

User safety



WARNING: Do not use the Indego or its accessories in any way not described in this manual.

Intended use and Indications for use

The Parker HMC Indego is a powered lower limb orthosis which fits to the lower limbs and trunk of the user. Indego is intended to enable individuals with lower-limb weakness or paralysis to perform ambulatory functions in a clinical or personal use setting with the help of a specially trained clinician or companion. Only individuals who take part in and successfully pass the clinical training program requirements can use or help in the use of Indego. The Indego is not intended for sports or stair climbing.

Contraindications for use

The contraindications listed here are not exhaustive. The decision as to whether a user is suitable for Indego use must come as written approval from their physician. As part of this medical clearance process, the physician must evaluate the risks of Indego use against the benefits gained from it.

- Severe vascular disorders of the lower limbs (e.g. unresolved deep vein thrombosis).
- Diminished standing tolerance (caused by, e.g. orthostatic hypotension).
- Poor bone health that places the user at an increased risk for fracture during ambulation.
- Passive joint range of motion that cannot achieve at least neutral position at hips, knees and ankles.
- Uncontrolled autonomic dysreflexia.
- Uncontrolled hypertension or hypotension.
- Poor skin integrity in areas in contact with the device.
- Cognitive impairments resulting in inability to follow directions.
- Visual impairments which would make ambulation unsafe.
- Lower limb prosthesis.
- Any condition which in the opinion of a medical doctor prevents the user from using the device.

General warnings

The following are general warnings for using the Indego or its accessories.



WARNING: If device or accessory behavior not as described in this manual occurs, stop using the device and contact the Helpline.

Training

User training

Indego Users and their **Support Persons** must complete *Indego Personal Use Training* to use the Indego outside of a clinical setting. A certified Indego Trainer give this training. Contact Parker HMC if you wish to refresh or update your training.

Device warnings

Autonomic dysreflexia/Autonomic hyperreflexia

Autonomic dysreflexia (also called autonomic hyperreflexia) is a serious medical condition associated with spinal cord injury at or above the sixth thoracic vertebral level (T6 and higher) and can affect individuals with complete or incomplete injuries.

Common signs include sudden increase in blood pressure, severe headache, excessive sweating, goosebumps, blurred vision, flushed skin, nasal congestion, slow pulse, tightness in chest, and anxiety.

Autonomic dysreflexia is a medical emergency needing immediate medical attention. If symptoms occur while using the Indego, cease use and remove the device at once. Sit up or raise your head and remain upright, empty bowel or bladder, loosen or remove tight clothing, and check blood pressure until normal. Seek medical attention at once if symptoms persist.

Users with uncontrolled autonomic dysreflexia must not use the Indego.

Clothing requirements

Wear clothes that cover all skin in contact with the device, including socks over your feet, to reduce the risk of skin irritation and related complications. Wear long trousers made of soft fabric (shorts or cropped trousers should not be worn). Very loose or very thick clothes may prevent proper fitting.

Wear shoes with removable insoles for proper fit of the ankle foot orthosis (AFO) and good skin care. Shoes must enclose the foot and should have flat non-slip soles and a stiff heel counter.

Take care with the placement of urinary catheter leg bags and tubing to reduce the risk of autonomic dysreflexia and similar events. Users with urinary catheter leg bags with tubing learn good placement of their catheter during their training.

Exposure to magnetic fields and other forms of radiation

Users may not receive any X-ray, computed tomography (CT) or magnetic resonance imaging (MRI) scan, diathermy treatment or other form of intentional radiation exposure while wearing the Indego. Turn off and remove the device. Never bring your Indego into proximity with MRI equipment.

The electromagnetic fields and radiation generated by these systems may damage mechanical or electrical parts. If the Indego is exposed to a high-strength magnetic field, cease use and contact the Helpline for your device to receive service.



WARNING: MR unsafe. Do not use the Indego or accessories in areas of strong magnetic or electrical fields.

Avoid close contact with other devices that emit electromagnetic energy such as RFID or electromagnetic security systems.

Skin integrity

Users and their support persons must check all areas of the user's skin underneath the device for redness, pressure sores or any other sign of contact injury. If sores or bruising are present, cease use until the injury heals. Notify a physician if an injury does not heal.

Stability aids

Users with lower-limb weakness or paralysis should use a platform walker, rolling walker, or forearm crutches with their Indego. Users with upper-limb weakness or paralysis should use a platform walker. Users with hemiparesis may use a hemi walker, quad or single point cane.

Do not carry items by hand while using the Indego.

