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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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September 21, 2004

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ASTM D02.B0.03 L-37 Surveillance Panel
Members and Guests:

Attached for your review and comment are the unconfirmed minutes of the August 24th and 25th, 2004 L-37 Surveillance Panel Meeting at the PRI Headquarters in Warrendale, PA. Please direct any corrections or comments to my attention.

Sincerely,

Donald T. Bartlett

Donald T. Bartlett, Chairman
L-37 Surveillance Panel

Report of Meeting
L-37 Surveillance Panel
PRI Headquarters, Apollo Room, Warrendale, Pa.
August 24th/25th, 2004

Sign-in/Review of Membership: The meeting was called to order at 10:09 a.m. The sign-in sheet is *Attachment 1*. Mr. Koglin replaced Mr. Layton as the voting member for Afton Chemical and Mr. Linden requested voting membership representing GMR Research and Development. See *Attachment 2*.

Meeting Agenda: The meeting agenda was reviewed and is included as *Attachment 3*.

Approval of Minutes:

Ms. Whitton motioned, second by Mr. Koehler: That we accept the minutes from the June 16th Surveillance Panel meeting and the June 30th Surveillance Panel teleconference call as written with no corrections. The motion was approved unanimously.

Action Items assigned from these meetings:

1. The TMC is to issue LT1-1 and LT2-1 reference targets for the P4L626A/V1L686 lubrited hardware batch. The TMC will notify the panel Chairman and a teleconference call will be convened to review/approve the targets.

2. The TMC is to ask/confirm with the suppliers to attempt to confirm the additional supply of LT1-1 and LT2-1 fluid is or is not the same as the original shipment. The TMC will share this information with the panel at our next meeting.

3. With respect to Proposal # 2 (long term) After determining expected performance levels for each distress parameter for RO 151-3, LT1-1 & LT2-1, the panel will develop statistically (at 95% CI) based correction factors to bring the mean of parameter result for each gear set within a matrix back to the target performance levels. This process would be applied consistently for each successive gear batch.

4. Mr. Sullivan was asked to present Proposals # 1 and # 2 and Motion # 1 from the September 25th panel meeting to the LRI committee in the open meeting on Thursday, August 25th, 2004.

Motions approved from the September 24th, 2004 Meeting:

Motion #1 ⇒ Ms Whitton, Second ⇒ Mr. Koehler: That we accept the minutes from the June 16th Surveillance Panel meeting and the June 30th Surveillance Panel teleconference call as written with no corrections.

Motion #2 ⇒ Ms Sullivan, Second ⇒ Mr. Smith: The panel has determined that the modified axle cooling system drawing is technically accurate and equivalent to the June 30th motion originally approved by the panel.

Motion #3 ⇒ Jerry Gropp, Second ⇒ Don Lind): Propose that LT1-1 and LT2-1 be adopted as reference oils in the L-37 test using lubrited hardware. These oils and TMC 151-3 will each be assigned at equal rates for the lubrited V1L686/P4L626A hardware and subsequent lubrited hardware batches. The panel requests that the TMC obtain a 5-year supply of each oil (or a 5-drum minimum).

Motions approved from the September 25th, 2004 Meeting:

Motion #1 ⇒ Mr. Sullivan, Second ⇒ Ms. Whitton): Knowing that the panel has determined that Ridging distress is the primary cause for failing to meet this current expectation, the panel proposes a correction factor for Ridging (both pinion and ring) of +0.6065 transformed units for low temperature L-37 tests using the V1L686/P4L626A lubrited hardware. Using this correction factor in the current 16-test low temperature matrix will allow 68.8% of the ridging ratings to meet the pass/fail limit of '8' dependent on using ASTM E29 to round corrected results to a whole number. Effective date for tests completing is on or after 8/25/04.

Motion #2 ⇒ Mr. Gropp, Second ⇒ Ms. Whitton): Each of the 4 labs will equally participate in a 44-test matrix to evaluate the V1L351/P4T771 non-lubrited hardware batch.

8-tests on TMC 151-3 (standard)
8-tests on TMC LT1-1 (standard)
8-tests on TMC LT2-1 (standard)
4-test on TMC 127 (standard)

8-tests on TMC LT1-1 (Canadian)
8-tests on TMC LT2-1 (Canadian)

- TMC will assign each lab one test on TMC 127 and the panel will stop to review results (to insure that this oil has performed as expected). Targeted completion date is September 17th. The chairman is to convene a panel teleconference call.

- TMC will then assign each lab one test on TMC 151-3, and the panel will stop to review results to date. Targeted completion date is October 1st. The chairman is to convene a panel teleconference call.

- Assuming discrimination is seen between the results of the oils, the remainder of the test matrix will be completed. Targeted completion date/report data to TMC is by December 15th, 2004.

- The plan is to review data with intent to approve batch at the February 2005 meeting.

- Labs were requested to randomly select hardware from their full shipment to get a good feel of severity through out the hardware batch.

Summary of Meeting Discussion, Actions, Proposals and Motions:

Status of Information Letter 04-1:

The chairman commented that the draft information letter was reviewed for intent by the laboratory TF during Monday's meeting and should be released in the next couple of weeks. He thanked the TMC and the laboratory TF for their efforts in review. *Attachment 4* details the drawings the panel was asked to re-approve since some of the measurements called out are different than what was originally approved at the June 30th panel teleconference call. The reason for the differences is that measurements from centerlines and reference points were changed to meet accepted drawing practices. Upon review, Mr. Sullivan motioned, second by Mr. Smith: The panel has determined that the modified axle cooling system drawing is technically accurate and equivalent to the June 30th motion originally approved by the panel. The motion was unanimously approved with 5 votes for, 0 opposed, and no abstentions.

Low Temperature Standard and Canadian Matrix Testing on Lubrited Batch V1L686/P4L626A

The chairman thanked the industry labs for their efforts to complete the 4-lab, 32-test matrix that we would spend the majority of today's meeting discussing. Mr. Lind started with a review of the data and is included as *Attachment 5*. The following details a summary of that attachment. For reference, note that the line drawn on the plots at the 'Merits' value represents the 'MIL-PRF-2105E/SAE J-2360 specification candidate pass/fail line'.

- Page 1 is a table summary of the 32-test matrix results.
- Page 2 is a table summary of all industry acceptable TMC 151-3 reference results on the same hardware batch.
- Pages 3-6 detail plots of "L-37 Reference Oil Performance by Oil and Test Version' by distress type. Note: the scatter and severity with Ridging on page 6, few tests would be deemed an 'acceptable candidate pass' (pass line ≥ 8). All other distresses were deemed 'historical/acceptable'.
- Page 7 details the Ridging plot of "L-37 Reference Oil Performance by Oil and Test Version' reflecting the same data with the currently approved lubrited hardware correction factor on this hardware batch of 0.5186 transformed units (TU) applied. Note: still less than half of the results would be deemed an 'acceptable candidate pass'.
- Page 8 details the Ridging plot of "L-37 Reference Oil Performance by Oil and Test Version' reflecting the same data with the TMC proposed lubrited hardware correction factor on this hardware batch of 0.5878 TU applied. Note: approximately 75 % of the results would be deemed an 'acceptable candidate pass'.
- Pages 9-12 detail plots of LT1-1 results "L-37 Reference Oil Performance by LTMSLAB' by distress type. Note: page 11 details the scatter and severity by laboratory test type on Ridging distress. All other distresses were deemed 'historical/acceptable'.
- Pages 13-16 detail plots of LT2-1 results "L-37 Reference Oil Performance by LTMSLAB' by distress type. Note: page 14 details the scatter and severity by laboratory test type on Ridging distress. All other distresses were deemed 'historical/acceptable'.
- Pages 17-21 was a table exercise by the TMC to look at the Ridging raw data (no correction factor applied) by various combinations of oil code, test type, and Ridging rating to arrive at visual display/calculation for percent passes by Riding distress.

A major portion of the meeting time was used for getting personal thoughts/opinions out on the table, earnest exploration of ideas, and good strong/shared philosophical discussions ensued. And from that came related motions and proposals. A summary of general consensus with final motions and proposals follows:

- Currently, correction factors only apply to this Lubrited hardware batch. Defining an anchor hardware batch has been elusive up to this point in time. As can be seen from the data, the TMC 151 reference oils passed only 41.8% time. Mr. Bartlett commented that, by definition, TMC 151 is a category reference oil and should pass all distress parameters most/if not all of the time.

- The higher hardware "match number" would seem to correlate with severity but after discussions with Mr. Okamuro, it is just luck because of the way the pinion and ring are mated late in the lapping process.

- Irrespective of test type (Standard or Canadian) the V1L686/P4L626A lubrited hardware batch does have a Ridging distress issue (sometimes leading to unacceptable and premature pitting spalling results) that needs to be addressed. Extreme Ridging makes it hard to tell if Rippling is sometimes even present as well. The other distress parameters, otherwise, look historical/appropriate and have normal distribution. Mr Lind commented that, at times, we see differences/impreciseness in the lab, but not across the labs, therefore it is indicative of a hardware related issue. If we change the way we derive a correction factor, we should look at both the Standard and Canadian tests.

- Mr. Lind stated his opinion that a factory fill (FF) oil should pass 75% of the time or better. Mr. Sullivan and Mr. Gropp pointed out that this assumption must apply to passing all 10 of the distress requirements. FF oils pass low temp test at least 75%, Ridging is the dominant failure mode now and we should bring 5's to ≥8's. Several commented that it appears that we need a separate correction factor's, one for the Standard and a different one for the Canadian test. Mr. Sullivan also stated that the data does not suggest that we can do away with low temperature testing requirement to reduce the number of tests required for program approvals. Mr. Koehler pointed out that the data does seem to indicate that we have greater precision in the low temperature versus the standard.

- Mr. Gropp presented historical L-37 pass/fail data (MIL 2105E) for tests using TMC 129 and TMC 151 oils on the same lubrited hardware batch (See *Attachment 6)*. The data was prepared for use in discussions when correction factors were being discussed. A correction factor helped but did not fully address the severity offset for this hardware.

- Mrs. Vermilyia, the Lubrizol statistician in attendance, pointed out that we have no fail oil to compare. The more important question is will a fail oil pass? It was pointed out that in actuality; we have never had a 'fail' oil for lubrited hardware.

- Mr. Farber and Mr. Gropp agreed that we need to be changing our philosophical thinking/comfort zone from talking 'anchor batch hardware' to 'anchor oils'.

- Mr. Sullivan expressed questions/comments on rounding techniques that some labs have used inside the LRI process for rounding off/up the final ridging distress value. In designated places you round. ASTM E-29 provides guidelines on rounding methods. Mr. Sullivan stated that he feels that the number on the LRI GL form needs to be to the same precision or resolution (# of decimals) as the requirements in the L-test(s) data dictionary. He indicated that he will have a presentation on behalf of Exxon Mobil for the open portion of the LRI meeting later this week looking for further clarification on rounding and recognition/use of ASTM E-29 document rounding technique. A copy of the presentation he made is included as Attachment 7.

- Mr. Sullivan suggested that we write an expectation statement for these oils. The severity anchor point expectation should be based on these oils passing a certain percentage of time and not based on hardware percentage.

  For Low Temperature test only, we set the pass/fail rate for these commercially available fluids (LT1-1 & LT2-1) as they should be passing the MIL-2105E specifications between 75 to 85% of the time. While there were a few failures on other distress parameters, the primary failure parameter is Ridging.

  The panel worked as a team to draft Proposal 1 (short term), Motion 1, and Proposal 2 (long term). **The two proposals and motion were tabled (with consensus) for presentation and adoption at the September 25th SP meeting** that would be attended by LRI committee members. A follow-up L-37 meeting is scheduled at 3:00-5:00 p.m., Wednesday, August 25th, 2004.

  Proposal 1 (short term):

  Specific for V1L686/P4L626A lubrited gear batch in the Canadian version of the L-37 test.

  Expectation statement: LT1-1 & LT2-1 performance level for Canadian L-37 should be that the over-all pass rate range for all collective parameters is between 75% and 90%.

  Motion 1:
  Knowing that the SP has determined that Ridging distress is the primary cause for failing to meet this current expectation, the panel proposes a correction factor for Ridging (both pinion and ring) of +0.6065 transformed units (TF) for low temperature L-37 tests using the lubrited V1L686/P4L626A hardware. Using this correction factor in the current 16-test low temperature matrix will allow 68.8% of the ridging ratings to meet the pass/fail limit of '8' dependent on using ASTM E29 to round corrected results to a whole number. Effective date for tests completing is on or after 8/25/04.

Proposal 2 (long term): For Lubrited Hardware Batch V1L686/P4L626A

The following would apply individually to both the L-37 Standard and Canadian version of the L-37 test:
After determining expected performance levels for each distress parameter for RO 151-3, LT1-1 & LT2-1, the panel will develop statistically (at 95% CI) based correction factors to bring the mean of parameter result for each gear set within a matrix back to the target performance levels. This process would be applied consistently for each successive hardware batch.

- In continuing discussion, Mr. Gropp motioned, second by Mr. Lind: Propose that LT1-1 and LT2-1 be adopted as reference oils in the L-37 test using lubrited hardware. These oils and TMC 151-3 will each be assigned at equal rates for the lubrited V1L686/P4L626A hardware and subsequent lubrited hardware batches. The panel requests that the TMC obtain a 5-year supply of each oil (or a 5-drum minimum).

  Action Item (TMC): The TMC is to issue LT1-1 and LT2-1 reference targets for the P4L626A/V1L686 lubrited hardware batch. The TMC will notify the panel Chairman and a teleconference call will be convened to review/approve the targets.

  Action Item (TMC): Mr. Koehler asked that the TMC ask the suppliers to attempt to confirm the additional supply of fluid is or is not the same as the original shipment. The TMC will share this information with the panel.
  The motion passed unanimously, 5 votes for, 0 opposed, and 0 abstentions.

Update on 2004 Non-Lubrited Gear Batch Industry Order

The chairman reviewed the status and comments from Mr. Okamuro. See *Attachment 8*.

The panel deemed that we should move forward quickly with approving the new hardware batch before the 2003 Lubrited T758A/L247 batch because of an industry shortage on non-lubrited hardware and the Dana facility production move to Ft. Wayne. It was decided that we take the same 'up front' approach to testing/batch approval that we just finished with the lubrited low temperature study.

After further discussion, Mr. Gropp motioned, seconded by Ms. Whitton: Each of the 3 labs that purchased V1L351/P4T771 non-lubrited hardware will run the following Standard L-37 tests (3 X TMC-151-3, 3 X LT1-1, and 3 X LT2-1) and run the following Low Temperature Canadian tests (3 X LT1-1, and 3 X LT2-1).
Note: It was decided to table this motion and address it at the 8/25/04 SP meeting.

Attachment 9 was not discussed in detail, rather just verbally commented on. It is included to capture the analysis by the TMC looking at "L-37 Reference Oil Performance by Contact Pattern" by hardware type and distress. Based on the limited data for some types of contact pattern values, the Delta/S graphs do not indicated any specific contact pattern to be driving severity or more preferred.

2003 Lubrited T758A/L247 Axle Batch Order

A follow up on a past action item: All labs were asked to forward to the TMC the summary data and charts from their 'one minute logs' for speed, torque and lubricant temperature from the phase 3 matrix tests. Three labs had completed the task. Parc reported that their lab cannot supply the TMC a data trace with time/date stamps to show transition between gear conditioning and test. They will be able to do that in future tests when requested.

Panel consensus was that further efforts on testing and batch approval will commence after completion of the 2004 non-lubrited hardware matrix approval program.

A motion to adjourn the August 24th panel meeting was made by Mr. Koglin and seconded by Mr. Smith.

The meeting was adjourned at 5:30 pm and will reconvene on September 25th, 2004.

The September 25th, 2004 meeting was called to order at 03:32 p.m. The sign-in sheet is *Attachment 1* (shows the two respective meeting dates and attendees sign-in initials).

The Chairman opened the meeting by revisiting/summarizing the agenda and the progress made during the September 24th, 2004 panel meeting.

Mr. Sullivan revisited the need to address and clarify rounding of test results. He will ask the LRI to issue a memo indicating they support and use ASTM E-29 Standard Practices for rounding where appropriate. Again, see *Attachment 7*.

Mr. Sullivan reviewed the Industry Low Temperature L-37 matrix results using LT1-1 and LT2-1 in the P4L626A/V1L686 lubrited hardware batch. His summary highlighted the expectations for the oils which were given to the Industry as qualified MIL-2105E fluids which, by and large, failed the tests. Assuming one could round off to the level of the MIL specification, a correction factor is needed to correct the original merit ratings from 5 to 8's or better. Based on the results from the 32-test L-37 Low temperature matrix, the L-37 SP proposal would allow a pass rate of 62.5%.

Follow-up tabled proposals and motion from September 24th meeting.

- **Proposal 1 (short term):**

  Specific for V1L686/P4L626A lubrited gear batch in the Canadian version of the L-37 test.

  Expectation statement: LT1-1 & LT2-1 performance level for Canadian L-37 should be that the over-all pass rate range for all collective parameters is between 75% and 90%.

- **Proposal 2 (long term):** For Lubrited Gear Batch V1L686/P4L626A

  The following would apply individually to both the Standard L-37 and Canadian version of the L-37 test:

  After determining expected performance levels for each distress parameter for RO 151-3, LT1-1 & LT2-1, the panel will develop statistically (at 95% CI) based correction factors to bring the mean of parameter result for each gear set within a matrix back to the target performance levels. This process would be applied consistently for each successive gear batch.

  For long-term proposal 2, a starting point would be to send a table to the OEM's and have them fill out the merit ratings for each distress type for LT1-1 and LT2-1 using any existing or prior L-37 Canadian Test data. If they do not have the actual numbers, they could fill out their expectations.

At the time of its approval, Mr. Follis expressed that he and Mr. Linden did not realize that the current correction factor for the P4L626A/V1L686 gear batch would take a 6 to a 7.8 and rounded to an 8 'Pass'. Regardless of rounding, he mentioned that he has rejected some original merit ratings of 6 because he didn't feel they were good enough. Many times, Mr. Follis will ask for a re-rate. He also commented that many times he felt our actual ratings were more severe.

Motion # 1:

Mr. Sullivan motioned, second by Ms. Claire: Knowing that the panel has determined that Ridging distress is the primary cause for failing to meet this current expectation, the panel proposes a correction factor for Ridging (both pinion and ring) of +0.6065 transformed units for low temperature L-37 tests using the lubrited V1L686/P4L626A hardware. Using this correction factor in the current 16-test low temperature matrix, will allow 68.8% of the ridging ratings to meet the pass/fail limit of '8' dependent on using ASTM E29 to round corrected results to a whole number. Effective date for tests completing is on or after 8/25/04.

The motion passed unanimously, 6 votes for, 0 opposed, and 0 abstentions.

*Note: Panel consensus was to present this to the LRI committee during the August 26th, 2004 open meeting and mention that this included panel participation of 3 LRI members.

Follow-up tabled motion on 2004 Non-Lubrited Hardware Batch from September 24th meeting.

The PARC laboratory reported that they initially decided not to order any of the 2004 hardware. Based on the panel discussions and motions, they indicated that they would like to participate in the matrix plus acquire a small amount of hardware from the other laboratories for low temperature candidate testing approvals. The industry laboratory consensus was to sell/exchange a small portion of laboratory hardware with PARC to meet the above stated needs. After group discussion and consensus the September 24th meeting was modified as follows:

Motion by Mr. Gropp, second by Ms. Whitton): Each of the 4 labs will equally participate in a 44-test matrix to evaluate the V1L351/P4T771 non-lubrited hardware batch.

8-tests on TMC 151-3 (standard)
8-tests on TMC LT1-1 (standard)
8-tests on TMC LT2-1 (standard)
4-test on TMC 127 (standard)

8-tests on TMC LT1-1 (Canadian)
8-tests on TMC LT2-1 (Canadian)

- TMC will assign each lab one test on TMC 127 and stop to review results (to insure that this oil has performed as expected). Targeted completion date is September 17th. Chairman will convene a panel teleconference call.

- TMC will then assign each lab one test on TMC 151-3, and stop to review results to date. Targeted completion date is October 1st. The chairman will convene a panel teleconference call.

- Assuming discrimination is seen between the results of the oils, the remainder of the test matrix will be completed. Targeted completion date/report data to TMC is by December 15th.

- We will review data with intent to approve the hardware batch at the February 2005 meeting.

- Labs were requested to randomly select hardware from their full shipment to get a good feel of severity through out the hardware batch.

The motion passed, 6 votes in favor, 0 opposed, 0 abstentions.

