TEST REPORT
IEC 60825-1
Safety of laser products -
Part 1: Equipment classification and requirements

Report Number. ..... :	68.140.19.0245.01
Date of issue..... :	2019-05-05
Total number of pages ..... :	17 (including attachments)
Name of Testing Laboratory preparing the Report…….. :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Applicant's name ..... :	Ningbo Oubo Hardware Industrial Ltd.
Address ..... :	Shunyu West Road 185, Yuyao, Ningbo 315400, China.
Test specification:	
Standard ..... :	IEC 60825-1:2014 (Third Edition)
Test procedure ..... :	Type test
Non-standard test method..... :	N/A
Test Report Form No..... :	IEC60825_1E
Test Report Form(s) Originator ..... :	ÖVE
Master TRF..... :	Dated 2014-07

Test item description ..... :	laser distance meter
Trade Mark ..... :	DEMASS
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	LDM-M12, LDM-M12+, LDM-M15, LDM-M15+, LDM-M20, LDM-M20+, LDM-M25, LDM-M25+, LDM-M30, LDM-M30+, LDM-M40, LDM-M40+, LDM-M60, LDM-M60+, LDM-M70, LDM-M70+, LDM-M80, LDM-M80+, LDM-M100, LDM-M100+, LDMeter DA30
Ratings ..... :	5VDC through USB port or 3.7VDC by rechargeable battery

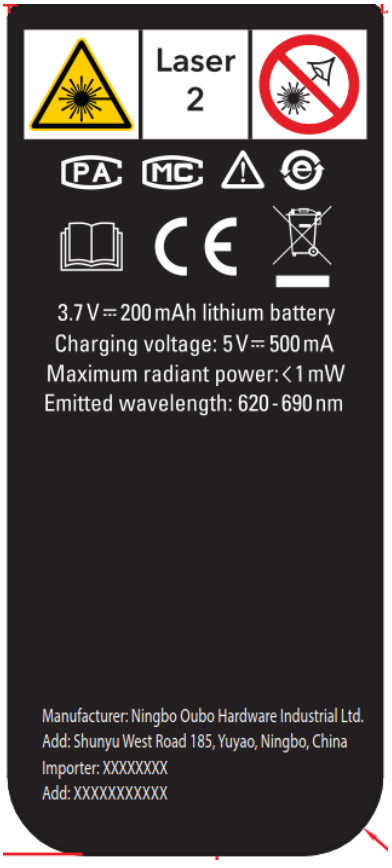
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ CB Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch	
Testing location/ address ..... :	Building 12&13, Zhiheng Wisdomland Business Park Nantou Checkpoint Road 2, Nanshan District 518052 Shenzhen, CHINA	
☐ Associated CB Testing Laboratory:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :	Sky Feng Project Handler	
Approved by (name, function, signature) ..... :	Sadie Jiang Designated Reviewer	
☐ Testing procedure: TMP/CTF Stage 1:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature) ..... :		
☐ Testing procedure: WMT/CTF Stage 2:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature)..... :		
Approved by (name, function, signature) ..... :		
☐ Testing procedure: SMT/CTF Stage 3 or 4:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature)..... :		
Approved by (name, function, signature) ..... :		
Supervised by (name, function, signature)..... :		

List of Attachments (including a total number of pages in each attachment): Attachments No. 1: 1 pages of test report IEC 60825-1 European group differences and national differences; Attachments No. 2: 3 pages of Photo documentation.
Summary of testing:

Tests performed - IEC 60825-1:2014 - EN 60825-1:2014 Based on the test results, the submitted samples are classified as Class 2 Laser product.	**Testing location:** Building 12&13, Zhiheng Wisdomland Business Park Nantou Checkpoint Road 2, Nanshan District 518052 Shenzhen, CHINA
Summary of compliance with National Differences: **Nil.**	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Test item particulars:	
Classification of installation and use..... :	Portable
Supply Connection ..... :	Battery
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object does not meet the requirement..... :	F (Fail)
Testing:	
Date of receipt of test item ..... :	2018-04-11 and 2019-04-16
Date (s) of performance of tests ..... :	2018-07-17 to 2018-07-27

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... : Shenzhen Dobiy Electronic Co., Ltd.

6th Floor, Building B, Qiaode Science Park, Rd7 West of High-tech Park, Guangming, Tianliao Community, Gongming office, Guangming new area Shenzhen, Guangdong, CHINA

General product information:

Laser distance meter.

