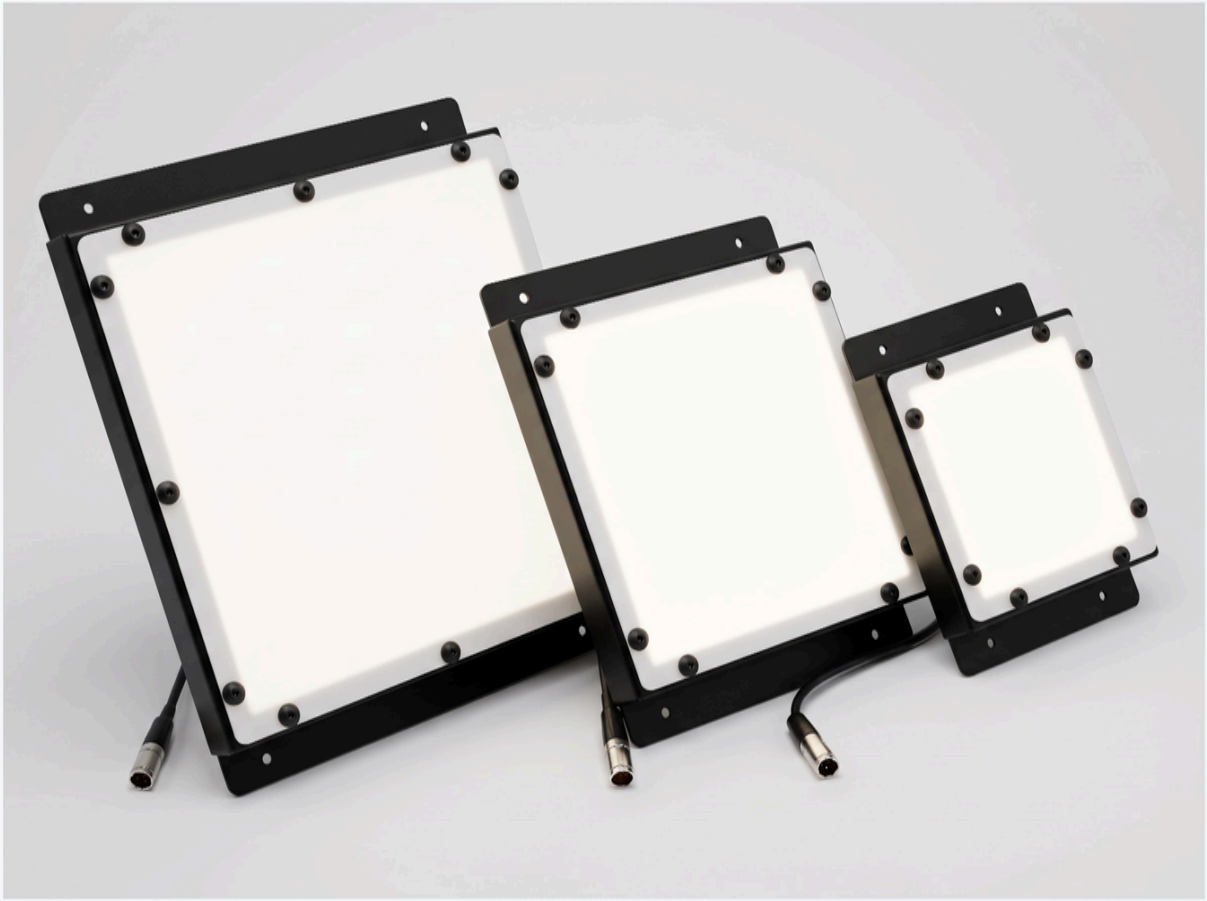
USER MANUAL

PRODUCT SERIES

D Series Backlight



PRION Machine Vision Lighting
High-PerformanceIndustrialIllumination Solutions

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1. TECHNICAL SPECIFICATIONS AND PARAMETERS

1.1 Electrical Specifications

Model	Active Lighting Area (E × F)	Input Voltage	Input Current (continuous)	Input Current (15 µs)	Power Consumption
D0505	50 x 50 mm	24V DC	0,16 A	0,38 A	3,8 W
D0606	60 x 60 mm	24V DC	0,23 A	0,55 A	5,5 W
D1010	100 x 89 mm	24V DC	0,54 A	1,30 A	13,0 W
D1015	100 x 150 mm	24V DC	0,94 A	2,26 A	22,6 W
D1515	150 x 150 mm	24V DC	1,30 A	3,12 A	31,2 W
D1525	150 x 250 mm	24V DC	2,00 A	4,80 A	48,0 W
D2020	200 x 189 mm	24V DC	2,40 A	5,76 A	57,6 W
D2030	300 x 200 mm	24V DC	3,75 A	9,00 A	90,0 W
D3030	300 x 289 mm	24V DC	5,50 A	13,20 A	132,0 W
D3045	450 x 300 mm	24V DC	8,44 A	20,26 A	202,6 W
D4040	400 x 402 mm	24V DC	10,05 A	24,12 A	241,2 W
D4060	400 x 602 mm	24V DC	15,05 A	36,12 A	361,2 W
D5035	500 x 350 mm	24V DC	10,94 A	26,26 A	262,6 W
D5050	489 x 499 mm	24V DC	16,00 A	38,40 A	384,0 W
D5075	499 x 752 mm	24V DC	23,45 A	56,28 A	562,8 W
D8080	799 x 789 mm	24V DC	40,90 A	98,16 A	981,6 W
D8822	881 x 226 mm	24V DC	11,90 A	28,56 A	285,6 W

1.2 Optical Parameters

Model	Active Lighting Area (E × F)	Luminous Flux (lm)	Beam Angle
D0505	50 x 50 mm	450 lm	85°
D0606	60 x 60 mm	650 lm	85°
D1010	100 x 89 mm	1 530 lm	85°
D1015	100 x 150 mm	2 660 lm	85°
D1515	150 x 150 mm	3 670 lm	85°
D1525	150 x 250 mm	5 650 lm	85°
D2020	200 x 189 mm	6 780 lm	85°
D2030	300 x 200 mm	10 600 lm	85°
D3030	300 x 289 mm	15 540 lm	85°
D3045	450 x 300 mm	23 850 lm	85°
D4040	400 x 402 mm	28 400 lm	85°
D4060	400 x 602 mm	42 500 lm	85°
D5035	500 x 350 mm	30 900 lm	85°
