TECHCON


# Application Report: 2K Adhesive

# APPLICATION:
# Loctite SI 5615 2K Adhesive


Fluid Viscosity:

A=30,000 to 100,000cps

B=10,000 to 70,000cps

Packaging:

400ml dual cartridge

## Customer

Suppliers of products and services for environmental and industrial measurement

## Summary

A general study was performed using Loctite SI 5615 2-component adhesive, supplied in a 400 ml dual cartridge. The purpose of the test was to create a system that could convert the customer's current manual mixing and dispensing process into an automated mixing and dispensing process, to fill the internal groove of their supplied parts.

Target Volumes:
A = 0.20 ml
B = 0.25 ml

Techcon did not have a method of connecting a 400 ml dual cartridge directly to the TS8200D Micro-Meter Mix system, the preferred system for precision 2K dispensing.

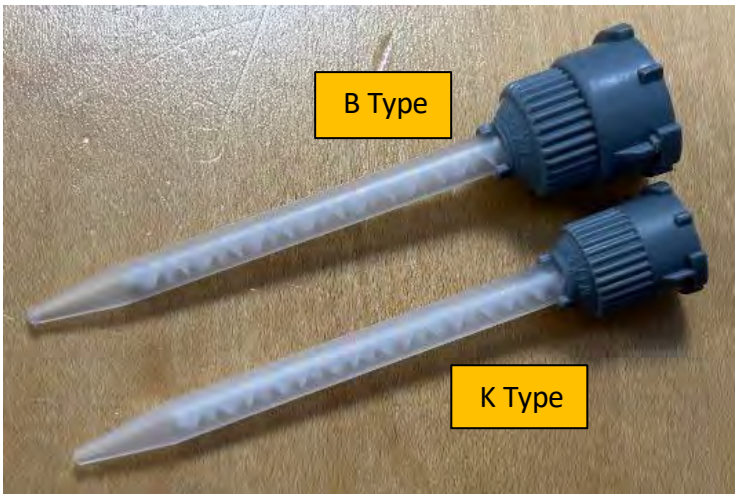
For the tests to be run, Techcon had to feed each of the two fluids from single-component packaging, such as a syringe or cartridge. There is no known method to automate the transfer from 400 ml dual cartridge to syringes/cartridges, so for the purposes of the test, the fluid was manually transferred from the dual cartridge to syringes and then centrifuged to remove any entrapped air.


B-Type spiral mixing nozzle

# Setup

- TS8200D-300-SYS Micro-Meter Mix - this is the chosen dispensing valve, fitted with 300 x 300 rotors and stators.
- The Loctite SI 5615 after being transferred from 400 ml side-by-side cartridges to individual cartridges.
- The TS580D-MM controller was used to operate the valve and pressurize the syringes.
- The TSR2302E Dispensing Robot was used to provide mounting and movement during the testing.

TS8200D-300 Micro-Meter Mix




Supplied B Type Spiral static mixer (top) is the same ID, size, elements and outlet as Techcon's TMS03-16S-MKH-PK K-Type spiral static mixer. This meant testing could be completed with the standard K Type mixer adaptor already fitted to the

TS580D-MM
Controller

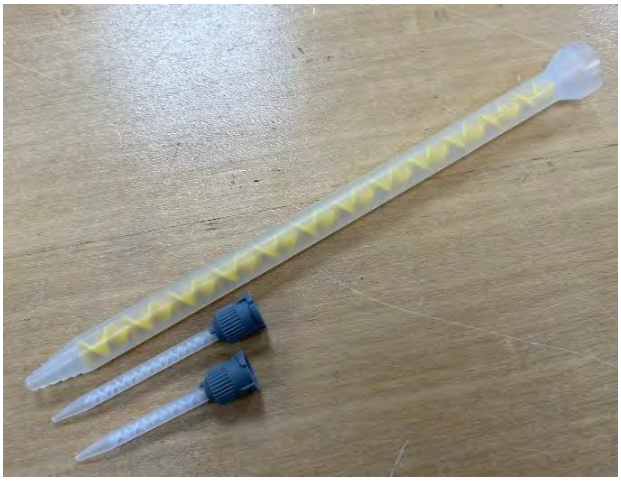
TSR2302E
Dispensing Robot

# Process

The Micro-Meter Mix valves were fully bled and purged before use.

