



REALWEAR NAVIGATOR Z1

User Guide



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REALWEAR NAVIGATOR Z1



The RealWear NAVIGATOR Z1 is hands-free Android™ tablet class wearable computer for industrial workers and is an intrinsically safe ATEX Zone 1 and CSA C1/D1 certified fully rugged head-mounted device.

The RealWear NAVIGATOR Z1 provides the foundation for Connected Worker programs.

Use it in wet, dusty, hot, dangerous, and loud industrial environments.

It optionally snaps into safety helmets or attaches to bump caps and can be used with safety glasses or corrective eyewear.

The high-resolution micro display fits just below your line of sight. It's an industrial dashboard: there when you need it and out of your way when you don't.

The NAVIGATOR Z1 works with powerful software applications from our solution partners in four core categories, each optimized for completely hands-free voice control. That means no scrolling, swiping, or tapping - just simple voice commands.

Use it for remote mentor video calling, document navigation, guided workflow, mobile forms and industrial IoT data visualization.

NAVIGATOR Z1 Features



Intrinsically Safe
IECEX ZONE1, ATEX ZONE 1 AND CSA C1/D1



100% Hands free
Voice based operating system with local speech recognition in loud areas.



Powerful Audio
Integrated speaker and 3.5mm audio jack for use with hearing protection.



Unmatched Noise Cancellation
The NAVIGATOR Z1 uses four microphones and advanced algorithms to perform noise cancellation prior to voice recognition.



PPE Compatible
Designed to work with standard hard helmets, bump caps and safety glasses.



Full-Shift Battery
8–10 hours with typical use.



Outdoor Display
Viewable in bright sunlight.



Waterproof
IP66 – Protected against heavy seas or powerful jets of water.



Dust Tight
IP66 – Complete protection against the ingress of micro particles.



Drop Proof
Resistant to 2-meter drops onto concrete from any angle.



Built Rugged
Fully operational from -20° C to +55° C.

NAVIGATOR Z1 Product Specifications

Core Platform & Functions

Qualcomm® QCS6490 - Kryo 670 CPU built on Arm v8 Cortex technology; 6th gen Qualcomm AI Engine; Adreno 643 GPU at 812 MHz

Included Applications

Document Navigator, Camera with Barcode Reader, Audio Recorder, Video Recorder, Webpage Viewer, Cloud Sync, Media Player, Calculator, Pedometer, Timer

Languages Supported

Chinese (Cantonese, Mandarin-Simplified and Traditional), Czech, Danish, Dutch, English (American, Australian, British, Indian), French, German, Indonesian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Spanish, Thai, Turkish

Memory

128 GB Internal Storage / 8 GB RAM

Operating System

Android 12 (AOSP) + WearHF™ hands-free interface

Connectivity & Sensors

Bluetooth

Bluetooth Low Energy 5.2

Wi-Fi

Wi-Fi 6E - IEEE 802.11 a/b/g/n/ac/ax – 2.4GHz and 5GHz, 6GHz

GPS and Location

GPS, GLONASS, NavIC, BeiDou, Galileo, QZSS, SBAS

IMU

9-DOF (3-axis accelerometer, magnetometer, and gyroscope), software enhanced stabilization

Battery

Capacity

2550 mAh Li-Ion; removable and rechargeable (Outside of Zone 1)

Battery Life

Full shift (8-10 hours) with typical use

Physical Characteristics

Weight

379 g

Ruggedization

Intrinsically Safe, 2-meter drop, IP66, MIL-STD-810H

Dedicated Keys

Power key, application-specific Action key

Ports

3.5mm audio, 1 USB-C for data and charging

Boom Arm

Adjust six ways for all head sizes, left or right eye compatible, display flips out of the way when not in use

Display

Type

24° field-of-view, 24-bit color LCoS, 0.35 inch diagonal, outdoor visible

Resolution

HD (1280x720)

Audio

Microphone

4 digital microphones with active noise cancellation

Accurate voice recognition even in 100 dBA of typical industrial noise

Speaker

Internal 91 dB loudspeaker

Multimedia

Camera

48 MP Sensor, PDAF with LED flashlight, modular (removable outside of Zone 1)

Video

Up to 1080p @ 60fps, >6X zoom in HD, video stabilization. codecs: VP8, VP9, H.264, H.265 HEVC

Accessories

Includes Intrinsically Safe inline safety box charging cable, Works with most Navigator accessories including mounting solutions, Intrinsically Safe hearing protection, replacement clips, and more. Not all accessories are rated for IS zones.

