



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**
June 2015
Power Tools Central Service Workshop
Różyniec 83C, 59-706 Gromadka,
Polen

III. Testobject

Battery nutrunner:
EABC 60-370

Serial number 14 F 87585
15 C 93571
15 F 93018

Model	EABC 60-370
Ordering No	6151658460
Square Drive / Female Hex	Square drive
Torque range ft lb	7.4 – 44
Torque range Nm	10 – 60
CS distance mm	-
Weight kg	3.35
Weight lb	5.18
Length mm	559
Speed r/min	370
Height mm	60.4
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

Hersteller:	BLM, Mailand (Italien)
Typ:	3860/4
Ser.-Nr.:	3860SKY.103
Zelle 2 :	10-50 N·m, dynamisch
Rückführung:	EN2530
Ser.-Nr.:	188.50.143
Zelle 3 :	50-250 N·m, dynamisch
Ser.-Nr.:	188.2198
Rückführung:	EN2531
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 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 :	10 - 60 N•m
Testing torque / 30% hard/soft joint	25.00 N•m
Testing torque / 80% hard/soft joint	50.00 N•m
Testing torque / 100% hard/soft joint	60.00 N•m
Speed 1 step	370 rpm
Speed 2 step	50 rpm
Angle threshold / 30%	12.50 Nm
Angle threshold / 80%	25.00 Nm
Angle threshold / 100%	30.00 Nm
Switching torque / 30%	11.25 Nm
Switching torque / 80%	22.50 Nm
Switching torque / 100%	27.00 Nm
Angle strategy 40°	12 N•m (36.00) N•m
Angle strategy 180°	12 N•m (48.00) N•m

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°	
EABC60-370		Test torque	25,00 Nm		50,00 Nm		60,00 Nm	
		Speed 1st stage	370 rpm					
		Speed 2st stage	50 rpm					
		Start angle measurement	12,50 Nm		25,00 Nm		30,00 Nm	
	14F87585	cm	2,01	3,41	2,27	4,31	2,25	3,33
		cmk	1,93	3,33	2,04	4,11	2,19	3,12
	15C93571	cm	3,07	4,26	2,75	5,19	2,88	4,17
		cmk	3,00	4,22	2,21	5,12	2,71	4,16
	15F93018	cm	2,13	3,77	2,54	5,14	2,25	3,37
		cmk	2,05	3,36	2,12	4,68	2,12	3,06

Min cm/cmk	cm	2,01	3,41	2,27	4,31	2,25	3,33
	cmk	1,93	3,33	2,04	4,11	2,12	3,06

	Range:	≥ 1,67	
Capability Index:	C_m	2,01	OK
Capability Index:	C_{mk}	1,93	OK

Ranges of tolerance for angle and torque

Tool type	Serial Nr.	Test data	60% from range		80% from range	
			40°		180°	
EABC60-370		Test torque	19,2 Nm		25,6 Nm	
		Speed 1st stage	410 rpm			
		Start angle	6,4 Nm		6,4 Nm	
	14F87585	Torque	±	6,41%	±	6,67%
		Angle	±	4,6°	±	5,8°
	15C93571	Torque	±	6,50%	±	4,96%
		Angle	±	1,8°	±	5,8°
	15F93018	Torque	±	6,54%	±	5,05%
		Angle	±	4,2°	±	6,8°

Max Torque	Torque	Range:	7%	Range:	7%	40°
	lst:	±	6,54%	±	6,67%	OK
Max Angle	Angle	Range:	5°	Range:	10°	40°
	lst:	±	4,6°	±	6,8°	OK

CERTIFIKAT

Machine capability test

Certificate no.:

234084-01

Customer

Desoutter Industrial Tools

Test object

Manufacturer: **Desoutter**

Tool type: **EABC60-370**

Serial - No. : **14F87585**

Torque range

of: **10 Nm**
to: **60 Nm**

Number of screw tightenings

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

Torque to be achieved

at 30%	==>	25,00 Nm
at 80%	==>	50,00 Nm
at 100%	==>	60,00 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:

2015-06-17

CERTIFIKAT

Machine capability tests

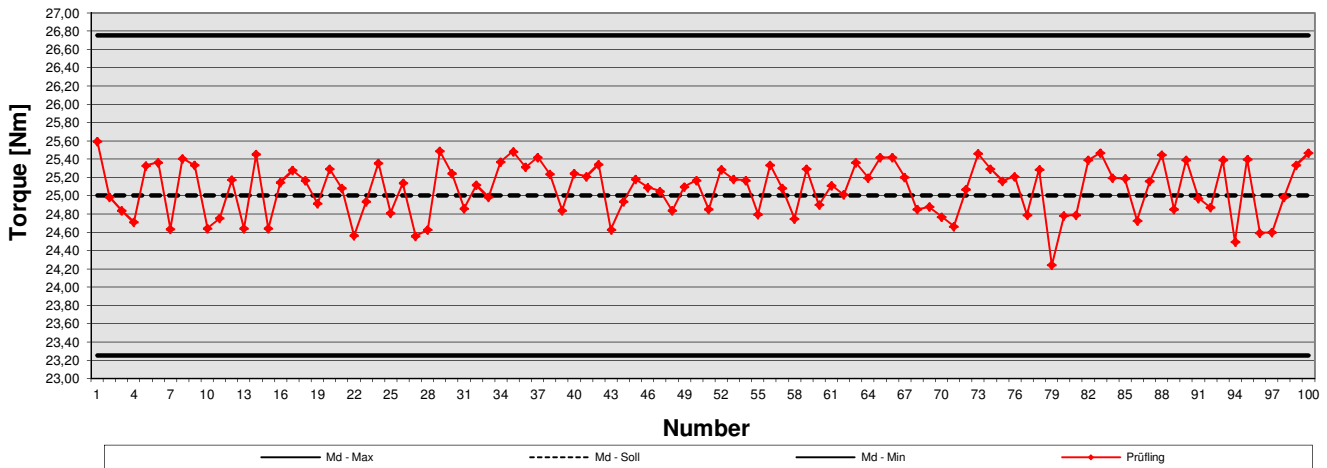


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 14F87585

30% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	26,75	25,00	23,25	+/- 7,00%

