

QUICK REFERENCE

AC & DC Adjustable Speed Drives



Micro Series NEMA Enclosed AC Inverters

Speedmaster® adjustable speed drives with plain-English programming and read-out. Models range from 1/4 through 150 HP. NEMA 1 enclosure.
Page 103 & 106



Micro Series WASHGUARD™ AC Inverters

Speedmaster® adjustable speed drives in NEMA 4/12 and NEMA 4X enclosures. Plain-English programming and read-out. Models range from 1/4 through 125 HP.
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SM2 Series Flux Vector™ Sub-Micro AC Inverters

Speedmaster® sensorless vector drives with “big drive” features and ultra-compact size. Models range from 1/2 through 25 HP. IP21 enclosure — Nema1 Type.
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SM Series Sub-Micro AC Inverters

Speedmaster® adjustable speed drives for simpler applications not requiring the advanced features of the SM-Plus Series. Models range from 1/3 through 15 HP. IP 20 enclosure — chassis mount.
Page 108



ACH Series HVAC Inverters

Full featured ACH Series drives for HVAC applications. Models range from 60 HP through 150 HP.
Page 107



DC Adjustable Speed Drives

Speedmaster® DC drives for use with SCR rated motors. Models range from sub-FHP through 3 HP. NEMA 1, NEMA 4/12 and NEMA 4X enclosures available.
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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 one 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.
- RS485 Serial communications using MODBUS protocol.
- Underwriters Laboratories Listed.



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.



P-I-D OPTION INVERTER DRIVES

A P-I-D (Proportional, Integral and Derivative) option is readily available in a Local/Remote configuration to facilitate a set point for maintaining speed in relation to pressure or flow for example. Please call your local branch for pricing.



LEESON Canada also carries inverter accessories such as line reactors and load filters – see page 114.

NEMA 1 (IP31) • THREE PHASE INPUT/OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
200-230 Volts	1/2	2.2	200-230	174914	\$989	6	A	B
	1	4.0	200-230	174915	1067	6	A	C
	1 1/2	5.2	200-230	174916	1152	6	A	C
	2	6.8	200-230	174917	1165	9	A	E
	3	9.6	200-230	174918	1250	9	A	E
	5	15.2	200-230	174919	1561	11	A	F
	7 1/2	22.0	200-230	174545	2250	15	A	M
	10	28.0	200-230	174551	2850	19	A	L
	15	42.0	200-230	174557	3616	20	A	N
	20	54.0	200-230	174560	4780	31	A	P
	25	68.0	200-230	174569	5732	38	A	T
	30	80.0	200-230	174571	6030	44	A	T
400-480 Volts	40	104.0	200-230	174576	8581	130	A	AE
	60	154.0	200-230	174578	12845	185	A	AF
	1	2.0	400-480	174920	1230	6	A	B
	2	3.4	400-480	174921	1399	8	A	D
	3	4.8	400-480	174922	1564	9	A	E
	5	7.6	400-480	174923	1756	9	A	E
	7 1/2	11.0	400-480	174924	2440	15	A	I
	10	14.0	400-480	174552	3079	15	A	M
	15	21.0	400-480	174558	3757	19	A	L
	20	27.0	400-480	174561	4650	20	A	N
	25	34.0	400-480	174563	5679	31	A	P
	30	40.0	400-480	174565	5800	31	A	P
	40	52.0	400-480	174567	6299	39	A	T
	50	65.0	400-480	174593	7323	44	A	W
	60	77.0	400-480	174572	8193	67	A	W
480-590 Volts where needed	75	96.0	400-480	174580	10382	185	A	AG
	100	124.0	400-480	174582	12814	250	A	AH
	125	156.0	400-480	174584	14667	260	A	AH
	150	180.0	400-480	174586	20099	360	A	AL
	1	1.6	480-590	174925	1402	6	A	B
	2	2.7	480-590	174926	1523	8	A	D
	3	3.9	480-590	174927	1687	9	A	E
	5	6.1	480-590	174928	1945	9	A	F
	7 1/2	9.0	480-590	174929	2629	15	A	I
	10	11.0	480-590	174553	3540	16	A	R
	15	17.0	480-590	174559	4309	19	A	N
	20	22.0	480-590	174562	5197	22	A	O
25	27.0	480-590	174564	6199	31	A	P	
30	32.0	480-590	174566	6323	32	A	S	
40	41.0	480-590	174599	7001	38	A	T	
50	52.0	480-590	174594	8202	45	A	W	
60	62.0	480-590	174573	9178	51	A	W	

See page 105 for Dimensions

NEMA 1 (IP31) • SINGLE PHASE INPUT 230V THREE PHASE OUTPUT (Use with three phase 230V motor)

HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
1/4	1.4	115/230	174930	\$1003	5	A	A
1	4.0	115/230	174931	1198	7	A	D
1 1/2	5.2	115/230	174932	1298	7	A	D
2	6.8	208-230	174933	1391	9	A	E
3	9.6	208-230	174934	1419	9	A	E

Catalogue numbers in blue are NEW items.

AC/DC Speed Control



AC ADJUSTABLE SPEED DRIVES

MICRO SERIES INVERTERS

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

FOOD-SAFE epoxy finish. (1/2 HP to 5 HP are white. Above 5 HP are gray.) 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 4X (IP65) STAINLESS STEEL

300-SERIES STAINLESS STEEL enclosures are fully gasketed to withstand frequent washdown in corrosive or caustic environments. These Speedmaster® Micro Series drives have the same features as units shown on the previous page.



WASHGUARD™ NEMA 4X

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

	HP	Output Amps	Input Voltage:☆	Catalogue Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
200-240 Volts	1/2	2.2	200-240	174935	\$1087	8	A	G
	1	4	200-240	174936	1187	8	A	G
	1 1/2	5.2	200-240	174482	1190	8	A	Y
	2	6.8	200-240	174937	1305	10	A	H
	3	9.6	200-240	174938	1381	11	A	J
	5	15.2	200-240	174730	1908	11	A	K
	7 1/2	22	200-240	174734	2402	27	A	Q
	10	28	200-240	174737	3028	32	A	U
	15	43	200-240	174740	3754	40	A	V
	20	54	200-240	174743*	4818	42	A	AA
400-480 Volts	25	68	200-240	174595*	5800	53	A	Z
	30	80	200-240	174596*	6146	53	A	Z
	1	2	400-480	174939	1329	8	A	G
	2	3.4	400-480	174940	1500	10	A	H
	3	4.8	400-480	174941	1637	10	A	H
	5	7.6	400-480	174942	1899	11	A	J
	7 1/2	11	400-480	174548	2549	11	A	K
	10	14	400-480	174554	3213	11	A	Q
	15	21	400-480	174749	3868	32	A	U
	20	27	400-480	174752	4818	36	A	V
480-590 Volts where needed	25	34	400-480	174755*	5715	42	A	AA
	30	40	400-480	174757*	5835	53	A	AA
	40	52	400-480	174513*	6344	54	A	Z
	50	65	400-480	174511*	7363	75	A	AB
	60	77	400-480	174574*	8290	98	A	AB
	75	96	400-480	174581*	11299	200	A	AJ
	100	124	400-480	174583*	14007	300	A	AP
	125	156	400-480	174585*	15860	310	A	AO
	1	1.6	480-590	174943	1467	8	A	G
	2	2.7	480-590	174944	1628	10	A	H
3	3.9	480-590	174945	1785	10	A	H	
5	6.1	480-590	174946	2060	11	A	J	
7 1/2	9	480-590	174549	2748	13	A	K	
10	11	480-590	174556	3602	17	A	Q	
15	17	480-590	174763	4352	38	A	U	
20	22	480-590	174766	5297	40	A	V	
25	27	480-590	174769*	6317	42	A	AA	
30	32	480-590	174597*	6354	53	A	AA	
40	41	480-590	174512*	7051	54	A	Z	
50	52	480-590	174510*	8231	75	A	AB	
60	62	480-590	174575*	9208	98	A	AB	

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

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

	HP	Output Amps	Input Voltage:☆	Catalogue Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key	
200-240 Volts	1/2	2.2	200-240	174527	\$1252	8	A	G	
	1	4	200-240	174528	1344	8	A	G	
	1 1/2	5.2	200-240	174529	1410	8	A	Y	
	2	6.8	200-240	174530	1490	10	A	H	
	3	9.6	200-240	174531	1565	11	A	J	
	5	15.2	200-240	174732	2182	11	A	K	
	7 1/2	22	200-240	174735	2684	27	A	Q	
	10	28	200-240	174738	3341	32	A	U	
	15	43	200-240	174741	4081	40	A	V	
	400-480 Volts	1	2	400-480	174532	1476	8	A	G
2		3.4	400-480	174533	1670	10	A	H	
3		4.8	400-480	174534	1794	10	A	H	
5		7.6	400-480	174535	2045	11	A	J	
7 1/2		11	400-480	174745	2772	11	A	K	
10		14	400-480	174747	3438	11	A	Q	
15		21	400-480	174750	4108	32	A	U	
20		27	400-480	174753	5068	36	A	V	
480-590 Volts		1	1.6	480-590	174536	1604	8	A	G
		2	2.7	480-590	174537	1794	10	A	H
	3	3.9	480-590	174538	1935	10	A	H	
	5	6.1	480-590	174539	2195	11	A	J	
	7 1/2	9	480-590	174759	2957	13	A	K	
	10	11	480-590	174761	3799	17	A	Q	
	15	17	480-590	174764	4557	38	A	U	
	20	22	480-590	174767	5514	40	A	V	

☆ User programmable for 50Hz and other voltage inputs

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

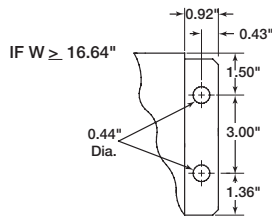
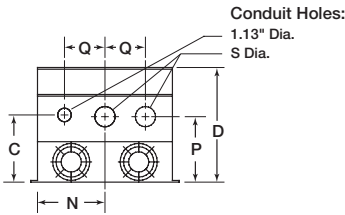
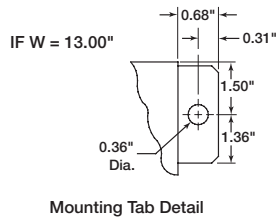
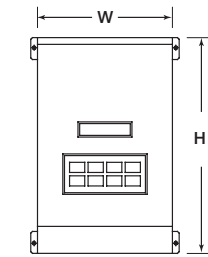
	HP	Output Amps	Input Voltage:☆	Catalogue Number	List Price	App. Wgt. (lbs.)	Disc. Sym.	Dimension Key
	1/4	1.4	115/230	174519	\$1230	8	A	AD
	1/2	2.2	115/230	174520	1362	8	A	X
	1	4	115/230	174521	1459	11	A	H
	1 1/2	5.2	115/230	174517	1534	11	A	H
	2	6.8	208-230	174525	1613	11	A	H
	3	9.6	208-230	174526	1794	12	A	J

