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Pro series electronic dynamometer



Figure,

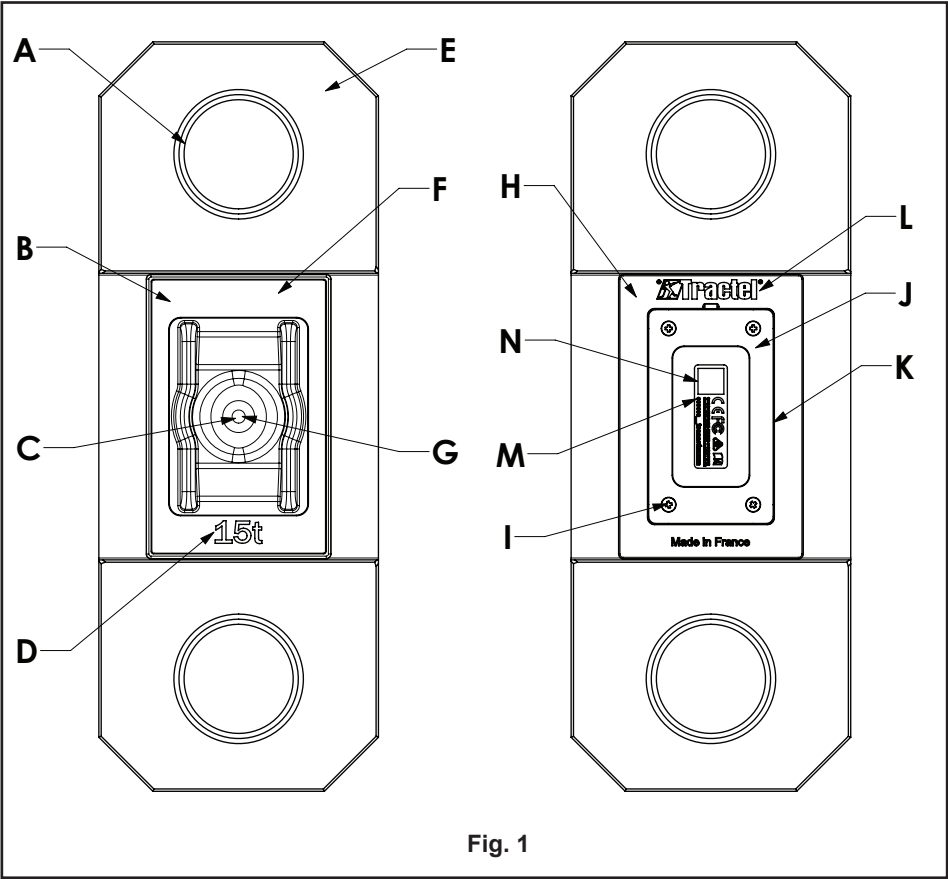


Fig. 1

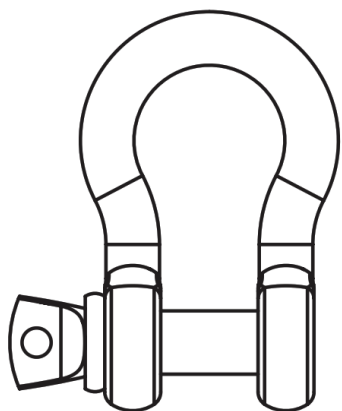
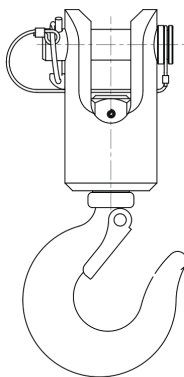


Fig. 2



type

Fig. 3A

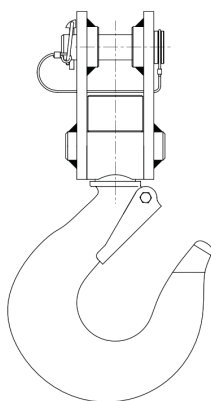
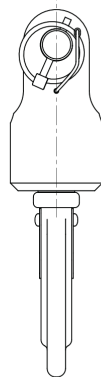


