



GENERAL PRODUCT DESCRIPTION

The **V*S Master** motor, like the RPM AC motor, was designed from the beginning to be a Variable Speed Inverter Duty motor. It is not a fixed speed motor design that has been re-rated to be an Inverter Duty motor. All V*S Master motors are designed to operate from zero speed to base speed with full load current and torque below the class F temperature rise. Each V*S Master has three thermostats, one per phase, to provide Inverter Duty thermal protection. The V*S Master 1800 rpm, 1200 rpm and 900 rpm motors truly provide the performance of a blower-cooled motor in a TEFC enclosure. This means that the customer does not need to purchase and mount a blower motor starter or install three-phase power leads to the blower motor.

V*S Master Features

- **1000:1 Constant Torque** - This means that the V*S Master is designed to operate from zero to base speed continuously with full load current and torque. The V*S Master TEFC and TENV motors are designed to draw nameplate current continuously at zero speed without exceeding the class F temperature rise. The industry standard is to call this capability 1000:1 Constant Torque, some manufacturers identify this capability 1000:1 Constant Torque, some manufacturers identify this capability as 2000:1, 3000:1, infinity:1, etc. All of these terms describe the same capability of the AC Motor, one is not better than another.
- **Standard NEMA T Frames** - V*S Master motors, 2 HP to 500 HP are all in standard NEMA frames (Larger motors are in above NEMA frames 447T through L449T).
- **Cast Iron Frames** - All V*S Master motors are in cast iron frames with cast iron end brackets. Adding XT features also provides a cast iron fan cover and conduit box along with other XT features.
- **200% Overload Torque** - Each V*S Master has an electrical design that will provide 200% overload torque for one minute from zero to base speed.
- **Constant Horsepower** - The standard V*S Master is designed to provide constant horsepower to 1.5 times base speed.
- **Thermostats** - Each V*S Master motor has three normally closed thermostats connected in series, one in each phase of the motor. One set of P1 and P2 leads is brought to the conduit box. If any of the thermostats opens, the P1 and P2 circuit opens.
- **Encoder Provisions** - Each V*S Master has encoder provisions as a standard feature, even if an encoder is not ordered with the motor.
 - TEFC - Hole Drilled and Tapped in the Motor Shaft
 - TENV - Machined End Bracket with a Hole Drilled and Tapped in the Motor Shaft
- **Insulated Bearing** - Every 440 frame (444T through L449T) has an opposite drive end insulated bearing as standard to reduce the chances of the bearings being damaged by shaft currents. In large motors (440 frames) it is quite common to have shaft currents caused by magnetic flux dissymmetry, one insulated bearing will usually protect against this source of shaft currents. Other modifications, such as "Current Shield" can be added to protect against other sources of shaft currents.
- **Corona Free Insulation** - Every V*S Master motor has Reliance Electric's "Corona Free" insulation system that exceeds the insulation





V*S Master Features (cont.)

requirements described in NEMA MG1-2003, part 31, for Definite Purpose, Inverter-Fed Polyphase motors.

- **Class F Insulation** - V*S Master motors have class F insulation and operate below class F temperature rise. Nearly all TEFC V*S Master motors operate with a class B rise over a 4:1 speed range. That means that most TEFC 1800-rpm motors will operate with a class B rise over a 450 rpm to 1800 rpm (covers most actual operating conditions) speed range.
- **40° C ambient** - Standard on nameplate, many V*S Master motors are suitable for higher ambient temperatures with only a nameplate change.
- **Continuous Duty** - Contact Reliance Electric for different duty cycles
- **1.0 Service Factor** - Because V*S Master motors are designed for Inverter Duty applications, not across-the-line designs, all designs have a 1.0 SF as standard on inverter power.
- **Re-greaseable bearings** - For longest life in severe duty applications, all V*S Master motors have re-greaseable bearings.
- **Stainless Steel Nameplates** - Every V*S Master motor has an Inverter Duty stainless steel nameplate with the electrical design number, magnetizing current, constant torque speed range, number of poles, rotor inertia, bearing numbers and other NEMA data.
- **F1 Mounting** - Conduit box location is F1 as standard on NEMA frame motors (IEC motors have conduit box on opposite side as standard). F2 or top mounted conduit boxes are available as a modification.
- Visit web site www.reliance.com for additional Inverter Duty Motor information. Download the V*S Master Data Sheet, RAPS-540-2.



