FIRETS 法瑞测试设备

# FRTS-YB500A

# Explosion Suppression Performance Test System

## Explosion Suppression Performance Test System

EXPLOSION SUPPRESSION / COMPARATIVE TESTING

**Premixed atmosphere · Air-blast baseline · Device comparison**

Suppression performance should not be judged from a single peak-pressure drop. This system emphasises pairing an air-blast baseline without agent release with a device-actuation comparison inside the same vessel, atmosphere definition and traceable measurement chain. The cover figure is a CAD arrangement render; the orange body is a specimen envelope, not a live product photograph.

### Comparative logic

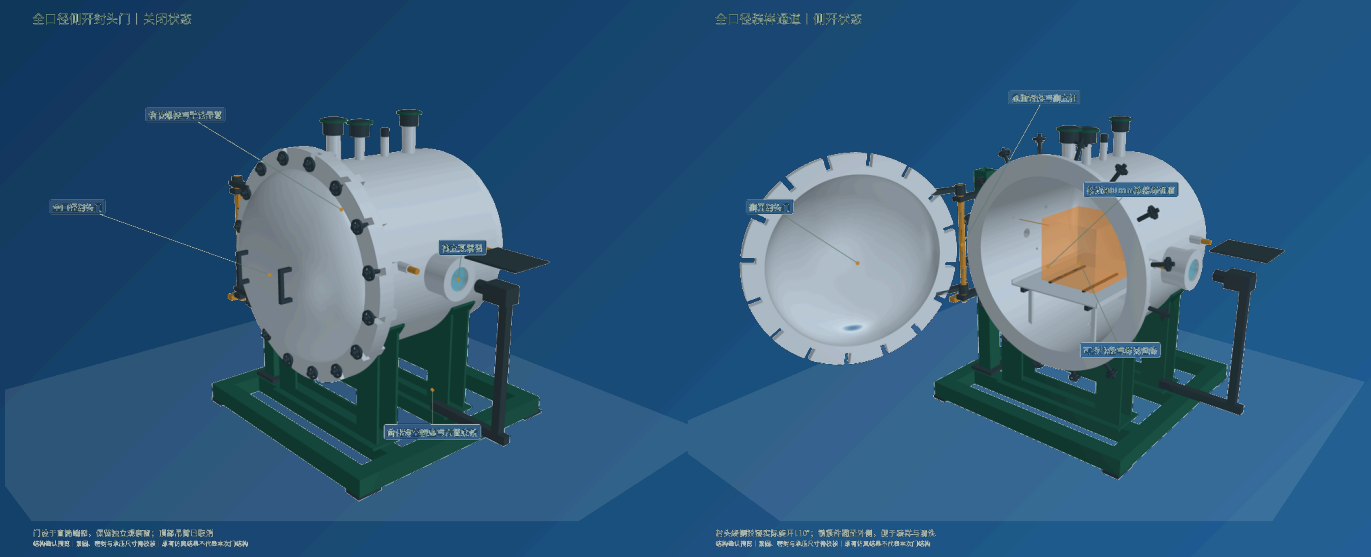
Read air-blast and actuated results together; do not turn one pressure drop into a full extinguishing claim.

### Full-bore loading path

About 800 mm ID side-opening door and a removable tray for device placement, observation and service.

### Traceable measurements

Static pressure, dynamic pressure, temperature and imaging share a time base; raw data and processing parameters are retained.



