Report of Meeting
L-60-1 Surveillance Panel Conference Call
August 10th , 2023

Attendees:

SwRI -	**Mueller**
Lubrizol -	**Schaup**, Ariemma
Afton -	**Sangpeal,** Bell
Intertek -	**Lange**
TMC -	**Moyer**
BASF -	**Arjun,**Caridi
Dana -	**Zyski,** Carr
Cummins-Meritor -	LaBond, **Carter**
Army -	Sattler, **Comfort**
AAM -	**Muransky**
Navistar -	Morris
Daimler -	Neal
Fuchs -	Bender, Yucebligic

Voting Members in **BOLD**

1.0 Membership Review

2.0 Meeting minutes Approval

– May 9th, 2023, ASTM Meeting #209

Motion #1 → Arjun Goyal 1st /2nd Amy Zyski to approve the meeting minutes from the February 9th , 2022, ASTM Meeting. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

3.0 L-60-1 Severity Task Force action items

- Sediment was identified in reference oil 148-1 and is suspected in 155-1.
- Reference oil 148-1 was removed from the reference pool, 155-2 is being tested (see motion attached in appendix)

4.0 Gear Analysis

- Gear Analysis was completed for a second time, the committee decided that there was no need to continue the investigation.

5.0 Old Business

6.0 New Business

- Committee to be canvased for suggestions for the TMC's yearly oil analysis suite.
- Verbiage for PD4000 around rules for reference oil process (cradle to grave)
- Review footnotes and remove or edit as necessary

7.0 Adjourn

Motion #3 → A. Zyski 1st /2nd Allen Comfort to adjourn. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

Respectfully submitted,

Nicholas Schaup
L-60-1 Surveillance Panel Chairman

8/9/23

Motion for L-60 155-2

All labs will run current inventory (2 samples) of 155-2 as soon as possible, the data will be reviewed after completion and evaluated against 155-1 targets. If the fluids are found acceptable the labs that declared the runs as reference are calibrated, if the lab declared the runs as industry donated they will be given two additional runs for the reference period.

LZ: Reference attempt

SwRi: Industry

Afton: Reference

Intertek: Industry

Caroline Motioned

Jason Second

8/9/23

Motion for L-60

Immediate discontinuation of reference oil 148-1. References will be run solely on 155-1 until a second oil can be defined.

Motion Troy

Arjun

D02.B0.03

L-60-1 Surveillance Panel Meeting

05/10/2023

13:30 pm– 15:30 pm

Nick Schaup

Agenda

- Call to Order/Agenda review
- Membership review
- Meeting Minute Approvals
  - May. 10th 2023, ASTM Meeting
- L-60-1 Sediment Discussion
  - Mixing procedure/148-1 Replacement
- L-60-1 Severity Task Force Follow up
  - LZ Prep + oldest oil
- Sole source replacements
- Gear Presentation review
- Old Business?
- New business
- Adjournment

Membership Review

Allen Comfort	US Army
Amy Zyski	Dana
Arjun Goyal	BASF
Anthony Lange	Intertek
Jason W. Carter	Cummins - Meritor
Dylan Beck	TMC
Nick Schaup	Lubrizol
Matt Sangpeal	Afton
Caroline Mueller	SwRI
Rob Banas	ExxonMobil
Troy Muransky	AAM
Rebecca Warden	Oranite

Meeting Minutes Approval

- May 10th, 2023, ASTM Meeting

intertek
Total Quality. Assured.

L60-1 REFERENCE OIL CONCERNS

08/09/2023

BACKGROUND

- Intertek is currently referenced

- There is an industry severity issue that started back for Intertek in February of 2021
- The issue causes the labs to randomly but consistently produce severe rating results
- Currently there are 2 labs that are unable to reference due to this issue.

CONCERN

- There is an unknown substance in the Reference oils we received back in 2020-2022.
- Multiple labs have confirmed they are seeing this in some of their reference samples.
- Intertek was able to reference using reference oils we received this year that did not exhibit the same unknown substance.
- Could this be the cause of the industry severity issue?

CONTINUED

REQUEST FOR INFORMATION

1. Has the TMC been able to analyze and verify what the substance is?
2. What is the Procedure the TMC uses to mix and pull the samples to send to the labs for testing?
3. What are the annual Quality control checks procedures at the TMC?
    1. What are your limits on the annual checks to say if the oil is bad or good?
4. How does the TMC store reference oils?

STEPS FORWARD?

- How do we proceed?

- If it is additive drop-out can we get it back into solution or does the oil need to be retired? If not, can we filter out the contamination?

+001 210 634 1103

Anthony.lange@intertek.com

intertek.com

intertek

Total Quality. Assured.

L-60 Sediment Discussion Cont.

- Mixing procedure at each lab?
- Replacement of 148-1?

Nick,

Back in 1Q2022 we started looking at a replacement for the low inventory TMC148-1 oil for L60-1 since I believe it could no longer be blended.
I sent the L60-1 data below to R. Slocum on my selected TMC 148-1 replacement candidate, GO-13357-07, but I don't recall him addressing it at L60-1 Surveillance Panel mtgs.
Dylan would like you to address this topic once again at the August L60-1 SP mtg.

L60-1 50 hrs								
Lab, Run #, Gear batch	EV, 5F-440, 7-18-47	EV, 4F-386, 7-18-47	EV, 5F-435, 12-11-36	EV, 4F-378, 12-11-45	SR, 16-0228, 5-18-60	SR, 16-0239, 12-11-45	SR, 16-0233, 5-18-65	J2360 limits
Visc increase, %	35.6	38.2	36.4	36.4	44	43	45	100 max.
Pentane insol. wt%	0.3	0.4	0.6	0.4	0.4	0.4	0.3	3.0 max.
Toluene insol. wt%	0.2	0.3	0.4	0.4	0.4	0.6	0.4	2.0 max.
C/V	5.6	5.4	6.4	6.8	7.6	7.4	7.3	7.5 min.
Sludge	9.5	9.4	9.5	9.3	9.5	9.6	9.5	9.4 min.
	Fail	Fail	Fail	Fail	Borderline Pass	Fail	Fail	

The candidate oil is an 80W-90 that contains a J2360 qualified additive in Grp II, but a limited slip booster is added that has a negative effect on C/V.

Thanks, Don

L-60 LZ prep W/Oldest Oil

- Do we want to move forward with this?
  - If so what dates work for everyone?

Sole Source Discussion

- Replacing sole source for Flow meter and Copper Strips

Failure Analysis

Test gears

Dipl.-Ing (FH) Manfred Herz Dr.-Ing. Hans-Willi Raedt

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Content

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination Request

- Material Number, Part Name
  - First batch of 3 Gears, numbered 06-18-48; 11-00-01; 12-11-34
  - Second batch of 3 Gears with same numbering as first batch
- Customer, Customers Drawing Number
  - Afton Chemical
- Manufacturing Number, Part Number / Serial Number
  - tbd
- Reason / Aim of Examination
  - Different results on test site for lubricants

Quelle/*Source*: Information provided by applicant

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination

- Provided Samples
  - Optical surface investigation
- Sample taking
  - Cutting piece of each gear
  - Nital etching
  - Imaging with optical microscope
  - Imaging with SEM
  - EDS Mapping

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01

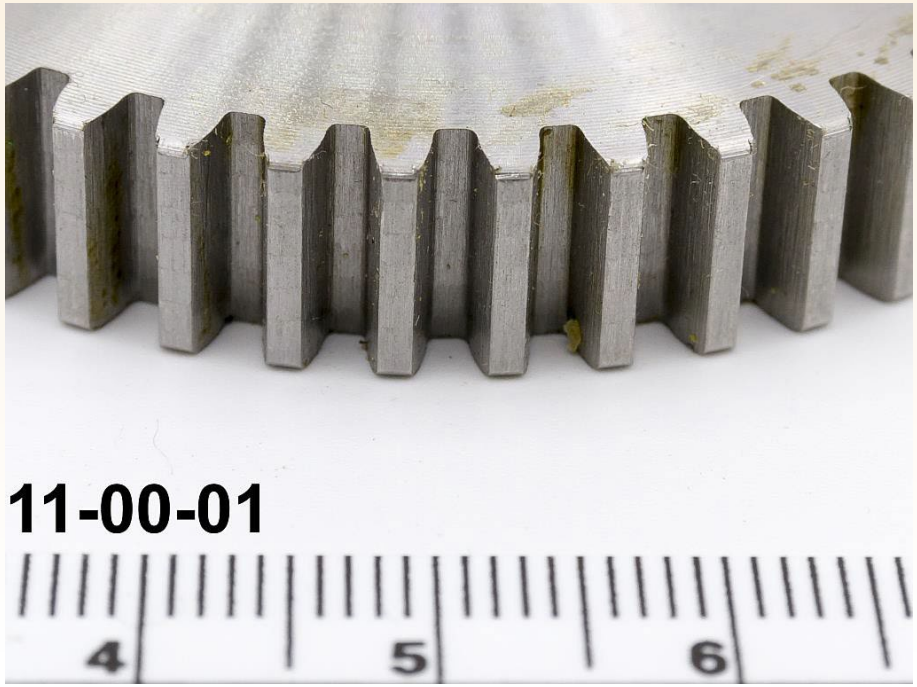
- Part in condition as delivered
  - Machined surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01