Follow up action item: The chairman has included the presentation Mr. Sullivan presented on behalf of the panel to the LRI # 132 open meeting on Thursday, August 26th, 2004. See Attachment 10.

The chairman thanked the surveillance panel, test laboratories, TMC, and OEM's and the respective companies for their support of time and money. We spent a total of 9 hours (over two days) in meetings. We will look back on this as a milestone that will provide a basis and direction for use with subsequent hardware batch introductions and a way to approach hardware severity issues through correction factor application. This will simplify industry efforts as we move forward.

With a motion by Mr. Gropp and a second by Mr. Koglin, the meeting was adjourned 5:20 p.m.

Respectfully submitted,

Donald T. Bartlett

Donald T. Bartlett
L-37 Surveillance Panel Chairman

Meetings 8-25 8-24

NOTE: Sent in draft one pg 2 mailing on 8/24 & 8/25/04

ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 24, 2004

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* Initial to indicate attendance at subject meeting

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ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 24, 2004

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* Initial to indicate attendance at subject meeting

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ASTM L-37 Surveillance Panel Membership/Mailing List

meetings 8/25 8/24

Meeting Date: August 24, 2004

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Attachment 1
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ASTM L-37 Surveillance Panel Membership/Mailing List

Meetings 8/25 8/24

Meeting Date: August 24, 2004

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	Miller, Ken	Non Voting	Dana Corporation 1293 Glenway Drive Statesville, NC 28677	Phone: 704-878- Fax: 704-878-5735 E-Mail:
	Okamuro, Ken	Voting	Dana Corporation 1293 Glenway Drive Statesville, NC 28677	Phone: 704-878-5642 Fax: 704-878-5735 E-Mail: Ken.Okamuro@dana.com
	Radonich, Peter	Non Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-2184 Fax: 440-347-9011 E-Mail: pdr@lubrizol.com

* Initial to indicate attendance at subject meeting

Meetings
8/25 8/24

ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 24, 2004

Initials*	Name	Voting Status	Company Name & Address	Phone/Email Info
	Sanchez, Art	Non Voting	Southwest Research Institute PO Drawer 28510 San Antono, Texas 78228-0510	Phone: 210-522-3445 Fax: 210-680-1777 E-Mail: asanchez@swri.edu
CSC	Schenkenbeger, Chris	Non Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-2927 Fax: 440-347-2878 E-Mail: csc@lubrizol.com
	Smith, Dale	Voting	PARC Technical Services, Inc. 100 William Pitt Way Pittsburgh, PA 15238	Phone: 412-826-5051 Fax: 412-826-5443 E-Mail: dsmith@parctech.com
	Sopko, Harry	Non Voting	PARC Technical Services, Inc. 100 William Pitt Way Pittsburg, PA 15238	Phone: 412-826-5165 Fax: 412-826-5443 E-Mail: hsopko@parctech.com
WTS	Sullivan, Bill	Voting	ExxonMobil Chemical Company P. O. Box 3140 Edison, New Jersey 08818	Phone: 732-321-3354 Fax: 732-321-6064 E-Mail: william.t.sullivan@exxonmobil.com
	Tschirhart, Garland	Non Voting	Southwest Research Institute PO Drawer 28510 San Antono, Texas 78228-0510	Phone: 210-522-3445 Fax: 210-680-1777 E-Mail: gtschirhart@swri.edu

* Initial to indicate attendance at subject meeting

meetings 8/25 & 8/24

ASTM L-37 Surveillance Panel Membership/Mailing List

Meeting Date: August 24, 2004

Initials*	Name	Voting Status	Company Name & Address	Phone/Email Info
DRV	Vermilyia, Denise	Non Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-4681 Fax: 440-347- E-Mail: drc@lubrizol.com
	Vettel, Paula	Voting	D. A. Stuart Company 4580 Weaver Parkway Warrenville, Illinois 60555	Phone: 630-393-8859 Fax: 630-393-8577 E-Mail: pvettel@dastuart.net
CMW	CMW	Non Voting	AFTON CHEMICAL ~~Ethyl~~ Corporation PO Box 2158, 500 Spring St. Richmond, VA 23218	Phone: 804-788-5052 Fax: 804-788-6243 E-Mail: ~~Claire_Whitton@ethyl.com~~ claire.whittone aftonchemical.com
	Yanchar, Paul	Non Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-3474468 Fax: 440-347-9011 E-Mail: pjy@lubrizol.com
	Zakarian, Jack	Non Voting	Chevron Products 100 Chevron Way Richmond, CA 94802	Phone: 510-242-3595 Fax: 510-242-3758 E-Mail: jaza@chevron.com
	Zreik, Khaled A.	Voting	AMSTA-TR-D/210 Tank Automotive & Armament 6501 East 11 Mile road Warren, MI 48397-5000	Phone: 586-574-4227 Fax: 586-574-4244 E-Mail: Zreikk@@tacom.army.mil

* Initial to indicate attendance at subject meeting

Attachment 1
Page Page 6 of 7
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ASTM L-37 Surveillance Panel Membership/Mailing List

Meetings
8/25 8/24

Meeting Date: August 24, 2004

Initials*	Name	Voting Status	Company Name & Address	Phone/Email Info
	Vermilya, Denise	non voting	The Lubrizol Corp	Phone: 440 347 4681 Fax: E-Mail: drc@lubrizol.com
JB	Janice Becker	non voting	Afton Chemical	Phone: 804 788-5293 Fax: E-Mail: Janice.BeckerCP@afton chemical.com
C.K	Cory Kaplin	Voting	Hfo	Phone: Fax: E-Mail:
CC	CHRIS CASTANIEN	Non Voting	Lubrizol	440 347 2973 CCA@Lubrizol.com

* Initial to indicate attendance at subject meeting

Attachment 1
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L-37 Surveillance Panel Voting Members

Donald Bartlett	The Lubrizol Corporation (Chairman)
Tom Bryson	Volvo Powertrain Corporation
Juan Buitrago	Chevron Oronite Company
Brian Koehler	Southwest Research Institute
Cory Koglin	Ethyl Petroleum Additives, Inc.
Don Lind	ASTM Test Monitoring Center
Jim Linden	GMR Research and Development
Thelma Marougy	Eaton Corporation
Bruce McGlone	ArvinMeritor Materials Engineering
Ken Okamuro	Dana Corporation
Dale Smith	PARC Technical Services
William Sullivan	ExxonMobil Chemical Co.
Paula Vettel	D.A. Stuart Co.
Khaled A. Zreik	AMSTA-TR-D/210 US Army Tacom-Tardec

L-37 Surveillance Panel
PRI/ Headquarters, Apollo Room - Warrendale, PA
August 24th, 2004

AGENDA

Call to Order/Review Membership

Approval of Minutes:
- June 16th SP Meeting.
- June 30th SP Teleconference Call/Meeting.

Status of Information Letter 04-1

Low Temperature Standard & Canadian Testing Decisions:
- Review the 32-Test Matrix Data on 626A/686 Hardware.
- Anchor Batch Decision/Targets/Correction Factors?
- Where Do We Go From Here?
- Is There Still Value with the Extra Testing Load on the Industry for Low Temperature Testing?
  - If Yes, What is the Plan?

2003 Lubrited Gear Batch T758A:
- Can We Move Forward with Batch Approval?
- Do We Need Low Temperature Testing Runs?
- Anchor Batch Decision/Targets/Correction Factors?

2004 Non-Lubrited Gear Batch Industry Order Update:
- Trip to Ft. Wayne Completed by TF in July.
- Hardware Being Assembled as We Meet and Will be Shipped to the Labs by Last August.
- Testing Matrix, What Oils/Develop a Plan/Test When?

TMC Update/Discussions:
- Status of TMC 151 Re-blend.
- Report on Rater Calibration Workshop – Focus L-37.
- Control Charting Lubrited and Non-Lubrited Hardware Together.
- New Changes to the Test Reporting Formats.

Adjournment

- Information Letter L-37 04-1:

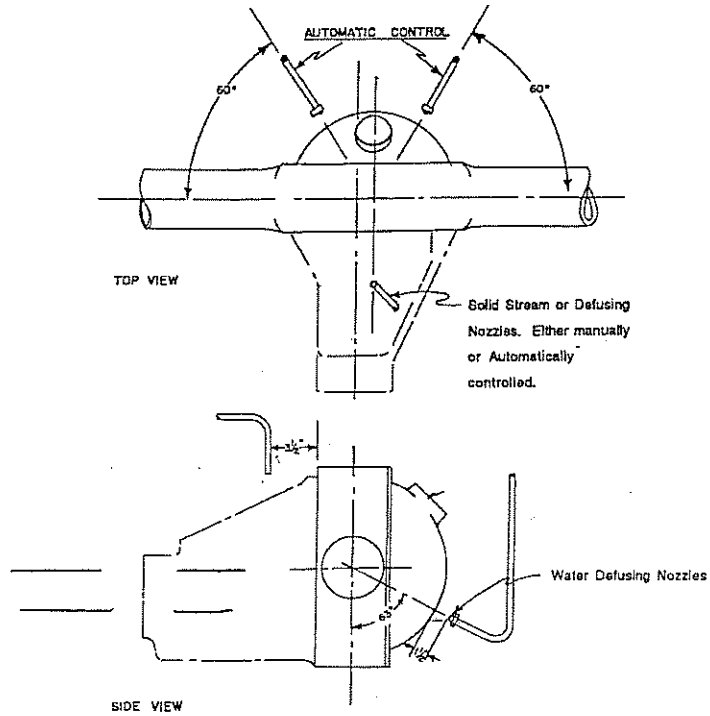
  - Address Questions on Proposed Drawing.

  - Address Fraction Tolerances.
    - Top Water Nozzle.
    - Back Cover Spray Nozzles.
    - Other?

Attachment 4
Page 1 of 4
Reference L-37

old A5.1 for Reference/Compare

A5. AXLE COOLING SYSTEM



NOTE—Use ⅜ in. tubing for all water lines.

in.	mm	in.	mm
⅜	9.5	3½	88.9
1½	38.1		

FIG. A5.1 Location of Spray Nozzles on Axle

A6. TEST VERSIONS AND AXLE PART NUMBERS

A6.1 *Axle Used in Test*—Two types of test axle are run in this test.

A6.1.1 *Uncoated Axle*—Dana Model 60, 5.86 ratio, standard differential with uncoated ring gear and uncoated pinion, Part No. 060AA100-2.[10] Also referred to as plain or green axles.

A6.1.2 *Coated Axle*[16]—Dana Model 60, 5.86 ratio, standard differential with coated ring gear and coated pinion, Part No. 060AA100-4.[10] Also referred to as lubrited or lubrized axles.

A6.2 *Test Versions*—This test has four commonly used versions. The test procedures and conditions described previously in this test method will be referred to as the standard version. All versions maintain the same test procedures, wheel load, and wheel speed conditions. The differences occur in the axle oil temperature and axle type used. Table A6.1 describes each version.

TABLE A6.1 Test Versions[A,B]

Test Version	Axle Type	Gear Conditioning Axle Temperature	Gear Test Phase Axle Temperature
Standard	uncoated	297 ± 3°F (147.2 ± 1.7°C)	275 ± 3°F (135.0 ± 1.7°C)
Standard	coated	297 ± 3°F (147.2 ± 1.7°C)	275 ± 3°F (135.0 ± 1.7°C)
Canadian	uncoated	220 ± 3°F (104.4 ± 1.7°C)	200 ± 3°F (93.3 ± 1.7°C)
Canadian	coated	220 ± 3°F (104.4 ± 1.7°C)	200 ± 3°F (93.3 ± 1.7°C)

[A] All versions use the same wheel speed, load conditions, and test procedures, which are described in Section 10.

[B] Both Canadian test versions typically used for evaluation of 75W lubricants.

[16] A manganese phospate coating.

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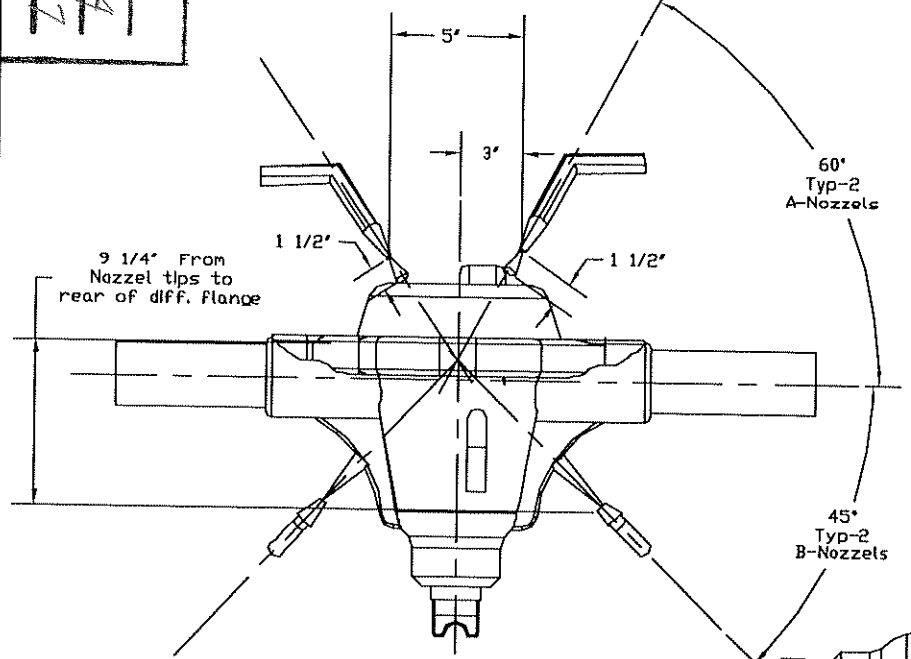
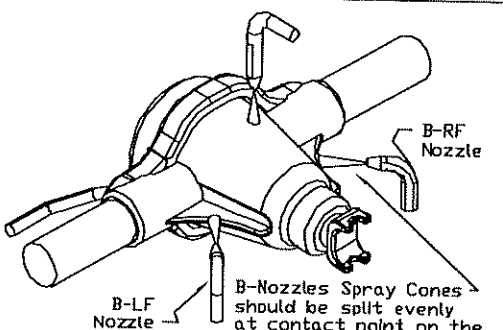
Reference L-37

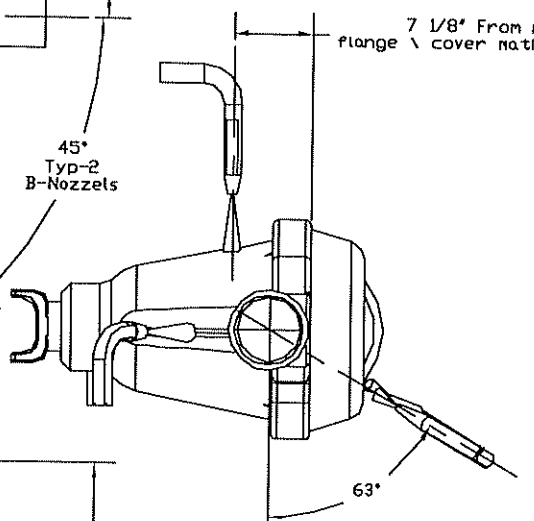
Attachment
Page
Reference
4
2-4-4
A-37

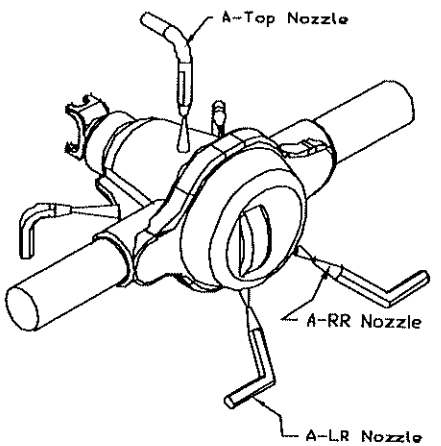
New A5.1

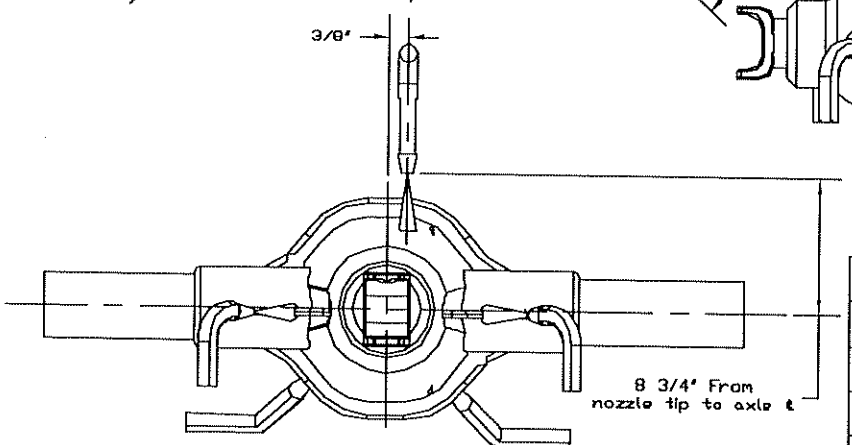
NO.	DATE	REVISION	APPROVAL











TOLERANCES	A	NAME	DATE
FRACTIONS ± 1/2	DRW.	SHS	09-02-04
XX DEC. ±	CHK.	DTB	
XXX DEC. ±	APPR.	CAS	
ANGLES ± 5°	SCALE	none	

Nozzle placements, relative to Dana-60 Differential.

1, Nozzles-A , req.w\all L-37 test versions.
(Nozzles-A, driven by Control Valve-A)

2, Nozzles-B, req for Low temp.\Canadian Version only.
(Nozzles-B, driven by Control Valve-B)

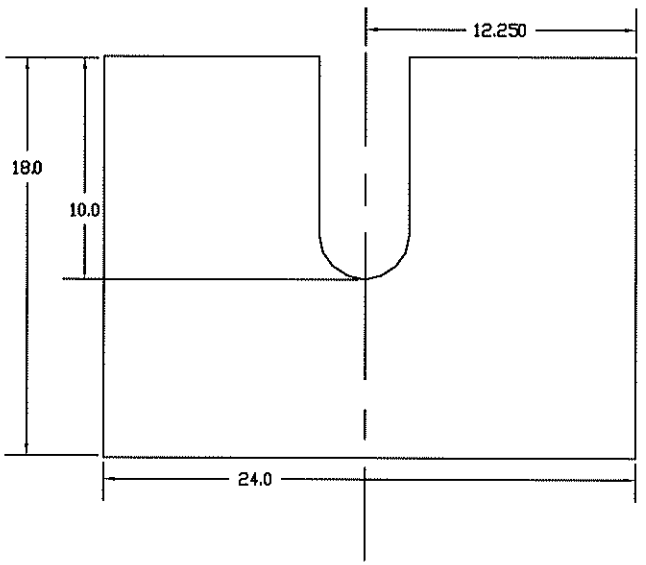
TITLE AXLE - COOLING NOZZLE DETAILS

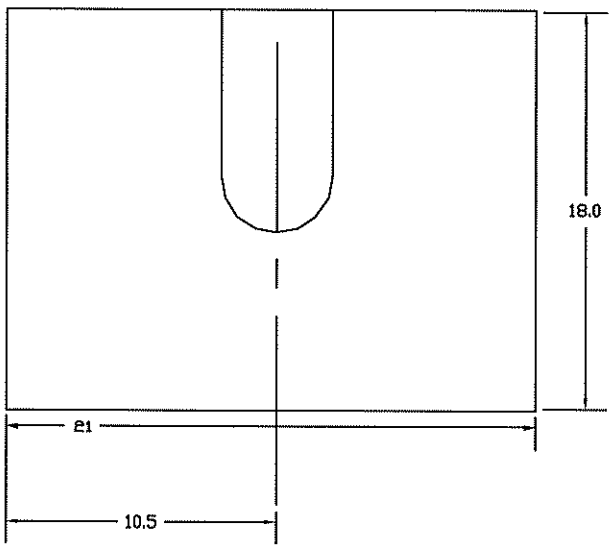
REF. NO. T030783

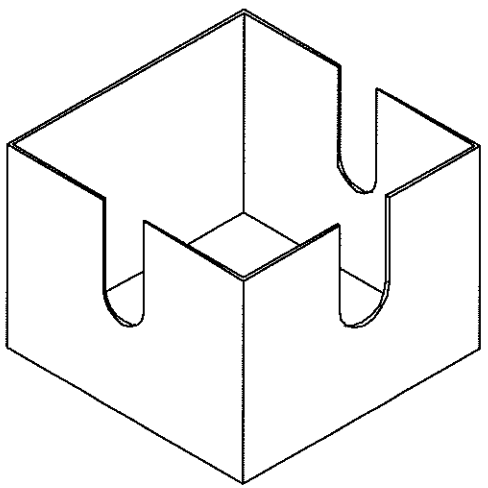
DRW. NO. 00015733

new drawing 4x.x

NO.	DATE	REVISION	APPROVAL







Attachment 4
Page 1 of 4
Reference
7-27

ITEM	QUAN	PART NO/NAME	DESCRIPTION
1	1	Main Chamber	ALUM. PLATE

TOLERANCES	A NAME	DATE	NOTES: Box dimensions are typical. A Lid & flexible material, i.e. rubber, will be needed for water containment.
FRACTIONS ±	DRW. SHS	7-29-04	
XX DEC. ±	CHK. DTB		
XXX DEC. ±	APPR. CAS		TITLE AXLE COOING CHAMBER
ANGLES ±	SCALE 3/8		REF. NO. T030783 / DRW. NO. 00015727

