DTC
Dynamic Testing Consultants

TECHNICAL BID

DTC Hot Tack Tester model 52-F/300

1. Purpose
The instrument is designed for meeting the test requirements for the Heat Seal Properties and processing parameters of flexible packaging materials. It is equally well suited for R & D and Quality Assurance.

The basic principle is the measurement of the strength of a heat seal immediately after the seal is made and still in hot condition. The maximum seal strength during the peeling procedure is the "Hot tack". It is expressed as a force with the unit N in the metric system (lbs in the US system) and related to the seal width in mm (or inch in the US system).

The guide lines for performing Hot tack tests are published in the ASTM Standard ASTM F 1921 "Testing of Heat Sealing Properties (Hot tack)". This is so far the only standard for Hot tack measurement.
The standard describes two different test methods: method A and method B.
The DTC instrument performs tests according to method B, which is the dominant test method all over the world. The Standard mentions the DTC instrument as a suitable instrument for performing the tests as required by the Standard.

The DTC Hot tack instrument can easily perform the test procedures according to the Standard, however can provide test possibilities far beyond the standard tests described in the Standard. This is especially useful in R & D environments. For example, one can simulate sealing processes other than the common heat sealing with constant temperature seal bars using other sealing devices like Impulse sealing tools, Trim Sealing tools, sealing processes with Air Pre-heating of the seal interface, etc. These devices are available as options.
In contrast to the standard procedure where samples are sealed together on the same side there is often the need to seal side "A" to side "B", or to seal two different materials. For example paper to film, film to stiff paper board, or even two stiff boards. All these cases can be handled by DTC Hot tack testers. Methods will be provided by DTC.

2. Design and Features.
The presented Hot tack tester 52-F/300 is the 4th generation of DTC Hot tack instruments. The development started in 1982, thus DTC has a 33 years of experience in development of instruments and test methods as well as the production of such instruments.
As a result of the long experience with the Hot tack issue, the presented instrument is a synthesis of good mechanical design, modern electronics, and a state-of-the-art software. There are close to 100 DTC Hot tack testers delivered around the world.

The mechanical design is characterized by a rugged yet elegant framework, housing the sealing and peeling mechanisms, the specimen insertion system, all assisted by either servo controls or pneumatic actuators. With respect to the requirements to minimize an operator influence on the test results (as also described by the ASTM standard) the design of the specimen insertion devices and the test sequence have been subject to careful considerations. Specimen insertion into the grips is the only manual contact with the specimen. Thereafter the test sequence is automated.

The standard specimen grips are of the parallel clamp type and are capable of clamping test strips of up to 2 mm thickness and 25 mm width. Clamp operation is done with a foot pedal thus providing two free hands for the operator to slip in the test strips.
Normally the specimens are sealed together with seal sides A to A. In this case the test strip is a single strip and folded in the automated inserting device providing side A to A.
For sealing side A to side B (two different materials) a special yet simple test sample procedure is required and described in the manuals.

Semi-stiff materials like coated card board can also be tested. Test sample preparation and handling is described in the manuals.

Fig.1.The Hot tack instrument model 52-F/300

3. Test software

All settings and commands are done with the computer program. As link between the computer and the instrument there are electronic interfaces in the instrument itself connected by a USB cable.

The software is running with a MS Windows surface, although the underlying measurement and control programs are custom made real time programs. The test program for Hot tack testing is the "Wintack" program, a DTC propriety. It is extremely user-friendly. The operator has not to be a computer specialist for running even advanced tests.

DTC provides IBM compatible PC´s as standard, and with Microsoft Operating system Windows 7.
The advantage of using Microsoft Operating systems are the powerful capabilities of the programmes associated. As standard, DTC delivers also MS Office along with the systems, thus MS Excel is present. DTC has developed customized routines to transfer test results to Excel in order to create fast and easily Summary Reports, ready for presentation.
Together with the speedy mechanical test sequence, the Wintack software allows for a high test production volume with high quality test results.

A detailed description of the test software Wintack is available. This document shows some Examples of Test Results / Summary Reports/ on page 4.

