AUTOMATED GAS-CYLINDER CABINET

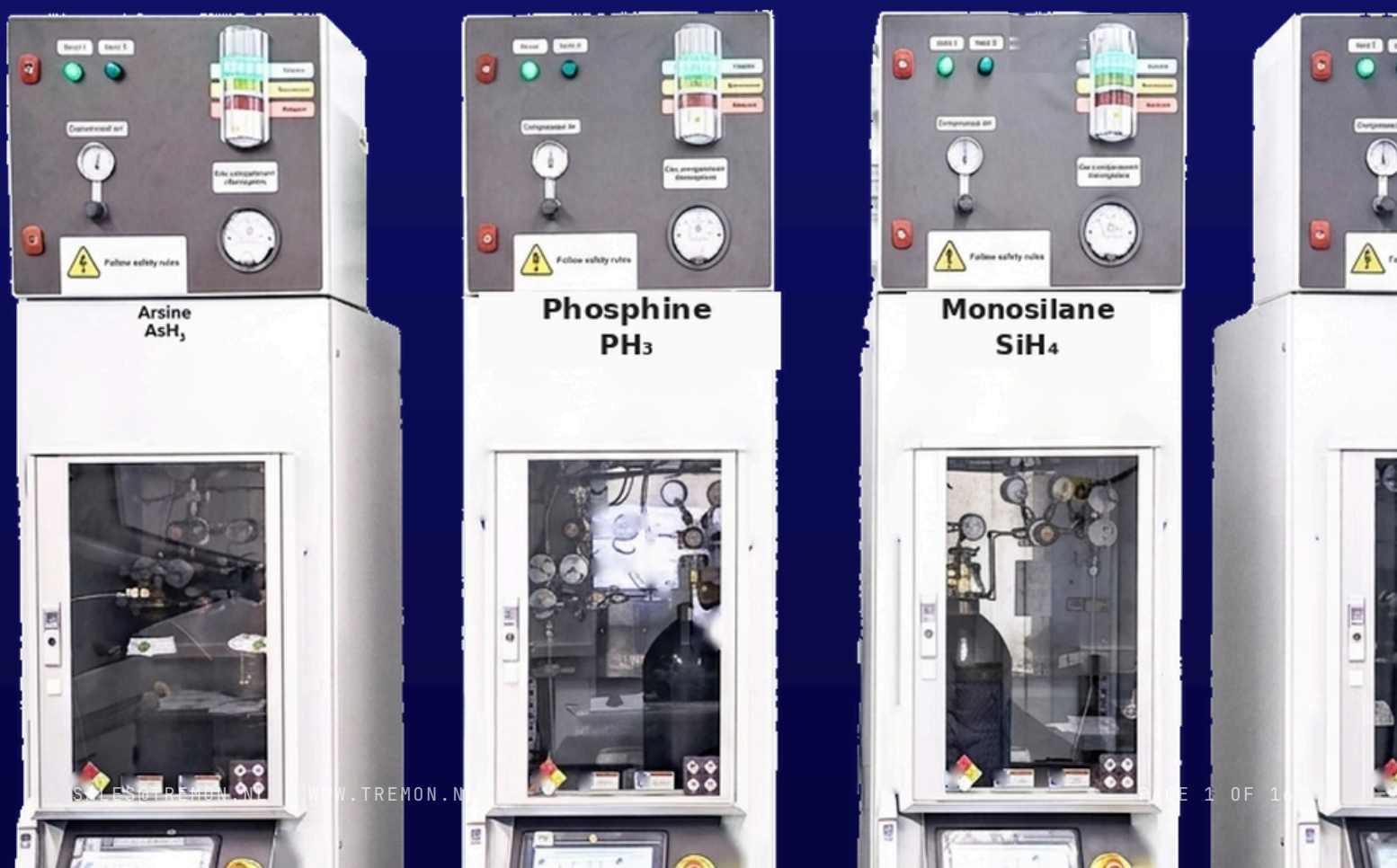
GASPOD

Safe storage & uninterrupted supply of inert, flammable and toxic gases for the semiconductor industry

TREMON

MEASUREMENT TECHNOLOGY

Data sheet · GASPOD · Rev. 09/2026



PURPOSE & APPLICATION

The **GASPOD** automated gas cabinet is engineered for the **safe storage and uninterrupted supply of inert, flammable and toxic gases** of various purity into a process line while preserving the original gas purity. Modular construction with options by gas type and customer specification satisfies virtually any requirement without compromising build quality or safety principles.

Application areas

- Semiconductor wafer fabrication
- Energy & power industry
- Scientific & research facilities
- Chemical & process plants
- Gas-supply infrastructure

Capacity

Cabinet designs hold up to four 50-litre cylinders at working pressure up to 300 bar. All cylinders can be manifolded by a gas-distribution panel purpose-built for the gas in use.

