Homologation

Cordless Assembly Tools

Model: CTBAW153

Serial no.: 1019841

Contents

Homologation: CTBAW153 SN: 1019841

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Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 50 rpm	4,9 %
Single-stage tightening system	☐	Speed 100 %	1025 rpm

Manufacturer: Apex Tool Group Serial no: **1019841**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 7,02 Nm

Hard joint (H)	41,23	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,45	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	6,53 7,51 Nm	6,53 - 7,51 Nm
	Tolerance down / up	7	7 %
	Average torque	6,87	6,90 Nm
	Standard deviation	0,05	0,05 Nm
	Torque scatter (99,73%)	0,33	0,31 Nm
	C_m	2,99	3,12
	C_{mk}	2,09	2,37

b)	Min. C_m hard/soft (lowest value)	2,99
	Min. C_{mk} hard/soft (lowest value)	2,09

Capability is reached if minimum C_{mk} value ≥1.67

Note:

Machine Capability Study
Control System

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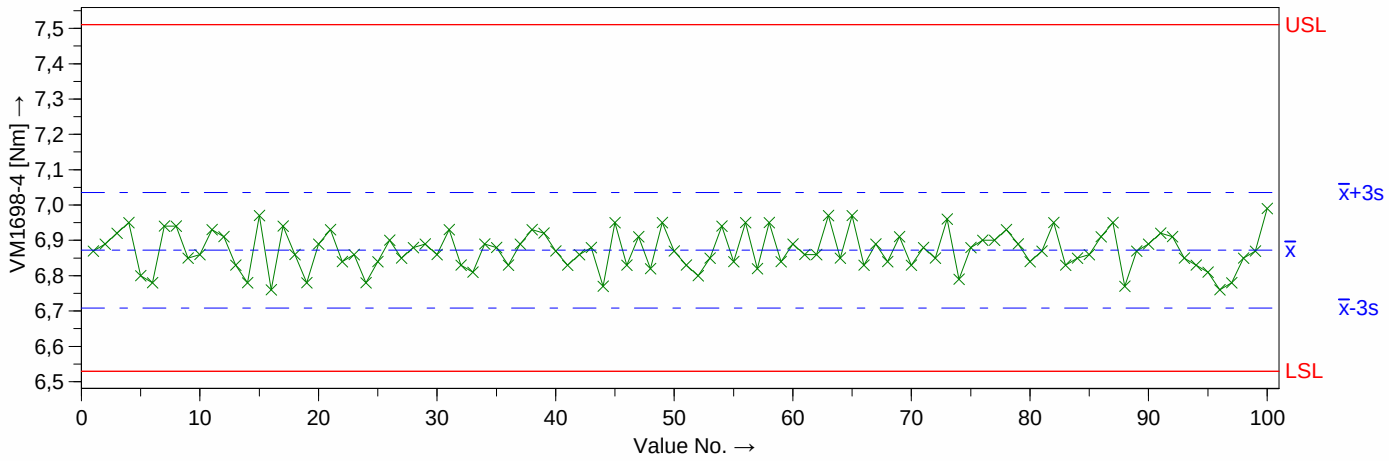
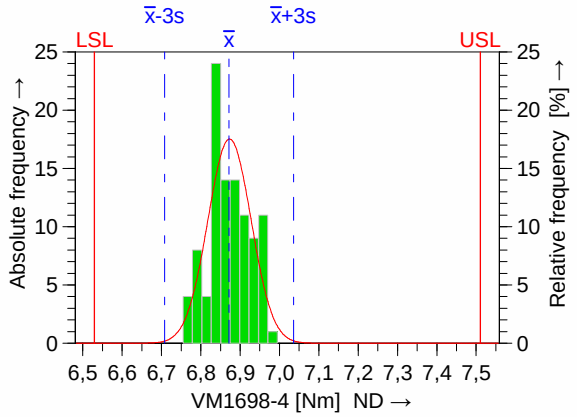
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

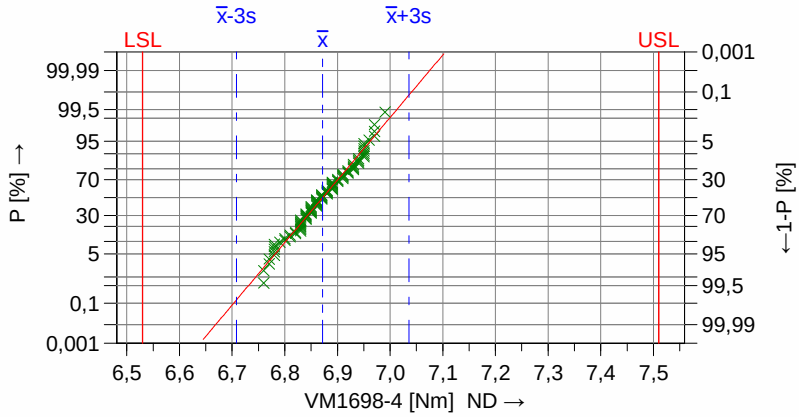
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_d	Char.Descr.	VM1698-4	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	1024210	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 10:32:12 to 26.07.2022 10:46:26

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			x̄	6.8719
LSL	6.53	x_{min}	6.76	x̄-3s	6.7080
USL	7.51	x_{max}	6.99	x̄+3s	7.0358
T	0.98	R	0.23	6s	0.3277
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	2.99
Critical capability index	=	C_{mk}	2.09

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_d	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	1024210	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	6,87	6,89	6,92	6,95	6,80	6,78	6,94	6,94	6,85	6,86
1024210	VM1698-4	Grad	30,00	30,00	30,25	30,75	29,00	28,75	30,25	30,25	29,75	29,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	6,93	6,91	6,83	6,78	6,97	6,76	6,94	6,86	6,78	6,89
1024210	VM1698-4	Grad	30,50	30,25	29,75	29,25	30,50	28,75	30,25	29,75	29,00	30,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	6,93	6,84	6,86	6,78	6,84	6,90	6,85	6,88	6,89	6,86
1024210	VM1698-4	Grad	30,75	30,25	30,25	29,75	30,50	30,75	30,50	30,25	30,50	29,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	6,93	6,83	6,81	6,89	6,88	6,83	6,89	6,93	6,92	6,87
1024210	VM1698-4	Grad	30,00	30,00	30,00	30,75	30,50	30,00	30,00	30,75	31,00	30,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	6,83	6,86	6,88	6,77	6,95	6,83	6,91	6,82	6,95	6,87
1024210	VM1698-4	Grad	30,25	30,25	29,75	29,25	30,50	30,25	30,75	30,00	31,00	30,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	6,83	6,80	6,85	6,94	6,84	6,95	6,82	6,95	6,84	6,89
1024210	VM1698-4	Grad	30,25	29,75	30,50	30,50	30,25	30,50	30,25	30,75	30,00	30,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	6,86	6,86	6,97	6,85	6,97	6,83	6,89	6,84	6,91	6,83
1024210	VM1698-4	Grad	30,00	29,75	31,00	30,00	30,75	29,75	30,50	30,00	30,75	30,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	6,88	6,85	6,96	6,79	6,88	6,90	6,90	6,93	6,89	6,84
1024210	VM1698-4	Grad	29,75	30,50	31,25	29,75	30,50	30,75	30,25	31,00	30,25	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_d	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	1024210	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,87	6,95	6,83	6,85	6,86	6,91	6,95	6,77	6,87	6,89
1024210	VM1698-4	Grad	30,50	31,00	30,00	30,00	30,00	30,75	31,00	29,50	30,50	30,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	6,92	6,91	6,85	6,83	6,81	6,76	6,78	6,85	6,87	6,99
1024210	VM1698-4	Grad	31,00	31,00	30,25	30,00	29,75	29,50	29,75	30,25	30,25	31,50

Machine Capability Study
Tool System

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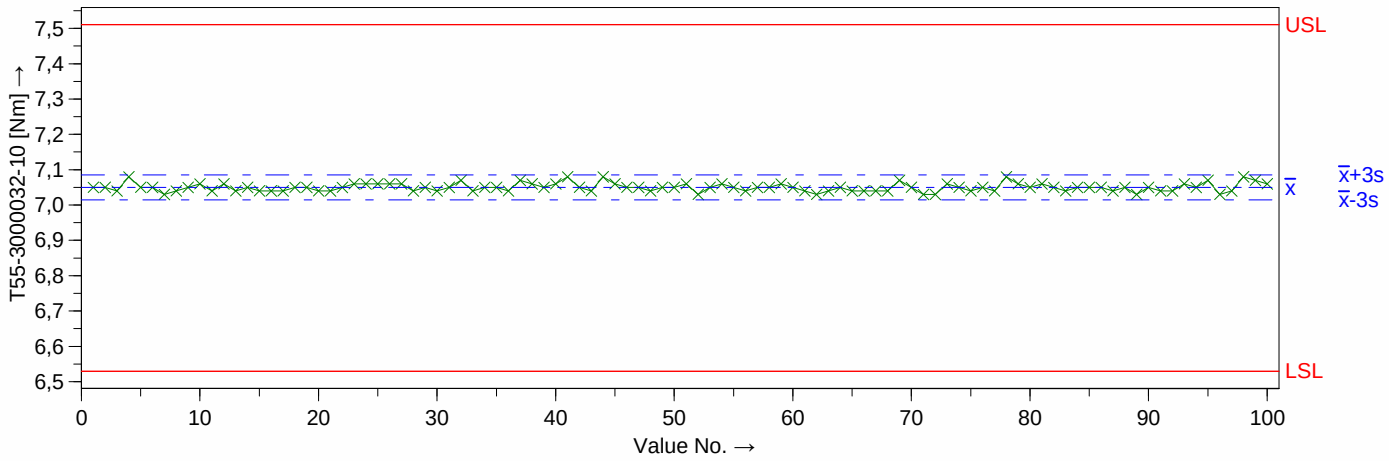
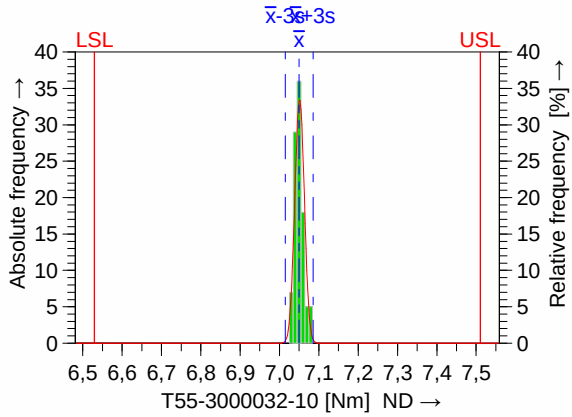
Plant ATG Westhausen		Operator Name Sünder	Date 26.07.2022

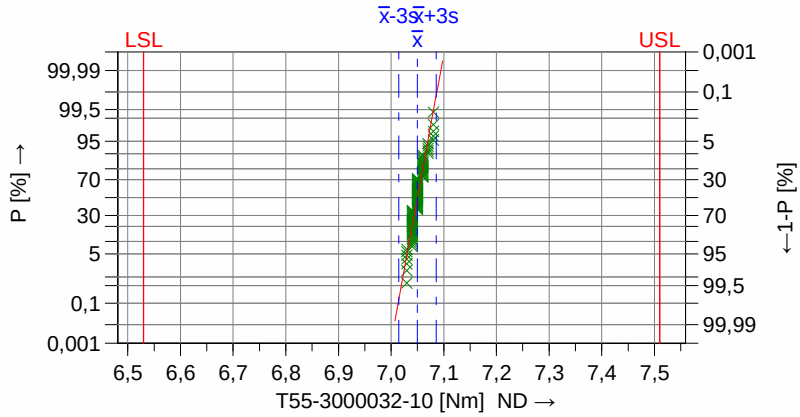
Ord. No. CTBAW153	Part type CTBAW153		Contr.item yes
Serial No. 1019841_d	Char.Descr. T55-3000032-10	Nom.val. 7,02 0,49	USL 7,51
	Serial No. 199777	Unit Nm -0,49	LSL 6,53
Char.Type variable		Tolerance value 7 %	Decimal Pl. 2
Cust.Name Cleco	Reference System VM1698-4	Test Electronic MPRO400GCD-P	
Contr.No. Homologation	Reference Transducer 10 / 1026388	nges. 100	

Evaluation from 26.07.2022 10:32:12 to 26.07.2022 10:46:26

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0500
LSL	6.53	x_{min}	7.03	$\bar{x}$-3s	7.0143
USL	7.51	x_{max}	7.08	$\bar{x}$+3s	7.0857
T	0.98	R	0.05	6s	0.0714
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	13.73
Critical capability index	=	C_{mk}	12.89

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019841_d1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	199777	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	7,05	7,05	7,04	7,08	7,05	7,05	7,03	7,04	7,05	7,06
199777	T55-3000032-10	Grad	31,00	31,00	31,00	32,00	30,00	29,00	31,00	32,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	7,04	7,06	7,04	7,05	7,04	7,04	7,04	7,05	7,05	7,04
199777	T55-3000032-10	Grad	31,00	31,00	31,00	30,00	31,00	30,00	31,00	30,00	30,00	32,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	7,04	7,05	7,06	7,06	7,06	7,06	7,06	7,04	7,05	7,04
199777	T55-3000032-10	Grad	32,00	31,00	31,00	30,00	32,00	31,00	31,00	31,00	32,00	31,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	7,05	7,07	7,04	7,05	7,05	7,04	7,07	7,06	7,05	7,06
199777	T55-3000032-10	Grad	32,00	31,00	30,00	31,00	31,00	31,00	31,00	32,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	7,08	7,05	7,04	7,08	7,06	7,05	7,05	7,04	7,05	7,05
199777	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	32,00	31,00	32,00	31,00	32,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	7,06	7,03	7,05	7,06	7,05	7,04	7,05	7,05	7,06	7,05
199777	T55-3000032-10	Grad	31,00	31,00	31,00	32,00	32,00	32,00	31,00	32,00	31,00	32,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	7,04	7,03	7,04	7,05	7,04	7,04	7,04	7,04	7,07	7,05
199777	T55-3000032-10	Grad	31,00	31,00	32,00	31,00	32,00	31,00	32,00	31,00	32,00	31,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	7,03	7,03	7,06	7,05	7,04	7,05	7,04	7,08	7,06	7,05
199777	T55-3000032-10	Grad	31,00	32,00	33,00	31,00	32,00	32,00	31,00	32,00	31,00	32,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	199777	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	7,06	7,05	7,04	7,05	7,05	7,05	7,04	7,05	7,03	7,05
199777	T55-3000032-10	Grad	32,00	32,00	31,00	31,00	31,00	32,00	32,00	31,00	32,00	32,00

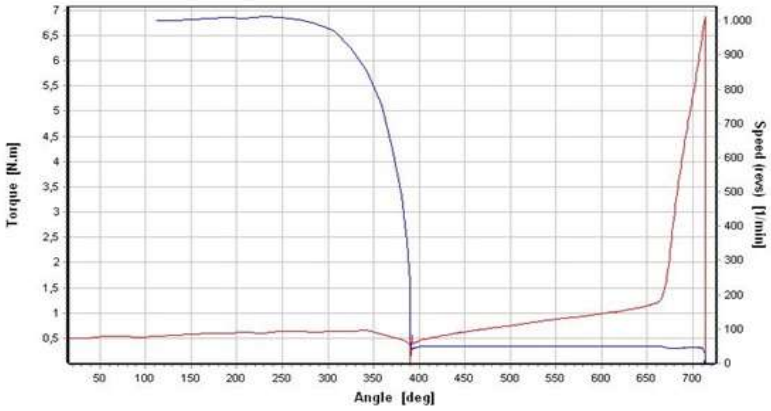
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	7,04	7,04	7,06	7,05	7,07	7,03	7,04	7,08	7,07	7,06
199777	T55-3000032-10	Grad	32,00	31,00	31,00	31,00	31,00	30,00	30,00	31,00	31,00	32,00

Torque graphs

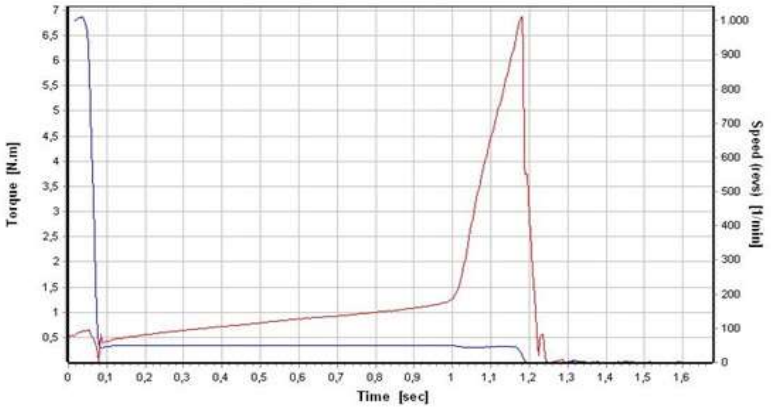
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019841**

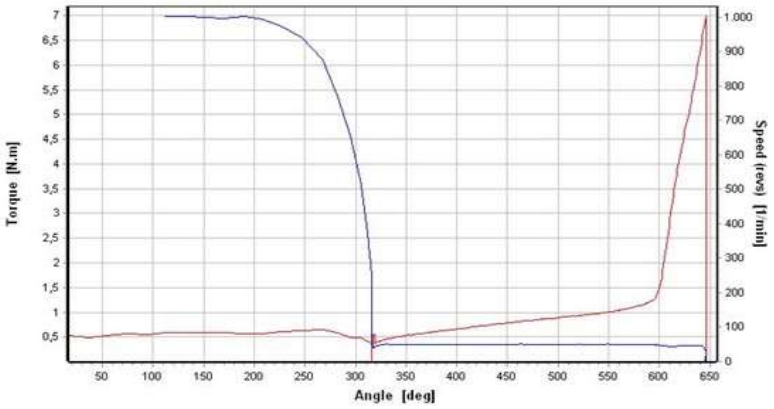
Angle degree: **30°**
Test torque: **7,0 Nm**



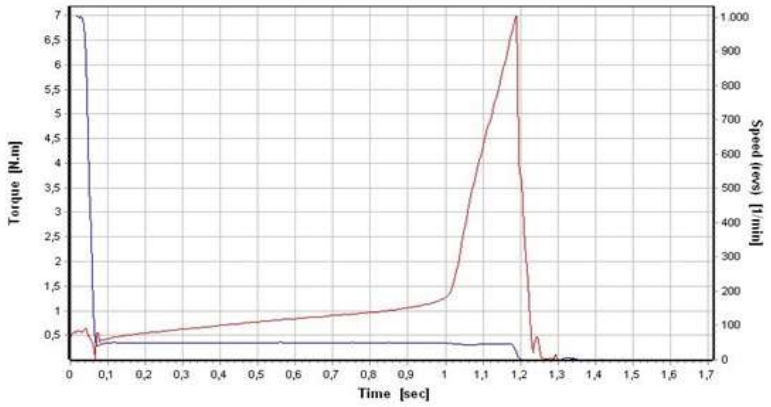
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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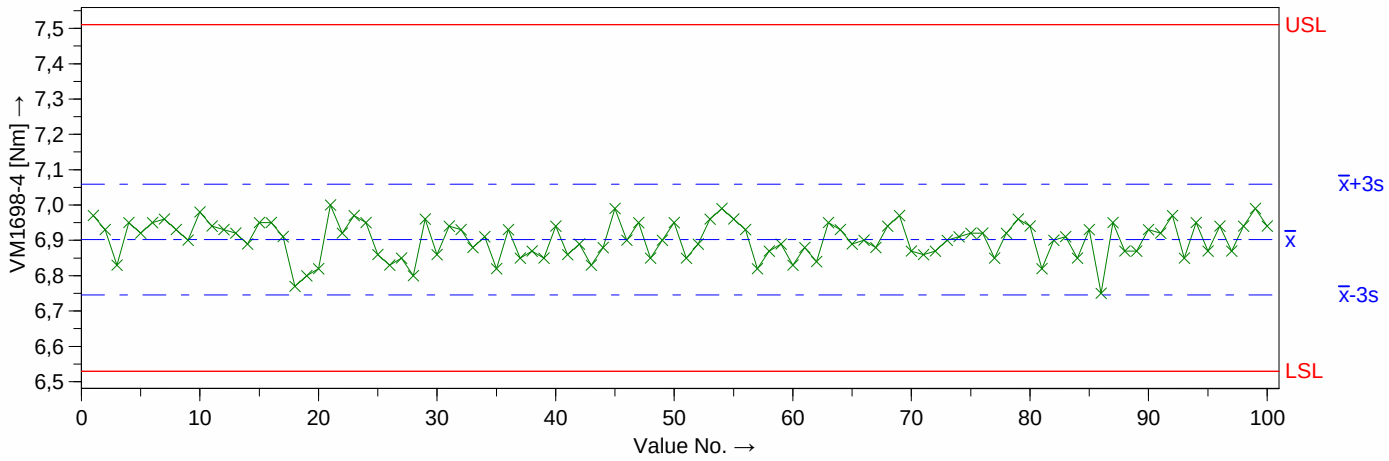
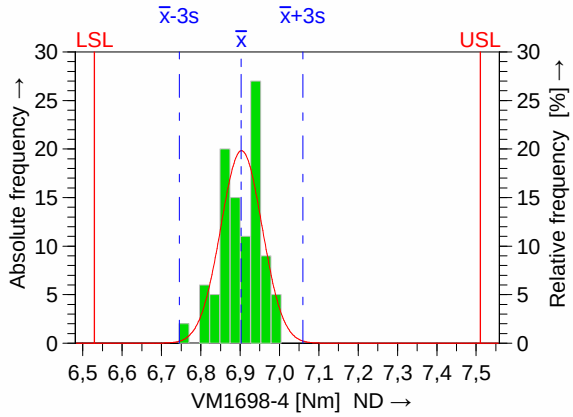
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

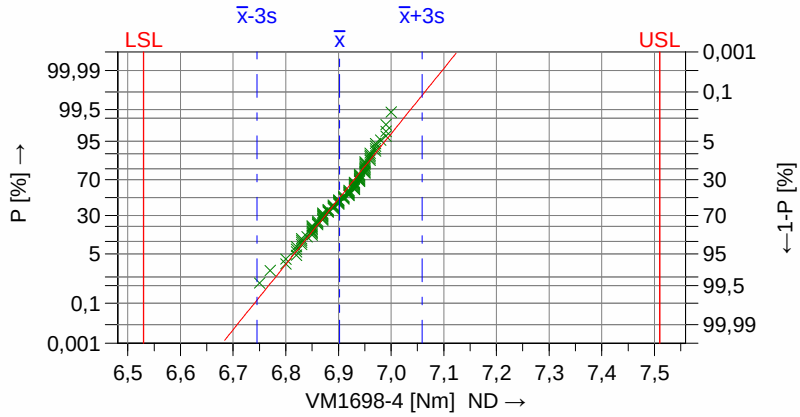
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_c	Char.Descr.	VM1698-4	Nom.val. 7,02 0,49	USL 7,51
		Serial No.	1024210	Unit Nm -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 10:54:15 to 26.07.2022 11:16:10

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			x̄	6.9023
LSL	6.53	x_{min}	6.75	x̄-3s	6.7454
USL	7.51	x_{max}	7.00	x̄+3s	7.0592
T	0.98	R	0.25	6s	0.3138
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	3.12
Critical capability index	=	C_{mk}	2.37

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_c	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	1024210	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	6,97	6,93	6,83	6,95	6,92	6,95	6,96	6,93	6,90	6,98
1024210	VM1698-4	Grad	367,50	362,25	352,75	363,25	360,00	361,75	362,75	361,75	359,25	365,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	6,94	6,93	6,92	6,89	6,95	6,95	6,91	6,77	6,80	6,82
1024210	VM1698-4	Grad	364,00	363,00	361,25	358,00	364,25	362,00	358,75	342,75	346,00	349,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	7,00	6,92	6,97	6,95	6,86	6,83	6,85	6,80	6,96	6,86
1024210	VM1698-4	Grad	369,50	359,75	365,25	361,75	356,25	350,75	351,25	345,50	364,00	353,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	6,94	6,93	6,88	6,91	6,82	6,93	6,85	6,87	6,85	6,94
1024210	VM1698-4	Grad	361,25	361,00	354,00	359,00	347,50	361,00	351,25	353,75	351,75	362,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	6,86	6,89	6,83	6,88	6,99	6,90	6,95	6,85	6,90	6,95
1024210	VM1698-4	Grad	352,25	355,25	348,75	352,75	367,00	356,00	362,25	352,00	355,50	363,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	6,85	6,89	6,96	6,99	6,96	6,93	6,82	6,87	6,89	6,83
1024210	VM1698-4	Grad	351,00	356,00	361,75	366,25	362,50	360,25	348,75	353,75	354,75	349,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	6,88	6,84	6,95	6,93	6,89	6,90	6,88	6,94	6,97	6,87
1024210	VM1698-4	Grad	354,00	350,00	367,50	365,25	361,25	362,00	360,25	366,50	369,00	358,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	6,86	6,87	6,90	6,91	6,92	6,92	6,85	6,92	6,96	6,94
1024210	VM1698-4	Grad	357,75	357,50	364,50	364,75	365,50	366,50	356,75	364,50	369,50	368,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_c	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	1024210	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,82	6,90	6,91	6,85	6,93	6,75	6,95	6,87	6,87	6,93
1024210	VM1698-4	Grad	353,25	361,00	363,25	358,75	365,75	347,50	369,00	360,75	360,00	368,00

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	6,92	6,97	6,85	6,95	6,87	6,94	6,87	6,94	6,99	6,94
1024210	VM1698-4	Grad	363,25	370,75	357,50	367,00	359,25	366,50	359,50	366,75	374,00	367,75

