Homologation

Cordless Assembly Tools

Model: CTBAW153

Serial no.: 1019131

Contents

Homologation: CTBAW153 SN: 1019131

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Test sheet no. 2

Machine Capability Study 30 %

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

Manufacturer: Apex Tool Group Serial no: **1019131**

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

Hard joint (H)	42,43	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,45	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	6,53 7,51 Nm	6,53 - 7,51 Nm
	Tolerance down / up	7	7 %
	Average torque	7,07	6,91 Nm
	Standard deviation	0,06	0,03 Nm
	Torque scatter (99,73%)	0,33	0,21 Nm
	C_m	2,94	4,69
	C_{mk}	2,63	3,61

b)	Min. C_m hard/soft (lowest value)	2,94
	Min. C_{mk} hard/soft (lowest value)	2,63

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

Note:

Machine Capability Study
Control System

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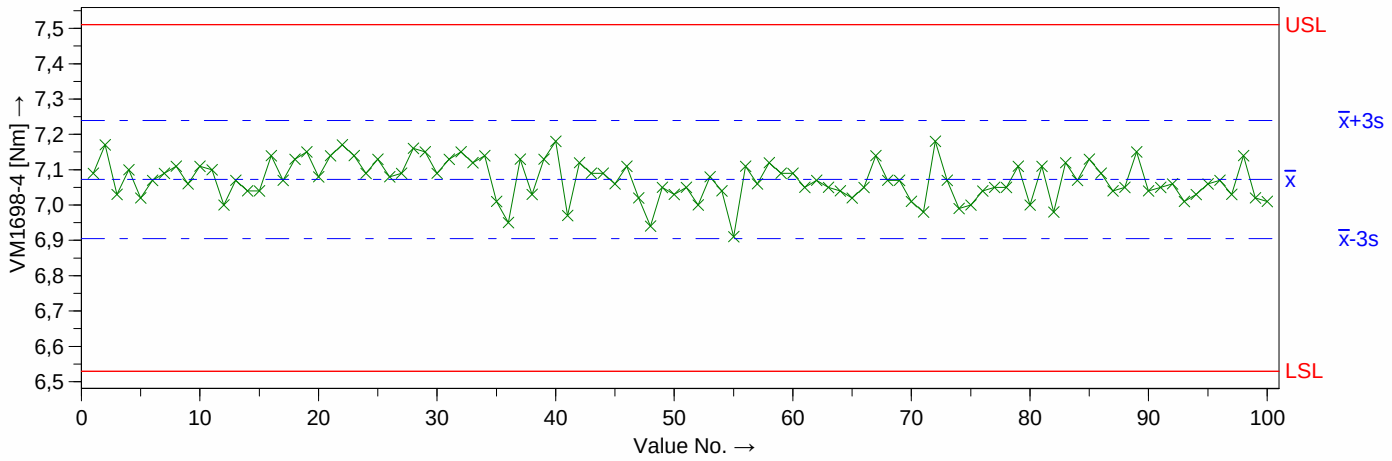
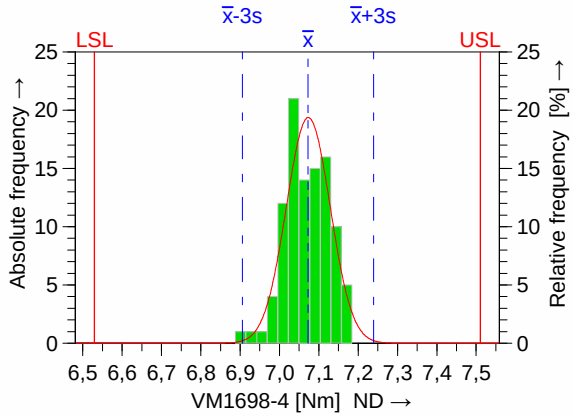
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

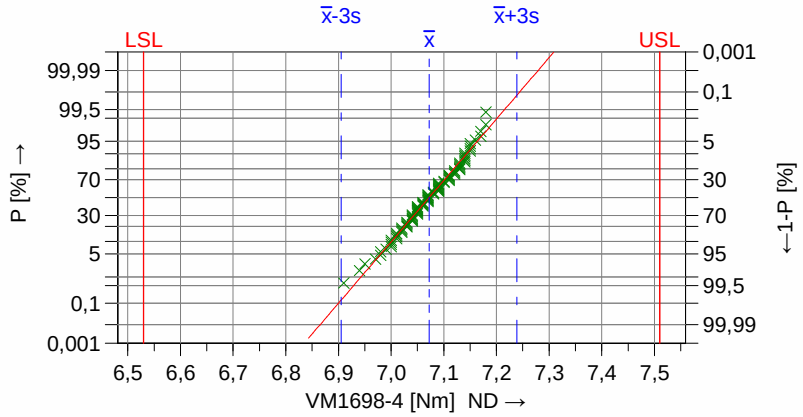
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_d	Char.Descr.	VM1698-4	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	1024210	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 09:53:06 to 29.07.2022 10:05:54

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			x̄	7.0721
LSL	6.53	x_{min}	6.91	x̄-3s	6.9053
USL	7.51	x_{max}	7.18	x̄+3s	7.2389
T	0.98	R	0.27	6s	0.3336
		$n_{<T>}$	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	2.94
Critical capability index	=	C_{mk}	2.63

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 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	7,09	7,17	7,03	7,10	7,02	7,07	7,09	7,11	7,06	7,11
1024210	VM1698-4	Grad	29,50	30,50	29,25	29,75	29,25	29,50	30,00	30,00	29,25	30,25

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	7,10	7,00	7,07	7,04	7,04	7,14	7,07	7,13	7,15	7,08
1024210	VM1698-4	Grad	30,00	29,00	29,50	29,50	29,25	30,00	30,00	30,25	30,25	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	7,14	7,17	7,14	7,09	7,13	7,08	7,09	7,16	7,15	7,09
1024210	VM1698-4	Grad	30,25	30,25	30,25	29,75	30,00	29,50	29,25	30,50	30,25	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	7,13	7,15	7,12	7,14	7,01	6,95	7,13	7,03	7,13	7,18
1024210	VM1698-4	Grad	30,25	30,25	29,75	29,50	29,00	28,50	30,50	30,00	30,25	30,75

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	6,97	7,12	7,09	7,09	7,06	7,11	7,02	6,94	7,05	7,03
1024210	VM1698-4	Grad	29,25	30,50	30,50	30,25	30,25	30,00	29,75	28,75	30,00	29,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	7,05	7,00	7,08	7,04	6,91	7,11	7,06	7,12	7,09	7,09
1024210	VM1698-4	Grad	30,00	29,75	30,50	29,75	28,75	30,75	30,25	30,00	30,50	30,50

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	7,05	7,07	7,05	7,04	7,02	7,05	7,14	7,07	7,07	7,01
1024210	VM1698-4	Grad	30,00	30,25	30,00	29,50	29,50	30,00	31,00	30,00	30,25	29,25

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	6,98	7,18	7,07	6,99	7,00	7,04	7,05	7,05	7,11	7,00
1024210	VM1698-4	Grad	29,25	31,25	30,25	29,75	29,75	29,75	29,75	29,50	30,25	29,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	7,11	6,98	7,12	7,07	7,13	7,09	7,04	7,05	7,15	7,04
1024210	VM1698-4	Grad	30,50	29,50	30,50	30,00	30,25	30,00	30,00	30,00	30,50	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	7,05	7,06	7,01	7,03	7,06	7,07	7,03	7,14	7,02	7,01
1024210	VM1698-4	Grad	30,00	29,75	29,50	29,75	30,00	30,00	30,00	30,50	29,50	29,50

Machine Capability Study
Tool System

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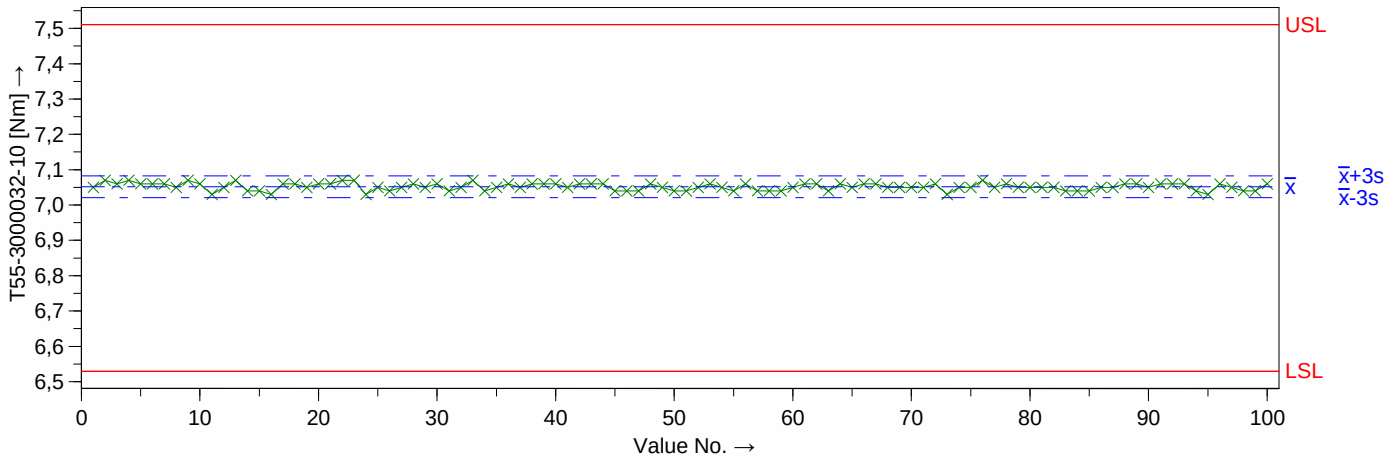
Plant ATG Westhausen		Operator Name Sünder	Date 29.07.2022

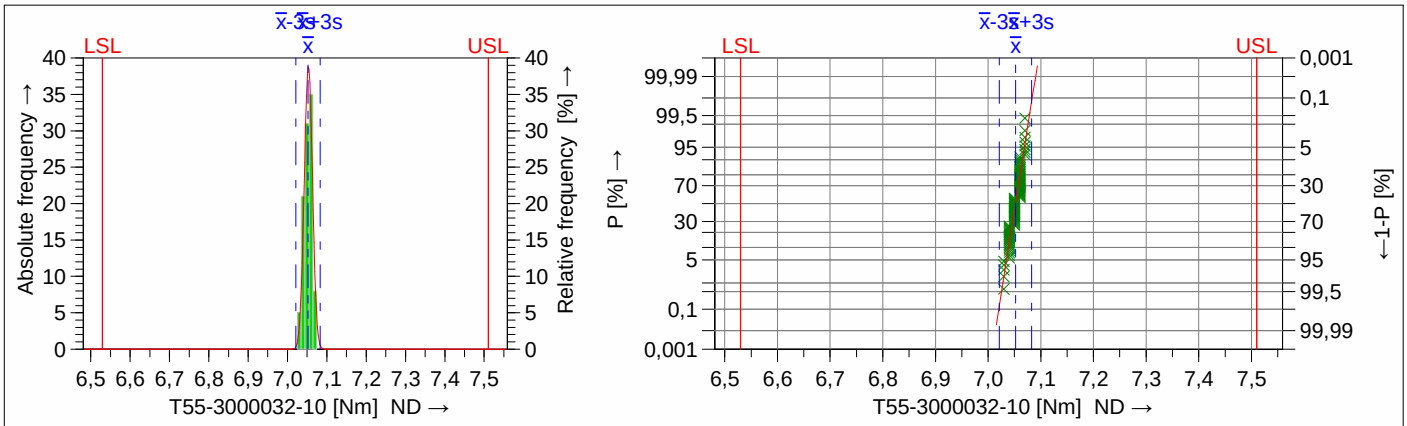
Ord. No. CTBAW153	Part type CTBAW153				Contr.item yes
Serial No. 1019131_d	Char.Descr. T55-3000032-10	Nom.val.	7,02	0,49	USL 7,51
	Serial No. 191790	Unit	Nm	-0,49	LSL 6,53
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Cleco	Reference System VM1698-4	Test Electronic MPRO400GCD-P
Contr.No. Homologation	Reference Transducer 10 / 1026388	nges. 100

Evaluation from 29.07.2022 09:53:06 to 29.07.2022 10:05:54

Rem. TQ 30% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0520
LSL	6.53	x_{min}	7.03	$\bar{x}$-3s	7.0213
USL	7.51	x_{max}	7.07	$\bar{x}$+3s	7.0827
T	0.98	R	0.04	6s	0.0615
		$n_{<T>}$	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	15.94
Critical capability index	=	C_{mk}	14.90

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019131_d1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	191790	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
191790	T55-3000032-10	Nm	7,05	7,07	7,06	7,07	7,06	7,06	7,06	7,05	7,07	7,06
191790	T55-3000032-10	Grad	29,00	30,00	29,00	30,00	29,00	29,00	30,00	30,00	29,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
191790	T55-3000032-10	Nm	7,03	7,05	7,07	7,04	7,04	7,03	7,06	7,06	7,05	7,06
191790	T55-3000032-10	Grad	29,00	29,00	29,00	29,00	29,00	30,00	30,00	30,00	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}
191790	T55-3000032-10	Nm	7,06	7,07	7,07	7,03	7,05	7,04	7,05	7,06	7,05	7,06
191790	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	30,00	29,00	29,00	31,00	30,00	29,00

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}
191790	T55-3000032-10	Nm	7,04	7,05	7,07	7,04	7,05	7,06	7,05	7,06	7,06	7,06
191790	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	29,00	28,00	31,00	29,00	30,00	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}
191790	T55-3000032-10	Nm	7,05	7,06	7,06	7,06	7,04	7,04	7,04	7,06	7,05	7,04
191790	T55-3000032-10	Grad	29,00	30,00	30,00	29,00	30,00	30,00	29,00	28,00	30,00	29,00

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}
191790	T55-3000032-10	Nm	7,04	7,05	7,06	7,05	7,04	7,06	7,04	7,04	7,04	7,05
191790	T55-3000032-10	Grad	30,00	29,00	30,00	29,00	29,00	30,00	30,00	31,00	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}
191790	T55-3000032-10	Nm	7,06	7,06	7,04	7,06	7,05	7,06	7,06	7,05	7,05	7,05
191790	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	29,00	31,00	30,00	30,00	29,00	29,00

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}
191790	T55-3000032-10	Nm	7,05	7,06	7,03	7,05	7,05	7,07	7,05	7,06	7,05	7,05
191790	T55-3000032-10	Grad	29,00	31,00	30,00	29,00	30,00	29,00	30,00	30,00	30,00	29,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_d	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	191790	LSL	6,53
				USL	7,51
Remark	TQ 30% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
191790	T55-3000032-10	Nm	7,05	7,05	7,04	7,04	7,04	7,05	7,05	7,06	7,06	7,05
191790	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	31,00	30,00

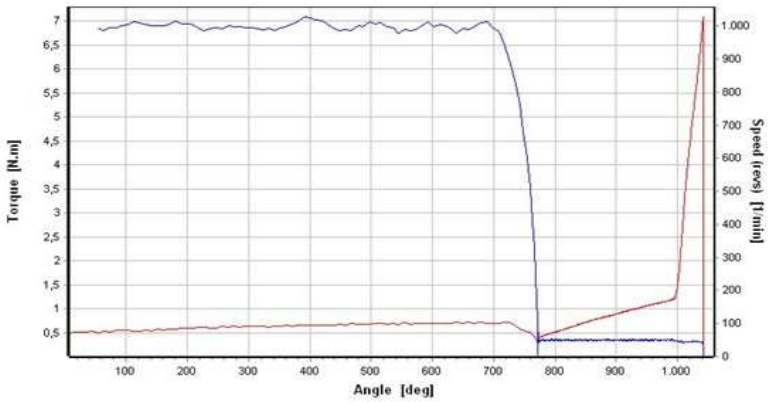
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	7,06	7,06	7,06	7,04	7,03	7,06	7,05	7,04	7,04	7,06
191790	T55-3000032-10	Grad	30,00	29,00	29,00	29,00	30,00	30,00	29,00	31,00	29,00	29,00

Torque graphs

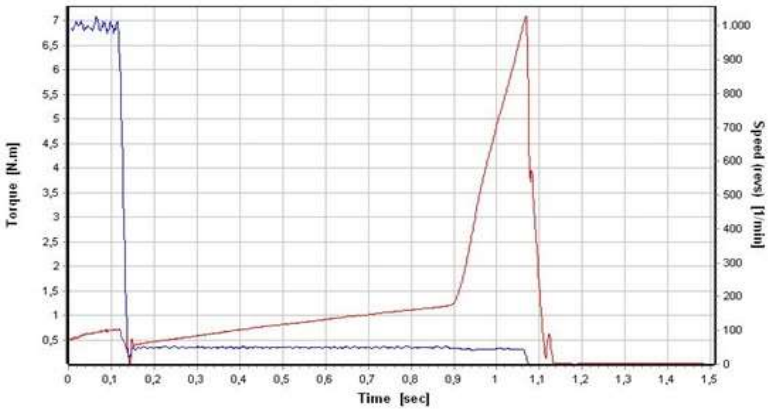
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019131**

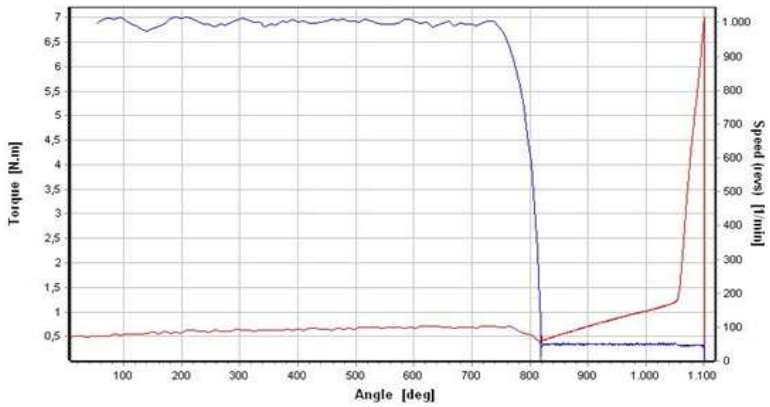
Angle degree: **30°**
Test torque: **7,0 Nm**



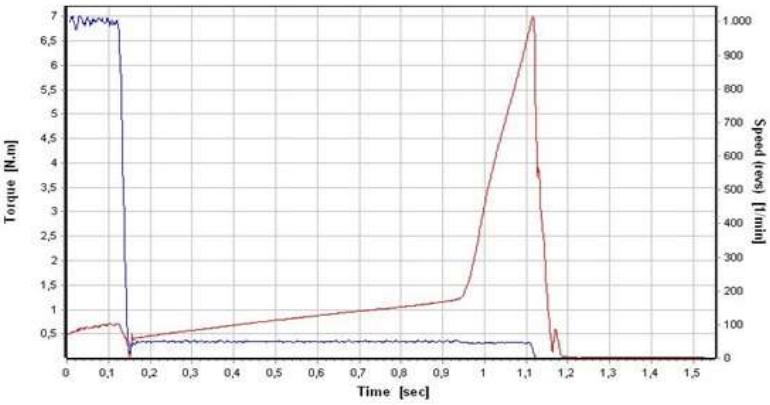
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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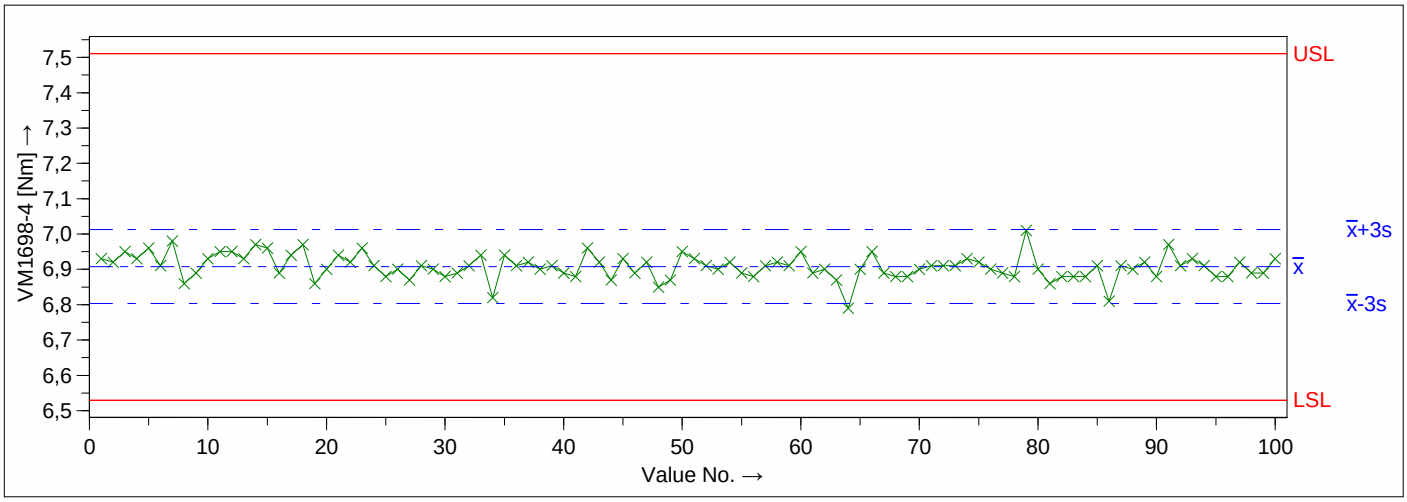
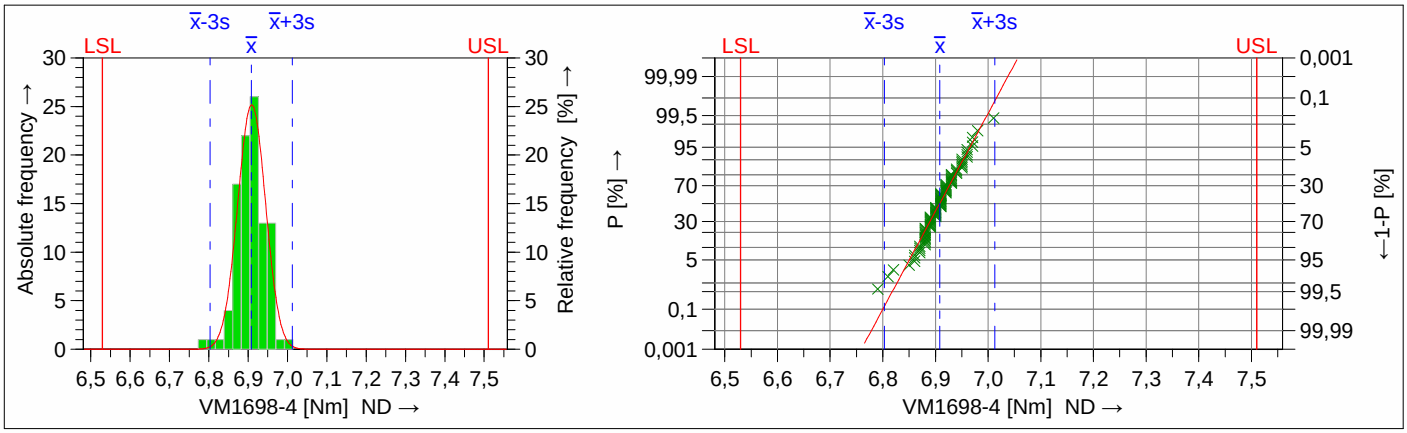
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_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 29.07.2022 10:17:47 to 29.07.2022 10:39:47

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	6.9079
LSL	6.53	x_{min}	6.79	$\bar{x}$-3s	6.8033
USL	7.51	x_{max}	7.01	$\bar{x}$+3s	7.0125
T	0.98	R	0.22	6s	0.2091
		$n_{<T>}$	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	4.69
Critical capability index	=	C_{mk}	3.61

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	6,93	6,92	6,95	6,93	6,96	6,91	6,98	6,86	6,89	6,93
1024210	VM1698-4	Grad	364,00	361,75	364,75	363,50	367,25	364,00	370,50	355,50	361,75	367,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	6,95	6,95	6,93	6,97	6,96	6,89	6,94	6,97	6,86	6,90
1024210	VM1698-4	Grad	366,25	368,75	364,75	364,00	368,00	363,25	366,75	368,25	358,00	360,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	6,94	6,92	6,96	6,91	6,88	6,90	6,87	6,91	6,90	6,88
1024210	VM1698-4	Grad	366,75	362,25	365,50	364,00	359,50	364,50	360,00	363,00	362,50	358,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	6,89	6,91	6,94	6,82	6,94	6,91	6,92	6,90	6,91	6,89
1024210	VM1698-4	Grad	360,75	364,50	362,50	351,00	365,00	361,00	365,00	363,00	364,50	357,50

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	6,88	6,96	6,92	6,87	6,93	6,89	6,92	6,85	6,87	6,95
1024210	VM1698-4	Grad	358,25	369,00	367,00	357,00	362,50	358,25	363,00	358,50	358,50	363,25

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	6,93	6,91	6,90	6,92	6,89	6,88	6,91	6,92	6,91	6,95
1024210	VM1698-4	Grad	362,50	362,50	358,25	363,50	362,25	358,75	361,50	362,25	361,00	367,50

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	6,89	6,90	6,87	6,79	6,90	6,95	6,89	6,88	6,88	6,90
1024210	VM1698-4	Grad	362,00	360,75	356,25	350,00	360,75	364,25	361,50	362,00	357,50	361,50

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	6,91	6,91	6,91	6,93	6,92	6,90	6,89	6,88	7,01	6,90
1024210	VM1698-4	Grad	362,75	363,50	361,75	364,00	363,75	361,50	358,75	360,50	374,25	365,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,86	6,88	6,88	6,88	6,91	6,81	6,91	6,90	6,92	6,88
1024210	VM1698-4	Grad	360,75	358,25	358,75	359,25	363,00	353,75	365,50	360,25	363,25	360,25

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	6,97	6,91	6,93	6,91	6,88	6,88	6,92	6,89	6,89	6,93
1024210	VM1698-4	Grad	368,50	358,50	362,00	362,50	362,25	360,25	363,75	361,00	361,75	363,00