Fig. 3B
Type

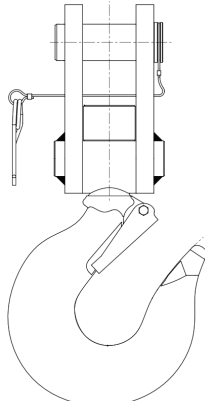
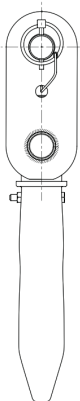
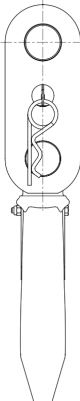


Fig. 3C
Type



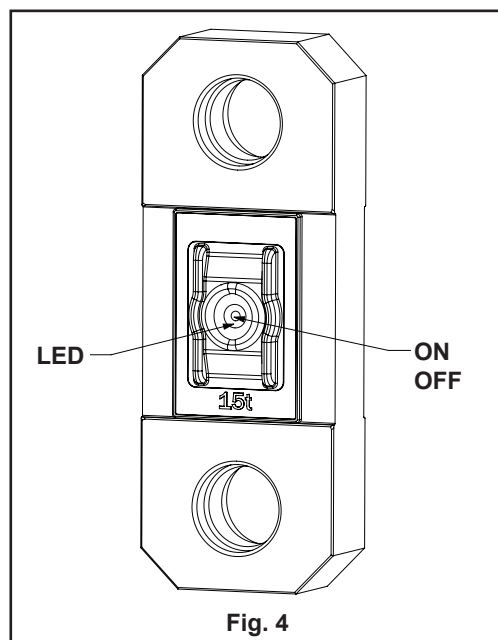


Fig. 4

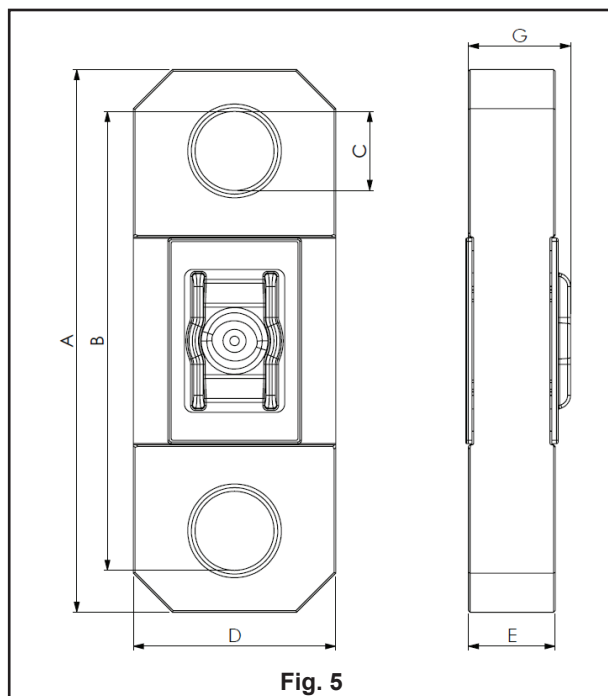


Fig. 5

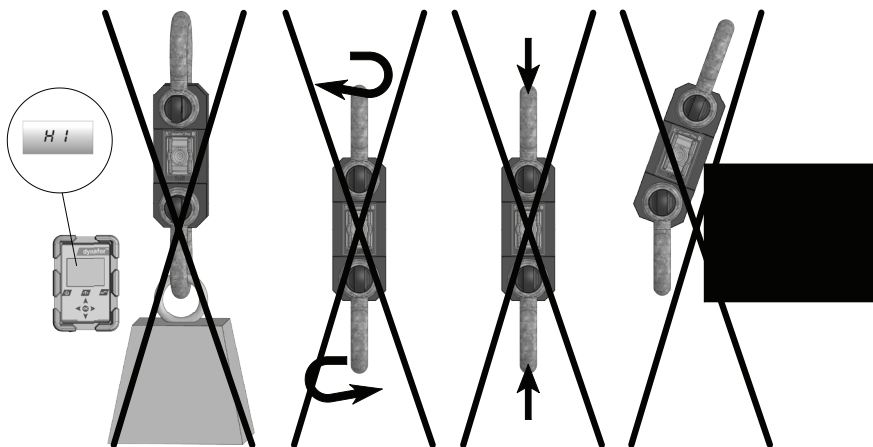


Fig. 6

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1. Priority instructions

1. Before installing and using this product, it is essential that you read these instructions and comply with its instructions for safe and effective use. A copy of these instructions must be made available to all operators. Additional copies can be obtained upon request from Tractel®.
2. Do not use this product if any of the labels affixed to it or any of its accessories, or any of the markings on it as shown at the end of this manual are no longer present or legible. Identical labels can be obtained upon request from Tractel® and must be affixed before continuing to use this product.
3. Make sure that any user of this product is familiar with its operation and capable of applying the safety requirements for the task to be performed. These instructions must be made available to these users. Protect your equipment from uncontrolled intervention.
4. This product must be installed and put into operation in conditions that ensure the safety of the installer in accordance with applicable local regulations.
5. Every time you use the product, first inspect its condition and that of any accessories. Never use a product that does not appear to be in good condition.
6. Return the product to the manufacturer for servicing if there are any visible or operating problems unrelated to the battery condition.
7. Protect the product from impacts.
8. This product may never be used for operations other than those described in these instructions. It may never be used for loads above the safe working load indicated on the product. It may never be used in an explosive atmosphere.
9. Before this product is used in a man-riding system, the supervisor must first verify the application of the coefficients of use required for the safety of personnel, and generally compliance with the safety regulations applicable to the load line in which it is used.
10. Tractel® shall not be liable for the operation of this product in an assembly configuration not described in these instructions.
11. Any modification of this product without the approval of Tractel® or any removal of any component part shall release Tractel® from any liability.
12. Any disassembly of this product not described in this device or any repair work not approved by Tractel® shall release Tractel® from any liability, especially if original parts are replaced by parts from another source.
13. A dynafor™ dynamometer is a lifting accessory and the safety regulations applicable to that category of equipment must be applied.

14. When the product is finally withdrawn from service, it must be scrapped in such a way that it cannot be used again. Comply with environmental protection regulations.
15. This product is approved according to European regulations and the standards specified in the section "11. Regulations and standards", and must be verified for compliance with the regulations of any other country in which it may be used, prior to commissioning and use. Comply with such regulations.
