

SHIZHONG FLOW INSTRUMENTS

PRODUCT BROCHURE & SELECTION GUIDE • 2026 EDITION

ADAPTIVE WIDE-RANGE DP FLOWMETER

Stable low-flow measurement. Protected peak-flow capacity. One integrated DP platform.



Wide Range DP Flowmeter

Dual-Orifice Technology for Stable
Low-Flow Measurement

High Accuracy

Wide Turndown

Custom Engineering

MEASURE CONFIDENTLY FROM MINIMUM DEMAND TO PEAK LOAD.

Shizhong combines dedicated low- and high-flow primary elements with automatic, position-confirmed changeover. Choose a standards-based dual-orifice configuration or a full-flow-calibrated dual-balanced configuration for the evidence and operating range your project requires.

Jinan Shizhong Automation Instruments Co., Ltd. | Invention patent ZL202510551686.1

SECTION 01

Wide operating ranges demand a smarter DP solution

Conventional DP measurement can lose useful signal at minimum demand or create excessive differential pressure at peak load.

THE WIDE-RANGE CHALLENGE

Because flow is proportional to the square root of differential pressure, a 100:1 flow span corresponds to approximately a 10,000:1 DP span. One fixed primary element is rarely the best measurement geometry at both extremes.

At low flow, the available DP signal falls rapidly and becomes more sensitive to zero stability, process pulsation and impulse-line effects. At high flow, the same restrictive element can increase DP and permanent pressure loss. Shizhong addresses both conditions by assigning each duty to a primary element engineered for its own operating band.

What the adaptive platform delivers

- A stronger, more usable DP signal during low-demand operation.
- High-flow capacity engineered around the permitted DP and pressure-loss limits.
- An overlapping measurement zone for stable, repeatable changeover.
- Element-specific compensation and coefficient data for each active measurement path.
- Position-confirmed switching with hysteresis, diagnostics and continuous totalization.
- One coordinated engineering package covering the primary elements, transmitters, control logic and project documentation.

Conventional approach	Observed limitation	Adaptive response
Single orifice + one DP range	Low-flow DP becomes too small	Dedicated low-range primary element
Oversized DP span	Poor low-end resolution	Two optimized, overlapping flow bands
Parallel meters	More valves, pipework and maintenance	One integrated switching platform
Fixed threshold	Chatter near the changeover point	Hysteresis + stability-time logic

DESIGNED AROUND YOUR OPERATING ENVELOPE

Share the minimum, normal and maximum flow, actual piping arrangement, permitted pressure loss and accuracy objective. Shizhong then selects the measurement path, overlap band and calibration scope for the project.

SECTION 02

Automatic range adaptation, one continuous measurement

The active primary element changes with demand while the flow signal, totalization and operating record remain coordinated.

Layer	Function	Typical project content
Sensing	Measure DP, static pressure and temperature	DP transmitter, P/T sensors, impulse system
Calculation	Calculate compensated flow and total	Density/expansibility compensation, element-specific coefficients
Decision	Evaluate changeover conditions	Flow/DP thresholds, hysteresis, stability timer, diagnostics
Actuation	Select the low- or high-range element	Actuator, mechanical carrier, position feedback
Communication	Report measurement and events	4–20 mA, HART, RS485/Modbus, pulse/frequency

How automatic changeover protects measurement continuity

1. Continuously evaluate compensated flow, DP, pressure, temperature and signal stability.
2. Recognize entry into the engineered overlap zone and apply separate upward and downward thresholds for stable operation.
3. Preserve the running total and operating state before changeover begins.
4. Move to the required primary element and confirm its position through feedback.
5. Activate the correct coefficient and compensation set for the confirmed measurement path.
6. Continue normal accumulation and record the changeover event for diagnostics and traceability.

ENGINEERED OVERLAP, VERIFIED CHANGEOVER

The overlap zone and transition logic are validated in both increasing- and decreasing-flow directions so the complete system can deliver stable measurement and traceable totalization across the specified range.

