Application Note	AN-MEGA-0008-v101EN

Faster deceleration with Low Frequency Braking

Inverter type	FRENIC-MEGA
Software version	1000 and above
Required options	
Related documentation	FRENIC MEGA_Instruction Manual_INR-SI47-1335-E
Author	Andreas Schader
Revised	Jordi Català
Approved	David Bedford
Use	Public, Web
Date	17/06/2010
Version	1.0.1
Languages	English

Introduction.

This document describes how FRENIC-MEGA can perform low frequency braking using only customizable logic.
Low frequency braking is often used in applications were a fast deceleration time must be achieved but braking resistor can not be used, for example saws in wood industry.

Principle of the Solution.

In this solution we will use the physical effect of eddy current to decelerate the motor. When FWD is removed we will stop the output of the inverter by BX signal, this will cause the motor to coast. During coasting we will keep RUN by customizable logic and already set a preset speed. After a very short coasting time (less than 10ms), the drive will inject the preset frequency to the motor. As this frequency does not match the actual motor speed, eddy current is created. This causes high current consumption to the inverter and also causes a deceleration effect in the motor.

Control signals used.

Terminal	Description	Usage
PLC	+24V	
FWD		Run Signal

Logic circuit.

Figure 1 shows the logic diagram implemented by customizable logic of FRENIC-MEGA.

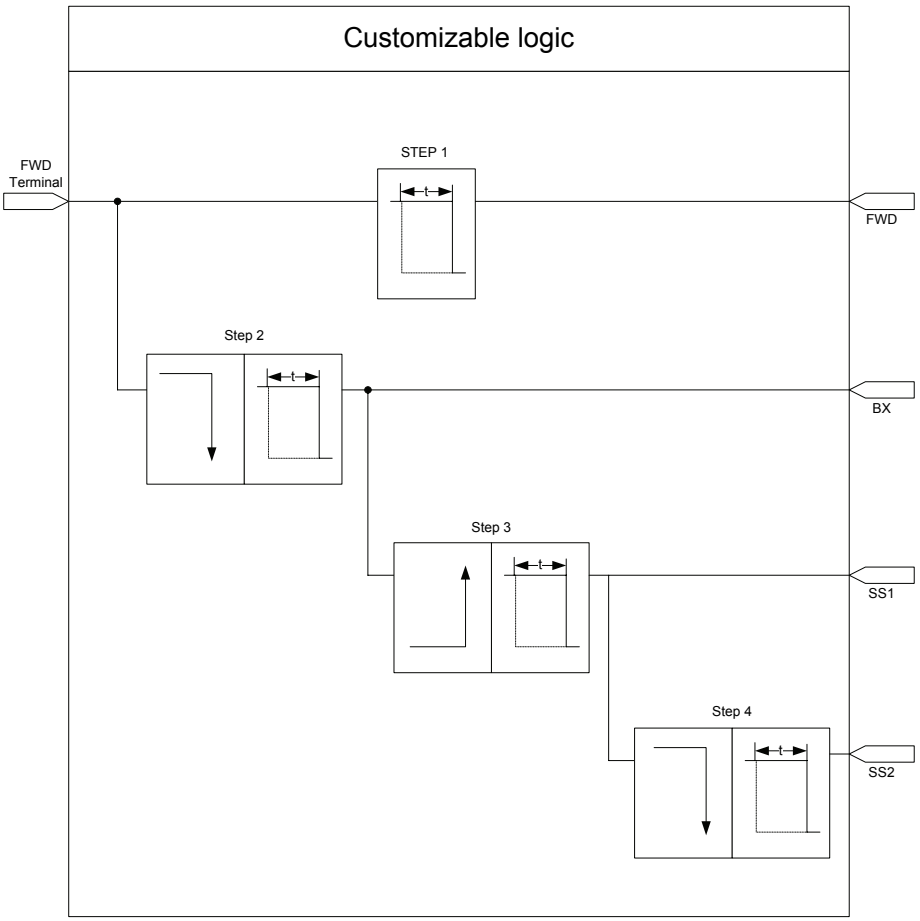

Figure 1. Logic diagram implemented by customizable logic.

Timing diagram.

Figure 2 shows the time diagram during of the low frequency braking operation.

