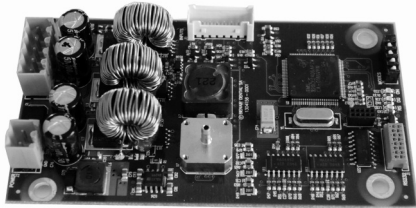




# DMX-i



## Instruction

REF 2100203-0003/2019.02

### English

In these instructions, "Device" corresponds to the product described in the heading "Type". For example, turbine, contra-angle, handpiece, micromotor, tube, electronics, connectors, station etc.

### Type

Electronic control for Bien-Air Dental micromotors. Brushless micromotors without sensors, with current limiting function, check of torque and speed.

### Intended use

Product intended for professional use only. Use in dentistry for prophylaxis and general dentistry. Any use other than that for which this device is intended is prohibited and may prove dangerous. The intended EM environment (per IEC 60601-1-2 ed. 4.0) is Professional healthcare facility environment.

### Technical data

#### Dimensions

102 x 58 x 27 mm

#### Weight

approx.75 g

#### Voltage

32 Vdc ±10%

#### Description

For device references, see fig. 2 5. MX-i system: consists of an MX-i LED motor, MX-i LED cable, and DMX-i electronic control.

#### Current limitation:

Micromotor MX-i LED: 8 A

#### Electric power supply nominal power rating:

120 VA

#### Connectors and wiring diagram

see fig. 1 and fig. 2.

0 Feed voltage

1 Motor and light

2 Analogue inputs

3 DIP switches

4 Air pressure sensor

5 Device references

6 Diagnostic LEDs

The general wiring diagram shows all the main connections of the complete MX-i system. The connections actually required depend on the integration of the MX-i system in the unit and the desired functions.

The following table describes the main characteristics of each connection described in the wiring diagram.

#### Precautions to be taken during integration

- During integration, only use a medical supply that conforms to standards EN /IEC 60601-1 and EN /IEC 60601-1-2, respecting the required withstand voltage, creepage distances and distances in air. Following integration, the complete assembly becomes an EM system.

- Caution: The DC power supply line overall length must be shorter than 3 m. The use of ferrite beads is strongly recommended.
- Connect the ground (GND) of all the electronic controls connected to the DMX-i. This also applies to digital interfaces.
- The motor light must be powered from the DMX-i. Do not use another power supply for the light.
- The input voltage levels can be configured via the RS-232 serial interface (document available on request).
- Caution: The overall RS-232 cable length must be shorter than 3 meters. The use of a shielded RS-232 cable is strongly recommended.
- For more information or if you have any questions about the integration, wiring configuration or programming of the MX2 system, please contact your Bien-Air Dental representative (addresses below).
- Only use accessories, transducers and cables specified by Bien-Air Dental SA.

#### Protection installed

##### Temperature

- The motor and electronic control temperatures are continuously controlled by the system.

##### Power supply

- The electronic control system is protected against over- and undervoltage, and also against short circuits on the feed input.

##### 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 stops.

#### Exhaust air

REF 249.39.11: this system is only necessary if the device is pneumatically-controlled, with the air pedal in the raised position, and if the valve controlled by the pedal is not fitted with a vent. Contact your dealer for fitting.

#### Standards

This electronic control conforms to electrical safety standards in line with standard IEC 60601-1 and those governing electromagnetic compatibility in line with standard IEC 60601-1-2.

#### Electromagnetic compatibility

Corresponds to the electromagnetic compatibility in accordance with IEC 60601-1-2. Declaration by the manufacturer regarding electromagnetic compatibility: refer to the tables on pages 3-4.

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.

#### Information

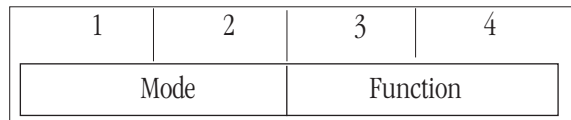
The technical specifications, illustrations and dimensions contained in these instructions are given only as a guide. They may not be the subject of any claim. The manufacturer reserves the right to make technical improvements to its equipment, without amending these instructions. For all addi-

Description	Diagram ref.	Specification	Notes
<b>DMX-i REF 1501397-001</b>			
Voltage	Input -	32 Vdc +/- 10%	
Speed reference	Input	0 to 5 Vdc (linear)	Pull-down Input
Rotation (CW/CCW)	Input	0 or 5 Vdc (TTL)	Pull-down Input
Brightness	Input	0 to 5 Vdc (16 output levels)	Pull-up Input
Pneumatic pressure reference	Input	0 to 3 bar (0 to 300 kPa, 0 to 43.5 psi)	
Motor Power	Output	Phases A, B, and C	
Motor Light	Output	L+ / L-	

RS-232	Digitale interface
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#### Operating mode selection by DIP-Switches

The 4 DIP-Switches are used to configure the system, and in particular to select the operating mode (see table below). For more information and technical support, please contact your Bien-Air Dental SA dealer.



The serial mode protocols for mode 3 are available on request from your Bien-Air Dental SA dealer.

0 = OFF    1 = ON

Mode	Dip switches				Description
	1	2	3	4	
0	0	0	X	X	Electric mode from 100 rpm to 40 000 rpm
1	0	1	X	X	Pneumatic mode from 100 rpm to 40 000 rpm
2	1	0	X	X	Pneumatic mode with electric limitation
3	1	1	X	X	Serial mode (RS232)
All	X	X	1	X	Status frame auto-send (1 = enabled, 0 = disabled)
All modes except 3	X	X	X	1	Light delay (1 = enabled, 0 = disabled)
Mode 3 only	1	1	X	1	Frame check (0 = checksum, 1 = CRC)

#### Main functions and controls

- Pneumatic control.
- Electric control by analogue inputs or digital interface (RS-232)
- The system variable parameters are as follows:
  - Speed range 100 - 40.000 rpm (maximum torque of over 3.0 Ncm available across the full speed range)
  - Progressive or ON/OFF mode speed adjustment
  - Maximum torque adjustable from 10 to 100% in 1% stages
  - Brightness control (16 settings) or light ON/OFF
  - Reversal of rotation direction (clockwise/anti-clockwise)

tional information, please contact Bien-Air Dental SA at the address indicated on the back cover.

**Disposal**

This device must be recycled. Electrical and electronic equipment may contain dangerous substances which constitute health and environmental hazards. The user must return the device to its dealer or establish direct contact with an approved body for treatment and recovery of this type of equipment (European Directive 2002/96/EC).

**Maintenance**

Only use maintenance products and components from Bien-Air Dental. The use of other products and components can void the guarantee.

**Servicing**

Never disassemble the device. For any modification and repair, we recommend that you contact your regular supplier or Bien-Air Dental directly. Bien-Air Dental asks the user to have its dynamic instruments checked or inspected at least once a year.

**Working environment**

- Temperature: +10°C (50°F) to +40°C (104°F)
- Relative humidity: 30% to 80%, including condensation
- Atmospheric pressure: 700 hPa to 1060 hPa

**Transport and storage**

Environmental conditions for a period of max. 15 weeks

- Temperature: -25°C (-13°F) to +70°C (158°F)
- Relative humidity: 10% to 100%, including condensation
- Atmospheric pressure: 500 hPa to 1060 hPa

**Other precautions for use**

The device must be used by a qualified person in accordance with the current legal provisions concerning industrial safety, health and accident prevention measures, and these working instructions. In accordance with these requirements, the operators:

- must only use operating devices that are in perfect working order; in the event of irregular functioning, excessive vibration, abnormal heating or other signs indicating malfunction of the device, the work must be stopped immediately; in this case, contact a repair centre that is approved by Bien-Air Dental;

- must ensure that the device is used only for the purpose for which it is intended, must protect themselves, their patients and third parties from any danger, and must avoid contamination through the use of the product.

The device is not authorised for use in an explosive atmosphere (anaesthetic gas).

Avoid any contact with liquids.

**Guarantee**

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

In the event of justified claim, Bien-Air Dental or its authorised 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 shall not be held responsible 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 "fibre optic" type 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 authorised by Bien-Air Dental.

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.

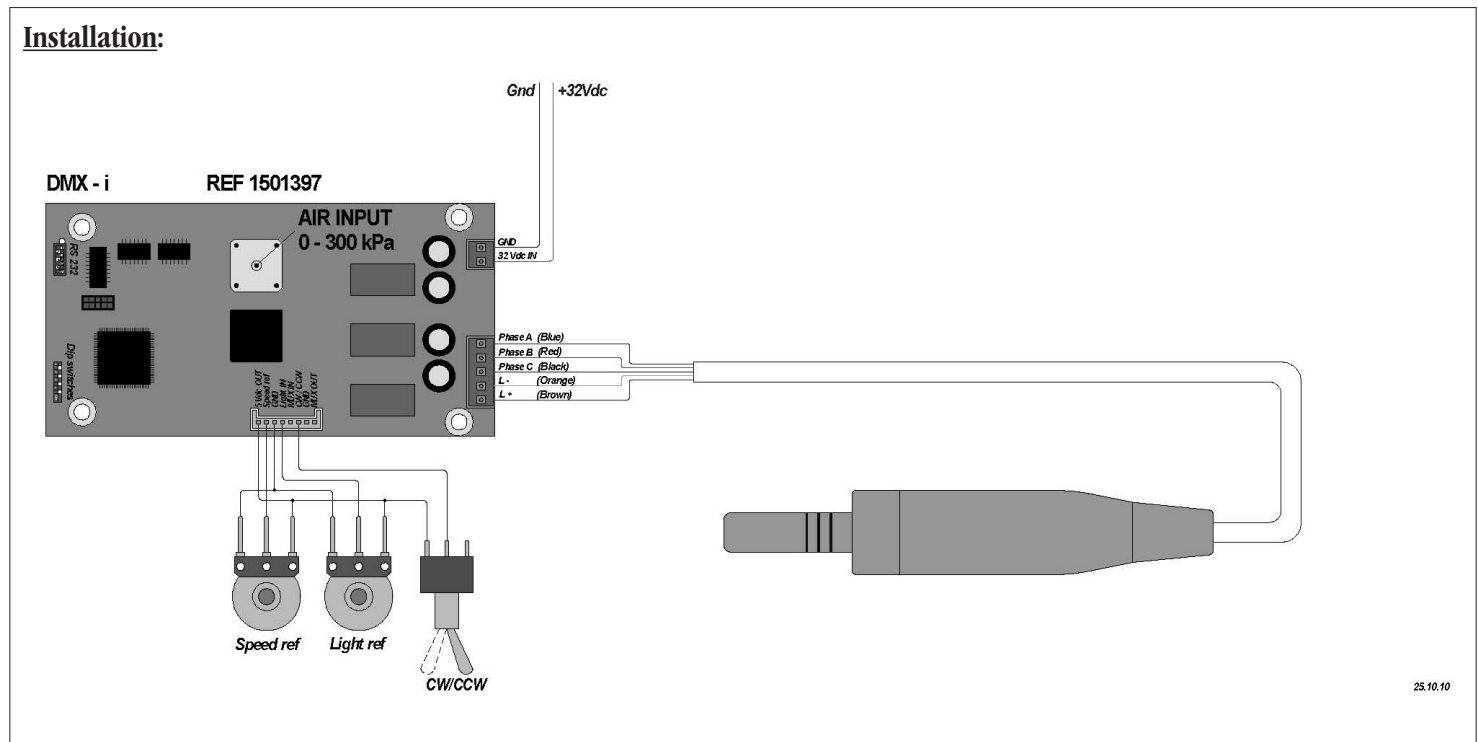


fig. 1

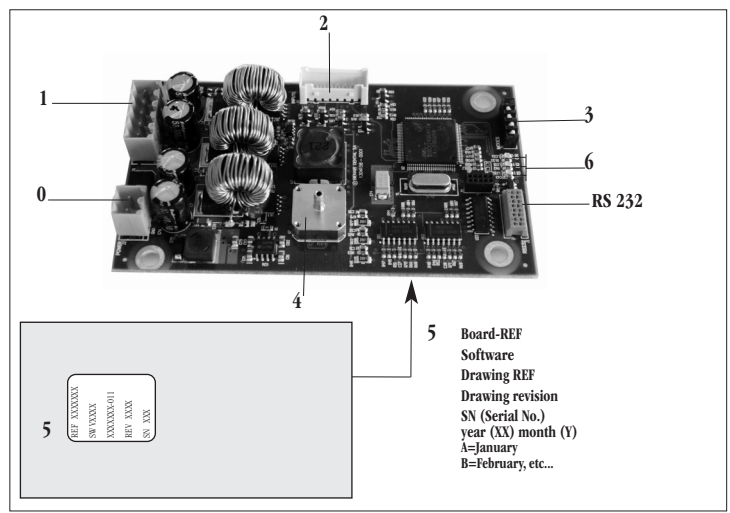


fig. 2

6

**Diagnostic LEDs**

<b>ON</b>	The green LED is lit when the board is powered
<b>DG</b>	The red LED flashes (1-7 times) when a fault occurs (see fault list)
<b>RS</b>	The amber LED flashes during RS232 communication

**Fault list**

<b>Fault 1:</b>	<b>Short circuit in motor or cord</b>
<b>Fault 2:</b>	<b>Motor live disconnected in motor or cord</b>
<b>Fault 3:</b>	<b>RS232 communication cut</b>
<b>Fault 4:</b>	<b>EEPROM memory fault</b>
<b>Fault 5:</b>	<b>Motor control overheating</b>
<b>Fault 6:</b>	<b>Motor control voltage too low</b>
<b>Fault 7:</b>	<b>Motor control voltage too high</b>



### Precautions regarding Electromagnetic Compatibility (EMC)

Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the user's manual and in the present document.

The DMX-i complies with the EMC requirements according to IEC 60601-1-2. Radio transmitting equipment, cellular phones, etc. shall not be used in the close proximity of the device since this could influence the performance of the device. Particular precaution must be considered during use of strong emission sources such as High Frequency surgical equipment and similar so that e.g. the HF cables are not routed on or near the device. If in doubt, please contact a qualified technician or Bien-Air Dental.

Since this device is intended to be used adjacent to or stacked with other equipment, the responsibility of verifying normal operation in the configuration in which it will be used falls onto the dental unit manufacturer.

### WARNING!

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

### Guidance and manufacturer's declaration – electromagnetic emissions

The DMX-i is intended for use in the electromagnetic environment specified below. The customer or the user of the DMX-i should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The DMX-i uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	The DMX-i is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.

### Guidance and manufacturer's declaration – electromagnetic immunity

The DMX-i is intended for use in the electromagnetic environment specified below. The customer or the user of the DMX-i should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2 kV air ±4 kV air ±8 kV air ±5 kV air ±15 kV air	±8 kV contact ±2 kV air ±4 kV air ±8 kV air ±5 kV air ±15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines N.A.	Mains power quality should be that of a typical commercial or hospital environment. NOTE 3
Surge IEC 61000-4-5	±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	±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	Mains power quality should be that of a typical commercial or hospital environment. NOTE 3
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% $U_T$ for 0.5 cycle, at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°  0% $U_T$ for 1 cycle and 70% $U_T$ for 25/30 cycles at 0°  0% $U_T$ for 250 cycles at 0°	0% $U_T$ for 0.5 cycle, at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°  0% $U_T$ for 1 cycle and 70% $U_T$ for 25/30 cycles at 0°  0% $U_T$ for 250 cycles at 0°	Mains power quality should be that of a commercial or hospital environment. If the user of the DMX-i requires continued operation during mains power interruptions, it is recommended that the DMX-i be powered from an uninterruptible power supply or a battery. NOTE 3
Magnetic field due to main frequency (50/60 Hz) IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
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	3 Vrms 0.15 MHz - 80 MHz 6 Vrms in ISM bands 0.15 MHz - 80 MHz 80% AM at 1kHz	Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, <sup>a</sup> should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:
Radiated RF EM fields IEC 61000-4-3	3 V/m 80 MHz - 2.7 GHz 80% AM at 1kHz	3 V/m 80 MHz - 2.7 GHz 80% AM at 1kHz	
Proximity fields from RF wireless communications equipment IEC 61000-4-3	Test freq. [MHz]	Max. power [W]	Immunity test level [V/m]
	385	1.8	27
	450	2	28
	710, 745, 780	0.2	9
	810, 870, 930	2	28
	1720, 1845, 1970	2	28
	2450	2	28
5240, 5500, 5785	0.2	9	Distance: 0.3 m

NOTE  $U_T$  is the a.c. mains voltage prior to application of the test level.

**Essential performance:** The essential performance is the maintaining of the visual lighting intensity of the LED and the maintaining of motor speed. Maximum allowed speed deviation is ± 10%.

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

NOTE 3 Not applicable for the board itself. Applicable when integrated in a dental unit.

<sup>a</sup> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and lan mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast 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 DMX-i is used exceeds the applicable RF compliance level above, the DMX-i should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the DMX-i.





REF	Legend
1501397-001	Electronic DMX-i
1302410-001	Upper cover
1302411-001	Lower cover
1500579-001	Cable RS-232. L = 30 cm.
1501418-001	Analogue input cable. L = 30 cm.
249.39.11-001	Exhaust air
1600755-001	MX-i LED micromotor, sterilisable
1600606-001	Cable for MX-i LED micromotor, sterilisable. L = 1,8 m.

This product may be covered by one or more of the following patents:

**EP Europe:** 745358 / 688539 / 948294 / 1145688 / 1563800 / 1563801 / 1675523 / 1753360 **DE Germany:** 29616023.7  
**DK Denmark:** 9600315 **FR France:** 2722972 **CH Switzerland:** 693922 **CN China:** 100528099 / 100522100 / 100522099 /  
 100553584 **JP Japan:** 3892485 / 4298933 / 7000419 **US United-States:** 5453008 / 6033220 / 6319003 / 7214060 / 7448870  
**RU Russia:** 2361540 / 2361541 / 2372046

REF 1501397-001 BOARD DMX-i

#### Symbols



Manufacturer.



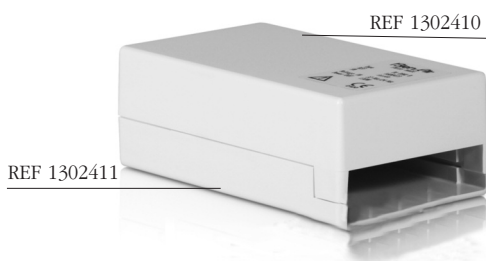
Recyclable electrical and electronic material.



Light.

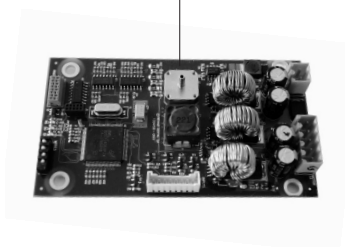
#### Set supplied

**DMX-i**  
**REF 1501397-001**



REF 1302410

REF 1501397 DMX-i

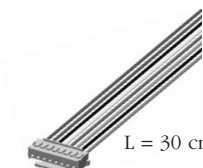


#### Optional accessories



L = 30 cm.

REF 1500579-001



L = 30 cm.

REF 1501418-001



L = 1,8 m

REF 1600606-001



REF 1600755-001

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