Homologation

Cordless Assembly Tools

Model: CTBAW153

Serial no.: 1019840

Contents

Homologation: CTBAW153 SN: 1019840

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Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 50 rpm	4,88 %
Single-stage tightening system	☐	Speed 100 %	1025 rpm

Manufacturer: Apex Tool Group Serial no: **1019840**

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

Hard joint (H)	41,60	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,40	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	6,93	6,81 Nm
	Standard deviation	0,05	0,04 Nm
	Torque scatter (99,73%)	0,27	0,26 Nm
	C_m	3,59	3,79
	C_{mk}	2,95	2,15

b)	Min. C_m hard/soft (lowest value)	3,59
	Min. C_{mk} hard/soft (lowest value)	2,15

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

Note:

Machine Capability Study
Control System

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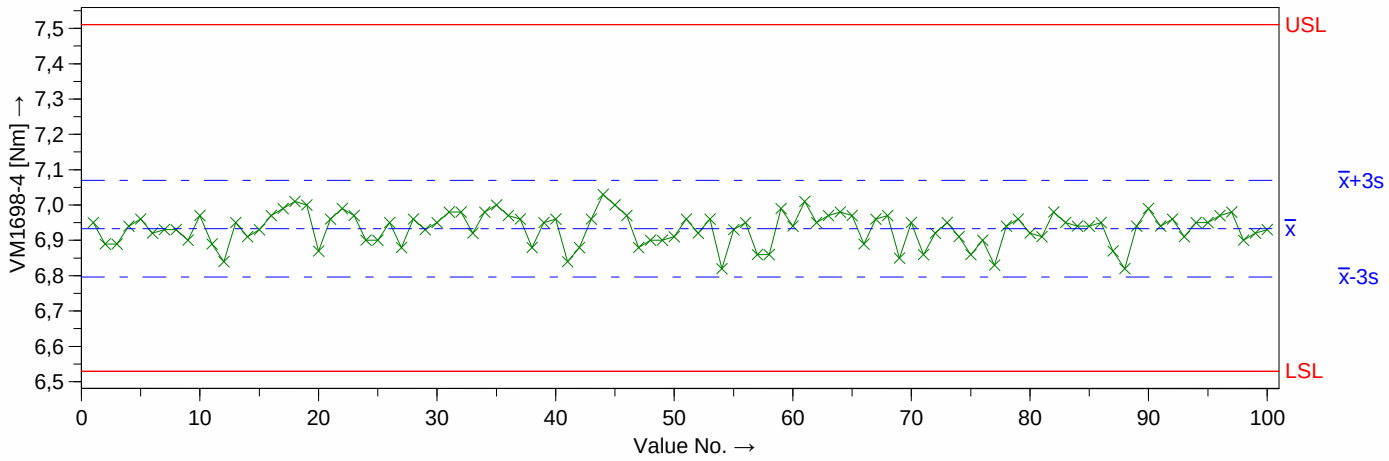
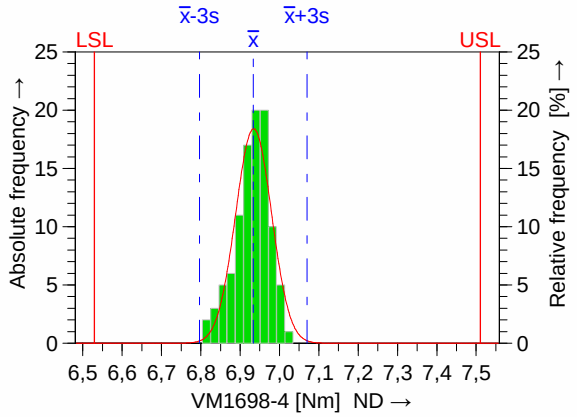
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

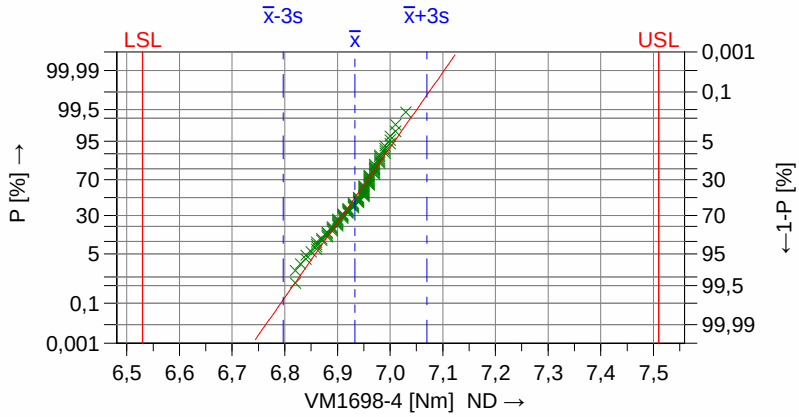
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_d	Char.Descr.	VM1698-4	Nom.val. 7,02	0,49 USL 7,51
		Serial No.	1024210	Unit Nm	-0,49 LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 22.07.2022 13:26:54 to 22.07.2022 13:39:30

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			x̄	6.9332
LSL	6.53	x_{min}	6.82	x̄-3s	6.7967
USL	7.51	x_{max}	7.03	x̄+3s	7.0697
T	0.98	R	0.21	6s	0.2730
		$n_{<T>}$	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	3.59
Critical capability index	=	C_{mk}	2.95

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

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Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019840_dM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.121 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	6,95	6,89	6,89	6,94	6,96	6,92	6,93	6,93	6,90	6,97
1024210	VM1698-4	Grad	30,50	29,75	29,75	30,75	30,50	30,25	30,25	30,25	30,25	31,00

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}
1024210	VM1698-4	Nm	6,89	6,84	6,95	6,91	6,93	6,97	6,99	7,01	7,00	6,87
1024210	VM1698-4	Grad	30,00	29,50	30,75	30,00	30,50	30,75	31,25	31,50	30,25	29,50

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	6,96	6,99	6,97	6,90	6,90	6,95	6,88	6,96	6,93	6,95
1024210	VM1698-4	Grad	30,25	30,25	30,25	29,75	29,50	30,50	29,50	30,00	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	6,98	6,98	6,92	6,98	7,00	6,97	6,96	6,88	6,95	6,96
1024210	VM1698-4	Grad	30,25	30,25	30,00	30,75	30,75	30,50	30,50	29,50	30,50	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	6,84	6,88	6,96	7,03	7,00	6,97	6,88	6,90	6,90	6,91
1024210	VM1698-4	Grad	29,00	29,50	30,50	30,75	31,00	30,50	29,75	29,50	29,75	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	6,96	6,92	6,96	6,82	6,93	6,95	6,86	6,86	6,99	6,94
1024210	VM1698-4	Grad	30,25	29,75	30,75	29,00	30,00	30,25	30,00	29,25	30,50	30,25

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	7,01	6,95	6,97	6,98	6,97	6,89	6,96	6,97	6,85	6,95
1024210	VM1698-4	Grad	30,75	30,00	30,00	30,25	31,00	29,75	30,00	30,25	29,50	30,00

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	6,86	6,92	6,95	6,91	6,86	6,90	6,83	6,94	6,96	6,92
1024210	VM1698-4	Grad	29,50	30,25	30,50	30,25	29,50	29,75	29,00	30,25	30,25	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.121 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	6,91	6,98	6,95	6,94	6,94	6,95	6,87	6,82	6,94	6,99
1024210	VM1698-4	Grad	30,25	30,75	30,50	30,25	30,50	30,50	29,75	29,00	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	6,94	6,96	6,91	6,95	6,95	6,97	6,98	6,90	6,92	6,93
1024210	VM1698-4	Grad	30,50	30,00	30,00	30,25	30,25	30,50	30,75	29,75	30,25	30,50

Machine Capability Study
Tool System

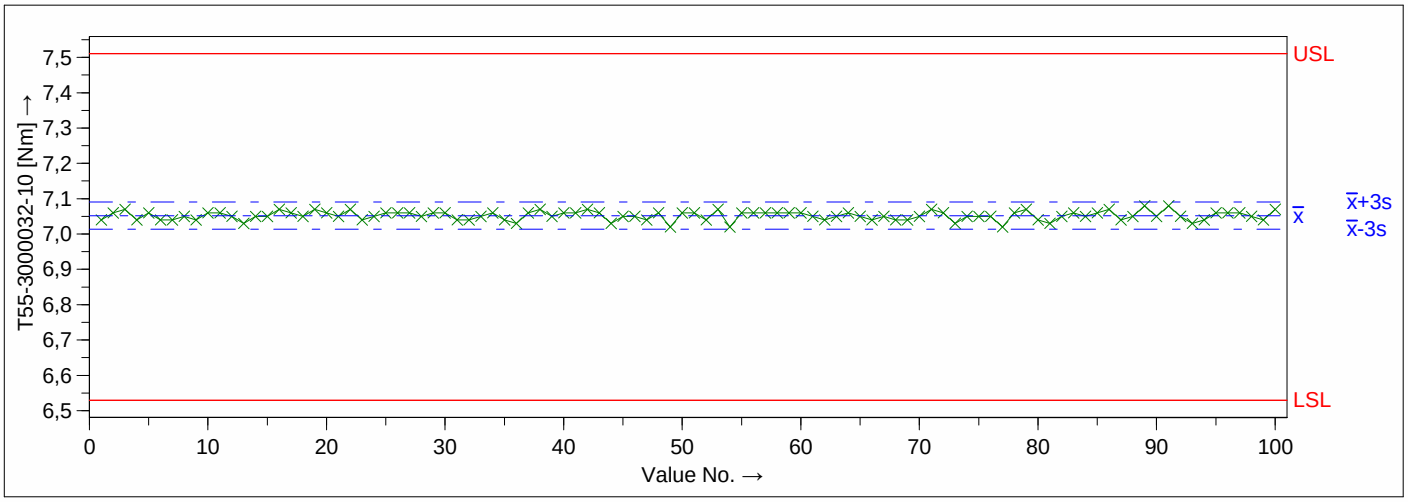
Cleco Production Tools

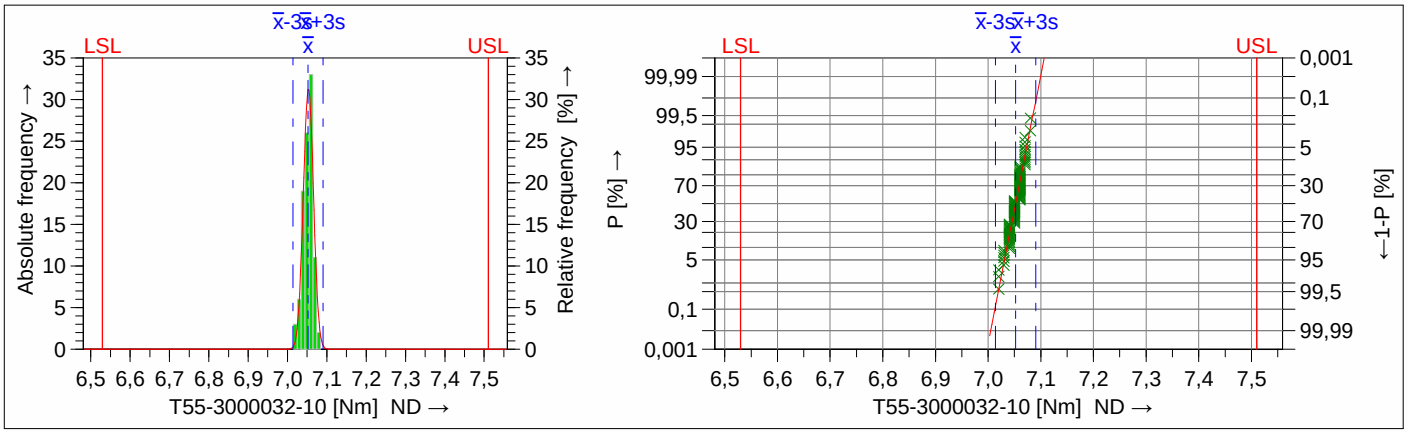
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_d	Char.Descr.	T55-3000032-10	Nom.val. 7,02	0,49 USL 7,51
		Serial No.	193773	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 22.07.2022 13:27:09 to 22.07.2022 13:40:17

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0521
LSL	6.53	x_{min}	7.02	$\bar{x}$-3s	7.0139
USL	7.51	x_{max}	7.08	$\bar{x}$+3s	7.0903
T	0.98	R	0.06	6s	0.0764
		$n_{<T>}$	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	12.82
Critical capability index	=	C_{mk}	11.98

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

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Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	193773	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 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}
193773	T55-3000032-10	Nm	7,04	7,06	7,07	7,04	7,06	7,04	7,04	7,05	7,04	7,06
193773	T55-3000032-10	Grad	30,00	30,00	32,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00

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}
193773	T55-3000032-10	Nm	7,06	7,05	7,03	7,05	7,05	7,07	7,06	7,05	7,07	7,06
193773	T55-3000032-10	Grad	30,00	31,00	30,00	31,00	32,00	32,00	31,00	31,00	30,00	31,00

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}
193773	T55-3000032-10	Nm	7,05	7,07	7,04	7,05	7,06	7,06	7,06	7,05	7,06	7,06
193773	T55-3000032-10	Grad	31,00	31,00	30,00	30,00	31,00	30,00	31,00	31,00	31,00	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}
193773	T55-3000032-10	Nm	7,04	7,04	7,05	7,06	7,04	7,03	7,06	7,07	7,05	7,06
193773	T55-3000032-10	Grad	31,00	30,00	31,00	32,00	31,00	31,00	30,00	31,00	31,00	29,00

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}
193773	T55-3000032-10	Nm	7,06	7,07	7,06	7,03	7,05	7,05	7,04	7,06	7,02	7,06
193773	T55-3000032-10	Grad	30,00	31,00	31,00	31,00	31,00	30,00	30,00	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}
193773	T55-3000032-10	Nm	7,06	7,04	7,07	7,02	7,06	7,06	7,06	7,06	7,06	7,06
193773	T55-3000032-10	Grad	30,00	31,00	30,00	31,00	30,00	31,00	30,00	31,00	31,00	31,00

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}
193773	T55-3000032-10	Nm	7,05	7,04	7,05	7,06	7,05	7,04	7,05	7,04	7,04	7,05
193773	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	31,00	30,00	31,00	30,00	30,00	30,00

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}
193773	T55-3000032-10	Nm	7,07	7,06	7,03	7,05	7,05	7,05	7,02	7,06	7,07	7,04
193773	T55-3000032-10	Grad	31,00	31,00	30,00	30,00	31,00	29,00	31,00	30,00	31,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	193773	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 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}
193773	T55-3000032-10	Nm	7,03	7,05	7,06	7,05	7,06	7,07	7,04	7,05	7,08	7,05
193773	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	30,00	30,00	30,00	30,00	31,00	31,00

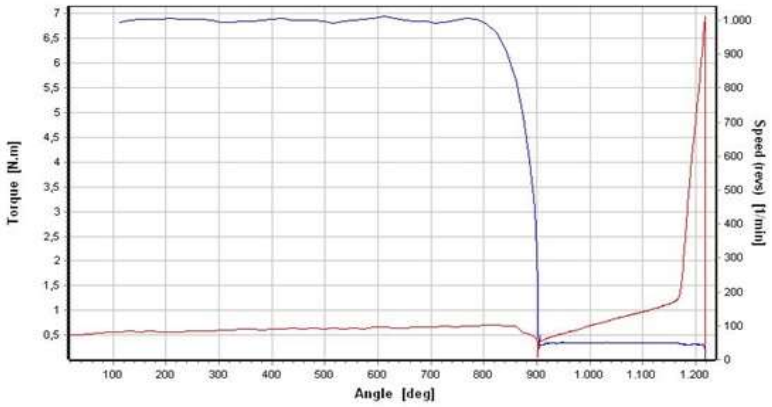
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	7,08	7,05	7,03	7,04	7,06	7,06	7,06	7,05	7,04	7,07
193773	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00

Torque graphs

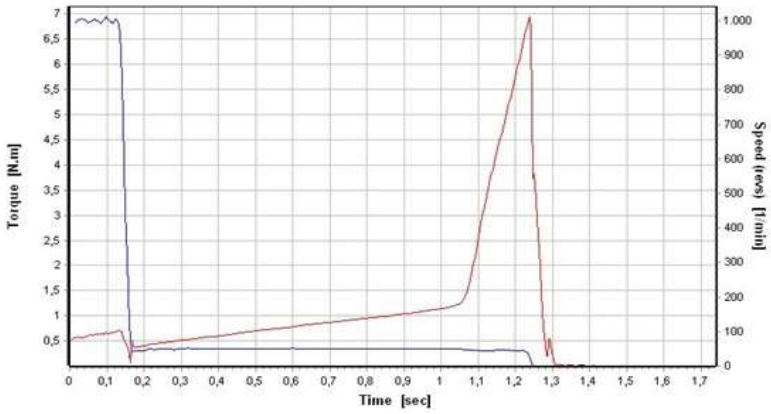
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019840**

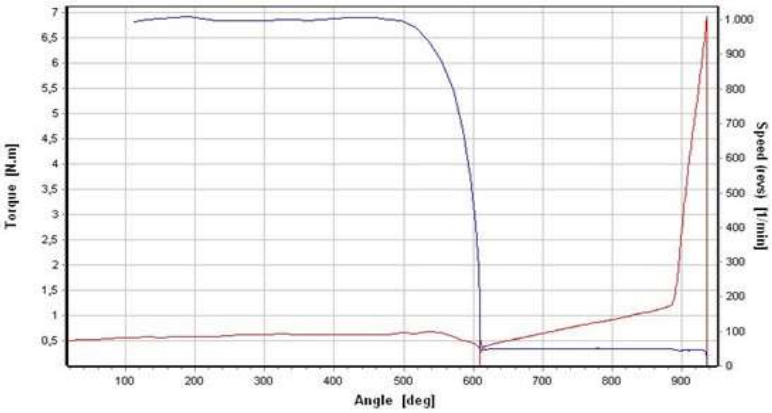
Angle degree: **30°**
Test torque: **7,0 Nm**



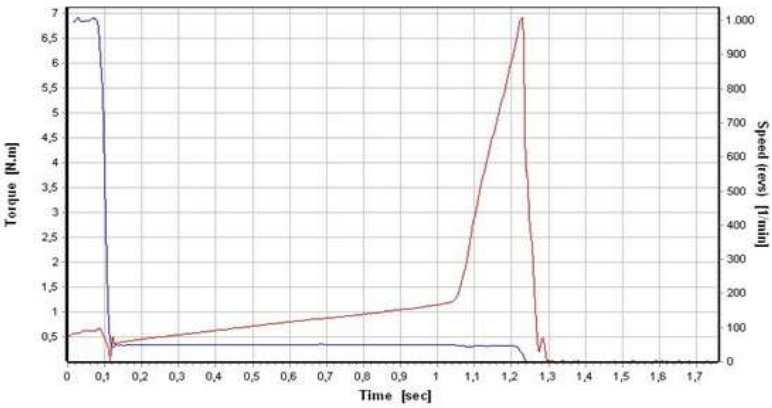
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

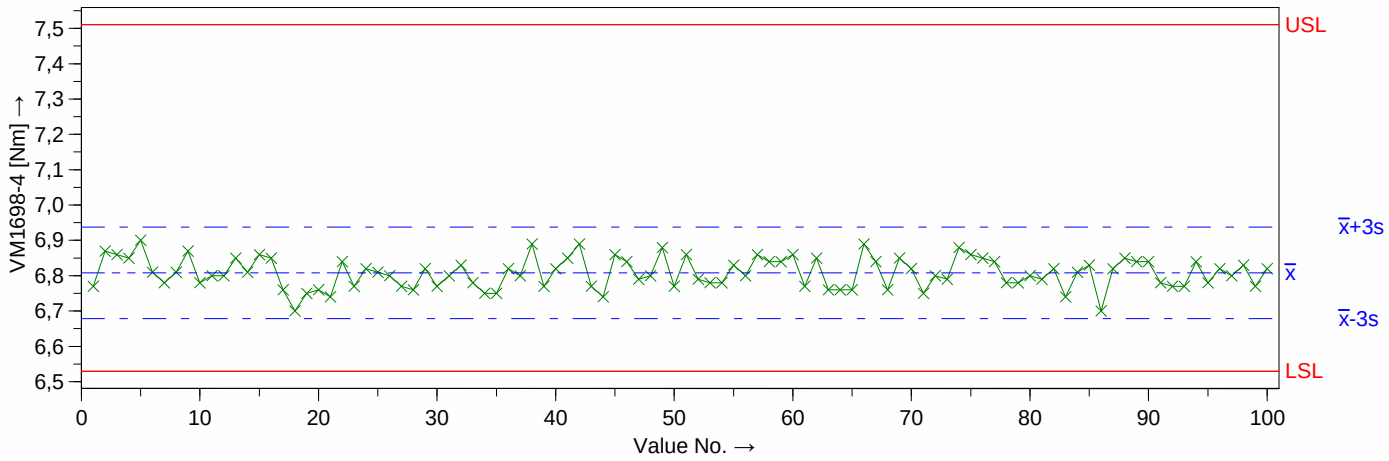
Machine Capability Study
Control System

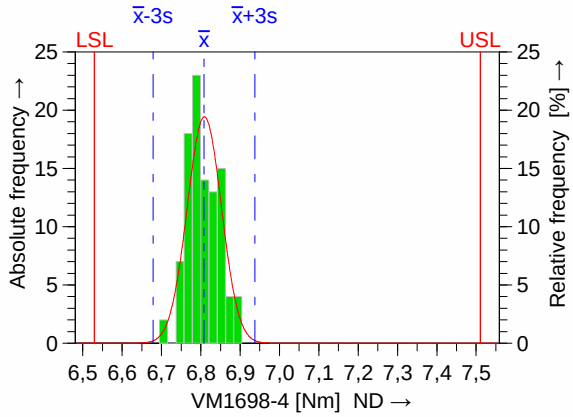
Plant	ATG Westhausen	Operator Name	Sünder
Date	27.07.2022		

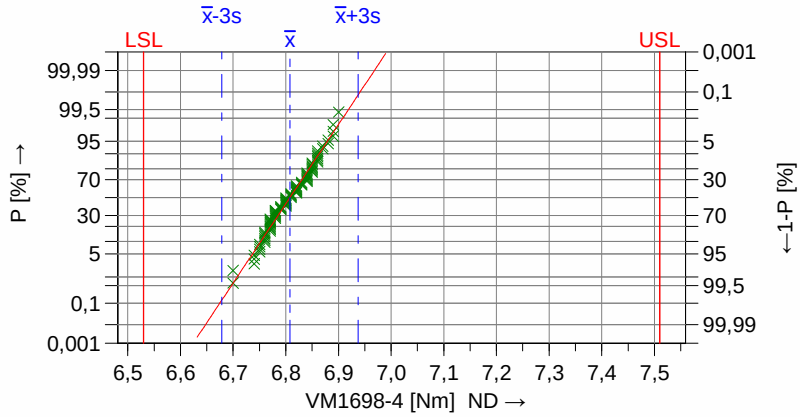
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_c	Char.Descr.	VM1698-4	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	1024210	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 27.07.2022 09:42:33 to 27.07.2022 10:05:29

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	6.8079
LSL	6.53	x_{min}	6.70	$\bar{x}$-3s	6.6786
USL	7.51	x_{max}	6.90	$\bar{x}$+3s	6.9372
T	0.98	R	0.20	6s	0.2586
		$n_{<T>}$	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	3.79
Critical capability index	=	C_{mk}	2.15

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 27.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.121 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	6,77	6,87	6,86	6,85	6,90	6,81	6,78	6,81	6,87	6,78
1024210	VM1698-4	Grad	371,25	373,00	376,00	375,25	384,00	372,25	370,50	374,50	381,50	373,75

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	6,80	6,80	6,85	6,81	6,86	6,85	6,76	6,70	6,75	6,76
1024210	VM1698-4	Grad	367,00	374,25	378,00	371,75	372,75	367,50	362,00	357,00	358,25	359,25

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	6,74	6,84	6,77	6,82	6,81	6,80	6,77	6,76	6,82	6,77
1024210	VM1698-4	Grad	357,50	373,00	363,00	366,00	365,75	363,00	359,00	358,25	368,00	360,00

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	6,80	6,83	6,78	6,75	6,75	6,82	6,80	6,89	6,77	6,82
1024210	VM1698-4	Grad	363,00	367,25	365,75	356,25	361,75	369,50	358,75	373,50	360,50	365,50

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	6,85	6,89	6,77	6,74	6,86	6,84	6,79	6,80	6,88	6,77
1024210	VM1698-4	Grad	369,00	372,50	360,75	356,75	368,75	370,25	361,75	364,50	374,00	360,50

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	6,86	6,79	6,78	6,78	6,83	6,80	6,86	6,84	6,84	6,86
1024210	VM1698-4	Grad	369,50	360,75	358,50	361,50	365,50	362,50	370,25	370,00	368,50	370,00

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	6,77	6,85	6,76	6,76	6,76	6,89	6,84	6,76	6,85	6,82
1024210	VM1698-4	Grad	358,25	370,25	362,50	357,50	357,75	373,75	367,25	357,50	366,75	366,25

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	6,75	6,80	6,79	6,88	6,86	6,85	6,84	6,78	6,78	6,80
1024210	VM1698-4	Grad	357,50	364,25	365,75	369,75	371,00	373,75	369,50	362,00	356,50	358,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 27.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.121 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	6,79	6,82	6,74	6,81	6,83	6,70	6,82	6,85	6,84	6,84
1024210	VM1698-4	Grad	354,75	358,75	352,50	359,25	360,75	348,25	357,75	364,75	362,25	364,50

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	6,78	6,77	6,77	6,84	6,78	6,82	6,80	6,83	6,77	6,82
1024210	VM1698-4	Grad	357,00	356,75	353,75	360,25	354,00	360,75	358,50	361,50	357,75	358,50