D5050	489 x 499 mm	45 200 lm	85°
D5075	499 x 752 mm	66 200 lm	85°
D8080	799 x 789 mm	115 500 lm	85°
D8822	881 x 226 mm	33 600 lm	85°

1.3 LED Wavelengths, Color Spectrum

The PRION Backlight Series is offered in a wide selection of monochromatic wavelengths and white color temperatures, optimized for high-contrast machine vision inspection. Below are the monochromatic wavelength distributions and white light color temperature classifications.

Monochromatic Wavelengths (nm)

Color / Type	Dominant Wavelength	Spectral Distribution / Bar
Blue	455 nm (±10 nm)	
Green	525 nm (±10 nm)	
Red	625 nm (±10 nm)	
IR (Infrared)	940 nm	

White Light Color Temperatures (CCT)

Option Code	Color Temperature (CCT)	Typical Application
6500K	Cool White (Daylight)	High brightness contrast, metallic surface inspection

2. PRODUCT OVERVIEW AND GENERAL PRINCIPLES

The Prion Backlight Series is engineered for high-precision machine vision illumination, delivering uniform diffuse lighting for edge inspection, dimensional metrology, and defect detection in industrial automation environments.

2.1 Manual Conventions and Symbols

This datasheet uses standardized safety symbols and typographical conventions to highlight critical operational instructions and potential handling hazards.

- **DANGER / WARNING:** Indicates an imminent or potential electrical hazard that may result in severe equipment damage or personal injury if safety precautions are ignored.
- **CAUTION:** Highlights mandatory handling guidelines to prevent electrostatic discharge (ESD) or optical surface contamination.
- **NOTE:** Provides technical tips, optimal operating parameters, or configuration recommendations for peak operational performance.

