



QA Technology Company, Inc.

A p p l i c a t i o n s N o t e
Socket Insertion and Retention Forces for
Different Materials 100-25 Series
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Scope and Test Procedure:

To measure the forces involved when installing and removing sockets from different materials. This information is useful for determining press capacities for socket installation and if its retention force when installed in the socket mounting plate is adequate for a given application. Socket insertion force is the maximum force required to push a socket into a socket mounting plate. The retention force or holding force is the maximum force required to push a socket out of the socket mounting plate. A number of variables affect these forces, this applications note focuses on socket finish, mounting plate material, hole size, and installation method.

The socket insertion and retention forces were measured for 5 different socket types in 5 different materials (3/8" thick). The 5 materials were sent to a printed circuit board manufacturer to be cut into test blocks and drilled with methods typical of production hole drilling equipment. Each material was drilled with both #51 (.0670") and 1.75mm (.0689") drill bits which represented the extremes of the recommended hole tolerance for our 100-25 Series (.067"-.069"). The sockets were installed with both the press-in and multi-hit method. The press-in method utilizes an arbor press with a flat pusher to push the sockets into the socket mounting plate at a slow uniform rate. The multi-hit method uses an IT100 socket installation tool and hammer to install the sockets. After being installed, the mounted sockets were allowed to sit for a minimum of 48 hours before they were removed (pushed out). All force measurements were taken with a Chatillon DFG200 digital force gauge and data was recorded in pounds.

Variables:

Sockets (5): 100-SDN250W, 100-SDG250W, 100-SDS250M, 100-SDN254W, 100-SDH250W

Materials (5): Acrylic, Delrin, G10/FR4, Polycarbonate, and PVC

Hole Size (2): #51 (.0670"), 1.75mm (.0689") all holes measured within the recommended .067-.069" range for our 100-25 Series of sockets when measured with our PG100 pin gauge.

Installation Method (2): Press-in, multi-hit

Conclusions:

In general, the test results follow the table below for G10/FR4 socket mounting plates.

G10/FR4	Socket Part No.	Hole Size	Press Method
Higher Forces	100-SDS250M	#51	Press-In
↓	100-SDN254W	1.75mm	Press-Out
	100-SDG250W		Multi-Hit press-Out
	100-SDH250W		
	Lower Forces	100-SDN250W	



The test results follow the table below for the plastic mounting plates.

	Material	Socket Part No.	Hole Size	Press Method
Higher Forces ↓ Lower Forces	Acrylic	100-SDN254W	#51	Press-Out
	PVC	100-SDH250W	1.75mm	Press-In
	Polycarbonate	100-SDS250M		Multi-Hit press-Out
	Delrin	100-SDG250W		
		100-SDN250W		

The above table is subjective because the majority of the forces for the PVC, Polycarbonate, and Delrin were very similar and a definite trend was not evident.

Data:

The press-in force, press-out force, and the multi-hit press-out forces were recorded and the average was calculated. The tests were all done with 50 piece samples and resulted in 7,500 individual measurements. The table below lists the calculated average force measurements for the tests.

Average Force in Lbs.

Socket Part No.	Material Drill Size	Acrylic		Delrin		G10/FR4		Polycarbonate		PVC	
		#51	1.75	#51	1.75	#51	1.75	#51	1.75	#51	1.75
100-SDN250W	Press-In	19.3	19.3	12.7	8.4	56.2	48.6	14.0	9.2	14.4	8.5
	Press-Out	22.1	19.0	15.4	9.9	27.7	28.5	16.1	9.0	16.4	11.0
	Multi-Hit Out	16.3	14.0	14.4	10.1	22.5	23.0	13.9	8.8	12.8	9.9
100-SDG250W	Press-In	23.5	23.0	15.2	10.5	55.4	48.3	16.1	11.7	17.7	11.8
	Press-Out	22.1	20.2	16.0	10.3	41.7	33.5	15.8	11.1	17.8	12.9
	Multi-Hit Out	14.8	17.2	13.9	10.0	34.8	23.4	15.8	10.9	15.1	12.1
100-SDS250M	Press-In	42.4	29.5	14.3	8.9	92.0	69.6	17.8	9.1	20.2	9.8
	Press-Out	44.1	28.3	15.0	9.5	84.0	66.2	16.8	9.8	18.7	11.1
	Multi-Hit Out	36.1	28.3	14.7	9.2	58.4	49.7	16.2	9.8	17.4	10.5
100-SDN254W	Press-In	27.1	28.6	14.7	12.1	52.6	57.7	16.3	13.1	15.4	11.7
	Press-Out	28.5	21.1	16.0	15.2	34.5	40.1	18.3	14.2	16.4	12.8
	Multi-Hit Out	18.7	12.6	12.6	13.5	29.0	33.9	15.3	13.8	14.0	11.6
100-SDH250W	Press-In	21.3	25.4	15.4	13.7	48.1	43.6	16.9	12.4	20.8	15.3
	Press-Out	16.0	21.4	16.0	15.2	32.0	24.4	17.2	11.9	20.4	17.3
	Multi-Hit Out	12.6	18.6	13.3	14.5	25.5	20.1	15.1	10.9	13.1	14.1

Test plan, test data, and socket mounting plate specifications are available upon request