

CGEM gas slow control

20250211

Group Meeting

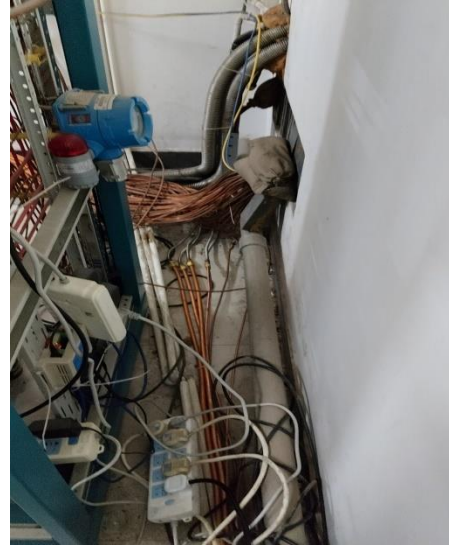
CGEM gas system status



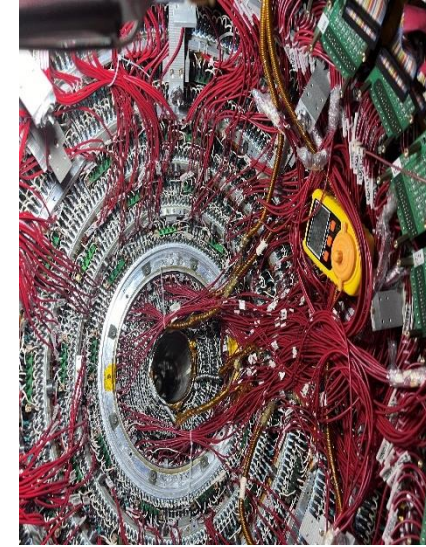
Gas rack



Mixing gas



pipes



Pipe ports to detectors



slow control

Schedule

- The current gas system, which has been in service since last October, will eventually need slow control to run automatically.
- By February 22, the gas system will begin to complete automated operation under slow-control system control after the following tasks have been completed.
 1. Mixed gas mass flow meter installation
 2. Slow control module installation and commissioning

The above two tasks require the gas supply to be stopped for at least 4 hours for system switchover.