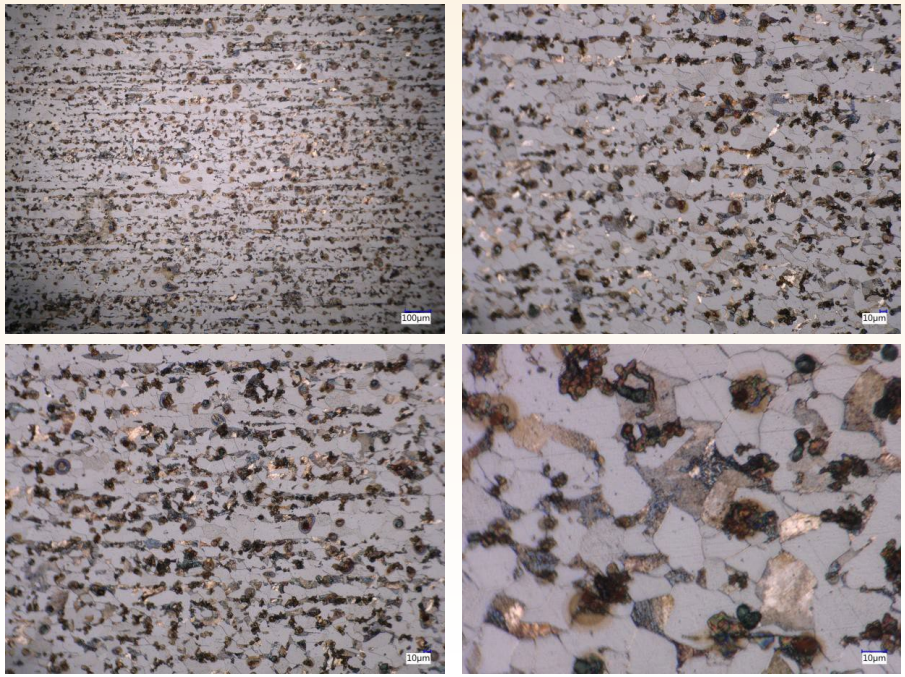
- Part in condition as delivered
  - Machined surface
    - Some residues from packaging paper

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01



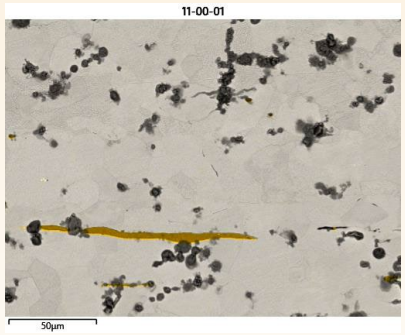
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

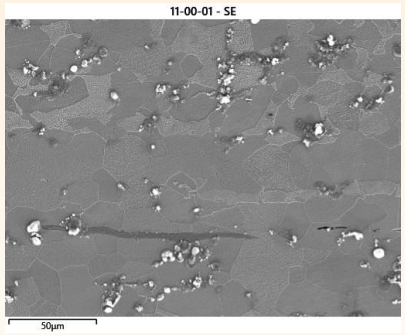
Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

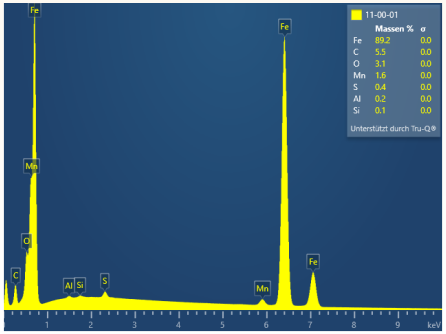
prosimalys

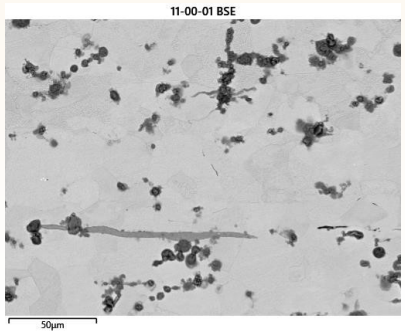
Examination – part 11-00-01

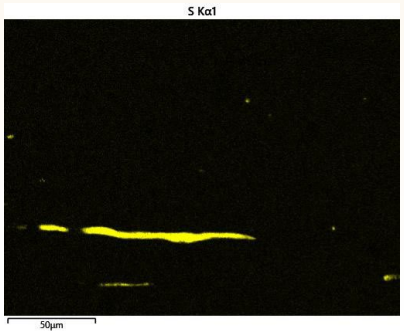


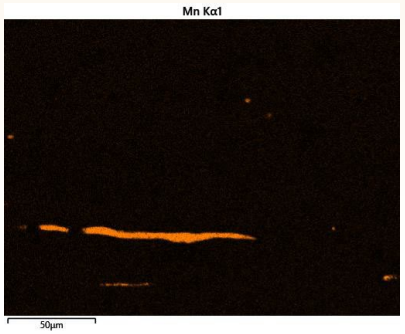


- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides







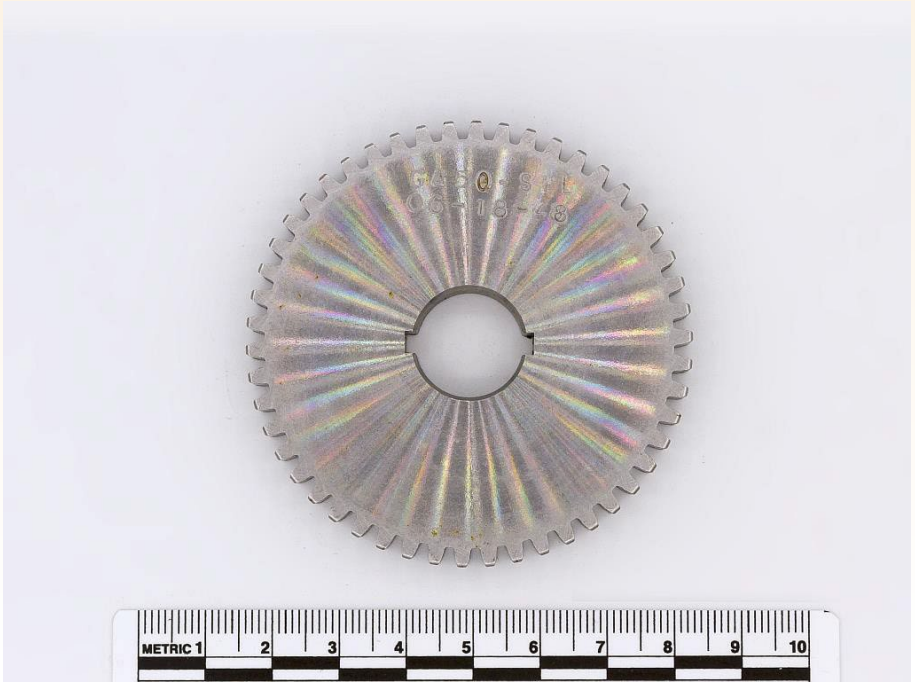


Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48



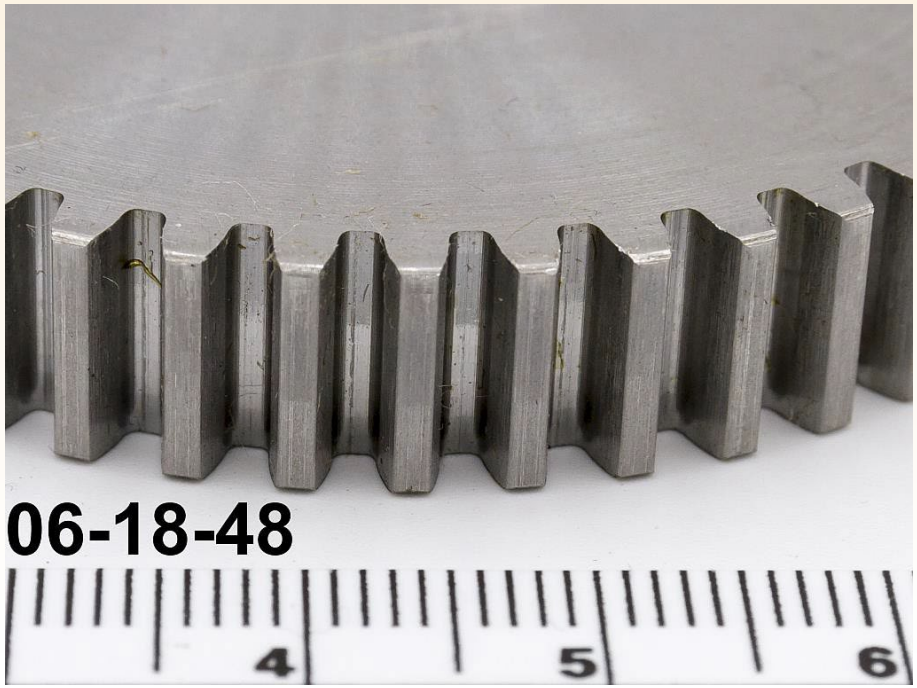
- Part in condition as delivered
  - Machined surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48