- V*S Master motors are CSA, Canadian Standards Association, certified and carry the monogram on the nameplate. All accessories attached the motor must also carry their own CSA mark. Reliance Electric's file number for V*S Master motors is, LR7861.



- The European Committee for Electrotechnical Standardization defines compliance standards for the CE mark required on motors shipping to Europe. It is available upon request on all V*S Master motors. The V*S Master IEC motors carry the CE mark as standard. All accessories attached to the motor must also carry their own CE mark.



- V*S Master motors carry the Underwriters' Laboratories, Inc., Recognized Component mark for electric motors used in ordinary locations (not explosion-proof). Reliance Electric's file number for V*S Master motors is, E54825.

V*S Master Features (cont.)



Optimum Pole

Reliance Electric's Inverter Duty Motors are based on the use of "optimum pole" design. Unlike fixed speed motors, Inverter-Fed motors can have different base speeds based on different base frequencies. For example, a four-pole motor designed with a base frequency of 40 hertz and a base voltage of 460 vac will have a base synchronous speed of 1200 rpm.

Reliance Electric selects the number of poles to be used on an Inverter Duty motor so that the torque density, speed range, efficiency, power factor, overload capability and acoustic noise can be optimized. Like the Inverter Duty RPM AC motor, most of the Inverter Duty V*S Master motors in frames 180T through 400T are four-pole designs, regardless of the base speed. The Inverter is set to match the motor nameplate, for example, 50 hp, 1200 rpm, 460 vac, 40 hertz, and 4 poles. On larger frames of Inverter Duty AC motors, many of the designs are six-pole, regardless of the base speed.

This approach has also been used in Reliance Electric's DC Motor designs for years. Most of the DC motor ratings 500 hp and less are four-pole designs, regardless of the base speed.

For more information on optimum pole design, go to Reliance Electric's web site, www.reliance.com, and print the white paper, "Optimum Pole Configuration of A-C Induction Motors used on Adjustable Frequency Power Supplies," B-7100-1.



V*S MASTER STOCK MODEL NUMBERS

Inverter Duty AC Motor
Continuous Constant Torque to Zero Speed
1000:1 Constant Torque
TEFC & TENV

Features

- Cast Iron frame and end brackets
- Three normally closed thermostats, one per phase
- Shaft drilled and tapped for installation of stub shaft
- 200% overload torque for one minute below base speed
- Class F insulation
- TEFC, Class B Rise for 4:1 Constant Torque
- Continuous Duty
- 40° C Ambient
- Inverter Duty - not for “across the line” operation
- See previous Product Pages for additional features