The used Laser specification as below:

Laser module	Manufacturer	V_F (V)	I_F (mA)	Optical Power (mW)	Wavelength (nm)
QL65D5S-A	Quantum Semiconductor International Co., Ltd.	2,2-2,6	--	5	650-660

All models used same laser modules, model LDM-M30+ was selected as representative model to perform all test.

IEC 60825-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	**CLASSIFICATION PRINCIPLES**		
4.3	Classification rules		---
4.3 a	Radiation of a single wavelength		P
4.3 b	Radiation of multiple wavelengths		N/A
	1) Laser product emits at two or more wavelengths shown as additive in Table 1		N/A
	2) Laser product emits at two or more wavelengths not shown as additive in Table 1		N/A
4.3 c	Radiation from extended sources (see 5.4.3)		N/A
4.3 d	Non-uniform, non-circular or multiple apparent source		N/A
4.3 e	Time bases		---
	1) 0,25 s		P
	2) 100 s		N/A
	3) 30000 s		N/A
4.3 f	Repetitively pulsed or modulated lasers		N/A
	1) Any single pulse		N/A
	2) Average power for pulse trains		N/A
	3) Pulse duration $t \leq T_i$ .....: Number of pulses N and C_5 .....:		N/A
	3) Pulse duration $t > T_i$ .....: Number of pulses N and C_5 .....:		N/A
4.4	Laser products designed to function as conventional lamps.		N/A
	α measured at 200 mm distance from closest point of human access ($\alpha > 5$ mrad).		N/A
	Un-weighted radiance L measured at 200 mm distance (comparison with $L_T = 1\ MWm^{-2}sr^{-1}/\alpha$) under reasonably foreseeable single fault conditions.		N/A
	Evaluation of emission according to IEC 62471 series (optional): Standard applied (IEC 62471 series)……,….. ....: Risk Group…….…….. ....: Labelling……....: Classification of product based on accessible laser radiation (if no laser radiation accessible: Class 1).		N/A
5	**DETERMINATION OF THE ACCESSIBLE EMISSION LEVEL and PRODUCT CLASSIFICATION**		
5.1	Tests		---

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	Compliance under reasonably foreseeable single fault conditions.		P
5.3	Determination of the class of the laser product ....: For Class 1C: vertical safety standard applied with requirements for Class 1C.	Not applicable	---
5.4	Measurement geometry		---
5.4.1	General		---
5.4.2	Default (simplified) evaluation		P
	Conditions applied .....:	Condition 3	P
	Aperture diameter .....:	7mm	P
	Reference point : .....:	Lens	P
	Measurement distance .....: (for each condition)	100mm	P
5.4.3	Evaluation condition for extended sources		N/A
	Conditions applied .....:		N/A
	Most restrictive position .....: (distance from reference point)		N/A
	Angular subtense of the apparent source α and C_6: (for each condition)		N/A
5.4.3 a	Aperture diameters (for each condition). .....:		N/A
5.4.3 b	Angle of acceptance (for each condition)……...:		N/A

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Measured accessible laser radiation and comparison with AEL:

TABLE: Calculation of Accessible emission limit (AEL)			
Class	2	Time base t:	0.25s
Wavelength λ :	653.5nm	Beam shape	Point
Angular Subtense α:	≤1.5mrad	Position of app. source:	Lens
Distance r:	100mm	Distance r:	—
Aperture d:	7mm	Aperture d:	—
Angle of acc. γp (Rth):	—	Angle of acc. γ_p (Phc):	—
Breakpoint T1:	—	Pulse width t_{pw}:	—
Breakpoint T2:	—	Period duration:	—
C1:	—	Number of pulses N:	—
C2:	—	C_5:	—
C3:	—	C_6:	1
C4:	—	C_7:	—
AEL limits:	1.0mW		

TABLE: Radiant power under normal and fault condition	
Ambient temperature:	24.5°C
Ambient radiation:	1.89μW compensated with “zero” function of power meter
Measurement condition:	Condition 3 according to standard.

Measurement	Measured radiant laser power
Normal operation with DC battery	0.684mW
Fault condition for R81 short circuit:	Up to 0.776mW, then shut down; recoverable
Fault condition for pin a and pin b of Q1 short circuit	Shut down and recoverable
Fault condition for pin a and pin c of Q1 short circuit	Shut down and recoverable
Fault condition for pin b and pin c of Q1 short circuit	Shut down and recoverable
Conclusion: The measured emission from the product did not exceed the accessible emission level of Class 2; the test subject was classified as “Class 2 Laser product”.	