A mandatory calibration took place before any actual dispensing occurred.

The customer's current process uses a very large mixer nozzle. Through Techcon's testing, it was found that if the system is idle for 2.5 minutes, the fluid will begin to cure in the static mixer and cannot be dispensed out fully. The mixer should therefore be replaced or flushed through before 2.5 minutes of idle time has elapsed.



Using the customer's long mixer, the estimated waste volume was approximately 8 ml, meaning *it would take 22 dispenses before the mixer is fully refreshed.*

Using Techcon's short mixer, the waste volume was only 0.49 ml, meaning *only two dispenses would be required to fully refresh the mixer.*

There is considerably less wastage in purging the Techcon mixer or having to replace it compared to the current customer mixer.

# Equipment Used

TS8200D-300-SYS
Micro Meter Mix System
(Includes TS580D-MM
Controller)

TMS03-16S-MKH-PK
Static Mixer

2 X 8200D-PS
Optional Pressure Sensor

TSD931-96
Adaptor

7550LL1NWPK
55 ml Syringe + White Piston

TS580D-MM Controller

TSD931-81B
Adaptor

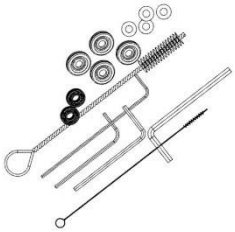
7015LLPK
Tip Cap (x50)

8100-100-002
Spare Stator 100 Series

TSD931-82B
Adaptor

P3022VPK
Receiver Head O-Ring (x10)

