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Guide To Flow Control + Process Visiblity

AUTOMATION IN CHEMICAL SYNTHESIS OPERATIONS

The upgrade that maximized hydrogen control

A process industry equipment manufacturer needed stable hydrogen delivery across capillary-sized channels for a continuous flow microreactor. The hydrogen process required hazardous area considerations.

Their previous setup placed a conventional mass flow controller inside a purge box.

It worked, but wasn't efficient enough.

One new device, more process data

The system integrator replaced the purge box arrangement with an Alicat® IS-Max™ intrinsically safe mass flow controller. The device was configured for their application needs: 6 SLPM hydrogen, 1 bar g inlet pressure, and vacuum at the outlet.

The Alicat device was mounted directly in the classified area and connected to the existing automation system through analog and digital outputs. With accurate and repeatable measurements at 1,000 times per second, the instrument responded quickly without exposing the reactor to a sudden surge when vacuum is applied.

Reliable process visibility and control

The IS-MAX gave operators data and process control in one intrinsically safe device. They could see flow, pressure, temperature, totalized flow, and gained a few other benefits:

- ► 30ms to setpoint for stable gas feed across reactor channels
- ► 0.2% repeatability of hydrogen flow, run to run
- ► 1 unit meter+control valve for fewer components
- ► Fewer fittings and leak paths, in less space
- ► Eliminated a purge box and its gas supply
- ► Up to 13 process parameters reported to PLC
- ► Accuracy as good as ± 0.1% of full scale or ± 0.5% of reading

It was an upgrade that gave system engineers a better vantage point. More data reported, and more control over the process.

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What we learned from the customer's experience

Safety hardware can slow automation

Outcomes of retrofitting hazardous areas are contingent on the strengths and shortcomings of the components that make up that system's design. Explosion-proof enclosures need access planning and inspections. Changes to signal barriers, conditioners, tubing, fittings, and layout add work before the system is ready to run.

For this customer, IS-Max MFCs made their system better by delivering three desirable and essential features:

Limit ignition energy at the device

Measure and control the process

Send data to the network

Comparing flow devices in hazardous area system designs

	Armored rotameter with manually adjusted needle valve or regulator	Thermal sensor MFC in explosion-proof enclosure	ATEX, CID1 or CID2 flow meter with external valve for flow control	Alicat IS-Max Mass Flow Controller
Measurement parameters	Shows volumetric flow rate of calibration gas. ✗	Mass flow (only) calculated based on K factors. ~	Mass & volumetric flow, absolute pressure & temperature. ~	True mass flow & 12 other parameters. Optional RH sensor. ✓
Accuracy	±1–2% of FS on cal gas. Decreased accuracy on process gases like H_2, He, CO_2. ~	Typically ±0.5–1.0% of setpoint, depending on gas and flow rate. ~	As good as ±2% of full scale flow rate. ✗	As good as ± 0.1% of full scale or ± 0.5% of reading. ✓
Repeatability	~±0.25–0.5% of full scale ✗	±0.2% of setpoint ~	±0.25% full scale ~	As good as ±0.1% of reading and ±0.02% of full scale ✓
Control mechanism	Manual adjustments are imprecise, require technicians in hazardous zones. ✗	Integrated proportional control valve. ~500 ms to 2 seconds for setpoint changes. ~	Manually configure meter + valve control loop. ~	Integrated proportional control with 30 ms response to new setpoint. ✓
P&ID Impact	Easy installation with no electrical barriers. Relatively small footprint. ✓	Largest, most complex footprint. Requires purge lines, rated cable glands, & tubing penetration. ✗	Meter and valve separated, with distinct cables & barriers. Potentially large footprint. ~	One device, barriers needed for each parameter + control input. Small footprint vs multi-instrument cluster. ✓

Alicat IS-Max offers **the only** fully integrated control solution for mass flow in areas where explosive gases are continuously present.
Triple certified for global use: Class I Division 1, ATEX Zone 0, IECEx

Compare options. Click for specifications and details.

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The world's first and only MFC for C1D1 Zone 0

With 30ms control response times, IS-Max mass flow controllers have the speed to make your process smooth. Certified for measurement and control where explosive gases are continuously present, you can use them in the strictest safety zones.