CMIR	LAB	OIL	Match #	Test_Type	PINBAT	RINGBAT	DTCOMP	P_WEAR	P_RIDG	P_RIPP	P_SPIT	R_WEAR	R_RIDG	R_RIPP	R_SPIT	lpcrat	fpcrat
52087	D	LT1-1	1864	LOWTEMP	V1L686	P4L626A	20040703	7	6	9	9.8	8	9	10	9.8	2	1
52088	D	LT1-1	1902	LOWTEMP	V1L686	P4L626A	20040704	7	6	9	9.8	8	6	9	9.8	2	-1
52092	B	LT1-1	657	LOWTEMP	V1L686	P4L626A	20040702	6	7	8	9.9	6	8	9	9.9	2	-1
52093	B	LT1-1	1485	LOWTEMP	V1L686	P4L626A	20040703	6	(4)	9	9.3	5	(5)	9	9.7	2	-1
52097	E	LT1-1	1386	LOWTEMP	V1L686	P4L626A	20040714	6	6	9	9.8	7	8	9	9.9	2	-1
52404	E	LT1-1	394	LOWTEMP	V1L686	P4L626A	20040726	6	(4)	9	9.3	6	(4)	9	9.7	2	0
52384	A	LT1-1	146	LOWTEMP	V1L686	P4L626A	20040702	7	6	9	9	6	8	9	9.9	2	1
52388	A	LT1-1	134	LOWTEMP	V1L686	P4L626A	20040715	7	6	9	9.9	7	7	9	9.9	2	-1
52415	D	LT1-1	1890	STANDARD	V1L686	P4L626A	20040713	7	6	10	9.5	8	7	10	9.9	2	-1
52416	D	LT1-1	1977	STANDARD	V1L686	P4L626A	20040723	6	6	10	8	9	7	10	10	2	-1
52394	B	LT1-1	637	STANDARD	V1L686	P4L626A	20040705	6	7	9	9.6	6	8	9	9.9	2	-1
52395	B	LT1-1	1495	STANDARD	V1L686	P4L626A	20040707	4	(3)	9	6	5	(4)	9	9.6	2	-1
52098	E	LT1-1	915	STANDARD	V1L686	P4L626A	20040718	6	5	9	9.7	7	6	9	9.9	2	-1
52099	E	LT1-1	181	STANDARD	V1L686	P4L626A	20040725	7	7	9	9.9	7	8	9	9.9	2	-1
52385	A	LT1-1	132	STANDARD	V1L686	P4L626A	20040707	7	7	9	9.6	7	7	9	9.9	2	1
52386	A	LT1-1	121	STANDARD	V1L686	P4L626A	20040713	7	7	8	9.7	7	7	8	9.9	2	1
52089	D	LT2-1	1907	LOWTEMP	V1L686	P4L626A	20040714	7	5	9	9.7	7	5	10	9.7	2	-1
52420	D	LT2-1	1881	LOWTEMP	V1L686	P4L626A	20040718	7	6	8	9.7	9	7	9	9.9	2	-1
52096	B	LT2-1	651	LOWTEMP	V1L686	P4L626A	20040708	7	7	9	9.8	7	7	10	9.9	2	-1
52401	B	LT2-1	618	LOWTEMP	V1L686	P4L626A	20040712	7	8	9	9.9	8	9	10	9.9	2	-1
52102	E	LT2-1	919	LOWTEMP	V1L686	P4L626A	20040720	7	8	9	9.9	7	9	9	9.9	2	-1
52409	E	LT2-1	944	LOWTEMP	V1L686	P4L626A	20040721	6	(4)	9	9.5	6	(4)	9	9.9	2	-1
52107	A	LT2-1	1814	LOWTEMP	V1L686	P4L626A	20040709	7	(4)	10	9.8	6	(5)	9	9.9	2	1
52108	A	LT2-1	1860	LOWTEMP	V1L686	P4L626A	20040710	7	(4)	9	9.8	6	(5)	8	9.9	2	1
52090	D	LT2-1	1551	STANDARD	V1L686	P4L626A	20040715	7	6	8	9.5	8	7	10	9.8	2	1
52421	D	LT2-1	341	STANDARD	V1L686	P4L626A	20040727	7	6	9	9.3	8	7	10	10	3	1
52399	B	LT2-1	622	STANDARD	V1L686	P4L626A	20040710	7	6	8	9.7	7	7	9	9.9	2	-1
52400	B	LT2-1	633	STANDARD	V1L686	P4L626A	20040711	6	6	8	9.7	6	5	10	9.9	2	-1
52410	E	LT2-1	945	STANDARD	V1L686	P4L626A	20040722	7	8	8	9.9	7	9	9	9.9	2	-1
52411	E	LT2-1	197	STANDARD	V1L686	P4L626A	20040723	7	7	8	(2)	7	(9)	9	9.9	2	-1
52389	A	LT2-1	139	STANDARD	V1L686	P4L626A	20040711	7	8	7	9.9	7	9	9	9.9	2	1
52390	A	LT2-1	161	STANDARD	V1L686	P4L626A	20040712	7	7	6	9.9	7	9	10	9.9	2	-1

Attachment 5
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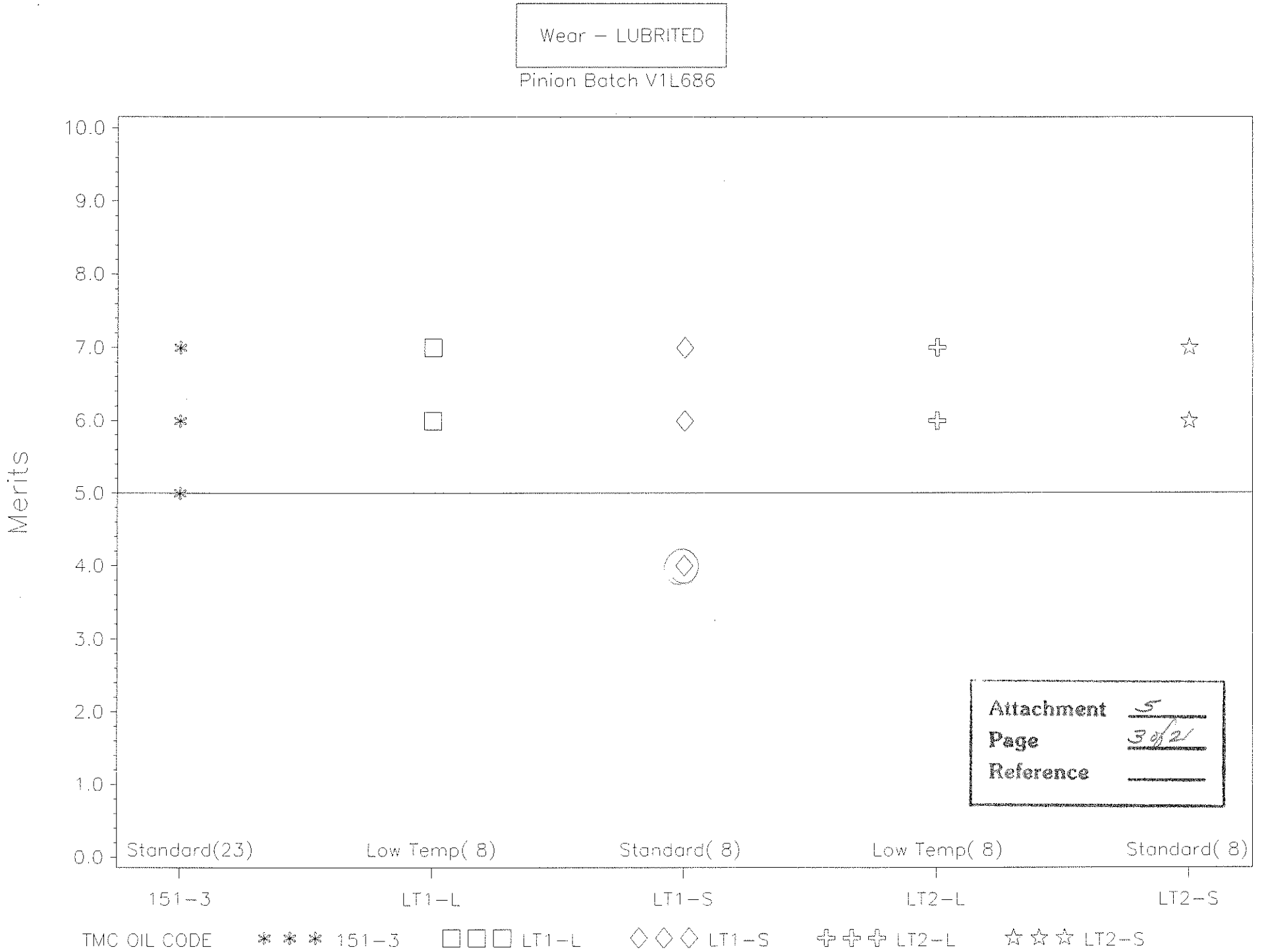
Reference L-37

I Included the 151-3 reference oil data as additional information. This data is not part of the Matrix.

39375	D	151-3	1496	V1L686	P4L626A	20011215	7	5	9	9.8	9	7	9	10	2	0
42482	D	151-3	24	V1L686	P4L626A	20020820	7	7	9	9.9	8	9	10	10	3	0
46785	D	151-3	89	V1L686	P4L626A	20030514	7	7	9	9.9	9	10	10	10	2	-1
49499	D	151-3	1886	V1L686	P4L626A	20031016	7	8	9	9.9	9	10	10	10	3	0
37940	B	151-3	1471	V1L686	P4L626A	20010619	7	6	9	9.8	8	6	9	9.9	.	.
37942	B	151-3	1861	V1L686	P4L626A	20020130	6	6	9	9.6	6	7	9	9.9	2	-1
42494	B	151-3	1939	V1L686	P4L626A	20020802	6	(3)	8	7	5	4	9	9.7	2	1
42497	B	151-3	1950	V1L686	P4L626A	20020807	6	6	9	9.6	6	5	9	9.9	2	0
46082	B	151-3	1257	V1L686	P4L626A	20030625	6	6	8	9.3	6	7	9	9.9	2	-1
49045	B	151-3	1217	V1L686	P4L626A	20040211	5	5	9	9.8	6	5	10	9.8	2	-1
49048	B	151-3	634	V1L686	P4L626A	20040214	6	6	8	9.8	6	6	9	9.9	2	-1
51845	B	151-3	636	V1L686	P4L626A	20040722	7	8	9	9.9	7	9	10	10	2	-1
37581	E	151-3	123	V1L686	P4L626A	20010731	6	6	9	9.9	7	7	9	9.9	.	.
37584	E	151-3	958	V1L686	P4L626A	20020517	7	7	9	9.9	7	6	9	9.9	2	-1
46788	E	151-3	1401	V1L686	P4L626A	20030319	7	6	8	9.8	7	6	9	9.9	2	0
42481	A	151-3	5	V1L686	P4L626A	20030508	7	8	8	9.9	7	9	9	9.9	3	-1
46800	A	151-3	355	V1L686	P4L626A	20040130	7	7	9	9.9	8	9	9	9.9	2	-1
37238	D	151-3	130	V1L686	P4L626A	20000715	7	5	9	9.9	8	6	10	10	.	.
37235	E	151-3	14	V1L686	P4L626A	20000808	6	8	9	9.9	7	9	10	9.9	.	.
37225	B	151-3	81	V1L686	P4L626A	20000727	7	7	9	9.7	7	7	10	9.9	.	.
37226	B	151-3	120	V1L686	P4L626A	20000728	7	8	9	9.9	7	8	10	9.9	.	.
37239	D	151-3	20	V1L686	P4L626A	20000716	7	7	9	9.9	8	9	10	10	.	.
37230	A	151-3	94	V1L686	P4L626A	20000808	7	5	9	9.9	8	6	10	10	.	.

Attachment 5
Page 2 of 21
Reference L-37

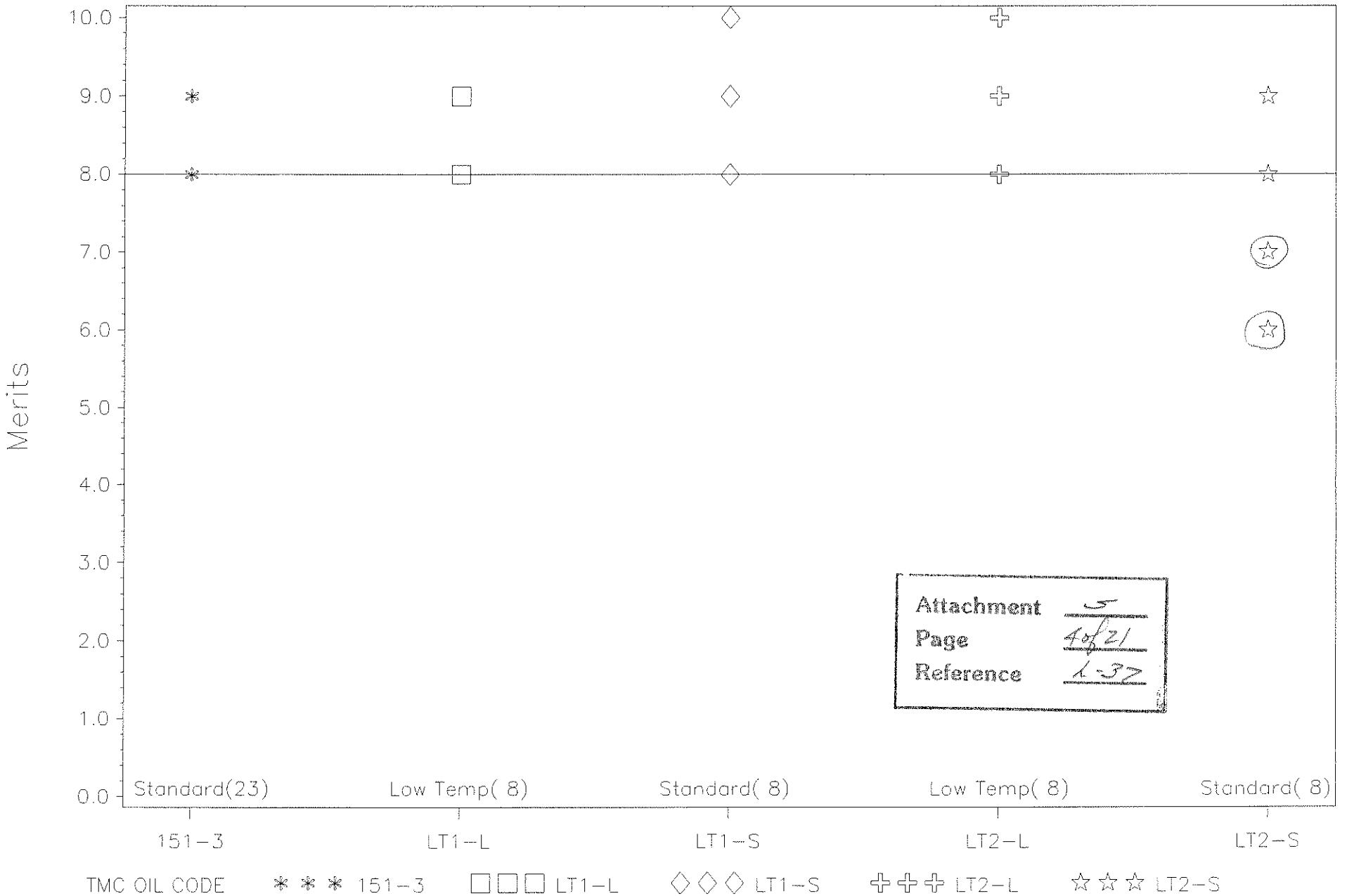
L-37 Reference Oil Performance by Oil and Test Version



