Fuji Electric

Application Note	AN-MEGA-0022-v102EN

FRENIC-MEGA, controlled automatic deceleration when input power is lost

Inverter type	FRENIC MEGA
Software version	3700 or later
Required options	-
Related documentation	MEGA_IM_AE_1335a-E
Author	Martin Fuchs
Use	Public, Web
Date	11/10/2012
Version	1.0.2
Languages	English

1. Introduction.

This document describes a special set up of FRENIC MEGA to control a circular knitting machine. The goal of this set up is to have an automatic stop of the machine when the input power is lost.

The two new functions needed are:

- Upon detecting the state of under-voltage the inverter should stop in a fixed distance (⅓ turn of the machine). S-Curves should be active during this operation. This operation should be automatically done by the inverter.
- By activating a digital input the inverter should enter a force to stop state with a fixed deceleration time. S-Curves should also be active during this operation.

Initial tests showed that the machine is very sensitive and S-curves are necessary to protect the needles from damage, especially at stopping with short deceleration times. To fulfill the first request, functions F14=2 and F14=3 were tested. First tests with F14=2 were successful but as soon as the machine reached its working temperature the deceleration distance was more than ½ turn of the machine. Adjusting the parameters H92/H93 did not lead to better results.
By using ***BATRY*** function the inverter was able to control the motor at power loss but S-curves were inactive so the machine was shaking and vibrating.

To fulfill the second request, DI-Function ***STOP*** was tested. The deceleration way was good at H56=0.8s but the control was too hard and the whole machine is shaking/vibrating. This is related to the missing S-curves.

2. System set up.

The idea was to use the Analog output programmed as EDC to trigger the event of a power loss. This Analog value should be supplied to an analog input like in Figure 1. Programming the analog input as a PID-feedback allows using the ***PID-ALM*** even PID-control is not active. The alarm level will be set to J13 while for example 52% ≈ 520Vdc.

PID-ALM signal will be input to customized logic to switch the deceleration time and to set the speed set-point to '0Hz'. To make the reaction time of the analog signal processing as fast as possible, all filters for this signal path should be set to '0.0s'.

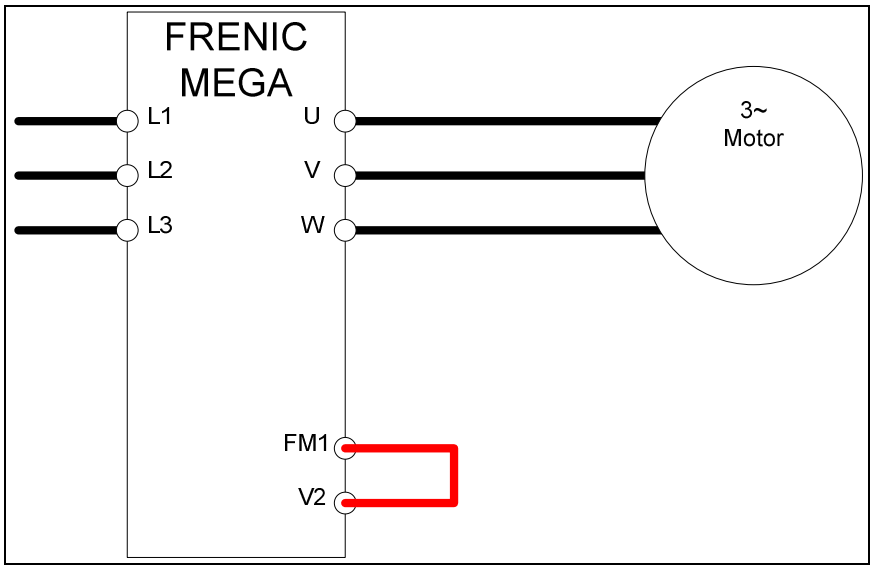

Figure 1. System set up.

It is necessary to use F14=3 and H92 and H93 to continue operation during the power loss. Otherwise the inverter is not able to control the motor when the power is lost. The Control loop can be set very calm not to have a big effect of the DC-link control.

Setting a bit longer deceleration time (0.7s -> 0.9s) let the inverter immediately go off because all the energy of DC-link was consumed by the motor.

The customized circuit logic will be:

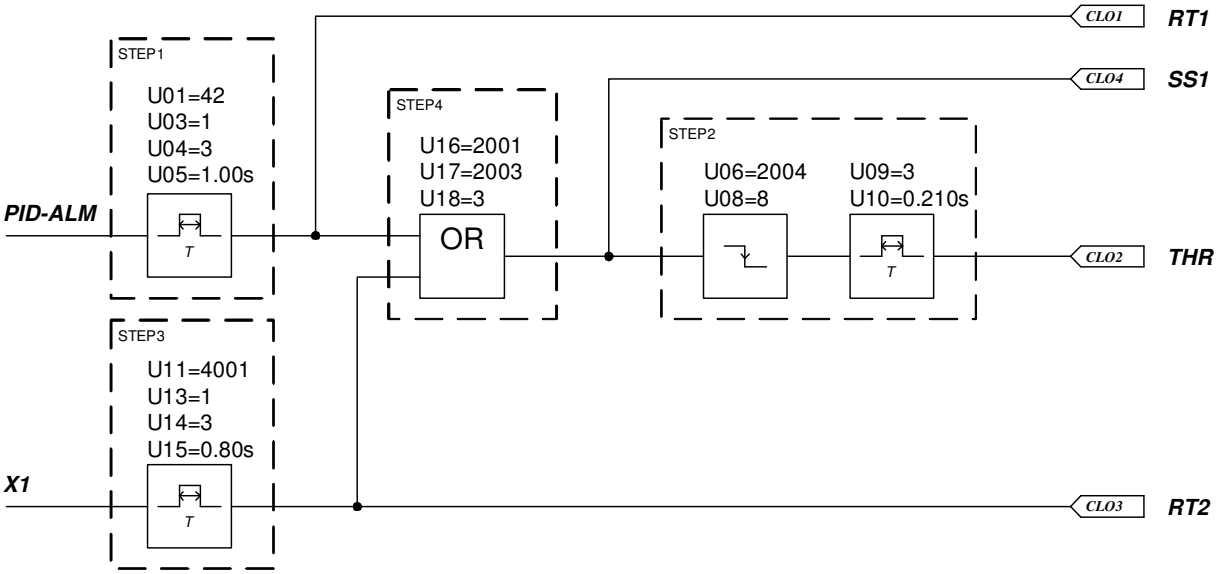

Figure 2. Customizable Logic Setup

3. Parameter settings.

Table 1 below describes the function codes settings of the FRENIC MEGA inverter different from default.

Table 1. Function codes different from default settings for the FRENIC MEGA

F. No.	Establishment item	Set Value
F03	Maximum Frequency 1	80.0
F07	Acceleration Time 1	5.00
F08	Deceleration Time 1	1.50
F14	Restart Mode after Momentary Power Failure (Mode selection)	3
F15	Frequency Limiter (High)	80.0
F23	Starting Frequency 1	1.0
F25	Stop Frequency	0.0
F31	Analog Output [FM 1] (Function)	9
F42	Drive Control Selection 1	1
F43	Current Limiter (Mode selection)	0
E01	Terminal [X1] Function	100
E11	Deceleration Time 2	0.70
E13	Deceleration Time 3	0.70
E63	Terminal [V2] Extended Function	5
C43	Analog input Adjustment for [V2] (Filter time constant)	0.00
H07	Acceleration/Deceleration Pattern	2
H08	Rotational Direction Limitation	1
H15	Restart Mode after Momentary Power Failure (Continuous running level)	500
H57	1st S-curve acceleration range (Leading edge)	5
H58	2nd S-curve acceleration range (Trailing edge)	5
H59	1st S-curve deceleration range (Leading edge)	5
H60	2nd S-curve deceleration range (Trailing edge)	20
H72	Main Power Down Detection (Mode selection)	0
H92	Continuity of Running (P)	0.800
H93	Continuity of Running (I)	0.600
J06	PID Control (Feedback filter)	0.0
J13	PID Control (Lower level alarm (AL))	55
U00	Customizable Logic (Mode selection)	1
U01	Customizable Logic Step 1 (Input 1)	42
U03	Customizable Logic Step 1 (Logic circuit)	1
U04	Customizable Logic Step 1 (Type of timer)	3
U05	Customizable Logic Step 1 (Timer)	1.00
U06	Customizable Logic Step 2 (Input 1)	2004
U08	Customizable Logic Step 2 (Logic circuit)	8
U09	Customizable Logic Step 2 (Type of timer)	3
U10	Customizable Logic Step 2 (Timer)	0.10
U11	Customizable Logic Step 3 (Input 1)	4001
U13	Customizable Logic Step 3 (Logic circuit)	1
U14	Customizable Logic Step 3 (Type of timer)	3
U15	Customizable Logic Step 3 (Timer)	0.80
U16	Customizable Logic Step 4 (Input 1)	2001
U17	Customizable Logic Step 4 (Input 2)	2003
U18	Customizable Logic Step 4 (Logic circuit)	3
U71	Customizable Logic Output Signal 1 (Output selection)	1
U72	Customizable Logic Output Signal 2 (Output selection)	2
U73	Customizable Logic Output Signal 3 (Output selection)	3

F. No.	Establishment item	Set Value
U74	Customizable Logic Output Signal 4 (Output selection)	4
U81	Customizable Logic Output Signal 1 (Function selection)	4
U82	Customizable Logic Output Signal 2 (Function selection)	1009
U83	Customizable Logic Output Signal 3 (Function selection)	5
U84	Customizable Logic Output Signal 4 (Function selection)	0

4. Conclusion.

With the above measures it was possible to fulfil the customer requests by using analog signals and customized logic.

5. Document history.

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First	07/11/2012	M Fuchs		
1.0.1	Adapted to standard format	11/12/2012	JM Ibanez	J Català	J Català
1.0.2	H92 and H93 mistake fixed	20/12/2012	JM Ibanez	J Català	J Català