Hard joint 30°



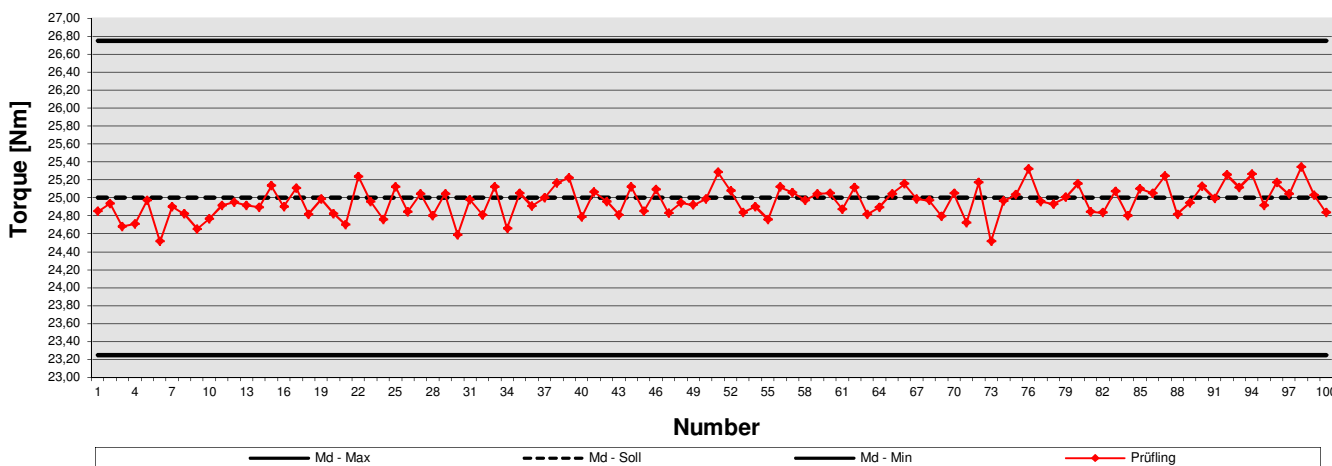
Statistics of the test piece

max. Torque	25,59 Nm	1 sig	0,290 Nm
min. Torque	24,24 Nm	6 sig	1,742 Nm
spread	1,35 Nm	+3 sig	25,94 Nm
Average	25,07 Nm	-3 sig	24,20 Nm

$$C_m = 2,01$$

$$C_{mk} = 1,93$$

Soft joint 360°



Statistics of the test piece

max. Torque	25,34 Nm	1 sig	0,171 Nm
min. Torque	24,51 Nm	6 sig	1,027 Nm
spread	0,83 Nm	+3 sig	25,47 Nm
Average	24,96 Nm	-3 sig	24,45 Nm

$$C_m = 3,41$$

$$C_{mk} = 3,33$$

CERTIFIKAT

Machine capability tests

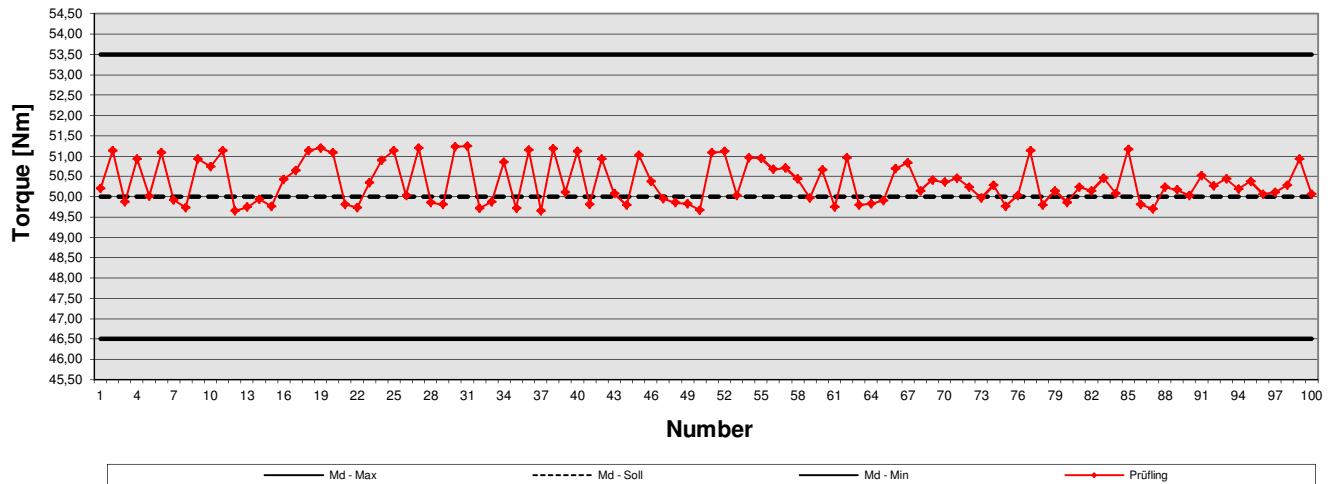


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 14F87585

80% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°



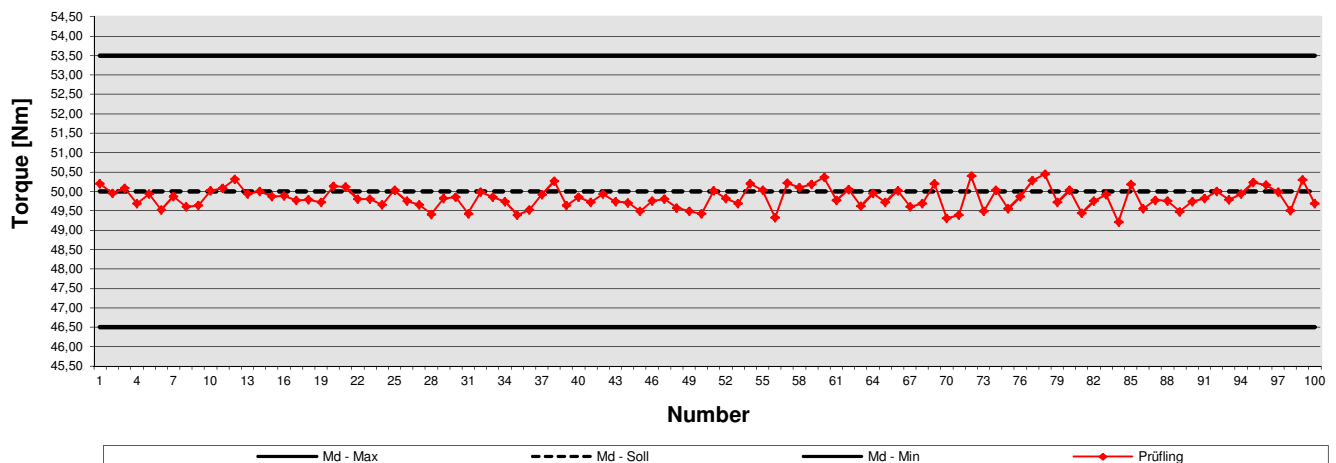
Statistics of the test piece

max. Torque	51,24 Nm	1 sig	0,514 Nm
min. Torque	49,65 Nm	6 sig	3,086 Nm
spread	1,59 Nm	+3 sig	51,90 Nm
Average	50,35 Nm	-3 sig	48,81 Nm

$$C_m = 2,27$$

$$C_{mk} = 2,04$$

Soft joint 360°



Statistics of the test piece

max. Torque	50,44 Nm	1 sig	0,270 Nm
min. Torque	49,20 Nm	6 sig	1,623 Nm
spread	1,24 Nm	+3 sig	50,65 Nm
Average	49,83 Nm	-3 sig	49,02 Nm