Machine Capability Study
Tool System

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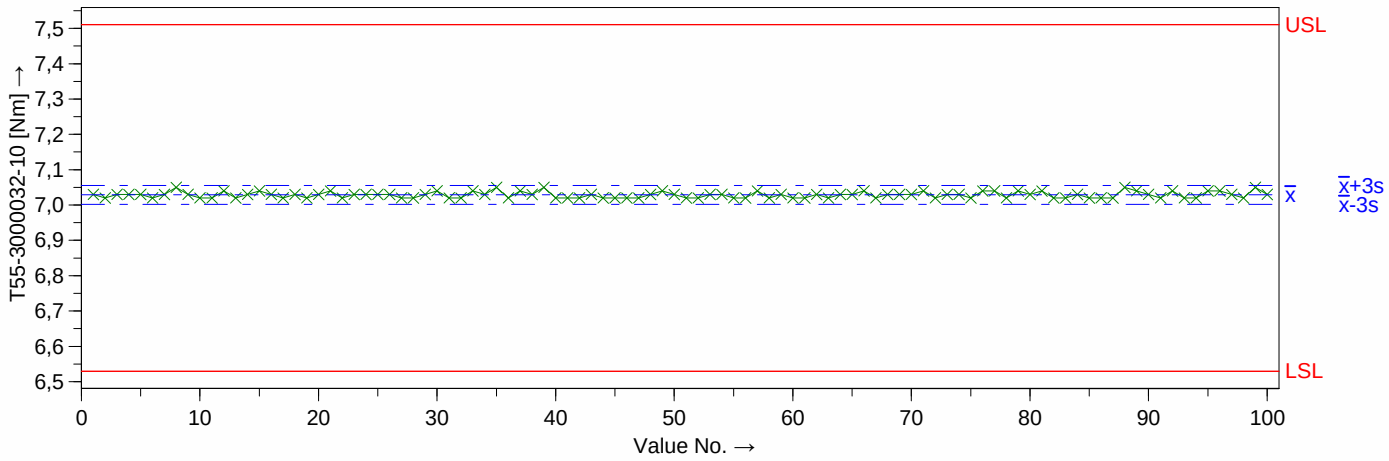
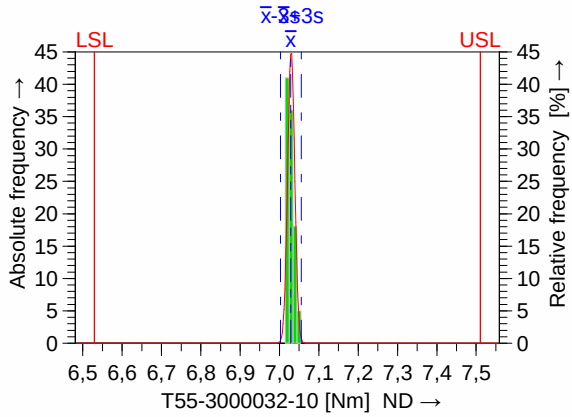
Plant	ATG Westhausen	Operator Name	Sünder
Date	27.07.2022		

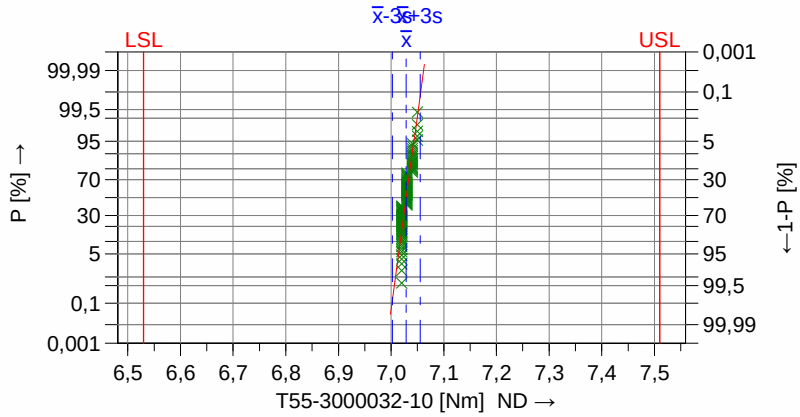
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_c	Char.Descr.	T55-3000032-10	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	193773	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 27.07.2022 09:42:33 to 27.07.2022 10:05:29

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0287
LSL	6.53	x_{min}	7.02	$\bar{x}$-3s	7.0022
USL	7.51	x_{max}	7.05	$\bar{x}$+3s	7.0552
T	0.98	R	0.03	6s	0.0530
		$n_{<T>}$	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	18.48
Critical capability index	=	C_{mk}	18.15

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 27.07.2022

Serial No.	1019840_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	193773	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 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}
193773	T55-3000032-10	Nm	7,03	7,02	7,03	7,03	7,03	7,02	7,03	7,05	7,03	7,02
193773	T55-3000032-10	Grad	374,00	378,00	384,00	381,00	396,00	381,00	377,00	383,00	385,00	380,00

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}
193773	T55-3000032-10	Nm	7,02	7,04	7,02	7,03	7,04	7,03	7,02	7,03	7,02	7,03
193773	T55-3000032-10	Grad	377,00	381,00	383,00	379,00	378,00	377,00	370,00	365,00	365,00	366,00

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}
193773	T55-3000032-10	Nm	7,04	7,02	7,03	7,03	7,03	7,03	7,02	7,02	7,03	7,04
193773	T55-3000032-10	Grad	365,00	377,00	368,00	373,00	370,00	367,00	365,00	367,00	373,00	366,00

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}
193773	T55-3000032-10	Nm	7,02	7,02	7,04	7,03	7,05	7,02	7,04	7,03	7,05	7,02
193773	T55-3000032-10	Grad	371,00	375,00	371,00	365,00	367,00	377,00	366,00	381,00	367,00	372,00

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}
193773	T55-3000032-10	Nm	7,02	7,02	7,03	7,02	7,02	7,02	7,02	7,03	7,04	7,03
193773	T55-3000032-10	Grad	373,00	380,00	369,00	364,00	380,00	382,00	368,00	367,00	382,00	373,00

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}
193773	T55-3000032-10	Nm	7,02	7,02	7,03	7,03	7,02	7,02	7,04	7,02	7,03	7,02
193773	T55-3000032-10	Grad	376,00	368,00	362,00	368,00	370,00	371,00	375,00	378,00	374,00	373,00

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}
193773	T55-3000032-10	Nm	7,02	7,03	7,02	7,03	7,03	7,04	7,02	7,03	7,03	7,03
193773	T55-3000032-10	Grad	366,00	379,00	369,00	364,00	361,00	383,00	375,00	365,00	376,00	369,00

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}
193773	T55-3000032-10	Nm	7,04	7,02	7,03	7,03	7,02	7,04	7,04	7,02	7,04	7,03
193773	T55-3000032-10	Grad	363,00	373,00	368,00	380,00	379,00	383,00	379,00	372,00	371,00	365,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 27.07.2022

Serial No.	1019840_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	193773	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.121 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}
193773	T55-3000032-10	Nm	7,04	7,02	7,02	7,03	7,02	7,02	7,02	7,05	7,04	7,03
193773	T55-3000032-10	Grad	359,00	364,00	361,00	367,00	371,00	355,00	362,00	374,00	374,00	369,00

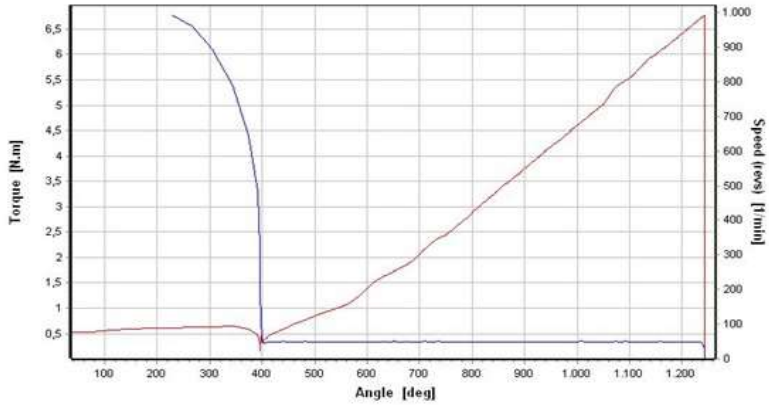
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	7,02	7,04	7,02	7,02	7,04	7,04	7,03	7,02	7,05	7,03
193773	T55-3000032-10	Grad	362,00	363,00	360,00	366,00	360,00	365,00	361,00	377,00	368,00	365,00

Torque graphs

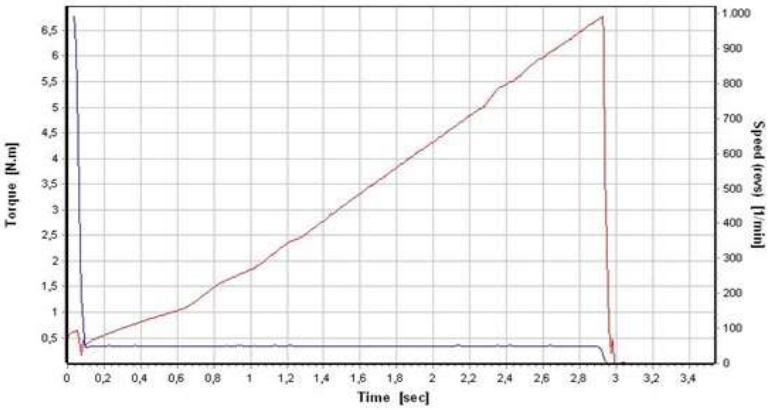
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019840**

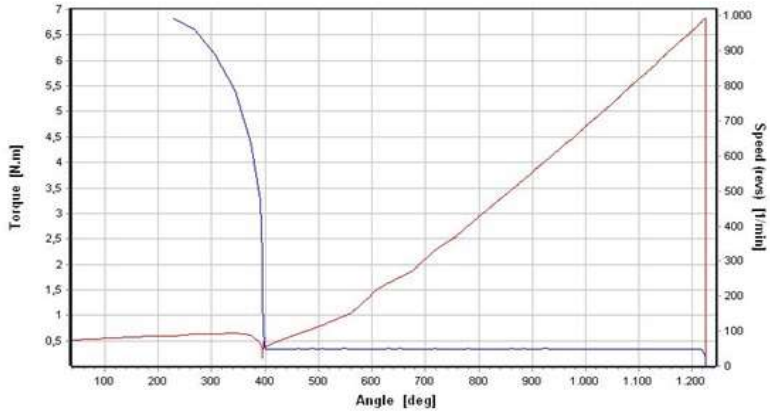
Angle degree: **360°**
Test torque: **7,0 Nm**



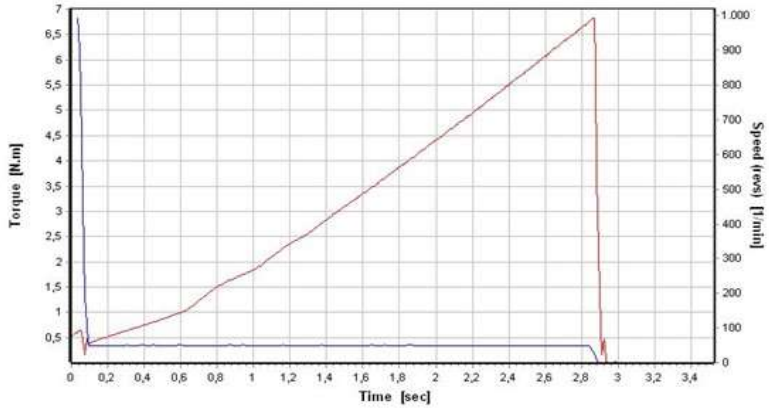
Value no. 1
Graph
Torque / Angle / Speed



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: **1019840**

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

Hard joint (H)	75,51	Nm / Revolution	Angle degree	30°
Soft joint (L)	6,18	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	12,58	12,35 Nm
	Standard deviation	0,08	0,07 Nm
	Torque scatter (99,73%)	0,47	0,44 Nm
	C_m	3,81	4,04
	C_{mk}	3,23	2,37

b)	Min. C_m hard/soft (lowest value)	3,81
	Min. C_{mk} hard/soft (lowest value)	2,37

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

Note:

Machine Capability Study
Control System

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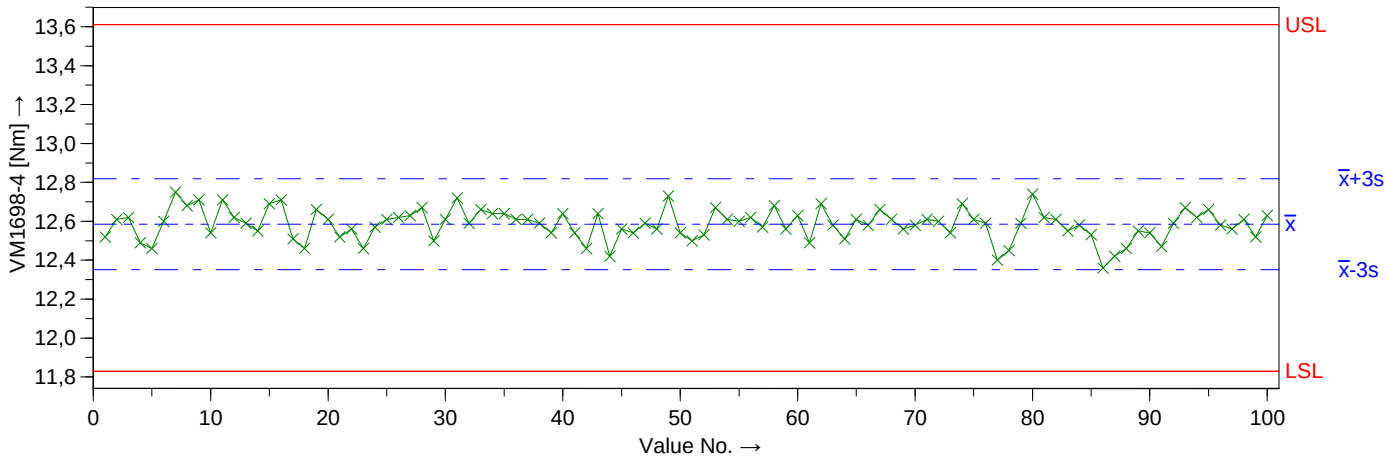
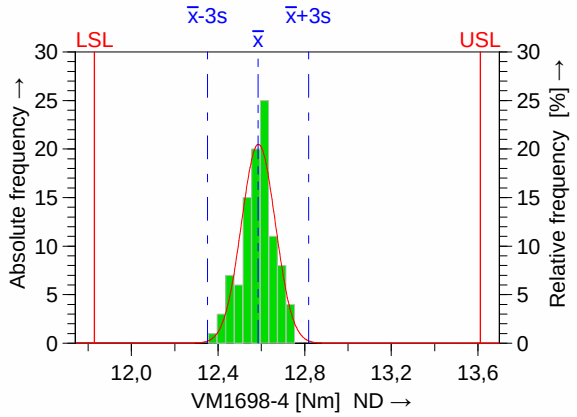
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

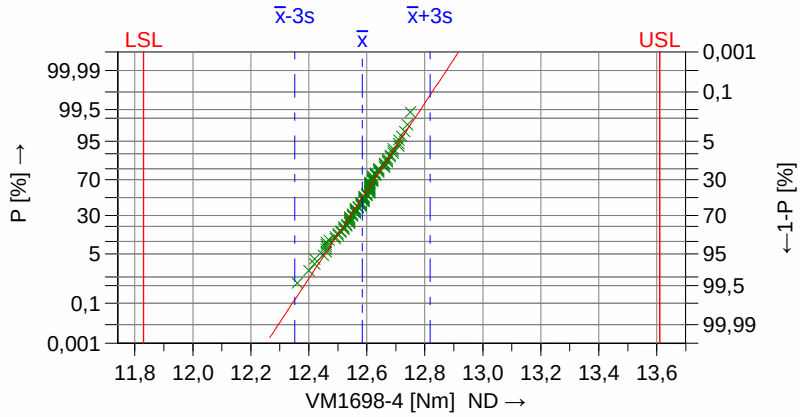
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_h	Char.Descr.	VM1698-4	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	1024210	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 22.07.2022 09:30:57 to 22.07.2022 09:48:20

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.5845
LSL	11.83	x_{min}	12.36	$\bar{x}$-3s	12.3508
USL	13.61	x_{max}	12.75	$\bar{x}$+3s	12.8182
T	1.78	R	0.39	6s	0.4674
		$n_{<T>}$	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	3.81
Critical capability index	=	C_{mk}	3.23

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 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	12,52	12,61	12,62	12,49	12,46	12,60	12,75	12,68	12,71	12,54
1024210	VM1698-4	Grad	28,50	29,00	29,00	28,25	28,25	29,75	30,25	30,00	29,50	29,25

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	12,71	12,62	12,59	12,55	12,69	12,71	12,51	12,46	12,66	12,61
1024210	VM1698-4	Grad	29,75	29,75	29,25	29,00	30,25	30,25	28,75	29,25	30,00	29,25

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	12,52	12,56	12,46	12,57	12,61	12,62	12,63	12,67	12,50	12,61
1024210	VM1698-4	Grad	28,75	29,50	30,00	30,25	30,25	31,25	30,75	30,75	30,25	30,50

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	12,72	12,59	12,66	12,64	12,64	12,61	12,61	12,59	12,54	12,64
1024210	VM1698-4	Grad	30,50	30,75	31,00	30,25	30,25	30,75	30,25	30,25	29,75	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	12,54	12,46	12,64	12,42	12,56	12,54	12,59	12,56	12,73	12,54
1024210	VM1698-4	Grad	30,25	30,00	30,75	30,00	30,50	30,50	30,75	30,25	31,25	30,75

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	12,50	12,53	12,67	12,61	12,60	12,62	12,57	12,68	12,56	12,63
1024210	VM1698-4	Grad	29,75	29,25	29,50	29,50	29,50	30,00	29,50	29,50	30,00	30,00

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	12,49	12,69	12,58	12,51	12,61	12,58	12,66	12,61	12,56	12,58
1024210	VM1698-4	Grad	29,25	30,75	30,00	30,00	30,25	30,00	30,00	29,75	29,75	30,00

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	12,61	12,60	12,54	12,69	12,61	12,59	12,40	12,45	12,59	12,74
1024210	VM1698-4	Grad	29,50	29,25	30,00	29,75	29,50	29,75	28,50	29,25	30,75	31,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	12,62	12,61	12,55	12,58	12,53	12,36	12,42	12,46	12,55	12,54
1024210	VM1698-4	Grad	30,75	30,25	30,00	29,50	29,75	29,25	29,00	29,00	29,00	29,50

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	12,47	12,59	12,67	12,62	12,66	12,58	12,56	12,61	12,52	12,63
1024210	VM1698-4	Grad	29,75	30,25	30,50	29,75	30,00	31,00	30,75	31,00	30,25	30,25

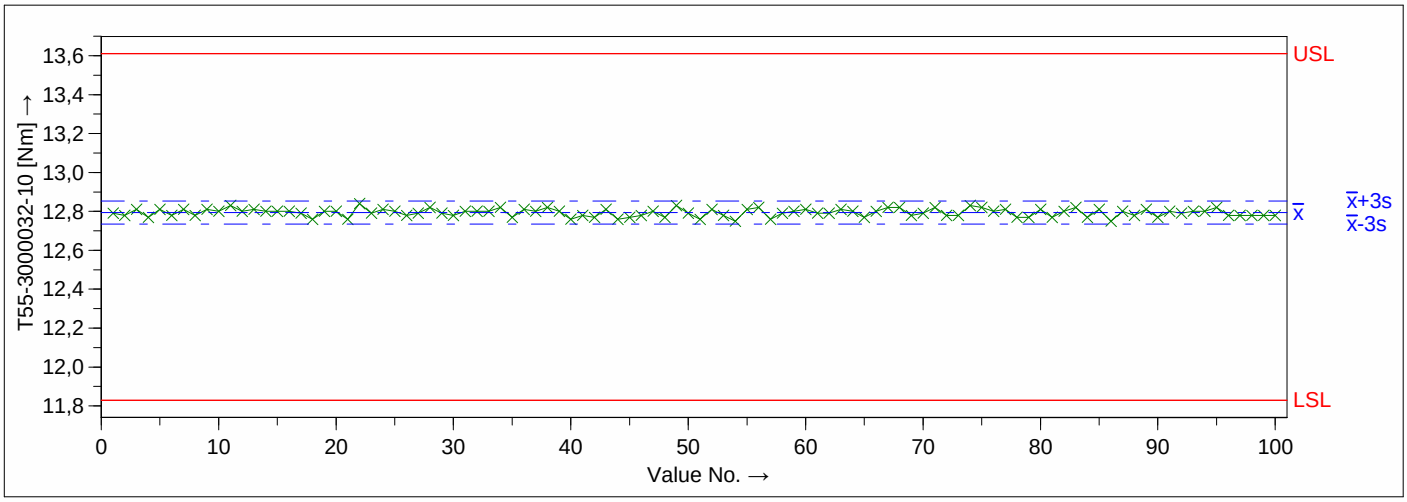
Machine Capability Study
Tool System

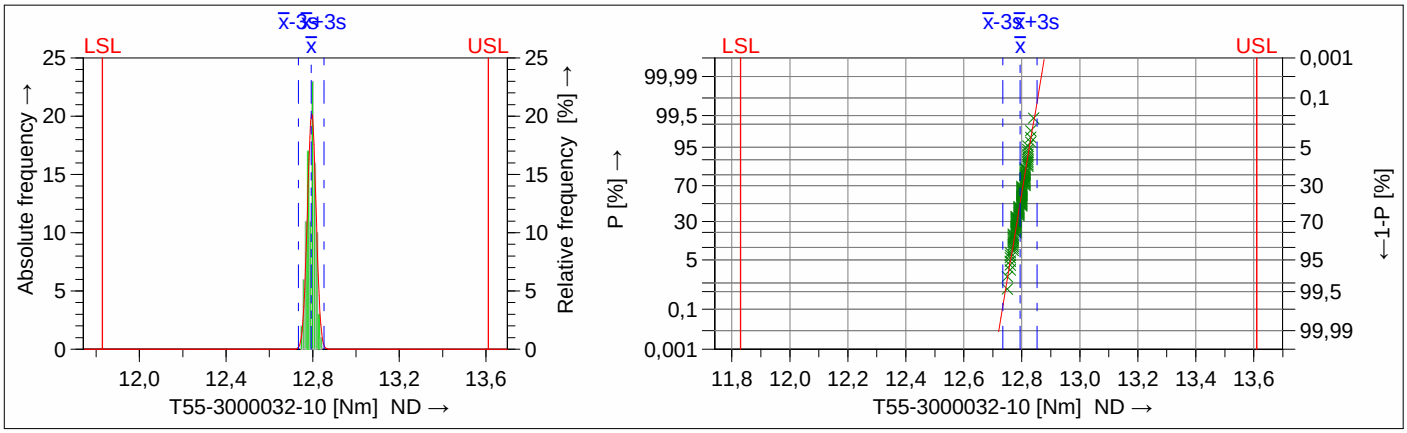
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_h	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	193773	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 22.07.2022 09:30:57 to 22.07.2022 09:48:20

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7937
LSL	11.83	x_{min}	12.75	$\bar{x}$-3s	12.7347
USL	13.61	x_{max}	12.84	$\bar{x}$+3s	12.8527
T	1.78	R	0.09	6s	0.1181
		$n_{<T>}$	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	15.08
Critical capability index	=	C_{mk}	13.83

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 22.07.2022

Serial No.	1019840_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	12,79	12,78	12,81	12,77	12,81	12,78	12,81	12,78	12,81	12,80
193773	T55-3000032-10	Grad	28,00	29,00	29,00	28,00	28,00	30,00	30,00	30,00	30,00	29,00

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}
193773	T55-3000032-10	Nm	12,83	12,80	12,81	12,80	12,80	12,80	12,79	12,76	12,80	12,80
193773	T55-3000032-10	Grad	30,00	29,00	29,00	29,00	30,00	30,00	29,00	29,00	30,00	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}
193773	T55-3000032-10	Nm	12,76	12,84	12,79	12,81	12,80	12,78	12,79	12,82	12,79	12,78
193773	T55-3000032-10	Grad	28,00	29,00	30,00	30,00	30,00	31,00	31,00	31,00	30,00	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}
193773	T55-3000032-10	Nm	12,80	12,80	12,80	12,82	12,77	12,81	12,80	12,82	12,80	12,76
193773	T55-3000032-10	Grad	31,00	30,00	31,00	30,00	30,00	30,00	30,00	30,00	29,00	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}
193773	T55-3000032-10	Nm	12,78	12,77	12,81	12,76	12,77	12,78	12,80	12,77	12,83	12,79
193773	T55-3000032-10	Grad	30,00	30,00	31,00	30,00	30,00	31,00	31,00	31,00	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}
193773	T55-3000032-10	Nm	12,76	12,81	12,78	12,75	12,81	12,82	12,76	12,79	12,80	12,81
193773	T55-3000032-10	Grad	30,00	29,00	29,00	30,00	29,00	30,00	29,00	29,00	30,00	30,00

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}
193773	T55-3000032-10	Nm	12,79	12,79	12,81	12,80	12,77	12,80	12,82	12,82	12,78	12,79
193773	T55-3000032-10	Grad	29,00	31,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00

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}
193773	T55-3000032-10	Nm	12,82	12,78	12,78	12,83	12,82	12,80	12,81	12,77	12,77	12,81
193773	T55-3000032-10	Grad	29,00	30,00	30,00	30,00	29,00	29,00	28,00	29,00	31,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	12,77	12,80	12,82	12,77	12,81	12,75	12,80	12,78	12,81	12,77
193773	T55-3000032-10	Grad	31,00	30,00	30,00	30,00	30,00	29,00	29,00	29,00	29,00	29,00

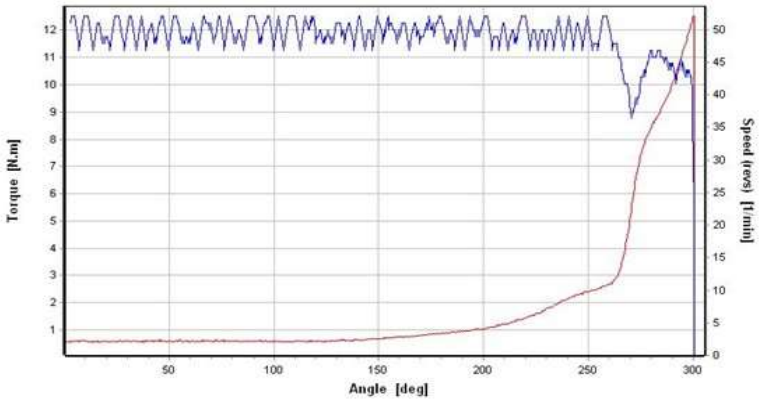
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	12,80	12,79	12,80	12,80	12,82	12,78	12,78	12,78	12,78	12,78
193773	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	30,00	31,00	30,00	31,00	30,00	30,00

Torque graphs

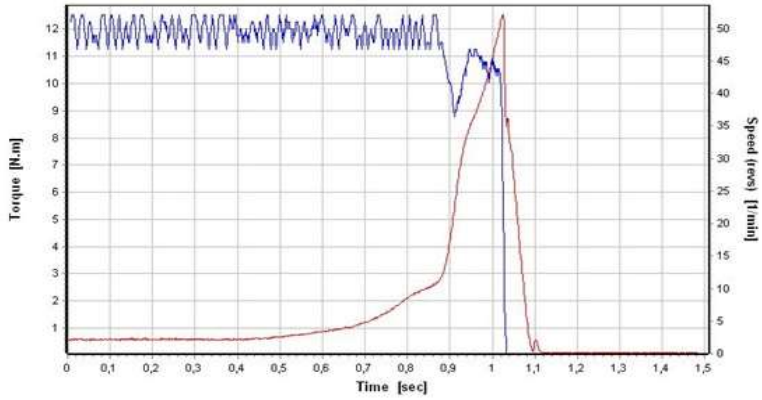
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019840**

