







GV3000 Overload Ratings

What overload ratings does the GV3000 have with vector and general purpose regulation?

An improvement in the AC Drives technology has been achieved by Reliance Electric's GV3000. With the software selectable choice of either vector or general purpose regulation the GV3000 suits a wide range of variable speed applications.

> In vector regulation, an induction motor driven by the GV3000 can develop 150% starting torque from standstill, hold 100% rated torque at zero speed, respond to load changes in a 15 Hz bandwidth to maintain speed and closely regulate motor speed. All this, and provide 150% overload capability.

But, few applications require that the GV3000 be set to vector regulation. In fact, it has been estimated that fewer than 10% of all variable speed drive applications require the performance of an AC vector drive. The majority of AC drives are used in fan and pump applications in which torque requirements (both starting and running) and speed regulation are less demanding.

With the GV3000 programmed as a general purpose AC drive, it is ideally suited for a wide range of both constant and variable torque applications. Let's take a look at some of the performance characteristics that make the GV3000 unique.

Volts per Hertz Curves

With the GV3000 operating in general purpose regulation, 11.018 sets the volts perhertz curve or what's known as the speed/torque capability of the drive/motor combination.

With variable torque loads such as centrifugal fans and pumps, the load varies with the square of the speed. This is defined by the affinity laws for centrifugal loads. With parameter H.018 set to 2, the ratio of volts per hertz will match the load of a centrifugal fan or pump and provide a squared volts per hertz output to the motor. The purpose for this setting is to match the lorque producing capability of the drive/motor combination to the load. In centrifugal fan/pump applications, this reduces motor flux density and improves operating efficiencies.



Figure 1. GV3000 H.018 = 2

For **constant torque** loads parameter H.018 is set to 0, then the volts per hertz ratio will be linear and the GV3000 will provide a constant ratio of volts per hertz up to the base frequency setting. This is required for applications such as mixers, conveyors, and extruders. The torque demanded by the load remains the same regardless of the operating speed.



Figure 2. GV3000 H.018 - 0

There is one additional volts per hertz curve which makes the GV3000 unique. It is the result of the many combination drive/motor tests we have performed. The "optimized" volts per hertz curve provides additional voltage to the motor in the middle of the speed range. Combination tests have proven that motors draw less current and run cooler with this volts per hertz setting. A motor operated by a GV3000 with H.018 set equal to 1 will produce slightly more torque at starting and running up through 50 hertz. It will also product rated torque over a wider speed range.



The ratio of volts per hertz determines whether the GV3000 performs as a variable torque drive for centrifugal loads such as fans and pumps, or as a constant drive torque drive for conveyors, extruders, and mixers. Another important operating characteristic of an AC drive is it's ability to provide overload current to the motor when sudden load increases occur.

Overload Current Capability

In centrifugal fan and pump applications sudden increases in load may occur when solids or semi-solids go through a pump, or when pressure changes in a fan system. In constant torque applications overloads may occur when boxes stack up on a conveyor, or when the batch in a mixer begins to harden. In most cases, overloads only last a few seconds. The AC drive must produce an increased amount of current to the motor during this overload period. Why? Because as the motor starts to slip more when an overload occurs it draws more current from the AC drive. An AC drive can typically supply rated overload current in an attempt. to maintain speed for one minute before tripping.

You'll find that in many cases the GV3000 can provide nearly 150% of the motors rated output current, even though it is producing 110% of its own continuous output amp rating. Since most motors and drives are oversized to begin with, it should be considered a fallback position to oversize the GV3000 without studying the nature of the application.

With the GV3000 overload current capability depends on whether it's programmed for vector or general purpose regulation. The overload capability in vector regulation is 150% of rated GV3000 current for one minute. This is ideal for the more demanding loads being controlled by the GV3000 in vector regulation. In general purpose regulation the overload rating of the CV3000 is 110% continuously, not one minute. The 110% overload meets the performance requirements of many variable and constant torque loads. Fans and pumps seldom have overloads more than this, and even constant torque loads such as extruders and mixers seldom have overloads more than 110%.

If it is known that the application requires 150% overload, one option is to program the GV3000 for vector regulation. If the application calls for the GV3000 to operate in general purpose regulation and the overload can possibly be greater than 110%, or even up to 150%, then oversizing the GV3000 is the other option.

