

**MEASUREMENT & FIXED PRESSURE-REDUCTION
SOLUTIONS****ILLUSTRATIVE MULTISTAGE CONCEPT**

Orifice Portfolio

Primary measurement elements and engineered fixed-restriction assemblies for process piping.

**SELECT BY PROCESS DUTY****01****Measure**Orifice Plate
Assemblies**02****Reduce**

Model SRO

03**Stage**

MSRO Assemblies

A practical technical guide for early application review. Final supplied configuration is governed by approved order documentation.

Illustrative concept only. Final geometry, materials, interfaces and documentation are project defined.

01 / Portfolio selector

Start with the process duty

Use this selector as an orientation tool for enquiry development. It does not replace duty calculation, application review or approved order documentation.

01 / MEASURE

Orifice Plate Assemblies

For differential-pressure flow-measurement systems in closed conduits.

START WITH: fluid, flow range, plate profile and pressure-taking context

02 / REDUCE

Model SRO

For a defined permanent pressure reduction evaluated within a single stage.

START WITH: pressure conditions, service behaviour and mechanical interface

03 / STAGE

MSRO Assemblies

For high differential-pressure duties requiring staged engineering review.

START WITH: pressure reduction, phase behaviour, risk criteria and line envelope

A common enquiry foundation

Information group	Provide with the enquiry
Process duty	Medium, composition / density basis, phase, normal / minimum / maximum flow, operating and design pressures, operating temperature and required duty objective.
Service behaviour	Vapour-pressure relationship, gas properties, potential critical-flow, cavitation, flashing, noise, vibration, solids, erosion or fouling considerations as applicable.
Mechanical interface	Line size and schedule, connection standard, face type, materials, corrosion allowance, available installation length, supports and access constraints.
Project controls	Tagging, approved standards, testing, inspection, certification, documentation, client specification and ITP requirements.

FINAL CONFIGURATION

The selector identifies a discussion route only. Final product selection, geometry, materials, limits and documentation are defined by the approved order data sheet, drawings, calculation basis and nameplate.

02 / Orifice Plate Assemblies

Precision primary elements for flow measurement

A configurable differential-pressure primary-element family for flow-measurement applications that require controlled plate geometry, pressure-taking and project-defined interfaces.

Product purpose

An orifice plate assembly creates a controlled restriction in a closed conduit. The selected plate and the upstream/downstream pressure relationship form the basis for the specified differential-pressure measurement system.

Typical application sectors

Sector	Typical requirement context
Oil and gas	Process, utility and export measurement duties.
Petrochemical	Process monitoring and engineered plant interfaces.
Power generation	Utility and process flow measurement applications.
Fertilizer and water	Process-fluid and utility measurement duties.



Representative visual reference only. Final configuration is defined by approved order documentation.

Configurable plate families

SQUARE-EDGE

Conventional differential-pressure measurement geometry. Final bore and plate detail follow approved calculation.

QUARTER-CIRCLE / CONICAL ENTRANCE

Specialised profile categories reviewed for the application. Final geometry is project defined.

ECCENTRIC / SEGMENTAL

Application-dependent geometries for process review, including two-phase, dirty or particle-laden contexts.

MULTIHOLE

Multiple openings with total opening area selected for the duty. Calculation and application dependent.

03 / Orifice Plate Assemblies

Pressure-taking and construction

Pressure-taking is selected together with plate family, flange construction and piping interface. Final flange class, facing, materials, bolting, gaskets and accessories are order-defined.

Pressure-taking options

Method	Configuration guidance
Flange taps	Pressure taps located on flanges or a carrier ring.
Corner taps	Pressure taps at flanges, annular chambers or a monolithic plate.
Radius taps	Tappings at D and D/2; the relevant spool pipe forms part of the assembly.
Pipe taps	Tappings at 2.5D upstream and 8D downstream; the relevant spool pipe forms part of the assembly.

PROJECT-DEFINED INTERFACE

Thread form, tap position, spacing and orientation require approved project definition.

Construction and supply concepts

PLATE ONLY

Primary element provided as a plate.

PLATE ASSEMBLY

Plate configured with associated pressure-boundary components.

CARRIER RINGS

Plate held between rings that provide the process interface and tapping arrangement.

MONOLITHIC TYPE

Plate and pressure-taking features formed as an integral component for compact installation.

Interface review

PRESSURE-TAKING CONTEXT

Flange-tap and corner-tap categories may be considered during application review.

SEALING-FACE CONTEXT

Raised-face and ring-joint contexts may be considered; final facing is defined by approved order documents.

04 / Orifice Plate Assemblies

Reference guidance for application review

Published reference bands assist application review only. They are not a production drawing, standard bore profile, performance commitment, material commitment or final application approval.

Profile reference bands

Profile	Reference standard	Nominal size	Beta ratio	Coefficient uncertainty
Square-edge	ISO 5167-2	≥ 2 in / 50 mm	0.20–0.75	+/- 0.5% of rate at mid-beta; assess range limits
Quarter-circle / conical entrance	ISO/TR 15377	≥ 2 in / 50 mm	0.245–0.600 / 0.100–0.316	+/- 2% of rate
Eccentric	ISO/TR 15377	≥ 4 in / 100 mm	0.46–0.84	Beta dependent; % of rate
Segmental	ISO/TR 15377 (see note)	≥ 4 in / 100 mm	0.35–0.80	+/- 1–2% of rate
Multihole	Application-defined	Application-defined	Application-defined	Application-defined

Note: The segmental band is vendor / application-defined reference guidance; ISO/TR 15377 is cited for reference context. The square-edge beta 0.20–0.75 is a Globe United reference band; ISO 5167-2 may permit a wider range subject to tapping and Reynolds limits.

Raised-face thickness reference

Nominal size	Plate thickness
< 2 in	Application-defined
2–6 in	3 mm
8–14 in	6 mm
16–24 in	10 mm
≥ 26 in	16 mm

These bands apply to a differential pressure of 1,000 mbar. Other plate thicknesses are available on request.

Enquiry and support

DEFINE THE ENQUIRY

Provide process fluid and phase, operating and design pressure / temperature, flow conditions, pipe size and schedule, governing standard, pressure class, facing, tapping method, materials, accessories, test scope and documentation requirements.

SUPPORT SCOPE

Inspection, welding procedures and qualifications, finishing, isolation valves, condensate pots and manifolds may be available on request, subject to application requirements.

REFERENCE-DATA CONTROL

Final delivered plate profile, bore, dimensions, thickness, pressure-taking arrangement, threads, materials, sealing face, ratings, inspection scope and documentation are governed exclusively by approved order documentation.

05 / Model SRO

Permanent pressure reduction, reviewed around the duty

A single-stage restriction-orifice solution introduces a defined permanent restriction into process piping. The final arrangement is selected against approved process conditions, mechanical interfaces and project requirements.

What the single-stage concept provides

Selection begins with the process duty—not with a generic plate size. Service medium, pressure conditions, operating flow, vapour-pressure relationship and allowable acoustic exposure should be available for engineering review.

Typical application context

Service setting	Selection focus
Process piping	Duty basis and downstream conditions for permanent reduction between defined pressures.
Vent / discharge service	Flow regime, acoustic review and line constraints before downstream handling.
Liquid process service	Pressure profile and cavitation / flashing assessment.



Representative visual reference only. The image does not define final bore, thickness, edge profile, material, dimensions or process connections.

01 / CONFIRM THE DUTY

Establish process conditions, required pressure reduction and relevant operating window.

02 / SCREEN SERVICE BEHAVIOUR

Review gas or liquid characteristics, risk conditions and downstream context.

03 / CONFIRM ORDER BASIS

Define mechanical interface, documentation and project controls through approved order documents.

Gas-service and liquid-service review

A reliable selection basis considers pressure-reduction behaviour and service risks before a configuration is proposed.

GAS-SERVICE REVIEW

Screen pressure reduction and acoustic risk together

Confirm gas composition, pressure, temperature, flow range and downstream condition. Evaluate the required reduction for acceleration and potential critical-flow behaviour. Consider predicted noise, vibration, downstream piping and site-exposure requirements.

ESCALATE WHEN

The required reduction is severe; gas acceleration may become critical; noise or vibration constraints are specified; downstream pressure must be controlled or protected; or project documentation defines a particular calculation or verification basis.

LIQUID-SERVICE REVIEW

Review the pressure profile before selecting the restriction

Confirm fluid composition, solids where relevant, operating temperature and vapour-pressure relationship. Map upstream/downstream operating and design pressure, required reduction and expected flow range. Assess cavitation and flashing risk against the approved application basis.

ESCALATE WHEN

Duties have large pressure reductions, elevated vapour-pressure sensitivity, flashing potential, solids, erosive service, unstable flow, or project limits on vibration and noise.

ENGINEERING REVIEW CONTROL

This page provides a qualitative route to review. It does not publish a critical pressure-drop calculation, predicted noise level, required plate thickness, flow coefficient or final configuration. If the duty cannot be safely or practically resolved in one pressure-reduction step, a different or staged technical solution may require review.

07 / Model SRO

Enquiry basis and final configuration

Use this framework to organise an enquiry. It is a communication tool—not a stock-code declaration or final technical specification.

MODEL FRAMEWORK · FOR ENQUIRY REFERENCE

SRO — NPS — CONN — FACE — PLATE — MOC — TAG

SRO: single-stage restriction-orifice model · NPS: line size · CONN: connection requirement · FACE: facing requirement · PLATE: restriction concept · MOC: material requirement · TAG: project identifier

Required process definition

Field	Provide with enquiry
Medium	Name, composition / density basis and relevant phase behaviour.
Conditions	Upstream / downstream operating and design pressure; operating temperature.
Flow	Normal, minimum and maximum flow; event flow where applicable.
Duty objective	Required permanent pressure reduction and downstream constraints.
Risk controls	Noise, vibration, cavitation, flashing and erosion considerations.

Required mechanical definition

Field	Provide with enquiry
Pipeline	Line size, schedule / wall basis and available installation arrangement.
Interface	Connection standard, rating, face type and mating connection details.
Materials	Process compatibility, corrosion allowance and material specification.
Project controls	Tag, document list, client specification and ITP requirements.
Accessories	Spacers, gaskets, bolting, insulation or special handling requirements.

FINAL-ORDER AUTHORITY

Restriction form, material of construction, process connections, plate geometry, inspection and documentation are controlled by the approved duty calculation, approved material specification, purchase order, drawings, ITP and nameplate.

08 / MSRO Assemblies

Pressure reduction, engineered in stages

A Multistage Restriction Orifice assembly uses multiple restriction plates in series to distribute a required pressure reduction across calculated stages.

A fixed pressure-drop solution for high-differential duties

Rather than dissipating the entire differential at a single restriction, the pressure drop is assigned across calculated stages selected for the actual duty. The assembly has no modulating trim or moving parts and is not a substitute for a control valve where continuous modulation is required.

ENGINEERING PRINCIPLE

Final stage count, bore geometry, material selection, spool length, end connection and pressure rating are defined by approved process data, selected design code and project specifications.



Illustrative multistage restriction-orifice concept. Final stage geometry, pressure boundary, materials, interfaces and documentation are project defined.

WHEN TO CONSIDER A STAGED RESTRICTION

Consider an MSRO when the process requires a defined fixed pressure drop and a single restriction is likely to create unacceptable hydraulic, mechanical, acoustic or equipment-life exposure. Suitability remains subject to individual engineering review.

09 / MSRO Assemblies

Manage the risks that drive a multistage design

A high pressure drop is an equipment-integrity question as well as a flow calculation. The review considers the fluid, pressure profile, piping system and installation envelope together.

RISK 01 / CAVITATION AND FLASHING

Vapour cavities can form at low-pressure zones and collapse as pressure recovers; flashing persists where pressure remains below vapour pressure. Review the fluid vapour-pressure margin and pressure-recovery behaviour.

RISK 02 / NOISE AND VIBRATION

High velocity and rapid energy dissipation can create acoustic energy, vibration and fatigue exposure. Review the restriction path with connected piping, supports, insulation and downstream equipment.

RISK 03 / EROSION AND FOULING

Solids, droplets, corrosive media or excessive velocity can damage restriction edges or block small bores. Match material selection and bore arrangement to fluid cleanliness and wear mechanism.

RISK 04 / INSTALLATION ENVELOPE

A staged assembly can require inter-stage spool length, additional interfaces, access and support. Available axial space and piping load paths are part of the engineering review.

Design checks

Review area	Engineering focus
Fluid behaviour	Phase, vapour-pressure margin, pressure recovery, local velocity, compressibility and predicted choked-flow behaviour.
Mechanical basis	Line size, interface, selected materials, spool arrangement, installation space, supports and constructability.
Performance constraints	Required pressure reduction, noise exposure, vibration criteria, operating envelope and downstream piping exposure.

10 / MSRO Assemblies

Configuration, envelope and materials

Catalog values establish capability context; the approved data sheet, calculation basis and drawings establish the supplied configuration.

Configuration concepts

Concept	Application context
Single-bore staged plates	Sequential plates with one calculated bore per stage, reviewed for controlled-flow applications.
Multi-bore staged plates	Multiple restriction holes that distribute flow across the plate, reviewed for capacity and local-velocity management.
Flanged spool assembly	Purpose-built spool with selected RF, RTJ or other specified flange interface.
Butt-weld spool assembly	Pipe ends prepared for welding into the process line under the approved fabrication and installation plan.

Technical envelope

Parameter	Catalog capability / qualifier
Nominal line size	1/2 in to 24 in may be reviewed; larger sizes are subject to feasibility review.
Interface pressure class	ASME Class 150 through Class 2500 may be assessed for the selected flange interface.
Process media	Liquids, gases, steam and other process fluids may be considered, subject to phase behaviour, cleanability, materials compatibility and process requirements.

Materials and metallurgy

TYPICAL MATERIAL FAMILIES

Carbon and low-temperature carbon steels; austenitic stainless steels; duplex and super-duplex stainless steels; and nickel-alloy families may be assessed against the duty.

PLATE-SPECIFIC METALLURGY

Restriction plates can require a different material selection from the outer spool to manage edge wear, corrosion, velocity exposure or a client metallurgy specification.

COMPLETE PRESSURE BOUNDARY

Gasket type, bolt grade, facing, torque procedure, flange rating, temperature and process compatibility are reviewed as a system.

RATING CONTROL

Final rating is verified against the applicable flange standard, material, design pressure, design temperature and approved project documentation.

11 / MSRO Assemblies

From process data to approved drawing

A structured review connects hydraulic performance with constructability, inspection and documentation.

01 Confirm duty

Review fluid, phase, normal / minimum / maximum flow, inlet and outlet pressures, operating temperature and required operating envelope.

02 Characterise risk

Evaluate vapour-pressure margin, pressure recovery, flashing / cavitation potential, compressibility, sonic-flow behaviour, velocity and anticipated noise / vibration exposure.

03 Select arrangement

Define stage count, restriction geometry, material families, line interfaces, space allowance and mechanical arrangement.

04 Review constructability

Confirm spool length, supports, flange access, lifting, inspection access, welding needs and connection details.

05 Release documentation

Issue the final data sheet, calculation summary, general arrangement drawing, ITP and agreed manufacturing-data-book scope.

MSRO ENQUIRY CHECKLIST

Fluid / composition / phase; density, viscosity and vapour pressure at temperature; solids content; normal / minimum / maximum flow; inlet and outlet pressure; pipe data; design P/T; corrosion allowance; flange or weld-end detail; available length; supports; code; material restrictions; sour-service requirement; inspection and document scope.

INSTALLATION AND COMMISSIONING

Install in the flow direction shown on the nameplate and approved GA drawing. After mechanical completion, pressurise gradually and observe for leakage, abnormal differential pressure, noise and vibration. Full site requirements follow the project drawings, procedures and applicable IOM documentation.

DESIGN BASIS

The approved data sheet, calculation package and GA drawing—not generic catalog values—define the final performance and physical configuration of every MSRO assembly.

12 / Applications and engineering support

Built around the piping system

Application suitability is confirmed by the process review and approved project documentation, not assumed from the industry alone.

UPSTREAM**Oil and gas production**

Wellhead, separator, water-injection, blowdown, depressurisation and process-letdown duties where a fixed restriction path is part of the operating design.

MIDSTREAM**Transmission and terminals**

Pipeline pressure management, equipment bypass, pump protection and utility-water systems where the duty and available envelope can be engineered.

DOWNSTREAM**Refining and petrochemical**

Process-unit letdown, utility service, chemical injection and high-pressure liquid systems requiring a defined fixed restriction path.

POWER AND WATER**Power generation and industrial water**

Boiler-feedwater recirculation, condensate, high-pressure water distribution, pump minimum-flow and utility-service applications.

FLANGED SPOOL INTERFACE

Flanged assemblies are configured with the selected pressure class, facing, bolting compatibility and gasket arrangement. Installation alignment and tightening follow the approved project procedure.

BUTT-WELD INTERFACE

Butt-weld assemblies require project-approved welding controls appropriate to the selected materials and piping system. Heat input, cleanliness, weld-spatter protection and any required NDE or post-weld activities follow the approved plan.

DIMENSIONAL CONTROL

Detailed dimensional drawings and installation arrangements are issued against the approved project configuration. Do not interpret any catalog visual as a dimensional release, process connection schedule or approved installation arrangement.

13 / Quality and documentation

Defined by the approved order basis

Inspection, testing, certification, documentation and witness requirements are aligned to the agreed ITP, applicable code and purchase requirements.

Area	Potential scope where specified	Final authority
Material and traceability	Material heat / lot traceability, MTC review, PMI and hardness verification.	Approved ITP, material specification and purchase requirements.
Weld and fabrication	Weld inspection, NDE, pressure testing and fabrication verification activities.	Applicable code, approved procedures and ITP.
Dimensional and interface	Plate geometry, bore dimensions, spool dimensions, flange interface, markings and final visual condition.	Approved drawings and inspection scope.
Documentation	Calculation summary, GA drawing, certificates, ITP records, test / NDE reports, final dimensional documentation and data book.	Contractually agreed documentation schedule.
Third-party inspection	Customer-appointed witness / hold points and inspection participation.	Enquiry, purchase order and approved ITP.

MATERIAL

Traceability and certificate review are incorporated where specified.

VERIFICATION

Testing and inspection are aligned to the defined ITP and applicable code.

DELIVERY

The final document pack reflects the agreed order requirements.

QUALITY CONTROL

A capability or potential scope in this catalog does not imply standard supply. Confirm inspection, testing, certification, documentation and witness requirements against approved order documentation before manufacture.

14 / Project-definition guide

The information required for a confident review

Complete process and mechanical information enables a safer, more accurate and more commercially efficient application review.

PROCESS DUTY

Medium, composition / density basis, phase, normal / minimum / maximum flow, inlet and outlet operating / design pressure, operating temperature, required pressure reduction or measurement duty.

SERVICE BEHAVIOUR

Vapour pressure at temperature; gas molecular weight and compressibility information where applicable; solids; anticipated fouling; cavitation, flashing, critical-flow, noise, vibration and erosion considerations.

MECHANICAL AND SITE DATA

Pipe nominal size, schedule and internal diameter; design P/T; corrosion allowance; flange rating / facing or weld-end detail; available installation length; supports, access and handling constraints.

PROJECT CONTROLS

Applicable code, client specification, materials restrictions, inspection level, third-party witness points, certificates, testing, documentation deliverables, tagging and approved ITP requirements.

ORDER-DOCUMENT PRECEDENCE

Final supplied configuration, materials, dimensions, limits, process connections, accessories, inspection scope and documentation are governed exclusively by the approved order data sheet, approved drawings, calculation basis and nameplate.

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ENGINEERED FOR THE PROCESS DUTY

Let's define the right restriction path.

Share your process duty, mechanical interface and project controls with Globe United FZE for application review and quotation.

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