ACCESSORIES FOR THE MICRO SERIES DRIVES

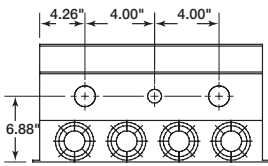
MICRO SERIES INVERTERS



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

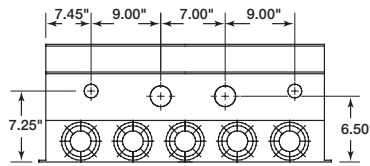


CONDUIT HOLES FOR 174578.00



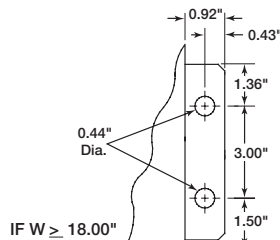
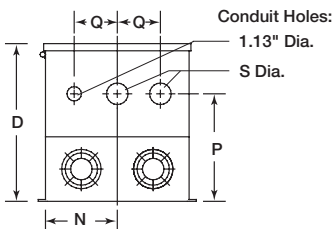
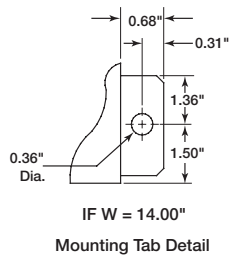
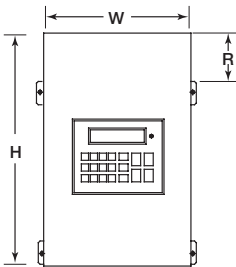
Conduit Holes: Large holes = 1.75"
Small hole = 1.13"

CONDUIT HOLES FOR 174586.00



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

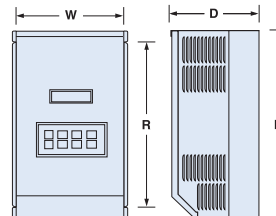
TYPE 12 DIMENSIONS FOR MODELS RATED ABOVE 30 HP AT 240/200 VAC AND 60 HP AT 400/480 VAC



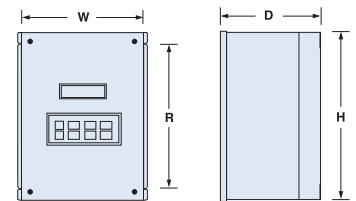
MICRO SERIES INVERTER DIMS. (Inches) • NEMA 1, NEMA 4/12 & NEMA 4X

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					
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					
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

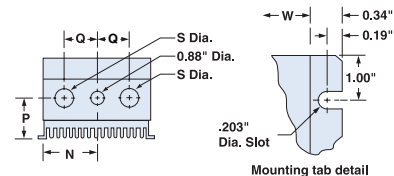
NEMA 1 ONLY



NEMA 4/12 WASHGUARD™ ONLY



NEMA 1 & NEMA 4/12





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.

DYNAMIC BRAKING BOARDS*

Drive HP	Drive Voltage Rating	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
1/2-3	All	174184	\$335	A	2
5	200-230V	174185	380	A	2
5	460-480V	174185	380	A	2
5	550-575V	174184	334	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	\$340	A	2
7 1/2	460-480V	174193	340	A	2
7 1/2	550-575V	174193	340	A	2
10 - 60	All	174192	340	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	\$167	A	1	
1	200-230V	174179	167	A	1	
	460-480V	174179	167	A	1	
	550-575V	174178	167	A	1	
1 1/2	200-230V	174179	167	A	1	
	2	200-230V	174180	167	A	1
	460-480V	174180	167	A	1	
3	550-575V	174179	167	A	1	
	200-230V	174182	234	A	1	
	460-480V	174182	234	A	1	
5	550-575V	174181	234	A	1	
	200-230V	174183	234	A	1	
	460-480V	174183	234	A	1	
7 1/2	550-575V	174182	234	A	1	
	200-230V	174143	271	A	1	
	460-480V	174143	271	A	1	
10	550-575V	174148	271	A	1	
	200-230V	174143	271	A	1	
	460-480V	174143	271	A	1	
15-20	550-575V	174148	271	A	1	
	200-230V	174144	326	A	1	
	460-480V	174144	326	A	1	
25-30	550-575V	174149	326	A	1	
	200-230V	174145	551	A	1	
	460-480V	174145	551	A	1	
40	550-575V	174140	551	A	1	
	200-230V	174145	551	A	1	
	460-480V	174146	910	A	1	
50-60	550-575V	174141	910	A	1	
	460-480V	174147	1049	A	1	
	550-575V	174142	1049	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,



Item	Catalog Number	List Price	Disc. Sym	App. Wgt.(lbs.)
Keypad	174177	\$236	A	2
2.5 ft. Cable	RKP25	366	A	2
5 ft. Cable	RKP50	408	A	2
10 ft. Cable	RKP100	493	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

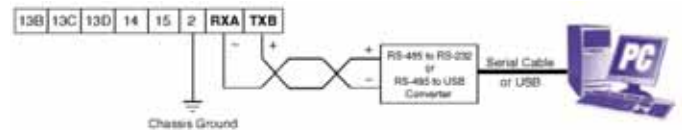


Note 2: Refer to the converter manufacturer's instructions for proper converter configuration. The converter is not supplied by LEESON.

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.

ACH SERIES INVERTERS FOR HVAC APPLICATIONS

"I don't have to search for external components like timers and PID controllers and then worry about their compatibility. It's all there, in the drive."



The new ABB ACH550 Series Drives takes the typical operator interface to a new level. ABB ACH Series Drive Keypads use full language, no codes. This keypad emulates the human interface of a cell phone.

Using the intuitive interface, you control the panel's functions in one of 14 selectable languages.



The new ABB ACH Series Drive has pioneered several new-to-the-market features such as:

Help Screens

• Maintenance Assistants

The Maintenance Assistant alerts users when equipment maintenance is required, based on selected inputs.

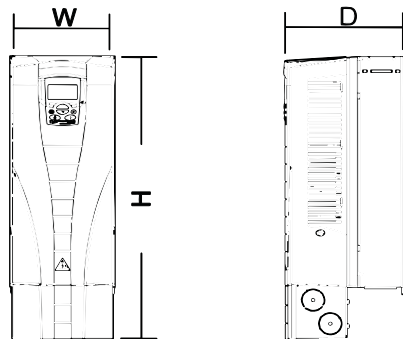
• Diagnostic Assistants

Pressing the Help Key brings the user to the Diagnostic Assistant; it suggests possible causes of the trip and probable corrective actions.

• Programming Assistants

Programming Assistants configure the drive for an application. For example, the Assistant prompts the user through a series of 12 questions; and uses the answers to these questions to set 26 parameters inside of the drive's program. No need to navigate the drive menus!

ABB drives "UH" (basic Nema 1 box) designation come with built-in EMI/RFI filter & 5% Line Reactor, standard, on all drives.



Wall Mount

Features

Pre-configured HVAC application solutions

14 different HVAC application macros are pre-programmed into the HVAC drive. Application macros for supply and return fans, cooling tower fans, booster pumps and condensers are available, just to name a few. The user can create two additional application macros, selectable manually or through a customer contact. To illustrate this, the user can create "summer" and "winter" application macros and select between these according to the time of the year.

Patented Swinging DC choke - up to 64% less harmonics

ABB's patent-pending swinging choke means the ACH Series Drive reduces harmonics of up to 64% at partial loads when compared to a PWM AFD with no chokes. There is no need to oversize the supply cables.

N2, FLN and Modbus embedded

Commonly used HVAC field buses are embedded into the memory of the drive, ensuring that they are always there if you need them. ABB has a long history in building automation, with more than 80,000 installed drives utilizing serial communications. LonWorks, Profibus and other plug-in modules fit under the cover of the drive. A single twisted pair avoids great lengths of conventional cabling, reducing cost and increasing system reliability.

Built-in timers

External timer circuits are no longer needed. Built-in timers - utilizing the real-time clock and calendar allow starting and stopping the drive or changing the speed according to a set time and date. Relay outputs can be operated by the timers to control any auxiliary equipment on site.

Built-in EMI/RFI filters

The ACH Series Drive is designed to meet the EMC product standard EN61800-3 for the 1st Environment. These standard filters eliminate the need for any external filtering hardware.

ABB ACH Series Drive are UL/cUL and CSA Listed and the enclosures are UL Plenum Rated.

NEMA 1 Enclosures 208/230 Volts

HP	Catalogue Number	List Price	Disc. Sym	App. Wgt (lbs)	Amps	Dim. H"xW"xD"
60	ACH550-UH-178A-2	\$12845	A	152	178	34.6 x 11.8 x 15.8
75	ACH550-UH-221A-2	15175	A	152	221	34.6 x 11.8 x 15.8
100	ACH550-UH-248A-2	18429	A	152	248	34.6 x 11.8 x 15.8

480 Volts

HP	Catalogue Number	List Price	Disc. Sym	App. Wgt (lbs)	Amps	Dim. H"xW"xD"
60	ACH550-UH-078A-4	\$10878	A	75	77	29.0 x 10.4 x 11.3
75	ACH550-UH-096A-4	12119	A	75	96	29.0 x 10.4 x 11.3
100	ACH550-UH-124A-4	15061	A	152	124	34.6 x 11.8 x 15.8
125	ACH550-UH-157 A-4	15748	A	152	157	34.6 x 11.8 x 15.8
150	ACH550-UH-180A-4	20579	A	152	180	34.6 x 11.8 x 15.8

600 Volts

HP	Catalogue Number	List Price	Disc. Sym	App. Wgt (lbs)	Amps	Dim. H"xW"xD"
60	ACH550-UH-062A-6	\$12451	A	53	62	27.1 x 8.0 x 10.3
75	ACH550-UH-077A-6	13869	A	152	77	34.6 x 11.8 x 15.8
100	ACH550-UH-099A-6	17196	A	152	99	34.6 x 11.8 x 15.8
125	ACH550-UH-125 A-6	18029	A	152	125	34.6 x 11.8 x 15.8
150	ACH550-UH-144A-6	23547	A	152	144	34.6 x 11.8 x 15.8

Call your Leeson representative for UL Type 12 enclosures.

E-Bypass

Matched electronically controlled bypasses are available. Call for more information.



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:



SM SERIES

- 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
- Output signal calibration
- 1st 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



SINGLE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps 230 VAC	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
110-120 Volts	1/3	1.7	110-120	174263	\$395	2	A	A5
	1/2	2.4	110-120	174264	429	2	A	A5
	1	4.2	110-120	174265	568	3	A	B5
	1 1/2	6.0	110-120	174266	645	3	A	B5

SINGLE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
208-240 Volts	1/3	1.7	208-240	174267	\$337	2	A	A5
	1/2	2.4	208-240	174268	366	2	A	A5
	1	4.2	208-240	174270	409	3	A	A6
	1 1/2	6.0	208-240	174271	525	4	A	B5
	2	7.0	208-240	174272	587	5	A	B5
	3	9.6	208-240	174273	636	5	A	B6