Control & monitoring system

- Pneumatic-valve control
- Cabinet-parameter monitoring & live status display
- Continuous gas-leak & fire-safety monitoring
- Exhaust-ventilation & door-state monitoring
- Ethernet uplink (Modbus TCP) to plant automation
- Event logging & pre-programmed processes

Fully automated gas panels

Flammable and toxic gases are handled by fully automated gas panels under a single cabinet control and monitoring system.

OPERATOR & SAFETY FEATURES

`Touch-Screen ≥ 10″` `EMO button` `status light column` `password access levels` `door locks` `helium leak test`

A ≥ 10″ colour Touch-Screen operator panel, emergency-off (EMO) button, tri-colour status column (green ready · yellow warning · red alarm/leak/fire), multi-level password protection, and tempered safety glass provide layered protection and remove operator error during cylinder change.

UPPER-HEAD INDICATORS

The upper section of every GASPOD cabinet carries the operator-facing indication set — a tri-colour status column, dual-inlet power indication, compressed-air and ventilation gauges, all visible through tempered safety glass.

Status light column	Green — safety system on, cabinet ready; yellow — warning or operator action required; red — process alarm / fault / gas leak / fire signal
Power-present indicators	Inlet 1 and Inlet 2 supply status
Compressed-air pressure indicator	With pressure regulator
Ventilation differential-pressure gauge	Monitors exhaust-ventilation pressure drop
Tempered safety glass	Large viewing window for visual control

Cylinder scales — continuous liquefied-gas level control by weight

GASPOD cabinet — head with status column, gauges & touch-screen; body with viewing window & EMO button

AUTOMATED GAS PANEL

Flammable and toxic gases are handled by fully automated gas panels built on components from leading global manufacturers, operating under the single cabinet control & monitoring system. Panels are configured per gas type and customer specification.

Full process schematics (P&ID) for the two principal cabinet types — toxic gas and forming gas — are provided in **Appendix A**.

Gas panel — pneumatic valves, regulators & manifolds on the mounting plate

FIRE & LEAK SAFETY

Ignition of pyrophoric gases is monitored by a **UV/IR flame detector**. Gas leaks are detected by **gas analyzers** and, on any leak, the cabinet safety system acts on the automated panel.

Coaxial-line safety: the GASPOD safety system monitors coaxial-line tightness. On a pressure drop (leak) in the coaxial line the system blocks cabinet operation; work resumes only after the cause is found and eliminated.

UV/IR flame detector

AUTOMATION & PROCESS CONTROL

Semi-automatic & automatic modes

Semi-automatic control gathers safety-sensor and gas-panel data with warning/alarm signalling and emergency gas-supply shut-off. Automatic control maintains set pressure, runs pre-programmed emergency actions, and performs the automatic vacuum-and-nitrogen-purge sequence of gas lines during cylinder change.

Real-time visualisation

Dynamic animated process view — schematic, pressure, weight and alarms — with clear audible and visual fault messages. Event data is written to a microSD card.

Key functions

- Pressure/weight thresholds for auto cylinder switch-over
- Discrete I/O + Ethernet (Modbus TCP) to building safety
- Emergency gas-supply shut-off
- Cylinder scales for liquefied-gas level
- Manual valve-override capability
- Bottle-to-line pressure reduction
- High-pressure gas "breakthrough" protection
- Process-gas flow control (≤ 10 L/min, configurable)

CYLINDER & GAS-PANEL HEATING

Continuous gas draw causes adiabatic expansion and cooling (notable for SF_6, propane, nitrogen, oxygen, BCl_3, WF_6 and HF), which can form condensate and clog lines. Heating of the cylinder, gas panel and lines prevents condensate. Setpoints are field-adjustable.

Cylinder heating

Cylinder thermal insulation, heating-control cabinet, surface-mounted temperature sensor and a flat silicone heater keep the cylinder at setpoint.

Gas-panel heating

Thermal insulation, temperature sensor, flat heating element and mounting panel prevent condensate forming on the gas panel.

Gas-line heating

Heating cable over the tube under thermal insulation keeps process lines above the condensation point.

Gas-cylinder temperature	26 ± 4 °C
Gas-panel temperature	35 ± 4 °C
Pipeline temperature	44 ± 4 °C
Maximum heating temperature	60 °C
Maximum heating power	≤ 2000 W

FUNCTIONS

- Semi-automatic control — gathers safety-sensor and gas-panel data with warning/alarm signalling and emergency gas shut-off
- Automatic control — holds set pressure, runs pre-programmed emergency actions, and performs the auto vacuum-and-nitrogen-purge of gas lines at cylinder change
- Programming of gas-pressure or cylinder-weight level for automatic cylinder switch-over
- Dynamic animated real-time process view — schematic, pressure, weight and alarms
- Clear audible & visual fault messages and signalling
- Emergency gas-supply shut-off
- Process-gas flow control (≤ 10 L/min or other configured value)
- Pressure reduction from cylinder to line
- Protection of process equipment from high-pressure gas "breakthrough"
- External discrete inputs and outputs
- Ethernet (Modbus TCP) uplink to the building safety system
- Event logging to microSD; repeatable processes independent of the human factor