Machine Capability Study
Tool System

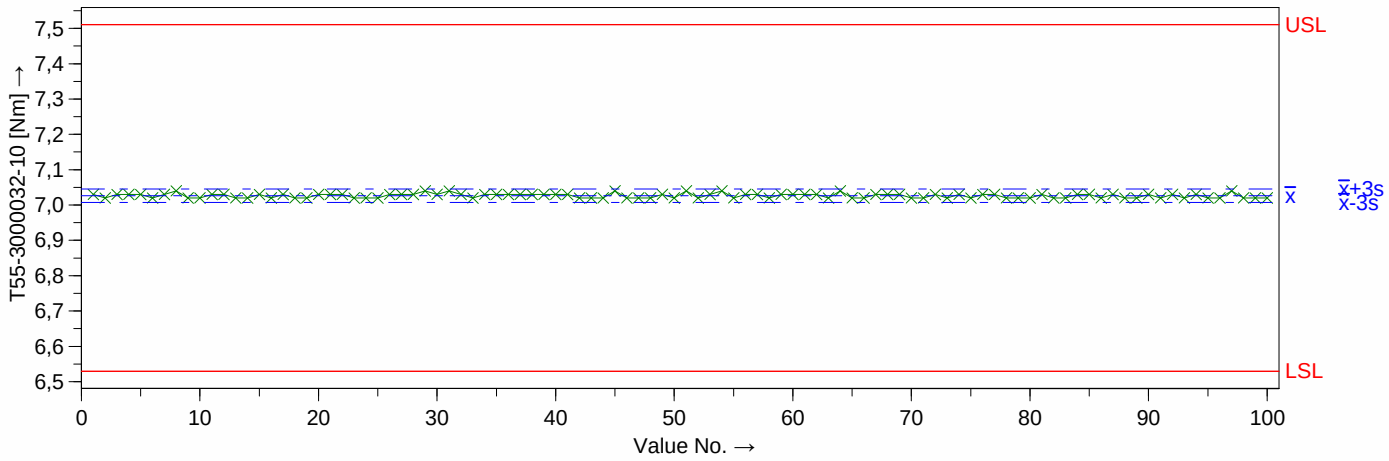
Page 1 / 1

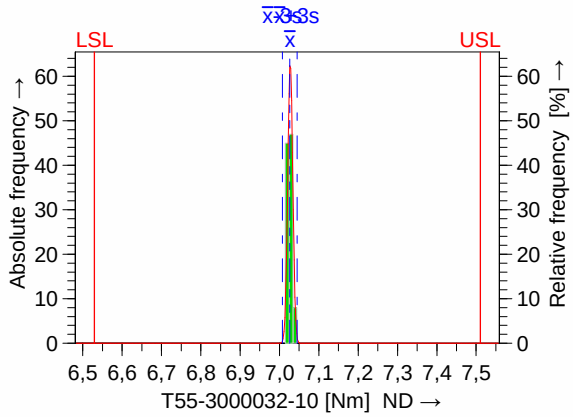
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

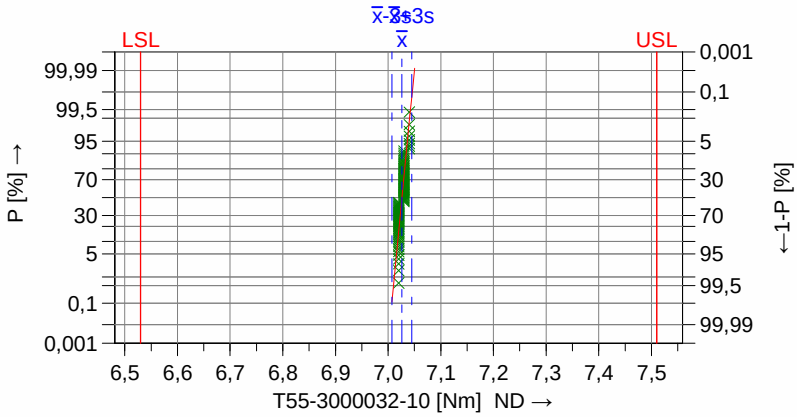
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_c	Char.Descr.	T55-3000032-10	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	199777	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 10:54:15 to 26.07.2022 11:16:10

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0263
LSL	6.53	x_{min}	7.02	$\bar{x}$-3s	7.0074
USL	7.51	x_{max}	7.04	$\bar{x}$+3s	7.0452
T	0.98	R	0.02	6s	0.0378
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1 1.4 $\hat{\sigma}$ = S_{tot}	
Potential Capability index	=	C_m	25.92
Critical capability index	=	C_{mk}	25.59

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019841_c1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	199777	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	7,03	7,02	7,03	7,03	7,03	7,02	7,03	7,04	7,02	7,02
199777	T55-3000032-10	Grad	377,00	373,00	361,00	376,00	360,00	373,00	369,00	372,00	374,00	371,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	7,03	7,03	7,02	7,02	7,03	7,02	7,03	7,02	7,02	7,03
199777	T55-3000032-10	Grad	376,00	364,00	368,00	364,00	378,00	375,00	362,00	344,00	359,00	360,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	7,03	7,03	7,02	7,02	7,02	7,03	7,03	7,03	7,04	7,03
199777	T55-3000032-10	Grad	379,00	373,00	375,00	363,00	364,00	360,00	359,00	358,00	366,00	362,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	7,04	7,03	7,02	7,03	7,03	7,03	7,03	7,03	7,03	7,03
199777	T55-3000032-10	Grad	364,00	372,00	362,00	363,00	359,00	363,00	358,00	358,00	358,00	363,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	7,03	7,02	7,02	7,02	7,04	7,02	7,02	7,02	7,03	7,02
199777	T55-3000032-10	Grad	359,00	361,00	361,00	357,00	379,00	369,00	363,00	362,00	361,00	375,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	7,04	7,02	7,03	7,04	7,02	7,03	7,03	7,02	7,03	7,03
199777	T55-3000032-10	Grad	359,00	371,00	379,00	376,00	375,00	373,00	359,00	364,00	361,00	357,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	7,03	7,03	7,02	7,04	7,02	7,02	7,03	7,03	7,03	7,02
199777	T55-3000032-10	Grad	362,00	361,00	378,00	369,00	378,00	377,00	364,00	378,00	377,00	361,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	7,02	7,03	7,02	7,03	7,02	7,03	7,03	7,02	7,02	7,02
199777	T55-3000032-10	Grad	365,00	364,00	378,00	375,00	375,00	378,00	366,00	378,00	377,00	380,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	199777	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.122 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	7,03	7,02	7,02	7,03	7,03	7,02	7,03	7,02	7,02	7,03
199777	T55-3000032-10	Grad	360,00	362,00	381,00	361,00	377,00	362,00	380,00	362,00	362,00	377,00

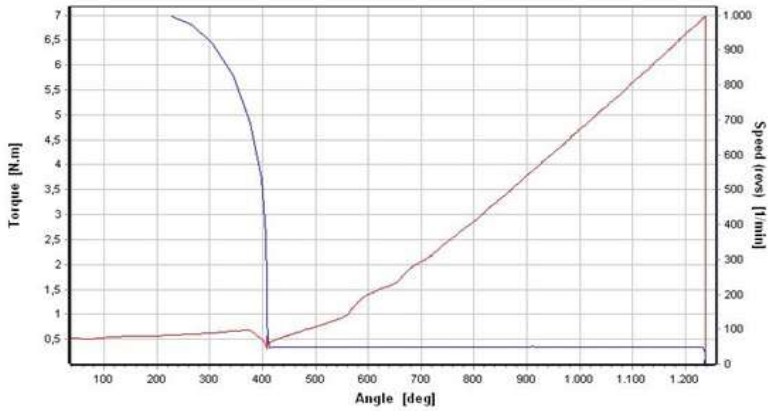
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	7,02	7,03	7,02	7,03	7,02	7,02	7,04	7,02	7,02	7,02
199777	T55-3000032-10	Grad	366,00	379,00	361,00	377,00	362,00	376,00	361,00	376,00	381,00	374,00

Torque graphs

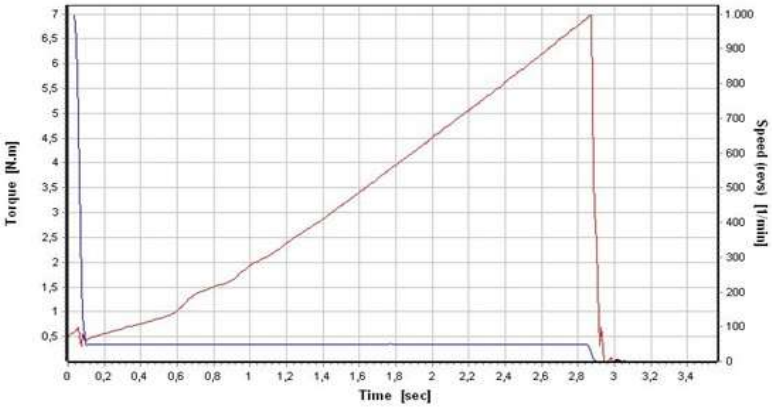
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019841**

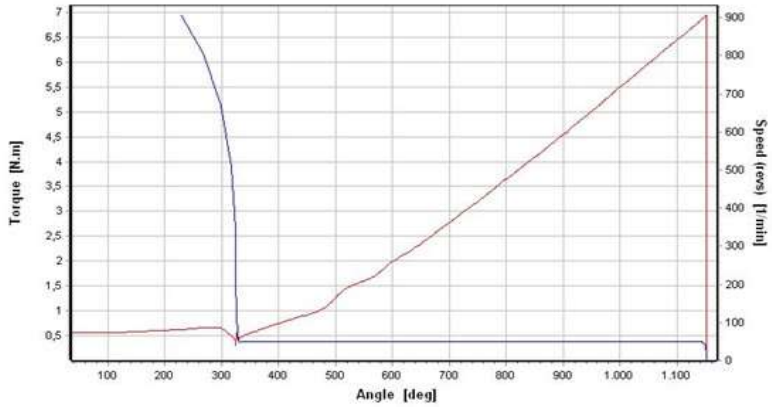
Angle degree: **360°**
Test torque: **7,0 Nm**



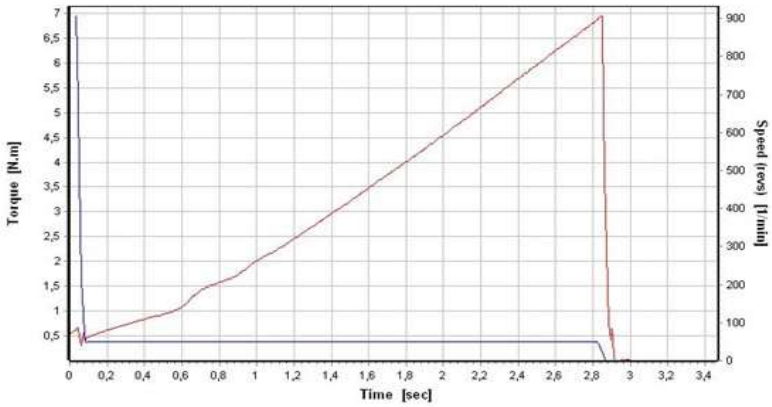
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 3

Machine Capability Study 80 %

Multi-stage tightening system	☑	Speed 50 rpm	4,9 %
Single-stage tightening system	☐	Speed 100 %	1025 rpm

Manufacturer: Apex Tool Group Serial no: **1019841**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 12,72 Nm

Hard joint (H)	75,29	Nm / Revolution	Angle degree	30°
Soft joint (L)	6,23	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	11,83 13,61 Nm	11,83 - 13,61 Nm
	Tolerance down / up	7	7 %
	Average torque	12,55	12,46 Nm
	Standard deviation	0,09	0,08 Nm
	Torque scatter (99,73%)	0,56	0,47 Nm
	C_m	3,17	3,82
	C_{mk}	2,56	2,70

b)	Min. C_m hard/soft (lowest value)	3,17
	Min. C_{mk} hard/soft (lowest value)	2,56

Capability is reached if minimum C_{mk} value ≥1.67

Note:

Machine Capability Study
Control System

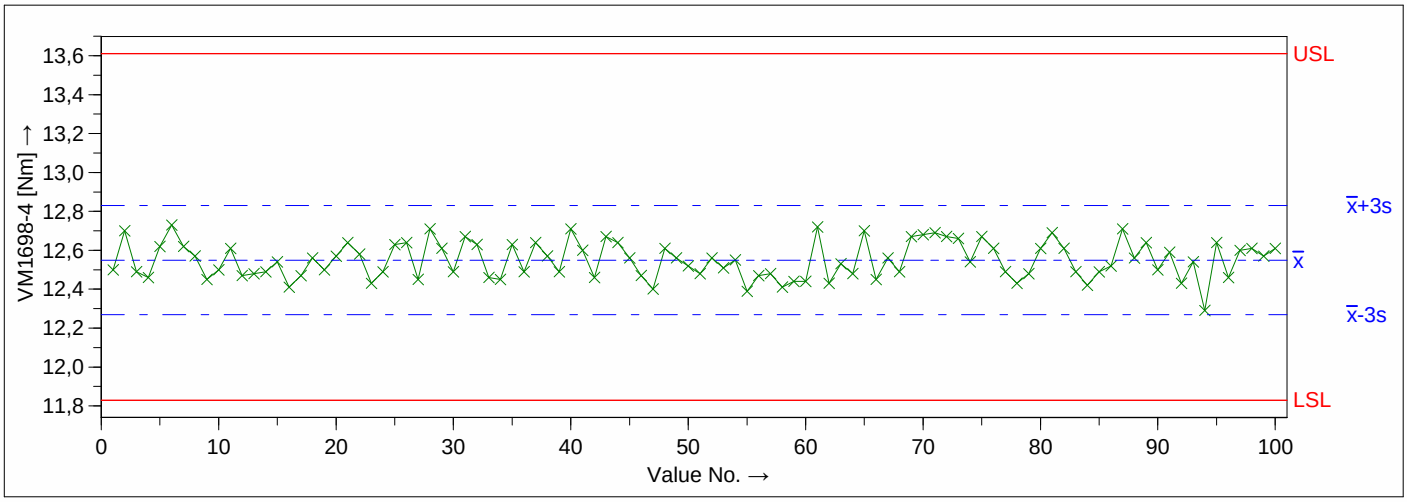
Cleco Production Tools

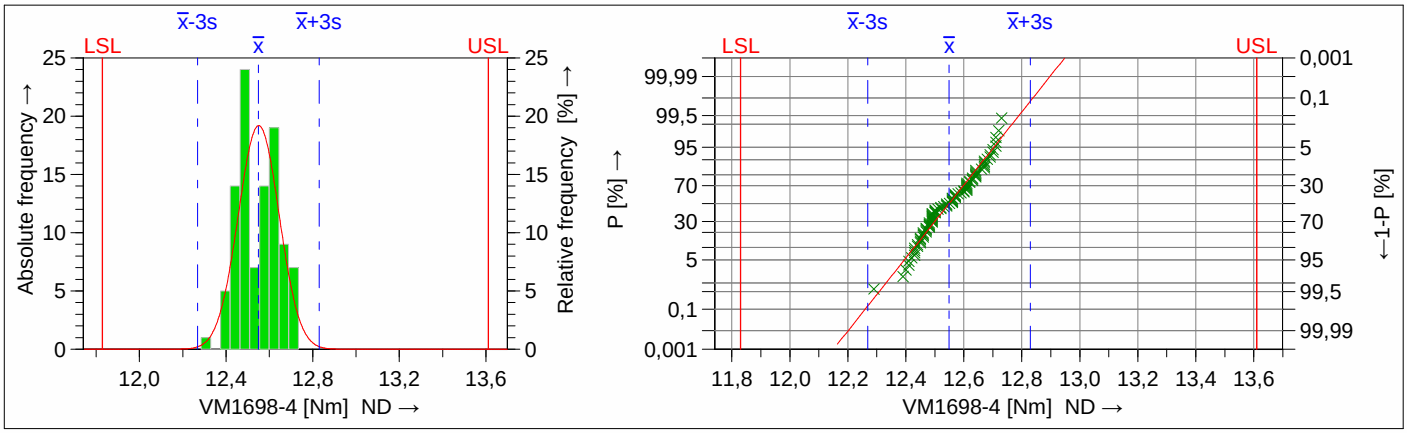
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_h	Char.Descr.	VM1698-4	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	1024210	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 10:04:47 to 25.07.2022 10:18:44

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			x̄	12.5490
LSL	11.83	x_{min}	12.29	x̄-3s	12.2685
USL	13.61	x_{max}	12.73	x̄+3s	12.8295
T	1.78	R	0.44	6s	0.5610
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	3.17
Critical capability index	=	C_{mk}	2.56

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_h	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	12,50	12,70	12,49	12,46	12,62	12,73	12,62	12,57	12,45	12,50
1024210	VM1698-4	Grad	30,00	30,75	29,00	29,50	28,75	29,50	29,25	29,25	29,25	29,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	12,61	12,47	12,48	12,49	12,54	12,41	12,47	12,56	12,50	12,57
1024210	VM1698-4	Grad	30,25	29,75	26,00	27,50	28,75	28,25	28,75	26,75	28,00	27,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	12,64	12,58	12,43	12,49	12,63	12,64	12,45	12,71	12,61	12,49
1024210	VM1698-4	Grad	31,50	31,00	27,25	31,00	30,00	28,00	31,00	32,50	31,25	31,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	12,67	12,63	12,46	12,45	12,63	12,49	12,64	12,57	12,49	12,71
1024210	VM1698-4	Grad	30,25	31,75	28,25	30,25	28,50	28,50	31,75	31,25	31,00	31,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	12,60	12,46	12,67	12,64	12,56	12,47	12,40	12,61	12,56	12,52
1024210	VM1698-4	Grad	29,00	30,25	32,00	32,00	31,00	30,75	30,25	31,00	28,75	29,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	12,48	12,56	12,51	12,55	12,39	12,47	12,48	12,41	12,44	12,44
1024210	VM1698-4	Grad	30,25	30,50	30,00	30,00	29,00	29,00	29,25	29,25	29,25	28,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	12,72	12,43	12,53	12,48	12,70	12,45	12,56	12,49	12,67	12,68
1024210	VM1698-4	Grad	31,00	26,75	30,00	29,50	29,25	30,50	31,25	31,75	31,50	32,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	12,69	12,67	12,66	12,54	12,67	12,61	12,49	12,43	12,48	12,61
1024210	VM1698-4	Grad	31,75	31,00	31,25	30,50	30,50	31,00	29,50	28,75	29,25	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_h	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	12,69	12,61	12,49	12,42	12,49	12,52	12,71	12,56	12,64	12,50
1024210	VM1698-4	Grad	31,00	31,00	30,00	30,00	30,00	28,25	31,50	30,75	30,50	30,50

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,59	12,43	12,54	12,29	12,64	12,46	12,60	12,61	12,57	12,61
1024210	VM1698-4	Grad	31,00	28,00	30,00	27,50	30,75	29,75	30,25	30,75	30,25	30,25

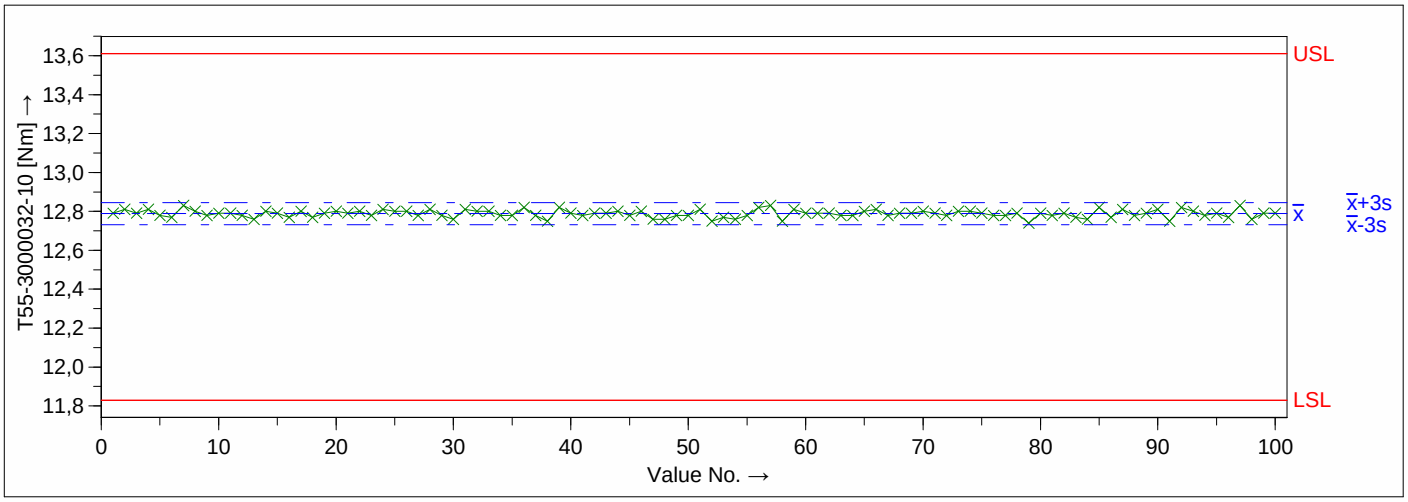
Machine Capability Study
Tool System

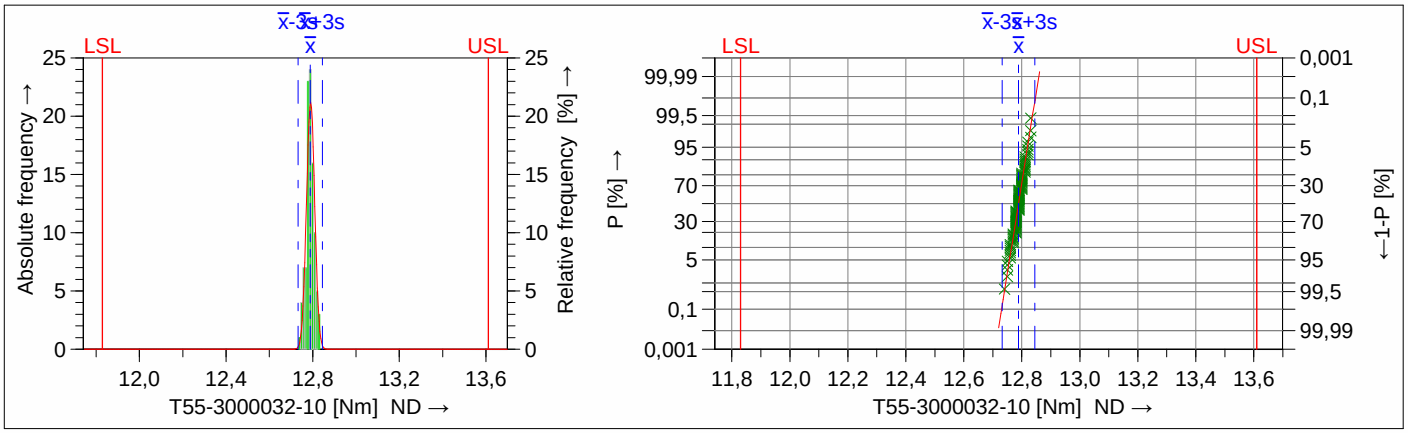
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_h	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	199777	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 10:04:47 to 25.07.2022 10:18:44

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7884
LSL	11.83	x_{min}	12.74	$\bar{x}$-3s	12.7320
USL	13.61	x_{max}	12.83	$\bar{x}$+3s	12.8448
T	1.78	R	0.09	6s	0.1127
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = s_{tot}
Potential Capability index	=	C_m	15.79
Critical capability index	=	C_{mk}	14.58

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	12,79	12,81	12,79	12,81	12,78	12,77	12,83	12,80	12,78	12,79
199777	T55-3000032-10	Grad	30,00	31,00	29,00	30,00	30,00	31,00	29,00	29,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	12,79	12,78	12,76	12,80	12,79	12,77	12,80	12,77	12,79	12,80
199777	T55-3000032-10	Grad	30,00	30,00	28,00	28,00	30,00	30,00	30,00	28,00	28,00	29,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	12,79	12,80	12,78	12,81	12,80	12,80	12,78	12,81	12,78	12,76
199777	T55-3000032-10	Grad	32,00	31,00	29,00	31,00	32,00	30,00	31,00	32,00	32,00	31,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	12,81	12,80	12,80	12,78	12,78	12,82	12,78	12,75	12,82	12,79
199777	T55-3000032-10	Grad	30,00	32,00	28,00	30,00	29,00	30,00	32,00	32,00	31,00	32,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	12,78	12,79	12,79	12,80	12,78	12,80	12,76	12,76	12,78	12,78
199777	T55-3000032-10	Grad	31,00	31,00	32,00	32,00	30,00	31,00	30,00	31,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	12,81	12,75	12,77	12,76	12,78	12,82	12,83	12,75	12,81	12,79
199777	T55-3000032-10	Grad	30,00	31,00	30,00	30,00	29,00	29,00	30,00	29,00	29,00	29,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	12,79	12,79	12,78	12,78	12,80	12,81	12,78	12,79	12,79	12,80
199777	T55-3000032-10	Grad	31,00	27,00	30,00	30,00	30,00	31,00	31,00	32,00	32,00	32,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	12,79	12,78	12,80	12,80	12,79	12,78	12,78	12,79	12,74	12,79
199777	T55-3000032-10	Grad	32,00	31,00	31,00	30,00	31,00	31,00	30,00	29,00	30,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	12,78	12,79	12,77	12,76	12,82	12,77	12,81	12,78	12,79	12,81
199777	T55-3000032-10	Grad	31,00	31,00	30,00	30,00	30,00	28,00	32,00	31,00	31,00	31,00

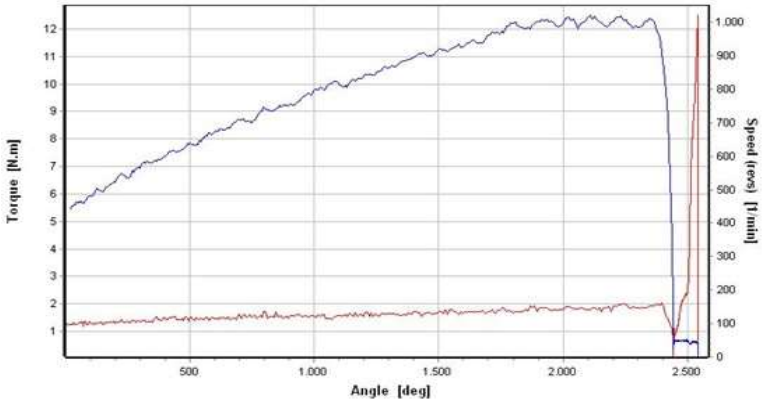
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	12,75	12,82	12,80	12,78	12,79	12,77	12,83	12,76	12,79	12,79
199777	T55-3000032-10	Grad	31,00	28,00	30,00	29,00	31,00	30,00	30,00	31,00	30,00	31,00

Torque graphs

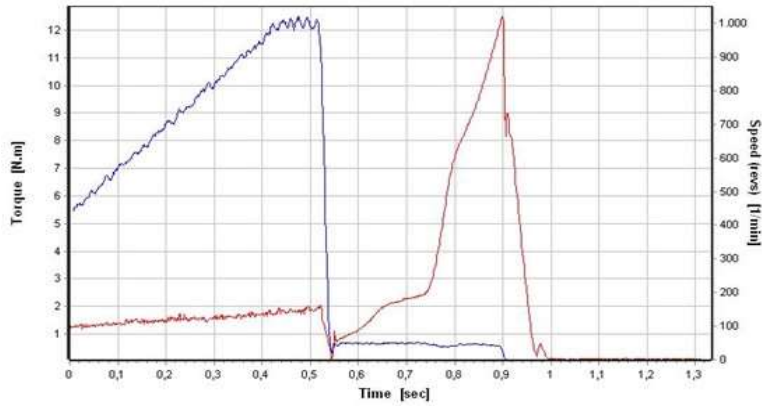
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019841**