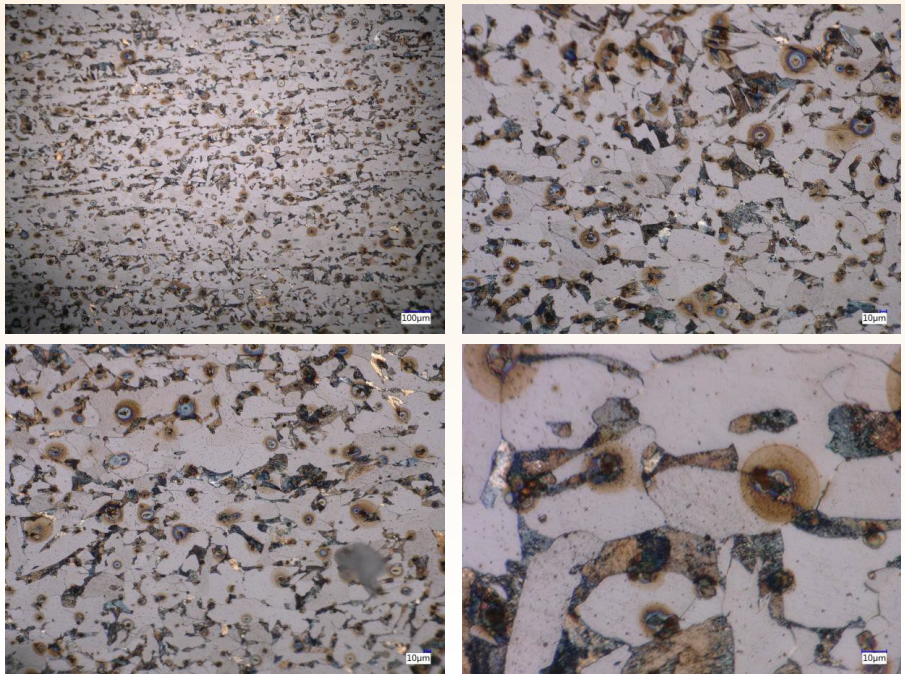
- Part in condition as delivered
  - Machined surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48



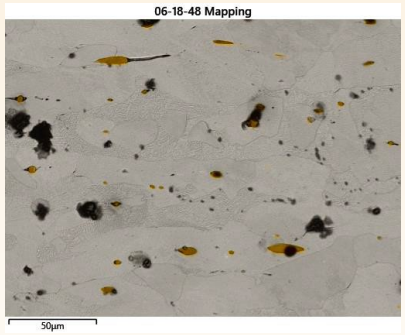
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

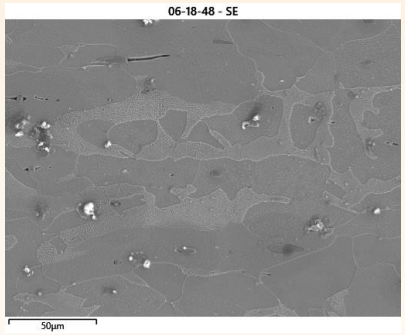
Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

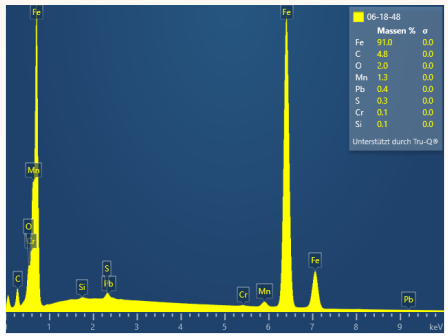
prosimalys

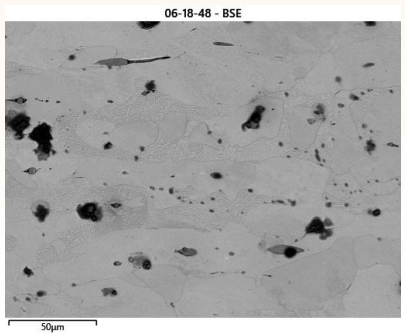
Examination – part 06-18-48

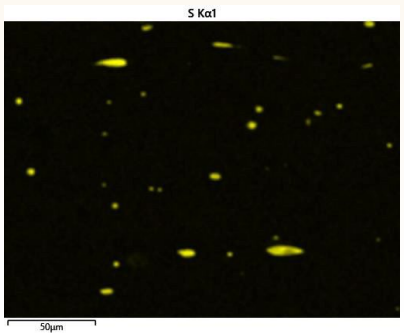


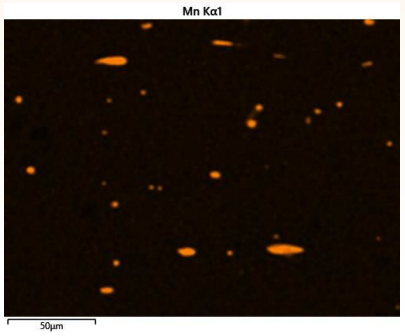


- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides









Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34

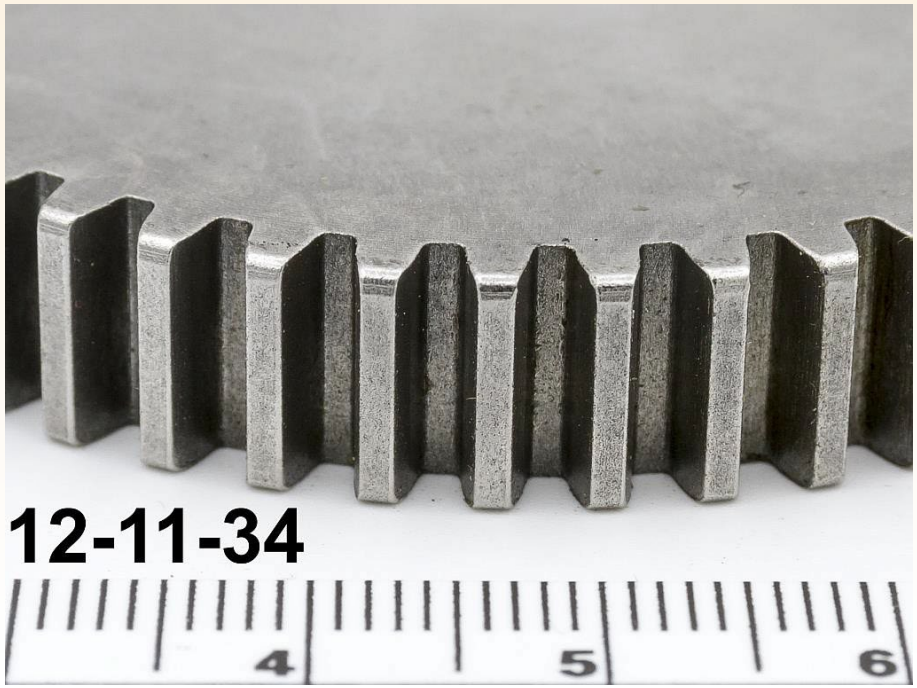
- Part in condition as delivered
  - Shot peened surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34



