

**MICRO SERIES  
INVERTER DRIVES**

Full feature, ultra-friendly operation.  
Programs and reads-out in plain English.

- Intelligent Power Module-IGBT's with a 16 bit Intel microprocessor.
- User choice programming with:
  - ✓ Choice of "Quick Start" factory presets.
  - ✓ Built-In English programmable options via the key touch-pad.
- Output Frequency: 0-120 Hz.
- Overload Current Capacity: 150% for one minute, based on nominal output of the control.
- Speed reference signal. Choice of potentiometer, 0-10VDC or 4-20mA inputs.
- Analog output signal, 0-10VDC, speed or load.
- Two auxiliary contacts: One form C relay and two open collector output.
- Preset speeds: Four.
- Slip compensation.
- Adjustable carrier frequency.
- Adjustable acceleration and deceleration times.
- Forward/Reverse.
- DC braking—time and voltage adjustable.
- Password protected.
- Constant torque—with adjustable current limit.
- 150% overload capacity for one minute based on nominal output rating of the control.
- Rugged, heavy-gauge steel enclosures with barrier type terminal strips.
- Underwriters Laboratories Listed.
- Dynamic Braking is available as a kit for installation in the field (see page 110), or as a Modification (see page 131).
- Remote keypad is available as a kit for installation in the field (see page 110), or as a Modification (see page 130).



NEMA 1

**Speedmaster® Micro Series compact inverters** offer "big drive" features for adapting standard or premium efficiency three phase motors to adjustable speed operation. Utilizing the latest micro-processor and advanced IGBT power conversion devices, these high performance controls program and read-out in plain English, eliminating the frustration and time involved in looking-up confusing coded symbols. Complete, rugged steel enclosures for NEMA 1 (IP31) or NEMA 4/12 (IP65) service do not require additional enclosure protection as with many plastic-housed compact drives. Built-in thermal overload protection reduces additional costs. Heavy duty wiring terminals accessible via three conduit openings on the bottom of the housing for power in/out and input/output signals speeds installation and reduces installation costs.

Effective July 1, 2006, the Micro Series inverters have PID software built in making them a closed-loop inverter if needed.



Catalog numbers in blue are NEW items.

**NEMA 1 (IP31) • THREE PHASE INPUT/OUTPUT**

	HP	Output Amps	Input Voltage ☆	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
200-240 Volts	1/2	2.2	200-240	<b>174914</b>	\$801	6	A	B
	1	4.0	200-240	<b>174915</b>	842	6	A	C
	1 1/2	5.2	200-240	<b>174916</b>	882	6	A	C
	2	6.8	200-240	<b>174917</b>	943	9	A	E
	3	9.6	200-240	<b>174918</b>	1014	9	A	E
	5	15.2	200-240	<b>174919</b>	1198	11	A	F
	7 1/2	25.0	200-240	<b>174545</b>	1731	13	A	M
	10	28.0	200-240	<b>174551</b>	2295	15	A	L
	15	42.0	200-240	<b>174557</b>	3028	19	A	N
	20	54.0	200-240	<b>174560</b>	4110	21	A	P
	25	68.0	200-240	<b>174569</b>	4977	38	A	T
	30	80.0	200-240	<b>174571</b>	5973	44	A	T
400-480 Volts	40	104.0	200-240	<b>174576</b>	9200	130	A	AE
	60	154.0	200-240	<b>174578</b>	13000	185	A	AF
	1	2.0	400-480	<b>174920</b>	1011	6	A	B
	2	3.4	400-480	<b>174921</b>	1109	7	A	D
	3	4.8	400-480	<b>174922</b>	1198	9	A	E
	5	7.6	400-480	<b>174923</b>	1347	9	A	E
	7 1/2	11.0	400-480	<b>174924</b>	1831	11	A	I
	10	14.0	400-480	<b>174552</b>	2487	13	A	M
	15	21.0	400-480	<b>174558</b>	3195	15	A	L
	20	27.0	400-480	<b>174561</b>	4240	17	A	N
	25	34.0	400-480	<b>174563</b>	4999	21	A	P
	30	40.0	400-480	<b>174565</b>	5443	21	A	P
	40	52.0	400-480	<b>174567</b>	6273	35	A	T
	50	65.0	400-480	<b>174593</b>	7647	44	A	W
	60	77.0	400-480	<b>174572</b>	8400	44	A	W
75	96.0	200-240	<b>174580</b>	10650	185	A	AG	
100	124.0	200-240	<b>174582</b>	12950	250	A	AH	
125	156.0	200-240	<b>174584</b>	14550	260	A	AH	
150	180.0	200-240	<b>174586</b>	19850	360	A	AL	
480-590 Volts	1	1.6	480-590	<b>174925</b>	1120	6	A	B
	2	2.7	480-590	<b>174926</b>	1238	7	A	D
	3	3.9	480-590	<b>174927</b>	1369	9	A	E
	5	6.1	480-590	<b>174928</b>	1491	9	A	F
	7 1/2	9.0	480-590	<b>174929</b>	1824	11	A	I
	10	11.0	480-590	<b>174553</b>	2779	13	A	R
	15	17.0	480-590	<b>174559</b>	3670	17	A	N
	20	22.0	480-590	<b>174562</b>	4661	19	A	O
	25	27.0	480-590	<b>174564</b>	5505	21	A	P
	30	32.0	480-590	<b>174598</b>	6021	22	A	S
	40	41.0	480-590	<b>174599</b>	6837	38	A	T
50	52.0	480-590	<b>174594</b>	8295	45	A	W	
60	62.0	480-590	<b>174573</b>	9279	51	A	W	

☆ User programmable for 50Hz and other voltage inputs

**NEMA 1 (IP31) • SINGLE PHASE INPUT  
230V THREE PHASE OUTPUT**

(Use with three phase 230V motor)

	HP	Output Amps 230 VAC	Input Voltage	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
	1/4	1.4	115/230	<b>174930</b>	\$757	5	A	A
	1/2	2.2	115/230	<b>174997</b>	914	7	A	AC
	1	4.0	115/230	<b>174931</b>	921	7	A	D
	1 1/2	5.2	115/230	<b>174932</b>	1020	7	A	D
	2	6.8	200-230	<b>174933</b>	973	9	A	E
	3	9.6	200-230	<b>174934</b>	1072	9	A	E

# AC ADJUSTABLE SPEED DRIVES MICRO SERIES INVERTERS



## WASHGUARD NEMA 4/12 (IP65/IP54) EPOXY COATED

**FOOD-SAFE** epoxy finish. No external cooling fan required on NEMA 4 (IP65) drives. NEMA 12 drives have external cooling fan. Fully gasketed, water, oil and dust-tight enclosure. These Speedmaster® Micro Series drives have the same features as units shown on the previous page.



