GVR Frequently Asked Questions

Q. Can the GVR be used in coastal regions?
A. Yes, the GVR is very well suited to this type of environment.

The materials used in the GVR have been carefully selected to ensure a lifetime of trouble free operation under all environmental conditions. The tank is made from cast aluminium (link here) with a composite material base plate. The control box and all other external fixings use and austenitic grade of stainless steel (304) while the main mounting bracket is made from zinc plated steel. Bushings are equally well adapted and are offer customers a choice of either EPDM or silicone rubber with extended creepage.

Over time, slight discolouration of the tank exterior may be noticed. This is normal and is caused by oxidation of the aluminium. The design of the GVR has taken this into account and this condition does not lead to any deterioration in the operation of the GVR during its lifetime. (When installing the GVR, it is important to ensure that no copper is connected directly to the aluminium tank.)

The discolouration of the GVR tank should not be confused with bimetallic corrosion which has become a feature of other designs in the market place. This type of corrosion is known as galvanic corrosion and is caused by the reaction between the aluminimum and certain other metals. Such reactions can lead to the cracking of porcelain bushings or interference to operating levers.

Q. Can I measure the pressure of the SF6 in the GVR? / Does the GVR have a low gas alarm?
A. Yes, this is standard for the Panacea and an option for the Polarr relay.

Gas pressure can be measured using a hand held gauge pressed directly onto the filling valve on the side of the tank. This is the most accurate method but not the most practical when the equipment is in service.

GVRs supplied with the Panacea relay can read the gas pressure directly off the front panel or access this through telemetry. The value of the pressure can also be used as a logical element within the control logic of the Panacea. For example, a low gas situation could be used to disable an auto-reclose operation. The 351R is unable to measure pressure directly, but it can use one of its spare inputs to monitor the SF6 contact accessory developed for the Polarr relay (described below).

With the Polarr relay, the relay itself does not actually monitor or measure the gas pressure but as an option, the pressure transducer in the GVR can be wired into the control box. This can then be accessed by a hand held gauge through an optional front panel mounted socket to give pressure indication, alternatively, the signal can be converted into a healthy / fail signal that can be read by a suitable RTU.

Q. I am concerned about what some other companies have been saying about SF6. Should I avoid its use?
A. There is no need for concern. Certain arguments against SF6 have primarily been circulated by companies with competing products.

In the words of EPRI, SF6 is recognised as a “wonderful dielectric, a highly electronegative gas with insulating and arc-interrupting properties that no alternative or substitute material can match.”

Q. Do I need to have an external supply to power the GVR?
A. No. The GVR is unique in that it can be supplied with the Polarr relay operating from Lithium batteries.

This eliminates the need for any external supply and allows the GVR to be installed in areas where it is undesirable to fit a pole mounted VT. This only applies to the GVR with the Polarr relay on its own. If an additional RTU is required, or the Panacea relay is used, an auxiliary supply is required

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Q. Can I fit surge arrestors to the GVR?
A. Yes, the GVR can be supplied with integral surge arrestor mounting brackets.

The GVR has been engineered to accept a wide range of surge arrestors, conveniently mounted directly onto the GVR tank. This makes is very convenient to mount the GVR as this work can be done before the GVR is installed on the pole.

Q. What bushing material options are available for the GVR?
A. EPDM or Silicone rubber.
Both offer excellent dielectric properties with the benefits of being light weight and vandal resistant. The Silicone that we use is Dow Corning HV1760-80 and is also used by manufacturers of surge arrestors.

Q. I would like to use the Panacea relay but need to change the front panel keys into my own language for ease of use by my operators. Can this be done?
A. Yes, this is possible for the 351R at the moment and will in the future be available on the Panacea. It is a simple process that make use of interchangeable labels. This is an option that needs to be specified at time of ordering.

This will result in lower training costs and reduce any danger of mal operation due to operator error. This facility can also be used in conjunction with the internal logic of the relay to enable the relay to be fully customised.

So for example, with one set of logic and front panel labels the relay can be used for auto-reclosing and with another set it could be configured to become a sectionaliser of switch. The obvious advantage of this facility is the increased flexibility of the Panacea and GVR but it should not be forgotten that benefits are also achieved through commonality of parts. More information is available at http://www.selinc.com/sel-351r_labels.htm.

Q. I am not currently using the GVR and have a problem with mag inrush causing my existing reclosers to mal operate on their instantaneous settings. Can I overcome this problem with the GVR? I do not want to delay the trip because this limits the stages in protection that I can use of the network.
A. Yes, the Panacea relay has front end filtering to ensure immunity to mag inrush currents.

The filtering within the Panacea is a half-cycle cosine filter. This together with the front end anti-aliasing filters will effectively reject everything other than fundamental. This ensures that it is immune to DC and harmonic components that are characteristic of mag inrush current. Relays that simply measure the rms value of the current inputs may be influenced by DC and harmonic components. Although this will generally not present a problem for IDMT curves, it may lead to mal operation of the relay on its instantaneous elements if these elements are not delayed. More information on the Panacea's filtering can be seen at http://www.selinc.com/techpprs/6041.pdf.

Q. I need to include extra stages of protection on my network but cannot have any more reclosers because of time grading constraints. Can I still use the GVR but operate it as a sectionaliser?
A. Yes, the GVR with Panacea has the option to reconfigure the way that the relay works. By reprogramming the Panacea it can operate as a simple switch (remote remote control applications) or even as a sectionaliser.

The Panacea is one of the most flexible protection relays available today. The functionality of the relay is provided by the configuration of the relays internal logic. For reclosing applications the relay is configured in one way - this is the standard configuration. However, if a a customer requires a sectionaliser, the logic can be reconfigured to operate accordingly. In addition to reclosing logic, the Panacea can also be configured as a voltage sensing sectionaliser, current sensing sectionaliser simple switch for automation purposes, or

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automatic switch for voltage throw over applications. In order to assist ease of operation, the Panacea front

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labels can be swapped to ensure that the push button labels reflect their current application - see comment on interchangeable labels above.

Q. Can the GVR be used as a sectionaliser?

A. Yes, the GVR can be supplied with dedicated sectionalising electronics for current sensing sectionalising applications. Alternatively, the Panacea can be used with modified logic to offer either current or voltage sensing sectionalisers.

The GVS is a variation on the GVR that utilises the GVR circuit breaker including vacuum interrupters, magnetic actuator mechanism and current transformers inside the aluminium tank.

The sectionalising logic is provided by tank mounted dedicated sectionalising electronics with a pole mounted VT for the power supply. The GVS can be upgraded to a remote controlled sectionaliser by the addition of a suitable RTU located in a pole mounted control box. Connections to the GVS are achieved through a conveniently located panel mounted socket.

One of the benefits of utilising the GVS as a sectionaliser is that it can be later upgraded to a full auto-recloser by the addition of a suitable auto-reclosing relay such as the Polarr or Panacea.

Q Can the GVR be used to identify the distance to fault?

A. Yes, the Panacea has the facility to program the lines impedance and length which allows it to give fault distances - either in front or behind the GVR depending on the direction of the fault. However, as with all fault distance locators, this should be used with caution.

In all fault location algorithms inaccuracies are introduced because of load flow, fault resistance etc. The algorithms used in the Panacea try to minimise these inaccuracies giving a superior fault distance locator. The fault locator algorithm assumes that the circuit is a plain feeder and is homogeneous. This means that there are no T points and the line is of the same construction throughout. If there are T points then these will make a contribution to the fault and effect the fault location.

Similarly if the line is non-homogeneous then further manual calculation is needed. As a simple example lets assume a 15 km line with the first 10km overhead line followed by a 5 km cable. If we assume the O/H is 1 ohm/km and the cable is 0.2 ohm/km then the total impedance is 11 ohms. If we know get a a fault location of 92% the immediate conclusion is 13.8 km away. Which is incorrect. The correct answer is 10.6km. Reason. The fault locator assumes the line is the same impedance throughout, the answer of 92% is actually of the complete impedance, 92% of 11 ohms is 10.12 ohms. 10 ohms for the O/H line and then 0.12 ohms into the cable.

Q The GVR is my preferred choice for an auto-recloser circuit breaker. I know that the Panacea is based on the SEL 351R but I would prefer to use the SEL 351R or 351S - is this possible and are there any differences?

A. Yes it is possible to use the SEL 351R with the GVR, there are 3 enhancements to the Panacea to consider before making the decision.

The enhancements that resulted in the Panacea are based around the integration of the SEL 351R with GVR and include SF6 pressure measurement, voltage measurement from capacitive voltage transducers in the GVR, fault counters for each phase plus integrated magnetic actuator control circuitry.

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For reasons of commonality of spares and user familiarity, some customers prefer to use the SEL351R. This is possible by the use of the magnetic actuator interface accessory. If SF6 monitoring or voltage monitoring (this is monitoring rather than measurement), additional accessories are also available.

The GVR and 351R can be supplied by Whipp & Bourne in a complete package or alternatively, the GVR and accessories can be supplied for integration with a customer supplied relay such as the 351R or 351S.

If a customers concern is primarily front panel familiarity, then the Panacea with a user configurable label may be a better solution - more information is available at http://www.selinc.com/sel-351r_labels.htm.

Q. What is the maximum baud rate of the Panacea?
A. The baud rate of the Panacea can be set between 300 and 38,400.

Q. What SCADA protocols can I use with the GVR?
A. The GVR can be used with just about any protocol in the market place today including DNP3 and IEC 870.

The DNP3 is probably the most widely used protocol used for overhead line automation. It is built into the Panacea relay as standard and is also available in wide range of RTUs for use with the Polarr relay. More information on the DNP3 protocol is available in the section on RTUs and Radios.

Customers wishing to use IEC 870 or any other protocol can do so using the Polarr relay and a suitable RTU. More information on other protocols is available in the section on RTUs and Radios.

Q. What information is available regarding the weathering characteristics and suitability of EPDM rubber for bushings?
A. We have extensive ageing test data for EPDM.

The compound was formulated by GEC Henley over 30 years ago and has been used in every climate on earth. Because the EPDM bushings are over-rated for creepage by a factor of 50%, any general concerns about the suitability of EPDM and it's weathering characteristics should be put to rest. The GVR uses 38kV creepage EPDM bushings for the 15.5kV and 27kV rated units. The 38kV GVR has EPDM bushings rated for 46kV. They are approximately 4 inches longer overall (not creepage) that the other. Refer to the Fitandforget page for more details of the bushing construction.

Q. What is the potential for separation or moisture ingress on the bushings?
A. Extremely limited. The EPDM and silicone bushings are fused directly to the bushing stem. Refer to the Fitandforget page for more details of the bushing construction.

Q. Is it necessary to top up the SF6?
A. No, the GVR design complies with IEC 60694 section 5.15.3 as a "sealed pressure system" and no further gas replenishment is required during its design life of 30 years.

For more information visit the Fitandforget page where you can learn more about the GVR tank and sealing system.

Q. What is the operating time of the GVR magnetic actuator?
A. The GVR operating times are typically 20mS for a trip and 80mS on the close. This allows fault clearing times as fast as 70mS and dead times as low as 250mS for each trip / close cycle in the sequence.

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The times will vary slightly between ratings and the type of power supply utilised. The worse case times are 25mS for a trip and 110mS for a close, these are the times taken from operation of the contactors controlling the actuator, to the primary contacts separating / touching. For fault clearance times, it is necessary to take into account worse case arcing of 15mS plus the operating time of the relay. Both the Polarr and Panacea have been configured to allow fastest fault clearing times of 70mS.

The GVR has been optimised for recloser operation but a faster version is utilised on the high speed transfer switch manufacturer by Powell Esco for underground vault operations. For more information on this application please contact your local Whipp & Bourne agent or www.powellesco.com.

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Q. What metering CTs options are available for GVR?
A. The GVR metering of the metering CTs in the GVR are to the BS EN 60044 standards with options for 0.5 and 1% accuracy.

As an option the GVR can be supplied with metering CTs. These are located inside the tank on the opposite set of bushings to where the protection CTs are located. We have options for Class 1 (1% accuracy) and Class 0.5 (0.5% accuracy) with a wide range of ratios available including 200/1, 300/1, 300/5 and 600/5.

Q. If the cold Load pickup feature has been programmed in (settings applied) is this function active in both local and remote conditions?
A. Yes cold Load pickup is active in both local and remote conditions.

This is because the cold load pickup featured is intended for those applications where the start up currents of a system, which occur when the GVR are closed, might cause normal protection sequence to trip. Therefore it operates on closing of the GVR and not the method used to initiate the close. Refer to the GVR / Polarr Installation, operation and maintenance manual for further details.

Q. As the GVR is a sealed pressure system does it leak SF6 gas?
A. Yes, a very small amount of SF6 gas per annum.

All GVR's are tested to BSEN 60694-15 this standard sets the leak rate per year at 1%, however the GVR tanks have a maximum leak rate of 0.64% per year which, as you can see is under the standard set by BSEN 60694-15.

Q. What is the maximum umbilical length that can be used with the standard polarr CT's?
A. 20 metres is the maximum length permissible.