BUILT-IN ELECTRIC MICROMOTOR

EMB-901

Installation, Operation & User Manual

Brushless fiber-optic micromotor system for building into a dental delivery unit · Installation, operation, care, troubleshooting and EMC information



DOCUMENT
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How to read this manual

⚠ **WARNING** Risk of injury or damage to the equipment. Follow exactly.

ⓘ **NOTE** Information that makes the job easier or the result more reliable.

Technical support

(800) 560-8222

Monday to Friday, 8:00 AM to 5:00 PM Pacific.

SECTION 01

System components

The EMB-901 is a brushless electric micromotor with a high-brightness LED light, built into a dental delivery unit. It runs from the unit's existing air-driven controls: the motor cord takes water and coolant air, and the drive air signal goes to the driver module, so the foot pedal starts the motor. Use it with speed-increasing and reduction handpieces for most clinical work.



Brushless motor

`EMB-901-MOTOR`

Permanent-magnet brushless motor with variable torque output and LED light.



Control box

`EMB-901-Control Unit Built in`

Touch pad for speed, direction and memory, with a digital RPM display.



Driver module

`EMB-901-Power Module Built in`

Executes the control box commands and drives the motor.



Motor cord

`EMB-901-Cable Built in`

Connects the motor to the unit, carrying water, coolant air and power.

Features

- No routine maintenance
- Low vibration and low noise
- Simple touch-pad operation
- Two memory settings (M1, M2)

Identification

Set model	EMB-901 Built in
Production date	On the control box label
Motor marking	EM600
Coupling	ISO 3964 handpiece coupling

ISO 13485 ISO 9001 TÜVRheinland CERTIFIED CE 0197 FDA

GETTING STARTED

Specifications

Brushless motor

Maximum speed	40,000 rpm ±10%
Minimum speed	2,000 rpm ±10%
Maximum torque	3 Ncm
Length	50 mm
Weight	87 g

Control box

Size	123 × 63 × 42 mm
Electrical class	Class I, type BF applied part
Ingress protection	IPX1 (vertically falling drops)

Driver module

Input	24 V AC ±5%, 6.5 A, 50/60 Hz
Power	130 W
Drive air pressure	0–3 bar (0–3 kg/cm²)
EMC	IEC 60601-1-2

Operating conditions

Temperature	10 °C to 40 °C
Relative humidity	30% to 80%

Transport and storage

Temperature	−18 °C to 70 °C
Relative humidity	10% to 100%
Atmospheric pressure	500 to 1060 hPa

GETTING STARTED

Safety and symbols

Safety

No flammable gases
Do not run the motor where flammable anesthetics, oxygen or nitrous oxide mixtures are present.

Keep the motor dry
Oil or liquid inside the motor damages the motor and the control unit.

Pacemakers
The motor may interfere with cardiac pacemakers. If a patient has a pacemaker, consult their cardiologist.

Protect the hose
Do not twist or kink the handpiece hose.

Water and air quality
Supply water and air must meet the required quality standards.

Power plug
Do not pull or touch the power plug while the unit is running.

Qualified users only
For dental treatment by qualified personnel, and for no other purpose.

Symbols


Protective earth (ground)


Caution: refer to the accompanying documents


Caution: dangerous voltage


LED light


Type B applied part


Alternating current


Recyclable materials


Separate collection of electrical and electronic equipment



CE marking with notified body number



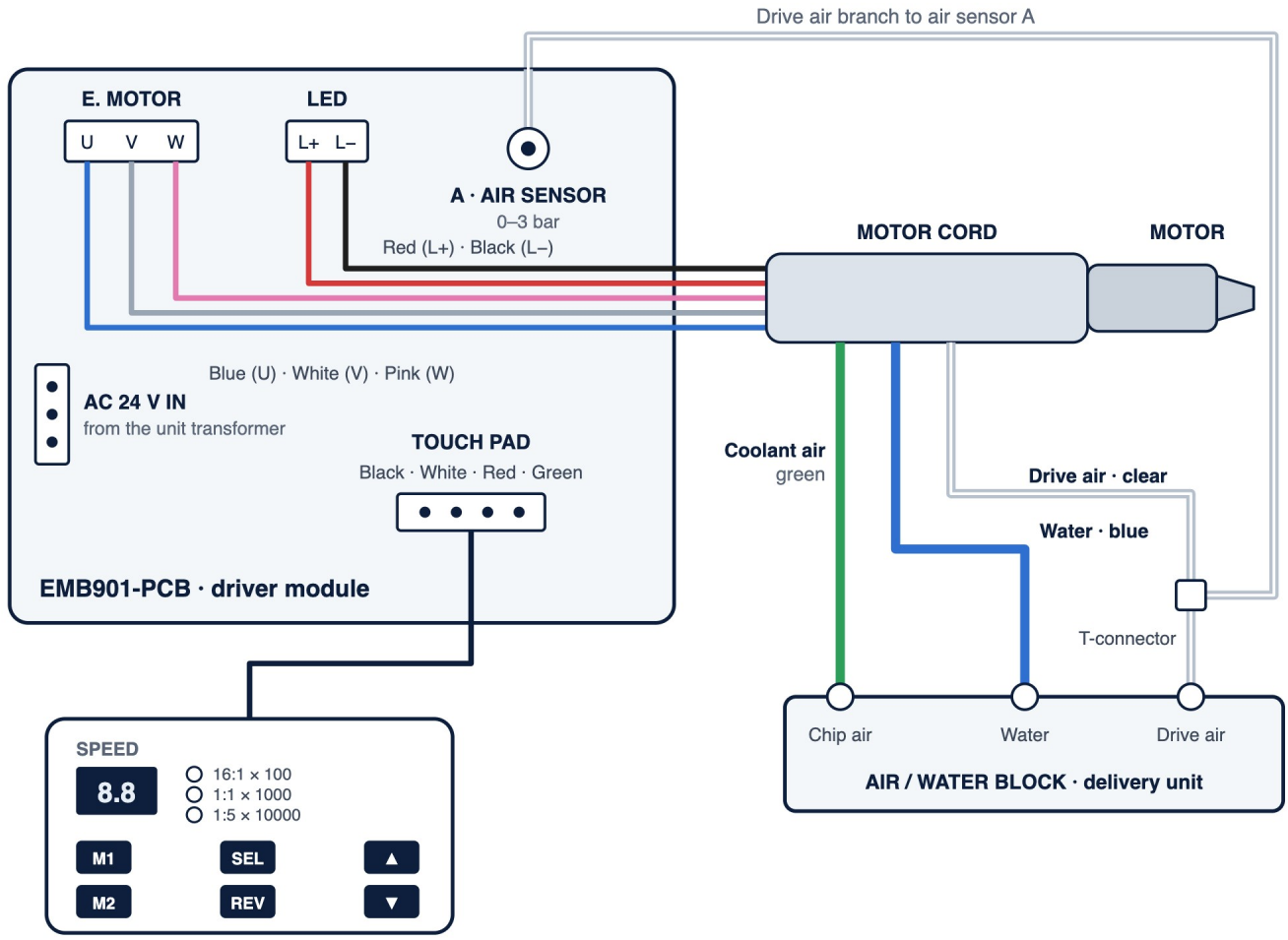
Authorized representative in the EU


Manufacturer

SECTION 02

Wiring and tubing diagram

How the driver module, motor cord, touch pad and the unit's air/water block connect.



⚠ **CAUTION** Turn off the water and the unit's main power before installing. Turn the unit on only when the installation is complete.

INSTALLATION

Installation steps

Read this manual before installing and keep it for reference. Connect every wire carefully: correct installation is required for IEC 60601-1-2 compliance and for the warranty.

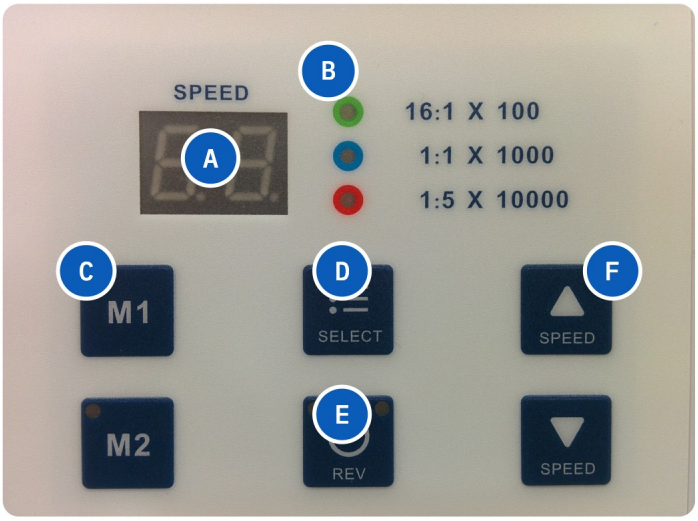
1. **Turn off the water and the main power** of the delivery unit.
2. **Mount the driver module and the control box** in the delivery unit, in a safe place away from water.
3. **Connect 24 V AC** from the unit transformer to **AC 24 V IN** on the driver module.
4. **Connect the motor cord wires** to the driver module: motor **U V W** (blue, white, pink) and **LED L+ L–** (red, black).
5. **Connect the touch pad cable** (black, white, red, green) to the **TOUCH PAD** header.
6. **Connect the tubing** from the air/water block: chip air to the **green** tube, water to the **blue** tube, drive air to the **clear** tube through the T-connector.
7. **Connect the T-connector branch** to air sensor **A** on the driver module (0–3 bar).
8. **Turn on the water and power,** then test the motor, water and spray with the foot pedal.

Connections

CONNECTOR	WIRES / TUBE	GOES TO
E. MOTOR U V W	Blue, white, pink	Motor cord
LED L+ L–	Red, black	Motor cord
TOUCH PAD	Black, white, red, green	Control box touch pad
AC 24 V IN	3-pin	Unit transformer, 24 V AC
A · Air sensor	Clear tube, T-connector branch	Drive air
Motor cord tubing	Green · blue · clear	Chip air · water · drive air

SECTION 03

Control panel



A — SPEED display
Shows the set speed. Multiply by the factor of the lit handpiece indicator.

B — Handpiece indicators
16:1 × 100 (green) · 1:1 × 1000 (blue) · 1:5 × 10000 (red).

C — M1 and M2
Memory buttons. Hold 5 seconds to save the current setting.

D — SELECT
Chooses the handpiece type. Works only when the motor is stopped.

E — REV
Switches between forward and reverse. The lamp shows reverse.

F — SPEED ▲ / ▼
Raises or lowers the motor speed.

Speed range by handpiece

HANDPIECE RATIO	INDICATOR	DISPLAY	SPEED (RPM)
16:1 reduction	Green · × 100	01–25	100–2,500
1:1 direct	Blue · × 1000	02–40	2,000–40,000
1:5 increasing	Red · × 10000	01–20	10,000–200,000

OPERATION

Using the motor

1. **Set the handpiece type.** With the motor stopped, press **SELECT** until the indicator for your handpiece ratio lights (page 8).
2. **Set the speed** with **SPEED ▲** and **SPEED ▼**. The display shows the speed in the units of the lit indicator.

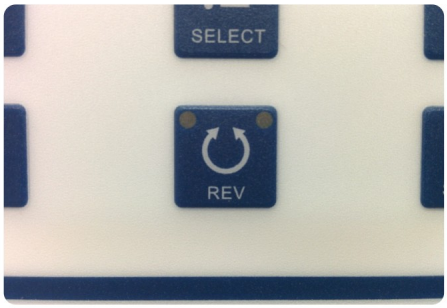


Fig. 5 Forward or reverse

STEP 3

Forward or reverse

Press **REV** to change the direction of rotation. The lamp on the button lights in reverse.

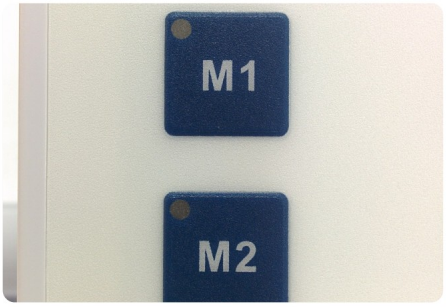


Fig. 6 Memory settings

STEP 4

Memory settings

Press and hold **M1** or **M2** for at least 5 seconds, until it beeps, to save the current setting. Press it briefly to recall it. The lamp shows which memory is selected. Memory works only when the motor is stopped.

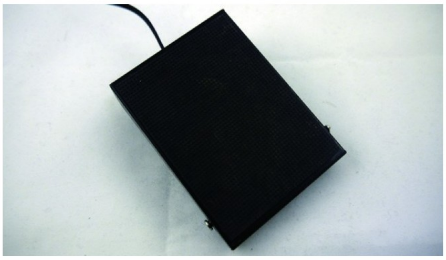


Fig. 7 Run with the foot pedal

STEP 5

Run with the foot pedal

When the settings are complete, press the delivery unit's air foot pedal. Drive air reaches the air sensor and the motor runs.

SECTION 04

Cleaning, sterilization and service

Cleaning

- Wipe with a clean, damp cloth to disinfect.
- Clean the control box with a soft cloth; keep chemical solvents off its surface.
- Do not press on the light source.
- Do not use disinfectants containing acetone, chlorine or bleach.
- Do not immerse in liquid.
- Do not use an ultrasonic cleaner.

Sterilization

Autoclave the angles (handpiece attachments) before first use and after each patient.

⚠ **CAUTION** Do not autoclave or heat-sterilize the control box, driver module or motor cord.

Service

- Do not take the product apart. For any adjustment or repair, contact your dealer or TPC.
- Have the equipment inspected at least once a year.
- Use only tools and parts supplied by TPC. Other parts void the warranty.

ⓘ **INFORMATION** Specifications, drawings and dimensions in this manual are for reference and may change without notice.

SECTION 05

Troubleshooting

If the motor stops because of a fault, overload or misuse, the control box checks itself and shows an error code on the SPEED display. Turn the power off and on again. If the same code returns, follow the remedy below.

Error codes

CODE	ERROR	CAUSE	REMEDY
E0	**Overcurrent**	Motor overload.	Restart. If it persists, contact your dealer.
E1	**Overheat**	Thermal protection after long use at high load.	Let it cool, then try again.
E2	**Inrush current**	Inrush current detected.	Restart. If it persists, contact your dealer.
E3	**Light voltage**	Overvoltage from the internal circuit.	Restart. If it persists, contact your dealer.
E4	**Motor start**	Motor did not reach the set speed in time; broken motor cord wire or internal fault.	Check the motor cord. Restart; if it persists, contact your dealer.
E5	**Input overvoltage**	Overvoltage at the control box input.	Check the 24 V AC supply. Restart; if it persists, contact your dealer.

Other problems

PROBLEM	CAUSE	SOLUTION
Pilot lamp does not light	Power switch is off. Power plug not connected. Internal fuse blown.	Turn the power on. Check the connection. Contact your dealer.
Motor does not run	Tubing, motor cord or driver module not connected correctly. No drive air, or low pressure, from the unit. An error code is shown.	Check the connections (page 6). Check the delivery unit air pressure. See the error codes above.

REFERENCE

Electromagnetic compatibility

The EMB-901 complies with IEC 60601-1-2. Install and use it as this manual describes. Keep radio transmitters and mobile phones away from it, and do not route high-frequency surgical leads near it. Do not stack it with other equipment; if you must, check that it operates normally. Parts and cables not specified by TPC may increase emissions or reduce immunity.

Emissions

TEST	COMPLIANCE	ENVIRONMENT
RF emissions, CISPR 11	Group 1	Uses RF energy only internally; emissions are very low and unlikely to interfere with nearby equipment.
RF emissions, CISPR 11	Class B	Suitable for all establishments, including domestic ones and those connected directly to the public low-voltage supply.
Harmonic emissions, IEC 61000-3-2	Class A	
Voltage fluctuations / flicker, IEC 61000-3-3	Complies	

Immunity

TEST	IEC 60601 TEST LEVEL	ENVIRONMENT
ESD, IEC 61000-4-2	±2, ±4, ±6 kV contact ±2, ±4, ±8 kV air	Floors wood, concrete or ceramic tile. With synthetic flooring, relative humidity at least 30%.
Fast transient / burst, IEC 61000-4-4	±2 kV power lines ±1 kV input/output lines	Mains quality of a typical commercial or hospital environment.
Surge, IEC 61000-4-5	±0.5, ±1 kV line to line ±0.5, ±1, ±2 kV line to ground	Mains quality of a typical commercial or hospital environment.
Voltage dips and interruptions, IEC 61000-4-11	<5% UT for 0.5 cycle 40% UT for 5 cycles 70% UT for 25 cycles <5% UT for 5 s	Mains quality of a typical commercial or hospital environment. For continued use during interruptions, power from a UPS or battery.
Power-frequency magnetic field, IEC 61000-4-8	3 A/m (50/60 Hz)	At levels of a typical commercial or hospital location.