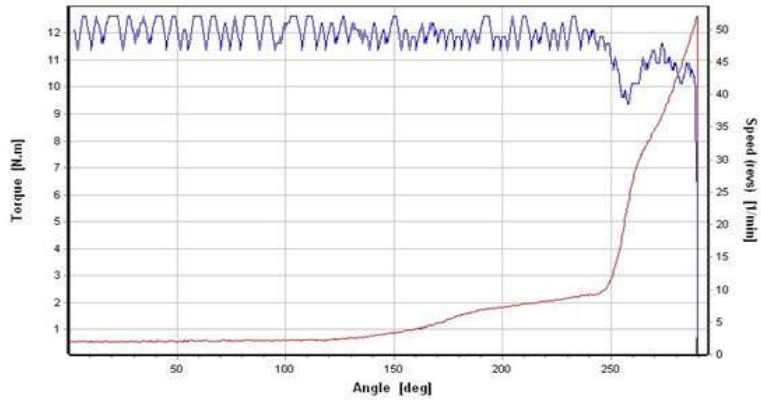
Angle degree: **30°**
Test torque: **12,7 Nm**



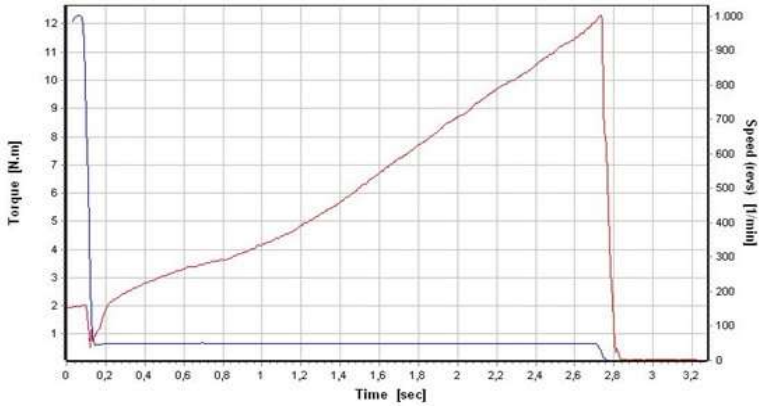
Value no. 1
Graph
Torque / Angle / Speed



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

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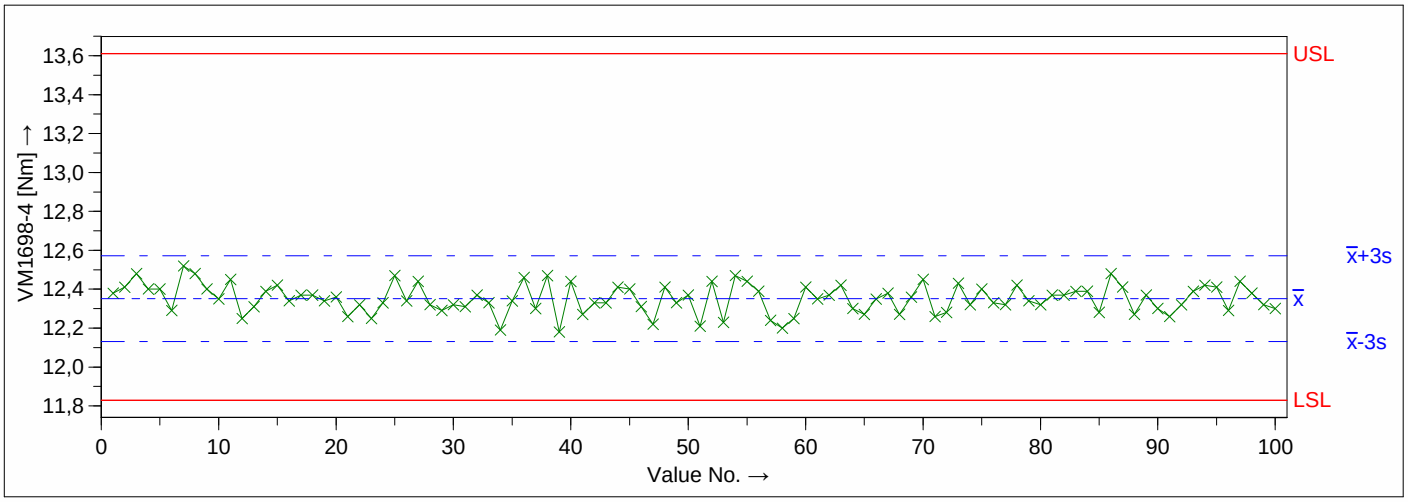
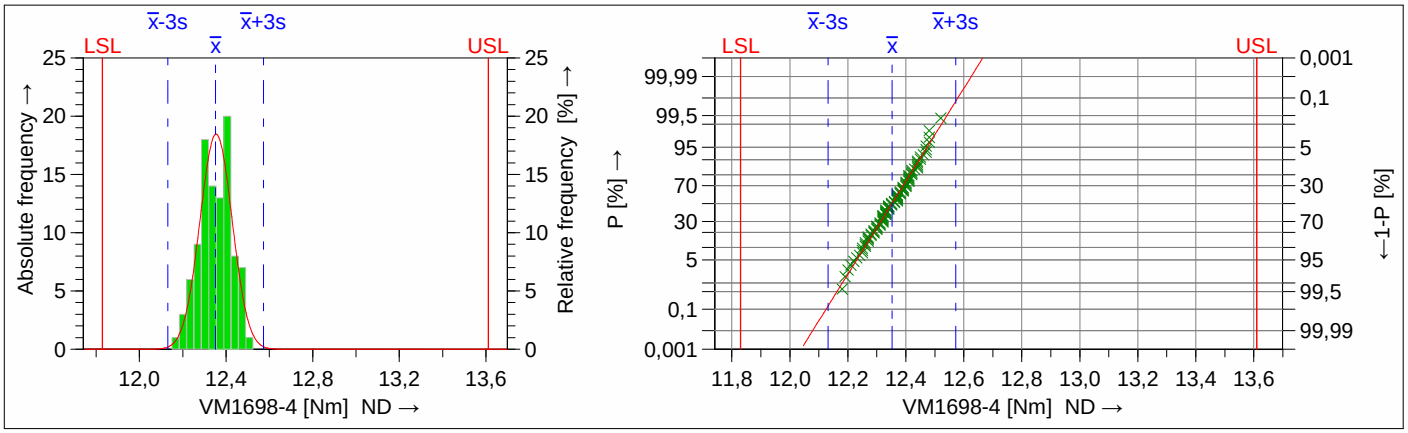
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_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 26.07.2022 14:19:47 to 26.07.2022 15:26:59

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.3520
LSL	11.83	x_{min}	12.18	$\bar{x}$-3s	12.1315
USL	13.61	x_{max}	12.52	$\bar{x}$+3s	12.5725
T	1.78	R	0.34	6s	0.4409
		$n_{<T>}$	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	4.04
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.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	12,38	12,41	12,48	12,40	12,40	12,29	12,52	12,48	12,40	12,35
1024210	VM1698-4	Grad	378,50	384,75	369,00	374,50	374,50	361,00	365,75	383,75	377,50	365,75

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	12,45	12,25	12,31	12,39	12,42	12,34	12,37	12,37	12,34	12,36
1024210	VM1698-4	Grad	379,25	361,25	358,25	358,50	374,50	371,00	362,25	363,50	355,50	359,75

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	12,26	12,32	12,25	12,33	12,47	12,34	12,44	12,32	12,29	12,32
1024210	VM1698-4	Grad	346,00	349,00	358,75	370,00	379,00	362,50	362,00	358,50	352,75	359,75

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	12,31	12,37	12,33	12,19	12,34	12,46	12,30	12,47	12,18	12,44
1024210	VM1698-4	Grad	359,25	356,50	361,00	353,00	356,75	358,75	344,00	372,00	352,75	361,25

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	12,27	12,33	12,33	12,41	12,40	12,31	12,22	12,41	12,33	12,37
1024210	VM1698-4	Grad	354,25	353,00	357,50	354,50	355,00	361,00	358,25	360,75	359,25	358,00

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	12,21	12,44	12,23	12,47	12,44	12,39	12,24	12,20	12,25	12,41
1024210	VM1698-4	Grad	343,25	359,25	351,25	368,00	365,00	365,25	352,75	339,50	350,25	365,75

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	12,35	12,37	12,42	12,30	12,27	12,35	12,38	12,27	12,36	12,45
1024210	VM1698-4	Grad	368,25	371,25	366,75	356,00	353,00	364,75	359,00	353,75	372,00	366,75

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	12,26	12,28	12,43	12,32	12,40	12,33	12,32	12,42	12,34	12,32
1024210	VM1698-4	Grad	355,25	351,75	361,25	363,00	363,00	370,75	361,00	365,50	357,00	355,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	12,37	12,37	12,39	12,39	12,28	12,48	12,41	12,27	12,37	12,30
1024210	VM1698-4	Grad	351,75	354,50	371,25	363,00	346,75	365,75	360,00	348,25	350,50	361,00

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	12,26	12,32	12,39	12,42	12,41	12,29	12,44	12,38	12,32	12,30
1024210	VM1698-4	Grad	354,75	364,00	360,50	362,25	352,75	350,50	355,00	378,25	357,75	356,00

Machine Capability Study
Tool System

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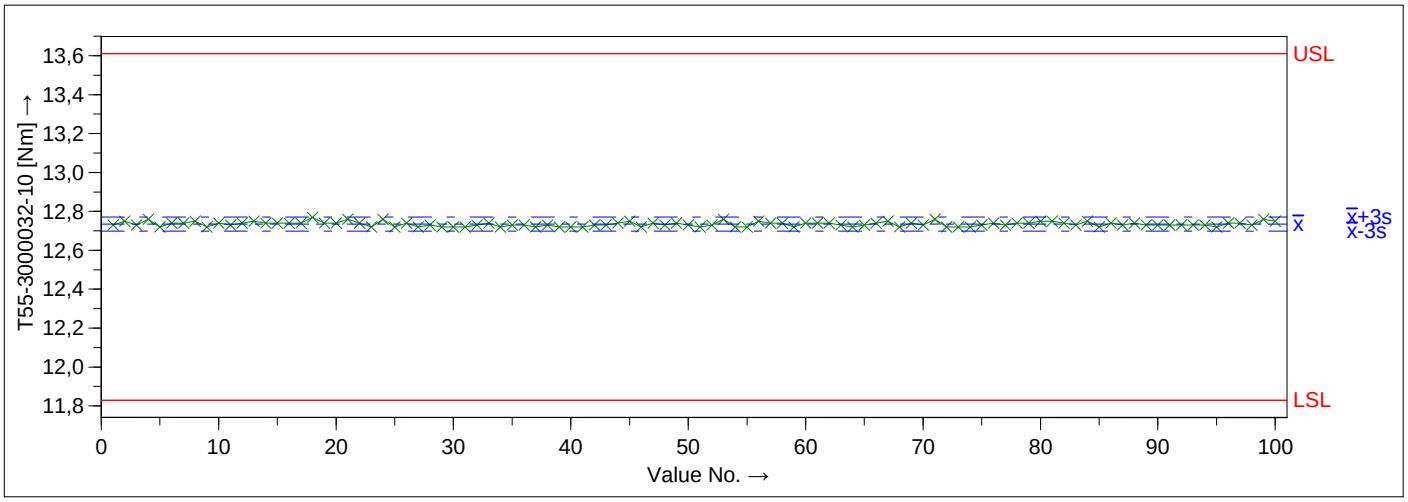
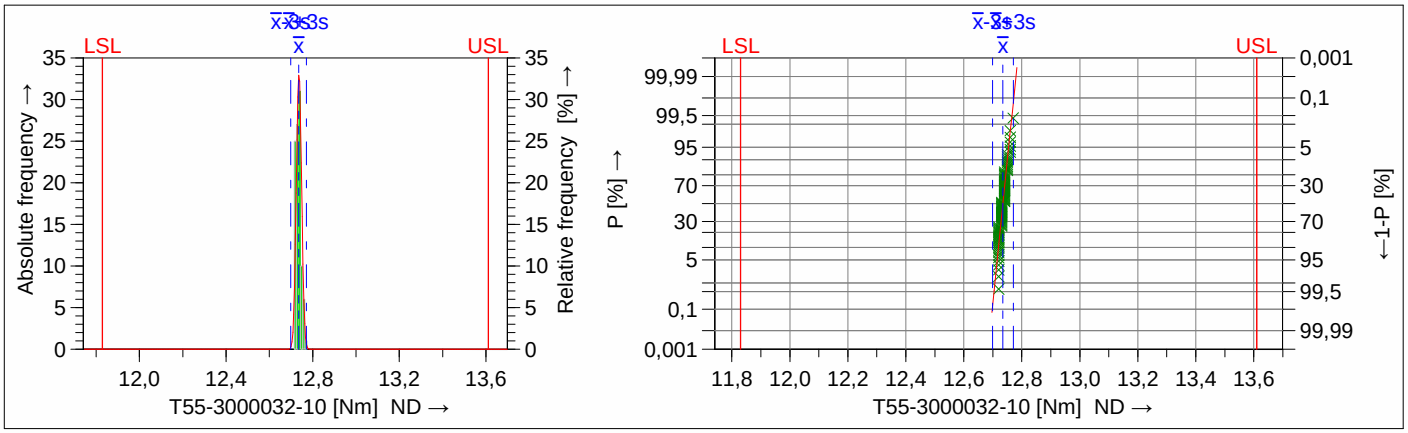
Plant	ATG Westhausen	Operator Name	Sünder
Date	26.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_g	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	193773	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 26.07.2022 14:19:47 to 26.07.2022 15:26:59

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7348
LSL	11.83	x_{min}	12.72	$\bar{x}$-3s	12.6987
USL	13.61	x_{max}	12.77	$\bar{x}$+3s	12.7709
T	1.78	R	0.05	6s	0.0721
		$n_{<T>}$	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	24.69
Critical capability index	=	C_{mk}	24.28

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.	1019840_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	12,73	12,75	12,73	12,76	12,72	12,74	12,74	12,75	12,72	12,74
193773	T55-3000032-10	Grad	379,00	388,00	375,00	379,00	378,00	365,00	367,00	384,00	376,00	367,00

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}
193773	T55-3000032-10	Nm	12,73	12,74	12,75	12,74	12,74	12,74	12,74	12,77	12,74	12,74
193773	T55-3000032-10	Grad	380,00	363,00	362,00	359,00	376,00	376,00	366,00	365,00	360,00	362,00

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}
193773	T55-3000032-10	Nm	12,76	12,74	12,72	12,76	12,72	12,74	12,72	12,73	12,72	12,72
193773	T55-3000032-10	Grad	344,00	347,00	363,00	372,00	381,00	365,00	361,00	362,00	355,00	366,00

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}
193773	T55-3000032-10	Nm	12,72	12,73	12,74	12,72	12,73	12,73	12,72	12,73	12,72	12,72
193773	T55-3000032-10	Grad	366,00	364,00	363,00	359,00	362,00	362,00	347,00	376,00	354,00	364,00

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}
193773	T55-3000032-10	Nm	12,72	12,73	12,73	12,74	12,75	12,72	12,74	12,73	12,74	12,73
193773	T55-3000032-10	Grad	363,00	361,00	358,00	357,00	360,00	362,00	362,00	368,00	361,00	362,00

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}
193773	T55-3000032-10	Nm	12,72	12,73	12,76	12,72	12,72	12,75	12,74	12,74	12,72	12,74
193773	T55-3000032-10	Grad	345,00	370,00	354,00	371,00	372,00	373,00	357,00	343,00	357,00	370,00

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}
193773	T55-3000032-10	Nm	12,74	12,74	12,73	12,72	12,73	12,74	12,75	12,72	12,74	12,73
193773	T55-3000032-10	Grad	369,00	376,00	373,00	361,00	365,00	365,00	362,00	359,00	375,00	372,00

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}
193773	T55-3000032-10	Nm	12,76	12,72	12,72	12,72	12,73	12,74	12,73	12,74	12,74	12,75
193773	T55-3000032-10	Grad	364,00	356,00	367,00	374,00	367,00	383,00	364,00	369,00	360,00	362,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 26.07.2022

Serial No.	1019840_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	12,75	12,74	12,73	12,75	12,72	12,74	12,73	12,74	12,73	12,73
193773	T55-3000032-10	Grad	360,00	364,00	378,00	371,00	356,00	370,00	364,00	359,00	357,00	364,00

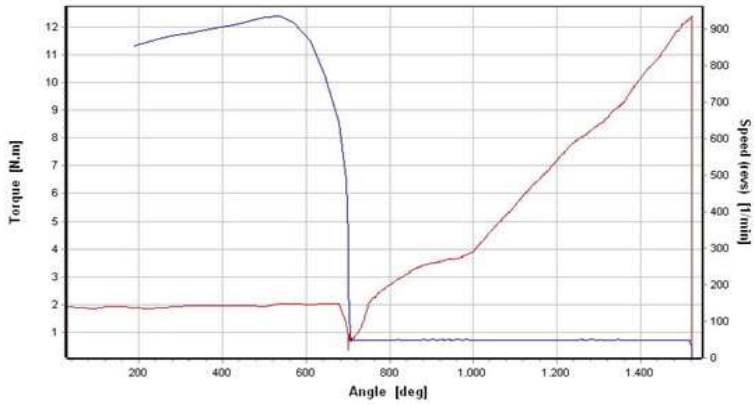
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	12,73	12,73	12,73	12,73	12,72	12,74	12,74	12,73	12,76	12,75
193773	T55-3000032-10	Grad	357,00	368,00	373,00	366,00	359,00	356,00	361,00	380,00	363,00	361,00

Torque graphs

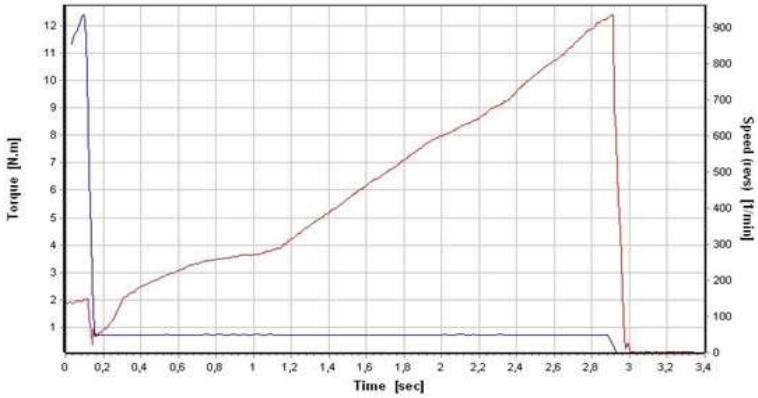
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019840**

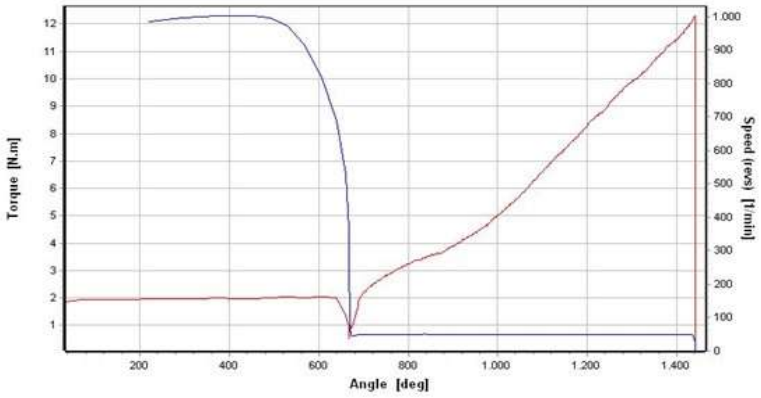
Angle degree: **360°**
Test torque: **12,7 Nm**



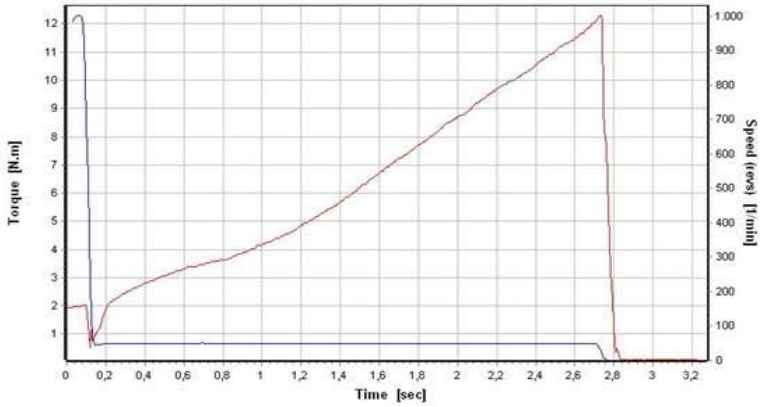
Value no. 1
Graph
Torque / Angle / Speed



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: **1019840**

Test torque: Tq max. 15,00 Nm

Hard joint (H)	89,47 Nm / Revolution	Angle degree	30°
Soft joint (L)	7,27 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	14,91	14,54 Nm
	Standard deviation	0,05	0,08 Nm
	Torque scatter (99,73%)	0,32	0,45 Nm
	C_m	6,53	4,64
	C_{mk}	5,99	2,62

b)	Min. C_m hard/soft (lowest value)	4,64
	Min. C_{mk} hard/soft (lowest value)	2,62

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

Note:

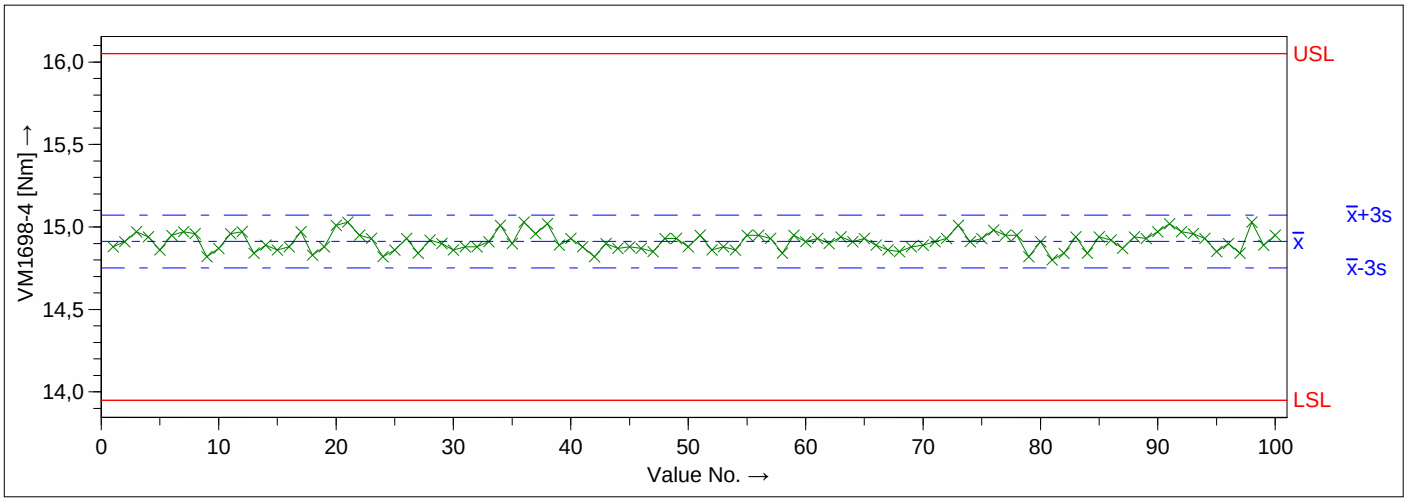
Machine Capability Study
Control System

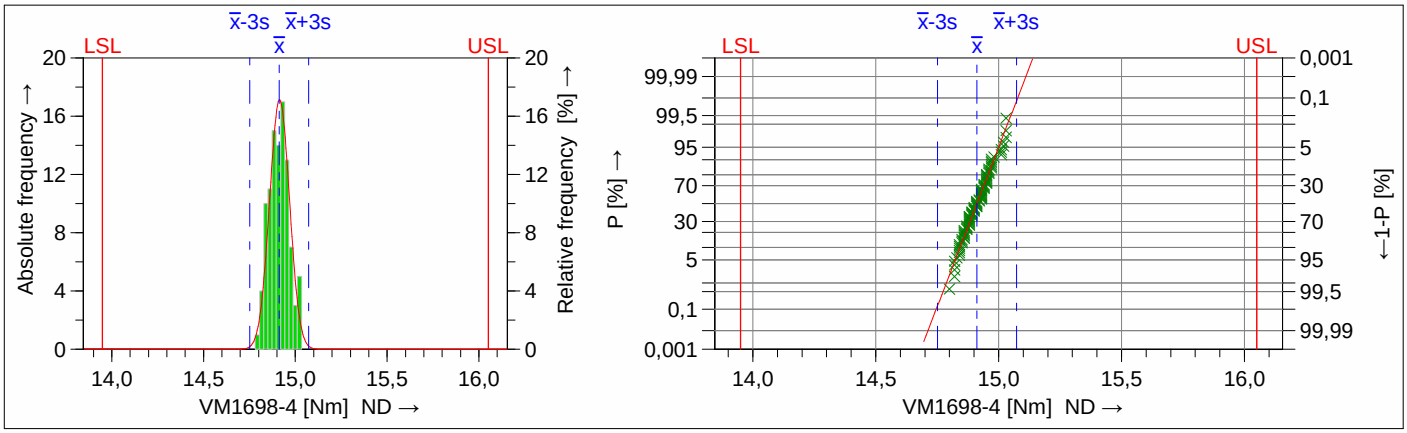
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_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 22.07.2022 14:31:51 to 22.07.2022 14:45:50

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	14.9117
LSL	13.95	x_{min}	14.80	$\bar{x}$-3s	14.7510
USL	16.05	x_{max}	15.03	$\bar{x}$+3s	15.0724
T	2.10	R	0.23	6s	0.3214
		$n_{<T>}$	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	6.53
Critical capability index	=	C_{mk}	5.99

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 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	14,88	14,91	14,97	14,94	14,86	14,95	14,97	14,96	14,82	14,87
1024210	VM1698-4	Grad	28,50	30,00	30,50	30,25	30,75	31,00	31,00	31,00	31,00	31,00

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}
1024210	VM1698-4	Nm	14,96	14,97	14,84	14,89	14,86	14,88	14,97	14,83	14,88	15,01
1024210	VM1698-4	Grad	31,00	31,25	30,75	30,75	30,00	30,75	30,75	29,75	30,25	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	15,03	14,95	14,93	14,82	14,86	14,93	14,84	14,92	14,90	14,86
1024210	VM1698-4	Grad	30,75	30,50	30,50	30,25	30,50	31,00	30,25	30,50	30,25	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}
1024210	VM1698-4	Nm	14,88	14,88	14,91	15,01	14,90	15,03	14,96	15,02	14,89	14,93
1024210	VM1698-4	Grad	30,25	30,75	30,25	30,25	30,25	30,50	30,25	30,50	30,50	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	14,88	14,82	14,90	14,87	14,88	14,87	14,85	14,93	14,93	14,88
1024210	VM1698-4	Grad	30,50	29,75	30,50	30,25	30,25	30,75	30,50	30,50	30,50	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	14,95	14,86	14,88	14,86	14,95	14,95	14,93	14,84	14,95	14,91
1024210	VM1698-4	Grad	30,50	30,00	30,25	30,50	30,25	30,50	30,50	30,25	30,25	30,00

