



Test report

Battery screwdriver – homologation

I. Customer

CP Georges Renault
Mr. Thibault Valantin
ZAC de la Lorie-38 rue Bobby Sands
BP 10273
F – 44818 Saint Herblain

II. Date of test/ location

September 2014
Power Tools Central Service Workshop
Różyniec 83C, 59-706 Gromadka,
Polen

III. Testobject

Battery screw driver:

ELS2.5-1550-P

Serial number 14 D 03836

14 D 03839

14 D 03842

Li-Ion 18 VDC 1,3 Ah 23,4 Wh

Serial number 00289-12-W16

ELIT Speed Module



Model	ELS2.5-1550-P
Ordering No	6151654190
Square Drive / Female Hex	Female Hex
Torque range ft lb	3.5 – 22
Torque range Nm	0.4 - 2.5
CS distance mm	-
Weight kg	0.8
Weight lb	1.76
Length mm	215
Speed r/min	500-1550
Height mm	212
Square drive in	¼

IV. Test condition

a. Mounting



b. Test equipment

Hersteller: **BLM, Mailand (Italien)**
Typ: **3860/4**
Ser.-Nr.: **3860SKY.103**
Zelle 1 : **1-10 N·m, dynamisch**
Ser.-Nr.: **188.10.144**
Rückführung: **EN1049**
Filterfrequenz: **300 Hz**



MANUFACTURER: BLM
MODEL: 3860/4
SERIAL NUMBER: 3860SKY.103
POWER SUPPLY: PRIMARY: 220 V
50-60 Hz
SECONDARY: 24 V
POWER 1320 W
NOMINAL 10A
07/2004 CE

c. Explanation of the test

The screwdrivers were provided for homologation test from the production line of the manufacturer.

After evaluation the built-in clutch torque for each class within 25 pre adjusting joints the measurement series of 100 screws were documented without any changing of the built-in clutch of the battery screwdriver.

d. Screw driver test conditions

Range of the screwdriver device :	0,4-2.5 N·m
Testing torque / 30% hard/soft joint	1.03 N·m
Testing torque / 80% hard/soft joint	2.08 N·m
Testing torque / 100% hard/soft joint	2.5 N·m
Speed 1 step	600 U / Min
Series	6x 100 Joint/ results

e. Results

Desoutter / 1-Step tool			Cm - CmK result					
Tool type	Serial Nr.	Test data	30,00%		80,00%		100,00%	
			30 °±5°	360 °±15°	30 °±5°	360 °±15°	30 °±5°	360 °±15°
ELS2.5-1550-P		Test torque	1,03 Nm		2,08 Nm		2,5 Nm	
		Speed 1st stage	600 rpm					
		Start angle measurement	0,52 Nm		1,04 Nm		1,25 Nm	
	14D03836	cm	2,15	2,13	4,40	3,56	3,61	3,81
		cmk	2,12	2,02	4,26	3,46	3,35	3,74
	14D03839	cm	2,40	2,11	2,27	2,79	2,47	3,33
		cmk	2,32	2,01	2,26	2,63	2,34	3,22
	14D03842	cm	2,44	2,11	3,87	4,97	5,04	5,48
		cmk	2,16	2,09	3,82	4,89	4,78	5,27

CERTIFIKAT

Machine capability test

Certificate no.: 207174-01

Customer Desoutter Industrial Tools

Test object

Manufacturer: Desoutter
Tool type: ELS2.5-1550-P Serial - No. : 14D03836

Torque range

of: 0,4 Nm
to: 2,5 Nm

<u>Number of screw tightenings</u>			<u>Torque to be achieved</u>		
at 30%	==>	100	at 30%	==>	1,03 Nm
at 80%	==>	100	at 80%	==>	2,08 Nm
at 100%	==>	100	at 100%	==>	2,50 Nm

Above mentioned number of unions were performed on a hard and on a soft joint.

The series of measurements were divided into 30%, 80% and 100% of the torque range, and a joint with a rotation angle of 30 ° (hard) and 360 ° (soft).

Tolerance is the difference between USL, upper limit, and LSL, Lower Limit.

Date:

2014-10-24

CERTIFIKAT

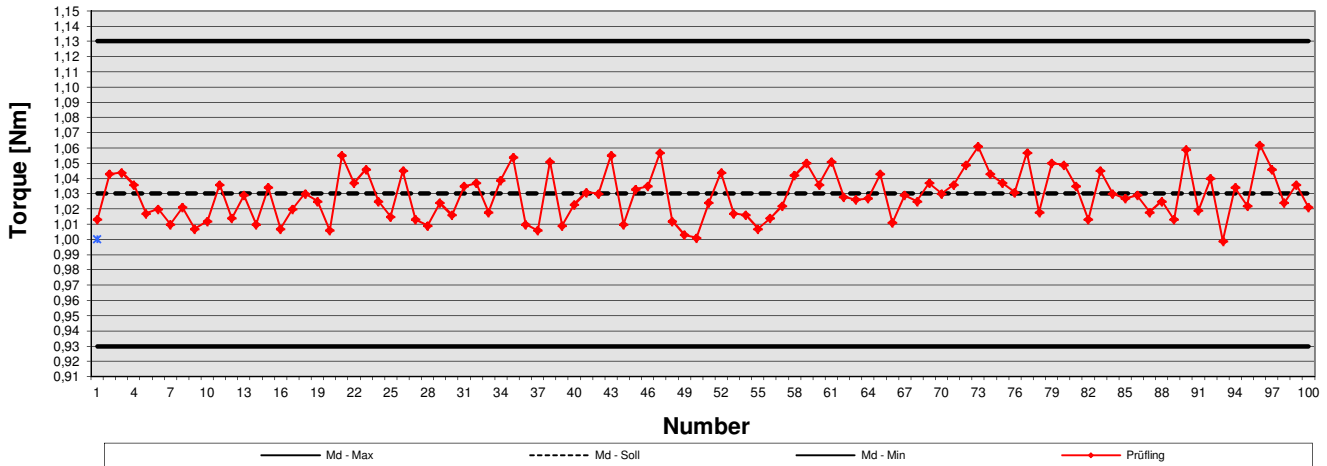
Machine capability tests

Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03836

30% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	1,13	1,03	0,93	+/- 10,00%

