



Homologation tightening tool

Date : 2018-07-30

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Test sheet no. 1a

General technical data

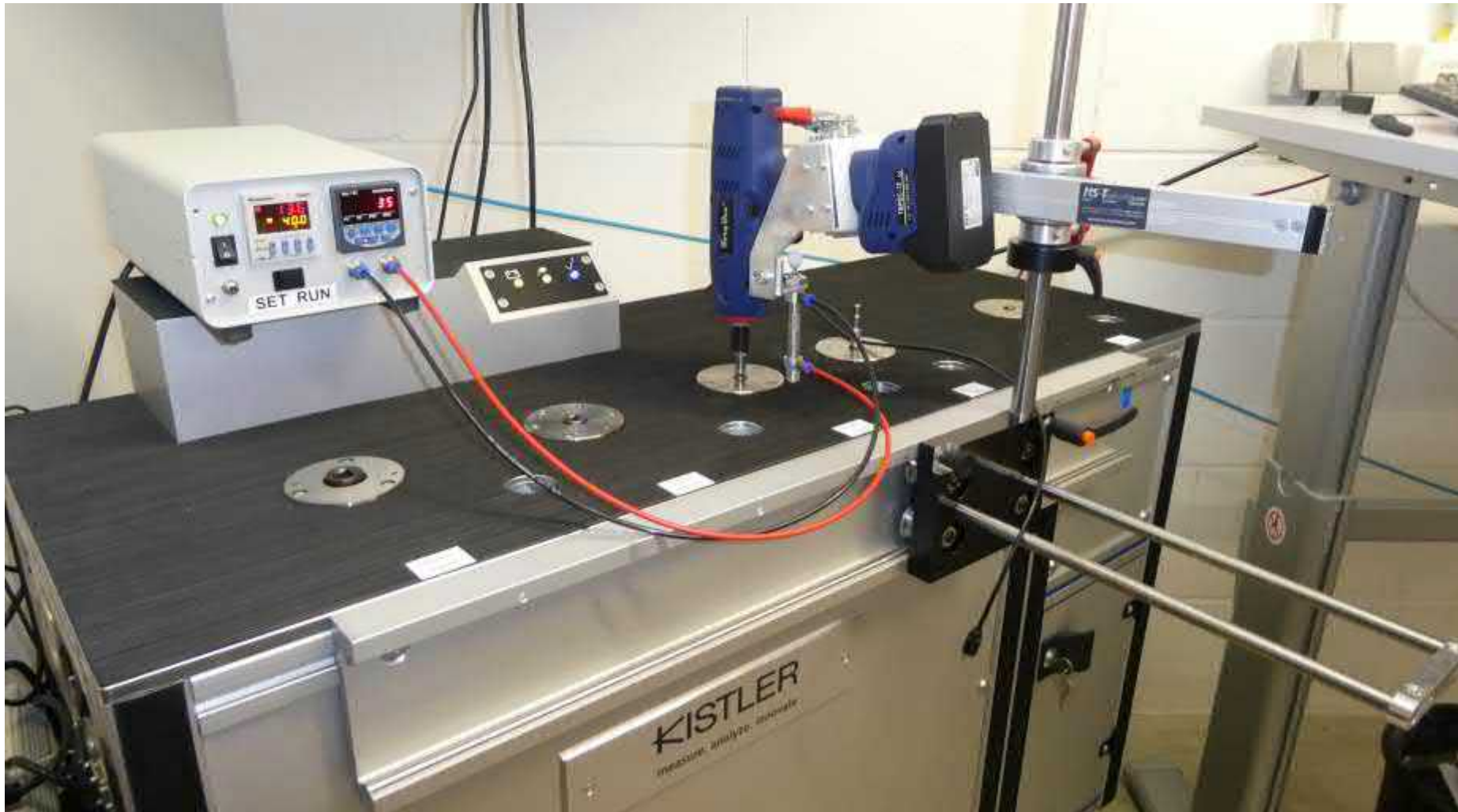
Manufacturer: HS-Technik GmbH **Machine type:** Battery nutrunning tool

Model TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB

Serial number:
18240032
18240039
18240041

Torque range	1 N·m	to	14 N·m		
Torque tolerance		\pm	7%		
Elektronic tool	Yes	Operating voltage	18,0	Volt	
Weight			1,15	kg	
Output square			1/4"-Hex		
Maximum rotational speed idle gear first stage			550	rpm	
Maximum rotational speed idle gear last stage			50	rpm	
Minimum rotational speed idle gear last stage			20	rpm	
Noise level in idle gear at maximum rotational speed			71	dB(A)	
Measuring room temperature	$\pm 2^{\circ}\text{C}$		22	$^{\circ}\text{C}$	
Temperature in case of electrical tools		At the angle head	-	$^{\circ}\text{C}$	
Temperature after 100 measurements each		At the electric motor	35	$^{\circ}\text{C}$	
At max. M		At the handle	30	$^{\circ}\text{C}$	
Number of tightening using one Battery					
At max. Md		360° soft	628	tightenigs	
		30° hard	1.884	tightenigs	
Tightening strategies	Current shutdown		Yes		
	M-control		Yes		
	M/angle-control		Yes		
	Angle/m-control		Yes		
	Yield point control		Yes		
	Clamping force control		-		
Options	Tightening monitoring		Yes		
	Pulsing		-		
	Tightening/loosening - tightening		Yes		
	Cutting-tightening monitoring		Yes		
	Left tightening		Yes		
	Other procedures				
Torsion, angle resolution	$\pm 0,1^{\circ}$ degree				
Md-accuracy	$\pm \leq 1$ %				

Test set up





Homologation tightening tool

Manufacturer : HS-Technik GmbH, Im Martelacker 12, D-79588 Efringen-Kirchen

Model : TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB

Operating range : 1,00 to 14,00 N·m (M_{rated})

SN: 18240032 Battery nutrunning tool
18240039
18240041

Torque - homologation

		Master - reference						EC - tightening tool						Difference evaluation								
Tool	Serial-No.	Test data	30%		80%		100%		30%		80%		100%		30%		80%		100%			
			30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°	30° ±5°	360° ±15°		
TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	18240032	Test torque ($M_{target} \pm 7\%$)	4,90 N·m		11,40 N·m		14,00 N·m		4,90 N·m		11,40 N·m		14,00 N·m		4,90 N·m		11,40 N·m		14,00 N·m			
		Rotation angle starting torque (Ma0)	2,450 N·m		5,700 N·m		7,000 N·m		2,450 N·m		5,700 N·m		7,000 N·m		2,450 N·m		5,700 N·m		7,000 N·m			
		Upper tolerance limit (T_o / M_{max})	5,243 N·m		12,198 N·m		14,980 N·m		5,243 N·m		12,198 N·m		14,980 N·m		5,243 N·m		12,198 N·m		14,980 N·m			
		Lower tolerance limit (T_u / M_{min})	4,557 N·m		10,602 N·m		13,020 N·m		4,557 N·m		10,602 N·m		13,020 N·m		4,557 N·m		10,602 N·m		13,020 N·m			
		Speed max. 1.Step			550 rpm		550 rpm				550 rpm		550 rpm				550 rpm		550 rpm			
		Speed at final torque approx. ca.			50 rpm		50 rpm				50 rpm		50 rpm				50 rpm		50 rpm			
			Average torque (\bar{x})	4,911 N·m	4,876 N·m	11,436 N·m	11,419 N·m	14,036 N·m	13,997 N·m	4,945 N·m	4,902 N·m	11,465 N·m	11,410 N·m	14,104 N·m	14,014 N·m	-0,034 N·m	-0,025 N·m	-0,029 N·m	0,009 N·m	0,0424	0,0375	0,0389
			Standard deviation (s)	0,0166	0,0137	0,0187	0,0426	0,0508	0,0414	0,0140	0,0039	0,0187	0,0092	0,0260	0,0126	0,0107	0,0134	0,0098	0,0424	0,0375	0,0389	
			Scatter (R) (99,73%)	0,0830	0,0630	0,0970	0,1440	0,2260	0,1530	0,0600	0,0100	0,0900	0,0300	0,1200	0,0500	0,0510	0,0630	0,0550	0,1390	0,1410	0,1250	
			Torque rate (N·m/s)	29,467	2,438	68,617	5,709	84,216	6,998	29,671	2,451	68,791	5,705	84,622	7,007	-0,204	-0,013	-0,174	0,004	-0,406	-0,008	
			C_m	6,8814	8,3450	14,1933	6,2453	6,4330	7,8965	8,1467	29,6106	14,2500	28,9050	12,5848	25,9146	10,6687	8,5241	27,2751	6,2737	8,7153	8,3889	
			C_{mk}	6,6587	7,7687	13,5495	6,1000	6,1972	7,8704	7,0756	29,4552	13,0857	28,5573	11,2544	25,5523	9,6111	7,8906	26,2839	6,2032	8,1134	8,2439	
	18240039	Average torque (\bar{x})	4,912 N·m	4,901 N·m	11,401 N·m	11,439 N·m	14,038 N·m	14,018 N·m	4,943 N·m	4,901 N·m	11,453 N·m	11,411 N·m	14,104 N·m	14,016 N·m	-0,031 N·m	0,000 N·m	-0,052 N·m	0,029 N·m	-0,066 N·m	0,002 N·m		
		Standard deviation (s)	0,0151	0,0070	0,0181	0,0196	0,0220	0,0210	0,0162	0,0030	0,0175	0,0134	0,0201	0,0133	0,0075	0,0070	0,0152	0,0149	0,0154	0,0176		
		Scatter (R) (99,73%)	0,0720	0,0280	0,0930	0,1060	0,1210	0,1050	0,0800	0,0100	0,1000	0,1000	0,1100	0,0500	0,0400	0,0320	0,0650	0,0550	0,0770	0,0770		
		Torque rate (N·m/s)	29,470	2,450	68,405	5,720	84,227	7,009	29,657	2,451	68,716	5,705	84,622	7,008	-0,187	0,000	-0,311	0,014	-0,396	0,001		
		C_m	7,5782	16,3373	14,7035	13,5432	14,8456	15,5451	7,0529	37,9201	15,1869	19,8734	16,2249	24,6404	15,3003	16,2504	17,4676	17,9021	21,2293	18,5138		
		C_{mk}	7,3195	16,3106	14,6869	12,8738	14,2737	15,2656	6,1729	37,8095	14,1840	19,6044	14,5081	24,2381	13,9134	16,2296	16,3337	17,2596	19,8007	18,4832		
	18240041	Average torque (\bar{x})	4,902 N·m	4,872 N·m	11,385 N·m	11,423 N·m	14,022 N·m	13,996 N·m	4,941 N·m	4,901 N·m	11,457 N·m	11,411 N·m	14,105 N·m	14,016 N·m	-0,039 N·m	-0,030 N·m	-0,072 N·m	0,012 N·m	-0,084 N·m	-0,020 N·m		
		Standard deviation (s)	0,0175	0,0110	0,0428	0,0412	0,0390	0,0459	0,0136	0,0034	0,0227	0,0091	0,0220	0,0113	0,0108	0,0113	0,0430	0,0409	0,0362	0,0459		
		Scatter (R) (99,73%)	0,0770	0,0540	0,1720	0,1400	0,1790	0,1450	0,0700	0,0100	0,1200	0,0500	0,1000	0,0400	0,0500	0,0540	0,1470	0,1350	0,1440	0,1430		
		Torque rate (N·m/s)	29,414	2,436	68,312	5,712	84,129	6,998	29,646	2,451	68,744	5,706	84,632	7,008	-0,232	-0,015	-0,432	0,006	-0,503	-0,010		
		C_m	6,5415	10,3470	6,2194	6,4540	8,3756	7,1120	8,4094	33,8267	11,7054	29,2650	14,8534	28,9559	10,5828	10,1237	6,1802	6,5104	9,0155	7,1172		
		C_{mk}	6,4984	9,4963	6,1052	6,2658	8,1912	7,0801	7,4042	33,6985	10,8634	28,8580	13,2559	28,4832	9,3875	9,2530	5,6221	6,4111	8,2443	6,9690		
		Min C_m/C_{mk}	C_m	6,5415	8,3450	6,2194	6,2453	6,4330	7,1120	7,0529	29,6106	11,7054	19,8734	12,5848	24,6404	10,5828	8,5241	6,1802	6,2737	8,7153	7,1172	
			C_{mk}	6,4984	7,7687	6,1052	6,1000	6,1972	7,0801	6,1729	29,4552	10,8634	19,6044	11,2544	24,2381	9,3875	7,8906	5,6221	6,2032	8,1134	6,9690	
		Target value: $\geq 2,00$	Capability index :	C_m	6,219	i.O.	C_m	7,053	i.O.	$\geq 2,00$	Capability index :	C_m	7,053	i.O.	$\geq 2,00$	Capability index :	C_m	6,180	i.O.	$\geq 2,00$		
		Target value: $\geq 1,67$	Capability index :	C_{mk}	6,100	i.O.	C_{mk}	6,173	i.O.	$\geq 1,67$	Capability index :	C_{mk}	6,173	i.O.	$\geq 1,67$	Capability index :	C_{mk}	5,622	i.O.	$\geq 1,67$		

All test are based on the standards VDI/VDE 2647 - 02-2013 und VDI/VDE 2645 Blatt 2 - 09-2014



Homologation tightening tool

Manufacturer : **HS-Technik GmbH, Im Martelacker 12, D-79588 Efringen-Kirchen**

Model : **TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB**

Operating range : **1,00 to 14,00 N-m (M_{nenn})**

SN: **18240032** Battery nutrunning tool
18240039
18240041

Angle - homologation

		Master - reference				
Tool	Serial-No.	Test data	60%		80%	
			40° ± 5°	40° ± 5°	180° ± 10°	180° ± 10°
TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Test torque (M _{target}) ±7%	11,20 N-m			
		Rotation angle starting torque (Ma0)	2,800 N-m		2,800 N-m	
		Upper tolerance limit (T _u / M _{max})	8,988 N-m		11,984 N-m	
		Lower tolerance limit (T _l / M _{min})	7,812 N-m		10,416 N-m	
		Speed max. 1 Step	550 rpm			
		Speed at final torque approx. ca.	50 rpm			
	18240032	Average torque (x̄)	8,295 N-m	39,888°	11,137 N-m	180,480°
		Standard deviation (s)	0,0555	0,3378	0,0835	0,6510
		Scatter (R) (99,73%)	0,229	1,500	0,324	2,500
		Torque rate (N-m/°)	37,329	-	11,137	-
	C _m	3,5314	4,9339	3,1283	5,1201	
	C _{mk}	2,9028	4,8229	2,8767	4,8743	
18240039	Average torque (x̄)	8,432 N-m	39,888°	11,151 N-m	180,178°	
	Standard deviation (s)	0,0548	0,2873	0,0747	0,6158	
	Scatter (R) (99,73%)	0,263	1,500	0,300	2,500	
	Torque rate (N-m/°)	37,944	-	11,151	-	
	C _m	3,5765	5,8010	3,4992	5,4134	
	C _{mk}	3,3824	5,6705	3,2785	5,3173	
18240041	Average torque (x̄)	8,417 N-m	39,905°	11,182 N-m	180,048°	
	Standard deviation (s)	0,0529	0,3052	0,0772	0,7210	
	Scatter (R) (99,73%)	0,245	1,500	0,289	2,750	
	Torque rate (N-m/°)	37,876	-	11,182	-	
	C _m	3,7022	5,4606	3,3865	4,6233	
	C _{mk}	3,5961	5,3569	3,3085	4,6014	
Min C _m /C _{mk}		C _m	3,5314	4,9339	3,1283	4,6233
		C _{mk}	2,9028	4,8229	2,8767	4,6014

EC - tightening tool			
60%		80%	
40° ± 5°	40° ± 5°	180° ± 10°	180° ± 10°
8,40 N-m	11,20 N-m	4,200 N-m	5,600 N-m
8,988 N-m	11,984 N-m	7,812 N-m	10,416 N-m
550 rpm			
50 rpm			

8,326 N-m	40,847°	11,179 N-m	180,853°
0,0524	0,1201	0,0726	0,1888
0,220	0,600	0,280	1,100
37,468	-	50,306	-
3,7370	13,8719	3,6013	17,6549
3,2686	11,5220	3,5057	16,1489

8,466 N-m	40,836°	11,201 N-m	180,873°
0,0518	0,1299	0,0680	0,1769
0,260	0,600	0,260	0,900
38,099	-	11,201	-
3,7833	12,8309	3,8411	18,8460
3,3561	10,6855	3,8377	17,2007

8,454 N-m	40,832°	11,244 N-m	180,890°
0,0558	0,1127	0,0826	0,2106
0,240	0,500	0,340	1,100
38,045	-	50,596	-
3,5102	14,7875	3,1651	15,8294
3,1854	12,3269	2,9891	14,4206

3,5102	12,8309	3,1651	15,8294
3,1854	10,6855	2,9891	14,4206

Capability index (Ma) :	C _m	3,165	i.O.
Capability index (Ma):	C _{mk}	2,989	i.O.

Capability index (°) :	C _m	12,831	i.O.
Capability index (°) :	C _{mk}	10,686	i.O.

Difference evaluation			
60%		80%	
40° ± 5°	40° ± 5°	180° ± 10°	180° ± 10°
8,40 N-m	11,20 N-m	4,200 N-m	5,600 N-m
8,988 N-m	11,984 N-m	7,812 N-m	10,416 N-m
550 rpm			
50 rpm			

-0,31 N-m	-960°	-0,42 N-m	-373°
0,0089	0,3396	0,0233	0,6789
0,045	1,600	0,092	2,750
-0,139	-	-0,190	-
22,0986	4,9075	11,2158	4,9100
20,9351	3,9658	10,6115	4,7269

-0,34 N-m	-948°	-0,50 N-m	-696°
0,0100	0,3238	0,0228	0,6210
0,046	1,550	0,100	2,800
-0,155	-	-0,050	-
19,6308	5,1466	11,4705	5,3679
18,4793	4,1703	10,7369	4,9946

-0,38 N-m	-927°	-0,62 N-m	-843°
0,0105	0,3245	0,0217	0,7430
0,049	1,600	0,089	2,800
-0,169	-	-0,277	-
18,5969	5,1368	12,0432	4,4862
17,4096	4,1844	11,0962	4,1082

18,5969	4,9075	11,2158	4,4862
17,4096	3,9658	10,6115	4,1082

Capability index (Ma) :	C _m	11,216	i.O.
Capability index (Ma):	C _{mk}	10,612	i.O.

Capability index (°) :	C _m	4,486	i.O.
Capability index (°) :	C _{mk}	3,966	i.O.

All test are based on the standards VDI/VDE 2647 - 02-2013 und VDI/VDE 2645 Blatt 2 - 09-2014

1 - test point 30% - 30° - hard

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date:	2018-07-30
Serial-no.:	18240032			
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	4,900 N·m	Target:	30,00 ° (degree)	
Rotation angle starting torque (M _{rot}):	2,450 N·m			
± Tolerance:	7,00 %	± Tolerance:	5,00 ° (degree)	
+ Tolerance:	0,343 N·m	+ Tolerance:	5,00 ° (degree)	
- Tolerance:	0,343 N·m	- Tolerance:	5,00 ° (degree)	
Upper tolerance (T _u /M _{test}):	5,243 N·m	(T _u /M _{test}):	35,00 ° (degree)	
Lower tolerance (T _l /M _{test}):	4,557 N·m	(T _l /M _{test}):	25,00 ° (degree)	
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	4,911 N·m	Average	30,012%	\bar{x}	31,023°
M _{max}	4,980 N·m	Maximal	31,250%	M _{max}	32,800°
M _{min}	4,875 N·m	Minimal	29,250%	M _{min}	29,800°
R (99,73%)	0,083 N·m	Scatter	2,000%	R (99,73%)	2,800°
s	0,0168 N·m	Standard deviation	0,4284°	s	0,5170°
6 s	0,1013 N·m	6 x Standard deviation	2,570%	6 s	3,101%
N·m ²	29,466 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	6,8814	Capacity index Cmk	3,8902	Cm	3,2240
Cmk	6,5582	Capacity index Cmk	3,8804	Cmk	2,8544

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date:	2018-07-30
Serial-no.:	18240032			
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	4,900 N·m	Target:	30,00 ° (degree)	
Rotation angle starting torque (M _{rot}):	2,450 N·m			
± Tolerance:	7,00 %	± Tolerance:	5,00 ° (degree)	
+ Tolerance:	0,343 N·m	+ Tolerance:	5,00 ° (degree)	
- Tolerance:	0,343 N·m	- Tolerance:	5,00 ° (degree)	
Upper tolerance (T _u /M _{test}):	5,243 N·m	(T _u /M _{test}):	35,00 ° (degree)	
Lower tolerance (T _l /M _{test}):	4,557 N·m	(T _l /M _{test}):	25,00 ° (degree)	
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	4,945 N·m	Average	31,023%	\bar{x}	31,023°
M _{max}	4,980 N·m	Maximal	32,800%	M _{max}	32,800°
M _{min}	4,900 N·m	Minimal	29,800%	M _{min}	29,800°
R (99,73%)	0,060 N·m	Scatter	2,800%	R (99,73%)	2,800°
s	0,0140 N·m	Standard deviation	0,5170°	s	0,5170°
6 s	0,0840 N·m	6 x Standard deviation	2,570%	6 s	3,101%
N·m ²	29,676 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	6,1467	Capacity index Cmk	3,2240	Cm	3,2240
Cmk	5,9755	Capacity index Cmk	2,8544	Cmk	2,8544

Difference evaluation

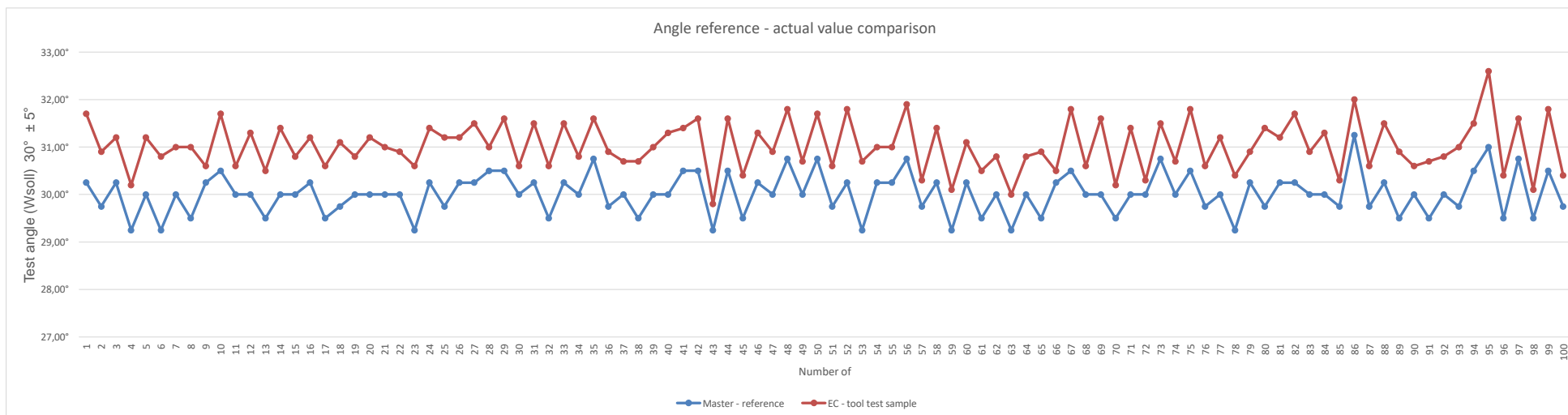
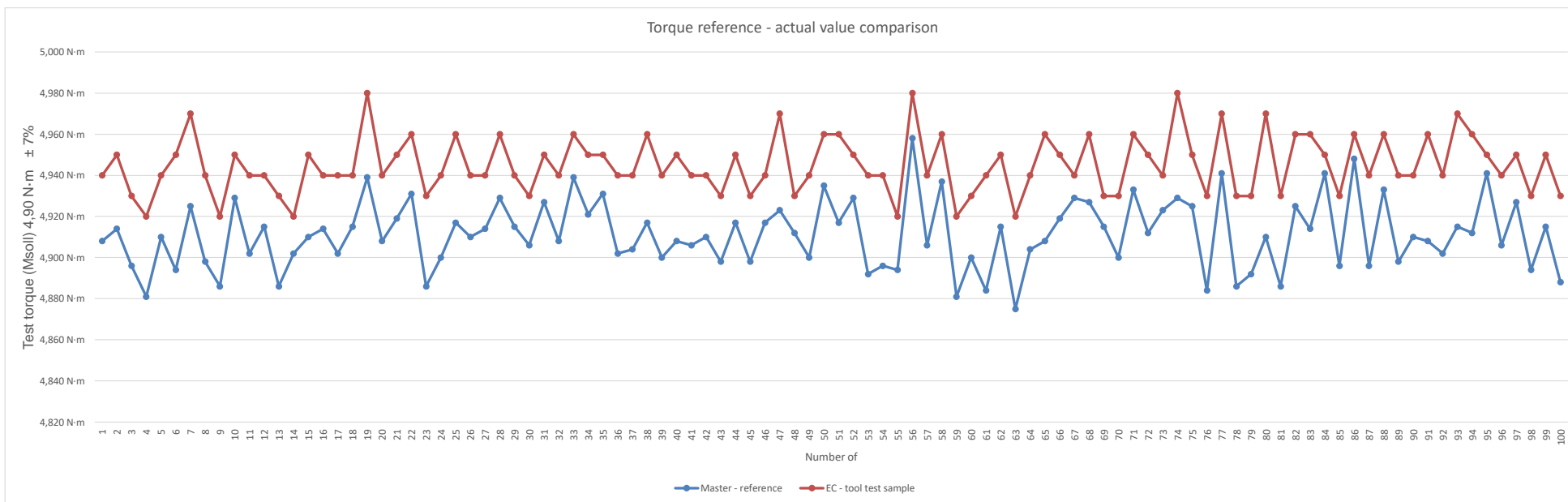
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date:	2018-07-30
Serial-no.:	18240032			
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	0,000 N·m	Target:	0,00 ° (degree)	
Rotation angle starting torque (M _{rot}):	0,000 N·m			
± Tolerance:	7,00 %	± Tolerance:	5,00 ° (degree)	
+ Tolerance:	0,343 N·m	+ Tolerance:	5,00 ° (degree)	
- Tolerance:	0,343 N·m	- Tolerance:	5,00 ° (degree)	
Upper tolerance (T _u /M _{test}):	-0,343 N·m	(T _u /M _{test}):	-5,00 ° (degree)	
Lower tolerance (T _l /M _{test}):	-0,343 N·m	(T _l /M _{test}):	-5,00 ° (degree)	
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	-0,030 N·m	Average	-1,015%	\bar{x}	-1,015°
M _{max}	-0,090 N·m	Maximal	-0,250%	M _{max}	-0,250°
M _{min}	-0,600 N·m	Minimal	-1,650%	M _{min}	-1,650°
R (99,73%)	0,067 N·m	Scatter	1,400%	R (99,73%)	1,400°
s	0,0107 N·m	Standard deviation	0,3038°	s	0,3038°
6 s	0,0642 N·m	6 x Standard deviation	1,857%	6 s	1,857°
N·m ²	-0,240 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	10,6687	Capacity index Cmk	5,3841	Cm	5,3841
Cmk	9,5111	Capacity index Cmk	4,2982	Cmk	4,2982

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB							SN: 18240032							Date: 2018-07-30						
Measurement result							Measurement result							Measurement result						
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle			Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle			Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle		
				Difference (°)	Difference (°)	Difference (%)					Difference (°)	Difference (°)	Difference (%)					Difference (°)	Difference (°)	Difference (%)
1	4,908 N·m	0,008 N·m	0,16%	30,25°	0,25°	0,83%	1	4,940 N·m	0,040 N·m	0,82%	31,70°	1,70°	5,67%	1	-0,032 N·m	-0,65%	-1,45°	-4,83%		
2	4,914 N·m	0,014 N·m	0,29%	29,75°	-0,25°	-0,83%	2	4,950 N·m	0,050 N·m	1,02%	30,90°	0,90°	3,00%	2	-0,036 N·m	-0,73%	-1,75°	-3,83%		
3	4,896 N·m	-0,004 N·m	-0,08%	30,25°	0,25°	0,83%	3	4,930 N·m	0,030 N·m	0,61%	31,20°	1,20°	4,00%	3	-0,038 N·m	-0,89%	-0,95°	-3,17%		
4	4,919 N·m	0,019 N·m	0,39%	30,25°	0,25°	0,83%	4	4,920 N·m	0,020 N·m	0,41%	30,60°	0,60°	2,00%	4	-0,040 N·m	-0,82%	-0,95°	-3,17%		
5	4,910 N·m	0,010 N·m	0,20%	30,00°	0,00°	0,00%	5	4,940 N·m	0,040 N·m	0,82%	31,20°	1,20°	4,00%	5	-0,030 N·m	-0,61%	-1,20°	-4,00%		
6	4,894 N·m	-0,006 N·m	-0,12%	29,25°	-0,75°	-2,50%	6	4,950 N·m	0,050 N·m	1,02%	30,80°	0,80°	2,67%	6	-0,056 N·m	-1,14%	-1,55°	-5,17%		
7	4,925 N·m	0,025 N·m	0,51%	30,00°	0,00°	0,00%	7	4,970 N·m	0,070 N·m	1,43%	31,00°	1,00°	3,33%	7	-0,045 N·m	-0,92%	-1,00°	-3,33%		
8	4,896 N·m	-0,002 N·m	-0,04%	29,50°	-0,50°	-1,67%	8	4,940 N·m	0,040 N·m	0,82%	31,00°	1,00°	3,33%	8	-0,042 N·m	-0,86%	-1,50°	-5,00%		
9	4,914 N·m	0,014 N·m	0,29%	30,00°	0,00°	0,00%	9	4,920 N·m	0,020 N·m	0,41%	31,00°	1,00°	3,33%	9	-0,044 N·m	-0,90%	-1,40°	-4,67%		
10	4,929 N·m	0,029 N·m	0,59%	30,50°	0,50°	1,67%	10	4,950 N·m	0,050 N·m	1,02%	31,70°	1,70°	5,67%	10	-0,021 N·m	-0,43%	-1,20°	-4,00%		
11	4,902 N·m	0,002 N·m	0,04%	30,00°	0,00°	0,00%	11	4,940 N·m	0,040 N·m	0,82%	30,60°	0,60°	2,00%	11	-0,038 N·m	-0,80%	-0,60°	-2,00%		
12	4,915 N·m	0,015 N·m	0,31%	30,00°	0,00°	0,00%	12	4,940 N·m	0,040 N·m	0,82%	31,30°	1,30°	4,33%	12	-0,025 N·m	-0,51%	-1,30°	-4,33%		
13	4,886 N·m	-0,014 N·m	-0,29%	29,50°	-0,50°	-1,67%	13	4,930 N·m	0,030 N·m	0,61%	30,50°	0,50°	1,67%	13	-0,044 N·m	-0,90%	-1,00°	-3,33%		
14	4,902 N·m	0,002 N·m	0,04%	30,00°	0,00°	0,00%	14	4,920 N·m	0,020 N·m	0,41%	31,00°	1,00°	3,33%	14	-0,041 N·m	-0,84%	-1,40°	-4,67%		
15	4,910 N·m	0,010 N·m	0,20%	30,00°	0,00°	0,00%	15	4,950 N·m	0,050 N·m	1,02%	30,80°	0,80°	2,67%	15	-0,040 N·m	-0,82%	-0,80°	-2,67%		
16	4,914 N·m	0,014 N·m	0,29%	30,25°	0,25°	0,83%	16	4,940 N·m	0,040 N·m	0,82%	31,20°	1,20°	4,00%	16	-0,026 N·m	-0,53%	-0,95°	-3,17%		
17	4,902 N·m	0,002 N·m	0,04%	29,50°	-0,50°	-1,67%	17	4,940 N·m	0,040 N·m	0,82%	30,60°	0,60°	2,00%	17	-0,038 N·m	-0,78%	-1,10°	-3,67%		
18	4,915 N·m	0,015 N·m	0,31%	29,75°	-0,25°	-0,83%	18	4,940 N·m	0,040 N·m	0,82%	31,10°	1,10°	3,67%	18	-0,026 N·m	-0,51%	-1,35°	-4,50%		
19	4,939 N·m	0,039 N·m	0,80%	30,00°	0,00°	0,00%	19	4,950 N·m	0,050 N·m	1,02%	30,60°	0,60°	2,00%	19	-0,044 N·m	-0,90%	-1,10°	-3,67%		
20	4,908 N·m	0,008 N·m	0,16%	30,00°	0,00°	0,00%	20	4,940 N·m	0,040 N·m	0,82%	31,20°	1,20°	4,00%	20	-0,032 N·m	-0,65%	-1,20°	-4,00%		
21	4,919 N·m	0,019 N·m	0,39%	30,00°	0,00°	0,00%	21	4,950 N·m	0,050 N·m	1,02%	31,00°	1,00°	3,33%	21	-0,031 N·m	-0,63%	-1,00°	-3,33%		
22	4,931 N·m	0,031 N·m	0,63%	30,00°	0,00°	0,00%	22	4,960 N·m	0,060 N·m	1,22%	30,90°	0,90°	3,00%	22	-0,029 N·m	-0,59%	-0,90°	-3,00%		
23	4,896 N·m	-0,014 N·m	-0,29%	29,25°	-0,75°	-2,50%	23	4,930 N·m	0,030 N·m	0,61%	30,60°	0,60°	2,00%	23	-0,044 N·m	-0,90%	-1,35°	-4,50%		
24	4,900 N·m	0,000 N·m	0,00%	30,25°	0,25°	0,83%	24	4,950 N·m	0,050 N·m	1,02%	31,00°	1,00°	3,33%	24	-0,040 N·m	-0,82%	-1,15°	-3,83%		
25	4,917 N·m	0,017 N·m	0,35%	29,75°	-0,25°	-0,83%	25	4,960 N·m	0,060 N·m	1,22%	31,20°	1,20°	4,00%	25	-0,043 N·m	-0,88%	-1,45°	-4,83%		
26	4,910 N·m	0,010 N·m	0,20%	30,25°	0,25°	0,83%	26	4,940 N·m	0,040 N·m	0,82%	31,20°	1,20°	4,00%	26	-0,030 N·m	-0,61%	-0,95°	-3,17%		
27	4,914 N·m	0,014 N·m	0,29%	30,25°	0,25°	0,83%	27	4,940 N·m	0,040 N·m	0,82%	31,50°	1,50°	5,00%	27	-0,026 N·m	-0,53%	-1,25°	-4,17%		
28	4,929 N·m	0,029 N·m	0,59%	30,50°	0,50°	1,67%	28	4,940 N·m	0,040 N·m	0,82%	31,00°	1,00°	3,33%	28	-0,031 N·m	-0,63%	-0,90°	-3,00%		
29	4,915 N·m	0,015 N·m	0,31%	30,00°	0,00°	0,00%	29	4,950 N·m	0,050 N·m	1,02%	30,60°	0,60°	2,00%	29	-0,033 N·m	-0,67%	-1,10°	-3,67%		
30	4,906 N·m	0,006 N·m	0,12%	30,00°	0,00°	0,00%	30	4,930 N·m	0,030 N·m	0,61%	30,60°	0,60°	2,00%	30	-0,024 N·m	-0,49%	-0,60°	-2,00%		
31	4,927 N·m	0,027 N·m	0,55%	30,25°	0,25°	0,83%	31	4,950 N·m	0,050 N·m	1,02%	31,50°	1,50°	5,00%	31	-0,023 N·m	-0,47%	-1,25°	-4,17%		
32	4,908 N·m	0,008 N·m	0,16%	29,50°	-0,50°	-1,67%	32	4,940 N·m	0,040 N·m	0,82%	30,60°	0,60°	2,00%	32	-0,032 N·m	-0,65%	-1,10°	-3,67%		
33	4,939 N·m	0,039 N·m	0,80%	30,25°	0,25°	0,83%	33	4,950 N·m	0,050 N·m	1,02%	31,50°	1,50°	5,00%	33	-0,022 N·m	-0,43%	-1,25°	-4,17%		
34	4,902 N·m	0,002 N·m	0,04%	30,00°	0,00°	0,00%	34	4,960 N·m	0,060 N·m	1,22%	30,60°	0,60°	2,00%	34	-0,040 N·m	-0,82%	-1,15°	-3,83%		
35	4,931 N·m	0,031 N·m	0,63%	30,75°	0,75°	2,50%</														

1 - Chart - 30% - 30° - hard



2 - test point 30% - 30° - hard

Master - reference

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 30 %	
Test torque (M_{test}): 4,900 N·m		Target: 30,00 ° (degree)			
Rotation angle starting torque (M_{rot}): 2,450 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: 0,343 N·m		+ Tolerance: 5,00 (degree)			
- Tolerance: 0,343 N·m		- Tolerance: 5,00 (degree)			
Upper tolerance (T_u/M_{test}): 5,243 N·m		(T_u/M_{test}): 35,00 (degree)			
Lower tolerance (T_l/M_{test}): 4,557 N·m		(T_l/M_{test}): 25,00 (degree)			
Speed: 1 Step: 550 rpm		2 Step: 50 rpm			

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	4,9117 N·m	\bar{x}	29,8800°	\bar{x}	30,6240°
σ	4,9470 N·m	σ	30,5000°	σ	31,6000°
M _{max}	4,8750 N·m	M _{max}	29,0000°	M _{max}	29,4000°
M _{min}	4,9075 N·m	M _{min}	30,0000°	M _{min}	29,4000°
R (99,73%)	0,0720 N·m	R (99,73%)	1,5000°	R (99,73%)	2,2000°
s	0,0151 N·m	s	0,4012°	s	0,6086°
σ_s	0,0095 N·m	σ_s	0,2407°	σ_s	0,3651°
N·m ²	29,4703 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	7,5782	Capability index Cm	4,1542	Cm	7,3887
Cmk	7,3196	Capability index Cmk	4,6545	Cmk	2,3914

EC tightening tool

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 30 %	
Test torque (M_{test}): 4,900 N·m		Target: 30,00 ° (degree)			
Rotation angle starting torque (M_{rot}): 2,450 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: 0,343 N·m		+ Tolerance: 5,00 (degree)			
- Tolerance: 0,343 N·m		- Tolerance: 5,00 (degree)			
Upper tolerance (T_u/M_{test}): 5,243 N·m		(T_u/M_{test}): 35,00 (degree)			
Lower tolerance (T_l/M_{test}): 4,557 N·m		(T_l/M_{test}): 25,00 (degree)			
Speed: 1 Step: 550 rpm		2 Step: 50 rpm			

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	4,9282 N·m	\bar{x}	30,6240°	\bar{x}	30,6240°
σ	4,9800 N·m	σ	31,6000°	σ	31,6000°
M _{max}	4,9000 N·m	M _{max}	29,4000°	M _{max}	29,4000°
M _{min}	4,9000 N·m	M _{min}	29,4000°	M _{min}	29,4000°
R (99,73%)	0,0800 N·m	R (99,73%)	2,2000°	R (99,73%)	2,2000°
s	0,0162 N·m	s	0,6086°	s	0,6086°
σ_s	0,0102 N·m	σ_s	0,4012°	σ_s	0,3651°
N·m ²	29,6568 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	7,0529	Capability index Cm	4,1542	Cm	2,3887
Cmk	6,5129	Capability index Cmk	4,6545	Cmk	2,3914

Difference evaluation

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 30 %	
Test torque (M_{test}): 0,000 N·m		Target: 0,00 ° (degree)			
Rotation angle starting torque (M_{rot}): 0,000 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: -0,343 N·m		+ Tolerance: -5,00 (degree)			
- Tolerance: -0,343 N·m		- Tolerance: -5,00 (degree)			
Upper tolerance (T_u/M_{test}): -0,343 N·m		(T_u/M_{test}): -5,00 (degree)			
Lower tolerance (T_l/M_{test}): -0,343 N·m		(T_l/M_{test}): -5,00 (degree)			
Speed: 1 Step: 550 rpm		2 Step: 50 rpm			

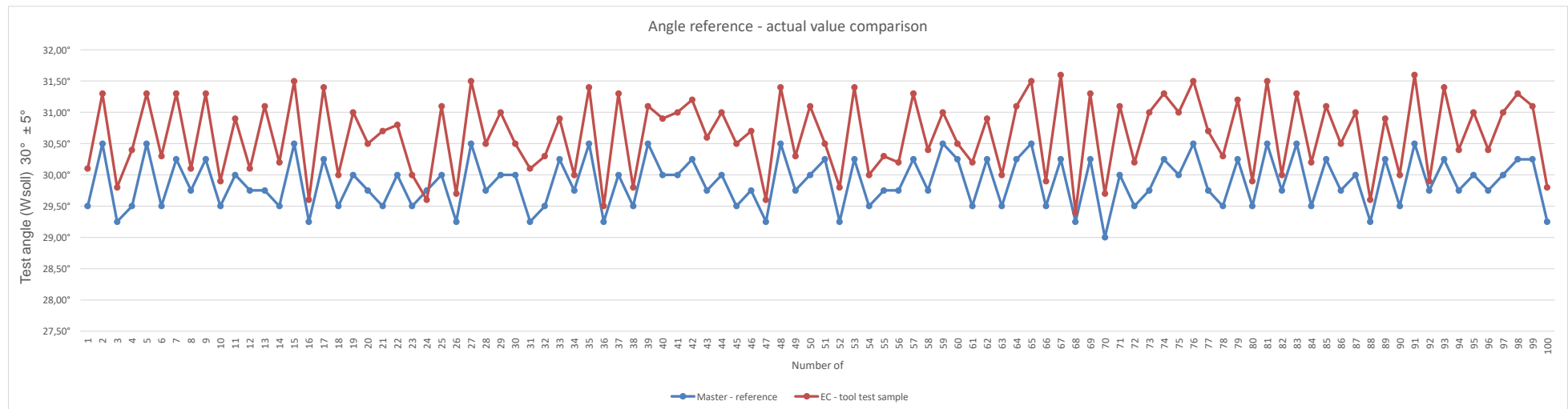
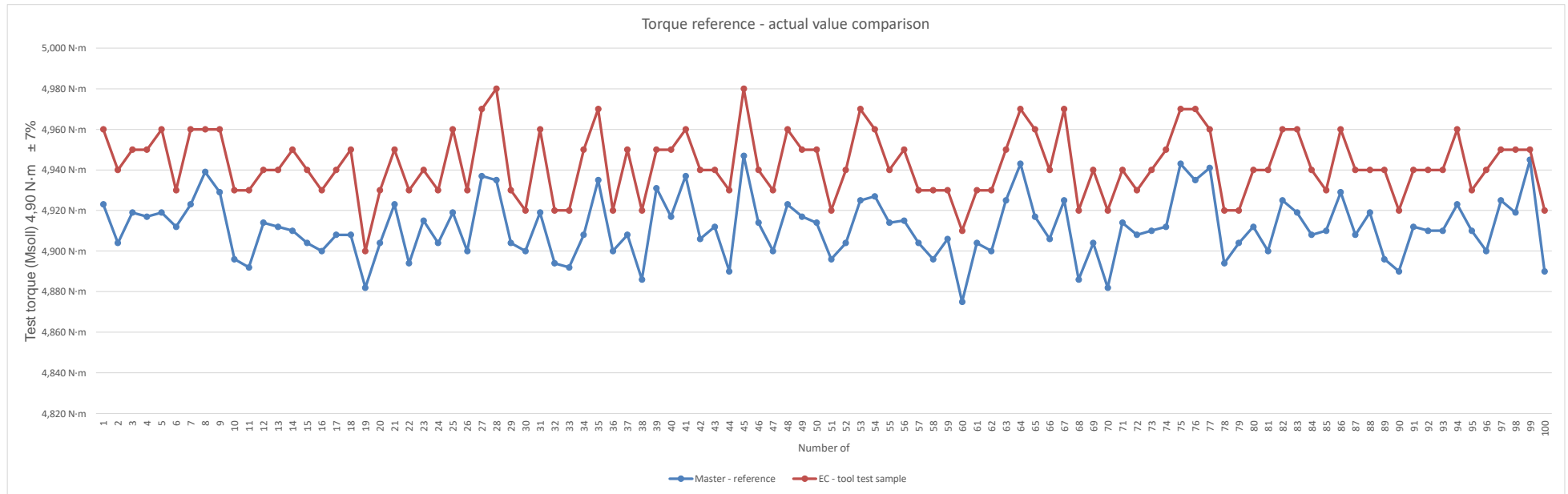
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0311 N·m	\bar{x}	-0,7540°	\bar{x}	-0,7540°
σ	-0,0050 N·m	σ	0,1500°	σ	0,1500°
M _{max}	-0,4500 N·m	M _{max}	-1,3500°	M _{max}	-1,3500°
M _{min}	0,0400 N·m	M _{min}	1,5000°	M _{min}	1,5000°
R (99,73%)	0,0075 N·m	R (99,73%)	0,3062°	R (99,73%)	0,3062°
s	0,0045 N·m	s	0,1500°	s	0,1500°
σ_s	0,0030 N·m	σ_s	0,0938°	σ_s	0,0938°
N·m ²	-1,865 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	15,3034	Capability index Cm	5,4427	Cm	5,4427
Cmk	15,1314	Capability index Cmk	6,6261	Cmk	6,6261

Measurement result

Nr.	Torque			Angle		
	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	4,923 N·m	0,023 N·m	0,47%	29,50°	-0,50°	-1,67%
2	4,904 N·m	0,004 N·m	0,08%	30,50°	0,50°	1,67%
3	4,919 N·m	0,019 N·m	0,39%	29,25°	-0,75°	-2,50%
4	4,920 N·m	0,020 N·m	0,41%	29,25°	-0,75°	-2,50%
5	4,919 N·m	0,019 N·m	0,39%	30,50°	0,50°	1,67%
6	4,912 N·m	0,012 N·m	0,24%	29,50°	-0,50°	-1,67%
7	4,923 N·m	0,023 N·m	0,47%	30,25°	0,25°	0,83%
8	4,939 N·m	0,039 N·m	0,80%	29,75°	-0,25°	-0,83%
9	4,929 N·m	0,029 N·m	0,59%	29,50°	-0,50°	-1,67%
10	4,896 N·m	-0,004 N·m	-0,08%	29,50°	-0,50°	-1,67%
11	4,882 N·m	-0,008 N·m	-0,16%	30,00°	0,00°	0,00%
12	4,914 N·m	0,014 N·m	0,29%	29,75°	-0,25°	-0,83%
13	4,912 N·m	0,012 N·m	0,24%	29,75°	-0,25°	-0,83%
14	4,910 N·m	0,010 N·m	0,20%	29,50°	-0,50°	-1,67%
15	4,904 N·m	0,004 N·m	0,08%	30,50°	0,50°	1,67%
16	4,900 N·m	0,000 N·m	0,00%	29,25°	-0,75°	-2,50%
17	4,908 N·m	0,008 N·m	0,16%	30,25°	0,25°	0,83%
18	4,908 N·m	0,008 N·m	0,16%	29,50°	-0,50°	-1,67%
19	4,882 N·m	-0,018 N·m	-0,37%	30,00°	0,00°	0,00%
20	4,904 N·m	0,004 N·m	0,08%	29,75°	-0,25°	-0,83%
21	4,923 N·m	0,023 N·m	0,47%	29,50°	-0,50°	-1,67%
22	4,894 N·m	-0,006 N·m	-0,12%	30,00°	0,00°	0,00%
23	4,915 N·m	0,015 N·m	0,31%	29,50°	-0,50°	-1,67%
24	4,900 N·m	0,000 N·m	0,00%	29,75°	-0,25°	-0,83%
25	4,919 N·m	0,019 N·m	0,39%	30,00°	0,00°	0,00%
26	4,900 N·m	0,000 N·m	0,00%	29,25°	-0,75°	-2,50%
27	4,937 N·m	0,037 N·m	0,76%	30,50°	0,50°	1,67%
28	4,935 N·m	0,035 N·m	0,71%	29,75°	-0,25°	-0,83%
29	4,900 N·m	0,000 N·m	0,00%	30,00°	0,00°	0,00%
30	4,900 N·m	0,000 N·m	0,00%	30,00°	0,00°	0,00%
31	4,919 N·m	0,019 N·m	0,39%	29,25°	-0,75°	-2,50%
32	4,894 N·m	-0,006 N·m	-0,12%	29,50°	-0,50°	-1,67%
33	4,882 N·m	-0,008 N·m	-0,16%	30,25°	0,25°	0,83%
34	4,900 N·m	0,000 N·m	0,00%	29,75°	-0,25°	-0,83%
35	4,935 N·m	0,035 N·m	0,71%	30,50°	0,50°	1,67%
36	4,900 N·m	0,000 N·m	0,00%	29,25°	-0,75°	-2,50%
37	4,908 N·m	0,008 N·m	0,16%	30,00°	0,00°	0,00%
38	4,888 N·m	-0,014 N·m	-0,29%	29,50°	-0,50°	-1,67%
39	4,900 N·m	0,000 N·m	0,00%	30,00°	0,00°	0,00%
40	4,917 N·m	0,017 N·m	0,35%	30,00°	0,00°	0,00%
41	4,937 N·m	0,037 N·m	0,76%	30,00°	0,00°	0,00%
42	4,908 N·m	0,008 N·m	0,12%	30,25°	0,25°	0,83%
43	4,912 N·m	0,012 N·m	0,24%	29,75°	-0,25°	-0,83%
44	4,910 N·m	0,010 N·m	0,20%	30,00°	0,00°	0,00%
45	4,947 N·m	0,047 N·m	0,96%	29,50°	-0,50°	-1,67%
46	4,914 N·m	0,014 N·m	0,29%	29,75°	-0,25°	-0,83%
47	4,900 N·m	0,000 N·m	0,00%	29,25°	-0,75°	-2,50%
48	4,929 N·m	0,029 N·m	0,47%	30,50°	0,50°	1,67%
49	4,917 N·m	0,017 N·m	0,35%	30,00°	0,00°	0,00%
50	4,914 N·m	0,014 N·m	0,29%	30,00°	0,00°	0,00%
51	4,896 N·m	-0,004 N·m	-0,08%	30,25°	0,25°	0,83%
52	4,904 N·m	0,004 N·m	0,08%	29,25°	-0,75°	-2,50%
53	4,929 N·m	0,029 N·m	0,51%	30,25°	0,25°	0,83%
54	4,927 N·m	0,027 N·m	0,55%	29,75°	-0,25°	-0,83%
55	4,914 N·m	0,014 N·m	0,29%	29,75°	-0,25°	-0,83%
56	4,915 N·m	0,015 N·m	0,31%	29,75°	-0,25°	-0,83%
57	4,904 N·m	0,004 N·m	0,08%	30,25°	0,25°	0,83%
58	4,886 N·m	-0,004 N·m	-0,08%	29,75°	-0,25°	-0,83%
59	4,900 N·m	0,000 N·m	0,00%	30,00°	0,00°	0,00%
60	4,875 N·m	-0,025 N·m	-0,51%	30,25°	0,25°	0,83%
61	4,904 N·m	0,004 N·m	0,08%	29,50°	-0,50°	-1,67%
62	4,900 N·m	0,000 N·m	0,00%	30,25°	0,25°	0,83%
63	4,925 N·m	0,025 N·m	0,51%	29,50°	-0,50°	-1,67%
64	4,943 N·m	0,043 N·m	0,88%	30,25°	0,25°	0,83%
65	4,917 N·m	0,017 N·m	0,35%	30,50°	0,50°	1,67%
66	4,906 N·m	0,006 N·m	0,12%	29,50°	-0,50°	-1,67%
67	4,925 N·m	0,025 N·m	0,51%	30,25°	0,25°	0,83%
68	4,886 N·m	-0,014 N·m	-0,29%	29,25°	-0,75°	-2,50%
69	4,904 N·m	0,004 N·m	0,08%	30,25°	0,25°	0,83%
70	4,882 N·m	-0,018 N·m	-0,37%	29,00°	-1,00°	-3,33%
71	4,914 N·m	0,014 N·m	0,29%	30,00°	0,00°	0,00%
72	4,908 N·m	0,008 N·m	0,16%	29,50°	-0,50°	-1,67%
73	4,910 N·m	0,010 N·m	0,20%	29,75°	-0,25°	-0,83%
74	4,912 N·m	0,012 N·m	0,24%	30,25°	0,25°	0,83%
75	4,943 N·m	0,043 N·m	0,88%	30,00°	0,00°	0,00%
76	4,935 N·m	0,035 N·m	0,71%	30,50°	0,50°	1,67%
77	4,941 N·m	0,041 N·m	0,84%	29,75°	-0,25°	-0,83%
78	4,894 N·m	-0,006 N·m	-0,12%	29,50°	-0,50°	-1,67%
79	4,904 N·m	0,004 N·m	0,08%	30,25°	0,25°	0,83%
80	4,912 N·m	0,012 N·m	0,24%	29,50°	-0,50°	-1,67%
81	4,900 N·m	0,000 N·m	0,00%	30,50°	0,50°	1,67%
82	4,925 N·m	0,025 N·m	0,51%	29,75°	-0,25°	-0,83%
83	4,910 N·m	0,010 N·m	0,20%	30,25°	0,25°	0,83%
84	4,908 N·m	0,0				

2 - Chart - 30% - 30° - hard



3 - test point 30% - 30° - hard

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	30 %	
Test torque (M_{test}):	4,900 N·m	Target: 30,00° (degree)
Rotation angle starting torque (M_{rot}):	2,450 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,343 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,343 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T_u/M_{test}):	5,243 N·m	(T_u/M_{test}): 35,00° (degree)
Lower tolerance (T_l/M_{test}):	4,557 N·m	(T_l/M_{test}): 25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
4.9023 N·m	\bar{x} 29,9175°	30,00°
M _{max} 4,9480 N·m	Maximal	M _{max} 31,2500°
M _{min} 4,8710 N·m	Minimal	M _{min} 29,0000°
R (99,73%) 0,0770 N·m	Scatter	R (99,73%) 2,2500°
s 0,0175 N·m	Standard deviation	s 0,4834°
σ 0,0499 N·m	6 × Standard deviation	6 × 2,9003°
N·m ² 29,4136 N·m	Torque rate	

Homologation	Machine capacity test - MCT	Homologation
Cm 6,5415	Capacity index Cm	Cm 3,4479
Cmk 6,5988	Capacity index Cmk	Cmk 3,9311

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	30 %	
Test torque (M_{test}):	4,900 N·m	Target: 30,00° (degree)
Rotation angle starting torque (M_{rot}):	2,450 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,343 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,343 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T_u/M_{test}):	5,243 N·m	(T_u/M_{test}): 35,00° (degree)
Lower tolerance (T_l/M_{test}):	4,557 N·m	(T_l/M_{test}): 25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
4.9100 N·m	\bar{x} 30,6750°	30,00°
M _{max} 4,9800 N·m	Maximal	M _{max} 32,1000°
M _{min} 4,9100 N·m	Minimal	M _{min} 29,8000°
R (99,73%) 0,0700 N·m	Scatter	R (99,73%) 2,5000°
s 0,0136 N·m	Standard deviation	s 0,5437°
σ 0,4099 N·m	6 × Standard deviation	6 × 3,2622°
N·m ² 29,6600 N·m	Torque rate	

Homologation	Machine capacity test - MCT	Homologation
Cm 6,4094	Capacity index Cm	Cm 3,0653
Cmk 7,4692	Capacity index Cmk	Cmk 2,6515

Difference evaluation

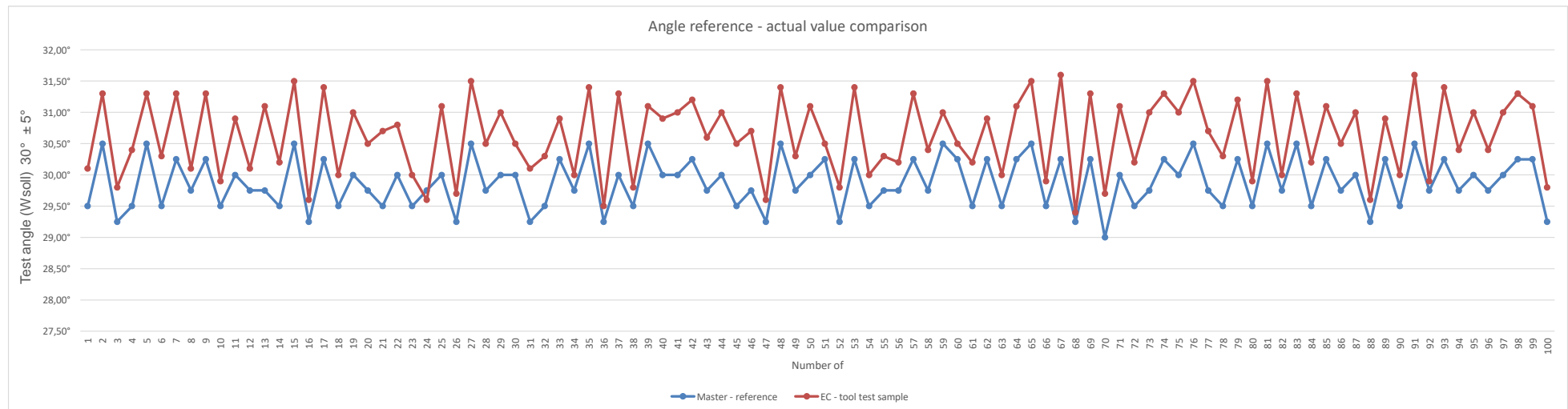
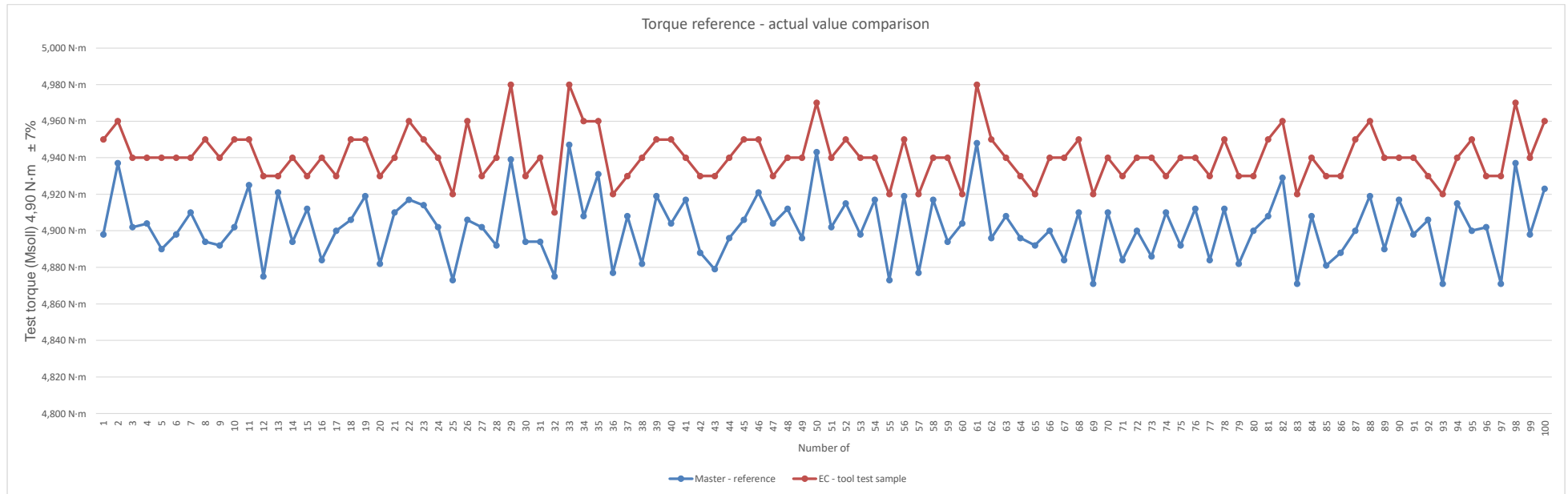
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	30 %	
Test torque (M_{test}):	0,000 N·m	Target: 0,00° (degree)
Rotation angle starting torque (M_{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,343 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,343 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T_u/M_{test}):	-0,343 N·m	(T_u/M_{test}): -5,00° (degree)
Lower tolerance (T_l/M_{test}):	-0,343 N·m	(T_l/M_{test}): -5,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
-0,0387 N·m	\bar{x} -0,7675°	0,00°
M _{max} -0,0900 N·m	Maximal	M _{max} 0,0650°
M _{min} -0,0590 N·m	Minimal	M _{min} -1,3500°
R (99,73%) 0,0700 N·m	Scatter	R (99,73%) 1,4000°
s 0,0136 N·m	Standard deviation	s 0,2941°
σ 0,4099 N·m	6 × Standard deviation	6 × 1,7645°
N·m ² -0,2324 N·m	Torque rate	

Homologation	Machine capacity test - MCT	Homologation
Cm 10,5628	Capacity index Cm	Cm 5,6674
Cmk 9,9876	Capacity index Cmk	Cmk 4,6888

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB						SN: 18240041						Date: 2018-07-30											
Measurement result																							
Torque			Angle			Torque			Angle			Torque			Angle								
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)			
1	4.898 N·m	-0,002 N·m	-0,04%	30,50°	0,50°	1,67%	1	4.950 N·m	0,050 N·m	1,02%	31,40°	1,40°	4,67%	1	-0,052 N·m	-1,06%	-0,03%	-0,90°	-3,00%	-3,00%			
2	4.937 N·m	0,037 N·m	0,76%	30,75°	0,75°	2,50%	2	4.960 N·m	0,060 N·m	1,22%	31,80°	1,80°	6,00%	2	-0,023 N·m	-0,47%	-0,15%	-1,05°	-3,50%	-3,50%			
3	4.902 N·m	0,002 N·m	0,04%	29,50°	-0,50°	-1,67%	3	4.940 N·m	0,040 N·m	0,82%	30,10°	0,10°	0,33%	3	-0,038 N·m	-0,78%	-0,13%	-0,60°	-2,00%	-2,00%			
4	4.898 N·m	-0,008 N·m	-0,16%	30,00°	0,00°	0,00%	4	4.950 N·m	0,050 N·m	1,02%	31,40°	1,40°	4,33%	4	-0,045 N·m	-0,90%	-0,15%	-0,90°	-2,80%	-2,80%			
5	4.890 N·m	-0,010 N·m	-0,20%	30,25°	0,25°	0,83%	5	4.940 N·m	0,040 N·m	0,82%	31,10°	1,10°	3,67%	5	-0,050 N·m	-1,02%	-0,15%	-0,85°	-2,80%	-2,80%			
6	4.898 N·m	-0,002 N·m	-0,04%	30,75°	0,75°	2,50%	6	4.940 N·m	0,040 N·m	0,82%	31,30°	1,30°	4,33%	6	-0,042 N·m	-0,86%	-0,15%	-0,75°	-2,50%	-2,50%			
7	4.910 N·m	0,010 N·m	0,20%	31,25°	1,25°	4,17%	7	4.940 N·m	0,040 N·m	0,82%	32,00°	2,00°	6,67%	7	-0,030 N·m	-0,61%	-0,15%	-0,75°	-2,50%	-2,50%			
8	4.894 N·m	-0,006 N·m	-0,12%	31,00°	1,00°	3,33%	8	4.950 N·m	0,050 N·m	1,02%	32,10°	2,10°	7,00%	8	-0,056 N·m	-1,14%	-0,15%	-1,10°	-3,60%	-3,60%			
9	4.898 N·m	-0,008 N·m	-0,16%	29,75°	-0,25°	-0,83%	9	4.950 N·m	0,050 N·m	1,02%	31,00°	1,00°	3,33%	9	-0,048 N·m	-0,98%	-0,15%	-0,90°	-2,80%	-2,80%			
10	4.902 N·m	0,002 N·m	0,04%	31,00°	1,00°	3,33%	10	4.950 N·m	0,050 N·m	1,02%	31,70°	1,70°	5,67%	10	-0,048 N·m	-0,98%	-0,15%	-0,70°	-2,30%	-2,30%			
11	4.925 N·m	0,025 N·m	0,51%	31,00°	1,00°	3,33%	11	4.960 N·m	0,060 N·m	1,22%	31,60°	1,60°	5,33%	11	-0,025 N·m	-0,51%	-0,15%	-0,60°	-2,00%	-2,00%			
12	4.875 N·m	-0,025 N·m	-0,51%	30,00°	0,00°	0,00%	12	4.930 N·m	0,030 N·m	0,61%	30,90°	0,90°	3,00%	12	-0,055 N·m	-1,12%	-0,15%	-0,90°	-3,00%	-3,00%			
13	4.921 N·m	0,021 N·m	0,43%	29,50°	-0,50°	-1,67%	13	4.950 N·m	0,050 N·m	1,02%	31,00°	0,00°	0,00%	13	-0,038 N·m	-0,78%	-0,15%	-0,50°	-1,60%	-1,60%			
14	4.894 N·m	-0,008 N·m	-0,16%	29,75°	-0,25°	-0,83%	14	4.950 N·m	0,050 N·m	1,02%	31,00°	1,00°	3,33%	14	-0,021 N·m	-0,43%	-0,15%	-1,35°	-4,50%	-4,50%			
15	4.912 N·m	0,012 N·m	0,24%	29,50°	-0,50°	-1,67%	15	4.930 N·m	0,030 N·m	0,61%	30,20°	0,20°	0,67%	15	-0,018 N·m	-0,37%	-0,15%	-0,70°	-2,30%	-2,30%			
16	4.884 N·m	-0,016 N·m	-0,33%	29,50°	-0,50°	-1,67%	16	4.940 N·m	0,040 N·m	0,82%	30,60°	0,60°	2,00%	16	-0,056 N·m	-1,14%	-0,15%	-1,10°	-3,60%	-3,60%			
17	4.900 N·m	0,000 N·m	0,00%	29,75°	-0,25°	-0,83%	17	4.930 N·m	0,030 N·m	0,61%	30,30°	0,30°	1,00%	17	-0,030 N·m	-0,61%	-0,15%	-0,55°	-1,80%	-1,80%			
18	4.906 N·m	0,006 N·m	0,12%	30,00°	0,00°	0,00%	18	4.950 N·m	0,050 N·m	1,02%	31,00°	0,00°	0,00%	18	-0,044 N·m	-0,90%	-0,15%	-1,00°	-3,30%	-3,30%			
19	4.896 N·m	-0,004 N·m	-0,08%	30,25°	0,25°	0,83%	19	4.950 N·m	0,050 N·m	1,02%	31,00°	0,40°	1,33%	19	-0,028 N·m	-0,57%	-0,15%	-0,85°	-2,60%	-2,60%			
20	4.882 N·m	-0,018 N·m	-0,37%	29,75°	-0,25°	-0,83%	20	4.930 N·m	0,030 N·m	0,61%	30,50°	0,50°	1,67%	20	-0,048 N·m	-0,98%	-0,15%	-0,75°	-2,50%	-2,50%			
21	4.910 N·m	0,010 N·m	0,20%	29,50°	-0,50°	-1,67%	21	4.940 N·m	0,040 N·m	0,82%	29,80°	-0,20°	-0,67%	21	-0,030 N·m	-0,61%	-0,15%	-0,30°	-1,00%	-1,00%			
22	4.917 N·m	0,017 N·m	0,35%	29,25°	-0,75°	-2,50%	22	4.960 N·m	0,060 N·m	1,22%	30,20°	0,20°	0,67%	22	-0,043 N·m	-0,88%	-0,15%	-0,95°	-3,10%	-3,10%			
23	4.914 N·m	0,014 N·m	0,29%	29,25°	-0,75°	-2,50%	23	4.950 N·m	0,050 N·m	1,02%	29,60°	-0,40°	-1,33%	23	-0,038 N·m	-0,78%	-0,15%	-0,35°	-1,10%	-1,10%			
24	4.902 N·m	0,002 N·m	0,04%	30,00°	0,00°	0,00%	24	4.950 N·m	0,050 N·m	1,02%	30,60°	0,60°	2,00%	24	-0,038 N·m	-0,78%	-0,15%	-0,80°	-2,60%	-2,60%			
25	4.873 N·m	-0,027 N·m	-0,55%	29,25°	-0,75°	-2,50%	25	4.920 N·m	0,020 N·m	0,41%	30,30°	0,30°	1,00%	25	-0,047 N·m	-0,96%	-0,15%	-1,05°	-3,50%	-3,50%			
26	4.906 N·m	0,006 N·m	0,12%	30,75°	0,75°	2,50%	26	4.960 N·m	0,060 N·m	1,22%	31,30°	1,30°	4,33%	26	-0,054 N·m	-1,10%	-0,15%	-0,55°	-1,80%	-1,80%			
27	4.902 N·m	0,002 N·m	0,04%	30,75°	0,75°	2,50%	27	4.930 N·m	0,030 N·m	0,61%	30,80°	0,80°	2,67%	27	-0,028 N·m	-0,57%	-0,15%	-1,05°	-3,50%	-3,50%			
28	4.882 N·m	-0,008 N·m	-0,16%	29,25°	-0,25°	-0,83%	28	4.940 N·m	0,040 N·m	0,82%	31,00°	1,00°	3,33%	28	-0,048 N·m	-0,98%	-0,15%	-0,75°	-2,50%	-2,50%			
29	4.896 N·m	-0,004 N·m	-0,08%	30,00°	0,00°	0,00%	29	4.950 N·m	0,050 N·m	1,02%	31,00°	1,10°	3,67%	29	-0,028 N·m	-0,57%	-0,15%	-0,85°	-2,60%	-2,60%			
30	4.894 N·m	-0,006 N·m	-0,12%	30,25°	0,25°	0,83%	30	4.930 N·m	0,030 N·m	0,61%	30,80°	0,80°	2,67%	30	-0,036 N·m	-0,73%	-0,15%	-0,55°	-1,80%	-1,80%			
31	4.894 N·m	-0,006 N·m	-0,12%	30,25°	0,25°	0,83%	31	4.940 N·m	0,040 N·m	0,82%	30,90°	0,90°	3,00%	31	-0,046 N·m	-0,94%	-0,15%	-0,65°	-2,10%	-2,10%			
32	4.875 N·m	-0,025 N·m	-0,51%	30,50°	0,50°	1,67%	32	4.910 N·m	0,010 N·m	0,20%	31,20°	1,20°	4,00%	32	-0,035 N·m	-0,71%	-0,15%	-0,70°	-2,30%	-2,30%			
33	4.947 N·m	0,047 N·m	0,96%	31,25°	1,25°	4,17%	33	4.950 N·m	0,050 N·m	1,02%	32,10°	2,10°	7,00%	33	-0,038 N·m	-0,78%	-0,15%	-0,85°	-2,60%	-2,60%			
34	4.896 N·m	-0,004 N·m	-0,08%	30,75°	0,75°	2,50%	34	4.950 N·m	0,050 N·m	1,02%	31,00°	1,50°	5,00%	34	-0,045 N·m	-0,90%	-0,15%	-0,75°	-2,50%	-2,50%			
35	4.931 N·m	0,031 N·m	0,63%	30,50°	0,50°	1,67%	35	4.960 N·m	0,060 N·m	1,22%	31,00°	0,00°	0,00%	35	-0,029 N·m	-0,59%	-0,15%	-0,50°	-1,60%	-1,6			

3 - Chart - 30% - 30° - hard



1 - test point 30% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB			
Serial-no.:	18240032		Date:	2018-07-30
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	4,900 N·m	Target:	360,00	(degree)
Rotation angle starting torque (M _{rot}):	2,450 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	5,243 N·m	(T _u /M _{test}):	375,00	(degree)
Lower tolerance (T _l /M _{test}):	4,557 N·m	(T _l /M _{test}):	345,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	4,8763 N·m	Number of measurements	356,7760°	\bar{x}	366,7760°
M _{max}	4,9140 N·m	Maximal	364,0000°	M _{max}	367,8000°
M _{min}	4,8510 N·m	Minimal	350,0000°	M _{min}	362,0000°
R (99,73%)	0,0630 N·m	Scatter	14,0000°	R (99,73%)	14,8000°
s	0,0137 N·m	Standard deviation	3,5993°	s	3,7480°
σ	0,0028 N·m	6 x Standard deviation	21,5960°	σ	22,7950°
N·m ²	2,482 N·m	Torque rate		N·m ²	

Homologation		Machine capacity test - MCT		Homologation	
Cm	8,3450	Capacity index Cm	1,8891	Cm	1,3891
Cmk	7,2620	Capacity index Cmk	1,6905	Cmk	2,4520

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB			
Serial-no.:	18240032		Date:	2018-07-30
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	4,900 N·m	Target:	360,00	(degree)
Rotation angle starting torque (M _{rot}):	2,450 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	5,243 N·m	(T _u /M _{test}):	375,00	(degree)
Lower tolerance (T _l /M _{test}):	4,557 N·m	(T _l /M _{test}):	345,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	4,9018 N·m	Number of measurements	360,9820°	\bar{x}	360,9820°
M _{max}	4,9100 N·m	Maximal	367,8000°	M _{max}	367,8000°
M _{min}	4,9000 N·m	Minimal	352,0000°	M _{min}	362,0000°
R (99,73%)	0,0100 N·m	Scatter	14,8000°	R (99,73%)	14,8000°
s	0,0039 N·m	Standard deviation	3,7480°	s	3,7480°
σ	0,0023 N·m	6 x Standard deviation	22,4950°	σ	22,4950°
N·m ²	2,4509 N·m	Torque rate		N·m ²	

Homologation		Machine capacity test - MCT		Homologation	
Cm	29,6108	Capacity index Cm	1,3348	Cm	1,3348
Cmk	29,4520	Capacity index Cmk	1,2474	Cmk	1,2474

Difference evaluation

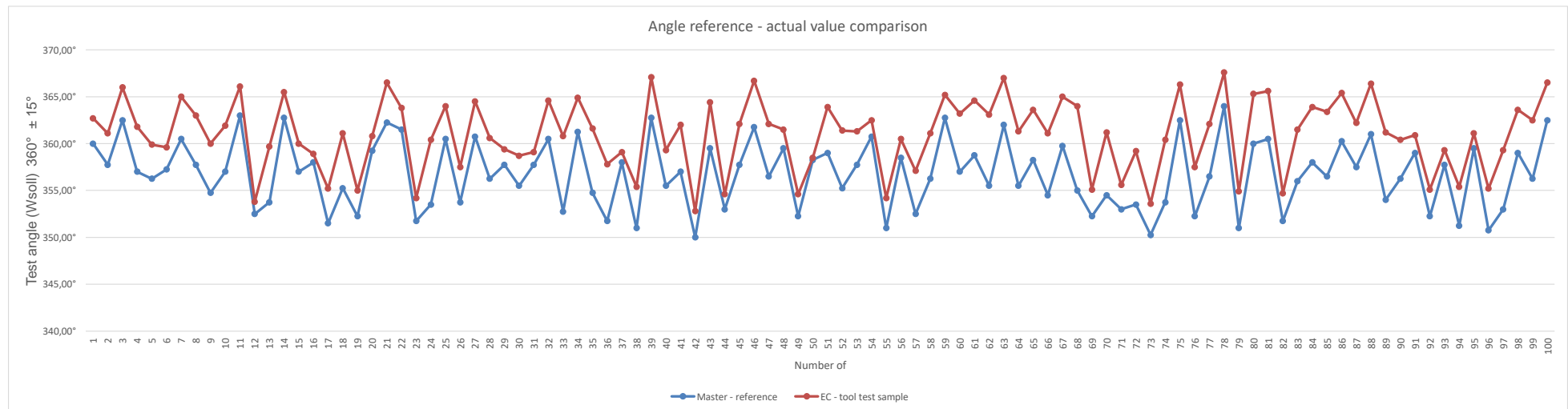
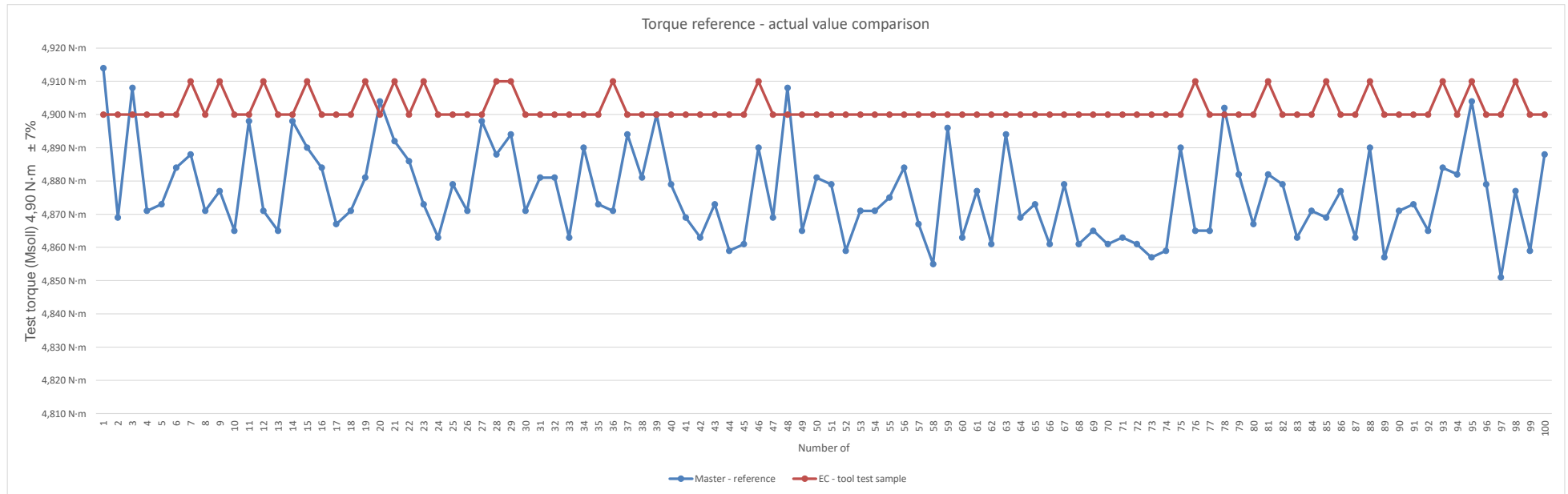
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB			
Serial-no.:	18240032		Date:	2018-07-30
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	30 %			
Test torque (M _{test}):	0,000 N·m	Target:	0,00	(degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	-0,343 N·m	(T _u /M _{test}):	-15,00	(degree)
Lower tolerance (T _l /M _{test}):	-0,343 N·m	(T _l /M _{test}):	-15,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	-0,0225 N·m	Number of measurements	-4,2070°	\bar{x}	-4,2070°
M _{max}	0,0140 N·m	Maximal	-0,2500°	M _{max}	-0,2500°
M _{min}	-0,0490 N·m	Minimal	-9,0000°	M _{min}	-9,0000°
R (99,73%)	0,0630 N·m	Scatter	8,7500°	R (99,73%)	8,7500°
s	0,0134 N·m	Standard deviation	1,7544°	s	1,7544°
σ	0,0005 N·m	6 x Standard deviation	10,5260°	σ	10,5260°
N·m ²	-0,0127 N·m	Torque rate		N·m ²	

Homologation		Machine capacity test - MCT		Homologation	
Cm	6,5241	Capacity index Cm	2,6499	Cm	2,6499
Cmk	7,2620	Capacity index Cmk	2,6560	Cmk	2,6560

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB						
Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	4,914 N·m	0,014 N·m	0,29%	360,00°	0,00°	0,00%
2	4,869 N·m	-0,031 N·m	-0,63%	357,75°	-2,25°	-0,62%
3	4,908 N·m	0,008 N·m	0,16%	362,50°	2,50°	0,69%
4	4,829 N·m	-0,029 N·m	-0,59%	352,00°	-8,00°	-2,21%
5	4,873 N·m	-0,027 N·m	-0,55%	356,25°	-3,75°	-1,04%
6	4,884 N·m	-0,016 N·m	-0,33%	357,25°	-2,75°	-0,76%
7	4,888 N·m	-0,012 N·m	-0,24%	360,20°	0,20°	0,06%
8	4,871 N·m	-0,029 N·m	-0,59%	357,75°	-2,25°	-0,62%
9	4,887 N·m	-0,027 N·m	-0,55%	352,75°	-7,25°	-2,07%
10	4,865 N·m	-0,035 N·m	-0,71%	357,00°	-3,00°	-0,83%
11	4,898 N·m	-0,002 N·m	-0,04%	363,00°	3,00°	0,83%
12	4,871 N·m	-0,029 N·m	-0,59%	352,50°	-7,50°	-2,08%
13	4,865 N·m	-0,035 N·m	-0,71%	353,75°	-6,25°	-1,74%
14	4,898 N·m	-0,002 N·m	-0,04%	362,75°	2,75°	0,76%
15	4,890 N·m	-0,010 N·m	-0,20%	357,00°	-3,00°	-0,83%
16	4,884 N·m	-0,016 N·m	-0,33%	358,00°	-2,00°	-0,56%
17	4,867 N·m	-0,033 N·m	-0,67%	351,50°	-8,50°	-2,36%
18	4,871 N·m	-0,029 N·m	-0,59%	356,25°	-4,75°	-1,32%
19	4,881 N·m	-0,019 N·m	-0,39%	352,25°	-7,75°	-2,16%
20	4,904 N·m	0,004 N·m	0,08%	359,25°	0,25°	0,07%
21	4,892 N·m	-0,008 N·m	-0,16%	362,25°	2,25°	0,63%
22	4,886 N·m	-0,014 N·m	-0,29%	361,50°	1,50°	0,42%
23	4,873 N·m	-0,027 N·m	-0,55%	351,75°	-8,25°	-2,29%
24	4,867 N·m	-0,037 N·m	-0,75%	352,25°	-8,25°	-2,31%
25	4,879 N·m	-0,021 N·m	-0,43%	360,50°	0,50°	0,14%
26	4,871 N·m	-0,029 N·m	-0,59%	353,75°	-6,25°	-1,74%
27	4,898 N·m	-0,002 N·m	-0,04%	360,75°	0,75°	0,21%
28	4,888 N·m	-0,012 N·m	-0,24%	356,25°	-3,75°	-1,04%
29	4,899 N·m	-0,003 N·m	-0,06%	352,00°	-8,00°	-2,21%
30	4,871 N·m	-0,029 N·m	-0,59%	355,50°	-4,50°	-1,25%
31	4,881 N·m	-0,019 N·m	-0,39%	357,75°	-2,25°	-0,62%
32	4,881 N·m	-0,019 N·m	-0,39%	360,75°	0,75°	0,14%
33	4,865 N·m	-0,037 N·m	-0,76%	352,75°	-7,25°	-2,01%
34	4,899 N·m	-0,003 N·m	-0,06%	362,25°	2,25°	0,63%
35	4,873 N·m	-0,027 N·m	-0,55%	354,75°	-5,25°	-1,46%
36	4,871 N·m	-0,029 N·m	-0,59%	351,75°	-8,25°	-2,29%
37	4,894 N·m	-0,006 N·m	-0,12%	358,00°	-2,00°	-0,56%
38	4,881 N·m	-0,019 N·m	-0,39%	351,00°	-9,00°	-2,50%
39	4,899 N·m	-0,003 N·m	-0,06%	362,25°	2,25°	0,63%
40	4,879 N·m	-0,021 N·m	-0,43%	355,50°	-4,50°	-1,25%
41	4,869 N·m	-0,031 N·m	-0,63%	357,00°	-3,00°	-0,83%
42	4,863 N·m	-0,037 N·m	-0,76%	350,00°	-10,00°	-2,78%
43	4,873 N·m	-0,027 N·m	-0,55%	359,50°	0,50°	0,14%
44	4,894 N·m	-0,004 N·m	-0,08%	360,25°	0,25°	0,07%
45	4,861 N·m	-0,039 N·m	-0,80%	357,75°	-2,25°	-0,62%
46	4,890 N·m	-0,010 N·m	-0,20%	361,75°	1,75°	0,49%
47	4,869 N·m	-0,031 N·m	-0,63%	356,50°	-3,50°	-0,97%
48	4,881 N·m	-0,019 N·m	-0,39%	359,50°	0,50°	0,14%
49	4,865 N·m	-0,035 N·m	-0,71%	352,25°	-7,25°	-2,07%
50	4,881 N·m	-0,019 N·m	-0,39%	356,25°	-1,75°	-0,49%
51	4,869 N·m	-0,031 N·m	-0,63%	357,00°	-3,00°	-0,83%
52	4,869 N·m	-0,031 N·m	-0,63%	355,25°	-5,25°	-1,46%
53	4,873 N·m	-0,027 N·m	-0,55%	357,75°	-2,25°	-0,62%
54	4,871 N·m	-0,029 N·m	-0,59%	360,75°	0,75°	0,14%
55	4,875 N·m	-0,025 N·m	-0,51%	351,00°	-9,00°	-2,50%
56	4,884 N·m	-0,016 N·m	-0,33%	358,50°	-1,50°	-0,42%
57	4,867 N·m	-0,033 N·m	-0,67%	352,50°	-7,50°	-2,08%
58	4,861 N·m	-0,045 N·m	-0,92%	356,25°	-3,75°	-1,04%
59	4,896 N·m	-0,004 N·m	-0,08%	360,00°	0,00°	0,00%
60	4,863 N·m	-0,037 N·m	-0,76%	357,00°	-3,00°	-0,83%
61	4,877 N·m	-0,023 N·m	-0,47%	358,75°	-1,25°	-0,35%
62	4,861 N·m	-0,039 N·m	-0,80%	355,50°	-5,50°	-1,53%
63	4,894 N·m	-0,006 N·m	-0,12%	362,00°	2,00°	0,56%
64	4,869 N·m	-0,031 N·m	-0,63%	357,50°	-4,50°	-1,25%
65	4,873 N·m	-0,027 N·m	-0,55%	356,25°	-1,75°	-0,49%
66	4,861 N·m	-0,039 N·m	-0,80%	354,50°	-5,50°	-1,53%
67	4,879 N·m	-0,021 N·m	-0,43%	359,75°	0,25°	0,07%
68	4,861 N·m	-0,039 N·m	-0,80%	355,00°	-5,00°	-1,39%
69	4,865 N·m	-0,035 N·m	-0,71%	352,25°	-7,25°	-2,07%
70	4,861 N·m	-0,039 N·m	-0,80%	354,50°	-5,50°	-1,53%
71	4,863 N·m	-0,037 N·m	-0,76%	353,00°	-4,00°	-1,11%
72	4,861 N·m	-0,039 N·m	-0,80%	353,50°	-4,50°	-1,25%
73	4,857 N·m	-0,043 N·m	-0,88%	360,25°	0,25°	0,07%
74	4,859 N·m	-0,041 N·m	-0,84%	353,75°	-6,25°	-1,74%
75	4,890 N·m	-0,010 N·m	-0,20%	366,30°	6,30°	1,75%
76	4,865 N·m	-0,035 N·m	-0,71%	352,25°	-7,25°	-2,07%
77	4,865 N·m	-0,035 N·m	-0,71%	356,50°	-3,50°	-0,97%
78	4,902 N·m	0,002 N·m	0,04%	367,00°	7,00°	2,11%
79	4,882 N·m	-0,018 N·m	-0,37%	355,10°	-4,90°	-1,36%
80	4,867 N·m	-0,033 N·m	-0,67%	360,00°	0,00°	0,00%
81	4,882 N·m	-0,018 N·m	-0,37%	360,50°	0,50°	0,14%
82	4,879 N·m	-0,021 N·m	-0,43%	351,75°	-8,25°	-2,29%
83	4,863 N·m	-0,037 N·m	-0,76%	356,00°	-4,00°	-1,11%
84	4,871 N·m	-0,029 N·m	-0,59%	358,00°	-2,00°	-0,56%
85	4,869 N·m	-0,031 N·m	-0,63%	356,50°	-3,50°	-0,97%
86	4,877 N·m	-0,023 N·m	-0,47%	360,25°	0,25°	0,07%
87	4,863 N·m	-0,037 N·m	-0,76%	357,50°	-2,50°	-0,69%
88	4,899 N·m	-0,003 N·m	-0,06%	362,00°	2,00°	0,56%
89	4,890 N·m	-0,01				

1 - Chart - 30% - 360° - soft



2 - test point 30% - 360° soft

Master - reference

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30%		
Test torque (M _{test}):	4,900 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M _{rot}):	2,450 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	5,243 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T _u /M _{test}):	0,070 %	(T _u /M _{test}):	375,00 (degree)
Lower tolerance (T _l /M _{test}):	-4,557 N·m	(T _l /M _{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	4,906 N·m	\bar{x}	359,657°	\bar{x}	361,258°
M _{max}	4,914 N·m	Maximal	368,250°	M _{max}	370,500°
M _{min}	4,886 N·m	Minimal	352,500°	M _{min}	354,500°
R (99,73%)	0,028 N·m	Scatter	15,500°	R (99,73%)	16,000°
s	0,070 N·m	Standard deviation	3,0539°	s	3,1489°
σ	0,219 N·m	6 x Standard deviation	18,3237°	σ	18,8934°
N·m ²	2,453 N·m	Torque rate		σ	

Homologation		Machine capability test - MCT		Homologation	
Cm	16,3373	Capability index Cm	1,6372	Cm	1,6372
Cmk	16,2196	Capability index Cmk	1,5998	Cmk	1,5998

EC tightening tool

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30%		
Test torque (M _{test}):	4,900 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M _{rot}):	2,450 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	5,243 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T _u /M _{test}):	0,070 %	(T _u /M _{test}):	375,00 (degree)
Lower tolerance (T _l /M _{test}):	-4,557 N·m	(T _l /M _{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	4,901 N·m	\bar{x}	359,657°	\bar{x}	361,258°
M _{max}	4,910 N·m	Maximal	368,250°	M _{max}	370,500°
M _{min}	4,900 N·m	Minimal	352,500°	M _{min}	354,500°
R (99,73%)	0,010 N·m	Scatter	15,500°	R (99,73%)	16,000°
s	0,030 N·m	Standard deviation	3,0539°	s	3,1489°
σ	0,090 N·m	6 x Standard deviation	18,3237°	σ	18,8934°
N·m ²	2,455 N·m	Torque rate		σ	

Homologation		Machine capability test - MCT		Homologation	
Cm	37,9201	Capability index Cm	1,5879	Cm	1,5879
Cmk	37,8625	Capability index Cmk	1,4547	Cmk	1,4547

Difference evaluation

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30%		
Test torque (M _{test}):	0,000 N·m	Target:	0,00 (degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	-0,343 N·m	- Tolerance:	-15,00 (degree)
Upper tolerance (T _u /M _{test}):	-	(T _u /M _{test}):	-
Lower tolerance (T _l /M _{test}):	-0,343 N·m	(T _l /M _{test}):	-15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

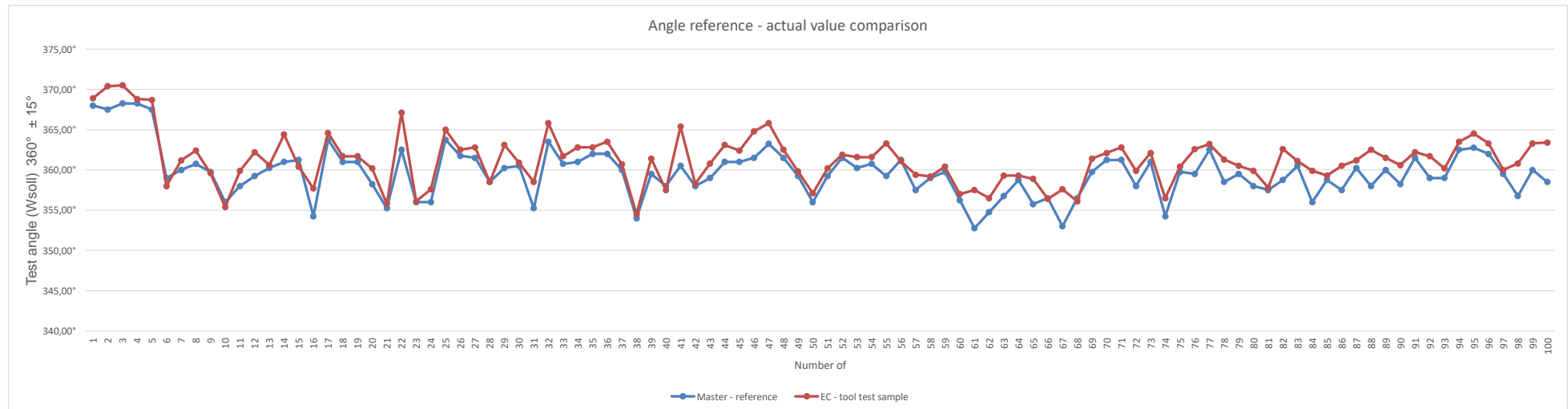
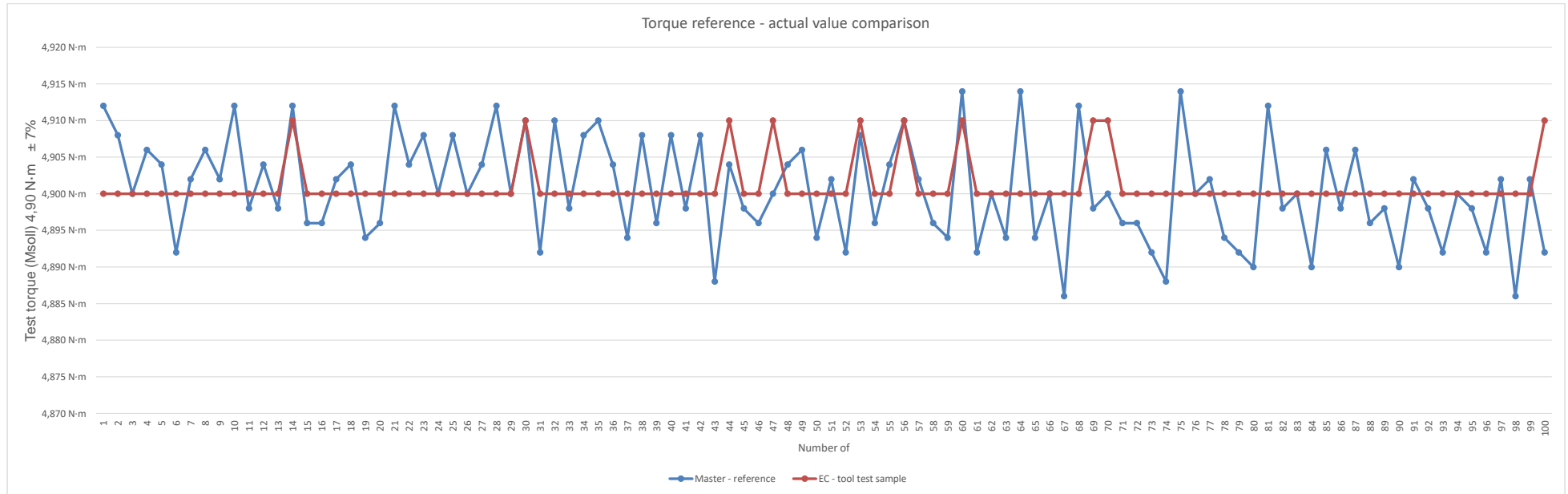
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,004 N·m	\bar{x}	-1,600°	\bar{x}	-1,600°
M _{max}	0,014 N·m	Maximal	1,000°	M _{max}	1,000°
M _{min}	-0,010 N·m	Minimal	-4,900°	M _{min}	-4,900°
R (99,73%)	0,030 N·m	Scatter	5,900°	R (99,73%)	5,900°
s	0,070 N·m	Standard deviation	1,5347°	s	1,5347°
σ	0,219 N·m	6 x Standard deviation	9,2082°	σ	9,2082°
N·m ²	-0,002 N·m	Torque rate		σ	

Homologation		Machine capability test - MCT		Homologation	
Cm	16,2504	Capability index Cm	1,6373	Cm	1,6373
Cmk	16,2296	Capability index Cmk	1,5988	Cmk	1,5988

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		SN: 18240039		Date: 2018-07-30	
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Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	4,912 N·m	0,012 N·m	0,24%	368,00°	8,00°	2,22%
2	4,908 N·m	0,008 N·m	0,16%	367,50°	7,50°	2,08%
3	4,900 N·m	0,000 N·m	0,00%	368,25°	8,25°	2,29%
4	4,902 N·m	0,002 N·m	0,04%	368,25°	8,25°	2,29%
5	4,904 N·m	0,004 N·m	0,08%	367,50°	7,50°	2,08%
6	4,892 N·m	-0,008 N·m	-0,16%	368,00°	8,00°	2,22%
7	4,902 N·m	0,002 N·m	0,04%	368,00°	8,00°	2,22%
8	4,906 N·m	0,006 N·m	0,12%	367,50°	7,50°	2,08%
9	4,902 N·m	0,002 N·m	0,04%	368,25°	8,25°	2,29%
10	4,912 N·m	0,012 N·m	0,24%	368,00°	8,00°	2,22%
11	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
12	4,904 N·m	0,004 N·m	0,08%	368,25°	8,25°	2,29%
13	4,898 N·m	-0,002 N·m	-0,04%	367,50°	7,50°	2,08%
14	4,912 N·m	0,012 N·m	0,24%	367,50°	7,50°	2,08%
15	4,896 N·m	-0,004 N·m	-0,08%	368,25°	8,25°	2,29%
16	4,896 N·m	-0,004 N·m	-0,08%	368,25°	8,25°	2,29%
17	4,902 N·m	0,002 N·m	0,04%	368,25°	8,25°	2,29%
18	4,904 N·m	0,004 N·m	0,08%	367,50°	7,50°	2,08%
19	4,894 N·m	-0,006 N·m	-0,12%	367,50°	7,50°	2,08%
20	4,896 N·m	-0,004 N·m	-0,08%	368,25°	8,25°	2,29%
21	4,912 N·m	0,012 N·m	0,24%	368,25°	8,25°	2,29%
22	4,904 N·m	0,004 N·m	0,08%	367,50°	7,50°	2,08%
23	4,908 N·m	0,008 N·m	0,16%	368,00°	8,00°	2,22%
24	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
25	4,908 N·m	0,008 N·m	0,16%	368,00°	8,00°	2,22%
26	4,900 N·m	0,000 N·m	0,00%	367,50°	7,50°	2,08%
27	4,904 N·m	0,004 N·m	0,08%	367,50°	7,50°	2,08%
28	4,912 N·m	0,012 N·m	0,24%	368,00°	8,00°	2,22%
29	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
30	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
31	4,892 N·m	-0,008 N·m	-0,16%	368,00°	8,00°	2,22%
32	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
33	4,898 N·m	-0,002 N·m	-0,04%	367,50°	7,50°	2,08%
34	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
35	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
36	4,904 N·m	0,004 N·m	0,08%	368,00°	8,00°	2,22%
37	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
38	4,908 N·m	0,008 N·m	0,16%	368,00°	8,00°	2,22%
39	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
40	4,908 N·m	0,008 N·m	0,16%	368,00°	8,00°	2,22%
41	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
42	4,908 N·m	0,008 N·m	0,16%	368,00°	8,00°	2,22%
43	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
44	4,914 N·m	0,014 N·m	0,28%	368,00°	8,00°	2,22%
45	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
46	4,896 N·m	-0,004 N·m	-0,08%	368,00°	8,00°	2,22%
47	4,900 N·m	0,000 N·m	0,00%	368,25°	8,25°	2,29%
48	4,904 N·m	0,004 N·m	0,08%	367,50°	7,50°	2,08%
49	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
50	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
51	4,902 N·m	0,002 N·m	0,04%	368,00°	8,00°	2,22%
52	4,892 N·m	-0,008 N·m	-0,16%	368,00°	8,00°	2,22%
53	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
54	4,896 N·m	-0,004 N·m	-0,08%	368,00°	8,00°	2,22%
55	4,904 N·m	0,004 N·m	0,08%	368,00°	8,00°	2,22%
56	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
57	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
58	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
59	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
60	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
61	4,892 N·m	-0,008 N·m	-0,16%	368,00°	8,00°	2,22%
62	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
63	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
64	4,910 N·m	0,010 N·m	0,20%	368,00°	8,00°	2,22%
65	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
66	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
67	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
68	4,902 N·m	0,002 N·m	0,04%	368,00°	8,00°	2,22%
69	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
70	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
71	4,896 N·m	-0,004 N·m	-0,08%	368,00°	8,00°	2,22%
72	4,898 N·m	-0,002 N·m	-0,04%	368,00°	8,00°	2,22%
73	4,894 N·m	-0,006 N·m	-0,12%	368,00°	8,00°	2,22%
74	4,888 N·m	-0,012 N·m	-0,24%	368,00°	8,00°	2,22%
75	4,914 N·m	0,014 N·m	0,28%	368,00°	8,00°	2,22%
76	4,900 N·m	0,000 N·m	0,00%	368,00°	8,00°	2,22%
77						

2 - Chart - 30% - 360° - soft



3 - test point 30% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30 %		
Test torque (M_{test}):	4,900 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M_{rot}):	2,450 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	5,243 N·m	(T_u/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	4,557 N·m	(T_l/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
4.8718 N·m	4.8718 N·m	362,2675°
M _{max}	Maximal	M _{max}
4.8660 N·m	4.8660 N·m	363,5000°
M _{min}	Minimal	M _{min}
0,0540 N·m	0,0540 N·m	16,7500°
R (99,73%)	Scatter	R (99,73%)
0,0110 N·m	0,0110 N·m	3,5949°
s	Standard deviation	s
0,0026 N·m	0,0026 N·m	21,5604°
N·m ²	Torque rate	6 s

Homologation	Machine capability test - MCT	Homologation
Cm	Capacity index Cm	Cm
10,3470	10,3470	1,9909
Cmk	Capacity index Cmk	Cmk
9,5926	9,5926	1,1105

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30 %		
Test torque (M_{test}):	4,900 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M_{rot}):	2,450 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	5,243 N·m	(T_u/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	4,557 N·m	(T_l/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
4.9013 N·m	4.9013 N·m	365,6170°
M _{max}	Maximal	M _{max}
4,9000 N·m	4,9000 N·m	373,5000°
M _{min}	Minimal	M _{min}
0,0100 N·m	0,0100 N·m	18,5000°
R (99,73%)	Scatter	R (99,73%)
0,0034 N·m	0,0034 N·m	3,6433°
s	Standard deviation	s
0,0020 N·m	0,0020 N·m	21,8801°
N·m ²	Torque rate	6 s

Homologation	Machine capability test - MCT	Homologation
Cm	Capacity index Cm	Cm
33,8267	33,8267	1,2724
Cmk	Capacity index Cmk	Cmk
33,8267	33,8267	0,8585

Difference evaluation

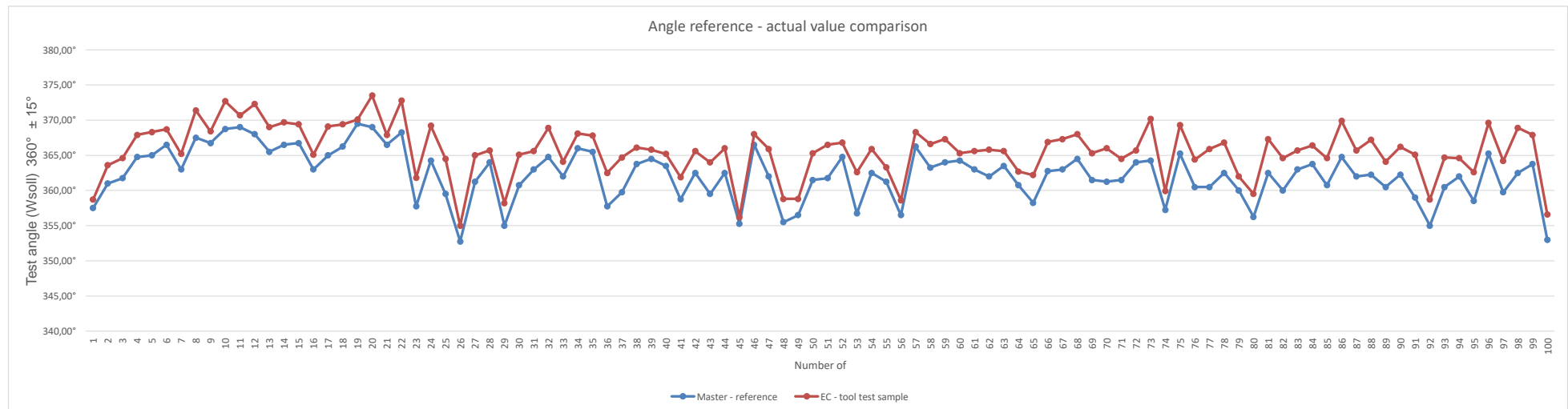
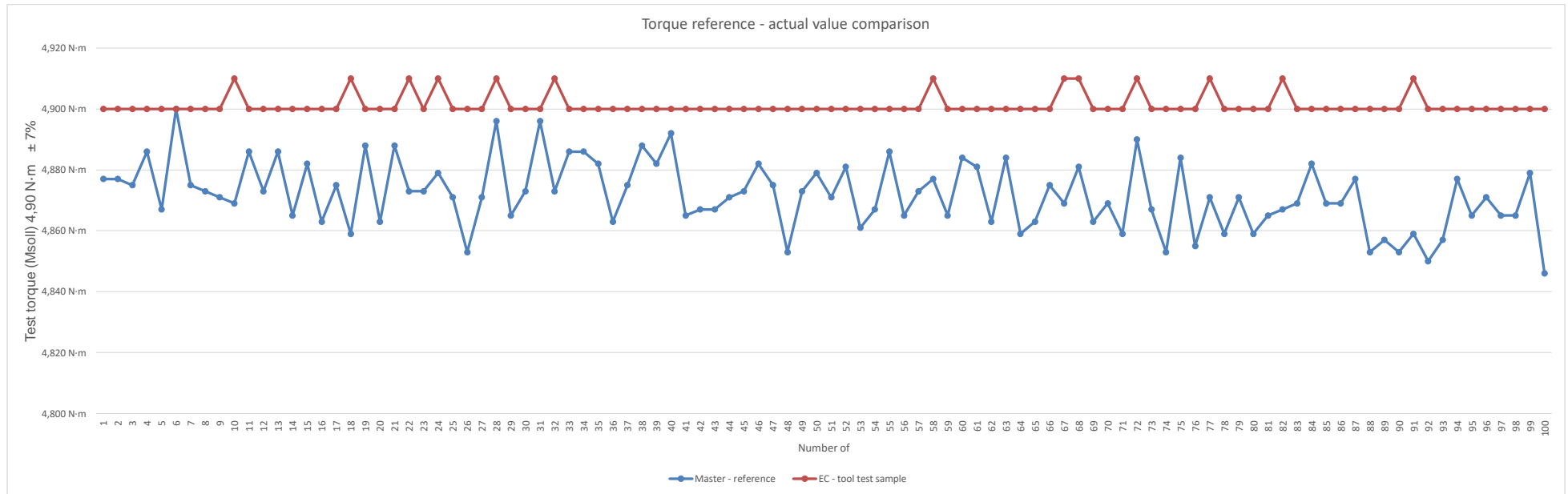
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	30 %		
Test torque (M_{test}):	0,000 N·m	Target:	0,00 (degree)
Rotation angle starting torque (M_{rot}):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,343 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,343 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	-0,343 N·m	(T_u/M_{test}):	-15,00 (degree)
Lower tolerance (T_l/M_{test}):	-0,343 N·m	(T_l/M_{test}):	-15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
-0,0295 N·m	-0,0295 N·m	-3,3495°
M _{max}	Maximal	M _{max}
0,0000 N·m	0,0000 N·m	-0,6000°
M _{min}	Minimal	M _{min}
-0,0540 N·m	-0,0540 N·m	-6,4000°
R (99,73%)	Scatter	R (99,73%)
0,0540 N·m	0,0540 N·m	5,8000°
s	Standard deviation	s
0,0113 N·m	0,0113 N·m	3,6407°
6 s	6 s	7,4442°
N·m ²	Torque rate	6 s

Homologation	Machine capability test - MCT	Homologation
Cm	Capacity index Cm	Cm
10,1237	10,1237	4,0301
Cmk	Capacity index Cmk	Cmk
9,5256	9,5256	3,1366

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB							SN: 18240041							Date: 2018-07-30						
Measurement result																				
Torque							Angle													
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	4,877 N·m	-0,023 N·m	-0,47%	357,50°	-2,50°	-0,69%	1	4,900 N·m	0,000 N·m	0,00%	368,70°	-1,30°	-0,36%	1	4,900 N·m	0,000 N·m	0,00%	368,70°	-1,30°	-0,36%
2	4,877 N·m	-0,023 N·m	-0,47%	361,00°	1,00°	0,28%	2	4,900 N·m	0,000 N·m	0,00%	363,60°	3,60°	1,00%	2	4,900 N·m	0,000 N·m	0,00%	363,60°	3,60°	1,00%
3	4,875 N·m	-0,025 N·m	-0,51%	361,75°	1,75°	0,49%	3	4,900 N·m	0,000 N·m	0,00%	364,60°	4,60°	1,28%	3	4,900 N·m	0,000 N·m	0,00%	364,60°	4,60°	1,28%
4	4,874 N·m	-0,026 N·m	-0,53%	362,50°	2,50°	0,65%	4	4,900 N·m	0,000 N·m	0,00%	367,40°	7,40°	2,15%	4	4,900 N·m	0,000 N·m	0,00%	367,40°	7,40°	2,15%
5	4,867 N·m	-0,033 N·m	-0,67%	365,00°	5,00°	1,39%	5	4,900 N·m	0,000 N·m	0,00%	368,30°	8,30°	2,31%	5	4,900 N·m	0,000 N·m	0,00%	368,30°	8,30°	2,31%
6	4,900 N·m	0,000 N·m	0,00%	366,50°	6,50°	1,81%	6	4,900 N·m	0,000 N·m	0,00%	368,70°	8,70°	2,42%	6	4,900 N·m	0,000 N·m	0,00%	368,70°	8,70°	2,42%
7	4,875 N·m	-0,025 N·m	-0,51%	363,00°	3,00°	0,83%	7	4,900 N·m	0,000 N·m	0,00%	365,20°	5,20°	1,44%	7	4,900 N·m	0,000 N·m	0,00%	365,20°	5,20°	1,44%
8	4,874 N·m	-0,026 N·m	-0,53%	367,50°	7,50°	2,08%	8	4,900 N·m	0,000 N·m	0,00%	371,40°	11,40°	3,17%	8	4,900 N·m	0,000 N·m	0,00%	371,40°	11,40°	3,17%
9	4,874 N·m	-0,026 N·m	-0,53%	368,75°	8,75°	2,38%	9	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,35%	9	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,35%
10	4,868 N·m	-0,031 N·m	-0,63%	368,75°	8,75°	2,43%	10	4,900 N·m	0,000 N·m	0,00%	372,70°	12,70°	3,53%	10	4,900 N·m	0,000 N·m	0,00%	372,70°	12,70°	3,53%
11	4,886 N·m	-0,014 N·m	-0,29%	369,00°	9,00°	2,50%	11	4,900 N·m	0,000 N·m	0,00%	370,70°	10,70°	2,97%	11	4,900 N·m	0,000 N·m	0,00%	370,70°	10,70°	2,97%
12	4,873 N·m	-0,027 N·m	-0,55%	368,00°	8,00°	2,22%	12	4,900 N·m	0,000 N·m	0,00%	372,30°	12,30°	3,42%	12	4,900 N·m	0,000 N·m	0,00%	372,30°	12,30°	3,42%
13	4,886 N·m	-0,014 N·m	-0,29%	365,50°	5,50°	1,53%	13	4,900 N·m	0,000 N·m	0,00%	369,00°	9,00°	2,50%	13	4,900 N·m	0,000 N·m	0,00%	369,00°	9,00°	2,50%
14	4,865 N·m	-0,035 N·m	-0,71%	365,50°	5,50°	1,53%	14	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%	14	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%
15	4,882 N·m	-0,018 N·m	-0,37%	366,75°	6,75°	1,88%	15	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,61%	15	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,61%
16	4,863 N·m	-0,037 N·m	-0,76%	363,00°	3,00°	0,83%	16	4,900 N·m	0,000 N·m	0,00%	365,10°	5,10°	1,42%	16	4,900 N·m	0,000 N·m	0,00%	365,10°	5,10°	1,42%
17	4,875 N·m	-0,025 N·m	-0,51%	365,00°	5,00°	1,39%	17	4,900 N·m	0,000 N·m	0,00%	369,10°	9,10°	2,53%	17	4,900 N·m	0,000 N·m	0,00%	369,10°	9,10°	2,53%
18	4,859 N·m	-0,041 N·m	-0,84%	366,25°	6,25°	1,74%	18	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,61%	18	4,900 N·m	0,000 N·m	0,00%	369,40°	9,40°	2,61%
19	4,885 N·m	-0,012 N·m	-0,25%	362,50°	2,50°	0,69%	19	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%	19	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%
20	4,863 N·m	-0,037 N·m	-0,76%	369,00°	9,00°	2,50%	20	4,900 N·m	0,000 N·m	0,00%	373,50°	13,50°	3,75%	20	4,900 N·m	0,000 N·m	0,00%	373,50°	13,50°	3,75%
21	4,888 N·m	-0,012 N·m	-0,24%	366,50°	6,50°	1,81%	21	4,900 N·m	0,000 N·m	0,00%	367,90°	7,90°	2,19%	21	4,900 N·m	0,000 N·m	0,00%	367,90°	7,90°	2,19%
22	4,873 N·m	-0,027 N·m	-0,55%	368,25°	8,25°	2,29%	22	4,900 N·m	0,000 N·m	0,00%	372,80°	12,80°	3,66%	22	4,900 N·m	0,000 N·m	0,00%	372,80°	12,80°	3,66%
23	4,873 N·m	-0,027 N·m	-0,55%	357,75°	-2,25°	-0,62%	23	4,900 N·m	0,000 N·m	0,00%	361,80°	1,80°	0,50%	23	4,900 N·m	0,000 N·m	0,00%	361,80°	1,80°	0,50%
24	4,871 N·m	-0,029 N·m	-0,43%	362,50°	2,50°	0,69%	24	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%	24	4,900 N·m	0,000 N·m	0,00%	370,10°	10,10°	2,85%
25	4,871 N·m	-0,029 N·m	-0,59%	359,50°	-0,50°	-0,14%	25	4,900 N·m	0,000 N·m	0,00%	364,50°	4,50°	1,25%	25	4,900 N·m	0,000 N·m	0,00%	364,50°	4,50°	1,25%
26	4,853 N·m	-0,047 N·m	-0,96%	352,75°	-7,25°	-2,01%	26	4,900 N·m	0,000 N·m	0,00%	355,00°	-5,00°	-1,39%	26	4,900 N·m	0,000 N·m	0,00%	355,00°	-5,00°	-1,39%
27	4,871 N·m	-0,029 N·m	-0,59%	361,25°	1,25°	0,36%	27	4,900 N·m	0,000 N·m	0,00%	365,00°	5,00°	1,39%	27	4,900 N·m	0,000 N·m	0,00%	365,00°	5,00°	1,39%
28	4,896 N·m	-0,004 N·m	-0,08%	364,00°	4,00°	1,11%	28	4,900 N·m	0,000 N·m	0,00%	365,70°	5,70°	1,58%	28	4,900 N·m	0,000 N·m	0,00%	365,70°	5,70°	1,58%
29	4,865 N·m	-0,035 N·m	-0,71%	362,50°	2,50°	0,69%	29	4,900 N·m	0,000 N·m	0,00%	365,00°	5,00°	1,39%	29	4,900 N·m	0,000 N·m	0,00%	365,00°	5,00°	1,39%
30	4,873 N·m	-0,027 N·m	-0,55%	360,75°	0,75°	0,21%	30	4,900 N·m	0,000 N·m	0,00%	365,10°	5,10°	1,42%	30	4,900 N·m	0,000 N·m	0,00%	365,10°	5,10°	1,42%
31	4,896 N·m	-0,004 N·m	-0,08%	363,00°	3,00°	0,83%	31	4,900 N·m	0,000 N·m	0,00%	365,60°	5,60°	1,56%	31	4,900 N·m	0,000 N·m	0,00%	365,60°	5,60°	1,56%
32	4,873 N·m	-0,027 N·m	-0,55%	364,																

3 - Chart - 30% - 360° - soft



1 - test point 80% - 30° hard

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	90 %
Sample size:	100 piece	
Test point:	80 %	
Test torque (M _{test}):	11,400 N·m	Target: 30,00° (degree)
Rotation angle starting torque (M _{rot}):	5,700 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,798 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,798 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}): 35,00° (degree)
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}): 25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4662 N·m	Average	\bar{x}	29,7775°	
M _{max}	11,4870 N·m	Maximal	M _{max}	30,2500°	
M _{min}	11,3900 N·m	Minimal	M _{min}	11,4200 N·m	
R (99,73%)	0,0970 N·m	Scatter	R (99,73%)	0,7500°	
s	0,0187 N·m	Standard deviation	s	0,1585°	
6 s	0,1132 N·m	6 x Standard deviation	6 s	0,9510°	
N·m ²	68,6712 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	14,1933	Capability index Cmk	10,5157	Cm	10,5157
Cmk	15,5596	Capability index Cmk	10,0478	Cmk	15,5596

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	90 %
Sample size:	100 piece	
Test point:	80 %	
Test torque (M _{test}):	11,400 N·m	Target: 30,00° (degree)
Rotation angle starting torque (M _{rot}):	5,700 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,798 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,798 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}): 35,00° (degree)
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}): 25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4662 N·m	Average	\bar{x}	31,3900°	
M _{max}	11,5100 N·m	Maximal	M _{max}	32,3000°	
M _{min}	11,4200 N·m	Minimal	M _{min}	11,4200 N·m	
R (99,73%)	0,0900 N·m	Scatter	R (99,73%)	1,8000°	
s	0,0187 N·m	Standard deviation	s	0,2862°	
6 s	0,1132 N·m	6 x Standard deviation	6 s	1,7172°	
N·m ²	68,7912 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	14,2500	Capability index Cmk	5,8232	Cm	5,8232
Cmk	15,5857	Capability index Cmk	4,1938	Cmk	15,5857

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	80 %
Sample size:	100 piece	
Test torque (M _{test}):	0,000 N·m	Target: 0,00° (degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	-0,798 N·m	+ Tolerance: -5,00° (degree)
- Tolerance:	-0,798 N·m	- Tolerance: -5,00° (degree)
Upper tolerance (T _u /M _{test}):	0,798 N·m	(T _u /M _{test}): -5,00° (degree)
Lower tolerance (T _l /M _{test}):	-0,798 N·m	(T _l /M _{test}): -5,00° (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

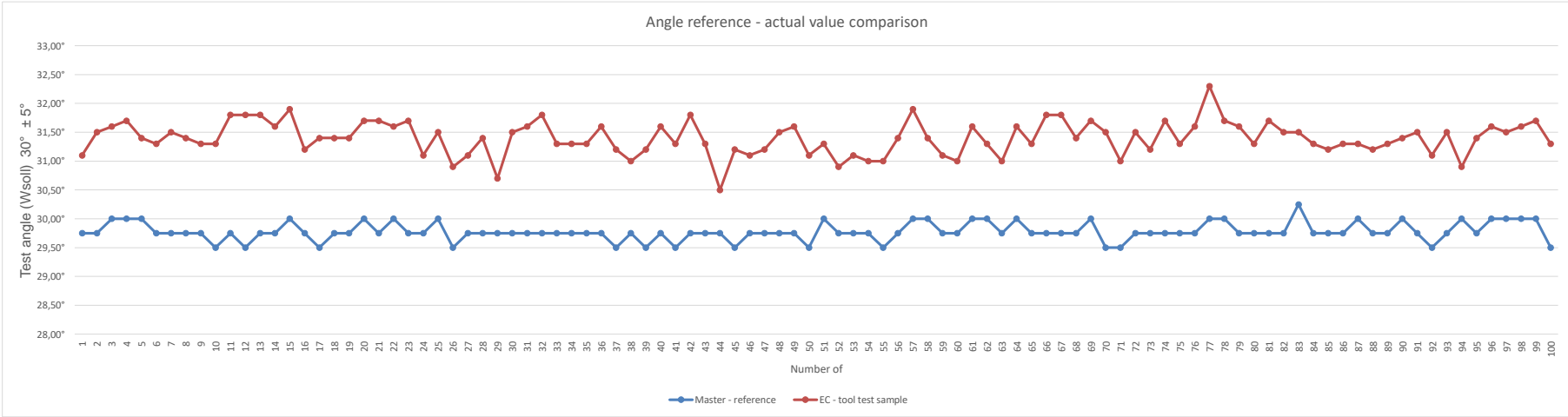
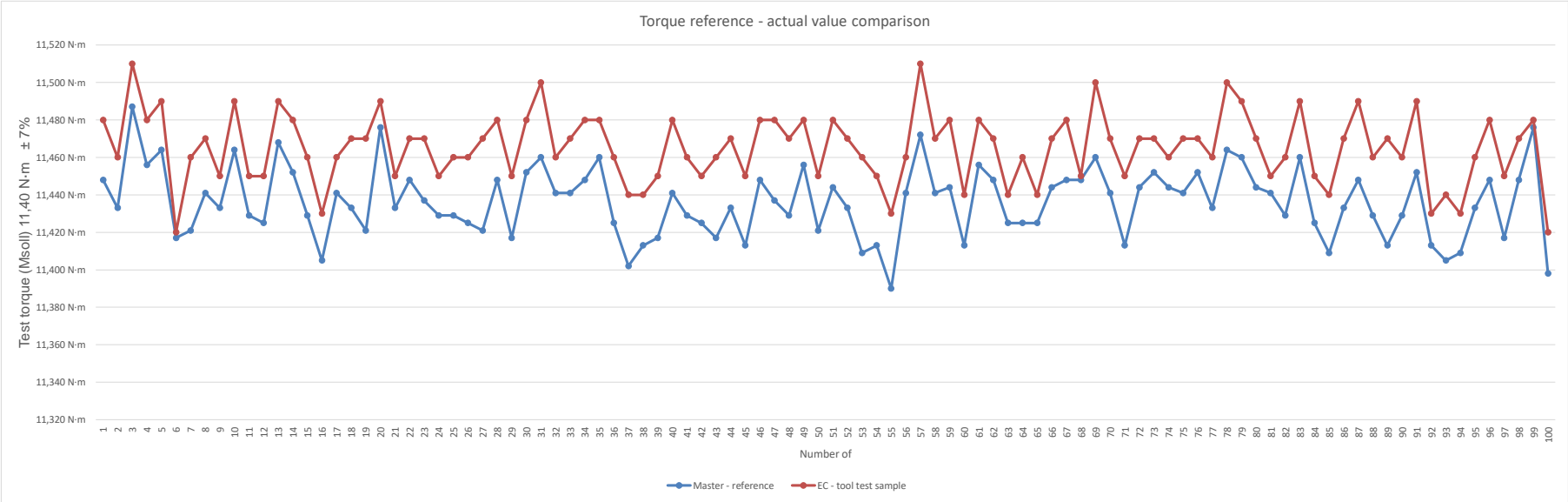
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0290 N·m	Average	\bar{x}	-1,6215°	
M _{max}	-0,0020 N·m	Maximal	M _{max}	-0,7500°	
M _{min}	-0,0570 N·m	Minimal	M _{min}	-2,3000°	
R (99,73%)	0,0550 N·m	Scatter	R (99,73%)	1,5500°	
s	0,0098 N·m	Standard deviation	s	0,2722°	
6 s	0,0593 N·m	6 x Standard deviation	6 s	1,6332°	
N·m ²	-0,1740 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	27,2751	Capability index Cmk	6,1204	Cm	6,1204
Cmk	25,8298	Capability index Cmk	4,4358	Cmk	25,8298

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB SN: 18240032 Date: 2018-07-30

Measurement result				Measurement result			
Nr.	Torque (N·m)		Difference (%)	Angle (°)		Difference (%)	Difference (%)
	Torque (N·m)	Difference (%)		Angle (°)	Difference (%)		
1	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
2	11,433 N·m	0,033 N·m	0,29%	30,07°	-0,25°	-0,83%	
3	11,487 N·m	0,077 N·m	0,76%	30,00°	0,00°	0,00%	
4	11,452 N·m	0,052 N·m	0,46%	29,75°	-0,25°	-0,83%	
5	11,464 N·m	0,064 N·m	0,56%	30,00°	0,00°	0,00%	
6	11,417 N·m	0,017 N·m	0,15%	29,75°	-0,25°	-0,83%	
7	11,421 N·m	0,021 N·m	0,18%	29,75°	-0,25°	-0,83%	
8	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
9	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
10	11,464 N·m	0,064 N·m	0,56%	29,50°	-0,50°	-1,67%	
11	11,429 N·m	0,029 N·m	0,25%	29,75°	-0,25°	-0,83%	
12	11,425 N·m	0,025 N·m	0,22%	29,50°	-0,50°	-1,67%	
13	11,468 N·m	0,068 N·m	0,60%	29,75°	-0,25°	-0,83%	
14	11,452 N·m	0,052 N·m	0,46%	29,75°	-0,25°	-0,83%	
15	11,429 N·m	0,029 N·m	0,25%	30,00°	0,00°	0,00%	
16	11,405 N·m	0,005 N·m	0,04%	29,75°	-0,25°	-0,83%	
17	11,441 N·m	0,041 N·m	0,36%	29,50°	-0,50°	-1,67%	
18	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
19	11,421 N·m	0,021 N·m	0,18%	29,75°	-0,25°	-0,83%	
20	11,476 N·m	0,076 N·m	0,67%	30,00°	0,00°	0,00%	
21	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
22	11,448 N·m	0,048 N·m	0,42%	30,00°	0,00°	0,00%	
23	11,437 N·m	0,037 N·m	0,32%	29,75°	-0,25°	-0,83%	
24	11,429 N·m	0,029 N·m	0,25%	29,75°	-0,25°	-0,83%	
25	11,429 N·m	0,029 N·m	0,25%	30,00°	0,00°	0,00%	
26	11,425 N·m	0,025 N·m	0,22%	29,50°	-0,50°	-1,67%	
27	11,421 N·m	0,021 N·m	0,18%	29,75°	-0,25°	-0,83%	
28	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
29	11,417 N·m	0,017 N·m	0,15%	29,75°	-0,25°	-0,83%	
30	11,452 N·m	0,052 N·m	0,46%	29,75°	-0,25°	-0,83%	
31	11,460 N·m	0,060 N·m	0,53%	29,75°	-0,25°	-0,83%	
32	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
33	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
34	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
35	11,460 N·m	0,060 N·m	0,53%	29,75°	-0,25°	-0,83%	
36	11,425 N·m	0,025 N·m	0,22%	29,75°	-0,25°	-0,83%	
37	11,402 N·m	0,002 N·m	0,02%	29,50°	-0,50°	-1,67%	
38	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%	
39	11,417 N·m	0,017 N·m	0,15%	29,75°	-0,25°	-0,83%	
40	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
41	11,429 N·m	0,029 N·m	0,25%	29,50°	-0,50°	-1,67%	
42	11,425 N·m	0,025 N·m	0,22%	29,75°	-0,25°	-0,83%	
43	11,417 N·m	0,017 N·m	0,15%	29,75°	-0,25°	-0,83%	
44	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
45	11,413 N·m	0,013 N·m	0,11%	29,50°	-0,50°	-1,67%	
46	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
47	11,437 N·m	0,037 N·m	0,32%	29,75°	-0,25°	-0,83%	
48	11,429 N·m	0,029 N·m	0,25%	29,75°	-0,25°	-0,83%	
49	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
50	11,421 N·m	0,021 N·m	0,18%	29,50°	-0,50°	-1,67%	
51	11,444 N·m	0,044 N·m	0,39%	30,00°	0,00°	0,00%	
52	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
53	11,468 N·m	0,068 N·m	0,60%	29,75°	-0,25°	-0,83%	
54	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%	
55	11,390 N·m	-0,010 N·m	-0,09%	29,50°	-0,50°	-1,67%	
56	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
57	11,472 N·m	0,072 N·m	0,63%	30,00°	0,00°	0,00%	
58	11,441 N·m	0,041 N·m	0,36%	30,00°	0,00°	0,00%	
59	11,444 N·m	0,044 N·m	0,39%	30,00°	0,00°	0,00%	
60	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%	
61	11,456 N·m	0,056 N·m	0,49%	30,00°	0,00°	0,00%	
62	11,448 N·m	0,048 N·m	0,42%	30,00°	0,00°	0,00%	
63	11,425 N·m	0,025 N·m	0,22%	29,75°	-0,25°	-0,83%	
64	11,425 N·m	0,025 N·m	0,22%	30,00°	0,00°	0,00%	
65	11,425 N·m	0,025 N·m	0,22%	29,75°	-0,25°	-0,83%	
66	11,444 N·m	0,044 N·m	0,39%	29,75°	-0,25°	-0,83%	
67	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
68	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	
69	11,460 N·m	0,060 N·m	0,53%	30,00°	0,00°	0,00%	
70	11,441 N·m	0,041 N·m	0,36%	29,50°	-0,50°	-1,67%	
71	11,413 N·m	0,013 N·m	0,11%	29,50°	-0,50°	-1,67%	
72	11,444 N·m	0,044 N·m	0,39%	29,75°	-0,25°	-0,83%	
73	11,452 N·m	0,052 N·m	0,46%	29,75°	-0,25°	-0,83%	
74	11,444 N·m	0,044 N·m	0,39%	29,75°	-0,25°	-0,83%	
75	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
76	11,452 N·m	0,052 N·m	0,46%	29,75°	-0,25°	-0,83%	
77	11,433 N·m	0,033 N·m	0,29%	30,00°	0,00°	0,00%	
78	11,464 N·m	0,064 N·m	0,56%	30,00°	0,00°	0,00%	
79	11,460 N·m	0,060 N·m	0,53%	29,75°	-0,25°	-0,83%	
80	11,444 N·m	0,044 N·m	0,39%	29,75°	-0,25°	-0,83%	
81	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%	
82	11,429 N·m	0,029 N·m	0,25%	29,75°	-0,25°	-0,83%	
83	11,460 N·m	0,060 N·m	0,53%	30,25°	0,25°	0,83%	
84	11,425 N·m	0,025 N·m	0,22%	29,75°	-0,25°	-0,83%	
85	11,409 N·m	0,009 N·m	0,08%	29,75°	-0,25°	-0,83%	
86	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%	
87	11,448 N·m	0,048 N·m	0,42%	30,00°	0,00°	0,00%	
88	11,448 N·m	0,048 N·m	0,42%	29,75°	-0,25°	-0,83%	

1 - Chart- 80% - 30° - hard



2 - test point 80% - 30° hard

Master - reference

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date: 2018-07-30	
Serial-no.:	18240039	Test point:	80 %
Operating range (N·m):	1,00 to 14,00	Test torque (M_{test}):	11,400 N·m
Sample size:	100 piece	Target:	30,00° (degree)
Rotation angle starting torque (M₀):	5,700 N·m	± Tolerance:	5,00° (degree)
± Tolerance:	7,00° N·m	+ Tolerance:	5,00° (degree)
- Tolerance:	0,798 N·m	- Tolerance:	5,00° (degree)
Upper tolerance (T_u/M_{max}):	12,198 N·m	(T_u/M_{max}):	35,00° (degree)
Lower tolerance (T_l/M_{min}):	10,602 N·m	(T_l/M_{min}):	25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	11,4000 N·m	\bar{x}	29,8150°	\bar{x}	31,2600°
M _{max}	11,4520 N·m	M _{max}	31,0000°	M _{max}	32,5000°
M _{min}	11,3500 N·m	M _{min}	29,2500°	M _{min}	30,7000°
R (99,73%)	0,0930 N·m	R (99,73%)	1,7500°	R (99,73%)	1,8000°
s	0,0181 N·m	s	0,3689°	s	0,3689°
σ	0,0565 N·m	σ	1,2217°	σ	1,2217°
N·m ²	68,6540 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	14,7035	Capability index Cmk	4,5213	Cm	4,6682
Cmk	14,6526	Capability index Cmk	4,3540	Cmk	3,3998

EC tightening tool

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date: 2018-07-30	
Serial-no.:	18240039	Test point:	80 %
Operating range (N·m):	1,00 to 14,00	Test torque (M_{test}):	11,400 N·m
Sample size:	100 piece	Target:	30,00° (degree)
Rotation angle starting torque (M₀):	5,700 N·m	± Tolerance:	5,00° (degree)
± Tolerance:	7,00° N·m	+ Tolerance:	5,00° (degree)
- Tolerance:	0,798 N·m	- Tolerance:	5,00° (degree)
Upper tolerance (T_u/M_{max}):	12,198 N·m	(T_u/M_{max}):	35,00° (degree)
Lower tolerance (T_l/M_{min}):	10,602 N·m	(T_l/M_{min}):	25,00° (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	11,4527 N·m	\bar{x}	31,2600°	\bar{x}	31,2600°
M _{max}	11,5200 N·m	M _{max}	32,5000°	M _{max}	32,5000°
M _{min}	11,4200 N·m	M _{min}	30,7000°	M _{min}	30,7000°
R (99,73%)	0,1000 N·m	R (99,73%)	1,8000°	R (99,73%)	1,8000°
s	0,0175 N·m	s	0,3689°	s	0,3689°
σ	0,1051 N·m	σ	1,2217°	σ	1,2217°
N·m ²	68,7162 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	15,1869	Capability index Cmk	4,6682	Cm	4,6682
Cmk	14,1458	Capability index Cmk	3,3998	Cmk	3,3998

Difference evaluation

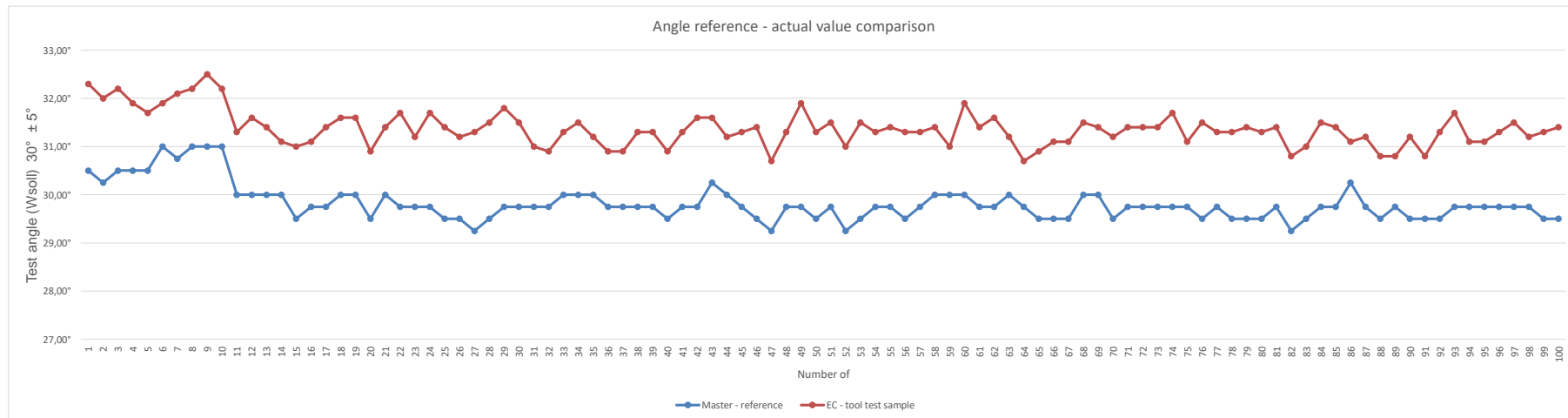
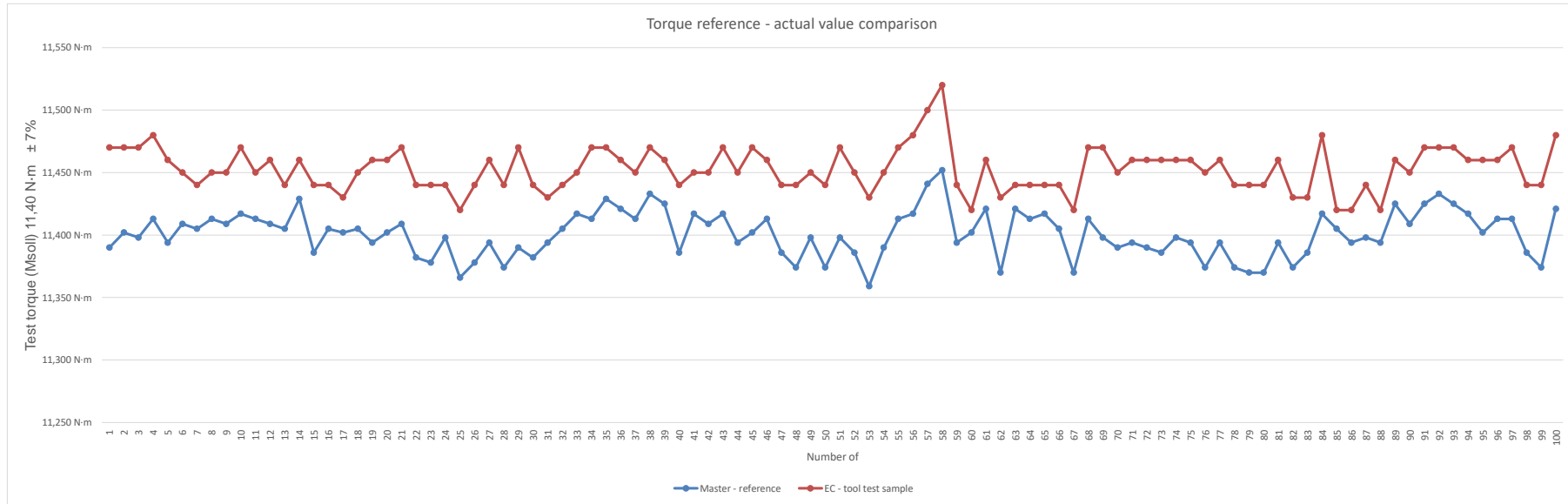
Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Date: 2018-07-30	
Serial-no.:	18240039	Test point:	80 %
Operating range (N·m):	1,00 to 14,00	Test torque (M_{test}):	0,000 N·m
Sample size:	100 piece	Target:	0,00° (degree)
Rotation angle starting torque (M₀):	0,000 N·m	± Tolerance:	5,00° (degree)
± Tolerance:	0,798 N·m	+ Tolerance:	5,00° (degree)
- Tolerance:	-0,798 N·m	- Tolerance:	-5,00° (degree)
Upper tolerance (T_u/M_{max}):	0,798 N·m	(T_u/M_{max}):	5,00° (degree)
Lower tolerance (T_l/M_{min}):	-0,798 N·m	(T_l/M_{min}):	-5,00° (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle °(degree)	
n	100	n	100	n	100
\bar{x}	-0,0518 N·m	\bar{x}	-1,5540°	\bar{x}	-1,5540°
M _{max}	-0,0150 N·m	M _{max}	-0,8500°	M _{max}	-0,8500°
M _{min}	-0,8000 N·m	M _{min}	-2,1500°	M _{min}	-2,1500°
R (99,73%)	0,0650 N·m	R (99,73%)	1,3000°	R (99,73%)	1,3000°
s	0,0152 N·m	s	0,2889°	s	0,2889°
σ	0,0518 N·m	σ	1,0555°	σ	1,0555°
N·m ²	-3,108 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	17,4676	Capability index Cmk	4,6682	Cm	5,9326
Cmk	16,3339	Capability index Cmk	4,6682	Cmk	4,6682

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		SN: 18240039		Date: 2018-07-30		
Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	11,390 N·m	-0,010 N·m	-0,09%	30,50°	0,50°	1,67%
2	11,402 N·m	0,002 N·m	0,02%	30,25°	0,25°	0,83%
3	11,398 N·m	-0,002 N·m	-0,02%	30,50°	0,50°	1,67%
4	11,413 N·m	0,013 N·m	0,11%	30,00°	0,00°	0,00%
5	11,394 N·m	-0,006 N·m	-0,05%	30,50°	0,50°	1,67%
6	11,409 N·m	0,009 N·m	0,08%	31,00°	1,00°	3,33%
7	11,405 N·m	0,005 N·m	0,04%	30,75°	0,75°	2,50%
8	11,413 N·m	0,013 N·m	0,11%	31,00°	1,00°	3,33%
9	11,398 N·m	-0,002 N·m	-0,02%	31,00°	0,00°	0,00%
10	11,417 N·m	0,017 N·m	0,15%	31,00°	1,00°	3,33%
11	11,413 N·m	0,013 N·m	0,11%	30,00°	0,00°	0,00%
12	11,409 N·m	0,009 N·m	0,08%	30,00°	0,00°	0,00%
13	11,405 N·m	0,005 N·m	0,04%	30,00°	0,00°	0,00%
14	11,429 N·m	0,029 N·m	0,25%	30,00°	0,00°	0,00%
15	11,386 N·m	-0,014 N·m	-0,12%	29,50°	-0,50°	-1,67%
16	11,405 N·m	0,005 N·m	0,04%	29,75°	-0,25°	-0,83%
17	11,402 N·m	0,002 N·m	0,02%	29,75°	-0,25°	-0,83%
18	11,405 N·m	0,005 N·m	0,04%	30,00°	0,00°	0,00%
19	11,394 N·m	-0,006 N·m	-0,05%	30,00°	0,00°	0,00%
20	11,402 N·m	0,002 N·m	0,02%	29,50°	-0,50°	-1,67%
21	11,409 N·m	0,009 N·m	0,08%	30,00°	0,00°	0,00%
22	11,382 N·m	-0,018 N·m	-0,16%	29,75°	-0,25°	-0,83%
23	11,378 N·m	-0,022 N·m	-0,19%	29,75°	-0,25°	-0,83%
24	11,398 N·m	-0,002 N·m	-0,02%	29,75°	-0,25°	-0,83%
25	11,386 N·m	-0,034 N·m	-0,30%	29,50°	-0,50°	-1,67%
26	11,378 N·m	-0,022 N·m	-0,19%	29,50°	-0,50°	-1,67%
27	11,394 N·m	-0,006 N·m	-0,05%	29,25°	-0,75°	-2,50%
28	11,374 N·m	-0,026 N·m	-0,23%	29,50°	-0,50°	-1,67%
29	11,380 N·m	-0,010 N·m	-0,09%	30,00°	0,00°	0,00%
30	11,382 N·m	-0,018 N·m	-0,16%	29,75°	-0,25°	-0,83%
31	11,394 N·m	-0,006 N·m	-0,05%	29,75°	-0,25°	-0,83%
32	11,405 N·m	0,005 N·m	0,04%	29,75°	-0,25°	-0,83%
33	11,417 N·m	0,017 N·m	0,15%	30,00°	0,00°	0,00%
34	11,413 N·m	0,013 N·m	0,11%	30,00°	0,00°	0,00%
35	11,429 N·m	0,029 N·m	0,25%	30,00°	0,00°	0,00%
36	11,421 N·m	0,021 N·m	0,18%	29,75°	-0,25°	-0,83%
37	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%
38	11,433 N·m	0,033 N·m	0,29%	29,75°	-0,25°	-0,83%
39	11,429 N·m	0,029 N·m	0,25%	29,75°	-0,25°	-0,83%
40	11,386 N·m	-0,014 N·m	-0,12%	29,50°	-0,50°	-1,67%
41	11,417 N·m	0,017 N·m	0,15%	29,75°	-0,25°	-0,83%
42	11,409 N·m	0,009 N·m	0,08%	29,75°	-0,25°	-0,83%
43	11,417 N·m	0,017 N·m	0,15%	30,00°	0,00°	0,00%
44	11,414 N·m	0,014 N·m	0,12%	30,00°	0,00°	0,00%
45	11,402 N·m	0,002 N·m	0,02%	29,75°	-0,25°	-0,83%
46	11,413 N·m	0,013 N·m	0,11%	29,50°	-0,50°	-1,67%
47	11,386 N·m	-0,014 N·m	-0,12%	29,25°	-0,75°	-2,50%
48	11,374 N·m	-0,026 N·m	-0,23%	29,75°	-0,25°	-0,83%
49	11,388 N·m	-0,002 N·m	-0,02%	29,75°	-0,25°	-0,83%
50	11,374 N·m	-0,026 N·m	-0,23%	29,50°	-0,50°	-1,67%
51	11,398 N·m	-0,002 N·m	-0,02%	29,75°	-0,25°	-0,83%
52	11,386 N·m	-0,014 N·m	-0,12%	29,25°	-0,75°	-2,50%
53	11,390 N·m	-0,041 N·m	-0,36%	29,50°	-0,50°	-1,67%
54	11,390 N·m	-0,010 N·m	-0,09%	29,50°	-0,50°	-1,67%
55	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%
56	11,417 N·m	0,017 N·m	0,15%	29,50°	-0,50°	-1,67%
57	11,441 N·m	0,041 N·m	0,36%	29,75°	-0,25°	-0,83%
58	11,429 N·m	0,029 N·m	0,25%	30,00°	0,00°	0,00%
59	11,384 N·m	-0,008 N·m	-0,07%	30,00°	0,00°	0,00%
60	11,402 N·m	0,002 N·m	0,02%	30,00°	0,00°	0,00%
61	11,421 N·m	0,021 N·m	0,18%	29,75°	-0,25°	-0,83%
62	11,370 N·m	-0,030 N·m	-0,26%	29,75°	-0,25°	-0,83%
63	11,421 N·m	0,021 N·m	0,18%	30,00°	0,00°	0,00%
64	11,413 N·m	0,013 N·m	0,11%	29,75°	-0,25°	-0,83%
65	11,417 N·m	0,017 N·m	0,15%	29,50°	-0,50°	-1,67%
66	11,405 N·m	0,005 N·m	0,04%	29,50°	-0,50°	-1,67%
67	11,370 N·m	-0,030 N·m	-0,26%	29,50°	-0,50°	-1,67%
68	11,413 N·m	0,013 N·m	0,11%	30,00°	0,00°	0,00%
69	11,388 N·m	-0,002 N·m	-0,02%	30,00°	0,00°	0,00%
70	11,390 N·m	-0,010 N·m	-0,09%	29,50°	-0,50°	-1,67%
71	11,394 N·m	-0,006 N·m	-0,05%	29,75°	-0,25°	-0,83%
72	11,390 N·m	-0,010 N·m	-0,09%	29,75°	-0,25°	-0,83%
73	11,388 N·m	-0,014 N·m	-0,12%	29,75°	-0,25°	-0,83%
74	11,388 N·m	-0,002 N·m	-0,02%	29,75°	-0,25°	-0,83%
75	11,394 N·m	-0,006 N·m	-0,05%	29,75°	-0,25°	-0,83%
76	11,374 N·m	-0,026 N·m	-0,23%	29,50°	-0,50°	-1,67%
77	11,394 N·m	-0,006 N·m	-0,05%	29,75°	-0,25°	

2 - Chart - 80% - 30° hard



3 - test point 80% - 30° hard

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	80 %	
Test torque (M_{avg}):	11,400 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M₀):	5,700 N·m	
± Tolerance:	7,00 N·m	± Tolerance: 5,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,798 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T_u/M_{avg}):	12,198 N·m	(T _u /M _{avg}): 35,00 (degree)
Lower tolerance (T_l/M_{avg}):	10,602 N·m	(T _l /M _{avg}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,3853 N·m	Number of measurements	30,0800°	\bar{x}	31,6930°
σ	11,8680 N·m	Maximal	31,7500°	σ	33,4000°
M _{max}	11,2960 N·m	Minimal	28,2500°	M _{max}	33,4000°
M _{min}	0,1720 N·m	Scatter	3,5000°	M _{min}	29,9000°
R (99,73%)	0,0428 N·m	Standard deviation	0,8549°	R (99,73%)	3,5000°
s	0,2566 N·m	6 x Standard deviation	5,1298°	s	0,8072°
N·m ²	68,3120 N·m	Torque rate	6 s	6 s	4,8432°

Homologation	Machine capability test - MCT	Homologation	Machine capability test - MCT
Cm	6,2194	Capability index Cm	1,9495
Cmk	6,0526	Capability index Cmk	1,9183

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	80 %	
Test torque (M_{avg}):	11,400 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M₀):	5,700 N·m	
± Tolerance:	7,00 N·m	± Tolerance: 5,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,798 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T_u/M_{avg}):	12,198 N·m	(T _u /M _{avg}): 35,00 (degree)
Lower tolerance (T_l/M_{avg}):	10,602 N·m	(T _l /M _{avg}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4574 N·m	Number of measurements	30,0800°	\bar{x}	31,6930°
σ	11,5150 N·m	Maximal	31,7500°	σ	33,4000°
M _{max}	11,3900 N·m	Minimal	28,2500°	M _{max}	33,4000°
M _{min}	0,1720 N·m	Scatter	3,5000°	M _{min}	29,9000°
R (99,73%)	0,0428 N·m	Standard deviation	0,8549°	R (99,73%)	3,5000°
s	0,2566 N·m	6 x Standard deviation	5,1298°	s	0,8072°
N·m ²	68,7444 N·m	Torque rate	6 s	6 s	4,8432°

Homologation	Machine capability test - MCT	Homologation	Machine capability test - MCT
Cm	11,7054	Capability index Cm	2,0648
Cmk	10,5824	Capability index Cmk	1,9556

Difference evaluation

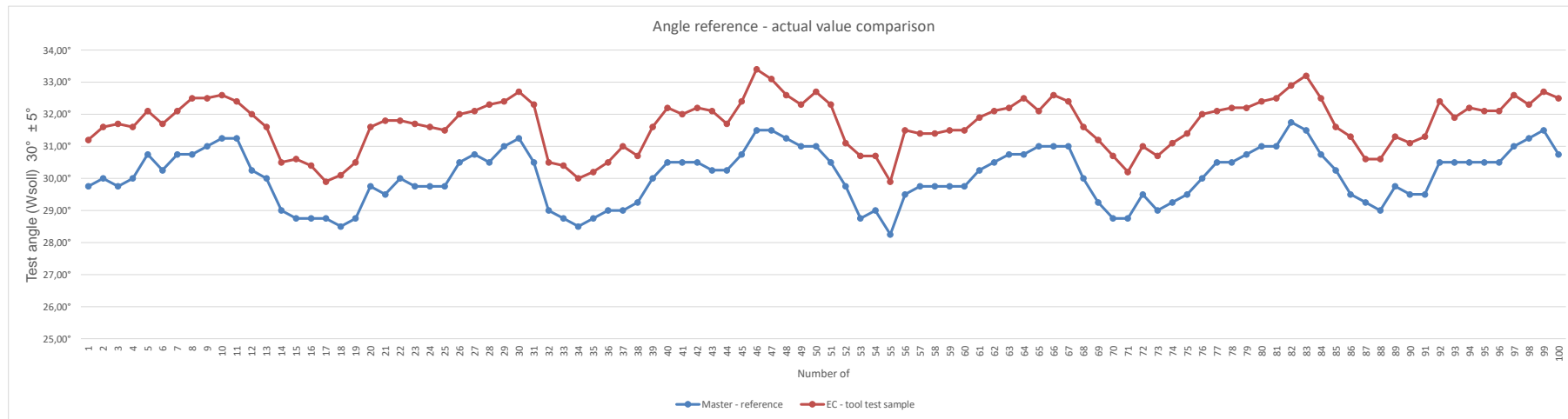
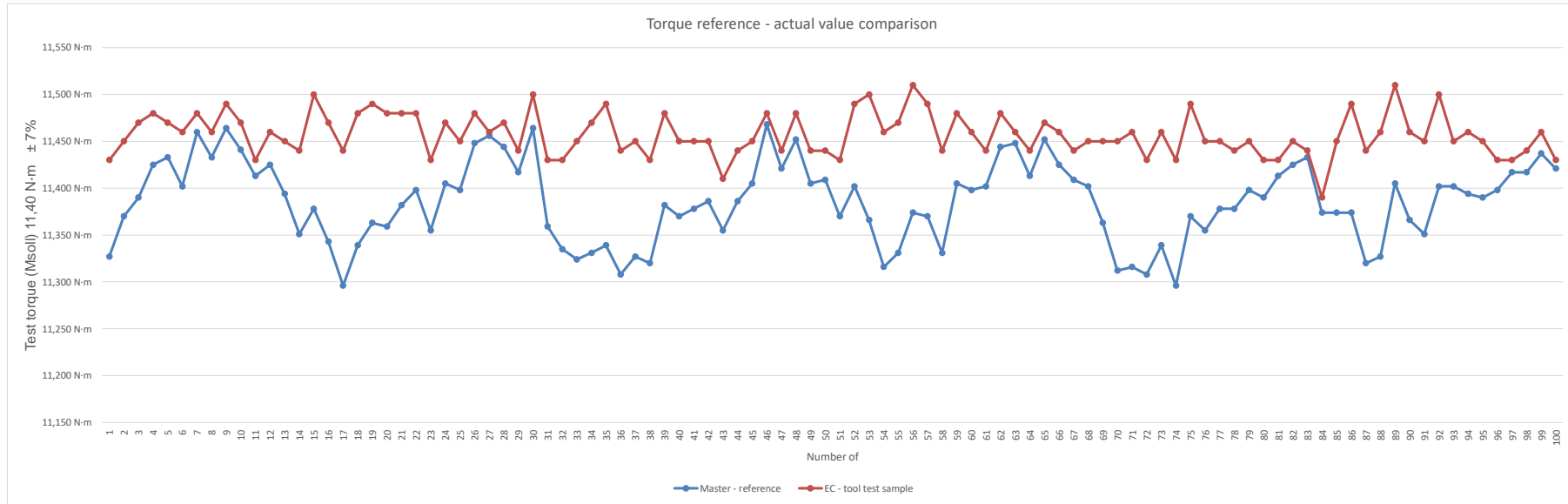
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	80 %	
Test torque (M_{avg}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M₀):	0,000 N·m	
± Tolerance:	7,00 N·m	± Tolerance: 5,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	-0,798 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T_u/M_{avg}):	0,798 N·m	(T _u /M _{avg}): 5,00 (degree)
Lower tolerance (T_l/M_{avg}):	-0,798 N·m	(T _l /M _{avg}): -5,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0721 N·m	Number of measurements	-1,6130°	\bar{x}	-1,6130°
σ	-0,0400 N·m	Maximal	-1,0500°	σ	-1,0500°
M _{max}	-0,1510 N·m	Minimal	-2,3000°	M _{max}	-2,3000°
M _{min}	0,1470 N·m	Scatter	1,2500°	M _{min}	1,2500°
R (99,73%)	0,0430 N·m	Standard deviation	0,2259°	R (99,73%)	0,2259°
s	0,2592 N·m	6 x Standard deviation	1,3554°	s	1,3554°
N·m ²	-0,4324 N·m	Torque rate	6 s	6 s	1,3554°

Homologation	Machine capability test - MCT	Homologation	Machine capability test - MCT
Cm	6,1802	Capability index Cm	7,3771
Cmk	5,6224	Capability index Cmk	4,9721

