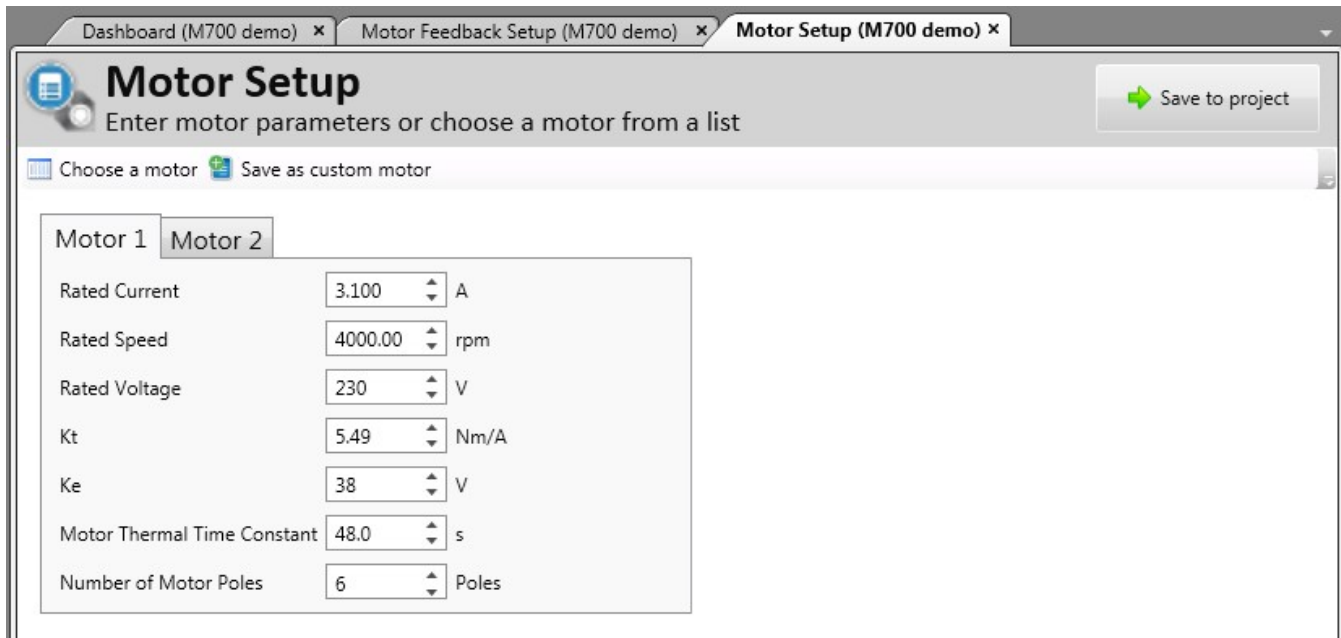


This Application Note applies to M700 – M702 drives

## **M700 Setup for DX-316 Servo Motor (Resolver feedback)**

This application note will show the motor and feedback parameter setup required for a DX-316 servo motor using Unidrive M Connect software when used with a Unidrive M700. Furthermore this application note will focus on motor and feedback setup for the DX-316 servo motor and will assume the drive type and mode of operation have been selected. If needed please refer to application note AN0009 M700 Demo Basic Drive Motor Setup using M Connect Software for selecting the drive type and mode of operation. It is also assumed that the motor power and P1 feedback wiring have been completed in accordance with the M700 Control User Guide. An Ethernet patch cable connected to a M700 demo unit with a PC static IP address set to IP address 192.168.1.100 was used for demonstration purposes and all live screen captures in this document.

First enter the DX-316 motor setup shown below. If you think this DX-316 motor setup may be useful in future applications you can select 'Save as custom motor' to add this motor to the drop down list. When finished click on 'Save to Project'.




The screenshot shows the 'Motor Setup' window in the Unidrive M Connect software. The window has three tabs: 'Dashboard (M700 demo)', 'Motor Feedback Setup (M700 demo)', and 'Motor Setup (M700 demo)'. The 'Motor Setup' tab is active. The window title is 'Motor Setup' and it contains the instruction 'Enter motor parameters or choose a motor from a list'. There are two buttons at the top right: 'Save to project' (with a green arrow icon) and 'Save as custom motor' (with a green plus icon). Below these buttons are two tabs: 'Motor 1' and 'Motor 2'. The 'Motor 1' tab is selected. The parameters for Motor 1 are as follows:

Parameter	Value	Unit
Rated Current	3.100	A
Rated Speed	4000.00	rpm
Rated Voltage	230	V
Kt	5.49	Nm/A
Ke	38	V
Motor Thermal Time Constant	48.0	s
Number of Motor Poles	6	Poles

Enter the Motor Feedback Setup Encoder type Resolver and click on 'Save to project'.

