SWTW17-41

The Development of a Testing Facility of Contactors with Fine Pitch Size

Prof. Woo Seong Che[1]*, Kyung-Woo Kim[2]

[1]Department of Mechatronics Engineering, Kyungsung University, Busan 48434, Republic of Korea

[2]Sysdine Co. Limited, Daejeon 305700, Republic of Korea

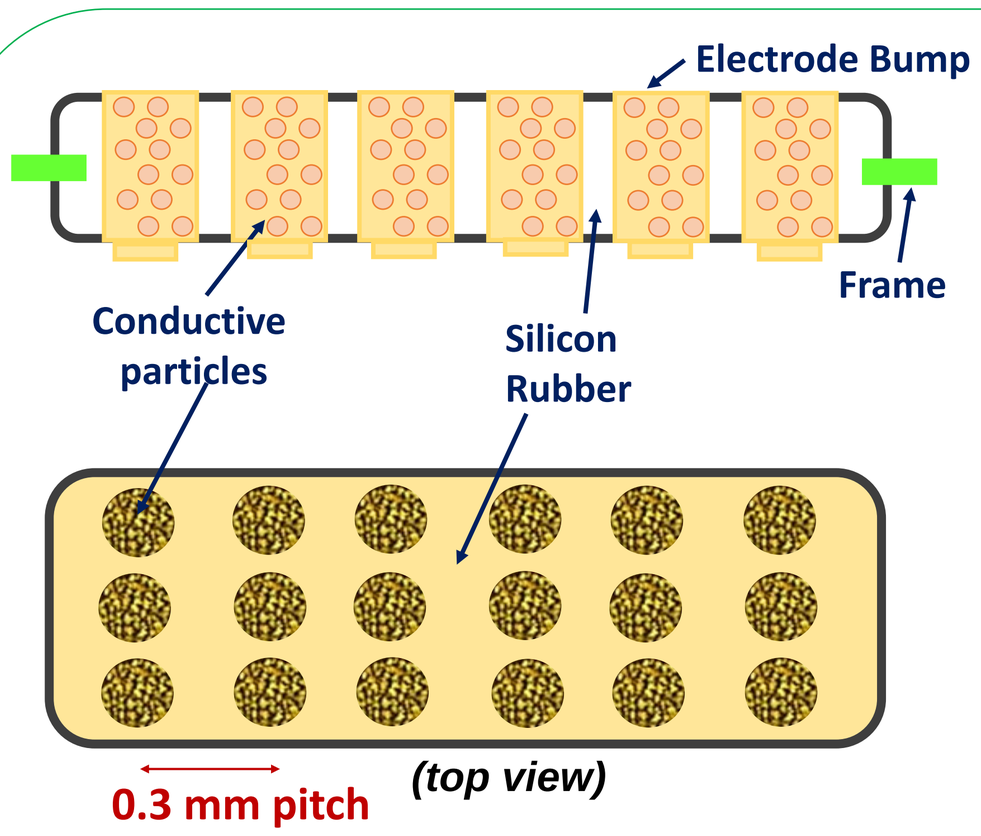
*Corresponding author: wsche@ks.ac.kr

• Introduction

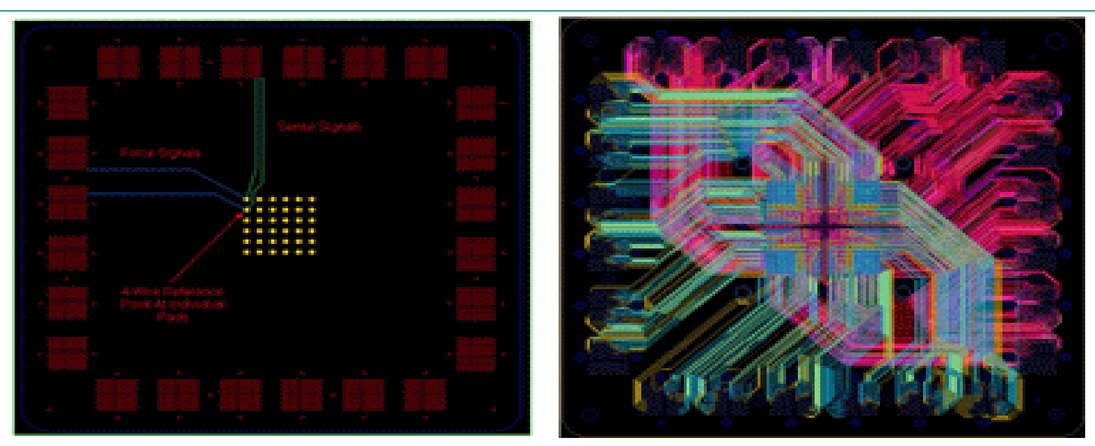
- In recent years, the test socket market is being changed at a much faster pace than in the past from both of the mechanical and electrical perspectives such as pitch size and high speed.
- The test socket industry is always trying to introduce something new of both electrical and mechanical issues as package pitch sizes shrink below 0.3 mm.
- The shrinking of pitch sizes from 1 to 0.5 mm is much easier, but that's not the case for further shrinking from 0.5 mm below to 0.3 mm pitch (*see below figure which shows X-ray image of interface board*).
- At present 0.4 mm pitch is becoming increasingly common and slowly the test socket industry migrating to 0.3 mm.
- But the pitch sizes of 0.3 mm and further below sizes are still in the initial stages of developing or prototype testing.
- Achieving these pitch sizes are the biggest challenges for test socket industries, for this we need to look at new technologies.
- Now a days, developing of Rubber sockets demands more attractive features than pogo pin test sockets.
- Rubber Socket is composed with conductive poles in the silicone body. The pole is composed of conductive powder/particles (*shown in below figure*).
- *Rubber Socket* is made for better solutions than the *Pogo Pin* test sockets to achieve the required things to reduce the cost, minimize the package size, high pin count, high frequency.
- Besides, Rubber socket can meet requirements of fine pitch size and various interfaces.
- The present study introduces a new developed technology for a testing facility of contactors which can be possible to use for 0.2 mm fine pitch size *Rubber Sockets*.

- **Acknowledgement: This work was supported by the Technological Innovation R&D Program (S2432884) funded by the Small and Medium Business Administration(SMBA, Korea)**

• Materials and Methods



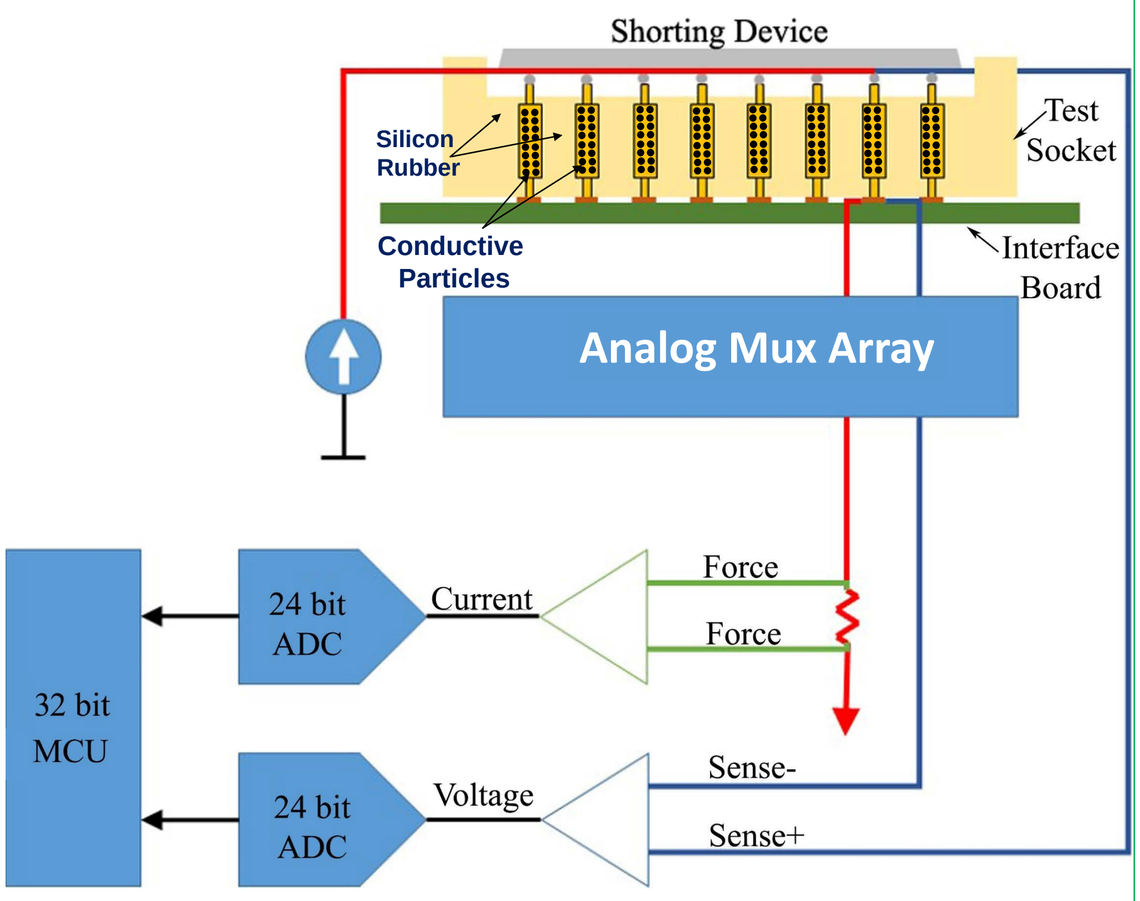
Rubber type Test Socket



Design Pattern of Interface Board of Conventional design

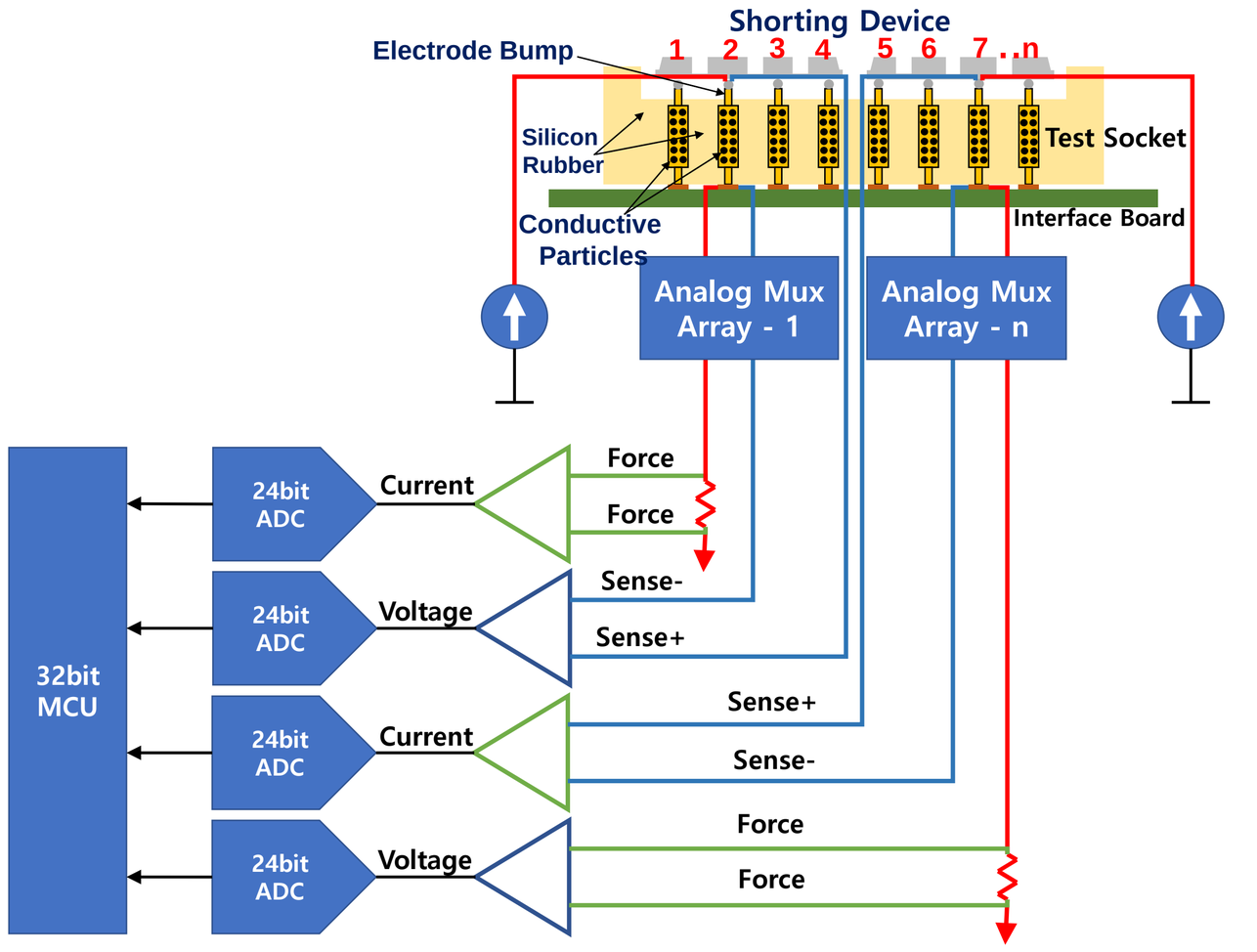
- **Results and Discussion**

Conventional Design



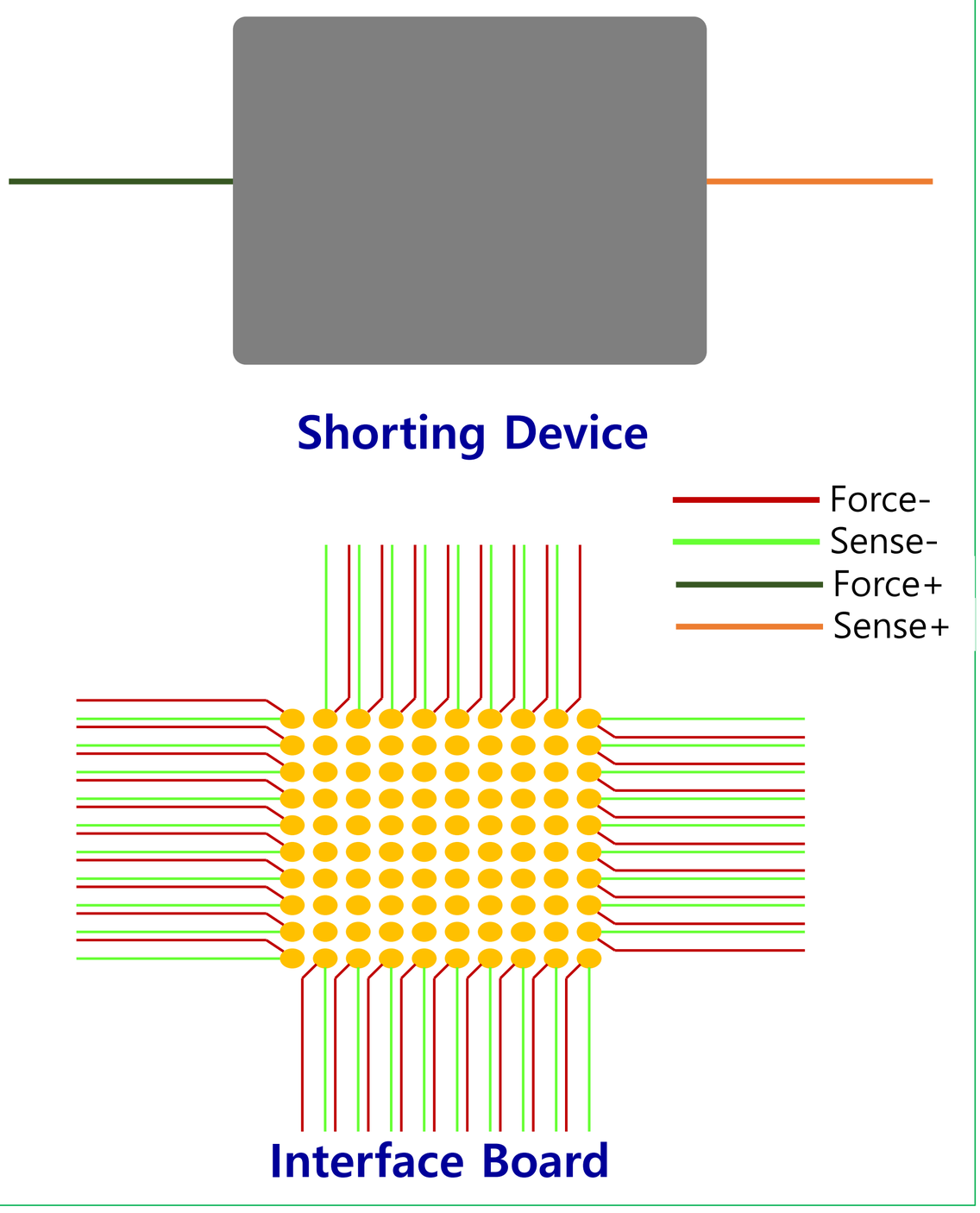
- In the conventional design, standard 4-wire resistance method used, which is possible for only single analog mux array
- All pins should be connected to one board, thus resulted in very complicated design
- A single analog mux array has connected by the all lines of the interface board

Developed Design

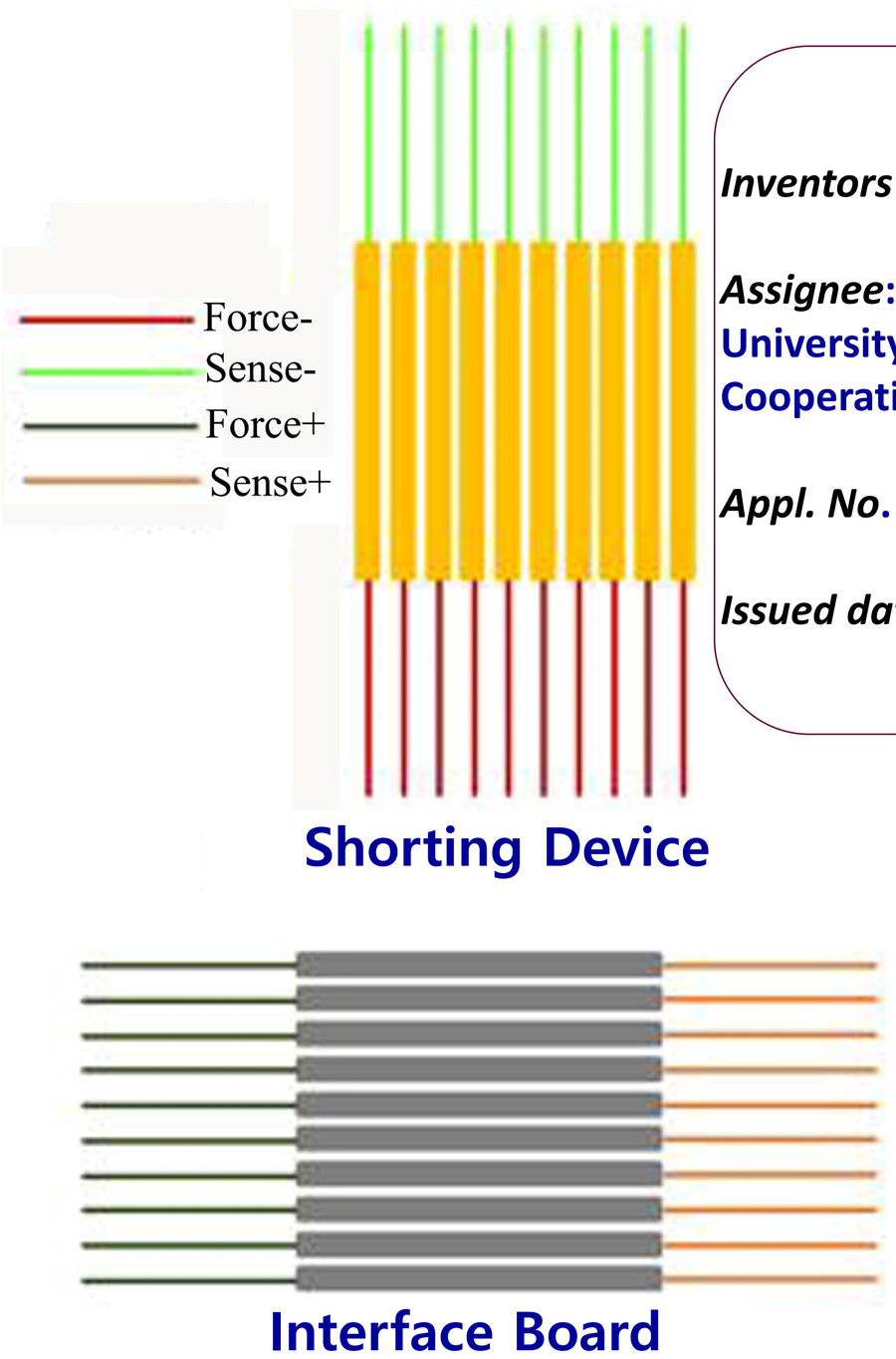


- The pattern of the Interface board extracted into two lines corresponding to Force- & Sense- for horizontal axis (or vertical axis). In the shorting device, two lines corresponding to Force + and Sense +, 4-wire configuration using the extraction method.
- With analog mux (we can measure the N×N Pins using electrically operating On/Off Switch)

Conventional Design: Interface/Shorting Device



Developed Design: Interface/Shorting Device



Patent:

***Inventors*: Dr. Woo Seong Che**

***Assignee*: Kyungsung University, Industry-University Cooperation Foundation**

***Appl. No*. 10-2017-000615-2**

***Issued date*: 2017-01-13**

Conventional: Interface/Shorting Device

- ✓ The Resistance Measurement Module with a measurement speed of 25 pins/sec.
- ✓ The minimum pitch of the test socket that can be measured by the conventional method is 0.5 mm.
- ✓ The test socket pad of the interface board is worn-out due to the increasing number of inspections.

Developed: Interface/Shorting Device

- ✓ It is implemented that the Resistance Measurement Module with a measurement speed of 100 pins/sec.
- ✓ Development of Interface Board capable of measuring 0.2 mm pitch test socket.
- ✓ Real-time monitoring viewer development.

- The basic method of 4-wire resistance measurement method was used, which is an effective way to remove line resistance, which can be a problem when measuring resistances of several mΩ.
- The principle of the 4-wire resistance measurement method is that the current does not decrease due to the resistance in the series circuit but is inversely proportional to the resistance in the parallel circuit.
- Developed resistance measurement module consisting of A/D converter and constant current, and constructed “n” resistance measurement modules in parallel to achieve the development goal by shortening the measurement time which is the core of development contents.
- Resistance measurement module developed to measure up to 100 pins/sec with the accuracy of 1 mΩ and range of 0-100Ω.

Conclusion

- The newly developed equipment can be able to inspect the memory test sockets as well as the non-memory semiconductor test sockets
- Also developed a viewer that can monitor the inspection results in real time, thus maximizing the production and management of efficiency in the production site, and to enhance the status of the semiconductor powerhouse through export.
- The developed interface board can be capable of measuring 0.2 mm pitch test socket.
- Using this method it is possible to measure the resistance measurement module with a measurement speed of 100 pins/sec.
- It is consistent, reproducible, automated process control, all sources of variables (real time data, pins, touch down), minimal test time.

SYSDINE’s Now a Days Products

Single point CRF Tester

◆**Function**

- ➢ **SP-CRF: Single Point Resistance, Force, Distance Measurement**
  - ✓ **Mode: Continuous, Step;** ➢ **L/C : Life Cycle Test (Option)**
- ▪ ***Applications*: Test Socket, Pogo Pin, Pogo Pin Connector Test 등**

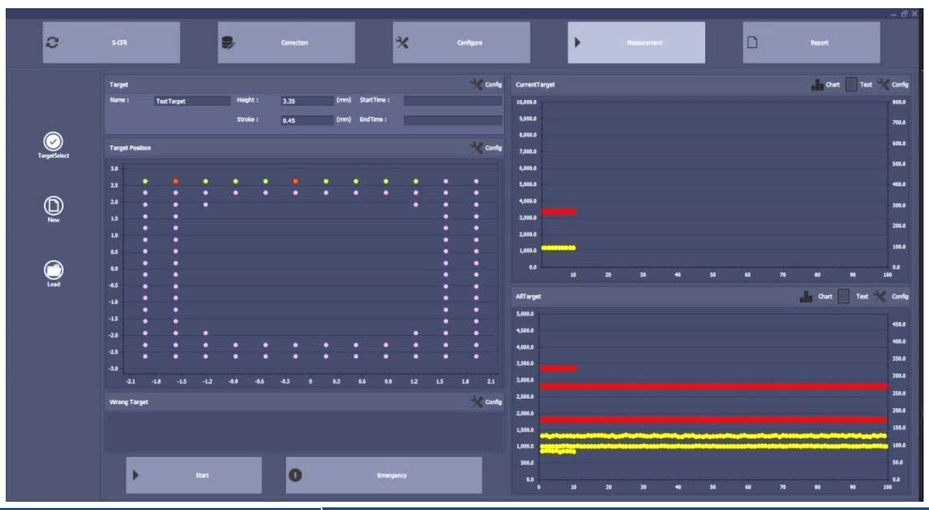
	Robot (X, Y, Z)			Measurement					
				Resistance			Force		
	Work Range (mm)	Resolution (mm)	Repeatability (mm)	Range (Ω)	Resolution (mΩ)	Accuracy	Capacity (kgf)	Resolution (gf)	Accuracy
Spec	150X100 X100	0.01	±0.02	100	0.1	20+20 ±(ppm of reading + ppm of range)	2	0.1	±0.2% F.S.
Remark	Customizable			Customizable			Customizable		

Multi point CRF Tester

◆**Function**

- ➢ **MP-CRF : Multi Point Resistance, Force, Distance Measurement (Option : Open/Short, Leakage)**
  - ✓ **Mode : Step,** ➢ **L/C : Life Cycle Test (Option)**

◆***Applications:* Test Socket, Pogo Pin, Pogo Pin Connector Test 등**



	Robot (X, Y, Z)			Measurement					
				Resistance			Force		
	Work Range (mm)	Resolution (mm)	Repeatability (mm)	Range (Ω)	Resolution (mΩ)	Accuracy	Capacity (kgf)	Resolution (gf)	Accuracy
Spec	150X100 X100	0.01	±0.02	100	0.1	20+20 (ppm of reading + ppm of range)	50	5	±0.2% F.S.
Remark	Customizable			Customizable			Customizable		