Power Tools Central Service Workshop

Rózyniec 83C, 59-706 Gromadka,
Polen

Test report

Battery angle nutrunner – 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

August 2015
Power Tools Central Service Workshop
Rózyniec 83C, 59-706 Gromadka,
Polen

III. Testobject

Battery nutrunner:
EABC 50-450
Serial number 14E87418
15E93467
15E93889

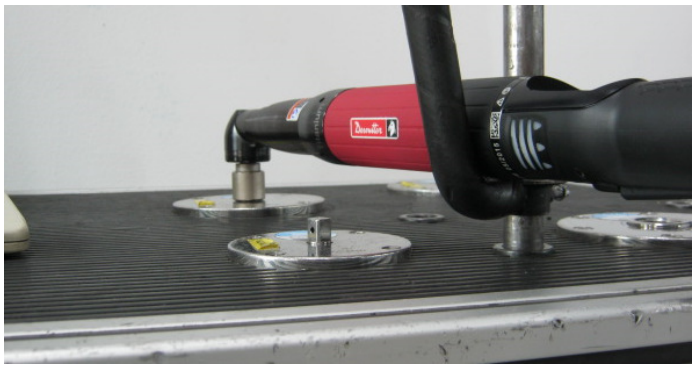
Model	EABC 50-450
Ordering No	6151658450
Square Drive / Female Hex	Square drive
Torque range ft lb	6.6 – 37
Torque range Nm	9 – 50
CS distance mm	-
Weight kg	2.04
Weight lb	4.50
Length mm	546
Speed r/min	450
Height mm	51
Square drive in	3/8

Li-Ion 36 VDC 2,1 Ah
Serial number 00198-15-W13

Controller CVI3 – Vision
Serial number: 27011100077

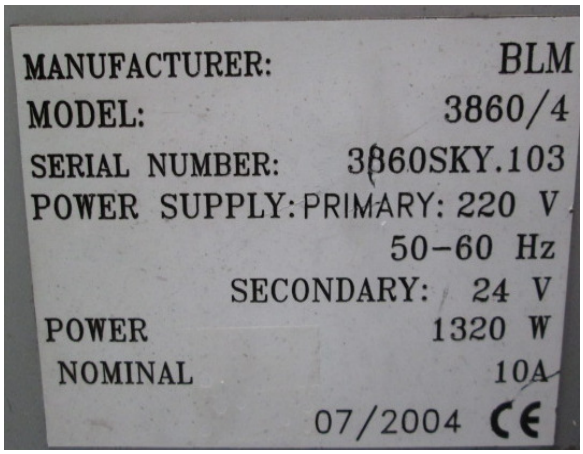
IV. Test condition

a. Mounting



b. Test equipment

Manufacturer:	**BLM, Mailand (Italien)**
Type:	**3860/4**
Ser.-Nr.:	**3860SKY.103**
Cell 2 :	**10-50 N·m, dynamisch**
Calibration certificate:	**EN2530, E15253**
Software:	**QS – Torque (32 Bit)**
Filter Frequency:	**300 Hz**



c. Explanation of the test

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

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

From the VDI / VDE 2647, the standard values for break times between were the fastening cycles taken:

30% hart:	2 Sekunden
30% weich:	5 Sekunden
80% hart:	15 Sekunden
80% weich:	20 Sekunden
100% hart:	35 Sekunden
100% weich:	45 Sekunden

d. Nutrunner test conditions

Range of the screwdriver device :		9 – 50 Nm
Testing torque / 30% hard/soft joint		21.30 Nm
Testing torque / 80% hard/soft joint		41.80 Nm
Testing torque / 100% hard/soft joint		50.00 Nm
Speed 1 step		450 rpm
Speed 2 step		50 rpm
Angle threshold / 30%		10.65 Nm
Angle threshold / 80%		20.90 Nm
Angle threshold / 100%		25.00 Nm
Switching torque / 30%		9.585 Nm
Switching torque / 80%		18.81 Nm
Switching torque / 100%		22.50 Nm
Angle strategy 40°	10 Nm	(30.00) Nm
Angle strategy 180°	10 Nm	(40.00) Nm
Series		8 x 100 Joint/ results

e. Results

Reached Cm and Cmk values

Desoutter / 2-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°
EABC50-450		Test torque		21,30 Nm		41,80 Nm		50,00 Nm	
		Speed 1st stage		450 rpm					
		Speed 2st stage		50 rpm					
		Start angle measurement		10,65 Nm		20,90 Nm		25,00 Nm	
	14E87418		cm	3,41	3,02	3,52	3,51	3,46	2,97
			cmk	3,08	2,85	3,43	3,25	3,28	2,64
	15E93467		cm	2,09	2,68	2,43	2,92	3,25	3,32
			cmk	2,03	2,39	2,24	2,74	3,01	3,01
	15E93889		cm	2,62	3,69	2,58	2,98	2,69	3,52
			cmk	2,33	3,68	2,35	2,94	2,69	3,48

Min cm/cmk	cm	2,09	2,68	2,43	2,92	2,69	2,97
	cmk	2,03	2,39	2,24	2,74	2,69	2,64

	Range:	≥ 1,67	
Capability Index:	C_m	2,09	**OK**
Capability Index:	C_{mk}	2,03	**OK**

Ranges of tolerance for angle and torque

Tool type	Serial Nr.	Test data	60% from range		80% from range	
			40°		**180°**	
EABC50-450		Test torque	30,00 Nm		40,00 Nm	
		Speed 1st stage	450 rpm			
		Start angle	10,00 Nm		10,00 Nm	
	14E87418	Torque	±	4,89%	±	3,16%
		Angle	±	1,4°	±	2,2°
	15E93467	Torque	±	5,26%	±	5,73%
		Angle	±	1,1°	±	5,8°
	15E93889	Torque	±	4,40%	±	4,34%
		Angle	±	1,2°	±	2,9°

Max Torque	Torque	Range:	**7%**	Range:	**7%**	40°
	Ist:	±	5,26%	±	5,73%	**OK**
Max Angle	Angle	**Range:**	**5°**	**Soll: ±**	**10°**	40°
	Ist:	±	1,4°	±	5,8°	**OK**

Power Tools Central Service Workshop
Rózyniec 83C, 59-706 Gromadka,

CERTIFIKAT

Machine capability test

Certificate no.: **234089-01**

Customer **Desoutter Industrial Tools**

Test object

Manufacturer: **Desoutter**
Tool type: **EABC50-450** Serial - No. : **14E87418**

Torque range

of: **9 Nm**
to: **50 Nm**

Number of screw tightenings			Torque to be achieved		
at 30%	==>	**100**	at 30%	==>	**21,30 Nm**
at 80%	==>	**100**	at 80%	==>	**41,80 Nm**
at 100%	==>	**100**	at 100%	==>	**50,00 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:

