INTANGLES
INGENIOUS

Data Sheet

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INTANGLES™
A DIGITAL TWIN COMPANY

www.intangles.ai

Ingenious, an advanced portable device, is at the heart of the Digital Twin technology and is an enabler in creating a digital replica of physical assets, processes, or systems, either on the cloud or on the device itself. Based on real-world requirements, the device is configured to acquire a multitude of data from different sensors. Its powerful quad-core processor and built-in data transmission capability, either through 4G/LTE, Bluetooth or Wi-Fi, enables the data to be processed on the device or the cloud. The core objective of this solution is to leverage physics & machine learning-based predictive analytics to impact the total cost of ownership (TCO), improve operational efficiency, enhance the end-user experience through an intuitive web and mobile-based app and stay connected to your asset 24x7. From monitoring asset health to insightful reporting to raising alerts of various severity levels, the solution is a companion to fleet operators.

Vehicle Health Monitoring

Intangles' Ingenious uses historical and real-time data to deliver warnings/alerts of possible failures, significantly reducing vehicles' on-road breakdowns, thereby increasing operational hours and lowering maintenance/repair costs. With Ingenious, you have the necessary information related to fault codes that may arise in your vehicles, whether minor, major, or critical, at your fingertips. You can look at remedies depending on the severity. Along with faults, our proprietary predictive algorithms, coupled with machine learning, help fleet operators conduct preventive and proactive maintenance, making sure your vehicles stay healthy. A significant advantage of the vehicle health monitoring feature is to raise alerts and communicate via texts or web portals long before the ECU displays a diagnostic trouble code on the vehicle's dashboard.

Driver Behavior Monitoring

Intangles' comprehensive solutions track more than 20 exceptions in driver behavior, like overspeeding, idling, hard braking, and free running, to name a few, which helps generate actionable insights. Our Driving Scorecard feature is an automated peer-to-peer ranking model that enables you to promote and incentivize good driving behavior. It provides accurate feedback on gear utilization trends, idling instances, and other erroneous driving practices, thereby improving fuel efficiency and the overall health of your vehicle.

Fuel Monitoring

Intangles' patented Machine Learning-based fuel tracking algorithms detect the exact amount and location of fillings/pilferages and, in turn, help compute the accurate cost per km of fuel consumed. In addition, the fuel monitoring solution does not need an external sensor to be mounted on the fuel tank, obviating calibration and long installation times.

DEF Tracking

Ingenious tracks the usage and level of AUS-32 (also known as Diesel Exhaust Fluid, AdBlue, or Urea) in vehicles that use Selective Catalytic Reduction (SCR) technology. It also detects pilferage and monitors consumption, allowing you to have real-time visibility over the usage of AUS-32 in your vehicles.

Operations Automation

Ingenious is known on many occasions to preempt critical engine breakdowns resulting in lower downtimes and maintenance costs. Insights on optimized route management and application-specific performance aggregates help you better plan your operations with a focus on higher margins. Fuel pilferage alerts enable a direct reduction in trip overheads. Smart reporting reduces dependency on manpower. You can leverage our suite of ML and deep learning-based algorithms to analyze real-time data obtained from your vehicles and experience proactive service in the truest sense.

Range Prediction

Our comprehensive feature sets around cloud-integrated range prediction provide data on the number of charging cycles from the moment our device is installed on the vehicle, as well as extrapolated historic charging cycles data from the moment the vehicle rolls out from the manufacturing line. Ingenious also provides accurate SOC and DTE predictions considering varying ambient and driving conditions. In addition to weather forecasts, our models have been trained to make predictions considering motor torque, vehicle speed, ambient temperature and sunset-sunrise trends which influence the use of HVAC and lighting. This multi-parametric approach enables consistently accurate range predictions across dynamic driving ecosystems.

Location Tracking

Intangles' Ingenious provides real-time location tracking of your fleet. It keeps you informed about the live location of your vehicles, activity status, fluid levels (fuel and exhaust fluid), and active service reminders. It enables you to optimize your routes, allocate resources effectively, and enhance overall operational efficiency.