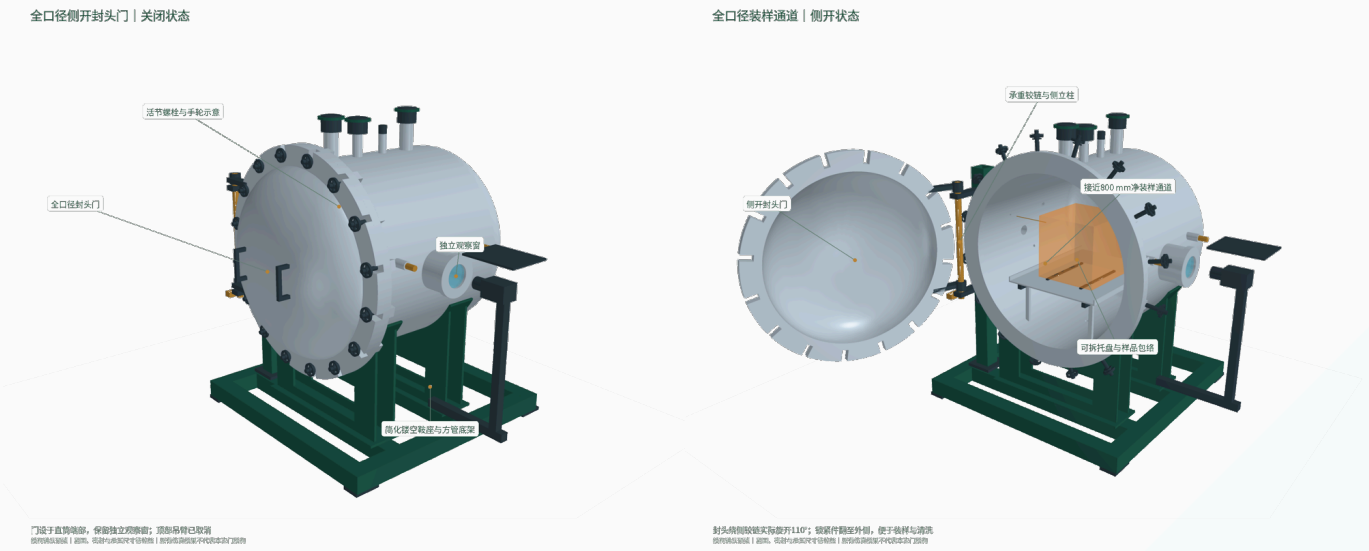
CAD closed/open comparison; orange body is a specimen envelope, not a live photo.

**Sichuan Farui Testing Equipment Co., Ltd.**

01 / PRODUCT / APPLICATION

# Product purpose and selection

FRTS-YB500A supports comparative testing of fire-extinguishing or explosion-suppression devices in a controlled premixed combustible atmosphere. A horizontal vessel of about 0.49 m³ organises air-blast baseline runs and device-actuation runs so pressure, flame and temperature records can be read under the same geometry, atmosphere definition and measurement chain. This edition is written from the user-supplied arrangement package for external technical communication. It is arrangement-level material: manufacturing drawings are not released here, and no allowable working pressure or extinguishing-efficiency claim is stated.




CAD closed/open comparison; orange body is a specimen envelope, not a live photo.

02 / MANUFACTURER DATA

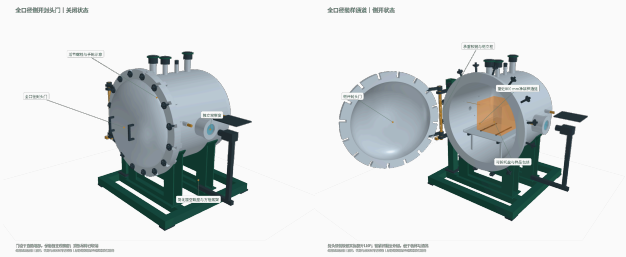
# Published technical data

| Item / condition | Published value / method note |
|---|---|
| **Model** | FRTS-YB500A |
| **Product name** | Explosion Suppression Performance Test System |
| **Short name** | Suppression test system |
| **Vessel gross volume (CAD)** | About 0.49 m³ (490.000 L, including closed nozzle cavities) |
| **Empty net volume (fixed internals deducted)** | About 487.198 L (arrangement figure; physical vessel must be remeasured) |
| **Inner diameter / door opening** | Ø800 mm (full-bore side-opening head arrangement) |
| **Centre height** | 900 mm above reference floor |
| **Test atmosphere definition** | 20% six-component premix + 80% dry air (final in-vessel composition) |

PURPOSE & COMPARISON LOGIC

# Purpose: compare suppression action under like conditions

Establish an air-blast baseline first, then run device-actuation comparisons. What is compared is pressure, flame and temperature change under the same conditions—not one absolute peak-pressure number.



CAD closed/open comparison; orange body is a specimen envelope, not a live photo.

## The evaluation question the system serves

When a fire-extinguishing or explosion-suppression device enters a controlled premixed combustible atmosphere, the laboratory question is how pressure rise, flame travel and local temperature change before and after actuation, and whether those changes can be reproduced and compared under one geometry and atmosphere definition. FRTS-YB500A organises the vessel, loading path, atmosphere interfaces and transient measurement chain into a discussable test route so the client, designer and laboratory can talk from the same boundary conditions instead of mixing volumes, mixtures or sensor layouts. This manual presents that route and its limits. It does not present the current arrangement as a pressure-certified or extinguishing-certified finished product.