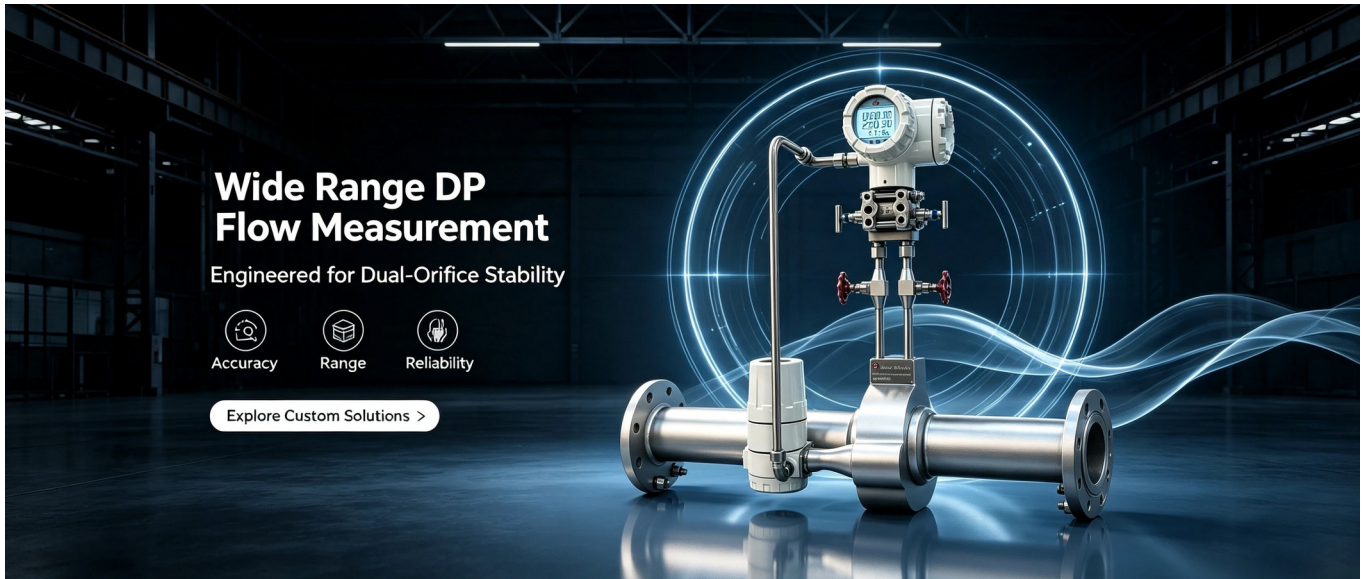
Built-in reliability features

- Defined de-energized state and recovery logic.
- Position plausibility check before accepting a coefficient set.
- Manual emergency operation and maintenance isolation as specified.
- Event logging for changeover, timeout, sensor fault and parameter changes.

SECTION 03

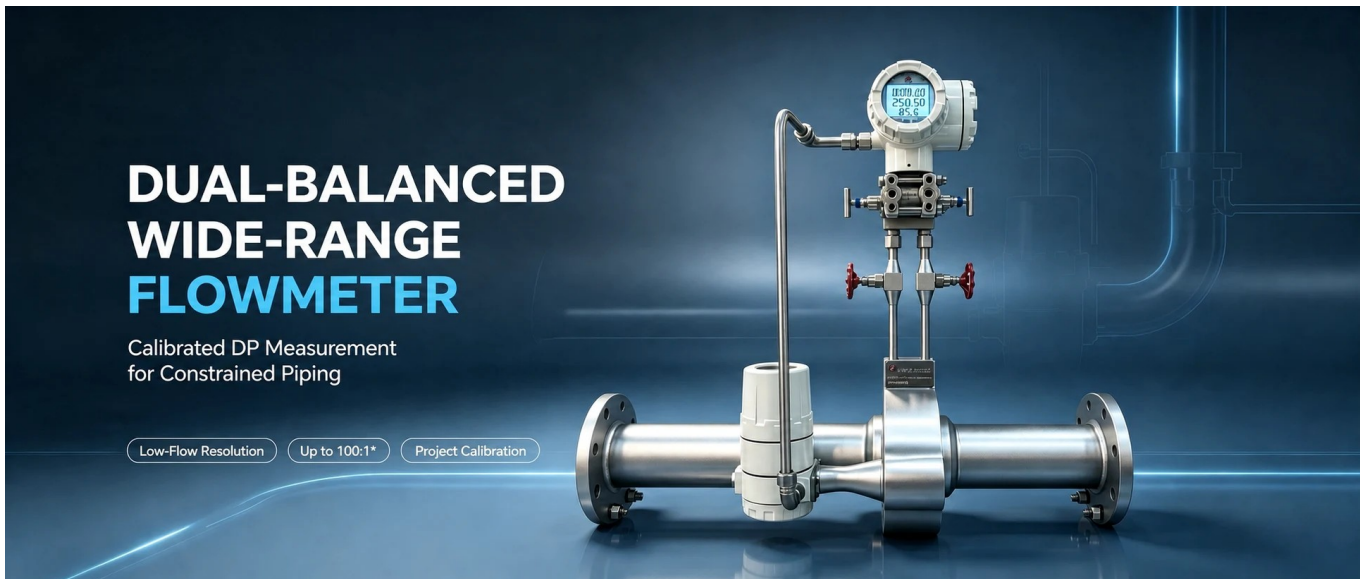
Two configurations for two project priorities

