Homologation

Fixtured Spindle

Model: 1BD-1B012A-1K3D-1VK3D

Serial no.: 755950

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Homologation: 1BD-1B012A-1K3D-1VK3D SN: 755950

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Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 50 rpm	1,6 %
Single-stage tightening system	☐	Speed 100 %	3152 rpm

Manufacturer: Apex Tool Group Serial no: **755950**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 5,00 Nm

Hard joint (H)	29,76 Nm / Revolution	Angle degree	30°
Soft joint (L)	2,46 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	4,65 - 5,35 Nm	4,65 - 5,35 Nm
	Tolerance down / up	7 %	7 %
	Average torque	4,96 Nm	4,92 Nm
	Standard deviation	0,02 Nm	0,03 Nm
	Torque scatter (99,73%)	0,13 Nm	0,16 Nm
	C_m	5,19	4,41
	C_{mk}	4,61	3,41

b)	Min. C_m hard/soft (lowest value)	4,41
	Min. C_{mk} hard/soft (lowest value)	3,41

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

Note:

Machine Capability Study
Control System

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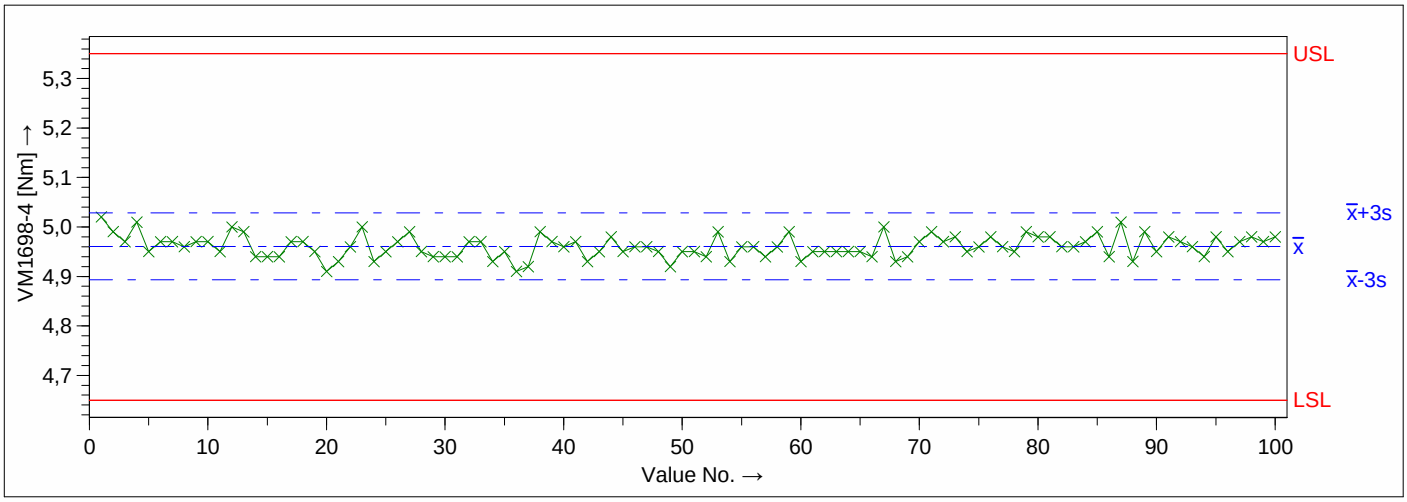
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