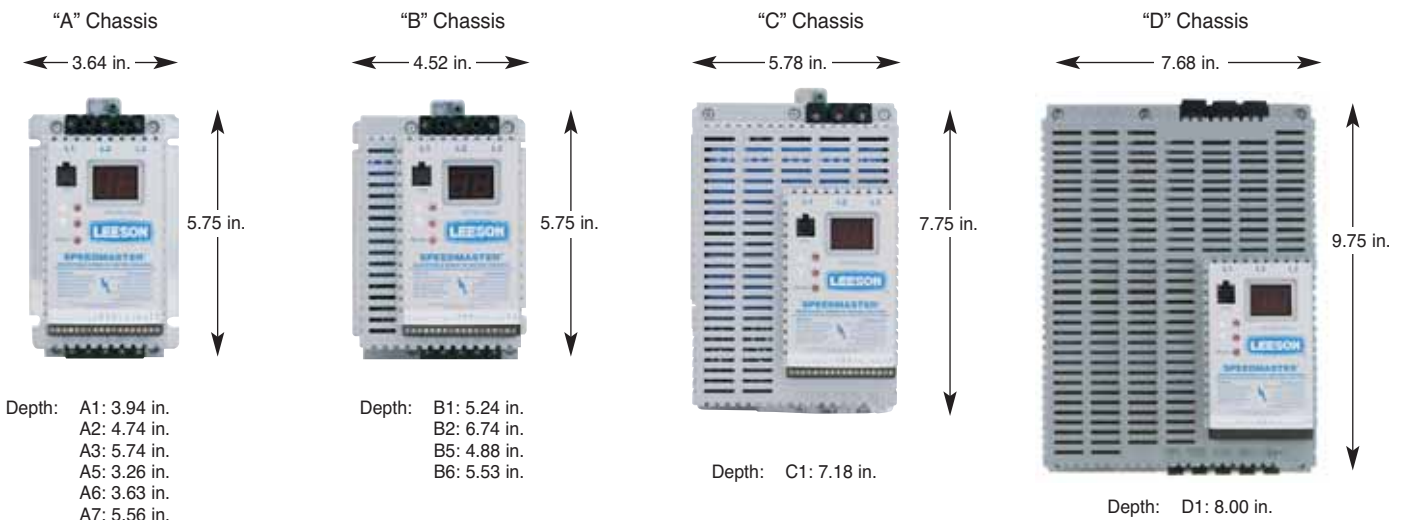
THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
208-240 Volts	1/2	2.4	208-240	174274	\$361	2	A	A5
	1	4.2	208-240	174276	404	2	A	A6
	1 1/2	6.0	208-240	174277	481	3	A	A7
	2	7.0	208-240	174278	544	3	A	A7
	3	9.6	208-240	174279	602	3	A	B6
	5	15.2	208-240	174288	685	5	A	B2
	7 1/2	22.0	208-240	174280	994	8	A	C1
	10	28.0	208-240	174290	1064	8	A	C1
	15	42.0	208-240	174292	1740	14	A	D1

THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
400-480 Volts	1/2	1.1	400-480	174281	\$425	2	A	A1
	1	2.1	400-480	174282	455	3	A	A2
	1 1/2	3.0	400-480	174283	493	3	A	A3
	2	3.4	400-480	174284	527	4	A	A3
	3	4.8	400-480	174286	577	4	A	B1
	5	7.8	400-480	174287	691	5	A	B2
	7 1/2	11.0	400-480	174285	960	5	A	B2
	10	14.0	400-480	174291	1150	8	A	C1
	15	21.0	400-480	174293	1310	8	A	C1

DIMENSIONS: SM AND SM PLUS INVERTERS



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

AC ADJUSTABLE SPEED DRIVES



SM PLUS SUB-MICRO INVERTERS

SM PLUS SUB-MICRO INVERTER DRIVES

BIG performance from an ultra-compact design. Over 50 programmable functions:

- 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
- Three programmable terminals for speed reference and control activation
- Two open collector auxiliary outputs to indicate: Run, Fault, Inverse Fault, Fault Lockout, At Set Speed, Above Preset Speed, Current Limit, Automatic Mode, and Reverse.
- Automatic restart after fault
- Control via 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
- I²t motor thermal overload protection
- Fixed boost for high starting torque
- Accel boost for high torque accelerating at any speed
- Slip compensation
- Activation or disabling of serial communications
- Assignment of serial addresses
- Modbus® Serial Communication Protocol
- Password protection
- Fault history: Stores eight previous trips
- Terminal status indication
- Parameter reset: Reset to factory defaults (choice of 50 Hz or 60 Hz factory settings) or OEM defaults
- IP20 enclosure
- Dynamic braking and remote keypad kits available on page 111



SM PLUS

SINGLE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps 230 VAC	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
115/230 Volts	1/4	1.4	115/230	174450 ^a	\$645	2	A	A1
	1/2	2.2	115/230	174451 ^a	692	3	A	A1
	1	4.2	115/230	174492	835	4	A	B1
	1 1/2	6.0	115/230	174445	940	5	A	B1

^d To be discontinued when present stock is depleted.

SINGLE OR THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
200-230 Volts	1/4	1.4	200-230	174452	\$597	2	A	A1
	1/2	2.2	200-230	174453	623	2	A	A1
	1	4.2	200-230	174454	671	3	A	A2
	1 1/2	6.0	200-230	174493	798	4	A	B1
	2	6.8	200-230	174494	882	5	A	B2
	3	9.6	200-230	174495	1073	5	A	B2
	5	15.2	200-230	174444	1469	8	A	C1

THREE PHASE INPUT/OUTPUT

	HP	Output Amps	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension Key
200-230 Volts	1	4.2	200-230	174455	\$618	3	A	A2
	1 1/2	6.0	200-230	174456	729	3	A	A3
	2	6.8	200-230	174457	803	4	A	A3
	3	9.6	200-230	174458	956	4	A	A3
	5	15.2	200-230	174446	1231	4	A	B2
	7 1/2	22.0	200-230	174438	1680	8	A	C1
	10	28.0	200-230	174439	2008	8	A	C1
	15	42.0	200-230	174429	2383	13	A	D1
	20	54.0	200-230	174430	2921	14	A	D1
	460-480 Volts	1/2	1.1	460-480	174459	697	2	A
1		2.1	460-480	174460	750	3	A	A2
1 1/2		3.0	460-480	174461	819	3	A	A3
2		3.4	460-480	174462	903	4	A	A3
3		4.8	460-480	174463	1009	4	A	A3
5		7.6	460-480	174447	1289	5	A	B2
7 1/2		11.0	460-480	174440	1680	8	A	C1
10		14.0	460-480	174441	2008	8	A	C1
15		21.0	460-480	174431	2336	13	A	D1
20		27.0	460-480	174432	2860	14	A	D1
550-575 Volts*	25	34.0	460-480	174433	3403	14	A	D1
	30	40.0	460-480	174500	3800	4	A	D1
	1	1.7	550-575	174464	803	3	A	A2
	2	3.0	550-575	174491	962	4	A	A3
	3	4.2	550-575	174497	1141	5	A	B2
	5	6.6	550-575	174448	1395	5	A	B2
	7 1/2	9.9	550-575	174442	1812	8	A	C1
	10	12.2	550-575	174443	2145	8	A	C1
	15	19.0	550-575	174434	2476	8	A	D1
	20	24.0	550-575	174435	3029	14	A	D1
25	27.0	550-575	174436	3581	14	A	D1	

* Can be utilized with 480V - consult manual

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
Digital Outputs	Open-collector: 40 mA at 30 VDC
Power Supply for Aux. Relays	40 mA at 12 VDC



AC ADJUSTABLE SPEED DRIVES

SM2 SERIES SUB-MICRO INVERTERS

SM2 SERIES FLUX VECTOR™ DRIVE

With its price, its flexibility and a power range of up to 25 Hp, the SM2 SERIES FLUX VECTOR™ drive excels in environments where inverter technology was once considered too costly, including packaging machinery, food processing machinery, material handling/conveying systems and HVAC systems.



The SM2 SERIES FLUX VECTOR™ carries all the features required by demanding applications including four modes of operation (V/Hz, Enhanced V/Hz, Vector Speed, and Torque), high starting torque, auto-tuning, advanced low-speed control, and dynamic speed regulation.

General Specifications:

- **Horsepower:** 1 to 25HP (0.75 to 18.5kW)
- **Supply Power:**
 - Single Phase: 120, 208, 220 or 240VAC
 - Three Phase: 208, 240, 400, 480 or 600VAC
 - 50 / 60 Hz

Motors: Designed for operation with vector duty rated induction motors rated for 120, 200, 230, 400, 460 or 575VAC from 0 to 240Hz.

Enclosure: NEMA1, IP21, -10 to 55°C, 2.5% derate per °C above 40°C

Standard Features: Easy Set-up and Operation: Program the Vector control in one of four convenient ways:

- From the front of the drive
- The optional remote keypad
- A PC Using TechLink Software (Available free from www.leeson.ca)
- The innovative EPM Programmer.

Modes of operation:

- Open Loop Flux Vector (Speed or Torque)
- V/Hz (constant or variable)
- Enhanced V/Hz with Auto-tuning

Easy to Use Keypad & Display 6-Button Interface:

- Start
- Stop
- Forward/Reverse
- Scroll Up
- Scroll Down
- Enter/Mode

Vivid Illumination:

- 4 digit LED display
- Easy to read from a distance
- Movable Decimal Point

Acceleration/Deceleration Profiles:

- Two Independent Accel Ramps
- Two Independent Decel Ramps
- Linear or S-Type
- Auxiliary Ramp-to-Stop

Output Frequency:

- 500 Hz Std., 1000 Hz Optional

Selectable Logic Assertion:

- Positive Logic Input (PNP current sourcing)
- Negative Logic Input (NPN current sinking)

Multiple Braking Functions

Loss of Follower Management

Speed Commands: Keypad, Jog, Floating Point Control

Voltage: Scalable 0-10 VDC,

Current: Scalable 4-20 mA, Potentiometer, 8 Preset Speeds

Process Control: PID Modes: Direct or Reverse Acting, PID Sleep Mode

SINGLE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps 230 VAC	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension H x W x D (in.)
120-240 Volts	1/3	1.7	120/240	174603	\$320	5	A	7.5 x 3.9 x 4.35
	1/2	2.4	120/240	174604	340	5	A	7.5 x 3.9 x 4.35
	1	4.2	120/240	174605	380	5	A	7.5 x 3.9 x 4.35

SINGLE OR THREE PHASE INPUT/THREE PHASE OUTPUT

	HP	Output Amps 230 VAC	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension H x W x D (in.)
208-240 Volts	1/3	1.7	200/240	174606	\$301	5	A	7.5 x 3.9 x 4.35
	1/2	2.4	200/240	174607	317	5	A	7.5 x 3.9 x 4.35
	1	4.2	200/240	174608	336	5	A	7.5 x 3.9 x 4.35
	1 1/2	6	200/240	174609	375	11	A	7.5 x 3.9 x 5.45
	2	7	200/240	174610	406	11	A	7.5 x 3.9 x 5.45
	3	9.6	200/240	174611	515	11	A	7.5 x 3.9 x 5.45

THREE PHASE INPUT/OUTPUT

	HP	Output Amps 230 VAC	Input Voltage	Catalogue Number	List Price	App. Wgt.(lbs.)	Disc. Sym.	Dimension H x W x D (in.)	
208-240 Volts	1 1/2	6	200/240	174612	\$357	11	A	7.5 x 3.9 x 5.45	
	2	7	200/240	174613	383	11	A	7.5 x 3.9 x 5.45	
	3	9.6	200/240	174614	483	11	A	7.5 x 3.9 x 5.45	
	5	16.5	200/240	174615	576	15	A	7.5 x 3.9 x 5.8	
	7 1/2	23	200/240	174616	TBA	18	A	9.83 x 5.12 x 6.3	
	10	29	200/240	174617	TBA	18	A	9.83 x 5.12 x 6.3	
	15	42	200/240	174618	TBA	20	A	12.33 x 6.88 x 8.08	
	20	54	200/240	174619	TBA	20	A	12.33 x 6.88 x 8.08	
	400-480 Volts	1/2	1.3/1.1	400/480	174620	366	5	A	7.5 x 3.9 x 4.35
		1	2.42/1	400/480	174621	394	5	A	7.5 x 3.9 x 4.35
1 1/2		3.5/3.0	400/480	174622	425	11	A	7.5 x 3.9 x 5.45	
2		4.0/3.5	400/480	174623	455	11	A	7.5 x 3.9 x 5.45	
3		5.5/4.8	400/480	174624	536	11	A	7.5 x 3.9 x 5.45	
5		9.4/8.2	400/480	174625	606	15	A	7.5 x 3.9 x 5.8	
7 1/2		12.6/11	400/480	174626	TBA	18	A	9.83 x 5.12 x 6.3	
10		16.1/14	400/480	174627	TBA	18	A	9.83 x 5.12 x 6.3	
15		24/21	400/480	174628	TBA	20	A	12.33 x 6.88 x 8.08	
20		31/27	400/480	174629	TBA	20	A	12.33 x 6.88 x 8.08	
480-600 Volts	25	39/34	400/480	174630	TBA	20	A	12.33 x 6.88 x 8.08	
	1	1.7	480/600	174631	453	5	A	7.5 x 3.9 x 4.35	
	2	2.7	480/600	174632	506	11	A	7.5 x 3.9 x 5.45	
	3	3.9	480/600	174633	585	11	A	7.5 x 3.9 x 5.45	
	5	6.1	480/600	174634	660	15	A	7.5 x 3.9 x 5.8	
	7.5	9	480/600	174635	TBA	18	A	9.83 x 5.12 x 6.3	
	10	11	480/600	174636	TBA	18	A	9.83 x 5.12 x 6.3	
480-600 Volts	15	17	480/600	174637	TBA	20	A	12.33 x 6.88 x 8.08	
	20	22	480/600	174638	TBA	20	A	12.33 x 6.88 x 8.08	
	25	27	480/600	174639	TBA	20	A	12.33 x 6.88 x 8.08	

