VE-3x Series Velocity Sensor

Installation and Operation Manual

Author:	Ralph Böniger
Checked:	Dr. Talhan Biro
Approved:	Johannes Grob
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Distribution:	GeoSIG Ltd

GeoSIG Ltd, Wiesenstrasse 39, 8952 Schlieren, Switzerland
Phone: + 41 44 810 2150, Fax: + 41 44 810 2350
info@geosig.com, www.geosig.com

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Warnings and Safety

The sensor housing provides no protection against explosive atmosphere. It must not be directly operated in area where explosive gases are present.

Introduction

The GeoSIG VE-3x series velocity sensors consist of the following sensor types:

- VE-31 uniaxial
- VE-32 biaxial
- VE-33 triaxial

All sensor types are implemented in the same water- and dustproof, 195 x 112 x 95 mm cast aluminium housing. The modules inside the VE velocity sensors are quality geophones. Small size and single bolt fixation allow for both saving space and installation time. Levelling is accomplished via three point levelling screws. Alternatively, the flanges that support levelling can be used for mounting if desired.

2. Electrical Connector

All the VE-3x velocity sensors are supplied as standard with a 2 m connection cable. Based on the intended use, the 12 pin metallic style connectors will be supplied in one of the following options: Binder Serie 623 or Binder Serie 423.

2.1. Binder Serie 623

GeoSIG	P/N #J_CIR.012.002.F
Binder Serie 623	P/N 99 4606 00 12

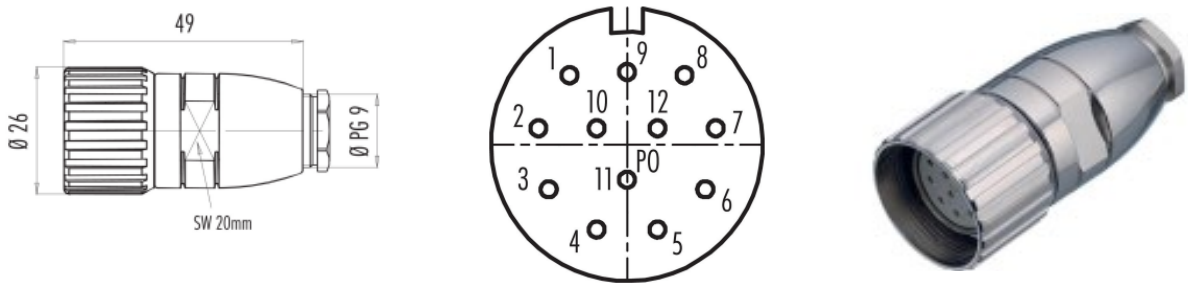

Figure 1, Binder Serie 623 Connector

The cable gland nut is determined according to the cable external diameter and must be separately ordered. It must also provide the cable shield connection to connector case.

2.2. Binder Serie 423

GeoSIG	P/N #J_CIR.012.010.M
Binder Serie 423	P/N 99 5629 00 12

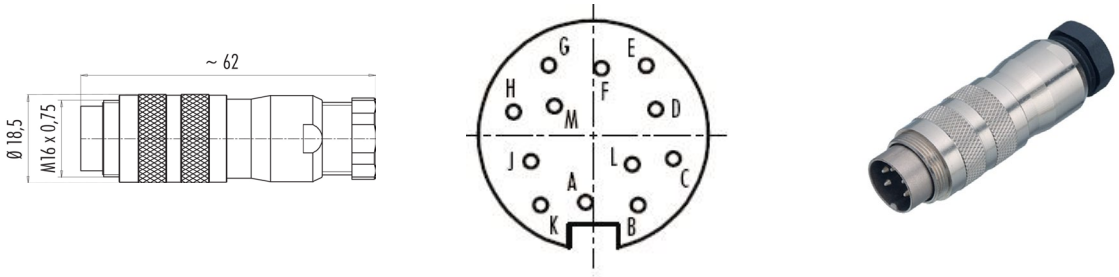

Figure 2, Binder Serie 423 connector

Cable gland nut has to be determined as per cable external diameter and must be separately ordered. It has also to provide the cable shield connection to connector case.

2.3. Connector Pin Description

The connector pin assignment and cable colour code can be observed in the table below:

Binder Connector		SIGNAL	Comment	Colour	
Serie 623	Serie 423				
Pinout	Pinout				
1	A	OUTPUT X (+)	X-Signal High, 430 Ω output impedance	White	
2	B	OUTPUT X (-)	X-Signal Low, 430 Ω output impedance	Brown	
3	C	OUTPUT Y (+)	Y-Signal High, 430 Ω output impedance	Green	
4	D	OUTPUT Y (-)	Y-Signal Low, 430 Ω output impedance	Yellow	
5	E	OUTPUT Z (+)	Z-Signal High, 430 Ω output impedance	Grey	
6	F	OUTPUT Z (-)	Z-Signal Low, 430 Ω output impedance	Pink	
7	G	SHIELD	SHIELD	Blue	
8	H	RESERVED	RESERVED	Red	
9	J	RESERVED	RESERVED	Black	
10	K	RESERVED	RESERVED	Violet	
11	L	RESERVED	RESERVED	Grey/Pink	
12	M	RESERVED	RESERVED	Red/Blue	

Table 1. VE-3x Connector Pin Assignment and Cable Colour Code

The analog output voltages of VE velocity sensor are referenced to 0 VDC with a sensitivity of 27.3 Vs/m.

2.4. Cable Configuration, Specification and Length

The cable configuration, specification, length and quality of installation affect the quality of analog signal received, the cost of materials and the long-term reliability of the system. When cabling is ordered as part of the system, GeoSIG engineers review the installation plan and the cable specifications as well as environmental conditions to assist you in achieving a reliable and cost-effective installation. Following the guidelines outlined below will help further ensure your success.

A cable must not only be able to transmit power and signals, but must also survive the environment in which it is placed. This includes chemical exposure, UV exposure, impact and cut protection, temperature extremes and any regulatory safety requirements. Because the permutations are so numerous, it is not practical to specify particular manufacturer's cable part numbers here. However, GeoSIG engineers will work with you to help you specify an appropriate cable. The electrical parameters required for transmission of signals and power is discussed below.
The cable construction must be an overall shielded twisted pair type for optimal protection from electromagnetic interference (EMI) sources along the path of transmission. Normally the shield can be a foil wrapper with a drain wire. However, if the cable is to be installed in close proximity to high voltage power cables an overall braided shield is additionally recommended.

For optimum noise shield performance and maximum cable run lengths, the VE velocity sensor signals should be paired as shown on Table 2.

Table 2. Cable Wire Pair Assignments

Pair	Wire Pair Function
1	X-Signal high and low
2	Y-Signal high and low
3	Z-Signal high and low

Connect the cable shield to the local ground at the recorder

Cables do not generate noise. However, longer cables increase the amount of the contributed noise from external sources. Cables should always be routed as far from power distribution and control wiring as possible. Again, if the cable needs to be installed close to power cables, an overall braided shield is additionally recommended.

Cable resistance primarily determines the maximum cable length. This is not an issue related to analog signal degradation since both the signal currents and the transmission bandwidth are comparatively quite low. The main limitation is an outcome of voltage drops in the power supply due to cable resistance. The following table lists typical conductor resistance values for twisted pair shielded cables.

Table 3. Typical Twisted Pair Shielded Cable Specifications

Diameter mm	Square mm^2	Resistance Ω/km	AWG
0.25	0.051	371	30
0.42	0.14	135	-
0.45	0.159	114	25
0.51	0.204	93	24
0.53	0.22	86	-
0.64	0.321	52	22
0.80	0.5	39	-
0.81	0.515	34	20
0.98	0.75	26	-
1.02	0.817	21	18
1.13	1.0	19	-

While selecting a cable, a maximum total resistance of 100 Ω should be taken into account and the values out of the table above must be doubled (forward and back path) to have the correct resistance value.

3. Installation

The VE velocity sensors are fairly simple devices to use, but some care must be taken in installation to be assured of proper performance. Because there are many considerations, we recommend that before starting installation, you review each section of this manual to ensure the best possible chance of a simple installation that works right the first time. Prior to and after installation we recommend that you verify functionality of the VE velocity sensor and the cable assembly with testing the output signal of the sensor. This may save time and trouble as well as give confidence that connections are done correctly.

The location of the sensor, preferably as close as possible to the associated recorder, should be as level and smooth as possible and the foundation should be of concrete, rock or similar material which is perfectly bonded to the ground or structure to be measured or monitored. Special installations such as installing vertically on a reinforced concrete wall (i.e. vertical foundation) are also possible, provided that the sensor is compatible with the required orientation, the location is appropriately selected and the sensor is properly mounted.

3.1. Installing

The VE velocity sensor must be firmly mounted to the foundation and levelled using the single centre pivot bolt and the three point levelling screws. "T" slot on the bottom and side of the sensor housing are made to accept an M8 x 35 mm stainless steel bolt head. This centre pivot bolt is first fastened to the foundation leaving approximately 18 – 20 mm of height above the installation surface. The sensor, at its “T” slot, is then slipped onto the bolt head and oriented in the proper direction. The three point levelling screws are then adjusted and tightened to both level the sensor and securely fasten it to the surface.

In order to prevent any damage to the sensor housing or the fixation screw and/or anchor, do not tighten the levelling screws using excessive force.

Use a bubble level and place it on the top of sensor surface, level first along one axis, then the other as final levelling adjustments are made.

3.2. Axis Orientation Configuration

The axis orientation configuration is printed on each sensor's label that takes place on the housing. Geophones are sensitive to the gravity, therefore the VE velocity sensor has to be placed in accordance with the intended (and as purchased, i.e. horizontal or vertical) orientation.

Do not exchange the geophone axis orientation(s) without contacting GeoSIG. Doing so will void the warranty of the instrument and might also damage it completely.

The polarity of the signal can be changed basically by exchanging the connections to the geophone. Also this action has to be coordinated with GeoSIG and must be executed by a skilled electrician.