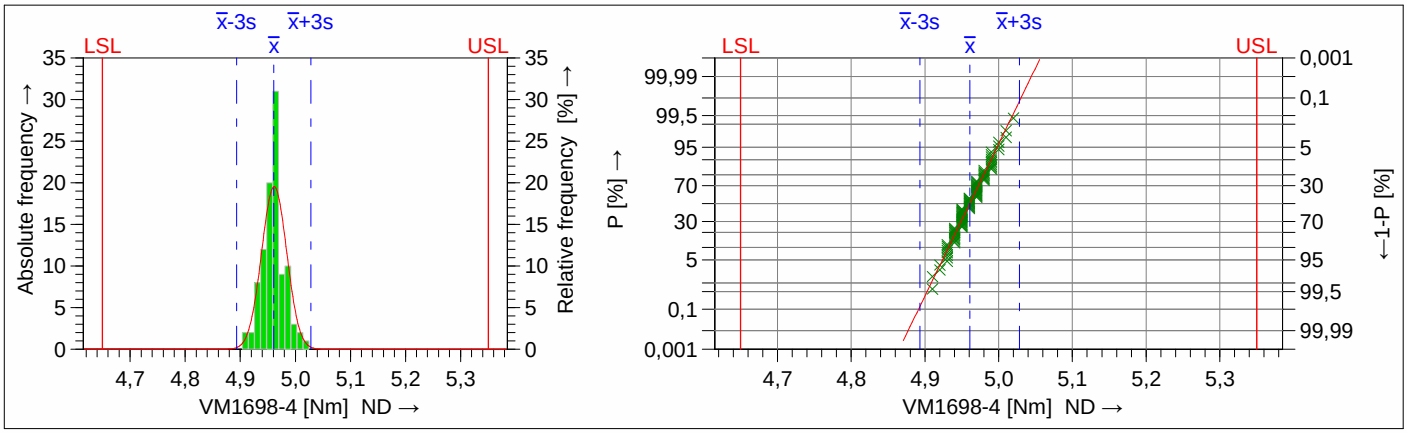
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_d	Char.Descr. VM1698-4	Nom.val.	5,00	0,35	USL 5,35
	Serial No. 1024210	Unit	Nm	-0,35	LSL 4,65
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

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

Evaluation from 14.06.2022 10:21:47 to 14.06.2022 10:35:36

Rem. TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			x̄	4.9608
LSL	4.65	x_{min}	4.91	x̄-3s	4.8934
USL	5.35	x_{max}	5.02	x̄+3s	5.0282
T	0.70	R	0.11	6s	0.1348
		$n_{<T>}$	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	5.19
Critical capability index	=	C_{mk}	4.61

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 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	5,02	4,99	4,97	5,01	4,95	4,97	4,97	4,96	4,97	4,97
1024210	VM1698-4	Grad	30,50	30,00	29,75	30,25	29,75	30,00	29,50	29,75	29,75	29,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	4,95	5,00	4,99	4,94	4,94	4,94	4,97	4,97	4,95	4,91
1024210	VM1698-4	Grad	29,50	31,00	30,25	29,50	29,25	29,50	30,00	29,50	29,75	28,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	4,93	4,96	5,00	4,93	4,95	4,97	4,99	4,95	4,94	4,94
1024210	VM1698-4	Grad	29,75	30,00	30,25	29,25	29,25	30,25	29,50	30,25	29,00	29,25

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	4,94	4,97	4,97	4,93	4,95	4,91	4,92	4,99	4,97	4,96
1024210	VM1698-4	Grad	29,25	29,50	29,50	29,25	29,75	30,25	29,75	31,25	30,50	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}
1024210	VM1698-4	Nm	4,97	4,93	4,95	4,98	4,95	4,96	4,96	4,95	4,92	4,95
1024210	VM1698-4	Grad	30,00	29,75	30,00	30,25	30,50	29,75	30,25	30,25	29,50	29,75

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	4,95	4,94	4,99	4,93	4,96	4,96	4,94	4,96	4,99	4,93
1024210	VM1698-4	Grad	30,00	30,00	30,75	30,00	29,75	30,25	30,25	29,75	30,50	30,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	4,95	4,95	4,95	4,95	4,95	4,94	5,00	4,93	4,94	4,97
1024210	VM1698-4	Grad	30,00	29,75	29,75	29,75	30,25	29,50	30,75	29,50	29,75	30,50

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	4,99	4,97	4,98	4,95	4,96	4,98	4,96	4,95	4,99	4,98
1024210	VM1698-4	Grad	30,50	30,25	30,50	30,00	30,50	30,50	30,25	30,00	30,50	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	4,98	4,96	4,96	4,97	4,99	4,94	5,01	4,93	4,99	4,95
1024210	VM1698-4	Grad	30,75	29,50	30,25	30,25	30,50	29,75	31,25	30,00	30,25	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}
1024210	VM1698-4	Nm	4,98	4,97	4,96	4,94	4,98	4,95	4,97	4,98	4,97	4,98
1024210	VM1698-4	Grad	30,00	30,25	29,75	30,00	30,25	29,50	29,75	31,00	30,00	30,25

