

Description

3x series system

1 Introduction

This document describes the **Dassym 3x** series of motors and controller boards. These sturdy brushless sensorless systems allow for good rotation characteristics over a wide speed range and are intended for general dentistry.

1.1 Main features

- Rotational speed from 1000 to 40000rpm.
- CW and CCW rotation with auto-stop mode.
- Current limitation from 500mA up to 7000mA with motor temperature survey.
- LED light control from 20mA up to 300mA.
- Automatic light control (selectable light shutdown delay when motor stopped).
- Ability to control Dassym MO-3x-2L motors with additional blue LED¹.
- Different control modes: direct, electric or pneumatic².
- Automatic storage of the working configuration.
- Ability to manage up to 8 peripherals (different motors, curing lights, etc.)³.
- 15 user memories for each peripheral working configuration.
- High speed serial interface with comprehensive DAPI-2 protocol for fine control and survey of the MB-30 board. Any functionality of the system can be managed through this interface.
- Easy firmware updates through the standard communication interface (DAPI-2).

1.2 Expansion capabilities

- 1 foot switch connector with analog speed reference (0 to 3.3V).
- 2 additional analog inputs (0 to 3.3V).
- 4 additional digital I/O available on the expansion connector.
- 2 additional digital I/O available on the motor connector.
- 1 I²C interface.

¹ Only MB-30-2L versions.

² Only MB-30-P versions.

³ With Dassym RT-02 expansion.

2 MB-30 series main boards characteristics

2.1 Mechanical

<i>Item</i>	<i>Units</i>	MB-30	MB-30-P
<i>Dimensions (L × W)</i>	[mm]	69 × 46	69 × 46
<i>Mounting holes (L, A⁴)</i>	[mm]	32, 39	32, 39
<i>Mounting screws (Ø)</i>	[mm]	2.5	2.5
<i>Height (-2L versions)</i>	[mm]	25 (30)	25 (30)
<i>Mass (-P)</i>	[g]	40 (42)	48 (50)

2.2 Power supply

<i>Item</i>	<i>Unit</i>	<i>Nominal</i>	<i>Comments</i>
<i>Nominal Voltage</i>	[V]	32	Rated torque as per section 4
<i>Minimum Voltage</i>	[V]	28	Less torque at higher speeds
<i>Maximum Voltage</i>	[V]	36	More torque at higher speeds
<i>Maximum Consumption</i>	[A]	8	Voltage should be maintained
<i>Idle Power</i>	[W]	0.5	
<i>Maximum Power</i>	[W]	240	Peak load, see section 4

2.3 Driver

<i>Item</i>	<i>Unit</i>	<i>Nominal</i>	<i>Comments</i>
<i>Minimum Speed</i>	[rpm]	1000	Sensorless limitation
<i>Peak Motor Current</i>	[mA]	7000	For limited time
<i>Peak Light Current</i>	[mA]	300	LED lighting only

⁴ MB-30 boards have 3 mounting holes arranged in a triangle. L is the base length, A the apex distance.

3 MO-3x series motors characteristics

3.1 Mechanical

<i>Item</i>	<i>Units</i>	MO-33	MO-34	<i>Comments</i>
<i>Dimensions ($\varnothing \times L$)</i>	[mm]	22 × 52 (73)	22 × 63 (84)	w/o (w/ nose)
<i>Mass</i>	[g]	86	99	w/ nose

3.2 Electrical

<i>Item</i>	<i>Units</i>	MO-33	MO-34	<i>Comments</i>
<i>Maximum Speed</i>	[rpm]	40 000	40 000	
<i>Maximum Torque</i>	[Ncm]	3.5	5.0	See section 4
<i>Speed Constant</i>	[rpm/V]	1960	1390	
<i>Torque Constant</i>	[Ncm/A]	0.51	0.72	
<i>Maximum Speed Voltage</i>	[V]	20.4	28.8	
<i>Maximum Torque Current</i>	[A]	7	7	
<i>Mechanical Power</i>	[W]	60	80	