WASHGUARD NEMA 4/12

## WASHGUARD NEMA 4/12 (IP65/IP54) THREE PHASE INPUT/OUTPUT

	HP	Output Amps	Input Voltage:☆	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
200-240 Volts	1/2	2.2	200-240	174935	\$1136	8	A	G
	1	4	200-240	174936	1233	8	A	G
	1 1/2	5.2	200-240	174482	1250	8	A	Y
	2	6.8	200-240	174937	1322	10	A	H
	3	9.6	200-240	174938	1429	11	A	J
	5	15.2	200-240	174730	1763	11	A	K
	7 1/2	22	200-240	174734	2445	27	A	Q
	10	28	200-240	174737	3085	32	A	U
	15	43	200-240	174740	3720	40	A	V
	20	54	200-240	174743*	4775	42	A	AA
	25	68	200-240	174595	6544	53	A	Z
	30	80	200-240	174596	6934	53	A	Z
	40	104	200-240	174577	10100	150	A	AM
	60	154	200-240	174579	13950	200	A	AN
	400-480 Volts	1	2	400-480	174939	1390	8	A
2		3.4	400-480	174940	1534	10	A	H
3		4.8	400-480	174941	1643	10	A	H
5		7.6	400-480	174942	1817	11	A	J
7 1/2		11	400-480	174548	2303	11	A	K
10		14	400-480	174554	3071	11	A	Q
15		21	400-480	174749	3825	32	A	U
20		27	400-480	174752	4906	36	A	V
25		34	400-480	174755*	5664	42	A	AA
30		40	400-480	174757*	6190	53	A	AA
40		52	400-480	174513*	7160	54	A	Z
50		65	400-480	174511*	8310	75	A	AB
60		77	400-480	174574*	9356	98	A	AB
75		96	200-240	174581	11550	200	A	AJ
100		124	200-240	174583	13950	300	A	AP
125	156	200-240	174585	15850	310	A	AO	
480-590 Volts	1	1.6	480-590	174943	1512	8	A	G
	2	2.7	480-590	174944	1687	10	A	H
	3	3.9	480-590	174945	1839	10	A	H
	5	6.1	480-590	174946	1980	11	A	J
	7 1/2	9	480-590	174549	2723	13	A	K
	10	11	480-590	174556	3571	17	A	Q
	15	17	480-590	174763	4314	38	A	U
	20	22	480-590	174766	5251	40	A	V
	25	27	480-590	174769*	6262	42	A	AA
	30	32	480-590	174597*	6873	53	A	AA
	40	41	480-590	174512*	7957	54	A	Z
	50	52	480-590	174510*	9289	75	A	AB
60	62	480-590	174575*	10391	98	A	AB	

☆ User programmable for 50Hz and other voltage inputs  
\* Enclosures are NEMA 12 only – others are NEMA 4/12



Standard at no extra cost on all LEESON stock NEMA three phase motors, 1 HP and larger, is the exclusive Inverter Rated Insulation System (IRIS™), providing superior protection against voltage spikes induced by variable frequency drives.

Catalog numbers in blue are NEW items.

## WASHGUARD NEMA 4X (IP65) STAINLESS STEEL

**300-SERIES STAINLESS STEEL NEMA 4X** enclosures are fully gasketed to withstand frequent washdown but must be protected from caustic agents. Paint-free stainless steel, no external fans, and anodized aluminum heat sinks provide superior heat transfer and greater structural integrity compared to plastic or fiberglass enclosures. These Speedmaster™ Micro Series drives have the same features as the NEMA 1 drives on the previous page.



WASHGUARD NEMA 4X

## WASHGUARD NEMA 4X (IP65) THREE PHASE INPUT/OUTPUT

	HP	Output Amps	Input Voltage:☆	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
200-240 Volts	1/2	2.2	200-240	174527	\$1334	8	A	G
	1	4	200-240	174528	1431	8	A	G
	1 1/2	5.2	200-240	174529	1498	8	A	Y
	2	6.8	200-240	174530	1588	10	A	H
	3	9.6	200-240	174531	1668	11	A	J
	5	15.2	200-240	174732	2323	11	A	K
	7 1/2	22	200-240	174735	2859	27	A	Q
	10	28	200-240	174738	3566	32	A	U
	15	43	200-240	174741	4358	40	A	V
	400-480 Volts	1	2	400-480	174532	1573	8	A
2		3.4	400-480	174533	1781	10	A	H
3		4.8	400-480	174534	1912	10	A	H
5		7.6	400-480	174535	2182	11	A	J
7 1/2		11	400-480	174745	2959	11	A	K
10		14	400-480	174747	3666	11	A	Q
15		21	400-480	174750	4386	32	A	U
480-590 Volts	20	27	400-480	174753	5414	36	A	V
	1	1.6	480-590	174536	1709	8	A	G
	2	2.7	480-590	174537	1908	10	A	H
	3	3.9	480-590	174538	2063	10	A	H
	5	6.1	480-590	174539	2335	11	A	J
	7 1/2	9	480-590	174759	3156	13	A	K
	10	11	480-590	174761	4052	17	A	Q
	15	17	480-590	174764	4867	38	A	U
20	22	480-590	174767	5883	40	A	V	

☆ User programmable for 50Hz and other voltage inputs

## WASHGUARD NEMA 4X (IP65) • SINGLE PHASE INPUT 230V THREE PHASE OUTPUT

(Use with three phase 230V motor)

	HP	Output Amps	Input Voltage:☆	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
1/4	1.4	115/230	174519	\$1305	8	A	AD	
1/2	2.2	115/230	174520	1451	8	A	X	
1	4	115/230	174521	1555	11	A	H	
1 1/2	5.2	115/230	174517	1912	11	A	H	
2	6.8	208-230	174525	1635	11	A	H	
3	9.6	208-230	174526	1715	12	A	J	

## WASHGUARD NEMA 4 (IP65) • SINGLE PHASE INPUT 230V THREE PHASE OUTPUT

(Use with three phase 230V motor)

	HP	Output Amps	Input Voltage:☆	Catalog Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
1/4	1.4	115/230	174996	\$1056	8	A	AD	
1/2	2.2	115/230	174998	1154	8	A	X	
1	4	115/230	174999	1262	11	A	H	
1 1/2	5.2	115/230	174515	1484	11	A	H	
2	6.8	208-230	174475	1343	11	A	H	
3	9.6	208-230	174729	1423	12	A	J	

# LEESON AC ADJUSTABLE SPEED DRIVES

## MICRO SERIES INVERTERS

### DYNAMIC BRAKING COMPONENTS FOR THE MICRO SERIES DRIVES

Micro Series Drives can be modified to include dynamic braking. The modifications involve replacing board(s) inside of the drive as well as adding a Dynamic Braking Resistor in a separate enclosure. Larger drives require a combination of Dynamic Braking Board and an additional Form C Relay Board. Instructions are included with the boards. Also available as a modification, see Mod Squad section, see page 131.

#### DYNAMIC BRAKING BOARDS\*

Drive HP	Drive Voltage Rating	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
1/2-3	All	174184	\$314	A	2
5	200-230V	174185	342	A	2
5	460-480V	174185	342	A	2
5	550-575V	174184	314	A	2

\* Dynamic braking Resistors are required with the Dynamic Braking Boards.

#### DYNAMIC BRAKING BOARDS WITH FORM C RELAY BOARD\*

Drive HP	Drive Voltage Rating	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
7 1/2	200-230V	174192	\$303	A	2
7 1/2	460-480V	174193	303	A	2
7 1/2	550-575V	174193	303	A	2
10 - 60	All	174192	303	A	2

\* Dynamic braking Resistors are required with the Dynamic Braking Boards.

#### DYNAMIC BRAKING RESISTORS\*\*

Drive HP	Drive Voltage Rating	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
1/2	200-230V	174178	\$138	A	1
1	200-230V	174179	138	A	1
	460-480V	174179	138	A	1
	550-575V	174178	138	A	1
1 1/2	200-230V	174179	138	A	1
2	200-230V	174180	138	A	1
	460-480V	174180	138	A	1
	550-575V	174179	138	A	1
3	200-230V	174182	196	A	1
	460-480V	174182	196	A	1
	550-575V	174181	196	A	1
5	200-230V	174183	196	A	1
	460-480V	174183	196	A	1
	550-575V	174182	196	A	1
7 1/2	200-230V	174143	227	A	1
	460-480V	174143	227	A	1
	550-575V	174148	227	A	1
10	200-230V	174143	227	A	1
	460-480V	174143	227	A	1
	550-575V	174148	227	A	1
15-20	200-230V	174144	345	A	1
	460-480V	174144	345	A	1
	550-575V	174149	345	A	1
25-30	200-230V	174145	583	A	1
	460-480V	174145	583	A	1
	550-575V	174140	583	A	1
40	460-480V	174146	761	A	1
	550-575V	174141	761	A	1
50-60	460-480V	174147	880	A	1
	550-575V	174142	880	A	1

\*\* Dynamic braking Resistors are provided with mounting brackets.

### REMOTE KEYPADS & CABLES FOR MICRO SERIES DRIVES\*

Cable and Keypad are purchased separately. Installing the Remote keypad and Cable involves partially dis-assembling the drive. Instructions are included with the keypad. Also available as a Modification, see Mod Squad section.



Item	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
Keypad	174177	\$181	A	2
2.5 ft. Cable	174174	53	A	2
5 ft. Cable	174175	76	A	2
10 ft. Cable	174176	124	A	2

\* Compatible with any Micro Series drive.

NOTE: Using the remote keypad on a WASHGUARD Duty Inverter is not recommended, for the control will no longer meet NEMA 4/12 sealing requirements.

### TECHLINK PROGRAMMING AND MONITORING SOFTWARE

Techlink Software is a powerful Drive Configuration tool that works in a Microsoft Windows environment. TechLink supports the following drives sold by LEESON: Micro Series, SM Plus Series and SM Vector Series.

TechLink allows a drive program to be created off line and to access the drive directly while connected over RS232 or RS485 (depending on the drive). RS485 supports several drives on one drive network but will require an RS232 to RS485 converter for most personal computers.

First time users visit LEESON's website, under "Literature" to download Tech-Link Software.

LEESON frequently updates Techlink software and the Models files to keep current with our expanding product offering and upgrades to our existing lines. If you have Techlink software installed on your computer and would like to check to see if you have the most current version of the TechLink program or the Models data, check the versions on the opening TechLink screen to the versions below. You will only need to download the program that has been updated. Each program below is a self extracting zip file; after expanding, run setup.exe to install.

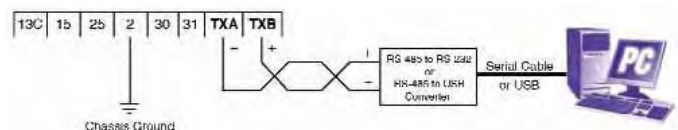
The diagrams below illustrate how to connect the LEESON Micro Series, SM Plus and SM Vector Series drives to a computer in order to use the TechLink software.

Note 1: When using serial communications, terminal 2 on the drive MUST be connected to chassis ground.

#### SM Plus & SM Vector Series

The SM Plus and SM Vector Series drives are RS-485, so a RS-232 to RS-485 or USB to RS-485 converter is required. The converter connects to the computer using a standard serial connection. A twisted pair connects the converter to the drive.

#### SM Plus & SM Vector Series Control Strip

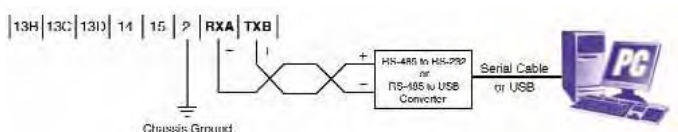


Note 2: Refer to the converter manufacturer's instructions for proper converter configuration. The converter is not supplied by LEESON.

#### Micro Series

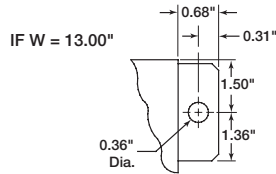
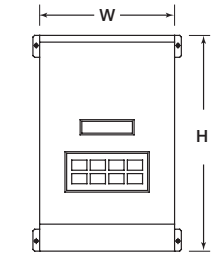
The Micro Series is RS-485, so a RS-232 to RS-485 or USB to RS-485 converter is required. The converter connects to the computer using a standard serial or USB connection. A twisted pair connects the converter to the drive.

#### Micro Series Control Strip

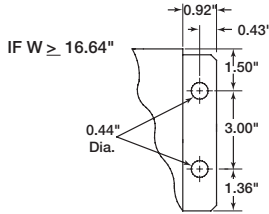
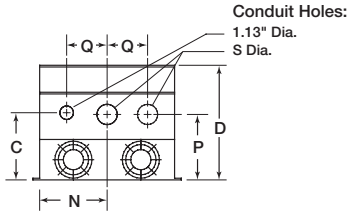


Note: 3 Refer to the converter manufacturer's instructions for proper converter configuration. The converter is not supplied by LEESON.

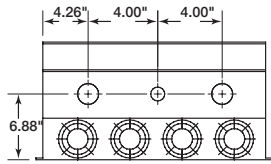
**TYPE 1 DIMENSIONS FOR MODELS RATED ABOVE 30 HP AT 240/200 VAC & 60 HP AT 590/480/400 VAC**



Mounting Tab Detail

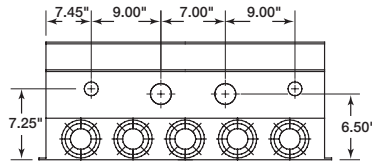


**CONDUIT HOLES FOR 174250.00**



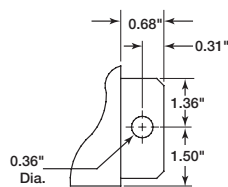
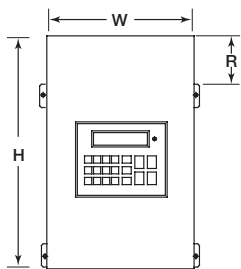
Conduit Holes: Large holes = 1.75"  
Small hole = 1.13"

**CONDUIT HOLES FOR 174258.00**

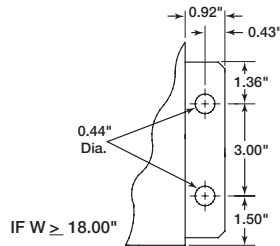
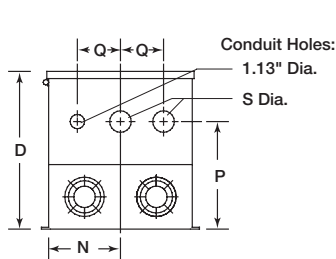


Conduit Holes: Large holes = 3.00"  
Small holes = 1.13"

**TYPE 12 DIMENSIONS FOR MODELS RATED ABOVE 30 HP AT 240/200 VAC AND 60 HP AT 400/480 VAC**



Mounting Tab Detail

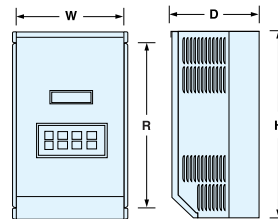


**MICRO SERIES INVERTER DIMS. (Inches) • NEMA 1, NEMA 4/12 & NEMA 4X**

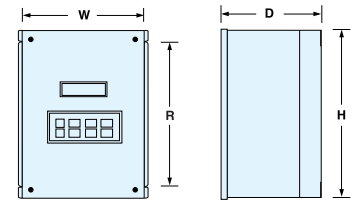
Dimension Key	H	W	D	N	P	Q	R	S		
A	7.50	4.70	3.33	2.35	1.60	1.37	5.50	0.88		
B	7.50	4.70	3.63	2.35	1.90	1.37	5.50	0.88		
C	7.50	4.70	4.33	2.35	2.60	1.37	5.50	0.88		
D	7.50	6.12	4.22	3.77	2.40	1.37	5.50	0.88		
E	7.50	6.12	5.12	3.77	3.30	1.37	5.50	0.88		
F	7.88	7.86	5.94	5.13	3.95	1.50	5.88	1.13		
G	7.88	6.12	4.35	3.06	2.70	1.37	5.88	0.88		
H	7.88	7.86	4.90	4.80	3.25	1.37	5.88	0.88		
I	9.38	7.86	6.25	5.13	3.95	1.50	7.38	1.13		
J	7.88	7.86	5.90	4.80	4.25	1.37	5.88	0.88		
K	9.75	10.26	7.20	5.13	5.25	2.00	7.75	1.13		
L	11.25	7.86	6.84	3.93	4.19	2.00	7.75	1.38		
M	9.38	7.86	6.84	3.93	4.19	2.00	5.88	1.13		
N	12.75	7.86	6.84	3.93	4.19	2.00	9.25	1.38		
O	12.75	7.86	7.40	3.93	4.19	2.00	9.25	1.38		
P	12.75	10.26	7.74	5.13	5.00	2.50	9.25	1.38		
Q	11.75	10.26	8.35	5.13	5.75	2.00	9.75	1.13		
R	9.38	7.86	7.40	3.93	4.19	2.00	5.88	1.13		
S	12.75	10.26	8.25	5.13	5.00	2.50	9.25	1.38		
T	15.75	10.26	8.35	5.13	5.75	2.50	12.25	1.38		
U	13.75	10.26	8.35	5.13	5.75	2.00	11.75	1.38		
V	15.75	10.26	8.35	5.13	5.75	2.00	13.75	1.38		
W	19.75	10.26	8.55	5.13	5.75	2.50	16.25	1.75		
X	7.88	7.86	3.75	4.80	2.10	1.37	5.88	0.88		
Y	7.88	6.12	5.25	3.06	3.60	1.37	5.88	0.88		
Z	20.25	10.26	8.35	5.13	5.75	2.00	16.25	1.38		
AA	15.75	10.26	8.35	5.13	5.75	2.00	11.75	1.38		
AB	21.00	13.72	8.35	5.13	6.10	2.00	16.25	1.38		
AC	7.50	6.12	3.63	3.77	1.80	1.37	5.50	0.88		
AD	7.88	6.12	3.63	3.06	2.00	1.37	5.88	0.88		
AE	25.00	13.00	10.50	5.56	6.50	2.62	-	1.38		
AF	47.00	16.64	11.85	SEE CHART					-	-
AG	29.00	16.64	11.85	7.14	6.88	3.12	-	1.75		
AH	29.00	24.42	11.85	11.12	6.50	4.50	-	2.50		
AI	29.00	36.66	11.85	11.50	9.00	4.50	-	2.50		
AJ	37.00	18.00	13.30	7.50	8.00	3.13	7.14	1.75		
AK	39.00	26.00	13.30	11.50	9.00	4.50	9.14	2.50		
AL	29.00	36.66	11.85	SEE CHART					-	-
AM	31.00	14.00	11.86	6.00	7.50	2.62	5.64	1.38		
AN	49.00	18.00	13.30	7.50	8.00	3.13	7.14	1.75		
AO	39.00	26.00	13.30	11.50	9.00	4.50	9.14	2.50		

AC Drives

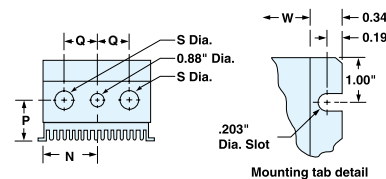
**NEMA 1 ONLY**



**NEMA 4/12 WASHGUARD ONLY**



**NEMA 1 & NEMA 4/12**



### SM PLUS SUB-MICRO INVERTER DRIVES

**BIG performance from an ultra-compact design. Provides 18 isolated I/O terminals plus RS485 Modbus® serial communication. Other features include:**

- Removable electronic programming module allows off-line set-up and program replication.
- Input line voltage calibration—optimizes over and under voltage trip levels
- Current limit to 180% with frequency foldback
- Adjustable carrier frequency (4 to 10 kHz)
- Adjustable V/Hz
- Output frequency to 240 Hz
- Seven preset speeds
- Automatic restart after fault
- Control via drive face, terminal strip or optional remote keypad
- Coast or ramp to stop
- Independent Accel and Decel adjustment
- Forward only or forward and reverse direction
- Adjustable DC injection braking
- Speed reference: Keypad, 0-10 VDC, or 4-20 mA
- Speed reference calibration
- Speed and load indicating output signal selection: 0-10 VDC or 4-20mA
- Output signal calibration
- I<sup>2</sup>t motor thermal overload protection; meets UL requirements for motor protection in single motor applications
- Fixed boost for high starting torque
- Accel boost for high torque accelerating at any speed
- Slip compensation
- Three-digit LED display
- Password protection
- Fault history: Stores eight previous trips
- Terminal status indication
- Default parameter reset
- IP20 enclosure with finger safe terminals
- Dynamic braking and remote keypad kits available on page 115



SM PLUS

### SINGLE PHASE INPUT/THREE PHASE OUTPUT

(Use with three phase 230V motor)

Volts	HP	Output Amps	Input Voltage Δ	Catalog Number	List Price	App. Wgt.(lbs.)	Disc Sym.	Dimension Key
115/230	1	2.0	115/230	174492	709	4	A	B1
	1 1/2	6.0	115/230	174445	800	5	A	B1

### SINGLE OR THREE PHASE INPUT/THREE PHASE OUTPUT

(Use with three phase 230V motor)

Volts	HP	Output Amps	Input Voltage Δ	Catalog Number	List Price	App. Wgt.(lbs.)	Disc Sym.	Dimension Key
200-230	1/4	1.4	200-230	174452	\$507	2	A	A1
	1/2	2.2	200-230	174453	529	2	A	A1
	1	4.2	200-230	174454	570	3	A	A2
	1 1/2	6.0	200-230	174493	677	4	A	B1
	2	6.8	200-230	174494	749	5	A	B2
	3	9.6	200-230	174495	910	5	A	B2
	5	15.2	200-230	174444	1247	8	A	C1

### THREE PHASE INPUT/OUTPUT

Volts	HP	Output Amps	Input Voltage Δ	Catalog Number	List Price	App. Wgt.(lbs.)	Disc Sym.	Dimension Key
200-230	1	4.2	200-230	174455	\$525	3	A	A2
	1 1/2	6.0	200-230	174456	618	3	A	A3
	2	6.8	200-230	174457	681	4	A	A3
	3	9.6	200-230	174458	812	4	A	A3
	5	15.2	200-230	174446	1045	4	A	B2
	7 1/2	22.0	200-230	174438	1427	8	A	C1
	10	28.0	200-230	174439	1705	8	A	C1
	15	42.0	200-230	174429	2209	13	A	D1
	20	54.0	200-230	174430	2710	14	A	D1
	460-480	1/2	1.1	460-480	174459	591	2	A
1		2.1	460-480	174460	637	3	A	A2
1 1/2		3.0	460-480	174461	696	3	A	A3
2		3.4	460-480	174462	768	4	A	A3
3		4.8	460-480	174463	858	4	A	A3
5		7.6	460-480	174447	1094	5	A	B2
7 1/2		11.0	460-480	174440	1427	8	A	C1
10		14.0	460-480	174441	1705	8	A	C1
15		21.0	460-480	174431	2166	13	A	D1
20		27.0	460-480	174432	2652	14	A	D1
25		34.0	460-480	174433	3156	14	A	D1
30		40.0	460-480	174500	3669	14	A	D1
550-575		1	1.7	550-575	174464	681	3	A
	2	3.0	550-575	174491	816	4	A	A3
	3	4.2	550-575	174497	969	5	A	B2
	5	6.6	550-575	174448	1185	5	A	B2
	7 1/2	9.9	550-575	174442	1539	8	A	C1
	10	12.2	550-575	174443	1824	8	A	C1
	15	19.0	550-575	174434	2389	8	A	D1
	20	24.0	550-575	174435	2922	14	A	D1
25	27.0	550-575	174436	3456	14	A	D1	

☆ User programmable for 50Hz and other voltage inputs



DIMENSIONS ON PAGE 113

#### SPECIFICATIONS:

Storage Temperature	-20° to 70° C
Ambient Operating Temperature	0° to 50° C
Ambient Humidity	<95% (non-condensing)
Maximum Altitude	3300 ft (1000m) above sea level
Input Line Voltages	115/230 VAC, 200-230 VAC, 460-480 VAC, and 550-575 VAC
Input Voltage Tolerance	+10%, -15%
Input Frequency Tolerance	48 to 62 Hz
Output Wave Form	Sine Coded PWM
Output Frequency	0-240 Hz
Carrier Frequency	4 kHz to 10 kHz

Enclosure	IP20
Service Factor	1.0
Efficiency	up to 98%
Power Factor (displacement)	>0.96
Overload Current Capacity	150% for 60 seconds 180% for 20 seconds
Speed Reference Follower	0-10 VDC, 4-20 mA
Control Voltage	15 VDC
Analog Outputs	0-10 VDC or 2-10 VDC: Proportional to frequency or load Open-collector: 40 mA at 30 VDC
Digital Outputs	40 mA at 30 VDC
Power Supply for Aux. Relays	40 mA at 12 VDC

# AC ADJUSTABLE SPEED DRIVES



## SM SERIES SUB-MICRO INVERTERS

### SM SERIES SUB-MICRO INVERTER DRIVES

For applications requiring a simpler drive without the advanced features of the SM-Plus drive. Provides 11 isolated I/O terminals with one Form A relay output. Other features include:

- Removable electronic programming module allows off-line set-up and program replication.
- Input line voltage calibration—optimizes over and under voltage trip levels
- Current limit to 180% with frequency foldback
- Adjustable carrier frequency (4 to 10 kHz)
- Adjustable V/Hz
- Output frequency to 240 Hz
- Seven preset speeds
- Automatic restart after fault
- Control via drive face, terminal strip or optional remote keypad
- Coast or ramp to stop
- Independent Accel and Decel adjustment
- Forward only or forward and reverse direction
- Adjustable DC injection braking
- Speed reference: Keypad, 0-10 VDC, or 4-20 mA
- Speed reference calibration
- I<sup>2</sup>t motor thermal overload protection; meets UL requirements for motor protection in single motor applications
- Fixed boost for high starting torque
- Accel boost for high torque accelerating at any speed
- Slip compensation
- Three-digit LED display
- Password protection
- Fault history: Stores eight previous trips
- Terminal status indication
- Default parameter reset
- IP20 enclosure with finger safe terminals
- Dynamic braking and remote keypad kits available on page 115



SM SERIES



☆ User programmable for 50Hz and other voltage inputs

### SINGLE PHASE INPUT/THREE PHASE OUTPUT

(Use with three phase 230V motor)

	HP	Output Amps 230 VAC	Input Voltage	Catalog Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
110-120 Volts	1/3	1.7	110-120	174263	\$345	2	A	A5
	1/2	2.4	110-120	174264	375	2	A	A5
	1	4.2	110-120	174265	498	3	A	B5
	1 1/2	6.0	110-120	174266	565	3	A	B5

### SINGLE PHASE INPUT/THREE PHASE OUTPUT

(Use with three phase 230V motor)

	HP	Output Amps	Input Voltage	Catalog Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
208-240 Volts	1/3	1.7	208-240	174267	\$320	2	A	A5
	1/2	2.4	208-240	174268	337	2	A	A5
	1	4.2	208-240	174270	375	3	A	A6
	1 1/2	6.0	208-240	174271	452	4	A	B5
	2	7.0	208-240	174272	530	5	A	B5
	3	9.6	208-240	174273	624	5	A	B6

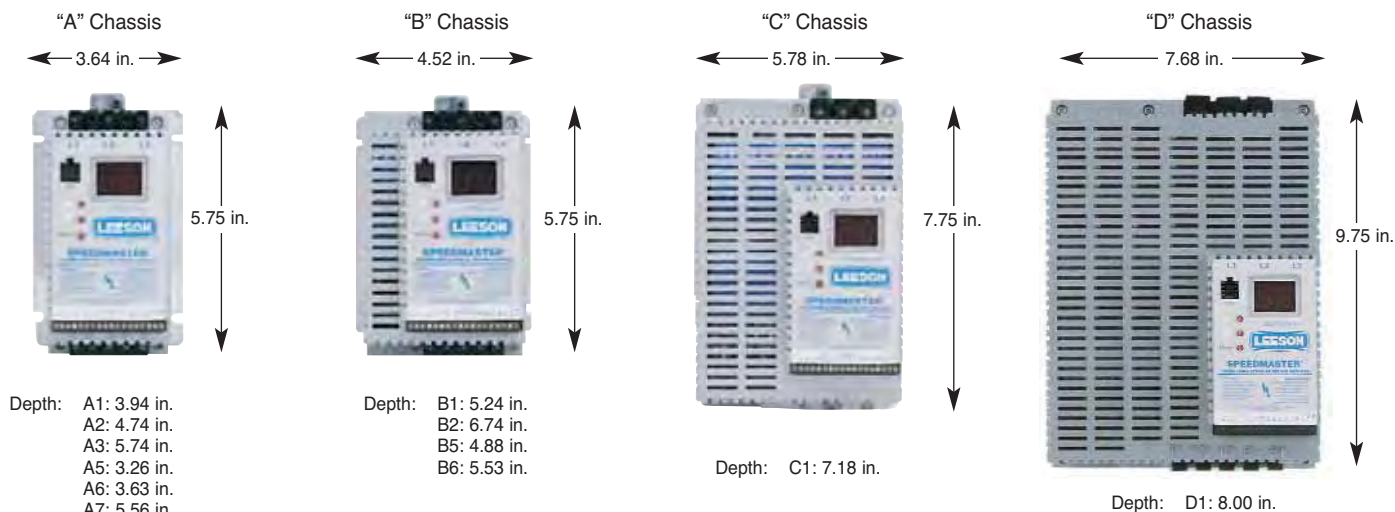
### THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalog Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
208-240 Volts	1/2	2.4	208-240	174274	\$320	2	A	A5
	1	4.2	208-240	174276	355	2	A	A6
	1 1/2	6.0	208-240	174277	422	3	A	A7
	2	7.0	208-240	174278	481	3	A	A7
	3	9.6	208-240	174279	533	3	A	B6
	5	15.2	208-240	174288	680	5	A	B2
	7 1/2	22	208-240	174280	939	8	A	C1
	10	28	208-240	174290	956	8	A	C1
	15	42	208-240	174292	1720	14	A	D1

### THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalog Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
400-480 Volts	1/2	1.1	400-480	174281	\$427	2	A	A1
	1	2.1	400-480	174282	457	3	A	A2
	1 1/2	3.0	400-480	174283	496	3	A	A3
	2	3.4	400-480	174284	529	4	A	A3
	3	4.8	400-480	174286	581	4	A	B1
	5	7.8	400-480	174287	695	5	A	B2
	7 1/2	11	400-480	174285	903	5	A	B2
	10	14	400-480	174291	1076	8	A	C1
	15	21	400-480	174293	1272	8	A	C1

### DIMENSIONS: SM, SM PLUS AND SM VECTOR INVERTERS



Dimensions shown for reference only. Contact LEESON for detailed drawing.

AC Drives

### SM VECTOR SUB-MICRO INVERTER DRIVES

Sensorless Vector AC Drive delivers up to 200% starting torque and can control a vector duty motor down to 1Hz at full output torque!

- The SM-Vector drive is designed for operation with vector duty rated induction motors rated for 200, 230, 400, 460, or 590VAC from 0 to 240Hz.
- IP20 enclosure with finger safe terminals
- Easy setup and operation – Program the SM-Vector drive one of four different ways:
  - From the front of the drive
  - The optional remote keypad
  - A PC using the TechLink Software
  - The EPM Programmer
- Modes of operation:
  - Constant Torque V/Hz
  - Variable Torque V/Hz
  - Sensorless Vector – speed mode
  - Sensorless Vector – torque mode
- Auto Tuning determines key performance values based on the motor and installation variables. Required for operation in vector modes, but can be used to enhance performance in V/Hz mode.
- The SM-Vector drive is an approved thermal overload protection device for single motor applications.
- 18 isolated terminals provide 5 logic inputs and 2 logic outputs.
- Two reference inputs allow for 4-20mA and either 0-10V or bipolar -10 to +10V
- Two analog outputs indicate speed and load.
- Two wire RS485 serial communication.
- Dynamic braking and remote keypad kits available on page 115



SM VECTOR

### SINGLE OR THREE PHASE INPUT/THREE PHASE OUTPUT (Use with three phase 230V motor)

	HP	Output Amps 230VAC	Input Voltage ⚡	Catalog Number	List Price	Wgt. (lbs.)	Disc Sym.	Dimension Key
208-240 Volts	1/2	2.2	208-240	174000	\$532	2	A	A1
	1	4.2	208-240	174001	599	3	A	A2
	1 1/2	6.0	208-240	174002	711	4	A	B1
	2	6.8	208-240	174003	786	5	A	B2
	3	9.6	208-240	174004	956	5	A	B2

### THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps 230VAC	Input Voltage ⚡	Catalog Number	List Price	Wgt. (lbs.)	Disc Sym.	Dimension Key
208-240 Volts	1	4.2	208-240	174006	\$551	3	A	A2
	1 1/2	6.0	208-240	174007	649	3	A	A3
	2	6.8	208-240	174008	715	4	A	B2
	3	9.6	208-240	174009	853	4	A	B2
	5	15.2	208-240	174010	1097	4	A	B2
	7 1/2	22	208-240	174011	1498	8	A	C1
	10	28	208-240	174012	1790	8	A	C1

### THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage ⚡	Catalog Number	List Price	Wgt. (lbs.)	Disc Sym.	Dimension Key
400-480 Volts	1/2	1.1	400-480	174015	\$621	2	A	B1
	1	2.1	400-480	174016	669	3	A	B1
	1 1/2	3.0	400-480	174017	731	3	A	B1
	2	3.4	400-480	174018	806	4	A	B2
	3	4.8	400-480	174019	901	4	A	B2
	5	7.8	400-480	174020	1149	5	A	B2
	7 1/2	11	400-480	174021	1498	8	A	C1
	10	14	400-480	174022	1790	8	A	C1

### THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage ⚡	Catalog Number	List Price	Wgt. (lbs.)	Disc Sym.	Dimension Key
480-590 Volts	1	1.7	480-590	174027	\$715	3	A	B1
	2	3.0	480-590	174028	857	4	A	B2
	3	4.2	480-590	174029	1017	5	A	B2
	5	6.6	480-590	174030	1244	5	A	B2
	7 1/2	9.9	480-590	174031	1616	8	A	C1
	10	12.2	480-590	174032	1915	8	A	C1

⚡ User programmable for 50Hz and other voltage inputs



DIMENSIONS ON PAGE 113

#### SPECIFICATIONS:

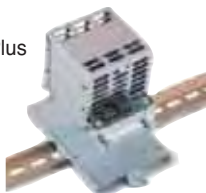
Storage Temperature	-20° to 70° C
Ambient Operating Temperature	0° to 50° C
Ambient Humidity	<95% (non-condensing)
Maximum Altitude	3300 ft (1000m) above sea level
Input Line Voltages	208-240 VAC, 400-480 VAC, 480-590 VAC
Input Voltage Tolerance	+10%, -15%
Input Frequency Tolerance	48 to 62 Hz
Output Wave Form	Sine Coded PWM
Output Frequency	0-240 Hz
Carrier Frequency	2 kHz, 4 kHz, 8 kHz

Enclosure	IP20
Service Factor	1.0
Efficiency	up to 98%
Power Factor (displacement)	0.96 or better
Overload Current Capacity	150% for 60 seconds 200% for 25 seconds
Speed Reference Follower	0-10 VDC, 4-20 mA
Control Voltage	15 VDC
Analog Outputs	0-10 VDC or 2-10 VDC: Proportional to speed, load, or torque
Digital Outputs	Open-collector: 50 mA at 30 VDC
Power Supply for Aux. Relays	50 mA at 12 VDC

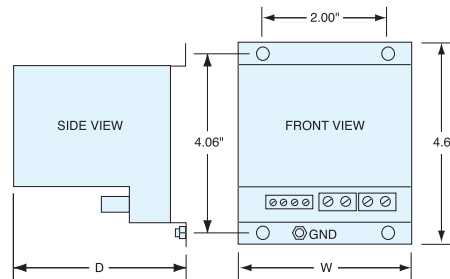
### ACCESSORIES FOR THE SM & SM-PLUS SERIES DRIVES

#### Dynamic Braking Components for the SM & SM-Plus Series Drives

Dynamic braking is available for the SM & SM-Plus series drives as a separate Dynamic Braking Module. Lower HP modules have the control electronics and the dynamic braking resistor in one convenient package. Larger units require a separate resistor. The modules can be panel or DIN rail mounted.



Dimensions (inches)		
HP	W	D
0.25-1.5	3.1	3.1
2-3	3.1	4.3
5	3.1	5.6
7.5-10	4.2	6.7



#### DYNAMIC BRAKING MODULES WITH BUILT-IN DYNAMIC BRAKING RESISTORS\*

Drive HP	Motor Voltage Rating	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/4-1/2	208-230V	174400	\$233	A	2
1/4-1/2	400-480V	174406	233	A	2
1 - 1 1/2	208-230V	174401	272	A	3
1 - 1 1/2	400-480V	174407	272	A	3
1 - 1 1/2	480-590V	174412	272	A	3
2 - 3	208-230V	174402	370	A	4
2 - 3	400-480V	174408	370	A	4
2 - 3	480-590V	174413	370	A	4
5	208-230V	174403	482	A	5
5	400-480V	174409	482	A	5
5	480-590V	174414	482	A	5
7 1/2	208-230V	174404	609	A	6
7 1/2	400-480V	174410	609	A	6
7 1/2	480-590V	174415	609	A	6
10	208-230V	174405	735	A	8
10	400-480V	174411	735	A	8
10	480-590V	174416	735	A	8

\* Braking Resistors are included with the module and not purchased separately.

#### DYNAMIC BRAKING MODULES WITHOUT RESISTORS\*

Drive HP	Motor Voltage Rating	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
15-20	208-230V	174417	\$314	A	10
15-25	400-480V	174418	314	A	10
15-25	480-590V	174419	314	A	10

\* Dynamic Braking Resistors are purchased and mounted separately.

#### DYNAMIC BRAKING RESISTORS\*\*

Drive HP	Motor Voltage Rating	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
15-20	208-230V	174144	\$345	A	1
15-20	400-480V	174144	345	A	1
15-20	480-590V	174149	345	A	1
25	400-480V	174145	583	A	1
25	480-590V	174140	583	A	1

\*\* Dynamic Braking Resistors are provided with mounting brackets.

### ELECTRONIC PROGRAMMING UNIT

Electronic Programming Unit allows off-line set-up and replication of the drive's plug-in electronic programming module (shown at right). Excellent for multi-drive applications. Keypad input and alphanumeric display simplify programming. RS-232 serial port allows downloading of configuration files from personal computer.