- Model Name: **System Health Monitoring Device**
- Variant 1 Model Number: INT-SHMD-V1.0I
- Variant 2 Model Number: INT-SHMD-V1.0E

OBD Device Technical Specifications and Features

Communication		
Network Modes	Regions: EMEA, SEA, Australia, NZ LTE-FDD: B1, B3, B7, B8, B20, B28 LTE-TDD: B38, B40	
SIM	Replaceable Micro SIM/eSIM	
Antenna	Internal: Wide Band Flexi Antenna External: SMA Connector + Wide Band Wired Antenna	
Packet Data	Supports: TCP/UDP/PPP/NTP/ NITZ/FTP/HTTP/PING/CMUX/ HTTPS/FTPS/SSL/FILE/MQTT/ MMS Protocols	
SMS	Text messages for data forwarding Text and PDU mode	
Items	Maximum radio-frequency power	
Bluetooth	Bluetooth BR/EDR (2402-2480 MHz)	7.4 dBm
	Bluetooth -LE (2402-2480 MHz)	7.24 dBm
GSM	DCS1800	30 dBm ±2 dB(PCL=0)
LTE	Band 1 (1920-1980 MHz)	Class 3 (23 dBm ±2 dB)
	Band 3 (1710-1785 MHz)	Class 3 (23 dBm ±2 dB)
	Band 7 (2500-2570 MHz)	Class 3 (23 dBm ±2 dB)

Communication		
LTE	Band 8 (880-915 MHz)	Class 3 (23 dBm ±2 dB)
	Band 20 (832-862 MHz)	Class 3 (23 dBm ±2 dB)
	Band 28 (703-748 MHz)	Class 3 (23 dBm ±2 dB)
	Band 38 (2570-2620 MHz)	Class 3 (23 dBm ±2 dB)
	Band 40 (2300-2400 MHz)	Class 3 (23 dBm ±2 dB)

GNSS	
Technology (L86)	GPS + GLONASS
Technology (EC200UEU)	GPS + GLONASS + BDS + Galileo
Sensitivity (Tracking)	-167 dBm
Acquisition (Normal)	Cold Start <35s Warm Start <30s Hot Start <1s
Antenna	Internal: Patch-on-top Antenna External: SMA Connector + Wide Band Wired Antenna

Interfaces	
CAN	Standard CAN 2.0 up to 1 Mbps Data Protocols: ISO 15765, SAE J1939-21, SAE J1939-FMS Diagnostic/Application Protocols: Standard OBD2, WWH-OBD, UDS (ISO 14229), KWP (ISO 14230)
RS485	MODBUS, J1708
K-line	Data Protocols: ISO 9141, ISO 14230
I/O	Digital I/O: 2 Analog I/O: 6

Power	
Input Voltage	8V to 32V, supports both 12V and 24V electrical systems
Average Current Consumption	190 mA for 12V System and 100 mA for 24V System
Internal Battery	Lithium-Ion Cell - 3.6V, 2550 mAh Protections: Overcurrent, Overcharge, and Over-Discharge
Sleep Current	4 mA for 24V system 6.5 mA for 12V system

Storage	
Internal Memory for User Data	Upto 1.5 MB
External Flash Memory	Upto 32 MB