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	14,93	14,90	14,94	14,91	14,93	14,89	14,86	14,85	14,88	14,89
1024210	VM1698-4	Grad	30,25	30,25	30,50	30,25	30,25	29,75	30,00	30,25	30,25	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	14,91	14,93	15,01	14,91	14,93	14,98	14,95	14,95	14,82	14,91
1024210	VM1698-4	Grad	30,25	30,50	30,50	30,25	30,25	30,50	30,50	30,50	30,00	30,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	14,80	14,84	14,94	14,84	14,94	14,92	14,87	14,94	14,93	14,97
1024210	VM1698-4	Grad	29,75	29,50	29,75	29,75	30,50	30,00	29,75	30,50	30,25	30,25

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	15,02	14,97	14,96	14,93	14,85	14,90	14,84	15,03	14,89	14,95
1024210	VM1698-4	Grad	30,50	30,25	30,50	30,25	30,00	30,25	30,00	30,50	29,75	30,50

Machine Capability Study
Tool System

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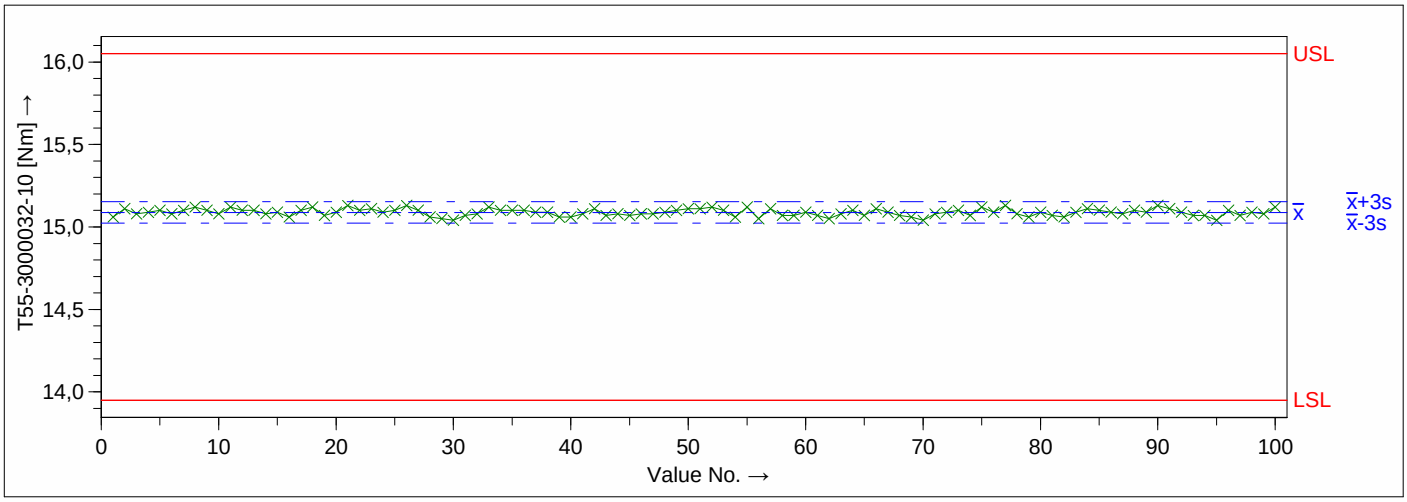
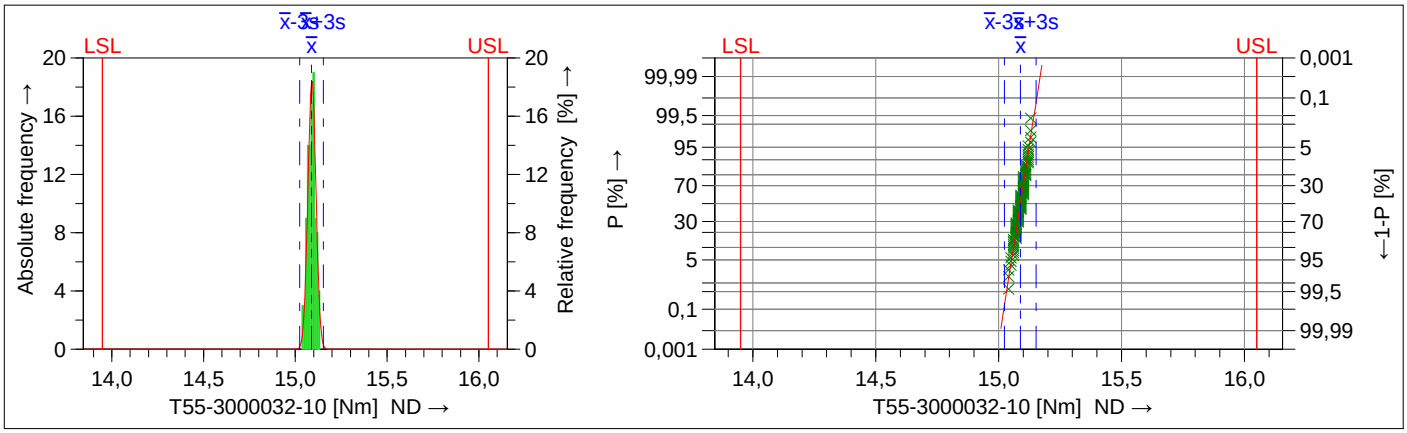
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_b	Char.Descr.	T55-3000032-10	Nom.val. 15,00 / 1,05	USL 16,05
		Serial No.	193773	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 22.07.2022 14:31:51 to 22.07.2022 14:45:50

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0881
LSL	13.95	x_{min}	15.04	$\bar{x}$-3s	15.0233
USL	16.05	x_{max}	15.13	$\bar{x}$+3s	15.1529
T	2.10	R	0.09	6s	0.1295
		$n_{<T>}$	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	16.21
Critical capability index	=	C_{mk}	14.85

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 22.07.2022

Serial No.	1019840_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	193773	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	15,06	15,11	15,08	15,09	15,10	15,08	15,10	15,12	15,10	15,08
193773	T55-3000032-10	Grad	29,00	30,00	31,00	30,00	31,00	32,00	31,00	31,00	31,00	32,00

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}
193773	T55-3000032-10	Nm	15,12	15,10	15,10	15,08	15,09	15,06	15,10	15,12	15,07	15,09
193773	T55-3000032-10	Grad	32,00	32,00	31,00	31,00	31,00	31,00	31,00	30,00	31,00	31,00

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}
193773	T55-3000032-10	Nm	15,13	15,10	15,11	15,09	15,10	15,13	15,10	15,06	15,05	15,04
193773	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	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}
193773	T55-3000032-10	Nm	15,07	15,08	15,12	15,10	15,10	15,10	15,09	15,09	15,06	15,06
193773	T55-3000032-10	Grad	31,00	31,00	31,00	30,00	31,00	31,00	31,00	31,00	31,00	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}
193773	T55-3000032-10	Nm	15,08	15,11	15,07	15,08	15,07	15,08	15,08	15,09	15,10	15,11
193773	T55-3000032-10	Grad	31,00	30,00	30,00	30,00	30,00	31,00	31,00	31,00	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}
193773	T55-3000032-10	Nm	15,11	15,12	15,10	15,06	15,12	15,05	15,11	15,07	15,07	15,09
193773	T55-3000032-10	Grad	31,00	31,00	31,00	31,00	30,00	31,00	31,00	30,00	30,00	30,00

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}
193773	T55-3000032-10	Nm	15,07	15,05	15,08	15,10	15,07	15,11	15,09	15,07	15,06	15,04
193773	T55-3000032-10	Grad	31,00	30,00	30,00	31,00	31,00	30,00	30,00	31,00	30,00	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}
193773	T55-3000032-10	Nm	15,08	15,09	15,10	15,07	15,12	15,09	15,13	15,08	15,06	15,09
193773	T55-3000032-10	Grad	31,00	31,00	30,00	30,00	31,00	30,00	31,00	31,00	30,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	193773	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	15,07	15,06	15,09	15,11	15,10	15,09	15,08	15,10	15,09	15,13
193773	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	31,00	31,00

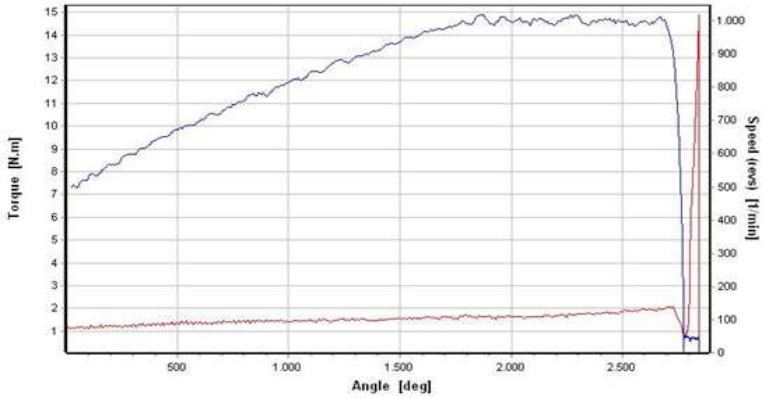
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	15,11	15,09	15,07	15,07	15,04	15,10	15,07	15,09	15,08	15,12
193773	T55-3000032-10	Grad	31,00	30,00	31,00	30,00	30,00	30,00	30,00	30,00	30,00	31,00

Torque graphs

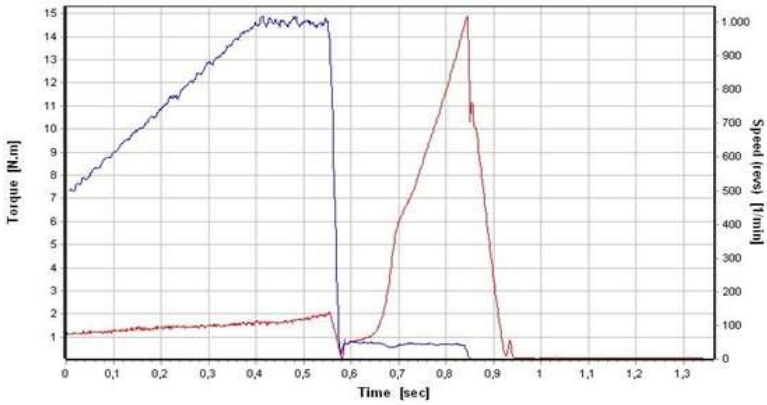
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019840**

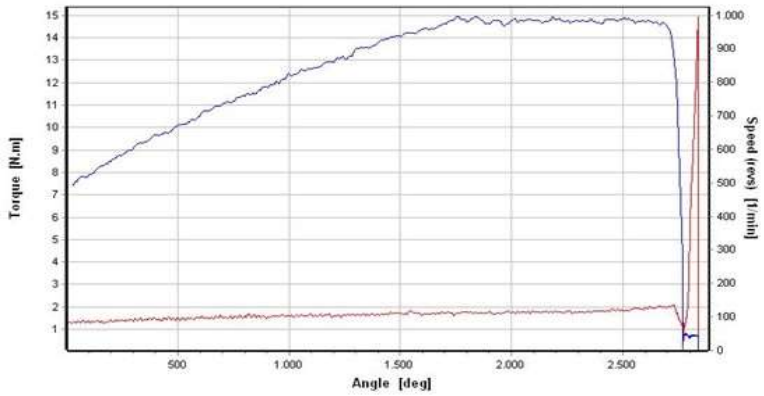
Angle degree: **30°**
Test torque: **15,0 Nm**



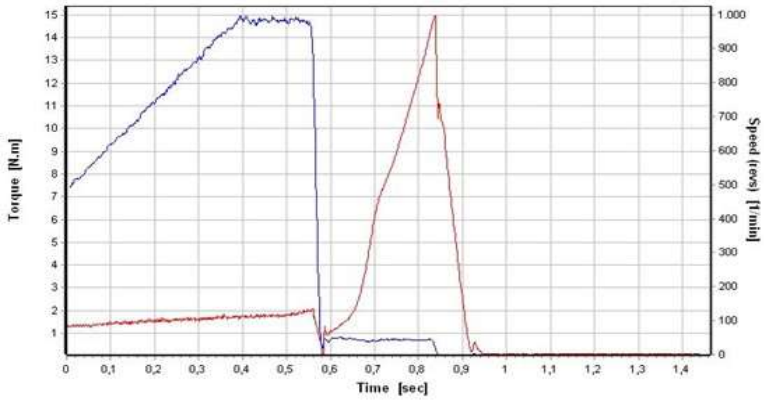
Value no. 1
Graph
Torque / Angle / Speed



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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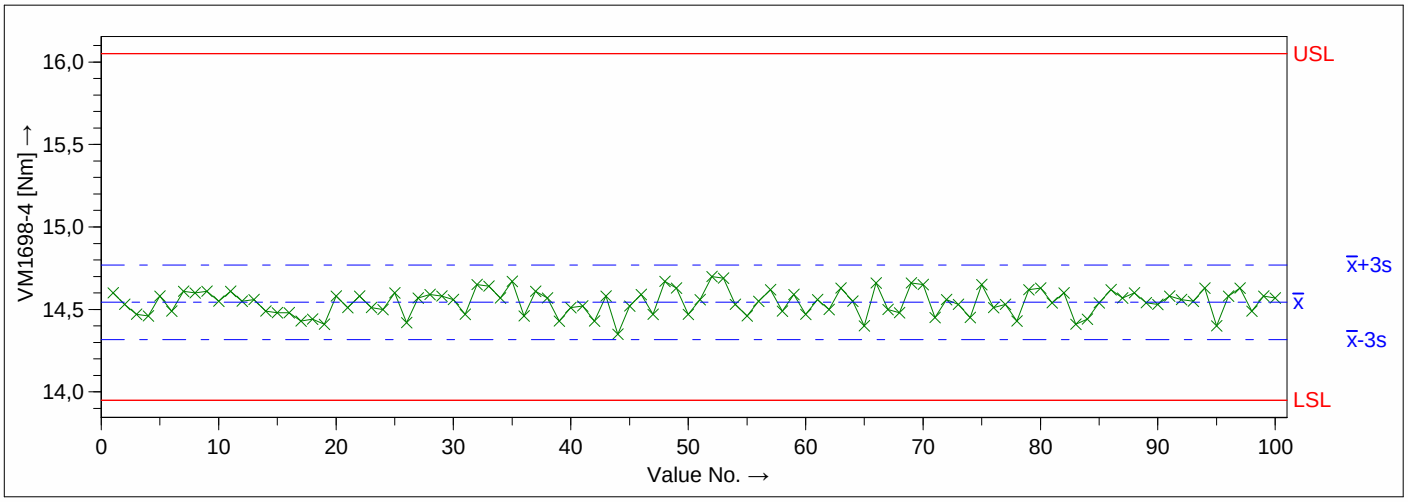
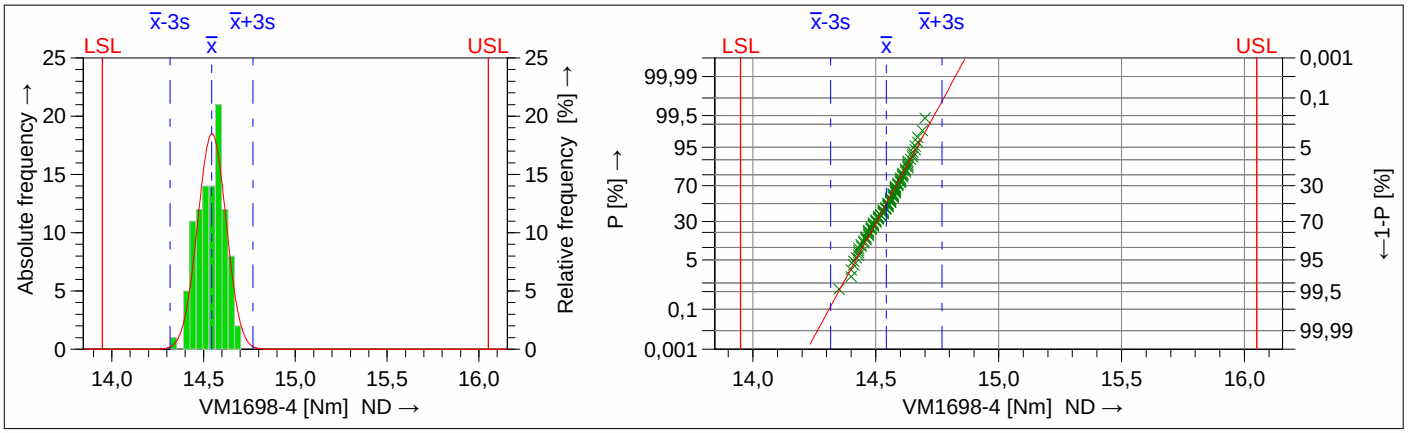
Plant	ATG Westhausen	Operator Name	Sünder
Date	27.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_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 / 1016388	nges.	100

Evaluation from 27.07.2022 07:43:51 to 27.07.2022 09:32:47

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	14.5433
LSL	13.95	x_{min}	14.35	$\bar{x}$-3s	14.3170
USL	16.05	x_{max}	14.70	$\bar{x}$+3s	14.7696
T	2.10	R	0.35	6s	0.4526
		$n_{<T>}$	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	4.64
Critical capability index	=	C_{mk}	2.62

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 27.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	14,60	14,53	14,47	14,46	14,58	14,49	14,61	14,60	14,61	14,55
1024210	VM1698-4	Grad	362,00	357,75	355,25	355,75	365,75	357,00	363,75	361,25	360,00	364,75

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	14,61	14,55	14,56	14,49	14,48	14,48	14,43	14,44	14,41	14,58
1024210	VM1698-4	Grad	359,50	360,50	350,25	344,50	352,50	352,00	352,00	356,75	350,50	347,25

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	14,51	14,58	14,51	14,50	14,60	14,42	14,57	14,59	14,58	14,56
1024210	VM1698-4	Grad	361,75	362,00	344,50	355,00	360,25	351,50	350,25	355,50	354,75	348,25

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	14,47	14,65	14,64	14,57	14,67	14,46	14,61	14,57	14,43	14,51
1024210	VM1698-4	Grad	345,75	357,75	355,00	359,50	356,25	351,00	362,75	355,75	354,50	345,75

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	14,52	14,43	14,58	14,35	14,52	14,59	14,47	14,67	14,63	14,47
1024210	VM1698-4	Grad	349,50	352,75	360,75	350,25	361,50	353,50	351,75	363,75	357,25	353,25

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	14,56	14,70	14,69	14,53	14,46	14,55	14,62	14,49	14,59	14,47
1024210	VM1698-4	Grad	353,50	367,25	366,25	363,00	356,75	364,75	356,50	360,00	371,50	360,50

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	14,56	14,50	14,63	14,55	14,40	14,66	14,50	14,48	14,66	14,65
1024210	VM1698-4	Grad	351,25	363,00	359,75	374,00	370,00	363,50	375,50	359,25	381,50	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	14,45	14,56	14,53	14,45	14,65	14,51	14,53	14,43	14,62	14,63
1024210	VM1698-4	Grad	373,50	366,00	351,50	361,00	377,25	362,75	367,50	361,25	370,00	362,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 27.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.124 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	14,54	14,60	14,41	14,44	14,54	14,62	14,57	14,60	14,54	14,53
1024210	VM1698-4	Grad	373,00	369,25	359,00	366,25	369,25	367,75	377,25	368,75	378,50	365,25

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	14,58	14,56	14,55	14,63	14,40	14,58	14,63	14,49	14,58	14,57
1024210	VM1698-4	Grad	364,25	364,25	370,75	368,00	361,25	373,00	372,50	361,25	361,25	357,75

Machine Capability Study
Tool System

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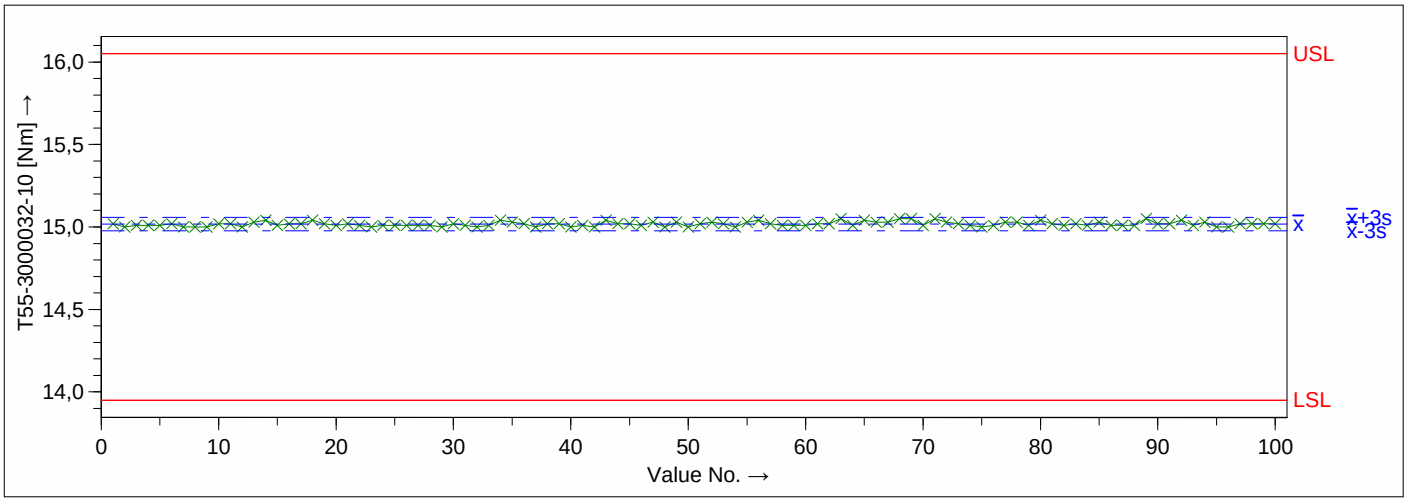
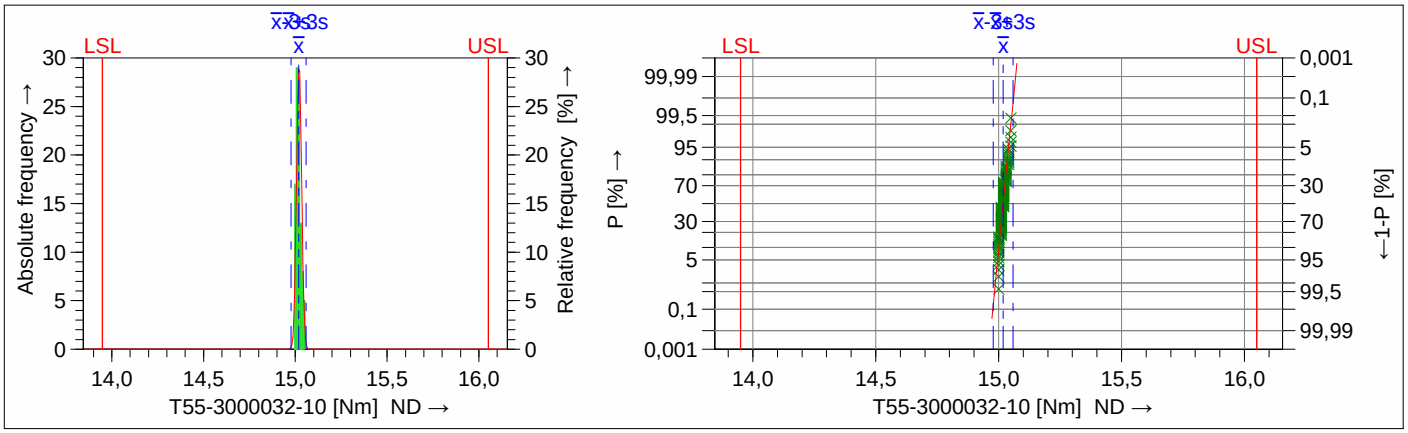
Plant	ATG Westhausen	Operator Name	Sünder
Date	27.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_a	Char.Descr.	T55-3000032-10	Nom.val. 15,00 1,05	USL 16,05
		Serial No.	193773	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 / 1016388	nges.	100

Evaluation from 27.07.2022 07:43:51 to 27.07.2022 09:32:46

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0181
LSL	13.95	x_{min}	15.00	$\bar{x}$-3s	14.9773
USL	16.05	x_{max}	15.05	$\bar{x}$+3s	15.0589
T	2.10	R	0.05	6s	0.0817
		$n_{<T>}$	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	25.72
Critical capability index	=	C_{mk}	25.27

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019840_a1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 27.07.2022

Serial No.	1019840_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	193773	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	15,02	15,00	15,01	15,01	15,01	15,02	15,00	15,00	15,00	15,02
193773	T55-3000032-10	Grad	365,00	361,00	360,00	361,00	368,00	361,00	370,00	363,00	372,00	370,00

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}
193773	T55-3000032-10	Nm	15,02	15,00	15,03	15,04	15,01	15,02	15,02	15,04	15,02	15,01
193773	T55-3000032-10	Grad	365,00	365,00	357,00	345,00	357,00	360,00	356,00	361,00	358,00	350,00

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}
193773	T55-3000032-10	Nm	15,02	15,01	15,00	15,01	15,01	15,01	15,01	15,01	15,00	15,02
193773	T55-3000032-10	Grad	366,00	369,00	352,00	363,00	375,00	359,00	356,00	361,00	359,00	357,00

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}
193773	T55-3000032-10	Nm	15,01	15,00	15,01	15,04	15,03	15,02	15,00	15,02	15,02	15,00
193773	T55-3000032-10	Grad	358,00	360,00	361,00	364,00	358,00	351,00	371,00	356,00	360,00	348,00

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}
193773	T55-3000032-10	Nm	15,01	15,00	15,04	15,02	15,02	15,01	15,03	15,00	15,03	15,00
193773	T55-3000032-10	Grad	356,00	361,00	365,00	357,00	365,00	355,00	359,00	374,00	367,00	358,00

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}
193773	T55-3000032-10	Nm	15,02	15,03	15,02	15,00	15,03	15,04	15,02	15,01	15,01	15,01
193773	T55-3000032-10	Grad	357,00	374,00	371,00	372,00	362,00	364,00	360,00	366,00	381,00	367,00

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}
193773	T55-3000032-10	Nm	15,02	15,02	15,05	15,01	15,04	15,03	15,03	15,05	15,05	15,01
193773	T55-3000032-10	Grad	356,00	367,00	365,00	379,00	377,00	368,00	383,00	362,00	391,00	360,00

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}
193773	T55-3000032-10	Nm	15,05	15,03	15,02	15,01	15,00	15,01	15,03	15,03	15,01	15,04
193773	T55-3000032-10	Grad	378,00	373,00	356,00	368,00	384,00	371,00	382,00	365,00	380,00	364,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 27.07.2022

Serial No.	1019840_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	193773	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.124 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}
193773	T55-3000032-10	Nm	15,02	15,01	15,02	15,01	15,03	15,01	15,01	15,01	15,05	15,02
193773	T55-3000032-10	Grad	380,00	379,00	362,00	373,00	375,00	374,00	385,00	374,00	384,00	373,00

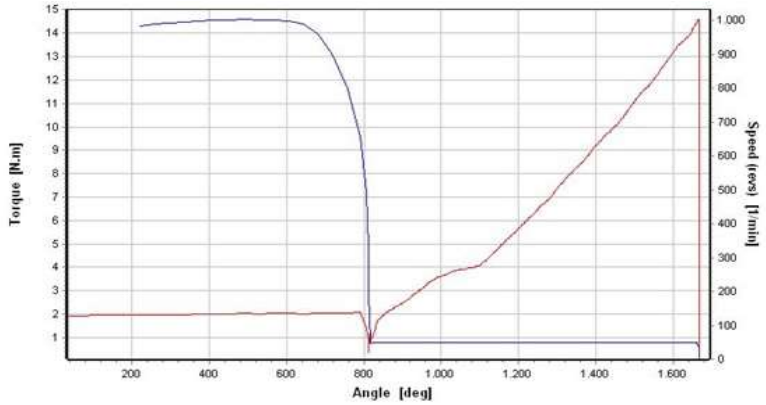
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	15,02	15,04	15,01	15,03	15,00	15,00	15,02	15,02	15,02	15,02
193773	T55-3000032-10	Grad	375,00	372,00	381,00	378,00	372,00	379,00	384,00	365,00	366,00	360,00

Torque graphs

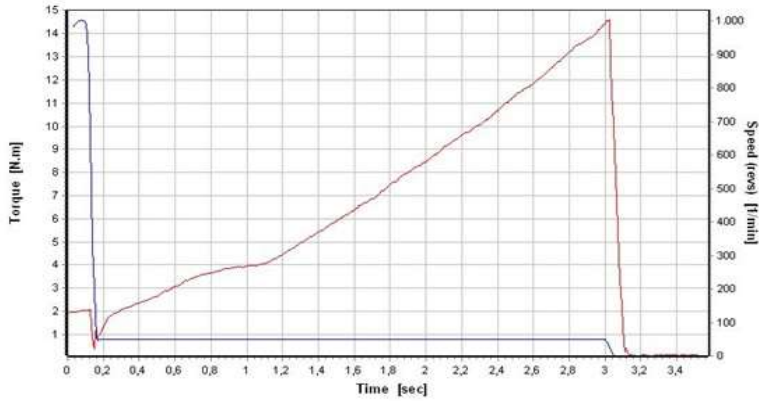
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019840**

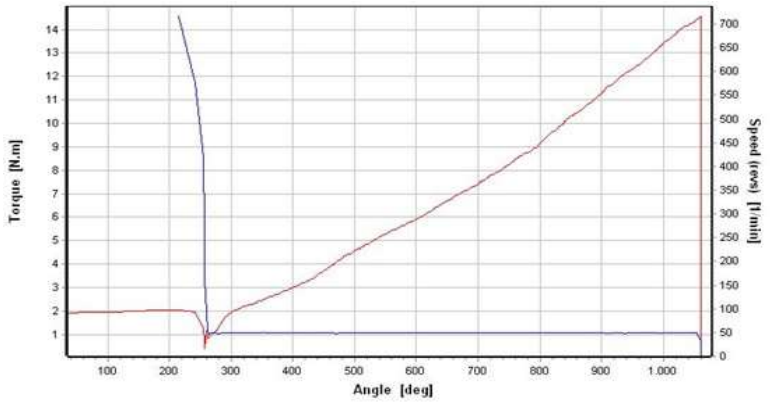
Angle degree: **360°**
Test torque: **15,0 Nm**



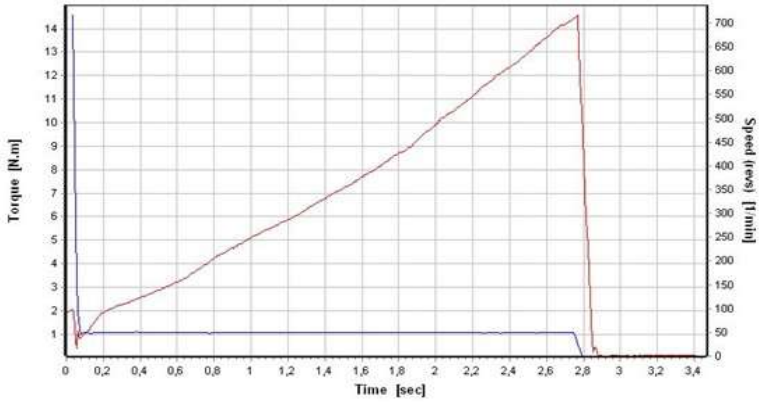
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019840

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: 6,16 % ± **3,08 %**

Angle degree: 40° Tolerance: 1,8° ± **0,9°**

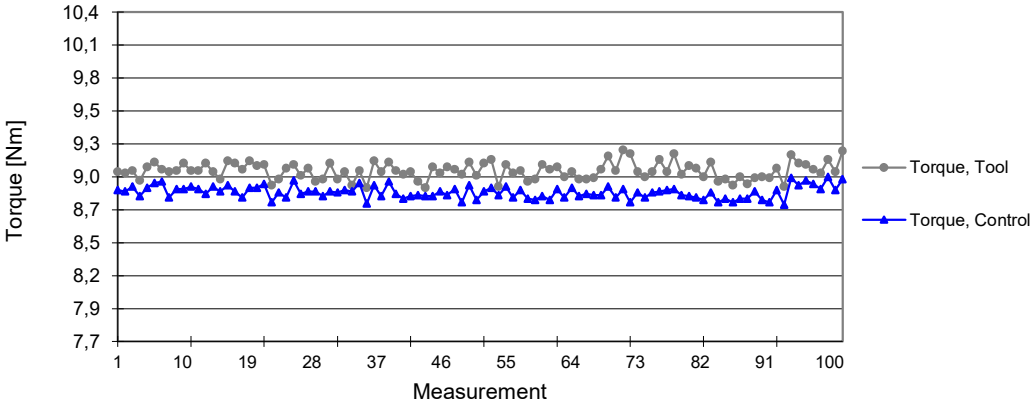
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

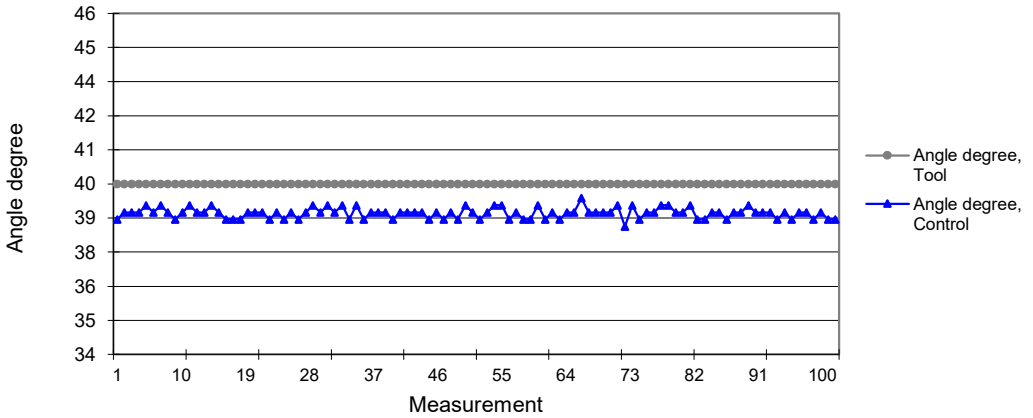
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,04	40,00	8,89	38,75	0,15	1,25
2	9,03	40,00	8,88	39,00	0,15	1,00
3	9,05	40,00	8,92	39,00	0,13	1,00
4	8,97	40,00	8,84	39,00	0,13	1,00
5	9,08	40,00	8,91	39,25	0,17	0,75
6	9,12	40,00	8,95	39,00	0,17	1,00
7	9,06	40,00	8,96	39,25	0,10	0,75
8	9,04	40,00	8,83	39,00	0,21	1,00
9	9,05	40,00	8,90	38,75	0,15	1,25
10	9,11	40,00	8,90	39,00	0,21	1,00
11	9,05	40,00	8,92	39,25	0,13	0,75
12	9,05	40,00	8,90	39,00	0,15	1,00
13	9,11	40,00	8,86	39,00	0,25	1,00
14	9,04	40,00	8,92	39,25	0,12	0,75
15	8,98	40,00	8,88	39,00	0,10	1,00
16	9,13	40,00	8,93	38,75	0,20	1,25
17	9,11	40,00	8,88	38,75	0,23	1,25
18	9,06	40,00	8,83	38,75	0,23	1,25
19	9,13	40,00	8,91	39,00	0,22	1,00
20	9,09	40,00	8,91	39,00	0,18	1,00
21	9,10	40,00	8,94	39,00	0,16	1,00
22	8,93	40,00	8,79	38,75	0,14	1,25
23	8,98	40,00	8,87	39,00	0,11	1,00
24	9,07	40,00	8,83	38,75	0,24	1,25
25	9,10	40,00	8,97	39,00	0,13	1,00
26	9,01	40,00	8,86	38,75	0,15	1,25
27	9,07	40,00	8,88	39,00	0,19	1,00
28	8,96	40,00	8,88	39,25	0,08	0,75
29	8,98	40,00	8,84	39,00	0,14	1,00
30	9,11	40,00	8,88	39,25	0,23	0,75
31	8,98	40,00	8,87	39,00	0,11	1,00
32	9,04	40,00	8,89	39,25	0,15	0,75
33	8,93	40,00	8,88	38,75	0,05	1,25
34	9,05	40,00	8,95	39,25	0,10	0,75
35	8,91	40,00	8,78	38,75	0,13	1,25
36	9,13	40,00	8,93	39,00	0,20	1,00
37	9,04	40,00	8,84	39,00	0,20	1,00
38	9,12	40,00	8,96	39,00	0,16	1,00
39	9,05	40,00	8,86	38,75	0,19	1,25
40	9,02	40,00	8,82	39,00	0,20	1,00
41	9,04	40,00	8,84	39,00	0,20	1,00
42	8,96	40,00	8,85	39,00	0,11	1,00
43	8,91	40,00	8,84	39,00	0,07	1,00
44	9,08	40,00	8,84	38,75	0,24	1,25
45	9,03	40,00	8,88	39,00	0,15	1,00
46	9,08	40,00	8,85	38,75	0,23	1,25
47	9,06	40,00	8,90	39,00	0,16	1,00
48	9,02	40,00	8,79	38,75	0,23	1,25
49	9,12	40,00	8,93	39,25	0,19	0,75
50	9,01	40,00	8,81	39,00	0,20	1,00
51	9,11	40,00	8,88	38,75	0,23	1,25
52	9,14	40,00	8,91	39,00	0,23	1,00
53	8,92	40,00	8,85	39,25	0,07	0,75
54	9,10	40,00	8,92	39,25	0,18	0,75
55	9,03	40,00	8,83	38,75	0,20	1,25
56	9,05	40,00	8,89	39,00	0,16	1,00
57	8,96	40,00	8,82	38,75	0,14	1,25
58	8,98	40,00	8,81	38,75	0,17	1,25
59	9,10	40,00	8,84	39,25	0,26	0,75
60	9,06	40,00	8,81	38,75	0,25	1,25
61	9,08	40,00	8,90	39,00	0,18	1,00
62	9,00	40,00	8,83	38,75	0,17	1,25
63	9,04	40,00	8,91	39,00	0,13	1,00
64	8,98	40,00	8,84	39,00	0,14	1,00
65	8,98	40,00	8,86	39,50	0,12	0,50
66	8,99	40,00	8,85	39,00	0,14	1,00
67	9,06	40,00	8,85	39,00	0,21	1,00
68	9,17	40,00	8,92	39,00	0,25	1,00
69	9,05	40,00	8,83	39,00	0,22	1,00
70	9,22	40,00	8,90	39,25	0,32	0,75
71	9,19	40,00	8,79	38,50	0,40	1,50
72	9,04	40,00	8,87	39,25	0,17	0,75
73	9,00	40,00	8,83	38,75	0,17	1,25
74	9,04	40,00	8,87	39,00	0,17	1,00
75	9,14	40,00	8,88	39,00	0,26	1,00
76	9,04	40,00	8,89	39,25	0,15	0,75
77	9,19	40,00	8,90	39,25	0,29	0,75
78	9,02	40,00	8,85	39,00	0,17	1,00
79	9,09	40,00	8,84	39,00	0,25	1,00
80	9,07	40,00	8,83	39,25	0,24	0,75
81	9,00	40,00	8,81	38,75	0,19	1,25
82	9,12	40,00	8,87	38,75	0,25	1,25
83	8,96	40,00	8,79	39,00	0,17	1,00
84	8,98	40,00	8,82	39,00	0,16	1,00
85	8,93	40,00	8,79	38,75	0,14	1,25
86	9,00	40,00	8,82	39,00	0,18	1,00
87	8,94	40,00	8,82	39,00	0,12	1,00
88	8,99	40,00	8,88	39,25	0,11	0,75
89	9,00	40,00	8,81	39,00	0,19	1,00
90	8,99	40,00	8,79	39,00	0,20	1,00
91	9,07	40,00	8,89	39,00	0,18	1,00
92	8,92	40,00	8,77	38,75	0,15	1,25
93	9,18	40,00	8,99	39,00	0,19	1,00
94	9,11	40,00	8,93	38,75	0,18	1,25
95	9,10	40,00	8,97	39,00	0,13	1,00
96	9,06	40,00	8,94	39,00	0,12	1,00
97	9,03	40,00	8,90	38,75	0,13	1,25
98	9,14	40,00	9,00	39,00	0,14	1,00
99	9,04	40,00	8,89	38,75	0,15	1,25
100	9,21	40,00	8,98	38,75	0,23	1,25
				Standard deviation:	**0,055**	**0,184**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





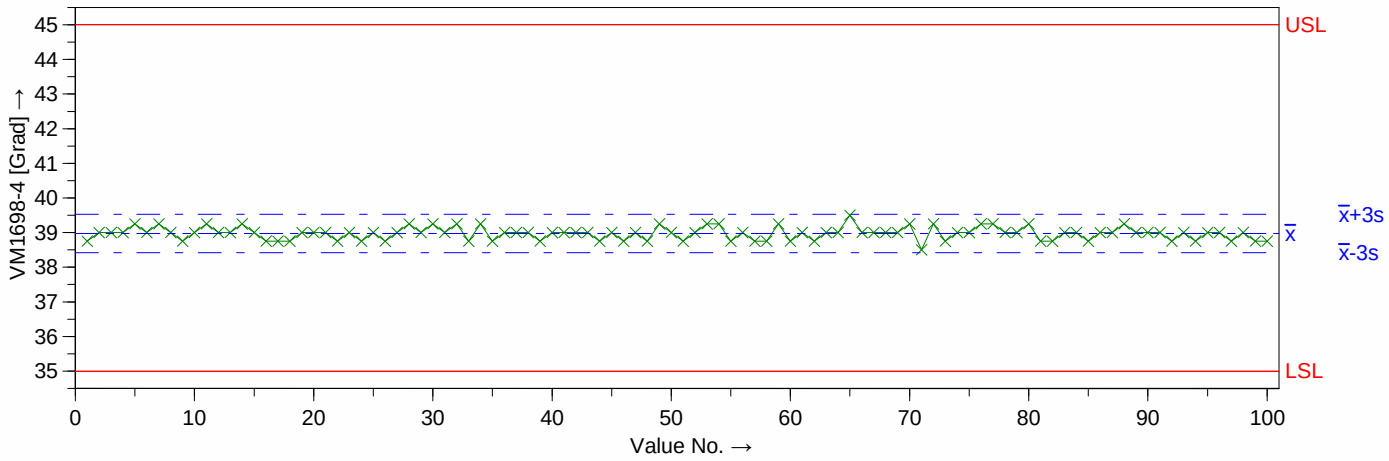
Machine Capability Study
Control System

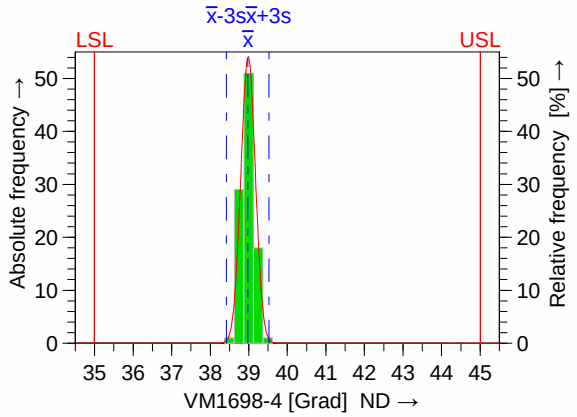
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

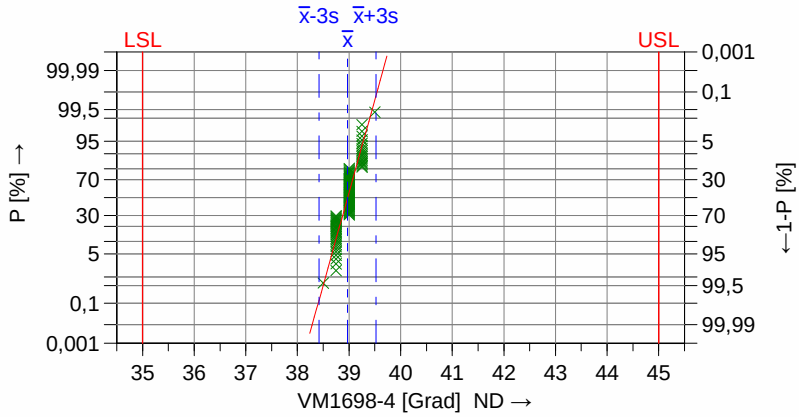
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_k	Char.Descr.	VM1698-4	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 22.07.2022 11:23:50 to 22.07.2022 11:40:32

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	38.9725
LSL	35.00	x_{min}	38.50	$\bar{x}$-3s	38.4197
USL	45.00	x_{max}	39.50	$\bar{x}$+3s	39.5253
T	10.00	R	1.00	6s	1.1057
		$n_{<T>}$	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	9.04
Critical capability index	=	C_{mk}	7.19

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 22.07.2022

Serial No.	1019840_k	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 60% Angle 40°+/-5°* TQ-Cal.: 16.59 Nm; C ur.-Cal.: 0.125 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	8,89	8,88	8,92	8,84	8,91	8,95	8,96	8,83	8,90	8,90
1024210	VM1698-4	Grad	38,75	39,00	39,00	39,00	39,25	39,00	39,25	39,00	38,75	39,00

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}
1024210	VM1698-4	Nm	8,92	8,90	8,86	8,92	8,88	8,93	8,88	8,83	8,91	8,91
1024210	VM1698-4	Grad	39,25	39,00	39,00	39,25	39,00	38,75	38,75	38,75	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	8,94	8,79	8,87	8,83	8,97	8,86	8,88	8,88	8,84	8,88
1024210	VM1698-4	Grad	39,00	38,75	39,00	38,75	39,00	38,75	39,00	39,25	39,00	39,25

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	8,87	8,89	8,88	8,95	8,78	8,93	8,84	8,96	8,86	8,82
1024210	VM1698-4	Grad	39,00	39,25	38,75	39,25	38,75	39,00	39,00	39,00	38,75	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	8,84	8,85	8,84	8,84	8,88	8,85	8,90	8,79	8,93	8,81
1024210	VM1698-4	Grad	39,00	39,00	39,00	38,75	39,00	38,75	39,00	38,75	39,25	39,00

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	8,88	8,91	8,85	8,92	8,83	8,89	8,82	8,81	8,84	8,81
1024210	VM1698-4	Grad	38,75	39,00	39,25	39,25	38,75	39,00	38,75	38,75	39,25	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	8,90	8,83	8,91	8,84	8,86	8,85	8,85	8,92	8,83	8,90
1024210	VM1698-4	Grad	39,00	38,75	39,00	39,00	39,50	39,00	39,00	39,00	39,00	39,25

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	8,79	8,87	8,83	8,87	8,88	8,89	8,90	8,85	8,84	8,83
1024210	VM1698-4	Grad	38,50	39,25	38,75	39,00	39,00	39,25	39,25	39,00	39,00	39,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_k	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 60% Angle 40°+/-5°* TQ-Cal.: 16.59 Nm; C ur.-Cal.: 0.125 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	8,87	8,79	8,82	8,79	8,82	8,82	8,88	8,81	8,79
1024210	VM1698-4	Grad	38,75	38,75	39,00	39,00	38,75	39,00	39,00	39,25	39,00	39,00

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	8,89	8,77	8,99	8,93	8,97	8,94	8,90	9,00	8,89	8,98
1024210	VM1698-4	Grad	39,00	38,75	39,00	38,75	39,00	39,00	38,75	39,00	38,75	38,75

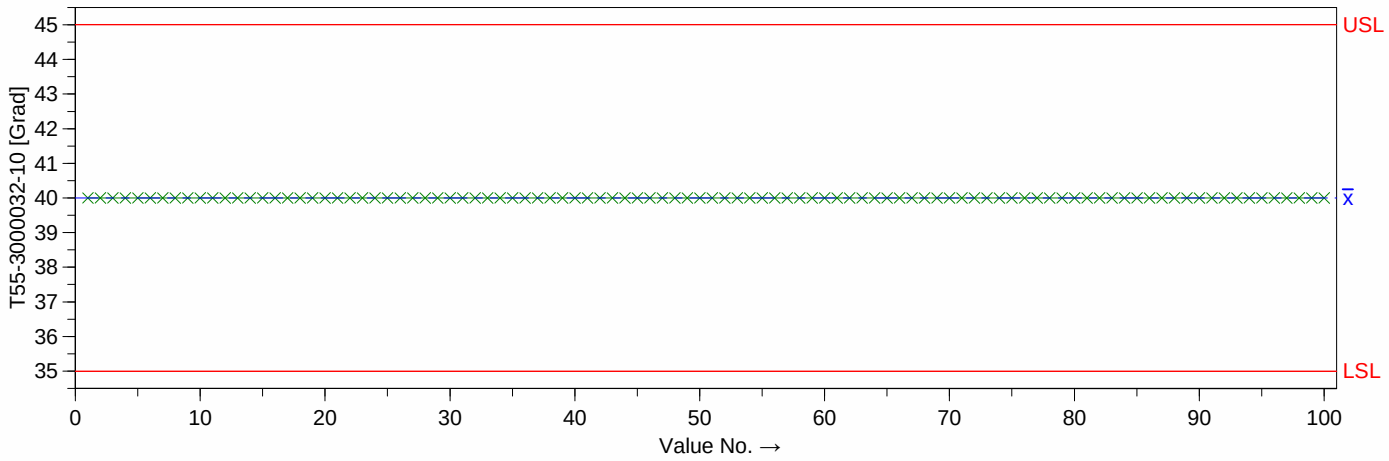
Machine Capability Study
Tool System

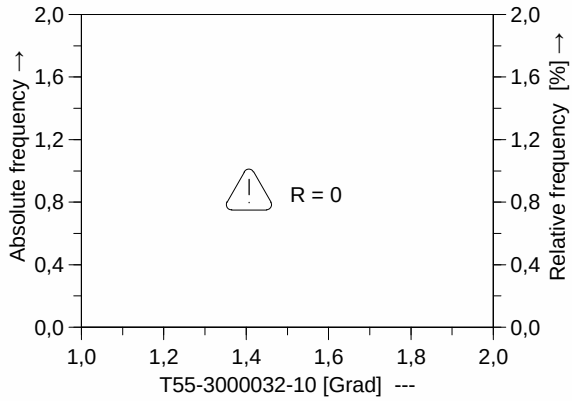
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

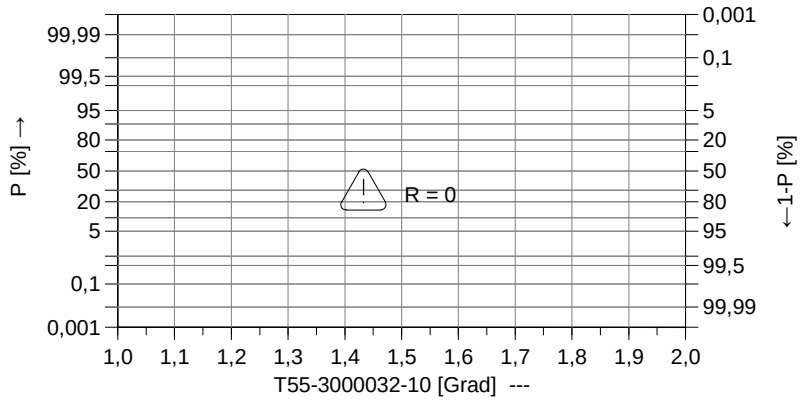
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_k	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	193773	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 22.07.2022 11:23:50 to 22.07.2022 11:40:32

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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 22.07.2022

Serial No.	1019840_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.59 Nm; C ur.-Cal.: 0.125 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}
193773	T55-3000032-10	Nm	9,04	9,03	9,05	8,97	9,08	9,12	9,06	9,04	9,05	9,11
193773	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}
193773	T55-3000032-10	Nm	9,05	9,05	9,11	9,04	8,98	9,13	9,11	9,06	9,13	9,09
193773	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}
193773	T55-3000032-10	Nm	9,10	8,93	8,98	9,07	9,10	9,01	9,07	8,96	8,98	9,11
193773	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}
193773	T55-3000032-10	Nm	8,98	9,04	8,93	9,05	8,91	9,13	9,04	9,12	9,05	9,02
193773	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}
193773	T55-3000032-10	Nm	9,04	8,96	8,91	9,08	9,03	9,08	9,06	9,02	9,12	9,01
193773	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}
193773	T55-3000032-10	Nm	9,11	9,14	8,92	9,10	9,03	9,05	8,96	8,98	9,10	9,06
193773	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}
193773	T55-3000032-10	Nm	9,08	9,00	9,04	8,98	8,98	8,99	9,06	9,17	9,05	9,22
193773	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}
193773	T55-3000032-10	Nm	9,19	9,04	9,00	9,04	9,14	9,04	9,19	9,02	9,09	9,07
193773	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 22.07.2022

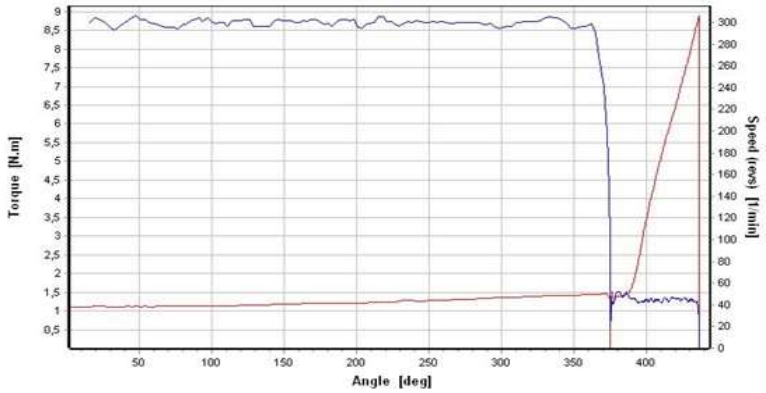
Serial No.	1019840_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.59 Nm; C ur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
193773	T55-3000032-10	Nm	9,00	9,12	8,96	8,98	8,93	9,00	8,94	8,99	9,00	8,99
193773	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