Available 1st Quarter 2007

Voltage Monitoring

Current Monitoring

Real Time Monitoring: 8 register fault history, Software Version Drive Network ID, DC Bus Voltage (V), Motor Voltage (V), Output Current (%) Motor Current (A), Motor Torque (%), Power (kW) Energy Consumption (kWh), Heatsink Temperature (°C), 0-10 VDC Input (User Defined), 4-20 mA Input (User Defined) PID

Feedback (User Defined), Analog Output (% Load, % Torque, kW), Network Speed (baud rate), Terminal Continuity, Keypad Status,

Elapsed Run Time (hours), Elapsed Power on Time (hours)

Standards: UL (USA), cUL (Canada), CE (Europe), GOST (Russia/Ukraine) C-Tick (Australia/New Zealand)

AC ADJUSTABLE SPEED DRIVES

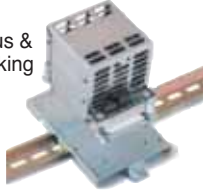
SM PLUS SUB-MICRO INVERTERS



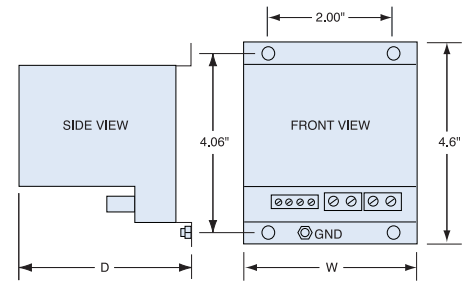
ACCESSORIES FOR THE SM & SM-PLUS SERIES DRIVES

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

Dynamic braking is available for the SM, SM-Plus & Vector 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	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/4-1/2	208-230V	174400	\$220	A	2
1/4-1/2	400-480V	174406	220	A	2
1 - 1 1/2	208-230V	174401	256	A	3
1 - 1 1/2	400-480V	174407	256	A	3
1 - 1 1/2	480-590V	174412	256	A	3
2 - 3	208-230V	174402	348	A	4
2 - 3	400-480V	174408	348	A	4
2 - 3	480-590V	174413	348	A	4
5	208-230V	174403	348	A	5
5	400-480V	174409	454	A	5
5	480-590V	174414	454	A	5
7 1/2	208-230V	174404	573	A	6
7 1/2	400-480V	174410	573	A	6
7 1/2	480-590V	174415	573	A	6
10	208-230V	174405	692	A	8
10	400-480V	174411	692	A	8
10	480-590V	174416	692	A	8

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

DYNAMIC BRAKING MODULES WITHOUT RESISTORS*

Drive HP	Motor Voltage Rating	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
15-20	208-230V	174417	\$295	A	10
15-25	400-480V	174418	295	A	10
15-25	480-590V	174419	295	A	10

* Dynamic Braking Resistors are purchased and mounted separately.

DYNAMIC BRAKING RESISTORS**

Drive HP	Motor Voltage Rating	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
15-20	208-230V	174144	\$326	A	1
15-20	400-480V	174144	326	A	1
15-20	480-590V	174149	326	A	1
25	400-480V	174145	551	A	1
25	480-590V	174140	551	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.



Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
174189	\$766	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.



Catalogue Number	List Price (6 pcs.)	Disc. Sym.	App. Wgt. (lbs.)
174186	\$158	A	3
174187	174	A	3
174188	211	A	3

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.**



Catalogue Number	List Price (10 pcs.)	Disc. Sym.	App. Wgt. (lbs.)
174190	\$157	A	1
218-001*	16	A	<1

*Qty 1

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	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
SM Vector	174306	\$210	A	2
SM Plus	174191	210	A	2
SM	174194	210	A	2



AC ADJUSTABLE SPEED DRIVES

FHP SERIES • SINGLE & DUAL VOLTAGE AC DRIVES

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
- Input 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.
- 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 through 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 isolation card 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

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/THREE PHASE OUTPUT*

HP	Input Voltage	Output Amps	Output Voltage	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/4	230	1.2	230	175318	\$291	A	2
	115/230	1.2	230	175319	385	A	2
	115	2.4	115	175320	301	A	3
1/2	230	2.4	230	175321	301	A	3
	115/230	2.4	230	175310	390	A	3
	115	4.0	115	175322	375	A	4
1	230	4.0	230	175323	388	A	4
	115/230	4.0	230	175311	466	A	4

*These drives will also run 1ph motors such as PSC, shaded pole and synchronous.

FHP SERIES AC DRIVES • ACCESSORIES

Item Description	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
Process Control Module (PCM) Kit*	175324	\$45	A	2
Carrier Frequency Capacitor Kit	175325	11	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
- Built-in isolation card to accept a speed reference signal



HP	Input Voltage	Output Amps	Output Voltage	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)
1/6-1	115/230	4.0	115-230	175326	\$701	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	Catalogue Number	List Price	Disc. Sym.	App. Wgt. (lbs.)	FL Amps 230V	% F.L. Eff.	"C" Dim. (Inches)
1/6	1725	48CZ	102792	\$218	A	15	1.3	56.0	8.94
1/4	1725	48CZ	102793	218	A	15	1.4	58.0	8.94
1/3	1725	48CZ	102794	221	A	20	1.6	64.0	9.19
1/2	1725	48CZ	102795	249	A	24	1.8	77.0	10.19

LEESONGuard™ HSC • HOT STANDBY CONTROL



Applications:

- Fans
- Pumps
- Cooling Towers
- Chillers
- Conveyors
- Food Processing

The LEESONGuard™ HSC is designed to “failsafe” a VFD drive system. By constantly monitoring the VFD the HSC will respond to a fault code by automatically switching quickly and reliably to a redundant drive thus maintaining continuous operation where it is critical. This eliminates both downtime and startup time. (The board works in conjunction with other field devices such as relays and contacts.)

The standard design is pre-programmed for Lead/Lag Pump Control, Bypass and Hot Standby. The mode can be switched by simply using a jumper on the card . This flexible control renders other custom configurations possible - please contact LEESON.

The design of the card is compact, open style for easy integration into a new or existing system. Implementation is easy - there is no cable, no software, no external power supply or programming required. In many instances it eliminates the need for a PLC and when installing in a Lead/Lag pump system only one VFD is required where two is conventional, thereby minimizing cost and realizing a quicker payback.

There are three modes available:

- Lead/Lag Pump Control - user selectable (no jumper)
- Automatic/Manual Bypass - user selectable (with jumper)
- Hot Standby - user selectable (with jumper)

Features:

- Continuous monitoring of VFD faults
- Universal input power
- Built-in 24Vdc power supply for discrete field devices
- 5 Vdc power supply module
- Suitable for any size system regardless of voltage or HP

Includes:

- Complete installation instructions
- Wiring diagrams
- Mounting standoffs

HOT STANDBY CONTROL

Catalogue Number	List Price	Disc. Sym.	App. Weight	Input Voltage	Card (dim) L x W (mm)	Mounting (dim) L x W (mm)
HSC-1	\$649	A	1	90 - 600VAC	12.4 X 8.5	11.3 X 7.45

LEESONGuard™ INPUT/OUTPUT CONNECTORS DESCRIPTION

INPUT TERMINALS

Input Pin	Description
GND	Ground
GND	Ground
APJ	VFD Mode OR Motor Mode Select Jumper
CS2	Contactora #2 Status
CS1	Contactora #1 Status
SWS	Selector Switch for
a) Motor A OR Motor B Selection for Motor HSC Configuration	
OR	
b) VFD A OR VFD B Selection for VFD HSC Configuration	
ERB	VFD B Error
ERA	VFD A Error
STB	VFD B Status
STA	VFD A Status
+5VDC@20mA	Auxiliary Control Voltage
GND	DC common negative connection