2 - 300 HP

HP	Synch RPM	Voltage	Frame	Enclosure	Model Number	List Price	Price Symbol	Norm. Stock	460V AMPS	Dimensions Sheet	Approx. Wt. (lb.)
2	1200	230/460	184TC	TENV	P18G1187	\$1,214	RVM22	Yes	2.6	613050-145	86
	1200	230/460	184TC	TEFC	P18G1192	1,179	RVM22	Yes	2.6	613051-127	110
3	1800	230/460	182TC	TENV	P18G1188	975	RVM22	Yes	3.8	613050-145	86
	1800	230/460	182TC	TEFC	P18G1193	946	RVM22	Yes	3.8	613051-127	110
5	1800	230/460	L184TC	TENV	P18G1189	1,139	RVM22	Yes	6.4	613050-145	121
	1800	230/460	L184TC	TEFC	P18G1194	1,106	RVM22	Yes	6.4	613051-127	115
7.5	1800	230/460	L215TC	TENV	P21G1162	1,424	RVM22	Yes	6.3	613050-145	175
	1800	230/460	213TC	TEFC	P21G1167	1,383	RVM22	Yes	10.8	613051-127	170
10	1800	230/460	254TC	TENV	P25G1152	1,765	RVM22	Yes	12.7	611741-267	185
	1800	230/460	L215TC	TEFC	P21G1164	1,605	RVM22	Yes	12.5	613051-4	190
15	1800	230/460	256TC	TENV	P25G1150	2,195	RVM22	Yes	18.7	611741-267	265
	1800	230/460	254TC	TEFC	P25G1153	1,925	RVM22	Yes	18.4	613051-127	280
20	1800	460	256TC	TEFC	P25G1151	2,110	RVM22	Yes	25.5	611740-3	325
25	1800	460	284TC	TEFC	P28G1083	2,668	RVM22	Yes	31	611740-3	445
30	1800	460	286T	TEFC	P28G3207	2,813	RVM22	Yes	38.1	611740-1	450
40	1800	460	364T	TENV	P36G3209	6,063	RVM22		30	611741-1	505
	1800	460	324T	TEFC	P32G3207	3,949	RVM22	Yes	49.8	611740-1	540
50	1800	460	326T	TEFC	P32G3208	4,826	RVM22	Yes	62.6	611740-1	580
60	1800	460	364T	TEFC	P36G3207	5,979	RVM22	Yes	71.4	611740-1	800
75	1800	460	365T	TEFC	P36G3208	7,489	RVM22	Yes	89.4	611740-1	840
100	1800	460	405T	TEFC	P40G3207	9,680	RVM22	Yes	115.4	611740-1	1160
125	1800	460	444T	TEFC	P44G3207	12,015	RVM22	Yes	151	611740-1	1540
150	1800	460	445T	TEFC	P44G3208	14,339	RVM22	Yes	177	611740-1	1730
200	1800	460	447T	TEFC	P44G3213	16,990	RVM22	Yes	226	616524-1	2275
250	1800	460	449T	TEFC	P44G3214	21,003	RVM22	Yes	279	616524-1	2650
300	1800	460	449T	TEFC	P44G3215	24,014	RVM22	Yes	338	616524-1	2650

NOTE: For the current version of Inverter Duty Motor dimension sheets, connection diagrams, design curves, etc., visit www.reliance.com

(1) - F Rise 1000:1 CT, F Rise 4:1 CT

(2) - Rated only for 4:1 constant torque speed range, F Rise

V*S Master Stock Encoder Kits



**60HP, TEFC, 364T
with HS35 ENCODER**

Encoder With Mounting Kit - Requires Both Model Numbers

Frame	Enclosure	Type	Supply Voltage	Output/PPR	Encoder Model	List Price	Mounting Kit Model	List Price	Price Symbol
180T-250T	TENV	RA HS35-MS	5 to 24 vdc	Single/1024	K99G40	\$1,100	K18G22	\$100	RVM22
180-440T	TEFC	RA HS35-MS	5 to 24 vdc	Single/1024	K99G40	1,100	K21G23	100	RVM22
180T-250T	TENV	BEI HS35	5 to 15 vdc	Single/1024	K99G32	1,000	K18G22	100	RVM22
180T-440T	TEFC	BEI HS35	5 to 15 vdc	Single/1024	K99G32	1,000	K21G23	100	RVM22
180T-250T	TENV	BEI HS35	5 to 24 vdc	Single/2048	K99G36	1,000	K18G22	100	RVM22
180T-440T	TEFC	BEI HS35	5 to 24 vdc	Single/2048	K99G36	1,000	K21G23	100	RVM22
180T-250T	TENV	BEI HS35	5 to 24 vdc	Single/1024	K99G34	1,000	K18G22	100	RVM22
180T-440T	TEFC	BEI HS35	5 to 24 vdc	Single/1024	K99G34	1,000	K21G23	100	RVM22
180T-250T	TENV	HSD35	5 to 26 vdc	Single/1024	K99G41	1,250	K21G25	100	RVM22
180T-440T	TEFC	HSD35	5 to 26 vdc	Single/1024	K99G41	1,250	K21G23	100	RVM22

RA HS35-MS - The Reliance Avtron RA HS35-MS encoder is a hollow shaft encoder with a single output, 1024 ppr, that has two channel quadrature outputs (A and B) with complementary outputs and a marker pulse (Z). The mating screw-on MS (Military-Style) connector is included with the encoder. The encoder requires 5-24 vdc input and is rated for 85 degrees C ambient, 6,000 rpm maximum and has a IP65 enclosure rating. The magnetic rotor is mechanically more robust than glass or metal optical disks. This Reliance Avtron encoder has a shaft design that provides extended life compared to other HS35 model encoders.

BEI HS35 - This is an optical hollow shaft encoder with a single output, 1024 ppr, that has two channel quadrature outputs (A and B) with complementary outputs and a marker pulse (Z). The mating screw-on MS (Military-Style) connector is included with the encoder. Two versions of the encoder are stocked, 5 to 15 vdc input and a 5 to 26 vdc input, both are rated for 70 degrees C ambient, 6000 rpm maximum. This encoder comes with a protective cover as shown in the above picture. See BEI's web site for additional information, www.beiied.com.

LakeShore HSD35 - The HSD35 is a hollow shaft encoder with a single output, 1024 ppr, that has two channel quadrature outputs (A and B) with complementary outputs and a marker pulse (Z). Encoder includes EPIC latching industrial connector. The encoder requires 5-26 vdc input and is rated for 70 degrees C ambient, 3600 rpm maximum. The HSD35 optical encoder replaces the HS35M. For more information on LakeShore or DynaPar encoders, see web site www.dancon.com.

NOTES: For mounting of the above encoders and kits by Reliance Electric, see the Modification Center price pages of this section

See the Variable Speed Catalog or the Configurator for a complete list of encoders available on production Inverter Duty AC Motor orders.

V*S Inverter Duty Motor - Pricing

**TOTALLY ENCLOSED FAN COOLED (TEFC)
& NON-VENTILATED (TENV)
1000:1 CONSTANT TORQUE ⁽¹⁾
2 - 500 HP
3-PHASE, 460V ⁽²⁾**



364T FRAME, TEFC-VSM WITH HS-35 ENCODER

FEATURES

- Continuous Duty
- Inverter Duty - Not For "Across the Line" Operation
- Standard 1 Minute Overload
200% Below Base Speed
- Class F Insulation
- 40° C Ambient / 1.0 S.F.
- Constant Horsepower Speed Range - 1.5 Times Base Speed⁽³⁾
- Three Thermostats (1 N.C. per Phase)
- F-1 Mounting as Standard
- Cast Iron Frame & End Brackets
- Encoder Provisions⁽⁴⁾
- Insulated O.D.E. Bearing as Standard on All 440 Frames
- See Previous Product Page for Complete Description & Features

HP	Synch RPM	Frame	Enclosure	FLA (5) @ 460V	List Price
2	1200	184T	TENV	3.4	\$1,211
	1200	184T	TEFC	3.4	1,176
	900	213T	TEFC	3.4	1,468
3	1800	182T	TENV	4.8	956
	1800	182T	TEFC	4.8	927
	1500	182T	TEFC	4.8	1075
	1200	215T	TENV	3.9	1,617
	1200	213T	TEFC	4.8	1,588
	900	L215T	TEFC	4.8	1,786
5	1800	L184T	TENV	7.6	1,131
	1800	L184T	TEFC	7.6	1,098
	1500	L184T	TEFC	7	1,230
	1200	L215T	TENV	6.2	1,873
	1200	L215T	TEFC	7.6	1,840
	900	254T	TEFC	6.7	2,067
7.5	1800	L215T	TENV	11	1,435
	1800	213T	TEFC	11	1,394
	1500	213T	TEFC	10	1,490
	1200	254T	TEFC	9.5	2,170
	900	256T	TEFC	11	2,512
	1800	254T	TENV	14	1,660
10	1800	L215T	TEFC	12.4	1,525
	1500	L215T	TEFC	14	1,685
	1200	256T	TEFC	12.6	2,458
	900	284T	TEFC	13	2,967
	1800	256T	TENV	21	2,090
15	1800	254T	TEFC	21	1,860
	1500	254T	TEFC	21	1,990
	1200	284T	TEFC	19.2	2,903
	900	286T	TEFC	21	3,353
	1800	284T	TENV	24.3	2,402
20	1800	256T	TEFC	25.6	2,005
	1500	284T	TEFC	25.6	2,447
	1200	286T	TEFC	25.3	3,301
	900	324T	TEFC	27	4,381
	1800	324T	TENV	30.6	3,198
25	1800	284T	TEFC	31	2,523
	1500	284T	TEFC	32	2,775
	1200	324T	TEFC	31.6	4,333
	900	326T	TEFC	34	5,350
	1800	326T	TENV	36.4	4,963
30	1800	286T	TEFC	38.3	2,813
	1500	324T	TEFC	38.3	3,830
	1200	326T	TEFC	37.5	5,303
	900	364T	TEFC	40	6,932