3.3 Lighting

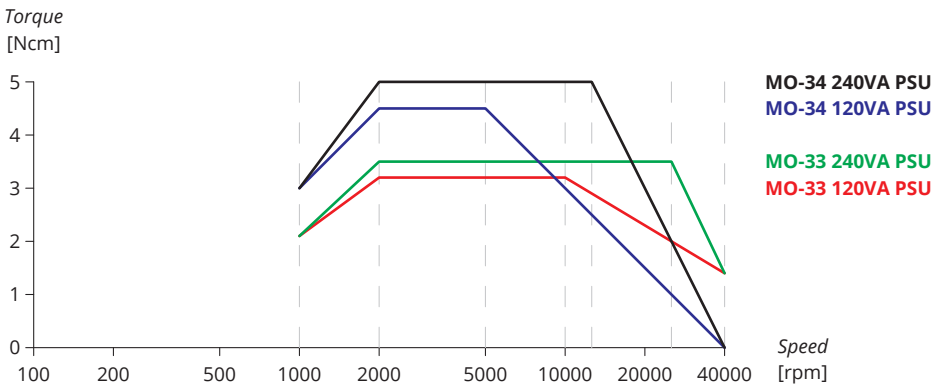
<i>Item</i>	<i>Units</i>	MO-3x-L	MO-3x-2L	<i>Comments</i>
<i>Maximum Brightness</i>	[lux]	40000	60000	LED lighting

3.4 Cooling

<i>Item</i>	<i>Units</i>	MO-33-F	MO-34	<i>Comments</i>
<i>Cooling Air Pressure</i>	[bar]	2.7	—	
<i>Cooling Air Flow</i>	[l/min]	20	—	
<i>Spray Type</i>		Internal	—	

4 Torque Curves

The 3x series systems are able to deliver a controlled torque over a good range of speeds. At low speeds, torque is limited by the sensorless configuration of the driver, while at higher speed it is limited by the voltage reserve available. The following curves and tables represent the guaranteed torque under a 32V constant voltage power supply of given power.



MO-33 240VA			MO-33 120VA			MO-34 240VA			MO-34 120VA		
Speed [rpm]	Torque [Ncm] %		Speed [rpm]	Torque [Ncm] %		Speed [rpm]	Torque [Ncm] %		Speed [rpm]	Torque [Ncm] %	
1000	2.1	60	1000	2.1	60	1000	3.0	60	1000	3.0	60
2000	3.5	100	2000	3.2	90	2000	5.0	100	2000	4.5	90
25000	3.5	100	10000	3.2	90	15000	5.0	100	5000	4.5	90
40000	1.4	40	40000	1.4	40	40000	0.0	0	40000	0.0	0

5 Operation & Wiring

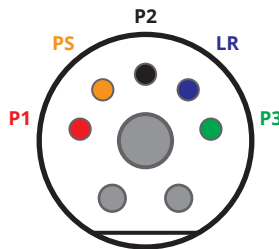
MO-3x series motors are **sensorless** motors for which the rotor position is acquired by the MB-3x board through the back electromotive force (BEMF) generated on the phase wires when the motor is running.

This kind of motor doesn't need any supplemental power supply besides the rotating field between **motor phase 1**, **motor phase 2** & **motor phase 3**.

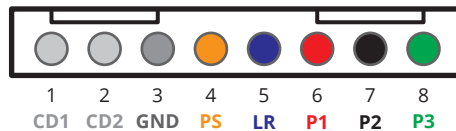
Lighting is powered through voltage differential between a **light reference voltage** and the **light power supply**. This voltage is independent from motor phases.

Hence:

- Connecting **P1**, **P2** & **P3** wires is *enough* in order for a MO-3x motor to run.
- **LR** & **PS** wires are used *only* for motors with embedded lighting (L series motors).



Dassym MO-xx motors rear view



Dassym MB-xx boards motor connector

Pin	Description	Motor	Light
P1	Motor phase 1 & Back electromotive force 1	✓	
P2	Motor phase 2 & Back electromotive force 2	✓	
P3	Motor phase 3 & Back electromotive force 3	✓	
LR	Light reference voltage		✓
PS	Light power supply		✓

⚠ The motor and light connections are electrically independent from each other. Light reference voltage is not necessarily connected to the ground.