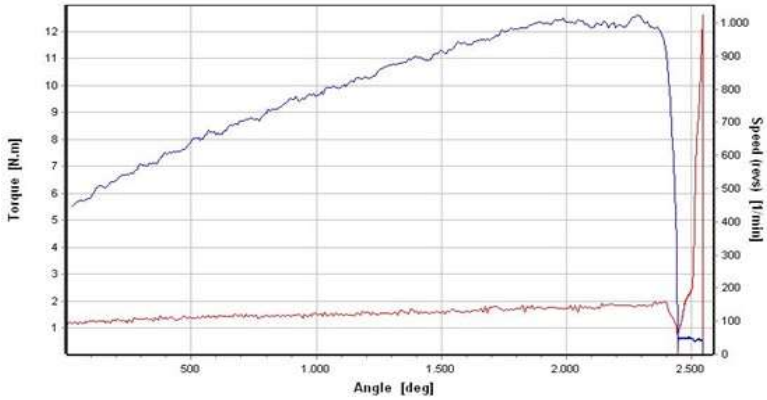
Angle degree: **30°**
Test torque: **12,7 Nm**



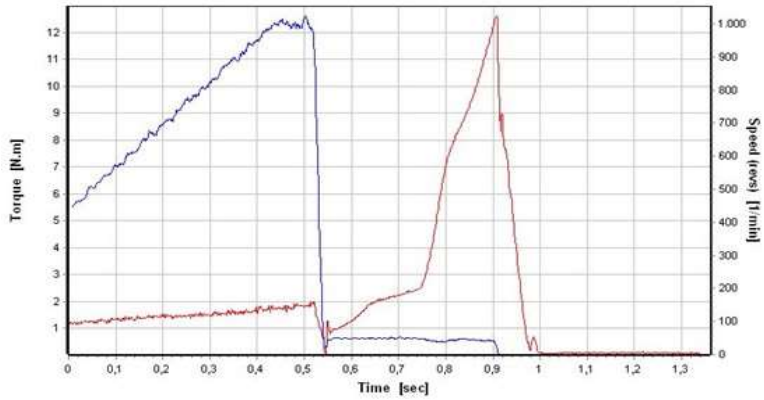
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

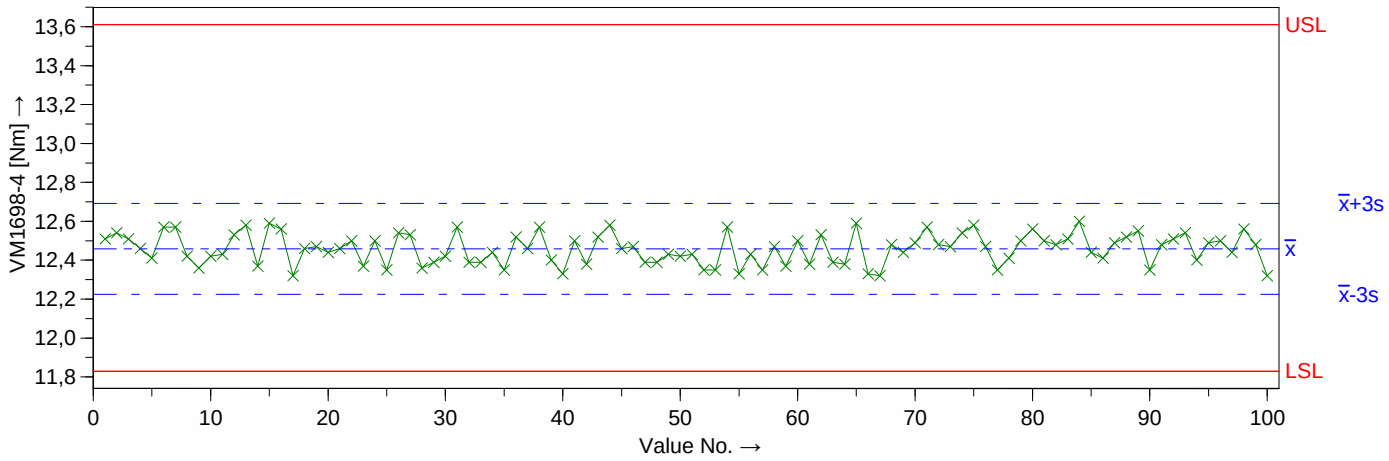
Cleco Production Tools

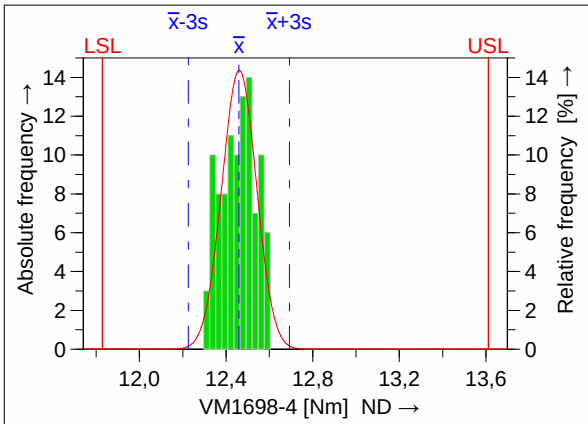
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

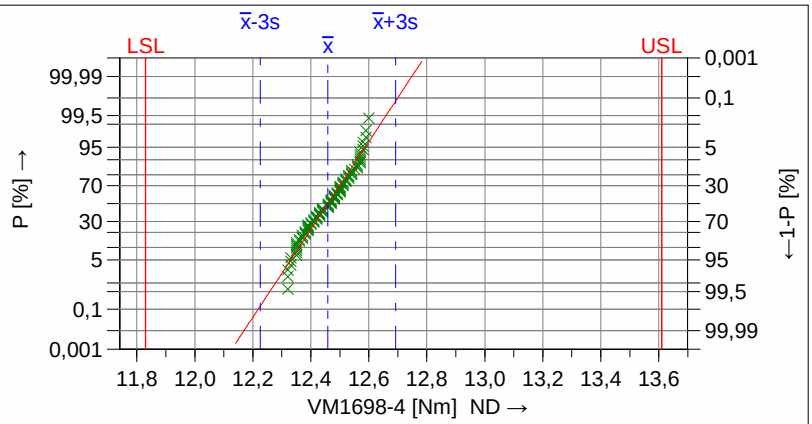
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_g	Char.Descr.	VM1698-4	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	1024210	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 11:14:19 to 25.07.2022 12:19:42

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.4588
LSL	11.83	x_{min}	12.32	$\bar{x}$-3s	12.2256
USL	13.61	x_{max}	12.60	$\bar{x}$+3s	12.6920
T	1.78	R	0.28	6s	0.4665
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	3.82
Critical capability index	=	C_{mk}	2.70

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_g	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	12,51	12,54	12,51	12,46	12,41	12,57	12,57	12,42	12,36	12,42
1024210	VM1698-4	Grad	367,50	356,25	371,25	360,00	371,75	357,25	373,25	366,50	360,75	362,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	12,43	12,53	12,58	12,37	12,59	12,56	12,32	12,46	12,47	12,44
1024210	VM1698-4	Grad	356,50	359,25	367,50	355,50	370,75	375,50	359,25	369,50	340,00	338,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	12,46	12,50	12,37	12,50	12,35	12,54	12,53	12,36	12,39	12,42
1024210	VM1698-4	Grad	346,25	359,25	361,25	384,25	360,00	369,00	354,25	345,50	349,50	348,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	12,57	12,39	12,39	12,44	12,35	12,52	12,46	12,57	12,40	12,33
1024210	VM1698-4	Grad	369,50	360,75	354,50	349,00	357,25	369,00	354,50	380,25	364,75	369,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	12,50	12,38	12,52	12,58	12,46	12,47	12,39	12,39	12,43	12,42
1024210	VM1698-4	Grad	344,50	352,75	367,25	369,25	370,25	358,25	364,75	373,25	356,25	372,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	12,43	12,35	12,35	12,57	12,33	12,43	12,35	12,47	12,37	12,50
1024210	VM1698-4	Grad	364,25	356,75	363,50	367,75	358,75	362,25	356,00	370,25	359,25	361,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	12,38	12,53	12,39	12,38	12,59	12,33	12,32	12,48	12,44	12,49
1024210	VM1698-4	Grad	352,00	352,25	361,50	352,50	365,50	343,25	349,25	358,25	359,50	364,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	12,57	12,48	12,47	12,54	12,58	12,47	12,35	12,41	12,50	12,56
1024210	VM1698-4	Grad	365,25	359,75	351,50	361,75	384,00	359,25	360,75	368,25	359,50	357,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_g	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	12,50	12,48	12,51	12,60	12,44	12,41	12,49	12,52	12,55	12,35
1024210	VM1698-4	Grad	362,00	352,50	358,75	364,75	354,75	348,25	361,50	353,25	372,75	353,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,48	12,51	12,54	12,40	12,49	12,50	12,44	12,56	12,48	12,32
1024210	VM1698-4	Grad	364,50	361,25	359,00	352,50	365,75	368,50	361,50	365,25	368,25	343,75

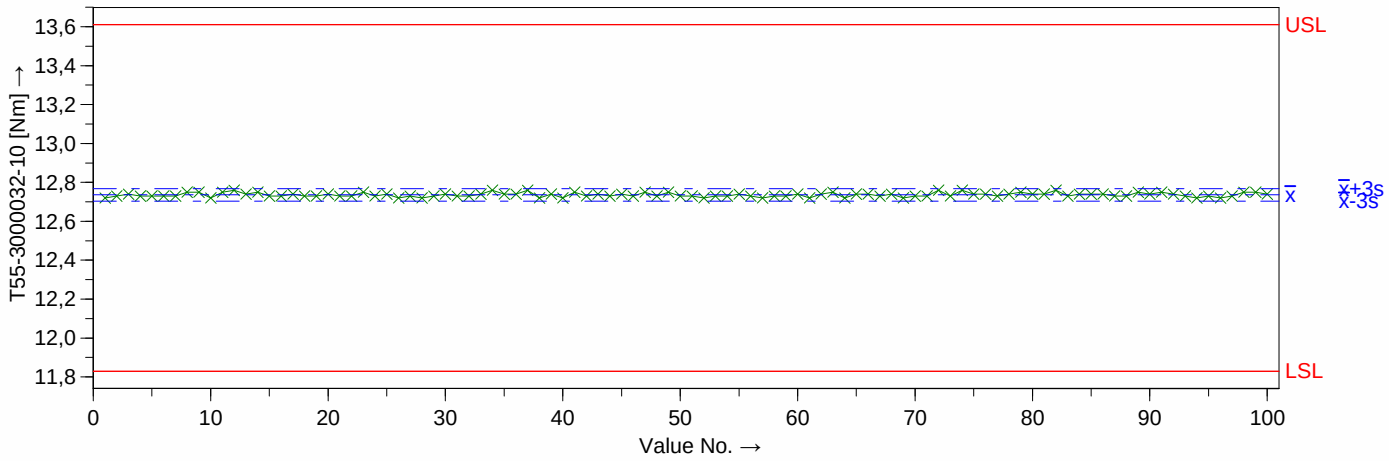
Machine Capability Study
Tool System

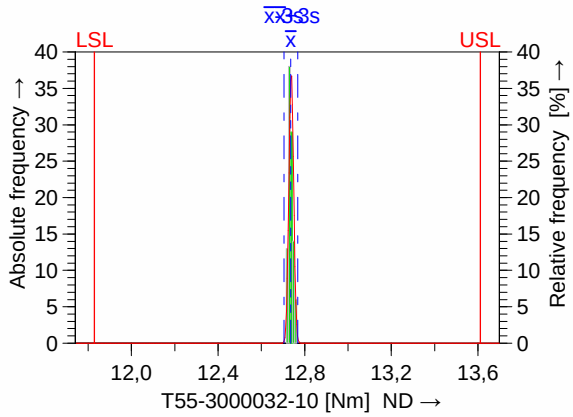
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

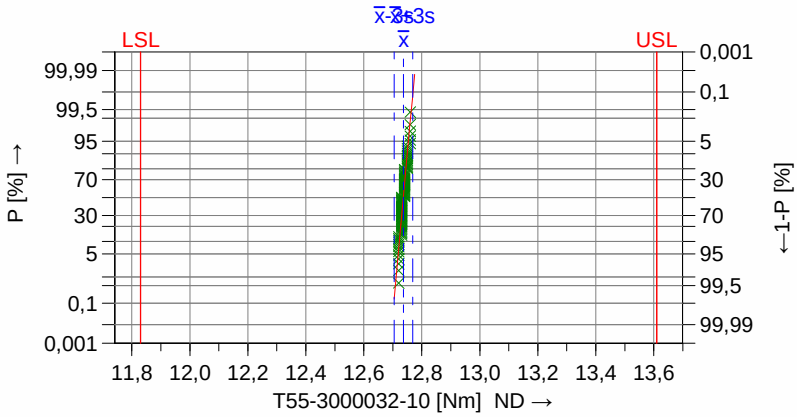
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_g	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	199777	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 11:14:19 to 25.07.2022 12:19:42

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7362
LSL	11.83	x_{min}	12.72	$\bar{x}$-3s	12.7041
USL	13.61	x_{max}	12.76	$\bar{x}$+3s	12.7683
T	1.78	R	0.04	6s	0.0643
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	27.70
Critical capability index	=	C_{mk}	27.20

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	12,72	12,73	12,74	12,73	12,73	12,73	12,73	12,75	12,75	12,72
199777	T55-3000032-10	Grad	378,00	359,00	377,00	362,00	379,00	362,00	380,00	375,00	363,00	366,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	12,75	12,76	12,74	12,75	12,73	12,73	12,74	12,73	12,73	12,74
199777	T55-3000032-10	Grad	361,00	374,00	374,00	361,00	376,00	379,00	363,00	380,00	344,00	342,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	12,73	12,73	12,75	12,73	12,74	12,72	12,73	12,72	12,73	12,74
199777	T55-3000032-10	Grad	361,00	362,00	377,00	397,00	362,00	376,00	358,00	360,00	357,00	358,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	12,73	12,73	12,74	12,76	12,74	12,74	12,76	12,72	12,74	12,72
199777	T55-3000032-10	Grad	376,00	364,00	360,00	359,00	362,00	377,00	361,00	381,00	369,00	380,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	12,75	12,73	12,74	12,73	12,74	12,73	12,75	12,73	12,75	12,73
199777	T55-3000032-10	Grad	356,00	359,00	376,00	375,00	380,00	363,00	379,00	379,00	361,00	380,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	12,73	12,72	12,73	12,73	12,74	12,73	12,72	12,73	12,73	12,74
199777	T55-3000032-10	Grad	380,00	363,00	366,00	377,00	364,00	366,00	362,00	379,00	364,00	362,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	12,72	12,74	12,75	12,72	12,74	12,74	12,73	12,74	12,72	12,73
199777	T55-3000032-10	Grad	358,00	359,00	363,00	361,00	374,00	358,00	359,00	361,00	365,00	374,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	12,73	12,76	12,73	12,76	12,74	12,74	12,73	12,74	12,75	12,74
199777	T55-3000032-10	Grad	368,00	361,00	358,00	363,00	393,00	361,00	365,00	378,00	361,00	370,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	12,74	12,76	12,73	12,74	12,74	12,74	12,73	12,73	12,75	12,74
199777	T55-3000032-10	Grad	362,00	358,00	362,00	367,00	362,00	356,00	364,00	358,00	378,00	359,00

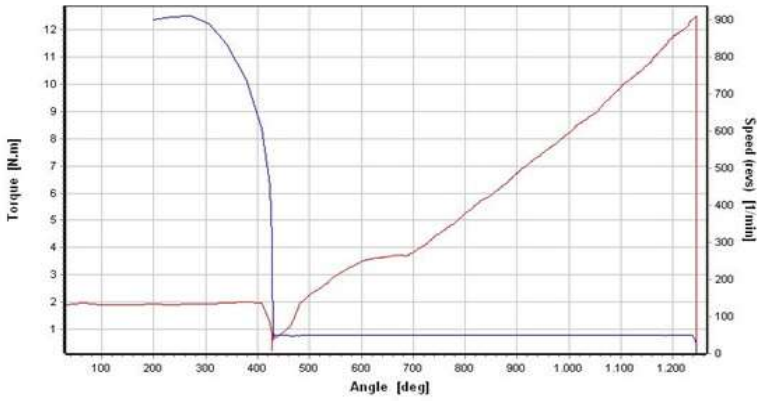
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	12,75	12,74	12,73	12,72	12,73	12,72	12,73	12,75	12,75	12,74
199777	T55-3000032-10	Grad	367,00	362,00	371,00	359,00	378,00	377,00	365,00	376,00	380,00	344,00

Torque graphs

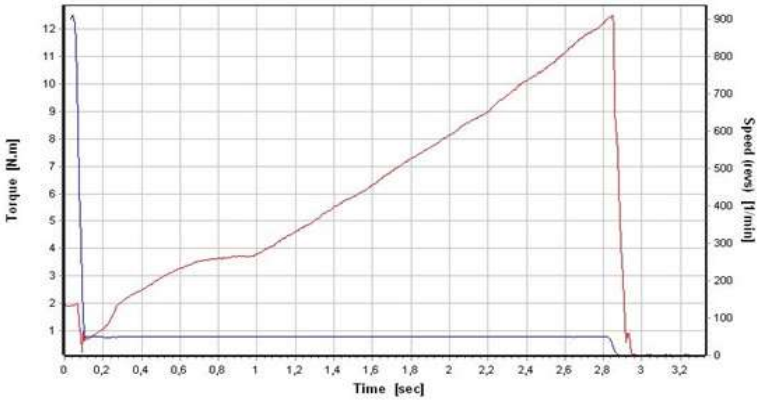
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019841**

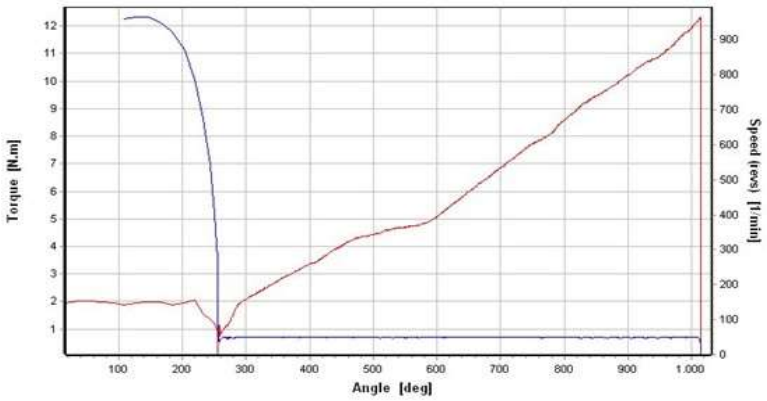
Angle degree: **360°**
Test torque: **12,7 Nm**



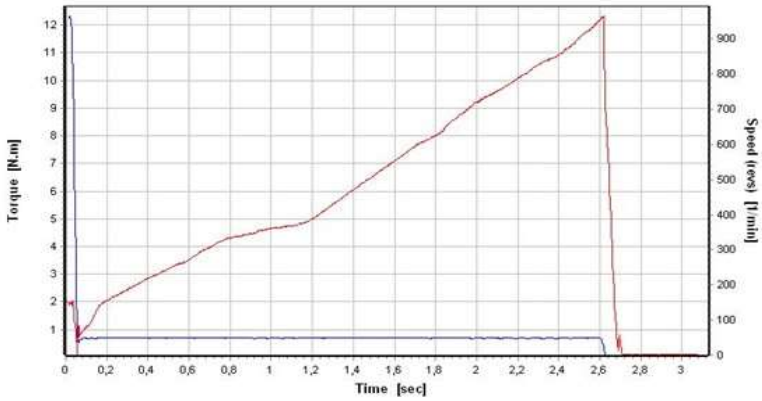
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

Multi-stage tightening system	☑	Speed 50 rpm	4,9 %
Single-stage tightening system	☐	Speed 100 %	1025 rpm

Manufacturer: Apex Tool Group

Serial no: **1019841**

Test torque: Tq max. 15,00 Nm

Hard joint (H)	89,60	Nm / Revolution	Angle degree	30°
Soft joint (L)	7,33	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	13,95 16,05 Nm	13,95 - 16,05 Nm
	Tolerance down / up	7	7 %
	Average torque	14,93	14,66 Nm
	Standard deviation	0,08	0,10 Nm
	Torque scatter (99,73%)	0,46	0,57 Nm
	C_m	4,54	3,68
	C_{mk}	4,26	2,49

b)	Min. C_m hard/soft (lowest value)	3,68
	Min. C_{mk} hard/soft (lowest value)	2,49

Capability is reached if minimum C_{mk} value ≥1.67

Note:

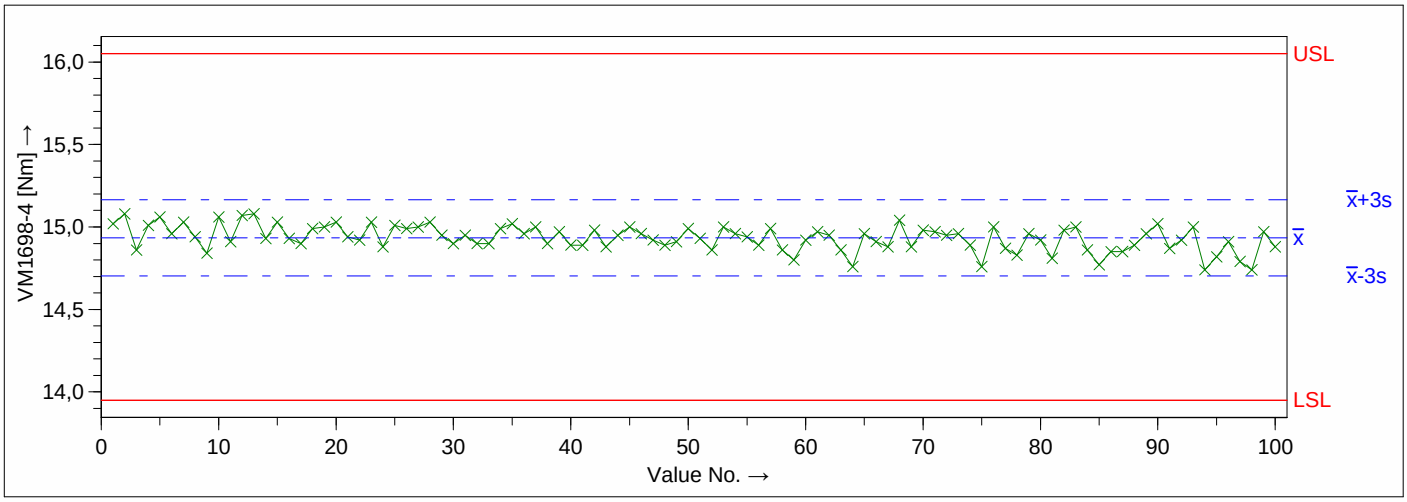
Machine Capability Study
Control System

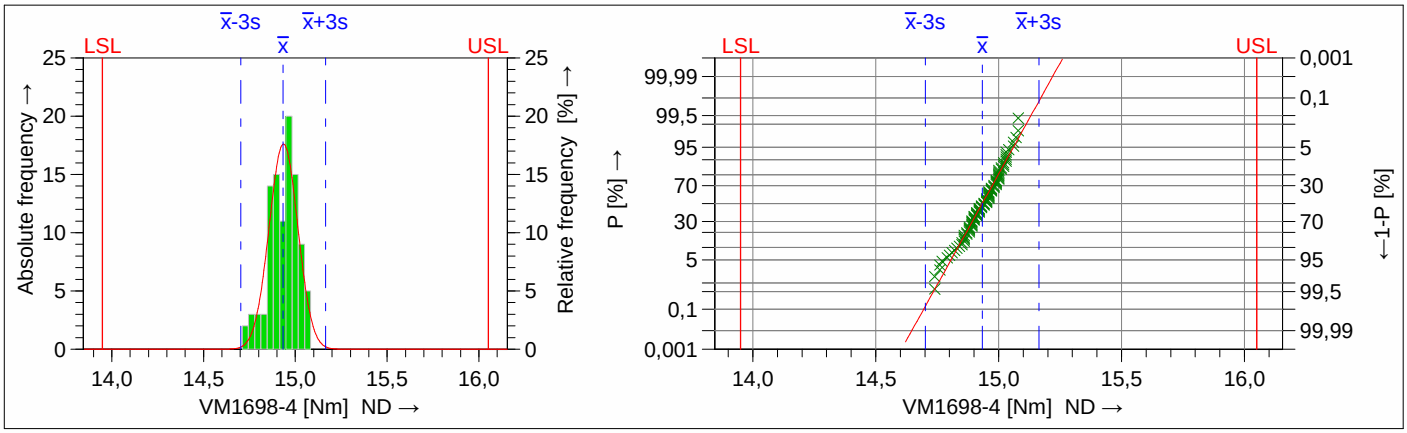
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_b	Char.Descr.	VM1698-4	Nom.val. 15,00	1,05 USL 16,05
		Serial No.	1024210	Unit Nm	-1,05 LSL 13,95
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 07:58:13 to 25.07.2022 08:08:54

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	14.9331
LSL	13.95	x_{min}	14.74	$\bar{x}$-3s	14.7021
USL	16.05	x_{max}	15.08	$\bar{x}$+3s	15.1641
T	2.10	R	0.34	6s	0.4621
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	4.54
Critical capability index	=	C_{mk}	4.26

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_b	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	15,02	15,08	14,86	15,01	15,06	14,96	15,03	14,94	14,84	15,06
1024210	VM1698-4	Grad	31,00	31,00	31,00	31,25	31,50	31,50	31,50	31,00	31,50	31,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	14,91	15,07	15,08	14,93	15,03	14,93	14,90	14,99	15,00	15,03
1024210	VM1698-4	Grad	31,00	31,00	31,00	30,25	30,00	30,25	30,25	31,25	30,50	31,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	14,94	14,92	15,03	14,88	15,01	14,99	15,00	15,03	14,95	14,90
1024210	VM1698-4	Grad	29,50	30,00	29,75	30,25	30,25	30,25	30,50	30,00	30,00	29,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	14,95	14,90	14,90	14,99	15,02	14,96	15,00	14,90	14,97	14,89
1024210	VM1698-4	Grad	30,25	29,75	30,50	31,25	30,25	30,25	30,25	30,00	30,75	29,50

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	14,89	14,98	14,88	14,95	15,00	14,96	14,92	14,89	14,91	14,99
1024210	VM1698-4	Grad	30,00	30,50	29,75	30,25	29,50	30,25	30,50	29,75	30,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	14,93	14,86	15,00	14,96	14,94	14,89	14,99	14,86	14,80	14,92
1024210	VM1698-4	Grad	31,25	29,50	30,50	30,25	30,25	29,75	30,25	30,00	30,50	30,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	14,97	14,95	14,86	14,76	14,96	14,91	14,88	15,04	14,88	14,98
1024210	VM1698-4	Grad	30,00	30,75	30,50	29,75	30,00	30,25	30,50	30,50	30,75	31,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	14,97	14,95	14,96	14,89	14,76	15,00	14,87	14,83	14,96	14,92
1024210	VM1698-4	Grad	29,50	30,50	29,25	29,25	29,25	29,50	28,75	29,00	30,75	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_b	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	14,81	14,98	15,00	14,86	14,77	14,85	14,85	14,89	14,96	15,02
1024210	VM1698-4	Grad	29,50	30,00	31,50	30,50	29,75	29,00	30,50	30,25	30,75	31,00