Price Symbol: RVM32

V*S Inverter Duty Motor - Pricing

**TOTALLY ENCLOSED FAN COOLED (TEFC)
& NON-VENTILATED (TENV)
1000:1 CONSTANT TORQUE (1)
2 - 500 HP
3-PHASE, 460V (2)**



V*S Master Motor

PPM AC Motors
1/3 - 5 HP

PPM AC Motors
2 - 1,000 HP

Large AC Motors

Small, Medium & Large DC Motors

HP	Synch RPM	Frame	Enclosure	FLA (5) @ 460V	List Price	
40	1800	364T	TENV	48.2	\$6,063	
	1800	324T	TEFC	49.8	3,949	
	1500	324T	TEFC	50.7	4,420	
	1200	364T	TEFC	49.6	6,388	
	900	365T	TEFC	52	8,587	
50	1800	404T	TENV	57.9	7,526	
	1800	326T	TEFC	62.6	4,826	
	1500	364T	TEFC	64.1	5,800	
	1200	365T	TEFC	60.7	7,913	
	900	404T	TEFC	65	9,559	
60	1800	364T	TEFC	71.4	5,979	
	1500	364T	TEFC	74	6,693	
	1200	404T	TEFC	71.1	9,443	
	900	405T	TEFC	77	10,703	
	75	1800	365T	TEFC	89.4	7,489
1500		405T	TEFC	91	9,375	
1200		405T	TEFC	85.1	10,340	
900		444T	TEFC	89	13,866	
100		1800	405T	TEFC	116	9,680
	1500	444T	TEFC	118	11,655	
	1200	444T	TEFC	115	13,356	
	900	445T	TEFC	124	16,088	
	125	1800	444T	TEFC	151	12,015
1500		445T	TEFC	152	13,908	
1200		445T	TEFC	142	14,998	
900		447T	TEFC	156	19,290	
150		1800	445T	TEFC	178	14,339
	1500	445T	TEFC	178	15,880	
	1200	447T	TEFC	180	18,502	
	900	449T	TEFC	180	24,240	
	200	1800	447T	TEFC	226	16,990
1500		447T	TEFC	231	18,915	
1200		449T	TEFC	224	22,996	
900		L449T	TEFC	240	40,140	
250		1800	449T	TEFC	279	21,003
	1500	449T	TEFC	288	23,520	
	1200	449T	TEFC	283	26,880	
	900 ⁽⁶⁾	L449T	TEFC	302	44,841	
	300	1800	449T	TEFC	339	24,014
1500		L449T	TEFC	348	27,950	
1200		L449T	TEFC	341	36,011	
350		1800	L449T	TEFC	398	28,811
		1500	L449T	TEFC	398	32,270
400	1800	L449T	TEFC	446	38,500	
	1500 ⁽⁷⁾	L449T	TEFC	458	40,810	
450	1800	L449T	TEFC	502	46,315	
	1500 ⁽⁷⁾	L449T ⁽⁶⁾	TEFC	515	47,115	
500	1800 ⁽⁷⁾	L449T	TEFC	551	47,680	

Footnotes:

- (1) 1000:1 constant torque is another way of stating that the motor is designed to operate from zero speed to base speed with continuous full load current and torque. The V*S Master TEFC and TENV motors are designed to operate continuously at zero speed.
- (2) Standard voltages available: 230, 380, 460 & 575v. For any other special voltage, please see voltage in modification section.
- (3) For Constant Horsepower Speed Ranges greater than 1.5 times the motor base speed, please contact Variable Speed Product Marketing for pricing.
- (4) Encoder provisions as standard
TEFC - Hole drilled and tapped for stub shaft
TENV - Machined O.D.E. bracket as well as hole drilled and tapped for stub shaft
- (5) For estimating purposes only.
- (6) Class H Insulation.
- (7) Rated only for 4:1 constant torque speed range, F Rise. Contact Variable Speed Product Marketing for quotation on a TEFC for 1000:1 constant torque.