Hard joint 30°



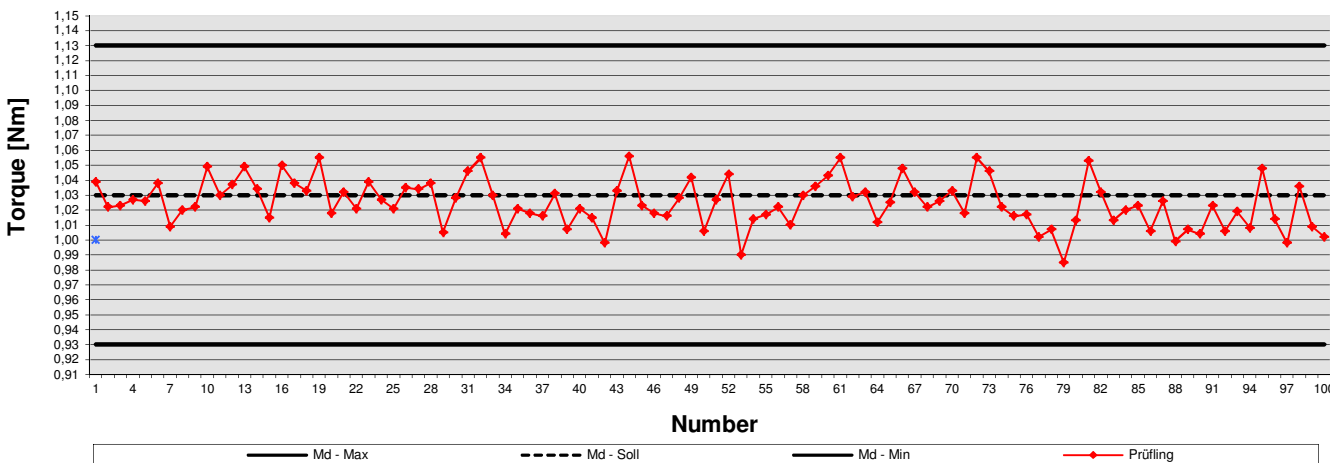
Statistics of the test piece

max. Torque	1,06 Nm	1 sig	0,015 Nm
min. Torque	1,00 Nm	6 sig	0,093 Nm
spread	0,06 Nm	+3 sig	1,08 Nm
Average	1,03 Nm	-3 sig	0,98 Nm

$$C_m = 2,15$$

$$C_{mk} = 2,12$$

Soft joint 360°



Statistics of the test piece

max. Torque	1,06 Nm	1 sig	0,016 Nm
min. Torque	0,99 Nm	6 sig	0,094 Nm
spread	0,07 Nm	+3 sig	1,07 Nm
Average	1,02 Nm	-3 sig	0,98 Nm

$$C_m = 2,13$$

$$C_{mk} = 2,02$$

CERTIFIKAT

Machine capability tests

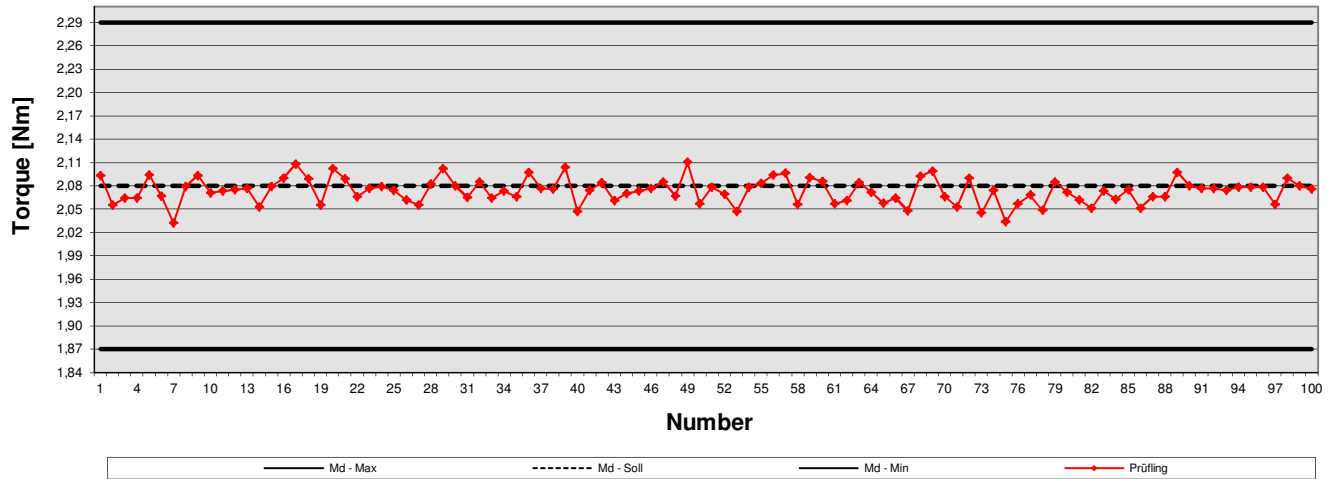


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03836

80% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,29	2,08	1,87	+/- 10,00%

Hard joint 30°



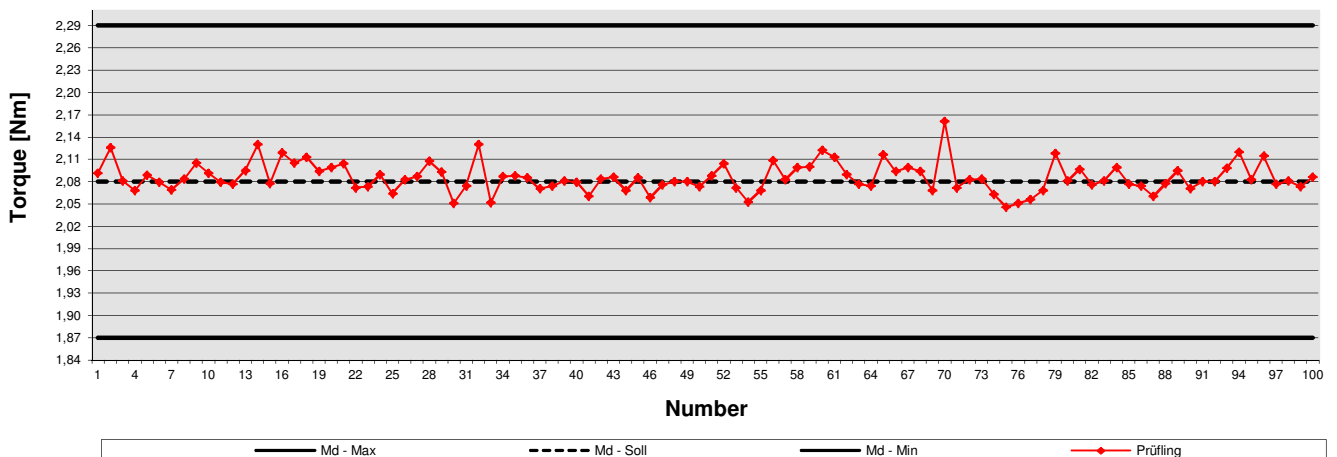
Statistics of the test piece

max. Torque	2,11 Nm	1 sig	0,016 Nm
min. Torque	2,03 Nm	6 sig	0,096 Nm
spread	0,08 Nm	+3 sig	2,12 Nm
Average	2,07 Nm	-3 sig	2,03 Nm

$$C_m = 4,40$$

$$C_{mk} = 4,26$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,16 Nm	1 sig	0,020 Nm
min. Torque	2,05 Nm	6 sig	0,118 Nm
spread	0,12 Nm	+3 sig	2,14 Nm
Average	2,09 Nm	-3 sig	2,03 Nm

$$C_m = 3,56$$

$$C_{mk} = 3,46$$

CERTIFIKAT

Machine capability tests

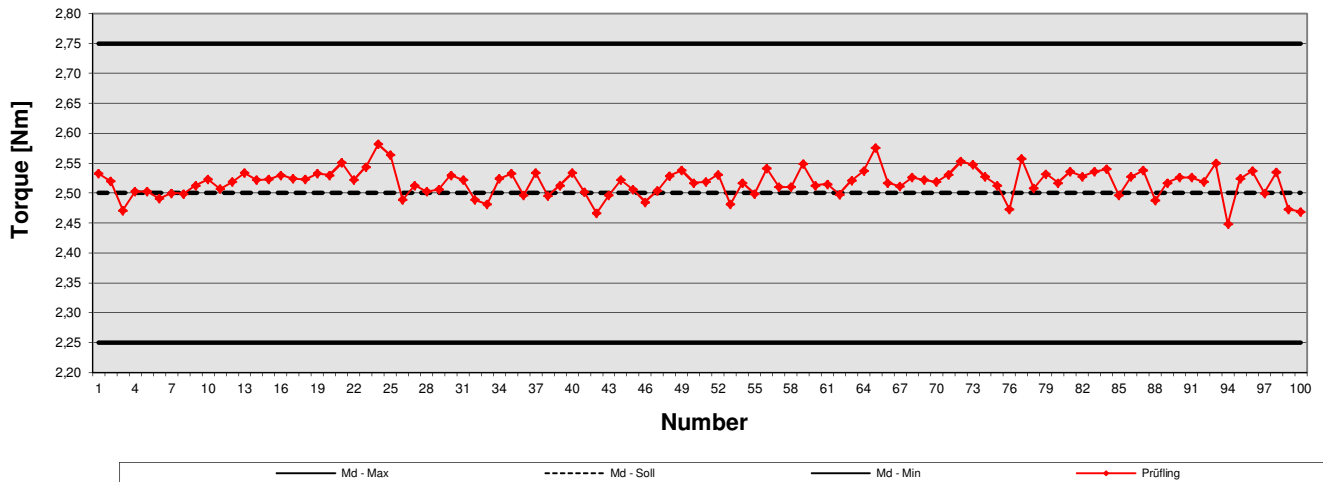


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03836

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,75	2,50	2,25	+/- 10,00%

Hard joint 30°



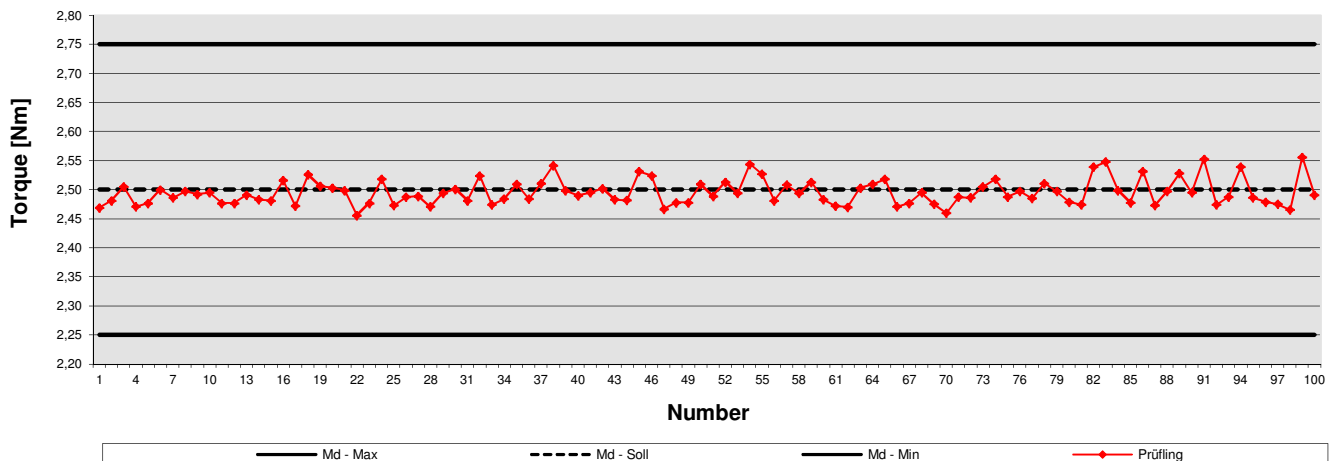
Statistics of the test piece

max. Torque	2,58 Nm	1 sig	0,023 Nm
min. Torque	2,45 Nm	6 sig	0,139 Nm
spread	0,13 Nm	+3 sig	2,59 Nm
Average	2,52 Nm	-3 sig	2,45 Nm

$$C_m = 3,61$$

$$C_{mk} = 3,35$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,56 Nm	1 sig	0,022 Nm
min. Torque	2,46 Nm	6 sig	0,131 Nm
spread	0,10 Nm	+3 sig	2,56 Nm
Average	2,50 Nm	-3 sig	2,43 Nm

$$C_m = 3,81$$

$$C_{mk} = 3,74$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03836

Combined statistics for the test object (hard and soft joint) [Md = 30%]

Number of tightenings	200	6 sigma	0,09 Nm
Average	1,03 Nm	Mean value offset	0,00 Nm
Sigma	0,02 Nm	Mean value offset %	0,39 %
Dispersion	0,08 Nm	comb. average torque	1,03 Nm
max. Torque	1,06 Nm	comb. torque variation	0,10 Nm
min. Torque	0,99 Nm	comb. torque variation %	9,49 %

$C_m = 2,15$

$C_{mk} = 2,12$

Combined statistics for the test object (hard and soft joint) [Md = 80%]

Number of tightenings	200	6 sigma	0,11 Nm
Average	2,08 Nm	Mean value offset	0,01 Nm
Sigma	0,02 Nm	Mean value offset %	0,59 %
Dispersion	0,13 Nm	comb. average torque	2,09 Nm
max. Torque	2,16 Nm	comb. torque variation	0,12 Nm
min. Torque	2,03 Nm	comb. torque variation %	5,71 %

$C_m = 3,92$

$C_{mk} = 3,91$

Combined statistics for the test object (hard and soft joint) [Md = 100%]

Number of tightenings	200	6 sigma	0,13 Nm
Average	2,51 Nm	Mean value offset	0,02 Nm
Sigma	0,02 Nm	Mean value offset %	0,89 %
Dispersion	0,13 Nm	comb. average torque	2,51 Nm
max. Torque	2,58 Nm	comb. torque variation	0,16 Nm
min. Torque	2,45 Nm	comb. torque variation %	6,27 %

$C_m = 3,72$

$C_{mk} = 3,62$

CERTIFIKAT

Machine capability test

Certificate no.:

207174-02

Customer

Desoutter Industrial Tools

Test object

Manufacturer: Desoutter

Tool type: ELS2.5-1550-P

Serial - No. : 14D03839

Torque range

of: 0,4 Nm
to: 2,5 Nm

Number of screw tightenings

at 30%	==>	100
at 80%	==>	100
at 100%	==>	100

Torque to be achieved

at 30%	==>	1,03 Nm
at 80%	==>	2,08 Nm
at 100%	==>	2,50 Nm

Above mentioned number of unions were performed on a hard and on a soft joint.

The series of measurements were divided into 30%, 80% and 100% of the torque range, and a joint with a rotation angle of 30 ° (hard) and 360 ° (soft).

Tolerance is the difference between USL, upper limit, and LSL, Lower Limit.

Date:

2014-10-24

CERTIFIKAT

Machine capability tests

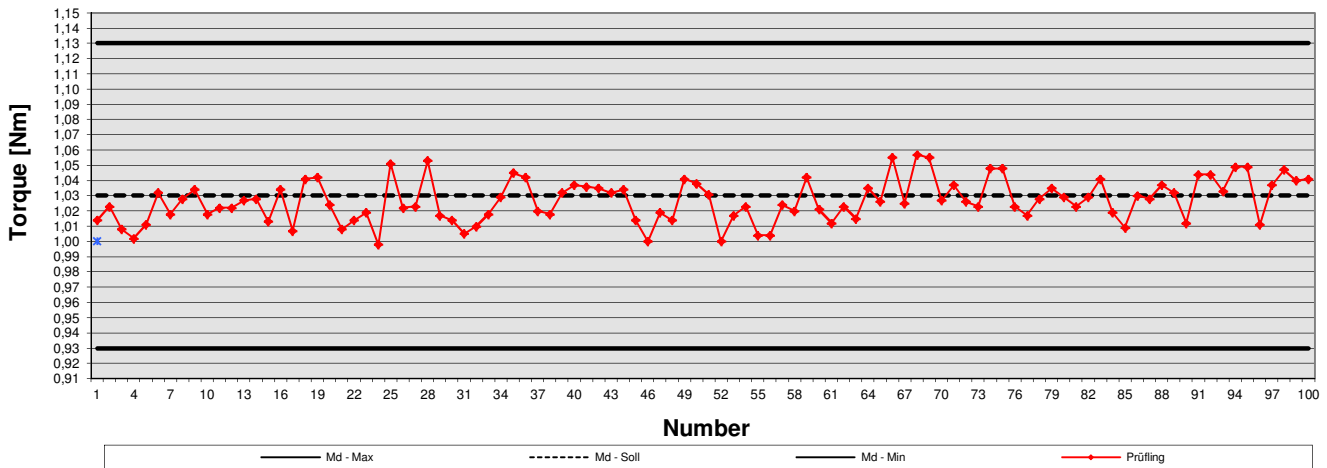


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03839

30% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	1,13	1,03	0,93	+/- 10,00%

Hard joint 30°



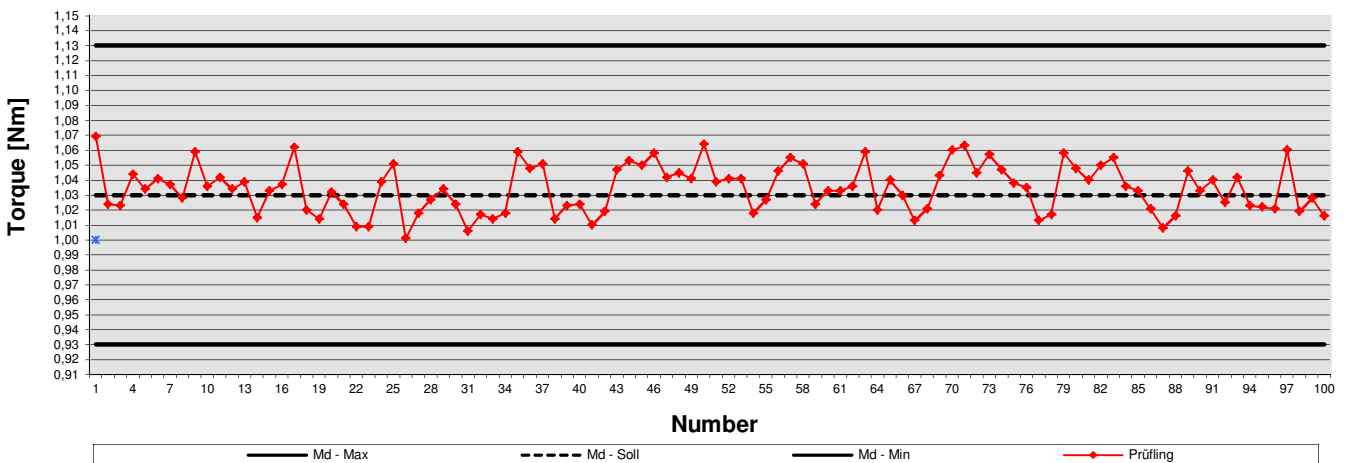
Statistics of the test piece

max. Torque	1,06 Nm	1 sig	0,014 Nm
min. Torque	1,00 Nm	6 sig	0,083 Nm
spread	0,06 Nm	+3 sig	1,07 Nm
Average	1,03 Nm	-3 sig	0,99 Nm

$$C_m = 2,40$$

$$C_{mk} = 2,32$$

Soft joint 360°



Statistics of the test piece

max. Torque	1,07 Nm	1 sig	0,016 Nm
min. Torque	1,00 Nm	6 sig	0,095 Nm
spread	0,07 Nm	+3 sig	1,08 Nm
Average	1,03 Nm	-3 sig	0,99 Nm

$$C_m = 2,11$$

$$C_{mk} = 2,01$$

CERTIFIKAT

Machine capability tests

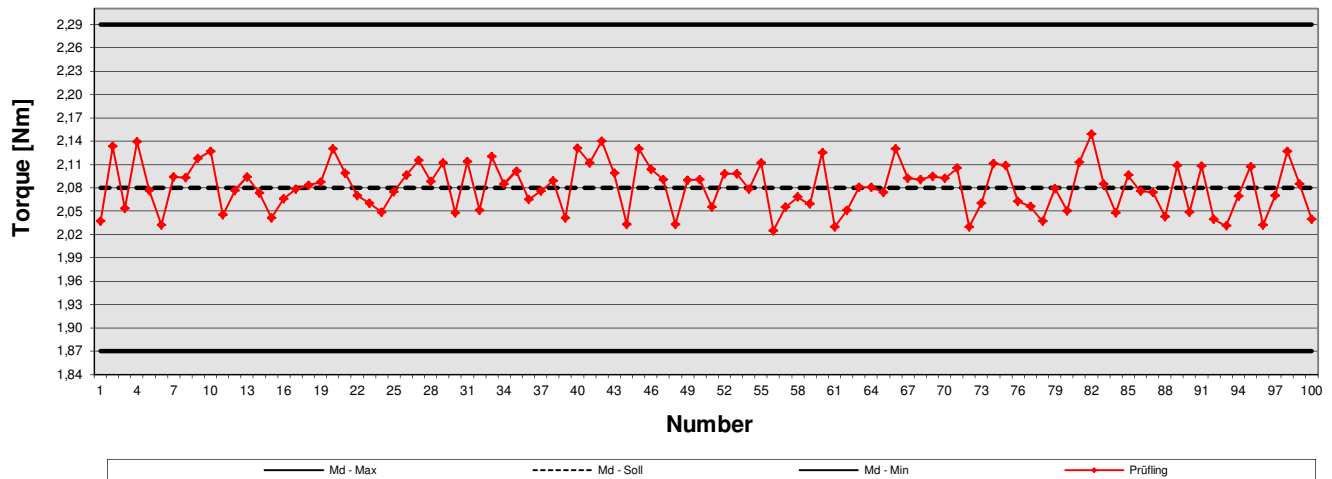


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03839

80% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,29	2,08	1,87	+/- 10,00%

Hard joint 30°



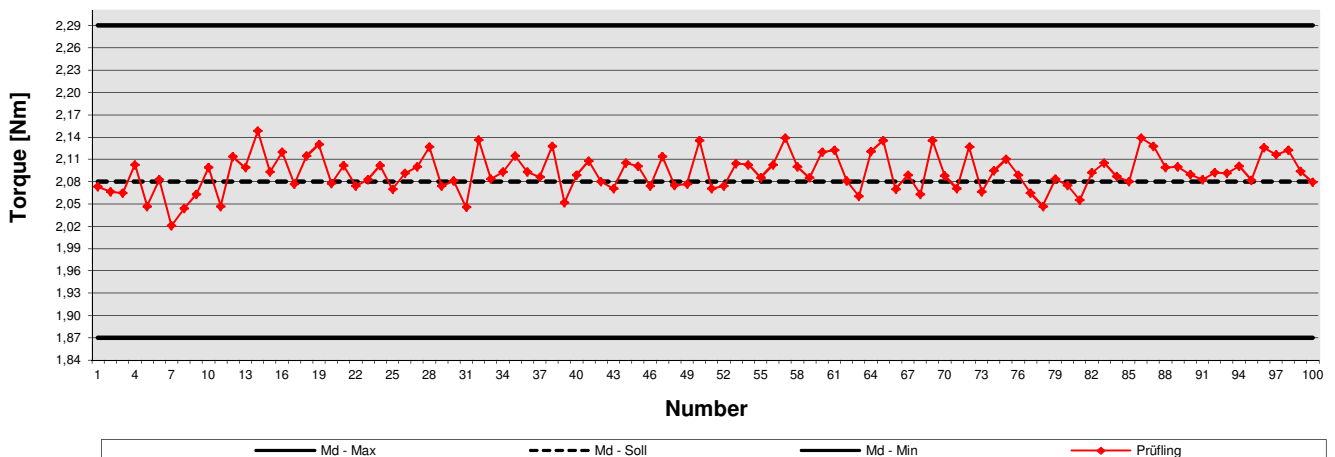
Statistics of the test piece

max. Torque	2,15 Nm	1 sig	0,031 Nm
min. Torque	2,03 Nm	6 sig	0,185 Nm
spread	0,12 Nm	+3 sig	2,17 Nm
Average	2,08 Nm	-3 sig	1,99 Nm

$$C_m = 2,27$$

$$C_{mk} = 2,26$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,15 Nm	1 sig	0,025 Nm
min. Torque	2,02 Nm	6 sig	0,150 Nm
spread	0,13 Nm	+3 sig	2,17 Nm
Average	2,09 Nm	-3 sig	2,02 Nm

$$C_m = 2,79$$

$$C_{mk} = 2,63$$

CERTIFIKAT

Machine capability tests

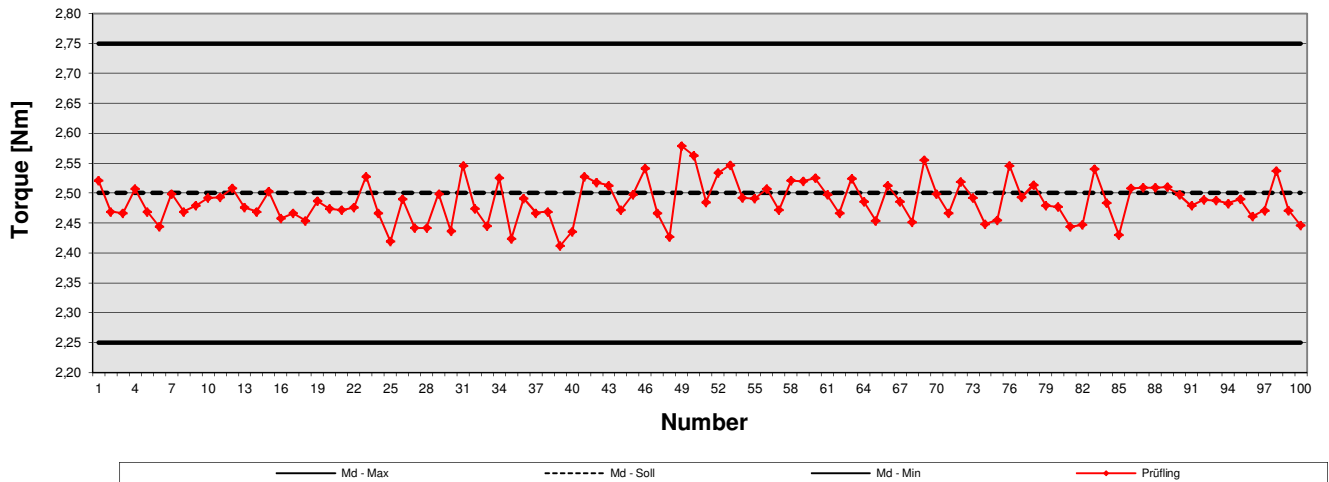


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03839

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,75	2,50	2,25	+/- 10,00%

Hard joint 30°



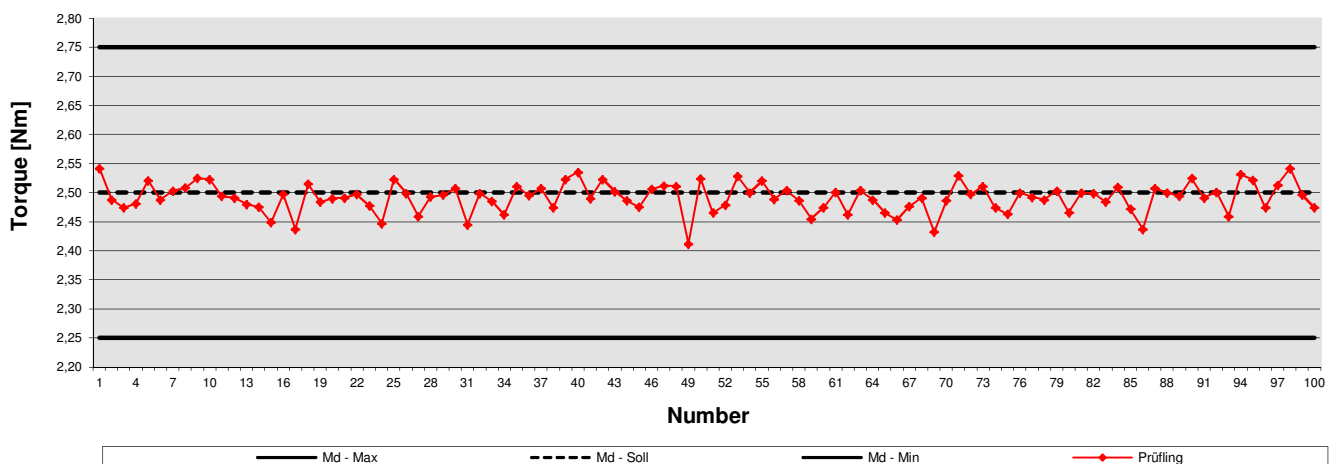
Statistics of the test piece

max. Torque	2,58 Nm	1 sig	0,034 Nm
min. Torque	2,41 Nm	6 sig	0,202 Nm
spread	0,17 Nm	+3 sig	2,59 Nm
Average	2,49 Nm	-3 sig	2,39 Nm

$$C_m = 2,47$$

$$C_{mk} = 2,34$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,54 Nm	1 sig	0,025 Nm
min. Torque	2,41 Nm	6 sig	0,150 Nm
spread	0,13 Nm	+3 sig	2,57 Nm
Average	2,49 Nm	-3 sig	2,42 Nm

$$C_m = 3,33$$

$$C_{mk} = 3,22$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03839

Combined statistics for the test object (hard and soft joint) [Md = 30%]

Number of tightenings	200	6 sigma	0,09 Nm
Average	1,03 Nm	Mean value offset	0,01 Nm
Sigma	0,01 Nm	Mean value offset %	0,75 %
Dispersion	0,07 Nm	comb. average torque	1,03 Nm
max. Torque	1,07 Nm	comb. torque variation	0,10 Nm
min. Torque	1,00 Nm	comb. torque variation %	9,38 %

$$C_m = 2,24$$

$$C_{mk} = 2,17$$

Combined statistics for the test object (hard and soft joint) [Md = 80%]

Number of tightenings	200	6 sigma	0,17 Nm
Average	2,09 Nm	Mean value offset	0,01 Nm
Sigma	0,03 Nm	Mean value offset %	0,51 %
Dispersion	0,13 Nm	comb. average torque	2,08 Nm
max. Torque	2,15 Nm	comb. torque variation	0,18 Nm
min. Torque	2,02 Nm	comb. torque variation %	8,87 %

$$C_m = 2,50$$

$$C_{mk} = 2,42$$

Combined statistics for the test object (hard and soft joint) [Md = 100%]

Number of tightenings	200	6 sigma	0,18 Nm
Average	2,49 Nm	Mean value offset	0,00 Nm
Sigma	0,03 Nm	Mean value offset %	0,19 %
Dispersion	0,17 Nm	comb. average torque	2,49 Nm
max. Torque	2,58 Nm	comb. torque variation	0,20 Nm
min. Torque	2,41 Nm	comb. torque variation %	8,13 %

$$C_m = 2,81$$

$$C_{mk} = 2,69$$

CERTIFIKAT

Machine capability test

Certificate no.:

207174-03

Customer

Desoutter Industrial Tools

Test object

Manufacturer: **Desoutter**

Tool type: **ELS2.5-1550-P**

Serial - No. : **14D03842**

Torque range

of: **0,4 Nm**
to: **2,5 Nm**

Number of screw tightenings

at 30%	==>	100
at 80%	==>	100
at 100%	==>	100

Torque to be achieved

at 30%	==>	1,03 Nm
at 80%	==>	2,08 Nm
at 100%	==>	2,50 Nm

Above mentioned number of unions were performed on a hard and on a soft joint.

The series of measurements were divided into 30%, 80% and 100% of the torque range, and a joint with a rotation angle of 30 ° (hard) and 360 ° (soft).

Tolerance is the difference between USL, upper limit, and LSL, Lower Limit.

Date:

2014-10-25

CERTIFIKAT

Machine capability tests

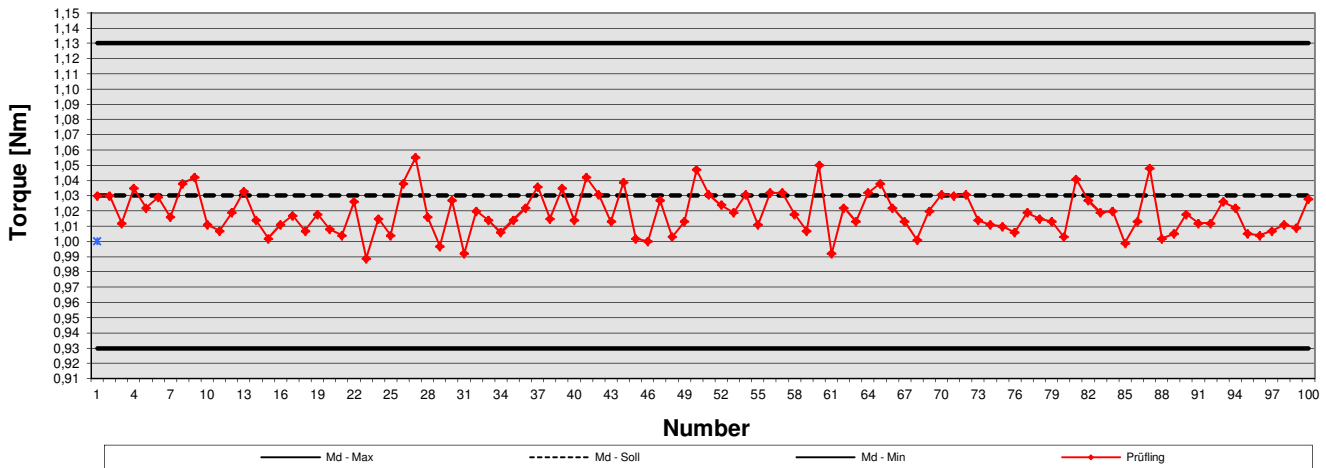


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03842

30% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	1,13	1,03	0,93	+/- 10,00%

Hard joint 30°



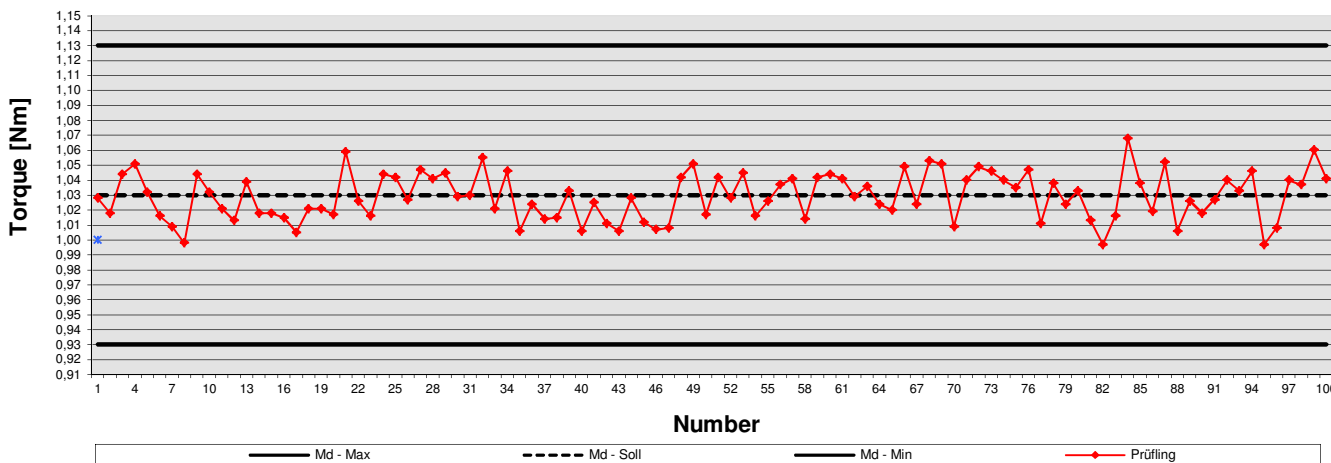
Statistics of the test piece

max. Torque	1,06 Nm	1 sig	0,014 Nm
min. Torque	0,99 Nm	6 sig	0,082 Nm
spread	0,07 Nm	+3 sig	1,06 Nm
Average	1,02 Nm	-3 sig	0,98 Nm

$$C_m = 2,44$$

$$C_{mk} = 2,16$$

Soft joint 360°



Statistics of the test piece

max. Torque	1,07 Nm	1 sig	0,016 Nm
min. Torque	1,00 Nm	6 sig	0,095 Nm
spread	0,07 Nm	+3 sig	1,08 Nm
Average	1,03 Nm	-3 sig	0,98 Nm

$$C_m = 2,11$$

$$C_{mk} = 2,09$$

CERTIFIKAT

Machine capability tests

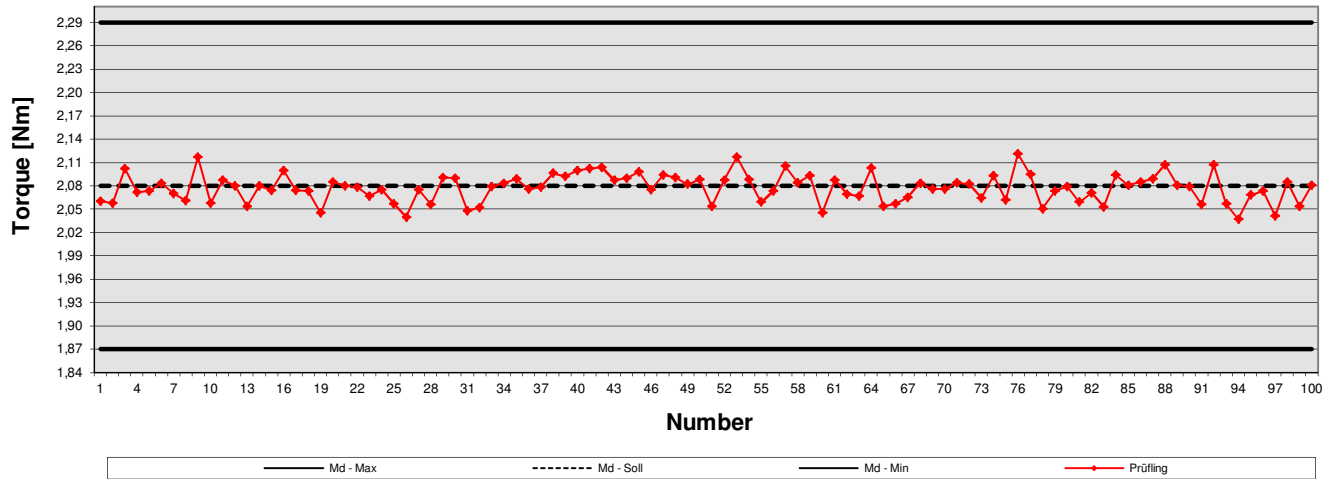


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03842

80% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,29	2,08	1,87	+/- 10,00%

Hard joint 30°



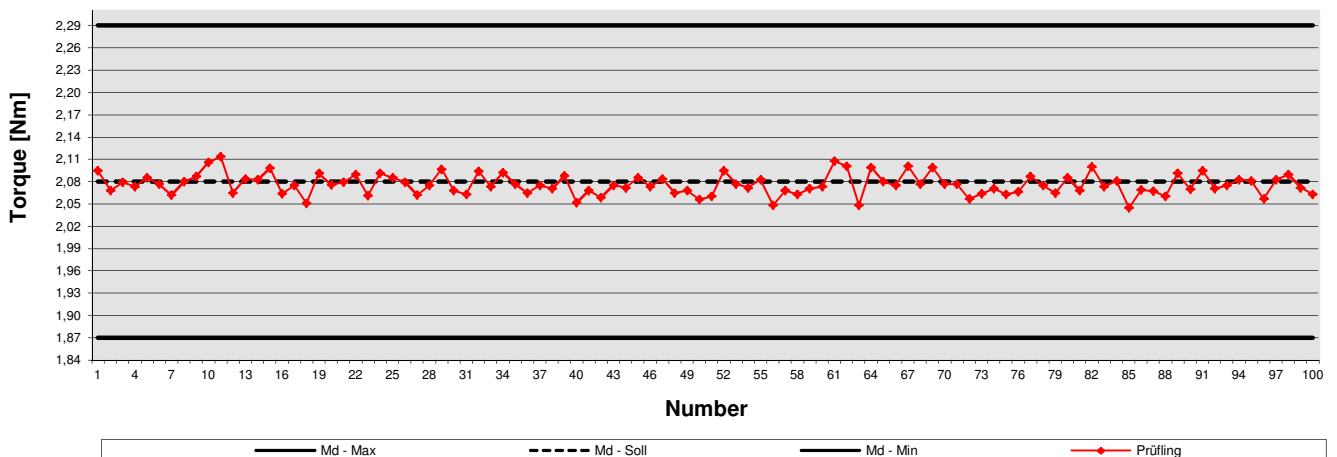
Statistics of the test piece

max. Torque	2,12 Nm	1 sig	0,018 Nm
min. Torque	2,04 Nm	6 sig	0,108 Nm
spread	0,08 Nm	+3 sig	2,13 Nm
Average	2,08 Nm	-3 sig	2,02 Nm

$$C_m = 3,87$$

$$C_{mk} = 3,82$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,11 Nm	1 sig	0,014 Nm
min. Torque	2,05 Nm	6 sig	0,084 Nm
spread	0,07 Nm	+3 sig	2,12 Nm
Average	2,08 Nm	-3 sig	2,03 Nm

$$C_m = 4,97$$

$$C_{mk} = 4,89$$

CERTIFIKAT

Machine capability tests

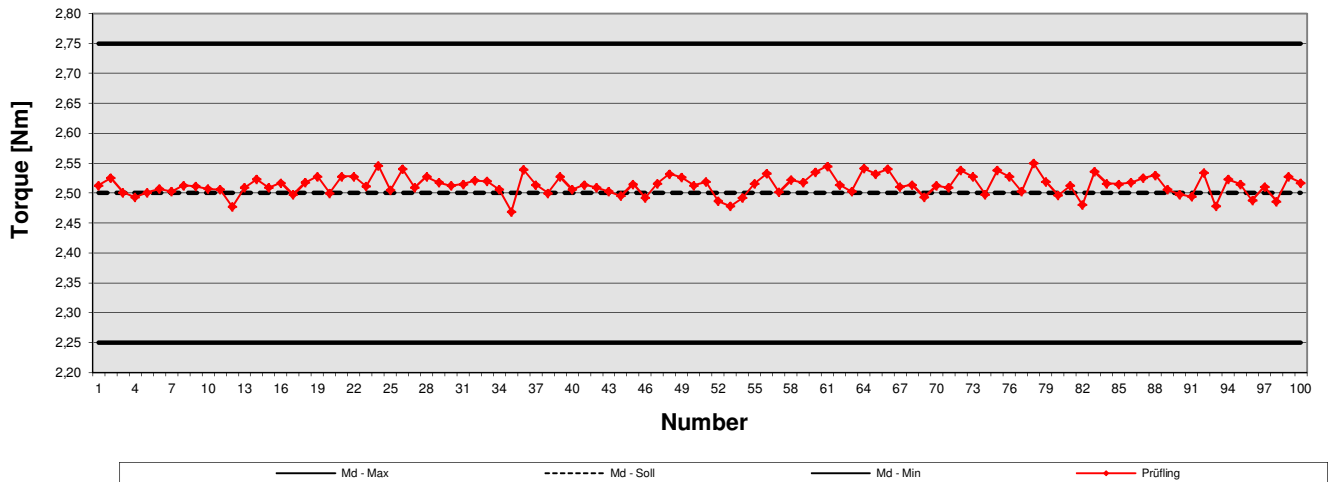


Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03842

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	2,75	2,50	2,25	+/- 10,00%

Hard joint 30°



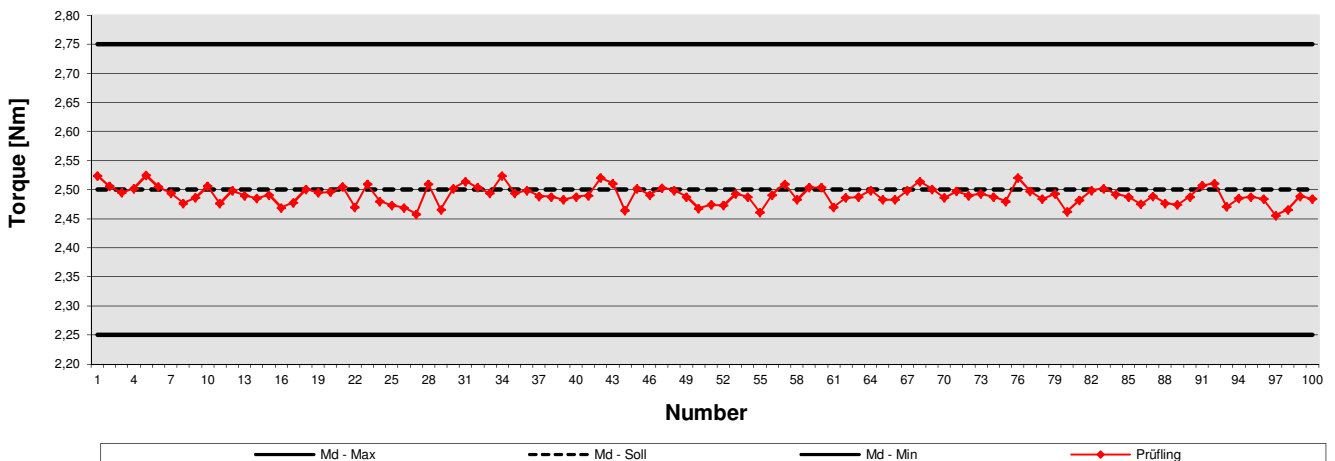
Statistics of the test piece

max. Torque	2,55 Nm	1 sig	0,017 Nm
min. Torque	2,47 Nm	6 sig	0,099 Nm
spread	0,08 Nm	+3 sig	2,56 Nm
Average	2,51 Nm	-3 sig	2,46 Nm

$$C_m = 5,04$$

$$C_{mk} = 4,78$$

Soft joint 360°



Statistics of the test piece

max. Torque	2,53 Nm	1 sig	0,015 Nm
min. Torque	2,46 Nm	6 sig	0,091 Nm
spread	0,07 Nm	+3 sig	2,54 Nm
Average	2,49 Nm	-3 sig	2,44 Nm

$$C_m = 5,48$$

$$C_{mk} = 5,27$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: ELS2.5-1550-P

Serial - No. : 14D03842

Combined statistics for the test object (hard and soft joint) [Md = 30%]

Number of tightenings	200	6 sigma	0,09 Nm
Average	1,02 Nm	Mean value offset	0,01 Nm
Sigma	0,01 Nm	Mean value offset %	1,01 %
Dispersion	0,08 Nm	comb. average torque	1,03 Nm
max. Torque	1,07 Nm	comb. torque variation	0,10 Nm
min. Torque	0,99 Nm	comb. torque variation %	9,62 %

$$C_m = 2,26$$

$$C_{mk} = 2,00$$

Combined statistics for the test object (hard and soft joint) [Md = 80%]

Number of tightenings	200	6 sigma	0,10 Nm
Average	2,08 Nm	Mean value offset	0,00 Nm
Sigma	0,02 Nm	Mean value offset %	0,04 %
Dispersion	0,08 Nm	comb. average torque	2,08 Nm
max. Torque	2,12 Nm	comb. torque variation	0,11 Nm
min. Torque	2,04 Nm	comb. torque variation %	5,22 %

$$C_m = 4,33$$

$$C_{mk} = 4,26$$

Combined statistics for the test object (hard and soft joint) [Md = 100%]

Number of tightenings	200	6 sigma	0,09 Nm
Average	2,50 Nm	Mean value offset	0,02 Nm
Sigma	0,02 Nm	Mean value offset %	0,91 %
Dispersion	0,09 Nm	comb. average torque	2,50 Nm
max. Torque	2,55 Nm	comb. torque variation	0,12 Nm
min. Torque	2,46 Nm	comb. torque variation %	4,71 %

$$C_m = 5,26$$

$$C_{mk} = 5,23$$

a. Temperature

There was hardly no noticeable warming of the tool detected.

b. Battery lifetime

After amount of 894 tightening on a hard joint and 708 tightening on a soft joint the screw driver indicates a renewing of the battery load/ battery change.

V. Comments

The testing process and statistical analysis were performed according to the currently applicable guideline VDI/VDE 2647.

The traceability of all generated static measurements and the traceability of measuring equipment used within calibration certificates are supported by the documentary proof of the legality of those accredited by the DKD laboratory according to DIN 51309 K 41401 guaranteed.

The corresponding proofs are in this report along with all other test results.

Responsible for implementing



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