Machine Capability Study
Tool System

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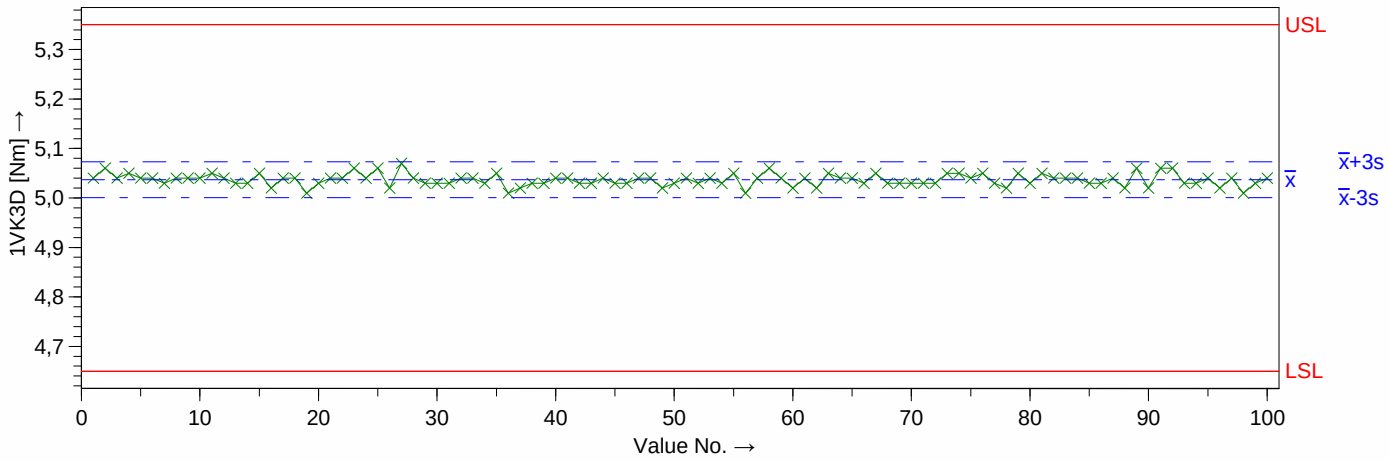
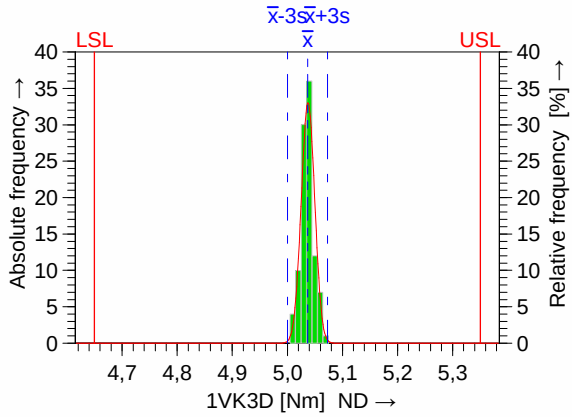
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

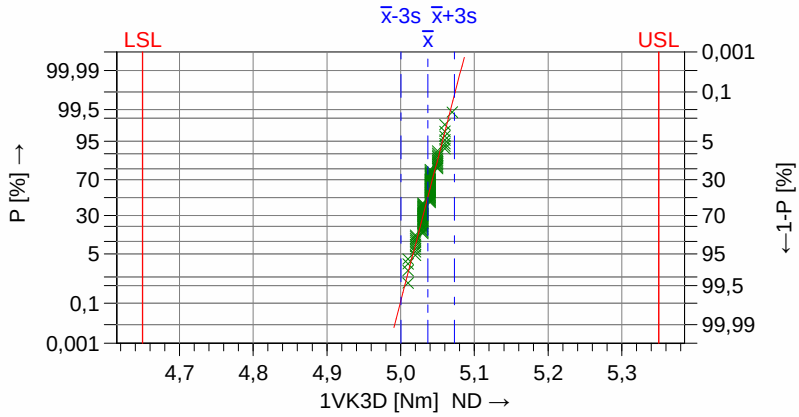
Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_d	Char.Descr.	1VK3D	Nom.val. 5,00 / 0,35	USL 5,35
		Serial No.	198081	Unit Nm / -0,35	LSL 4,65
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 14.06.2022 10:21:49 to 14.06.2022 10:35:36

Rem. TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0367
LSL	4.65	x_{min}	5.01	$\bar{x}$-3s	5.0005
USL	5.35	x_{max}	5.07	$\bar{x}$+3s	5.0729
T	0.70	R	0.06	6s	0.0724
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = s_{tot}
Potential Capability index	=	C_m	9.67
Critical capability index	=	C_{mk}	8.66