2.2 Product Identification and Serial Number Label

Each Prion Backlight unit features a high-durability flag-type cable label securely affixed near the input connector. This label provides immediate visual reference for the model code, color temperature, and operating voltage directly on the wiring harness.

Label Format Example	Description / Field Breakdown
D1010 6500K DC 24V	**D1010:** Productmodel/activearea code **6500K:** Opticalcolor/colortemperature (or W / R / B / G / IR) **DC 24V:** Rated operating voltage

Electrical Wiring & Polarity

The lighting unit features a standard two-core flexible industrial cable exiting from the housing. Polarity must be strictly observed during installation to ensure proper operation and protect internal driver electronics:

- **Black Wire:** Defined as **GND** (Ground / 0V reference). Connect to the negative power supply or controller terminal.
- **RedWire:** Defined as **+24V DC** (Positive power supply). Connect to the +24V DC positive output terminal.

> **CAUTION:** Always verify multimeter voltage polarity prior to energizing the circuit. Reversing the positive and negative leads will prevent the unit from illuminating and may damage internal electronic components.

2.3 Storage and Operating Conditions

To ensure maximum product longevity, optical stability, and reliability, environmental parameters must be strictly maintained within specified industrial limits during storage and active operation.

2.4 Photobiological Safety Classification

Prion Backlight units are classified according to standard photobiological safety regulations (such as IEC/EN 62471) depending on the emitted wavelength and optical output intensity.

- **Standard Emission:** Most visible light models are classified under Risk Group 0 (Exempt) or Risk Group 1 (Low Risk) under normal operating conditions.
- **High-Intensity / Strobe Usage:** When operated in high-intensity continuous modes or external strobe overdrive modes, operators are advised to avoid direct prolonged staring into the emitting optical surface.
- **Safety Precaution:** Appropriate warning labels and optical baffles should be integrated into the machine vision enclosure if the optical window is directly accessible during maintenance.

> **WARNING:** For ultraviolet (UV) or high-power infrared (IR) variants, appropriate protective eyewear must be worn during alignment and servicing to prevent retinal or corneal exposure.

2.5 Cleaning and Maintenance Procedures

Regular maintenance ensures optimal light output uniformity and prevents dust or particulate accumulation from interfering with machine vision inspection accuracy.

2.5.1 Optical Window Cleaning

- **Frequency:** Inspect monthly; clean only when particulate accumulation or smudges are visible on the diffuser/glass surface.
- **Approved Solvents:** Use isopropyl alcohol (IPA) or optical-grade lens cleaning solutions with a lint-free micro-fiber cloth.
- **Prohibited Actions:** Never use abrasive cloths, strong industrial solvents, acetone, or sharp metallic objects that may scratch or degrade the optical diffuser plate.

7.5.2 General Housing Maintenance

- **Power Disconnection:** Always disconnect the 24V DC power supply before performing any physical cleaning, cabling checks, or structural re-tightening.
- **Housing Inspection:** Periodically verify that mounting screws, bracket fittings, and cable strain reliefs are securely fastened to prevent vibration-induced loosening in harsh industrial environments.

3. COLLIMATED (PARALLEL LIGHT) FILTER TECHNOLOGY

3.1 Technology Principle and Optical Advantages in Machine Vision

Standard backlight illuminators emit divergent light rays across wide angles, which can cause edge scattering, diffraction effects, and reduced silhouette contrast in high-precision machine vision and dimensional measurement applications. The PRION Collimated Backlight option integrates advanced micro-optic parallel light filters that align light rays into low-divergence parallel bundles.



Figure 4.1: Comparison between Standard Backlight divergent light emission and Collimated Backlight parallel ray bundle.