Dashboard (M700 demo) x
Motor Feedback Setup (M700 demo) x
Motor Setup (M700 demo) x



## Motor Feedback Setup

Setup the drive's motor feedback configuration parameters.

Save to project

Motor feedback device connected to: Drive P1
Drive feedback mode: Position Feedback

Drive P1 Drive P2

### What type of encoder is attached to the drive?

Encoder type: Resolver Rotary Linear

### Rotary Resolver configuration:

Error detection:

- ☒ Enable wire break detect
- ☐ Enable phase error detect
- ☐ Enable SSI power supply alarm bit monitor
- ☐ Disable trips {Enc 1} to {Enc 7}

Encoder setup:

Encoder supply voltage 5V

Auto Configuration Disable On Off

### Advanced Features:

Additional power up delay 0.0 s

Feedback Filter Disabled

Normalisation Turns 16

Feedback Reverse On Off

Once Resolver feedback has been selected open Menu 3 Parameters and set up the P1 Resolver Poles Pr 03.065 and P1 Resolver Excitation Pr 03.066 as shown below.

Dashboard (M700 demo) x
Menu 03 : Speed Cont...ack (M700 demo) x



## Menu 03 : Speed Control and Position Feedback

View parameters on the drive and option modules.

Live

Compare with Defaults
Compare with File
Print
Print preview
PDF export
Columns
View


Search.....

Menu caption on keypad: Speed Control & Pos. Feedback

Parameter	Caption	Caption on keypad	Categories	Value	Source/
03.038	P1 Device Type	P1 Device Type		Resolver	
03.039	P1 Termination Select	P1 Termination Select		1	
03.040	P1 Error Detection Level	P1 Error Detection Level		0 0001	
03.041	P1 Auto-configuration Select	P1 Auto-config Select		Enabled	
03.042	P1 Feedback Filter	P1 Feedback Filter		Disabled	
03.043	P1 Maximum Reference	P1 Maximum Reference		3000 rpm	
03.044	P1 Reference Scaling	P1 Reference Scaling		1.000	
03.045	P1 Reference	P1 Reference		0.0 %	
03.046	P1 Reference destination	P1 Reference destination		0.000	Unassign
03.047	P1 SSI Incremental Mode	P1 SSI Incremental Mode		<input type="checkbox"/> Off	
03.048	P1 SSI Binary Mode	P1 SSI Binary Mode		<input type="checkbox"/> Off	
03.049	P1 Additional Power-up Delay	P1 Additional Power-up Delay		0.0 s	
03.050	P1 Feedback Lock	P1 Feedback Lock		<input type="checkbox"/> Off	
03.051	P1 Linear Feedback Select	P1 Linear Feedback Select		<input type="checkbox"/> Off	
03.052	P1 Linear Comms Pitch	P1 Linear Comms Pitch		0.001	
03.053	P1 Linear Line Pitch	P1 Linear Line Pitch		0.001	
03.054	P1 Linear Comms And Line Pitch Units	P1 Lin Comms & Line Pitch Units		millimetres	
03.055	P1 Pole Pitch	P1 Pole Pitch		10.00 mm	
03.056	P1 Feedback Reverse	P1 Feedback Reverse		<input type="checkbox"/> Off	
03.057	P1 Normalisation Turns	P1 Normalisation Turns		16	
03.058	P1 Normalised Position	P1 Normalised Position		189038612	
03.059	P1 Normalised Marker Position	P1 Normalised Marker Position		0	
03.060	P1 Calculation Time	P1 Calculation Time		5 µs	
03.061	P1 Recovery Time	P1 Recovery Time		30 µs	
03.062	P1 Line Delay Time	P1 Line Delay Time		143 ns	
03.063	P1 Low Speed Update Rate Active	P1 LowSpd Update Rate Active		<input type="checkbox"/> Off	
03.064	P1 Encoder Protocol Detected	P1 Enc Protocol Detected		None	
03.065	P1 Resolver Poles	P1 Resolver Poles		2 Poles	
03.066	P1 Resolver Excitation	P1 Resolver Excitation		8kHz 2V	

The motor is now ready for Autotune. Make sure the motor is disconnected from the load with nothing connected to the motor shaft. With the drive disabled and Run commands all off go to parameter Pr 00.0040 either via the drive keypad or using MConnect and change this to 2. Close the drive Enable contact and turn Run Forward On. This will initiate a rotating Autotune needed to find the Position Feedback Phase Angle 03.025. Once a successful Autotune has been completed with no drive trips the Position Feedback Phase Angle 03.025 should have been found by the drive. Turn Run Forward Off and Open the drive enable contact. Now is a good time to save parameters in the drive either via MConnect or via the drive keypad.