16. Any use of this product with additional equipment that relays its signals to an operating system must be preceded by a risk analysis specific to the operating functions used and all appropriate measures must be taken accordingly.

2. Definitions and pictograms

2.1. Definitions

In this manual, the following terms have the meaning given below:

"Product": Item or equipment described in this manual and delivered complete in the standard version, or in its various existing models.

"Installation": All the operations required to bring the complete product from the state in which it was delivered into a state of commissioning (or connection to other elements for commissioning).

"Supervisor": Individual or party responsible for the management and safe use of the product described in the manual.

"Technician": Qualified person familiar with the product, in charge of the maintenance operations described and permitted in the manual.

"Operator": Individual using the product in accordance with the instructions in this manual.

"MR": Measurement Range (full scale).

"SWL": Safe Working Load.

2.2. Pictograms



"DANGER": When placed at the beginning of a paragraph, it indicates instructions for preventing injuries ranging from minor to fatal and also environmental damage.



"IMPORTANT": When placed at the beginning of a paragraph, it indicates instructions for preventing product failure or damage which would not directly endanger the life or health of operators or other individuals and/or which may harm the environment.



"NB": When placed at the beginning of a paragraph, it indicates the necessary precautions to apply for efficient and ergonomic installation, use and maintenance.



When placed on the product itself or a product component, it indicates the need to read the operating and maintenance manual.

3. Description and markings

3.1. Presentation

dynafor™ Pro are precision force sensors (0.2% MR) for measuring forces and indicating loads. The capacity range is from 1 t to 250 t.

The material is delivered with its batteries in a case* containing:

- The dynafor™ Pro.
- Its installation, operating and maintenance manual.
- Its adjustment certificate.
- Its CE declaration of conformity.

*For dynafor™ Pro with capacities of 100 t and 250 t, the material is delivered in a wooden box.

Adjustment certificate

This document is valid for one year and certifies that the sensor has been adjusted using an internal Tractel® procedure on a calibration bench with a standard sensor connected to the international standard.

Option : Calibration certificate ISO 376

On request, the sensor can be delivered with an ISO 376 calibration certificate up to 50 t.

This document, which is valid for up to 26 months, certifies that the product has been calibrated in accordance with ISO 376, on a calibration bench whose standard sensor is connected to the international standard.

The technologies implemented at the levels of radio and software offer, in addition to the traditional uses expected of a dynamometer, multiple configuration possibilities that combine several sensors. They also provide access to advanced functions such as recording, threshold management and monitoring.

The option of a PC link via a USB port opens the door to data management and archiving.

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The different possible combinations are described in chapter 4. Associated equipment.

3.2. Operating principle

The operating principle of dynafor™ Pro is based on the measurement using strain gauges of the elongation, within the elastic limit, of a metal body subjected to tensile stress.

The product operates in all directions.

3.3. Markings

See figure 1.

A	Fastening ring
B	Front panel
C	Operation indicator
D	Maximum sensor capacity
E	Sensor body
F	Model
G	On/Off (Start/Stop) button
H	Back plate
I	Cover fixing screw J
J	Battery compartment cover
K	Battery compartment (3 x "AA")
L	Manufacturer
M	Serial number
N	QR code directing to the tracinfo platform containing manual, adjustment certificate and data sheet

4. Associated equipment

The product is compatible with the following equipment:

Lifting accessories:

- Bow shackle
- Swivel hook

Dynafor™	Bow shackle	Swivel hook
Pro 1t	47916	40977 (type A)
Pro 3.2t	47916	40977 (type A)
Pro 6.5t	47926	105567 (type B)
Pro 15t	112427	113227 (type C)
Pro 25t	47946	51207 (type C)
Pro 50t	47956	Custom-made
Pro 100t	38166	Custom-made
Pro 250t	93106	Custom-made

For details of lifting accessories, please refer to the technical sheet, illustration of bow shackles in figure 2, and swivel hook in figure 3.

Lifting accessories not recommended by Tractel® must be correctly dimensioned according to the local regulations in force.

Display devices:

- The dynafor™ HHD remote display unit offers multiple functionalities including the reading and management of 4 sensors up to a distance of 400 m in open air.
Codes: 293609 when purchased simultaneously with a dynafor™ Expert or Pro sensor
Code: 293449 when purchased separately
- AL128 large display unit for high visibility, 128 mm high digits with wireless communication up to 200 m in open air.
Code: 293489

Threshold safety management module:

- dynafor™ monitoring unit (DMU) offering the same functionalities as the dynafor™ HHD remote display unit and allowing up to 5 relays to be controlled.
Code: 293479

Software:

- Loader software for downloading the data recorded on the dynafor™ HHD remote display unit to a computer.
Code: 293509
- Monitoring software allows load values to be displayed, recorded and analysed live for up to 8 sensors. Requires the dynafor™ HHD remote display unit.
Code: 68968
- dynafor™ app for displaying the load value of a sensor from a smartphone or tablet via Bluetooth up to 30 m in open air. Available on iOS and Android.

5. Uses



The supervisor must ensure that a technician is tasked with installing the product. The supervisor must ensure that the operator has reviewed this installation, operation and maintenance manual before they use the product.

5.1. Installing the batteries

The three 1.5 V "AA" batteries are factory installed.

Remove the insulating tab protruding from the battery compartment to activate the batteries. For subsequent battery replacement, please refer to section 7.1. Battery replacement.

5.2. Installation

During installation, it is absolutely necessary to:

1. Make sure that the load line anchor point or points are sufficiently strong for the force that will be applied.
2. Make sure that the lifting accessories at both ends of the product are compatible and comply with applicable local regulations.
3. Correctly lock the shackles by screwing their pin in fully. Lock the clevis hook pin correctly with its safety pin. Make sure that the hook safety catch is present and in good working order.
4. Allow the product to line up freely in the line of force.
5. Check the presence and condition of the batteries in the sensor.
6. Connect the product to the remote display unit or to a smartphone via the Tractel app.
7. Make sure there is a good radio link between the sensor and the display box.

Use the product only with tensile force.

The product may be used in all directions, including horizontally.

The product works satisfactorily in a temperature range of -20°C to +50°C. For use beyond those temperatures, the product must have thermal protection.

5.4.3. Information provided by the sensor LED

Sensor operation MODE	Sensor LED flashing	Measurements per seconds	Battery life
Stop	Off	-	-
Standard	1 flash per second	4 per second	300 h
Economy*	1 flash every 4 seconds	1 every 4 seconds	1,000 h
Sleep	1 flash every 8 seconds	-	3,000 h
Peak load	2 flashes per second	32 per second	100 h
Batteries low.	Identical to separate modes, but one LED at the same time		-

*The factory default setting is to switch automatically to economy mode if there is no load variation (10% of SWL) for 5 minutes. This economy mode is adjustable. See the dynafor™ HHD remote display unit manual.

5.4.4. Operation in multiple and extended configuration



NB: For further details, please refer to the associated equipment manuals defined in chapter 4. Associated equipment

The multiple configuration consists in connecting up to four sensors and one or more display devices. The sensors can have different capacities. (For more than four sensors, the PC connection option is required.)

5.3. Starting up the sensor

Always switch on the sensor before switching on the remote display unit, otherwise the remote display unit will not be able to establish the radio link.

A light impulse on the Start/Stop button located in the centre of the membrane activates the ON/OFF switch. (See figure 4, item G.)

When the power is turned on, the two red LEDs start to flash simultaneously.

5.4. Functions

5.4.1. Operation in basic configuration

Basic configuration consists in using a set made up of a single sensor and a single remote display unit, and/or a single sensor and a smartphone equipped with the dynafor™ App. This set measures and displays the force at the sensor.

5.4.2. Automatic zeroing

When the dynafor™ Pro is switched on, the associated display unit will show "0" providing the measured force is less than 10% of the SWL of the product.

For some applications, it is useful to display the measurements from several sensors on a single dynafor™ HHD remote display unit.

Example: Lifting a load with a spreader bar suspended from two winches, each equipped with a sensor. The grouping together of the two force measurements on a single dynafor™ HHD remote display unit allows the operator to view the two forces and their total value and to check that the load is correctly distributed between the two winches.

Contact Tractel® for any further information on multiple configurations.

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5.5. Turning the product off

To turn the product off, press and hold the Start/Stop button for 2 seconds without pressing too hard.

If there is no load variation, the product will go on sleep automatically after 20 minutes. This automatic sleep preserves the sensor batteries.

The sensor switches back on automatically when a display device is reconnected.

This automatic sleep can be adjusted. See the dynafor™ HHD remote display unit manual.

5.6. Deinstallation

When deinstalling the product, make sure that all tensile forces have been removed beforehand.

Clean the product and store it according to the sections 7.2. Other verifications and 8. Transport and storage.

6. Prohibited uses

THE FOLLOWING ARE FORBIDDEN:

See figure 6

- Using the product in a man-riding system without first carrying out a specific risk analysis.
- Modifying the product.
- Using the product beyond its SWL with static or dynamic forces.
- Arc welding with the product in the ground circuit.
- Exposing the product to any electric and/or electromagnetic shock.
- Disassembling or opening the product.
- Using the product for operations other than those described in this manual.
- Using the product if there is a risk that it may be subjected to compressive, bending or torsional loads.
- Preventing the product being aligned in the line of force.
- Using the product in a highly corrosive environment.
- Using the product in an explosive environment.
- Using the product outside the temperature range of -20°C to 50°C.
- Using the product if it has been subjected to a force above 110% of its SWL.
- Using the product if it does not appear to be in good condition.
- Using the product if the markings are missing or illegible.

- Using the product with stainless steel accessories.

7. Maintenance and periodic verification

7.1. Battery replacement

The LEDs in the centre of the sensor's Start/Stop button flash one after the other when the batteries are emptied.

A warning message is also displayed on the remote display unit. They need to be replaced.

- Using a Philips screwdriver, remove the battery compartment cover.
- Replace the three "AA" 1.5 V batteries with new ones, minding the polarities.
- Put back the battery compartment cover and tighten the fixing screws so that the cover is flush with the edge of the battery compartment.

7.2. Other verifications

Tractel® recommends periodically inspecting the visual condition of the product and cleaning the sensor regularly with a dry cloth.

Tractel® also recommends annual recalibration (for adjustment see section 3.1. Presentation) before the valid certificate expires.

Tractel® can provide these services on request.

8. Transport and storage

During storage and/or transport, the product must be:

- Packed in its original packaging with the batteries removed
- Stored in a dry location
- Stored at a temperature between -20°C and 60°C
- Protected from chemical, mechanical or any other type of attack.

9. Product disposal and environmental protection

The product must be disposed of in accordance with the regulations applicable in the country of use.

The product complies with the requirements of the REACH regulation and the RoHS directive; it is not covered by the WEEE directive.

The different product components must be recycled on the basis of the table below, after separating metal and synthetic materials. These materials must be recycled by specialist organisations.

At the time of disposal, only trained individuals may dismantle the product to separate its components.

Component	To be treated as a waste of the type
Product body	Aluminium
Electronic housing (plastic)	Ordinary waste
Printed circuit board and display	Electronics
Batteries	Accumulator

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10. Technical specifications

Model		Pro 1	Pro 3.2	Pro 6.5	Pro 15	Pro 25	Pro 50	Pro 100	Pro 250
SWL	t	1	3.2	6.5	15	25	50	100	250
Safety coefficient		> 4							
Accuracy	+/-%	0.2% EM à 21 °C							
	+/- kg	2	6.4	13	30	50	100	200	500
Resolution	kg	0.2	0.5	1	5	10	20	50	100
Measurement frequency	Hz	4 Hz-32 Hz in peak load mode – 1 Hz in economy mode							
Max. display	%	110% de la SWL							
Battery life	h	300 to 1,000 depending on use							
RF (radio frequency) technology		2.4 GHz – 2.4835 GHz owner, range up to 400 m in open air							
RF radio power output	dBm	9.5							
Bluetooth technology		BLE 4.0 (2.4 GHz – 2.4835 GHz), range up to 30 m in open air							
BLE radio power output	dBm	7.71							
Weight	kg	0.70	0.86	1.60	3.66	5.33	11.45	27.48	97.98
IP rating		IP 64 (IP 67 as option)							
Operating temperature	°C	-20 °C à +50 °C							
Sensor material		Aluminium				High strength Aluminium			
Batteries		3x AA							
Dimensions (see figure 5)									
A	mm	216	216	248	319	357	446	559	797
B		192.8	193.8	214.1	269.8	301.6	371.2	454.2	609.1
C		21.5	21.5	28.8	46.5	57.4	78.8	107.6	162.1
D		79	92	113	119	132	152	196	329
E		23	23	32	51	61	90	129	180
G		39	39	39	62	65	91	133.5	Irrelevant

11. Regulations and standards

The product described in this manual complies with the following:

European standards

Machinery Directive 2006/42/EC
Directive 2014/53/EU (RED)

Reference of radio standards
EN300440 V2.1.1

EN300328 V2.2.2
ETSI 203367 V1.1.0

Reference of health standards
EN62479 (2010)

Reference of EMC standards
EN61326-1 (2013)
EN301 489- 1 & 17

Reference of electrical safety standards
IEC/EN61010-1 (Amd 1 ed. 3)

Australian and New Zealand standards

Reference of electrical safety standards
AS/NZ61010-1

Russian standards

Reference of EMC and electrical safety standards
Technical regulation CU TR 020/2011

International standards

IEC 61326-1 ed. 2: 2012
IEC 61311: 2007

American and Canadian standards

Reference of radio standards
FCC section 15
RSS-GEN & RSS-210

Reference of EMC standards
FCC section 15
ICES-003

NB: This equipment has been tested and deemed to comply with the limits for a class A digital device, pursuant to section 15 of the FCC regulations. These limits are designed to provide reasonable protection against harmful interference when the equipment is

used in a commercial environment. This equipment generates, uses and can emit radio waves, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference, in which case the user must eliminate the interference at his or her own expense.

NB: This product complies with Industry Canada's RSS applicable to licence-exempt radio apparatus. The equipment may be operated under the following two conditions: (1) it must not cause any interference, and (2) the user of the device must be prepared to accept any radio interference received, even if such interference is likely to affect the operation of the device.

In accordance with Industry Canada regulations, this radio transmitter may be operated with an antenna of a type and maximum gain (or less) approved for the transmitter by Industry Canada.

To reduce the risk of radio interference for other users, the type of antenna and its gain should be chosen so that the equivalent isotropic radiated power (e.i.r.p.) does not exceed the intensity required to establish satisfactory communication.

12. Troubleshooting

Problems	Possible causes	Remedies
The sensor does not turn on	Batteries empty.	Replace the batteries.
	Defective electronics.	Contact Tractel®
Sensor LED flashing at 4 Hz (4 times a second)	No communication between the sensor and its printed circuit board.	Contact Tractel®

For any other issues related to the remote display unit, see the manual.

13. Declaration of conformity

Copy of the declaration of conformity in the appendix