8200D-SEALKIT



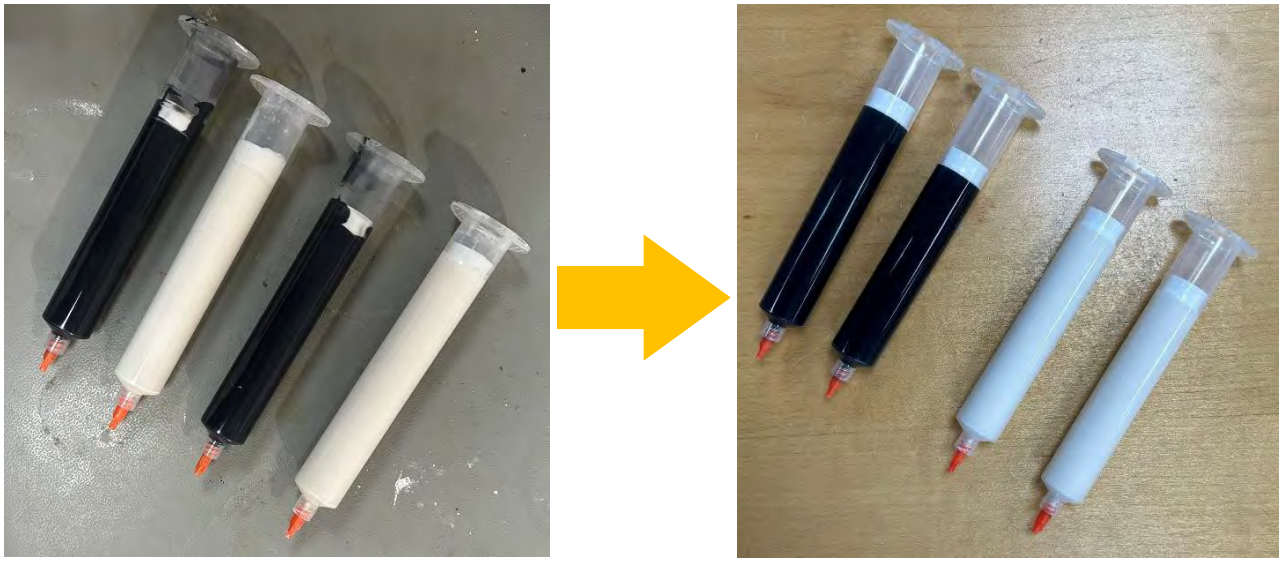
8200D-CLEANKIT

2 x 73006RHB
Receiver Head

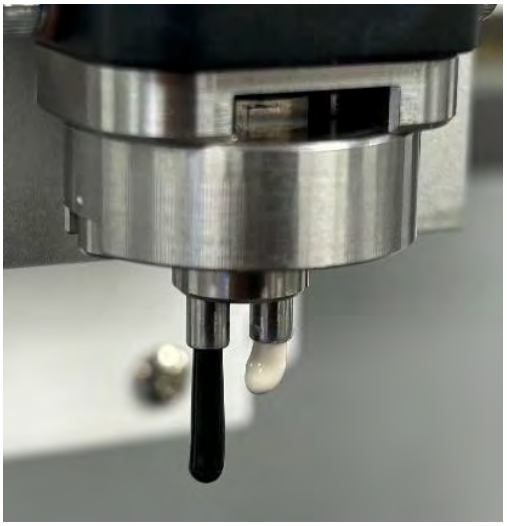
# Testing

Many preliminary tests were run to dial in a set up that yielded reliable mixing and dispensing.

Before the tests certain activities had to take place such as manually transferring fluid from the 400 ml dual cartridge to 55 ml single syringes and centrifuging. Centrifuging took 5 minutes at 1000 rpm. Then transferring again to clean the syringe – the 2nd transfer is optional.



The syringes were then attached to the valve and the fluid was purged through the valve under 50 psi pressure. This was later found to be the pressure required for the thicker Part A, ensuring the rotor/stator chamber is not starved.

Once satisfied, the pump was full and pressurized with fluid, the air was bled from the system through the air bleeding ports until only fluid was seen in the waste syringes. The waste syringes were removed and closing screws reattached.

The next step was to fit the calibration adaptor, purge until air free fluid was seen exiting the calibration adaptor outlets and proceed to complete the mandatory calibration steps. This balances the motors leading to accurate mixing ratios. This procedure will also calculate the minimum and maximum flow rates that the rotor/stator configuration is able to achieve. For this TS8200D-300-SYS with 300 Series rotors/stators the flow range was calculated to be 4.15 – 15.185 ml/minute. If this pump was to be used in production, Techcon would recommend the TS8200D-200-SYS configuration instead. The 200 model will still achieve 4.15 ml per minute, but it would be in the middle of the flow range rather than extreme minimum, that was used during filling, allowing for slower dispensing if required.

Several wet tests were completed to determine the volume required to fill the internal cavity including the evidence of fluid exiting the bottom hole. Programmed volume was set to 0.25ml which was the most up to date volume the customer provided to Techcon. This volume did not allow flow through the exit hole. However, 0.354ml (5 seconds) did show fluid exiting the bottom hole, as per picture to the left.

Back pressure was observed, meaning the mixer should be left in position for 20 seconds so that the back pressure dissipates through the part. Failure to do this will result in a messy tail when the mixer nozzle is retracted and moved to part 2.

The final test was to try and run the entire process automatically on the TSR2402E Dispensing Robot with a 400 mm x 400 mm x 100 mm working area. General concept worked, however, there are several points to make:

1 – Fluid risks dripping on the robot base plate from exit hole. Suggest raising fixture to incorporate waste collection.

2 – Entry guides should be adjusted to exactly match conical mixer shape for perfect entry alignment.

3 – Time delay required after each dispense, otherwise back pressure will leak across the fixture.

4 – Physical contact will damage the end of the static mixer, risking spillage. Suggest frequent "as required" mixer changes to prevent this.

5 – Parts need to not move in the fixture when the mixer is press against it.

## Mixing

The mixing was successful with K Type mixers. A variety of mixers were tested and the Shore hardness was checked after 24 hours. The mixed material achieved the hardness specification set out on the data sheet: Shore Hardness A 34. The hope was that shorter mixer nozzles would reduce back pressure. This was the case but did not mix well enough.

## Dispensing

This proved that, although samples were produced, the process will need additional modifications if moving from manual to automation. There are some problem areas to consider:

400 ml dual cartridge – Techcon cannot directly connect the 400 ml dual cartridge to the valve. The fluid had to be manually transferred and then centrifuged to remove air. There is no adaptor to do this. It was very messy and time consuming to fill four syringes.

Back pressure – The fluid is being squeezed through the very small orifice of the static mixer and back pressure builds up. This results in a continuous leak from the mixer nozzle when the valve has stopped, which is uncontrollable. The only way to manage this issue is to hold the static mixer/tip in position for 15-20 seconds to allow the back pressure to dissipate.

Alignment, moving nozzle - Static mixers have a lot of internal lateral movement due to their length and mechanical structure. This means after replacement or wiping, they will not be in the same position. For automation, a fixture that perfectly guides the mixer nozzle to the entry is required, due to the small orifice. Without a guide, it is expected that there will be a lot of misalignments if trying to automate.

3rd and 4th filling hit the target location and fluid exited the exit hole.

1st, 2nd, 5th and 6th missed the entry location slightly meaning some fluid spilled out the top and fluid did not exit the exit hole meaning insufficient filling of the part.

During the tests, the parts were moving in the fixture, leading to three risks:

1. The robot programming is slightly off, as the fixture is obscuring the view.
2. Even if correctly aligned, the touching of the parts is causing movement of the parts in the fixture.
3. Fluid could spill onto the robot base as fluid exits the exit hole.

## Ways to Alleviate these Risks:

#1 & #2: Ensure the fixture includes a guide to perfectly align the K-Type static mixer to the entry hole location. Ensure that no movement is possible when the static mixer touches the part.

#3: Ensure a type of drip tray, for waste management, is built into the fixture that collects any waste from the exit hole without interfering with the parts.

## Conclusion

To conclude, the Micro-Meter Mix valve has a wide operating window to dispense Loctite SI 5615 successfully at a 2:1 ratio, if additional measures are considered and put in place, that are highlighted in this report.

The challenge with any 2K material is having to measure and mix the resin and hardener. Inaccurate mix ratios will affect the strength and longevity of the cured compound, leading to possible connection failures and limiting the lifespan of the final assembly.

When working with 2K compounds, choosing the right metering and mixing equipment is crucial to the consistency and performance of the final product. To meet the challenges of dispensing 2K materials, Techcon developed the TS8200D Micro-Meter Mix 2K dispensing system. Micro-Meter Mix combines the volumetric accuracy of two independently controlled progressive cavity (PC) pumps. Through controlling the pumps separately, users can achieve 2K dispensing with up to +/- 1% accuracy at mix ratios between 1:1 and 10:1.

To learn more about how the TS8200D Micro-Meter Mix system works, and how it would improve your connector potting process, contact Techcon today. Our application engineers are always happy to test your materials with our dispensing valves, to determine the ideal equipment for your application.

Contact Techcon to discover how we can improve your throughput, safety, and product quality with our custom-made dispensing solutions. www.techcon.com/contact-us

# Find the Best Dispensing Solution for Your Application

**Determining the best configuration of valves, fluid line assemblies, controllers, adapters, syringes, and/or dispensing cartridges for your own needs is not easy.**

## Techcon is here to help

Take advantage of the Techcon Material Test Program, a service where our Application Engineers test your material in our systems and dispense on your part to build the best bespoke solution to meet your requirements.

### Interested? Fill out the Application Form or contact your Techcon Regional Sales Manager:

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