04 / PURPOSE & COMPARISON LOGIC

# Purpose: compare suppression action under like conditions · continued

## Why the air-blast baseline must be kept

An air-blast run is the baseline combustion test without releasing extinguishing agent. The report should state whether the tray, probes and device housing remain installed, because those internals change blockage, heat transfer and flow and therefore affect peak pressure and the pressure-rise history. Only by reading air-blast and actuated results together can one judge how much of a pressure drop, flame suppression or temperature change belongs to the device itself and how much belongs to loading state or measurement layout. A single peak-pressure reduction does not prove full extinguishing capability, and a research calculation must not be rewritten as a product performance figure.

## External brochure versus engineering finalisation

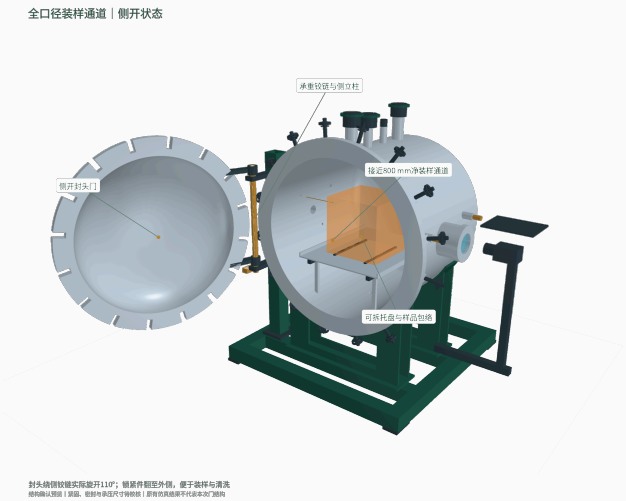
The supplied package states that the present work is a three-dimensional arrangement for structural discussion, technical exchange, quotation and later professional design input. Manufacturing drawings are not released, and no allowable working pressure is given. This product manual therefore separates discussable test capability from items that still need professional design confirmation: bolting, flanges, seals, rupture protection, ignition hardware and allowable pressure. Readers may carry the test logic, loading approach and measurement-chain requirements into technical talks; final hardware values must follow the design and inspection documents confirmed by both parties.

Based on the user-supplied arrangement package. Arrangement-level briefing only; not a manufacturing drawing, pressure certificate or extinguishing-efficiency guarantee.

VESSEL STRUCTURE & LOADING

# Vessel structure and loading path

A horizontal vessel, full-bore side-opening door and removable tray form the main loading path. Shown dimensions are arrangement parameters, not strength-selected manufacturing sizes.




Full-bore side door and tray loading path; orange cube is a specimen envelope.

## Overall arrangement

The vessel lies horizontally with an 800 mm inner diameter, about 200 mm inner head depth at each end, a straight-shell tangent length of about 705.760 mm and a centre height of 900 mm. The front head opens sideways at the straight-shell face, matching the bore to form a near full-diameter loading path. Side columns and the skid carry door loads; the present discussion uses a 110° opening angle. The removable tray is 480 mm wide, with a provisional specimen envelope of about 300×300×300 mm and 10 kg—arrangement assumptions only. Real specimens require reassessment of displacement, blockage and instrumentation. The skid may use rectangular hollow sections and saddles, with painted carbon steel as a cost option. Wetted vessel material is discussed as stainless steel; 304 or 316L must be confirmed against gas, moisture, agent and cleaning media.

06 / VESSEL STRUCTURE & LOADING

# Vessel structure and loading path · continued

## Side-opening door and locking indication

Locking is shown as multiple swing-bolt / hand-wheel stations to reduce full fastener removal. Count, diameter, material, preload, slot geometry and hand-wheel size are not yet fixed for pressure service, so the layout must not be marketed as a finished single-handle quick-opening mechanism, nor declared a regulatory quick-opening door. Discrete-angle interference checks only support arrangement-level geometry; they do not prove continuous travel, clearances, tolerances or hand working space. Centre of gravity, hinge deflection, foundation loads and overturning resistance remain for professional design.

## Observation and lighting windows

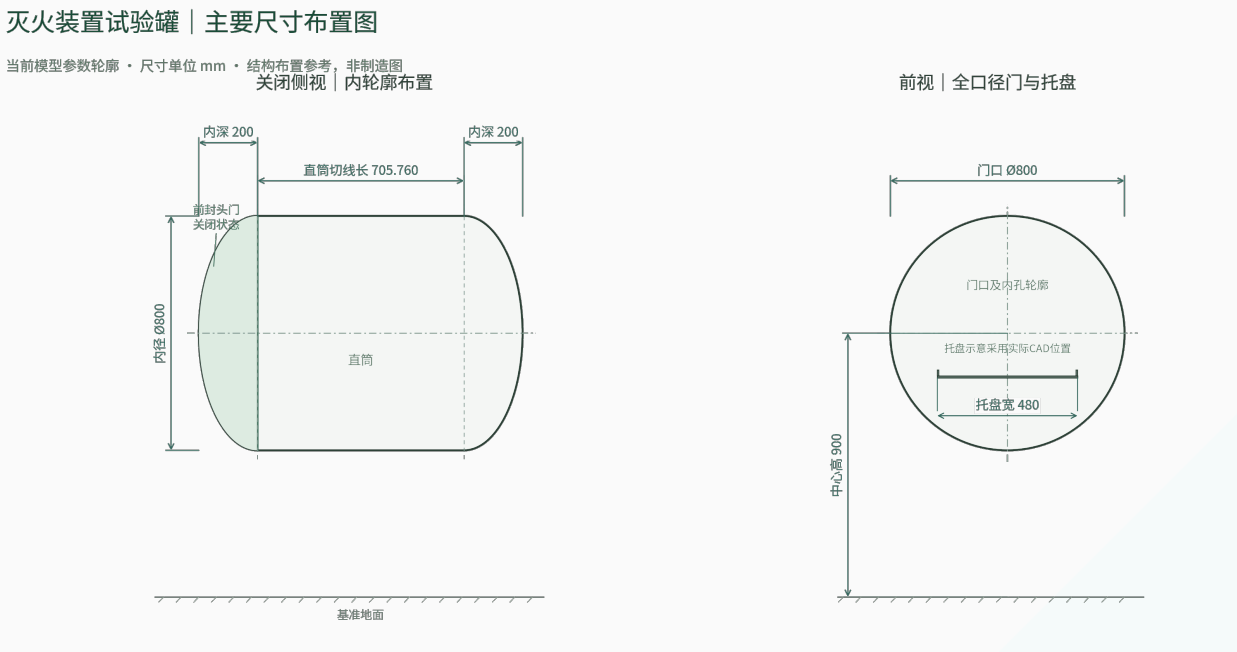
Independent observation and lighting windows are retained to reduce same-side reflection into cameras. Acrylic plates in the original request should be split by function: a pressure-boundary viewing assembly and replaceable anti-fouling shields. Nominal window DN is not clear aperture; CAD glass thickness is a placeholder and has not been verified for differential pressure, thermal shock, edge clamping, fatigue or fragment protection. Contracts should state whether a window is a pressure part or a sacrificial shield so consumable protection is never mistaken for the pressure boundary.

| Item / condition | Published value / method note |
| --- | --- |
| **Gross gas-domain CAD volume** | 490.000 L |
| **Fixed-internal displacement** | About 2.8017 L |

07 / VESSEL STRUCTURE & LOADING

# Vessel structure and loading path · continued

| Item / condition | Published value / method note |
| --- | --- |
| Empty net volume | About 487.198 L |
| Tray width (arrangement) | 480 mm |




Main dimension layout (mm): ID, tangent length, head depth, centre height and tray width; arrangement reference, not a manufacturing drawing.

Shell thickness and similar CAD values are arrangement only, not strength selections. Physical net volume must be measured after manufacture.

PORTS & MEASUREMENT CHAIN

# Ports, ignition reserve and measurement chain

Atmosphere, vacuum, venting, static pressure, dynamic pressure, temperature, wiring and viewing ports are grouped by function. Dynamic measurements must keep raw waveforms and processing parameters.

## Functional port groups

The arrangement reserves ports for vacuum, premix supply, controlled venting, static absolute pressure, two dynamic-pressure channels, thermocouple feedthrough, low-voltage cable feedthrough, diagnostic/ignition reserve, observation, lighting and low-point drain. Diameters in the table are CAD flow-path indications and must not be purchased as matching threaded fittings without redesign. Normal venting and dynamic relief must be defined separately: no relief device is designed yet, so a controlled vent must not be described as finished explosion protection. The ignition port is only a diagnostic/ignition system reserve; a low-voltage terminal must not be treated as a high-voltage ignition feedthrough. Complete ignition hardware, insulation, sealing and connection are set by the responsible specialist.

## Static versus dynamic pressure

The static absolute-pressure port serves initial-state absolute measurement and is kept distinct from dynamic piezoelectric sensing. Two dynamic channels capture deflagration transients. If CAD holes remain as long, narrow impulse lines, microsecond system response must not be claimed; mountings must follow manufacturer flush-mount practice. Dynamic chains should store unsmoothed raw data and report range, calibration, mounting, sample rate, analogue bandwidth, anti-aliasing, trigger delay and processing algorithms. dP/dt is sensitive to filtering and noise and must be delivered with those parameters. Ordinary PLC polling is not equivalent to deflagration transient acquisition.

