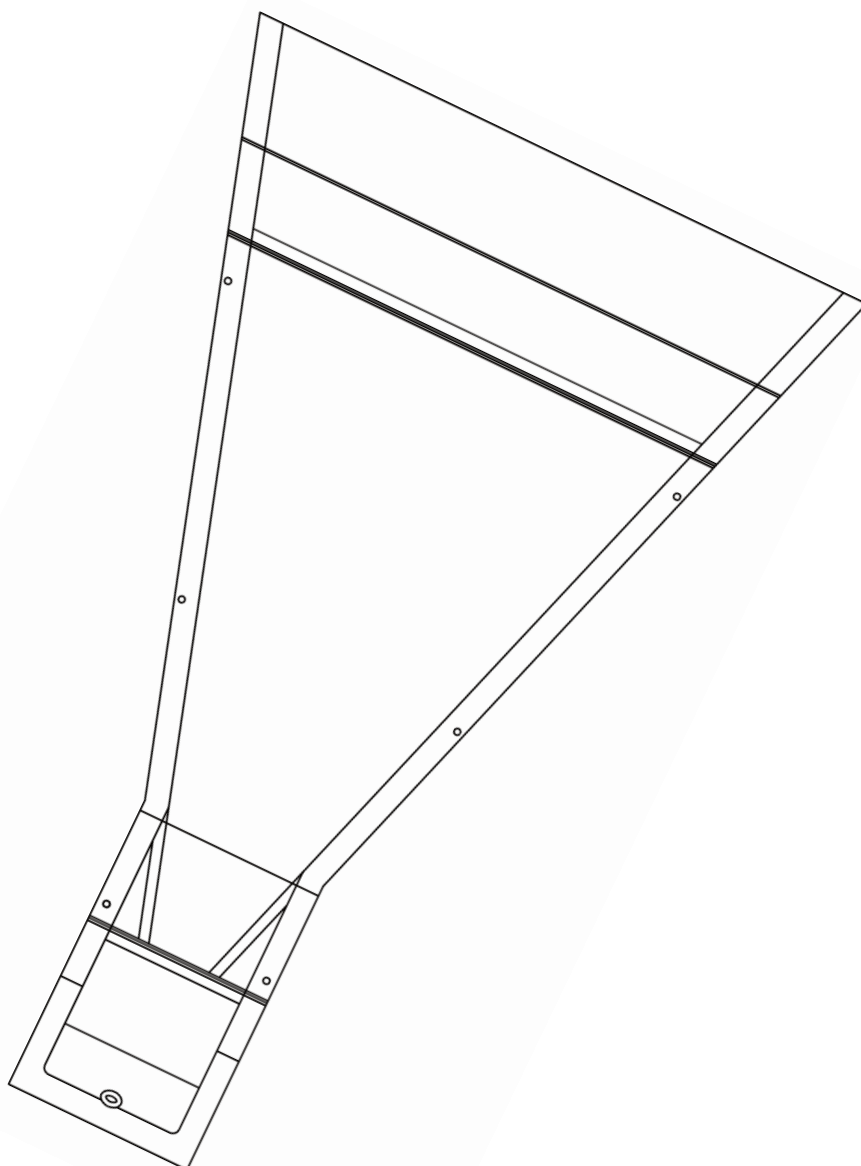


Installation Manual

AXYS® ABF-260

Model ABF-260/100W

(Part No. 570270)



REFERENCE TO EC STATEMENT OF CONFORMITY

This document confirms that this product manufactured by Duran Audio bears the CE label and meets the requirements of the following standard:

Safety:

IEC60065:2001 (ed7), A1:2005, A2:2010
(where applicable)

Fire Retardant Class:

DIN 4102 class B2

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Zaltbommel, November 2012.

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1. IMPORTANT SAFETY INSTRUCTIONS



This symbol is intended to alert you to the presence of uninsulated dangerous voltages within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



This symbol is used throughout this manual and is intended to alert you to the presence of important instructions.