Choose a standards-based dual-orifice route or a full-flow-calibrated dual-balanced route within the same adaptive platform.



A. Dual-orifice — standards-based measurement sections

Choose this configuration when the project values a recognized standard-orifice calculation basis, familiar DP engineering practice and documented ISO 5167-2 design limits for each qualifying active measurement section.



B. Dual-balanced — calibrated performance route

Choose this configuration when the project prioritizes the widest calibrated operating envelope, stronger low-flow DP or an engineered solution for constrained piping. System coefficients and performance are established through full-flow calibration.

FAST SELECTION GUIDE

Select dual-orifice when a standard-orifice basis leads the specification. Select dual-balanced when maximum calibrated range or limited straight pipe leads the decision. For regulated or commercial-settlement service, Shizhong aligns the configuration and documentation with the applicable project requirements.

SECTION 04

Dual-orifice: standards-based wide-range measurement

Two independently sized standard-orifice sections create optimized, overlapping low- and high-flow measurement bands.

The low-range orifice uses a smaller beta ratio to generate useful DP at reduced flow. The high-range orifice uses a larger beta ratio to preserve peak-flow capacity and manage pressure loss. Only one section is active at a time, and each section has its own verified geometry, pressure-tapping arrangement and calculation set.

ISO 5167-2:2022 design basis

Item	Typical ISO 5167-2 boundary	Project action
Pipe diameter	$50 \text{ mm} \leq D \leq 1,000 \text{ mm}$	Verify measured internal diameter and condition
Orifice bore	$d \geq 12.5 \text{ mm}$	Check both active plates
Beta ratio	$0.10 \leq \beta \leq 0.75$	Size each band independently
Reynolds number	$ReD \geq 5,000$ plus equation limits	Verify at minimum flow in each band
Tappings	Corner, flange, or D and D/2	Keep geometry consistent with the calculation
Flow condition	Full-pipe, single-phase, subsonic, non-pulsating	Review wetness, pulsation and entrainment

Why customers choose the dual-orifice route

- A recognized ISO 5167-2 calculation basis for each qualifying active standard-orifice section.
- Familiar pressure-tapping options and established DP engineering practice.
- Independent sizing of the low- and high-flow bands around the actual operating profile.
- A coordinated switching, actuation and control package engineered and validated by Shizhong.

STANDARDS AND SYSTEM VALIDATION

Each qualifying active orifice section is designed within the applicable ISO 5167-1/-2:2022 limits. Straight-run requirements are confirmed for the actual disturbance and beta ratio, while the combined switching system is engineered and validated for the project.

SECTION 05

Dual-balanced: maximum calibrated operating range

Two multi-hole open-area designs strengthen low-flow resolution while preserving high-flow capacity.

Symmetrically arranged multi-hole elements redistribute the local velocity field and create a more usable low-flow DP signal. The low- and high-range elements are engineered as one adaptive system, with project coefficients established through full-flow calibration.

CALIBRATED AS A COMPLETE MEASUREMENT SYSTEM

Primary elements, pressure tapping, transmitter ranges, switching logic and calculation parameters are calibrated or validated together, giving the customer one coordinated performance basis.

Documented 100:1 performance milestone

Parameter	Low-range element	High-range element	Combined
Open area	25.0%	72.9%	—
Hole pattern	4 symmetric holes, Ø6.25 mm	5-star holes, Ø16.29 mm	—
Flow range	0.38–3.8 m³/h	3.8–38.0 m³/h	0.38–38.0 m³/h
Recorded coverage	10:1 band	10:1 band	100:1 combined

DOCUMENTED TEST BASIS

A combined 100:1 range was achieved in this DN50 water development configuration. Shizhong confirms the guaranteed range for each project through application-specific sizing and full-system flow calibration.

Where the dual-balanced route adds value

- Batch and intermittent process duty with long low-flow periods.
- Seasonal utility demand and large day/night load variation.
- Retrofits where a project-calibrated solution is preferred for the available piping layout.
- Projects seeking one integrated meter instead of multiple parallel metering trains.

SECTION 06

Choose the right configuration with confidence

Match the measurement route to the project's standards basis, operating range, piping and calibration requirements.

Decision factor	Dual-orifice route	Dual-balanced route
Primary value	Standardized active orifice sections	Maximum calibrated operating envelope
Element	Two single-hole orifices with different β	Two multi-hole elements with different open areas
Coefficient basis	ISO 5167-2 when each section is within scope	Calibration-derived for the complete system
Straight run	ISO 5167-2, disturbance- and β -specific	Project-validated for the actual piping
Turndown	Overlapping bands; confirmed by sizing	Up to 100:1 demonstrated in the DN50 water test
Calibration	Recommended for the complete switching system	Required for guaranteed performance
Best fit	Standard basis and review documentation first	Extreme range or constrained piping first
Customer outcome	Standards-based range extension with familiar DP practice	Maximum calibrated range in one integrated platform

A practical six-step selection process

1. Confirm the minimum, normal and maximum flow and the time spent in each operating band.
2. Identify the medium, operating pressure, temperature and required compensation method.
3. Map the actual upstream and downstream fittings and available straight run.
4. Define the permitted DP, permanent pressure loss and accuracy objective.
5. Select the dual-orifice or dual-balanced route according to the required standards and calibration basis.
6. Finalize the approved range, documentation and any regulated or commercial-settlement requirements.

SHIZHONG APPLICATION REVIEW

Send us the process data and piping arrangement. Our engineers will return a recommended measurement path, preliminary range split, calibration scope and documentation plan for technical review.

SECTION 07

Performance you can document

Shizhong connects the published accuracy target to the complete meter, approved configuration and defined operating conditions.

Performance item	Project value	Delivered evidence
Primary-element basis	A defined coefficient model or calibration curve	Calculation report or calibration data
Instrument package	Matched DP, pressure and temperature ranges	Approved data sheet and transmitter configuration
Flow calibration	Measured performance at stated points and conditions	Calibration certificate and uncertainty statement
Changeover validation	Stable transition through the overlap band	Increasing/decreasing-flow test record
Installed target	A project-specific accuracy objective	Approved uncertainty budget and installation requirements

Published performance targets

REFERENCE-CONDITION TARGET

Full-system flow-calibration target: $\pm 0.5\%$ under the defined calibration conditions.

TYPICAL INSTALLED TARGET

$\pm 1.0\%$ when the approved sizing, installation, calibration scope and uncertainty requirements are met.

What Shizhong reviews for the project

- Differential pressure, static pressure, temperature and density/expansibility inputs.
- Pipe diameter, orifice bore or calibrated multi-hole curve, and material expansion.
- Installation disturbance, pulsation, impulse-line effects and zero stability.
- Element position, switching repeatability, overlap-band fitting and totalization continuity.
- Differences between calibration and service fluid, Reynolds number and piping geometry.

A CLEAR PERFORMANCE BASIS

The quotation and approved data sheet define the covered flow band, service conditions, calibration scope, installation requirements and project-specific performance commitment.

SECTION 08

Engineered for reliable field performance

Application review, installation details and commissioning checks are coordinated with the selected measurement path.

Check	Dual-orifice requirement	Dual-balanced requirement
Straight run	Per ISO 5167-2 for the actual disturbance and β	Match the validated/calibrated project layout
Primary elements	Inspect edge, bore, thickness, flatness and concentricity	Verify element identity, pattern, orientation and cleanliness
Pressure taps	Match the selected corner/flange/D-D/2 geometry	Use the approved equalizing/tapping arrangement
Impulse lines	Equal routing, correct slope, vent/drain and heat tracing	Same, plus switching-event response check
Parameters	Separate geometry and coefficient set per plate	Separate calibration curve per element
Changeover	Test both directions through the overlap band	Test both directions and cumulative continuity

Commissioning and acceptance sequence

1. Verify tag, flow direction, pipe data, flange rating and material certificate.
2. Confirm the physical element position agrees with the feedback signal.
3. Zero and range-check DP, pressure and temperature channels.
4. Load the approved low- and high-range parameter sets and protect them from unauthorized change.
5. Test upward and downward changeover, hysteresis, timeout and alarm handling.
6. Compare instantaneous flow and total before, during and after repeated changeovers.
7. Archive as-left parameters, calibration evidence and event logs in the turnover package.

STRAIGHT-RUN REQUIREMENTS MATCH THE PROJECT

For dual-orifice configurations, Shizhong applies the disturbance- and beta-specific ISO 5167-2 basis. For dual-balanced configurations, the requirement is confirmed against the actual piping and approved validation or calibration arrangement.

SECTION 09

Send us your operating data

Complete process and piping information allows Shizhong to return a faster, more accurate technical proposal.

Required input	Customer/project data
Medium / composition / phase	_____
Pipe size / ID / schedule / material	_____
Minimum / normal / maximum flow	_____
Operating / design pressure	_____
Operating / design temperature	_____
Density / viscosity / gas properties	_____
Allowed DP / permanent pressure loss	_____
Upstream fittings and available straight run	_____
Downstream fittings and available straight run	_____
Accuracy / turndown / metrology purpose	_____
Flange standard / rating / face	_____
Materials / corrosion / erosion	_____
Hazardous area / IP / ambient limits	_____
Power / output / protocol	_____
Calibration and documentation requirements	_____

HELP US REVIEW THE REAL INSTALLATION

For constrained piping, include a dimensioned sketch or photographs showing the nearest upstream and downstream elbows, tees, valves, reducers, pumps or compressors. This allows the proposed straight-run and calibration basis to reflect the actual site.

SECTION 10

A complete engineered package

Each proposal brings the measurement route, hardware, calculation basis and project documentation together in one defined scope.

Suggested configuration code

SZ-WRDP / [DO or DB] / DN / RATING / MATERIAL / TAP / P-T / OUTPUT / CAL / OPTIONS

DO = dual-orifice route. DB = dual-balanced route. Final code is confirmed on the approved data sheet.

Code group	Typical choices	Engineering note
Measurement path	DO / DB	Select from the decision matrix
Pressure class	PN16–PN100 standard; higher by review	Mechanical, seal and actuator torque check
Process temperature	–40 to +550°C by configuration	Material, seals and actuator/electronics limits apply
Outputs	4–20 mA, HART, RS485/Modbus, pulse/frequency	Confirm control-system interface
Calibration	Section check / full-system flow calibration	DB route requires full-system calibration
Documentation	EN 10204, drawings, calculation, calibration, IOM	Define language and approval stage

Typical project deliverables

- Approved data sheet and sizing/calculation report for both operating bands.
- General arrangement, tapping and installation drawings.
- Element identification and coefficient/calibration data.
- Switching thresholds, hysteresis, stability time and alarm logic.
- Calibration certificate and uncertainty statement.
- Electrical diagram, communication map, IOM manual and spare-parts list.
- Commissioning and changeover acceptance record.

FROM APPLICATION REVIEW TO COMMISSIONING

Shizhong confirms the final range, accuracy, straight-run requirements and documentation scope after reviewing the complete operating envelope and installation arrangement.

SECTION 11

Patented innovation, international engineering basis

A Shizhong-developed adaptive platform supported by invention protection, recognized DP standards and project-specific validation.

INVENTION-PATENTED DEVELOPMENT

Supported by Shizhong invention patent ZL202510551686.1, "A Differential-Pressure Measurement Device," grant publication CN120102006 B.

The patented development supports an adaptive wide-range DP platform that combines optimized measurement sections, automatic path selection and coordinated totalization in one engineered system.

Normative and guidance references

- ISO 5167-1:2022 — General principles and requirements: <https://www.iso.org/standard/79179.html>
- ISO 5167-2:2022 — Orifice plates: <https://www.iso.org/standard/79180.html>
- ISO/TR 9464:2023 — Uncertainty guidelines: <https://www.iso.org/standard/85583.html>
- ISO/TR 12767:2023 — Effects of departures from ISO 5167: <https://www.iso.org/standard/85584.html>

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REQUEST YOUR APPLICATION REVIEW

Send your minimum, normal and maximum flow together with the medium, pressure, temperature and piping arrangement. Shizhong will recommend the measurement route and prepare a project-specific technical proposal.

MEASURE CONFIDENTLY FROM MINIMUM DEMAND TO PEAK LOAD