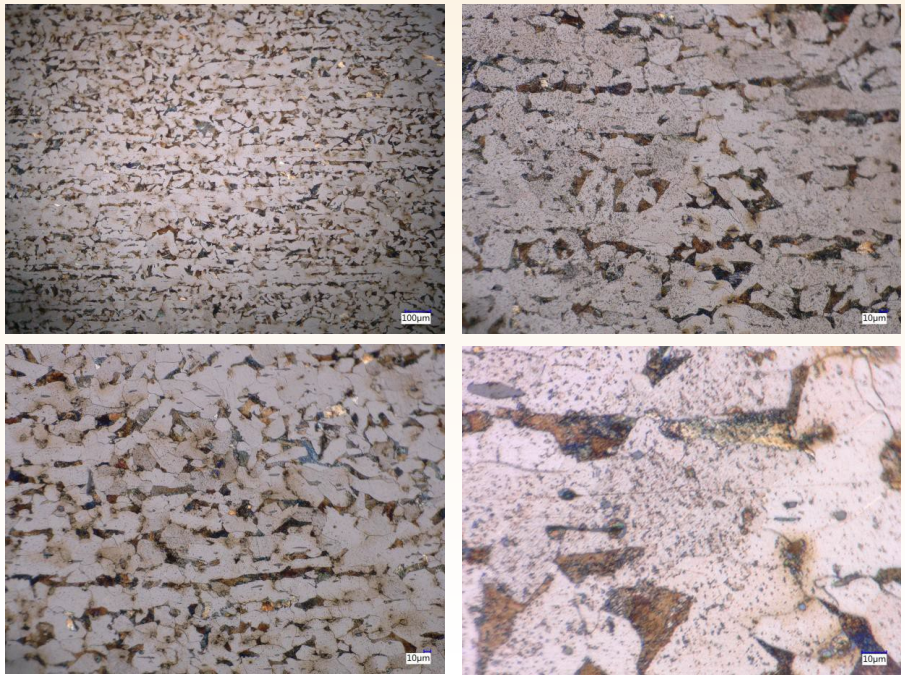
- Part in condition as delivered
  - Shot peened surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34



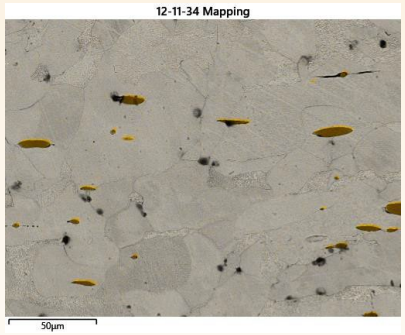
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

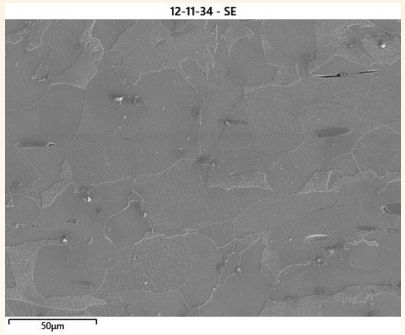
Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

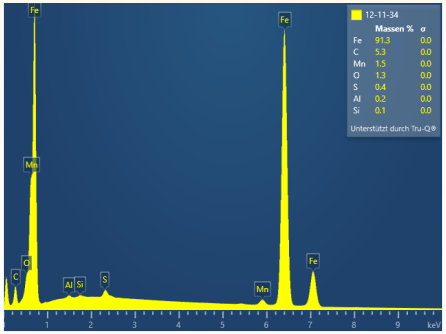
prosimalys

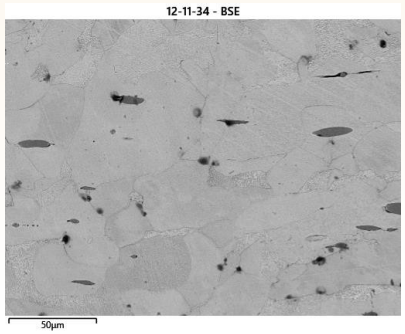
Examination – part 12-11-34

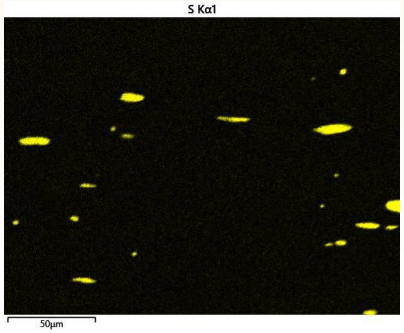


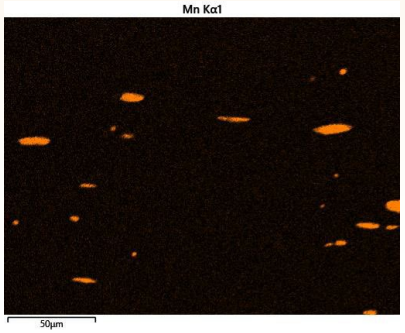


- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides







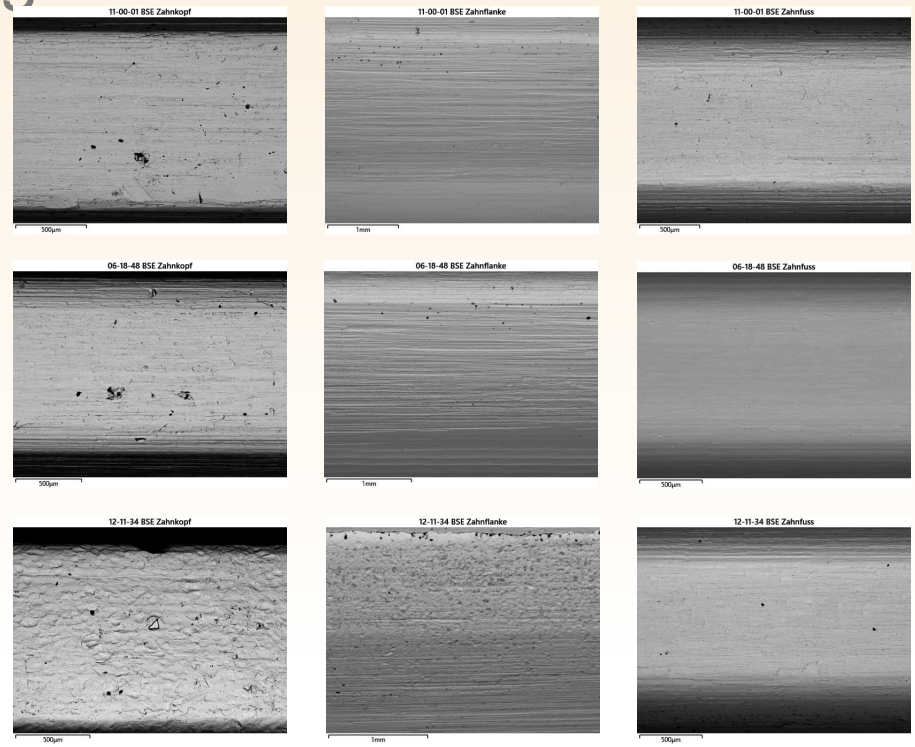


Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – Comparison of second gear batch



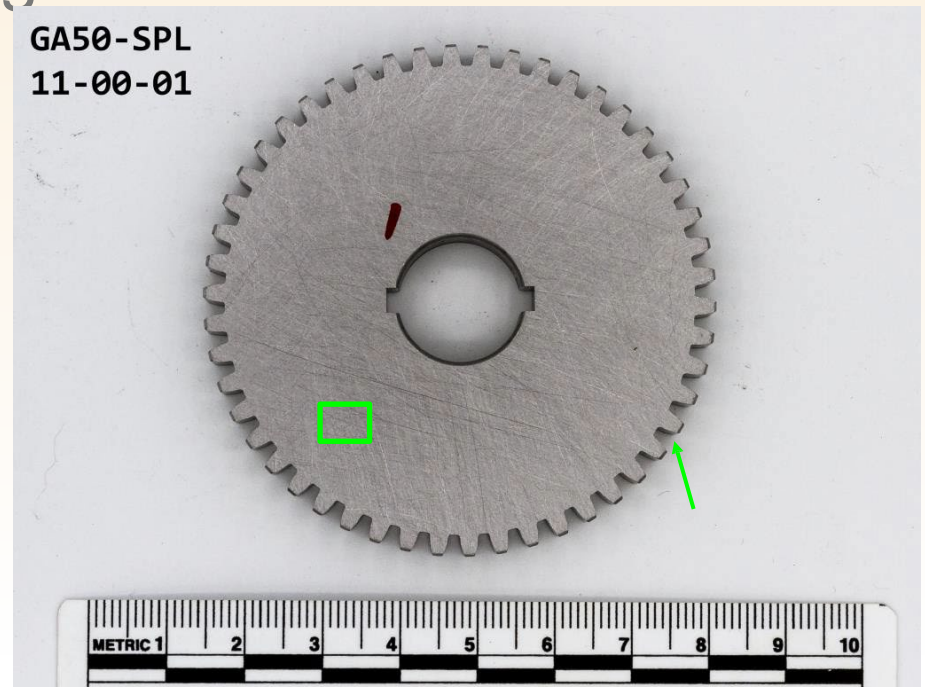
- Overview of gear surfaces
  - Surface comparison of three gears