2015-08-27

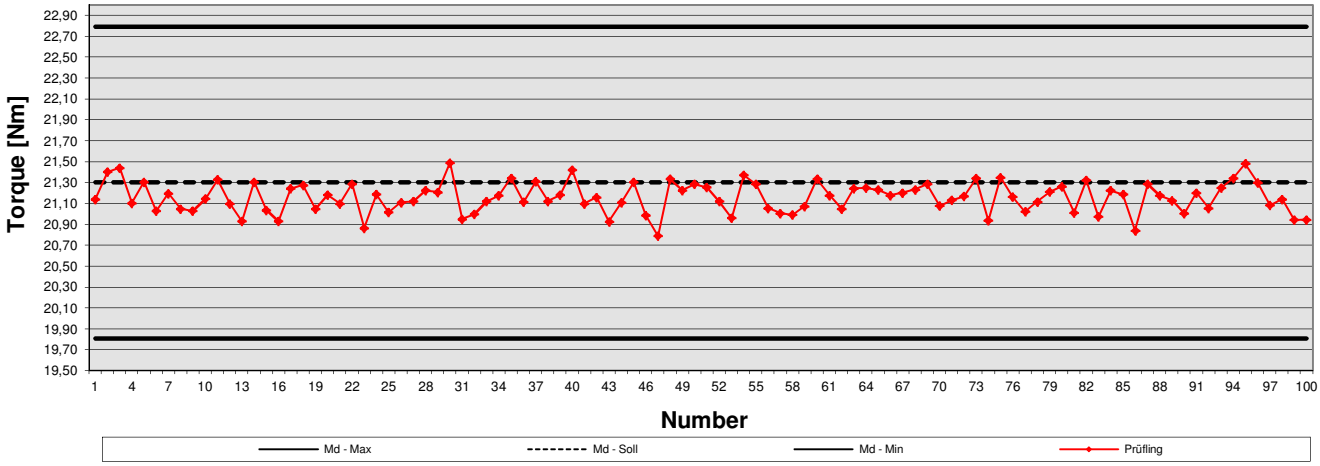
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 14E87418

30% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	22,79	21,30	19,81	+/- 7,00%

Hard joint 30°

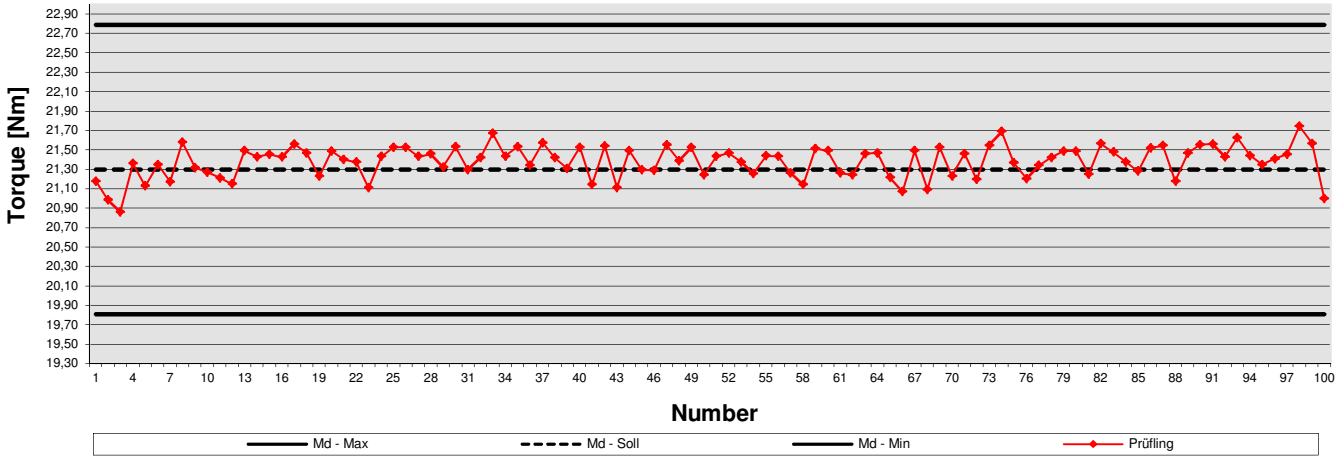


Statistics of the test piece

max. Torque	21,49	Nm	1 sig	0,146	Nm
min. Torque	20,79	Nm	6 sig	0,874	Nm
spread	0,70	Nm	+3 sig	21,59	Nm
Average	21,16	Nm	-3 sig	20,72	Nm

C_m = *3,41* C_{mk} = *3,08*

Soft joint 360°



Statistics of the test piece

max. Torque	21,75	Nm	1 sig	0,165	Nm
min. Torque	20,86	Nm	6 sig	0,988	Nm
spread	0,88	Nm	+3 sig	21,88	Nm
Average	21,38	Nm	-3 sig	20,89	Nm

C_m = *3,02* C_{mk} = *2,85*

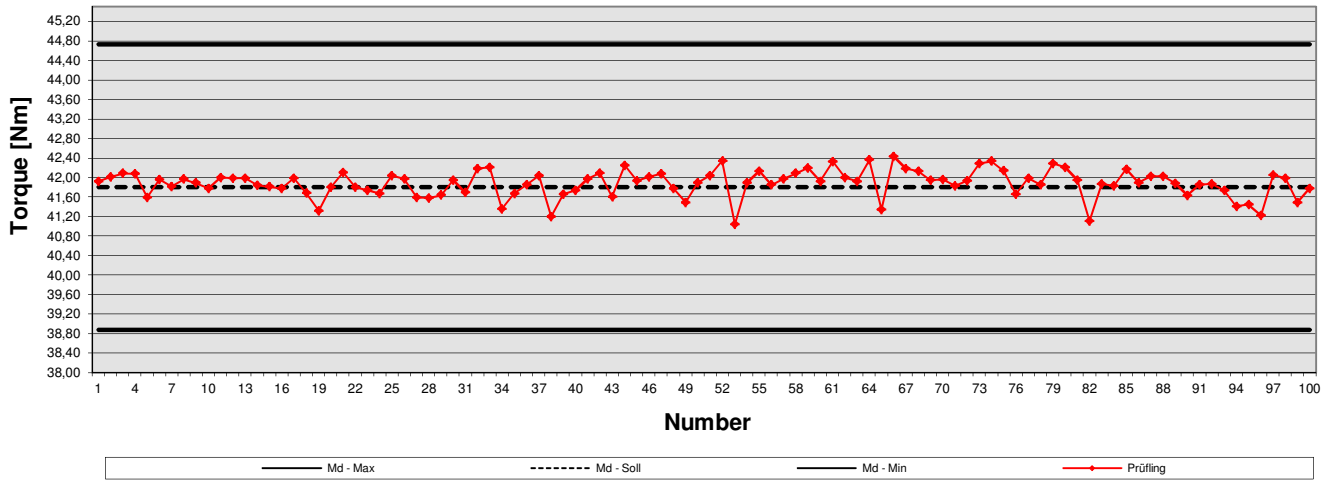
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 14E87418

80% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	44,73	41,80	38,87	+/- 7,00%

Hard joint 30°

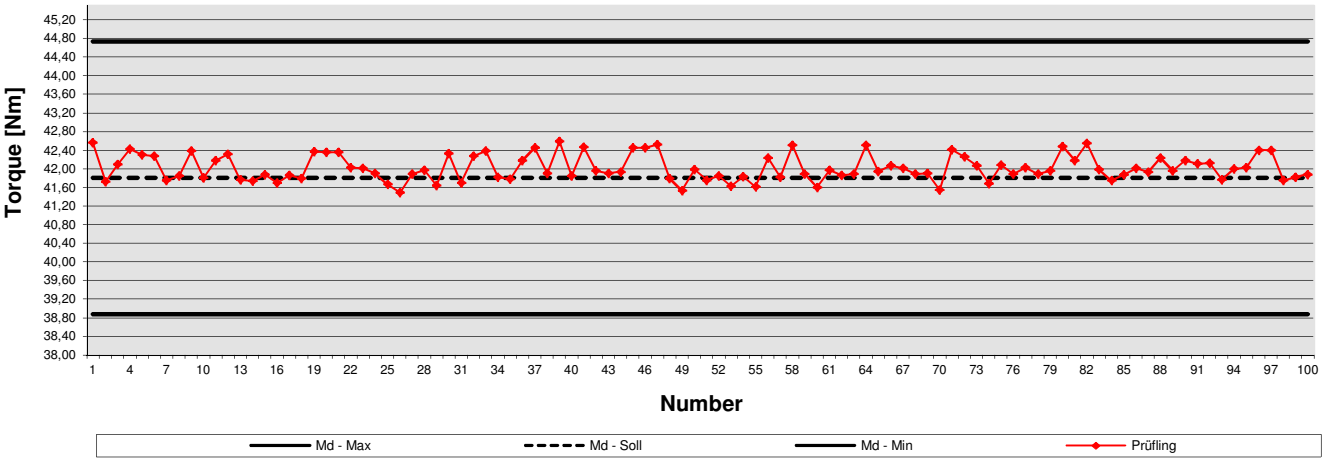


Statistics of the test piece

max. Torque	42,43	Nm	1 sig	0,277	Nm
min. Torque	41,04	Nm	6 sig	1,665	Nm
spread	1,39	Nm	+3 sig	42,71	Nm
Average	41,88	Nm	-3 sig	41,05	Nm

C_m = *3,52* C_{mk} = *3,43*

Soft joint 360°



Statistics of the test piece

max. Torque	42,59	Nm	1 sig	0,278	Nm
min. Torque	41,48	Nm	6 sig	1,667	Nm
spread	1,10	Nm	+3 sig	42,86	Nm
Average	42,02	Nm	-3 sig	41,19	Nm

C_m = *3,51* C_{mk} = *3,25*

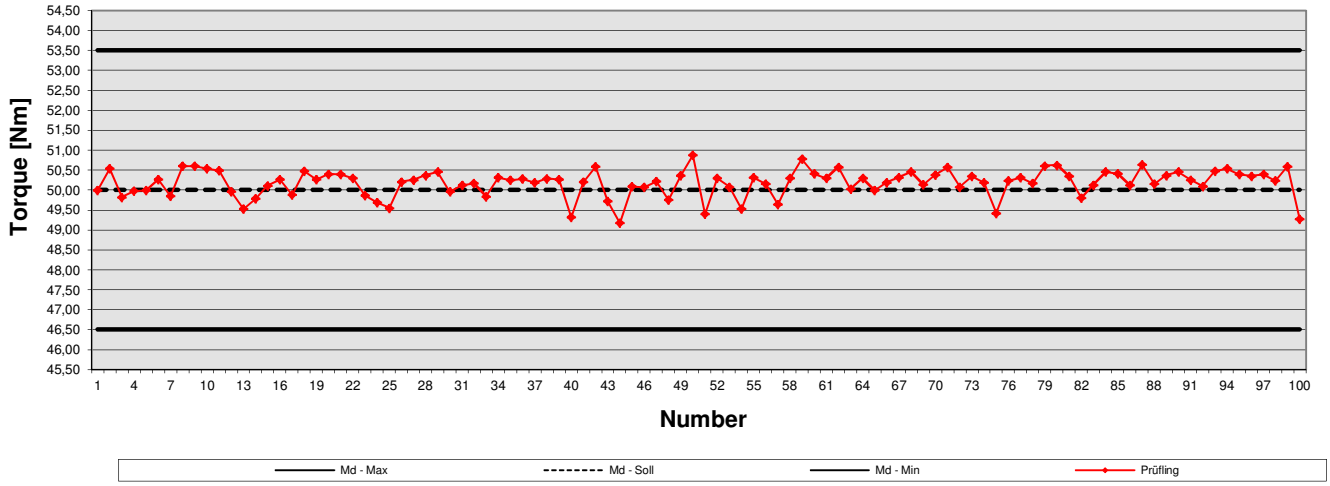
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 14E87418

100% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°

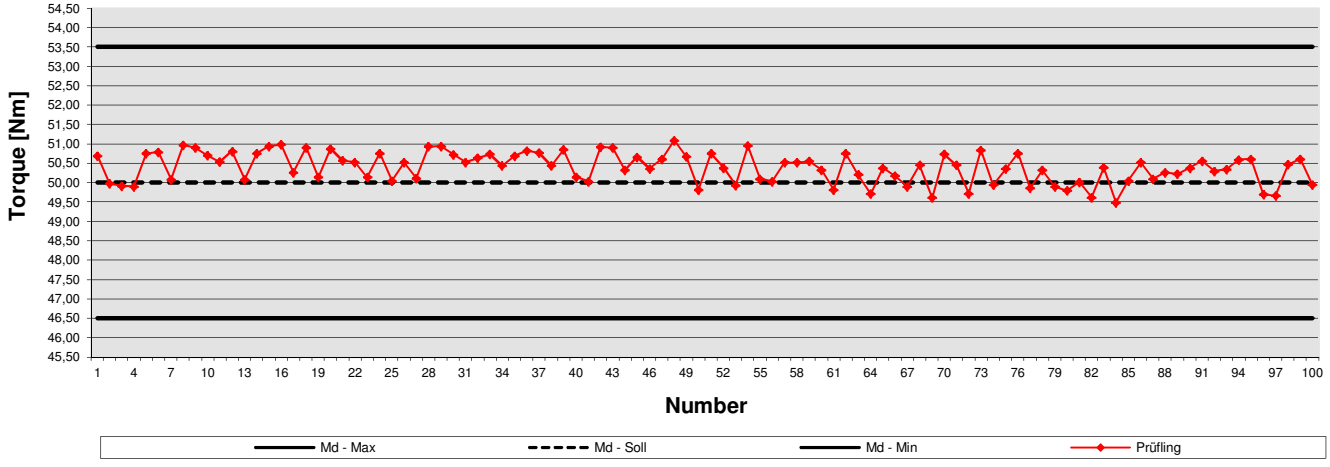


Statistics of the test piece

max. Torque	50,88	Nm	1 sig	0,338	Nm
min. Torque	49,17	Nm	6 sig	2,025	Nm
spread	1,70	Nm	+3 sig	51,19	Nm
Average	50,18	Nm	-3 sig	49,17	Nm

C_m = *3,46* C_{mk} = *3,28*

Soft joint 360°



Statistics of the test piece

max. Torque	51,09	Nm	1 sig	0,392	Nm
min. Torque	49,49	Nm	6 sig	2,355	Nm
spread	1,60	Nm	+3 sig	51,57	Nm
Average	50,39	Nm	-3 sig	49,21	Nm

C_m = *2,97* C_{mk} = *2,64*

CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter

Tool type: EABC50-450 Serial - No. : 14E87418

Combined statistics for the test object (hard and soft joint)

[Md = 30%]

Number of tightenings	200	6 sigma	0,93 Nm
Average	21,16 Nm	Mean value offset	0,22 Nm
Sigma	0,16 Nm	Mean value offset %	1,05 %
Dispersion	0,96 Nm	comb. average torque	21,30 Nm
max. Torque	21,75 Nm	comb. torque variation	1,15 Nm
min. Torque	20,79 Nm	comb. torque variation %	5,42 %

$C_m = 3,20$ $C_{mk} = 2,90$

Combined statistics for the test object (hard and soft joint)

[Md = 80%]

Number of tightenings	200	6 sigma	1,66 Nm
Average	41,95 Nm	Mean value offset	0,14 Nm
Sigma	0,28 Nm	Mean value offset %	0,34 %
Dispersion	1,54 Nm	comb. average torque	41,95 Nm
max. Torque	42,59 Nm	comb. torque variation	1,81 Nm
min. Torque	41,04 Nm	comb. torque variation %	4,31 %

$C_m = 3,53$ $C_{mk} = 3,35$

Combined statistics for the test object (hard and soft joint)

[Md = 100%]

Number of tightenings	200	6 sigma	2,19 Nm
Average	50,29 Nm	Mean value offset	0,21 Nm
Sigma	0,37 Nm	Mean value offset %	0,42 %
Dispersion	1,92 Nm	comb. average torque	50,37 Nm
max. Torque	51,09 Nm	comb. torque variation	2,40 Nm
min. Torque	49,17 Nm	comb. torque variation %	4,77 %

$C_m = 3,20$ $C_{mk} = 2,93$

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Rózyniec 83C, 59-706 Gromadka,

CERTIFIKAT

Machine capability test

Certificate no.: **234089-02**

Customer **Desoutter Industrial Tools**

Test object

Manufacturer: **Desoutter**
Tool type: **EABC50-450** Serial - No. : **15E93467**

Torque range

of: **9 Nm**
to: **50 Nm**

Number of screw tightenings			Torque to be achieved		
at 30%	==>	**100**	at 30%	==>	**21,30 Nm**
at 80%	==>	**100**	at 80%	==>	**41,80 Nm**
at 100%	==>	**100**	at 100%	==>	**50,00 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:

2015-08-27

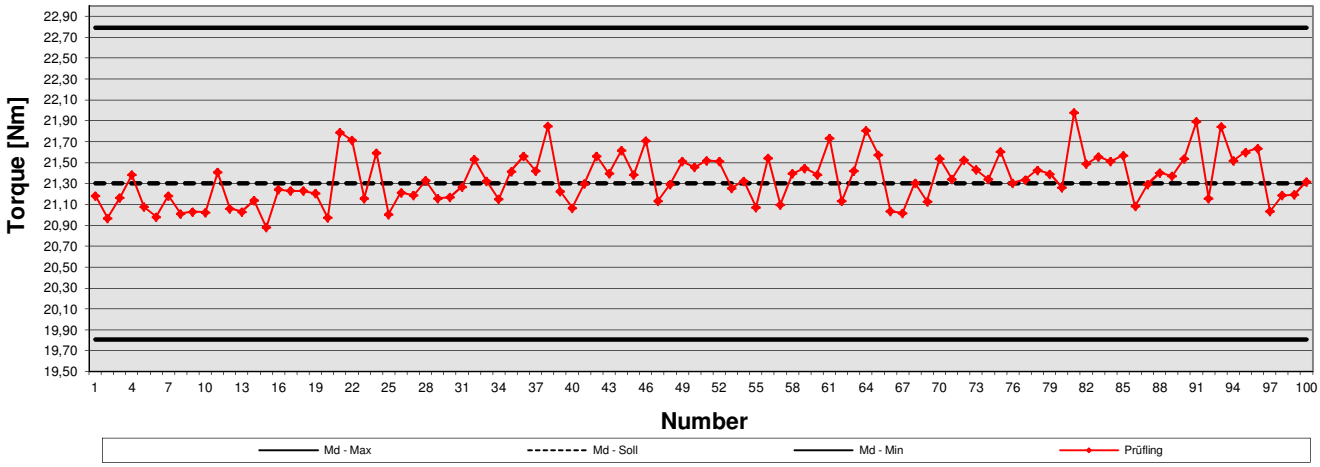
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93467

30% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	22,79	21,30	19,81	+/- 7,00%

Hard joint 30°

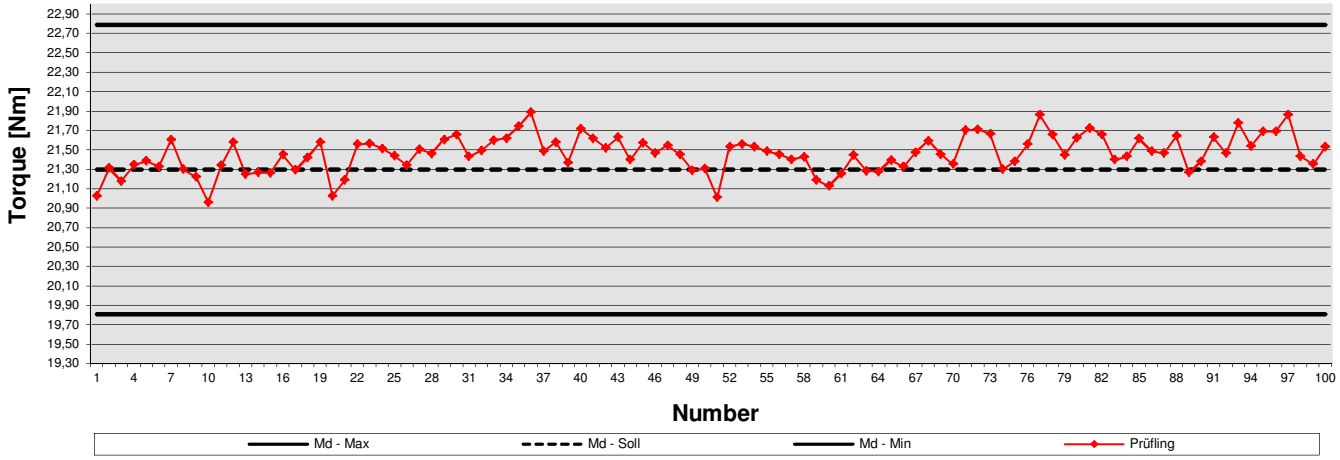


Statistics of the test piece

max. Torque	21,98	Nm	1 sig	0,237	Nm
min. Torque	20,88	Nm	6 sig	1,423	Nm
spread	1,10	Nm	+3 sig	22,05	Nm
Average	21,34	Nm	-3 sig	20,63	Nm

C_m = *2,09* C_{mk} = *2,03*

Soft joint 360°



Statistics of the test piece

max. Torque	21,89	Nm	1 sig	0,185	Nm
min. Torque	20,96	Nm	6 sig	1,112	Nm
spread	0,93	Nm	+3 sig	22,02	Nm
Average	21,46	Nm	-3 sig	20,91	Nm

C_m = *2,68* C_{mk} = *2,39*

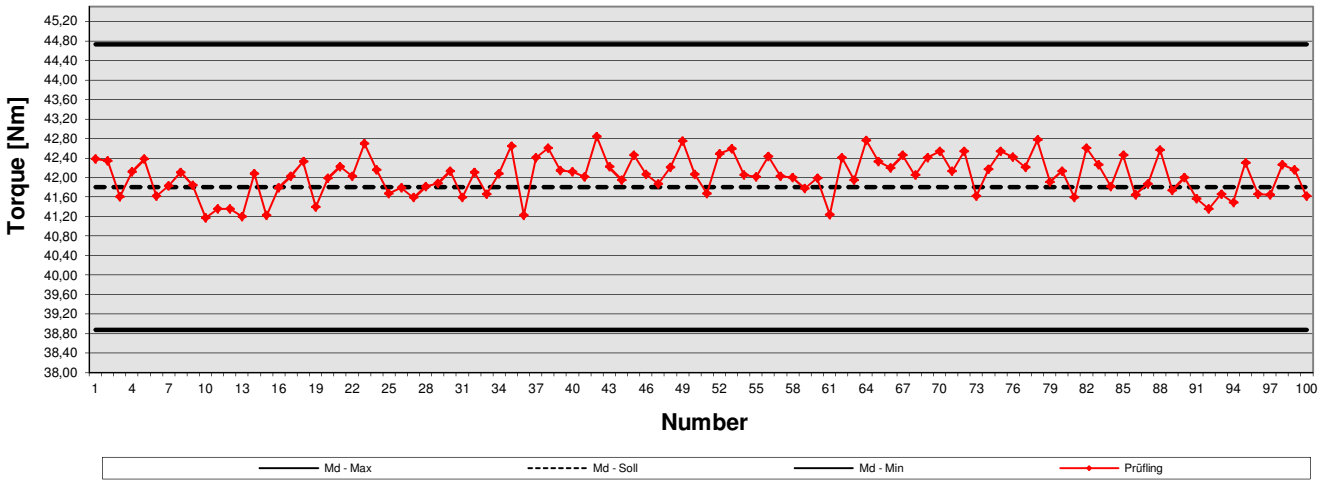
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93467

80% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	44,73	41,80	38,87	+/- 7,00%

Hard joint 30°

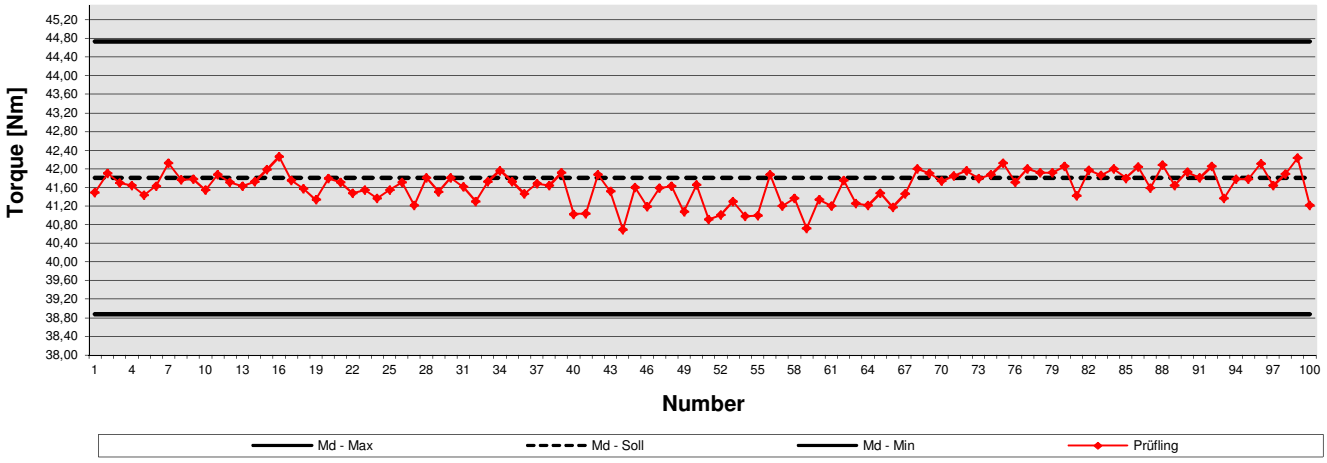


Statistics of the test piece

max. Torque	**42,84**	**Nm**	**1 sig**	**0,402**	**Nm**
min. Torque	**41,17**	**Nm**	**6 sig**	**2,415**	**Nm**
spread	**1,67**	**Nm**	**+3 sig**	**43,24**	**Nm**
Average	**42,03**	**Nm**	**-3 sig**	**40,82**	**Nm**

C_m = *2,43* C_{mk} = *2,24*

Soft joint 360°



Statistics of the test piece

max. Torque	**42,26**	**Nm**	**1 sig**	**0,335**	**Nm**
min. Torque	**40,69**	**Nm**	**6 sig**	**2,009**	**Nm**
spread	**1,57**	**Nm**	**+3 sig**	**42,63**	**Nm**
Average	**41,62**	**Nm**	**-3 sig**	**40,62**	**Nm**

C_m = *2,92* C_{mk} = *2,74*

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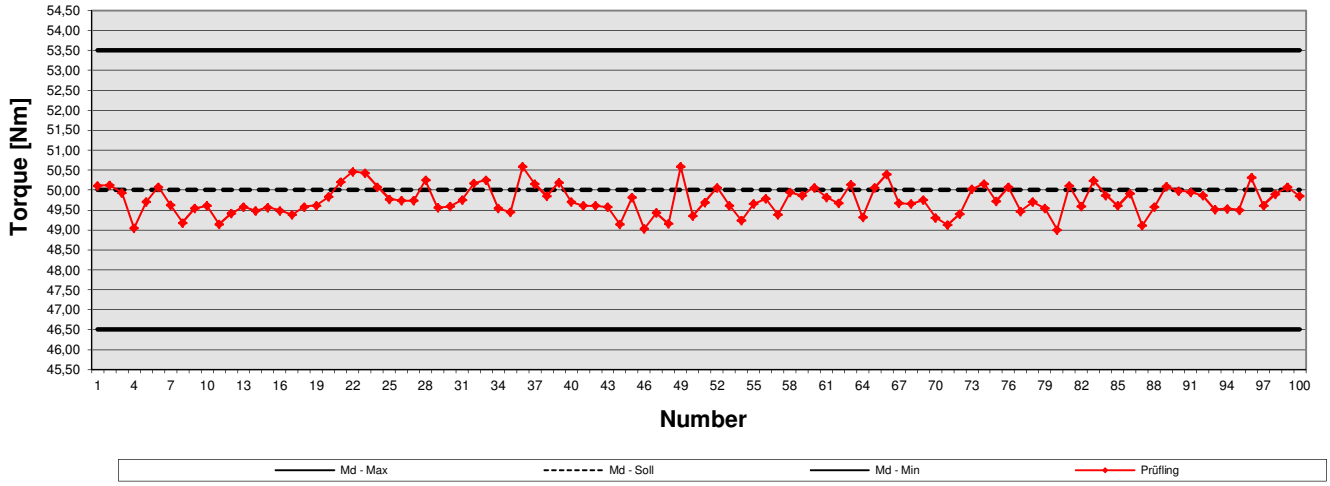
Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93467

100% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°

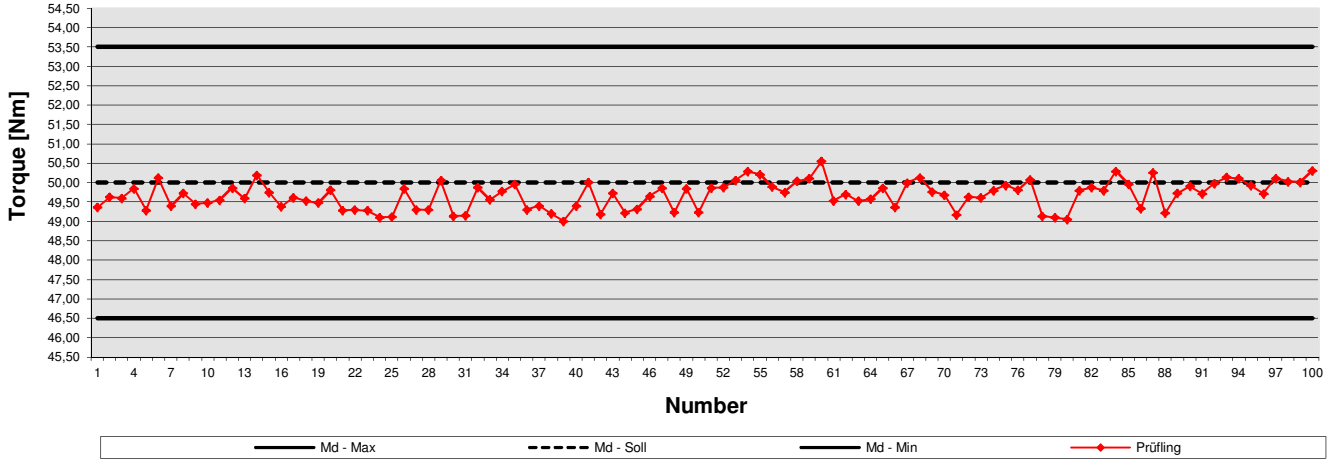


Statistics of the test piece

max. Torque	50,58	Nm	1 sig	0,359	Nm
min. Torque	49,01	Nm	6 sig	2,152	Nm
spread	1,58	Nm	+3 sig	50,82	Nm
Average	49,74	Nm	-3 sig	48,67	Nm

C_m = *3,25* C_{mk} = *3,01*

Soft joint 360°



Statistics of the test piece

max. Torque	50,55	Nm	1 sig	0,352	Nm
min. Torque	49,01	Nm	6 sig	2,109	Nm
spread	1,54	Nm	+3 sig	50,73	Nm
Average	49,68	Nm	-3 sig	48,62	Nm

C_m = *3,32* C_{mk} = *3,01*

CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter

Tool type: EABC50-450 Serial - No. : 15E93467

Combined statistics for the test object (hard and soft joint)

[Md = 30%]

Number of tightenings	200	6 sigma	1,27 Nm
Average	21,34 Nm	Mean value offset	0,12 Nm
Sigma	0,21 Nm	Mean value offset %	0,56 %
Dispersion	1,10 Nm	comb. average torque	21,34 Nm
max. Torque	21,98 Nm	comb. torque variation	1,42 Nm
min. Torque	20,88 Nm	comb. torque variation %	6,67 %

$C_m = 2,34$ $C_{mk} = 2,27$

Combined statistics for the test object (hard and soft joint)

[Md = 80%]

Number of tightenings	200	6 sigma	2,22 Nm
Average	41,83 Nm	Mean value offset	0,41 Nm
Sigma	0,37 Nm	Mean value offset %	0,97 %
Dispersion	2,15 Nm	comb. average torque	41,93 Nm
max. Torque	42,84 Nm	comb. torque variation	2,62 Nm
min. Torque	40,69 Nm	comb. torque variation %	6,25 %

$C_m = 2,65$ $C_{mk} = 2,62$

Combined statistics for the test object (hard and soft joint)

[Md = 100%]

Number of tightenings	200	6 sigma	2,13 Nm
Average	49,71 Nm	Mean value offset	0,07 Nm
Sigma	0,35 Nm	Mean value offset %	0,14 %
Dispersion	1,58 Nm	comb. average torque	49,72 Nm
max. Torque	50,58 Nm	comb. torque variation	2,20 Nm
min. Torque	49,01 Nm	comb. torque variation %	4,42 %

$C_m = 3,29$ $C_{mk} = 3,02$

Power Tools Central Service Workshop
Rózyniec 83C, 59-706 Gromadka,

CERTIFIKAT

Machine capability test

Certificate no.: **234089-03**

Customer **Desoutter Industrial Tools**

Test object

Manufacturer: **Desoutter**
Tool type: **EABC50-450** Serial - No. : **15E93889**

Torque range

of: **9 Nm**
to: **50 Nm**

Number of screw tightenings			Torque to be achieved		
at 30%	==>	**100**	at 30%	==>	**21,30 Nm**
at 80%	==>	**100**	at 80%	==>	**41,80 Nm**
at 100%	==>	**100**	at 100%	==>	**50,00 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:

2015-08-28

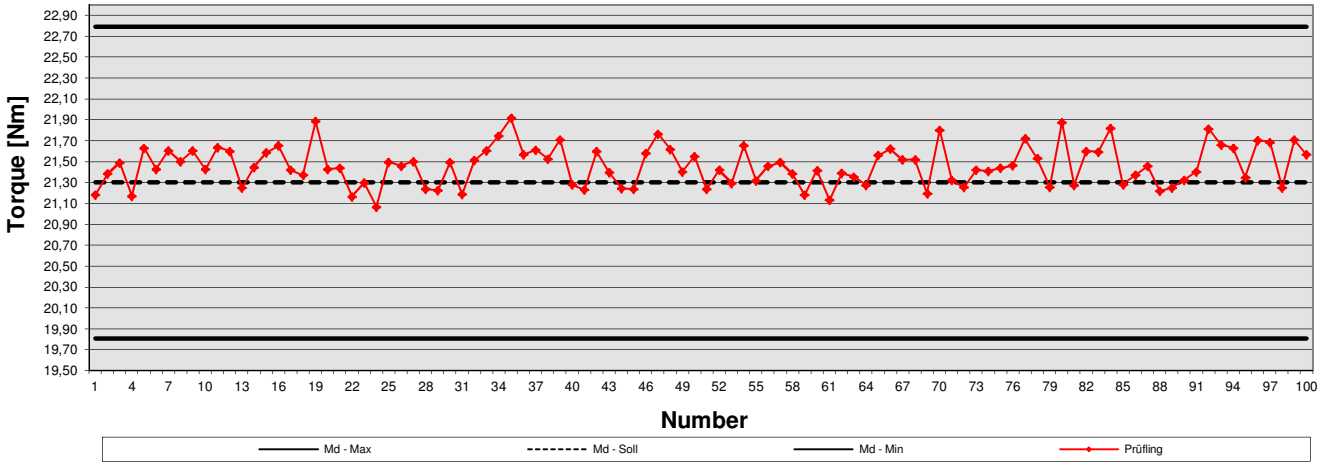
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93889

30% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	22,79	21,30	19,81	+/- 7,00%

Hard joint 30°

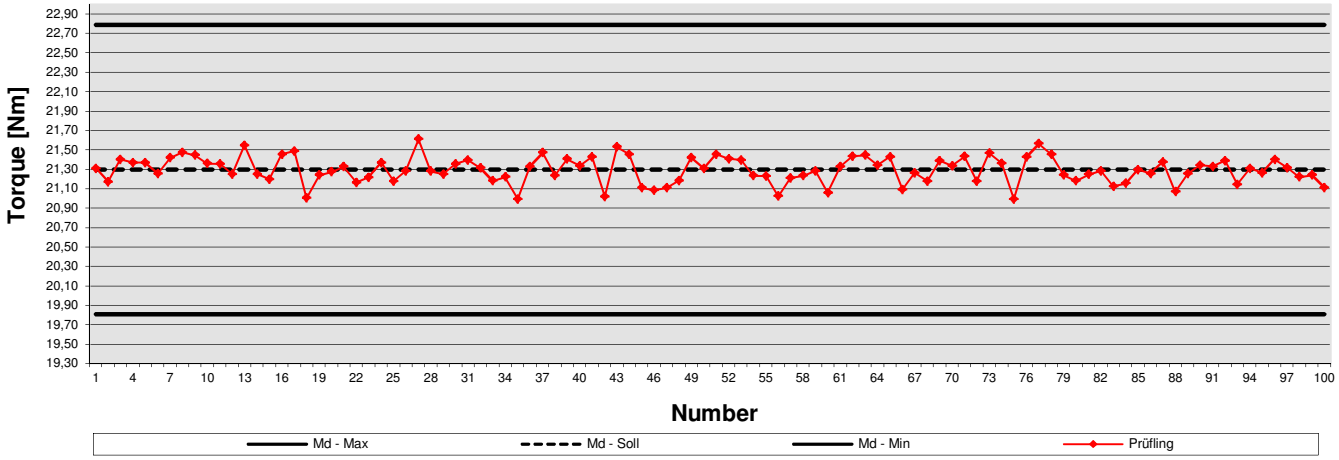


Statistics of the test piece

max. Torque	21,92	Nm	1 sig	0,190	Nm
min. Torque	21,07	Nm	6 sig	1,139	Nm
spread	0,85	Nm	+3 sig	22,03	Nm
Average	21,46	Nm	-3 sig	20,89	Nm

C_m = *2,62* C_{mk} = *2,33*

Soft joint 360°



Statistics of the test piece

max. Torque	21,61	Nm	1 sig	0,135	Nm
min. Torque	20,99	Nm	6 sig	0,807	Nm
spread	0,62	Nm	+3 sig	21,70	Nm
Average	21,29	Nm	-3 sig	20,89	Nm

C_m = *3,69* C_{mk} = *3,68*

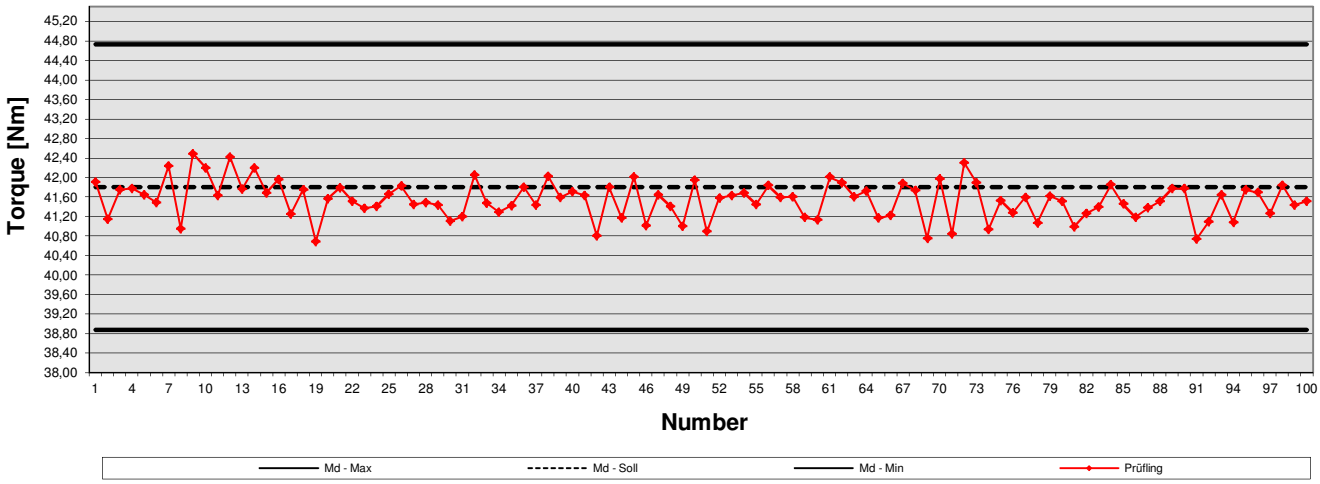
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93889

80% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	44,73	41,80	38,87	+/- 7,00%

Hard joint 30°

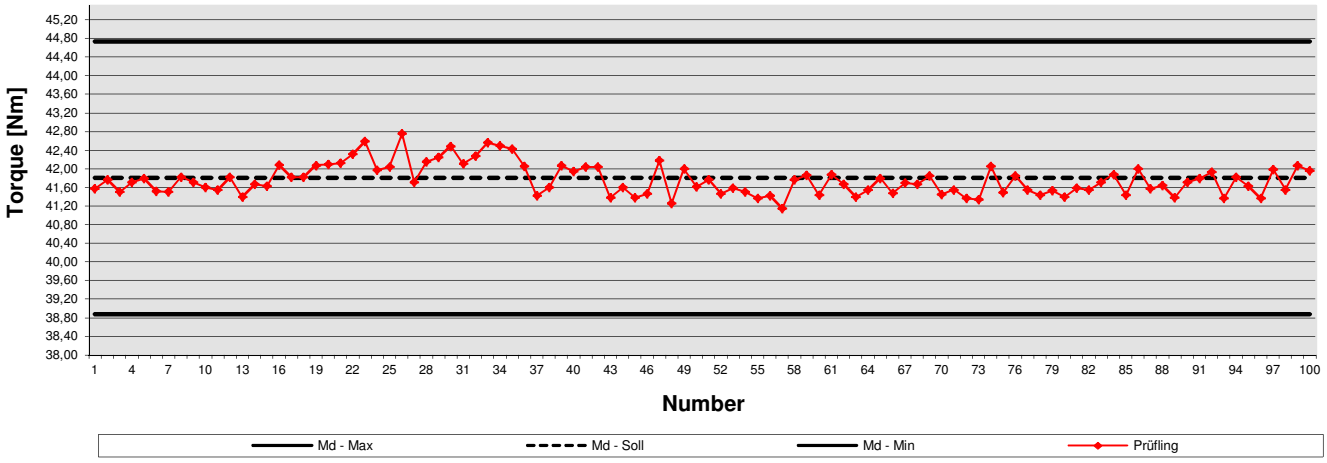


Statistics of the test piece

max. Torque	42,49	Nm	1 sig	0,379	Nm
min. Torque	40,69	Nm	6 sig	2,273	Nm
spread	1,80	Nm	+3 sig	42,67	Nm
Average	41,54	Nm	-3 sig	40,40	Nm

C_m = *2,58* C_{mk} = *2,35*

Soft joint 360°



Statistics of the test piece

max. Torque	42,75	Nm	1 sig	0,328	Nm
min. Torque	41,15	Nm	6 sig	1,967	Nm
spread	1,60	Nm	+3 sig	42,74	Nm
Average	41,76	Nm	-3 sig	40,77	Nm

C_m = *2,98* C_{mk} = *2,94*

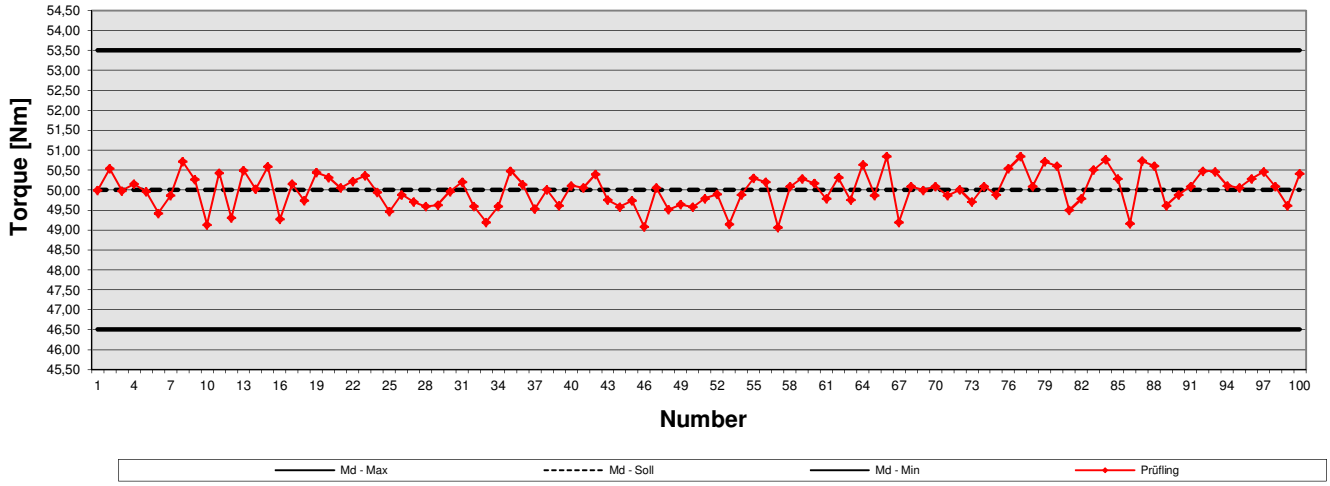
CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter
Tool type: EABC50-450 Serial - No. : 15E93889

100% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°

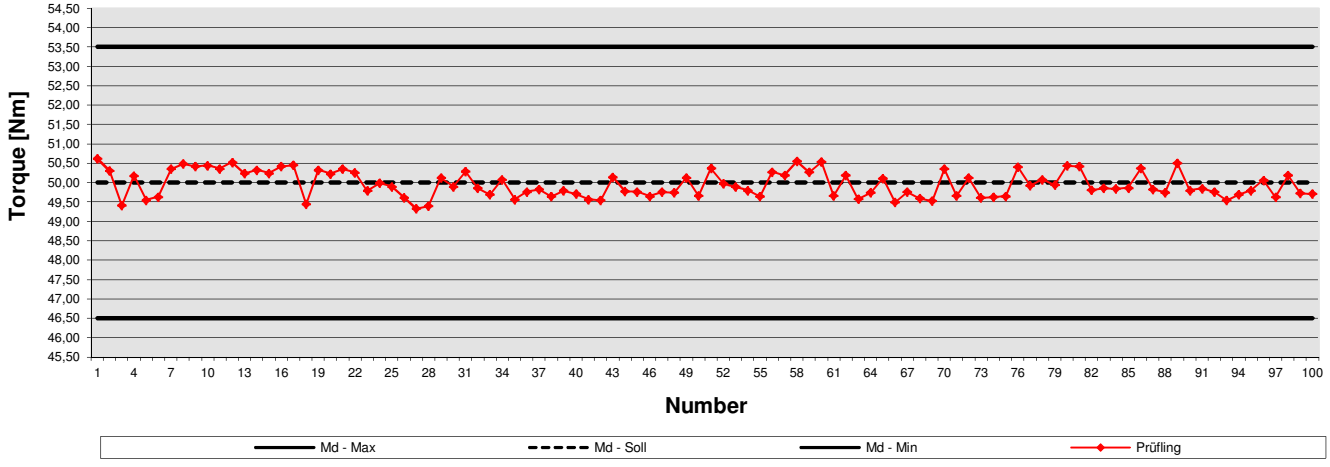


Statistics of the test piece

max. Torque	50,85	Nm	1 sig	0,433	Nm
min. Torque	49,07	Nm	6 sig	2,601	Nm
spread	1,78	Nm	+3 sig	51,30	Nm
Average	50,00	Nm	-3 sig	48,70	Nm

C_m = *2,69* C_{mk} = *2,69*

Soft joint 360°



Statistics of the test piece

max. Torque	50,62	Nm	1 sig	0,331	Nm
min. Torque	49,33	Nm	6 sig	1,988	Nm
spread	1,29	Nm	+3 sig	50,95	Nm
Average	49,96	Nm	-3 sig	48,96	Nm

C_m = *3,52* C_{mk} = *3,48*

CERTIFIKAT

Machine capability tests

Manufacturer: Desoutter

Tool type: EABC50-450 Serial - No. : 15E93889

Combined statistics for the test object (hard and soft joint)

[Md = 30%]

Number of tightenings	200	6 sigma	0,98 Nm
Average	21,47 Nm	Mean value offset	0,17 Nm
Sigma	0,16 Nm	Mean value offset %	0,79 %
Dispersion	0,92 Nm	comb. average torque	21,46 Nm
max. Torque	21,92 Nm	comb. torque variation	1,14 Nm
min. Torque	20,99 Nm	comb. torque variation %	5,32 %

$C_m = 3,03$ $C_{mk} = 2,69$

Combined statistics for the test object (hard and soft joint)

[Md = 80%]

Number of tightenings	200	6 sigma	2,12 Nm
Average	41,65 Nm	Mean value offset	0,22 Nm
Sigma	0,35 Nm	Mean value offset %	0,53 %
Dispersion	2,06 Nm	comb. average torque	41,57 Nm
max. Torque	42,75 Nm	comb. torque variation	2,34 Nm
min. Torque	40,69 Nm	comb. torque variation %	5,63 %

$C_m = 2,76$ $C_{mk} = 2,62$

Combined statistics for the test object (hard and soft joint)

[Md = 100%]

Number of tightenings	200	6 sigma	2,31 Nm
Average	49,98 Nm	Mean value offset	0,04 Nm
Sigma	0,38 Nm	Mean value offset %	0,09 %
Dispersion	1,78 Nm	comb. average torque	50,00 Nm
max. Torque	50,85 Nm	comb. torque variation	2,60 Nm
min. Torque	49,07 Nm	comb. torque variation %	5,20 %

$C_m = 3,03$ $C_{mk} = 3,01$

a. Temperature

There was hardly no noticeable warming of the tool detected.

b. Battery lifetime

After amount of 126 tightening on soft joint and 297 tightening on hard joint the nutrunner indicates a renewing of the battery load/ battery change.

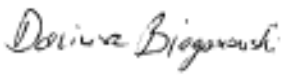
V. Comments

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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