Introduction: Understanding Intrinsically Safe Devices and Their Use in Hazardous Locations

Background

RealWear launched a model of its award-winning ruggedized head-mounted wearable computer for industry called the RealWear Navigator Z1 (hereafter referred as the "NAVIGATOR Z1"). The NAVIGATOR Z1 is deemed "Intrinsically Safe."

Introduction

While much has been written about operating equipment safely, there has been far less literature written on the equipment itself that must be used. This white paper attempts to explain simply what it means for a product to be deemed intrinsically safe, and what type of certification is necessary to effectively reduce the risk of an explosion. Choosing the right certified equipment for the right job is an important task of every buyer.

Company disclaimer

This paper should serve only as a primer and other documents and expertise is required for final purchasing decisions.

What does Intrinsically Safe mean?

Intrinsic safety is a design approach to make an equipment safe to be used in a hazardous location. Hazardous locations are the areas where flammable liquids, gases or vapors or combustible dust exist in sufficient quantities to produce an explosion or fire. In hazardous locations, specially designed equipment must be used to protect against the potentially explosive environments. These devices which can be used in the potentially explosive environments without causing an explosion are called Intrinsically Safe devices. The intrinsically safe design technique is based on limiting energy, electrical and thermal to a level below that required to ignite a specific hazardous atmospheric mixture.

What is an Explosion?

An explosion is a rapid increase in volume and release of energy in an extreme manner, usually with the generation of high temperatures and the release of gases. There are three elements which must be present to cause an explosion:



Figure 0: Three Required Elements for Occurrence of an Explosion

1. Ignition Source

An ignition source is an element which can cause a fire or explosion. Open flames, sparks, static electricity and hot surfaces are all possible ignition sources.

2. Flammable substance

Flammable substances are those gases, liquids and solids that will ignite and continue to burn in air if exposed to a source of ignition.

3. Oxidizer

An oxidizer is a kind of chemical whereby fuel is required to burn. An oxidizer must be present in sufficient quantity in combination with the flammable substance to produce an explosive mixture. The most common oxidizer is air (O₂). Industries like refineries, chemical plants, paint shops, mills, flour silos, tanks, cleaning facilities, and loading facilities for flammable gases, liquids, and solids are the places where explosions occur frequently.

How to eliminate/minimize the possibility of an explosion?

As mentioned above, there are three elements which must be present to cause an explosion. If one of these elements is eliminated, ignition will not occur. In hazardous locations, flammable substances and oxidizers cannot be eliminated with certainty. Therefore, inhibiting ignition of a potentially explosive atmosphere can eliminate danger at the source. The intrinsically safe device limits the electrical energy at potential sources of ignition in electrical circuits (hot components and spark sources) to such low levels that – even under abnormal (fault) conditions – there is no possibility of the electrical energy igniting an explosive atmosphere.

How to tell if equipment is legitimately safe to be used in hazardous locations?

An intrinsically safe product must go through a rigorous set of tests put forth by experts in the field of safety. Products that stand up to these standards and pass these tests are considered “Intrinsically Safe Certified.”

There are many different authorized agencies that certify intrinsically safe equipment. The European certification is called ATEX; the North American standard is the NEC500, which can be applied for through UL, FM, CSA or QPS, for example. An international procedure for the certification of electrical equipment across the globe is called IECEx. Any equipment that is used in hazardous locations should be certified by one of these well-known systems and agencies.

What is ATEX?

ATEX is an abbreviation for “ATmosphere EXplosible”. At the same time, ATEX is the abbreviated name of the European Directive 2014/34/EU concerning the placing on the market of explosion-proof electrical and mechanical equipment, components and protective systems.