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01 - second gear batch



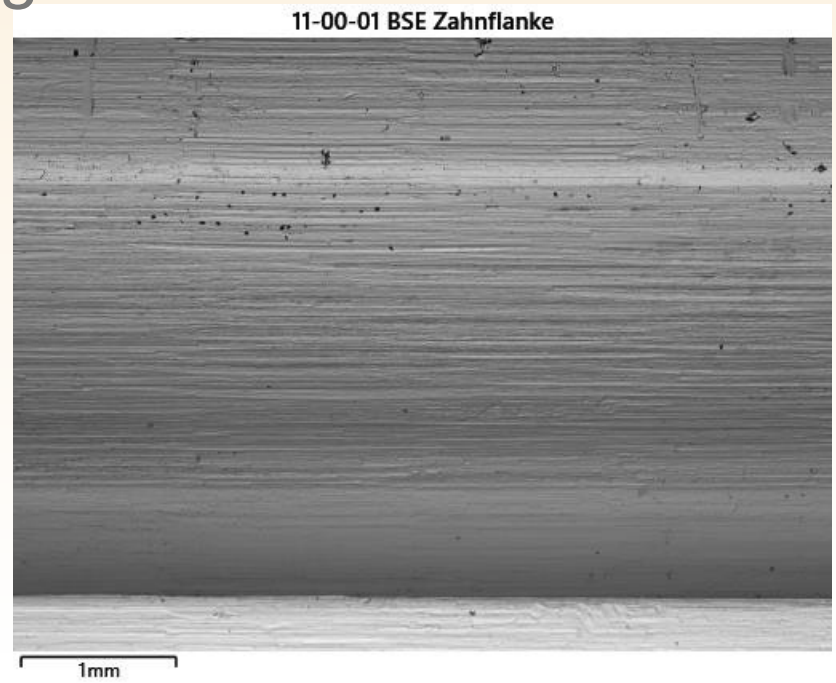
- Overview ground surface
  - SEM areas shown in picture

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01 - second gear batch



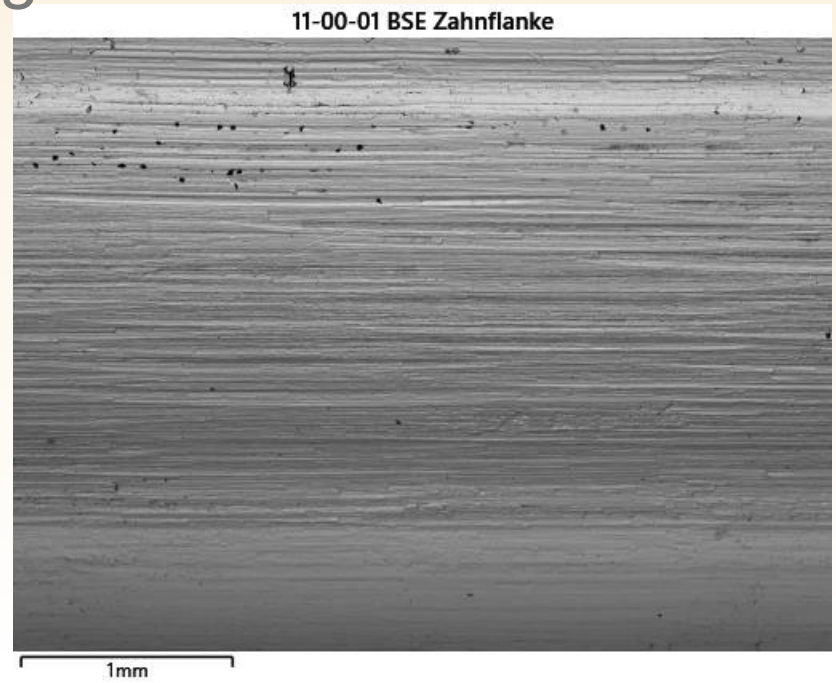
- Gear tooth flank
  - Rough surface from machining

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01 - second gear batch



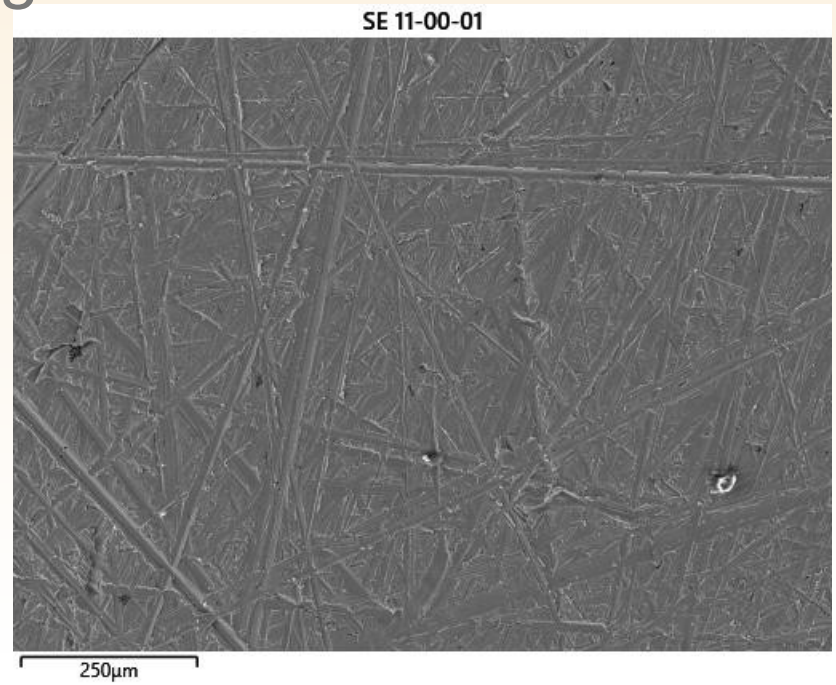
- Gear tooth flank
  - Rough surface from machining

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01 - second gear batch



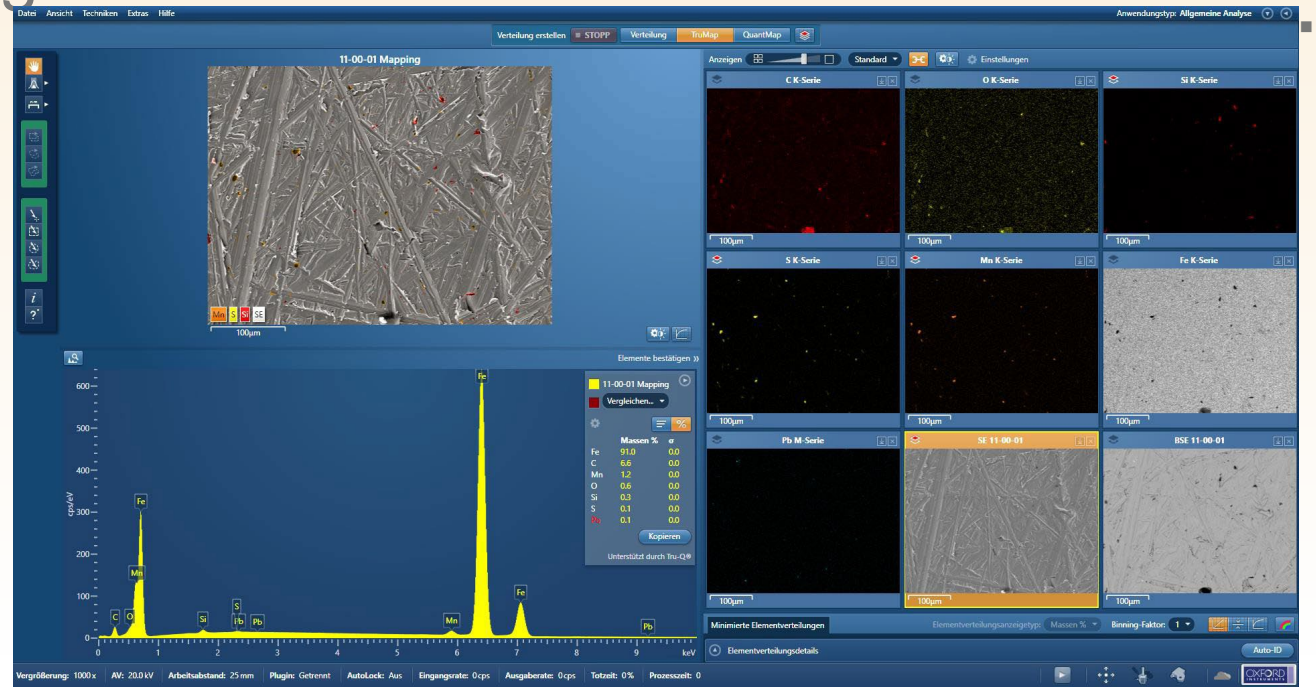
- Gear face
  - Grinded surface with some silicon indentions