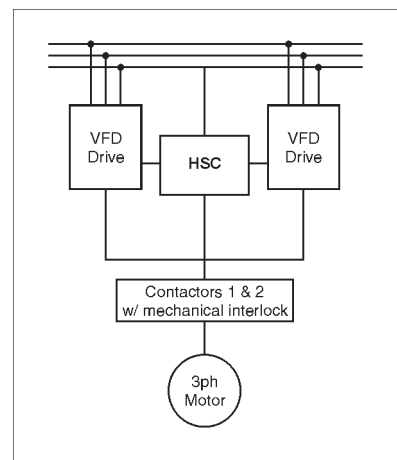
OUTPUT TERMINALS

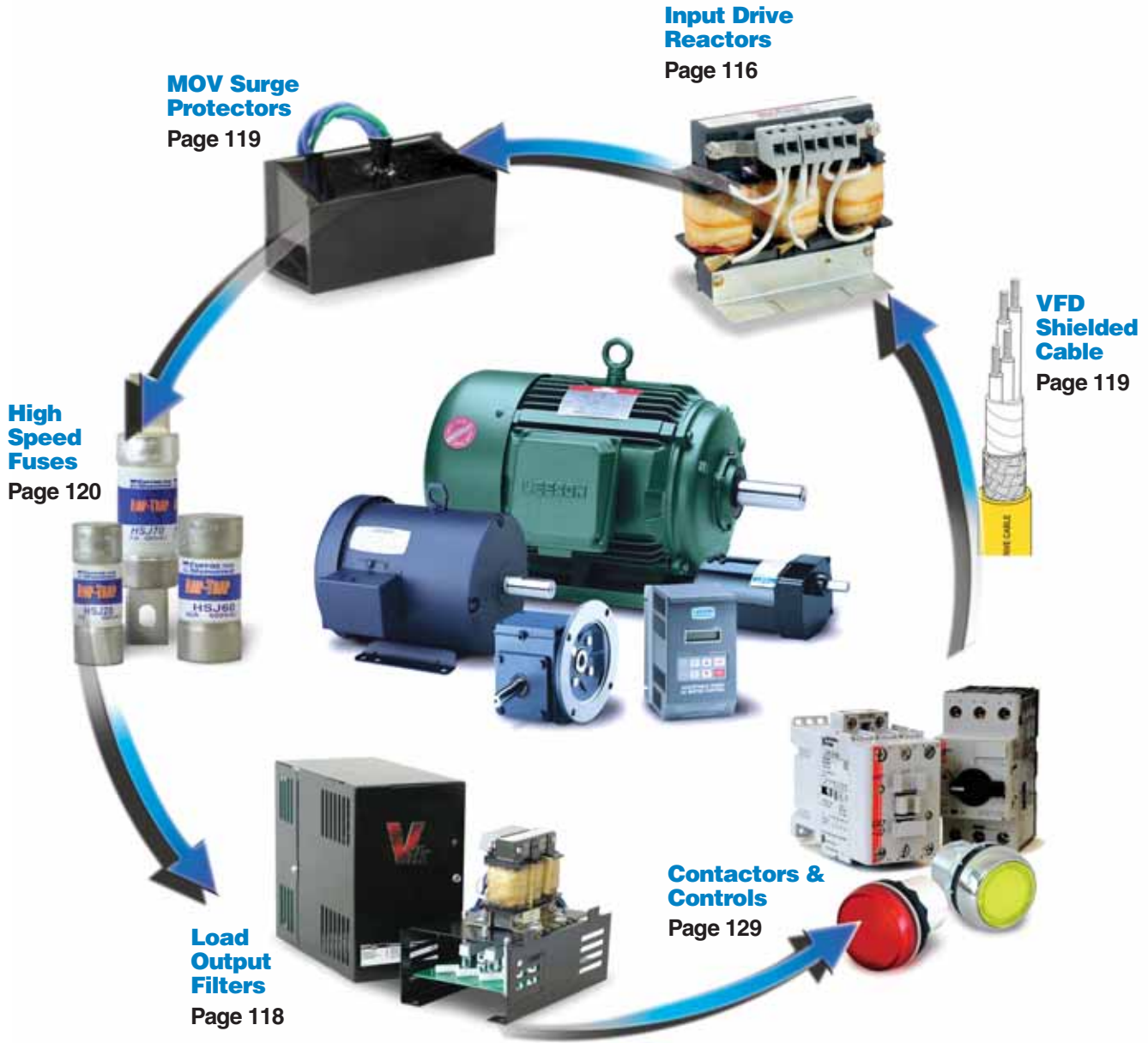
Input Pin	Description
DB1	
DB2	VFD B Start/Stop
+24VDC@120mA	Contactora #1 Coil terminal A1
+24VDC@120mA	Contactora #2 Coil terminal A1
BC1	To contactora #1 Coil terminal A2
BC2	To contactora #2 Coil terminal A2
ALM	User alarm
DA1/DA2	VFD A Start/Stop
DB1/DB2	VFD B Start/Stop

LED LIGHTS

LED	Description
D1	User alarm
D2	Contactora #2 ON
D3	Contactora #1 ON
D4	VFD A RUNNING
D5	VFD B RUNNING

EXAMPLE OF A HOT STANDBY SYSTEM





Protect Your Investment.

VARIABLE FREQUENCY DRIVE SET-UP

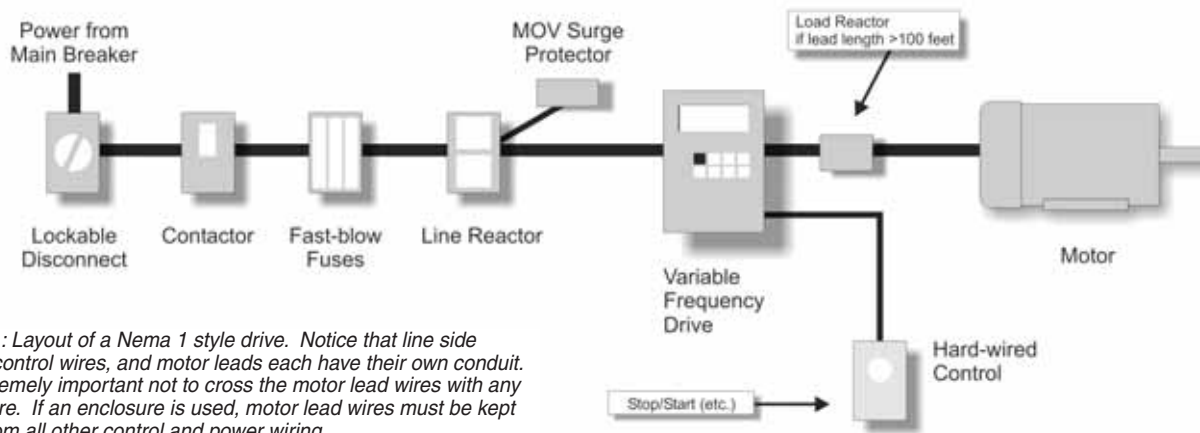


Figure 1: Layout of a Nema 1 style drive. Notice that line side power, control wires, and motor leads each have their own conduit. It is extremely important not to cross the motor lead wires with any other wire. If an enclosure is used, motor lead wires must be kept away from all other control and power wiring.

Installation of the VFD should entail some basic components (Figure 1). The following is a brief description of these components. **N.B. As with all electrical equipment installation must be done by certified or licensed personnel. Always check with provincial and federal standards and codes for your area.**

LOCKABLE DISCONNECT SWITCH (PG 135)

The lockable disconnect switch is designed to disconnect the main power source, single or three phase.

CONTACTOR (PG 136)

The option of using a contactor ensures that the drive will not be damaged due to any rapid fluctuations in power levels such as in a rainstorm or thunderstorm where power may be cycling rapidly (check on the proper electrical code for contactor and fuse configuration). In some types of drives that have a standard DC Bus configuration the rapid cycling of line side power may cause severe damage possibly requiring a new drive. This is only a suggestion to be used in cases where heavy rainstorms occur and the specific drive system is critical.

HIGH-SPEED FUSES (PG 120)

Most drives require high-speed fuses (also known as semiconductor rated fuses). Because of their energy limiting characteristics, they are able to protect semiconductor devices such as variable frequency drives from excess energy let-through under fault current conditions.

The use of time delay fuses is not recommended as they are meant for loads such as motors or heaters not electronic devices such as fax machines, computers, and variable frequency drives.

LINE REACTOR (PG 116)

The line reactor is basically protecting the full wave rectifier on the front end of the drive and the DC Bus (all those capacitors in the drive). It attenuates most voltage anomalies and must be used where the voltage is 575 volts, close to a power factor correction bank or where THD (Total Harmonic Distortion) is high. The line reactor will attenuate most of these and is

always a good idea to use regardless since drives tend to be voltage sensitive devices. N.B. The line reactor must be sized for the nominal load that the drive is working at. If the line reactor is sized for the full load rating and the drive only outputs half of its capability then the line reactor will not provide adequate protection.

MOV SURGE PROTECTOR (PG 119)

The MOV Surge Protector will ensure that the full wave bridge rectifier on the input side of the VFD will be protected from any dangerous voltage transients and will reduce the effect of lightning. The use of an MOV is recommended. This device is placed at the line reactor and is wired in parallel with the incoming power line.

LOAD REACTOR/FILTER (PG 118)

If the motor leads are within 100 feet in length then no Load Filter is required as the motor windings will not experience any adverse effects from Reflective Wave Phenomena. This applies to a Carrier Frequency of 2.5KHZ; if higher, then leads must be shorter.

If the leads are over 100 feet in length then a Load Reactor/Filter is required.

CONTROL WIRING (PG 119)

Control wiring to the drive from the station should be stranded, shielded and 18 to 24AWG in size. It should be wired directly to the input terminals of the drive since dry contact signals are used for the discrete stop/start, forward/reverse etc. The majority of control boards on most drives are totally isolated from the drive itself and must not see any voltage via the control wire to the drive's control from either a radiated, conducted or emitted source.



AC ADJUSTABLE SPEED DRIVES INPUT LINE REACTORS



LEESON three-phase AC reactors are intended for use as input (or output) filters for variable frequency drives. Drive performance is improved by protecting the input rectifier from failure or damage and acting as a buffer between the line and the solid state power circuit.

Transient voltages on the AC power line can cause inrush currents to an AC drive. These transient voltage conditions are often caused by utility capacitor switching. The addition of a line reactor will limit the magnitude of inrush current preventing tips and component failures.

OPTIMIZED DRIVE REACTORS • KDR

The new KDR Optimized Drive Reactors have been designed to provide the rugged reliability customers have come to expect. These reactors are now available for both the input and the output of PWM drives.

The KDR reactors for the input are available in two ratings versions, Low "Z" (low impedance) and High "Z" (high impedance). The Low "Z" units can be used in any application where traditionally either a 1.5% or 3% impedance reactor would be applied. The High "Z" units can be used in any application where traditionally a 5% impedance reactor would be applied.

The output reactors (see page 119) have been selected based on the unit's ability to withstand the rigors of variable system characteristics. With TCI's same outstanding warranty and performance guarantee, the KDR Optimized Drive Reactors offer a superior design and performance solution.

Features

- Lifetime warranty
- Universal footprint
- All copper windings
- CSA certified
- UL/ULC recognized

208-240V • LOW (Z) IMPEDANCE

Low "Z" units can be used in any application where traditionally either a 1.5% or 3% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA54L	\$116	2.4	7	4.00 x 4.18 x 3.75	4
0.75	KDRA53L	118	3.5	12	4.00 x 4.18 x 3.75	4
1	KDRA25L	120	4.6	11	4.00 x 4.18 x 3.75	4
1.5	KDRA26L	125	6.6	18	4.00 x 4.18 x 3.75	4
2	KDRA27L	127	7.5	21	4.00 x 4.18 x 3.75	4
3	KDRA28L	143	10.6	29	4.00 x 4.18 x 3.75	4
5	KDRB22L	204	16.7	38	5.00 x 6.00 x 4.00	8
7.5	KDRB23L	233	24.2	48	5.00 x 6.00 x 4.00	8
10	KDRD25L	238	30.8	64	5.75 x 7.20 x 4.25	12
15	KDRD24L	243	46.2	85	5.75 x 7.20 x 4.25	12
20	KDRD26L	259	59.4	94	5.75 x 7.20 x 4.25	12
25	KDRC22L	346	74.8	114	5.75 x 7.20 x 5.00	15
30	KDRF24L	353	88	135	7.00 x 9.00 x 6.00	30
40	KDRF25L	523	114	149	7.00 x 9.00 x 6.00	30
50	KDRF26L	614	143	154	7.00 x 9.00 x 6.00	30
60	KDRH22L	717	169	209	9.00 x 11.00 x 7.00	45
75	KDRI23L	731	211	294	9.00 x 11.00 x 7.00	50
100	KDRI24L	818	273	276	9.00 x 11.00 x 7.00	50
125	KDRG22L	1070	343	370	9.00 x 11.00 x 8.00	65
150	KDRJ23L	1095	396	401	9.00 x 11.00 x 9.00	70
200	KDRJ24L	1321	528	442	9.00 x 11.00 x 9.00	70

208-240V • HIGH (Z) IMPEDANCE

High "Z" units can be used in any application where traditionally a 5% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA54H	\$121	2.4	14	4.00 x 4.18 x 3.75	4
0.75	KDRA53H	127	3.5	16.8	4.00 x 4.18 x 3.75	4
1	KDRA25H	134	4.6	23.6	4.00 x 4.18 x 3.75	4
1.5	KDRA27H	144	6.6	30.6	4.00 x 4.18 x 3.75	4
2	KDRA26H	149	7.5	30.5	4.00 x 4.18 x 3.75	4
3	KDRA28H	154	10.6	43.1	4.00 x 4.18 x 3.75	4
5	KDRB25H	217	16.7	53.1	5.00 x 6.00 x 4.00	8
7.5	KDRB26H	223	24.2	66.5	5.00 x 6.00 x 4.00	8
10	KDRD21H	228	30.8	91.8	5.75 x 7.20 x 4.25	12
15	KDRD22H	296	46.2	107.8	5.75 x 7.20 x 4.25	12
20	KDRC22H	335	59.4	113.1	5.75 x 7.20 x 5.00	15
25	KDRF28H	394	74.8	151	7.00 x 9.00 x 6.00	30
30	KDRF25H	407	88	179.2	7.00 x 9.00 x 6.00	30
40	KDRF26H	547	114	192.8	7.00 x 9.00 x 6.00	30
50	KDRH24H	656	143	201	9.00 x 11.00 x 7.00	38
60	KDRH23H	765	169	220	9.00 x 11.00 x 7.00	45
75	KDRI22H	943	211	311.5	9.00 x 11.00 x 7.00	50
100	KDRI21H	1161	273	296.4	9.00 x 11.00 x 7.00	50
125	KDRG25H	1231	343	346.5	9.00 x 11.00 x 8.00	65
150	KDRJ22H	1259	396	465.3	9.00 x 11.00 x 9.00	70
200	KDRJ21H	1458	528	516.2	9.00 x 11.00 x 9.00	70

Catalogue numbers in blue are NEW items.