- 1) Read these instructions.
- 2) Keep these instructions.
- 3) Heed all warnings.
- 4) Follow all instructions.
- 5) Do not use this apparatus near water.
- 6) Clean only with dry cloth.
- 7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- 8) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- 9) Only use attachments/accessories specified by the manufacturer.
- 10) Use only with the cart, stand, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- 11) Refer servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.



Warning -To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.



Warning -The installer should ensure that the mechanical mounting method employed should be capable of supporting four times the weight of the unit (i.e., with a safety factor of 4).

2. INTRODUCTION

This manual describes the recommended installation procedures for the AXYS® ABF-260 range of loudspeakers.

The ABF-260 is available in two versions, the ABF-260/50W and the ABF-260/100W. These differ primarily in their maximum power ratings (and correspondingly, in their acoustic output); there are also minor mechanical differences.

This manual is valid for the ABF-260/100W.

The ABF-260 is a high power, low distortion horn loudspeaker intended for use in Public Address and Voice Alarm (PA/VA) systems in locations with high ambient noise levels. It is particularly suitable for installation in reverberant spaces such as road tunnels where high noise levels are normal, but speech transmission with good intelligibility is required in emergency situations.

The AXYS® ABF-260 employs the patented principle of Acoustic Boundary Flare (ABF) geometry. It is designed to be mounted directly on the roof of the tunnel; the roof in front of the flare then acts as an acoustic waveguide, resulting in a coherent wavefront. It is this coherence which ensures that high sound pressure levels (SPLs) and good intelligibility are maintained even some distance from the loudspeaker. For this reason, correct loudspeaker placement and orientation are critical, as the desired coverage will not be achieved otherwise.

The ABF-260 is designed for use in 100 V audio distribution systems. It is not suitable for direct connection to power amplifiers equipped only with outputs suitable for driving low impedance (4 - 8 Ω) loads.

This manual covers:

- Mechanical installation of the loudspeaker.
- Wiring and connection details.
- Identification of internal components (in Appendix).

UNPACKING

The ABF-260 is shipped in a cardboard packing case.

In addition to the horn loudspeaker itself, the shipment also includes:

- Production measurement report
- Mating (male) Hirschmann connector
- Installation manual (this document)

OVERVIEW

If installing an ABF-260 for the first time, it may be helpful to spend a few moments identifying the unit's main features after unpacking.

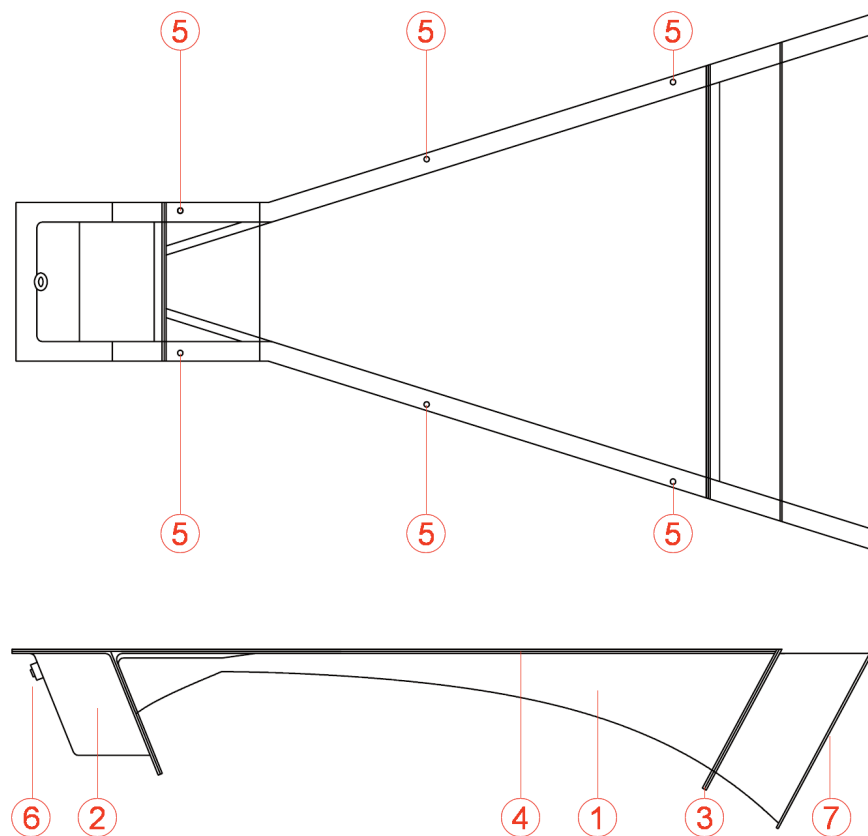


Fig. 1: ABF-260 main features.