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_d1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	5,04	5,06	5,04	5,05	5,04	5,04	5,03	5,04	5,04	5,04
198081	1VK3D	Grad	31,00	30,00	30,00	31,00	30,00	30,00	30,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198081	1VK3D	Nm	5,05	5,04	5,03	5,03	5,05	5,02	5,04	5,04	5,01	5,03
198081	1VK3D	Grad	30,00	31,00	31,00	30,00	30,00	31,00	31,00	31,00	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}
198081	1VK3D	Nm	5,04	5,04	5,06	5,04	5,06	5,02	5,07	5,04	5,03	5,03
198081	1VK3D	Grad	31,00	31,00	31,00	30,00	30,00	31,00	31,00	31,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198081	1VK3D	Nm	5,03	5,04	5,04	5,03	5,05	5,01	5,02	5,03	5,03	5,04
198081	1VK3D	Grad	30,00	30,00	30,00	30,00	31,00	31,00	31,00	32,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198081	1VK3D	Nm	5,04	5,03	5,03	5,04	5,03	5,03	5,04	5,04	5,02	5,03
198081	1VK3D	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	30,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198081	1VK3D	Nm	5,04	5,03	5,04	5,03	5,05	5,01	5,04	5,06	5,04	5,02
198081	1VK3D	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	32,00	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}
198081	1VK3D	Nm	5,04	5,02	5,05	5,04	5,04	5,03	5,05	5,03	5,03	5,03
198081	1VK3D	Grad	31,00	31,00	31,00	30,00	31,00	30,00	32,00	30,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198081	1VK3D	Nm	5,03	5,03	5,05	5,05	5,04	5,05	5,03	5,02	5,05	5,03
198081	1VK3D	Grad	31,00	31,00	31,00	31,00	31,00	32,00	31,00	30,00	31,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	5,05	5,04	5,04	5,04	5,03	5,03	5,04	5,02	5,06	5,02
198081	1VK3D	Grad	31,00	30,00	31,00	31,00	32,00	31,00	33,00	31,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198081	1VK3D	Nm	5,06	5,06	5,03	5,03	5,04	5,02	5,04	5,01	5,03	5,04
198081	1VK3D	Grad	31,00	31,00	30,00	31,00	31,00	30,00	30,00	32,00	31,00	31,00

Machine Capability Study
Tool System

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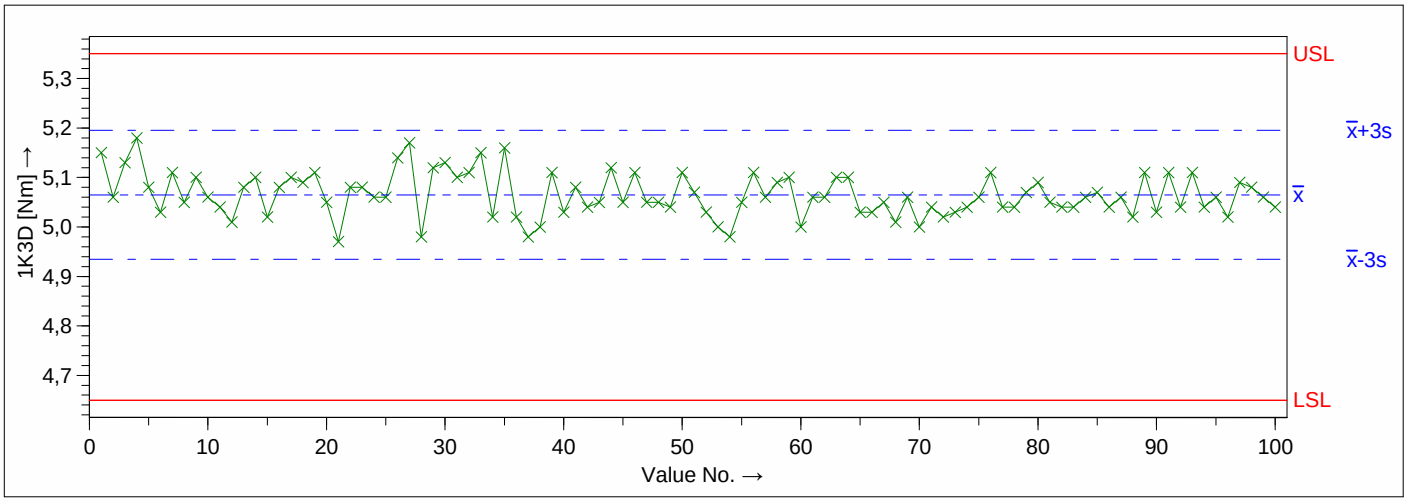
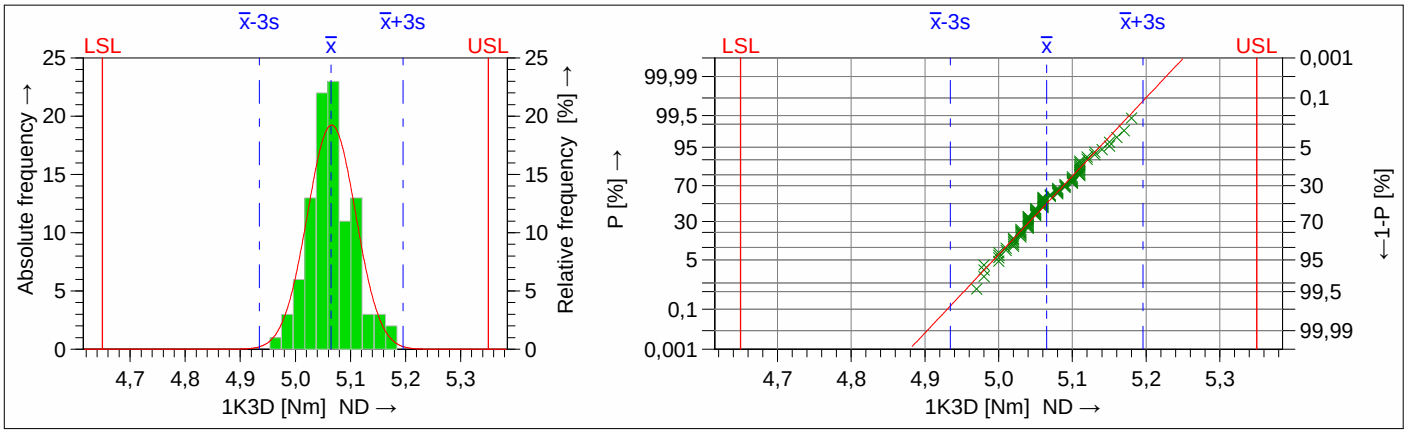
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_d	Char.Descr.	1K3D	Nom.val. 5,00 / 0,35	USL 5,35
		Serial No.	205496	Unit Nm / -0,35	LSL 4,65
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 14.06.2022 10:21:49 to 14.06.2022 10:35:37

Rem. TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0650
LSL	4.65	x_{min}	4.97	$\bar{x}$-3s	4.9344
USL	5.35	x_{max}	5.18	$\bar{x}$+3s	5.1956
T	0.70	R	0.21	6s	0.2613
		$n_{<T>}$	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	2.68
Critical capability index	=	C_{mk}	2.18

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_d2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	5,15	5,06	5,13	5,18	5,08	5,03	5,11	5,05	5,10	5,06
205496	1K3D	Grad	31,00	30,00	30,00	31,00	30,00	30,00	30,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
205496	1K3D	Nm	5,04	5,01	5,08	5,10	5,02	5,08	5,10	5,09	5,11	5,05
205496	1K3D	Grad	30,00	31,00	31,00	30,00	30,00	31,00	31,00	31,00	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}
205496	1K3D	Nm	4,97	5,08	5,08	5,06	5,06	5,14	5,17	4,98	5,12	5,13
205496	1K3D	Grad	31,00	31,00	31,00	30,00	30,00	31,00	31,00	31,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
205496	1K3D	Nm	5,10	5,11	5,15	5,02	5,16	5,02	4,98	5,00	5,11	5,03
205496	1K3D	Grad	30,00	30,00	30,00	30,00	31,00	31,00	31,00	32,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
205496	1K3D	Nm	5,08	5,04	5,05	5,12	5,05	5,11	5,05	5,05	5,04	5,11
205496	1K3D	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	30,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
205496	1K3D	Nm	5,07	5,03	5,00	4,98	5,05	5,11	5,06	5,09	5,10	5,00
205496	1K3D	Grad	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	32,00	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}
205496	1K3D	Nm	5,06	5,06	5,10	5,10	5,03	5,03	5,05	5,01	5,06	5,00
205496	1K3D	Grad	31,00	31,00	31,00	30,00	31,00	30,00	32,00	30,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
205496	1K3D	Nm	5,04	5,02	5,03	5,04	5,06	5,11	5,04	5,04	5,07	5,09
205496	1K3D	Grad	31,00	31,00	31,00	31,00	31,00	32,00	31,00	30,00	31,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_d	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	5,05	5,04	5,04	5,06	5,07	5,04	5,06	5,02	5,11	5,03
205496	1K3D	Grad	31,00	30,00	31,00	31,00	32,00	31,00	33,00	31,00	31,00	31,00

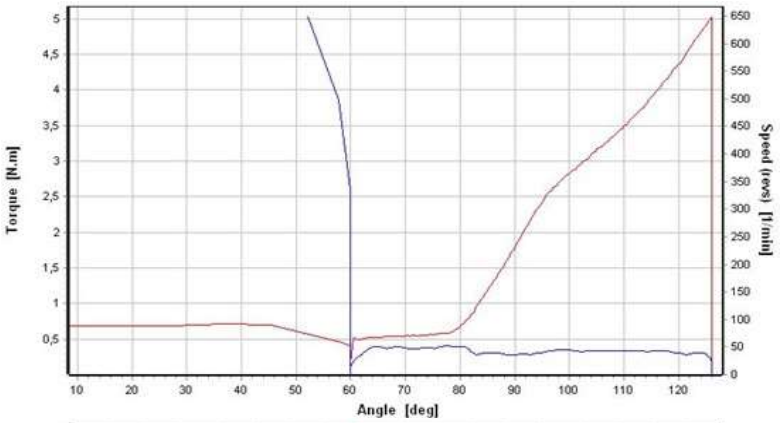
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	5,11	5,04	5,11	5,04	5,06	5,02	5,09	5,08	5,06	5,04
205496	1K3D	Grad	31,00	31,00	30,00	31,00	31,00	30,00	30,00	32,00	31,00	31,00

Torque graphs

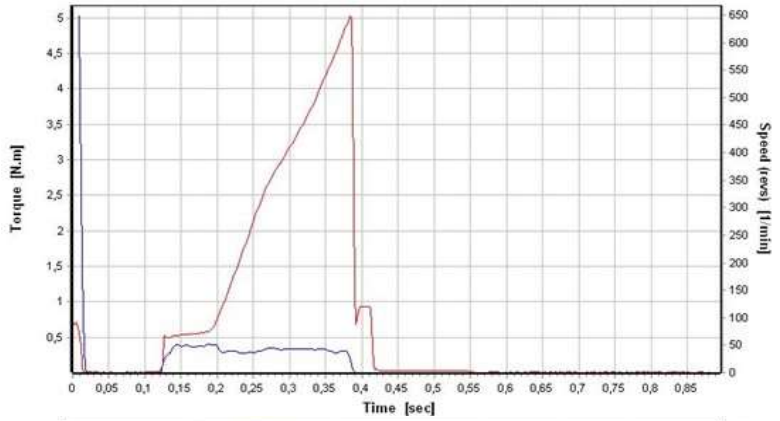
Machine Capability Study 30 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

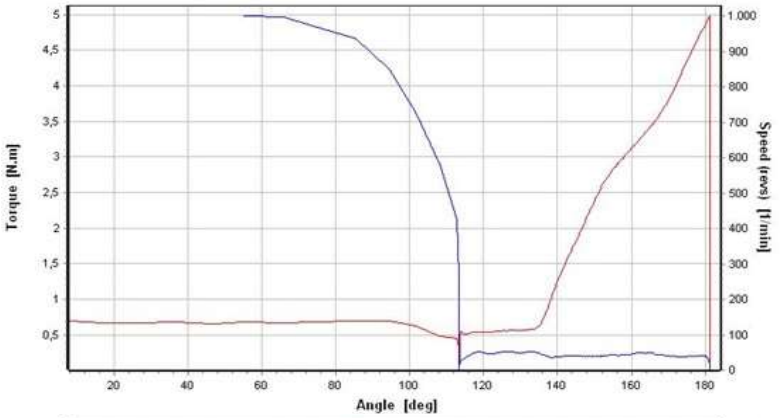
Angle degree: **30°**
Test torque: **5,0 Nm**