Machine Capability Study
Tool System

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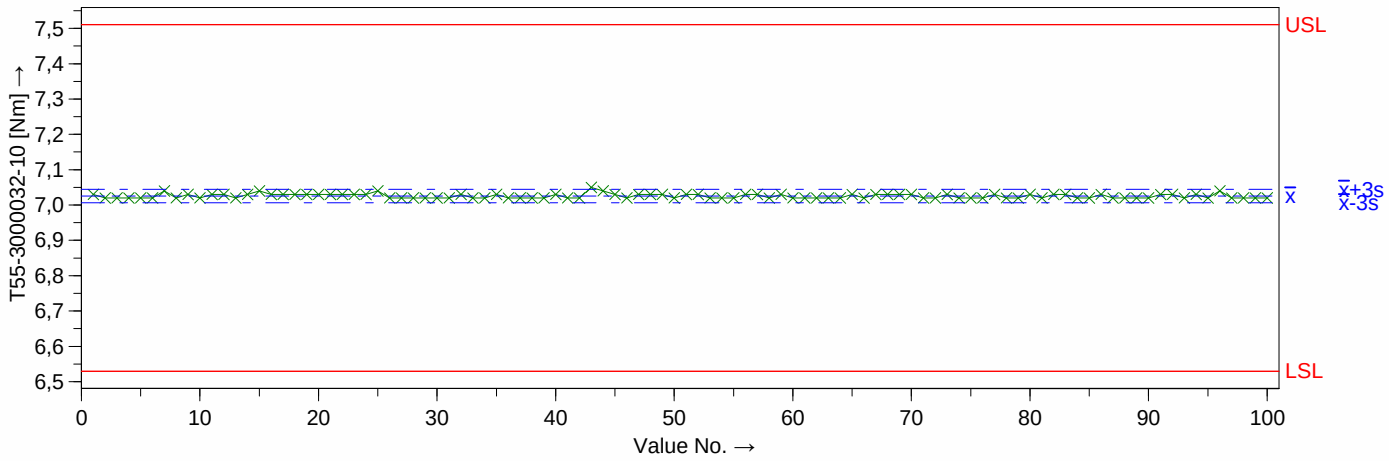
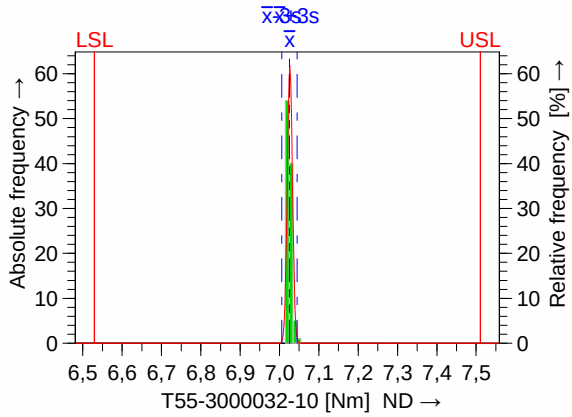
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

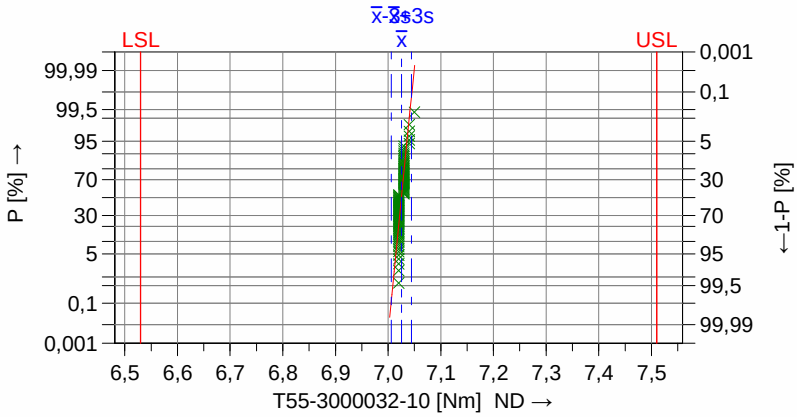
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_c	Char.Descr.	T55-3000032-10	Nom.val. 7,02 / 0,49	USL 7,51
		Serial No.	191790	Unit Nm / -0,49	LSL 6,53
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 10:17:47 to 29.07.2022 10:39:47

Rem. TQ 30% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	7.02			$\bar{x}$	7.0253
LSL	6.53	x_{min}	7.02	$\bar{x}$-3s	7.0060
USL	7.51	x_{max}	7.05	$\bar{x}$+3s	7.0446
T	0.98	R	0.03	6s	0.0386
		$n_{<T>}$	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	25.41
Critical capability index	=	C_{mk}	25.13

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019131_c1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	191790	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
191790	T55-3000032-10	Nm	7,03	7,02	7,02	7,02	7,02	7,02	7,04	7,02	7,03	7,02
191790	T55-3000032-10	Grad	363,00	356,00	362,00	358,00	374,00	361,00	374,00	362,00	361,00	366,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
191790	T55-3000032-10	Nm	7,03	7,03	7,02	7,03	7,04	7,03	7,03	7,03	7,03	7,03
191790	T55-3000032-10	Grad	366,00	375,00	361,00	362,00	365,00	365,00	369,00	370,00	364,00	365,00

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}
191790	T55-3000032-10	Nm	7,03	7,03	7,03	7,03	7,04	7,02	7,02	7,02	7,02	7,02
191790	T55-3000032-10	Grad	365,00	362,00	366,00	366,00	364,00	374,00	365,00	367,00	361,00	363,00

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}
191790	T55-3000032-10	Nm	7,02	7,03	7,02	7,02	7,03	7,02	7,02	7,02	7,02	7,03
191790	T55-3000032-10	Grad	363,00	364,00	363,00	357,00	364,00	362,00	367,00	367,00	364,00	359,00

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}
191790	T55-3000032-10	Nm	7,02	7,02	7,05	7,04	7,03	7,02	7,03	7,03	7,03	7,02
191790	T55-3000032-10	Grad	360,00	376,00	366,00	364,00	360,00	357,00	364,00	361,00	362,00	370,00

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}
191790	T55-3000032-10	Nm	7,03	7,03	7,02	7,02	7,02	7,03	7,03	7,02	7,03	7,02
191790	T55-3000032-10	Grad	362,00	363,00	358,00	364,00	367,00	361,00	367,00	369,00	362,00	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}
191790	T55-3000032-10	Nm	7,02	7,02	7,02	7,02	7,03	7,02	7,03	7,03	7,03	7,03
191790	T55-3000032-10	Grad	366,00	360,00	363,00	357,00	362,00	363,00	364,00	364,00	363,00	364,00

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}
191790	T55-3000032-10	Nm	7,02	7,02	7,03	7,02	7,02	7,02	7,03	7,02	7,02	7,03
191790	T55-3000032-10	Grad	364,00	363,00	361,00	364,00	361,00	363,00	364,00	365,00	376,00	367,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_c	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	7,02
Ord. No.	CTBAW153	Serial No.	191790	LSL	6,53
				USL	7,51
Remark	TQ 30% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
191790	T55-3000032-10	Nm	7,02	7,03	7,03	7,02	7,02	7,03	7,02	7,02	7,02	7,02
191790	T55-3000032-10	Grad	365,00	360,00	359,00	362,00	365,00	358,00	364,00	362,00	365,00	361,00

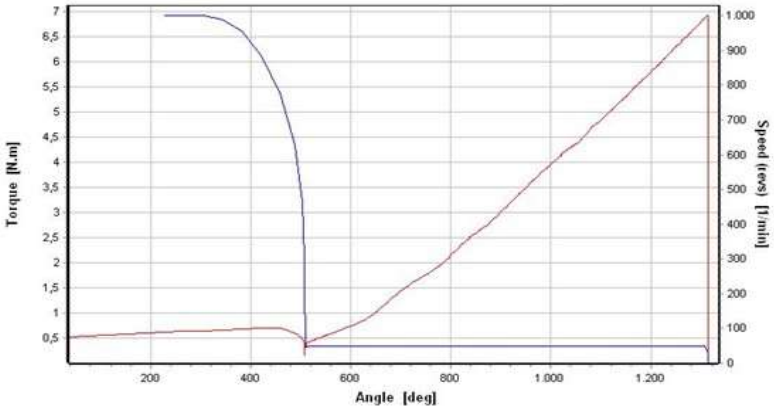
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	7,03	7,03	7,02	7,03	7,02	7,04	7,02	7,02	7,02	7,02
191790	T55-3000032-10	Grad	376,00	363,00	363,00	366,00	368,00	360,00	365,00	363,00	362,00	366,00

Torque graphs

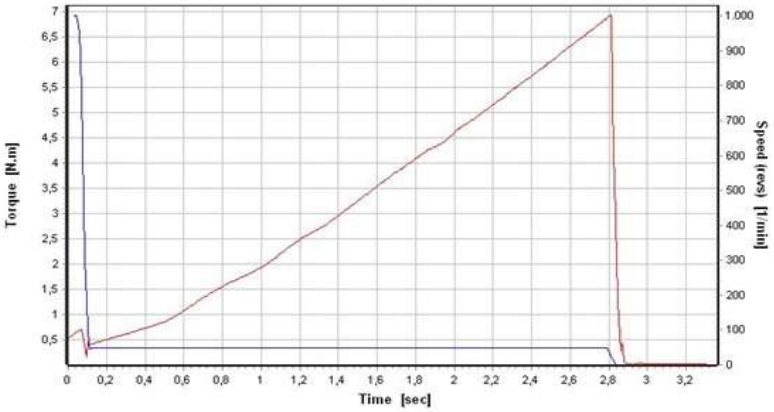
Machine Capability Study 30 %

Model: **CTBAW153**
Serial no: **1019131**

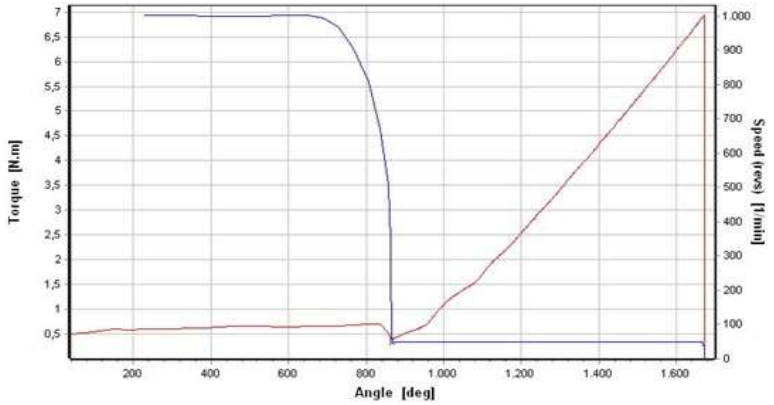
Angle degree: **360°**
Test torque: **7,0 Nm**



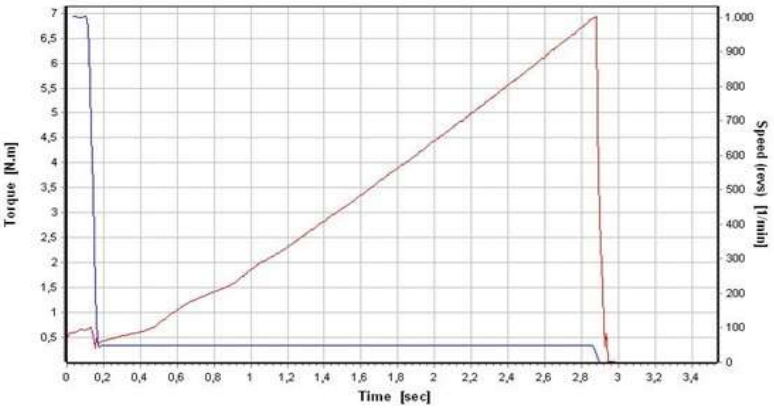
Value no. 1
Graph
Torque / Angle / Speed



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: **1019131**

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

Hard joint (H)	77,09	Nm / Revolution	Angle degree	30°
Soft joint (L)	6,30	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	12,85	12,61 Nm
	Standard deviation	0,09	0,07 Nm
	Torque scatter (99,73%)	0,52	0,40 Nm
	C_m	3,41	4,45
	C_{mk}	2,92	3,88

b)	Min. C_m hard/soft (lowest value)	3,41
	Min. C_{mk} hard/soft (lowest value)	2,92

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

Note:

Machine Capability Study
Control System

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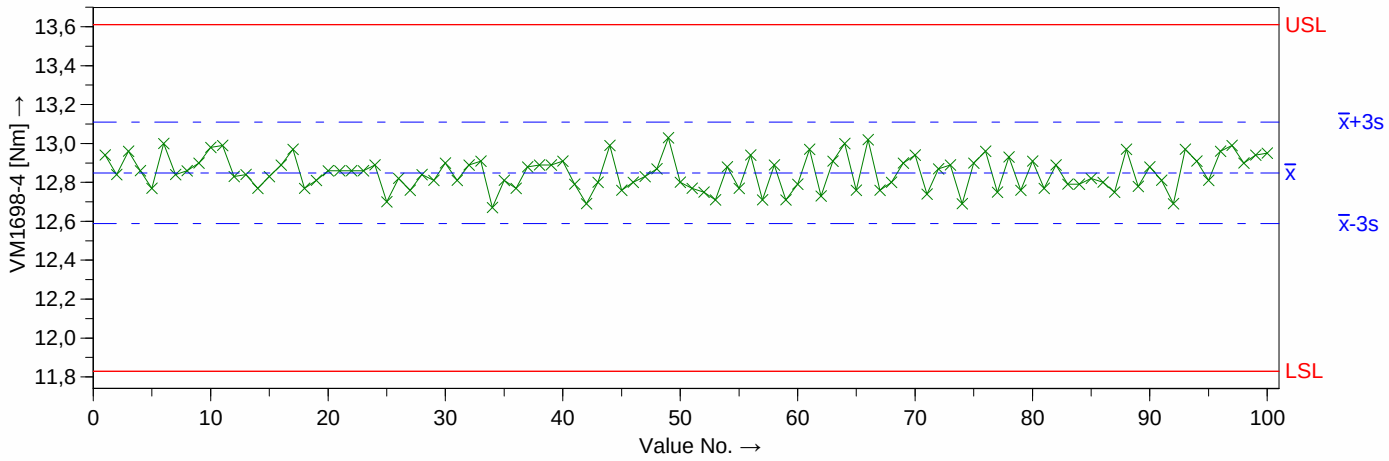
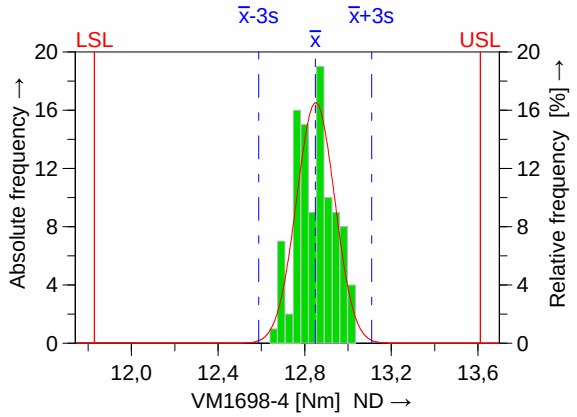
Plant	ATG Westhausen	Operator Name	Sünder
Date	01.08.2022		

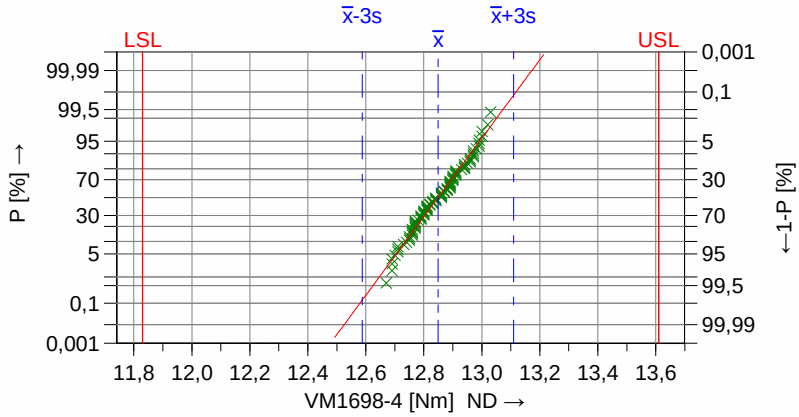
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_h	Char.Descr.	VM1698-4	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	1024210	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 01.08.2022 07:46:53 to 01.08.2022 08:00:59

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.8488
LSL	11.83	x_{min}	12.67	$\bar{x}$-3s	12.5878
USL	13.61	x_{max}	13.03	$\bar{x}$+3s	13.1098
T	1.78	R	0.36	6s	0.5219
		$n_{<T>}$	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	3.41
Critical capability index	=	C_{mk}	2.92

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\1019131_hM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 01.08.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.126 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	12,94	12,84	12,96	12,86	12,77	13,00	12,84	12,86	12,90	12,98
1024210	VM1698-4	Grad	30,50	30,75	29,75	30,75	29,25	30,25	29,50	29,25	29,00	30,25

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	12,99	12,83	12,84	12,77	12,83	12,89	12,97	12,77	12,81	12,86
1024210	VM1698-4	Grad	29,75	30,00	30,25	30,00	30,25	77,50	29,50	29,75	27,75	30,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	12,86	12,86	12,86	12,89	12,70	12,82	12,76	12,84	12,81	12,90
1024210	VM1698-4	Grad	28,50	29,50	29,75	30,25	29,50	30,00	30,00	30,75	30,00	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	12,81	12,89	12,91	12,67	12,81	12,77	12,88	12,89	12,89	12,91
1024210	VM1698-4	Grad	30,50	29,25	30,00	29,25	30,25	30,00	28,50	30,50	30,25	29,75

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	12,79	12,69	12,80	12,99	12,76	12,80	12,83	12,87	13,03	12,80
1024210	VM1698-4	Grad	30,25	29,75	30,00	30,25	30,00	30,25	29,75	29,25	29,75	29,00

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	12,77	12,75	12,71	12,88	12,77	12,94	12,71	12,89	12,71	12,79
1024210	VM1698-4	Grad	30,50	30,50	30,25	31,25	31,00	30,50	30,25	29,75	31,00	30,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	12,97	12,73	12,91	13,00	12,76	13,02	12,76	12,80	12,90	12,94
1024210	VM1698-4	Grad	31,00	30,50	28,75	29,75	29,75	30,00	30,00	30,25	28,75	29,25

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	12,74	12,87	12,89	12,69	12,90	12,96	12,75	12,93	12,76	12,91
1024210	VM1698-4	Grad	29,50	30,25	29,00	30,00	29,00	30,75	28,00	30,75	28,25	30,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 01.08.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.126 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	12,77	12,89	12,79	12,79	12,82	12,80	12,75	12,97	12,78	12,88
1024210	VM1698-4	Grad	29,00	30,50	75,75	28,50	30,00	28,00	28,00	29,75	28,50	27,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,81	12,69	12,97	12,91	12,81	12,96	12,99	12,90	12,94	12,95
1024210	VM1698-4	Grad	27,50	27,25	30,00	30,25	29,00	31,75	31,50	31,00	31,00	30,50

Machine Capability Study
Tool System

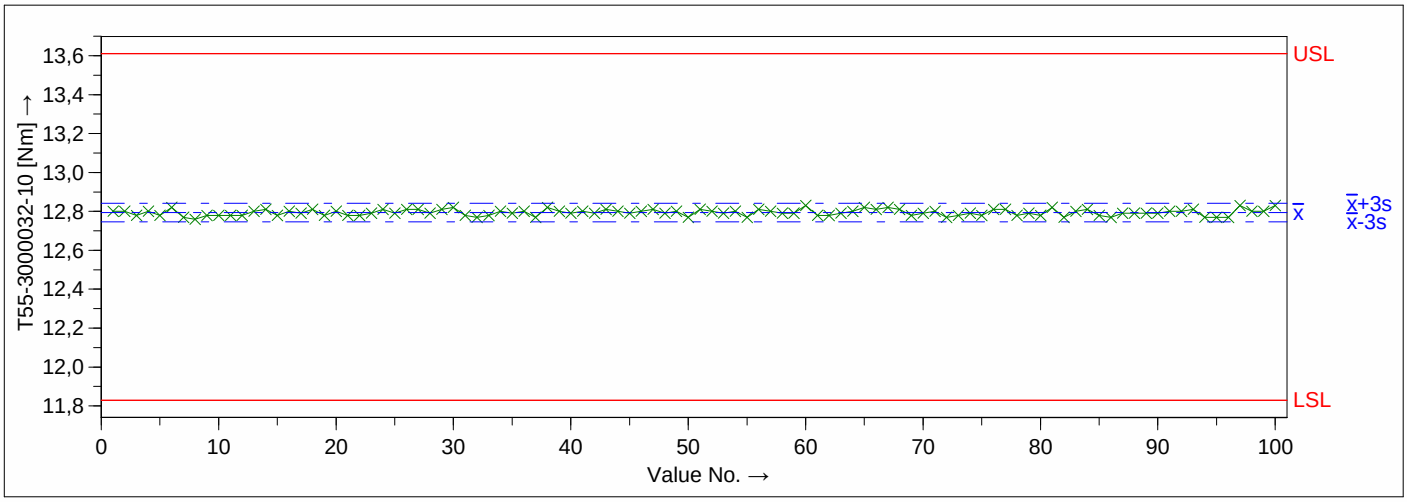
Page 1 / 1

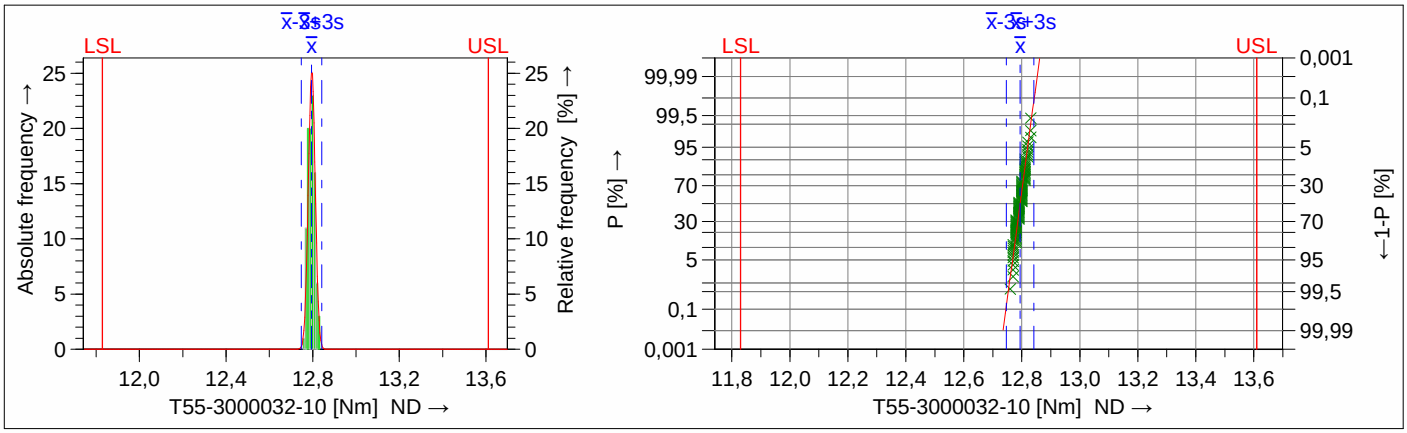
Plant	ATG Westhausen	Operator Name	Sünder
Date	01.08.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_h	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	191790	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 01.08.2022 07:46:53 to 01.08.2022 08:01:00

Rem. TQ 80% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7940
LSL	11.83	x_{min}	12.76	$\bar{x}$-3s	12.7467
USL	13.61	x_{max}	12.83	$\bar{x}$+3s	12.8413
T	1.78	R	0.07	6s	0.0946
		$n_{<T>}$	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	18.82
Critical capability index	=	C_{mk}	17.26

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 01.08.2022

Serial No.	1019131_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 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}
191790	T55-3000032-10	Nm	12,80	12,80	12,78	12,80	12,78	12,82	12,77	12,76	12,78	12,78
191790	T55-3000032-10	Grad	30,00	30,00	29,00	30,00	29,00	30,00	29,00	29,00	29,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
191790	T55-3000032-10	Nm	12,78	12,78	12,80	12,81	12,78	12,80	12,79	12,81	12,78	12,80
191790	T55-3000032-10	Grad	29,00	30,00	30,00	29,00	30,00	77,00	29,00	29,00	28,00	30,00

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}
191790	T55-3000032-10	Nm	12,78	12,78	12,79	12,81	12,79	12,81	12,81	12,79	12,81	12,82
191790	T55-3000032-10	Grad	28,00	29,00	29,00	30,00	29,00	29,00	30,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
191790	T55-3000032-10	Nm	12,78	12,77	12,78	12,80	12,79	12,80	12,77	12,82	12,80	12,79
191790	T55-3000032-10	Grad	30,00	29,00	30,00	29,00	30,00	29,00	28,00	30,00	30,00	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}
191790	T55-3000032-10	Nm	12,80	12,79	12,81	12,80	12,79	12,80	12,81	12,79	12,80	12,77
191790	T55-3000032-10	Grad	30,00	29,00	30,00	30,00	30,00	30,00	29,00	29,00	30,00	29,00

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}
191790	T55-3000032-10	Nm	12,81	12,80	12,79	12,80	12,77	12,81	12,80	12,79	12,79	12,83
191790	T55-3000032-10	Grad	30,00	30,00	30,00	31,00	30,00	30,00	30,00	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}
191790	T55-3000032-10	Nm	12,78	12,78	12,79	12,80	12,82	12,81	12,82	12,81	12,78	12,79
191790	T55-3000032-10	Grad	31,00	30,00	29,00	29,00	29,00	30,00	29,00	30,00	29,00	29,00

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}
191790	T55-3000032-10	Nm	12,80	12,77	12,78	12,79	12,78	12,81	12,81	12,78	12,79	12,78
191790	T55-3000032-10	Grad	29,00	29,00	29,00	29,00	29,00	30,00	28,00	30,00	28,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 01.08.2022

Serial No.	1019131_h	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,83
				USL	13,61
Remark	TQ 80% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 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}
191790	T55-3000032-10	Nm	12,82	12,77	12,80	12,81	12,78	12,77	12,79	12,79	12,79	12,79
191790	T55-3000032-10	Grad	28,00	30,00	76,00	28,00	30,00	27,00	27,00	29,00	28,00	27,00

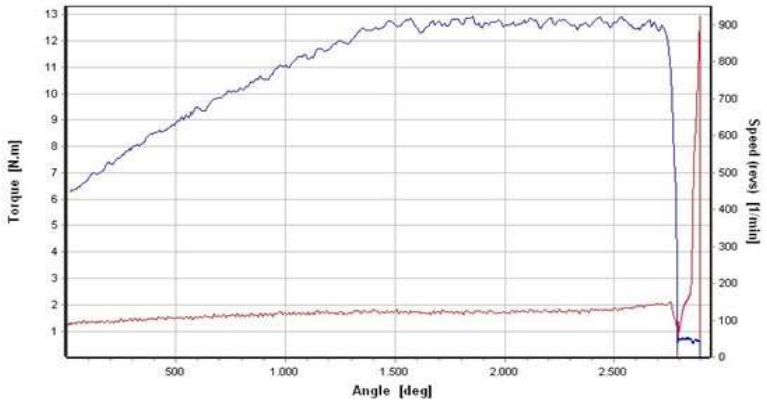
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	12,80	12,80	12,81	12,77	12,77	12,77	12,83	12,80	12,80	12,83
191790	T55-3000032-10	Grad	27,00	27,00	30,00	30,00	29,00	31,00	31,00	31,00	31,00	30,00

Torque graphs

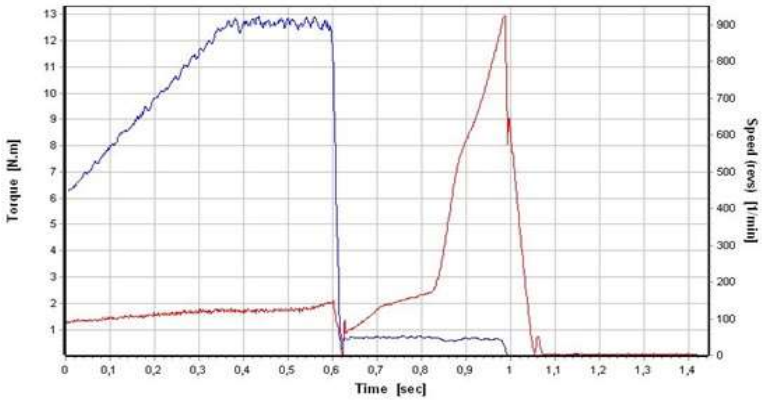
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019131**