- | | |
|--|-------------------|
| 1. Glass fibre-reinforced polyester horn flare | 5. Mounting holes |
| 2. Horn driver housing | 6. Connector |
| 3. Water resistant stainless steel mesh | 7. Horn Exit |
| 4. Mounting surface | |

3. INSTALLATION GUIDE

PREPARING FOR INSTALLATION

It is assumed that the installation site (e.g. tunnel) has been the subject of extensive acoustic analysis prior to the actual installation. The analysis should have assessed the acoustic conditions in the tunnel and defined the operating scenarios (Local/All call, traffic speed, ventilation active/inactive etc) for the PA/VA system. The minimum speech intelligibility requirements must be met for each scenario. The acoustic properties of the tunnel's interior surfaces (acoustic absorption and scattering coefficients) and the expected background noise levels due to the traffic and/or ventilation system should also have been established. More information regarding the acoustic design procedure, including design guidelines, is available on the AXYS® website.

Various acoustic modelling software applications are available; CATT-Acoustic® modelling is suitable when accurate predictions of the STI (Speech Intelligibility Index) are necessary.

Nearly all tunnel installations will need to employ multiple ABF-260 units to obtain satisfactory sound coverage. The acoustic design procedure will have identified the number of ABF-260s required and the optimum physical location for each to accurately achieve the desired acoustic coverage. In particular, the height above the roadway, and any mechanical mounting angles will have been specified. 50 m linear spacing between units is typical, but two or more units may be required at each position when the overall tunnel width is more than 15 m.

The installer should confirm that he/she has all necessary information relating to the location and physical orientation of all ABF-260 units making up the system. It is important to recognise that even small deviations from the calculated positions can adversely affect the desired acoustic coverage.

MECHANICAL INSTALLATION

Location

The ideal mounting situation for the ABF-260 is with the flat surface of the horn secured flush to the mounting surface (the tunnel roof). If the roof is curved, a totally flush fitment may be unachievable; see "Fixing to a curved roof" in this section. Tunnel infrastructure may also preclude a flush fitment; see "Non-flush installation" at the end of this section.

The ABF-260 should be mounted so that the flare of the horn faces the oncoming traffic. If it is found that tunnel infrastructure items (lights, traffic signs, fans, etc.) are within 5 m of the horn flare and in line with the horn, an alternative mounting location should be found. In such cases, the installer must contact the acoustic designer for guidance before proceeding with the installation.



Do not mount the ABF-260 in the vicinity of high pressure deluge / sprinkler system water outlets. Any water outlets of the sprinkler system should not spray directly into/onto the ABF-260.

Fixings

Fixing is via the six 8 mm mounting holes around the edge of the upper (flat) surface. M8 screws or bolts should be used, of a length appropriate to the type of mounting employed (see below).



The weight of the ABF-260 is 28 kg, and a safety factor of 4 should be allowed when checking the safe load capability of the mountings.

The diagram on the following page (fig. 2) gives the dimensions required for marking the mounting hole locations on the roof for each model. When marking out for the holes, take care that the hole positions take into account any mounting angle specified for the horn by the acoustic specification.

The roof mountings can be in the form of threaded inserts, commercially available as "Rawlbolts", or similar. An alternative approach is to inject a fire resistant chemical screw fixing compound into the hole and fix the loudspeaker using 8 mm diameter hex-head coach screws. The horn may need to be supported during the compound's setting phase (curing time).