OPTIONS

- Multi-level password protection of critical functions
- Door locks protecting cylinders from unauthorised access
- Helium leak test after welding & assembly of gas panels
- Stainless-steel folding ramp for easy cylinder installation
- Large viewing window for visual control
- Manual valve-override capability
- Cylinder scales for liquefied-gas level control
- Cylinder, gas-panel and gas-line heating (see heating section)
- Interface language — English (Russian to order)

ORDERING INFORMATION

Configuration is defined by an order code. Two examples are shown — a toxic-gas cabinet and a forming-gas (15% H_2 + N_2) cabinet.

TOXIC-GAS CABINET

GASPOD – A – AsH_3 – C – 2 – 1 – A – 1 – C – X – 5.0

FORMING-GAS CABINET (15% H_2 + N_2)

GASPOD – A – 15%H_2+N_2 – C – 2 – 1 – A – 1 – C – 5.0

GASPOD — gas-cylinder cabinet · **A/P/PA** — automated / manual / partly automated · **<formula>** — gas chemical formula · **C/X** — chemical scrubber yes / no · **<n>** — cylinders in cabinet · **<r>** — number of ramps · **A/P/X** — auto / manual / no cylinder switch-over · **1 / 1V / X** — N_2 purge / purge + evacuation / none · **C/B/X** — mains N_2 / own purge cylinder / none · **O/X** — with / without heating · **<purity>** — gas purity (e.g. 5.0)

CABINET CONFIGURATIONS (CYLINDERS)

CYLINDERS IN CABINET

CODE	DESCRIPTION
1	1 process-gas cylinder with external purge-gas source
2	1 process-gas + 1 purge-gas cylinder, automatic change-over
2	2 process-gas cylinders, automatic change-over, external purge source
3	2 process-gas + 1 purge-gas cylinder, automatic change-over

OPERATING SEQUENCES

Pre-programmed automated sequences run from the touch-screen for the two main cabinet types.

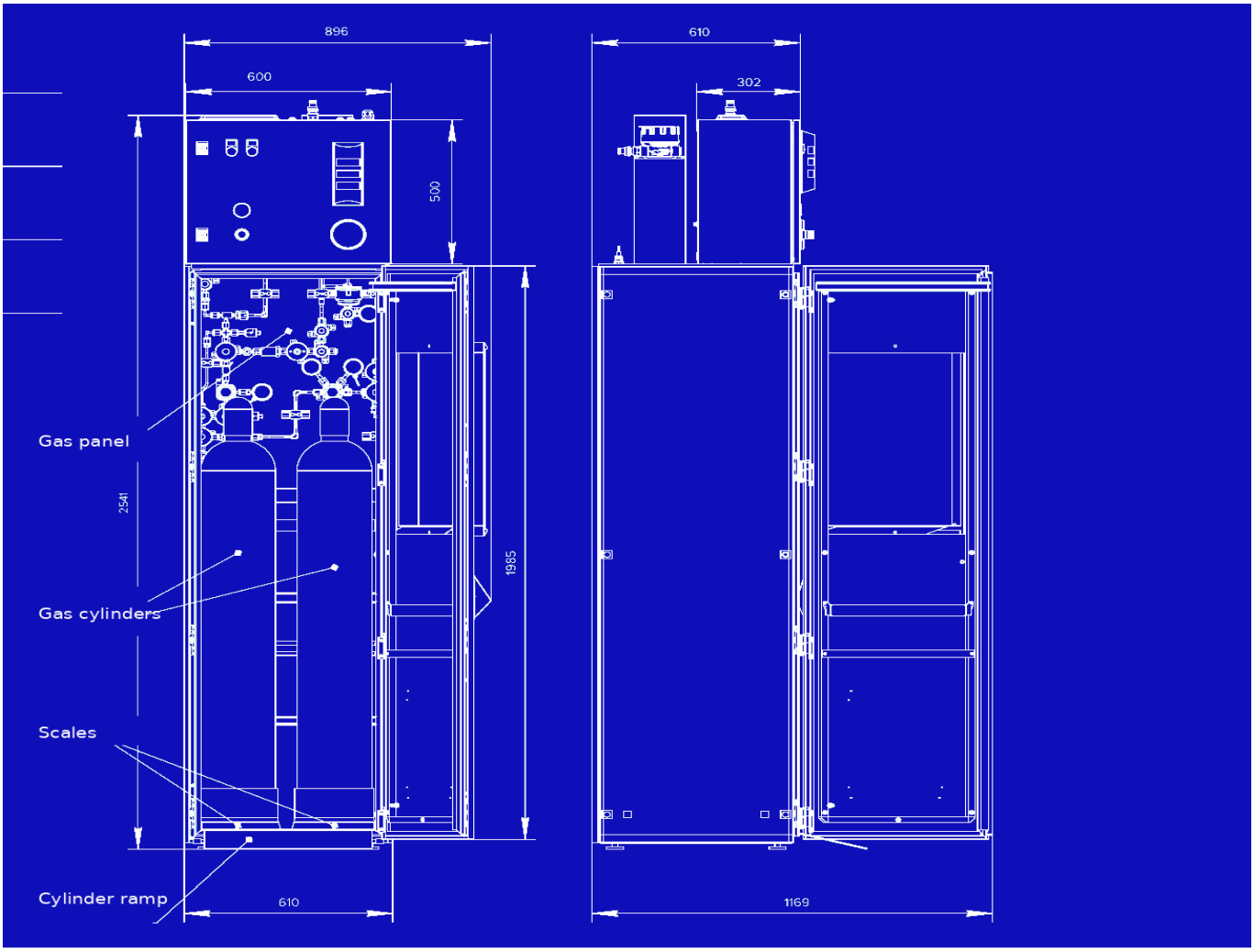
Toxic-gas cabinet

1. Nitrogen-cylinder replacement
2. Full nitrogen fill of the gas panel (preservation during downtime or storage)
3. Nitrogen fill of the gas panel with bleeding
4. Process-gas cylinder replacement
5. Process-gas supply

Forming-gas cabinet (15% H_2 + N_2)

1. Full nitrogen fill of the gas panel (preservation during downtime or storage)
2. Left-cylinder replacement
3. Right-cylinder replacement
4. Process-gas supply
5. Automatic switch-over from the left cylinder to the right

CABINET DIMENSIONS



Front & side elevations — 2550 × 610 × 610 mm; gas panel, cylinders, scales & cylinder ramp

TECHNICAL CHARACTERISTICS (1 OF 2)

ELECTRICAL PARAMETERS

Power supply (two inputs: main & backup)	220 V, (50 ± 1) Hz
Power consumption	98 W (without heating); ≤ 2098 W (with heating)

PROCESS-GAS CYLINDER CONNECTION

Maximum pressure	150 bar
Cylinder connection type	DN1
Gas purity, min.	0.6

NITROGEN (PURGE-GAS) CYLINDER CONNECTION

Maximum pressure	200 bar
Cylinder connection type	DN9
Gas purity, min.	0.6

PROCESS-GAS DELIVERY TO THE PROCESS LINE

Maximum pressure	7 bar
Connection	Coaxial weld-on pipe: inner ¼", outer ½"; size per ASTM A269
Maximum flow	5 std L/min

NITROGEN FOR EJECTOR SUPPLY

Inlet pressure	4.8 bar
Flow	≤ 5.1 m^3/h
Connection	¼" VCR (M)
Nitrogen purity	≥ 99.9 %vol

EJECTOR COLLECTION LINE

Connection	½" VCR (M)

TECHNICAL CHARACTERISTICS (2 OF 2)

PURGE-NITROGEN COLLECTION LINE

Connection	¼" VCR (M)

COMPRESSED-AIR / NITROGEN CONNECTION

Connection	6 mm
Flow	≤ 10 L/min (duty-dependent)
Compressed-air class	≥ class 1.4 per ISO 8573-1:2016

FIRE-SUPPRESSION SPRINKLER

Connection flange	G ½" external
Pressure	0.2–1.2 MPa(g); flow 120 L/min at 0.2 MPa(g)

EXHAUST VENTILATION

Connection flange	DN150
Flow	from 425 m^3/h

MASS & DIMENSIONS

Overall dimensions (H×W×D)	2550 × 610 × 610 mm
Cabinet mass (without cylinders)	≤ 250 kg
Body material	Powder-coated steel
Ingress protection	IP54
Service clearance	≥ 1 m front, ≥ 0.5 m top
Number of feet	8 feet

AMBIENT CONDITIONS

Temperature	+5 … +30 °C (+5 … +60 °C storage)
Pressure	700–1300 mbar
Humidity	0–80 % RH

Technical characteristics are finalised at order placement.

WORKING GASES

GASPOD cabinets operate with the following gases (grouped by role). The exact gas and configuration are set at order placement.