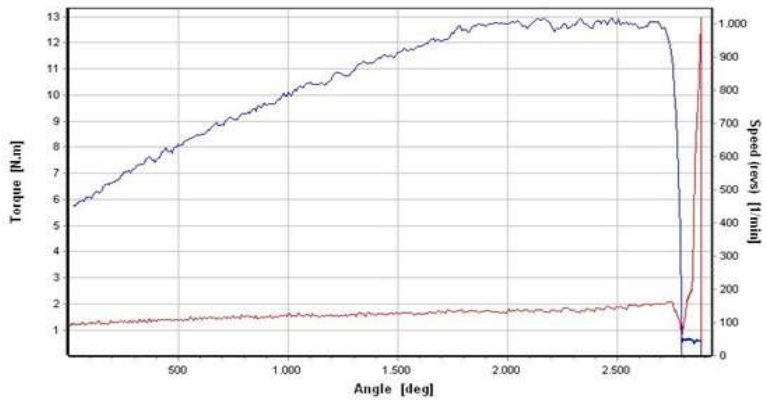
Angle degree: **30°**
Test torque: **12,7 Nm**



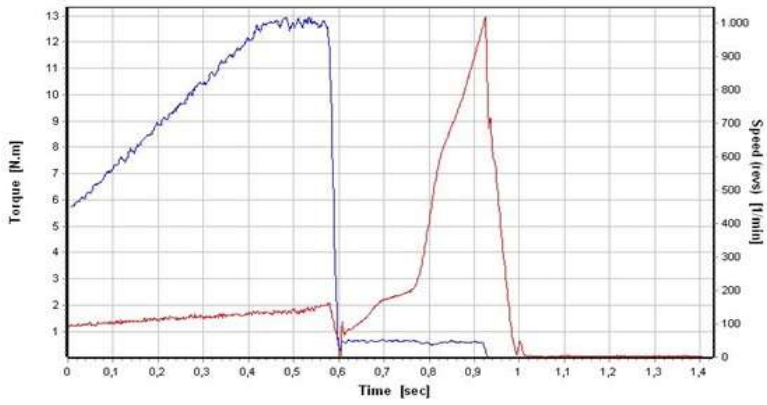
Value no. 1
Graph
Torque / Angle / Speed



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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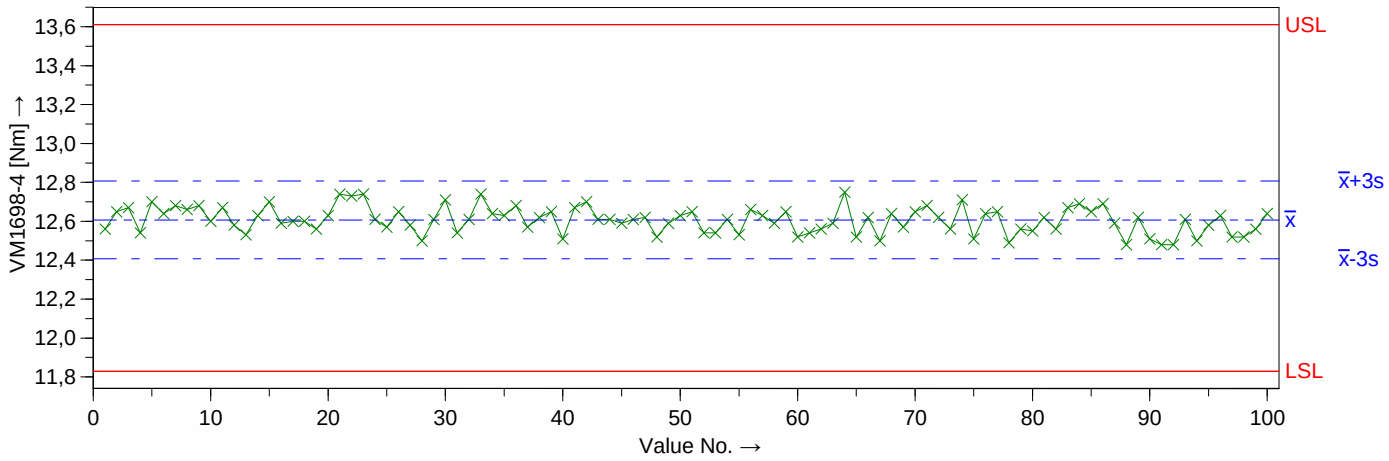
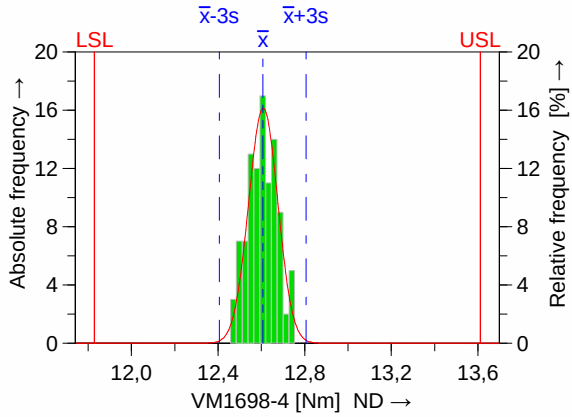
Plant	ATG Westhausen	Operator Name	Sünder
Date	01.08.2022		

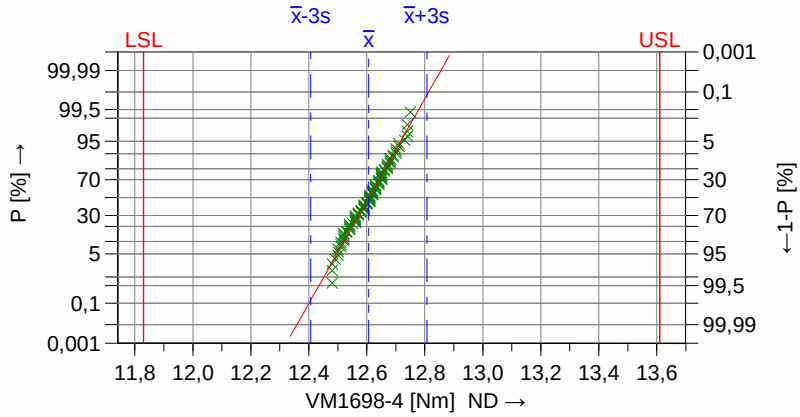
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_g	Char.Descr.	VM1698-4	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	1024210	Unit Nm -0,89	LSL 11,83
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 01.08.2022 08:37:38 to 01.08.2022 09:45:30

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.6068
LSL	11.83	x_{min}	12.48	$\bar{x}$-3s	12.4067
USL	13.61	x_{max}	12.75	$\bar{x}$+3s	12.8069
T	1.78	R	0.27	6s	0.4003
		$n_{<T>}$	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	4.45
Critical capability index	=	C_{mk}	3.88

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 01.08.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.126 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	12,56	12,65	12,67	12,54	12,70	12,64	12,68	12,66	12,68	12,60
1024210	VM1698-4	Grad	358,75	358,50	380,75	385,50	367,25	368,75	374,50	367,00	382,25	359,75

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	12,67	12,58	12,53	12,63	12,70	12,59	12,60	12,60	12,56	12,63
1024210	VM1698-4	Grad	367,00	370,50	377,75	369,25	361,25	359,75	358,00	353,00	350,25	362,25

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	12,74	12,73	12,74	12,61	12,57	12,65	12,58	12,50	12,61	12,71
1024210	VM1698-4	Grad	366,25	368,25	361,75	358,00	348,50	378,50	360,75	353,50	356,00	357,25

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	12,54	12,61	12,74	12,64	12,63	12,68	12,57	12,62	12,65	12,51
1024210	VM1698-4	Grad	352,50	354,50	389,75	352,75	355,25	356,00	352,75	375,25	362,00	346,00

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	12,67	12,70	12,61	12,61	12,59	12,61	12,62	12,52	12,59	12,63
1024210	VM1698-4	Grad	357,25	356,75	356,75	353,00	359,00	378,25	356,75	348,25	351,75	358,75

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	12,65	12,54	12,54	12,61	12,53	12,66	12,63	12,59	12,65	12,52
1024210	VM1698-4	Grad	372,50	350,25	354,00	354,25	343,25	388,75	376,75	346,50	353,25	352,50

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	12,54	12,56	12,59	12,75	12,52	12,62	12,50	12,64	12,57	12,65
1024210	VM1698-4	Grad	352,50	352,75	350,75	358,75	348,75	351,50	355,00	370,50	359,00	367,00

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	12,68	12,62	12,56	12,71	12,51	12,64	12,65	12,49	12,56	12,55
1024210	VM1698-4	Grad	386,75	354,50	350,00	370,25	361,75	361,25	365,25	355,00	372,00	353,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 01.08.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.126 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	12,56	12,67	12,69	12,65	12,69	12,59	12,48	12,62	12,51
1024210	VM1698-4	Grad	365,25	348,00	365,00	361,25	359,75	364,75	360,00	348,00	362,25	348,50

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	12,48	12,48	12,61	12,50	12,58	12,63	12,52	12,52	12,56	12,64
1024210	VM1698-4	Grad	356,75	352,50	360,00	351,00	354,75	355,25	344,75	369,00	358,25	363,75

Machine Capability Study
Tool System

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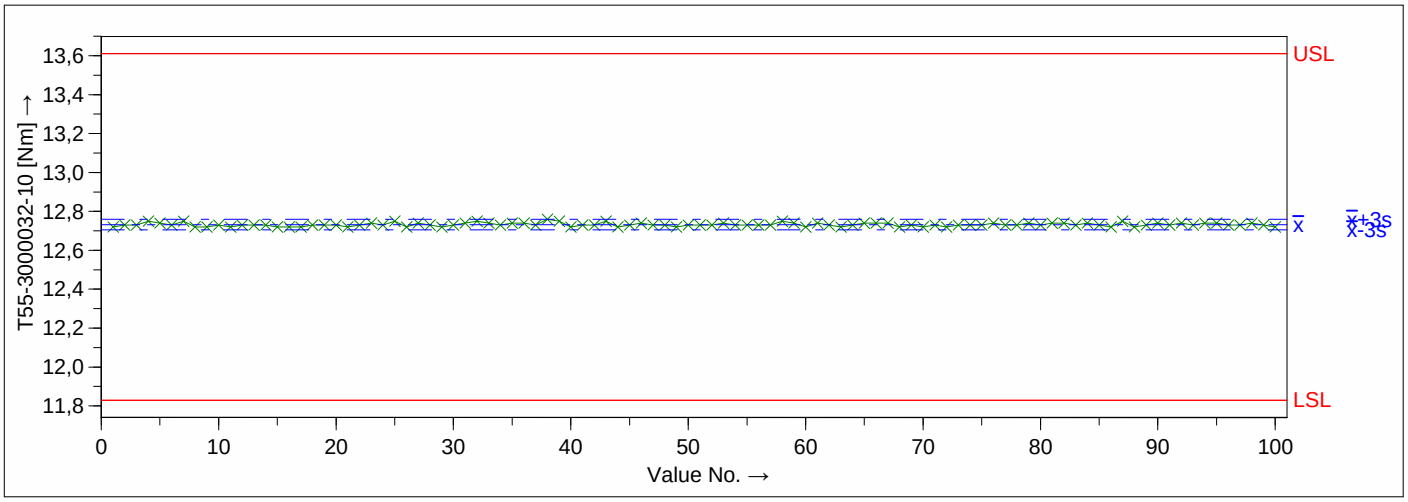
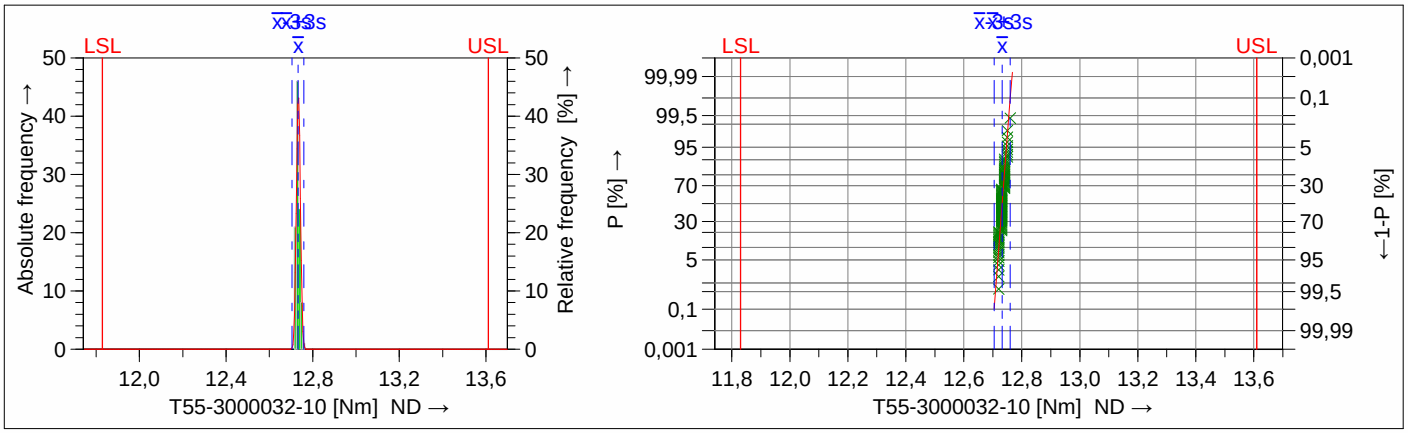
Plant	ATG Westhausen	Operator Name	Sünder
Date	01.08.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_g	Char.Descr.	T55-3000032-10	Nom.val. 12,72 0,89	USL 13,61
		Serial No.	191790	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 01.08.2022 08:37:38 to 01.08.2022 09:45:30

Rem. TQ 80% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.72			$\bar{x}$	12.7322
LSL	11.83	x_{min}	12.72	$\bar{x}$-3s	12.7050
USL	13.61	x_{max}	12.76	$\bar{x}$+3s	12.7594
T	1.78	R	0.04	6s	0.0543
		$n_{<T>}$	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	32.77
Critical capability index	=	C_{mk}	32.32

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 01.08.2022

Serial No.	1019131_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 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}
191790	T55-3000032-10	Nm	12,72	12,73	12,73	12,75	12,74	12,73	12,75	12,72	12,72	12,73
191790	T55-3000032-10	Grad	357,00	356,00	376,00	383,00	362,00	361,00	371,00	361,00	379,00	357,00

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}
191790	T55-3000032-10	Nm	12,72	12,73	12,73	12,73	12,72	12,72	12,72	12,73	12,73	12,73
191790	T55-3000032-10	Grad	362,00	365,00	378,00	363,00	356,00	356,00	354,00	354,00	345,00	358,00

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}
191790	T55-3000032-10	Nm	12,72	12,73	12,74	12,73	12,75	12,72	12,74	12,73	12,72	12,73
191790	T55-3000032-10	Grad	361,00	370,00	357,00	356,00	343,00	374,00	360,00	350,00	354,00	356,00

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}
191790	T55-3000032-10	Nm	12,74	12,75	12,74	12,73	12,74	12,74	12,73	12,76	12,75	12,72
191790	T55-3000032-10	Grad	348,00	354,00	384,00	353,00	355,00	352,00	351,00	370,00	360,00	344,00

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}
191790	T55-3000032-10	Nm	12,73	12,73	12,75	12,72	12,73	12,74	12,73	12,73	12,72	12,73
191790	T55-3000032-10	Grad	355,00	353,00	356,00	347,00	355,00	378,00	355,00	342,00	345,00	355,00

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}
191790	T55-3000032-10	Nm	12,73	12,73	12,74	12,73	12,73	12,73	12,73	12,75	12,74	12,72
191790	T55-3000032-10	Grad	363,00	348,00	344,00	347,00	340,00	385,00	373,00	341,00	353,00	347,00

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}
191790	T55-3000032-10	Nm	12,74	12,73	12,72	12,73	12,74	12,74	12,74	12,72	12,73	12,72
191790	T55-3000032-10	Grad	345,00	349,00	345,00	353,00	344,00	342,00	342,00	361,00	357,00	363,00

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}
191790	T55-3000032-10	Nm	12,73	12,72	12,73	12,73	12,73	12,74	12,73	12,73	12,74	12,73
191790	T55-3000032-10	Grad	380,00	354,00	344,00	363,00	359,00	358,00	361,00	345,00	365,00	345,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 01.08.2022

Serial No.	1019131_g	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,72
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,83
				USL	13,61
Remark	TQ 80% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.126 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}
191790	T55-3000032-10	Nm	12,74	12,74	12,73	12,74	12,73	12,72	12,75	12,72	12,73	12,74
191790	T55-3000032-10	Grad	359,00	342,00	360,00	354,00	358,00	356,00	358,00	344,00	362,00	342,00

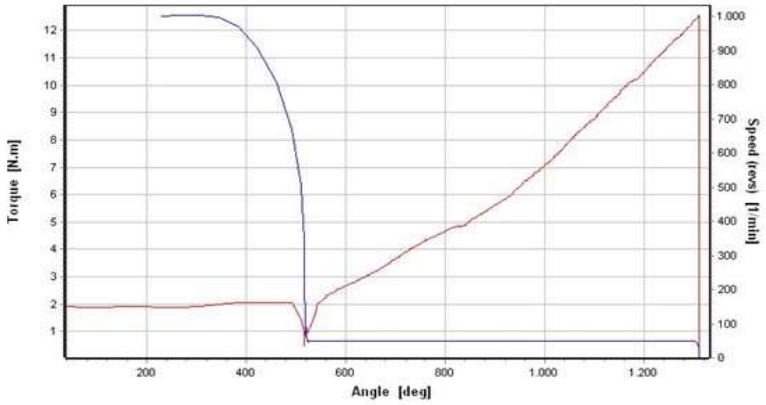
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	12,73	12,74	12,73	12,74	12,74	12,73	12,73	12,74	12,73	12,72
191790	T55-3000032-10	Grad	350,00	347,00	357,00	345,00	347,00	353,00	341,00	363,00	357,00	358,00

Torque graphs

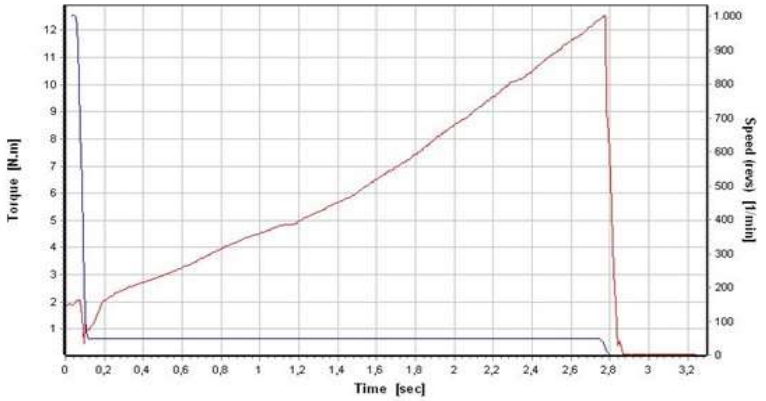
Machine Capability Study 80 %

Model: **CTBAW153**
Serial no: **1019131**

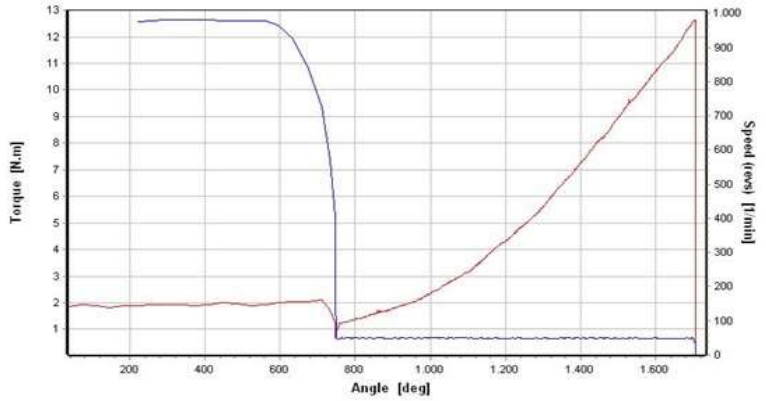
Angle degree: **360°**
Test torque: **12,7 Nm**



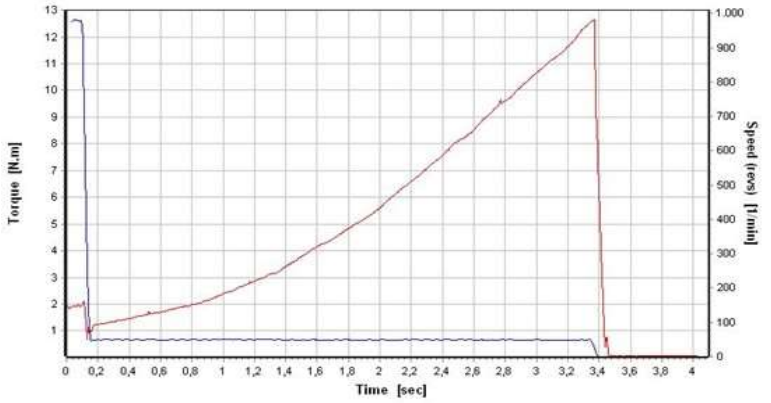
Value no. 1
Graph
Torque / Angle / Speed



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: **1019131**

Test torque: Tq max. 15,00 Nm

Hard joint (H)	90,96	Nm / Revolution	Angle degree	30°
Soft joint (L)	7,42	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	15,16	14,83 Nm
	Standard deviation	0,07	0,08 Nm
	Torque scatter (99,73%)	0,41	0,51 Nm
	C_m	5,07	4,13
	C_{mk}	4,29	3,47

b)	Min. C_m hard/soft (lowest value)	4,13
	Min. C_{mk} hard/soft (lowest value)	3,47

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

Note:

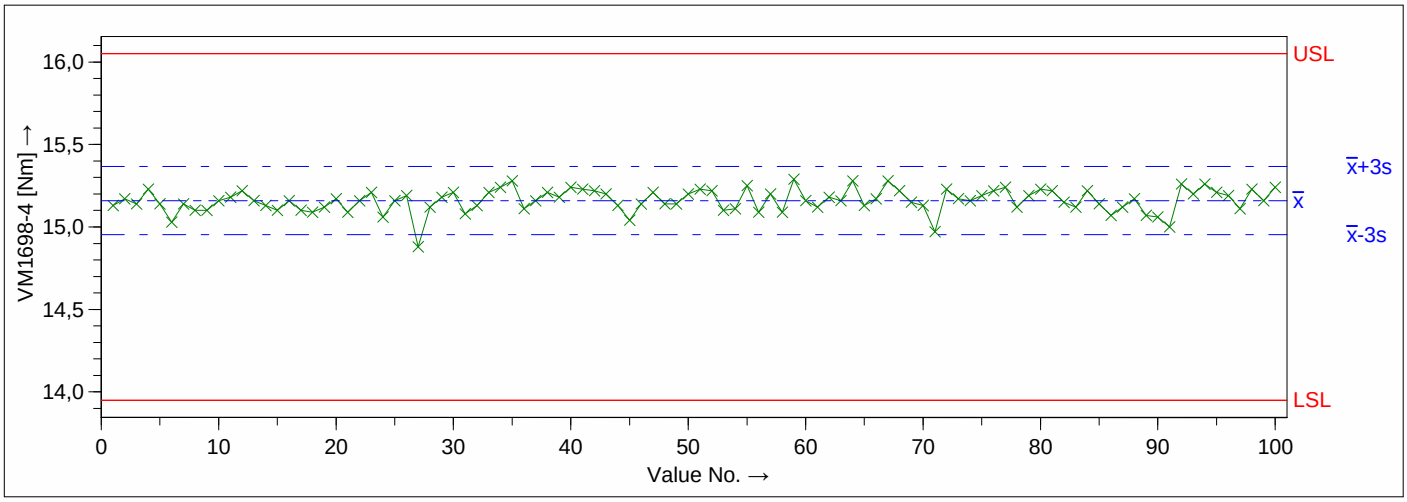
Machine Capability Study
Control System

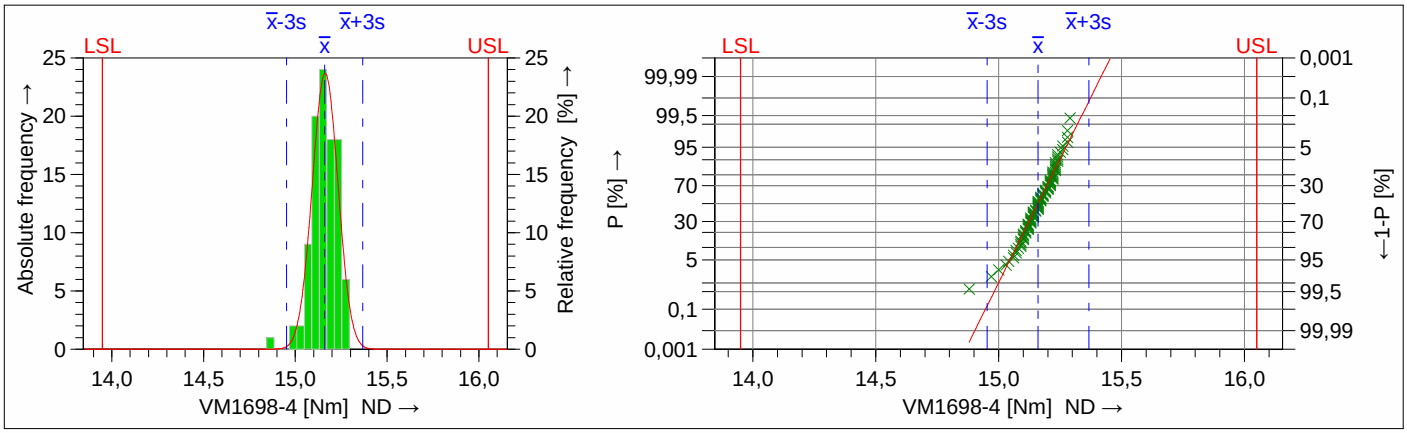
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_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 29.07.2022 14:37:59 to 29.07.2022 14:52:01

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.1600
LSL	13.95	x_{min}	14.88	$\bar{x}$-3s	14.9527
USL	16.05	x_{max}	15.29	$\bar{x}$+3s	15.3673
T	2.10	R	0.41	6s	0.4146
		$n_{<T>}$	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	5.07
Critical capability index	=	C_{mk}	4.29

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 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 1000/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	15,13	15,17	15,14	15,23	15,14	15,03	15,14	15,10	15,10	15,16
1024210	VM1698-4	Grad	30,75	30,25	30,25	31,25	31,00	30,50	30,50	30,75	30,75	30,75

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	15,18	15,22	15,16	15,13	15,10	15,16	15,10	15,09	15,12	15,17
1024210	VM1698-4	Grad	30,50	30,50	30,75	30,50	30,25	30,50	30,25	29,75	31,25	30,25

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	15,09	15,16	15,21	15,06	15,16	15,19	14,88	15,12	15,18	15,21
1024210	VM1698-4	Grad	30,50	30,50	30,75	29,50	30,50	30,50	29,25	30,25	30,75	30,25

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	15,08	15,13	15,21	15,24	15,28	15,11	15,16	15,21	15,18	15,24
1024210	VM1698-4	Grad	30,50	30,50	30,75	30,50	30,75	30,50	30,25	31,00	30,75	30,75

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	15,23	15,22	15,20	15,13	15,04	15,14	15,21	15,14	15,14	15,20
1024210	VM1698-4	Grad	31,00	30,25	30,75	30,50	30,25	30,50	30,50	30,75	30,50	30,50

