

BOREHOLE GEOPHONE

Mod. GFA-50/100



User Manual

Edition 2025 Copyright 2025 P.A.S.I. All Right Reserved

PLEASE NOTE

When the geophone is clamped to the side of the hole it is important to reach minimum pressure of 2 bar (lower pressure does not guarantee that the pneumatic circuit will hold). When unclamping move the lever (UNCLAMP/CLAMP) to the UNCLAMPED position very slowly to allow time for the air to be released and pressure to be lost. If necessary keep repeating this procedure.

3D BOREHOLE GEOPHONE MOD. GFA

GFA down-hole 3D geophone is used to acquire seismic waves in a borehole. The 3D geophone is made up with 3 high sensitivity sensor elements mounted according to the three orthogonal axes (XYZ), which can acquire the seismic wave from the 3 directions respectively. Standard sensors have a natural frequency of 10Hz.

STANDARD PACKAGE

In your 3D Borehole Geophone mod. GFA standard package you will find the following items:

- Borehole Geophone, coiled on the reel.
- Air pump
- Cleat assembly
- Cable adapter from borehole geophone panel to seismograph connector (standard NK2721C other option on request)
- User Manual (in PDF format see PASI USB pen drive)



✿ GFA-50 Borehole 3D geophone with air pump, cleat assembly and standard connecting cable to seismograph.



↑ Cleat Assembly (to suspend the GFA at the mouth of the borehole)

Standard adapter cable to seismograph with Cannon NK2721C connector (other options on request) ♥



OPERATING INSTRUCTIONS:

A good coupling with the borehole wall is necessary not only for a good transmission of the seismic waves, but also to avoid any damage of the cable.

The first thing to do is positioning the 3D Borehole geophone at the proper depth inside the borehole. To do that, we recommend the following procedure:

1. To avoid strong hurts of the geophones, mount the cleat assembly at the mouth of the borehole and use it during measuring operations (e.g. you can use a couple of bricks to support and level it). To avoid cable torsion, we suggest first to unroll the necessary cable length and then manually download the borehole geophone to the requested depth (normally the max. depth requested, as you make measurements from bottom to the top of the hole – e.g.: -50m).

Then you can position the cable inside the cleat and close it: the geophone will remain suspended at the requested measuring depth. It cannot goes down, but you can upload it by pulling the cable and make the next measure (e.g.: -49m)





FIG. 1 Cleat in the open position



FIG. 2 Cleat in the closed position

Now you can proceed by connecting the pump air tube and the seismograph adapter cable to the related plugs on the reel panel (see FIG.3).

2. For clamping operation, move the hand lever to the right. Connect the air tube of the pump to the AIR PUMP input and start inflating; when the pressure indicator of your pump rises to 0.5 Mpa (5bar), you can stop inflating. In most of the cases inflating up to 2-3 bar will be enough to obtain a good clamping. <u>Be careful not to inflate more than 5 bars.</u>

Close the safety valve mounted at the pump air outlet.

NOTE: to verify the proper functioning of the clamping system, we recommend to make a pumping test with the 3D geophone probe out of the borehole

Take all your measurements and save all data on your seismograph. At this point you are ready to make a new measurement, and a different depth:

3. To unclamp the geophone, move the hand lever to the left and let the air go out from the discharge valve positioned inside the reel (not visible in the picture). This operation will take approx.10-15 sec. Open the safety valve mounted at the pump air outlet. Then you can upload the 3D geophone to the next depth of measurement and start again from point 2 (clamping operation).

NOTE: THIS OPERATION MUST BE DONE WITH THE CABLE IN YOUR HAND (DON'T ROLL UP THE CABLE ON THE REEL!) TO AVOID ANY TWISTING



clamping/unclamping



Safety valve mounted at the pump air outlet

FIG. 3 The GFA panel on the reel

P.A.S.I. srl - via Galliari 5/E - 10125 TORINO - ITALY Tel.+39 011 650.70.33 Fax +39 011 658.646 E-MAIL sales@pasisrl.it www.pasisrl.it - www.pasigeophysics.com At the end of the measuring session you can unclamp the borehole geophone for the last time and upload it at the surface. Now disconnect the seismograph adapter cable; to disconnect the air tube, don't forget the very last operation:

4. To remove the air tube, press the grey ring of the input air pump plug and – at the same time – pull out the air tube.

Finally, you can roll up the geophone cable on its reel.

ACCESSORIES:

Space assembly for the connection of 2 GFA in series



Mounting instructions:

1. Remove the counterweight as in the image below.



2. Connect the extension shaft (Spacing Assembly) using the three screws supplied. **WARNING**: the three screws can only be placed in one position and you must respect it.



3. Align the geophones, insert the cable of the second geophone in the appropriate slot (see image below) and fix the extension shaft (Spacing Assembly) using the three screws supplied (see image below).

WARNING: the position of these screws is unique and you must respect it.

To facilitate the assembly, place the two geophones on a flat surface with the flaps open so that to ensure alignment.



4. Secure the cable with cable ties as far as the end of the first geophone (see picture below).



5. If you use the geophone without buffers (see image below) you are advised to keep the cable positioned as shown in the photo below, use the flap that comes out as a reference.



CABLE CONNECTIONS:

GFA borehole geophone is delivered with a cable adapter with 27 poles Cannon connector as follows:

Vertical channel (Z) \rightarrow pin 1(+) (BROWN) & 2(-) WHITE of the connector Horizontal channel (X or H1) \rightarrow pin 3(+) GREEN & 4(-) YELLOW of the connector Horizontal channel (Y or H2) \rightarrow pin 5(+) PINK & 6(-) GREY of the connector If necessary, before use in a borehole you can verify the good working of the 3D geophone by setting the seismograph in "noise monitor" and knocking gently on the external case.

Cannon connector wirings: Vertical: BROWN (positive) e WHITE (negative) Horizontal 1: GREEN (positive) e YELLOW (negative) Horizontal 2: PINK (positive) e GREY (negative)

Different productions may have different colour wirings, so testing with a multi-meter could be useful to identify the different geophones. First you have to identify the 3 couples of wires (they should have a resistance of about 3500Ω at the edge. After this, let the multi-meter connected while knocking on the 3D geophone case vertically to identify the vertical channel sensor and horizontally - at 90 degrees - to find out the two horizontal channels.

CAUTIONS:

During transportation and use of the device, protect the probe and avoid intense vibration and impact. Store the instrument in a cool and dry place.

Don't pull or bend the GFA cable. Don't approach sharp objects during transportation. After use, don't forget to always clean and dry the GFA.

DIMENSIONS:

The GFA can be adapted in different borehole sizes. If the diameter is too small or too big, it is possible to remove the spacer block or to substitute it. Custom-made spacers are manufactured by PASI s.r.l. on request.

FIG 4: GFA probe - with standard spacer block - in clamped position.FIG 5: The spacer block can be removed from the GFA probe by using an Allen keyFIG.6: CAUTION: It's essential to move the 2 screws found at the spacerextremities in the holes left open by the spacer removal. If not closed water and dirtwill enter in the probe damaging it!





FIG. 4

FIG. 5



FIG. 6

Standard spacer block dimensions:

- The diameter of the geophone unclamped with the spacer block is Φ78 mm
- The diameter of the geophone clamped with the spacer block is Φ128 mm
- The diameter of the geophone unclamped without the spacer block is Φ50 mm
- The diameter of the geophone clamped without the spacer block is Φ100 mm

The GFA down-hole 3D geophone is lightweight and easy to carry (only 12 kg for the GFA-50 and 17kg for GFA-100). The outside case of the probe is in anodized aluminium, with a steady structure for long time using and easy maintenance.

The adapter cable for seismograph is terminated with Cannon connector NK2721C (standard version - other options on request).

CONNECTING THE GFA TO A PASI SEISMOGRAPH (physical connections)

- 12 channel instruments:

PIN		Channel
1	-Z	1 (-)
2	+Z	1 (+)
3	-X	2 (-)
4	+X	2 (+)
5	-Y	3 (-)
6	+Y	3 (+)

- 24 channel instruments:

Channel Connector 1-12

PIN		Channel
1	-Z	12 (-)
2	+Z	12 (+)
3	-X	11 (-)
4	+X	11 (+)
5	-Y	10 (-)
6	+Y	10 (+)

Channel Connector 13-24

PIN		Channel
1	-Z	13 (-)
2	+Z	13 (+)
3	-X	14 (-)
4	+X	14 (+)
5	-Y	15 (-)
6	+Y	15 (+)

MAIN TECHNICAL SPECIFICATIONS:

1.Natural frequency:	10±5% Hz
2.Sensitivity:	1000±5% (<i>mv/cms</i> ⁻¹)
3.Damping factor:	0.55±10%
4.Inner resistivity:	$3500\Omega\pm5\%$ (core body)
5.Distortion:	≤0.2%
6.Insulation resistance:	≥50MΩ
7.Running temperature:	-40°C to+70°C
8.Probe size:	Ф50*570mm
9.Normal working angle:	<20°
10.Cable length:	50/100m