

PVL - RPV

Internally LED Illuminated IP34 Guidance Signs

Compliance with standards

ICAO: Annex 14, Volume I, para. 5.4 and
Appendix 4 (Current edition)

CENELEC: pr ENV 50235/1996

NATO: STANAG 3316

UK: CAP 168, Chapter 7

CE: Approved

Various national standards available upon request



Fig. 1

Uses

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

Features

- Generalises the advantages of LED technology to taxiway signs:
 - 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.
- Photometry
 - Innovative light source design (Patent Pending);
 - Exceeds ICAO requirements for luminance and colorimetry (see photometric results);
 - Efficient light engine - no internal reflector to achieve photometric requirements;
 - Very uniform luminance over the surface of the sign ensures excellent legibility even in the worst visibility conditions;
 - 2 level dimming as prescribed in Annex 14, Chapter 5.4.1.7 in case of high RVR (in 6,6A supply only).
- 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.
- Reliability
 - 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 wind velocities up to 322 km/h.

Construction

Materials and Finish

Self carrying, corrosion-proof 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; colour: white RAL 9016.

Light sources with very long lifetime

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

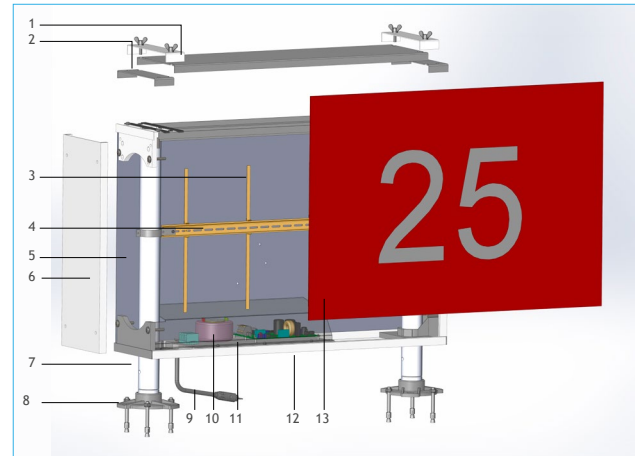


Fig. 2: construction

9. 2 core cable with FAA L823 plug (supplied separately)
10. Power adaptor
11. Power adaptor 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)

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. Sign sizes are governed by:

- the runway code they are associated to (for their height)
- their type: Mandatory or Information
- 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 (Fig. 2).

Information signs are all the other signs (except runway distance signs) providing information on routing (direction or destination) and on location. Information signs (Fig. 1) have black lettering on yellow background, except location signs. Location signs have a yellow legend on a black background (Fig. 6). The message on stand-alone location signs is surrounded by a yellow border.



Fig. 3

Photometric Performance (Typical values)

Average sign luminance

Calculated as per ICAO Annex 14, Appendix 4, Fig. 4.1.

Colour	Luminance (cd/m ²)	Min. ICAO requirement RVR < 800m
Red	49.6	30
Yellow	197.3	150
White	371	300

Note: the luminance levels adapt to night conditions and good visibility conditions at lower brightness settings as specified in ICAO Annex 14 Par. 5.4.1.7.

Ratios:

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

Colorimetry of sign in night conditions

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

Colour	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: 2.8 to 6.6 A, 50 or 60 Hz; through (a) suitable series transformer(s) (Fig. 7).

2-core cable (length: 1 m) with FAA L-823, 2-pole plug supplied with the PVL. Parallel: 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

IP 34

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).

Mandatory signs								
Size	Sign height = 600 mm				Sign height = 800 mm			
	Sign length	Led PCB strips	Power Consumption W	power consumption VA	required series transformer*	LED PCB Strips	power consumption W	power consumption VA
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 strips	Power Consumption W	power consumption VA	required series transformer*	LED PCB Strips	power consumption W	power consumption VA
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

Fig. 4a: Power consumption - Series Supplies

Technical Data (continued)

	n° of LED strips	3	4	5	6	7	8	9
load*	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

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

Fig. 4b: Power consumption - Parallel Supplies

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 cable

ADB strongly recommends the use of safety cables in order to stop signs from flying around should they be accidentally blown down due to exceptional wind gusts or jet blast.

Installation (Fig. 5)

The PVL's are shipped preassembled. 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 a flexible conduit down to a conduit elbow (catalogue leaflet A.05.110) or to an FAA style transformer housing (cat. leaflet A.05.120) embedded in the concrete.

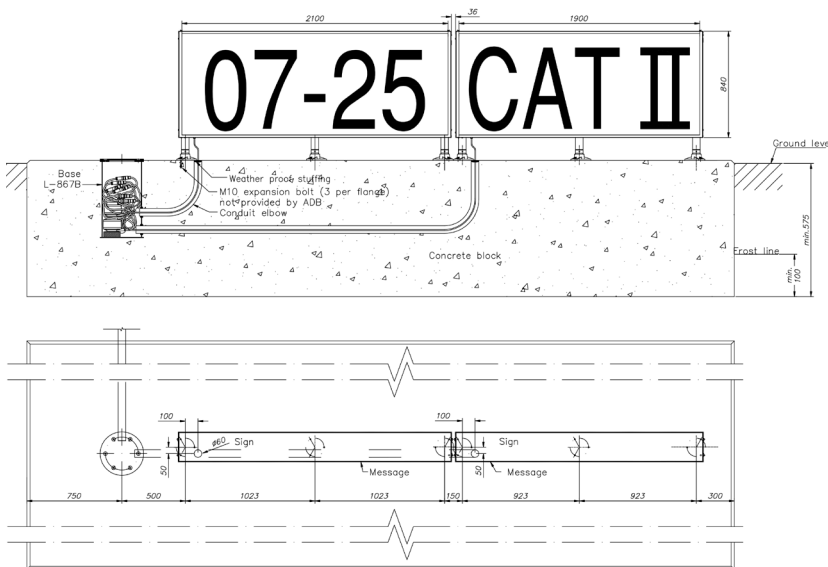


fig. 5: Installation drawing

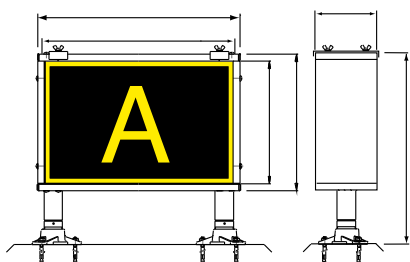


Fig. 6: Outside dimensions

L (mm)	700	900	1100	1300	1500	1700	1900
L1 (mm)	748	948	1148	1349	1550	1750	1951

L (mm)	2100	2300	2500	2700	2900
L1 (mm)	2151	2351	2552	2752	2953

H = 600 or 800 mm
Symbol height = H/2
T = 820 or 1020 mm

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 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 x 500 x 215	12 kg

Ordering Code

PVL sign or retrofit kit 1PVL 6D 1 23 AO3

PVL sign or retrofit kit

Complete sign 1PVL
Retrofit kit RPVO

Type (H)

Information sign 600 mm = 6D
Information sign 800 mm = 8D
Mandatory sign 600 mm = 6M
Mandatory sign 800 mm = 8M

Power supply

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

Length (L)

700 mm = 07
900 mm = 09
1100 mm = 11
1300 mm = 13
1500 mm = 15
...
per 200 mm
...
2900 mm = 29

With safety switch and safety rope O
Without safety switch and safety rope F

Cable Run

Through flexible conduit 3
Through the leg 4

Notes:

Special requirements to be specified in full text = S
N.B: Each ordering code shall be completed with the legend panels and colours.

Packaging Data PVL

Length code	H=600mm			H=800mm		
	Net weight (kg)	Packing Sizes (mm)	Gross weight (kg)	Net weight (kg)	Packing Sizes (mm)	Gross weight (kg)
07	27	350 x 830 x 800	32	32	350 x 1030 x 800	37
09	29	350 x 830 x 1000	38	34	350 x 1030 x 1000	43
11	33	350 x 830 x 1200	42	38	350 x 1030 x 1200	47
13	37	350 x 830 x 1400	46	42	350 x 1030 x 1400	51
15	42	350 x 830 x 1600	51	47	350 x 1030 x 1600	56
17	52	350 x 830 x 1800	62	61	350 x 1030 x 1800	71
19	56	350 x 830 x 2000	66	63	350 x 1030 x 2000	75
21	57	350 x 830 x 2200	70	65	350 x 1030 x 2200	79
23	64	350 x 830 x 2400	80	74	350 x 1030 x 2400	90
25	68	350 x 830 x 2600	85	78	350 x 1030 x 2600	95
27	73	350 x 830 x 2800	90	83	350 x 1030 x 2800	100
29	78	350 x 830 x 3000	95	88	350 x 1030 x 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, Vol. I, Para. 5.4 and Appendix 4. The sign shall consist of a rigid, self-supporting aluminum housing of low mass. 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, matte finish.

Assembly of the sign mechanical components shall be by means of screws or similar devices to facilitate the repair of accidentally damaged signs. Welding of mechanical parts is not allowed. The polycarbonate legend panel shall be U.V. and abrasion resistant and flame retardant. Its minimum thickness shall be 4 mm. The message shall be obtained by applying, on the inner face of the panel only, a self-adhesive film, by means of a vacuum-based process. No paint shall be used. The legend panel shall be one-piece (seamless) for all sign sizes up to 3 m. A polyethylene sheath, to be removed after installation, shall protect it externally.

In order to cleanly break in case of impact, the sign supporting legs shall include a weakening groove. Each leg shall have provision for attaching an optional safety cable to hold the sign captive to the mounting flanges 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 ICAO wind velocities up to 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 can either be supplied from a 6,6 A series supply or from a 230 V parallel supply 50 or 60 Hz.

Power requirements shall not exceed:

- 50 W per meter panel length with a power factor of 0,95 minimum at 6,6 A (series supply)
- 50 W per meter panel length with a power factor between 0,70 and 0,90 (parallel supply) irrespective of the panel length.

Light source replacement shall require no tools. Removal of the front panel or other wind-sensitive large-size panels for the purpose of LED strip replacement or troubleshooting shall not be permitted. No internal reflectors shall be used. Protection class of the sign shall be IP 34 or better.

The sign shall start and operate reliably from -40°C to +55°C ambient air temperature. The sign shall be delivered fully assembled and tested, with its mounting flanges, ready for installation.