Dashboard (M700 demo) ×
Menu 03 : Speed Cont...ack (M700 demo) ×
Menu 05 : Motor Control (M700 demo) ×



## Menu 05 : Motor Control

View parameters on the drive and option modules.

Live


Compare with Defaults
Compare with File
Print
Print preview
PDF export
Columns
View

Search.....

Menu caption on keypad: Motor Control

Parameter	Caption	Caption on keypad	Categories	Value	Source
05.000	Parameter mm.000	Parameter mm.000		0	
05.001	Output Frequency	Output Frequency		0.0 Hz	
05.002	Output Voltage	Output Voltage		0 V	
05.003	Output Power	Output Power		0.000 kW	
05.005	D.c. Bus Voltage	D.c. Bus Voltage		348 V	
05.007	Rated Current	Rated Current		3.100 A	
05.008	Rated Speed			4000.00 rpm	
05.009	Rated Voltage			230 V	
05.011	Number Of Motor Poles			Automatic Poles	
05.012	Auto-tune			0	
05.013	Minimal Movement Phasing Test Mod			Free	
05.014	Phasing Test On Enable			Disabled	
05.015	Minimal Movement Phasing Test Current	Minimal Movement Phasing Current		1%	
05.016	Minimal Movement Phasing Test Angle	Minimal Movement Phasing Angle		0.00 °	
05.017	Stator Resistance	Stator Resistance		1.641864 Ω	
05.018	Maximum Switching Frequency	Max Switching Frequency		6	
05.021	Mechanical Load Test Level	Mechanical Load Test Level		0 %	
05.022	Enable High Speed Mode	Enable High Speed Mode		Disable	
05.023	D.c. Bus Voltage High Range	D.c. Bus Voltage High Range		348 V	
05.024	Ld	Ld		5.318 mH	
05.026	High Dynamic Performance Enable	High Dynamic Performance Enable		<input type="checkbox"/> Off	
05.027	Flux Control Gain	Flux Control Gain		1.0	
05.028	Torque Linearisation Disable	Torque Linearisation Disable		<input type="checkbox"/> Off	
05.031	Voltage Controller Gain	Voltage P Gain		1	
05.032	Torque Per Amp	Torque Per Amp		5.49 Nm/A	
05.033	Volts Per 1000rpm	Volts Per 1000rpm		38 V	

Save parameters in drive



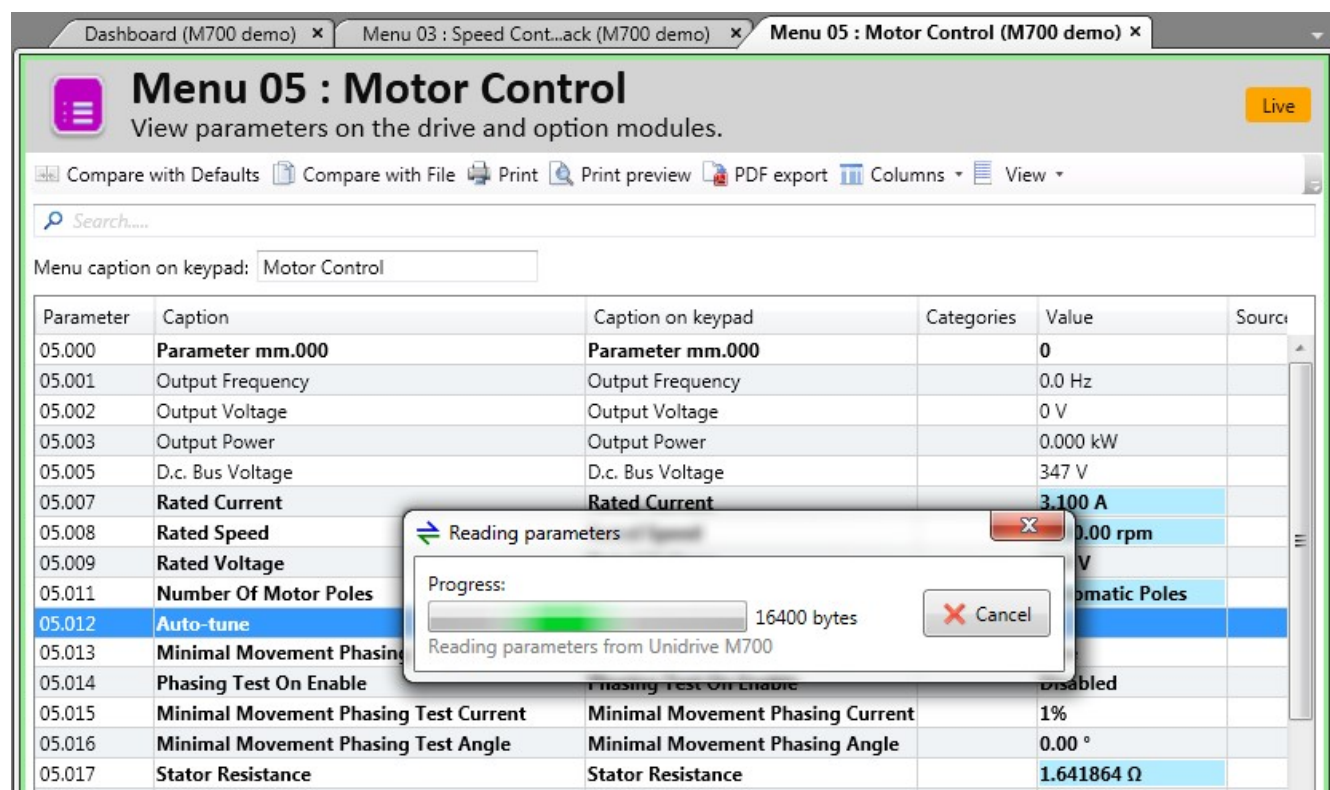
Drive parameter save in progress.

⚠ Do not remove power from the drive.

The motor is now ready for use. If the gains appear to be aggressive you can lower gain values in the Current and Speed loops. Below are gains that were decreased after Autotune and used with an unloaded DX-316C servo motor.

Parameter	Caption	Categories	Offline Value	Default Value
03.010	Speed Controller Proportional Gain Kp1		0.0050 s/rad	0.0100 s/rad
03.038	P1 Device Type		Resolver	AB Servo
03.066	P1 Resolver Excitation		8kHz 2V	6kHz 3V
04.013	Current Controller Kp Gain		15	150
04.014	Current Controller Ki Gain		1031	2000

The final thing to consider is saving your setup to a MConnect project. Go online with MConnect and select 'Upload from Drive' to save the changes in the drive to a project.



Dashboard (M700 demo) x Menu 03 : Speed Cont...ack (M700 demo) x Menu 05 : Motor Control (M700 demo) x

## Menu 05 : Motor Control

View parameters on the drive and option modules. Live

Compare with Defaults Compare with File Print Print preview PDF export Columns View

Search.....

Menu caption on keypad: Motor Control

Parameter	Caption	Caption on keypad	Categories	Value	Source
05.000	Parameter mm.000	Parameter mm.000		0	
05.001	Output Frequency	Output Frequency		0.0 Hz	
05.002	Output Voltage	Output Voltage		0 V	
05.003	Output Power	Output Power		0.000 kW	
05.005	D.c. Bus Voltage	D.c. Bus Voltage		347 V	
05.007	Rated Current	Rated Current		3.100 A	
05.008	Rated Speed			0.00 rpm	
05.009	Rated Voltage			V	
05.011	Number Of Motor Poles			Automatic Poles	
05.012	Auto-tune				
05.013	Minimal Movement Phasing				
05.014	Phasing Test On Enable	Phasing Test On Enable		Disabled	
05.015	Minimal Movement Phasing Test Current	Minimal Movement Phasing Current		1%	
05.016	Minimal Movement Phasing Test Angle	Minimal Movement Phasing Angle		0.00 °	
05.017	Stator Resistance	Stator Resistance		1.641864 Ω	

Reading parameters

Progress: 16400 bytes

Reading parameters from Unidrive M700

Cancel

**Resources:** can be found on our website: [www.controltechniques.com](http://www.controltechniques.com)

For help contact [techsupport.cta@mail.nidec.com](mailto:techsupport.cta@mail.nidec.com), or call Technical Support at 952-995-8000, 24/7/365