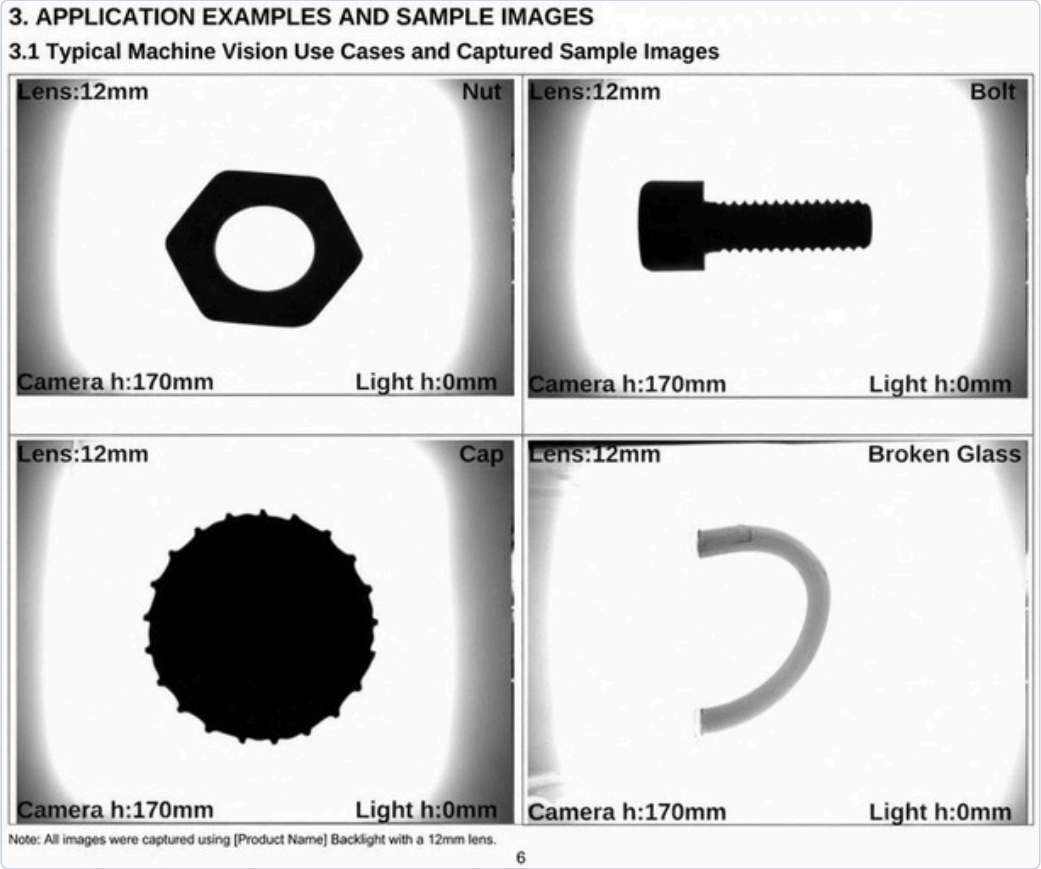
Key Benefits of Collimated Illumination:

- **Sharp Edge Contrast:** Drastically minimizes light diffraction around object edges, ensuring extremely accurate outer diameter and profile measurements.
- **LowAngular Deviation:** Parallel ray bundles maintain high directionality, preventing light scatter into nearby optical paths.
- **Enhanced Defect Detection:** Ideal for transparent object inspection, pinhole detection, and high-precision edge tracking.

4. APPLICATION EXAMPLES AND SAMPLE IMAGES

4.1 Typical Machine Vision Use Cases and Captured Sample Images

Backlight illuminationcreates maximumcontrastsilhouette images by projectinguniformhigh-intensity light directly into the camera's optical path. This method is exceptionally effective for dimensional measurement, edge detection, and internal defect inspection across diverse manufacturing sectors.



Nut & Bolt Inspection (Dimensional Verification): High-contrast edge extraction allows precise inner diameter measurements, thread pitch verification, and outer contour tolerance checks.

Cap Quality Control (Contour & Profile Analysis): Radial tooth uniformity and structural integrity are effortlessly verified through sharp silhouette profiling.

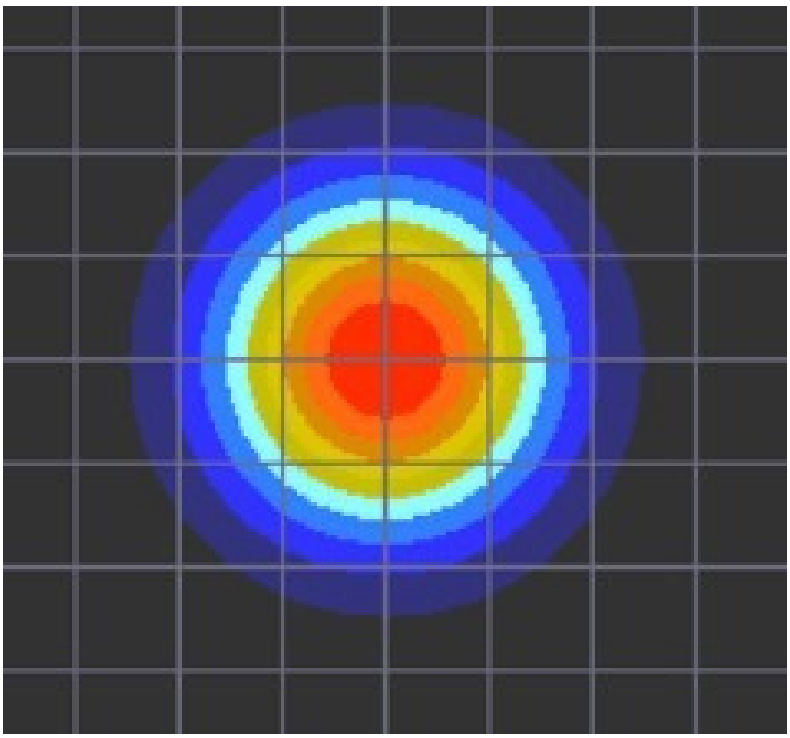
Transparent Material Inspection (Broken Glass / Defect Detection): Light refraction and diffusion reveal internal cracks, inclusions, or structural breaks in translucent and transparent components.

Note: All images were captured using Backlight with a 12mm lens (Camera h: 170mm, Light h: 0mm).

5. LIGHT INTENSITY DISTRIBUTION AND LIGHT MAP

5.1 Surface Illuminance Distribution and Light Map Analysis

To ensure long-term luminous flux maintenance and spatial uniformity under continuous strobe or constant-current operation, the photometric performance of the Prion Backlight series has been evaluated via advanced optical simulation and high-resolution illumination mapping



Peak Illuminance Concentration: The highest luminous intensity and illuminance concentration are localized directly beneath the LED array footprint on the active optical emission area. Under maximum rated drive currents, the spatial light output and junction-level flux maintenance remain safely within optimized optical thresholds, preventing premature lumen depreciation and ensuring stable long-term performance.

Aperture & Housing Illumination Distribution: The precision-engineered anodized aluminum profile housing and diffuser assembly act as an efficient optical integrator, uniformly distributing light energy across the lateral emission window to maximize uniform surface illumination and eliminate hot spots.

Optical Gradient & Uniformity Profile:A smooth and gradual illumination gradient is observable from the central optical axis outward to the perimeter edges, indicating low optical losses, high-efficiency diffuser integration, and exceptional uniformity across the entire backlight emission surface.

6. GENERAL INFORMATION AND SAFETY

6.1 Disclaimer

The information contained in this technical manual is subject to change without prior notice to improve reliability, function, or design. Prion Endüstriyel Aydınlatma Ltd. Şti. assumes no responsibility or liability for any errors, omissions, or inaccuracies that may appear in this document.

Prion machine vision lighting products are designed and manufactured for professional industrial applications, automated optical inspection (AOI) systems, and machine vision setups. The user is solely responsible for determining the suitability of the product for its intended application. Prion shall not be liable for any direct, indirect, consequential, or incidental damages—including but not limited to loss of profits, downtime, production losses, or damage to other equipment—arising from the improper installation, misuse, unauthorized modification, or failure to follow the instructions provided in this manual.

6.2 Forbidden Use

To ensure safe operation and prevent damage to the product, human safety hazards, or system failures, the use of Prion machine vision lighting products under the following conditions is strictly prohibited:

- **Hazardous & Explosive Environments:** Operating the lighting fixtures in flammable, explosive, or volatile gas/dust environments where certified explosion-proof (Ex-proof) equipment is legally required.
- **Direct Human Eye Exposure:** Staring directly into active high-intensity LEDs or optical outputs without appropriate eye protection (photobiological safety precautions must be observed, especially in high-power and strobe modes).
- **Unspecified Electrical Power Sources:** Connecting the device to AC mains voltages, unregulated power supplies, or power sources exceeding the specified DC voltage and current ratings (e.g., exceeding standard 24V/36V DC thresholds without authorized driver architectures).
- **Exceeding Environmental Limits:** Operating or storing the product outside the defined temperature, humidity, and ingress protection (IP) limits specified in this manual.
- **Unauthorized Disassembly & Modification:** Opening the enclosure, removing optical filters, modifying internal electronic circuitry, or tampering with LED array boards without explicit written authorization from Prion R&D.
- **Medical & Life-Support Systems:** Utilizing the lighting products in critical life-support systems, medical diagnostic equipment, or any application where a product malfunction could directly result in severe personal injury or human fatality.

6.3 ORDERING CODE AND CONFIGURATION

PrionBacklightseriesfixtures are designated withstandard model codes starting with **D**. For applications requiring collimated light output, the prefix changes to **C**. Below is the complete list of standard and collimated model configurations available:

Standard Model (D Series - Backlight)	Collimated Model (C Series)
D0505	C-D0505
D0606	C-D0606
D1010	C-D1010
D1015	C-D1015
D1515	C-D1515
D1525	C-D1525
D2020	C-D2020
D2030	C-D2030
D3030	C-D3030
D3045	C-D3045
D4040	C-D4040
D4060	C-D4060
D5035	C-D5035
D5050	C-D5050
D5075	C-D5075
D8080	C-D8080
D8822	C-D8822

7. INSTALLATION AND GETTING STARTED

This section provides core guidelines for mounting, integrating, and configuring the Prion Backlight series within an industrial machine vision assembly.

7.1 Hardware Overview

The Prion Backlight assembly consists of a rugged sheet metal housing enclosing high-density LED matrices and uniform diffusion layers, built for continuous factory floor operation.

- **Optical Active Area:** Emitting surface designed to deliver uniform background illumination for silhouette and defect detection.
- **Housing Design:** Industrial-grade rugged sheet metal enclosure built for reliable integration in automated machine vision systems.
- **Wiring Harness:** Flexible industrial-grade cable equipped with a flag-type label and stripped wire ends (Red: +24V DC, Black: GND).

7.2 Optional Accessories

To facilitate integration into various automation cells, optional expansion accessories are available upon request.

Item Type	Accessory Name / Code	Description
Optional	External Strobe Controller	Regulates overdrive pulses and trigger timing for high-speed imaging.
Optional	Extension Cable (2m / 5m)	Industrial shielded extension harness with quick-disconnect fittings.

7.3 Direct Wiring and Power Connection

Prion Backlight units are designed for straightforward integration without requiring complex intermediate connectors or proprietary terminal blocks. The unit features a direct two-core flexible industrial cable exiting the enclosure.

Direct Cable Specifications & Polarity

To energize and operate the backlight unit, simply connect the two exposed wire leads directly to a regulated 24V DC power source, strictly observing the color-coded polarity:

- **Red Wire (+):** Connect directly to the **+24V DC** positive output of the power supply.
- **Black Wire (-):** Connect directly to the **GND** (0V reference) terminal of the power supply.

CAUTION: Supplying power directly via these two leads is fully sufficient to run the unit. Always verify polarity with a multimeter before energizing. Reversing the connections will prevent illumination and may damage internal components.

Operational Verification

Upon applying stable 24V DC power across the red and black leads, the backlight will immediately emit uniform illumination at full nominal intensity. No configuration or signal input is required for standard continuous operation.

8. WARRANTY AND CERTIFICATIONS

This section outlines the standard warranty terms, liability limitations, and regulatory compliance details applicable to the Prion Backlight series.

8.1 Warranty Terms and Scope

Prion Endüstriyel Aydınlatma guarantees that all backlight products are free from defects in materials and workmanship under normal industrial use and proper installation conditions.

- **Warranty Period:** 3 (three) years from the original date of invoice/delivery.
- **Coverage:** Repair or replacement of defective units at the manufacturer's discretion, provided the unit has not been subjected to unauthorized modification, physical damage, incorrect polarity wiring, or operation outside specified electrical/thermal limits.

8.2 CE Declaration of Conformity & RoHS Compliance

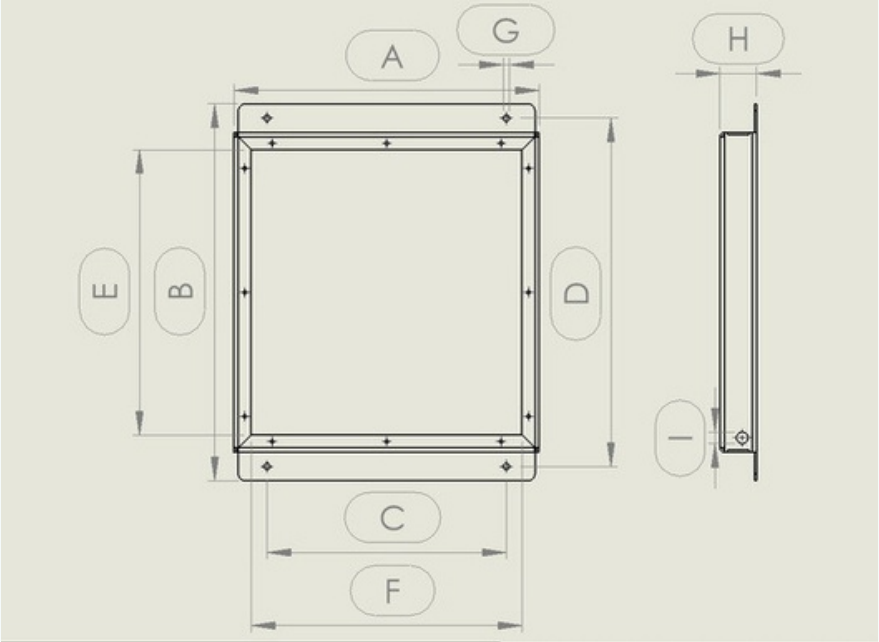
Prion Backlight units are designed and manufactured in accordance with applicable European Union directives regarding electromagnetic compatibility and electrical safety.

- **CE Compliance:** Manufactured in conformity with standard industrial CE directives for machine vision illumination components.
- **RoHS Certified LEDs:** All high-density LEDs utilized within the Prion Backlight assemblies are fully RoHS compliant, ensuring the restriction of hazardous substances such as lead, mercury, and cadmium.

NOTE: For compliance certificates, technical support inquiries, or custom design requests, please contact Prion technical support or visit our official documentation portal.

9. MECHANICAL SPECIFICATIONS AND DIMENSIONS

9.1 Product Dimensions and Technical Drawings



MODEL	A	B	C	D	E*	F*	G	H	I
D0505	63,6	84	40	74	**50**	**50**	4	16,4	6
D0606	73,6	94	50	84	**60**	**60**	4	16,4	6
D1010	113	163	67	143	**100**	**89**	4,5	25,5	8
D1015	174	163	128	143	**100**	**150**	4,5	25,5	8
D1515	163	213	117	193	**150**	**150**	4,5	25,5	8
D1525	274	213	228	193	**150**	**250**	4,5	25,5	8
D2020	213	263	167	243	**200**	**189**	4,5	25,5	8
D2030	325	263	279	243	**300**	**200**	4,5	25,5	8
D3030	313	363	267	343	**300**	**289**	4,5	33	8
D3045	474	363	428	343	**450**	**300**	4,5	33	8
D4040	426	464	380	444	**400**	**402**	4,5	33	8
D4060	626	464	575	444	**400**	**602**	4,5	33	8
D5035	524	363	468	343	**300**	**500**	4,5	33	8
D5050	513	563	467	543	**489**	**499**	5	43	13
D5075	776	563	730	543	**499**	**752**	5	43	13
D8080	813	863	767	843	**799**	**789**	5	53	13
D8822	250	1005	184	955	**881**	**226**	5	25,5	13

***Note:** Columns E and F indicate the lighting (active) area dimensions. All measurements are in mm.