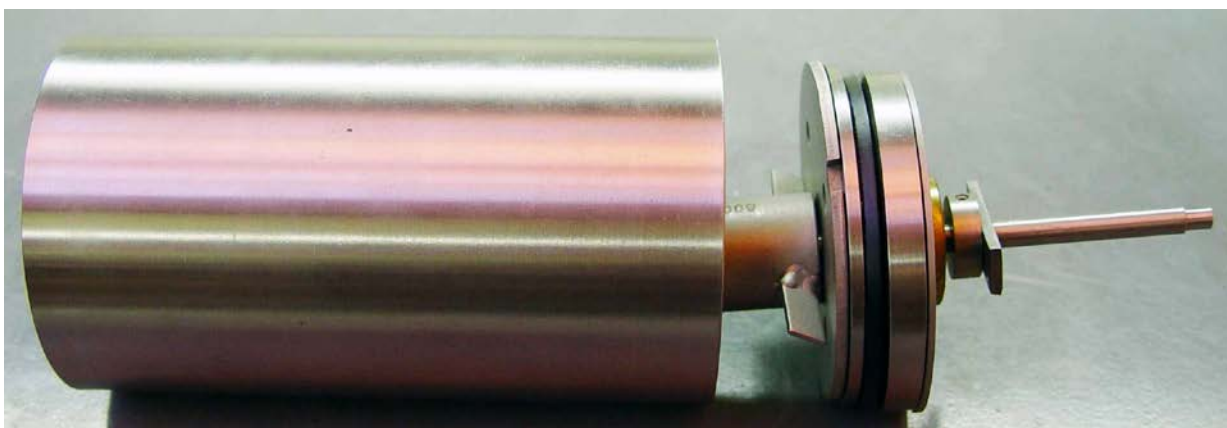


Thixotropic Slurry Cup Instruction Manual



Manual No. D00900347, Revision B

Instrument No. 100072538

Thixotropic Slurry Cup Instruction Manual

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1 Introduction

The Thixotropic Slurry Cup (P/N 100072538) is specially designed for the HPHT Consistometer, Model 290 (P/N 101443590) when testing thixotropic cement slurries or slurries that usually form plugs in the standard HPHT slurry cups. (A plug is a gelation or setting around the paddle with a thin slurry between the sleeve and the outside of the paddle.) This slurry cup design helps minimize plugging because it provides better movement of the slurry. Occasionally, some slurries may still plug even when using the thixotropic slurry cup.

This instruction manual explains how to assemble the Thixotropic Slurry Cup and perform a Thickening-Time Test with this slurry cup.



The Thixotropic Slurry Cup is not the same slurry cup used in the HPHT Consistometer Retrofit Kit, Mini MACS[®], or MACS II[®]. If the Thixotropic Slurry Cup is used in these instruments, the slurry could be contaminated with pressurization water and the thickening time results could be affected.

1.1 Document Conventions

The following icons are used as necessary in this instruction manual.



NOTE. Notes emphasize additional information that may be useful to the reader.



CAUTION. Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.



MANDATORY ACTION. Gives directions that, if not observed, could result in loss of data or in damage to equipment.



WARNING! Describes an unsafe condition or practice that if not corrected, could result in personal injury or threat to health.



ELECTRICITY WARNING! Alerts the operator that there is risk of electric shock.



HOT SURFACE! Alerts the operator that there is a hot surface and that there is risk of getting burned if the surface is touched.



EXPLOSION RISK! Alerts the operator that there is risk of explosion.

2 Safety

Safe laboratory practices and procedures should be observed. Always wear personal protective equipment (PPE).

3 Thixotropic Slurry Cup Assembly

Figure 3-1 shows the individual parts of the Thixotropic Slurry Cup (P/N 100072538). Figure 3-2 shows the diaphragm system.



These slurry cup parts should be greased as described in API RP 10B-2: base threads of the sleeve; plug pivot area and threads; diaphragm hub; insert; and O-rings. For the sleeve, only the outer portion of the inner split sleeve should be greased to prevent cement getting between it and the outer sleeve and cementing them together.



Grease applied to other parts of the slurry cup (not listed above) will wear off during testing and may contaminate the cement slurry, thus affecting test results.

