Specialists in design, manufacture, assembly and testing of Nozzle Check, Twin Plate, Sprung Disc and Swing Type Check valves.

UK suppliers to energy, water and process industries since 1988
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The Glen Foundry Group

All three companies are located within 25 minutes travelling distance from each other in Ayrshire, Scotland, UK.
Anderson Stewart Castings is a high precision investment foundry which has earned an International reputation built up from supplying a wide spectrum of industries over the past 50 years:

- Gas turbine Manufacturers
- Offshore drilling
- Gas detection equipment manufacturers
- Power generation
- Valve manufacturers
- Gearbox Transmission producers
- Medical instrument and implant producers

At present Anderson Stewart has a workforce of 75 people
Precision Tooling Services in Ayrshire provides a manufacturing facility for machined components for a range of customers within the Aerospace, Automotive, Renewables and Oil & Gas industries. Established for over 25 years and located in the aerospace park at Prestwick airport.

At present Precision Tooling has a workforce of 45 people.
Examples of Group Facilities

- Precision Tooling Machine Shop
- Abacus Surface Lapping Equipment
- Abacus Automated Pressure Testing
- Precision Tooling Spark Erosion
Abacus Valves is an international supplier of check (non return) valves with over 25 years of market history for the design, manufacture and supply of its approved products.

Products include Nozzle Check, Twin Plate, Axial Sprung Disc and Wafer Swing Type Check Valves.

With a focus on quality supply for both commodity and project based orders, *Abacus* typically carries over £1M worth of stock goods ranging from standard twin plates to wafer swing types to high performance axial non slam nozzle check valves.
Abacus Valves International Ltd – Industries Served

- Upstream/downstream oil and gas
- Petrochemical, refining and processing
- Natural gas: gasification and liquefaction
- Chemical Manufacture
- Water
- Gas Compression
- Nuclear
- Mining
- Heat Exchange
- Marine
Abacus Valves International Ltd – Check Valves General Overview

Check valves, or non-return valves, are installed in pipeline systems to permit fluid flow in one direction only and close automatically and instantaneously if flow is interrupted or reversed.

They depend on line pressure and velocity to open and close.

The basic principle in all check valves is common -:
An obturator (e.g. disc, plate) moves into its open position under conditions of normal flow. When flow is stopped, or reversed, the obturator closes the valve.
Some valve designs incorporate springs or external weighted levers to provide additional forces and make the valve self-acting.
Gravity and back pressure are other examples of forces which can be combined to aid closure of the valve.

Correct Sizing-:
Line velocity pressure must be capable of holding the obturator in a stable, fully open position. Insufficient line velocity pressure can result in premature wear, turbulence, vibration and noisy operation.

Typical applications of check valves -:
Protection of any item of equipment that can be affected by reverse flow (i.e. pumps, control valves, flow-meters etc.)
Prevention of reverse flow on system shutdown.
Prevention of flooding.
Prevention of flow under gravity.
Relief of vacuum conditions.

Note:
Although check valves can effectively shut off reverse flow, they should never be used in place of an isolation valve.
Abacus Valves International Ltd – Design Facilities

- Fully integrated Computer Aided Engineering (CAE)
- Computational Fluid Dynamics Flow Simulation (CFD)
- Finite Element Analysis (FEA)
Abacus Valves International Ltd – Twin Plate Check Valves

The Abacus twin plate check valve provides an economical, efficient and dynamically responsive alternative to traditional check valves like the full bodied swing type. The twin plate can be installed horizontally, vertically (flow up) or customised for vertically (flow down).

This compact, spring assisted, valve option is installed sandwiched between any recognised flange arrangement with the stop pin vertically positioned.

The valve geometry takes the form of a simple cylinder with a vertical central web.

This slim cylindrical profile offers a high strength, high flow capacity, self acting check valve solution.
The Abacus Twin Plate Check Valve works on the following principle:

Two sprung loaded, semi-circular disc’s hinged on a vertical pin.
The torsion spring contact legs are designed such that the resultant spring force acts beyond the centroid of the disc’s. The disc are designed for a clearance fit between the hinge bores and the vertical hinge pin.
When the upstream (inlet) fluid force is greater than the spring force, the disc will move off the seat, heal first as the resultant force acts at the disc centroid position and flow is induced. This prevents the disc’s from scuffing the seat.
as flow rate increases the disc rotates towards a fully open position where it stops against the top pin.
When the flow starts to decelerate, the disc’s react immediately, with the aid of the spring, to move back towards the seat.
The disc’s will fully close against the seat just before backflow starts, forming a non-slam, tight shut-off.
Abacus Valves International Ltd – Non Slam Nozzle Check Valves

The Abacus Nozzle Check Valve has the following benefits:

- Minimum pressure drop across the valve
- Minimised water hammer effect in system
- Quick, Dynamic, non slam response to flow conditions thus reducing reverse velocity
- Reliable, maintenance free operation
- Tight shut-off

With an engineering team with many years experience in check valve design, the Abacus Nozzle Check valve has been designed and developed using the latest CAE software with fully integrated Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) studies to optimise the design with independent flow testing carried out to benchmark simulation studies.

Velocity Plot  Pressure Plot
The Abacus Nozzle Check Valve works on the following principle:

Axially guided valve disc held against the seat by spring force and back pressure when the upstream (inlet) fluid force is greater than the spring force, the disc will move axially off its seat and flow induced.

As flow rate increases the disc is forced towards a fully open position where it sits against the diffuser/backstop.

The contoured body-disc-diffuser arrangement assures *venturi* flow characteristics ensuring minimal pressure drop across the valve and streamlined flow.

When the flow starts to decelerate, the disc reacts immediately, with the aid of the spring, to move off from the diffuser and back towards the seat.

The disc will fully close just before backflow starts.
Abacus Valves International Ltd – Axial Sprung Disc

For small diameter, typically DN15-100 (Standard Range) and DN15-300 (Plastic and High Performance Range), Abacus offer a range of Sprung Disc Wafer Check Valves. Sprung Disc valves, typically, have four main components —: body, disc, spring and spring retainer. When the upstream (inlet) fluid force is greater than the spring force, the disc will move axially of its seat and flow induced. This represents the valve in an open position. When the differential pressure across the valve is reduced, the spring exerts a force to push the disc back onto its seat, closing the valve quickly to prevent reverse flow. This represents the valve in a closed position.
Swing type check valves can contain as little as two main components but generally consist of a body, a seat and a disc. The principle of a swing type wafer check is much the same as full bodied versions except when the disc opens it is forced up to a point of contact with the pipe bore. This however means the disc must be smaller than the NPS and thus higher pressure drop is a characteristic. Swing type wafer check valves have the advantage that they are of a compact design and low cost in comparison to their full bodied variants.

Commonly swing types are utilised in larger pipelines, however it should be noted that this type of valve the following characteristics typically occur:

- Disc float on the fluid stream causing pressure drop
- Slam action when the disc, often heavy, shuts (potential wear issues and generation of waterhammer)
Abacus offer a wide range of standard and bespoke design options.

Common options are:

- Wafer Connection (Flat Faced, Raised Face, RTJ)
- Hub Ended Connection
- Integral Flange Connection (ASME, DIN, EN, AW etc)
- Solid Lugged Through Drilled
- Non Standard Slim Profile
- Lined (Elastomer, PFA)
- Resilient Seats (Elastomer, PTFE)
- Customer specified cracking pressure
Abacus offer a wide range of materials. Common options are:

- Carbon Steels (WCB, WCC, LCB, LCC......)
- Stainless Steels (CF8M, CF3M, 6Mo, CA15...........)
- Duplex Stainless Steels (Gr4A, Gr5A, Gr6A...........)
- Nickel Alloys (Monel®, Hastelloy®, Inconel®...........)
- Copper Alloys and Aluminium Bronzes (LG2, C95800, AB2...........)
- Grey and Ductile Irons (EN-GJL-250, EN-GJS-500/7....)

- Fully qualified weld overlays:
  - Stellite®6
  - Austenitic Stainless Steel
  - Martensitic Stainless Steel
Abacus Valves International Ltd – Quality

- ISO 9001:2008
- PED 97/23/EC
- GOST-R
- Achilles JQS & FPAl
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