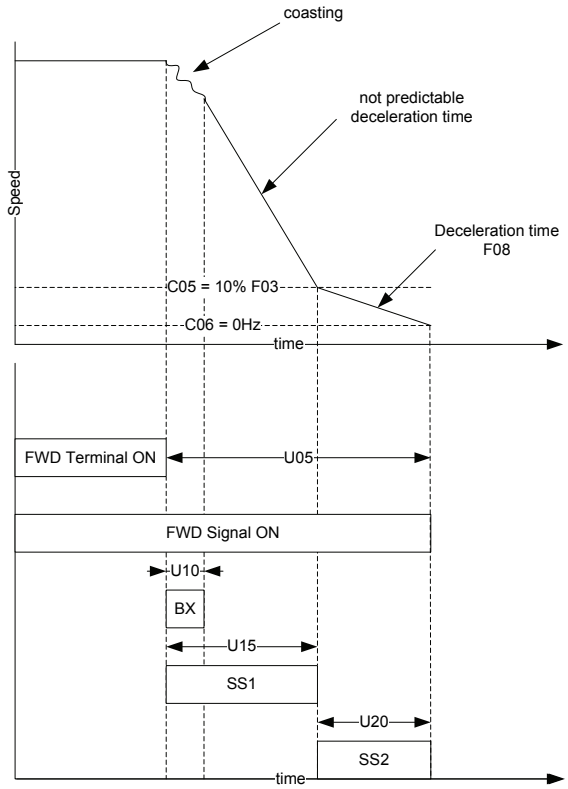

Figure 2. Time diagram.

Functions different from factory default.

The following table shows the function codes different from factory default setting.

Function Code	Description	Setting	Comment
F02	Operation Method	1	Via digital inputs
F03	Maximum Frequency 1		Application Data
F04	Base Frequency 1		Rated Motor Data
F05	Rated Voltage at Base Frequency 1		Rated Motor Data
P01	Motor 1 Number of Poles		Rated Motor Data
P02	Motor 1 Rated Capacity		Rated Motor Data
P03	Motor 1 Rated Current		Rated Motor Data
E98	FWD Terminal	100	No function
C05	Preset speed	~10% F03	Low frequency for braking
C07	Preset speed	0 Hz	Stop Speedy
U00	Customizable Logic (Mode selection)	1	Enable customizable logic

Function Code	Description	Setting	Comment
U01	Customizable Logic Step 1 (Input 1)	4010	FWD terminal
U03	Customizable Logic Step 1 (Logic circuit)	1	Pass through
U04	Customizable Logic Step 1 (Type of timer)	2	Off delay
U05	Customizable Logic Step 1 (Timer)	1.0	Time to keep run, depends on the application, at least U15 + U20
U06	Customizable Logic Step 2 (Input 1)	4010	FWD terminal
U08	Customizable Logic Step 2 (Logic circuit)	8	Falling edge detector
U09	Customizable Logic Step 2 (Type of timer)	2	Off delay
U10	Customizable Logic Step 2 (Timer)	0.10	BX time
U11	Customizable Logic Step 3 (Input 1)	2002	Input from logic step 2
U13	Customizable Logic Step 3 (Logic circuit)	7	Rising edge detector
U14	Customizable Logic Step 3 (Type of timer)	2	Off delay timer
U15	Customizable Logic Step 3 (Timer)	0.80	Time for braking to low frequency, depends on the application
U16	Customizable Logic Step 4 (Input 1)	2003	Input from logic step 3
U18	Customizable Logic Step 4 (Logic circuit)	8	Falling edge detector
U19	Customizable Logic Step 4 (Type of timer)	2	Off delay timer
U20	Customizable Logic Step 4 (Timer)	0.20	Time for deceleration to stop, depends on the application
U71	Customizable Logic Output Signal 1 (Output selection)	1	Step 1
U72	Customizable Logic Output Signal 2 (Output selection)	2	Step 2
U73	Customizable Logic Output Signal 3 (Output selection)	3	Step 3
U74	Customizable Logic Output Signal 4 (Output selection)	4	Step 4
U81	Customizable Logic Output Signal 1 (Function selection)	98	FWD
U82	Customizable Logic Output Signal 2 (Function selection)	7	BX
U83	Customizable Logic Output Signal 3 (Function selection)	0	SS1
U84	Customizable Logic Output Signal 4 (Function selection)	1	SS2

Conclusion.

As described in this document, with FRENIC-MEGA it is possible to perform low frequency braking to achieve very fast deceleration ramps without using a braking resistor. The actual deceleration time depends very much on the setting of F03 and C05 and the total inertia of the system. There is no formula to calculate the braking time, therefore setting those times is always empiric.

The disadvantage is that very high losses are generated in the motor during braking, this may damage the windings and will always cause high losses during braking. Low frequency braking should only be used in applications were a low number of stops per day will occur.

Document history.

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First Version	15/06/2010	A. Schader	J. Català	
1.0.1	Small text changes	17/06/2010	A. Schader	J. Català	D.Bedford