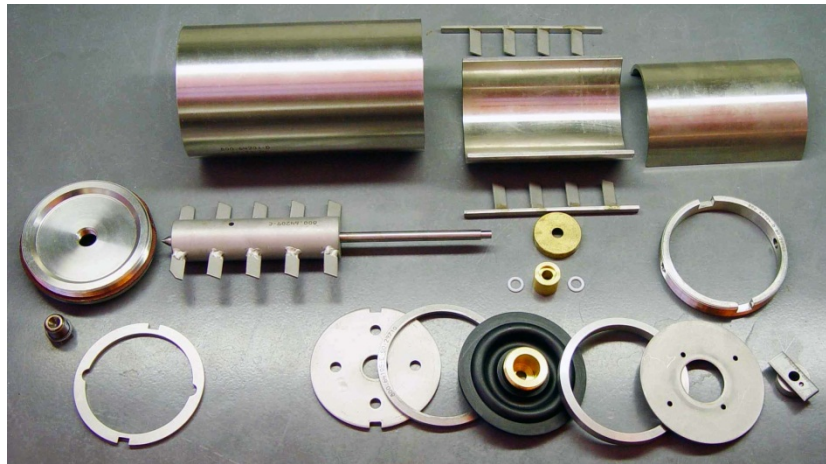


Figure 3-1 Individual Components of the Thixotropic Slurry Cup

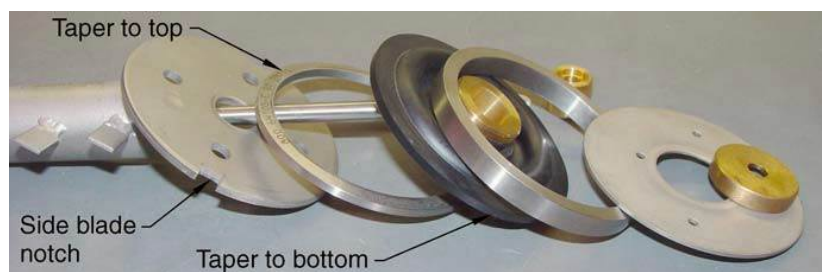


Figure 3-2 Diaphragm System

3.1 Assembly Procedure

1. Insert the hub and O-rings into the diaphragm hub assembly (Figure 3-3).

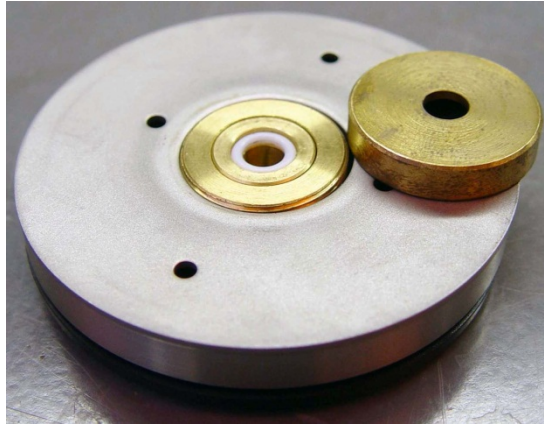


Figure 3-3 Diaphragm Hub Assembly (Hub and O-rings inserted)