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6	**ENGINEERING SPECIFICATIONS**		
6.2	Protective housing		---
6.2.1	General		---
	Protective housing prevents access to energy levels in excess of the AEL for Class 1.		N/A
	Protective housing prevents access to energy levels equivalent to Class 4 and withstands exposures under reasonably foreseeable single fault conditions.		N/A
	Maintenance of Class 1, 1C, 1M, 2, 2M, or 3R (access to emissions of Class 3B or 4 is prevented).		N/A
	Maintenance of Class 3B product (access to emission of Class 4 is prevented).		N/A
6.2.2	Service		N/A
6.2.3	Removable laser system (laser system complies with requirements of Clauses 6 and 7).		N/A
6.3	Access panels and safety interlocks		---
6.3.1	Panel is intended to be removed during operation (or maintenance) and would give access to higher energy levels (see Table 13).		N/A
	Accessible emission (after removal of the panel) corresponds to product Class (designated by “X” in Table 13)		N/A
	Emission through the opening if interlocked panel of Class 1, 1C, 1M, 2, or 2M is removed (Emission < AEL of Class 1M or 2M).		N/A
	Emission through the opening if interlocked panel of Class 3R, 3B, or 4 is removed (Emission < AEL of Class 3R).		N/A
	Requirements regarding reasonably foreseeable single fault condition.		N/A
6.3.2	Override mechanism		N/A
	Behaviour of override in operation when the panel is replaced.		N/A
	Visible or audible warning for override mode.		N/A
6.4	Remote interlock connector		N/A
6.5	Manual reset		N/A
6.6	Key control		N/A
6.7	Laser radiation emission warning		---

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6.7.1	Laser product is a 3R (λ<400 nm; λ>700 nm), 1C, 3B or 4 laser systems.		N/A
6.7.2	Audible or visible warning.		N/A
	Warning is failsafe or redundant.		N/A
	Viewing of the visible warning does not require exposure to emissions > AEL for Class 1M and 2M.		N/A
6.7.3	Operational control and laser aperture are provided with a warning device when they are separated more than 2 m from warning device.		N/A
6.7.4	Visible indication of output aperture if laser emission may be distributed through more than one output.		N/A
6.7.5	Switch for handheld Class 3R device must be depressed for emission (in lieu of emission indicator).		N/A
6.8	Beam stop or attenuator		N/A
6.9	Controls		N/A
6.10	Viewing optics		N/A
	a) Human access to laser radiation in excess of Class 1M prevented when the shutter is opened or attenuation varied.		N/A
	b) Opening of the shutter or variation of the attenuation prevented when exposure to laser radiation in excess of Class 1M is possible.		N/A
6.11	Scanning safeguard		N/A
6.12	Safeguard for Class 1C products		N/A
	a) Human access to laser radiation in excess of AEL for Class 1 measured under Condition 3 is prevented.		N/A
	b) Human access to laser radiation in excess of AEL for Class 3B measured through 3,5 mm aperture at 5 mm distance from applicator is prevented.		N/A
6.13	Walk-in access		N/A
	a) Means provided so that any person inside the housing can prevent activation of Class 3B or 4 laser hazards.		N/A
	b) A warning device provides adequate warning of emission to any person within the housing.		N/A

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	c) Where “walk-in” access during operation is intended or reasonably foreseeable, emission of laser radiation that is equivalent to Class 3B or 4 while someone is present inside the enclosure of Class 1, Class 2 or Class 3R product is prevented by engineering means.		N/A
6.14	Environmental conditions		---
	- climatic conditions		N/A
	- vibration and shock		N/A
6.15	Protection against other hazards		---
6.15.1	Non-optical hazards (product safety standard)		N/A
	- electrical hazards;		N/A
	- excessive temperature;		N/A
	- spread of fire from the equipment;		N/A
	- sound and ultrasonics;		N/A
	- harmful substances;		N/A
	- explosion;		N/A
6.15.2	Collateral radiation		N/A
6.16	Power limiting circuit		N/A

7	**LABELLING**		
7.1	General		---
	Labels durable, permanently affixed		P
	Labels clearly visible		P
	Reading of labels is possible without exposure to laser radiation in excess of AEL for Class 1.		P
	Colour combination		P
	Labelling impractical due to the size or design of the product.		N/A
	Warning label – Hazard symbol (Figure 3)		N/A
7.2 - 7.7	Text on explanatory label or pictogram (laser class, warning text)		P
7.8	Aperture label		N/A
7.9	Radiation output and standards information		---
	Max output of laser radiation .....:	<1mW	P
	Pulse duration .....:		N/A