Control

0.5 SCCM to 250 SLPM full scale flow rates. 11.5 to 160 PSIA operation. 320 PSIA high-pressure option on select models.

Accuracy

Gas flow accuracy as good as ±0.5% of reading or ±0.1% of full scale on IS-Max

Certification

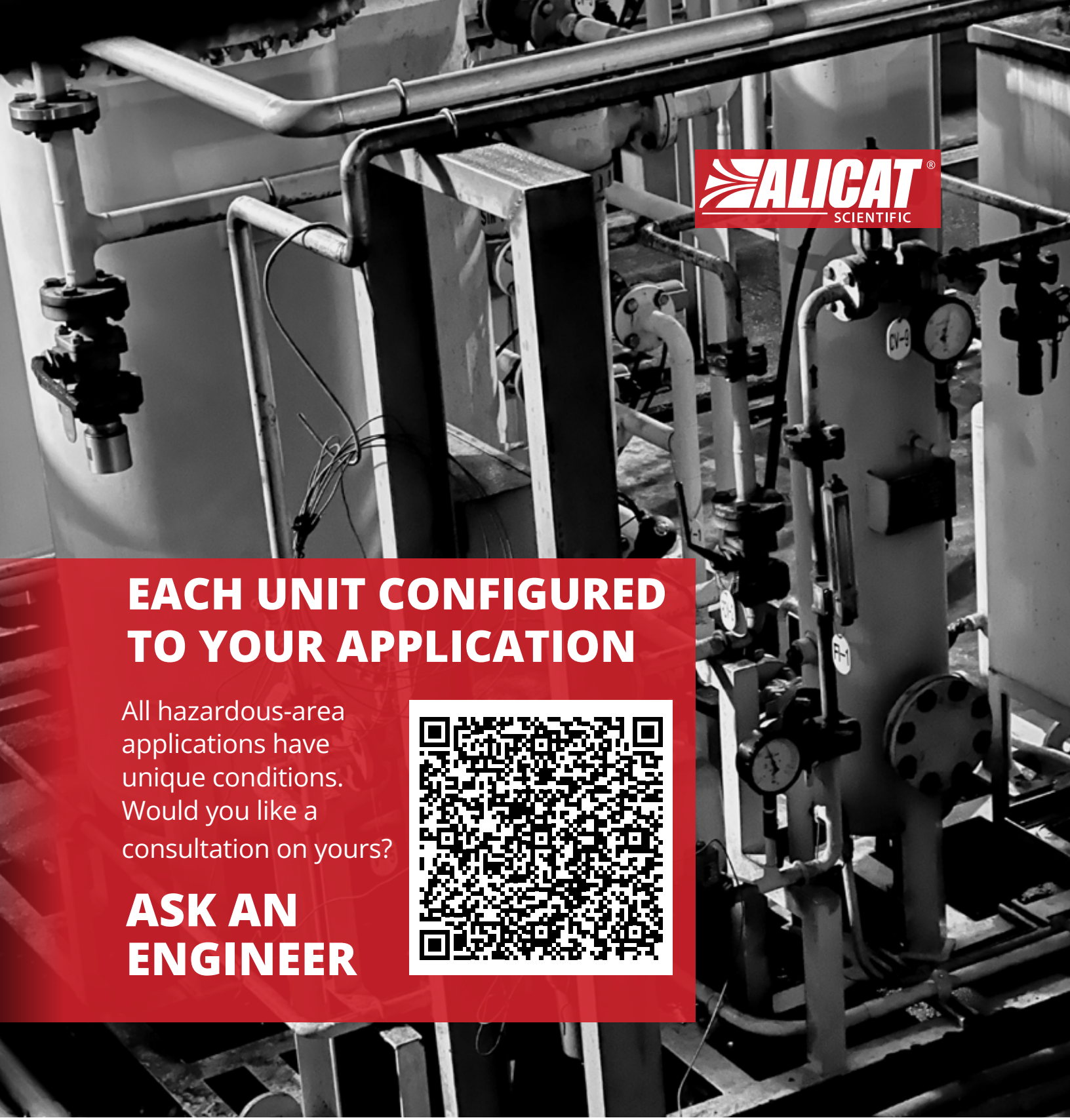
Certified worldwide by cDEKRAus, ATEX, and IECEx for Zone 0, 1 & 2 (Class I Division 1 and CID2) areas

Communication

Digital communication through Modbus RTU or Alicat ASCII, and 4 to 20 mA analog

Configurations

Backlit on-device display and control menus, IP66 case, choice of process connections, up to 128 pre-loaded gas calibrations.



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EACH UNIT CONFIGURED TO YOUR APPLICATION

All hazardous-area applications have unique conditions. Would you like a consultation on yours?

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