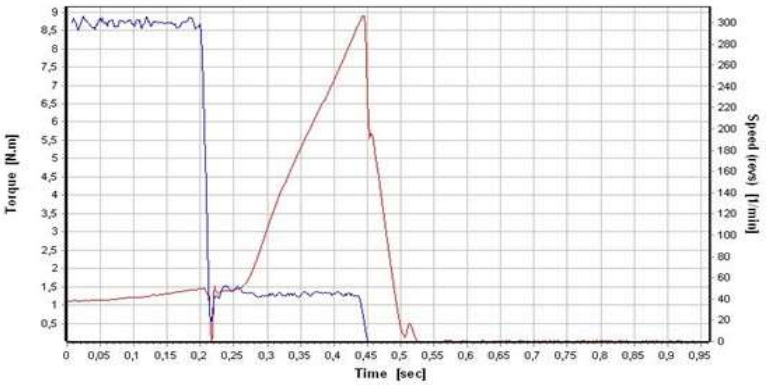
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	9,07	8,92	9,18	9,11	9,10	9,06	9,03	9,14	9,04	9,21
193773	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

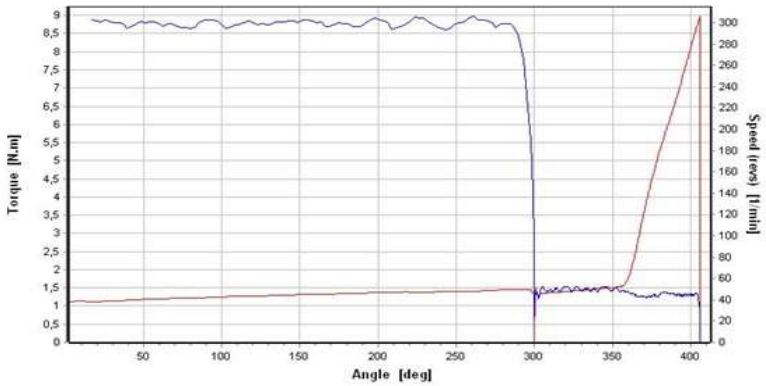
Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



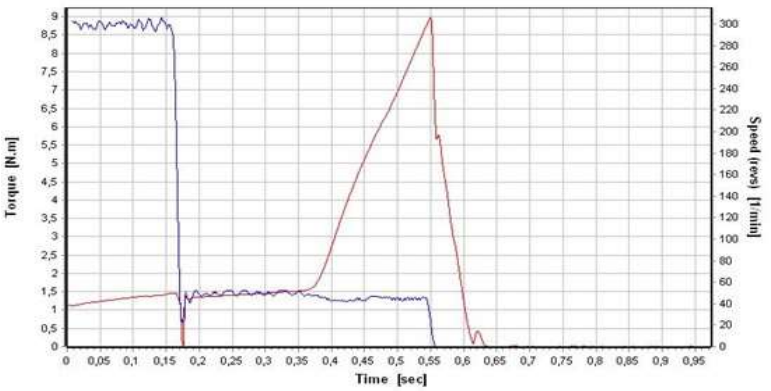
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019840

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: 7,47 % ± **3,73 %**

Angle degree: 40° Tolerance: 3,0° ± **1,5°**

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

Tool with angle correction

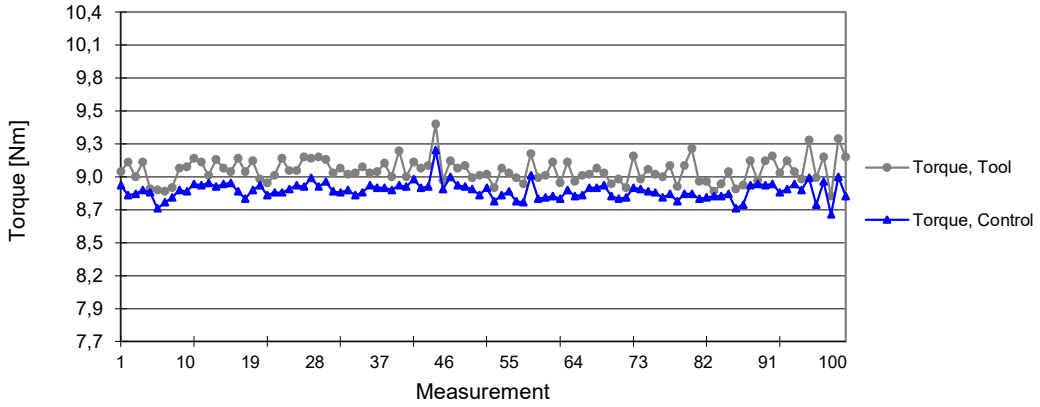
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move **+**", the angle range in the screw direction,
In the column "Move **-**" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle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

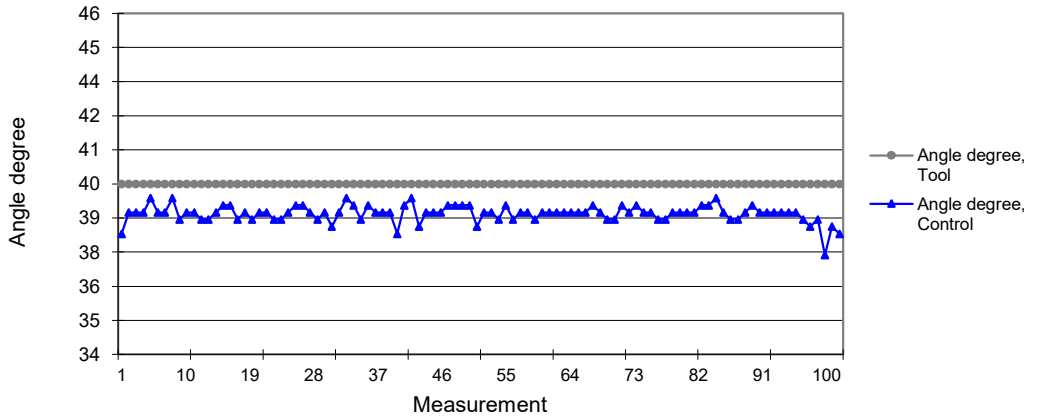
Move		Test conditions
+	**-**	
0	**0-25°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,04	40,00	8,93	38,25	0,11	1,75
2	9,12	40,00	8,85	39,00	0,27	1,00
3	9,00	40,00	8,86	39,00	0,14	1,00
4	9,12	40,00	8,89	39,00	0,23	1,00
5	8,90	40,00	8,87	39,50	0,03	0,50
6	8,89	40,00	8,74	39,00	0,15	1,00
7	8,88	40,00	8,79	39,00	0,09	1,00
8	8,91	40,00	8,83	39,50	0,08	0,50
9	9,07	40,00	8,89	38,75	0,18	1,25
10	9,08	40,00	8,88	39,00	0,20	1,00
11	9,15	40,00	8,94	39,00	0,21	1,00
12	9,12	40,00	8,93	38,75	0,19	1,25
13	9,01	40,00	8,95	38,75	0,06	1,25
14	9,14	40,00	8,92	39,00	0,22	1,00
15	9,07	40,00	8,94	39,25	0,13	0,75
16	9,04	40,00	8,95	39,25	0,09	0,75
17	9,15	40,00	8,88	38,75	0,27	1,25
18	9,04	40,00	8,82	39,00	0,22	1,00
19	9,13	40,00	8,89	38,75	0,24	1,25
20	8,98	40,00	8,93	39,00	0,05	1,00
21	8,95	40,00	8,85	39,00	0,10	1,00
22	9,01	40,00	8,87	38,75	0,14	1,25
23	9,15	40,00	8,87	38,75	0,28	1,25
24	9,05	40,00	8,90	39,00	0,15	1,00
25	9,05	40,00	8,93	39,25	0,12	0,75
26	9,16	40,00	8,92	39,25	0,24	0,75
27	9,15	40,00	8,99	39,00	0,16	1,00
28	9,16	40,00	8,92	38,75	0,24	1,25
29	9,14	40,00	8,96	39,00	0,18	1,00
30	9,03	40,00	8,88	38,50	0,15	1,50
31	9,07	40,00	8,87	39,00	0,20	1,00
32	9,02	40,00	8,89	39,50	0,13	0,50
33	9,03	40,00	8,85	39,25	0,18	0,75
34	9,08	40,00	8,87	38,75	0,21	1,25
35	9,03	40,00	8,93	39,25	0,10	0,75
36	9,04	40,00	8,91	39,00	0,13	1,00
37	9,11	40,00	8,91	39,00	0,20	1,00
38	9,00	40,00	8,89	39,00	0,11	1,00
39	9,21	40,00	8,93	38,25	0,28	1,75
40	9,00	40,00	8,92	39,25	0,08	0,75
41	9,12	40,00	8,98	39,50	0,14	0,50
42	9,07	40,00	8,91	38,50	0,16	1,50
43	9,09	40,00	8,92	39,00	0,17	1,00
44	9,43	40,00	9,22	39,00	0,21	1,00
45	8,97	40,00	8,90	39,00	0,07	1,00
46	9,13	40,00	9,00	39,25	0,13	0,75
47	9,07	40,00	8,93	39,25	0,14	0,75
48	9,09	40,00	8,92	39,25	0,17	0,75
49	8,99	40,00	8,90	39,25	0,09	0,75
50	9,01	40,00	8,85	38,50	0,16	1,50
51	9,02	40,00	8,91	39,00	0,11	1,00
52	8,91	40,00	8,80	39,00	0,11	1,00
53	9,07	40,00	8,85	38,75	0,22	1,25
54	9,03	40,00	8,88	39,25	0,15	0,75
55	8,99	40,00	8,80	38,75	0,19	1,25
56	8,94	40,00	8,79	39,00	0,15	1,00
57	9,19	40,00	9,01	39,00	0,18	1,00
58	8,99	40,00	8,82	38,75	0,17	1,25
59	9,01	40,00	8,83	39,00	0,18	1,00
60	9,12	40,00	8,84	39,00	0,28	1,00
61	8,95	40,00	8,82	39,00	0,13	1,00
62	9,12	40,00	8,89	39,00	0,23	1,00
63	8,96	40,00	8,84	39,00	0,12	1,00
64	9,01	40,00	8,85	39,00	0,16	1,00
65	9,02	40,00	8,91	39,00	0,11	1,00
66	9,07	40,00	8,91	39,25	0,16	0,75
67	9,03	40,00	8,93	39,00	0,10	1,00
68	8,94	40,00	8,84	38,75	0,10	1,25
69	8,98	40,00	8,82	38,75	0,16	1,25
70	8,91	40,00	8,83	39,25	0,08	0,75
71	9,17	40,00	8,91	39,00	0,26	1,00
72	8,98	40,00	8,90	39,25	0,08	0,75
73	9,06	40,00	8,88	39,00	0,18	1,00
74	9,02	40,00	8,87	39,00	0,15	1,00
75	9,00	40,00	8,83	38,75	0,17	1,25
76	9,09	40,00	8,86	38,75	0,23	1,25
77	8,92	40,00	8,80	39,00	0,12	1,00
78	9,09	40,00	8,86	39,00	0,23	1,00
79	9,23	40,00	8,86	39,00	0,37	1,00
80	8,96	40,00	8,82	39,00	0,14	1,00
81	8,96	40,00	8,83	39,25	0,13	0,75
82	8,88	40,00	8,84	39,25	0,04	0,75
83	8,94	40,00	8,84	39,50	0,10	0,50
84	9,04	40,00	8,86	39,00	0,18	1,00
85	8,90	40,00	8,74	38,75	0,16	1,25
86	8,93	40,00	8,77	38,75	0,16	1,25
87	9,13	40,00	8,93	39,00	0,20	1,00
88	8,97	40,00	8,94	39,25	0,03	0,75
89	9,13	40,00	8,93	39,00	0,20	1,00
90	9,17	40,00	8,94	39,00	0,23	1,00
91	9,03	40,00	8,87	39,00	0,16	1,00
92	9,13	40,00	8,90	39,00	0,23	1,00
93	9,04	40,00	8,94	39,00	0,10	1,00
94	8,98	40,00	8,89	39,00	0,09	1,00
95	9,30	40,00	8,99	38,75	0,31	1,25
96	8,99	40,00	8,77	38,50	0,22	1,50
97	9,16	40,00	8,96	38,75	0,20	1,25
98	8,84	40,00	8,69	37,50	0,15	2,50
99	9,31	40,00	9,00	38,50	0,31	1,50
100	9,16	40,00	8,84	38,25	0,32	1,75
				Standard deviation:	**0,067**	**0,295**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019840**
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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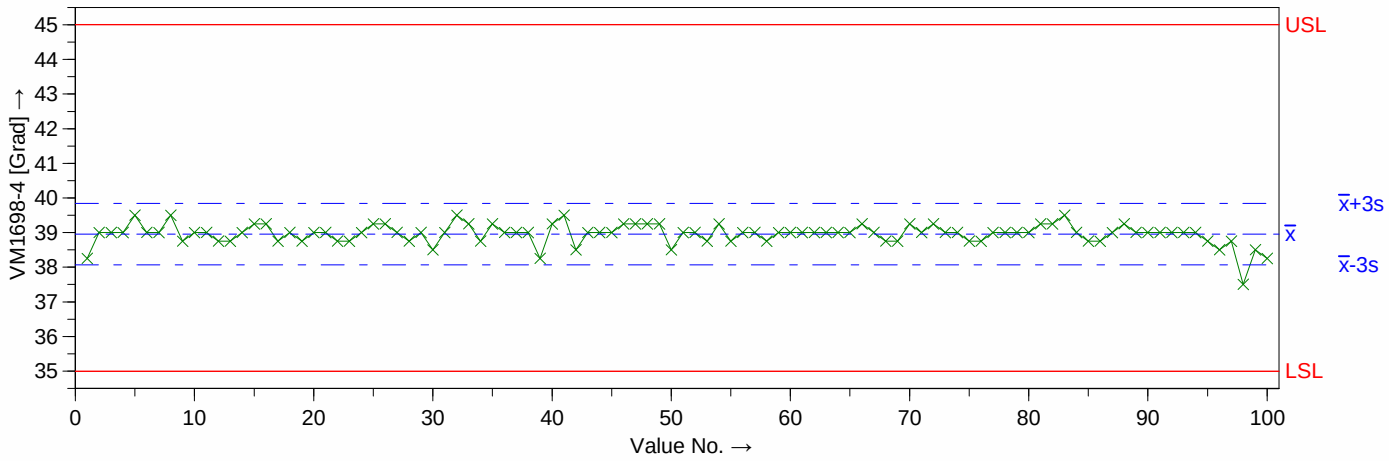
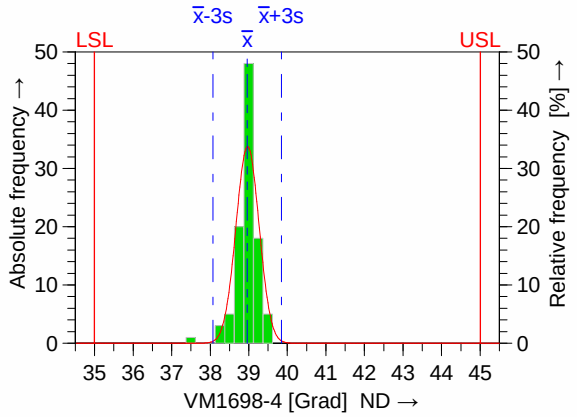
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

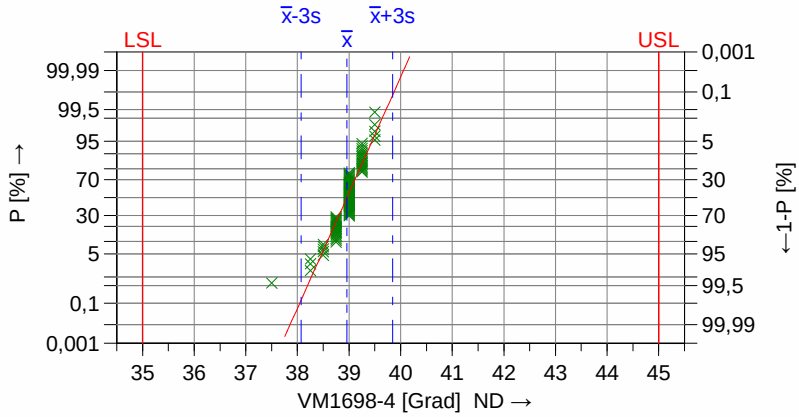
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_m	Char.Descr.	VM1698-4	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 22.07.2022 11:53:11 to 22.07.2022 12:06:48

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	38.9575
LSL	35.00	x_{min}	37.50	$\bar{x}$-3s	38.0717
USL	45.00	x_{max}	39.50	$\bar{x}$+3s	39.8433
T	10.00	R	2.00	6s	1.7717
		$n_{<T>}$	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	5.64
Critical capability index	=	C_{mk}	4.47

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 22.07.2022

Serial No.	1019840_m	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 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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	8,93	8,85	8,86	8,89	8,87	8,74	8,79	8,83	8,89	8,88
1024210	VM1698-4	Grad	38,25	39,00	39,00	39,00	39,50	39,00	39,00	39,50	38,75	39,00

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}
1024210	VM1698-4	Nm	8,94	8,93	8,95	8,92	8,94	8,95	8,88	8,82	8,89	8,93
1024210	VM1698-4	Grad	39,00	38,75	38,75	39,00	39,25	39,25	38,75	39,00	38,75	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	8,85	8,87	8,87	8,90	8,93	8,92	8,99	8,92	8,96	8,88
1024210	VM1698-4	Grad	39,00	38,75	38,75	39,00	39,25	39,25	39,00	38,75	39,00	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	8,87	8,89	8,85	8,87	8,93	8,91	8,91	8,89	8,93	8,92
1024210	VM1698-4	Grad	39,00	39,50	39,25	38,75	39,25	39,00	39,00	39,00	38,25	39,25

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	8,98	8,91	8,92	9,22	8,90	9,00	8,93	8,92	8,90	8,85
1024210	VM1698-4	Grad	39,50	38,50	39,00	39,00	39,00	39,25	39,25	39,25	39,25	38,50

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	8,91	8,80	8,85	8,88	8,80	8,79	9,01	8,82	8,83	8,84
1024210	VM1698-4	Grad	39,00	39,00	38,75	39,25	38,75	39,00	39,00	38,75	39,00	39,00

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	8,82	8,89	8,84	8,85	8,91	8,91	8,93	8,84	8,82	8,83
1024210	VM1698-4	Grad	39,00	39,00	39,00	39,00	39,00	39,25	39,00	38,75	38,75	39,25

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	8,91	8,90	8,88	8,87	8,83	8,86	8,80	8,86	8,86	8,82
1024210	VM1698-4	Grad	39,00	39,25	39,00	39,00	38,75	38,75	39,00	39,00	39,00	39,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_m	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 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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	8,83	8,84	8,84	8,86	8,74	8,77	8,93	8,94	8,93	8,94
1024210	VM1698-4	Grad	39,25	39,25	39,50	39,00	38,75	38,75	39,00	39,25	39,00	39,00

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	8,87	8,90	8,94	8,89	8,99	8,77	8,96	8,69	9,00	8,84
1024210	VM1698-4	Grad	39,00	39,00	39,00	39,00	38,75	38,50	38,75	37,50	38,50	38,25

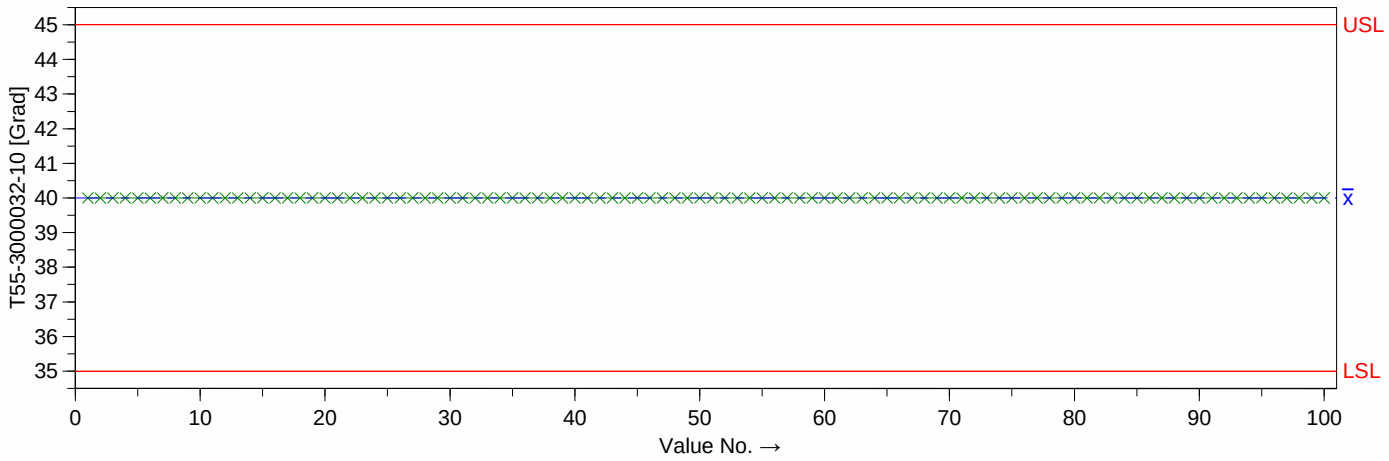
Machine Capability Study
Tool System

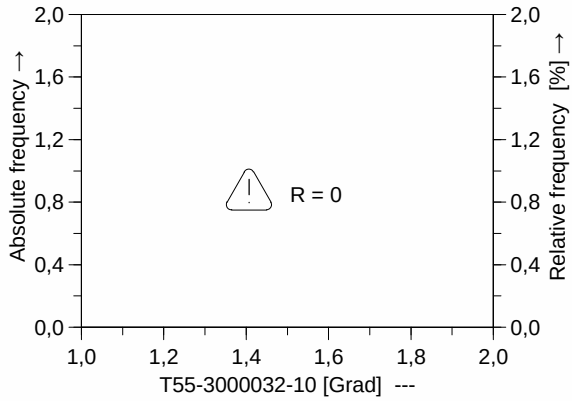
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

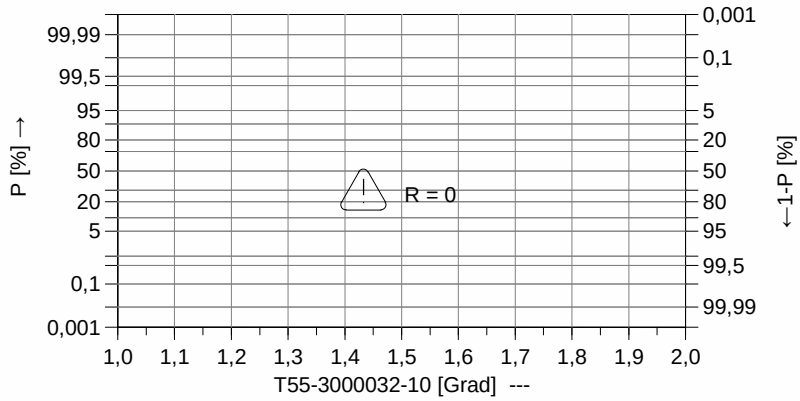
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_m	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	193773	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 22.07.2022 11:53:11 to 22.07.2022 12:06:48

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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 22.07.2022

Serial No.	1019840_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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}
193773	T55-3000032-10	Nm	9,04	9,12	9,00	9,12	8,90	8,89	8,88	8,91	9,07	9,08
193773	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}
193773	T55-3000032-10	Nm	9,15	9,12	9,01	9,14	9,07	9,04	9,15	9,04	9,13	8,98
193773	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}
193773	T55-3000032-10	Nm	8,95	9,01	9,15	9,05	9,05	9,16	9,15	9,16	9,14	9,03
193773	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}
193773	T55-3000032-10	Nm	9,07	9,02	9,03	9,08	9,03	9,04	9,11	9,00	9,21	9,00
193773	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}
193773	T55-3000032-10	Nm	9,12	9,07	9,09	9,43	8,97	9,13	9,07	9,09	8,99	9,01
193773	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}
193773	T55-3000032-10	Nm	9,02	8,91	9,07	9,03	8,99	8,94	9,19	8,99	9,01	9,12
193773	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}
193773	T55-3000032-10	Nm	8,95	9,12	8,96	9,01	9,02	9,07	9,03	8,94	8,98	8,91
193773	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}
193773	T55-3000032-10	Nm	9,17	8,98	9,06	9,02	9,00	9,09	8,92	9,09	9,23	8,96
193773	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 22.07.2022

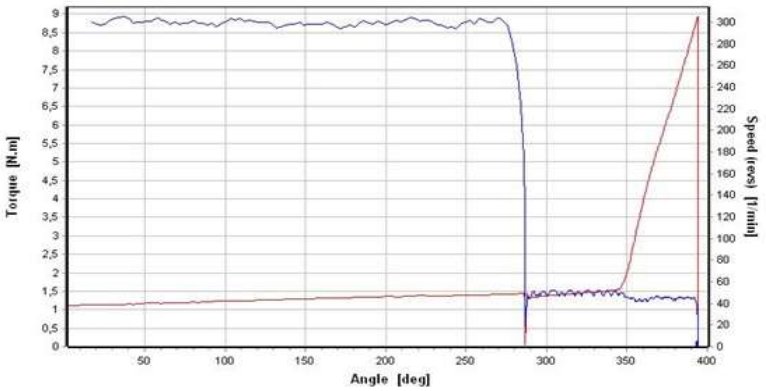
Serial No.	1019840_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
193773	T55-3000032-10	Nm	8,96	8,88	8,94	9,04	8,90	8,93	9,13	8,97	9,13	9,17
193773	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

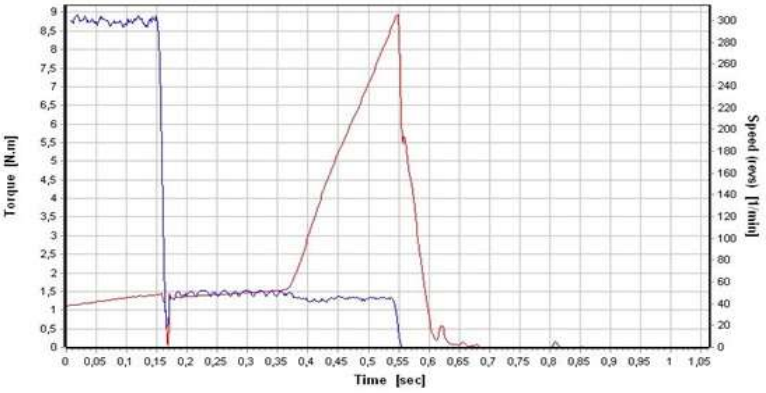
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	9,03	9,13	9,04	8,98	9,30	8,99	9,16	8,84	9,31	9,16
193773	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

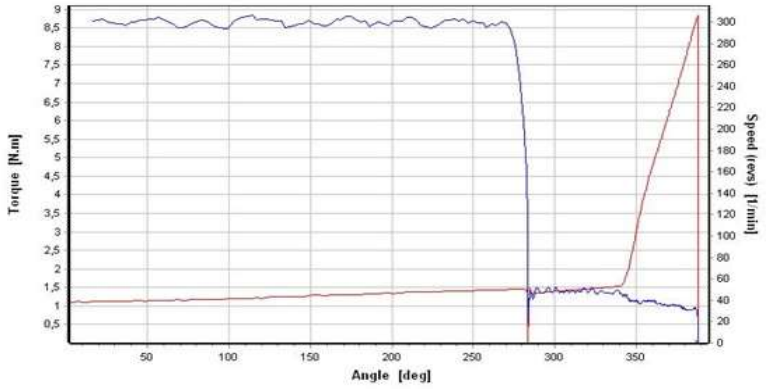
Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool with angle correction	



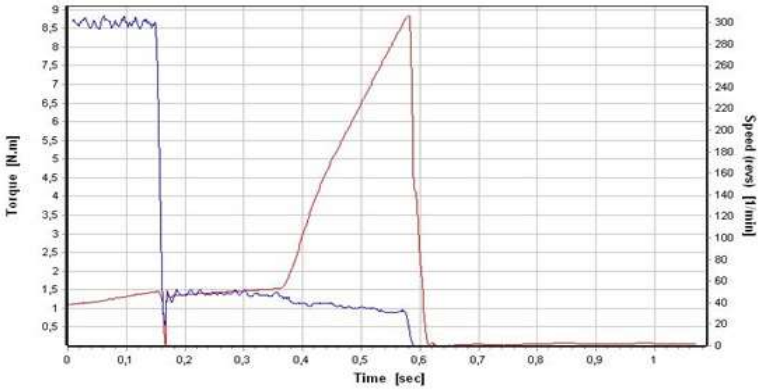
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019840

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: 5,84 % ± **2,92 %**

Angle degree: 180° Tolerance: 8,6° ± **4,3°**

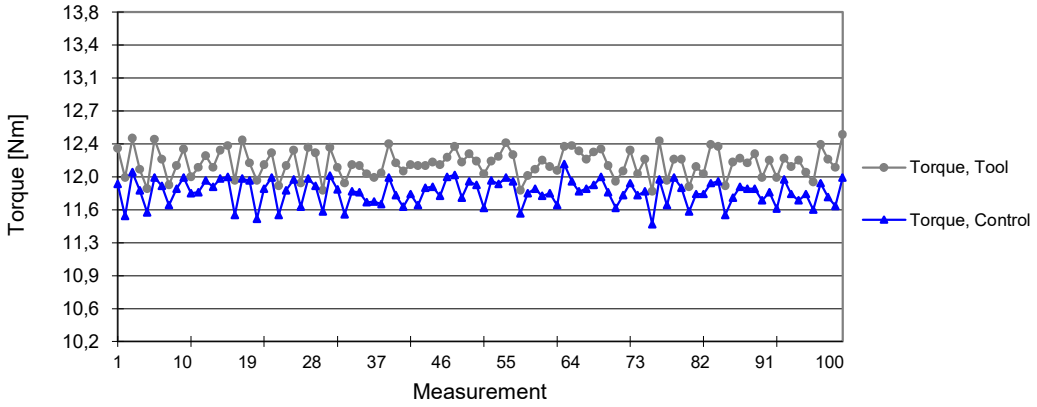
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

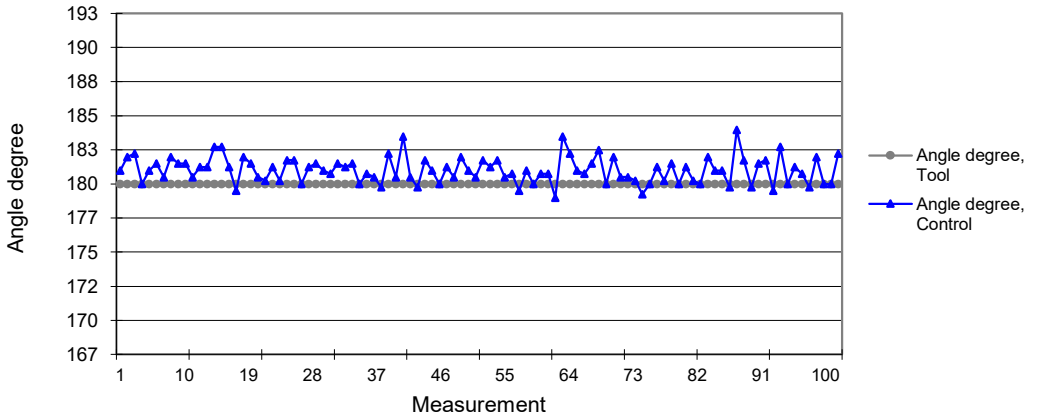
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	12,31	180,00	11,92	181,00	0,39	1,00
2	11,99	180,00	11,57	182,00	0,42	2,00
3	12,42	180,00	12,05	182,25	0,37	2,25
4	12,08	180,00	11,85	180,00	0,23	0,00
5	11,87	180,00	11,61	181,00	0,26	1,00
6	12,41	180,00	11,99	181,50	0,42	1,50
7	12,19	180,00	11,90	180,50	0,29	0,50
8	11,91	180,00	11,69	182,00	0,22	2,00
9	12,12	180,00	11,87	181,50	0,25	1,50
10	12,30	180,00	11,99	181,50	0,31	1,50
11	12,00	180,00	11,82	180,50	0,18	0,50
12	12,10	180,00	11,83	181,25	0,27	1,25
13	12,23	180,00	11,96	181,25	0,27	1,25
14	12,10	180,00	11,89	182,75	0,21	2,75
15	12,29	180,00	11,98	182,75	0,31	2,75
16	12,34	180,00	12,00	181,25	0,34	1,25
17	11,96	180,00	11,58	179,50	0,38	0,50
18	12,40	180,00	11,98	182,00	0,42	2,00
19	12,15	180,00	11,96	181,50	0,19	1,50
20	11,96	180,00	11,54	180,50	0,42	0,50
21	12,13	180,00	11,87	180,25	0,26	0,25
22	12,26	180,00	11,99	181,25	0,27	1,25
23	11,90	180,00	11,58	180,25	0,32	0,25
24	12,12	180,00	11,85	181,75	0,27	1,75
25	12,29	180,00	11,97	181,75	0,32	1,75
26	11,93	180,00	11,67	180,00	0,26	0,00
27	12,32	180,00	11,98	181,25	0,34	1,25
28	12,26	180,00	11,90	181,50	0,36	1,50
29	11,85	180,00	11,62	181,00	0,23	1,00
30	12,32	180,00	12,01	180,75	0,31	0,75
31	12,10	180,00	11,86	181,50	0,24	1,50
32	11,93	180,00	11,59	181,25	0,34	1,25
33	12,13	180,00	11,84	181,50	0,29	1,50
34	12,12	180,00	11,83	180,00	0,29	0,00
35	12,03	180,00	11,72	180,75	0,31	0,75
36	11,99	180,00	11,73	180,50	0,26	0,50
37	12,04	180,00	11,70	179,75	0,34	0,25
38	12,36	180,00	11,99	182,25	0,37	2,25
39	12,15	180,00	11,80	180,50	0,35	0,50
40	12,06	180,00	11,67	183,50	0,39	3,50
41	12,13	180,00	11,81	180,50	0,32	0,50
42	12,12	180,00	11,69	179,75	0,43	0,25
43	12,12	180,00	11,88	181,75	0,24	1,75
44	12,16	180,00	11,89	181,00	0,27	1,00
45	12,13	180,00	11,79	180,00	0,34	0,00
46	12,21	180,00	12,00	181,25	0,21	1,25
47	12,33	180,00	12,02	180,50	0,31	0,50
48	12,16	180,00	11,77	182,00	0,39	2,00
49	12,25	180,00	11,95	181,00	0,30	1,00
50	12,17	180,00	11,91	180,50	0,26	0,50
51	12,03	180,00	11,66	181,75	0,37	1,75
52	12,17	180,00	11,96	181,25	0,21	1,25
53	12,22	180,00	11,92	181,75	0,30	1,75
54	12,37	180,00	11,99	180,50	0,38	0,50
55	12,24	180,00	11,95	180,75	0,29	0,75
56	11,85	180,00	11,60	179,50	0,25	0,50
57	12,01	180,00	11,82	181,00	0,19	1,00
58	12,08	180,00	11,87	180,00	0,21	0,00
59	12,18	180,00	11,79	180,75	0,39	0,75
60	12,11	180,00	11,82	180,75	0,29	0,75
61	12,07	180,00	11,69	179,00	0,38	1,00
62	12,33	180,00	12,14	183,50	0,19	3,50
63	12,34	180,00	11,95	182,25	0,39	2,25
64	12,28	180,00	11,84	181,00	0,44	1,00
65	12,19	180,00	11,87	180,75	0,32	0,75
66	12,27	180,00	11,91	181,50	0,36	1,50
67	12,30	180,00	12,00	182,50	0,30	2,50
68	12,12	180,00	11,83	180,00	0,29	0,00
69	11,95	180,00	11,66	182,00	0,29	2,00
70	12,06	180,00	11,80	180,50	0,26	0,50
71	12,29	180,00	11,93	180,50	0,36	0,50
72	12,03	180,00	11,80	180,25	0,23	0,25
73	12,19	180,00	11,84	179,25	0,35	0,75
74	11,84	180,00	11,48	180,00	0,36	0,00
75	12,39	180,00	11,97	181,25	0,42	1,25
76	11,96	180,00	11,69	180,25	0,27	0,25
77	12,19	180,00	11,99	181,50	0,20	1,50
78	12,19	180,00	11,88	180,00	0,31	0,00
79	11,89	180,00	11,62	181,25	0,27	1,25
80	12,11	180,00	11,81	180,25	0,30	0,25
81	12,03	180,00	11,81	180,00	0,22	0,00
82	12,35	180,00	11,93	182,00	0,42	2,00
83	12,33	180,00	11,95	181,00	0,38	1,00
84	11,90	180,00	11,58	181,00	0,32	1,00
85	12,16	180,00	11,77	179,75	0,39	0,25
86	12,20	180,00	11,89	184,00	0,31	4,00
87	12,15	180,00	11,87	181,75	0,28	1,75
88	12,25	180,00	11,87	179,75	0,38	0,25
89	11,99	180,00	11,74	181,50	0,25	1,50
90	12,18	180,00	11,83	181,75	0,35	1,75
91	11,99	180,00	11,65	179,50	0,34	0,50
92	12,20	180,00	11,97	182,75	0,23	2,75
93	12,11	180,00	11,81	180,00	0,30	0,00
94	12,18	180,00	11,74	181,25	0,44	1,25
95	12,05	180,00	11,81	180,75	0,24	0,75
96	11,94	180,00	11,64	179,75	0,30	0,25
97	12,35	180,00	11,93	182,00	0,42	2,00
98	12,19	180,00	11,78	180,00	0,41	0,00
99	12,10	180,00	11,68	180,00	0,42	0,00
100	12,46	180,00	11,99	182,25	0,47	2,25
				Standard deviation:	**0,070**	**0,863**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





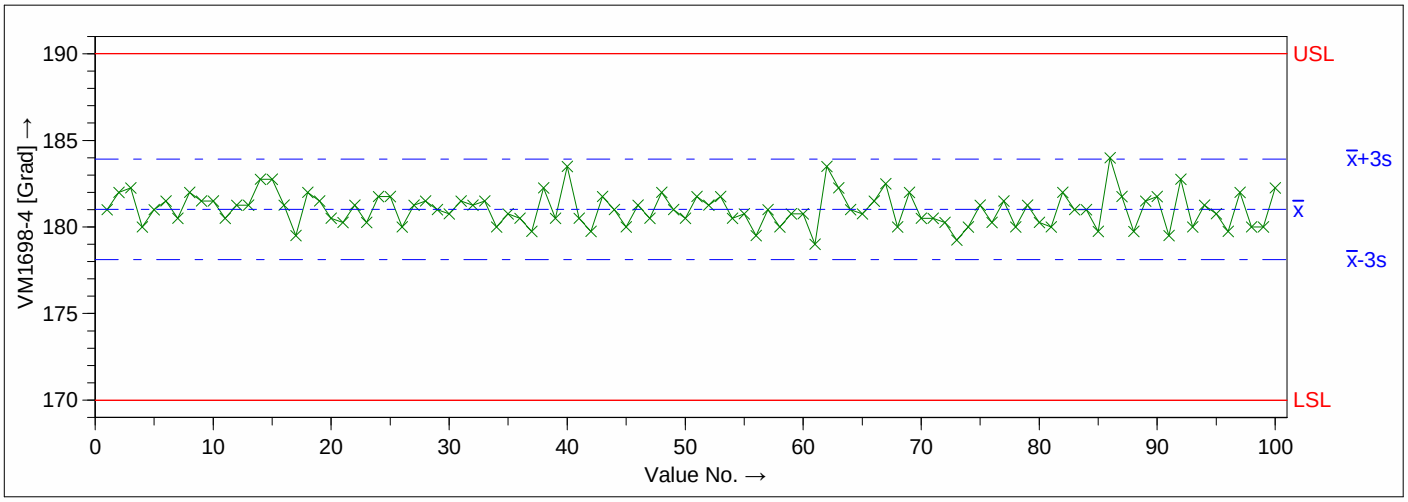
Machine Capability Study
Control System

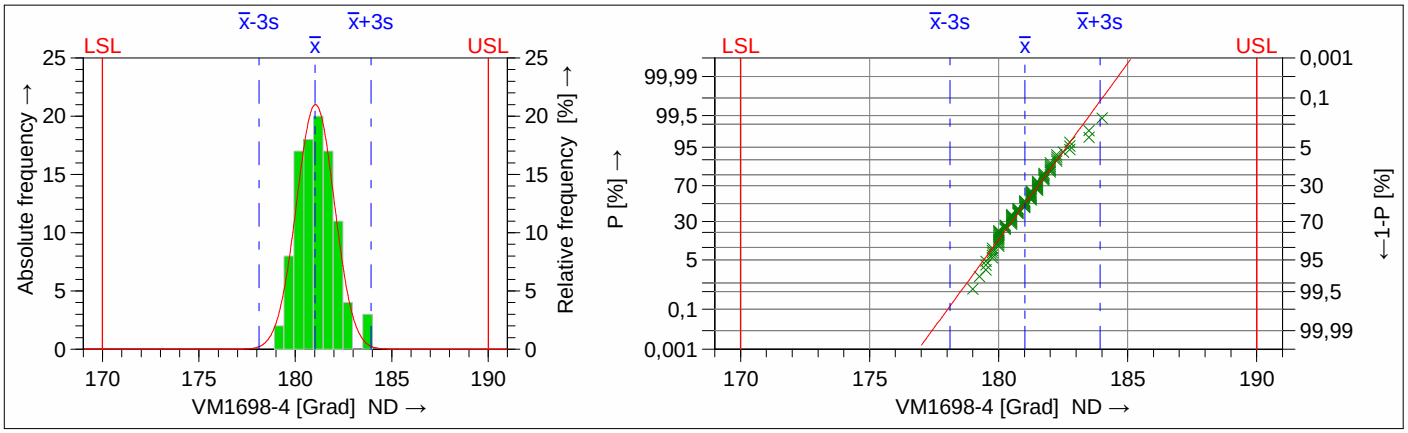
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_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 22.07.2022 09:57:38 to 22.07.2022 10:21:18

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	181.0225
LSL	170.00	x_{min}	179.00	$\bar{x}$-3s	178.1166
USL	190.00	x_{max}	184.00	$\bar{x}$+3s	183.9284
T	20.00	R	5.00	6s	5.8118
		$n_{<T>}$	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	3.44
Critical capability index	=	C_{mk}	3.09

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 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.125 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	11,92	11,57	12,05	11,85	11,61	11,99	11,90	11,69	11,87	11,99
1024210	VM1698-4	Grad	181,00	182,00	182,25	180,00	181,00	181,50	180,50	182,00	181,50	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	11,82	11,83	11,96	11,89	11,98	12,00	11,58	11,98	11,96	11,54
1024210	VM1698-4	Grad	180,50	181,25	181,25	182,75	182,75	181,25	179,50	182,00	181,50	180,50

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	11,87	11,99	11,58	11,85	11,97	11,67	11,98	11,90	11,62	12,01
1024210	VM1698-4	Grad	180,25	181,25	180,25	181,75	181,75	180,00	181,25	181,50	181,00	180,75

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	11,86	11,59	11,84	11,83	11,72	11,73	11,70	11,99	11,80	11,67
1024210	VM1698-4	Grad	181,50	181,25	181,50	180,00	180,75	180,50	179,75	182,25	180,50	183,50

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	11,81	11,69	11,88	11,89	11,79	12,00	12,02	11,77	11,95	11,91
1024210	VM1698-4	Grad	180,50	179,75	181,75	181,00	180,00	181,25	180,50	182,00	181,00	180,50

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	11,66	11,96	11,92	11,99	11,95	11,60	11,82	11,87	11,79	11,82
1024210	VM1698-4	Grad	181,75	181,25	181,75	180,50	180,75	179,50	181,00	180,00	180,75	180,75

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	11,69	12,14	11,95	11,84	11,87	11,91	12,00	11,83	11,66	11,80
1024210	VM1698-4	Grad	179,00	183,50	182,25	181,00	180,75	181,50	182,50	180,00	182,00	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	11,93	11,80	11,84	11,48	11,97	11,69	11,99	11,88	11,62	11,81
1024210	VM1698-4	Grad	180,50	180,25	179,25	180,00	181,25	180,25	181,50	180,00	181,25	180,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.59 Nm; Cur.-Cal.: 0.125 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	11,81	11,93	11,95	11,58	11,77	11,89	11,87	11,87	11,74	11,83
1024210	VM1698-4	Grad	180,00	182,00	181,00	181,00	179,75	184,00	181,75	179,75	181,50	181,75

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	11,65	11,97	11,81	11,74	11,81	11,64	11,93	11,78	11,68	11,99
1024210	VM1698-4	Grad	179,50	182,75	180,00	181,25	180,75	179,75	182,00	180,00	180,00	182,25

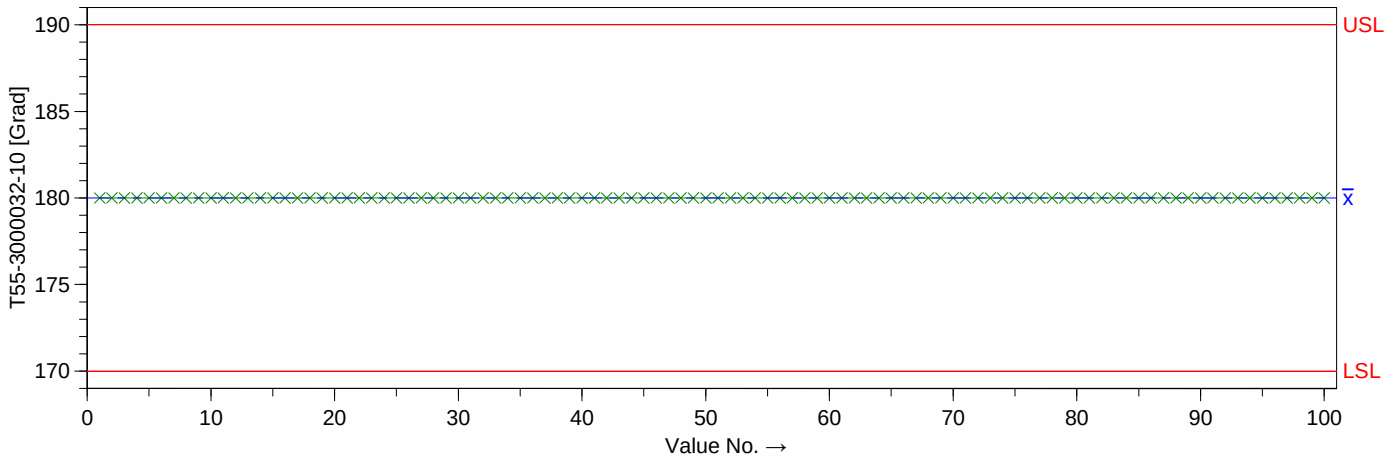
Machine Capability Study
Tool System

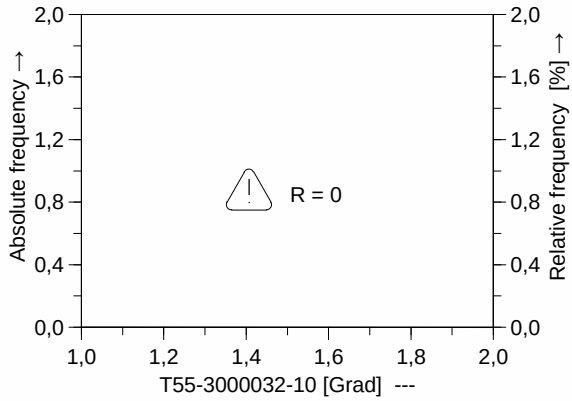
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

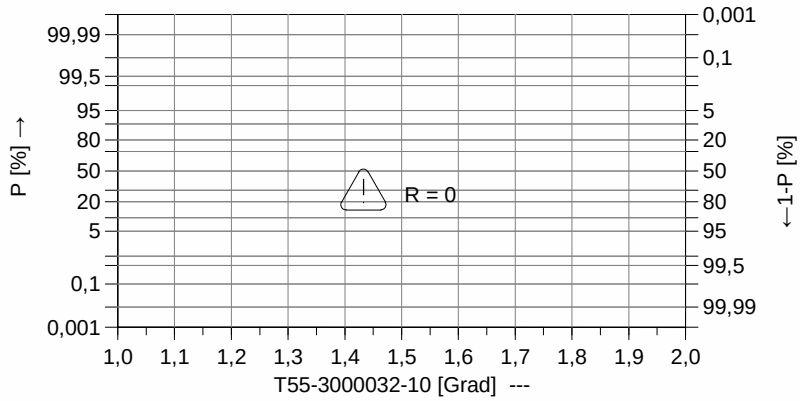
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_l	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	193773	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 22.07.2022 09:57:38 to 22.07.2022 10:21:18

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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 22.07.2022

Serial No.	1019840_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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}
193773	T55-3000032-10	Nm	12,31	11,99	12,42	12,08	11,87	12,41	12,19	11,91	12,12	12,30
193773	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}
193773	T55-3000032-10	Nm	12,00	12,10	12,23	12,10	12,29	12,34	11,96	12,40	12,15	11,96
193773	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}
193773	T55-3000032-10	Nm	12,13	12,26	11,90	12,12	12,29	11,93	12,32	12,26	11,85	12,32
193773	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}
193773	T55-3000032-10	Nm	12,10	11,93	12,13	12,12	12,03	11,99	12,04	12,36	12,15	12,06
193773	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}
193773	T55-3000032-10	Nm	12,13	12,12	12,12	12,16	12,13	12,21	12,33	12,16	12,25	12,17
193773	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}
193773	T55-3000032-10	Nm	12,03	12,17	12,22	12,37	12,24	11,85	12,01	12,08	12,18	12,11
193773	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}
193773	T55-3000032-10	Nm	12,07	12,33	12,34	12,28	12,19	12,27	12,30	12,12	11,95	12,06
193773	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}
193773	T55-3000032-10	Nm	12,29	12,03	12,19	11,84	12,39	11,96	12,19	12,19	11,89	12,11
193773	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 22.07.2022

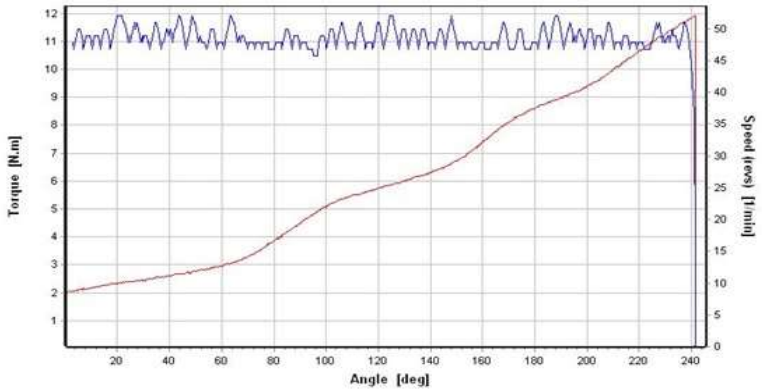
Serial No.	1019840_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
193773	T55-3000032-10	Nm	12,03	12,35	12,33	11,90	12,16	12,20	12,15	12,25	11,99	12,18
193773	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

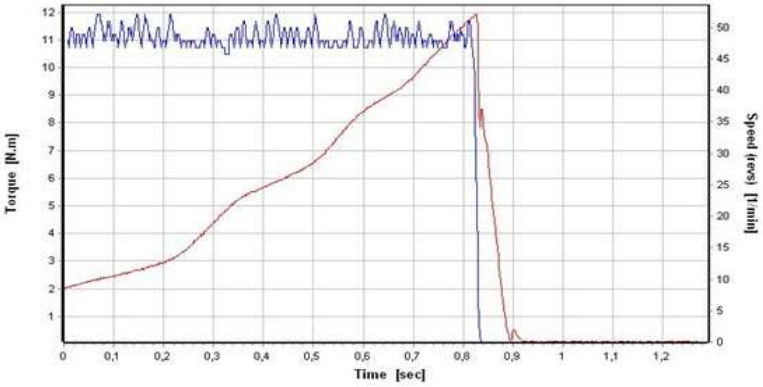
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	11,99	12,20	12,11	12,18	12,05	11,94	12,35	12,19	12,10	12,46
193773	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

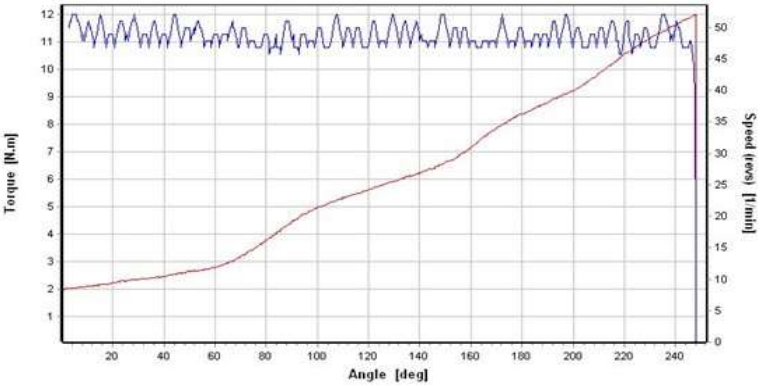
Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



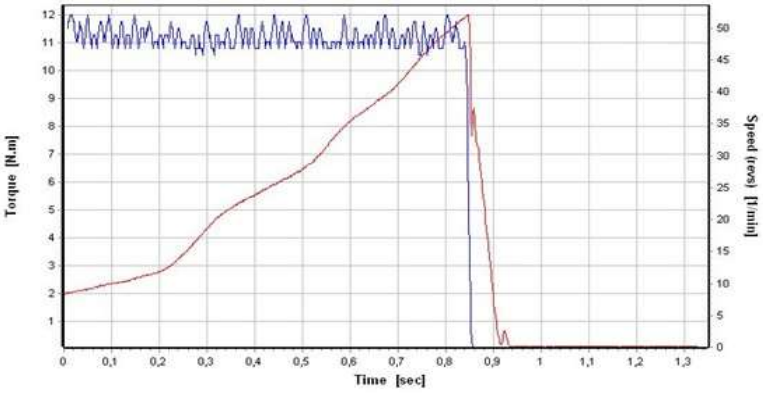
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019840

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: 5,73 % ± **2,87 %**

Angle degree: 180° Tolerance: 10,9° ± **5,5°**

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

Tool with angle correction

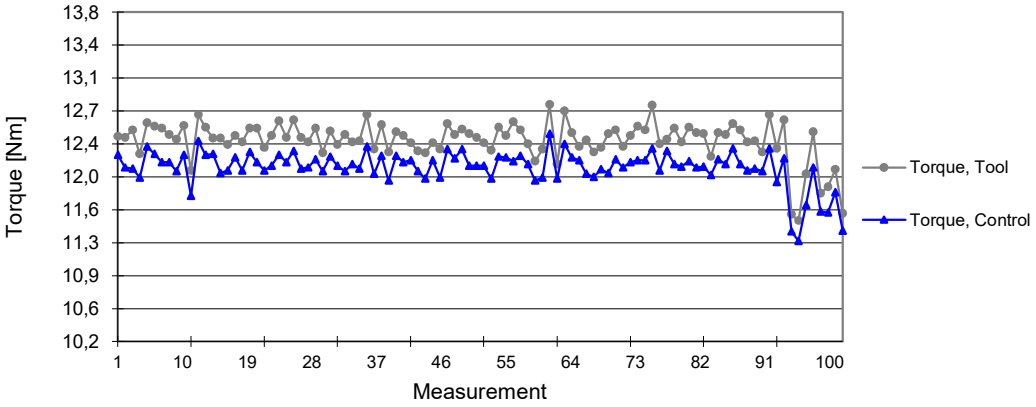
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move +", the angle range in the screw direction,
In the column "Move -" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle values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

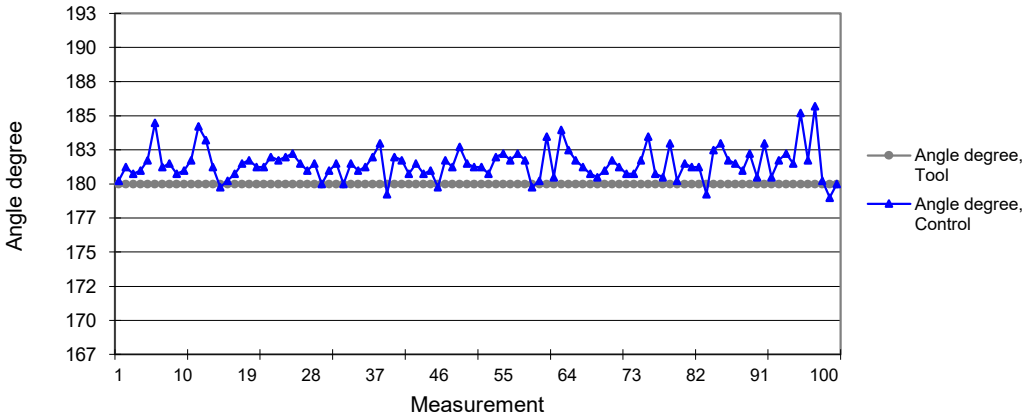
Move		Test conditions
+	**-**	0
0-25°	**0-45°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	12,44	180,00	12,24	180,25	0,20	0,25
2	12,43	180,00	12,10	181,25	0,33	1,25
3	12,51	180,00	12,09	180,75	0,42	0,75
4	12,25	180,00	11,99	181,00	0,26	1,00
5	12,59	180,00	12,33	181,75	0,26	1,75
6	12,55	180,00	12,25	184,50	0,30	4,50
7	12,53	180,00	12,16	181,25	0,37	1,25
8	12,46	180,00	12,16	181,50	0,30	1,50
9	12,41	180,00	12,06	180,75	0,35	0,75
10	12,56	180,00	12,24	181,00	0,32	1,00
11	12,07	180,00	11,79	181,75	0,28	1,75
12	12,68	180,00	12,39	184,25	0,29	4,25
13	12,54	180,00	12,24	183,25	0,30	3,25
14	12,42	180,00	12,25	181,25	0,17	1,25
15	12,42	180,00	12,04	179,75	0,38	0,25
16	12,35	180,00	12,07	180,25	0,28	0,25
17	12,45	180,00	12,21	180,75	0,24	0,75
18	12,38	180,00	12,07	181,50	0,31	1,50
19	12,53	180,00	12,27	181,75	0,26	1,75
20	12,53	180,00	12,16	181,25	0,37	1,25
21	12,32	180,00	12,07	181,25	0,25	1,25
22	12,45	180,00	12,12	182,00	0,33	2,00
23	12,61	180,00	12,24	181,75	0,37	1,75
24	12,43	180,00	12,16	182,00	0,27	2,00
25	12,62	180,00	12,28	182,25	0,34	2,25
26	12,43	180,00	12,09	181,50	0,34	1,50
27	12,38	180,00	12,10	181,00	0,28	1,00
28	12,53	180,00	12,19	181,50	0,34	1,50
29	12,26	180,00	12,06	180,00	0,20	0,00
30	12,50	180,00	12,22	181,00	0,28	1,00
31	12,35	180,00	12,12	181,50	0,23	1,50
32	12,46	180,00	12,06	180,00	0,40	0,00
33	12,38	180,00	12,14	181,50	0,24	1,50
34	12,39	180,00	12,09	181,00	0,30	1,00
35	12,68	180,00	12,33	181,25	0,35	1,25
36	12,30	180,00	12,03	182,00	0,27	2,00
37	12,57	180,00	12,23	183,00	0,34	3,00
38	12,27	180,00	11,96	179,25	0,31	0,75
39	12,49	180,00	12,23	182,00	0,26	2,00
40	12,45	180,00	12,16	181,75	0,29	1,75
41	12,37	180,00	12,18	180,75	0,19	0,75
42	12,28	180,00	12,06	181,50	0,22	1,50
43	12,26	180,00	11,98	180,75	0,28	0,75
44	12,37	180,00	12,18	181,00	0,19	1,00
45	12,30	180,00	11,99	179,75	0,31	0,25
46	12,58	180,00	12,30	181,75	0,28	1,75
47	12,46	180,00	12,20	181,25	0,26	1,25
48	12,52	180,00	12,30	182,75	0,22	2,75
49	12,47	180,00	12,12	181,50	0,35	1,50
50	12,43	180,00	12,12	181,25	0,31	1,25
51	12,37	180,00	12,12	181,25	0,25	1,25
52	12,29	180,00	11,98	180,75	0,31	0,75
53	12,54	180,00	12,22	182,00	0,32	2,00
54	12,45	180,00	12,21	182,25	0,24	2,25
55	12,60	180,00	12,17	181,75	0,43	1,75
56	12,51	180,00	12,23	182,25	0,28	2,25
57	12,36	180,00	12,14	181,75	0,22	1,75
58	12,17	180,00	11,96	179,75	0,21	0,25
59	12,30	180,00	11,99	180,25	0,31	0,25
60	12,79	180,00	12,47	183,50	0,32	3,50
61	12,14	180,00	11,98	180,50	0,16	0,50
62	12,72	180,00	12,36	184,00	0,36	4,00
63	12,48	180,00	12,21	182,50	0,27	2,50
64	12,33	180,00	12,18	181,75	0,15	1,75
65	12,40	180,00	12,03	181,25	0,37	1,25
66	12,27	180,00	12,00	180,75	0,27	0,75
67	12,32	180,00	12,08	180,50	0,24	0,50
68	12,47	180,00	12,04	181,00	0,43	1,00
69	12,51	180,00	12,19	181,75	0,32	1,75
70	12,33	180,00	12,10	181,25	0,23	1,25
71	12,45	180,00	12,16	180,75	0,29	0,75
72	12,55	180,00	12,18	180,75	0,37	0,75
73	12,51	180,00	12,18	181,75	0,33	1,75
74	12,78	180,00	12,31	183,50	0,47	3,50
75	12,36	180,00	12,07	180,75	0,29	0,75
76	12,41	180,00	12,28	180,50	0,13	0,50
77	12,53	180,00	12,14	183,00	0,39	3,00
78	12,38	180,00	12,11	180,25	0,27	0,25
79	12,54	180,00	12,17	181,50	0,37	1,50
80	12,48	180,00	12,10	181,25	0,38	1,25
81	12,47	180,00	12,11	181,25	0,36	1,25
82	12,22	180,00	12,02	179,25	0,20	0,75
83	12,48	180,00	12,19	182,50	0,29	2,50
84	12,46	180,00	12,14	183,00	0,32	3,00
85	12,58	180,00	12,31	181,75	0,27	1,75
86	12,51	180,00	12,14	181,50	0,37	1,50
87	12,38	180,00	12,07	181,00	0,31	1,00
88	12,39	180,00	12,09	182,25	0,30	2,25
89	12,27	180,00	12,06	180,50	0,21	0,50
90	12,68	180,00	12,31	183,00	0,37	3,00
91	12,31	180,00	11,94	180,50	0,37	0,50
92	12,62	180,00	12,20	181,75	0,42	1,75
93	11,59	180,00	11,40	182,25	0,19	2,25
94	11,52	180,00	11,30	181,50	0,22	1,50
95	12,03	180,00	11,69	185,25	0,34	5,25
96	12,49	180,00	12,10	181,75	0,39	1,75
97	11,82	180,00	11,62	185,75	0,20	5,75
98	11,89	180,00	11,61	180,25	0,28	0,25
99	12,08	180,00	11,83	179,00	0,25	1,00
100	11,60	180,00	11,41	180,00	0,19	0,00
				Standard deviation:	**0,069**	**1,089**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	





Machine Capability Study
Control System

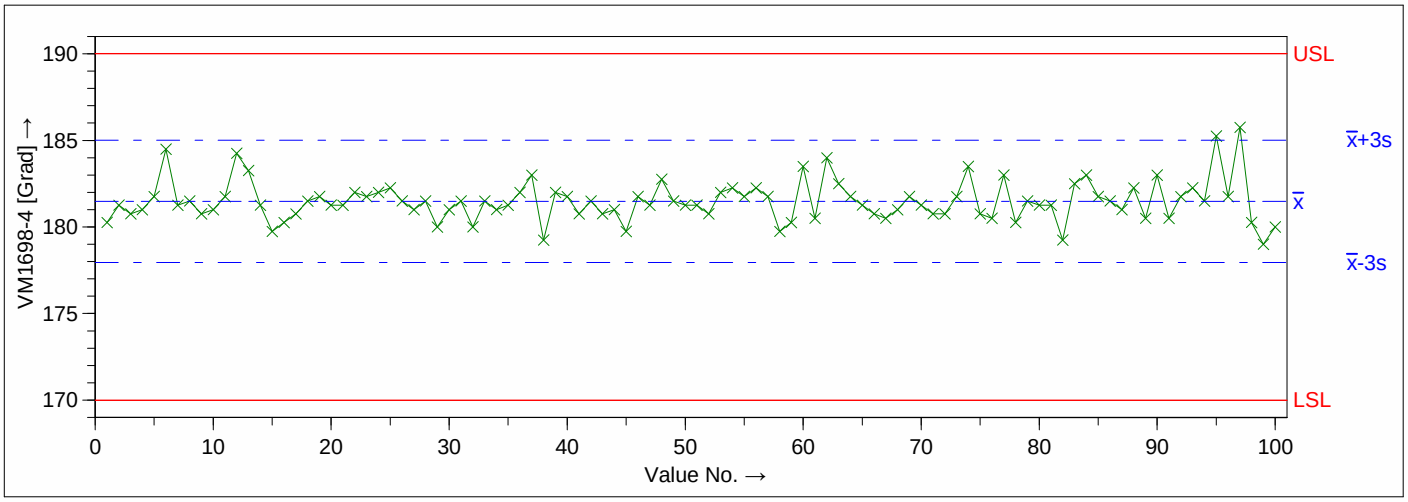
Cleco Production Tools

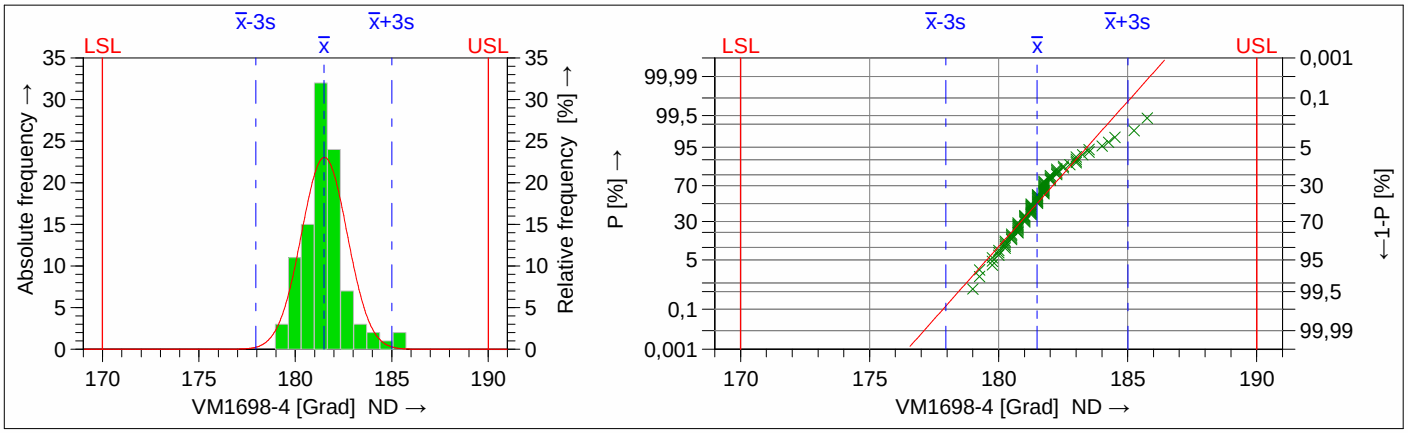
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_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 22.07.2022 10:49:17 to 22.07.2022 11:12:44

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	181.4825
LSL	170.00	x_{min}	179.00	$\bar{x}$-3s	177.9530
USL	190.00	x_{max}	185.75	$\bar{x}$+3s	185.0120
T	20.00	R	6.75	6s	7.0590
		$n_{<T>}$	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	2.83
Critical capability index	=	C_{mk}	2.41

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 22.07.2022

Serial No.	1019840_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.: 16.5 9 Nm; Cur.-Cal.: 0.125 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	12,24	12,10	12,09	11,99	12,33	12,25	12,16	12,16	12,06	12,24
1024210	VM1698-4	Grad	180,25	181,25	180,75	181,00	181,75	184,50	181,25	181,50	180,75	181,00

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}
1024210	VM1698-4	Nm	11,79	12,39	12,24	12,25	12,04	12,07	12,21	12,07	12,27	12,16
1024210	VM1698-4	Grad	181,75	184,25	183,25	181,25	179,75	180,25	180,75	181,50	181,75	181,25

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	12,07	12,12	12,24	12,16	12,28	12,09	12,10	12,19	12,06	12,22
1024210	VM1698-4	Grad	181,25	182,00	181,75	182,00	182,25	181,50	181,00	181,50	180,00	181,00

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	12,12	12,06	12,14	12,09	12,33	12,03	12,23	11,96	12,23	12,16
1024210	VM1698-4	Grad	181,50	180,00	181,50	181,00	181,25	182,00	183,00	179,25	182,00	181,75

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	12,18	12,06	11,98	12,18	11,99	12,30	12,20	12,30	12,12	12,12
1024210	VM1698-4	Grad	180,75	181,50	180,75	181,00	179,75	181,75	181,25	182,75	181,50	181,25

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	12,12	11,98	12,22	12,21	12,17	12,23	12,14	11,96	11,99	12,47
1024210	VM1698-4	Grad	181,25	180,75	182,00	182,25	181,75	182,25	181,75	179,75	180,25	183,50

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	11,98	12,36	12,21	12,18	12,03	12,00	12,08	12,04	12,19	12,10
1024210	VM1698-4	Grad	180,50	184,00	182,50	181,75	181,25	180,75	180,50	181,00	181,75	181,25

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	12,16	12,18	12,18	12,31	12,07	12,28	12,14	12,11	12,17	12,10
1024210	VM1698-4	Grad	180,75	180,75	181,75	183,50	180,75	180,50	183,00	180,25	181,50	181,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 22.07.2022

Serial No.	1019840_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.: 16.5 9 Nm; Cur.-Cal.: 0.125 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	12,11	12,02	12,19	12,14	12,31	12,14	12,07	12,09	12,06	12,31
1024210	VM1698-4	Grad	181,25	179,25	182,50	183,00	181,75	181,50	181,00	182,25	180,50	183,00

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	11,94	12,20	11,40	11,30	11,69	12,10	11,62	11,61	11,83	11,41
1024210	VM1698-4	Grad	180,50	181,75	182,25	181,50	185,25	181,75	185,75	180,25	179,00	180,00

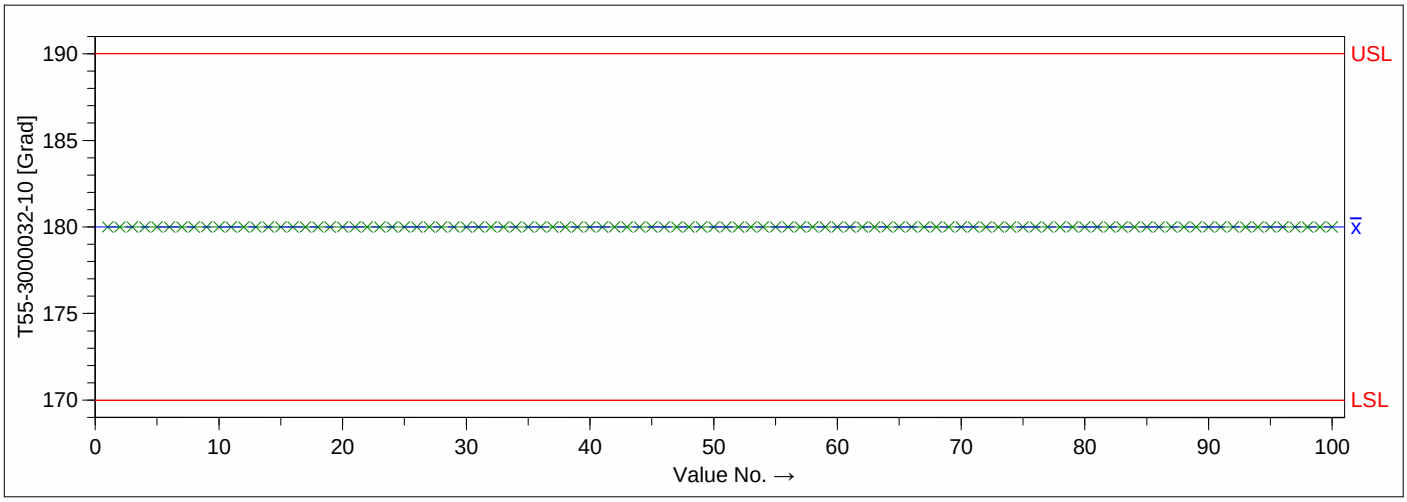
Machine Capability Study
Tool System

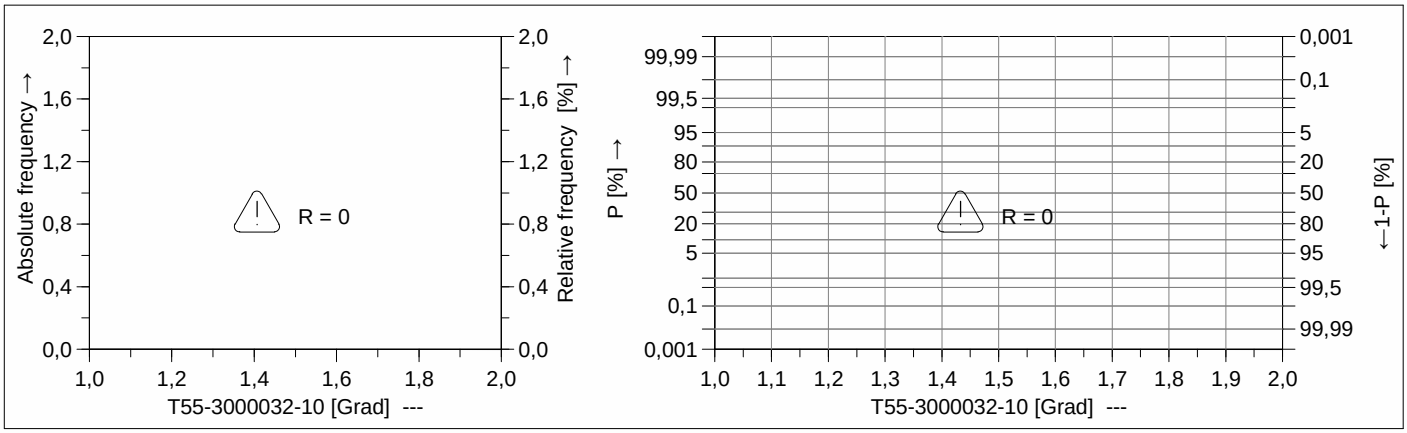
Plant	ATG Westhausen	Operator Name	Sünder
Date	22.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019840_n	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	193773	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 22.07.2022 10:49:17 to 22.07.2022 11:12:44

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.59 Nm; Cur.-Cal.: 0.125 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 22.07.2022

Serial No.	1019840_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 9 Nm; Cur.-Cal.: 0.125 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}
193773	T55-3000032-10	Nm	12,44	12,43	12,51	12,25	12,59	12,55	12,53	12,46	12,41	12,56
193773	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}
193773	T55-3000032-10	Nm	12,07	12,68	12,54	12,42	12,42	12,35	12,45	12,38	12,53	12,53
193773	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}
193773	T55-3000032-10	Nm	12,32	12,45	12,61	12,43	12,62	12,43	12,38	12,53	12,26	12,50
193773	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}
193773	T55-3000032-10	Nm	12,35	12,46	12,38	12,39	12,68	12,30	12,57	12,27	12,49	12,45
193773	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}
193773	T55-3000032-10	Nm	12,37	12,28	12,26	12,37	12,30	12,58	12,46	12,52	12,47	12,43
193773	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}
193773	T55-3000032-10	Nm	12,37	12,29	12,54	12,45	12,60	12,51	12,36	12,17	12,30	12,79
193773	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}
193773	T55-3000032-10	Nm	12,14	12,72	12,48	12,33	12,40	12,27	12,32	12,47	12,51	12,33
193773	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}
193773	T55-3000032-10	Nm	12,45	12,55	12,51	12,78	12,36	12,41	12,53	12,38	12,54	12,48
193773	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 22.07.2022

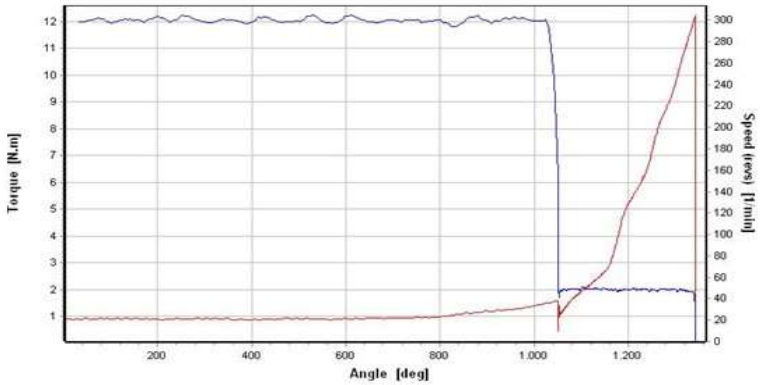
Serial No.	1019840_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	193773	LSL	11,83
				USL	13,61
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 9 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
193773	T55-3000032-10	Nm	12,47	12,22	12,48	12,46	12,58	12,51	12,38	12,39	12,27	12,68
193773	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

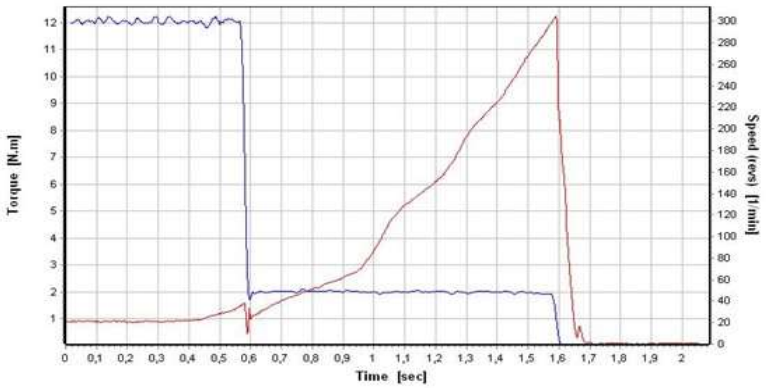
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
193773	T55-3000032-10	Nm	12,31	12,62	11,59	11,52	12,03	12,49	11,82	11,89	12,08	11,60
193773	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

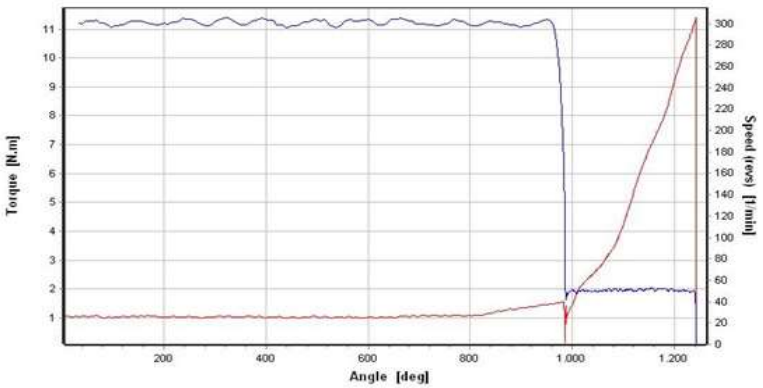
Model:	**CTBAW153**	Serial no:	**1019840**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	



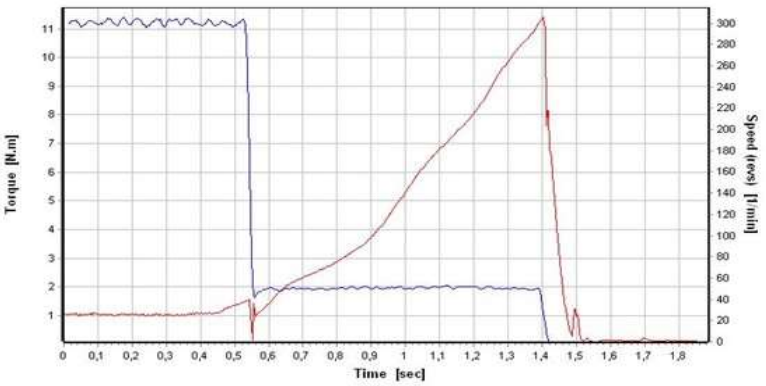
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed