Set supplied- DMX3 REF 1600903-001

1
2

REF 1302410 (1) / 1302411 (2)
REF 1501468

Compatible items

REF 1600677-001
REF 1600700-001
REF 1600751-001
REF 1600780-001
REF 1600756-001

REF 1600755-001
REF 1600606-001
REF 1500580-001
REF 1500666-001
REF 1500554-001
REF 1305350-001
REF 1500579-001
REF 1501748-001
# Table of contents

1 Symbols ........................................ 2  
  1.1 Description of symbols ............... 2  

2 Identification and Intended use .... 2  
  2.1 Identification ......................... 2  
  2.2 Intended use ............................ 2  

3 Warnings & Precautions of use ... 3  
  3.1 Precautions ............................. 3  
  3.2 Precautions to be taken during integration ................. 3  
  3.3 Electromagnetic compatibility (precautions) .............. 4  
  3.4 Electromagnetic compatibility (description) ............. 5  

4 Description ............................... 8  
  4.1 System overview ...................... 8  
  4.2 Connectors .............................. 8  
  4.3 Main functions ....................... 10  
  4.4 Technical data ......................... 10  
  4.5 Protection installed ................. 10  
  4.6 Environmental protection and information for disposal .... 11  

5 Installation .............................. 12  
  5.1 Operating modes .................... 12  
  5.2 Wiring diagrams ...................... 13  
    5.2.1 Mode 0 (Electrical mode from 100 rpm to 40,000 rpm) .......... 13  
    5.2.2 Mode 1: Pneumatic mode from 100 rpm to 40,000 rpm .......... 14  
    5.2.3 Mode 2: Pneumatic mode with electric limitation ... 15  
    5.2.4 Mode 3: Serial mode (RS-232) ......................... 16  

6 Maintenance ............................ 17  
  6.1 Servicing .............................. 17  

7 General information, guarantee and references .... 17  
  7.1 Notation ............................... 17  
  7.2 Terms of guarantee ................... 17  
  7.3 References ............................. 18  
    7.3.1 Set supplied (see cover page) ......... 18  
    7.3.2 Optional accessories (see cover page) ...... 18  

1 Symbols

1.1 Description of symbols

<table>
<thead>
<tr>
<th>Sign</th>
<th>Description</th>
<th>Sign</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manufacturer.</td>
<td></td>
<td>Serial number.</td>
</tr>
<tr>
<td></td>
<td>Reference number.</td>
<td></td>
<td>Recyclable electrical and electronic materials.</td>
</tr>
<tr>
<td></td>
<td>CAUTION!</td>
<td></td>
<td>Light.</td>
</tr>
</tbody>
</table>

2 Identification and Intended use

2.1 Identification

Electronic control for Bien-Air Dental MCX, MX2 and MX-i brushless and sensorless micromotors.

2.2 Intended use

This product is intended solely for professional use. It is intended for use in dentistry for restorative, endodontics and implantology procedures. Any use other than that for which this product is intended is prohibited and may prove dangerous.
3 Warnings & Precautions of use

3.1 Precautions

This electronic control conforms to electrical safety standards in line with standard IEC 60601-1, third edition, and those governing electromagnetic compatibility in line with standard IEC 60601-1-2, fourth edition. The intended EM environment is Professional healthcare facility environment.

⚠ CAUTION

The device must be used by a competent person, in particular in compliance with the legal provisions in force regarding occupational safety, health and accident prevention measures, and these operating instructions. According to these measures, the user has the following obligations:

• To only use devices that are in perfect working order.
• To make sure that the board is used only for the purpose for which it is intended.
• Avoid contact with liquid.

3.2 Precautions to be taken during integration

⚠ CAUTION

• The DC power supply line overall length must be shorter than 3 meters. The use of ferrite beads is strongly recommended.
• The overall RS-232 cable length must be shorter than 3 meters. The use of a shielded RS-232 cable is strongly recommended.
• During integration, only use a medical supply that conforms to standards EN/IEC 60601-1, third edition, respecting the required withstand voltage, creepage distances and distances in air.
• Following integration, the complete assembly becomes an EM (electro-medical) system.
• Connect the earths (GND) of all the electronic controls connected to the DMX3.
• This also applies to digital interfaces.
• The input voltage levels can be configured via the RS-232 serial interface (document available on request). For more information or if you have any questions about the integration, wiring configuration or programming of the DMX3 system, please contact your Bien-Air Dental representative (addresses below).
• Only use accessories and cables specified by Bien-Air Dental SA.
3.3 Electromagnetic compatibility (precautions)

⚠ CAUTION
The DMX3 complies with the EMC requirements according to IEC 60601-1-2. Radio transmitting equipment, cellular phones, etc., should not be used in the immediate vicinity of the device, since this could affect its operation. Special precautions should be taken when using strong emission sources such as high-frequency surgical equipment and other similar devices, to ensure that HF cables are not routed above or near the device. If in doubt, please contact a qualified technician or Bien-Air.

The DMX3 must not be used adjacent to or stacked with other devices. If adjacent or stacked conditions of use are necessary, the DMX3 must be monitored to verify that it operates normally in the configuration in which it will be used.

⚠ CAUTION
The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by Bien-Air as spare parts for internal components, may result in increased emissions or decreased immunity.

⚠ CAUTION
Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the device, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
3.4 Electromagnetic compatibility (description)

Guidance and manufacturer’s declaration – Electromagnetic emissions

The DMX3 is intended for use in the electromagnetic environment specified below. The customer or the user of the DMX3 must ensure that it is actually used in such an environment.

<table>
<thead>
<tr>
<th>Emissions test</th>
<th>Compliance</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions CISPR 11</td>
<td>Group 1</td>
<td>The DMX3 uses RF energy for its internal operation only. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>RF emissions CISPR 11</td>
<td>Class B</td>
<td>The DMX3 is suitable for use in any building, including residential buildings and those directly connected to the public low-voltage power supply network that supplies buildings used for residential purposes.</td>
</tr>
<tr>
<td>Harmonic emissions IEC 61000-3-2</td>
<td>Class A</td>
<td></td>
</tr>
<tr>
<td>Emissions due to voltage fluctuations IEC 61000-3-3</td>
<td>Not applicable</td>
<td></td>
</tr>
</tbody>
</table>
**Guidance and manufacturer’s declaration – Electromagnetic immunity**

The DMX3 is intended for use in the electromagnetic environment specified below. The customer or the user of the DMX3 must ensure that it is actually used in such an environment.

<table>
<thead>
<tr>
<th>Immunity test</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge (ESD)</td>
<td>±8 kV contact ±2 kV air ±4 kV air ±8 kV air ±15 kV air</td>
<td>±8 kV contact ±2 kV air ±4 kV air ±8 kV air ±15 kV air</td>
<td>Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.</td>
</tr>
<tr>
<td>IEC 61000-4-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical fast transient/burst</td>
<td>±2 kV for power supply lines ±1 kV for other lines</td>
<td>±2 kV for power supply lines N.A.</td>
<td>Mains power quality should be that of a commercial or hospital environment.</td>
</tr>
<tr>
<td>IEC 61000-4-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surge IEC 61000-4-5</td>
<td>±0.5 kV line to line ±1 kV line to line ±0.5 kV line to earth ±1 kV line to earth ±2 kV line to earth</td>
<td>±0.5 kV line to line ±1 kV line to line ±0.5 kV line to earth ±1 kV line to earth ±2 kV line to earth</td>
<td>Mains power quality should be that of a commercial or hospital environment.</td>
</tr>
<tr>
<td>IEC 61000-4-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11</td>
<td>0% UT for 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% UT for 1 cycle and 70% UT for 25/30 cycles at 0° 0% UT for 250 cycles at 0°</td>
<td>0% UT for 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% UT for 1 cycle and 70% UT for 25/30 cycles at 0° 0% UT for 250 cycles at 0°</td>
<td>Mains power quality should be that of a commercial or hospital environment. If the user of the DMX3 requires continued operation during mains power interruptions, it is recommended that the DMX3 be powered from an uninterruptible power supply or a battery.</td>
</tr>
<tr>
<td>IEC 61000-4-11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnetic field due to mains frequency (50/ 60 Hz) IEC 61000-4-8</td>
<td>30 A/m</td>
<td>30 A/m</td>
<td>Magnetic fields generated by the mains frequency should be at levels characteristic of a typical location in a typical commercial or hospital environment.</td>
</tr>
</tbody>
</table>
### Conducted disturbances induced by RF fields

- **IEC 61000-4-6**
  - 3 Vrms
  - 0.15 MHz - 80 MHz
  - 6 Vrms in ISM bands
  - 0.15 MHz - 80 MHz
  - 80% AM at 1kHz

### Radiated RF EM fields

- **IEC 61000-4-3**
  - 3 V/m
  - 80 MHz - 2.7 GHz
  - 80% AM at 1kHz

### Proximity fields from RF wireless communications equipment

- **IEC 61000-4-3**

<table>
<thead>
<tr>
<th>Test freq. [MHz]</th>
<th>Max. Power [W]</th>
<th>Immunity test level [V/m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>385</td>
<td>1.8</td>
<td>27</td>
</tr>
<tr>
<td>450</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>710, 745, 780</td>
<td>0.2</td>
<td>9</td>
</tr>
<tr>
<td>810, 870, 930</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>1720, 1845, 1970</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>2450</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>5240, 5500, 5785</td>
<td>0.2</td>
<td>9</td>
</tr>
</tbody>
</table>

**Distance:** 0.3 m

**NOTE:** UT is the a.c. mains voltage prior to application of the test level.

**Essential performance per IEC 60601-1:** The essential performance is to maintain the visual luminous intensity of the LED and the motor speed. The maximum speed deviation is ±5%.

**IEC 61000-4-6:** motor rotation slightly perturbed between 950 kHz and 1MHz. Rotation speed slightly under the -5% tolerance. As no risks have been identified, the tests were considered passed without deviation in compliance levels.

---

1. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and mobile field radios, amateur radios, AM and FM radio broadcasts and TV broadcasts cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the DMX3 is used exceeds the RF compliance level mentioned above, the DMX3 should be observed to verify that it is operating normally. If abnormal operation is observed, additional measures may be necessary, such as reorienting or relocating the DMX3.

**Note:** At 80 MHz and 800 MHz, the higher frequency range applies. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
4 Description

4.1 System overview

The MCX and MX2 micromotors are intended exclusively for prophylaxis, restorative and endodontics procedures.

The MX-i motor is intended exclusively for implantology procedures.

The DMX3 electronic control is able to control the following different motor parameters specifically: speed of rotation (100 rpm to 40,000 rpm); torque limits; the motor’s direction of rotation (forward, reverse) and the luminous intensity.

Depending on the software configuration, endodontic modes may not be available (auto-reverse/auto-forward).

Endodontic modes are not available with the MX-i motor.

4.2 Connectors

FIG. 1

(1) Power supply
(2) Motor output
(3) Motor MUX & valve
(4) Additional card
(5) DIP switch - mode configuration
(6) RS-232
(7) CAN
(8) Air pressure sensor
(9) Analogue input
(10) Board REF
    Soft version: XX = year, YY = month
    Drawing number
    Revision number
    SN (Serial Number)
(11) Software configuration number
### FIG. 2

Connectors specifications

<table>
<thead>
<tr>
<th>#</th>
<th>Item</th>
<th>Type</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply</td>
<td>Input</td>
<td>32 VDC +/-10%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Motor output</td>
<td>Output</td>
<td>Phases A, B and C L+, L- (LED light)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Motor MUX &amp; valve</td>
<td>Output</td>
<td>MUX 1, MUX 2, valve 24 Vdc, Imax = 300 mA</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Additional card</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DIP SWITCH</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RS-232</td>
<td>I/O</td>
<td>Digital interface</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CAN</td>
<td>I/O</td>
<td>Digital interface</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Air pressure sensor</td>
<td>Input</td>
<td>0 to 3 bar (0 to 300 kPa, 0 to 43.5 psi)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Holders 1, 2 and 3</td>
<td>Input</td>
<td>Active at 0 Vdc</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rotation (CW/CCW)</td>
<td>Input</td>
<td>0 or 5 Vdc (TTL)</td>
<td>Pull-down input</td>
</tr>
<tr>
<td>9</td>
<td>Brightness control</td>
<td>Input</td>
<td>0 to 5 Vdc (16 output settings)</td>
<td>Pull-up input</td>
</tr>
<tr>
<td>9</td>
<td>Speed reference</td>
<td>Input</td>
<td>0 to 5 Vdc</td>
<td>Pull-down input</td>
</tr>
</tbody>
</table>

See FIG. 1 for numbering.
4.3 Main functions

• Controls up to three motors (MCX, MX2, MX-i).
• Pneumatic control.
• Electric controlled by analogue inputs or digital interface (RS-232).

The system’s variable parameters are as follows:
• Speed range: 100 to 40,000 rpm
• Progressive or ON/OFF mode speed adjustment
• Maximum torque adjustable from 10% to 100% in 1% increments
• Motor’s LED brightness control (16 settings) or light ON/OFF
• Restorative mode (clockwise/anti-clockwise)
• Endodontics mode (available depending on the configuration):
  • Auto-reverse mode: The direction of rotation is automatically reversed when the torque limit is reached (adjustable from 10% to 100% of the maximum torque).
  • Auto-forward mode: The direction of rotation is reversed in a similar manner to auto-reverse mode; in addition, the motor switches automatically to clockwise rotation after an adjustable period of anti-clockwise rotation (from 0 to 25 seconds).

4.4 Technical data

⚠️ CAUTION
The technical specifications, illustrations and dimensions contained in these instructions are given only as a guide. They may not be the subject of any claim. The manufacturer reserves the right to make technical improvements to its equipment, without amending these instructions. For all additional information, please contact Bien-Air Dental SA at the address indicated on the back cover.

Dimensions (LxWxH): ...... 102 x 58 x 27mm
Weight: ...................... Approx. 78 g
Supply voltage: ............. 32 VDC +/-15% (min. 27.2 VDC, max. 36.8 VDC)
Nominal power: ............. 60 W (MCX and MX2)
......................... 120 W (MX-i)

Environmental conditions - Operating
• Temperature: +10 °C to +40 °C
• Relative humidity: 30% to 80%, including condensation
• Atmospheric pressure: 700 hPa to 1060 hPa

Environmental conditions - Transport and storage
• Max. period: 15 weeks
• Temperature: -25 °C to +70 °C
• Relative humidity: 10% to 95%
• Atmospheric pressure: 500 hPa to 1060 hPa
4.5 Protection installed

**Temperature**
The motor outer surface and electronic control temperatures are continuously controlled by the system.

**Power supply**
The electronic control is protected against over- and under-voltage, and also against polarity reversal.

**Motor and light**
The motor output (phases) is protected against short circuits.
The light output is protected against short circuits.
Interruption of one, two or three phases is detected by the system, and the motor either does not start or it stops.

**Exhaust air**
REF 1501748-001: This system is only necessary if the control unit is pneumatically controlled, with the pedal in the raised position, and if the valve controlled by the pedal is not fitted with a vent.
Contact your dealer for fitting.

---

4.6 Environmental protection and information for disposal

This device must be recycled. Electrical and electronic equipment may contain dangerous substances which constitute health and environmental hazards. The user can return the device to their dealer or directly enlist the services of a firm accredited for the processing and recovery of this type of equipment (European Directive 2002/96/EC).
5 Installation

5.1 Operating modes

FIG. 3
The 6 DIP switches are used to configure the system, and in particular to select the operating mode (see table below). The system installation depends on the chosen operating mode. For more information and technical support, please contact your Bien-Air Dental dealer.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Dip Switches</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 0 X X X X X</td>
<td>Electrical mode from 100 rpm to 40’000 rpm</td>
</tr>
<tr>
<td>1</td>
<td>0 1 X X X X X</td>
<td>Pneumatic mode from 100 rpm to 40’000 rpm</td>
</tr>
<tr>
<td>2</td>
<td>1 0 X X X X X</td>
<td>Pneumatic mode with electric limitation</td>
</tr>
<tr>
<td>3</td>
<td>1 1 X X X X X</td>
<td>Serial mode (RS232)</td>
</tr>
<tr>
<td>All</td>
<td>X X 1 X X X</td>
<td>Status frame auto-send (1 = enabled, 0 = disabled)</td>
</tr>
<tr>
<td>All modes except 3</td>
<td>X X 1 X X X</td>
<td>Light delay (1 = enabled, 0 = disabled)</td>
</tr>
<tr>
<td>Mode 3 only</td>
<td>1 1 X 1 X X</td>
<td>Frame check (0 = checksum, 1 = CRC)</td>
</tr>
</tbody>
</table>

Note: Dip switches states: 0 = OFF, 1 = ON, X = no influence.
5.2  Wiring diagrams

The wiring diagrams below show a standard configuration of the system in the four operating modes. The connections depend on the integration in the unit and the desired functions.

5.2.1  Mode 0 (Electrical mode from 100 rpm to 40,000 rpm)

The motor’s target speed is attained using a potentiometer (10 kΩ) or an electric pedal. A 10 kΩ potentiometer is required in order to vary the luminous intensity.
5.2.2 Mode 1: Pneumatic mode from 100 rpm to 40,000 rpm

The motor’s target speed is attained using an air-driven pedal connected to the pressure sensor (0 to 3 bar). A 10 kΩ potentiometer is required in order to vary the luminous intensity.
5.2.3 Mode 2: Pneumatic mode with electric limitation

FIG. 6

Pneumatic mode (mode 1) with maximum speed limitation. Identical to mode 1 but with the maximum speed limited by a potentiometer (10 kΩ). A 10 kΩ potentiometer is required in order to vary the luminous intensity.
5.2.4 Mode 3: Serial mode (RS-232)

FIG. 7

The DMX3 is controlled using an RS-232 communication protocol. The RS-232 communication protocol is available by request from Bien-Air Dental SA. A 10 kΩ potentiometer is required in order to vary the luminous intensity.
6 Maintenance

⚠ CAUTION
Use only genuine Bien-Air Dental maintenance products and parts. The use of other products or parts could void the warranty.

6.1 Servicing

Never dismantle the device. For all servicing and repairs, it is recommended that you contact your usual supplier or Bien-Air Dental directly.

7 General information, guarantee and references

7.1 Notation

• A, B, C, etc. Text preceded by a letter indicates a procedure to be carried out step-by-step.
• (1), (2), (3), etc. Text preceded by a number indicates text used in conjunction with an illustration.

7.2 Terms of guarantee

Bien-Air Dental grants the user a guarantee covering all functional defects, material or production faults. The guarantee period for this device is 12 months from the date of invoicing.

In the event of a justified claim, Bien-Air Dental SA or its authorized representative will fulfil the company’s obligations under this guarantee by repairing or replacing the product free of charge. Any other claims, of whatever nature, in particular in the form of a claim for damages and interest, are excluded.

Bien-Air Dental SA shall not be held liable for damage or injury and the consequences thereof, resulting from:
• excessive wear and tear
• improper use
• non-observance of the instructions for installation, operation and maintenance
• unusual chemical, electrical or electrolytic influences
• poor connections, whether of the air, water or electricity supply.

The guarantee does not cover flexible “fiber optic” type light conductors, or any parts made of synthetic materials. The guarantee shall become null and void if the damage and its consequences are due to improper manipulation of the product, or modifications to the product carried out by persons not authorized by Bien-Air Dental SA.

Claims under the terms of the guarantee will be considered only on presentation, together with the product, of the invoice or the consignment note, on which the date of purchase, the product reference and the serial no. should be clearly indicated.
### 7.3 References

#### 7.3.1 Set supplied (see cover page)

<table>
<thead>
<tr>
<th>REF</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600903-001</td>
<td>DMX3 Set</td>
</tr>
</tbody>
</table>

#### 7.3.2 Optional accessories (see cover page)

<table>
<thead>
<tr>
<th>REF</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1305350-001</td>
<td>Internal Power Supply</td>
</tr>
<tr>
<td>1500554-001</td>
<td>Dual Motor Switch</td>
</tr>
<tr>
<td>1500579-001</td>
<td>Cable RS-232. L=30 cm</td>
</tr>
<tr>
<td>1500580-001</td>
<td>Converter 24/32 Vdc and 24 Vdc</td>
</tr>
<tr>
<td>1600606-001</td>
<td>HOSE MX-i (L=1.7m)</td>
</tr>
<tr>
<td>1500666-001</td>
<td>External Power Supply</td>
</tr>
<tr>
<td>1600677-001</td>
<td>Micromotor MX2 LED</td>
</tr>
<tr>
<td>1600700-001</td>
<td>MX2 hose, grey silicon (L=1.7m)</td>
</tr>
<tr>
<td>1600751-001</td>
<td>Micromotor MCX LED</td>
</tr>
<tr>
<td>1600755-001</td>
<td>Micromotor MX-i LED</td>
</tr>
<tr>
<td>1600756-001</td>
<td>MCX hose, grey silicon (L=1.7m)</td>
</tr>
<tr>
<td>1600780-001</td>
<td>Micromotor MCX</td>
</tr>
<tr>
<td>1501748-001</td>
<td>Exhaust air</td>
</tr>
</tbody>
</table>
Warranty: 12 Months