L-37 Reference Oil Performance by Oil and Test Version

Rippling – LUBRITED

Pinion Batch V1L686

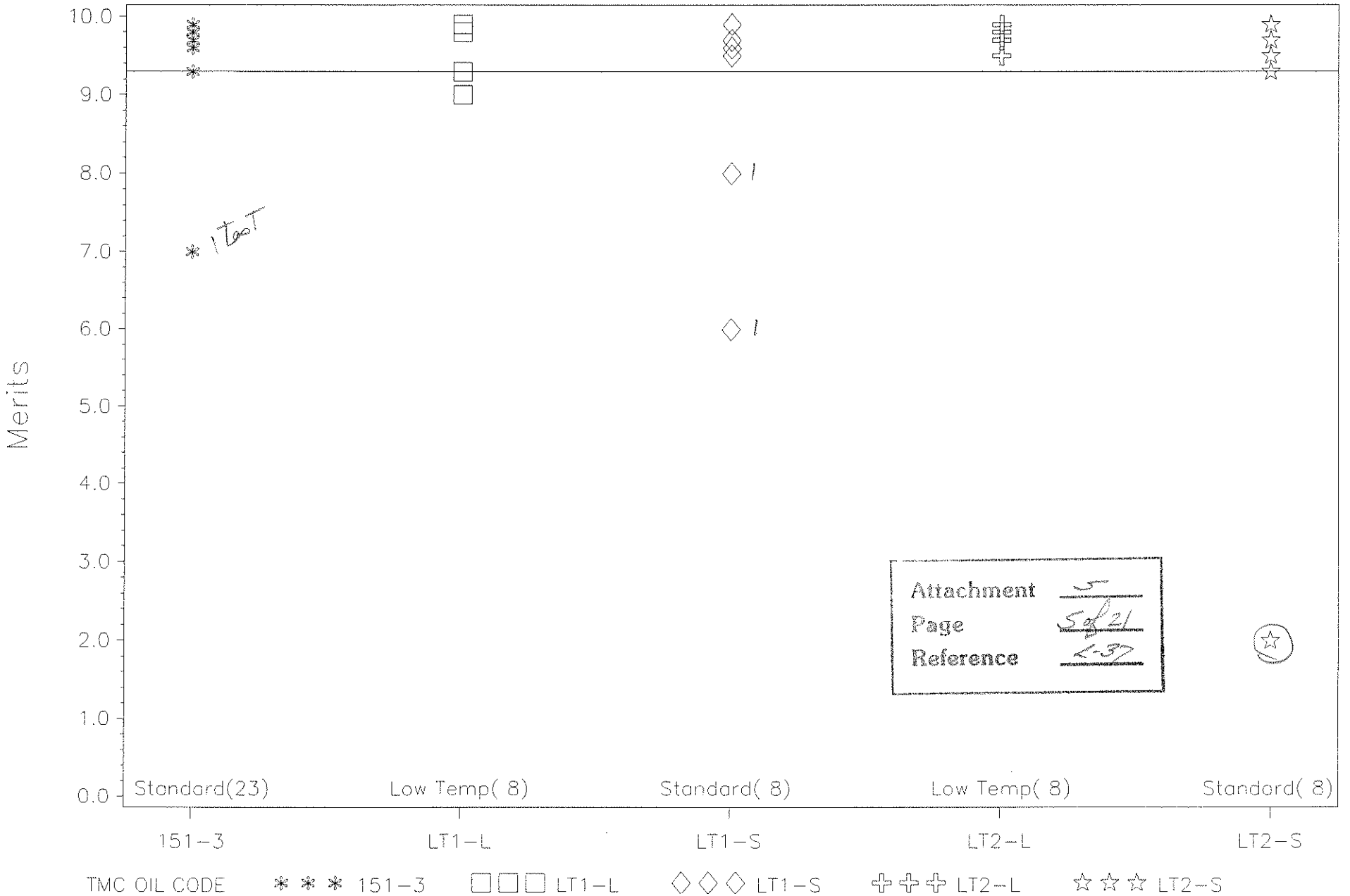


Attachment 5
Page 4 of 21
Reference L-37

L-37 Reference Oil Performance by Oil and Test Version

Spitting -- LUBRITED

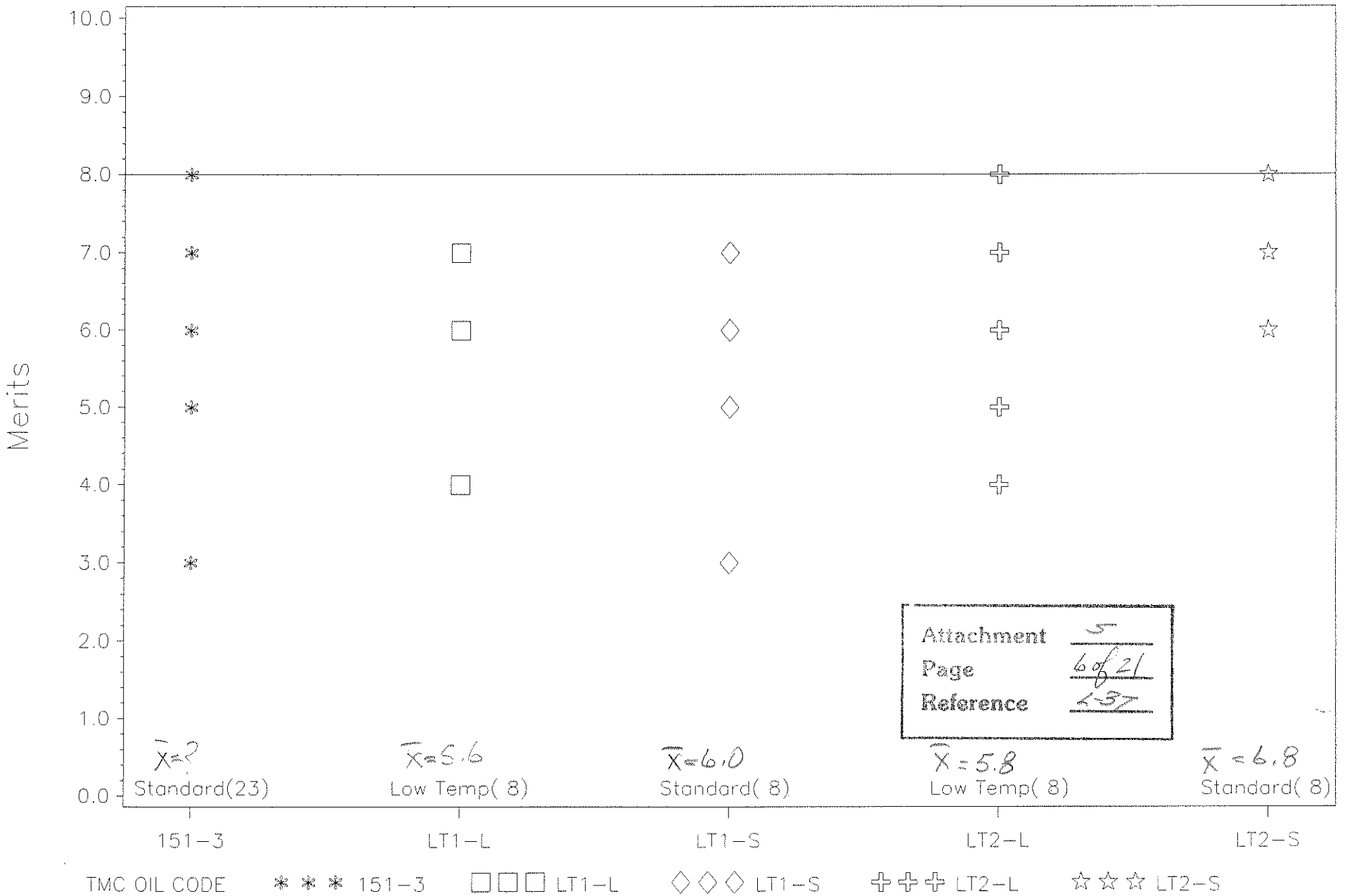
Pinion Batch V1L686



L-37 Reference Oil Performance by Oil and Test Version

Ridging – LUBRITED

Pinion Batch V1L686



Attachment 5
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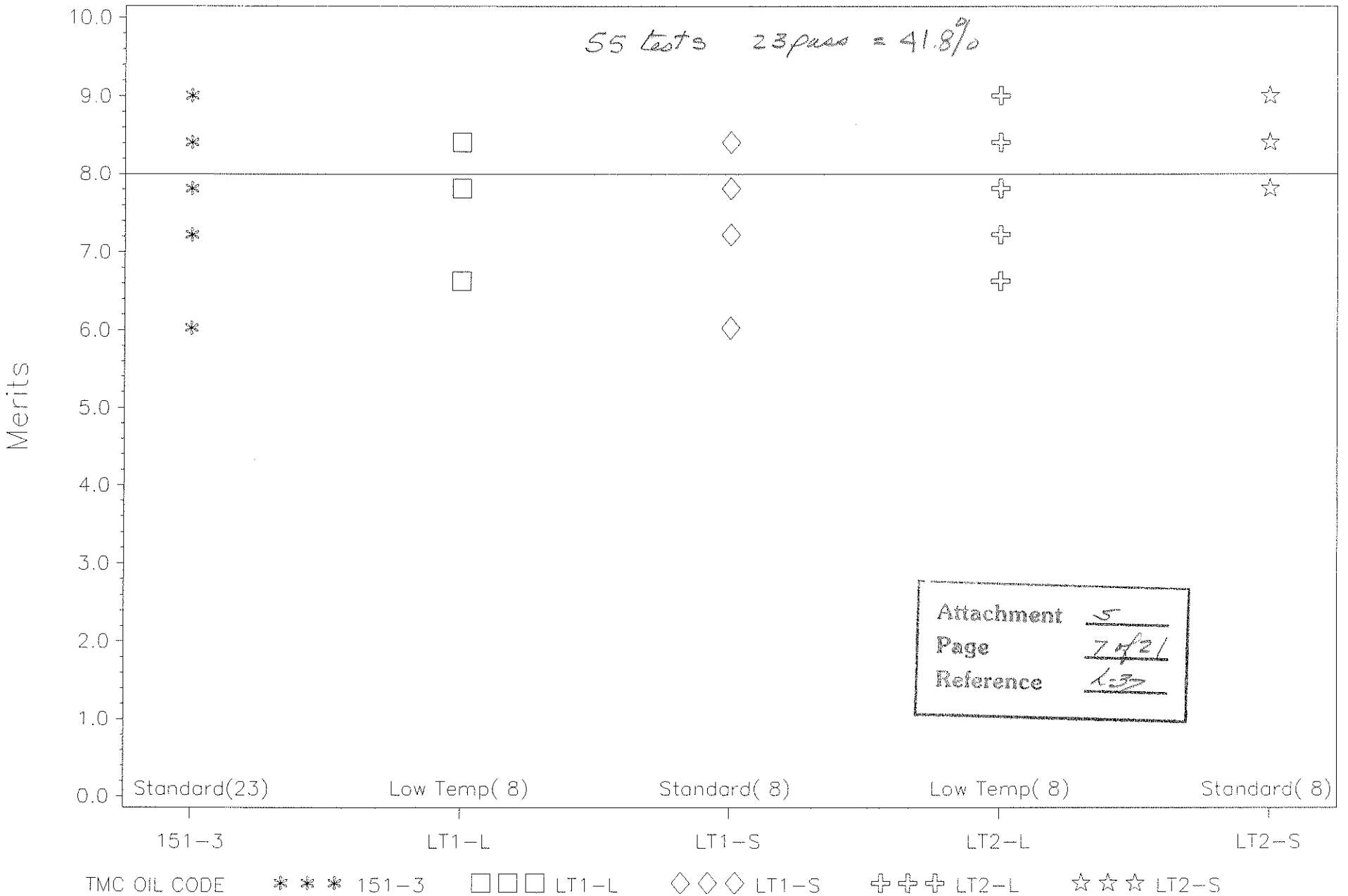
Reference L-37

L-37 Reference Oil Performance by Oil and Test Version

Ridging – LUBRITED

Pinion Batch V1L686 (Current Correction Factor = 0.5186 T.U.)



Attachment 5
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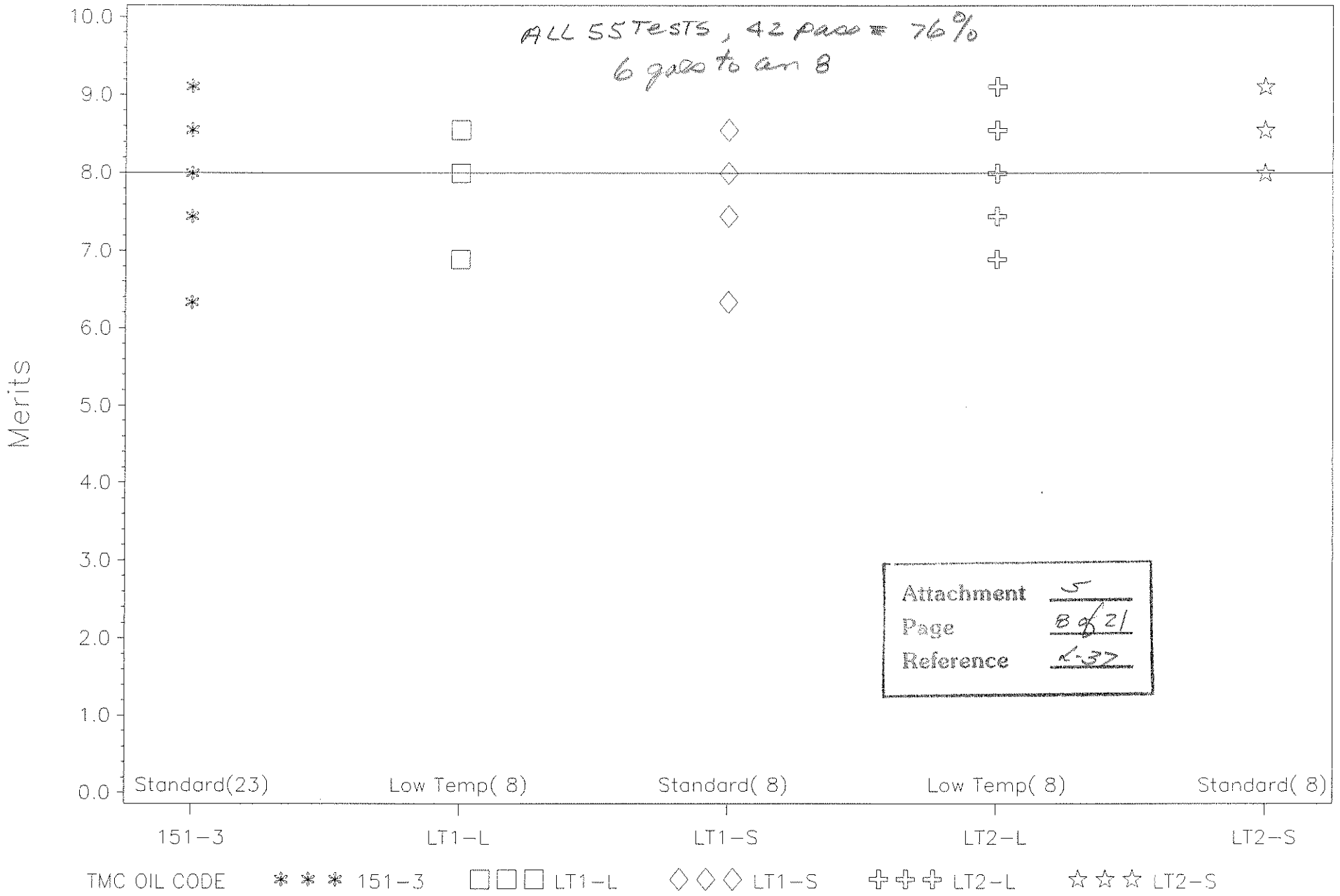
Reference L-37

L-37 Reference Oil Performance by Oil and Test Version

Ridging – LUBRITED

Pinion Batch V1L686 (New Correction Factor = 0.5878 T.U.)



Attachment 5
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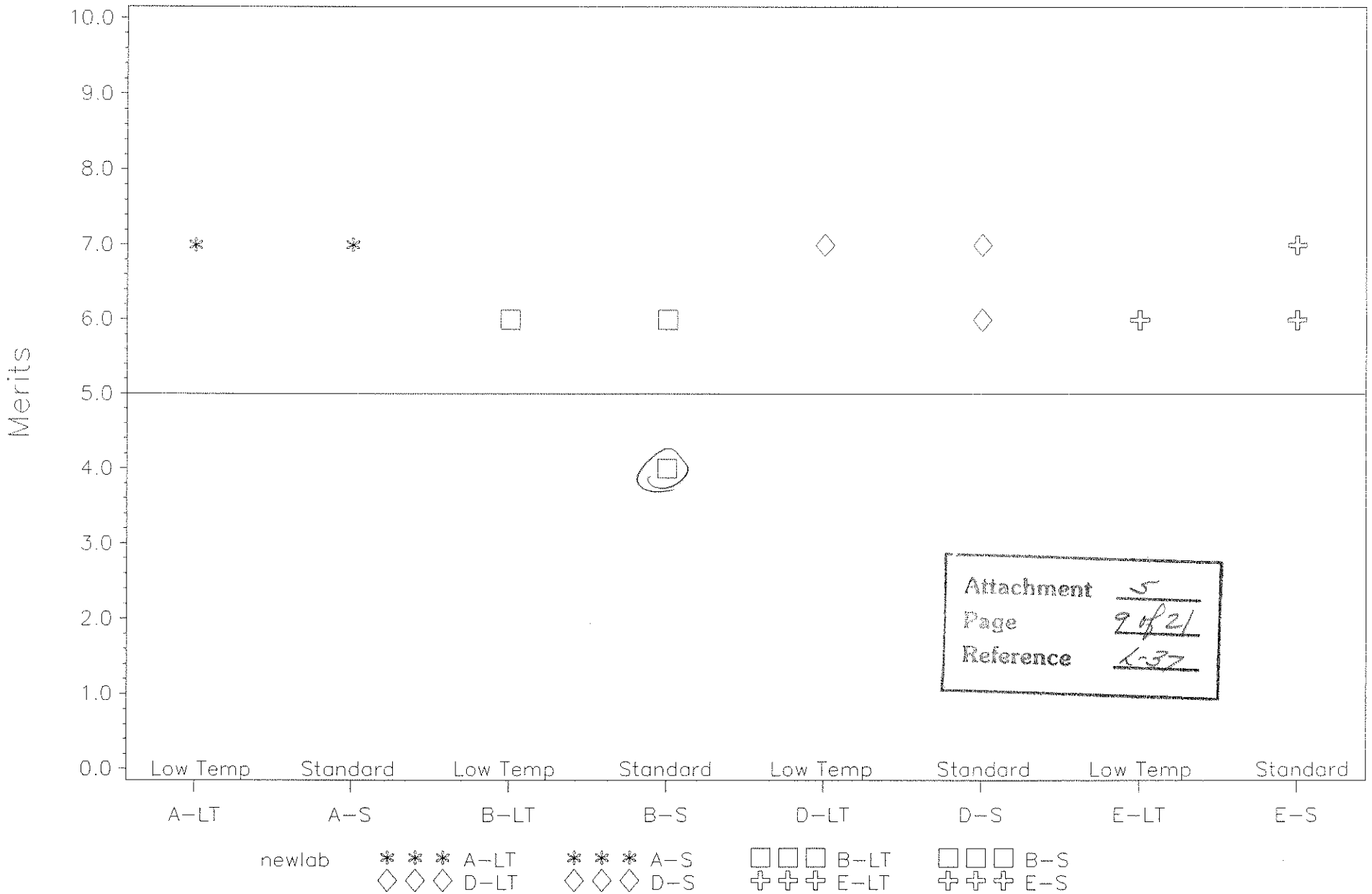
L-37 Reference Oil Performance by LTMSLAB

Wear – LUBRITED

Reference Oil LT1-1
Pinion Batch V1L686



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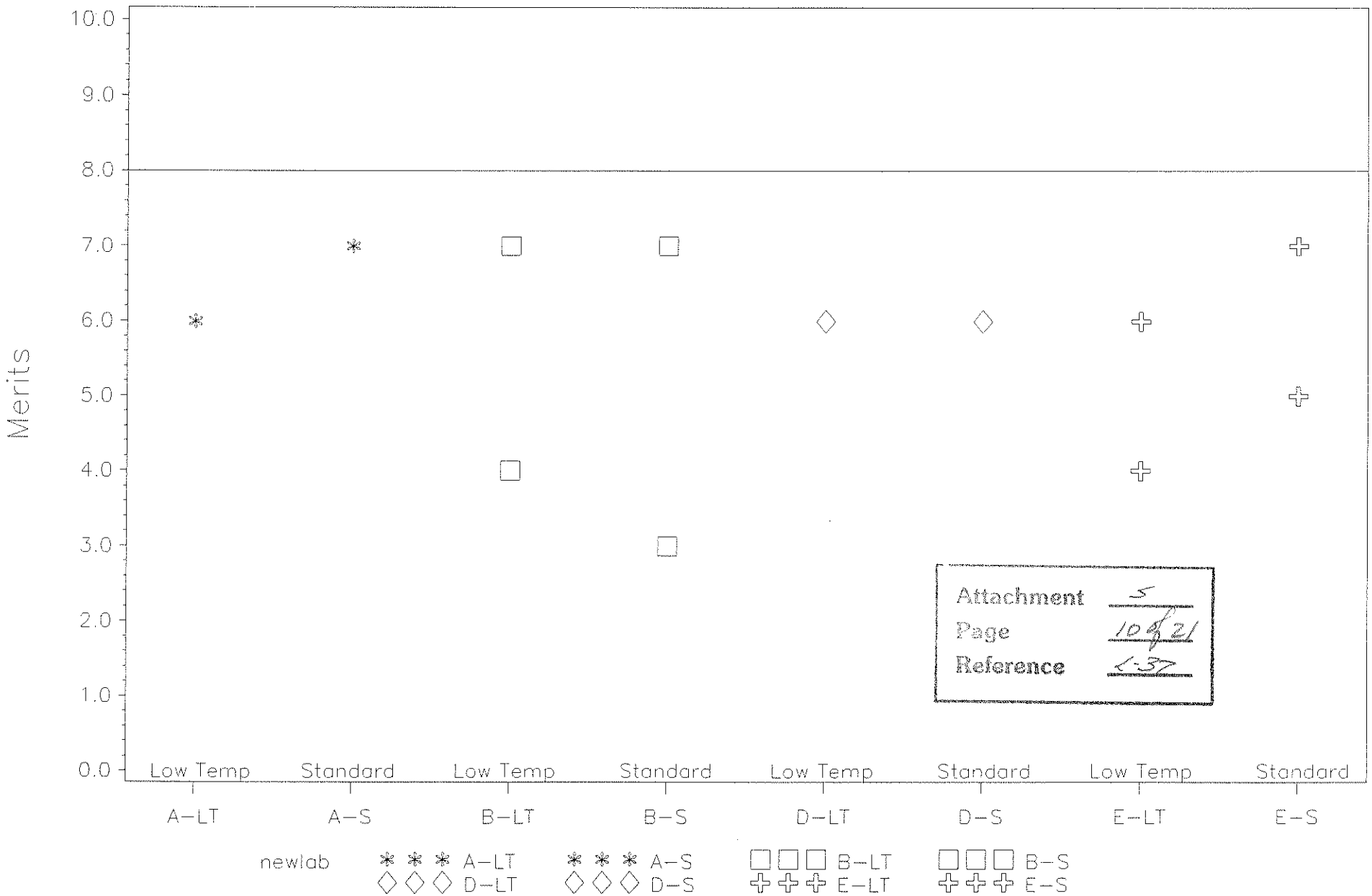
L-37 Reference Oil Performance by LTMSLAB

Ridging - LUBRITED

Reference Oil LT1-1
Pinion Batch V1L686



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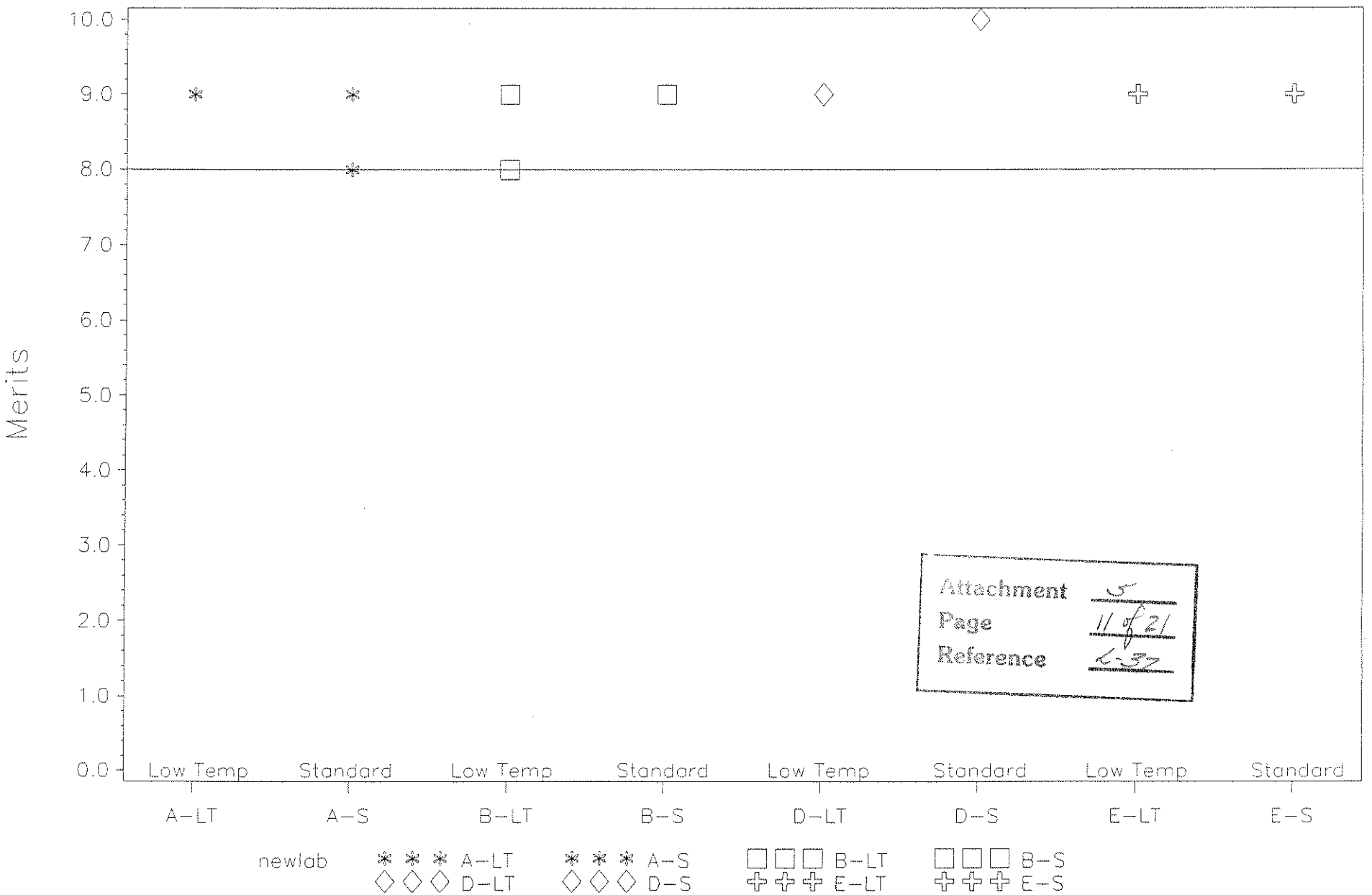
L-37 Reference Oil Performance by LTMSLAB

Rippling - LUBRITED

Reference Oil LT1-1
Pinion Batch V1L686



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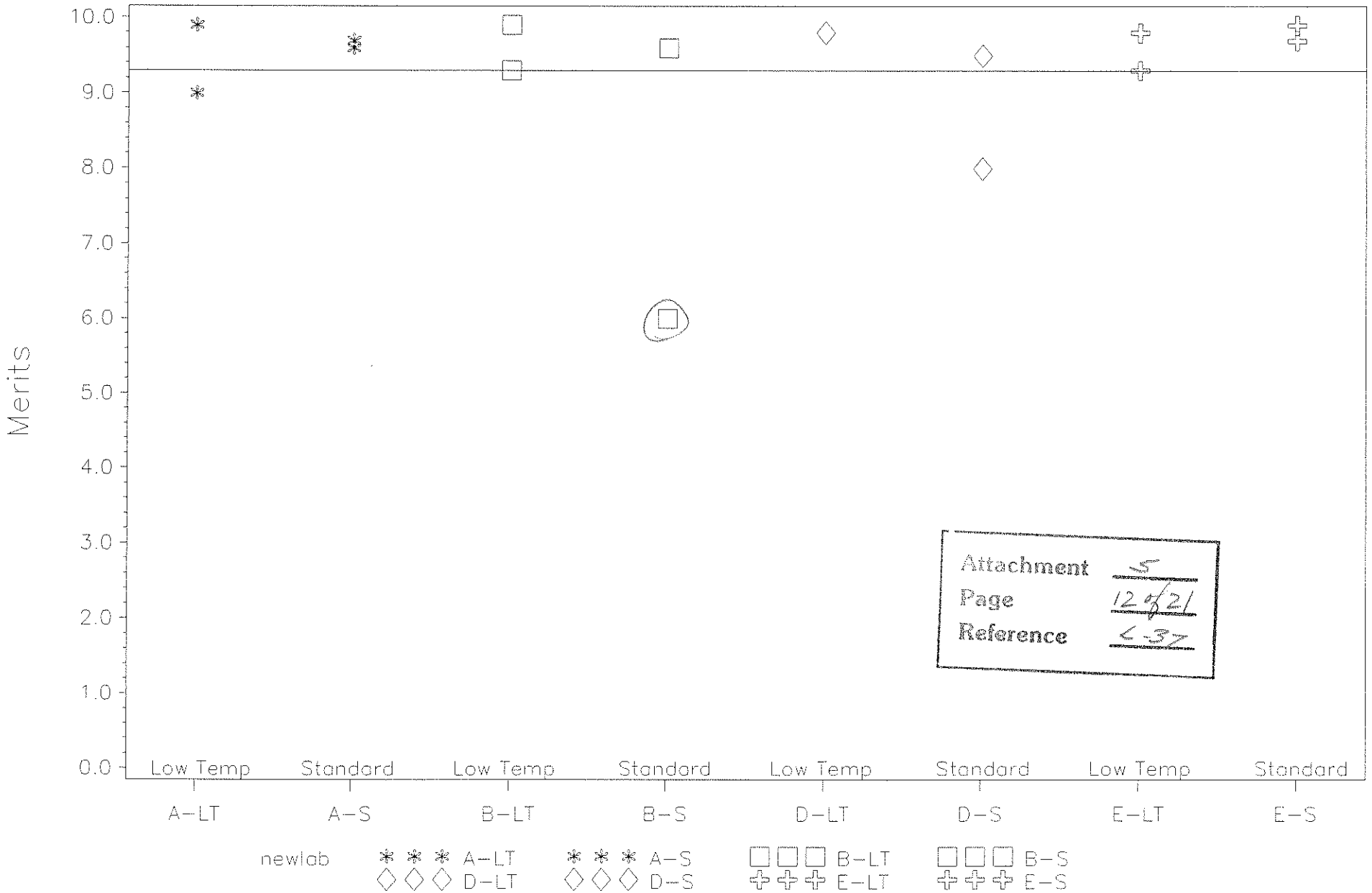
L-37 Reference Oil Performance by LTMSLAB

Spitting – LUBRITED

Reference Oil LT1-1
Pinion Batch V1L686



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L-37 Reference Oil Performance by LTMSLAB

Wear – LUBRITED

Reference Oil LT2-1
Pinion Batch V1L686

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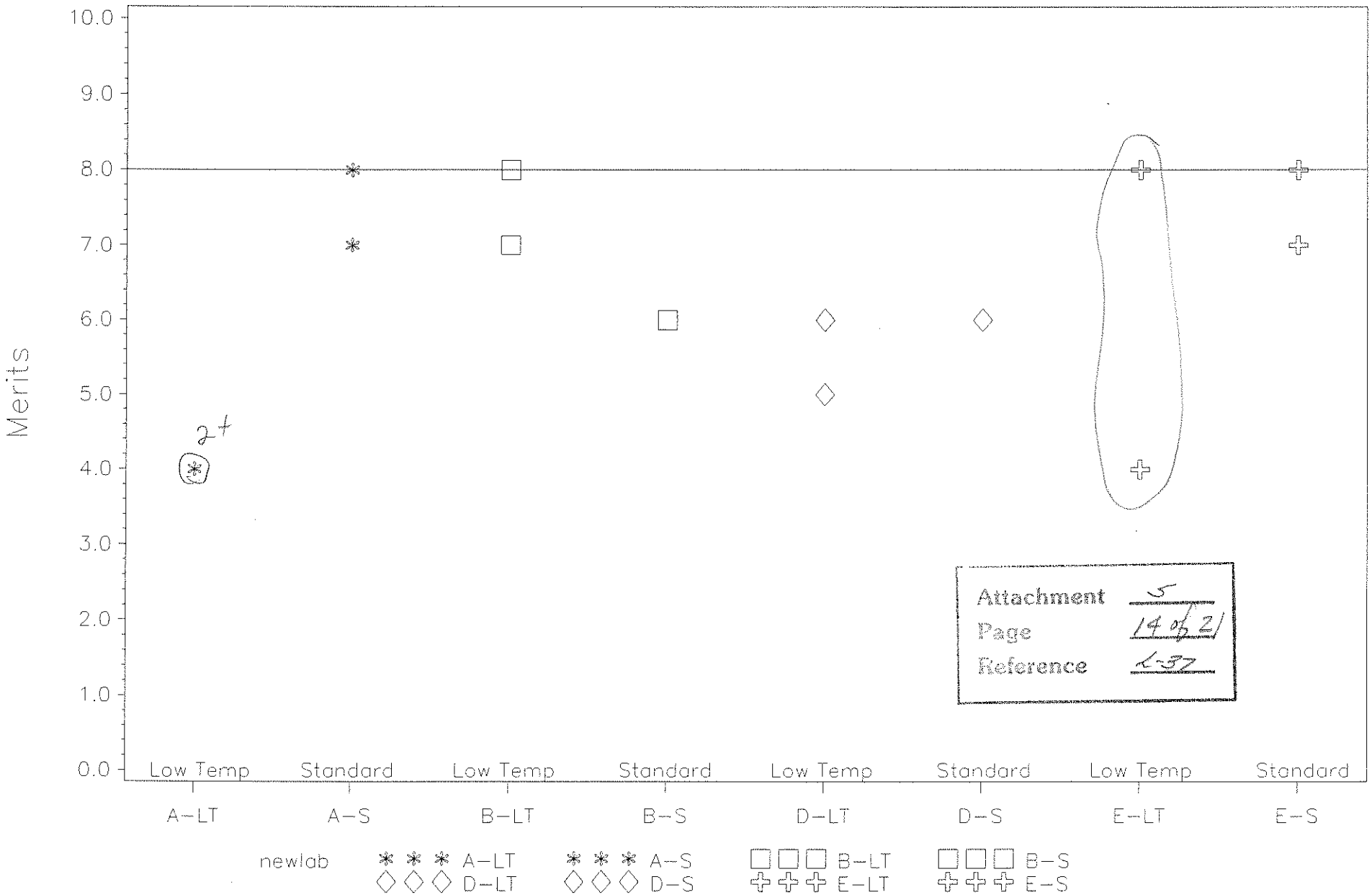
L-37 Reference Oil Performance by LTMSLAB

Ridging – LUBRITED

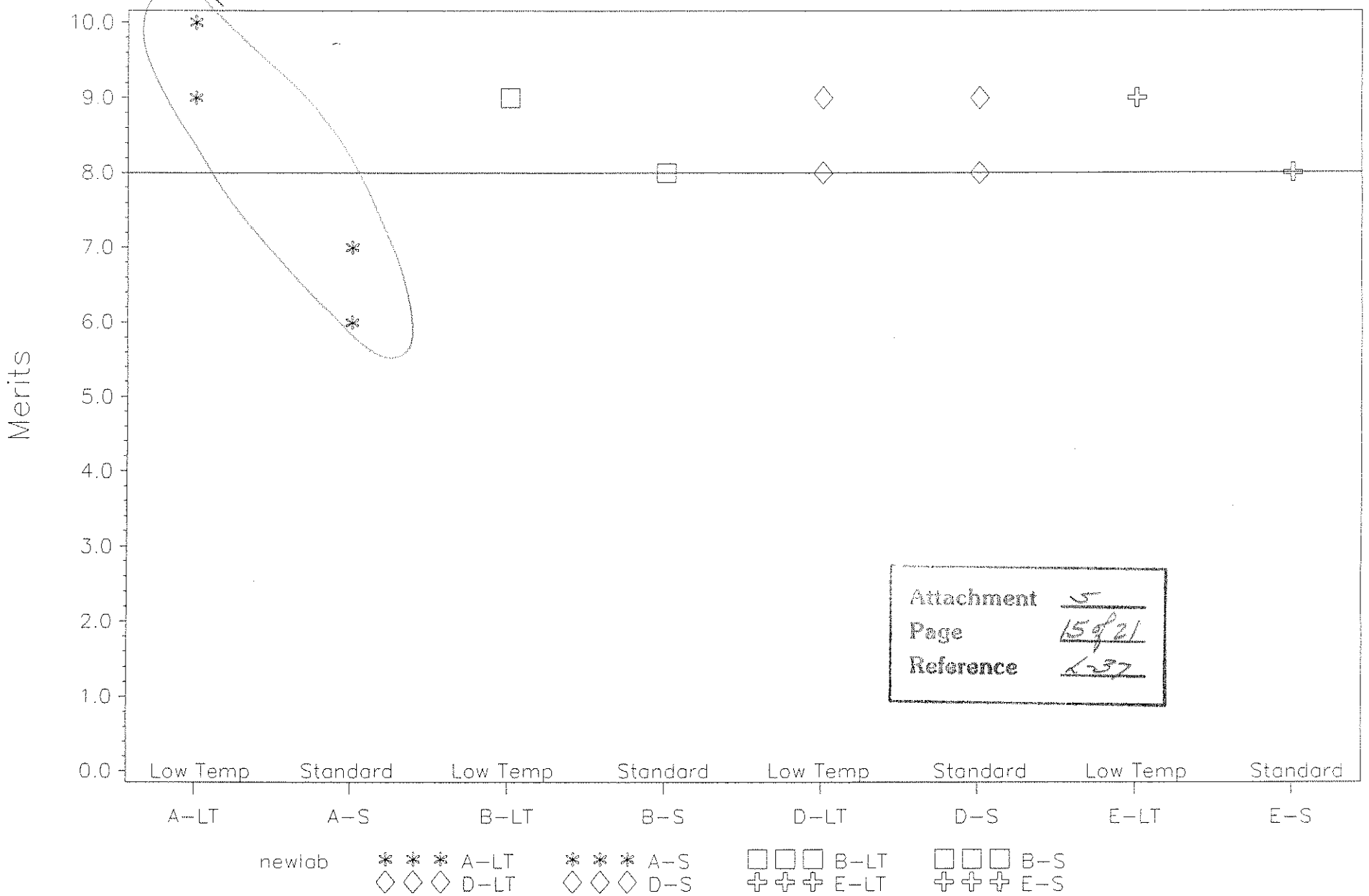
Reference Oil LT2-1
Pinion Batch V1L686



L-37 Reference Oil Performance by LTMSLAB

Rippling – LUBRITED

Reference Oil LT2-1
Pinion Batch V1L686



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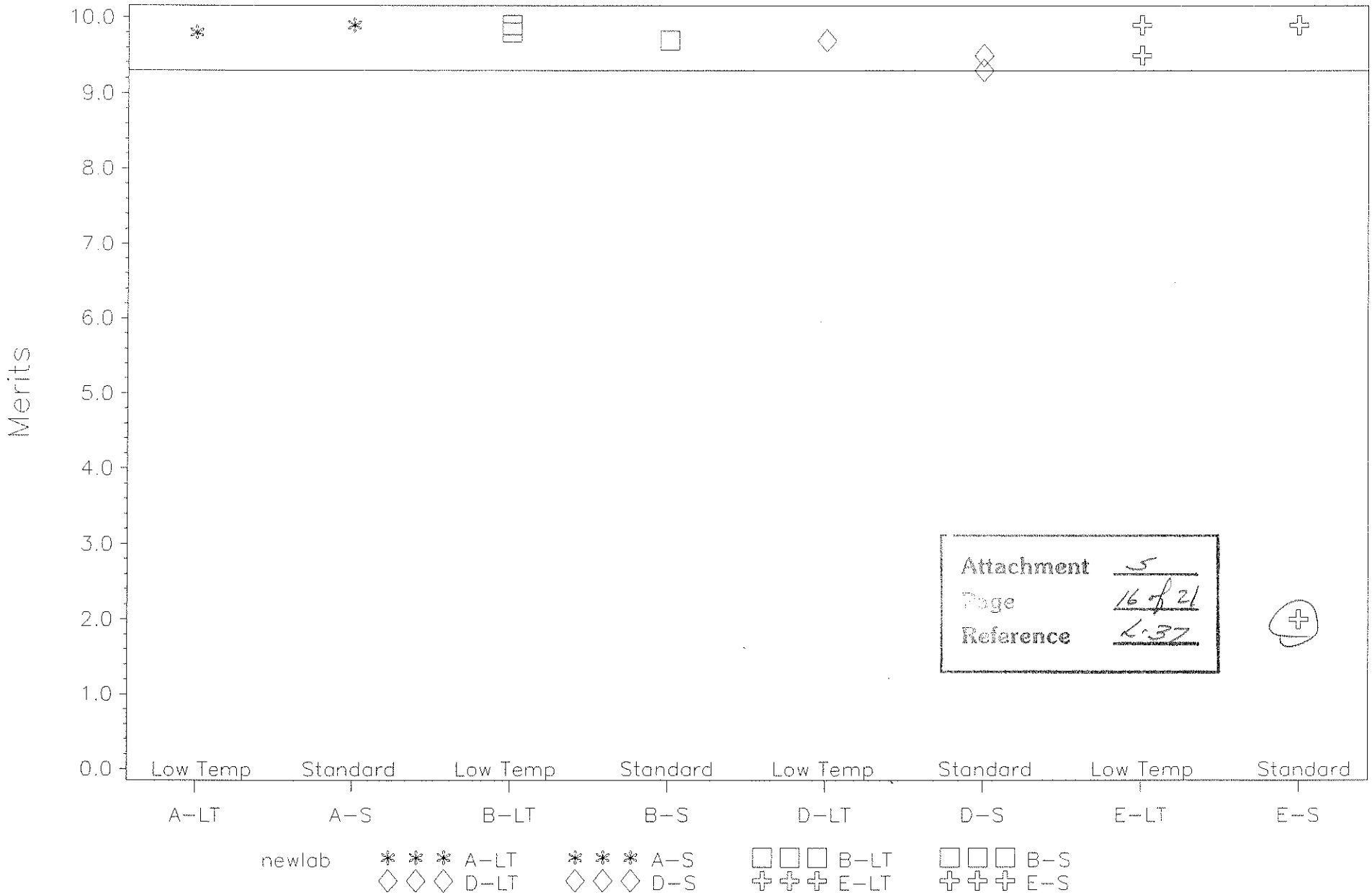
L-37 Reference Oil Performance by LTMSLAB

Spitting – LUBRITED

Reference Oil LT2-1
Pinion Batch V1L686



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NO CF STD + L.T. LT1-1 & LT2-1

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52395	B	LT1-1	V1L686	P4L626A	20040707	3	Standard	
52404	E	LT1-1	V1L686	P4L626A	20040726	4	Lowtemp	
52409	E	LT2-1	V1L686	P4L626A	20040721	4	Lowtemp	
52093	B	LT1-1	V1L686	P4L626A	20040703	4	Lowtemp	
52107	A	LT2-1	V1L686	P4L626A	20040709	4	Lowtemp	
52108	A	LT2-1	V1L686	P4L626A	20040710	4	Lowtemp	
52098	E	LT1-1	V1L686	P4L626A	20040718	5	Standard	26/32 = 81.3%
52089	D	LT2-1	V1L686	P4L626A	20040714	5	Lowtemp	
52388	A	LT1-1	V1L686	P4L626A	20040715	6	Lowtemp	
52384	A	LT1-1	V1L686	P4L626A	20040702	6	Lowtemp	
52421	D	LT2-1	V1L686	P4L626A	20040727	6	Standard	
52399	B	LT2-1	V1L686	P4L626A	20040710	6	Standard	
52400	B	LT2-1	V1L686	P4L626A	20040711	6	Standard	
52097	E	LT1-1	V1L686	P4L626	20040714	6	Lowtemp	24/32 = 75.0%
52090	D	LT2-1	V1L686	P4L626A	20040715	6	Standard	
52087	D	LT1-1	V1L686	P4L626A	20040703	6	Lowtemp	
52420	D	LT2-1	V1L686	P4L626A	20040718	6	Lowtemp	CF .5878
52415	D	LT1-1	V1L686	P4L626A	20040713	6	Standard	
52088	D	LT1-1	V1L686	P4L626A	20040704	6	Lowtemp	
52416	D	LT1-1	V1L686	P4L626A	20040723	6	Standard	
52386	A	LT1-1	V1L686	P4L626A	20040713	7	Standard	
52385	A	LT1-1	V1L686	P4L626A	20040707	7	Standard	
52390	A	LT2-1	V1L686	P4L626A	20040712	7	Standard	
52099	E	LT1-1	V1L686	P4L626A	20040725	7	Standard	12/32 = 37.5%
52411	E	LT2-1	V1L686	P4L626A	20040723	7	Standard	
52394	B	LT1-1	V1L686	P4L626A	20040705	7	Standard	
52096	B	LT2-1	V1L686	P4L626A	20040708	7	Lowtemp	
52092	B	LT1-1	V1L686	P4L626A	20040702	7	Lowtemp	
52389	A	LT2-1	V1L686	P4L626A	20040711	8	Standard	
52401	B	LT2-1	V1L686	P4L626A	20040712	8	Lowtemp	4/32 = 12.5%
52102	E	LT2-1	V1L686	P4L626A	20040720	8	Lowtemp	
52410	E	LT2-1	V1L686	P4L626A	20040722	8	Standard	

+ 3 INVALIDS W/ BROKEN TEETH
1 INVALID D.A. WHEEL SPEED

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NO CF & STD

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52395	B	LT1-1	V1L686	P4L626A	20040707	3	Standard	
52098	E	LT1-1	V1L686	P4L626A	20040718	5	Standard	15/16 = 93.8%
52421	D	LT2-1	V1L686	P4L626A	20040727	6	Standard	
52399	B	LT2-1	V1L686	P4L626A	20040710	6	Standard	
52400	B	LT2-1	V1L686	P4L626A	20040711	6	Standard	14/16 = 87.5%
52090	D	LT2-1	V1L686	P4L626A	20040715	6	Standard	
52415	D	LT1-1	V1L686	P4L626A	20040713	6	Standard	
52416	D	LT1-1	V1L686	P4L626A	20040723	6	Standard	
52386	A	LT1-1	V1L686	P4L626A	20040713	7	Standard	
52385	A	LT1-1	V1L686	P4L626A	20040707	7	Standard	
52390	A	LT2-1	V1L686	P4L626A	20040712	7	Standard	8/16 = 50%
52099	E	LT1-1	V1L686	P4L626A	20040725	7	Standard	
52411	E	LT2-1	V1L686	P4L626A	20040723	7	Standard	
52394	B	LT1-1	V1L686	P4L626A	20040705	7	Standard	
52389	A	LT2-1	V1L686	P4L626A	20040711	8	Standard	2/16 = 12.5%
52410	E	LT2-1	V1L686	P4L626A	20040722	8	Standard	

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NO OF 4 C.T. LT1-1 LT2-1

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52404	E	LT1-1	V1L686	P4L626A	20040726	4	Lowtemp	
52409	E	LT2-1	V1L686	P4L626A	20040721	4	Lowtemp	
52093	B	LT1-1	V1L686	P4L626A	20040703	4	Lowtemp	16/16 = 100%
52107	A	LT2-1	V1L686	P4L626A	20040709	4	Lowtemp	
52108	A	LT2-1	V1L686	P4L626A	20040710	4	Lowtemp	
52089	D	LT2-1	V1L686	P4L626A	20040714	5	Lowtemp	11/16 = 68.8%
52388	A	LT1-1	V1L686	P4L626A	20040715	6	Lowtemp	
52384	A	LT1-1	V1L686	P4L626A	20040702	6	Lowtemp	
52097	E	LT1-1	V1L686	P4L626	20040714	6	Lowtemp	10/16 = 62.5%
52087	D	LT1-1	V1L686	P4L626A	20040703	6	Lowtemp	
52420	D	LT2-1	V1L686	P4L626A	20040718	6	Lowtemp	
52088	D	LT1-1	V1L686	P4L626A	20040704	6	Lowtemp	
52096	B	LT2-1	V1L686	P4L626A	20040708	7	Lowtemp	4/16 = 25%
52092	B	LT1-1	V1L686	P4L626A	20040702	7	Lowtemp	
52401	B	LT2-1	V1L686	P4L626A	20040712	8	Lowtemp	2/16 = 12.5%
52102	E	LT2-1	V1L686	P4L626A	20040720	8	Lowtemp	

shows need for separate O.F.

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TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	NO CF # 151 LT1-1 LT2-2 STD
52395	B	LT1-1	V1L686	P4L626A	20040707	3	Standard	
42494	B	151-3	V1L686	P4L626A	20020802	3	Standard	
37230	A	151-3	V1L686	P4L626A	20000808	5	Standard	
37238	D	151-3	V1L686	P4L626A	20000715	5	Standard	
52098	E	LT1-1	V1L686	P4L626A	20040718	5	Standard	37/39 = 94.9%
49045	B	151-3	V1L686	P4L626A	20040211	5	Standard	
39375	D	151-3	V1L686	P4L626A	20011215	5	Standard	
37581	E	151-3	V1L686	P4L626A	20010731	6	Standard	
52421	D	LT2-1	V1L686	P4L626A	20040727	6	Standard	
52399	B	LT2-1	V1L686	P4L626A	20040710	6	Standard	
52400	B	LT2-1	V1L686	P4L626A	20040711	6	Standard	
49048	B	151-3	V1L686	P4L626A	20040214	6	Standard	
46082	B	151-3	V1L686	P4L626A	20030625	6	Standard	
46788	E	151-3	V1L686	P4L626A	20030319	6	Standard	32/39 = 82.1%
37940	B	151-3	V1L686	P4L626A	20010619	6	Standard	
52090	D	LT2-1	V1L686	P4L626A	20040715	6	Standard	
37942	B	151-3	V1L686	P4L626A	20020130	6	Standard	
52415	D	LT1-1	V1L686	P4L626A	20040713	6	Standard	
42497	B	151-3	V1L686	P4L626A	20020807	6	Standard	
52416	D	LT1-1	V1L686	P4L626A	20040723	6	Standard	
37239	D	151-3	V1L686	P4L626A	20000716	7	Standard	
42482	D	151-3	V1L686	P4L626A	20020820	7	Standard	
37225	B	151-3	V1L686	P4L626A	20000727	7	Standard	
46785	D	151-3	V1L686	P4L626A	20030514	7	Standard	
52386	A	LT1-1	V1L686	P4L626A	20040713	7	Standard	
52385	A	LT1-1	V1L686	P4L626A	20040707	7	Standard	19/39 = 48.7%
52390	A	LT2-1	V1L686	P4L626A	20040712	7	Standard	
52099	E	LT1-1	V1L686	P4L626A	20040725	7	Standard	
52411	E	LT2-1	V1L686	P4L626A	20040723	7	Standard	
46800	A	151-3	V1L686	P4L626A	20040130	7	Standard	
52394	B	LT1-1	V1L686	P4L626A	20040705	7	Standard	
37584	E	151-3	V1L686	P4L626A	20020517	7	Standard	
42481	A	151-3	V1L686	P4L626A	20030508	8	Standard	
37235	E	151-3	V1L686	P4L626A	20000808	8	Standard	
37226	B	151-3	V1L686	P4L626A	20000728	8	Standard	
52389	A	LT2-1	V1L686	P4L626A	20040711	8	Standard	7/39 = 17.9%
51845	B	151-3	V1L686	P4L626A	20040722	8	Standard	
52410	E	LT2-1	V1L686	P4L626A	20040722	8	Standard	
49499	D	151-3	V1L686	P4L626A	20031016	8	Standard	

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NO CF ALL

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52395	B	LT1-1	V1L686	P4L626A	20040707	3	Standard	
42494	B	151-3	V1L686	P4L626A	20020802	3	Standard	
52404	E	LT1-1	V1L686	P4L626A	20040726	4	Lowtemp	
52409	E	LT2-1	V1L686	P4L626A	20040721	4	Lowtemp	
52093	B	LT1-1	V1L686	P4L626A	20040703	4	Lowtemp	
52107	A	LT2-1	V1L686	P4L626A	20040709	4	Lowtemp	
52108	A	LT2-1	V1L686	P4L626A	20040710	4	Lowtemp	
37230	A	151-3	V1L686	P4L626A	20000808	5	Standard	
37238	D	151-3	V1L686	P4L626A	20000715	5	Standard	
52098	E	LT1-1	V1L686	P4L626A	20040718	5	Standard	48/55 = 87.3%
49045	B	151-3	V1L686	P4L626A	20040211	5	Standard	
39375	D	151-3	V1L686	P4L626A	20011215	5	Standard	
52089	D	LT2-1	V1L686	P4L626A	20040714	5	Lowtemp	
37581	E	151-3	V1L686	P4L626A	20010731	6	Standard	
52388	A	LT1-1	V1L686	P4L626A	20040715	6	Lowtemp	
52384	A	LT1-1	V1L686	P4L626A	20040702	6	Lowtemp	
52421	D	LT2-1	V1L686	P4L626A	20040727	6	Standard	
52399	B	LT2-1	V1L686	P4L626A	20040710	6	Standard	
52400	B	LT2-1	V1L686	P4L626A	20040711	6	Standard	
49048	B	151-3	V1L686	P4L626A	20040214	6	Standard	
46082	B	151-3	V1L686	P4L626A	20030625	6	Standard	
52097	E	LT1-1	V1L686	P4L626	20040714	6	Lowtemp	42/55 = 76.4%
46788	E	151-3	V1L686	P4L626A	20030319	6	Standard	
37940	B	151-3	V1L686	P4L626A	20010619	6	Standard	
52090	D	LT2-1	V1L686	P4L626A	20040715	6	Standard	
37942	B	151-3	V1L686	P4L626A	20020130	6	Standard	
52087	D	LT1-1	V1L686	P4L626A	20040703	6	Lowtemp	
52420	D	LT2-1	V1L686	P4L626A	20040718	6	Lowtemp	
52415	D	LT1-1	V1L686	P4L626A	20040713	6	Standard	
52088	D	LT1-1	V1L686	P4L626A	20040704	6	Lowtemp	
42497	B	151-3	V1L686	P4L626A	20020807	6	Standard	
52416	D	LT1-1	V1L686	P4L626A	20040723	6	Standard	
37239	D	151-3	V1L686	P4L626A	20000716	7	Standard	
42482	D	151-3	V1L686	P4L626A	20020820	7	Standard	
37225	B	151-3	V1L686	P4L626A	20000727	7	Standard	
46785	D	151-3	V1L686	P4L626A	20030514	7	Standard	
52386	A	LT1-1	V1L686	P4L626A	20040713	7	Standard	
52385	A	LT1-1	V1L686	P4L626A	20040707	7	Standard	
52390	A	LT2-1	V1L686	P4L626A	20040712	7	Standard	23/55 = 41.8%
52099	E	LT1-1	V1L686	P4L626A	20040725	7	Standard	
52411	E	LT2-1	V1L686	P4L626A	20040723	7	Standard	
46800	A	151-3	V1L686	P4L626A	20040130	7	Standard	
52394	B	LT1-1	V1L686	P4L626A	20040705	7	Standard	
52096	B	LT2-1	V1L686	P4L626A	20040708	7	Lowtemp	
52092	B	LT1-1	V1L686	P4L626A	20040702	7	Lowtemp	
37584	E	151-3	V1L686	P4L626A	20020517	7	Standard	
42481	A	151-3	V1L686	P4L626A	20030508	8	Standard	
37235	E	151-3	V1L686	P4L626A	20000808	8	Standard	
37226	B	151-3	V1L686	P4L626A	20000728	8	Standard	
52389	A	LT2-1	V1L686	P4L626A	20040711	8	Standard	
52401	B	LT2-1	V1L686	P4L626A	20040712	8	Lowtemp	9/55 = 16.4%
51845	B	151-3	V1L686	P4L626A	20040722	8	Standard	
52102	E	LT2-1	V1L686	P4L626A	20040720	8	Lowtemp	
52410	E	LT2-1	V1L686	P4L626A	20040722	8	Standard	
49499	D	151-3	V1L686	P4L626A	20031016	8	Standard	

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LRI 132

Warrrendale, PA August 26, 2004

Data Rounding

ExxonMobil Chemical

Background:

A good many of the specification requirements in SAE 2360 are expressed in limits with less precision than the results from the relevant tests.

Examples:

		Limit	Test Result
L-33-1			
	Merit Rating[1]	>= 9.0	x.yy
L-60-1			
	KV Increase	<= 100%	xx.yy
	Carbon/Varnish	>= 7.5	x.yy
	Sludge	>= 9.4	x.yy
	Toluene Insol	<= 3%	x.yy
	Pentane Insol	<= 2%	x.yy
L-37			
	Ridging[2]	8	x.y

[1] With additional caviats
[2] For V1L686/P4L626A lubrited gear batch

Attachment 7
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Reference L-37

There is currently no guidance within SAE2360 procedures and the specification document as to how (if allowed) to round off candidate data. We believe that rounding off data in programs has been accepted by the LRI, but not universally.

EXXONMOBIL PROPOSAL

To give clear guidance to all current and future SAE 2360 program presenters, we are requesting that the PRI issue an information letter that specifies the use of rounding where test result precision is greater than the corresponding limit and reference ASTM Standard Practice E 29 –02 for the methodology.

Example Language could actually be pulled from E 29 in 6.3.2:

The following applies to all specifies limits in this standard: For the purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded "to the nearest unit" in the last right –hand digit used in the expressing the specification limit, in accordance with the rounding method ASTM Standard Practice E 29, for Using Significant Digits in Test Data to Determine Conformance with Specifications.

LUBRIZOL

Ridging Results Using V1L686/P4L626A Lubrited Hardware

- V1L686/P4L626A lubrited hardware produces very severe results on ridging
  - Pass rate on high-performing oils drops from 96% to 29%
    - High-performing oils are
      - TMC 129 – The historic "good" reference oil in the L-37 test
      - TMC 151 – The industry's Category Reference Oil, which replaces TMC 129
- A Correction Factor was implemented in an effort to address this hardware-related offset in test severity
- The effectiveness of this Correction Factor is tied to the use of ASTM rounding of the test results
  - Pass rate increases to 50% if Correction Factor, but not ASTM rounding, is used
    - Improvement in pass rate, but still unacceptably low
  - Pass rate increases to 79% if ASTM rounding is used

Attachment 6
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Reference L-37

LUBRIZOL

Pass Rate for Pinion Ridging Using Lubrited Hardware

Oil	Pass Rate using Previous Hardware *	Pass Rate Using V1L686/P4L626A Hardware		
		Using Original Rating	Using Correction Factor but Not Rounding	Using Correction Factor and Rounding
TMC 129	93%	67%	67%	100%
TMC 151	100%	22%	47%	75%
TMC 129 plus TMC 151	96%	29%	50%	79%

* Previous hardware = all hardware other than V1L686/P4L626A

Above information based upon use of all data in the TMC database as of 9/11/2002

Attachment 6
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Reference L-37

LUBRIZOL

Ridging Results Using V1L686/P4L626A Lubrited Hardware

- Comments/Conclusions
  - The use of ASTM rounding is a commonly-accepted practice
    - Used in the ASTM L-60-1 and L-33-1 tests
    - Used in numerous crankcase engine oil tests
  - In the current case, the use of a Correction Factor is of limited value without the use of ASTM rounding
  - The use of a Correction Factor in combination with ASTM rounding was a conservative approach to addressing this hardware-related severity problem
    - The pass rate was improved, but still not returned to historic levels
  - This batch of hardware is not usable without the use of a Correction Factor in combination with the use of ASTM rounding
    - Similar situation may be encountered with future batches of hardware

Attachment 6
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Reference L-37

➢ 2004 Non-Lubrited Axle Batch Order

✓ Purchase Orders Tendered – Two Year Order

- Ethyl - 300
- Lubrizol - 240
- Parc - 0
- SwRI - 225

Totals - 765

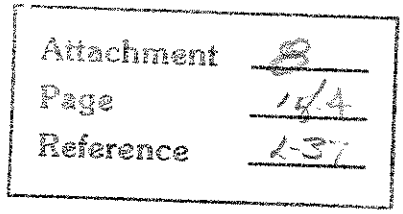
✓ Lab Hardware TF did visit the Ft Wayne facilities prior to production in July.

- Hardware will have the same gear geometry development as the T758A/L247 lubrited hardware.

- Hardware Gear Batch Code is:
  - Pinion V1L351
  - Ring P4T771

- Shortage of axles is approximately 19 % due to Ft. Wayne development learning curve. Lab final distribution determined after final build out count and a percent of actual order.

- With respect to protecting the axle from rusting, as before, Dana is performing a final rinse that will serve as a flash rust preventative coating that will work for a short period of time. No other coatings were applied due to industry concerns.



➢ **2004 Non-Lubrited Axle Batch Order – Dana Update Ken Okamuro/Ken Miller**

- Kenny Miller and I observed the first axles being built. What was very noticeable was that due to minimum lapping to preserve the tool marks, the contact patterns are not as filled in under the light test load we use at assembly.

- When you see the pattern, it may look narrow and have the appearance of bias. In fact, under slightly higher load it will fill out. The V&H check of the pattern confirms it does not have bias. At assembly, they will judge the pattern with the following criteria:

  1) If the solid contact line is longer at the top than the bottom, the pattern is slightly flanked out (F+1).

  2) If the solid contact line is the same length top and bottom, the pattern is centered (F0).

  3) If the solid contact line is longer at the bottom than the top, the pattern is slightly flanked in (F-1).

- The axles are stamped with Julian date, year, and shift on the housing cover flange just above the axle tube. There is a second date stamp on the flange from our supplier that is the date the housing was machined. **You do not want to use this date**. Ken indicated that a second shift individual did not follow that instruction on 70 axles assembled and the date will not be in that location. The issue for subsequent builds has been corrected. This really should not be an issue since the date is still there, just in a different location on the 70 axles.

- **2004 Non-Lubrited Axle Batch Order – Dana Update Ken Okamuro/Ken Miller**

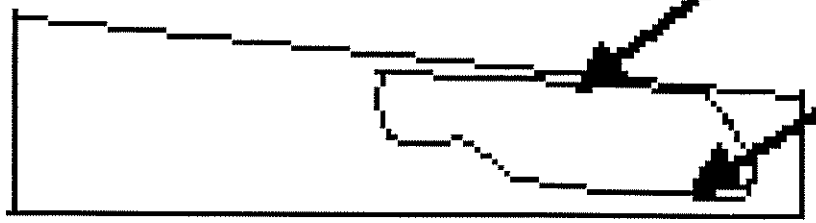
  - On another question from Ken, he asks, If a rust preventative is going to be necessary on future hardware, has the Panel studied the effect of long-term storage from these preservatives? While they may not be chemically active on steel, are there other considerations like oxidation, evaporation, hardening, hydrolytic tendency, protection period, etc. It might be worthwhile to test this now and have an answer for the next hardware run.

  - As of Friday, August 20th, we have had no problems with the ring and pinion sets or the carriers. The patterns are very consistent, 90% are an L2F0. We are about 1/2 way through the build and will continue on Saturday. It looks like we will be able to ship mid-end next week. Bill Ramsey will give you the date and quantity being shipped to the labs.

  ✓ Matrix Testing - One phase only.

  - How many/what oils/when will Matrix testing start?

L2F+1



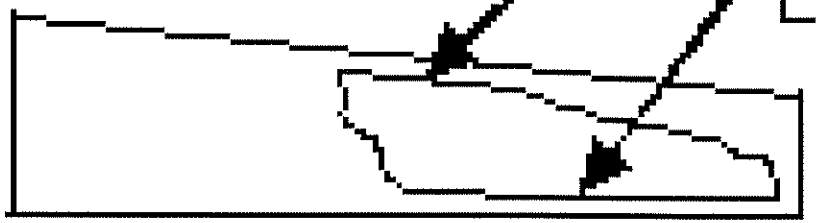
Longer line contact

Shorter line contact

L2F0

Equal length

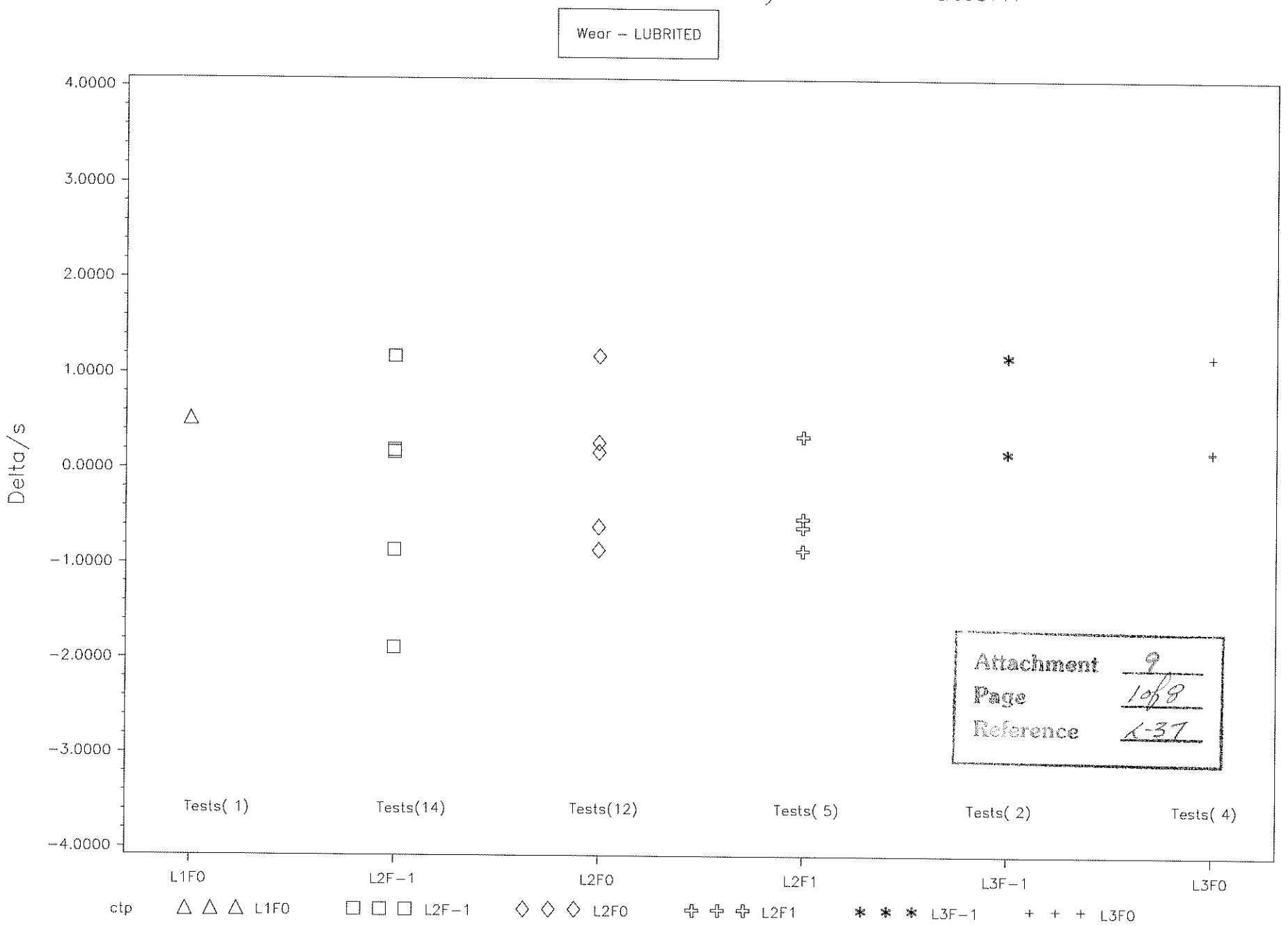
L2F-1



Short line contact

Longer line contact

L-37 Reference Oil Performance by Contact Pattern



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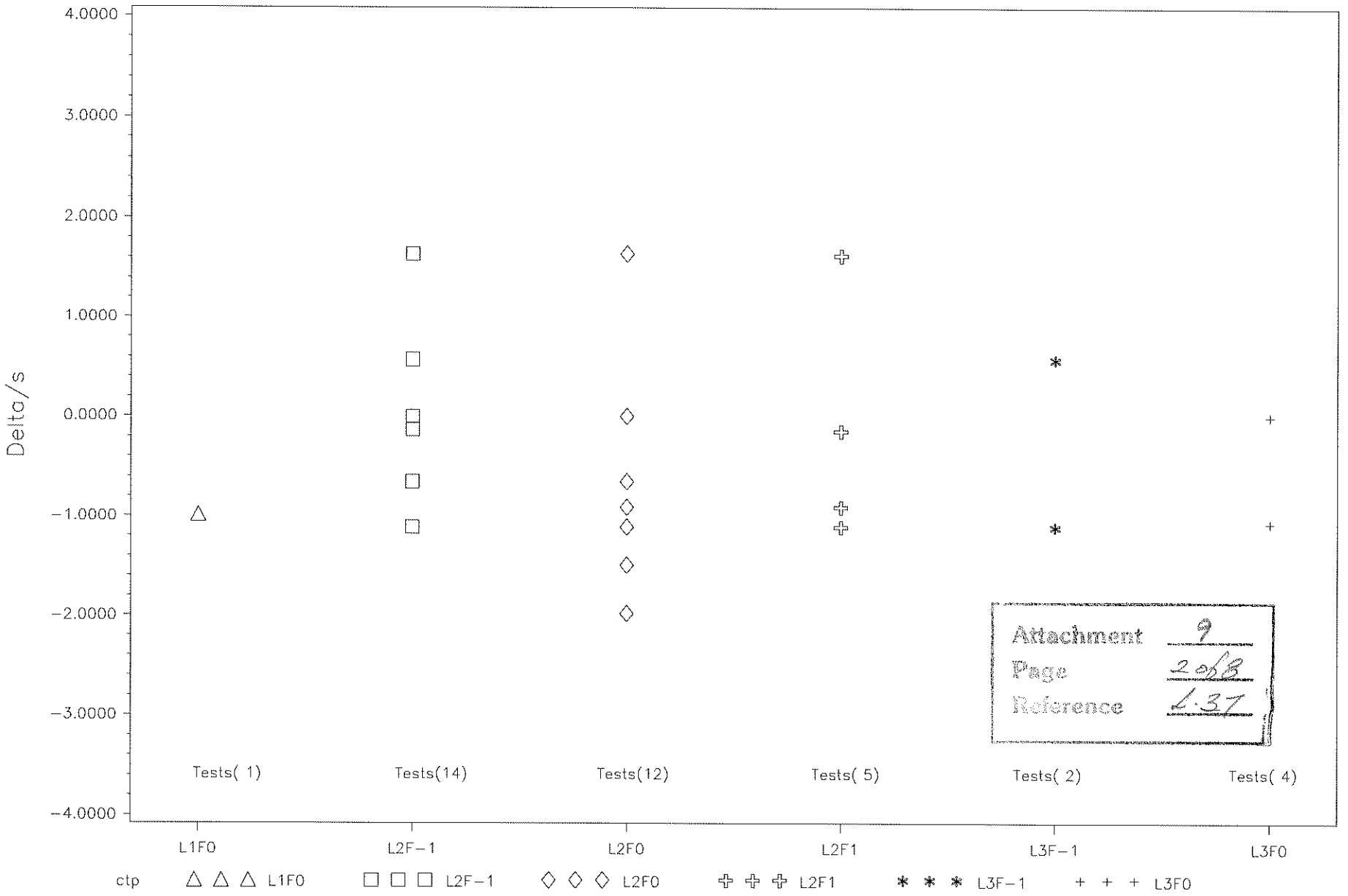
L-37 Reference Oil Performance by Contact Pattern

Rippling – LUBRITED



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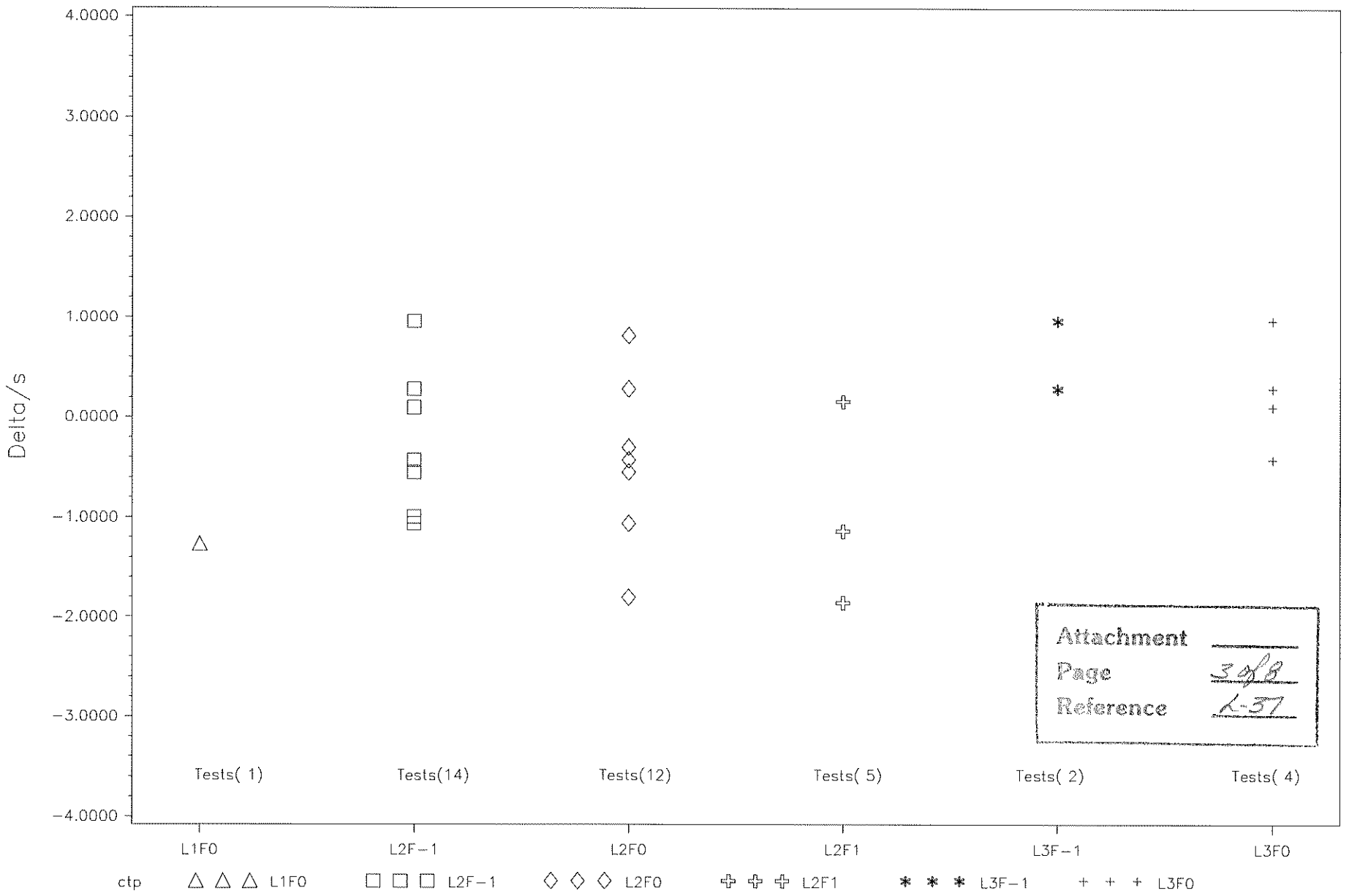
L-37 Reference Oil Performance by Contact Pattern

Ridging - LUBRITED



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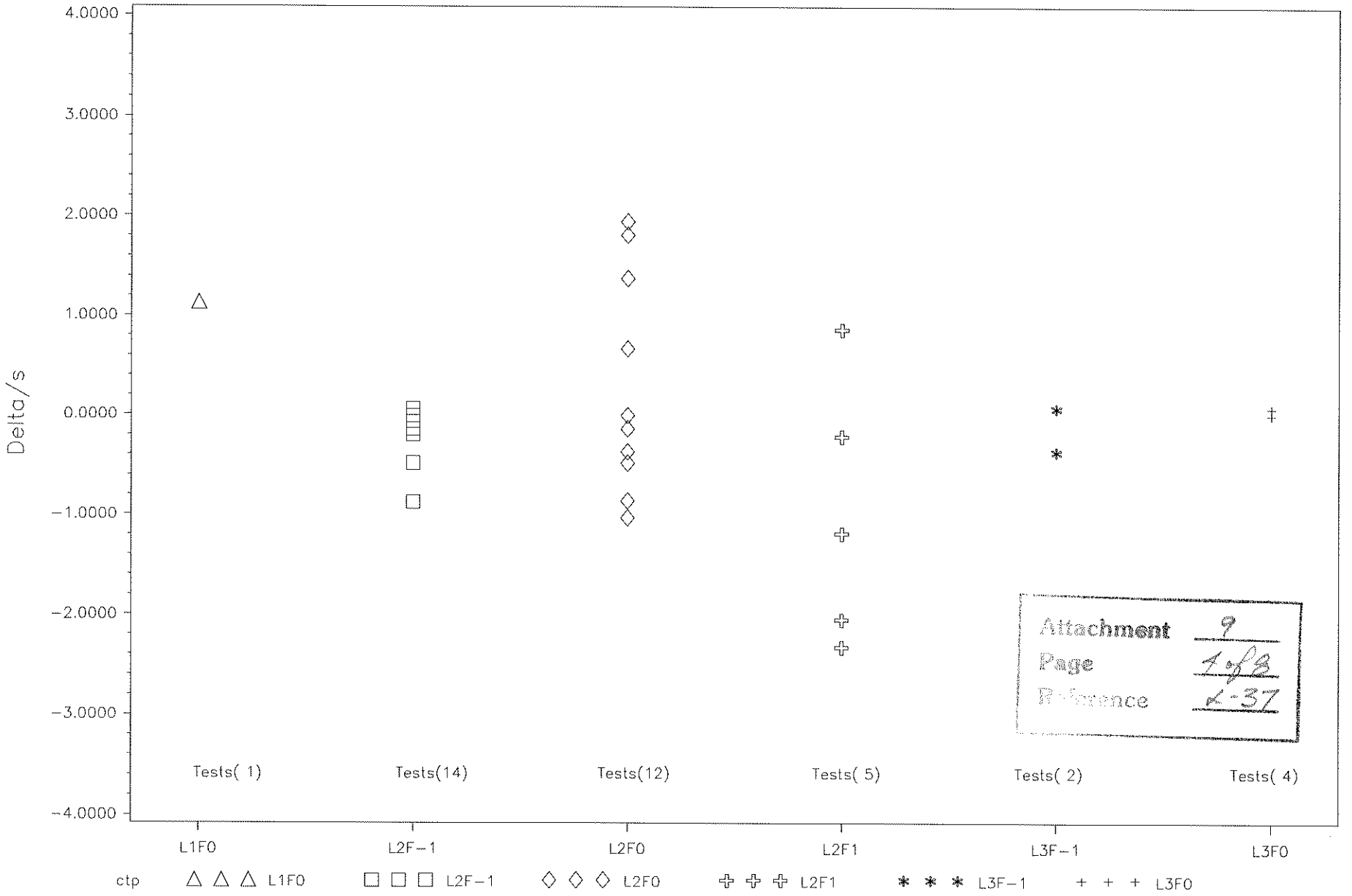
L-37 Reference Oil Performance by Contact Pattern

Spitting – LUBRITED



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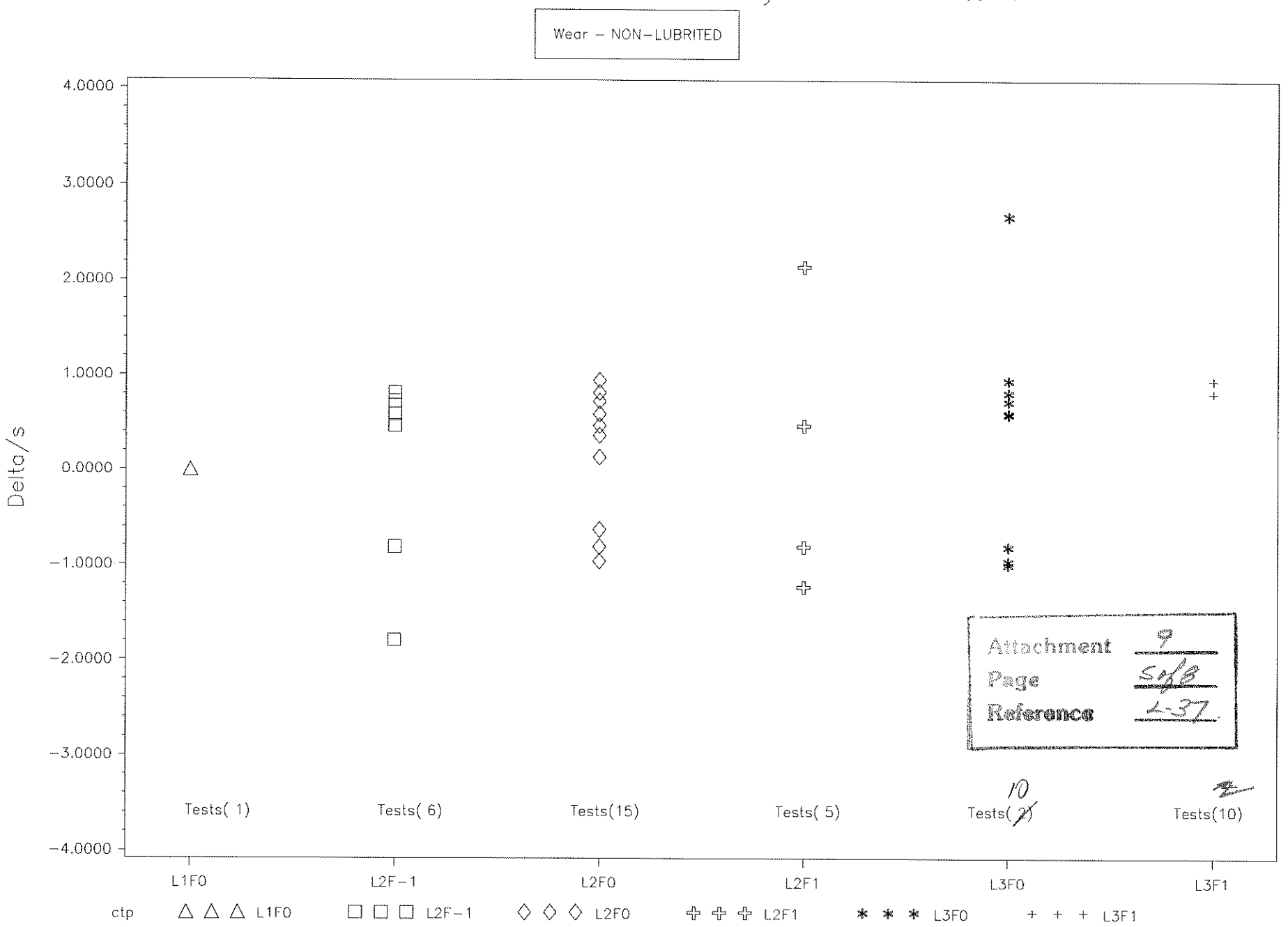
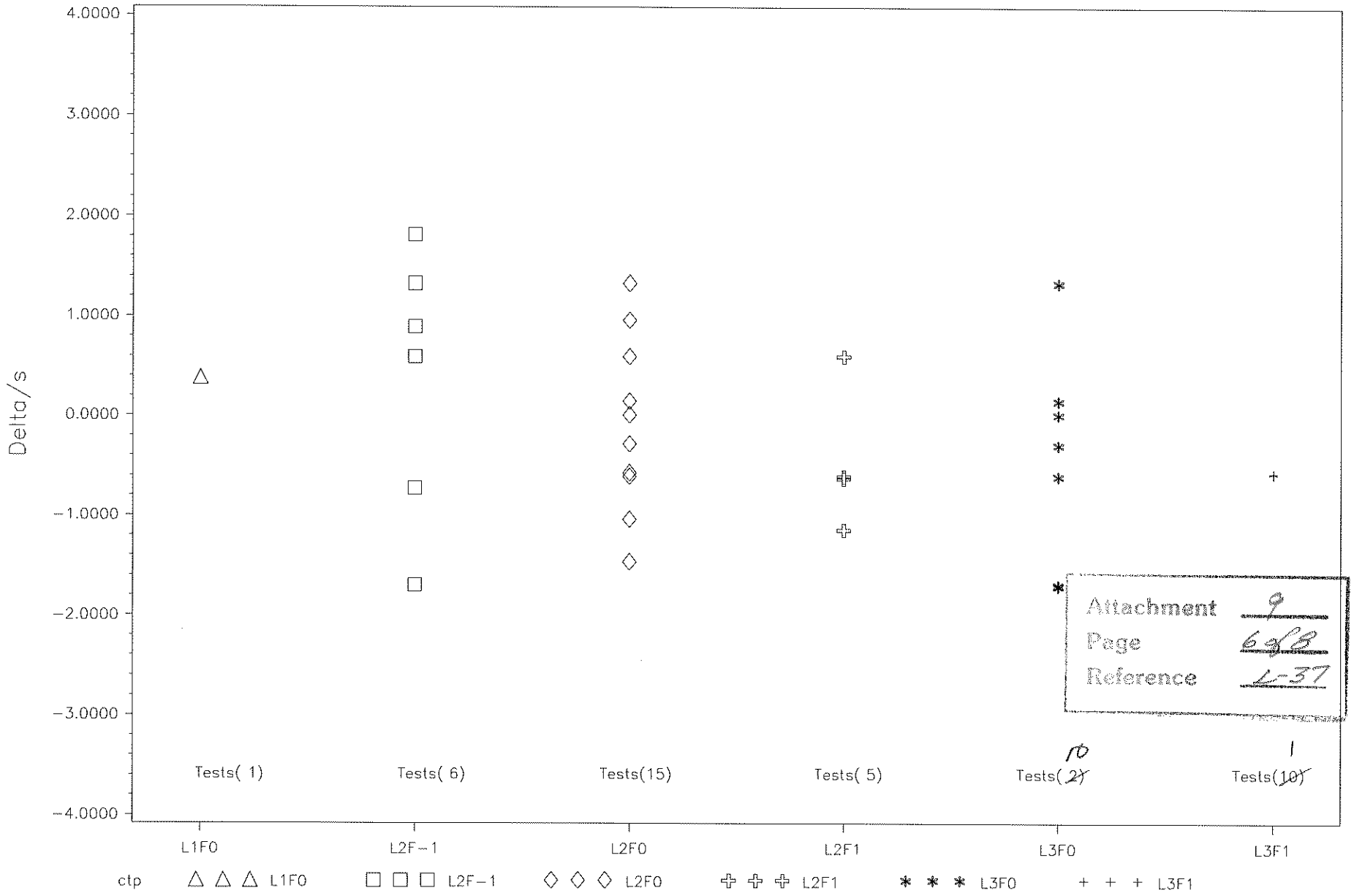
L-37 Reference Oil Performance by Contact Pattern



L-37 Reference Oil Performance by Contact Pattern

Rippling – NON-LUBRITED



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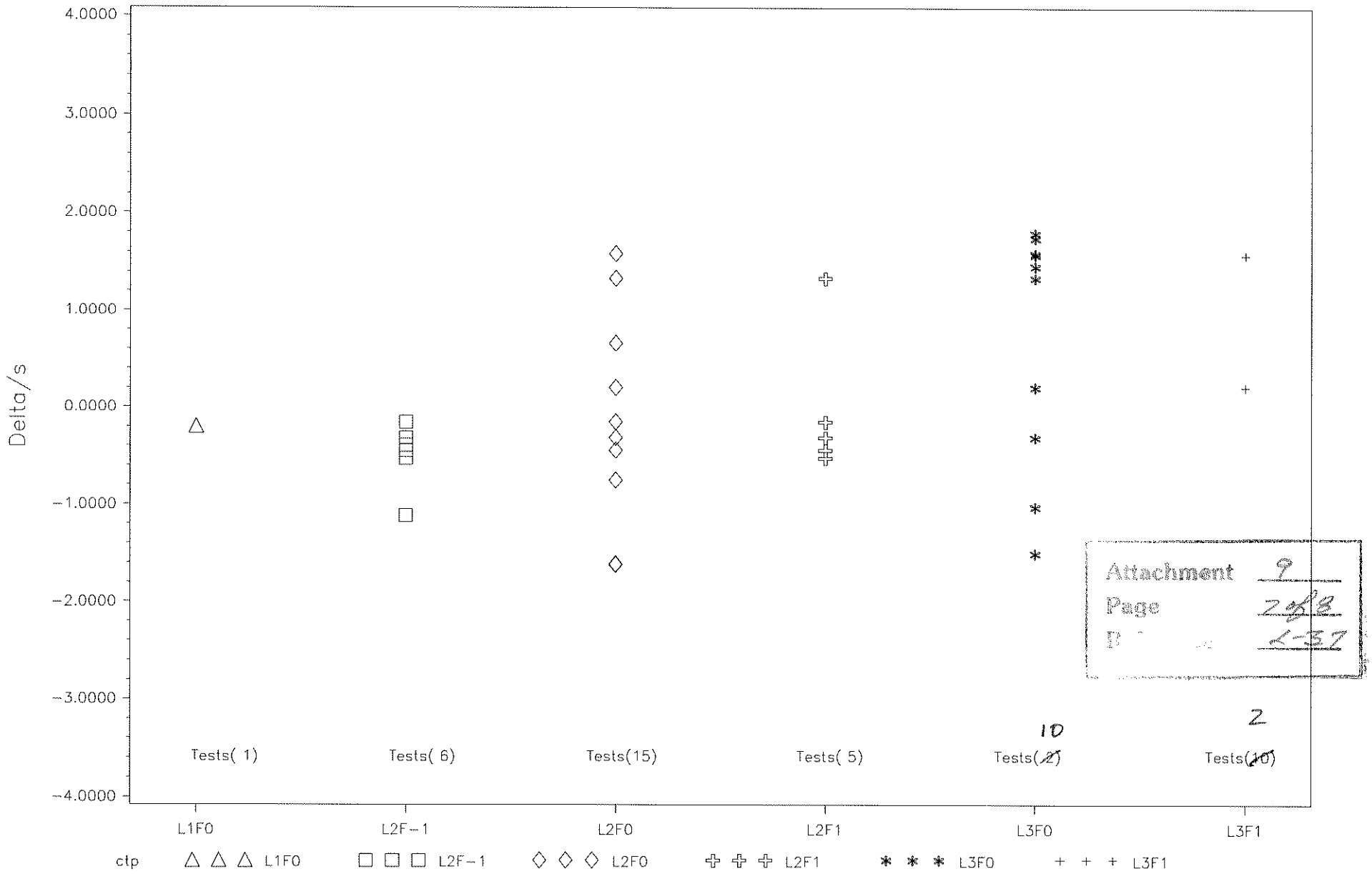
L-37 Reference Oil Performance by Contact Pattern

Ridging – NON-LUBRITED



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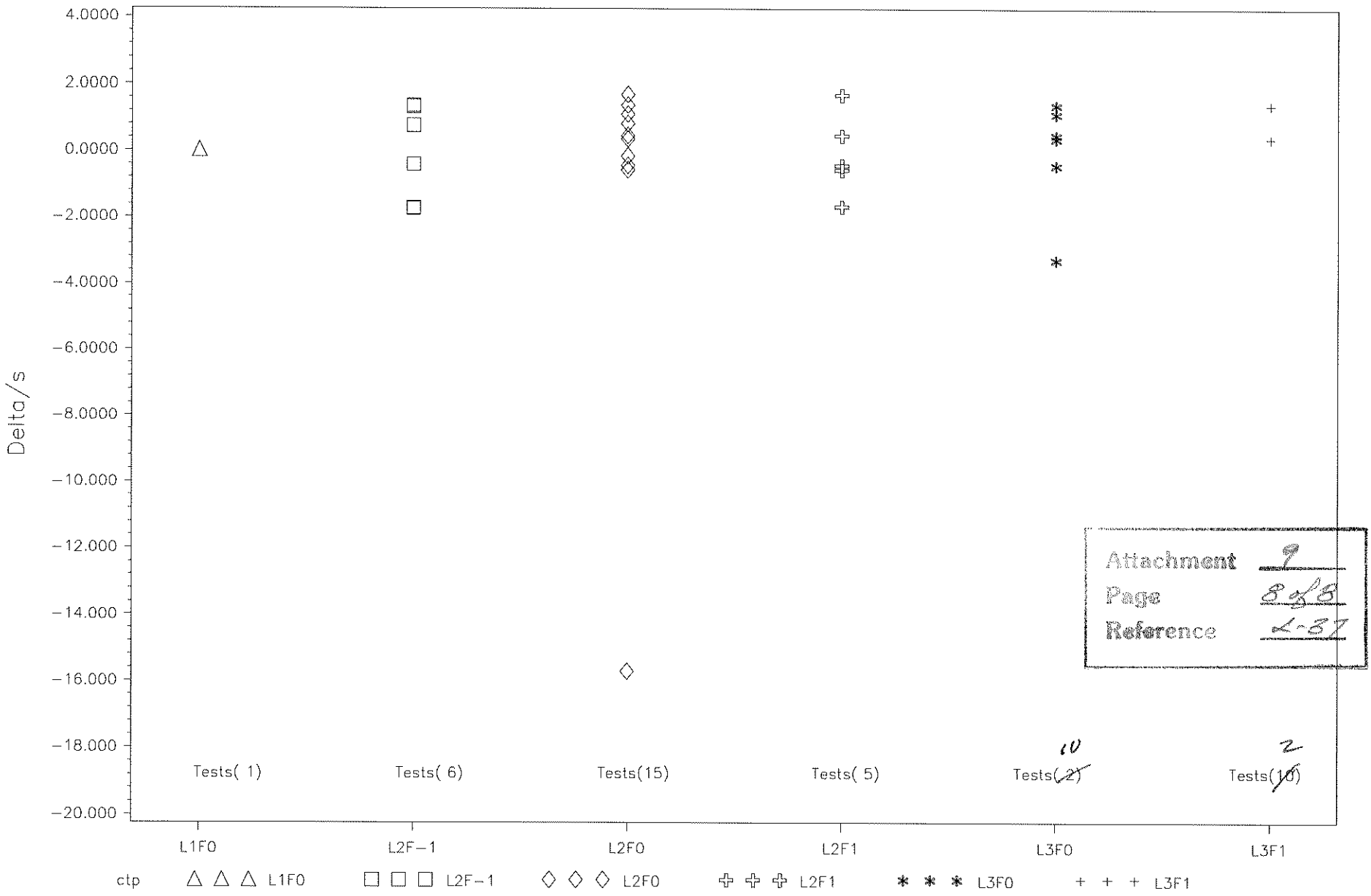
L-37 Reference Oil Performance by Contact Pattern

Spitting – NON-LUBRITED



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LRI 132

Warrrendale, PA August 26, 2004

ASTM D02.B03
L-37 Surveillance Panel

- Low Temp Test Activity Update
- Correction Factor Proposal

Low Temperature Test Activity

- Hardware and procedure updates defined and in place for both LT and RT variants

- Two new reference fluids (LT1, LT2) have been acquired and more is to be ordered. These new oils will be rolled into referencing system for both regular and low temperature procedures.

- An 8 test per oil, per procedure version, per lab has been run on TMC 151, LT1 and LT2[1] in the lubrited gear batch V1L686/P4L626A.

- An 8 test per oil, per procedure version, per lab has been scheduled

[1] TMC 151 was not run in the LT procedure, LT1 and LT2 were run in both.

Attachment 10
Page 25/11
Reference L-37

for TMC 151, LT1 and LT2 (and with TMC 127 discrimination tests) in the newest plain gear batch,now being shipped from Statesville.

- The SP plans to look at developing OEM lead consensus target performance values for the three oils (TMC 151, LT1, LT2) in each performance area (wear, rippling, ridging, and spitting). These targets will then be used to test the concept that each new gear batch will be qualified with matrix testing to develop CF's that bring each oil's tested performance value back to the target in each performance category.

- V1L686/P4L626A Test Matrix Summary

  - Data indicates that the two 75W oils react differently to the LT test. **The RT and LT tests do not give the same results.**

  - The previously developed correction factors for ridging in the RT procedure based on TMC 151 and TMC 128 data are appropriate also for L T1 and LT2.

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Reference	L-37

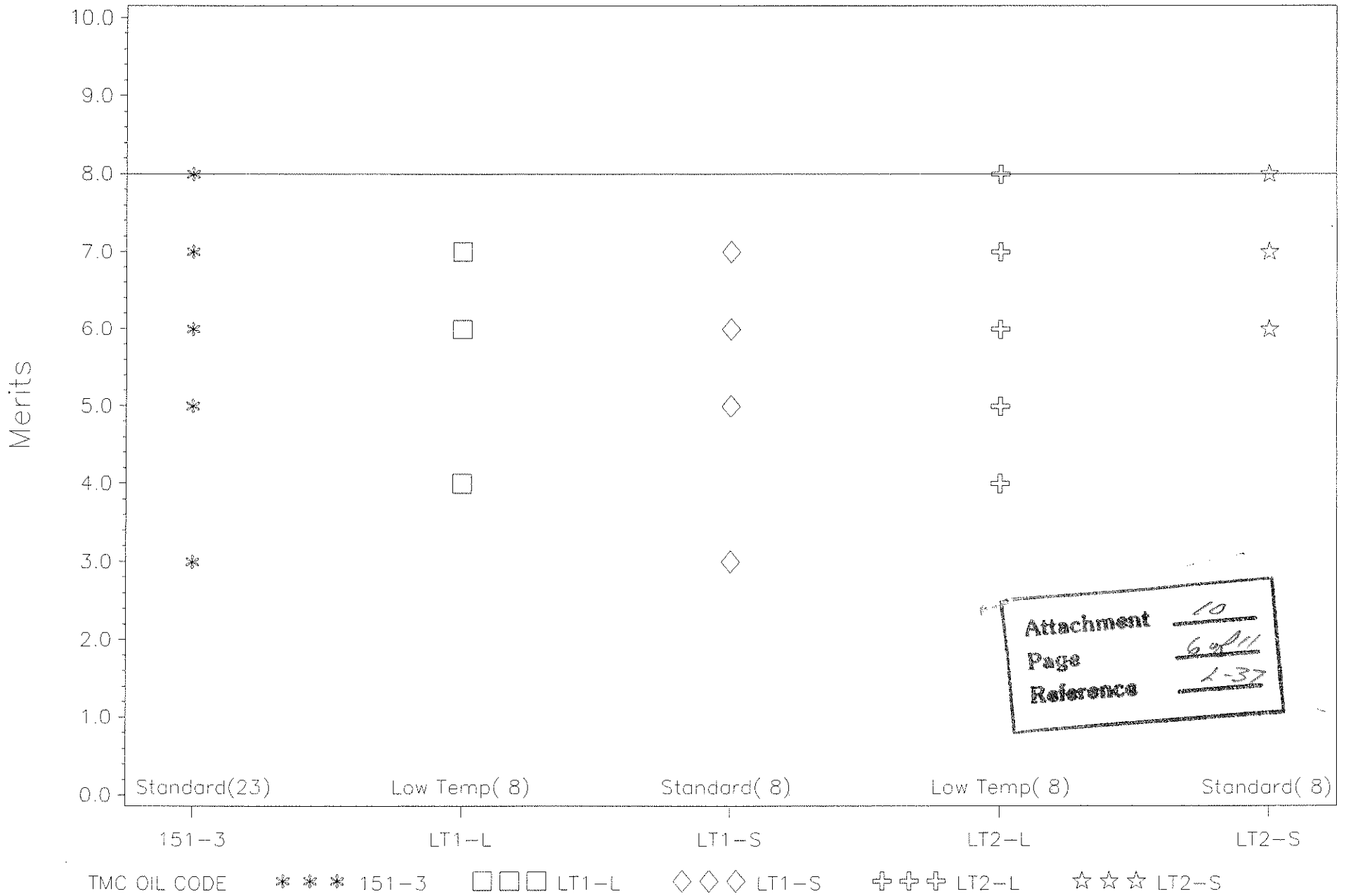
- The LT test data on LT1 and LT2 indicates that a new correction factor would be needed.
  - The correction factor is only needed for ridging.

Attachment	10
Page	5 & 11
Reference	L-37

L-37 Reference Oil Performance by Oil and Test Version

Ridging -- LUBRITED

Pinion Batch V1L686



Attachment 10
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Reference L-37

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52395	B	LT1-1	V1L686	P4L626A	20040707	3	Standard	
52098	E	LT1-1	V1L686	P4L626A	20040718	5	Standard	15/16 = 93.8%
52421	D	LT2-1	V1L686	P4L626A	20040727	6	Standard	
52399	B	LT2-1	V1L686	P4L626A	20040710	6	Standard	
52400	B	LT2-1	V1L686	P4L626A	20040711	6	Standard	14/16 = 87.5%
52090	D	LT2-1	V1L686	P4L626A	20040715	6	Standard	
52415	D	LT1-1	V1L686	P4L626A	20040713	6	Standard	
52416	D	LT1-1	V1L686	P4L626A	20040723	6	Standard	
52386	A	LT1-1	V1L686	P4L626A	20040713	7	Standard	
52385	A	LT1-1	V1L686	P4L626A	20040707	7	Standard	
52390	A	LT2-1	V1L686	P4L626A	20040712	7	Standard	8/16 = 50%
52099	E	LT1-1	V1L686	P4L626A	20040725	7	Standard	
52411	E	LT2-1	V1L686	P4L626A	20040723	7	Standard	
52394	B	LT1-1	V1L686	P4L626A	20040705	7	Standard	
52389	A	LT2-1	V1L686	P4L626A	20040711	8	Standard	2/16 = 12.5%
52410	E	LT2-1	V1L686	P4L626A	20040722	8	Standard	

Attachment 10
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Reference L-37

TESTKEY	LTMSLAB	IND	PINBAT	RINGBAT	DTCOMP	RIDG	Test Type	
52404	E	LT1-1	V1L686	P4L626A	20040726	4	Lowtemp	
52409	E	LT2-1	V1L686	P4L626A	20040721	4	Lowtemp	
52093	B	LT1-1	V1L686	P4L626A	20040703	4	Lowtemp	16/16 = 100%
52107	A	LT2-1	V1L686	P4L626A	20040709	4	Lowtemp	
52108	A	LT2-1	V1L686	P4L626A	20040710	4	Lowtemp	
52089	D	LT2-1	V1L686	P4L626A	20040714	5	Lowtemp	11/16 = 68.8%
52388	A	LT1-1	V1L686	P4L626A	20040715	6	Lowtemp	
52384	A	LT1-1	V1L686	P4L626A	20040702	6	Lowtemp	
52097	E	LT1-1	V1L686	P4L626	20040714	6	Lowtemp	10/16 = 62.5%
52087	D	LT1-1	V1L686	P4L626A	20040703	6	Lowtemp	
52420	D	LT2-1	V1L686	P4L626A	20040718	6	Lowtemp	
52088	D	LT1-1	V1L686	P4L626A	20040704	6	Lowtemp	
52096	B	LT2-1	V1L686	P4L626A	20040708	7	Lowtemp	4/16 = 25%
52092	B	LT1-1	V1L686	P4L626A	20040702	7	Lowtemp	
52401	B	LT2-1	V1L686	P4L626A	20040712	8	Lowtemp	2/16 = 12.5%
52102	E	LT2-1	V1L686	P4L626A	20040720	8	Lowtemp	

Attachment 10
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Reference L-37

ASTM D02.B03 Proposal to the LRI [2]

Base on the following performance expectation statement:

LT1-1 & LT2-1 performance level in the Canadian L-37 test should be such that the over-all pass rate range for the population of test results is between 75% and 90%.

Proposal:

Knowing that the SP has determined that ridging distress is the primary cause for failing to meet this current expectation, the SP proposes a correction factor for ridging (pinion and ring) of +0.6065 transformed units for low temperature L-37 tests using the V1L686/P4L626A gear set. Using this correction factor in

[2] Specific for V1L686/P4L626A lubrited gear batch in the Canadian version of the L-37 test.

Attachment 10
Page 9 of 11
Reference L-37

the current 16-test low temperature matrix, would allow 68.8% of the ridging ratings to meet the pass/fail limit of '8' dependent on using ASTM E29 to round corrected results to a whole number.

Note: Effective date for tests completing on or after 8/25/04.

L-37 Test Options

Rotten

- Develop data set to define correction factors, then assign.

More Rotten

- If CF's unacceptable, adjust test conditions.

Really Really Rotten

- Shut down test until acceptable gear sets are available and reject new gear set.

Rs Heroic Maximus

- None of above: No CF status quo

  → Some new SAE 2360 quality oils will not be approved against spec

  → SAE 2360 now is a two tier standard invisible to the