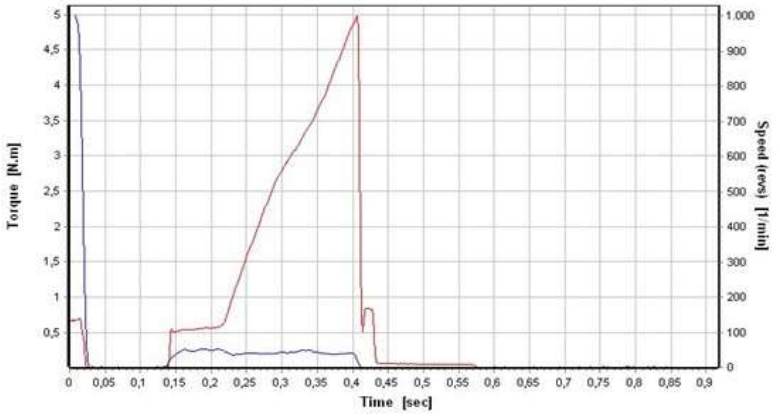
Value no. 1
Graph
Torque / Angle / Speed



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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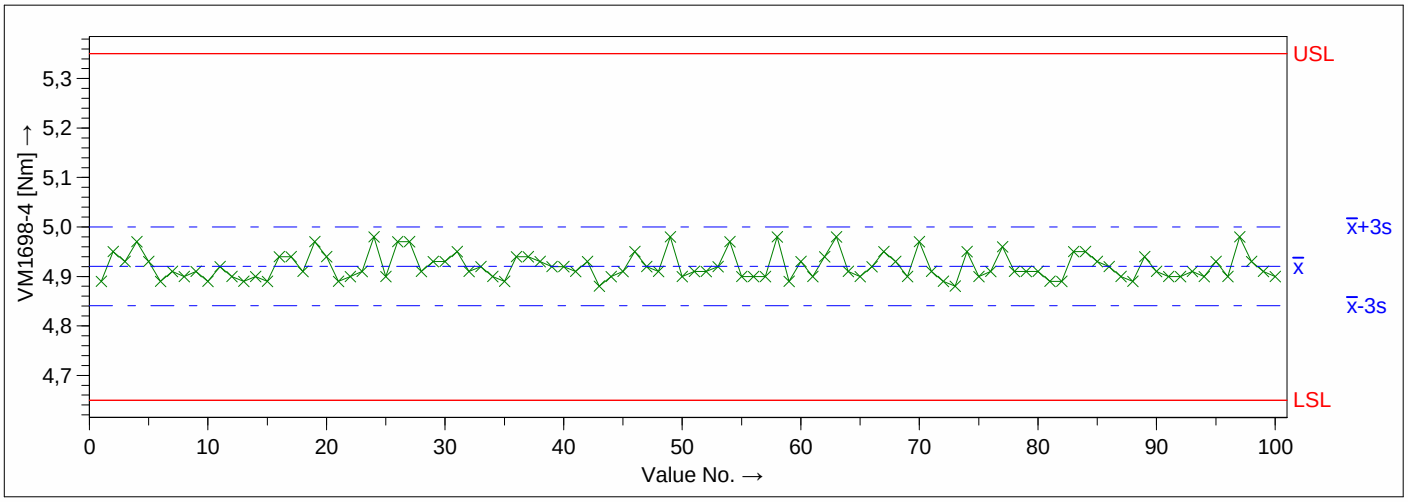
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