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	15,23	15,22	15,10	15,11	15,25	15,09	15,20	15,09	15,29	15,16
1024210	VM1698-4	Grad	30,50	30,25	29,50	30,75	30,25	30,25	30,50	30,50	31,00	30,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	15,12	15,18	15,16	15,28	15,13	15,17	15,28	15,22	15,15	15,13
1024210	VM1698-4	Grad	30,50	31,00	30,25	31,00	30,50	30,50	30,75	31,00	29,75	30,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	14,97	15,23	15,17	15,16	15,19	15,22	15,24	15,12	15,19	15,23
1024210	VM1698-4	Grad	29,00	31,00	30,50	30,50	30,50	30,50	30,00	30,00	30,50	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.125 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	15,22	15,15	15,12	15,22	15,14	15,07	15,12	15,17	15,07	15,06
1024210	VM1698-4	Grad	30,00	30,25	30,75	30,75	30,50	29,75	30,25	30,50	31,00	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	15,00	15,26	15,20	15,26	15,21	15,19	15,11	15,23	15,16	15,24
1024210	VM1698-4	Grad	30,00	30,25	30,75	30,50	30,25	30,50	29,50	30,75	30,00	30,25

Machine Capability Study
Tool System

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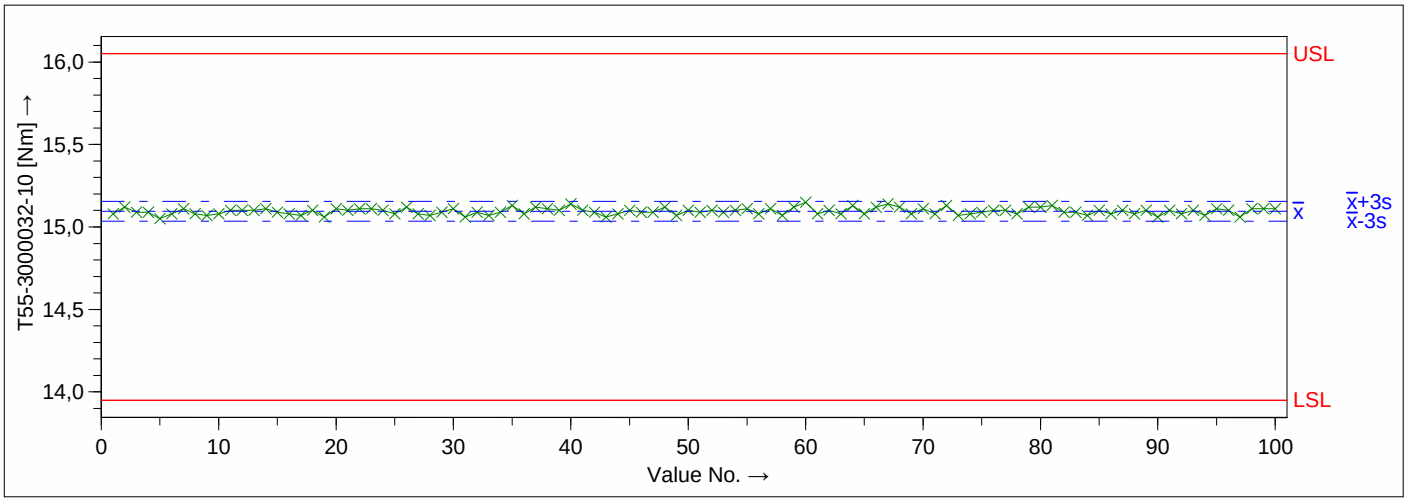
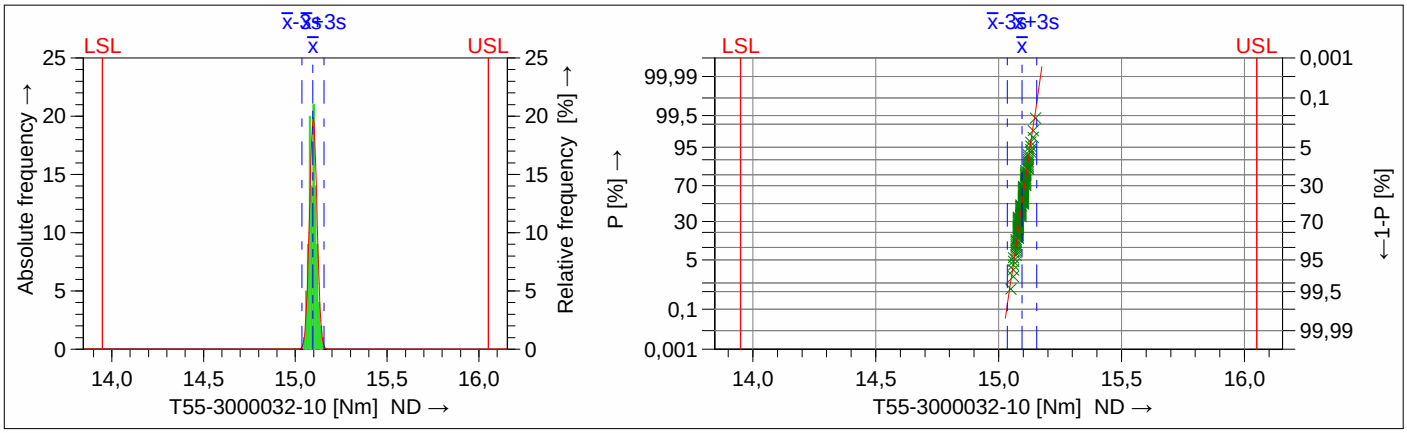
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_b	Char.Descr.	T55-3000032-10	Nom.val. 15,00 / 1,05	USL 16,05
		Serial No.	191790	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 29.07.2022 14:37:59 to 29.07.2022 14:52:00

Rem. TQ 100% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0951
LSL	13.95	x_{min}	15.05	$\bar{x}$-3s	15.0349
USL	16.05	x_{max}	15.15	$\bar{x}$+3s	15.1553
T	2.10	R	0.10	6s	0.1205
		$n_{<T>}$	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	17.43
Critical capability index	=	C_{mk}	15.86

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 29.07.2022

Serial No.	1019131_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 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}
191790	T55-3000032-10	Nm	15,08	15,12	15,09	15,09	15,05	15,08	15,11	15,08	15,07	15,08
191790	T55-3000032-10	Grad	30,00	30,00	30,00	31,00	30,00	31,00	30,00	30,00	31,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
191790	T55-3000032-10	Nm	15,10	15,10	15,10	15,11	15,09	15,08	15,07	15,10	15,06	15,11
191790	T55-3000032-10	Grad	31,00	30,00	31,00	30,00	31,00	30,00	31,00	30,00	31,00	30,00

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}
191790	T55-3000032-10	Nm	15,10	15,11	15,11	15,10	15,08	15,12	15,08	15,07	15,09	15,11
191790	T55-3000032-10	Grad	30,00	30,00	31,00	29,00	31,00	30,00	29,00	30,00	31,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
191790	T55-3000032-10	Nm	15,06	15,09	15,07	15,09	15,13	15,08	15,12	15,11	15,10	15,14
191790	T55-3000032-10	Grad	30,00	30,00	31,00	30,00	31,00	30,00	30,00	30,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
191790	T55-3000032-10	Nm	15,10	15,09	15,06	15,08	15,10	15,09	15,09	15,12	15,07	15,10
191790	T55-3000032-10	Grad	31,00	30,00	30,00	30,00	30,00	30,00	30,00	31,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
191790	T55-3000032-10	Nm	15,09	15,10	15,09	15,10	15,11	15,08	15,11	15,07	15,12	15,15
191790	T55-3000032-10	Grad	31,00	30,00	30,00	30,00	30,00	30,00	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}
191790	T55-3000032-10	Nm	15,08	15,10	15,08	15,13	15,08	15,12	15,14	15,12	15,08	15,11
191790	T55-3000032-10	Grad	30,00	31,00	30,00	31,00	30,00	30,00	30,00	31,00	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}
191790	T55-3000032-10	Nm	15,08	15,13	15,07	15,08	15,09	15,10	15,10	15,08	15,12	15,12
191790	T55-3000032-10	Grad	29,00	31,00	30,00	30,00	30,00	31,00	30,00	30,00	30,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_b	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	13,95
				USL	16,05
Remark	TQ 100% hard +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 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}
191790	T55-3000032-10	Nm	15,13	15,09	15,09	15,07	15,10	15,08	15,10	15,08	15,10	15,06
191790	T55-3000032-10	Grad	30,00	30,00	31,00	30,00	30,00	30,00	31,00	30,00	31,00	29,00

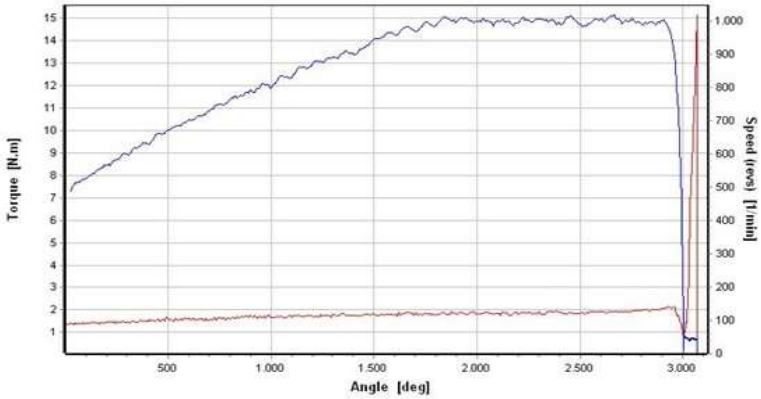
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	15,10	15,08	15,10	15,07	15,11	15,10	15,06	15,11	15,11	15,11
191790	T55-3000032-10	Grad	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00

Torque graphs

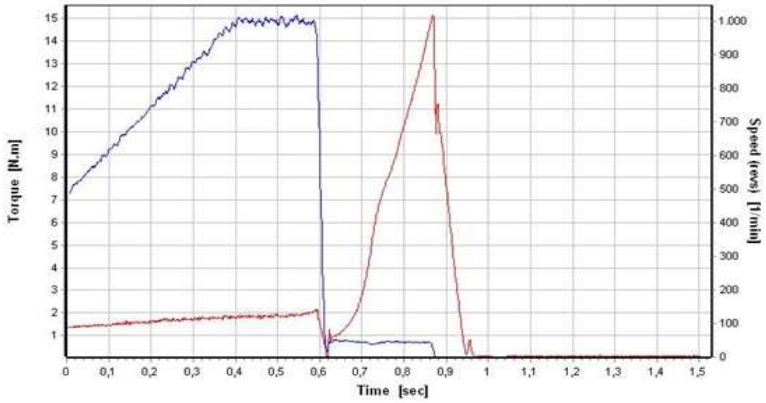
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019131**

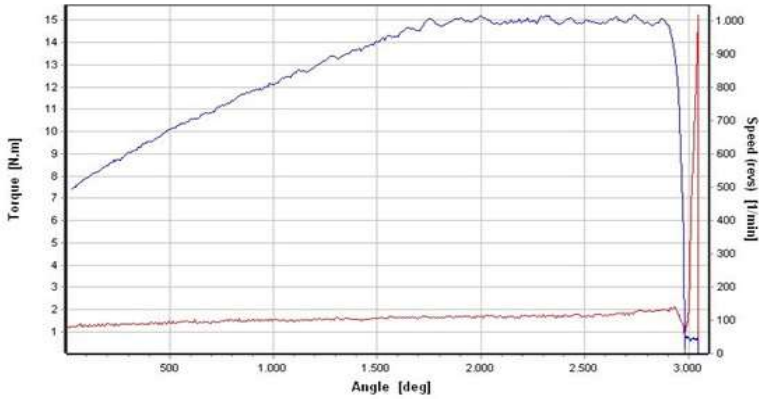
Angle degree: **30°**
Test torque: **15,0 Nm**



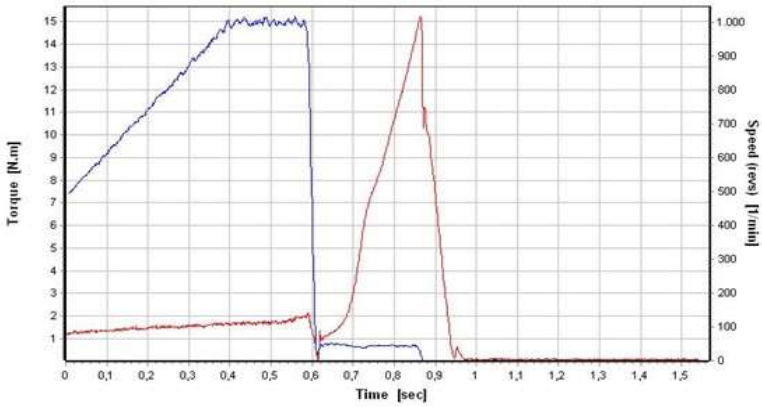
Value no. 1
Graph
Torque / Angle / Speed



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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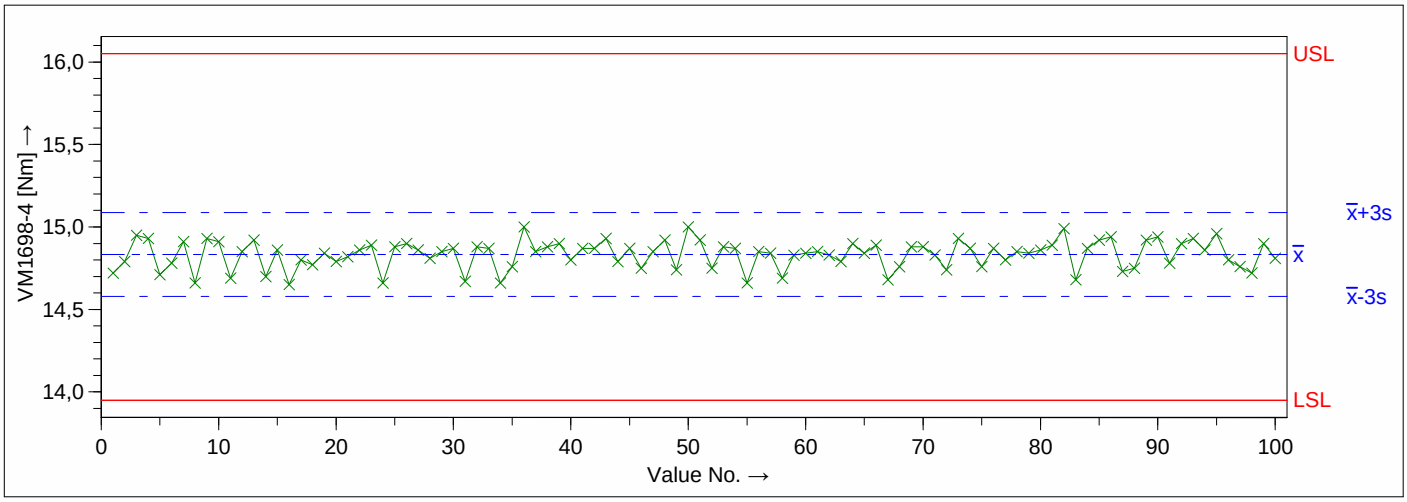
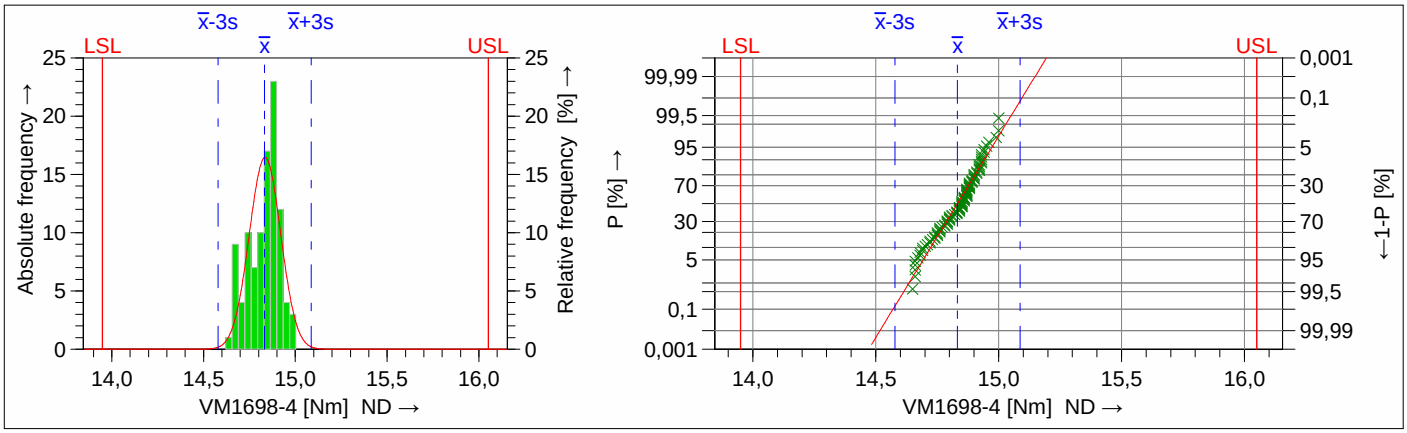
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_a	Char.Descr.	VM1698-4	Nom.val. 15,00 1,05	USL 16,05
		Serial No.	1024210	Unit Nm -1,05	LSL 13,95
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 29.07.2022 15:07:25 to 29.07.2022 17:45:41

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	14.8325
LSL	13.95	x_{min}	14.65	$\bar{x}$-3s	14.5781
USL	16.05	x_{max}	15.00	$\bar{x}$+3s	15.0869
T	2.10	R	0.35	6s	0.5088
		$n_{<T>}$	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	4.13
Critical capability index	=	C_{mk}	3.47

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 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.125 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	14,72	14,79	14,95	14,93	14,71	14,78	14,91	14,66	14,93	14,91
1024210	VM1698-4	Grad	367,25	383,50	379,25	378,00	365,75	369,00	387,75	368,00	375,50	376,75

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	14,69	14,85	14,92	14,70	14,86	14,65	14,80	14,77	14,84	14,79
1024210	VM1698-4	Grad	363,75	366,25	370,50	363,00	384,75	359,50	368,00	364,25	362,50	358,25

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	14,82	14,86	14,89	14,66	14,88	14,90	14,86	14,81	14,85	14,87
1024210	VM1698-4	Grad	360,75	363,75	366,00	350,25	361,50	364,50	363,25	360,00	369,50	364,00

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	14,67	14,88	14,87	14,66	14,76	15,00	14,85	14,88	14,90	14,80
1024210	VM1698-4	Grad	357,00	359,25	359,25	354,50	359,50	376,00	364,00	363,75	368,75	368,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	14,87	14,87	14,93	14,79	14,87	14,75	14,85	14,92	14,74	15,00
1024210	VM1698-4	Grad	365,00	363,50	372,25	371,50	365,50	352,00	360,00	373,75	357,25	365,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	14,92	14,75	14,88	14,87	14,66	14,85	14,84	14,69	14,83	14,84
1024210	VM1698-4	Grad	363,00	358,25	360,75	364,25	354,25	363,50	362,75	355,25	365,00	363,00

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	14,85	14,83	14,79	14,90	14,84	14,89	14,68	14,76	14,88	14,88
1024210	VM1698-4	Grad	362,25	365,00	362,00	362,50	359,75	376,75	355,25	359,75	364,75	365,00

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	14,83	14,74	14,93	14,87	14,76	14,87	14,80	14,85	14,84	14,86
1024210	VM1698-4	Grad	364,50	360,75	364,00	367,75	361,25	363,75	366,50	365,75	359,25	372,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_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.: 16.50 Nm; Cur.-Cal.: 0.125 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	14,89	14,99	14,68	14,87	14,92	14,94	14,73	14,75	14,92	14,94
1024210	VM1698-4	Grad	366,25	365,75	356,50	371,50	365,25	367,00	355,00	362,75	366,50	368,50

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	14,78	14,90	14,93	14,86	14,96	14,80	14,76	14,72	14,90	14,81
1024210	VM1698-4	Grad	357,25	372,50	365,00	370,25	367,50	365,00	363,50	357,00	365,50	363,50

Machine Capability Study
Tool System

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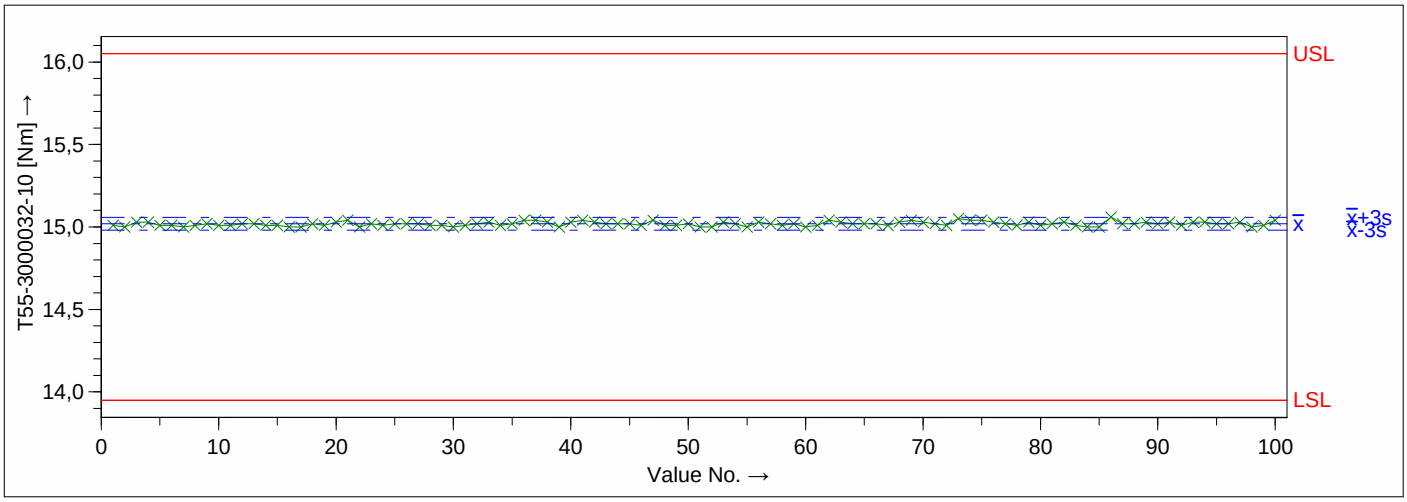
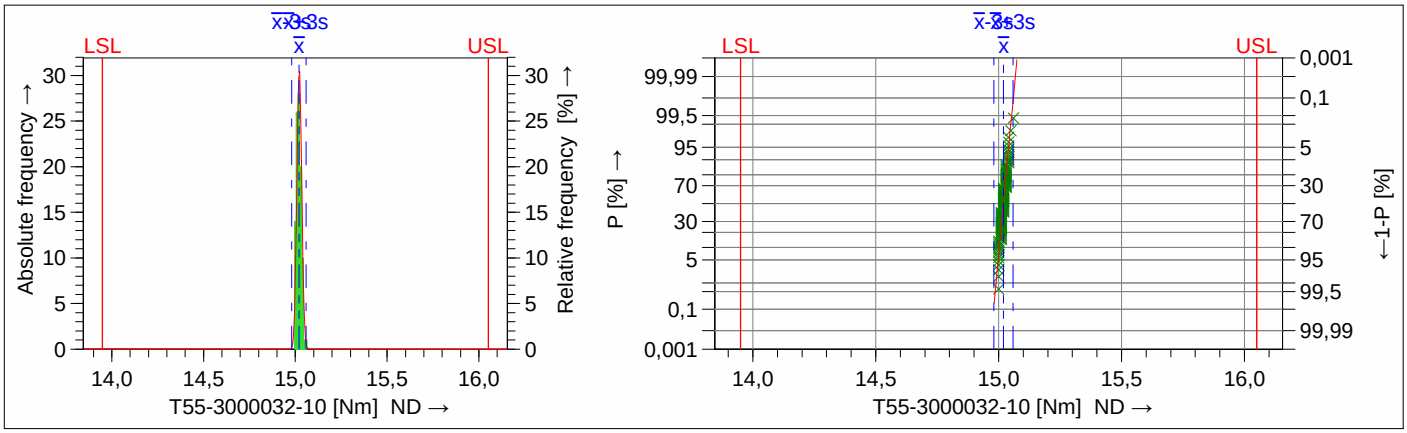
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_a	Char.Descr.	T55-3000032-10	Nom.val. 15,00 / 1,05	USL 16,05
		Serial No.	191790	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 29.07.2022 15:07:25 to 29.07.2022 17:45:41

Rem. TQ 100% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	15.00			$\bar{x}$	15.0193
LSL	13.95	x_{min}	15.00	$\bar{x}$-3s	14.9804
USL	16.05	x_{max}	15.06	$\bar{x}$+3s	15.0582
T	2.10	R	0.06	6s	0.0778
		$n_{<T>}$	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	26.99
Critical capability index	=	C_{mk}	26.49

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 29.07.2022

Serial No.	1019131_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 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}
191790	T55-3000032-10	Nm	15,01	15,00	15,03	15,03	15,01	15,01	15,00	15,01	15,02	15,01
191790	T55-3000032-10	Grad	364,00	382,00	380,00	377,00	364,00	364,00	380,00	365,00	373,00	375,00

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}
191790	T55-3000032-10	Nm	15,01	15,02	15,02	15,01	15,01	15,00	15,00	15,02	15,01	15,03
191790	T55-3000032-10	Grad	363,00	368,00	371,00	361,00	382,00	362,00	370,00	363,00	360,00	359,00

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}
191790	T55-3000032-10	Nm	15,04	15,00	15,02	15,01	15,02	15,02	15,02	15,01	15,01	15,00
191790	T55-3000032-10	Grad	360,00	359,00	363,00	345,00	357,00	361,00	360,00	360,00	366,00	358,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
191790	T55-3000032-10	Nm	15,01	15,02	15,03	15,01	15,02	15,04	15,04	15,03	15,00	15,03
191790	T55-3000032-10	Grad	356,00	356,00	357,00	350,00	359,00	376,00	362,00	361,00	365,00	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}
191790	T55-3000032-10	Nm	15,04	15,03	15,02	15,02	15,02	15,01	15,04	15,01	15,01	15,02
191790	T55-3000032-10	Grad	363,00	363,00	370,00	366,00	364,00	349,00	358,00	375,00	353,00	361,00

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}
191790	T55-3000032-10	Nm	15,00	15,00	15,03	15,02	15,00	15,03	15,02	15,01	15,02	15,00
191790	T55-3000032-10	Grad	359,00	354,00	357,00	361,00	347,00	361,00	361,00	357,00	359,00	360,00

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}
191790	T55-3000032-10	Nm	15,01	15,04	15,03	15,02	15,02	15,02	15,01	15,03	15,04	15,03
191790	T55-3000032-10	Grad	359,00	365,00	362,00	358,00	358,00	378,00	357,00	359,00	360,00	361,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
191790	T55-3000032-10	Nm	15,02	15,01	15,05	15,04	15,04	15,03	15,02	15,01	15,03	15,01
191790	T55-3000032-10	Grad	361,00	360,00	361,00	362,00	360,00	361,00	362,00	362,00	358,00	364,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_a	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	15,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	13,95
				USL	16,05
Remark	TQ 100% soft +/-7% * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 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}
191790	T55-3000032-10	Nm	15,02	15,03	15,01	15,00	15,00	15,06	15,02	15,02	15,03	15,02
191790	T55-3000032-10	Grad	361,00	360,00	349,00	369,00	360,00	370,00	347,00	361,00	361,00	370,00