The ability to provide overload torque is a function of GV3000 output current relative to the motor full load amps(FLA). This is a key point. The continuous output current of the GV3000 times the overload rating is the total current that the GV3000 can provide. This overload current must be compared to the motor FLA.

GV3000 Overload Amp Capacity (%) =

GV3000 Continuous Output Amps X GV3000 Overload Capability X 100 Motor Full Load Amps

This calculation have been completed for XE motors in both 4 and 6 pole configurations in the following table.



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GV3000 General Purpose Current Capacity with Performance-matched XE motors

Motor	France	Motor	Motor	P.048=U_H GV3000 Model	GV3000 Continuous Ouput	Overload Amps
	1427	1900	1.2	11/1150	Ampa 0.1	trapacity
	1451	1900	1.3	104150	2.1	127.%
	1467	1200	1.4	11/4150	2.1	11 EQ
	1451	1200	2.0	014150	2.1	1079/
	1451	1200	2.0	204150	3.4	167%
	104	1200	1.5	174130	2.1	10472
	1401			Ansided	·····	
		12 816				
000000000		000038000000	<u></u>		4	
2	1451	1800	2.7	204150	3.4	136%
2	184	1800	2.6	2V4150	3,4	144%
2	L1841	1200	2.8	2V4150	3.4	133%
2	1451	1800	2.7	3V4150	5.3	215%
2	184	1800	2.6	3V4150	5.3	224%
2	L184T	1200	2.8	3V4150	5.3	208%
	1627 2437	3800	3.6 1.8	304150 204150	5.6 8.3	1383 1388
	Z13T	1283	12	SXA15D	92	20092
5	L184T	1800	6.1	5\/4150	8.2	148%
5	L184T	1800	6.1	7V4150	11.1	200%
5	L215T	1200	6.9	5V4150	8.2	133%
5	L215T	1200	6.9	7V4150	11.1	179%
	2451					
7. 4 7.5 7.5	213T - 3841 - 2647	1888 3300 3290	910 578 928	1099-150 784180 1864186	13.9	170% 125% 138%
10	L215T	1800	11.9	10V4150	13.9	128%
10	L215T	1800	11.9	15V4150	21.0	194%
10	256T	1200	12.7	10V4150	13.9	120%
10	256T	1200	12.7	15V4150	21.0	182%
00035000	2547		000018-10000	STATISTICS STATISTICS	000000000000000000000000000000000000000	
	2547		18.1	28X/130	27.b.	
	2847	1233	19.2	1584160	21.0	120%
	CB47	1200	18.3	2974150	· · · · · · · · · · · · · · · · · · ·	********
20	256T	1800	23.8	20V4150	27.0	125%
20	256T	1800	23.8	25G4150	30.4	141%
20	256T	1800	23.8	25V4150	34.5	161%
20	286T	1200	25.6	20V4150	27.0	116%
20	286T	1200	25.6	25G4150	30.4	131%

Mator HP	Frame	Mator Speed	Motor FLA	P.048=U_H GV3000 Model Number	GV3000 Continuous Ouput Amps	Overload Amps Capacity
20	296T	1200	25.6	25V4150	34.5	148%
	2847		200.28.0000			
25	2841			251/4150	045	C.96%-
28	2841	(80)	29.1	30,4180	a9:0	1473
	. 384T	isin.	29.1	4004150	54.0	204%
	0641	200		ZSEAND	G0-ja	····· (12%
		730	29.8	0514785		
	. 3227	<u></u>		30,74160		144%
-25	. 7695	200	6.63	48Y414D	64 p · · · · ·	
30	286T	1800	36.1	30V4150	39.0	119%
30	286T	1800	36.1	40V4150	54.0	165%
30	326T	1200	35.8	30V4150	39.0	120%
30	326T	1200	35.8	40V4150	54.0	166%
	. 2247	020	4B.S	4094160		129%
-чр	- 3247	600	48-3	50V415D	••••••67-p••••••	······tsas
40	3641	200	49	40,4190		
- 40		0300	49.4	5024160		149%
50	326T	1800	59.6	50V4150	67.0	124%
50	326T	1800	59.6	60C4150	78.0	144%
50	326T	1800	59.6	50R4150	90.0	166%
50	365T	1200	61.7	50V4150	67.0	119%
50	365T	1200	61.7	60G4150	78.0	139%
50	365T	1200	61.7	50R4150	90.0	160%
	3647	500	0.50			·····
BD	- 9647		66 O	JOR (15D	90 B	1.08
60	2847	020	BB Q	76894160	116.0	
	4047	1900	88.0	5004150		······································
BD	4047	200	69.0	50F415D	90 B	143%
18	4947	250	59 Q	7894180	118.0	1.98%
75	365T	1800	86.0	75R4150	116.0	148%
75	385T	1600	86.0	125R4150	210.0	269%
75	405T	1200	86.9	75R4150	116.0	147%
75	405T	1200	86.9	125R4150	210.0	266%
	4057	200	0000000000000		······	(//////COSS/////////////////////////////
190	4357	(29,0)	0.511	12584150	@10.0	208%
, ilvi	444.7	san	115.0	75faliso	Hea.	11112
101		200	115.8	126630160	Zind	Letix.
125	444T	1800	138.0	125R4140	210.0	167%
125	445T	1200	143.0	125R4150	210.0	162%
	M61.	0000000	0058536000	19664160	2000 Zik 6.0000	000000000000000000000000000000000000000
		2000	174.6	19504160	210.0	1.918



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Motor Overload Protection

The GV3000 has a UL approved motor overload protection function (P.040 & P.041). This function will protect the motor being operated (For multiple motor applications each motor must have its own separate overload protection device.) based on the FLA rating of the motor. In either general purpose or vector regulation this function provides I²t, protection based on 150% motor current for one minute. If the GV3000 is not oversized when programmed for general purpose regulation, then the time until the GV3000 trips on "OL" will be extended. Thus, only if this function is turned off will the GV3000 provide 110% current continuously.

The Competition

It should not be assumed that all competitive drives provide 150% overload in all cases and under all circumstances. The following table compares GV3000 ratings to the Mitsubishi A200, Magentek CPD503, Baldor Series 15, and ABB ACS 500.

HP Rating	Reliance GV3000	Magnetek GPD 503	Baldor Series 15	Mitsubishi A200	ABE ACS 500
1	2.1	2.9	1.8	1.8	n/a
2	3.4	4.5	3.4	3.0	n/a
з	5.3	5,4	4.8	4.8	4.8
5	8.2	9.0	7.6	6.7	7.6
7.5	11.1	13.5	11.0	9.0	11.0
10	13.9	13.5	14.0	14.0	14.0
15	21.0	18.0	21.0	21.0	21.0
20	27.0	27.0	27.0	27.0	27.0
25	30.4	36.0	34.0	34.0	34.0
30	39.0	54.0	40.0	40.0	40.0
40	54.0	54.0	52.0	52.0	52.0
50	67.0	72.0	65.0	65.0	65.0
60	78.0	90.0	80.0	77.0	77.0
75	116.0	106.0	100.0	92.0	96.0
100	210.0	n/a	125.0	124.0	158.0
125	210.0	n/a	160.0	n√a	180.0
150	210.0	n/a	n/a.	n/a	240.0

Continuous Current Ratings - 460 VAC Drives

Notes:

Reliance: General Purpose overload is 110% continuously! Carrier frequency derating 75 IIP and up.

Magnetek: Overload rating is 125% for 1 minute. Carrier frequency limitations not clear. **Mitsubishi:** Overload rating is 120% for 1 minute: 150% for 30 seconds.

ABB: Overload rating is 110% for 1 minute. Current ratings are based on 3 kHz with derating required for higher carriers.

Baldor: Overload rating is 115% for 1 minute.

Summary

- It's the Volts per Hertz setting that determines whether the GV3000 is a variable torque drive or a constant torque drive.
- Overload current capacity is a function of GV3000 continuous output current times the overload divided by motor FLA.
- Many constant torque applications don't require more than 110% overload.
- The solutions for increased ourrent capacity are programming the GV3000 for vector regulation, or oversizing in general purpose regulation.
- 5. The GV3000 can provide 110% output current continuously with general purpose regulation which no other competitive AC drive can claim!

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