Swiss motion

Description

9x series system

1 Introduction

This document describes the **Dassym 9x** series of motors and controller boards. These high performance brushless systems allow for good torque characteristics over a wide speed range and are intended for general dentistry as well as specific applications.

1.1 Main features

— Rotational speed from 80 to 40000rpm.
— CW and CCW rotation with auto-stop, auto-reverse and rocking modes.
— 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-9x-2 motors with additional blue LED [1].
— Different control modes: direct, electric or pneumatic [2].
— 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-92 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 with SPI capability available on the expansion connector.
— 2 additional digital I/O with RS-232 capability available on the motor connector.
— 1 I^2C interface & 1 CAN interface.

[1] Only MB-92-2L versions.
[2] Only MB-92-P versions.
[3] With Dassym RT-02 expansion.

2 MB-92 series boards characteristics

2.1 Mechanical

Item	*Units*	**MB-92**	**MB-92-P**	**MB-92-B**
Dimensions (L × W)	[mm]	90 × 75	90 × 75	102 × 59
Mounting holes (L x W)	[mm]	82 × 67	82 × 67	95 × 51
Mounting screws (Ø)	[mm]	3	3	3
Height (-2L versions)	[mm]	20 (30)	20 (30)	20 (30)
Mass (-2L versions)	[g]	55 (67)	57 (69)	53 (65)

2.2 Power supply

Item	*Unit*	*Nominal*	*Comments*
Nominal Voltage	[V]	32	Rated torque as per section 4
Minimum Voltage	[V]	28	Less torque at higher speeds
Maximum Voltage	[V]	36	More torque at higher speeds
Maximum Consumption	[A]	8	Voltage should be maintained
Idle Power	[W]	0.8	
Maximum Power	[W]	240	Peak load, see section 4

2.3 Driver

Item	*Unit*	*Nominal*	*Comments*
Minimum Speed	[rpm]	80	H-bridge switching limitation
Peak Motor Current	[mA]	7000	For limited time
Peak Light Current	[mA]	300	LED lighting only

3 MO-9x series motors characteristics

3.1 Mechanical

Item	*Units*	**MO-93**	**MO-94**	*Comments*
Dimensions (Ø × L)	[mm]	22 × 52 (73)	22 × 63 (84)	w/o (w/ nose)
Mass	[g]	86	99	w/ nose

3.2 Electrical

Item	*Units*	**MO-93**	**MO-94**	*Comments*
Maximum Speed	[rpm]	40000	40000	
Maximum Torque	[Ncm]	3.5	5.0	See section 4
Speed Constant	[rpm/V]	1960	1390	
Torque Constant	[Ncm/A]	0.51	0.72	
Maximum Speed Voltage	[V]	20.4	28.8	
Maximum Torque Current	[A]	7	7	
Mechanical Power	[W]	60	80	

3.3 Lighting

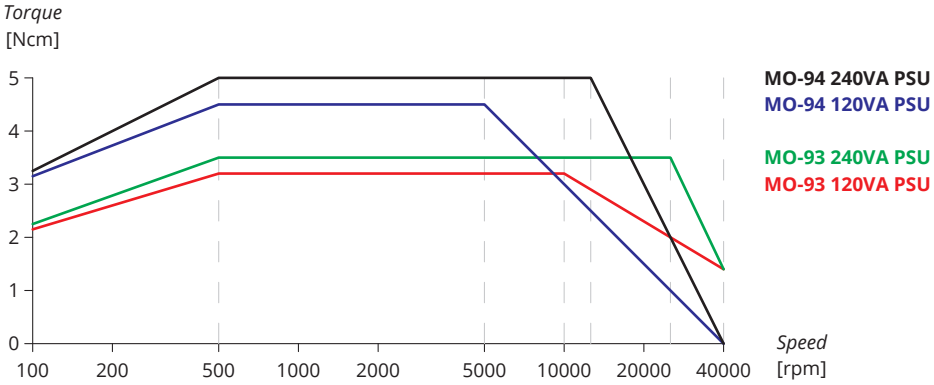
Item	*Units*	**MO-9x-L**	**MO-9x-2L**	*Comments*
Maximum Brightness	[lux]	40000	60000	LED lighting

3.4 Cooling

Item	*Units*	**MO-93-F**	**MO-94**	*Comments*
Cooling Air Pressure	[bar]	2.7	—	
Cooling Air Flow	[Nl/min]	20	—	
Spray Type		Internal	—	

4 Torque Curves

The 9x series systems are able to deliver a controlled torque over a wide range of speeds. At low speeds, torque is limited by the H-bridge 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-93 240VA			MO-93 120VA			MO-94 240VA			MO-94 120VA		
Speed [rpm]	*Torque* [Ncm]	%	*Speed* [rpm]	*Torque* [Ncm]	%	*Speed* [rpm]	*Torque* [Ncm]	%	*Speed* [rpm]	*Torque* [Ncm]	%
80	2.1	60	80	2.1	60	80	3.0	60	80	3.0	60
500	3.5	100	500	3.2	90	500	5.0	100	500	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-9x series motors have an **embedded electronics** module which acquires and multiplexes orthogonal signals over **motor phase 2** & **motor phase 3** in order for the MB-9x board to know of the actual rotor position.

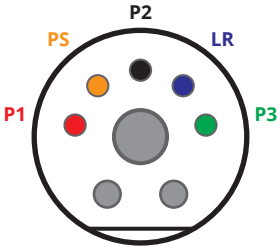
The embedded electronics module is powered by a **phantom power supply** which is around 8V over **motor phase 1**. This voltage is *floating* with respect to the ground.

Lighting is powered through voltage differential between a **light reference voltage** and the **phantom power supply**. This voltage is *floating* with respect to the ground.

Hence:

— Connecting **P1**, **P2**, **P3** & **PS** wires is *mandatory* in order for a MO-9x motor to run.

— **LR** wire is 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 & Embedded electronics reference voltage	√	
P2	Motor phase 2 & Multiplexed sine signal	√	
P3	Motor phase 3 & Multiplexed cosine signal	√	
LR	Light reference voltage		√
PS	Motor embedded electronics power supply	√	√

⚠ None of these wires are connected to the ground! Don't try it, this will lead to a total destruction of the MB-9x board or the MO-9x motor!