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 11-00-01 - second gear batch



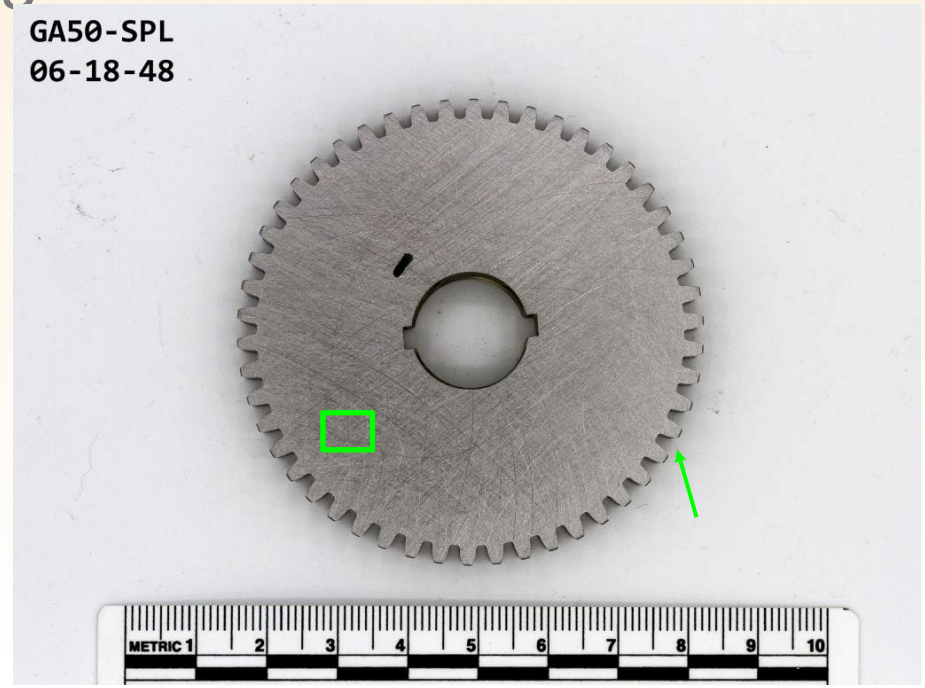
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48 - second gear batch



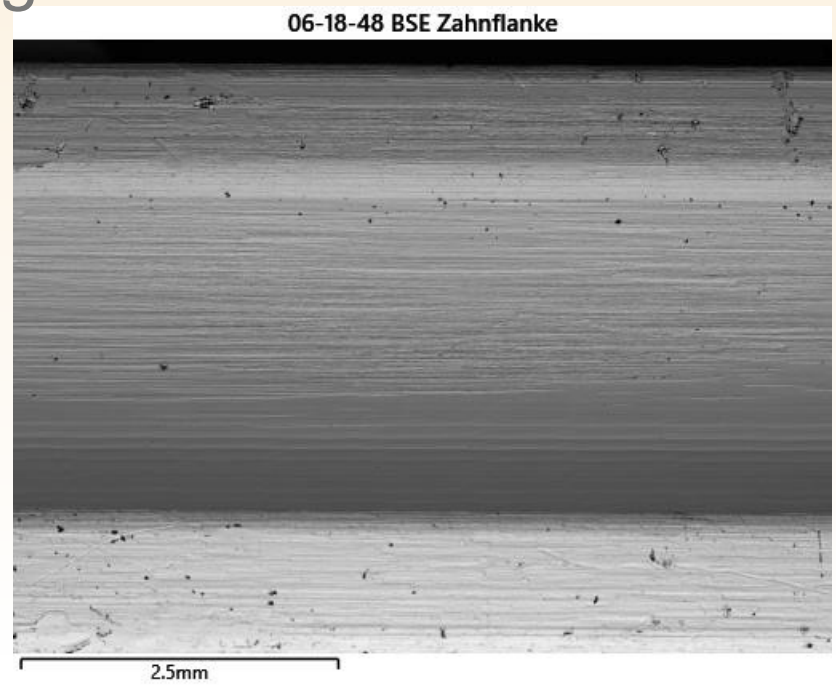
- Overview ground surface
  - SEM areas shown in picture

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48 - second gear batch



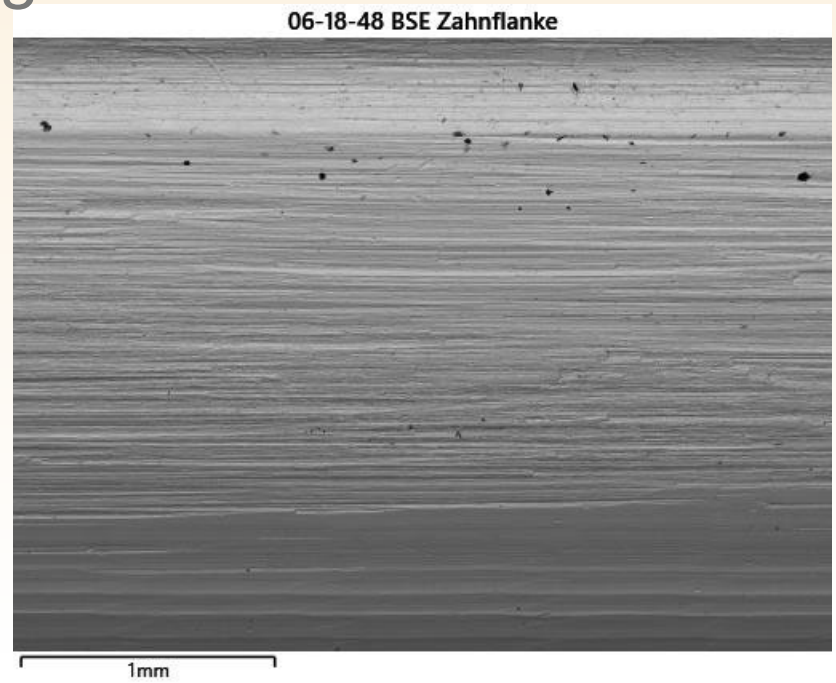
- Gear tooth flank
  - Machined surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48 - second gear batch