It also covers safety devices, controlling devices and regulating devices intended for use outside potentially explosive atmospheres but required for, or contributing to, the safe functioning of equipment and protective systems with respect to the risks of explosion.

Equipment and protective systems which fall under Directive 2014/34/EU may be placed on the market only if they bear a CE mark and are accompanied by an EC attestation of conformity certifying that the basic health and safety requirements have been met and that the applicable conformity assessment procedures have been observed.

Classification of Zones

According to Directive 2014/34/EU, a potentially explosive area is a space in which the atmosphere could become explosive on account of the local and/or operational conditions. An explosive atmosphere is defined as a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapors, mists or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture. In North America, hazardous locations have traditionally been defined by a combination of classes and divisions as follows:

Hazard - Gas / vapor / mist	
Zone 0	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist <u>is present</u> continuously or for long periods or frequently
Zone 1	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist <u>is likely</u> to occur in normal operation occasionally
Zone 2	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist <u>is not likely</u> to occur in normal operation but, if it does occur, will persist for a short period only



Figure 1: Zone Classification for Gas/Vapor/Mist

Dust clouds in the explosive region (above the minimum explosible concentration) are categorized into 3 zones, based upon the grade of release.

Hazard - Powder / dust	
Zone 20	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air <u>is present continuously, or for long periods or frequently</u> .
Zone 21	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air <u>is likely to occur in normal operation occasionally</u> .
Zone 22	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

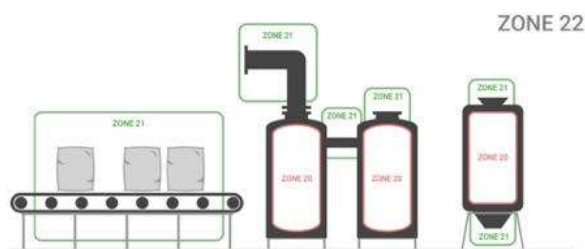


Figure 2: Zone Classification for Combustible Dust/Powder

What is IECEx?

International Electrotechnical Commission System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres (IECEx System)

IECEx is a voluntary system which provides an internationally accepted means of proving compliance with IEC standards. IEC standards are used in many national approval schemes and, as such, IECEx certification can be used to support national compliance, negating the need in most cases for additional testing.

Benefits of IECEx

Because countries operate under different standards, “Ex” equipment often needs to be re-tested and re-certified to the appropriate standards of that country, adding to the cost of the equipment. The IECEx scheme significantly reduces the need for re-testing and certification by conforming to international IEC standards and therefore makes international trade easier, quicker and more cost-effective.

IECEx Process

CSA Group and Sira Certification Service are both Accepted Certification Bodies (ExCB) and Test Laboratories (ExTL) and, as such, can assess a product to the relevant standards, resulting in the compilation of an IECEx Test Report (ExTR) and IECEx Certificate of Conformity (CofC).

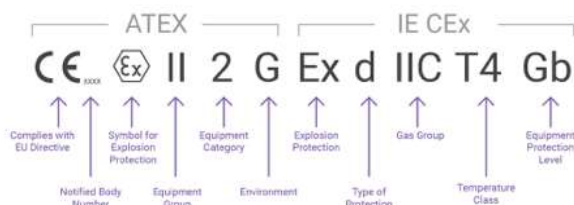


Figure 3: Typical ATEX and IECEx Markings

What is CSA?

CSA stands for the Canadian Standards Association. The organization, CSA International, is recognized throughout North America and Europe. Like other certification companies, it tests consumer and business products to see how it responds to certain situations and types of wear.

CSA uses the same classification of hazardous locations set forth by the NEC, which breaks hazardous locations into classes and divisions. CSA also accounts for the European zones, which are equivalent to divisions. For example, in North America, you may see it stated as, "Class 1, Division 1", while in Europe, you will see it stated as, "Class 1, Zone 1". It is also seen abbreviated as, "C1/D1", "C1D1," or "C1-D1."

What is NEC500?