480V • LOW (Z) IMPEDANCE

Low "Z" units can be used in any application where traditionally either a 1.5% or 3% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA6L	\$121	1.1	5.6	4.00 x 4.18 x 3.75	4
0.75	KDRA7L	124	1.6	10	4.00 x 4.18 x 3.75	4
1	KDRA8L	127	2.1	10.4	4.00 x 4.18 x 3.75	4
1.5	KDRA9L	130	3	17	4.00 x 4.18 x 3.75	4
2	KDRA1L	134	3.4	19	4.00 x 4.18 x 3.75	4
3	KDRA2L	146	4.8	23	4.00 x 4.18 x 3.75	4
5	KDRA3L	153	7.6	49	4.00 x 4.18 x 3.75	4
7.5	KDRA4L	158	11	40	4.00 x 4.18 x 3.75	4
10	KDRA5L	212	14	64	4.00 x 4.18 x 3.75	5
15	KDRB2L	217	21	65	5.00 x 6.00 x 4.00	8
20	KDRB1L	228	27	79	5.00 x 6.00 x 4.00	8
25	KDRD1L	234	34	96	5.75 x 7.20 x 4.25	10
30	KDRD2L	296	40	105	5.75 x 7.20 x 4.25	10
40	KDRC1L	327	52	114	5.75 x 7.20 x 5.00	15
50	KDRF2L	382	65	114	7.00 x 9.00 x 6.00	25
60	KDRF4L	394	77	169	7.00 x 9.00 x 6.00	25
75	KDRF3L	525	96	193	7.00 x 9.00 x 6.00	30
100	KDRH3L	608	124	225	7.00 x 9.00 x 7.00	40
125	KDRH2L	750	156	254	9.00 x 11.00 x 7.00	40
150	KDRH1L	880	180	299	9.00 x 11.00 x 7.00	40
200	KDRG3L	1118	240	280	9.00 x 11.00 x 8.00	65
250	KDRG1L	1231	302	337	9.00 x 11.00 x 8.00	65
300	KDRG2L	1259	361	381	9.00 x 11.00 x 8.00	65
350	KDRJ2L	1458	414	465	9.00 x 11.00 x 9.00	70

480V • HIGH (Z) IMPEDANCE

High "Z" units can be used in any application where traditionally a 5% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA6H	\$130	1.1	9	4.00 x 4.18 x 3.75	4
0.75	KDRA7H	133	1.6	15	4.00 x 4.18 x 3.75	4
1	KDRA8H	135	2.1	12	4.00 x 4.18 x 3.75	4
1.5	KDRA9H	137	3	23	4.00 x 4.18 x 3.75	4
2	KDRA1H	140	3.4	33	4.00 x 4.18 x 3.75	4
3	KDRA2H	173	4.8	38	4.00 x 4.18 x 3.75	4
5	KDRA3H	181	7.6	80	4.00 x 4.18 x 3.75	4
7.5	KDRA4H	203	11	77	4.00 x 4.18 x 3.75	5
10	KDRA5H	253	14	111	4.00 x 4.18 x 3.75	5
15	KDRB2H	260	21	133	5.00 x 6.00 x 4.00	7
20	KDRC3H	292	27	108	5.75 x 7.20 x 5.00	15
25	KDRC1H	350	34	112	5.75 x 7.20 x 5.00	15
30	KDRE2H	397	40	141	5.75 x 7.20 x 5.00	16
40	KDRF4H	414	52	169	7.00 x 9.00 x 6.00	25
50	KDRF1H	570	65	191	7.00 x 9.00 x 6.00	25
60	KDRF2H	591	77	226	7.00 x 9.00 x 6.00	25
75	KDRH2H	671	96	212	9.00 x 11.00 x 7.00	45
100	KDR12H	803	124	362	9.00 x 11.00 x 7.00	50
125	KDRG3H	903	156	274	9.00 x 11.00 x 8.00	55
150	KDRG1H	1102	180	359	9.00 x 11.00 x 8.00	55
200	KDRJ1H	1466	240	420	9.00 x 11.00 x 9.00	70
250	KDRL1H	1598	302	548	11.38 x 14.50 x 9.50	110
300	KDRL2H	1609	361	786	11.38 x 14.50 x 9.31	95
350	KDRL3H	1834	414	750	11.38 x 14.50 x 9.31	100

575-600V • LOW (Z) IMPEDANCE

Low "Z" units can be used in any application where traditionally either a 1.5% or 3% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA55L	\$110	0.9	6	4.00 x 4.18 x 3.75	4
0.75	KDRA56L	112	1.3	9.3	4.00 x 4.18 x 3.75	4
1	KDRA50L	117	1.7	12	4.00 x 4.18 x 3.75	4
1.5	KDRA51L	120	2.4	19	4.00 x 4.18 x 3.75	4
2	KDRA46L	121	2.7	22	4.00 x 4.18 x 3.75	4
3	KDRA52L	127	3.9	23.3	4.00 x 4.18 x 3.75	4
5	KDRA47L	134	6.1	34.7	4.00 x 4.18 x 3.75	4
7.5	KDRA48L	158	9	42.9	4.00 x 4.18 x 3.75	4
10	KDRA49L	176	11	43.8	4.00 x 4.18 x 3.75	5
15	KDRB45L	200	17	66.2	5.00 x 6.00 x 4.00	8
20	KDRB44L	212	22	71.2	5.00 x 6.00 x 4.00	8
25	KDRB43L	231	27	76.7	5.00 x 6.00 x 4.00	8
30	KDRD42L	234	32	106	5.75 x 7.20 x 4.25	12
40	KDRC43L	254	41	109	5.75 x 7.20 x 5.00	15
50	KDRC44L	274	52	123	5.75 x 7.20 x 5.00	15
60	KDRF46L	365	62	181	7.00 x 9.00 x 6.00	30
75	KDRF47L	378	77	194	7.00 x 9.00 x 6.00	30
100	KDRF45L	525	99	194	7.00 x 9.00 x 6.00	30
125	KDRH43L	596	125	261	9.00 x 11.00 x 7.00	45
150	KDRH44L	742	144	253	9.00 x 11.00 x 7.00	45
200	KDR142L	790	192	342	9.00 x 11.00 x 7.00	50
250	KDRG47L	881	242	394	9.00 x 11.00 x 8.00	65
300	KDRG45L	1034	289	374	9.00 x 11.00 x 8.00	65
350	KDRJ45L	1156	336	474	9.00 x 11.00 x 9.00	70

575-600V • HIGH (Z) IMPEDANCE

High "Z" units can be used in any application where traditionally a 5% impedance reactor would be applied.

HP	Catalogue Number	List Price	Amps	Watts Loss	Dimensions (Inches) Height x Width x Depth	Weight
0.5	KDRA55H	\$121	0.9	9	4.00 x 4.18 x 3.75	4
0.75	KDRA52H	125	1.3	13	4.00 x 4.18 x 3.75	4
1	KDRA50H	127	1.7	17	4.00 x 4.18 x 3.75	4
1.5	KDRA51H	130	2.4	26	4.00 x 4.18 x 3.75	4
2	KDRA43H	133	2.7	24	4.00 x 4.18 x 3.75	4
3	KDRA44H	134	3.9	35	4.00 x 4.18 x 3.75	4
5	KDRA45H	192	6.1	48	4.00 x 4.18 x 3.75	4
7.5	KDRB42H	238	9	61	5.00 x 6.00 x 4.00	8
10	KDRB43H	268	11	71	5.00 x 6.00 x 4.00	8
15	KDRB44H	275	17	73	5.00 x 6.00 x 4.00	8
20	KDRD41H	292	22	106	5.75 x 7.20 x 4.25	12
25	KDRC43H	316	27	107	5.75 x 7.20 x 5.00	15
30	KDRE42H	368	32	140	5.75 x 7.20 x 5.00	16
40	KDRF44H	438	41	172	7.00 x 9.00 x 6.00	30
50	KDRF45H	559	52	166	7.00 x 9.00 x 6.00	30
60	KDRH43H	602	62	205	9.00 x 11.00 x 6.00	45
75	KDRH42H	627	77	251	9.00 x 11.00 x 6.00	45
100	KDR141H	912	99	268	9.00 x 11.00 x 7.00	50
125	KDRG44H	961	125	381	9.00 x 11.00 x 7.50	65
150	KDRG45H	1004	144	406	9.00 x 11.00 x 8.00	65
200	KDRJ41H	1277	192	466	9.00 x 11.00 x 9.00	70
250	KDRL46H	1794	242	472	11.38 x 15.00 x 11.00	110
300	KDRL47H	1824	289	490	11.38 x 15.00 x 11.00	110
350	KDRL48H	1885	336	539	11.38 x 15.00 x 11.00	110



MOTOR PROTECTION FILTERS

V1000 KLC SERIES



The addition of a TCI V1000 filter will help reduce motor heating, motor noise, and motor vibration by reducing the current harmonics in a drive system.

Peak Voltages on a 460V system can reach 1200 to 1600 V, causing rapid breakdown of motor insulation, leading to motor failure. On 575 V systems, the peak voltages can easily reach 2100 V. If this is left uncontrolled, insulation failure may occur. The same peak voltages that damage the motor can also damage the cable. Since the V1000 filters are designed to be placed at the output of the drive, these units will also protect the cable runs.

Electrical Features:

- High Performance
 - Limits Peak Voltage
 - Increases Voltage Rise Time
- Reduce Filter Size
 - Smaller Mechanical Layout

Specific Applications can reach 3000 feet (individual results may vary)

Single Motor or Multiple Motor

Efficiency is greater than 98%

UL and CUL Listed

Filtering increases Motor Life

The V1000 reduces common mode current by at least 30%. The V1000 substantially slows down the rate of change of the PWM switching as seen by the load. The slowing of the rate of change of the PWM switching increases the capacitive coupling impedance between bearings and bearing races. The increase in capacitive coupling, in turn, reduces the damaging Common Mode Currents and increases motor up-time. The V1000 reduces bearing, pitting, and fluting.

The V1000 Motor Protecting Output Filters have been designed to limit peak voltage and increase voltage rise time. In specific applications, the V1000 has performed with cable runs of up to 3,000 feet.

The V1000 is guaranteed by TCI to limit motor terminal voltage to 150% of bus voltage (peak input voltage) when applied to the output of a VFD and ahead of a motor connected with up to 2000ft leads depending on carrier frequency and lead type and following the manufacturer's guidelines. The V1K must be sized at no more than 110% of the drive output current rating. Additional restrictions apply for multiple motor applications, consult factory. The V1K must be sized to have regular line current loading of no less than 25% of its current rating. If the load has a potential for overhauling the drive must be equipped with braking resistors or other features limiting bus voltage to no more than the level of the peak line voltage. The V1K must be wired no more than 12 feet from the drive.

V1000 OPEN FILTER

Catalogue Number	List Price	480V	Motor HP 600V	240V	Rated Current	Dim. (in.) H" x W" x D"	Weight (lbs)	EX Model Cat. Number	List Price
V1K2A00	\$521	0.75	1	-	2	9.00 x 5.50 x 7.25	8	V1K2A00EX	\$599
V1K3A00	532	1 - 1.5	2	0.5	3	9.00 x 5.50 x 7.25	8	V1K3A00EX	612
V1K4A00	545	2	3	0.75	4	9.00 x 5.50 x 7.25	8	V1K4A00EX	626
V1K6A00	558	3	-	1 - 1.5	6	9.00 x 5.50 x 7.25	8	V1K6A00EX	641
V1K8A00	567	5	5	2	8	9.00 x 5.50 x 8.25	8	V1K8A00EX	651
V1K12A00	590	7.5	10	3	12	9.00 x 5.50 x 8.25	8	V1K12A00EX	679
V1K16A00	596	10	-	5	16	9.00 x 5.50 x 8.25	12	V1K16A00EX	686
V1K18A00	658	10	15	-	18	9.00 x 5.50 x 8.25	12	V1K18A00EX	757
V1K21A00	745	15	-	-	21	9.00 x 5.50 x 8.25	12	V1K21A00EX	858
V1K25A00	795	15	20	7.5	25	9.00 x 5.50 x 8.25	12	V1K25A00EX	915
V1K27A00	827	20	25	-	27	9.00 x 5.50 x 8.25	14	V1K27A00EX	952
V1K35A00	862	25	30	10	35	12.00 x 8.00 x 9.00	17	V1K35A00EX	991
V1K45A00	896	30	40	15	45	12.00 x 8.00 x 9.00	17	V1K45A00EX	1031
V1K55A00	924	40	50	20	55	12.00 x 8.00 x 9.00	23	V1K55A00EX	1062
V1K80A00	1304	50 - 60	75	25 - 30	80	12.00 x 8.00 x 9.00	23	V1K80A00EX	1499
V1K110A00	1532	75	100	40	110	12.00 x 8.00 x 10.25	40	V1K110A00EX	1762
V1K130A00	1791	100	125	50	130	8.50 x 11.75 x 9.50	55	V1K130A00EX	2060
V1K160A00	1974	125	150	60	160	8.50 x 11.75 x 10.50	60	V1K160A00EX	2270
V1K200A00	2152	150	200	75	200	8.50 x 11.75 x 9.25	60	V1K200A00EX	2474
V1K250A00	2211	200	250	100	250	8.50 x 11.75 x 9.25	65	V1K250A00EX	2543
V1K305A00	2403	250	300	-	305	8.75 x 11.75 x 12.25	80	V1K305A00EX	2764
V1K362A00	2752	300	350	150	362	8.75 x 11.75 x 12.00	80	V1K362A00EX	3164
V1K420A00	3188	350	450	-	420	10.00 x 11.75 x 13.75	95	V1K420A00EX	3665

V1000 ENCLOSED FILTER

Catalogue Number	List Price	480V	Motor HP 600V	240V	Rated Current	Dim. (in.) H" x W" x D"	Weight (lbs)	EX Model Cat. Number	List Price
V1K2A01	\$828	0.75	1	-	2	9.00 x 5.50 x 10.00	11	V1K2A01EX	\$953
V1K3A01	834	1 - 1.5	2	0.5	3	9.00 x 5.50 x 10.00	11	V1K3A01EX	958
V1K4A01	838	2	3	0.75	4	9.00 x 5.50 x 10.00	11	V1K4A01EX	965
V1K6A01	854	3	-	1 - 1.5	6	9.00 x 5.50 x 10.00	11	V1K6A01EX	983
V1K8A01	873	5	5	2	8	9.00 x 5.50 x 10.00	11	V1K8A01EX	1004
V1K12A01	912	7.5	10	3	12	9.00 x 5.50 x 10.00	11	V1K12A01EX	1049
V1K16A01	929	10	-	5	16	9.00 x 5.50 x 10.00	15	V1K16A01EX	1070
V1K18A01	969	10	15	-	18	9.00 x 5.50 x 10.00	15	V1K18A01EX	1113
V1K21A01	1008	15	-	-	21	9.00 x 5.50 x 10.00	15	V1K21A01EX	1160
V1K25A01	1031	15	20	7.5	25	9.00 x 5.50 x 10.00	15	V1K25A01EX	1186
V1K27A01	1069	20	25	-	27	9.00 x 5.50 x 10.00	15	V1K27A01EX	1229
V1K35A01	1106	25	30	10	35	12.00 x 8.00 x 11.50	23	V1K35A01EX	1271
V1K45A01	1142	30	40	15	45	12.00 x 8.00 x 11.50	23	V1K45A01EX	1315
V1K55A01	1246	40	50	20	55	12.00 x 8.00 x 11.50	23	V1K55A01EX	1433
V1K80A01	1621	50 - 60	75	25 - 30	80	12.00 x 8.00 x 11.50	29	V1K80A01EX	1865
V1K110A01	2226	75	100	40	110	16.50 x 18.00 x 15.00	68	V1K110A01EX	2559
V1K130A01	2509	100	125	50	130	16.50 x 18.00 x 15.00	83	V1K130A01EX	2886
V1K160A01	2694	125	150	60	160	16.50 x 18.00 x 15.00	83	V1K160A01EX	3099
V1K200A01	2806	150	200	75	200	16.50 x 18.00 x 15.00	93	V1K200A01EX	3227
V1K250A01	2860	200	250	100	250	16.50 x 18.00 x 15.00	93	V1K250A01EX	3289
V1K305A01	2877	250	300	-	305	16.50 x 18.00 x 30.00	117	V1K305A01EX	3310
V1K362A01	3203	300	350	150	362	16.50 x 18.00 x 30.00	117	V1K362A01EX	3684
V1K420A01	3472	350	450	-	420	16.50 x 18.00 x 30.00	132	V1K420A01EX	3993

* Use the "EX" version of the filter under the following situations:

FLEXIBLE ARMORED THHN CABLE - UNITS 35 AMPS AND BELOW

Frequency (kHz)	Cable Length			
	100'	101'-500'	501'-1000'	>1000'
2	std.	std.	std.	✓
4	std.	std.	std.	✓
6	std.	std.	✓	MtrGrd
8	std.	✓	MtrGrd	MtrGrd

FLEXIBLE ARMORED THHN CABLE - UNITS 45 AMPS TO 420 AMPS

Frequency (kHz)	Cable Length			
	100'	101'-500'	501'-1000'	>1000'
2	std.	std.	std.	✓
4	std.	std.	std.	✓
6	std.	std.	std.	✓
8	std.	✓	✓	✓

FLAT CABLE OR VFD CABLE - UNITS 35 AMPS AND BELOW

Frequency (kHz)	Cable Length			
	100'	101'-500'	501'-1000'	>1000'
2	std.	std.	std.	✓
4	std.	std.	✓	MtrGrd
6	std.	std.	MtrGrd	MtrGrd
8	MtrGrd	MtrGrd	MtrGrd	MtrGrd

FLEXIBLE ARMORED THHN CABLE - UNITS 45 AMPS TO 420 AMPS

Frequency (kHz)	Cable Length			
	100'	101'-500'	501'-1000'	>1000'
2	std.	std.	std.	✓
4	std.	std.	✓	MtrGrd
6	std.	✓	MtrGrd	MtrGrd
8	MtrGrd	MtrGrd	MtrGrd	MtrGrd

Catalogue numbers in blue are NEW items.

Discount table A



OUTPUT DRIVE REACTORS

KDR Optimized Drive Reactors are used between the output of AC-PWM variable frequency drives and the motor, where the motor lead lengths are less than 100 feet.

The addition of the KDR unit to the output of a drive will dampen overshoot peak voltage, reduce motor heating and audible noise, helping to extend the life of the motor. The units also help prevent inverter instantaneous overcurrent trips because they provide needed inductance when the load on an inverter has an abnormally high capacitance.

The 100 foot guideline has been recommended because as motor leads become longer, the resonant frequency is lowered, and the magnitude and duration of the voltage spikes increases. Even though the addition of a KDR can be beneficial, the addition of a reactor may be ineffective and potentially detrimental to system performance where motor lead lengths exceed 100 feet.

MOV • SURGE ARRESTERS

For maximum attenuation of spikes



Surge arresters help to protect sensitive electronics equipment from dangerous voltage transients and spikes.

These modules can be wired into a three phase reactor to work together for maximum attenuation of spikes. The reactor helps to extend the module life by attenuating the most severe parts of the spike.

- Features:**
3 MOV's
4 Leads
Peak Current - 6500Amps

CABLE FOR VARIABLE FREQUENCY DRIVES

Advance protection for drives and soft starters

Composite Insulation System designed to withstand Corona discharge build up from voltage spikes during operation. Prevents damage to motors and controllers.

Finely stranded copper conductors improve flexibility and extend conductor life in dynamic applications.

Nylon fillers are low friction and non-wicking to provide increased flexibility in dynamic application.

Specially compounded TPE jacket and oil resistant insulation system provide first line defense against oil, ozone, UV as well as most chemicals.

Ultra-Shield construction, a heavy duty 90% coverage of tinned copper braid coupled with a high flex aluminum mylar shield for protection from EM and RF interference which can affect and possibly damage surrounding equipment.



TREX-ONIC® VFD CABLE*

Catalogue Number	Cable Size AWG/Cond.	Stranding	Ampacity	Nominal O.D. (in.)	Weight (Lbs/1000')
60041	14/4	105 x 34	25	0.645"	192
60042	12/4	168 x 34	30	0.730"	230
60043	10/4	229 x 34	40	0.790"	302
60044	8/4	413 x 34	55	0.945"	498
60045	6/4	665 x 34	75	1.080"	714

*Contact factory for pricing

TREX-ONIC® VFD CABLE w/BRAKE & SIGNAL PAIRS*

Catalogue Number	Power Conductor			16 AWG brake & Signal Pairs		Drain Wires	Jacket Thickness	Nom. O.D. (in.)	Weight (Lbs/1000')
	Size AWG/Cond.	Stranding	Ampacity	No. of Pairs	Stranding				
60021	14/4	41x30	25	1	26x30	18	0.063	0.62	215
60023	12/4	65x30	30	1	26x30	18	0.063	0.66	310
60025	10/4	105x30	40	1	26x30	18	0.073	0.76	420
60026	8/4	168x30	55	1	26x30	18	0.083	0.94	650
60027	6/4	266x30	75	1	26x30	18	.083	1.05	950
60028	14/4	41x30	25	2	26x30	18	0.063	0.68	280
60029	12/4	65x30	30	2	26x30	18	0.073	0.76	395
60030	10/4	105x30	40	2	26x30	18	0.085	0.85	505
60031	8/4	168x30	55	2	26x30	18	0.085	0.999	800
60032	6/4	266x30	75	2	26x30	18	.090	1.1	1175

*Contact factory for pricing



HIGH-SPEED FUSES

AMP-TRAP®



Prevent One Monster of a Problem With Amp-Trap® High-Speed J Fuses

Most of today's drives and soft-starters don't have room for the high-speed internal fusing that protects their sensitive power semiconductors. And while traditional branch circuit protection meets NEC® requirements, it leaves motor controllers vulnerable to costly damage and downtime.