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	Emitted wavelength(s) .....:	620-690nm	P
	Name and publication date of the standard .....:	IEC 60825-1:2014	P
7.10	Labels for access panels		---
7.10.1 a) – f)	Labels for panels - warning wording used .....:		N/A
7.10.2	Labels for safety interlocked panels - Warning wording used .....:		N/A
7.11	Warning for invisible laser radiation .....:		N/A
7.12	Warning for visible laser radiation .....:	LASER RADIATION	P
7.13	Warning for potential hazard to the skin or anterior parts of the eye - warning wording used .....:		N/A

8	**OTHER INFORMATIONAL REQUIREMENTS**		
8.1	Information for the user		---
	a) adequate instructions for assembly, maintenance and safe use and description of the classification limitations, if appropriate.		N/A
	b) additional warning for Class 1M and 2M		N/A
	c) laser beam parameters for radiation above the AEL of Class 1		---
	• Wavelength .....:	620-690nm	P
	• Beam divergence .....:		N/A
	• Pulse pattern .....: (pulse duration, repetition rate, …)		N/A
	• Maximum power or energy output .....:	<1mW	P
	d) safety instruction for embedded laser products and other incorporated laser products.		N/A
	e) MPE and NOHD for Class 3B and 4 laser products; For collimated beam Class 1M and 2M lasers the extended NOHD (ENOHD).		N/A
	f) information for the selection of eye protection.		N/A
	g) reproduction of all required labels and warnings.		N/A
	h) location of laser apertures		N/A
	i) list of controls, adjustments of procedures for operation and maintenance - and warning statement.		N/A
	j) information (compatibility requirements) about laser energy source if not incorporated.		N/A

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	k) additional warning for Class 1, 1M, 2, 2M, and 3R regarding skin or corneal burns.		N/A
	l) Information for Class 1C products (e.g. warning that repeated application may pose a risk).		N/A
8.2	Purchasing and service information		N/A
	a) safety classification of each laser product stated in all descriptive material (e.g. brochures).		N/A
	b) adequate instructions for servicing available: • warnings and precautions regarding exposure of laser emission above Class 1 • maintenance schedule • list of controls and procedures that could increase accessible emissions • description of displaceable parts • protective procedures for service personnel • reproduction of labels and hazard warnings		N/A
9	**ADDITIONAL REQUIREMENTS FOR SPECIFIC LASER PRODUCTS**		
9.1	Applicable other parts of the standard series IEC 60825		---
	IEC 60825-2 (Safety of optical communication systems)		N/A
	IEC 60825-4 (Laser guards)		N/A
	IEC 60825-12 (Safety of free space optical communication systems used for transmission of information)		N/A
9.2	Medical laser products: Class 3B and Class 4 medical laser products comply with IEC 60601-2-22		N/A
9.3	Laser processing machines: Comply with IEC/ISO 11553 series.		N/A
9.4	Electric toys: Comply with IEC 62115		N/A
9.5	Consumer electronic products: Comply with IEC 60950 (IT-equipment) or IEC 60065 (AV equipment)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Laser module	Quantum Semiconductor International Co., Ltd.	QL65D5S-A	Optical output: 5mW; Operating voltage: Vop=2.2-2.6V; Wavelength: λ=650-660nm	IEC/EN 60825-1	Tested with appliance.
Supplementary information: [1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

Appended table	**EQUIPMENT MANUFACTURE INFORMATION (DATA SHEET) ABOUT THE CONTAINING LASER COMPONENT/S**		—
	Manufacturer .....:	Quantum Semiconductor International Co., Ltd.	—
	Type designation .....:	QL65D5S-A	—
	Structure .....:	Laser diode	—
	Wavelength .....:	650-660nm	—
	Output power (min. and max.) .....:	5mW	—
	Radiation is		—
	Continuous .....:	CW	—
	Pulsed .....:	--	—
	Pulse time .....:	--	—
	Pulse repetition frequency .....:	--	—
	Others .....:	--	—

IEC 60825-1E – ATTACHMENT No. 1			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 60825-1 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES Equipment classification and requirements – Safety of laser products
Differences according to.....: EN 60825-1:2014

	CENELEC COMMON MODIFICATIONS (EN)	N/A
	No Common modifications	N/A

ZB	**ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)**		N/A
	No special National conditions		N/A

ZC	**ANNEX ZC, NATIONAL DEVIATIONS (EN)**		N/A
	No National deviations		N/A

Attachments No. 2

Details of: Over view

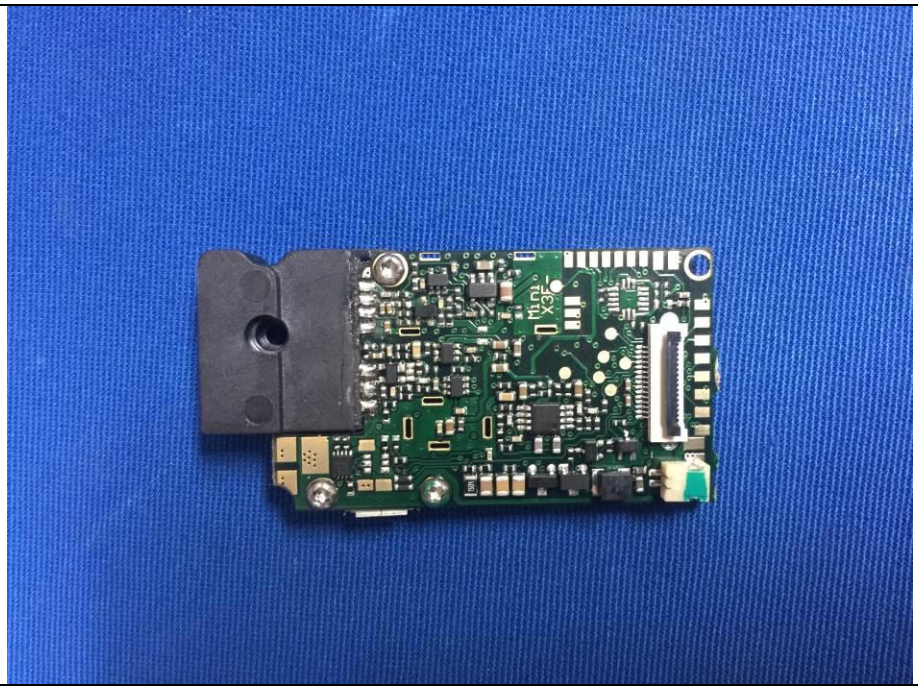
Details of: Over view

Attachments No. 2

Details of: Internal view

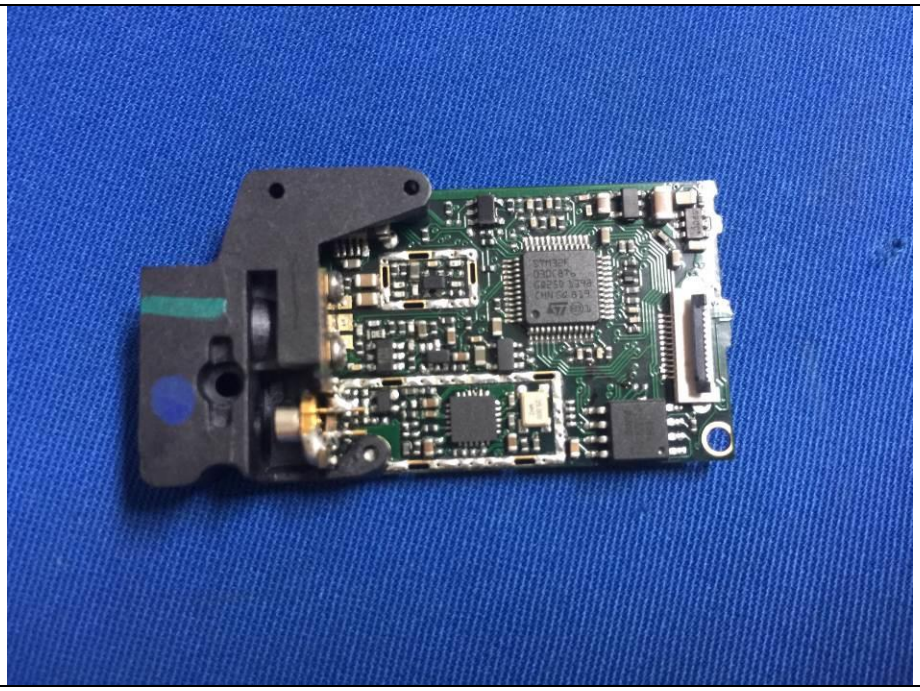
Laser

Details of: PCB



Attachments No. 2

Details of: PCB



Details of: PCB