Walking environments

The Indego is safe for use on indoor and outdoor surfaces including carpet, hard floors, level grass, pavement, sidewalks, curb cutouts with a grade equal to or less than 8°, and ramps with a grade equal to or less than 5°. Do not use your Indego on slippery or wet surfaces. Also avoid uneven or unstable surfaces such as gravel or sand.

Never use your Indego to walk on a treadmill, moving walkway, or escalator.

Turn off your device after entering any vehicle.

You must place your Indego in **{Standby}** after entering an elevator to prevent stepping while the elevator is moving.

Walking speeds

The maximum walking speed a user can reach depends on their physical capability and familiarity with the Indego. In a clinical trial with persons with spinal cord injury, users walked between 0.19 and 0.59 meters per second / 0.43 and 1.32 mph on paved surfaces after 27 hours of use over 8 weeks. Users may not be able to cross a street in the time allotted by crosswalk signals.

In a trial with experienced Indego users with spinal cord injury, walking speeds between 0.48 and 0.78 meters per second / 1.07 to 1.74 mph were achieved with **Advanced Gait**.

Accessory warnings

Recharging the handheld controller (Apple iPod touch)

Never recharge or plug the handheld controller into a power source or other device while using it with the Indego. Refer to the iPod touch user guide for instructions on its use.

<https://www.apple.com/support/ipodtouch/>

Recharging the Indego

Power off the Indego before recharging the battery. The Indego disables itself and the front LEDs turn red if the charger is plugged in when the Indego is on.

Note The Indego does not walk or transition with the charger plugged in.

General cautions

The following are general cautions associated with use of the Indego or its accessories.

Device cautions

Access to the device, handheld controller, and other accessories

Do not allow children or pets to access the Indego or the handheld controller/Indego mobile app. Damage to the device or unintended changes to settings may occur.

Avoid extreme use and storage conditions

Do not expose the Indego to extreme temperatures or inclement weather. Damage to the device may occur that may impair its safety and effectivity. Avoid temperatures above 88°F / 31°C or below 32°F / 0°C during use, or to temperatures above 122°F / 50°C or below -4°F / -20°C during storage or transport.

Do not leave the Indego in a parked car or other extreme temperature environment.

Avoid contact with liquids

The Indego may be safely used outdoors, but avoid exposure to rain, snow, and ice.

Avoid exposing the Indego to liquid spills or immersion. Liquid may migrate into the device housings and damage the internal components.

Battery

The battery cannot be user-replaced. Contact Parker HMC if you suspect a battery malfunction.

Intended use

Do not use or try to use the Indego or its accessories for any purpose not described in the indications for use.

RF communications

The Indego sends and receives information to and from the handheld controller over a Bluetooth connection on the 2.4 GHz ISM band. Other devices (such as cell phones, wireless networks, other Bluetooth devices) using a similar frequency may impair communication between the Indego and the controller. No wrong data or commands are sent due to this interference and no harm to the Indego or controller occurs. Moving away from or turning off these other devices may allow communication.

The Indego uses a Bluetooth® smart (Low Energy) module compliant with the Bluetooth smart standard. The Indego handheld controller / Apple iPod touch has a built-in Bluetooth module. These modules handle all communication between the controller and device. The wireless Bluetooth communication used by the Indego system performs four functions:

1. The Indego is enabled by beginning a session in the Indego app,
2. Settings changes made in the app are sent to the Indego,
3. Status information is sent from the Indego and displayed by the app during a session, and
4. Diagnostic data and performance information can be sent to the app from the Indego for upload from the controller over Wi-Fi for troubleshooting purposes.



Caution: Electronic equipment using in the same frequency band used by the Bluetooth® smart module may interfere with the reception of commands from the controller by the Indego. Reorienting the controller, disabling the interfering devices, or decreasing the distance between the controller and the device typically solves these issues.

Vital signs monitoring

User blood pressure changes during use may result from position changes, such as going from sitting to standing, or as a response to the physical activity of walking.

Monitor blood pressure and heart rate before, during, and after each Indego use session.

Abnormalities in blood pressure or heart rate should be reported to your primary care physician and use stopped if the physician believes continued use is hazardous.

Charger and power supply cautions

Avoid extreme temperatures when charging

Avoid exposing the charger to extreme temperatures during use. Device charging must occur between 41 and 88 °F / 5 and 31 °C.

Note Charging occurs very slowly outside of this temperature range. Charging does not occur at all if the environment is very hot or very cold.

Avoid spills or immersion on charger

Exposing the Indego charger to liquid may damage the internal components. Do not get the charger or power supply wet.

Indoor use only

The charger is for indoor use only. Damage to the charger or device may occur if used outdoors.

Power supply

Only use the supplied AC line cable, power supply, and charger to charge the Indego. Do not use any other power supply than the provided XP Power AHM100PS48C2-8.

Do not place the charger so it is difficult to reach or unplug from the AC power source.

Other (third-party) equipment

Use and care of mobility devices or stability aids such as wheelchairs, rolling walkers, platform walkers, forearm crutches, or canes should follow their user instructions.



Caution: Do not use with any overhead harness that touches the device when properly adjusted.

Emergency procedures

Shutdown and doff device

Circumstances may arise that need the Indego to be turned off quickly or emergency medical attention be given to the user. If such an emergency occurs the user or support person should:

- 1 Turn off the Indego by holding both power buttons until the front LEDs change to white and then turn off.



Press and hold both power buttons until LEDs turn off



Caution: Do not perform this two-button shutdown procedure if there is no emergency. Diagnostic and session data are lost.

- 2 The knee brakes engage and the hip joints rotate freely with the power off. The support person can help lower the user into a seated position. Press the brake release button on each lower leg to allow the knees to rotate.



Brake release button

- 3 Pull up on each BOA knob to release the tension in the straps and unclasp them.

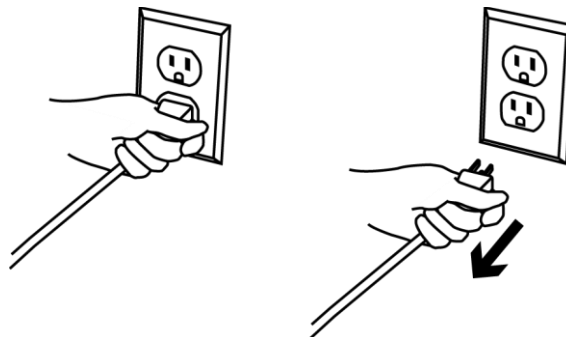


Boa release

- 4 Remove the user from the Indego or take it apart to remove it.

Disconnecting the charger power supply

If an emergency occurs while the device is charging or plugged into the charger, disconnect the power supply from the wall by pulling the power cable from the wall receptacle.



Unplug charger from AC power

Note

Power loss

If the device loses power for any reason, the brakes engage while the hip joints rotate freely, like long-legged braces. Turn the knee joints (to straighten or bend the legs) by pressing the brake release button on the front of the upper leg near the knee.

Regulatory information

Medical device directive

This product conforms to the requirements of council directive 93/42/EEC concerning medical devices when it bears the following CE mark of conformity:



UL Certifications

The Indego is UL certified (file number E474726) as Medical General Medical Equipment, AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY, when it bears the following mark:



The Indego Charger is UL certified (file number E353146) AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY in accordance with ANSI/AAMI ES60601-1 (2005, 3rd ed.), when it bears the following mark:



WEEE

The Waste Electrical and Electronic Equipment (WEEE) mark applies in countries with WEEE and electronics waste regulation. This equipment must not be disposed as unsorted municipal waste. Follow all local and regional requirements. Contact Parker HMC for information on proper disposal.



Technical information

Powered Exoskeleton	
User weight	Up to 250 lbs. (113 kg)
Operating conditions*	32 to 88 °F / 0 to 31 °C 0 to 90% non-condensing relative humidity 78 to 101 kPa
Dimensions	28.7 x 18.3 x 22.7 inches / 73 x 46 x 58 cm
Device weight	29 lbs. / 13 kg
Power rating	37.8 VDC, 25 A
Energy	159 Wh (4.9 Ah)
Operating time	A fully charged battery typically lasts 2,500 steps or 90 minutes in the Motion+ Software Suite. How long the battery lasts depends on settings, user height, weight, and impairment level, as well as how much time is spent in {Standby}. Step counts from 1,500 to 4,000 per charge are normal.
Charge time	4 hours
Range of motion	Knee 10° extension/110° flexion Hip 30° extension/110° flexion
Storage conditions	-4 to 122 °F / -20 to 50°C 0 to 90% non-condensing relative humidity 11.6 to 101 kPa
Device expected life	5 years with proper servicing
Battery expected life	2.5 year of normal use

*If you store the Indego outside this range, let it sit for 2-hours inside the range before use.

Indego Charger	
Operating condition†	41 to 88 °F / 5 to 31 °C 15 to 90% non-condensing relative humidity 70 to 106 kPa
Dimensions	2 x 3 x 8 inches / 5 x 7 x 20 cm
Weight	0.6 lbs. / 0.3 kg
Input	48 VDC
Output	48 VDC, 1.5 A
Storage conditions	-13 to 158 °F / -25 to 70 °C 0 to 90% non-condensing relative humidity 7 to 106 kPa
Expected life	5 years

†Charging times increase at higher temperatures

Power Supply	
Manufacturer and model	XP Power AHM100PS48C2-8
Operating conditions†	41 to 104 °F / 5 to 40 °C 15 to 90% non-condensing relative humidity 70 to 106 kPa
Dimensions	6 x 3 x 2 inches / 16 x 6 x 4 cm)
Weight	1 lbs. / 0.5 kg
Input	100-240 V~1.8 A, 50/60 Hz
Output	48 VDC, 1.5 A
Storage conditions	-40 to 185 °F / -40 to 85°C 5 to 95% non-condensing relative humidity 70 to 106 kPa
Expected life	5 years

Safety standards

IEC 60601-1, ANSI/AAMI ES 60601-1, CAN/CSA-C22.2 No. 60601-1

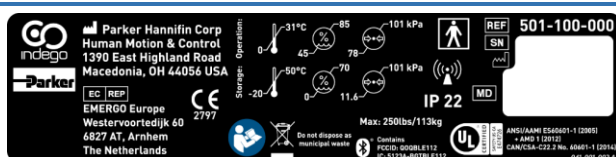
IEC 60601-1-2

IEC 60601-1-6

IEC 60601-1-11

IEC 62366

Device labels



On the tail of the hip, under the torso pad.



Detachable component labels on each part.



On the bottom of the charger.

Radiofrequency communication specifications

Description of the Bluetooth system

The Indego uses Bluetooth smart (Low Energy) technology, whose standards, licensing, and trademarks are managed by the Bluetooth Special Interest Group (SIG).

BLE is a wireless personal network communication technology which uses the 2.400 GHz-2.4835 GHz industrial, scientific, and medical radio band, separated into 40 2-MHz wide channels. The transmitter uses digital modulation to rapidly distribute the BLE signal over these channels in a pseudorandom pattern which is known to the receiver. This Direct-Sequence Spread Spectrum (DSSS) modulation scheme reduces the likelihood of interference and interception while allowing many devices to share the same frequency band. Within a given channel, BLE employs Gaussian frequency shift modulation to transfer data at 1 Mbit/s with a maximum output power of 10 mW/MHz and a minimum 6dB bandwidth of at least 500 kHz. Data is transferred in 10-47 byte packets, each having a 3-byte cyclic redundancy check (CRC) that is used to verify the packet contents once received. Packets which the receiver cannot verify are not acknowledged. The sender may retransmit the packet until such acknowledgement is received.

Bluetooth communication occurs between a Bluetooth Module on the Indego Device, and a Bluetooth Module in the iOS Device which runs the Indego mobile app. The Bluetooth module contained in the Indego Device is Bluetooth SIG qualified, listed as a controller subsystem, and is compliant with the RF PHY (Radio Frequency Physical Layer), LL (Link Layer), and HCI (Host Controller Interface/Transport Layer) Profiles of Bluetooth Specification Version 4.0. The module has a transmit power of +3 dBm to -23 dBm (approximately 2 mW to 5.0 μ W) and a receive sensitivity of -85 dBm to -91 dBm (approximately 3.2 nW to .79 nW), respectively. The module complies with Federal Communications Commission (FCC) and Industry Canada (IC) Regulations, is CE qualified, and is certified by MIC Japan and KCC (Korea). The FCC ID and IC Certification number for the module may be found on the Indego Hip labeling. Details about the iOS Device may be found on Apple's website (<http://www.apple.com/ipod-touch/specs/>).

Quality of service

The selected Bluetooth components and the Bluetooth technology they employ should allow for reliable communication in the presence of other wireless devices and give reasonable protection against wireless interference.

There is a possibility that other wireless equipment could delay or disrupt Bluetooth communication between the Indego Device and Indego mobile application. Such interference will not cause harm to you or the Indego as the Bluetooth connection is only needed to enable the device. If Bluetooth communication is compromised, the device will continue to run with its current settings. Note, however, that sending information to (e.g. Settings), or receiving information from (e.g. Step Count) the Indego Device will not be possible until a clear connection is reestablished. The likelihood of outside interference increases when the connection between the Indego Device and App occurs: 1) over greater distances, 2) through obstructions and 3) in the presence of other active wireless equipment.

To help proper operation of the Indego's Bluetooth components, do the following:

- 1 Keep the Indego mobile app and Indego Device within 3 meters of one another.











- 2 Remove any intervening obstacles between the Indego Device and App.
- 3 Move away from or power off any wireless equipment in the vicinity.

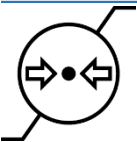



Data security

Security against malicious Indego BLE connections is provided by: 1) the limited range over which Bluetooth Low Energy communication can occur, 2) the connection requirements which must be met for that communication to occur, and 3) the device-specific (as opposed to user-specific) nature of the data which is transferred during such communication. That is, for a third party to receive, record, transmit, or otherwise affect the BLE data passing between the Indego Device and the Indego mobile app, that party (or any malicious device they might employ) would need to be within BLE range of the Indego Device or Indego mobile app at a time when the two are disconnected, as only a single Bluetooth connection is allowed between an Indego Device and Indego mobile app at any given time. (Once connected, the Indego mobile app cannot connect to another Indego Device and the connected Indego Device cannot be connected to from other Indego mobile apps.) Should malicious wireless interaction occur at a time when these conditions are met, the only information available to the third-party would be settings specific to the Indego device.

The Bluetooth code cannot be accessed or altered over the air. If a Bluetooth “deadlock” occurs, the user cannot enable the Indego for use. If a Bluetooth “crash” occurs, the app no longer functions (settings cannot be changed, data logging does not occur) but the user may continue using the Indego normally.

Symbols used on the device and packaging

Symbol	Standard Reference	Description
	ISO7000:2493	Catalog (part) number.
	ISO7000:2498	Serial number.
	ISO7000:3082	Manufacturer ID.
	ISO7000:2497	Date of manufacture.
	n/a	Do not dispose of this device in normal municipal waste, contact the manufacturer.
	n/a	UL certification mark and File Number (E474726).
	n/a	CE mark with notified body ID.
	IEC60417:5333	Body Floating applied part.
	AAMI/ANSI ES60601 1:2005(R)2012 +A1:2012 Annex D, Table D.2 Row 10	Mandatory: Read user manual before use.
	ISO7000:2620	Humidity limitations.

Symbol	Standard Reference	Description
	ISO7000:2621	Atmospheric pressure limitations.
	ISO7000:0632	Temperature limitations.
	IEC60417:5140	Non-ionizing radiation; radiofrequency interference may occur near this device.
	n/a	Bluetooth symbol.
IP 22	AAMI/ANSI ES60601 1:2005(R)2012 +A1:2012 Annex D, Table D.3 Row 2	Ingress protection rating, protection from insertion of fingers and dripping water when tilted up to 15°.
R_x only	n/a	Use of this device is restricted to on the order of a physician.

Guidance and manufacturer's declaration

Electromagnetic emissions

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

Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Class B	The Indego is suitable for use in all establishments, including domestic establishments. Conducted emissions tests were not performed. Device is battery operated
Harmonic emissions IEC 61000-3-2	Not applicable	Device is battery operated
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	Device is battery operated


Electromagnetic immunity

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

Immunity test	ISO 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ± 8 kV air	±6 kV contact ± 8 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	±2 kV for power supply lines	Device is battery operated and does not have I/O cables
Surge IEC 61000-4-5	±1 kV line(s) to line(s) ±2 kV line(s) to earth	±1 kV line(s) to line(s) ±2 kV line(s) to earth	Device is battery operated and does not have I/O cables
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s		Device is battery operated and does not have I/O cables.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. NOTE Tests performed at 50 and 60Hz
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity

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

Immunity test	ISO 60601 test level	Compliance level	Electromagnetic environment – guidance	
			Portable and mobile RF communications equipment should be used no closer to any part of the Indego, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.	
			Recommended separation distance	
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	$[V_1] = 3 V_{rms}$	$d = \left[\frac{3.5}{V_1} \right] \sqrt{P}$	
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	$[E_1] = 3 V/m$	$d = \left[\frac{3.5}{E_1} \right] \sqrt{P}$	80 MHz to 800 MHz
			$d = \left[\frac{7}{E_1} \right] \sqrt{P}$	800 MHz to 2.3 GHz
where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).				
Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey ^a , should be less than the compliance level in each frequency range ^b .				
Interference may occur in the vicinity of equipment marked with the following symbol:				
				

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.

^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land 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 Indego is used exceeds the applicable RF compliance level above, the Indego should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Indego

^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than $[V_1]$ V/m.

Recommended separation distances between portable and mobile RF communications equipment and the Indego

The Indego is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Indego can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Indego as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1.1667\sqrt{P}$	80 MHz to 800 MHz $d = 1.1667\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3333\sqrt{P}$
0.01	.11667	.11667	.23333
0.1	.36894	.36894	.73785
1	1.1667	1.1667	2.3333
10	3.6894	3.6894	7.3785
100	11.667	11.667	23.333

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for 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.