Silicon precursor gases

- Dichlorosilane, SiH_2Cl_2
- Disilane, Si_2H_6
- Germane, GeH_4
- Methylsilane, CH_3SiH_3
- Silane, SiH_4
- Silicon tetrachloride, $SiCl_4$
- Germanium tetrafluoride, GeF_4
- Silicon tetrafluoride, SiF_4
- Trichlorosilane, $HSiCl_3$

Corrosive gases

- Hydrogen bromide, HBr
- Hydrogen chloride, HCl
- Chlorine, Cl_2

Atmospheric gases

- Argon, Ar
- Nitrogen, N_2
- Helium, He
- Hydrogen, H_2
- Oxygen, O_2

Reagent gases

- Ammonia, NH_3
- Carbon dioxide, CO_2
- Carbon monoxide, CO
- Sulfur dioxide, SO_2
- Tungsten hexafluoride, WF_6
- Nitrous oxide, N_2O

Dopant gases

- Arsine, AsH_3
- Diborane, B_2H_6
- Phosphine, PH_3
- Boron trifluoride, BF_3
- Boron trifluoride-11 (enriched), $^{11}BF_3$
- Trimethylboron, $B(CH_3)_3$

Etch gases

- Hydrogen bromide, HBr
- Hydrogen chloride, HCl
- Boron trichloride, BCl_3
- Hydrogen fluoride, HF
- Chlorine, Cl_2
- Nitrogen trifluoride, NF_3
- Sulfur hexafluoride, SF_6
- Halocarbon-116, C_2F_6
- Halocarbon-14, CF_4
- Halocarbon-218, C_3F_8
- Halocarbon-23, CHF_3
- Halocarbon-32, CH_2F_2
- Halocarbon RC318, C_4F_8

DATA EXCHANGE — MODBUS TCP

GASPOD cabinets act as a Modbus-TCP server. Values are held in a buffer for polling over Modbus TCP. The "Open Modbus-TCP Specification" v1.0 (Schneider Electric) is supported, compatible with most factory automation, HMI/visualisation and SCADA systems. Communication is over port 502.

SUPPORTED FUNCTION CODES

CODE	DESCRIPTION
0x01	Read Coil Status (poll flags)
0x04	Read Input Registers (poll values)

COIL REGISTERS (0X01) — READ ONLY

BIT	SIGNAL	ADDR
0	Overall cabinet status (1 = normal)	0
1	Overall cabinet status (1 = warning)	1
2	Overall cabinet status (1 = alarm)	2
3	Safety-loop status (0 = normal)	3
4	Gas analyzer — MPC exceeded, threshold 1 (0 = normal)	4
5	Gas analyzer — MPC exceeded, threshold 2 (0 = normal)	5
6	Fire inside cabinet (0 = normal)	6
7	Insufficient exhaust airflow (0 = normal)	7
8	Coaxial-space pressure below normal (0 = normal)	8
9	No power on input 1 (0 = normal)	9

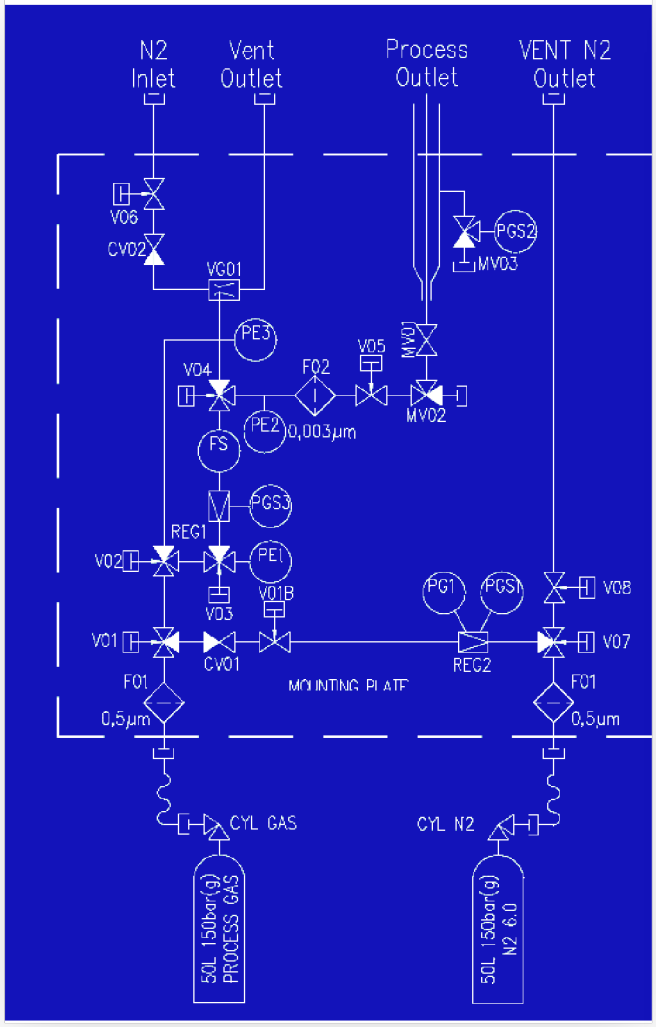
BIT	SIGNAL	ADDR
10	No power on input 2 (0 = normal)	10
11	EMO button pressed (0 = normal)	11
12	Gas-line overpressure (0 = normal)	12
13	Compressed-air pressure too low (0 = normal)	13
14	Main cabinet door open (0 = closed)	14
15	Auxiliary cabinet door open (0 = closed)	15
16	Automation-cabinet door open (0 = closed)	16
17	Cylinder 1 gas nearly empty (0 = normal)	17
18	Cylinder 2 gas nearly empty (0 = normal)	18
20	Process gas being supplied to line (0 = supply closed)	20