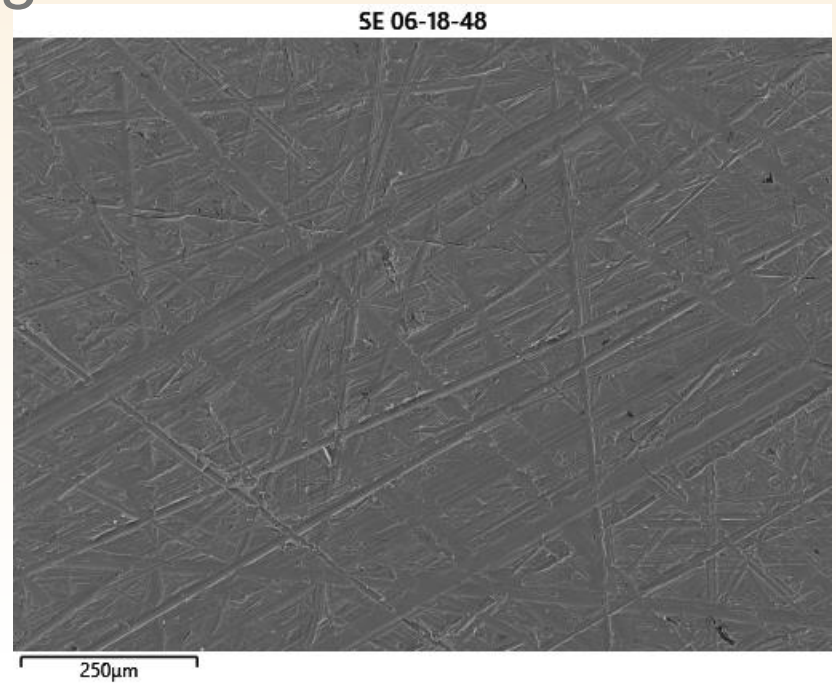
- Gear tooth flank
  - Machined surface

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48 - second gear batch



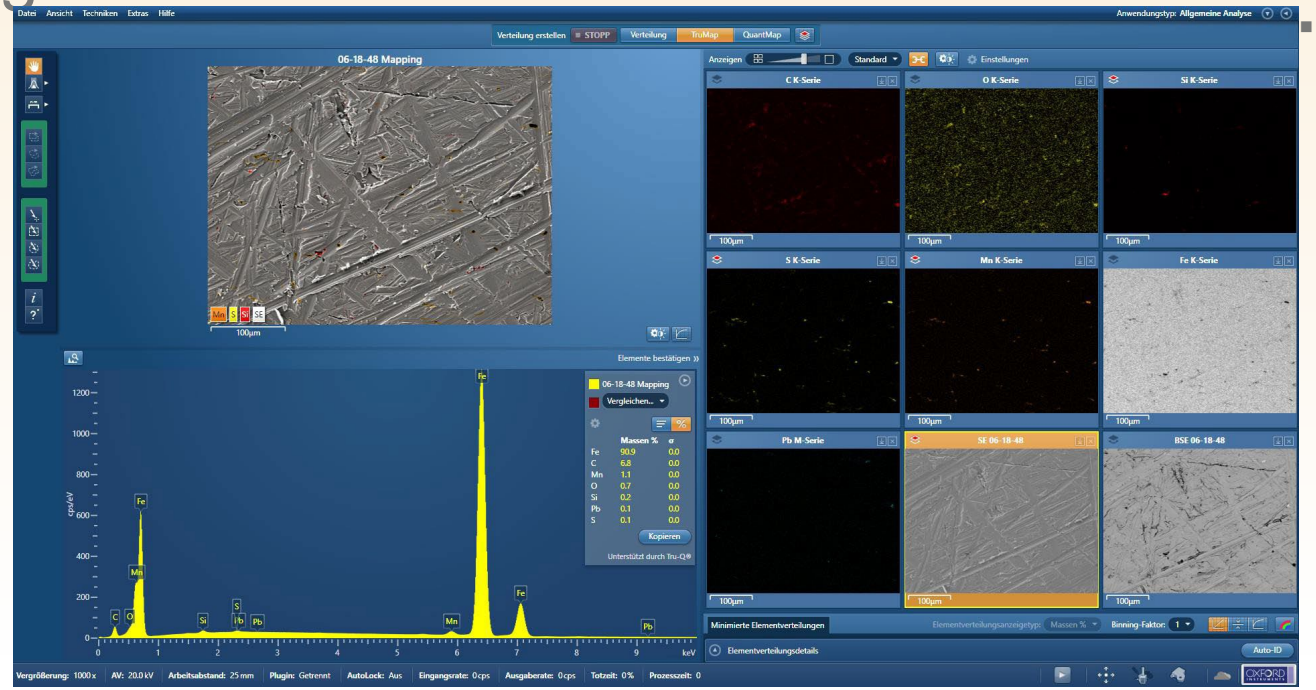
- Gear face
  - Grinded surface with some silicon indentions

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 06-18-48 - second gear batch



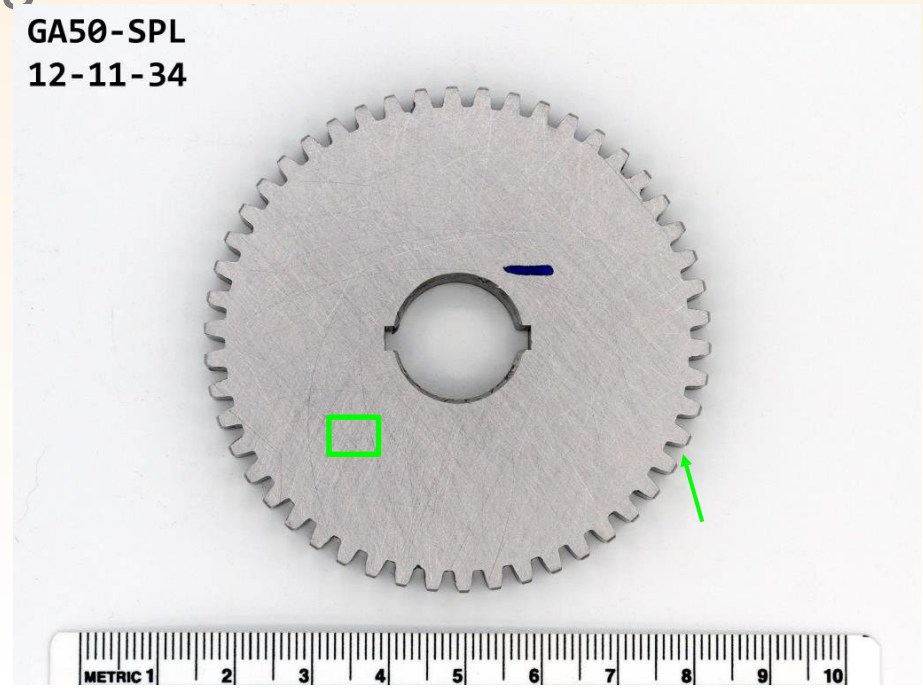
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34 - second gear batch



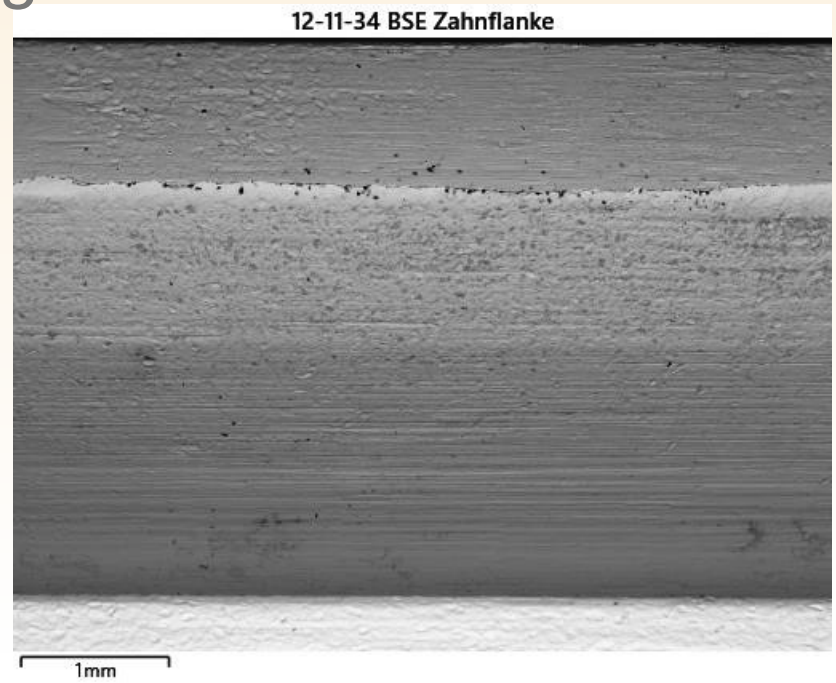
- Overview ground surface
  - SEM areas shown in picture

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34 - second gear batch



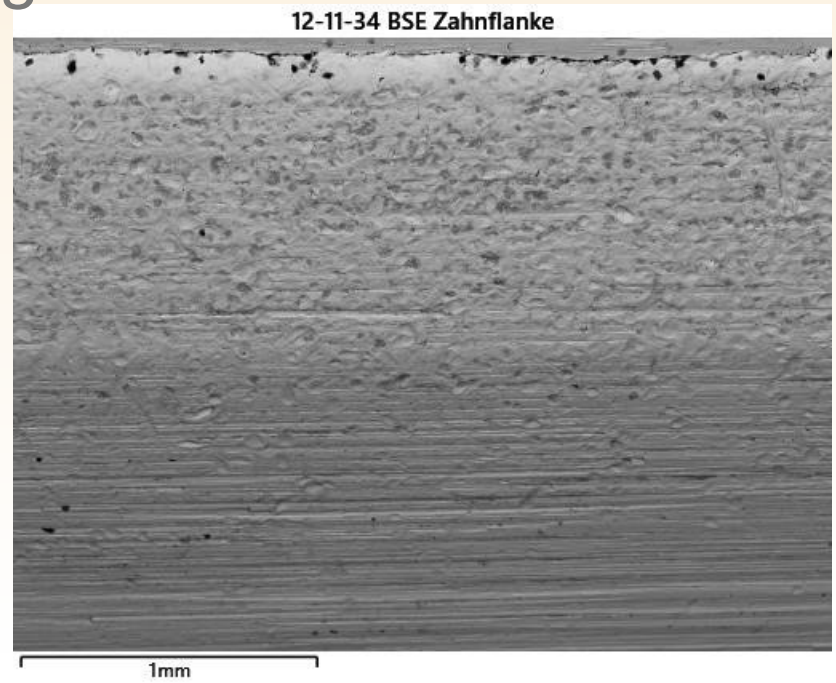
- Gear tooth flank
  - Surface machined and shot peened