Price Symbol: RVM32

V*S Inverter Duty Motor - Pricing



**TOTALLY ENCLOSED FAN COOLED (TEFC)
4:1 CONSTANT TORQUE⁽¹⁾ WITH CLASS B RISE
1000:1 CONSTANT TORQUE⁽²⁾ WITH CLASS F RISE
2 - 450HP
3-PHASE, 460V⁽³⁾**

FEATURES

- Continuous Duty
- Inverter Duty - Not for “Across the Line” Operation
- Standard 1 Minute Overload
200% Below Base Speed
- Class F Insulation
- 40° C Ambient / 1.0 S.F.
- Constant Horsepower Speed Range - 1.5 Times Base Speed⁽⁴⁾
- Three Thermostats (1 N.C. per Phase)
- F-1 Mounting as Standard
- Cast Iron Frame & End Brackets
- Encoder Provisions⁽⁵⁾
- Insulated O.D.E. Bearing as Standard on All 440 Frames
- See Previous Product Page for Complete Description & Features

HP	Synch RPM	Frame	FLA ⁽⁶⁾ @ 460V	VSM List Price
2	1200	184T	3.4	\$1,176
	1800	182T	4.8	927
3	1200	213T	4.8	1,588
	1800	L184T	7.6	1,098
5	1200	L215T	7.6	1,840
	1800	213T	11	1,394
7.5	1200	254T	9.5	2,170
	1800	L215T	12.4	1,525
10	1200	256T	12.6	2,458
	1800	254T	21	1,860
15	1200	284T	19.2	2,903
	1800	256T	25.6	2,005
20	1200	286T	25.3	3,301
	1800	284T	31	2,523
25	1200	324T	31.6	4,333
	1800	286T	38.3	2,813
30	1200	326T	37.5	5,303
	1800	324T	49.8	3,949
40	1200	364T	49.6	6,388
	1800	326T	62.6	4,826
50	1200	365T	60.7	7,913
	1800	364T	71.4	5,979
60	1200	404T	71.1	9,443
	1800	365T	89.4	7,489
75	1200	405T	85.1	10,340
	1800	405T	116	9,680
100	1200	444T	115	13,356
	1800	444T	151	12,015
125	1200	445T	142	14,998
	1800	445T	178	14,339
150	1200	447T	180	18,502
	1800	447T	226	16,990
200	1200	449T	224	22,996

Price Symbol: RVM32

V*S Inverter Duty Motor - Pricing

**TOTALLY ENCLOSED FAN COOLED (TEFC)
4:1 CONSTANT TORQUE⁽¹⁾ WITH CLASS B RISE
1000:1 CONSTANT TORQUE⁽²⁾ WITH CLASS F RISE
2 - 450HP
3-PHASE, 460V⁽³⁾**



HP	Synch RPM	Frame	FLA ⁽⁶⁾ @ 460V	VSM List Price
250	1800	449T	279	\$21,003
	1200	L449T	283	28,800
300	1800	449T	339	24,014
	1200	L449T	341	36,011
350	1800	L449T	398	28,811
400	1800	L449T	446	38,500
450	1800	L449T	502	46,315

For the most current version of Inverter Duty Motor dimension sheets, connection diagrams, design curves, etc., go to www.reliance.com.

Footnotes

- (1) 4:1 constant torque with Class B Rise means that the V*S Master motors listed above, will operate with a Class B Rise over at least a 4 to 1 speed range (450 to 1800 rpm for example). Many customers request Class B Rise for increased insulation and bearing life or have safety specifications with regard to motor skin temperature.
- (2) 1000:1 constant is another way of stating that the motor is designed to operate from zero speed to base speed with full load current and torque. The V*S Master TEFC and TENV motors are designed to operate continuously at zero speed.
- (3) Standard voltages available: 230, 380, 460 & 575v. For any other special voltage, please see voltage in modification section.
- (4) For Constant Horsepower Speed Ranges greater than 1.5 times the motor base speed, please contact Variable Speed Product Marketing for pricing.
- (5) Encoder provisions as standard
TEFC - Hole drilled and tapped for stub shaft
- (6) For estimating purposes only.
- (7) 841XL features do not necessarily mean that the Inverter Duty motor will meet Temperature Rise or Noise Levels proposed by IEEE841 fixed speed specifications. VSM-841XL will meet the mechanical features of the Reliance Electric 841XL motor.

Price Symbol: RVM32