

	OGI Process Equipment White Paper		Doc No:	WP: 2202
			Initial Issue Date	10/26/2022
Speed Control Valve			Revision Date:	
			Revision No.	Rev – 0
			Approved:	JMP
Author: Jim Buenzow	Issuing Dept:	R&D Engineering	Page:	Page 1 of 3

Introduction:

Purpose: Upgrading the current speed control valves with a lower capacity speed control valve that is better suited for small volume temperature control valve diaphragm cases. Upgrade of speed control valve will provide a more refined control on burner ON transition.

Background:

In mid-2021, OGI/TERI changed to an SMC AS4000 speed control valve that would better meet the low ambient temperatures where most of the TERI brand natural gas line heaters are installed. The speed control valve selected was one with which we have had good success and that was considered standard equipment on all BMS and Relighter Systems.

By early 2022, we received feedback from one of our TERI heater product reps that they were having difficulty setting the transition speed on our standard heater’s Temperature Control Valves (TCV). It was later verified by our TERI Field Technicians that they were able to set the transition speed when on site, but they noticed that the repeatability of the transition speed was not maintained.

Discussion:

The SMC AS4000 speed control valve has commonly been supplied with standard burner management systems to control opening speed of 1” Kimray 1400 or a 2” Kimray 2150 / 2200 temperature control valve. The pneumatic loading volume of these valves is ~60cuin. for the 1400 and ~170cuin. for the 2150/2200.

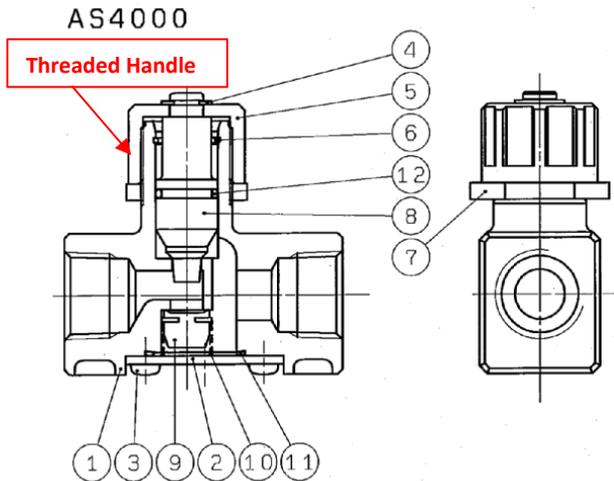
OGI’s typical gas train includes a 1” Kimray ABC2 (130 SMT ADAB-D) or a 2” Kimray EUB5 (230 SMT 2DA5-D) with pneumatic loading volumes of ~5.5cuin. and ~25cuin., respectively, depending on the gas train size. As is easily seen, the difference in volume between the Kimray High Pressure TCV (1400 and 2150/2200) versus the Kimray Low Pressure TCV (130SMT and 230SMT) is significant.

When each heater was originally set up in the OGI factory during the FAT testing, OGI technicians were able to set the AS4000 to control the transition speed of the Low Pressure TCV’s. This OGI FAT is a one-time, thorough test of all heater functionality. The issue was that days later, when the heater was field testing, the AS4000 SCV did not hold its pre-tuned speed. This became more apparent when Field Technicians would set the AS4000 to control the TCV transition speed one day, and it was significantly different the next day, sometimes causing the main burner to come on abruptly, resulting in pilot flame failures.

OGI reviewed the performance of the AS4000 over multiple TCV cycles and found that when this SCV was installed on smaller diaphragmed TCV’s, the AS4000 was open so little that it could not maintain consistent, repeatable flow through the valve. Initially the transition speed was able to be set, but it would not be maintained as was communicated by our reps and Service Technicians.

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Further investigation found that to the construction of the AS4000 created hysteresis between the adjustment handle and the valve needle. The valve's plunger/needle position is controlled by the threaded adjustment handle, not a threaded needle. This small hysteresis combined with the partially opened valve, resulted in poor repeatable flow control.

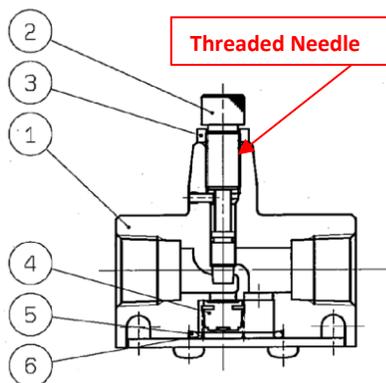


Component Parts

No.	Description	Material	Note
①	Body	Aluminum alloy	
②	Cap	Rolled steel	
③	Cross-recessed head cap screw	Steel wire	
④	E type snap ring	Stainless steel	
⑤	Handle	Zinc alloy	
⑥	Ring	Steel wire	
⑦	Lock nut	Zinc alloy	
⑧	Needle	Aluminum alloy	
⑨	Valve	NBR/Brass	
⑩	Spring	Stainless steel	
⑪	O-ring	NBR	
⑫	O-ring	NBR	

To resolve the hysteresis issue, we looked at the construction of the AS2000 and AS3000 series SMC Speed Control Valves. The needle is directly threaded to the valve body and is directly adjusted and locked. No external handle or related hysteresis. An SMC AS3000 series SCV was purchased for testing with the smaller TCV's which proved to be significantly better. Measurable burner transition consistency was found across multiple days of operation. Additionally, adjustability was improved with the smaller AS3000 valve compared to the AS4000. The AS3000 was selected as this is the smallest SMC SCV available in the low temperature option.

AS2000 • AS3000



Component Parts

No.	Description	Material		Note
		AS2000	AS3000	
①	Body	Zinc alloy	Aluminum alloy	
②	Needle	Brass	Brass	Electroless nickel plating
③	Lock nut	Brass	Carbon steel	AS2000 : Electroless nickel plating
④	Valve	NBR/Brass	NBR/Brass	
⑤	O-ring	NBR	NBR	
⑥	Spring	Stainless steel	Stainless steel	

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Conclusion:

From the study summary above, we confirmed improved repeatable main burner ON transition speed control when using the AS3000 for smaller pneumatic loading diaphragmed Temperature Control Valves. Testing has also proven that using the AS4000 for larger diaphragmed valves is acceptable since the AS4000 valve position is open more, negating the effect of this hysteresis.

Moving forward, OGI will be incorporating use of the two different Speed Control Valves as follows:

1. Use the SMC AS3000-2AN-L (OGI Part No. 414147) for smaller diaphragm Temperature Control Valves (TCVs). This includes all 1" Kimray ABC2 (130 SMT ADAB-D), 1" Invalco 468, 1" Fisher 119 or 2" Kimray EUB5 (230 SMT 2DA5-D).
2. Use the SMC AS4000-2AN-L (OGI Part No. 411391) for larger diaphragm Temperature Control Valves (TCVs). This includes the 1" Kimray 1400 valve, the 2" Kimray 2150/2200 valves, and the 2" Invalco DSG-203-415 valves.