The National Electrical Code (NEC), is a regionally adoptable standard for the safe installation of electrical equipment in the United States. NEC500 refers to Article 500 in NEC. A hazardous (classified) location is defined as an area where the possibility of fire or explosion can be created by the presence of flammable or combustible gases or vapors, combustible dust, or easily ignitable fibers/filings. Electric arcs, sparks, and/or heated surfaces can serve as a source of ignition in such environments. Article 500 provides a foundation for applying Article 501 (Class I Locations), Article 502 (Class II Locations), Article 503 (Class III Locations), and Article 504 (Intrinsically Safe Systems)—all of which immediately follow Article 500.

The NEC organizes flammability properties into Class I, II, and III, in Article 501, 502, and 503, respectively. It defines and describes these in Article 500 (OSHA also defines and describes these). Article 500 is the basis for all hazardous location work and the related Articles that follow it (see Figure).

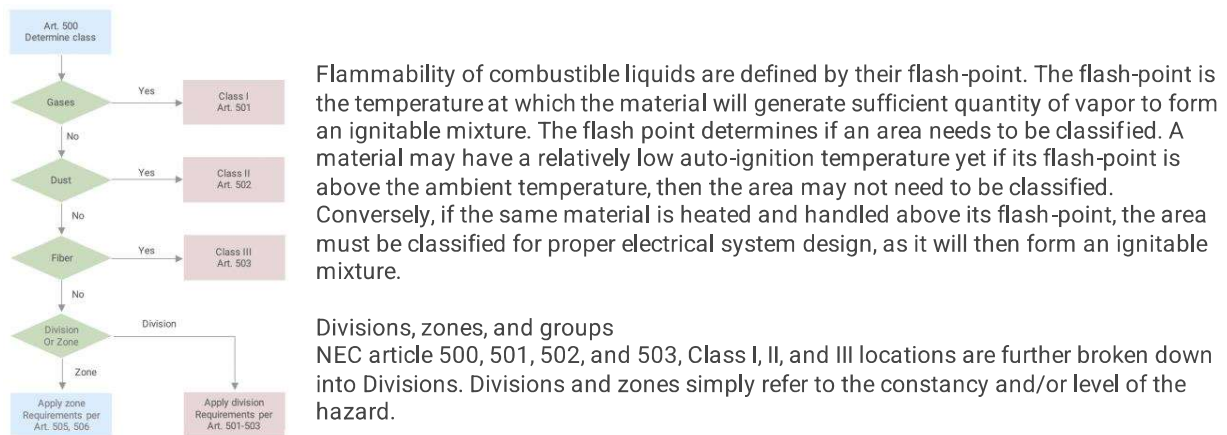


Figure 4: Article 500

There are two divisions and three zones:

Division 1 or Zone 0	the hazard is continuous
Division 1 or Zone 1	the hazard is intermittent
Division 2 or Zone 2	the hazard is present only under abnormal conditions

There are three hazardous location classes – respectively Class 1, Class 2, and Class 3. They simply refer to the type of hazard in general terms:

Class 1	the hazard is a flammable vapor
Class 2	the hazard is a flammable dust
Class 3	the hazard is a flammable fiber

Each chemical gas or vapor used in industry is classified into a gas group.

NEC Division System Gas & Dust Groups		
Area	Group	Representative Materials
Class I, Division 1 & 2	A	Acetylene
	B	Hydrogen
	C	Ethylene
	D	Propane
Class II, Division 1 & 2	E (Division 1 only)	Metal dusts, such as magnesium (Division 1 only)
	F	Carbonaceous dusts, such as carbon & charcoal
	G	Non-conductive dusts, such as flour, grain, wood & plastic
Class III, Division 1 & 2	None	Ignitable fibers/flyings, such as cotton lint, flax & rayon
Zone 0, 1 & 2	IIC	Acetylene & Hydrogen (equivalent to NEC Class I, Groups A and B)
	IIB+H ₂	Hydrogen (equivalent to NEC Class I, Group B)
	IIB	Ethylene (equivalent to NEC Class I, Group C)
Zone 20, 21 & 22	IIIC	Conductive dusts, such as magnesium (equivalent to NEC Class II, Group E)
	IIIB	Non-conductive dusts, such as flour, grain, wood & plastic (equivalent to NEC Class II, Groups F and G)
	IIA	ignitable fibers/flyings, such as cotton lint, flax & rayon (equivalent to NEC Class III)
Mines susceptible to firedamp	I (IEC only)	Methane

Table 0: NEC Division System Gas & Dust Groups

Group IIC is the most severe Zone system gas group. Hazards in this group gas can be ignited very easily indeed. Equipment marked as suitable for Group IIC is also suitable for IIB and IIA. Equipment marked as suitable for IIB is also suitable for IIA but NOT for IIC. If equipment is marked, for example, Ex e II T4 then it is suitable for all subgroups IIA, IIB and IIC

A list must be drawn up of every explosive material that is on the refinery/chemical complex and included in the site plan of the classified areas. The above groups are formed in order of how explosive the material would be if it was ignited, with IIC being the most explosive Zone system gas group and IIA being the least. The groups also indicate how much energy is required to ignite the material by energy or thermal effects, with IIA requiring the most energy and IIC the least for Zone system gas groups.

Temperature classification

Another important consideration is the temperature classification of the electrical equipment. The surface temperature or any parts of the electrical equipment that may be exposed to the hazardous atmosphere should be tested that it does not exceed 80% of the auto-ignition temperature of the specific gas or vapor in the area where the equipment is intended to be used.

The temperature classification on the electrical equipment label will be one of the followings (in degree Celsius):

USA °C		International (IEC) °C	Germany °C Continuous - Short Time
T1 - 450	T3A - 180	T1 - 450	G1: 360 - 400
T2 - 300	T3B - 165	T2 - 300	G2: 240 - 270
T2A - 280	T3C - 160	T3 - 200	G3: 160 - 180
T2B - 260	T4 - 135	T4 - 135	G4: 110 - 125
T2C - 230	T4A - 120	T5 - 100	G5: 80 - 90
T2D - 215	T5 - 100	T6 - 85	
T3 - 200	T6 - 85		

Table 1: Temperature Classification

What does it mean to have Class 1, Div 1, Zone 1 Certification?

A device that is designed for locations where flammable vapors are continuously present is designated with a CSA Class 1, Div 1 certification and ATEX Zone 1 device. Those certified devices can be used in environments in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is likely to occur in normal operation occasionally. It may be obvious, by now, that the correct designation is extremely important for worker safety reasons. Failing to correctly designate a product can result in an injury or fatal disaster, severe damage to both facilities and resources, and bring about legal ramifications or other risks. Of course, this certification comes only after thorough and rigorous testing by experienced, independent third parties.

RealWear NAVIGATOR Z1 is a Class 1, Div 1, Zone 1 Certified Wearable Computing device which can be safely used in such hazardous locations. Here are the current certifications for the RealWear NAVIGATOR Z1:

ATEX	DRAFT (NOT FINAL) II 2G Ex ib IIC T4 Gb II 2D Ex ib IIIC T135°C Db IP6X
IECEX	DRAFT (NOT FINAL) Ex ib IIC T4 Gb Ex ib IIIC T135°C Db IP6X
NEC500	DRAFT (NOT FINAL) Class I, Division 1, Groups A,B,C,D T4 Class II & III, Division 1, Groups E,F,G

Table 2: RealWear Certifications (as of mm.dd.yy)

Intrinsically Safe Certification Process for RealWear

Manufacturing an Intrinsically Safe product and certifying it to be used in hazardous locations across the world is a skilled and challenging task. RealWear partnered with industry experts at i.safe MOBILE for the development and certification of the RealWear NAVIGATOR Z1 product. i.safe MOBILE incorporates all international standards into the product development and is also a member of relevant standards committees. To fulfill all requirements for explosion protection, i.safe MOBILE develops its products from the ground up, so users all over the world can be sure to use high-quality communication technology compliant with current standards. i.safe MOBILE developed and tested the RealWear NAVIGATOR Z1 which was certified by renowned notified bodies ATEX, IECEx and NEC500 to ensure that the products satisfied all country-specific requirements. To achieve the highest level of certification that RealWear achieved is no small feat and took more than two years to complete.

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NAVIGATOR Z1 Software Brief

NAVIGATOR Z1 powered by Android 12 - is the only software purpose-built for harsh or dangerous environments where workers use their hands for more connected and secure work. It is optimized for safe and secure jobs, taking hands-free to new heights of productivity and connectivity.

NAVIGATOR Z1 Safety Guidelines

Battery Performance

A rechargeable battery powers your device. Never use any uncertified charger. Use the battery only for its intended purpose. Never use any charger or battery that is damaged. If the battery is completely discharged, it may take a few minutes before the charging indicator appears on the display or before the device can be used. The full performance of a new battery is achieved only after 3 to 4 complete charge and discharge cycles. The battery can be charged and discharged for multiple cycles, but it will eventually wear out. Unplug the charger from the electrical plug and the device when not in use. Ensure that you do not leave the fully charged battery connected to the charger. If left unused, a fully charged battery will lose its charge over time.

Warning: There is a risk of explosion while charging if a battery other than the specified model is used.

Avoid Short Circuit

Do not short-circuit the battery. An accidental short-circuit can occur when a metallic object such as a coin, clip, or pen causes direct connection of the positive (+) and negative (-) terminals of the battery. A short-circuit at the terminals may damage the battery or the connecting object.

Avoid High Temperatures

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. For the best results, try to keep the battery between -10°C and +50°C (+14°F and 122°F). A device with a hot or cold battery may not work temporarily, even when the battery is fully charged. Battery performance is particularly limited in temperatures well below freezing.

Battery Disposal

Do not dispose of the device in fire as it contains an inbuilt battery which may explode. Dispose of the device according to local regulations and recycle when possible. Do not dispose as household waste. Do not dismantle, open or shred cells or batteries. In the event of a battery leak, do not allow the liquid to come in contact with the skin or eyes. In the event of leak or a hazard seek medical help immediately.

Child Safety

Do not allow children to play with your device or its accessories. Keep it out of their reach. They could hurt themselves or others or could accidentally damage the device or accessories. Your device and its accessories may contain small parts, which could be detached and create a choking hazard.

Health and Safety Warnings

Stop using RealWear NAVIGATOR Z1 or its display immediately if you experience a headache, vertigo, dizziness or nausea. Do not use the NAVIGATOR Z1 display while operating any vehicle. Move the boom arm completely out of your line of sight when not using the display. Maintain situational awareness of your surroundings while using the NAVIGATOR Z1.

Safety and Usage Guidelines

- Do not use the display while operating any vehicle. While in a vehicle in motion or actively operating any equipment, make sure the boom arm or display pod is sufficiently out of your line of sight.
- Eye protection is recommended in hazardous work environments. Use of eye protection is up to the respective business operations and occupations of each end user.
- Always use your dominant eye for comfortable viewing.

Disposal of Old Electrical and Electronic Equipment



The symbol of the crossed-out wheeled bin indicates that within the countries in the European Union, this product, and any enhancements marked with this symbol, cannot be disposed as unsorted waste but must be taken to separate collection at their end-of-life.

Disposal of Battery



Please check local regulations for disposal of batteries. The battery should never be placed in municipal waste. Use a battery disposal facility if available.

Guideline for Headphone and Earphone



To prevent possible hearing damage, do not listen at high volume levels for long periods.

A pleine puissance, l'écoute prolongée du baladeur peut endommager l'oreille de l'utilisateur.

Charger Use Safety Instructions

Warning: To use the charger follow these instructions:

- Make sure that the cable plug is properly connected.
- Keep the charger away from liquids.
- In case of any strange smell or noise from the charger, disconnect it and contact support.
- Before cleaning the cable or charger, disconnect from power supply.
- When using an extension cable, check the integrity of the ground conductor.
- Disconnect the charger from NAVIGATOR Z1, once the battery is fully charged.
- Do not use this charger in wet areas. This charger is for indoor use only.
- Do not insert or remove the plug with wet hands.
- Do not open the charger. For any issues, contact support.
- Do not cut, break or bend the cable in a knot.
- Do not put any objects on the cable that may let it overheat. It may damage the cable and cause fire or electrocution.
- Do not use any cable other than the original cable as it may cause short circuit or electrocution.