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB													
SN: 18240041													
Date: 2018-07-30													
Measurement result					Measurement result								
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	11,327 N·m	-0,73 N·m	-6,4%	29,75°	-0,25°	-0,83%	1	11,430 N·m	0,030 N·m	0,26%	31,20°	1,20°	4,00%
2	11,370 N·m	-0,930 N·m	-8,2%	30,00°	0,00°	0,00%	2	11,450 N·m	0,050 N·m	0,44%	31,60°	1,60°	5,33%
3	11,390 N·m	-0,910 N·m	-8,0%	29,75°	0,25°	0,83%	3	11,470 N·m	0,070 N·m	0,61%	31,70°	1,70°	5,67%
4	11,425 N·m	-0,935 N·m	-8,2%	31,00°	0,00°	0,00%	4	11,480 N·m	0,080 N·m	0,70%	32,60°	2,60°	8,33%
5	11,435 N·m	-0,933 N·m	-8,2%	30,75°	0,75°	2,50%	5	11,470 N·m	0,070 N·m	0,61%	32,10°	2,10°	7,00%
6	11,402 N·m	-0,902 N·m	-7,9%	30,25°	0,25°	0,83%	6	11,460 N·m	0,060 N·m	0,53%	31,70°	1,70°	5,67%
7	11,460 N·m	-0,900 N·m	-7,8%	30,75°	0,75°	2,50%	7	11,480 N·m	0,080 N·m	0,70%	32,10°	2,10°	7,00%
8	11,435 N·m	-0,933 N·m	-8,2%	30,75°	0,75°	2,50%	8	11,480 N·m	0,080 N·m	0,70%	32,50°	2,50°	8,33%
9	11,464 N·m	-0,904 N·m	-7,9%	31,00°	-0,25°	-0,83%	9	11,480 N·m	0,080 N·m	0,70%	32,60°	2,60°	8,33%
10	11,441 N·m	-0,941 N·m	-8,3%	31,25°	1,25°	4,17%	10	11,470 N·m	0,070 N·m	0,61%	32,60°	2,60°	8,33%
11	11,413 N·m	-0,913 N·m	-8,1%	31,25°	1,25°	4,17%	11	11,430 N·m	0,030 N·m	0,26%	32,40°	2,40°	8,00%
12	11,425 N·m	-0,925 N·m	-8,1%	30,25°	0,25°	0,83%	12	11,460 N·m	0,060 N·m	0,53%	32,00°	2,00°	6,67%
13	11,394 N·m	-0,906 N·m	-7,9%	30,00°	0,00°	0,00%	13	11,450 N·m	0,050 N·m	0,44%	31,60°	1,60°	5,33%
14	11,351 N·m	-0,949 N·m	-8,4%	29,00°	-1,00°	-3,33%	14	11,440 N·m	0,040 N·m	0,35%	30,60°	0,60°	1,87%
15	11,378 N·m	-0,922 N·m	-8,1%	28,75°	-1,25°	-4,17%	15	11,500 N·m	0,100 N·m	0,88%	30,60°	0,60°	2,00%
16	11,343 N·m	-0,957 N·m	-8,5%	28,75°	-1,25°	-4,17%	16	11,470 N·m	0,070 N·m	0,61%	30,40°	0,40°	1,33%
17	11,296 N·m	-1,014 N·m	-9,0%	28,75°	-1,25°	-4,17%	17	11,440 N·m	0,040 N·m	0,35%	29,90°	-0,10°	-0,33%
18	11,339 N·m	-0,961 N·m	-8,5%	28,50°	-1,50°	-5,00%	18	11,480 N·m	0,080 N·m	0,70%	30,10°	0,10°	0,33%
19	11,363 N·m	-0,937 N·m	-8,2%	29,75°	-0,25°	-0,83%	19	11,480 N·m	0,080 N·m	0,70%	30,60°	0,60°	1,87%
20	11,359 N·m	-0,941 N·m	-8,3%	29,75°	-0,25°	-0,83%	20	11,480 N·m	0,080 N·m	0,70%	31,60°	1,60°	5,33%
21	11,382 N·m	-0,918 N·m	-8,1%	29,50°	-0,50°	-1,67%	21	11,480 N·m	0,080 N·m	0,70%	31,80°	1,80°	6,00%
22	11,398 N·m	-0,902 N·m	-7,9%	30,00°	0,00°	0,00%	22	11,480 N·m	0,080 N·m	0,70%	31,80°	1,80°	6,00%
23	11,355 N·m	-0,945 N·m	-8,3%	29,75°	-0,25°	-0,83%	23	11,430 N·m	0,030 N·m	0,26%	31,70°	1,70°	5,67%
24	11,404 N·m	-0,905 N·m	-7,9%	29,75°	-0,25°	-0,83%	24	11,450 N·m	0,050 N·m	0,44%	31,60°	1,60°	5,33%
25	11,398 N·m	-0,902 N·m	-7,9%	29,75°	-0,25°	-0,83%	25	11,450 N·m	0,050 N·m	0,44%	31,50°	1,50°	5,00%
26	11,448 N·m	-0,848 N·m	-7,4%	30,50°	0,50°	1,67%	26	11,480 N·m	0,080 N·m	0,70%	32,00°	2,00°	6,67%
27	11,456 N·m	-0,846 N·m	-7,4%	30,75°	0,75°	2,50%	27	11,460 N·m	0,060 N·m	0,53%	32,10°	2,10°	7,00%
28	11,444 N·m	-0,844 N·m	-7,4%	30,50°	0,50°	1,67%	28	11,470 N·m	0,070 N·m	0,61%	32,30°	2,30°	7,67%
29	11,417 N·m	-0,871 N·m	-7,7%	31,00°	1,00°	3,33%	29	11,480 N·m	0,080 N·m	0,70%	32,40°	2,40°	8,00%
30	11,464 N·m	-0,844 N·m	-7,4%	31,25°	1,25°	4,17%	30	11,500 N·m	0,100 N·m	0,88%	32,70°	2,70°	9,00%
31	11,359 N·m	-0,941 N·m	-8,3%	30,50°	0,50°	1,67%	31	11,430 N·m	0,030 N·m	0,26%	32,30°	2,30°	7,67%
32	11,335 N·m	-0,965 N·m	-8,5%	29,00°	-1,00°	-3,33%	32	11,430 N·m	0,030 N·m	0,26%	31,80°	0,80°	2,67%
33	11,324 N·m	-0,976 N·m	-8,6%	28,75°	-1,25°	-4,17%	33	11,450 N·m	0,050 N·m	0,44%	30,40°	0,40°	1,33%
34	11,363 N·m	-0,937 N·m	-8,2%	29,75°	-0,25°	-0,83%	34	11,480 N·m	0,080 N·m	0,70%	30,60°	0,60°	1,87%
35	11,339 N·m	-0,961 N·m	-8,5%	28,75°	-1,25°	-4,17%	35	11,490 N·m	0,090 N·m	0,79%	30,20°	0,20°	0,67%
36	11,308 N·m	-0,992 N·m	-8,8%	29,00°	-1,00°	-3,33%	36	11,440 N·m	0,040 N·m	0,35%	30,50°	0,50°	1,67%
37	11,327 N·m	-0,973 N·m	-8,6%	29,25°	-1,00°	-3,33%	37	11,450 N·m	0,050 N·m	0,44%	31,00°	1,00°	3,33%
38	11,320 N·m	-0,980 N·m	-8,7%	29,25°	-0,75°	-2,50%	38	11,430 N·m	0,030 N·m	0,26%	30,70°	0,70°	2,33%
39	11,329 N·m	-0,971 N·m	-8,6%	29,00°	-1,00°	-3,33%	39	11,480 N·m	0,080 N·m	0,70%	31,60°	1,60°	5,33%
40	11,370 N·m	-0,930 N·m	-8,2%	30,50°	0,50°	1,67%	40	11,450 N·m	0,050 N·m	0,44%	32,20°	2,20°	7,33%
41	11,378 N·m	-0,922 N·m	-8,1%	30,50°	0,50°	1,67%	41	11,450 N·m	0,050 N·m	0,44%	32,00°	2,00°	6,67%
42	11,386 N·m	-0,914 N·m	-8,0%	30,50°	0,50°	1,67%	42	11,450 N·m	0,050 N·m	0,44%	32,20°	2,20°	7,33%
43	11,355 N·m	-0,945 N·m	-8,3%	30,25°	0,25°	0,83%	43	11,410 N·m</					

3 - Chart - 80% - 30° hard



1 - test point 80% - 360° soft

Master - reference

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB			
Serial-no.:	18240032			
Date:	2018-07-30			
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	80 %			
Test torque (M _{test}):	11,400 N·m	Target:	360,00	(degree)
Rotation angle starting torque (M _{rot}):	5,700 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	0,798 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}):	375,00	(degree)
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}):	345,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4186 N·m	Average	361,1700°	\bar{x}	360,1700°
M _{max}	11,4870 N·m	Maximal	371,2500°	M _{max}	371,2500°
M _{min}	11,3430 N·m	Minimal	349,5000°	M _{min}	349,5000°
R (99,73%)	0,1440 N·m	Scatter	21,7500°	R (99,73%)	21,7500°
s	0,0426 N·m	Standard deviation	6,3005°	s	6,3005°
N·m ²	0,2556 N·m	6 x Standard deviation	37,8032°	6 s	37,8032°
N·m ³	5,7093 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	6,2453	Capability index Cm	0,7936	Cm	0,7936
Cmk	5,5096	Capability index Cmk	0,7846	Cmk	0,7846

EC tightening tool

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB			
Serial-no.:	18240032			
Date:	2018-07-30			
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	80 %			
Test torque (M _{test}):	11,400 N·m	Target:	360,00	(degree)
Rotation angle starting torque (M _{rot}):	5,700 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	0,798 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}):	375,00	(degree)
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}):	345,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4026 N·m	Average	361,8050°	\bar{x}	361,8050°
M _{max}	11,4300 N·m	Maximal	371,7000°	M _{max}	371,7000°
M _{min}	11,4000 N·m	Minimal	363,0000°	M _{min}	363,0000°
R (99,73%)	0,0300 N·m	Scatter	18,7000°	R (99,73%)	18,7000°
s	0,0052 N·m	Standard deviation	4,7172°	s	4,7172°
N·m ²	5,7048 N·m	6 x Standard deviation	28,3032°	6 s	28,3032°
		Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	26,9050	Capability index Cm	1,6599	Cm	1,6599
Cmk	26,5575	Capability index Cmk	0,9324	Cmk	0,9324

Difference evaluation

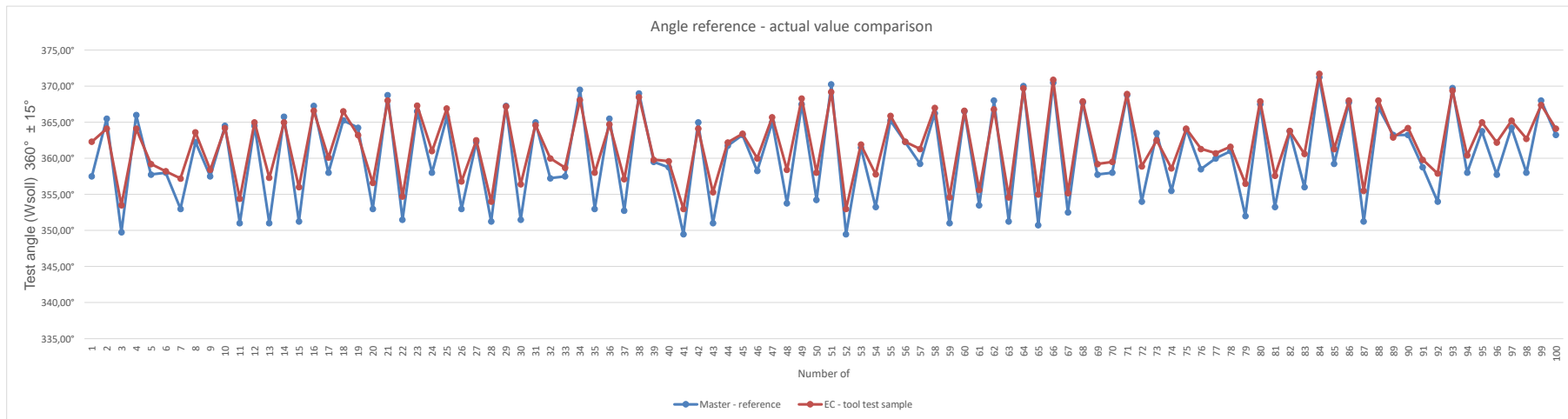
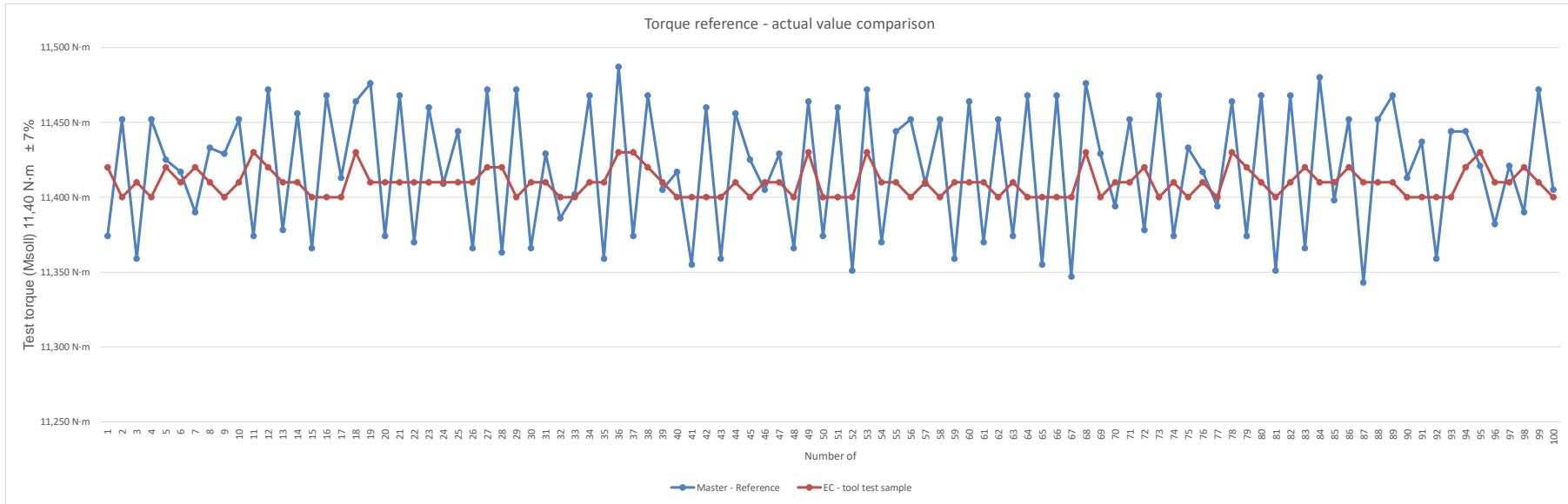
Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB			
Serial-no.:	18240032			
Date:	2018-07-30			
Operating range (N·m):	1,00	to	14,00	
Sample size:	100 piece			
Test point:	80 %			
Test torque (M _{test}):	0,000 N·m	Target:	0,00	(degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m			
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)
+ Tolerance:	-0,798 N·m	+ Tolerance:	15,00	(degree)
- Tolerance:	-0,798 N·m	- Tolerance:	15,00	(degree)
Upper tolerance (T _u /M _{test}):	0,798 N·m	(T _u /M _{test}):	15,00	(degree)
Lower tolerance (T _l /M _{test}):	-0,798 N·m	(T _l /M _{test}):	-15,00	(degree)
Speed:	1 Step:	550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	0,0000 N·m	Average	-1,6350°	\bar{x}	-1,6350°
M _{max}	0,0720 N·m	Maximal	1,9000°	M _{max}	1,9000°
M _{min}	-0,0670 N·m	Minimal	-6,3000°	M _{min}	-6,3000°
R (99,73%)	0,1390 N·m	Scatter	8,2000°	R (99,73%)	8,2000°
s	0,0426 N·m	Standard deviation	1,9711°	s	1,9711°
N·m ²	0,0045 N·m	6 x Standard deviation	11,8266°	6 s	11,8266°
		Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	6,2737	Capability index Cm	2,5367	Cm	2,5367
Cmk	5,5096	Capability index Cmk	2,5266	Cmk	2,5266

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB						
Measurement result						
Nr.	Torque			Angle		
	(N·m)	Difference (%)	Difference (%)	(°)	Difference (%)	Difference (%)
1	11,374 N·m	-0,026 N·m	-0,23%	357,50°	-2,50°	-0,69%
2	11,452 N·m	0,052 N·m	0,46%	365,50°	5,50°	1,53%
3	11,359 N·m	-0,041 N·m	-0,36%	349,75°	-10,25°	-2,83%
4	11,429 N·m	0,029 N·m	0,25%	367,50°	-2,50°	-0,69%
5	11,425 N·m	0,025 N·m	0,22%	357,75°	-2,25°	-0,62%
6	11,417 N·m	0,017 N·m	0,15%	365,00°	-2,00°	-0,56%
7	11,390 N·m	-0,010 N·m	-0,09%	353,00°	-7,00°	-1,94%
8	11,433 N·m	0,033 N·m	0,29%	362,25°	2,25°	0,63%
9	11,429 N·m	0,029 N·m	0,25%	367,50°	-2,50°	-0,69%
10	11,452 N·m	0,052 N·m	0,46%	364,50°	4,50°	1,25%
11	11,374 N·m	-0,026 N·m	-0,23%	351,00°	-9,00°	-2,50%
12	11,472 N·m	0,072 N·m	0,63%	364,50°	4,50°	1,25%
13	11,378 N·m	-0,022 N·m	-0,19%	351,00°	-9,00°	-2,50%
14	11,472 N·m	0,072 N·m	0,63%	365,75°	5,75°	1,63%
15	11,386 N·m	-0,034 N·m	-0,30%	351,25°	-8,75°	-2,43%
16	11,468 N·m	0,068 N·m	0,60%	367,25°	7,25°	2,01%
17	11,413 N·m	0,013 N·m	0,11%	358,00°	-2,00°	-0,56%
18	11,464 N·m	0,064 N·m	0,56%	365,25°	5,25°	1,46%
19	11,478 N·m	0,078 N·m	0,69%	364,25°	4,25°	1,18%
20	11,374 N·m	-0,026 N·m	-0,23%	353,00°	-7,00°	-1,94%
21	11,468 N·m	0,068 N·m	0,60%	368,75°	8,75°	2,43%
22	11,370 N·m	-0,030 N·m	-0,26%	351,50°	-8,50°	-2,36%
23	11,460 N·m	0,060 N·m	0,53%	366,50°	6,50°	1,81%
24	11,429 N·m	0,029 N·m	0,25%	358,00°	-2,00°	-0,56%
25	11,444 N·m	0,044 N·m	0,39%	365,75°	5,75°	1,63%
26	11,366 N·m	-0,034 N·m	-0,30%	353,00°	-7,00°	-1,94%
27	11,472 N·m	0,072 N·m	0,63%	362,25°	2,25°	0,63%
28	11,363 N·m	-0,037 N·m	-0,32%	351,25°	-8,75°	-2,43%
29	11,472 N·m	0,072 N·m	0,63%	365,75°	5,75°	1,63%
30	11,386 N·m	-0,034 N·m	-0,30%	351,50°	-8,50°	-2,36%
31	11,429 N·m	0,029 N·m	0,25%	365,00°	5,00°	1,39%
32	11,386 N·m	-0,014 N·m	-0,12%	357,25°	-2,75°	-0,76%
33	11,402 N·m	0,002 N·m	0,02%	357,50°	-2,50°	-0,69%
34	11,468 N·m	0,068 N·m	0,60%	366,50°	6,50°	1,81%
35	11,359 N·m	-0,041 N·m	-0,36%	353,00°	-7,00°	-1,94%
36	11,487 N·m	0,087 N·m	0,76%	365,50°	5,50°	1,53%
37	11,374 N·m	-0,026 N·m	-0,23%	352,75°	-7,25°	-2,01%
38	11,468 N·m	0,068 N·m	0,60%	366,00°	6,00°	1,74%
39	11,468 N·m	0,068 N·m	0,60%	367,50°	7,50°	2,08%
40	11,417 N·m	0,017 N·m	0,15%	358,75°	-1,25°	-0,35%
41	11,355 N·m	-0,045 N·m	-0,39%	350,50°	-10,50°	-2,92%
42	11,460 N·m	0,060 N·m	0,53%	366,00°	6,00°	1,74%
43	11,389 N·m	-0,041 N·m	-0,36%	351,00°	-9,00°	-2,50%
44	11,468 N·m	0,068 N·m	0,60%	367,50°	7,50°	2,08%
45	11,425 N·m	0,025 N·m	0,22%	363,25°	3,25°	0,90%
46	11,405 N·m	0,005 N·m	0,04%	358,25°	-1,75°	-0,49%
47	11,429 N·m	0,029 N·m	0,25%	365,00°	5,00°	1,39%
48	11,386 N·m	-0,034 N·m	-0,30%	353,75°	-8,25°	-2,24%
49	11,464 N·m	0,064 N·m	0,56%	367,50°	7,50°	2,08%
50	11,374 N·m	-0,026 N·m	-0,23%	354,25°	-5,75°	-1,60%
51	11,460 N·m	0,060 N·m	0,53%	370,25°	10,25°	2,85%
52	11,351 N·m	-0,049 N·m	-0,43%	349,50°	-10,50°	-2,92%
53	11,429 N·m	0,029 N·m	0,25%	361,50°	1,50°	0,42%
54	11,370 N·m	-0,030 N·m	-0,26%	352,25°	-7,75°	-2,10%
55	11,444 N·m	0,044 N·m	0,39%	365,25°	5,25°	1,46%
56	11,452 N·m	0,052 N·m	0,46%	362,25°	2,25°	0,63%
57	11,409 N·m	0,009 N·m	0,08%	359,25°	-0,75°	-0,21%
58	11,462 N·m	0,062 N·m	0,54%	366,25°	6,25°	1,74%
59	11,359 N·m	-0,041 N·m	-0,36%	351,00°	-9,00°	-2,50%
60	11,464 N·m	0,064 N·m	0,56%	366,50°	6,50°	1,81%
61	11,370 N·m	-0,030 N·m	-0,26%	353,50°	-6,50°	-1,81%
62	11,452 N·m	0,052 N·m	0,46%	368,00°	8,00°	2,22%
63	11,374 N·m	-0,026 N·m	-0,23%	351,25°	-8,75°	-2,43%
64	11,468 N·m	0,068 N·m	0,60%	370,00°	10,00°	2,78%
65	11,385 N·m	-0,045 N·m	-0,39%	350,75°	-10,25°	-2,92%
66	11,468 N·m	0,068 N·m	0,60%	370,50°	10,50°	2,92%
67	11,347 N·m	-0,053 N·m	-0,46%	352,50°	-7,50°	-2,08%
68	11,478 N·m	0,078 N·m	0,69%	367,75°	7,75°	2,19%
69	11,429 N·m	0,029 N·m	0,25%	367,75°	7,75°	2,19%
70	11,394 N·m	-0,006 N·m	-0,05%	358,00°	-2,00°	-0,56%
71	11,452 N·m	0,052 N·m	0,46%	368,75°	8,75°	2,43%
72	11,378 N·m	-0,022 N·m	-0,19%	354,00°	-6,00°	-1,67%
73	11,468 N·m	0,068 N·m	0,60%	363,50°	3,50°	0,97%
74	11,374 N·m	-0,026 N·m	-0,23%	352,00°	-8,00°	-2,22%
75	11,433 N·m	0,033 N·m	0,29%	364,00°	4,00°	1,14%
76	11,417 N·m	0,017 N·m	0,15%	358,50°	-1,50°	-0,42%
77	11,394 N·m	-0,006 N·m	-0,05%	360,00°	0,00°	0,00%
78	11,464 N·m	0,064 N·m	0,56%	361,00°	1,00°	0,28%
79	11,374 N·m	-0,026 N·m	-0,23%	352,00°	-8,00°	-2,22%
80	11,468 N·m	0,068 N·m	0,60%	367,50°	7,50°	2,08%
81	11,351 N·m	-0,049 N·m	-0,43%	353,25°	-6,75°	-1,88%
82	11,468 N·m	0,068 N·m	0,60%	363,75°	3,75°	1,04%
83	11,444 N·m	0,044 N·m	0,39%	366,00°	6,00°	1,74%
84	11,480 N·m	0,080 N·m	0,70%	371,25°	11,25°	3,13%
85	11,388 N·m	-0,002 N·m	-0,02%	359,25°	-0,75°	-0,21%
86	11,452 N·m	0,052 N·m	0,46%	367,75°	7,75°	2,19%
87	11,343 N·m	-0,057 N·m	-0,50%	351,25°	-8,75°	-2,43%
88						

1 - Chart - 80% - 360°-soft



2 - test point 80% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240039		
Date:	2018-07-30		
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	80 %		
Test torque (M_{test}):	11,400 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M_{rot}):	5,700 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,798 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	12,198 N·m	(T_l/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	10,602 N·m	(T_u/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4394 N·m	Average	360,8950°	\bar{x}	0,4142°
M _{max}	11,5150 N·m	Maximal	371,7500°	M _{max}	1,4500°
M _{min}	11,4000 N·m	Minimal	355,7500°	M _{min}	-1,7500°
R (99,73%)	0,1060 N·m	Scatter	16,0000°	R (99,73%)	3,2000°
s	0,0196 N·m	Standard deviation	2,9233°	s	0,7817°
σ	0,1788 N·m	6 x Standard deviation	17,5398°	σ	4,7219°
N·m ²	5,7197 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	13,5432	Capability index Cmk	1,7104	Cm	1,9132
Cmk	12,8756	Capability index Cmk	1,6083	Cmk	1,7462

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240039		
Date:	2018-07-30		
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	80 %		
Test torque (M_{test}):	11,400 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M_{rot}):	5,700 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,798 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	12,198 N·m	(T_l/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	10,602 N·m	(T_u/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4108 N·m	Average	361,2000°	\bar{x}	0,361200°
M _{max}	11,5000 N·m	Maximal	371,2000°	M _{max}	1,4500°
M _{min}	11,4000 N·m	Minimal	355,8000°	M _{min}	-1,5000°
R (99,73%)	0,1000 N·m	Scatter	15,4000°	R (99,73%)	3,2000°
s	0,0194 N·m	Standard deviation	2,8134°	s	0,7817°
σ	0,1680 N·m	6 x Standard deviation	16,8804°	σ	4,7219°
N·m ²	5,7054 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	19,8734	Capability index Cmk	1,9132	Cm	1,9132
Cmk	19,8654	Capability index Cmk	1,7462	Cmk	1,7462

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240039		
Date:	2018-07-30		
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	80 %		
Test torque (M_{test}):	0,000 N·m	Target:	0,00 (degree)
Rotation angle starting torque (M_{rot}):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,798 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	-0,798 N·m	(T_l/M_{test}):	-15,00 (degree)
Lower tolerance (T_l/M_{test}):	-0,798 N·m	(T_u/M_{test}):	-15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step:	50 rpm

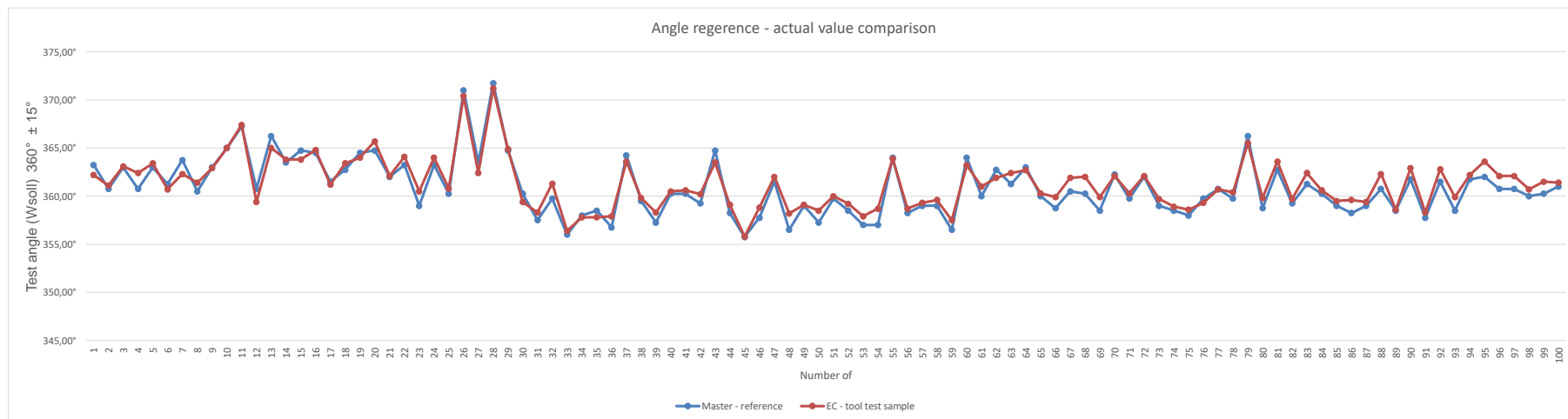
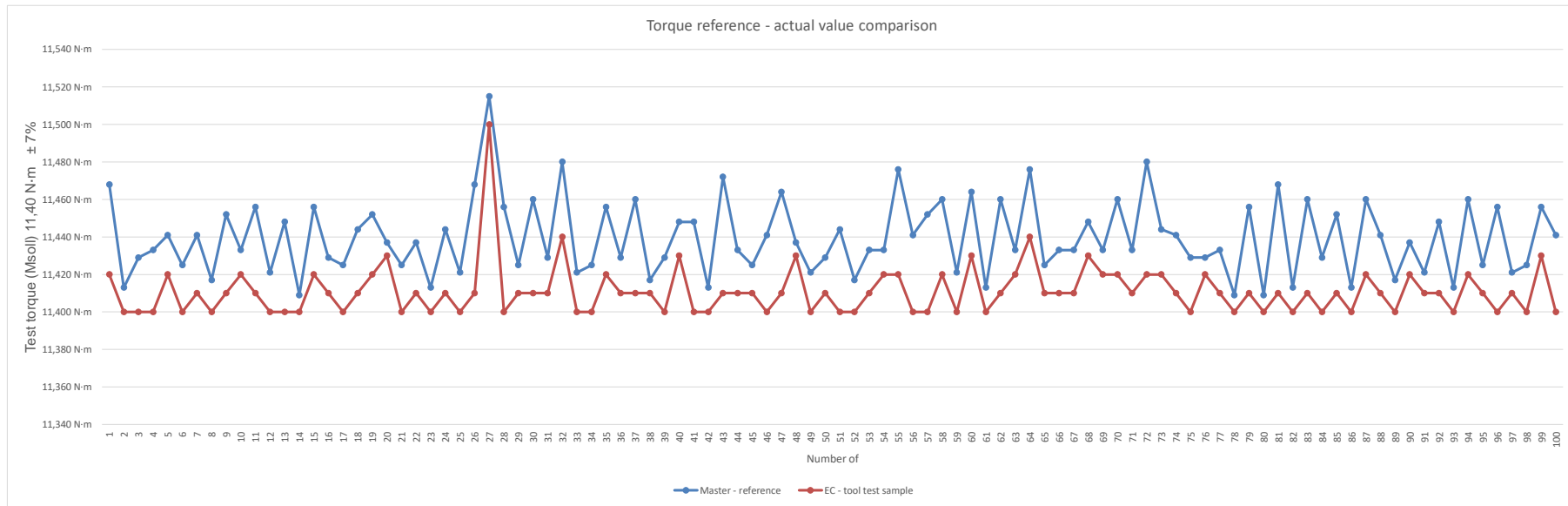
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	0,0286 N·m	Average	0,0000°	\bar{x}	-0,4142°
M _{max}	0,0620 N·m	Maximal	1,4500°	M _{max}	1,4500°
M _{min}	0,0070 N·m	Minimal	-1,7500°	M _{min}	-1,7500°
R (99,73%)	0,0550 N·m	Scatter	3,2000°	R (99,73%)	3,2000°
s	0,0149 N·m	Standard deviation	0,7817°	s	0,7817°
σ	0,1248 N·m	6 x Standard deviation	4,7219°	σ	4,7219°
N·m ²	0,0143 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	17,9021	Capability index Cmk	6,5334	Cm	6,5334
Cmk	17,8296	Capability index Cmk	6,1768	Cmk	6,1768

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB SN: 18240039 Date: 2018-07-30

Measurement result				Measurement result									
Nr.	Torque			Angle			Nr.	Torque			Angle		
	(N·m)	(N·m)	Difference (%)	(°)	(°)	Difference (%)		(N·m)	(N·m)	Difference (%)	(°)	(°)	Difference (%)
1	11,468 N·m	0,068 N·m	0,60%	363,25°	3,25°	0,90%	1	11,420 N·m	0,020 N·m	0,18%	362,20°	2,20°	0,61%
2	11,413 N·m	0,013 N·m	0,11%	360,75°	0,75°	0,21%	2	11,400 N·m	0,000 N·m	0,00%	361,10°	1,10°	0,31%
3	11,429 N·m	0,029 N·m	0,25%	363,00°	3,00°	0,83%	3	11,400 N·m	0,000 N·m	0,00%	363,10°	3,10°	0,86%
4	11,452 N·m	0,042 N·m	0,46%	362,50°	2,50°	0,70%	4	11,400 N·m	0,000 N·m	0,00%	362,40°	2,40°	0,67%
5	11,441 N·m	0,041 N·m	0,36%	363,00°	3,00°	0,83%	5	11,420 N·m	0,020 N·m	0,18%	363,40°	3,40°	0,94%
6	11,425 N·m	0,025 N·m	0,22%	361,25°	1,25°	0,35%	6	11,400 N·m	0,000 N·m	0,00%	360,70°	0,70°	0,19%
7	11,417 N·m	0,017 N·m	0,15%	363,75°	3,75°	1,04%	7	11,410 N·m	0,010 N·m	0,09%	362,30°	2,30°	0,64%
8	11,441 N·m	0,041 N·m	0,36%	363,50°	3,50°	0,97%	8	11,400 N·m	0,000 N·m	0,00%	361,40°	1,40°	0,39%
9	11,452 N·m	0,042 N·m	0,46%	362,50°	2,50°	0,70%	9	11,400 N·m	0,000 N·m	0,00%	363,80°	3,80°	1,06%
10	11,433 N·m	0,033 N·m	0,29%	365,00°	5,00°	1,39%	10	11,420 N·m	0,020 N·m	0,18%	365,00°	5,00°	1,39%
11	11,456 N·m	0,056 N·m	0,49%	367,25°	7,25°	2,01%	11	11,410 N·m	0,010 N·m	0,08%	367,40°	7,40°	2,06%
12	11,421 N·m	0,021 N·m	0,18%	360,75°	0,75°	0,21%	12	11,400 N·m	0,000 N·m	0,00%	359,40°	-0,60°	-0,17%
13	11,448 N·m	0,048 N·m	0,42%	366,25°	6,25°	1,74%	13	11,400 N·m	0,000 N·m	0,00%	365,00°	5,00°	1,39%
14	11,409 N·m	0,009 N·m	0,08%	363,50°	3,50°	0,97%	14	11,400 N·m	0,000 N·m	0,00%	363,80°	3,80°	1,06%
15	11,456 N·m	0,056 N·m	0,49%	364,75°	4,75°	1,32%	15	11,420 N·m	0,020 N·m	0,18%	363,80°	3,80°	1,06%
16	11,429 N·m	0,029 N·m	0,25%	364,50°	4,50°	1,25%	16	11,410 N·m	0,010 N·m	0,09%	364,80°	4,80°	1,33%
17	11,425 N·m	0,025 N·m	0,22%	361,50°	1,50°	0,42%	17	11,400 N·m	0,000 N·m	0,00%	361,20°	1,20°	0,33%
18	11,444 N·m	0,044 N·m	0,39%	362,75°	2,75°	0,76%	18	11,410 N·m	0,010 N·m	0,09%	363,40°	3,40°	0,94%
19	11,452 N·m	0,052 N·m	0,46%	364,50°	4,50°	1,25%	19	11,420 N·m	0,020 N·m	0,18%	364,00°	4,00°	1,11%
20	11,437 N·m	0,037 N·m	0,32%	364,75°	4,75°	1,32%	20	11,430 N·m	0,030 N·m	0,26%	365,70°	5,70°	1,58%
21	11,425 N·m	0,025 N·m	0,22%	362,00°	2,00°	0,56%	21	11,400 N·m	0,000 N·m	0,00%	362,10°	2,10°	0,58%
22	11,437 N·m	0,037 N·m	0,32%	363,25°	3,25°	0,90%	22	11,410 N·m	0,010 N·m	0,09%	364,10°	4,10°	1,14%
23	11,413 N·m	0,013 N·m	0,11%	359,00°	-1,00°	-0,28%	23	11,400 N·m	0,000 N·m	0,00%	360,50°	0,50°	0,14%
24	11,444 N·m	0,044 N·m	0,39%	362,75°	2,75°	0,76%	24	11,410 N·m	0,010 N·m	0,09%	364,00°	4,00°	1,11%
25	11,421 N·m	0,021 N·m	0,18%	360,25°	0,25°	0,07%	25	11,400 N·m	0,000 N·m	0,00%	360,80°	0,80°	0,22%
26	11,468 N·m	0,068 N·m	0,60%	371,00°	11,00°	3,06%	26	11,410 N·m	0,010 N·m	0,09%	370,40°	10,40°	2,89%
27	11,515 N·m	0,115 N·m	1,01%	363,50°	3,50°	0,97%	27	11,500 N·m	0,100 N·m	0,88%	362,40°	2,40°	0,67%
28	11,456 N·m	0,056 N·m	0,49%	371,75°	11,75°	3,26%	28	11,400 N·m	0,000 N·m	0,00%	371,20°	11,20°	3,11%
29	11,452 N·m	0,052 N·m	0,46%	362,50°	2,50°	0,70%	29	11,400 N·m	0,000 N·m	0,00%	364,00°	4,00°	1,11%
30	11,460 N·m	0,060 N·m	0,53%	360,25°	0,25°	0,07%	30	11,410 N·m	0,010 N·m	0,09%	359,40°	-0,60°	-0,17%
31	11,429 N·m	0,029 N·m	0,25%	357,50°	-2,50°	-0,69%	31	11,410 N·m	0,010 N·m	0,09%	368,30°	-1,70°	-0,47%
32	11,480 N·m	0,080 N·m	0,70%	359,75°	-0,25°	-0,07%	32	11,440 N·m	0,040 N·m	0,35%	361,30°	1,30°	0,36%
33	11,421 N·m	0,021 N·m	0,18%	359,00°	-1,00°	-0,11%	33	11,400 N·m	0,000 N·m	0,00%	356,40°	-3,60°	-1,00%
34	11,448 N·m	0,048 N·m	0,42%	362,75°	2,75°	0,76%	34	11,400 N·m	0,000 N·m	0,00%	361,80°	1,80°	0,51%
35	11,456 N·m	0,056 N·m	0,49%	359,50°	-1,50°	-0,42%	35	11,420 N·m	0,020 N·m	0,18%	357,80°	-2,20°	-0,61%
36	11,429 N·m	0,029 N·m	0,25%	356,75°	-3,25°	-0,90%	36	11,410 N·m	0,010 N·m	0,09%	357,90°	-2,10°	-0,58%
37	11,460 N·m	0,060 N·m	0,53%	364,25°	4,25°	1,18%	37	11,410 N·m	0,010 N·m	0,09%	363,60°	3,60°	1,00%
38	11,417 N·m	0,017 N·m	0,15%	359,50°	-0,50°	-0,14%	38	11,410 N·m	0,010 N·m	0,09%	359,80°	-0,20°	-0,06%
39	11,429 N·m	0,029 N·m	0,25%	362,75°	2,75°	0,76%	39	11,400 N·m	0,000 N·m	0,00%	368,30°	-1,70°	-0,47%
40	11,448 N·m	0,048 N·m	0,42%	360,25°	0,25°	0,07%	40	11,430 N·m	0,030 N·m	0,26%	360,50°	0,50°	0,14%
41	11,448 N·m	0,048 N·m	0,42%	360,25°	0,25°	0,07%	41	11,400 N·m	0,000 N·m	0,00%	360,60°	0,60°	0,17%
42	11,413 N·m	0,013 N·m	0,11%	359,25°	-0,75°	-0,21%	42	11,400 N·m	0,000 N·m	0,00%	360,20°	0,20°	0,06%
43	11,472 N·m	0,072 N·m	0,63%	364,75°	4,75°	1,32%	43	11,410 N·m					

2 - Chart - 80% - 360°-soft



3 - test point 80% - 360° soft

Master - reference

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		18240041		Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00		90 %				
Sample size:	100 piece						
Test point:	80 %						
Test torque (M _{test}):	11,400 N·m	Target:	360,00	(degree)			
Rotation angle starting torque (M _{rot}):	5,700 N·m						
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)			
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00	(degree)			
- Tolerance:	0,798 N·m	- Tolerance:	15,00	(degree)			
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}):	375,00	(degree)			
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}):	345,00	(degree)			
Speed:	1 Step:	550 rpm	2 Step:	50 rpm			

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4233 N·m	Average	\bar{x}	7,1800°	
M _{max}	11,4870 N·m	Maximal	M _{max}	37,0000°	
M _{min}	11,3470 N·m	Minimal	M _{min}	353,0000°	
R (99,73%)	0,1400 N·m	Scatter	R (99,73%)	17,0000°	
s	0,0412 N·m	Standard deviation	s	3,6810°	
6 s	0,2472 N·m	6 x Standard deviation	6 s	21,9662°	
N·m ²	5,7116 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	6,4540	Capability index Cm	2,1857	Cm	1,3657
Cmk	6,2526	Capability index Cmk	2,0329	Cmk	1,2937

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		SN: 18240041		Date:	2018-07-30	
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Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (%)	Difference (°)	Angle (°)	Difference (%)	Difference (°)
1	11,472 N·m	0,072 N·m	0,63%	367,00°	7,00°	1,94%
2	11,370 N·m	-0,030 N·m	-0,26%	354,00°	-6,00°	-1,67%
3	11,452 N·m	0,052 N·m	0,46%	364,75°	4,75°	1,32%
4	11,323 N·m	-0,022 N·m	-0,19%	361,75°	-2,25°	-0,62%
5	11,456 N·m	0,056 N·m	0,49%	363,75°	3,75°	1,04%
6	11,460 N·m	0,060 N·m	0,53%	360,75°	0,75°	0,21%
7	11,444 N·m	-0,044 N·m	-0,39%	360,25°	0,25°	0,07%
8	11,369 N·m	-0,041 N·m	-0,36%	353,00°	-7,00°	-1,94%
9	11,423 N·m	0,023 N·m	0,20%	361,75°	1,75°	0,49%
10	11,448 N·m	0,048 N·m	0,42%	361,00°	1,00°	0,28%
11	11,374 N·m	-0,024 N·m	-0,23%	357,25°	-2,75°	-0,76%
12	11,468 N·m	0,068 N·m	0,60%	363,00°	3,00°	0,83%
13	11,366 N·m	-0,034 N·m	-0,30%	357,00°	-3,00°	-0,83%
14	11,468 N·m	0,068 N·m	0,60%	365,50°	5,50°	1,53%
15	11,370 N·m	-0,030 N·m	-0,26%	357,25°	-2,75°	-0,76%
16	11,460 N·m	0,060 N·m	0,53%	366,00°	6,00°	1,67%
17	11,359 N·m	-0,041 N·m	-0,36%	357,00°	-3,00°	-0,83%
18	11,452 N·m	0,052 N·m	0,46%	361,50°	1,50°	0,42%
19	11,423 N·m	0,023 N·m	0,20%	361,25°	1,25°	0,35%
20	11,468 N·m	0,068 N·m	0,60%	361,75°	1,75°	0,49%
21	11,460 N·m	0,060 N·m	0,53%	360,75°	0,75°	0,21%
22	11,370 N·m	-0,030 N·m	-0,26%	356,00°	-4,00°	-1,11%
23	11,464 N·m	0,064 N·m	0,56%	361,50°	1,50°	0,42%
24	11,452 N·m	0,052 N·m	0,46%	361,25°	1,25°	0,35%
25	11,374 N·m	-0,026 N·m	-0,23%	355,00°	-5,00°	-1,39%
26	11,464 N·m	0,064 N·m	0,56%	366,75°	6,75°	1,88%
27	11,425 N·m	0,025 N·m	0,22%	360,50°	0,50°	0,14%
28	11,370 N·m	-0,030 N·m	-0,26%	358,25°	-1,75°	-0,49%
29	11,468 N·m	0,068 N·m	0,60%	361,25°	1,25°	0,35%
30	11,480 N·m	0,080 N·m	0,70%	364,75°	4,75°	1,32%
31	11,363 N·m	-0,037 N·m	-0,32%	357,25°	-2,75°	-0,76%
32	11,472 N·m	0,072 N·m	0,63%	367,75°	7,75°	2,15%
33	11,374 N·m	-0,026 N·m	-0,23%	357,25°	-2,75°	-0,76%
34	11,468 N·m	0,068 N·m	0,60%	361,40°	1,40°	0,39%
35	11,363 N·m	-0,037 N·m	-0,32%	355,75°	-4,25°	-1,18%
36	11,448 N·m	0,048 N·m	0,42%	362,00°	2,00°	0,56%
37	11,437 N·m	0,037 N·m	0,32%	360,50°	0,50°	0,14%
38	11,366 N·m	-0,034 N·m	-0,30%	358,50°	-1,50°	-0,42%
39	11,468 N·m	0,068 N·m	0,60%	361,25°	1,25°	0,35%
40	11,441 N·m	0,041 N·m	0,36%	360,75°	0,75°	0,21%
41	11,394 N·m	-0,006 N·m	-0,05%	360,00°	0,00°	0,00%
42	11,409 N·m	0,009 N·m	0,08%	360,00°	0,00°	0,00%
43	11,460 N·m	0,060 N·m	0,53%	361,00°	1,00°	0,28%
44	11,405 N·m	0,005 N·m	0,04%	361,25°	1,25°	0,35%
45	11,433 N·m	0,033 N·m	0,29%	362,00°	2,00°	0,56%
46	11,448 N·m	0,048 N·m	0,42%	361,75°	1,75°	0,49%
47	11,405 N·m	0,005 N·m	0,04%	361,00°	1,00°	0,28%
48	11,472 N·m	0,072 N·m	0,63%	368,00°	8,00°	2,23%
49	11,410 N·m	0,010 N·m	0,09%	360,75°	0,75°	0,21%
50	11,433 N·m	0,033 N·m	0,29%	361,75°	1,75°	0,49%
51	11,347 N·m	-0,053 N·m	-0,46%	359,25°	-0,75°	-0,21%
52	11,476 N·m	0,076 N·m	0,67%	364,00°	4,00°	1,11%
53	11,413 N·m	0,013 N·m	0,11%	363,50°	3,50°	0,97%
54	11,382 N·m	-0,018 N·m	-0,16%	360,25°	0,25°	0,07%
55	11,448 N·m	0,048 N·m	0,42%	364,25°	4,25°	1,18%
56	11,378 N·m	-0,022 N·m	-0,19%	358,25°	-1,75°	-0,49%
57	11,452 N·m	0,052 N·m	0,46%	362,50°	2,50°	0,69%
58	11,366 N·m	-0,034 N·m	-0,30%	361,50°	1,50°	0,42%
59	11,386 N·m	-0,014 N·m	-0,12%	360,25°	0,25°	0,07%
60	11,460 N·m	0,060 N·m	0,53%	366,50°	6,50°	1,81%
61	11,441 N·m	0,041 N·m	0,36%	366,25°	6,25°	1,76%
62	11,460 N·m	0,060 N·m	0,53%	364,50°	4,50°	1,25%
63	11,417 N·m	0,017 N·m	0,15%	362,50°	2,50°	0,69%
64	11,460 N·m	0,060 N·m	0,53%	361,00°	1,00°	0,28%
65	11,409 N·m	0,009 N·m	0,08%	362,75°	2,75°	0,76%
66	11,366 N·m	-0,034 N·m	-0,30%	356,25°	-3,75°	-1,04%
67	11,464 N·m	0,064 N·m	0,56%	367,00°	7,00°	1,94%
68	11,402 N·m	0,002 N·m	0,02%	361,50°	1,50°	0,42%
69	11,456 N·m	0,056 N·m	0,49%	360,50°	0,50°	0,14%
70	11,405 N·m	0,005 N·m	0,04%	362,50°	2,50°	0,69%
71	11,441 N·m	0,041 N·m	0,36%	363,50°	3,50°	0,97%
72	11,487 N·m	0,087 N·m	0,76%	366,75°	6,75°	1,88%
73	11,417 N·m	0,017 N·m	0,15%	362,50°	2,50°	0,69%
74	11,351 N·m	-0,049 N·m	-0,43%	360,25°	0,25°	0,07%
75	11,464 N·m	0,064 N·m	0,56%	370,00°	10,00°	2,78%
76	11,374 N·m	-0,026 N·m	-0,23%	357,25°	-2,75°	-0,76%
77	11,452 N·m	0,052 N·m	0,46%	366,25°	6,25°	1,76%
78	11,370 N·m	-0,030 N·m	-0,26%	362,25°	2,25°	0,63%
79	11,437 N·m	0,037 N·m	0,32%	363,50°	3,50°	0,97%
80	11,425 N·m	0,025 N·m	0,22%	365,75°	5,75°	1,60%
81	11,386 N·m	-0,014 N·m	-0,12%	357,50°	-2,50°	-0,69%
82	11,456 N·m	0,056 N·m	0,49%	366,00°	6,00°	1,67%
83	11,413 N·m	0,013 N·m	0,11%	361,75°	1,75°	0,49%
84	11,483 N·m	0,083 N·m	0,73%	365,50°	5,50°	1,53%
85	11,359 N·m	-0,041 N·m	-0,36%	360,75°	0,75°	0,21%
86	11,382 N·m	-0,018 N·m	-0,16%	359,25°	-0,75°	-0,21%
87	11,468 N·m	0,068 N·m	0,60%	365,75°	5,75°	1,60%
88	11,413 N·m	0,013 N·m	0,11%	360,25°	0,25°	0,07%
89	11,468 N·m	0,068 N·m	0,60%	365,50°	5,50°	1,53%
90	11,448 N·m	0,048 N·m	0,42%	366,25°	6,25°	1,74%
91	11,366 N·m	-0,034 N·m	-0,30%	357,75°	-2,75°	-0,62%
92	11,476 N·m	0,076 N·m	0,67%	365,50°	5,50°	1,53%
93	11,413 N·m	0,013 N·m	0,11%	360,25°	0,25°	0,07%
94	11,374 N·m	-0,026 N·m	-0,23%	357,50°	-2,50°	-0,69%
95	11,444 N·m	0,044 N·m	0,39%	363,00°	3,00°	0,83%
96	11,366 N·m	-0,034 N·m	-0,30%	361,75°	1,75°	0,49%
97	11,468 N·m	0,068 N·m	0,60%	365,75°	5,75°	1,60%
98	11,409 N·m	0,009 N·m	0,08%	360,25°	0,25°	0,07%
99	11,382 N·m	-0,018 N·m	-0,16%	357,25°	-2,75°	-0,76%
100	11,472 N·m	0,072 N·m	0,63%	368,75°	8,75°	2,41%

EC tightening tool

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		18240041		Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00		90 %				
Sample size:	100 piece						
Test point:	80 %						
Test torque (M _{test}):	11,400 N·m	Target:	360,00	(degree)			
Rotation angle starting torque (M _{rot}):	5,700 N·m						
± Tolerance:	7,00 %	± Tolerance:	15,00	(degree)			
+ Tolerance:	0,798 N·m	+ Tolerance:	15,00	(degree)			
- Tolerance:	0,798 N·m	- Tolerance:	15,00	(degree)			
Upper tolerance (T _u /M _{test}):	12,198 N·m	(T _u /M _{test}):	375,00	(degree)			
Lower tolerance (T _l /M _{test}):	10,602 N·m	(T _l /M _{test}):	345,00	(degree)			
Speed:	1 Step:	550 rpm	2 Step:	50 rpm			

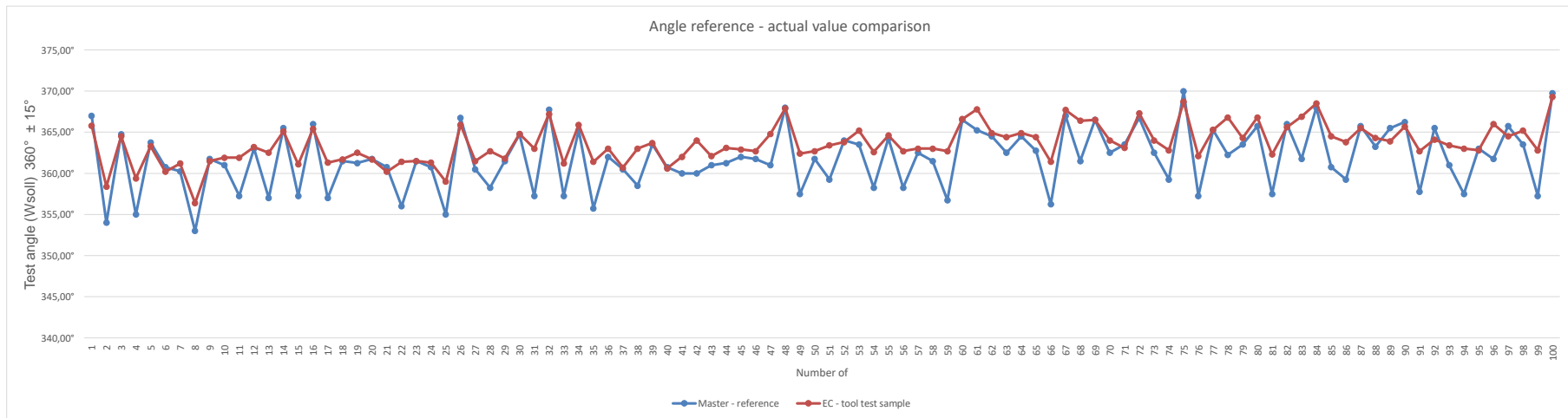
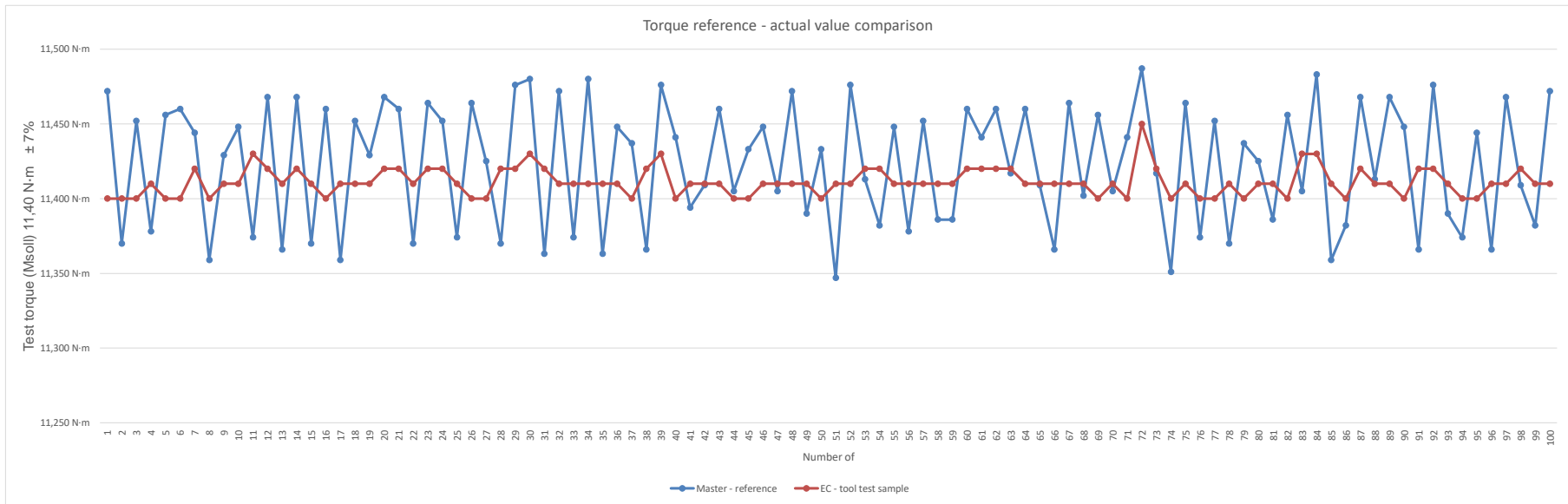
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,4111 N·m	Average	\bar{x}	363,5040°	
M _{max}	11,4500 N·m	Maximal	M _{max}	369,3000°	
M _{min}	11,4000 N·m	Minimal	M _{min}	359,4000°	
R (99,73%)	0,0500 N·m	Scatter	R (99,73%)	12,9000°	
s	0,0091 N·m	Standard deviation	s	2,3196°	
6 s	0,0546 N·m	6 x Standard deviation	6 s	13,9179°	
N·m ²	5,7056 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	29,2650	Capability index Cm	2,1555	Cm	2,1555
Cmk	26,5826	Capability index Cmk	1,8390	Cmk	1,8390

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		SN: 18240041		Date:	2018-07-30	
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Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (%)	Difference (°)	Angle (°)	Difference (%)	Difference (°)
1	11,400 N·m	0,000 N·m	0,00%	365,80°	5,80°	1,61%
2	11,400 N·m	0,000 N·m	0,00%	358,40°	-1,60°	-0,44%
3	11,410 N·m	0,000 N·m	0,00%	364,50°	4,50°	1,29%
4	11,410 N·m	0,000 N·m	0,00%	361		

3 - Chart - 80% -360°-soft



1 - test point 100% - 30° hard

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	14,000 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M _{rot}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T _u /M _{test}):	14,98 N·m	(T _u /M _{test}): 35,00 (degree)
Lower tolerance (T _l /M _{test}):	13,02 N·m	(T _l /M _{test}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	14,059 N·m	Number of measurements	29,9425°	\bar{x}	32,0640°
M _{max}	14,180 N·m	Maximal	30,7500°	M _{max}	33,1000°
M _{min}	13,910 N·m	Minimal	29,0000°	M _{min}	31,1000°
R (99,73%)	0,280 N·m	Scatter	1,7500°	R (99,73%)	2,0000°
s	0,0508 N·m	Standard deviation	0,4049°	s	0,4516°
σ	0,2235 N·m	6 x Standard deviation	2,4295°	σ	2,7096°
N·m ²	84,2155 N·m	Torque rate		N·m ²	

Homologation		Machine capability test - MCT		Homologation	
Cm	6,4330	Capability index Cm	4,1161	Cm	3,6906
Cmk	5,9722	Capability index Cmk	4,0687	Cmk	2,1671

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	14,000 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M _{rot}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T _u /M _{test}):	14,98 N·m	(T _u /M _{test}): 35,00 (degree)
Lower tolerance (T _l /M _{test}):	13,02 N·m	(T _l /M _{test}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	14,1038 N·m	Number of measurements	29,9425°	\bar{x}	32,0640°
M _{max}	14,170 N·m	Maximal	30,7500°	M _{max}	33,1000°
M _{min}	14,050 N·m	Minimal	29,0000°	M _{min}	31,1000°
R (99,73%)	0,120 N·m	Scatter	1,7500°	R (99,73%)	2,0000°
s	0,0260 N·m	Standard deviation	0,4049°	s	0,4516°
σ	0,1572 N·m	6 x Standard deviation	2,4295°	σ	2,7096°
N·m ²	84,6216 N·m	Torque rate		N·m ²	

Homologation		Machine capability test - MCT		Homologation	
Cm	12,5848	Capability index Cm	4,1161	Cm	3,6906
Cmk	12,2544	Capability index Cmk	4,0687	Cmk	2,1671

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	0,980 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,980 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T _u /M _{test}):	0,980 N·m	(T _u /M _{test}): 5,00 (degree)
Lower tolerance (T _l /M _{test}):	-0,980 N·m	(T _l /M _{test}): -5,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

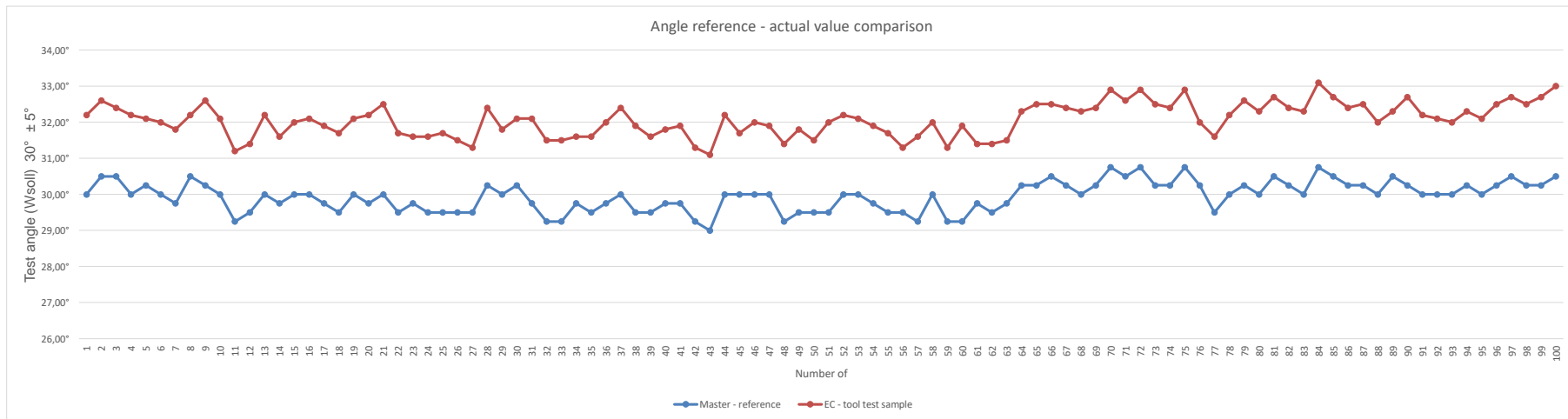
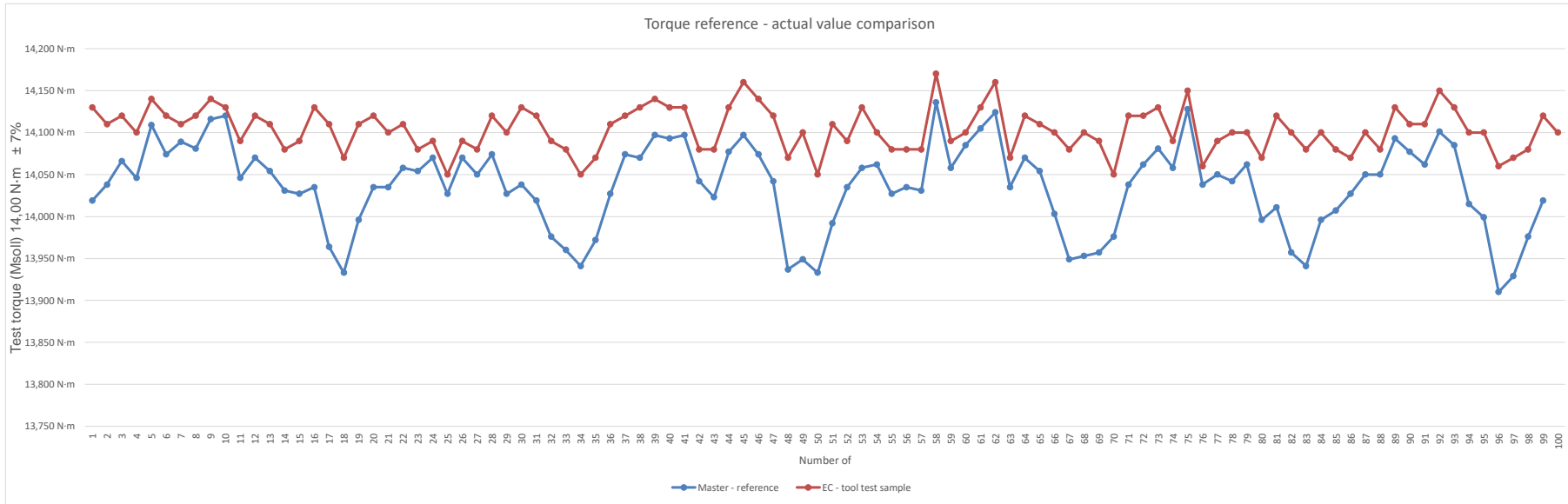
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0677 N·m	Number of measurements	7	\bar{x}	-2,1215°
M _{max}	-0,1010 N·m	Maximal	-1,6500°	M _{max}	-2,6500°
M _{min}	-0,1510 N·m	Minimal	-1,8500°	M _{min}	-1,0000°
R (99,73%)	0,0470 N·m	Scatter	0,7500°	R (99,73%)	1,0000°
s	0,1315 N·m	Standard deviation	0,3689°	s	1,0969°
σ	0,2249 N·m	6 x Standard deviation	2,2134°	σ	6,5814°
N·m ²	-0,061 N·m	Torque rate		N·m ²	

Homologation		Machine capability test - MCT		Homologation	
Cm	8,7154	Capability index Cm	4,1161	Cm	8,4666
Cmk	5,1734	Capability index Cmk	4,0687	Cmk	4,6746

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		SN: 18240032	Date: 2018-07-30
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Measurement result						
Nr.	Torque			Angle		
	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	14,019 N·m	0,019 N·m	0,14%	30,00°	0,00°	0,00%
2	14,038 N·m	0,038 N·m	0,27%	30,50°	0,50°	1,67%
3	14,068 N·m	0,068 N·m	0,47%	30,50°	0,50°	1,67%
4	14,068 N·m	0,068 N·m	0,47%	30,25°	0,25°	0,83%
5	14,109 N·m	0,109 N·m	0,78%	30,25°	0,25°	0,83%
6	14,074 N·m	0,074 N·m	0,53%	30,00°	0,00°	0,00%
7	14,089 N·m	0,089 N·m	0,64%	29,75°	-0,25°	-0,83%
8	14,081 N·m	0,081 N·m	0,58%	30,50°	0,50°	1,67%
9	14,115 N·m	0,115 N·m	0,83%	30,00°	0,00°	0,00%
10	14,120 N·m	0,120 N·m	0,86%	30,00°	0,00°	0,00%
11	14,046 N·m	0,046 N·m	0,33%	29,25°	-0,75°	-2,50%
12	14,070 N·m	0,070 N·m	0,50%	29,50°	-0,50°	-1,67%
13	14,054 N·m	0,054 N·m	0,39%	30,00°	0,00°	0,00%
14	14,077 N·m	0,077 N·m	0,55%	29,75°	-0,25°	-0,83%
15	14,027 N·m	0,027 N·m	0,19%	30,00°	0,00°	0,00%
16	14,035 N·m	0,035 N·m	0,25%	30,00°	0,00°	0,00%
17	13,964 N·m	-0,036 N·m	-0,26%	29,75°	-0,25°	-0,83%
18	13,933 N·m	-0,067 N·m	-0,48%	29,50°	-0,50°	-1,67%
19	14,027 N·m	0,027 N·m	0,19%	30,00°	0,00°	0,00%
20	14,035 N·m	0,035 N·m	0,25%	29,75°	-0,25°	-0,83%
21	14,035 N·m	0,035 N·m	0,25%	30,00°	0,00°	0,00%
22	14,058 N·m	0,058 N·m	0,41%	29,50°	-0,50°	-1,67%
23	14,054 N·m	0,054 N·m	0,39%	29,75°	-0,25°	-0,83%
24	14,070 N·m	0,070 N·m	0,50%	29,50°	-0,50°	-1,67%
25	14,027 N·m	0,027 N·m	0,19%	29,50°	-0,50°	-1,67%
26	14,070 N·m	0,070 N·m	0,50%	30,00°	0,00°	0,00%
27	14,050 N·m	0,050 N·m	0,36%	29,50°	-0,50°	-1,67%
28	14,074 N·m	0,074 N·m	0,53%	30,25°	0,25°	0,83%
29	14,027 N·m	0,027 N·m	0,19%	30,00°	0,00°	0,00%
30	14,038 N·m	0,038 N·m	0,27%	30,25°	0,25°	0,83%
31	14,019 N·m	0,019 N·m	0,14%	29,75°	-0,25°	-0,83%
32	13,976 N·m	-0,024 N·m	-0,17%	29,25°	-0,75°	-2,50%
33	13,960 N·m	-0,040 N·m	-0,29%	29,25°	-0,75°	-2,50%
34	14,027 N·m	0,027 N·m	0,19%	29,50°	-0,50°	-1,67%
35	13,972 N·m	-0,028 N·m	-0,20%	29,50°	-0,50°	-1,67%
36	14,027 N·m	0,027 N·m	0,19%	29,75°	-0,25°	-0,83%
37	14,074 N·m	0,074 N·m	0,53%	30,00°	0,00°	0,00%
38	14,070 N·m	0,070 N·m	0,50%	29,50°	-0,50°	-1,67%
39	14,077 N·m	0,077 N·m	0,55%	29,50°	-0,50°	-1,67%
40	14,093 N·m	0,093 N·m	0,66%	29,75°	-0,25°	-0,83%
41	14,097 N·m	0,097 N·m	0,69%	29,75°	-0,25°	-0,83%
42	14,042 N·m	0,042 N·m	0,30%	29,25°	-0,75°	-2,50%
43	14,035 N·m	0,035 N·m	0,25%	29,00°	-1,00°	-3,33%
44	14,077 N·m	0,077 N·m	0,55%	30,00°	0,00°	0,00%
45	14,097 N·m	0,097 N·m	0,69%	30,00°	0,00°	0,00%
46	14,074 N·m	0,074 N·m	0,53%	30,00°	0,00°	0,00%
47	14,042 N·m	0,042 N·m	0,30%	30,00°	0,00°	0,00%
48	13,967 N·m	-0,063 N·m	-0,45%	29,25°	-0,75°	-2,50%
49	13,949 N·m	-0,081 N·m	-0,57%	29,00°	-1,00°	-3,33%
50	13,933 N·m	-0,067 N·m	-0,48%	29,50°	-0,50°	-1,67%
51	13,992 N·m	-0,008 N·m	-0,06%	29,50°	-0,50°	-1,67%
52	14,035 N·m	0,035 N·m	0,25%	30,00°	0,00°	0,00%
53	14,058 N·m	0,058 N·m	0,41%	30,00°	0,00°	0,00%
54	14,062 N·m	0,062 N·m	0,44%	30,00°	0,00°	0,00%
55	14,027 N·m	0,027 N·m	0,19%	29,50°	-0,50°	-1,67%
56	14,035 N·m	0,035 N·m	0,25%	29,50°	-0,50°	-1,67%
57	14,031 N·m	0,031 N·m	0,22%	29,25°	-0,75°	-2,50%
58	14,138 N·m	0,138 N·m	0,97%	30,00°	0,00°	0,00%
59	14,088 N·m	0,088 N·m	0,63%	30,00°	0,00°	0,00%
60	14,085 N·m	0,085 N·m	0,61%	29,25°	-0,75°	-2,50%
61	14,105 N·m	0,105 N·m	0,75%	29,75°	-0,25°	-0,83%
62	14,124 N·m	0,124 N·m	0,89%	29,50°	-0,50°	-1,67%
63	14,035 N·m	0,035 N·m	0,25%	29,75°	-0,25°	-0,83%
64	14,070 N·m	0,070 N·m	0,50%	30,25°	0,25°	0,83%
65	14,054 N·m	0,054 N·m	0,39%	30,25°	0,25°	0,83%
66	14,003 N·m	0,003 N·m	0,02%	30,50°	0,50°	1,67%
67	13,949 N·m	-0,051 N·m	-0,36%	30,25°	0,25°	0,83%
68	13,957 N·m	-0,047 N·m	-0,34%	30,00°	0,00°	0,00%
69	13,957 N·m	-0,043 N·m	-0,31%	30,25°	0,25°	0,83%
70	13,976 N·m	-0,024 N·m	-0,17%	30,75°	0,75°	2,50%
71	14,038 N·m	0,038 N·m	0,27%	30,50°	0,50°	1,67%
72	14,062 N·m	0,062 N·m	0,44%	30,75°	0,75°	2,50%
73	14,081 N·m	0,081 N·m	0,58%	30,25°	0,25°	0,83%
74	14,058 N·m	0,058 N·m	0,41%	30,25°	0,25°	0,83%
75	14,128 N·m	0,128 N·m	0,91%	30,75°	0,75°	2,50%
76	14,038 N·m	0,038 N·m	0,27%	30,25°	0,25°	0,83%
77	14,050 N·m	0,050 N·m	0,36%	29,50°	-0,50°	-1,67%
78	14,042 N·m	0,042 N·m	0,30%	30,00°	0,00°	0,00%
79	14,062 N·m	0,062 N·m	0,44%	30,25°	0,25°	0,83%
80	13,996 N·m	-0,004 N·m	-0,03%	30,00°	0,00°	0,00%
81	14,011 N·m	0,011 N·m	0,08%	30,50°	0,50°	1,67%
82	13,957 N·m	-0,043 N·m	-0,31%	30,25°	0,25°	0,83%
83	13,911 N·m	-0,059 N·m	-0,42%	30,00°	0,00°	0,00%
84	13,996 N·m	-0,004 N·m	-0,03%	30,75°	0,75°	2,50%
85	14,007 N·m	0,007 N·m	0,05%	30,50°	0,50°	1,67%
86	14,027 N·m	0,027 N·m	0,19%	30,25°	0,25°	0,83%
87	14,050 N·m	0,050 N·m	0,36%	30,25°	0,25°	0,83%
88	14,060 N·m	0,060 N·m	0,43%	30,00°	0,00°	0,00%
89	14,033 N·m	0,033 N·m	0,24%	30,50°	0,50°	1,67%
90	14,077 N·m	0,077 N·m	0,55%	30,25°	0,25°	0,83%
91	14,062 N·m	0,062 N·m	0,44%	30,00°	0,00°	0,00%
92	14,101 N·m					

1 - Chart- 100% - 30°-hard



2 - test point 100% - 30° hard

Master - reference

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 100 %	
Test torque (M_{test}): 14,000 N·m		Target: 30,00 ° (degree)		± Tolerance: 7,00 %	
Rotation angle starting torque (M₀): 7,000 N·m		± Tolerance: 5,00 (degree)		+ Tolerance: 0,98 N·m	
± Tolerance: 0,98 N·m		+ Tolerance: 5,00 (degree)		- Tolerance: 0,98 N·m	
Upper tolerance (T_u/M_{test}): 14,98 N·m		(T_u/M_{test}): 35,00 (degree)		Lower tolerance (T_l/M_{test}): 13,02 N·m	
(T_l/M_{test}): 25,00 (degree)		Speed: 1 Step: 550 rpm		2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	14,0378 N·m	\bar{x}	29,9700 °	\bar{x}	32,1440 °
M _{max}	14,1010 N·m	M _{max}	31,0000 °	M _{max}	33,2000 °
M _{min}	13,9800 N·m	M _{min}	29,2500 °	M _{min}	31,0000 °
R (99,73%)	0,1210 N·m	R (99,73%)	1,7500 °	R (99,73%)	2,2000 °
s	0,0220 N·m	s	0,3083 °	s	0,3498 °
σ	0,1201 N·m	σ	1,8498 °	σ	2,2000 °
N·m ²	84,2865 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	14,9456	Capacity index Cm	5,4069	Cm	16,2249
Cmk	14,2735	Capacity index Cmk	5,3735	Cmk	14,5893

EC tightening tool

Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 100 %	
Test torque (M_{test}): 14,000 N·m		Target: 30,00 ° (degree)		± Tolerance: 7,00 %	
Rotation angle starting torque (M₀): 7,000 N·m		± Tolerance: 5,00 (degree)		+ Tolerance: 0,98 N·m	
± Tolerance: 0,98 N·m		+ Tolerance: 5,00 (degree)		- Tolerance: 0,98 N·m	
Upper tolerance (T_u/M_{test}): 14,98 N·m		(T_u/M_{test}): 35,00 (degree)		Lower tolerance (T_l/M_{test}): 13,02 N·m	
(T_l/M_{test}): 25,00 (degree)		Speed: 1 Step: 550 rpm		2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	14,1037 N·m	\bar{x}	32,1440 °	\bar{x}	32,1440 °
M _{max}	14,1500 N·m	M _{max}	33,2000 °	M _{max}	33,2000 °
M _{min}	14,0400 N·m	M _{min}	31,0000 °	M _{min}	31,0000 °
R (99,73%)	0,1100 N·m	R (99,73%)	2,2000 °	R (99,73%)	2,2000 °
s	0,0201 N·m	s	0,3498 °	s	0,3498 °
σ	0,1100 N·m	σ	2,2000 °	σ	2,2000 °
N·m ²	84,6222 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	16,2249	Capacity index Cm	4,9605	Cm	16,2249
Cmk	14,5893	Capacity index Cmk	4,9448	Cmk	14,5893

Difference evaluation

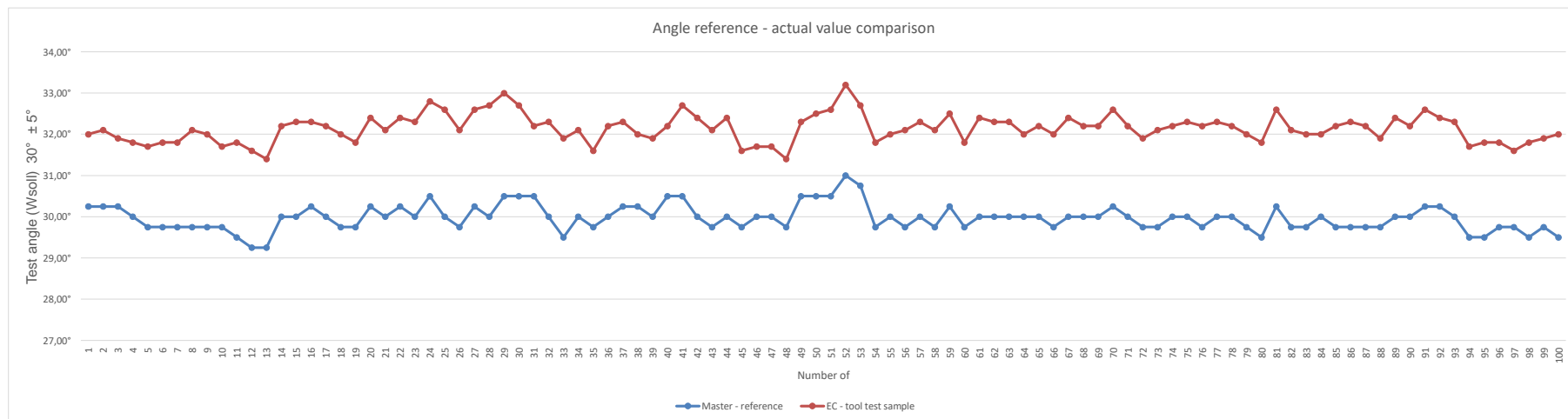
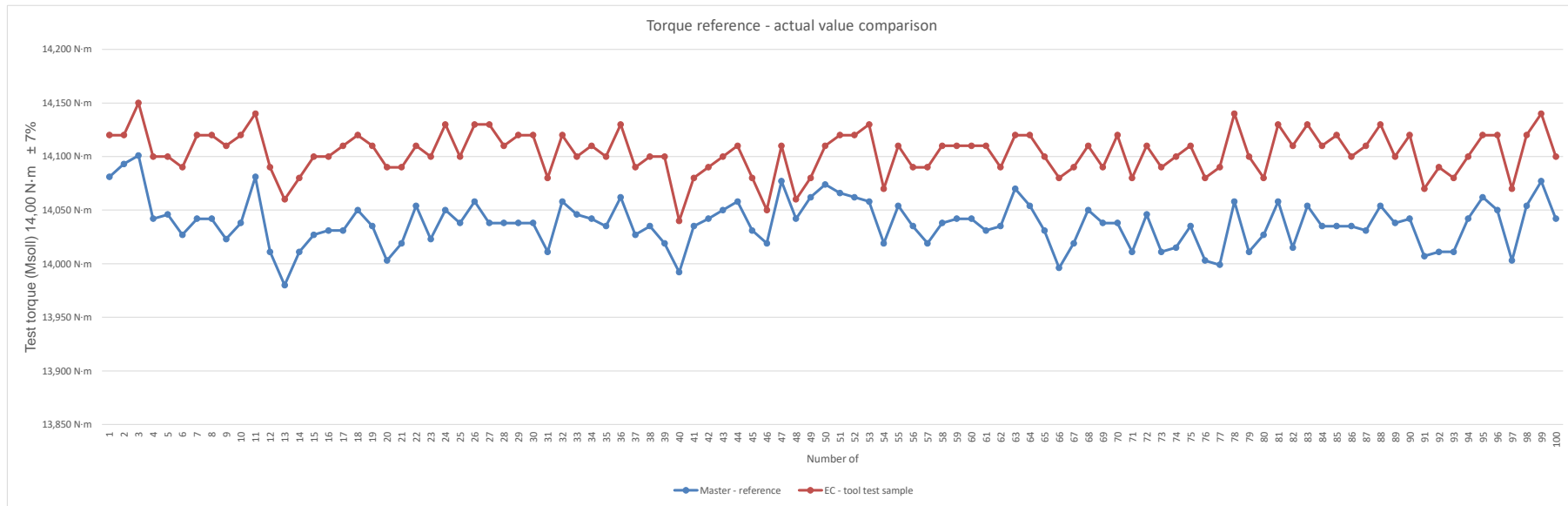
Tool Model: TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 100 %	
Test torque (M_{test}): 0,000 N·m		Target: 0,00 ° (degree)		± Tolerance: 7,00 %	
Rotation angle starting torque (M₀): 0,000 N·m		± Tolerance: 5,00 (degree)		+ Tolerance: 0,980 N·m	
± Tolerance: 0,980 N·m		+ Tolerance: 5,00 (degree)		- Tolerance: 0,980 N·m	
Upper tolerance (T_u/M_{test}): 0,980 N·m		(T_u/M_{test}): 5,00 (degree)		Lower tolerance (T_l/M_{test}): -0,980 N·m	
(T_l/M_{test}): -5,00 (degree)		Speed: 1 Step: 550 rpm		2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle ° (degree)	
n	100	n	100	n	100
\bar{x}	-0,0659 N·m	\bar{x}	-2,1740 °	\bar{x}	-2,1740 °
M _{max}	-0,1800 N·m	M _{max}	-1,6500 °	M _{max}	-1,6500 °
M _{min}	-0,9500 N·m	M _{min}	-2,7000 °	M _{min}	-2,7000 °
R (99,73%)	0,0770 N·m	R (99,73%)	1,0500 °	R (99,73%)	1,0500 °
s	0,0234 N·m	s	0,2248 °	s	0,2248 °
σ	0,1201 N·m	σ	1,3498 °	σ	1,3498 °
N·m ²	-0,3957 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	21,2293	Capacity index Cm	7,4293	Cm	21,2293
Cmk	16,8099	Capacity index Cmk	6,4398	Cmk	16,8099

Measurement result				Measurement result									
Nr.	Torque			Angle			Nr.	Torque			Angle		
	(N·m)	Difference (N·m)	Difference (%)	(°)	Difference (°)	Difference (%)		(N·m)	Difference (N·m)	Difference (%)	(°)	Difference (°)	Difference (%)
1	14,081 N·m	0,081 N·m	0,58%	30,25°	0,25°	0,83%	1	14,120 N·m	0,120 N·m	0,86%	32,00°	2,00°	6,67%
2	14,093 N·m	0,093 N·m	0,66%	30,25°	0,25°	0,83%	2	14,120 N·m	0,120 N·m	0,86%	32,10°	2,10°	7,00%
3	14,101 N·m	0,101 N·m	0,72%	30,25°	0,25°	0,83%	3	14,150 N·m	0,150 N·m	1,07%	31,80°	1,80°	6,33%
4	14,052 N·m	0,052 N·m	0,37%	30,25°	0,25°	0,83%	4	14,130 N·m	0,130 N·m	0,93%	32,00°	2,00°	6,33%
5	14,046 N·m	0,046 N·m	0,33%	29,75°	-0,25°	-0,83%	5	14,100 N·m	0,100 N·m	0,71%	31,70°	1,70°	5,67%
6	14,027 N·m	0,027 N·m	0,19%	29,75°	-0,25°	-0,83%	6	14,090 N·m	0,090 N·m	0,64%	31,80°	1,80°	6,00%
7	14,042 N·m	0,042 N·m	0,30%	29,75°	-0,25°	-0,83%	7	14,120 N·m	0,120 N·m	0,86%	31,80°	1,80°	6,00%
8	14,042 N·m	0,042 N·m	0,30%	29,75°	-0,25°	-0,83%	8	14,120 N·m	0,120 N·m	0,86%	32,10°	2,10°	7,00%
9	14,032 N·m	0,032 N·m	0,23%	29,75°	-0,25°	-0,83%	9	14,100 N·m	0,100 N·m	0,71%	32,00°	2,00°	6,33%
10	14,038 N·m	0,038 N·m	0,27%	29,75°	-0,25°	-0,83%	10	14,120 N·m	0,120 N·m	0,86%	31,70°	1,70°	5,67%
11	14,081 N·m	0,081 N·m	0,58%	29,50°	-0,50°	-1,67%	11	14,140 N·m	0,140 N·m	1,00%	31,80°	1,80°	6,00%
12	14,011 N·m	0,011 N·m	0,08%	29,25°	-0,75°	-2,50%	12	14,090 N·m	0,090 N·m	0,64%	31,60°	1,60°	5,33%
13	13,980 N·m	-0,020 N·m	-0,14%	29,25°	-0,75°	-2,50%	13	14,080 N·m	0,080 N·m	0,57%	31,40°	1,40°	4,67%
14	14,011 N·m	0,011 N·m	0,08%	30,00°	0,00°	0,00%	14	14,080 N·m	0,080 N·m	0,57%	32,00°	2,00°	7,33%
15	14,027 N·m	0,027 N·m	0,19%	30,00°	0,00°	0,00%	15	14,100 N·m	0,100 N·m	0,71%	32,30°	2,30°	7,67%
16	14,031 N·m	0,031 N·m	0,22%	30,25°	0,25°	0,83%	16	14,100 N·m	0,100 N·m	0,71%	32,30°	2,30°	7,67%
17	14,031 N·m	0,031 N·m	0,22%	30,00°	0,00°	0,00%	17	14,110 N·m	0,110 N·m	0,79%	32,20°	2,20°	7,33%
18	14,050 N·m	0,050 N·m	0,36%	29,75°	-0,25°	-0,83%	18	14,120 N·m	0,120 N·m	0,86%	32,00°	2,00°	6,67%
19	14,035 N·m	0,035 N·m	0,25%	29,75°	-0,25°	-0,83%	19	14,130 N·m	0,130 N·m	0,93%	32,00°	2,00°	6,33%
20	14,003 N·m	0,003 N·m	0,02%	30,25°	0,25°	0,83%	20	14,090 N·m	0,090 N·m	0,64%	32,40°	2,40°	8,00%
21	14,019 N·m	0,019 N·m	0,14%	30,00°	0,00°	0,00%	21	14,090 N·m	0,090 N·m	0,64%	32,10°	2,10°	7,00%
22	14,054 N·m	0,054 N·m	0,39%	30,25°	0,25°	0,83%	22	14,110 N·m	0,110 N·m	0,79%	32,40°	2,40°	8,00%
23	14,023 N·m	0,023 N·m	0,16%	30,00°	0,00°	0,00%	23	14,100 N·m	0,100 N·m	0,71%	32,30°	2,30°	7,67%
24	14,032 N·m	0,032 N·m	0,23%	30,00°	0,00°	0,00%	24	14,100 N·m	0,100 N·m	0,71%	32,30°	2,30°	7,67%
25	14,038 N·m	0,038 N·m	0,27%	30,00°	0,00°	0,00%	25	14,100 N·m	0,100 N·m	0,71%	32,60°	2,60°	8,67%
26	14,058 N·m	0,058 N·m	0,41%	29,75°	-0,25°	-0,83%	26	14,130 N·m	0,130 N·m	0,93%	32,10°	2,10°	7,00%
27	14,038 N·m	0,038 N·m	0,27%	30,25°	0,25°	0,83%	27	14,130 N·m	0,130 N·m	0,93%	32,60°	2,60°	8,67%
28	14,038 N·m	0,038 N·m	0,27%	30,00°	0,00°	0,00%	28	14,110 N·m	0,110 N·m	0,79%	32,70°	2,70°	9,00%
29	14,038 N·m	0,038 N·m	0,27%	30,50°	0,50°	1,67%	29	14,110 N·m	0,110 N·m	0,79%	32,70°	2,70°	9,00%
30	14,038 N·m	0,038 N·m	0,27%	30,50°	0,50°	1,67%	30	14,120 N·m	0,120 N·m	0,86%	32,70°	2,70°	9,00%
31	14,041 N·m	0,041 N·m	0,29%	30,50°	0,50°	1,67%	31	14,080 N·m	0,080 N·m	0,57%	32,20°	2,20°	7,33%
32	14,058 N·m	0,058 N·m	0,41%	30,00°	0,00°	0,00%	32	14,120 N·m	0,120 N·m	0,86%	32,30°	2,30°	7,67%
33	14,046 N·m	0,046 N·m	0,33%	29,50°	-0,50°	-1,67%	33	14,100 N·m	0,100 N·m	0,71%	31,80°	1,80°	6,33%
34	14,046 N·m	0,046 N·m	0,33%	30,00°	0,00°	0,00%	34	14,100 N·m	0,100 N·m	0,71%	32,00°	2,00°	6,33%
35	14,035 N·m	0,035 N·m	0,25%	29,75°	-0,25°	-0,83%	35	14,100 N·m	0,100 N·m	0,71%	31,60°	1,60°	5,33%
36	14,062 N·m	0,062 N·m	0,44%	30,00°	0,00°	0,00%	36	14,130 N·m	0,130 N·m	0,93%	32,20°	2,20°	7,33%
37	14,027 N·m	0,027 N·m	0,19%	30,25°	0,25°	0,83%	37	14,090 N·m	0,090 N·m	0,64%	32,30°	2,30°	7,67%
38	14,035 N·m	0,035 N·m	0,25%	30,25°	0,25°	0,83%	38	14,100 N·m	0,100 N·m	0,71%	32,00°	2,00°	6,67%
39	14,019 N·m	0,019 N·m	0,14%	30,00°	0,00°	0,00%	39	14,100 N·m	0,100 N·m	0,71%	32,00°	2,00°	6,67%
40	13,992 N·m	-0,008 N·m	-0,06%	30,50°	0,50°	1,67%	40	14,040 N·m	0,040 N·m	0,29%	32,20°	2,20°	7,33%
41	14,035 N·m	0,035 N·m	0,25%	30,50°	0,50°	1,67%	41	14,080 N·m	0,080 N·m	0,57%	32,70°	2,70°	9,00%
42	14,042 N·m	0,042 N·m	0,30%	30,00°	0,00°	0,00%	42	14,090 N·m	0,090 N·m	0,64%	32,40°	2,40°	8,00%
43	14,050 N·m	0,050 N·m	0,36%	29,75°	-0,25°	-0,83%	43	14,100 N·m	0,100 N·m	0,71%	32,10°	2,10°	7,00%
44	14,058 N·m	0,058 N·m	0,41%	30,00°	0,00°	0,00%	44	14,110 N·m	0,110 N·m	0,79%	32,00°	2,00°	6,67%
45	14,031 N·m	0,031 N·m	0,22%	29,75°	-0,25°	-0,83%	45	14,080 N·m	0,080 N·m	0,57%	31,60°	1,60°	5,33%
46	14,019 N·m	0,019 N·m	0,14%	30,00°	0,00°	0,00%	46	14,050 N·m	0,050				

2 - Chart - 100% - 30°-hard



3 - test point 100% - 30° hard

Master - reference

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{test}):	14,000 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M_{rot}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T_u/M_{test}):	14,98 N·m	(T _u /M _{test}): 35,00 (degree)
Lower tolerance (T_l/M_{test}):	13,02 N·m	(T _l /M _{test}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
100	100	100
\bar{x}	14,0216 N·m	\bar{x}
σ	0,0027 N·m	σ
M _{max}	14,0800 N·m	M _{max}
M _{min}	13,9100 N·m	M _{min}
R (99,73%)	0,1700 N·m	R (99,73%)
s	0,0390 N·m	s
6 s	0,2340 N·m	6 s
N·m ²	84,1294 N·m	N·m ²

Homologation	Machine capability test - MCT	Homologation
Cm	8,375%	Cm
Cmk	5,192%	Cmk
	Capacity index Cm	5,2401
	Capacity index Cmk	5,1172

EC tightening tool

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{test}):	14,000 N·m	Target: 30,00 (degree)
Rotation angle starting torque (M_{rot}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 5,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 5,00 (degree)
Upper tolerance (T_u/M_{test}):	14,98 N·m	(T _u /M _{test}): 35,00 (degree)
Lower tolerance (T_l/M_{test}):	13,02 N·m	(T _l /M _{test}): 25,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
100	100	100
\bar{x}	14,1054 N·m	\bar{x}
σ	0,0027 N·m	σ
M _{max}	14,1500 N·m	M _{max}
M _{min}	14,0500 N·m	M _{min}
R (99,73%)	0,1000 N·m	R (99,73%)
s	0,0390 N·m	s
6 s	0,2340 N·m	6 s
N·m ²	84,6324 N·m	N·m ²

Homologation	Machine capability test - MCT	Homologation
Cm	14,853%	Cm
Cmk	5,252%	Cmk
	Capacity index Cm	5,2001
	Capacity index Cmk	5,1211

Difference evaluation

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{test}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M_{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00 (degree)
+ Tolerance:	-0,980 N·m	+ Tolerance: -5,00 (degree)
- Tolerance:	-0,980 N·m	- Tolerance: -5,00 (degree)
Upper tolerance (T_u/M_{test}):	0,980 N·m	(T _u /M _{test}): 5,00 (degree)
Lower tolerance (T_l/M_{test}):	-0,980 N·m	(T _l /M _{test}): -5,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

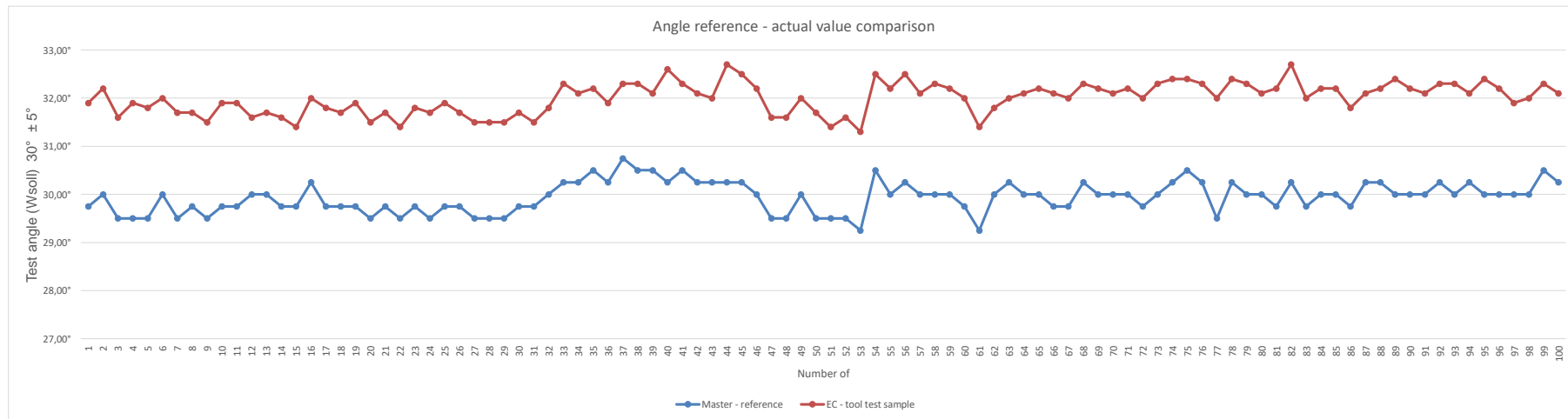
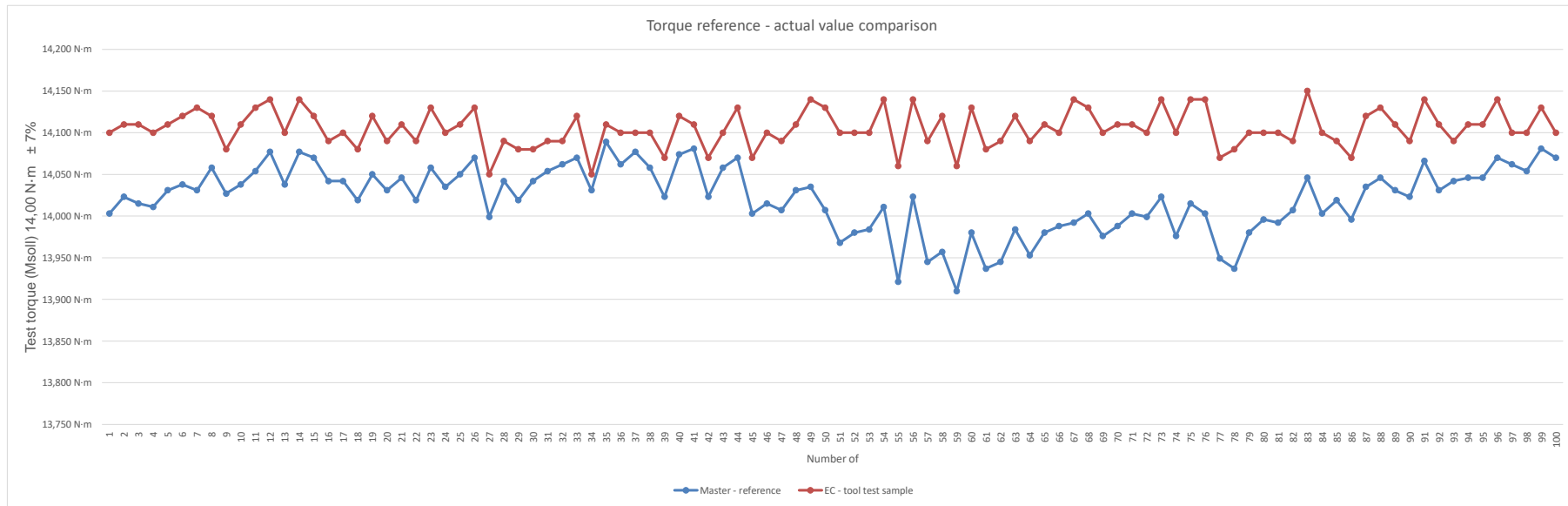
Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
100	100	100
\bar{x}	-0,0838 N·m	\bar{x}
σ	-0,0190 N·m	σ
M _{max}	-0,1900 N·m	M _{max}
M _{min}	-0,1630 N·m	M _{min}
R (99,73%)	0,1400 N·m	R (99,73%)
s	0,0390 N·m	s
6 s	0,2340 N·m	6 s
N·m ²	-0,5030 N·m	N·m ²

Homologation	Machine capability test - MCT	Homologation
Cm	9,0155%	Cm
Cmk	5,254%	Cmk
	Capacity index Cm	7,6201
	Capacity index Cmk	4,5291

Measurement result

Nr.	Torque			Angle		
	(N·m)	Difference (%)	(°)	Difference (%)	Difference (%)	Difference (%)
1	14,003 N·m	0,003 N·m	0,02%	29,75°	-0,25°	-0,83%
2	14,023 N·m	0,023 N·m	0,16%	30,00°	0,00°	0,00%
3	14,015 N·m	0,015 N·m	0,11%	29,50°	-0,50°	-1,67%
4	14,031 N·m	0,031 N·m	0,22%	29,75°	-0,25°	-0,83%
5	14,031 N·m	0,031 N·m	0,22%	29,50°	-0,50°	-1,67%
6	14,038 N·m	0,038 N·m	0,27%	30,00°	0,00°	0,00%
7	14,031 N·m	0,031 N·m	0,22%	29,50°	-0,50°	-1,67%
8	14,058 N·m	0,058 N·m	0,41%	29,75°	-0,25°	-0,83%
9	14,027 N·m	0,027 N·m	0,19%	29,75°	-0,25°	-0,83%
10	14,038 N·m	0,038 N·m	0,27%	29,75°	-0,25°	-0,83%
11	14,054 N·m	0,054 N·m	0,39%	29,75°	-0,25°	-0,83%
12	14,077 N·m	0,077 N·m	0,55%	30,00°	0,00°	0,00%
13	14,038 N·m	0,038 N·m	0,27%	30,00°	0,00°	0,00%
14	14,077 N·m	0,077 N·m	0,55%	29,75°	-0,25°	-0,83%
15	14,070 N·m	0,070 N·m	0,50%	29,75°	-0,25°	-0,83%
16	14,042 N·m	0,042 N·m	0,30%	30,25°	0,25°	0,83%
17	14,042 N·m	0,042 N·m	0,30%	29,75°	-0,25°	-0,83%
18	14,019 N·m	0,019 N·m	0,14%	29,75°	-0,25°	-0,83%
19	14,050 N·m	0,050 N·m	0,36%	29,75°	-0,25°	-0,83%
20	14,031 N·m	0,031 N·m	0,22%	29,50°	-0,50°	-1,67%
21	14,046 N·m	0,046 N·m	0,33%	29,75°	-0,25°	-0,83%
22	14,019 N·m	0,019 N·m	0,14%	29,50°	-0,50°	-1,67%
23	14,058 N·m	0,058 N·m	0,41%	29,75°	-0,25°	-0,83%
24	14,025 N·m	0,025 N·m	0,18%	29,50°	-0,50°	-1,67%
25	14,050 N·m	0,050 N·m	0,36%	29,75°	-0,25°	-0,83%
26	14,070 N·m	0,070 N·m	0,50%	29,75°	-0,25°	-0,83%
27	13,999 N·m	-0,001 N·m	-0,01%	29,50°	-0,50°	-1,67%
28	14,042 N·m	0,042 N·m	0,30%	29,50°	-0,50°	-1,67%
29	14,019 N·m	0,019 N·m	0,14%	29,75°	-0,25°	-0,83%
30	14,042 N·m	0,042 N·m	0,30%	29,75°	-0,25°	-0,83%
31	14,054 N·m	0,054 N·m	0,39%	29,75°	-0,25°	-0,83%
32	14,062 N·m	0,062 N·m	0,44%	30,00°	0,00°	0,00%
33	14,070 N·m	0,070 N·m	0,50%	30,25°	0,25°	0,83%
34	14,050 N·m	0,050 N·m	0,36%	30,25°	0,25°	0,83%
35	14,089 N·m	0,089 N·m	0,64%	30,50°	0,50°	1,67%
36	14,062 N·m	0,062 N·m	0,44%	30,25°	0,25°	0,83%
37	14,077 N·m	0,077 N·m	0,55%	30,75°	0,75°	2,50%
38	14,058 N·m	0,058 N·m	0,41%	30,50°	0,50°	1,67%
39	14,023 N·m	0,023 N·m	0,16%	30,50°	0,50°	1,67%
40	14,074 N·m	0,074 N·m	0,53%	30,25°	0,25°	0,83%
41	14,081 N·m	0,081 N·m	0,58%	30,50°	0,50°	1,67%
42	14,023 N·m	0,023 N·m	0,16%	30,25°	0,25°	0,83%
43	14,043 N·m	0,043 N·m	0,31%	30,25°	0,25°	0,83%
44	14,070 N·m	0,070 N·m	0,50%	30,50°	0,50°	1,67%
45	14,003 N·m	0,003 N·m	0,02%	30,25°	0,25°	0,83%
46	14,015 N·m	0,015 N·m	0,11%	30,00°	0,00°	0,00%
47	14,007 N·m	0,007 N·m	0,05%	29,50°	-0,50°	-1,67%
48	14,031 N·m	0,031 N·m	0,22%	29,50°	-0,50°	-1,67%
49	14,035 N·m	0,035 N·m	0,25%	30,00°	0,00°	0,00%
50	14,007 N·m	0,007 N·m	0,05%	29,50°	-0,50°	-1,67%
51	13,968 N·m	-0,032 N·m	-0,23%	29,50°	-0,50°	-1,67%
52	13,960 N·m	-0,020 N·m	-0,14%	29,50°	-0,50°	-1,67%
53	14,034 N·m	0,034 N·m	0,24%	29,25°	-0,75°	-2,50%
54	14,011 N·m	0,011 N·m	0,08%	30,50°	0,50°	1,67%
55	13,921 N·m	-0,079 N·m	-0,56%	30,00°	0,00°	0,00%
56	14,023 N·m	0,023 N·m	0,16%	30,25°	0,25°	0,83%
57	13,945 N·m	-0,055 N·m	-0,39%	30,00°	0,00°	0,00%
58	14,048 N·m	0,048 N·m	0,34%	30,00°	0,00°	0,00%
59	13,910 N·m	-0,090 N·m	-0,64%	30,00°	0,00°	0,00%
60	13,980 N·m	-0,020 N·m	-0,14%	29,75°	-0,25°	-0,83%
61	13,937 N·m	-0,063 N·m	-0,45%	29,25°	-0,75°	-2,50%
62	13,945 N·m	-0,055 N·m	-0,39%	30,00°	0,00°	0,00%
63	13,984 N·m	-0,016 N·m	-0,11%	30,00°	0,00°	0,00%
64	13,953 N·m	-0,047 N·m	-0,34%	30,00°	0,00°	0,00%
65	13,980 N·m	-0,020 N·m	-0,14%	30,00°	0,00°	0,00%
66	13,968 N·m	-0,012 N·m	-0,09%	29,75°	-0,25°	-0,83%
67	13,992 N·m	-0,008 N·m	-0,06%	29,75°	-0,25°	-0,83%
68	14,003 N·m	0,003 N·m	0,02%	30,00°	0,00°	0,00%
69	13,976 N·m	-0,024 N·m	-0,17%	30,00°	0,00°	0,00%
70	13,988 N·m	-0,012 N·m	-0,09%	30,00°	0,00°	0,00%
71	14,003 N·m	0,003 N·m	0,02%	30,00°	0,00°	0,00%
72	13,999 N·m	-0,001 N·m	-0,01%	29,75°	-0,25°	-0,83%
73	14,023 N·m	0,023 N·m	0,16%	30,00°	0,00°	0,00%
74	13,976 N·m	-0,024 N·m	-0,17%	30,25°	0,25°	0,83%
75	14,015 N·m	0,015 N·m	0,11%	30,50°	0,50°	1,67%
76	14,003 N·m	0,003 N·m	0,02%	30,25°	0,25°	0,83%
77	13,949 N·m	-0,051 N·m	-0,36%	29,50°	-0,50°	-1,67%
78	13,937 N·m	-0,063 N·m	-0,45%	30,25°	0,25°	0,83%
79	13,980 N·m	-0,020 N·m	-0,14%	30,00°	0,00°	0,00%
80	13,966 N·m	-0,034 N·m	-0,24%	30,00°	0,00°	0,00%
81	13,992 N·m	-0,008 N·m	-0,06%	29,75°	-0,25°	-0,83%
82	14,007 N·m	0,007 N·m	0,05%	30,25°	0,25°	0,83%
83	14,034 N·m	0,034 N·m	0,24%	29,75°	-0,25°	-0,83%
84	14,003 N·m	0,003 N·m	0,02%	30,00°	0,00°	0,00%
85	14,019 N·m	0,019 N·m	0,14%	30,00°	0,00°	0,00%
86	13,996 N·m	-0,004 N·m	-0,03%	29,75°	-0,25°	-0,83%
87	14,035 N·m	0,035 N·m	0,25%	30,25°	0,25°	0,83%
88	14,046 N·m	0,046 N·m	0,33%	30,00°	0,00°	0,00%
89	14,031 N·m	0,031 N·m	0,22%	30,00°	0,00°	0,00%
90	14,023 N·m	0,023 N·m	0,16%	30,00°	0,00°	0,00%
91	14,066 N·m	0,066 N·m	0,47%	30,00°	0,00°	0,00%
92	14,031 N·m	0,031 N·m	0,22%	30,25°	0,25°	0,83%
93	14,042 N·m	0,042 N·m	0,30%	30,00°	0,00°	0,00%
94	14,046 N·m	0,046 N·m	0,33%	30,25°	0,25°	0,83%
95	14,046 N·m	0,046 N·m	0,33%	30,00°	0,00°	0,00%
96	14,070 N·m	0,070 N·m	0,50%	30,00°	0,00°	0,00%
97	14,062 N·m	0,062 N·m	0,44%	30,00°	0,00°	0,00%
98	14,064 N·m	0,064 N·m	0,46%	30,00°	0,00°	0,00%
99	14,081 N·m	0,081 N·m				

3 - Chart - 100% - 30°-hard



1 - test point 100% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{meas}):	14,000 N·m	Target: 360,00 (degree)
Rotation angle starting torque (M_{st}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T_u/M_{meas}):	14,98 N·m	(T _u /M _{meas}): 375,00 (degree)
Lower tolerance (T_l/M_{meas}):	13,02 N·m	(T _l /M _{meas}): 345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	13,968 N·m	Average	\bar{x}	358,7500°	
M _{max}	14,070 N·m	Maximal	M _{max}	367,0000°	
M _{min}	13,820 N·m	Minimal	M _{min}	350,5000°	
R (99,73%)	0,150 N·m	Scatter	R (99,73%)	16,5000°	
s	0,0414 N·m	Standard deviation	s	4,2018°	
σ	0,2462 N·m	6 x Standard deviation	σ	25,2108°	
N·m ^u	6,984 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	7,8965	Capability index Cm	1,1904	Cm	1,1904
Cmk	7,8796	Capability index Cmk	1,1908	Cmk	1,1908

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{meas}):	14,000 N·m	Target: 360,00 (degree)
Rotation angle starting torque (M_{st}):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T_u/M_{meas}):	14,98 N·m	(T _u /M _{meas}): 375,00 (degree)
Lower tolerance (T_l/M_{meas}):	13,02 N·m	(T _l /M _{meas}): 345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	14,017 N·m	Average	\bar{x}	361,1620°	
M _{max}	14,050 N·m	Maximal	M _{max}	367,9000°	
M _{min}	14,000 N·m	Minimal	M _{min}	353,7000°	
R (99,73%)	0,050 N·m	Scatter	R (99,73%)	14,2000°	
s	0,0168 N·m	Standard deviation	s	3,1348°	
σ	0,2462 N·m	6 x Standard deviation	σ	18,8887°	
N·m ^u	7,0068 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	25,9146	Capability index Cm	1,5884	Cm	1,5884
Cmk	25,5525	Capability index Cmk	1,5915	Cmk	1,5915

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M_{meas}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M_{st}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,980 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	-0,980 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T_u/M_{meas}):	0,980 N·m	(T _u /M _{meas}): 15,00 (degree)
Lower tolerance (T_l/M_{meas}):	-0,980 N·m	(T _l /M _{meas}): -15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

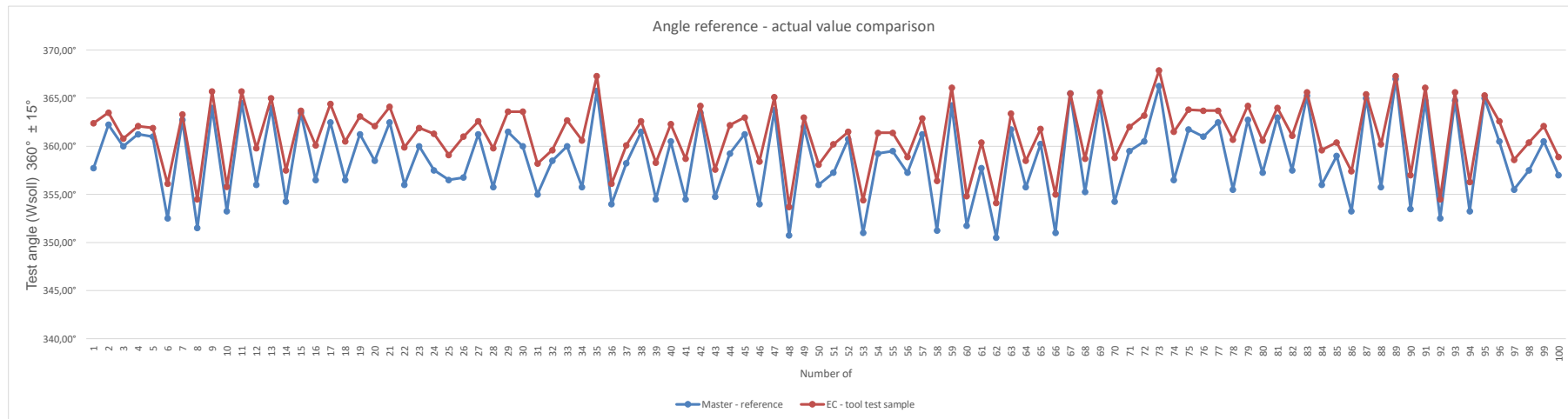
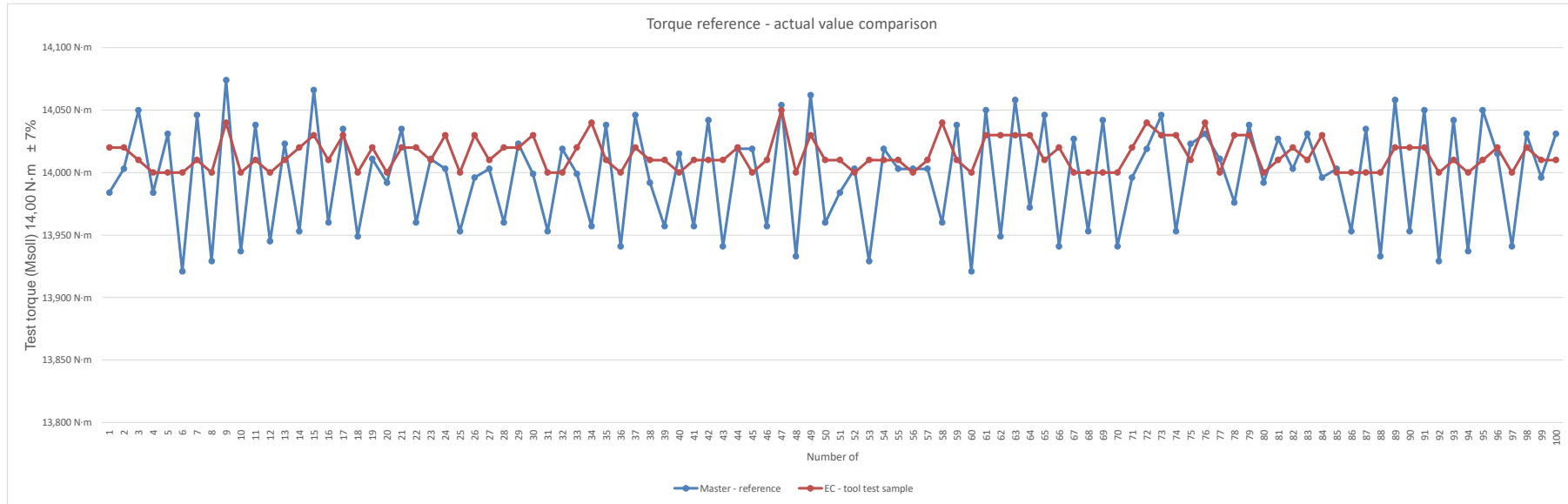
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0169 N·m	Average	\bar{x}	-2,4120°	
M _{max}	0,0420 N·m	Maximal	M _{max}	0,0000°	
M _{min}	-0,0830 N·m	Minimal	M _{min}	-5,2000°	
R (99,73%)	0,1250 N·m	Scatter	R (99,73%)	5,2000°	
s	0,0398 N·m	Standard deviation	s	1,2367°	
σ	0,2392 N·m	6 x Standard deviation	σ	7,4204°	
N·m ^u	-0,0085 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	8,3689	Capability index Cm	3,6558	Cm	3,6558
Cmk	8,2438	Capability index Cmk	3,2326	Cmk	3,2326

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB SN: 18240032 Date: 2018-07-30

Measurement result				Measurement result			
Nr.	Torque		Difference (%)	Angle		Difference (%)	Difference (%)
	(N·m)	(N·m)		(°)	(°)		
1	13,984 N·m	-0,016 N·m	-0,11%	357,75°	-2,25°	-0,62%	
2	14,003 N·m	0,003 N·m	0,02%	362,25°	2,25°	0,63%	
3	14,005 N·m	0,005 N·m	0,36%	360,00°	0,00°	0,00%	
4	14,001 N·m	-0,016 N·m	-0,11%	361,25°	4,00°	1,11%	
5	14,031 N·m	0,031 N·m	0,22%	361,00°	1,00°	0,28%	
6	13,921 N·m	-0,079 N·m	-0,56%	352,50°	-7,50°	-2,08%	
7	14,046 N·m	0,046 N·m	0,33%	362,75°	2,75°	0,76%	
8	13,929 N·m	-0,071 N·m	-0,51%	351,50°	-8,50°	-2,38%	
9	14,007 N·m	0,007 N·m	0,03%	361,00°	4,00°	1,11%	
10	13,937 N·m	-0,063 N·m	-0,45%	353,25°	-6,75°	-1,88%	
11	14,038 N·m	0,038 N·m	0,27%	364,50°	4,50°	1,25%	
12	13,945 N·m	-0,055 N·m	-0,39%	356,00°	-4,00°	-1,11%	
13	14,023 N·m	0,023 N·m	0,16%	364,00°	4,00°	1,11%	
14	13,963 N·m	-0,047 N·m	-0,34%	354,25°	-5,75°	-1,60%	
15	14,066 N·m	0,066 N·m	0,47%	363,50°	3,50°	0,97%	
16	13,960 N·m	-0,040 N·m	-0,29%	356,50°	-3,50°	-0,97%	
17	14,035 N·m	0,035 N·m	0,25%	362,50°	2,50°	0,69%	
18	13,949 N·m	-0,051 N·m	-0,36%	356,50°	-3,50°	-0,97%	
19	14,001 N·m	0,001 N·m	0,01%	361,25°	1,25°	0,35%	
20	13,992 N·m	-0,008 N·m	-0,06%	358,50°	-1,50°	-0,42%	
21	14,035 N·m	0,035 N·m	0,25%	362,50°	2,50°	0,69%	
22	13,960 N·m	-0,040 N·m	-0,29%	356,00°	-4,00°	-1,11%	
23	14,011 N·m	0,011 N·m	0,08%	360,00°	0,00°	0,00%	
24	14,003 N·m	0,003 N·m	0,03%	361,25°	1,25°	0,35%	
25	13,953 N·m	-0,047 N·m	-0,34%	356,50°	-3,50°	-0,97%	
26	13,996 N·m	-0,004 N·m	-0,03%	356,75°	-3,25°	-0,90%	
27	14,003 N·m	0,003 N·m	0,02%	361,25°	1,25°	0,35%	
28	13,960 N·m	-0,040 N·m	-0,29%	355,75°	-4,25°	-1,18%	
29	14,023 N·m	0,023 N·m	0,16%	361,25°	1,25°	0,35%	
30	13,999 N·m	-0,001 N·m	-0,01%	360,00°	0,00°	0,00%	
31	13,953 N·m	-0,047 N·m	-0,34%	356,00°	-5,00°	-1,39%	
32	14,019 N·m	0,019 N·m	0,14%	358,50°	-1,50°	-0,42%	
33	13,999 N·m	-0,001 N·m	-0,01%	360,00°	0,00°	0,00%	
34	14,007 N·m	0,007 N·m	0,05%	361,00°	1,00°	0,28%	
35	14,038 N·m	0,038 N·m	0,27%	365,75°	5,75°	1,60%	
36	13,941 N·m	-0,059 N·m	-0,42%	354,00°	-6,00°	-1,67%	
37	14,046 N·m	0,046 N·m	0,33%	358,25°	-1,75°	-0,49%	
38	13,992 N·m	-0,008 N·m	-0,06%	361,50°	1,50°	0,42%	
39	14,007 N·m	0,007 N·m	0,05%	361,25°	1,25°	0,35%	
40	14,015 N·m	0,015 N·m	0,11%	360,50°	0,50°	0,14%	
41	13,957 N·m	-0,043 N·m	-0,31%	354,50°	-5,50°	-1,53%	
42	14,042 N·m	0,042 N·m	0,30%	363,50°	3,50°	0,97%	
43	14,033 N·m	0,033 N·m	0,24%	354,75°	-4,25°	-1,26%	
44	14,019 N·m	0,019 N·m	0,14%	360,25°	0,25°	0,07%	
45	14,019 N·m	0,019 N·m	0,14%	361,25°	1,25°	0,35%	
46	13,957 N·m	-0,043 N·m	-0,31%	354,00°	-6,00°	-1,67%	
47	14,054 N·m	0,054 N·m	0,39%	363,75°	3,75°	1,04%	
48	13,933 N·m	-0,067 N·m	-0,48%	359,75°	-3,25°	-0,92%	
49	14,023 N·m	0,023 N·m	0,16%	360,25°	0,25°	0,07%	
50	14,015 N·m	0,015 N·m	0,11%	360,50°	0,50°	0,14%	
51	13,984 N·m	-0,016 N·m	-0,11%	357,25°	-2,75°	-0,76%	
52	14,003 N·m	0,003 N·m	0,02%	360,75°	0,75°	0,21%	
53	14,003 N·m	0,003 N·m	0,02%	351,00°	-8,00°	-2,29%	
54	14,019 N·m	0,019 N·m	0,14%	360,25°	0,25°	0,07%	
55	14,003 N·m	0,003 N·m	0,02%	359,50°	-0,50°	-0,14%	
56	14,003 N·m	0,003 N·m	0,02%	357,25°	-2,75°	-0,76%	
57	14,003 N·m	0,003 N·m	0,02%	361,25°	1,25°	0,35%	
58	14,038 N·m	0,038 N·m	0,27%	361,25°	1,25°	0,35%	
59	13,921 N·m	-0,079 N·m	-0,56%	351,75°	-8,25°	-2,29%	
60	14,050 N·m	0,050 N·m	0,36%	357,75°	2,25°	0,62%	
61	13,949 N·m	-0,051 N·m	-0,36%	350,50°	-9,50°	-2,64%	
62	14,038 N·m	0,038 N·m	0,27%	361,75°	1,75°	0,49%	
63	13,972 N·m	-0,047 N·m	-0,34%	355,50°	-3,50°	-1,00%	
64	14,046 N·m	0,046 N·m	0,33%	360,25°	0,25°	0,07%	
65	13,941 N·m	-0,059 N·m	-0,42%	351,00°	-9,00°	-2,59%	
66	14,027 N·m	0,027 N·m	0,19%	365,50°	5,50°	1,53%	
67	13,983 N·m	-0,047 N·m	-0,34%	355,25°	-4,75°	-1,32%	
68	14,042 N·m	0,042 N·m	0,30%	364,50°	4,50°	1,25%	
69	14,027 N·m	0,027 N·m	0,19%	354,25°	-5,75°	-1,60%	
70	13,996 N·m	-0,004 N·m	-0,03%	359,50°	-0,50°	-0,14%	
71	14,019 N·m	0,019 N·m	0,14%	360,50°	0,50°	0,14%	
72	14,046 N·m	0,046 N·m	0,33%	366,25°	6,25°	1,74%	
73	13,978 N·m	-0,024 N·m	-0,17%	365,50°	5,50°	1,53%	
74	13,953 N·m	-0,047 N·m	-0,34%	360,50°	0,50°	0,14%	
75	14,023 N·m	0,023 N·m	0,16%	361,75°	1,75°	0,49%	
76	14,031 N·m	0,031 N·m	0,22%	361,00°	1,00°	0,28%	
77	14,011 N·m	0,011 N·m	0,08%	362,50°	2,50°	0,69%	
78	13,978 N·m	-0,024 N·m	-0,17%	365,50°	5,50°	1,53%	
79	14,038 N·m	0,038 N·m	0,27%	360,75°	0,75°	0,21%	
80	13,992 N·m	-0,008 N·m	-0,06%	357,25°	-2,75°	-0,76%	
81	14,027 N·m	0,027 N·m	0,19%	363,00°	3,00°	0,83%	
82	14,003 N·m	0,003 N·m	0,02%	363,00°	3,00°	0,83%	
83	14,003 N·m	0,003 N·m	0,02%	363,00°	3,00°	0,83%	
84	14,027 N·m	0,027 N·m	0,19%	363,00°	3,00°	0,83%	
85	14,003 N·m	0,003 N·m	0,02%	363,00°	3,00°	0,83%	
86	13,953 N·m	-0,047 N·m	-0,34%	352,50°	-7,50°	-2,08%	
87	14,035 N·m	0,035 N·m	0				

1 - Chart - 100% - 360°-soft



2 - test point 100% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	14,000 N·m	Target: 360,00 (degree)
Rotation angle starting torque (M ₀):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T _u /M _{test}):	14,98 N·m	(T _u /M _{test}): 375,00 (degree)
Lower tolerance (T _l /M _{test}):	13,02 N·m	(T _l /M _{test}): 345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	14,0176 N·m	Number of measurements	357,1575°	\bar{x}	357,1575°
σ	14,0810 N·m	Maximal	363,5000°	M _{max}	363,5000°
M _{max}	13,9760 N·m	Minimal	352,0000°	M _{min}	352,0000°
M _{min}	0,1050 N·m	Scatter	11,5000°	R (99,73%)	11,5000°
R (99,73%)	0,0210 N·m	Standard deviation	2,7388°	s	2,7388°
s	0,1281 N·m	6 x Standard deviation	16,4328°	6 s	16,4328°
N·m ²	7,0088 N·m	Torque rate			

Homologation		Machine capacity test - MCT		Homologation	
Cm	15,5451	Capacity index Cm	1,8256	Cm	1,8256
Cmk	15,2526	Capacity index Cmk	1,4737	Cmk	1,4737

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	14,000 N·m	Target: 360,00 (degree)
Rotation angle starting torque (M ₀):	7,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T _u /M _{test}):	14,98 N·m	(T _u /M _{test}): 375,00 (degree)
Lower tolerance (T _l /M _{test}):	13,02 N·m	(T _l /M _{test}): 345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	14,0160 N·m	Number of measurements	357,1575°	\bar{x}	357,1575°
σ	14,0500 N·m	Maximal	364,8000°	M _{max}	364,8000°
M _{max}	14,0000 N·m	Minimal	353,0000°	M _{min}	353,0000°
M _{min}	0,0500 N·m	Scatter	11,8000°	R (99,73%)	11,8000°
R (99,73%)	0,0176 N·m	Standard deviation	2,7388°	s	2,7388°
s	0,1281 N·m	6 x Standard deviation	16,4328°	6 s	16,4328°
N·m ²	7,0080 N·m	Torque rate			

Homologation		Machine capacity test - MCT		Homologation	
Cm	24,6404	Capacity index Cm	1,9477	Cm	1,9477
Cmk	24,2393	Capacity index Cmk	1,8046	Cmk	1,8046

Difference evaluation

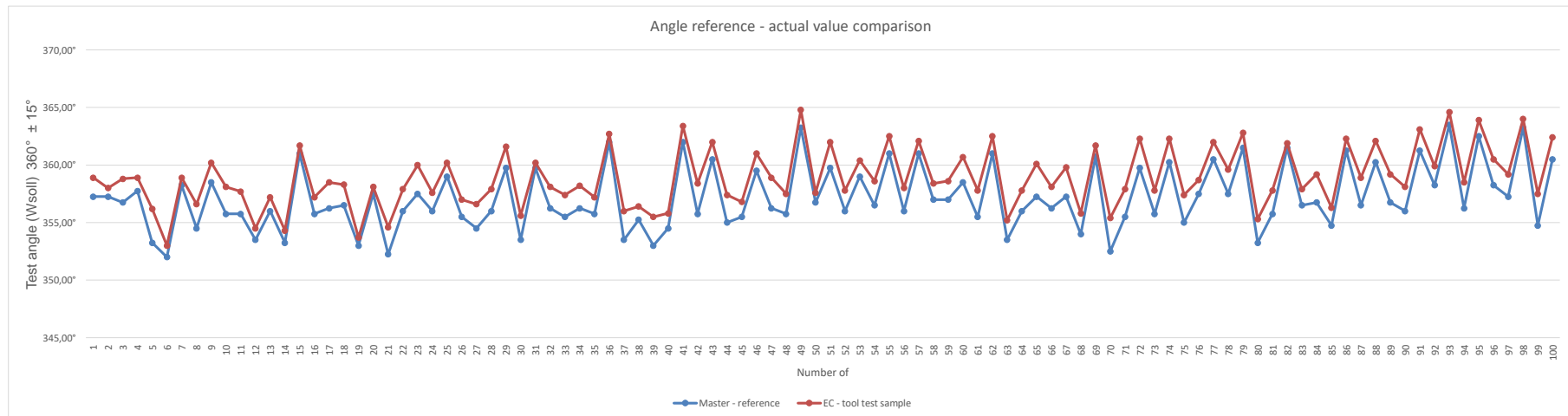
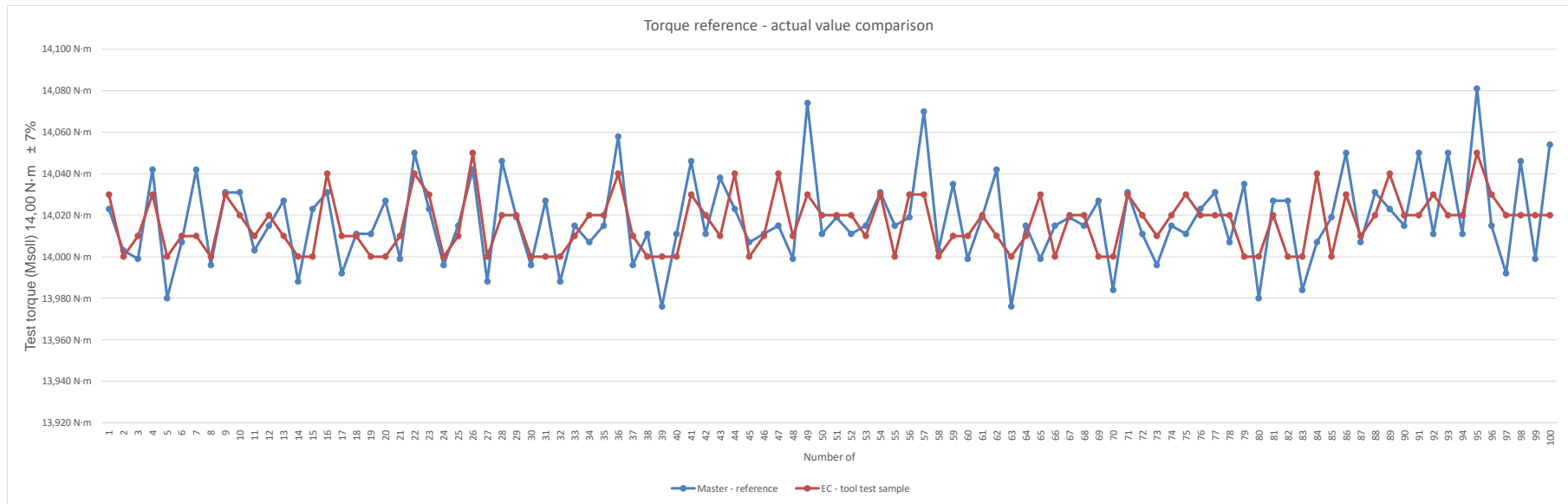
Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	100 %	
Test torque (M _{test}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M ₀):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 15,00 (degree)
+ Tolerance:	0,980 N·m	+ Tolerance: 15,00 (degree)
- Tolerance:	-0,980 N·m	- Tolerance: 15,00 (degree)
Upper tolerance (T _u /M _{test}):	0,980 N·m	(T _u /M _{test}): 15,00 (degree)
Lower tolerance (T _l /M _{test}):	-0,980 N·m	(T _l /M _{test}): -15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	0,0016 N·m	Number of measurements	-1,7405°	\bar{x}	-1,7405°
σ	0,0440 N·m	Maximal	-0,4000°	M _{max}	-0,4000°
M _{max}	-0,0300 N·m	Minimal	-2,9500°	M _{min}	-2,9500°
M _{min}	0,0770 N·m	Scatter	2,5500°	R (99,73%)	2,5500°
R (99,73%)	0,0176 N·m	Standard deviation	0,5968°	s	0,5968°
s	0,0099 N·m	6 x Standard deviation	3,5812°	6 s	3,5812°
N·m ²	0,0008 N·m	Torque rate			

Homologation		Machine capacity test - MCT		Homologation	
Cm	18,5138	Capacity index Cm	8,3771	Cm	8,3771
Cmk	18,0528	Capacity index Cmk	7,6528	Cmk	7,6528

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB									
Measurement result									
Nr.	Torque			Angle			Difference (%)	Difference (%)	Difference (%)
	(N·m)	(N·m)	(%)	(°)	(°)	(%)			
1	14,023 N·m	0,023 N·m	0,16%	357,25°	-2,75°	-0,76%			
2	14,003 N·m	0,003 N·m	0,02%	357,25°	-2,75°	-0,76%			
3	13,989 N·m	-0,001 N·m	-0,01%	356,75°	-3,25°	-0,90%			
4	14,023 N·m	0,023 N·m	0,16%	357,25°	-2,75°	-0,76%			
5	13,980 N·m	-0,020 N·m	-0,14%	353,25°	-6,75°	-1,88%			
6	14,007 N·m	0,007 N·m	0,05%	352,00°	-8,00°	-2,22%			
7	14,042 N·m	0,042 N·m	0,30%	358,25°	-1,75°	-0,49%			
8	13,986 N·m	-0,004 N·m	-0,03%	354,50°	-5,50°	-1,53%			
9	14,031 N·m	0,031 N·m	0,22%	356,00°	-3,00°	-0,82%			
10	14,031 N·m	0,031 N·m	0,22%	355,75°	-4,25°	-1,18%			
11	14,003 N·m	0,003 N·m	0,02%	355,75°	-4,25°	-1,18%			
12	14,015 N·m	0,015 N·m	0,11%	353,50°	-6,50°	-1,81%			
13	14,027 N·m	0,027 N·m	0,19%	356,00°	-4,00°	-1,11%			
14	13,988 N·m	-0,012 N·m	-0,09%	353,25°	-6,75°	-1,88%			
15	14,023 N·m	0,023 N·m	0,16%	361,00°	1,00°	0,28%			
16	14,031 N·m	0,031 N·m	0,22%	355,75°	-4,25°	-1,18%			
17	13,992 N·m	-0,008 N·m	-0,06%	356,25°	-3,75°	-1,04%			
18	14,011 N·m	0,011 N·m	0,08%	356,50°	-3,50°	-0,97%			
19	14,011 N·m	0,011 N·m	0,08%	353,00°	-7,00°	-1,94%			
20	14,027 N·m	0,027 N·m	0,19%	357,50°	-2,50°	-0,69%			
21	13,999 N·m	-0,001 N·m	-0,01%	352,25°	-7,25°	-2,15%			
22	14,050 N·m	0,050 N·m	0,36%	356,00°	-4,00°	-1,11%			
23	14,023 N·m	0,023 N·m	0,16%	357,50°	-2,50°	-0,69%			
24	13,986 N·m	-0,004 N·m	-0,03%	356,50°	-3,50°	-0,97%			
25	14,015 N·m	0,015 N·m	0,11%	359,00°	-1,00°	0,28%			
26	14,042 N·m	0,042 N·m	0,30%	355,50°	-4,50°	-1,25%			
27	13,988 N·m	-0,012 N·m	-0,09%	354,50°	-5,50°	-1,53%			
28	14,046 N·m	0,046 N·m	0,33%	356,00°	-4,00°	-1,11%			
29	14,019 N·m	0,019 N·m	0,14%	353,25°	-6,75°	-1,88%			
30	13,986 N·m	-0,004 N·m	-0,03%	353,50°	-6,50°	-1,81%			
31	14,027 N·m	0,027 N·m	0,19%	359,75°	-0,25°	0,07%			
32	13,988 N·m	-0,012 N·m	-0,09%	356,25°	-3,75°	-1,04%			
33	14,015 N·m	0,015 N·m	0,11%	355,50°	-4,50°	-1,25%			
34	14,015 N·m	0,015 N·m	0,11%	356,25°	-3,25°	-0,90%			
35	14,015 N·m	0,015 N·m	0,11%	355,75°	-4,25°	-1,18%			
36	14,058 N·m	0,058 N·m	0,41%	362,00°	2,00°	0,56%			
37	13,996 N·m	-0,004 N·m	-0,03%	353,50°	-6,50°	-1,81%			
38	14,011 N·m	0,011 N·m	0,08%	355,25°	-4,75°	-1,32%			
39	14,015 N·m	0,015 N·m	0,11%	356,00°	-4,00°	-1,11%			
40	14,011 N·m	0,011 N·m	0,08%	354,50°	-5,50°	-1,53%			
41	14,046 N·m	0,046 N·m	0,33%	362,00°	2,00°	0,56%			
42	14,011 N·m	0,011 N·m	0,08%	355,75°	-4,25°	-1,18%			
43	14,023 N·m	0,023 N·m	0,16%	360,50°	0,50°	0,14%			
44	14,023 N·m	0,023 N·m	0,16%	357,25°	-2,75°	-0,76%			
45	14,007 N·m	0,007 N·m	0,05%	355,50°	-4,50°	-1,25%			
46	14,011 N·m	0,011 N·m	0,08%	359,50°	-0,50°	0,14%			
47	14,011 N·m	0,011 N·m	0,08%	356,25°	-3,75°	-1,04%			
48	13,986 N·m	-0,001 N·m	-0,01%	355,75°	-4,25°	-1,18%			
49	14,014 N·m	0,014 N·m	0,10%	357,00°	-3,00°	-0,82%			
50	14,011 N·m	0,011 N·m	0,08%	356,75°	-3,25°	-0,90%			
51	14,019 N·m	0,019 N·m	0,14%	359,75°	-0,25°	0,07%			
52	14,011 N·m	0,011 N·m	0,08%	356,00°	-4,00°	-1,11%			
53	14,015 N·m	0,015 N·m	0,11%	359,00°	-1,00°	0,28%			
54	14,031 N·m	0,031 N·m	0,22%	355,00°	-5,00°	-1,39%			
55	14,015 N·m	0,015 N·m	0,11%	361,00°	1,00°	0,28%			
56	14,019 N·m	0,019 N·m	0,14%	356,00°	-4,00°	-1,11%			
57	14,070 N·m	0,070 N·m	0,50%	361,00°	1,00°	0,28%			
58	14,033 N·m	0,033 N·m	0,24%	357,00°	-3,00°	-0,82%			
59	14,035 N·m	0,035 N·m	0,25%	357,00°	-3,00°	-0,82%			
60	13,989 N·m	-0,001 N·m	-0,01%	358,50°	-3,50°	-0,94%			
61	14,019 N·m	0,019 N·m	0,14%	355,50°	-4,50°	-1,25%			
62	14,042 N·m	0,042 N·m	0,30%	361,00°	1,00°	0,28%			
63	14,011 N·m	0,011 N·m	0,08%	353,50°	-6,50°	-1,81%			
64	14,015 N·m	0,015 N·m	0,11%	356,00°	-4,00°	-1,11%			
65	13,989 N·m	-0,001 N·m	-0,01%	357,25°	-2,75°	-0,76%			
66	14,015 N·m	0,015 N·m	0,11%	356,25°	-3,25°	-0,90%			
67	14,019 N·m	0,019 N·m	0,14%	357,25°	-2,75°	-0,76%			
68	14,015 N·m	0,015 N·m	0,11%	354,00°	-6,00°	-1,67%			
69	14,027 N·m	0,027 N·m	0,19%	360,75°	0,75°	0,21%			
70	13,984 N·m	-0,016 N·m	-0,11%	352,50°	-7,50°	-2,08%			
71	14,031 N·m	0,031 N·m	0,22%	355,50°	-4,50°	-1,25%			
72	14,011 N·m	0,011 N·m	0,08%	356,75°	-3,25°	-0,90%			
73	13,986 N·m	-0,004 N·m	-0,03%	355,75°	-4,25°	-1,18%			
74	14,015 N·m	0,015 N·m	0,11%	360,25°	0,25°	0,07%			
75	14,011 N·m	0,011 N·m	0,08%	355,00°	-5,00°	-1,39%			
76	14,023 N·m	0,023 N·m	0,16%						

2 - Chart - 100% - 360°-soft



3 - test point 100% - 360° soft

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	100 %		
Test torque (M_{test}):	14,000 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M₀):	7,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	14,98 N·m	(T_u/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	13,02 N·m	(T_l/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)	Statistical evaluation	Angle (degree)
n	n	n
100	100	100
\bar{x}	\bar{x}	\bar{x}
13,956 N·m	359,502°	362,940°
σ	σ	σ
14,070 N·m	367,750°	369,000°
M _{max}	M _{max}	M _{max}
13,825 N·m	363,250°	368,000°
M _{min}	M _{min}	M _{min}
14,150 N·m	365,250°	369,000°
R (99,73%)	R (99,73%)	R (99,73%)
0,445 N·m	14,500°	14,500°
s	s	s
0,0459 N·m	3,631°	3,631°
6 s	6 s	6 s
0,2778 N·m	21,789°	21,789°
N·m ²	Torque rate	Torque rate

Homologation	Machine capacity test - MCT	Homologation
Cm	7,1120	Cm
Cmk	7,9590	Cmk
	Capability index Crk	1,3768
	Capability index Crk	1,5311

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	100 %		
Test torque (M_{test}):	14,000 N·m	Target:	360,00 (degree)
Rotation angle starting torque (M₀):	7,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,98 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	0,98 N·m	- Tolerance:	15,00 (degree)
Upper tolerance (T_u/M_{test}):	14,98 N·m	(T_u/M_{test}):	375,00 (degree)
Lower tolerance (T_l/M_{test}):	13,02 N·m	(T_l/M_{test}):	345,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

Torque (N·m)	Statistical evaluation	Angle (degree)
n	n	n
100	100	100
\bar{x}	\bar{x}	\bar{x}
14,016 N·m	362,940°	362,940°
σ	σ	σ
14,040 N·m	369,000°	369,000°
M _{max}	M _{max}	M _{max}
14,000 N·m	368,000°	368,000°
M _{min}	M _{min}	M _{min}
14,040 N·m	365,250°	365,250°
R (99,73%)	R (99,73%)	R (99,73%)
0,040 N·m	10,800°	10,800°
s	s	s
0,0113 N·m	2,366°	2,366°
6 s	6 s	6 s
0,14019°	14,019°	14,019°
N·m ²	Torque rate	Torque rate

Homologation	Machine capacity test - MCT	Homologation
Cm	26,9559	Cm
Cmk	26,4822	Cmk
	Capability index Crk	2,1399
	Capability index Crk	1,8026

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB		
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	100 %		
Test torque (M_{test}):	0,000 N·m	Target:	0,00 (degree)
Rotation angle starting torque (M₀):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	15,00 (degree)
+ Tolerance:	0,980 N·m	+ Tolerance:	15,00 (degree)
- Tolerance:	-0,980 N·m	- Tolerance:	-15,00 (degree)
Upper tolerance (T_u/M_{test}):	0,980 N·m	(T_u/M_{test}):	15,00 (degree)
Lower tolerance (T_l/M_{test}):	-0,980 N·m	(T_l/M_{test}):	-15,00 (degree)
Speed:	1 Step: 550 rpm	2 Step: 50 rpm	

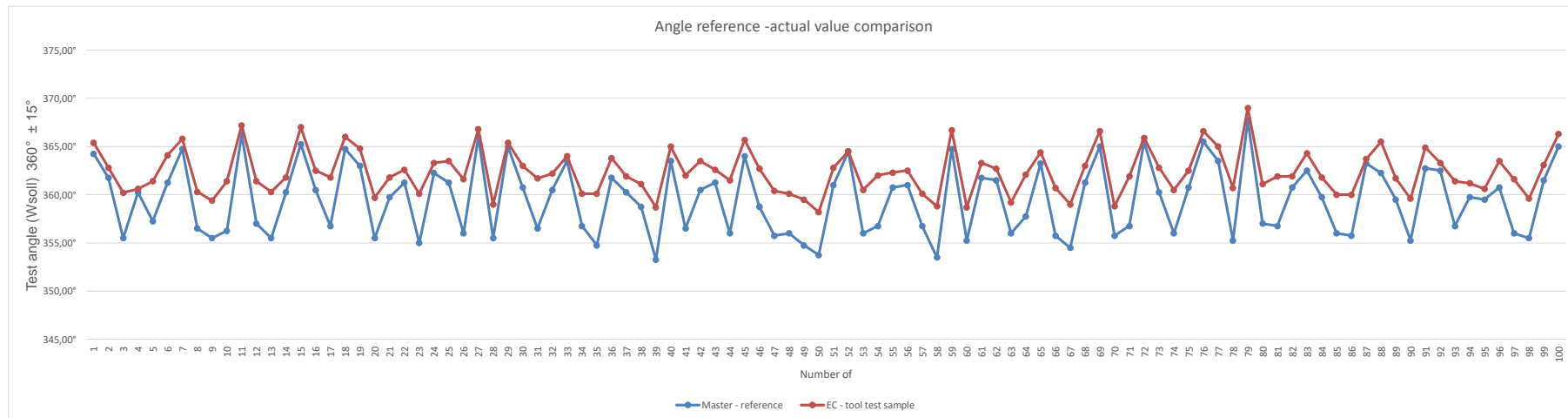
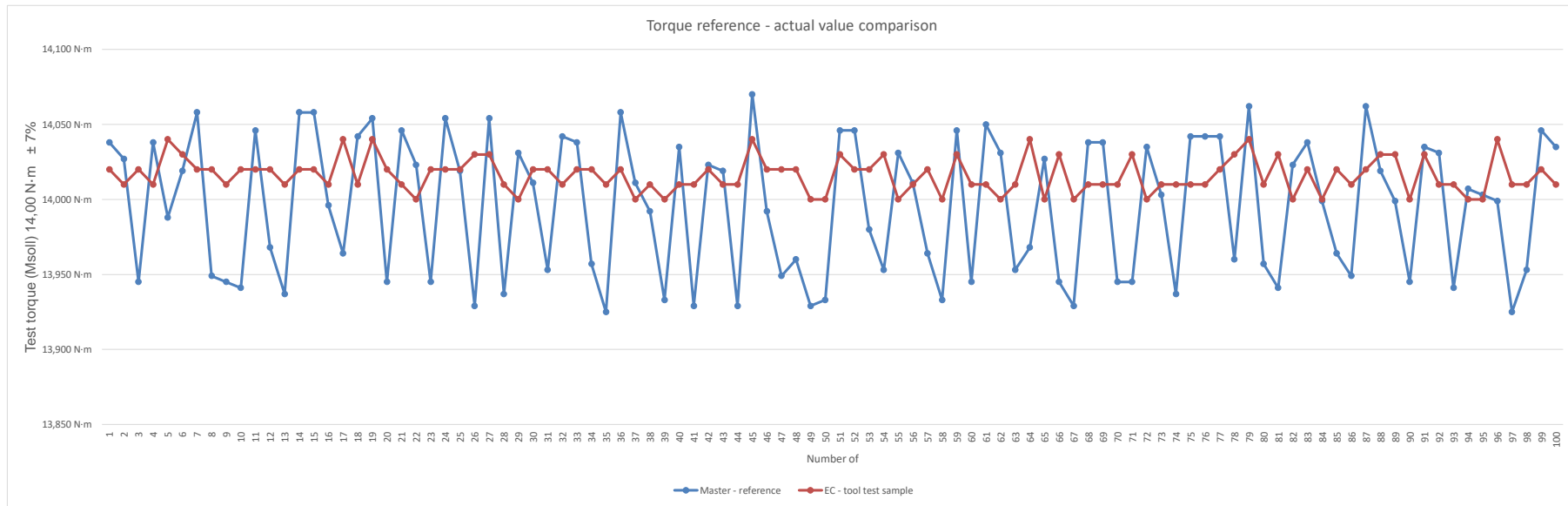
Torque (N·m)	Statistical evaluation	Angle (degree)
n	n	n
100	100	100
\bar{x}	\bar{x}	\bar{x}
-0,0204 N·m	-2,881°	-2,881°
σ	σ	σ
0,0420 N·m	0,000°	0,000°
M _{max}	M _{max}	M _{max}
-0,1010 N·m	-5,600°	-5,600°
M _{min}	M _{min}	M _{min}
0,1430 N·m	1,800°	1,800°
R (99,73%)	R (99,73%)	R (99,73%)
0,445 N·m	5,600°	5,600°
s	s	s
0,0459 N·m	1,800°	1,800°
6 s	6 s	6 s
0,2778 N·m	21,789°	21,789°
N·m ²	Torque rate	Torque rate

Homologation	Machine capacity test - MCT	Homologation
Cm	7,1172	Cm
Cmk	6,5926	Cmk
	Capability index Crk	3,0351
	Capability index Crk	2,4561

TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB SN: 18240041 Date: 2018-07-30

Measurement result				Measurement result									
Nr.	Torque			Angle			Nr.	Torque			Angle		
	(N·m)	Difference (N·m)	Difference (%)	(°)	Difference (°)	Difference (%)		(N·m)	Difference (N·m)	Difference (%)	(°)	Difference (°)	Difference (%)
1	14,038 N·m	0,038 N·m	0,27%	364,25°	4,25°	1,18%	1	14,020 N·m	0,020 N·m	0,14%	365,40°	5,40°	1,50%
2	14,027 N·m	0,027 N·m	0,19%	361,75°	1,75°	0,49%	2	14,010 N·m	0,010 N·m	0,07%	362,80°	2,80°	0,78%
3	13,945 N·m	-0,055 N·m	-0,39%	355,50°	-4,50°	-1,25%	3	14,020 N·m	0,020 N·m	0,14%	360,20°	2,20°	0,63%
4	14,038 N·m	0,038 N·m	0,27%	364,25°	4,25°	1,18%	4	14,010 N·m	0,010 N·m	0,07%	364,80°	9,80°	2,73%
5	13,989 N·m	-0,012 N·m	-0,09%	357,25°	-2,75°	-0,76%	5	14,040 N·m	0,040 N·m	0,29%	361,40°	1,40°	0,39%
6	14,019 N·m	0,019 N·m	0,14%	361,25°	1,25°	0,35%	6	14,030 N·m	0,030 N·m	0,21%	364,10°	4,10°	1,14%
7	14,068 N·m	0,068 N·m	0,41%	364,75°	4,75°	1,32%	7	14,020 N·m	0,020 N·m	0,14%	365,80°	5,80°	1,61%
8	13,949 N·m	-0,051 N·m	-0,36%	355,50°	-4,50°	-1,25%	8	14,020 N·m	0,020 N·m	0,14%	360,30°	0,30°	0,08%
9	14,058 N·m	0,058 N·m	0,41%	363,25°	3,25°	0,90%	9	14,010 N·m	0,010 N·m	0,07%	364,80°	9,80°	2,73%
10	13,941 N·m	-0,059 N·m	-0,42%	355,25°	-3,75°	-1,04%	10	14,020 N·m	0,020 N·m	0,14%	361,40°	1,40°	0,39%
11	14,046 N·m	0,046 N·m	0,33%	366,25°	6,25°	1,74%	11	14,020 N·m	0,020 N·m	0,14%	367,20°	7,20°	2,00%
12	13,968 N·m	-0,032 N·m	-0,23%	357,00°	-3,00°	-0,83%	12	14,020 N·m	0,020 N·m	0,14%	361,40°	1,40°	0,39%
13	13,937 N·m	-0,063 N·m	-0,45%	355,50°	-4,50°	-1,25%	13	14,010 N·m	0,010 N·m	0,07%	360,30°	0,30°	0,08%
14	14,058 N·m	0,058 N·m	0,41%	363,25°	3,25°	0,90%	14	14,020 N·m	0,020 N·m	0,14%	362,80°	2,80°	0,78%
15	14,058 N·m	0,058 N·m	0,41%	363,25°	3,25°	0,90%	15	14,020 N·m	0,020 N·m	0,14%	367,00°	7,00°	1,94%
16	13,996 N·m	-0,044 N·m	-0,31%	360,50°	0,50°	0,14%	16	14,010 N·m	0,010 N·m	0,07%	362,50°	2,50°	0,69%
17	13,964 N·m	-0,036 N·m	-0,26%	356,75°	-3,25°	-0,90%	17	14,040 N·m	0,040 N·m	0,29%	361,80°	1,80°	0,50%
18	14,042 N·m	0,042 N·m	0,30%	364,75°	4,75°	1,32%	18	14,010 N·m	0,010 N·m	0,07%	366,00°	6,00°	1,67%
19	14,058 N·m	0,058 N·m	0,41%	363,25°	3,25°	0,90%	19	14,010 N·m	0,010 N·m	0,07%	364,80°	4,80°	1,33%
20	13,945 N·m	-0,055 N·m	-0,39%	355,50°	-4,50°	-1,25%	20	14,020 N·m	0,020 N·m	0,14%	359,70°	-0,30°	-0,08%
21	14,046 N·m	0,046 N·m	0,33%	359,75°	-0,25°	-0,07%	21	14,010 N·m	0,010 N·m	0,07%	361,80°	1,80°	0,50%
22	14,023 N·m	0,023 N·m	0,16%	361,25°	1,25°	0,35%	22	14,000 N·m	0,000 N·m	0,00%	362,60°	2,60°	0,72%
23	13,945 N·m	-0,055 N·m	-0,39%	355,50°	-4,50°	-1,25%	23	14,020 N·m	0,020 N·m	0,14%	360,10°	0,10°	0,03%
24	14,054 N·m	0,054 N·m	0,39%	362,50°	2,50°	0,69%	24	14,020 N·m	0,020 N·m	0,14%	364,80°	3,80°	1,05%
25	14,019 N·m	0,019 N·m	0,14%	361,25°	1,25°	0,35%	25	14,020 N·m	0,020 N·m	0,14%	363,50°	3,50°	0,97%
26	13,929 N·m	-0,071 N·m	-0,51%	356,00°	-4,00°	-1,11%	26	14,030 N·m	0,030 N·m	0,21%	361,60°	1,60°	0,44%
27	14,054 N·m	0,054 N·m	0,39%	366,00°	6,00°	1,67%	27	14,030 N·m	0,030 N·m	0,21%	366,80°	6,80°	1,89%
28	13,937 N·m	-0,063 N·m	-0,45%	355,50°	-4,50°	-1,25%	28	14,010 N·m	0,010 N·m	0,07%	359,00°	-1,00°	-0,28%
29	14,031 N·m	0,031 N·m	0,22%	360,75°	0,75°	0,21%	29	14,000 N·m	0,000 N·m	0,00%	362,80°	2,80°	0,78%
30	14,011 N·m	0,011 N·m	0,08%	360,75°	0,75°	0,21%	30	14,020 N·m	0,020 N·m	0,14%	363,00°	3,00°	0,83%
31	13,953 N·m	-0,047 N·m	-0,34%	356,50°	-3,50°	-0,97%	31	14,020 N·m	0,020 N·m	0,14%	361,70°	1,70°	0,47%
32	14,042 N·m	0,042 N·m	0,30%	360,50°	0,50°	0,14%	32	14,010 N·m	0,010 N·m	0,07%	362,20°	2,20°	0,61%
33	14,038 N·m	0,038 N·m	0,27%	363,50°	3,50°	0,97%	33	14,020 N·m	0,020 N·m	0,14%	364,00°	4,00°	1,11%
34	14,058 N·m	0,058 N·m	0,41%	363,25°	3,25°	0,90%	34	14,010 N·m	0,010 N·m	0,07%	364,80°	0,10°	0,03%
35	13,925 N·m	-0,075 N·m	-0,54%	354,75°	-5,25°	-1,46%	35	14,010 N·m	0,010 N·m	0,07%	360,10°	0,10°	0,03%
36	14,058 N·m	0,058 N·m	0,41%	361,75°	1,75°	0,49%	36	14,020 N·m	0,020 N·m	0,14%	363,80°	3,80°	1,06%
37	14,011 N·m	0,011 N·m	0,08%	360,25°	0,25°	0,07%	37	14,000 N·m	0,000 N·m	0,00%	361,30°	0,30°	0,08%
38	13,992 N·m	-0,008 N·m	-0,06%	358,75°	-1,25°	-0,35%	38	14,010 N·m	0,010 N·m	0,07%	361,10°	1,10°	0,31%
39	14,037 N·m	0,037 N·m	0,27%	363,75°	3,75°	1,03%	39	14,000 N·m	0,000 N·m	0,00%	364,50°	4,50°	1,23%
40	14,035 N·m	0,035 N·m	0,25%	363,50°	3,50°	0,97%	40	14,010 N·m	0,010 N·m	0,07%	365,00°	5,00°	1,39%
41	13,929 N·m	-0,071 N·m	-0,51%	356,00°	-4,00°	-1,11%	41	14,010 N·m	0,010 N·m	0,07%	362,00°	2,00°	0,56%
42	14,023 N·m	0,023 N·m	0,16%	360,50°	0,50°	0,14%	42	14,020 N·m	0,020 N·m	0,14%	362,50°	2,50	