Fig.2. Hot tack instrument 52-F/300 and PC

Some Wintack software features are listed here:
- The whole test sequence comprising sealing and peeling are shown graphically for each individual test. This provides an intuitive presentation to the operator allowing immediate judgement of whether the test is correct or not.
- Each achieved test parameter is checked in each test by the software for correct performance and recorded adjacent to the set parameter.
- The Hot tack value is presented numerically. A cursor allows for evaluation of specific points of the curves.
- Upon the operator´s judgement for accepted test, the measured values are transferred to the Result table.
- A test batch is grouped into a selected number of test temperature steps and a number of individuals at each temperature step. This is the standard Hot tack test at varying temperature. However, with the DTC Hot tack instrument, batch tests can also be performed with varying seal time or varying seal pressure or varying delay time.
- A special feature is the calculation of the peeling energy necessary to peel apart the seal bond. This allows for a judgement on the toughness of a bond and its feasibility for specific packaging processes.
- The graphical display of a test sequence can be stored and retrieved for later analysis or comparison.

- The Result table shows the results of the individual tests as well as the summary for each group and statistics as max. and min. values, average, and standard deviation.
- With a customized routine the results can be transferred to MS Excel in the format of a Summary Report for a batch, ready for presentation. Another customized routine allows for a presentation of up to 5 different batches on one graph, including numeric tables and statistics. This provides a very useful tool to compare for example different sealing properties of different materials.
- Test Settings for different materials can be stored in a data base and recalled whenever tests at known settings shall be performed.
- The failure mode of the peeled specimen is selectable and will be recorded in the Result table as well.
- Besides the most common Hot tack test with variable temperature, the Wintack program also allows for batch tests with variable seal time, variable seal pressure, variable delay.

Examples of Summary Reports provided by the Wintack software.

Batch Test. Name: Htgraph7

Material:	41109	SealTemp:	Vary
Batch Nr:	1	Seal Time:	0.5
Testpar:	AMC41109	SealPress:	0.5
Operator:	nn	Delay time:	0.20
Created:	2002-06-06	PeelSpeed:	200

7 Groups: 4 pcs./group

	HtF_Max			
SealTemp	Min.	Max.	Avg.	Std.
120	0.93	1.27	1.12	0.15
130	2.47	2.63	2.57	0.0735
140	3.32	3.85	3.61	0.228
150	2.79	3.31	3.07	0.214
160	2.1	2.38	2.24	0.118
170	1.74	2.06	1.93	0.136
180	1.68	1.83	1.78	0.0678
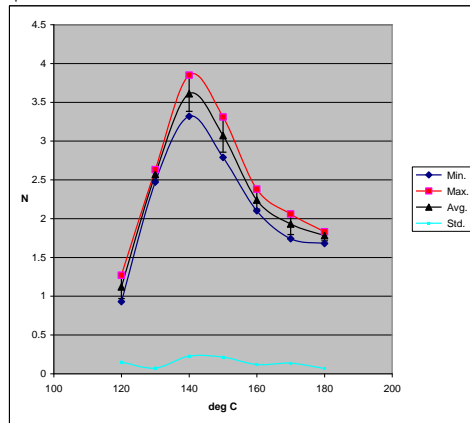
spec. width 25 mm

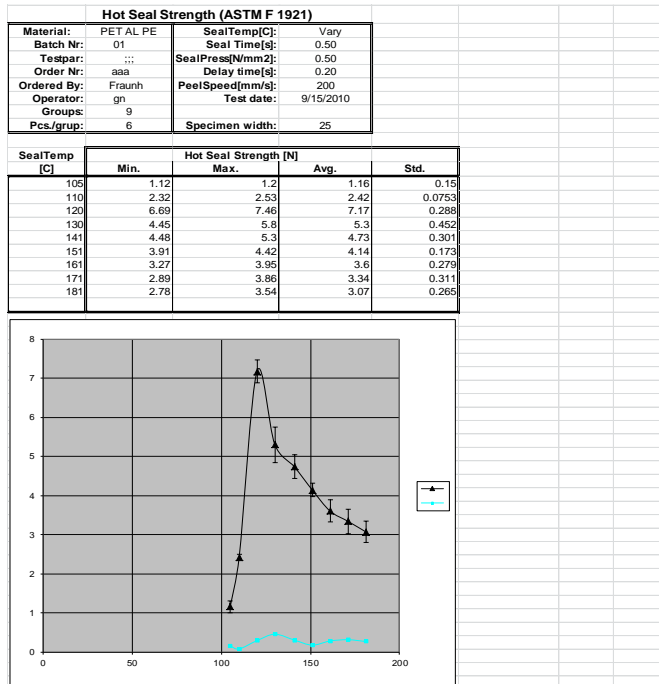**Presentation of up to 5 batch tests on common graph. Name: Htgraphjmf.**