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,87	14,92	15,00	14,74	14,82	14,91	14,79	14,74	14,97	14,88
1024210	VM1698-4	Grad	29,75	29,00	30,50	29,50	29,25	31,00	29,00	29,50	29,75	30,50

Machine Capability Study
Tool System

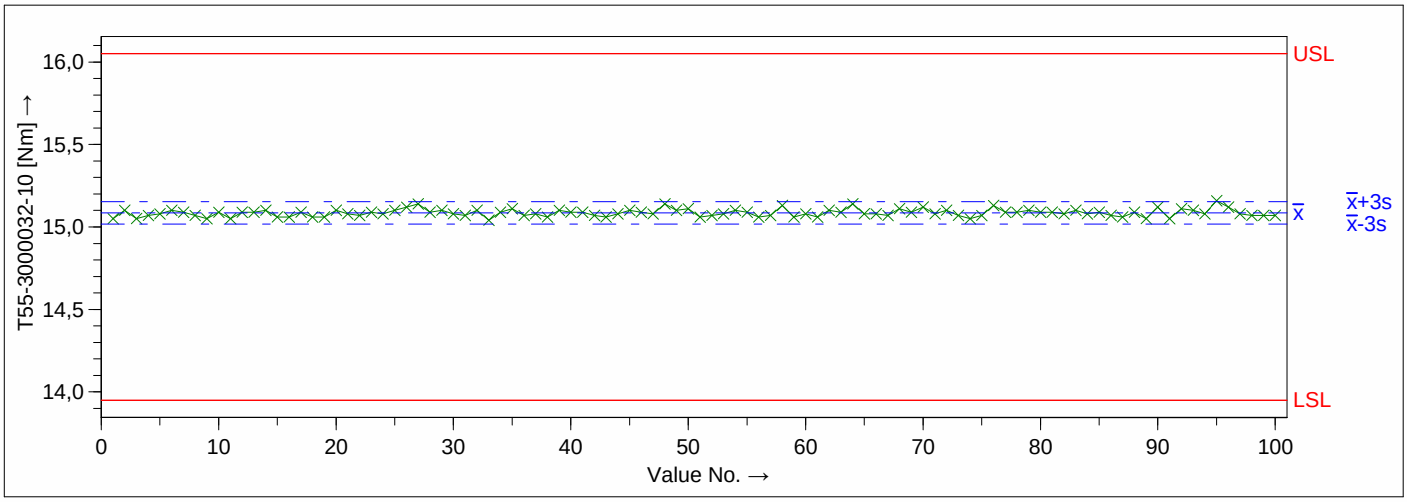
Page 1 / 1

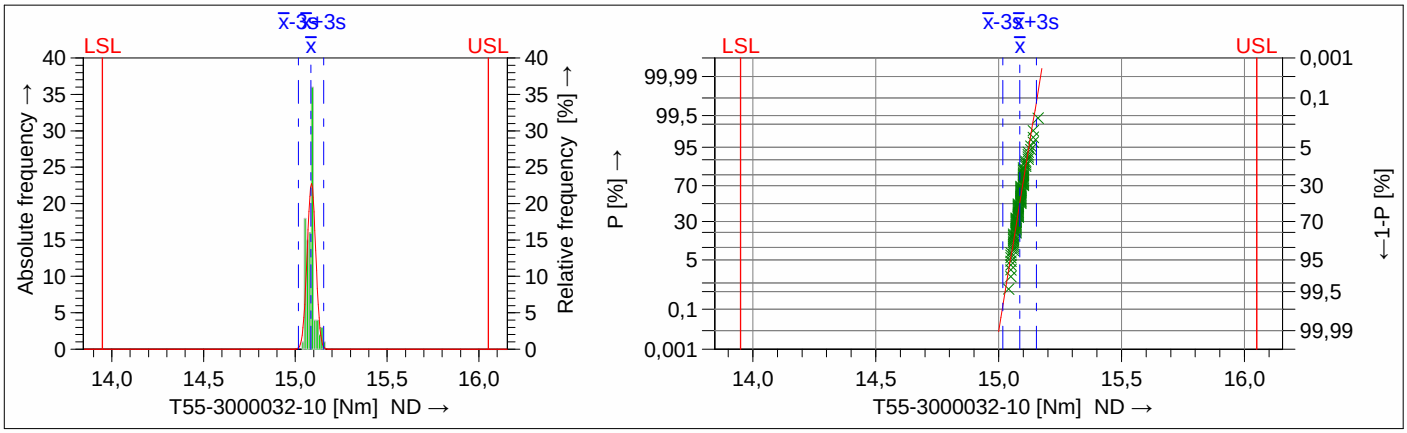
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_b	Char.Descr.	T55-3000032-10	Nom.val. 15,00 / 1,05	USL 16,05
		Serial No.	199777	Unit Nm / -1,05	LSL 13,95
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 07:58:13 to 25.07.2022 08:08:53

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0854
LSL	13.95	x_{min}	15.04	$\bar{x}$-3s	15.0170
USL	16.05	x_{max}	15.16	$\bar{x}$+3s	15.1538
T	2.10	R	0.12	6s	0.1368
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	15.35
Critical capability index	=	C_{mk}	14.10

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	15,05	15,10	15,05	15,07	15,08	15,10	15,09	15,07	15,05	15,09
199777	T55-3000032-10	Grad	32,00	32,00	32,00	33,00	32,00	33,00	33,00	32,00	33,00	33,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	15,05	15,09	15,09	15,10	15,06	15,06	15,09	15,06	15,06	15,10
199777	T55-3000032-10	Grad	32,00	33,00	32,00	32,00	32,00	31,00	32,00	32,00	31,00	33,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	15,08	15,07	15,09	15,08	15,10	15,12	15,14	15,09	15,10	15,08
199777	T55-3000032-10	Grad	30,00	32,00	31,00	32,00	32,00	31,00	32,00	31,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	15,07	15,10	15,04	15,09	15,11	15,07	15,08	15,06	15,10	15,09
199777	T55-3000032-10	Grad	32,00	31,00	32,00	32,00	31,00	32,00	32,00	32,00	32,00	30,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	15,09	15,07	15,06	15,08	15,10	15,09	15,08	15,14	15,10	15,11
199777	T55-3000032-10	Grad	32,00	31,00	31,00	31,00	30,00	31,00	32,00	30,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	15,06	15,07	15,08	15,10	15,09	15,06	15,07	15,13	15,06	15,08
199777	T55-3000032-10	Grad	32,00	31,00	32,00	31,00	31,00	31,00	32,00	30,00	31,00	32,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	15,06	15,10	15,09	15,14	15,08	15,08	15,07	15,11	15,09	15,12
199777	T55-3000032-10	Grad	31,00	32,00	32,00	30,00	31,00	32,00	32,00	32,00	32,00	32,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	15,08	15,10	15,07	15,05	15,07	15,13	15,09	15,09	15,10	15,09
199777	T55-3000032-10	Grad	31,00	31,00	30,00	30,00	30,00	30,00	29,00	30,00	32,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	15,09	15,08	15,10	15,08	15,09	15,07	15,06	15,09	15,05	15,12
199777	T55-3000032-10	Grad	30,00	31,00	33,00	32,00	30,00	31,00	32,00	32,00	31,00	32,00

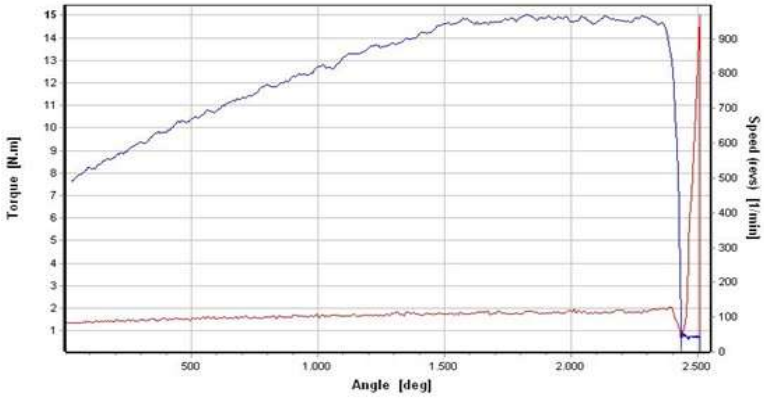
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	15,05	15,11	15,10	15,08	15,16	15,12	15,08	15,07	15,07	15,07
199777	T55-3000032-10	Grad	31,00	30,00	32,00	31,00	30,00	32,00	30,00	30,00	30,00	32,00

Torque graphs

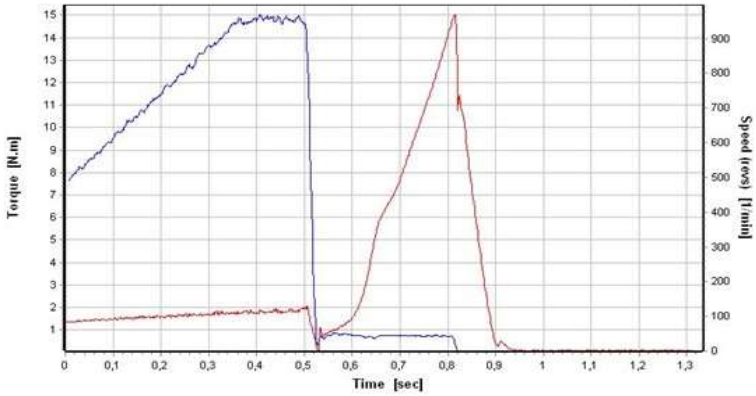
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019841**

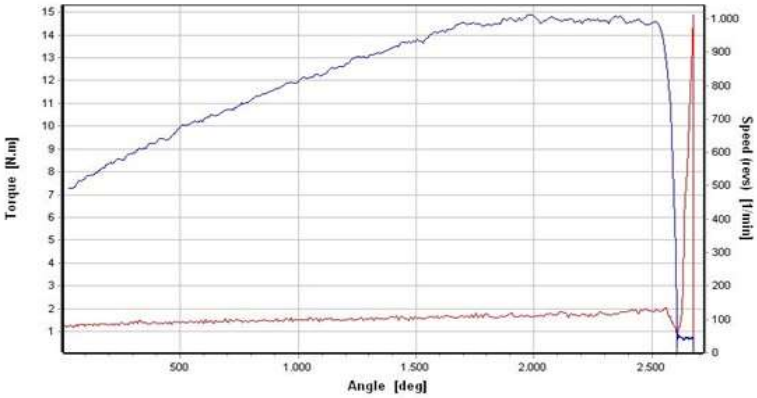
Angle degree: **30°**
Test torque: **15,0 Nm**



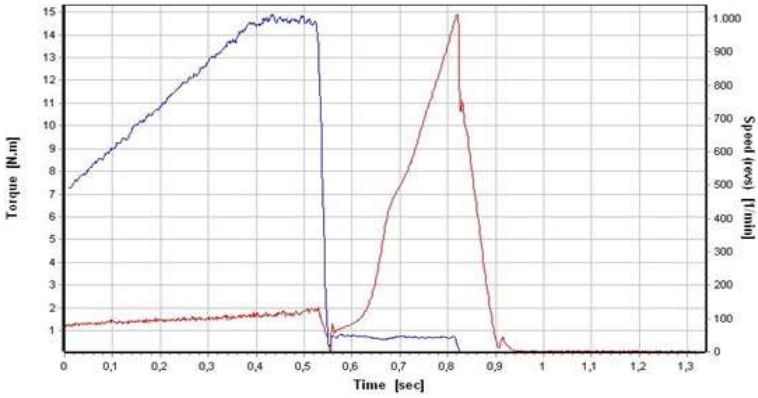
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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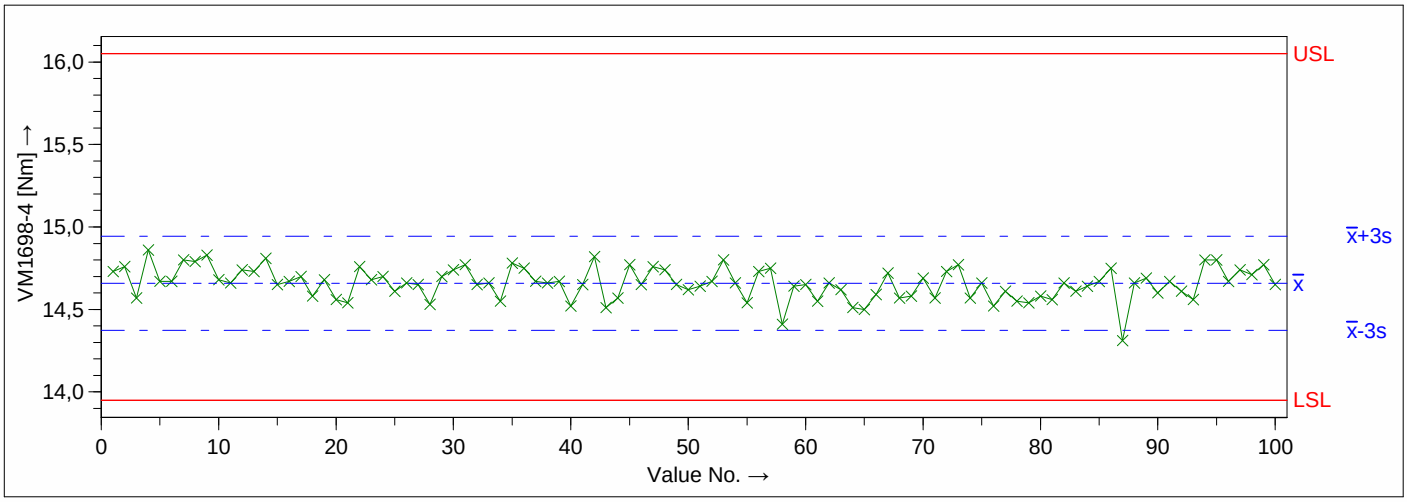
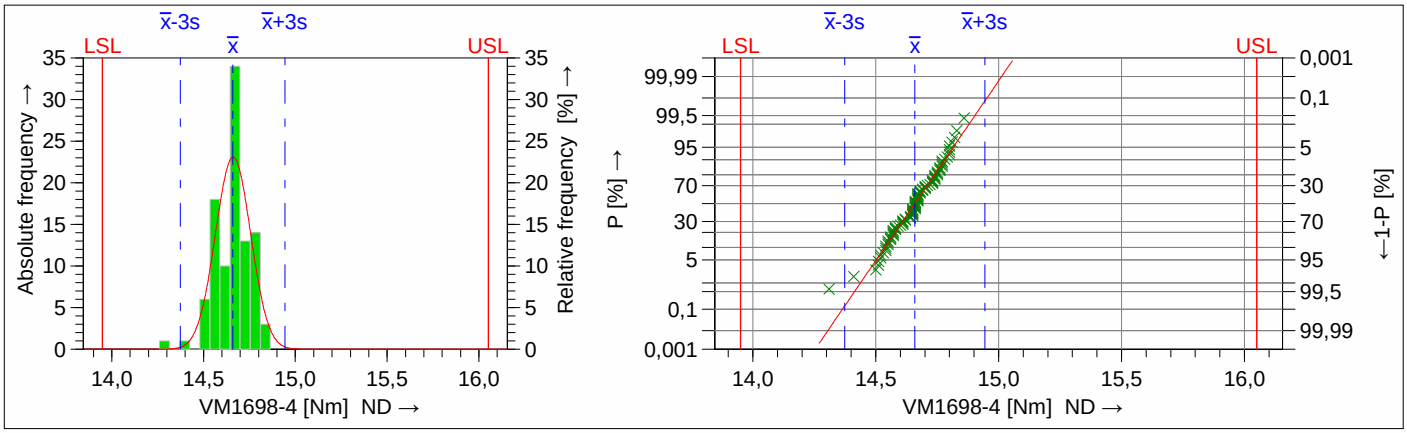
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_a	Char.Descr.	VM1698-4	Nom.val. 15,00	1,05 USL 16,05
		Serial No.	1024210	Unit Nm	-1,05 LSL 13,95
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 26.07.2022 07:38:28 to 26.07.2022 09:40:26

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	14.6584
LSL	13.95	x_{min}	14.31	$\bar{x}$-3s	14.3734
USL	16.05	x_{max}	14.86	$\bar{x}$+3s	14.9434
T	2.10	R	0.55	6s	0.5701
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	3.68
Critical capability index	=	C_{mk}	2.49

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019841_aM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_a	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	14,73	14,76	14,57	14,86	14,67	14,67	14,80	14,79	14,83	14,68
1024210	VM1698-4	Grad	347,75	348,50	343,75	365,50	342,50	349,00	350,00	348,75	360,50	352,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	14,66	14,74	14,73	14,81	14,65	14,67	14,70	14,58	14,68	14,56
1024210	VM1698-4	Grad	343,50	342,50	350,50	346,00	364,50	347,00	360,50	340,50	349,00	352,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	14,54	14,76	14,68	14,70	14,61	14,66	14,65	14,53	14,70	14,74
1024210	VM1698-4	Grad	347,00	356,75	358,50	357,50	363,50	365,25	361,00	353,50	365,50	364,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	14,77	14,65	14,66	14,55	14,78	14,75	14,67	14,66	14,67	14,52
1024210	VM1698-4	Grad	369,75	356,00	366,25	359,50	375,50	362,00	362,50	359,75	357,00	363,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	14,65	14,82	14,51	14,57	14,77	14,65	14,76	14,74	14,65	14,62
1024210	VM1698-4	Grad	363,25	365,75	347,75	359,25	370,25	360,75	366,50	360,75	356,50	367,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	14,64	14,67	14,80	14,66	14,54	14,73	14,75	14,41	14,64	14,65
1024210	VM1698-4	Grad	363,75	357,50	361,25	348,75	357,50	366,25	365,00	349,25	358,25	365,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	14,55	14,66	14,62	14,51	14,50	14,59	14,72	14,57	14,58	14,69
1024210	VM1698-4	Grad	352,25	355,75	361,50	354,25	350,00	360,00	360,00	357,00	355,50	358,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	14,57	14,73	14,77	14,57	14,66	14,52	14,61	14,55	14,54	14,58
1024210	VM1698-4	Grad	361,25	363,75	365,75	355,50	356,25	349,00	360,50	360,00	356,25	354,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_a	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	14,56	14,66	14,61	14,64	14,67	14,75	14,31	14,66	14,69	14,60
1024210	VM1698-4	Grad	355,50	363,00	369,25	359,50	361,00	362,00	335,75	363,00	361,50	357,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,67	14,61	14,56	14,80	14,80	14,67	14,74	14,71	14,77	14,65
1024210	VM1698-4	Grad	358,50	354,00	360,50	367,75	366,75	359,75	364,75	357,25	365,50	354,75

Machine Capability Study
Tool System

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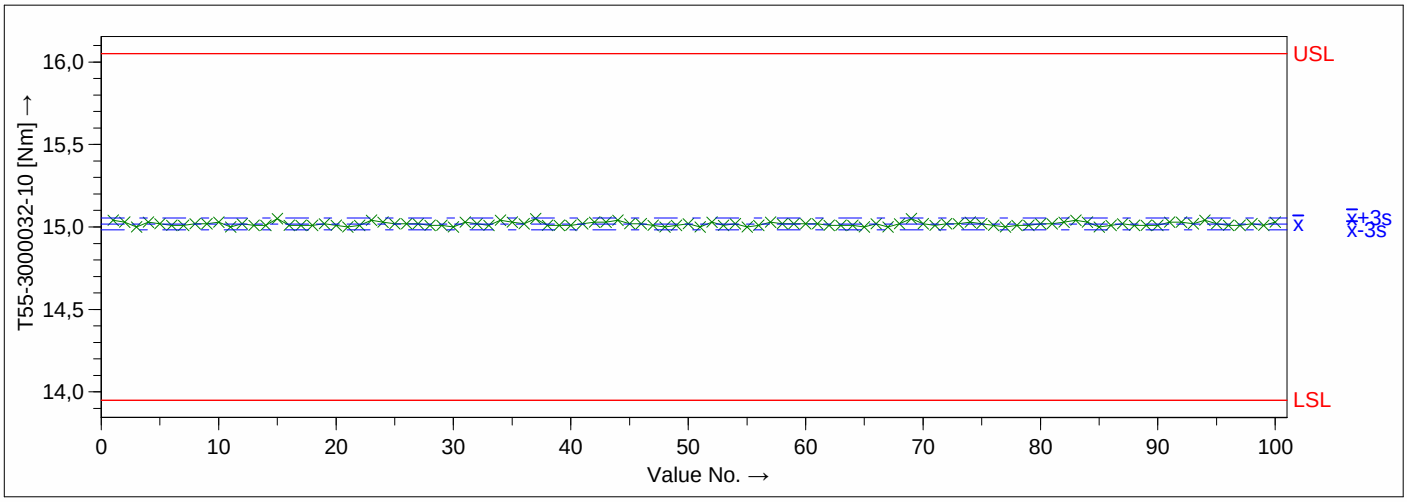
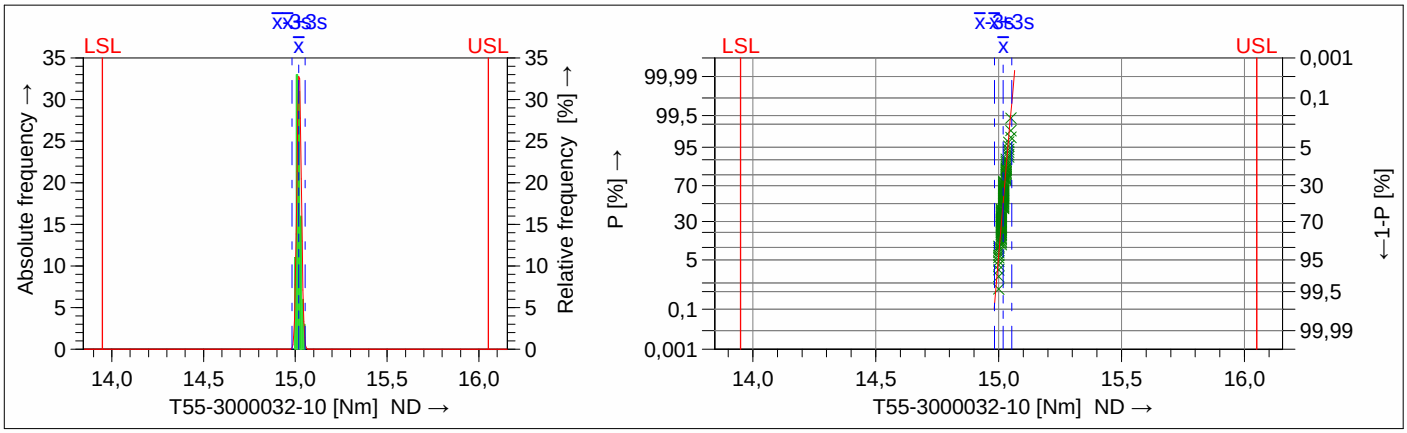
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_a	Char.Descr.	T55-3000032-10	Nom.val. 15,00 1,05	USL 16,05
		Serial No.	199777	Unit Nm -1,05	LSL 13,95
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 26.07.2022 07:38:28 to 26.07.2022 09:40:26

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0182
LSL	13.95	x_{min}	15.00	$\bar{x}$-3s	14.9824
USL	16.05	x_{max}	15.05	$\bar{x}$+3s	15.0540
T	2.10	R	0.05	6s	0.0715
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	29.35
Critical capability index	=	C_{mk}	28.84

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	15,04	15,03	15,00	15,03	15,02	15,01	15,01	15,02	15,02	15,03
199777	T55-3000032-10	Grad	356,00	357,00	360,00	372,00	355,00	361,00	353,00	356,00	369,00	359,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	15,00	15,02	15,01	15,01	15,05	15,01	15,01	15,01	15,02	15,01
199777	T55-3000032-10	Grad	348,00	343,00	358,00	355,00	378,00	354,00	364,00	360,00	361,00	356,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	15,00	15,01	15,04	15,03	15,02	15,02	15,02	15,01	15,01	15,00
199777	T55-3000032-10	Grad	357,00	361,00	362,00	361,00	369,00	377,00	365,00	361,00	373,00	373,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	15,03	15,02	15,01	15,04	15,03	15,02	15,05	15,01	15,01	15,01
199777	T55-3000032-10	Grad	375,00	360,00	377,00	362,00	381,00	370,00	366,00	362,00	364,00	368,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	15,02	15,03	15,03	15,04	15,02	15,02	15,01	15,00	15,01	15,02
199777	T55-3000032-10	Grad	366,00	375,00	360,00	364,00	377,00	365,00	374,00	372,00	362,00	379,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	15,00	15,03	15,01	15,02	15,00	15,01	15,03	15,02	15,02	15,02
199777	T55-3000032-10	Grad	375,00	362,00	371,00	361,00	364,00	376,00	375,00	361,00	362,00	375,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	15,02	15,01	15,01	15,01	15,00	15,02	15,00	15,02	15,05	15,02
199777	T55-3000032-10	Grad	362,00	361,00	369,00	365,00	357,00	366,00	372,00	362,00	361,00	376,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	15,01	15,02	15,02	15,03	15,02	15,01	15,00	15,01	15,01	15,02
199777	T55-3000032-10	Grad	374,00	373,00	375,00	369,00	361,00	359,00	368,00	372,00	362,00	362,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	15,02	15,03	15,04	15,03	15,00	15,01	15,02	15,01	15,01	15,01
199777	T55-3000032-10	Grad	366,00	379,00	377,00	365,00	368,00	372,00	342,00	373,00	372,00	363,00

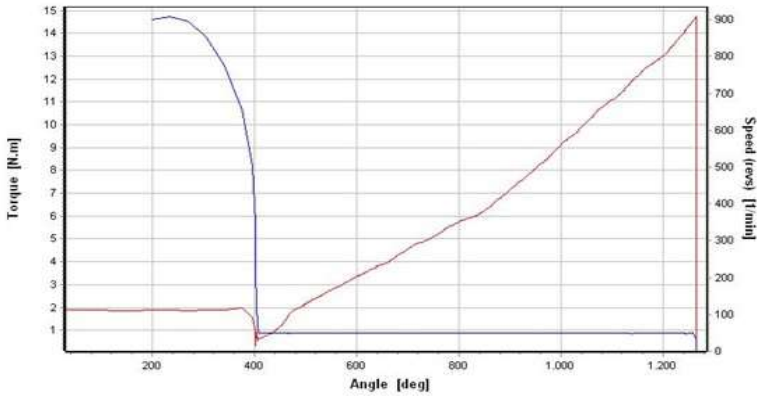
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	15,03	15,03	15,02	15,04	15,02	15,01	15,01	15,02	15,01	15,03
199777	T55-3000032-10	Grad	367,00	361,00	365,00	374,00	373,00	370,00	374,00	360,00	373,00	360,00

Torque graphs

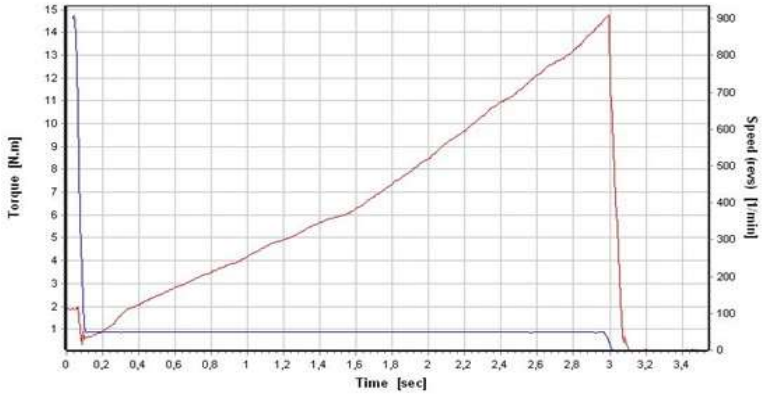
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019841**

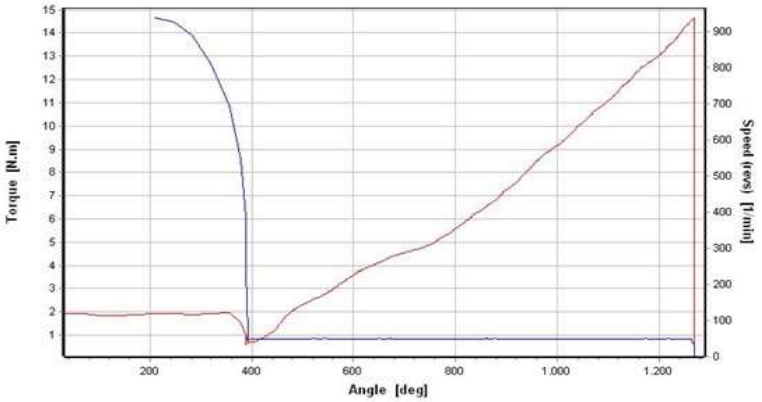
Angle degree: **360°**
Test torque: **15,0 Nm**



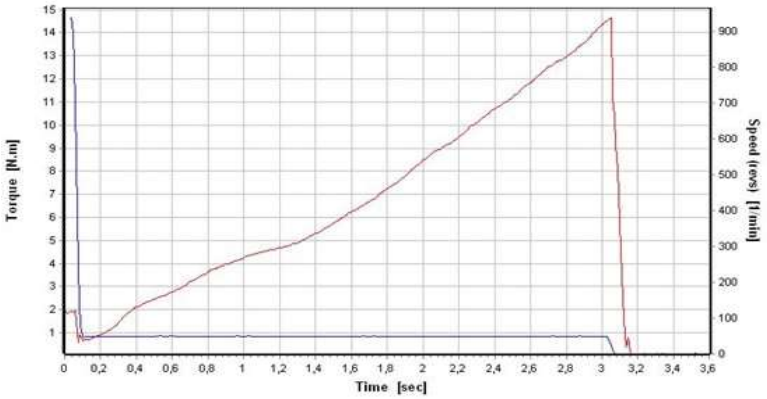
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

General Specifications

Manufacturer: Apex Tool Group **Tool type:** Cordless Assembly Tools

Model: CTBAW153 **Serial no:** 1019841

Torque range: **3,6 Nm to 15 Nm**

Difference evaluation: Reference/Tool at 40° / 60 %

Capability examination

Snugfit value: 3 Nm **Torque tolerance ±** 7 %

Target torque: 9 Nm Tolerance: 5,81 % ± **2,90 %**

Angle degree: 40° Tolerance: 3,5° ± **1,8°**

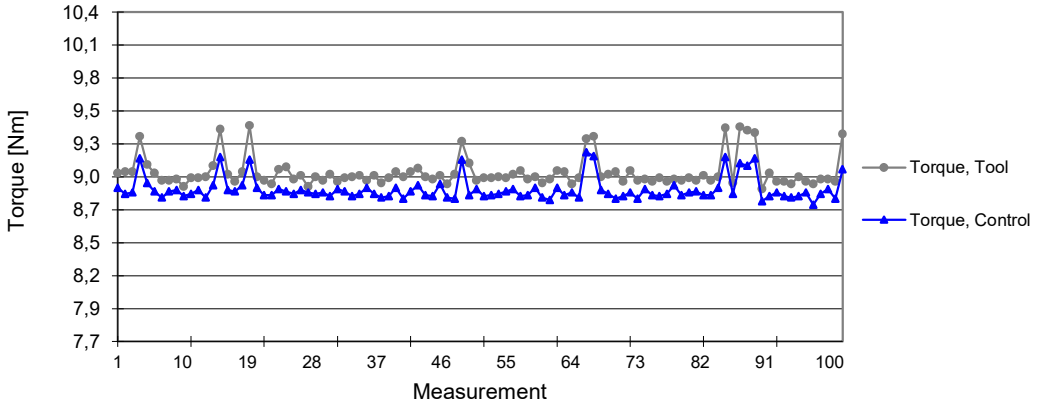
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

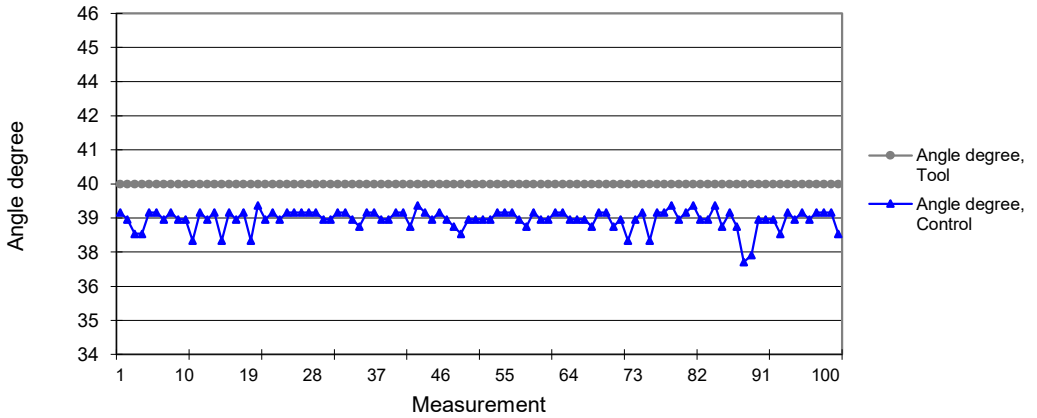
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,03	40,00	8,91	39,00	0,12	1,00
2	9,04	40,00	8,86	38,75	0,18	1,25
3	9,04	40,00	8,87	38,25	0,17	1,75
4	9,33	40,00	9,15	38,25	0,18	1,75
5	9,10	40,00	8,95	39,00	0,15	1,00
6	9,03	40,00	8,88	39,00	0,15	1,00
7	8,97	40,00	8,83	38,75	0,14	1,25
8	8,97	40,00	8,88	39,00	0,09	1,00
9	8,98	40,00	8,89	38,75	0,09	1,25
10	8,92	40,00	8,84	38,75	0,08	1,25
11	8,99	40,00	8,86	38,00	0,13	2,00
12	8,99	40,00	8,89	39,00	0,10	1,00
13	9,00	40,00	8,83	38,75	0,17	1,25
14	9,09	40,00	8,93	39,00	0,16	1,00
15	9,39	40,00	9,16	38,00	0,23	2,00
16	9,02	40,00	8,89	39,00	0,13	1,00
17	8,96	40,00	8,88	38,75	0,08	1,25
18	9,04	40,00	8,93	39,00	0,11	1,00
19	9,42	40,00	9,14	38,00	0,28	2,00
20	9,00	40,00	8,91	39,25	0,09	0,75
21	8,97	40,00	8,85	38,75	0,12	1,25
22	8,94	40,00	8,85	39,00	0,09	1,00
23	9,06	40,00	8,90	38,75	0,16	1,25
24	9,08	40,00	8,88	39,00	0,20	1,00
25	8,98	40,00	8,86	39,00	0,12	1,00
26	9,01	40,00	8,89	39,00	0,12	1,00
27	8,92	40,00	8,87	39,00	0,05	1,00
28	9,00	40,00	8,86	39,00	0,14	1,00
29	8,97	40,00	8,87	38,75	0,10	1,25
30	9,02	40,00	8,84	38,75	0,18	1,25
31	8,96	40,00	8,90	39,00	0,06	1,00
32	8,99	40,00	8,88	39,00	0,11	1,00
33	9,00	40,00	8,84	38,75	0,16	1,25
34	9,01	40,00	8,86	38,50	0,15	1,50
35	8,97	40,00	8,91	39,00	0,06	1,00
36	9,01	40,00	8,86	39,00	0,15	1,00
37	8,95	40,00	8,83	38,75	0,12	1,25
38	8,99	40,00	8,84	38,75	0,15	1,25
39	9,04	40,00	8,91	39,00	0,13	1,00
40	9,00	40,00	8,82	39,00	0,18	1,00
41	9,04	40,00	8,88	38,50	0,16	1,50
42	9,07	40,00	8,93	39,25	0,14	0,75
43	9,00	40,00	8,85	39,00	0,15	1,00
44	8,98	40,00	8,84	38,75	0,14	1,25
45	9,01	40,00	8,94	39,00	0,07	1,00
46	8,94	40,00	8,83	38,75	0,11	1,25
47	9,02	40,00	8,82	38,50	0,20	1,50
48	9,29	40,00	9,14	38,25	0,15	1,75
49	9,11	40,00	8,85	38,75	0,26	1,25
50	8,97	40,00	8,90	38,75	0,07	1,25
51	8,99	40,00	8,84	38,75	0,15	1,25
52	8,99	40,00	8,85	38,75	0,14	1,25
53	9,00	40,00	8,86	39,00	0,14	1,00
54	8,99	40,00	8,88	39,00	0,11	1,00
55	9,02	40,00	8,90	39,00	0,12	1,00
56	9,05	40,00	8,84	38,75	0,21	1,25
57	8,98	40,00	8,85	38,50	0,13	1,50
58	9,00	40,00	8,91	39,00	0,09	1,00
59	8,95	40,00	8,83	38,75	0,12	1,25
60	8,98	40,00	8,81	38,75	0,17	1,25
61	9,05	40,00	8,91	39,00	0,14	1,00
62	9,04	40,00	8,85	39,00	0,19	1,00
63	8,94	40,00	8,87	38,75	0,07	1,25
64	8,99	40,00	8,83	38,75	0,16	1,25
65	9,31	40,00	9,20	38,75	0,11	1,25
66	9,33	40,00	9,17	38,50	0,16	1,50
67	9,00	40,00	8,89	39,00	0,11	1,00
68	9,02	40,00	8,86	39,00	0,16	1,00
69	9,04	40,00	8,82	38,50	0,22	1,50
70	8,96	40,00	8,84	38,75	0,12	1,25
71	9,05	40,00	8,87	38,00	0,18	2,00
72	8,97	40,00	8,82	38,75	0,15	1,25
73	8,98	40,00	8,90	39,00	0,08	1,00
74	8,96	40,00	8,85	38,00	0,11	2,00
75	8,99	40,00	8,84	39,00	0,15	1,00
76	8,96	40,00	8,86	39,00	0,10	1,00
77	8,98	40,00	8,93	39,25	0,05	0,75
78	8,97	40,00	8,85	38,75	0,12	1,25
79	8,99	40,00	8,87	39,00	0,12	1,00
80	8,97	40,00	8,88	39,25	0,09	0,75
81	9,01	40,00	8,85	38,75	0,16	1,25
82	8,97	40,00	8,85	38,75	0,12	1,25
83	9,00	40,00	8,91	39,25	0,09	0,75
84	9,40	40,00	9,16	38,50	0,24	1,50
85	8,95	40,00	8,86	39,00	0,09	1,00
86	9,41	40,00	9,11	38,50	0,30	1,50
87	9,38	40,00	9,09	37,25	0,29	2,75
88	9,36	40,00	9,15	37,50	0,21	2,50
89	8,90	40,00	8,80	38,75	0,10	1,25
90	9,03	40,00	8,84	38,75	0,19	1,25
91	8,96	40,00	8,87	38,75	0,09	1,25
92	8,96	40,00	8,84	38,25	0,12	1,75
93	8,94	40,00	8,83	39,00	0,11	1,00
94	9,00	40,00	8,84	38,75	0,16	1,25
95	8,96	40,00	8,87	39,00	0,09	1,00
96	8,94	40,00	8,77	38,75	0,17	1,25
97	8,98	40,00	8,86	39,00	0,12	1,00
98	8,98	40,00	8,90	39,00	0,08	1,00
99	8,96	40,00	8,82	39,00	0,14	1,00
100	9,35	40,00	9,06	38,25	0,29	1,75
				Standard deviation:	**0,052**	**0,350**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





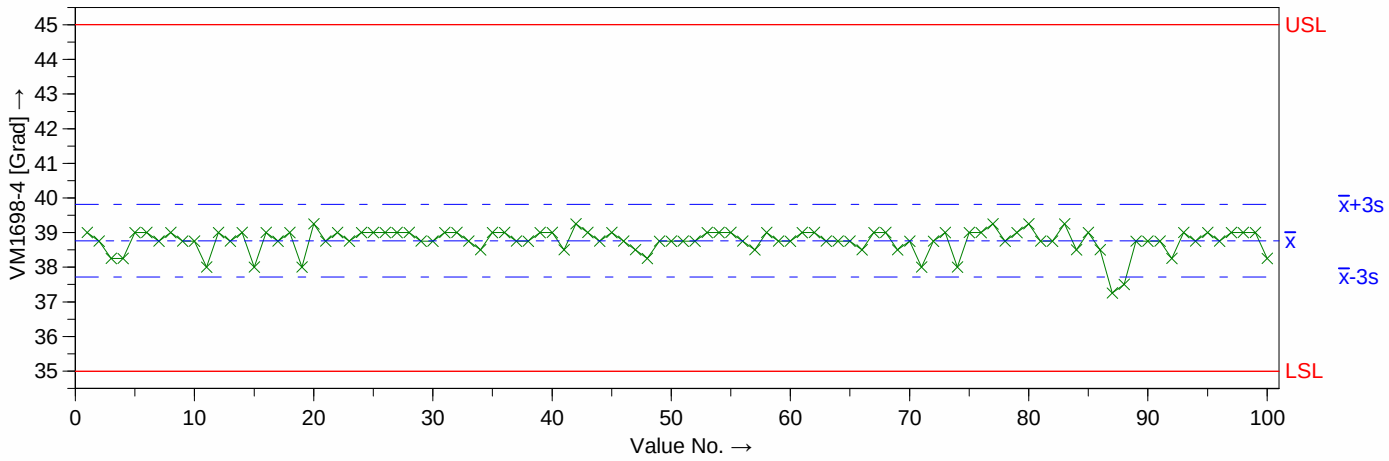
Machine Capability Study
Control System

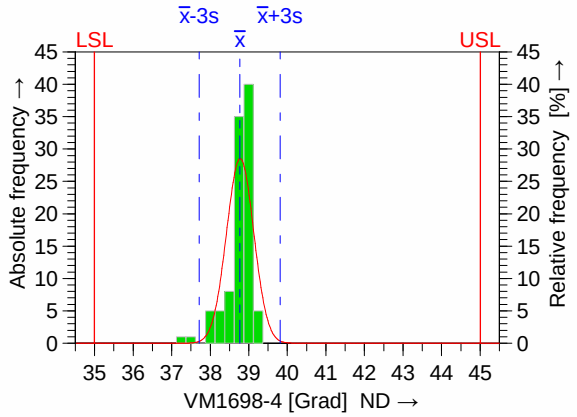
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

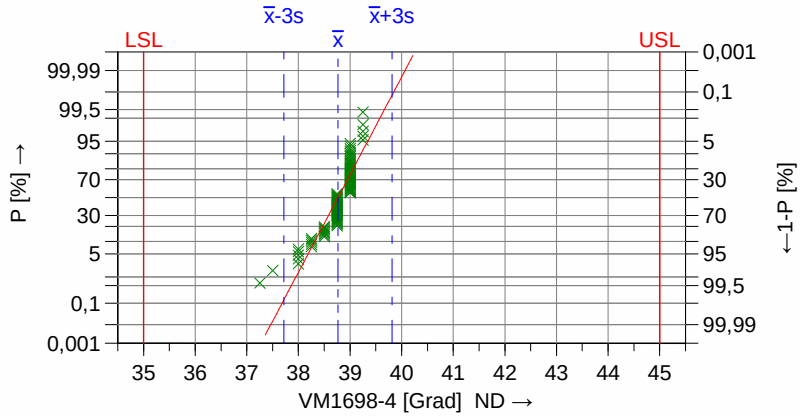
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_k	Char.Descr.	VM1698-4	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 09:48:10 to 26.07.2022 10:01:03

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	38.7650
LSL	35.00	x_{min}	37.25	$\bar{x}$-3s	37.7161
USL	45.00	x_{max}	39.25	$\bar{x}$+3s	39.8139
T	10.00	R	2.00	6s	2.0978
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		$M1_{1,4}$ $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	4.77
Critical capability index	=	C_{mk}	3.59

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_k	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.16 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	8,91	8,86	8,87	9,15	8,95	8,88	8,83	8,88	8,89	8,84
1024210	VM1698-4	Grad	39,00	38,75	38,25	38,25	39,00	39,00	38,75	39,00	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	8,86	8,89	8,83	8,93	9,16	8,89	8,88	8,93	9,14	8,91
1024210	VM1698-4	Grad	38,00	39,00	38,75	39,00	38,00	39,00	38,75	39,00	38,00	39,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	8,85	8,85	8,90	8,88	8,86	8,89	8,87	8,86	8,87	8,84
1024210	VM1698-4	Grad	38,75	39,00	38,75	39,00	39,00	39,00	39,00	39,00	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	8,90	8,88	8,84	8,86	8,91	8,86	8,83	8,84	8,91	8,82
1024210	VM1698-4	Grad	39,00	39,00	38,75	38,50	39,00	39,00	38,75	38,75	39,00	39,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	8,88	8,93	8,85	8,84	8,94	8,83	8,82	9,14	8,85	8,90
1024210	VM1698-4	Grad	38,50	39,25	39,00	38,75	39,00	38,75	38,50	38,25	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	8,84	8,85	8,86	8,88	8,90	8,84	8,85	8,91	8,83	8,81
1024210	VM1698-4	Grad	38,75	38,75	39,00	39,00	39,00	38,75	38,50	39,00	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	8,91	8,85	8,87	8,83	9,20	9,17	8,89	8,86	8,82	8,84
1024210	VM1698-4	Grad	39,00	39,00	38,75	38,75	38,75	38,50	39,00	39,00	38,50	38,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	8,87	8,82	8,90	8,85	8,84	8,86	8,93	8,85	8,87	8,88
1024210	VM1698-4	Grad	38,00	38,75	39,00	38,00	39,00	39,00	39,25	38,75	39,00	39,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_k	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.16 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	8,85	8,85	8,91	9,16	8,86	9,11	9,09	9,15	8,80	8,84
1024210	VM1698-4	Grad	38,75	38,75	39,25	38,50	39,00	38,50	37,25	37,50	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	8,87	8,84	8,83	8,84	8,87	8,77	8,86	8,90	8,82	9,06
1024210	VM1698-4	Grad	38,75	38,25	39,00	38,75	39,00	38,75	39,00	39,00	39,00	38,25

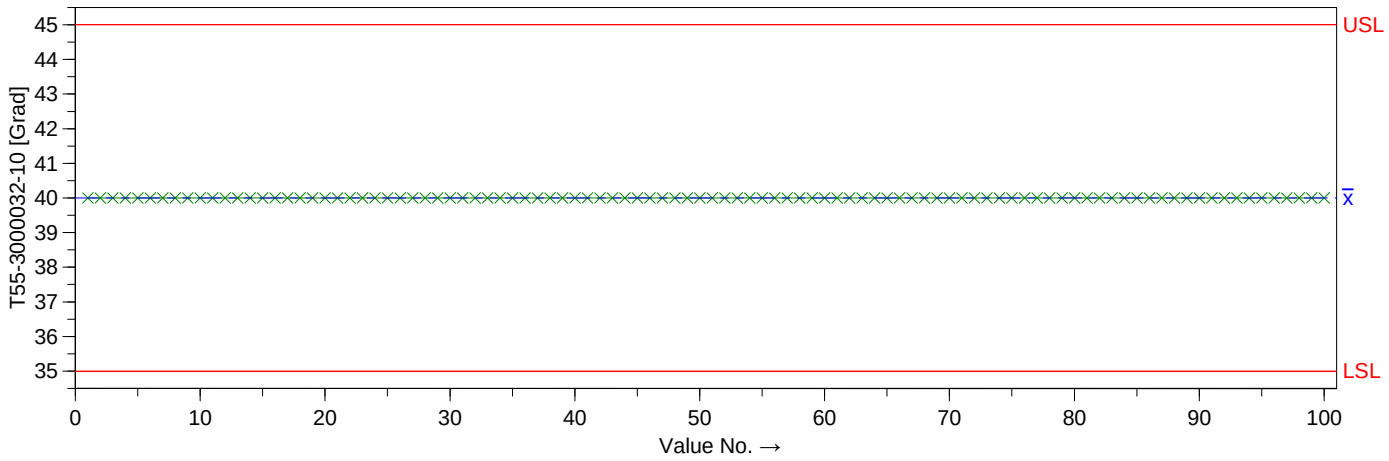
Machine Capability Study
Tool System

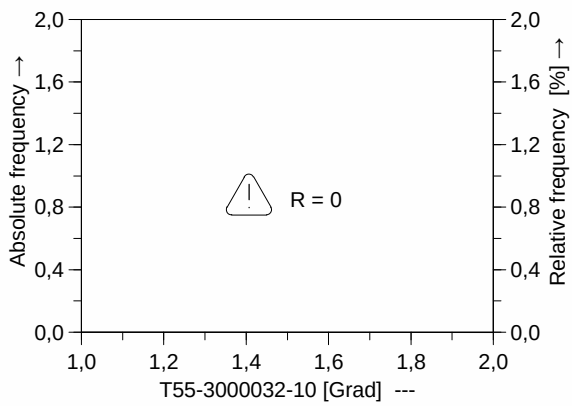
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

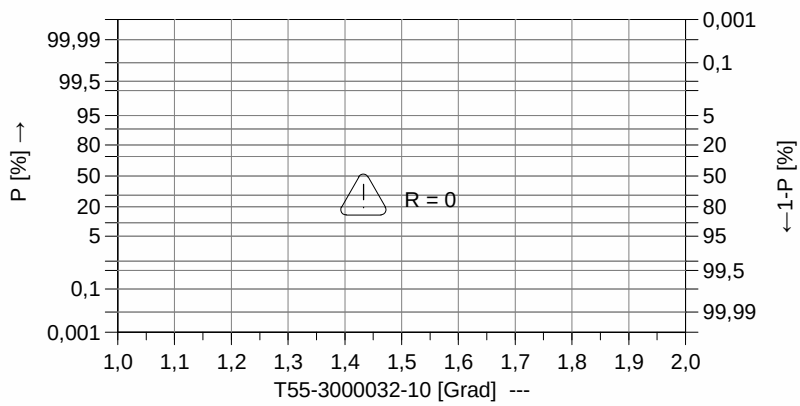
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_k	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	199777	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 09:48:10 to 26.07.2022 10:01:03

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	40.0000
LSL	35.00	x_{min}	40.00		
USL	45.00	x_{max}	40.00		
T	10.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.16 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	9,03	9,04	9,04	9,33	9,10	9,03	8,97	8,97	8,98	8,92
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	8,99	8,99	9,00	9,09	9,39	9,02	8,96	9,04	9,42	9,00
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	8,97	8,94	9,06	9,08	8,98	9,01	8,92	9,00	8,97	9,02
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	8,96	8,99	9,00	9,01	8,97	9,01	8,95	8,99	9,04	9,00
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	9,04	9,07	9,00	8,98	9,01	8,94	9,02	9,29	9,11	8,97
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	8,99	8,99	9,00	8,99	9,02	9,05	8,98	9,00	8,95	8,98
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	9,05	9,04	8,94	8,99	9,31	9,33	9,00	9,02	9,04	8,96
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	9,05	8,97	8,98	8,96	8,99	8,96	8,98	8,97	8,99	8,97
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

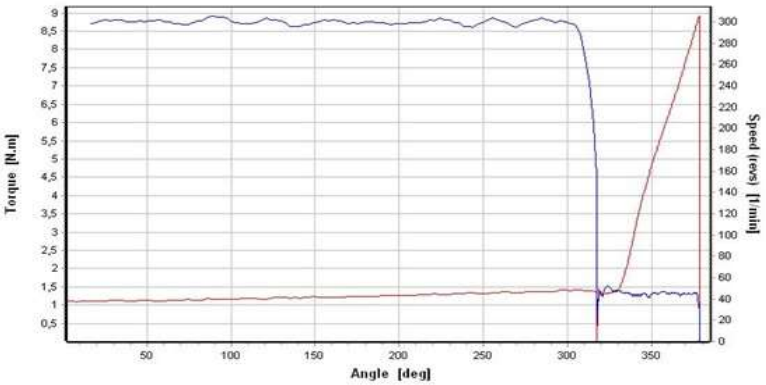
Serial No.	1019841_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.16 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	9,01	8,97	9,00	9,40	8,95	9,41	9,38	9,36	8,90	9,03
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

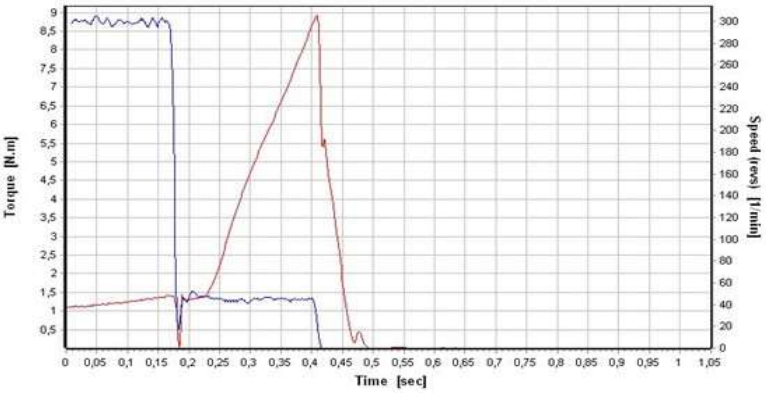
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	8,96	8,96	8,94	9,00	8,96	8,94	8,98	8,98	8,96	9,35
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

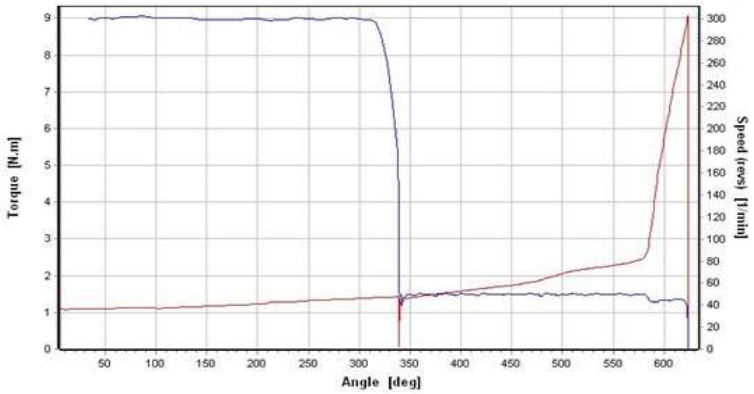
Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



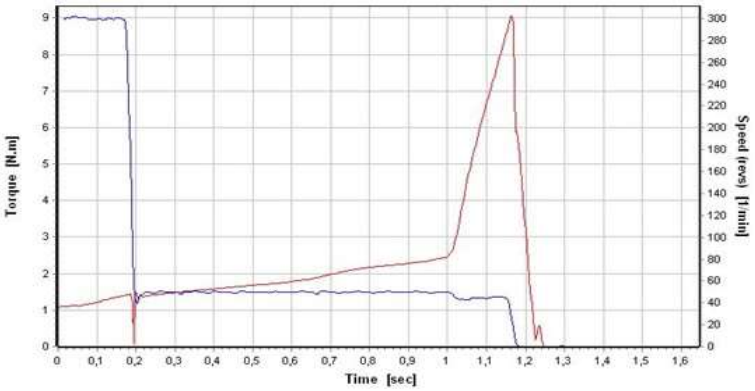
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

General Specifications

Manufacturer: Apex Tool Group **Tool type:** Cordless Assembly Tools

Model: CTBAW153 **Serial no:** 1019841

Torque range: **3,6 Nm to 15 Nm**

Difference evaluation: Reference/Tool at 40° / 60 %

Capability examination

Snugfit value: 3 Nm **Torque tolerance ±** 7 %

Target torque: 9 Nm Tolerance: 5,79 % ± **2,90 %**

Angle degree: 40° Tolerance: 3,2° ± **1,6°**

Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

Tool with angle correction

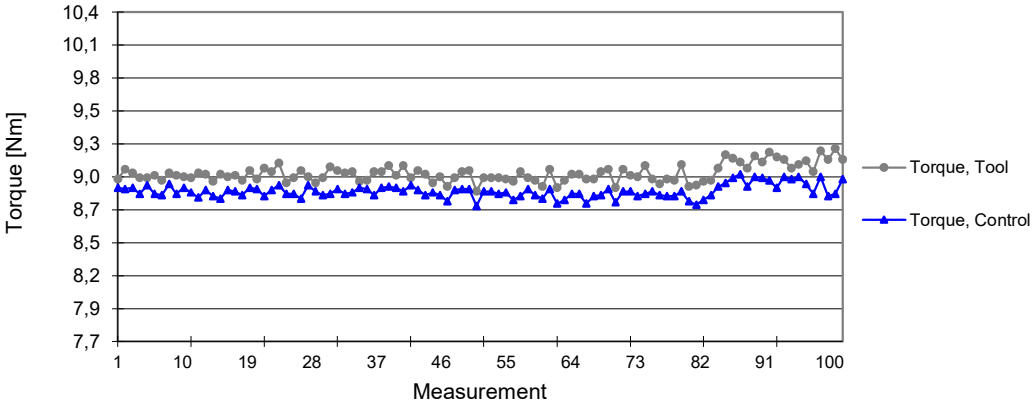
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move +", the angle range in the screw direction,
In the column "Move -" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle values and directions of movement.
The indicated maximum values for "Move +" and "Move -"
have per measurement series minimum 5 times.

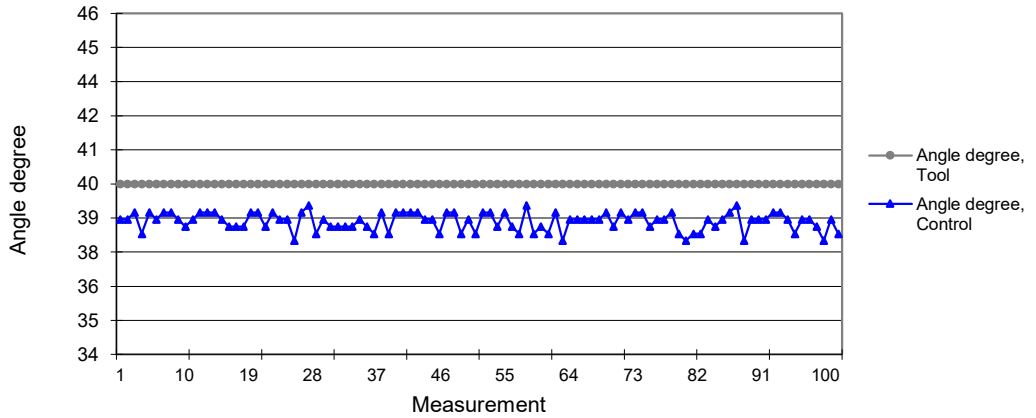
Move		Test conditions
+	**-**	0
0-25°	**0-45°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	8,98	40,00	8,91	38,75	0,07	1,25
2	9,06	40,00	8,90	38,75	0,16	1,25
3	9,03	40,00	8,91	39,00	0,12	1,00
4	8,99	40,00	8,86	38,25	0,13	1,75
5	8,99	40,00	8,93	39,00	0,06	1,00
6	9,01	40,00	8,86	38,75	0,15	1,25
7	8,97	40,00	8,85	39,00	0,12	1,00
8	9,03	40,00	8,94	39,00	0,09	1,00
9	9,01	40,00	8,86	38,75	0,15	1,25
10	9,00	40,00	8,91	38,50	0,09	1,50
11	8,99	40,00	8,87	38,75	0,12	1,25
12	9,03	40,00	8,83	39,00	0,20	1,00
13	9,02	40,00	8,89	39,00	0,13	1,00
14	8,96	40,00	8,84	39,00	0,12	1,00
15	9,02	40,00	8,82	38,75	0,20	1,25
16	9,00	40,00	8,89	38,50	0,11	1,50
17	9,01	40,00	8,88	38,50	0,13	1,50
18	8,97	40,00	8,85	38,50	0,12	1,50
19	9,05	40,00	8,91	39,00	0,14	1,00
20	8,98	40,00	8,90	39,00	0,08	1,00
21	9,07	40,00	8,84	38,50	0,23	1,50
22	9,04	40,00	8,89	39,00	0,15	1,00
23	9,11	40,00	8,93	38,75	0,18	1,25
24	8,95	40,00	8,86	38,75	0,09	1,25
25	8,99	40,00	8,86	38,00	0,13	2,00
26	9,05	40,00	8,82	39,00	0,23	1,00
27	9,00	40,00	8,93	39,25	0,07	0,75
28	8,95	40,00	8,88	38,25	0,07	1,75
29	8,99	40,00	8,85	38,75	0,14	1,25
30	9,08	40,00	8,86	38,50	0,22	1,50
31	9,05	40,00	8,90	38,50	0,15	1,50
32	9,03	40,00	8,86	38,50	0,17	1,50
33	9,04	40,00	8,87	38,50	0,17	1,50
34	8,96	40,00	8,91	38,75	0,05	1,25
35	8,97	40,00	8,90	38,50	0,07	1,50
36	9,04	40,00	8,85	38,25	0,19	1,75
37	9,04	40,00	8,91	39,00	0,13	1,00
38	9,09	40,00	8,92	38,25	0,17	1,75
39	9,01	40,00	8,91	39,00	0,10	1,00
40	9,09	40,00	8,88	39,00	0,21	1,00
41	8,99	40,00	8,93	39,00	0,06	1,00
42	9,05	40,00	8,89	39,00	0,16	1,00
43	9,02	40,00	8,85	38,75	0,17	1,25
44	8,95	40,00	8,87	38,75	0,08	1,25
45	9,00	40,00	8,85	38,25	0,15	1,75
46	8,92	40,00	8,80	39,00	0,12	1,00
47	8,99	40,00	8,89	39,00	0,10	1,00
48	9,04	40,00	8,90	38,25	0,14	1,75
49	9,05	40,00	8,90	38,75	0,15	1,25
50	8,88	40,00	8,76	38,25	0,12	1,75
51	8,99	40,00	8,88	39,00	0,11	1,00
52	8,99	40,00	8,88	39,00	0,11	1,00
53	8,99	40,00	8,86	38,50	0,13	1,50
54	8,98	40,00	8,87	39,00	0,11	1,00
55	8,96	40,00	8,81	38,50	0,15	1,50
56	9,04	40,00	8,84	38,25	0,20	1,75
57	8,99	40,00	8,90	39,25	0,09	0,75
58	8,97	40,00	8,85	38,25	0,12	1,75
59	8,92	40,00	8,82	38,50	0,10	1,50
60	9,06	40,00	8,90	38,25	0,16	1,75
61	8,91	40,00	8,78	39,00	0,13	1,00
62	8,97	40,00	8,81	38,00	0,16	2,00
63	9,02	40,00	8,86	38,75	0,16	1,25
64	9,02	40,00	8,86	38,75	0,16	1,25
65	8,98	40,00	8,78	38,75	0,20	1,25
66	8,98	40,00	8,84	38,75	0,14	1,25
67	9,04	40,00	8,85	38,75	0,19	1,25
68	9,06	40,00	8,90	39,00	0,16	1,00
69	8,91	40,00	8,79	38,50	0,12	1,50
70	9,06	40,00	8,88	39,00	0,18	1,00
71	9,01	40,00	8,88	38,75	0,13	1,25
72	9,00	40,00	8,84	39,00	0,16	1,00
73	9,09	40,00	8,86	39,00	0,23	1,00
74	8,98	40,00	8,88	38,50	0,10	1,50
75	8,94	40,00	8,85	38,75	0,09	1,25
76	8,98	40,00	8,84	38,75	0,14	1,25
77	8,97	40,00	8,84	39,00	0,13	1,00
78	9,10	40,00	8,88	38,25	0,22	1,75
79	8,92	40,00	8,80	38,00	0,12	2,00
80	8,93	40,00	8,77	38,25	0,16	1,75
81	8,96	40,00	8,81	38,25	0,15	1,75
82	8,97	40,00	8,85	38,75	0,12	1,25
83	9,07	40,00	8,92	38,50	0,15	1,50
84	9,18	40,00	8,95	38,75	0,23	1,25
85	9,15	40,00	8,99	39,00	0,16	1,00
86	9,12	40,00	9,02	39,25	0,10	0,75
87	9,07	40,00	8,92	38,00	0,15	2,00
88	9,17	40,00	9,00	38,75	0,17	1,25
89	9,12	40,00	8,99	38,75	0,13	1,25
90	9,20	40,00	8,97	38,75	0,23	1,25
91	9,16	40,00	8,91	39,00	0,25	1,00
92	9,14	40,00	9,00	39,00	0,14	1,00
93	9,07	40,00	8,98	38,75	0,09	1,25
94	9,10	40,00	9,00	38,25	0,10	1,75
95	9,13	40,00	8,94	38,75	0,19	1,25
96	9,04	40,00	8,86	38,75	0,18	1,25
97	9,21	40,00	9,00	38,50	0,21	1,50
98	9,14	40,00	8,84	38,00	0,30	2,00
99	9,23	40,00	8,86	38,75	0,37	1,25
100	9,14	40,00	8,98	38,25	0,16	1,75
				Standard deviation:	**0,052**	**0,315**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool with angle correction	





Machine Capability Study
Control System

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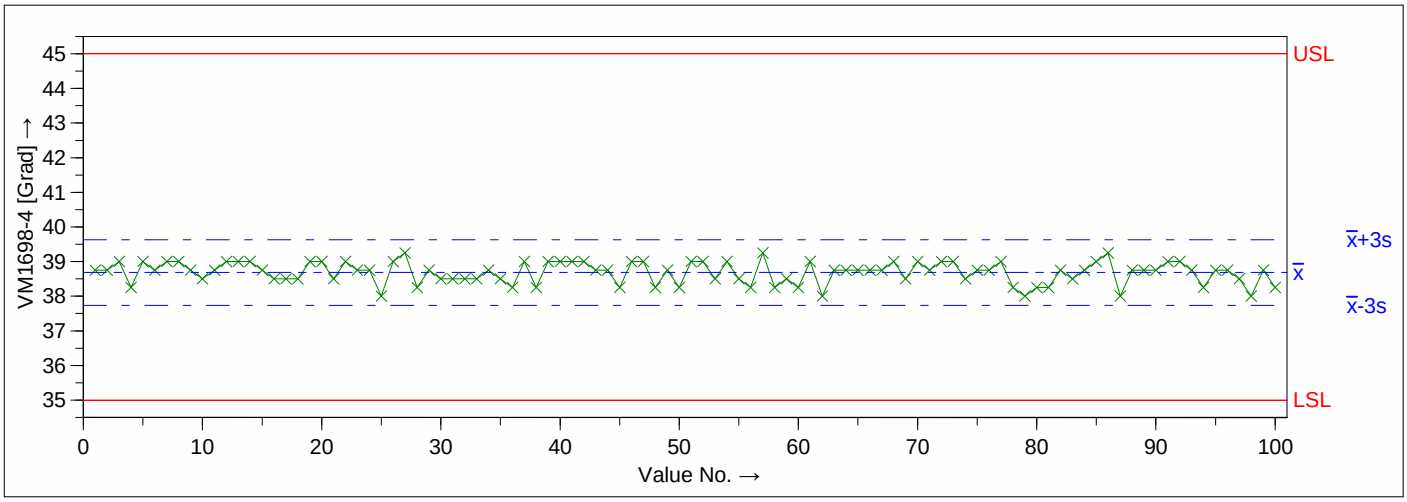
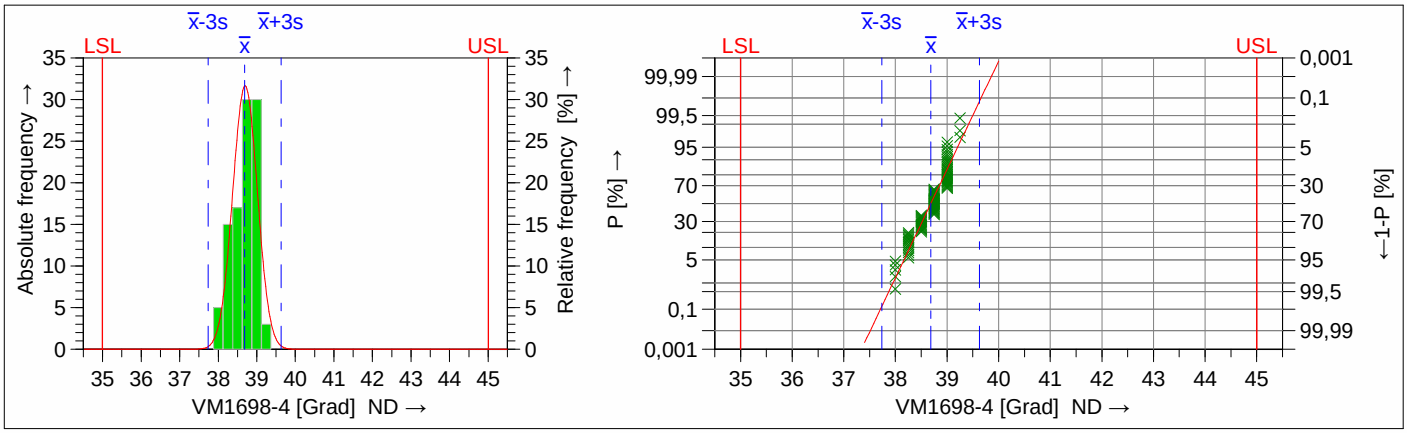
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_m	Char.Descr.	VM1698-4	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 10:11:06 to 26.07.2022 10:24:22

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	38.6850
LSL	35.00	x_{min}	38.00	$\bar{x}$-3s	37.7398
USL	45.00	x_{max}	39.25	$\bar{x}$+3s	39.6302
T	10.00	R	1.25	6s	1.8904
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	5.29
Critical capability index	=	C_{mk}	3.90

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_m	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	8,91	8,90	8,91	8,86	8,93	8,86	8,85	8,94	8,86	8,91
1024210	VM1698-4	Grad	38,75	38,75	39,00	38,25	39,00	38,75	39,00	39,00	38,75	38,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	8,87	8,83	8,89	8,84	8,82	8,89	8,88	8,85	8,91	8,90
1024210	VM1698-4	Grad	38,75	39,00	39,00	39,00	38,75	38,50	38,50	38,50	39,00	39,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	8,84	8,89	8,93	8,86	8,86	8,82	8,93	8,88	8,85	8,86
1024210	VM1698-4	Grad	38,50	39,00	38,75	38,75	38,00	39,00	39,25	38,25	38,75	38,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	8,90	8,86	8,87	8,91	8,90	8,85	8,91	8,92	8,91	8,88
1024210	VM1698-4	Grad	38,50	38,50	38,50	38,75	38,50	38,25	39,00	38,25	39,00	39,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	8,93	8,89	8,85	8,87	8,85	8,80	8,89	8,90	8,90	8,76
1024210	VM1698-4	Grad	39,00	39,00	38,75	38,75	38,25	39,00	39,00	38,25	38,75	38,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	8,88	8,88	8,86	8,87	8,81	8,84	8,90	8,85	8,82	8,90
1024210	VM1698-4	Grad	39,00	39,00	38,50	39,00	38,50	38,25	39,25	38,25	38,50	38,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	8,78	8,81	8,86	8,86	8,78	8,84	8,85	8,90	8,79	8,88
1024210	VM1698-4	Grad	39,00	38,00	38,75	38,75	38,75	38,75	38,75	39,00	38,50	39,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	8,88	8,84	8,86	8,88	8,85	8,84	8,84	8,88	8,80	8,77
1024210	VM1698-4	Grad	38,75	39,00	39,00	38,50	38,75	38,75	39,00	38,25	38,00	38,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_m	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	8,81	8,85	8,92	8,95	8,99	9,02	8,92	9,00	8,99	8,97
1024210	VM1698-4	Grad	38,25	38,75	38,50	38,75	39,00	39,25	38,00	38,75	38,75	38,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	8,91	9,00	8,98	9,00	8,94	8,86	9,00	8,84	8,86	8,98
1024210	VM1698-4	Grad	39,00	39,00	38,75	38,25	38,75	38,75	38,50	38,00	38,75	38,25

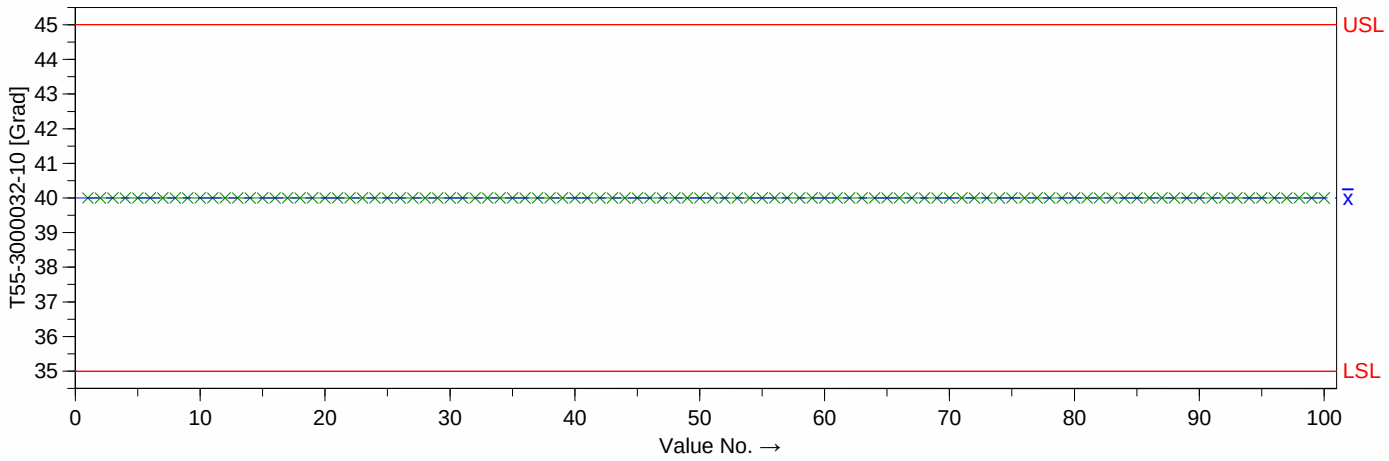
Machine Capability Study
Tool System

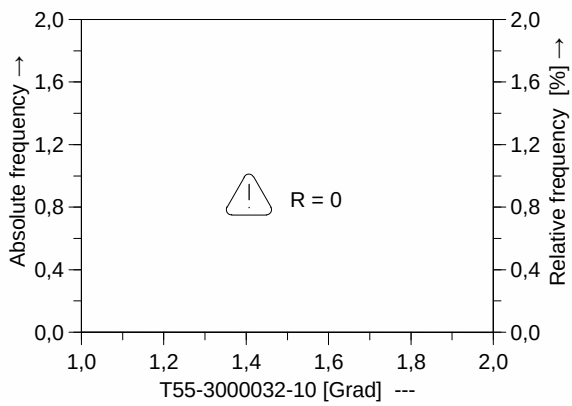
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

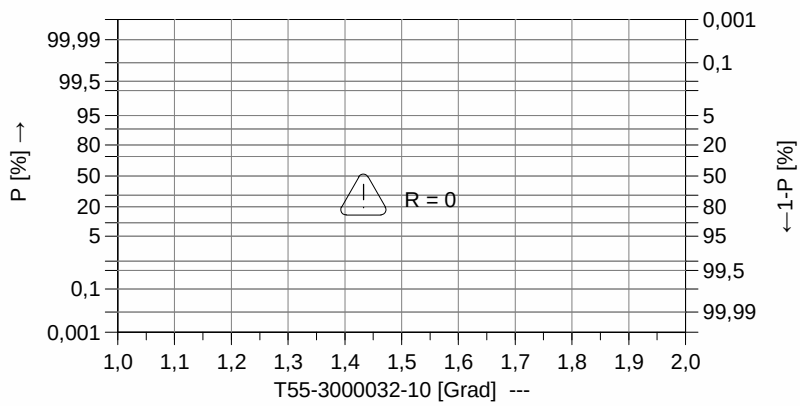
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_m	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	199777	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 26.07.2022 10:11:06 to 26.07.2022 10:24:22

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	40.0000
LSL	35.00	x_{min}	40.00		
USL	45.00	x_{max}	40.00		
T	10.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019841_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	8,98	9,06	9,03	8,99	8,99	9,01	8,97	9,03	9,01	9,00
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	8,99	9,03	9,02	8,96	9,02	9,00	9,01	8,97	9,05	8,98
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	9,07	9,04	9,11	8,95	8,99	9,05	9,00	8,95	8,99	9,08
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	9,05	9,03	9,04	8,96	8,97	9,04	9,04	9,09	9,01	9,09
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	8,99	9,05	9,02	8,95	9,00	8,92	8,99	9,04	9,05	8,88
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	8,99	8,99	8,99	8,98	8,96	9,04	8,99	8,97	8,92	9,06
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	8,91	8,97	9,02	9,02	8,98	8,98	9,04	9,06	8,91	9,06
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	9,01	9,00	9,09	8,98	8,94	8,98	8,97	9,10	8,92	8,93
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

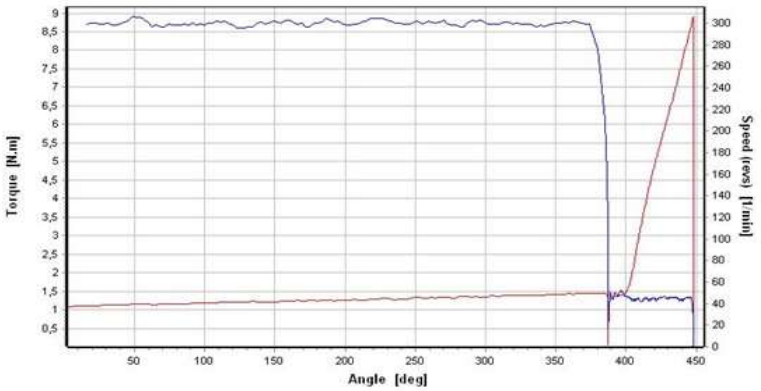
Serial No.	1019841_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	199777	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	8,96	8,97	9,07	9,18	9,15	9,12	9,07	9,17	9,12	9,20
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

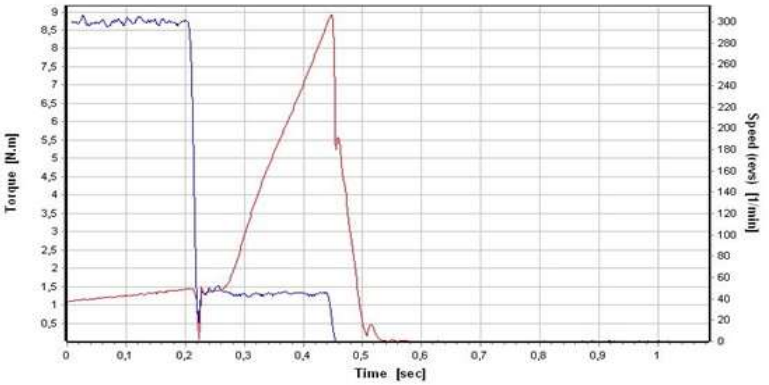
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	9,16	9,14	9,07	9,10	9,13	9,04	9,21	9,14	9,23	9,14
199777	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

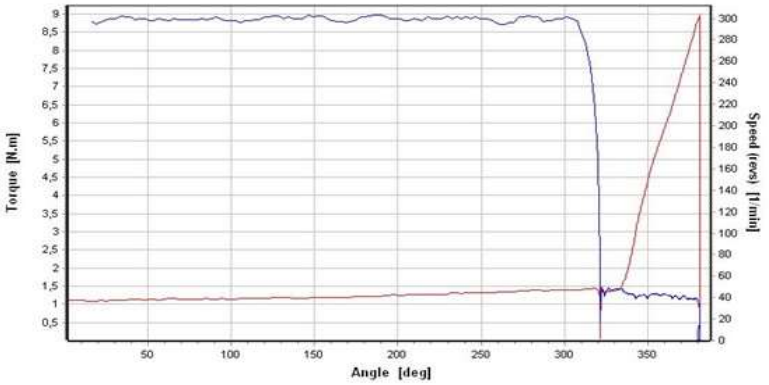
Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool with angle correction	



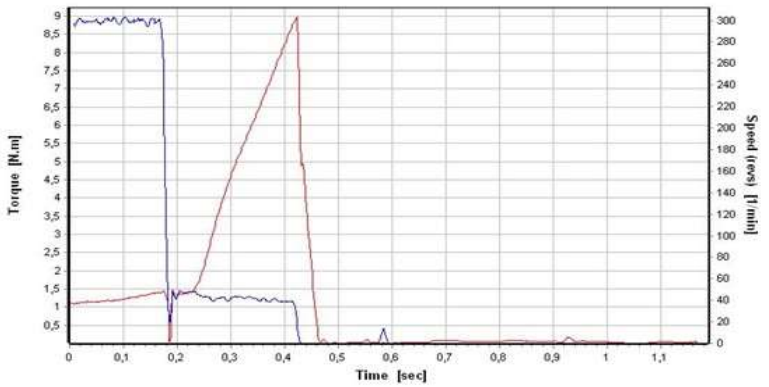
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

General Specifications

Manufacturer: Apex Tool Group **Tool type:** Cordless Assembly Tools

Model: CTBAW153 **Serial no:** 1019841

Torque range: **3,6 Nm to 15 Nm**

Difference evaluation: Reference/Tool at 180 ° / 80%

Capability examination

Snugfit value: 3 Nm **Torque tolerance ±** 7 %

Target torque: 12 Nm Tolerance: 5,82 % ± **2,91 %**

Angle degree: 180° Tolerance: 7,6° ± **3,8°**

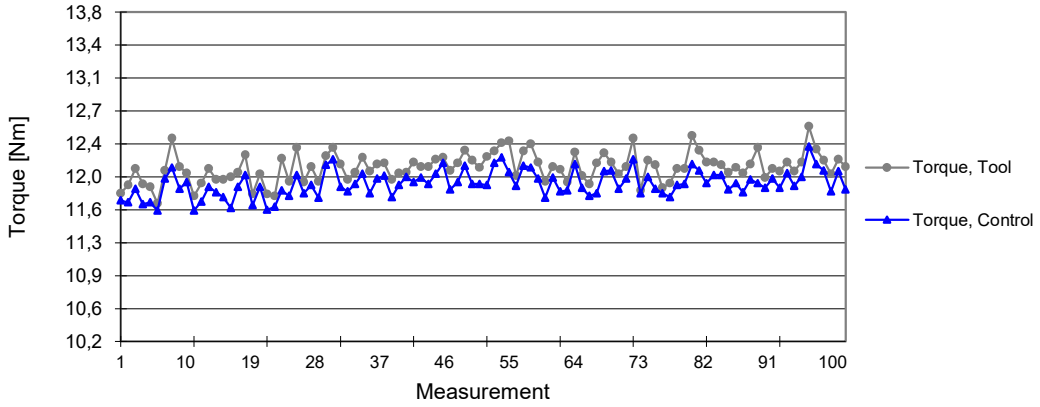
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

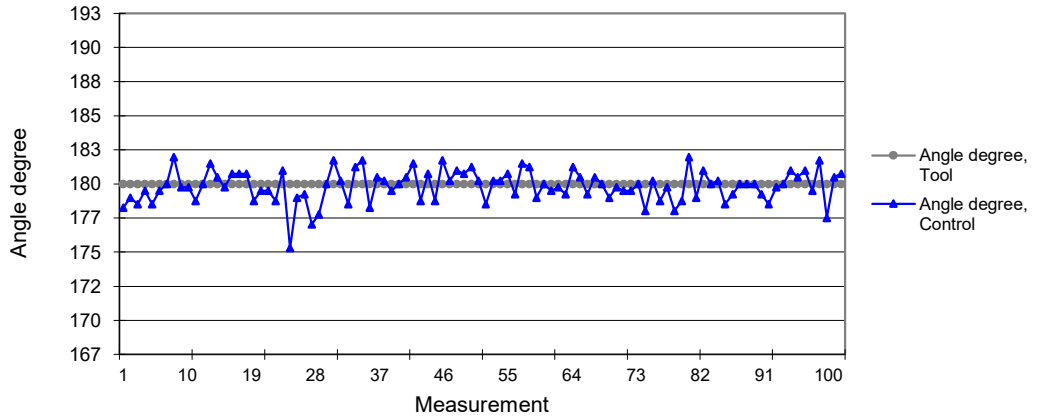
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	11,82	180,00	11,74	178,25	0,08	1,75
2	11,91	180,00	11,72	179,00	0,19	1,00
3	12,09	180,00	11,87	178,50	0,22	1,50
4	11,92	180,00	11,70	179,50	0,22	0,50
5	11,89	180,00	11,72	178,50	0,17	1,50
6	11,71	180,00	11,63	179,50	0,08	0,50
7	12,07	180,00	11,98	180,00	0,09	0,00
8	12,42	180,00	12,10	182,00	0,32	2,00
9	12,11	180,00	11,87	179,75	0,24	0,25
10	12,04	180,00	11,94	179,75	0,10	0,25
11	11,79	180,00	11,63	178,75	0,16	1,25
12	11,93	180,00	11,73	180,00	0,20	0,00
13	12,09	180,00	11,89	181,50	0,20	1,50
14	11,97	180,00	11,83	180,50	0,14	0,50
15	11,97	180,00	11,78	179,75	0,19	0,25
16	12,00	180,00	11,66	180,75	0,34	0,75
17	12,05	180,00	11,89	180,75	0,16	0,75
18	12,24	180,00	12,02	180,75	0,22	0,75
19	11,81	180,00	11,69	178,75	0,12	1,25
20	12,03	180,00	11,89	179,50	0,14	0,50
21	11,81	180,00	11,64	179,50	0,17	0,50
22	11,79	180,00	11,67	178,75	0,12	1,25
23	12,20	180,00	11,85	181,00	0,35	1,00
24	11,95	180,00	11,79	175,25	0,16	4,75
25	12,32	180,00	12,02	179,00	0,30	1,00
26	11,94	180,00	11,82	179,25	0,12	0,75
27	12,11	180,00	11,91	177,00	0,20	3,00
28	11,95	180,00	11,77	177,75	0,18	2,25
29	12,23	180,00	12,13	180,00	0,10	0,00
30	12,32	180,00	12,19	181,75	0,13	1,75
31	12,14	180,00	11,89	180,25	0,25	0,25
32	11,97	180,00	11,84	178,50	0,13	1,50
33	12,05	180,00	11,92	181,25	0,13	1,25
34	12,21	180,00	12,03	181,75	0,18	1,75
35	12,06	180,00	11,82	178,25	0,24	1,75
36	12,14	180,00	11,98	180,50	0,16	0,50
37	12,15	180,00	12,01	180,25	0,14	0,25
38	11,97	180,00	11,78	179,50	0,19	0,50
39	12,04	180,00	11,91	180,00	0,13	0,00
40	12,05	180,00	12,00	180,50	0,05	0,50
41	12,16	180,00	11,94	181,50	0,22	1,50
42	12,11	180,00	11,99	178,75	0,12	1,25
43	12,11	180,00	11,92	180,75	0,19	0,75
44	12,19	180,00	12,03	178,75	0,16	1,25
45	12,21	180,00	12,15	181,75	0,06	1,75
46	12,07	180,00	11,86	180,25	0,21	0,25
47	12,15	180,00	11,94	181,00	0,21	1,00
48	12,29	180,00	12,12	180,75	0,17	0,75
49	12,18	180,00	11,92	181,25	0,26	1,25
50	12,10	180,00	11,92	180,25	0,18	0,25
51	12,22	180,00	11,91	178,50	0,31	1,50
52	12,28	180,00	12,15	180,25	0,13	0,25
53	12,37	180,00	12,21	180,25	0,16	0,25
54	12,39	180,00	12,05	180,75	0,34	0,75
55	12,01	180,00	11,90	179,25	0,11	0,75
56	12,28	180,00	12,12	181,50	0,16	1,50
57	12,36	180,00	12,10	181,25	0,26	1,25
58	12,16	180,00	11,98	179,00	0,18	1,00
59	11,95	180,00	11,77	180,00	0,18	0,00
60	12,11	180,00	11,99	179,50	0,12	0,50
61	12,08	180,00	11,84	179,75	0,24	0,25
62	11,94	180,00	11,85	179,25	0,09	0,75
63	12,27	180,00	12,14	181,25	0,13	1,25
64	12,01	180,00	11,88	180,50	0,13	0,50
65	11,92	180,00	11,79	179,25	0,13	0,75
66	12,15	180,00	11,82	180,50	0,33	0,50
67	12,26	180,00	12,06	180,00	0,20	0,00
68	12,16	180,00	12,07	179,00	0,09	1,00
69	12,03	180,00	11,87	179,75	0,16	0,25
70	12,11	180,00	11,98	179,50	0,13	0,50
71	12,42	180,00	12,19	179,50	0,23	0,50
72	11,85	180,00	11,82	180,00	0,03	0,00
73	12,18	180,00	12,00	178,00	0,18	2,00
74	12,13	180,00	11,87	180,25	0,26	0,25
75	11,88	180,00	11,82	178,75	0,06	1,25
76	11,93	180,00	11,78	179,75	0,15	0,25
77	12,09	180,00	11,91	178,00	0,18	2,00
78	12,09	180,00	11,92	178,75	0,17	1,25
79	12,45	180,00	12,14	182,00	0,31	2,00
80	12,29	180,00	12,07	179,00	0,22	1,00
81	12,16	180,00	11,93	181,00	0,23	1,00
82	12,16	180,00	12,02	180,00	0,14	0,00
83	12,13	180,00	12,02	180,25	0,11	0,25
84	12,05	180,00	11,86	178,50	0,19	1,50
85	12,10	180,00	11,93	179,25	0,17	0,75
86	12,04	180,00	11,83	180,00	0,21	0,00
87	12,14	180,00	11,97	180,00	0,17	0,00
88	12,32	180,00	11,93	180,00	0,39	0,00
89	11,99	180,00	11,88	179,25	0,11	0,75
90	12,09	180,00	11,98	178,50	0,11	1,50
91	12,06	180,00	11,88	179,75	0,18	0,25
92	12,16	180,00	12,04	180,00	0,12	0,00
93	12,06	180,00	11,90	181,00	0,16	1,00
94	12,16	180,00	12,00	180,50	0,16	0,50
95	12,55	180,00	12,33	181,00	0,22	1,00
96	12,30	180,00	12,14	179,50	0,16	0,50
97	12,18	180,00	12,07	181,75	0,11	1,75
98	12,03	180,00	11,84	177,50	0,19	2,50
99	12,19	180,00	12,06	180,50	0,13	0,50
100	12,11	180,00	11,86	180,75	0,25	0,75
				Standard deviation:	**0,070**	**0,755**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





Machine Capability Study
Control System

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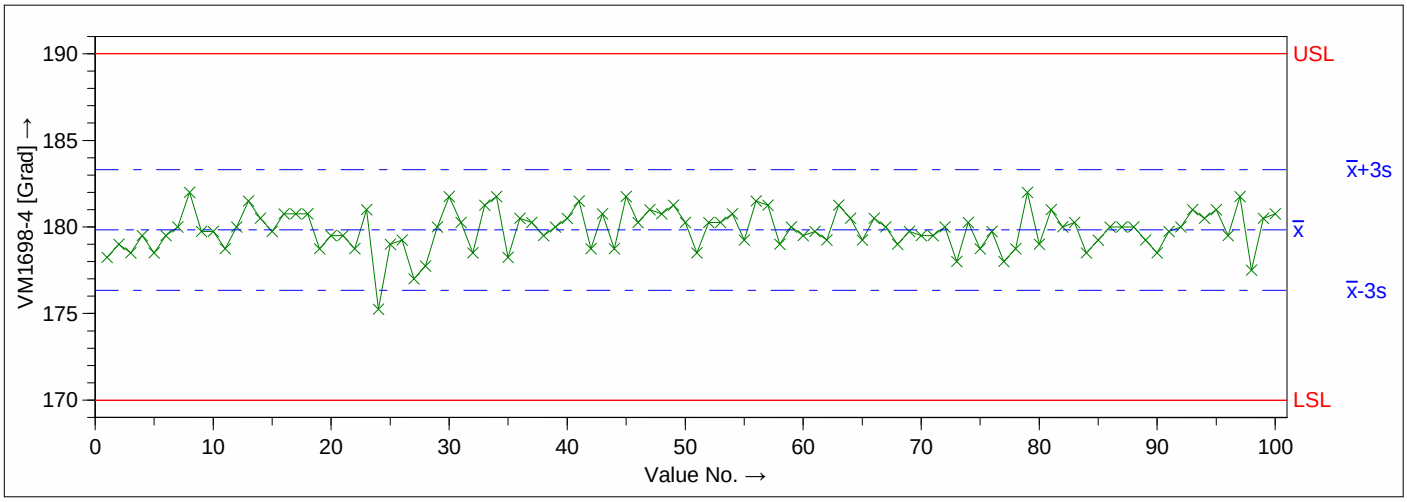
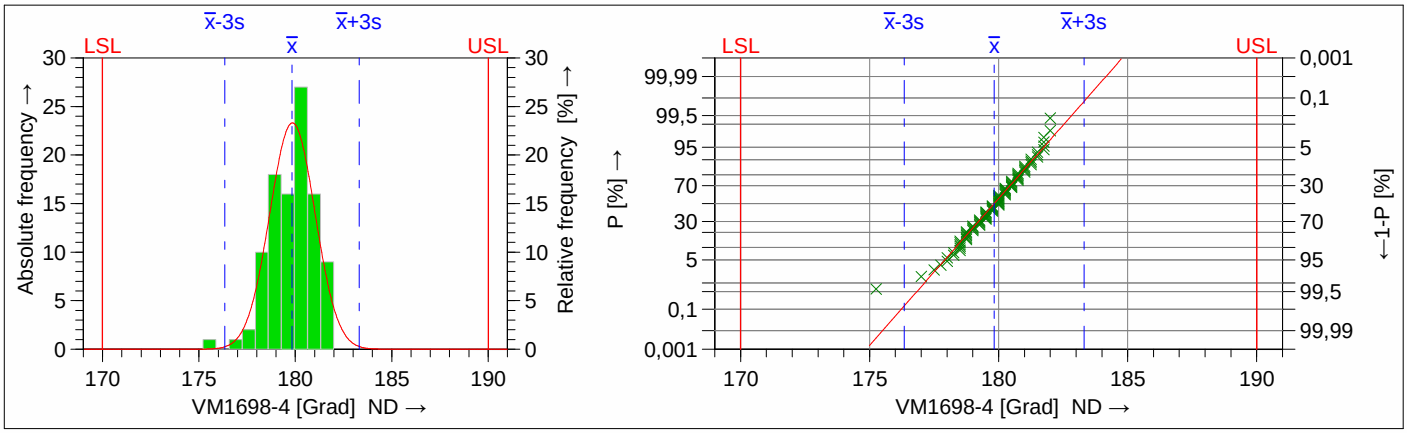
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_l	Char.Descr.	VM1698-4	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	1024210	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 12:48:32 to 25.07.2022 13:11:49

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	179.8275
LSL	170.00	x_{min}	175.25	$\bar{x}$-3s	176.3378
USL	190.00	x_{max}	182.00	$\bar{x}$+3s	183.3172
T	20.00	R	6.75	6s	6.9795
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma} = S_{tot}$	
Potential Capability index	=	C_m	2.87
Critical capability index	=	C_{mk}	2.82

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_I	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	11,74	11,72	11,87	11,70	11,72	11,63	11,98	12,10	11,87	11,94
1024210	VM1698-4	Grad	178,25	179,00	178,50	179,50	178,50	179,50	180,00	182,00	179,75	179,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	11,63	11,73	11,89	11,83	11,78	11,66	11,89	12,02	11,69	11,89
1024210	VM1698-4	Grad	178,75	180,00	181,50	180,50	179,75	180,75	180,75	180,75	178,75	179,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	11,64	11,67	11,85	11,79	12,02	11,82	11,91	11,77	12,13	12,19
1024210	VM1698-4	Grad	179,50	178,75	181,00	175,25	179,00	179,25	177,00	177,75	180,00	181,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	11,89	11,84	11,92	12,03	11,82	11,98	12,01	11,78	11,91	12,00
1024210	VM1698-4	Grad	180,25	178,50	181,25	181,75	178,25	180,50	180,25	179,50	180,00	180,50

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	11,94	11,99	11,92	12,03	12,15	11,86	11,94	12,12	11,92	11,92
1024210	VM1698-4	Grad	181,50	178,75	180,75	178,75	181,75	180,25	181,00	180,75	181,25	180,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	11,91	12,15	12,21	12,05	11,90	12,12	12,10	11,98	11,77	11,99
1024210	VM1698-4	Grad	178,50	180,25	180,25	180,75	179,25	181,50	181,25	179,00	180,00	179,50

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	11,84	11,85	12,14	11,88	11,79	11,82	12,06	12,07	11,87	11,98
1024210	VM1698-4	Grad	179,75	179,25	181,25	180,50	179,25	180,50	180,00	179,00	179,75	179,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	12,19	11,82	12,00	11,87	11,82	11,78	11,91	11,92	12,14	12,07
1024210	VM1698-4	Grad	179,50	180,00	178,00	180,25	178,75	179,75	178,00	178,75	182,00	179,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_I	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	11,93	12,02	12,02	11,86	11,93	11,83	11,97	11,93	11,88	11,98
1024210	VM1698-4	Grad	181,00	180,00	180,25	178,50	179,25	180,00	180,00	180,00	179,25	178,50

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,88	12,04	11,90	12,00	12,33	12,14	12,07	11,84	12,06	11,86
1024210	VM1698-4	Grad	179,75	180,00	181,00	180,50	181,00	179,50	181,75	177,50	180,50	180,75

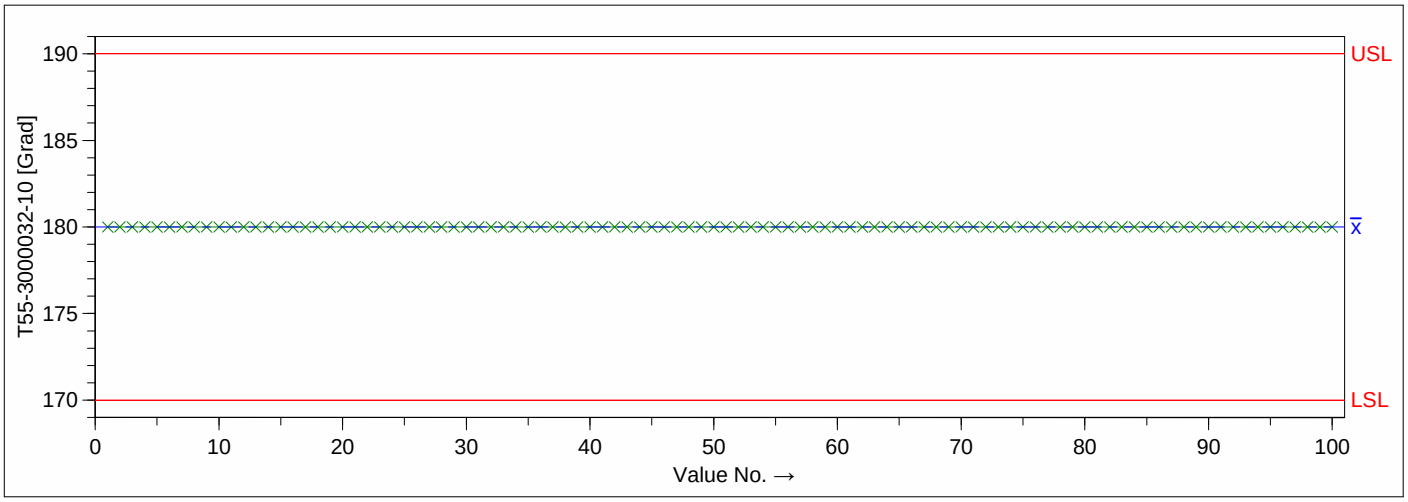
Machine Capability Study
Tool System

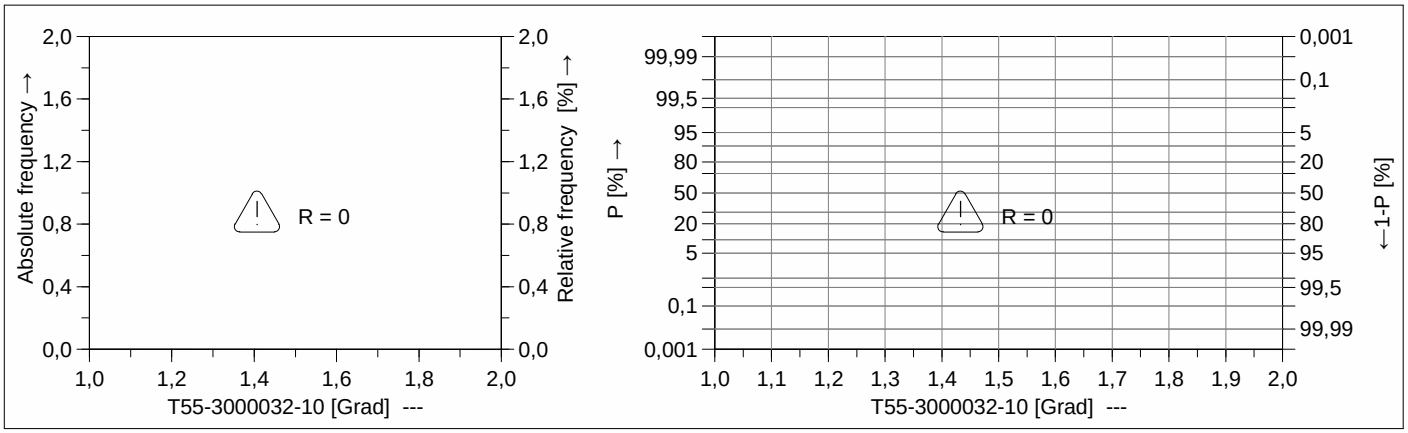
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_l	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	199777	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 12:48:32 to 25.07.2022 13:11:49

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	180.0000
LSL	170.00	x_{min}	180.00		
USL	190.00	x_{max}	180.00		
T	20.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	11,82	11,91	12,09	11,92	11,89	11,71	12,07	12,42	12,11	12,04
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	11,79	11,93	12,09	11,97	11,97	12,00	12,05	12,24	11,81	12,03
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	11,81	11,79	12,20	11,95	12,32	11,94	12,11	11,95	12,23	12,32
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	12,14	11,97	12,05	12,21	12,06	12,14	12,15	11,97	12,04	12,05
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	12,16	12,11	12,11	12,19	12,21	12,07	12,15	12,29	12,18	12,10
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	12,22	12,28	12,37	12,39	12,01	12,28	12,36	12,16	11,95	12,11
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	12,08	11,94	12,27	12,01	11,92	12,15	12,26	12,16	12,03	12,11
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	12,42	11,85	12,18	12,13	11,88	11,93	12,09	12,09	12,45	12,29
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

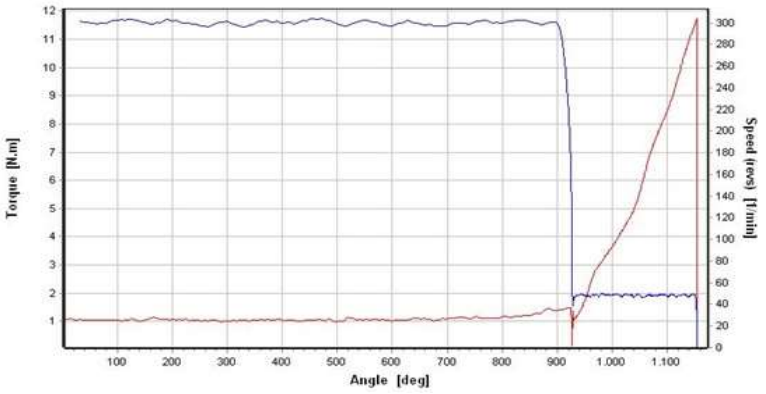
Serial No.	1019841_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	12,16	12,16	12,13	12,05	12,10	12,04	12,14	12,32	11,99	12,09
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

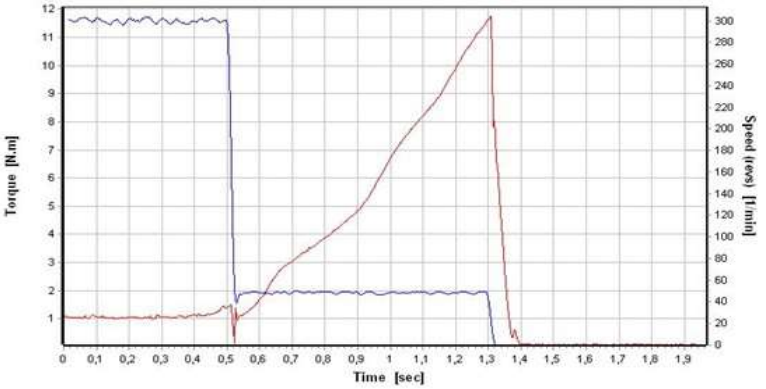
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	12,06	12,16	12,06	12,16	12,55	12,30	12,18	12,03	12,19	12,11
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

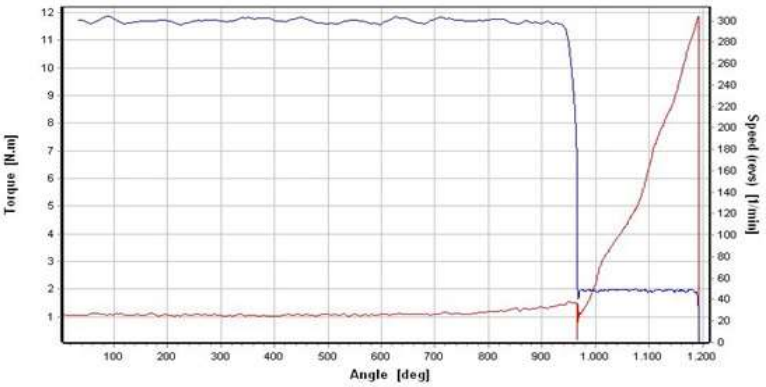
Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



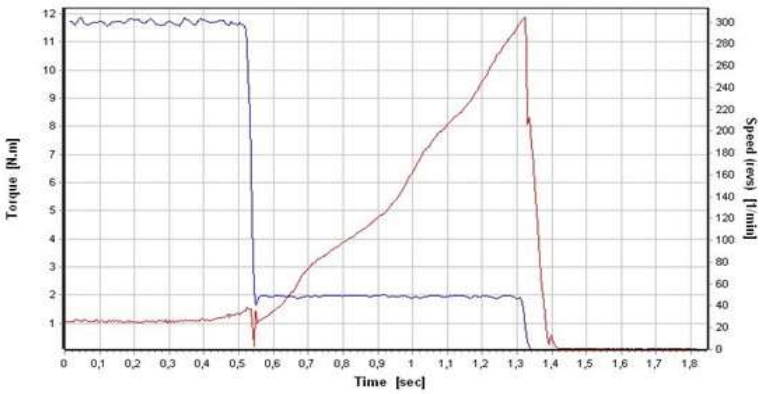
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

General Specifications

Manufacturer: Apex Tool Group **Tool type:** Cordless Assembly Tools

Model: CTBAW153 **Serial no:** 1019841

Torque range: **3,6 Nm to 15 Nm**

Difference evaluation: Reference/Tool at 180 ° / 80%

Capability examination

Snugfit value: 3 Nm **Torque tolerance ±** 7 %

Target torque: 12 Nm Tolerance: 6,44 % ± **3,22 %**

Angle degree: 180° Tolerance: 8,2° ± **4,1°**

Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

Tool with angle correction

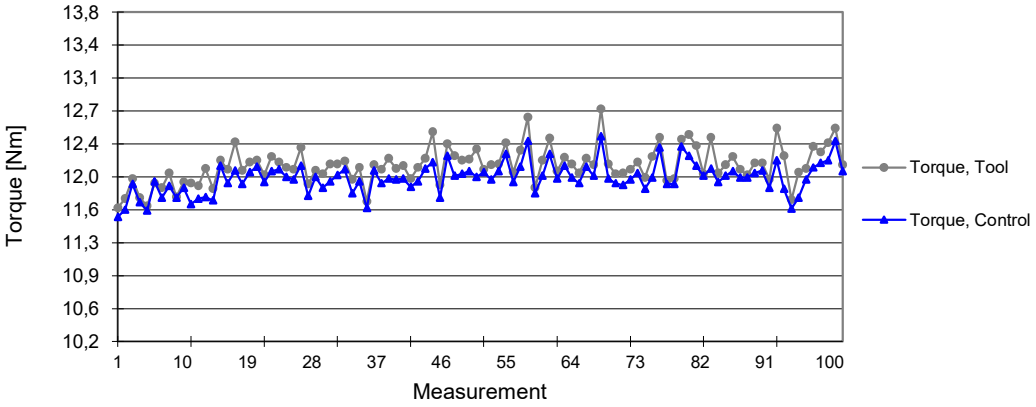
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move +", the angle range in the screw direction,
In the column "Move -" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle values and directions of movement.
The indicated maximum values for "Move +" and "Move -"
have per measurement series minimum 5 times.

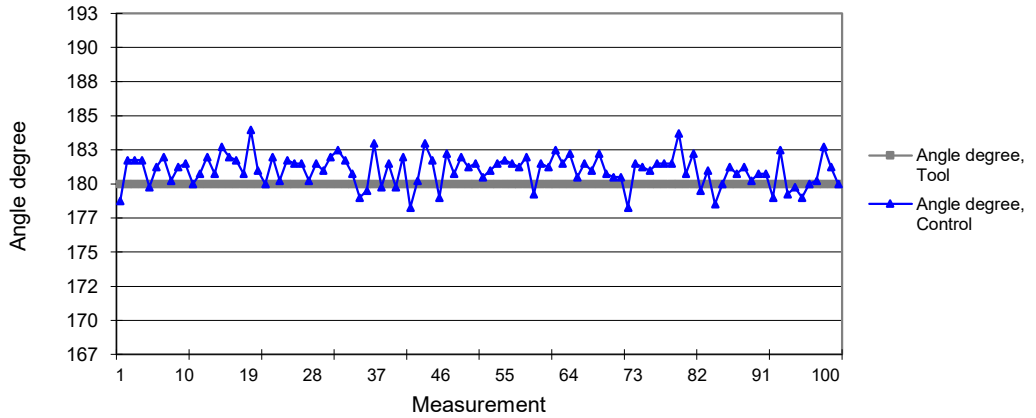
Move		Test conditions
+	**-**	0
0-25°	**0-45°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	11,66	180,00	11,56	178,75	0,10	1,25
2	11,76	180,00	11,64	181,75	0,12	1,75
3	11,98	180,00	11,92	181,75	0,06	1,75
4	11,77	180,00	11,72	181,75	0,05	1,75
5	11,68	180,00	11,63	179,75	0,05	0,25
6	11,93	180,00	11,95	181,25	0,02	1,25
7	11,88	180,00	11,77	182,00	0,11	2,00
8	12,04	180,00	11,90	180,25	0,14	0,25
9	11,78	180,00	11,77	181,25	0,01	1,25
10	11,94	180,00	11,88	181,50	0,06	1,50
11	11,93	180,00	11,70	180,00	0,23	0,00
12	11,90	180,00	11,76	180,75	0,14	0,75
13	12,09	180,00	11,78	182,00	0,31	2,00
14	11,87	180,00	11,74	180,75	0,13	0,75
15	12,18	180,00	12,12	182,75	0,06	2,75
16	12,08	180,00	11,93	182,00	0,15	2,00
17	12,38	180,00	12,07	181,75	0,31	1,75
18	12,07	180,00	11,92	180,75	0,15	0,75
19	12,16	180,00	12,05	184,00	0,11	4,00
20	12,18	180,00	12,11	181,00	0,07	1,00
21	12,02	180,00	11,94	180,00	0,08	0,00
22	12,22	180,00	12,06	182,00	0,16	2,00
23	12,16	180,00	12,08	180,25	0,08	0,25
24	12,10	180,00	12,00	181,75	0,10	1,75
25	12,08	180,00	11,97	181,50	0,11	1,50
26	12,32	180,00	12,12	181,50	0,20	1,50
27	11,92	180,00	11,79	180,25	0,13	0,25
28	12,07	180,00	12,00	181,50	0,07	1,50
29	12,03	180,00	11,88	181,00	0,15	1,00
30	12,14	180,00	11,95	182,00	0,19	2,00
31	12,14	180,00	12,02	182,50	0,12	2,50
32	12,17	180,00	12,08	181,75	0,09	1,75
33	11,97	180,00	11,82	180,75	0,15	0,75
34	12,10	180,00	11,95	179,00	0,15	1,00
35	11,73	180,00	11,66	179,50	0,07	0,50
36	12,13	180,00	12,07	183,00	0,06	3,00
37	12,08	180,00	11,93	179,75	0,15	0,25
38	12,20	180,00	11,98	181,50	0,22	1,50
39	12,09	180,00	11,97	179,75	0,12	0,25
40	12,12	180,00	11,98	182,00	0,14	2,00
41	11,98	180,00	11,89	178,25	0,09	1,75
42	12,10	180,00	11,95	180,25	0,15	0,25
43	12,20	180,00	12,09	183,00	0,11	3,00
44	12,49	180,00	12,16	181,75	0,33	1,75
45	11,91	180,00	11,77	179,00	0,14	1,00
46	12,36	180,00	12,23	182,25	0,13	2,25
47	12,23	180,00	12,01	180,75	0,22	0,75
48	12,18	180,00	12,03	182,00	0,15	2,00
49	12,19	180,00	12,06	181,25	0,13	1,25
50	12,30	180,00	12,00	181,50	0,30	1,50
51	12,08	180,00	12,05	180,50	0,03	0,50
52	12,13	180,00	11,97	181,00	0,16	1,00
53	12,14	180,00	12,06	181,50	0,08	1,50
54	12,37	180,00	12,25	181,75	0,12	1,75
55	12,05	180,00	11,94	181,50	0,11	1,50
56	12,29	180,00	12,11	181,25	0,18	1,25
57	12,65	180,00	12,39	182,00	0,26	2,00
58	11,88	180,00	11,82	179,25	0,06	0,75
59	12,18	180,00	12,01	181,50	0,17	1,50
60	12,42	180,00	12,25	181,25	0,17	1,25
61	12,06	180,00	11,98	182,50	0,08	2,50
62	12,21	180,00	12,12	181,50	0,09	1,50
63	12,14	180,00	11,99	182,25	0,15	2,25
64	12,04	180,00	11,93	180,50	0,11	0,50
65	12,20	180,00	12,11	181,50	0,09	1,50
66	12,13	180,00	12,01	181,00	0,12	1,00
67	12,74	180,00	12,44	182,25	0,30	2,25
68	12,14	180,00	11,98	180,75	0,16	0,75
69	12,03	180,00	11,93	180,50	0,10	0,50
70	12,04	180,00	11,91	180,50	0,13	0,50
71	12,08	180,00	11,97	178,25	0,11	1,75
72	12,16	180,00	12,04	181,50	0,12	1,50
73	11,99	180,00	11,87	181,25	0,12	1,25
74	12,22	180,00	11,99	181,00	0,23	1,00
75	12,43	180,00	12,32	181,50	0,11	1,50
76	11,96	180,00	11,92	181,50	0,04	1,50
77	11,98	180,00	11,92	181,50	0,06	1,50
78	12,41	180,00	12,33	183,75	0,08	3,75
79	12,46	180,00	12,23	180,75	0,23	0,75
80	12,34	180,00	12,12	182,25	0,22	2,25
81	12,03	180,00	12,01	179,50	0,02	0,50
82	12,43	180,00	12,09	181,00	0,34	1,00
83	12,04	180,00	11,94	178,50	0,10	1,50
84	12,13	180,00	12,01	180,00	0,12	0,00
85	12,22	180,00	12,06	181,25	0,16	1,25
86	12,08	180,00	11,99	180,75	0,09	0,75
87	12,02	180,00	11,99	181,25	0,03	1,25
88	12,15	180,00	12,04	180,25	0,11	0,25
89	12,15	180,00	12,07	180,75	0,08	0,75
90	11,97	180,00	11,88	180,75	0,09	0,75
91	12,53	180,00	12,18	179,00	0,35	1,00
92	12,23	180,00	11,87	182,50	0,36	2,50
93	11,75	180,00	11,65	179,25	0,10	0,75
94	12,05	180,00	11,77	179,75	0,28	0,25
95	12,09	180,00	11,97	179,00	0,12	1,00
96	12,33	180,00	12,10	180,00	0,23	0,00
97	12,27	180,00	12,15	180,25	0,12	0,25
98	12,37	180,00	12,18	182,75	0,19	2,75
99	12,53	180,00	12,39	181,25	0,14	1,25
100	12,13	180,00	12,06	180,00	0,07	0,00
				Standard deviation:	**0,077**	**0,814**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	





Machine Capability Study
Control System

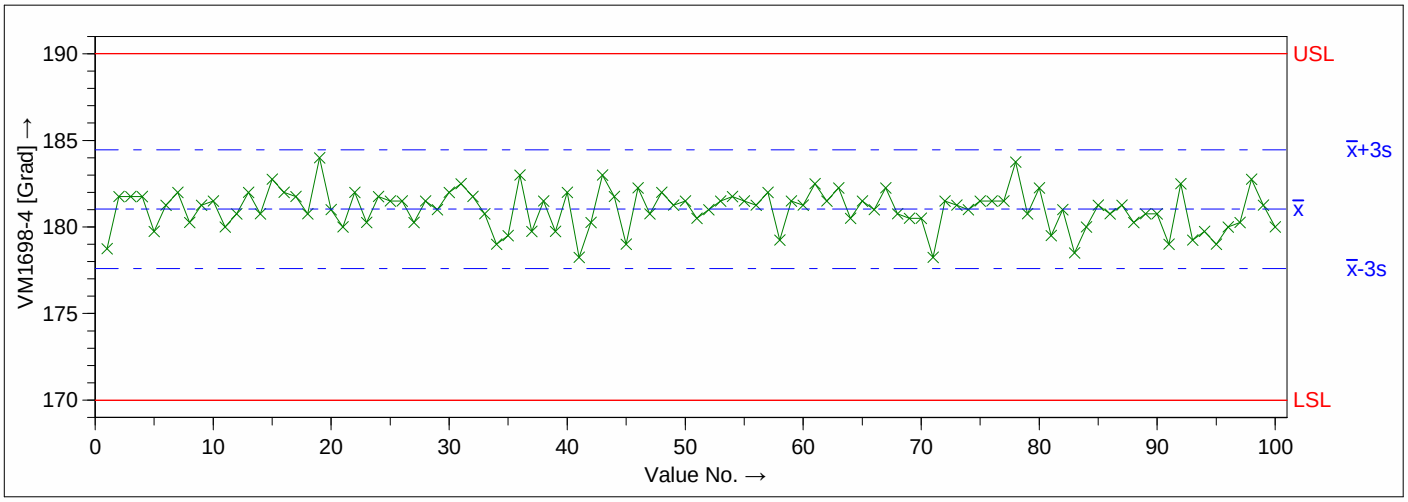
Page 1 / 1

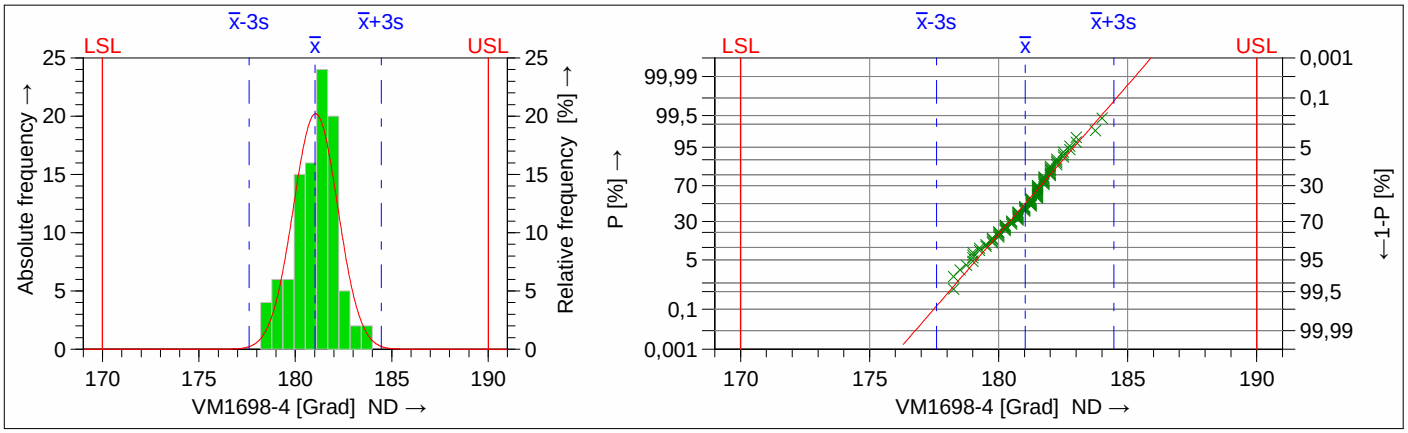
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_n	Char.Descr.	VM1698-4	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	1024210	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 14:50:54 to 25.07.2022 15:19:25

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	181.0275
LSL	170.00	x_{min}	178.25	$\bar{x}$-3s	177.5932
USL	190.00	x_{max}	184.00	$\bar{x}$+3s	184.4618
T	20.00	R	5.75	6s	6.8686
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	2.91
Critical capability index	=	C_{mk}	2.61

The requirements were met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_n	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.1 6 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	11,56	11,64	11,92	11,72	11,63	11,95	11,77	11,90	11,77	11,88
1024210	VM1698-4	Grad	178,75	181,75	181,75	181,75	179,75	181,25	182,00	180,25	181,25	181,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	11,70	11,76	11,78	11,74	12,12	11,93	12,07	11,92	12,05	12,11
1024210	VM1698-4	Grad	180,00	180,75	182,00	180,75	182,75	182,00	181,75	180,75	184,00	181,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	11,94	12,06	12,08	12,00	11,97	12,12	11,79	12,00	11,88	11,95
1024210	VM1698-4	Grad	180,00	182,00	180,25	181,75	181,50	181,50	180,25	181,50	181,00	182,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	12,02	12,08	11,82	11,95	11,66	12,07	11,93	11,98	11,97	11,98
1024210	VM1698-4	Grad	182,50	181,75	180,75	179,00	179,50	183,00	179,75	181,50	179,75	182,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	11,89	11,95	12,09	12,16	11,77	12,23	12,01	12,03	12,06	12,00
1024210	VM1698-4	Grad	178,25	180,25	183,00	181,75	179,00	182,25	180,75	182,00	181,25	181,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	12,05	11,97	12,06	12,25	11,94	12,11	12,39	11,82	12,01	12,25
1024210	VM1698-4	Grad	180,50	181,00	181,50	181,75	181,50	181,25	182,00	179,25	181,50	181,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	11,98	12,12	11,99	11,93	12,11	12,01	12,44	11,98	11,93	11,91
1024210	VM1698-4	Grad	182,50	181,50	182,25	180,50	181,50	181,00	182,25	180,75	180,50	180,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	11,97	12,04	11,87	11,99	12,32	11,92	11,92	12,33	12,23	12,12
1024210	VM1698-4	Grad	178,25	181,50	181,25	181,00	181,50	181,50	181,50	183,75	180,75	182,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_n	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.1 6 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	12,01	12,09	11,94	12,01	12,06	11,99	11,99	12,04	12,07	11,88
1024210	VM1698-4	Grad	179,50	181,00	178,50	180,00	181,25	180,75	181,25	180,25	180,75	180,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,18	11,87	11,65	11,77	11,97	12,10	12,15	12,18	12,39	12,06
1024210	VM1698-4	Grad	179,00	182,50	179,25	179,75	179,00	180,00	180,25	182,75	181,25	180,00

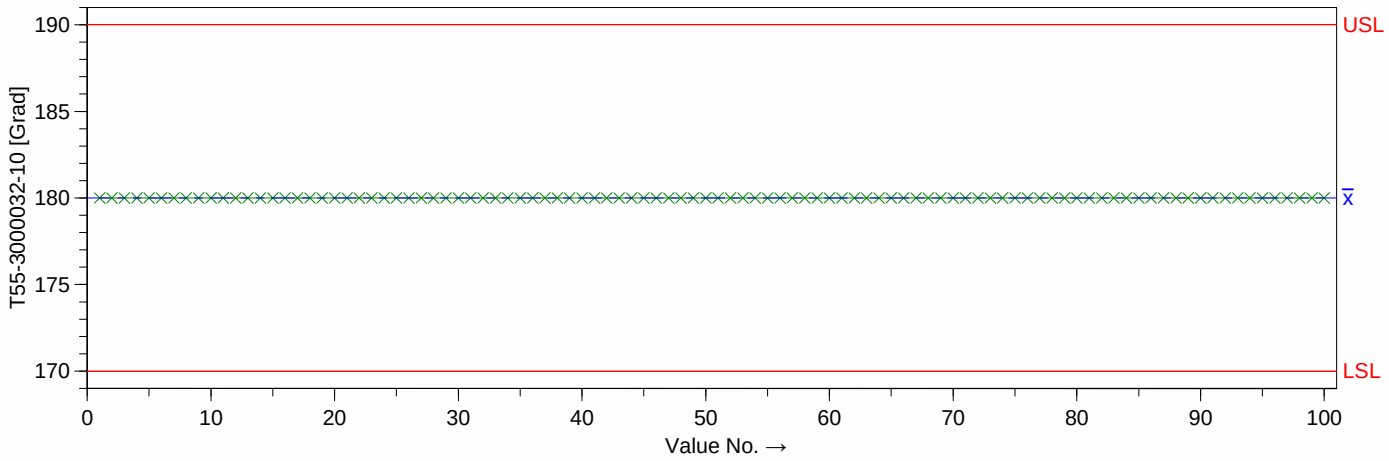
Machine Capability Study
Tool System

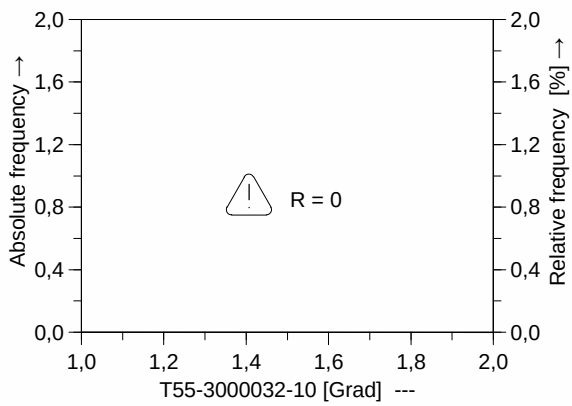
Plant	ATG Westhausen	Operator Name	Sünder
Date	25.07.2022		

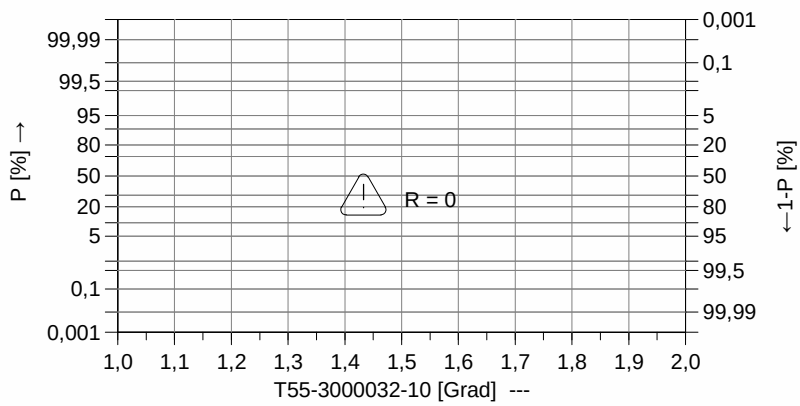
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019841_n	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	199777	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 25.07.2022 14:50:54 to 25.07.2022 15:19:25

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.16 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	180.0000
LSL	170.00	x_{min}	180.00		
USL	190.00	x_{max}	180.00		
T	20.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

Serial No.	1019841_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.1 6 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
199777	T55-3000032-10	Nm	11,66	11,76	11,98	11,77	11,68	11,93	11,88	12,04	11,78	11,94
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
199777	T55-3000032-10	Nm	11,93	11,90	12,09	11,87	12,18	12,08	12,38	12,07	12,16	12,18
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
199777	T55-3000032-10	Nm	12,02	12,22	12,16	12,10	12,08	12,32	11,92	12,07	12,03	12,14
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
199777	T55-3000032-10	Nm	12,14	12,17	11,97	12,10	11,73	12,13	12,08	12,20	12,09	12,12
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
199777	T55-3000032-10	Nm	11,98	12,10	12,20	12,49	11,91	12,36	12,23	12,18	12,19	12,30
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
199777	T55-3000032-10	Nm	12,08	12,13	12,14	12,37	12,05	12,29	12,65	11,88	12,18	12,42
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
199777	T55-3000032-10	Nm	12,06	12,21	12,14	12,04	12,20	12,13	12,74	12,14	12,03	12,04
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
199777	T55-3000032-10	Nm	12,08	12,16	11,99	12,22	12,43	11,96	11,98	12,41	12,46	12,34
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 25.07.2022

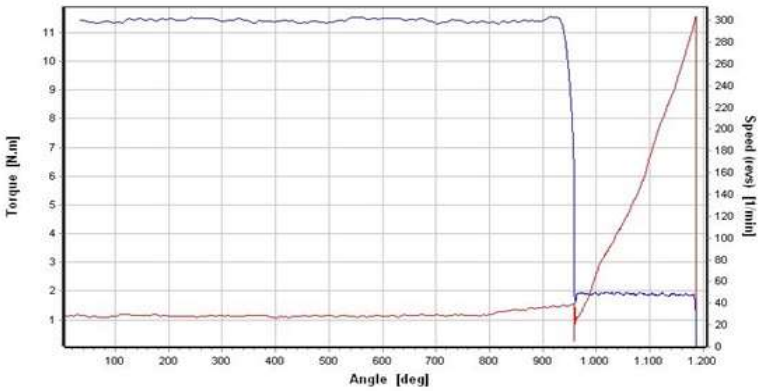
Serial No.	1019841_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	199777	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.1 6 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
199777	T55-3000032-10	Nm	12,03	12,43	12,04	12,13	12,22	12,08	12,02	12,15	12,15	11,97
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

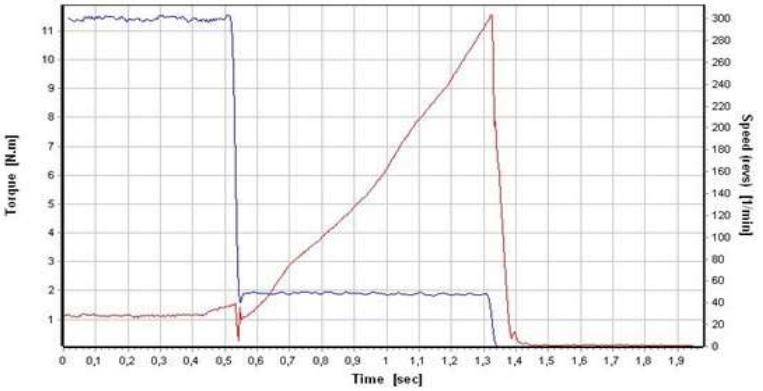
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
199777	T55-3000032-10	Nm	12,53	12,23	11,75	12,05	12,09	12,33	12,27	12,37	12,53	12,13
199777	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

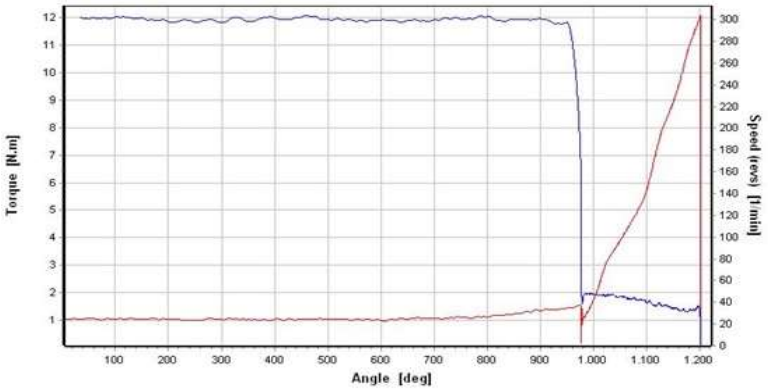
Model:	**CTBAW153**	Serial no:	**1019841**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	



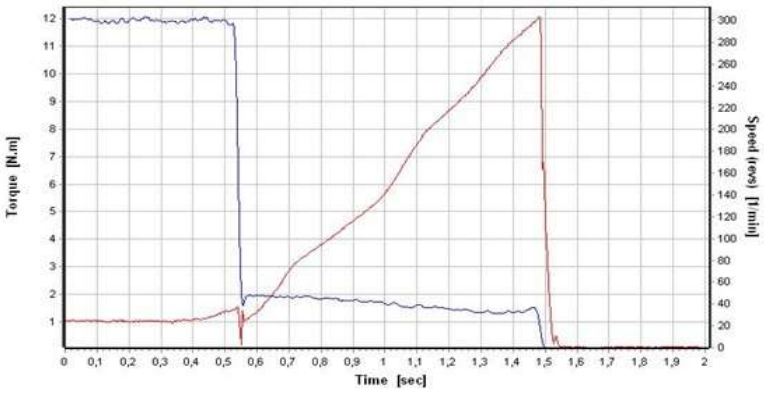
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed