Subject:	**Commissioning of Leroy Somer Interchangeable Dyneo+ Motor (Without Position Feedback) with Unidrive M700 / M701 / M702**

Documentation Category:	Drive setup, gain settings, autotune	**Product Category:**	Unidrive M
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Revision History

Revision	Date	Revising Author	Comments
1.00	23/10/2020	Mike Quinlan	Initial Version
2.00	04/02/2022	Mike Quinlan	

Summary of Contents

This document details the set-up of Leroy Somer Dyneo+ motors (11 to 90kW interchangeable version, 1500/3000rpm) without position feedback on Unidrive M700/701/702.

1. Introduction

Before setting the drive, please follow the safety and installation instructions for Dyneo+ motors and Unidrive M700/701/702 drives described in their respective manuals.

Dyneo+ motors: http://www.leroy-somer.com/documentation_pdf/5411_en.pdf

Unidrive M700/701/702 drives: see the Getting started guide and associated Power Installation Guides (available from the Control Techniques website).

⚠ **The installation and commissioning must be carried out by qualified, competent and authorized personnel.**

Then proceed with the quick commissioning described in §2 from the factory setting.

Requirements:

- Parameters shown in motor data tables from the annex are only applicable for the Unidrive M700/701/702 drive rating indicated for each data line. If a drive with a different rating is used, then *Current Controller Kp Gain* (**Pr 04.013**) and *Current Controller Ki Gain* (**Pr 04.014**) must be scaled, as detailed below:

    New value = Annex value x ($Kc_{New\ drive}$ / $Kc_{Annex\ drive}$)

    Values for Kc can be found in the Parameter Reference Guide, in the Current Ratings section.

- Ensure the drive has a firmware version equal or higher than V01.20.00.00.

2. Commissioning with Unidrive M700/701/702: RFC-S mode for interchangeable Dyneo⁺ permanent magnet motors without position feedback (sensorless)

Action	Description
Before power-up	Ensure: • The drive enable signal is not given (terminal 31 on Unidrive M700 / M701 and terminals 11 & 13 on Unidrive M702). • The Run signal is not given • Motor is connected
Power-up the drive	If RFC-S mode is displayed when the drive is powered up: • If the frequency of the mains supply is 60Hz, set **Pr 00.000** = 1244, otherwise if the frequency of the mains is 50Hz, set **Pr 00.000** = 1233. If Open Loop or RFC-A mode is displayed when the drive is powered up: • Set Pr 00.048 = RFC-S (3). • If the frequency of the mains supply is 60Hz, set **Pr 00.000** = 1254, otherwise if the frequency of the mains is 50Hz, **Pr 00.000** = 1253. Press the red Reset button or toggle the Reset logic input. These actions will leave the drive in RFC-S mode with defaulted parameters. The drive will be in a tripped state, but the associated trips are addressed by settings within this procedure.
Advanced menu access from the keypad	To access all menus required for commissioning, set **Pr 00.049** = All Menus (1). Reminder: Select the menus using the left and right arrows. The parameters are selected using the up and down arrows.
Motor thermistor set-up	The motor PTC thermistor must be connected to the drive: • M700/M701: Connect thermistor to analogue input 3 (terminals 8 and 11). • M702 (with date code 1710 or later): Connect thermistor to digital input 5 / analogue input 3 (terminals 8 and 10). For the drive to manage the thermistor, set Analogue Input 3 Mode **Pr 07.015** = Therm Short Cct (7). If connection of the thermistor leaves insufficient inputs, then it may be necessary to fit an SI-I/O module.
Enter motor nameplate details	Refer to the Dyneo+ motor tables located in the Appendix. Select the table corresponding to the motor speed range (1500 or 3000 rpm). Then depending on the motor type and its power, select the line that corresponds to the voltage, the supply frequency and the rated speed of the application. From this line, set in the drive the values of all the parameters listed in the table. **NOTE: If the motor type does not appear in the table, then it is from the Compact range. In this case, please contact Control Techniques Technical Support.** Example: For the 1500 range motor, LSHRM 160MR1 – 11 kW 400V – 50Hz with a rated speed of 1500 rpm, parameter values to set in the drive are the ones of the green line as indicated below: [table below] NOTE: When setting **Pr 05.069**, it may be necessary to increase the value entered, to ensure that the actual trip level displayed in **Pr 05.068** is close to (but not greater than) the required value.
Set maximum speed	Set the maximum speed in **Pr 01.006**.
Set acceleration and deceleration rates	Set: • *Ramp Rate Units* (**Pr 02.039**) = On (1) • Acceleration rate in **Pr 02.011** (s up to **Pr 01.006**) - A value of 20s suits most applications. • Deceleration rate in **Pr 02.021** (s up to **Pr 01.006**) - A value of 20s suits most applications. If a braking resistor is installed, set **Pr 02.004** = Fast (0). Also ensure **Pr 10.030** and **Pr 10.031** and **Pr 10.061** are set correctly, otherwise premature 'Brake R Too Hot' trips may be seen.

Parameter table referenced in the example:

1500 range Motor Type	Powerdrive F300 Drive type	04.013 Motor Rated Frequency (Hz)	04.014 Current controller Kp Gain (-)	05.007 Current controller Ki Gain (-)	05.008 Rated current (A)	05.009 Rated speed (rpm)	05.011 Rated voltage (V)	05.017 Number Of Motor Poles	05.024 Stator Resistance (Ω)	05.033 Ld (mH)	05.069 Volts per 1000 rpm (V/kmin-1)	05.072 Over-current Trip Level (% Inom)	05.075 No-load Lq (mH)	05.078 Iq Test Current For Inductance Measurement (%)	05.082 Lq At The Defined Iq Test Current (mH)	05.084 Id Test Current for Inductance Measurement (%)	05.087 Lq At The Defined Id Test Current (mH)	User Defined Rated Torque Angle (°)
LSHRM 160 MR1_11 kW	044-00240A	50	152	269	21	1500	400	4 Poles	0.315822	7.63	72	236%	68.5	73	44.8	-108	68.5	56
	044-00240A	60	152	269	20	1800	400	4 Poles	0.315822	7.63	72	244%	68.5	73	44.8	-108	68.5	56
	044-00240A	60	152	269	21	1800	460	4 Poles	0.315822	7.63	72	233%	68.5	73	44.8	-108	68.5	56
	064-00480A	87	124	219	38	2600	400	4 Poles	0.105274	2.54	42	218%	22.8	73	14.9	-108	22.8	56

Additional settings	Set: • *Speed Controller Proportional Gain Kp1 (**Pr 03.010**) = 0.0300* • *Speed Controller Integral Gain Ki1 (**Pr 03.011**) = 0.10* • *RFC Feedback Mode (**Pr 03.024**) = Sensorless* • *P1 Error Detection Level (**Pr 03.040**) = 0* • *P1 Thermistor Fault Detection (**Pr 03.123**) = None* • *Motoring Current Limit (**Pr 04.005**) = 120% max* • *Regenerating Current Limit (**Pr 04.006**) = 120% max* • *Symmetrical Current Limit (**Pr 04.007**) = 120% max* • *Current Reference Filter 1 Time Constant (**Pr 04.012**) = 1ms [It may be necessary to increase this value to counteract ripple from low resolution estimated feedback]* • *Thermal Protection Mode (**Pr 04.016**) = Disabled* • *User Current Maximum Scaling (**Pr 04.024**) = 120% max* • *Maximum Switching Frequency (**Pr 05.018**) = 3kHz* • *Enable High Speed Mode (**Pr 05.022**) = Enable (2)* • *Flux Control Gain (**Pr 05.027**) = 0.1* • *Minimum Switching Frequency (**Pr 05.038**) = 3kHz (1)* • *Voltage Headroom (**Pr 05.041**) = 5% [Do not set a lower value. Increase this value to 10%, if the motor is unstable in the field weakening area]* • *RFC Low Speed Mode (**Pr 05.064**) = Injection* • *Saliency Torque Control Select (**Pr 05.065**) = Auto [Ensure that **Pr 05.066** = High, otherwise check the value entered for **Pr 05.087** from the table]* • *Inverted Saturation Characteristic (**Pr 05.070**) = On (1)* • *Low Speed Sensorless Mode Current (**Pr 05.071**) = 60% [Note: This forces a reduced current limit between zero speed and 20% of motor rated speed]* • *Stop Mode (**Pr 06.001**) = Ramp* • *Hold Zero Speed (**Pr 06.008**) = 0 (Disabled)* If the load is a high inertia, **Pr 03.010** may need to be increased.
Save parameters	Select 'Save Parameters' in **Pr mm.000** and press the red reset button or toggle the reset digital input.

Appendix

1500 range Motor Type	Powerdrive F300 Drive type	Motor Rated Frequency	Current controller Kp Gain (04.013)	Current controller Ki Gain (04.014)	Rated current (05.007)	Rated speed (05.008)	Rated voltage (05.009)	Number Of Motor Poles (05.011)	Stator Resistance (05.017)	Ld (05.024)	Volts per 1000 rpm (05.033)	Over-current Trip Level (05.069)	No-load Lq (05.072)	Iq Test Current For Inductance Measurement (05.075)	Lq At The Defined Iq Test Current (05.078)	Id Test Current for Inductance Measurement (05.082)	Lq At The Defined Id Test Current (05.084)	User Defined Rated Torque Angle (05.087)
		Hz	-	-	A	rpm	V		Ω	mH	V/kmin-1	% Inom	mH	%	mH	%	mH	°
LSHRM 160 MR1_11 kW	044-00240A	50	152	269	21	1500	400	4 Poles	0.315822	7.63	72	236%	68.5	73	44.8	-108	68.5	56
	044-00240A	60	152	269	20	1800	400	4 Poles	0.315822	7.63	72	244%	68.5	73	44.8	-108	68.5	56
	044-00240A	60	152	269	21	1800	460	4 Poles	0.315822	7.63	72	233%	68.5	73	44.8	-108	68.5	56
	064-00480A	87	124	219	38	2600	400	4 Poles	0.105274	2.54	42	218%	22.8	73	14.9	-108	22.8	56
LSHRM 160 LR1_15 kW	064-00380A	50	304	493	28	1500	400	4 Poles	0.284540	7.48	79	199%	67.9	75	40.5	-106	67.9	58
	054-00300A	60	234	381	27	1800	400	4 Poles	0.284540	7.48	79	204%	67.9	75	40.5	-106	67.9	58
	054-00300A	60	234	381	27	1800	460	4 Poles	0.284540	7.48	79	204%	67.9	75	40.5	-106	67.9	58
	064-00630A	87	136	221	49	2600	400	4 Poles	0.094847	2.49	45	189%	22.6	75	13.5	-106	22.6	58
LSHRM 180 M1_18,5 kW	064-00480A	50	277	444	36	1500	400	4 Poles	0.213304	5.68	73	181%	43.3	71	31.5	-109	43.3	57
	064-00480A	60	277	444	35	1800	400	4 Poles	0.213304	5.68	73	185%	43.3	71	31.5	-109	43.3	57
	064-00480A	60	277	444	36	1800	460	4 Poles	0.213304	5.68	73	183%	43.3	71	31.5	-109	43.3	57
	074-00790A	87	145	232	63	2600	400	4 Poles	0.071101	1.89	42	174%	14.4	71	10.5	-109	14.4	57
LSHRM 180 L1_22 kW	064-00480A	50	207	281	42	1500	400	4 Poles	0.135163	4.25	72	196%	33.1	73	25.0	-108	33.1	56
	064-00480A	60	207	281	40	1800	400	4 Poles	0.135163	4.25	72	207%	33.1	73	25.0	-108	33.1	56
	064-00480A	60	207	281	41	1800	460	4 Poles	0.135163	4.25	72	202%	33.1	73	25.0	-108	33.1	56
	074-00940A	87	127	172	74	2600	400	4 Poles	0.045054	1.42	41	189%	11.0	73	8.3	-108	11.0	56
LSHRM 200 LQ1_30 kW	064-00630A	50	190	252	57	1500	400	4 Poles	0.108310	3.49	72	174%	27.5	69	19.7	-110	27.5	58
	064-00630A	60	190	252	55	1800	400	4 Poles	0.108310	3.49	72	181%	27.5	69	19.7	-110	27.5	58
	064-00630A	60	190	252	56	1800	460	4 Poles	0.108310	3.49	72	177%	27.5	69	19.7	-110	27.5	58
	074-01120A	87	135	179	99	2600	400	4 Poles	0.036103	1.16	41	168%	9.17	69	6.6	-110	9.2	58
LSHRM 225 SZ1_37 kW	074-00790A	50	232	290	70	1500	400	4 Poles	0.088734	3.03	72	164%	24.1	69	16.7	-110	24.1	58
	074-00790A	60	232	290	68	1800	400	4 Poles	0.088734	3.03	72	168%	24.1	69	16.7	-110	24.1	58
	074-00790A	60	232	290	69	1800	460	4 Poles	0.088734	3.03	72	166%	24.1	69	16.7	-110	24.1	58
	084-01550A	87	157	196	122	2600	400	4 Poles	0.029578	1.01	42	157%	8.0	69	5.6	-110	8.0	58
LSHRM 225 MG_45 kW	074-00940A	50	220	172	82	1500	400	4 Poles	0.045053	2.467	77	201%	23.6	67	14.6	-111	23.6	59
	074-00940A	60	220	172	80	1800	400	4 Poles	0.045053	2.467	77	207%	23.6	67	14.6	-111	23.6	59
	074-00940A	60	220	172	83	1800	460	4 Poles	0.045053	2.467	77	198%	23.6	67	14.6	-111	23.6	59
	084-01840A	87	150	117	142	2600	400	4 Poles	0.015018	0.822	44	195%	7.9	67	4.9	-111	7.9	59
LSHRM 250 ME_55 kW	074-01120A	50	234	168	99	1500	400	4 Poles	0.033880	2.015	77	199%	19.7	67	10.9	-111	19.7	59
	074-01120A	60	234	168	95	1800	400	4 Poles	0.033880	2.015	77	208%	19.7	67	10.9	-111	19.7	59
	074-01120A	60	234	168	98	1800	460	4 Poles	0.033880	2.015	77	202%	19.7	67	10.9	-111	19.7	59
	094-02210A	87	136	98	176	2600	400	4 Poles	0.011293	0.672	44	189%	6.6	67	3.6	-111	6.6	59
LSHRM 280 SD_75 kW	084-01550A	50	261	163	134	1500	400	4 Poles	0.024613	1.677	82	185%	16.7	63	9.0	-114	16.7	61
	084-01550A	60	261	163	130	1800	400	4 Poles	0.024613	1.677	82	190%	16.7	63	9.0	-114	16.7	61
	084-01550A	60	261	163	131	1800	460	4 Poles	0.024613	1.677	82	189%	16.7	63	9.0	-114	16.7	61
	094-02660A	87	127	80	231	2600	400	4 Poles	0.008204	0.559	47	180%	5.6	63	3.0	-114	5.6	61
LSHRM 280 MD_90 kW	084-01840A	50	261	154	163	1500	400	4 Poles	0.019819	1.432	80	174%	14.4	63	7.5	-114	14.4	61
	084-01840A	60	261	154	158	1800	400	4 Poles	0.019819	1.432	80	179%	14.4	63	7.5	-114	14.4	61
	084-01840A	60	261	154	155	1800	460	4 Poles	0.019819	1.432	80	182%	14.4	63	7.5	-114	14.4	61
	104-03200E	87	149	77	279	2600	400	4 Poles	0.006606	0.477	46	171%	4.8	63	2.5	-114	4.8	61

3000 range Motor Type	Powerdrive F300 Drive Type	Parameters															
		05.006	04.013	04.014	05.007	05.008	05.009	05.011	05.017	05.024	05.033	05.069	05.072	05.075	05.078	05.082	05.084	05.087
		Motor Rated Frequency	Current controller Kp Gain	Current controller Ki Gain	Rated current	Rated speed	Rated voltage	Number Of Motor Poles	Stator Resistance	Transient Inductance / Ld	Volts per 1000 rpm	Over-current Trip Level	No-load Lq	Iq Test Current For Inductance Measurement	Lq At The Defined Iq Test Current	Id Test Current for Inductance Measurement	Lq At The Defined Id Test Current	User Defined Rated Torque Angle
		Hz	-	-	A	rpm	V		Ω	mH	V/kmin-1	% Inom	mH	%	mH	%	mH	°
LSHRM 160 MR1_11kW	044-00240A	100	95	213	20	3000	400	4 Poles	0.250147	4.78	43	238%	41.3	73	27.8	-108	41.3	56
	044-00240A	120	95	213	20	3600	400	4 Poles	0.250147	4.78	43	244%	41.3	73	27.8	-108	41.3	56
	044-00240A	120	95	213	20	3600	460	4 Poles	0.250147	4.78	43	243%	41.3	73	27.8	-108	41.3	56
	064-00480A	173	78	173	36	5200	400	4 Poles	0.083382	1.59	25	223%	13.8	73	9.3	-108	13.8	56
LSHRM 160 MR1_15kW	064-00380A	100	117	223	28	3000	400	4 Poles	0.128766	2.88	39	254%	25.5	75	17.7	-106	25.5	55
	054-00300A	120	90	172	27	3600	400	4 Poles	0.128766	2.88	39	259%	25.5	75	17.7	-106	25.5	55
	064-00380A	120	117	223	28	3600	460	4 Poles	0.128766	2.88	39	249%	25.5	75	17.7	-106	25.5	55
	064-00630A	173	52	100	51	5200	400	4 Poles	0.042922	0.96	23	226%	8.5	75	5.9	-106	8.5	55
LSHRM 160 LR1_18,5kW	064-00380A	100	117	223	34	3000	400	4 Poles	0.128766	2.88	39	209%	25.5	71	16.0	-109	25.5	57
	064-00380A	120	117	223	33	3600	400	4 Poles	0.128766	2.88	39	214%	25.5	71	16.0	-109	25.5	57
	064-00380A	120	117	223	33	3600	460	4 Poles	0.128766	2.88	39	212%	25.5	71	16.0	-109	25.5	57
	074-00790A	173	74	140	62	5200	400	4 Poles	0.042922	0.96	23	186%	8.5	71	5.3	-109	8.5	57
LSHRM 180 M1_22kW	064-00480A	100	104	192	42	3000	400	4 Poles	0.092501	2.13	38	216%	15.8	76	12.6	-105	15.8	54
	064-00480A	120	104	192	40	3600	400	4 Poles	0.092501	2.13	38	224%	15.8	76	12.6	-105	15.8	54
	064-00480A	120	104	192	41	3600	460	4 Poles	0.092501	2.13	38	218%	15.8	76	12.6	-105	15.8	54
	074-00940A	173	64	118	74	5200	400	4 Poles	0.030834	0.71	22	200%	5.3	76	4.2	-105	5.3	54
LSHRM 200 LQ1_30kW	064-00630A	100	116	215	57	3000	400	4 Poles	0.092501	2.13	38	159%	15.8	69	11.0	-110	15.8	58
	064-00630A	120	116	215	57	3600	400	4 Poles	0.092501	2.13	38	158%	15.8	69	11.0	-110	15.8	58
	064-00630A	120	116	215	57	3600	460	4 Poles	0.092501	2.13	38	160%	15.79	69	11.0	-110	15.8	58
LSHRM 200 LQ1_37kW	074-00790A	100	109	174	70	3000	400	4 Poles	0.053326	1.42	37	178%	10.8	71	8.0	-109	10.8	57
	074-00790A	120	109	174	69	3600	400	4 Poles	0.053326	1.42	37	181%	10.8	71	8.0	-109	10.8	57
	074-00790A	120	109	174	69	3600	460	4 Poles	0.053326	1.42	37	181%	10.8	71	8.0	-109	10.8	57
LSHRM 225 MY1_45kW	074-00940A	100	106	142	84	3000	400	4 Poles	0.037145	1.185	38	180%	9.2	71	6.8	-109	9.2	57
	074-00940A	120	106	142	82	3600	400	4 Poles	0.037145	1.185	38	184%	9.2	71	6.8	-109	9.2	57
	074-00940A	120	106	142	83	3600	460	4 Poles	0.037145	1.185	38	181%	9.2	71	6.8	-109	9.2	57
LSHRM 250 ME_55 kW	074-01120A	100	118	104	100	3000	400	4 Poles	0.021063	1.019	43	226%	9.5	71	5.7	-109	9.5	57
	074-01120A	120	118	104	101	3600	400	4 Poles	0.021063	1.019	43	225%	9.5	71	5.7	-109	9.5	57
	074-01120A	120	118	104	100	3600	460	4 Poles	0.021063	1.019	43	226%	9.5	71	5.7	-109	9.5	57
LSHRM 280 SC_75 kW	084-01550A	100	123	109	138	3000	400	4 Poles	0.016370	0.794	38	185%	7.4	65	4.1	-113	7.4	60
	084-01550A	120	123	109	136	3600	400	4 Poles	0.016370	0.794	38	187%	7.4	65	4.1	-113	7.4	60
	084-01550A	120	123	109	135	3600	460	4 Poles	0.016370	0.794	38	189%	7.4	65	4.1	-113	7.4	60
LSHRM 280 MC_90 kW	084-01840A	100	112	88	167	3000	400	4 Poles	0.011253	0.617	38	190%	5.9	65	3.3	-113	5.9	60
	084-01840A	120	112	88	160	3600	400	4 Poles	0.011253	0.617	38	198%	5.9	65	3.3	-113	5.9	60
	084-01840A	120	112	88	168	3600	460	4 Poles	0.011253	0.617	38	189%	5.9	65	3.3	-113	5.9	60