3 - Chart - 100% - 360°-soft



1 - test point 40° - 60%

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	40°	
Test torque (M_{test}):	8,400 N·m	Target: 40,00° (degree)
Rotation angle starting torque (M_{rot}):	2,800 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,588 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,588 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T_u/M_{test}):	0,988 N·m	(T _u /M _{test}): 45,00° (degree)
Lower tolerance (T_l/M_{test}):	7,812 N·m	(T _l /M _{test}): 35,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
\bar{x}	\bar{x}	\bar{x}
M _{max}	Maximal	M _{max}
M _{min}	Minimal	M _{min}
R (99.73%)	Scatter	R (99.73%)
s	Standard deviation	s
6 s	6 x Standard deviation	6 s
N·m ²	Torque rate	

Homologation	Machine capability test - MCT	Homologation
Cm	3.5314	Cm
Cmk	2.9262	Cmk
	Capacity index Cm	4.9339
	Capacity index Cmk	4.8229

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	40°	
Test torque (M_{test}):	8,400 N·m	Target: 40,00° (degree)
Rotation angle starting torque (M_{rot}):	2,800 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,588 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	0,588 N·m	- Tolerance: 5,00° (degree)
Upper tolerance (T_u/M_{test}):	0,988 N·m	(T _u /M _{test}): 45,00° (degree)
Lower tolerance (T_l/M_{test}):	7,812 N·m	(T _l /M _{test}): 35,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
\bar{x}	\bar{x}	\bar{x}
M _{max}	Maximal	M _{max}
M _{min}	Minimal	M _{min}
R (99.73%)	Scatter	R (99.73%)
s	Standard deviation	s
6 s	6 x Standard deviation	6 s
N·m ²	Torque rate	

Homologation	Machine capability test - MCT	Homologation
Cm	3.7370	Cm
Cmk	3.2525	Cmk
	Capacity index Cm	13.8719
	Capacity index Cmk	11.8229

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240032	Date: 2018-07-30
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	40°	
Test torque (M_{test}):	0,000 N·m	Target: 0,00° (degree)
Rotation angle starting torque (M_{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 5,00° (degree)
+ Tolerance:	0,588 N·m	+ Tolerance: 5,00° (degree)
- Tolerance:	-0,588 N·m	- Tolerance: -5,00° (degree)
Upper tolerance (T_u/M_{test}):	0,988 N·m	(T _u /M _{test}): 5,00° (degree)
Lower tolerance (T_l/M_{test}):	-0,588 N·m	(T _l /M _{test}): -5,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

Torque (N·m)	Statistical evaluation	Angle (degree)
n	Number of measurements	n
\bar{x}	\bar{x}	\bar{x}
M _{max}	Maximal	M _{max}
M _{min}	Minimal	M _{min}
R (99.73%)	Scatter	R (99.73%)
s	Standard deviation	s
6 s	6 x Standard deviation	6 s
N·m ²	Torque rate	

Homologation	Machine capability test - MCT	Homologation
Cm	22.0986	Cm
Cmk	20.9551	Cmk
	Capacity index Cm	4.9075
	Capacity index Cmk	3.9525

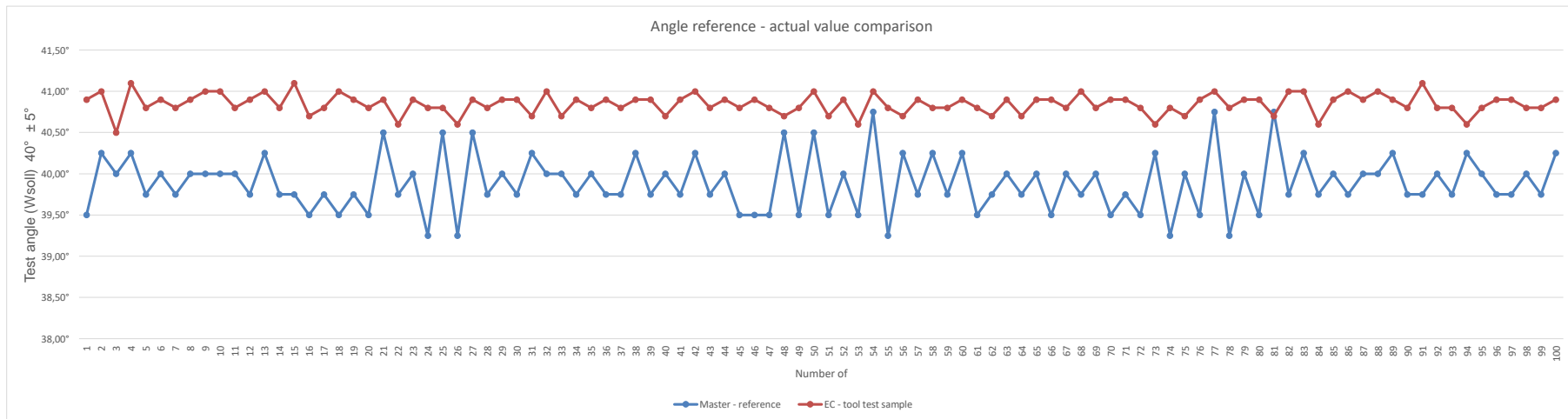
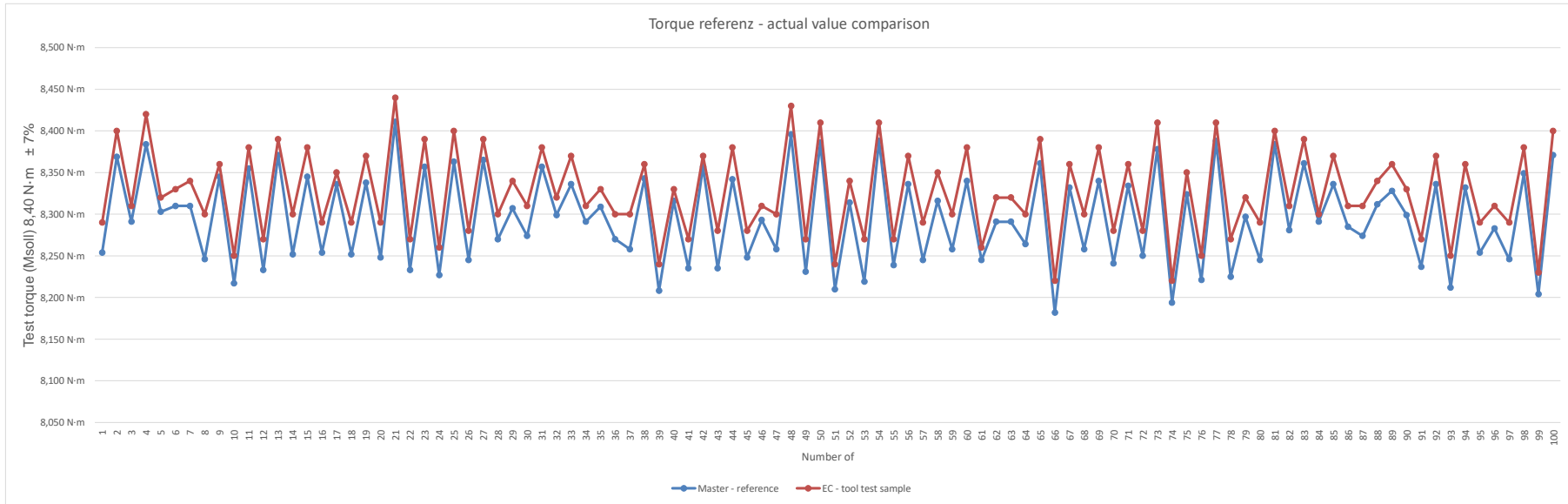
Measurement result

Nr.	Torque			Angle		
	(N·m)	Difference (%)	Difference (%)	(°)	Difference (%)	Difference (%)
1	8.254 N·m	-0.146 N·m	-1.74%	39.50°	-0.50°	-1.25%
2	8.369 N·m	-0.031 N·m	-0.37%	40.25°	0.25°	0.63%
3	8.291 N·m	-0.109 N·m	-1.30%	40.00°	0.00°	0.00%
4	8.345 N·m	-0.055 N·m	-0.65%	40.00°	0.25°	0.63%
5	8.303 N·m	-0.097 N·m	-1.15%	39.75°	-0.25°	-0.62%
6	8.310 N·m	-0.090 N·m	-1.07%	40.00°	0.00°	0.00%
7	8.310 N·m	-0.090 N·m	-1.07%	39.75°	-0.25°	-0.62%
8	8.246 N·m	-0.154 N·m	-1.83%	40.00°	0.00°	0.00%
9	8.322 N·m	-0.074 N·m	-0.89%	39.75°	-0.25°	-0.62%
10	8.217 N·m	-0.183 N·m	-2.18%	40.00°	0.00°	0.00%
11	8.355 N·m	-0.045 N·m	-0.54%	40.00°	0.00°	0.00%
12	8.233 N·m	-0.167 N·m	-1.99%	39.75°	-0.25°	-0.62%
13	8.252 N·m	-0.029 N·m	-0.35%	39.75°	-0.25°	-0.62%
14	8.325 N·m	-0.049 N·m	-0.59%	39.75°	-0.25°	-0.62%
15	8.345 N·m	-0.055 N·m	-0.65%	39.75°	-0.25°	-0.62%
16	8.254 N·m	-0.146 N·m	-1.74%	39.75°	-0.25°	-0.62%
17	8.336 N·m	-0.064 N·m	-0.76%	39.75°	-0.25°	-0.62%
18	8.252 N·m	-0.148 N·m	-1.76%	39.50°	-0.50°	-1.25%
19	8.328 N·m	-0.052 N·m	-0.62%	39.75°	-0.25°	-0.62%
20	8.248 N·m	-0.152 N·m	-1.81%	39.50°	-0.50°	-1.25%
21	8.411 N·m	0.011 N·m	0.13%	40.50°	0.50°	1.25%
22	8.233 N·m	-0.167 N·m	-1.99%	39.75°	-0.25°	-0.62%
23	8.357 N·m	-0.043 N·m	-0.51%	40.00°	0.00°	0.00%
24	8.327 N·m	-0.073 N·m	-0.87%	39.25°	-0.75°	-1.88%
25	8.363 N·m	-0.037 N·m	-0.44%	40.50°	0.50°	1.25%
26	8.245 N·m	-0.155 N·m	-1.85%	39.25°	-0.75°	-1.88%
27	8.365 N·m	-0.035 N·m	-0.42%	40.50°	0.50°	1.25%
28	8.270 N·m	-0.130 N·m	-1.55%	39.75°	-0.25°	-0.62%
29	8.307 N·m	-0.068 N·m	-0.81%	39.75°	-0.25°	-0.62%
30	8.274 N·m	-0.126 N·m	-1.50%	39.75°	-0.25°	-0.62%
31	8.357 N·m	-0.043 N·m	-0.51%	40.25°	0.25°	0.63%
32	8.299 N·m	-0.101 N·m	-1.20%	40.00°	0.00°	0.00%
33	8.336 N·m	-0.064 N·m	-0.76%	40.00°	0.00°	0.00%
34	8.309 N·m	-0.091 N·m	-1.08%	39.75°	-0.25°	-0.62%
35	8.309 N·m	-0.091 N·m	-1.08%	40.00°	0.00°	0.00%
36	8.270 N·m	-0.130 N·m	-1.55%	39.75°	-0.25°	-0.62%
37	8.258 N·m	-0.142 N·m	-1.69%	39.75°	-0.25°	-0.62%
38	8.345 N·m	-0.055 N·m	-0.65%	40.25°	0.25°	0.63%
39	8.328 N·m	-0.052 N·m	-0.62%	39.75°	-0.25°	-0.62%
40	8.316 N·m	-0.064 N·m	-0.76%	40.00°	0.00°	0.00%
41	8.235 N·m	-0.165 N·m	-1.96%	39.75°	-0.25°	-0.62%
42	8.357 N·m	-0.043 N·m	-0.51%	40.25°	0.25°	0.63%
43	8.235 N·m	-0.165 N·m	-1.96%	40.25°	0.25°	0.63%
44	8.328 N·m	-0.052 N·m	-0.62%	40.00°	0.00°	0.00%
45	8.248 N·m	-0.152 N·m	-1.81%	39.50°	-0.50°	-1.25%
46	8.293 N·m	-0.107 N·m	-1.27%	39.50°	-0.50°	-1.25%
47	8.258 N·m	-0.142 N·m	-1.69%	39.50°	-0.50°	-1.25%
48	8.396 N·m	-0.004 N·m	-0.05%	40.50°	0.50°	1.25%
49	8.359 N·m	-0.069 N·m	-0.82%	39.75°	-0.25°	-0.62%
50	8.386 N·m	-0.014 N·m	-0.17%	40.50°	0.50°	1.25%
51	8.210 N·m	-0.180 N·m	-2.26%	39.50°	-0.50°	-1.25%
52	8.314 N·m	-0.086 N·m	-1.02%	40.00°	0.00°	0.00%
53	8.295 N·m	-0.105 N·m	-1.25%	39.50°	-0.50°	-1.25%
54	8.312 N·m	-0.088 N·m	-1.05%	40.00°	0.00°	0.00%
55	8.239 N·m	-0.161 N·m	-1.92%	39.25°	-0.75°	-1.88%
56	8.336 N·m	-0.064 N·m	-0.76%	40.25°	0.25°	0.63%
57	8.245 N·m	-0.155 N·m	-1.85%	39.75°	-0.25°	-0.62%
58	8.255 N·m	-0.094 N·m	-1.13%	40.25°	0.25°	0.63%
59	8.245 N·m	-0.155 N·m	-1.85%	39.75°	-0.25°	-0.62%
60	8.340 N·m	-0.060 N·m	-0.71%	40.25°	0.25°	0.63%
61	8.245 N·m	-0.155 N·m	-1.85%	39.50°	-0.50°	-1.25%
62	8.291 N·m	-0.109 N·m	-1.30%	39.75°	-0.25°	-0.62%
63	8.291 N·m	-0.109 N·m	-1.30%	40.00°	0.00°	0.00%
64	8.264 N·m	-0.136 N·m	-1.62%	39.75°	-0.25°	-0.62%
65	8.361 N·m	-0.039 N·m	-0.46%	40.00°	0.00°	0.00%
66	8.182 N·m	-0.218 N·m	-2.60%	39.50°	-0.50°	-1.25%
67	8.332 N·m	-0.068 N·m	-0.81%	40.00°	0.00°	0.00%
68	8.256 N·m	-0.142 N·m	-1.69%	39.75°	-0.25°	-0.62%
69	8.340 N·m	-0.060 N·m	-0.71%	40.00°	0.00°	0.00%
70	8.241 N·m	-0.159 N·m	-1.89%	39.50°	-0.50°	-1.25%
71	8.334 N·m	-0.066 N·m	-0.79%	39.75°	-0.25°	-0.62%
72	8.250 N·m	-0.150 N·m	-1.79%	39.50°	-0.50°	-1.25%
73	8.378 N·m	-0.026 N·m	-0.31%	40.25°	0.25°	0.63%
74	8.194 N·m	-0.206 N·m	-2.45%	39.25°	-0.75°	-1.88%
75	8.324 N·m	-0.076 N·m	-0.90%	40.00°	0.00°	0.00%
76	8.221 N·m	-0.179 N·m	-2.13%	39.50°	-0.50°	-1.25%
77	8.388 N·m	-0.012 N·m	-0.14%	40.75°	0.75°	1.88%
78	8.225 N·m	-0.175 N·m	-2.08%	39.25°	-0.75°	-1.88%
79	8.297 N·m	-0.103 N·m	-1.23%	40.00°	0.00°	0.00%
80	8.245 N·m	-0.155 N·m	-1.85%	39.50°	-0.50°	-1.25%
81	8.384 N·m	-0.016 N·m	-0.19%	40.75°	0.75°	1.88%
82	8.281 N·m	-0.119 N·m	-1.42%	39.75°	-0.25°	-0.62%
83	8.316 N·m	-0.089 N·m	-1.05%	40.25°	0.25°	0.63%
84	8.291 N·m	-0.109 N·m	-1.30%	39.75°	-0.25°	-0.62%
85	8.336 N·m	-0.064 N·m	-0.76%	40.00°	0.00°	0.00%
86	8.285 N·m	-0.115 N·m	-1.37%	39.75°	-0.25°	-0.62%
87	8.274 N·m	-0.126 N·m	-1.50%	40.00°	0.00°	0.00%
88	8.312 N·m	-0.088 N·m	-1.05%	40.00°	0.00°	0.00%
89	8.328 N·m	-0.072 N·m	-0.86%	40.25°	0.25°	0.63%
90	8.299 N·m	-0.101 N·m	-1.20%	39.75°	-0.25°	-0.62%
91	8.237 N·m	-0.163 N·m	-1.94%	39.75°	-0.25°	-0.62%
92	8.336 N·m	-0.064 N·m	-0.76%	40.00°	0.00°	0.00%
93	8.312 N·m	-0.088 N·m	-1.05%	40.00°	0.00°	0.00%
94	8.332 N·m	-0.068 N·m	-0.81%	40.25°	0.25°	0.63%
95	8.254 N·m	-0.146 N·m	-1.74%	40.00°	0.00°	0.00%
96	8.283 N·m	-0.117 N·m	-1.39%	39.75°	-0.25°	-0.62%
97	8.246 N·m	-0.154 N·m	-1.83%	39.75°	-0.25°	-0.62%
98	8.340 N·m	-0.060 N·m	-0.71%	40.00°	0.00°	0.00%
99	8.204 N·m	-0.196 N·m	-2.33%	39.75°	-0.25°	-0.62%
100	8.371 N·m	-0.029 N·m	-0.35%	40.25°	0.25°	0.63%

Measurement result

Nr.	Torque			Angle		
	(N·m)	Difference (%)	Difference (%)	(°)	Difference (%)	Difference (%)
1	8.290 N·m	-0.110 N·m	-1.31%	40.90°	0.90°	2.25%
2	8.400 N·m	0.000 N·m	0.00%	41.00°	1.00°	2.50%
3	8.310 N·m	-0.090 N·m				

1 - Chart - 40° - 60%



2 - test point 40° - 60%

Master - reference

Tool Model: TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 40°	
Test torque (M_{test}): 8,400 N·m		Target: 40,00° (degree)			
Rotation angle starting torque (M_{rot}): 2,800 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: 0,588 N·m		+ Tolerance: 5,00 (degree)			
- Tolerance: 0,588 N·m		- Tolerance: 5,00 (degree)			
Upper tolerance (T_u/M_{test}): 0,988 N·m		(T_u/M_{test}): 45,00 (degree)			
Lower tolerance (T_l/M_{test}): 7,812 N·m		(T_l/M_{test}): 35,00 (degree)			
Speed: 1 Step: 50 rpm		2 Step: 50 rpm			

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	8,4319 N·m	\bar{x}	39,8875°	\bar{x}	40,8260°
M _{max}	8,5860 N·m	M _{max}	40,7500°	M _{max}	41,1000°
M _{min}	8,3050 N·m	M _{min}	39,2500°	M _{min}	40,5000°
R (99,73%)	0,2630 N·m	R (99,73%)	1,5000°	R (99,73%)	0,6000°
s	0,0548 N·m	s	0,2873°	s	0,1299°
σ	0,2088 N·m	σ	1,0238°	σ	0,4724°
N·m ²	37,9436 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	3,7653	Capacity index Cm	5,8010	Cm	5,8010
Cmk	3,3522	Capacity index Cmk	5,6525	Cmk	5,6525

EC tightening tool

Tool Model: TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 40°	
Test torque (M_{test}): 8,400 N·m		Target: 40,00° (degree)			
Rotation angle starting torque (M_{rot}): 2,800 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: 0,588 N·m		+ Tolerance: 5,00 (degree)			
- Tolerance: 0,588 N·m		- Tolerance: 5,00 (degree)			
Upper tolerance (T_u/M_{test}): 0,988 N·m		(T_u/M_{test}): 45,00 (degree)			
Lower tolerance (T_l/M_{test}): 7,812 N·m		(T_l/M_{test}): 35,00 (degree)			
Speed: 1 Step: 50 rpm		2 Step: 50 rpm			

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	8,4664 N·m	\bar{x}	40,8260°	\bar{x}	40,8260°
M _{max}	8,6000 N·m	M _{max}	41,1000°	M _{max}	41,1000°
M _{min}	8,3400 N·m	M _{min}	40,5000°	M _{min}	40,5000°
R (99,73%)	0,2600 N·m	R (99,73%)	0,6000°	R (99,73%)	0,6000°
s	0,0518 N·m	s	0,2873°	s	0,1299°
σ	0,1868 N·m	σ	1,0238°	σ	0,4724°
N·m ²	38,0988 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	3,7833	Capacity index Cm	5,8525	Cm	12,8300
Cmk	3,5825	Capacity index Cmk	5,6525	Cmk	10,6525

Difference evaluation

Tool Model: TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Serial-no.: 18240039		Date: 2018-07-30	
Operating range (N·m): 1,00 to 14,00		Sample size: 100 piece		Test point: 40°	
Test torque (M_{test}): 0,000 N·m		Target: 0,00° (degree)			
Rotation angle starting torque (M_{rot}): 0,000 N·m					
± Tolerance: 7,00 %		± Tolerance: 5,00 (degree)			
+ Tolerance: -0,588 N·m		+ Tolerance: -5,00 (degree)			
- Tolerance: -0,588 N·m		- Tolerance: -5,00 (degree)			
Upper tolerance (T_u/M_{test}): 0,588 N·m		(T_u/M_{test}): 5,00 (degree)			
Lower tolerance (T_l/M_{test}): -0,588 N·m		(T_l/M_{test}): -5,00 (degree)			
Speed: 1 Step: 50 rpm		2 Step: 50 rpm			

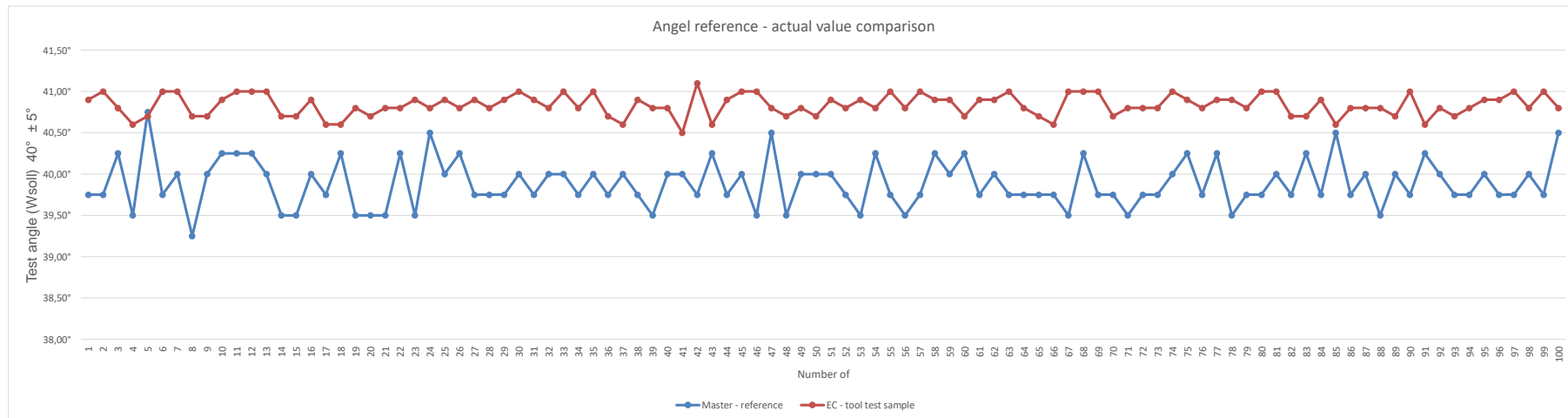
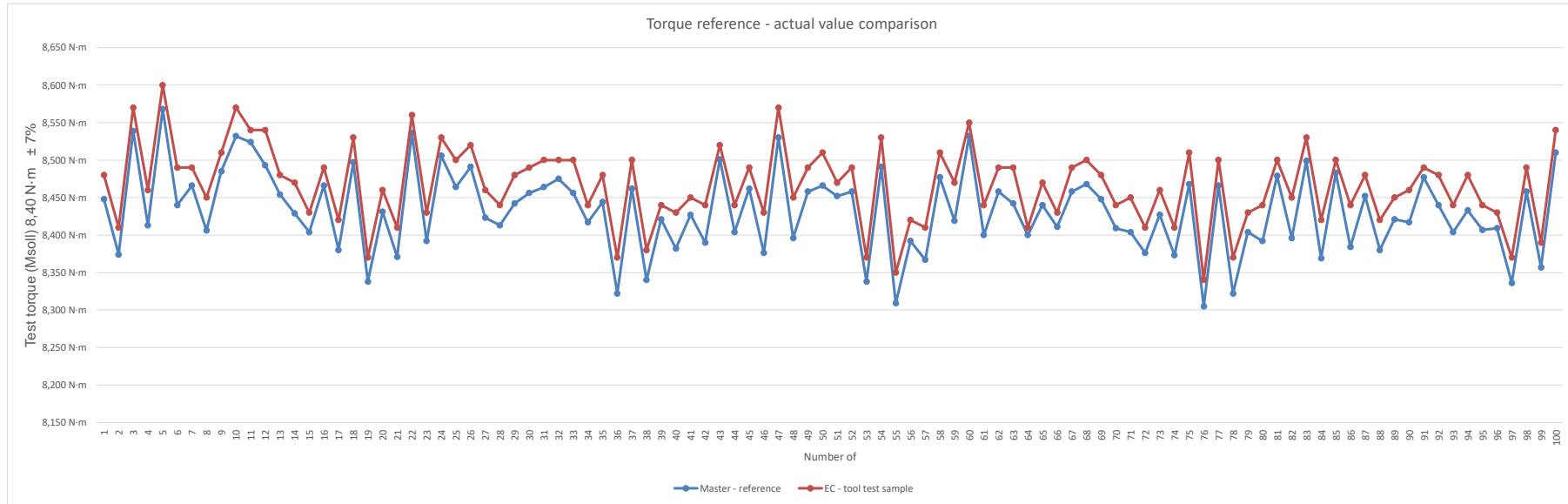
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0345 N·m	\bar{x}	-0,9485°	\bar{x}	-0,9485°
M _{max}	-0,0100 N·m	M _{max}	0,0500°	M _{max}	0,0500°
M _{min}	-0,0560 N·m	M _{min}	-1,5000°	M _{min}	-1,5000°
R (99,73%)	0,0460 N·m	R (99,73%)	1,5500°	R (99,73%)	1,5500°
s	0,0100 N·m	s	0,3288°	s	0,3288°
σ	0,0399 N·m	σ	1,1937°	σ	1,1937°
N·m ²	-0,1552 N·m	Torque rate		Torque rate	

Homologation		Machine capability test - MCT		Homologation	
Cm	19,6308	Capacity index Cm	5,1466	Cm	5,1466
Cmk	16,4792	Capacity index Cmk	4,1762	Cmk	4,1762

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB SN: 18240039 Date: 2018-07-30

Measurement result				Angle			
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	
1	8,448 N·m	0,048 N·m	0,57%	39,75°	-0,25°	-0,62%	
2	8,374 N·m	-0,026 N·m	-0,31%	39,75°	-0,25°	-0,62%	
3	8,539 N·m	0,139 N·m	1,65%	40,25°	0,25°	0,63%	
4	8,424 N·m	0,014 N·m	0,15%	39,50°	-0,50°	-1,25%	
5	8,568 N·m	0,168 N·m	2,00%	40,75°	0,75°	1,88%	
6	8,440 N·m	0,040 N·m	0,48%	39,75°	-0,25°	-0,62%	
7	8,468 N·m	0,068 N·m	0,79%	40,00°	0,00°	0,00%	
8	8,406 N·m	0,006 N·m	0,07%	39,25°	-0,75°	-1,88%	
9	8,485 N·m	0,085 N·m	1,01%	40,00°	0,00°	0,00%	
10	8,532 N·m	0,132 N·m	1,57%	40,25°	0,25°	0,63%	
11	8,524 N·m	0,124 N·m	1,48%	40,25°	0,25°	0,63%	
12	8,493 N·m	0,093 N·m	1,11%	40,25°	0,25°	0,63%	
13	8,454 N·m	0,054 N·m	0,64%	40,00°	0,00°	0,00%	
14	8,422 N·m	0,022 N·m	0,25%	39,50°	-0,50°	-1,25%	
15	8,404 N·m	0,004 N·m	0,05%	39,50°	-0,50°	-1,25%	
16	8,466 N·m	0,066 N·m	0,79%	40,00°	0,00°	0,00%	
17	8,380 N·m	-0,020 N·m	-0,24%	39,75°	-0,25°	-0,62%	
18	8,497 N·m	0,097 N·m	1,15%	40,25°	0,25°	0,63%	
19	8,438 N·m	0,038 N·m	0,45%	39,50°	-0,50°	-1,25%	
20	8,431 N·m	0,031 N·m	0,37%	39,50°	-0,50°	-1,25%	
21	8,371 N·m	-0,029 N·m	-0,35%	39,50°	-0,50°	-1,25%	
22	8,536 N·m	0,136 N·m	1,62%	40,25°	0,25°	0,63%	
23	8,392 N·m	-0,008 N·m	-0,10%	39,50°	-0,50°	-1,25%	
24	8,418 N·m	0,018 N·m	0,21%	39,50°	-0,50°	-1,25%	
25	8,464 N·m	0,064 N·m	0,76%	40,00°	0,00°	0,00%	
26	8,491 N·m	0,091 N·m	1,08%	40,25°	0,25°	0,63%	
27	8,423 N·m	0,023 N·m	0,27%	39,75°	-0,25°	-0,62%	
28	8,413 N·m	0,013 N·m	0,15%	39,75°	-0,25°	-0,62%	
29	8,402 N·m	0,002 N·m	0,02%	39,50°	-0,50°	-1,25%	
30	8,456 N·m	0,056 N·m	0,67%	40,00°	0,00°	0,00%	
31	8,464 N·m	0,064 N·m	0,76%	39,75°	-0,25°	-0,62%	
32	8,475 N·m	0,075 N·m	0,89%	40,00°	0,00°	0,00%	
33	8,456 N·m	0,056 N·m	0,67%	40,00°	0,00°	0,00%	
34	8,404 N·m	0,004 N·m	0,05%	39,50°	-0,50°	-1,25%	
35	8,444 N·m	0,044 N·m	0,52%	40,00°	0,00°	0,00%	
36	8,322 N·m	-0,078 N·m	-0,93%	39,75°	-0,25°	-0,62%	
37	8,462 N·m	0,062 N·m	0,74%	40,00°	0,00°	0,00%	
38	8,340 N·m	-0,060 N·m	-0,71%	39,75°	-0,25°	-0,62%	
39	8,401 N·m	0,001 N·m	0,01%	39,50°	-0,50°	-1,25%	
40	8,382 N·m	-0,018 N·m	-0,21%	40,00°	0,00°	0,00%	
41	8,427 N·m	0,027 N·m	0,32%	40,00°	0,00°	0,00%	
42	8,390 N·m	-0,010 N·m	-0,12%	39,75°	-0,25°	-0,62%	
43	8,501 N·m	0,101 N·m	1,20%	40,25°	0,25°	0,63%	
44	8,404 N·m	0,004 N·m	0,05%	39,50°	-0,50°	-1,25%	
45	8,462 N·m	0,062 N·m	0,74%	40,00°	0,00°	0,00%	
46	8,376 N·m	-0,024 N·m	-0,29%	39,50°	-0,50°	-1,25%	
47	8,530 N·m	0,130 N·m	1,55%	40,50°	0,50°	1,25%	
48	8,398 N·m	-0,004 N·m	-0,05%	39,50°	-0,50°	-1,25%	
49	8,458 N·m	0,058 N·m	0,69%	40,00°	0,00°	0,00%	
50	8,466 N·m	0,066 N·m	0,79%	40,00°	0,00°	0,00%	
51	8,452 N·m	0,052 N·m	0,62%	40,00°	0,00°	0,00%	
52	8,458 N·m	0,058 N·m	0,69%	39,75°	-0,25°	-0,62%	
53	8,497 N·m	0,097 N·m	1,16%	39,50°	-0,50°	-1,25%	
54	8,491 N·m	0,091 N·m	1,08%	39,50°	-0,50°	-1,25%	
55	8,309 N·m	-0,091 N·m	-1,08%	39,75°	-0,25°	-0,62%	
56	8,392 N·m	-0,008 N·m	-0,10%	39,50°	-0,50°	-1,25%	
57	8,367 N·m	-0,033 N·m	-0,39%	39,75°	-0,25°	-0,62%	
58	8,499 N·m	0,099 N·m	1,19%	40,25°	0,25°	0,63%	
59	8,419 N·m	0,019 N·m	0,23%	39,50°	-0,50°	-1,25%	
60	8,532 N·m	0,132 N·m	1,57%	40,25°	0,25°	0,63%	
61	8,400 N·m	0,000 N·m	0,00%	39,75°	-0,25°	-0,62%	
62	8,458 N·m	0,058 N·m	0,69%	40,00°	0,00°	0,00%	
63	8,442 N·m	0,042 N·m	0,50%	39,75°	-0,25°	-0,62%	
64	8,400 N·m	0,000 N·m	0,00%	39,75°	-0,25°	-0,62%	
65	8,440 N·m	0,040 N·m	0,48%	39,75°	-0,25°	-0,62%	
66	8,411 N·m	0,011 N·m	0,13%	39,75°	-0,25°	-0,62%	
67	8,458 N·m	0,058 N·m	0,69%	39,50°	-0,50°	-1,25%	
68	8,468 N·m	0,068 N·m	0,81%	40,25°	0,25°	0,63%	
69	8,448 N·m	0,048 N·m	0,57%	39,75°	-0,25°	-0,62%	
70	8,409 N·m	0,009 N·m	0,11%	39,75°	-0,25°	-0,62%	
71	8,404 N·m	0,004 N·m	0,05%	39,50°	-0,50°	-1,25%	
72	8,376 N·m	-0,024 N·m	-0,29%	39,75°	-0,25°	-0,62%	
73	8,427 N·m	0,027 N·m	0,32%	39,75°	-0,25°	-0,62%	
74	8,373 N·m	-0,027 N·m	-0,32%	40,00°	0,00°	0,00%	
75	8,468 N·m	0,068 N·m	0,81%	40,25°	0,25°	0,63%	
76	8,305 N·m	-0,095 N·m	-1,13%	39,75°	-0,25°	-0,62%	
77	8,466 N·m	0,066 N·m	0,79%	40,25°	0,25°	0,63%	
78	8,322 N·m	-0,078 N·m	-0,93%	39,50°	-0,50°	-1,25%	
79	8,404 N·m	0,004 N·m	0,05%	39,75°	-0,25°	-0,62%	
80	8,392 N·m	-0,008 N·m	-0,10%	39,75°	-0,25°	-0,62%	
81	8,479 N·m	0,079 N·m	0,94%	40,00°	0,00°	0,00%	
82	8,398 N·m	-0,004 N·m	-0,05%	39,75°	-0,25°	-0,62%	
83	8,3						

2 - Chart - 40° - 60%



3 - test point 40° - 60%

Master - reference

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	40°		
Test torque (M _{avg}):	8,400 N·m	Target:	40,00° (degree)
Rotation angle starting torque (M _{st}):	2,800 N·m		
± Tolerance:	7,00 %	± Tolerance:	5,00° (degree)
+ Tolerance:	0,588 N·m	+ Tolerance:	5,00° (degree)
- Tolerance:	0,588 N·m	- Tolerance:	5,00° (degree)
Upper tolerance (T _u /M _{avg}):	8,988 N·m	(T _u /M _{avg}):	45,00° (degree)
Lower tolerance (T _l /M _{avg}):	7,812 N·m	(T _l /M _{avg}):	35,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	8,4169 N·m	\bar{x}	8,4544 N·m	\bar{x}	40,8200°
M _{max}	8,5260 N·m	M _{max}	8,5600 N·m	M _{max}	41,0000°
M _{min}	8,2810 N·m	M _{min}	8,3200 N·m	M _{min}	40,6000°
R (99,73%)	0,2450 N·m	R (99,73%)	0,2400 N·m	R (99,73%)	0,5000°
s	0,0529 N·m	s	0,0558 N·m	s	0,1127°
6 s	0,3176 N·m	6 s	0,3353 N·m	6 s	0,6762°
N·m ²	37,8759 N·m	Torque rate		Torque rate	

Homologation		Machine capacity test - MCT		Homologation	
Cm	3,7022	Capacity index Cm	5,4606	Cm	5,4606
Cmk	3,2566	Capacity index Cmk	5,2566	Cmk	5,2566

EC tightening tool

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	40°		
Test torque (M _{avg}):	8,400 N·m	Target:	40,00° (degree)
Rotation angle starting torque (M _{st}):	2,800 N·m		
± Tolerance:	7,00 %	± Tolerance:	5,00° (degree)
+ Tolerance:	0,588 N·m	+ Tolerance:	5,00° (degree)
- Tolerance:	0,588 N·m	- Tolerance:	5,00° (degree)
Upper tolerance (T _u /M _{avg}):	8,988 N·m	(T _u /M _{avg}):	45,00° (degree)
Lower tolerance (T _l /M _{avg}):	7,812 N·m	(T _l /M _{avg}):	35,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm	

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	8,4544 N·m	\bar{x}	8,4544 N·m	\bar{x}	40,8200°
M _{max}	8,5600 N·m	M _{max}	8,5600 N·m	M _{max}	41,0000°
M _{min}	8,3200 N·m	M _{min}	8,3200 N·m	M _{min}	40,6000°
R (99,73%)	0,2400 N·m	R (99,73%)	0,2400 N·m	R (99,73%)	0,5000°
s	0,0558 N·m	s	0,0558 N·m	s	0,1127°
6 s	0,3353 N·m	6 s	0,3353 N·m	6 s	0,6762°
N·m ²	38,0448 N·m	Torque rate		Torque rate	

Homologation		Machine capacity test - MCT		Homologation	
Cm	3,5102	Capacity index Cm	14,7875	Cm	14,7875
Cmk	3,1454	Capacity index Cmk	12,2566	Cmk	12,2566

Difference evaluation

Tool Model:		TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB	
Serial-no.:	18240041	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	40°		
Test torque (M _{avg}):	0,000 N·m	Target:	0,00° (degree)
Rotation angle starting torque (M _{st}):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	5,00° (degree)
+ Tolerance:	-0,048 N·m	+ Tolerance:	-5,00° (degree)
- Tolerance:	-0,588 N·m	- Tolerance:	-5,00° (degree)
Upper tolerance (T _u /M _{avg}):	-0,588 N·m	(T _u /M _{avg}):	-5,00° (degree)
Lower tolerance (T _l /M _{avg}):	-0,588 N·m	(T _l /M _{avg}):	-5,00° (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm	

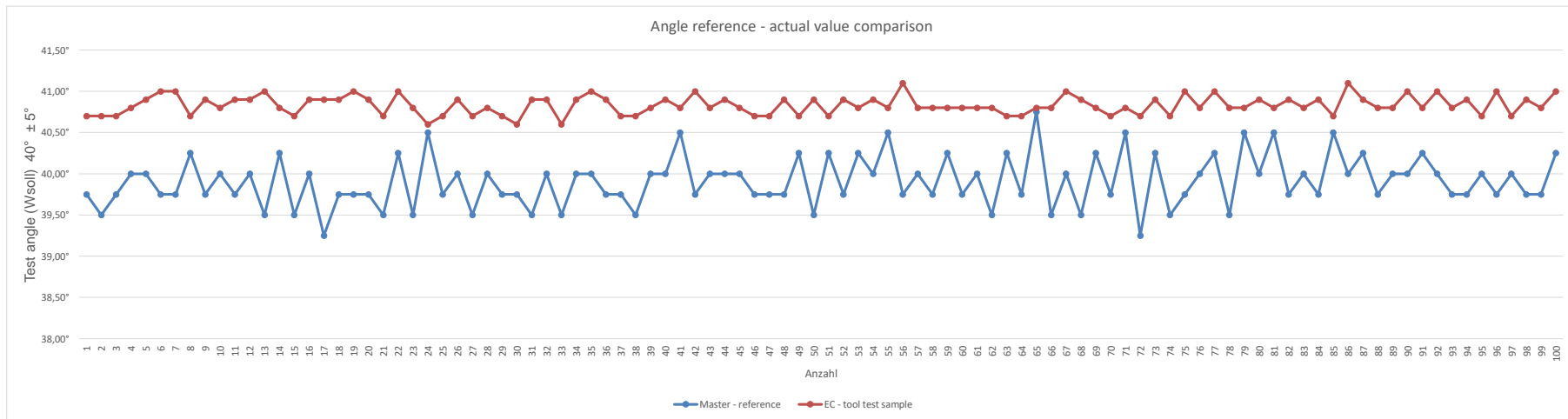
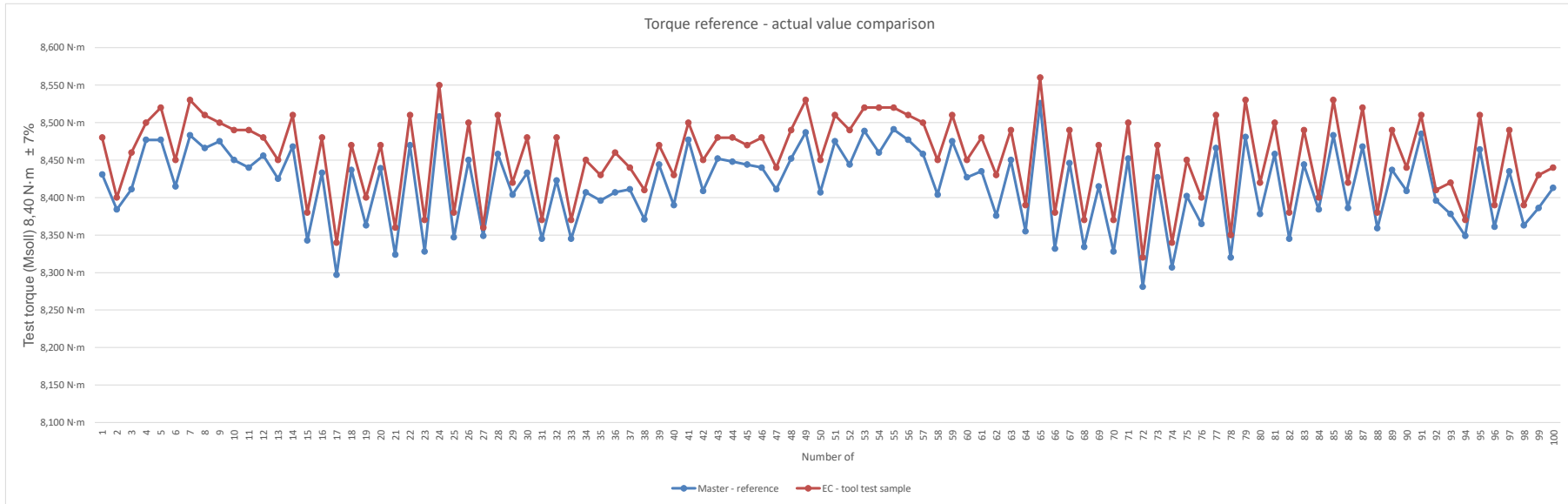
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0375 N·m	\bar{x}	-0,0375 N·m	\bar{x}	-0,9200°
M _{max}	-0,0110 N·m	M _{max}	-0,0110 N·m	M _{max}	-0,6500°
M _{min}	-0,0600 N·m	M _{min}	-0,0600 N·m	M _{min}	-1,6500°
R (99,73%)	0,0490 N·m	R (99,73%)	0,0500°	R (99,73%)	1,6000°
s	0,0105 N·m	s	0,0112°	s	0,3245°
6 s	-0,0630 N·m	6 s	-0,3762°	6 s	-1,9485°
N·m ²	-0,1689 N·m	Torque rate		Torque rate	

Homologation		Machine capacity test - MCT		Homologation	
Cm	16,5963	Capacity index Cm	5,1368	Cm	5,1368
Cmk	17,4096	Capacity index Cmk	4,1844	Cmk	4,1844

Measurement result

Nr.	Torque			Angle		
	(N·m)	Difference (N·m)	Difference (%)	(°)	Difference (°)	Difference (%)
1	8,431 N·m	0,031 N·m	0,37%	39,75°	-0,25°	-0,62%
2	8,384 N·m	-0,016 N·m	-0,19%	39,50°	-0,50°	-1,25%
3	8,419 N·m	0,011 N·m	0,13%	39,75°	0,25°	0,62%
4	8,427 N·m	0,018 N·m	0,22%	40,25°	0,25°	0,62%
5	8,477 N·m	0,077 N·m	0,92%	40,00°	0,00°	0,00%
6	8,415 N·m	0,015 N·m	0,18%	39,75°	-0,25°	-0,62%
7	8,483 N·m	0,083 N·m	0,99%	40,25°	-0,25°	-0,62%
8	8,466 N·m	0,066 N·m	0,79%	40,25°	0,25°	0,63%
9	8,458 N·m	0,058 N·m	0,69%	40,25°	0,25°	0,63%
10	8,450 N·m	0,050 N·m	0,60%	40,00°	0,00°	0,00%
11	8,440 N·m	0,040 N·m	0,48%	39,75°	-0,25°	-0,62%
12	8,456 N·m	0,056 N·m	0,67%	40,00°	0,00°	0,00%
13	8,425 N·m	0,025 N·m	0,30%	39,50°	-0,50°	-1,25%
14	8,468 N·m	0,068 N·m	0,81%	40,25°	0,25°	0,63%
15	8,343 N·m	-0,057 N·m	-0,68%	39,50°	-0,50°	-1,25%
16	8,433 N·m	0,033 N·m	0,39%	40,00°	0,00°	0,00%
17	8,297 N·m	-0,103 N·m	-1,23%	39,25°	-0,75°	-1,88%
18	8,437 N·m	0,037 N·m	0,44%	39,75°	-0,25°	-0,62%
19	8,363 N·m	-0,037 N·m	-0,44%	39,75°	-0,25°	-0,62%
20	8,439 N·m	0,039 N·m	0,46%	39,75°	-0,25°	-0,62%
21	8,324 N·m	-0,076 N·m	-0,90%	39,50°	-0,50°	-1,25%
22	8,470 N·m	0,070 N·m	0,83%	40,25°	0,25°	0,63%
23	8,328 N·m	-0,072 N·m	-0,86%	39,50°	-0,50°	-1,25%
24	8,408 N·m	0,008 N·m	0,09%	40,00°	0,00°	0,00%
25	8,347 N·m	-0,053 N·m	-0,63%	39,75°	-0,25°	-0,62%
26	8,450 N·m	0,050 N·m	0,60%	40,00°	0,00°	0,00%
27	8,349 N·m	-0,051 N·m	-0,61%	39,50°	-0,50°	-1,25%
28	8,458 N·m	0,058 N·m	0,69%	40,00°	0,00°	0,00%
29	8,404 N·m	0,004 N·m	0,04%	40,00°	0,00°	0,00%
30	8,433 N·m	0,033 N·m	0,39%	39,75°	-0,25°	-0,62%
31	8,345 N·m	-0,055 N·m	-0,65%	39,50°	-0,50°	-1,25%
32	8,423 N·m	0,023 N·m	0,27%	40,00°	0,00°	0,00%
33	8,345 N·m	-0,055 N·m	-0,65%	39,50°	-0,50°	-1,25%
34	8,407 N·m	0,007 N·m	0,08%	40,00°	0,00°	0,00%
35	8,396 N·m	-0,004 N·m	-0,05%	40,00°	0,00°	0,00%
36	8,407 N·m	0,007 N·m	0,08%	39,75°	-0,25°	-0,62%
37	8,411 N·m	0,011 N·m	0,13%	39,75°	-0,25°	-0,62%
38	8,371 N·m	-0,029 N·m	-0,35%	39,50°	-0,50°	-1,25%
39	8,404 N·m	0,004 N·m	0,04%	40,00°	0,00°	0,00%
40	8,399 N·m	-0,010 N·m	-0,12%	40,00°	0,00°	0,00%
41	8,477 N·m	0,077 N·m	0,92%	40,50°	0,50°	1,25%
42	8,409 N·m	0,009 N·m	0,11%	39,75°	-0,25°	-0,62%
43	8,452 N·m	0,052 N·m	0,62%	40,25°	0,25°	0,63%
44	8,448 N·m	0,048 N·m	0,57%	40,00°	0,00°	0,00%
45	8,444 N·m	0,044 N·m	0,52%	40,00°	0,00°	0,00%
46	8,440 N·m	0,040 N·m	0,48%	39,75°	-0,25°	-0,62%
47	8,411 N·m	0,011 N·m	0,13%	39,75°	-0,25°	-0,62%
48	8,462 N·m	0,062 N·m	0,74%	39,75°	-0,25°	-0,62%
49	8,477 N·m	0,077 N·m	0,92%	40,50°	0,50°	1,25%
50	8,407 N·m	0,007 N·m	0,08%	39,50°	-0,50°	-1,25%
51	8,475 N·m	0,075 N·m	0,89%	40,25°	0,25°	0,63%
52	8,444 N·m	0,044 N·m	0,52%	39,75°	-0,25°	-0,62%
53	8,460 N·m	0,060 N·m	0,71%	40,25°	0,25°	0,63%
54	8,450 N·m	0,050 N·m	0,60%	40,00°	0,00°	0,00%
55	8,491 N·m	0,091 N·m	1,08%	40,50°	0,50°	1,25%
56	8,477 N·m	0,077 N·m	0,92%	39,75°	-0,25°	-0,62%
57	8,458 N·m	0,058 N·m	0,69%	40,00°	0,00°	0,00%
58	8,404 N·m	0,004 N·m	0,04%	39,75°	-0,25°	-0,62%
59	8,475 N·m	0,075 N·m	0,89%	40,25°	0,25°	0,63%
60	8,427 N·m	0,027 N·m	0,32%	39,75°	-0,25°	-0,62%
61	8,433 N·m	0,033 N·m	0,39%	40,00°	0,00°	0,00%
62	8,376 N·m	-0,024 N·m	-0,29%	39,50°	-0,50°	-1,25%
63	8,450 N·m	0,050 N·m	0,60%	40,25°	0,25°	0,63%
64	8,355 N·m	-0,045 N·m	-0,54%	39,75°	-0,25°	-0,62%
65	8,526 N·m	0,126 N·m	1,50%	40,75°	0,75°	1,88%
66	8,332 N·m	-0,068 N·m	-0,81%	39,50°	-0,50°	-1,25%
67	8,446 N·m	0,046 N·m	0,55%	40,00°	0,00°	0,00%
68	8,406 N·m	0,006 N·m	0,07%	39,50°	-0,50°	-1,25%
69	8,415 N·m	0,015 N·m	0,18%	39,75°	-0,25°	-0,62%
70	8,328 N·m	-0,072 N·m	-0,86%	39,75°	-0,25°	-0,62%
71	8,452 N·m	0,052 N·m	0,62%	40,50°	0,50°	1,25%
72	8,281 N·m	-0,119 N·m	-1,42%	39,25°	-0,75°	-1,88%
73	8,427 N·m	0,027 N·m	0,32%	40,25°	0,25°	0,63%
74	8,307 N·m	-0,093 N·m	-1,09%	39,50°	-0,50°	-1,25%
75	8,402 N·m	0,002 N·m	0,02%	39,75°	-0,25°	-0,62%
76	8,365 N·m	-0,035 N·m	-0,42%	40,00°	0,00°	0,00%
77	8,466 N·m	0,066 N·m	0,79%	40,25°	0,25°	0,63%
78	8,320 N·m	-0,080 N·m	-0,95%	39,50°	-0,50°	-1,25%
79	8,481 N·m	0,081 N·m	0,96%	40,50°	0,50°	1,25%
80	8,378 N·m	-0,022 N·m	-0,26%	40,00°	0,00°	0,00%
81	8,458 N·m	0,058 N·m	0,69%	40,50°	0,50°	1,25%
82	8,345 N·m	-0,055 N·m	-0,65%	39,75°	-0,25°	-0,62%
83	8,404 N·m	0,004 N·m	0,04%	40,00°	0,00°	0,00%
84	8,384 N·m	-0,016 N·m	-0,19%	39,75°	-0,25°	-0,62%
85	8,483 N·m	0,083 N·m	0,99%	40,50°	0,50°	1,25%
86	8,386 N·m	-0,014 N·m	-0,17%	40,00°	0,00°	0,00%
87	8,468 N·m	0,068 N·m	0,81%	40,25°	0,25°	0,63%
88	8,360 N·m	-0,040 N·m	-0,48%	39,75°	-0,25°	-0,62%
89	8,437 N·m	0,037 N·m	0,44%	40,00°	0,00°	0,00%
90	8,409 N·m	0,009 N·m	0,11%	40,00°	0,00°	0,00%
91	8,465 N·m	0,065 N·m				

3 - Chart - 40° - 60%



1 - test point 180° - 80%

Master - reference

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Date:	2018-07-30
Serial-no.:	18240032		180	
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	180			
Test torque (M _{test}):	11,200 N·m	Target:	180,00	(degree)
Rotation angle starting torque (M _{rot}):	2,800 N·m			
± Tolerance:	7,00 %	± Tolerance:	10,00	(degree)
+ Tolerance:	0,784 N·m	+ Tolerance:	10,00	(degree)
- Tolerance:	0,784 N·m	- Tolerance:	10,00	(degree)
Upper tolerance (T _u /M _{test}):	11,984 N·m	(T _u /M _{test}):	190,00	(degree)
Lower tolerance (T _l /M _{test}):	10,416 N·m	(T _l /M _{test}):	170,00	(degree)
Speed:	1 Step:	50 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)			
n	100	n	100	n	100		
\bar{x}	11,1370 N·m	Number of measurements	180,4800*	\bar{x}	180,4800*		
M _{max}	11,2650 N·m	Maximal	M _{max} 181,7500*	M _{max}	181,7500*		
M _{min}	10,9410 N·m	Minimal	M _{min} 179,2500*	M _{min}	179,2500*		
R (99,73%)	0,3240 N·m	Scatter	R (99,73%) 2,5000*	R (99,73%)	2,5000*		
s	0,8835 N·m	Standard deviation	s 0,8510*	s	0,8510*		
σ	0,9120 N·m	6 x Standard deviation	σ 5,1060*	σ	5,1060*		
N·m ²	11,370 N·m	Torque rate	σ	3,9062*	Torque rate	σ	3,9062*

Homologation		Machine capability test - MCT		Homologation	
Cm	3,1283	Capability index Cmk	5,1201	Cm	5,1201
Cmk	2,5252	Capability index Cmk	4,5745	Cmk	4,5745

EC tightening tool

Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Date:	2018-07-30
Serial-no.:	18240032		180	
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	180			
Test torque (M _{test}):	11,200 N·m	Target:	180,00	(degree)
Rotation angle starting torque (M _{rot}):	2,800 N·m			
± Tolerance:	7,00 %	± Tolerance:	10,00	(degree)
+ Tolerance:	0,784 N·m	+ Tolerance:	10,00	(degree)
- Tolerance:	0,784 N·m	- Tolerance:	10,00	(degree)
Upper tolerance (T _u /M _{test}):	11,984 N·m	(T _u /M _{test}):	190,00	(degree)
Lower tolerance (T _l /M _{test}):	10,416 N·m	(T _l /M _{test}):	170,00	(degree)
Speed:	1 Step:	50 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)			
n	100	n	100	n	100		
\bar{x}	11,1792 N·m	Number of measurements	180,8500*	\bar{x}	180,8500*		
M _{max}	11,2900 N·m	Maximal	M _{max} 181,3000*	M _{max}	181,3000*		
M _{min}	11,0100 N·m	Minimal	M _{min} 180,2000*	M _{min}	180,2000*		
R (99,73%)	0,2800 N·m	Scatter	R (99,73%) 1,1000*	R (99,73%)	1,1000*		
s	0,7233 N·m	Standard deviation	s 0,7888*	s	0,7888*		
σ	0,7468 N·m	6 x Standard deviation	σ 4,7328*	σ	4,7328*		
N·m ²	11,1792 N·m	Torque rate	σ	1,1528*	Torque rate	σ	1,1528*

Homologation		Machine capability test - MCT		Homologation	
Cm	3,6013	Capability index Cmk	17,6549	Cm	17,6549
Cmk	3,5252	Capability index Cmk	15,4548	Cmk	15,4548

Difference evaluation

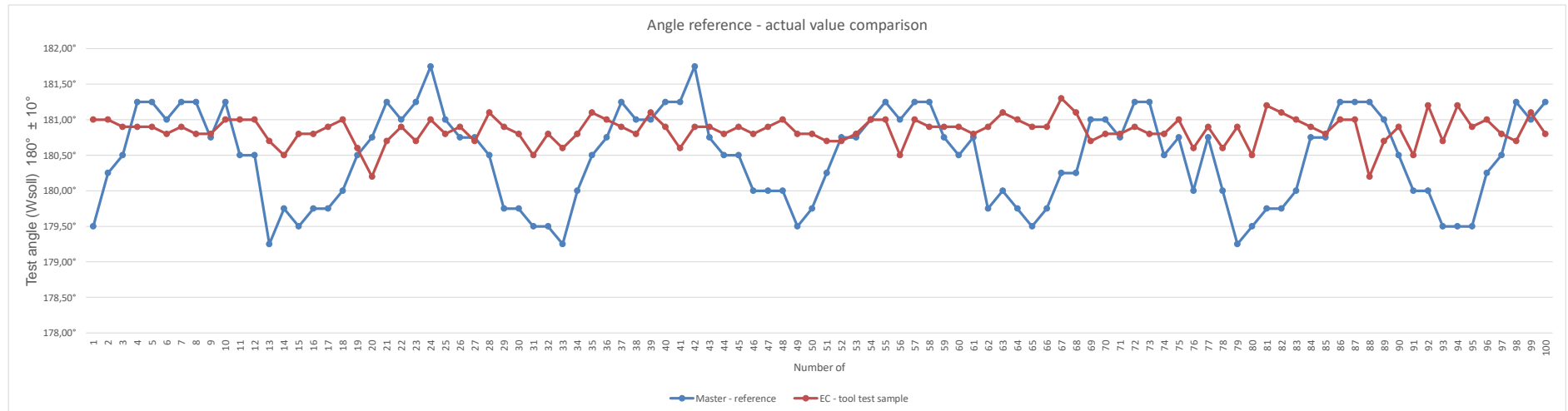
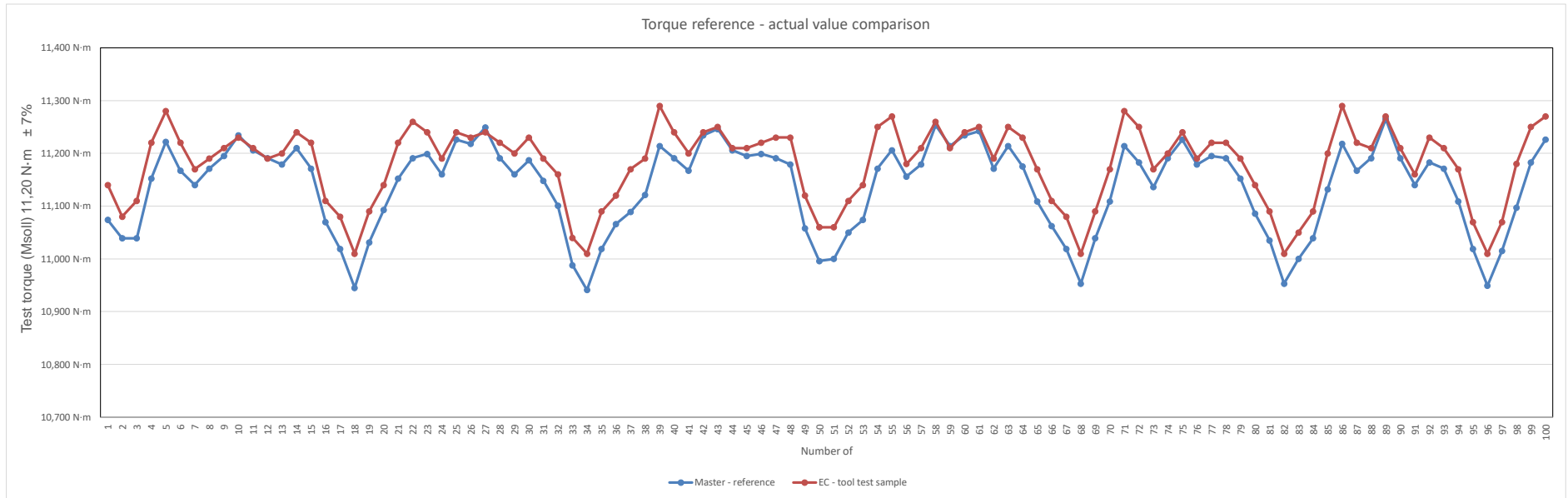
Tool Model:	TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB		Date:	2018-07-30
Serial-no.:	18240032		180	
Operating range (N·m):	1,00	to 14,00		
Sample size:	100 piece			
Test point:	180			
Test torque (M _{test}):	0,000 N·m	Target:	0,00	(degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m			
± Tolerance:	7,00 %	± Tolerance:	10,00	(degree)
+ Tolerance:	0,784 N·m	+ Tolerance:	10,00	(degree)
- Tolerance:	0,784 N·m	- Tolerance:	10,00	(degree)
Upper tolerance (T _u /M _{test}):	0,784 N·m	(T _u /M _{test}):	10,00	(degree)
Lower tolerance (T _l /M _{test}):	-0,784 N·m	(T _l /M _{test}):	-10,00	(degree)
Speed:	1 Step:	50 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)			
n	100	n	100	n	100		
\bar{x}	-0,4422 N·m	Number of measurements	180,3700*	\bar{x}	-0,3730*		
M _{max}	0,0900 N·m	Maximal	M _{max} 1,0500*	M _{max}	1,0500*		
M _{min}	-0,8300 N·m	Minimal	M _{min} -1,7000*	M _{min}	-1,7000*		
R (99,73%)	0,9200 N·m	Scatter	R (99,73%) 2,7500*	R (99,73%)	2,7500*		
s	0,2333 N·m	Standard deviation	s 0,6789*	s	0,6789*		
σ	0,2422 N·m	6 x Standard deviation	σ 4,0732*	σ	4,0732*		
N·m ²	-0,4422 N·m	Torque rate	σ	4,0732*	Torque rate	σ	4,0732*

Homologation		Machine capability test - MCT		Homologation	
Cm	11,2158	Capability index Cmk	4,9100	Cm	4,9100
Cmk	10,6135	Capability index Cmk	4,7228	Cmk	4,7228

TBPEEC-12xx, TBPEEC-12B, TBPEEC-12W, TBPEEC-12WB							SN: 18240032							Date: 2018-07-30						
Measurement result							Measurement result							Measurement result						
Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)	Nr.	Torque (N·m)	Difference (N·m)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	11,074 N·m	-0,126 N·m	-1,13%	179,50°	-0,50°	-0,28%	1	11,140 N·m	-0,060 N·m	-0,54%	181,00°	1,00°	0,56%	1	-0,066 N·m	-0,59%	181,00°	1,00°	-0,83%	
2	11,039 N·m	-0,161 N·m	-1,44%	180,25°	0,25°	0,14%	2	11,080 N·m	-0,120 N·m	-1,07%	181,00°	1,00°	0,56%	2	-0,041 N·m	-0,37%	181,00°	1,00°	-0,75°	-0,42%
3	11,039 N·m	-0,161 N·m	-1,44%	180,50°	0,50°	0,28%	3	11,110 N·m	-0,090 N·m	-0,80%	180,90°	0,90°	0,50%	3	-0,071 N·m	-0,63%	180,90°	0,90°	-0,40°	-0,22%
4	11,042 N·m	-0,158 N·m	-1,43%	180,50°	0,50°	0,28%	4	11,220 N·m	0,020 N·m	0,18%	180,80°	0,80°	0,44%	4	-0,068 N·m	-0,61%	180,80°	0,80°	-0,45°	-0,25%
5	11,222 N·m	0,022 N·m	0,20%	181,25°	1,25°	0,69%	5	11,280 N·m	0,080 N·m	0,71%	180,90°	0,90°	0,50%	5	-0,058 N·m	-0,52%	180,90°	0,90°	0,35°	0,19%
6	11,167 N·m	-0,033 N·m	-0,29%	181,00°	1,00°	0,56%	6	11,220 N·m	0,020 N·m	0,18%	180,80°	0,80°	0,44%	6	-0,053 N·m	-0,47%	180,80°	0,80°	0,20°	0,11%
7	11,140 N·m	-0,090 N·m	-0,80%	181,25°	1,25°	0,69%	7	11,170 N·m	-0,030 N·m	-0,27%	180,90°	0,90°	0,50%	7	-0,030 N·m	-0,27%	180,90°	0,90°	0,35°	0,19%
8	11,171 N·m	-0,029 N·m	-0,26%	181,25°	1,25°	0,69%	8	11,190 N·m	-0,010 N·m	-0,09%	180,80°	0,80°	0,44%	8	-0,018 N·m	-0,17%	180,80°	0,80°	0,45°	0,26%
9	11,185 N·m	-0,045 N·m	-0,41%	179,75°	-0,25°	-0,14%	9	11,230 N·m	0,030 N·m	0,27%	180,80°	0,80°	0,44%	9	-0,015 N·m	-0,14%	180,80°	0,80°	-0,05°	-0,25%
10	11,234 N·m	0,034 N·m	0,30%	181,25°	1,25°	0,69%	10	11,230 N·m	0,030 N·m	0,27%	181,00°	1,00°	0,56%	10	0,004 N·m	0,04%	181,00°	1,00°	0,25°	0,14%
11	11,206 N·m	0,006 N·m	0,05%	180,50°	0,50°	0,28%	11	11,210 N·m	0,010 N·m	0,09%	181,00°	1,00°	0,56%	11	-0,004 N·m	-0,04%	181,00°	1,00°	-0,20°	-0,28%
12	11,191 N·m	-0,009 N·m	-0,08%	180,50°	0,50°	0,28%	12	11,190 N·m	-0,010 N·m	-0,09%	181,00°	1,00°	0,56%	12	-0,001 N·m	0,01%	181,00°	1,00°	-0,50°	-0,28%
13	11,179 N·m	-0,021 N·m	-0,19%	179,25°	-0,75°	-0,42%	13	11,200 N·m	0,000 N·m	0,00%	180,70°	0,70°	0,39%	13	-0,021 N·m	-0,19%	180,70°	0,70°	-1,45°	-0,81%
14	11,210 N·m	0,010 N·m	0,09%	179,75°	-0,25°	-0,14%	14	11,240 N·m	0,040 N·m	0,36%	180,60°	0,60°	0,33%	14	-0,020 N·m	-0,27%	180,60°	0,60°	-1,75°	-1,05°
15	11,171 N·m	-0,029 N·m	-0,26%	179,50°	-0,50°	-0,28%	15	11,220 N·m	0,020 N·m	0,18%	180,80°	0,80°	0,44%	15	-0,049 N·m	-0,44%	180,80°	0,80°	-1,30°	-0,72%
16	11,070 N·m	-0,130 N·m	-1,16%	179,75°	-0,25°	-0,14%	16	11,110 N·m	-0,020 N·m	-0,18%	180,80°	0,80°	0,44%	16	-0,040 N·m	-0,36%	180,80°	0,80°	-1,05°	-0,58%
17	11,019 N·m	-0,181 N·m	-1,62%	179,75°	-0,25°	-0,14%	17	11,080 N·m	-0,120 N·m	-1,07%	180,90°	0,90°	0,50%	17	-0,061 N·m	-0,54%	180,90°	0,90°	-1,15°	-0,64%
18	10,945 N·m	-0,255 N·m	-2,28%	180,00°	0,00°	0,00%	18	11,010 N·m	-0,190 N·m	-1,70%	181,00°	1,00°	0,56%	18	-0,065 N·m	-0,58%	181,00°	1,00°	-1,00°	-0,56%
19	11,031 N·m	-0,169 N·m	-1,51%	180,50°	0,50°	0,28%	19	11,090 N·m	-0,110 N·m	-0,98%	180,80°	0,80°	0,44%	19	-0,059 N·m	-0,53%	180,80°	0,80°	-1,15°	-0,64%
20	11,093 N·m	-0,107 N·m	-0,96%	180,75°	0,75°	0,42%	20	11,140 N·m	-0,060 N·m	-0,54%	180,20°	0,20°	0,11%	20	-0,047 N·m	-0,42%	180,20°	0,20°	0,55°	0,31%
21	11,152 N·m	-0,048 N·m	-0,43%	181,25°	1,25°	0,69%	21	11,220 N·m	0,020 N·m	0,18%	180,70°	0,70°	0,39%	21	-0,068 N·m	-0,61%	180,70°	0,70°	0,55°	0,31%
22	11,191 N·m	-0,009 N·m	-0,08%	181,00°	1,00°	0,56%	22	11,260 N·m	0,060 N·m	0,54%	180,90°	0,90°	0,50%	22	-0,069 N·m	-0,62%	180,90°	0,90°	0,10°	0,06%
23	11,199 N·m	-0,001 N·m	-0,01%	181,25°	1,25°	0,69%	23	11,240 N·m	0,040 N·m	0,36%	180,70°	0,70°	0,39%	23	-0,041 N·m	-0,37%	180,70°	0,70°	0,55°	0,31%
24	11,160 N·m	-0,040 N·m	-0,36%	181,25°	1,25°	0,69%	24	11,190 N·m	-0,010 N·m	-0,09%	181,00°	1,00°	0,56%	24	-0,030 N·m	-0,27%	181,00°	1,00°	0,25°	0,14%
25	11,226 N·m	0,026 N·m	0,23%	181,00°	1,00°	0,56%	25	11,240 N·m	0,040 N·m	0,36%	180,80°	0,80°	0,44%	25	-0,014 N·m	-0,12%	180,80°	0,80°	0,20°	0,11%
26	11,218 N·m	0,018 N·m	0,16%	180,75°	0,75°	0,42%	26	11,230 N·m	0,030 N·m	0,27%	180,90°	0,90°	0,50%	26	-0,012 N·m	-0,11%	180,90°	0,90°	-0,15°	-0,08%
27	11,249 N·m	0,049 N·m	0,44%	180,75°	0,75°	0,42%	27	11,240 N·m	0,040 N·m	0,36%	180,70°	0,70°	0,39%	27	0,009 N·m	0,09%	180,70°	0,70°	0,05°	0,03%
28	11,191 N·m	-0,009 N·m	-0,08%	180,50°	0,50°	0,28%	28	11,220 N·m	0,020 N·m	0,18%	181,10°	1,10°	0,61%	28	-0,028 N·m	-0,28%	181,10°	1,10°	-0,60°	-0,33%
29	11,160 N·m	-0,040 N·m	-0,36%	180,50°	0,50°	0,28%	29	11,260 N·m	0,060 N·m	0,54%	181,00°	1,00°	0,56%	29	-0,076 N·m	-0,70%	181,00°	1,00°	-1,15°	-0,64%
30	11,187 N·m	-0,013 N·m	-0,12%	179,75°	-0,25°	-0,14%	30	11,230 N·m	0,030 N											

1 - Chart - 180° - 80%



2 - test point 180° - 80%

Master - reference

Tool Model:		TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	180		
Test torque (M _{avg}):	11,200 N·m	Target:	180,00 (degree)
Rotation angle starting torque (M _{st}):	2,800 N·m		
± Tolerance:	7,00 %	± Tolerance:	10,00 (degree)
+ Tolerance:	0,784 N·m	+ Tolerance:	10,00 (degree)
- Tolerance:	-0,784 N·m	- Tolerance:	-10,00 (degree)
Upper tolerance (T _u /M _{avg}):	11,984 N·m	(T _u /M _{avg}):	180,00 (degree)
Lower tolerance (T _l /M _{avg}):	10,416 N·m	(T _l /M _{avg}):	170,00 (degree)
Speed:	1 Step: 50 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,506 N·m	Average	11,506 N·m	\bar{x}	180,775°
M _{max}	11,260 N·m	Maximal	181,500°	M _{max}	181,500°
M _{min}	10,960 N·m	Minimal	179,000°	M _{min}	179,000°
R (99,73%)	0,300 N·m	Scatter	R (99,73%)	0,615°	
s	0,047 N·m	Standard deviation	s	0,615°	
σ	0,151 N·m	6 x Standard deviation	σ	3,690°	
N·m ²	11,506 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	3,4992	Capability index Cmk	5,4134	Cm	5,4134
Cmk	3,2782	Capability index Cmk	5,3175	Cmk	5,3175

EC tightening tool

Tool Model:		TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	180		
Test torque (M _{avg}):	11,200 N·m	Target:	180,00 (degree)
Rotation angle starting torque (M _{st}):	2,800 N·m		
± Tolerance:	7,00 %	± Tolerance:	10,00 (degree)
+ Tolerance:	0,784 N·m	+ Tolerance:	10,00 (degree)
- Tolerance:	-0,784 N·m	- Tolerance:	-10,00 (degree)
Upper tolerance (T _u /M _{avg}):	11,984 N·m	(T _u /M _{avg}):	180,00 (degree)
Lower tolerance (T _l /M _{avg}):	10,416 N·m	(T _l /M _{avg}):	170,00 (degree)
Speed:	1 Step: 50 rpm	2 Step:	50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,200 N·m	Average	11,200 N·m	\bar{x}	180,775°
M _{max}	11,310 N·m	Maximal	181,200°	M _{max}	181,200°
M _{min}	11,050 N·m	Minimal	180,300°	M _{min}	180,300°
R (99,73%)	0,260 N·m	Scatter	R (99,73%)	0,900°	
s	0,080 N·m	Standard deviation	s	0,789°	
σ	0,240 N·m	6 x Standard deviation	σ	4,734°	
N·m ²	11,200 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	3,8411	Capability index Cmk	18,8460	Cm	18,8460
Cmk	3,5377	Capability index Cmk	17,2500	Cmk	17,2500

Difference evaluation

Tool Model:		TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240039	Date:	2018-07-30
Operating range (N·m):	1,00 to 14,00		
Sample size:	100 piece		
Test point:	180		
Test torque (M _{avg}):	0,000 N·m	Target:	0,00 (degree)
Rotation angle starting torque (M _{st}):	0,000 N·m		
± Tolerance:	7,00 %	± Tolerance:	10,00 (degree)
+ Tolerance:	-0,784 N·m	+ Tolerance:	10,00 (degree)
- Tolerance:	0,784 N·m	- Tolerance:	-10,00 (degree)
Upper tolerance (T _u /M _{avg}):	-0,784 N·m	(T _u /M _{avg}):	10,00 (degree)
Lower tolerance (T _l /M _{avg}):	-0,784 N·m	(T _l /M _{avg}):	-10,00 (degree)
Speed:	1 Step: 50 rpm	2 Step:	50 rpm

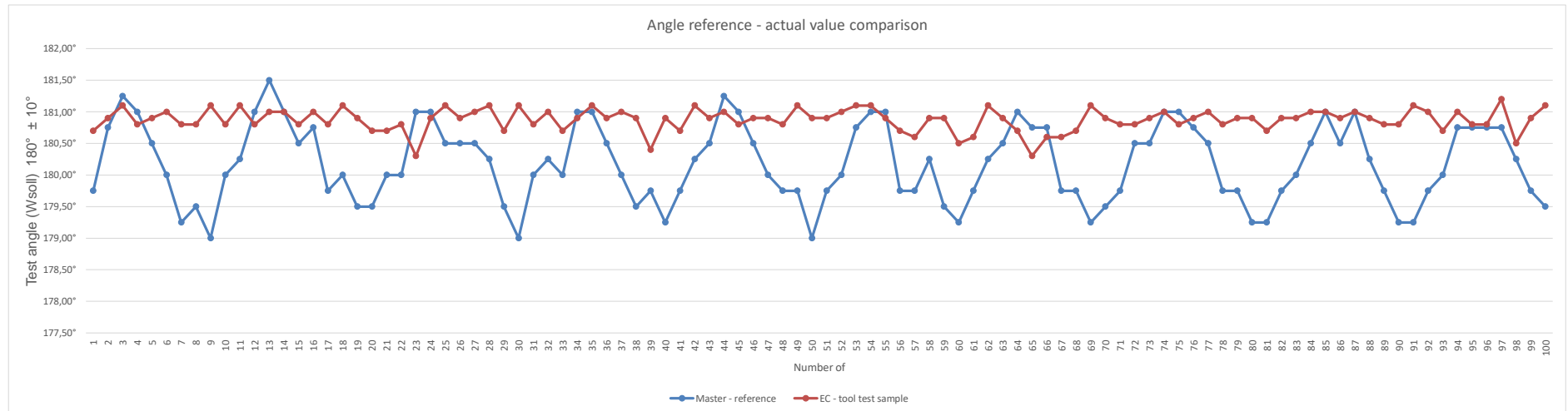
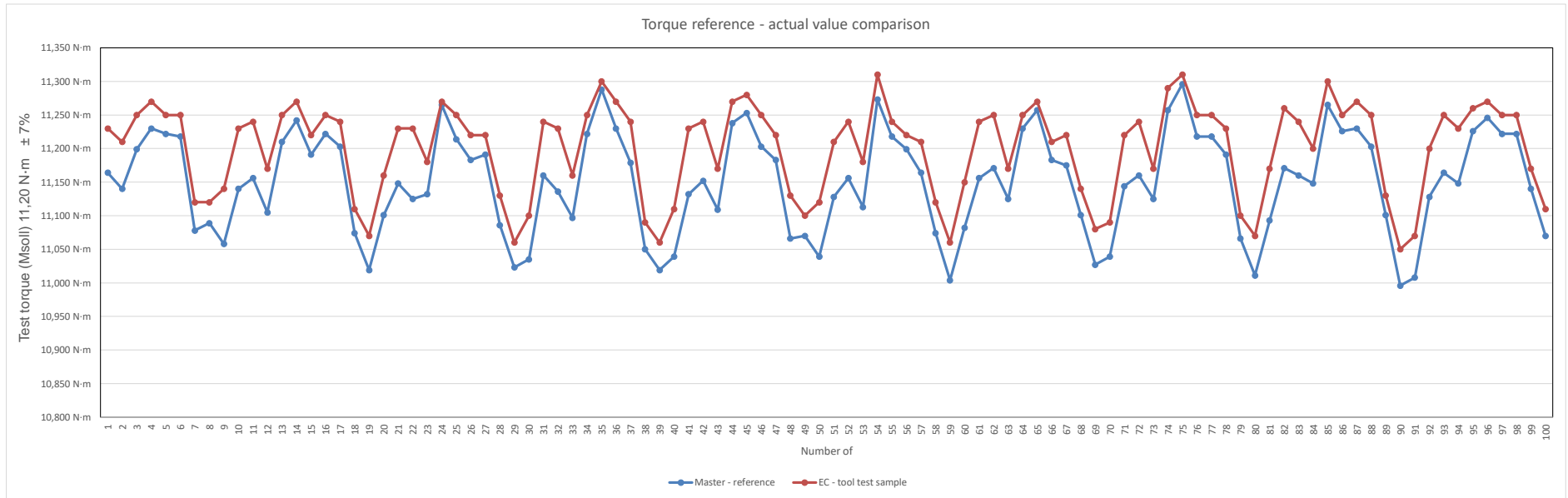
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0501 N·m	Average	-0,0501 N·m	\bar{x}	-0,6955°
M _{max}	-0,0500 N·m	Maximal	0,7000°	M _{max}	0,7000°
M _{min}	-0,1000 N·m	Minimal	-2,1000°	M _{min}	-2,1000°
R (99,73%)	0,1000 N·m	Scatter	R (99,73%)	2,8000°	
s	0,0228 N·m	Standard deviation	s	0,8210°	
σ	0,0684 N·m	6 x Standard deviation	σ	4,9260°	
N·m ²	-0,0501 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	11,4705	Capability index Cmk	5,3679	Cm	5,3679
Cmk	10,3298	Capability index Cmk	4,9484	Cmk	4,9484

Measurement result

Torque		Difference		Angle		
Nr.	(N·m)	(N·m)	(%)	(°)	(°)	(%)
1	11,164 N·m	-0,036 N·m	-0,32%	179,75°	-0,25°	-0,14%
2	11,140 N·m	-0,060 N·m	-0,54%	181,75°	0,75°	0,42%
3	11,199 N·m	-0,001 N·m	-0,01%	181,25°	1,25°	0,69%
4	11,233 N·m	0,033 N·m	0,27%	181,25°	1,00°	0,56%
5	11,222 N·m	0,022 N·m	0,20%	180,50°	0,50°	0,28%
6	11,218 N·m	0,018 N·m	0,16%	180,00°	0,00°	0,00%
7	11,078 N·m	-0,122 N·m	-1,09%	179,25°	-0,75°	-0,42%
8	11,089 N·m	-0,111 N·m	-0,99%	179,50°	-0,50°	-0,28%
9	11,142 N·m	0,042 N·m	0,37%	181,00°	1,00°	0,56%
10	11,140 N·m	-0,060 N·m	-0,54%	180,00°	0,00°	0,00%
11	11,156 N·m	-0,044 N·m	-0,39%	180,25°	0,25°	0,14%
12	11,105 N·m	-0,095 N·m	-0,85%	181,00°	1,00°	0,56%
13	11,210 N·m	0,010 N·m	0,09%	181,50°	1,50°	0,83%
14	11,242 N·m	0,042 N·m	0,37%	181,00°	1,00°	0,56%
15	11,191 N·m	-0,009 N·m	-0,08%	180,50°	0,50°	0,28%
16	11,222 N·m	0,022 N·m	0,20%	180,75°	0,75°	0,42%
17	11,203 N·m	0,003 N·m	0,03%	179,75°	-0,25°	-0,14%
18	11,074 N·m	-0,126 N·m	-1,13%	180,00°	0,00°	0,00%
19	11,243 N·m	0,043 N·m	0,38%	179,50°	-0,50°	-0,28%
20	11,101 N·m	-0,099 N·m	-0,88%	179,50°	-0,50°	-0,28%
21	11,148 N·m	-0,052 N·m	-0,46%	180,00°	0,00°	0,00%
22	11,125 N·m	-0,075 N·m	-0,67%	180,00°	0,00°	0,00%
23	11,132 N·m	-0,068 N·m	-0,61%	181,00°	1,00°	0,56%
24	11,268 N·m	0,068 N·m	0,61%	181,00°	1,00°	0,56%
25	11,214 N·m	0,014 N·m	0,12%	180,50°	0,50°	0,28%
26	11,183 N·m	-0,017 N·m	-0,15%	180,50°	0,50°	0,28%
27	11,191 N·m	-0,009 N·m	-0,08%	180,50°	0,50°	0,28%
28	11,086 N·m	-0,114 N·m	-1,02%	180,25°	0,25°	0,14%
29	11,128 N·m	-0,072 N·m	-0,64%	179,00°	-0,50°	-0,28%
30	11,035 N·m	-0,165 N·m	-1,47%	179,00°	-1,00°	-0,56%
31	11,160 N·m	-0,040 N·m	-0,36%	180,00°	0,00°	0,00%
32	11,136 N·m	-0,024 N·m	-0,21%	180,25°	0,25°	0,14%
33	11,097 N·m	-0,103 N·m	-0,92%	180,00°	0,00°	0,00%
34	11,202 N·m	0,002 N·m	0,02%	180,00°	0,00°	0,00%
35	11,288 N·m	0,088 N·m	0,79%	181,00°	1,00°	0,56%
36	11,230 N·m	0,030 N·m	0,27%	180,50°	0,50°	0,28%
37	11,179 N·m	-0,021 N·m	-0,19%	180,00°	0,00°	0,00%
38	11,050 N·m	-0,150 N·m	-1,34%	179,50°	-0,50°	-0,28%
39	11,193 N·m	-0,081 N·m	-0,72%	179,00°	-1,00°	-0,56%
40	11,039 N·m	-0,161 N·m	-1,44%	179,25°	-0,75°	-0,42%
41	11,132 N·m	-0,068 N·m	-0,61%	179,75°	-0,25°	-0,14%
42	11,152 N·m	-0,048 N·m	-0,43%	180,25°	0,25°	0,14%
43	11,109 N·m	-0,091 N·m	-0,81%	180,50°	0,50°	0,28%
44	11,228 N·m	0,028 N·m	0,25%	181,00°	1,00°	0,56%
45	11,253 N·m	0,053 N·m	0,47%	181,00°	1,00°	0,56%
46	11,203 N·m	0,003 N·m	0,03%	180,50°	0,50°	0,28%
47	11,183 N·m	-0,017 N·m	-0,15%	180,00°	0,00°	0,00%
48	11,163 N·m	-0,134 N·m	-1,20%	179,75°	-0,25°	-0,14%
49	11,070 N·m	-0,130 N·m	-1,18%	180,00°	0,00°	0,00%
50	11,039 N·m	-0,161 N·m	-1,44%	179,00°	-1,00°	-0,56%
51	11,128 N·m	-0,072 N·m	-0,64%	179,75°	-0,25°	-0,14%
52	11,156 N·m	-0,044 N·m	-0,39%	180,00°	0,00°	0,00%
53	11,133 N·m	-0,087 N·m	-0,78%	180,75°	0,75°	0,42%
54	11,273 N·m	0,073 N·m	0,65%	181,00°	1,00°	0,56%
55	11,218 N·m	0,018 N·m	0,16%	181,00°	1,00°	0,56%
56	11,199 N·m	-0,001 N·m	-0,01%	179,75°	-0,25°	-0,14%
57	11,164 N·m	-0,036 N·m	-0,32%	179,75°	-0,25°	-0,14%
58	11,074 N·m	-0,126 N·m	-1,13%	180,25°	0,25°	0,14%
59	11,044 N·m	-0,106 N·m	-0,96%	180,00°	0,00°	0,00%
60	11,082 N·m	-0,118 N·m	-1,05%	179,25°	-0,75°	-0,42%
61	11,156 N·m	-0,044 N·m	-0,39%	179,75°	-0,25°	-0,14%
62	11,171 N·m	-0,029 N·m	-0,26%	180,25°	0,25°	0,14%
63	11,125 N·m	-0,075 N·m	-0,67%	180,50°	0,50°	0,28%
64	11,230 N·m	0,030 N·m	0,27%	181,00°	1,00°	0,56%
65	11,257 N·m	0,057 N·m	0,51%	180,75°	0,75°	0,42%
66	11,183 N·m	-0,017 N·m	-0,15%	180,75°	0,75°	0,42%
67	11,175 N·m	-0,025 N·m	-0,22%	179,75°	-0,25°	-0,14%
68	11,101 N·m	-0,099 N·m	-0,88%	179,75°	-0,25°	-0,14%
69	11,027 N·m	-0,173 N·m	-1,54%	179,25°	-0,75°	-0,42%
70	11,039 N·m	-0,161 N·m	-1,44%	179,50°	-0,50°	-0,28%
71	11,144 N·m	-0,056 N·m	-0,50%	179,75°	-0,25°	-0,14%
72	11,160 N·m	-0,040 N·m	-0,36%	180,50°	0,50°	0,28%
73	11,125 N·m	-0,075 N·m	-0,67%	180,50°	0,50°	0,28%
74	11,257 N·m	0,057 N·m	0,51%	181,00°	1,00°	0,56%
75	11,296 N·m	0,096 N·m	0,86%	181,00°	1,00°	0,56%
76	11,218 N·m	0,018 N·m	0,16%	180,75°	0,75°	0,42%
77	11,218 N·m	0,018 N·m	0,16%	180,50°	0,50°	0,28%

2 - Chart - 180° - 80%



3 - test point 180° - 80%

Master - reference

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	180	
Test torque (M _{test}):	11,200 N·m	Target: 180,00 (degree)
Rotation angle starting torque (M _{rot}):	2,800 N·m	
± Tolerance:	7,00 %	± Tolerance: 10,00 (degree)
+ Tolerance:	0,784 N·m	+ Tolerance: 10,00 (degree)
- Tolerance:	0,784 N·m	- Tolerance: 10,00 (degree)
Upper tolerance (T _u /M _{test}):	11,984 N·m	(T _u /M _{test}): 180,00 (degree)
Lower tolerance (T _l /M _{test}):	10,416 N·m	(T _l /M _{test}): 170,00 (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,1820 N·m	Average	11,1820 N·m	\bar{x}	180,0475°
M _{max}	11,3120 N·m	Maximal	11,3120 N·m	M _{max}	181,5000°
M _{min}	10,2030 N·m	Minimal	10,2030 N·m	M _{min}	178,5000°
R (99,73%)	0,2890 N·m	Scatter	0,2890 N·m	R (99,73%)	2,7500°
s	0,0772 N·m	Standard deviation	0,0772 N·m	s	0,7210°
σ	0,4825 N·m	6 x Standard deviation	0,4825 N·m	σ	4,3265°
N·m ²	11,1820 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	3,3865	Capability index Crk	4,6233	Cm	4,6233
Cmk	3,3865	Capability index Crk	4,6233	Cmk	4,6233

EC tightening tool

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	180	
Test torque (M _{test}):	11,200 N·m	Target: 180,00 (degree)
Rotation angle starting torque (M _{rot}):	2,800 N·m	
± Tolerance:	7,00 %	± Tolerance: 10,00 (degree)
+ Tolerance:	0,784 N·m	+ Tolerance: 10,00 (degree)
- Tolerance:	0,784 N·m	- Tolerance: 10,00 (degree)
Upper tolerance (T _u /M _{test}):	11,984 N·m	(T _u /M _{test}): 180,00 (degree)
Lower tolerance (T _l /M _{test}):	10,416 N·m	(T _l /M _{test}): 170,00 (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	11,2436 N·m	Average	11,2436 N·m	\bar{x}	180,8000°
M _{max}	11,4100 N·m	Maximal	11,4100 N·m	M _{max}	181,3000°
M _{min}	11,0700 N·m	Minimal	11,0700 N·m	M _{min}	180,2000°
R (99,73%)	0,3400 N·m	Scatter	0,3400 N·m	R (99,73%)	1,1000°
s	0,0826 N·m	Standard deviation	0,0826 N·m	s	0,2106°
σ	0,4956 N·m	6 x Standard deviation	0,4956 N·m	σ	1,2636°
N·m ²	11,2436 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	3,1651	Capability index Crk	4,5294	Cm	4,5294
Cmk	3,1651	Capability index Crk	4,5294	Cmk	4,5294

Difference evaluation

Tool Model:	TBPEC-12xx, TBPEC-12B, TBPEC-12W, TBPEC-12WB	
Serial-no.:	18240041	
Date:	2018-07-30	
Operating range (N·m):	1,00 to 14,00	
Sample size:	100 piece	
Test point:	180	
Test torque (M _{test}):	0,000 N·m	Target: 0,00 (degree)
Rotation angle starting torque (M _{rot}):	0,000 N·m	
± Tolerance:	7,00 %	± Tolerance: 10,00 (degree)
+ Tolerance:	-0,784 N·m	+ Tolerance: 10,00 (degree)
- Tolerance:	-0,784 N·m	- Tolerance: 10,00 (degree)
Upper tolerance (T _u /M _{test}):	0,784 N·m	(T _u /M _{test}): 10,00 (degree)
Lower tolerance (T _l /M _{test}):	-0,784 N·m	(T _l /M _{test}): -10,00 (degree)
Speed:	1 Step: 50 rpm	2 Step: 50 rpm

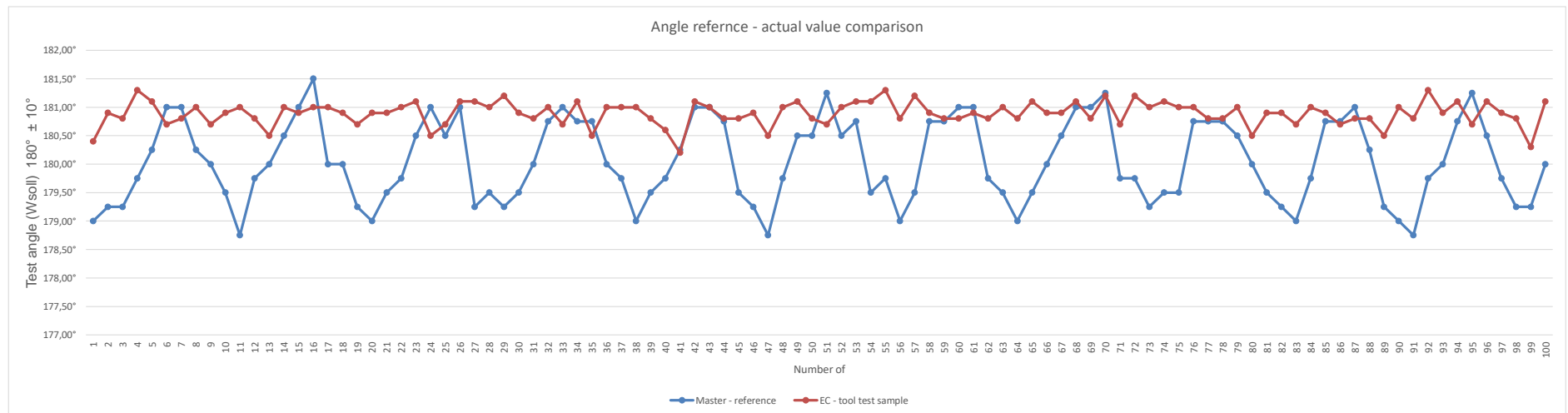
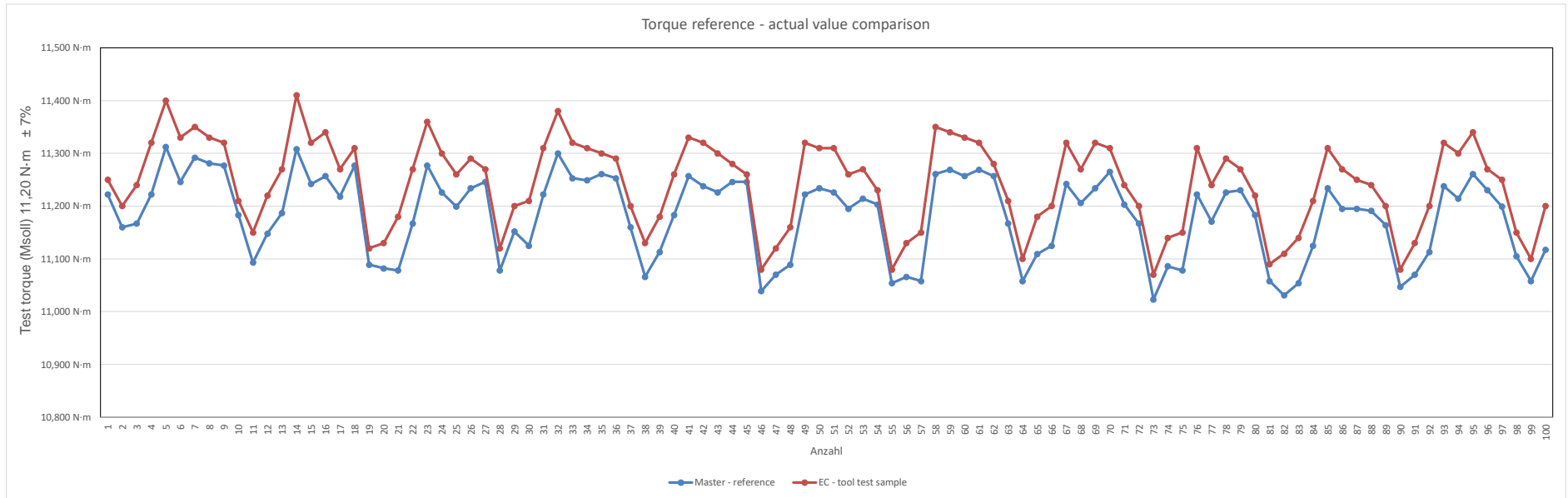
Torque (N·m)		Statistical evaluation		Angle (degree)	
n	100	n	100	n	100
\bar{x}	-0,0617 N·m	Average	-0,0617 N·m	\bar{x}	-0,8425°
M _{max}	-0,0140 N·m	Maximal	-0,0140 N·m	M _{max}	0,5500°
M _{min}	-0,1030 N·m	Minimal	-0,1030 N·m	M _{min}	-2,2500°
R (99,73%)	0,0890 N·m	Scatter	0,0890 N·m	R (99,73%)	2,8000°
s	0,0217 N·m	Standard deviation	0,0217 N·m	s	0,7430°
σ	1,3025 N·m	6 x Standard deviation	1,3025 N·m	σ	4,4582°
N·m ²	-0,0617 N·m	Torque rate			

Homologation		Machine capability test - MCT		Homologation	
Cm	12,0432	Capability index Crk	4,4882	Cm	4,4882
Cmk	11,8952	Capability index Crk	4,1082	Cmk	4,1082

Measurement result

Nr.	Torque			Angle		
	Torque (N·m)	Difference (%)	Difference (%)	Angle (°)	Difference (°)	Difference (%)
1	11,222 N·m	0,022 N·m	0,20%	179,00°	179,00°	-0,56%
2	11,160 N·m	-0,040 N·m	-0,36%	179,25°	179,25°	-0,42%
3	11,167 N·m	-0,033 N·m	-0,29%	179,25°	179,25°	-0,42%
4	11,032 N·m	-0,150 N·m	-1,35%	179,25°	179,25°	-0,42%
5	11,312 N·m	0,112 N·m	1,00%	180,25°	180,25°	0,14%
6	11,246 N·m	0,046 N·m	0,41%	181,00°	181,00°	0,56%
7	11,292 N·m	0,092 N·m	0,82%	181,00°	181,00°	0,56%
8	11,281 N·m	0,081 N·m	0,72%	180,25°	180,25°	0,14%
9	11,277 N·m	0,077 N·m	0,69%	180,50°	180,50°	0,00%
10	11,183 N·m	-0,017 N·m	-0,15%	179,50°	179,50°	-0,28%
11	11,093 N·m	-0,107 N·m	-0,96%	178,75°	178,75°	-0,69%
12	11,148 N·m	-0,052 N·m	-0,46%	179,75°	179,75°	-0,14%
13	11,187 N·m	-0,013 N·m	-0,12%	180,00°	180,00°	0,00%
14	11,152 N·m	-0,038 N·m	-0,36%	180,50°	180,50°	0,00%
15	11,242 N·m	0,042 N·m	0,37%	181,00°	181,00°	0,56%
16	11,257 N·m	0,057 N·m	0,51%	181,50°	181,50°	0,83%
17	11,218 N·m	0,018 N·m	0,16%	180,00°	180,00°	0,00%
18	11,277 N·m	0,077 N·m	0,69%	180,00°	180,00°	0,00%
19	11,089 N·m	-0,111 N·m	-0,99%	179,25°	179,25°	-0,42%
20	11,082 N·m	-0,118 N·m	-1,05%	179,00°	179,00°	-0,56%
21	11,078 N·m	-0,122 N·m	-1,09%	179,50°	179,50°	-0,28%
22	11,167 N·m	-0,033 N·m	-0,29%	179,75°	179,75°	-0,14%
23	11,277 N·m	0,077 N·m	0,69%	180,50°	180,50°	0,00%
24	11,278 N·m	0,078 N·m	0,69%	181,00°	181,00°	0,56%
25	11,199 N·m	-0,001 N·m	-0,01%	180,50°	180,50°	0,00%
26	11,234 N·m	0,034 N·m	0,30%	181,00°	181,00°	0,56%
27	11,246 N·m	0,046 N·m	0,41%	179,25°	179,25°	-0,42%
28	11,078 N·m	-0,122 N·m	-1,09%	179,50°	179,50°	-0,28%
29	11,152 N·m	-0,048 N·m	-0,43%	179,25°	179,25°	-0,42%
30	11,125 N·m	-0,075 N·m	-0,67%	179,50°	179,50°	-0,28%
31	11,222 N·m	0,022 N·m	0,20%	180,00°	180,00°	0,00%
32	11,300 N·m	0,100 N·m	0,89%	180,75°	180,75°	0,42%
33	11,233 N·m	0,033 N·m	0,29%	181,00°	181,00°	0,56%
34	11,228 N·m	0,028 N·m	0,25%	180,75°	180,75°	0,42%
35	11,281 N·m	0,081 N·m	0,54%	180,75°	180,75°	0,42%
36	11,253 N·m	0,053 N·m	0,47%	180,00°	180,00°	0,00%
37	11,160 N·m	-0,040 N·m	-0,36%	179,75°	179,75°	-0,14%
38	11,066 N·m	-0,134 N·m	-1,20%	179,00°	179,00°	-0,56%
39	11,233 N·m	0,033 N·m	0,29%	179,50°	179,50°	-0,28%
40	11,183 N·m	-0,017 N·m	-0,15%	179,75°	179,75°	-0,14%
41	11,257 N·m	0,057 N·m	0,51%	180,25°	180,25°	0,14%
42	11,238 N·m	0,038 N·m	0,34%	181,00°	181,00°	0,56%
43	11,226 N·m	0,026 N·m	0,23%	181,00°	181,00°	0,56%
44	11,246 N·m	0,046 N·m	0,41%	180,75°	180,75°	0,42%
45	11,246 N·m	0,046 N·m	0,41%	179,50°	179,50°	-0,28%
46	11,039 N·m	-0,161 N·m	-1,44%	179,25°	179,25°	-0,42%
47	11,070 N·m	-0,130 N·m	-1,16%	178,75°	178,75°	-0,69%
48	11,083 N·m	-0,111 N·m	-0,99%	179,75°	179,75°	-0,14%
49	11,222 N·m	0,022 N·m	0,20%	180,00°	180,00°	0,00%
50	11,234 N·m	0,034 N·m	0,30%	180,50°	180,50°	0,00%
51	11,226 N·m	0,026 N·m	0,23%	181,25°	181,25°	0,69%
52	11,195 N·m	-0,005 N·m	-0,04%	180,50°	180,50°	0,00%
53	11,214 N·m	0,014 N·m	0,12%	180,75°	180,75°	0,42%
54	11,203 N·m	0,003 N·m	0,03%	179,50°	179,50°	-0,28%
55	11,054 N·m	-0,146 N·m	-1,30%	179,75°	179,75°	-0,14%
56	11,066 N·m	-0,134 N·m	-1,20%	179,00°	179,00°	-0,56%
57	11,058 N·m	-0,142 N·m	-1,27%	179,50°	179,50°	-0,28%
58	11,289 N·m	0,089 N·m	0,54%	180,75°	180,75°	0,42%
59	11,289 N·m	0,089 N·m	0,54%	180,75°	180,75°	0,42%
60	11,287 N·m	0,087 N·m	0,51%	181,00°	181,00°	0,56%
61	11,269 N·m	0,069 N·m	0,62%	181,00°	181,00°	0,56%
62	11,257 N·m	0,057 N·m	0,51%	179,75°	179,75°	-0,14%
63	11,167 N·m	-0,033 N·m	-0,29%	179,50°	179,50°	-0,28%
64	11,058 N·m	-0,142 N·m	-1,27%	179,00°	179,00°	-0,56%
65	11,109 N·m	-0,091 N·m	-0,81%	179,50°	179,50°	-0,28%
66	11,125 N·m	-0,075 N·m	-0,67%	180,00°	180,00°	0,00%
67	11,242 N·m	0,042 N·m	0,37%	180,50°	180,50°	0,00%
68	11,236 N·m	0,036 N·m	0,30%	181,00°	181,00°	0,56%
69	11,234 N·m	0,034 N·m	0,30%	181,00°	181,00°	0,56%
70	11,265 N·m	0,065 N·m	0,58%	181,25°	181,25°	0,69%
71	11,203 N·m	0,003 N·m	0,03%	179,75°	179,75°	-0,14%
72	11,187 N·m	-0,033 N·m	-0,29%	179,75°	179,75°	-0,14%
73	11,023 N·m	-0,177 N·m	-1,58%	179,25°	179,25°	-0,42%
74	11,086 N·m	-0,114 N·m	-1,02%	179,50°	179,50°	-0,28%
75	11,078 N·m	-0,122 N·m	-1,09%	179,50°	179,50°	-0,28%
76	11,222 N·m	0,022 N·m	0,20%	180,75°	180,75°	0,42%
77	11,171 N·m	-0,029 N·m	-0,26%	180,75°	180,75°	0,42%
78	11,228 N·m	0,028 N·m	0,25%	180,75°	180,75°	0,42%
79	11,230 N·m	0,030 N·m	0,27%	180,50°	180,50°	0,00%
80	11,183 N·m	-0,017 N·m	-0,15%	180,00°	180,00°	0,00%
81	11,058 N·m	-0,142 N·m	-1,27%	179,50°	179,50°	-0,28%
82	11,031 N·m	-0,169 N·m	-1,51%	179,25°	179,25°	-0,42%
83	11,284 N·m	0,084 N·m	0,50%	180,25°	180,25°	0,14%
84	11,125 N·m	-0,075 N·m	-0,67%	179,75°	179,75°	-0,14%
85	11,234 N·m	0,034 N·m	0,30%	180,75°	180,75°	0,42%
86	11,195 N·m	-0,005 N·m	-0,04%	180,75°	180,75°	0,42%
87	11,195 N·m	-0,005 N·m	-0,04%	181,00°	181,00°	0,56%
88	11,191 N·m	-0,009 N·m	-0,08%	180,25°	180,25°	0,14%
89						

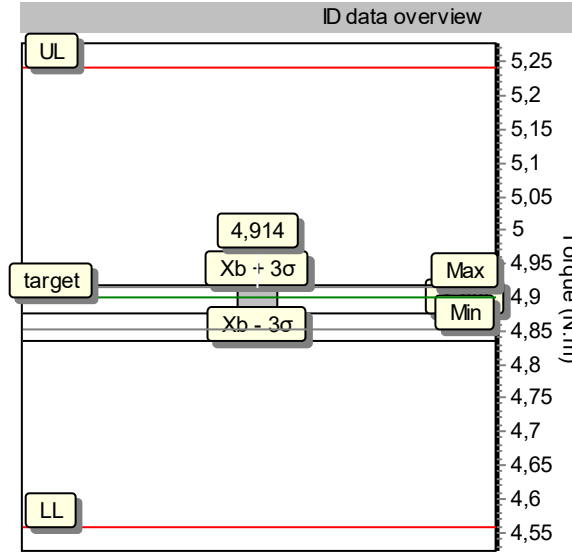
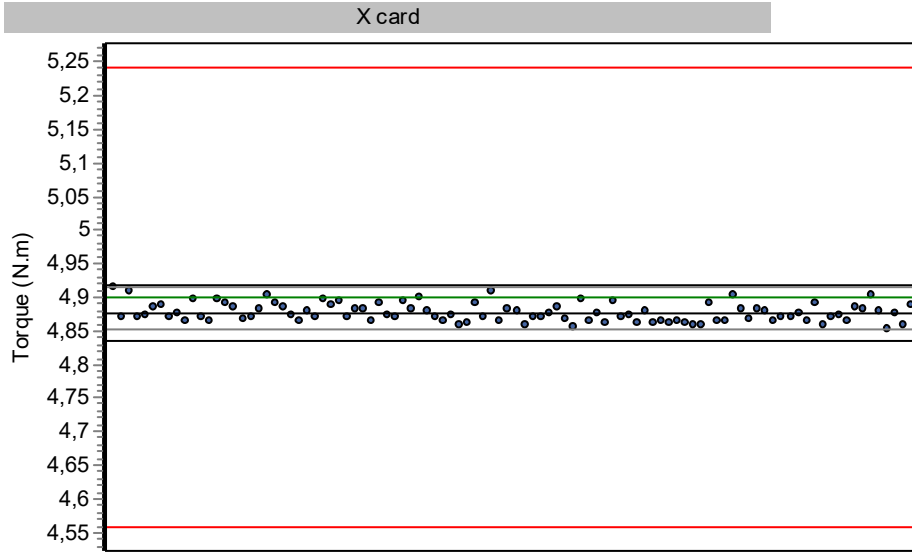
3 - Chart - 180° - 80%



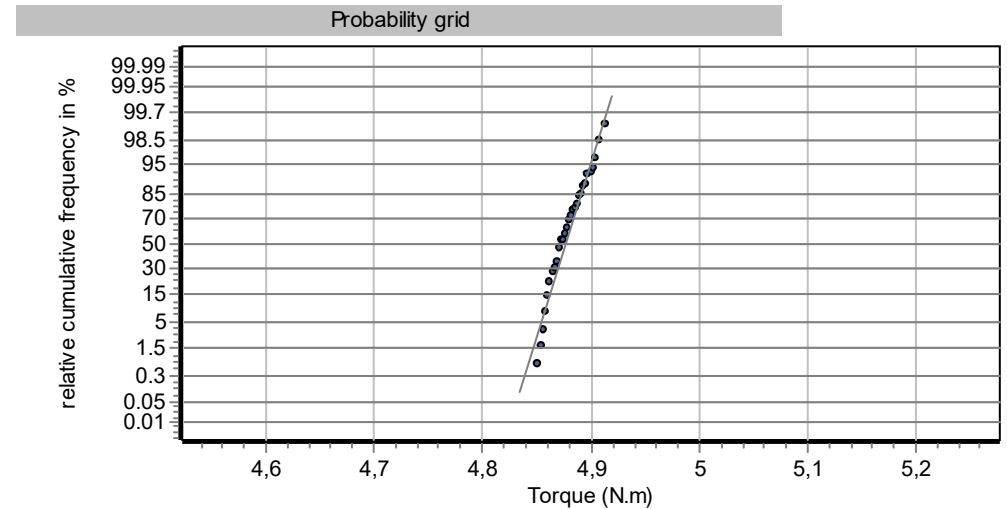
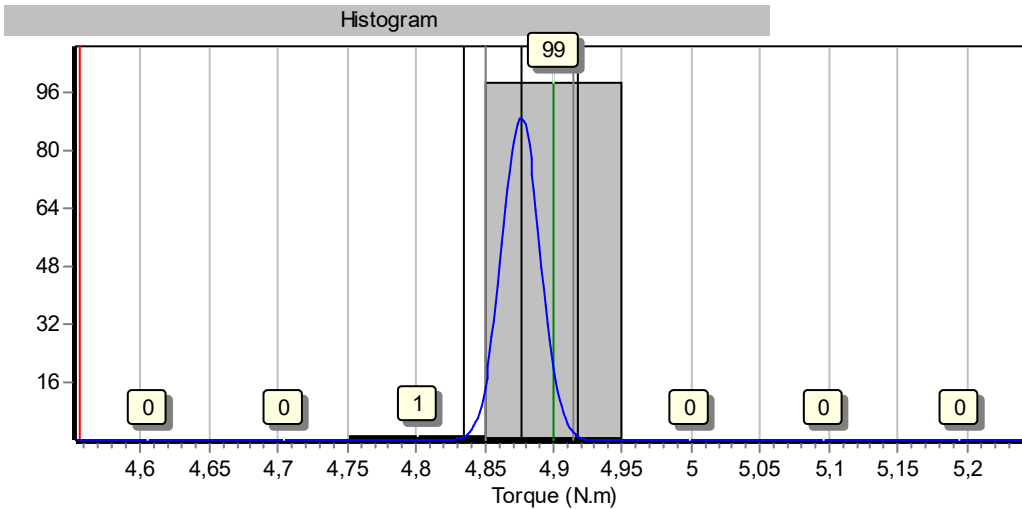
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 30% Screw joint: soft



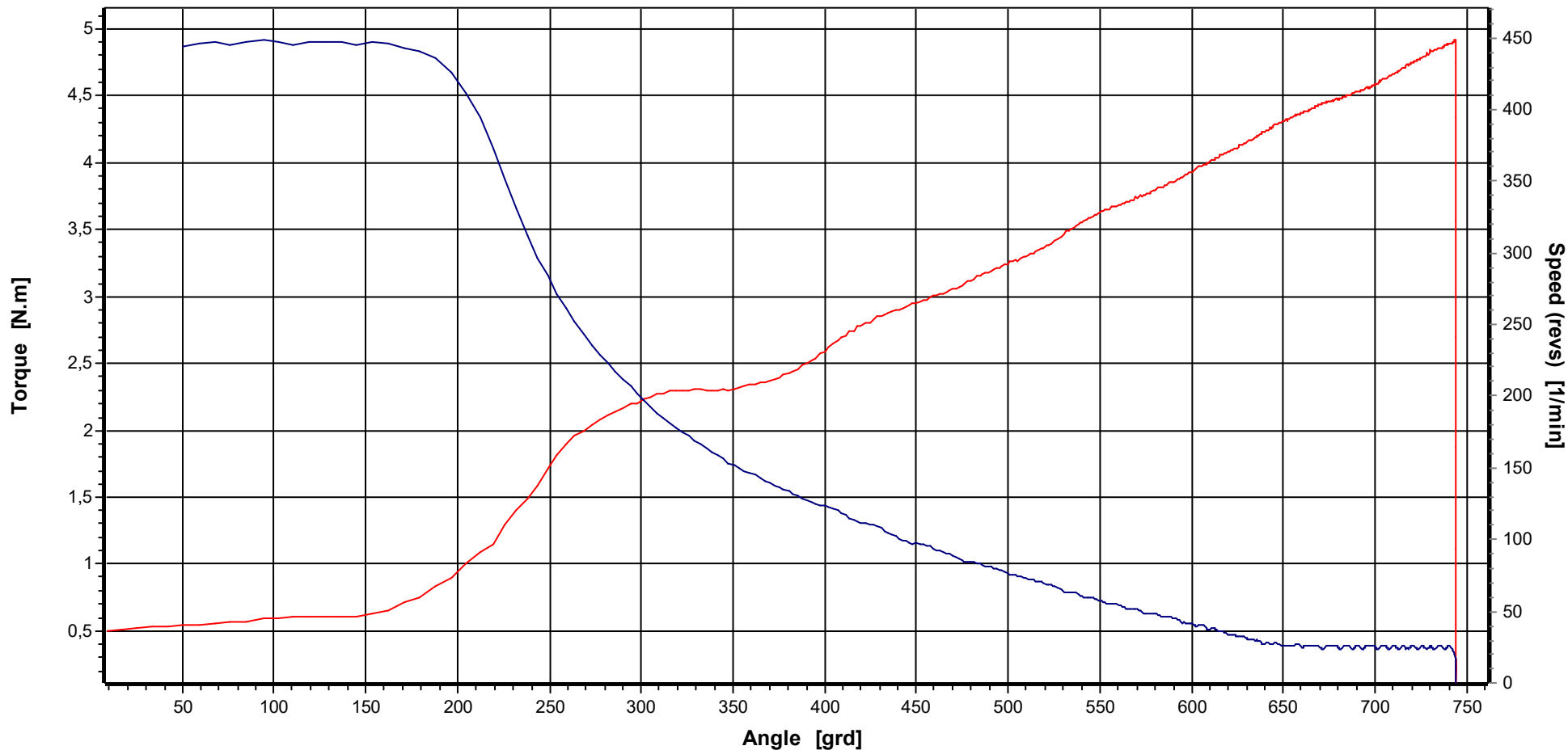
Tester	M.Brkic
N	100
Target	4,90 N.m
UL	5,24 N.m
LL	4,56 N.m
Max	4,91 N.m
Min	4,85 N.m
xq	4,8763 N.m
s	0,0137 N.m
Cm	8,345
Cmk	7,769



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

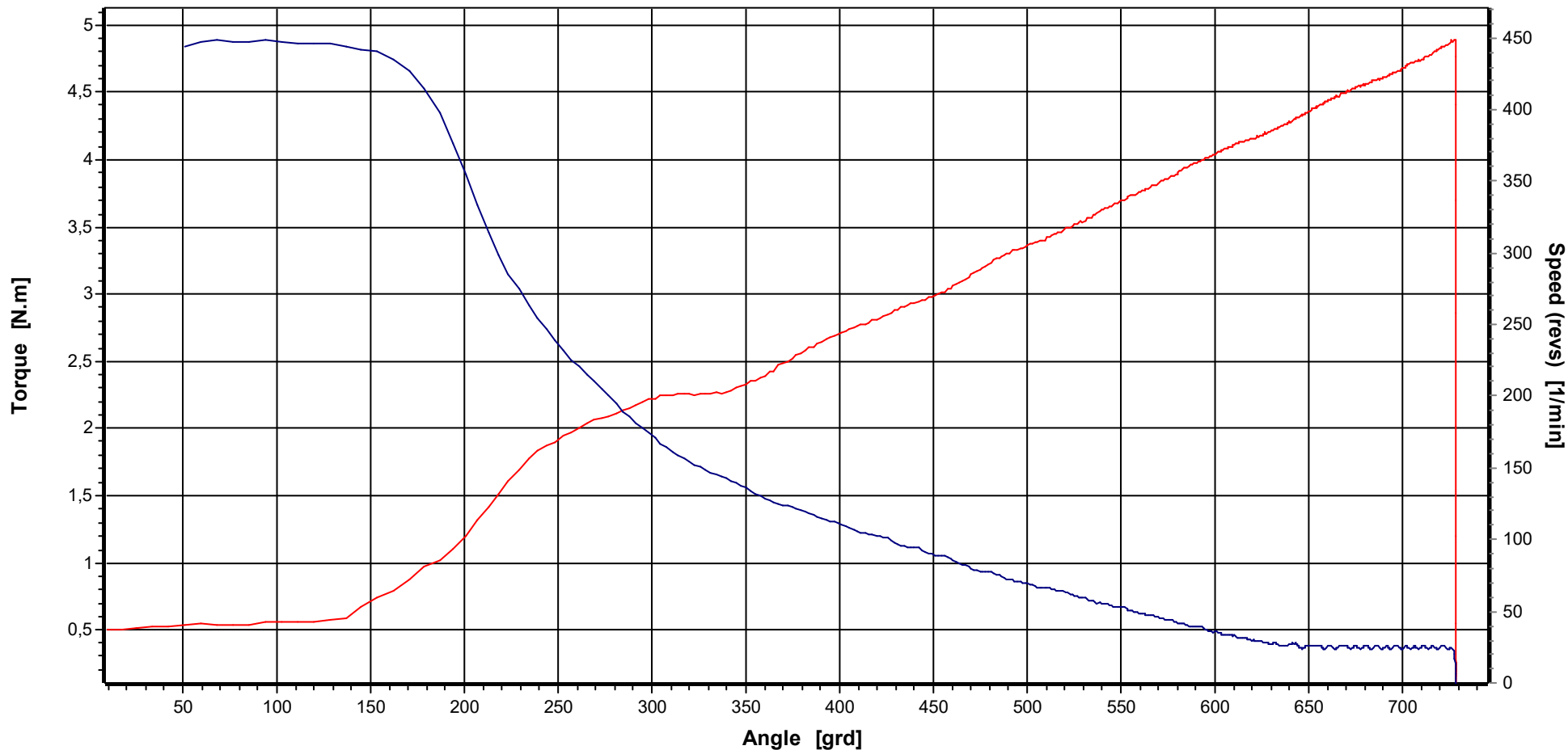


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:14:38
UL	5,24 N.m	Supporting points	653			Date/time measurement	21.06.2018 15:14:38

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

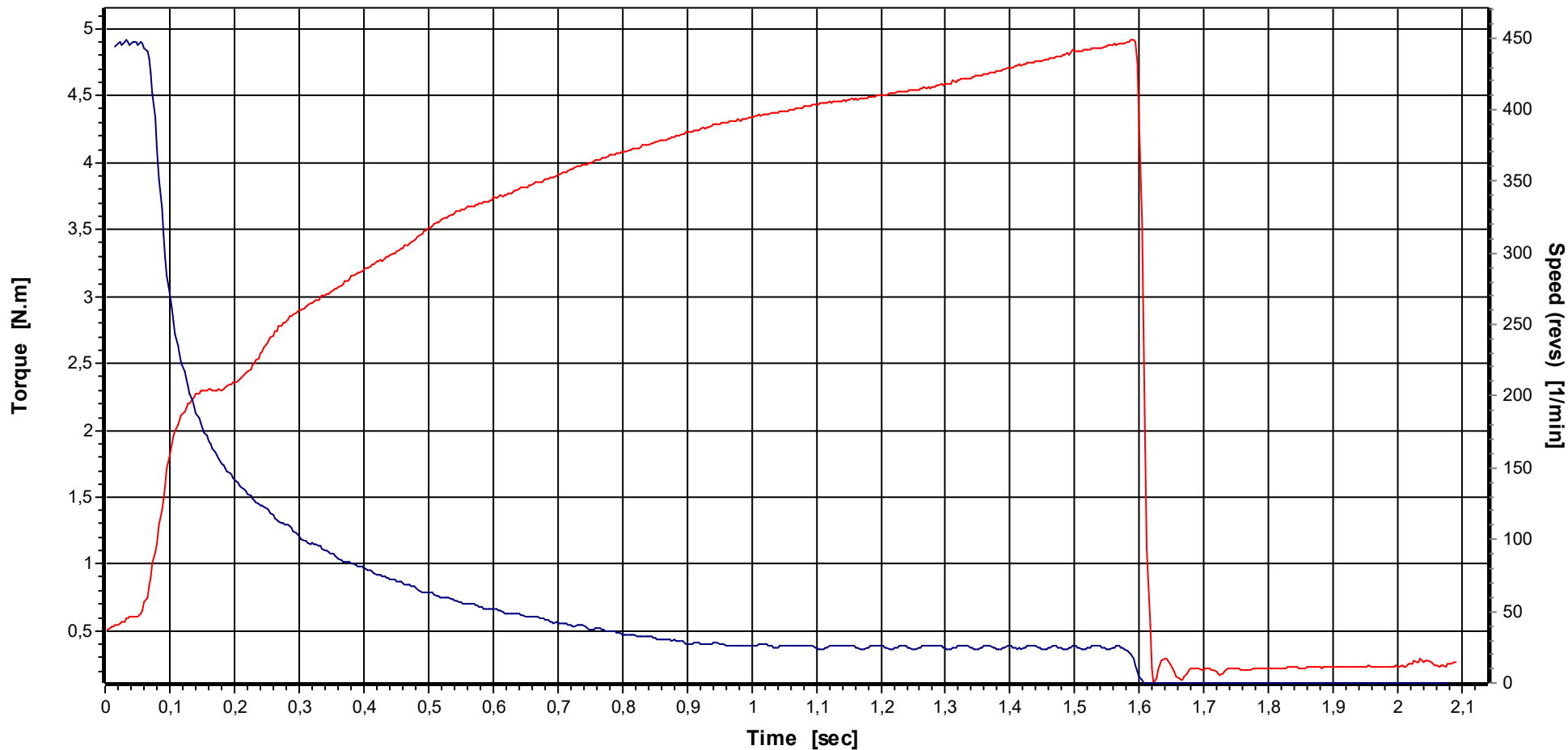


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:14:38
UL	5,24 N.m	Supporting points	663			Date/time measurement	21.06.2018 15:25:21

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

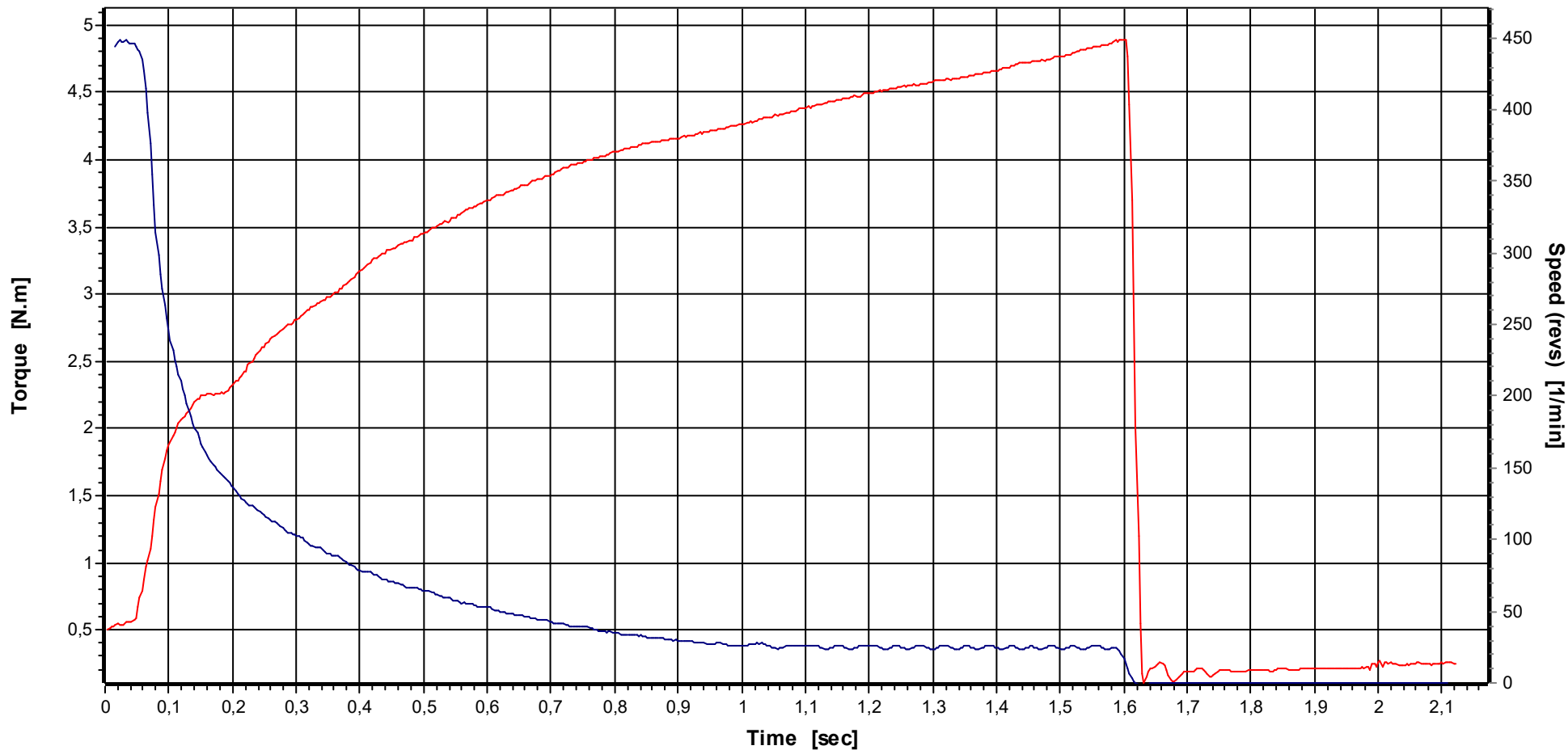


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:14:38
UL	5,24 N.m	Supporting points	653			Date/time measurement	21.06.2018 15:14:38

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:14:38
UL	5,24 N.m	Supporting points	663			Date/time measurement	21.06.2018 15:25:21

Date/ Time	21.06.2018 15:14:38	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,8763	0,0630	0,0137	8,345	7,769	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,914 N.m	0,3 %	360,00 °	0,0 %	452 rpm	50 rpm	21.06.2018	15:14:38
2	4,869 N.m	-0,6 %	357,75 °	-0,6 %	454 rpm	52 rpm	21.06.2018	15:14:44
3	4,908 N.m	0,2 %	362,50 °	0,7 %	453 rpm	50 rpm	21.06.2018	15:14:51
4	4,871 N.m	-0,6 %	357,00 °	-0,8 %	454 rpm	51 rpm	21.06.2018	15:14:57
5	4,873 N.m	-0,6 %	356,25 °	-1,0 %	453 rpm	51 rpm	21.06.2018	15:15:04
6	4,884 N.m	-0,3 %	357,25 °	-0,8 %	453 rpm	52 rpm	21.06.2018	15:15:10
7	4,888 N.m	-0,2 %	360,50 °	0,1 %	453 rpm	50 rpm	21.06.2018	15:15:17
8	4,871 N.m	-0,6 %	357,75 °	-0,6 %	453 rpm	51 rpm	21.06.2018	15:15:23
9	4,877 N.m	-0,5 %	354,75 °	-1,5 %	453 rpm	51 rpm	21.06.2018	15:15:30
10	4,865 N.m	-0,7 %	357,00 °	-0,8 %	452 rpm	52 rpm	21.06.2018	15:15:36
11	4,898 N.m	0,0 %	363,00 °	0,8 %	453 rpm	50 rpm	21.06.2018	15:15:43
12	4,871 N.m	-0,6 %	352,50 °	-2,1 %	453 rpm	51 rpm	21.06.2018	15:15:49
13	4,865 N.m	-0,7 %	353,75 °	-1,7 %	454 rpm	51 rpm	21.06.2018	15:15:55
14	4,898 N.m	0,0 %	362,75 °	0,8 %	452 rpm	50 rpm	21.06.2018	15:16:02
15	4,890 N.m	-0,2 %	357,00 °	-0,8 %	454 rpm	52 rpm	21.06.2018	15:16:08
16	4,884 N.m	-0,3 %	358,00 °	-0,6 %	453 rpm	52 rpm	21.06.2018	15:16:15
17	4,867 N.m	-0,7 %	351,50 °	-2,4 %	453 rpm	51 rpm	21.06.2018	15:16:21
18	4,871 N.m	-0,6 %	355,25 °	-1,3 %	453 rpm	52 rpm	21.06.2018	15:16:28
19	4,881 N.m	-0,4 %	352,25 °	-2,2 %	454 rpm	51 rpm	21.06.2018	15:16:34
20	4,904 N.m	0,1 %	359,25 °	-0,2 %	454 rpm	51 rpm	21.06.2018	15:16:41
21	4,892 N.m	-0,2 %	362,25 °	0,6 %	453 rpm	50 rpm	21.06.2018	15:16:48
22	4,886 N.m	-0,3 %	361,50 °	0,4 %	454 rpm	51 rpm	21.06.2018	15:16:54
23	4,873 N.m	-0,6 %	351,75 °	-2,3 %	454 rpm	51 rpm	21.06.2018	15:17:00
24	4,863 N.m	-0,8 %	353,50 °	-1,8 %	453 rpm	51 rpm	21.06.2018	15:17:07
25	4,879 N.m	-0,4 %	360,50 °	0,1 %	453 rpm	50 rpm	21.06.2018	15:17:14
26	4,871 N.m	-0,6 %	353,75 °	-1,7 %	453 rpm	52 rpm	21.06.2018	15:17:20
27	4,898 N.m	0,0 %	360,75 °	0,2 %	453 rpm	50 rpm	21.06.2018	15:17:27
28	4,888 N.m	-0,2 %	356,25 °	-1,0 %	454 rpm	52 rpm	21.06.2018	15:17:33
29	4,894 N.m	-0,1 %	357,75 °	-0,6 %	452 rpm	52 rpm	21.06.2018	15:17:40
30	4,871 N.m	-0,6 %	355,50 °	-1,3 %	453 rpm	51 rpm	21.06.2018	15:17:46
31	4,881 N.m	-0,4 %	357,75 °	-0,6 %	453 rpm	52 rpm	21.06.2018	15:17:53
32	4,881 N.m	-0,4 %	360,50 °	0,1 %	453 rpm	50 rpm	21.06.2018	15:17:59
33	4,863 N.m	-0,8 %	352,75 °	-2,0 %	453 rpm	51 rpm	21.06.2018	15:18:06
34	4,890 N.m	-0,2 %	361,25 °	0,3 %	453 rpm	50 rpm	21.06.2018	15:18:12
35	4,873 N.m	-0,6 %	354,75 °	-1,5 %	453 rpm	51 rpm	21.06.2018	15:18:18
36	4,871 N.m	-0,6 %	351,75 °	-2,3 %	453 rpm	50 rpm	21.06.2018	15:18:25
37	4,894 N.m	-0,1 %	358,00 °	-0,6 %	454 rpm	51 rpm	21.06.2018	15:18:32
38	4,881 N.m	-0,4 %	351,00 °	-2,5 %	454 rpm	52 rpm	21.06.2018	15:18:38
39	4,900 N.m	0,0 %	362,75 °	0,8 %	453 rpm	50 rpm	21.06.2018	15:18:45
40	4,879 N.m	-0,4 %	355,50 °	-1,3 %	453 rpm	52 rpm	21.06.2018	15:18:51
41	4,869 N.m	-0,6 %	357,00 °	-0,8 %	453 rpm	51 rpm	21.06.2018	15:18:57
42	4,863 N.m	-0,8 %	350,00 °	-2,8 %	453 rpm	51 rpm	21.06.2018	15:19:04
43	4,873 N.m	-0,6 %	359,50 °	-0,1 %	454 rpm	51 rpm	21.06.2018	15:19:11
44	4,859 N.m	-0,8 %	353,00 °	-1,9 %	454 rpm	51 rpm	21.06.2018	15:19:17
45	4,861 N.m	-0,8 %	357,75 °	-0,6 %	453 rpm	51 rpm	21.06.2018	15:19:23
46	4,890 N.m	-0,2 %	361,75 °	0,5 %	454 rpm	50 rpm	21.06.2018	15:19:30
47	4,869 N.m	-0,6 %	356,50 °	-1,0 %	452 rpm	52 rpm	21.06.2018	15:19:36
48	4,908 N.m	0,2 %	359,50 °	-0,1 %	453 rpm	50 rpm	21.06.2018	15:19:43
49	4,865 N.m	-0,7 %	352,25 °	-2,2 %	453 rpm	51 rpm	21.06.2018	15:19:49
50	4,881 N.m	-0,4 %	358,25 °	-0,5 %	454 rpm	51 rpm	21.06.2018	15:19:56

Date/ Time	21.06.2018 15:14:38	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

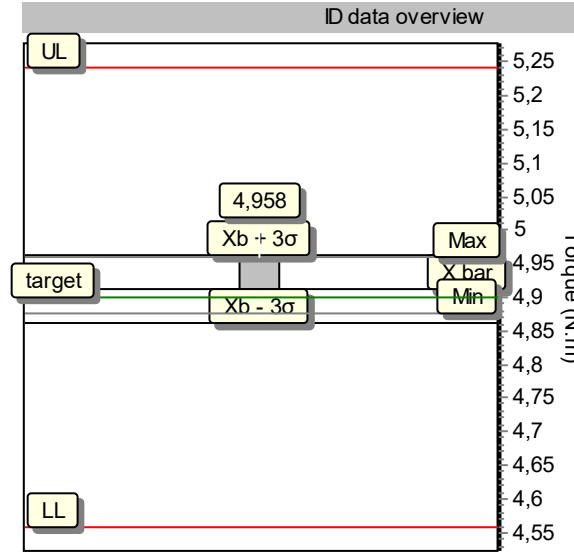
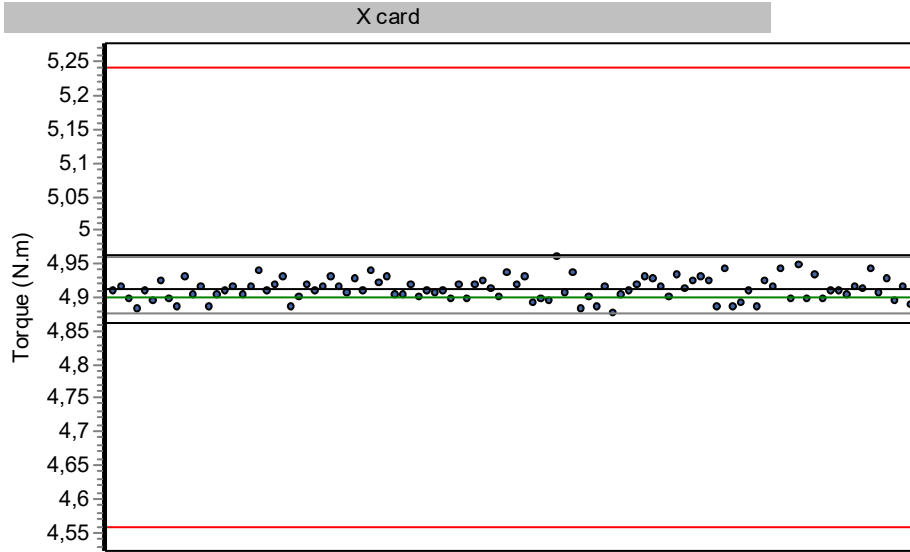
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,8763	0,0630	0,0137	8,345	7,769	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,879 N.m	-0,4 %	359,00 °	-0,3 %	453 rpm	50 rpm	21.06.2018	15:20:02
52	4,859 N.m	-0,8 %	355,25 °	-1,3 %	454 rpm	51 rpm	21.06.2018	15:20:09
53	4,871 N.m	-0,6 %	357,75 °	-0,6 %	453 rpm	51 rpm	21.06.2018	15:20:15
54	4,871 N.m	-0,6 %	360,75 °	0,2 %	453 rpm	51 rpm	21.06.2018	15:20:22
55	4,875 N.m	-0,5 %	351,00 °	-2,5 %	454 rpm	51 rpm	21.06.2018	15:20:28
56	4,884 N.m	-0,3 %	358,50 °	-0,4 %	454 rpm	52 rpm	21.06.2018	15:20:35
57	4,867 N.m	-0,7 %	352,50 °	-2,1 %	453 rpm	51 rpm	21.06.2018	15:20:41
58	4,855 N.m	-0,9 %	356,25 °	-1,0 %	453 rpm	51 rpm	21.06.2018	15:20:48
59	4,896 N.m	-0,1 %	362,75 °	0,8 %	454 rpm	50 rpm	21.06.2018	15:20:54
60	4,863 N.m	-0,8 %	357,00 °	-0,8 %	454 rpm	51 rpm	21.06.2018	15:21:01
61	4,877 N.m	-0,5 %	358,75 °	-0,3 %	453 rpm	50 rpm	21.06.2018	15:21:07
62	4,861 N.m	-0,8 %	355,50 °	-1,3 %	454 rpm	51 rpm	21.06.2018	15:21:14
63	4,894 N.m	-0,1 %	362,00 °	0,6 %	453 rpm	50 rpm	21.06.2018	15:21:20
64	4,869 N.m	-0,6 %	355,50 °	-1,3 %	454 rpm	51 rpm	21.06.2018	15:21:27
65	4,873 N.m	-0,6 %	358,25 °	-0,5 %	453 rpm	50 rpm	21.06.2018	15:21:33
66	4,861 N.m	-0,8 %	354,50 °	-1,5 %	453 rpm	52 rpm	21.06.2018	15:21:40
67	4,879 N.m	-0,4 %	359,75 °	-0,1 %	453 rpm	50 rpm	21.06.2018	15:21:46
68	4,861 N.m	-0,8 %	355,00 °	-1,4 %	454 rpm	51 rpm	21.06.2018	15:21:53
69	4,865 N.m	-0,7 %	352,25 °	-2,2 %	454 rpm	51 rpm	21.06.2018	15:21:59
70	4,861 N.m	-0,8 %	354,50 °	-1,5 %	453 rpm	51 rpm	21.06.2018	15:22:06
71	4,863 N.m	-0,8 %	353,00 °	-1,9 %	454 rpm	51 rpm	21.06.2018	15:22:13
72	4,861 N.m	-0,8 %	353,50 °	-1,8 %	454 rpm	51 rpm	21.06.2018	15:22:19
73	4,857 N.m	-0,9 %	350,25 °	-2,7 %	454 rpm	51 rpm	21.06.2018	15:22:25
74	4,859 N.m	-0,8 %	353,75 °	-1,7 %	453 rpm	51 rpm	21.06.2018	15:22:32
75	4,890 N.m	-0,2 %	362,50 °	0,7 %	453 rpm	50 rpm	21.06.2018	15:22:38
76	4,865 N.m	-0,7 %	352,25 °	-2,2 %	452 rpm	50 rpm	21.06.2018	15:22:45
77	4,865 N.m	-0,7 %	356,50 °	-1,0 %	453 rpm	51 rpm	21.06.2018	15:22:51
78	4,902 N.m	0,0 %	364,00 °	1,1 %	453 rpm	50 rpm	21.06.2018	15:22:58
79	4,882 N.m	-0,4 %	351,00 °	-2,5 %	453 rpm	51 rpm	21.06.2018	15:23:04
80	4,867 N.m	-0,7 %	360,00 °	0,0 %	453 rpm	51 rpm	21.06.2018	15:23:11
81	4,882 N.m	-0,4 %	360,50 °	0,1 %	454 rpm	50 rpm	21.06.2018	15:23:17
82	4,879 N.m	-0,4 %	351,75 °	-2,3 %	453 rpm	52 rpm	21.06.2018	15:23:24
83	4,863 N.m	-0,8 %	356,00 °	-1,1 %	454 rpm	51 rpm	21.06.2018	15:23:30
84	4,871 N.m	-0,6 %	358,00 °	-0,6 %	453 rpm	50 rpm	21.06.2018	15:23:37
85	4,869 N.m	-0,6 %	356,50 °	-1,0 %	453 rpm	51 rpm	21.06.2018	15:23:43
86	4,877 N.m	-0,5 %	360,25 °	0,1 %	454 rpm	50 rpm	21.06.2018	15:23:50
87	4,863 N.m	-0,8 %	357,50 °	-0,7 %	453 rpm	51 rpm	21.06.2018	15:23:56
88	4,890 N.m	-0,2 %	361,00 °	0,3 %	453 rpm	50 rpm	21.06.2018	15:24:03
89	4,857 N.m	-0,9 %	354,00 °	-1,7 %	454 rpm	51 rpm	21.06.2018	15:24:09
90	4,871 N.m	-0,6 %	356,25 °	-1,0 %	454 rpm	50 rpm	21.06.2018	15:24:16
91	4,873 N.m	-0,6 %	359,00 °	-0,3 %	454 rpm	51 rpm	21.06.2018	15:24:22
92	4,865 N.m	-0,7 %	352,25 °	-2,2 %	453 rpm	51 rpm	21.06.2018	15:24:29
93	4,884 N.m	-0,3 %	357,75 °	-0,6 %	454 rpm	51 rpm	21.06.2018	15:24:35
94	4,882 N.m	-0,4 %	351,25 °	-2,4 %	454 rpm	51 rpm	21.06.2018	15:24:42
95	4,904 N.m	0,1 %	359,50 °	-0,1 %	454 rpm	50 rpm	21.06.2018	15:24:49
96	4,879 N.m	-0,4 %	350,75 °	-2,6 %	454 rpm	51 rpm	21.06.2018	15:24:55
97	4,851 N.m	-1,0 %	353,00 °	-1,9 %	453 rpm	51 rpm	21.06.2018	15:25:01
98	4,877 N.m	-0,5 %	359,00 °	-0,3 %	453 rpm	50 rpm	21.06.2018	15:25:08
99	4,859 N.m	-0,8 %	356,25 °	-1,0 %	453 rpm	51 rpm	21.06.2018	15:25:14
100	4,888 N.m	-0,2 %	362,50 °	0,7 %	453 rpm	50 rpm	21.06.2018	15:25:21

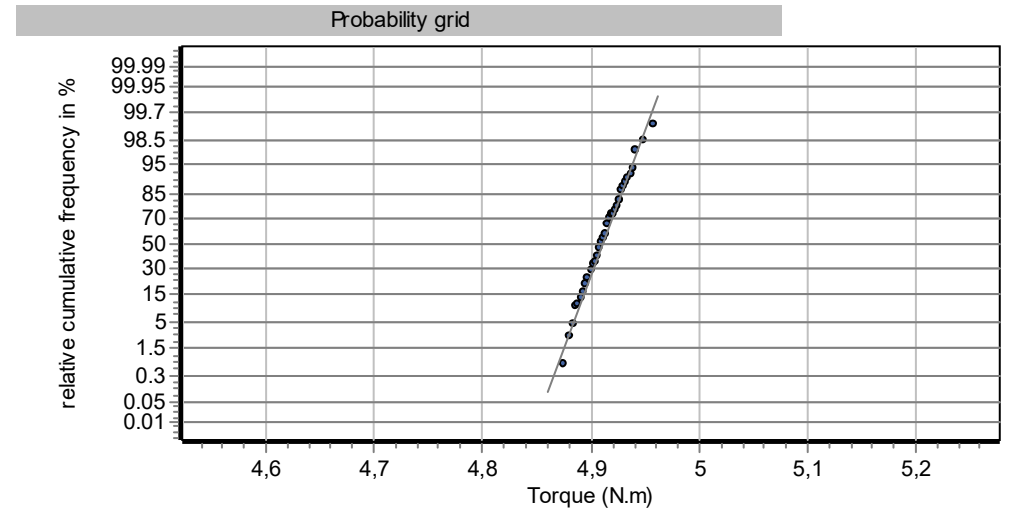
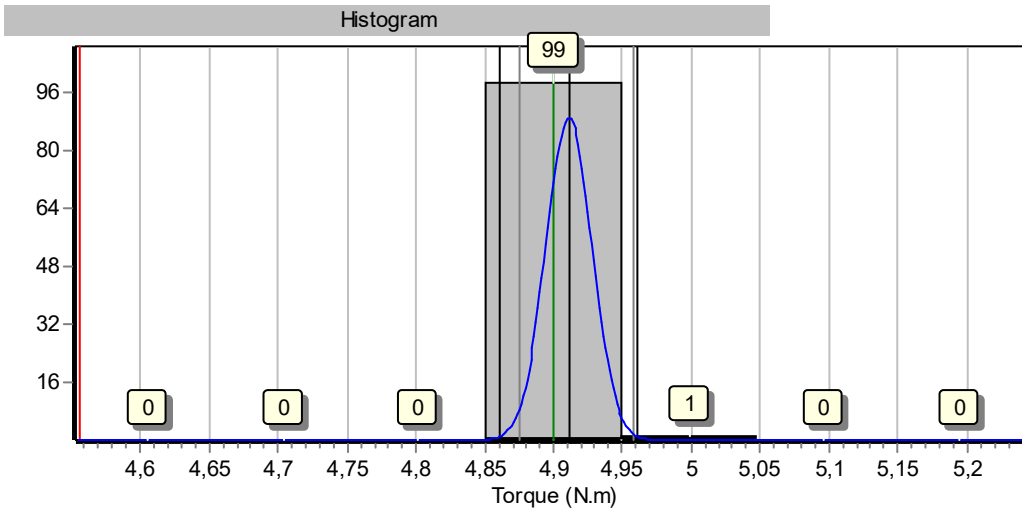
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 30% Screw joint: hard



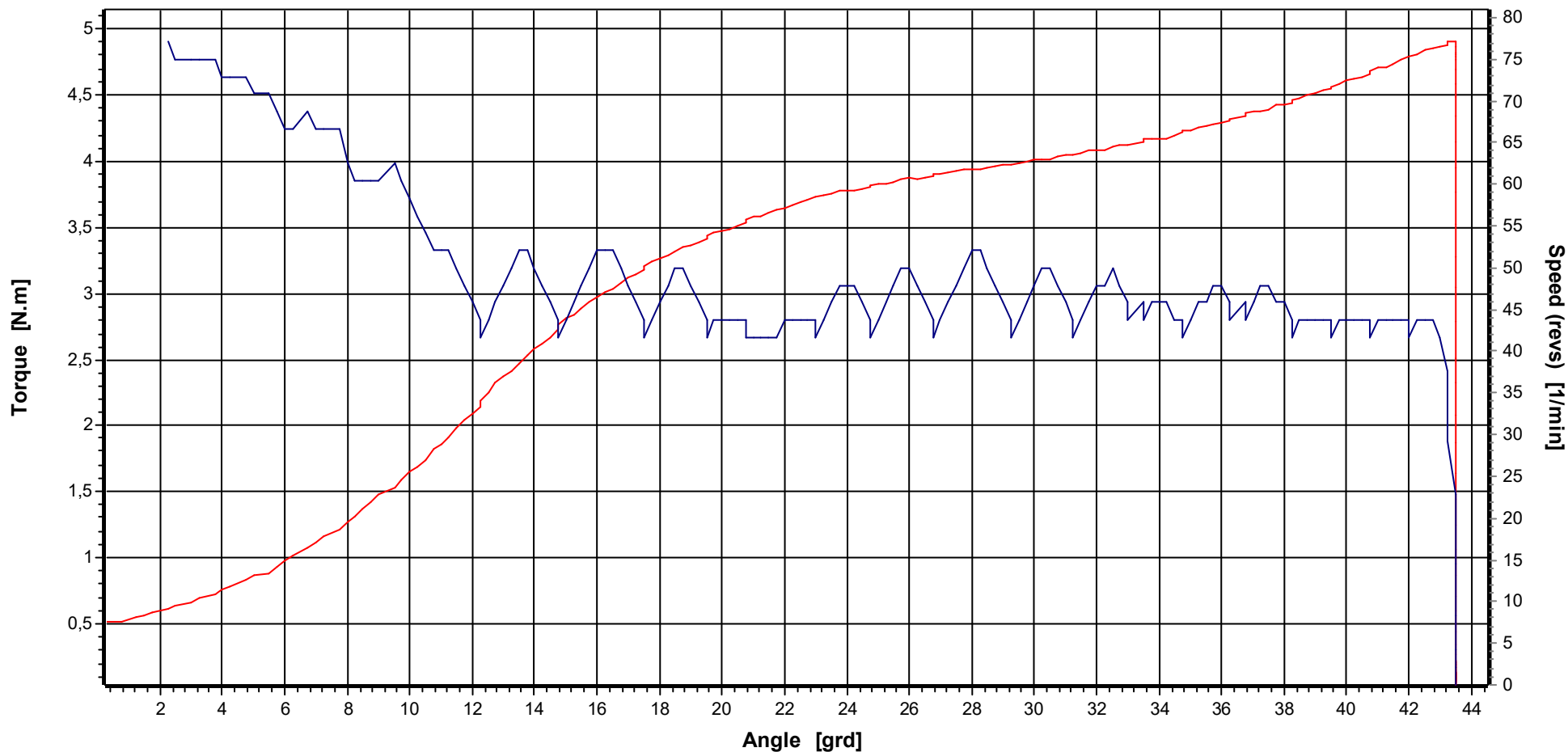
Tester	M.Brkc	
N	100	
Target	4,90	N.m
UL	5,24	N.m
LL	4,56	N.m
Max	4,96	N.m
Min	4,88	N.m
xq	4,9111	N.m
s	0,0166	N.m
Cm	6,881	
Cmk	6,659	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

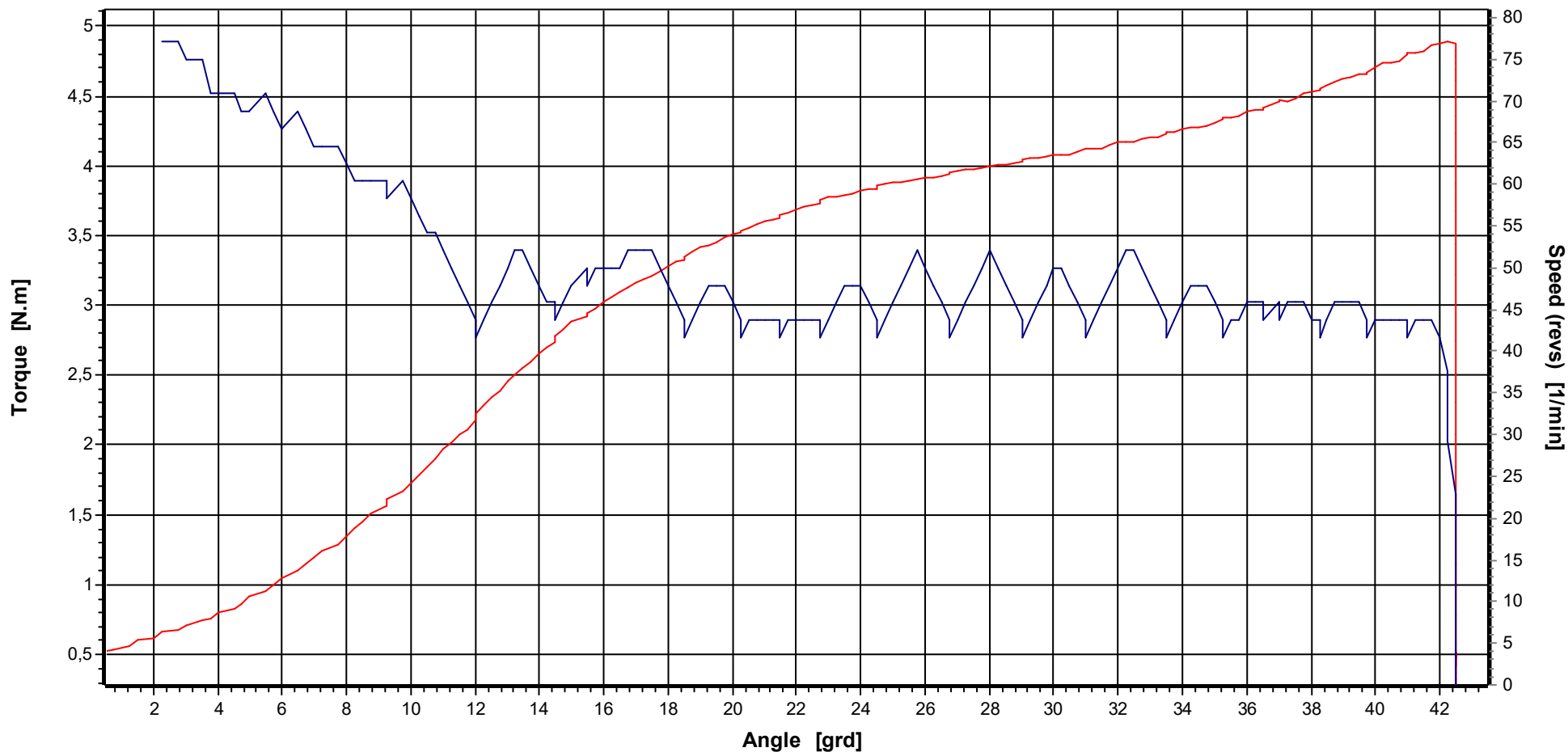


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:41:58
UL	5,24 N.m	Supporting points	805			Date/time measurement	21.06.2018 15:41:58

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

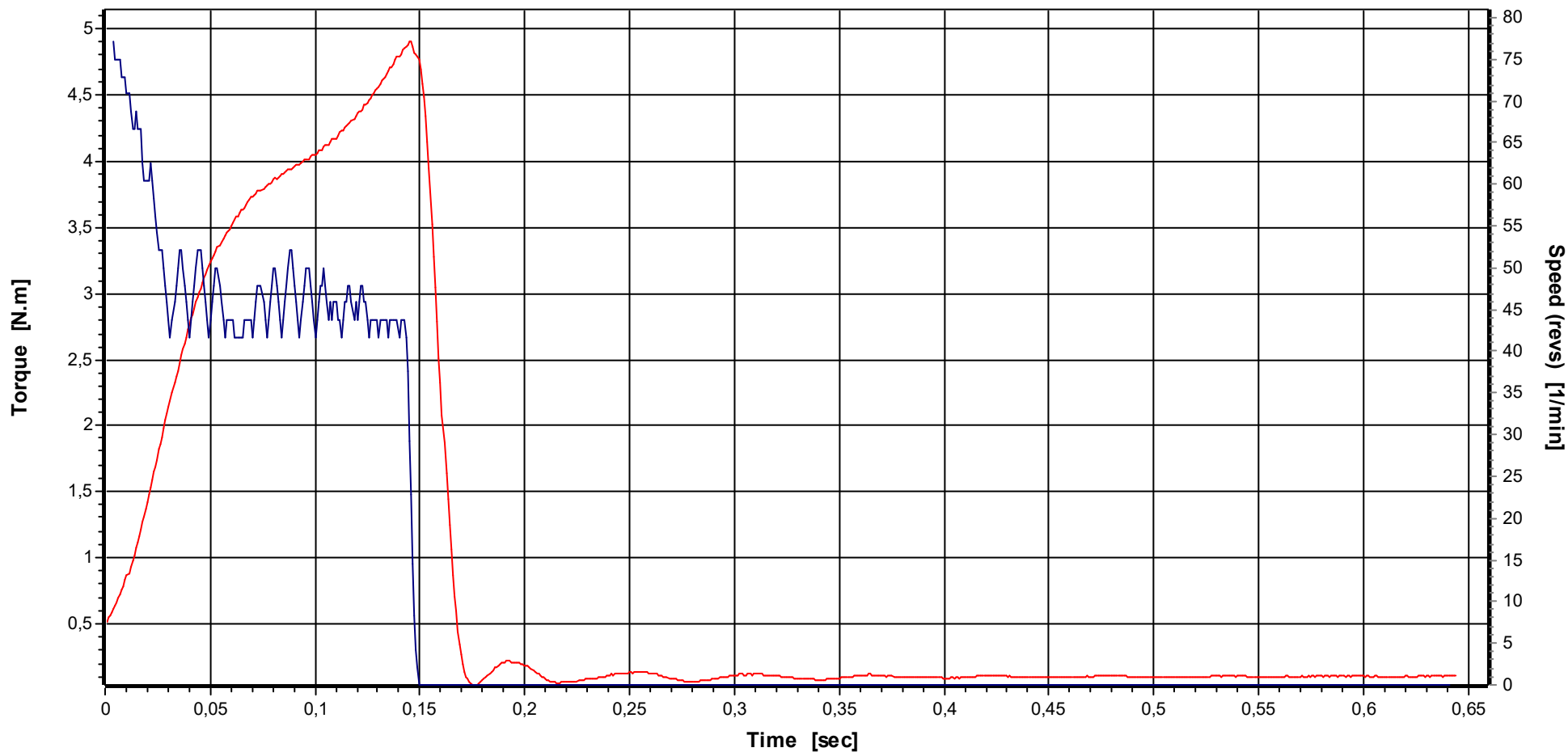


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:41:58
UL	5,24 N.m	Supporting points	799			Date/time measurement	21.06.2018 15:51:03

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

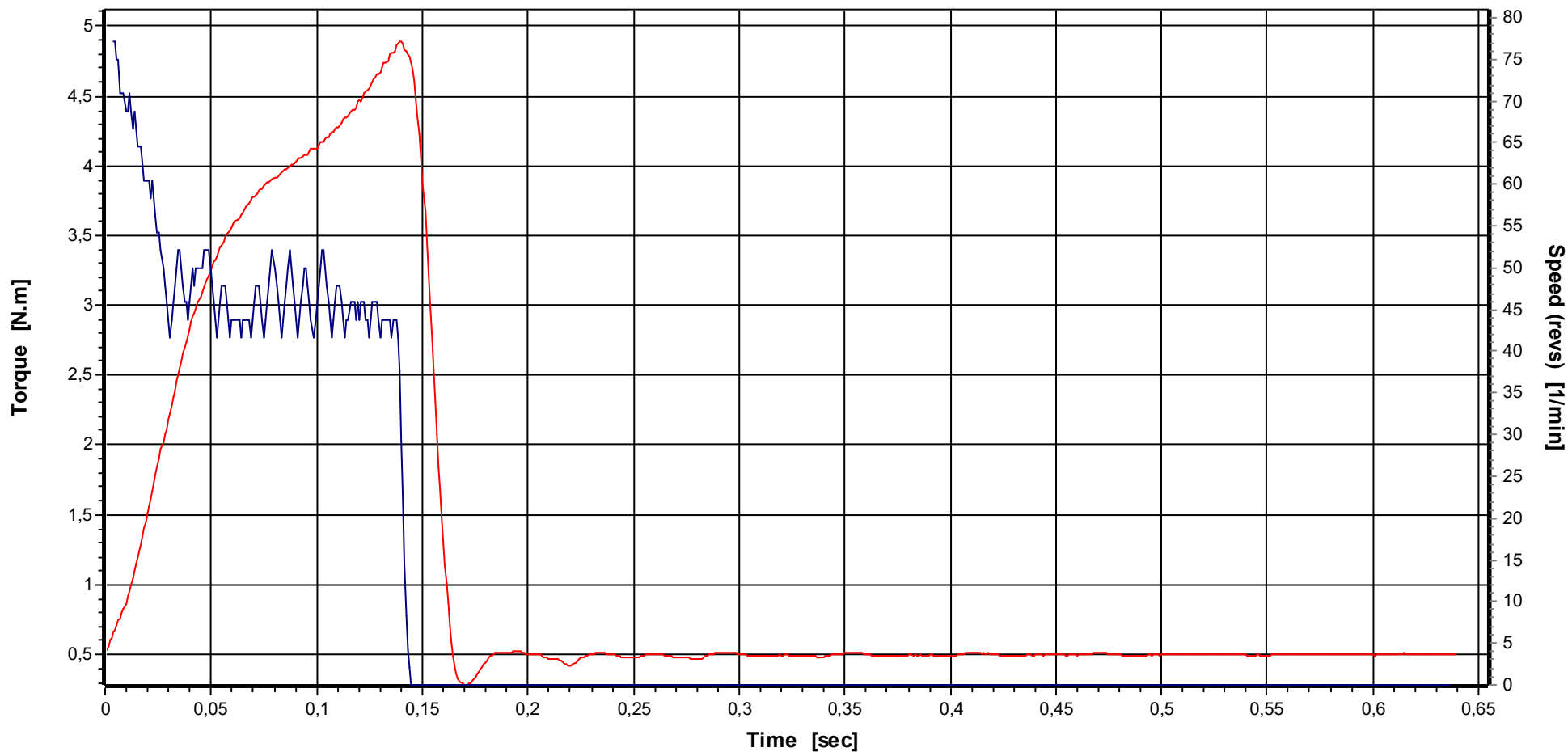


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:41:58
UL	5,24 N.m	Supporting points	805			Date/time measurement	21.06.2018 15:41:58

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 15:41:58
UL	5,24 N.m	Supporting points	799			Date/time measurement	21.06.2018 15:51:03

Date/ Time	21.06.2018 15:41:58	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9111	0,0830	0,0166	6,881	6,659	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,908 N.m	0,2 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:41:58
2	4,914 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	21.06.2018	15:42:04
3	4,896 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:42:09
4	4,881 N.m	-0,4 %	29,25 °	-2,5 %	99 rpm	47 rpm	21.06.2018	15:42:15
5	4,910 N.m	0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:42:20
6	4,894 N.m	-0,1 %	29,25 °	-2,5 %	99 rpm	46 rpm	21.06.2018	15:42:26
7	4,925 N.m	0,5 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:42:31
8	4,898 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:42:37
9	4,886 N.m	-0,3 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:42:42
10	4,929 N.m	0,6 %	30,50 °	1,7 %	100 rpm	47 rpm	21.06.2018	15:42:48
11	4,902 N.m	0,0 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:42:53
12	4,915 N.m	0,3 %	30,00 °	0,0 %	100 rpm	47 rpm	21.06.2018	15:42:59
13	4,886 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:43:04
14	4,902 N.m	0,0 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:43:10
15	4,910 N.m	0,2 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:43:15
16	4,914 N.m	0,3 %	30,25 °	0,8 %	100 rpm	47 rpm	21.06.2018	15:43:21
17	4,902 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:43:26
18	4,915 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	47 rpm	21.06.2018	15:43:32
19	4,939 N.m	0,8 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:43:37
20	4,908 N.m	0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:43:43
21	4,919 N.m	0,4 %	30,00 °	0,0 %	100 rpm	47 rpm	21.06.2018	15:43:48
22	4,931 N.m	0,6 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:43:54
23	4,886 N.m	-0,3 %	29,25 °	-2,5 %	99 rpm	47 rpm	21.06.2018	15:43:59
24	4,900 N.m	0,0 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:44:05
25	4,917 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	21.06.2018	15:44:10
26	4,910 N.m	0,2 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:44:16
27	4,914 N.m	0,3 %	30,25 °	0,8 %	100 rpm	46 rpm	21.06.2018	15:44:21
28	4,929 N.m	0,6 %	30,50 °	1,7 %	99 rpm	47 rpm	21.06.2018	15:44:27
29	4,915 N.m	0,3 %	30,50 °	1,7 %	100 rpm	47 rpm	21.06.2018	15:44:32
30	4,906 N.m	0,1 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:44:38
31	4,927 N.m	0,6 %	30,25 °	0,8 %	100 rpm	47 rpm	21.06.2018	15:44:43
32	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:44:49
33	4,939 N.m	0,8 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:44:54
34	4,921 N.m	0,4 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:45:00
35	4,931 N.m	0,6 %	30,75 °	2,5 %	99 rpm	46 rpm	21.06.2018	15:45:05
36	4,902 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	46 rpm	21.06.2018	15:45:11
37	4,904 N.m	0,1 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:45:16
38	4,917 N.m	0,3 %	29,50 °	-1,7 %	100 rpm	46 rpm	21.06.2018	15:45:22
39	4,900 N.m	0,0 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:45:27
40	4,908 N.m	0,2 %	30,00 °	0,0 %	100 rpm	46 rpm	21.06.2018	15:45:33
41	4,906 N.m	0,1 %	30,50 °	1,7 %	99 rpm	47 rpm	21.06.2018	15:45:38
42	4,910 N.m	0,2 %	30,50 °	1,7 %	100 rpm	46 rpm	21.06.2018	15:45:44
43	4,898 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	47 rpm	21.06.2018	15:45:49
44	4,917 N.m	0,3 %	30,50 °	1,7 %	100 rpm	47 rpm	21.06.2018	15:45:55
45	4,898 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:46:00
46	4,917 N.m	0,3 %	30,25 °	0,8 %	100 rpm	47 rpm	21.06.2018	15:46:06
47	4,923 N.m	0,5 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:46:11
48	4,912 N.m	0,2 %	30,75 °	2,5 %	100 rpm	47 rpm	21.06.2018	15:46:17
49	4,900 N.m	0,0 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:46:22
50	4,935 N.m	0,7 %	30,75 °	2,5 %	99 rpm	47 rpm	21.06.2018	15:46:28

Date/ Time	21.06.2018 15:41:58	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

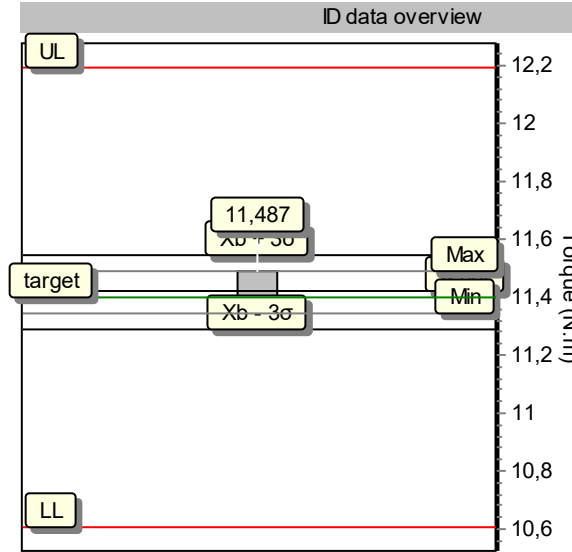
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9111	0,0830	0,0166	6,881	6,659	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,917 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	47 rpm	21.06.2018	15:46:33
52	4,929 N.m	0,6 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:46:39
53	4,892 N.m	-0,2 %	29,25 °	-2,5 %	99 rpm	46 rpm	21.06.2018	15:46:44
54	4,896 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:46:50
55	4,894 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:46:55
56	4,958 N.m	1,2 %	30,75 °	2,5 %	99 rpm	46 rpm	21.06.2018	15:47:01
57	4,906 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	46 rpm	21.06.2018	15:47:06
58	4,937 N.m	0,8 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:47:12
59	4,881 N.m	-0,4 %	29,25 °	-2,5 %	99 rpm	47 rpm	21.06.2018	15:47:17
60	4,900 N.m	0,0 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:47:23
61	4,884 N.m	-0,3 %	29,50 °	-1,7 %	100 rpm	47 rpm	21.06.2018	15:47:28
62	4,915 N.m	0,3 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:47:34
63	4,875 N.m	-0,5 %	29,25 °	-2,5 %	100 rpm	46 rpm	21.06.2018	15:47:39
64	4,904 N.m	0,1 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:47:45
65	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	21.06.2018	15:47:50
66	4,919 N.m	0,4 %	30,25 °	0,8 %	99 rpm	47 rpm	21.06.2018	15:47:56
67	4,929 N.m	0,6 %	30,50 °	1,7 %	100 rpm	47 rpm	21.06.2018	15:48:01
68	4,927 N.m	0,6 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:48:07
69	4,915 N.m	0,3 %	30,00 °	0,0 %	100 rpm	47 rpm	21.06.2018	15:48:12
70	4,900 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:48:18
71	4,933 N.m	0,7 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:48:23
72	4,912 N.m	0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:48:29
73	4,923 N.m	0,5 %	30,75 °	2,5 %	99 rpm	47 rpm	21.06.2018	15:48:34
74	4,929 N.m	0,6 %	30,00 °	0,0 %	100 rpm	47 rpm	21.06.2018	15:48:40
75	4,925 N.m	0,5 %	30,50 °	1,7 %	99 rpm	47 rpm	21.06.2018	15:48:45
76	4,884 N.m	-0,3 %	29,75 °	-0,8 %	100 rpm	46 rpm	21.06.2018	15:48:51
77	4,941 N.m	0,8 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:48:56
78	4,886 N.m	-0,3 %	29,25 °	-2,5 %	100 rpm	46 rpm	21.06.2018	15:49:02
79	4,892 N.m	-0,2 %	30,25 °	0,8 %	98 rpm	47 rpm	21.06.2018	15:49:07
80	4,910 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	47 rpm	21.06.2018	15:49:13
81	4,886 N.m	-0,3 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:49:18
82	4,925 N.m	0,5 %	30,25 °	0,8 %	100 rpm	46 rpm	21.06.2018	15:49:24
83	4,914 N.m	0,3 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:49:29
84	4,941 N.m	0,8 %	30,00 °	0,0 %	99 rpm	47 rpm	21.06.2018	15:49:35
85	4,896 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	47 rpm	21.06.2018	15:49:40
86	4,948 N.m	1,0 %	31,25 °	4,2 %	99 rpm	47 rpm	21.06.2018	15:49:46
87	4,896 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	46 rpm	21.06.2018	15:49:51
88	4,933 N.m	0,7 %	30,25 °	0,8 %	99 rpm	46 rpm	21.06.2018	15:49:57
89	4,898 N.m	0,0 %	29,50 °	-1,7 %	100 rpm	47 rpm	21.06.2018	15:50:02
90	4,910 N.m	0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:50:08
91	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	21.06.2018	15:50:13
92	4,902 N.m	0,0 %	30,00 °	0,0 %	99 rpm	46 rpm	21.06.2018	15:50:19
93	4,915 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	21.06.2018	15:50:24
94	4,912 N.m	0,2 %	30,50 °	1,7 %	99 rpm	46 rpm	21.06.2018	15:50:30
95	4,941 N.m	0,8 %	31,00 °	3,3 %	100 rpm	47 rpm	21.06.2018	15:50:35
96	4,906 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:50:41
97	4,927 N.m	0,6 %	30,75 °	2,5 %	100 rpm	47 rpm	21.06.2018	15:50:46
98	4,894 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	21.06.2018	15:50:52
99	4,915 N.m	0,3 %	30,50 °	1,7 %	100 rpm	47 rpm	21.06.2018	15:50:57
100	4,888 N.m	-0,2 %	29,75 °	-0,8 %	99 rpm	47 rpm	21.06.2018	15:51:03

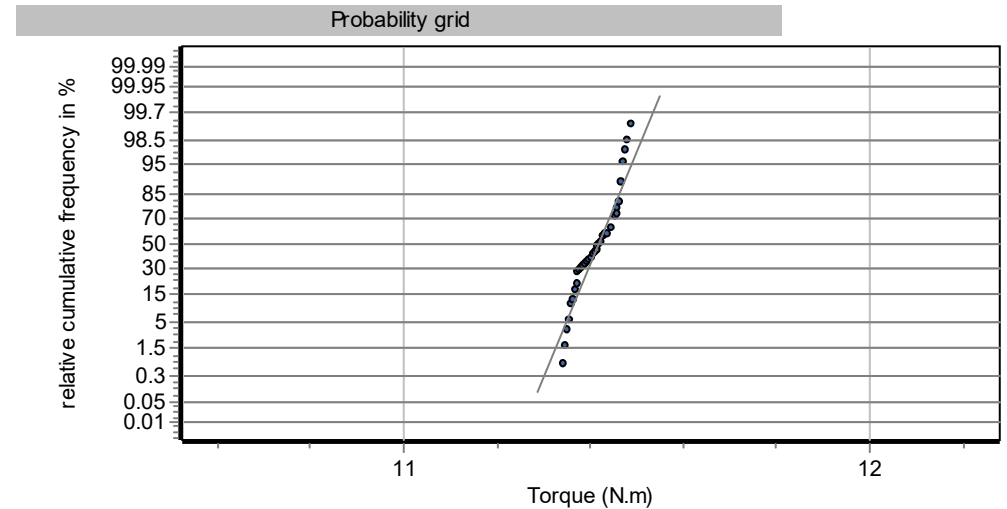
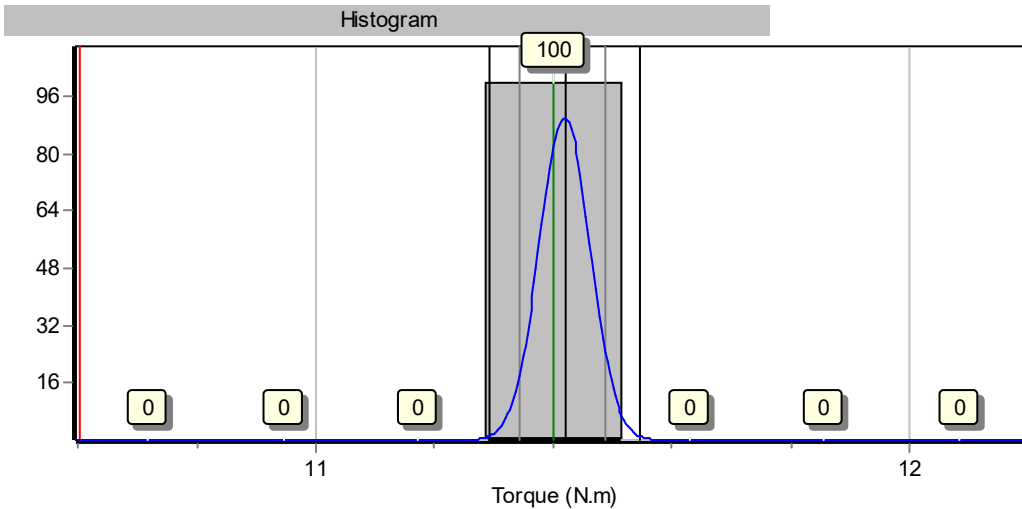
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 80% Screw joint: soft



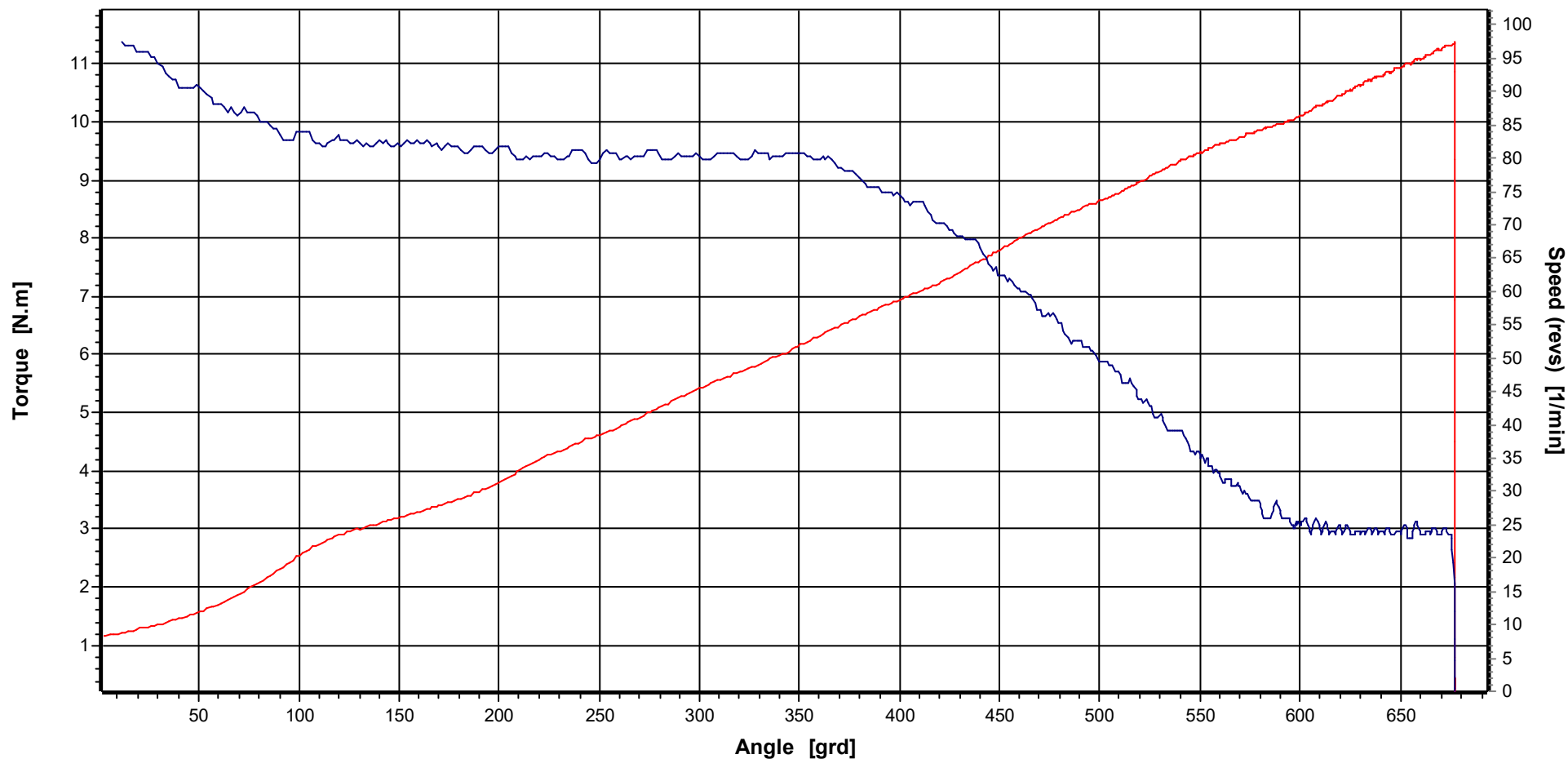
Tester	M.Brkcic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,49	N.m
Min	11,34	N.m
xq	11,4186	N.m
s	0,0426	N.m
Cm	6,245	
Cmk	6,100	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

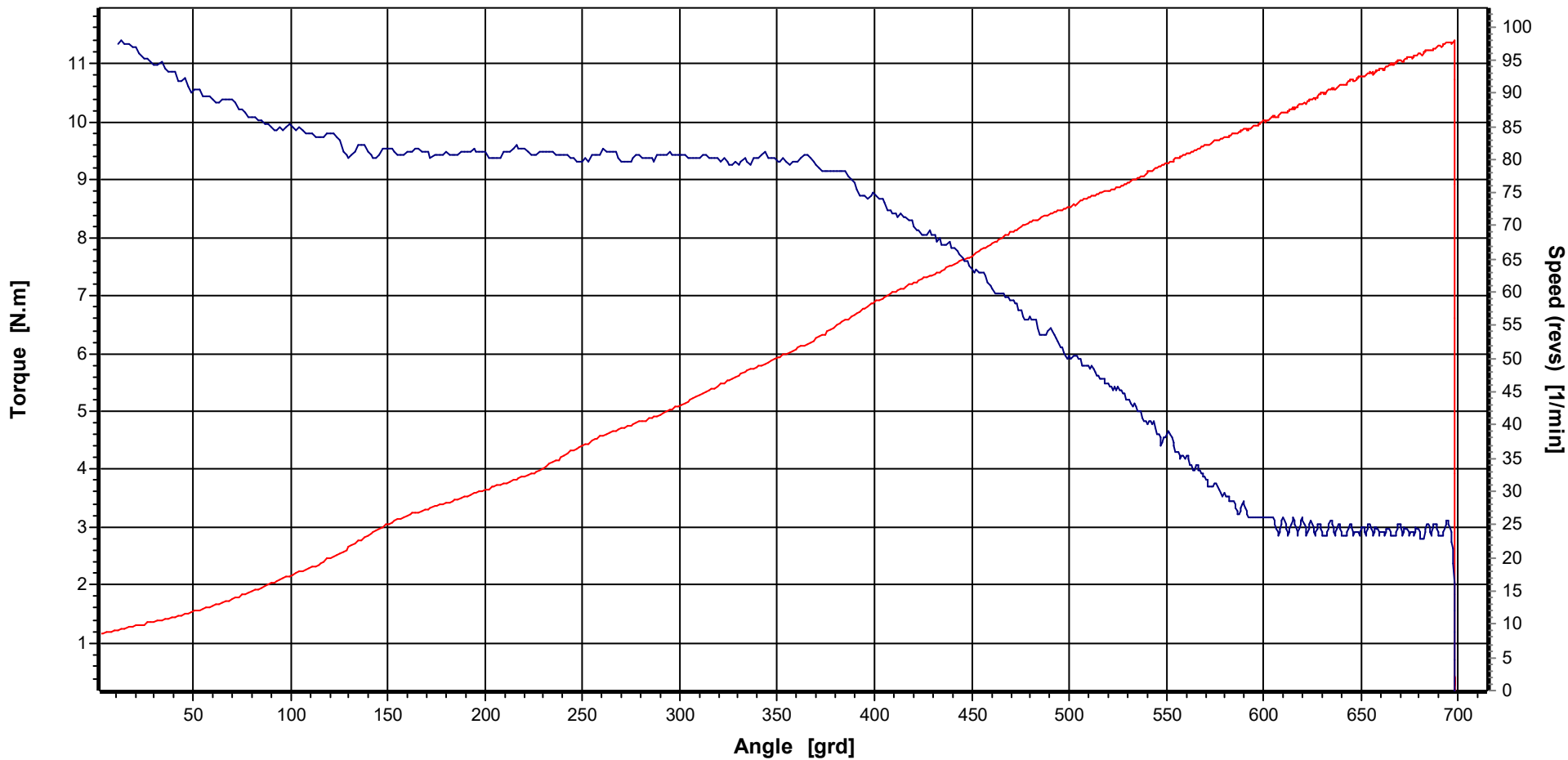


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 07:36:48
UL	12,20 N.m	Supporting points	809			Date/time measurement	21.06.2018 07:36:48

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

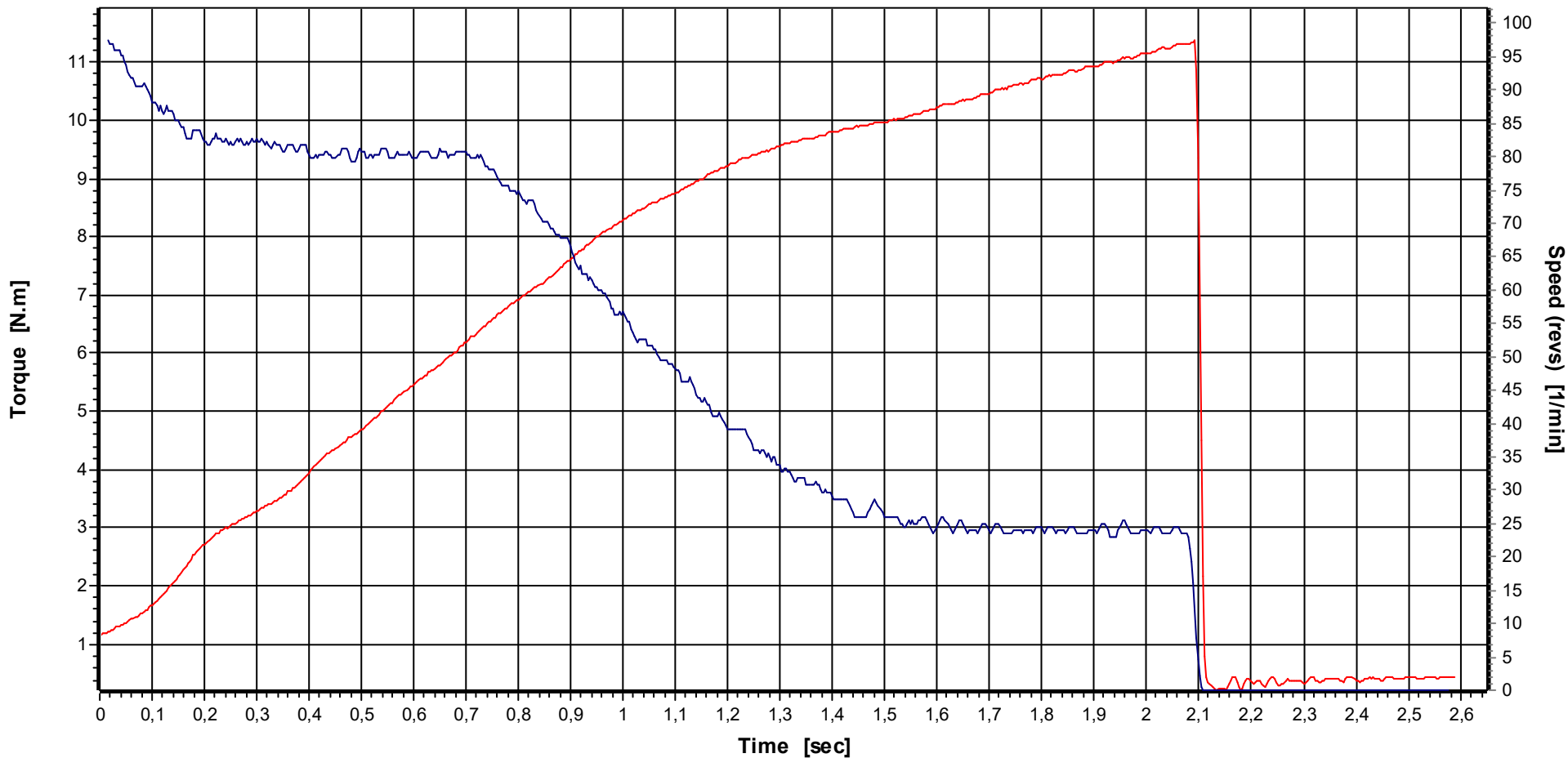


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 07:36:48
UL	12,20 N.m	Supporting points	847			Date/time measurement	21.06.2018 08:09:09

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

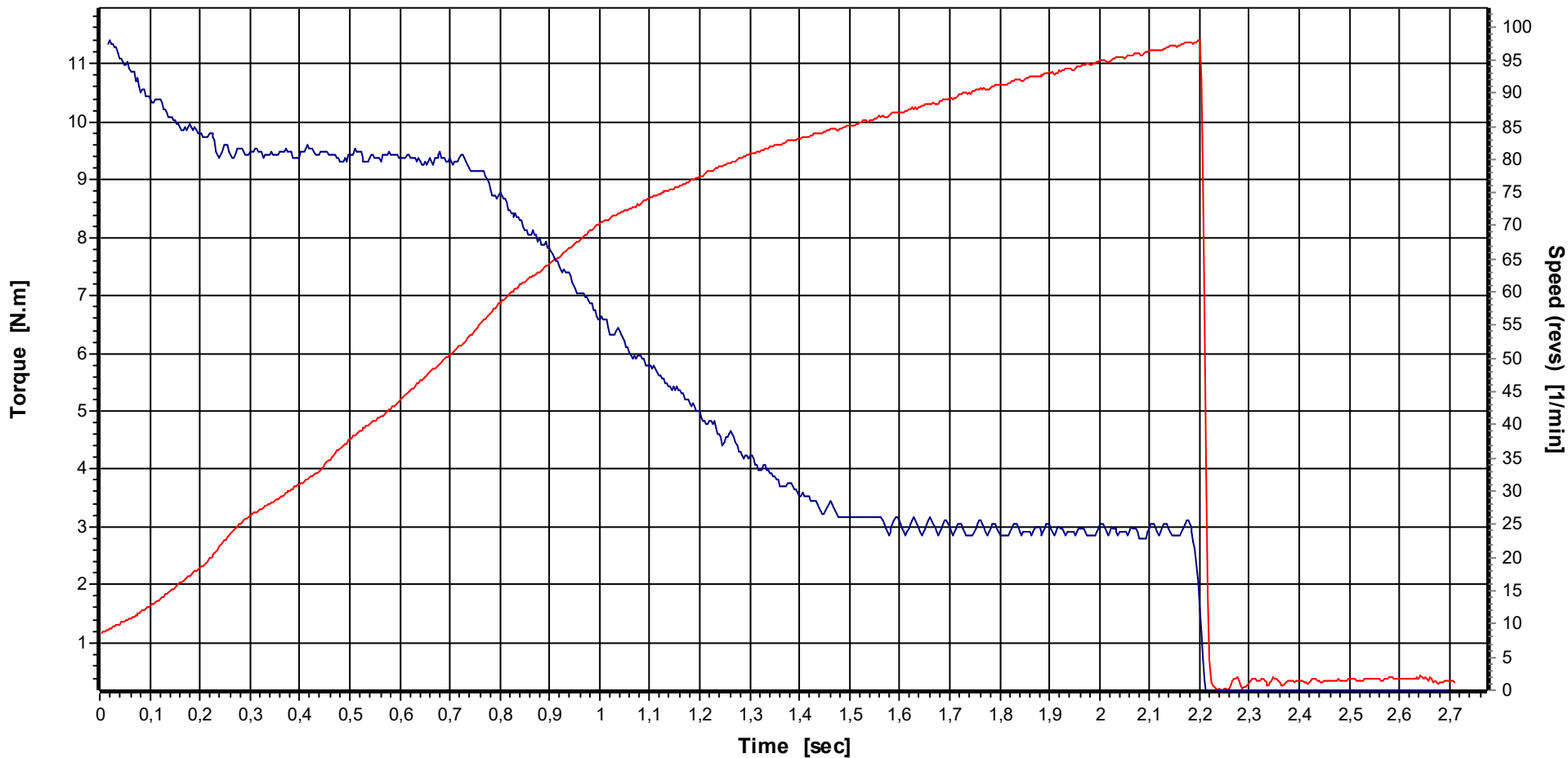


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 07:36:48
UL	12,20 N.m	Supporting points	809			Date/time measurement	21.06.2018 07:36:48

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 07:36:48
UL	12,20 N.m	Supporting points	847			Date/time measurement	21.06.2018 08:09:09

Date/ Time	21.06.2018 07:36:48	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4186	0,1440	0,0426	6,245	6,100	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,374 N.m	-0,2 %	357,50 °	-0,7 %	452 rpm	46 rpm	21.06.2018	07:36:48
2	11,452 N.m	0,5 %	365,50 °	1,5 %	452 rpm	45 rpm	21.06.2018	07:37:08
3	11,359 N.m	-0,4 %	349,75 °	-2,8 %	452 rpm	46 rpm	21.06.2018	07:37:27
4	11,452 N.m	0,5 %	366,00 °	1,7 %	452 rpm	45 rpm	21.06.2018	07:37:47
5	11,425 N.m	0,2 %	357,75 °	-0,6 %	452 rpm	47 rpm	21.06.2018	07:38:06
6	11,417 N.m	0,1 %	358,00 °	-0,6 %	452 rpm	46 rpm	21.06.2018	07:38:26
7	11,390 N.m	-0,1 %	353,00 °	-1,9 %	453 rpm	46 rpm	21.06.2018	07:38:46
8	11,433 N.m	0,3 %	362,25 °	0,6 %	452 rpm	45 rpm	21.06.2018	07:39:05
9	11,429 N.m	0,3 %	357,50 °	-0,7 %	452 rpm	47 rpm	21.06.2018	07:39:25
10	11,452 N.m	0,5 %	364,50 °	1,3 %	453 rpm	45 rpm	21.06.2018	07:39:45
11	11,374 N.m	-0,2 %	351,00 °	-2,5 %	453 rpm	46 rpm	21.06.2018	07:40:04
12	11,472 N.m	0,6 %	364,50 °	1,3 %	452 rpm	46 rpm	21.06.2018	07:40:24
13	11,378 N.m	-0,2 %	351,00 °	-2,5 %	451 rpm	46 rpm	21.06.2018	07:40:43
14	11,456 N.m	0,5 %	365,75 °	1,6 %	453 rpm	44 rpm	21.06.2018	07:41:03
15	11,366 N.m	-0,3 %	351,25 °	-2,4 %	452 rpm	46 rpm	21.06.2018	07:41:22
16	11,468 N.m	0,6 %	367,25 °	2,0 %	453 rpm	45 rpm	21.06.2018	07:41:42
17	11,413 N.m	0,1 %	358,00 °	-0,6 %	451 rpm	47 rpm	21.06.2018	07:42:02
18	11,464 N.m	0,6 %	365,25 °	1,5 %	453 rpm	45 rpm	21.06.2018	07:42:21
19	11,476 N.m	0,7 %	364,25 °	1,2 %	451 rpm	46 rpm	21.06.2018	07:42:41
20	11,374 N.m	-0,2 %	353,00 °	-1,9 %	451 rpm	46 rpm	21.06.2018	07:43:00
21	11,468 N.m	0,6 %	368,75 °	2,4 %	452 rpm	45 rpm	21.06.2018	07:43:21
22	11,370 N.m	-0,3 %	351,50 °	-2,4 %	453 rpm	46 rpm	21.06.2018	07:43:40
23	11,460 N.m	0,5 %	366,50 °	1,8 %	452 rpm	45 rpm	21.06.2018	07:44:00
24	11,409 N.m	0,1 %	358,00 °	-0,6 %	452 rpm	47 rpm	21.06.2018	07:44:19
25	11,444 N.m	0,4 %	365,75 °	1,6 %	452 rpm	45 rpm	21.06.2018	07:44:39
26	11,366 N.m	-0,3 %	353,00 °	-1,9 %	452 rpm	46 rpm	21.06.2018	07:44:58
27	11,472 N.m	0,6 %	362,25 °	0,6 %	452 rpm	46 rpm	21.06.2018	07:45:18
28	11,363 N.m	-0,3 %	351,25 °	-2,4 %	452 rpm	46 rpm	21.06.2018	07:45:37
29	11,472 N.m	0,6 %	367,25 °	2,0 %	452 rpm	45 rpm	21.06.2018	07:45:57
30	11,366 N.m	-0,3 %	351,50 °	-2,4 %	452 rpm	46 rpm	21.06.2018	07:46:16
31	11,429 N.m	0,3 %	365,00 °	1,4 %	452 rpm	45 rpm	21.06.2018	07:46:36
32	11,386 N.m	-0,1 %	357,25 °	-0,8 %	452 rpm	46 rpm	21.06.2018	07:46:56
33	11,402 N.m	0,0 %	357,50 °	-0,7 %	452 rpm	45 rpm	21.06.2018	07:47:15
34	11,468 N.m	0,6 %	369,50 °	2,6 %	452 rpm	45 rpm	21.06.2018	07:47:35
35	11,359 N.m	-0,4 %	353,00 °	-1,9 %	452 rpm	46 rpm	21.06.2018	07:47:54
36	11,487 N.m	0,8 %	365,50 °	1,5 %	453 rpm	46 rpm	21.06.2018	07:48:14
37	11,374 N.m	-0,2 %	352,75 °	-2,0 %	452 rpm	46 rpm	21.06.2018	07:48:34
38	11,468 N.m	0,6 %	369,00 °	2,5 %	452 rpm	45 rpm	21.06.2018	07:48:53
39	11,405 N.m	0,0 %	359,50 °	-0,1 %	452 rpm	45 rpm	21.06.2018	07:49:13
40	11,417 N.m	0,1 %	358,75 °	-0,3 %	452 rpm	46 rpm	21.06.2018	07:49:33
41	11,355 N.m	-0,4 %	349,50 °	-2,9 %	451 rpm	46 rpm	21.06.2018	07:49:52
42	11,460 N.m	0,5 %	365,00 °	1,4 %	453 rpm	46 rpm	21.06.2018	07:50:12
43	11,359 N.m	-0,4 %	351,00 °	-2,5 %	452 rpm	46 rpm	21.06.2018	07:50:31
44	11,456 N.m	0,5 %	361,75 °	0,5 %	453 rpm	46 rpm	21.06.2018	07:50:51
45	11,425 N.m	0,2 %	363,25 °	0,9 %	452 rpm	45 rpm	21.06.2018	07:51:11
46	11,405 N.m	0,0 %	358,25 °	-0,5 %	452 rpm	46 rpm	21.06.2018	07:51:30
47	11,429 N.m	0,3 %	365,00 °	1,4 %	452 rpm	45 rpm	21.06.2018	07:51:50
48	11,366 N.m	-0,3 %	353,75 °	-1,7 %	453 rpm	46 rpm	21.06.2018	07:52:09
49	11,464 N.m	0,6 %	367,50 °	2,1 %	453 rpm	44 rpm	21.06.2018	07:52:29
50	11,374 N.m	-0,2 %	354,25 °	-1,6 %	452 rpm	46 rpm	21.06.2018	07:52:48

Date/ Time	21.06.2018 07:36:48	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

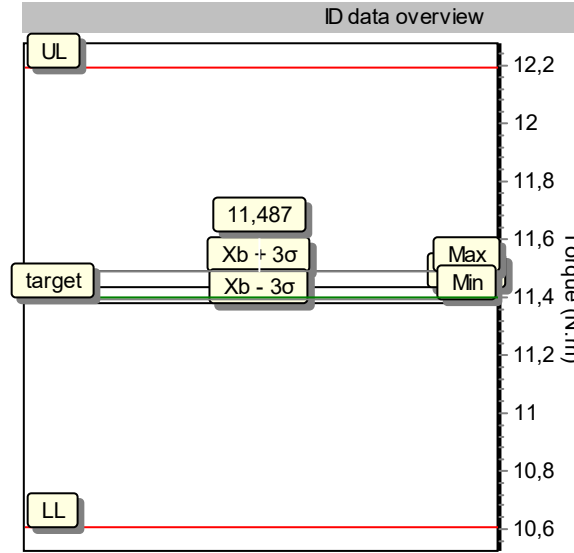
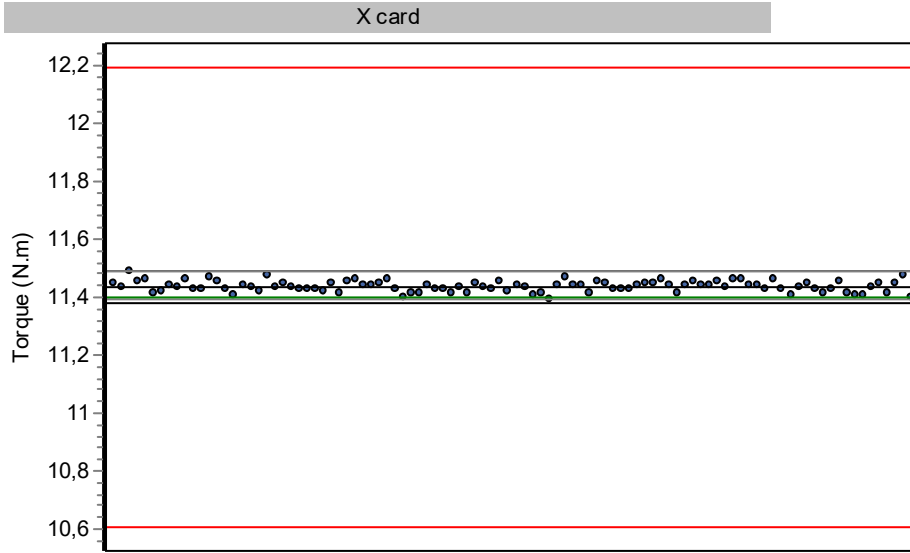
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4186	0,1440	0,0426	6,245	6,100	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,460 N.m	0,5 %	370,25 °	2,8 %	453 rpm	45 rpm	21.06.2018	07:53:08
52	11,351 N.m	-0,4 %	349,50 °	-2,9 %	452 rpm	46 rpm	21.06.2018	07:53:28
53	11,472 N.m	0,6 %	361,50 °	0,4 %	452 rpm	46 rpm	21.06.2018	07:53:47
54	11,370 N.m	-0,3 %	353,25 °	-1,9 %	452 rpm	46 rpm	21.06.2018	07:54:07
55	11,444 N.m	0,4 %	365,25 °	1,5 %	452 rpm	44 rpm	21.06.2018	07:54:27
56	11,452 N.m	0,5 %	362,25 °	0,6 %	451 rpm	46 rpm	21.06.2018	07:54:46
57	11,409 N.m	0,1 %	359,25 °	-0,2 %	451 rpm	46 rpm	21.06.2018	07:55:06
58	11,452 N.m	0,5 %	366,25 °	1,7 %	453 rpm	44 rpm	21.06.2018	07:55:25
59	11,359 N.m	-0,4 %	351,00 °	-2,5 %	453 rpm	46 rpm	21.06.2018	07:55:45
60	11,464 N.m	0,6 %	366,50 °	1,8 %	452 rpm	45 rpm	21.06.2018	07:56:04
61	11,370 N.m	-0,3 %	353,50 °	-1,8 %	453 rpm	46 rpm	21.06.2018	07:56:24
62	11,452 N.m	0,5 %	368,00 °	2,2 %	451 rpm	45 rpm	21.06.2018	07:56:44
63	11,374 N.m	-0,2 %	351,25 °	-2,4 %	453 rpm	46 rpm	21.06.2018	07:57:03
64	11,468 N.m	0,6 %	370,00 °	2,8 %	452 rpm	45 rpm	21.06.2018	07:57:23
65	11,355 N.m	-0,4 %	350,75 °	-2,6 %	453 rpm	46 rpm	21.06.2018	07:57:42
66	11,468 N.m	0,6 %	370,50 °	2,9 %	452 rpm	45 rpm	21.06.2018	07:58:03
67	11,347 N.m	-0,5 %	352,50 °	-2,1 %	452 rpm	46 rpm	21.06.2018	07:58:22
68	11,476 N.m	0,7 %	367,75 °	2,2 %	452 rpm	44 rpm	21.06.2018	07:58:41
69	11,429 N.m	0,3 %	357,75 °	-0,6 %	451 rpm	46 rpm	21.06.2018	07:59:01
70	11,394 N.m	-0,1 %	358,00 °	-0,6 %	452 rpm	45 rpm	21.06.2018	07:59:20
71	11,452 N.m	0,5 %	368,75 °	2,4 %	452 rpm	45 rpm	21.06.2018	07:59:40
72	11,378 N.m	-0,2 %	354,00 °	-1,7 %	453 rpm	46 rpm	21.06.2018	08:00:00
73	11,468 N.m	0,6 %	363,50 °	1,0 %	452 rpm	46 rpm	21.06.2018	08:00:19
74	11,374 N.m	-0,2 %	355,50 °	-1,3 %	452 rpm	46 rpm	21.06.2018	08:00:39
75	11,433 N.m	0,3 %	364,00 °	1,1 %	452 rpm	45 rpm	21.06.2018	08:00:59
76	11,417 N.m	0,1 %	358,50 °	-0,4 %	452 rpm	47 rpm	21.06.2018	08:01:18
77	11,394 N.m	-0,1 %	360,00 °	0,0 %	451 rpm	45 rpm	21.06.2018	08:01:38
78	11,464 N.m	0,6 %	361,00 °	0,3 %	452 rpm	46 rpm	21.06.2018	08:01:57
79	11,374 N.m	-0,2 %	352,00 °	-2,2 %	451 rpm	46 rpm	21.06.2018	08:02:17
80	11,468 N.m	0,6 %	367,50 °	2,1 %	452 rpm	44 rpm	21.06.2018	08:02:36
81	11,351 N.m	-0,4 %	353,25 °	-1,9 %	452 rpm	46 rpm	21.06.2018	08:02:56
82	11,468 N.m	0,6 %	363,75 °	1,0 %	452 rpm	46 rpm	21.06.2018	08:03:16
83	11,366 N.m	-0,3 %	356,00 °	-1,1 %	452 rpm	46 rpm	21.06.2018	08:03:35
84	11,480 N.m	0,7 %	371,25 °	3,1 %	452 rpm	45 rpm	21.06.2018	08:03:55
85	11,398 N.m	0,0 %	359,25 °	-0,2 %	452 rpm	46 rpm	21.06.2018	08:04:14
86	11,452 N.m	0,5 %	367,75 °	2,2 %	453 rpm	44 rpm	21.06.2018	08:04:34
87	11,343 N.m	-0,5 %	351,25 °	-2,4 %	453 rpm	46 rpm	21.06.2018	08:04:54
88	11,452 N.m	0,5 %	367,00 °	1,9 %	451 rpm	45 rpm	21.06.2018	08:05:13
89	11,468 N.m	0,6 %	363,25 °	0,9 %	451 rpm	46 rpm	21.06.2018	08:05:33
90	11,413 N.m	0,1 %	363,25 °	0,9 %	453 rpm	45 rpm	21.06.2018	08:05:53
91	11,437 N.m	0,3 %	358,75 °	-0,3 %	452 rpm	46 rpm	21.06.2018	08:06:12
92	11,359 N.m	-0,4 %	354,00 °	-1,7 %	451 rpm	46 rpm	21.06.2018	08:06:32
93	11,444 N.m	0,4 %	369,75 °	2,7 %	452 rpm	44 rpm	21.06.2018	08:06:51
94	11,444 N.m	0,4 %	358,00 °	-0,6 %	451 rpm	47 rpm	21.06.2018	08:07:11
95	11,421 N.m	0,2 %	363,75 °	1,0 %	452 rpm	45 rpm	21.06.2018	08:07:30
96	11,382 N.m	-0,2 %	357,75 °	-0,6 %	453 rpm	46 rpm	21.06.2018	08:07:50
97	11,421 N.m	0,2 %	364,25 °	1,2 %	451 rpm	45 rpm	21.06.2018	08:08:10
98	11,390 N.m	-0,1 %	358,00 °	-0,6 %	453 rpm	46 rpm	21.06.2018	08:08:29
99	11,472 N.m	0,6 %	368,00 °	2,2 %	452 rpm	45 rpm	21.06.2018	08:08:49
100	11,405 N.m	0,0 %	363,25 °	0,9 %	453 rpm	45 rpm	21.06.2018	08:09:09

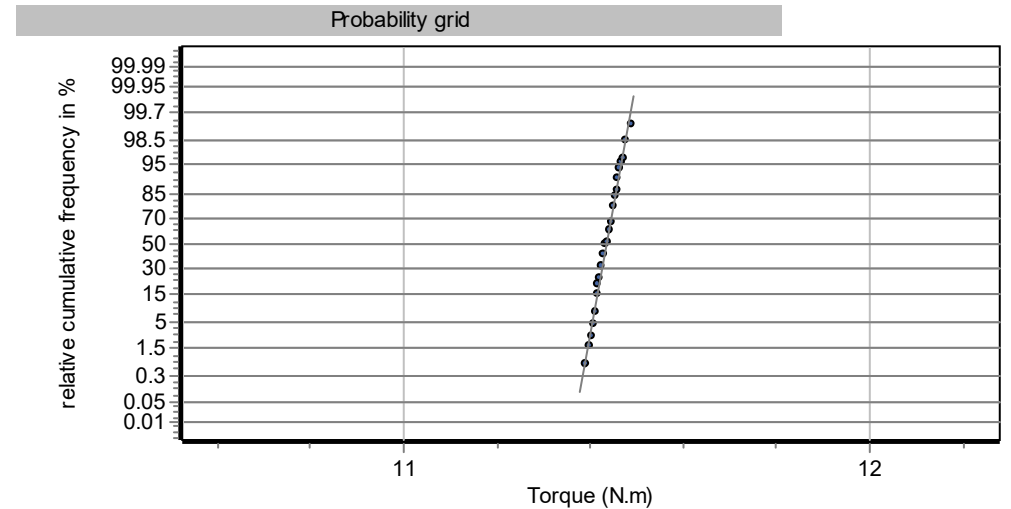
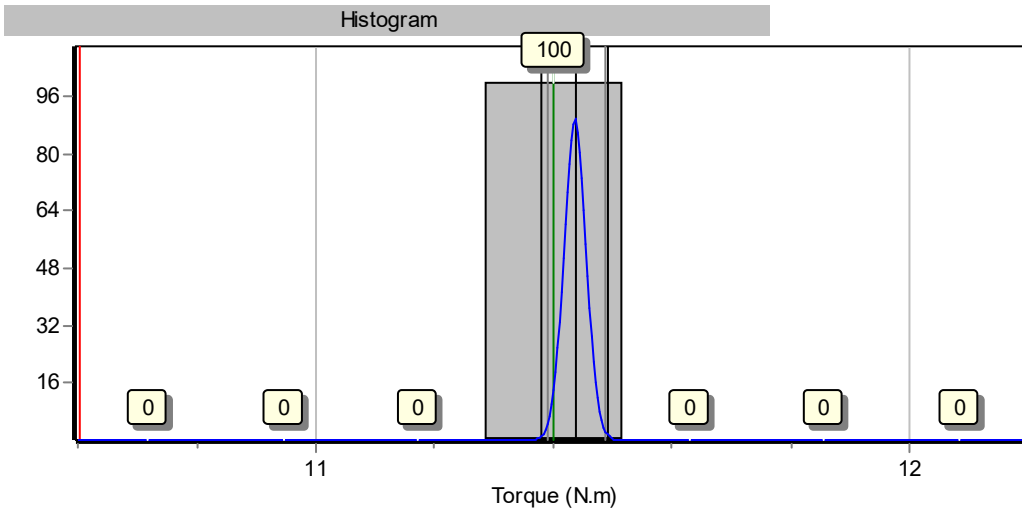
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 80% Screw joint: hard



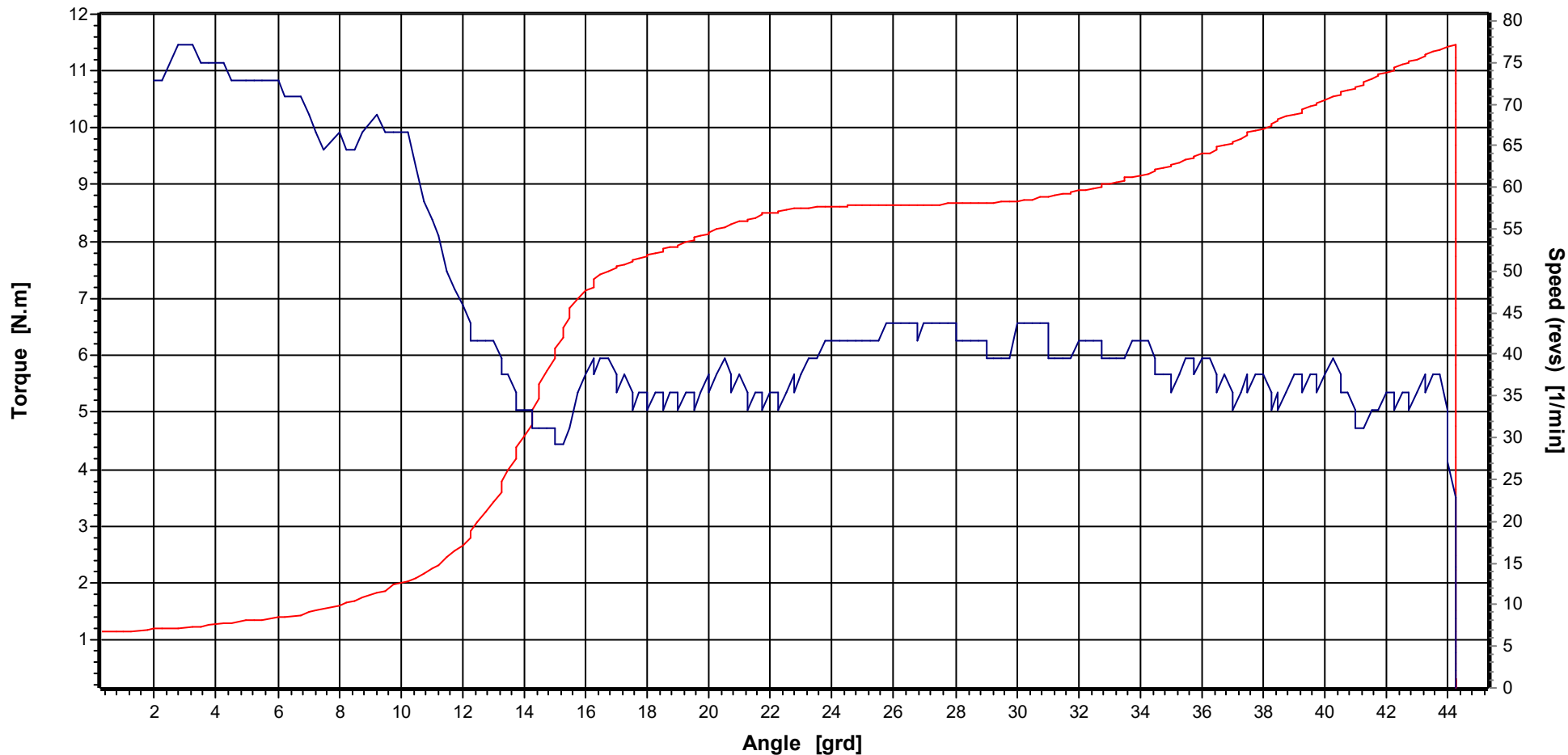
Tester	M.Brkcic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,49	N.m
Min	11,39	N.m
xq	11,4362	N.m
s	0,0187	N.m
Cm	14,193	
Cmk	13,549	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

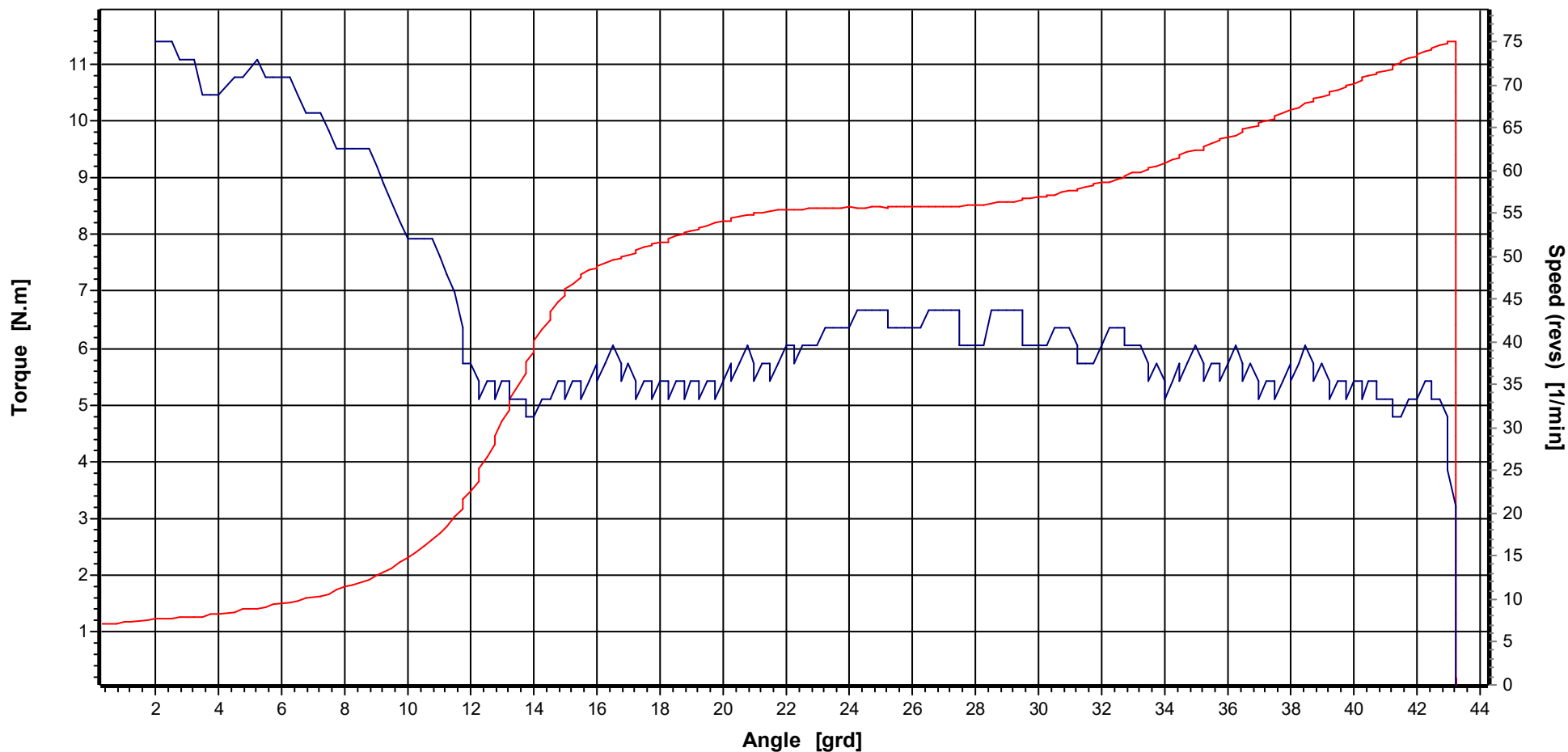


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:05:32
UL	12,20 N.m	Supporting points	829			Date/time measurement	21.06.2018 10:05:32

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

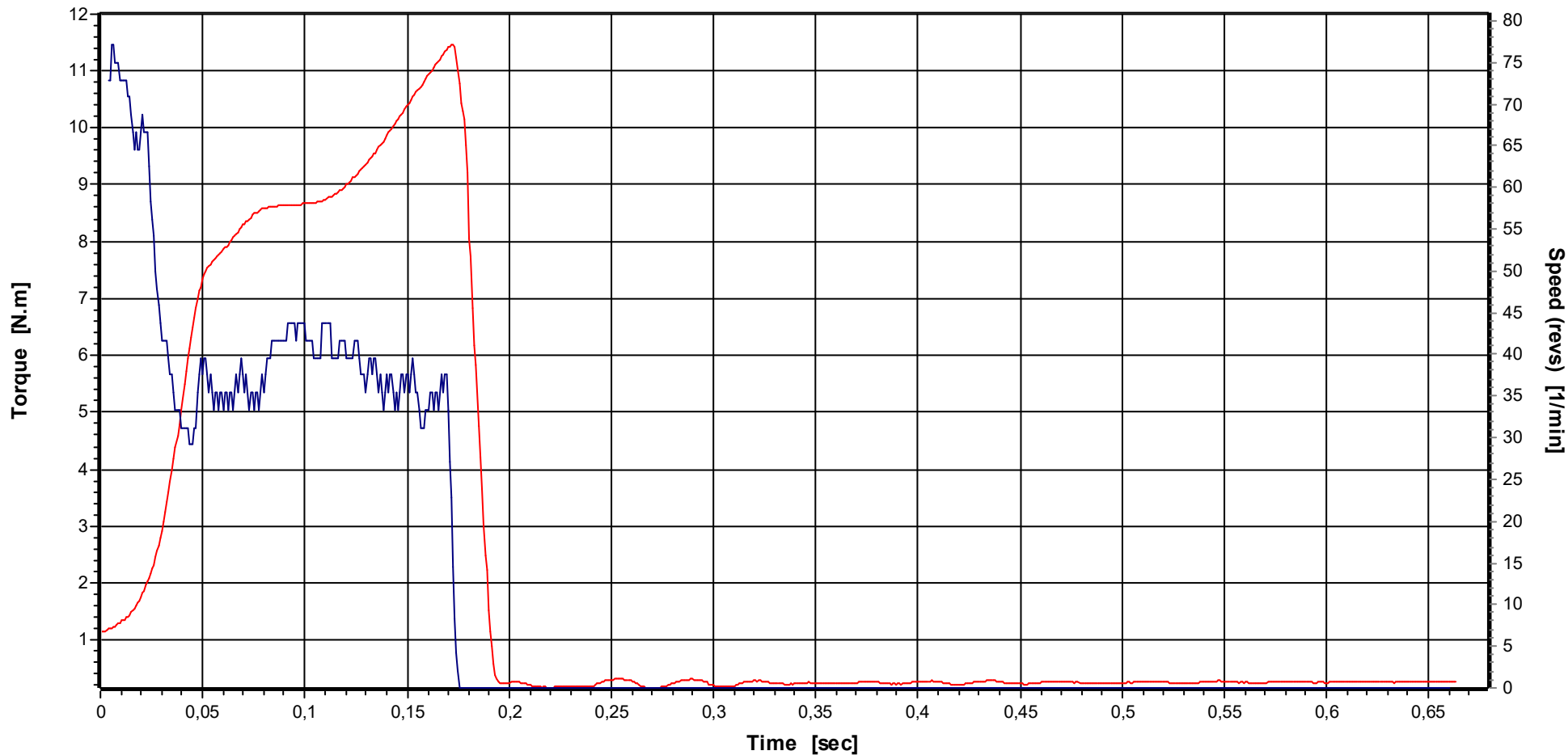


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:05:32
UL	12,20 N.m	Supporting points	808			Date/time measurement	21.06.2018 10:35:14

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

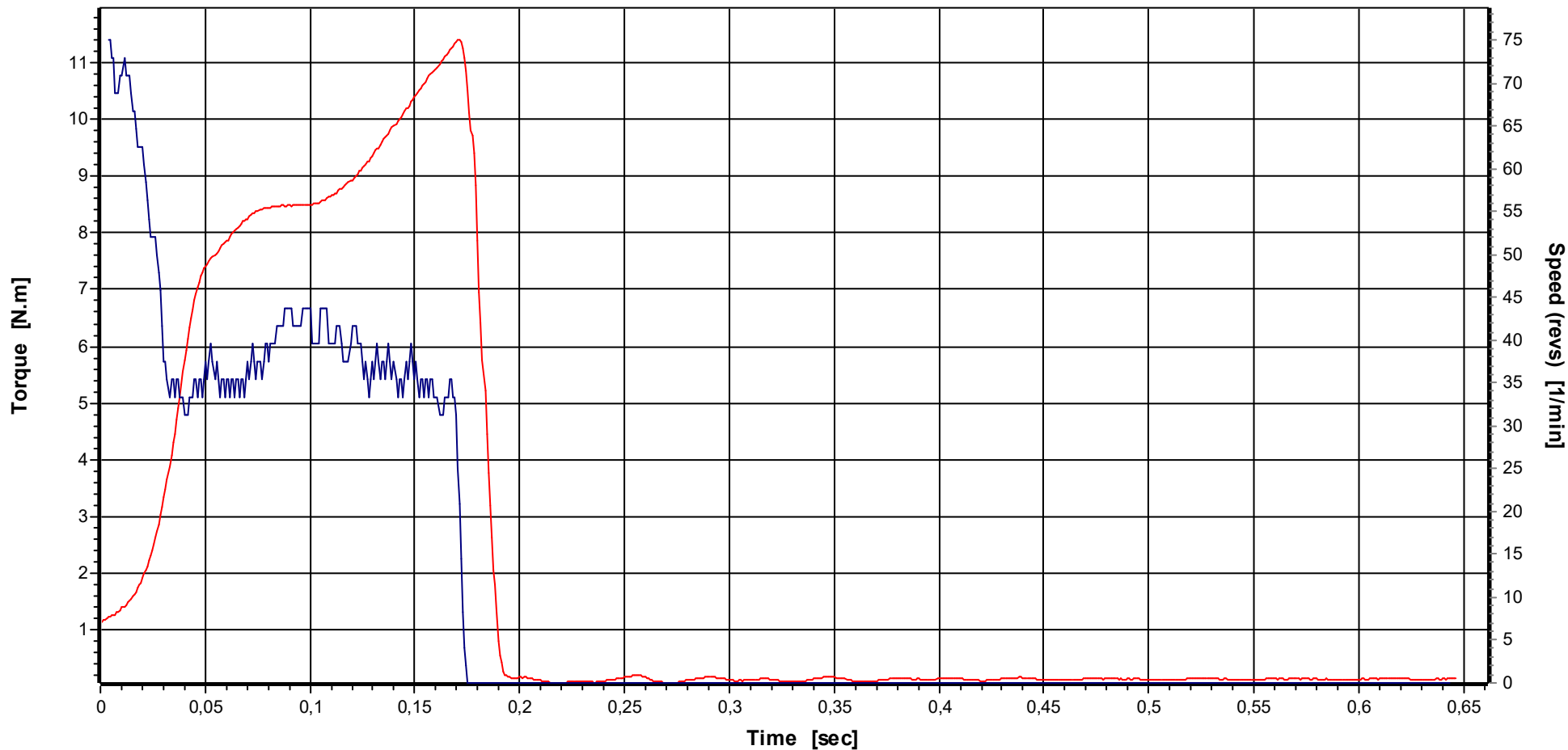


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:05:32
UL	12,20 N.m	Supporting points	829			Date/time measurement	21.06.2018 10:05:32

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:05:32
UL	12,20 N.m	Supporting points	808			Date/time measurement	21.06.2018 10:35:14

Date/ Time	21.06.2018 10:05:32	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4362	0,0970	0,0187	14,193	13,549	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,448 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:05:32
2	11,433 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:05:50
3	11,487 N.m	0,8 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:06:08
4	11,456 N.m	0,5 %	30,00 °	0,0 %	100 rpm	39 rpm	21.06.2018	10:06:26
5	11,464 N.m	0,6 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:06:44
6	11,417 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:07:02
7	11,421 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:07:20
8	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:07:38
9	11,433 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:07:56
10	11,464 N.m	0,6 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:08:14
11	11,429 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	39 rpm	21.06.2018	10:08:32
12	11,425 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	39 rpm	21.06.2018	10:08:50
13	11,468 N.m	0,6 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:09:08
14	11,452 N.m	0,5 %	29,75 °	-0,8 %	99 rpm	39 rpm	21.06.2018	10:09:26
15	11,429 N.m	0,3 %	30,00 °	0,0 %	100 rpm	39 rpm	21.06.2018	10:09:44
16	11,405 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:10:02
17	11,441 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	39 rpm	21.06.2018	10:10:20
18	11,433 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:10:38
19	11,421 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:10:56
20	11,476 N.m	0,7 %	30,00 °	0,0 %	100 rpm	39 rpm	21.06.2018	10:11:14
21	11,433 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:11:32
22	11,448 N.m	0,4 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:11:50
23	11,437 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:12:08
24	11,429 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:12:26
25	11,429 N.m	0,3 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:12:44
26	11,425 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:13:02
27	11,421 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:13:20
28	11,448 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:13:38
29	11,417 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:13:56
30	11,452 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:14:14
31	11,460 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:14:32
32	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:14:50
33	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:15:08
34	11,448 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:15:26
35	11,460 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:15:44
36	11,425 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:16:02
37	11,402 N.m	0,0 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:16:20
38	11,413 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:16:38
39	11,417 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:16:56
40	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:17:14
41	11,429 N.m	0,3 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:17:32
42	11,425 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:17:50
43	11,417 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:18:08
44	11,433 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:18:26
45	11,413 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	39 rpm	21.06.2018	10:18:44
46	11,448 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:19:02
47	11,437 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:19:20
48	11,429 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:19:38
49	11,456 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:19:56
50	11,421 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	39 rpm	21.06.2018	10:20:14

Date/ Time	21.06.2018 10:05:32	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

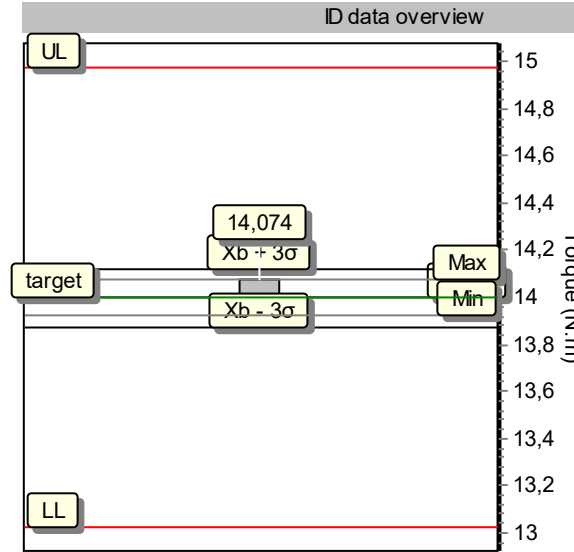
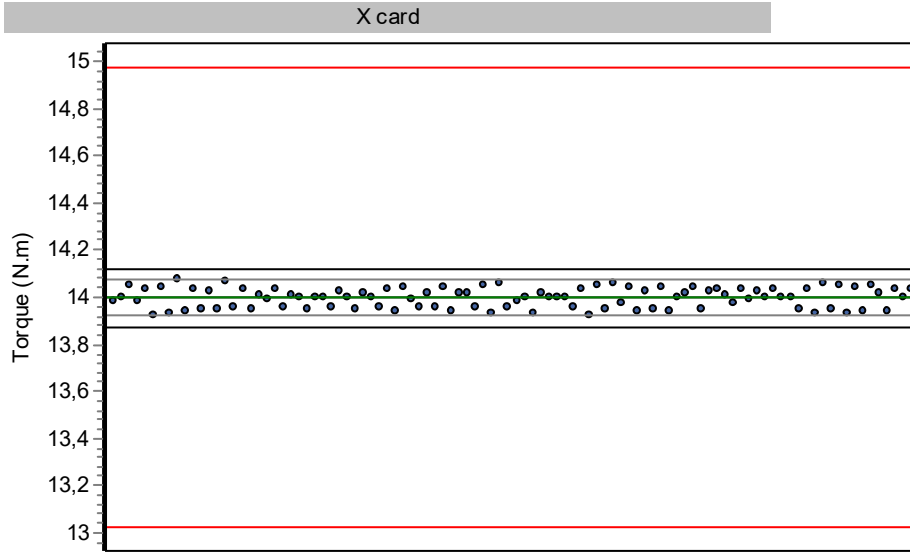
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4362	0,0970	0,0187	14,193	13,549	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,444 N.m	0,4 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:20:32
52	11,433 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:20:50
53	11,409 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:21:08
54	11,413 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:21:26
55	11,390 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	21.06.2018	10:21:44
56	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:22:02
57	11,472 N.m	0,6 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:22:20
58	11,441 N.m	0,4 %	30,00 °	0,0 %	99 rpm	38 rpm	21.06.2018	10:22:38
59	11,444 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:22:56
60	11,413 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:23:14
61	11,456 N.m	0,5 %	30,00 °	0,0 %	99 rpm	38 rpm	21.06.2018	10:23:32
62	11,448 N.m	0,4 %	30,00 °	0,0 %	100 rpm	39 rpm	21.06.2018	10:23:50
63	11,425 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:24:08
64	11,425 N.m	0,2 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:24:26
65	11,425 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	39 rpm	21.06.2018	10:24:44
66	11,444 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:25:02
67	11,448 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:25:20
68	11,448 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:25:38
69	11,460 N.m	0,5 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:25:56
70	11,441 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:26:14
71	11,413 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	21.06.2018	10:26:32
72	11,444 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:26:50
73	11,452 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:27:08
74	11,444 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:27:26
75	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:27:44
76	11,452 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:28:02
77	11,433 N.m	0,3 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:28:20
78	11,464 N.m	0,6 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:28:38
79	11,460 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:28:56
80	11,444 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:29:14
81	11,441 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:29:32
82	11,429 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	39 rpm	21.06.2018	10:29:50
83	11,460 N.m	0,5 %	30,25 °	0,8 %	100 rpm	38 rpm	21.06.2018	10:30:08
84	11,425 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:30:26
85	11,409 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:30:44
86	11,433 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:31:02
87	11,448 N.m	0,4 %	30,00 °	0,0 %	99 rpm	38 rpm	21.06.2018	10:31:20
88	11,429 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:31:38
89	11,413 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:31:56
90	11,429 N.m	0,3 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:32:14
91	11,452 N.m	0,5 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:32:32
92	11,413 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:32:50
93	11,405 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	21.06.2018	10:33:08
94	11,409 N.m	0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	21.06.2018	10:33:26
95	11,433 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	38 rpm	21.06.2018	10:33:44
96	11,448 N.m	0,4 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:34:02
97	11,417 N.m	0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	21.06.2018	10:34:20
98	11,448 N.m	0,4 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:34:38
99	11,476 N.m	0,7 %	30,00 °	0,0 %	100 rpm	38 rpm	21.06.2018	10:34:56
100	11,398 N.m	0,0 %	29,50 °	-1,7 %	100 rpm	38 rpm	21.06.2018	10:35:14

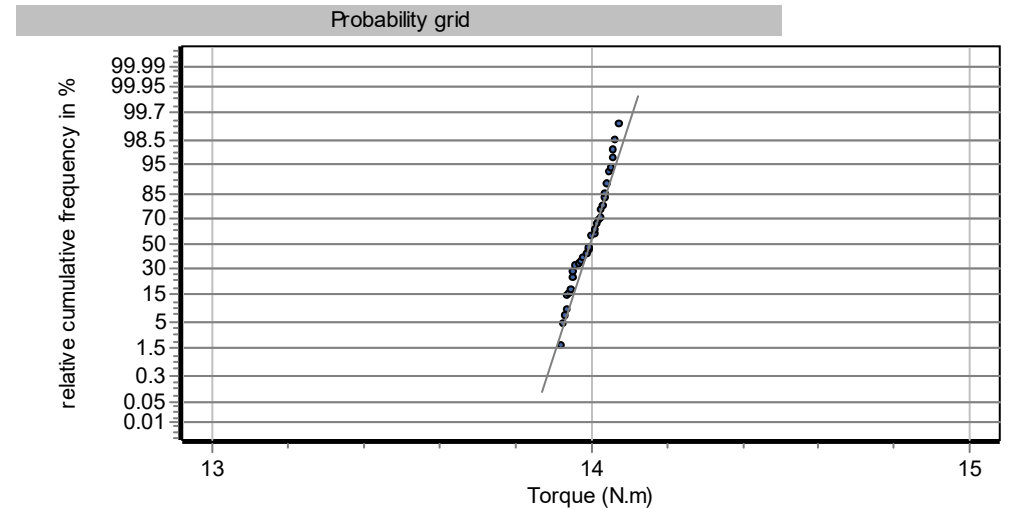
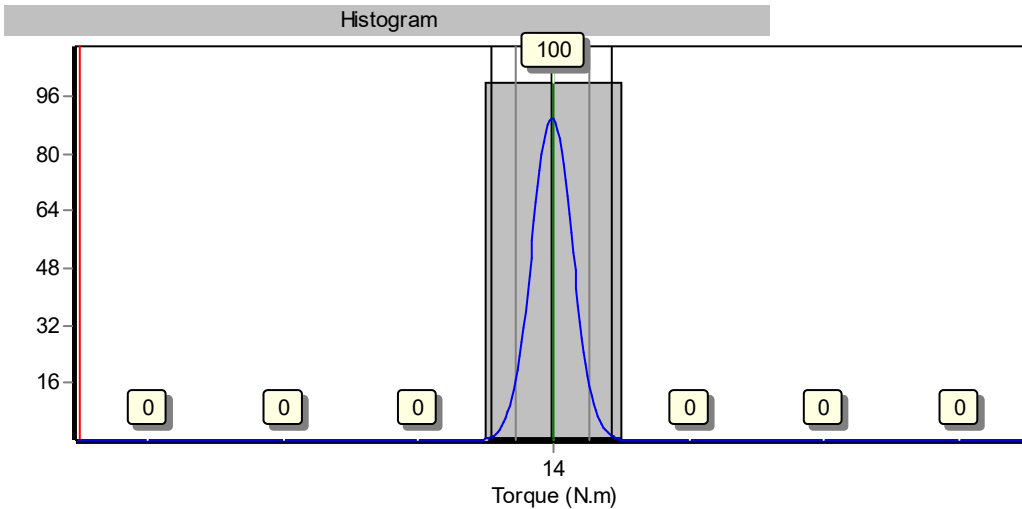
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 100% Screw joint: soft



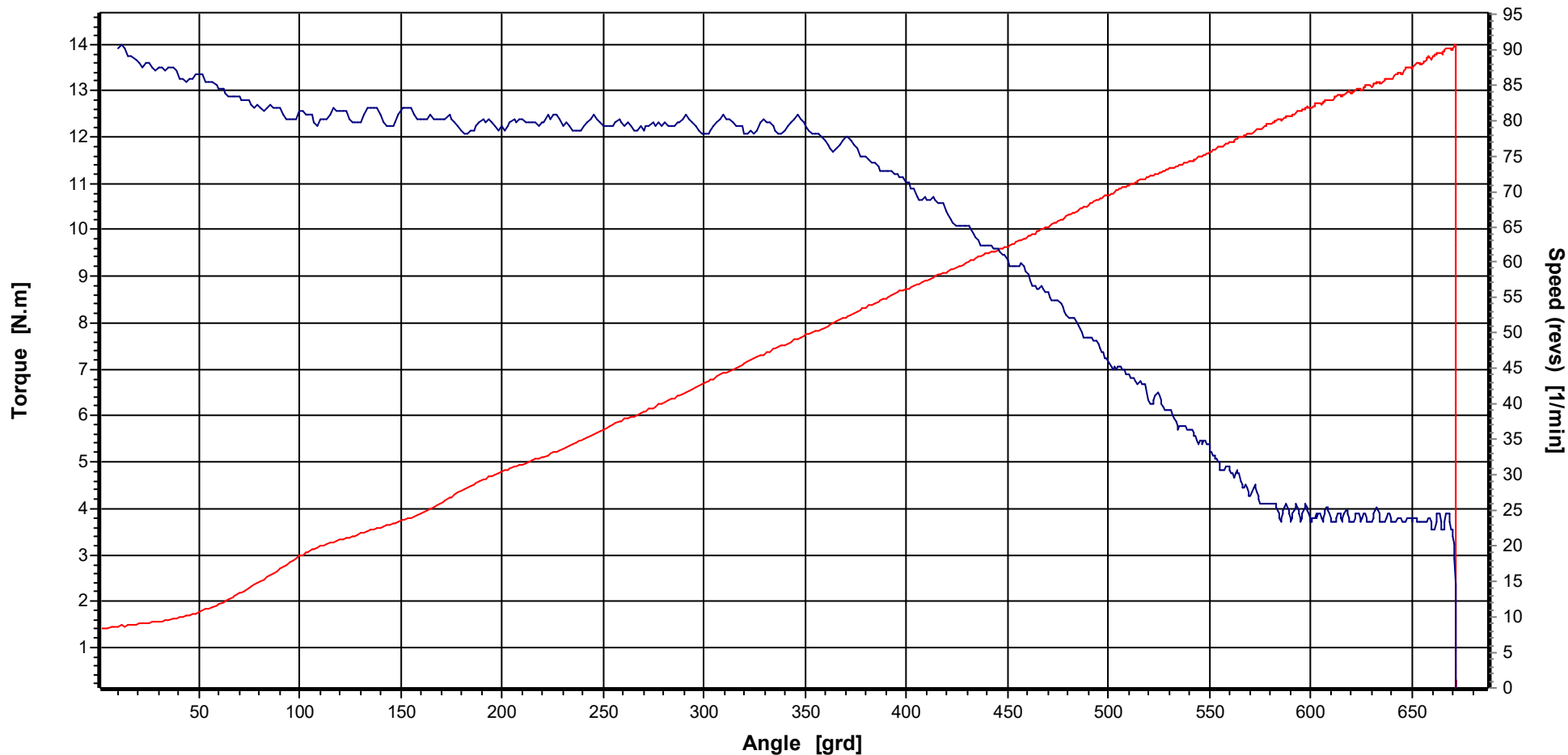
Tester	M.Brkc	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,07	N.m
Min	13,92	N.m
xq	13,9968	N.m
s	0,0414	N.m
Cm	7,897	
Cmk	7,870	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

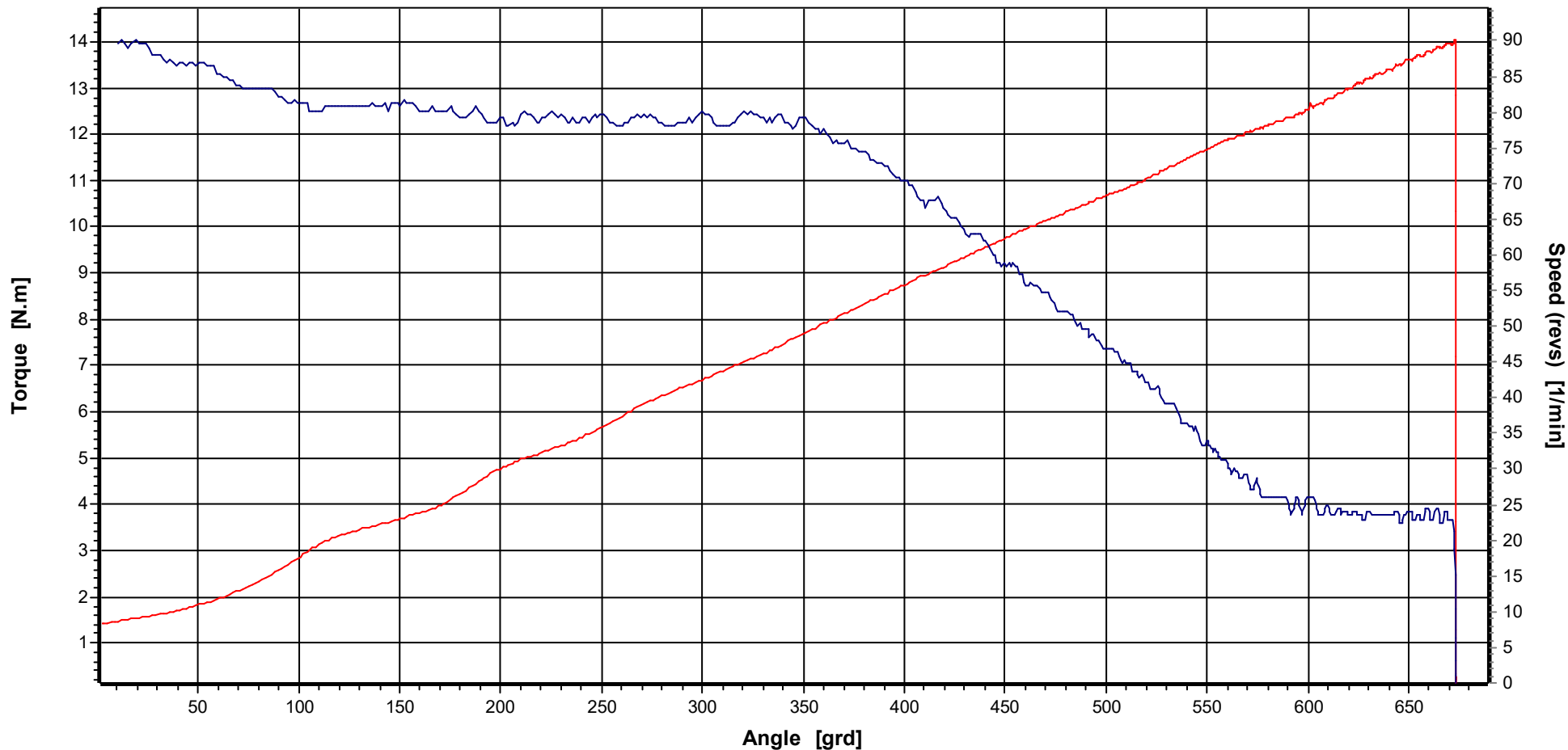


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:53:06
UL	14,98 N.m	Supporting points	820			Date/time measurement	21.06.2018 10:53:06

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

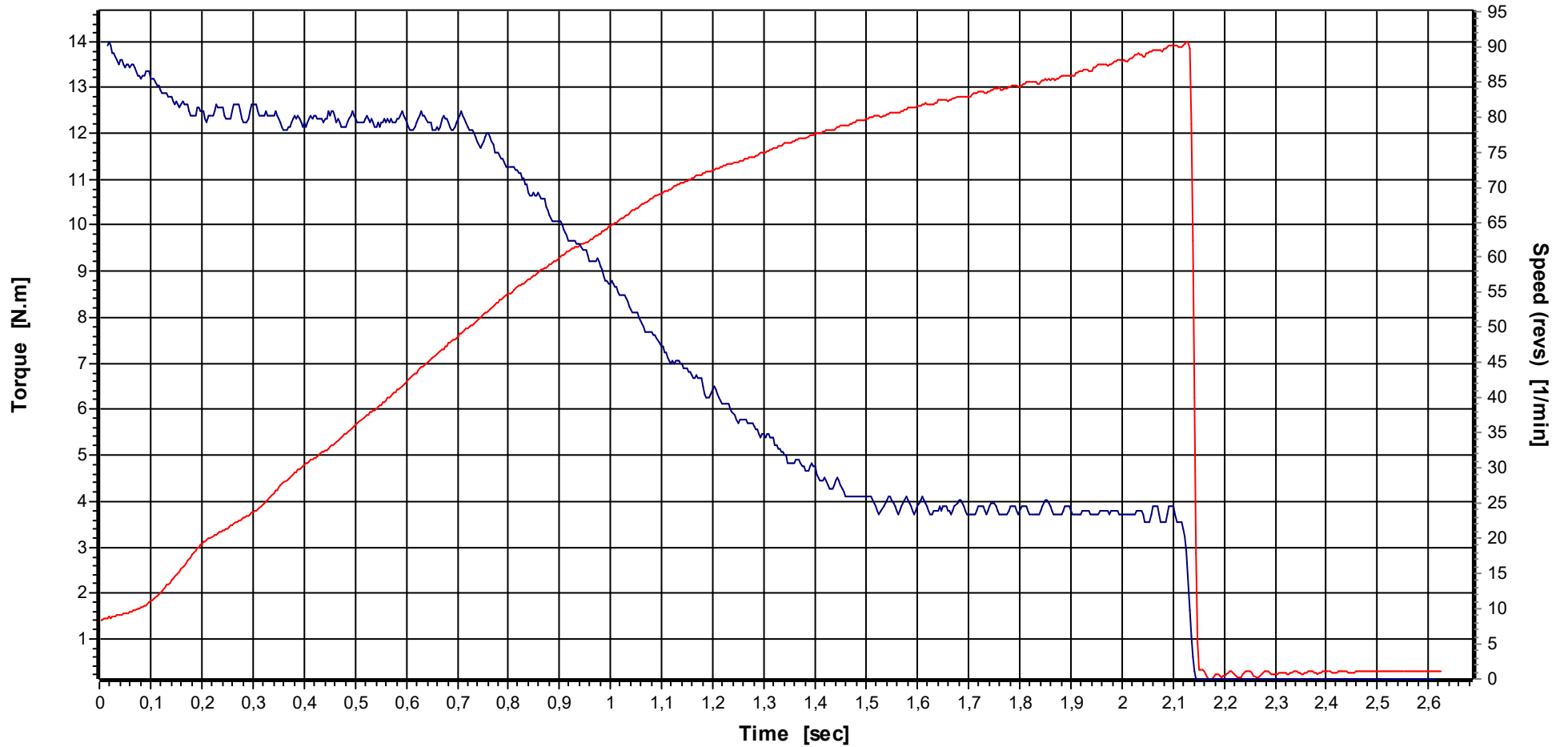


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:53:06
UL	14,98 N.m	Supporting points	823			Date/time measurement	21.06.2018 12:07:21

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

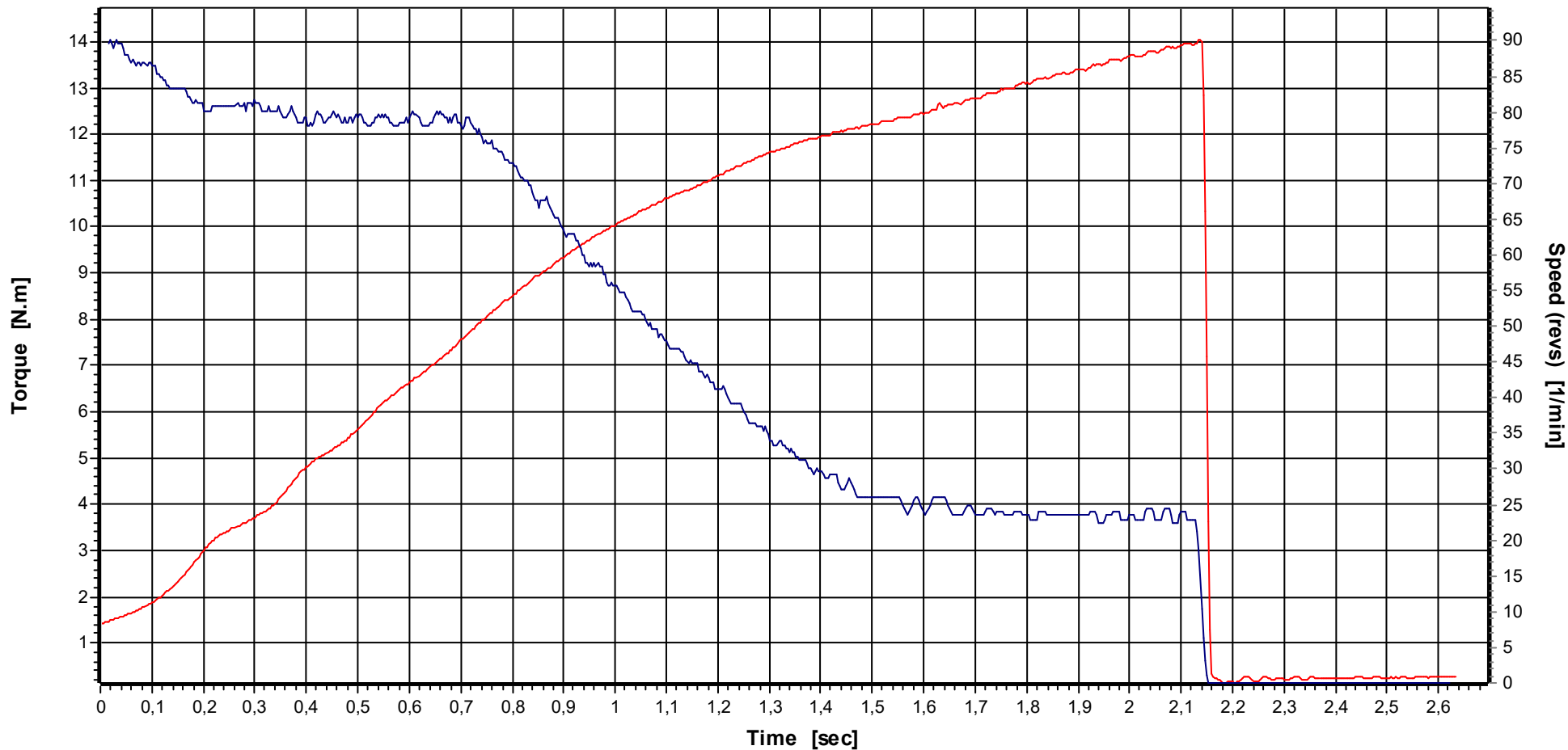


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:53:06
UL	14,98 N.m	Supporting points	820			Date/time measurement	21.06.2018 10:53:06

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 10:53:06
UL	14,98 N.m	Supporting points	823			Date/time measurement	21.06.2018 12:07:21

Date/ Time	21.06.2018 10:53:06	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		
Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		
Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	13,9968	0,1530	0,0414	7,897	7,870	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	13,984 N.m	-0,1 %	357,75 °	-0,6 %	453 rpm	45 rpm	21.06.2018	10:53:06
2	14,003 N.m	0,0 %	362,25 °	0,6 %	453 rpm	44 rpm	21.06.2018	10:53:51
3	14,050 N.m	0,4 %	360,00 °	0,0 %	453 rpm	45 rpm	21.06.2018	10:54:36
4	13,984 N.m	-0,1 %	361,25 °	0,3 %	453 rpm	44 rpm	21.06.2018	10:55:21
5	14,031 N.m	0,2 %	361,00 °	0,3 %	452 rpm	45 rpm	21.06.2018	10:56:06
6	13,921 N.m	-0,6 %	352,50 °	-2,1 %	453 rpm	44 rpm	21.06.2018	10:56:51
7	14,046 N.m	0,3 %	362,75 °	0,8 %	453 rpm	45 rpm	21.06.2018	10:57:36
8	13,929 N.m	-0,5 %	351,50 °	-2,4 %	453 rpm	45 rpm	21.06.2018	10:58:21
9	14,074 N.m	0,5 %	364,00 °	1,1 %	453 rpm	45 rpm	21.06.2018	10:59:06
10	13,937 N.m	-0,5 %	353,25 °	-1,9 %	453 rpm	44 rpm	21.06.2018	10:59:51
11	14,038 N.m	0,3 %	364,50 °	1,3 %	453 rpm	44 rpm	21.06.2018	11:00:36
12	13,945 N.m	-0,4 %	356,00 °	-1,1 %	454 rpm	45 rpm	21.06.2018	11:01:21
13	14,023 N.m	0,2 %	364,00 °	1,1 %	453 rpm	43 rpm	21.06.2018	11:02:06
14	13,953 N.m	-0,3 %	354,25 °	-1,6 %	454 rpm	45 rpm	21.06.2018	11:02:51
15	14,066 N.m	0,5 %	363,50 °	1,0 %	453 rpm	45 rpm	21.06.2018	11:03:36
16	13,960 N.m	-0,3 %	356,50 °	-1,0 %	453 rpm	45 rpm	21.06.2018	11:04:21
17	14,035 N.m	0,3 %	362,50 °	0,7 %	453 rpm	44 rpm	21.06.2018	11:05:06
18	13,949 N.m	-0,4 %	356,50 °	-1,0 %	454 rpm	45 rpm	21.06.2018	11:05:51
19	14,011 N.m	0,1 %	361,25 °	0,3 %	453 rpm	44 rpm	21.06.2018	11:06:36
20	13,992 N.m	-0,1 %	358,50 °	-0,4 %	453 rpm	45 rpm	21.06.2018	11:07:21
21	14,035 N.m	0,3 %	362,50 °	0,7 %	454 rpm	44 rpm	21.06.2018	11:08:06
22	13,960 N.m	-0,3 %	356,00 °	-1,1 %	454 rpm	45 rpm	21.06.2018	11:08:51
23	14,011 N.m	0,1 %	360,00 °	0,0 %	453 rpm	44 rpm	21.06.2018	11:09:36
24	14,003 N.m	0,0 %	357,50 °	-0,7 %	453 rpm	45 rpm	21.06.2018	11:10:21
25	13,953 N.m	-0,3 %	356,50 °	-1,0 %	452 rpm	44 rpm	21.06.2018	11:11:06
26	13,996 N.m	0,0 %	356,75 °	-0,9 %	454 rpm	45 rpm	21.06.2018	11:11:51
27	14,003 N.m	0,0 %	361,25 °	0,3 %	455 rpm	44 rpm	21.06.2018	11:12:36
28	13,960 N.m	-0,3 %	355,75 °	-1,2 %	454 rpm	45 rpm	21.06.2018	11:13:21
29	14,023 N.m	0,2 %	361,50 °	0,4 %	454 rpm	44 rpm	21.06.2018	11:14:06
30	13,999 N.m	0,0 %	360,00 °	0,0 %	454 rpm	45 rpm	21.06.2018	11:14:51
31	13,953 N.m	-0,3 %	355,00 °	-1,4 %	453 rpm	45 rpm	21.06.2018	11:15:36
32	14,019 N.m	0,1 %	358,50 °	-0,4 %	453 rpm	45 rpm	21.06.2018	11:16:21
33	13,999 N.m	0,0 %	360,00 °	0,0 %	453 rpm	44 rpm	21.06.2018	11:17:06
34	13,957 N.m	-0,3 %	355,75 °	-1,2 %	454 rpm	45 rpm	21.06.2018	11:17:51
35	14,038 N.m	0,3 %	365,75 °	1,6 %	453 rpm	44 rpm	21.06.2018	11:18:36
36	13,941 N.m	-0,4 %	354,00 °	-1,7 %	453 rpm	45 rpm	21.06.2018	11:19:21
37	14,046 N.m	0,3 %	358,25 °	-0,5 %	453 rpm	45 rpm	21.06.2018	11:20:06
38	13,992 N.m	-0,1 %	361,50 °	0,4 %	454 rpm	44 rpm	21.06.2018	11:20:51
39	13,957 N.m	-0,3 %	354,50 °	-1,5 %	453 rpm	45 rpm	21.06.2018	11:21:36
40	14,015 N.m	0,1 %	360,50 °	0,1 %	453 rpm	44 rpm	21.06.2018	11:22:21
41	13,957 N.m	-0,3 %	354,50 °	-1,5 %	453 rpm	45 rpm	21.06.2018	11:23:06
42	14,042 N.m	0,3 %	363,50 °	1,0 %	453 rpm	44 rpm	21.06.2018	11:23:51
43	13,941 N.m	-0,4 %	354,75 °	-1,5 %	453 rpm	44 rpm	21.06.2018	11:24:36
44	14,019 N.m	0,1 %	359,25 °	-0,2 %	453 rpm	45 rpm	21.06.2018	11:25:21
45	14,019 N.m	0,1 %	361,25 °	0,3 %	454 rpm	44 rpm	21.06.2018	11:26:06
46	13,957 N.m	-0,3 %	354,00 °	-1,7 %	453 rpm	45 rpm	21.06.2018	11:26:51
47	14,054 N.m	0,4 %	363,75 °	1,0 %	454 rpm	44 rpm	21.06.2018	11:27:36
48	13,933 N.m	-0,5 %	350,75 °	-2,6 %	454 rpm	44 rpm	21.06.2018	11:28:21
49	14,062 N.m	0,4 %	362,00 °	0,6 %	453 rpm	45 rpm	21.06.2018	11:29:06
50	13,960 N.m	-0,3 %	356,00 °	-1,1 %	454 rpm	44 rpm	21.06.2018	11:29:51

Date/ Time	21.06.2018 10:53:06	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

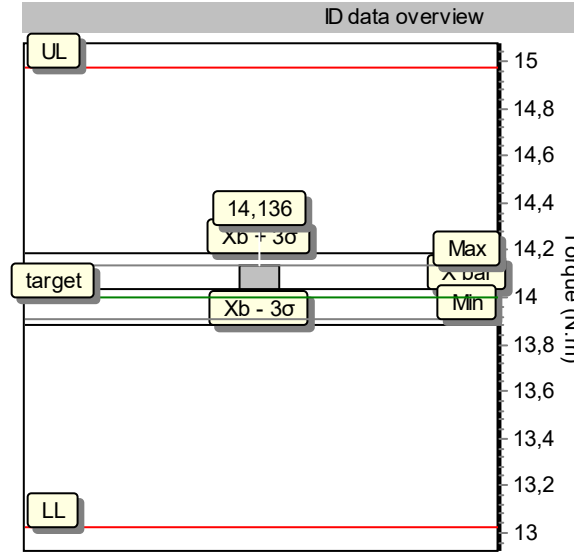
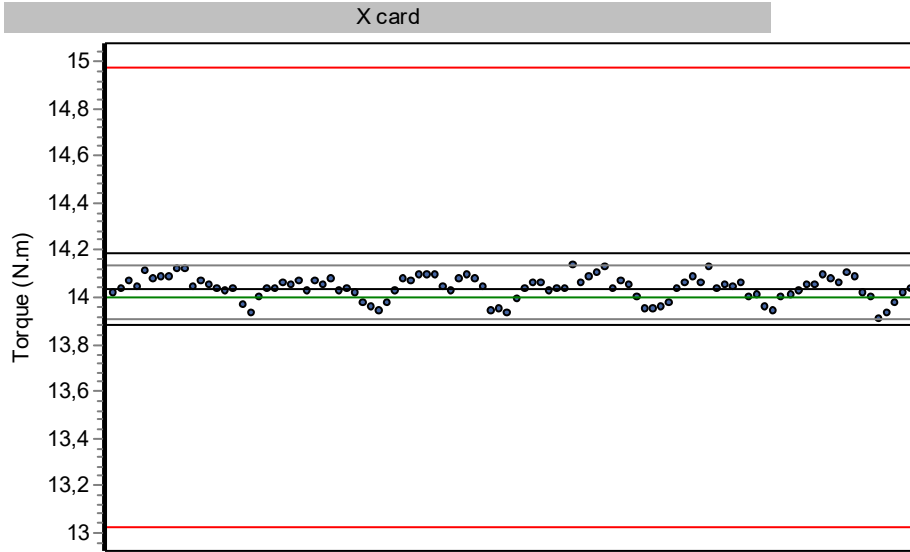
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	13,9968	0,1530	0,0414	7,897	7,870	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	13,984 N.m	-0,1 %	357,25 °	-0,8 %	453 rpm	46 rpm	21.06.2018	11:30:36
52	14,003 N.m	0,0 %	360,75 °	0,2 %	454 rpm	44 rpm	21.06.2018	11:31:21
53	13,929 N.m	-0,5 %	351,00 °	-2,5 %	453 rpm	44 rpm	21.06.2018	11:32:06
54	14,019 N.m	0,1 %	359,25 °	-0,2 %	453 rpm	45 rpm	21.06.2018	11:32:51
55	14,003 N.m	0,0 %	359,50 °	-0,1 %	454 rpm	44 rpm	21.06.2018	11:33:36
56	14,003 N.m	0,0 %	357,25 °	-0,8 %	453 rpm	45 rpm	21.06.2018	11:34:21
57	14,003 N.m	0,0 %	361,25 °	0,3 %	453 rpm	44 rpm	21.06.2018	11:35:06
58	13,960 N.m	-0,3 %	351,25 °	-2,4 %	453 rpm	44 rpm	21.06.2018	11:35:51
59	14,038 N.m	0,3 %	364,25 °	1,2 %	454 rpm	43 rpm	21.06.2018	11:36:36
60	13,921 N.m	-0,6 %	351,75 °	-2,3 %	453 rpm	44 rpm	21.06.2018	11:37:21
61	14,050 N.m	0,4 %	357,75 °	-0,6 %	453 rpm	45 rpm	21.06.2018	11:38:06
62	13,949 N.m	-0,4 %	350,50 °	-2,6 %	452 rpm	44 rpm	21.06.2018	11:38:51
63	14,058 N.m	0,4 %	361,75 °	0,5 %	453 rpm	45 rpm	21.06.2018	11:39:36
64	13,972 N.m	-0,2 %	355,75 °	-1,2 %	453 rpm	44 rpm	21.06.2018	11:40:21
65	14,046 N.m	0,3 %	360,25 °	0,1 %	452 rpm	45 rpm	21.06.2018	11:41:06
66	13,941 N.m	-0,4 %	351,00 °	-2,5 %	452 rpm	44 rpm	21.06.2018	11:41:51
67	14,027 N.m	0,2 %	365,50 °	1,5 %	453 rpm	44 rpm	21.06.2018	11:42:36
68	13,953 N.m	-0,3 %	355,25 °	-1,3 %	453 rpm	45 rpm	21.06.2018	11:43:21
69	14,042 N.m	0,3 %	364,50 °	1,3 %	453 rpm	44 rpm	21.06.2018	11:44:06
70	13,941 N.m	-0,4 %	354,25 °	-1,6 %	452 rpm	45 rpm	21.06.2018	11:44:51
71	13,996 N.m	0,0 %	359,50 °	-0,1 %	452 rpm	44 rpm	21.06.2018	11:45:36
72	14,019 N.m	0,1 %	360,50 °	0,1 %	452 rpm	45 rpm	21.06.2018	11:46:21
73	14,046 N.m	0,3 %	366,25 °	1,7 %	454 rpm	43 rpm	21.06.2018	11:47:06
74	13,953 N.m	-0,3 %	356,50 °	-1,0 %	453 rpm	45 rpm	21.06.2018	11:47:51
75	14,023 N.m	0,2 %	361,75 °	0,5 %	453 rpm	44 rpm	21.06.2018	11:48:36
76	14,031 N.m	0,2 %	361,00 °	0,3 %	452 rpm	45 rpm	21.06.2018	11:49:21
77	14,011 N.m	0,1 %	362,50 °	0,7 %	454 rpm	44 rpm	21.06.2018	11:50:06
78	13,976 N.m	-0,2 %	355,50 °	-1,3 %	453 rpm	45 rpm	21.06.2018	11:50:51
79	14,038 N.m	0,3 %	362,75 °	0,8 %	454 rpm	44 rpm	21.06.2018	11:51:36
80	13,992 N.m	-0,1 %	357,25 °	-0,8 %	453 rpm	45 rpm	21.06.2018	11:52:21
81	14,027 N.m	0,2 %	363,00 °	0,8 %	454 rpm	43 rpm	21.06.2018	11:53:06
82	14,003 N.m	0,0 %	357,50 °	-0,7 %	452 rpm	45 rpm	21.06.2018	11:53:51
83	14,031 N.m	0,2 %	365,25 °	1,5 %	454 rpm	44 rpm	21.06.2018	11:54:36
84	13,996 N.m	0,0 %	356,00 °	-1,1 %	453 rpm	45 rpm	21.06.2018	11:55:21
85	14,003 N.m	0,0 %	359,00 °	-0,3 %	453 rpm	44 rpm	21.06.2018	11:56:06
86	13,953 N.m	-0,3 %	353,25 °	-1,9 %	453 rpm	45 rpm	21.06.2018	11:56:51
87	14,035 N.m	0,3 %	365,00 °	1,4 %	454 rpm	44 rpm	21.06.2018	11:57:36
88	13,933 N.m	-0,5 %	355,75 °	-1,2 %	453 rpm	45 rpm	21.06.2018	11:58:21
89	14,058 N.m	0,4 %	367,00 °	1,9 %	453 rpm	44 rpm	21.06.2018	11:59:06
90	13,953 N.m	-0,3 %	353,50 °	-1,8 %	453 rpm	44 rpm	21.06.2018	11:59:51
91	14,050 N.m	0,4 %	364,75 °	1,3 %	453 rpm	44 rpm	21.06.2018	12:00:36
92	13,929 N.m	-0,5 %	352,50 °	-2,1 %	453 rpm	44 rpm	21.06.2018	12:01:21
93	14,042 N.m	0,3 %	364,75 °	1,3 %	452 rpm	44 rpm	21.06.2018	12:02:06
94	13,937 N.m	-0,5 %	353,25 °	-1,9 %	453 rpm	44 rpm	21.06.2018	12:02:51
95	14,050 N.m	0,4 %	365,00 °	1,4 %	453 rpm	43 rpm	21.06.2018	12:03:36
96	14,015 N.m	0,1 %	360,50 °	0,1 %	452 rpm	45 rpm	21.06.2018	12:04:21
97	13,941 N.m	-0,4 %	355,50 °	-1,3 %	452 rpm	44 rpm	21.06.2018	12:05:06
98	14,031 N.m	0,2 %	357,50 °	-0,7 %	452 rpm	45 rpm	21.06.2018	12:05:51
99	13,996 N.m	0,0 %	360,50 °	0,1 %	453 rpm	44 rpm	21.06.2018	12:06:36
100	14,031 N.m	0,2 %	357,00 °	-0,8 %	452 rpm	45 rpm	21.06.2018	12:07:21

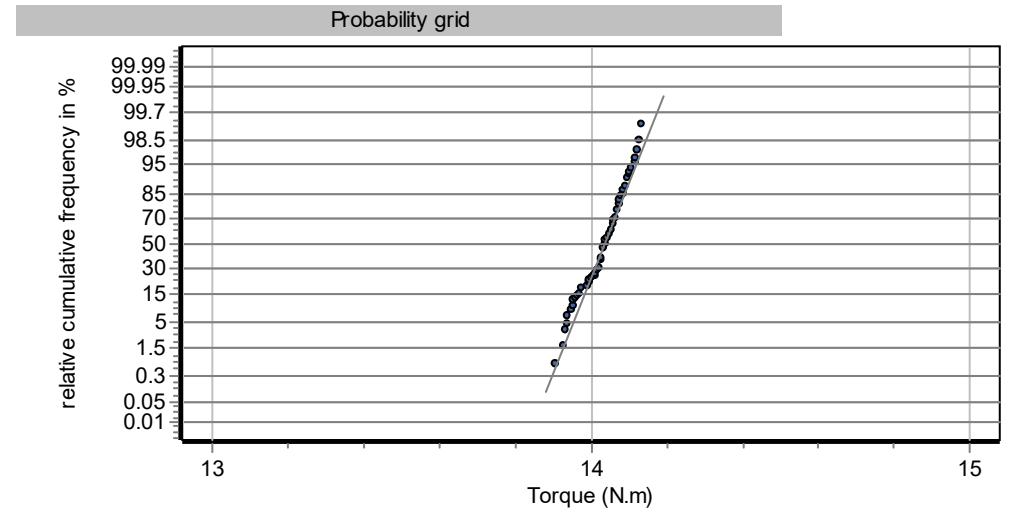
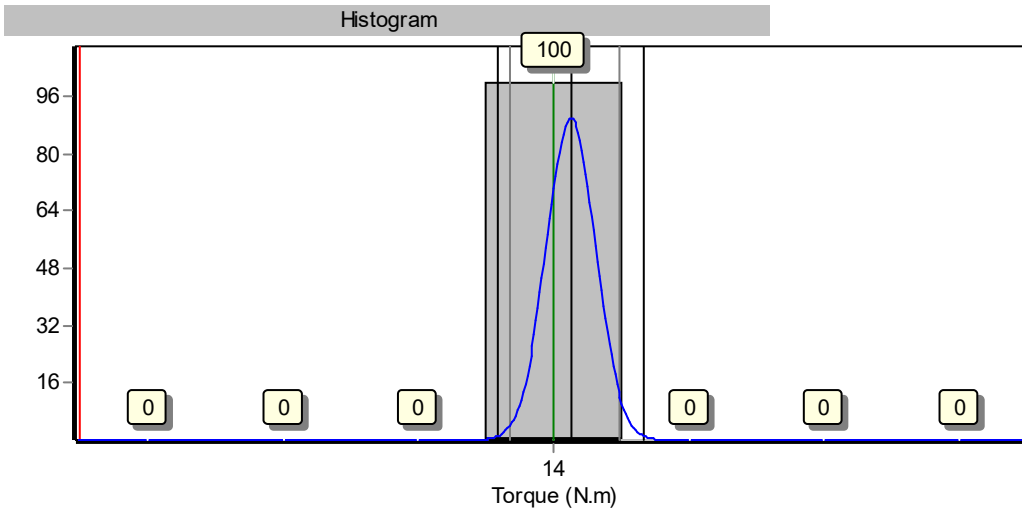
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 100% Screw joint: hard



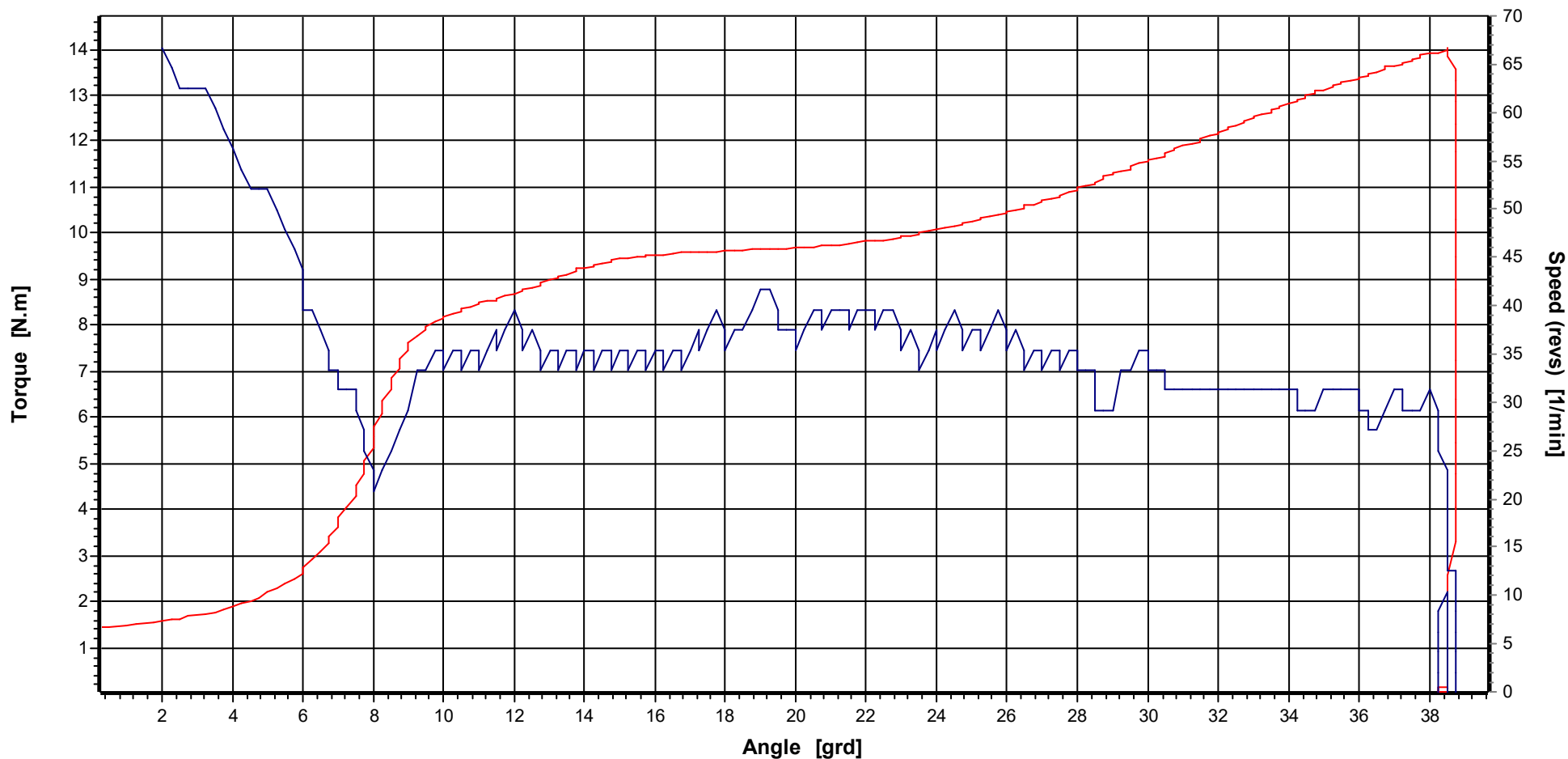
Tester	M.Brkc	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,14	N.m
Min	13,91	N.m
xq	14,0359	N.m
s	0,0508	N.m
Cm	6,433	
Cmk	6,197	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

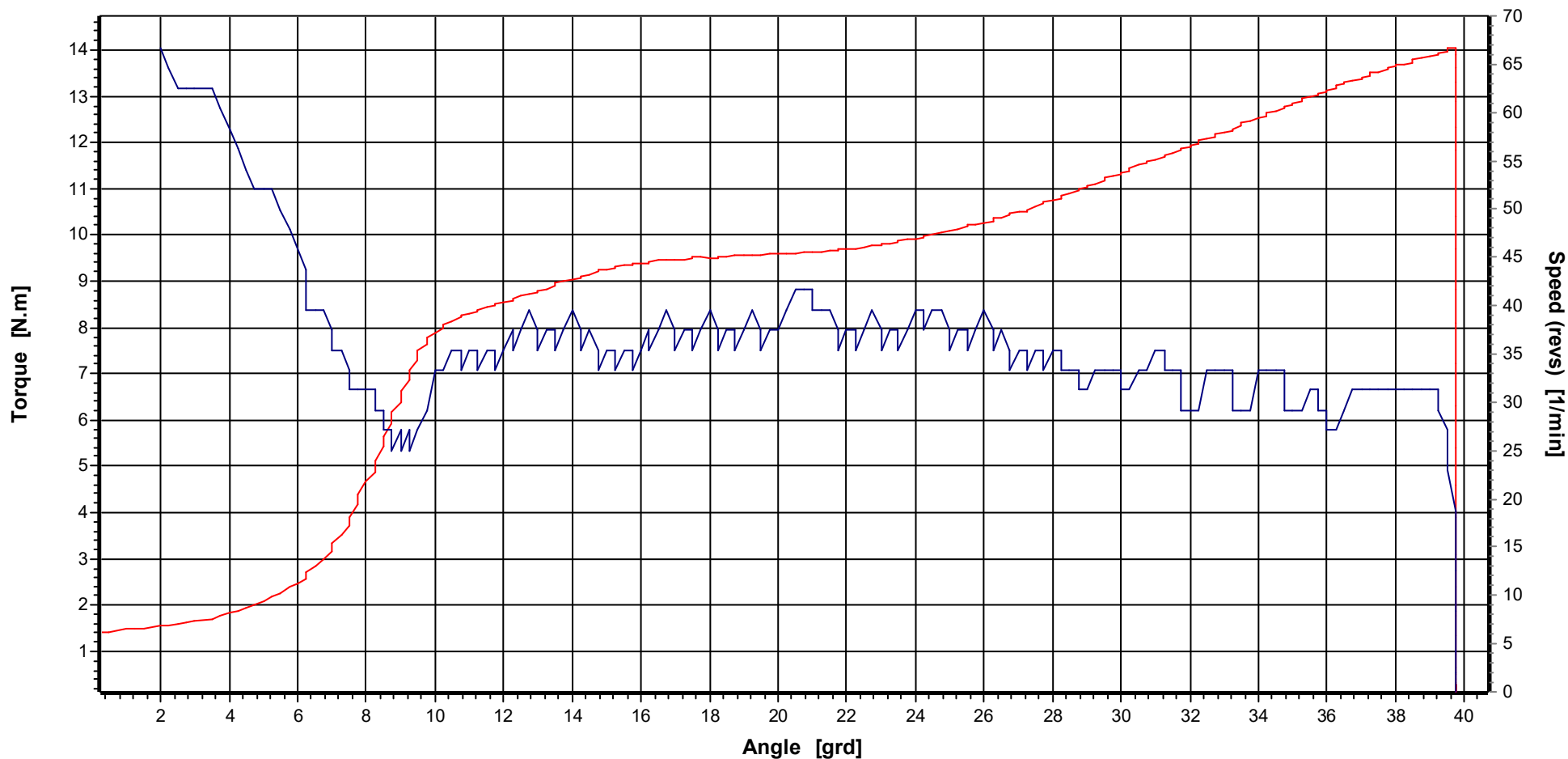


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 13:13:48
UL	14,98 N.m	Supporting points	902			Date/time measurement	21.06.2018 13:13:48

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

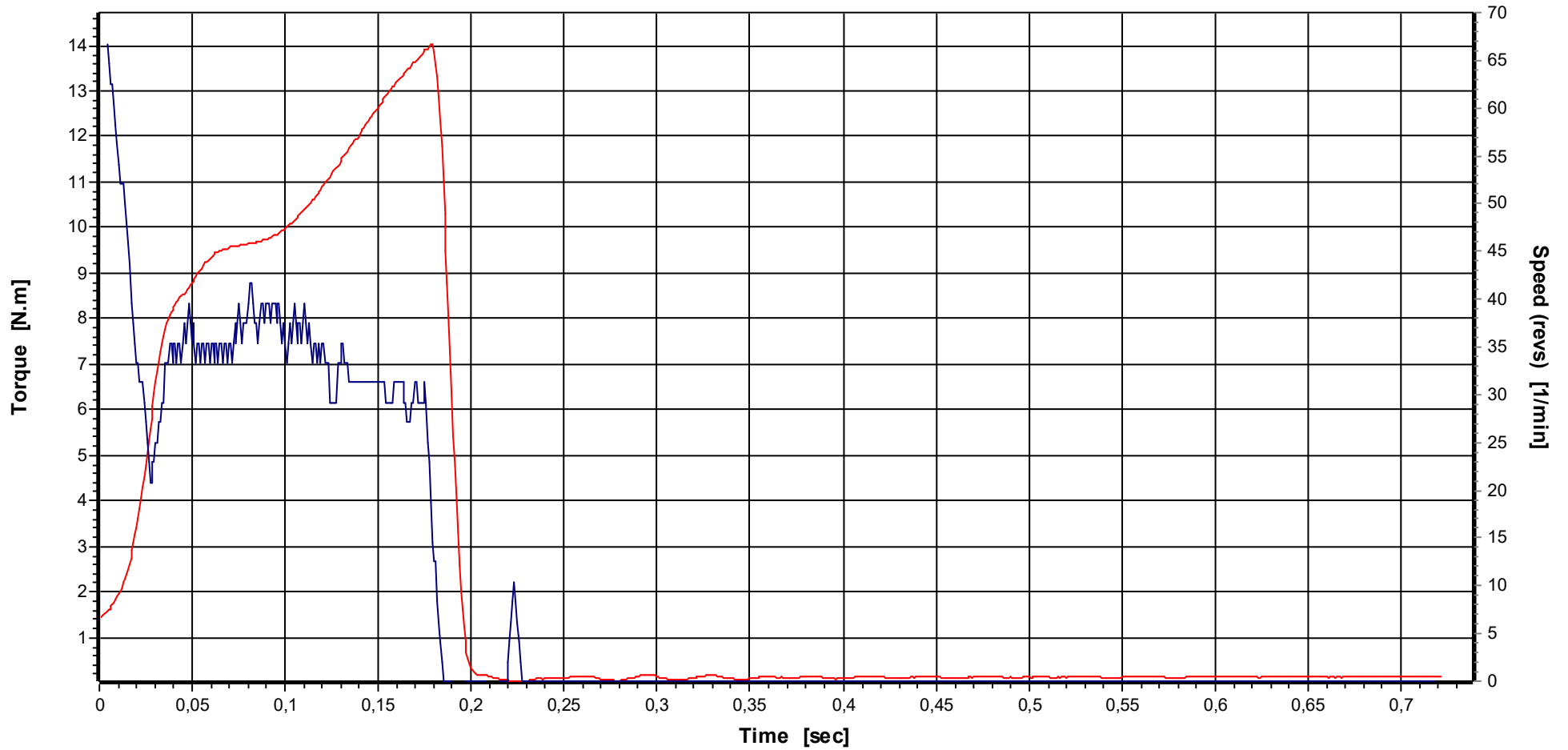


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 13:13:48
UL	14,98 N.m	Supporting points	849			Date/time measurement	21.06.2018 14:25:55

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

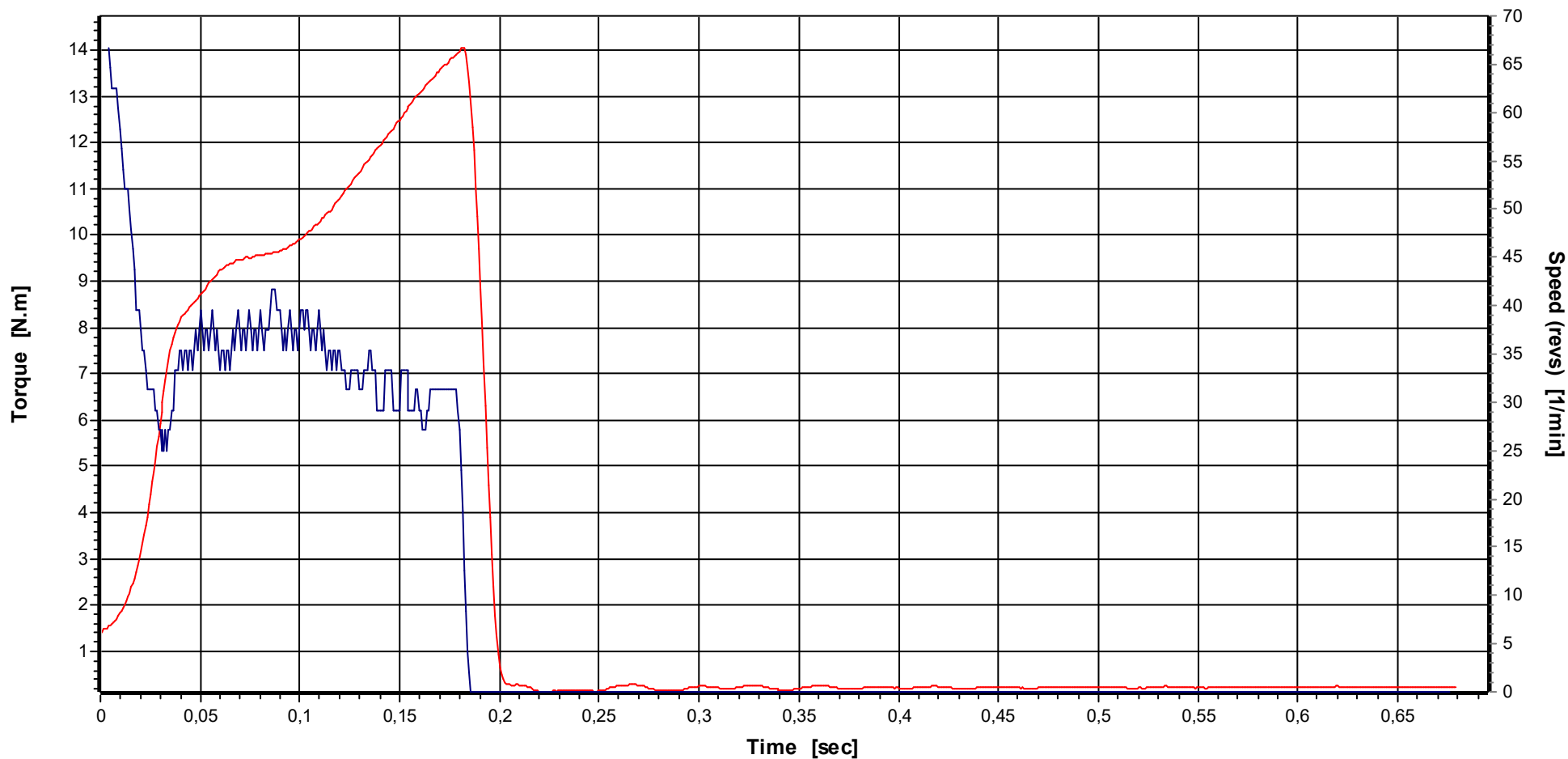


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	21.06.2018 13:13:48
UL	14,98 N.m	Supporting points	902			Date/time measurement	21.06.2018 13:13:48

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	21.06.2018 13:13:48
UL	14,98 N.m	Supporting points	849			Date/time measurement	21.06.2018 14:25:55

Date/ Time	21.06.2018 13:13:48	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0359	0,2260	0,0508	6,433	6,197	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	14,019 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:13:48
2	14,038 N.m	0,3 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	13:14:33
3	14,066 N.m	0,5 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	13:15:16
4	14,046 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:16:00
5	14,109 N.m	0,8 %	30,25 °	0,8 %	99 rpm	35 rpm	21.06.2018	13:16:44
6	14,074 N.m	0,5 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:17:27
7	14,089 N.m	0,6 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:18:11
8	14,081 N.m	0,6 %	30,50 °	1,7 %	100 rpm	35 rpm	21.06.2018	13:18:55
9	14,116 N.m	0,8 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	13:19:38
10	14,120 N.m	0,9 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:20:22
11	14,046 N.m	0,3 %	29,25 °	-2,5 %	100 rpm	35 rpm	21.06.2018	13:21:06
12	14,070 N.m	0,5 %	29,50 °	-1,7 %	100 rpm	34 rpm	21.06.2018	13:21:50
13	14,054 N.m	0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:22:33
14	14,031 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:23:17
15	14,027 N.m	0,2 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:24:01
16	14,035 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:24:44
17	13,964 N.m	-0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:25:28
18	13,933 N.m	-0,5 %	29,50 °	-1,7 %	100 rpm	35 rpm	21.06.2018	13:26:12
19	13,996 N.m	0,0 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:26:55
20	14,035 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:27:39
21	14,035 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:28:23
22	14,058 N.m	0,4 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:29:07
23	14,054 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:29:50
24	14,070 N.m	0,5 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:30:34
25	14,027 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	35 rpm	21.06.2018	13:31:18
26	14,070 N.m	0,5 %	29,50 °	-1,7 %	100 rpm	35 rpm	21.06.2018	13:32:01
27	14,050 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	35 rpm	21.06.2018	13:32:45
28	14,074 N.m	0,5 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	13:33:29
29	14,027 N.m	0,2 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:34:12
30	14,038 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	13:34:56
31	14,019 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:35:40
32	13,976 N.m	-0,2 %	29,25 °	-2,5 %	100 rpm	34 rpm	21.06.2018	13:36:24
33	13,960 N.m	-0,3 %	29,25 °	-2,5 %	100 rpm	35 rpm	21.06.2018	13:37:07
34	13,941 N.m	-0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:37:51
35	13,972 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:38:35
36	14,027 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:39:18
37	14,074 N.m	0,5 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:40:02
38	14,070 N.m	0,5 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:40:46
39	14,097 N.m	0,7 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:41:29
40	14,093 N.m	0,7 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:42:13
41	14,097 N.m	0,7 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:42:57
42	14,042 N.m	0,3 %	29,25 °	-2,5 %	100 rpm	34 rpm	21.06.2018	13:43:41
43	14,023 N.m	0,2 %	29,00 °	-3,3 %	100 rpm	34 rpm	21.06.2018	13:44:24
44	14,077 N.m	0,6 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:45:08
45	14,097 N.m	0,7 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:45:52
46	14,074 N.m	0,5 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:46:35
47	14,042 N.m	0,3 %	30,00 °	0,0 %	100 rpm	34 rpm	21.06.2018	13:47:19
48	13,937 N.m	-0,5 %	29,25 °	-2,5 %	100 rpm	34 rpm	21.06.2018	13:48:03
49	13,949 N.m	-0,4 %	29,50 °	-1,7 %	100 rpm	35 rpm	21.06.2018	13:48:46
50	13,933 N.m	-0,5 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:49:30

Date/ Time	21.06.2018 13:13:48	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

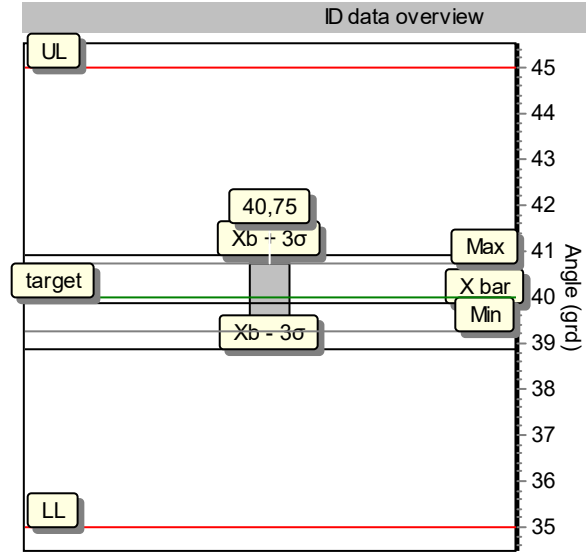
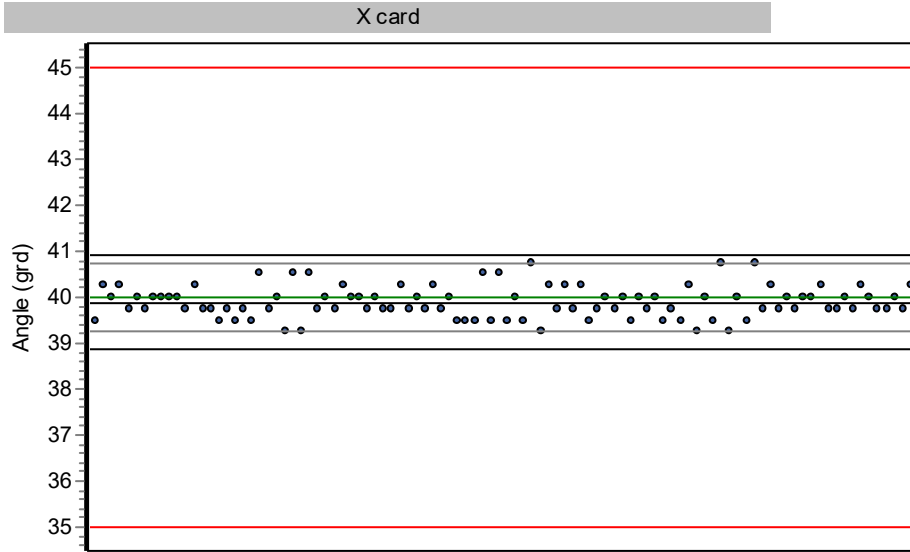
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0359	0,2260	0,0508	6,433	6,197	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	13,992 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:50:14
52	14,035 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:50:58
53	14,058 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	13:51:41
54	14,062 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	35 rpm	21.06.2018	13:52:25
55	14,027 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:53:09
56	14,035 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	35 rpm	21.06.2018	13:53:52
57	14,031 N.m	0,2 %	29,25 °	-2,5 %	99 rpm	35 rpm	21.06.2018	13:54:36
58	14,136 N.m	1,0 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	13:55:20
59	14,058 N.m	0,4 %	29,25 °	-2,5 %	100 rpm	34 rpm	21.06.2018	13:56:03
60	14,085 N.m	0,6 %	29,25 °	-2,5 %	100 rpm	35 rpm	21.06.2018	13:56:47
61	14,105 N.m	0,8 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:57:31
62	14,124 N.m	0,9 %	29,50 °	-1,7 %	100 rpm	34 rpm	21.06.2018	13:58:14
63	14,035 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	21.06.2018	13:58:58
64	14,070 N.m	0,5 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	13:59:42
65	14,054 N.m	0,4 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:00:26
66	14,003 N.m	0,0 %	30,50 °	1,7 %	100 rpm	35 rpm	21.06.2018	14:01:09
67	13,949 N.m	-0,4 %	30,25 °	0,8 %	99 rpm	35 rpm	21.06.2018	14:01:53
68	13,953 N.m	-0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:02:37
69	13,957 N.m	-0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:03:20
70	13,976 N.m	-0,2 %	30,75 °	2,5 %	99 rpm	36 rpm	21.06.2018	14:04:04
71	14,038 N.m	0,3 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	14:04:48
72	14,062 N.m	0,4 %	30,75 °	2,5 %	99 rpm	35 rpm	21.06.2018	14:05:31
73	14,081 N.m	0,6 %	30,25 °	0,8 %	99 rpm	35 rpm	21.06.2018	14:06:15
74	14,058 N.m	0,4 %	30,25 °	0,8 %	99 rpm	35 rpm	21.06.2018	14:06:59
75	14,128 N.m	0,9 %	30,75 °	2,5 %	100 rpm	35 rpm	21.06.2018	14:07:43
76	14,038 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:08:26
77	14,050 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	34 rpm	21.06.2018	14:09:10
78	14,042 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:09:54
79	14,062 N.m	0,4 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:10:37
80	13,996 N.m	0,0 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:11:21
81	14,011 N.m	0,1 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	14:12:05
82	13,957 N.m	-0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:12:49
83	13,941 N.m	-0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:13:32
84	13,996 N.m	0,0 %	30,75 °	2,5 %	99 rpm	36 rpm	21.06.2018	14:14:16
85	14,007 N.m	0,1 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	14:15:00
86	14,027 N.m	0,2 %	30,25 °	0,8 %	99 rpm	36 rpm	21.06.2018	14:15:43
87	14,050 N.m	0,4 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:16:27
88	14,050 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	14:17:11
89	14,093 N.m	0,7 %	30,50 °	1,7 %	100 rpm	35 rpm	21.06.2018	14:17:54
90	14,077 N.m	0,6 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:18:38
91	14,062 N.m	0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:19:22
92	14,101 N.m	0,7 %	30,00 °	0,0 %	100 rpm	35 rpm	21.06.2018	14:20:05
93	14,085 N.m	0,6 %	30,00 °	0,0 %	100 rpm	34 rpm	21.06.2018	14:20:49
94	14,015 N.m	0,1 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:21:33
95	13,999 N.m	0,0 %	30,00 °	0,0 %	99 rpm	35 rpm	21.06.2018	14:22:17
96	13,910 N.m	-0,6 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:23:00
97	13,929 N.m	-0,5 %	30,50 °	1,7 %	100 rpm	35 rpm	21.06.2018	14:23:44
98	13,976 N.m	-0,2 %	30,25 °	0,8 %	100 rpm	35 rpm	21.06.2018	14:24:28
99	14,019 N.m	0,1 %	30,25 °	0,8 %	99 rpm	35 rpm	21.06.2018	14:25:11
100	14,035 N.m	0,3 %	30,50 °	1,7 %	99 rpm	35 rpm	21.06.2018	14:25:55

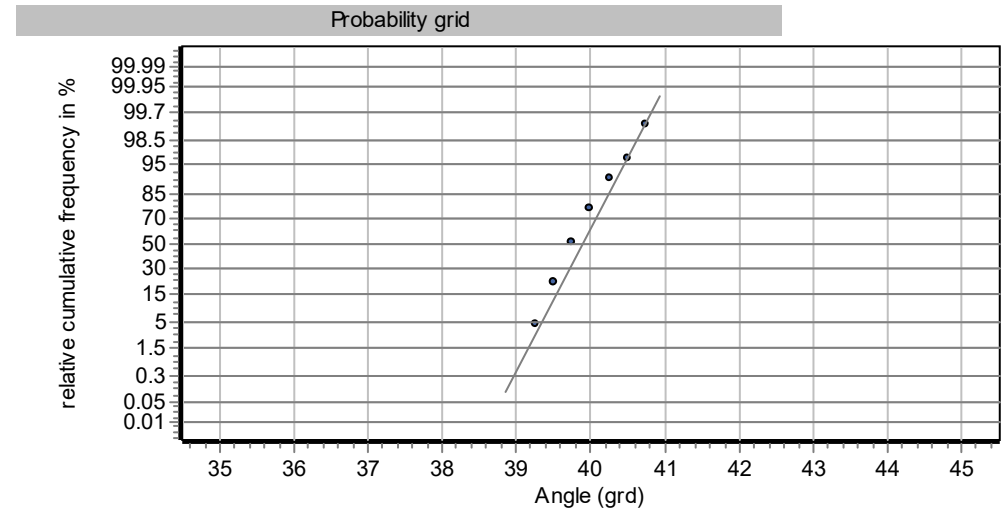
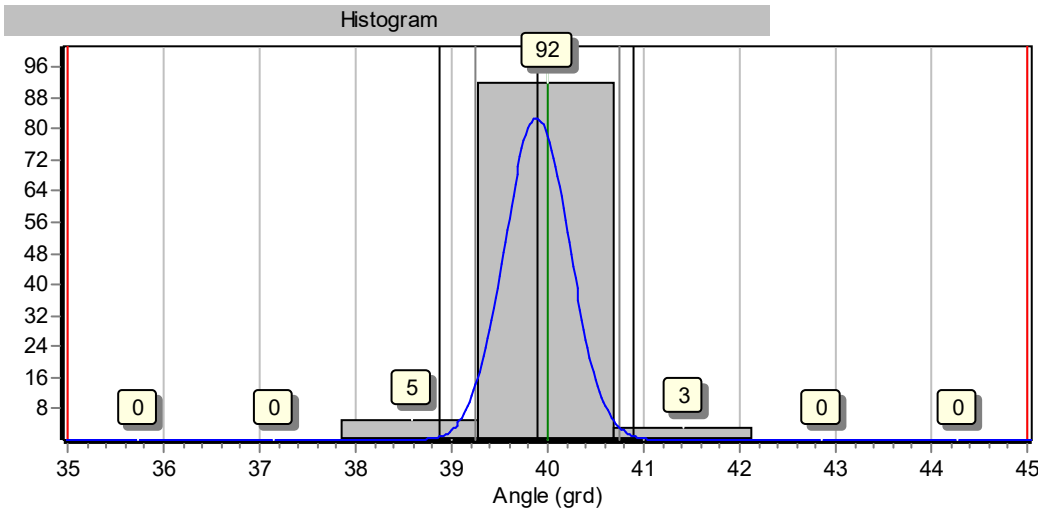
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 40 ° Screw joint: hard



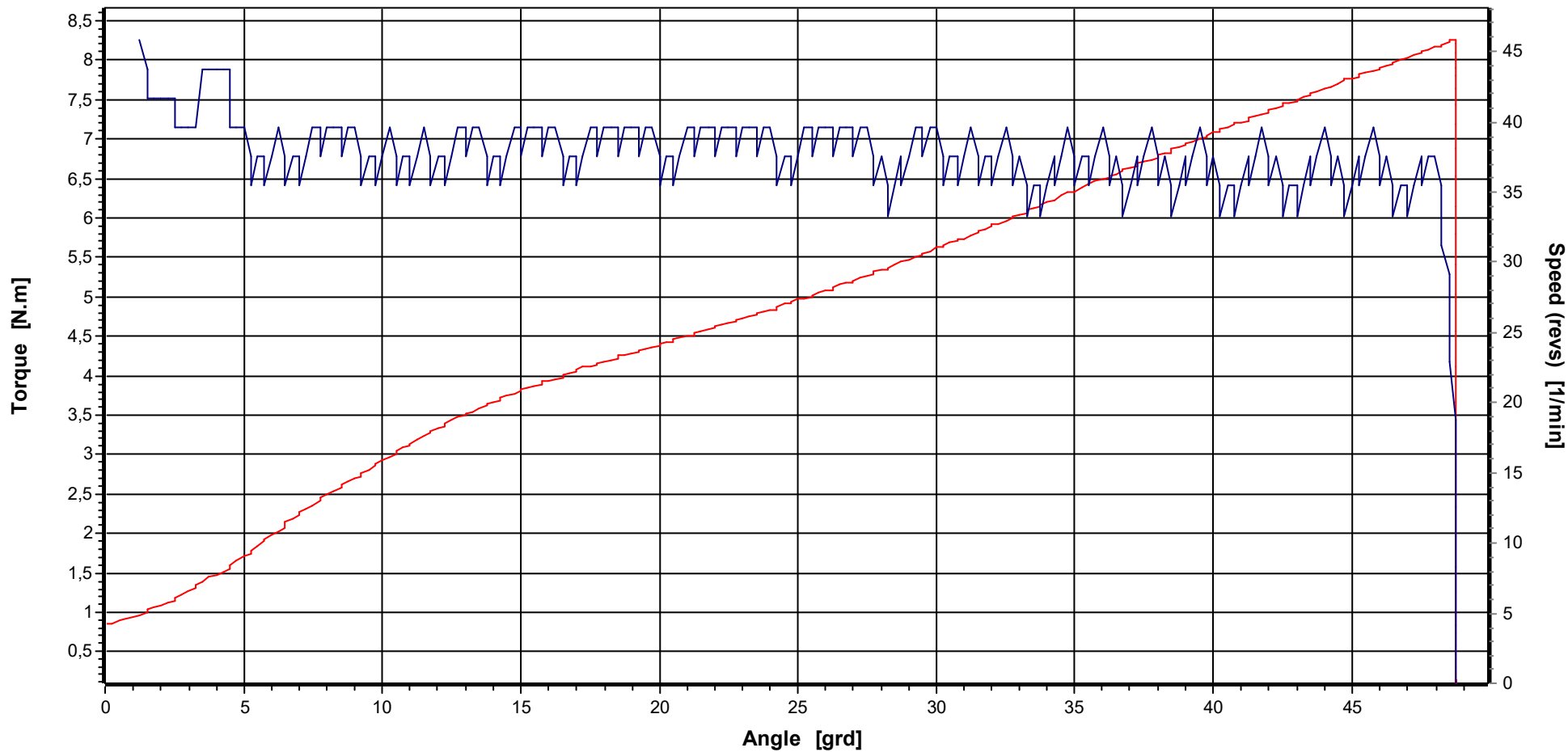
Tester	M.Brkic
N	100
Target	40,00 grd
UL	45,00 grd
LL	35,00 grd
Max	40,75 grd
Min	39,25 grd
xq	39,8875 grd
s	0,3378 grd
Cm	4,934
Cmk	4,823



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

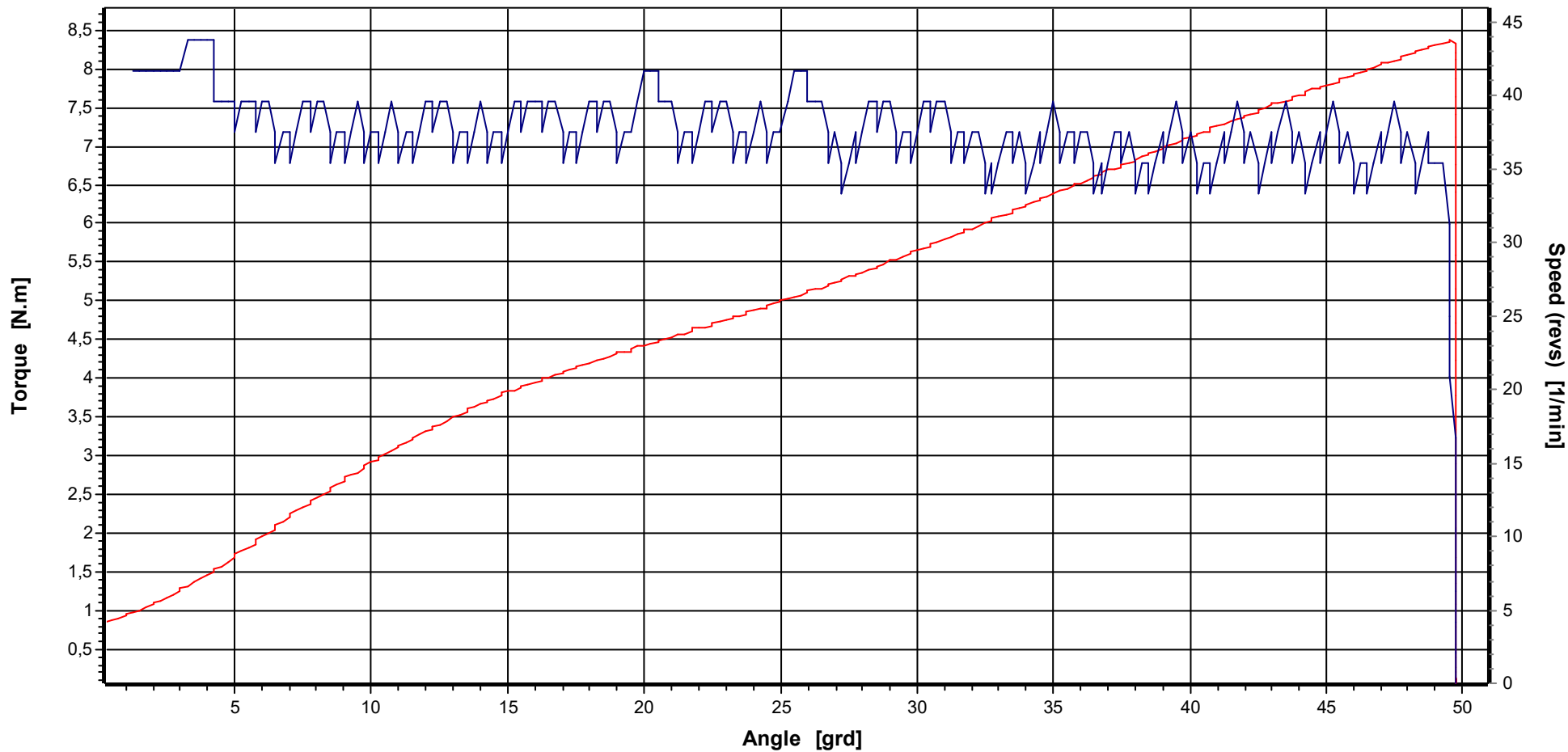


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	08.08.2018
LL	35,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	29.06.2018 09:38:47
UL	45,00 grd	Supporting points	891			Date/time measurement	29.06.2018 09:38:47

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

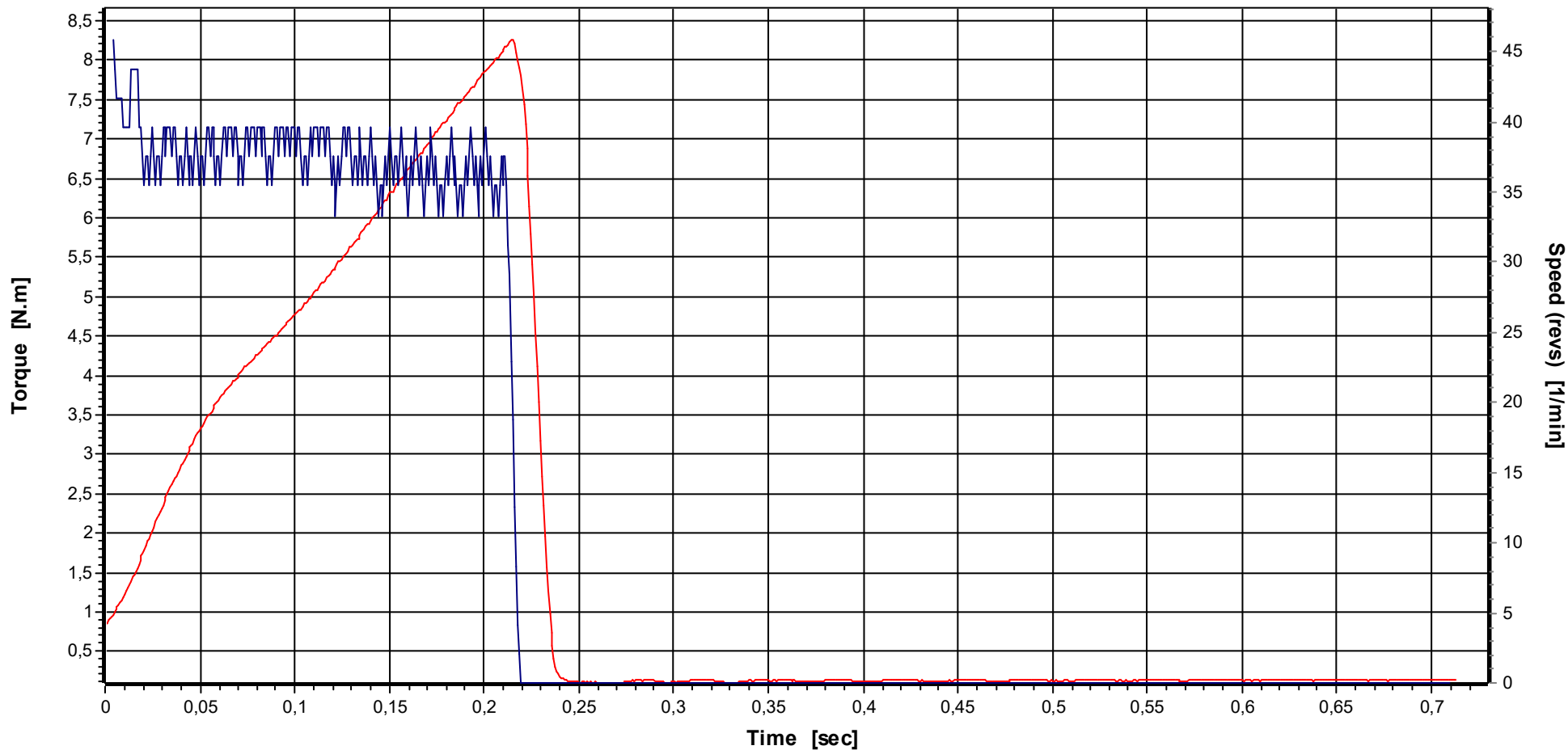


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	08.08.2018
LL	35,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	29.06.2018 09:38:47
UL	45,00 grd	Supporting points	898			Date/time measurement	29.06.2018 10:05:11

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

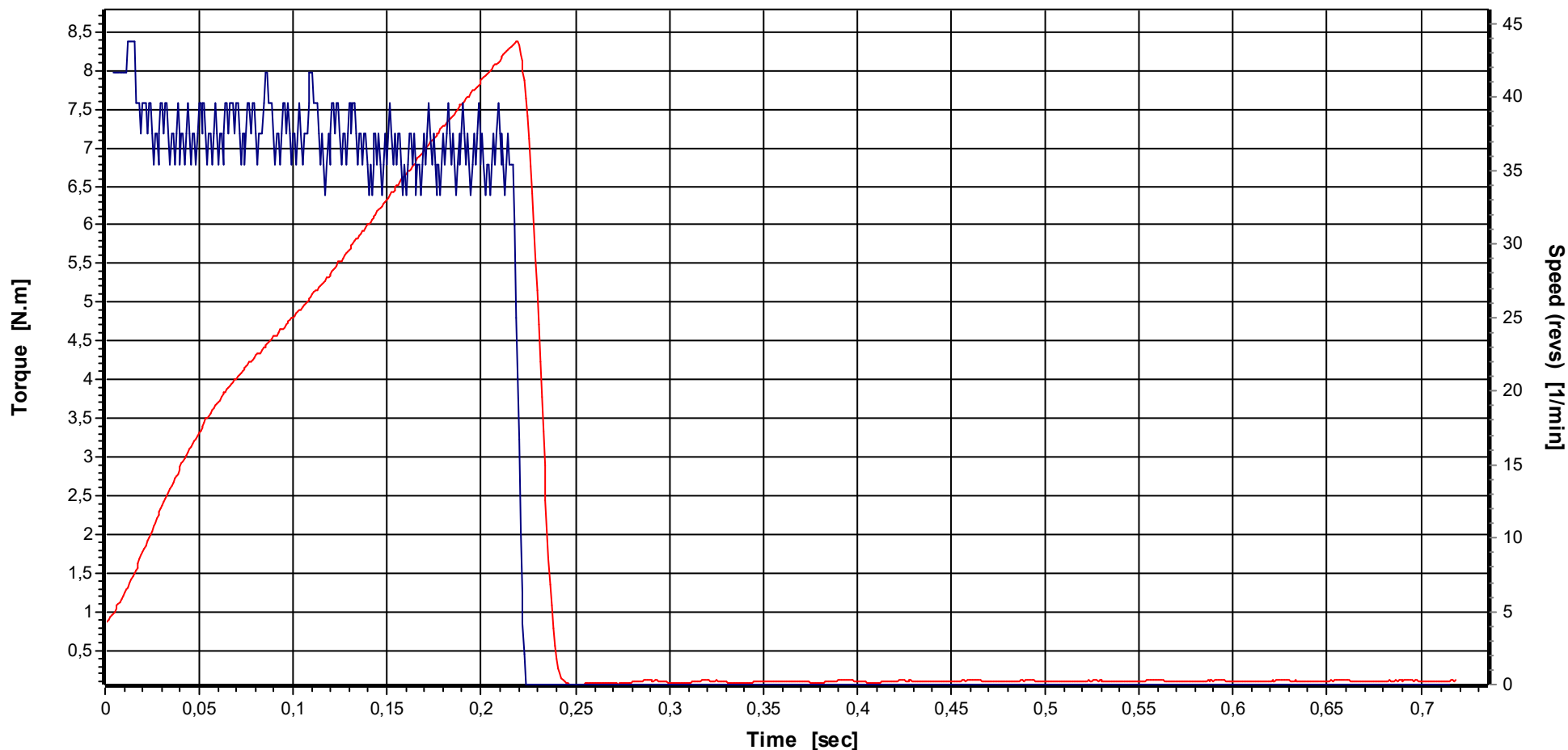


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	29.06.2018 09:38:47
UL	45,00 grd	Supporting points	891			Date/time measurement	29.06.2018 09:38:47

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	29.06.2018 09:38:47
UL	45,00 grd	Supporting points	898			Date/time measurement	29.06.2018 10:05:11

Date/ Time	29.06.2018 09:38:47	Transducer S/N	01033617
Tester/ Name	M.Brkcic	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,8875	1,5000	0,3378	4,934	4,823	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	39,50 °	-1,3 %	8,254 N.m	-1,7 %	50 rpm	29.06.2018	09:38:47
2	40,25 °	0,6 %	8,369 N.m	-0,4 %	50 rpm	29.06.2018	09:39:03
3	40,00 °	0,0 %	8,291 N.m	-1,3 %	50 rpm	29.06.2018	09:39:19
4	40,25 °	0,6 %	8,384 N.m	-0,2 %	50 rpm	29.06.2018	09:39:35
5	39,75 °	-0,6 %	8,303 N.m	-1,2 %	50 rpm	29.06.2018	09:39:51
6	40,00 °	0,0 %	8,310 N.m	-1,1 %	50 rpm	29.06.2018	09:40:07
7	39,75 °	-0,6 %	8,310 N.m	-1,1 %	50 rpm	29.06.2018	09:40:23
8	40,00 °	0,0 %	8,246 N.m	-1,8 %	50 rpm	29.06.2018	09:40:39
9	40,00 °	0,0 %	8,345 N.m	-0,7 %	50 rpm	29.06.2018	09:40:55
10	40,00 °	0,0 %	8,217 N.m	-2,2 %	50 rpm	29.06.2018	09:41:11
11	40,00 °	0,0 %	8,355 N.m	-0,5 %	50 rpm	29.06.2018	09:41:27
12	39,75 °	-0,6 %	8,233 N.m	-2,0 %	50 rpm	29.06.2018	09:41:43
13	40,25 °	0,6 %	8,371 N.m	-0,3 %	50 rpm	29.06.2018	09:41:59
14	39,75 °	-0,6 %	8,252 N.m	-1,8 %	50 rpm	29.06.2018	09:42:15
15	39,75 °	-0,6 %	8,345 N.m	-0,7 %	50 rpm	29.06.2018	09:42:31
16	39,50 °	-1,3 %	8,254 N.m	-1,7 %	50 rpm	29.06.2018	09:42:47
17	39,75 °	-0,6 %	8,336 N.m	-0,8 %	50 rpm	29.06.2018	09:43:03
18	39,50 °	-1,3 %	8,252 N.m	-1,8 %	50 rpm	29.06.2018	09:43:19
19	39,75 °	-0,6 %	8,338 N.m	-0,7 %	50 rpm	29.06.2018	09:43:35
20	39,50 °	-1,3 %	8,248 N.m	-1,8 %	50 rpm	29.06.2018	09:43:51
21	40,50 °	1,3 %	8,411 N.m	0,1 %	50 rpm	29.06.2018	09:44:07
22	39,75 °	-0,6 %	8,233 N.m	-2,0 %	50 rpm	29.06.2018	09:44:23
23	40,00 °	0,0 %	8,357 N.m	-0,5 %	50 rpm	29.06.2018	09:44:39
24	39,25 °	-1,9 %	8,227 N.m	-2,1 %	50 rpm	29.06.2018	09:44:55
25	40,50 °	1,3 %	8,363 N.m	-0,4 %	50 rpm	29.06.2018	09:45:11
26	39,25 °	-1,9 %	8,245 N.m	-1,8 %	50 rpm	29.06.2018	09:45:27
27	40,50 °	1,3 %	8,365 N.m	-0,4 %	50 rpm	29.06.2018	09:45:43
28	39,75 °	-0,6 %	8,270 N.m	-1,5 %	50 rpm	29.06.2018	09:45:59
29	40,00 °	0,0 %	8,307 N.m	-1,1 %	50 rpm	29.06.2018	09:46:15
30	39,75 °	-0,6 %	8,274 N.m	-1,5 %	50 rpm	29.06.2018	09:46:31
31	40,25 °	0,6 %	8,357 N.m	-0,5 %	50 rpm	29.06.2018	09:46:47
32	40,00 °	0,0 %	8,299 N.m	-1,2 %	50 rpm	29.06.2018	09:47:03
33	40,00 °	0,0 %	8,336 N.m	-0,8 %	50 rpm	29.06.2018	09:47:19
34	39,75 °	-0,6 %	8,291 N.m	-1,3 %	50 rpm	29.06.2018	09:47:35
35	40,00 °	0,0 %	8,309 N.m	-1,1 %	50 rpm	29.06.2018	09:47:51
36	39,75 °	-0,6 %	8,270 N.m	-1,5 %	50 rpm	29.06.2018	09:48:07
37	39,75 °	-0,6 %	8,258 N.m	-1,7 %	50 rpm	29.06.2018	09:48:23
38	40,25 °	0,6 %	8,343 N.m	-0,7 %	50 rpm	29.06.2018	09:48:39
39	39,75 °	-0,6 %	8,208 N.m	-2,3 %	50 rpm	29.06.2018	09:48:55
40	40,00 °	0,0 %	8,316 N.m	-1,0 %	50 rpm	29.06.2018	09:49:11
41	39,75 °	-0,6 %	8,235 N.m	-2,0 %	50 rpm	29.06.2018	09:49:27
42	40,25 °	0,6 %	8,357 N.m	-0,5 %	50 rpm	29.06.2018	09:49:43
43	39,75 °	-0,6 %	8,235 N.m	-2,0 %	50 rpm	29.06.2018	09:49:59
44	40,00 °	0,0 %	8,342 N.m	-0,7 %	50 rpm	29.06.2018	09:50:15
45	39,50 °	-1,3 %	8,248 N.m	-1,8 %	50 rpm	29.06.2018	09:50:31
46	39,50 °	-1,3 %	8,293 N.m	-1,3 %	50 rpm	29.06.2018	09:50:47
47	39,50 °	-1,3 %	8,258 N.m	-1,7 %	50 rpm	29.06.2018	09:51:03
48	40,50 °	1,3 %	8,396 N.m	0,0 %	50 rpm	29.06.2018	09:51:19
49	39,50 °	-1,3 %	8,231 N.m	-2,0 %	50 rpm	29.06.2018	09:51:35
50	40,50 °	1,3 %	8,386 N.m	-0,2 %	50 rpm	29.06.2018	09:51:51

Date/ Time	29.06.2018 09:38:47	Transducer S/N	01033617
Tester/ Name	M.Brkc	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

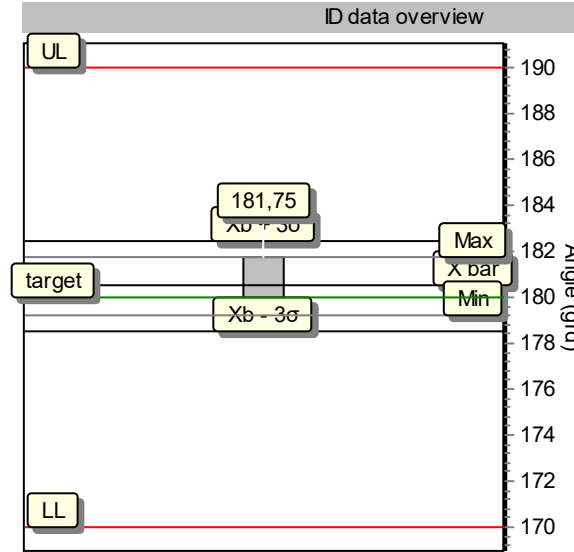
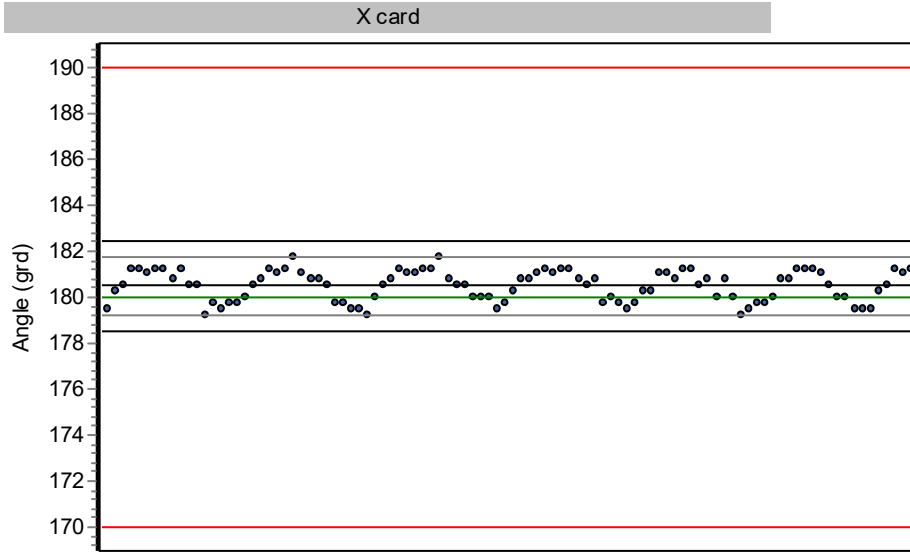
Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,8875	1,5000	0,3378	4,934	4,823	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	39,50 °	-1,3 %	8,210 N.m	-2,3 %	50 rpm	29.06.2018	09:52:07
52	40,00 °	0,0 %	8,314 N.m	-1,0 %	50 rpm	29.06.2018	09:52:23
53	39,50 °	-1,3 %	8,219 N.m	-2,2 %	50 rpm	29.06.2018	09:52:39
54	40,75 °	1,9 %	8,388 N.m	-0,1 %	50 rpm	29.06.2018	09:52:55
55	39,25 °	-1,9 %	8,239 N.m	-1,9 %	50 rpm	29.06.2018	09:53:11
56	40,25 °	0,6 %	8,336 N.m	-0,8 %	50 rpm	29.06.2018	09:53:27
57	39,75 °	-0,6 %	8,245 N.m	-1,8 %	50 rpm	29.06.2018	09:53:43
58	40,25 °	0,6 %	8,316 N.m	-1,0 %	50 rpm	29.06.2018	09:53:59
59	39,75 °	-0,6 %	8,258 N.m	-1,7 %	50 rpm	29.06.2018	09:54:15
60	40,25 °	0,6 %	8,340 N.m	-0,7 %	50 rpm	29.06.2018	09:54:31
61	39,50 °	-1,3 %	8,245 N.m	-1,8 %	50 rpm	29.06.2018	09:54:47
62	39,75 °	-0,6 %	8,291 N.m	-1,3 %	50 rpm	29.06.2018	09:55:03
63	40,00 °	0,0 %	8,291 N.m	-1,3 %	50 rpm	29.06.2018	09:55:19
64	39,75 °	-0,6 %	8,264 N.m	-1,6 %	50 rpm	29.06.2018	09:55:35
65	40,00 °	0,0 %	8,361 N.m	-0,5 %	50 rpm	29.06.2018	09:55:51
66	39,50 °	-1,3 %	8,182 N.m	-2,6 %	50 rpm	29.06.2018	09:56:07
67	40,00 °	0,0 %	8,332 N.m	-0,8 %	50 rpm	29.06.2018	09:56:23
68	39,75 °	-0,6 %	8,258 N.m	-1,7 %	50 rpm	29.06.2018	09:56:39
69	40,00 °	0,0 %	8,340 N.m	-0,7 %	50 rpm	29.06.2018	09:56:55
70	39,50 °	-1,3 %	8,241 N.m	-1,9 %	50 rpm	29.06.2018	09:57:11
71	39,75 °	-0,6 %	8,334 N.m	-0,8 %	50 rpm	29.06.2018	09:57:27
72	39,50 °	-1,3 %	8,250 N.m	-1,8 %	50 rpm	29.06.2018	09:57:43
73	40,25 °	0,6 %	8,378 N.m	-0,3 %	50 rpm	29.06.2018	09:57:59
74	39,25 °	-1,9 %	8,194 N.m	-2,5 %	50 rpm	29.06.2018	09:58:15
75	40,00 °	0,0 %	8,324 N.m	-0,9 %	50 rpm	29.06.2018	09:58:31
76	39,50 °	-1,3 %	8,221 N.m	-2,1 %	50 rpm	29.06.2018	09:58:47
77	40,75 °	1,9 %	8,388 N.m	-0,1 %	50 rpm	29.06.2018	09:59:03
78	39,25 °	-1,9 %	8,225 N.m	-2,1 %	50 rpm	29.06.2018	09:59:19
79	40,00 °	0,0 %	8,297 N.m	-1,2 %	50 rpm	29.06.2018	09:59:35
80	39,50 °	-1,3 %	8,245 N.m	-1,8 %	50 rpm	29.06.2018	09:59:51
81	40,75 °	1,9 %	8,384 N.m	-0,2 %	50 rpm	29.06.2018	10:00:07
82	39,75 °	-0,6 %	8,281 N.m	-1,4 %	50 rpm	29.06.2018	10:00:23
83	40,25 °	0,6 %	8,361 N.m	-0,5 %	50 rpm	29.06.2018	10:00:39
84	39,75 °	-0,6 %	8,291 N.m	-1,3 %	50 rpm	29.06.2018	10:00:55
85	40,00 °	0,0 %	8,336 N.m	-0,8 %	50 rpm	29.06.2018	10:01:11
86	39,75 °	-0,6 %	8,285 N.m	-1,4 %	50 rpm	29.06.2018	10:01:27
87	40,00 °	0,0 %	8,274 N.m	-1,5 %	50 rpm	29.06.2018	10:01:43
88	40,00 °	0,0 %	8,312 N.m	-1,0 %	50 rpm	29.06.2018	10:01:59
89	40,25 °	0,6 %	8,328 N.m	-0,9 %	50 rpm	29.06.2018	10:02:15
90	39,75 °	-0,6 %	8,299 N.m	-1,2 %	50 rpm	29.06.2018	10:02:31
91	39,75 °	-0,6 %	8,237 N.m	-1,9 %	50 rpm	29.06.2018	10:02:47
92	40,00 °	0,0 %	8,336 N.m	-0,8 %	50 rpm	29.06.2018	10:03:03
93	39,75 °	-0,6 %	8,212 N.m	-2,2 %	50 rpm	29.06.2018	10:03:19
94	40,25 °	0,6 %	8,332 N.m	-0,8 %	50 rpm	29.06.2018	10:03:35
95	40,00 °	0,0 %	8,254 N.m	-1,7 %	50 rpm	29.06.2018	10:03:51
96	39,75 °	-0,6 %	8,283 N.m	-1,4 %	50 rpm	29.06.2018	10:04:07
97	39,75 °	-0,6 %	8,246 N.m	-1,8 %	50 rpm	29.06.2018	10:04:23
98	40,00 °	0,0 %	8,349 N.m	-0,6 %	50 rpm	29.06.2018	10:04:39
99	39,75 °	-0,6 %	8,204 N.m	-2,3 %	50 rpm	29.06.2018	10:04:55
100	40,25 °	0,6 %	8,371 N.m	-0,3 %	50 rpm	29.06.2018	10:05:11

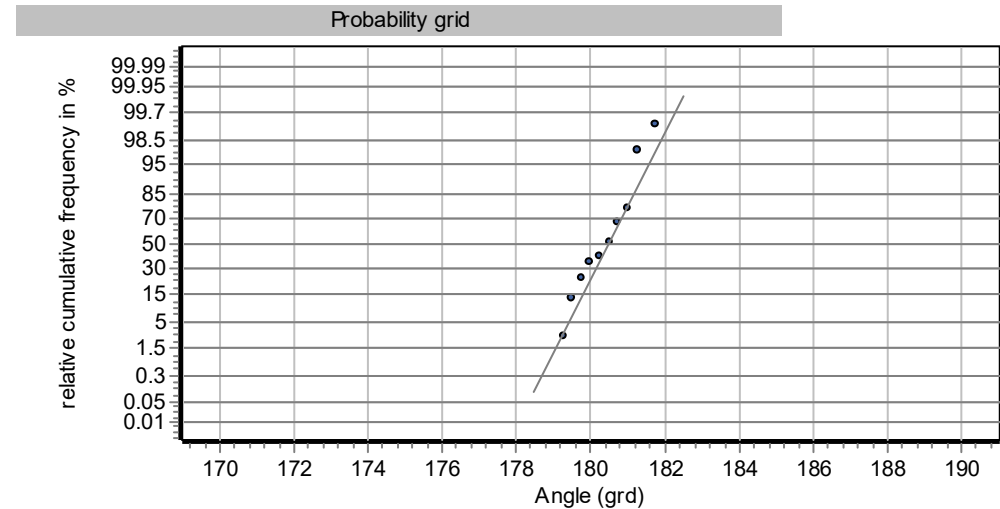
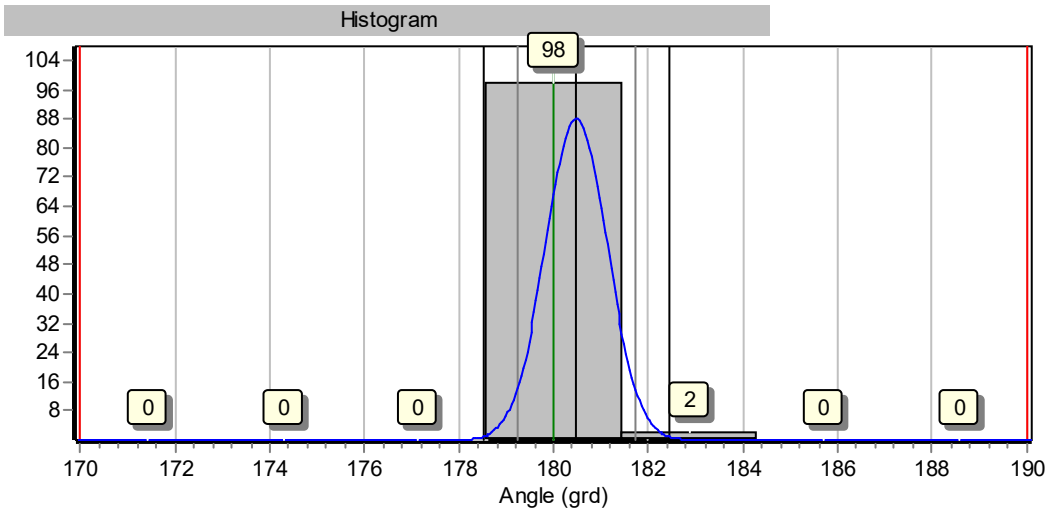
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240032

First sample MCT, 180 ° Screw joint: medium soft



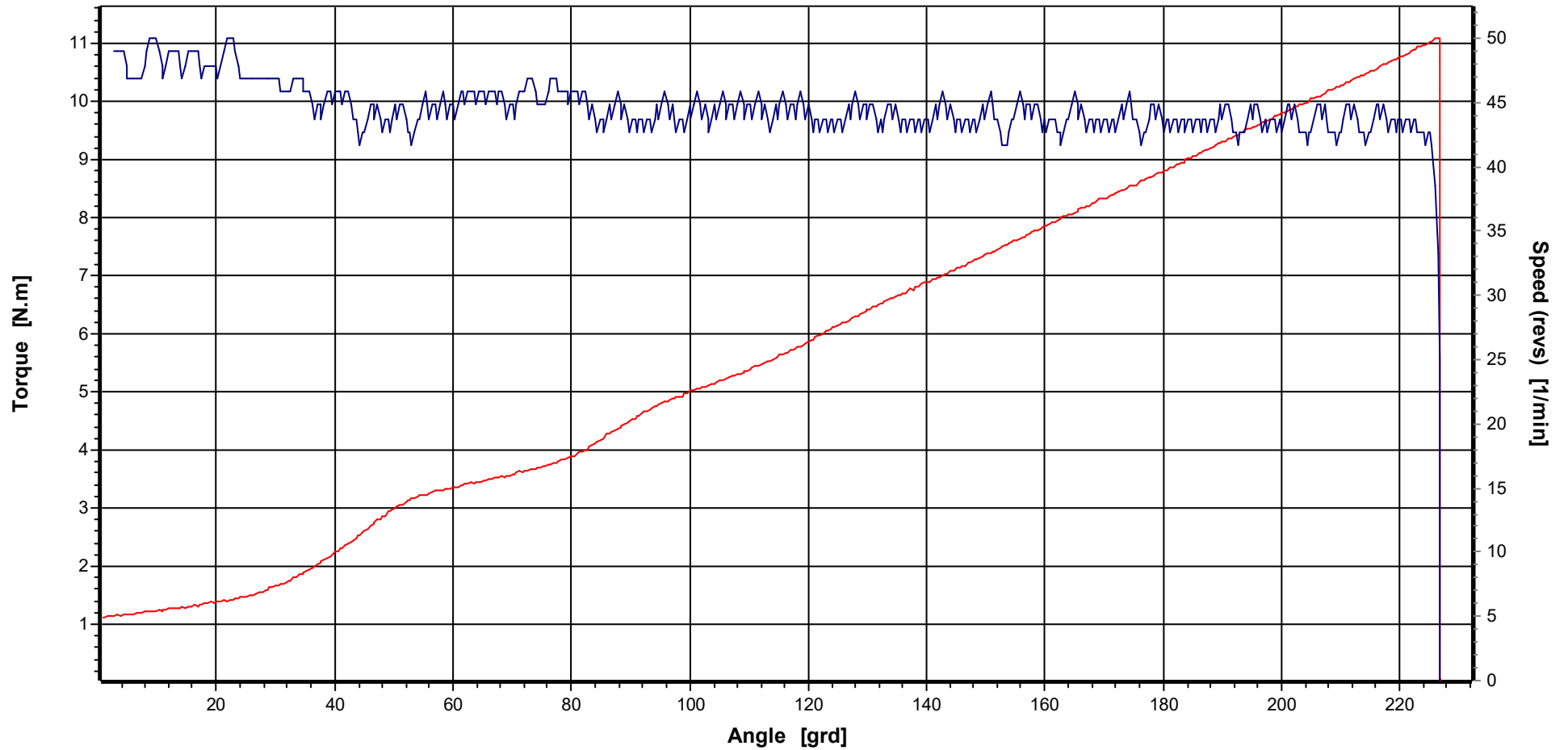
Tester	M.Brkcic
N	100
Target	180,00 grd
UL	190,00 grd
LL	170,00 grd
Max	181,75 grd
Min	179,25 grd
xq	180,4800 grd
s	0,6510 grd
Cm	5,120
Cmk	4,874



Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

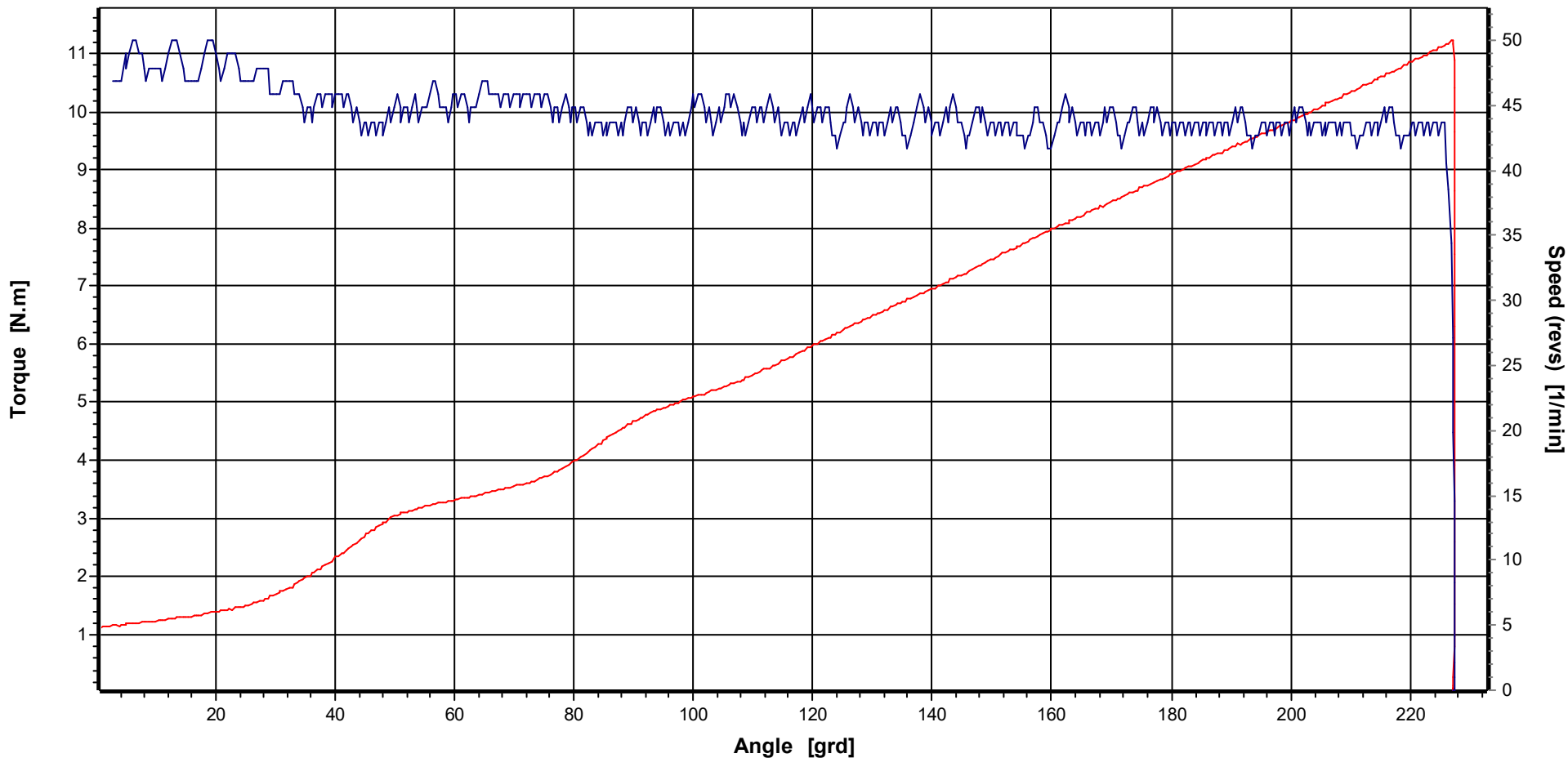


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	29.06.2018 07:29:20
UL	190,00 grd	Supporting points	840			Date/time measurement	29.06.2018 07:29:20

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

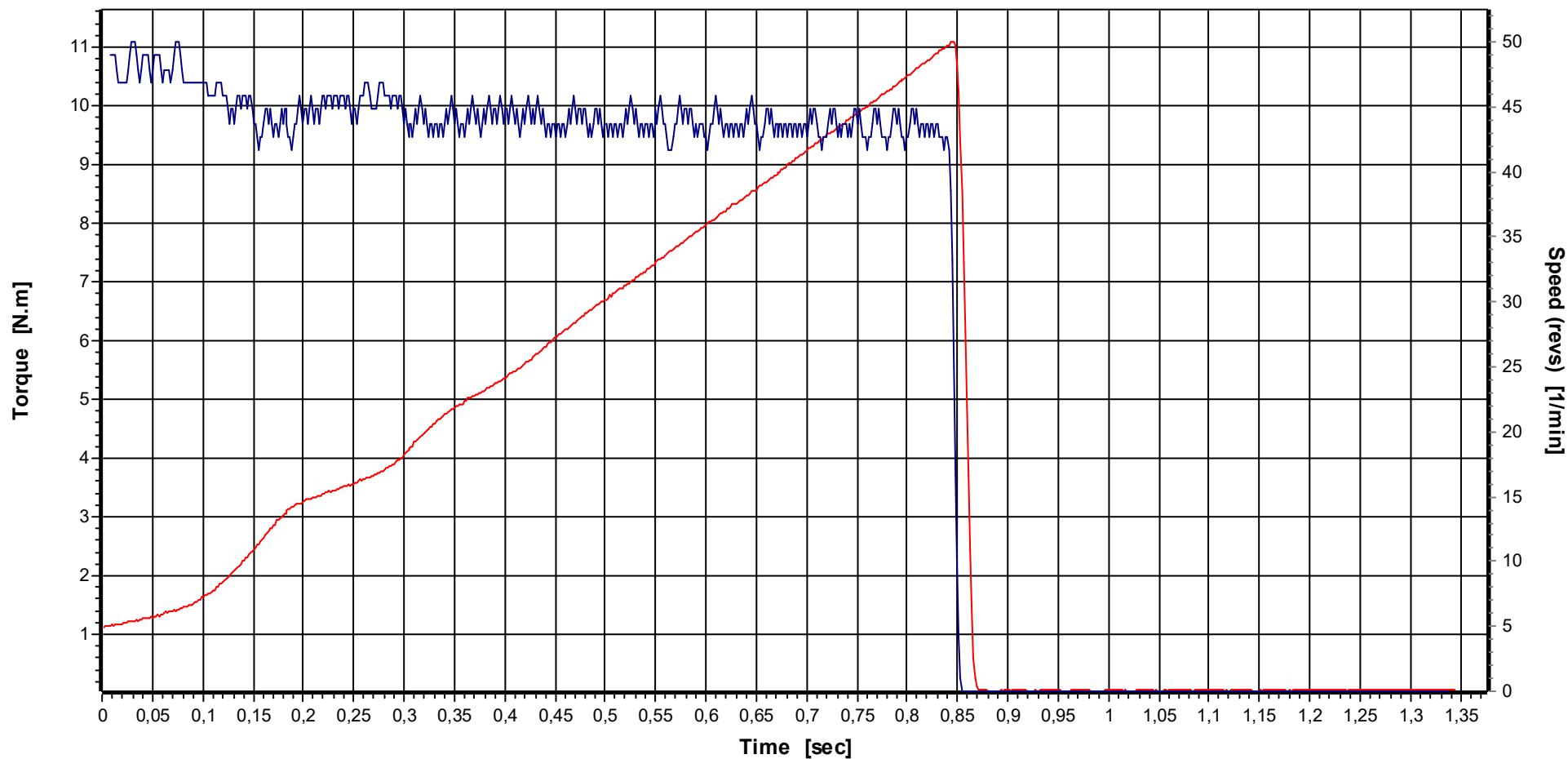


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	29.06.2018 07:29:20
UL	190,00 grd	Supporting points	853			Date/time measurement	29.06.2018 07:55:44

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

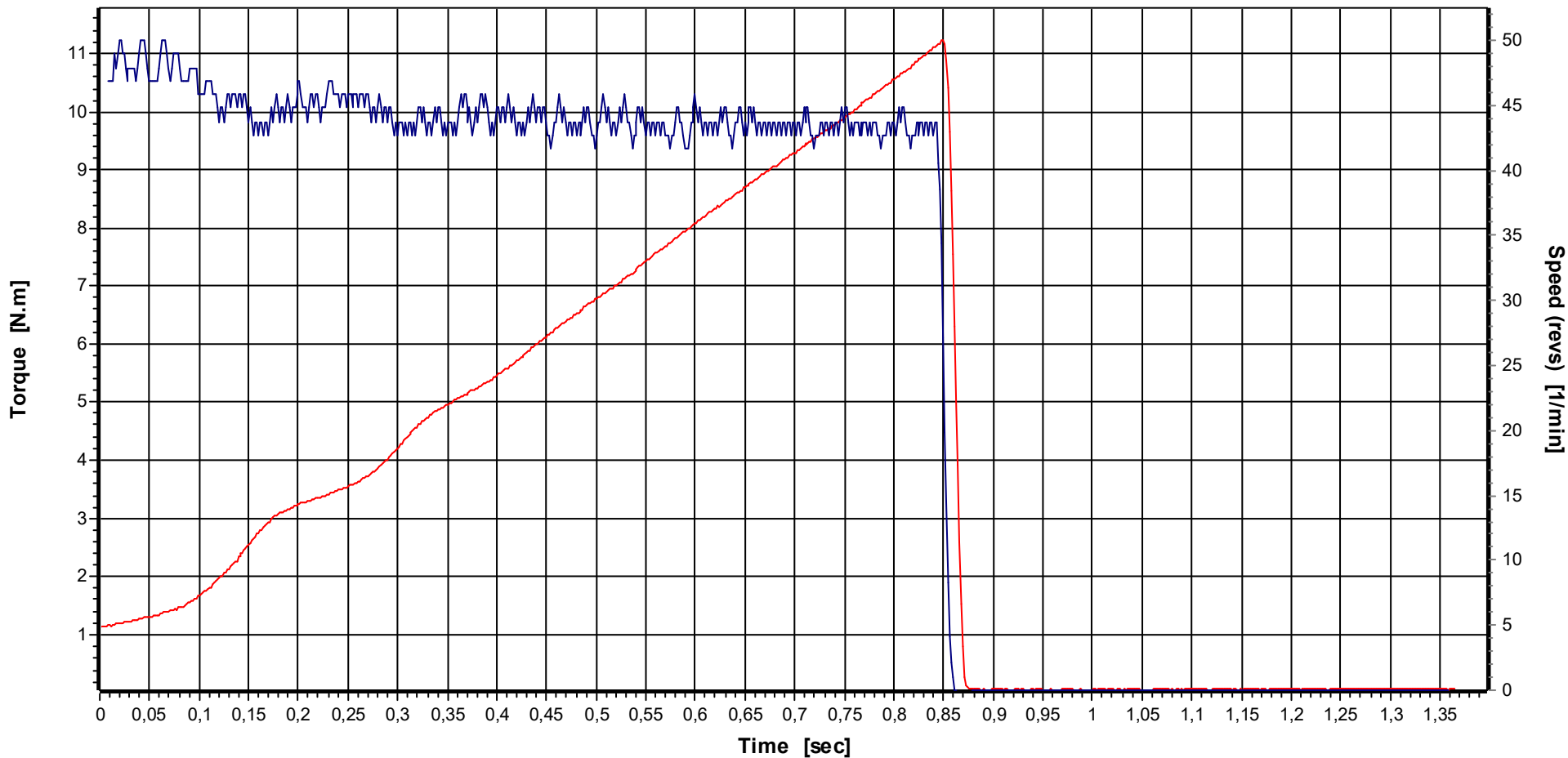


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	29.06.2018 07:29:20
UL	190,00 grd	Supporting points	840			Date/time measurement	29.06.2018 07:29:20

Graph

Tool model: TBPEC-12xx, Serial No.: 18240032
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	29.06.2018 07:29:20
UL	190,00 grd	Supporting points	853			Date/time measurement	29.06.2018 07:55:44

Date/ Time	29.06.2018 07:29:20	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,4800	2,5000	0,6510	5,120	4,874	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	179,50 °	-0,3 %	11,074 N.m	-1,1 %	50 rpm	29.06.2018	07:29:20
2	180,25 °	0,1 %	11,039 N.m	-1,4 %	50 rpm	29.06.2018	07:29:36
3	180,50 °	0,3 %	11,039 N.m	-1,4 %	50 rpm	29.06.2018	07:29:52
4	181,25 °	0,7 %	11,152 N.m	-0,4 %	50 rpm	29.06.2018	07:30:08
5	181,25 °	0,7 %	11,222 N.m	0,2 %	50 rpm	29.06.2018	07:30:24
6	181,00 °	0,6 %	11,167 N.m	-0,3 %	50 rpm	29.06.2018	07:30:40
7	181,25 °	0,7 %	11,140 N.m	-0,5 %	50 rpm	29.06.2018	07:30:56
8	181,25 °	0,7 %	11,171 N.m	-0,3 %	50 rpm	29.06.2018	07:31:12
9	180,75 °	0,4 %	11,195 N.m	0,0 %	50 rpm	29.06.2018	07:31:28
10	181,25 °	0,7 %	11,234 N.m	0,3 %	50 rpm	29.06.2018	07:31:44
11	180,50 °	0,3 %	11,206 N.m	0,1 %	50 rpm	29.06.2018	07:32:00
12	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:32:16
13	179,25 °	-0,4 %	11,179 N.m	-0,2 %	50 rpm	29.06.2018	07:32:32
14	179,75 °	-0,1 %	11,210 N.m	0,1 %	50 rpm	29.06.2018	07:32:48
15	179,50 °	-0,3 %	11,171 N.m	-0,3 %	50 rpm	29.06.2018	07:33:04
16	179,75 °	-0,1 %	11,070 N.m	-1,2 %	50 rpm	29.06.2018	07:33:20
17	179,75 °	-0,1 %	11,019 N.m	-1,6 %	50 rpm	29.06.2018	07:33:36
18	180,00 °	0,0 %	10,945 N.m	-2,3 %	50 rpm	29.06.2018	07:33:52
19	180,50 °	0,3 %	11,031 N.m	-1,5 %	50 rpm	29.06.2018	07:34:08
20	180,75 °	0,4 %	11,093 N.m	-1,0 %	50 rpm	29.06.2018	07:34:24
21	181,25 °	0,7 %	11,152 N.m	-0,4 %	50 rpm	29.06.2018	07:34:40
22	181,00 °	0,6 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:34:56
23	181,25 °	0,7 %	11,199 N.m	0,0 %	50 rpm	29.06.2018	07:35:12
24	181,75 °	1,0 %	11,160 N.m	-0,4 %	50 rpm	29.06.2018	07:35:28
25	181,00 °	0,6 %	11,226 N.m	0,2 %	50 rpm	29.06.2018	07:35:44
26	180,75 °	0,4 %	11,218 N.m	0,2 %	50 rpm	29.06.2018	07:36:00
27	180,75 °	0,4 %	11,249 N.m	0,4 %	50 rpm	29.06.2018	07:36:16
28	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:36:32
29	179,75 °	-0,1 %	11,160 N.m	-0,4 %	50 rpm	29.06.2018	07:36:48
30	179,75 °	-0,1 %	11,187 N.m	-0,1 %	50 rpm	29.06.2018	07:37:04
31	179,50 °	-0,3 %	11,148 N.m	-0,5 %	50 rpm	29.06.2018	07:37:20
32	179,50 °	-0,3 %	11,101 N.m	-0,9 %	50 rpm	29.06.2018	07:37:36
33	179,25 °	-0,4 %	10,988 N.m	-1,9 %	50 rpm	29.06.2018	07:37:52
34	180,00 °	0,0 %	10,941 N.m	-2,3 %	50 rpm	29.06.2018	07:38:08
35	180,50 °	0,3 %	11,019 N.m	-1,6 %	50 rpm	29.06.2018	07:38:24
36	180,75 °	0,4 %	11,066 N.m	-1,2 %	50 rpm	29.06.2018	07:38:40
37	181,25 °	0,7 %	11,089 N.m	-1,0 %	50 rpm	29.06.2018	07:38:56
38	181,00 °	0,6 %	11,121 N.m	-0,7 %	50 rpm	29.06.2018	07:39:12
39	181,00 °	0,6 %	11,214 N.m	0,1 %	50 rpm	29.06.2018	07:39:28
40	181,25 °	0,7 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:39:44
41	181,25 °	0,7 %	11,167 N.m	-0,3 %	50 rpm	29.06.2018	07:40:00
42	181,75 °	1,0 %	11,234 N.m	0,3 %	50 rpm	29.06.2018	07:40:16
43	180,75 °	0,4 %	11,246 N.m	0,4 %	50 rpm	29.06.2018	07:40:32
44	180,50 °	0,3 %	11,206 N.m	0,1 %	50 rpm	29.06.2018	07:40:48
45	180,50 °	0,3 %	11,195 N.m	0,0 %	50 rpm	29.06.2018	07:41:04
46	180,00 °	0,0 %	11,199 N.m	0,0 %	50 rpm	29.06.2018	07:41:20
47	180,00 °	0,0 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:41:36
48	180,00 °	0,0 %	11,179 N.m	-0,2 %	50 rpm	29.06.2018	07:41:52
49	179,50 °	-0,3 %	11,058 N.m	-1,3 %	50 rpm	29.06.2018	07:42:08
50	179,75 °	-0,1 %	10,996 N.m	-1,8 %	50 rpm	29.06.2018	07:42:24

Date/ Time	29.06.2018 07:29:20	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240032
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

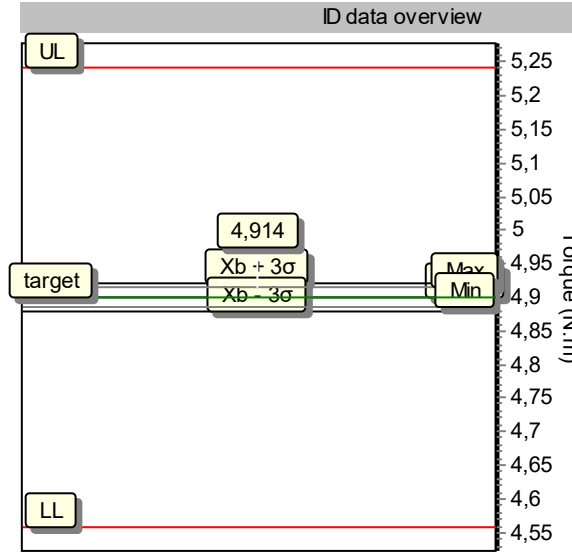
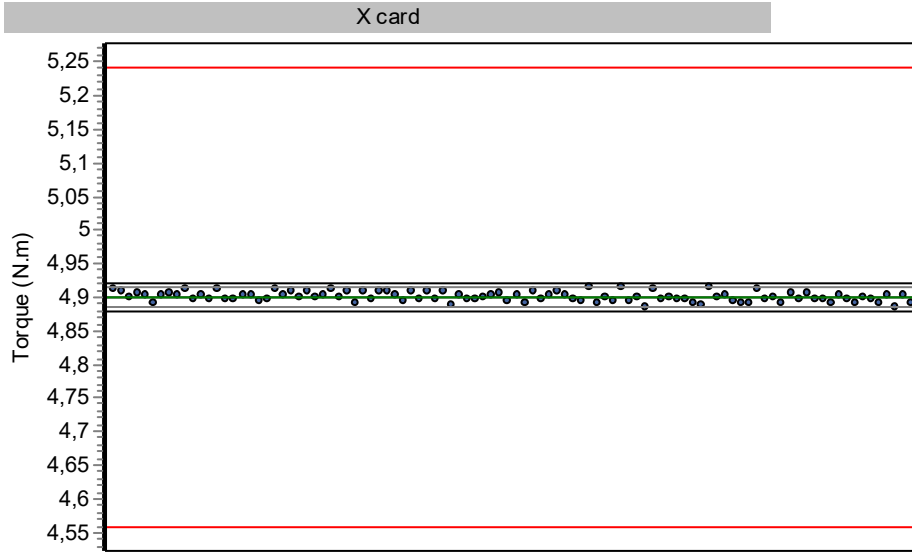
Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,4800	2,5000	0,6510	5,120	4,874	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	180,25 °	0,1 %	11,000 N.m	-1,8 %	50 rpm	29.06.2018	07:42:40
52	180,75 °	0,4 %	11,050 N.m	-1,3 %	50 rpm	29.06.2018	07:42:56
53	180,75 °	0,4 %	11,074 N.m	-1,1 %	50 rpm	29.06.2018	07:43:12
54	181,00 °	0,6 %	11,171 N.m	-0,3 %	50 rpm	29.06.2018	07:43:28
55	181,25 °	0,7 %	11,206 N.m	0,1 %	50 rpm	29.06.2018	07:43:44
56	181,00 °	0,6 %	11,156 N.m	-0,4 %	50 rpm	29.06.2018	07:44:00
57	181,25 °	0,7 %	11,179 N.m	-0,2 %	50 rpm	29.06.2018	07:44:16
58	181,25 °	0,7 %	11,253 N.m	0,5 %	50 rpm	29.06.2018	07:44:32
59	180,75 °	0,4 %	11,214 N.m	0,1 %	50 rpm	29.06.2018	07:44:48
60	180,50 °	0,3 %	11,234 N.m	0,3 %	50 rpm	29.06.2018	07:45:04
61	180,75 °	0,4 %	11,242 N.m	0,4 %	50 rpm	29.06.2018	07:45:20
62	179,75 °	-0,1 %	11,171 N.m	-0,3 %	50 rpm	29.06.2018	07:45:36
63	180,00 °	0,0 %	11,214 N.m	0,1 %	50 rpm	29.06.2018	07:45:52
64	179,75 °	-0,1 %	11,175 N.m	-0,2 %	50 rpm	29.06.2018	07:46:08
65	179,50 °	-0,3 %	11,109 N.m	-0,8 %	50 rpm	29.06.2018	07:46:24
66	179,75 °	-0,1 %	11,062 N.m	-1,2 %	50 rpm	29.06.2018	07:46:40
67	180,25 °	0,1 %	11,019 N.m	-1,6 %	50 rpm	29.06.2018	07:46:56
68	180,25 °	0,1 %	10,953 N.m	-2,2 %	50 rpm	29.06.2018	07:47:12
69	181,00 °	0,6 %	11,039 N.m	-1,4 %	50 rpm	29.06.2018	07:47:28
70	181,00 °	0,6 %	11,109 N.m	-0,8 %	50 rpm	29.06.2018	07:47:44
71	180,75 °	0,4 %	11,214 N.m	0,1 %	50 rpm	29.06.2018	07:48:00
72	181,25 °	0,7 %	11,183 N.m	-0,2 %	50 rpm	29.06.2018	07:48:16
73	181,25 °	0,7 %	11,136 N.m	-0,6 %	50 rpm	29.06.2018	07:48:32
74	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:48:48
75	180,75 °	0,4 %	11,226 N.m	0,2 %	50 rpm	29.06.2018	07:49:04
76	180,00 °	0,0 %	11,179 N.m	-0,2 %	50 rpm	29.06.2018	07:49:20
77	180,75 °	0,4 %	11,195 N.m	0,0 %	50 rpm	29.06.2018	07:49:36
78	180,00 °	0,0 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:49:52
79	179,25 °	-0,4 %	11,152 N.m	-0,4 %	50 rpm	29.06.2018	07:50:08
80	179,50 °	-0,3 %	11,086 N.m	-1,0 %	50 rpm	29.06.2018	07:50:24
81	179,75 °	-0,1 %	11,035 N.m	-1,5 %	50 rpm	29.06.2018	07:50:40
82	179,75 °	-0,1 %	10,953 N.m	-2,2 %	50 rpm	29.06.2018	07:50:56
83	180,00 °	0,0 %	11,000 N.m	-1,8 %	50 rpm	29.06.2018	07:51:12
84	180,75 °	0,4 %	11,039 N.m	-1,4 %	50 rpm	29.06.2018	07:51:28
85	180,75 °	0,4 %	11,132 N.m	-0,6 %	50 rpm	29.06.2018	07:51:44
86	181,25 °	0,7 %	11,218 N.m	0,2 %	50 rpm	29.06.2018	07:52:00
87	181,25 °	0,7 %	11,167 N.m	-0,3 %	50 rpm	29.06.2018	07:52:16
88	181,25 °	0,7 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:52:32
89	181,00 °	0,6 %	11,265 N.m	0,6 %	50 rpm	29.06.2018	07:52:48
90	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	29.06.2018	07:53:04
91	180,00 °	0,0 %	11,140 N.m	-0,5 %	50 rpm	29.06.2018	07:53:20
92	180,00 °	0,0 %	11,183 N.m	-0,2 %	50 rpm	29.06.2018	07:53:36
93	179,50 °	-0,3 %	11,171 N.m	-0,3 %	50 rpm	29.06.2018	07:53:52
94	179,50 °	-0,3 %	11,109 N.m	-0,8 %	50 rpm	29.06.2018	07:54:08
95	179,50 °	-0,3 %	11,019 N.m	-1,6 %	50 rpm	29.06.2018	07:54:24
96	180,25 °	0,1 %	10,949 N.m	-2,2 %	50 rpm	29.06.2018	07:54:40
97	180,50 °	0,3 %	11,015 N.m	-1,7 %	50 rpm	29.06.2018	07:54:56
98	181,25 °	0,7 %	11,097 N.m	-0,9 %	50 rpm	29.06.2018	07:55:12
99	181,00 °	0,6 %	11,183 N.m	-0,2 %	50 rpm	29.06.2018	07:55:28
100	181,25 °	0,7 %	11,226 N.m	0,2 %	50 rpm	29.06.2018	07:55:44

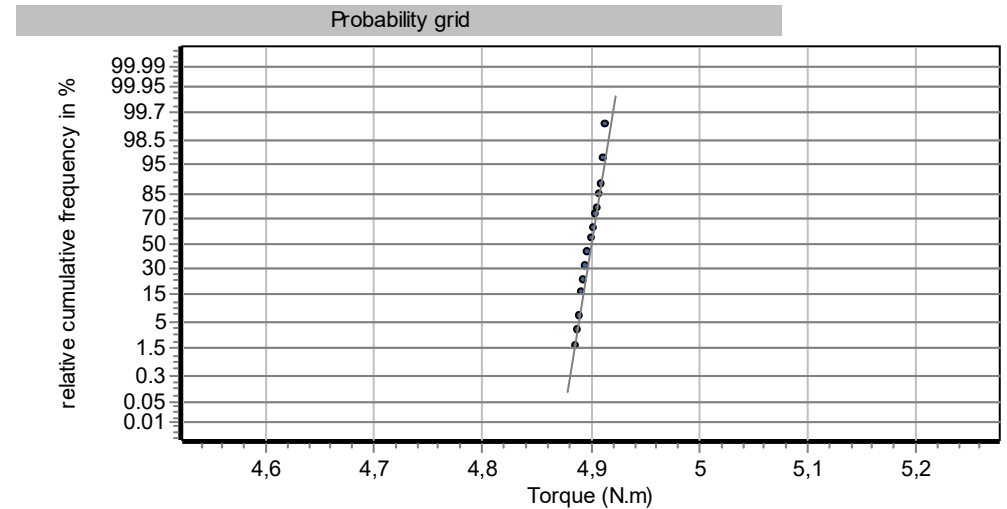
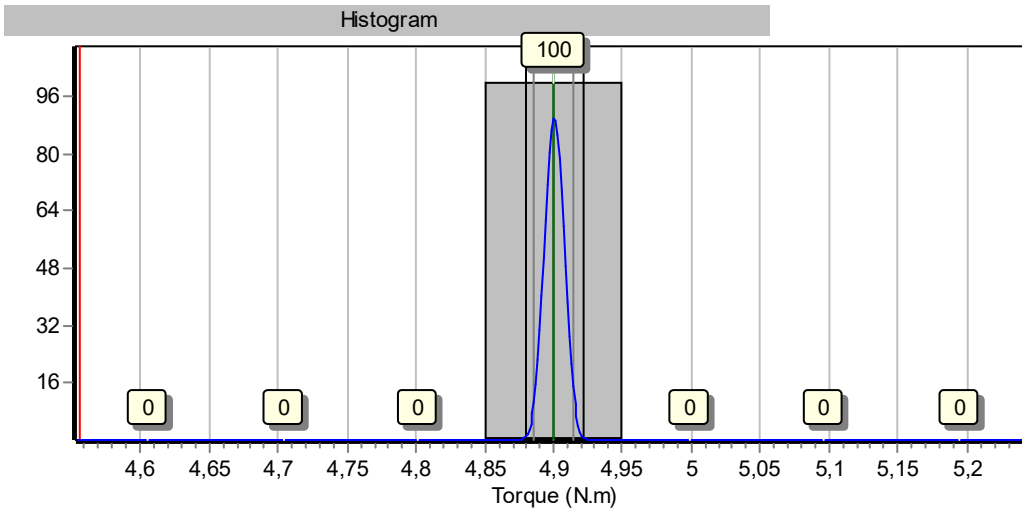
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 30% Screw joint: soft



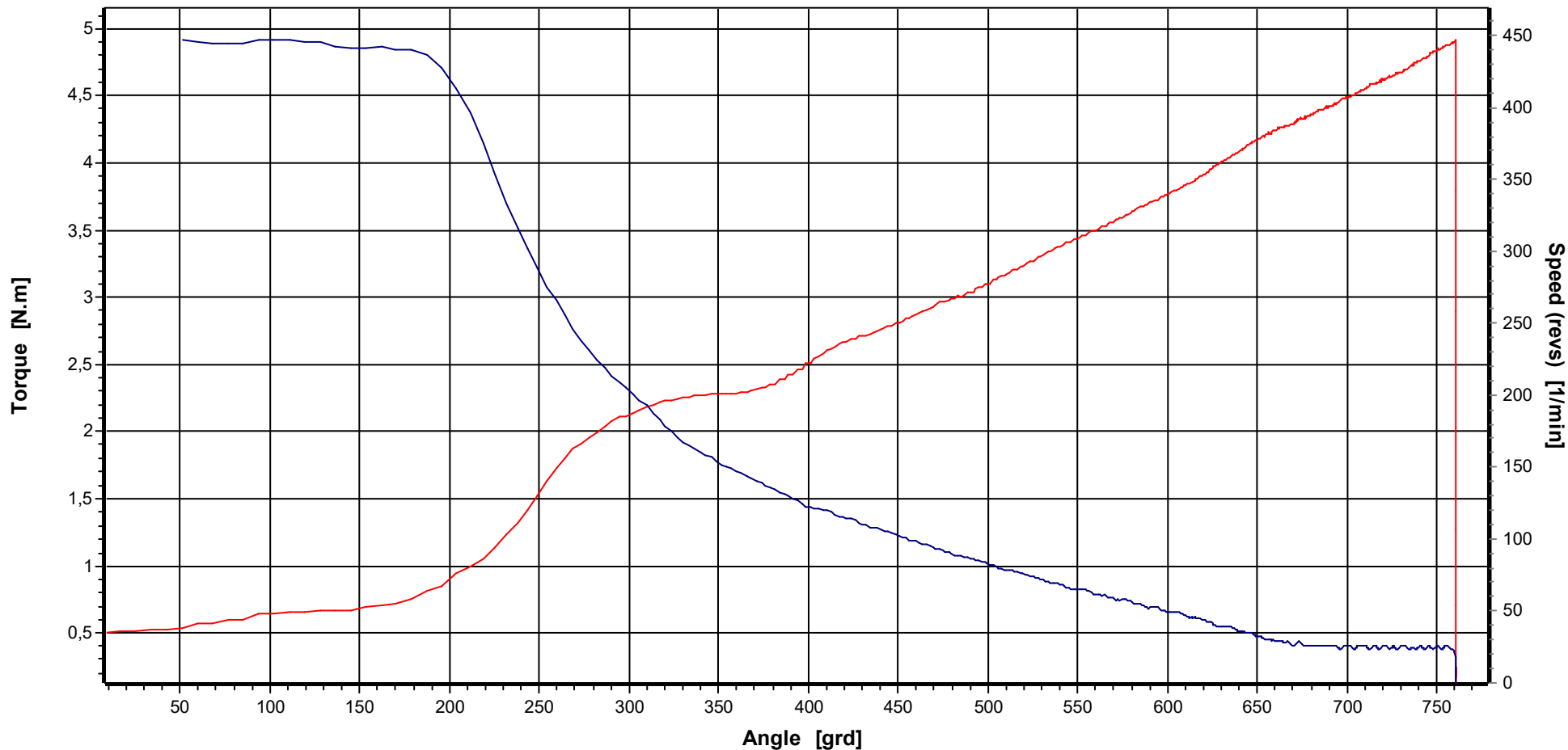
Tester	M.Brkc
N	100
Target	4,90 N.m
UL	5,24 N.m
LL	4,56 N.m
Max	4,91 N.m
Min	4,89 N.m
xq	4,9006 N.m
s	0,0070 N.m
Cm	16,337
Cmk	16,311



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

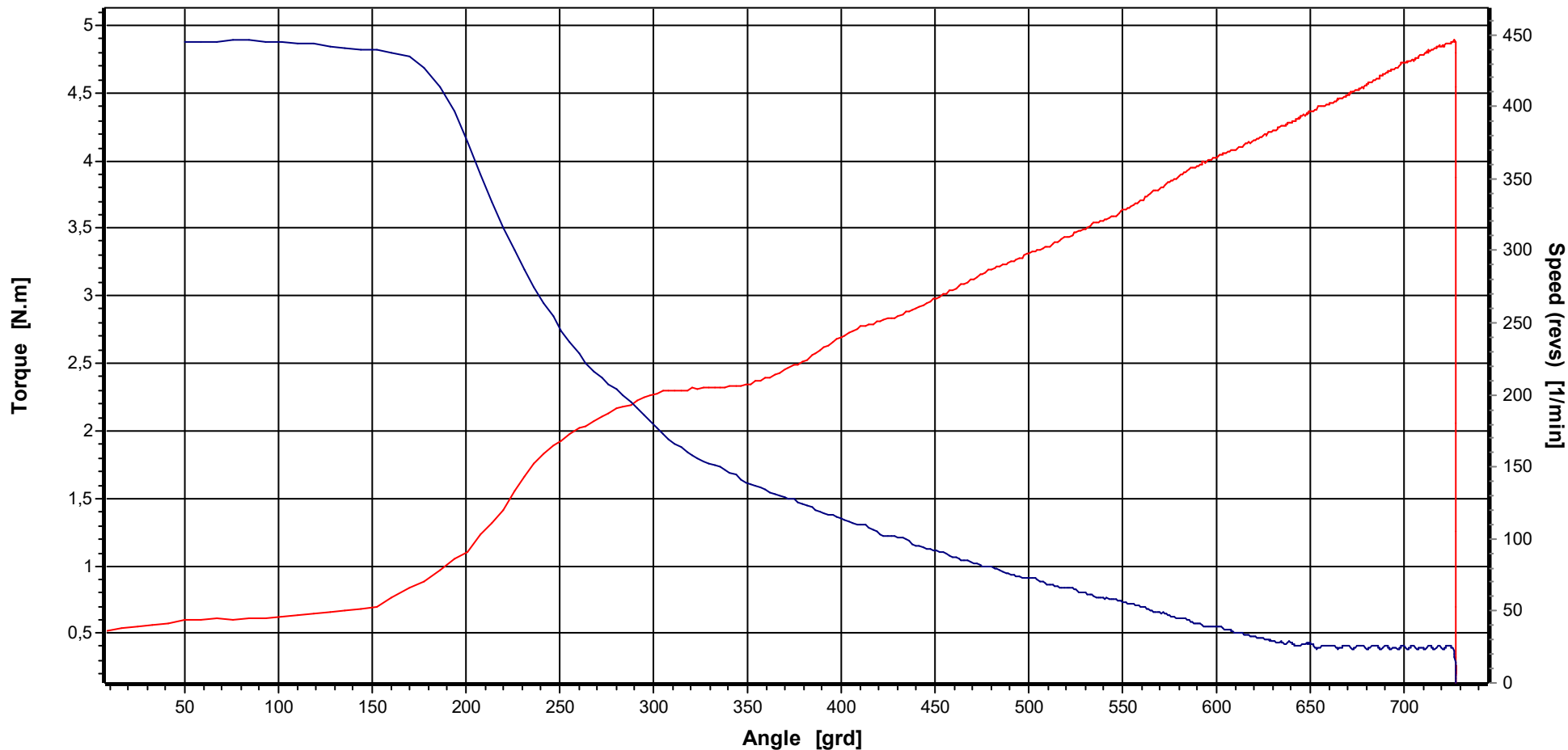


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:22:12
UL	5,24 N.m	Supporting points	650			Date/time measurement	02.07.2018 15:22:12

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

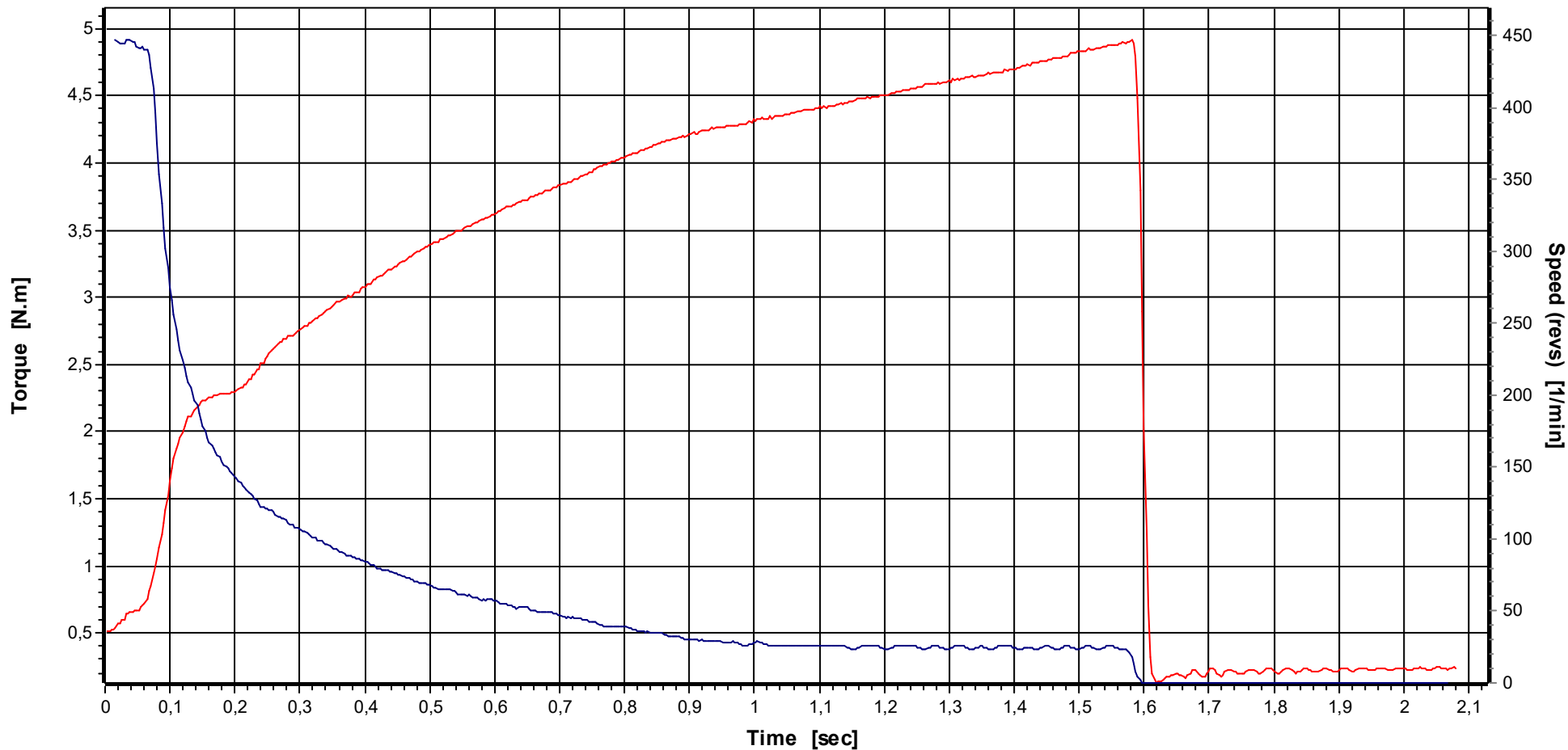


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:22:12
UL	5,24 N.m	Supporting points	638			Date/time measurement	02.07.2018 15:35:04

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

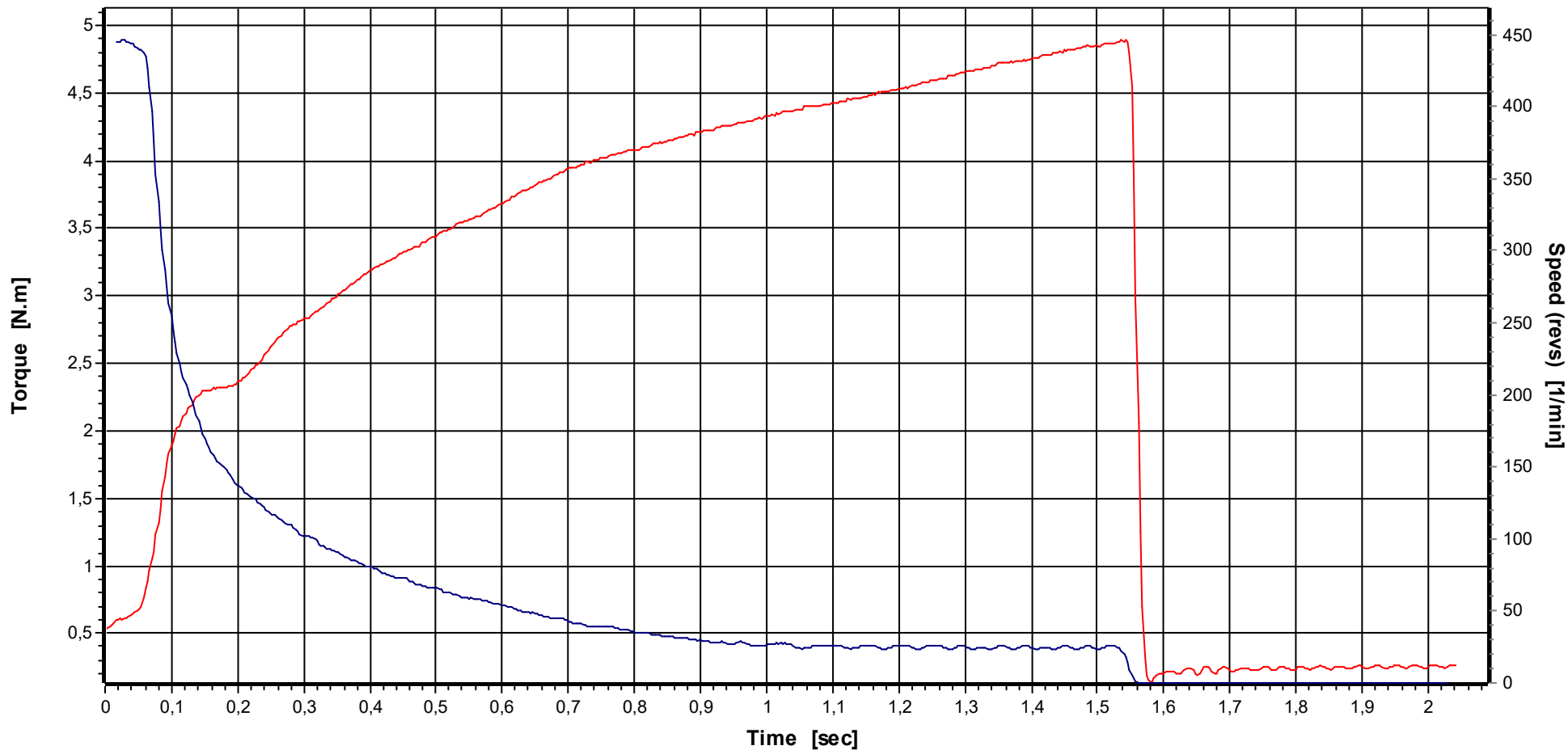


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:22:12
UL	5,24 N.m	Supporting points	650			Date/time measurement	02.07.2018 15:22:12

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	5	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:22:12
UL	5,24 N.m	Supporting points	638			Date/time measurement	02.07.2018 15:35:04

Date/ Time	02.07.2018 15:22:12	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9006	0,0280	0,0070	16,337	16,311	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,912 N.m	0,2 %	368,00 °	2,2 %	453 rpm	52 rpm	02.07.2018	15:22:12
2	4,908 N.m	0,2 %	367,50 °	2,1 %	453 rpm	51 rpm	02.07.2018	15:22:20
3	4,900 N.m	0,0 %	368,25 °	2,3 %	452 rpm	52 rpm	02.07.2018	15:22:28
4	4,906 N.m	0,1 %	368,25 °	2,3 %	453 rpm	51 rpm	02.07.2018	15:22:35
5	4,904 N.m	0,1 %	367,50 °	2,1 %	452 rpm	52 rpm	02.07.2018	15:22:43
6	4,892 N.m	-0,2 %	359,00 °	-0,3 %	454 rpm	52 rpm	02.07.2018	15:22:51
7	4,902 N.m	0,0 %	360,00 °	0,0 %	453 rpm	53 rpm	02.07.2018	15:22:59
8	4,906 N.m	0,1 %	360,75 °	0,2 %	453 rpm	52 rpm	02.07.2018	15:23:07
9	4,902 N.m	0,0 %	359,75 °	-0,1 %	453 rpm	52 rpm	02.07.2018	15:23:14
10	4,912 N.m	0,2 %	356,00 °	-1,1 %	454 rpm	52 rpm	02.07.2018	15:23:22
11	4,898 N.m	0,0 %	358,00 °	-0,6 %	453 rpm	52 rpm	02.07.2018	15:23:30
12	4,904 N.m	0,1 %	359,25 °	-0,2 %	454 rpm	53 rpm	02.07.2018	15:23:38
13	4,898 N.m	0,0 %	360,25 °	0,1 %	453 rpm	52 rpm	02.07.2018	15:23:46
14	4,912 N.m	0,2 %	361,00 °	0,3 %	454 rpm	52 rpm	02.07.2018	15:23:53
15	4,896 N.m	-0,1 %	361,25 °	0,3 %	453 rpm	51 rpm	02.07.2018	15:24:01
16	4,896 N.m	-0,1 %	354,25 °	-1,6 %	454 rpm	52 rpm	02.07.2018	15:24:09
17	4,902 N.m	0,0 %	363,75 °	1,0 %	453 rpm	53 rpm	02.07.2018	15:24:17
18	4,904 N.m	0,1 %	361,00 °	0,3 %	453 rpm	51 rpm	02.07.2018	15:24:25
19	4,894 N.m	-0,1 %	361,00 °	0,3 %	453 rpm	52 rpm	02.07.2018	15:24:32
20	4,896 N.m	-0,1 %	358,25 °	-0,5 %	453 rpm	52 rpm	02.07.2018	15:24:40
21	4,912 N.m	0,2 %	355,25 °	-1,3 %	453 rpm	52 rpm	02.07.2018	15:24:48
22	4,904 N.m	0,1 %	362,50 °	0,7 %	452 rpm	52 rpm	02.07.2018	15:24:56
23	4,908 N.m	0,2 %	356,00 °	-1,1 %	454 rpm	51 rpm	02.07.2018	15:25:04
24	4,900 N.m	0,0 %	356,00 °	-1,1 %	453 rpm	51 rpm	02.07.2018	15:25:11
25	4,908 N.m	0,2 %	363,75 °	1,0 %	453 rpm	53 rpm	02.07.2018	15:25:19
26	4,900 N.m	0,0 %	361,75 °	0,5 %	453 rpm	51 rpm	02.07.2018	15:25:27
27	4,904 N.m	0,1 %	361,50 °	0,4 %	453 rpm	52 rpm	02.07.2018	15:25:35
28	4,912 N.m	0,2 %	358,50 °	-0,4 %	453 rpm	51 rpm	02.07.2018	15:25:43
29	4,900 N.m	0,0 %	360,25 °	0,1 %	453 rpm	52 rpm	02.07.2018	15:25:50
30	4,910 N.m	0,2 %	360,50 °	0,1 %	453 rpm	51 rpm	02.07.2018	15:25:58
31	4,892 N.m	-0,2 %	355,25 °	-1,3 %	454 rpm	52 rpm	02.07.2018	15:26:06
32	4,910 N.m	0,2 %	363,50 °	1,0 %	453 rpm	53 rpm	02.07.2018	15:26:14
33	4,898 N.m	0,0 %	360,75 °	0,2 %	453 rpm	52 rpm	02.07.2018	15:26:22
34	4,908 N.m	0,2 %	361,00 °	0,3 %	453 rpm	52 rpm	02.07.2018	15:26:29
35	4,910 N.m	0,2 %	362,00 °	0,6 %	454 rpm	51 rpm	02.07.2018	15:26:37
36	4,904 N.m	0,1 %	362,00 °	0,6 %	453 rpm	53 rpm	02.07.2018	15:26:45
37	4,894 N.m	-0,1 %	360,00 °	0,0 %	453 rpm	52 rpm	02.07.2018	15:26:53
38	4,908 N.m	0,2 %	354,00 °	-1,7 %	453 rpm	52 rpm	02.07.2018	15:27:00
39	4,896 N.m	-0,1 %	359,50 °	-0,1 %	453 rpm	52 rpm	02.07.2018	15:27:08
40	4,908 N.m	0,2 %	358,00 °	-0,6 %	453 rpm	51 rpm	02.07.2018	15:27:16
41	4,898 N.m	0,0 %	360,50 °	0,1 %	454 rpm	52 rpm	02.07.2018	15:27:24
42	4,908 N.m	0,2 %	358,00 °	-0,6 %	453 rpm	51 rpm	02.07.2018	15:27:32
43	4,888 N.m	-0,2 %	359,00 °	-0,3 %	454 rpm	51 rpm	02.07.2018	15:27:40
44	4,904 N.m	0,1 %	361,00 °	0,3 %	453 rpm	52 rpm	02.07.2018	15:27:47
45	4,898 N.m	0,0 %	361,00 °	0,3 %	454 rpm	52 rpm	02.07.2018	15:27:55
46	4,896 N.m	-0,1 %	361,50 °	0,4 %	453 rpm	52 rpm	02.07.2018	15:28:03
47	4,900 N.m	0,0 %	363,25 °	0,9 %	454 rpm	51 rpm	02.07.2018	15:28:11
48	4,904 N.m	0,1 %	361,50 °	0,4 %	453 rpm	52 rpm	02.07.2018	15:28:19
49	4,906 N.m	0,1 %	359,25 °	-0,2 %	454 rpm	51 rpm	02.07.2018	15:28:26
50	4,894 N.m	-0,1 %	356,00 °	-1,1 %	454 rpm	51 rpm	02.07.2018	15:28:34

Date/ Time	02.07.2018 15:22:12	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

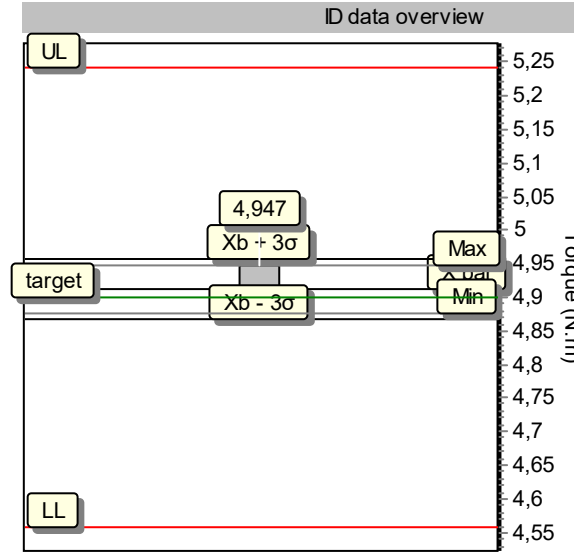
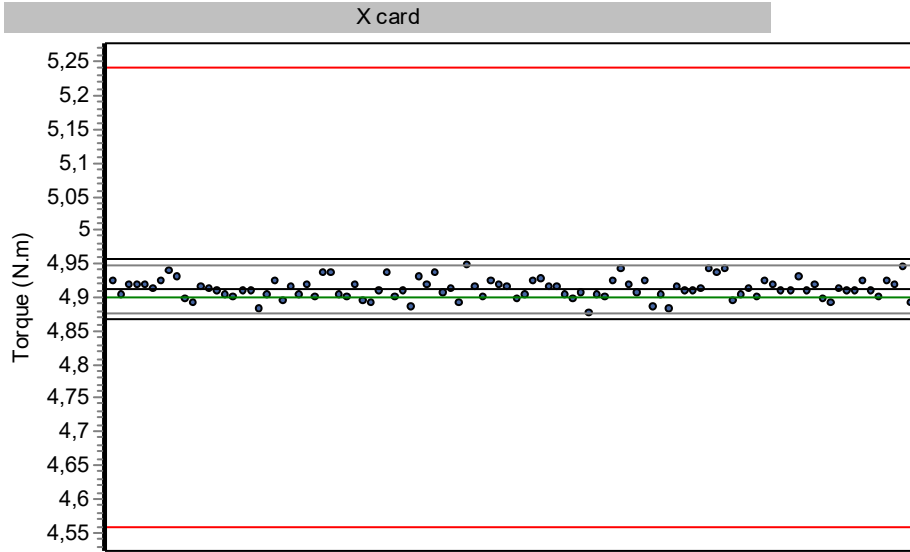
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9006	0,0280	0,0070	16,337	16,311	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,902 N.m	0,0 %	359,25 °	-0,2 %	453 rpm	52 rpm	02.07.2018	15:28:42
52	4,892 N.m	-0,2 %	361,50 °	0,4 %	454 rpm	51 rpm	02.07.2018	15:28:50
53	4,908 N.m	0,2 %	360,25 °	0,1 %	453 rpm	52 rpm	02.07.2018	15:28:58
54	4,896 N.m	-0,1 %	360,75 °	0,2 %	453 rpm	51 rpm	02.07.2018	15:29:05
55	4,904 N.m	0,1 %	359,25 °	-0,2 %	453 rpm	52 rpm	02.07.2018	15:29:13
56	4,910 N.m	0,2 %	361,25 °	0,3 %	454 rpm	51 rpm	02.07.2018	15:29:21
57	4,902 N.m	0,0 %	357,50 °	-0,7 %	453 rpm	52 rpm	02.07.2018	15:29:29
58	4,896 N.m	-0,1 %	359,00 °	-0,3 %	454 rpm	52 rpm	02.07.2018	15:29:37
59	4,894 N.m	-0,1 %	359,75 °	-0,1 %	453 rpm	51 rpm	02.07.2018	15:29:44
60	4,914 N.m	0,3 %	356,25 °	-1,0 %	454 rpm	52 rpm	02.07.2018	15:29:52
61	4,892 N.m	-0,2 %	352,75 °	-2,0 %	453 rpm	51 rpm	02.07.2018	15:30:00
62	4,900 N.m	0,0 %	354,75 °	-1,5 %	454 rpm	52 rpm	02.07.2018	15:30:08
63	4,894 N.m	-0,1 %	356,75 °	-0,9 %	454 rpm	51 rpm	02.07.2018	15:30:16
64	4,914 N.m	0,3 %	358,75 °	-0,3 %	453 rpm	51 rpm	02.07.2018	15:30:23
65	4,894 N.m	-0,1 %	355,75 °	-1,2 %	453 rpm	51 rpm	02.07.2018	15:30:31
66	4,900 N.m	0,0 %	356,50 °	-1,0 %	454 rpm	51 rpm	02.07.2018	15:30:39
67	4,886 N.m	-0,3 %	353,00 °	-1,9 %	453 rpm	52 rpm	02.07.2018	15:30:47
68	4,912 N.m	0,2 %	356,50 °	-1,0 %	454 rpm	51 rpm	02.07.2018	15:30:55
69	4,898 N.m	0,0 %	359,75 °	-0,1 %	453 rpm	52 rpm	02.07.2018	15:31:02
70	4,900 N.m	0,0 %	361,25 °	0,3 %	453 rpm	51 rpm	02.07.2018	15:31:10
71	4,896 N.m	-0,1 %	361,25 °	0,3 %	454 rpm	52 rpm	02.07.2018	15:31:18
72	4,896 N.m	-0,1 %	358,00 °	-0,6 %	454 rpm	51 rpm	02.07.2018	15:31:26
73	4,892 N.m	-0,2 %	361,00 °	0,3 %	454 rpm	52 rpm	02.07.2018	15:31:34
74	4,888 N.m	-0,2 %	354,25 °	-1,6 %	454 rpm	51 rpm	02.07.2018	15:31:41
75	4,914 N.m	0,3 %	359,75 °	-0,1 %	454 rpm	51 rpm	02.07.2018	15:31:49
76	4,900 N.m	0,0 %	359,50 °	-0,1 %	454 rpm	52 rpm	02.07.2018	15:31:57
77	4,902 N.m	0,0 %	362,50 °	0,7 %	453 rpm	51 rpm	02.07.2018	15:32:05
78	4,894 N.m	-0,1 %	358,50 °	-0,4 %	453 rpm	52 rpm	02.07.2018	15:32:13
79	4,892 N.m	-0,2 %	359,50 °	-0,1 %	453 rpm	51 rpm	02.07.2018	15:32:20
80	4,890 N.m	-0,2 %	358,00 °	-0,6 %	453 rpm	51 rpm	02.07.2018	15:32:28
81	4,912 N.m	0,2 %	357,50 °	-0,7 %	454 rpm	51 rpm	02.07.2018	15:32:36
82	4,898 N.m	0,0 %	358,75 °	-0,3 %	453 rpm	52 rpm	02.07.2018	15:32:44
83	4,900 N.m	0,0 %	360,50 °	0,1 %	454 rpm	50 rpm	02.07.2018	15:32:52
84	4,890 N.m	-0,2 %	356,00 °	-1,1 %	453 rpm	52 rpm	02.07.2018	15:32:59
85	4,906 N.m	0,1 %	358,75 °	-0,3 %	454 rpm	51 rpm	02.07.2018	15:33:07
86	4,898 N.m	0,0 %	357,50 °	-0,7 %	453 rpm	52 rpm	02.07.2018	15:33:15
87	4,906 N.m	0,1 %	360,25 °	0,1 %	454 rpm	50 rpm	02.07.2018	15:33:23
88	4,896 N.m	-0,1 %	358,00 °	-0,6 %	453 rpm	52 rpm	02.07.2018	15:33:30
89	4,898 N.m	0,0 %	360,00 °	0,0 %	454 rpm	51 rpm	02.07.2018	15:33:38
90	4,890 N.m	-0,2 %	358,25 °	-0,5 %	453 rpm	51 rpm	02.07.2018	15:33:46
91	4,902 N.m	0,0 %	361,50 °	0,4 %	454 rpm	50 rpm	02.07.2018	15:33:54
92	4,898 N.m	0,0 %	359,00 °	-0,3 %	453 rpm	52 rpm	02.07.2018	15:34:02
93	4,892 N.m	-0,2 %	359,00 °	-0,3 %	454 rpm	52 rpm	02.07.2018	15:34:10
94	4,900 N.m	0,0 %	362,50 °	0,7 %	453 rpm	53 rpm	02.07.2018	15:34:17
95	4,898 N.m	0,0 %	362,75 °	0,8 %	454 rpm	50 rpm	02.07.2018	15:34:25
96	4,892 N.m	-0,2 %	362,00 °	0,6 %	453 rpm	52 rpm	02.07.2018	15:34:33
97	4,902 N.m	0,0 %	359,50 °	-0,1 %	455 rpm	50 rpm	02.07.2018	15:34:41
98	4,886 N.m	-0,3 %	356,75 °	-0,9 %	454 rpm	52 rpm	02.07.2018	15:34:48
99	4,902 N.m	0,0 %	360,00 °	0,0 %	454 rpm	50 rpm	02.07.2018	15:34:56
100	4,892 N.m	-0,2 %	358,50 °	-0,4 %	453 rpm	52 rpm	02.07.2018	15:35:04

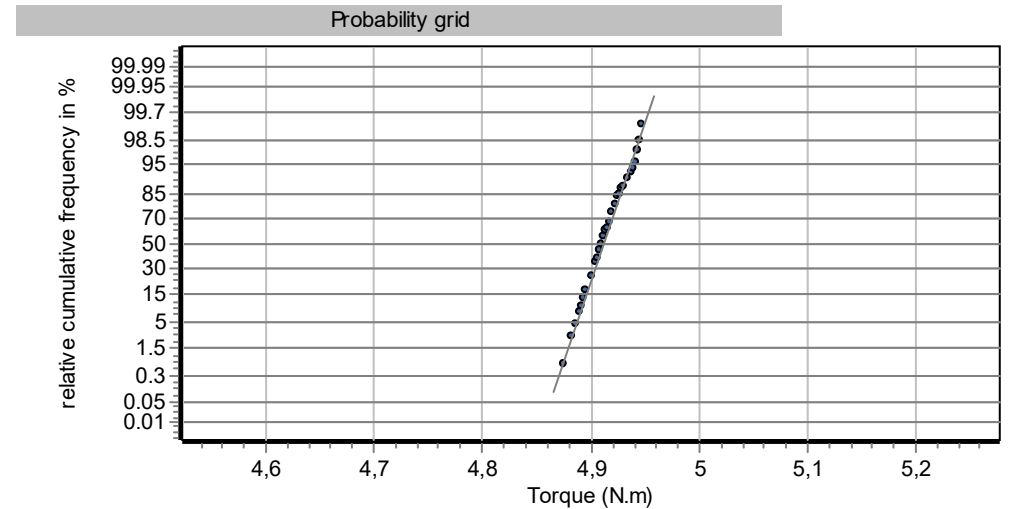
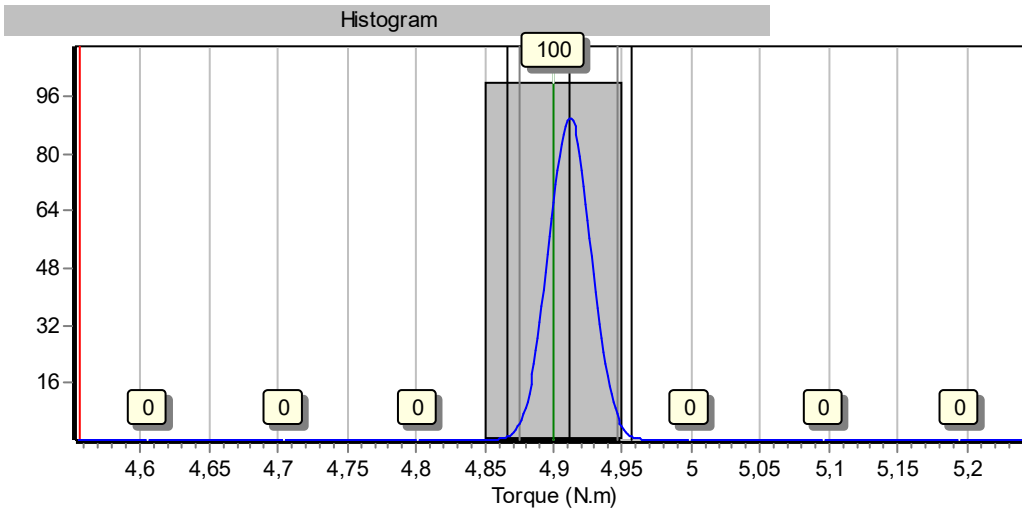
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 30% Screw joint: hard



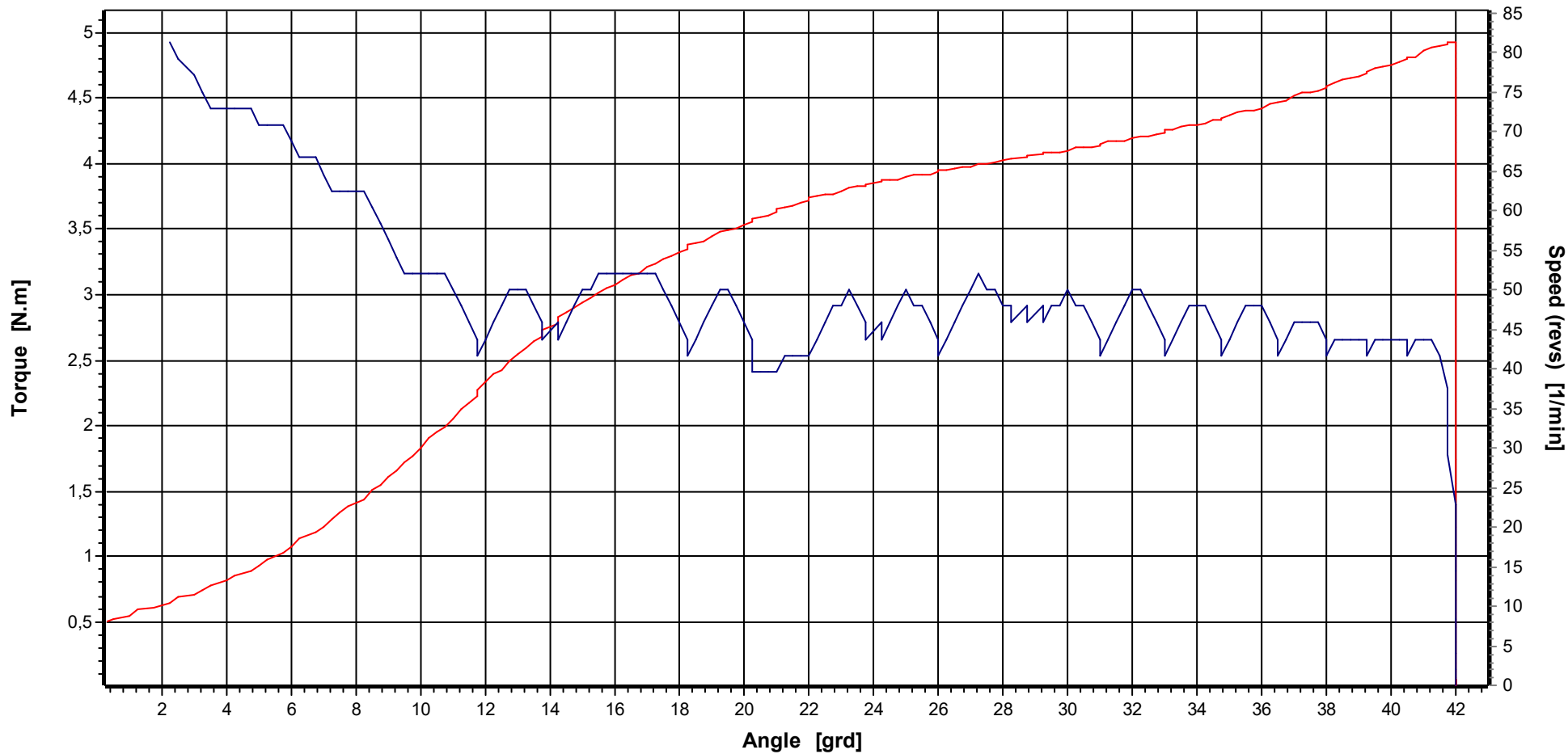
Tester	M.Brkc	
N	100	
Target	4,90	N.m
UL	5,24	N.m
LL	4,56	N.m
Max	4,95	N.m
Min	4,88	N.m
xq	4,9117	N.m
s	0,0151	N.m
Cm	7,578	
Cmk	7,319	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

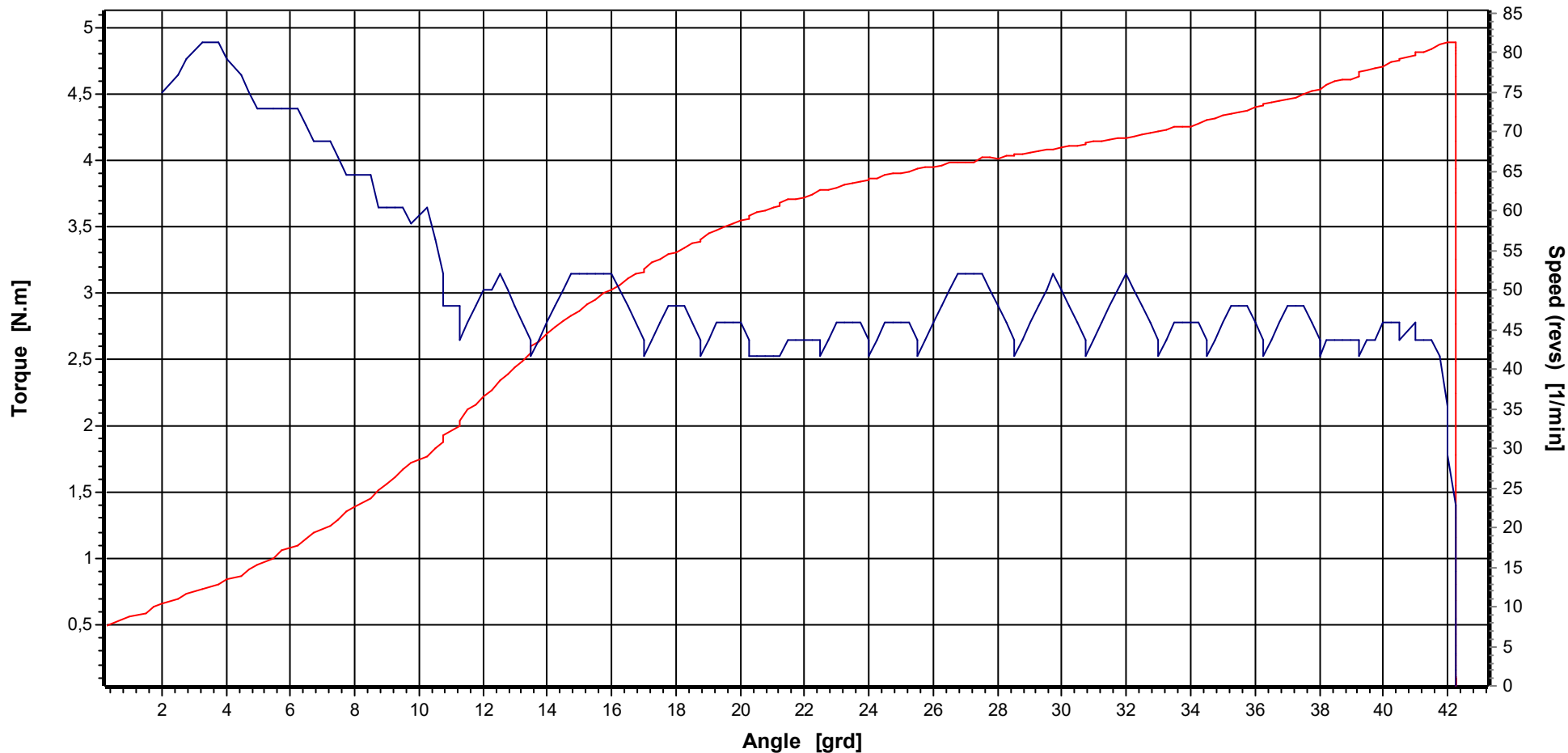


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:44:24
UL	5,24 N.m	Supporting points	798			Date/time measurement	02.07.2018 15:44:24

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

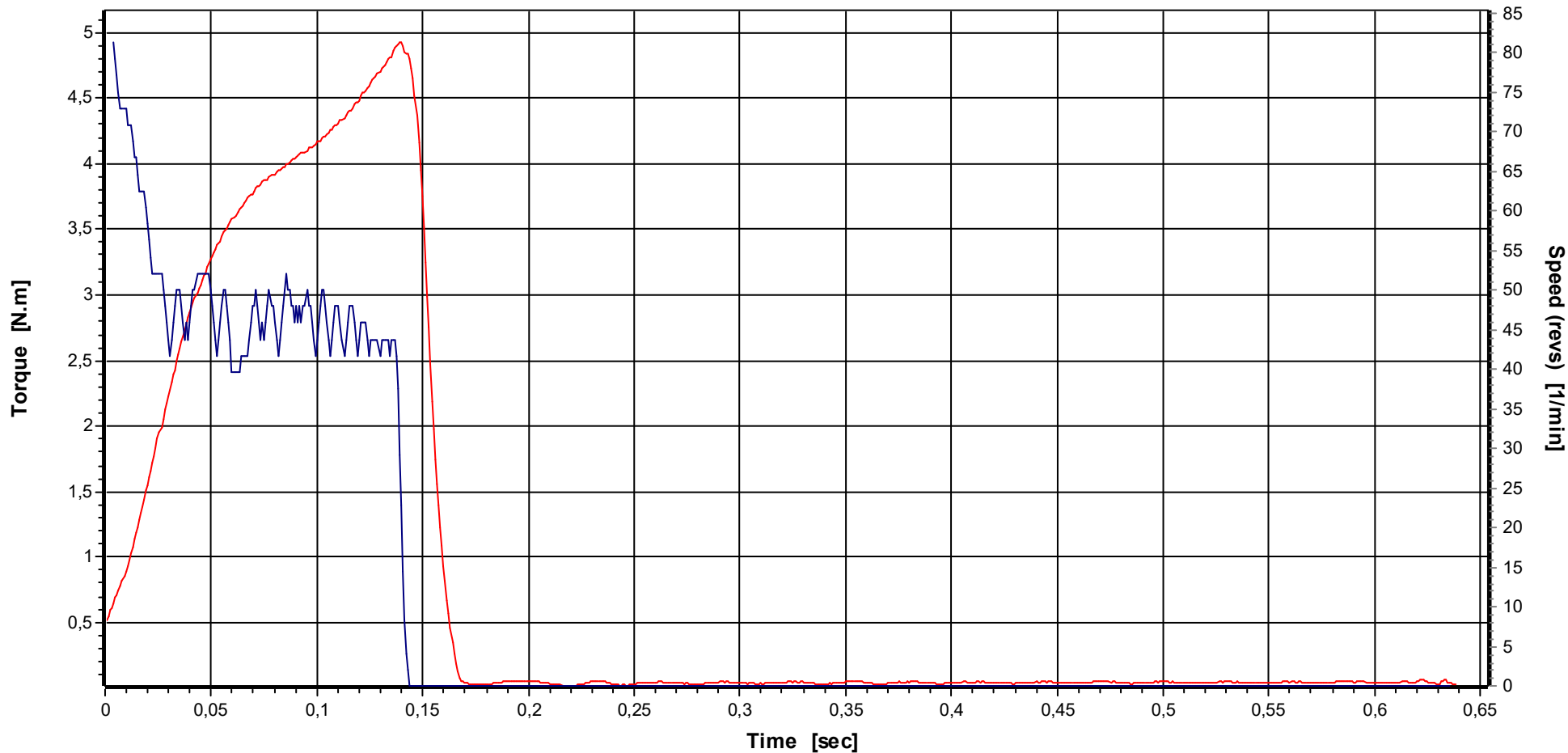


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:44:24
UL	5,24 N.m	Supporting points	799			Date/time measurement	02.07.2018 15:53:19

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

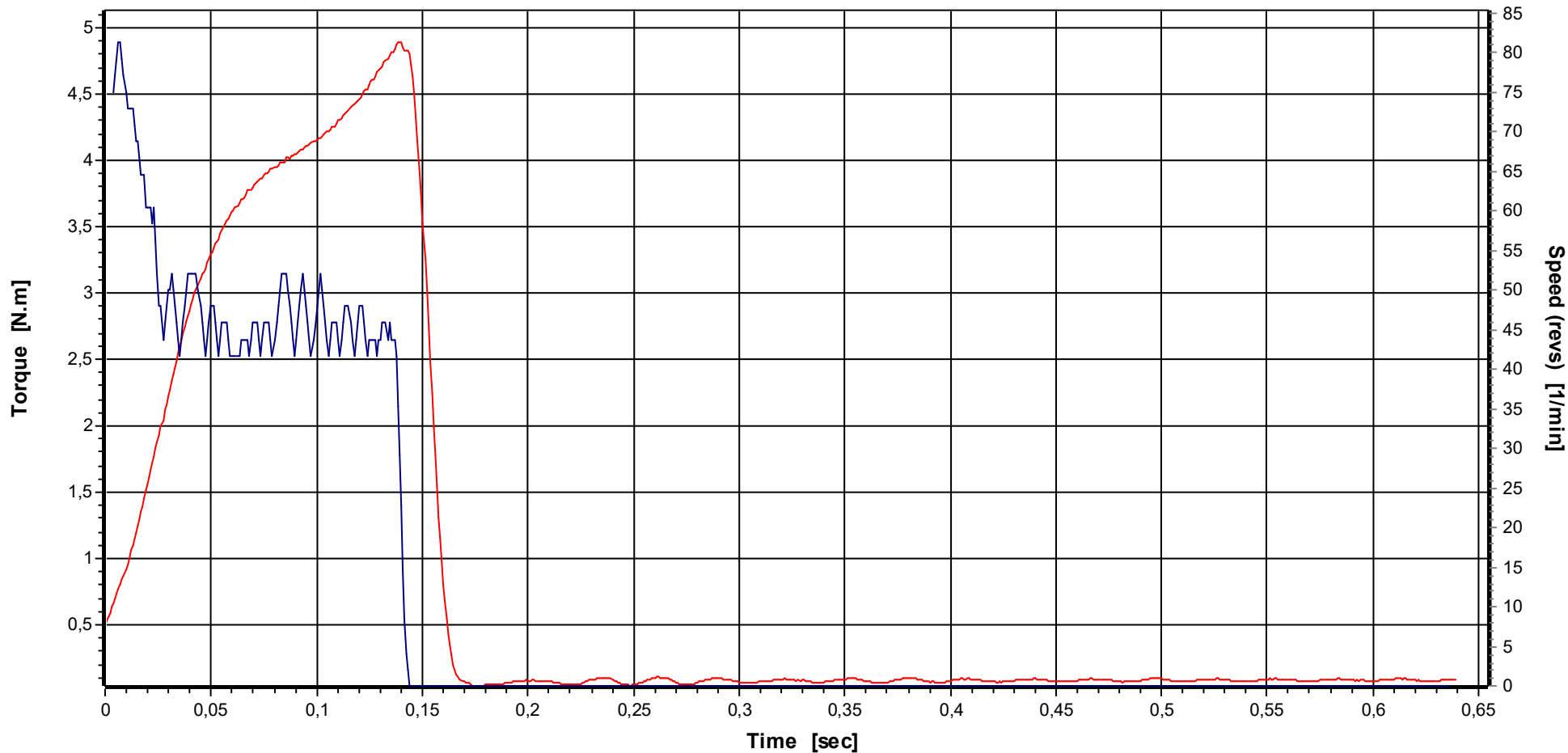


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:44:24
UL	5,24 N.m	Supporting points	798			Date/time measurement	02.07.2018 15:44:24

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 15:44:24
UL	5,24 N.m	Supporting points	799			Date/time measurement	02.07.2018 15:53:19

Date/ Time	02.07.2018 15:44:24	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		
Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		
Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark									
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation	
4,90	4,56	5,24	4,9117	0,0720	0,0151	7,578	7,319	OK	

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,923 N.m	0,5 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:44:24
2	4,904 N.m	0,1 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:44:30
3	4,919 N.m	0,4 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:44:35
4	4,917 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:44:40
5	4,919 N.m	0,4 %	30,50 °	1,7 %	100 rpm	45 rpm	02.07.2018	15:44:46
6	4,912 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:44:51
7	4,923 N.m	0,5 %	30,25 °	0,8 %	100 rpm	45 rpm	02.07.2018	15:44:57
8	4,939 N.m	0,8 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:45:02
9	4,929 N.m	0,6 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:45:08
10	4,896 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:45:13
11	4,892 N.m	-0,2 %	30,00 °	0,0 %	100 rpm	46 rpm	02.07.2018	15:45:18
12	4,914 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:45:24
13	4,912 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	47 rpm	02.07.2018	15:45:29
14	4,910 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:45:34
15	4,904 N.m	0,1 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:45:40
16	4,900 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:45:45
17	4,908 N.m	0,2 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:45:51
18	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:45:56
19	4,882 N.m	-0,4 %	30,00 °	0,0 %	100 rpm	46 rpm	02.07.2018	15:46:02
20	4,904 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:46:07
21	4,923 N.m	0,5 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:46:12
22	4,894 N.m	-0,1 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:46:18
23	4,915 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:46:23
24	4,904 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:46:28
25	4,919 N.m	0,4 %	30,00 °	0,0 %	100 rpm	46 rpm	02.07.2018	15:46:34
26	4,900 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:46:39
27	4,937 N.m	0,8 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:46:45
28	4,935 N.m	0,7 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:46:50
29	4,904 N.m	0,1 %	30,00 °	0,0 %	99 rpm	47 rpm	02.07.2018	15:46:56
30	4,900 N.m	0,0 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:47:01
31	4,919 N.m	0,4 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:47:06
32	4,894 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:47:12
33	4,892 N.m	-0,2 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:47:17
34	4,908 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:47:23
35	4,935 N.m	0,7 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:47:28
36	4,900 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:47:33
37	4,908 N.m	0,2 %	30,00 °	0,0 %	100 rpm	46 rpm	02.07.2018	15:47:39
38	4,886 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:47:44
39	4,931 N.m	0,6 %	30,50 °	1,7 %	99 rpm	47 rpm	02.07.2018	15:47:50
40	4,917 N.m	0,3 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:47:55
41	4,937 N.m	0,8 %	30,00 °	0,0 %	99 rpm	47 rpm	02.07.2018	15:48:00
42	4,906 N.m	0,1 %	30,25 °	0,8 %	99 rpm	46 rpm	02.07.2018	15:48:06
43	4,912 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:48:11
44	4,890 N.m	-0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:48:17
45	4,947 N.m	1,0 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:48:22
46	4,914 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:48:27
47	4,900 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:48:33
48	4,923 N.m	0,5 %	30,50 °	1,7 %	100 rpm	47 rpm	02.07.2018	15:48:38
49	4,917 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:48:44
50	4,914 N.m	0,3 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:48:49

Date/ Time	02.07.2018 15:44:24	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

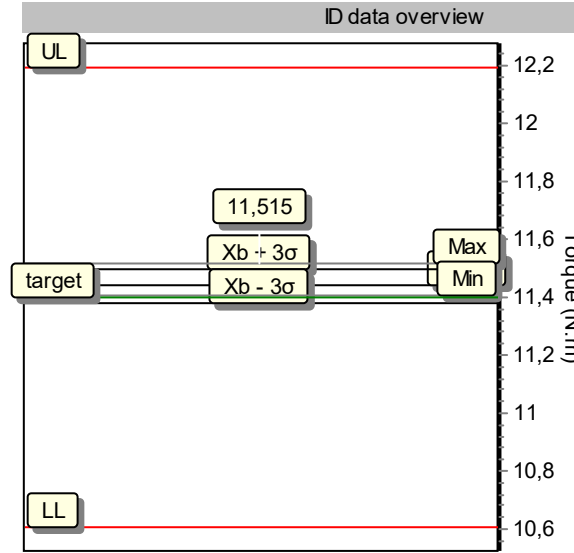
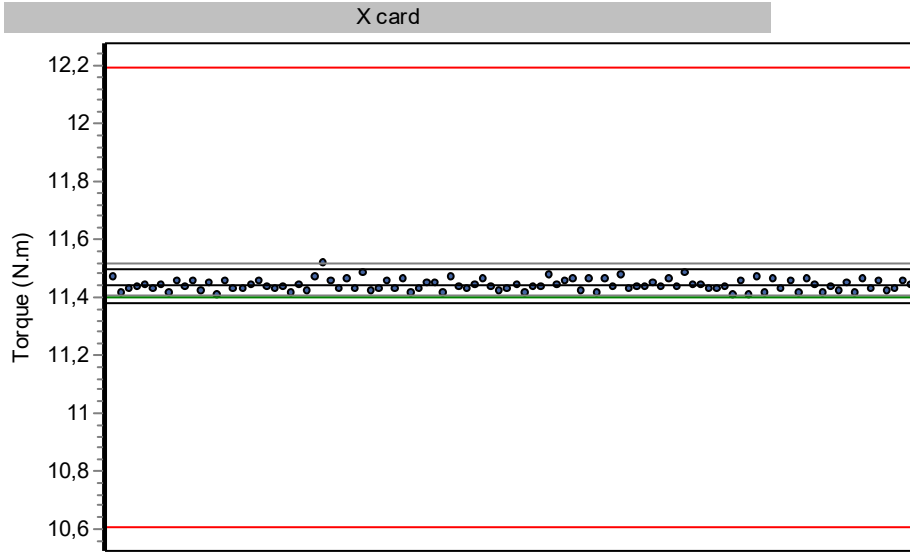
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9117	0,0720	0,0151	7,578	7,319	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,896 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	46 rpm	02.07.2018	15:48:54
52	4,904 N.m	0,1 %	29,25 °	-2,5 %	100 rpm	47 rpm	02.07.2018	15:49:00
53	4,925 N.m	0,5 %	30,25 °	0,8 %	99 rpm	46 rpm	02.07.2018	15:49:05
54	4,927 N.m	0,6 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:49:11
55	4,914 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:49:16
56	4,915 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:49:21
57	4,904 N.m	0,1 %	30,25 °	0,8 %	100 rpm	47 rpm	02.07.2018	15:49:27
58	4,896 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:49:32
59	4,906 N.m	0,1 %	30,50 °	1,7 %	99 rpm	47 rpm	02.07.2018	15:49:38
60	4,875 N.m	-0,5 %	30,25 °	0,8 %	99 rpm	47 rpm	02.07.2018	15:49:43
61	4,904 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:49:48
62	4,900 N.m	0,0 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:49:54
63	4,925 N.m	0,5 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:49:59
64	4,943 N.m	0,9 %	30,25 °	0,8 %	99 rpm	46 rpm	02.07.2018	15:50:04
65	4,917 N.m	0,3 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:50:10
66	4,906 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:50:15
67	4,925 N.m	0,5 %	30,25 °	0,8 %	100 rpm	45 rpm	02.07.2018	15:50:21
68	4,886 N.m	-0,3 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:50:26
69	4,904 N.m	0,1 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:50:32
70	4,882 N.m	-0,4 %	29,00 °	-3,3 %	99 rpm	46 rpm	02.07.2018	15:50:37
71	4,914 N.m	0,3 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:50:42
72	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:50:48
73	4,910 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	47 rpm	02.07.2018	15:50:53
74	4,912 N.m	0,2 %	30,25 °	0,8 %	99 rpm	46 rpm	02.07.2018	15:50:59
75	4,943 N.m	0,9 %	30,00 °	0,0 %	99 rpm	47 rpm	02.07.2018	15:51:04
76	4,935 N.m	0,7 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:51:09
77	4,941 N.m	0,8 %	29,75 °	-0,8 %	99 rpm	47 rpm	02.07.2018	15:51:15
78	4,894 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:51:20
79	4,904 N.m	0,1 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:51:26
80	4,912 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:51:31
81	4,900 N.m	0,0 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:51:36
82	4,925 N.m	0,5 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:51:42
83	4,919 N.m	0,4 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:51:47
84	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	02.07.2018	15:51:53
85	4,910 N.m	0,2 %	30,25 °	0,8 %	99 rpm	47 rpm	02.07.2018	15:51:58
86	4,929 N.m	0,6 %	29,75 °	-0,8 %	99 rpm	47 rpm	02.07.2018	15:52:03
87	4,908 N.m	0,2 %	30,00 °	0,0 %	100 rpm	46 rpm	02.07.2018	15:52:09
88	4,919 N.m	0,4 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:52:14
89	4,896 N.m	-0,1 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:52:20
90	4,890 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	47 rpm	02.07.2018	15:52:25
91	4,912 N.m	0,2 %	30,50 °	1,7 %	100 rpm	46 rpm	02.07.2018	15:52:30
92	4,910 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:52:36
93	4,910 N.m	0,2 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:52:41
94	4,923 N.m	0,5 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:52:47
95	4,910 N.m	0,2 %	30,00 °	0,0 %	99 rpm	46 rpm	02.07.2018	15:52:52
96	4,900 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	46 rpm	02.07.2018	15:52:57
97	4,925 N.m	0,5 %	30,00 °	0,0 %	100 rpm	47 rpm	02.07.2018	15:53:03
98	4,919 N.m	0,4 %	30,25 °	0,8 %	100 rpm	46 rpm	02.07.2018	15:53:08
99	4,945 N.m	0,9 %	30,25 °	0,8 %	99 rpm	47 rpm	02.07.2018	15:53:14
100	4,890 N.m	-0,2 %	29,25 °	-2,5 %	99 rpm	46 rpm	02.07.2018	15:53:19

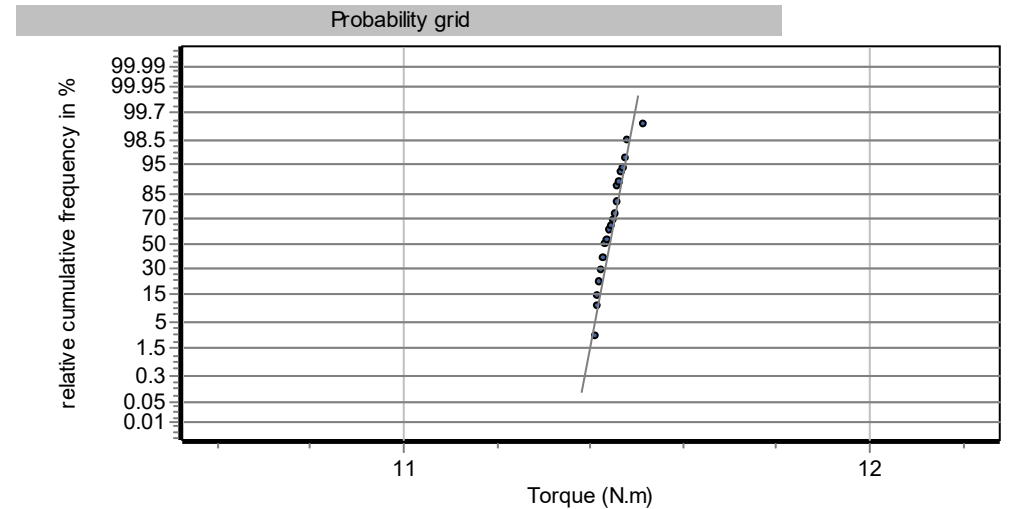
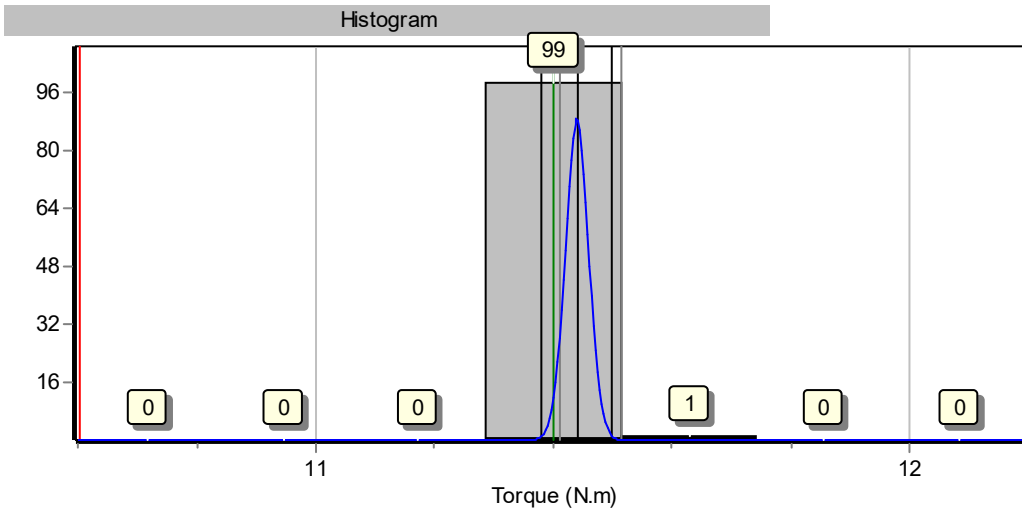
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 80% Screw joint: soft



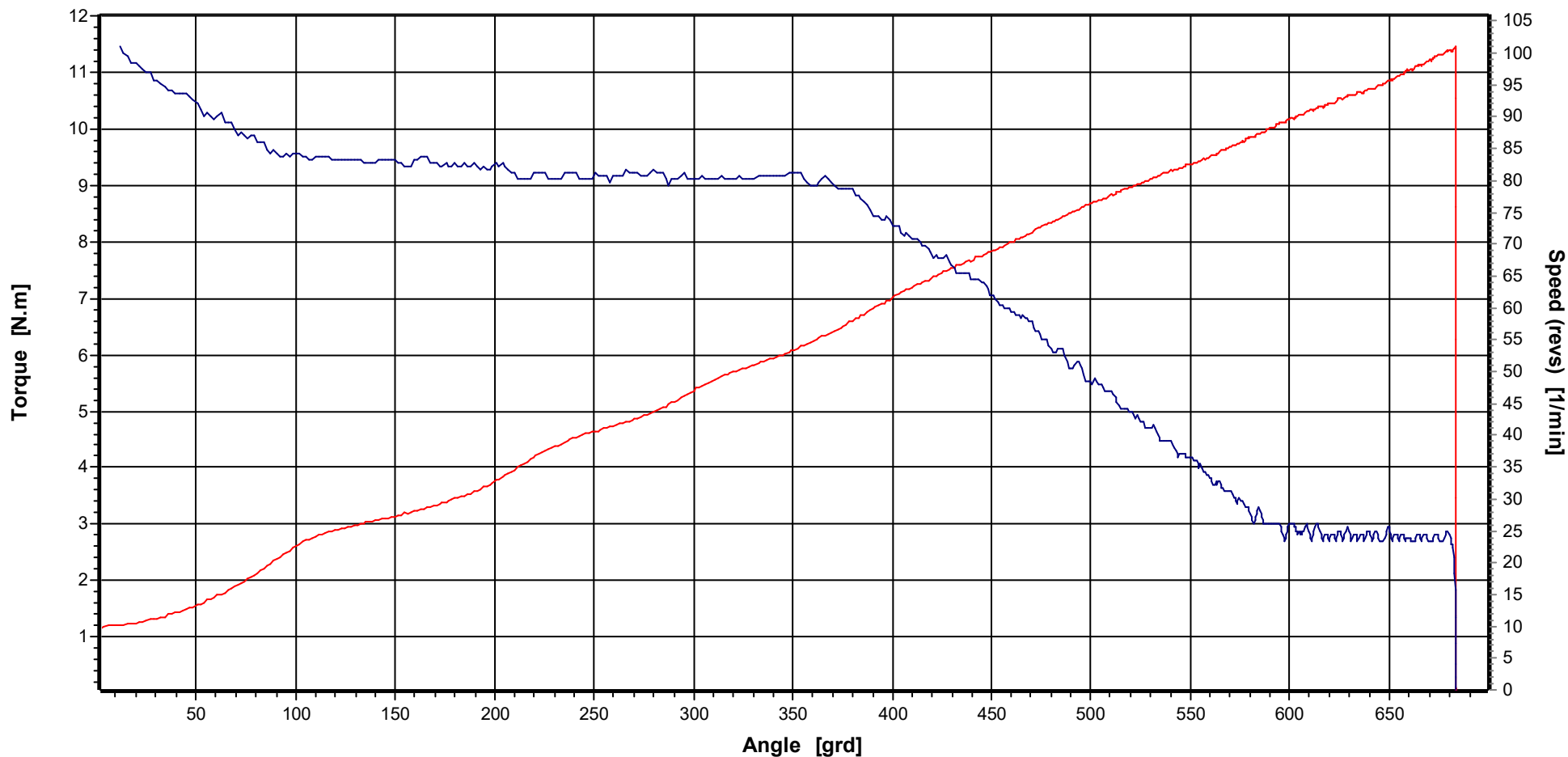
Tester	M.Brkcic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,52	N.m
Min	11,41	N.m
xq	11,4394	N.m
s	0,0196	N.m
Cm	13,543	
Cmk	12,874	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

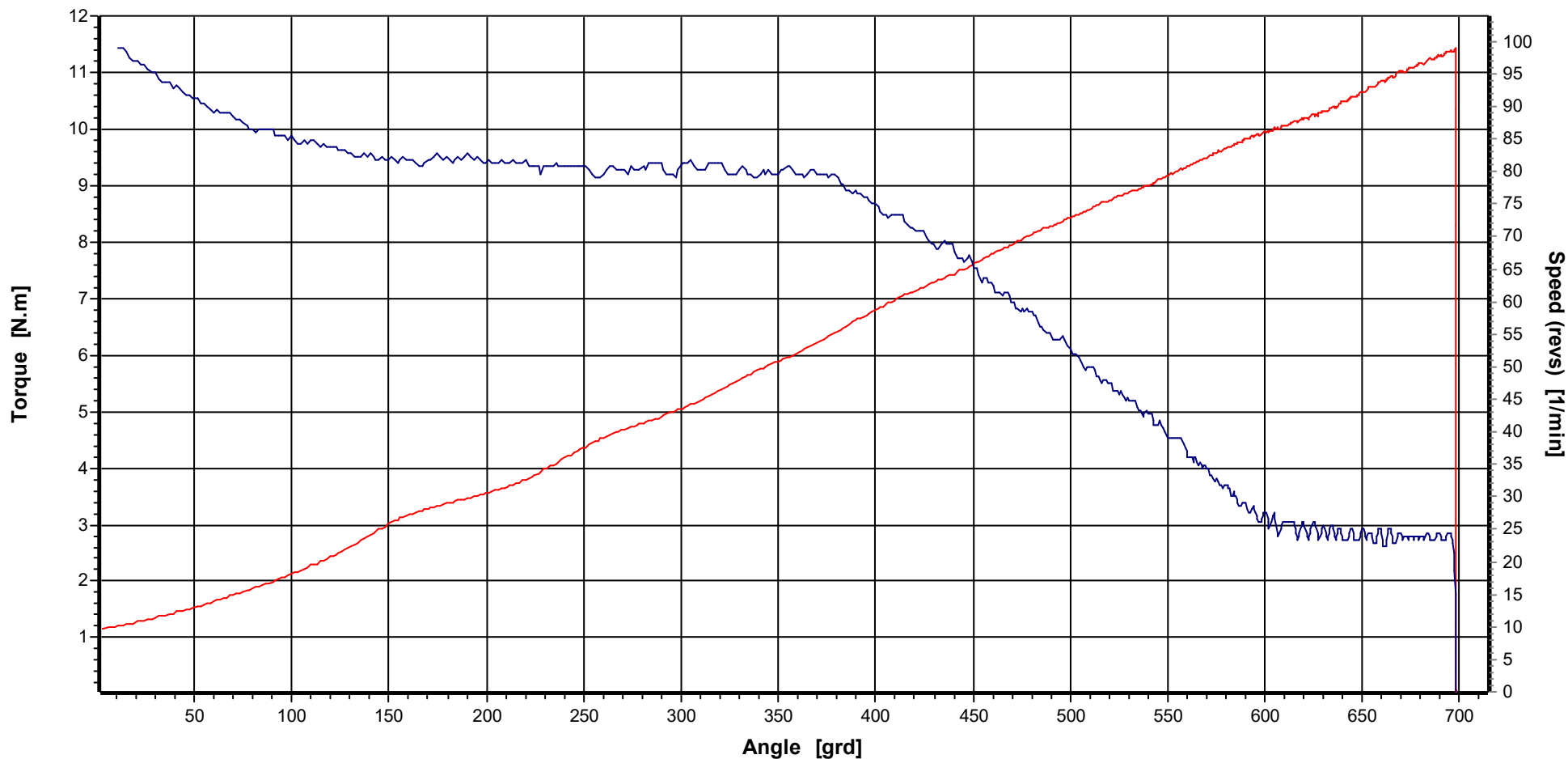


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 09:16:52
UL	12,20 N.m	Supporting points	820			Date/time measurement	02.07.2018 09:16:52

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

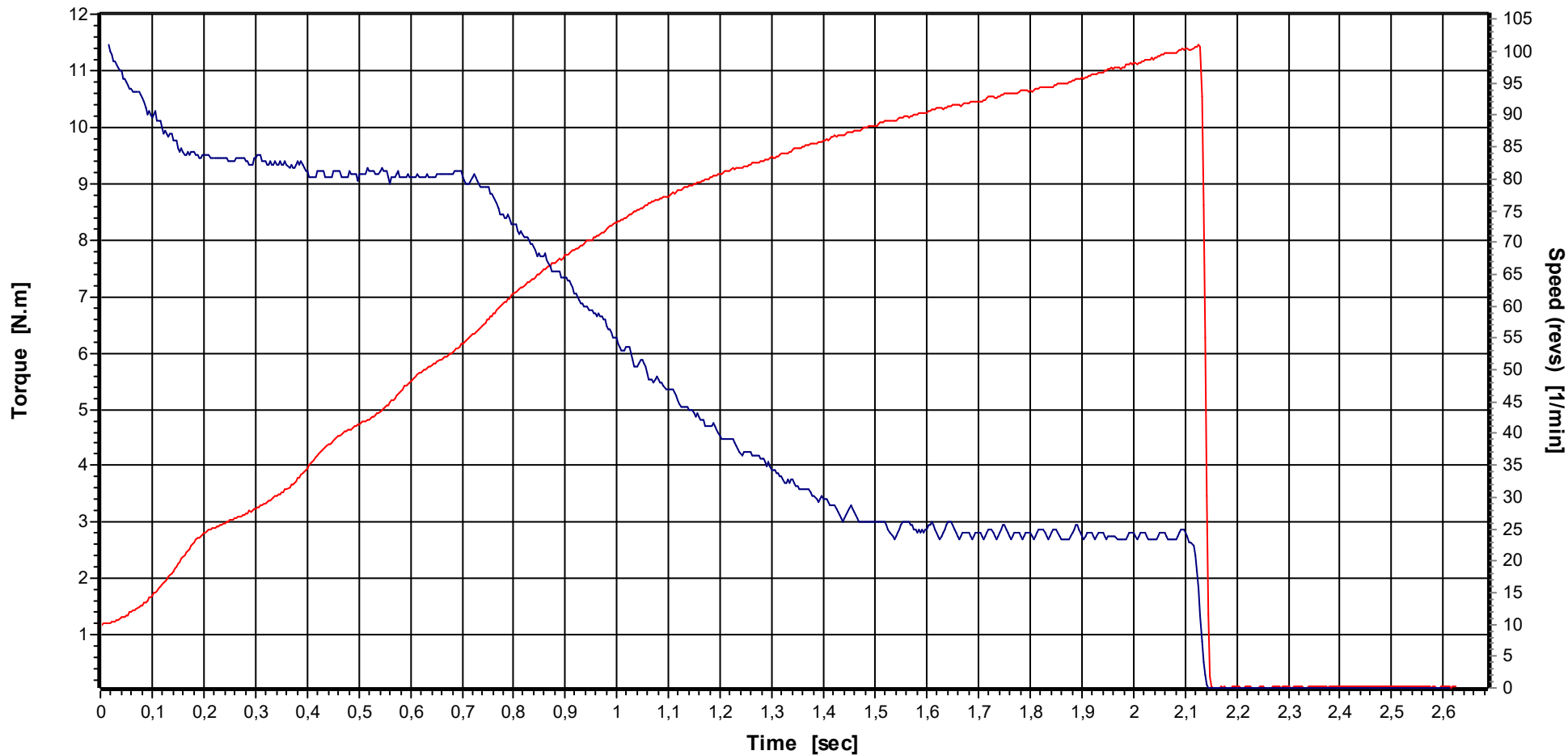


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 09:16:52
UL	12,20 N.m	Supporting points	833			Date/time measurement	02.07.2018 09:49:02

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

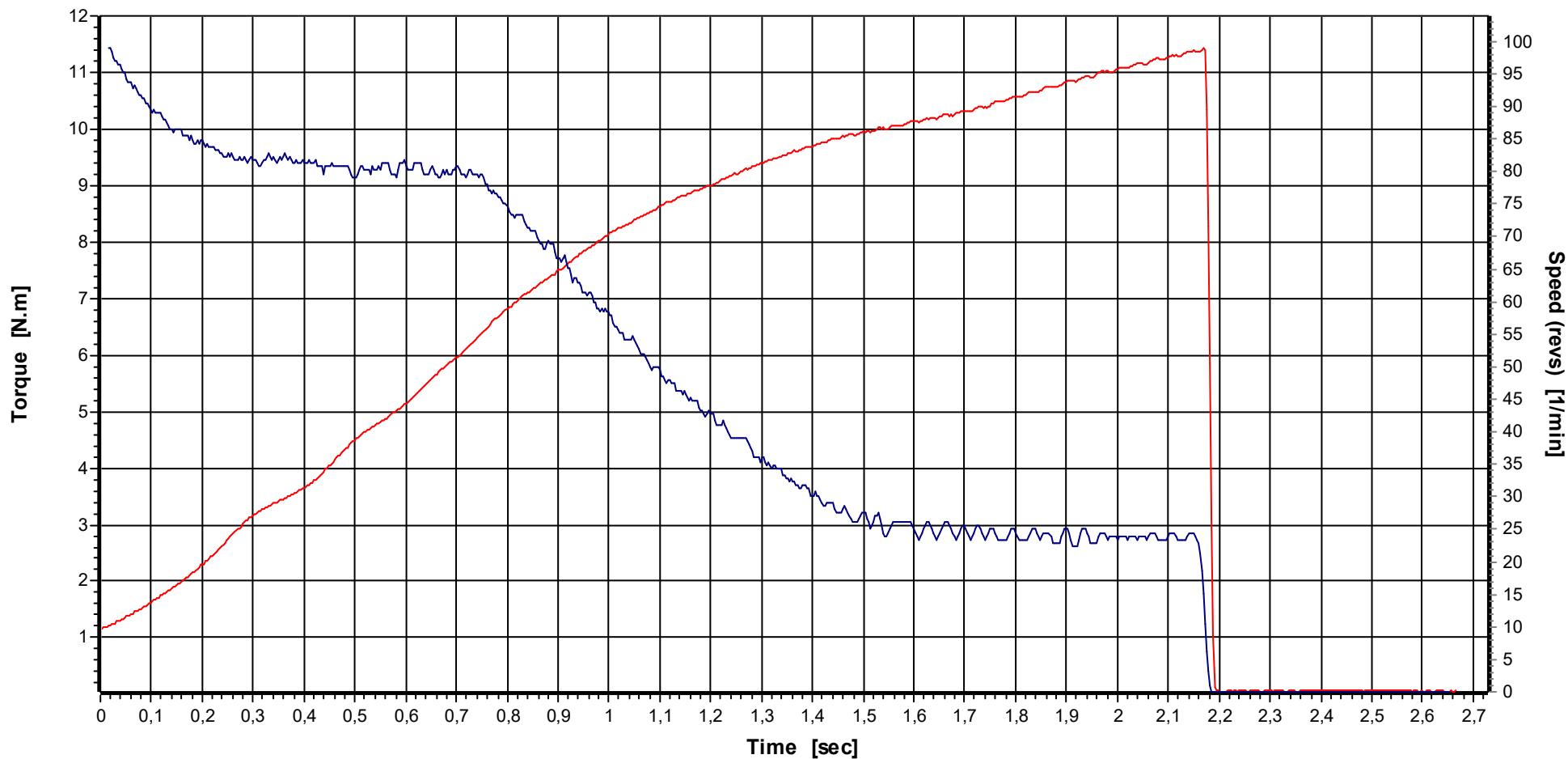


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 09:16:52
UL	12,20 N.m	Supporting points	820			Date/time measurement	02.07.2018 09:16:52

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 09:16:52
UL	12,20 N.m	Supporting points	833			Date/time measurement	02.07.2018 09:49:02

Date/ Time	02.07.2018 09:16:52	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4394	0,1060	0,0196	13,543	12,874	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,468 N.m	0,6 %	363,25 °	0,9 %	453 rpm	46 rpm	02.07.2018	09:16:52
2	11,413 N.m	0,1 %	360,75 °	0,2 %	452 rpm	47 rpm	02.07.2018	09:17:12
3	11,429 N.m	0,3 %	363,00 °	0,8 %	453 rpm	45 rpm	02.07.2018	09:17:31
4	11,433 N.m	0,3 %	360,75 °	0,2 %	453 rpm	47 rpm	02.07.2018	09:17:50
5	11,441 N.m	0,4 %	363,00 °	0,8 %	452 rpm	46 rpm	02.07.2018	09:18:10
6	11,425 N.m	0,2 %	361,25 °	0,3 %	453 rpm	46 rpm	02.07.2018	09:18:29
7	11,441 N.m	0,4 %	363,75 °	1,0 %	453 rpm	46 rpm	02.07.2018	09:18:49
8	11,417 N.m	0,1 %	360,50 °	0,1 %	452 rpm	47 rpm	02.07.2018	09:19:08
9	11,452 N.m	0,5 %	363,00 °	0,8 %	453 rpm	45 rpm	02.07.2018	09:19:28
10	11,433 N.m	0,3 %	365,00 °	1,4 %	453 rpm	47 rpm	02.07.2018	09:19:47
11	11,456 N.m	0,5 %	367,25 °	2,0 %	452 rpm	46 rpm	02.07.2018	09:20:07
12	11,421 N.m	0,2 %	360,75 °	0,2 %	453 rpm	47 rpm	02.07.2018	09:20:26
13	11,448 N.m	0,4 %	366,25 °	1,7 %	452 rpm	46 rpm	02.07.2018	09:20:46
14	11,409 N.m	0,1 %	363,50 °	1,0 %	453 rpm	47 rpm	02.07.2018	09:21:05
15	11,456 N.m	0,5 %	364,75 °	1,3 %	453 rpm	45 rpm	02.07.2018	09:21:25
16	11,429 N.m	0,3 %	364,50 °	1,3 %	452 rpm	47 rpm	02.07.2018	09:21:44
17	11,425 N.m	0,2 %	361,50 °	0,4 %	454 rpm	45 rpm	02.07.2018	09:22:04
18	11,444 N.m	0,4 %	362,75 °	0,8 %	452 rpm	46 rpm	02.07.2018	09:22:23
19	11,452 N.m	0,5 %	364,50 °	1,3 %	452 rpm	45 rpm	02.07.2018	09:22:43
20	11,437 N.m	0,3 %	364,75 °	1,3 %	453 rpm	47 rpm	02.07.2018	09:23:02
21	11,425 N.m	0,2 %	362,00 °	0,6 %	453 rpm	45 rpm	02.07.2018	09:23:22
22	11,437 N.m	0,3 %	363,25 °	0,9 %	453 rpm	46 rpm	02.07.2018	09:23:41
23	11,413 N.m	0,1 %	359,00 °	-0,3 %	454 rpm	46 rpm	02.07.2018	09:24:01
24	11,444 N.m	0,4 %	363,25 °	0,9 %	453 rpm	46 rpm	02.07.2018	09:24:20
25	11,421 N.m	0,2 %	360,25 °	0,1 %	453 rpm	46 rpm	02.07.2018	09:24:40
26	11,468 N.m	0,6 %	371,00 °	3,1 %	453 rpm	46 rpm	02.07.2018	09:24:59
27	11,515 N.m	1,0 %	363,50 °	1,0 %	453 rpm	47 rpm	02.07.2018	09:25:19
28	11,456 N.m	0,5 %	371,75 °	3,3 %	452 rpm	46 rpm	02.07.2018	09:25:38
29	11,425 N.m	0,2 %	364,75 °	1,3 %	453 rpm	47 rpm	02.07.2018	09:25:58
30	11,460 N.m	0,5 %	360,25 °	0,1 %	453 rpm	46 rpm	02.07.2018	09:26:17
31	11,429 N.m	0,3 %	357,50 °	-0,7 %	452 rpm	46 rpm	02.07.2018	09:26:37
32	11,480 N.m	0,7 %	359,75 °	-0,1 %	453 rpm	46 rpm	02.07.2018	09:26:57
33	11,421 N.m	0,2 %	356,00 °	-1,1 %	453 rpm	46 rpm	02.07.2018	09:27:16
34	11,425 N.m	0,2 %	358,00 °	-0,6 %	452 rpm	46 rpm	02.07.2018	09:27:36
35	11,456 N.m	0,5 %	358,50 °	-0,4 %	453 rpm	45 rpm	02.07.2018	09:27:55
36	11,429 N.m	0,3 %	356,75 °	-0,9 %	453 rpm	46 rpm	02.07.2018	09:28:14
37	11,460 N.m	0,5 %	364,25 °	1,2 %	452 rpm	46 rpm	02.07.2018	09:28:34
38	11,417 N.m	0,1 %	359,50 °	-0,1 %	453 rpm	47 rpm	02.07.2018	09:28:53
39	11,429 N.m	0,3 %	357,25 °	-0,8 %	453 rpm	45 rpm	02.07.2018	09:29:13
40	11,448 N.m	0,4 %	360,25 °	0,1 %	453 rpm	47 rpm	02.07.2018	09:29:33
41	11,448 N.m	0,4 %	360,25 °	0,1 %	453 rpm	46 rpm	02.07.2018	09:29:52
42	11,413 N.m	0,1 %	359,25 °	-0,2 %	453 rpm	47 rpm	02.07.2018	09:30:11
43	11,472 N.m	0,6 %	364,75 °	1,3 %	452 rpm	46 rpm	02.07.2018	09:30:31
44	11,433 N.m	0,3 %	358,25 °	-0,5 %	452 rpm	45 rpm	02.07.2018	09:30:50
45	11,425 N.m	0,2 %	355,75 °	-1,2 %	453 rpm	47 rpm	02.07.2018	09:31:10
46	11,441 N.m	0,4 %	357,75 °	-0,6 %	454 rpm	45 rpm	02.07.2018	09:31:29
47	11,464 N.m	0,6 %	361,50 °	0,4 %	453 rpm	46 rpm	02.07.2018	09:31:49
48	11,437 N.m	0,3 %	356,50 °	-1,0 %	453 rpm	45 rpm	02.07.2018	09:32:08
49	11,421 N.m	0,2 %	359,00 °	-0,3 %	453 rpm	46 rpm	02.07.2018	09:32:28
50	11,429 N.m	0,3 %	357,25 °	-0,8 %	453 rpm	45 rpm	02.07.2018	09:32:47

Date/ Time	02.07.2018 09:16:52	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

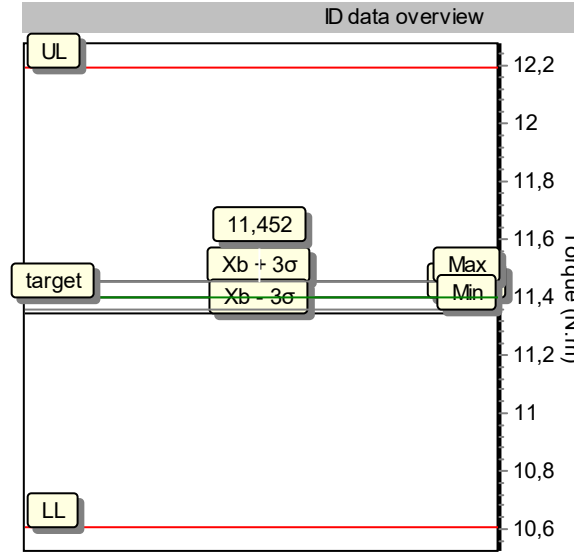
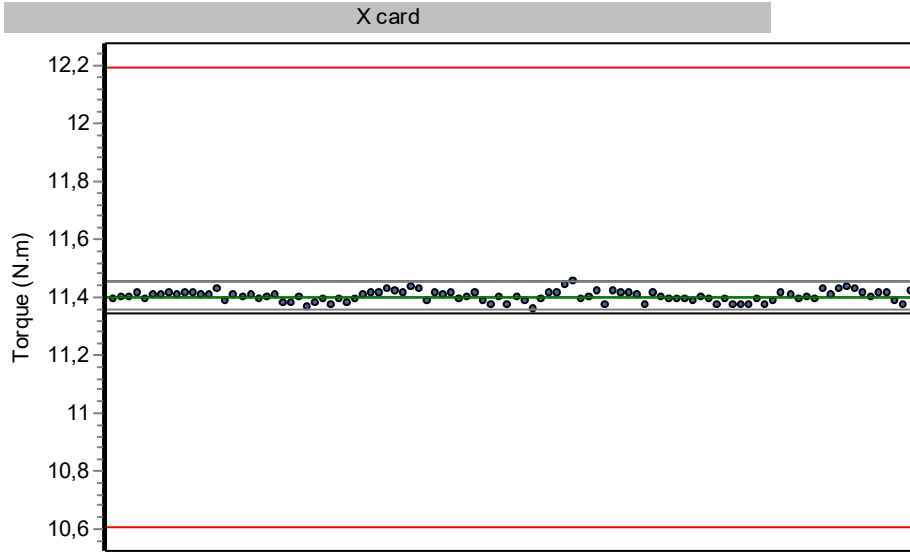
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4394	0,1060	0,0196	13,543	12,874	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,444 N.m	0,4 %	359,75 °	-0,1 %	453 rpm	46 rpm	02.07.2018	09:33:07
52	11,417 N.m	0,1 %	358,50 °	-0,4 %	454 rpm	47 rpm	02.07.2018	09:33:26
53	11,433 N.m	0,3 %	357,00 °	-0,8 %	452 rpm	46 rpm	02.07.2018	09:33:46
54	11,433 N.m	0,3 %	357,00 °	-0,8 %	453 rpm	45 rpm	02.07.2018	09:34:05
55	11,476 N.m	0,7 %	364,00 °	1,1 %	454 rpm	46 rpm	02.07.2018	09:34:25
56	11,441 N.m	0,4 %	358,25 °	-0,5 %	453 rpm	45 rpm	02.07.2018	09:34:44
57	11,452 N.m	0,5 %	359,00 °	-0,3 %	453 rpm	46 rpm	02.07.2018	09:35:04
58	11,460 N.m	0,5 %	359,00 °	-0,3 %	453 rpm	45 rpm	02.07.2018	09:35:23
59	11,421 N.m	0,2 %	356,50 °	-1,0 %	454 rpm	46 rpm	02.07.2018	09:35:43
60	11,464 N.m	0,6 %	364,00 °	1,1 %	453 rpm	46 rpm	02.07.2018	09:36:02
61	11,413 N.m	0,1 %	360,00 °	0,0 %	453 rpm	47 rpm	02.07.2018	09:36:22
62	11,460 N.m	0,5 %	362,75 °	0,8 %	454 rpm	46 rpm	02.07.2018	09:36:41
63	11,433 N.m	0,3 %	361,25 °	0,3 %	453 rpm	47 rpm	02.07.2018	09:37:01
64	11,476 N.m	0,7 %	363,00 °	0,8 %	453 rpm	46 rpm	02.07.2018	09:37:20
65	11,425 N.m	0,2 %	360,00 °	0,0 %	453 rpm	45 rpm	02.07.2018	09:37:40
66	11,433 N.m	0,3 %	358,75 °	-0,3 %	453 rpm	46 rpm	02.07.2018	09:37:59
67	11,433 N.m	0,3 %	360,50 °	0,1 %	453 rpm	45 rpm	02.07.2018	09:38:19
68	11,448 N.m	0,4 %	360,25 °	0,1 %	453 rpm	46 rpm	02.07.2018	09:38:38
69	11,433 N.m	0,3 %	358,50 °	-0,4 %	454 rpm	45 rpm	02.07.2018	09:38:58
70	11,460 N.m	0,5 %	362,25 °	0,6 %	453 rpm	46 rpm	02.07.2018	09:39:17
71	11,433 N.m	0,3 %	359,75 °	-0,1 %	453 rpm	45 rpm	02.07.2018	09:39:37
72	11,480 N.m	0,7 %	362,00 °	0,6 %	454 rpm	46 rpm	02.07.2018	09:39:56
73	11,444 N.m	0,4 %	359,00 °	-0,3 %	453 rpm	45 rpm	02.07.2018	09:40:16
74	11,441 N.m	0,4 %	358,50 °	-0,4 %	454 rpm	46 rpm	02.07.2018	09:40:35
75	11,429 N.m	0,3 %	358,00 °	-0,6 %	454 rpm	45 rpm	02.07.2018	09:40:55
76	11,429 N.m	0,3 %	359,75 °	-0,1 %	453 rpm	46 rpm	02.07.2018	09:41:14
77	11,433 N.m	0,3 %	360,75 °	0,2 %	454 rpm	45 rpm	02.07.2018	09:41:34
78	11,409 N.m	0,1 %	359,75 °	-0,1 %	453 rpm	47 rpm	02.07.2018	09:41:53
79	11,456 N.m	0,5 %	366,25 °	1,7 %	454 rpm	46 rpm	02.07.2018	09:42:13
80	11,409 N.m	0,1 %	358,75 °	-0,3 %	454 rpm	47 rpm	02.07.2018	09:42:32
81	11,468 N.m	0,6 %	362,75 °	0,8 %	454 rpm	46 rpm	02.07.2018	09:42:52
82	11,413 N.m	0,1 %	359,25 °	-0,2 %	454 rpm	47 rpm	02.07.2018	09:43:11
83	11,460 N.m	0,5 %	361,25 °	0,3 %	454 rpm	46 rpm	02.07.2018	09:43:31
84	11,429 N.m	0,3 %	360,25 °	0,1 %	453 rpm	45 rpm	02.07.2018	09:43:50
85	11,452 N.m	0,5 %	359,00 °	-0,3 %	454 rpm	46 rpm	02.07.2018	09:44:10
86	11,413 N.m	0,1 %	358,25 °	-0,5 %	454 rpm	47 rpm	02.07.2018	09:44:29
87	11,460 N.m	0,5 %	359,00 °	-0,3 %	454 rpm	46 rpm	02.07.2018	09:44:49
88	11,441 N.m	0,4 %	360,75 °	0,2 %	454 rpm	45 rpm	02.07.2018	09:45:08
89	11,417 N.m	0,1 %	358,50 °	-0,4 %	453 rpm	46 rpm	02.07.2018	09:45:28
90	11,437 N.m	0,3 %	361,75 °	0,5 %	454 rpm	45 rpm	02.07.2018	09:45:47
91	11,421 N.m	0,2 %	357,75 °	-0,6 %	453 rpm	47 rpm	02.07.2018	09:46:07
92	11,448 N.m	0,4 %	361,50 °	0,4 %	455 rpm	46 rpm	02.07.2018	09:46:26
93	11,413 N.m	0,1 %	358,50 °	-0,4 %	453 rpm	46 rpm	02.07.2018	09:46:46
94	11,460 N.m	0,5 %	361,75 °	0,5 %	453 rpm	45 rpm	02.07.2018	09:47:05
95	11,425 N.m	0,2 %	362,00 °	0,6 %	454 rpm	47 rpm	02.07.2018	09:47:25
96	11,456 N.m	0,5 %	360,75 °	0,2 %	453 rpm	46 rpm	02.07.2018	09:47:44
97	11,421 N.m	0,2 %	360,75 °	0,2 %	453 rpm	45 rpm	02.07.2018	09:48:04
98	11,425 N.m	0,2 %	360,00 °	0,0 %	454 rpm	47 rpm	02.07.2018	09:48:23
99	11,456 N.m	0,5 %	360,25 °	0,1 %	453 rpm	46 rpm	02.07.2018	09:48:43
100	11,441 N.m	0,4 %	361,00 °	0,3 %	454 rpm	45 rpm	02.07.2018	09:49:02

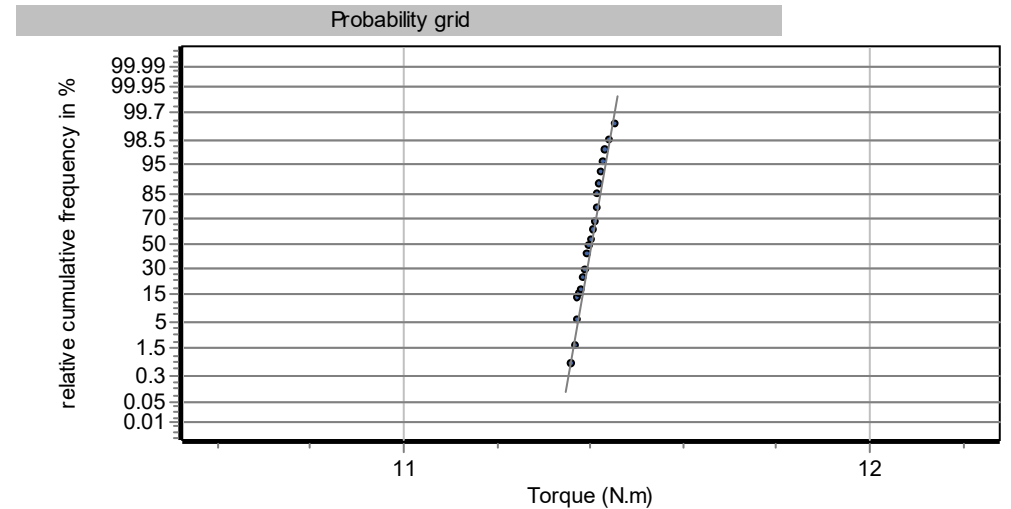
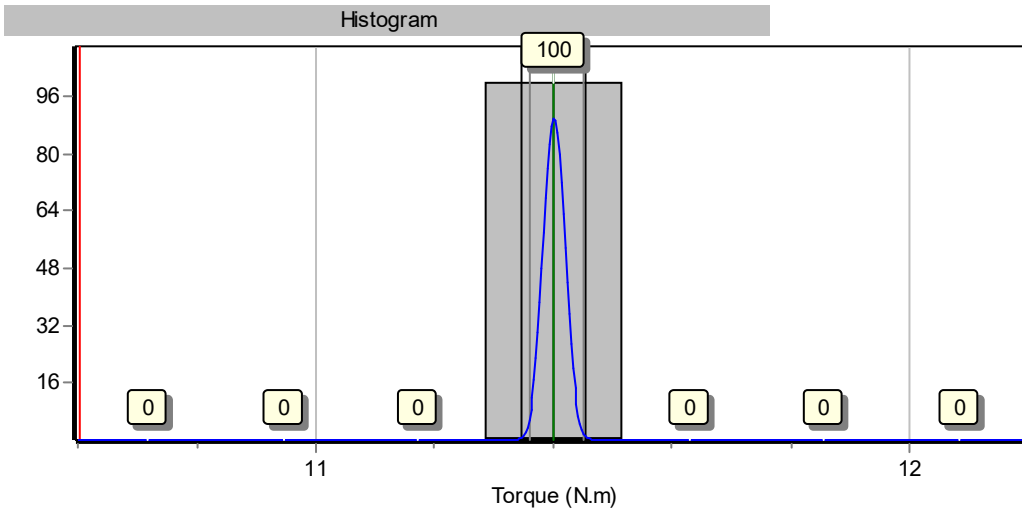
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 80% Screw joint: hard



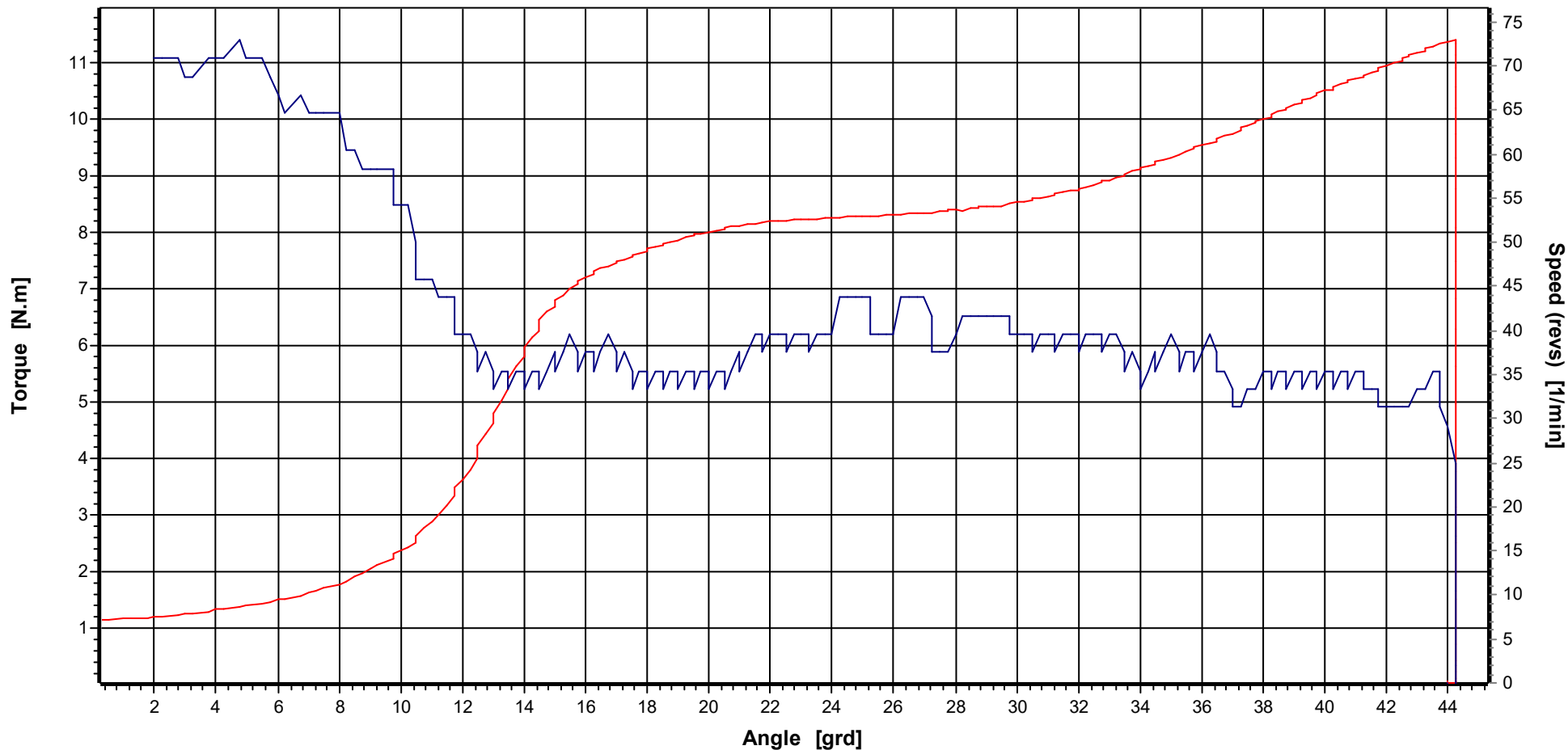
Tester	M.Brkcic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,45	N.m
Min	11,36	N.m
xq	11,4009	N.m
s	0,0181	N.m
Cm	14,703	
Cmk	14,687	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

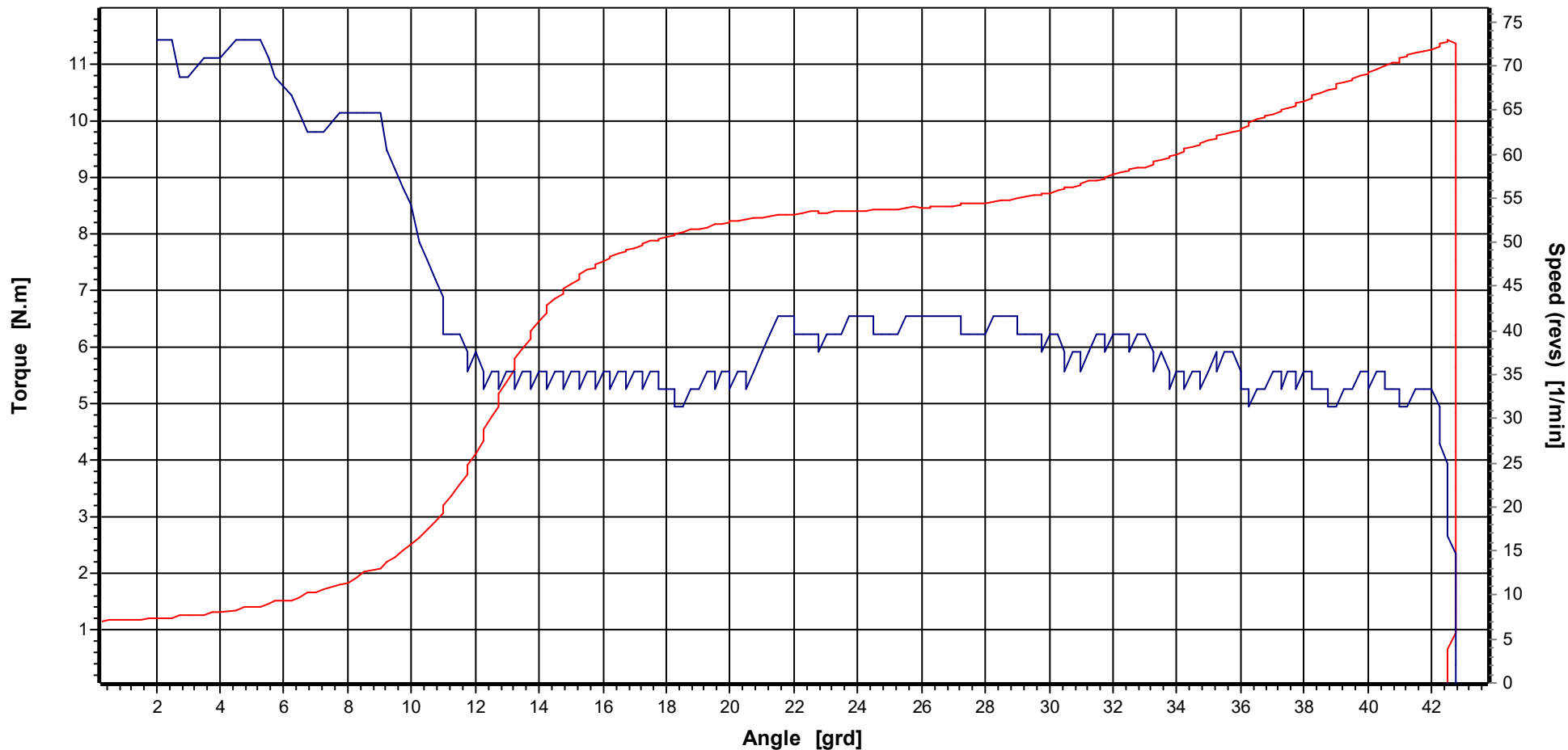


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 10:49:44
UL	12,20 N.m	Supporting points	887			Date/time measurement	02.07.2018 10:49:44

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

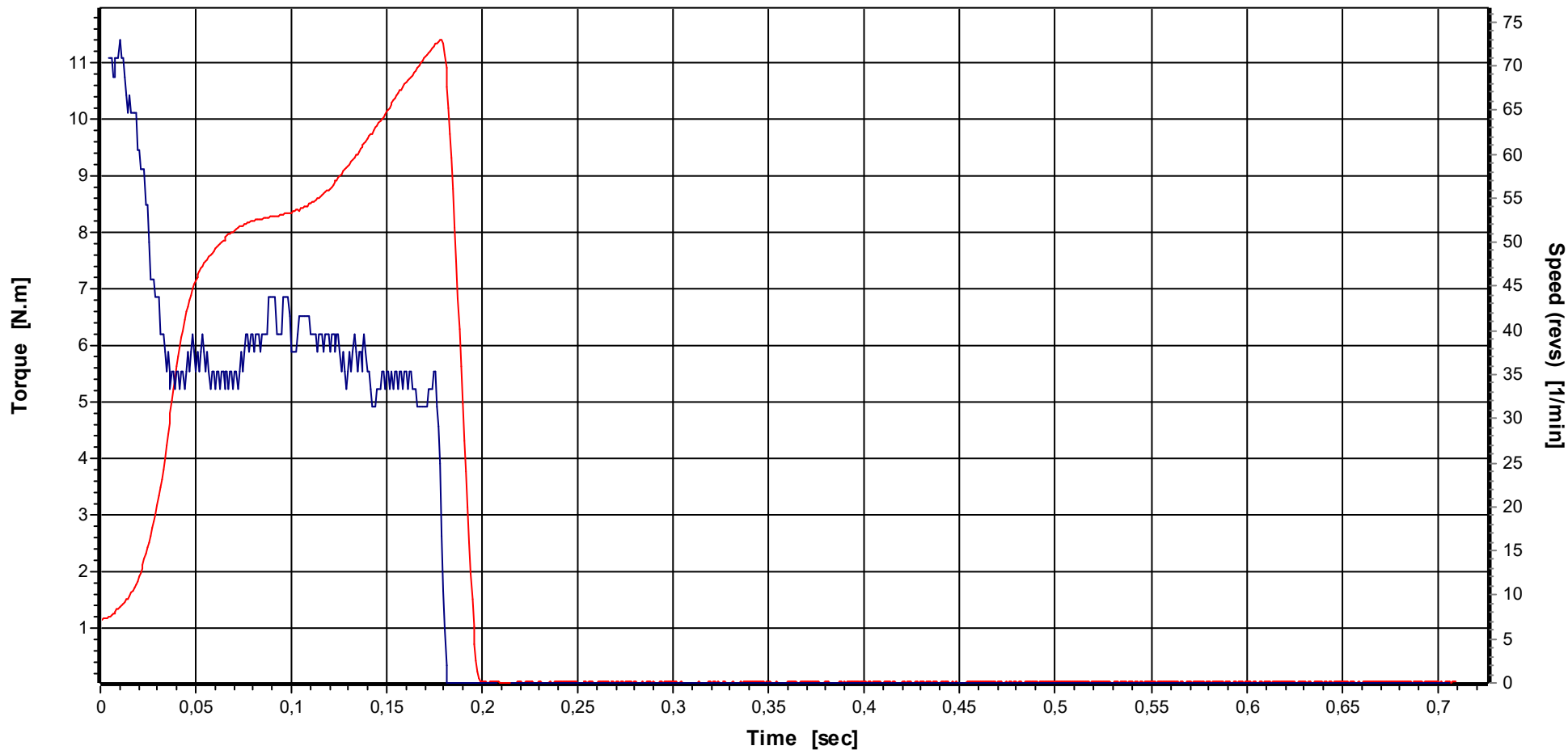


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 10:49:44
UL	12,20 N.m	Supporting points	862			Date/time measurement	02.07.2018 11:21:54

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

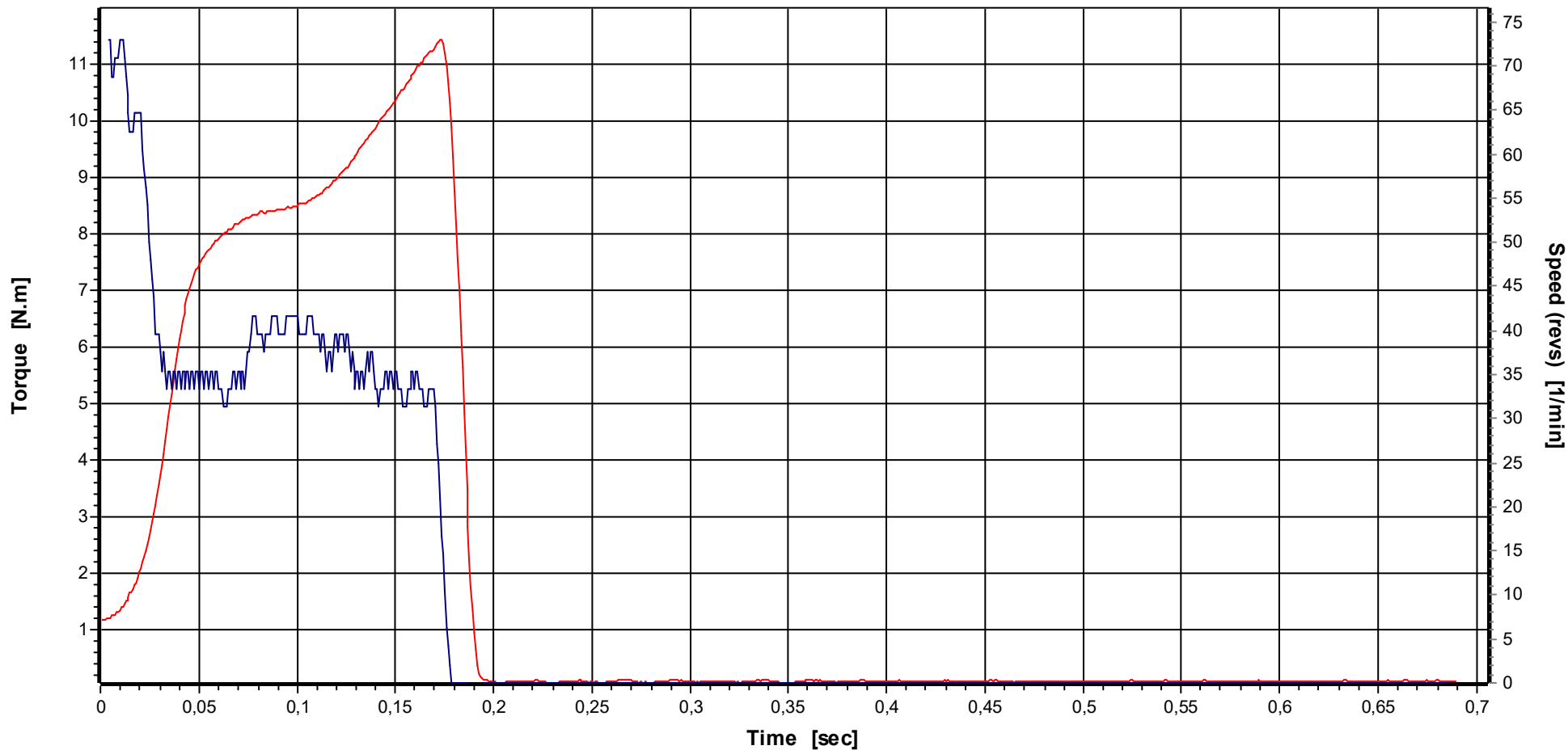


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 10:49:44
UL	12,20 N.m	Supporting points	887			Date/time measurement	02.07.2018 10:49:44

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 10:49:44
UL	12,20 N.m	Supporting points	862			Date/time measurement	02.07.2018 11:21:54

Date/ Time	02.07.2018 10:49:44	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4009	0,0930	0,0181	14,703	14,687	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,390 N.m	-0,1 %	30,50 °	1,7 %	100 rpm	38 rpm	02.07.2018	10:49:44
2	11,402 N.m	0,0 %	30,25 °	0,8 %	99 rpm	38 rpm	02.07.2018	10:50:03
3	11,398 N.m	0,0 %	30,50 °	1,7 %	99 rpm	38 rpm	02.07.2018	10:50:23
4	11,413 N.m	0,1 %	30,50 °	1,7 %	99 rpm	38 rpm	02.07.2018	10:50:42
5	11,394 N.m	-0,1 %	30,50 °	1,7 %	99 rpm	38 rpm	02.07.2018	10:51:02
6	11,409 N.m	0,1 %	31,00 °	3,3 %	99 rpm	38 rpm	02.07.2018	10:51:21
7	11,405 N.m	0,0 %	30,75 °	2,5 %	99 rpm	38 rpm	02.07.2018	10:51:41
8	11,413 N.m	0,1 %	31,00 °	3,3 %	99 rpm	38 rpm	02.07.2018	10:52:00
9	11,409 N.m	0,1 %	31,00 °	3,3 %	99 rpm	38 rpm	02.07.2018	10:52:20
10	11,417 N.m	0,1 %	31,00 °	3,3 %	99 rpm	38 rpm	02.07.2018	10:52:39
11	11,413 N.m	0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	10:52:59
12	11,409 N.m	0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	10:53:18
13	11,405 N.m	0,0 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	10:53:38
14	11,429 N.m	0,3 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	10:53:57
15	11,386 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	02.07.2018	10:54:17
16	11,405 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	10:54:36
17	11,402 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	10:54:56
18	11,405 N.m	0,0 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	10:55:15
19	11,394 N.m	-0,1 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	10:55:35
20	11,402 N.m	0,0 %	29,50 °	-1,7 %	100 rpm	38 rpm	02.07.2018	10:55:54
21	11,409 N.m	0,1 %	30,00 °	0,0 %	100 rpm	38 rpm	02.07.2018	10:56:14
22	11,382 N.m	-0,2 %	29,75 °	-0,8 %	100 rpm	38 rpm	02.07.2018	10:56:33
23	11,378 N.m	-0,2 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	10:56:53
24	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	02.07.2018	10:57:12
25	11,366 N.m	-0,3 %	29,50 °	-1,7 %	100 rpm	37 rpm	02.07.2018	10:57:32
26	11,378 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	38 rpm	02.07.2018	10:57:51
27	11,394 N.m	-0,1 %	29,25 °	-2,5 %	100 rpm	37 rpm	02.07.2018	10:58:11
28	11,374 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	37 rpm	02.07.2018	10:58:30
29	11,390 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	10:58:50
30	11,382 N.m	-0,2 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	10:59:09
31	11,394 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	10:59:29
32	11,405 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	10:59:48
33	11,417 N.m	0,1 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	11:00:07
34	11,413 N.m	0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	11:00:27
35	11,429 N.m	0,3 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	11:00:47
36	11,421 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:01:06
37	11,413 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:01:26
38	11,433 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:01:45
39	11,425 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:02:05
40	11,386 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	02.07.2018	11:02:24
41	11,417 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:02:44
42	11,409 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:03:03
43	11,417 N.m	0,1 %	30,25 °	0,8 %	99 rpm	37 rpm	02.07.2018	11:03:23
44	11,394 N.m	-0,1 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	11:03:42
45	11,402 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:04:02
46	11,413 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:04:21
47	11,386 N.m	-0,1 %	29,25 °	-2,5 %	99 rpm	37 rpm	02.07.2018	11:04:41
48	11,374 N.m	-0,2 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:05:00
49	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	02.07.2018	11:05:19
50	11,374 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:05:39

Date/ Time	02.07.2018 10:49:44	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

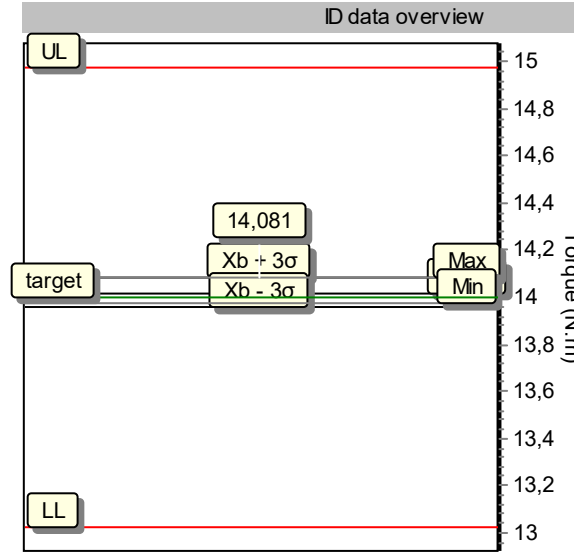
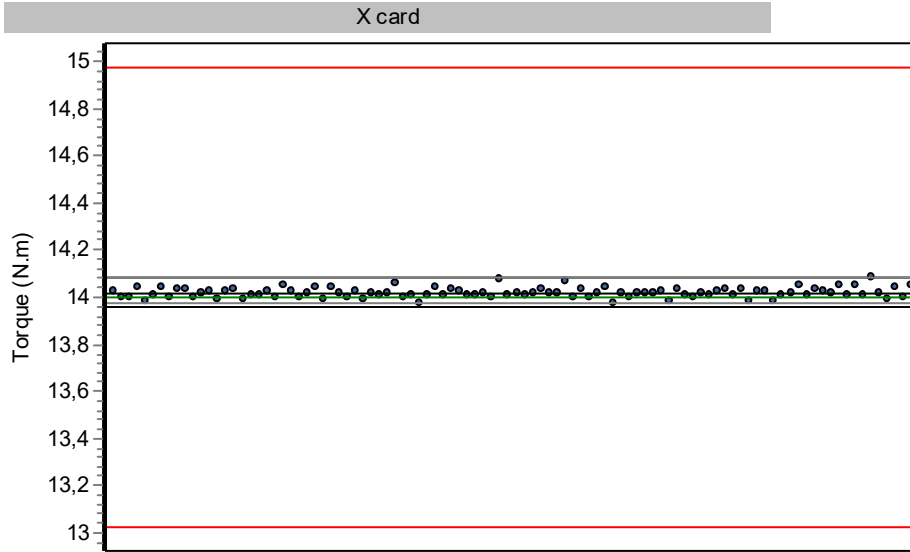
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4009	0,0930	0,0181	14,703	14,687	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:05:59
52	11,386 N.m	-0,1 %	29,25 °	-2,5 %	100 rpm	37 rpm	02.07.2018	11:06:18
53	11,359 N.m	-0,4 %	29,50 °	-1,7 %	100 rpm	38 rpm	02.07.2018	11:06:37
54	11,390 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:06:57
55	11,413 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:07:16
56	11,417 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:07:36
57	11,441 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:07:56
58	11,452 N.m	0,5 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	11:08:15
59	11,394 N.m	-0,1 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	11:08:35
60	11,402 N.m	0,0 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	11:08:54
61	11,421 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:09:13
62	11,370 N.m	-0,3 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:09:33
63	11,421 N.m	0,2 %	30,00 °	0,0 %	99 rpm	38 rpm	02.07.2018	11:09:53
64	11,413 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:10:12
65	11,417 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	02.07.2018	11:10:32
66	11,405 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:10:51
67	11,370 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:11:10
68	11,413 N.m	0,1 %	30,00 °	0,0 %	99 rpm	37 rpm	02.07.2018	11:11:30
69	11,398 N.m	0,0 %	30,00 °	0,0 %	100 rpm	38 rpm	02.07.2018	11:11:49
70	11,390 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:12:09
71	11,394 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:12:28
72	11,390 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	02.07.2018	11:12:48
73	11,386 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:13:08
74	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	02.07.2018	11:13:27
75	11,394 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:13:46
76	11,374 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	38 rpm	02.07.2018	11:14:06
77	11,394 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:14:25
78	11,374 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	37 rpm	02.07.2018	11:14:45
79	11,370 N.m	-0,3 %	29,50 °	-1,7 %	100 rpm	37 rpm	02.07.2018	11:15:05
80	11,370 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:15:24
81	11,394 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:15:44
82	11,374 N.m	-0,2 %	29,25 °	-2,5 %	99 rpm	37 rpm	02.07.2018	11:16:03
83	11,386 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:16:23
84	11,417 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:16:42
85	11,405 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:17:01
86	11,394 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	38 rpm	02.07.2018	11:17:21
87	11,398 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:17:40
88	11,394 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:18:00
89	11,425 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:18:19
90	11,409 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	38 rpm	02.07.2018	11:18:39
91	11,425 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:18:58
92	11,433 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	38 rpm	02.07.2018	11:19:18
93	11,425 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:19:37
94	11,417 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:19:57
95	11,402 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:20:16
96	11,413 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	38 rpm	02.07.2018	11:20:36
97	11,413 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	37 rpm	02.07.2018	11:20:56
98	11,386 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	37 rpm	02.07.2018	11:21:15
99	11,374 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	37 rpm	02.07.2018	11:21:34
100	11,421 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	37 rpm	02.07.2018	11:21:54

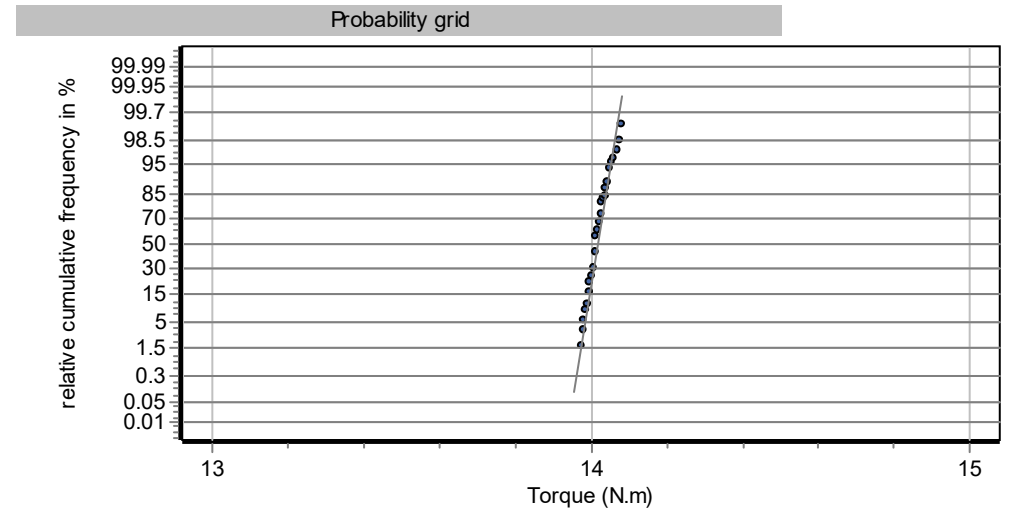
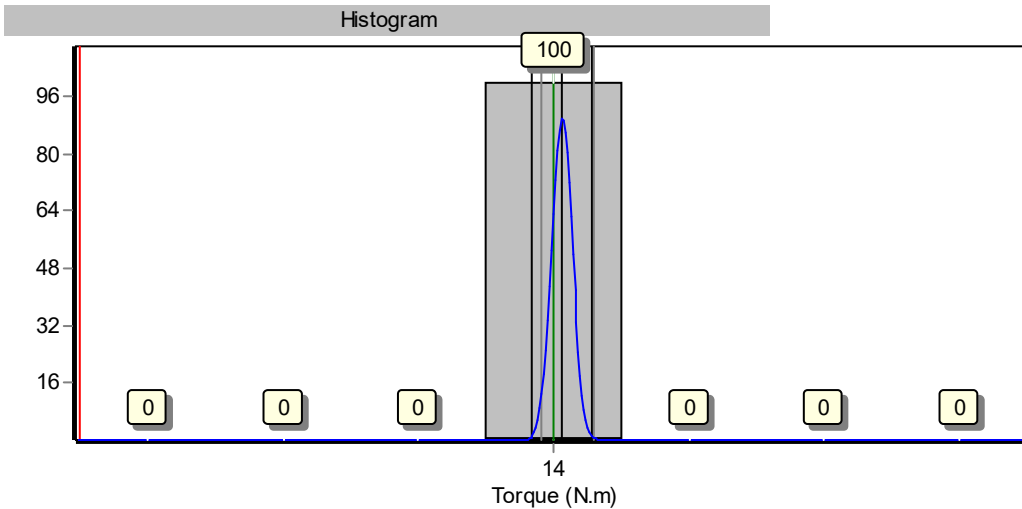
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 100% Screw joint: soft



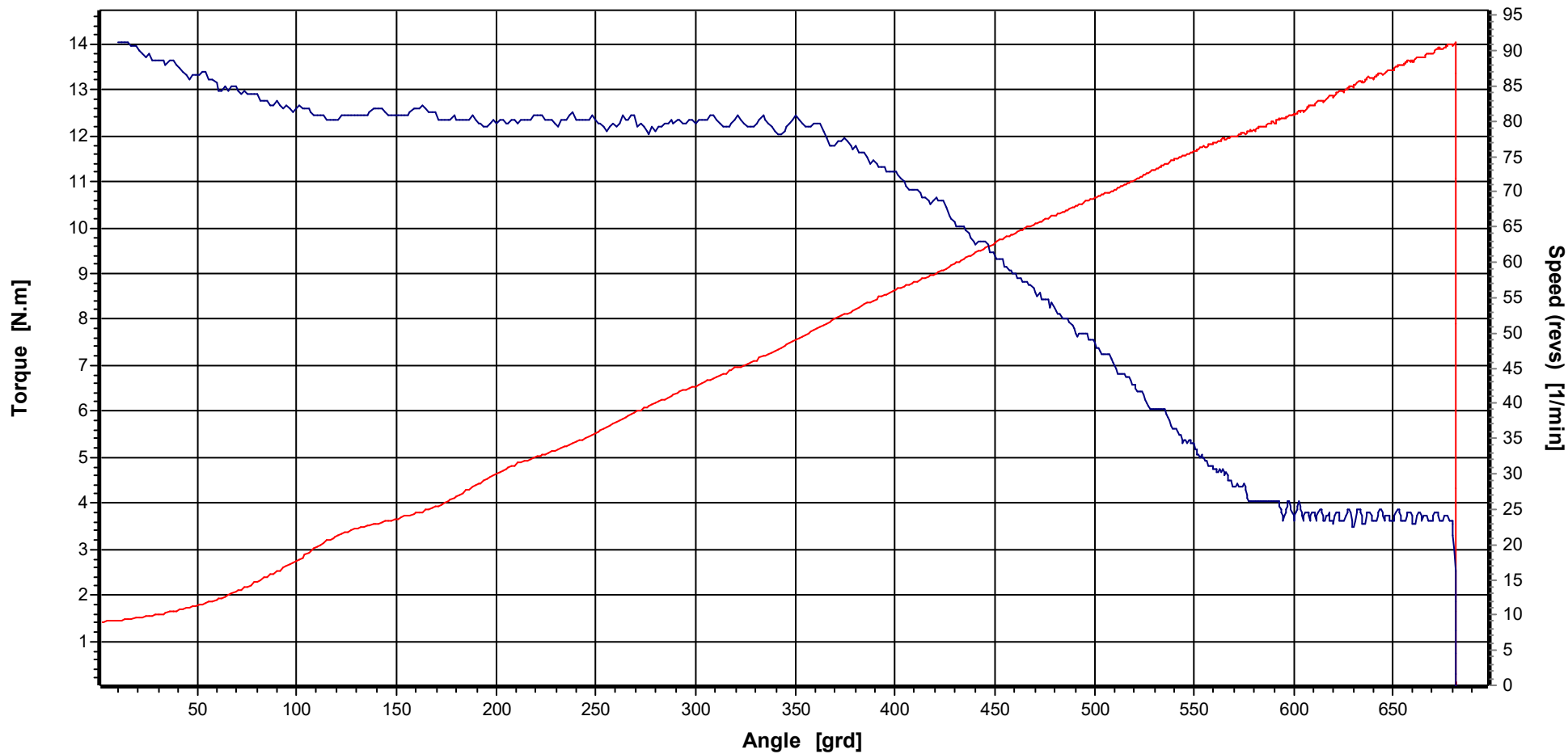
Tester	M.Brkcic	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,08	N.m
Min	13,98	N.m
xq	14,0176	N.m
s	0,0210	N.m
Cm	15,545	
Cmk	15,266	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

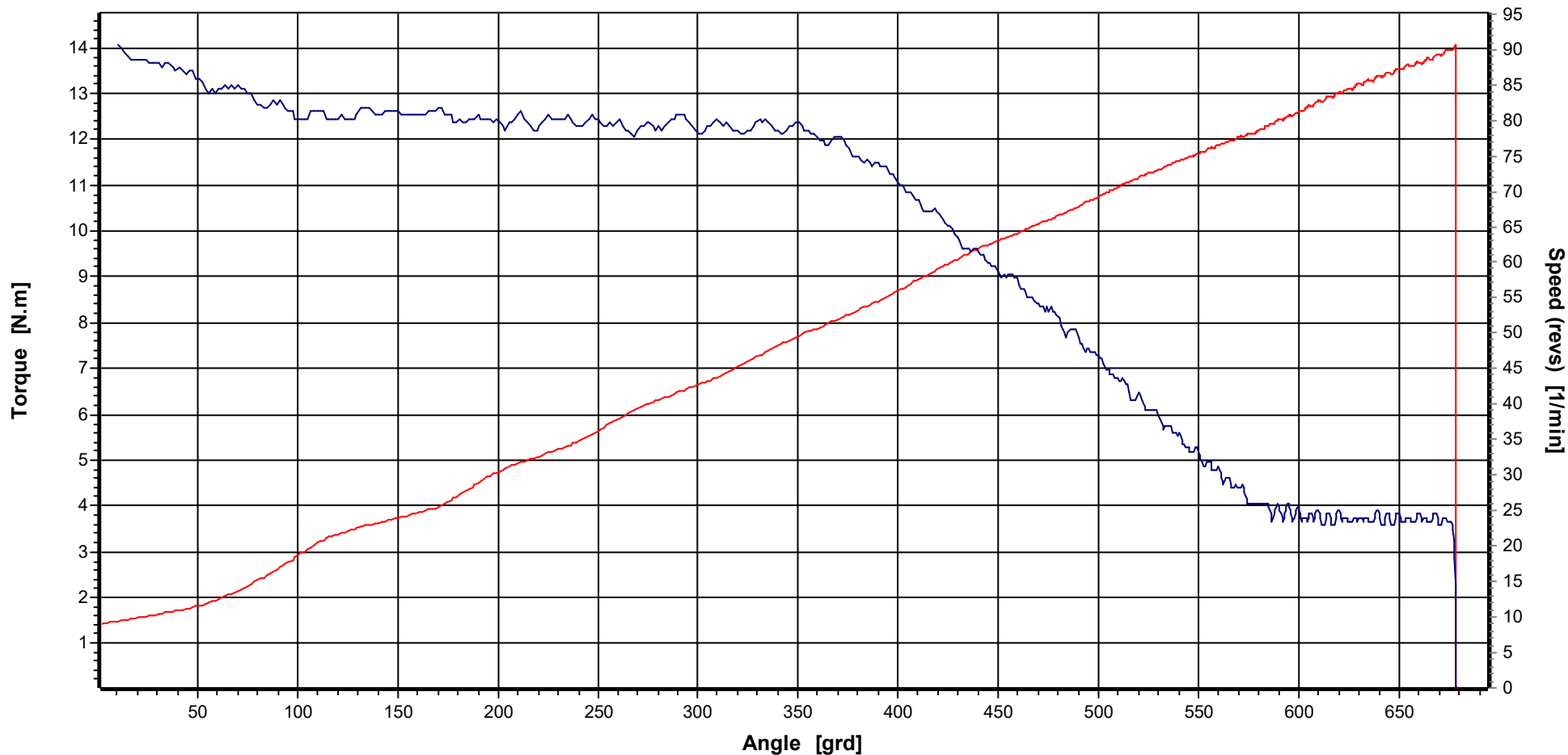


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 11:51:35
UL	14,98 N.m	Supporting points	839			Date/time measurement	02.07.2018 11:51:35

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

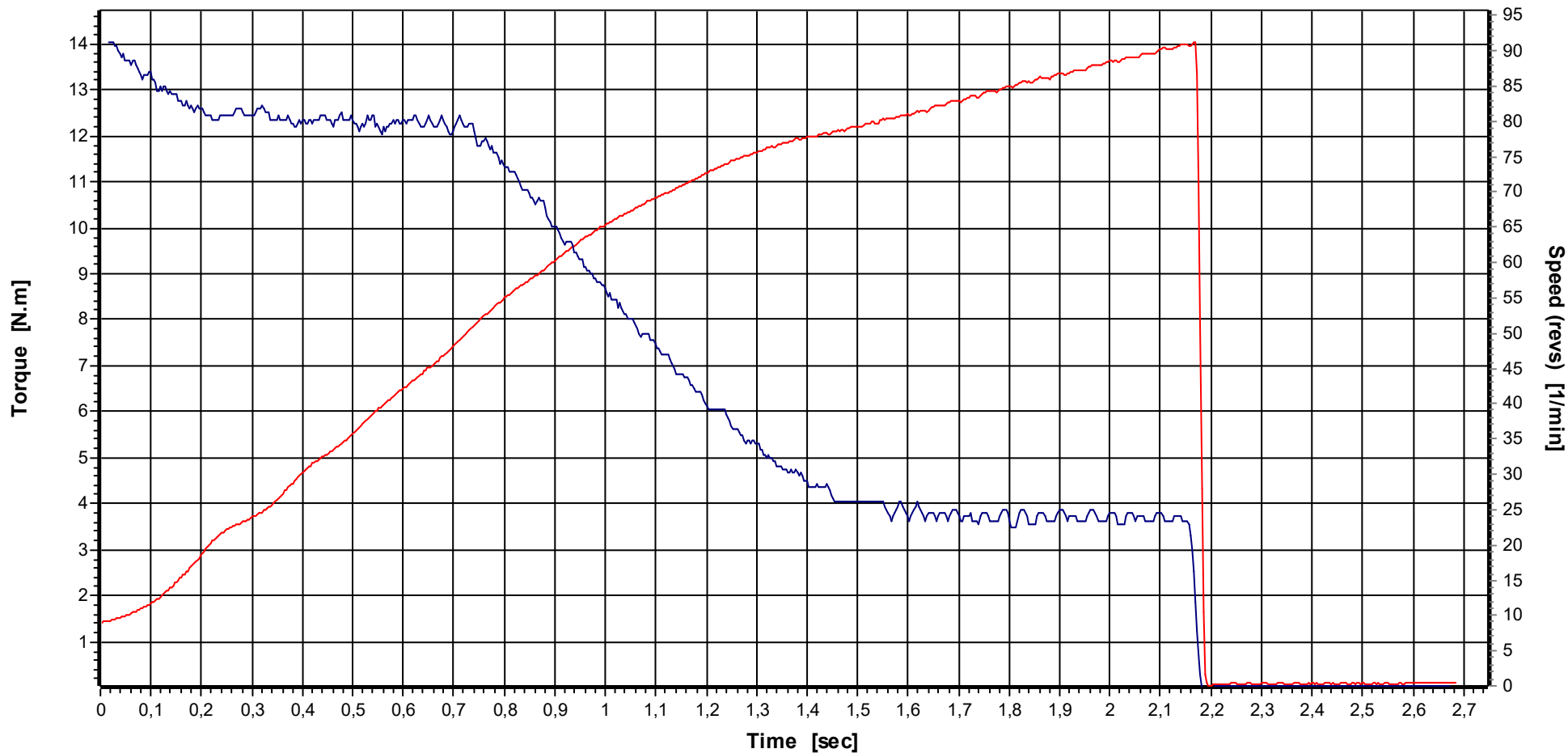


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 11:51:35
UL	14,98 N.m	Supporting points	837			Date/time measurement	02.07.2018 13:05:30

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

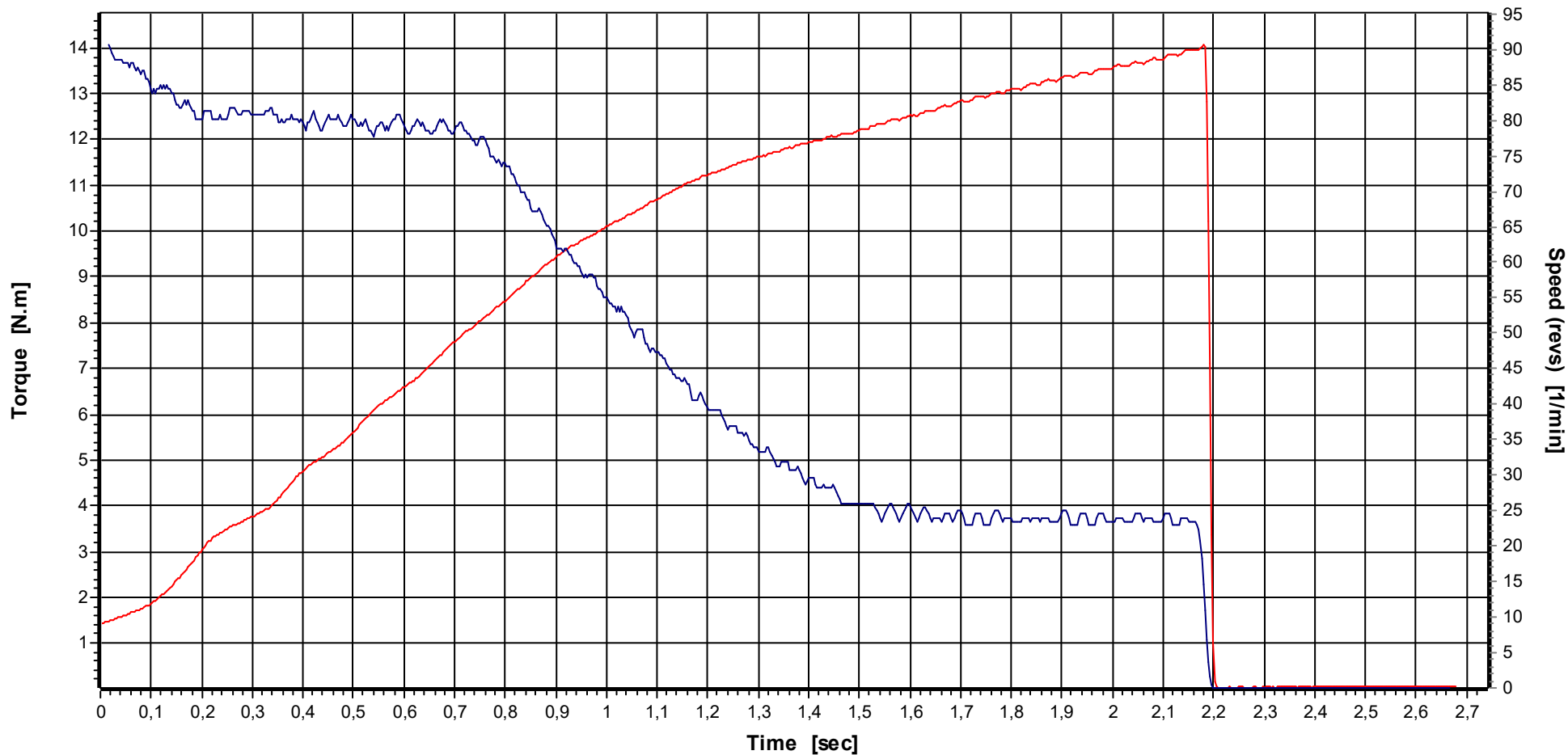


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 11:51:35
UL	14,98 N.m	Supporting points	839			Date/time measurement	02.07.2018 11:51:35

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 11:51:35
UL	14,98 N.m	Supporting points	837			Date/time measurement	02.07.2018 13:05:30

Date/ Time	02.07.2018 11:51:35	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0176	0,1050	0,0210	15,545	15,266	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	14,023 N.m	0,2 %	357,25 °	-0,8 %	454 rpm	45 rpm	02.07.2018	11:51:35
2	14,003 N.m	0,0 %	357,25 °	-0,8 %	453 rpm	44 rpm	02.07.2018	11:52:20
3	13,999 N.m	0,0 %	356,75 °	-0,9 %	454 rpm	45 rpm	02.07.2018	11:53:04
4	14,042 N.m	0,3 %	357,75 °	-0,6 %	454 rpm	45 rpm	02.07.2018	11:53:49
5	13,980 N.m	-0,1 %	353,25 °	-1,9 %	453 rpm	45 rpm	02.07.2018	11:54:34
6	14,007 N.m	0,1 %	352,00 °	-2,2 %	453 rpm	45 rpm	02.07.2018	11:55:19
7	14,042 N.m	0,3 %	358,25 °	-0,5 %	453 rpm	45 rpm	02.07.2018	11:56:03
8	13,996 N.m	0,0 %	354,50 °	-1,5 %	454 rpm	45 rpm	02.07.2018	11:56:48
9	14,031 N.m	0,2 %	358,50 °	-0,4 %	454 rpm	44 rpm	02.07.2018	11:57:33
10	14,031 N.m	0,2 %	355,75 °	-1,2 %	454 rpm	45 rpm	02.07.2018	11:58:18
11	14,003 N.m	0,0 %	355,75 °	-1,2 %	454 rpm	45 rpm	02.07.2018	11:59:03
12	14,015 N.m	0,1 %	353,50 °	-1,8 %	453 rpm	45 rpm	02.07.2018	11:59:47
13	14,027 N.m	0,2 %	356,00 °	-1,1 %	453 rpm	45 rpm	02.07.2018	12:00:32
14	13,988 N.m	-0,1 %	353,25 °	-1,9 %	453 rpm	45 rpm	02.07.2018	12:01:17
15	14,023 N.m	0,2 %	361,00 °	0,3 %	454 rpm	45 rpm	02.07.2018	12:02:02
16	14,031 N.m	0,2 %	355,75 °	-1,2 %	453 rpm	45 rpm	02.07.2018	12:02:47
17	13,992 N.m	-0,1 %	356,25 °	-1,0 %	453 rpm	45 rpm	02.07.2018	12:03:32
18	14,011 N.m	0,1 %	356,50 °	-1,0 %	455 rpm	44 rpm	02.07.2018	12:04:16
19	14,011 N.m	0,1 %	353,00 °	-1,9 %	454 rpm	45 rpm	02.07.2018	12:05:01
20	14,027 N.m	0,2 %	357,50 °	-0,7 %	454 rpm	45 rpm	02.07.2018	12:05:46
21	13,999 N.m	0,0 %	352,25 °	-2,2 %	453 rpm	45 rpm	02.07.2018	12:06:31
22	14,050 N.m	0,4 %	356,00 °	-1,1 %	454 rpm	45 rpm	02.07.2018	12:07:16
23	14,023 N.m	0,2 %	357,50 °	-0,7 %	454 rpm	45 rpm	02.07.2018	12:08:00
24	13,996 N.m	0,0 %	356,00 °	-1,1 %	454 rpm	45 rpm	02.07.2018	12:08:45
25	14,015 N.m	0,1 %	359,00 °	-0,3 %	454 rpm	44 rpm	02.07.2018	12:09:30
26	14,042 N.m	0,3 %	355,50 °	-1,3 %	454 rpm	45 rpm	02.07.2018	12:10:15
27	13,988 N.m	-0,1 %	354,50 °	-1,5 %	454 rpm	45 rpm	02.07.2018	12:11:00
28	14,046 N.m	0,3 %	356,00 °	-1,1 %	454 rpm	45 rpm	02.07.2018	12:11:44
29	14,019 N.m	0,1 %	359,75 °	-0,1 %	454 rpm	45 rpm	02.07.2018	12:12:29
30	13,996 N.m	0,0 %	353,50 °	-1,8 %	454 rpm	45 rpm	02.07.2018	12:13:14
31	14,027 N.m	0,2 %	359,75 °	-0,1 %	453 rpm	45 rpm	02.07.2018	12:13:59
32	13,988 N.m	-0,1 %	356,25 °	-1,0 %	454 rpm	45 rpm	02.07.2018	12:14:43
33	14,015 N.m	0,1 %	355,50 °	-1,3 %	454 rpm	45 rpm	02.07.2018	12:15:28
34	14,007 N.m	0,1 %	356,25 °	-1,0 %	454 rpm	45 rpm	02.07.2018	12:16:13
35	14,015 N.m	0,1 %	355,75 °	-1,2 %	454 rpm	45 rpm	02.07.2018	12:16:58
36	14,058 N.m	0,4 %	362,00 °	0,6 %	453 rpm	45 rpm	02.07.2018	12:17:43
37	13,996 N.m	0,0 %	353,50 °	-1,8 %	454 rpm	45 rpm	02.07.2018	12:18:27
38	14,011 N.m	0,1 %	355,25 °	-1,3 %	454 rpm	45 rpm	02.07.2018	12:19:12
39	13,976 N.m	-0,2 %	353,00 °	-1,9 %	454 rpm	45 rpm	02.07.2018	12:19:57
40	14,011 N.m	0,1 %	354,50 °	-1,5 %	454 rpm	45 rpm	02.07.2018	12:20:42
41	14,046 N.m	0,3 %	362,00 °	0,6 %	454 rpm	45 rpm	02.07.2018	12:21:27
42	14,011 N.m	0,1 %	355,75 °	-1,2 %	454 rpm	45 rpm	02.07.2018	12:22:11
43	14,038 N.m	0,3 %	360,50 °	0,1 %	454 rpm	45 rpm	02.07.2018	12:22:56
44	14,023 N.m	0,2 %	355,00 °	-1,4 %	454 rpm	45 rpm	02.07.2018	12:23:41
45	14,007 N.m	0,1 %	355,50 °	-1,3 %	453 rpm	45 rpm	02.07.2018	12:24:26
46	14,011 N.m	0,1 %	359,50 °	-0,1 %	454 rpm	44 rpm	02.07.2018	12:25:11
47	14,015 N.m	0,1 %	356,25 °	-1,0 %	454 rpm	45 rpm	02.07.2018	12:25:55
48	13,999 N.m	0,0 %	355,75 °	-1,2 %	453 rpm	45 rpm	02.07.2018	12:26:40
49	14,074 N.m	0,5 %	363,25 °	0,9 %	454 rpm	45 rpm	02.07.2018	12:27:25
50	14,011 N.m	0,1 %	356,75 °	-0,9 %	454 rpm	45 rpm	02.07.2018	12:28:10

Date/ Time	02.07.2018 11:51:35	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

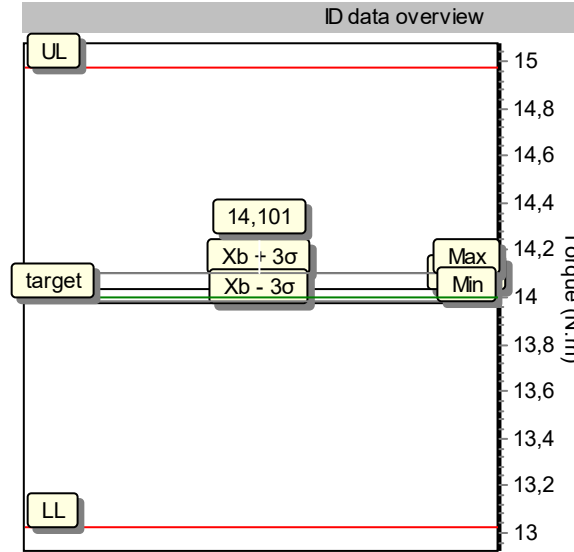
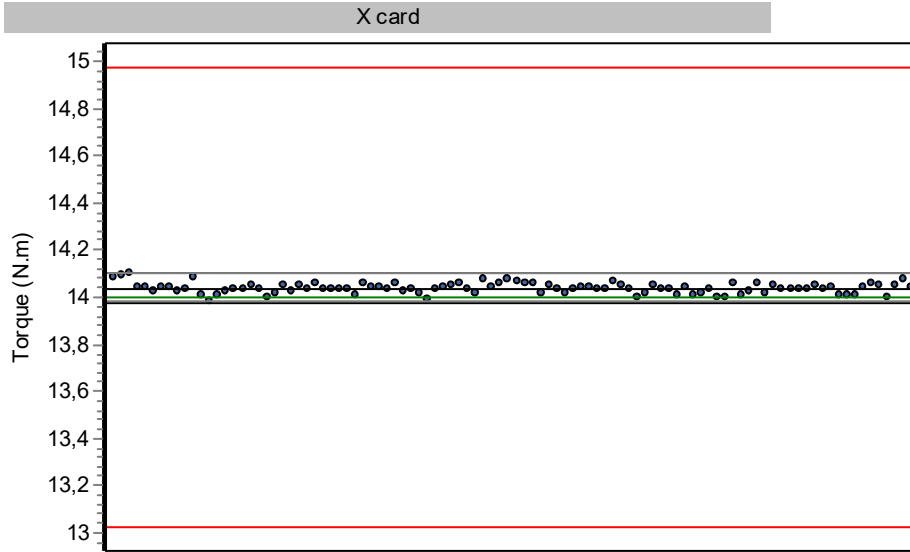
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0176	0,1050	0,0210	15,545	15,266	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	14,019 N.m	0,1 %	359,75 °	-0,1 %	454 rpm	44 rpm	02.07.2018	12:28:55
52	14,011 N.m	0,1 %	356,00 °	-1,1 %	453 rpm	45 rpm	02.07.2018	12:29:39
53	14,015 N.m	0,1 %	359,00 °	-0,3 %	454 rpm	44 rpm	02.07.2018	12:30:24
54	14,031 N.m	0,2 %	356,50 °	-1,0 %	454 rpm	45 rpm	02.07.2018	12:31:09
55	14,015 N.m	0,1 %	361,00 °	0,3 %	454 rpm	45 rpm	02.07.2018	12:31:54
56	14,019 N.m	0,1 %	356,00 °	-1,1 %	454 rpm	45 rpm	02.07.2018	12:32:39
57	14,070 N.m	0,5 %	361,00 °	0,3 %	453 rpm	45 rpm	02.07.2018	12:33:23
58	14,003 N.m	0,0 %	357,00 °	-0,8 %	454 rpm	45 rpm	02.07.2018	12:34:08
59	14,035 N.m	0,3 %	357,00 °	-0,8 %	454 rpm	45 rpm	02.07.2018	12:34:53
60	13,999 N.m	0,0 %	358,50 °	-0,4 %	454 rpm	45 rpm	02.07.2018	12:35:38
61	14,019 N.m	0,1 %	355,50 °	-1,3 %	454 rpm	45 rpm	02.07.2018	12:36:23
62	14,042 N.m	0,3 %	361,00 °	0,3 %	454 rpm	45 rpm	02.07.2018	12:37:07
63	13,976 N.m	-0,2 %	353,50 °	-1,8 %	454 rpm	45 rpm	02.07.2018	12:37:52
64	14,015 N.m	0,1 %	356,00 °	-1,1 %	453 rpm	45 rpm	02.07.2018	12:38:37
65	13,999 N.m	0,0 %	357,25 °	-0,8 %	454 rpm	45 rpm	02.07.2018	12:39:22
66	14,015 N.m	0,1 %	356,25 °	-1,0 %	453 rpm	45 rpm	02.07.2018	12:40:07
67	14,019 N.m	0,1 %	357,25 °	-0,8 %	454 rpm	44 rpm	02.07.2018	12:40:51
68	14,015 N.m	0,1 %	354,00 °	-1,7 %	454 rpm	44 rpm	02.07.2018	12:41:36
69	14,027 N.m	0,2 %	360,75 °	0,2 %	453 rpm	45 rpm	02.07.2018	12:42:21
70	13,984 N.m	-0,1 %	352,50 °	-2,1 %	454 rpm	45 rpm	02.07.2018	12:43:06
71	14,031 N.m	0,2 %	355,50 °	-1,3 %	454 rpm	44 rpm	02.07.2018	12:43:51
72	14,011 N.m	0,1 %	359,75 °	-0,1 %	454 rpm	44 rpm	02.07.2018	12:44:35
73	13,996 N.m	0,0 %	355,75 °	-1,2 %	454 rpm	45 rpm	02.07.2018	12:45:20
74	14,015 N.m	0,1 %	360,25 °	0,1 %	454 rpm	44 rpm	02.07.2018	12:46:05
75	14,011 N.m	0,1 %	355,00 °	-1,4 %	454 rpm	45 rpm	02.07.2018	12:46:50
76	14,023 N.m	0,2 %	357,50 °	-0,7 %	454 rpm	45 rpm	02.07.2018	12:47:35
77	14,031 N.m	0,2 %	360,50 °	0,1 %	454 rpm	44 rpm	02.07.2018	12:48:19
78	14,007 N.m	0,1 %	357,50 °	-0,7 %	453 rpm	45 rpm	02.07.2018	12:49:04
79	14,035 N.m	0,3 %	361,50 °	0,4 %	454 rpm	45 rpm	02.07.2018	12:49:49
80	13,980 N.m	-0,1 %	353,25 °	-1,9 %	454 rpm	45 rpm	02.07.2018	12:50:34
81	14,027 N.m	0,2 %	355,75 °	-1,2 %	454 rpm	44 rpm	02.07.2018	12:51:19
82	14,027 N.m	0,2 %	361,50 °	0,4 %	453 rpm	45 rpm	02.07.2018	12:52:03
83	13,984 N.m	-0,1 %	356,50 °	-1,0 %	453 rpm	44 rpm	02.07.2018	12:52:48
84	14,007 N.m	0,1 %	356,75 °	-0,9 %	454 rpm	45 rpm	02.07.2018	12:53:33
85	14,019 N.m	0,1 %	354,75 °	-1,5 %	454 rpm	45 rpm	02.07.2018	12:54:18
86	14,050 N.m	0,4 %	361,25 °	0,3 %	454 rpm	45 rpm	02.07.2018	12:55:03
87	14,007 N.m	0,1 %	356,50 °	-1,0 %	454 rpm	45 rpm	02.07.2018	12:55:47
88	14,031 N.m	0,2 %	360,25 °	0,1 %	454 rpm	44 rpm	02.07.2018	12:56:32
89	14,023 N.m	0,2 %	356,75 °	-0,9 %	454 rpm	45 rpm	02.07.2018	12:57:17
90	14,015 N.m	0,1 %	356,00 °	-1,1 %	454 rpm	45 rpm	02.07.2018	12:58:02
91	14,050 N.m	0,4 %	361,25 °	0,3 %	453 rpm	45 rpm	02.07.2018	12:58:47
92	14,011 N.m	0,1 %	358,25 °	-0,5 %	455 rpm	45 rpm	02.07.2018	12:59:31
93	14,050 N.m	0,4 %	363,50 °	1,0 %	454 rpm	45 rpm	02.07.2018	13:00:16
94	14,011 N.m	0,1 %	356,25 °	-1,0 %	454 rpm	45 rpm	02.07.2018	13:01:01
95	14,081 N.m	0,6 %	362,50 °	0,7 %	454 rpm	45 rpm	02.07.2018	13:01:46
96	14,015 N.m	0,1 %	358,25 °	-0,5 %	454 rpm	45 rpm	02.07.2018	13:02:31
97	13,992 N.m	-0,1 %	357,25 °	-0,8 %	453 rpm	45 rpm	02.07.2018	13:03:15
98	14,046 N.m	0,3 %	363,25 °	0,9 %	454 rpm	45 rpm	02.07.2018	13:04:00
99	13,999 N.m	0,0 %	354,75 °	-1,5 %	454 rpm	45 rpm	02.07.2018	13:04:45
100	14,054 N.m	0,4 %	360,50 °	0,1 %	454 rpm	45 rpm	02.07.2018	13:05:30

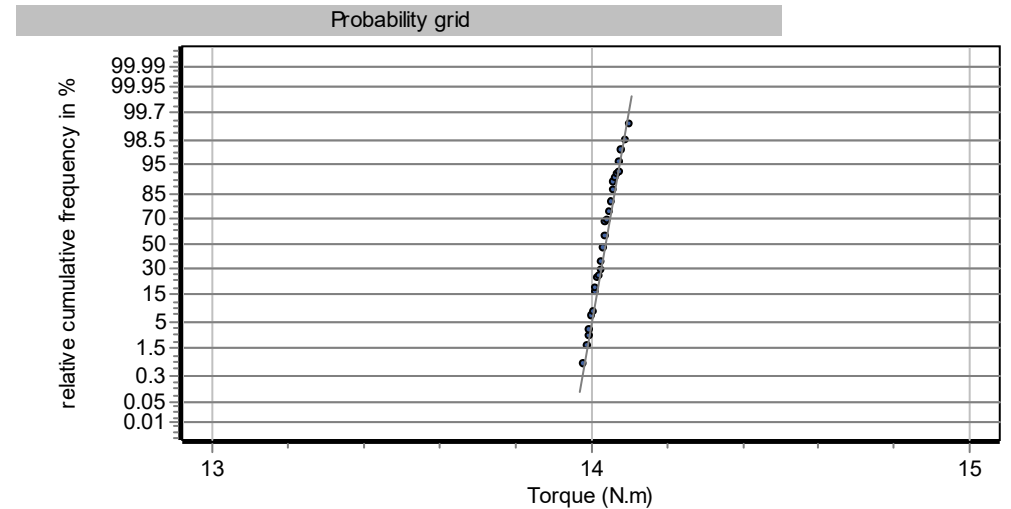
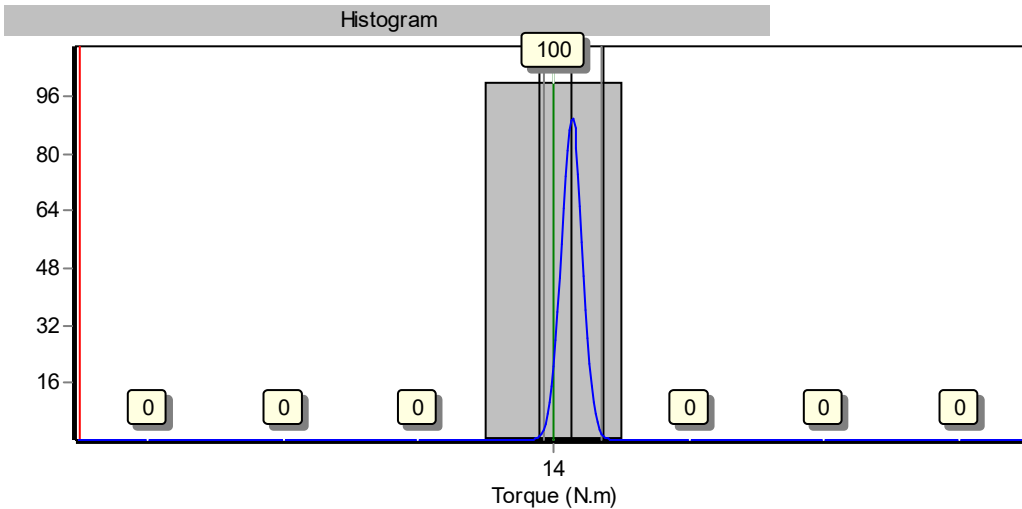
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 100% Screw joint: hard



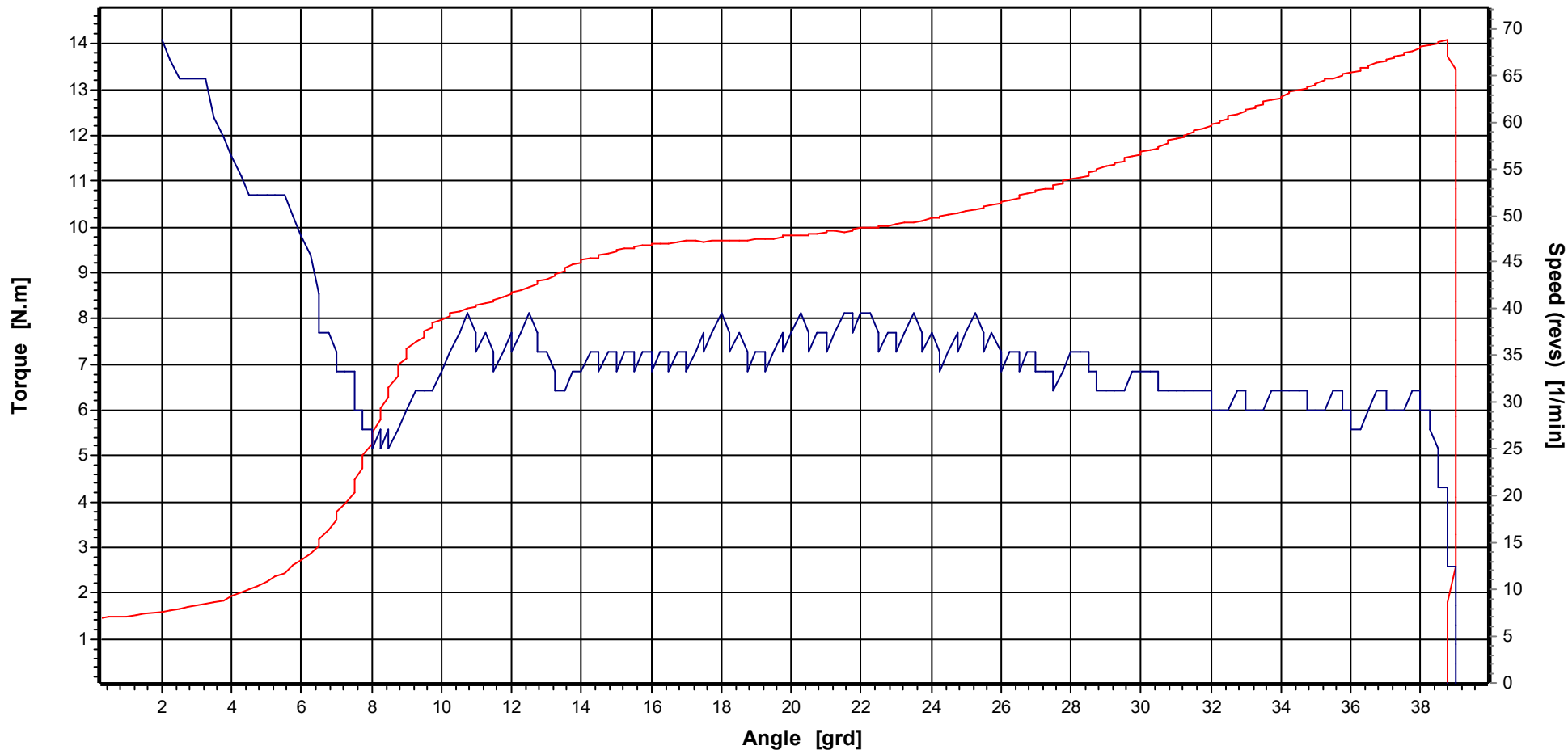
Tester	M.Brkic	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,10	N.m
Min	13,98	N.m
xq	14,0377	N.m
s	0,0220	N.m
Cm	14,846	
Cmk	14,274	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

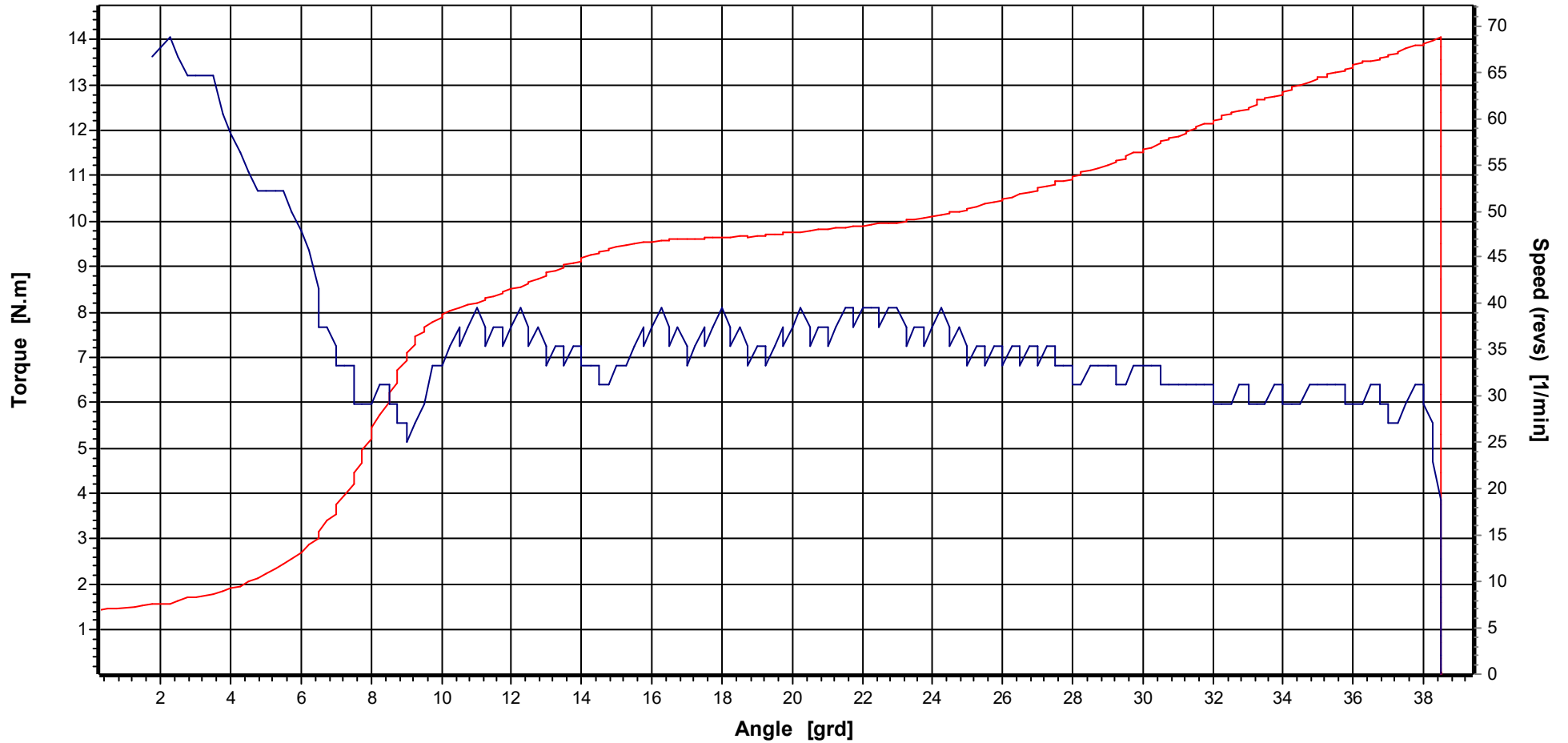


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 13:51:43
UL	14,98 N.m	Supporting points	868			Date/time measurement	02.07.2018 13:51:43

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

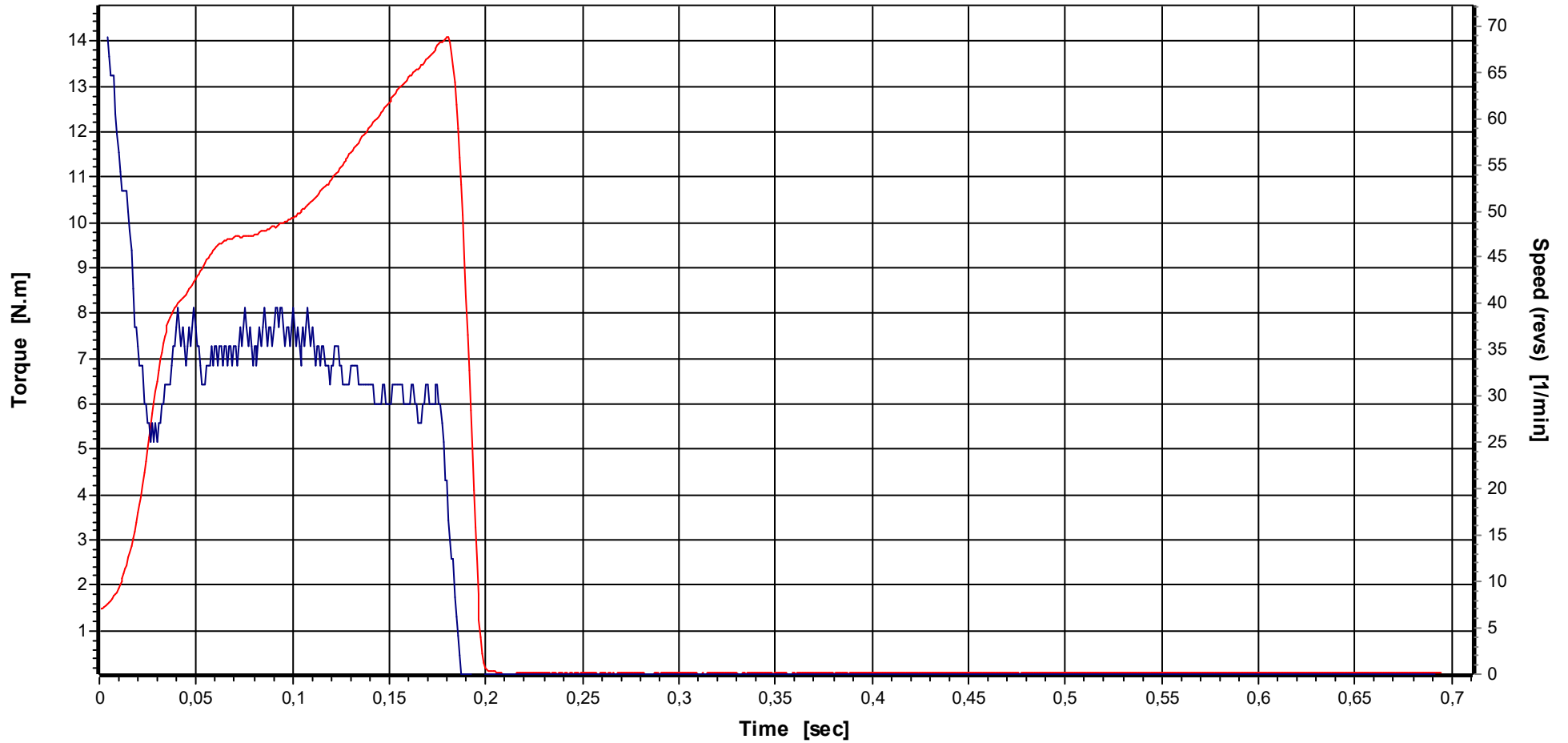


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 13:51:43
UL	14,98 N.m	Supporting points	846			Date/time measurement	02.07.2018 15:05:38

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

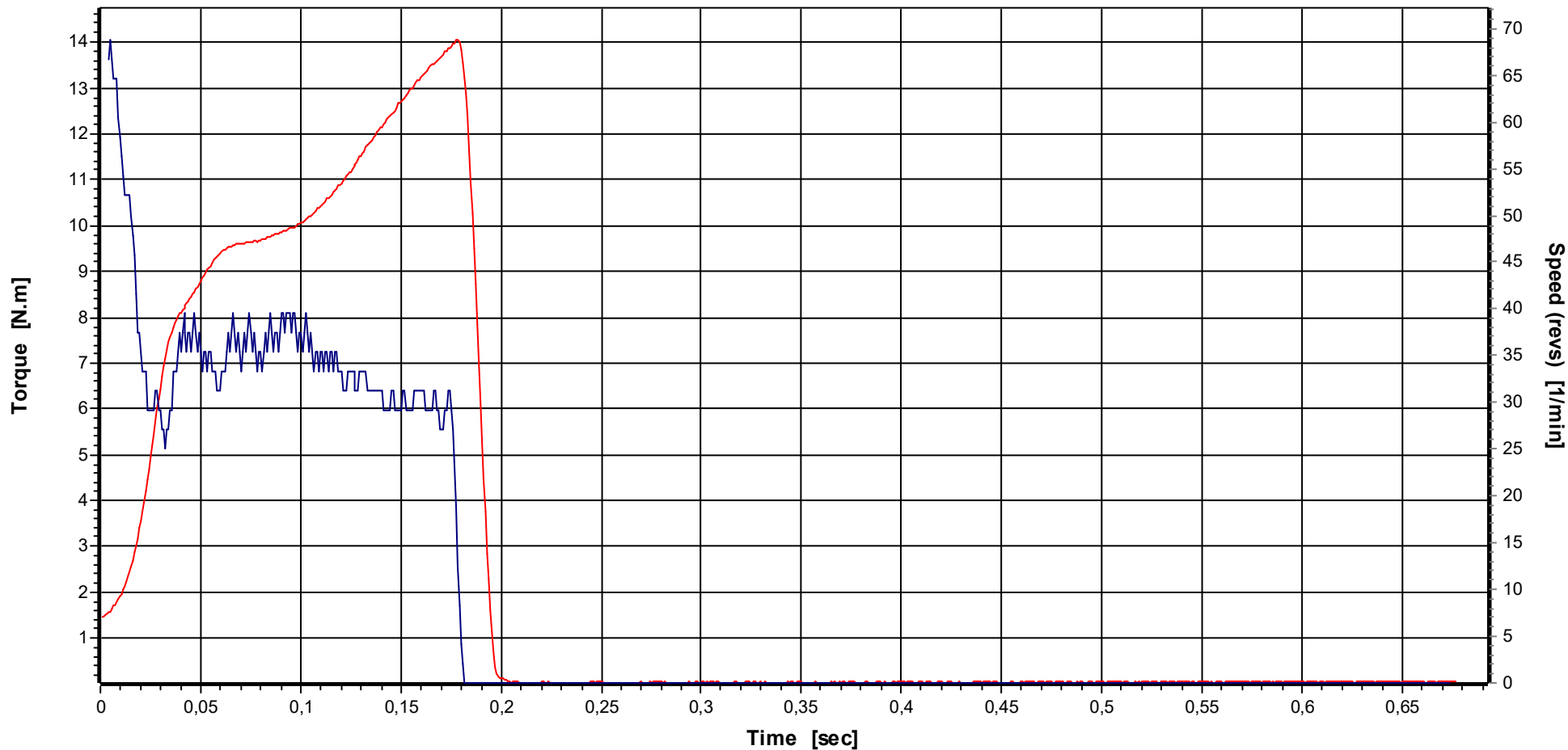


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	02.07.2018 13:51:43
UL	14,98 N.m	Supporting points	868			Date/time measurement	02.07.2018 13:51:43

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	02.07.2018 13:51:43
UL	14,98 N.m	Supporting points	846			Date/time measurement	02.07.2018 15:05:38

Date/ Time	02.07.2018 13:51:43	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0377	0,1210	0,0220	14,846	14,274	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	14,081 N.m	0,6 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	13:51:43
2	14,093 N.m	0,7 %	30,25 °	0,8 %	99 rpm	34 rpm	02.07.2018	13:52:27
3	14,101 N.m	0,7 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	13:53:12
4	14,042 N.m	0,3 %	30,00 °	0,0 %	99 rpm	34 rpm	02.07.2018	13:53:57
5	14,046 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	13:54:42
6	14,027 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	13:55:27
7	14,042 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	13:56:11
8	14,042 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	13:56:56
9	14,023 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	13:57:41
10	14,038 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	34 rpm	02.07.2018	13:58:26
11	14,081 N.m	0,6 %	29,50 °	-1,7 %	100 rpm	34 rpm	02.07.2018	13:59:11
12	14,011 N.m	0,1 %	29,25 °	-2,5 %	99 rpm	34 rpm	02.07.2018	13:59:55
13	13,980 N.m	-0,1 %	29,25 °	-2,5 %	100 rpm	34 rpm	02.07.2018	14:00:40
14	14,011 N.m	0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:01:25
15	14,027 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:02:10
16	14,031 N.m	0,2 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	14:02:55
17	14,031 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:03:39
18	14,050 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:04:24
19	14,035 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:05:09
20	14,003 N.m	0,0 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:05:54
21	14,019 N.m	0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:06:39
22	14,054 N.m	0,4 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:07:23
23	14,023 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:08:08
24	14,050 N.m	0,4 %	30,50 °	1,7 %	100 rpm	35 rpm	02.07.2018	14:08:53
25	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:09:38
26	14,058 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:10:22
27	14,038 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:11:07
28	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:11:52
29	14,038 N.m	0,3 %	30,50 °	1,7 %	100 rpm	35 rpm	02.07.2018	14:12:37
30	14,038 N.m	0,3 %	30,50 °	1,7 %	100 rpm	35 rpm	02.07.2018	14:13:22
31	14,011 N.m	0,1 %	30,50 °	1,7 %	100 rpm	35 rpm	02.07.2018	14:14:07
32	14,058 N.m	0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:14:51
33	14,046 N.m	0,3 %	29,50 °	-1,7 %	100 rpm	35 rpm	02.07.2018	14:15:36
34	14,042 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:16:21
35	14,035 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:17:06
36	14,062 N.m	0,4 %	30,00 °	0,0 %	100 rpm	34 rpm	02.07.2018	14:17:50
37	14,027 N.m	0,2 %	30,25 °	0,8 %	99 rpm	34 rpm	02.07.2018	14:18:35
38	14,035 N.m	0,3 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	14:19:20
39	14,019 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:20:05
40	13,992 N.m	-0,1 %	30,50 °	1,7 %	100 rpm	35 rpm	02.07.2018	14:20:50
41	14,035 N.m	0,3 %	30,50 °	1,7 %	99 rpm	35 rpm	02.07.2018	14:21:34
42	14,042 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:22:19
43	14,050 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:23:04
44	14,058 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:23:49
45	14,031 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:24:34
46	14,019 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:25:18
47	14,077 N.m	0,6 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:26:03
48	14,042 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:26:48
49	14,062 N.m	0,4 %	30,50 °	1,7 %	99 rpm	35 rpm	02.07.2018	14:27:33
50	14,074 N.m	0,5 %	30,50 °	1,7 %	99 rpm	35 rpm	02.07.2018	14:28:18

Date/ Time	02.07.2018 13:51:43	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

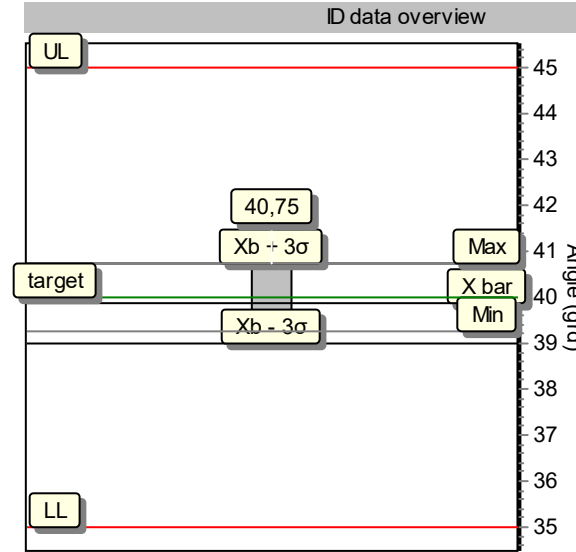
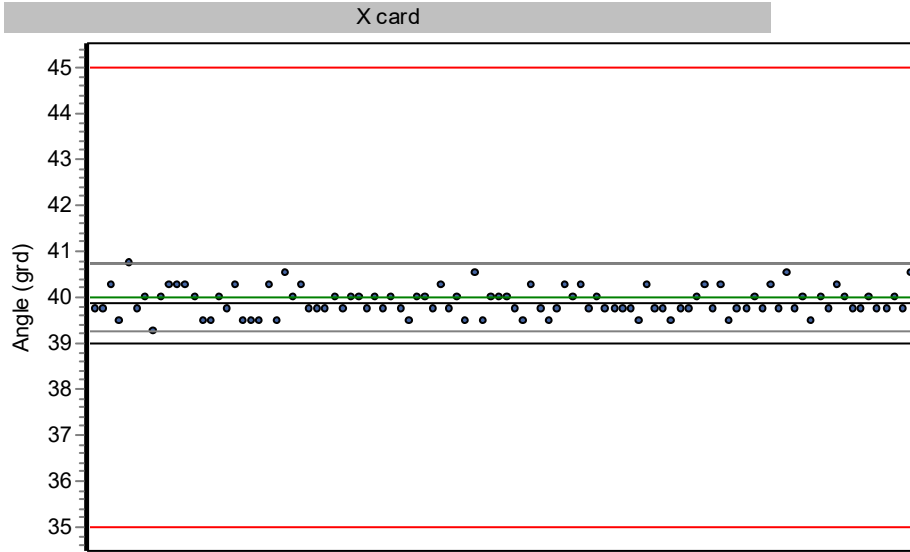
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0377	0,1210	0,0220	14,846	14,274	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	14,066 N.m	0,5 %	30,50 °	1,7 %	99 rpm	35 rpm	02.07.2018	14:29:02
52	14,062 N.m	0,4 %	31,00 °	3,3 %	99 rpm	35 rpm	02.07.2018	14:29:47
53	14,058 N.m	0,4 %	30,75 °	2,5 %	99 rpm	35 rpm	02.07.2018	14:30:32
54	14,019 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:31:17
55	14,054 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:32:02
56	14,035 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:32:47
57	14,019 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:33:31
58	14,038 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:34:16
59	14,042 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:35:01
60	14,042 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:35:46
61	14,031 N.m	0,2 %	30,00 °	0,0 %	99 rpm	34 rpm	02.07.2018	14:36:30
62	14,035 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:37:15
63	14,070 N.m	0,5 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:38:00
64	14,054 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:38:45
65	14,031 N.m	0,2 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:39:30
66	13,996 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:40:14
67	14,019 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:40:59
68	14,050 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:41:44
69	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:42:29
70	14,038 N.m	0,3 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	14:43:14
71	14,011 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	14:43:58
72	14,046 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:44:43
73	14,011 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	14:45:28
74	14,015 N.m	0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:46:13
75	14,035 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:46:58
76	14,003 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:47:42
77	13,999 N.m	0,0 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:48:27
78	14,058 N.m	0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:49:12
79	14,011 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	14:49:57
80	14,027 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	35 rpm	02.07.2018	14:50:42
81	14,058 N.m	0,4 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:51:26
82	14,015 N.m	0,1 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	14:52:11
83	14,054 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:52:56
84	14,035 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:53:41
85	14,035 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	14:54:26
86	14,035 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:55:10
87	14,031 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:55:55
88	14,054 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	14:56:40
89	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	02.07.2018	14:57:25
90	14,042 N.m	0,3 %	30,00 °	0,0 %	100 rpm	34 rpm	02.07.2018	14:58:10
91	14,007 N.m	0,1 %	30,25 °	0,8 %	99 rpm	35 rpm	02.07.2018	14:58:54
92	14,011 N.m	0,1 %	30,25 °	0,8 %	100 rpm	35 rpm	02.07.2018	14:59:39
93	14,011 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	02.07.2018	15:00:24
94	14,042 N.m	0,3 %	29,50 °	-1,7 %	100 rpm	35 rpm	02.07.2018	15:01:09
95	14,062 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	34 rpm	02.07.2018	15:01:54
96	14,050 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	35 rpm	02.07.2018	15:02:38
97	14,003 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	35 rpm	02.07.2018	15:03:23
98	14,054 N.m	0,4 %	29,50 °	-1,7 %	99 rpm	35 rpm	02.07.2018	15:04:08
99	14,077 N.m	0,6 %	29,75 °	-0,8 %	100 rpm	34 rpm	02.07.2018	15:04:53
100	14,042 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	35 rpm	02.07.2018	15:05:38

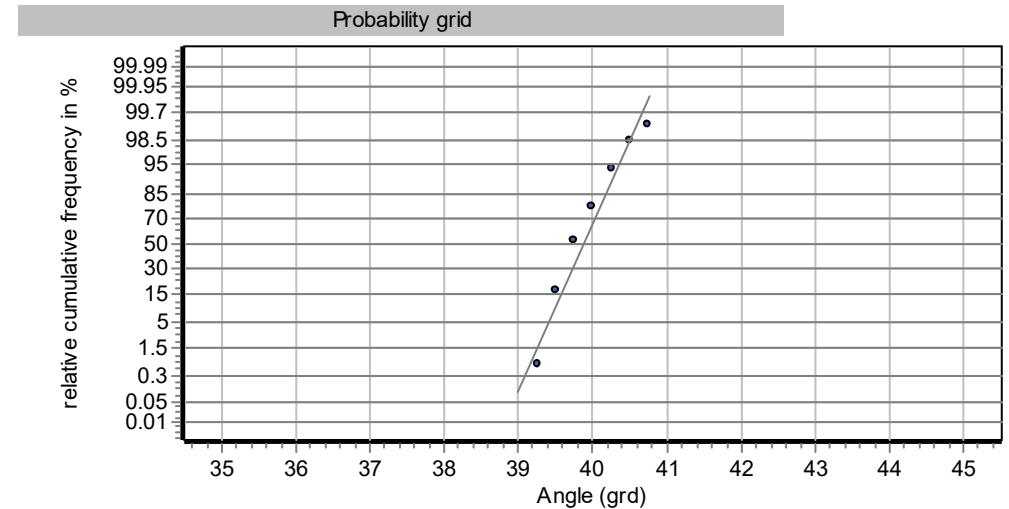
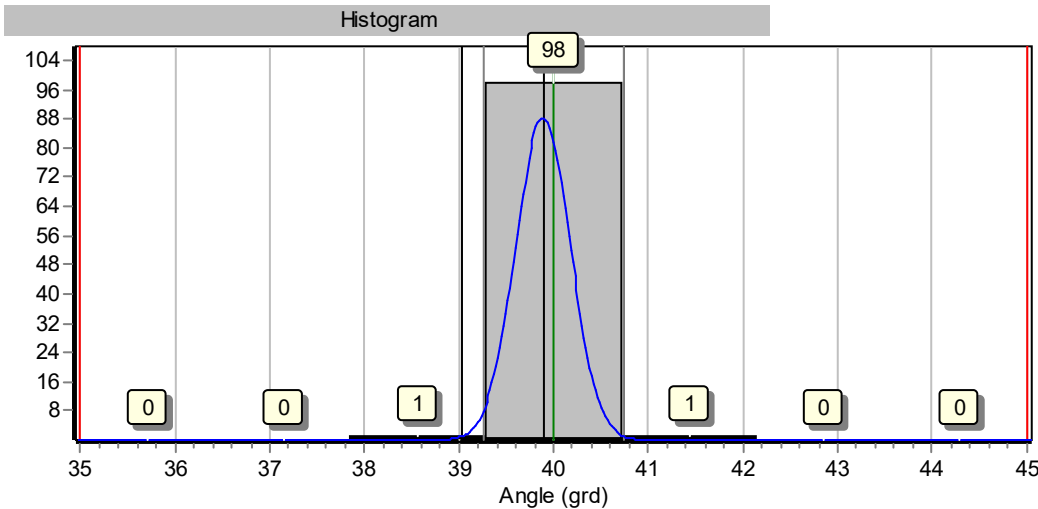
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 40 ° Screw joint: hard



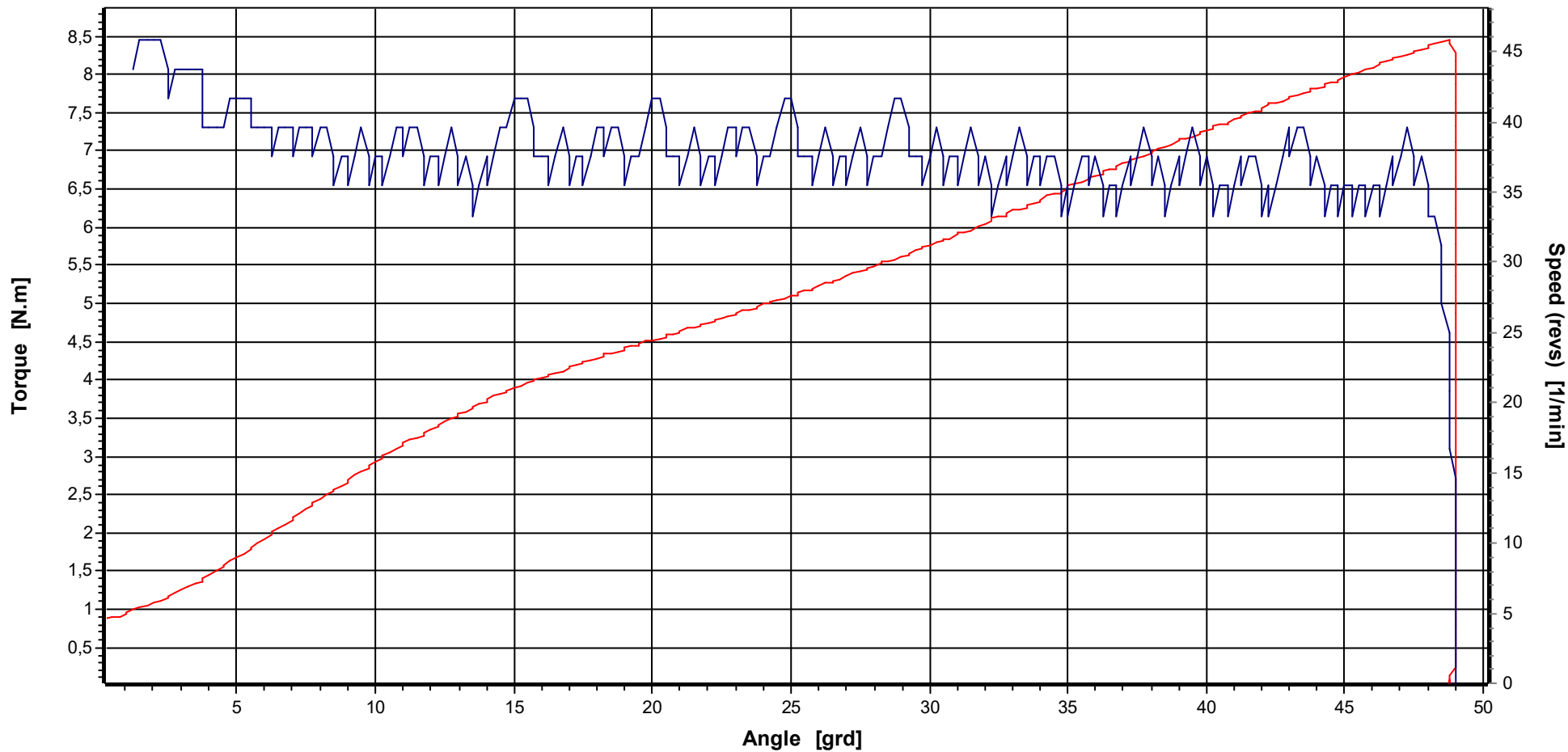
Tester	M.Brkcic
N	100
Target	40,00 grd
UL	45,00 grd
LL	35,00 grd
Max	40,75 grd
Min	39,25 grd
xq	39,8875 grd
s	0,2873 grd
Cm	5,801
Cmk	5,671



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

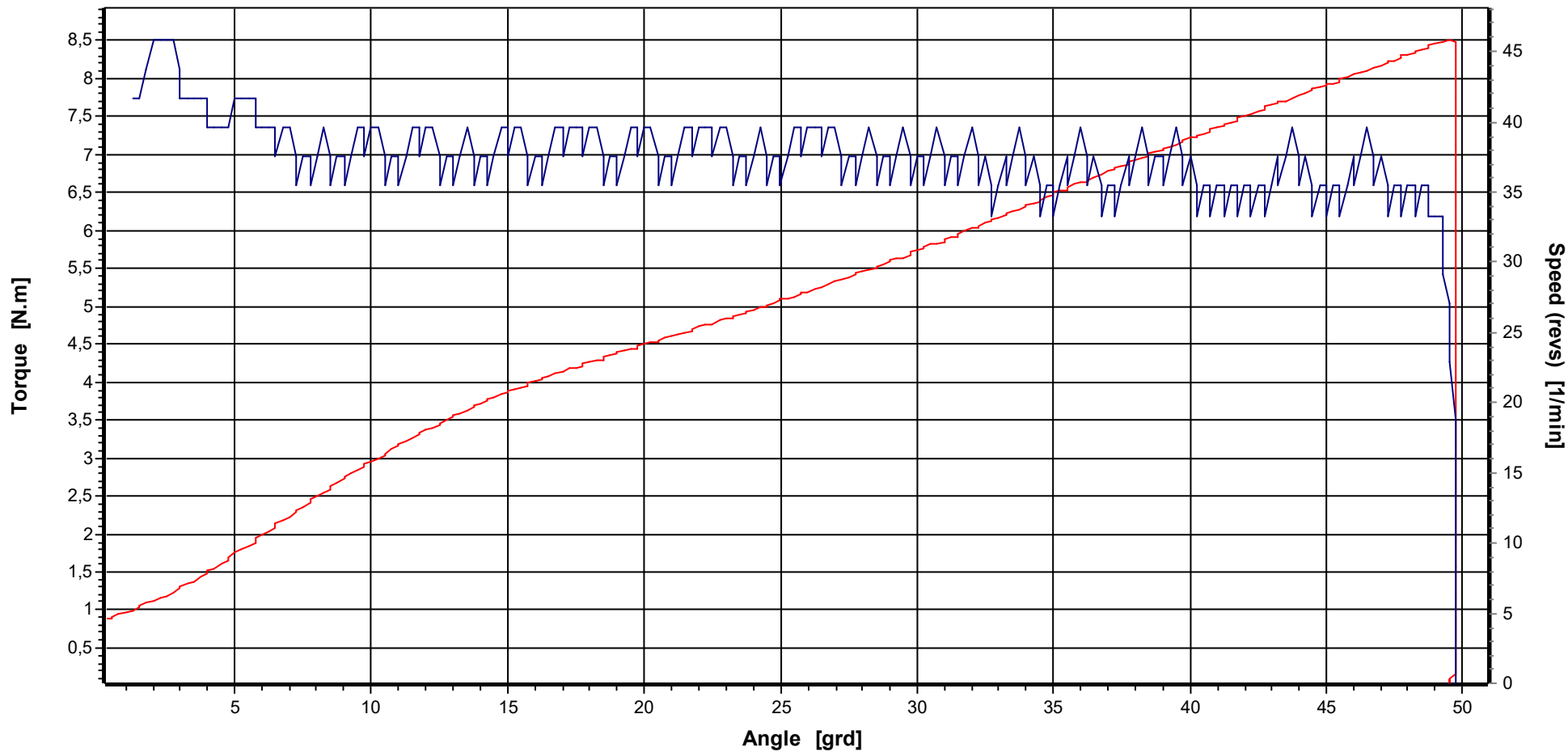


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	08.08.2018
LL	35,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	03.07.2018 15:35:59
UL	45,00 grd	Supporting points	919			Date/time measurement	03.07.2018 15:35:59

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

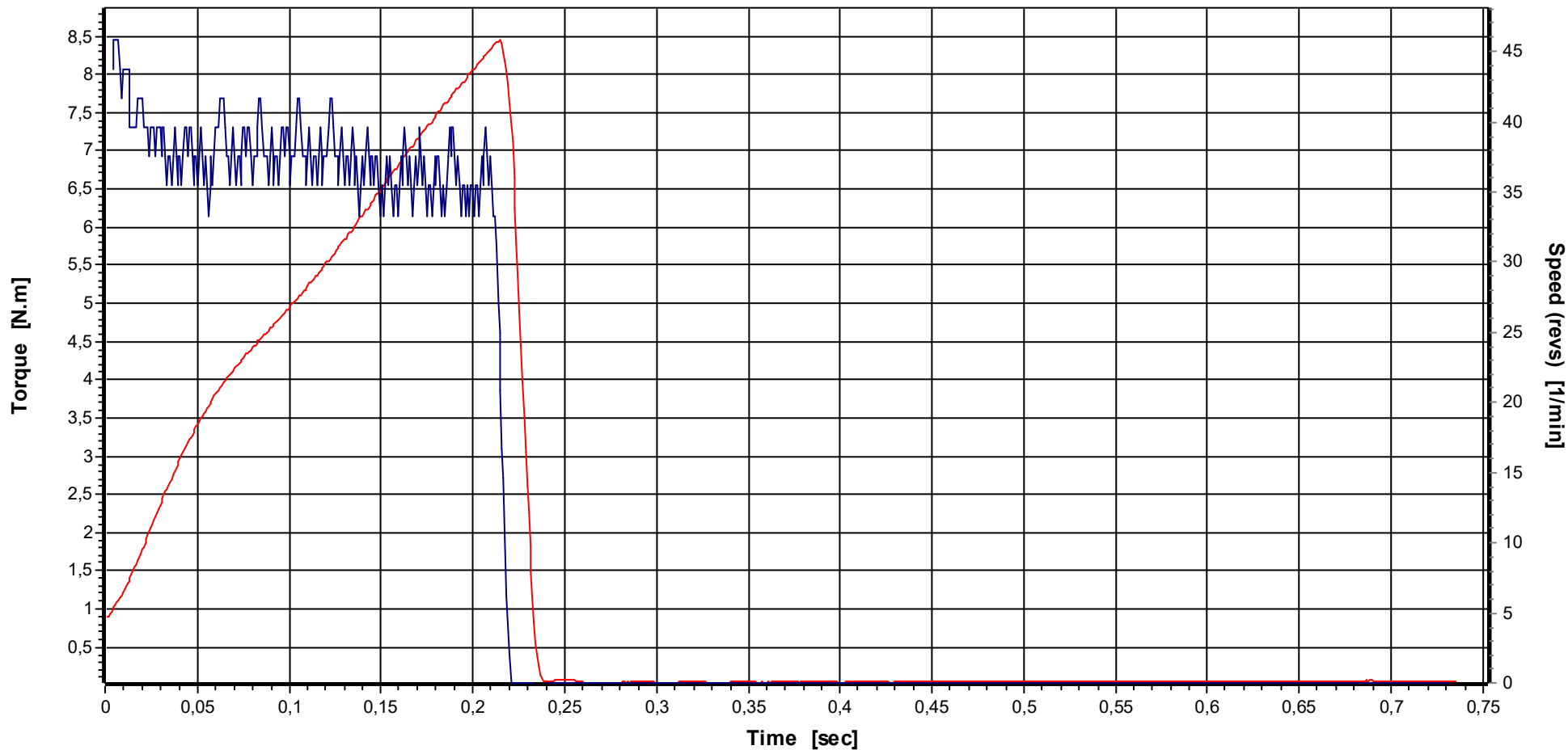


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grad	Random sample No.	7	Tester	M.Brkcic	Printout date	08.08.2018
LL	35,00 grad	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	03.07.2018 15:35:59
UL	45,00 grad	Supporting points	925			Date/time measurement	03.07.2018 16:00:44

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

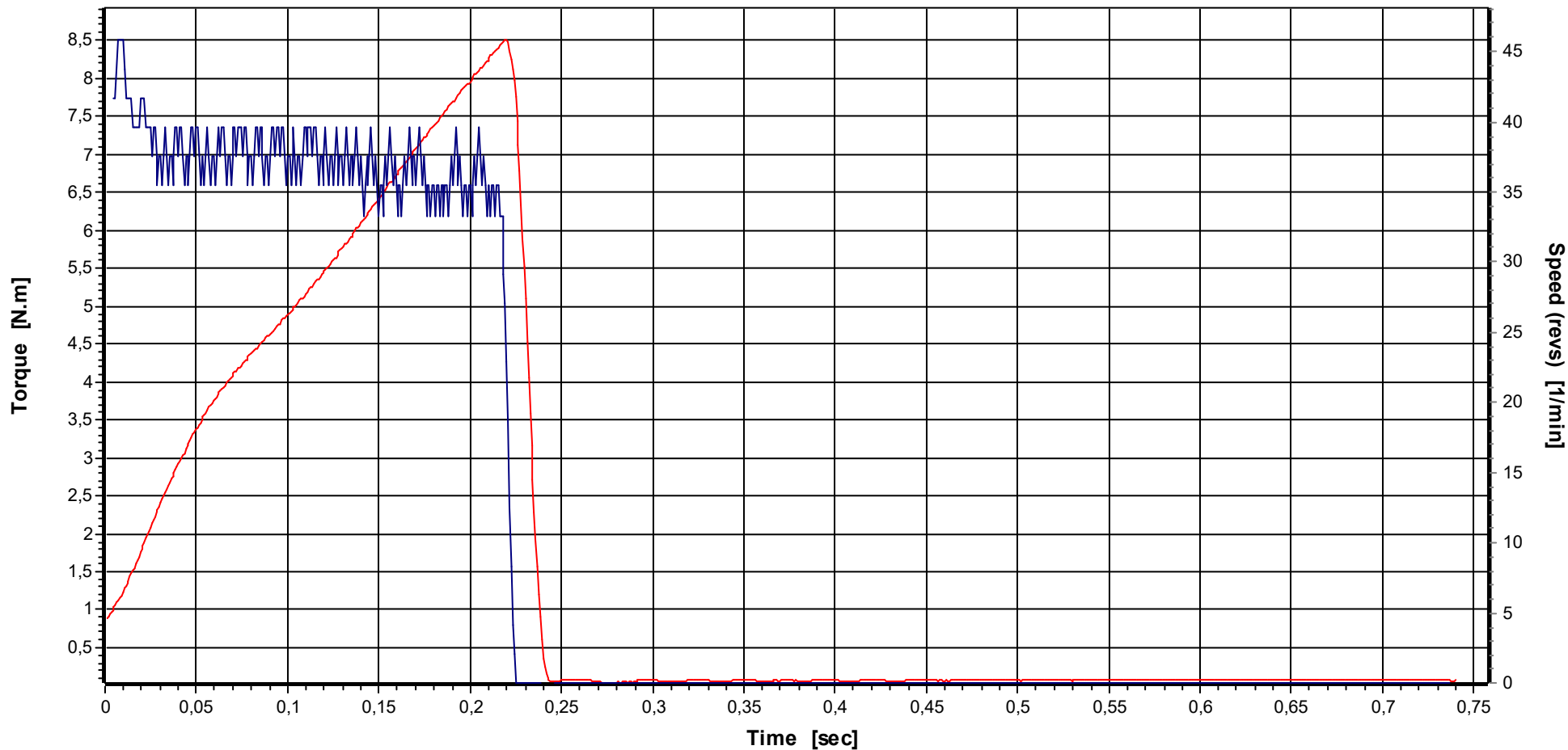


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	03.07.2018 15:35:59
UL	45,00 grd	Supporting points	919			Date/time measurement	03.07.2018 15:35:59

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	7	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	03.07.2018 15:35:59
UL	45,00 grd	Supporting points	925			Date/time measurement	03.07.2018 16:00:44

Date/ Time	03.07.2018 15:35:59	Transducer S/N	01033617
Tester/ Name	M.Brkc	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,8875	1,5000	0,2873	5,801	5,671	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	39,75 °	-0,6 %	8,448 N.m	0,6 %	50 rpm	03.07.2018	15:35:59
2	39,75 °	-0,6 %	8,374 N.m	-0,3 %	50 rpm	03.07.2018	15:36:14
3	40,25 °	0,6 %	8,539 N.m	1,7 %	49 rpm	03.07.2018	15:36:29
4	39,50 °	-1,3 %	8,413 N.m	0,2 %	50 rpm	03.07.2018	15:36:44
5	40,75 °	1,9 %	8,568 N.m	2,0 %	50 rpm	03.07.2018	15:36:59
6	39,75 °	-0,6 %	8,440 N.m	0,5 %	50 rpm	03.07.2018	15:37:14
7	40,00 °	0,0 %	8,466 N.m	0,8 %	50 rpm	03.07.2018	15:37:29
8	39,25 °	-1,9 %	8,406 N.m	0,1 %	50 rpm	03.07.2018	15:37:44
9	40,00 °	0,0 %	8,485 N.m	1,0 %	50 rpm	03.07.2018	15:37:59
10	40,25 °	0,6 %	8,532 N.m	1,6 %	50 rpm	03.07.2018	15:38:14
11	40,25 °	0,6 %	8,524 N.m	1,5 %	50 rpm	03.07.2018	15:38:29
12	40,25 °	0,6 %	8,493 N.m	1,1 %	50 rpm	03.07.2018	15:38:44
13	40,00 °	0,0 %	8,454 N.m	0,6 %	50 rpm	03.07.2018	15:38:59
14	39,50 °	-1,3 %	8,429 N.m	0,3 %	50 rpm	03.07.2018	15:39:14
15	39,50 °	-1,3 %	8,404 N.m	0,0 %	50 rpm	03.07.2018	15:39:29
16	40,00 °	0,0 %	8,466 N.m	0,8 %	50 rpm	03.07.2018	15:39:44
17	39,75 °	-0,6 %	8,380 N.m	-0,2 %	50 rpm	03.07.2018	15:39:59
18	40,25 °	0,6 %	8,497 N.m	1,2 %	49 rpm	03.07.2018	15:40:14
19	39,50 °	-1,3 %	8,338 N.m	-0,7 %	50 rpm	03.07.2018	15:40:29
20	39,50 °	-1,3 %	8,431 N.m	0,4 %	49 rpm	03.07.2018	15:40:44
21	39,50 °	-1,3 %	8,371 N.m	-0,3 %	50 rpm	03.07.2018	15:40:59
22	40,25 °	0,6 %	8,536 N.m	1,6 %	49 rpm	03.07.2018	15:41:14
23	39,50 °	-1,3 %	8,392 N.m	-0,1 %	50 rpm	03.07.2018	15:41:29
24	40,50 °	1,3 %	8,506 N.m	1,3 %	50 rpm	03.07.2018	15:41:44
25	40,00 °	0,0 %	8,464 N.m	0,8 %	50 rpm	03.07.2018	15:41:59
26	40,25 °	0,6 %	8,491 N.m	1,1 %	50 rpm	03.07.2018	15:42:14
27	39,75 °	-0,6 %	8,423 N.m	0,3 %	50 rpm	03.07.2018	15:42:29
28	39,75 °	-0,6 %	8,413 N.m	0,2 %	50 rpm	03.07.2018	15:42:44
29	39,75 °	-0,6 %	8,442 N.m	0,5 %	50 rpm	03.07.2018	15:42:59
30	40,00 °	0,0 %	8,456 N.m	0,7 %	50 rpm	03.07.2018	15:43:14
31	39,75 °	-0,6 %	8,464 N.m	0,8 %	50 rpm	03.07.2018	15:43:29
32	40,00 °	0,0 %	8,475 N.m	0,9 %	50 rpm	03.07.2018	15:43:44
33	40,00 °	0,0 %	8,456 N.m	0,7 %	50 rpm	03.07.2018	15:43:59
34	39,75 °	-0,6 %	8,417 N.m	0,2 %	50 rpm	03.07.2018	15:44:14
35	40,00 °	0,0 %	8,444 N.m	0,5 %	50 rpm	03.07.2018	15:44:29
36	39,75 °	-0,6 %	8,322 N.m	-0,9 %	50 rpm	03.07.2018	15:44:44
37	40,00 °	0,0 %	8,462 N.m	0,7 %	49 rpm	03.07.2018	15:44:59
38	39,75 °	-0,6 %	8,340 N.m	-0,7 %	50 rpm	03.07.2018	15:45:14
39	39,50 °	-1,3 %	8,421 N.m	0,3 %	49 rpm	03.07.2018	15:45:29
40	40,00 °	0,0 %	8,382 N.m	-0,2 %	50 rpm	03.07.2018	15:45:44
41	40,00 °	0,0 %	8,427 N.m	0,3 %	49 rpm	03.07.2018	15:45:59
42	39,75 °	-0,6 %	8,390 N.m	-0,1 %	50 rpm	03.07.2018	15:46:14
43	40,25 °	0,6 %	8,501 N.m	1,2 %	50 rpm	03.07.2018	15:46:29
44	39,75 °	-0,6 %	8,404 N.m	0,0 %	50 rpm	03.07.2018	15:46:44
45	40,00 °	0,0 %	8,462 N.m	0,7 %	50 rpm	03.07.2018	15:46:59
46	39,50 °	-1,3 %	8,376 N.m	-0,3 %	50 rpm	03.07.2018	15:47:14
47	40,50 °	1,3 %	8,530 N.m	1,5 %	50 rpm	03.07.2018	15:47:29
48	39,50 °	-1,3 %	8,396 N.m	0,0 %	50 rpm	03.07.2018	15:47:44
49	40,00 °	0,0 %	8,458 N.m	0,7 %	50 rpm	03.07.2018	15:47:59
50	40,00 °	0,0 %	8,466 N.m	0,8 %	50 rpm	03.07.2018	15:48:14

Date/ Time	03.07.2018 15:35:59	Transducer S/N	01033617
Tester/ Name	M.Brkcic	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

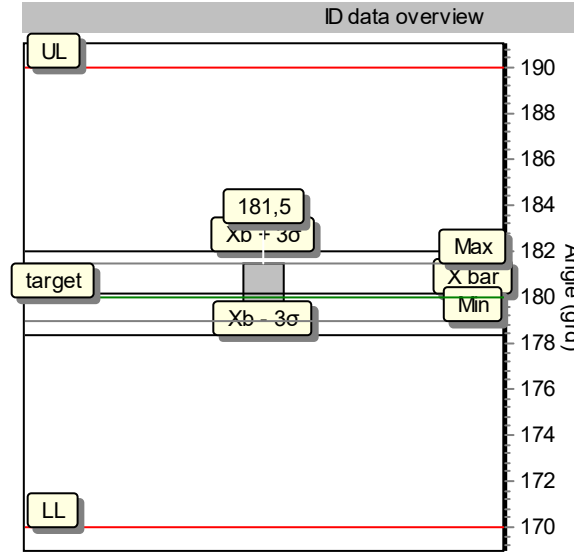
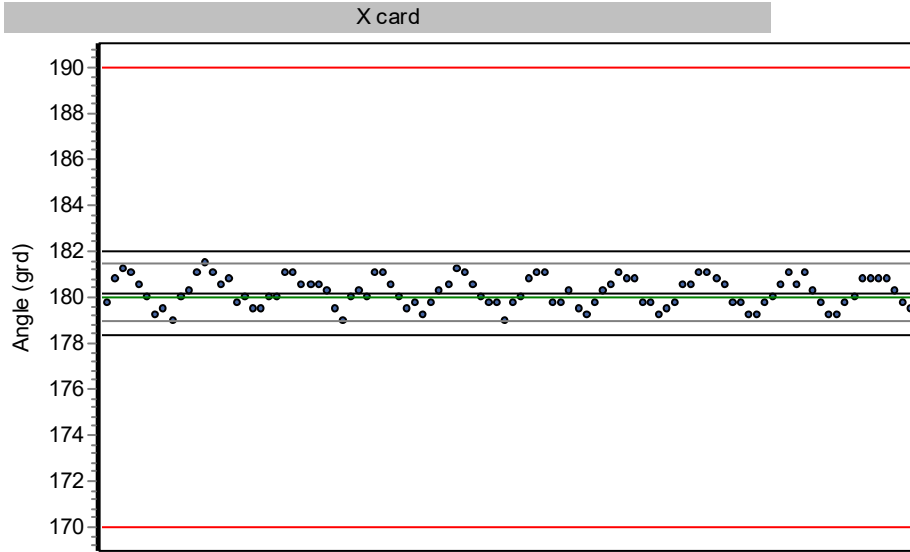
Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,8875	1,5000	0,2873	5,801	5,671	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	40,00 °	0,0 %	8,452 N.m	0,6 %	50 rpm	03.07.2018	15:48:29
52	39,75 °	-0,6 %	8,458 N.m	0,7 %	50 rpm	03.07.2018	15:48:44
53	39,50 °	-1,3 %	8,338 N.m	-0,7 %	50 rpm	03.07.2018	15:48:59
54	40,25 °	0,6 %	8,491 N.m	1,1 %	49 rpm	03.07.2018	15:49:14
55	39,75 °	-0,6 %	8,309 N.m	-1,1 %	50 rpm	03.07.2018	15:49:29
56	39,50 °	-1,3 %	8,392 N.m	-0,1 %	49 rpm	03.07.2018	15:49:44
57	39,75 °	-0,6 %	8,367 N.m	-0,4 %	50 rpm	03.07.2018	15:49:59
58	40,25 °	0,6 %	8,477 N.m	0,9 %	49 rpm	03.07.2018	15:50:14
59	40,00 °	0,0 %	8,419 N.m	0,2 %	50 rpm	03.07.2018	15:50:29
60	40,25 °	0,6 %	8,532 N.m	1,6 %	50 rpm	03.07.2018	15:50:44
61	39,75 °	-0,6 %	8,400 N.m	0,0 %	50 rpm	03.07.2018	15:50:59
62	40,00 °	0,0 %	8,458 N.m	0,7 %	50 rpm	03.07.2018	15:51:14
63	39,75 °	-0,6 %	8,442 N.m	0,5 %	50 rpm	03.07.2018	15:51:29
64	39,75 °	-0,6 %	8,400 N.m	0,0 %	50 rpm	03.07.2018	15:51:44
65	39,75 °	-0,6 %	8,440 N.m	0,5 %	50 rpm	03.07.2018	15:51:59
66	39,75 °	-0,6 %	8,411 N.m	0,1 %	50 rpm	03.07.2018	15:52:14
67	39,50 °	-1,3 %	8,458 N.m	0,7 %	50 rpm	03.07.2018	15:52:29
68	40,25 °	0,6 %	8,468 N.m	0,8 %	50 rpm	03.07.2018	15:52:44
69	39,75 °	-0,6 %	8,448 N.m	0,6 %	50 rpm	03.07.2018	15:52:59
70	39,75 °	-0,6 %	8,409 N.m	0,1 %	50 rpm	03.07.2018	15:53:14
71	39,50 °	-1,3 %	8,404 N.m	0,0 %	50 rpm	03.07.2018	15:53:29
72	39,75 °	-0,6 %	8,376 N.m	-0,3 %	50 rpm	03.07.2018	15:53:44
73	39,75 °	-0,6 %	8,427 N.m	0,3 %	50 rpm	03.07.2018	15:53:59
74	40,00 °	0,0 %	8,373 N.m	-0,3 %	50 rpm	03.07.2018	15:54:14
75	40,25 °	0,6 %	8,468 N.m	0,8 %	49 rpm	03.07.2018	15:54:29
76	39,75 °	-0,6 %	8,305 N.m	-1,1 %	50 rpm	03.07.2018	15:54:44
77	40,25 °	0,6 %	8,466 N.m	0,8 %	49 rpm	03.07.2018	15:54:59
78	39,50 °	-1,3 %	8,322 N.m	-0,9 %	50 rpm	03.07.2018	15:55:14
79	39,75 °	-0,6 %	8,404 N.m	0,0 %	49 rpm	03.07.2018	15:55:29
80	39,75 °	-0,6 %	8,392 N.m	-0,1 %	50 rpm	03.07.2018	15:55:44
81	40,00 °	0,0 %	8,479 N.m	0,9 %	50 rpm	03.07.2018	15:55:59
82	39,75 °	-0,6 %	8,396 N.m	0,0 %	50 rpm	03.07.2018	15:56:14
83	40,25 °	0,6 %	8,499 N.m	1,2 %	50 rpm	03.07.2018	15:56:29
84	39,75 °	-0,6 %	8,369 N.m	-0,4 %	50 rpm	03.07.2018	15:56:44
85	40,50 °	1,3 %	8,483 N.m	1,0 %	50 rpm	03.07.2018	15:56:59
86	39,75 °	-0,6 %	8,384 N.m	-0,2 %	50 rpm	03.07.2018	15:57:14
87	40,00 °	0,0 %	8,452 N.m	0,6 %	50 rpm	03.07.2018	15:57:29
88	39,50 °	-1,3 %	8,380 N.m	-0,2 %	50 rpm	03.07.2018	15:57:44
89	40,00 °	0,0 %	8,421 N.m	0,3 %	50 rpm	03.07.2018	15:57:59
90	39,75 °	-0,6 %	8,417 N.m	0,2 %	50 rpm	03.07.2018	15:58:14
91	40,25 °	0,6 %	8,477 N.m	0,9 %	50 rpm	03.07.2018	15:58:29
92	40,00 °	0,0 %	8,440 N.m	0,5 %	50 rpm	03.07.2018	15:58:44
93	39,75 °	-0,6 %	8,404 N.m	0,0 %	50 rpm	03.07.2018	15:58:59
94	39,75 °	-0,6 %	8,433 N.m	0,4 %	50 rpm	03.07.2018	15:59:14
95	40,00 °	0,0 %	8,407 N.m	0,1 %	50 rpm	03.07.2018	15:59:29
96	39,75 °	-0,6 %	8,409 N.m	0,1 %	50 rpm	03.07.2018	15:59:44
97	39,75 °	-0,6 %	8,336 N.m	-0,8 %	50 rpm	03.07.2018	15:59:59
98	40,00 °	0,0 %	8,458 N.m	0,7 %	49 rpm	03.07.2018	16:00:14
99	39,75 °	-0,6 %	8,357 N.m	-0,5 %	50 rpm	03.07.2018	16:00:29
100	40,50 °	1,3 %	8,510 N.m	1,3 %	49 rpm	03.07.2018	16:00:44

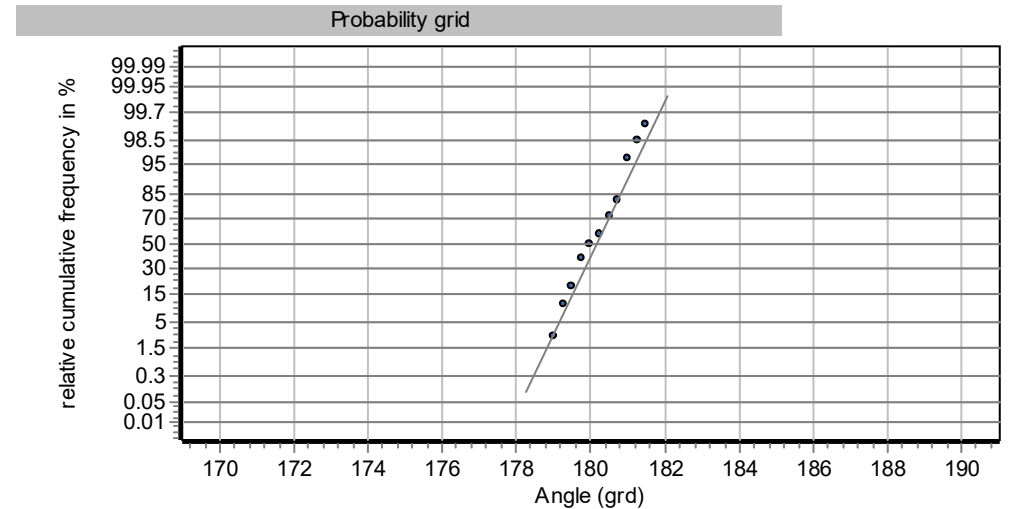
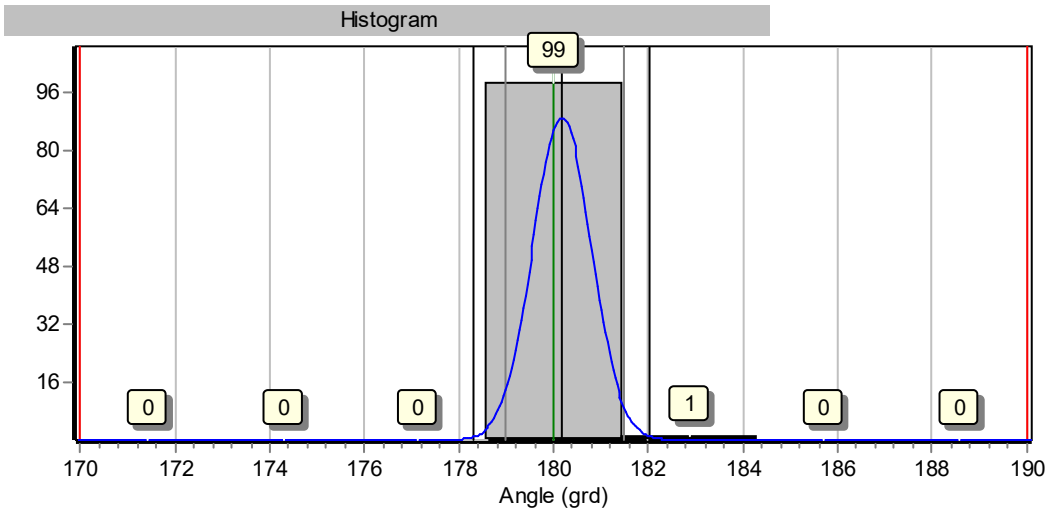
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240039

First sample MCT, 180 ° Screw joint: medium soft



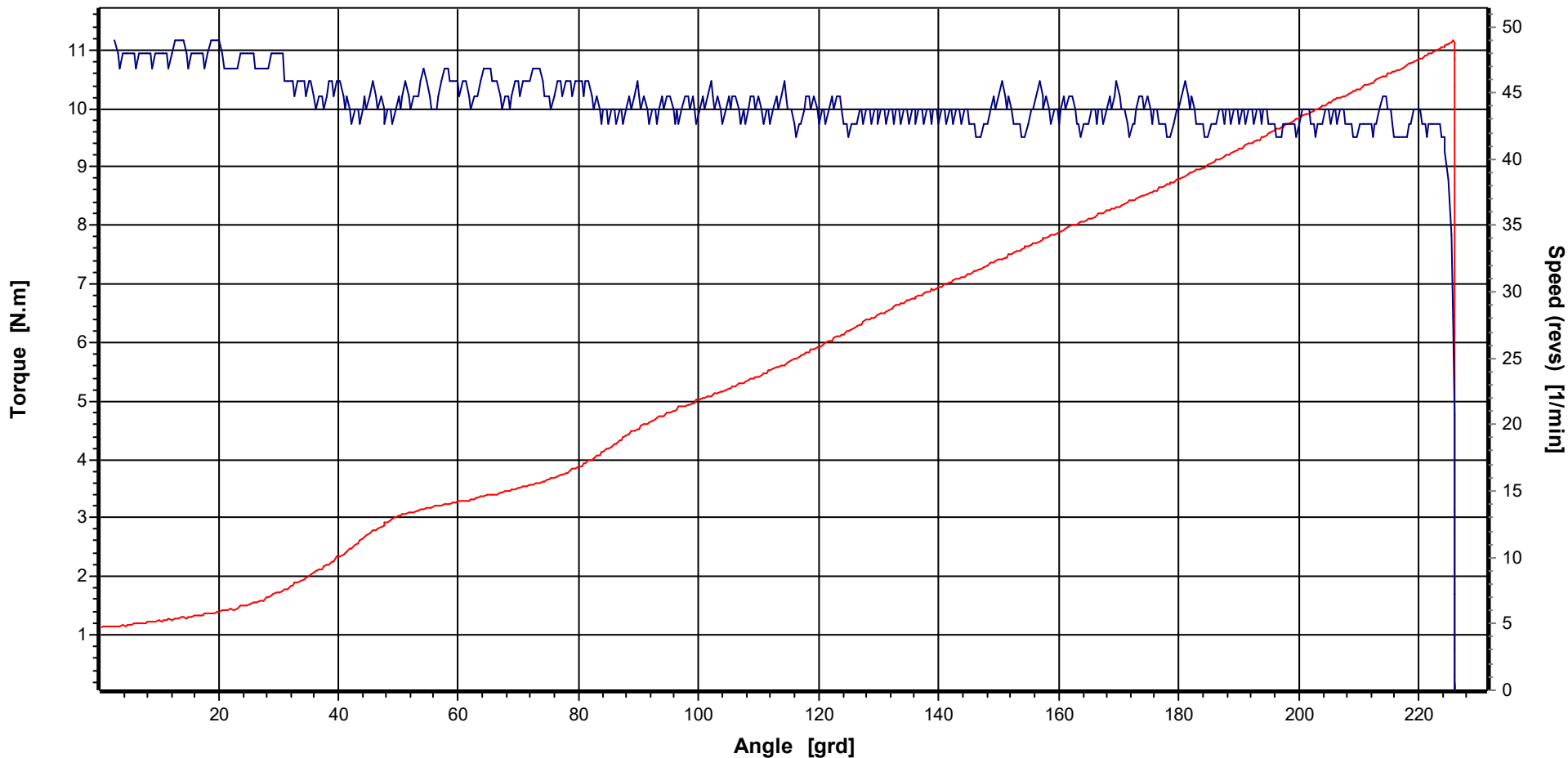
Tester	M.Brkcic
N	100
Target	180,00 grd
UL	190,00 grd
LL	170,00 grd
Max	181,50 grd
Min	179,00 grd
xq	180,1775 grd
s	0,6158 grd
Cm	5,413
Cmk	5,317



Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

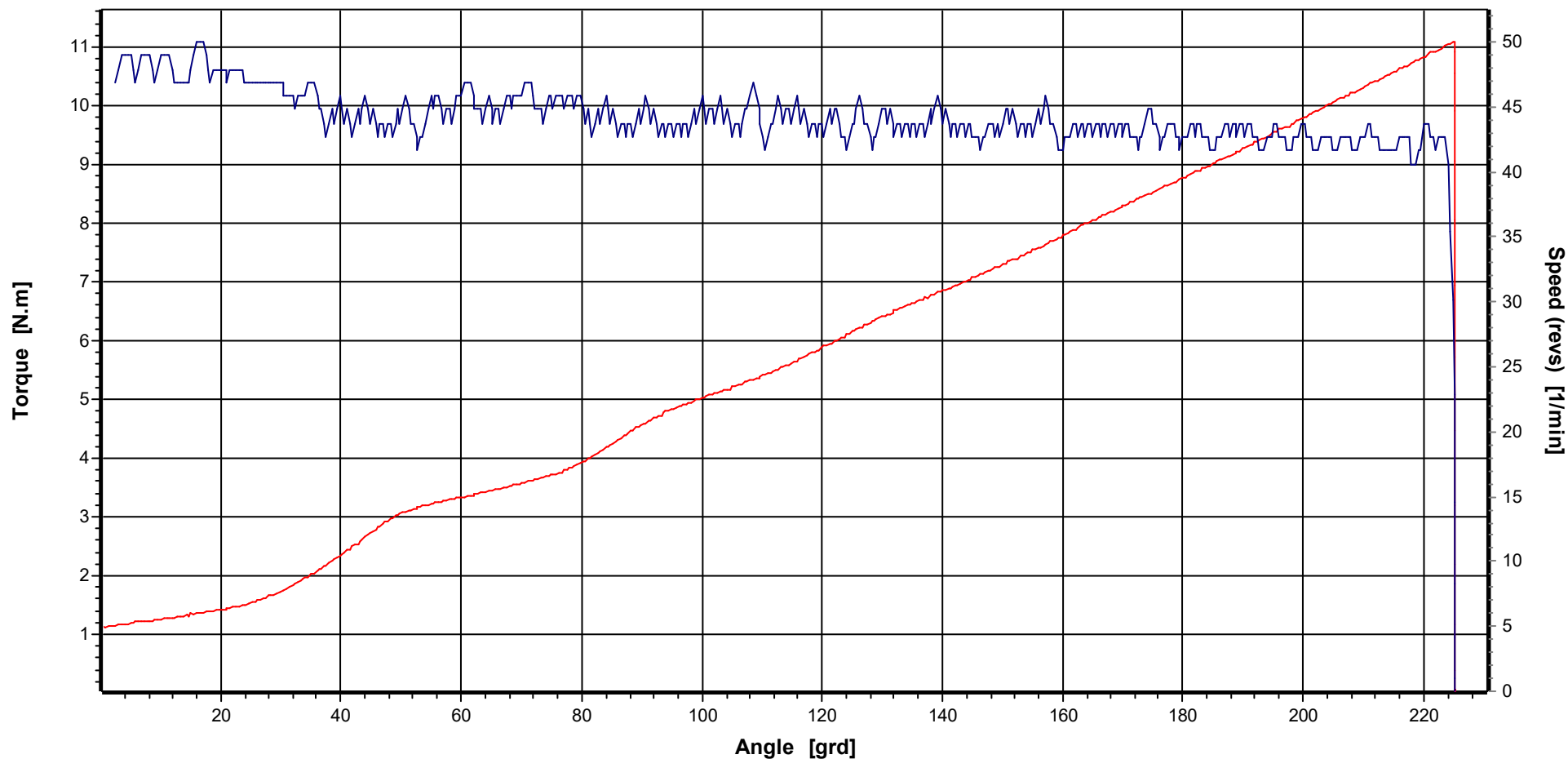


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	03.07.2018 16:12:10
UL	190,00 grd	Supporting points	842			Date/time measurement	03.07.2018 16:12:10

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

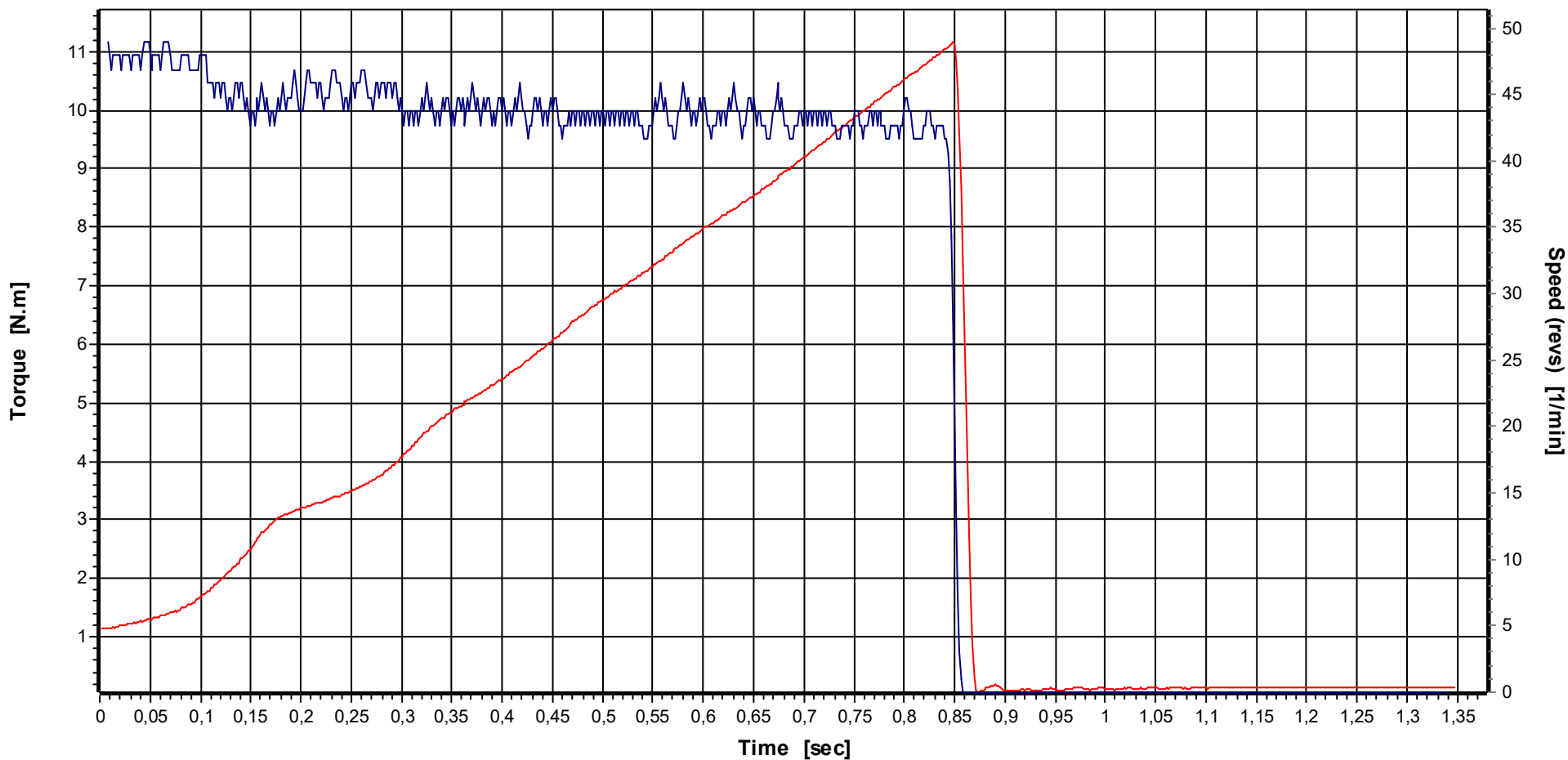


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	03.07.2018 16:12:10
UL	190,00 grd	Supporting points	841			Date/time measurement	03.07.2018 16:33:39

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

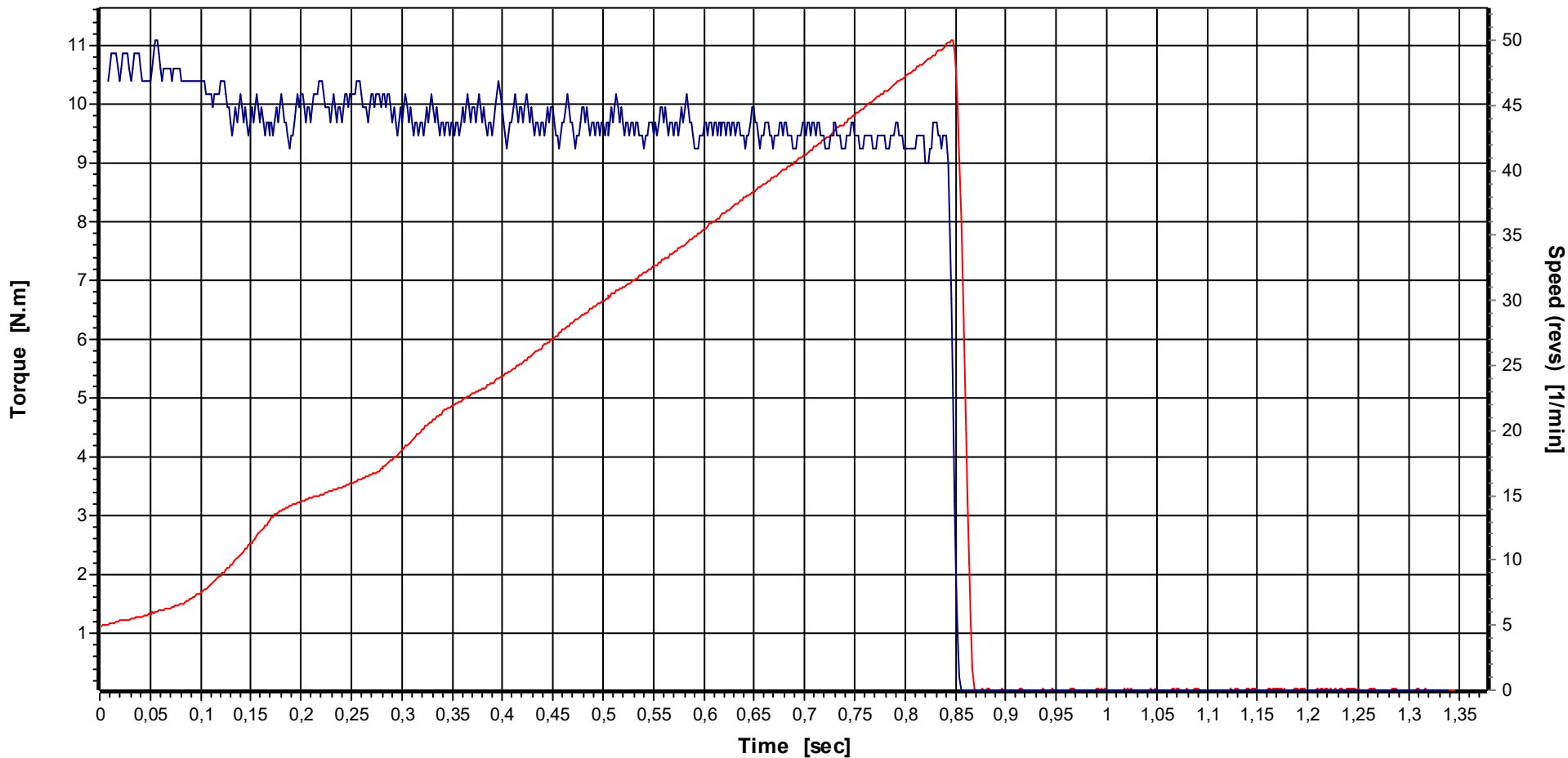


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	03.07.2018 16:12:10
UL	190,00 grd	Supporting points	842			Date/time measurement	03.07.2018 16:12:10

Graph

Tool model: TBPEC-12xx, Serial No.: 18240039
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	8	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	03.07.2018 16:12:10
UL	190,00 grd	Supporting points	841			Date/time measurement	03.07.2018 16:33:39

Date/ Time	03.07.2018 16:12:10	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,1775	2,5000	0,6158	5,413	5,317	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	179,75 °	-0,1 %	11,164 N.m	-0,3 %	50 rpm	03.07.2018	16:12:10
2	180,75 °	0,4 %	11,140 N.m	-0,5 %	50 rpm	03.07.2018	16:12:25
3	181,25 °	0,7 %	11,199 N.m	0,0 %	50 rpm	03.07.2018	16:12:39
4	181,00 °	0,6 %	11,230 N.m	0,3 %	50 rpm	03.07.2018	16:12:52
5	180,50 °	0,3 %	11,222 N.m	0,2 %	50 rpm	03.07.2018	16:13:05
6	180,00 °	0,0 %	11,218 N.m	0,2 %	50 rpm	03.07.2018	16:13:18
7	179,25 °	-0,4 %	11,078 N.m	-1,1 %	50 rpm	03.07.2018	16:13:31
8	179,50 °	-0,3 %	11,089 N.m	-1,0 %	50 rpm	03.07.2018	16:13:44
9	179,00 °	-0,6 %	11,058 N.m	-1,3 %	50 rpm	03.07.2018	16:13:57
10	180,00 °	0,0 %	11,140 N.m	-0,5 %	50 rpm	03.07.2018	16:14:10
11	180,25 °	0,1 %	11,156 N.m	-0,4 %	50 rpm	03.07.2018	16:14:23
12	181,00 °	0,6 %	11,105 N.m	-0,8 %	50 rpm	03.07.2018	16:14:36
13	181,50 °	0,8 %	11,210 N.m	0,1 %	50 rpm	03.07.2018	16:14:49
14	181,00 °	0,6 %	11,242 N.m	0,4 %	50 rpm	03.07.2018	16:15:02
15	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	03.07.2018	16:15:15
16	180,75 °	0,4 %	11,222 N.m	0,2 %	50 rpm	03.07.2018	16:15:28
17	179,75 °	-0,1 %	11,203 N.m	0,0 %	50 rpm	03.07.2018	16:15:41
18	180,00 °	0,0 %	11,074 N.m	-1,1 %	50 rpm	03.07.2018	16:15:54
19	179,50 °	-0,3 %	11,019 N.m	-1,6 %	50 rpm	03.07.2018	16:16:07
20	179,50 °	-0,3 %	11,101 N.m	-0,9 %	50 rpm	03.07.2018	16:16:20
21	180,00 °	0,0 %	11,148 N.m	-0,5 %	50 rpm	03.07.2018	16:16:33
22	180,00 °	0,0 %	11,125 N.m	-0,7 %	50 rpm	03.07.2018	16:16:46
23	181,00 °	0,6 %	11,132 N.m	-0,6 %	50 rpm	03.07.2018	16:16:59
24	181,00 °	0,6 %	11,265 N.m	0,6 %	50 rpm	03.07.2018	16:17:12
25	180,50 °	0,3 %	11,214 N.m	0,1 %	50 rpm	03.07.2018	16:17:25
26	180,50 °	0,3 %	11,183 N.m	-0,2 %	50 rpm	03.07.2018	16:17:38
27	180,50 °	0,3 %	11,191 N.m	-0,1 %	50 rpm	03.07.2018	16:17:51
28	180,25 °	0,1 %	11,086 N.m	-1,0 %	50 rpm	03.07.2018	16:18:04
29	179,50 °	-0,3 %	11,023 N.m	-1,6 %	50 rpm	03.07.2018	16:18:17
30	179,00 °	-0,6 %	11,035 N.m	-1,5 %	49 rpm	03.07.2018	16:18:30
31	180,00 °	0,0 %	11,160 N.m	-0,4 %	50 rpm	03.07.2018	16:18:43
32	180,25 °	0,1 %	11,136 N.m	-0,6 %	50 rpm	03.07.2018	16:18:56
33	180,00 °	0,0 %	11,097 N.m	-0,9 %	50 rpm	03.07.2018	16:19:09
34	181,00 °	0,6 %	11,222 N.m	0,2 %	50 rpm	03.07.2018	16:19:22
35	181,00 °	0,6 %	11,288 N.m	0,8 %	50 rpm	03.07.2018	16:19:35
36	180,50 °	0,3 %	11,230 N.m	0,3 %	50 rpm	03.07.2018	16:19:48
37	180,00 °	0,0 %	11,179 N.m	-0,2 %	50 rpm	03.07.2018	16:20:01
38	179,50 °	-0,3 %	11,050 N.m	-1,3 %	50 rpm	03.07.2018	16:20:14
39	179,75 °	-0,1 %	11,019 N.m	-1,6 %	50 rpm	03.07.2018	16:20:27
40	179,25 °	-0,4 %	11,039 N.m	-1,4 %	50 rpm	03.07.2018	16:20:40
41	179,75 °	-0,1 %	11,132 N.m	-0,6 %	50 rpm	03.07.2018	16:20:53
42	180,25 °	0,1 %	11,152 N.m	-0,4 %	50 rpm	03.07.2018	16:21:06
43	180,50 °	0,3 %	11,109 N.m	-0,8 %	50 rpm	03.07.2018	16:21:19
44	181,25 °	0,7 %	11,238 N.m	0,3 %	50 rpm	03.07.2018	16:21:32
45	181,00 °	0,6 %	11,253 N.m	0,5 %	50 rpm	03.07.2018	16:21:45
46	180,50 °	0,3 %	11,203 N.m	0,0 %	50 rpm	03.07.2018	16:21:58
47	180,00 °	0,0 %	11,183 N.m	-0,2 %	50 rpm	03.07.2018	16:22:11
48	179,75 °	-0,1 %	11,066 N.m	-1,2 %	51 rpm	03.07.2018	16:22:24
49	179,75 °	-0,1 %	11,070 N.m	-1,2 %	50 rpm	03.07.2018	16:22:37
50	179,00 °	-0,6 %	11,039 N.m	-1,4 %	50 rpm	03.07.2018	16:22:50

Date/ Time	03.07.2018 16:12:10	Transducer S/N	01032159
Tester/ Name	M.Brkc	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240039
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

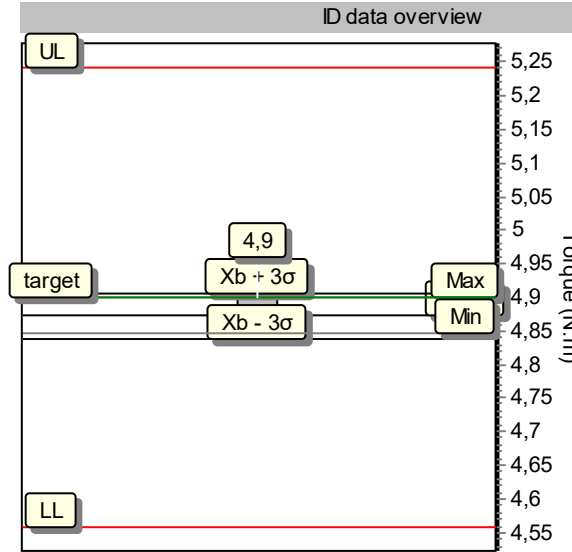
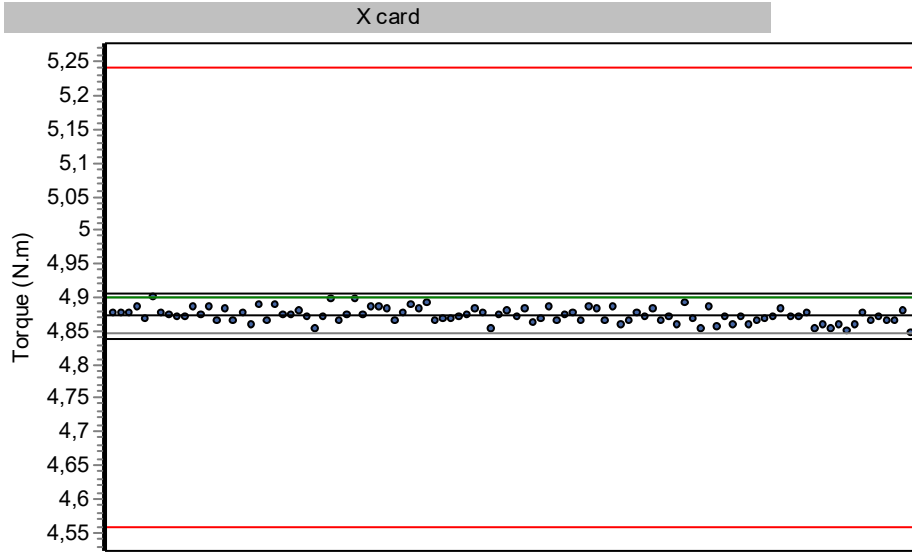
Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,1775	2,5000	0,6158	5,413	5,317	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	179,75 °	-0,1 %	11,128 N.m	-0,6 %	50 rpm	03.07.2018	16:23:03
52	180,00 °	0,0 %	11,156 N.m	-0,4 %	50 rpm	03.07.2018	16:23:16
53	180,75 °	0,4 %	11,113 N.m	-0,8 %	50 rpm	03.07.2018	16:23:29
54	181,00 °	0,6 %	11,273 N.m	0,7 %	50 rpm	03.07.2018	16:23:42
55	181,00 °	0,6 %	11,218 N.m	0,2 %	50 rpm	03.07.2018	16:23:55
56	179,75 °	-0,1 %	11,199 N.m	0,0 %	50 rpm	03.07.2018	16:24:08
57	179,75 °	-0,1 %	11,164 N.m	-0,3 %	51 rpm	03.07.2018	16:24:20
58	180,25 °	0,1 %	11,074 N.m	-1,1 %	50 rpm	03.07.2018	16:24:33
59	179,50 °	-0,3 %	11,004 N.m	-1,8 %	50 rpm	03.07.2018	16:24:47
60	179,25 °	-0,4 %	11,082 N.m	-1,1 %	50 rpm	03.07.2018	16:25:00
61	179,75 °	-0,1 %	11,156 N.m	-0,4 %	50 rpm	03.07.2018	16:25:13
62	180,25 °	0,1 %	11,171 N.m	-0,3 %	50 rpm	03.07.2018	16:25:26
63	180,50 °	0,3 %	11,125 N.m	-0,7 %	50 rpm	03.07.2018	16:25:39
64	181,00 °	0,6 %	11,230 N.m	0,3 %	50 rpm	03.07.2018	16:25:52
65	180,75 °	0,4 %	11,257 N.m	0,5 %	50 rpm	03.07.2018	16:26:05
66	180,75 °	0,4 %	11,183 N.m	-0,2 %	50 rpm	03.07.2018	16:26:18
67	179,75 °	-0,1 %	11,175 N.m	-0,2 %	51 rpm	03.07.2018	16:26:31
68	179,75 °	-0,1 %	11,101 N.m	-0,9 %	51 rpm	03.07.2018	16:26:43
69	179,25 °	-0,4 %	11,027 N.m	-1,5 %	50 rpm	03.07.2018	16:26:57
70	179,50 °	-0,3 %	11,039 N.m	-1,4 %	50 rpm	03.07.2018	16:27:10
71	179,75 °	-0,1 %	11,144 N.m	-0,5 %	50 rpm	03.07.2018	16:27:22
72	180,50 °	0,3 %	11,160 N.m	-0,4 %	50 rpm	03.07.2018	16:27:35
73	180,50 °	0,3 %	11,125 N.m	-0,7 %	50 rpm	03.07.2018	16:27:49
74	181,00 °	0,6 %	11,257 N.m	0,5 %	50 rpm	03.07.2018	16:28:02
75	181,00 °	0,6 %	11,296 N.m	0,9 %	50 rpm	03.07.2018	16:28:15
76	180,75 °	0,4 %	11,218 N.m	0,2 %	50 rpm	03.07.2018	16:28:28
77	180,50 °	0,3 %	11,218 N.m	0,2 %	51 rpm	03.07.2018	16:28:41
78	179,75 °	-0,1 %	11,191 N.m	-0,1 %	51 rpm	03.07.2018	16:28:54
79	179,75 °	-0,1 %	11,066 N.m	-1,2 %	50 rpm	03.07.2018	16:29:07
80	179,25 °	-0,4 %	11,011 N.m	-1,7 %	50 rpm	03.07.2018	16:29:19
81	179,25 °	-0,4 %	11,093 N.m	-1,0 %	50 rpm	03.07.2018	16:29:32
82	179,75 °	-0,1 %	11,171 N.m	-0,3 %	50 rpm	03.07.2018	16:29:46
83	180,00 °	0,0 %	11,160 N.m	-0,4 %	50 rpm	03.07.2018	16:29:59
84	180,50 °	0,3 %	11,148 N.m	-0,5 %	50 rpm	03.07.2018	16:30:11
85	181,00 °	0,6 %	11,265 N.m	0,6 %	50 rpm	03.07.2018	16:30:24
86	180,50 °	0,3 %	11,226 N.m	0,2 %	50 rpm	03.07.2018	16:30:38
87	181,00 °	0,6 %	11,230 N.m	0,3 %	50 rpm	03.07.2018	16:30:51
88	180,25 °	0,1 %	11,203 N.m	0,0 %	51 rpm	03.07.2018	16:31:03
89	179,75 °	-0,1 %	11,101 N.m	-0,9 %	50 rpm	03.07.2018	16:31:17
90	179,25 °	-0,4 %	10,996 N.m	-1,8 %	50 rpm	03.07.2018	16:31:29
91	179,25 °	-0,4 %	11,008 N.m	-1,7 %	50 rpm	03.07.2018	16:31:43
92	179,75 °	-0,1 %	11,128 N.m	-0,6 %	50 rpm	03.07.2018	16:31:55
93	180,00 °	0,0 %	11,164 N.m	-0,3 %	50 rpm	03.07.2018	16:32:08
94	180,75 °	0,4 %	11,148 N.m	-0,5 %	50 rpm	03.07.2018	16:32:21
95	180,75 °	0,4 %	11,226 N.m	0,2 %	50 rpm	03.07.2018	16:32:34
96	180,75 °	0,4 %	11,246 N.m	0,4 %	50 rpm	03.07.2018	16:32:48
97	180,75 °	0,4 %	11,222 N.m	0,2 %	50 rpm	03.07.2018	16:33:00
98	180,25 °	0,1 %	11,222 N.m	0,2 %	50 rpm	03.07.2018	16:33:14
99	179,75 °	-0,1 %	11,140 N.m	-0,5 %	51 rpm	03.07.2018	16:33:26
100	179,50 °	-0,3 %	11,070 N.m	-1,2 %	50 rpm	03.07.2018	16:33:39

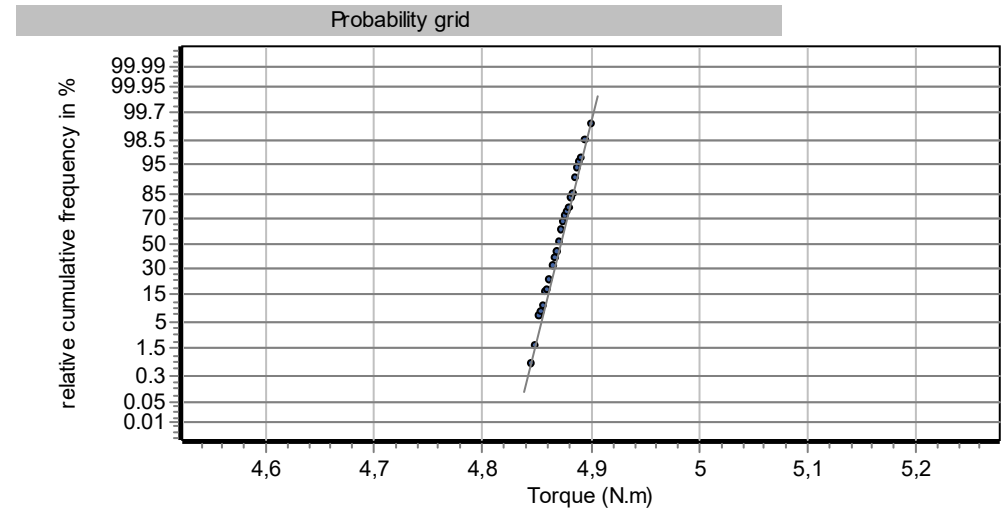
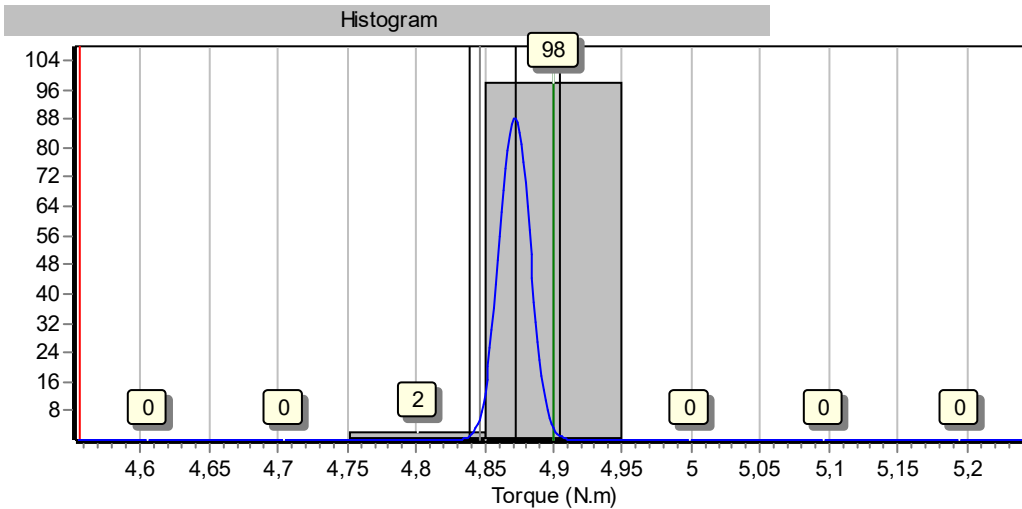
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 30% Screw joint: soft



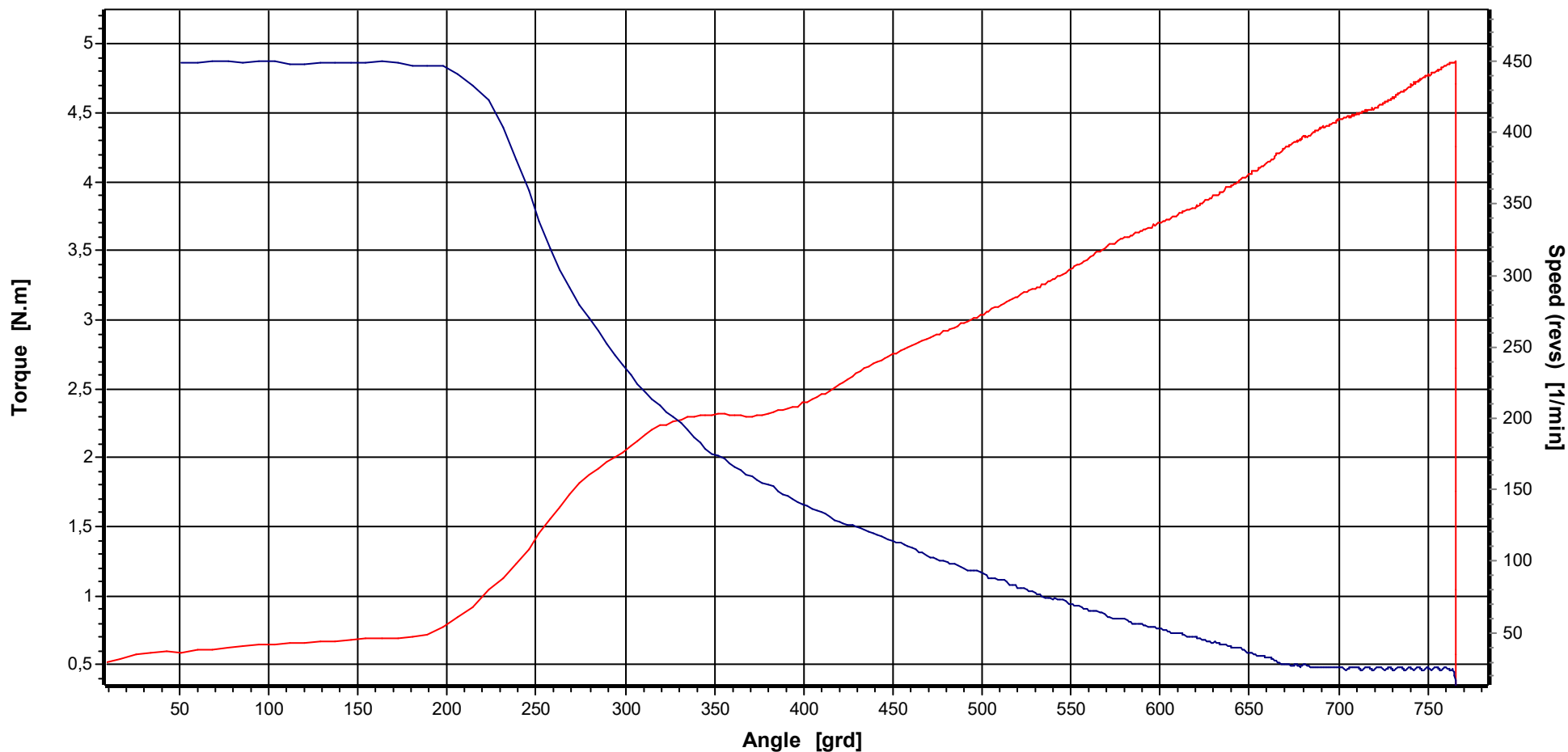
Tester	M.Brkic
N	100
Target	4,90 N.m
UL	5,24 N.m
LL	4,56 N.m
Max	4,90 N.m
Min	4,85 N.m
xq	4,8718 N.m
s	0,0110 N.m
Cm	10,347
Cmk	9,496



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

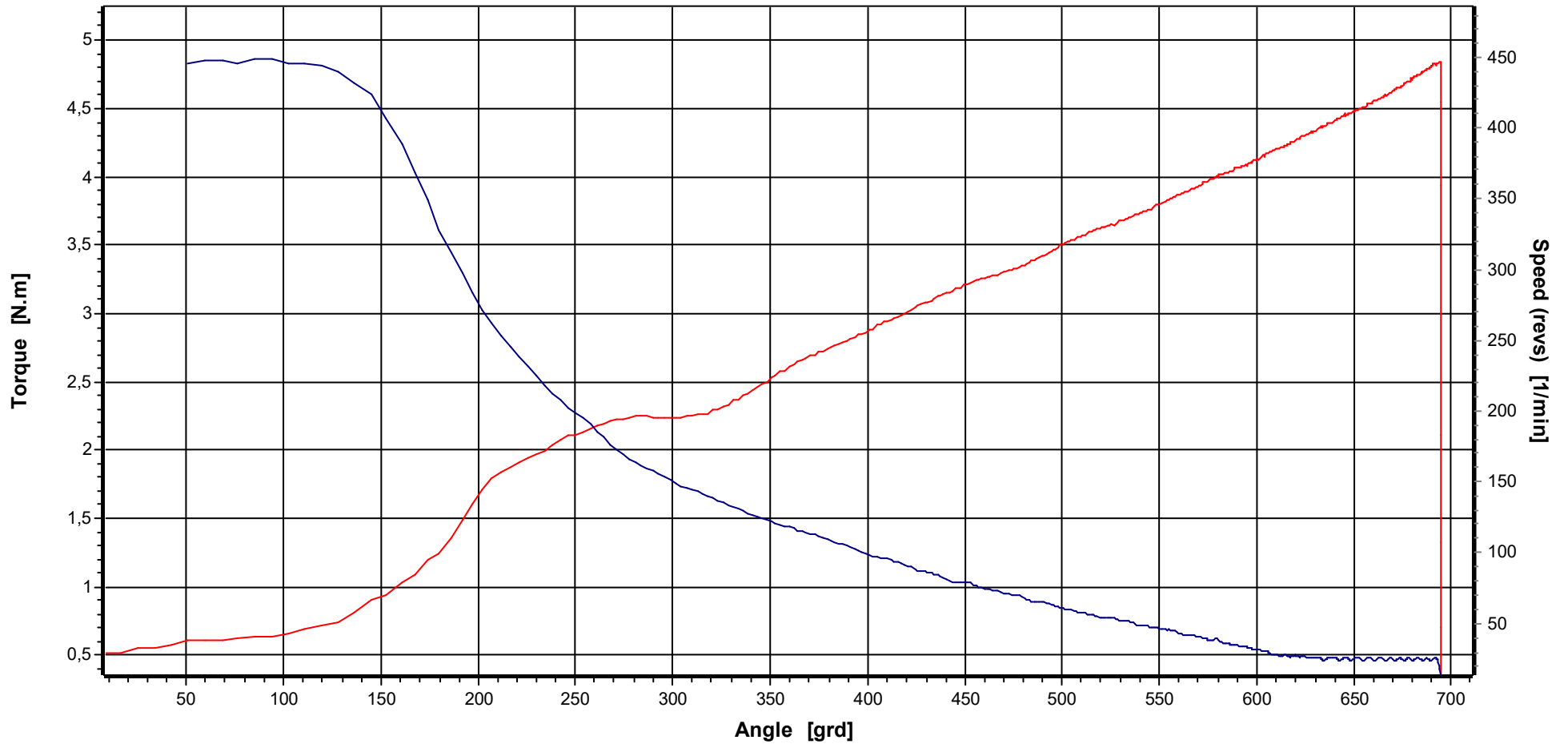


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 09:40:18
UL	5,24 N.m	Supporting points	638			Date/time measurement	20.07.2018 09:40:18

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

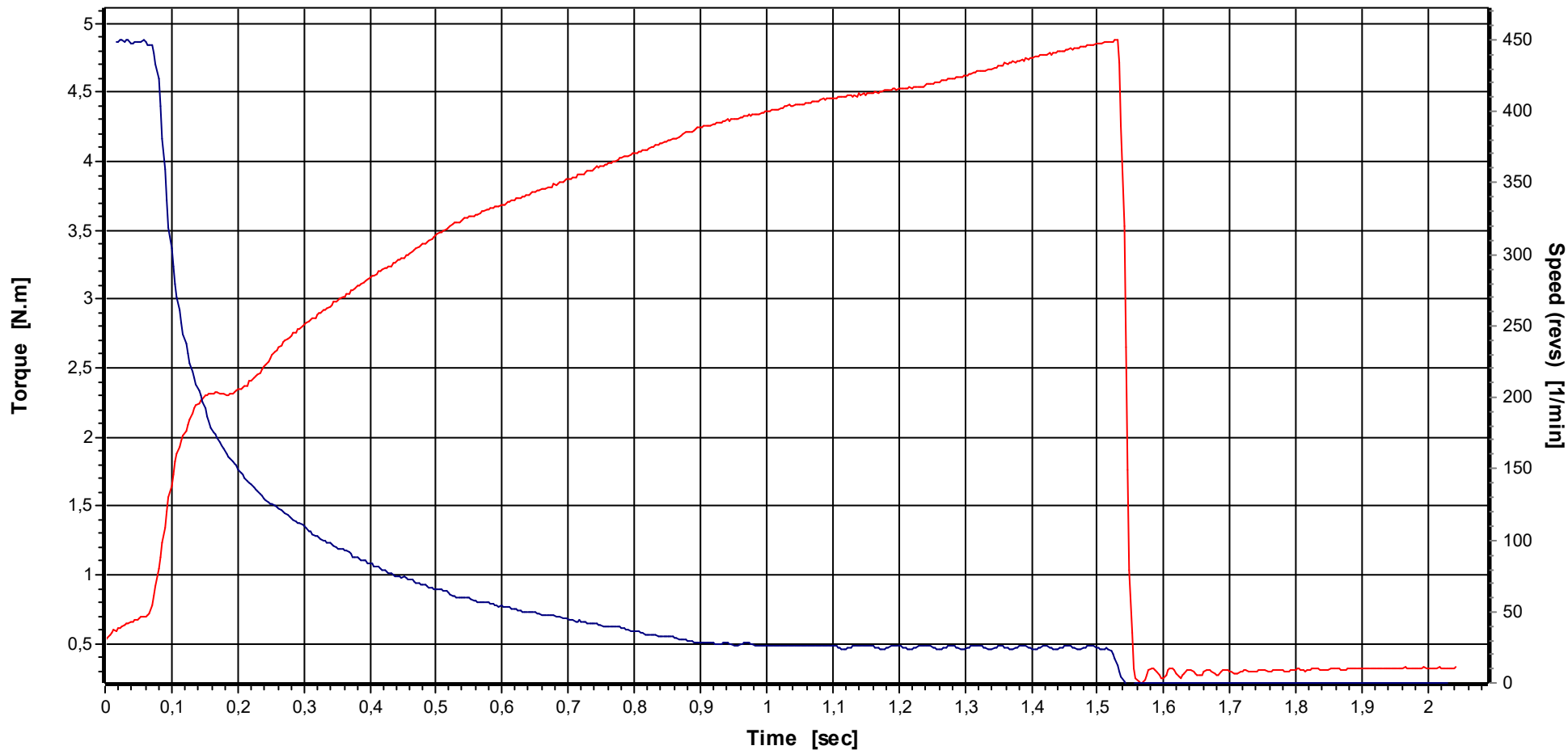


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 09:40:18
UL	5,24 N.m	Supporting points	625			Date/time measurement	20.07.2018 09:51:31

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

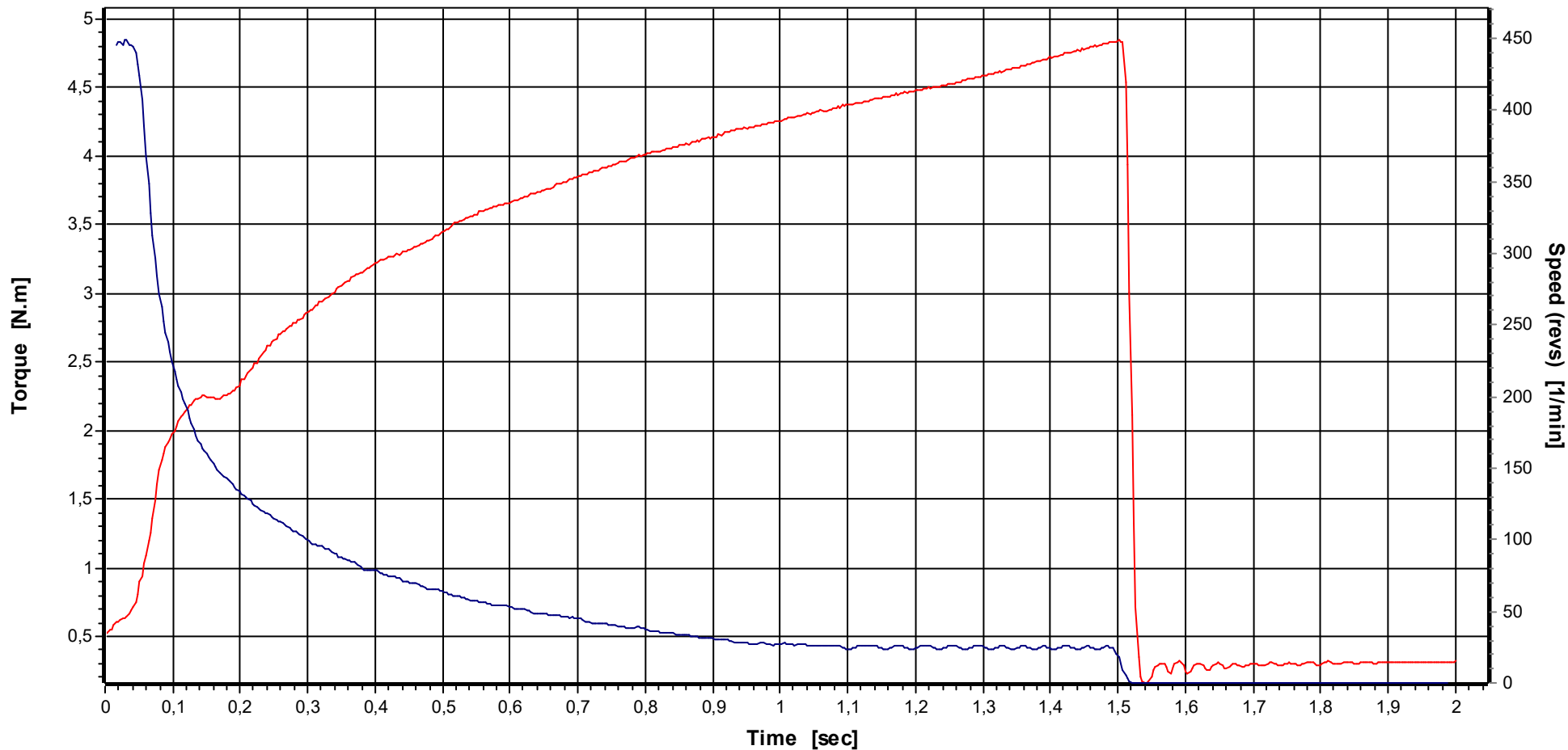


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 09:40:18
UL	5,24 N.m	Supporting points	638			Date/time measurement	20.07.2018 09:40:18

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 09:40:18
UL	5,24 N.m	Supporting points	625			Date/time measurement	20.07.2018 09:51:31

Date/ Time	20.07.2018 09:40:18	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,8718	0,0540	0,0110	10,347	9,496	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,877 N.m	-0,5 %	357,50 °	-0,7 %	452 rpm	52 rpm	20.07.2018	09:40:18
2	4,877 N.m	-0,5 %	361,00 °	0,3 %	451 rpm	51 rpm	20.07.2018	09:40:24
3	4,875 N.m	-0,5 %	361,75 °	0,5 %	453 rpm	53 rpm	20.07.2018	09:40:31
4	4,886 N.m	-0,3 %	364,75 °	1,3 %	452 rpm	51 rpm	20.07.2018	09:40:38
5	4,867 N.m	-0,7 %	365,00 °	1,4 %	452 rpm	51 rpm	20.07.2018	09:40:45
6	4,900 N.m	0,0 %	366,50 °	1,8 %	451 rpm	52 rpm	20.07.2018	09:40:52
7	4,875 N.m	-0,5 %	363,00 °	0,8 %	451 rpm	52 rpm	20.07.2018	09:40:58
8	4,873 N.m	-0,6 %	367,50 °	2,1 %	452 rpm	53 rpm	20.07.2018	09:41:05
9	4,871 N.m	-0,6 %	366,75 °	1,9 %	452 rpm	50 rpm	20.07.2018	09:41:12
10	4,869 N.m	-0,6 %	368,75 °	2,4 %	452 rpm	51 rpm	20.07.2018	09:41:19
11	4,886 N.m	-0,3 %	369,00 °	2,5 %	453 rpm	51 rpm	20.07.2018	09:41:26
12	4,873 N.m	-0,6 %	368,00 °	2,2 %	452 rpm	51 rpm	20.07.2018	09:41:33
13	4,886 N.m	-0,3 %	365,50 °	1,5 %	452 rpm	50 rpm	20.07.2018	09:41:39
14	4,865 N.m	-0,7 %	366,50 °	1,8 %	452 rpm	51 rpm	20.07.2018	09:41:46
15	4,882 N.m	-0,4 %	366,75 °	1,9 %	453 rpm	50 rpm	20.07.2018	09:41:53
16	4,863 N.m	-0,8 %	363,00 °	0,8 %	454 rpm	53 rpm	20.07.2018	09:42:00
17	4,875 N.m	-0,5 %	365,00 °	1,4 %	452 rpm	50 rpm	20.07.2018	09:42:07
18	4,859 N.m	-0,8 %	366,25 °	1,7 %	451 rpm	51 rpm	20.07.2018	09:42:13
19	4,888 N.m	-0,2 %	369,50 °	2,6 %	452 rpm	52 rpm	20.07.2018	09:42:20
20	4,863 N.m	-0,8 %	369,00 °	2,5 %	452 rpm	51 rpm	20.07.2018	09:42:27
21	4,888 N.m	-0,2 %	366,50 °	1,8 %	453 rpm	50 rpm	20.07.2018	09:42:34
22	4,873 N.m	-0,6 %	368,25 °	2,3 %	453 rpm	51 rpm	20.07.2018	09:42:40
23	4,873 N.m	-0,6 %	357,75 °	-0,6 %	452 rpm	50 rpm	20.07.2018	09:42:47
24	4,879 N.m	-0,4 %	364,25 °	1,2 %	452 rpm	52 rpm	20.07.2018	09:42:54
25	4,871 N.m	-0,6 %	359,50 °	-0,1 %	452 rpm	50 rpm	20.07.2018	09:43:01
26	4,853 N.m	-1,0 %	352,75 °	-2,0 %	452 rpm	52 rpm	20.07.2018	09:43:08
27	4,871 N.m	-0,6 %	361,25 °	0,3 %	453 rpm	53 rpm	20.07.2018	09:43:14
28	4,896 N.m	-0,1 %	364,00 °	1,1 %	452 rpm	51 rpm	20.07.2018	09:43:21
29	4,865 N.m	-0,7 %	355,00 °	-1,4 %	452 rpm	52 rpm	20.07.2018	09:43:28
30	4,873 N.m	-0,6 %	360,75 °	0,2 %	452 rpm	53 rpm	20.07.2018	09:43:35
31	4,896 N.m	-0,1 %	363,00 °	0,8 %	452 rpm	51 rpm	20.07.2018	09:43:42
32	4,873 N.m	-0,6 %	364,75 °	1,3 %	453 rpm	52 rpm	20.07.2018	09:43:48
33	4,886 N.m	-0,3 %	362,00 °	0,6 %	453 rpm	51 rpm	20.07.2018	09:43:55
34	4,886 N.m	-0,3 %	366,00 °	1,7 %	452 rpm	52 rpm	20.07.2018	09:44:02
35	4,882 N.m	-0,4 %	365,50 °	1,5 %	453 rpm	52 rpm	20.07.2018	09:44:09
36	4,863 N.m	-0,8 %	357,75 °	-0,6 %	452 rpm	50 rpm	20.07.2018	09:44:16
37	4,875 N.m	-0,5 %	359,75 °	-0,1 %	453 rpm	51 rpm	20.07.2018	09:44:22
38	4,888 N.m	-0,2 %	363,75 °	1,0 %	452 rpm	51 rpm	20.07.2018	09:44:29
39	4,882 N.m	-0,4 %	364,50 °	1,3 %	453 rpm	53 rpm	20.07.2018	09:44:36
40	4,892 N.m	-0,2 %	363,50 °	1,0 %	452 rpm	51 rpm	20.07.2018	09:44:43
41	4,865 N.m	-0,7 %	358,75 °	-0,3 %	452 rpm	51 rpm	20.07.2018	09:44:50
42	4,867 N.m	-0,7 %	362,50 °	0,7 %	452 rpm	51 rpm	20.07.2018	09:44:56
43	4,867 N.m	-0,7 %	359,50 °	-0,1 %	452 rpm	50 rpm	20.07.2018	09:45:03
44	4,871 N.m	-0,6 %	362,50 °	0,7 %	453 rpm	51 rpm	20.07.2018	09:45:10
45	4,873 N.m	-0,6 %	355,25 °	-1,3 %	452 rpm	51 rpm	20.07.2018	09:45:17
46	4,882 N.m	-0,4 %	366,50 °	1,8 %	453 rpm	52 rpm	20.07.2018	09:45:24
47	4,875 N.m	-0,5 %	362,00 °	0,6 %	452 rpm	50 rpm	20.07.2018	09:45:30
48	4,853 N.m	-1,0 %	355,50 °	-1,3 %	453 rpm	51 rpm	20.07.2018	09:45:37
49	4,873 N.m	-0,6 %	356,50 °	-1,0 %	453 rpm	50 rpm	20.07.2018	09:45:44
50	4,879 N.m	-0,4 %	361,50 °	0,4 %	453 rpm	50 rpm	20.07.2018	09:45:51

Date/ Time	20.07.2018 09:40:18	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

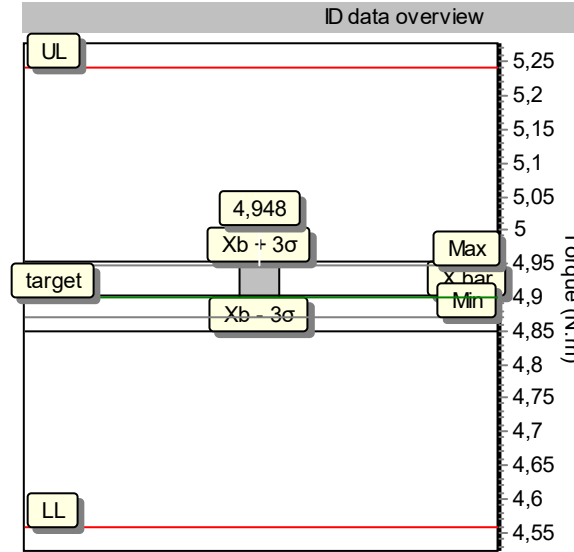
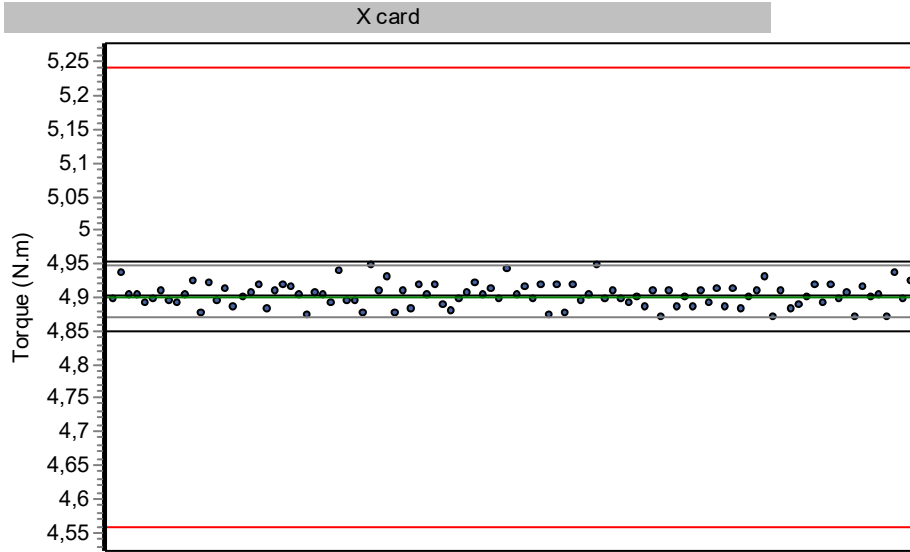
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,8718	0,0540	0,0110	10,347	9,496	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,871 N.m	-0,6 %	361,75 °	0,5 %	452 rpm	50 rpm	20.07.2018	09:45:58
52	4,881 N.m	-0,4 %	364,75 °	1,3 %	452 rpm	50 rpm	20.07.2018	09:46:04
53	4,861 N.m	-0,8 %	356,75 °	-0,9 %	453 rpm	51 rpm	20.07.2018	09:46:11
54	4,867 N.m	-0,7 %	362,50 °	0,7 %	452 rpm	51 rpm	20.07.2018	09:46:18
55	4,886 N.m	-0,3 %	361,25 °	0,3 %	452 rpm	50 rpm	20.07.2018	09:46:25
56	4,865 N.m	-0,7 %	356,50 °	-1,0 %	453 rpm	51 rpm	20.07.2018	09:46:32
57	4,873 N.m	-0,6 %	366,25 °	1,7 %	453 rpm	51 rpm	20.07.2018	09:46:38
58	4,877 N.m	-0,5 %	363,25 °	0,9 %	452 rpm	50 rpm	20.07.2018	09:46:45
59	4,865 N.m	-0,7 %	364,00 °	1,1 %	453 rpm	51 rpm	20.07.2018	09:46:52
60	4,884 N.m	-0,3 %	364,25 °	1,2 %	453 rpm	51 rpm	20.07.2018	09:46:59
61	4,881 N.m	-0,4 %	363,00 °	0,8 %	454 rpm	50 rpm	20.07.2018	09:47:06
62	4,863 N.m	-0,8 %	362,00 °	0,6 %	452 rpm	50 rpm	20.07.2018	09:47:12
63	4,884 N.m	-0,3 %	363,50 °	1,0 %	452 rpm	51 rpm	20.07.2018	09:47:19
64	4,859 N.m	-0,8 %	360,75 °	0,2 %	453 rpm	51 rpm	20.07.2018	09:47:26
65	4,863 N.m	-0,8 %	358,25 °	-0,5 %	454 rpm	52 rpm	20.07.2018	09:47:33
66	4,875 N.m	-0,5 %	362,75 °	0,8 %	453 rpm	50 rpm	20.07.2018	09:47:40
67	4,869 N.m	-0,6 %	363,00 °	0,8 %	453 rpm	52 rpm	20.07.2018	09:47:46
68	4,881 N.m	-0,4 %	364,50 °	1,3 %	452 rpm	50 rpm	20.07.2018	09:47:53
69	4,863 N.m	-0,8 %	361,50 °	0,4 %	453 rpm	50 rpm	20.07.2018	09:48:00
70	4,869 N.m	-0,6 %	361,25 °	0,3 %	453 rpm	49 rpm	20.07.2018	09:48:07
71	4,859 N.m	-0,8 %	361,50 °	0,4 %	453 rpm	51 rpm	20.07.2018	09:48:14
72	4,890 N.m	-0,2 %	364,00 °	1,1 %	453 rpm	51 rpm	20.07.2018	09:48:20
73	4,867 N.m	-0,7 %	364,25 °	1,2 %	452 rpm	51 rpm	20.07.2018	09:48:27
74	4,853 N.m	-1,0 %	357,25 °	-0,8 %	453 rpm	52 rpm	20.07.2018	09:48:34
75	4,884 N.m	-0,3 %	365,25 °	1,5 %	453 rpm	50 rpm	20.07.2018	09:48:41
76	4,855 N.m	-0,9 %	360,50 °	0,1 %	452 rpm	50 rpm	20.07.2018	09:48:48
77	4,871 N.m	-0,6 %	360,50 °	0,1 %	453 rpm	49 rpm	20.07.2018	09:48:54
78	4,859 N.m	-0,8 %	362,50 °	0,7 %	453 rpm	50 rpm	20.07.2018	09:49:01
79	4,871 N.m	-0,6 %	360,00 °	0,0 %	453 rpm	50 rpm	20.07.2018	09:49:08
80	4,859 N.m	-0,8 %	356,25 °	-1,0 %	453 rpm	51 rpm	20.07.2018	09:49:15
81	4,865 N.m	-0,7 %	362,50 °	0,7 %	454 rpm	52 rpm	20.07.2018	09:49:22
82	4,867 N.m	-0,7 %	360,00 °	0,0 %	454 rpm	49 rpm	20.07.2018	09:49:28
83	4,869 N.m	-0,6 %	363,00 °	0,8 %	453 rpm	50 rpm	20.07.2018	09:49:35
84	4,882 N.m	-0,4 %	363,75 °	1,0 %	452 rpm	51 rpm	20.07.2018	09:49:42
85	4,869 N.m	-0,6 %	360,75 °	0,2 %	453 rpm	50 rpm	20.07.2018	09:49:49
86	4,869 N.m	-0,6 %	364,75 °	1,3 %	453 rpm	51 rpm	20.07.2018	09:49:56
87	4,877 N.m	-0,5 %	362,00 °	0,6 %	453 rpm	50 rpm	20.07.2018	09:50:02
88	4,853 N.m	-1,0 %	362,25 °	0,6 %	453 rpm	51 rpm	20.07.2018	09:50:09
89	4,857 N.m	-0,9 %	360,50 °	0,1 %	454 rpm	49 rpm	20.07.2018	09:50:16
90	4,853 N.m	-1,0 %	362,25 °	0,6 %	452 rpm	50 rpm	20.07.2018	09:50:23
91	4,859 N.m	-0,8 %	359,00 °	-0,3 %	453 rpm	49 rpm	20.07.2018	09:50:30
92	4,850 N.m	-1,0 %	355,00 °	-1,4 %	453 rpm	50 rpm	20.07.2018	09:50:36
93	4,857 N.m	-0,9 %	360,50 °	0,1 %	453 rpm	50 rpm	20.07.2018	09:50:43
94	4,877 N.m	-0,5 %	362,00 °	0,6 %	453 rpm	50 rpm	20.07.2018	09:50:50
95	4,865 N.m	-0,7 %	358,50 °	-0,4 %	454 rpm	50 rpm	20.07.2018	09:50:57
96	4,871 N.m	-0,6 %	365,25 °	1,5 %	453 rpm	51 rpm	20.07.2018	09:51:04
97	4,865 N.m	-0,7 %	359,75 °	-0,1 %	454 rpm	49 rpm	20.07.2018	09:51:10
98	4,865 N.m	-0,7 %	362,50 °	0,7 %	454 rpm	51 rpm	20.07.2018	09:51:17
99	4,879 N.m	-0,4 %	363,75 °	1,0 %	453 rpm	50 rpm	20.07.2018	09:51:24
100	4,846 N.m	-1,1 %	353,00 °	-1,9 %	453 rpm	50 rpm	20.07.2018	09:51:31

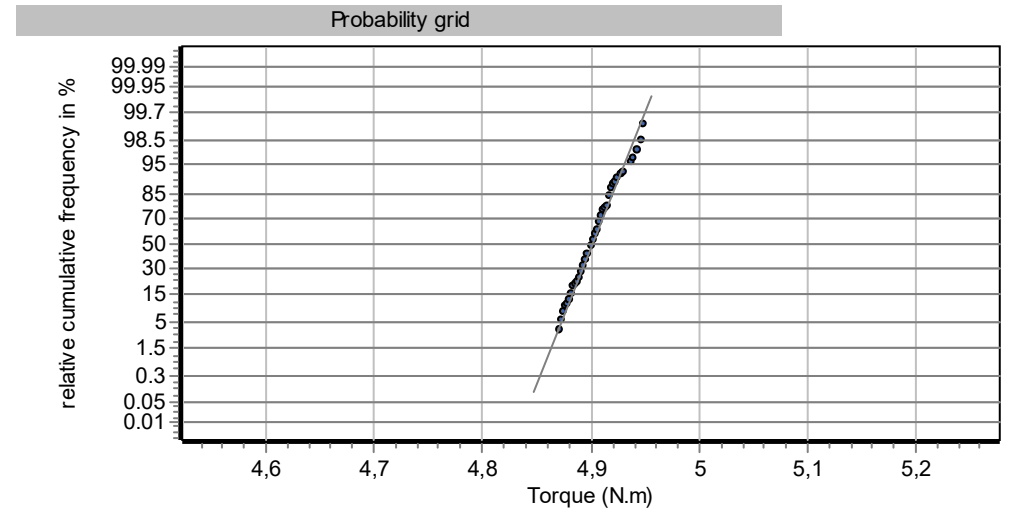
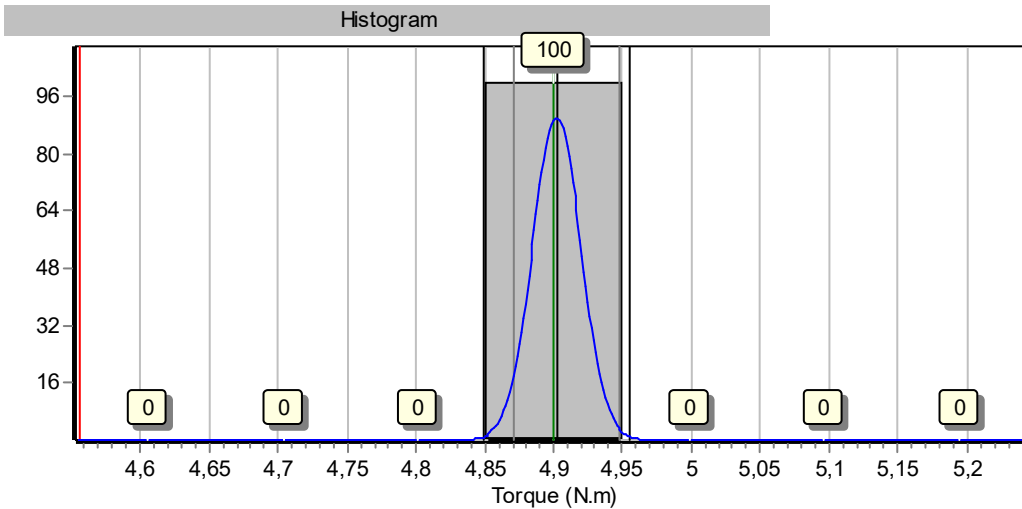
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 30% Screw joint: hard



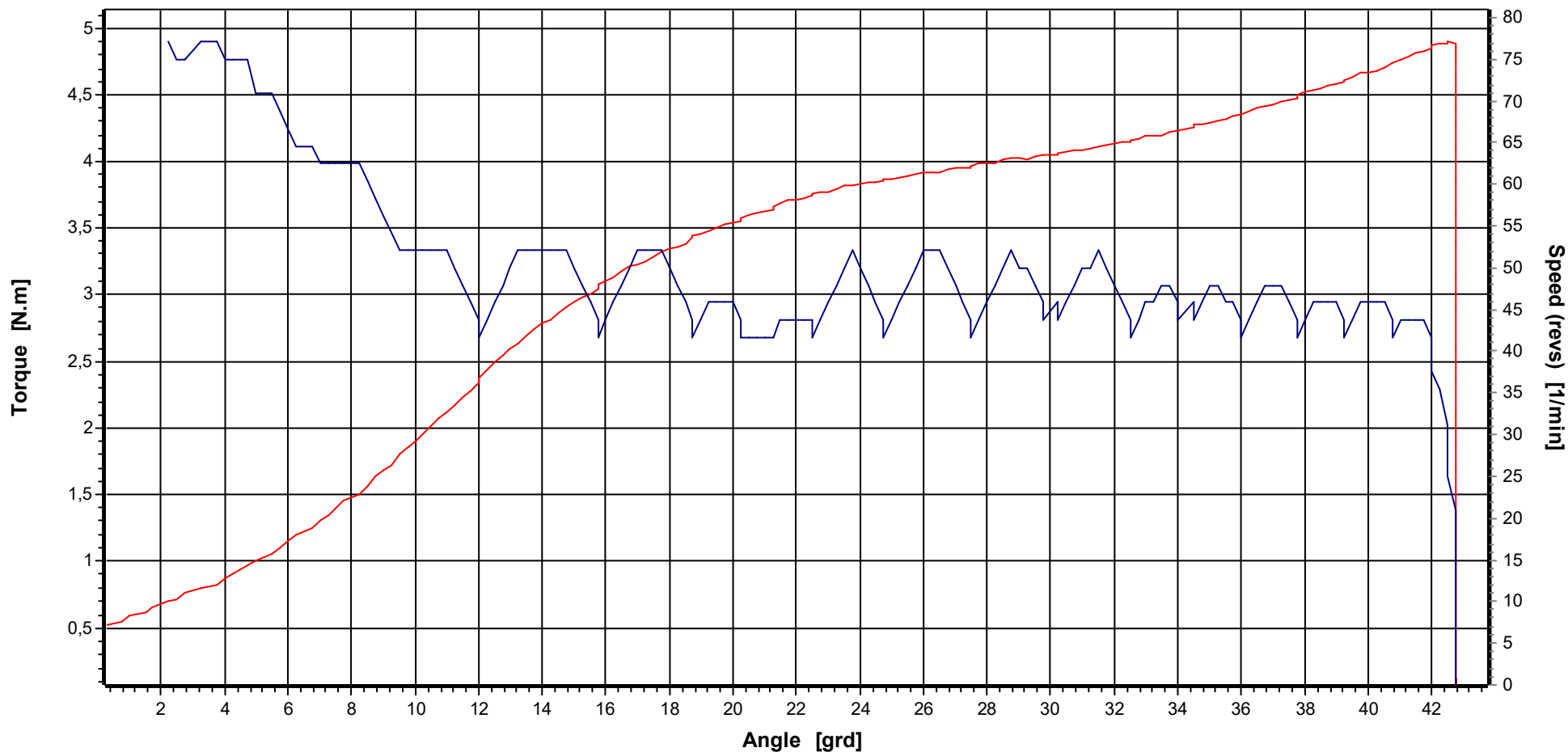
Tester	M.Brkic
N	100
Target	4,90 N.m
UL	5,24 N.m
LL	4,56 N.m
Max	4,95 N.m
Min	4,87 N.m
xq	4,9023 N.m
s	0,0175 N.m
Cm	6,541
Cmk	6,498



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

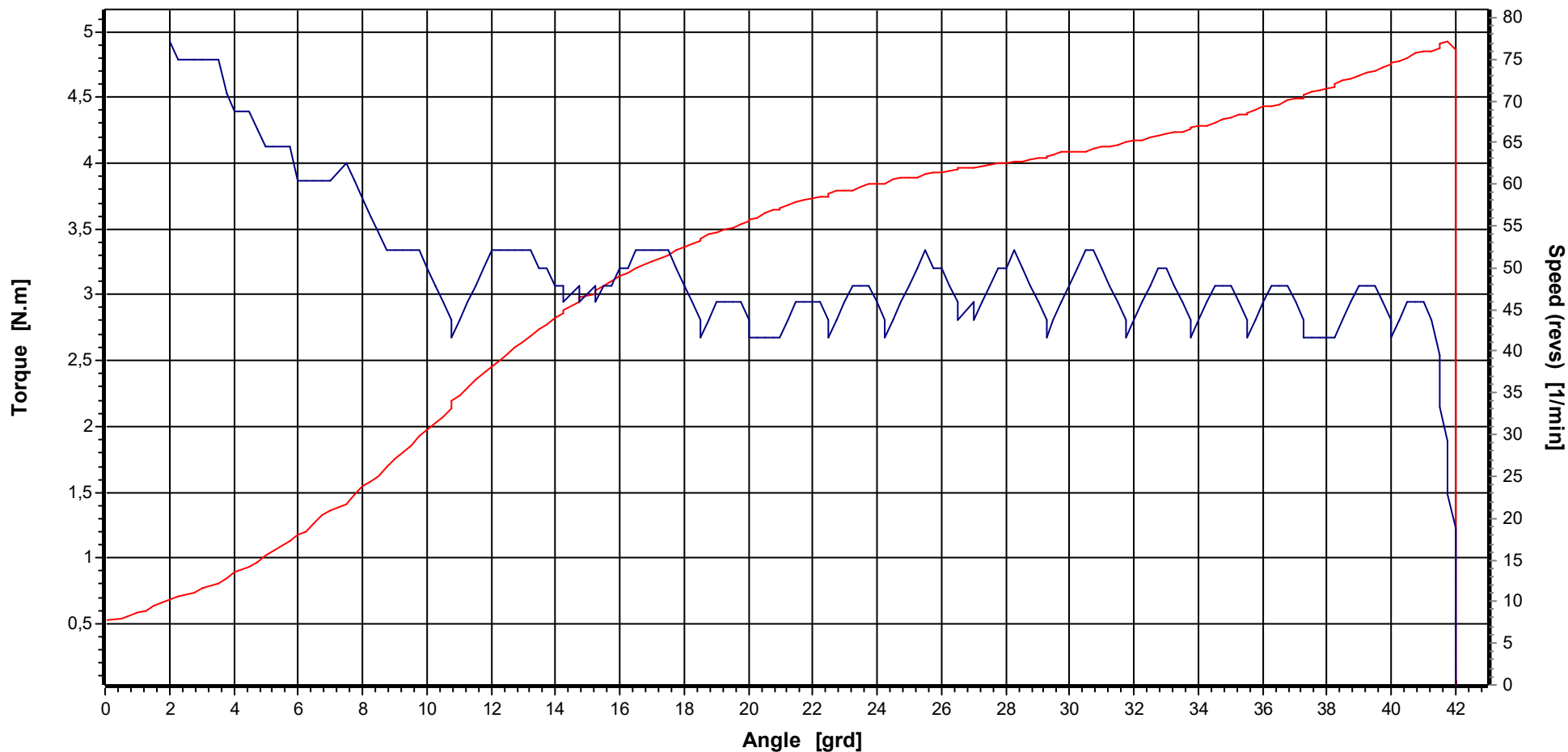


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 13:45:16
UL	5,24 N.m	Supporting points	800			Date/time measurement	04.07.2018 13:45:16

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

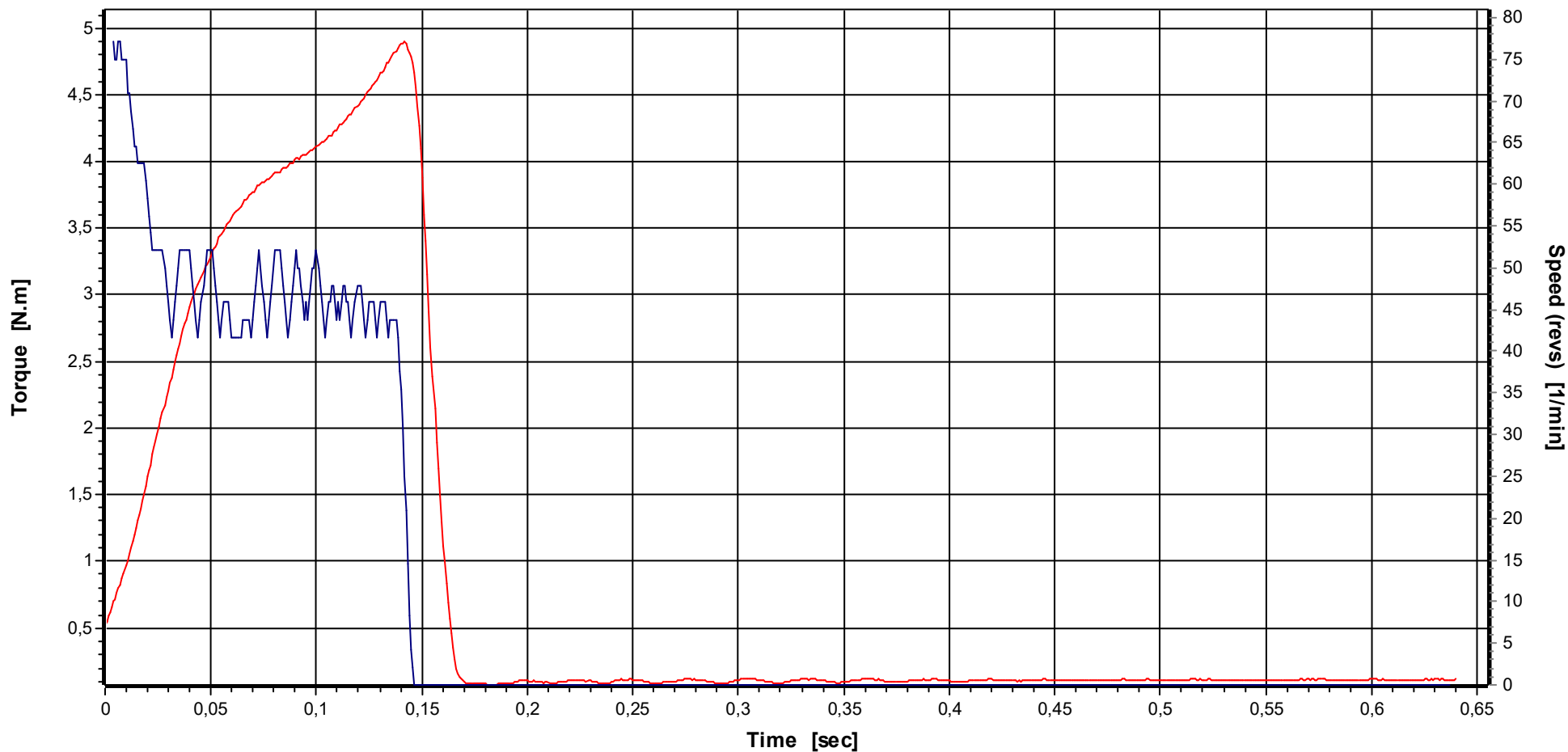


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	08.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 13:45:16
UL	5,24 N.m	Supporting points	801			Date/time measurement	04.07.2018 13:55:09

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

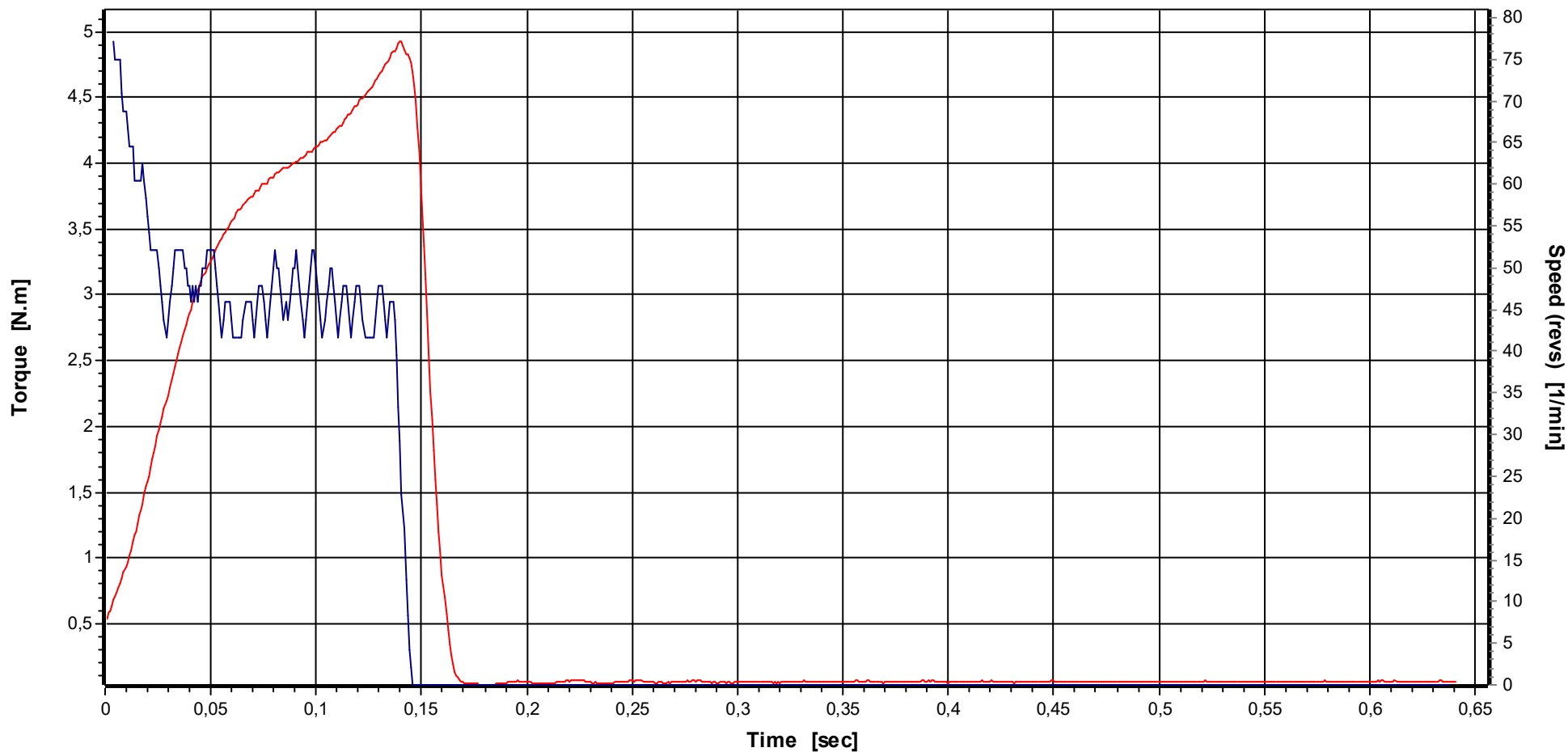


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurem. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 13:45:16
UL	5,24 N.m	Supporting points	800			Date/time measurement	04.07.2018 13:45:16

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	4,90 N.m	Random sample No.	6	Tester	M.Brkcic	Printout date	23.08.2018
LL	4,56 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 13:45:16
UL	5,24 N.m	Supporting points	801			Date/time measurement	04.07.2018 13:55:09

Date/ Time	04.07.2018 13:45:16	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9023	0,0770	0,0175	6,541	6,498	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	4,898 N.m	0,0 %	30,50 °	1,7 %	99 rpm	47 rpm	04.07.2018	13:45:16
2	4,937 N.m	0,8 %	30,75 °	2,5 %	100 rpm	46 rpm	04.07.2018	13:45:22
3	4,902 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	46 rpm	04.07.2018	13:45:27
4	4,904 N.m	0,1 %	30,50 °	1,7 %	99 rpm	47 rpm	04.07.2018	13:45:33
5	4,890 N.m	-0,2 %	30,25 °	0,8 %	100 rpm	48 rpm	04.07.2018	13:45:40
6	4,898 N.m	0,0 %	30,75 °	2,5 %	99 rpm	46 rpm	04.07.2018	13:45:46
7	4,910 N.m	0,2 %	31,25 °	4,2 %	100 rpm	48 rpm	04.07.2018	13:45:52
8	4,894 N.m	-0,1 %	31,00 °	3,3 %	98 rpm	47 rpm	04.07.2018	13:45:58
9	4,892 N.m	-0,2 %	30,00 °	0,0 %	100 rpm	47 rpm	04.07.2018	13:46:04
10	4,902 N.m	0,0 %	31,00 °	3,3 %	99 rpm	47 rpm	04.07.2018	13:46:10
11	4,925 N.m	0,5 %	31,00 °	3,3 %	100 rpm	48 rpm	04.07.2018	13:46:16
12	4,875 N.m	-0,5 %	30,00 °	0,0 %	98 rpm	47 rpm	04.07.2018	13:46:22
13	4,921 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	47 rpm	04.07.2018	13:46:28
14	4,894 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:46:34
15	4,912 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	46 rpm	04.07.2018	13:46:40
16	4,884 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	47 rpm	04.07.2018	13:46:46
17	4,900 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	47 rpm	04.07.2018	13:46:52
18	4,906 N.m	0,1 %	30,00 °	0,0 %	99 rpm	47 rpm	04.07.2018	13:46:58
19	4,919 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	46 rpm	04.07.2018	13:47:04
20	4,882 N.m	-0,4 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:47:10
21	4,910 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	04.07.2018	13:47:16
22	4,917 N.m	0,3 %	29,25 °	-2,5 %	100 rpm	47 rpm	04.07.2018	13:47:22
23	4,914 N.m	0,3 %	29,25 °	-2,5 %	99 rpm	46 rpm	04.07.2018	13:47:28
24	4,902 N.m	0,0 %	30,00 °	0,0 %	99 rpm	46 rpm	04.07.2018	13:47:33
25	4,873 N.m	-0,6 %	29,25 °	-2,5 %	100 rpm	47 rpm	04.07.2018	13:47:40
26	4,906 N.m	0,1 %	30,75 °	2,5 %	98 rpm	47 rpm	04.07.2018	13:47:46
27	4,902 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	47 rpm	04.07.2018	13:47:52
28	4,892 N.m	-0,2 %	30,25 °	0,8 %	98 rpm	47 rpm	04.07.2018	13:47:58
29	4,939 N.m	0,8 %	30,25 °	0,8 %	100 rpm	48 rpm	04.07.2018	13:48:04
30	4,894 N.m	-0,1 %	30,25 °	0,8 %	99 rpm	46 rpm	04.07.2018	13:48:10
31	4,894 N.m	-0,1 %	30,25 °	0,8 %	100 rpm	47 rpm	04.07.2018	13:48:16
32	4,875 N.m	-0,5 %	30,50 °	1,7 %	99 rpm	47 rpm	04.07.2018	13:48:22
33	4,947 N.m	1,0 %	31,25 °	4,2 %	100 rpm	48 rpm	04.07.2018	13:48:28
34	4,908 N.m	0,2 %	30,75 °	2,5 %	98 rpm	47 rpm	04.07.2018	13:48:34
35	4,931 N.m	0,6 %	30,50 °	1,7 %	100 rpm	47 rpm	04.07.2018	13:48:40
36	4,877 N.m	-0,5 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:48:46
37	4,908 N.m	0,2 %	29,75 °	-0,8 %	100 rpm	47 rpm	04.07.2018	13:48:52
38	4,882 N.m	-0,4 %	29,50 °	-1,7 %	99 rpm	47 rpm	04.07.2018	13:48:58
39	4,919 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	46 rpm	04.07.2018	13:49:04
40	4,904 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:49:10
41	4,917 N.m	0,3 %	30,00 °	0,0 %	100 rpm	46 rpm	04.07.2018	13:49:16
42	4,888 N.m	-0,2 %	29,25 °	-2,5 %	99 rpm	46 rpm	04.07.2018	13:49:21
43	4,879 N.m	-0,4 %	29,50 °	-1,7 %	98 rpm	46 rpm	04.07.2018	13:49:27
44	4,896 N.m	-0,1 %	29,00 °	-3,3 %	100 rpm	47 rpm	04.07.2018	13:49:34
45	4,906 N.m	0,1 %	30,00 °	0,0 %	98 rpm	47 rpm	04.07.2018	13:49:40
46	4,921 N.m	0,4 %	29,50 °	-1,7 %	100 rpm	47 rpm	04.07.2018	13:49:46
47	4,904 N.m	0,1 %	30,25 °	0,8 %	98 rpm	47 rpm	04.07.2018	13:49:52
48	4,912 N.m	0,2 %	30,25 °	0,8 %	100 rpm	48 rpm	04.07.2018	13:49:58
49	4,896 N.m	-0,1 %	30,00 °	0,0 %	98 rpm	47 rpm	04.07.2018	13:50:04
50	4,943 N.m	0,9 %	30,50 °	1,7 %	100 rpm	48 rpm	04.07.2018	13:50:10

Date/ Time	04.07.2018 13:45:16	Transducer S/N	01033617
Tester/ Name	M.Brkić	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	4,90 N.m	amount of inspection	100
Rotation angle start torque	2,450 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

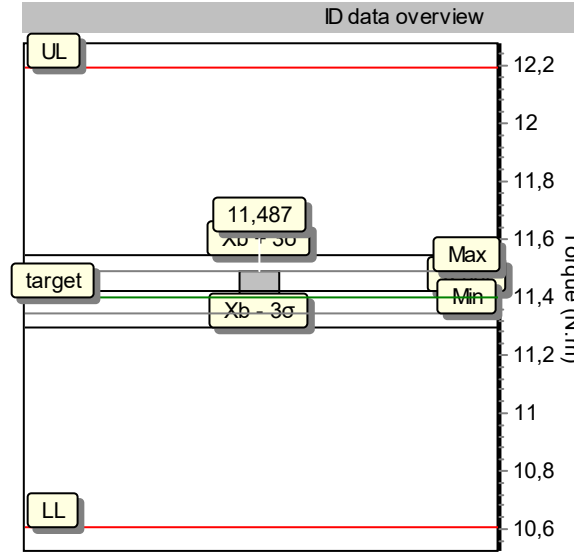
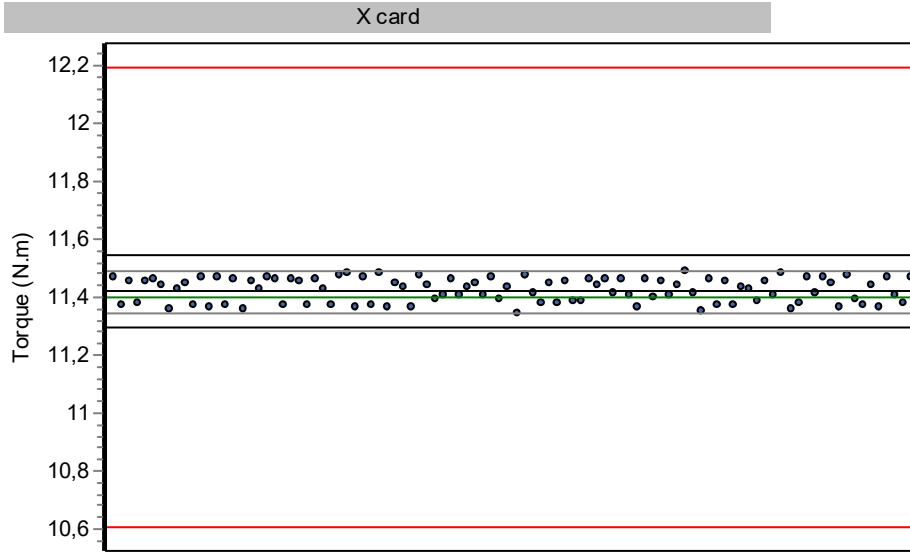
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
4,90	4,56	5,24	4,9023	0,0770	0,0175	6,541	6,498	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	4,902 N.m	0,0 %	30,50 °	1,7 %	99 rpm	47 rpm	04.07.2018	13:50:16
52	4,915 N.m	0,3 %	30,00 °	0,0 %	100 rpm	48 rpm	04.07.2018	13:50:22
53	4,898 N.m	0,0 %	29,75 °	-0,8 %	98 rpm	47 rpm	04.07.2018	13:50:28
54	4,917 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	47 rpm	04.07.2018	13:50:34
55	4,873 N.m	-0,6 %	29,75 °	-0,8 %	98 rpm	47 rpm	04.07.2018	13:50:40
56	4,919 N.m	0,4 %	30,00 °	0,0 %	100 rpm	46 rpm	04.07.2018	13:50:46
57	4,877 N.m	-0,5 %	30,00 °	0,0 %	99 rpm	47 rpm	04.07.2018	13:50:52
58	4,917 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	46 rpm	04.07.2018	13:50:58
59	4,894 N.m	-0,1 %	30,25 °	0,8 %	98 rpm	47 rpm	04.07.2018	13:51:04
60	4,904 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	47 rpm	04.07.2018	13:51:10
61	4,948 N.m	1,0 %	30,25 °	0,8 %	99 rpm	46 rpm	04.07.2018	13:51:15
62	4,896 N.m	-0,1 %	29,25 °	-2,5 %	100 rpm	47 rpm	04.07.2018	13:51:22
63	4,908 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	04.07.2018	13:51:28
64	4,896 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	46 rpm	04.07.2018	13:51:33
65	4,892 N.m	-0,2 %	29,00 °	-3,3 %	100 rpm	47 rpm	04.07.2018	13:51:40
66	4,900 N.m	0,0 %	29,75 °	-0,8 %	98 rpm	46 rpm	04.07.2018	13:51:46
67	4,884 N.m	-0,3 %	30,25 °	0,8 %	98 rpm	47 rpm	04.07.2018	13:51:51
68	4,910 N.m	0,2 %	30,00 °	0,0 %	100 rpm	48 rpm	04.07.2018	13:51:58
69	4,871 N.m	-0,6 %	29,75 °	-0,8 %	98 rpm	47 rpm	04.07.2018	13:52:04
70	4,910 N.m	0,2 %	29,25 °	-2,5 %	100 rpm	47 rpm	04.07.2018	13:52:10
71	4,884 N.m	-0,3 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:52:16
72	4,900 N.m	0,0 %	29,50 °	-1,7 %	100 rpm	46 rpm	04.07.2018	13:52:22
73	4,886 N.m	-0,3 %	29,50 °	-1,7 %	99 rpm	47 rpm	04.07.2018	13:52:28
74	4,910 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	46 rpm	04.07.2018	13:52:34
75	4,892 N.m	-0,2 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:52:40
76	4,912 N.m	0,2 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:52:46
77	4,884 N.m	-0,3 %	29,25 °	-2,5 %	98 rpm	47 rpm	04.07.2018	13:52:51
78	4,912 N.m	0,2 %	29,25 °	-2,5 %	100 rpm	47 rpm	04.07.2018	13:52:58
79	4,882 N.m	-0,4 %	30,00 °	0,0 %	99 rpm	47 rpm	04.07.2018	13:53:04
80	4,900 N.m	0,0 %	30,25 °	0,8 %	100 rpm	48 rpm	04.07.2018	13:53:10
81	4,908 N.m	0,2 %	30,50 °	1,7 %	99 rpm	47 rpm	04.07.2018	13:53:16
82	4,929 N.m	0,6 %	30,00 °	0,0 %	100 rpm	47 rpm	04.07.2018	13:53:22
83	4,871 N.m	-0,6 %	30,00 °	0,0 %	98 rpm	47 rpm	04.07.2018	13:53:28
84	4,908 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	47 rpm	04.07.2018	13:53:34
85	4,881 N.m	-0,4 %	30,00 °	0,0 %	98 rpm	47 rpm	04.07.2018	13:53:40
86	4,888 N.m	-0,2 %	29,75 °	-0,8 %	100 rpm	47 rpm	04.07.2018	13:53:46
87	4,900 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:53:52
88	4,919 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	46 rpm	04.07.2018	13:53:58
89	4,890 N.m	-0,2 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:54:04
90	4,917 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	46 rpm	04.07.2018	13:54:10
91	4,898 N.m	0,0 %	30,00 °	0,0 %	99 rpm	47 rpm	04.07.2018	13:54:16
92	4,906 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	47 rpm	04.07.2018	13:54:22
93	4,871 N.m	-0,6 %	29,50 °	-1,7 %	99 rpm	47 rpm	04.07.2018	13:54:28
94	4,915 N.m	0,3 %	30,00 °	0,0 %	100 rpm	46 rpm	04.07.2018	13:54:34
95	4,900 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:54:40
96	4,902 N.m	0,0 %	30,25 °	0,8 %	100 rpm	46 rpm	04.07.2018	13:54:46
97	4,871 N.m	-0,6 %	29,75 °	-0,8 %	99 rpm	47 rpm	04.07.2018	13:54:52
98	4,937 N.m	0,8 %	30,00 °	0,0 %	99 rpm	46 rpm	04.07.2018	13:54:58
99	4,898 N.m	0,0 %	29,25 °	-2,5 %	99 rpm	47 rpm	04.07.2018	13:55:03
100	4,923 N.m	0,5 %	30,25 °	0,8 %	99 rpm	47 rpm	04.07.2018	13:55:09

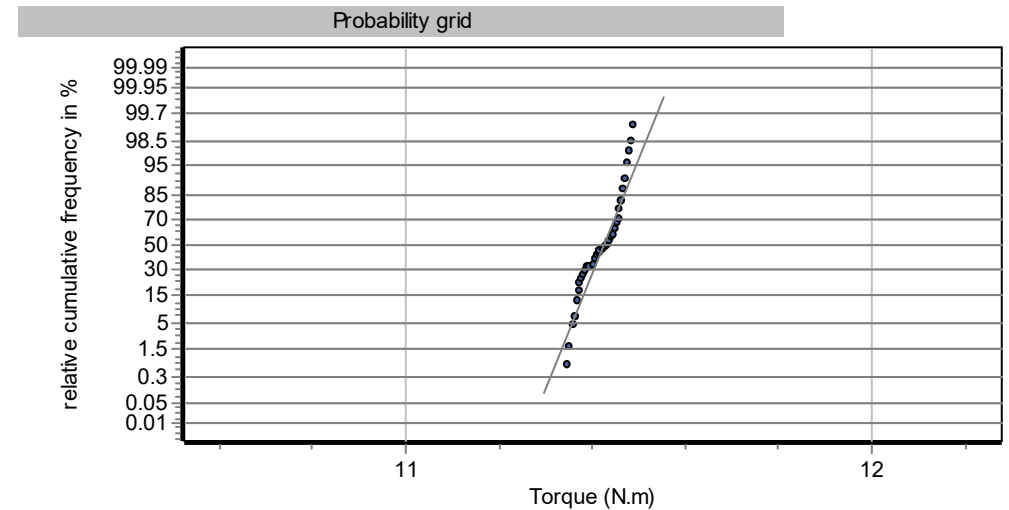
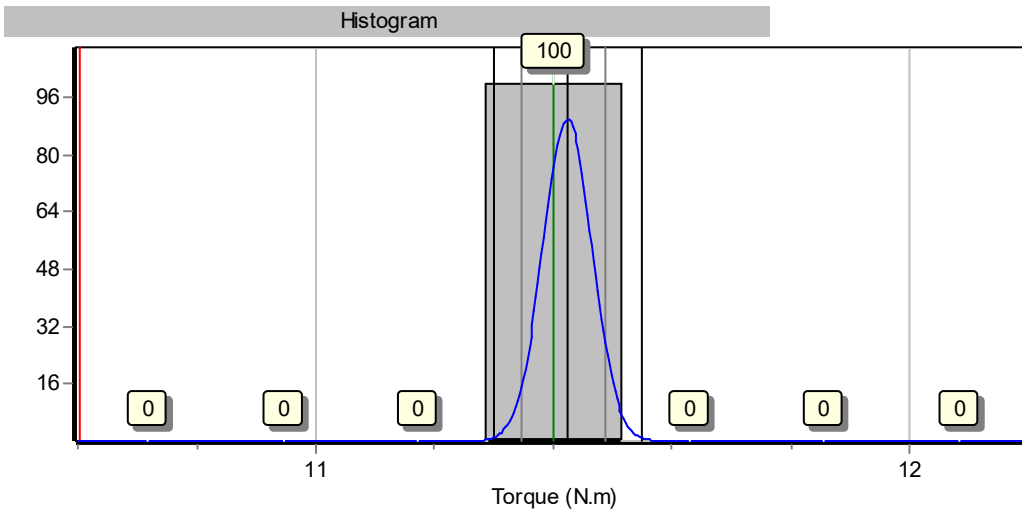
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 80% Screw joint: soft



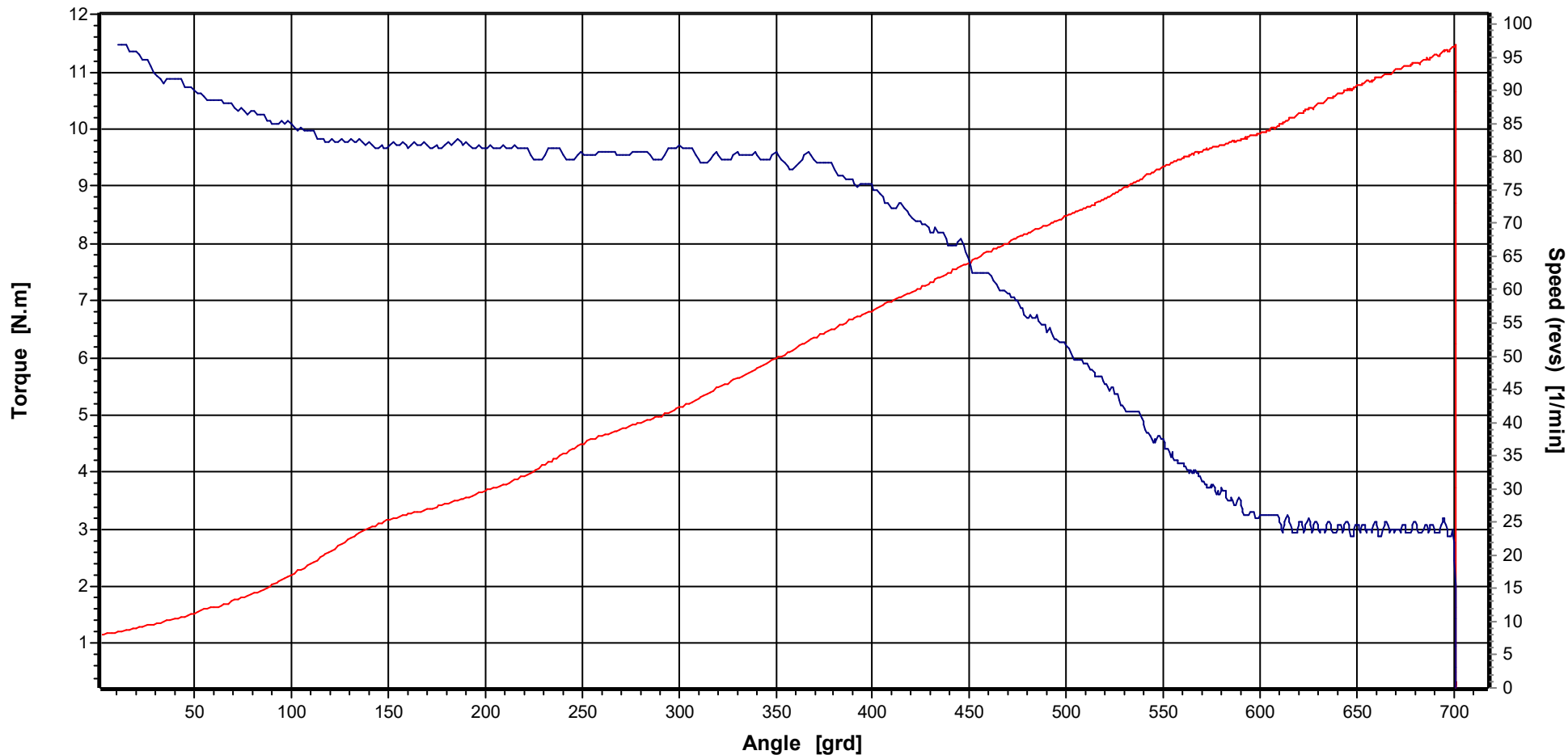
Tester	M.Brkcic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,49	N.m
Min	11,35	N.m
xq	11,4233	N.m
s	0,0412	N.m
Cm	6,454	
Cmk	6,266	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

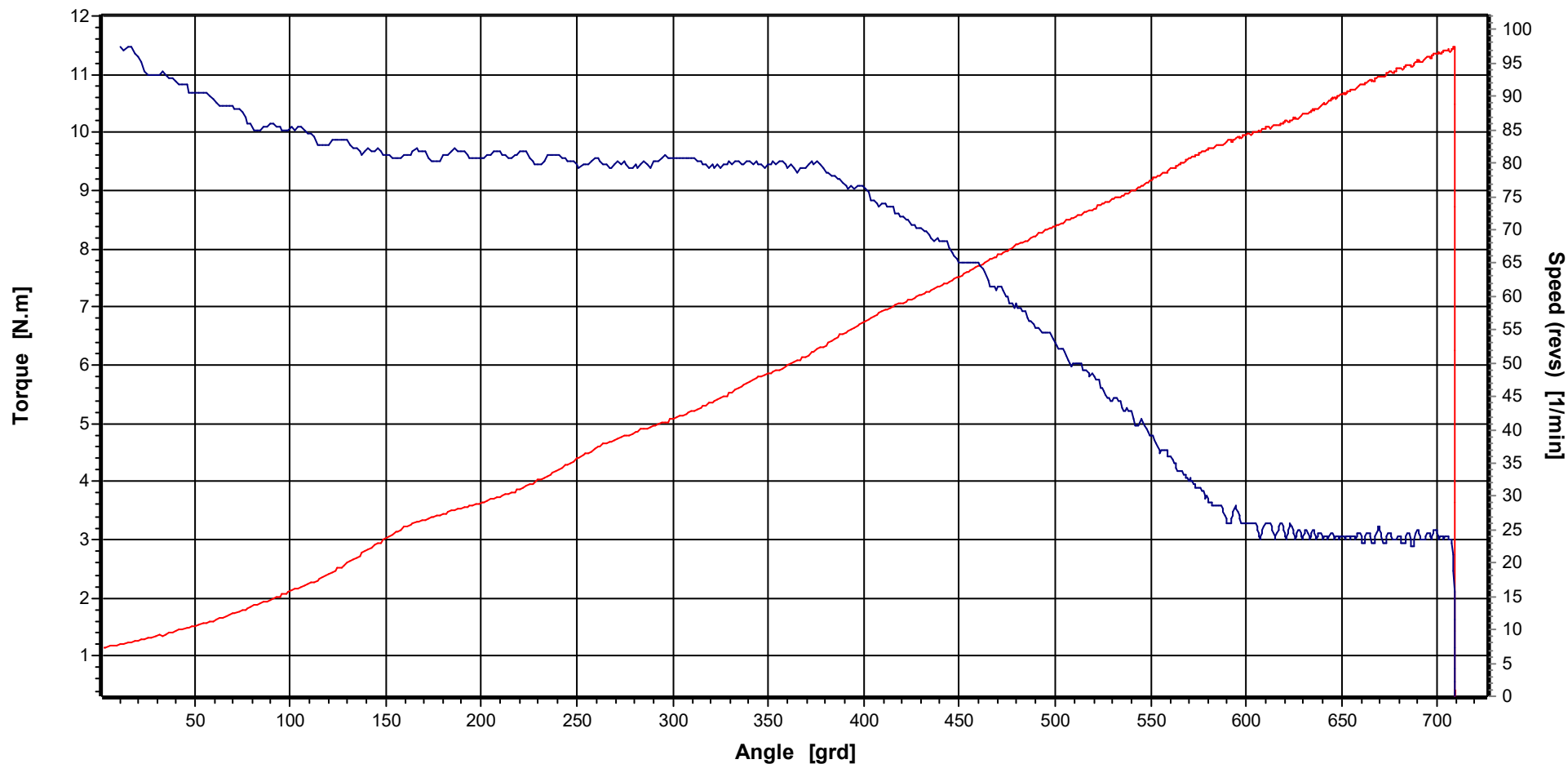


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 07:23:45
UL	12,20 N.m	Supporting points	850			Date/time measurement	04.07.2018 07:23:45

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

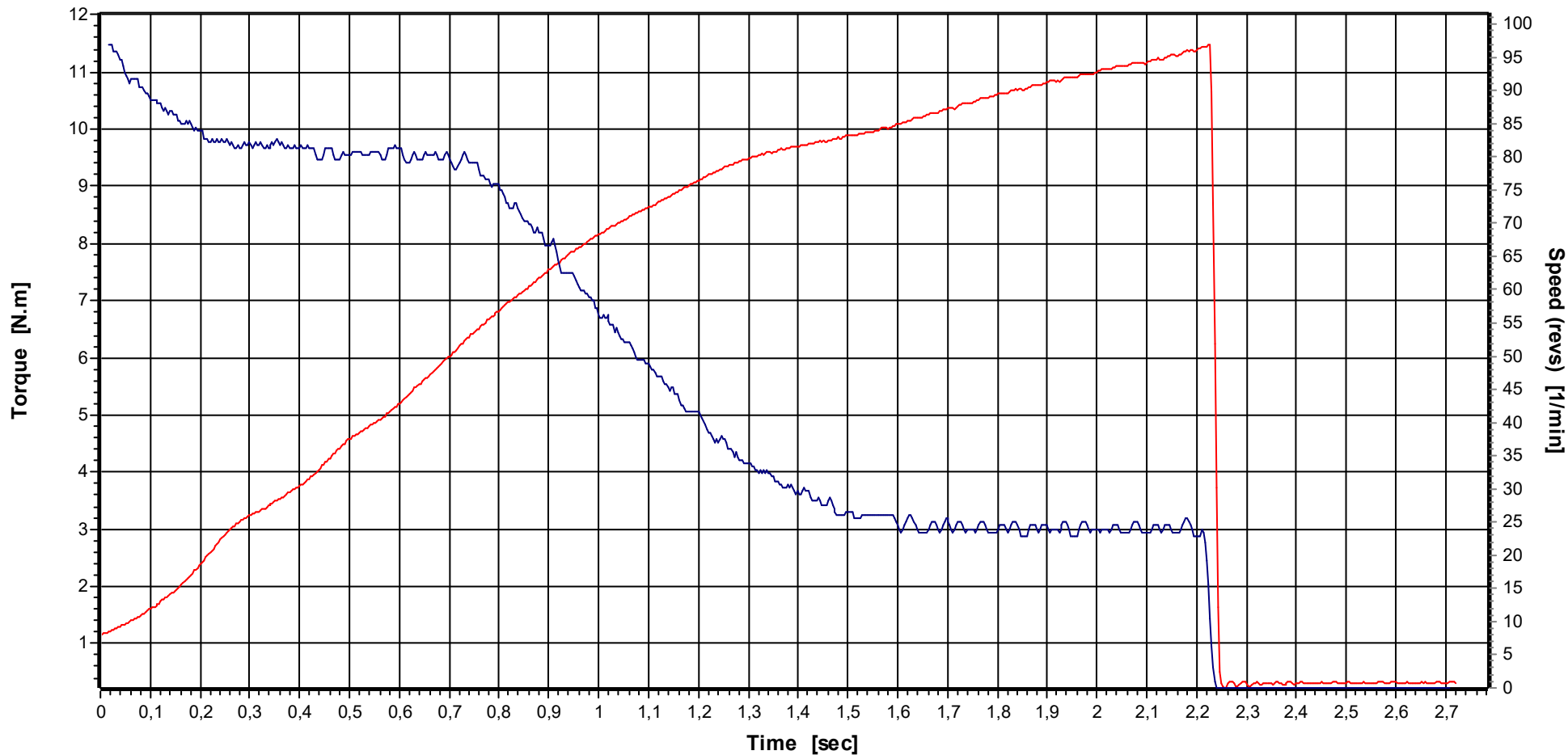


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 07:23:45
UL	12,20 N.m	Supporting points	861			Date/time measurement	04.07.2018 07:56:45

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

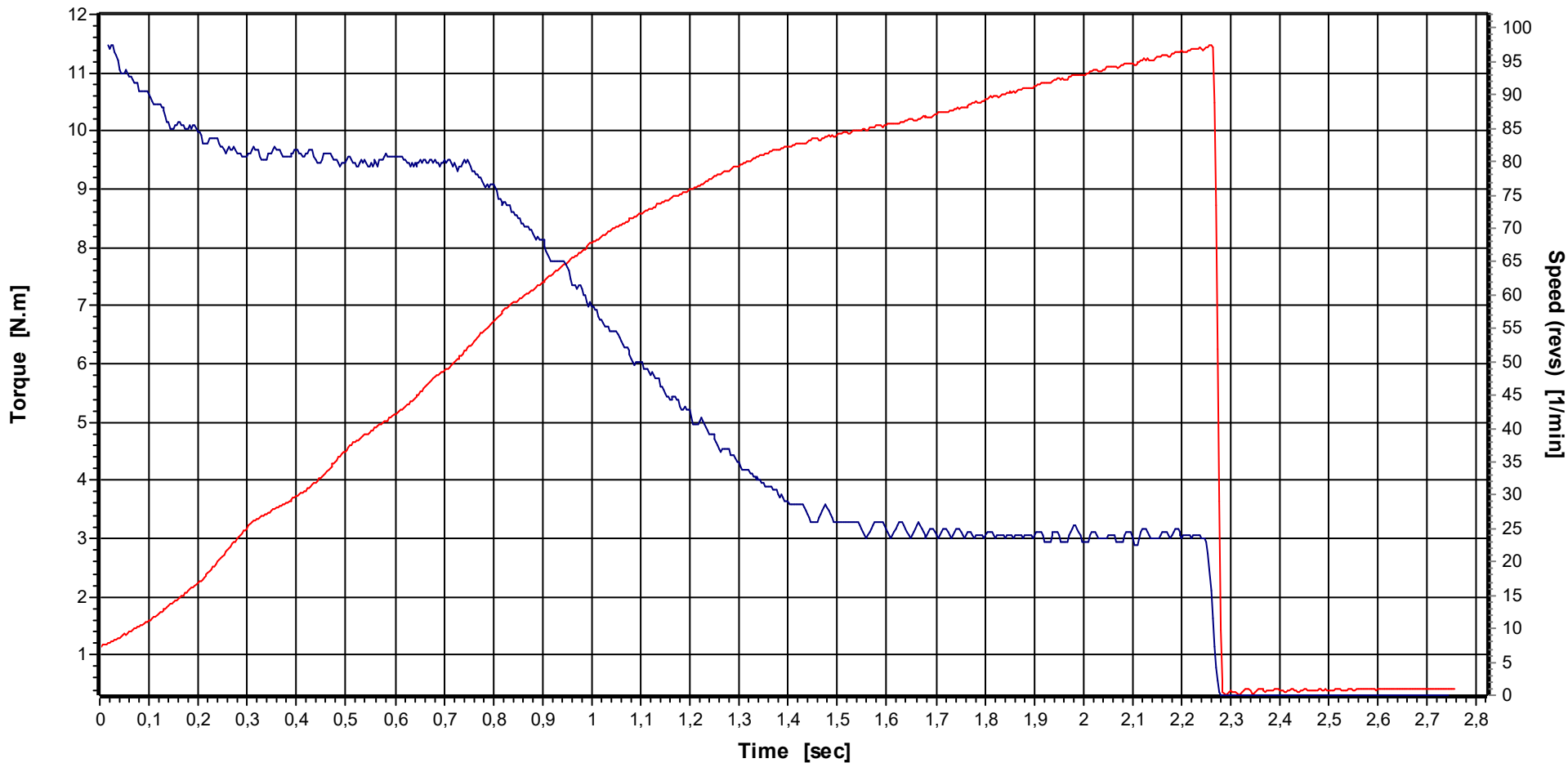


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 07:23:45
UL	12,20 N.m	Supporting points	850			Date/time measurement	04.07.2018 07:23:45

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	1	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 07:23:45
UL	12,20 N.m	Supporting points	861			Date/time measurement	04.07.2018 07:56:45

Date/ Time	04.07.2018 07:23:45	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4233	0,1400	0,0412	6,454	6,266	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,472 N.m	0,6 %	367,00 °	1,9 %	453 rpm	45 rpm	04.07.2018	07:23:45
2	11,370 N.m	-0,3 %	354,00 °	-1,7 %	451 rpm	46 rpm	04.07.2018	07:24:05
3	11,452 N.m	0,5 %	364,75 °	1,3 %	452 rpm	45 rpm	04.07.2018	07:24:25
4	11,378 N.m	-0,2 %	355,00 °	-1,4 %	452 rpm	47 rpm	04.07.2018	07:24:45
5	11,456 N.m	0,5 %	363,75 °	1,0 %	453 rpm	45 rpm	04.07.2018	07:25:05
6	11,460 N.m	0,5 %	360,75 °	0,2 %	453 rpm	47 rpm	04.07.2018	07:25:25
7	11,444 N.m	0,4 %	360,25 °	0,1 %	453 rpm	45 rpm	04.07.2018	07:25:45
8	11,359 N.m	-0,4 %	353,00 °	-1,9 %	451 rpm	47 rpm	04.07.2018	07:26:05
9	11,429 N.m	0,3 %	361,75 °	0,5 %	453 rpm	46 rpm	04.07.2018	07:26:25
10	11,448 N.m	0,4 %	361,00 °	0,3 %	453 rpm	46 rpm	04.07.2018	07:26:45
11	11,374 N.m	-0,2 %	357,25 °	-0,8 %	452 rpm	47 rpm	04.07.2018	07:27:05
12	11,468 N.m	0,6 %	363,00 °	0,8 %	454 rpm	45 rpm	04.07.2018	07:27:25
13	11,366 N.m	-0,3 %	357,00 °	-0,8 %	453 rpm	46 rpm	04.07.2018	07:27:45
14	11,468 N.m	0,6 %	365,50 °	1,5 %	454 rpm	45 rpm	04.07.2018	07:28:05
15	11,370 N.m	-0,3 %	357,25 °	-0,8 %	453 rpm	46 rpm	04.07.2018	07:28:25
16	11,460 N.m	0,5 %	366,00 °	1,7 %	453 rpm	45 rpm	04.07.2018	07:28:45
17	11,359 N.m	-0,4 %	357,00 °	-0,8 %	452 rpm	47 rpm	04.07.2018	07:29:05
18	11,452 N.m	0,5 %	361,50 °	0,4 %	453 rpm	46 rpm	04.07.2018	07:29:25
19	11,429 N.m	0,3 %	361,25 °	0,3 %	452 rpm	46 rpm	04.07.2018	07:29:45
20	11,468 N.m	0,6 %	361,75 °	0,5 %	453 rpm	46 rpm	04.07.2018	07:30:05
21	11,460 N.m	0,5 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	07:30:25
22	11,370 N.m	-0,3 %	356,00 °	-1,1 %	451 rpm	47 rpm	04.07.2018	07:30:45
23	11,464 N.m	0,6 %	361,50 °	0,4 %	453 rpm	46 rpm	04.07.2018	07:31:05
24	11,452 N.m	0,5 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	07:31:25
25	11,374 N.m	-0,2 %	355,00 °	-1,4 %	453 rpm	47 rpm	04.07.2018	07:31:45
26	11,464 N.m	0,6 %	366,75 °	1,9 %	453 rpm	45 rpm	04.07.2018	07:32:05
27	11,425 N.m	0,2 %	360,50 °	0,1 %	452 rpm	45 rpm	04.07.2018	07:32:25
28	11,370 N.m	-0,3 %	358,25 °	-0,5 %	452 rpm	47 rpm	04.07.2018	07:32:45
29	11,476 N.m	0,7 %	361,50 °	0,4 %	453 rpm	46 rpm	04.07.2018	07:33:05
30	11,480 N.m	0,7 %	364,75 °	1,3 %	453 rpm	45 rpm	04.07.2018	07:33:25
31	11,363 N.m	-0,3 %	357,25 °	-0,8 %	452 rpm	47 rpm	04.07.2018	07:33:45
32	11,472 N.m	0,6 %	367,75 °	2,2 %	453 rpm	45 rpm	04.07.2018	07:34:05
33	11,374 N.m	-0,2 %	357,25 °	-0,8 %	453 rpm	47 rpm	04.07.2018	07:34:25
34	11,480 N.m	0,7 %	365,25 °	1,5 %	454 rpm	45 rpm	04.07.2018	07:34:45
35	11,363 N.m	-0,3 %	355,75 °	-1,2 %	452 rpm	47 rpm	04.07.2018	07:35:05
36	11,448 N.m	0,4 %	362,00 °	0,6 %	453 rpm	46 rpm	04.07.2018	07:35:25
37	11,437 N.m	0,3 %	360,50 °	0,1 %	453 rpm	45 rpm	04.07.2018	07:35:45
38	11,366 N.m	-0,3 %	358,50 °	-0,4 %	453 rpm	47 rpm	04.07.2018	07:36:05
39	11,476 N.m	0,7 %	363,50 °	1,0 %	453 rpm	46 rpm	04.07.2018	07:36:25
40	11,441 N.m	0,4 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	07:36:45
41	11,394 N.m	-0,1 %	360,00 °	0,0 %	452 rpm	46 rpm	04.07.2018	07:37:05
42	11,409 N.m	0,1 %	360,00 °	0,0 %	452 rpm	47 rpm	04.07.2018	07:37:25
43	11,460 N.m	0,5 %	361,00 °	0,3 %	454 rpm	45 rpm	04.07.2018	07:37:45
44	11,405 N.m	0,0 %	361,25 °	0,3 %	452 rpm	47 rpm	04.07.2018	07:38:05
45	11,433 N.m	0,3 %	362,00 °	0,6 %	453 rpm	47 rpm	04.07.2018	07:38:25
46	11,448 N.m	0,4 %	361,75 °	0,5 %	453 rpm	45 rpm	04.07.2018	07:38:45
47	11,405 N.m	0,0 %	361,00 °	0,3 %	454 rpm	46 rpm	04.07.2018	07:39:05
48	11,472 N.m	0,6 %	368,00 °	2,2 %	453 rpm	45 rpm	04.07.2018	07:39:25
49	11,390 N.m	-0,1 %	357,50 °	-0,7 %	454 rpm	47 rpm	04.07.2018	07:39:45
50	11,433 N.m	0,3 %	361,75 °	0,5 %	453 rpm	45 rpm	04.07.2018	07:40:05

Date/ Time	04.07.2018 07:23:45	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

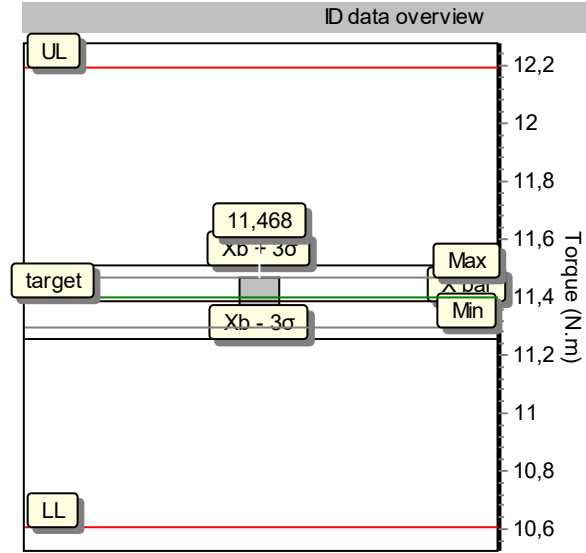
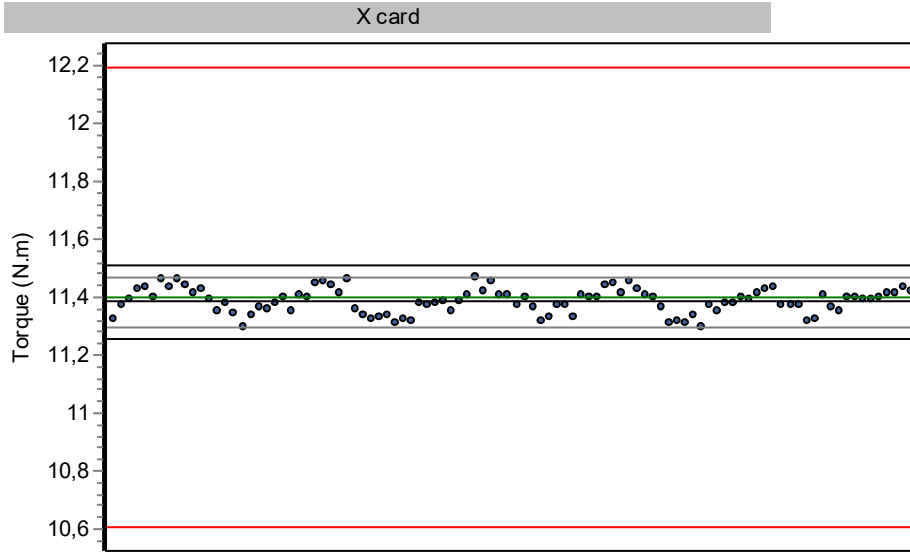
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,4233	0,1400	0,0412	6,454	6,266	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,347 N.m	-0,5 %	359,25 °	-0,2 %	452 rpm	46 rpm	04.07.2018	07:40:25
52	11,476 N.m	0,7 %	364,00 °	1,1 %	453 rpm	46 rpm	04.07.2018	07:40:45
53	11,413 N.m	0,1 %	363,50 °	1,0 %	453 rpm	47 rpm	04.07.2018	07:41:05
54	11,382 N.m	-0,2 %	358,25 °	-0,5 %	453 rpm	46 rpm	04.07.2018	07:41:25
55	11,448 N.m	0,4 %	364,25 °	1,2 %	454 rpm	44 rpm	04.07.2018	07:41:45
56	11,378 N.m	-0,2 %	358,25 °	-0,5 %	453 rpm	47 rpm	04.07.2018	07:42:05
57	11,452 N.m	0,5 %	362,50 °	0,7 %	454 rpm	45 rpm	04.07.2018	07:42:25
58	11,386 N.m	-0,1 %	361,50 °	0,4 %	452 rpm	46 rpm	04.07.2018	07:42:45
59	11,386 N.m	-0,1 %	356,75 °	-0,9 %	453 rpm	47 rpm	04.07.2018	07:43:05
60	11,460 N.m	0,5 %	366,50 °	1,8 %	454 rpm	44 rpm	04.07.2018	07:43:25
61	11,441 N.m	0,4 %	365,25 °	1,5 %	454 rpm	46 rpm	04.07.2018	07:43:45
62	11,460 N.m	0,5 %	364,50 °	1,3 %	454 rpm	44 rpm	04.07.2018	07:44:05
63	11,417 N.m	0,1 %	362,50 °	0,7 %	452 rpm	47 rpm	04.07.2018	07:44:25
64	11,460 N.m	0,5 %	364,50 °	1,3 %	454 rpm	45 rpm	04.07.2018	07:44:45
65	11,409 N.m	0,1 %	362,75 °	0,8 %	453 rpm	47 rpm	04.07.2018	07:45:05
66	11,366 N.m	-0,3 %	356,25 °	-1,0 %	453 rpm	47 rpm	04.07.2018	07:45:25
67	11,464 N.m	0,6 %	367,00 °	1,9 %	454 rpm	45 rpm	04.07.2018	07:45:45
68	11,402 N.m	0,0 %	361,50 °	0,4 %	454 rpm	46 rpm	04.07.2018	07:46:05
69	11,456 N.m	0,5 %	366,50 °	1,8 %	454 rpm	44 rpm	04.07.2018	07:46:25
70	11,405 N.m	0,0 %	362,50 °	0,7 %	452 rpm	46 rpm	04.07.2018	07:46:45
71	11,441 N.m	0,4 %	363,50 °	1,0 %	454 rpm	47 rpm	04.07.2018	07:47:05
72	11,487 N.m	0,8 %	366,75 °	1,9 %	453 rpm	44 rpm	04.07.2018	07:47:25
73	11,417 N.m	0,1 %	362,50 °	0,7 %	453 rpm	47 rpm	04.07.2018	07:47:45
74	11,351 N.m	-0,4 %	359,25 °	-0,2 %	453 rpm	47 rpm	04.07.2018	07:48:05
75	11,464 N.m	0,6 %	370,00 °	2,8 %	453 rpm	45 rpm	04.07.2018	07:48:25
76	11,374 N.m	-0,2 %	357,25 °	-0,8 %	453 rpm	47 rpm	04.07.2018	07:48:45
77	11,452 N.m	0,5 %	365,25 °	1,5 %	454 rpm	44 rpm	04.07.2018	07:49:05
78	11,370 N.m	-0,3 %	362,25 °	0,6 %	453 rpm	46 rpm	04.07.2018	07:49:25
79	11,437 N.m	0,3 %	363,50 °	1,0 %	453 rpm	47 rpm	04.07.2018	07:49:45
80	11,425 N.m	0,2 %	365,75 °	1,6 %	453 rpm	46 rpm	04.07.2018	07:50:05
81	11,386 N.m	-0,1 %	357,50 °	-0,7 %	453 rpm	47 rpm	04.07.2018	07:50:25
82	11,456 N.m	0,5 %	366,00 °	1,7 %	454 rpm	45 rpm	04.07.2018	07:50:45
83	11,405 N.m	0,0 %	361,75 °	0,5 %	454 rpm	47 rpm	04.07.2018	07:51:05
84	11,483 N.m	0,7 %	368,00 °	2,2 %	453 rpm	45 rpm	04.07.2018	07:51:25
85	11,359 N.m	-0,4 %	360,75 °	0,2 %	452 rpm	46 rpm	04.07.2018	07:51:45
86	11,382 N.m	-0,2 %	359,25 °	-0,2 %	452 rpm	47 rpm	04.07.2018	07:52:05
87	11,468 N.m	0,6 %	365,75 °	1,6 %	453 rpm	44 rpm	04.07.2018	07:52:25
88	11,413 N.m	0,1 %	363,25 °	0,9 %	452 rpm	47 rpm	04.07.2018	07:52:45
89	11,468 N.m	0,6 %	365,50 °	1,5 %	454 rpm	45 rpm	04.07.2018	07:53:05
90	11,448 N.m	0,4 %	366,25 °	1,7 %	453 rpm	45 rpm	04.07.2018	07:53:25
91	11,366 N.m	-0,3 %	357,75 °	-0,6 %	453 rpm	46 rpm	04.07.2018	07:53:45
92	11,476 N.m	0,7 %	365,50 °	1,5 %	453 rpm	45 rpm	04.07.2018	07:54:05
93	11,390 N.m	-0,1 %	361,00 °	0,3 %	453 rpm	46 rpm	04.07.2018	07:54:25
94	11,374 N.m	-0,2 %	357,50 °	-0,7 %	453 rpm	47 rpm	04.07.2018	07:54:45
95	11,444 N.m	0,4 %	363,00 °	0,8 %	453 rpm	44 rpm	04.07.2018	07:55:05
96	11,366 N.m	-0,3 %	361,75 °	0,5 %	452 rpm	46 rpm	04.07.2018	07:55:25
97	11,468 N.m	0,6 %	365,75 °	1,6 %	453 rpm	44 rpm	04.07.2018	07:55:45
98	11,409 N.m	0,1 %	363,50 °	1,0 %	453 rpm	46 rpm	04.07.2018	07:56:05
99	11,382 N.m	-0,2 %	357,25 °	-0,8 %	452 rpm	47 rpm	04.07.2018	07:56:25
100	11,472 N.m	0,6 %	369,75 °	2,7 %	453 rpm	44 rpm	04.07.2018	07:56:45

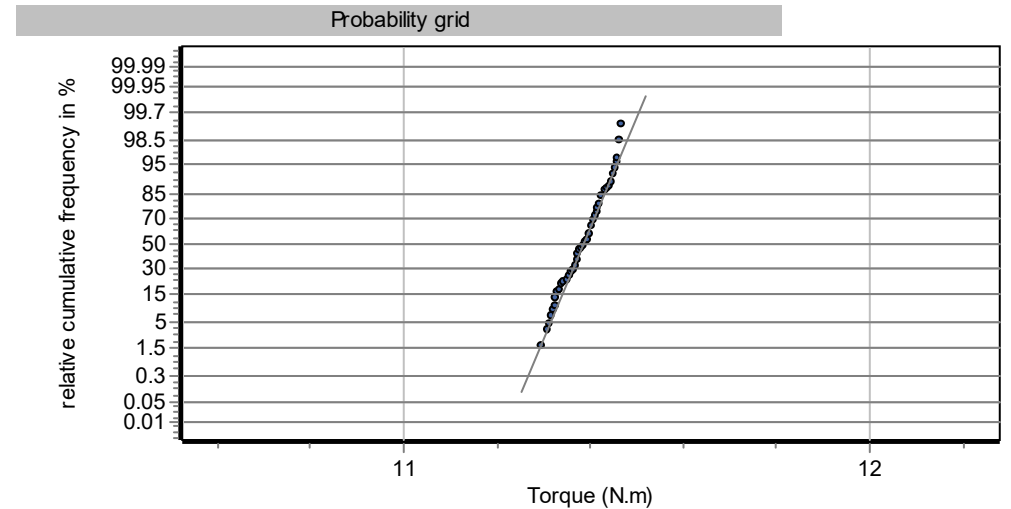
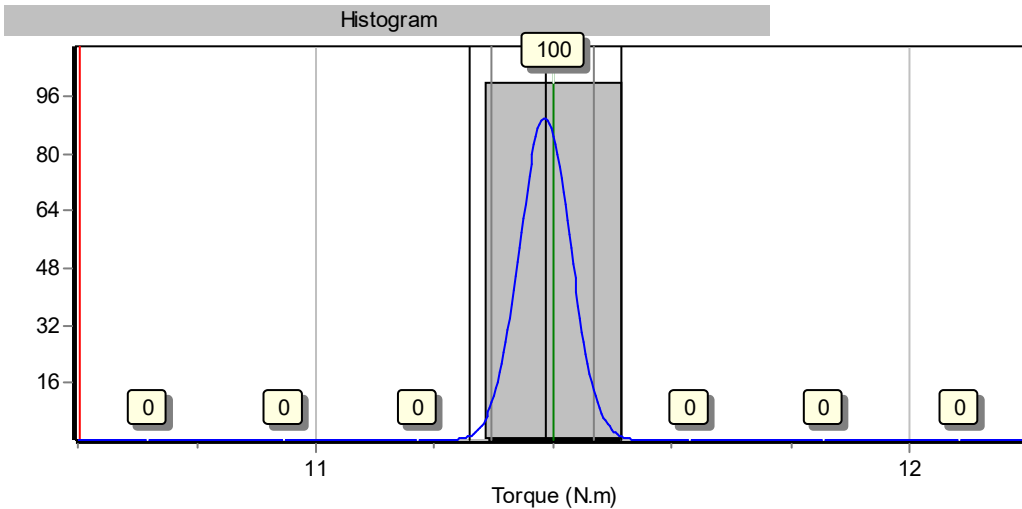
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 80% Screw joint: hard



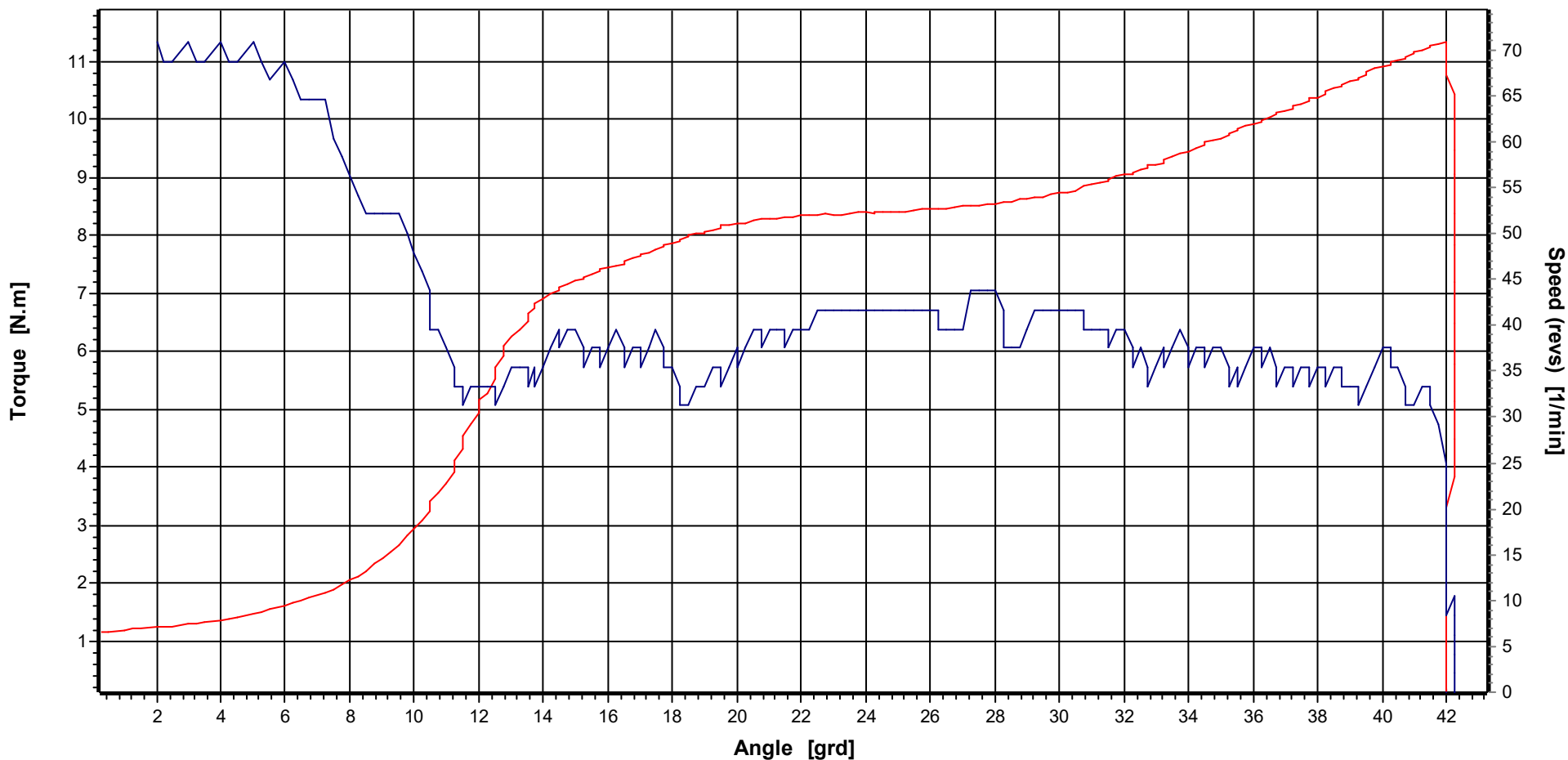
Tester	M.Brkic	
N	100	
Target	11,40	N.m
UL	12,20	N.m
LL	10,60	N.m
Max	11,47	N.m
Min	11,30	N.m
xq	11,3853	N.m
s	0,0428	N.m
Cm	6,219	
Cmk	6,105	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

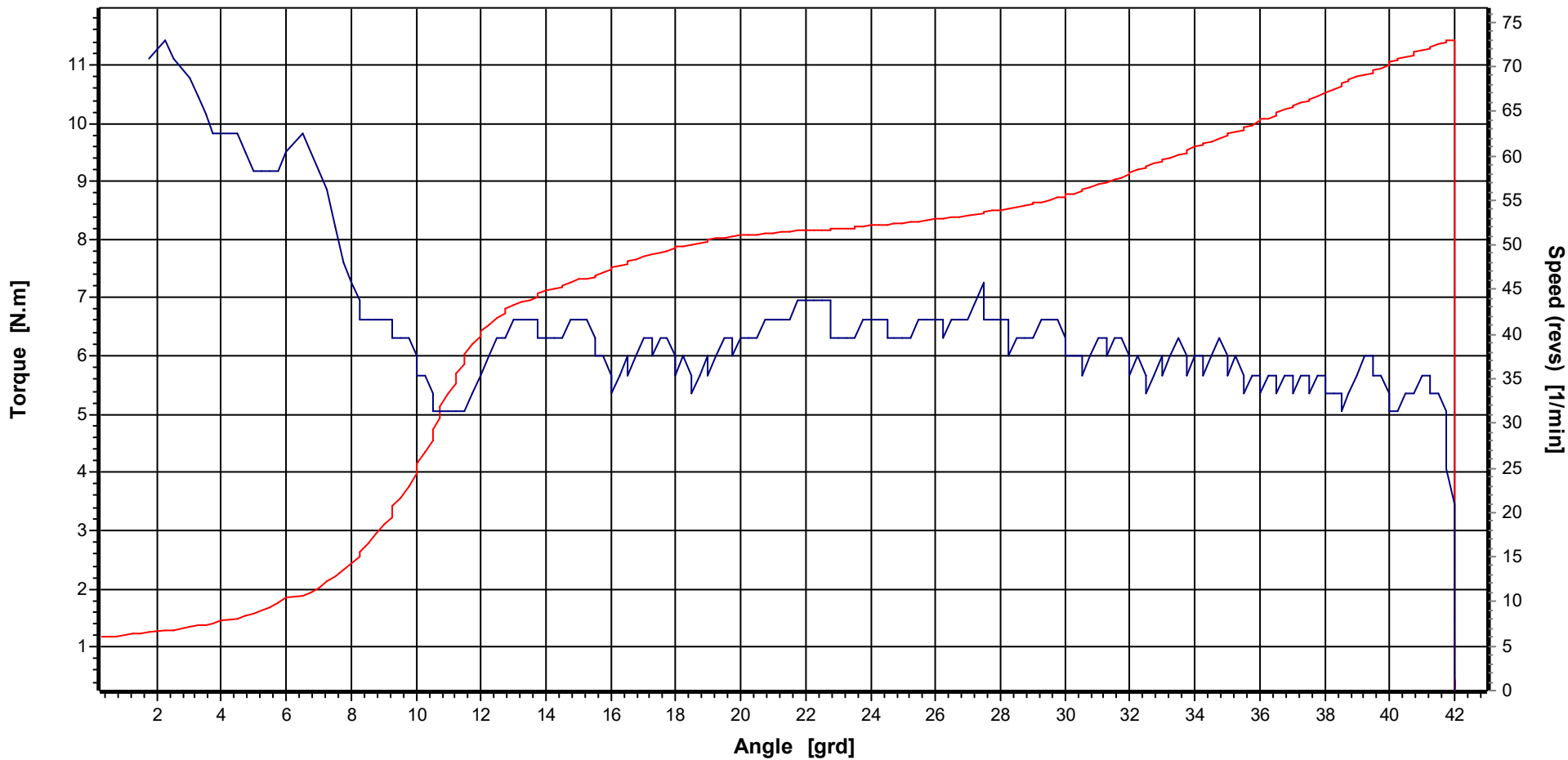


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 08:18:28
UL	12,20 N.m	Supporting points	851			Date/time measurement	04.07.2018 08:18:28

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

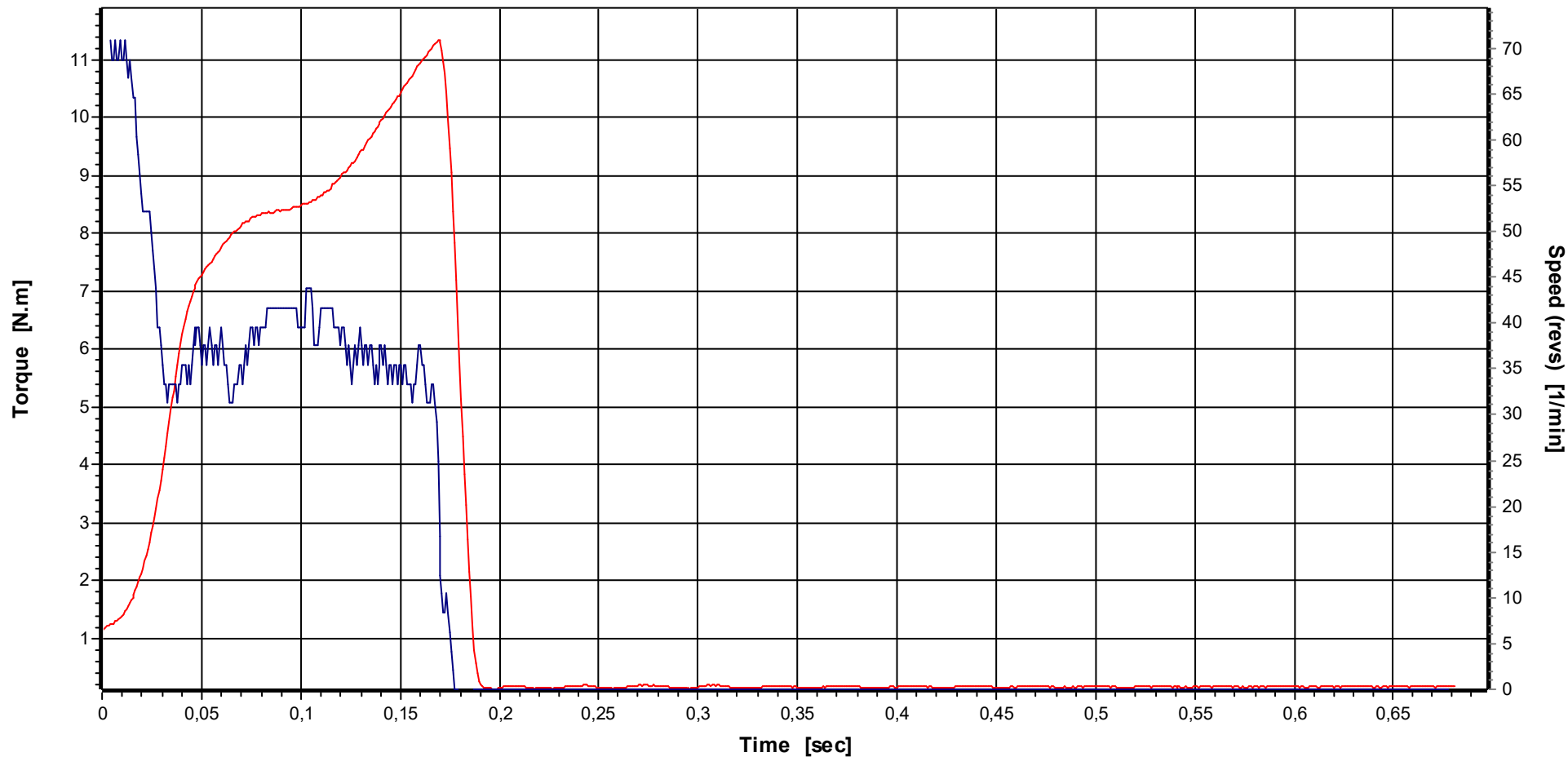


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	10,60 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 08:18:28
UL	12,20 N.m	Supporting points	837			Date/time measurement	04.07.2018 08:48:10

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

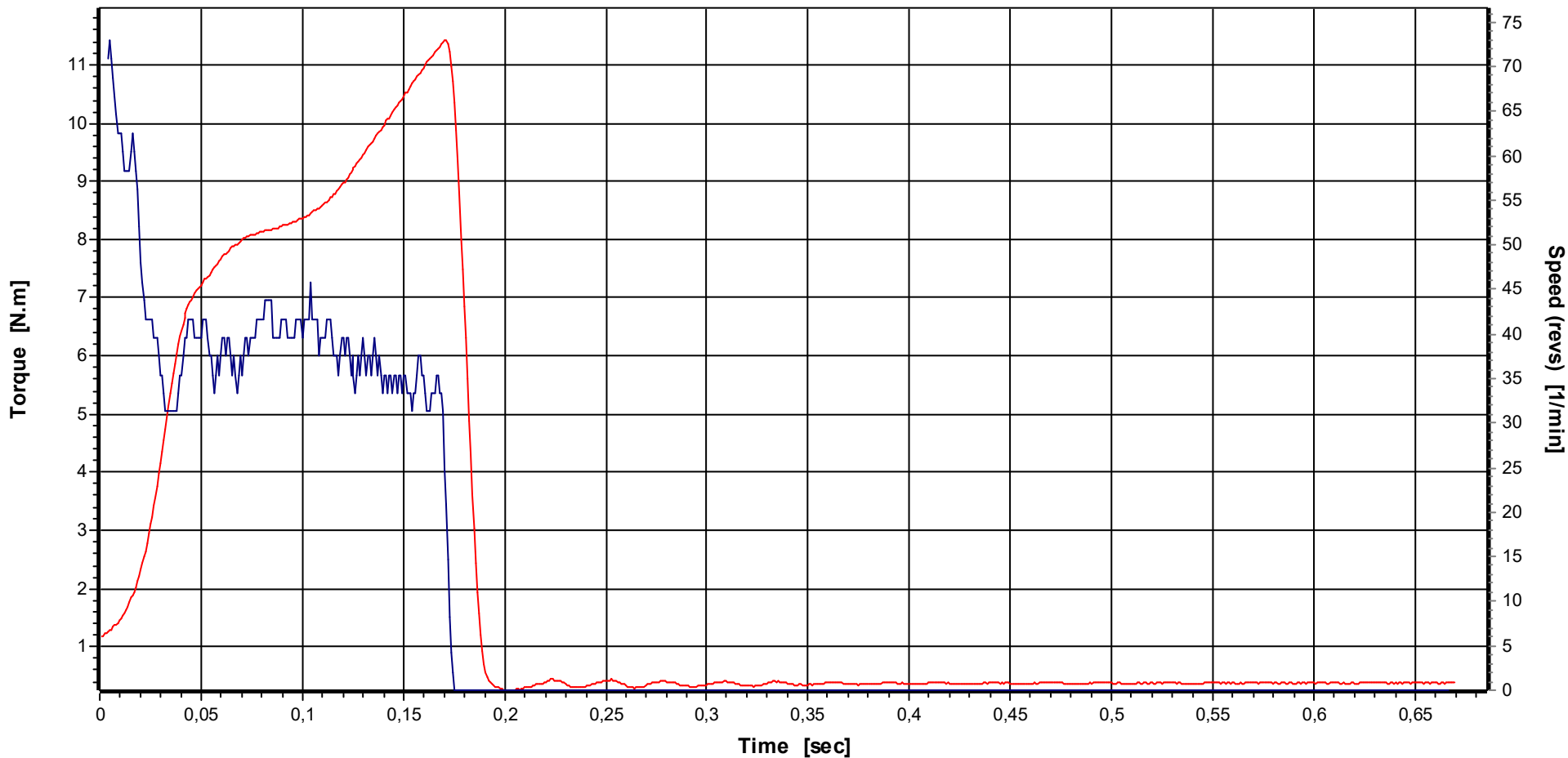


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 08:18:28
UL	12,20 N.m	Supporting points	851			Date/time measurement	04.07.2018 08:18:28

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	11,40 N.m	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	10,60 N.m	Measur. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 08:18:28
UL	12,20 N.m	Supporting points	837			Date/time measurement	04.07.2018 08:48:10

Date/ Time	04.07.2018 08:18:28	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,3853	0,1720	0,0428	6,219	6,105	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	11,327 N.m	-0,6 %	29,75 °	-0,8 %	99 rpm	38 rpm	04.07.2018	08:18:28
2	11,370 N.m	-0,3 %	30,00 °	0,0 %	100 rpm	38 rpm	04.07.2018	08:18:46
3	11,390 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:19:04
4	11,425 N.m	0,2 %	30,00 °	0,0 %	100 rpm	38 rpm	04.07.2018	08:19:22
5	11,433 N.m	0,3 %	30,75 °	2,5 %	99 rpm	38 rpm	04.07.2018	08:19:40
6	11,402 N.m	0,0 %	30,25 °	0,8 %	100 rpm	38 rpm	04.07.2018	08:19:58
7	11,460 N.m	0,5 %	30,75 °	2,5 %	99 rpm	38 rpm	04.07.2018	08:20:16
8	11,433 N.m	0,3 %	30,75 °	2,5 %	99 rpm	38 rpm	04.07.2018	08:20:34
9	11,464 N.m	0,6 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:20:52
10	11,441 N.m	0,4 %	31,25 °	4,2 %	99 rpm	39 rpm	04.07.2018	08:21:10
11	11,413 N.m	0,1 %	31,25 °	4,2 %	99 rpm	38 rpm	04.07.2018	08:21:28
12	11,425 N.m	0,2 %	30,25 °	0,8 %	99 rpm	38 rpm	04.07.2018	08:21:46
13	11,394 N.m	-0,1 %	30,00 °	0,0 %	99 rpm	38 rpm	04.07.2018	08:22:04
14	11,351 N.m	-0,4 %	29,00 °	-3,3 %	99 rpm	38 rpm	04.07.2018	08:22:22
15	11,378 N.m	-0,2 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:22:40
16	11,343 N.m	-0,5 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:22:58
17	11,296 N.m	-0,9 %	28,75 °	-4,2 %	99 rpm	37 rpm	04.07.2018	08:23:16
18	11,339 N.m	-0,5 %	28,50 °	-5,0 %	99 rpm	37 rpm	04.07.2018	08:23:34
19	11,363 N.m	-0,3 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:23:52
20	11,359 N.m	-0,4 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:24:10
21	11,382 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	38 rpm	04.07.2018	08:24:28
22	11,398 N.m	0,0 %	30,00 °	0,0 %	100 rpm	38 rpm	04.07.2018	08:24:46
23	11,355 N.m	-0,4 %	29,75 °	-0,8 %	99 rpm	38 rpm	04.07.2018	08:25:04
24	11,405 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:25:22
25	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:25:40
26	11,448 N.m	0,4 %	30,50 °	1,7 %	100 rpm	38 rpm	04.07.2018	08:25:58
27	11,456 N.m	0,5 %	30,75 °	2,5 %	99 rpm	39 rpm	04.07.2018	08:26:16
28	11,444 N.m	0,4 %	30,50 °	1,7 %	99 rpm	38 rpm	04.07.2018	08:26:34
29	11,417 N.m	0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:26:52
30	11,464 N.m	0,6 %	31,25 °	4,2 %	99 rpm	39 rpm	04.07.2018	08:27:10
31	11,359 N.m	-0,4 %	30,50 °	1,7 %	99 rpm	38 rpm	04.07.2018	08:27:28
32	11,335 N.m	-0,6 %	29,00 °	-3,3 %	99 rpm	37 rpm	04.07.2018	08:27:46
33	11,324 N.m	-0,7 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:28:04
34	11,331 N.m	-0,6 %	28,50 °	-5,0 %	99 rpm	37 rpm	04.07.2018	08:28:22
35	11,339 N.m	-0,5 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:28:40
36	11,308 N.m	-0,8 %	29,00 °	-3,3 %	100 rpm	38 rpm	04.07.2018	08:28:58
37	11,327 N.m	-0,6 %	29,00 °	-3,3 %	99 rpm	38 rpm	04.07.2018	08:29:16
38	11,320 N.m	-0,7 %	29,25 °	-2,5 %	99 rpm	38 rpm	04.07.2018	08:29:34
39	11,382 N.m	-0,2 %	30,00 °	0,0 %	99 rpm	39 rpm	04.07.2018	08:29:52
40	11,370 N.m	-0,3 %	30,50 °	1,7 %	100 rpm	38 rpm	04.07.2018	08:30:10
41	11,378 N.m	-0,2 %	30,50 °	1,7 %	100 rpm	38 rpm	04.07.2018	08:30:28
42	11,386 N.m	-0,1 %	30,50 °	1,7 %	100 rpm	38 rpm	04.07.2018	08:30:46
43	11,355 N.m	-0,4 %	30,25 °	0,8 %	100 rpm	38 rpm	04.07.2018	08:31:04
44	11,386 N.m	-0,1 %	30,25 °	0,8 %	100 rpm	38 rpm	04.07.2018	08:31:22
45	11,405 N.m	0,0 %	30,75 °	2,5 %	99 rpm	39 rpm	04.07.2018	08:31:40
46	11,468 N.m	0,6 %	31,50 °	5,0 %	99 rpm	39 rpm	04.07.2018	08:31:58
47	11,421 N.m	0,2 %	31,50 °	5,0 %	99 rpm	39 rpm	04.07.2018	08:32:16
48	11,452 N.m	0,5 %	31,25 °	4,2 %	99 rpm	39 rpm	04.07.2018	08:32:34
49	11,405 N.m	0,0 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:32:52
50	11,409 N.m	0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:33:10

Date/ Time	04.07.2018 08:18:28	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	11,40 N.m	amount of inspection	100
Rotation angle start torque	5,700 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

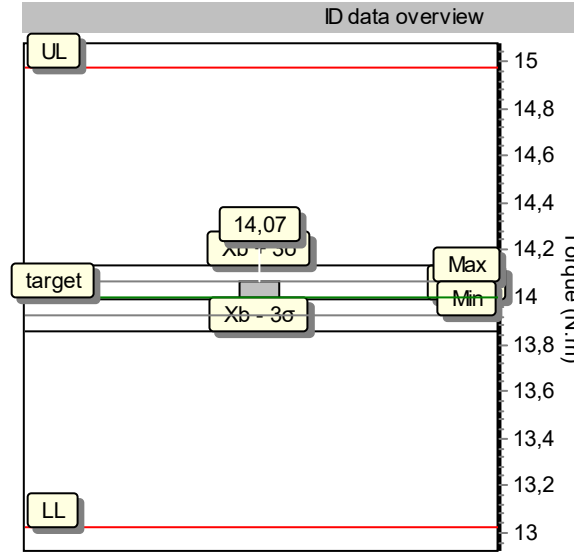
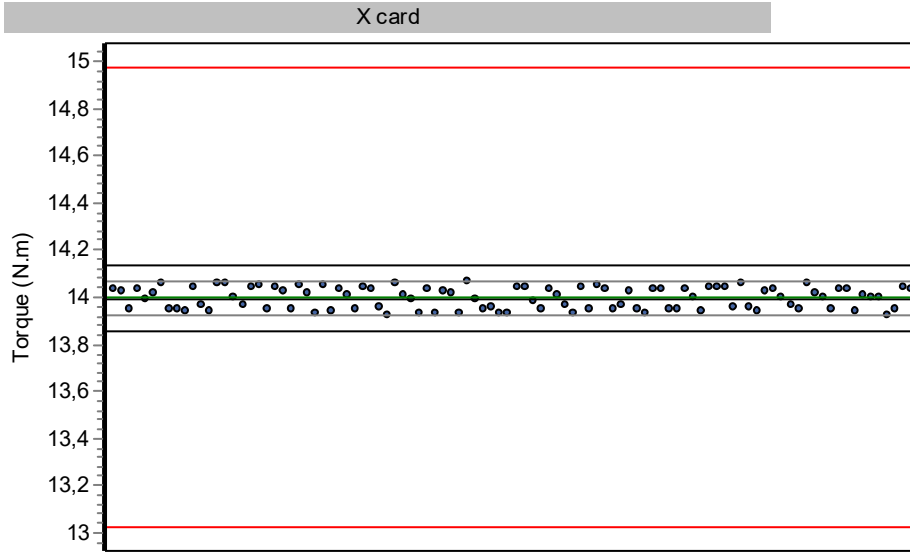
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
11,40	10,60	12,20	11,3853	0,1720	0,0428	6,219	6,105	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	11,370 N.m	-0,3 %	30,50 °	1,7 %	99 rpm	38 rpm	04.07.2018	08:33:28
52	11,402 N.m	0,0 %	29,75 °	-0,8 %	99 rpm	38 rpm	04.07.2018	08:33:46
53	11,366 N.m	-0,3 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:34:04
54	11,316 N.m	-0,7 %	29,00 °	-3,3 %	99 rpm	38 rpm	04.07.2018	08:34:22
55	11,331 N.m	-0,6 %	28,25 °	-5,8 %	100 rpm	37 rpm	04.07.2018	08:34:40
56	11,374 N.m	-0,2 %	29,50 °	-1,7 %	100 rpm	39 rpm	04.07.2018	08:34:58
57	11,370 N.m	-0,3 %	29,75 °	-0,8 %	99 rpm	38 rpm	04.07.2018	08:35:16
58	11,331 N.m	-0,6 %	29,75 °	-0,8 %	100 rpm	39 rpm	04.07.2018	08:35:34
59	11,405 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:35:52
60	11,398 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:36:10
61	11,402 N.m	0,0 %	30,25 °	0,8 %	100 rpm	38 rpm	04.07.2018	08:36:28
62	11,444 N.m	0,4 %	30,50 °	1,7 %	99 rpm	39 rpm	04.07.2018	08:36:46
63	11,448 N.m	0,4 %	30,75 °	2,5 %	99 rpm	38 rpm	04.07.2018	08:37:04
64	11,413 N.m	0,1 %	30,75 °	2,5 %	99 rpm	39 rpm	04.07.2018	08:37:22
65	11,452 N.m	0,5 %	31,00 °	3,3 %	99 rpm	38 rpm	04.07.2018	08:37:40
66	11,425 N.m	0,2 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:37:58
67	11,409 N.m	0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:38:16
68	11,402 N.m	0,0 %	30,00 °	0,0 %	99 rpm	38 rpm	04.07.2018	08:38:34
69	11,363 N.m	-0,3 %	29,25 °	-2,5 %	99 rpm	38 rpm	04.07.2018	08:38:52
70	11,312 N.m	-0,8 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:39:10
71	11,316 N.m	-0,7 %	28,75 °	-4,2 %	99 rpm	38 rpm	04.07.2018	08:39:28
72	11,308 N.m	-0,8 %	29,50 °	-1,7 %	100 rpm	38 rpm	04.07.2018	08:39:46
73	11,339 N.m	-0,5 %	29,00 °	-3,3 %	99 rpm	38 rpm	04.07.2018	08:40:04
74	11,296 N.m	-0,9 %	29,25 °	-2,5 %	100 rpm	38 rpm	04.07.2018	08:40:22
75	11,370 N.m	-0,3 %	29,50 °	-1,7 %	100 rpm	38 rpm	04.07.2018	08:40:40
76	11,355 N.m	-0,4 %	30,00 °	0,0 %	100 rpm	38 rpm	04.07.2018	08:40:58
77	11,378 N.m	-0,2 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:41:16
78	11,378 N.m	-0,2 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:41:34
79	11,398 N.m	0,0 %	30,75 °	2,5 %	100 rpm	39 rpm	04.07.2018	08:41:52
80	11,390 N.m	-0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:42:10
81	11,413 N.m	0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:42:28
82	11,425 N.m	0,2 %	31,75 °	5,8 %	99 rpm	39 rpm	04.07.2018	08:42:46
83	11,433 N.m	0,3 %	31,50 °	5,0 %	99 rpm	39 rpm	04.07.2018	08:43:04
84	11,374 N.m	-0,2 %	30,75 °	2,5 %	99 rpm	39 rpm	04.07.2018	08:43:22
85	11,374 N.m	-0,2 %	30,25 °	0,8 %	99 rpm	38 rpm	04.07.2018	08:43:40
86	11,374 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	38 rpm	04.07.2018	08:43:58
87	11,320 N.m	-0,7 %	29,25 °	-2,5 %	99 rpm	38 rpm	04.07.2018	08:44:16
88	11,327 N.m	-0,6 %	29,00 °	-3,3 %	100 rpm	38 rpm	04.07.2018	08:44:34
89	11,405 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	38 rpm	04.07.2018	08:44:52
90	11,366 N.m	-0,3 %	29,50 °	-1,7 %	100 rpm	39 rpm	04.07.2018	08:45:10
91	11,351 N.m	-0,4 %	29,50 °	-1,7 %	100 rpm	38 rpm	04.07.2018	08:45:28
92	11,402 N.m	0,0 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:45:46
93	11,402 N.m	0,0 %	30,50 °	1,7 %	100 rpm	38 rpm	04.07.2018	08:46:04
94	11,394 N.m	-0,1 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:46:22
95	11,390 N.m	-0,1 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:46:40
96	11,398 N.m	0,0 %	30,50 °	1,7 %	100 rpm	39 rpm	04.07.2018	08:46:58
97	11,417 N.m	0,1 %	31,00 °	3,3 %	99 rpm	39 rpm	04.07.2018	08:47:16
98	11,417 N.m	0,1 %	31,25 °	4,2 %	99 rpm	39 rpm	04.07.2018	08:47:34
99	11,437 N.m	0,3 %	31,50 °	5,0 %	99 rpm	39 rpm	04.07.2018	08:47:52
100	11,421 N.m	0,2 %	30,75 °	2,5 %	99 rpm	39 rpm	04.07.2018	08:48:10

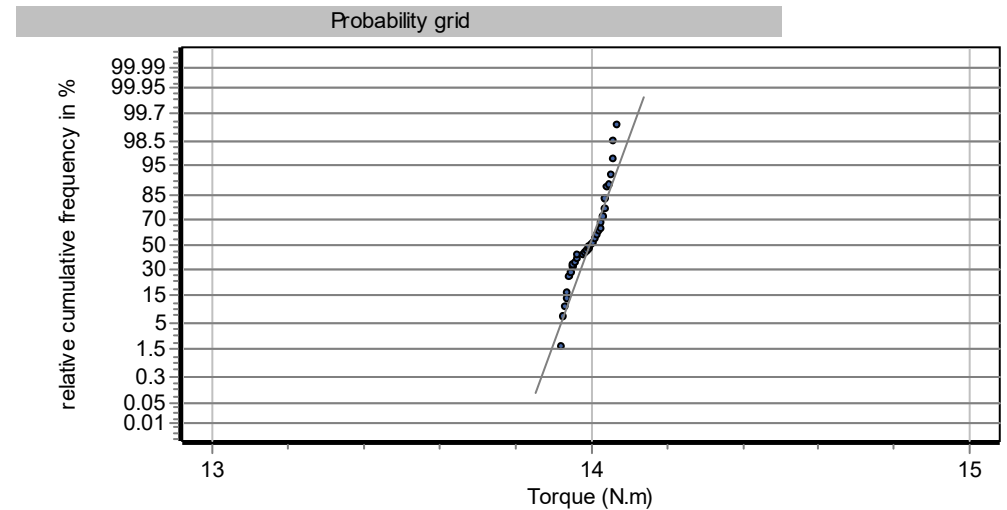
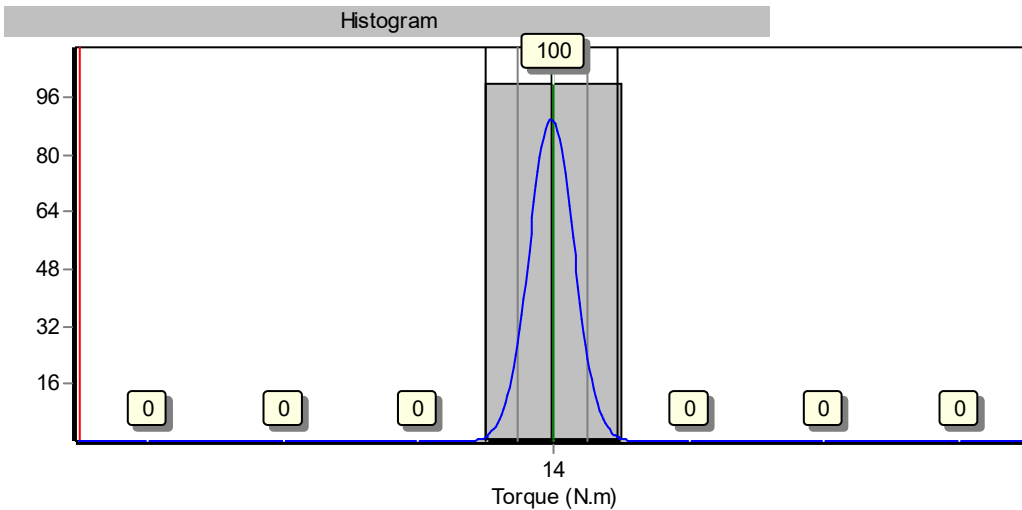
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 100% Screw joint: soft



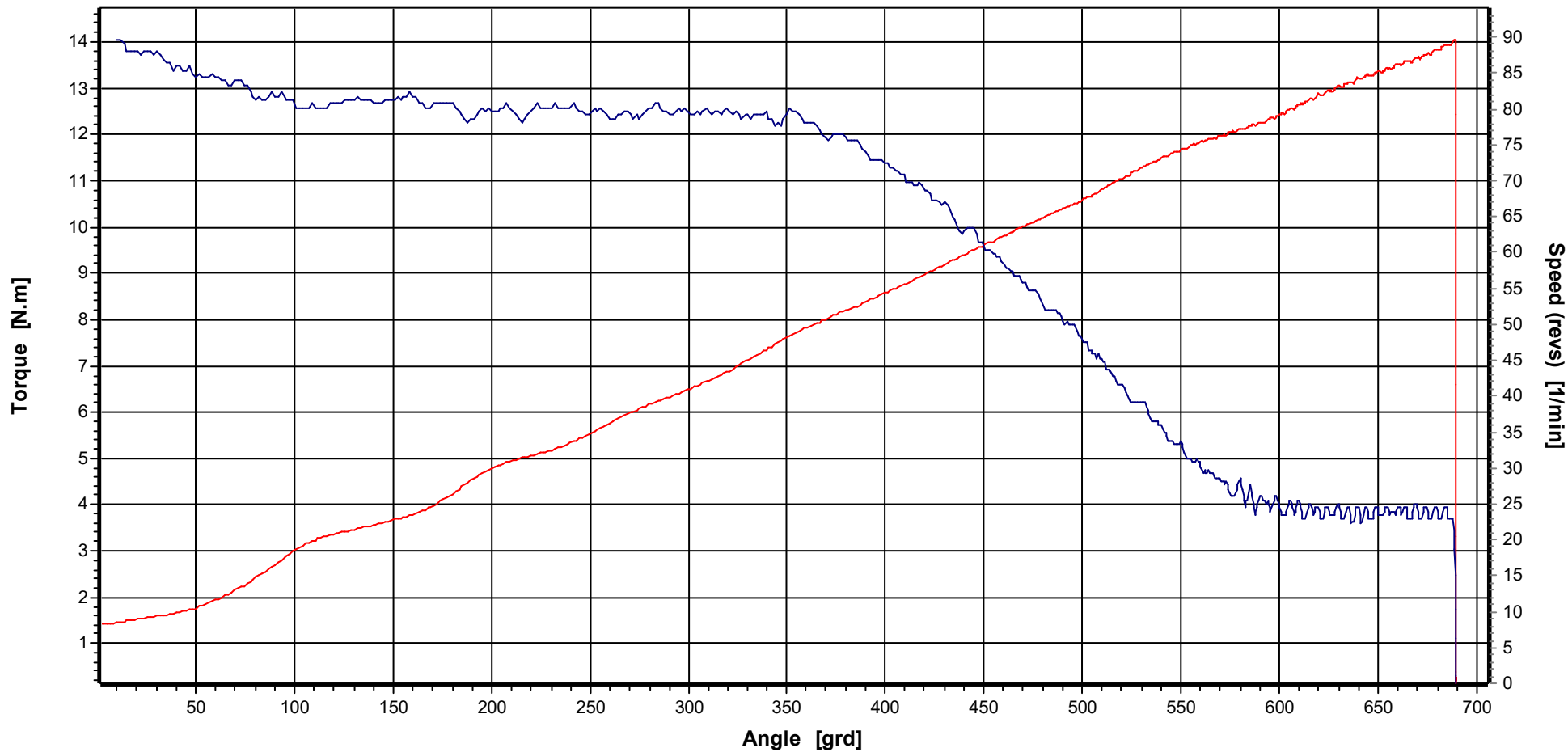
Tester	M.Brkc	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,07	N.m
Min	13,93	N.m
xq	13,9956	N.m
s	0,0459	N.m
Cm	7,112	
Cmk	7,080	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

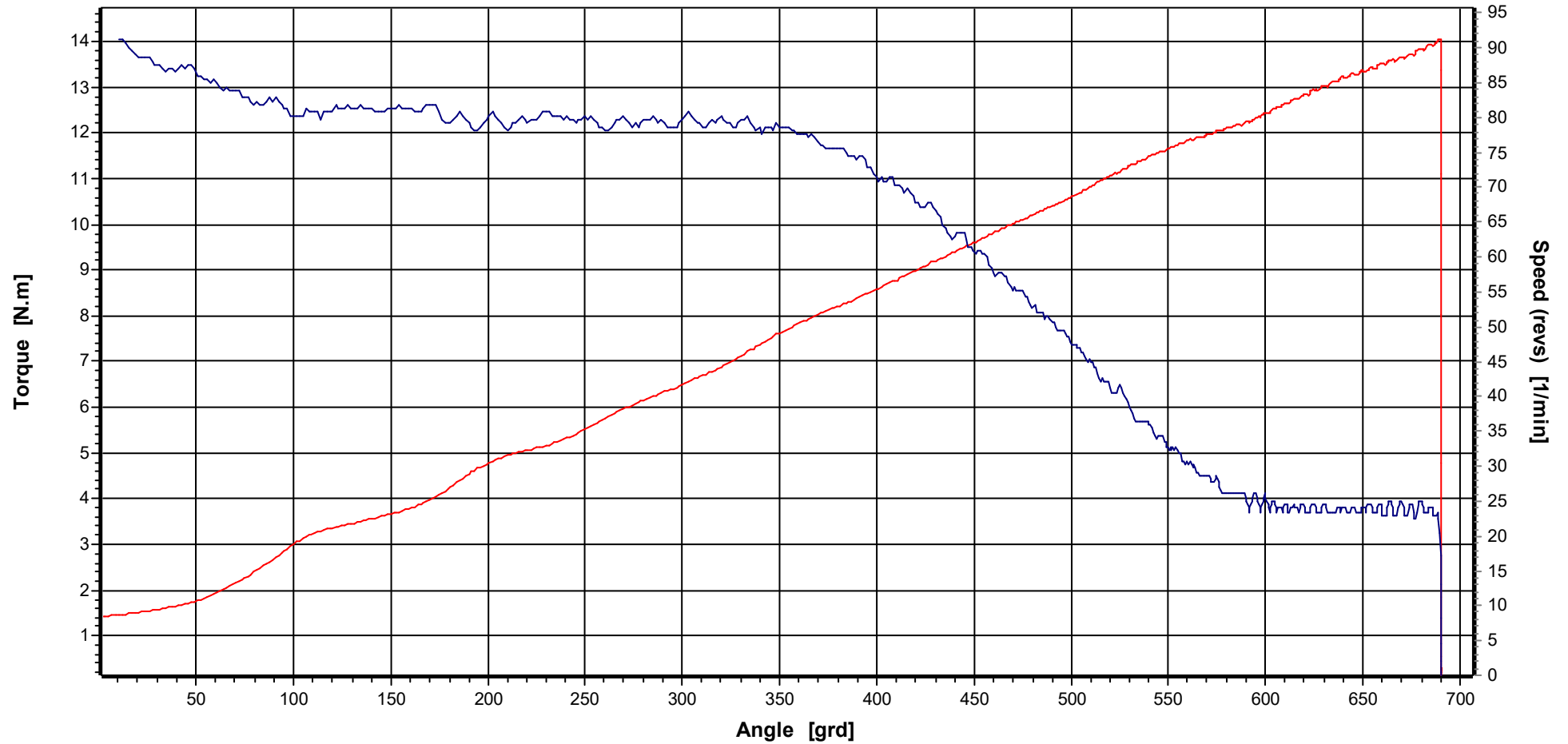


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 09:59:28
UL	14,98 N.m	Supporting points	855			Date/time measurement	04.07.2018 09:59:28

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

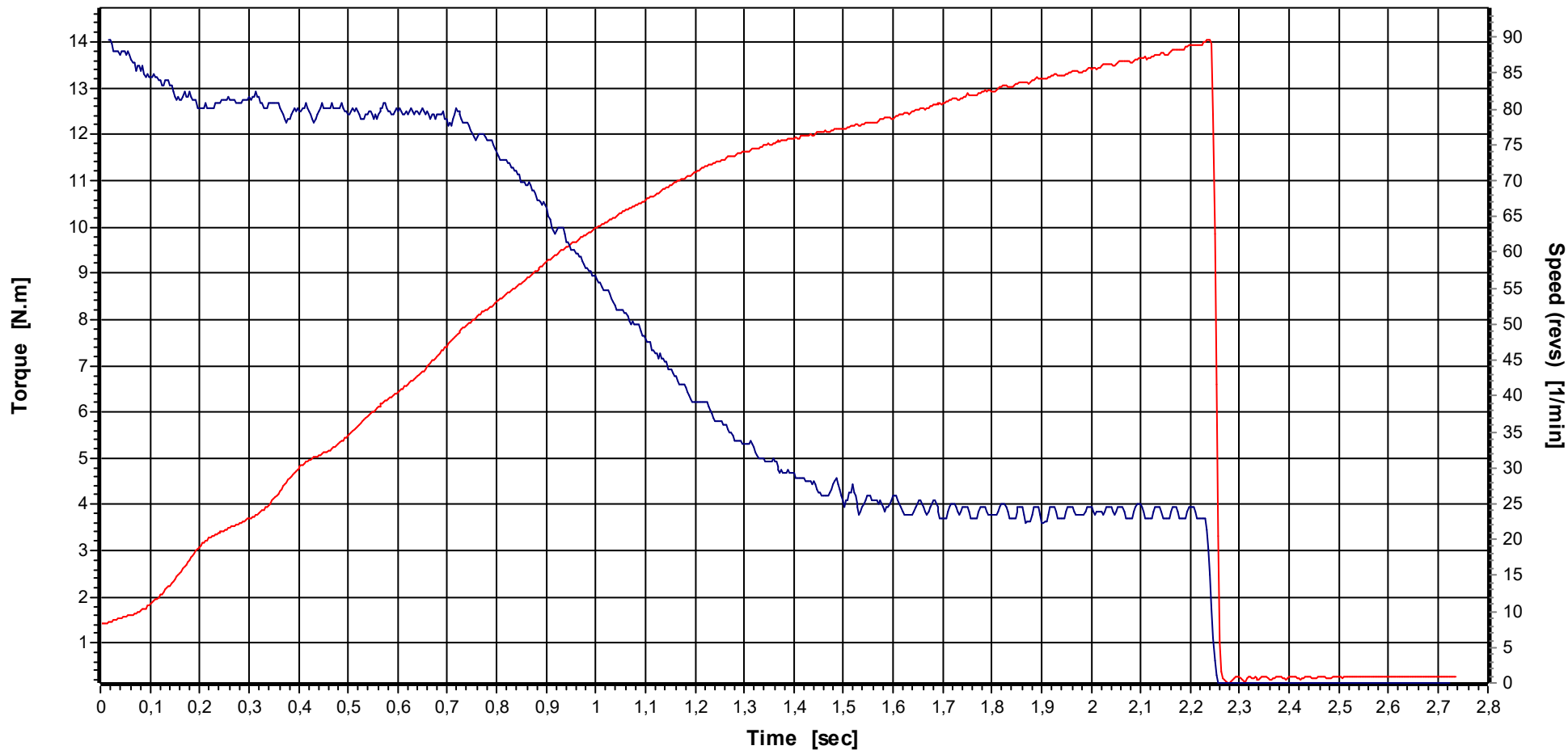


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 09:59:28
UL	14,98 N.m	Supporting points	857			Date/time measurement	04.07.2018 11:13:42

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

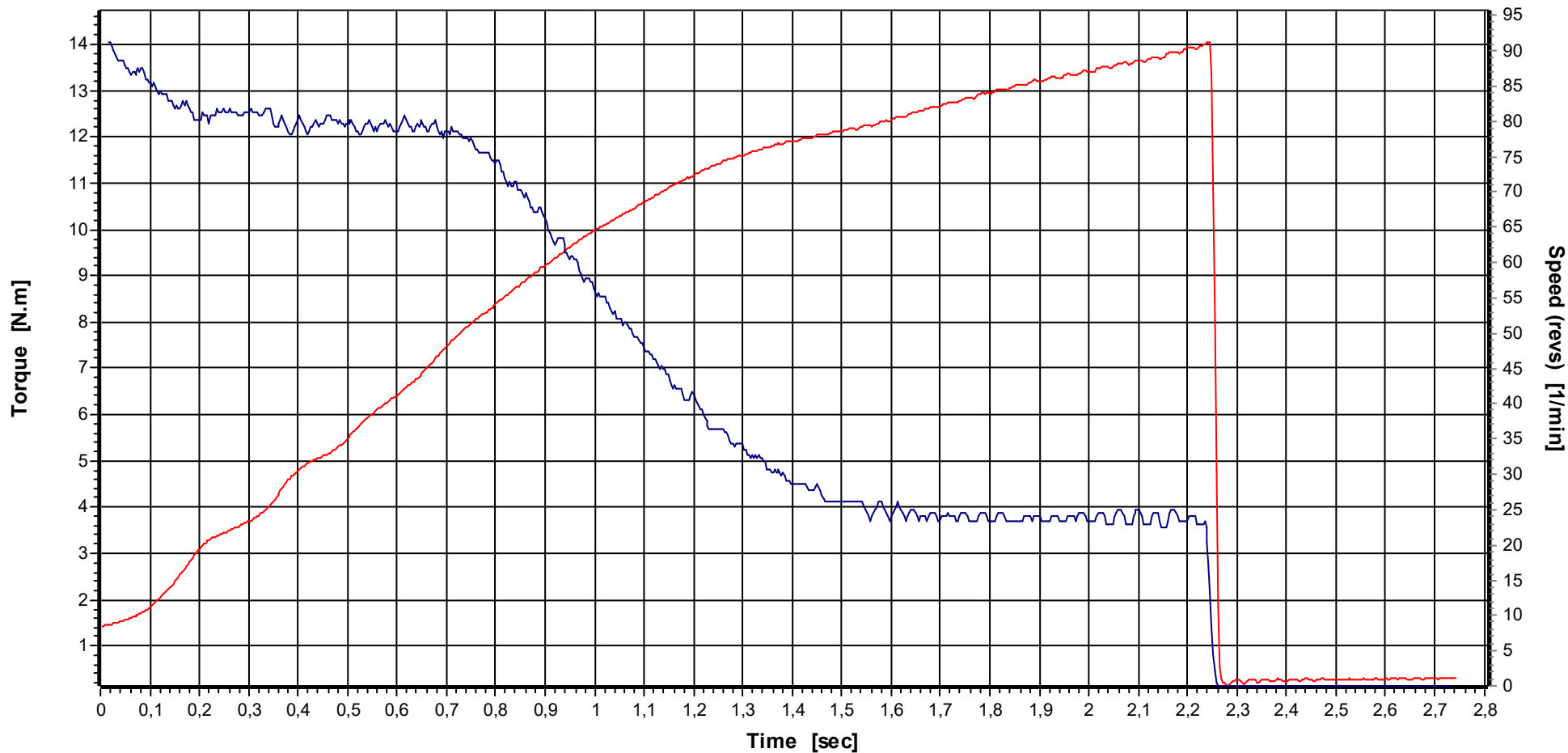


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 09:59:28
UL	14,98 N.m	Supporting points	855			Date/time measurement	04.07.2018 09:59:28

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 09:59:28
UL	14,98 N.m	Supporting points	857			Date/time measurement	04.07.2018 11:13:42

Date/ Time	04.07.2018 09:59:28	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	13,9956	0,1450	0,0459	7,112	7,080	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	14,038 N.m	0,3 %	364,25 °	1,2 %	454 rpm	44 rpm	04.07.2018	09:59:28
2	14,027 N.m	0,2 %	361,75 °	0,5 %	454 rpm	44 rpm	04.07.2018	10:00:13
3	13,945 N.m	-0,4 %	355,50 °	-1,3 %	454 rpm	45 rpm	04.07.2018	10:00:58
4	14,038 N.m	0,3 %	360,25 °	0,1 %	454 rpm	44 rpm	04.07.2018	10:01:43
5	13,988 N.m	-0,1 %	357,25 °	-0,8 %	453 rpm	45 rpm	04.07.2018	10:02:28
6	14,019 N.m	0,1 %	361,25 °	0,3 %	454 rpm	45 rpm	04.07.2018	10:03:13
7	14,058 N.m	0,4 %	364,75 °	1,3 %	454 rpm	44 rpm	04.07.2018	10:03:58
8	13,949 N.m	-0,4 %	356,50 °	-1,0 %	454 rpm	45 rpm	04.07.2018	10:04:43
9	13,945 N.m	-0,4 %	355,50 °	-1,3 %	453 rpm	45 rpm	04.07.2018	10:05:27
10	13,941 N.m	-0,4 %	356,25 °	-1,0 %	454 rpm	45 rpm	04.07.2018	10:06:12
11	14,046 N.m	0,3 %	366,25 °	1,7 %	455 rpm	44 rpm	04.07.2018	10:06:58
12	13,968 N.m	-0,2 %	357,00 °	-0,8 %	454 rpm	45 rpm	04.07.2018	10:07:43
13	13,937 N.m	-0,5 %	355,50 °	-1,3 %	453 rpm	45 rpm	04.07.2018	10:08:27
14	14,058 N.m	0,4 %	360,25 °	0,1 %	454 rpm	45 rpm	04.07.2018	10:09:13
15	14,058 N.m	0,4 %	365,25 °	1,5 %	454 rpm	44 rpm	04.07.2018	10:09:58
16	13,996 N.m	0,0 %	360,50 °	0,1 %	453 rpm	44 rpm	04.07.2018	10:10:43
17	13,964 N.m	-0,3 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	10:11:27
18	14,042 N.m	0,3 %	364,75 °	1,3 %	455 rpm	44 rpm	04.07.2018	10:12:13
19	14,054 N.m	0,4 %	363,00 °	0,8 %	453 rpm	44 rpm	04.07.2018	10:12:58
20	13,945 N.m	-0,4 %	355,50 °	-1,3 %	454 rpm	45 rpm	04.07.2018	10:13:42
21	14,046 N.m	0,3 %	359,75 °	-0,1 %	455 rpm	45 rpm	04.07.2018	10:14:28
22	14,023 N.m	0,2 %	361,25 °	0,3 %	454 rpm	44 rpm	04.07.2018	10:15:13
23	13,945 N.m	-0,4 %	355,00 °	-1,4 %	454 rpm	45 rpm	04.07.2018	10:15:57
24	14,054 N.m	0,4 %	362,25 °	0,6 %	454 rpm	44 rpm	04.07.2018	10:16:43
25	14,019 N.m	0,1 %	361,25 °	0,3 %	454 rpm	44 rpm	04.07.2018	10:17:28
26	13,929 N.m	-0,5 %	356,00 °	-1,1 %	454 rpm	45 rpm	04.07.2018	10:18:13
27	14,054 N.m	0,4 %	366,00 °	1,7 %	455 rpm	44 rpm	04.07.2018	10:18:58
28	13,937 N.m	-0,5 %	355,50 °	-1,3 %	454 rpm	45 rpm	04.07.2018	10:19:43
29	14,031 N.m	0,2 %	365,00 °	1,4 %	455 rpm	44 rpm	04.07.2018	10:20:28
30	14,011 N.m	0,1 %	360,75 °	0,2 %	454 rpm	44 rpm	04.07.2018	10:21:13
31	13,953 N.m	-0,3 %	356,50 °	-1,0 %	454 rpm	45 rpm	04.07.2018	10:21:58
32	14,042 N.m	0,3 %	360,50 °	0,1 %	454 rpm	45 rpm	04.07.2018	10:22:42
33	14,038 N.m	0,3 %	363,50 °	1,0 %	454 rpm	44 rpm	04.07.2018	10:23:28
34	13,957 N.m	-0,3 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	10:24:13
35	13,925 N.m	-0,5 %	354,75 °	-1,5 %	454 rpm	45 rpm	04.07.2018	10:24:57
36	14,058 N.m	0,4 %	361,75 °	0,5 %	454 rpm	45 rpm	04.07.2018	10:25:43
37	14,011 N.m	0,1 %	360,25 °	0,1 %	454 rpm	44 rpm	04.07.2018	10:26:28
38	13,992 N.m	-0,1 %	358,75 °	-0,3 %	453 rpm	45 rpm	04.07.2018	10:27:13
39	13,933 N.m	-0,5 %	353,25 °	-1,9 %	454 rpm	45 rpm	04.07.2018	10:27:57
40	14,035 N.m	0,3 %	363,50 °	1,0 %	454 rpm	44 rpm	04.07.2018	10:28:43
41	13,929 N.m	-0,5 %	356,50 °	-1,0 %	454 rpm	45 rpm	04.07.2018	10:29:28
42	14,023 N.m	0,2 %	360,50 °	0,1 %	454 rpm	45 rpm	04.07.2018	10:30:13
43	14,019 N.m	0,1 %	361,25 °	0,3 %	453 rpm	44 rpm	04.07.2018	10:30:58
44	13,929 N.m	-0,5 %	356,00 °	-1,1 %	453 rpm	45 rpm	04.07.2018	10:31:42
45	14,070 N.m	0,5 %	364,00 °	1,1 %	455 rpm	44 rpm	04.07.2018	10:32:28
46	13,992 N.m	-0,1 %	358,75 °	-0,3 %	453 rpm	45 rpm	04.07.2018	10:33:12
47	13,949 N.m	-0,4 %	355,75 °	-1,2 %	453 rpm	45 rpm	04.07.2018	10:33:57
48	13,960 N.m	-0,3 %	356,00 °	-1,1 %	454 rpm	45 rpm	04.07.2018	10:34:42
49	13,929 N.m	-0,5 %	354,75 °	-1,5 %	454 rpm	45 rpm	04.07.2018	10:35:27
50	13,933 N.m	-0,5 %	353,75 °	-1,7 %	454 rpm	45 rpm	04.07.2018	10:36:12

Date/ Time	04.07.2018 09:59:28	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	360,00 °		

Remark

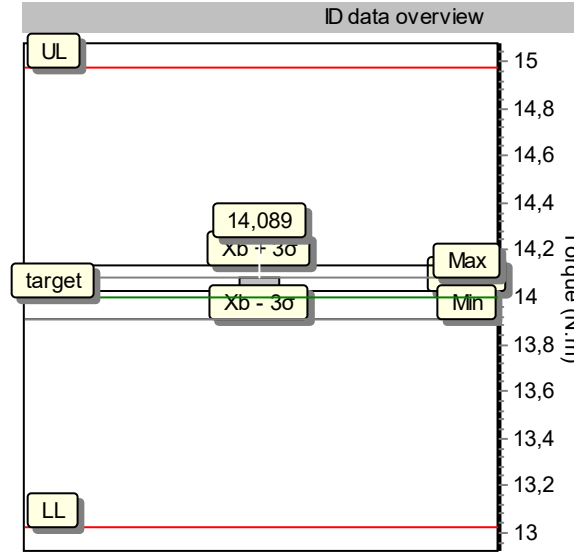
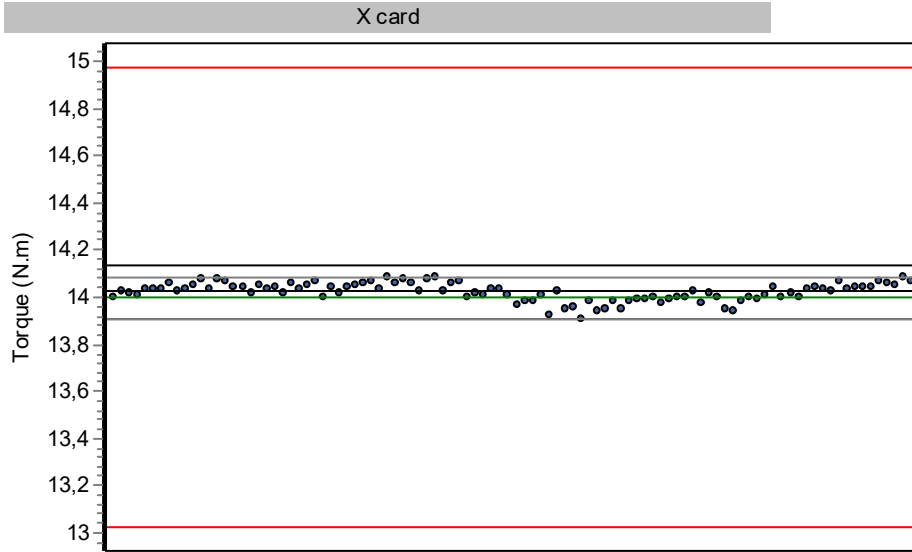
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	13,9956	0,1450	0,0459	7,112	7,080	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	14,046 N.m	0,3 %	361,00 °	0,3 %	454 rpm	45 rpm	04.07.2018	10:36:57
52	14,046 N.m	0,3 %	364,50 °	1,3 %	454 rpm	44 rpm	04.07.2018	10:37:42
53	13,980 N.m	-0,1 %	356,00 °	-1,1 %	454 rpm	45 rpm	04.07.2018	10:38:27
54	13,953 N.m	-0,3 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	10:39:12
55	14,031 N.m	0,2 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	10:39:57
56	14,011 N.m	0,1 %	361,00 °	0,3 %	454 rpm	44 rpm	04.07.2018	10:40:43
57	13,964 N.m	-0,3 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	10:41:27
58	13,933 N.m	-0,5 %	353,50 °	-1,8 %	454 rpm	45 rpm	04.07.2018	10:42:12
59	14,046 N.m	0,3 %	364,75 °	1,3 %	454 rpm	44 rpm	04.07.2018	10:42:58
60	13,945 N.m	-0,4 %	355,25 °	-1,3 %	454 rpm	45 rpm	04.07.2018	10:43:42
61	14,050 N.m	0,4 %	361,75 °	0,5 %	455 rpm	44 rpm	04.07.2018	10:44:28
62	14,031 N.m	0,2 %	361,50 °	0,4 %	454 rpm	44 rpm	04.07.2018	10:45:12
63	13,953 N.m	-0,3 %	356,00 °	-1,1 %	453 rpm	45 rpm	04.07.2018	10:45:57
64	13,968 N.m	-0,2 %	357,75 °	-0,6 %	454 rpm	45 rpm	04.07.2018	10:46:42
65	14,027 N.m	0,2 %	363,25 °	0,9 %	454 rpm	44 rpm	04.07.2018	10:47:28
66	13,945 N.m	-0,4 %	355,75 °	-1,2 %	454 rpm	45 rpm	04.07.2018	10:48:12
67	13,929 N.m	-0,5 %	354,50 °	-1,5 %	453 rpm	45 rpm	04.07.2018	10:48:57
68	14,038 N.m	0,3 %	361,25 °	0,3 %	454 rpm	45 rpm	04.07.2018	10:49:42
69	14,038 N.m	0,3 %	365,00 °	1,4 %	454 rpm	44 rpm	04.07.2018	10:50:28
70	13,945 N.m	-0,4 %	355,75 °	-1,2 %	454 rpm	45 rpm	04.07.2018	10:51:12
71	13,945 N.m	-0,4 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	10:51:57
72	14,035 N.m	0,3 %	365,50 °	1,5 %	455 rpm	44 rpm	04.07.2018	10:52:43
73	14,003 N.m	0,0 %	360,25 °	0,1 %	453 rpm	45 rpm	04.07.2018	10:53:27
74	13,937 N.m	-0,5 %	356,00 °	-1,1 %	453 rpm	45 rpm	04.07.2018	10:54:12
75	14,042 N.m	0,3 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	10:54:57
76	14,042 N.m	0,3 %	365,50 °	1,5 %	454 rpm	44 rpm	04.07.2018	10:55:42
77	14,042 N.m	0,3 %	363,50 °	1,0 %	453 rpm	44 rpm	04.07.2018	10:56:27
78	13,960 N.m	-0,3 %	355,25 °	-1,3 %	454 rpm	45 rpm	04.07.2018	10:57:12
79	14,062 N.m	0,4 %	367,75 °	2,2 %	455 rpm	44 rpm	04.07.2018	10:57:58
80	13,957 N.m	-0,3 %	357,00 °	-0,8 %	453 rpm	45 rpm	04.07.2018	10:58:42
81	13,941 N.m	-0,4 %	356,75 °	-0,9 %	453 rpm	45 rpm	04.07.2018	10:59:27
82	14,023 N.m	0,2 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	11:00:12
83	14,038 N.m	0,3 %	362,50 °	0,7 %	454 rpm	44 rpm	04.07.2018	11:00:57
84	13,999 N.m	0,0 %	359,75 °	-0,1 %	453 rpm	44 rpm	04.07.2018	11:01:42
85	13,964 N.m	-0,3 %	356,00 °	-1,1 %	452 rpm	45 rpm	04.07.2018	11:02:27
86	13,949 N.m	-0,4 %	355,75 °	-1,2 %	453 rpm	45 rpm	04.07.2018	11:03:12
87	14,062 N.m	0,4 %	363,25 °	0,9 %	454 rpm	44 rpm	04.07.2018	11:03:57
88	14,019 N.m	0,1 %	362,25 °	0,6 %	453 rpm	45 rpm	04.07.2018	11:04:43
89	13,999 N.m	0,0 %	359,50 °	-0,1 %	453 rpm	45 rpm	04.07.2018	11:05:27
90	13,945 N.m	-0,4 %	355,25 °	-1,3 %	453 rpm	45 rpm	04.07.2018	11:06:12
91	14,035 N.m	0,3 %	362,75 °	0,8 %	453 rpm	45 rpm	04.07.2018	11:06:57
92	14,031 N.m	0,2 %	362,50 °	0,7 %	453 rpm	44 rpm	04.07.2018	11:07:42
93	13,941 N.m	-0,4 %	356,75 °	-0,9 %	454 rpm	45 rpm	04.07.2018	11:08:27
94	14,007 N.m	0,1 %	359,75 °	-0,1 %	453 rpm	45 rpm	04.07.2018	11:09:12
95	14,003 N.m	0,0 %	359,50 °	-0,1 %	453 rpm	44 rpm	04.07.2018	11:09:57
96	13,999 N.m	0,0 %	360,75 °	0,2 %	453 rpm	45 rpm	04.07.2018	11:10:42
97	13,925 N.m	-0,5 %	356,00 °	-1,1 %	453 rpm	45 rpm	04.07.2018	11:11:27
98	13,953 N.m	-0,3 %	355,50 °	-1,3 %	453 rpm	45 rpm	04.07.2018	11:12:12
99	14,046 N.m	0,3 %	361,50 °	0,4 %	453 rpm	45 rpm	04.07.2018	11:12:57
100	14,035 N.m	0,3 %	365,00 °	1,4 %	453 rpm	44 rpm	04.07.2018	11:13:42

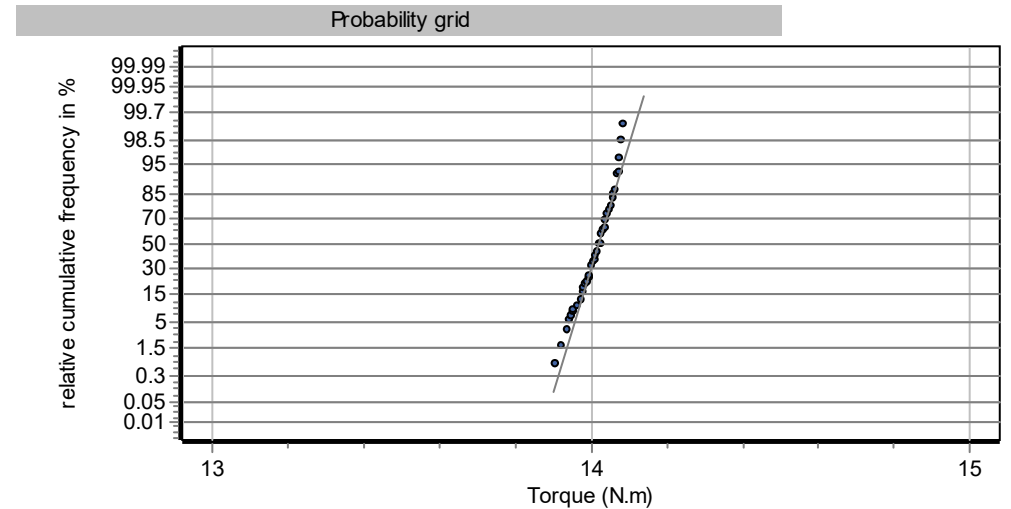
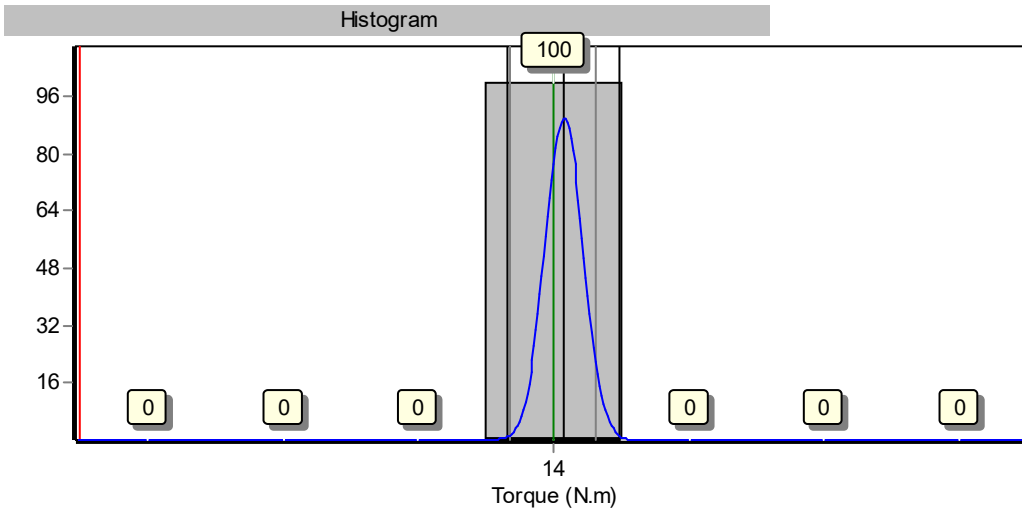
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 100% Screw joint: hard



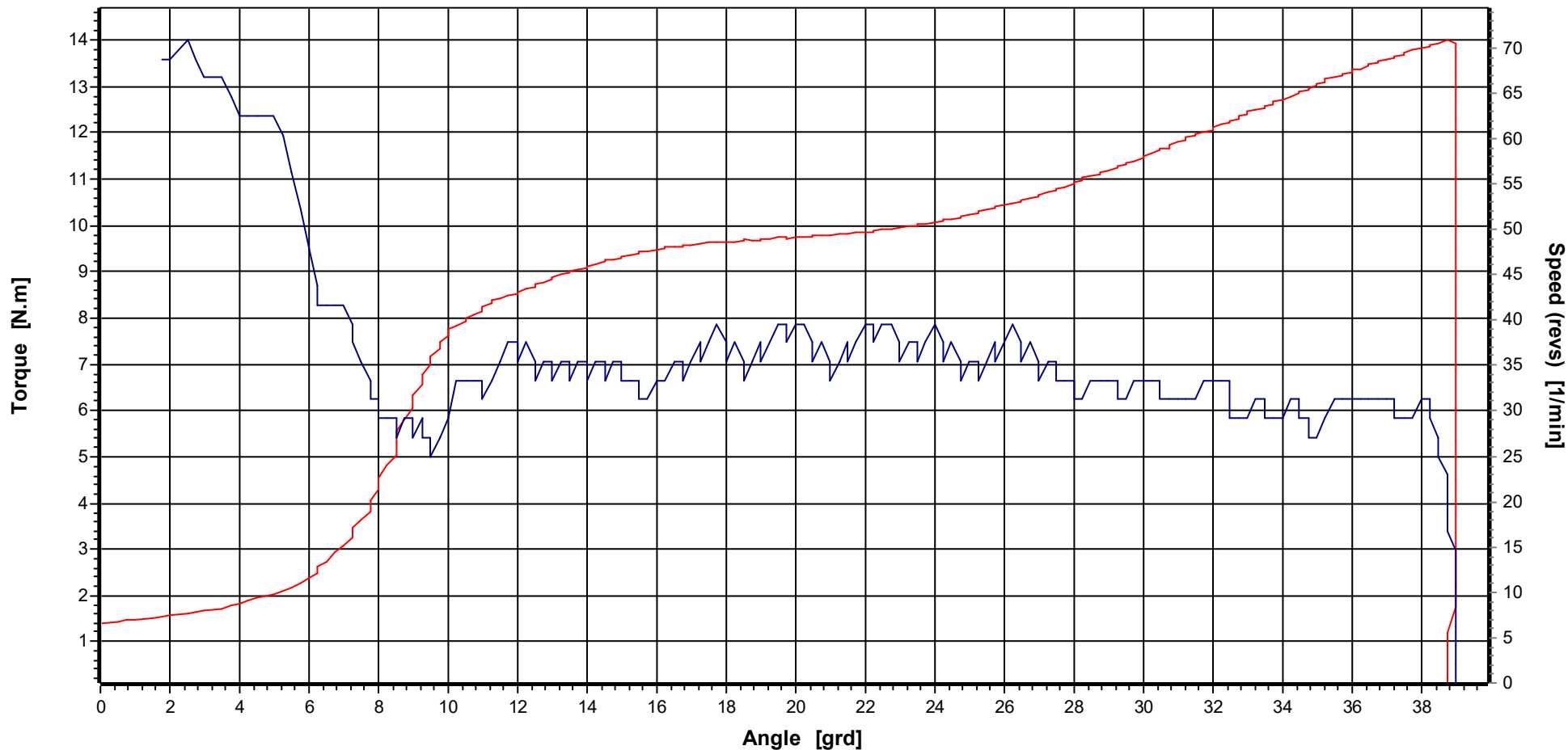
Tester	M.Brkic	
N	100	
Target	14,00	N.m
UL	14,98	N.m
LL	13,02	N.m
Max	14,09	N.m
Min	13,91	N.m
xq	14,0216	N.m
s	0,0390	N.m
Cm	8,376	
Cmk	8,191	



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

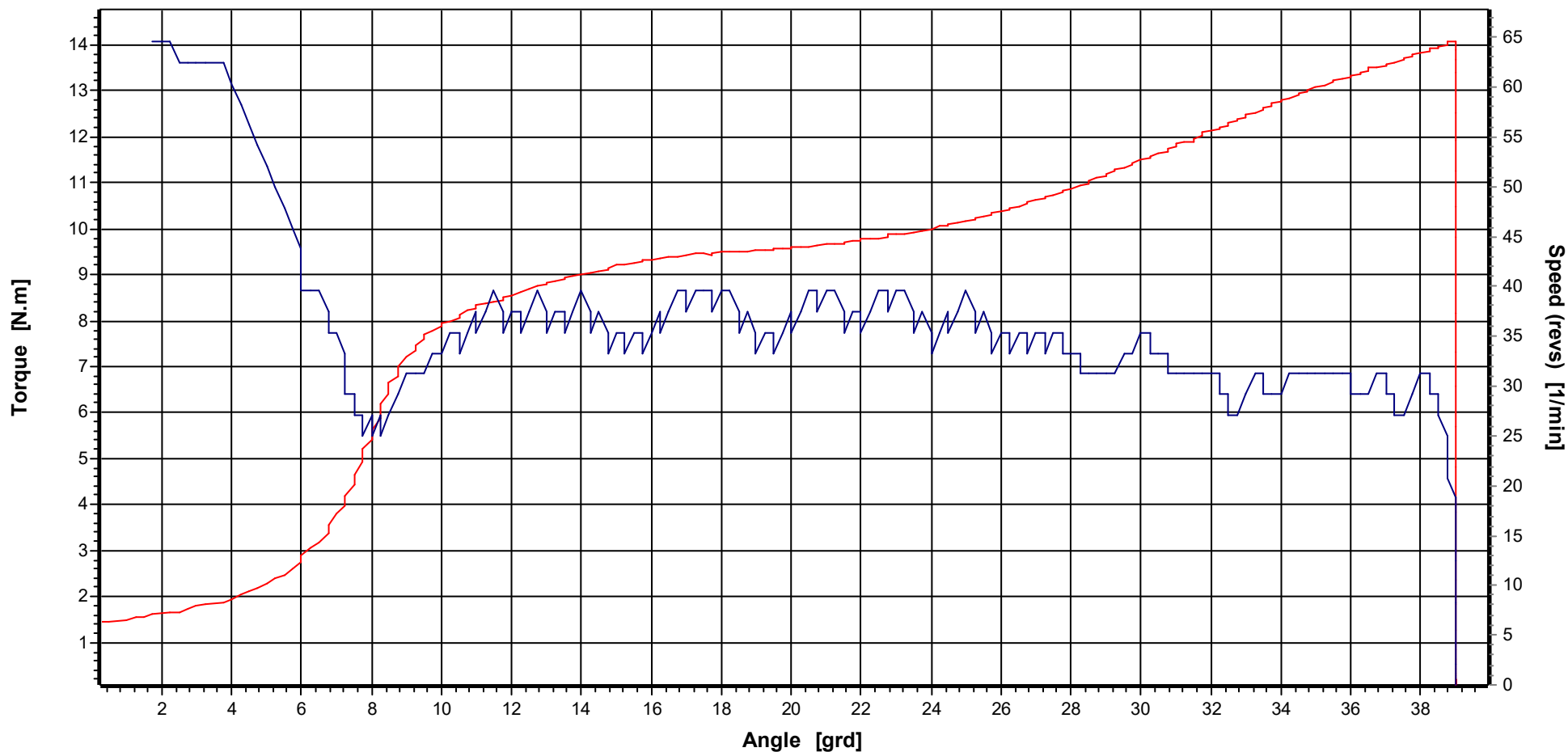


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 11:53:45
UL	14,98 N.m	Supporting points	868			Date/time measurement	04.07.2018 11:53:45

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

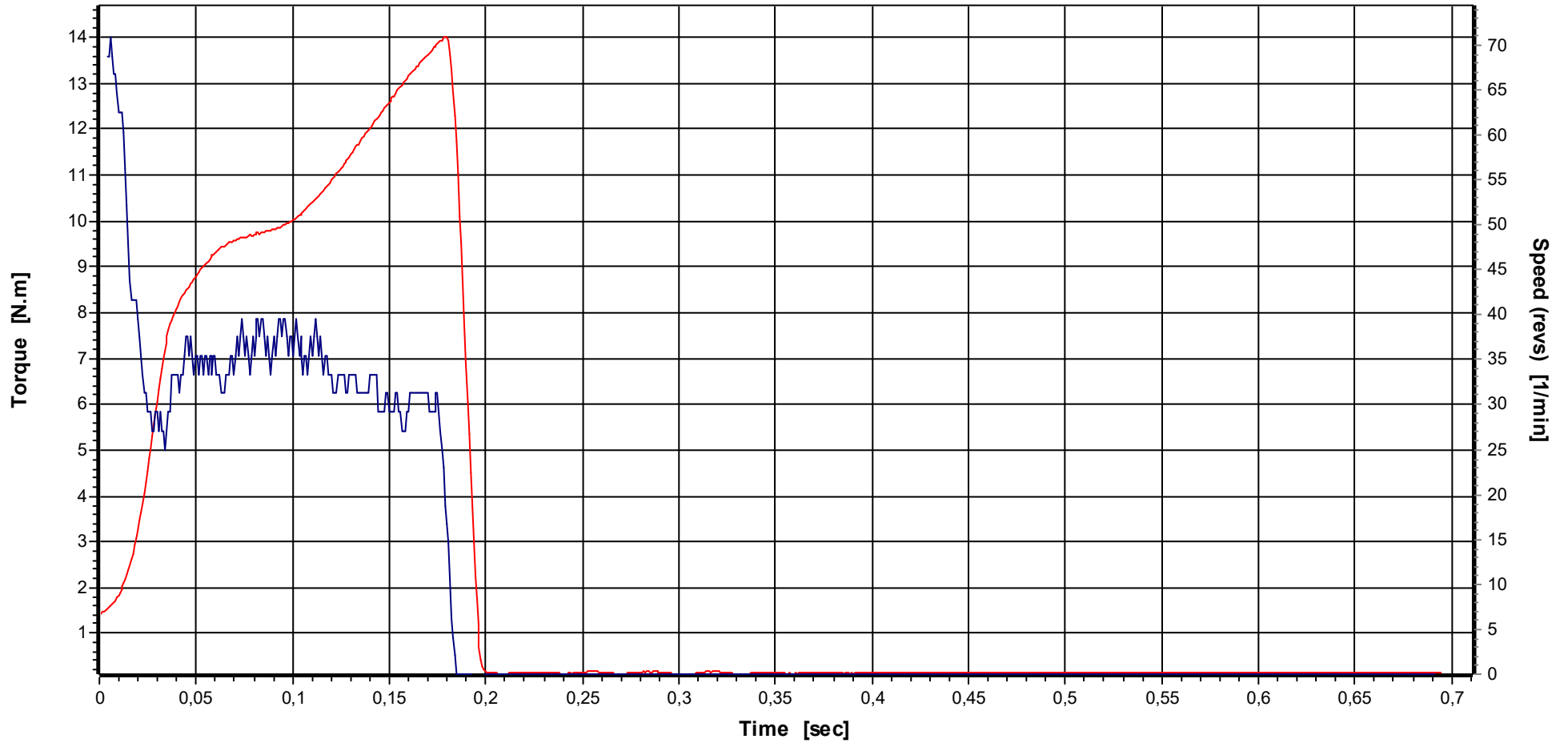


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	08.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 11:53:45
UL	14,98 N.m	Supporting points	847			Date/time measurement	04.07.2018 13:08:00

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

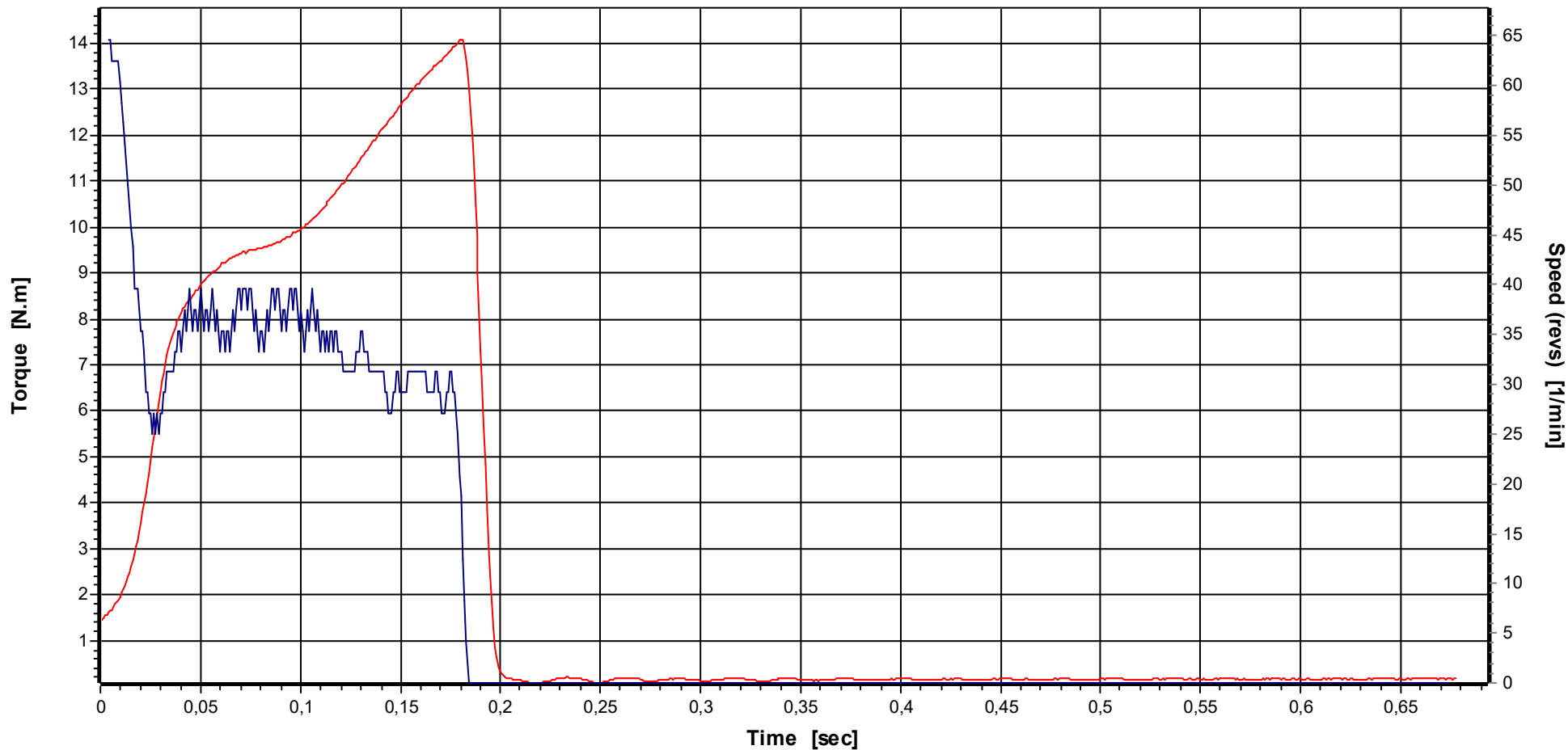


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	04.07.2018 11:53:45
UL	14,98 N.m	Supporting points	868			Date/time measurement	04.07.2018 11:53:45

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	14,00 N.m	Random sample No.	4	Tester	M.Brkcic	Printout date	23.08.2018
LL	13,02 N.m	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	04.07.2018 11:53:45
UL	14,98 N.m	Supporting points	847			Date/time measurement	04.07.2018 13:08:00

Date/ Time	04.07.2018 11:53:45	Transducer S/N	01032159
Tester/ Name	M.Brkcic	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0216	0,1790	0,0390	8,376	8,191	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
1	14,003 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	34 rpm	04.07.2018	11:53:45
2	14,023 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	11:54:30
3	14,015 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	34 rpm	04.07.2018	11:55:15
4	14,011 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	34 rpm	04.07.2018	11:56:00
5	14,031 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	35 rpm	04.07.2018	11:56:45
6	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	11:57:30
7	14,031 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	35 rpm	04.07.2018	11:58:15
8	14,058 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	11:59:00
9	14,027 N.m	0,2 %	29,50 °	-1,7 %	100 rpm	35 rpm	04.07.2018	11:59:45
10	14,038 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:00:30
11	14,054 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	34 rpm	04.07.2018	12:01:15
12	14,077 N.m	0,6 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:02:00
13	14,038 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:02:45
14	14,077 N.m	0,6 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:03:30
15	14,070 N.m	0,5 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:04:15
16	14,042 N.m	0,3 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:05:00
17	14,042 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:05:45
18	14,019 N.m	0,1 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:06:30
19	14,050 N.m	0,4 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:07:15
20	14,031 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:08:00
21	14,046 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:08:45
22	14,019 N.m	0,1 %	29,50 °	-1,7 %	100 rpm	35 rpm	04.07.2018	12:09:30
23	14,058 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:10:15
24	14,035 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:11:00
25	14,050 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:11:45
26	14,070 N.m	0,5 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:12:30
27	13,999 N.m	0,0 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:13:15
28	14,042 N.m	0,3 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:14:00
29	14,019 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:14:45
30	14,042 N.m	0,3 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:15:30
31	14,054 N.m	0,4 %	29,75 °	-0,8 %	100 rpm	34 rpm	04.07.2018	12:16:15
32	14,062 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:17:00
33	14,070 N.m	0,5 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:17:45
34	14,031 N.m	0,2 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:18:30
35	14,089 N.m	0,6 %	30,50 °	1,7 %	99 rpm	35 rpm	04.07.2018	12:19:15
36	14,062 N.m	0,4 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:20:00
37	14,077 N.m	0,6 %	30,75 °	2,5 %	99 rpm	35 rpm	04.07.2018	12:20:45
38	14,058 N.m	0,4 %	30,50 °	1,7 %	99 rpm	35 rpm	04.07.2018	12:21:30
39	14,023 N.m	0,2 %	30,50 °	1,7 %	99 rpm	35 rpm	04.07.2018	12:22:15
40	14,074 N.m	0,5 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:23:00
41	14,081 N.m	0,6 %	30,50 °	1,7 %	100 rpm	35 rpm	04.07.2018	12:23:45
42	14,023 N.m	0,2 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:24:30
43	14,058 N.m	0,4 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:25:15
44	14,070 N.m	0,5 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:26:00
45	14,003 N.m	0,0 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:26:45
46	14,015 N.m	0,1 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:27:30
47	14,007 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:28:15
48	14,031 N.m	0,2 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:29:00
49	14,035 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:29:45
50	14,007 N.m	0,1 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:30:30

Date/ Time	04.07.2018 11:53:45	Transducer S/N	01032159
Tester/ Name	M.Brkić	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target torque	14,00 N.m	amount of inspection	100
Rotation angle start torque	7,000 N.m	direction of rotation	right
Rotation angle	30,00 °		

Remark

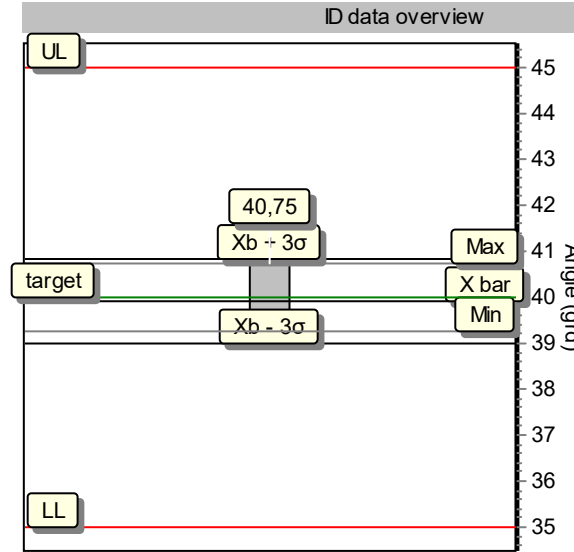
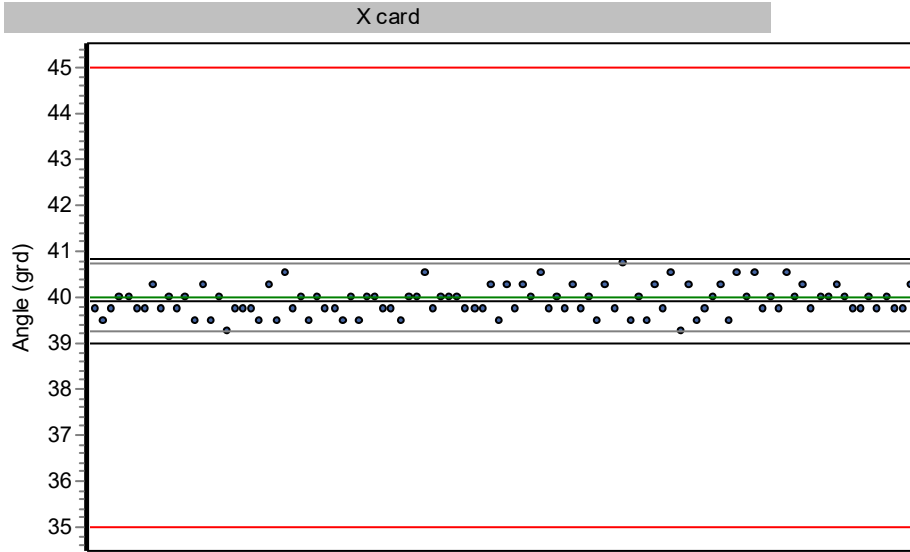
Target torque	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
14,00	13,02	14,98	14,0216	0,1790	0,0390	8,376	8,191	OK

No.	Torque	Diff.	Angle	Diff.	Speed-1	Speed-2	Date	Time
51	13,968 N.m	-0,2 %	29,50 °	-1,7 %	99 rpm	34 rpm	04.07.2018	12:31:15
52	13,980 N.m	-0,1 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:32:00
53	13,984 N.m	-0,1 %	29,25 °	-2,5 %	99 rpm	35 rpm	04.07.2018	12:32:45
54	14,011 N.m	0,1 %	30,50 °	1,7 %	99 rpm	35 rpm	04.07.2018	12:33:30
55	13,921 N.m	-0,6 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:34:15
56	14,023 N.m	0,2 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	12:35:00
57	13,945 N.m	-0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:35:45
58	13,957 N.m	-0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:36:30
59	13,910 N.m	-0,6 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:37:15
60	13,980 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:38:00
61	13,937 N.m	-0,5 %	29,25 °	-2,5 %	100 rpm	35 rpm	04.07.2018	12:38:45
62	13,945 N.m	-0,4 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:39:30
63	13,984 N.m	-0,1 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:40:15
64	13,953 N.m	-0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	12:41:00
65	13,980 N.m	-0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:41:45
66	13,988 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:42:30
67	13,992 N.m	-0,1 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:43:15
68	14,003 N.m	0,0 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:44:00
69	13,976 N.m	-0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:44:45
70	13,988 N.m	-0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:45:30
71	14,003 N.m	0,0 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:46:15
72	13,999 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:47:00
73	14,023 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:47:45
74	13,976 N.m	-0,2 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:48:30
75	14,015 N.m	0,1 %	30,50 °	1,7 %	100 rpm	35 rpm	04.07.2018	12:49:15
76	14,003 N.m	0,0 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:50:00
77	13,949 N.m	-0,4 %	29,50 °	-1,7 %	99 rpm	35 rpm	04.07.2018	12:50:45
78	13,937 N.m	-0,5 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:51:30
79	13,980 N.m	-0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:52:15
80	13,996 N.m	0,0 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:53:00
81	13,992 N.m	-0,1 %	29,75 °	-0,8 %	99 rpm	35 rpm	04.07.2018	12:53:45
82	14,007 N.m	0,1 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:54:30
83	14,046 N.m	0,3 %	29,75 °	-0,8 %	100 rpm	35 rpm	04.07.2018	12:55:15
84	14,003 N.m	0,0 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:56:00
85	14,019 N.m	0,1 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:56:45
86	13,996 N.m	0,0 %	29,75 °	-0,8 %	100 rpm	34 rpm	04.07.2018	12:57:30
87	14,035 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:58:15
88	14,046 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	12:59:00
89	14,031 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	12:59:45
90	14,023 N.m	0,2 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	13:00:30
91	14,066 N.m	0,5 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	13:01:15
92	14,031 N.m	0,2 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	13:02:00
93	14,042 N.m	0,3 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	13:02:45
94	14,046 N.m	0,3 %	30,25 °	0,8 %	100 rpm	35 rpm	04.07.2018	13:03:30
95	14,046 N.m	0,3 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	13:04:15
96	14,070 N.m	0,5 %	30,00 °	0,0 %	100 rpm	35 rpm	04.07.2018	13:05:00
97	14,062 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	13:05:45
98	14,054 N.m	0,4 %	30,00 °	0,0 %	99 rpm	35 rpm	04.07.2018	13:06:30
99	14,081 N.m	0,6 %	30,50 °	1,7 %	100 rpm	35 rpm	04.07.2018	13:07:15
100	14,070 N.m	0,5 %	30,25 °	0,8 %	99 rpm	35 rpm	04.07.2018	13:08:00

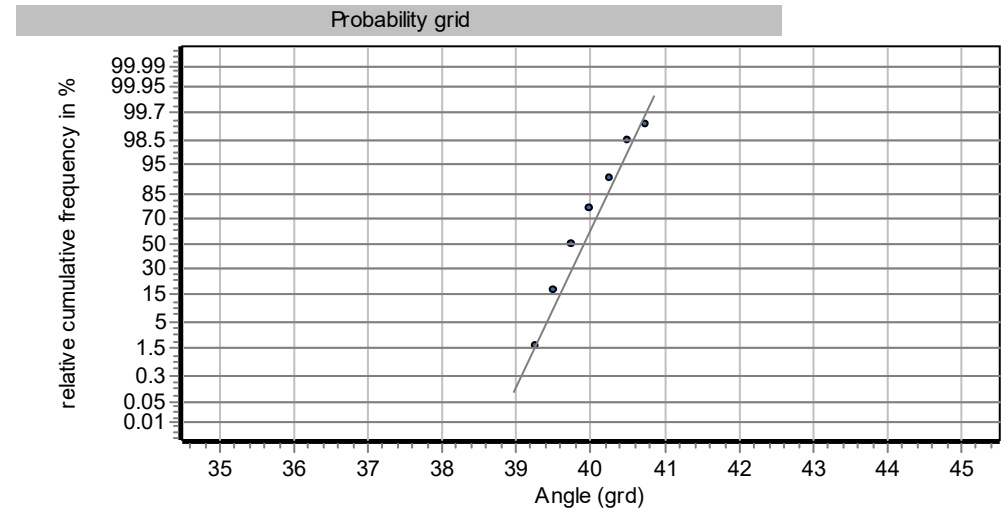
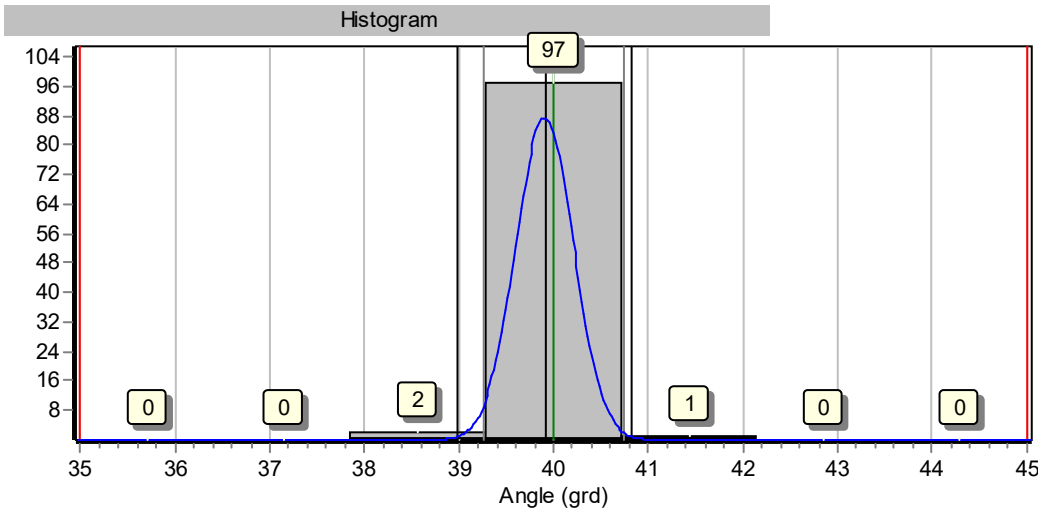
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 40 ° Screw joint: hard



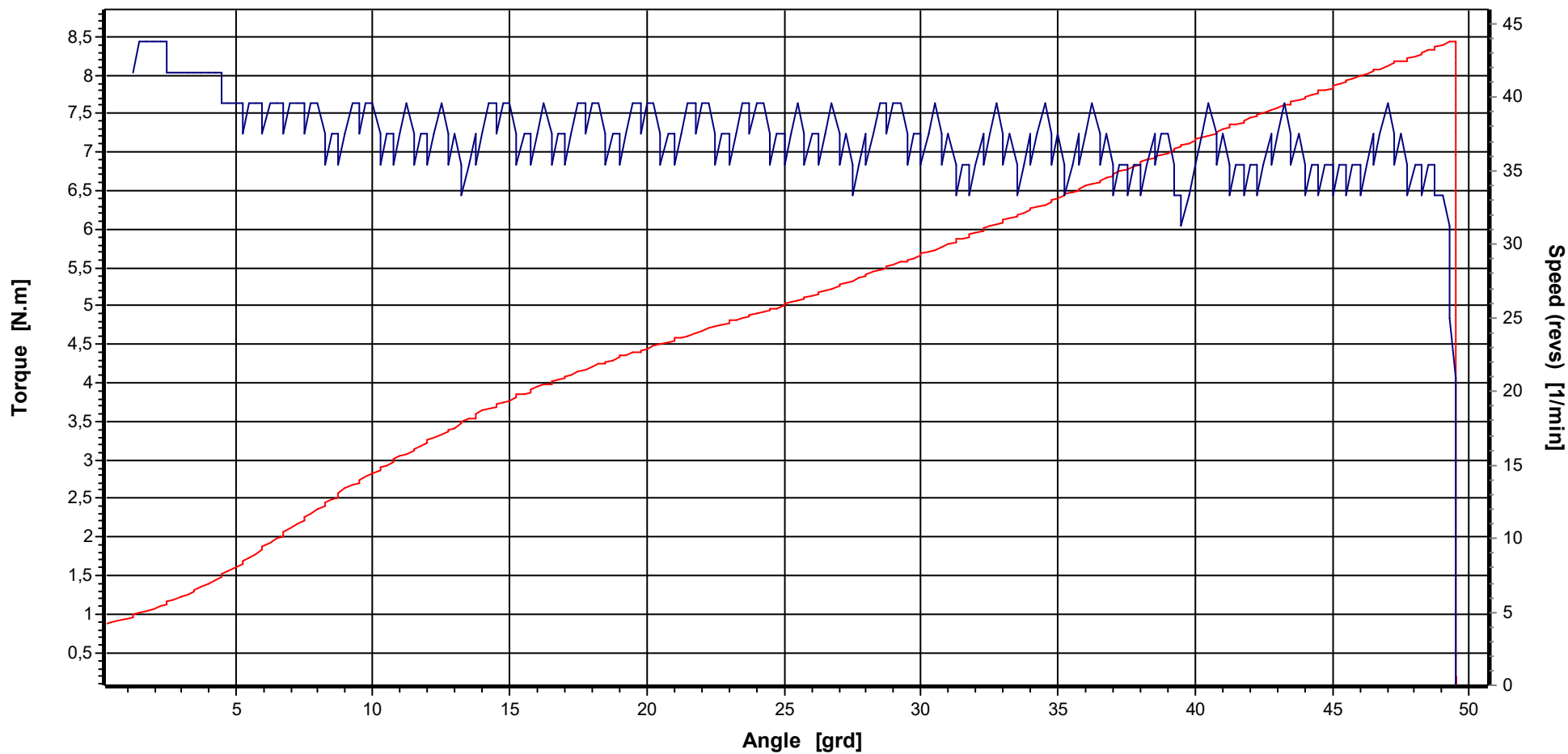
Tester	M.Brkcic
N	100
Target	40,00 grd
UL	45,00 grd
LL	35,00 grd
Max	40,75 grd
Min	39,25 grd
xq	39,9050 grd
s	0,3052 grd
Cm	5,461
Cmk	5,357



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

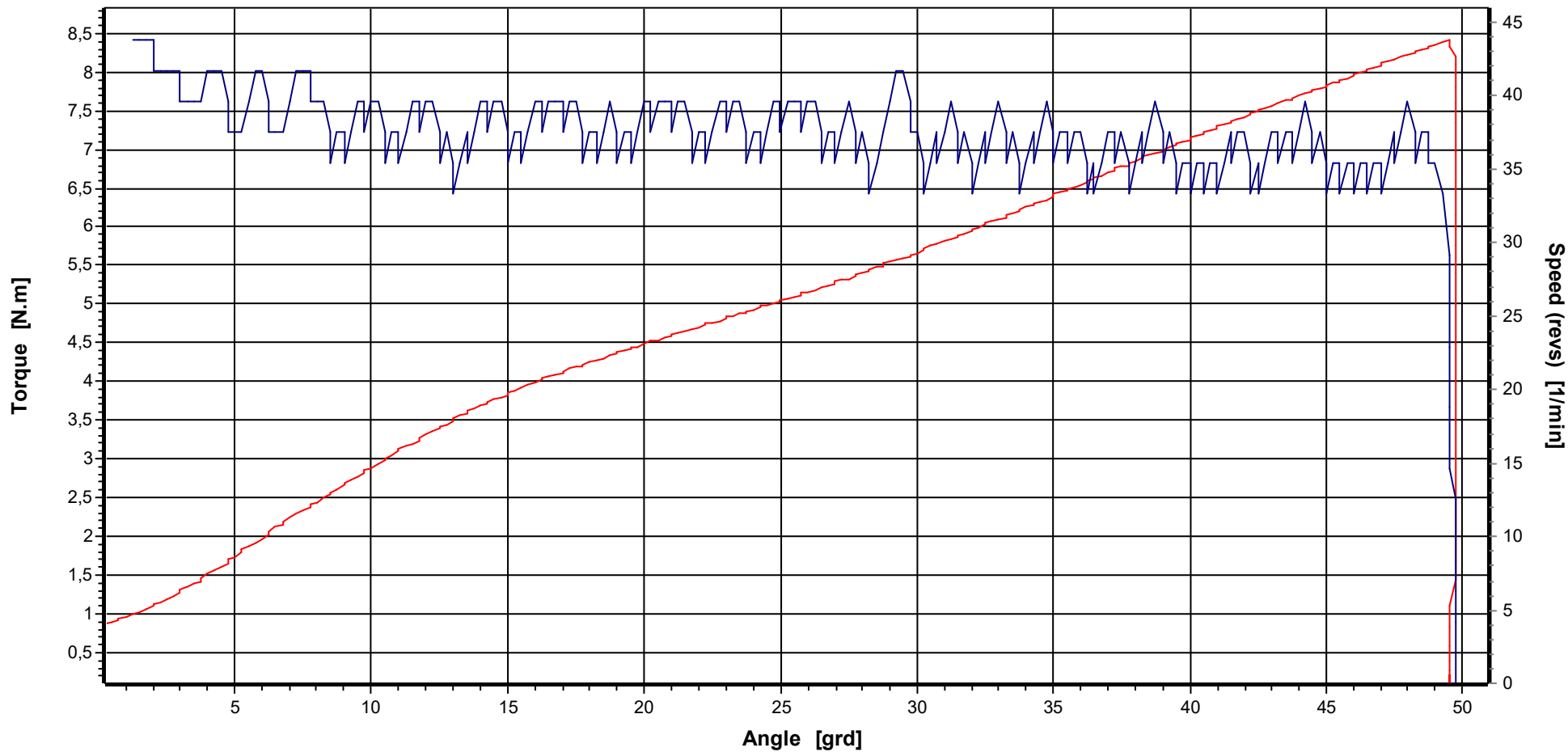


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	2	Tester	M.Brkcic	Printout date	08.08.2018
LL	35,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:06:04
UL	45,00 grd	Supporting points	898			Date/time measurement	20.07.2018 10:06:04

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

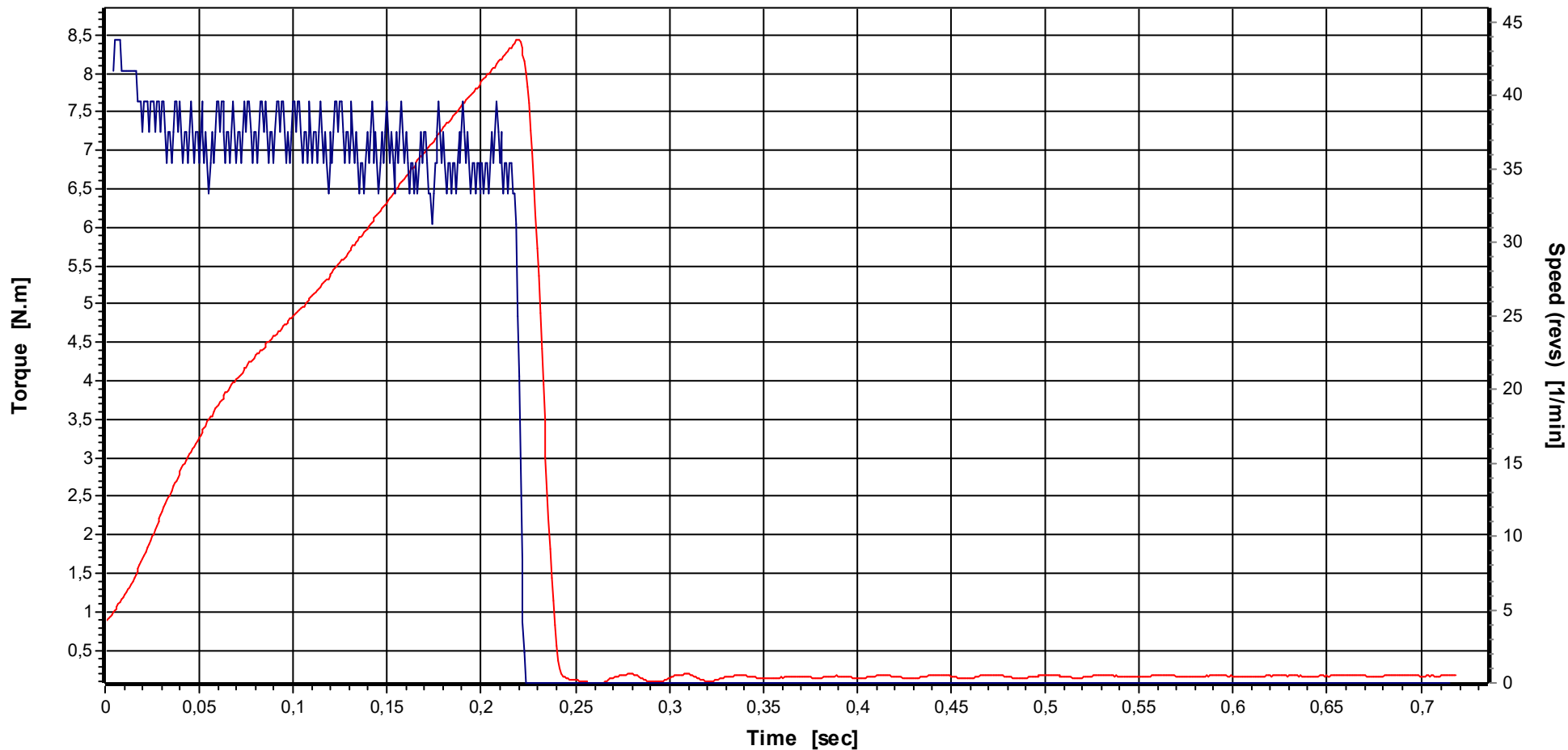


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	2	Tester	M.Brkić	Printout date	08.08.2018
LL	35,00 grd	Measur. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:06:04
UL	45,00 grd	Supporting points	919			Date/time measurement	20.07.2018 10:29:13

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

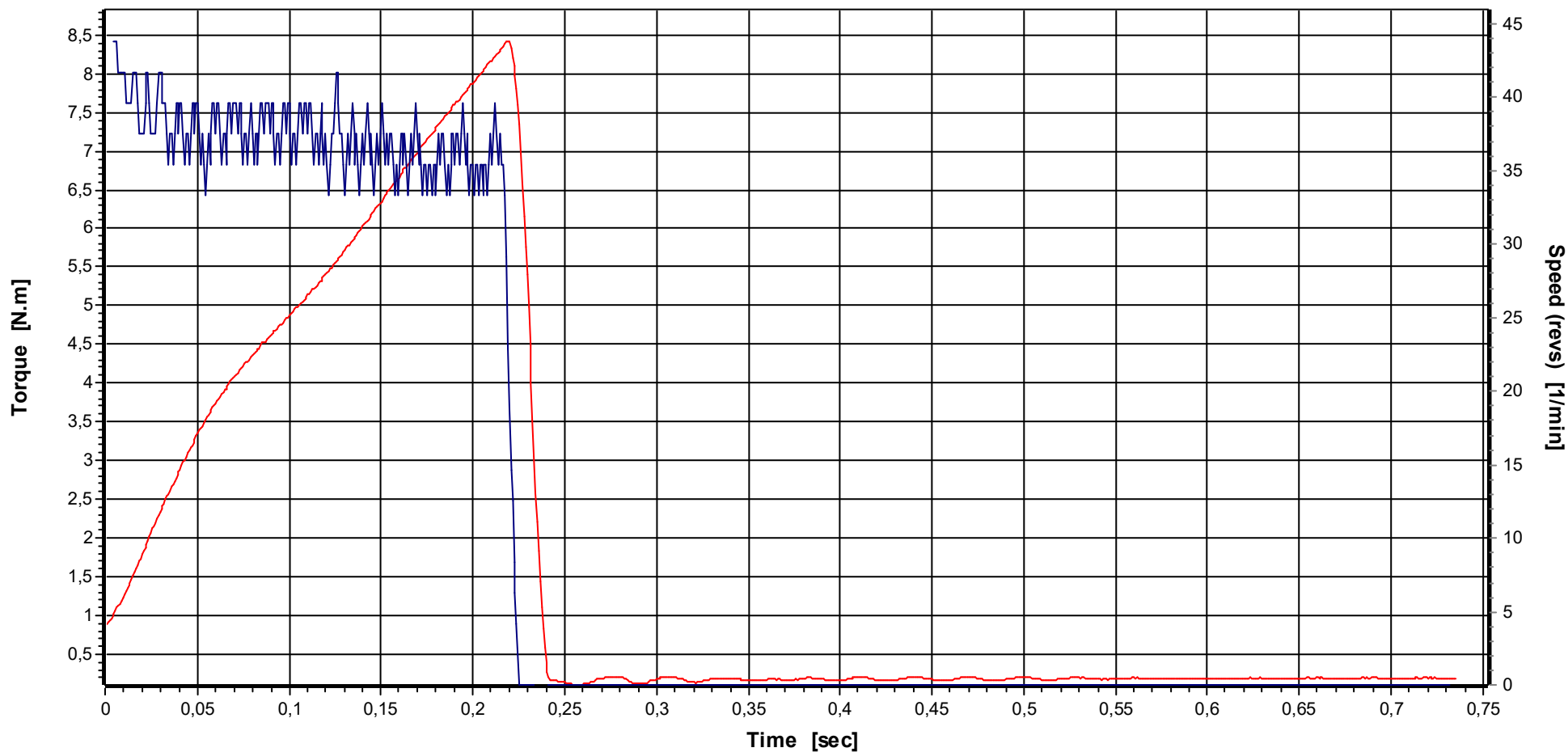


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:06:04
UL	45,00 grd	Supporting points	898			Date/time measurement	20.07.2018 10:06:04

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	40,00 grd	Random sample No.	2	Tester	M.Brkcic	Printout date	23.08.2018
LL	35,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:06:04
UL	45,00 grd	Supporting points	919			Date/time measurement	20.07.2018 10:29:13

Date/ Time	20.07.2018 10:06:04	Transducer S/N	01033617
Tester/ Name	M.Brkcic	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,9050	1,5000	0,3052	5,461	5,357	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	39,75 °	-0,6 %	8,431 N.m	0,4 %	50 rpm	20.07.2018	10:06:04
2	39,50 °	-1,3 %	8,384 N.m	-0,2 %	50 rpm	20.07.2018	10:06:18
3	39,75 °	-0,6 %	8,411 N.m	0,1 %	50 rpm	20.07.2018	10:06:32
4	40,00 °	0,0 %	8,477 N.m	0,9 %	50 rpm	20.07.2018	10:06:46
5	40,00 °	0,0 %	8,477 N.m	0,9 %	50 rpm	20.07.2018	10:07:00
6	39,75 °	-0,6 %	8,415 N.m	0,2 %	50 rpm	20.07.2018	10:07:14
7	39,75 °	-0,6 %	8,483 N.m	1,0 %	50 rpm	20.07.2018	10:07:28
8	40,25 °	0,6 %	8,466 N.m	0,8 %	50 rpm	20.07.2018	10:07:42
9	39,75 °	-0,6 %	8,475 N.m	0,9 %	50 rpm	20.07.2018	10:07:56
10	40,00 °	0,0 %	8,450 N.m	0,6 %	50 rpm	20.07.2018	10:08:10
11	39,75 °	-0,6 %	8,440 N.m	0,5 %	50 rpm	20.07.2018	10:08:24
12	40,00 °	0,0 %	8,456 N.m	0,7 %	50 rpm	20.07.2018	10:08:38
13	39,50 °	-1,3 %	8,425 N.m	0,3 %	50 rpm	20.07.2018	10:08:52
14	40,25 °	0,6 %	8,468 N.m	0,8 %	50 rpm	20.07.2018	10:09:06
15	39,50 °	-1,3 %	8,343 N.m	-0,7 %	50 rpm	20.07.2018	10:09:20
16	40,00 °	0,0 %	8,433 N.m	0,4 %	50 rpm	20.07.2018	10:09:34
17	39,25 °	-1,9 %	8,297 N.m	-1,2 %	50 rpm	20.07.2018	10:09:48
18	39,75 °	-0,6 %	8,437 N.m	0,4 %	50 rpm	20.07.2018	10:10:02
19	39,75 °	-0,6 %	8,363 N.m	-0,4 %	50 rpm	20.07.2018	10:10:16
20	39,75 °	-0,6 %	8,439 N.m	0,5 %	50 rpm	20.07.2018	10:10:30
21	39,50 °	-1,3 %	8,324 N.m	-0,9 %	50 rpm	20.07.2018	10:10:44
22	40,25 °	0,6 %	8,470 N.m	0,8 %	50 rpm	20.07.2018	10:10:58
23	39,50 °	-1,3 %	8,328 N.m	-0,9 %	50 rpm	20.07.2018	10:11:12
24	40,50 °	1,3 %	8,508 N.m	1,3 %	50 rpm	20.07.2018	10:11:26
25	39,75 °	-0,6 %	8,347 N.m	-0,6 %	50 rpm	20.07.2018	10:11:40
26	40,00 °	0,0 %	8,450 N.m	0,6 %	50 rpm	20.07.2018	10:11:54
27	39,50 °	-1,3 %	8,349 N.m	-0,6 %	50 rpm	20.07.2018	10:12:08
28	40,00 °	0,0 %	8,458 N.m	0,7 %	50 rpm	20.07.2018	10:12:22
29	39,75 °	-0,6 %	8,404 N.m	0,0 %	50 rpm	20.07.2018	10:12:36
30	39,75 °	-0,6 %	8,433 N.m	0,4 %	50 rpm	20.07.2018	10:12:50
31	39,50 °	-1,3 %	8,345 N.m	-0,7 %	49 rpm	20.07.2018	10:13:04
32	40,00 °	0,0 %	8,423 N.m	0,3 %	50 rpm	20.07.2018	10:13:18
33	39,50 °	-1,3 %	8,345 N.m	-0,7 %	49 rpm	20.07.2018	10:13:32
34	40,00 °	0,0 %	8,407 N.m	0,1 %	50 rpm	20.07.2018	10:13:46
35	40,00 °	0,0 %	8,396 N.m	0,0 %	49 rpm	20.07.2018	10:14:56
36	39,75 °	-0,6 %	8,407 N.m	0,1 %	50 rpm	20.07.2018	10:15:10
37	39,75 °	-0,6 %	8,411 N.m	0,1 %	49 rpm	20.07.2018	10:15:24
38	39,50 °	-1,3 %	8,371 N.m	-0,3 %	50 rpm	20.07.2018	10:15:38
39	40,00 °	0,0 %	8,444 N.m	0,5 %	49 rpm	20.07.2018	10:15:52
40	40,00 °	0,0 %	8,390 N.m	-0,1 %	50 rpm	20.07.2018	10:16:06
41	40,50 °	1,3 %	8,477 N.m	0,9 %	50 rpm	20.07.2018	10:16:20
42	39,75 °	-0,6 %	8,409 N.m	0,1 %	50 rpm	20.07.2018	10:16:34
43	40,00 °	0,0 %	8,452 N.m	0,6 %	50 rpm	20.07.2018	10:16:48
44	40,00 °	0,0 %	8,448 N.m	0,6 %	50 rpm	20.07.2018	10:17:02
45	40,00 °	0,0 %	8,444 N.m	0,5 %	50 rpm	20.07.2018	10:17:16
46	39,75 °	-0,6 %	8,440 N.m	0,5 %	50 rpm	20.07.2018	10:17:30
47	39,75 °	-0,6 %	8,411 N.m	0,1 %	50 rpm	20.07.2018	10:17:44
48	39,75 °	-0,6 %	8,452 N.m	0,6 %	50 rpm	20.07.2018	10:17:57
49	40,25 °	0,6 %	8,487 N.m	1,0 %	50 rpm	20.07.2018	10:18:10
50	39,50 °	-1,3 %	8,407 N.m	0,1 %	50 rpm	20.07.2018	10:18:23

Date/ Time	20.07.2018 10:06:04	Transducer S/N	01033617
Tester/ Name	M.Brkcic	Transducer	10 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target rotation angle	40,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	8,40 Nm		

Remark

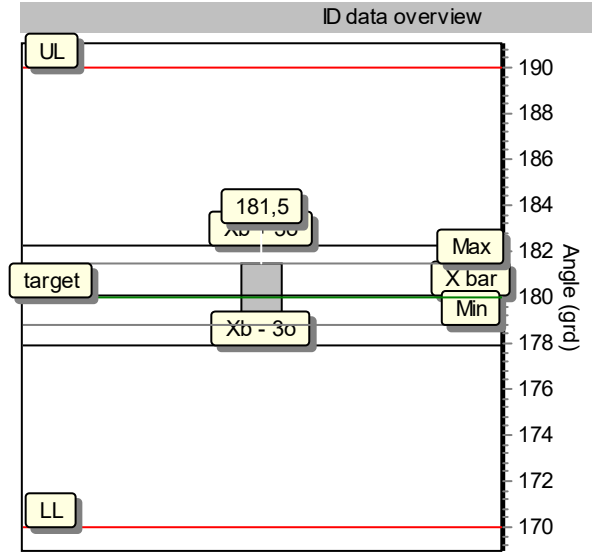
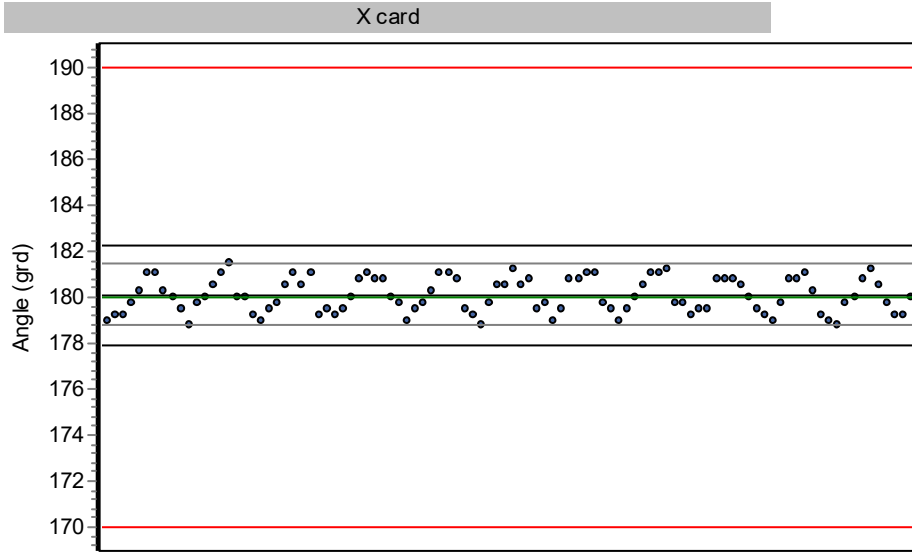
Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
40,00	35,00	45,00	39,9050	1,5000	0,3052	5,461	5,357	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	40,25 °	0,6 %	8,475 N.m	0,9 %	50 rpm	20.07.2018	10:18:36
52	39,75 °	-0,6 %	8,444 N.m	0,5 %	50 rpm	20.07.2018	10:18:49
53	40,25 °	0,6 %	8,489 N.m	1,1 %	50 rpm	20.07.2018	10:19:02
54	40,00 °	0,0 %	8,460 N.m	0,7 %	50 rpm	20.07.2018	10:19:15
55	40,50 °	1,3 %	8,491 N.m	1,1 %	50 rpm	20.07.2018	10:19:28
56	39,75 °	-0,6 %	8,477 N.m	0,9 %	50 rpm	20.07.2018	10:19:41
57	40,00 °	0,0 %	8,458 N.m	0,7 %	50 rpm	20.07.2018	10:19:54
58	39,75 °	-0,6 %	8,404 N.m	0,0 %	50 rpm	20.07.2018	10:20:07
59	40,25 °	0,6 %	8,475 N.m	0,9 %	50 rpm	20.07.2018	10:20:20
60	39,75 °	-0,6 %	8,427 N.m	0,3 %	50 rpm	20.07.2018	10:20:33
61	40,00 °	0,0 %	8,435 N.m	0,4 %	50 rpm	20.07.2018	10:20:46
62	39,50 °	-1,3 %	8,376 N.m	-0,3 %	50 rpm	20.07.2018	10:20:59
63	40,25 °	0,6 %	8,450 N.m	0,6 %	50 rpm	20.07.2018	10:21:12
64	39,75 °	-0,6 %	8,355 N.m	-0,5 %	50 rpm	20.07.2018	10:21:25
65	40,75 °	1,9 %	8,526 N.m	1,5 %	50 rpm	20.07.2018	10:21:38
66	39,50 °	-1,3 %	8,332 N.m	-0,8 %	50 rpm	20.07.2018	10:21:51
67	40,00 °	0,0 %	8,446 N.m	0,5 %	50 rpm	20.07.2018	10:22:04
68	39,50 °	-1,3 %	8,334 N.m	-0,8 %	50 rpm	20.07.2018	10:22:17
69	40,25 °	0,6 %	8,415 N.m	0,2 %	50 rpm	20.07.2018	10:22:30
70	39,75 °	-0,6 %	8,328 N.m	-0,9 %	50 rpm	20.07.2018	10:22:43
71	40,50 °	1,3 %	8,452 N.m	0,6 %	50 rpm	20.07.2018	10:22:56
72	39,25 °	-1,9 %	8,281 N.m	-1,4 %	50 rpm	20.07.2018	10:23:09
73	40,25 °	0,6 %	8,427 N.m	0,3 %	50 rpm	20.07.2018	10:23:22
74	39,50 °	-1,3 %	8,307 N.m	-1,1 %	50 rpm	20.07.2018	10:23:35
75	39,75 °	-0,6 %	8,402 N.m	0,0 %	50 rpm	20.07.2018	10:23:48
76	40,00 °	0,0 %	8,365 N.m	-0,4 %	50 rpm	20.07.2018	10:24:01
77	40,25 °	0,6 %	8,466 N.m	0,8 %	50 rpm	20.07.2018	10:24:14
78	39,50 °	-1,3 %	8,320 N.m	-1,0 %	50 rpm	20.07.2018	10:24:27
79	40,50 °	1,3 %	8,481 N.m	1,0 %	50 rpm	20.07.2018	10:24:40
80	40,00 °	0,0 %	8,378 N.m	-0,3 %	50 rpm	20.07.2018	10:24:53
81	40,50 °	1,3 %	8,458 N.m	0,7 %	50 rpm	20.07.2018	10:25:06
82	39,75 °	-0,6 %	8,345 N.m	-0,7 %	50 rpm	20.07.2018	10:25:19
83	40,00 °	0,0 %	8,444 N.m	0,5 %	50 rpm	20.07.2018	10:25:32
84	39,75 °	-0,6 %	8,384 N.m	-0,2 %	49 rpm	20.07.2018	10:25:45
85	40,50 °	1,3 %	8,483 N.m	1,0 %	50 rpm	20.07.2018	10:25:58
86	40,00 °	0,0 %	8,386 N.m	-0,2 %	49 rpm	20.07.2018	10:26:11
87	40,25 °	0,6 %	8,468 N.m	0,8 %	50 rpm	20.07.2018	10:26:24
88	39,75 °	-0,6 %	8,359 N.m	-0,5 %	49 rpm	20.07.2018	10:26:37
89	40,00 °	0,0 %	8,437 N.m	0,4 %	50 rpm	20.07.2018	10:26:50
90	40,00 °	0,0 %	8,409 N.m	0,1 %	49 rpm	20.07.2018	10:27:03
91	40,25 °	0,6 %	8,485 N.m	1,0 %	50 rpm	20.07.2018	10:27:16
92	40,00 °	0,0 %	8,396 N.m	0,0 %	49 rpm	20.07.2018	10:27:29
93	39,75 °	-0,6 %	8,378 N.m	-0,3 %	50 rpm	20.07.2018	10:27:42
94	39,75 °	-0,6 %	8,349 N.m	-0,6 %	50 rpm	20.07.2018	10:27:55
95	40,00 °	0,0 %	8,464 N.m	0,8 %	50 rpm	20.07.2018	10:28:08
96	39,75 °	-0,6 %	8,361 N.m	-0,5 %	49 rpm	20.07.2018	10:28:21
97	40,00 °	0,0 %	8,435 N.m	0,4 %	50 rpm	20.07.2018	10:28:34
98	39,75 °	-0,6 %	8,363 N.m	-0,4 %	49 rpm	20.07.2018	10:28:47
99	39,75 °	-0,6 %	8,386 N.m	-0,2 %	50 rpm	20.07.2018	10:29:00
100	40,25 °	0,6 %	8,413 N.m	0,2 %	49 rpm	20.07.2018	10:29:13

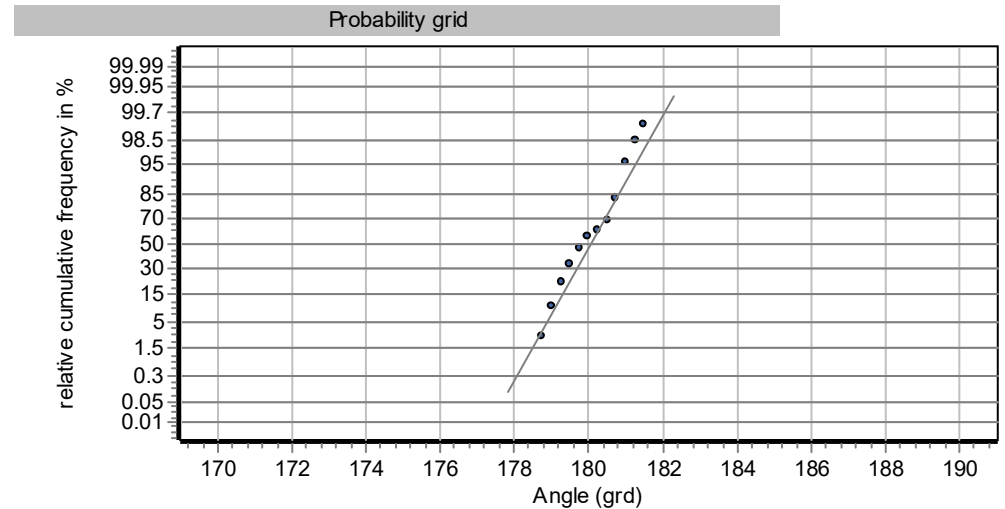
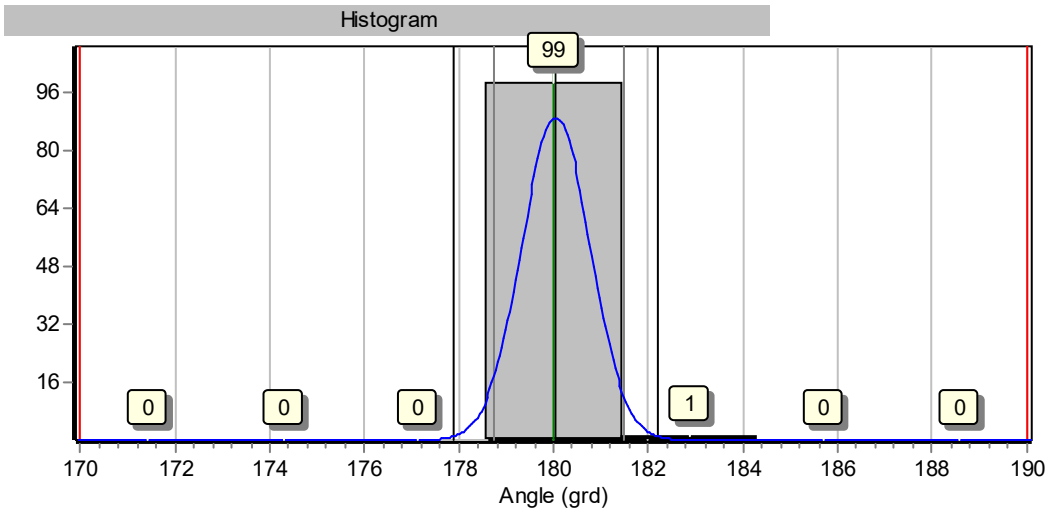
Graphic process analysis

HS-Technik, TBPEC-12xx, 18240041

First sample MCT, 180 ° Screw joint: medium soft



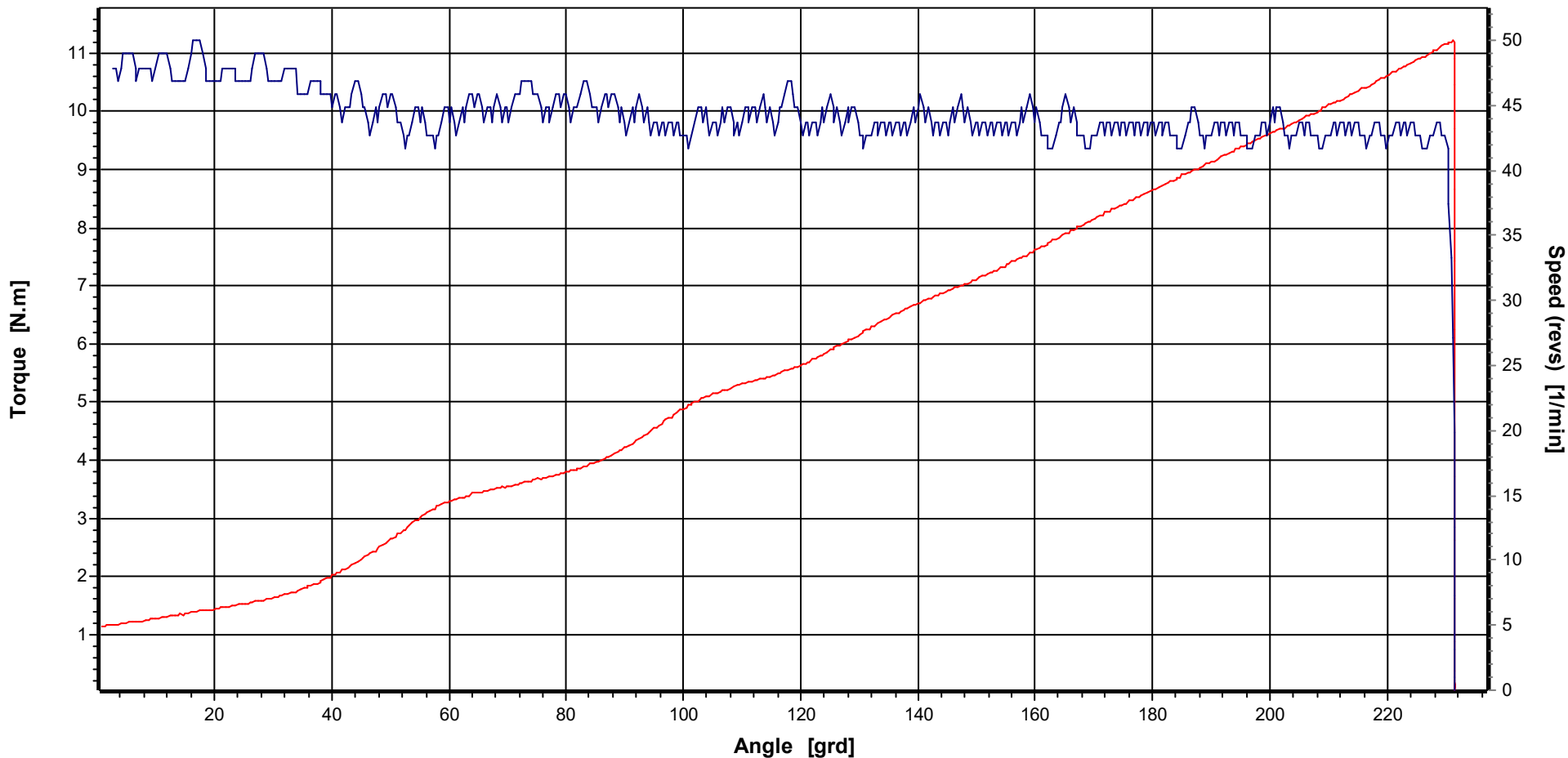
Tester	M.Brkcic
N	100
Target	180,00 grd
UL	190,00 grd
LL	170,00 grd
Max	181,50 grd
Min	178,75 grd
xq	180,0475 grd
s	0,7210 grd
Cm	4,623
Cmk	4,601



Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

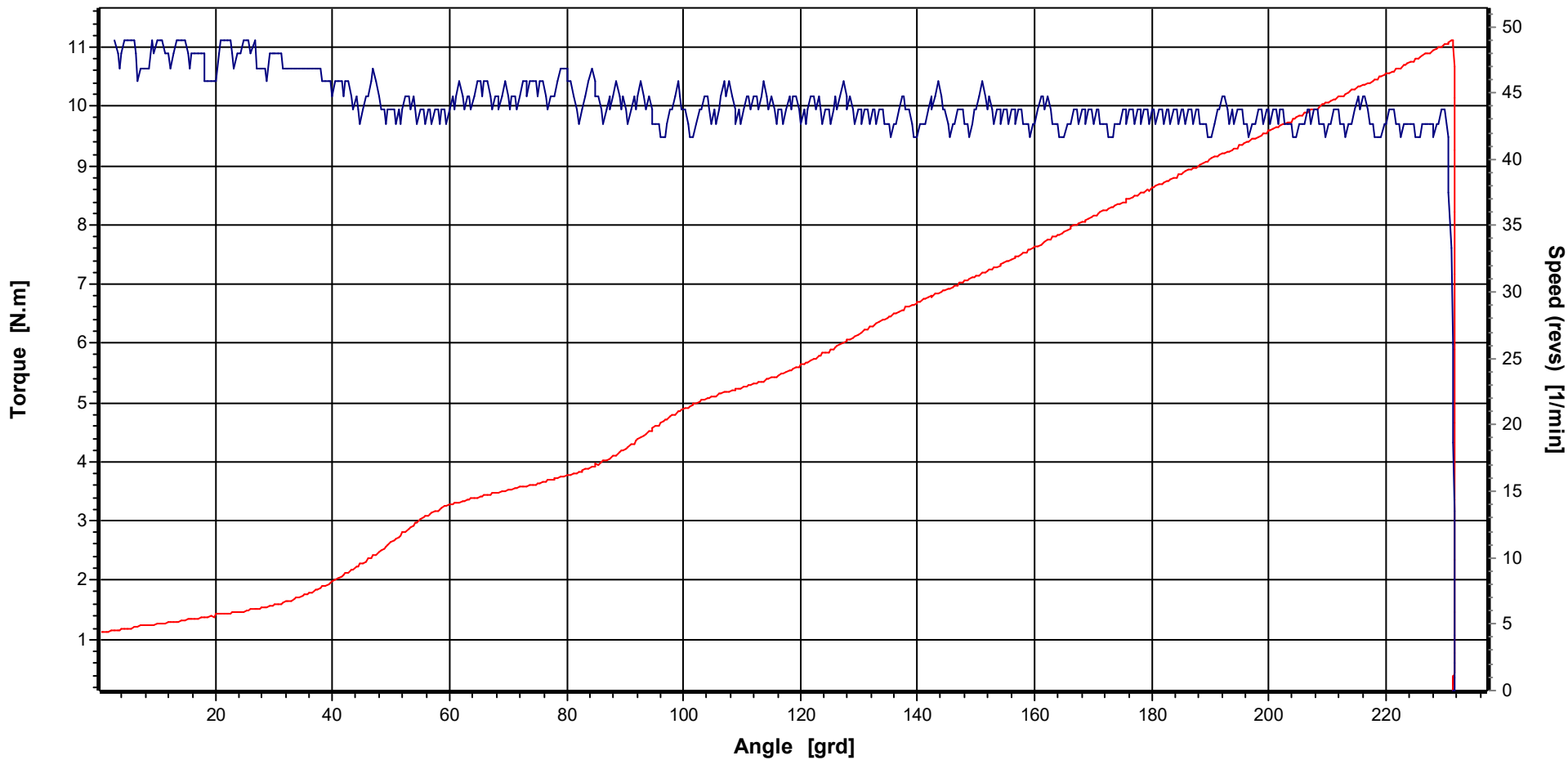


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:40:50
UL	190,00 grd	Supporting points	854			Date/time measurement	20.07.2018 10:40:50

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

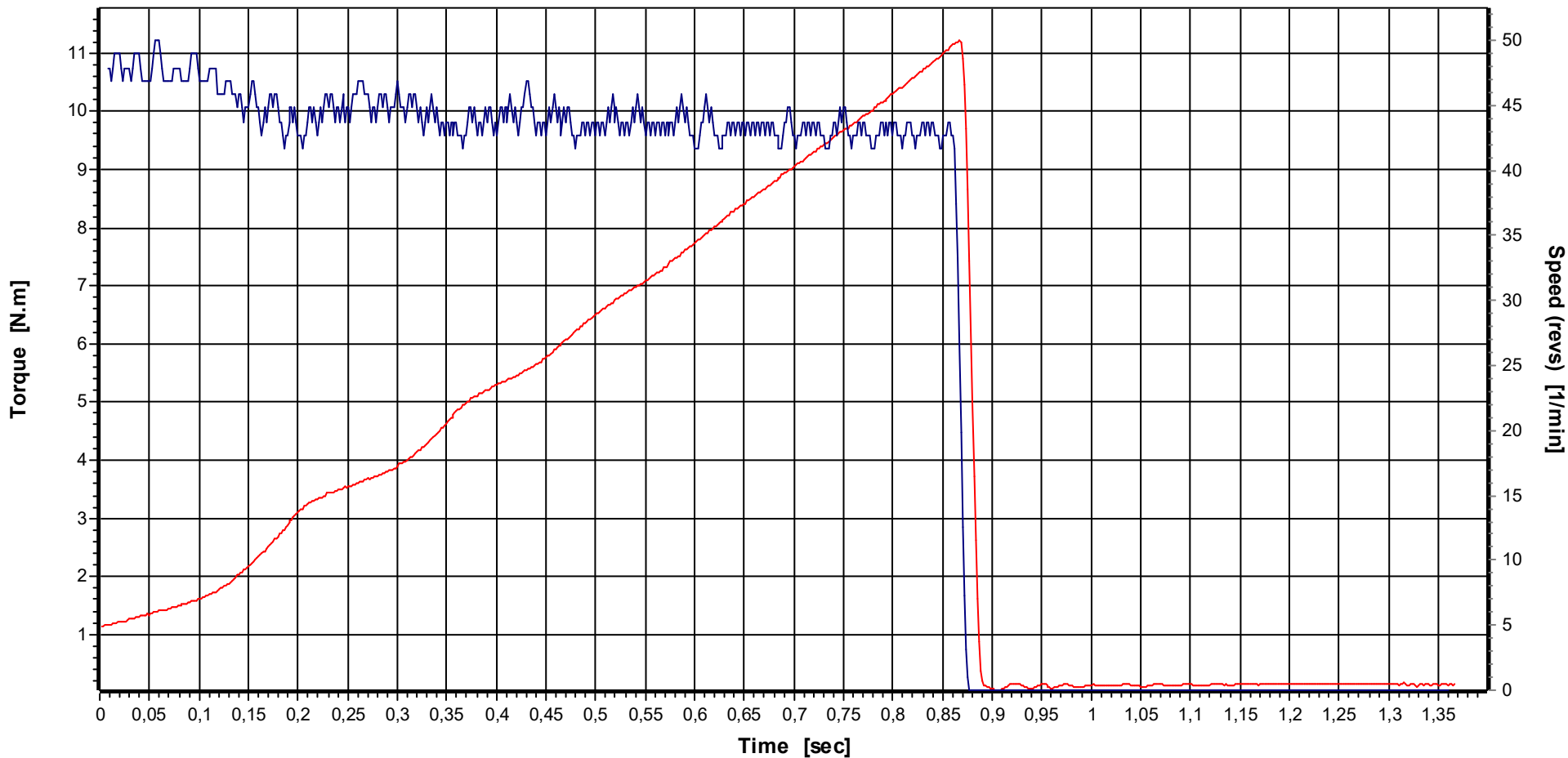


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	3	Tester	M.Brkcic	Printout date	08.08.2018
LL	170,00 grd	Measurem. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:40:50
UL	190,00 grd	Supporting points	868			Date/time measurement	20.07.2018 11:02:17

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH

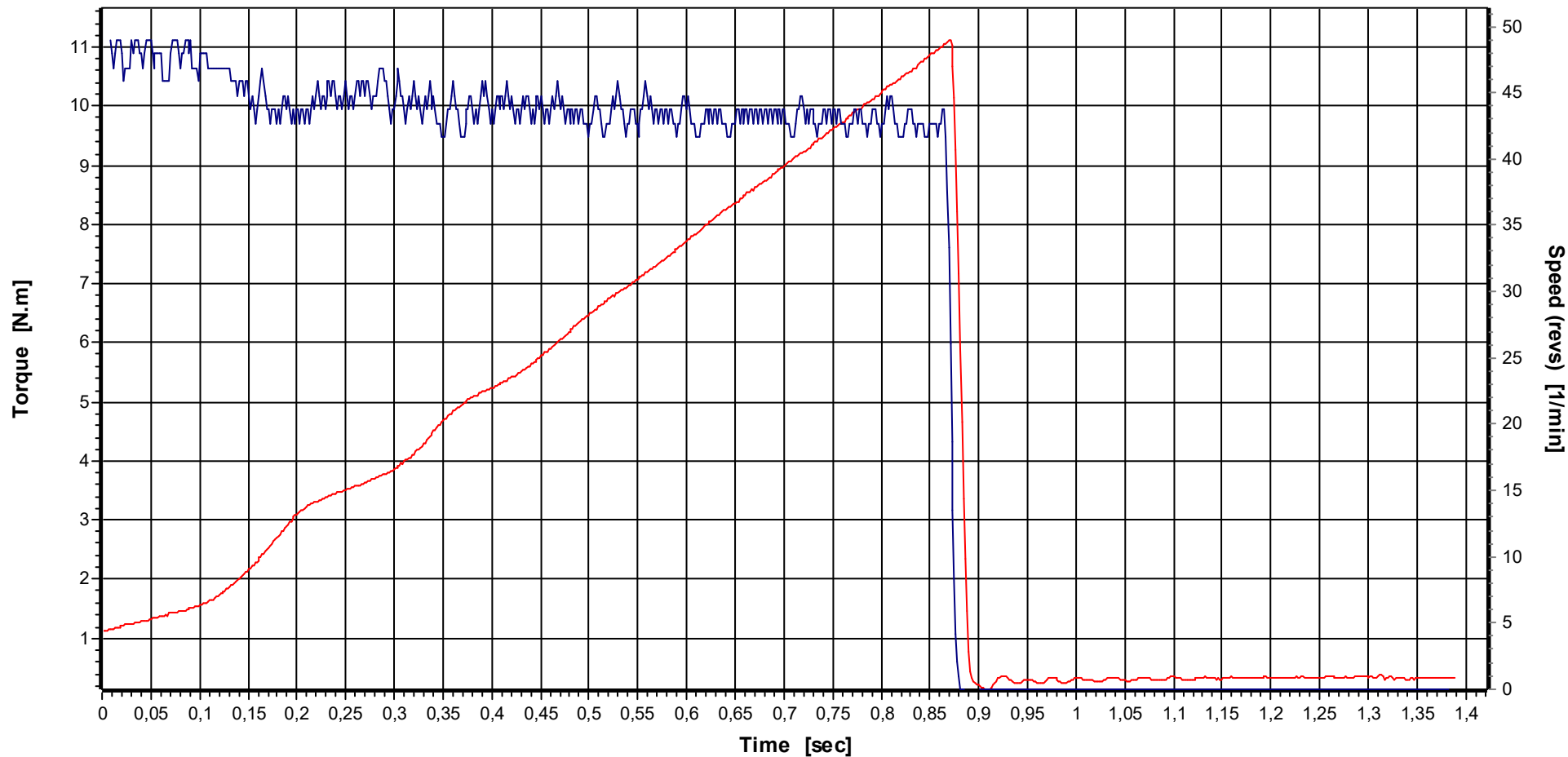


Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	1	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:40:50
UL	190,00 grd	Supporting points	854			Date/time measurement	20.07.2018 10:40:50

Graph

Tool model: TBPEC-12xx, Serial No.: 18240041
 Manufacturer: HS-Technik, Tool model: TBPEC-12xx

HS-Technik GmbH



Designation		TorqBee		Cost Point/Dep		Coding	
X(R)	180,00 grd	Random sample No.	3	Tester	M.Brkcic	Printout date	23.08.2018
LL	170,00 grd	Measurment. No.	100	Test strategy	First sample MCT	Date/time random sample	20.07.2018 10:40:50
UL	190,00 grd	Supporting points	868			Date/time measurement	20.07.2018 11:02:17

Date/ Time	20.07.2018 10:40:50	Transducer S/N	01032159
Tester/ Name	M.Brkc	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,0475	2,7500	0,7210	4,623	4,601	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
1	179,00 °	-0,6 %	11,222 N.m	0,2 %	50 rpm	20.07.2018	10:40:50
2	179,25 °	-0,4 %	11,160 N.m	-0,4 %	50 rpm	20.07.2018	10:41:03
3	179,25 °	-0,4 %	11,167 N.m	-0,3 %	50 rpm	20.07.2018	10:41:16
4	179,75 °	-0,1 %	11,222 N.m	0,2 %	50 rpm	20.07.2018	10:41:29
5	180,25 °	0,1 %	11,312 N.m	1,0 %	50 rpm	20.07.2018	10:41:42
6	181,00 °	0,6 %	11,246 N.m	0,4 %	50 rpm	20.07.2018	10:41:55
7	181,00 °	0,6 %	11,292 N.m	0,8 %	49 rpm	20.07.2018	10:42:08
8	180,25 °	0,1 %	11,281 N.m	0,7 %	50 rpm	20.07.2018	10:42:21
9	180,00 °	0,0 %	11,277 N.m	0,7 %	50 rpm	20.07.2018	10:42:34
10	179,50 °	-0,3 %	11,183 N.m	-0,2 %	50 rpm	20.07.2018	10:42:47
11	178,75 °	-0,7 %	11,093 N.m	-1,0 %	50 rpm	20.07.2018	10:43:00
12	179,75 °	-0,1 %	11,148 N.m	-0,5 %	50 rpm	20.07.2018	10:43:13
13	180,00 °	0,0 %	11,187 N.m	-0,1 %	50 rpm	20.07.2018	10:43:26
14	180,50 °	0,3 %	11,308 N.m	1,0 %	50 rpm	20.07.2018	10:43:39
15	181,00 °	0,6 %	11,242 N.m	0,4 %	50 rpm	20.07.2018	10:43:52
16	181,50 °	0,8 %	11,257 N.m	0,5 %	49 rpm	20.07.2018	10:44:05
17	180,00 °	0,0 %	11,218 N.m	0,2 %	50 rpm	20.07.2018	10:44:18
18	180,00 °	0,0 %	11,277 N.m	0,7 %	50 rpm	20.07.2018	10:44:31
19	179,25 °	-0,4 %	11,089 N.m	-1,0 %	50 rpm	20.07.2018	10:44:44
20	179,00 °	-0,6 %	11,082 N.m	-1,1 %	50 rpm	20.07.2018	10:44:57
21	179,50 °	-0,3 %	11,078 N.m	-1,1 %	50 rpm	20.07.2018	10:45:10
22	179,75 °	-0,1 %	11,167 N.m	-0,3 %	50 rpm	20.07.2018	10:45:23
23	180,50 °	0,3 %	11,277 N.m	0,7 %	50 rpm	20.07.2018	10:45:36
24	181,00 °	0,6 %	11,226 N.m	0,2 %	50 rpm	20.07.2018	10:45:49
25	180,50 °	0,3 %	11,199 N.m	0,0 %	49 rpm	20.07.2018	10:46:02
26	181,00 °	0,6 %	11,234 N.m	0,3 %	50 rpm	20.07.2018	10:46:15
27	179,25 °	-0,4 %	11,246 N.m	0,4 %	50 rpm	20.07.2018	10:46:28
28	179,50 °	-0,3 %	11,078 N.m	-1,1 %	51 rpm	20.07.2018	10:46:41
29	179,25 °	-0,4 %	11,152 N.m	-0,4 %	50 rpm	20.07.2018	10:46:54
30	179,50 °	-0,3 %	11,125 N.m	-0,7 %	50 rpm	20.07.2018	10:47:07
31	180,00 °	0,0 %	11,222 N.m	0,2 %	51 rpm	20.07.2018	10:47:20
32	180,75 °	0,4 %	11,300 N.m	0,9 %	50 rpm	20.07.2018	10:47:33
33	181,00 °	0,6 %	11,253 N.m	0,5 %	49 rpm	20.07.2018	10:47:46
34	180,75 °	0,4 %	11,249 N.m	0,4 %	49 rpm	20.07.2018	10:47:59
35	180,75 °	0,4 %	11,261 N.m	0,5 %	50 rpm	20.07.2018	10:48:12
36	180,00 °	0,0 %	11,253 N.m	0,5 %	50 rpm	20.07.2018	10:48:25
37	179,75 °	-0,1 %	11,160 N.m	-0,4 %	50 rpm	20.07.2018	10:48:38
38	179,00 °	-0,6 %	11,066 N.m	-1,2 %	50 rpm	20.07.2018	10:48:51
39	179,50 °	-0,3 %	11,113 N.m	-0,8 %	50 rpm	20.07.2018	10:49:04
40	179,75 °	-0,1 %	11,183 N.m	-0,2 %	50 rpm	20.07.2018	10:49:17
41	180,25 °	0,1 %	11,257 N.m	0,5 %	50 rpm	20.07.2018	10:49:30
42	181,00 °	0,6 %	11,238 N.m	0,3 %	50 rpm	20.07.2018	10:49:43
43	181,00 °	0,6 %	11,226 N.m	0,2 %	50 rpm	20.07.2018	10:49:56
44	180,75 °	0,4 %	11,246 N.m	0,4 %	50 rpm	20.07.2018	10:50:09
45	179,50 °	-0,3 %	11,246 N.m	0,4 %	50 rpm	20.07.2018	10:50:22
46	179,25 °	-0,4 %	11,039 N.m	-1,4 %	50 rpm	20.07.2018	10:50:35
47	178,75 °	-0,7 %	11,070 N.m	-1,2 %	50 rpm	20.07.2018	10:50:48
48	179,75 °	-0,1 %	11,089 N.m	-1,0 %	50 rpm	20.07.2018	10:51:01
49	180,50 °	0,3 %	11,222 N.m	0,2 %	50 rpm	20.07.2018	10:51:14
50	180,50 °	0,3 %	11,234 N.m	0,3 %	50 rpm	20.07.2018	10:51:27

Date/ Time	20.07.2018 10:40:50	Transducer S/N	01032159
Tester/ Name	M.Brkc	Transducer	20 N.m
Division	QS		

Manufacturer	HS-Technik	Serial No.	18240041
Model	TBPEC-12xx		

Target rotation angle	180,00 grd	amount of inspection	100
rotation angle start torque	2,800 N.m	direction of rotation	right
Torque	11,20 Nm		

Remark

Target angle	LL	UL	Xq	R	S	Cm	Cmk	Evaluation
180,00	170,00	190,00	180,0475	2,7500	0,7210	4,623	4,601	OK

No.	Angle	Diff.	Torque	Diff.	Speed	Date	Time
51	181,25 °	0,7 %	11,226 N.m	0,2 %	49 rpm	20.07.2018	10:51:40
52	180,50 °	0,3 %	11,195 N.m	0,0 %	49 rpm	20.07.2018	10:51:53
53	180,75 °	0,4 %	11,214 N.m	0,1 %	50 rpm	20.07.2018	10:52:06
54	179,50 °	-0,3 %	11,203 N.m	0,0 %	50 rpm	20.07.2018	10:52:19
55	179,75 °	-0,1 %	11,054 N.m	-1,3 %	50 rpm	20.07.2018	10:52:32
56	179,00 °	-0,6 %	11,066 N.m	-1,2 %	50 rpm	20.07.2018	10:52:45
57	179,50 °	-0,3 %	11,058 N.m	-1,3 %	50 rpm	20.07.2018	10:52:58
58	180,75 °	0,4 %	11,261 N.m	0,5 %	50 rpm	20.07.2018	10:53:11
59	180,75 °	0,4 %	11,269 N.m	0,6 %	50 rpm	20.07.2018	10:53:24
60	181,00 °	0,6 %	11,257 N.m	0,5 %	49 rpm	20.07.2018	10:53:37
61	181,00 °	0,6 %	11,269 N.m	0,6 %	50 rpm	20.07.2018	10:53:50
62	179,75 °	-0,1 %	11,257 N.m	0,5 %	50 rpm	20.07.2018	10:54:03
63	179,50 °	-0,3 %	11,167 N.m	-0,3 %	50 rpm	20.07.2018	10:54:16
64	179,00 °	-0,6 %	11,058 N.m	-1,3 %	50 rpm	20.07.2018	10:54:29
65	179,50 °	-0,3 %	11,109 N.m	-0,8 %	50 rpm	20.07.2018	10:54:42
66	180,00 °	0,0 %	11,125 N.m	-0,7 %	50 rpm	20.07.2018	10:54:55
67	180,50 °	0,3 %	11,242 N.m	0,4 %	50 rpm	20.07.2018	10:55:08
68	181,00 °	0,6 %	11,206 N.m	0,1 %	50 rpm	20.07.2018	10:55:21
69	181,00 °	0,6 %	11,234 N.m	0,3 %	50 rpm	20.07.2018	10:55:34
70	181,25 °	0,7 %	11,265 N.m	0,6 %	49 rpm	20.07.2018	10:55:47
71	179,75 °	-0,1 %	11,203 N.m	0,0 %	50 rpm	20.07.2018	10:56:00
72	179,75 °	-0,1 %	11,167 N.m	-0,3 %	50 rpm	20.07.2018	10:56:13
73	179,25 °	-0,4 %	11,023 N.m	-1,6 %	50 rpm	20.07.2018	10:56:26
74	179,50 °	-0,3 %	11,086 N.m	-1,0 %	50 rpm	20.07.2018	10:56:39
75	179,50 °	-0,3 %	11,078 N.m	-1,1 %	50 rpm	20.07.2018	10:56:52
76	180,75 °	0,4 %	11,222 N.m	0,2 %	50 rpm	20.07.2018	10:57:05
77	180,75 °	0,4 %	11,171 N.m	-0,3 %	50 rpm	20.07.2018	10:57:18
78	180,75 °	0,4 %	11,226 N.m	0,2 %	50 rpm	20.07.2018	10:57:31
79	180,50 °	0,3 %	11,230 N.m	0,3 %	49 rpm	20.07.2018	10:57:44
80	180,00 °	0,0 %	11,183 N.m	-0,2 %	50 rpm	20.07.2018	10:57:57
81	179,50 °	-0,3 %	11,058 N.m	-1,3 %	50 rpm	20.07.2018	10:58:10
82	179,25 °	-0,4 %	11,031 N.m	-1,5 %	50 rpm	20.07.2018	10:58:23
83	179,00 °	-0,6 %	11,054 N.m	-1,3 %	50 rpm	20.07.2018	10:58:36
84	179,75 °	-0,1 %	11,125 N.m	-0,7 %	51 rpm	20.07.2018	10:58:49
85	180,75 °	0,4 %	11,234 N.m	0,3 %	50 rpm	20.07.2018	10:59:02
86	180,75 °	0,4 %	11,195 N.m	0,0 %	50 rpm	20.07.2018	10:59:15
87	181,00 °	0,6 %	11,195 N.m	0,0 %	50 rpm	20.07.2018	10:59:28
88	180,25 °	0,1 %	11,191 N.m	-0,1 %	50 rpm	20.07.2018	10:59:41
89	179,25 °	-0,4 %	11,164 N.m	-0,3 %	50 rpm	20.07.2018	10:59:54
90	179,00 °	-0,6 %	11,047 N.m	-1,4 %	50 rpm	20.07.2018	11:00:07
91	178,75 °	-0,7 %	11,070 N.m	-1,2 %	50 rpm	20.07.2018	11:00:20
92	179,75 °	-0,1 %	11,113 N.m	-0,8 %	50 rpm	20.07.2018	11:00:33
93	180,00 °	0,0 %	11,238 N.m	0,3 %	50 rpm	20.07.2018	11:00:46
94	180,75 °	0,4 %	11,214 N.m	0,1 %	50 rpm	20.07.2018	11:00:59
95	181,25 °	0,7 %	11,261 N.m	0,5 %	50 rpm	20.07.2018	11:01:12
96	180,50 °	0,3 %	11,230 N.m	0,3 %	50 rpm	20.07.2018	11:01:25
97	179,75 °	-0,1 %	11,199 N.m	0,0 %	50 rpm	20.07.2018	11:01:38
98	179,25 °	-0,4 %	11,105 N.m	-0,8 %	50 rpm	20.07.2018	11:01:51
99	179,25 °	-0,4 %	11,058 N.m	-1,3 %	50 rpm	20.07.2018	11:02:04
100	180,00 °	0,0 %	11,117 N.m	-0,7 %	50 rpm	20.07.2018	11:02:17

Kalibrierlaboratorium für die Messgröße Drehmoment und Drehwinkel
Calibration laboratory for the measuring value torque and rotational angle

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst **DKD**



Deutsche
Akkreditierungsstelle
D-K-17572-01-00

Kalibrierschein
Calibration Certificate

Kalibrierzeichen
Calibration label

7760
D-K- 17572-01-00
2018-03

Gegenstand: **Drehmomentaufnehmer mit Messgerät**
Object torque transducer with measuring box

Aufnehmer / *Transducer*:
 Mod.Nr / *Mod.No.*: **30135004**
 Artikelnr. / *Art.No.*: **30135004**
 Nenn Drehmoment / *Nom.tq.*: **10 N·m**
 Serien-Nr. / *Serial number*: **1033620**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Messgerät / *Measuring box*:
 Mod.Nr / *Mod.No.*: **5413-5392/314**
 Artikelnr. / *Art.No.*: **9014020**
 Serien-Nr. / *Serial number*: **1034564**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Auftraggeber: **HS-Technik GmbH**
Customer

Im Martelacker 12
79588 Efringen-Kirchen

Auftragsnummer: **20109741**
Order No. **vom/from 2017-11-14**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem internationalen Einheitensystem (SI).
 Der DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
 Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

*This calibration certificate documents the tractability to national standards, which realize the units of measurement according to the International System of Units (SI).
 The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
 The user is obliged to have the object recalibrated at appropriate intervals.*



Anzahl der Seiten des Kalibrierscheines: **5**
Number of pages of the certificate

Datum der Kalibrierung: **2018-03-07**
Date of calibration

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This Calibration Certificate is based on the german language. In case of doubt only the german version is valid.

Datum <i>Date</i>	Leiter des Kalibrierlaboratoriums <i>Head of the calibration laboratory</i>	Bearbeiter <i>Person in charge</i>
2018-03-09	 Dr. rer. nat. Ludwig Freise	 L. Freise

Postanschrift/Mail address
 Kistler Remscheid GmbH
 Kalibrierlaboratorium
 Kölner Str. 71
 D-42897 Remscheid

Telefon-Durchwahl / Telephone extension
 (+49) 02191 698-0

Telefax
 (+49) 02191 60023

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D-K- 17572-01-00
2018-03

- 1 **Kalibrierverfahren / Calibration Procedure :** DIN EN ISO51309:2005
- 2 **Kalibriereinrichtung / Calibration device :** 1002052
- 2.1 Messunsicherheit für jede Drehmomentstufe in %
Uncertainty of measurement related to torque in %
- | Drehmoment /
Torque in N·m | Erw. Messunsicherheit /
Exp. Uncertainty (k = 2) in % : |
|-------------------------------|--|
| 2 -2 | 0,1 0,1 |
| 4 -4 | 0,1 0,1 |
| 6 -6 | 0,1 0,1 |
| 8 -8 | 0,1 0,1 |
| 10 -10 | 0,1 0,1 |
- 3 **Kalibriergegenstand / Calibration device :**
- 3.1 Justierwerte des Anzeigeegerätes /
Adjustment values of the indication device: Rechtsdrehmoment / *cw torque:* 9,7 N·m
- Justierwiderstand / *adjustment resistor:* 40,000 kΩ
- 3.2 Anschlusskabel / *Input cable :* Stecker intern
- 3.3 Schaltungsart / *Circuit type :* 6-Leiter
- 3.4 Einspannteile / *Adaptors :* 1/4"
- 4 **Kalibrieranordnung / Calibration installation :**
- 4.1 Einbaustellungen / *Mounting positions :* 2 x 90 °
- 4.2 Drehmomentvektor / *Torque vector :* vertikal / vertical
- 5 **Umgebungsbedingungen / environmental conditions :**
- Kalibriertemperatur / *Calibration temperature :* 22 °C
- relative Luftfeuchte / *Relative humidity :* 48,5 % r.H.
- 6 **Aufnehmernullsignale / Transducer zero signals :**
- vor Einbau / *before mounting :* 0,000 N·m
- nach Kalibrierung / *after calibration :* 0,000 N·m
- 7 **Zusätzliche Angaben / Additional information :**
- Eingebaut in / Built in: Mod.-Nr.: 5413-4821/10 S/N: 1033617
- PGM: 12.212.63

8 **Auswertung / Analysis**

8.1 **Kalibrierergebnis / Calibration results**

Drehmoment / torque in N·m	Signal / signal in N·m	Fall I / case I		Fall II / case II	
		rel. Messunsicherheit / <i>rel. uncertainty</i> k = 2 Ausgleichsfunktion / <i>interpolation</i> kubisch / <i>cubic</i> , in %	rel. Uns.-intervall/ <i>rel. uncert. interval</i> k = 2 linear, in %	Signal / signal in N·m	rel. Uns.-intervall/ <i>rel. uncert. interval</i> k = 2 linear, in %
Rechtsdrehmoment / <i>clockwise torque</i>					
0				0,001	
2				2,003	0,483
4				4,004	0,263
6				6,004	0,193
8				8,004	0,163
10				10,003	0,133
Links drehmoment / <i>anticlockwise torque</i>					

8.2 Klasseneinstufung nach DIN 51309 / Classification according to DIN 51309

Klasse Class	Fall I / case I kubische Ausgleichsfunktion cubic interpolation		Fall II / case II lineare Ausgleichsfunktion linear interpolation	
	von/from in N·m	bis / to	von/from in N·m	bis / to in N·m
Rechtsdrehmoment / clockwise torque				
0,05 0,1 0,2 0,5 1 2 5				2 10
Linksdrehmoment / anticlockwise torque				
0,05 0,1 0,2 0,5 1 2 5				

9 Messdaten / measuring data in N·m

Rechtsdrehmoment / clockwise torque						
0	0,000	0,000	0,000	0,000	0,001	0,001
2				2,000	2,007	2,003
4				4,003	4,007	4,005
6				6,003	6,006	6,004
8				8,004	8,006	8,005
10	10,002	9,999	10,001	10,004	10,004	10,004
N·m	1. pre-load 0°	2. pre-load 0°	3. pre-load 0°	0° up1	0° down	0° up2
0	0,000	0,000	0,002			
2		2,001	2,004			
4		4,002	4,004			
6		6,002	6,004			
8		8,002	8,003			
10	10,002	10,002	10,002			
N·m	pre-load 90°	90° up	90° down	pre-load 180°	180° up	180° down
Linksdrehmoment / anticlockwise torque						
N·m	1. pre-load 0°	2. pre-load 0°	3. pre-load 0°	0° up1	0° down	0° up2
N·m	pre-load 90°	90° up	90° down	pre-load 180°	180° up	180° down

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10 Interpolationsgleichungen / Interpolation equations S in N·m M in N·m
10.1 Fall I, Kubische Interpolationsgleichung / Case I, Cubic interpolation equation:

10.1.1 Rechtsdrehmoment / clockwise torque:
 $S_{ai} = \dots \cdot M_i + \dots \cdot M_i^2 + \dots \cdot M_i^3$
 $M_{ai} = \dots \cdot S_i + \dots \cdot S_i^2 + \dots \cdot S_i^3$

10.1.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = \dots \cdot M_i + \dots \cdot M_i^2 + \dots \cdot M_i^3$
 $M_{ai} = \dots \cdot S_i + \dots \cdot S_i^2 + \dots \cdot S_i^3$

10.2 Fall I, Lineare Interpolationsgleichung / Case I, Linear interpolation equation

10.2.1 Rechtsdrehmoment / clockwise torque: $S_{ai} = \dots \cdot M_i$
 $M_{ai} = \dots \cdot S_i$

9.2.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = \dots \cdot M_i$
 $M_{ai} = \dots \cdot S_i$

10.2.3 Rechts- und Linksdrehmoment / clockwise and anticlockwise torque:
 $S_{ai} = \dots \cdot M_i$ (siehe Fußnote / see footnote)
 $M_{ai} = \dots \cdot S_i$

10.3 Fall II, Lineare Interpolationsgleichung / Case II, Linear interpolation equation

10.3.1 Rechtsdrehmoment / clockwise torque: $S_{ai} = 1,00047500 \cdot M_i$
 $M_{ai} = 0,9995 \cdot S_i$

9.3.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = 0,00000000 \cdot M_i$
 $M_{ai} = 0,0000 \cdot S_i$

10.2.3 Rechts- und Linksdrehmoment / clockwise and anticlockwise torque:
 $S_{ai} = 0,50023750 \cdot M_i$ (siehe Fußnote / see footnote)
 $M_{ai} = 0,4998 \cdot S_i$

11 Kennwerte nach DIN 51309 / Classification criteria according to DIN 51309

M_K in N·m	Fall I / case I					Fall II / case II					r in N·m
	$\frac{b'}{Y}$ in %	$\frac{b}{Y}$ in %	$\frac{f_0}{Y_E}$ in %	$\frac{f_{a,cub}}{Y}$ in %	$\frac{f_{a,lin}}{Y}$ in %	$\frac{b'}{Y_h}$ in %	$\frac{b}{Y_h}$ in %	$\frac{f_0}{Y_{hE}}$ in %	$\frac{h}{Y_h}$ in %	$\frac{f_{a,lin}}{Y_h}$ in %	
10						0,000	0,020	-		0,030	0,002
8						0,012	0,025	-	0,025	0,047	0,002
6						0,017	0,017	-	0,050	0,062	0,002
4						0,050	0,025	-	0,100	0,100	0,002
2						0,150	0,050	-	0,349	0,150	0,002
0						-	-	0,020	-	-	-
						-	-	-	-	-	-

11.1 Kriecheinfluss aus Kurzzeitkriechen / Creep influence from short-term creep

Vor der ersten Messreihe wurde die Signaländerung während einer dreiminütigen Wartepause registriert.
 The signal variation during a three-minute waiting interval was recorded before the first series.
 Das mit dem Faktor 4 multiplizierte Kurzzeitkriechen ergibt / the short-term creep multiplied by 4 yields:

(Fußnote / footnote)

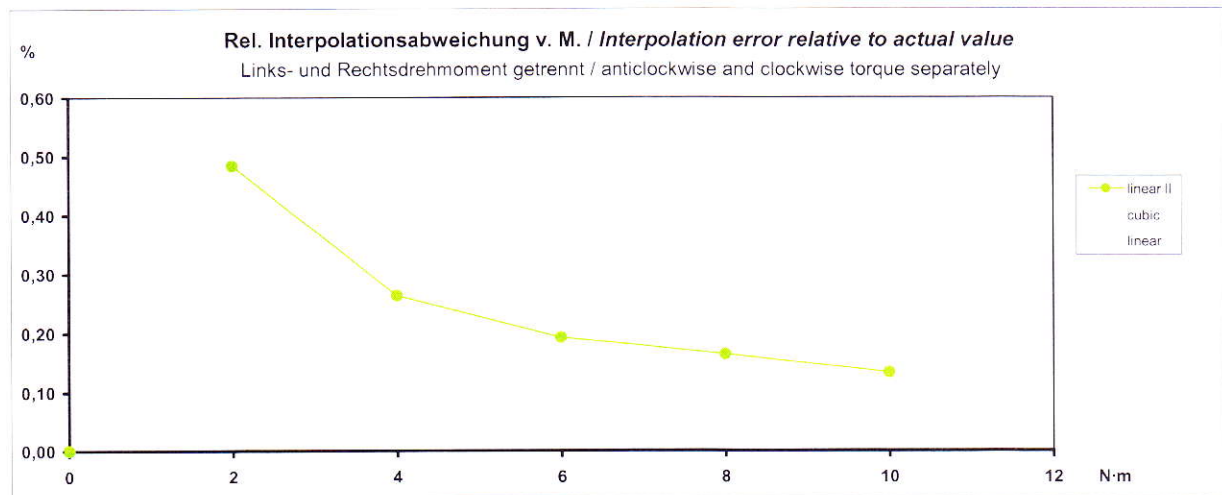
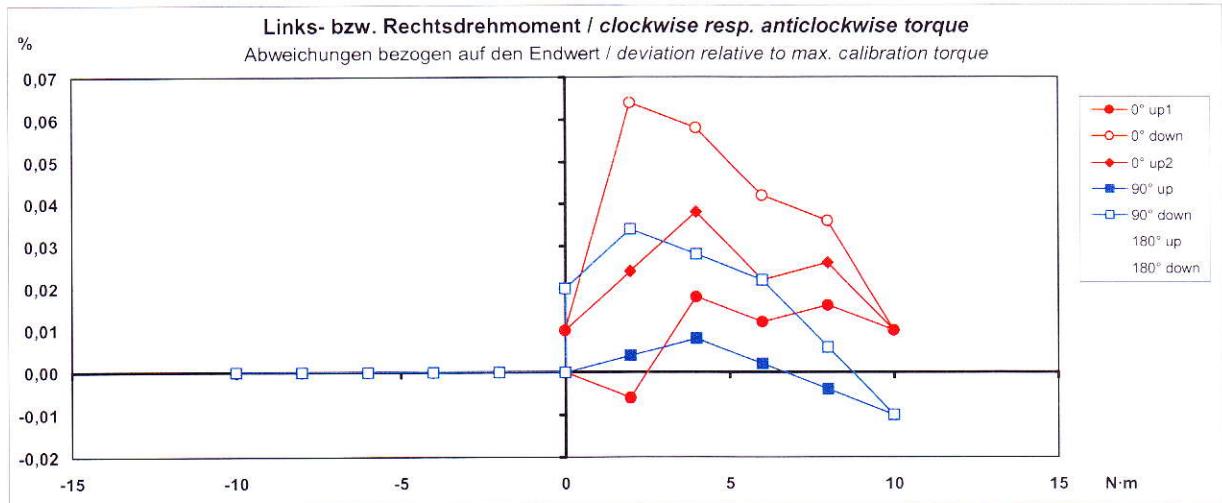
Die Bestimmung der linearen Interpolationsgleichung für Rechts- und Linksdrehmoment ist nicht identisch mit einem Kalibrierergebnis für Wechseldrehmoment. Sie ermöglicht es, mit nur einem Kalibrierfaktor das Anzeigergerät optimal für Rechts- und Linksdrehmoment anzupassen.

The linear interpolation equation for clockwise torque and anticlockwise torque can't be used as a calibration result for alternating torque. It only can be used to adjust the indicator optimally for clockwise torque and anticlockwise torque with a single calibration factor.

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12 Darstellung der Ergebnisse in Diagrammen / Results in diagrams

Bezugswert / Reference value: 10,003 N·m



Hinweis / Remark :

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For further information please visit www.european-accreditation.org and www.ilac.org.

Messgerätefähigkeitsuntersuchung

Measurement Capability Test

Kalibrierlaboratorium für die Messgröße Drehmoment und Drehwinkel
Calibration laboratory for the measuring value torque and angle



A Kistler Group Company

Nr./No. : D-50402

Gegenstand: **Drehmomentaufnehmer mit Messgerät**
Object **torque transducer with measuring box**

Sensor / Sensor:

Mod.Nr / Mod.No: **30135004**
Artikelnr. / Art.No: **30135004**
Nennwert / Nom.value.: **10 N·m**
Serien-Nr. / Serial number: **1030151**
Hersteller / Manufacturer: **SCHATZ GmbH, 42897 Remscheid**

Messgerät / Measuring box:

Mod.Nr / Mod.No: **5413-5392/304WA**
Artikelnr. / Art.No: **10000014**
Serien-Nr. / Serial number: **1014437**
Hersteller / Manufacturer: **SCHATZ GmbH, 42897 Remscheid**

Auftraggeber: **HS-Technik GmbH**
Customer

Im Martelacker 12
79588 Efringen-Kirchen

Auftragsnummer: **20109314**
Order No. **vom/from 2017-08-07**

Anzahl der Seiten des Kalibrierscheines: **2**
Number of pages of the certificate

Datum der Kalibrierung: **2017-09-17**
Date of calibration

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Calibration certificates without signature and seal are not valid.

This Calibration Certificate is based on the german language. In case of doubt only the german version is valid.

Dieser Kalibrierschein dokumentiert die Ergebnisse aus der Ermittlung des Zusammenhangs zwischen den angezeigten Werten dieses Messgerätes bzw. dieser Messeinrichtung und den zugehörigen, durch Normale festgelegten Werten der Messgröße Drehmoment unter vorgegebenen Bedingungen.
Die verwendeten Normale sind rückgeführt auf das DAkKS-Laboratorium der SCHATZ GmbH, welches nach DIN EN ISO/IEC 17025 arbeitet.
Das angewandte Kalibrierverfahren ist validiert.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration document proves the result from the determination of the coherence between displayed values of this measuring instrument resp. device and corresponding torque values, that have been fixed by comparison standards under given conditions.

The comparison standards applied are traceable to the DAkKS laboratory of SCHATZ GmbH which works according to DIN EN ISO/IEC 17025.

The applied calibration procedure is validated.

The user is obliged to have the object re-calibrated at appropriate intervals.



Stempel
Seal

Datum
Date

2017-09-26

Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory

Dr. rer. nat. Ludwig Freise

Bearbeiter

Person responsible

L. Freise

Postanschrift/Mail address

Telefon-Durchwahl/Telephon extension

Telefax

SCHATZ GmbH
Kalibrierlaboratorium
Kölner Str. 71
42897 Remscheid

02191/698-0

02191/60023

1 Kalibriereinrichtung / Calibration Unit :

Bezugsnormal / Reference Standard: 1002052
 Messunsicherheit / Uncertainty of Measurement: 0,10 %

2 Kalibrieranordnung / Calibration Mounting :

Einbaulage / Mounting Position: vertikal / vertical
 Einbauteile / Mounting Parts: 1/4"

3 Kalibriertemperatur / Temperature :

21,9 °C

4 Kalibrierverfahren / calibration procedure :

Messgerätfähigkeitsuntersuchung
 Measurement Capability Test

5 Kalibrierergebnis für das Rechtsdrehmoment /

Calibration result for clockwise torque:

Justierwert / Adjustment Value: 9,57 N·m

Messergebnisse in N·m

Messwerte ca. 20% v.E.	Sollwert	Messwerte ca. 60% v.E.	Sollwert	Messwerte 100%	Sollwert
	4,000		6,000		10,000
0°	4,001		6,002		10,001
	4,002		6,002		10,002
	4,002		6,001		10,001
	4,002		6,001		10,002
	4,000		6,000		10,001
90°	4,000		6,001		10,004
	4,002		6,002		10,003
	4,002		6,003		10,002
	4,001		6,002		10,002
	4,002		6,003		10,003
180°	4,001		6,000		10,000
	4,000		6,000		10,000
	4,001		6,001		10,001
	4,002		6,001		10,001
	4,000		6,001		10,002
270°	4,002		6,001		10,000
	4,001		6,001		10,002
	4,002		6,002		10,002
	4,001		6,002		10,002
	4,001		6,001		10,000
Mittelwert (x-quer)	4,001		6,001		10,002
Standardabweichung (s)	0,001		0,001		0,001
Abweichung (A)	0,001		0,001		0,002
Prozßtoleranz ±	10,0%		10,0%		10,0%
Sollvorgabe ≥	1,33		1,33		1,33
Cg	33,91		45,71		60,66
Cgk	33,38		45,20		60,19
Ergebnis	fähig		fähig		fähig

6 Bemerkungen / Remarks :

PGM 12.212.28
 Eingebaut in Mod.-Nr.: 5413-4821/10 S/N:1030149

Kalibrierlaboratorium für die Messgröße Drehmoment und Drehwinkel
Calibration laboratory for the measuring value torque and rotational angle

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst



Deutsche
Akkreditierungsstelle
D-K-17572-01-00

17123
D-K- 17572-01-00
2018-03

Kalibrierschein

Calibration Certificate

Kalibrierzeichen

Calibration label

Gegenstand: **Drehwinkelsensor**
Object **angle transducer**

Aufnehmer / *Transducer*:
 Mod.Nr / *Mod.No.*: **30135004**
 Artikelnr. / *Art.No.*: **30135004**
 Auflösung / *Resolution*: **0,25°**
 Serien-Nr. / *Serial number*: **1033620**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Messgerät / *Measuring box*:
 Mod.Nr / *Mod.No.*: **5413-5392/314**
 Artikelnr. / *Art.No.*: **9014020**
 Serien-Nr. / *Serial number*: **1034564**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Auftraggeber:
Customer **HS-Technik GmbH**

Im Martelacker 12
79588 Efringen-Kirchen

Auftragsnummer:
Order No. **20109741**
vom/from 2017-11-14

Anzahl der Seiten des Kalibrierscheines: **3**
Number of pages of the certificate

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem internationalen Einheitensystem (SI).
 Der DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
 Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

*This calibration certificate documents the tractability to national standards, which realize the units of measurement according to the International System of Units (SI).
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 The user is obliged to have the object recalibrated at appropriate intervals.*

Datum der Kalibrierung: **2018-03-08**
Date of calibration

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This Calibration Certificate is based on the german language. In case of doubt only the german version is valid.

Datum <i>Date</i>	Leiter des Kalibrierlaboratoriums <i>Head of the calibration laboratory</i>	Bearbeiter <i>Person in charge</i>
2018-03-09		
	Dr. rer. nat. Ludwig Freise	L. Freise

Postanschrift/Mail address	Telefon-Durchwahl / Telephone extension	Telefax
Kistler Remscheid GmbH Kalibrierlaboratorium Kölner Str. 71 D-42897 Remscheid	(+49) 02191 698-0	(+49) 02191 60023

- 1 **Kalibriereinrichtung / Calibration device:** Wkl-Referenz: ROD 280 S/N: 57920944 mit ND 287 S/N: 30969919
Messunsicherheit im Messbereich ¹: 0,25°
- 2 **Kalibrieranordnung / Calibration Mounting:**
Einbaulage / *Mounting Position*: vertikal / vertical
Einbauteile / *Mounting parts*: 1/4"
- 3 **Umgebungsbedingungen / conditions:** 22,0 °C 48,5 % r.H.
- 4 **Drehzahl / Rotation speed:** manuell/manual
- 5 **Kalibrierverfahren / Calibration Procedure:** VDI/VDE 2648 Blatt 1 / *sheet 1*
- 5.1 **Ort der Kalibrierung** Kistler Remscheid GmbH
Kalibrierlaboratorium
- 6 **Bemerkungen / Remarks:**

- 7 **Kalibrierergebnis / Calibration result:** **Anzeigenabweichung** 0,19 ° **Messunsicherheit:** 0,67 °
Display Deviation **Uncertainty**

Der Sensor hat keinen absoluten Nullpunkt. Tabelle 7 zeigt die Ergebnisse einer willkürlichen Kopplung von Referenz und Drehmomentgeber.
Es wird als Ergebnis das Intervall der Anzeigenabweichung und die maximale Messunsicherheit ausgewiesen.
Messreihe 1 für Einlauf des Systems, nicht berücksichtigt. Nach jeder Messreihe Sensorachse um 90° gedreht.

Zielwert <i>Target value</i> in °	Anzeigeabweichung ³ <i>Display Deviation</i> in °	Messunsicherheit ¹ <i>Uncertainty</i> in °	Wiederholpräzision ² <i>repeatability</i> in °	Auflösung <i>resolution</i> in °
0	0,00	0,38	0,00	0,25
30	-0,07	0,47	0,14	0,25
60	0,03	0,47	0,13	0,25
90	0,02	0,54	0,19	0,25
120	-0,09	0,59	0,23	0,25
150	-0,06	0,63	0,25	0,25
180	-0,10	0,55	0,20	0,25
210	-0,18	0,60	0,23	0,25
240	-0,09	0,55	0,20	0,25
270	-0,19	0,50	0,16	0,25
300	-0,09	0,64	0,26	0,25
330	-0,04	0,67	0,28	0,25
360	0,03	0,45	0,12	0,25

Die Berechnungen erfolgten nach VDI/VDE 2648 Blatt 1.

¹ Angegeben ist die erweiterte Meßunsicherheit, die sich aus der Standardmeßunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt.
Der Wert der Meßgröße liegt im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Wertintervall.

² Berechnet wurden die Kennwerte als Standardabweichungen aus den Ergebnissen von vier Messreihen.

³ Angegeben ist der Mittelwert der Anzeigenabweichung aus den Ergebnissen von vier Messreihen.

The calculation was made according VDI/VDE 2648 Part 1.

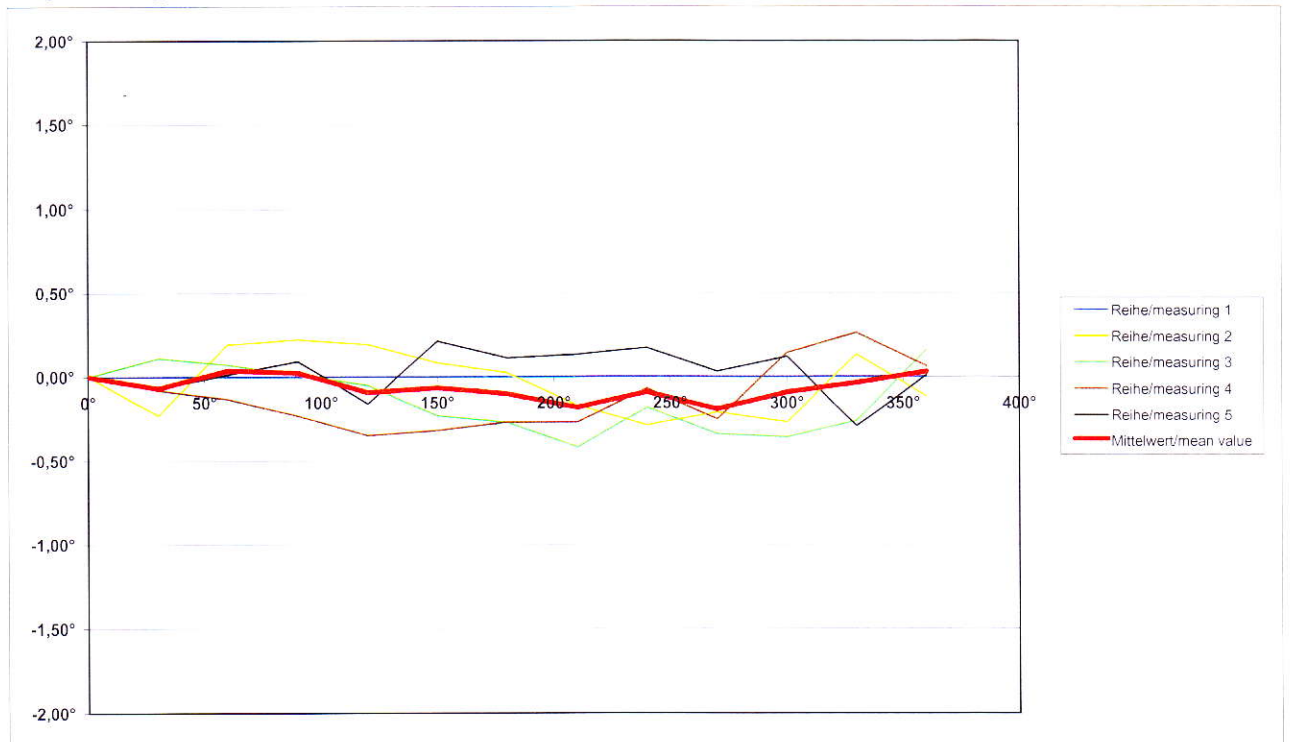
The characteristic values are calculated to standard deviation of four measurements.

The reported uncertainty is stated as the calculation of the standard deviation.

8 Messdaten / indicated values :

Messwerte Referenz reference values in °					Messwerte Prüfling test item values in °				
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
30,23	30,89	29,83	30,57	30,57	30,00	31,00	29,75	30,50	30,50
63,56	60,18	59,88	59,99	59,99	63,75	60,25	59,75	60,00	60,00
91,03	89,99	89,98	92,16	92,16	91,25	90,00	89,75	92,25	92,25
121,81	120,80	120,10	120,91	120,91	122,0	120,75	119,75	120,75	120,75
149,42	151,23	150,07	151,29	151,29	149,50	151,00	149,75	151,50	151,50
180,23	180,27	180,02	180,14	180,14	180,25	180,00	179,75	180,25	180,25
211,42	212,92	212,77	210,37	210,37	211,25	212,50	212,50	210,50	210,50
240,29	240,18	240,82	240,33	240,33	240,00	240,00	240,75	240,50	240,50
274,96	270,09	270,75	270,47	270,47	274,75	269,75	270,50	270,50	270,50
300,02	301,61	300,86	299,88	299,88	299,75	301,25	301,00	300,00	300,00
330,87	331,51	329,74	330,16	330,16	331,00	331,25	330,00	329,87	329,87
359,87	360,09	363,19	360,24	360,24	359,75	360,25	363,25	360,25	360,25
Position					Position				
Einlauf	0°	90°	180°	270°	Einlauf	0°	90°	180°	270°

9 Diagramm / diagram :



Hinweis / Remark :

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Kalibrierlaboratorium für die Messgröße Drehmoment und Drehwinkel
Calibration laboratory for the measuring value torque and rotational angle

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst **DKD**



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Akkreditierungsstelle
D-K-17572-01-00

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D-K- 17572-01-00
2018-03

Kalibrierschein

Calibration Certificate

Kalibrierzeichen

Calibration label

Gegenstand: **Drehmomentaufnehmer mit Messgerät**
Object torque transducer with measuring box

Aufnehmer / *Transducer*:
 Mod.Nr / *Mod.No.*: **30135005**
 Artikelnr. / *Art.No.*: **30135005**
 Nenndrehmoment / *Nom.tq.*: **20 N·m**
 Serien-Nr. / *Serial number*: **1032160**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Messgerät / *Measuring box*:
 Mod.Nr / *Mod.No.*: **5413-5392/314**
 Artikelnr. / *Art.No.*: **9014020**
 Serien-Nr. / *Serial number*: **1034564**
 Hersteller / *Manufacturer*: **Kistler Remscheid GmbH, 42897 Remscheid**

Auftraggeber: **HS-Technik GmbH**
Customer

Im Martelacker 12
79588 Efringen-Kirchen

Auftragsnummer: **20109741**
Order No. **vom/from 2017-11-14**

Anzahl der Seiten des Kalibrierscheines: **5**
Number of pages of the certificate

Datum der Kalibrierung: **2018-03-07**
Date of calibration

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 Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

*This calibration certificate documents the tractability to national standards, which realize the units of measurement according to the International System of Units (SI).
 The DAkKS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
 The user is obliged to have the object recalibrated at appropriate intervals.*

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This Calibration Certificate is based on the german language. In case of doubt only the german version is valid.

Datum <i>Date</i>	Leiter des Kalibrierlaboratoriums <i>Head of the calibration laboratory</i>	Bearbeiter <i>Person in charge</i>
2018-03-09	 Dr. rer. nat. Ludwig Freise	 L. Freise

Postanschrift/Mail address Kistler Remscheid GmbH Kalibrierlaboratorium Kölner Str. 71 D-42897 Remscheid	Telefon-Durchwahl / Telephone extension (+49) 02191 698-0	Telefax (+49) 02191 60023
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- 1 **Kalibrierverfahren / Calibration Procedure :** DIN EN ISO51309:2005
- 2 **Kalibriereinrichtung / Calibration device :** 1002053
- 2.1 Messunsicherheit für jede Drehmomentstufe in %
Uncertainty of measurement related to torque in %
- | Drehmoment /
Torque in N·m | Erw. Messunsicherheit /
Exp. Uncertainty (k = 2) in % : |
|-------------------------------|--|
| 4 -4 | 0,1 0,1 |
| 8 -8 | 0,1 0,1 |
| 12 -12 | 0,1 0,1 |
| 16 -16 | 0,1 0,1 |
| 20 -20 | 0,1 0,1 |
- 3 **Kalibriergegenstand / Calibration device :**
- 3.1 Justierwerte des Anzeigegeätes /
Adjustment values of the indication device:
- Justierwiderstand / *adjustment resistor:* Rechtsdrehmoment / *cw torque:* 19,505 N·m
- 3.2 Anschlusskabel / *Input cable :* 40,000 kΩ
- 3.3 Schaltungsart / *Circuit type :* Stecker intern
- 3.4 Einspannteile / *Adaptors :* 6-Leiter
1/4"
- 4 **Kalibrieranordnung / Calibration installation :**
- 4.1 Einbaustellungen / *Mounting positions :* 2 x 90 °
- 4.2 Drehmomentvektor / *Torque vector :* vertikal / *vertical*
- 5 **Umgebungsbedingungen / environmental conditions :**
- Kalibriertemperatur / *Calibration temperature :* 22 °C
- relative Luftfeuchte / *Relative humidity :* 48,5 % r.H.
- 6 **Aufnehmernullsignale / Transducer zero signals :**
- vor Einbau / *before mounting :* 0,000 N·m
- nach Kalibrierung / *after calibration :* 0,000 N·m
- 7 **Zusätzliche Angaben / Additional information :**
- Eingebaut in / *Built in:* Mod.-Nr.: 5413-4821/20 S/N: 1032159
- PGM: 12.212.63

8 **Auswertung / Analysis**

8.1 **Kalibrierergebnis / Calibration results**

Drehmoment / torque	Signal / signal	Fall I / case I		Fall II / case II	
		rel. Messunsicherheit / rel. uncertainty k = 2	rel. Uns.-intervall/ rel. uncert. interval k = 2	Signal / signal	rel. Uns.-intervall/ rel. uncert. interval k = 2
in N·m	in N·m	Ausgleichsfunktion / kubisch / <i>cubic</i> , in %	interpolation linear, in %	in N·m	linear, in %
Rechtsdrehmoment / <i>clockwise torque</i>					
0				0,003	
4				3,998	0,405
8				7,997	0,219
12				11,996	0,150
16				16,001	0,116
20				20,003	0,119
Links-drehmoment / <i>anticlockwise torque</i>					

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8.2 Klasseneinstufung nach DIN 51309 / Classification according to DIN 51309

Klasse Class	Fall I / case I kubische Ausgleichsfunktion cubic interpolation		Fall II / case II lineare Ausgleichsfunktion linear interpolation	
	von/from in N·m	bis / to	von/from in N·m	bis / to in N·m
Rechtsdrehmoment / clockwise torque				
0,05				
0,1				
0,2				
0,5				
1				4 20
2				
5				
Linksdrehmoment / anticlockwise torque				
0,05				
0,1				
0,2				
0,5				
1				
2				
5				

9 Messdaten / measuring data in N·m

Rechtsdrehmoment / clockwise torque						
	0,000	0,000	0,000	0,000	0,007	0,007
0						
4				3,992	4,004	4,003
8				7,992	8,002	7,999
12				11,997	12,000	11,998
16				16,001	16,002	16,003
20	20,006	20,012	20,000	20,004	20,004	20,009
N·m	1. pre-load 0°	2. pre-load 0°	3. pre-load 0°	0° up1	0° down	0° up2
0	0,000	0,000	0,003			
4		3,992	4,005			
8		7,994	8,000			
12		11,993	11,995			
16		15,998	16,001			
20	20,002	20,002	20,002			
N·m	pre-load 90°	90° up	90° down	pre-load 180°	180° up	180° down
Linksdrehmoment / anticlockwise torque						
N·m	1. pre-load 0°	2. pre-load 0°	3. pre-load 0°	0° up1	0° down	0° up2
N·m	pre-load 90°	90° up	90° down	pre-load 180°	180° up	180° down

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10 Interpolationsgleichungen / Interpolation equations S in N·m M in N·m
10.1 Fall I, Kubische Interpolationsgleichung / Case I, Cubic interpolation equation:

10.1.1 Rechtsdrehmoment / clockwise torque:
 $S_{ai} = \dots \cdot M_i + \dots \cdot M_i^2 + \dots \cdot M_i^3$
 $M_{ai} = \dots \cdot S_i + \dots \cdot S_i^2 + \dots \cdot S_i^3$

10.1.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = \dots \cdot M_i + \dots \cdot M_i^2 + \dots \cdot M_i^3$
 $M_{ai} = \dots \cdot S_i + \dots \cdot S_i^2 + \dots \cdot S_i^3$

10.2 Fall I, Lineare Interpolationsgleichung / Case I, Linear interpolation equation

10.2.1 Rechtsdrehmoment / clockwise torque: $S_{ai} = \dots \cdot M_i$
 $M_{ai} = \dots \cdot S_i$

9.2.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = \dots \cdot M_i$
 $M_{ai} = \dots \cdot S_i$

10.2.3 Rechts- und Linksdrehmoment / clockwise and anticlockwise torque:
 $S_{ai} = \dots \cdot M_i$ (siehe Fußnote / see footnote)
 $M_{ai} = \dots \cdot S_i$

10.3 Fall II, Lineare Interpolationsgleichung / Case II, Linear interpolation equation

10.3.1 Rechtsdrehmoment / clockwise torque: $S_{ai} = 0,99999091 \cdot M_i$
 $M_{ai} = 1,0000 \cdot S_i$

9.3.2 Linksdrehmoment / anticlockwise torque:
 $S_{ai} = 0,00000000 \cdot M_i$
 $M_{ai} = 0,0000 \cdot S_i$

10.2.3 Rechts- und Linksdrehmoment / clockwise and anticlockwise torque:
 $S_{ai} = 0,49999545 \cdot M_i$ (siehe Fußnote / see footnote)
 $M_{ai} = 0,5000 \cdot S_i$

11 Kennwerte nach DIN 51309 / Classification criteria according to DIN 51309

M_K	Fall I / case I					Fall II / case II					r
	$\frac{b'}{Y}$	$\frac{b}{Y}$	$\frac{f_0}{Y_E}$	$\frac{f_{a,cub}}{Y}$	$\frac{f_{a,lin}}{Y}$	$\frac{b'}{Y_h}$	$\frac{b}{Y_h}$	$\frac{f_0}{Y_{hE}}$	$\frac{h}{Y_h}$	$\frac{f_{a,lin}}{Y_h}$	
in N·m	in %	in %	in %	in %	in %	in %	in %	in %	in %	in %	in N·m
20						0,025	0,010	-	0,000	0,015	0,003
16						0,012	0,019	-	0,019	0,003	0,003
12						0,008	0,033	-	0,025	-0,031	0,003
8						0,088	0,025	-	0,125	-0,038	0,003
4						0,275	0,000	-	0,325	-0,044	0,003
0						-	-	0,035	-	-	-
						-	-	-	-	-	-

11.1 Kriecheinfluss aus Kurzzeitkriechen / Creep influence from short-term creep

Vor der ersten Messreihe wurde die Signaländerung während einer dreiminütigen Wartepause registriert.
The signal variation during a three-minute waiting interval was recorded before the first series.
 Das mit dem Faktor 4 multiplizierte Kurzzeitkriechen ergibt / *the short-term creep multiplied by 4 yields:*

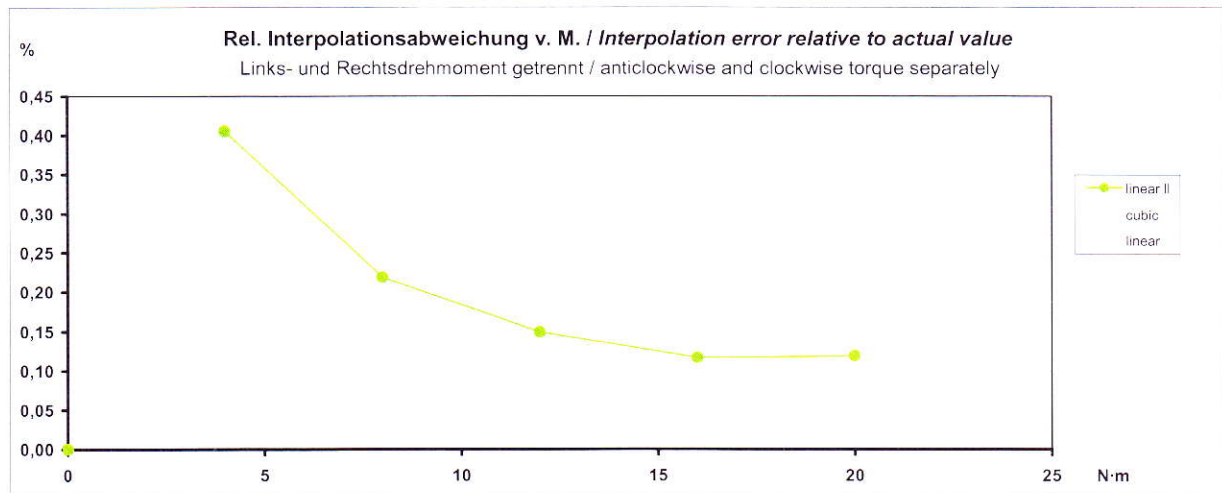
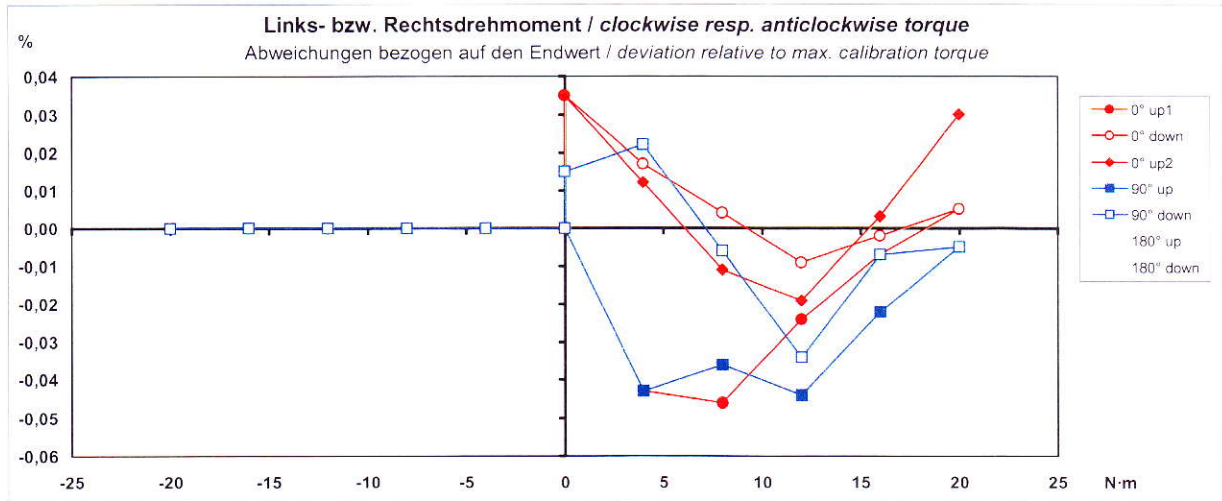
(Fußnote / footnote)

Die Bestimmung der linearen Interpolationsgleichung für Rechts- und Linksdrehmoment ist nicht identisch mit einem Kalibrierergebnis für Wechseldrehmoment. Sie ermöglicht es, mit nur einem Kalibrierfaktor das Anzeigergerät optimal für Rechts- und Linksdrehmoment anzupassen.
The linear interpolation equation for clockwise torque and anticlockwise torque can't be used as a calibration result for alternating torque. It only can be used to adjust the indicator optimally for clockwise torque and anticlockwise torque with a single calibration factor.

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12 Darstellung der Ergebnisse in Diagrammen / Results in diagrams

Bezugswert / Reference value: 20,003 N·m



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Calibration laboratory for the measuring value torque and rotational angle

akkreditiert durch die / accredited by the

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / as calibration laboratory in the

Deutschen Kalibrierdienst



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2018-03

Kalibrierschein
Calibration Certificate

Kalibrierzeichen
Calibration label

Gegenstand: **Drehwinkelsensor**
Object **angle transducer**

Aufnehmer / Transducer:
Mod.Nr / Mod.No.: **30135005**
Artikelnr. / Art.No.: **30135005**
Auflösung / Resolution **0,25°**
Serien-Nr. / Serial number: **1032160**
Hersteller / Manufacturer: **Kistler Remscheid GmbH, 42897 Remscheid**

Messgerät / Measuring box:
Mod.Nr / Mod.No.: **5413-5392/314**
Artikelnr. / Art.No.: **9014020**
Serien-Nr. / Serial number: **1034564**
Hersteller / Manufacturer: **Kistler Remscheid GmbH, 42897 Remscheid**

Auftraggeber: **HS-Technik GmbH**
Customer

Im Martelacker 12
79588 Efringen-Kirchen

Auftragsnummer: **20109741**
Order No. **vom/from 2017-11-14**

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Anzahl der Seiten des Kalibrierscheines: **3**
Number of pages of the certificate

Datum der Kalibrierung: **2018-03-08**
Date of calibration

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Datum Date	Leiter des Kalibrierlaboratoriums Head of the calibration laboratory	Bearbeiter Person in charge
2018-03-09	 Dr. rer. nat. Ludwig Freise	 L. Freise
Postanschrift/Mail address Kistler Remscheid GmbH Kalibrierlaboratorium Kölner Str. 71 D-42897 Remscheid	Telefon-Durchwahl / Telephon extension (+49) 02191 698-0	Telefax (+49) 02191 60023

- 1 **Kalibriereinrichtung / Calibration device:** Wkl-Referenz: ROD 280 S/N: 57920944 mit ND 287 S/N: 30969919
Messunsicherheit im Messbereich¹: 0,25°
- 2 **Kalibrieranordnung / Calibration Mounting:**
Einbaulage / Mounting Position: vertikal / vertical
Einbauteile / Mounting parts: 1/4"
- 3 **Umgebungsbedingungen / conditions:** 22,0 °C 48,5 % r.H.
- 4 **Drehzahl / Rotation speed:** manuell/manual
- 5 **Kalibrierverfahren / Calibration Procedure:** VDI/VDE 2648 Blatt 1 / sheet 1
- 5.1 **Ort der Kalibrierung** Kistler Remscheid GmbH
Kalibrierlaboratorium
- 6 **Bemerkungen / Remarks:**

- 7 **Kalibrierergebnis / Calibration result:** **Anzeigenabweichung 0,16 °** **Messunsicherheit: 0,83 °**
Display Deviation **Uncertainty**

Der Sensor hat keinen absoluten Nullpunkt. Tabelle 7 zeigt die Ergebnisse einer willkürlichen Kopplung von Referenz und Drehmomentgeber.
Es wird als Ergebnis das Intervall der Anzeigenabweichung und die maximale Messunsicherheit ausgewiesen.
Messreihe 1 für Einlauf des Systems, nicht berücksichtigt. Nach jeder Messreihe Sensorachse um 90° gedreht.

Zielwert Target value in °	Anzeigeabweichung ³ Display Deviation in °	Messunsicherheit ¹ Uncertainty in °	Wiederholpräzision ² repeatability in °	Auflösung resolution in °
0	0,00	0,38	0,00	0,25
30	-0,09	0,55	0,20	0,25
60	0,09	0,75	0,32	0,25
90	0,02	0,67	0,28	0,25
120	-0,01	0,70	0,29	0,25
150	0,15	0,80	0,35	0,25
180	-0,10	0,74	0,32	0,25
210	-0,16	0,64	0,26	0,25
240	-0,09	0,52	0,17	0,25
270	-0,05	0,83	0,37	0,25
300	-0,12	0,70	0,29	0,25
330	0,04	0,51	0,17	0,25
360	0,12	0,45	0,11	0,25

Die Berechnungen erfolgten nach VDI/VDE 2648 Blatt 1.

¹ Angegeben ist die erweiterte Meßunsicherheit, die sich aus der Standardmeßunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt.
Der Wert der Meßgröße liegt im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall.

² Berechnet wurden die Kennwerte als Standardabweichungen aus den Ergebnissen von vier Messreihen.

³ Angegeben ist der Mittelwert der Anzeigenabweichung aus den Ergebnissen von vier Messreihen.

The calculation was made according VDI/VDE 2648 Part 1.

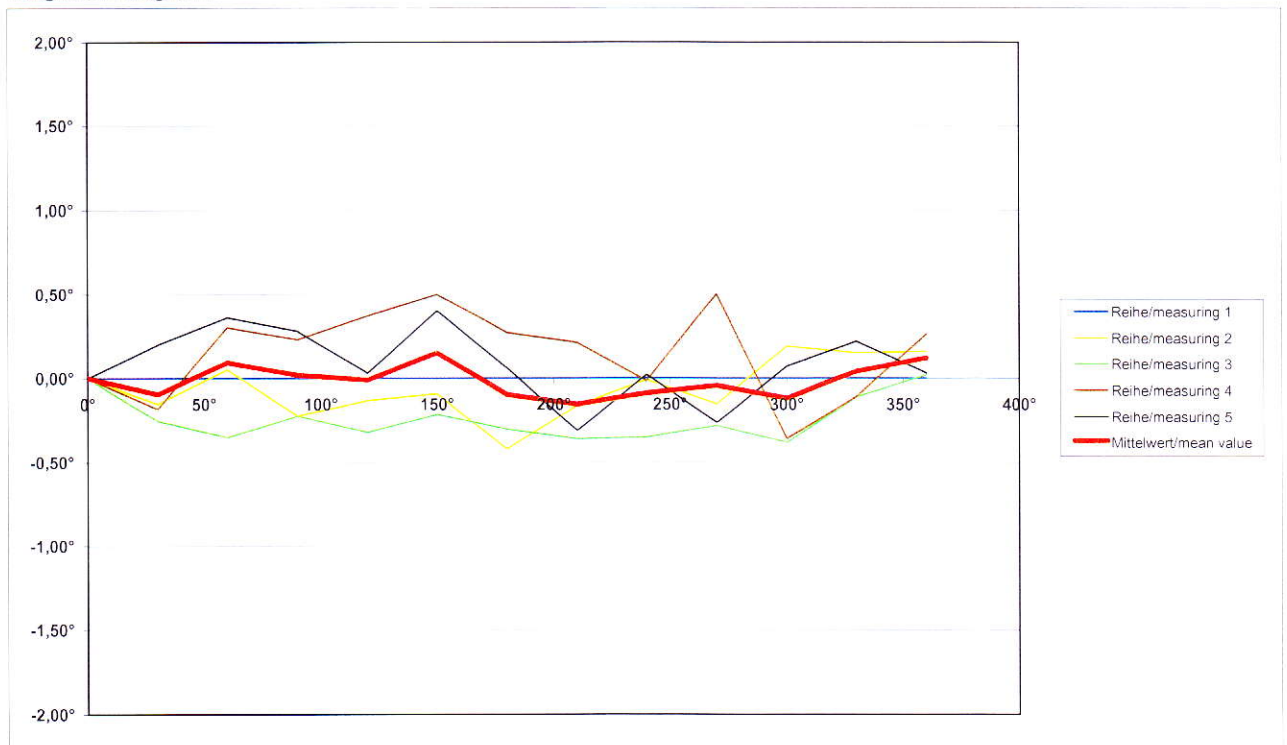
The characteristic values are calculated to standard deviation of four measurements.

The reported uncertainty is stated as the calculation of the standard deviation.

8 Messdaten / indicated values :

Messwerte Referenz reference values in °					Messwerte Prüfling test item values in °				
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
31,15	31,00	31,43	32,05	32,05	31,00	30,75	31,25	32,25	32,25
61,20	60,10	60,45	60,39	60,39	61,25	59,75	60,75	60,75	60,75
90,97	89,22	93,77	93,72	93,72	90,75	89,00	94,00	94,00	94,00
120,63	122,07	120,13	122,22	122,22	120,50	121,75	120,50	122,25	122,25
154,79	149,21	150,00	152,60	152,60	154,70	149,00	150,50	153,00	153,00
182,17	181,55	182,73	181,44	181,44	181,75	181,25	183,00	181,50	181,50
210,16	212,86	211,04	212,06	212,06	210,00	212,50	211,25	211,75	211,75
247,01	245,35	240,77	240,23	240,23	247,00	245,00	240,75	240,25	240,25
273,15	273,53	275,75	274,76	274,76	273,00	273,25	276,25	274,50	274,50
300,31	301,38	300,61	303,43	303,43	300,50	301,00	300,25	303,50	303,50
330,35	330,61	332,86	333,28	333,28	330,50	330,50	332,75	333,50	333,50
362,34	361,73	361,49	360,47	360,47	362,50	361,75	361,75	360,50	360,50
Position					Position				
Einlauf	0°	90°	180°	270°	Einlauf	0°	90°	180°	270°

9 Diagramm / diagram :



Hinweis / Remark :

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