuit phase-ground on the output
Operating interface (HMI)	Standard	9 keys: Run/Stop, Increment, Decrement, Direction of Rotation, Jog, Local/Remote, BACK, ESC and ENTER/MENU LCD Allows accessing/changing all the parameters Accurate indications: - Current: 5% of the rated current - Speed resolution: 1 RPM Can be mounted externally (remote mounting)

(1) Input levels for AI3 only (0 to 20) mA and (4 to 20) mA.
(2) The transistor outputs feature an internal freewheel diode for +24 V.

Technical Specifications

Degree of protection	IP20	Models size A, B, C without top cover and Nema1 kit Models size E without Nema1 kit
	IP20	Models size D without IP21 kit Models size E with Nema1 kit (KN1E-01 and KNE1-02)
	IP21	Models size A, B and C with top cover
	NEMA1/IP21	Models size A, B and C with top cover and Nema 1 kit Models size D with IP21 kit
	IP54	Back part of the CFW701 HVAC (external part for flange mounting)
Safety standards		UL 508C - Power conversion equipment UL 840 - Insulation coordination including clearances and creepage distances for electrical equipment EN 61800-51 - Safety requirements electrical thermal and energy EN 50178 - Electronic equipment for use in power installations EN 60204-1 - Safety of machinery. Electrical equipment of machines. Part: General requirement **Nota:** For a machine to comply with this standard, the manufacturer of the machine is responsible for installing an emergency stop device and a device for disconnection from the power line EN 60146 (IEC) - Semiconductor converters En 61800-2 - Adjustable speed electrical power drive systems - Part 2: General requirements - Ratings specifications for low voltage adjustable frequency AC power drive systems
Electromagnetic compatibility standards		EN 61800-3 - Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods EN 55011 - Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment CISPR11 - Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement EN 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test EN 61000-4-3 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test EN 61000-4-4 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test EN 61000-4-5 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test EN 61000-4-6 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, inducted by radio-frequency fields
Mechanical construction standards		EN 60529 - Degrees of protection provided by enclosures (IP code) UL 50 - Enclosures for electrical equipment

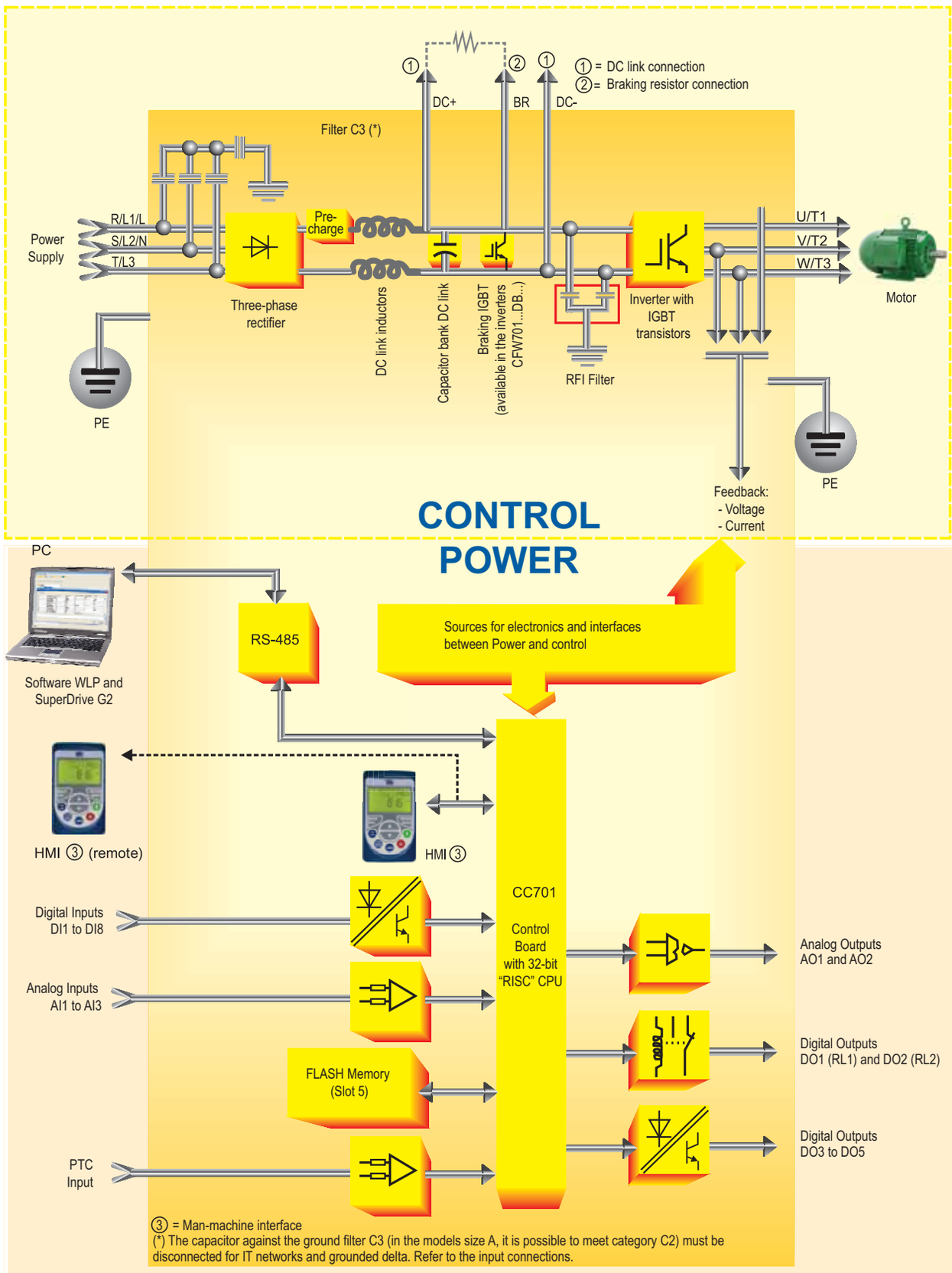
Technical Data

Voltage and rating features	Voltage	Single phase	200-220 V ac (+10 %-15 %)
		Three phase	200-220 V ac (+10 %-15 %)
			380-480 V ac (+10 %-15 %)
			500-600 V ac (+10%-15%)
	Power	Single phase	1.5 to 3 HP (1.1 to 2.2 kW)
		Three phase	1.5 to 75 HP (1.1 to 55 kW)
			2 to 150 HP (1.5 to 110 kW)
	Frequency	50...60 Hz (+/-2%_48 to 63 Hz)	
	Displacement factor	Greater than 0.98	
	Efficiency	Greater than 0.97	
	Power factor	0.94 for three phase input at nominal conditional 0.70 for single phase input at nominal conditional	
Control	Frequency range	0 to 3.4x motor rated frequency (P0403). The rated frequency is programable up to 300 Hz (V/Hz) and 120 Hz (vector mode). Switching Frequency data must be observed for speed limits.	
	Switching frequency	Standard: 5 kHz (A, B, C D frames)	
		2.5 kHz for all 380 V models frame E	
		2.5 kHz for frame E 220 V models 142/180 Amps (ND)	
		2.5 kHz for frame E 220 V model 211 Amps (ND/HD)	
		5 kHz for frame E 220 V models 142/180 Amps (HD)	
		Available options for 2.5 / 5 / 10 kHz (check for derating)	
	Overload	Normal Duty (ND)	110% for 1min every 10 min
		Aceleration	0 to 999 s
		Deceleration	0 to 999 s
Environment	Temperature	-10 to 50 °C (14 to 122 °F) for most of models. For operating temperature of each model the table " Dimensions, Weight and Temperature" shall be checked.	
		-10...60ºC for frames A, B, C and D (up to 45 °C without derating for models 13 A and 24 A/200...240 V, 7 and 10 A/380...480 V and up to 50 °C without derating for the other models) and-10...55 °C for frame E (up to 45 °C without derating). If derating has to be considered have 2% current reduction for each °C above the specific operating temperature.	
	Humidity	5 to 90% with no condensation	
	Altitude	0 to 1000 meters with no derating	
		Up to 4000 meters with current reduction of 1% for each 100 meters above 1000 meters	
Braking methods	Dynamic braking	Available as standard for frame sizes A, B, C and D for 460 V and D for 600 V. For frame size E "DB" models has to be used. An extra resistor must be fitted in for dynamic braking capability.	
	Optimal braking	There is no need for braking resistor	
	DC braking	DC Current applied to motor	
Performance	V/f	Speed control	Regulation: 1% of rated speed
			Speed Variation range 1:20
	Voltage Vector VVW		Regulation: 1% of rated speed
			Speed Variation range 1:30
I/Os	Inputs	Digital	8 x isolated bidirectional 24 V
		Analog	2 x +/-10V, 11 bits + signal (differencial) or 0/4...20 mA, 11 bits (differencial)
			Impedance: 400 kΩ for voltage signal / 500Ω for current signal
	Output	Relay	2 x relay NO/NC contact (240 V ac/1 A)
			4 x open drain (24 V/200 mA)
		Analog	1 x 0/4 - 20 mA 11bits
			2 x 0...10 V or 0/4...20 mA, 11 bits (not isolated from inverter ground)
	24 V power supply capacity	500 mA (available for the user, including I/Os)	

Technical Data

Communication	Modbus RTU BACnet MS/TP Metasys N2	RS485 built-in (Available in control terminals)
		RS485 built-in / Superdrive and WLP communication
Safety standards	UL 508C Power conversion equipment	
	UL 840 Insulation coordination including clearences and creepage distances for electrical equipment	
	EN61800-5-1 - Safety requirements electrical, thermal and energy.	
	EN 50178 - Electronic equipment for use in power installations.	
	EN 60204-1 - Safety of machinery. Electrical equipment of machines. Part 1: General requirements. In order to have a machine in conformity with this regulation, the machine builder is resposible forthe installation of na emergency shutdown device and na equipment for power disconnection.	
	EN 60146 (IEC 146) - Semiconductor converters.	
	EN 61800-2 - Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency A.C. power drive systems	
Mechanical Construccion Standards Eletromagnetic Compatibility Standards (EMC)	EN 60529 - Degrees of protection provided by enclosures (IP code).	
	UL 50 - Enclosures for electrical equipment	
	EN 61800-3 - Adjustable speed electrical power drive systems - Part 3: EMC product standard including specifc test methods.	
	EN 55011 - Limits and methods of measurement of radio disturbance characteristics of undustrial, scientific and medical (ISM) radio-frequency equipment.	
	CISPR 11 - Industrial, scientifc and medical (ISM) radio-frequency equipment - Eletromagnetic disturbance characteristics - Limits and methods of measurement.	
	EN 61000-4-2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Eletrostatic discharge immunity test.	
	EN 61000-4-3 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic feld immunity test.	
	EN 61000-4-4 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test.	
	EN 61000-4-5 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test.	
	EN 61000-4-6 - Electromagnetic compatibility (EMC)- Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio-frequency fields.	
Protections	Overcurrent / Short circuit	
	Under / Overvoltage in the power section	
	Phase loss	
	VSD thermal overload (IGBTs, rectifier and in the eletronics)	
	Motor thermal overload	
	Braking resistor overload	
	IGBTs overload	
	Motor overload	
	Fault / external alarm	
	CPU failure	
	Phase-to ground short circuit at the output	
	Failure at the heatsink fan	
	Motor overspeed	
	Wrong connection of encoder wiring	

Block Diagram



Block diagram of the CFW701 HVAC

Notes

Notes

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