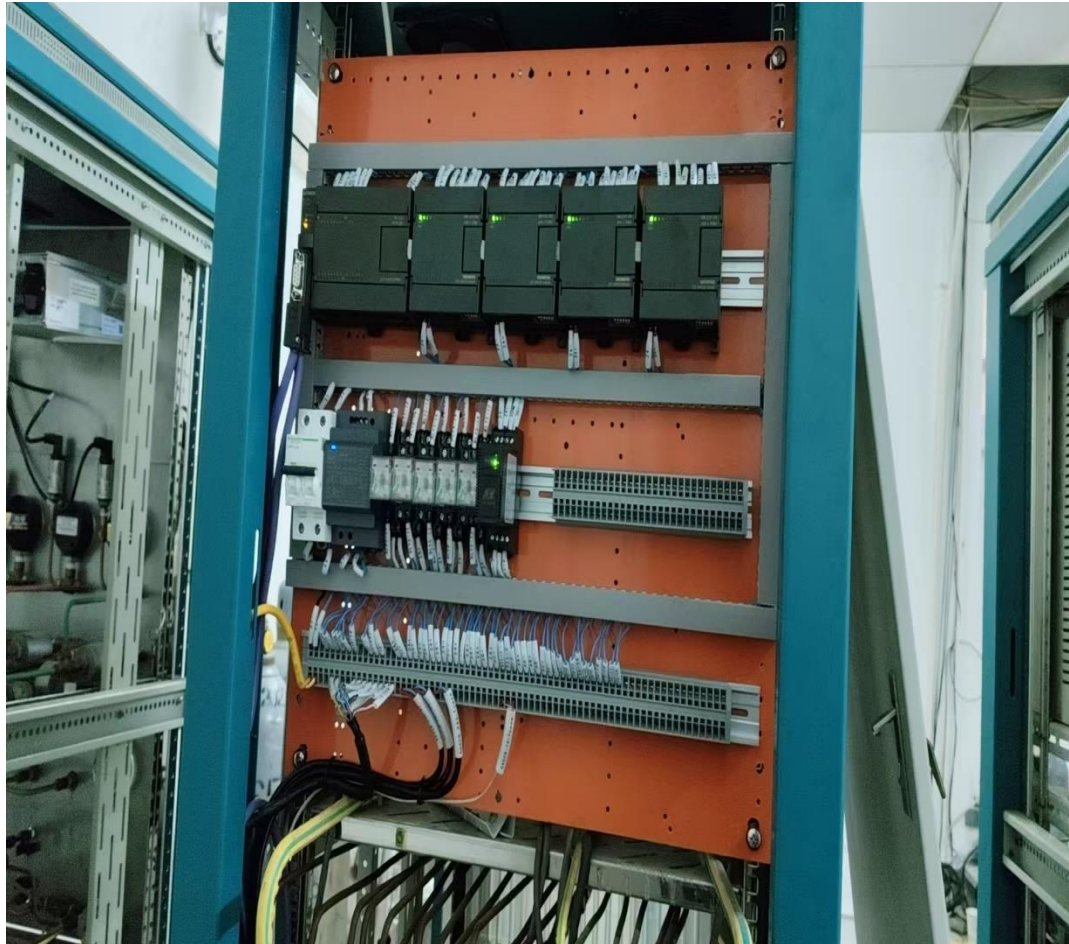
1. Flow rate of gas mixtures



- Mass flow rate now set to display
 - Argon 970sccm
 - Iso-butane 100sccm
- Float flow meter display flow (air)
 - Total mixture flow 1300sccm
 - Chamber1---250sccm
 - Chamber2---350sccm
 - Chamber3---500sccm (mass flow meter)
- Next Steps
 - Keep the four float flow meters and install mass flow meters on the back end of them.
 - Six different models of mass flow meters will arrive this weekend and can be installed. The previously ordered foreign flow meters have not yet arrived.
 - Transmit the flow signal to the slow control to complete the system properly.



2. Slow control system



The local PLC module for the slow control system has been installed.

Name		number	Signal	Range	Note
Pressure	Ar	1	0-6	0-6bar	
	I-b	1	0-6	0-6bar	
Flow rate	Ar	1	0-10000	0-10000	
	I-b	1	0-1000	0-1000	
On -Off	Ar	1			
	I-b	1			
Pressure of tank		1	4-20mA	0-6bar	
Tempters		1	4-20	0-28	
Pressure		1	4-20	0-0.3bar	
Total Flow rate		1	4-20	0-2500sccm	
Chamber 1	flow rate	1	0-5V	0-1000sccm	
Chamber 2	flow rate	1	0-5V	0-1000sccm	
Chamber 3	flow rate	1	0-5V	0-1000sccm	
Chamber 1 pressure		1	4-20	0-0.02bar	
Chamber 2 pressure		1	4-10	0-0.02bar	
Chamber 3 pressure		1	4-10	0-0.02bar	

2. Slow control system

Without buffer tank

- At present, according to the needs of the detector, without a buffer tank, we have changed part of the slow control logic to enable remote control work.
- Slow Control System Remote Control
 - The mixture gas distribution controller is always on.
 - When the ratio score is greater than 3%, the gas distribution system is automatically turned off.

With buffer tank

- Slow Control System Remote Control
 - The mixture gas distribution controller turns on intermittently with a buffer tank pressure between 0.5 and 0.9 atm.
 - When the ratio score is greater than 3%, the gas distribution system is automatically shut down. At maximum buffer tank pressure, the detector can be continuously supplied with gas for about 5 hours.

According to the existing conditions, we can first use no buffer tank operation for a few months, and then add the buffer tank operation after we have the conditions to replace the buffer tank gas during the downtime this summer.

Gas Circuit Scheme

Confirmation of gas parameters

➤ Gas type and score

90% Ar+10% i-C₄H₁₀

● Argon gas

- ① Purity is 99.999% or more (grade 5.0 or more).
- ② Ratio after mixing is 90% (tunable).
- ③ Unit gas pressure is 1.2 - 1.4 bar)

● Iso-C₄H₁₀ gas

- ① Purity is 99.99% (grade 4.0 or more). 99.9% available. It is difficult to use 99.99%, the gas source requires special purification and re-piping.
- ② Ratio after mixing is 10% (tunable).
- ③ Unit gas pressure is 1.2 - 1.4 bar

➤ Flow rate and pressure of the mixing gas

● The overall volume of the three chambers is 21.6L.

- Before: 5-7 chamber volumes are replaced per hour day. The flow rate is about 72-100sccm.
- After: 5-7 chamber volumes are replaced per hour. The flow rate is about 1650 - 2500sccm. The large mass flow meter has been changed on request.

● The internal pressure of the detectors is about 5-10 mbar (never above 20 mbar). The bubblers are empty and the Italians can set it up as desired.

➤ Buffer tank parameters

- Buffer tank pressure, 0.5-0.9 Bar.
- Buffer tank volume, about 0.3 cubic meters (diameter 500mm, height 1.5 meters).
- Buffer tank temperature, controlled between 23 ± 5 degrees, placed indoors.