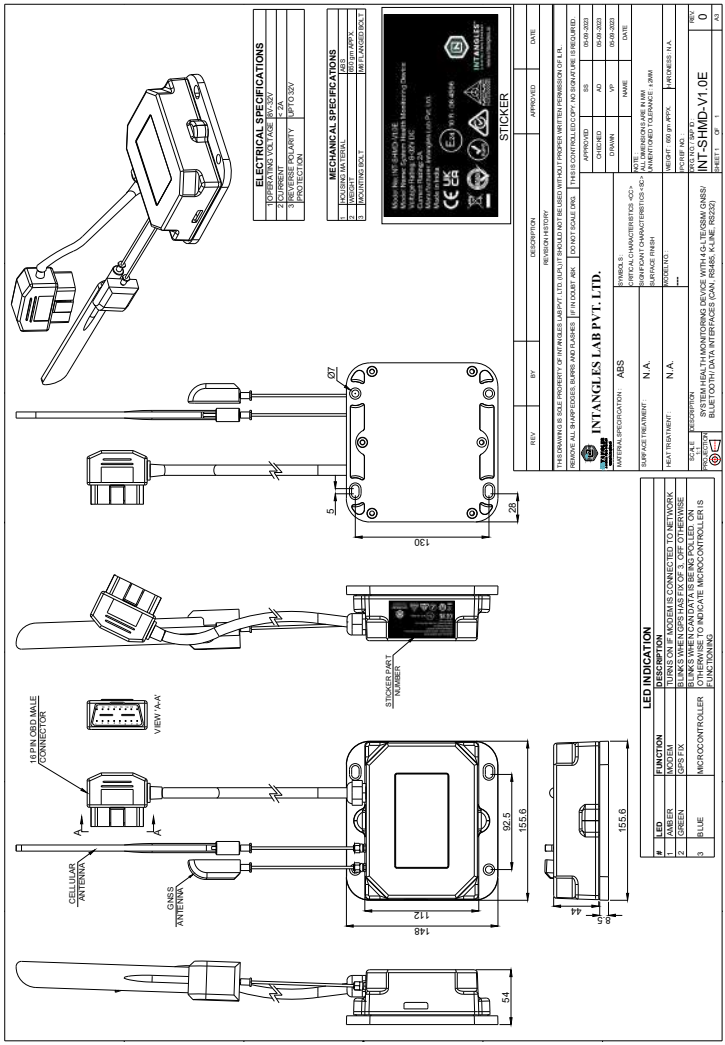
Vehicle Environment Immunity	
Immunity	Compliant with ISO 7637

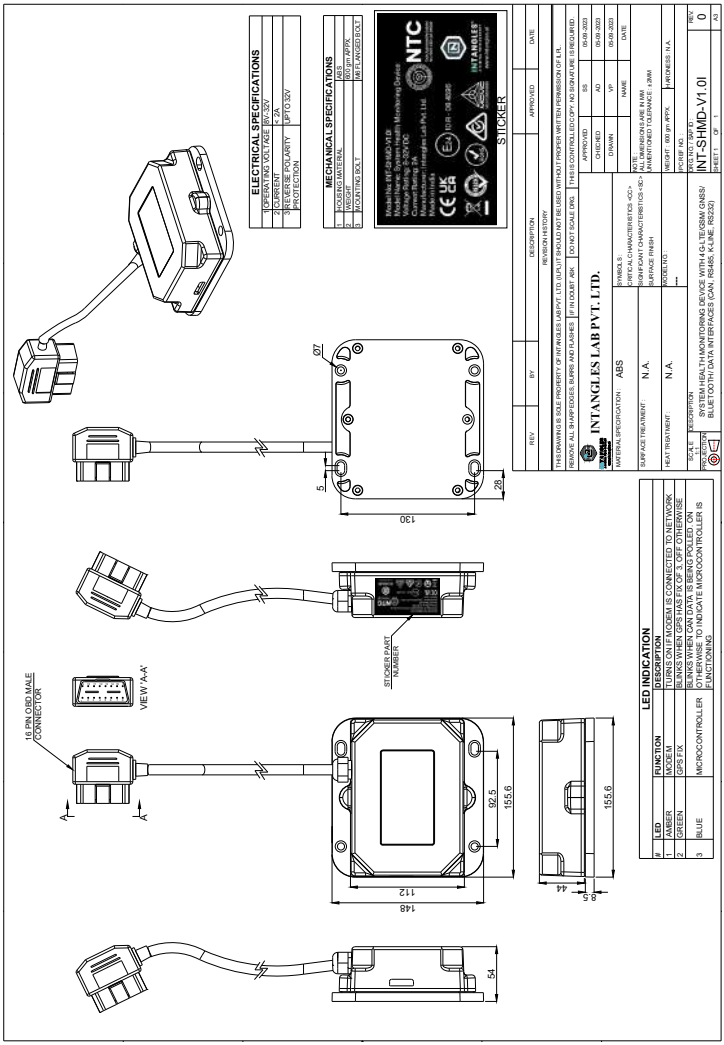
Environment	
Power Transients	ISO 7637 Test level IV
Temperature (Operation)	-40 °C to +85 °C
Temperature (Storage)	-20 °C to +70 °C
Ingress Protection	IP65
Vibration/Impact	Vibration - Frequency: 10-55-10 Hz Amplitude: 1.5 mm Amplitude Shock - 50 g
Mounting	Double-sided Adhesive Tape or M6 Bolts

Certifications	
Certifications	CE, REACH, WEEE, ECE R10, RCM, RoHS, NTC, SIRIM Compliant

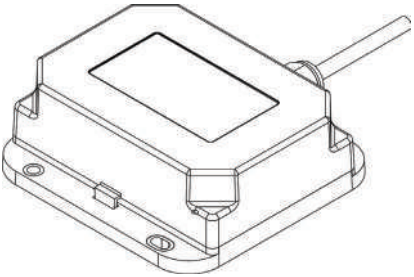
Over-the-Air (OTA) Support	
Firmware Updates	For New Features, Custom Applications and Maintenance
Parameters	For Enabling or Disabling Additional Features Sending Configuration Settings

Mechanical	
Dimensions	155.6 x 148 x 54 mm
Weight	23 oz / 650 grams approx
Housing	ABS





Product Overview



Device Identification

A device is identified by its unique IMEI number available on the stickers pasted on the device, as shown in the red box in the image below. Note it down and keep it handy for future communication with the Intangles Support Team.

Device Installation Prerequisites

Check the device compatibility matrix using the link below:

https://www.intangles.ai/device-compatibility-matrix/

or scan this code:

to verify if the device supports your vehicle. Ensure you have the correct diagnostic connector or adaptor.

Before installing the device, please record the device's IMEI number. The IMEI number is a unique number and is used to verify the communication status of the device.

Ensure no warning lamps on the vehicle's instrument panel are on while it is running and other components, such as headlamps and indicators, switches, etc., are functioning as expected prior to installing the device. If all functions are behaving normally, proceed with the installation.

SAFETY INSTRUCTIONS

- ⚠ DO NOT OPEN THE UNIT
- ⚠ DO NOT OBSTRUCT THE TOP SIDE OF THE UNIT
- ⚠ DO NOT DISPOSE OFF THE UNIT IN FIRE
- ⚠ DO NOT CONNECT THE UNIT IF IT IS CRACKED OR DAMAGED

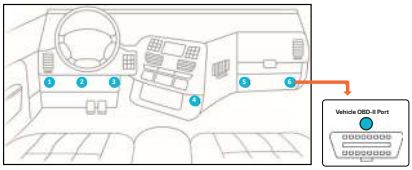
Installation Instructions

Ensure that it is safe to install the device on the vehicle. Please make sure that:

- The vehicle is at a standstill.
- The parking brake is engaged.
- The engine is turned off.

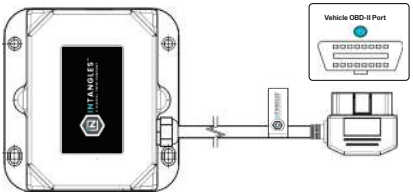
Locate the OBD-II port:

The OBD-II port is usually located under the dashboard or beneath the steering wheel column. If not located beneath the steering column, look for the port in the areas indicated in the image below or refer the OEM's user's manual to locate the OBD-II port.



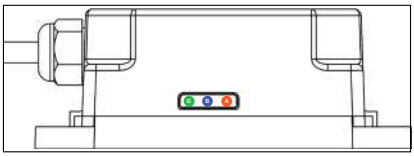
Connect the device to the OBD-II port:

Connect the "device OBD-II port (male connector)" to the "vehicle OBD-II port (female connector)" as indicated in the image. Please ensure that the device is well connected to the diagnostic port.



Note: You may require a vehicle-specific adapter cable to connect the device to the vehicle's OBD-II port. Refer to the adapter cable table and find the cable compatible with your vehicle.

Once the device is connected and receives power, the Blue LED will turn on. The behavior of each LED is as mentioned below:



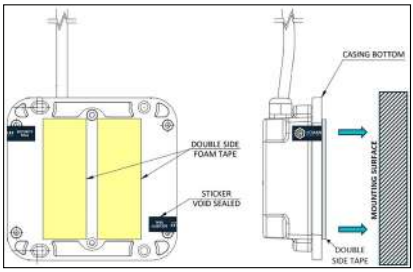
AMBER: Turns on when the device is connected to the network.

BLUE: Blinks when vehicle data is being polled.

GREEN: Blinks at 1 Hz when the device has a GPS 3D fix.

Device mounting:

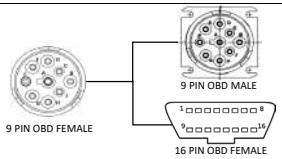
To mount the device, you can use double-sided adhesive tape or M6 bolts to secure the device onto a bracket at a suitable location in the vehicle.



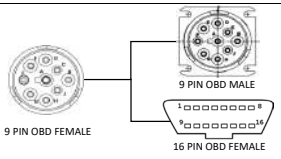
Note: If you are deploying the device under the dashboard, ensure that the top side of the device has enough clearance to ensure GPS

connectivity. Do not place the device near a source emitting radio frequency (e.g. infotainment, central door locking, etc), as it can adversely affect GPS performance.

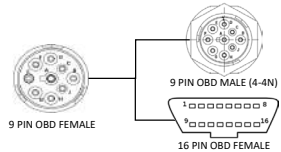
Adapter Cable Table



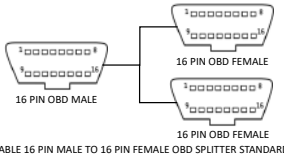
FGCABXXXAA02: CABLE 9 PIN FEMALE TO 9 PIN MALE AND 16 PIN FEMALE OBD SPLITTER ONLY CAN



FGCABXXXAA00: CABLE 9 PIN FEMALE TO 9 PIN MALE AND 16 PIN FEMALE OBD SPLITTER STANDARD



FGCABXXXAA20: CABLE 9 PIN FEMALE TO 9 PIN MALE 4-4N AND 16 PIN FEMALE OBD SPLITTER ONLY CAN



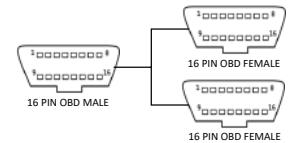
CABLE 16 PIN MALE TO 16 PIN FEMALE OBD SPLITTER STANDARD #
FGCABXXXAA12: # WITH ALL MOULDED CONNECTORS
FGCABXXXAA13: # WITH CLICK-FIT CONNECTORS
FGCABXXXAA24: # WITH FLANGE MOUNT BRACKET
FGCABXXXAA25: # WITH 15 ADAPTERS

CIRCUIT APPLICABLE FOR FGCABXXXAA02/20

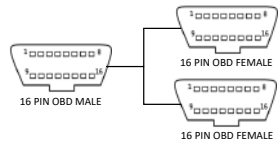
	9-Pin Female	9-Pin Male	16-Pin Female	Voltage wrt Ground
GROUND	A	A	4/5	0
BATT +	B	B	16	12/24
CAN Hi	C	C	6	2.6 to 3
CAN Lo	D	D	14	2 to 2.4
1708-A	F	F	3	4
1708-B	G	G	11	1

CIRCUIT APPLICABLE FOR FGCABXXXAA00/12/13/24

	9-Pin Female	9-Pin Male	16-Pin Female	Voltage wrt Gnd
GROUND	A	A	4/5	0
BATT +	B	B	16	12/24
CAN Hi	C	C	6	2.6 to 3
CAN Lo	D	D	14	2 to 2.4
1708-A	F	F	12	4
1708-B	G	G	13	1



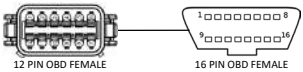
FGCABXXXAA23: CABLE 16 PIN MALE TO 16 PIN FEMALE OBD SPLITTER 1708 DISABLED



FGCABXXXAA22: CABLE 16 PIN MALE TO 16 PIN FEMALE OBD SPLITTER SINOTRUK SITRAK

	16-Pin Female For Scan Tool	16-Pin Female For Telematics	Voltage wrt Gnd
GROUND	4/5	4/5	0
BATT +	16	16	12/24
CAN Hi	6	6	2.6 to 3
CAN Lo	14	14	2 to 2.4
1708-A	12	12-NO WIRE	4
1708-B	13	13-NO WIRE	1

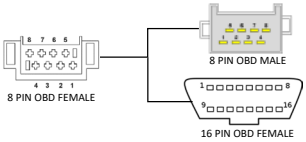
	16-Pin Female For Scan Tool	16-Pin Female For Telematics	Voltage wrt Gnd
GROUND	4/5	4/5	0
BATT +	16	16	12/24
CAN-1 Hi	6	3	2.5
CAN-1 Lo	14	11	2.5
CAN-2 Hi	11	6	2.6 to 3
CAN-2 Lo	12	14	2 to 2.4



12 PIN OBD FEMALE 16 PIN OBD FEMALE

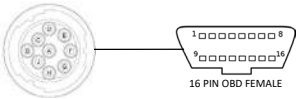
FGCABXXXAA18: CABLE 16 PIN FEMALE TO 12 PIN FEMALE OBD KOMATSU

	12-Pin Female	16-Pin Female	Volt wrt Gnd
GROUND	9/12	4/5	0
BATT +	1	16	12/24
CAN Hi	3	6	2.6 to 3
CAN Lo	10	14	2 to 2.4



8 PIN OBD FEMALE 8 PIN OBD MALE 16 PIN OBD FEMALE

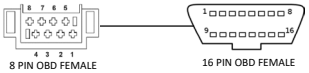
FGCABXXXAA14: CABLE 8 PIN FEMALE TO 8 PIN MALE AND 16 PIN FEMALE OBD SPLITTER VOLVO



9 PIN OBD FEMALE 16 PIN OBD FEMALE

FGCABXXXAA08: CABLE 16 PIN FEMALE TO 9 PIN FEMALE OBD CATERPILLAR

	9-Pin Female	16-Pin Female	Voltage wrt Ground
GROUND	B	4/5	0
BATT +	A	16	12/24
CAN Hi	G	6	2.6 to 3
CAN Lo	F	14	2 to 2.4
1708-A	J	12	4
1708-B	H	13	1



8 PIN OBD FEMALE 16 PIN OBD FEMALE

FGCABXXXAA10: CABLE 16 PIN FEMALE TO 8 PIN FEMALE OBD VOLVO

CIRCUIT APPLICABLE FOR FGCABXXAA10/14

	8-Pin Female	8-Pin Male	16-Pin Female	Voltage wrt Ground
GROUND	1	1	4/5	0
BATT +	8	8	16	12/24
1708-A	4	4	12	4
1708-B	7	7	13	1

WARNING!

- Power supply for the VHMS should be between 8V and 32V.
- The device should be placed atleast 1 m away from the operator.
- Do not attempt to install, reconfigure, or remove any product from the vehicle while the vehicle is in motion. This could result in malfunctions or collisions, leading to serious personal injury. In case of malfunction, park the vehicle, and then remove the device.
- The device can malfunction if the conditions are not met according to the mentioned technical specifications[Pg. 4-7].
- Read and understand all instructions prior to using this product.

Maintenance, Spares, Repair and Service

The equipment is designed to be a plug-and-play device. As such, there are no user-serviceable parts. In the case of a malfunction, contact the Intangles Support Team.

Warranty

Intangles Lab Pvt. Ltd. provides a limited warranty to the equipment purchaser at the point of sale. Contact the Intangles Support Team for full details of any applicable warranty.

Limitations of Use

Location mapping and vehicle tracking features available through the software are dependent on third-party providers and the availability and accuracy of the Global Positioning System ("GPS") operated by the United States government.

Third-party mapping and GPS data and services are subject to changes. Device communication features may be interrupted or inoperable if a vehicle travels outside a network coverage area or where there is a fault or service interruption with the carrier. Device communication also requires the transmission of data through the internet. Failure in internet access will result in the interruption of communications. As a result, the product and related software and services are not designed or intended as the primary means used in an emergency or fail-safe situations, including, without limitation, situations: (A) where a failure of same may result in a risk of property damage, death or personal injury; (B) where the product, software or services are used to alert others upon the occurrence of certain vehicular events recorded by the device; or (C) where the product is used as part of a fail-safe design for dangerous or emergency applications or as part of control measures required for hazardous materials, life support systems, munitions or weapons.

CE Statement

This device meets the EU requirements on the limitation of exposure of the general public to electromagnetic fields by way of health protection. The device complies with RF specifications when the device is placed at 20 cm from your body.

Important note:

Radiation Exposure Statement: This equipment complies with CE radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

NOTE IMPORTANTE

Pour l'utilisation de dispositifs mobiles Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements CE établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

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