



Royal Netherlands Navy



Date 12/01/2021

Ministry of Defence

Naval Maintenance and Sustainment Agency

TG DSP

Knowledge Centre Laser

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Our reference

CZSK 21-016 Qube-240.docx

Please quote date, our reference and subject when replying.

laser safety clearance certificate

Qube-240 LiDAR

SAP No.: NA

Expiry date: None

TECHNICAL ASSESSMENT

Equipment:	Qube-240 LiDAR
Reference number:	21-016 Qube-240
Part number:	NA
SAP number:	NA
Issue date:	12/01/2021
Expiry date:	None

Date
12/01/2021

Our reference
CZSK 21-016 Qube-240.docx

1. This LSCC is valid for the Qube-240 LiDAR payload (using the "Livoxtech Avia" laser). The LiDAR system is manufactured by YellowScan (www.yellowscan-lidar.com).
2. ENG Optronics has considered the safety aspects of the Qube-240. The purpose is to ensure that the procedures to be employed satisfy the current safety standards for the protection of persons against hazards from laser radiation as laid down in the IEC 60825 series.
3. ENG Optronics performed the assessment relying on the Qube-240 laser specifications provided by the manufacturer, no test-unit was delivered for evaluation. The classification of the Qube-240 was determined according to the data provided and is given in the table below:

Operating mode	Class
Qube-240	3R

4. **Class 3R** lasers can present a direct hazard to the bare eye on intentionally viewing into the beam, or with the use of viewing optics (like binoculars).
5. The IR beam of the Qube-240 can be hazardous to the *naked* eye within a distance, known as the Nominal Ocular Hazard Distance (NOHD). This distance is given in the table below:

Hazard distances	NOHD (m)
Qube-240	17

6. The IR beam of the Qube-240 can be hazardous to the eye using viewing optics such as *binoculars* within a distance, known as the Extended Nominal Ocular Hazard Distance (*extended* NOHD). Using 7x50 binoculars the eNOHD value is given in the table below:

Hazard distances	eNOHD (m)
Qube-240	584

7. The IR beam of the Qube-240 can be hazardous to the skin within a distance, known as the Nominal Skin Hazard Distance (NSHD). This distance is given in the table below:

Hazard distances	NSHD (m)
Qube-240	0

8. This certificate is subject to change without any further notice. The user shall investigate the validity at any time before making new decisions.
9. Based on the best available information at this time, ENG Optronics has agreed that a laser safety clearance certificate shall be issued to cover the Qube-240, subject to the equipment being operated according to the procedures previously outlined in the references below. The certificate will be automatically invalidated if the procedures or the parameters are changed without prior consultation, and approval by ENG Optronics.
10. This certificate invalidates all former ones issued for the Qube-240.
11. This certificate does not absolve all involved from taking the proper precautions for their own safety and that of others in accordance with the current Netherlands Occupational Health & Safety Legislation (**ARBOwet**).
12. This certificate is also meant for exchanging laser hazard evaluation data between Host and Visiting Nations, as outlined in the STANAG 3606

References:

- A. HMA/020 "Richtlijn Laserstraling Defensie" (publicatienummer NIS/Laserstraling editie 4.0), Dated: 15 October 2004
- B. NEN-EN-IEC 60825-1 Safety Of Laser Products - Part 1: Equipment Classification and Requirements (IEC 60825-1:2014). Dated: August 2014
- C. Source : LSCC Process SD-21-016 Qube-240.

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TECHNICAL ASSESSMENT

EQUIPMENT	Qube-240 LiDAR
REFERENCE NUMBER	21-016 Qube-240.docx
PART NUMBER / MOD VERSION	NA
NSN	NA
ISSUE DATE	01/12/2021
Expiry date:	None

Parameter [units]	Qube-240			
Wavelength λ [nm]	905			
Beam diameter at waist a (e^{-1}) [mm]	9.1			
Distance from aperture to beam waist w [m]	-			
Beam profile k [-]	1			
Divergence ϕ (e^{-1}) [mrad]	0.092			
	Single pulse	Pulse-train	Pulse sum T_i	Single pulse $AEL \cdot C_5$
Power output (max) P	245 [nJ]	1.47 [μ J]	0.294 [μ J]	245 [nJ]
Duration (FWHM)	6.5 [ns]	25 [μ s]	5 [μ s]	6.5 [ns]
Frequency (max) [kHz]	240	240	240	240
Laser class	3R			
NOHD [m]	17			
eNOHD (7x50) [m]	584			
NSHD [m]	0			

Comments

1. This LSCC is valid for the Qube-240 LiDAR payload.
2. Reference for the calculations is: NEN-EN-IEC 60825-1 SAFETY OF LASER PRODUCTS - PART 1: EQUIPMENT CLASSIFICATION AND REQUIREMENTS (IEC 60825-1:2014). DATED: AUGUST 2014

ing. F.E. Dreef
Head Engineering