09 / PORTS & MEASUREMENT CHAIN

# Ports, ignition reserve and measurement chain · continued

## Temperature, imaging and time base

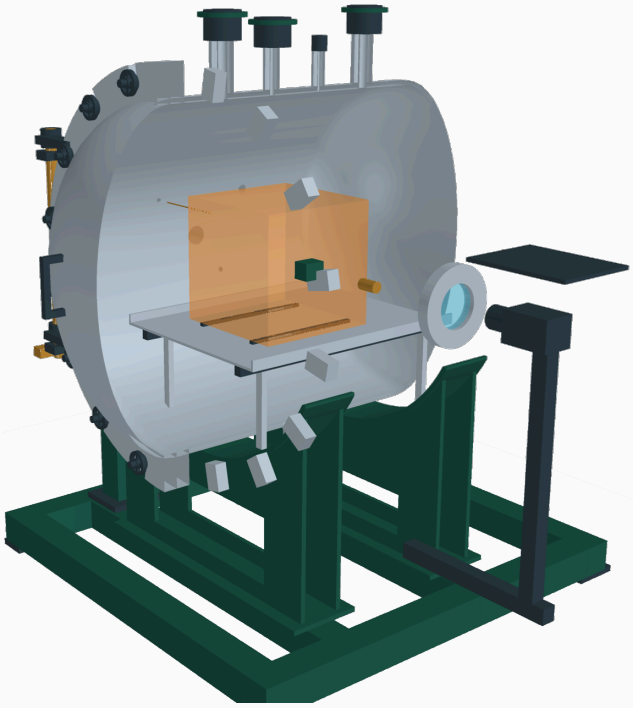
Pressure, temperature and video need a shared, traceable time base; otherwise air-blast and actuated comparisons lose alignment. Thermocouples need confirmed gas-tight fittings, sheaths, response time and type. Peak gas temperature is not the wall or sensor rating. If flame location and arrival time are used to check models or reproduce tests, high-speed imaging, exposure, field calibration and synchronisation must be specified separately; ordinary process video is not automatically a high-speed measurement. High-speed camera packages may be listed as options so quantitative flame-path results are not promised without hardware and calibration.

| Item / condition | Published value / method note |
|---|---|
| **V01 vacuum** | CAD path indication Ø25 mm; isolate the pump from combustion transients |
| **G01 premix supply** | CAD path indication Ø12 mm; pressure control, isolation, materials and seals confirmed as a set |
| **P00 static absolute pressure** | CAD path indication Ø8 mm; initial absolute pressure, distinct from dynamic sensing |
| **P01 / P02 dynamic pressure** | CAD path indication Ø6 mm; redesign for flush mounting—do not claim microsecond response with long impulse tubing |

10 / PORTS & MEASUREMENT CHAIN

# Ports, ignition reserve and measurement chain · continued

内部布置 | 剖切状态



托盘、接口和样品空间保持在固定筒体内；此图仅用于确认布置
结构确认预览 | 紧固、密封与承压尺寸待校核 | 所有仿真结果不代表本次门结构

Section arrangement for internals and ports; not a manufacturing section drawing.

Port diameters and positions follow the arrangement STEP; selection, installation and bandwidth follow the specialist measurement-chain documents.

ATMOSPHERE & THERMOCHEMISTRY

# Test atmosphere, thermochemistry and load bounds

The six-component premix itself contains no oxidiser. External discussion uses a final 20% premix plus 80% dry air. Thermochemical pressures are reference magnitudes, not design pressure.

| Item / condition | Published value / method note |
| --- | --- |
| **Equivalence ratio φ (this assumption)** | About 0.777 (lean; not a flammability-limit test result) |
| **Constant-volume equilibrium reference gauge pressure** | About 0.640 MPa (stated assumptions; not design pressure) |
| **Frozen-product cross-check gauge pressure** | About 0.657 MPa (not a structural load envelope) |

## 01 How the atmosphere is defined

The premix composition is ethane 1.17%, ethylene 5.35%, carbon dioxide 34.98%, methane 10.50%, carbon monoxide 11.40% and hydrogen 36.60%. Without oxidiser, that table alone does not define an in-vessel explosive atmosphere. All thermochemistry and flame-speed discussion here assumes a final in-vessel mix of 20% premix and 80% dry air, with dry air taken at the usual oxygen/nitrogen/argon order of magnitude. The 20% fraction is defined on the final in-vessel gas; a single vacuum reading is not proof that the ratio is already correct. Actual initial state also depends on absolute-pressure measurement, residual gas, temperature, leakage and uniformity. Operating procedures belong to the laboratory that runs the tests.

# Test atmosphere, thermochemistry and load bounds · continued

## 02 How to read thermochemical references

Under the stated assumptions of 298.15 K, 101325 Pa absolute initial state and closed adiabatic constant-volume equilibrium, ideal constant-volume chemical equilibrium gives a gauge-pressure reference of about 0.640 MPa; a frozen-product cross-check is about 0.657 MPa gauge. These figures illustrate hazard magnitude and an entry load for later structural talk. They are not a guaranteed upper bound on local transient pressure and must not be selected as equipment design pressure. The models omit local fluctuations, flame acceleration, windows or relief, agent release, device heat/gas release and structural dynamic response. Actual peak pressure, rise rate and timing require appropriate reacting-flow modelling and measurement.

## 03 Door load and structural design bounds

At about 0.65 MPa gauge on an 800 mm clear opening alone, the projected opening-direction force already reaches tens of tonnes-force in magnitude, showing that a full-bore door raises closure load while easing loading. The estimate is order-of-magnitude only and cannot size bolts or flanges. Real sealing diameter, preload, flange bending, eccentricity, fatigue and thermal effects belong in formal design. Structural design must at least cover internal and dynamic pressure basis, vacuum buckling, repeated full-bore door sealing, nozzle reinforcement, hinges and overturning resistance, window thermal shock, and fabrication, inspection and sealing. Finite-element results from an older small door or simplified shell do not apply to this assembly.

Gas procurement must confirm composition tolerance, stability, certificates and temperature-pressure basis. Price or stock availability is not promised without supplier documents.

RESEARCH SUPPORT & LIMITS

# Research support: what it can and cannot stand for

Three-dimensional premixed baselines, mesh sensitivity and the literature matrix support method discussion. They are not physical maximum pressure, extinguishing performance or whole-machine pressure qualification.

## Research work already completed

The support package ran a research premixed flame-front case on true geometry with fixed internals, storing pressure histories, probe records, temperature fields and conservation audits, and comparing mean-pressure differences between mesh levels at shared record times. Ideal constant-volume thermochemistry, one-dimensional laminar flames, a temperature-pressure flame-speed table and mesh-quality checks were also completed. Their value is to show why loading blockage, initial-state definition and instrumentation layout matter, and to leave a reviewable numerical baseline for later measurement comparison.

## Conclusions that are explicitly unsupported

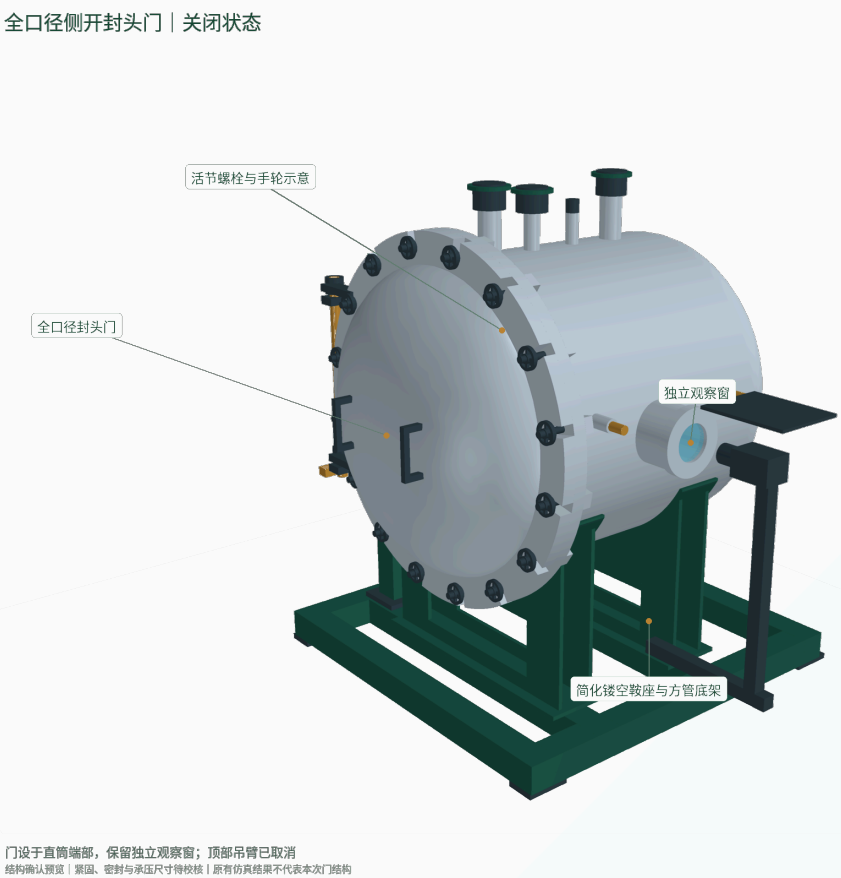
The research case uses a stated simplified combustion model and has not been validated against this vessel. It is not whole-machine pressure qualification, does not prove reacting-flow mesh independence and does not give suppression results after agent release. Mean-pressure differences at shared times are preliminary mesh sensitivity, not convergence order, GCI or experimental uncertainty. The literature matrix points to research methods for battery-vent hazard screening, flame-speed testing and deflagration simulation. It does not transplant other parties' measured values into certification for this vessel, nor turn public standard metadata into a regulatory equipment classification.

14 / RESEARCH SUPPORT & LIMITS

# Research support: what it can and cannot stand for · continued

## How to use the research support externally

In external communication, describe the research support as technical preparation that clarifies test boundaries and the later validation plan—not as proof that a device already suppresses explosions. Clients who need the system for development comparison or method research may request the atmosphere definition, loading state, measurement-chain configuration, raw-data formats for air-blast versus actuated cases, and the open list of pressure, window, relief and ignition items still to confirm. That keeps the detail while refusing to present unfinished design verification as a delivery guarantee.




Closed-state CAD isometric; fasteners and ports are arrangement indications.

15 / RESEARCH SUPPORT & LIMITS

# Research support: what it can and cannot stand for · continued

Three-dimensional results are a research baseline. Independent measured comparisons are still required before judging predictive value for a specific device test.

SELECTION & CONFIRMATION

# Selection talks, confirmation items and delivery bounds

State the test objective, specimen form, atmosphere, measurements and safety bounds once, then move into professional design, fabrication inspection and acceptance.

## 01 Information to bring to technical talks

At minimum, clarify the outline and mounting of the device under test, whether the housing remains for air-blast runs, whether the atmosphere follows this six-component diluted definition or another recipe, which pressure/temperature/imaging quantities must be recorded, which baseline and comparison cases the report must present side by side, and laboratory needs for vacuum, venting, cleaning and interlocks. If the specimen envelope or mass exceeds the present arrangement assumptions, raise that early so tray, probes and viewing can be adjusted. If custom premix is required, confirm composition tolerance, cylinder materials, analysis certificates and temperature-pressure basis at the same time.

## 02 Items still required before manufacture

Before manufacture, design conditions, full-opening door and window pressure boundaries, vacuum and cyclic loads, code applicability and equipment category, fabrication inspection and sealing, and the complete measurement chain still need confirmation. Dynamic-pressure sensor candidates must not confuse range, over-range and maximum-pressure figures. Vacuum pumps must be checked for hydrogen, carbon monoxide and hydrocarbon compatibility and must be isolated so they never see the combustion transient directly. Temperature probes, windows and seals must be assessed for continuous duty and short thermal shock. These belong to professional design and package selection; this manual does not invent an unverified allowable working pressure.

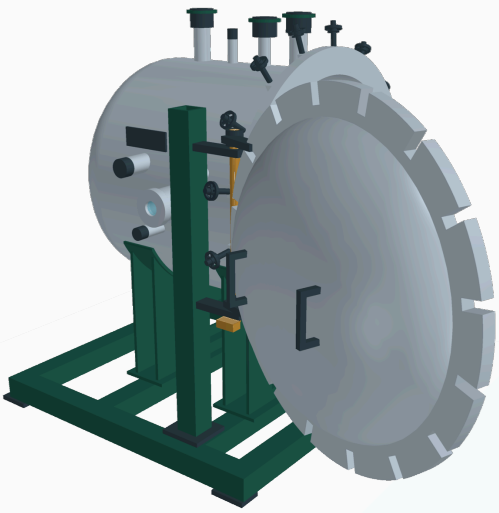
17 / SELECTION & CONFIRMATION

# Selection talks, confirmation items and delivery bounds · continued

## 03 How to read the deliverables

This product manual states the external position, test logic, arrangement concept and confirmation bounds of the FRTS-YB500A suppression test system. The engineering package may separately include STEP arrangements, parameter tables and research-case records for technical exchange. Customer acceptance follows the technical agreement, design drawings, inspection records and measured procedures confirmed by both parties. Sichuan Farui Testing Equipment Co., Ltd. can help discuss test schemes and system configuration inside those bounds. Any wording that turns research peak pressures, ideal constant-volume equilibrium or mesh comparisons into product qualification data is outside what this manual supports.

铰链与底架｜侧面结构



门重由侧置铰链和底架承托；底架预留调平与地面锚固位置
结构确认预留｜紧固、密封与承压尺寸待校核｜原有仿真结果不代表本次门结构

Hinge column and side support arrangement; door mass, deflection and overturning still need design review.

18 / SELECTION & CONFIRMATION

# Selection talks, confirmation items and delivery bounds · continued

Selection tables and supplier candidates list verification items only; they are not an ordered BOM or a price commitment.

19 / COMPANY

# High-tech enterprise

Sichuan Farui Testing Equipment Co., Ltd. holds a High-tech Enterprise certificate. Its work covers fire-protection and material fire-test equipment, measurement and control software, and laboratory system integration.




Original High-tech Enterprise certificate. Dates and identifiers follow the certificate as issued.

### Certificate number

GR202551000122

### Issue date

2025.12.02

### Stated validity

Three years

Issue date and validity are shown as stated on the certificate.

20 / COMPANY

# Quality management system

From technical requirements through on-site use, Farui organises instrument development, assembly and service within the certified management-system scope, connecting requirement confirmation, technical implementation and project delivery.


注册号：30924Q0210R0S

质量管理体系认证证书

兹证明

四川法瑞检测设备有限公司

统一社会信用代码：91510703MA6Z473E4K

注册地址：绵阳市涪城区剑安路 35 号（科技城软件产业园）

审核地址：四川省绵阳市游仙区科学城中经路 52 号辅助房 12、13 号

质量管理体系 符合

GB/T19001-2016 idt ISO9001:2015 标准要求

该管理体系认证所覆盖的范围为：

工业自动控制系统仪器装置的研发、组装及服务

该组织分场所信息：

"无"

获证组织在证书有效期内每年至少接受一次本认证机构的监督审核，并将监督审核合格标志粘贴于证书指定位置，此证书方可持续有效。本证书有效性请登录 http://cx.cnca.cn 查询

颁证日期：2024 年 06 月 06 日　　有效期至：2027 年 06 月 05 日

国评认证（成都）有限公司　　签发人：

地址：成都高新区[illegible]7 层 8 号

Original quality-management-system certificate. This is a company-system certificate, not product certification.

### Certified standard

GB/T 19001-2016 / ISO 9001:2015

### Certified scope

Research, assembly and service of industrial automatic-control system instruments

### Registration number

30924Q0210R0S

### Stated validity on the certificate

2024.06.06 — 2027.06.05

This page records the company management-system certificate. Coverage and current standing remain those registered by the certification body.

21 / COMPANY

# Industry participation

As a senior member of the Smart Laboratory Professional Committee of the China Association for Standardization, Farui follows test standards and smart-laboratory practice, connecting industry exchange with instrument design, measurement and technical service.




Original senior-membership certificate of the Smart Laboratory Professional Committee.

### Membership and organisation

Senior member, Smart Laboratory Professional Committee, China Association for Standardization

### Issue date

2026.07.21

### Stated validity on the certificate

2027.07.20

Membership is shown as registered on the original certificate and its stated validity date.

22 / COMPANY

# Research and standards participation

Around flame retardancy, fire protection and measurement systems, Farui continues to accumulate instrument-design, automatic-control and test-method experience, using research and standards participation in technical discussion and system design for complex tests.

**8** Invention patents (count)

**4** Utility models (count)

**4** GB/T participation (count)

### From method to apparatus

Test conditions, measured quantities and use cases are translated into configuration options, with the test method as the starting point for technical discussion.

### From signal to record

Data acquisition, control software and combined systems are organised so that original signals, operating conditions and reported results remain corresponding.

Figures follow the April 2026 company introduction. Patent applications are not distinguished from granted patents. Participation lists follow the corresponding documents.

CONTACT / FIRETS

# Contact Farui

Discuss device outline, comparison cases, atmosphere and measurements. Final pressure rating, seals, windows, relief and ignition follow confirmed design files.

## From the test need to the equipment configuration

Product selection / technical exchange

Project configuration / service enquiry

Connect on WeChat

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