$$C_m = 4,31$$

$$C_{mk} = 4,11$$

CERTIFIKAT

Machine capability tests

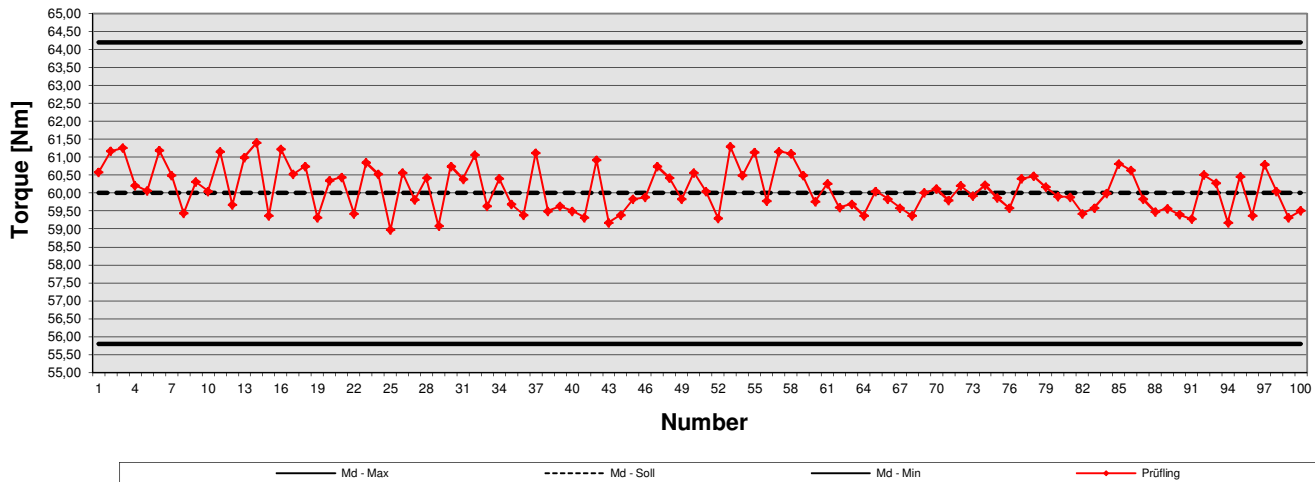


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 14F87585

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	64,20	60,00	55,80	+/- 7,00%

Hard joint 30°



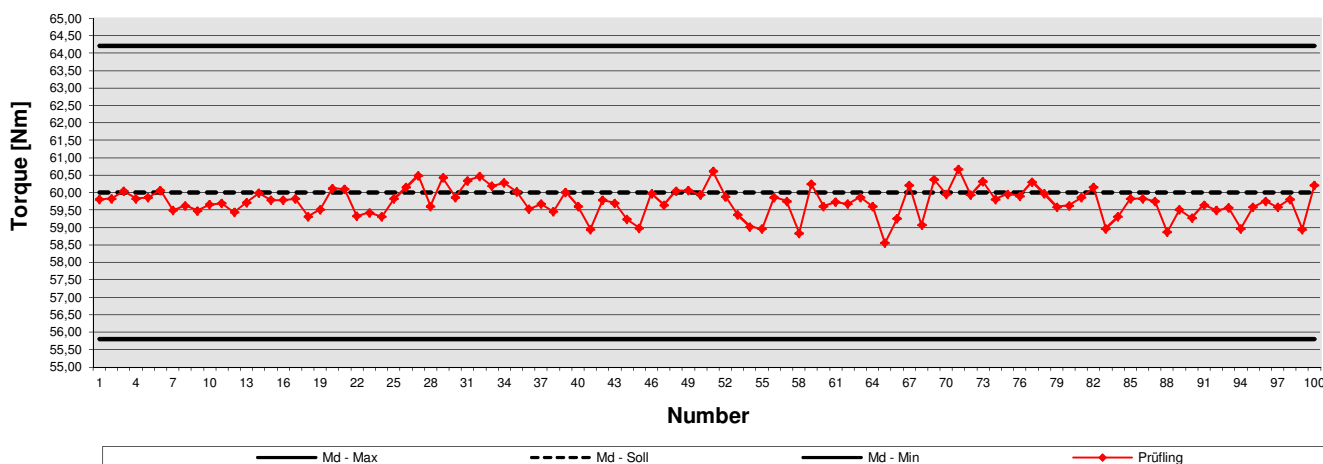
Statistics of the test piece

max. Torque	61,40 Nm	1 sig	0,622 Nm
min. Torque	58,98 Nm	6 sig	3,732 Nm
spread	2,42 Nm	+3 sig	61,98 Nm
Average	60,11 Nm	-3 sig	58,25 Nm

$$C_m = 2,25$$

$$C_{mk} = 2,19$$

Soft joint 360°



Statistics of the test piece

max. Torque	60,67 Nm	1 sig	0,420 Nm
min. Torque	58,56 Nm	6 sig	2,521 Nm
spread	2,12 Nm	+3 sig	60,99 Nm
Average	59,73 Nm	-3 sig	58,47 Nm

$$C_m = 3,33$$

$$C_{mk} = 3,12$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 14F87585

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

Number of tightenings	200	6 sigma	1,43 Nm
Average	25,07 Nm	Mean value offset	0,11 Nm
Sigma	0,24 Nm	Mean value offset %	0,45 %
Dispersion	1,35 Nm	comb. average torque	25,07 Nm
max. Torque	25,59 Nm	comb. torque variation	1,74 Nm
min. Torque	24,24 Nm	comb. torque variation %	6,95 %

$$C_m = 2,45$$

$$C_{mk} = 2,36$$

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

Number of tightenings	200	6 sigma	2,46 Nm
Average	50,09 Nm	Mean value offset	0,52 Nm
Sigma	0,41 Nm	Mean value offset %	1,03 %
Dispersion	2,04 Nm	comb. average torque	50,35 Nm
max. Torque	51,24 Nm	comb. torque variation	3,09 Nm
min. Torque	49,20 Nm	comb. torque variation %	6,13 %

$$C_m = 2,85$$

$$C_{mk} = 2,77$$

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

Number of tightenings	200	6 sigma	3,18 Nm
Average	59,92 Nm	Mean value offset	0,38 Nm
Sigma	0,53 Nm	Mean value offset %	0,63 %
Dispersion	2,84 Nm	comb. average torque	60,11 Nm
max. Torque	61,40 Nm	comb. torque variation	3,73 Nm
min. Torque	58,56 Nm	comb. torque variation %	6,21 %

$$C_m = 2,64$$

$$C_{mk} = 2,59$$

CERTIFIKAT

Machine capability test

Certificate no.:

234084-02

Customer

Desoutter Industrial Tools

Test object

Manufacturer: **Desoutter**

Tool type: **EABC60-370**

Serial - No. : **15C93571**

Torque range

of: **10 Nm**
to: **60 Nm**

Number of screw tightenings

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

Torque to be achieved

at 30%	==>	25,00 Nm
at 80%	==>	50,00 Nm
at 100%	==>	60,00 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:

2015-06-19

CERTIFIKAT

Machine capability tests

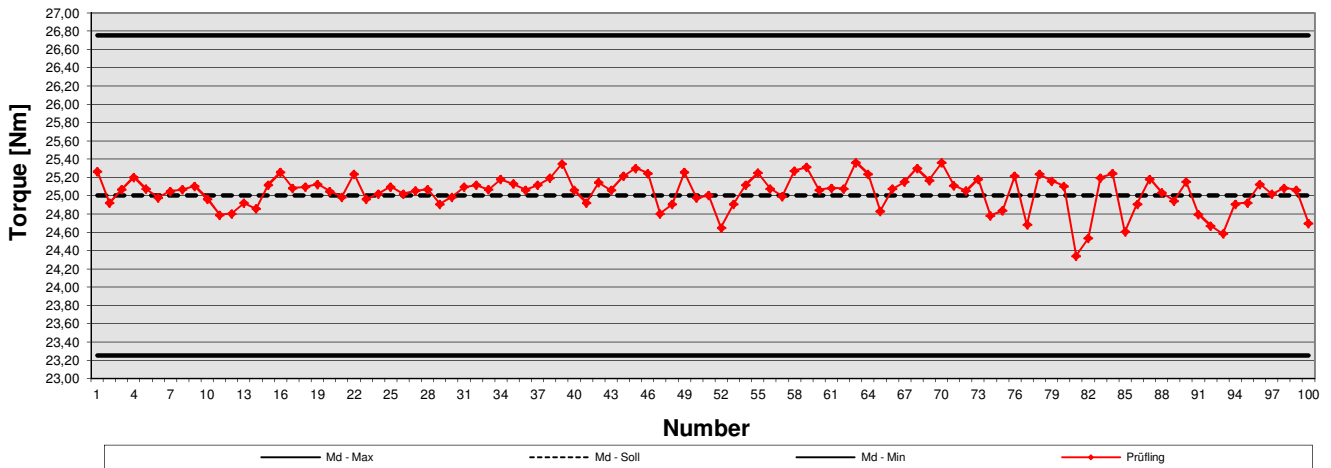


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15C93571

30% of the torque	USL (N·m)	Target (N·m)	LSL(N·m)	Tolerance [%]
	26,75	25,00	23,25	+/- 7,00%

Hard joint 30°



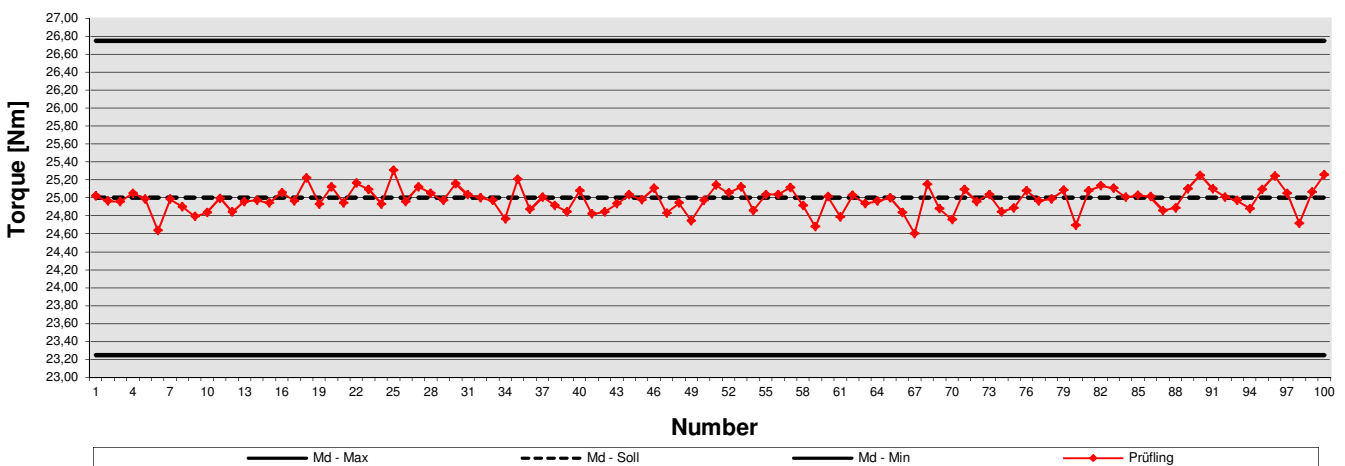
Statistics of the test piece

max. Torque	25,37 Nm		1 sig	0,190 Nm
min. Torque	24,34 Nm		6 sig	1,139 Nm
spread	1,02 Nm		+3 sig	25,61 Nm
Average	25,04 Nm		-3 sig	24,47 Nm

$$C_m = 3,07$$

$$C_{mk} = 3,00$$

Soft joint 360°



Statistics of the test piece

max. Torque	25,31 Nm		1 sig	0,137 Nm
min. Torque	24,60 Nm		6 sig	0,821 Nm
spread	0,70 Nm		+3 sig	25,39 Nm
Average	24,98 Nm		-3 sig	24,57 Nm

$$C_m = 4,26$$

$$C_{mk} = 4,22$$

CERTIFIKAT

Machine capability tests

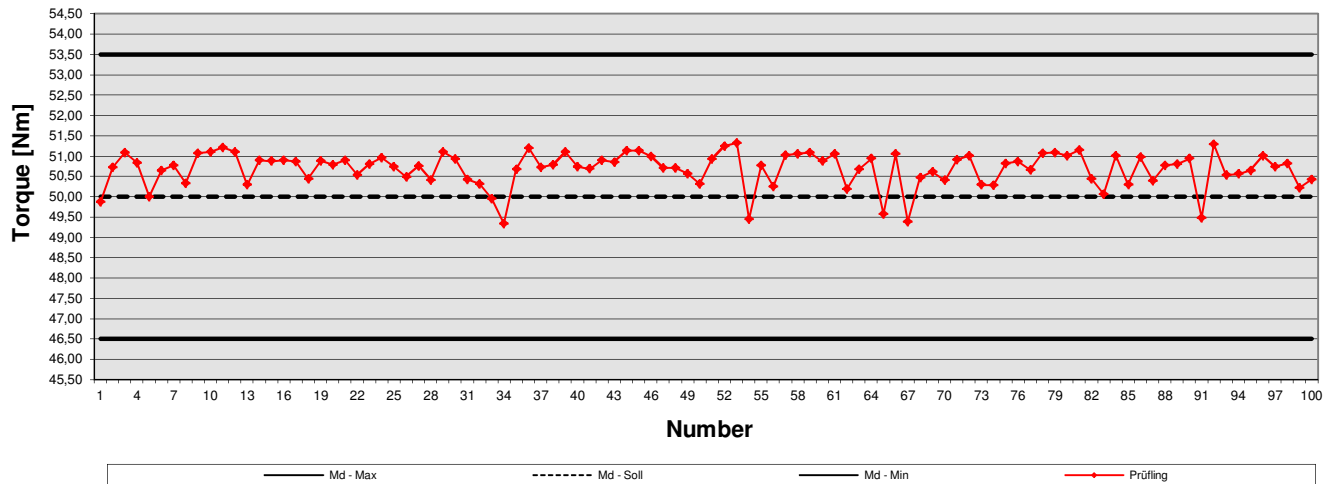


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15C93571

80% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°



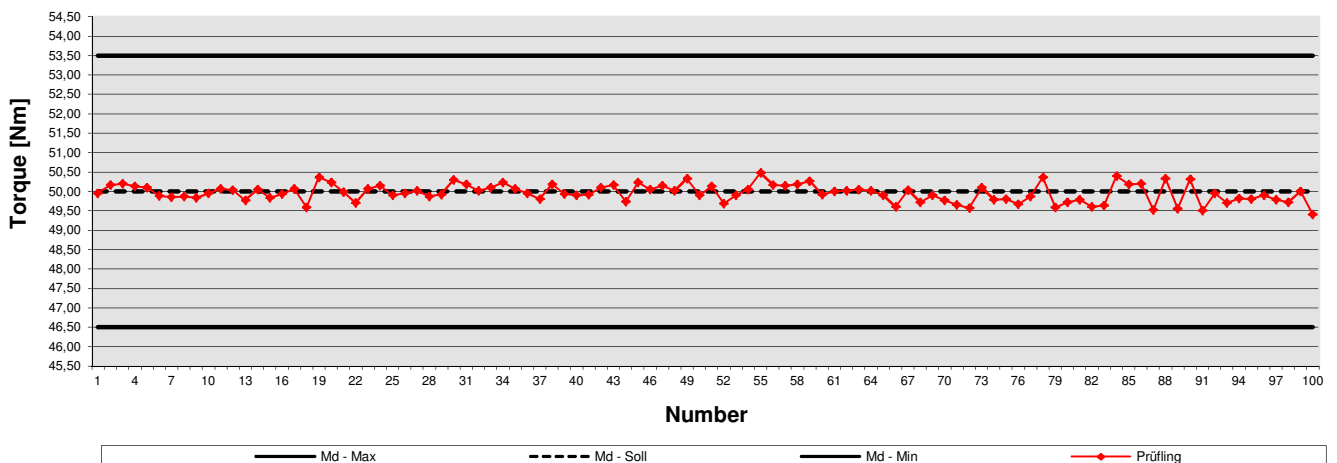
Statistics of the test piece

max. Torque	51,32 Nm	1 sig	0,424 Nm
min. Torque	49,35 Nm	6 sig	2,547 Nm
spread	1,98 Nm	+3 sig	51,96 Nm
Average	50,69 Nm	-3 sig	49,41 Nm

$$C_m = 2,75$$

$$C_{mk} = 2,21$$

Soft joint 360°



Statistics of the test piece

max. Torque	50,49 Nm	1 sig	0,225 Nm
min. Torque	49,41 Nm	6 sig	1,350 Nm
spread	1,07 Nm	+3 sig	50,63 Nm
Average	49,96 Nm	-3 sig	49,28 Nm

$$C_m = 5,19$$

$$C_{mk} = 5,12$$

CERTIFIKAT

Machine capability tests

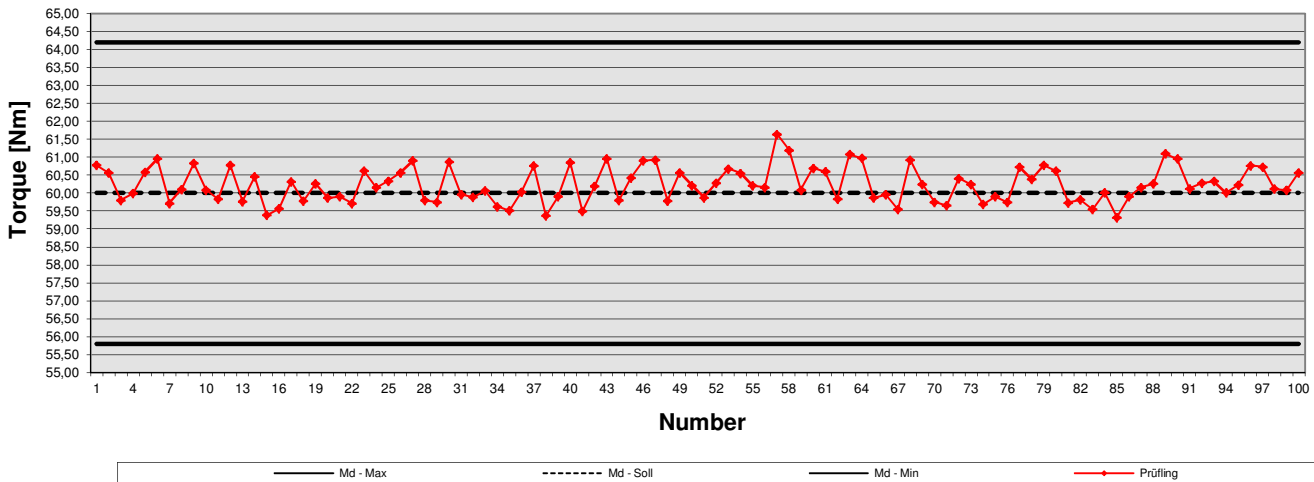


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15C93571

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	64,20	60,00	55,80	+/- 7,00%

Hard joint 30°

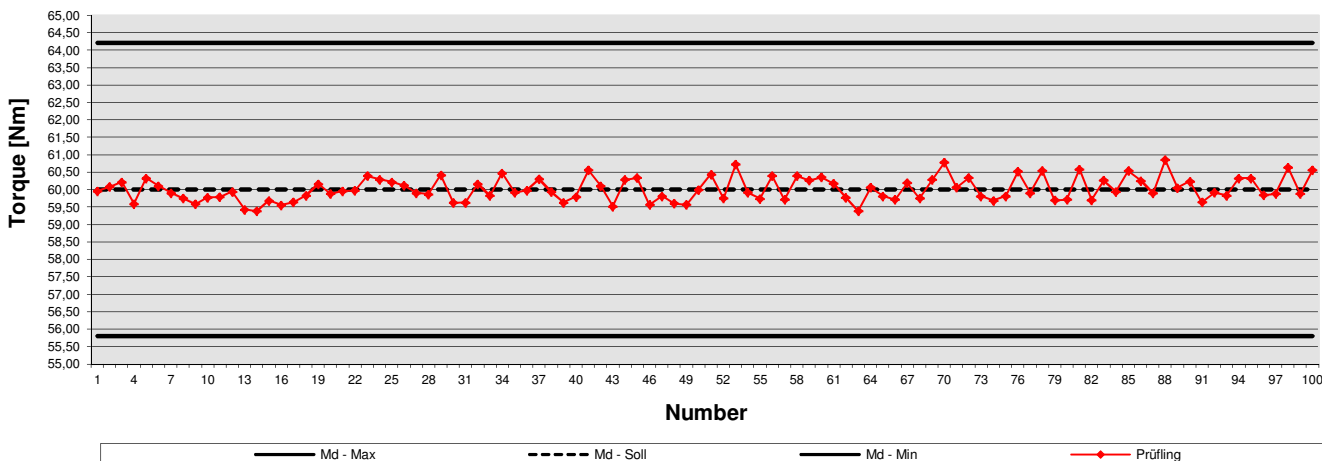


Statistics of the test piece			
max. Torque	61,64 Nm	1 sig	0,487 Nm
min. Torque	59,32 Nm	6 sig	2,922 Nm
spread	2,32 Nm	+3 sig	61,70 Nm
Average	60,24 Nm	-3 sig	58,77 Nm

$$C_m = 2,88$$

$$C_{mk} = 2,71$$

Soft joint 360°



Statistics of the test piece			
max. Torque	60,85 Nm	1 sig	0,336 Nm
min. Torque	59,38 Nm	6 sig	2,015 Nm
spread	1,47 Nm	+3 sig	61,02 Nm
Average	60,01 Nm	-3 sig	59,01 Nm

$$C_m = 4,17$$

$$C_{mk} = 4,16$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15C93571

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

Number of tightenings	200	6 sigma	0,99 Nm
Average	25,04 Nm	Mean value offset	0,06 Nm
Sigma	0,17 Nm	Mean value offset %	0,24 %
Dispersion	1,02 Nm	comb. average torque	25,04 Nm
max. Torque	25,37 Nm	comb. torque variation	1,14 Nm
min. Torque	24,34 Nm	comb. torque variation %	4,55 %

$C_m = 3,53$

$C_{mk} = 3,45$

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

Number of tightenings	200	6 sigma	2,03 Nm
Average	50,33 Nm	Mean value offset	0,73 Nm
Sigma	0,34 Nm	Mean value offset %	1,44 %
Dispersion	1,98 Nm	comb. average torque	50,62 Nm
max. Torque	51,32 Nm	comb. torque variation	2,68 Nm
min. Torque	49,35 Nm	comb. torque variation %	5,29 %

$C_m = 3,44$

$C_{mk} = 3,12$

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

Number of tightenings	200	6 sigma	2,50 Nm
Average	60,12 Nm	Mean value offset	0,22 Nm
Sigma	0,42 Nm	Mean value offset %	0,37 %
Dispersion	2,32 Nm	comb. average torque	60,24 Nm
max. Torque	61,64 Nm	comb. torque variation	2,92 Nm
min. Torque	59,32 Nm	comb. torque variation %	4,85 %

$C_m = 3,36$

$C_{mk} = 3,26$

CERTIFIKAT

Machine capability test

Certificate no.:

234084-03

Customer

Desoutter Industrial Tools

Test object

Manufacturer: **Desoutter**

Tool type: **EABC60-370**

Serial - No. : **15F93018**

Torque range

of: **10 Nm**
to: **60 Nm**

Number of screw tightenings

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

Torque to be achieved

at 30%	==>	25,00 Nm
at 80%	==>	50,00 Nm
at 100%	==>	60,00 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:

2015-06-22

CERTIFIKAT

Machine capability tests

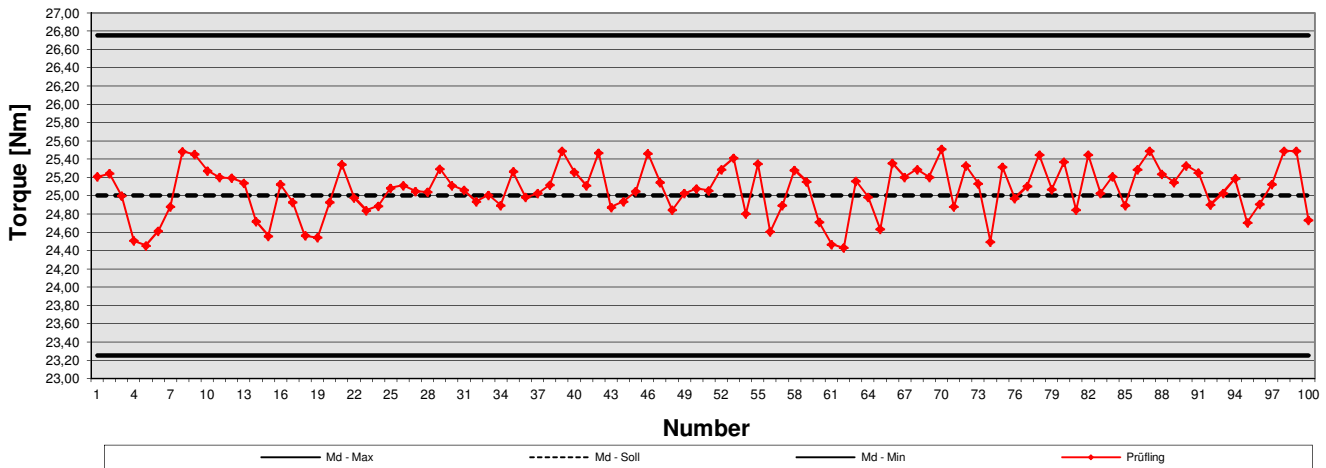


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15F93018

30% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	26,75	25,00	23,25	+/- 7,00%

Hard joint 30°



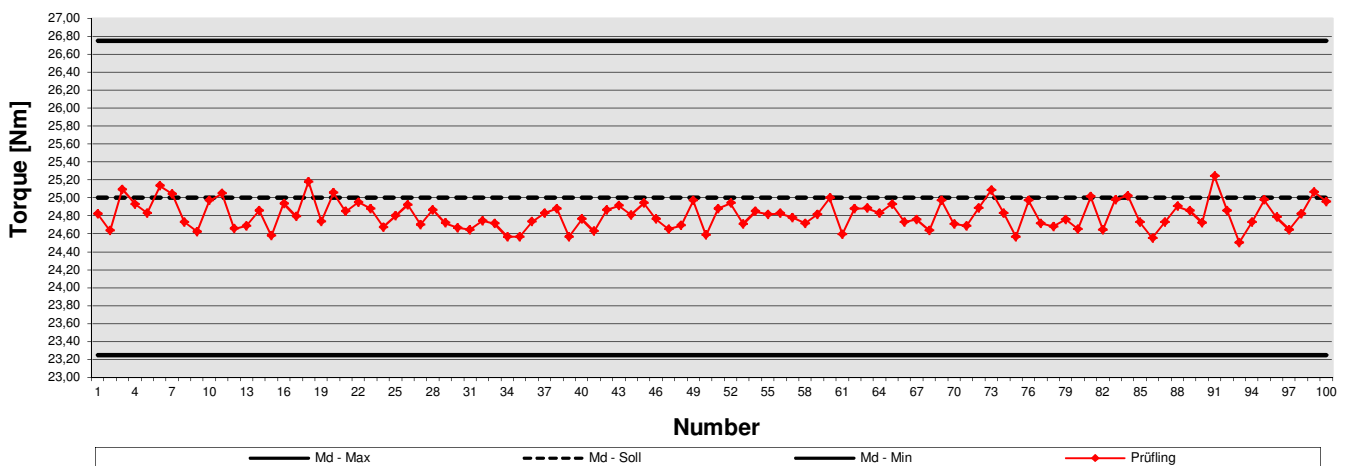
Statistics of the test piece

max. Torque	25,51 Nm	1 sig	0,273 Nm
min. Torque	24,43 Nm	6 sig	1,640 Nm
spread	1,08 Nm	+3 sig	25,89 Nm
Average	25,07 Nm	-3 sig	24,25 Nm

$$C_m = 2,13$$

$$C_{mk} = 2,05$$

Soft joint 360°



Statistics of the test piece

max. Torque	25,24 Nm	1 sig	0,155 Nm
min. Torque	24,50 Nm	6 sig	0,928 Nm
spread	0,74 Nm	+3 sig	25,27 Nm
Average	24,81 Nm	-3 sig	24,35 Nm

$$C_m = 3,77$$

$$C_{mk} = 3,36$$

CERTIFIKAT

Machine capability tests

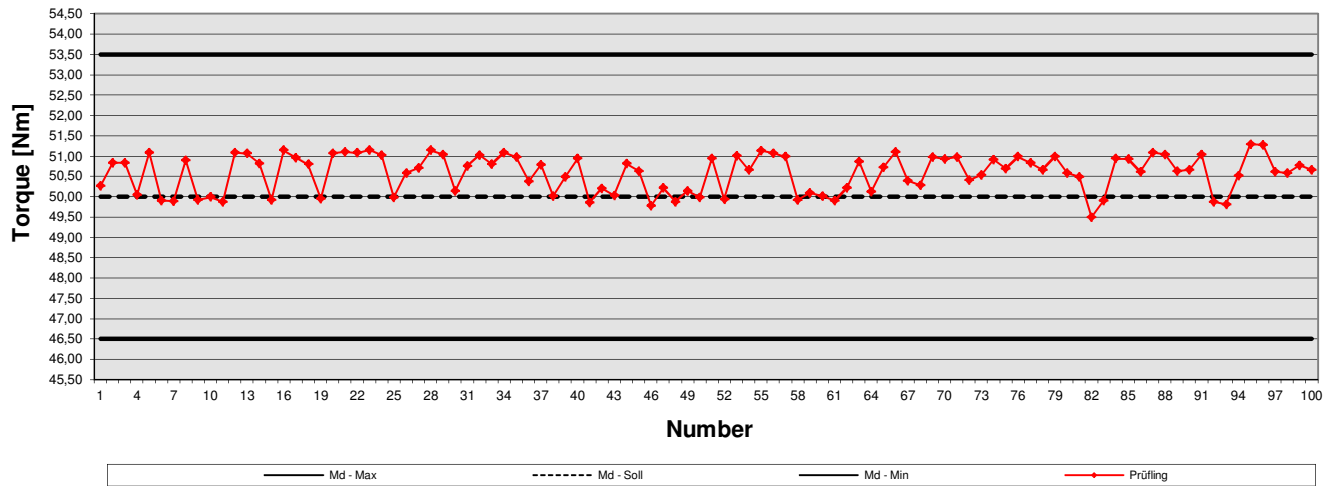


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15F93018

80% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	53,50	50,00	46,50	+/- 7,00%

Hard joint 30°



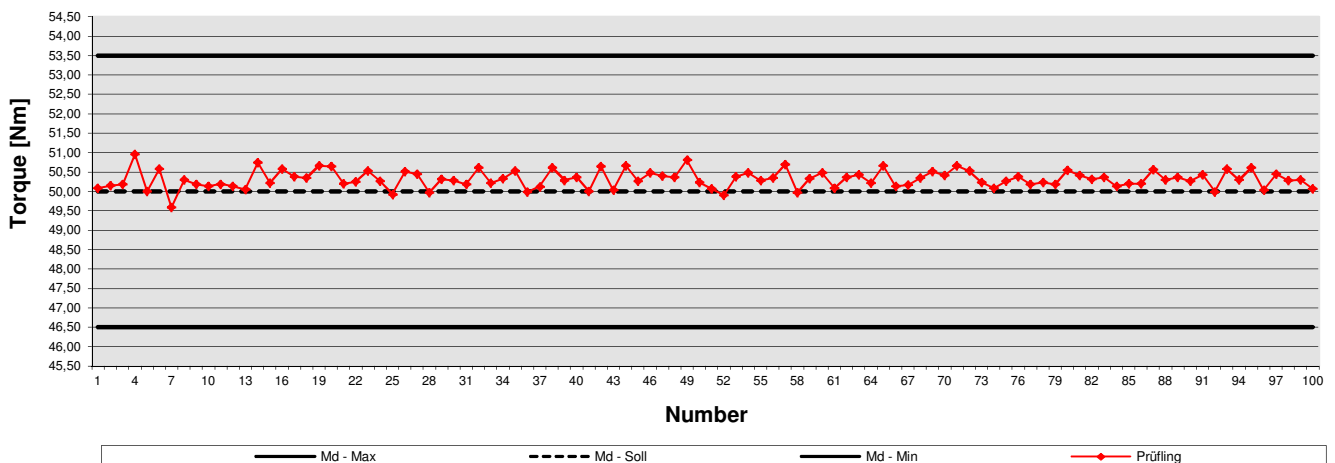
Statistics of the test piece

max. Torque	51,29 Nm	1 sig	0,459 Nm
min. Torque	49,49 Nm	6 sig	2,754 Nm
spread	1,79 Nm	+3 sig	51,96 Nm
Average	50,58 Nm	-3 sig	49,20 Nm

$$C_m = 2,54$$

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

Soft joint 360°



Statistics of the test piece

max. Torque	50,95 Nm	1 sig	0,227 Nm
min. Torque	49,58 Nm	6 sig	1,361 Nm
spread	1,37 Nm	+3 sig	51,00 Nm
Average	50,32 Nm	-3 sig	49,63 Nm

$$C_m = 5,14$$

$$C_{mk} = 4,68$$

CERTIFIKAT

Machine capability tests

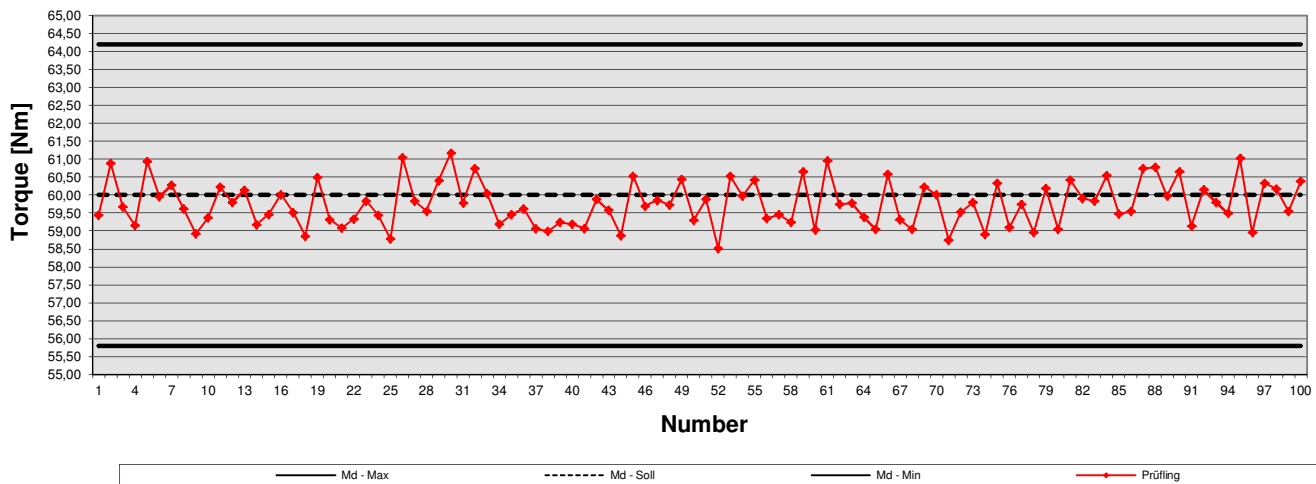


Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15F93018

100% of the torque	USL (N·m)	Target (N·m)	LSL (N·m)	Tolerance [%]
	64,20	60,00	55,80	+/- 7,00%

Hard joint 30°

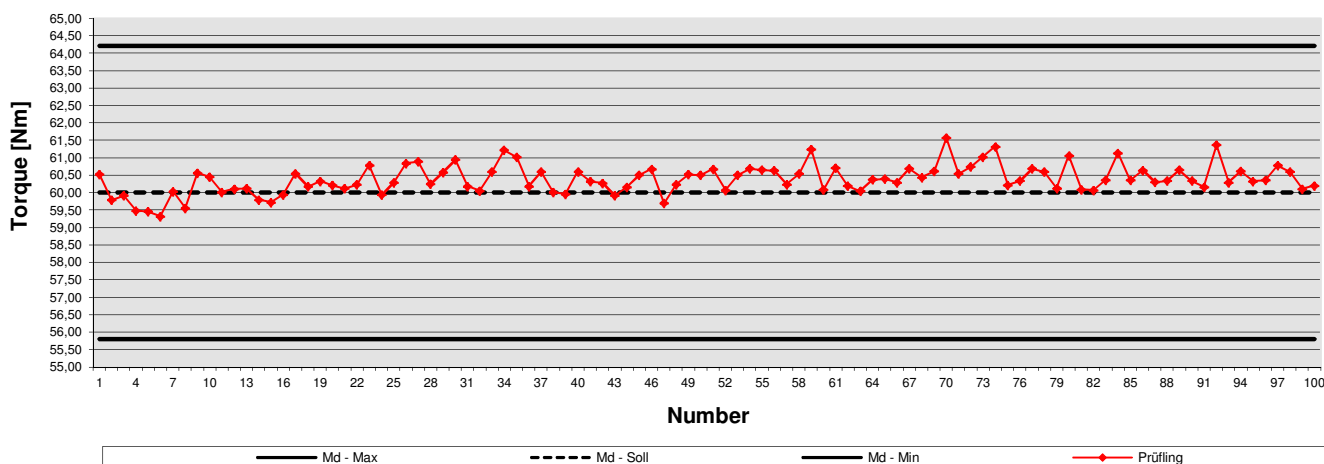


Statistics of the test piece			
max. Torque	61,17 Nm	1 sig	0,624 Nm
min. Torque	58,51 Nm	6 sig	3,741 Nm
spread	2,66 Nm	+3 sig	61,64 Nm
Average	59,76 Nm	-3 sig	57,89 Nm

$$C_m = 2,25$$

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

Soft joint 360°



Statistics of the test piece			
max. Torque	61,57 Nm	1 sig	0,416 Nm
min. Torque	59,32 Nm	6 sig	2,494 Nm
spread	2,25 Nm	+3 sig	61,63 Nm
Average	60,39 Nm	-3 sig	59,14 Nm

$$C_m = 3,37$$

$$C_{mk} = 3,06$$

CERTIFIKAT

Machine capability tests



Manufacturer: Desoutter
Tool type: EABC60-370

Serial - No. : 15F93018

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

Number of tightenings	200	6 sigma	1,33 Nm
Average	25,06 Nm	Mean value offset	0,26 Nm
Sigma	0,22 Nm	Mean value offset %	1,02 %
Dispersion	1,08 Nm	comb. average torque	25,07 Nm
max. Torque	25,51 Nm	comb. torque variation	1,64 Nm
min. Torque	24,43 Nm	comb. torque variation %	6,54 %

$$C_m = 2,63$$

$$C_{mk} = 2,54$$

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

Number of tightenings	200	6 sigma	2,17 Nm
Average	50,45 Nm	Mean value offset	0,27 Nm
Sigma	0,36 Nm	Mean value offset %	0,53 %
Dispersion	1,79 Nm	comb. average torque	50,58 Nm
max. Torque	51,29 Nm	comb. torque variation	2,75 Nm
min. Torque	49,49 Nm	comb. torque variation %	5,44 %

$$C_m = 3,23$$

$$C_{mk} = 2,81$$

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

Number of tightenings	200	6 sigma	3,17 Nm
Average	60,08 Nm	Mean value offset	0,62 Nm
Sigma	0,53 Nm	Mean value offset %	1,04 %
Dispersion	3,06 Nm	comb. average torque	59,76 Nm
max. Torque	61,57 Nm	comb. torque variation	3,74 Nm
min. Torque	58,51 Nm	comb. torque variation %	6,26 %

$$C_m = 2,65$$

$$C_{mk} = 2,60$$

a. Temperature

There was hardly no noticeable warming of the tool detected.

b. Battery lifetime

After amount of 151 tightening on soft joint and 589 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



Dariusz Bieganski

dariusz.bieganski@desouttertools.com