GUIDANCE SIGNS

# PVL - RPV

## Internally Illuminated PVL IP54 LED Guidance Signs and RPV LED Retrofit Kits


## Compliance with Standards (current version)

| | |
|---|---|
| **ICAO** | Annex 14, Volume I |
| **CENELEC** | pr ENV 50235/1996 |
| **NATO** | STANAG 3316 |

CE

## Uses

- Mandatory instruction signs
- Information signs
- VOR check-point sign

## Sign Selection

Extensive guidance material on the selection and the definition of the length of signs is provided in chapter 5.4 and Appendix 4 of ICAO Annex 14, Volume I, (current edition). Sign sizes are governed by:

1. The runway code they are associated to (for their height)
2. Their type: Mandatory or Information
3. The message length

**Mandatory signs**
are used to identify a location beyond which an authorization from the tower is required to proceed. They include: road-, taxi- and Cat I, II and III holding position signs, runway designation signs and “NO ENTRY” signs. They have white legends on red background.

**Information signs**
are all other signs (except runway distance signs) providing information on routing (direction or destination) and on location. Information signs have black lettering on yellow background, except location signs. Location signs have a yellow legend on a black background. The message on stand-alone location signs is surrounded by a yellow border.

## Features

**The advantages of LED technology to taxiway signs are:**

- Reduced maintenance thanks to the long lifetime of the LEDs.
- Reduced energy consumption.
- Improved signal due to the optical characteristics of the LED light sources.

**Legibility**

- Exceeds ICAO requirements for luminance and colorimetry (see photometric results)
- Efficient light engine - no internal reflector to achieve photometric requirements
- Uniform luminance over the surface of the sign ensures excellent legibility even in the worst visibility conditions
- 2 level dimming as prescribed in ICAO Annex 14, Volume I

**Savings**

- Low power consumption; high power factor
- Low maintenance costs: long-life light sources, self-cleaning vertical panels collect less dirt than sloped or curved panels
- Innovative light source design (Patent Pending)

**Reliability**

- Durable IP54 construction
- Reliable start and operation from -40°C to +55°C
- "Multi-lamp" design safeguards signal legibility in case of partial light source failure

**Construction**

- Easily replaceable and removable top panel for easy light source replacement
- Message symbols provided by self-adhesive film, vacuum applied on panel inner face
- Seamless message panels up to the ICAO recommended length of 3 m made of long-life, self-extinguishing polycarbonate; UV, abrasion and high temperature resistant
- 4 mm panel thickness exceeds industry standards for improved resistance to high winds and jet blast
- Modular construction: commonality of mechanical and electrical components throughout entire sign range
- Frangibility according to ICAO or FAA requirements, withstanding jet blasts and wind velocities up to 322 km/h

## Construction

**Materials and Finish**

Corrosion-proof, maintenance-free concept.

- Body: aluminum extrusions, panels, corner leg supports and mounting legs
- Legend panel: long-life polycarbonate, UV- and abrasion-resistant, self-extinguishing
- Plain stainless-steel hardware
- Baked polyester powder coating, color: white RAL 9016
- Light sources with very long lifetime

# PVL - RPV

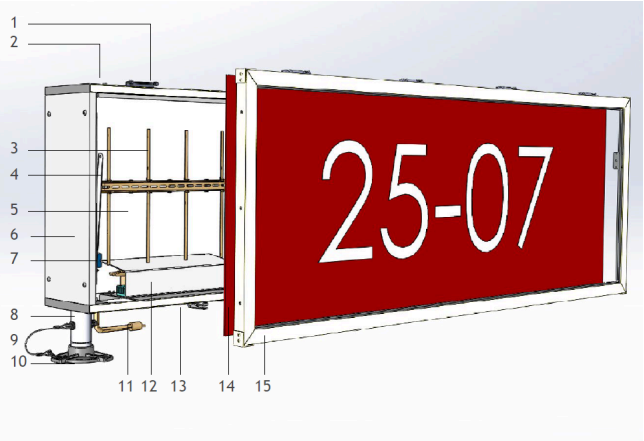



Figure 1. Construction

1. Cover clamp
2. Cover
3. LED strips (on horizontal support)
4. LED strip support
5. Rear panel
6. Side panel
7. Mounting leg
8. Mounting flange
9. 2 core cable with FAA L823 plug (supplied separately)
10. Power adapter
11. Power adapter cover
12. Sign bottom plate
13. Legend Panel
14. M10 expansion bolt (option, supplied separately)
15. Safety switch (operated outside) (not shown)
16. Tether (optional) (not shown)

## Photometric Performance

The luminance levels have been calculated as per ICAO Annex 14, Volume I. They adapt to night conditions and good visibility conditions at lower brightness settings as specified in the same document.

### Table 1: Average sign luminance

| Color | Luminance (cd/m$^2$) | Min. ICAO Requirement RVR <800 m |
|---|---|---|
| Red | 49.6 | 30 |
| Yellow | 197.3 | 150 |
| White | 371 | 300 |

Ratios:

- Red/White ratio: 1/ 7.48 (Specified: 1/5 < Ratio < 1/10 )
- Uniformity factor: Point to point ratio: all < 1.5 Overall max. to min. 2.53 (specified: < 5/1)

According to CIE no 39-2 (TC – 1,6) 1983 Fig. 4

### Table 2: Colorimetry of Sign in Night Condition

| Color | x | y |
|---|---|---|
| Red | 0.672 | 0.318 |
| Yellow | 0.515 | 0.480 |
| White | 0.344 | 0.360 |

**Illuminant:** internal source

CIE 1931 2. Standard Colorimetric Observer.

## Technical Data

**Electrical Supply**

Series (Fig. 4a): 2.8 to 6.6 A, 4.8 to 6.6 A or 6.6 A fix, 50 or 60 Hz; through (a) suitable series transformer(s) via a 2-core cable (length: 1 m) with FAA L-823, 2-pole plug supplied with the PVL. Parallel (Fig. 4b): 230V +/- 10% - 50/60 Hz Provision for earthing.

**Frangibility**

PVL signs are frangible as per ICAO Design Manual Part 6 and withstand wind velocities up to 322 km/h.

**IP Degree**

IP54 provides excellent protection against excessive rain water and solid particles (dust/sand) ingress.

**MTBF**

The individual LED have a lifetime of 50,000 hrs (nominal lifetime at operating current). The MTBF of the light sources including their power converters varies with the length and type of sign from over 20.000 hrs to over 100.000 hrs (ICAO compliant lengths).

# PVL - RPV

| Mandatory signs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Size | Sign height = 600 mm | | | | Sign height = 800 mm | | | |
| Sign length | Led PCB srtips | Power Consumption W | power consumption VA | required series transformer* | LED PCB Strips | power consumption W | power consumption VA | required series transformer* |
| 700 | 4 | 42 | 44 | 65 | - | - | - | - |
| 900 | 4 | 42 | 44 | 65 | 5 | 47 | 50 | 65 |
| 1100 | 5 | 47 | 50 | 65 | 6 | 53 | 55 | 65 |
| 1300 | 7 | 58 | 61 | 100 | 8 | 64 | 67 | 100 |
| 1500 | 8 | 64 | 67 | 100 | 9 | 70 | 73 | 100 |
| 1700 | 8 | 64 | 67 | 100 | 10 | 75 | 79 | 100 |
| 1900 | 8 | 64 | 67 | 100 | 12 | 88 | 90 | 100 |
| 2100 | 10 | 75 | 79 | 100 | 14 | 99 | 99 | 150 |
| 2300 | 10 | 75 | 79 | 100 | 15 | 105 | 105 | 150 |
| 2500 | 12 | 88 | 90 | 150 | 16 | 110 | 111 | 150 |
| 2700 | 12 | 88 | 90 | 150 | 18 | 121 | 122 | 150 |
| 2900 | 12 | 88 | 90 | 150 | 18 | 121 | 122 | 150 |
| 3300 | 16 | 110 | 111 | 150 | 22 | 161 | 168 | 200 |
| 3700 | 19 | 144 | 151 | 200 | 24 | 174 | 175 | 200 |

| Information signs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Size | Sign height = 600 mm | | | | Sign height = 800 mm | | | |
| Sign length | Led PCB srtips | Power Consumption W | power consumption VA | required series transformer* | LED PCB Strips | power consumption W | power consumption VA | required series transformer* |
| 700 | 3 | 36 | 38 | 45 | - | - | - | - |
| 900 | 3 | 36 | 38 | 45 | 4 | 42 | 44 | 65 |
| 1100 | 3 | 36 | 38 | 45 | 5 | 47 | 50 | 65 |
| 1300 | 4 | 42 | 44 | 65 | 6 | 53 | 55 | 65 |
| 1500 | 5 | 47 | 50 | 65 | 7 | 58 | 61 | 100 |
| 1700 | 6 | 53 | 55 | 65 | 8 | 64 | 67 | 100 |
| 1900 | 6 | 53 | 55 | 65 | 8 | 64 | 67 | 100 |
| 2100 | 8 | 64 | 67 | 100 | 10 | 75 | 79 | 100 |
| 2300 | 8 | 64 | 67 | 100 | 10 | 75 | 79 | 100 |
| 2500 | 9 | 70 | 73 | 100 | 12 | 88 | 90 | 150 |
| 2700 | 10 | 75 | 79 | 100 | 12 | 88 | 90 | 150 |
| 2900 | 11 | 81 | 84 | 100 | 12 | 88 | 90 | 150 |
| 3300 | 11 | 81 | 84 | 100 | 16 | 110 | 111 | 150 |
| 3700 | 14 | 99 | 99 | 150 | 17 | 116 | 117 | 150 |

Power adaptor up to 11 LED strips
Power adaptor for more than 11 LED strips
for RPV only
*recommended transformer for ICAO 2 step compliance

Figure 2. Power Consumption – Series Supplies

**Table 3: Power Consumption – Parallel Supplies**

| Load[1] | Number of LED strips | | | | | | |
|---|---|---|---|---|---|---|---|
| | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| **VA Prim** | 35 | 40 | 45 | 51 | 57 | 62 | 70 |
| **W Prim** | 24 | 30 | 35 | 42 | 49 | 55 | 63 |
| **Power factor** | 0.69 | 0.74 | 0.79 | 0.83 | 0.86 | 0.88 | 0.90 |

## Standard Options

**Bird Deterrent**

These polycarbonate strips with bayonet spikes, to deter the birds from sitting on the PVL, are located on the sign cover. Fitted with an adhesive backing and designed to be joined together, these strips are easy to install.

**Safety Switch**

This switch disconnects the power supply from the sign to allow safe maintenance.

**Safety Cables**

ADB SAFEGATE strongly recommends the use of safety cables to prevent signs from flying around in case of accidental blow down due to exceptional wind gusts or jet blast.

1 Σ loads per power adapters used; eg. for a sign with 11 strips; 45W + 51W= 96 W

# PVL - RPV

## Installation

The PVL are shipped pre-assembled. They have to be installed on a concrete foundation at the recommended distance from the runway or taxiway edge. Low-weight construction allows for ease of handling and installation of the PVL by two men. Leg flanges are secured on the foundation using expansion bolts (3 per flange).

The horizontal level of the PVL may be corrected by adjusting the mounting flanges in height (max.1.5 cm). The installation instructions are supplied with the equipment.

The cable is run in the left leg or in a flexible conduit down into a conduit elbow (catalogue leaflet A.05.110) or to an FAA style transformer housing (cat. leaflet A.05.120) embedded in the concrete.

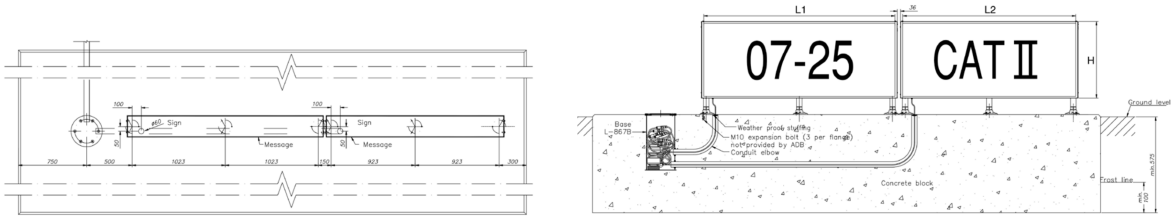
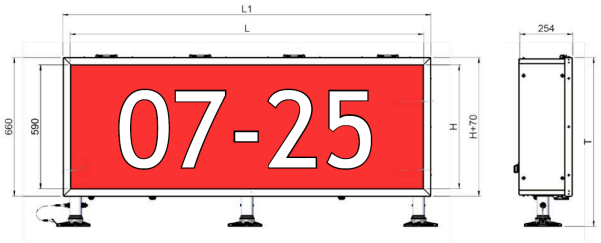



Figure 3. Installation Drawing

## Dimensions




| L (mm) | 700 | 900 | 1100 | 1300 | 1500 | 1700 | 1900 |
|---|---|---|---|---|---|---|---|
| L1 (mm) | 762 | 962 | 1162 | 1362 | 1562 | 1762 | 1962 |

| L (mm) | 2100 | 2300 | 2500 | 2700 | 2900 | 3300 | 3700 |
|---|---|---|---|---|---|---|---|
| L1 (mm) | 2162 | 2362 | 2362 | 2762 | 2962 | 3362 | 3762 |

- H = 600 or 800 mm
- Symbol height = H/2
- T = 804 or 1010 mm

## RPV Retrofit Kit

**Give your PVO signs a second life while reducing the maintenance costs.**

The LED arrangement of a PVL sign can also be mounted easily in any ADB PVO sign already installed. To do that, only the existing power adapter and the fluo tubes need to be removed. Any other equipment including the series transformers can remain as is.

The retrofit kit includes the LEDs and their fittings, making it possible to mount them directly in the sign using quick connectors, without the need for any modification, a new power converter and the necessary cabling. It takes a maximum of 20 minutes to replace the light engine for a 1500 mm long sign and the operation does not require equipment other than the usual tools available in every maintenance tool kit.

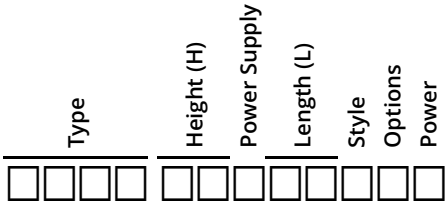
Just mail the following PVO characteristics to your ADB SAFEGATE sales contact to receive a quotation:

- Length and height of the sign or legend panel
- Type of sign: mandatory or information sign
- Power requirements: 6.6A series supply or 230V parallel supply

| Retrofit Kit with | Volume (L x W x H) mm | Gross weight |
|---|---|---|
| 1 power adapter | 1500×500×215 | 12 kg |

# PVL - RPV

## Ordering Code




**Type**
1PVL = Complete sign
RPV0 = Retrofit kit

**Height (H)**
6D = Information sign 600 mm
8D = Information sign 800 mm
6M = Mandatory sign 600 mm
8M = Mandatory sign 800 mm

**Power Supply**
1 = Series (2.8 to 6.6 A)
3 = Parallel (230 V)

**Length (L)**
07 = 700 mm
09 = 900 mm
11 = 1100 mm
13 = 1300 mm
15 = 1500 mm
17 = 1700 mm
19 = 1900 mm
21 = 2100 mm
23 = 2300 mm
25 = 2500 mm
27 = 2700 mm
29 = 2900 mm
33 = 3300 mm
37 = 3700 mm

**Style**
B = PVL IP54
0 = RPV retrofit kit standard
Z = RPV retrofit kit for signs predating 1PV

**Options**
F = With safety switch and safety rope
0 = Without safety switch and safety rope (use for RPV)

**Power**
3 = Through flexible conduit (use for RPV)
4 = Through the leg

## Packing data

| Length code | H = 600 | | | H = 800 | | |
|---|---|---|---|---|---|---|
| | Net weight (kg) | Packing sizes (mm) | Gross weight (kg) | Net weight (kg) | Packing sizes (mm) | Gross weight (kg) |
| 07 | 27 | 350 × 830 × 800 | 32 | 32 | 350 × 1030 × 800 | 37 |
| 09 | 29 | 350 × 830 × 1000 | 38 | 34 | 350 × 1030 × 1000 | 43 |
| 11 | 33 | 350 × 830 × 1200 | 42 | 38 | 350 × 1030 × 1200 | 47 |
| 13 | 37 | 350 × 830 × 1400 | 46 | 42 | 350 × 1030 × 1400 | 51 |
| 15 | 42 | 350 × 830 × 1600 | 51 | 47 | 350 × 1030 × 1600 | 56 |
| 17 | 52 | 350 × 830 × 1800 | 62 | 61 | 350 × 1030 × 1800 | 71 |
| 19 | 56 | 350 × 830 × 2000 | 66 | 63 | 350 × 1030 × 2000 | 75 |
| 21 | 57 | 350 × 830 × 2200 | 70 | 65 | 350 × 1030 × 2200 | 79 |
| 23 | 64 | 350 × 830 × 2400 | 80 | 74 | 350 × 1030 × 2400 | 90 |
| 25 | 68 | 350 × 830 × 2600 | 85 | 78 | 350 × 1030 × 2600 | 95 |
| 27 | 73 | 350 × 830 × 2800 | 90 | 83 | 350 × 1030 × 2800 | 100 |
| 29 | 78 | 350 × 830 × 3000 | 95 | 88 | 350 × 1030 × 3000 | 105 |

**Note:** The weight varies between series and parallel supplied versions all or not with or without switch.

## Suggested Specification

The Internally Illuminated Guidance Signs shall be in full compliance with ICAO Annex 14, Volume I, (current edition). The sign shall consist of a rigid, self-supporting aluminum housing of low mass. Its construction shall be modular with commonality of mechanical and electrical components throughout the entire sign range. The housing shall be painted in RAL 9016 white, mat finish and have a protection degree IP54 minimum. Assembly of the sign mechanical components shall be done by means of screws or similar hardware to facilitate the repair of accidentally damaged signs. Welding of mechanical parts is not allowed.

The legend panel shall consist of a high grade U.V., abrasion resistant and flame retardant polycarbonate with a thickness of 4 mm minimum. The legend panel shall be a (seamless) one-piece mechanically clamped, exchangeable panel. This implies that the use of chemical sealant should be avoided.The message shall be obtained by means of self-adhesive films applied on the inside of the sign. No paint shall be used. A polyethylene sheet, to be removed after installation, shall protect it externally.

The mounting legs shall form an integrated part of the sign housing so that the legs cannot be dissociated from the housing in case of extreme wind gusts. In order to cleanly break in case of impact, the sign supporting legs shall include a weakening groove. At least one of the legs shall have provision for attaching an optional safety cable to hold the sign captive toa mounting flange should the legs break. The legs shall extend over the entire panel height and thus participate actively in the sign's mechanical strength.The sign shall withstand the ICAO specified wind velocity of 322 km/h.

Sign illumination shall be realized via indirect light from LED with a life span of not less than 50,000 hours.The signs shall be powered either from a 6,6Amps series circuit or from the 230V mains power grid via a single power adapter, installed inside the sign. The power requirements shall not exceed 50W per meter panel length, irrespective of the panel height. The accessibility to the inside of the sign will be facilitated by a removable hinged front frame. Light source replacement shall require no tools.

The sign shall start and operate reliably from –40°C to +55°C ambient air temperature.The sign shall be delivered fully assembled ready for installation.