### EPM BULK PACK

Plug-in electronic programming modules (EPM). Allow off-line set-up and replication of program using Electronic Programming Unit (at left). **Set of 10.**



Catalog Number	List Price (10 pcs.)	Disc. Sym.	App. Wgt. (lbs.)
174190	\$142	A	1

Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
174189	\$648	A	2

### DIN RAIL MOUNTING KITS

Steel plates and fasteners for mounting drives on standard 35mm DIN rails for panel building. **Set of six.**



- 174186 for "A" chassis drives.
- 174187 for "B" chassis drives.
- 174188 for "C" chassis drives.

Catalog Number	List Price (6 pcs.)	Disc. Sym.	App. Wgt. (lbs.)
174186	\$132	A	3
174187	148	A	3
174188	176	A	3

### REMOTE KEYPAD

Remote keypad kit for includes eight-foot connecting cable and gasket. Mounted in proper enclosure, the keypad kit will provide up to NEMA 4 protection. **These keypads can only be used with Sub-Micro drives manufactured May, 1999 or later (date code of 9922 or higher).**



Drive Type	Catalog Number	List Price	App. Disc. Sym.	Wgt. (lbs.)
SM Plus	174191	\$187	A	2
SM	174194	152	A	2
SM Vector	174306	187	A	2



# AC ADJUSTABLE SPEED DRIVES

## SUB-MICRO INVERTER ACCESSORIES

### FHP SERIES AC DRIVES

#### General Specifications:

The FHP Series volts/hertz-type AC drives are as simple to setup and calibrate as an SCR-type DC drive. Rated from 1/4 to 1HP with 115V, 230V, or 115/230V "doubler" input power ratings.

The cost-conscious and compact chassis design of the FHP Series maintains the industry standard for mounting hole location.

The NEMA 4X enclosed drive has additional features in a compact package size.

With its compact size, standard features and application flexibility, the FHP Series is an excellent choice for most 1 hp and under AC applications.

#### Common features for chassis and enclosed units:

- Compact size – (4.30" x 3.70")
- Industry standard mounting
- Output voltage on dual voltage models is jumper selectable and can double the output voltage – allowing the use of a 230V motor when only 115V power is available.
- Quickly and easily change trimmer pot ranges for 1/15 to 1 hp motors.
- Easy calibration and setup with on board trim pot adjustments for boost, max speed, acceleration, deceleration, to overcome intermittent peak loads, then reduces the torque and torque limit.
- Torque 'foldback' feature – Allows up to 200% torque for short periods (output current) to a safe level that is set with the TQ LIMIT trim pot.
- 16kHz switching frequency, with option to change between 4 and 16kHz in the field.
- Adjustable torque boost for startup – Up to 200% additional torque for loads with high inertia or friction.
- Color-coded on-board LEDs for Power, Fault and Torque Limit enable easy visual determination of drive status.
- Easy start/stop and direction control with enable and Direction terminal connections.
- Accepts speed reference from 0-5VDC isolated signal or wired in speed potentiometer.
- Plug-in Process Control Module (PCM) kit available to accept 0-5VDC, 0-10VDC or 4-20mA input.
- UL listed

#### Special features of the NEMA 4X drive:

- NEMA 4X enclosure
- Jumper selectable DC injection braking or coast to stop
- Brake time and current are adjustable
- Built-in isolation card to accept a speed reference signal
- Min speed adjustment
- Auto or manual restart after power loss

PARAMETER	SPECIFICATIONS FOR ALL FHP MODELS
Max load	150% for 5 minutes
Output frequency	0-120Hz
Output type	6 step PWM
Switching frequency	4-16kHz range* with 16kHz as factory default
Speed regulation and range	±3% of base speed; up to 50:1
On-board adjustable trim pots	Max speed, accel, decel, boost & torque limit
Adjustable maximum frequency range	32-120Hz
Adjustable accel and decel time range	1-12 seconds
Torque boost range	0-200%
LED indicators	Power (green), Fault‡ (red), Torque Limit (yellow)
Instantaneous over-current trip time	3 µsec
Analog reference input and impedance	0-5VDC isolated, ~100Kohm
Plug-in PCM isolator card input	0-5 VDC, 0-10VDC, 4-20mA
Ambient temperature range	0-40°C
Weight (Chassis Models)	1.2 lbs.
Vibration	0.5G max (20-50Hz); 0.1G max (>50Hz)
Approvals	UL, cUL

\* Plug-in capacitor kit (175325) for field adjustments to less than 16khz; ‡ Faults are Over-voltage, Under-voltage and Instantaneous Over Current trip.



### FHP SERIES AC DRIVES • CHASSIS MOUNT SINGLE PHASE INPUT/SINGLE OR THREE PHASE OUTPUT

HP	Input Voltage	Output Amps	Output Voltage	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/4	230	1.2	230	175318	\$272	A	2
	115/230	1.2	230	175319	324	A	2
	115	2.4	115	175320	280	A	3
1/2	230	2.4	230	175321	280	A	3
	115/230	2.4	230	175310	357	A	3
	115	4.0	115	175322	348	A	4
1	230	4.0	230	175323	344	A	4
	115/230	4.0	230	175311	452	A	4

### FHP SERIES AC DRIVES • ACCESSORIES

Item Description	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
Process Control Module (PCM) Kit*	175324	\$88	A	2
Carrier Frequency Capacitor Kit	175325	21	A	1

\* PCM Kit is for use with chassis drives only.

### FHP SERIES AC DRIVES • NEMA 4X (IP65) SINGLE PHASE INPUT/THREE PHASE OUTPUT

- NEMA 4X enclosure
- Min speed adjustment
- Jumper selectable features:
  - DC injection braking or coast to stop
  - Brake time and current are adjustable
  - Auto or manual restart after power loss
- Built-in isolation card to accept a speed reference signal



HP	Input Voltage	Output Amps	Output Voltage	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/6-1	115/230	4.0	230	175326	\$634	A	7

### FHP MOTORS FOR AC DRIVES THREE PHASE • TEFC • C FACE WITH BASE

- Compact 48-frame design with keyed shaft
- Class F insulation
- 20:1 Constant torque rated
- Inverter IRIS™ insulation system
- 1/2" diameter keyed shaft with 48-C Face
- 115/230V 3-phase design optimized for FHP drives



HP	RPM 60 Hz	NEMA Frame	Catalog Number	List Price	Disc. Sym.	App. Wgt. (lbs.)	FL. Amps 230V	% F.L. Eff.	"C" Dim. (Inches)
1/6	1725	48CZ	102792	\$227	A	25	1.25	56.0	8.94
1/4	1725	48CZ	102793	257	A	26	1.4	58.0	8.94
1/3	1725	48CZ	102794	282	A	28	1.6	64.3	9.19
1/2	1725	48CZ	102795	317	A	30	1.8	77.0	10.19