That's why Fernaz Shawmut created the Amp-Trap High-Speed J fuse. Specifically designed to safeguard electronic motor

controllers, this monster of a fuse combines the overload capacity and dimensions the overload capacity and dimensions of a Class J with the performance of a semiconductor fuse.

The result is one fuse that provides two kinds of protection — the branch circuit protection required by the NEC and the high-speed protection you need to prevent damage to your motor controller's sensitive internal electronics.

HIGH SPEED CLASS J FUSES

Advance protection for drives and soft starters

Protect your wiring and power semiconductors with a single fuse. The new High Speed J (HSJ) combines the low I²t of a semiconductor fuse and the branch circuit performance of a Class J UL listed fuse. This fuse was designed for the starting characteristics of solid state motor controllers. The HSJ can provide branch circuit protection per NEC requirements, as well as very low I²t for protection of power semiconductors such as Diodes, SCR's, GTO's and SSR's

Features

Optimized over-load capability for withstanding elevated levels of current during electronic motor controller starts.

Low I²t (low thermal energy)

Excellent Cycling Ability for frequent starts/stops without nuisance opening

Applications

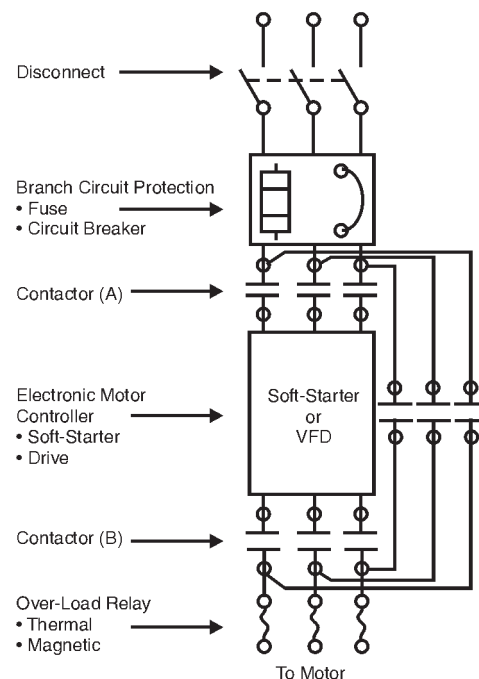
- Branch Circuit
- Control Panels
- Electric Motor Controllers
- Phase Controllers
- Drives
- Soft Starters
- Solid State Relays

Ratings

AC: 15:600A 600WAC, 200kA I.R., 300kA I.R. Self Certified

DC: 15-600A 500VDC, 100kA I.R., L/R 10mS

WIRING DIAGRAM



600V CLASS J FUSES

Amps	Catalogue Number	List Price	Dwg. No.
10	A4J10	\$13.32	1
15	HSJ15	23.87	1
17.5	HSJ17.5	23.87	1
20	HSJ20	23.87	1
25	HSJ25	23.87	1
30	HSJ30	23.87	1
35	HSJ35	32.28	1
40	HSJ40	35.73	1
45	HSJ45	35.73	1
50	HSJ50	35.73	1
60	HSJ60	35.73	1
70	HSJ70	71.16	2
80	HSJ80	71.16	2
90	HSJ90	71.16	2
100	HSJ100	71.16	2
110	HSJ110	127.39	2
125	HSJ125	127.39	2
150	HSJ150	127.39	2
175	HSJ175	127.39	2
200	HSJ200	127.39	2
225	HSJ225	242.89	2
250	HSJ250	242.89	2
300	HSJ300	242.89	2
350	HSJ350	242.89	2
400	HSJ400	242.89	2
450	HSJ450	242.89	2
500	HSJ500	242.89	2

Features

- Optional Indicator Lights
- DIN Rail Mount
- Non-load disconnect
- 600VAC: 30A & 60A
- Withstand rating: 200kA I.R.
- Min. voltage to operate indicator light: 90VAC, 115VDC

[Less than 0.7 mA leakage current at 600V]

- All Ultrasafe Fuse Holders meet the requirements of UL512
- UL Listed Guide IZLT, File E52283
- CSA Certified Class 6225 File 32169
- IEC 269

ULTRA SAFE FUSEHOLDERS



Ferraz Shawmut **ULTRASAFE modular 600 volt Fuse Holders for Class J fuses introduce a new level of safety and ease for installing or replacing Class J fuses.** ULTRASAFE holders qualify as "finger safe" to an IP20 grade of protection under IEC standards. The

US3J accommodates 30A Class J or 22 x 58 mm French Ferrule* fuses. The US6J is for 60A Class J fuses. ULTRASAFE holders are available in compact 1,2, or 3 pole units, with or without blown-fuse indicators in each pole.

Multi-pole units can also be made up in the field by using the multiple-pole Assembly Kits.

All units have provisions for locking in the open position for safety during fuse changeouts or equipment servicing. US3J and US6J holders can be snap-mounted to 35 mm DIN rail and they have a unique latch which will stay open to allow repositioning of the holder in the future. Ultrasafe body material is tough and durable polyamide.

[Contact LEESON for pricing](#)

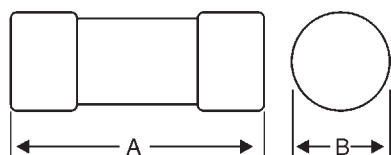
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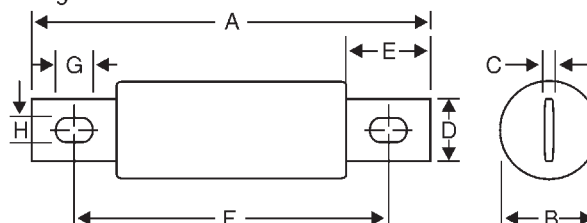
SELECTION GUIDE

LEESON Cat. No.	Fuse Cat. No.	LEESON Cat. No.	Fuse Cat. No.	LEESON Cat. No.	Fuse Cat. No.	LEESON Cat. No.	Fuse Cat. No.	LEESON Cat. No.	Fuse Cat. No.
174280	HSJ45	174463	A4J10	174551	HSJ60	174606	A4J10	174766	HSJ40
174285	HSJ25	174464	A4J10	174552	HSJ30	174607	A4J10	174767	HSJ40
174290	HSJ60	174475	HSJ25	174553	HSJ20	174608	HSJ15	174769	HSJ50
174291	HSJ30	174482	HSJ15	174554	HSJ30	174609	HSJ20	174914	A4J10
174292	HSJ80	174491	A4J10	174556	HSJ20	174610	HSJ25	174915	A4J10
174293	HSJ45	174492	HSJ15	174557	HSJ90	174611	HSJ30	174916	HSJ15
174391	HSJ25	174492	HSJ30	174558	HSJ45	174612	HSJ15	174917	HSJ15
174429	HSJ80	174493	HSJ15	174559	HSJ30	174613	HSJ15	174918	HSJ20
174430	HSJ100	174493	HSJ20	174560	HSJ110	174614	HSJ20	174919	HSJ30
174431	HSJ40	174494	HSJ15	174561	HSJ60	174615	HSJ30	174920	A4J10
174432	HSJ60	174494	HSJ25	174562	HSJ40	174620	A4J10	174921	A4J10
174433	HSJ70	174495	HSJ20	174563	HSJ70	174621	A4J10	174922	HSJ15
174434	HSJ35	174495	HSJ30	174564	HSJ50	174622	A4J10	174923	HSJ15
174435	HSJ40	174497	A4J10	174565	HSJ80	174623	A4J10	174924	HSJ25
174436	HSJ50	174500	HSJ80	174566	HSJ60	174624	A4J10	174925	A4J10
174438	HSJ45	174510	HSJ90	174567	HSJ100	174625	HSJ15	174926	A4J10
174439	HSJ60	174511	HSJ125	174569	HSJ150	174631	A4J10	174927	A4J10
174440	HSJ25	174512	HSJ70	174571	HSJ175	174632	A4J10	174928	HSJ15
174441	HSJ30	174513	HSJ100	174572	HSJ150	174633	A4J10	174929	HSJ17-1/2
174442	HSJ17-1/2	174515	HSJ35	174573	HSJ110	174634	HSJ15	174930	A4J10
174443	HSJ20	174517	HSJ35	174574	HSJ150	174729	HSJ40	174932	HSJ35
174444	HSJ30	174519	A4J10	174575	HSJ110	174730	HSJ30	174933	HSJ25
174444	HSJ45	174520	HSJ15	174576	HSJ150	174732	HSJ30	174934	HSJ40
174445	HSJ20	174521	HSJ25	174577	HSJ150	174734	HSJ45	174935	A4J10
174445	HSJ40	174525	HSJ25	174578	HSJ250	174735	HSJ45	174936	A4J10
174446	HSJ30	174526	HSJ40	174579	HSJ250	174737	HSJ60	174937	HSJ15
174447	HSJ15	174527	A4J10	174580	HSJ150	174738	HSJ60	174938	HSJ20
174448	HSJ15	174528	A4J10	174581	HSJ150	174740	HSJ90	174939	A4J10
174452	A4J10	174529	HSJ15	174582	HSJ200	174741	HSJ90	174940	A4J10
174452	A4J10	174530	HSJ15	174583	HSJ200	174743	HSJ110	174941	HSJ15
174453	A4J10	174531	HSJ20	174584	HSJ250	174745	HSJ25	174942	HSJ15
174453	A4J10	174532	A4J10	174585	HSJ250	174747	HSJ30	174943	A4J10
174454	A4J10	174533	A4J10	174586	HSJ300	174749	HSJ45	174944	A4J10
174454	HSJ17-1/2	174534	HSJ15	174593	HSJ125	174750	HSJ45	174945	A4J10
174455	A4J10	174535	HSJ15	174594	HSJ90	174752	HSJ60	174946	HSJ15
174456	HSJ15	174536	A4J10	174595	HSJ150	174753	HSJ60	174996	A4J10
174457	HSJ15	174537	A4J10	174596	HSJ175	174755	HSJ70	174997	HSJ15
174458	HSJ20	174538	A4J10	174597	HSJ60	174757	HSJ80	174998	HSJ15
174459	A4J10	174539	HSJ15	174599	HSJ70	174759	HSJ17-1/2	174999	HSJ25
174460	A4J10	174545	HSJ45	174603	A4J10	174761	HSJ20		
174461	A4J10	174548	HSJ25	174604	HSJ15	174763	HSJ30		
174462	A4J10	174549	HSJ17-1/2	174605	HSJ25	174764	HSJ30		

Dwg. 1



Dwg. 2



Amp Rating	in.	A mm	in.	B mm	in.	C mm	in.	D mm	in.	E mm	in.	F mm	in.	G mm	in.	H mm
1-30	2-1/4	57	13/16	21	-	-	-	-	-	-	-	-	-	-	-	-
31-60	2-3/8	60	1-1/16	27	-	-	-	-	-	-	-	-	-	-	-	-
61-100	4-5/8	117	1-1/8	29	1/8	3.2	3/4	19	1	25	3-5/8	92	3/8	10	9/32	7
101-200	5-3/4	146	1-5/8	41	3/16	4.8	1-1/8	29	1-3/8	35	4-3/8	111	3/8	10	9/32	7
201-400	7-1/8	181	2-1/8	54	1/4	6.3	1-5/8	41	1-7/8	48	5-1/4	133	17/32	13	13/32	10
401-500	8	203	2-1/2	64	3/8	9.5	2	51	2-1/8	54	6	152	11/16	18	17/32	13

Catalogue numbers in blue are NEW items.