2. Attach the top support and spacer to the diaphragm (Figure 3-4).

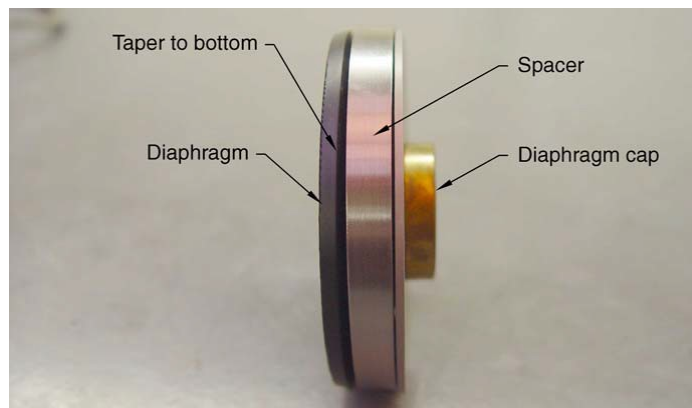


Figure 3-4 Diaphragm with Top Support and Spacer

3. Attach the diaphragm and spacers to the center paddle (Figure 3-4).

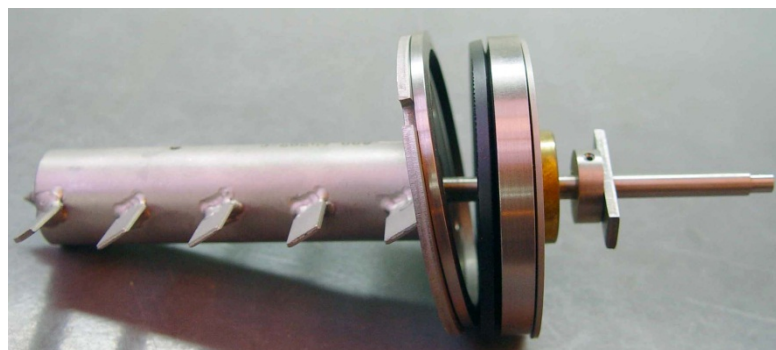


Figure 3-5 Diaphragm and Spacers Attached to Center Paddle

4. Insert the center paddle into the slurry cup sleeve (Figure 3-6).

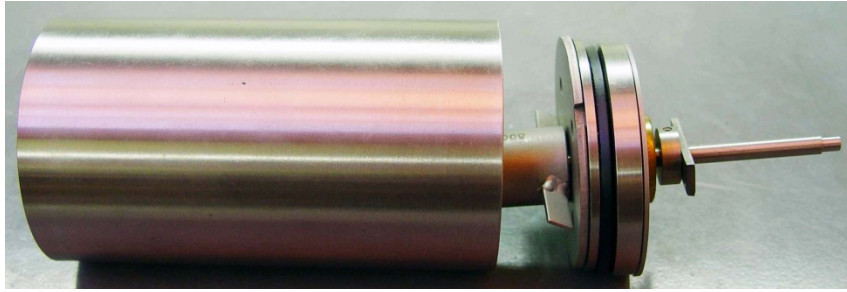


Figure 3-6 Center Paddle Inserted into Slurry Cup Sleeve

5. Place the center paddle with the top support and notch for side blades (Figure 3-7).

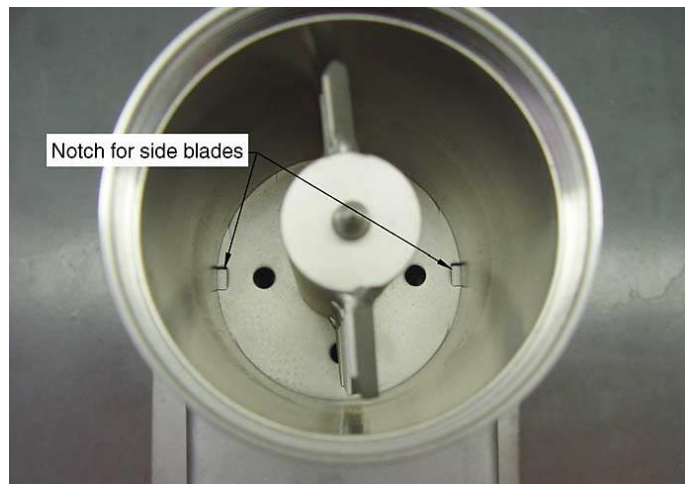


Figure 3-7 Center Paddle in Place (Top Support with Notch for Side Blades Shown)

6. On the side blades, locate the “T” which indicates the top (Figure 3-8).

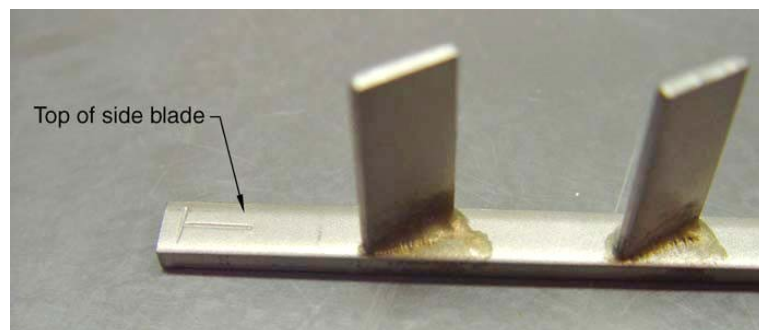


Figure 3-8 Top of Blades, “T”

7. Place the “T” on the side blades to the top of the slurry cup (Figure 3-9).

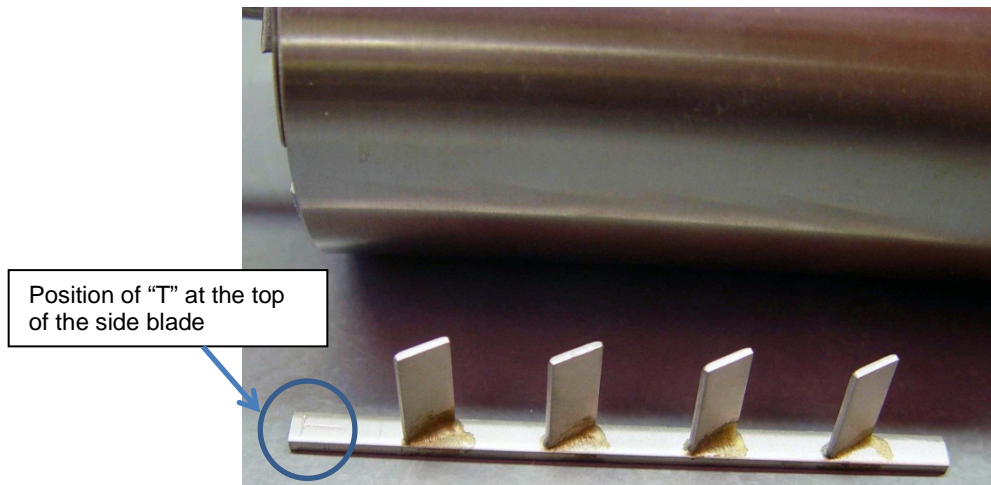


Figure 3-9 “T” on Side Blades Attached to Top of Slurry Cup

8. Insert the two side blades into the notches in the top plate and one of the inside sleeves (Figure 3-10).

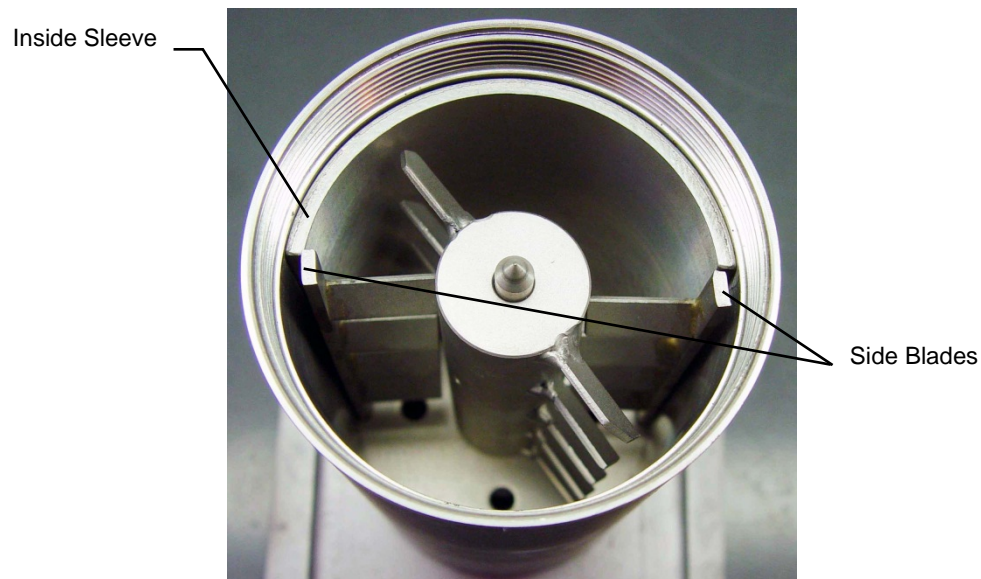


Figure 3-10 Two Side Blades Inserted into Notches and One Inside Sleeve in Place

9. Place the side blades and both inside sleeves (Figure 3-11).

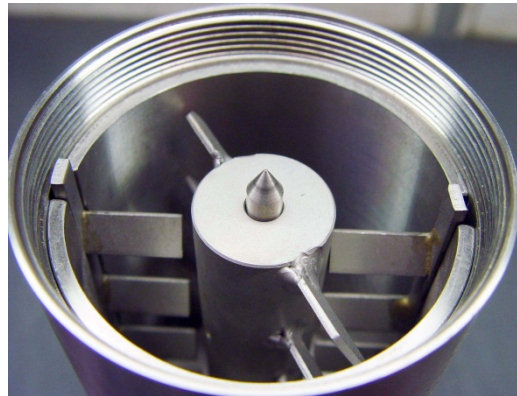


Figure 3-11 Side Blades and Inside Sleeves in Place

10. Insert the bottom retainer to hold the side blades in place (Figure 3-12).



Before adding slurry (or greasing the base threads on the sleeve or plug), place the base and plug into the bottom. Then push on the paddle shaft and make sure the paddle blade will rotate. If the paddle turns freely, remove the base and plug and grease the slurry cup's base threads and plug threads.



If the point of the paddle (or the pivot area of the plug) is worn or the slurry cup is improperly assembled, the center and side blades may contact each other. If this contact occurs, the paddle shaft or pivot plug that screws into the base must be replaced and reassembled.

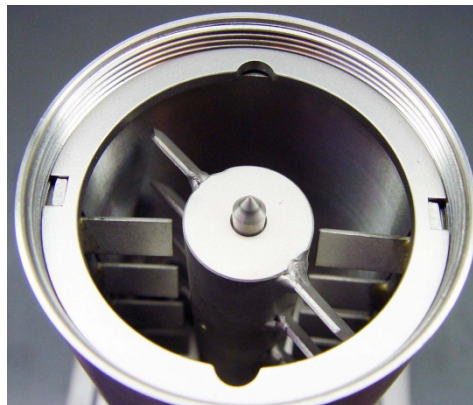


Figure 3-12 Bottom Retainer Holding Side Blades in Place

11. Pour slurry into the cup until it flows above the side blade holder and two or three clean threads show. (Cement slurry was not added in Figure 3-13.)
12. Install the base until cement exits the plug hole. About two to three threads should show on the outer diameter of the base when the plug is installed.
13. Install and tighten the plug so that the plug and base are secure. The slurry cup will be slightly pressurized. Contact between the diaphragm bottom and the paddle top will be minimized when pressure is applied, preventing an erroneously high consistency indication.



Figure 3-13 Base Plate Attached

14. Insert the bottom plug (Figure 3-14).

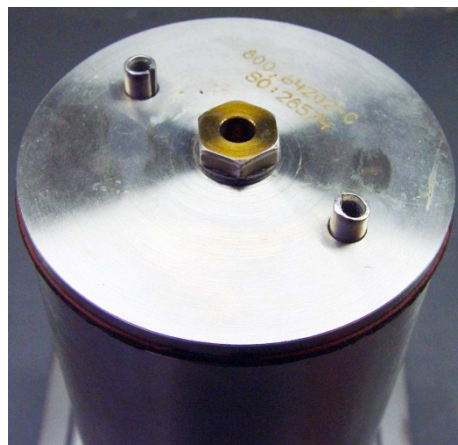


Figure 3-14 Bottom Plug Inserted

4 Thickening-Time Test



The Thixotropic Slurry Cup is not the same slurry cup used in the HPHT Consistometer, Mini MACS®, or MACS II®. If the Thixotropic Slurry Cup is used in these instruments, the slurry could be contaminated with pressurization water and the thickening time results could be affected.

The indicated slurry consistency may not accurately reflect the thickening time when using a thixotropic slurry cup. Thickening time can best be determined by following these guidelines:

- The time between mixing the slurry and rotating the slurry cup should not exceed 5 minutes (API recommendation). Gelation and high (false) initial consistency will be prevented. If possible, manually turn the paddle while filling the slurry cup and when moving the cup to the Consistometer, minimizing gelation before the test starts.
- Heat of hydration is the best indicator of thickening time.
- Making observations and judgments are required.

4.1 Consistency Measurements

With this slurry cup, the equivalent consistency is obtained by multiplying the API consistency measurement by 2.7. (The potentiometer must be API calibrated.) The comparison is shown below.

Thixotropic Slurry Cup (Tentative B_c)	Standard API Slurry Cup (B_c)
70	26
100	37

For the calibration spring used in the potentiometer, it is impossible to adjust the potentiometer to indicate the consistency equivalent obtained with a thixotropic slurry cup without using a multiplication correction factor or a graph. See Table 4-1.

4.2 Temperature Observations

Observing the temperatures of the slurry and oil in the chamber is equally important as observing the consistency. Heat of hydration characteristics are good indicators of thickening time when using the thixotropic slurry cup or standard slurry cup.

Table 4-1 Potentiometer Calibration Equivalent Measurements

(Using API Weight-Loaded Method for 52 mm Radius Potentiometer)

Calibration Weight (Grams)	Standard API Slurry Cup (B _c)	Thixotropic Slurry Cup (Tentative B _c)
20	1	3
30	4	10
50	9	24
60	11	31
70	14	38
80	17	45
100	22	59
110	24	66
115	26	70
120	27	73
130	30	80
150	35	94
158	37	100
160	37	101
200	48	130
250	61	165
285	70	189
300	74	200
350	87	235
400	100	270

API Consistency calibrated indications

Corresponding Thixotropic Slurry Cup Consistency indications

5 Troubleshooting

This section explains how to solve common problems that may occur when using the thixotropic slurry cup.

5.1 Low Mixing Consistencies

In some instances, cement slurries, usually containing thixotropic additives, gave initial consistencies in the Thixotropic Slurry Cup (from an API calibrated potentiometer) of 40 Bc to 45 Bc (108 Bc to 122 Bc thixotropic). Yet, the slurry mixed easily. These slurries will usually decrease below 26 Bc API (70 Bc thixotropic) after being stirred in the Consistometer. As the slurry sets, the consistency will increase again. Follow these steps to correct this problem:

1. Record the time required to reach 26 Bc API (70 Bc thixotropic). Continue the test until 70Bc API (189 Bc thixotropic) is reached. Record times at standard API consistencies: 26 Bc, 70 Bc, and 100 Bc. During this time, closely watch for heat of hydration, which is a better indication of setting than consistency alone.
2. Stop the test and immediately inspect the slurry. Determine whether the slurry would be pumpable at the time for 70 Bc (189 Bc thixotropic).
 - a. If the slurry would be pumpable, then this time is the thickening time.
 - b. If the slurry is too thick at 70 Bc (API), then the time to reach 26 Bc (70 Bc thixotropic) is the thickening time.



Heat of hydration occurring at thickening time is a good indication the time is valid.

5.2 Thin Slurry After Testing

On occasion, after the test reaches 26 Bc (70 Bc thixotropic), the slurry is very thin and pours easily. Follow these steps to address this problem:

1. Repeat the test and continue testing until 50 Bc or 70 Bc (135 Bc or 189 Bc thixotropic) is reached.
2. Monitor the temperature closely, looking for signs of heat of hydration.
3. After ending the test, observe the slurry and estimate the actual thickening time. If heat of hydration was observed, then this is a good indication of time the slurry sets and the actual thickening time.

6 Parts List

Refer to Figure 6-1.

Table 6-1 Thixotropic Slurry Cup, P/N 100072538

Item No.	Part No.	Quantity	Description
1	100072543	1	Baffle - Retaining - Side Blades - Slurry Cup
2	100072539	1	Sleeve - Slurry Cup - Thixotropic
3	100072542	1	Sleeve Assy - Split - Slurry Cup
4	100072541	1	Ring - Retaining - Side Blades - Slurry Cup
5	100072540	1	Base - Slurry Cup – Thixotropic (comes complete with 2 roll pins, P/N 100027296)
6	10004335	1	Plug - Base - Slurry Cup
8	100072547	1	Paddle - Slurry Cup - Thixotropic
9	100072548	1	Blade Assy - Side - Slurry Cup - Thixotropic
10	100021431	1	Pin - Roll - 1/16 x 3/4 – STNLS
11	100007922	1	Collar - Diaphragm - Slurry Cup - Thixotropic
12	100072546	1	Diaphragm - Buna-N - Slurry Cup
13	100072544	1	Ring - Spacer - Top Baffle - Slurry Cup - Thixotropic
14	1000072545	1	Baffle - Top - Slurry Cup - Thixotropic
15	100072536	1	Ring - Lock - Slurry Cup -
16	100004333	1	Shaft - Slurry Cup
17	100004336	1	Hub - Slurry Cup - Thixotropic
18	100004337	1	Cap - Hub - Slurry Cup - Thixotropic
19	100004338	1	Ring - Packing - Hub - Slurry Cup - Thixotropic
20	100002427	2	O-Ring - TEFLON - 3/8 x 1/4 x 1/16
21	100010309	1	Gasket - Cup Base
22	100007918	1	Disc - Drive - Slurry Cup
23	100007919	1	Bar - Drive - Slurry Cup
24	100072504	1	Pin - Shear - Slurry Cup
25	100008167	1	Screw - Set - #6-32 x 1/4 - Cup PT - Hex Soc
26	100027296	2	Pin - Roll - 59-048-250-0500-1/4 x 1/2 in (2 roll pins are included in the 100072540)
27	100010310	1	Gasket - Cup Plug

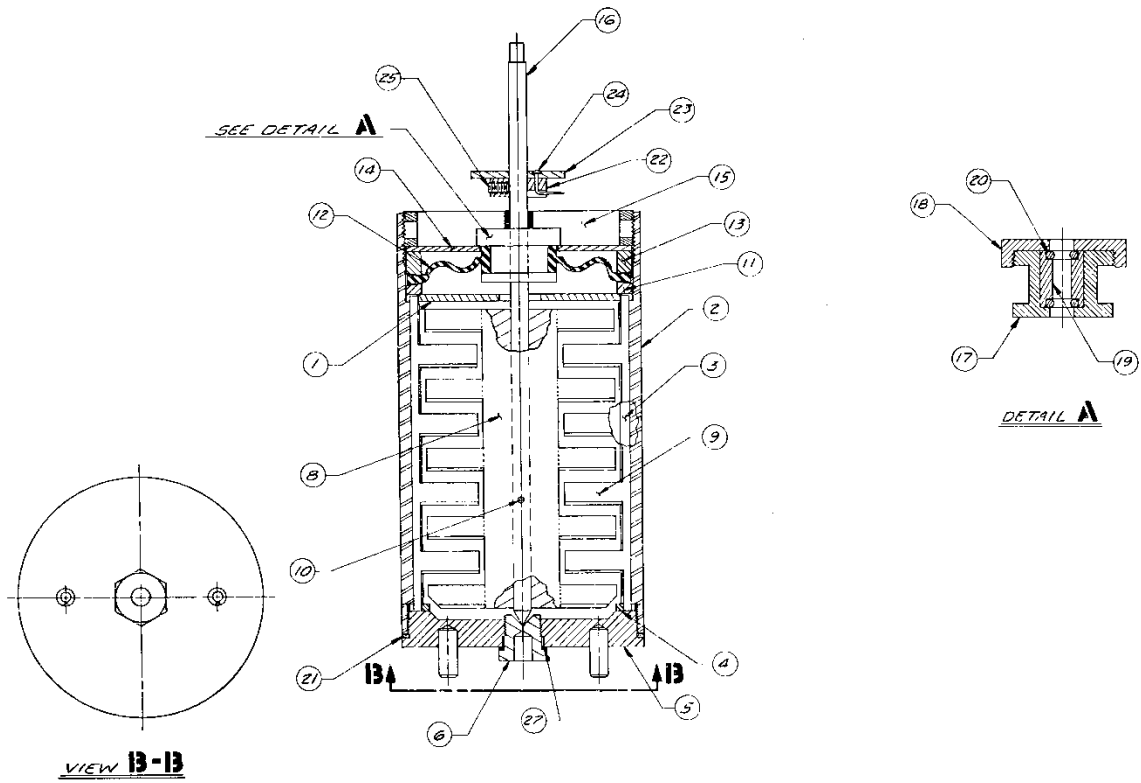


Figure 6-1 Thixotropic Slurry Cup (P/N 100072538)

7 Warranty and Returns

7.1 Warranty

Fann Instrument Company warrants only title to the equipment, products and materials supplied and that the same are free from defects in workmanship and materials for one year from date of delivery. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY, FITNESS OR OTHERWISE BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE. Fann's sole liability and Customer's exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale, lease or use of any equipment, products or materials is expressly limited to the replacement of such on their return to Fann or, at Fann's option, to the allowance to Customer of credit for the cost of such items. In no event shall Fann be liable for special, incidental, indirect, consequential or punitive damages. Notwithstanding any specification or description in its catalogs, literature or brochures of materials used in the manufacture of its products, Fann reserves the right to substitute other materials without notice. Fann does not warrant in any way equipment, products, and material not manufactured by Fann, and such will be sold only with the warranties, if any, that are given by the manufacturer thereof. Fann will only pass through to Customer the warranty granted to it by the manufacturer of such items.

7.2 Returns

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Fann will not be responsible for damage resulting from careless or insufficient packing.

Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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