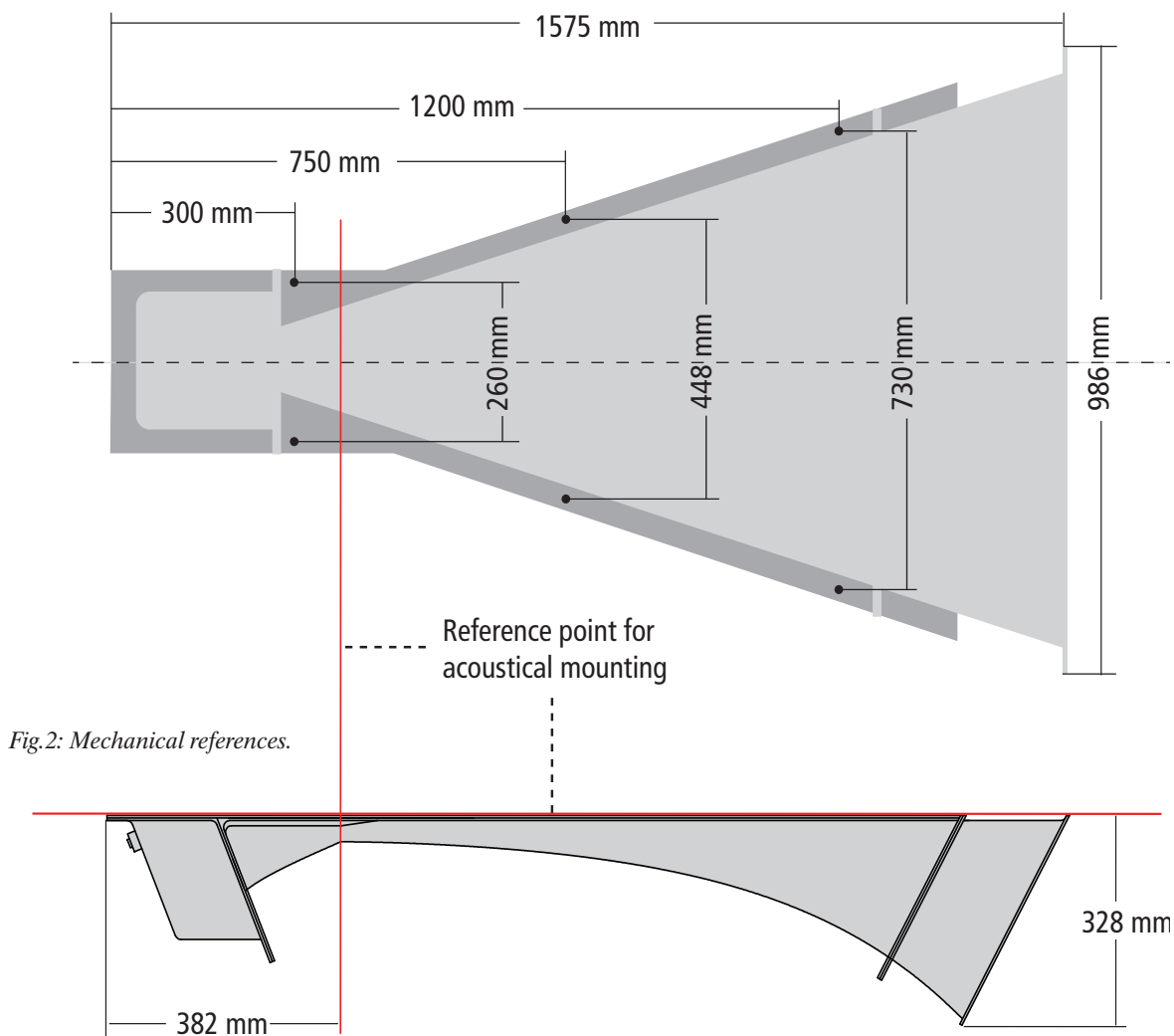


Fig. 2: Mechanical references.

FIXING TO A CURVED ROOF

In a tunnel with a curved roof, a totally flush fitment will be unachievable, the degree of deviation being dependent on the radius of curvature. In practice, the result will be a gap between the horn's upper surface and the tunnel roof, which will be at a maximum along the longitudinal centreline of the horn. If this gap is less than 2.5 cm no serious departure from the unit's specified performance will result. However a gap larger than this will impair the acoustic performance, and an alternative mounting method should be found (see hereafter).

NON-FLUSH INSTALLATION

If an acceptably flat fitment to the tunnel roof is unobtainable, either due to the tunnel's curvature or to lack of access to the specified mounting position because of signs, gantries, trunking or other infrastructure items, it may be necessary to mount the ABF-260 some distance below the tunnel roof. This can generally be achieved using Unistrut® or similar standard fixing systems. However, because of the ABF-260's "extended waveguide" principle of operation, its performance will be degraded significantly if it is "hung" in this manner in free air. This can be remedied by fixing the ABF-260 to a boundary plate (a flat board made of a suitable fire resistant material), to simulate the effect of the tunnel roof in a flush fixing. The board should be substantially larger than the horn, and a minimum size of 4 x 4 m is recommended.

4. ELECTRICAL CONNECTIONS

Electrical connection to the ABF-260 is via the 4-pin female Hirschmann connector on the rear of the driver housing. A mating male connector is supplied with each ABF-260. The connectors are rated IP67.

The pinout of the connector is given below:

PIN	FUNCTION
1	Audio in -ve (0)
2	Audio in +ve (100 V)
3	Current sensing (send)
$\frac{1}{\equiv}$ (4)	Current sensing (return)

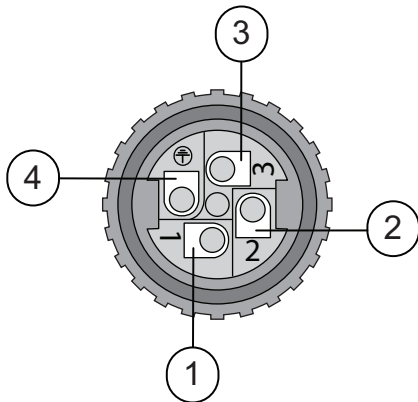


Fig. 3.1: Rear view of the mating connector showing the wiring terminals.

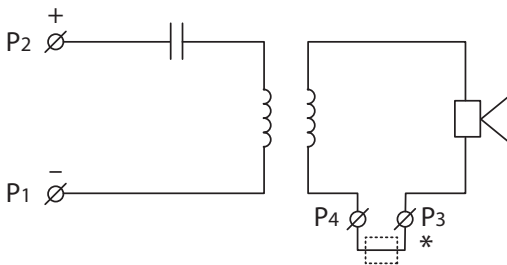


Fig. 3.2: ABF-260 wiring diagram.

AUDIO



Ensure that the speaker circuit is not active, either turning the amplifier(s) off, or disconnecting their outputs.

The 100 V line audio feed should be connected to pins 1 and 2, with the 'hot' (100 V) core going to pin 2.



If current sensing is not being used in the system, pins 3 and 4 **MUST** be connected together.

AMPLIFIER REQUIREMENTS

Duran Audio recommend the use of the AXYS® PB-400 or PB-800 Industry Amplifiers with the ABF-260.

The ABF-260/100W is rated at 100 watts on the 100 V line system. The amplifier used to drive the horns making up a single loudspeaker circuit must have a power rating sufficient to drive all the loudspeakers. The number of amplifiers to be used in a tunnel system will also be determined in part by life safety consideration of component redundancy and loudspeaker interleaving. A full discussion of these topics is beyond the scope of this document, but they should already have been taken into account by the system designer.

CURRENT SENSING

Life safety installations typically have very low duty cycles; that is, they spend the most of their service lives not being used. For this reason, many installations will require permanent loudspeaker monitoring to be implemented to verify the continued operation of the loudspeaker(s).

If the ABF-260 is being driven by an AXYS® PB-400 or PB-800 Industry Amplifier, no additional connections need be made, as these amplifiers include load monitoring as part of their design. (However, pins 3 and 4 of the connector must be connected together, as above).

Other third-party monitoring systems require access to the

* P3/P4 allow an external current sensing resistor to be connected in series with the driver (for 3rd party load monitoring).

secondary winding of the 100 V line transformer in order to sense the current taken by the driver coil itself**. In such cases, pins 3 and 4 should be wired to the external sensing device which will continually check that the loudspeaker and audio cabling is intact and functional.

CABLE SPECIFICATIONS

The maximum permissible cable length is dependent on the wire gauge of the cores. Too high a cable resistance, resulting either from too small a core diameter, an excessively long cable length, or a combination of the two, will result in an unacceptable level of signal loss between the power amplifier and the ABF-260.

The maximum signal loss that can be tolerated is depending on the design constraints of the installation (e.g. allowed reduction of maximum SPL that can be achieved). The tables below list the cable lengths which result in a 1 dB respectively 3 dB signal loss for various core diameters, and thus represent the maximum cable length which can be employed in each case. Installers should recognise that these are absolute maximum figures for one ABF-260 per power amplifier, and work well within these limits. Note that cable capacitance can become an issue as well considering impedance load monitoring with HF pilot tones, however detailed cable impedance modelling is not within the scope of this document.



The connector is designed for a maximum conductor cross-section of 1.5 mm². An external junction box might be required to interface between a cable with larger wire cross-section and the connector.

Wire cross-section	1.0 dB loss	3.0 dB loss
0.50 mm ²	133 m	449 m
0.75 mm ²	199 m	673 m
1.00 mm ²	265 m	897 m
1.50 mm ²	398 m	1346 m
2.50 mm ²	664 m	2243 m
4.00 mm ²	1062 m	3589 m

Table 1. Maximum cable length for a specified maximum loss (metric wire).

**This is normally accomplished by feeding the loudspeakers with a constant low-level, high-frequency 'trace tone', whose presence can be sensed by the monitoring equipment.

Wire	1.0 dB loss	3.0 dB loss
22 AWG	87 m	293 m
21 AWG	109 m	368 m
20 AWG	138 m	465 m
19 AWG	173 m	586 m
18 AWG	218 m	739 m
17 AWG	276 m	933 m
16 AWG	348 m	1175 m
15 AWG	438 m	1481 m
14 AWG	552 m	1866 m
13 AWG	695 m	2351 m
12 AWG	879 m	2970 m
11 AWG	1107 m	3742 m

Table 2. Maximum cable length for a specified maximum loss (AWG wire).

CONNECTOR ASSEMBLY

The mating connector is assembled as shown below.

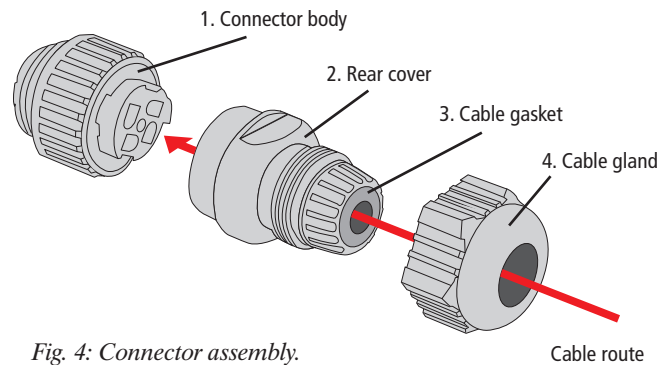


Fig. 4: Connector assembly.

Pass the cable through the cable gland (4) and the rear cover (2). Note that the rear orifice of the cover is pre-fitted with a gasket (3) which accepts cables up to 8 mm diameter. If the cable being installed is bigger than this, replace the gasket with the larger version supplied, which accepts cables up to 13 mm diameter.

Strip the jacket from the cable, exposing approx. 20-25 mm of the inner cores. Bare the ends to approx. 8 mm, and insert into the terminals (see page 9 for pinout details). Tighten the screws, ensure there are no stray strands from the cores.

Push the rear cover onto the connector body, twist and tighten by holding the centre of the body (the outer ring will rotate independently). Then tighten the rear cable gland onto the rear cover.

Do not overtighten any of the connector parts.

APPENDIX

MAINTENANCE AND CLEANING

The ABF-260 is designed to operate for an extended duration in a hostile environment. The driver enclosure is sealed and water resistant, and should only need to be removed in the very rare event of component failure. The enclosure and internal electrical components do not require regular maintenance.

The flare of the horn is fitted with an acoustically transparent corrosion resistant stainless steel (AISI 316) mesh, which protects the horn throat from the ingress of water, bird droppings and other detritus. Regular cleaning of this protection grid might be required in order to avoid deterioration of the acoustical performance of the ABF-260. The required cleaning interval is depending on the environmental classification with respect to dust deposit.

Although the ABF-260 is designed to withstand jet cleaning equipment, such as may be used in tunnel cleaning operations, it is advised to avoid spraying a high pressure/high rate water flow directly into the horn mouth.

1. Hirschmann connector socket
2. Driver connection (driver not shown)
3. Transformer
4. Capacitor

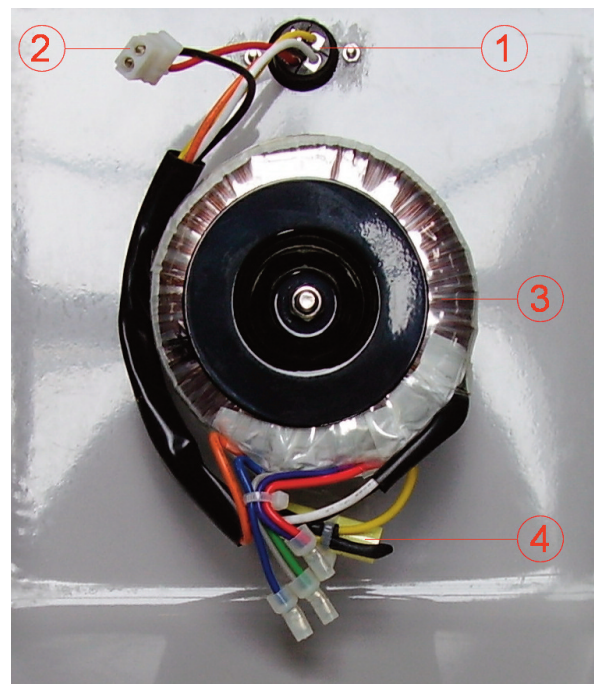
*Fig. 5: ABF-260 internal components mounted on rear cover.**

INTERNAL COMPONENTS

The ABF-260 has few internal components, and except for the unlikely event of a component failure, it should not be necessary to undo the sealed driver enclosure.

If this does prove necessary, the housing may be removed by undoing the eight M5 screws securing the enclosure to the rest of the assembly. Note that these screws are of two different lengths, the four inserted vertically into the flare top surface being the shorter. All the screws are fitted with both steel and rubber washers; the shorter screws have an additional larger diameter rubber washer internally which seals around the threaded inserts in the fibreglass moulding.

The primary internal components are indicated in the picture below.



When reassembling the driver housing, ensure to replace the rubber sealing strip, all the rubber washers and not to intermix the two screw lengths.

* Actual implementation for the ABF-260/100W differs slightly with respect to the wiring (blue in stead of orange conductor is wired to the socket) and the location of the connector socket.

TECHNICAL SPECIFICATIONS (PRELIMINARY)

Electrical	ABF-260/100W
Input voltage	100 V _{rms} (nominal)
Input Impedance	100 Ω (nominal), 75 Ω (min.)
Max. input power	100 W
Connector type	4-pin Hirschmann CA3GD
Acoustic	
Nominal frequency response	300 Hz - 11 kHz, +3/-10 dB
Horizontal opening angle (-6 dB points)	36° (500 Hz octave band)
	26° (1 kHz octave band)
	26° (2 kHz octave band)
Sensitivity (@ 1 m, 1 W input)	118 dB SPL (500 Hz octave band)
	119 dB SPL (1 kHz octave band)
	118 dB SPL (2 kHz octave band)
Directivity Index	17.5 dB (500 Hz octave band)
	19.6 dB (1 kHz octave band)
	18.5 dB (2 kHz octave band)
Mechanical	
Material	Glass fibre-reinforced polyester
Fire Retardency	DIN 4102 Class B2
Colour	Grey RAL 7004
Dimensions (L x W x H)	1575 x 986 x 328 mm
Weight	28 kg
Mounting	6 x 8 mm mounting holes
Water protection	Stainless steel mesh grille at horn mouth



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