INPUT REGISTERS (0X04) — READ ONLY

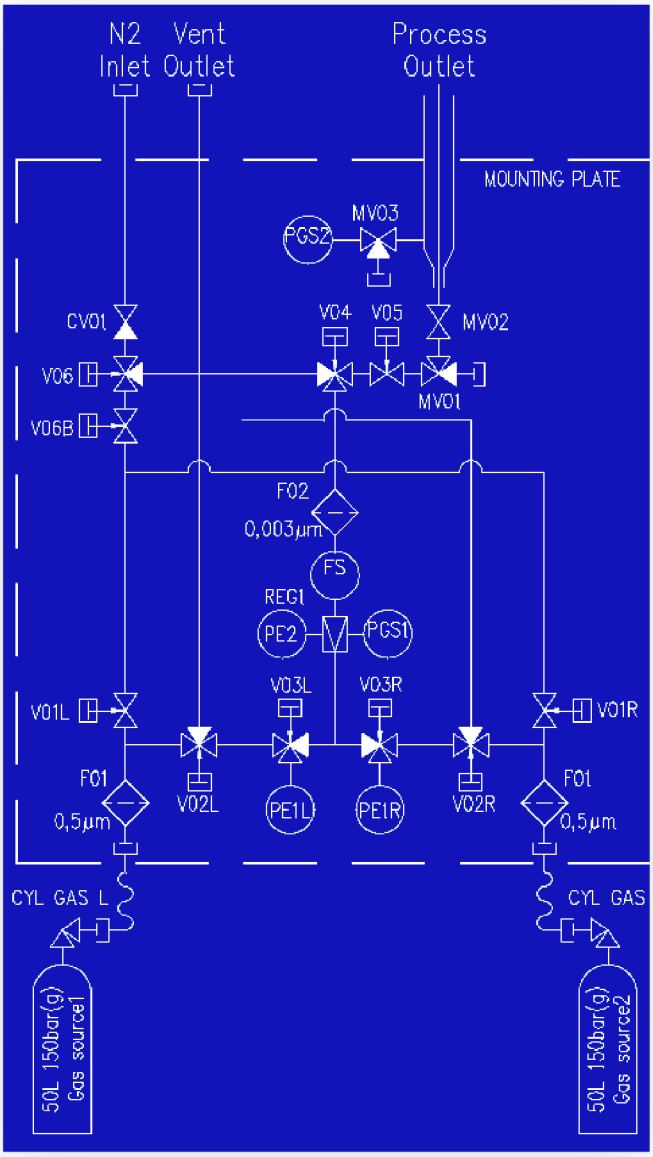
REG	VALUE	ADDR
0	Process-cylinder gas level	0
1	Process-cylinder gas mass	1
2	Process-cylinder gas pressure PE1	2
3	Purge-gas cylinder gas level	3
4	Process-line gas pressure PE2	4

APPENDIX A — PROCESS SCHEMATICS (P&ID)

Piping & instrumentation diagrams for the two principal automated cabinet configurations. Valve, regulator, filter and transmitter positions are representative; the final panel is built to the ordered gas and specification.



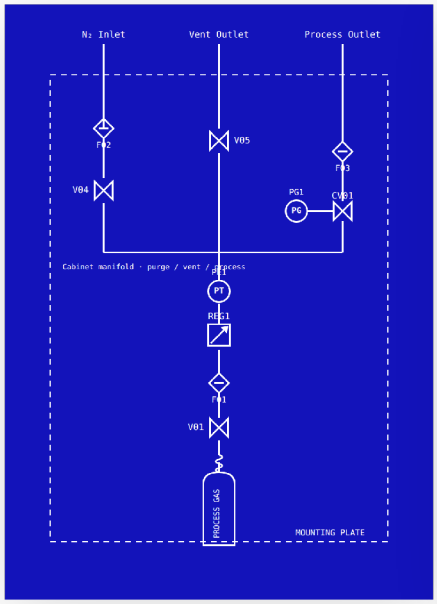
Toxic-gas cabinet — two cylinders (process AsH_3 + purge N_2), automatic change-over



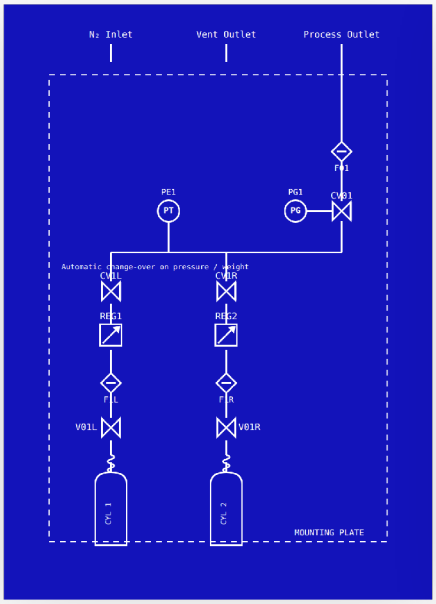
Forming-gas cabinet (15% H_2 + N_2) — two cylinders, automatic change-over

APPENDIX B — TYPICAL PROCESS CONFIGURATIONS

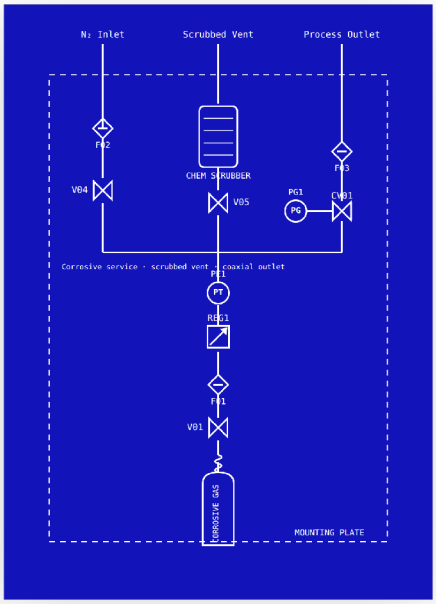
Representative GASPOD panel configurations for common supply scenarios. Symbols follow standard ISA/ISO P&ID notation; the exact valve, regulator and instrument count is set by the ordered gas, purity and change-over requirement.



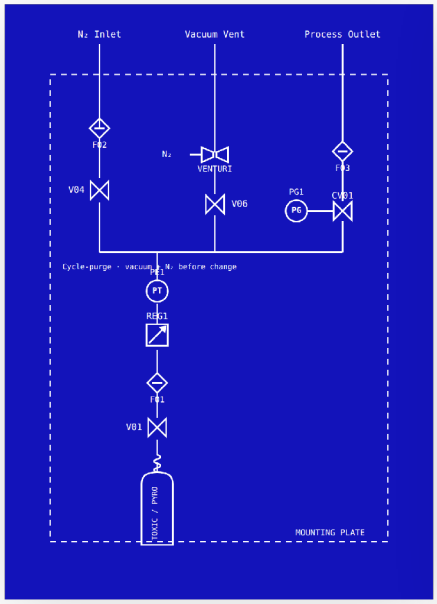
1 · Single cylinder with external N_2 purge — regulated supply, check-valve isolation



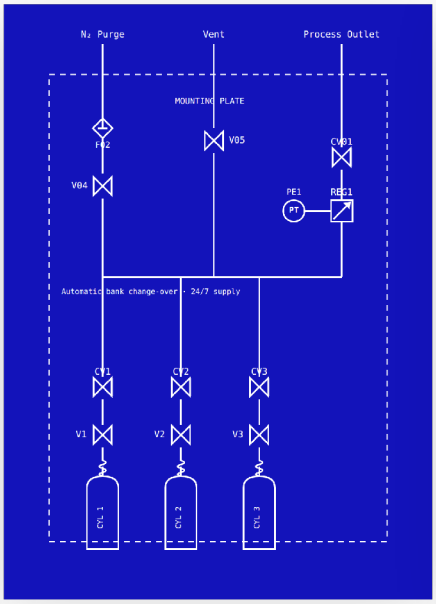
2 · Two cylinders, automatic change-over on pressure/weight for 24/7 supply



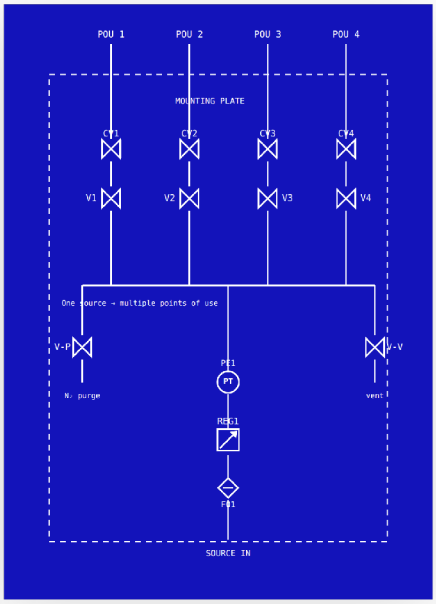
3 · Corrosive / toxic gas with chemical scrubber on the vent, coaxial outlet



4 · Cycle-purge with vacuum venturi — deep evacuation before cylinder change



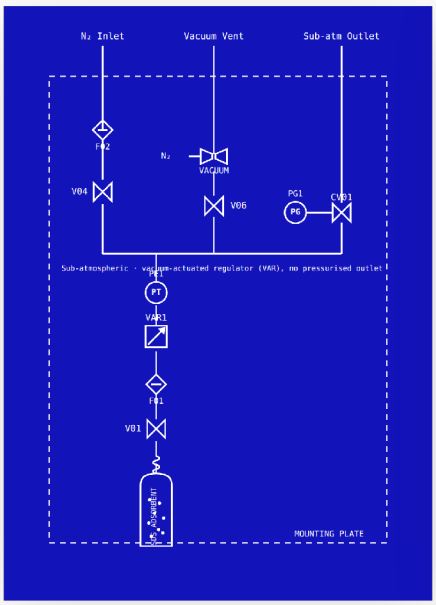
5 · Three-cylinder bank, automatic change-over for uninterrupted bulk supply



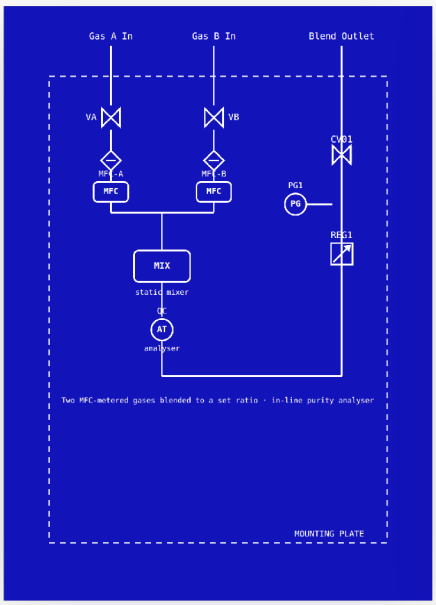
6 · Valve manifold box — one source distributed to multiple points of use

P&ID SYMBOL LEGEND

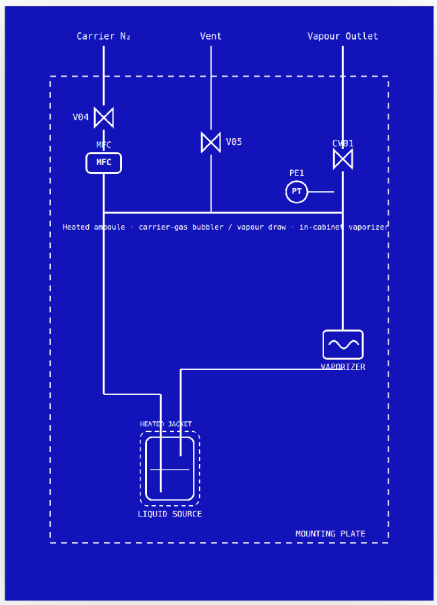
APPENDIX B — CONFIGURATIONS (CONT.)



7 · Sub-atmospheric delivery — adsorbent cylinder, vacuum-actuated regulator



8 · Gas mixing / blending panel — twin MFC metering with in-line analyser



9 · Liquid-source vaporizer — heated ampoule with carrier gas and vapour draw

CONFIGURATION SELECTION GUIDE

#	CONFIGURATION	TYPICAL SERVICE	KEY FEATURE
1	Single cylinder + N_2 purge	Inert & low-hazard specialty gas	One process cylinder, regulated supply, external N_2 purge
2	Dual, automatic change-over	Any gas requiring 24/7 continuity	Two cylinders, auto switch on pressure / weight
3	Corrosive + chemical scrubber	Corrosive / acid gases (HCl, Cl_2, BCl_3, WF_6)	Scrubbed vent, coaxial process outlet
4	Cycle-purge + vacuum venturi	Toxic / pyrophoric (AsH_3, PH_3, SiH_4, B_2H_6)	Alternating vacuum & N_2 purge before cylinder change
5	Three-cylinder bank	High-volume / bulk continuous supply	Bank auto change-over, single regulated outlet
6	Valve manifold box (VMB)	One source feeding multiple tools	Per-stick isolation, vent & purge, distribution header
7	Sub-atmospheric (SDS)	Dopant gases for ion implant (AsH_3, PH_3, BF_3)	Adsorbent cylinder, vacuum-actuated regulator, no pressurised outlet
8	Gas mixing / blending panel	On-site blends & dilutions to a set ratio	Twin MFC metering, static mixer, in-line purity analyser
9	Liquid-source vaporizer	Liquid precursors (TEOS, $TiCl_4$, CVD/ALD)	Heated ampoule, carrier-gas bubbler / vapour draw, in-cabinet vaporizer

Configurations may be combined (e.g. corrosive service with automatic change-over and cycle-purge). The final panel — valve, regulator, filter and instrument selection — is engineered to the ordered gas, purity class and supply-continuity requirement, and reflected in the GASPOD order cipher.

CONTACT

Tremon Solutions

Havensingel 100, 5611 VT Eindhoven, The Netherlands
sales@tremon.nl · www.tremon.nl
KVK 95114289 · BTW-ID NL005130552B15