

**PENSTOCK
SOLUTIONS**



**Glenfield
Invicta**
Delivering Project Solutions





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GLENFIELD INVICTA PENSTOCK SOLUTIONS



Penstock undergoing factory leakage and function testing.

Market leaders, distinguished by industry expertise and experience, Glenfield Invicta have rapidly become the 'go to' solution provider for penstock supply and installation throughout the UK.

At Glenfield Invicta, our reputation has been earned by ensuring that not only is the right solution chosen at inception stage, but that the right product is installed correctly, avoiding costly delays and frustrating call backs for problems with leakage and faulty operation.

Our fully certified Site Engineers have the expertise and knowledge to deliver an installation and maintenance service for any penstock, but will preferentially select from AVK Group's range of high quality penstocks should a supply and installation package be required.

The Penstock Supply and Installation Service Offering Includes:

- Design Input Product Selection
- Site Survey
- Associated Ancillaries
- Installation
- Actuation
- Commissioning
- Testing
- Maintenance
- Extended Warranties
- Removal and Refurbishment

Member of the AVK Group



GLENFIELD INVICTA MARKET SEGMENTS

CLEAN WATER



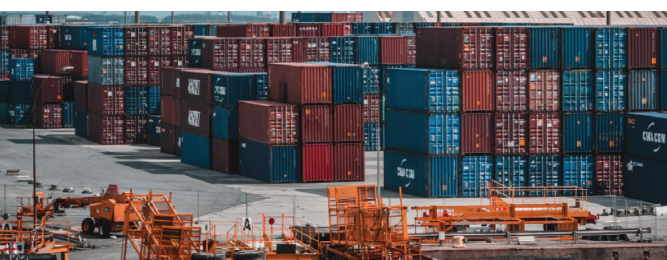
WASTE WATER

ENVIRONMENTAL & FLOOD PROTECTION



DAMS AND RESERVOIRS

HYDROPOWER



PORTS AND DOCKS

FEATURES AND BENEFITS

MINIMAL LEAKAGE RATE

Our penstock leakage rates are significantly lower than those required by BS7775:2005.

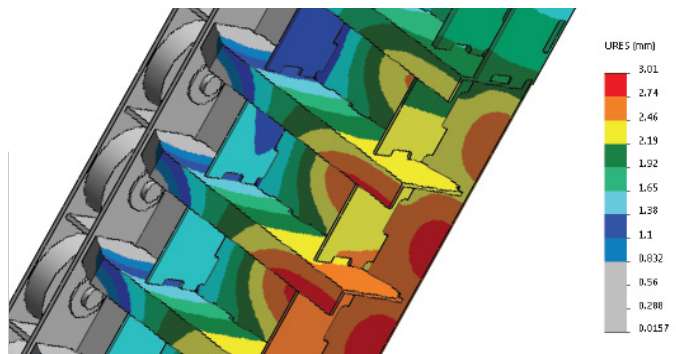
Upon request, we offer factory leakage and function testing of our penstocks.



HEAVY DUTY CONSTRUCTION, ROBUST DESIGN AND EXCEPTIONAL QUALITY

Our penstock range is designed using Finite Element Analysis (FEA) to ensure optimum rigidity and allow any undesirable deformation to be designed out pre-production.

The minimum thickness of our penstock's frame sections is 5mm and 6mm for the door. All of our penstock designs are optimised by means of FEA, to achieve the optimum balance between strength, rigidity, weight and cost. Robot cutting and welding is used for consistently high quality.



DESIGN CALCULATIONS

We specialise in providing comprehensive design calculations tailored to all your product requirements. Our team ensures that every detail is carefully analysed and verified, helping you achieve safe, efficient, and cost-effective designs. By combining technical expertise with industry standards, we deliver accurate results that support innovation, compliance and reliability.

7 Slide, analytical calculation

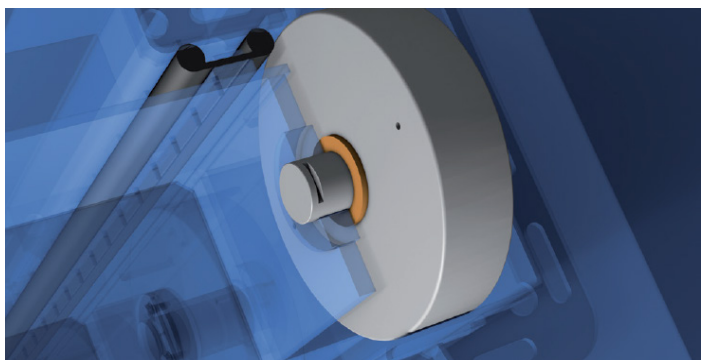
The slide is fabricated with a plate of 8 mm and ribs of 6 mm with L shape of 200 mm x 90 mm with a distance between them of 325 mm. An individual simply supported beam will be calculated:

Description	Symbol / Formula	Value	Units
Design water head	$LC1$	12,82	m
Span (distance between slides)	L	1837	mm
Width	C	325	mm
Lineal load	$q = C \cdot \frac{LC1}{100}$	41,67	N/mm
Maximum bending moment	$M = q \cdot \frac{L^2}{8} \cdot 10^{-6}$	17,58	kN·m
Beam moment of inertia	I	$2684 \cdot 10^4$	mm ⁴
Beam bending modulus	W	$174,5 \cdot 10^3$	mm ³
Bending stress	$\sigma = \frac{M}{W} \cdot 10^6$	100,7	MPa
Deflection	$y = \frac{5 \cdot q \cdot L^4}{384 \cdot E \cdot I}$	1,2	mm

UNIQUE SEAL AND GUIDE DESIGN

Our unique seal design allows low leakage rates, whilst at the same time, minimising the required actuator torques or thrusts. Self-cleaning HMWPE guides reduce friction during operation resulting in easy operation and extended product lifetime.

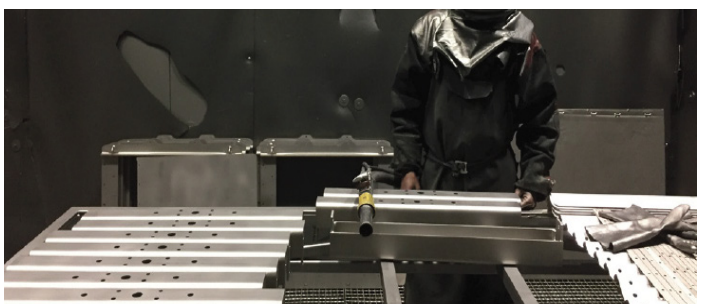
Self-adjusting lip-seals provide effective sealing without the need for wedges. This ensures that the excellent sealing performance is factory set, and consistently achieved with no adjustment required throughout the lifetime of the penstocks.



CORROSION PROTECTION

All penstocks are produced in stainless steel to ensure a 35+ year design life. Depending on the application, different stainless steel grades are used, from the more frequent AISI 304 & AISI 316 SS, special duplex (2205) and super duplex (2507).

All stainless steel surfaces are fully shot-blasted to passivate, and guarantee protection against corrosion.



PENSTOCK RANGE

			
DESCRIPTION	WALL MOUNTING PENSTOCK ORBINOX MU	CHANNEL MOUNTING PENSTOCK ORBINOX CC	WEIR PENSTOCK ORBINOX RB
MAIN FEATURES	• 4 sided sealing • Stainless steel construction • Bi or uni-directional sealing • Self-adjusting, factory set EPDM seals • Self-cleaning HMWPE guides • Suitable for wall mounting over circular or rectangle aperture • Leakage allowance - lower than allowable by BS7775:2005 • Easily replaceable seals	• 3 sided sealing • Stainless steel construction • Sized to suit exact channel dimensions and water levels • Bi or uni-directional sealing • Self-adjusting, factory set EPDM seals • Self-cleaning HMWPE guides • Suitable for mounting in open channels • Leakage allowance - lower than allowable by BS7775:2005 • Easily replaceable seals	• 3 or 4 sided sealing • Stainless steel construction • Suitable for wall mounting • Bi or uni-directional sealing • Self-adjusting, factory set EPDM seals • Self-cleaning HMWPE guides • Suitable for mounting in open channels • Leakage allowance - lower than allowable by BS7775:2005 • Easily replaceable seals
MAIN OPTIONS	• Non-rising or rising spindle • Open or closed frame • Stem extensions and wall brackets • Variety of actuator pedestals • Manual, pneumatic, electric or hydraulic actuation • Rebate mounting for larger sizes • WRAS approved materials available for potable water applications	• Non-rising or rising spindle • Manual, pneumatic, electric or hydraulic actuation • Rebate mounting or face mounting • WRAS approved materials available for potable water applications • Safety guards for motorised applications	• Non-rising or rising spindle • Open or closed frame • Stem extensions and wall brackets • Variety of actuator pedestals • Manual, pneumatic, electric or hydraulic actuation • WRAS approved materials available for potable water applications • Twin spindles
SIZE	Up to 4000mm x 4000mm	Up to 4000mm x 4000mm	Up to 4000mm x 4000mm
MAX WORKING PRESSURE	10m on/off seating as standard up to 1000mm x 1000mm, otherwise as required.	Equal to gate height.	As required.
CONSTRUCTION MATERIAL	Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.	Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.	Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.
APPLICABLE STANDARDS	Designed and manufactured in accordance with BS7775:2005. WIMES 8.10 compliant.	Designed and manufactured in accordance with BS7775:2005. WIMES 8.10 compliant.	Designed and manufactured in accordance with BS7775:2005. WIMES 8.10 compliant.

PENSTOCK RANGE



ALUMINIUM STOP LOGS
ORBINOX SA



STAINLESS STEEL STOP
LOG
ORBINOX SL



HANDSTOP OR STOP
GATE
ORBINOX AG

DESCRIPTION

MAIN FEATURES

- 3 sided sealing
- Stainless steel frame with aluminium logs
- Fixed individual log heights; 300mm, 225mm or 150mm
- Auxiliary external lifting device required
- Sized to suit exact channel/aperture
- Bi or uni-directional sealing
- Self-adjusting, factory set EPDM seals
- Self-cleaning HMWPE guides
- Suitable for mounting in open channels or face mounting to walls
- Easily replaceable seals

- 3 sided sealing
- Stainless steel construction for frame and logs
- Any size and combination or log heights available
- Auxiliary external lifting device required
- Sized to suit exact channel/aperture
- Bi or uni-directional sealing
- Self-adjusting, factory set EPDM seals
- Self-cleaning HMWPE guides
- Suitable for mounting in open channels or face mounting to walls
- Easily replaceable seals

- 3 sided sealing
- Stainless steel construction
- Auxiliary external lifting device required
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- Suitable for mounting in open channels or face mounting to walls
- Easily replaceable seals

MAIN OPTIONS

- Manual lifting poles or lifting beam for use with crane
- Rebate or face mounting configurations
- WRAS approved materials available for portable water applications
- Log storage racks

- Manual lifting poles or lifting beam for use with crane
- Rebate or face mounting configurations
- WRAS approved materials available for portable water applications
- Log storage racks

- Rebate or face mounting configurations
- WRAS approved materials available for portable water applications

SIZE

Up to 4000mm x 4000mm

Up to 4000mm x 4000mm

Up to 4000mm x 4000mm

MAX WORKING PRESSURE

Equal to total log height.

Equal to total log height.

Equal to total log height.

CONSTRUCTION MATERIAL

Frame in stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507. Logs in aluminium EN-AW 6063 T6

Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.

Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.

APPLICABLE STANDARDS

Designed and manufactured in accordance with DIN 19569.

Designed and manufactured in accordance with DIN 19569.

Designed and manufactured in accordance with DIN 19569.

WIMES 8.10 compliant.

WIMES 8.10 compliant.

WIMES 8.10 compliant.

PENSTOCK RANGE



ROLLER GATE
ORBINOX MV



RECTANGULAR FLAP
VALVE
ORBINOX RR



ROUND FLAP VALVE
ORBINOX RC

DESCRIPTION

MAIN FEATURES

- Custom made solutions for large apertures and high pressure
- 4-sided sealing
- Stainless steel or painted carbon steel construction
- Wheel design for opening and closing operation, minimises thrust
- Bi or uni-directional sealing
- Self-adjusting, factory set EPDM seals
- Self-cleaning HMWPE guides
- Suitable for wall mounting over circular or rectangular aperture

- 4-sided sealing
- Stainless steel construction
- Opening and closing by seating and unseating differential pressure
- Double hung to allow proper seating and minimal leakage
- Self-adjusting EPDM seals, ensuring watertight performance
- Factory set sealing
- Leakage allowance lower than allowable in DIN 19569-4 (Class 3)
- Easily replaceable seals

- All round sealing
- Stainless steel construction
- Opening and closing by seating and unseating differential pressure
- Double hung to allow proper seating and minimal leakage
- Self-adjusting EPDM seals, ensuring watertight performance
- Factory set sealing
- Leakage allowance lower than allowable in DIN 19569-4 (Class 3)
- Easily replaceable seals

MAIN OPTIONS

- Stem extensions and wall brackets
- Variety of actuator pedestals
- Manual, pneumatic, electric or hydraulic actuation
- Rebate mounting for larger sizes
- Fail-safe systems.

- Rectangular design
- Wall or flange mounting

- Round design
- Wall or flange mounting

SIZE

Up to 6000mm x 8000mm

Up to 4000mm x 4000mm

Up to 4000mm x 4000mm

MAX WORKING PRESSURE

Up to 100m

Typically 5m, higher upon request.

Typically 5m, higher upon request.

CONSTRUCTION MATERIAL

Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.

Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.

Stainless steel AISI 304, AISI 316, duplex 2205 or super duplex 2507.

APPLICABLE STANDARDS

Designed and manufactured in accordance with DIN 19704-1 & AWWA C561.

Designed and manufactured in accordance with DIN 19569.

WIMES 8.9 compliant.

Designed and manufactured in accordance with DIN 19569.

WIMES 8.9 compliant.

PENSTOCK APPLICATION



There are many options that should be considered when assessing a penstock application.

At Glenfield Invicta we take all these into consideration when assessing your penstock enquiry, as each one can influence the type and design of penstock required for your project.

- Location
- Liquid or fluid to be controlled
- Mounting; Wall, Weir or Channel
- Rising or non-rising spindle
- Head of water (in metres)
- Manual or actuated
- Isolating or modulating duty

WRAS APPROVED MATERIALS

Each of our penstocks and stop logs are available with WRAS approved materials for use with potable water.



PENSTOCK INSTALLATION

Although one of the simplest types of valves used in the UK Water Industry, penstocks are notoriously difficult to install.

All of our penstock installations are carried out safely with site specific risk assessments tailored to each individual installation.

Our fully certified site engineers have the expertise and knowledge to deliver an installation and maintenance service for any penstock, providing a single point of liability.

The wealth of capability ensures unrivalled competence at all phases of a project ensuring that your assets are perfectly designed, manufactured, installed, tested and commissioned.

Our “right first time” approach to all aspects of a project cycle, will give you the confidence that you will be left with a high quality installation from a company that stands behind its products.



Case Study
Name: Lee Tunnel

Work: Supply and install 19 actuated penstocks and 12 flap valves on Britain's largest water engineering project for 20 years.



Case Study
Name: Llyn Brenig

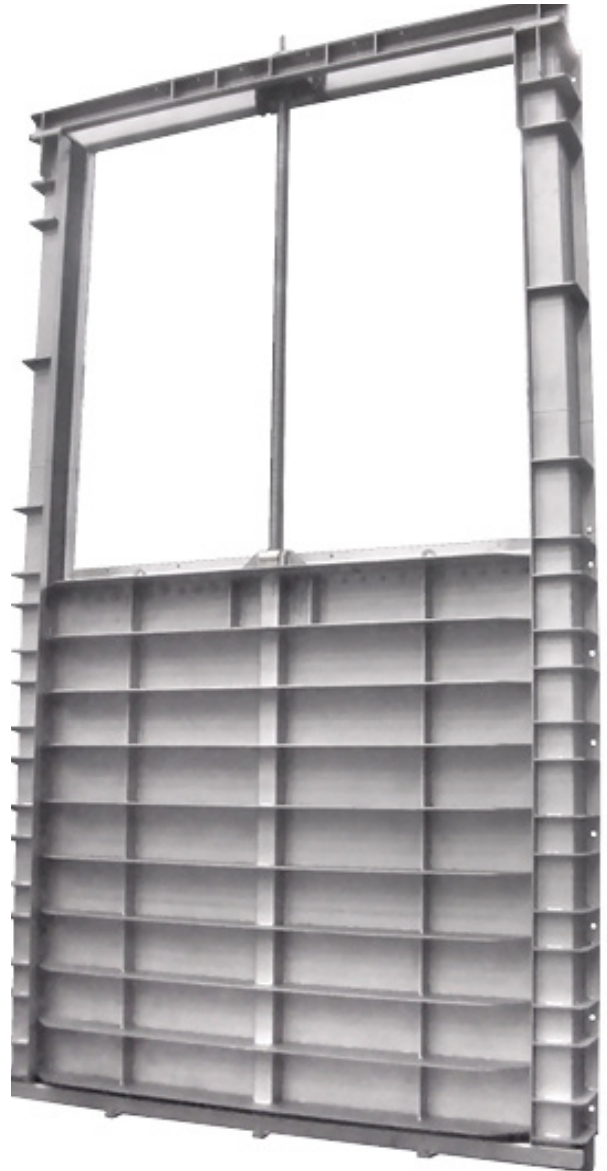
Work: Replacement of both primary and bulkhead gates, as well as installing a third gate to increase the tunnel's safety factor. The project was identified as a 'gold alert' as it involved a 'single point of failure'. Replacing the primary gate in the tunnel required confined space working.



STAINLESS STEEL VS CAST IRON

The advantages of stainless steel penstocks vs cast iron:

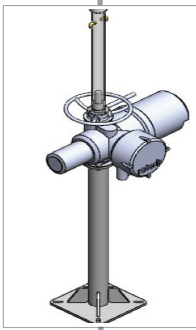
- Bespoke fabrication, tailored to suit each unique application and civil structure. Cast Iron penstocks are typically available in a range of standard sizes only.
- For channel mounting applications, stainless steel penstocks are designed for mounting into rebates, to leave the frame flush with the channel invert and side walls. Cast iron penstocks are designed for face mounting only.
- Much lighter than cast iron, making installation simpler, safer and more economical.
- Less prone to corrosion.
- Vastly superior sealing performance.
- Seals are easily replaceable with penstock frame in-situ. Not possible with a cast iron penstock's bronze sealing faces.
- Adjustment of wedges is required with cast iron penstocks to maintain original sealing performance. No adjustment to sealing required throughout the lifetime of the penstock.
- Lower torque requirement - cheaper actuation and less wear, meaning longer lifetime.
- Generally much shorter delivery lead time. Cast iron penstocks > 600mm are generally cast from new.
- Lower carbon footprint.



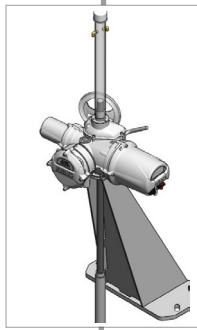
ACCESSORIES AND OPERATING EQUIPMENT

Main Actuation Options

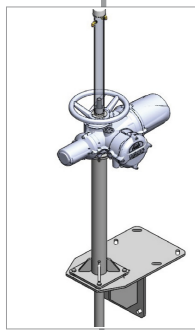
Actuator on
straight
floor pedestal



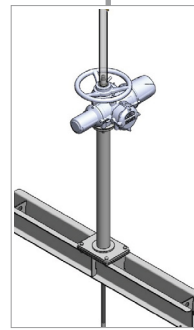
Actuator on
inclined floor
pedestal



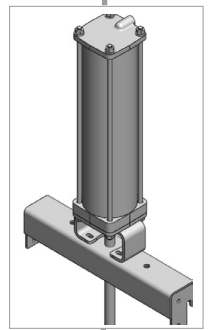
Actuator coping
bracket mounted
pedestal



Actuator on
frame mounted
pedestal



Actuator direct
on frame



Other options available upon request

With a 30+ team of design engineers, our local workshop facilities and our dedicated site service personnel, we can deliver a limitless range of dependable actuation solutions.

From periodic manual isolation to round-the-clock flow control or fast acting fail-safe applications, we have an individual actuation solution for every penstock.

Our cost effective, pre-configured, operating equipment solutions cater for all penstock installations be it a deep chamber or shallow channel. We are always ready to provide bespoke solutions for the most unusual and challenging operations.



PENSTOCK REPAIR, REFURBISHMENT AND REPLACEMENT



Glenfield Invicta has successfully repaired and refurbished penstocks on numerous projects, our reputation is such that we are considered specialists in this field.

We are frequently called upon to inspect and recommend a resolution for a whole range of penstock related issues including defective installation, operational failure, obsolescence issues and leakage.

We often find that repair and refurbishment solutions are more cost effective for our clients than replacement. Using our in-house expertise and skilled engineers, we can bring a new lease of life to ageing assets so that they give decades more dutiful service.

We can provide this service on or off site depending upon the circumstances. Where complete replacement is necessary we will preferentially select from our own AVK Group range of high quality penstocks. Actuators and related ancillaries are included within the scope of our service offer.

The penstock repair, refurbishment and replacement service offering includes:

- Feasibility studies
- Bespoke ancillaries and actuation solutions
- Condition reports
- Servicing
- Reverse engineering of obsolescent parts
- Actuator retrofit
- Product upgrades



Penstock before.



Penstock after.

PENSTOCK FAST-TRACK SERVICE

Bespoke, Top-Quality Penstock Solutions Delivered Fast.

At Glenfield Invicta, we are excited to launch our new, 'Penstock Fast-track' service. This exciting new service offers the very same high-quality penstock solutions that our customers know and trust, only now with much faster delivery times. You can count on receiving a top-tier AVK/Orbinox product, backed by the same excellent Glenfield Invicta service and support—but in a significantly reduced timescale, with no additional cost.

The 'Penstock Fast-track' service is built around the concept of immediate availability. By holding a range of pre-manufactured, standard-size penstocks and operating equipment in UK stock, we can dispatch your order within a week of drawing approval. This is a considerable advantage over the traditional lead times. With this service, clients in critical sectors such as water treatment, wastewater management, storm overflows, highways and drainage can keep their projects moving forward without unnecessary delays.

Standard Sizes Tailored to Industry Needs

The 'Penstock Fast-track' service has been designed with practicality and convenience in mind, focusing on delivering a range of standard size penstocks that cater to the most common applications across water, wastewater, and industrial sectors. These sizes have been carefully selected based on decades of experience in the industry, ensuring that they are suitable for the vast majority of projects.

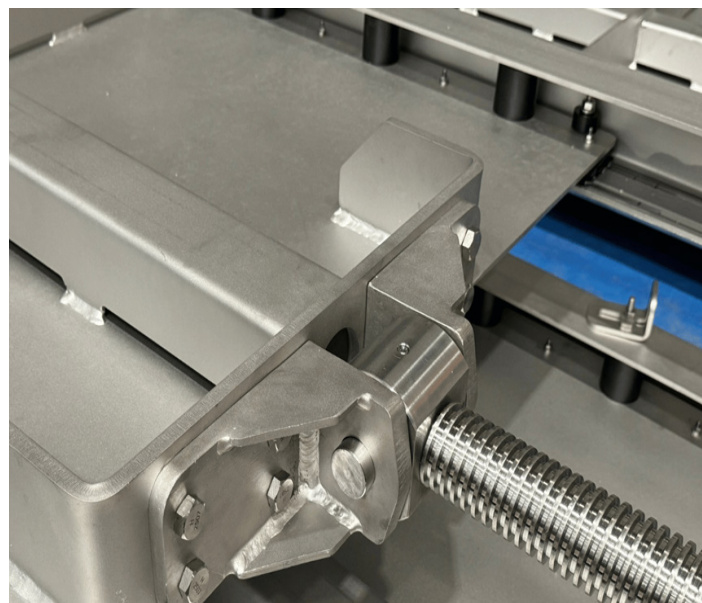
Available Sizes

Our Penstock Fast-Track service offers sizes from 200mm x 200mm to 1200mm x 1200mm.

Top Quality AVK/Orbinox Products

Our collaboration with our AVK Group sister company Orbinox combines the expertise of two industry leaders in valve and penstock solutions, bringing together Orbinox's global manufacturing experience and Glenfield Invicta's in-depth knowledge of UK infrastructure.

This partnership ensures that our service delivers not only speed but also reliability and quality, providing you with high-quality AVK/Orbinox products backed by Glenfield Invicta's exceptional service and support. These penstocks are engineered to the highest standards, ensuring long-lasting performance in demanding conditions with every product rigorously tested to meet the industry's toughest specifications.



Complete Solution

Along with supplying high-quality penstocks through our 'Penstock Fast-track' service, Glenfield Invicta offers complete installation support to ensure smooth project execution.

Why Choose 'Penstock Fast-track'?

- Rapid delivery
- Standard sizes from stock
- Quick turnaround
- Expert installation support
- Actuation service available

WHY CHOOSE GLENFIELD INVICTA

Complete Penstock Solutions

Specialists in the UK Water Industry with a proven track record spanning over 160 years Glenfield Invicta are part of the AVK Group of companies. ISO Certified.

Industry Expertise

Penstock Design and Manufacture

Our penstocks are designed and manufactured in house by our sister company Orbinox, an AVK Group company since 2011. With more than 50 years of global experience in the water industry, Orbinox offers a world class range of penstocks and stop logs.

Installation

Electrical, pneumatic and hydraulic installations. On-site repairs with nationwide coverage. Construction equipment ready with a team of certified engineers (confined space trained).

Minimal Plant Shutdown

Engineered Solutions

Valve and actuator selection with flow control valve sizing, design of extension spindles & valve operating kits. Modifications to pipework if required by valve installation and general valve/ actuator troubleshooting.

Repair and Refurbishment

Repair and refurbishment of all valve related equipment, both on and off site repairs. Site surveys to assess your requirements.

Extended Warranties

Fabrication of Ancillaries

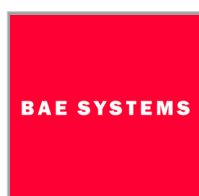
- Extended valve spindles
- Actuator/gearbox pedestals
- Actuator/gearbox drive bushes
- Actuator/gearbox mounting kits
- Spindle guide and support brackets

Customer Feedback

The team put the hours in and were good to work with, the Glenfield Invicta guys did a great job - they had everything with them that they needed, they executed the installation works in a very efficient and professional manner, AND they cleaned up after themselves, something you rarely find these days! Laing O'Rourke

'Please pass on my thanks to Vince and Tom for all their hard work and endeavours and going that 'extra mile' to complete the Penstock & FFT Drop Pipe installation it was much appreciated by the AGT site team.' Aecom Galliford Try

Example Client List







IF YOU NEED HELP WITH YOUR PROJECT, PLEASE CONTACT US BELOW AND USE REFERENCE: PENSTOCKS



enquiries@glenfieldinvicta.co.uk



+44 (0) 1622 754613



www.glenfieldinvicta.co.uk



[@glenfieldinvictaltd](https://www.linkedin.com/company/glenfieldinvicta)



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PENSTOCK 08/2025



Member of the AVK Group