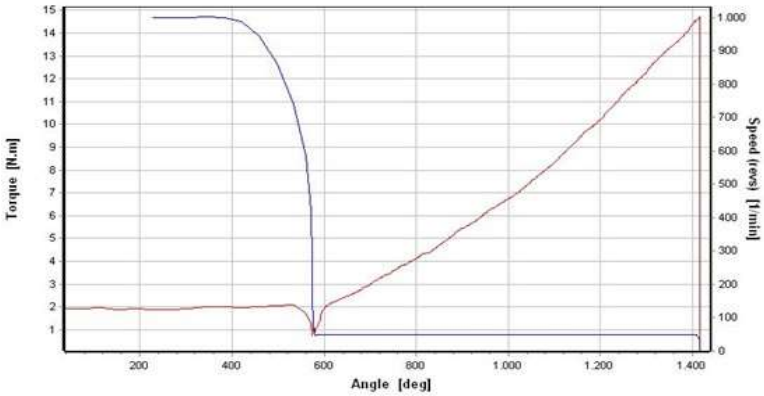
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	15,03	15,01	15,03	15,03	15,02	15,02	15,03	15,00	15,01	15,04
191790	T55-3000032-10	Grad	357,00	372,00	363,00	366,00	360,00	360,00	361,00	352,00	358,00	360,00

Torque graphs

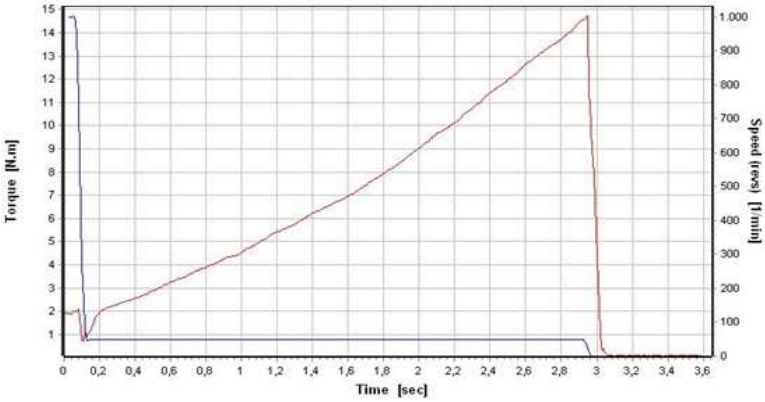
Machine Capability Study 100 %

Model: **CTBAW153**
Serial no: **1019131**

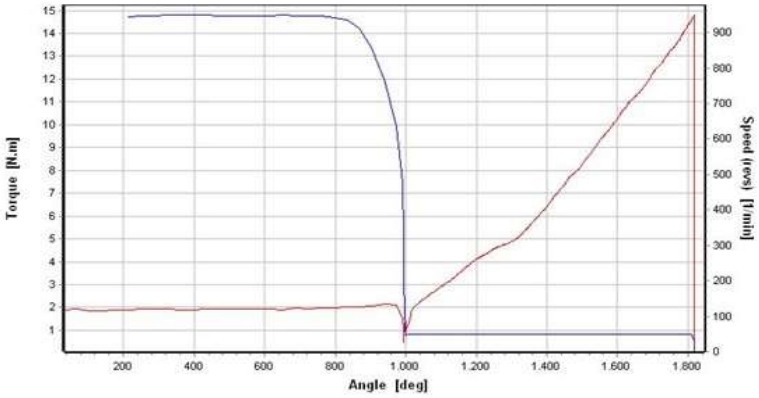
Angle degree: **360°**
Test torque: **15,0 Nm**



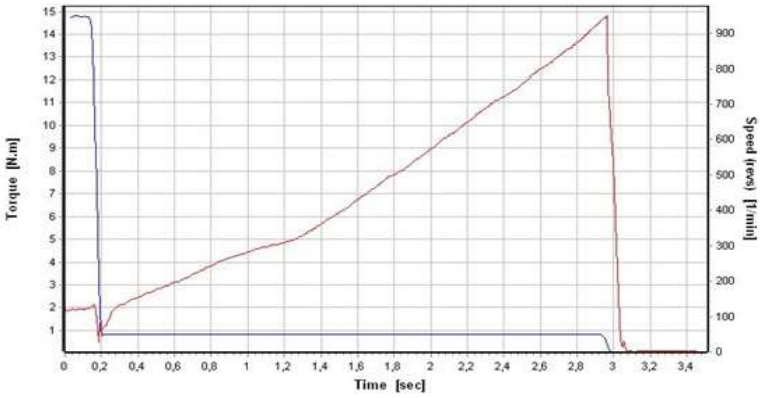
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019131

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: 6,64 % ± **3,32 %**

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

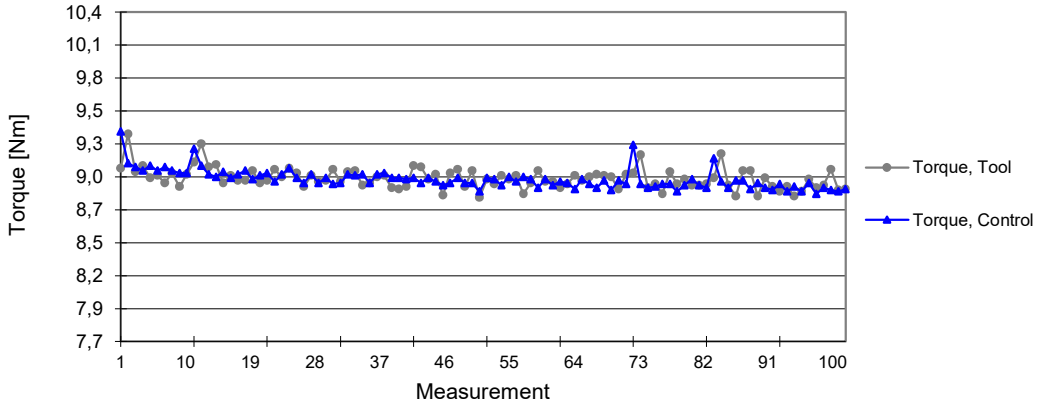
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

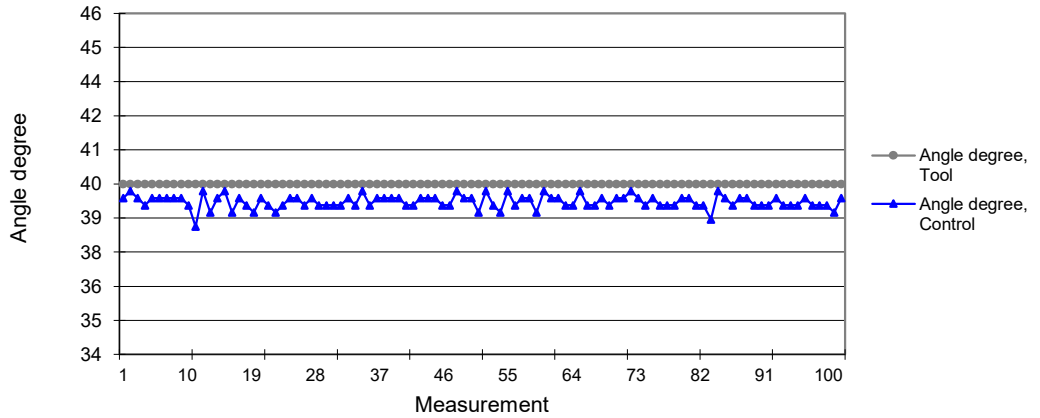
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,07	40,00	9,37	39,50	0,30	0,50
2	9,35	40,00	9,11	39,75	0,24	0,25
3	9,04	40,00	9,08	39,50	0,04	0,50
4	9,09	40,00	9,05	39,25	0,04	0,75
5	8,99	40,00	9,09	39,50	0,10	0,50
6	9,01	40,00	9,05	39,50	0,04	0,50
7	8,95	40,00	9,08	39,50	0,13	0,50
8	9,03	40,00	9,05	39,50	0,02	0,50
9	8,92	40,00	9,03	39,50	0,11	0,50
10	9,02	40,00	9,03	39,25	0,01	0,75
11	9,12	40,00	9,23	38,50	0,11	1,50
12	9,27	40,00	9,09	39,75	0,18	0,25
13	9,08	40,00	9,02	39,00	0,06	1,00
14	9,10	40,00	9,00	39,50	0,10	0,50
15	8,95	40,00	9,04	39,75	0,09	0,25
16	9,01	40,00	8,99	39,00	0,02	1,00
17	8,97	40,00	9,02	39,50	0,05	0,50
18	8,97	40,00	9,05	39,25	0,08	0,75
19	9,05	40,00	8,98	39,00	0,07	1,00
20	8,95	40,00	9,01	39,50	0,06	0,50
21	8,97	40,00	9,03	39,25	0,06	0,75
22	9,06	40,00	8,96	39,00	0,10	1,00
23	9,00	40,00	9,02	39,25	0,02	0,75
24	9,07	40,00	9,07	39,50	0,00	0,50
25	9,03	40,00	8,99	39,50	0,04	0,50
26	8,92	40,00	8,95	39,25	0,03	0,75
27	9,01	40,00	9,02	39,50	0,01	0,50
28	8,96	40,00	8,95	39,25	0,01	0,75
29	8,97	40,00	8,99	39,25	0,02	0,75
30	9,06	40,00	8,94	39,25	0,12	0,75
31	8,96	40,00	8,95	39,25	0,01	0,75
32	9,04	40,00	9,02	39,50	0,02	0,50
33	9,05	40,00	9,01	39,25	0,04	0,75
34	8,93	40,00	9,02	39,75	0,09	0,25
35	8,95	40,00	8,95	39,25	0,00	0,75
36	9,00	40,00	9,02	39,50	0,02	0,50
37	9,01	40,00	9,03	39,50	0,02	0,50
38	8,91	40,00	8,99	39,50	0,08	0,50
39	8,90	40,00	8,99	39,50	0,09	0,50
40	8,92	40,00	8,98	39,25	0,06	0,75
41	9,09	40,00	8,99	39,25	0,10	0,75
42	9,08	40,00	8,95	39,50	0,13	0,50
43	8,98	40,00	8,99	39,50	0,01	0,50
44	9,02	40,00	8,96	39,50	0,06	0,50
45	8,85	40,00	8,93	39,25	0,08	0,75
46	9,03	40,00	8,95	39,25	0,08	0,75
47	9,06	40,00	8,99	39,75	0,07	0,25
48	8,92	40,00	8,95	39,50	0,03	0,50
49	9,05	40,00	8,95	39,50	0,10	0,50
50	8,83	40,00	8,88	39,00	0,05	1,00
51	8,98	40,00	8,99	39,75	0,01	0,25
52	8,94	40,00	8,98	39,25	0,04	0,75
53	9,01	40,00	8,93	39,00	0,08	1,00
54	8,98	40,00	9,00	39,75	0,02	0,25
55	9,01	40,00	8,96	39,25	0,05	0,75
56	8,86	40,00	9,00	39,50	0,14	0,50
57	8,95	40,00	8,98	39,50	0,03	0,50
58	9,05	40,00	8,91	39,00	0,14	1,00
59	8,96	40,00	8,98	39,75	0,02	0,25
60	8,96	40,00	8,93	39,50	0,03	0,50
61	8,91	40,00	8,96	39,50	0,05	0,50
62	8,94	40,00	8,95	39,25	0,01	0,75
63	9,01	40,00	8,90	39,25	0,11	0,75
64	8,97	40,00	8,98	39,75	0,01	0,25
65	9,00	40,00	8,94	39,25	0,06	0,75
66	9,02	40,00	8,91	39,25	0,11	0,75
67	9,01	40,00	8,97	39,50	0,04	0,50
68	9,00	40,00	8,89	39,25	0,11	0,75
69	8,90	40,00	8,97	39,50	0,07	0,50
70	9,02	40,00	8,94	39,50	0,08	0,50
71	9,03	40,00	9,26	39,75	0,23	0,25
72	9,18	40,00	8,94	39,50	0,24	0,50
73	8,91	40,00	8,91	39,25	0,00	0,75
74	8,94	40,00	8,92	39,50	0,02	0,50
75	8,86	40,00	8,94	39,25	0,08	0,75
76	9,04	40,00	8,94	39,25	0,10	0,75
77	8,94	40,00	8,88	39,25	0,06	0,75
78	8,98	40,00	8,93	39,50	0,05	0,50
79	8,93	40,00	8,98	39,50	0,05	0,50
80	8,93	40,00	8,93	39,25	0,00	0,75
81	8,94	40,00	8,91	39,25	0,03	0,75
82	8,99	40,00	9,15	38,75	0,16	1,25
83	9,19	40,00	8,96	39,75	0,23	0,25
84	8,93	40,00	8,91	39,50	0,02	0,50
85	8,84	40,00	8,97	39,25	0,13	0,75
86	9,05	40,00	8,97	39,50	0,08	0,50
87	9,05	40,00	8,90	39,50	0,15	0,50
88	8,84	40,00	8,95	39,25	0,11	0,75
89	8,99	40,00	8,91	39,25	0,08	0,75
90	8,92	40,00	8,89	39,25	0,03	0,75
91	8,88	40,00	8,94	39,50	0,06	0,50
92	8,92	40,00	8,88	39,25	0,04	0,75
93	8,84	40,00	8,92	39,25	0,08	0,75
94	8,88	40,00	8,88	39,25	0,00	0,75
95	8,98	40,00	8,95	39,50	0,03	0,50
96	8,91	40,00	8,86	39,25	0,05	0,75
97	8,93	40,00	8,91	39,25	0,02	0,75
98	9,06	40,00	8,89	39,25	0,17	0,75
99	8,89	40,00	8,88	39,00	0,01	1,00
100	8,90	40,00	8,90	39,50	0,00	0,50
				Standard deviation:	**0,060**	**0,226**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





Machine Capability Study
Control System

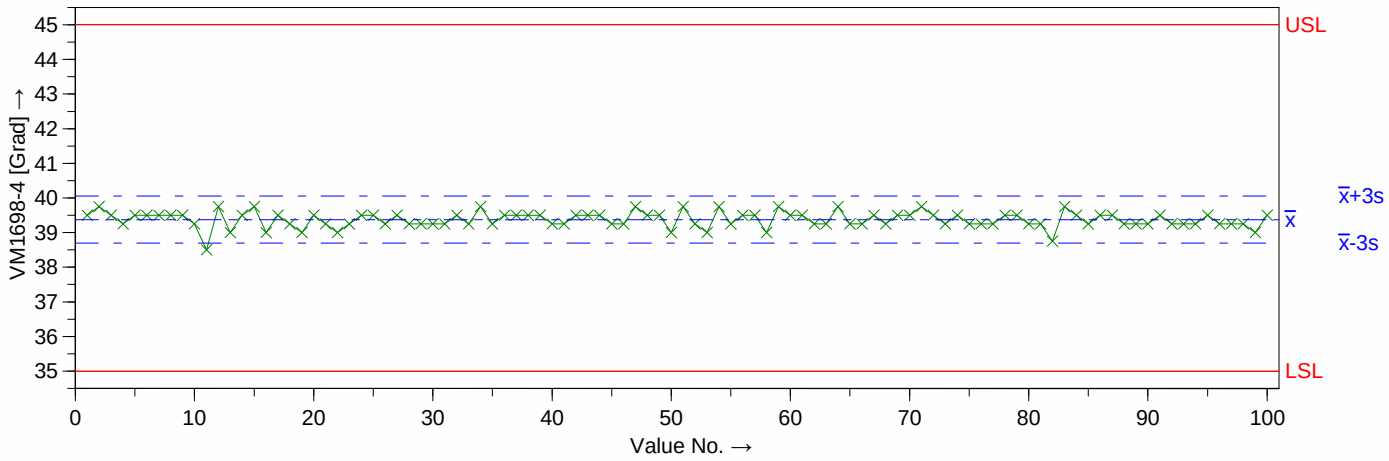
Page 1 / 1

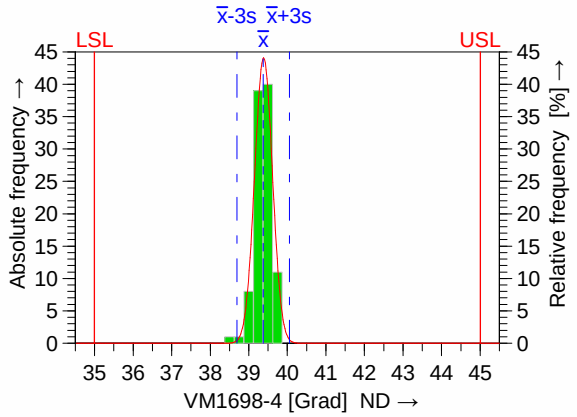
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

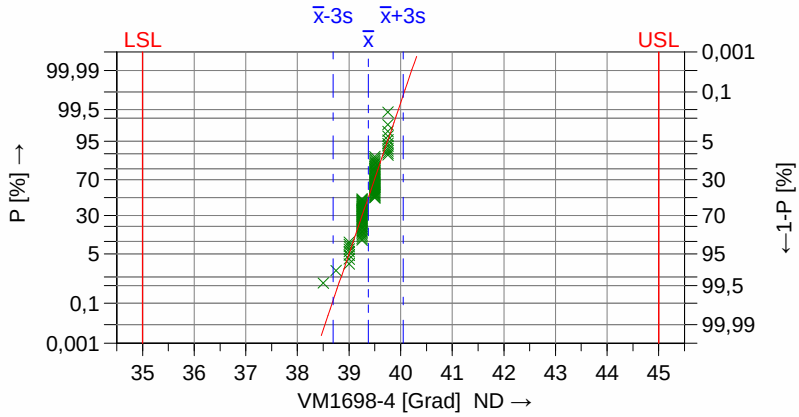
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_k	Char.Descr.	VM1698-4	Nom.val. 40,00	5,00 USL 45,00
		Serial No.	1024210	Unit Grad	-5,00 LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 11:58:43 to 29.07.2022 12:11:36

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	39.3725
LSL	35.00	x_{min}	38.50	$\bar{x}$-3s	38.6941
USL	45.00	x_{max}	39.75	$\bar{x}$+3s	40.0509
T	10.00	R	1.25	6s	1.3567
		$n_{<T>}$	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	7.37
Critical capability index	=	C_{mk}	6.45

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 29.07.2022

Serial No.	1019131_k	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.50 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	9,37	9,11	9,08	9,05	9,09	9,05	9,08	9,05	9,03	9,03
1024210	VM1698-4	Grad	39,50	39,75	39,50	39,25	39,50	39,50	39,50	39,50	39,50	39,25

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	9,23	9,09	9,02	9,00	9,04	8,99	9,02	9,05	8,98	9,01
1024210	VM1698-4	Grad	38,50	39,75	39,00	39,50	39,75	39,00	39,50	39,25	39,00	39,50

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	9,03	8,96	9,02	9,07	8,99	8,95	9,02	8,95	8,99	8,94
1024210	VM1698-4	Grad	39,25	39,00	39,25	39,50	39,50	39,25	39,50	39,25	39,25	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	8,95	9,02	9,01	9,02	8,95	9,02	9,03	8,99	8,99	8,98
1024210	VM1698-4	Grad	39,25	39,50	39,25	39,75	39,25	39,50	39,50	39,50	39,50	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	8,99	8,95	8,99	8,96	8,93	8,95	8,99	8,95	8,95	8,88
1024210	VM1698-4	Grad	39,25	39,50	39,50	39,50	39,25	39,25	39,75	39,50	39,50	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	8,99	8,98	8,93	9,00	8,96	9,00	8,98	8,91	8,98	8,93
1024210	VM1698-4	Grad	39,75	39,25	39,00	39,75	39,25	39,50	39,50	39,00	39,75	39,50

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	8,96	8,95	8,90	8,98	8,94	8,91	8,97	8,89	8,97	8,94
1024210	VM1698-4	Grad	39,50	39,25	39,25	39,75	39,25	39,25	39,50	39,25	39,50	39,50

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	9,26	8,94	8,91	8,92	8,94	8,94	8,88	8,93	8,98	8,93
1024210	VM1698-4	Grad	39,75	39,50	39,25	39,50	39,25	39,25	39,25	39,50	39,50	39,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_k	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.50 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	8,91	9,15	8,96	8,91	8,97	8,97	8,90	8,95	8,91	8,89
1024210	VM1698-4	Grad	39,25	38,75	39,75	39,50	39,25	39,50	39,50	39,25	39,25	39,25

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	8,94	8,88	8,92	8,88	8,95	8,86	8,91	8,89	8,88	8,90
1024210	VM1698-4	Grad	39,50	39,25	39,25	39,25	39,50	39,25	39,25	39,25	39,00	39,50

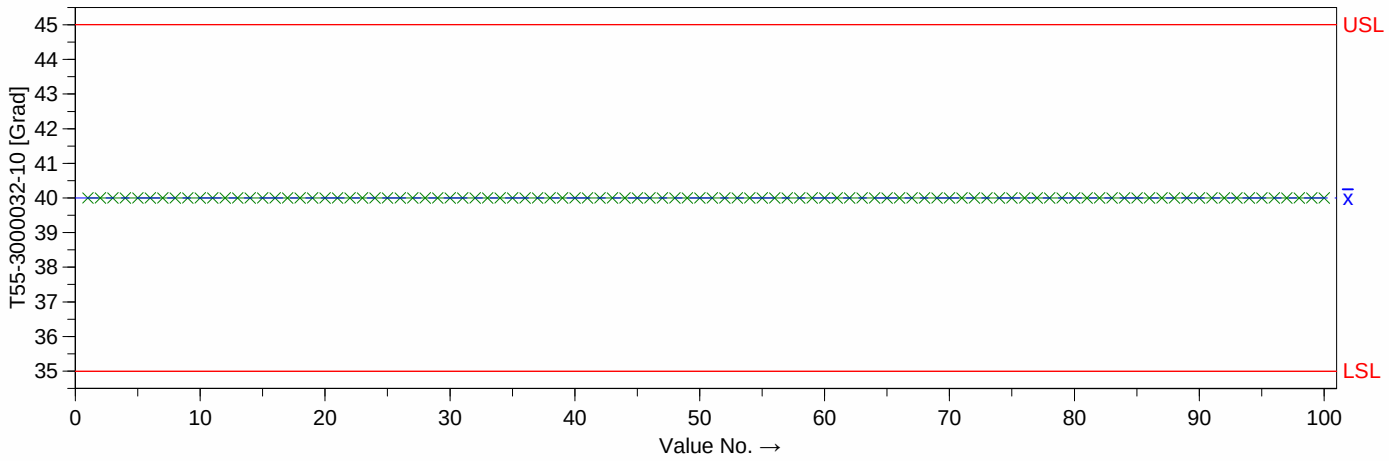
Machine Capability Study
Tool System

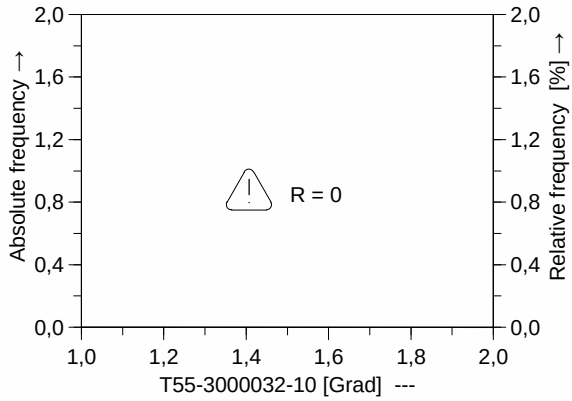
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

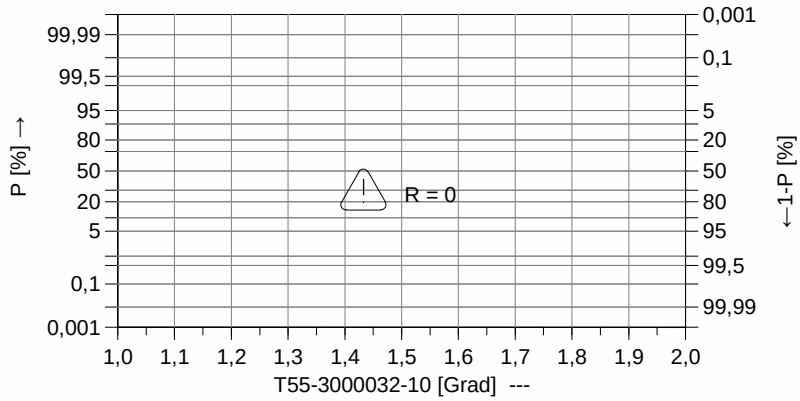
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_k	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	191790	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 11:58:25 to 29.07.2022 12:11:28

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







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

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.50 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
191790	T55-3000032-10	Nm	9,07	9,35	9,04	9,09	8,99	9,01	8,95	9,03	8,92	9,02
191790	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}
191790	T55-3000032-10	Nm	9,12	9,27	9,08	9,10	8,95	9,01	8,97	8,97	9,05	8,95
191790	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}
191790	T55-3000032-10	Nm	8,97	9,06	9,00	9,07	9,03	8,92	9,01	8,96	8,97	9,06
191790	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}
191790	T55-3000032-10	Nm	8,96	9,04	9,05	8,93	8,95	9,00	9,01	8,91	8,90	8,92
191790	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}
191790	T55-3000032-10	Nm	9,09	9,08	8,98	9,02	8,85	9,03	9,06	8,92	9,05	8,83
191790	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}
191790	T55-3000032-10	Nm	8,98	8,94	9,01	8,98	9,01	8,86	8,95	9,05	8,96	8,96
191790	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}
191790	T55-3000032-10	Nm	8,91	8,94	9,01	8,97	9,00	9,02	9,01	9,00	8,90	9,02
191790	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}
191790	T55-3000032-10	Nm	9,03	9,18	8,91	8,94	8,86	9,04	8,94	8,98	8,93	8,93
191790	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 29.07.2022

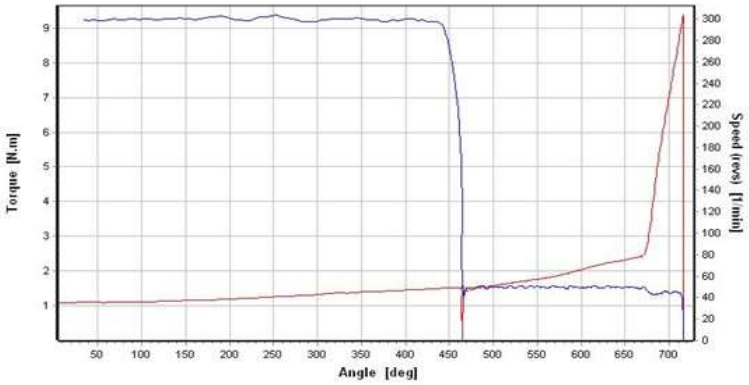
Serial No.	1019131_k	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 16.50 Nm; C ur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
191790	T55-3000032-10	Nm	8,94	8,99	9,19	8,93	8,84	9,05	9,05	8,84	8,99	8,92
191790	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

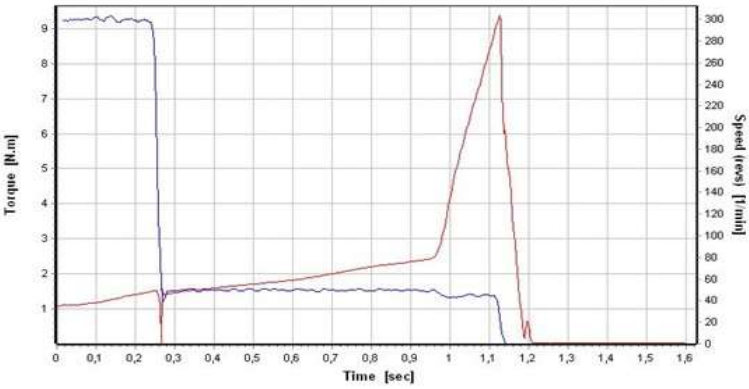
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	8,88	8,92	8,84	8,88	8,98	8,91	8,93	9,06	8,89	8,90
191790	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

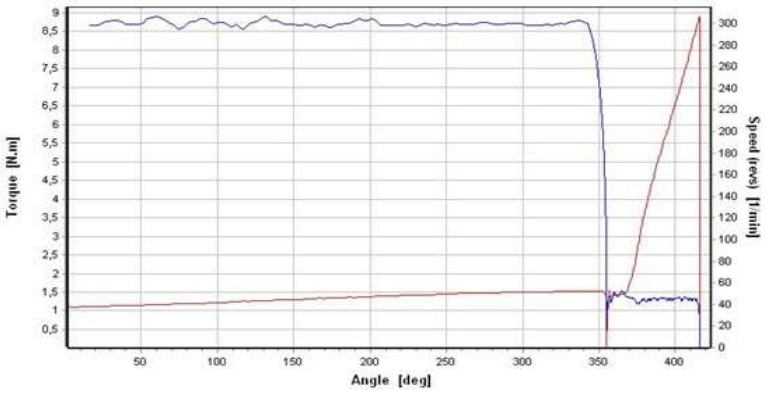
Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



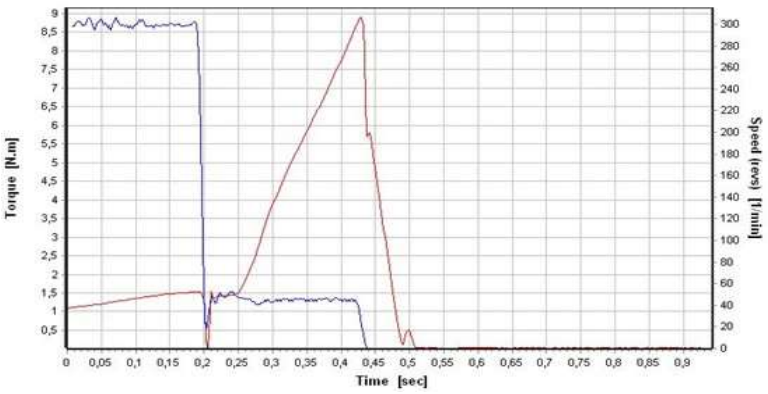
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019131

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: 4,61 % ± **2,30 %**

Angle degree: 40° Tolerance: 2,9° ± **1,5°**

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

Tool with angle correction

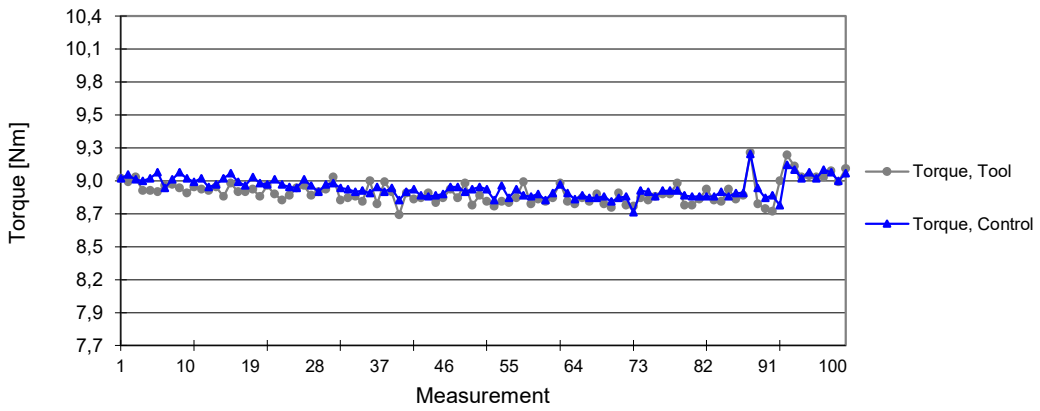
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move +", the angle range in the screw direction,
In the column "Move -" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle values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

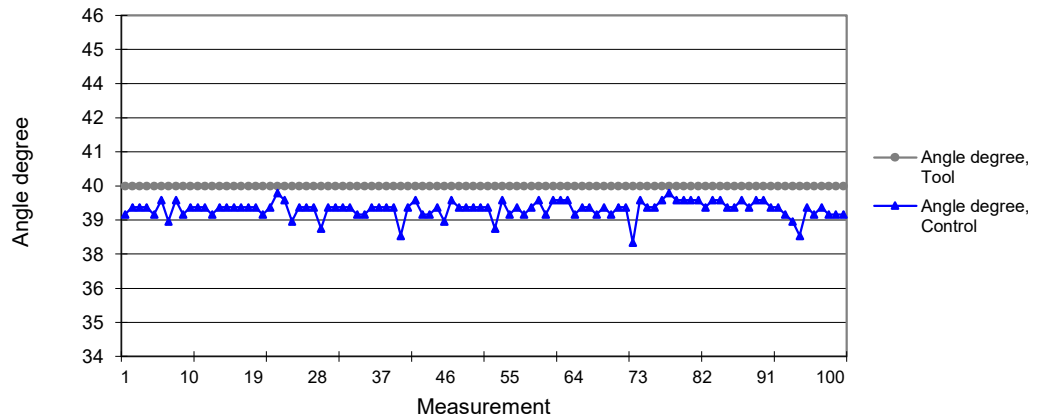
Move		Test conditions
+	**-**	0
0-25°	**0-45°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,02	40,00	9,02	39,00	0,00	1,00
2	8,99	40,00	9,05	39,25	0,06	0,75
3	9,03	40,00	9,01	39,25	0,02	0,75
4	8,92	40,00	9,00	39,25	0,08	0,75
5	8,92	40,00	9,02	39,00	0,10	1,00
6	8,91	40,00	9,07	39,50	0,16	0,50
7	8,96	40,00	8,94	38,75	0,02	1,25
8	8,97	40,00	9,01	39,50	0,04	0,50
9	8,94	40,00	9,07	39,00	0,13	1,00
10	8,90	40,00	9,02	39,25	0,12	0,75
11	8,95	40,00	8,99	39,25	0,04	0,75
12	8,93	40,00	9,02	39,25	0,09	0,75
13	8,92	40,00	8,95	39,00	0,03	1,00
14	8,95	40,00	8,97	39,25	0,02	0,75
15	8,87	40,00	9,02	39,25	0,15	0,75
16	8,98	40,00	9,06	39,25	0,08	0,75
17	8,91	40,00	8,99	39,25	0,08	0,75
18	8,91	40,00	8,96	39,25	0,05	0,75
19	8,93	40,00	9,03	39,25	0,10	0,75
20	8,87	40,00	8,98	39,00	0,11	1,00
21	8,96	40,00	8,97	39,25	0,01	0,75
22	8,89	40,00	9,01	39,75	0,12	0,25
23	8,84	40,00	8,97	39,50	0,13	0,50
24	8,88	40,00	8,95	38,75	0,07	1,25
25	8,94	40,00	8,94	39,25	0,00	0,75
26	8,96	40,00	9,01	39,25	0,05	0,75
27	8,88	40,00	8,96	39,25	0,08	0,75
28	8,91	40,00	8,91	38,50	0,00	1,50
29	8,93	40,00	8,97	39,25	0,04	0,75
30	9,03	40,00	8,98	39,25	0,05	0,75
31	8,84	40,00	8,94	39,25	0,10	0,75
32	8,86	40,00	8,93	39,25	0,07	0,75
33	8,87	40,00	8,91	39,00	0,04	1,00
34	8,83	40,00	8,92	39,00	0,09	1,00
35	9,00	40,00	8,90	39,25	0,10	0,75
36	8,81	40,00	8,95	39,25	0,14	0,75
37	8,99	40,00	8,91	39,25	0,08	0,75
38	8,91	40,00	8,94	39,25	0,03	0,75
39	8,72	40,00	8,84	38,25	0,12	1,75
40	8,90	40,00	8,91	39,25	0,01	0,75
41	8,85	40,00	8,93	39,50	0,08	0,50
42	8,86	40,00	8,88	39,00	0,02	1,00
43	8,90	40,00	8,87	39,00	0,03	1,00
44	8,82	40,00	8,88	39,25	0,06	0,75
45	8,86	40,00	8,89	38,75	0,03	1,25
46	8,93	40,00	8,95	39,50	0,02	0,50
47	8,86	40,00	8,95	39,25	0,09	0,75
48	8,98	40,00	8,91	39,25	0,07	0,75
49	8,80	40,00	8,93	39,25	0,13	0,75
50	8,88	40,00	8,95	39,25	0,07	0,75
51	8,83	40,00	8,93	39,25	0,10	0,75
52	8,79	40,00	8,84	38,50	0,05	1,50
53	8,83	40,00	8,96	39,50	0,13	0,50
54	8,82	40,00	8,86	39,00	0,04	1,00
55	8,86	40,00	8,93	39,25	0,07	0,75
56	8,99	40,00	8,88	39,00	0,11	1,00
57	8,81	40,00	8,87	39,25	0,06	0,75
58	8,85	40,00	8,89	39,50	0,04	0,50
59	8,83	40,00	8,84	39,00	0,01	1,00
60	8,86	40,00	8,90	39,50	0,04	0,50
61	8,98	40,00	8,97	39,50	0,01	0,50
62	8,83	40,00	8,90	39,50	0,07	0,50
63	8,81	40,00	8,85	39,00	0,04	1,00
64	8,86	40,00	8,88	39,25	0,02	0,75
65	8,83	40,00	8,86	39,25	0,03	0,75
66	8,89	40,00	8,86	39,00	0,03	1,00
67	8,81	40,00	8,87	39,25	0,06	0,75
68	8,78	40,00	8,83	39,00	0,05	1,00
69	8,90	40,00	8,86	39,25	0,04	0,75
70	8,80	40,00	8,87	39,25	0,07	0,75
71	8,79	40,00	8,74	38,00	0,05	2,00
72	8,86	40,00	8,92	39,50	0,06	0,50
73	8,84	40,00	8,91	39,25	0,07	0,75
74	8,87	40,00	8,87	39,25	0,00	0,75
75	8,89	40,00	8,92	39,50	0,03	0,50
76	8,89	40,00	8,92	39,75	0,03	0,25
77	8,98	40,00	8,92	39,50	0,06	0,50
78	8,80	40,00	8,88	39,50	0,08	0,50
79	8,80	40,00	8,87	39,50	0,07	0,50
80	8,85	40,00	8,87	39,50	0,02	0,50
81	8,93	40,00	8,87	39,25	0,06	0,75
82	8,84	40,00	8,87	39,50	0,03	0,50
83	8,83	40,00	8,91	39,50	0,08	0,50
84	8,93	40,00	8,87	39,25	0,06	0,75
85	8,85	40,00	8,90	39,25	0,05	0,75
86	8,88	40,00	8,90	39,50	0,02	0,50
87	9,23	40,00	9,22	39,25	0,01	0,75
88	8,81	40,00	8,94	39,50	0,13	0,50
89	8,77	40,00	8,86	39,50	0,09	0,50
90	8,75	40,00	8,88	39,25	0,13	0,75
91	9,00	40,00	8,80	39,25	0,20	0,75
92	9,21	40,00	9,13	39,00	0,08	1,00
93	9,12	40,00	9,09	38,75	0,03	1,25
94	9,03	40,00	9,02	38,25	0,01	1,75
95	9,04	40,00	9,07	39,25	0,03	0,75
96	9,03	40,00	9,02	39,00	0,01	1,00
97	9,03	40,00	9,09	39,25	0,06	0,75
98	9,08	40,00	9,07	39,00	0,01	1,00
99	8,99	40,00	9,00	39,00	0,01	1,00
100	9,10	40,00	9,06	39,00	0,04	1,00
				Standard deviation:	**0,041**	**0,292**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019131**
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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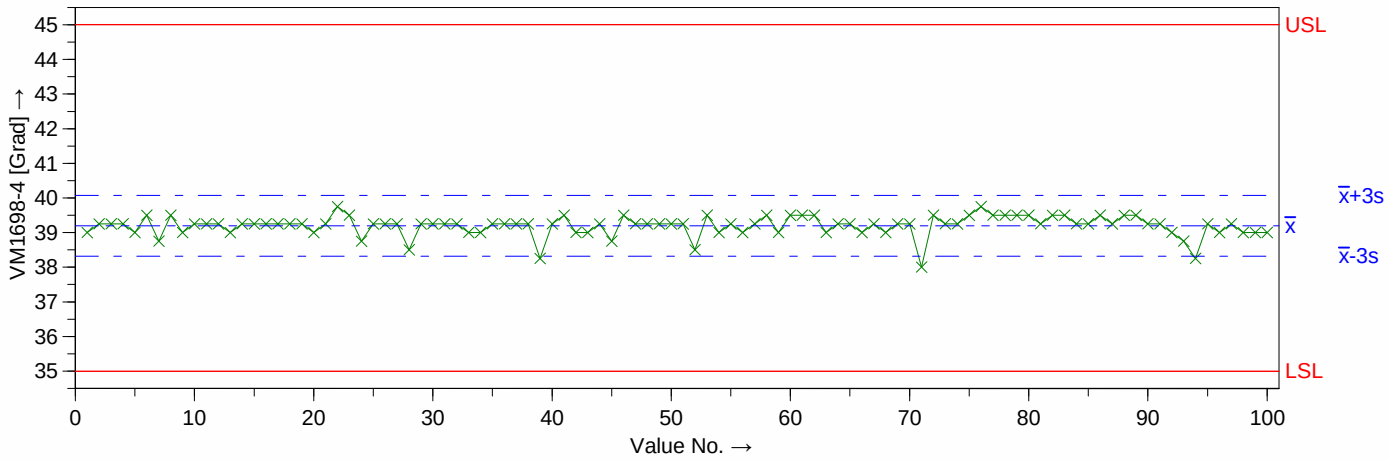
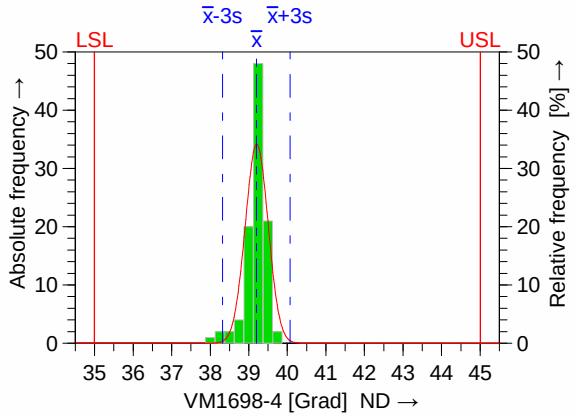
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

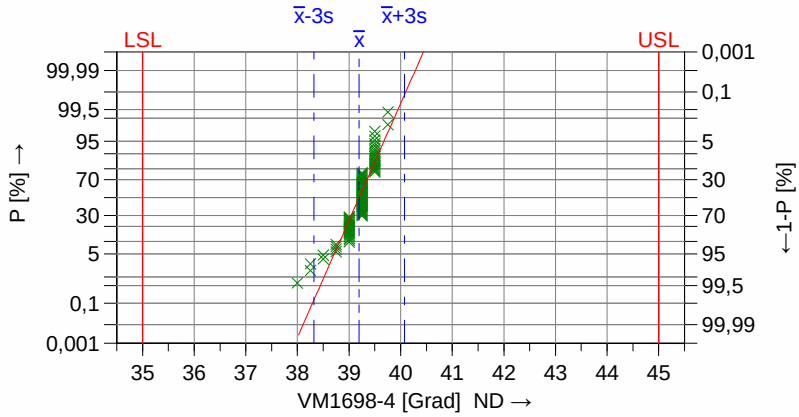
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_m	Char.Descr.	VM1698-4	Nom.val. 40,00	5,00 USL 45,00
		Serial No.	1024210	Unit Grad	-5,00 LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 12:37:58 to 29.07.2022 12:54:01

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	39.1950
LSL	35.00	x_{min}	38.00	$\bar{x}$-3s	38.3187
USL	45.00	x_{max}	39.75	$\bar{x}$+3s	40.0713
T	10.00	R	1.75	6s	1.7527
		$n_{<T>}$	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	5.71
Critical capability index	=	C_{mk}	4.79

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 29.07.2022

Serial No.	1019131_m	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	9,02	9,05	9,01	9,00	9,02	9,07	8,94	9,01	9,07	9,02
1024210	VM1698-4	Grad	39,00	39,25	39,25	39,25	39,00	39,50	38,75	39,50	39,00	39,25

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	8,99	9,02	8,95	8,97	9,02	9,06	8,99	8,96	9,03	8,98
1024210	VM1698-4	Grad	39,25	39,25	39,00	39,25	39,25	39,25	39,25	39,25	39,25	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	8,97	9,01	8,97	8,95	8,94	9,01	8,96	8,91	8,97	8,98
1024210	VM1698-4	Grad	39,25	39,75	39,50	38,75	39,25	39,25	39,25	38,50	39,25	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	8,94	8,93	8,91	8,92	8,90	8,95	8,91	8,94	8,84	8,91
1024210	VM1698-4	Grad	39,25	39,25	39,00	39,00	39,25	39,25	39,25	39,25	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	8,93	8,88	8,87	8,88	8,89	8,95	8,95	8,91	8,93	8,95
1024210	VM1698-4	Grad	39,50	39,00	39,00	39,25	38,75	39,50	39,25	39,25	39,25	39,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	8,93	8,84	8,96	8,86	8,93	8,88	8,87	8,89	8,84	8,90
1024210	VM1698-4	Grad	39,25	38,50	39,50	39,00	39,25	39,00	39,25	39,50	39,00	39,50

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	8,97	8,90	8,85	8,88	8,86	8,86	8,87	8,83	8,86	8,87
1024210	VM1698-4	Grad	39,50	39,50	39,00	39,25	39,25	39,00	39,25	39,00	39,25	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	8,74	8,92	8,91	8,87	8,92	8,92	8,92	8,88	8,87	8,87
1024210	VM1698-4	Grad	38,00	39,50	39,25	39,25	39,50	39,75	39,50	39,50	39,50	39,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_m	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	8,87	8,87	8,91	8,87	8,90	8,90	9,22	8,94	8,86	8,88
1024210	VM1698-4	Grad	39,25	39,50	39,50	39,25	39,25	39,50	39,25	39,50	39,50	39,25

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	8,80	9,13	9,09	9,02	9,07	9,02	9,09	9,07	9,00	9,06
1024210	VM1698-4	Grad	39,25	39,00	38,75	38,25	39,25	39,00	39,25	39,00	39,00	39,00

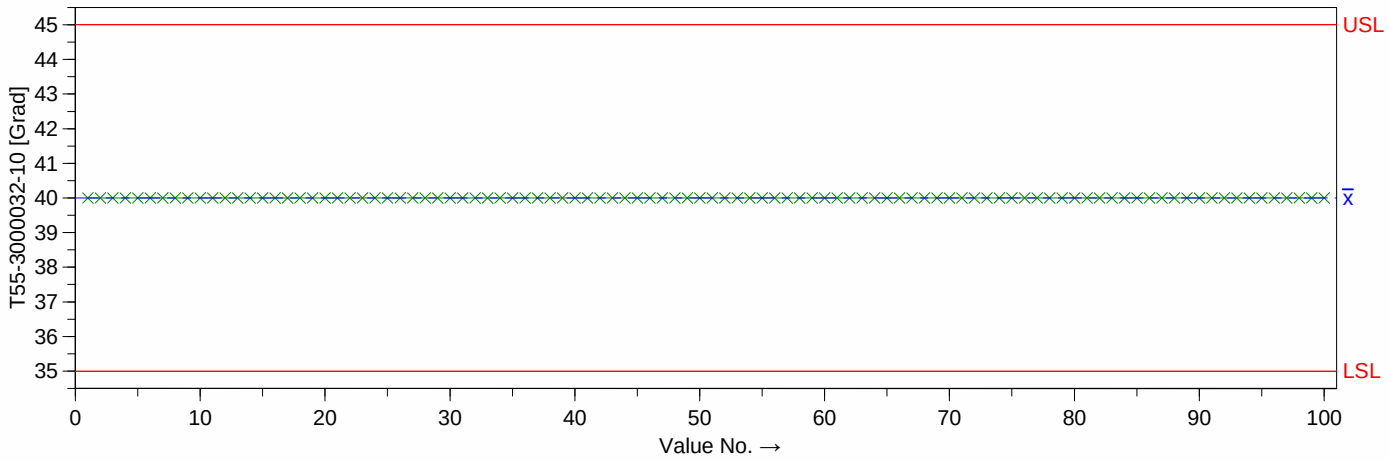
Machine Capability Study
Tool System

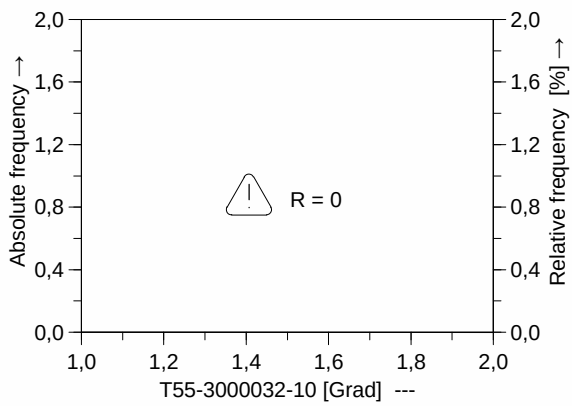
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

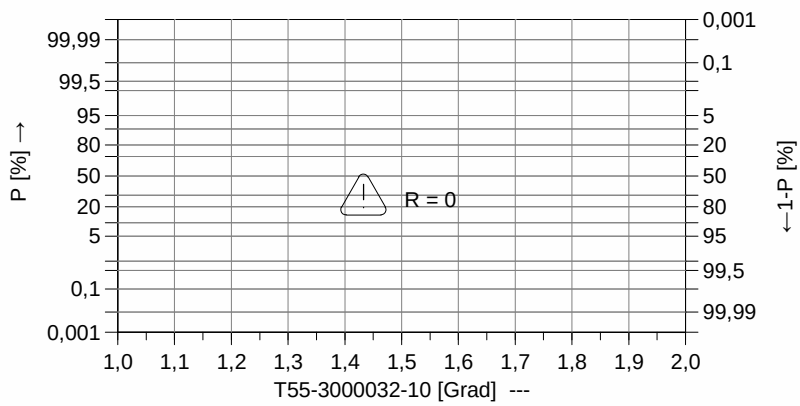
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_m	Char.Descr.	T55-3000032-10	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	191790	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 29.07.2022 12:37:57 to 29.07.2022 12:54:01

Rem. TQ 60% Angle 40° Gyro +/-5° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;







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

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
191790	T55-3000032-10	Nm	9,02	8,99	9,03	8,92	8,92	8,91	8,96	8,97	8,94	8,90
191790	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}
191790	T55-3000032-10	Nm	8,95	8,93	8,92	8,95	8,87	8,98	8,91	8,91	8,93	8,87
191790	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}
191790	T55-3000032-10	Nm	8,96	8,89	8,84	8,88	8,94	8,96	8,88	8,91	8,93	9,03
191790	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}
191790	T55-3000032-10	Nm	8,84	8,86	8,87	8,83	9,00	8,81	8,99	8,91	8,72	8,90
191790	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}
191790	T55-3000032-10	Nm	8,85	8,86	8,90	8,82	8,86	8,93	8,86	8,98	8,80	8,88
191790	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}
191790	T55-3000032-10	Nm	8,83	8,79	8,83	8,82	8,86	8,99	8,81	8,85	8,83	8,86
191790	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}
191790	T55-3000032-10	Nm	8,98	8,83	8,81	8,86	8,83	8,89	8,81	8,78	8,90	8,80
191790	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}
191790	T55-3000032-10	Nm	8,79	8,86	8,84	8,87	8,89	8,89	8,98	8,80	8,80	8,85
191790	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 29.07.2022

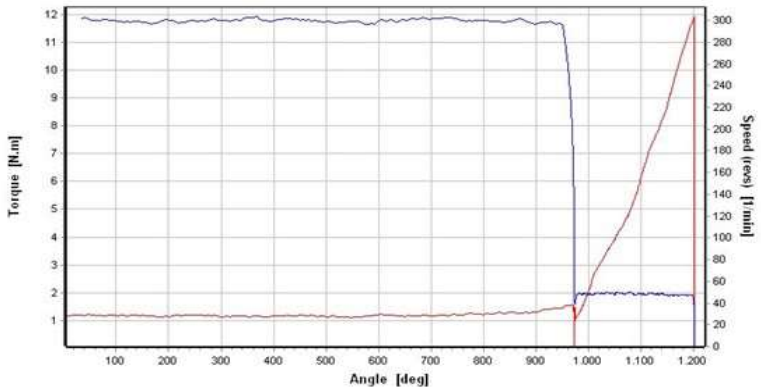
Serial No.	1019131_m	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	9,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	8,37
				USL	9,63
Remark	TQ 60% Angle 40°Gyro +/-5°* TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.123 Nm/A; Speed: 300/50 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
191790	T55-3000032-10	Nm	8,93	8,84	8,83	8,93	8,85	8,88	9,23	8,81	8,77	8,75
191790	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

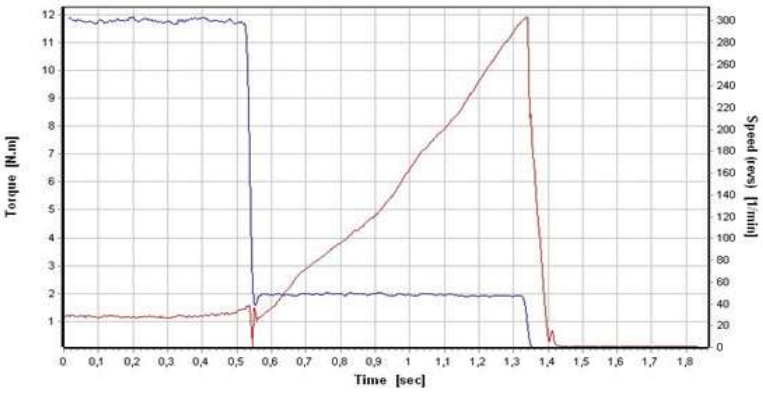
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	9,00	9,21	9,12	9,03	9,04	9,03	9,03	9,08	8,99	9,10
191790	T55-3000032-10	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

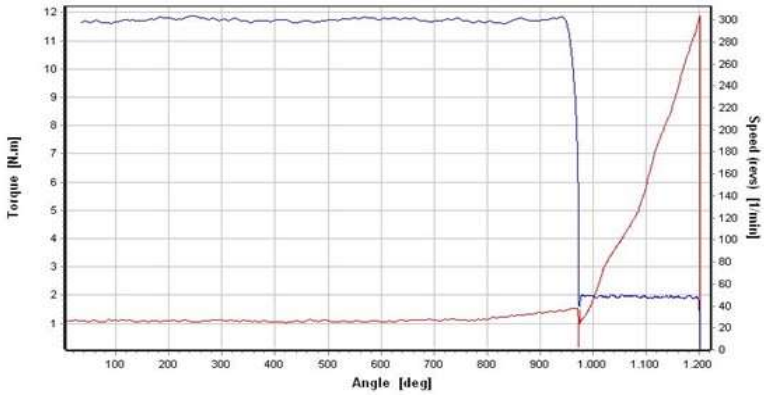
Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**9,00 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool with angle correction	



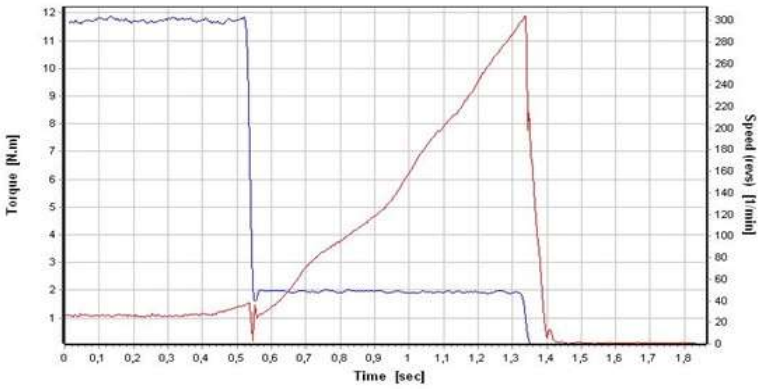
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019131

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

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

Capability examination

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

Target torque: 12 Nm Tolerance: 6,10 % ± **3,05 %**

Angle degree: 180° Tolerance: 12,9° ± **6,5°**

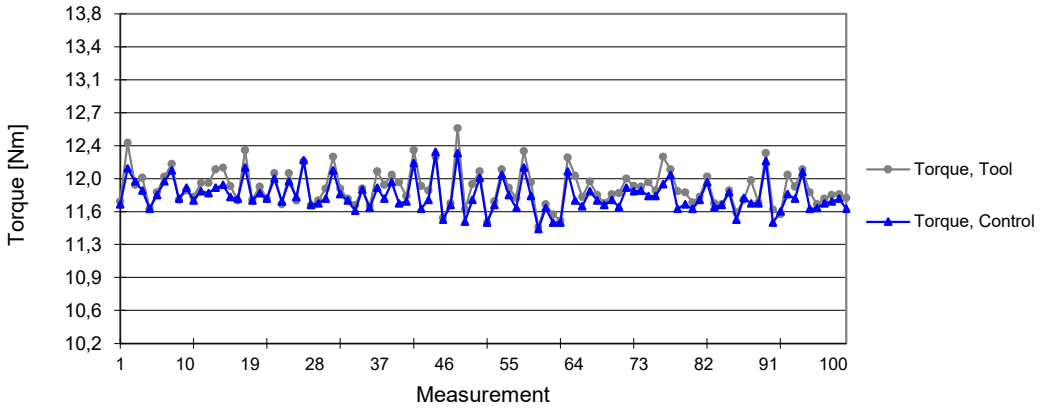
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

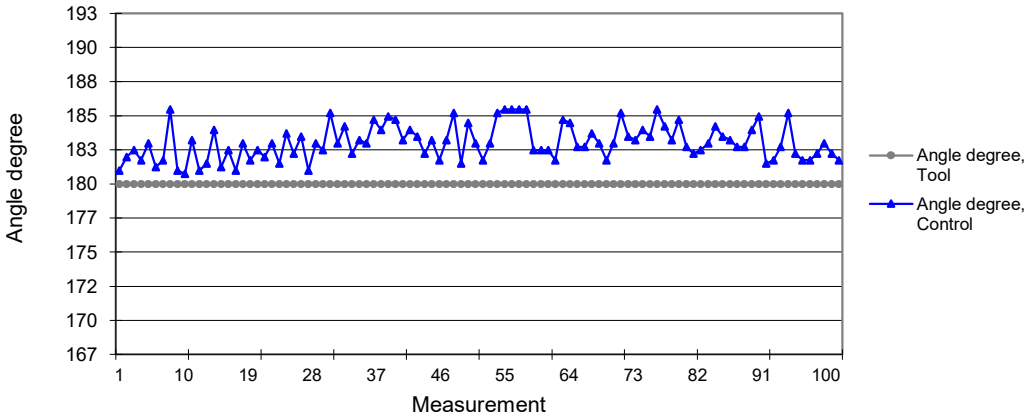
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	11,75	180,00	11,72	181,00	0,03	1,00
2	12,39	180,00	12,11	182,00	0,28	2,00
3	11,93	180,00	11,97	182,50	0,04	2,50
4	12,01	180,00	11,87	181,75	0,14	1,75
5	11,67	180,00	11,67	183,00	0,00	3,00
6	11,85	180,00	11,82	181,25	0,03	1,25
7	12,02	180,00	11,97	181,75	0,05	1,75
8	12,16	180,00	12,09	185,50	0,07	5,50
9	11,77	180,00	11,78	181,00	0,01	1,00
10	11,87	180,00	11,90	180,75	0,03	0,75
11	11,80	180,00	11,76	183,25	0,04	3,25
12	11,95	180,00	11,86	181,00	0,09	1,00
13	11,95	180,00	11,84	181,50	0,11	1,50
14	12,10	180,00	11,90	184,00	0,20	4,00
15	12,12	180,00	11,93	181,25	0,19	1,25
16	11,92	180,00	11,80	182,50	0,12	2,50
17	11,76	180,00	11,78	181,00	0,02	1,00
18	12,31	180,00	12,12	183,00	0,19	3,00
19	11,77	180,00	11,76	181,75	0,01	1,75
20	11,91	180,00	11,84	182,50	0,07	2,50
21	11,78	180,00	11,78	182,00	0,00	2,00
22	12,06	180,00	12,00	183,00	0,06	3,00
23	11,72	180,00	11,75	181,50	0,03	1,50
24	12,06	180,00	11,97	183,75	0,09	3,75
25	11,76	180,00	11,80	182,25	0,04	2,25
26	12,19	180,00	12,20	183,50	0,01	3,50
27	11,71	180,00	11,71	181,00	0,00	1,00
28	11,76	180,00	11,73	183,00	0,03	3,00
29	11,89	180,00	11,78	182,50	0,11	2,50
30	12,24	180,00	12,09	185,25	0,15	5,25
31	11,89	180,00	11,83	183,00	0,06	3,00
32	11,78	180,00	11,76	184,25	0,02	4,25
33	11,71	180,00	11,65	182,25	0,06	2,25
34	11,89	180,00	11,88	183,25	0,01	3,25
35	11,70	180,00	11,68	183,00	0,02	3,00
36	12,08	180,00	11,90	184,75	0,18	4,75
37	11,93	180,00	11,78	184,00	0,15	4,00
38	12,04	180,00	11,96	185,00	0,08	5,00
39	11,96	180,00	11,73	184,75	0,23	4,75
40	11,81	180,00	11,75	183,25	0,06	3,25
41	12,31	180,00	12,17	184,00	0,14	4,00
42	11,92	180,00	11,67	183,50	0,25	3,50
43	11,87	180,00	11,77	182,25	0,10	2,25
44	12,24	180,00	12,29	183,25	0,05	3,25
45	11,57	180,00	11,55	181,75	0,02	1,75
46	11,73	180,00	11,71	183,25	0,02	3,25
47	12,55	180,00	12,28	185,25	0,27	5,25
48	11,66	180,00	11,53	181,50	0,13	1,50
49	11,94	180,00	11,77	184,50	0,17	4,50
50	12,08	180,00	12,01	183,00	0,07	3,00
51	11,52	180,00	11,52	181,75	0,00	1,75
52	11,75	180,00	11,71	183,00	0,04	3,00
53	12,10	180,00	12,04	185,25	0,06	5,25
54	11,90	180,00	11,82	185,50	0,08	5,50
55	11,79	180,00	11,68	185,50	0,11	5,50
56	12,30	180,00	12,12	185,50	0,18	5,50
57	11,96	180,00	11,81	185,50	0,15	5,50
58	11,47	180,00	11,45	182,50	0,02	2,50
59	11,72	180,00	11,68	182,50	0,04	2,50
60	11,61	180,00	11,52	182,50	0,09	2,50
61	11,54	180,00	11,52	181,75	0,02	1,75
62	12,23	180,00	12,08	184,75	0,15	4,75
63	12,03	180,00	11,76	184,50	0,27	4,50
64	11,80	180,00	11,70	182,75	0,10	2,75
65	11,97	180,00	11,86	182,75	0,11	2,75
66	11,82	180,00	11,76	183,75	0,06	3,75
67	11,73	180,00	11,71	183,00	0,02	3,00
68	11,83	180,00	11,77	181,75	0,06	1,75
69	11,84	180,00	11,69	183,00	0,15	3,00
70	12,00	180,00	11,90	185,25	0,10	5,25
71	11,92	180,00	11,86	183,50	0,06	3,50
72	11,91	180,00	11,87	183,25	0,04	3,25
73	11,96	180,00	11,81	184,00	0,15	4,00
74	11,87	180,00	11,81	183,50	0,06	3,50
75	12,24	180,00	11,94	185,50	0,30	5,50
76	12,10	180,00	12,04	184,25	0,06	4,25
77	11,86	180,00	11,67	183,25	0,19	3,25
78	11,85	180,00	11,72	184,75	0,13	4,75
79	11,74	180,00	11,67	182,75	0,07	2,75
80	11,80	180,00	11,77	182,25	0,03	2,25
81	12,02	180,00	11,96	182,50	0,06	2,50
82	11,73	180,00	11,69	183,00	0,04	3,00
83	11,72	180,00	11,71	184,25	0,01	4,25
84	11,87	180,00	11,85	183,50	0,02	3,50
85	11,63	180,00	11,55	183,25	0,08	3,25
86	11,77	180,00	11,79	182,75	0,02	2,75
87	11,98	180,00	11,73	182,75	0,25	2,75
88	11,74	180,00	11,73	184,00	0,01	4,00
89	12,28	180,00	12,19	185,00	0,09	5,00
90	11,66	180,00	11,52	181,50	0,14	1,50
91	11,61	180,00	11,64	181,75	0,03	1,75
92	12,04	180,00	11,83	182,75	0,21	2,75
93	11,91	180,00	11,78	185,25	0,13	5,25
94	12,10	180,00	12,07	182,25	0,03	2,25
95	11,85	180,00	11,67	181,75	0,18	1,75
96	11,72	180,00	11,68	181,75	0,04	1,75
97	11,78	180,00	11,73	182,25	0,05	2,25
98	11,82	180,00	11,75	183,00	0,07	3,00
99	11,83	180,00	11,78	182,25	0,05	2,25
100	11,79	180,00	11,67	181,75	0,12	1,75
				Standard deviation:	**0,073**	**1,292**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





Machine Capability Study
Control System

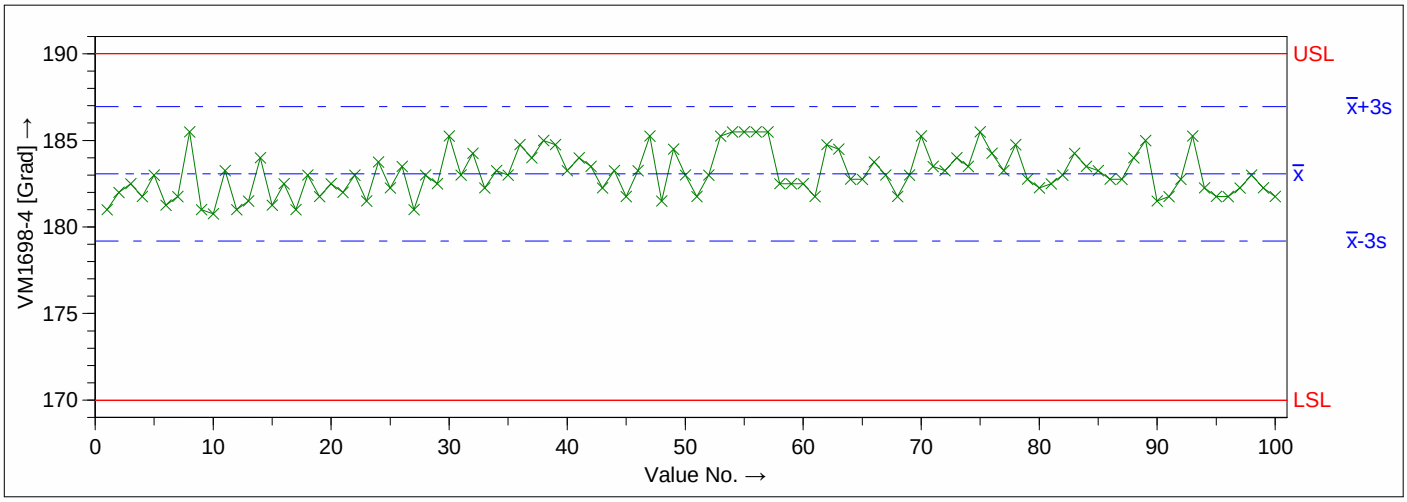
Page 1 / 1

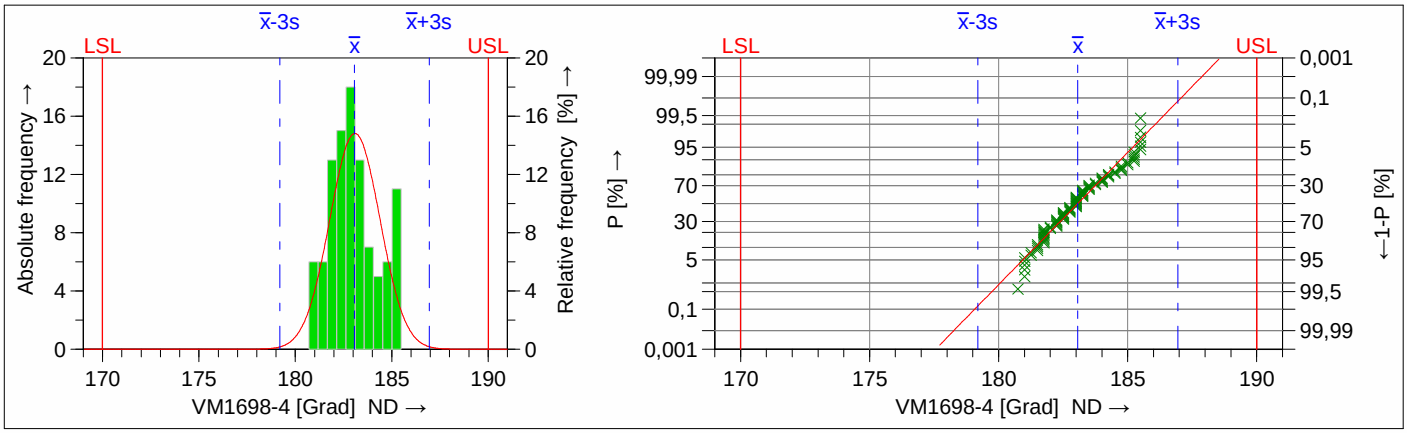
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_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 29.07.2022 13:03:12 to 29.07.2022 13:26:38

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	183.0675
LSL	170.00	x_{min}	180.75	$\bar{x}$-3s	179.1903
USL	190.00	x_{max}	185.50	$\bar{x}$+3s	186.9447
T	20.00	R	4.75	6s	7.7543
		$n_{<T>}$	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	2.58
Critical capability index	=	C_{mk}	1.79

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 29.07.2022

Serial No.	1019131_I	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.50 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	11,72	12,11	11,97	11,87	11,67	11,82	11,97	12,09	11,78	11,90
1024210	VM1698-4	Grad	181,00	182,00	182,50	181,75	183,00	181,25	181,75	185,50	181,00	180,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	11,76	11,86	11,84	11,90	11,93	11,80	11,78	12,12	11,76	11,84
1024210	VM1698-4	Grad	183,25	181,00	181,50	184,00	181,25	182,50	181,00	183,00	181,75	182,50

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	11,78	12,00	11,75	11,97	11,80	12,20	11,71	11,73	11,78	12,09
1024210	VM1698-4	Grad	182,00	183,00	181,50	183,75	182,25	183,50	181,00	183,00	182,50	185,25

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	11,83	11,76	11,65	11,88	11,68	11,90	11,78	11,96	11,73	11,75
1024210	VM1698-4	Grad	183,00	184,25	182,25	183,25	183,00	184,75	184,00	185,00	184,75	183,25

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	12,17	11,67	11,77	12,29	11,55	11,71	12,28	11,53	11,77	12,01
1024210	VM1698-4	Grad	184,00	183,50	182,25	183,25	181,75	183,25	185,25	181,50	184,50	183,00

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	11,52	11,71	12,04	11,82	11,68	12,12	11,81	11,45	11,68	11,52
1024210	VM1698-4	Grad	181,75	183,00	185,25	185,50	185,50	185,50	185,50	182,50	182,50	182,50

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	11,52	12,08	11,76	11,70	11,86	11,76	11,71	11,77	11,69	11,90
1024210	VM1698-4	Grad	181,75	184,75	184,50	182,75	182,75	183,75	183,00	181,75	183,00	185,25

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	11,86	11,87	11,81	11,81	11,94	12,04	11,67	11,72	11,67	11,77
1024210	VM1698-4	Grad	183,50	183,25	184,00	183,50	185,50	184,25	183,25	184,75	182,75	182,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_I	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.50 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	11,96	11,69	11,71	11,85	11,55	11,79	11,73	11,73	12,19	11,52
1024210	VM1698-4	Grad	182,50	183,00	184,25	183,50	183,25	182,75	182,75	184,00	185,00	181,50

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,64	11,83	11,78	12,07	11,67	11,68	11,73	11,75	11,78	11,67
1024210	VM1698-4	Grad	181,75	182,75	185,25	182,25	181,75	181,75	182,25	183,00	182,25	181,75

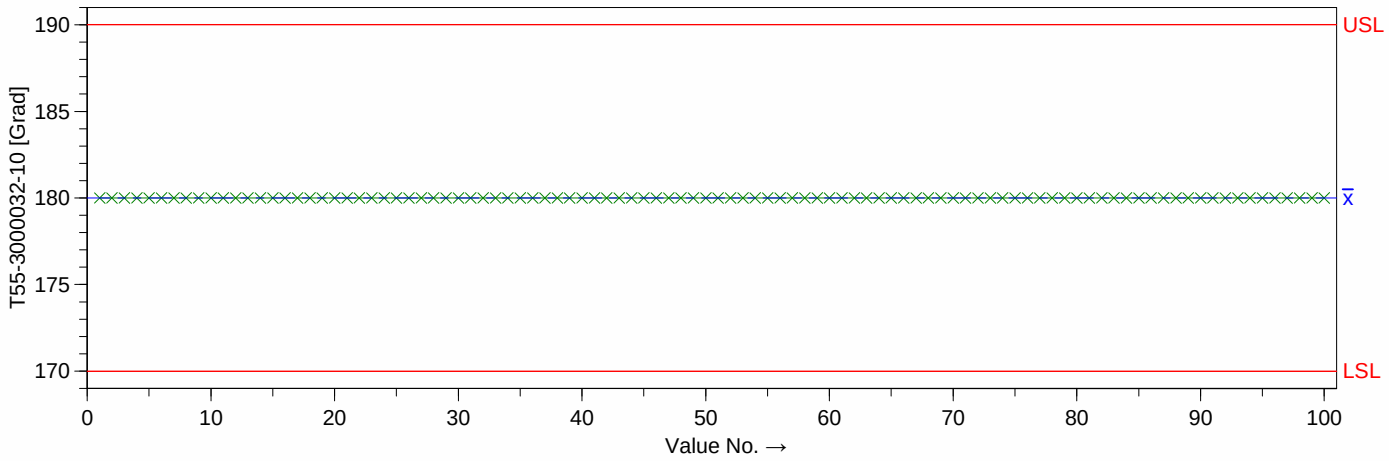
Machine Capability Study
Tool System

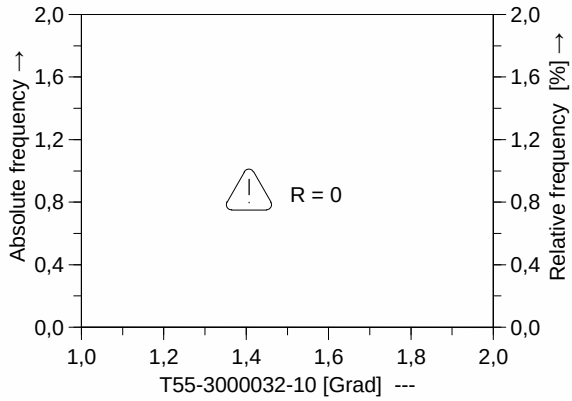
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

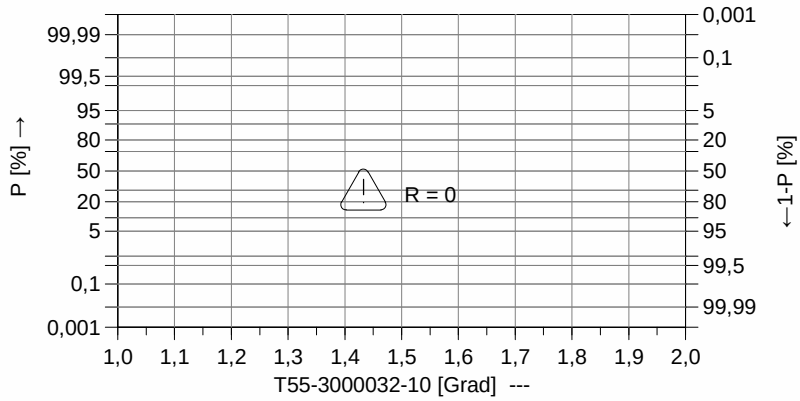
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_l	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	191790	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 29.07.2022 13:03:12 to 29.07.2022 13:26:38

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 16.50 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 29.07.2022

Serial No.	1019131_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.50 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}
191790	T55-3000032-10	Nm	11,75	12,39	11,93	12,01	11,67	11,85	12,02	12,16	11,77	11,87
191790	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}
191790	T55-3000032-10	Nm	11,80	11,95	11,95	12,10	12,12	11,92	11,76	12,31	11,77	11,91
191790	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}
191790	T55-3000032-10	Nm	11,78	12,06	11,72	12,06	11,76	12,19	11,71	11,76	11,89	12,24
191790	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}
191790	T55-3000032-10	Nm	11,89	11,78	11,71	11,89	11,70	12,08	11,93	12,04	11,96	11,81
191790	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}
191790	T55-3000032-10	Nm	12,31	11,92	11,87	12,24	11,57	11,73	12,55	11,66	11,94	12,08
191790	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}
191790	T55-3000032-10	Nm	11,52	11,75	12,10	11,90	11,79	12,30	11,96	11,47	11,72	11,61
191790	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}
191790	T55-3000032-10	Nm	11,54	12,23	12,03	11,80	11,97	11,82	11,73	11,83	11,84	12,00
191790	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}
191790	T55-3000032-10	Nm	11,92	11,91	11,96	11,87	12,24	12,10	11,86	11,85	11,74	11,80
191790	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 29.07.2022

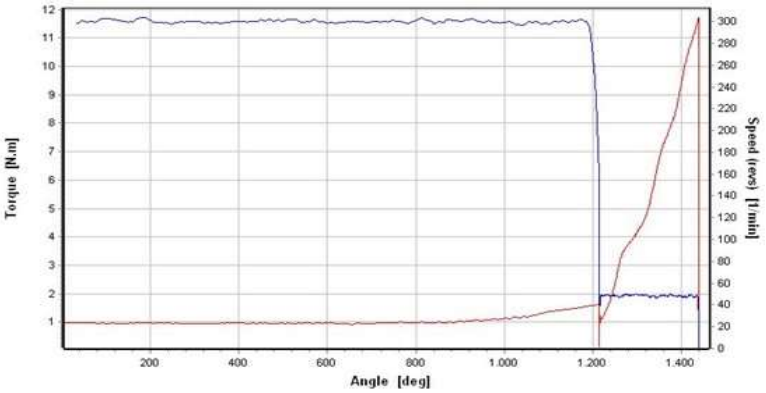
Serial No.	1019131_l	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
191790	T55-3000032-10	Nm	12,02	11,73	11,72	11,87	11,63	11,77	11,98	11,74	12,28	11,66
191790	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

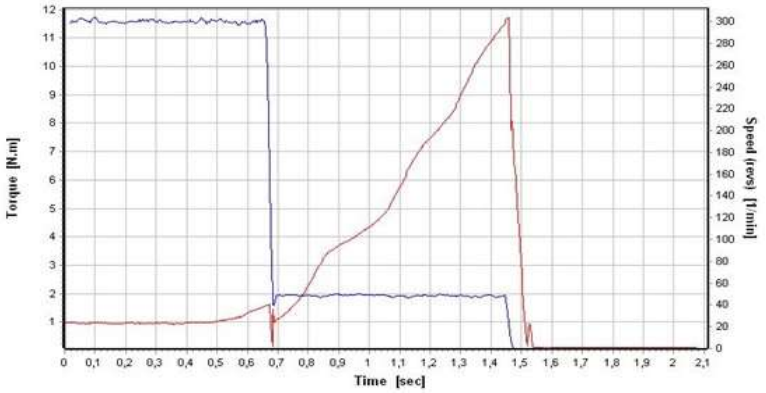
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	11,61	12,04	11,91	12,10	11,85	11,72	11,78	11,82	11,83	11,79
191790	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

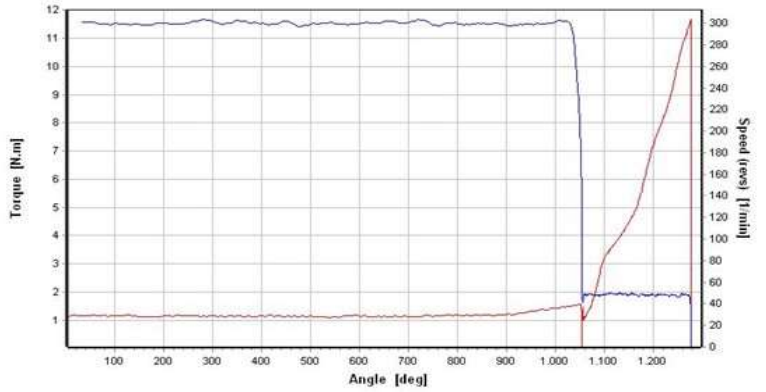
Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



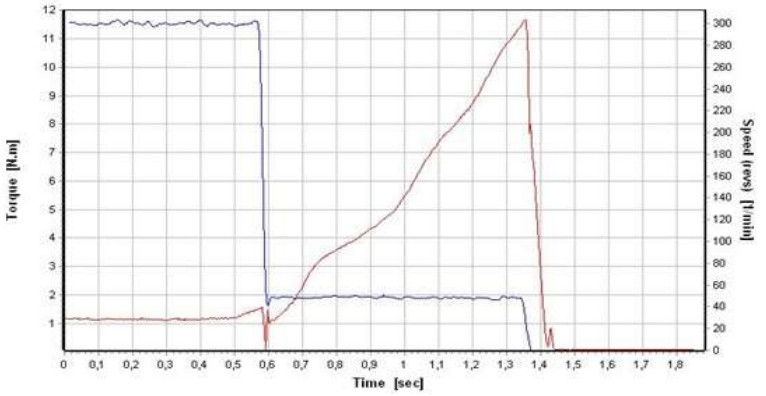
Value no. 1
Graph
Torque / Angle / Speed



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:** 1019131

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: 5,41 % ± **2,70 %**

Angle degree: 180° Tolerance: 13,6° ± **6,8°**

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

Tool with angle correction

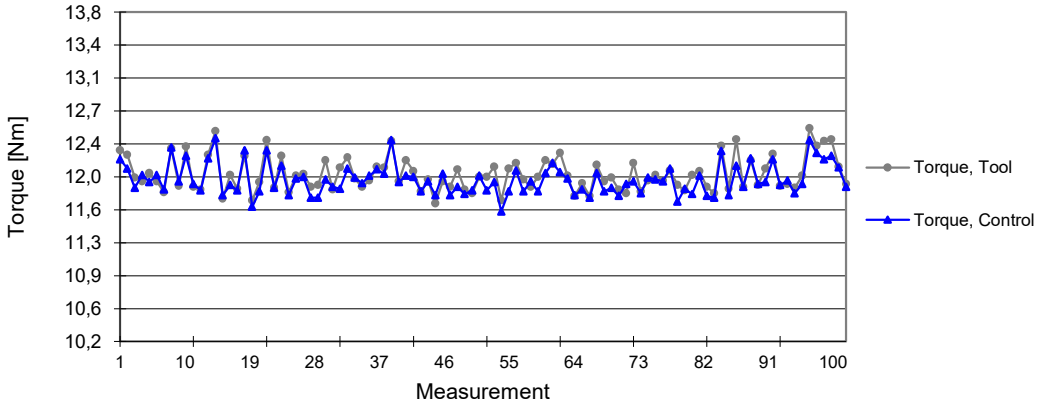
For measurements, the screwdriver must be held by hand and alternately moved.
In the column "Move +", the angle range in the screw direction,
In the column "Move -" of the direction opposite the direction of tightening,
within this range, the tool has to be moved.
Pay attention to changing angle values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

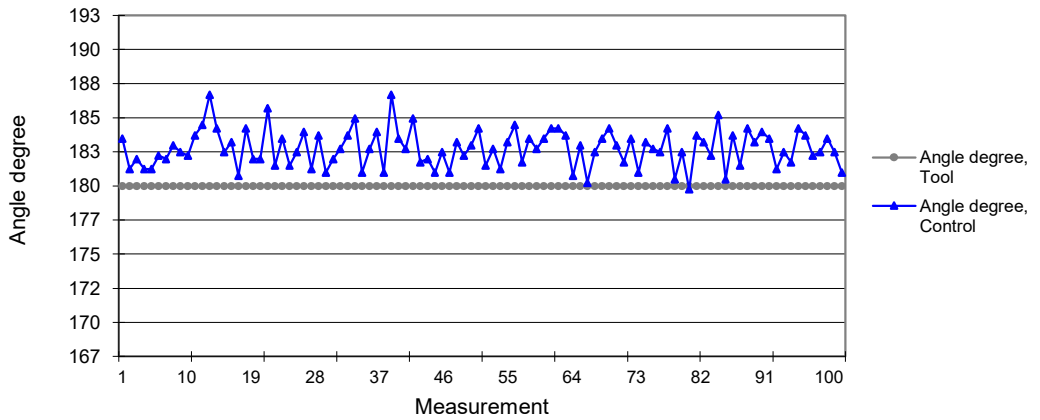
Move		Test conditions
+	**-**	0
0-25°	**0-45°**	Tool hand held

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	12,29	180,00	12,19	183,50	0,10	3,50
2	12,24	180,00	12,09	181,25	0,15	1,25
3	11,99	180,00	11,88	182,00	0,11	2,00
4	11,95	180,00	12,02	181,25	0,07	1,25
5	12,04	180,00	11,94	181,25	0,10	1,25
6	11,95	180,00	12,02	182,25	0,07	2,25
7	11,83	180,00	11,86	182,00	0,03	2,00
8	12,31	180,00	12,32	183,00	0,01	3,00
9	11,90	180,00	11,95	182,50	0,05	2,50
10	12,33	180,00	12,23	182,25	0,10	2,25
11	11,89	180,00	11,92	183,75	0,03	3,75
12	11,86	180,00	11,85	184,50	0,01	4,50
13	12,24	180,00	12,20	186,75	0,04	6,75
14	12,50	180,00	12,42	184,25	0,08	4,25
15	11,76	180,00	11,80	182,50	0,04	2,50
16	12,02	180,00	11,91	183,25	0,11	3,25
17	11,87	180,00	11,85	180,75	0,02	0,75
18	12,23	180,00	12,29	184,25	0,06	4,25
19	11,74	180,00	11,67	182,00	0,07	2,00
20	11,94	180,00	11,84	182,00	0,10	2,00
21	12,40	180,00	12,29	185,75	0,11	5,75
22	11,88	180,00	11,88	181,50	0,00	1,50
23	12,23	180,00	12,12	183,50	0,11	3,50
24	11,83	180,00	11,80	181,50	0,03	1,50
25	12,01	180,00	11,98	182,50	0,03	2,50
26	12,03	180,00	12,00	184,00	0,03	4,00
27	11,89	180,00	11,77	181,25	0,12	1,25
28	11,91	180,00	11,77	183,75	0,14	3,75
29	12,18	180,00	11,97	181,00	0,21	1,00
30	11,86	180,00	11,89	182,00	0,03	2,00
31	12,10	180,00	11,87	182,75	0,23	2,75
32	12,21	180,00	12,09	183,75	0,12	3,75
33	11,98	180,00	11,99	185,00	0,01	5,00
34	11,89	180,00	11,93	181,00	0,04	1,00
35	11,96	180,00	12,01	182,75	0,05	2,75
36	12,11	180,00	12,08	184,00	0,03	4,00
37	12,10	180,00	12,03	181,00	0,07	1,00
38	12,39	180,00	12,40	186,75	0,01	6,75
39	11,95	180,00	11,94	183,50	0,01	3,50
40	12,18	180,00	12,01	182,75	0,17	2,75
41	12,06	180,00	12,00	185,00	0,06	5,00
42	11,84	180,00	11,84	181,75	0,00	1,75
43	11,97	180,00	11,95	182,00	0,02	2,00
44	11,71	180,00	11,80	181,00	0,09	1,00
45	11,95	180,00	12,03	182,50	0,08	2,50
46	11,89	180,00	11,80	181,00	0,09	1,00
47	12,08	180,00	11,89	183,25	0,19	3,25
48	11,86	180,00	11,81	182,25	0,05	2,25
49	11,82	180,00	11,85	183,00	0,03	3,00
50	12,00	180,00	12,01	184,25	0,01	4,25
51	12,00	180,00	11,85	181,50	0,15	1,50
52	12,11	180,00	11,94	182,75	0,17	2,75
53	11,74	180,00	11,62	181,25	0,12	1,25
54	12,09	180,00	11,84	183,25	0,25	3,25
55	12,15	180,00	12,07	184,50	0,08	4,50
56	11,97	180,00	11,84	181,75	0,13	1,75
57	11,89	180,00	11,95	183,50	0,06	3,50
58	12,00	180,00	11,84	182,75	0,16	2,75
59	12,18	180,00	12,04	183,50	0,14	3,50
60	12,14	180,00	12,15	184,25	0,01	4,25
61	12,26	180,00	12,05	184,25	0,21	4,25
62	12,01	180,00	11,98	183,75	0,03	3,75
63	11,79	180,00	11,80	180,75	0,01	0,75
64	11,93	180,00	11,86	183,00	0,07	3,00
65	11,79	180,00	11,77	180,25	0,02	0,25
66	12,13	180,00	12,04	182,50	0,09	2,50
67	11,95	180,00	11,84	183,50	0,11	3,50
68	11,99	180,00	11,88	184,25	0,11	4,25
69	11,86	180,00	11,79	183,00	0,07	3,00
70	11,82	180,00	11,92	181,75	0,10	1,75
71	12,15	180,00	11,95	183,50	0,20	3,50
72	11,84	180,00	11,82	181,00	0,02	1,00
73	11,96	180,00	11,99	183,25	0,03	3,25
74	12,02	180,00	11,97	182,75	0,05	2,75
75	11,96	180,00	11,95	182,50	0,01	2,50
76	12,07	180,00	12,09	184,25	0,02	4,25
77	11,91	180,00	11,73	180,50	0,18	0,50
78	11,85	180,00	11,87	182,50	0,02	2,50
79	12,02	180,00	11,81	179,75	0,21	0,25
80	12,06	180,00	12,01	183,75	0,05	3,75
81	11,89	180,00	11,79	183,25	0,10	3,25
82	11,82	180,00	11,77	182,25	0,05	2,25
83	12,34	180,00	12,28	185,25	0,06	5,25
84	11,87	180,00	11,80	180,50	0,07	0,50
85	12,41	180,00	12,12	183,75	0,29	3,75
86	11,89	180,00	11,89	181,50	0,00	1,50
87	12,18	180,00	12,20	184,25	0,02	4,25
88	11,91	180,00	11,92	183,25	0,01	3,25
89	12,09	180,00	11,94	184,00	0,15	4,00
90	12,25	180,00	12,19	183,50	0,06	3,50
91	11,90	180,00	11,91	181,25	0,01	1,25
92	11,92	180,00	11,96	182,50	0,04	2,50
93	11,88	180,00	11,82	181,75	0,06	1,75
94	12,01	180,00	11,92	184,25	0,09	4,25
95	12,53	180,00	12,40	183,75	0,13	3,75
96	12,34	180,00	12,26	182,25	0,08	2,25
97	12,39	180,00	12,19	182,50	0,20	2,50
98	12,41	180,00	12,23	183,50	0,18	3,50
99	12,11	180,00	12,10	182,50	0,01	2,50
100	11,92	180,00	11,89	181,00	0,03	1,00
				Standard deviation:	**0,065**	**1,360**

Graphical representation

Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	





Machine Capability Study
Control System

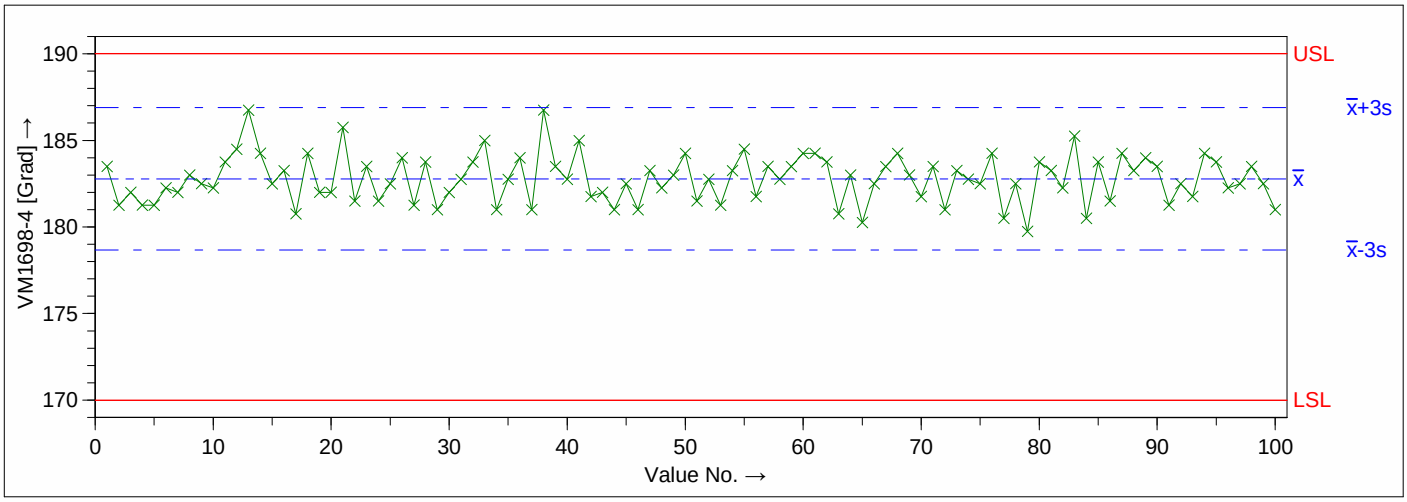
Page 1 / 1

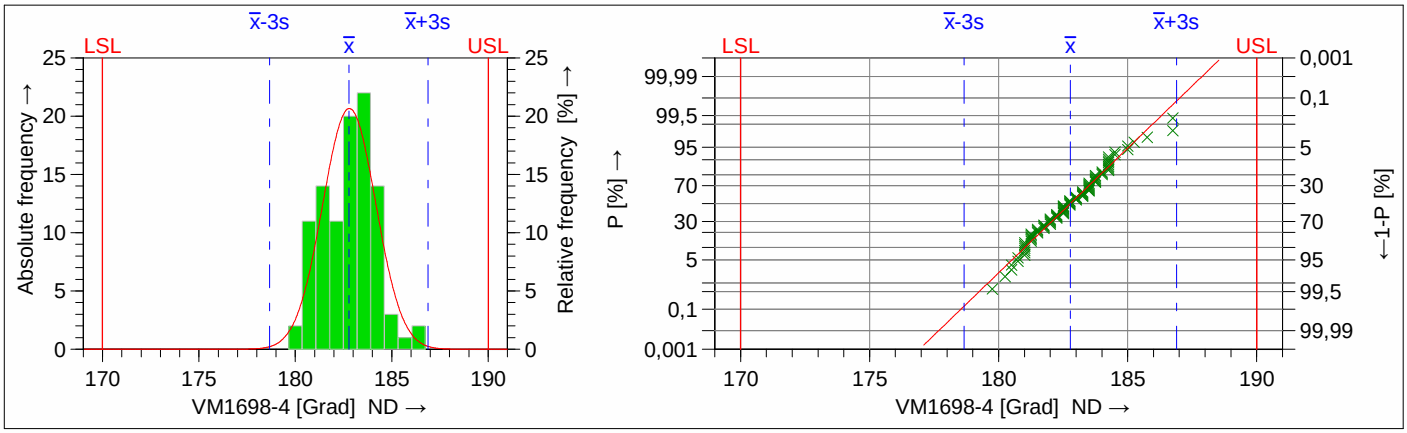
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_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 29.07.2022 13:47:49 to 29.07.2022 14:11:27

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.50 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	182.7775
LSL	170.00	x_{min}	179.75	$\bar{x}$-3s	178.6656
USL	190.00	x_{max}	186.75	$\bar{x}$+3s	186.8894
T	20.00	R	7.00	6s	8.2238
		$n_{<T>}$	100	$p_{<T>}$	99.99999 %
		$n_{>USL}$	0	$p_{>USL}$	0.00001%
		$n_{<LSL}$	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	2.43
Critical capability index	=	C_{mk}	1.76

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 29.07.2022

Serial No.	1019131_n	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 0 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	12,19	12,09	11,88	12,02	11,94	12,02	11,86	12,32	11,95	12,23
1024210	VM1698-4	Grad	183,50	181,25	182,00	181,25	181,25	182,25	182,00	183,00	182,50	182,25

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	11,92	11,85	12,20	12,42	11,80	11,91	11,85	12,29	11,67	11,84
1024210	VM1698-4	Grad	183,75	184,50	186,75	184,25	182,50	183,25	180,75	184,25	182,00	182,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	12,29	11,88	12,12	11,80	11,98	12,00	11,77	11,77	11,97	11,89
1024210	VM1698-4	Grad	185,75	181,50	183,50	181,50	182,50	184,00	181,25	183,75	181,00	182,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	11,87	12,09	11,99	11,93	12,01	12,08	12,03	12,40	11,94	12,01
1024210	VM1698-4	Grad	182,75	183,75	185,00	181,00	182,75	184,00	181,00	186,75	183,50	182,75

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	12,00	11,84	11,95	11,80	12,03	11,80	11,89	11,81	11,85	12,01
1024210	VM1698-4	Grad	185,00	181,75	182,00	181,00	182,50	181,00	183,25	182,25	183,00	184,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	11,85	11,94	11,62	11,84	12,07	11,84	11,95	11,84	12,04	12,15
1024210	VM1698-4	Grad	181,50	182,75	181,25	183,25	184,50	181,75	183,50	182,75	183,50	184,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	12,05	11,98	11,80	11,86	11,77	12,04	11,84	11,88	11,79	11,92
1024210	VM1698-4	Grad	184,25	183,75	180,75	183,00	180,25	182,50	183,50	184,25	183,00	181,75

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	11,95	11,82	11,99	11,97	11,95	12,09	11,73	11,87	11,81	12,01
1024210	VM1698-4	Grad	183,50	181,00	183,25	182,75	182,50	184,25	180,50	182,50	179,75	183,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 29.07.2022

Serial No.	1019131_n	Characteristic			
Part type	CTBAW153	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 0 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	11,79	11,77	12,28	11,80	12,12	11,89	12,20	11,92	11,94	12,19
1024210	VM1698-4	Grad	183,25	182,25	185,25	180,50	183,75	181,50	184,25	183,25	184,00	183,50

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,91	11,96	11,82	11,92	12,40	12,26	12,19	12,23	12,10	11,89
1024210	VM1698-4	Grad	181,25	182,50	181,75	184,25	183,75	182,25	182,50	183,50	182,50	181,00

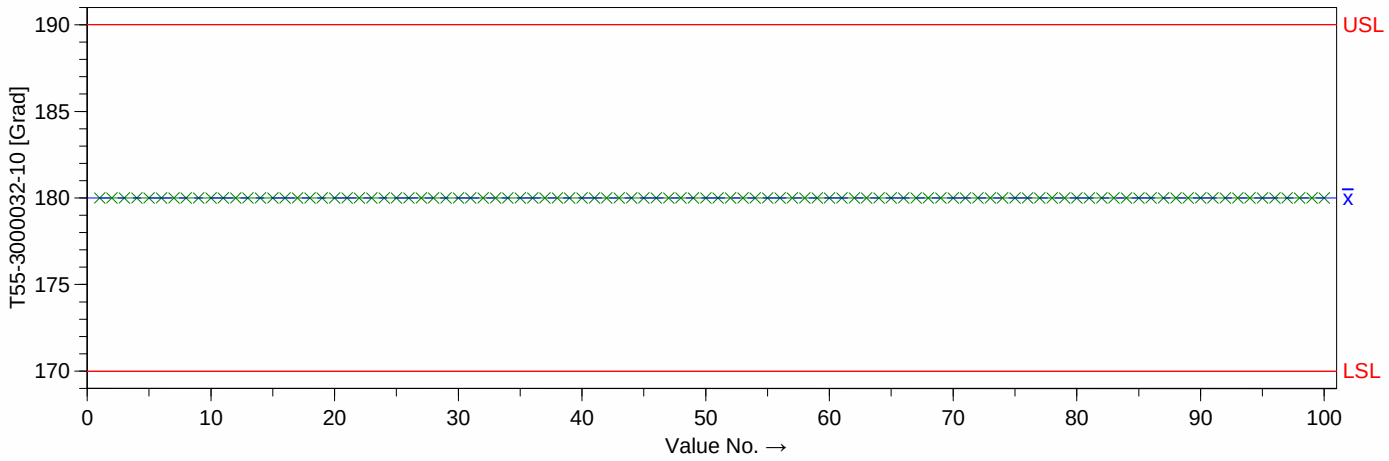
Machine Capability Study
Tool System

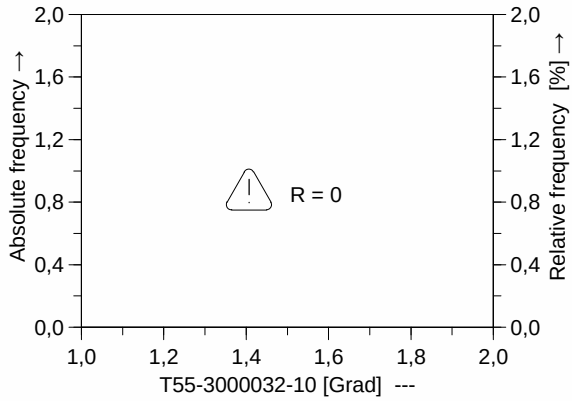
Plant	ATG Westhausen	Operator Name	Sünder
Date	29.07.2022		

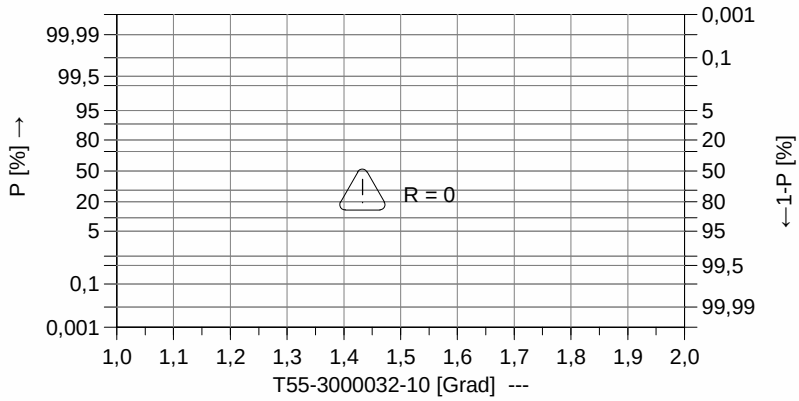
Ord. No.	CTBAW153	Part type	CTBAW153	Contr.item	yes
Serial No.	1019131_n	Char.Descr.	T55-3000032-10	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	191790	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 29.07.2022 13:47:49 to 29.07.2022 14:11:27

Rem. TQ 80% Angle 180° Gyro +/-10° * TQ-Cal.: 16.50 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 29.07.2022

Serial No.	1019131_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 0 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}
191790	T55-3000032-10	Nm	12,29	12,24	11,99	11,95	12,04	11,95	11,83	12,31	11,90	12,33
191790	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}
191790	T55-3000032-10	Nm	11,89	11,86	12,24	12,50	11,76	12,02	11,87	12,23	11,74	11,94
191790	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}
191790	T55-3000032-10	Nm	12,40	11,88	12,23	11,83	12,01	12,03	11,89	11,91	12,18	11,86
191790	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}
191790	T55-3000032-10	Nm	12,10	12,21	11,98	11,89	11,96	12,11	12,10	12,39	11,95	12,18
191790	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}
191790	T55-3000032-10	Nm	12,06	11,84	11,97	11,71	11,95	11,89	12,08	11,86	11,82	12,00
191790	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}
191790	T55-3000032-10	Nm	12,00	12,11	11,74	12,09	12,15	11,97	11,89	12,00	12,18	12,14
191790	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}
191790	T55-3000032-10	Nm	12,26	12,01	11,79	11,93	11,79	12,13	11,95	11,99	11,86	11,82
191790	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}
191790	T55-3000032-10	Nm	12,15	11,84	11,96	12,02	11,96	12,07	11,91	11,85	12,02	12,06
191790	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 29.07.2022

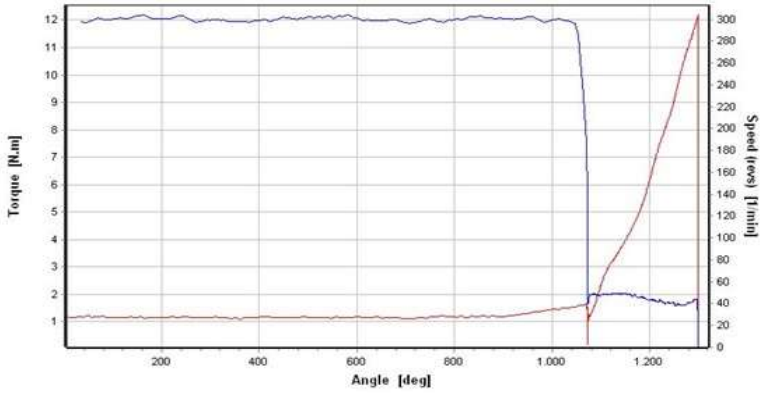
Serial No.	1019131_n	Characteristic			
Part type	CTBAW153	Char.Descr.	T55-3000032-10	Nom.val.	12,00
Ord. No.	CTBAW153	Serial No.	191790	LSL	11,16
				USL	12,84
Remark	TQ 80% Angle 180°Gyro +/-10°* TQ-Cal.: 16.5 0 Nm; Cur.-Cal.: 0.125 Nm/A; Speed: 300/50 rpm;				

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}
191790	T55-3000032-10	Nm	11,89	11,82	12,34	11,87	12,41	11,89	12,18	11,91	12,09	12,25
191790	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

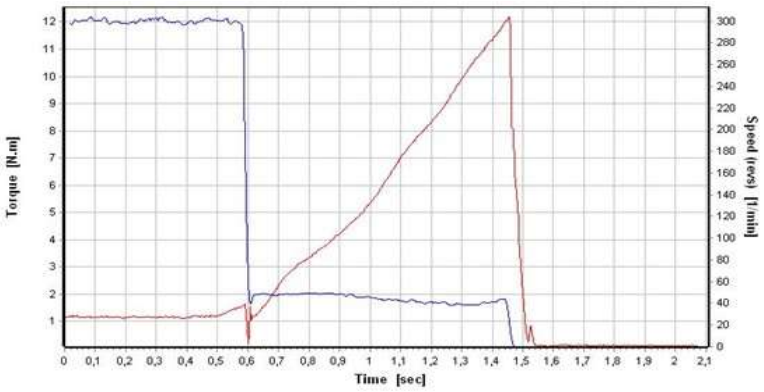
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
191790	T55-3000032-10	Nm	11,90	11,92	11,88	12,01	12,53	12,34	12,39	12,41	12,11	11,92
191790	T55-3000032-10	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

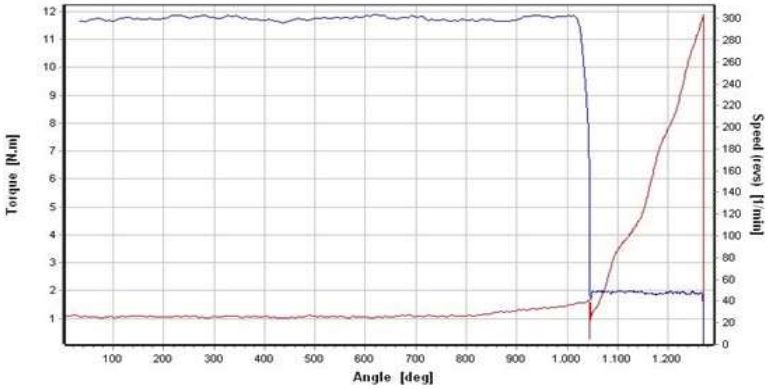
Model:	**CTBAW153**	Serial no:	**1019131**
Target torque:	**12,00 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool with angle correction	



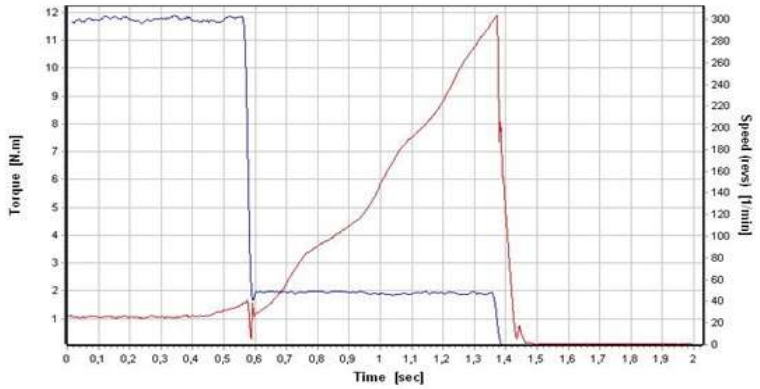
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed