YASKAWA

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CUSTOM SOFTWARE DESCRIPTION

HIGH SLIP BRAKING

Software Number: VSG111320		**Base Version:** VSG101114	
Product: G5+	**BNL:**	**Part Number:** CIMR-G5MXXXXXF-009	
Original Release Date: 2/11/02	**Author:** Ty Phillips		
Overview: The High Slip Braking feature greatly reduces stopping time by dissipating regenerative braking energy in the motor windings.			
Revision History:			

Overview:

The High Slip Braking (HSB) function dissipates regenerative deceleration energy in the motor by creating a large slip condition. The function is ideal for high inertia rotating loads such as centrifuges, presses, and blowers, and requires no braking resistor. Braking time can be achieved that is approximately 50% of the time required to decelerate a load normally without using a braking resistor. The HSB function can be used for motors operating in the constant power range.

- HSB only functions for motor stopping, not a change in frequency reference.
- Like the Fast Stop function, the inverter cannot be restarted during a HSB stop.
- Normal deceleration and HSB can be used together. The HSB function is initiated automatically upon stopping when the inverter is operated between two programmed frequencies.
- For HSB to work effectively, the motor should be 160kW or less. The load should have fairly high inertia, with normal deceleration (no braking resistor) requiring 30 - 180 sec.
- The HSB braking duty cycle should be 5% or less and the stopping time should limited to 90 sec or less, as the regenerative energy is dissipated as heat in the motor. When the motor becomes overloaded it will fault on OL1 (normal motor overload) or OL7 (HSB overload).
- HSB can only be used in the V/f control modes (open loop or with PG).
- To maximize the performance of HSB, verify parameter E2-05 (Motor Terminal Resistance) is set properly. If this data is not known, execute the auto-tuning function in either Open Loop Vector or Flux Vector control mode and then change the control mode to either of the V/f modes for using HSB.
- HSB cannot be used with synchronous motors.
- It is not possible to use HSB together with the KEB (Kinetic Energy Braking) function.

Additional Parameters:

No.	Digital Operator Display	Parameter Description	Unit	Setting Range	Default	V/f	V/f w/ PG	Open Loop Vector	Flux Vector
C9-01	HSB Down Freq	HSB Decel Frequency Width	1%	1 ~ 20	7	A	A	-	-
C9-02	HSB Current	HSB Current Limit	1%	100 ~ 200	150	A	A	-	-
C9-03	HSB Dwell Time	HSB Stop Dwell Time	0.1sec	0.1 ~ 10.0	1.0	A	A	-	-
C9-04	HSB OL Time	HSB OL Time	1sec	20 ~ 1200	40	A	A	-	-
C9-13	HSB On Freq	HSB On Frequency	0.01Hz	0.00 ~ 400.00	0.00	A	A	-	-
C9-14	HSB Off Freq	HSB Off Frequency	0.01Hz	0.00 ~ 400.00	0.00	A	A	-	-

Additional Faults:

Fault Code	Digital Operator Display	Fault Description	Cause
OL7	HSB-OL	HSB Overload	The inverter output frequency during HSB did not change within the time set in C9-04 (excessive machine inertia present).
OPE13	HSB Select Err	HSB Parameter Setting Error	C9-13 > C9-14 or C9-14 > 0 but control mode is not V/f

Description of Functionality:

When the inverter is running between the output frequencies set in C9-13 (HSB On Frequency) and C9-14 (HSB Off Frequency) and the run command is removed, the inverter will stop by HSB. The inverter cannot be restarted during an HSB stop.

Parameter C9-01 (HSB Decel Frequency Width) sets how aggressively the inverter decreases the output frequency as it stops the motor. If overvoltage (OV) faults occur during HSB, parameter C9-01 may need

to be increased. Parameter C9-02 (HSB Current Limit) sets the maximum current to be drawn during an HSB stop. Higher C9-02 settings will shorten motor stopping times but cause increased motor current, and therefore increased motor heating.

Parameter C9-03 (HSB Stop Dwell Time) sets the amount of time the inverter will dwell at E1-09 (Minimum Frequency). If this time is set too low, the machine inertia can cause the motor to rotate slightly after the HSB stop is complete and the inverter output is shut off.

Parameter C9-04 (HSB Overload Time) sets the time required for an OL7 (HSB Overload Fault) to occur when the inverter output frequency does not change for some reason during an HSB stop. Normally this does not need to be adjusted.

Parameter B2-04 (DC Injection Braking Time at Stop) should be set to a mimimum of 0.50 sec when using HSB. This will activate DC injection during the final portion of HSB and help ensure that motor stops completely.

An HSB stop is cancelled if either of the following occur:
- External Base Block command is given via multi-function input (H1-0X = 8,9).
- External Fast Stop command is given via multi-function input (H1-0X = 15,17).