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34 - second gear batch



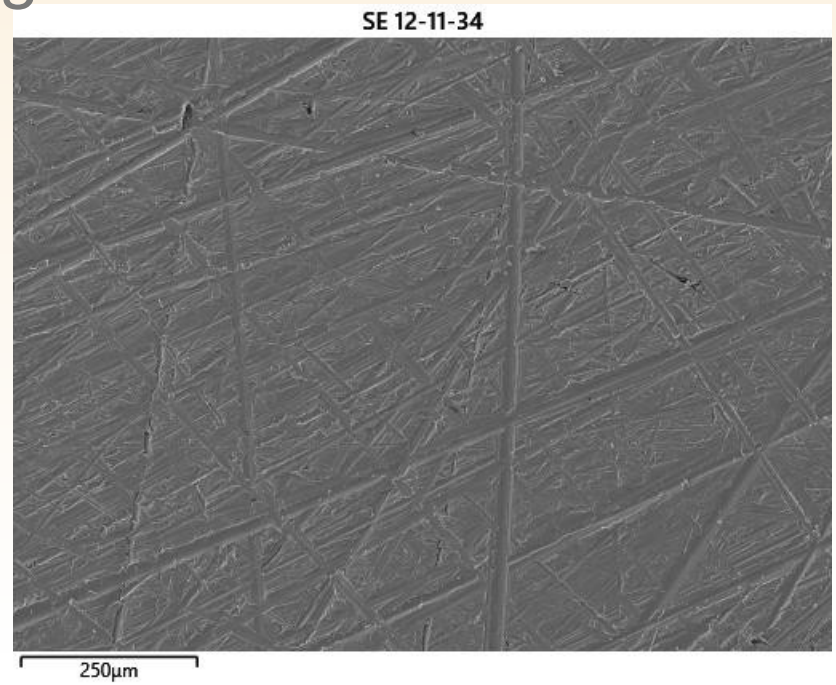
- Gear tooth flank
  - Surface machined and shot peened

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34 - second gear batch



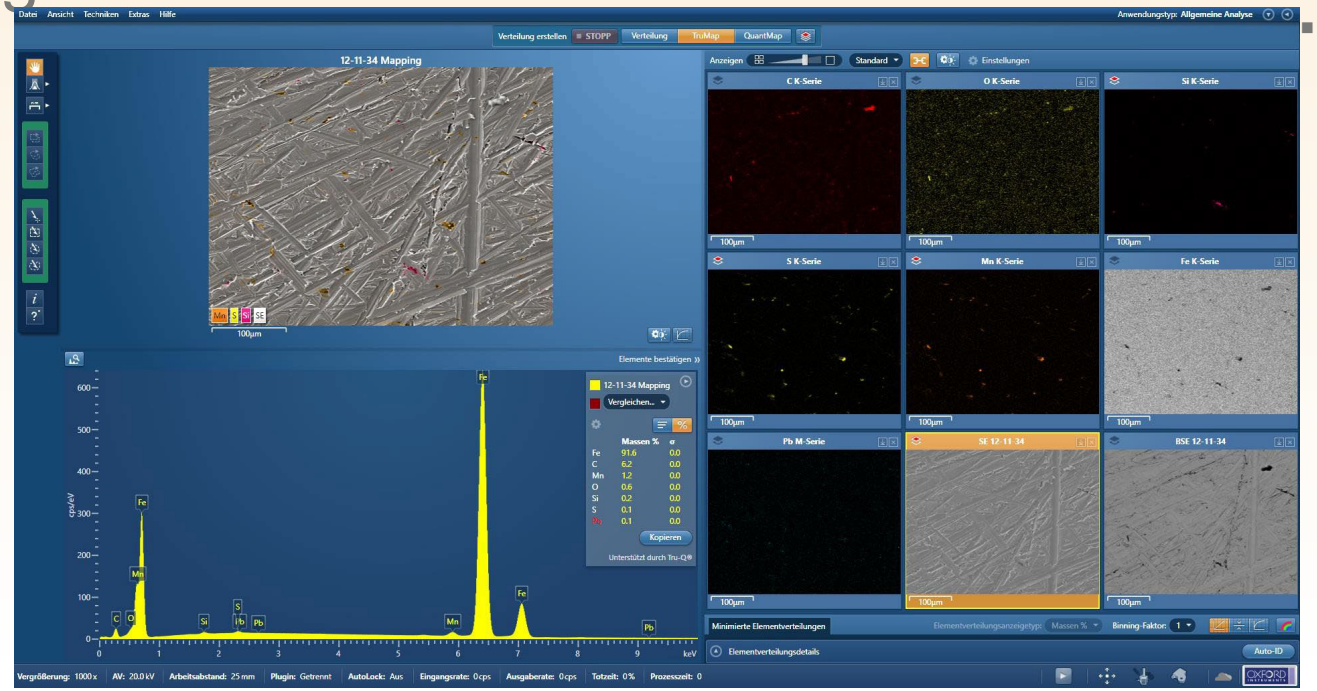
- Gear face
  - Grinded surface with some silicon indentions

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – part 12-11-34 - second gear batch



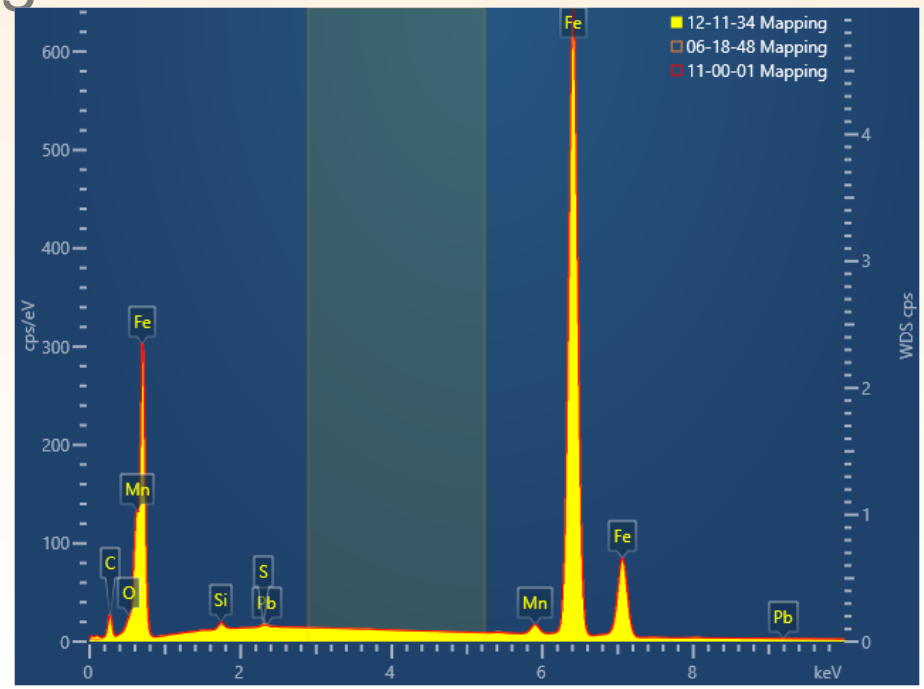
- Part cross section, nital etched
  - Microstructure ferrite/pearlite with some manganese sulfides

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Examination – Comparison - second gear batch



- Spectra comparison
  - Chemical composition similar within normal deviation

Masse-%	C	O	Si	S	Mn	Fe
06-18-48 Mapping	6.84	0.67	0.25			
11-00-01 Mapping						
12-11-34 M						

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Summary and Conclusiones first batch of gears

- Gears were delivered in different conditions
  - 11-00-01 and 06-18-48 machined
  - 12-11-34 shot peened
- No significant difference in microstructure was examined
- No significant chemical composition was examined
- Gears were not in condition prepared for test due to customer information
- No reason for different test results observed
- Further investigation may be taken in final testing condition
- Further investigation may be taken for red substance on surface after test which determines test result

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Summary and Conclusiones second batch of gears

- Gears were delivered in slightly different conditions on gear faces each one with
  one side ground and one side as machined or shot peened
  - 11-00-01 and 06-18-48 machined
  - 12-11-34 shot peened
- Surfaces show different conditions in gear tooth flanks
  - 11-00-01: Gear flank surface appears rough from machining
  - 06-18-48: Gear flank surface smoother than 11-00-01
  - 12-11-34: Gear flank surface shot peened
- Chemical composition with no significant difference
- Some dents with silicon inclusion on the grinded gear face on all parts
- Surface of gear face identical on all parts
- Differences in the test result can be attributed to different surfaces of the tooth
  flanks
- Further investigations of gears with different test results are recommended

Quelle/*Source*: prosimalys

© prosimalys GmbH – Status: May 15, 2023

prosimalys

Old Business

New Business

Adjournment