Material: OMO		SealTemp:	Vary
Batch Nr:	1	Seal Time:	0.5
Testpar:	3252090	SealPress:	0.1
Operator: gn		Delay time:	0.2
Created:	2002-05-28	PeelSpeed:	200

Material: OMO		SealTemp:	Vary
Batch Nr:	2	Seal Time:	0.5
Testpar:	3252090	SealPress:	0.1
Operator: gn		Delay time:	0.2
Created:	2002-05-28	PeelSpeed:	200

Material: OMO		SealTemp:	Vary
Batch Nr:	3	Seal Time:	0.5
Testpar:	3252090	SealPress:	0.1
Operator: gn		Delay time:	0.2
Created:	2002-05-28	PeelSpeed:	200

Material: OMO		SealTemp:	Vary
Batch Nr:	4	Seal Time:	0.5
Testpar:	3252090	SealPress:	0.1
Operator: gn		Delay time:	0.2
Created:	2002-05-28	PeelSpeed:	200

Material: White		SealTemp:	Vary
Batch Nr:	5	Seal Time:	0.5
Testpar:	3252090	SealPress:	0.1
Operator: gn		Delay time:	0.2
Created:	2002-05-28	PeelSpeed:	200

Spec. Width: 25 mm
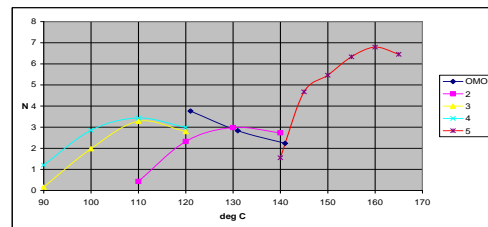
HtF_Max SealTemp	Avg. OMO	HtF_Max SealTemp	Avg. 2	HtF_Max SealTemp	Avg. 3	HtF_Max SealTemp	Avg. 4	HtF_Max SealTemp	Avg. 5
121	3.76	110	0.426	90	0.16	90	1.2	140	1.55
131	2.83	120	2.32	100	1.98	100	2.85	145	4.67
141	2.23	130	2.98	110	3.28	110	3.43	150	5.46
		140	2.73	120	2.79	120	2.99	155	6.33
								160	6.79
								165	6.45

Other types of Summary Report Sheets are available.
Example: Htgraph10.

Hot Seal Strength (ASTM F 1921)			
Material:	PET AL PE	SealTemp[C]:	Vary
Batch Nr:	01	Seal Time[s]:	0.50
Testpar:	;;;	SealPress[N/mm2]:	0.50
Order Nr:	aaa	Delay time[s]:	0.20
Ordered By:	Fraunh	PeelSpeed[mm/s]:	200
Operator:	gn	Test date:	9/15/2010
Groups:	9		
Pcs./grup:	6	Specimen width:	25

SealTemp [C]	Hot Seal Strength [N]			
	Min.	Max.	Avg.	Std.
105	1.12	1.2	1.16	0.15
110	2.32	2.53	2.42	0.0753
120	6.69	7.46	7.17	0.288
130	4.45	5.8	5.3	0.452
141	4.48	5.3	4.73	0.301
151	3.91	4.42	4.14	0.173
161	3.27	3.95	3.6	0.279
171	2.89	3.86	3.34	0.311
181	2.78	3.54	3.07	0.265

4. Scope of supply

The basic system supplied by DTC is specified in the requested quotation and is sufficient to perform Hot tack testing acc. to ASTM Standard method B, and also far beyond the basic requirements of the standard. Basic supply comprises machine hardware, computer hardware, MS-software, and Wintack test software for Hot tack testing.

All available options for hard- and software are available on request in the extended List of Accessories to the Hot tack instruments. Please contact DTC or their representative for a discussion on your specific needs.

Please, refer also to the Product Descriptions of the different Hot tack instruments.
Presently available standard models are:
52-F/300..........the most advanced instrument with highest specifications
52-E/300.........the "economic" version, yet fully capable of doing advanced Hot tack testing
52-F/281..........instrument with high sealing force and peeling force capacity and Air pre-heating
            system, used for Heat seal testing of thick paper board, roofing material, etc.
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