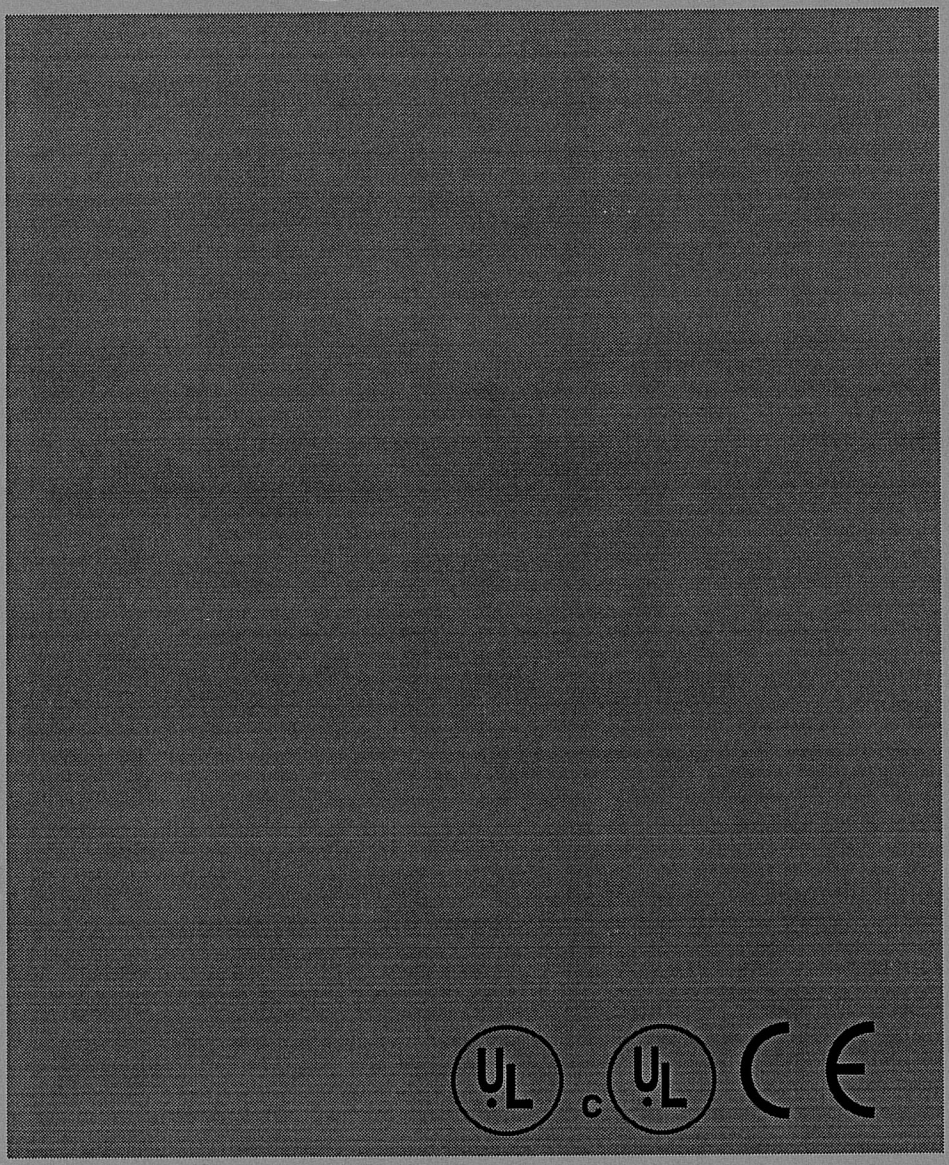
VISTA IV



INSTRUCTION MANUAL **POWER STAGE**

Important Note: The user should read this manual completely prior to operating the inverter

CAROTRON

3/97

This instruction manual must be made available to all users. Before working with this unit the user must be familiar with it. This is especially true for the attention, safety and warning guides. The meaning of the icons used in this manual are:

Danger
Warning
Caution

Attention, observe at all costs

Information
Help
Tip

Contents

1. General 2
1.1 Product Description 2
1.2 Model Number Information 3
1.3 Control Cabinet Installation 4
1.3 Installation Instructions 4

2. Technical Data 5
2.1 Summary Technical Data 200V Class 5
2.2 Summary of Technical Data 400V Class 6
2.3 Dimensions and Weight 8
2.4 Summary of the Power Circuit Terminals 10

3. Accessories 14
3.1 Braking resistors 14

4. Annex A 18
4.1 Overload curve 18
4.2 Low speed overload protection 18

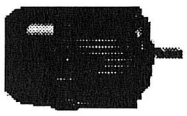
5. Annex B 19
5.1 External power supply for control circuits.....19

6. Annex C 19
6.1 Usage of input chokes.....19
6.2 Input filters EMC/EMI.....20
6.3 Motor chokes and output filters.....20

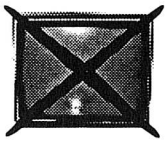
1. General

1.1 Product Description

In selecting the Carotron Vista IV series inverte, you have chosen a frequency inverter with the highest quality and dynamic performance.



It is exclusively designed for smooth speed regulation of a three-phase motor.



The operation of other electrical loads is forbidden and can lead to destruction of the unit.

This manual describes the frequency inverter **Vista IV.**

- 1 hp...15 hp / 230V class
- 1 hp...300hp / 460V class

The Carotron Vista IV inverter has the following features:

- small mounting footprint
- IGBT power circuit gives low switching losses
- low motor noise with high carrier frequency
- extensive protection for over- current, voltage and temperature
- voltage and current monitoring in static and dynamic operation
- short circuit proof and ground-fault proof
- noise immunity in accordance with IEC1000
- hardware current regulation
- integrated cooling fan
- uniform mounting pattern
- can be mounted side by side with zero clearance
- CE compliant and UL listed

1.2 Model Number Information

Model Number

V4 C 3 4 015 - 0 4 T

Dynamic Braking Options
0 : No Braking Circuit
T : Internal Transistor
R : Internal Transistor and Resistor

Max. Carrier Frequency
2 : 2 kHz
4 : 4 kHz
4 : 8 kHz
C : 12 kHz
G : 16 kHz

Enclosure Type
0 : Chassis Mounting
1 : NEMA 1
4 : NEMA 4

Horsepower Rating

Input Voltage Rating
2 : 230VAC (250-360 VDC for DC input models)
4 : 460VAC (420 - 720VDC for DC input models)

Number of Input Phases
0 : DC Input
1 : 1 Phase
3 : 3 Phase

Control Type
S : Simple Inverter Control
C : Configurable Inverter Control
F : Flux Vector Control (closed loop)

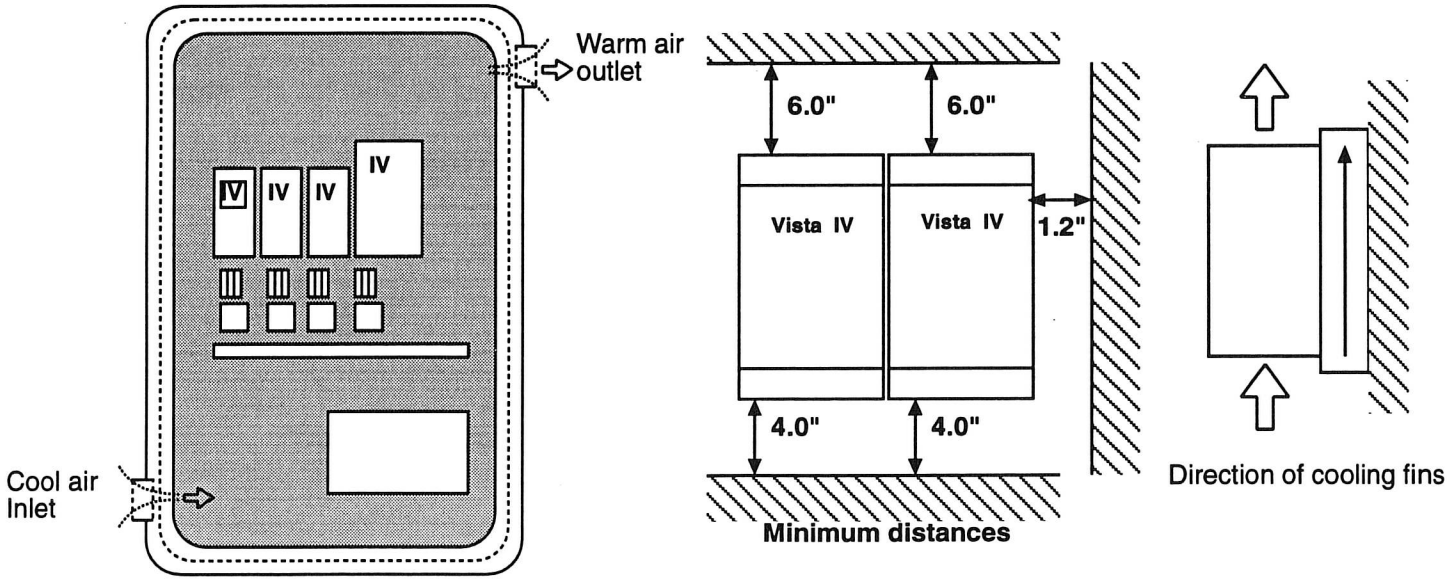
Control Series
V4 : Vista IV Series

1.3 Installation Instructions

- Install the Vista IV inverter on a firm mounting surface
- Take into consideration the minimum clearance distances when positioning the inverter. (see drawing below)
- Units are designed for vertical installation and can be aligned next to each other. Maintain a distance of at least 2 inches in front of the unit. Make sure cooling is sufficient.
- Water or mist Should not be allowed into theVista IV inverter
- Prevent dust from getting into the Vista IV inverter. When installing the unit inside a sealed enclosure, make sure the enclosure is sized correctly for proper heat dissipation.
- The Vista IV inverter must be installed in an explosion proof enclosure when operating in an explosion-proof environment.
- Protect the Vista IV inverter against conductive and corrosive gases and liquids.

Equipment, which produces electromagnetic fields or creates interference on the voltage supply, must be placed as far away as possible. Measures must be taken to suppress the interference. See annex C or contact Carotron for more information.

1.3 Control Cabinet Installation



2. Technical Data

2.1 Summary Technical Data 230V Class

Inverter Size	7	9	10	13		14	15
Output nominal power [kVA]	1.6	2.8	4	8.3		11	18
Recommended motor rating [HP]	1	2	3	7.5		10	15
Recommended motor rating [kW]	0.75	1.5	2.2	5.5		7.5	11
Rated output current [A]	4	7	10	24		33	49
Peak current (30 seconds) [A]	7.2	12.6	18	36.5		49.5	73.5
Rated input current [A]	7.4	13	19	26.5		36	54
Maximum carrier frequency [kHz][2]	4	4	16	4	16	16	16
Housing size	**D**	**D**	**D**	**E**	**G**	**G**	**G**
Power dissipation at rated load [W]	65	70	135	165	220	280	380
Max. allowable input fuse [A]	20	20	25	35		50	80
Recommended wire gauge [awg]	14	14	12	10		8	6
Min. braking resistor impedance [Ohm] [1]	56	56	28	39	16	13	11
Typ. braking resistor impedance [Ohm] [1]	100	100	68	56	22	16	13
max. braking current [A] [1]	7	7	14	21	29	29	34
Tightening torque for power terminals[in lb]	4				11		
Wiring diagram (see P.12/13)	**1**			**3**			
Supply voltage [VAC]	180...260 +/-0						
Supply voltage phases	1			3			
Supply voltage frequency [Hz]	50 / 60 +/- 2 (option 250...360 VDC)						
Output voltage [V]	3 phase 0 to V supply						
Output frequency [Hz]	dependent on max. carrier freq. 0 to 800Hz typ						
Storage temperature [°C/°F]	-25...70 °C / -13...158°F						
Operating temperature chassis [°C/°F]	-10...45 °C / 14...113°F						
Operating temperature NEMA 1/4 [°C/°F]	-10...40°C / 14...104°F						
Relative humidity	max. 95% without condensation						
Housing design	Chassis / NEMA 1 / 4			Chassis / NEMA1			
In accordance with...	EN 50081-1 / 50082-2 / NEMA / UL						
Standards for noise immunity	IEC 1000-4-2 / -3 / -4 / -5 / -6						
Standards for emitted interference	EN 55011 Class B / EN 55022 Class A						

1) This information pertains only to units with an internal braking module.
2) The maximum carrier frequency is defined by the power stage of the inverter. The actual operating carrier frequency is defined and adjusted through the control stage installed in the inverter.

The recommended motor is based on 2/4 pole standard motors. When using motors with different numbers of poles, the inverter must be dimensioned according to the motor rated current. Contact Carotron for special or medium frequency motors.

When installing at altitudes over 3300 feet, a power reduction of 1% per every additional 330 feet of elevation must be taken into consideration. The maximum elevation for operation is 9,840 feet.

2.2 Summary of Technical Data 460V Class

Inverter Size	7	9	10		12		13		14		15			16	
Output nominal power [kVA]	1.6	2.8	4		6.6		8.3		11		17			23	
Recommended motor rating [HP]	1	2	3		5		7.5		10		15			20	
Recommended motor rating [kW]	0.75	1.5	2.2		4		5.5		7.5		11			15	
Rated output current [A]	2.6	4.1	5.8		9.5		12		16.5		24			33	
Peak current (30 seconds) [A]	4.6	7.4	10.4		17.1		21.6	18	29.7	24.8	36			49.5	
Continuous current at 0 Hz [A] [3]	-							12	-	12	-	19	15	33	20
Rated input current [A]	2.6	4.5	6.4		10.5		13.2		18.1		26.5			36.5	
Maximum carrier frequency [kHz] [2]	4	4	4	12	4	16	16		8	16	4	8	16	4	16
Housing size	D	D	D	D	D	E	E	G	E	G	E	G	H	G	H
Power dissipation at rated load [W]	45	60	80	130	115	180	240	200	240	260	260	290	360	310	490
Max. allowable input fuse [A]	10		10		20		20		25		35			50	
Recommended wire gauge [awg]	14		14		14		14		12		10			8	
Min. braking resistor [Ohm] [1]	160		160		82	50	50	39	50	39	39		22	25	22
Typ. braking resistor [Ohm] [1]	390		270		150		100		82		56			39	
max. braking current [A] [1]	5				10	15	15	21	15	21	21			30	
Tightening torque for terminals [in lb]	4							11	4	11	4	11	22	11	22
Wiring diagram (see P.12/13)	2						3						4	3	4
Supply voltage [V]	305...500 +/-0 (400V Nominal voltage)														
Supply voltage phases	3														
Supply voltage frequency [Hz]	50 / 60 +/- 2 / (option 420...720VDC)														
Output voltage [V]	3 phase 0 to V_{supply}														
Output frequency [Hz]	dependent on maximum carrier frequency; 0 to 800Hz typ.														
Storage temperature [°C/°F]	-25...70 °C / -13...158°F														
Operating temperature [°C/°F]	-10...45 °C / 14...113°F Chassis -10...40°C / 14...104°F NEMA 1 / 4														
Relative humidity	max. 95% without condensation														
Housing design [4]	Chassis / NEMA1 / 4						C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N
In accordance with...	EN 50081-1 / 50082-2														
Standards for noise immunity	IEC 1000-4-2 / -3 / -4 / -5 / -6														
Standards for emitted interference	EN 55011 Class B / EN 55022 Class A														

1) Only valid for frequency inverters with internal braking transistor (see "Name Plate Information")
2) The maximum carrier frequency is defined by the power stage of the inverter. The actual operating carrier frequency is defined and adjusted through the control stage installed in the inverter.
3) On units with the flux vector card installed, this value is valid at the rated maximum carrier frequency and at a heat sink temperature of 90°C/194°F. When the carrier frequency is decreased, the allowable continuous current increases as a result.
4) C = Chassis N = NEMA 1

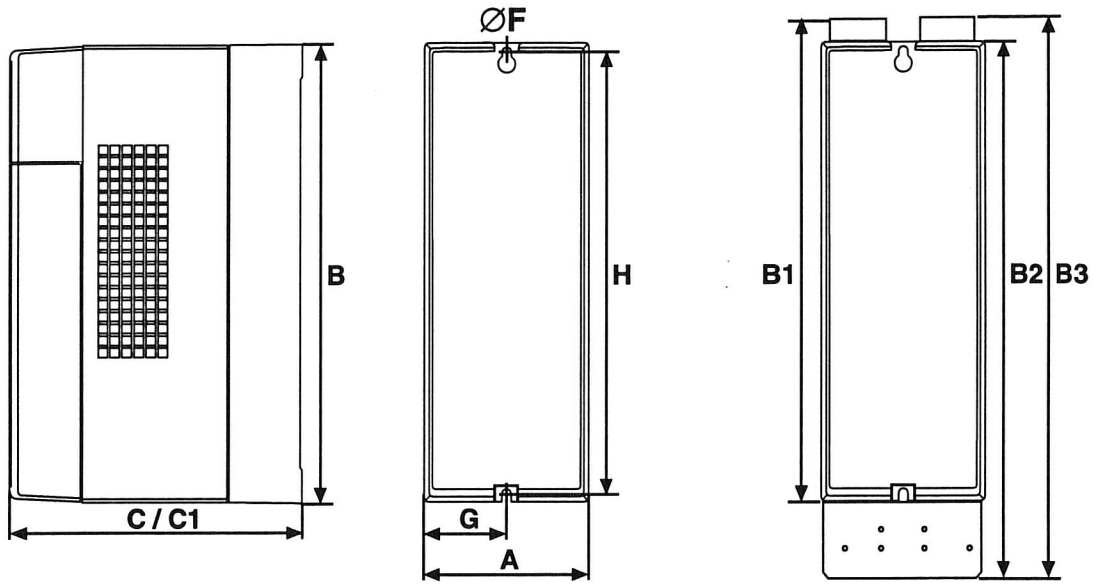
The recommended motor is based on 2/4 pole standard motors. When using motors with different numbers of poles, the inverter must be dimensioned according to the motor rated current. Contact Carotron for special or medium frequency motors.

17		18		19		20	21		22	23		24	25	26	27	28
29		35		42		52	62		80	104		125	145	173	208	256
25		30		40		50	60		75	100		150	175	200	250	300
18.5		22		30		37	45		55	75		90	110	132	160	200
42		50		60		75	90		115	150		180	210	250	300	370
63		75		90		112.5	135		172.5	225		225	262.5	312.5	375	462.5
30		45	40	60		75	90		115	150	140	135	190	210	300	370
46		55		66		83	100		127	165		198	231	275	330	410
8	16	8	16	4	8	8	4	8	8	4	8	8	4	4	2	2
H	K	H	K	H	K	K	K	L	L	L	M	M	N	N	P	P
470	700	610	850	540	750	900	850	1100	1400	1400	1800	2200	2300	2700	2900	3500
63	63	80	80	80	80	100	160		160	200	200	315	315	400	450	550
6	6	6	6	4	4	4	2		1	1/0	1/0	2/0	4/0	250	350	500
22	16	13	11	13	11	11	11	8	6	6	[5]					
28		22		16		13	11		9	6	[5]					
37	50	63	73	63	73	73	73	100	133	133	[5]					
22																
4											5					
305...500 +/-0 (400V Nominal voltage)																
3																
50 / 60 +/- 2 / (option 420...720VDC)																
3 phase 0 to V_{supply}																
dependent on maximum carrier frequency; 0 to 800Hz typ.																
-25...70 °C / -13...158°F																
-10...45 °C / 14...113°F Chassis -10...40°C / 14...104°F NEMA 1																
max. 95% without condensation																
C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N	C/N	C	C	C	C	C	C
EN 50081-1 / 50082-2																
IEC 1000-4-2 / -3 / -4 / -5 / -6																
EN 55011 Class B / EN 55022 Class A																

5) These units can be used with one or more external braking modules. For more information contact KEBCO.

When installing at altitudes over 3300 feet, a power reduction of 1% per every additional 330 feet of elevation must be taken into consideration. The maximum elevation for operation is 9,840 feet.

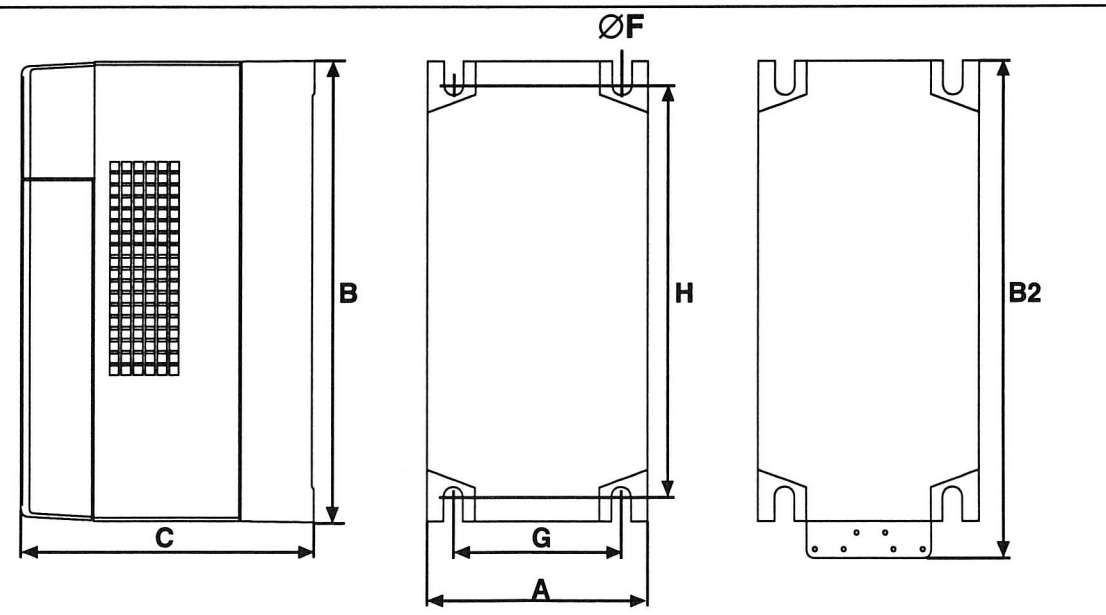
2.3 Dimensions and Weight



Housing Size	A	B	B1	B2	B3	C	C1	F	G	H	Weight [lbs]
D	3.5	9.8	10.4	11.3	11.9	6.3	8.3	0.2	1.8	9.4	4.4
E	5.1	11.4	-	12.9	-	7.9	-	0.25	2.6	10.8	7.7

B1 / C1 with base EMC filter
B2 with shield plate
B3 with base EMC filter and shield plate

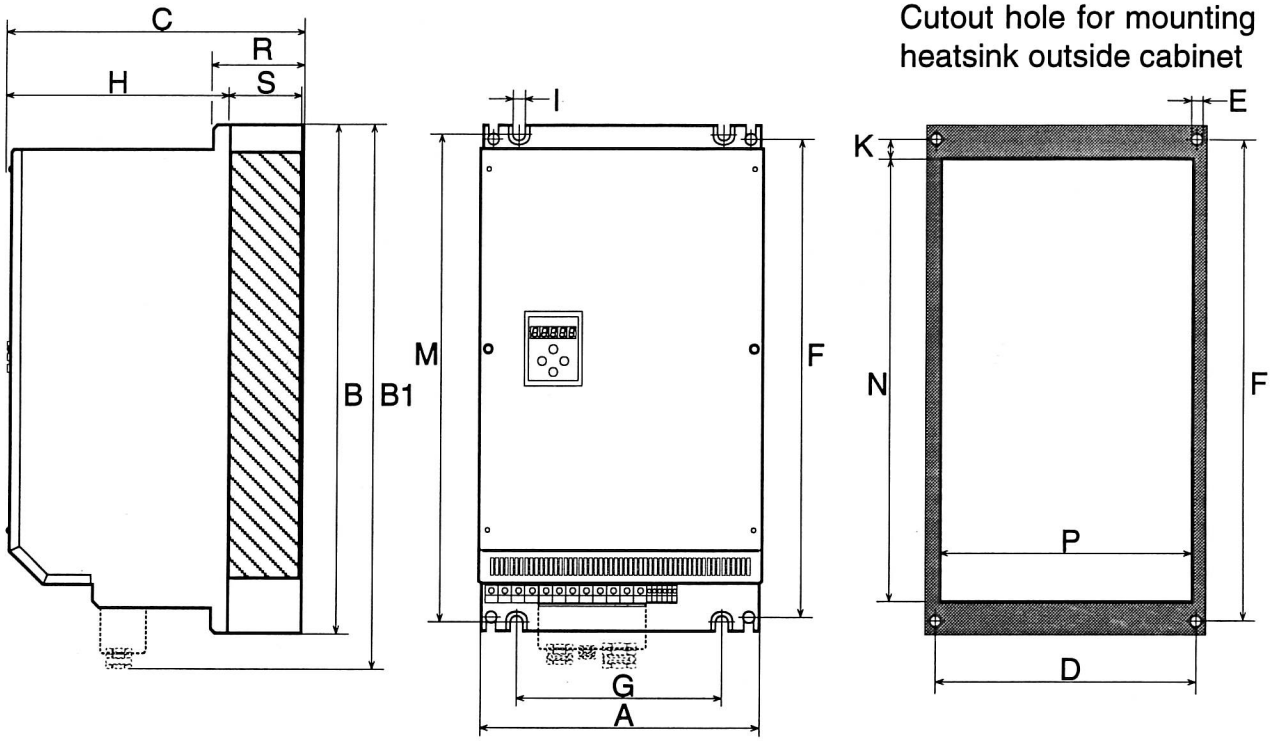
All dimensions in inches



Housing size	A	B	B2	C	F	G	H	Weight [lbs]
G	6.7	13.4	14.6	10.0	0.25	5.9	13.0	22.0
H	11.7	13.4	15.4	10.0	0.25	9.8	13.0	30.8

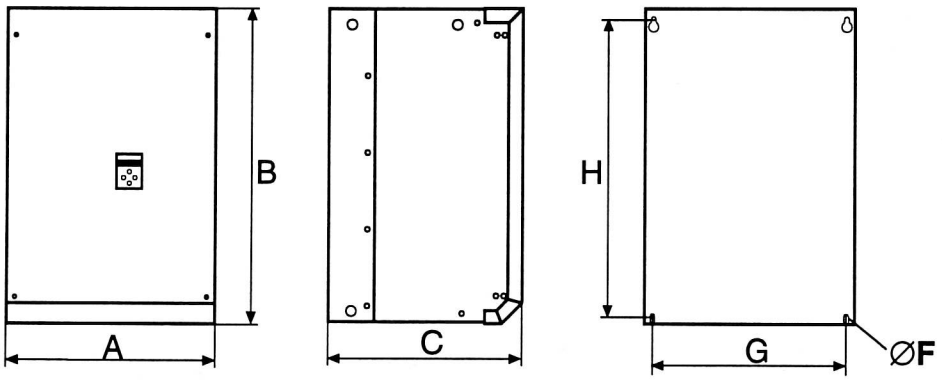
B2 with shield plate

All dimensions in inches



Housing	A	B	(B1)	C	D	E	F	G	H	I	K	M	N	P	R	S	Wt. [lbs]	
K	13.6	24.0	(26.0)	14.2	12.2	.25	22.8	9.8	10.7	.43	1.3	23.0	21.5	12.4	4.3	3.4	99	(125)
L	13.6	31.5	(34.5)	14.2	12.2	.25	30.3	9.8	10.7	.43	1.3	30.5	28.9	12.4	4.3	3.4	143	(176)

bracketed values are with shield plate and internal EMC filter — All dimensions are in inches



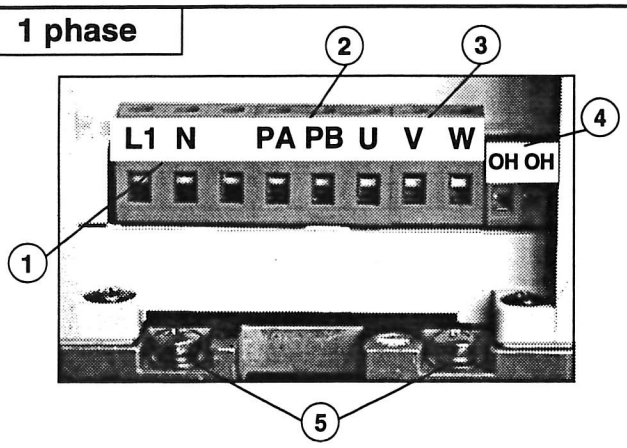
Housing size	A	B	B2	C	F	G	H	Weight [lbs]
M	16.2	24.25	14.6	14.8	0.3	15.0	22.7	132
N	20.0	32.4	15.4	14.0	0.3	18.2	30.8	231
P	20.0	32.4		16.0	0.3	18.2	30.8	242

B2 values are with shield plate — All dimensions in inches

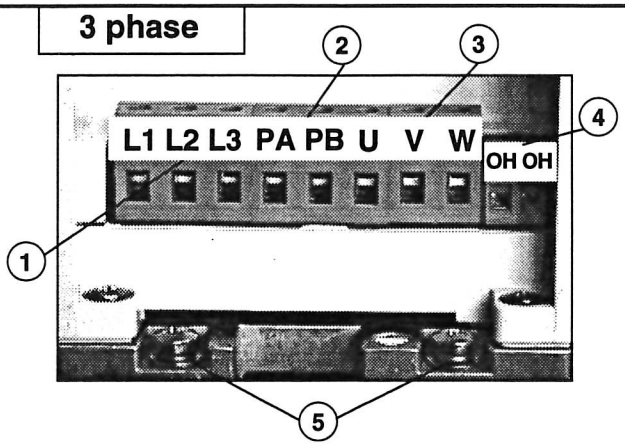
2.4 Summary of the Power Circuit Terminals

Housing size D

1 phase

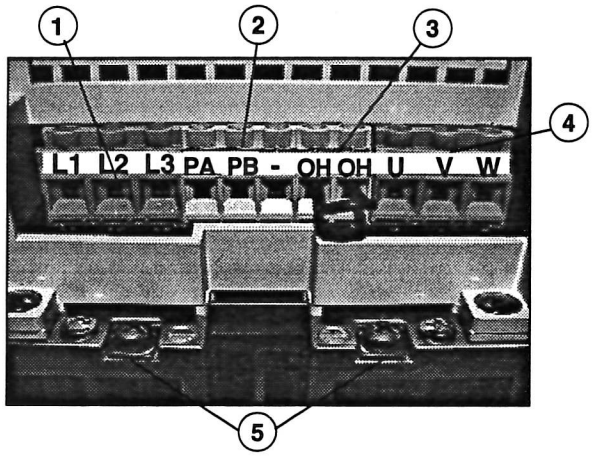


3 phase



①	**L1, N**	1 phase supply voltage	③	**U, V, W**	Motor connection
	L1, L2, L3	3 phase supply connection	④	**OH, OH**	Connection for temperature sensor
②	**PA, PB**	Connection for braking resistor	⑤	⏚	Connection for earth ground

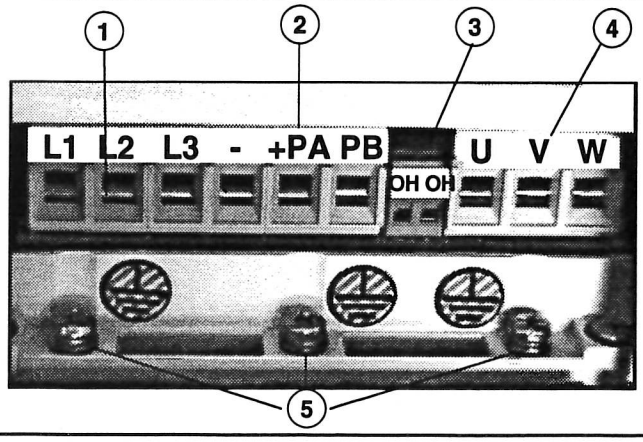
Housing size E



①	**L1, L2, L3**	3 phase supply voltage
②	**PA, PB**	Connection for braking resistor
	PA, -	Connection for braking module
③	**OH, OH**	Connection for temperature sensor
④	**U, V, W**	Motor connection
⑤	⏚	Connection for earth ground

⚠ Note -Always verify input voltage with name plate for proper connection.

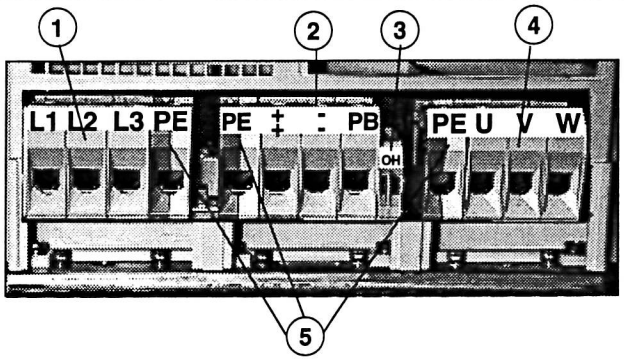
Housing size G



①	**L1, L2, L3**	3 phase supply voltage
②	**+PA, PB**	Connection for braking resistor
	+PA, -	Connection for braking module
③	**OH, OH**	Temperature sensor
④	**U, V, W**	Motor connection
⑤	⏚	Connection for earth ground

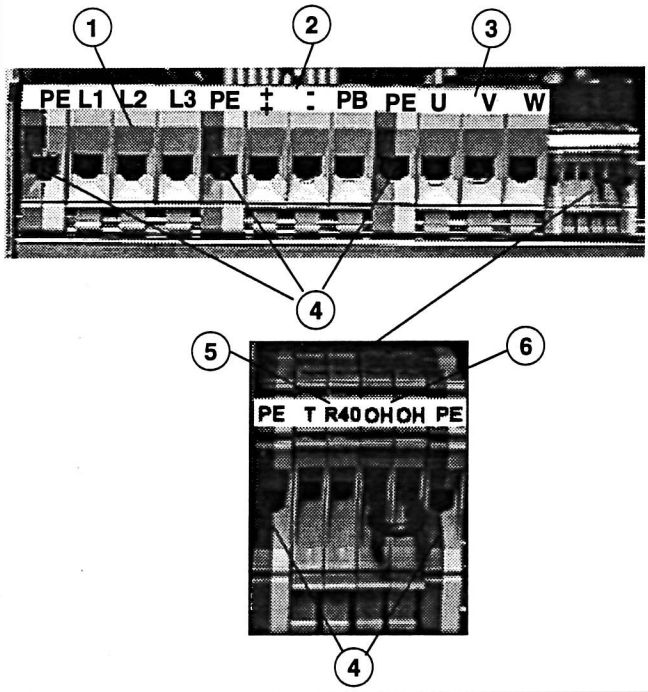
⚠ Note -Always verify input voltage with name plate for proper connection.

Housing size H



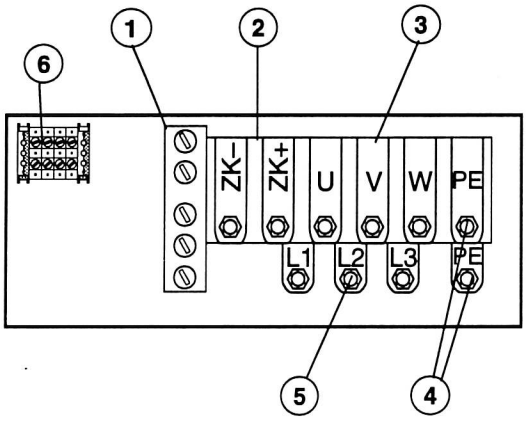
1	**L1, L2, L3**	3 phase supply voltage
2	**++, PB**	Connection for braking resistor
	++, --	Connection for braking module or DC input 420...720V DC
3	**OH, OH**	Connection for temperature sensor
4	**U, V, W**	Motor connection
5	**PE**	Connection for earth ground

Housing size K and L



1	**L1, L2, L3**	3 phase supply voltage
2	**++, PB**	Connection for braking resistor
	++, --	Connection for braking module DC input 420...720V DC
3	**U, V, W**	Motor connection
4	**PE**	Connection for earth ground
5	**T, R40**	Connection for separate supply (see Annex B)
6	**OH, OH**	Connection for temperature sensor

Housing size M, N and P

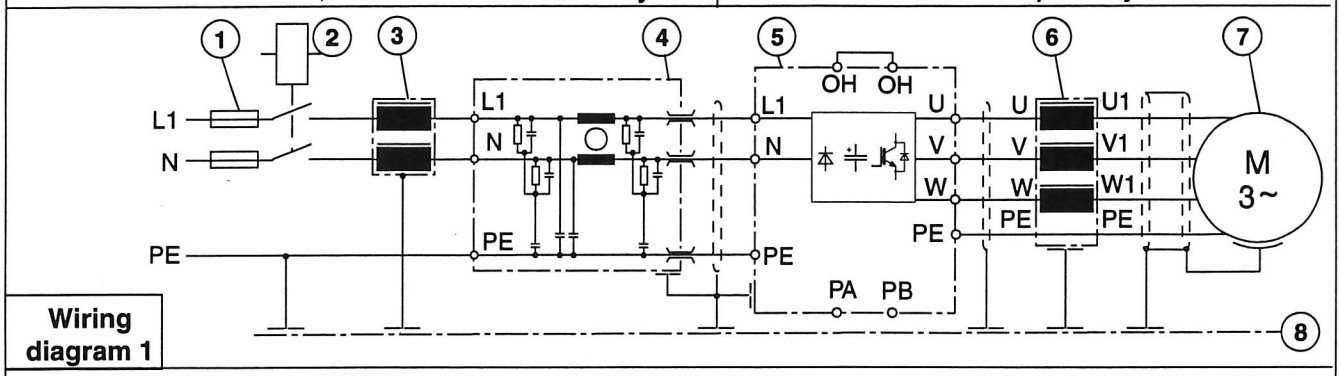


1	**F1...F5**	Fuses for control circuits (10A / 500V slow blow)
2	**-ZK, +ZK**	Connection for braking module
3	**U, V, W**	Motor connection
4	**PE, PE**	Connection for earth ground
5	**L1, L2, L3**	3 phase supply voltage
6	**OH, OH**	Connection for temperature sensor
	PE	Connection for earth ground
	X901/X902	Reserved Caution! These terminals are at the DC bus potential!

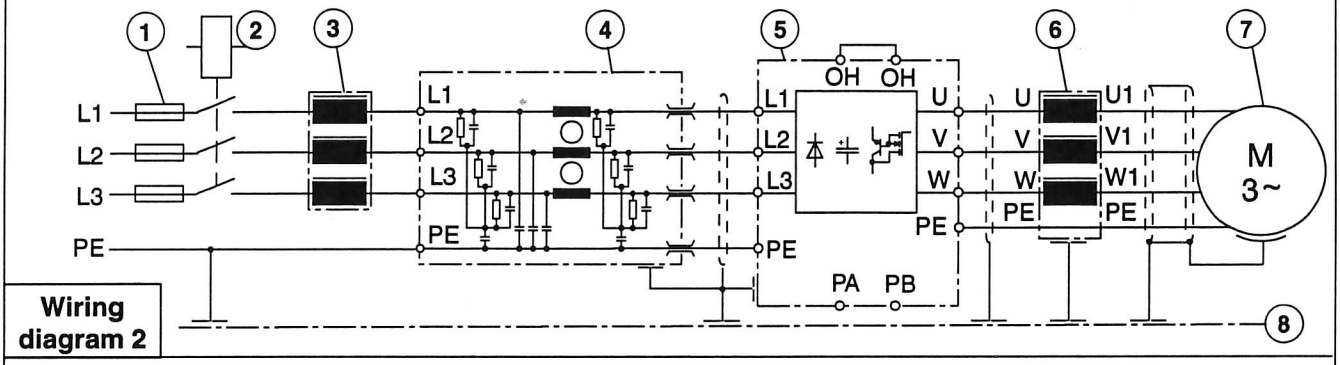
2.5 Connection of the Power Circuit

⚠ If the supply voltage is connected to the motor terminals, the unit will be destroyed!

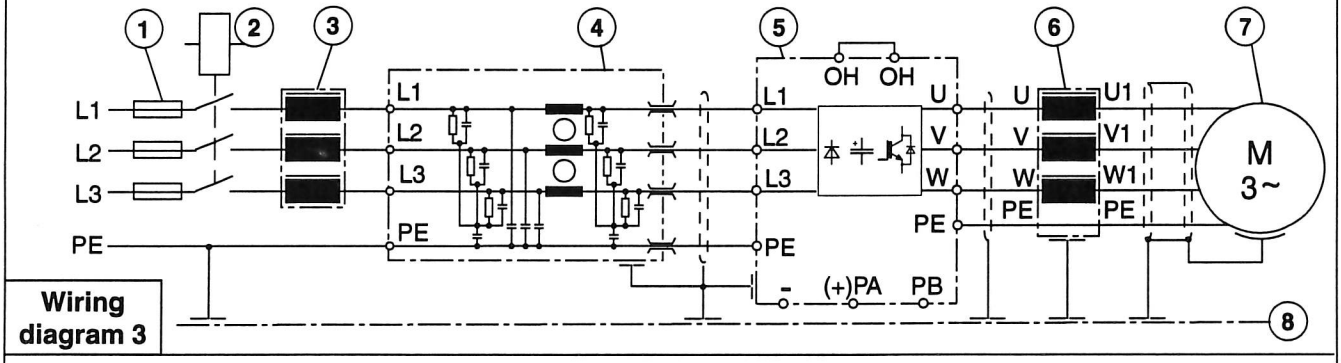
⚠ Pay attention to the supply voltage and the correct polarity of the motor!



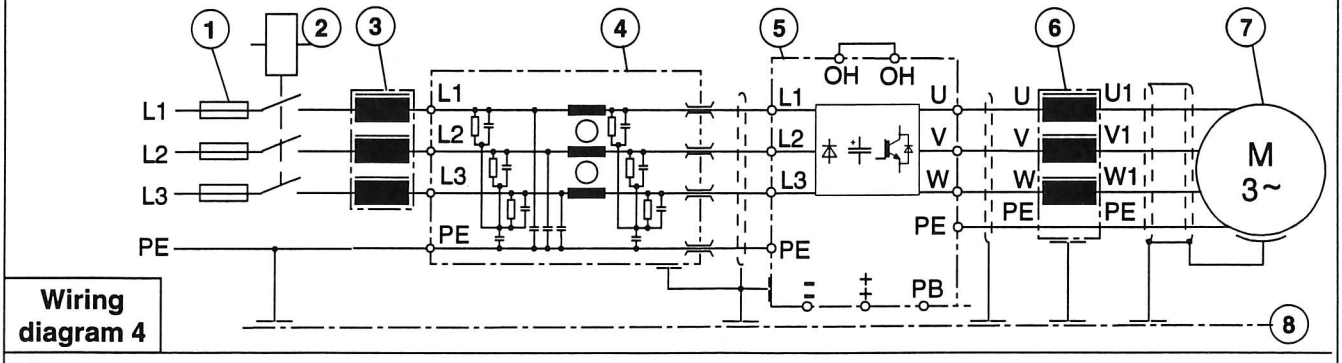
Wiring diagram 1



Wiring diagram 2



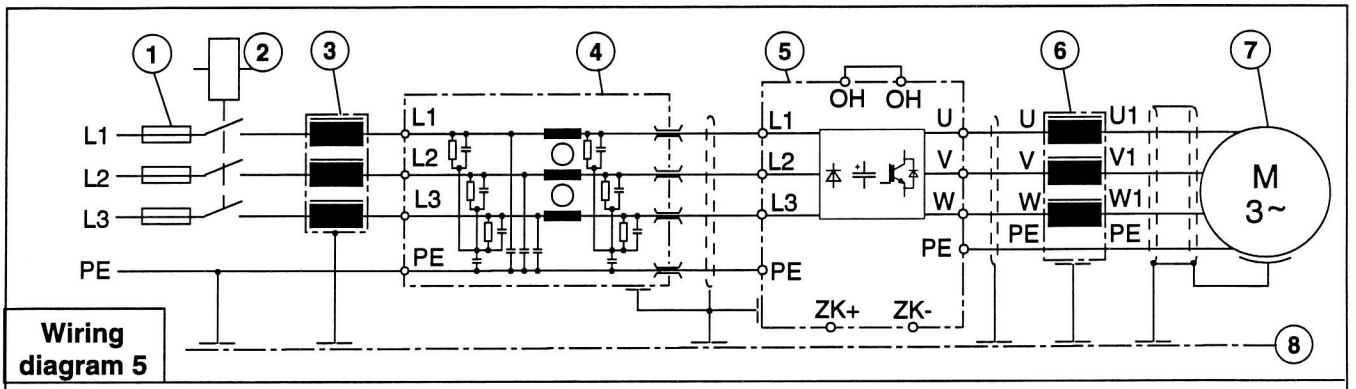
Wiring diagram 3



Wiring diagram 4

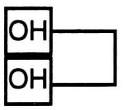
(1)	**Supply fuse** (see technical data for sizing)	(5)	**Vista IV Inverter**
(2)	**Supply contactor**	(6)	**Motor choke or output filter**
(3)	**Input choke** (Must be installed with units ≥ 100 hp)	(7)	**Motor**
(4)	**Interference suppression filter** (for CE)	(8)	**Mounting plate in control cabinet**

For additional information about when the additional components are required see Annex C.

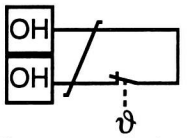


Wiring diagram 5

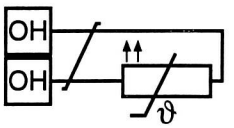
External temperature sensing
(for all units)



Jumper terminals when not using this function

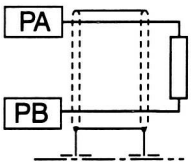


Thermo-switch (NC-contact)

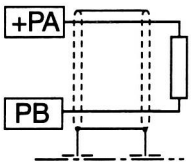


Temperature sensor (PTC)
1,5kΩ trigger resistance
500 Ω reset resistance

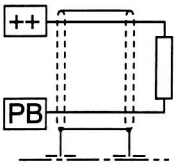
Connection of braking resistor
(only when internal braking transistor is installed, see page 5 in order to identify whether the unit has this option)



for wiring diagram 1 and 2

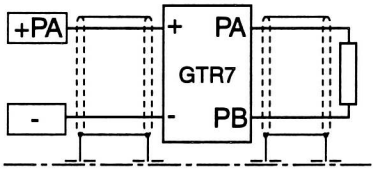


for wiring diagram 3

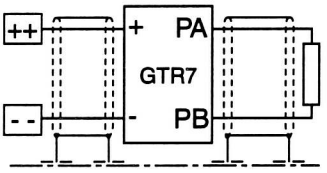


for wiring diagram 4

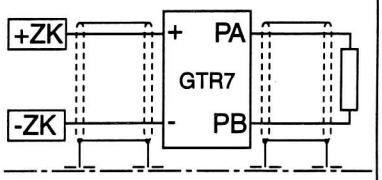
Connection of a braking module



for wiring diagram 3

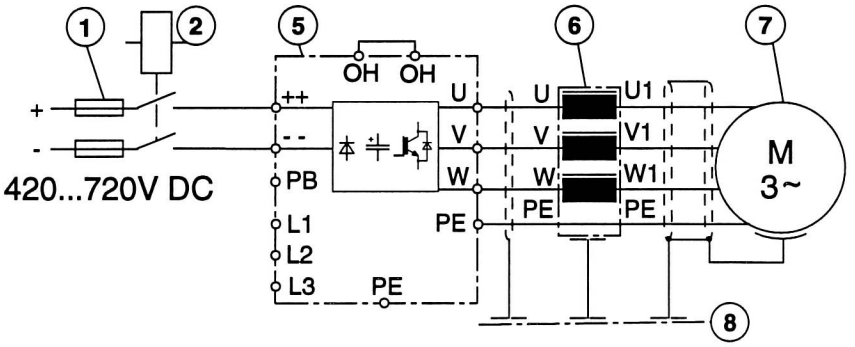


for wiring diagram 4



for wiring diagram 5

DC supply voltage input
(only when terminals ++ and - - are present. Inverter must be ordered from factory as DC supply, see page 5 for part numbers.)



(1)	**Supply fuse** (see technical data for sizing)	(5)	**Vista IV Inverter**
(2)	**Supply contactor**	(6)	**Motor choke or output filter**
(3)	**Input choke** (Must be installed with units ≥ 100 hp)	(7)	**Motor**
(4)	**Interference suppression filter** (for CE)	(8)	**Mounting plate in control cabinet**

For additional information about when the additional components are required see Annex C.

3. Accessories

3.1 Braking resistor

The Vista IV inverter can be equipped with an external braking resistor or an external braking module for limited 4 quadrant operation. The energy the motor regens into the inverter during deceleration is dissipated through the braking transistor to the braking resistor.

Installation Instructions

The braking resistor heats up during braking. If it is installed inside a control cabinet, sufficient interior cooling must be provided. The resistor should be mounted above and a minimum of 9 inches away from the inverter.

Selection of the braking resistor

Different braking resistors are available from Carotron. They are selected according to their application requirements. The selection formulas and technical data of the resistors are listed on the following pages. The procedure for selecting a braking resistor is outlined below.

1. Establish desired braking time.
2. Calculate braking time without braking resistor (t_{Bmin}).
3. If the desired braking time is shorter than the calculated braking time, it will be necessary to use a braking resistor. ($t_B < t_{Bmin}$)
4. Calculate braking torque (T_B) taking the load torque into account.
5. Calculate peak braking power (P_B). This must always be calculated for the "worst case" (n_{max} to standstill).
6. Selection of the braking resistors:
   a) The resistor should be selected so that $P_R \geq P_B$.
   b) P_N is to be selected according to the duty cycle factor (d.c.f.).
   The braking resistors may only be used for the specified value.
   The maximum ON period of the braking resistor may not be exceeded.
   6 % d.c.f. = maximum braking time 8 s
   25 % d.c.f. = maximum braking time 30 s
   40 % d.c.f. = maximum braking time 48 s
   Longer ON periods require specially-designed braking resistors.
   Take into account the current through the braking transistor.
7. Check whether the desired braking time is attained with the selected braking resistor (t_{Bmin}).

Note: Consider the capacity of the braking resistor and motor. The braking torque may not exceed the rated torque of the motor by more than 1.5 times. To realize maximum possible braking torque, the frequency inverter must be sized for the increased motor current.

Braking time

The braking time is adjusted in the frequency inverter through the deceleration parameters. If the selected deceleration time is too short, either the peak inverter current level or the maximum DC bus voltage will be exceeded. The error message ***E.OC*** or ***E.OP*** will result. The following formulas can be used to determine an allowable braking time.

Formulas

1. Braking time without braking resistor

$$t_{Bmin} = \frac{(J_M + J_L) \bullet (n_1 - n_2)}{9.55 \bullet (K \bullet T_N + T_L)}$$

Valid range: $n_1 > n_N$

(field weakening)

2. Braking torque (required)

$$T_B = \frac{(J_M + J_L) \bullet (n_1 - n_2)}{9.55 \bullet t_B} T_L$$

Conditions: $T_B \leq 1.5 \bullet T_N$

$f \leq 1.4$ x rated frequency of motor

3. Peak braking power

$$P_B = \frac{T_B \bullet n_1}{9.55}$$

Conditions: $P_B \leq P_R$

4. Braking time with braking resistor

$$t_{Bmin} * = \frac{(J_M + J_L) \bullet (n_1 - n_2)}{9.55 \bullet (K \bullet T_N + T_L + \frac{P_R \bullet 9.55}{(n_1 - n_2)})}$$

Valid range: $n_1 > n_N$

Conditions: $\frac{P_R \bullet 9.55}{(n_1 - n_2)} \leq T_N \bullet (1.5 - K)$

$f \leq 1.4$ x rated frequency of motor

$P_B \leq P_R$

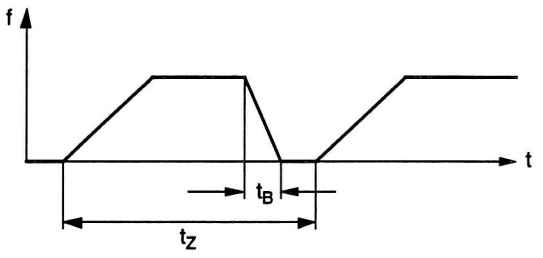
On period d.c.f.

ON period d.c.f for cycle time $t_Z \leq 120$ s

$$d.c.f = \frac{t_B}{t_Z} \bullet 100\ \%$$

ON period d.c.f for cycle time $t_Z > 120$ s

$$d.c.f = \frac{t_B}{120\ s} \bullet 100\ \%$$



Definitions

K =	0.25 for motors	up to 2 hp
	0.20 for motors	3 to 5 hp
	0.15 for motors	7.5 to15 hp
	0.08 for motors	20 to 60 hp
	0.05 for motors	75 to 300 hp

J_M	=	Moment of inertia of the motor	[kgm²]	T_B	=	Braking torque (required)	[Nm]
J_L	=	Moment of inertia of the load	[kgm²]	T_L	=	Load torque	[Nm]
n_1	=	Motor speed before deceleration	[rpm]	t_B	=	Braking time (required)	[s]
n_2	=	Motor speed after deceleration (Stand still = 0 rpm)	[rpm]	t_{Bmin}	=	Minimum braking time	[s]
				t_Z	=	Cycle time	[s]
n_N	=	Motor rated speed	[rpm]	P_B	=	Peak braking power	[W]
T_N	=	Motor rated torque	[Nm]	P_R	=	Peak power dissipation of the resistor	[W]

Resistor part number

xx.56.080-4xx8

- 00 = 6 % d.c.f. 01 = 25 % d.c.f. 02 = 40 % d.c.f.
- Voltage class 2 = 230V 4 = 400V
- Braking resistor
- Size

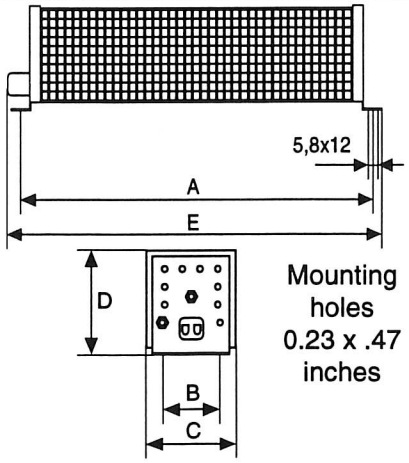
Technical data of the braking resistors

Part number	R_B [OHM]	P_R [2] [kW]	Use with inverter size	P_N Nominal power [1] [W] 6 %	25 %	40 %
07.53.080-2008	100	1.4	07...09	150		
10.56.080-2xx8	68	2.1	10...12	285	800	1000
11.56.080-2xx8	47	3.0	10...12	300	1000	1200
12.56.080-2xx8	33	4.3	12	430	1200	1600
13.56.080-2xx8	27	5.2	12	600	1700	2700
09.56.080-4xx8	390	1.5	07...09	150	430	800
10.56.080-4xx8	270	2.1	10...12	285	600	1000
11.56.080-4xx8	180	3.2	13	300	1000	1200
12.56.080-4xx8	150	3.9	13...14	430	1200	1700
13.56.080-4xx8	100	5.8	13...15	600	1700	2700
14.56.080-4xx8	82	7.0	13...15	800	2700	3700
15.56.080-4xx8	56	10.3	13...16	1200	3700	5500
16.56.080-4xx8	39/40	14.8/14.4	15...18	1700	5000	7500
17.56.080-4xx8	27 / 28	21.4 / 20.6	15...20	3000	7500	11500
18.56.080-4xx8	22	26.3	16...21	4000	9000	13500
19.56.080-4xx8	16	36.1	18...22	5500	12000	17000
20.56.080-4xx8	13	44.4	19...22	6500	16500	20000
21.56.080-4xx8	11	52.5	19...22	8000	20500	25000
22.56.080-4xx8	8.9 / 9.0	64.9 / 64.2	20...22	9500	25000	30000
23.56.080-4xx8	6.1 / 6.2	94.7 / 93.2	22	14000	31000	45500

[1] The nominal power (P_N) of the resistor to be selected is dependent on the peak braking power P_B and the duty cycle factor d.c.f [%].

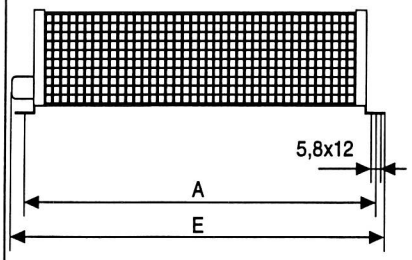
[2] Peak power dissipation of the resistor P_R.

Dimensions 200V

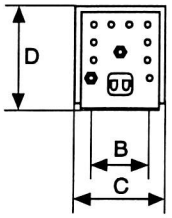


Part number	R_B [Ohm]	P_N [W]	A	B	C	D	E
			Dimensions in inches				
07.53.080-2008	100	150	7.2	1.9	3.0	3.4	8.9
10.56.080-2008	68	285	12.7	1.9	3.0	3.4	14.4
10.56.080-2018	68	600	16.8	2.5	3.6	4.7	18.3
10.56.080-2028	68	1000	24.6	2.5	3.6	4.7	26.2
11.56.080-2008	47	300	12.8	1.9	3.0	3.4	13.8
11.56.080-2018	47	1000	24.6	2.5	3.6	4.7	25.6
11.56.080-2028	47	1200	16.8	5.9	7.3	4.7	17.7
12.56.080-2008	33	430	12.8	2.5	3.6	4.7	13.8
12.56.080-2018	33	1200	16.8	5.9	7.3	4.7	17.7
12.56.080-2028	33	1700	16.9	7.5	9.1	5.7	17.7
13.56.080-2008	27	600	16.8	2.5	3.6	4.7	17.7
13.56.080-2018	27	1700	16.9	7.5	9.1	5.7	17.7
13.56.080-2028	27	2700	24.8	7.5	9.1	5.7	25.6

Dimensions 400V

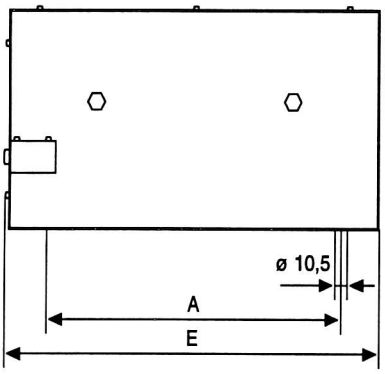


Mounting holes
0.23 x .47 inches

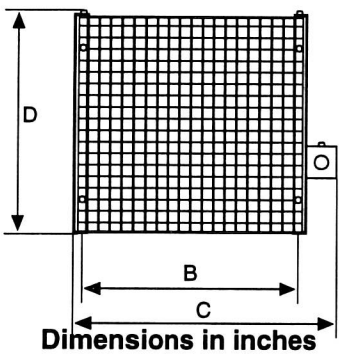


Dimensions in inches

Part number	R_B[Ohm]	P_N[W]	A	B	C	D	E
09.56.080-4008	390	150	7.2	1.9	3.0	3.4	8.9
09.56.080-4018	390	430	12.8	2.5	3.6	4.7	14.4
09.56.080-4028	390	800	20.7	2.5	3.6	4.7	22.3
10.56.080-4008	270	285	12.7	1.9	3.0	3.4	14.4
10.56.080-4018	270	600	16.8	2.5	3.6	4.7	18.4
10.56.080-4028	270	1000	24.6	2.5	3.6	4.7	26.2
11.56.080-4008	180	300	12.8	1.9	3.0	3.4	13.8
11.56.080-4018	180	1000	24.6	2.5	3.6	4.7	25.6
11.56.080-4028	180	1200	16.8	5.9	7.3	4.7	17.7
12.56.080-4008	150	430	12.8	2.5	3.6	4.7	13.8
12.56.080-4018	150	1200	16.8	5.9	7.3	4.7	17.7
12.56.080-4028	150	1700	16.9	7.5	9.1	5.7	17.7
13.56.080-4008	100	600	16.8	2.5	3.6	4.7	17.7
13.56.080-4018	100	1700	16.9	7.5	9.1	5.7	17.7
13.56.080-4028	100	2700	24.8	7.5	9.1	5.7	25.6
14.56.080-4008	82	800	20.7	2.5	3.6	4.7	21.7
14.56.080-4018	82	2700	24.8	7.5	9.1	5.7	25.6
14.56.080-4028	82	3700	32.7	7.5	9.1	5.7	33.5
15.56.080-4008	56	1200	16.8	5.9	7.3	4.7	17.7
15.56.080-4018	56	3700	32.7	7.5	9.1	5.7	33.5
15.56.080-4028	56	5500	32.7	11.8	13.4	5.7	33.5
16.56.080-4008	39	1700	16.9	7.5	9.1	5.7	17.7
16.56.080-4018	39	5000	15.0	14.6	16.9	10.2	19.3
16.56.080-4028	40	7500	15.0	22.4	24.8	10.2	19.3
17.56.080-4008	28	3000	15.0	10.6	330	10.2	19.3
17.56.080-4018	27	7500	15.0	22.4	24.8	10.2	19.3
17.56.080-4028	28	11500	15.0	30.3	32.7	10.2	19.3
18.56.080-4008	22	4000	15.0	14.6	16.9	10.2	19.3
18.56.080-4018	22	9000	15.0	22.4	24.8	10.2	19.3
18.56.080-4028	22	13500	15.0	30.3	32.7	10.2	19.3
19.56.080-4008	16	5500	15.0	14.6	16.9	10.2	19.3
19.56.080-4018	16	12000	15.0	30.3	32.7	10.2	19.3
19.56.080-4028	16	17000	15.0	38.2	1030	10.2	19.3
20.56.080-4008	13	6500	15.0	22.4	24.8	10.2	19.3
20.56.080-4018	13	16500	15.0	38.2	39.2	10.2	19.3
20.56.080-4028	13	20000	15.0	38.2	39.2	10.2	19.3
21.56.080-4008	11	8000	15.0	22.4	24.8	10.2	19.3
21.56.080-4018	11	20500	15.0	38.2	39.2	10.2	19.3
21.56.080-4028	11	25000	15.0	30.3	31.3	28.0	19.3
22.56.080-4008	8.9	9500	15.0	22.4	24.8	10.2	19.3
22.56.080-4018	9.0	25000	15.0	30.3	31.3	28.0	19.3
22.56.080-4028	9.0	30000	15.0	30.3	31.3	28.0	19.3
23.56.080-4008	6.1	14000	15.0	30.3	31.3	10.2	19.3
23.56.080-4018	6.2	31000	15.0	30.3	31.3	28.0	19.3
23.56.080-4028	6.2	45500	15.0	30.3	31.3	37.8	19.3



Mounting holes
dia.= 0.40 inches

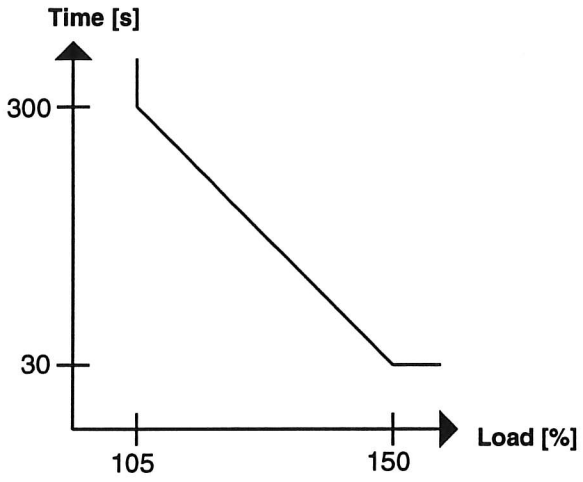


Dimensions in inches

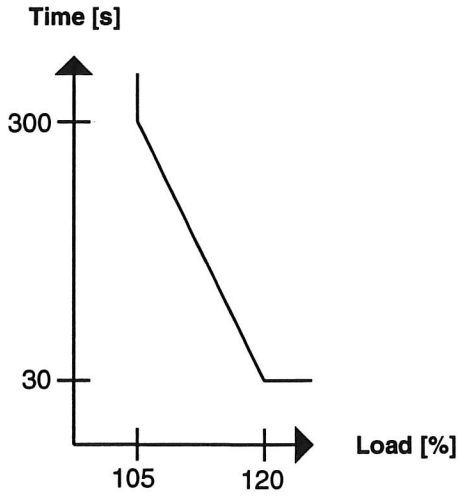
4. Annex A

4.1 Overload curve

Housing sizes D,E,G,H,K,L

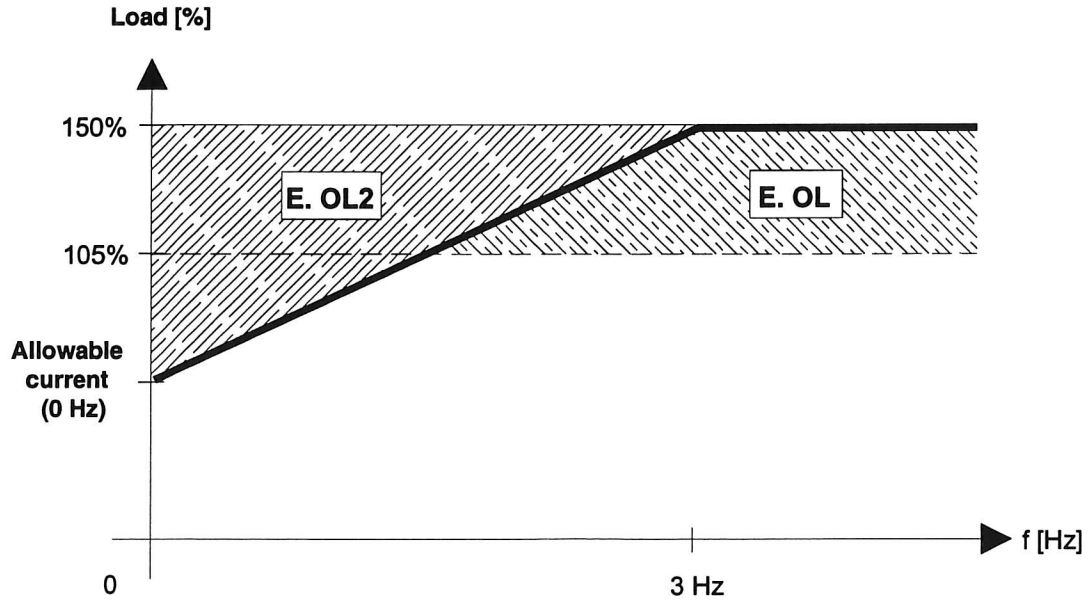


Housing sizes M,N,P



4.2 Low speed overload protection

(only valid for F4-F housing sizes G, H, K, L)



$$\text{Allowable current (0Hz)} = \frac{I_{\text{continuous@90°C}} \times (180°\text{C} - \text{heat sink temperature})}{90°\text{C}}$$

5. Annex B

5.1 External power supply for control circuits

In the K and L size housings, it is possible to run the control circuits of the inverter from a separate voltage supply. This may be necessary if it is desired to shut down the power stage (i.e. remove supply voltage) but still maintain communication with or functionality of the control stage. To set the inverter for this type of operation the wires connected to CN21 and CN22 on the driver card must be switched (see drawing below). The external power supply 305 to 500VAC or 420 to 720 VDC must be connected to the terminals T and R40 on the main power terminal strip.

6. Annex C

6.1 Usage of input chokes

Input chokes are typically required when the supply voltage contains voltage spikes, interference voltage or when harmonic distortion of the input current must be kept to a minimum.

In the first case, interference and or voltage spikes on the supply voltage are created when large loads such as heaters, motors, arc-welders etc. are turned on and off. In some instances, switching in and out large power factor correction capacitors either in the factory or on the utility grid can also lead to large voltage spikes appearing at the inverter. These spikes are typically short but high enough to create nuisance tripping of the inverter i.e. E.OP. The voltage spike enters the inverter and raises the DC bus voltage level above the predefined limit, 400V in 230V units and 800V in 460V units. The protection circuits in the inverter activate leading to an interruption in the operation of the unit.

When installing larger inverters (100 hp and greater), harmonic distortion in the line current can become a problem. This distortion is caused by the diode bridge rectifier which serves as the input to all inverters. This distortion can create large fluctuations in the line voltage within a facility leading to problems with other equipment. The choke reduces the distortion of the current there by eliminating the associated problems.

6.2 Input Filters EMC/EMI

Generally, the input filter is required whenever the inverter is required to meet the CE EMC directive 89/339.

The inverter produces high frequency electromagnetic interference as a result of the PWM output. This interference is transmitted back to the supply through the input rectifier and the supply wires. The filter is placed between the supply voltage and the inverter. It shunts the high frequency interference to earth ground, eliminating the interference. For CE purposes the filter is to be mounted with the inverter and together reduces the inverter noise emissions to meet EN 50081-2 level A. The filter also reduces external interference entering the inverter to meet the noise immunity standard EN 50082-2 level A.

On the smaller units the filters mount under the heatsink of the inverter using no additional panel space. The midsize units are mounted with the filter external and to the side of the inverter. The larger units either have the filter installed inside the main housing or outside depending on the size. For more information contact KEBCO.

6.3 Motor chokes and output filters

Motor chokes should be considered whenever the length of the motor wires exceeds 25 feet. Even when using an "Inverter Duty Motor", the choke should be installed. The choke is designed to limit the rate of change of the voltage or (DV/DT) at the motor windings. As the rate of change increases, capacitive currents flow between the individual windings in the motor. This leads to additional stress and heat in the motor windings. In addition, high DV/DT can generate voltage peaks on the motor leads. These peaks can often exceed the insulation rating of the motor windings and or the breakdown voltage ratings of the IGBT transistors in the inverter. When not eliminated, the voltage peaks can lead to premature failure of the motor windings and or the power transistors in the inverter. Installing a motor choke will typically result in between a 3% to 5% loss in motor voltage. In most applications this leads to a negligeable reduction in motor toque.

Output filters, DV/DT filters, or Sine Wave filters can be used to eliminate the same problems stated above. Due to the design of the filter, the DV/DT of the motor voltage can be greatly reduced as compared to a choke and the insertion loss is minimal. The high frequency energy can be returned to the DC bus of the inverter and used again. Sine Wave filters can be used to eliminate the PWM switching and produce a sine wave of variable voltage and frequency. This is an advantage with very long motor cables or when shielding of the motor leads is not possible.

CAROTRON Inc.
3204 Rocky River Rd.
Heath Springs, SC 29058
Tel. 803-286-8614 / Fax 803-286-6063