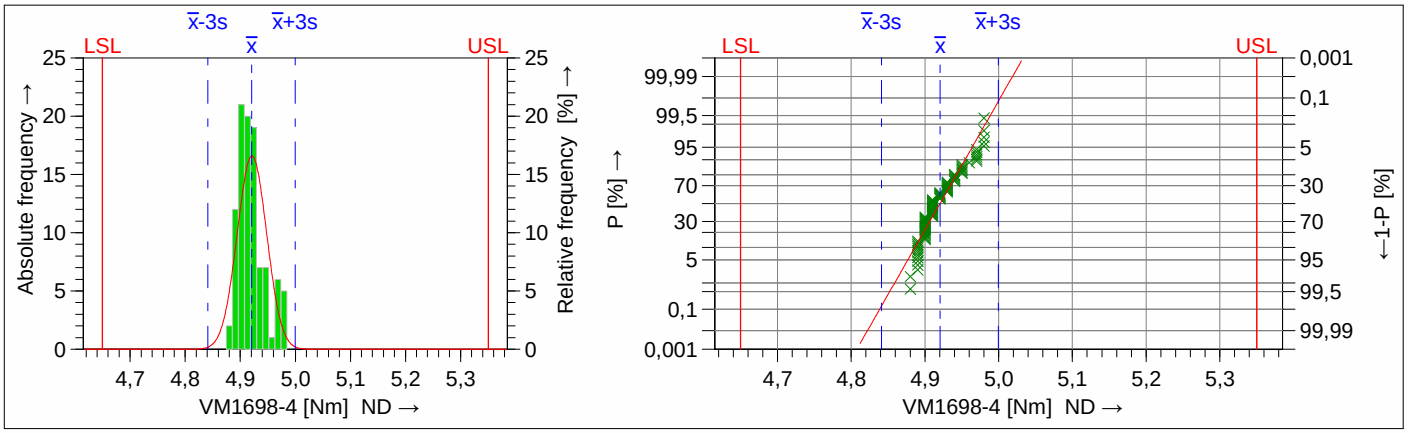
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_c	Char.Descr. VM1698-4	Nom.val.	5,00	0,35	USL 5,35
	Serial No. 1024210	Unit	Nm	-0,35	LSL 4,65
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

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

Evaluation from 14.06.2022 10:50:19 to 14.06.2022 11:08:28

Rem. TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	4.9204
LSL	4.65	x_{min}	4.88	$\bar{x}$-3s	4.8411
USL	5.35	x_{max}	4.98	$\bar{x}$+3s	4.9997
T	0.70	R	0.10	6s	0.1586
		$n_{<T>}$	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	4.41
Critical capability index	=	C_{mk}	3.41

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	4,89	4,95	4,93	4,97	4,93	4,89	4,91	4,90	4,91	4,89
1024210	VM1698-4	Grad	361,00	372,75	369,25	369,75	367,25	358,25	360,50	363,75	364,75	361,75

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	4,92	4,90	4,89	4,90	4,89	4,94	4,94	4,91	4,97	4,94
1024210	VM1698-4	Grad	366,75	363,50	364,00	364,25	368,50	367,25	367,75	360,00	375,50	371,25

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	4,89	4,90	4,91	4,98	4,90	4,97	4,97	4,91	4,93	4,93
1024210	VM1698-4	Grad	360,50	361,00	362,00	368,75	361,00	374,00	377,00	366,50	370,00	370,50

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	4,95	4,91	4,92	4,90	4,89	4,94	4,94	4,93	4,92	4,92
1024210	VM1698-4	Grad	370,75	359,00	358,25	355,00	356,00	363,75	363,00	357,75	354,75	360,50

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	4,91	4,93	4,88	4,90	4,91	4,95	4,92	4,91	4,98	4,90
1024210	VM1698-4	Grad	353,75	361,50	354,25	357,50	358,25	360,75	361,00	359,00	366,50	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}
1024210	VM1698-4	Nm	4,91	4,91	4,92	4,97	4,90	4,90	4,90	4,98	4,89	4,93
1024210	VM1698-4	Grad	356,75	357,25	360,00	369,25	353,50	353,75	353,75	363,50	357,75	364,25

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	4,90	4,94	4,98	4,91	4,90	4,92	4,95	4,93	4,90	4,97
1024210	VM1698-4	Grad	357,75	363,00	363,50	358,50	356,00	359,00	362,50	358,75	356,00	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	4,91	4,89	4,88	4,95	4,90	4,91	4,96	4,91	4,91	4,91
1024210	VM1698-4	Grad	356,75	353,75	350,75	367,25	365,50	355,75	365,00	358,00	359,00	357,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	4,89	4,89	4,95	4,95	4,93	4,92	4,90	4,89	4,94	4,91
1024210	VM1698-4	Grad	353,50	354,25	364,75	370,25	366,25	357,75	351,75	356,75	365,50	353,25

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	4,90	4,90	4,91	4,90	4,93	4,90	4,98	4,93	4,91	4,90
1024210	VM1698-4	Grad	350,25	361,75	359,00	359,50	367,25	360,50	377,50	364,00	363,50	360,75

Machine Capability Study
Tool System

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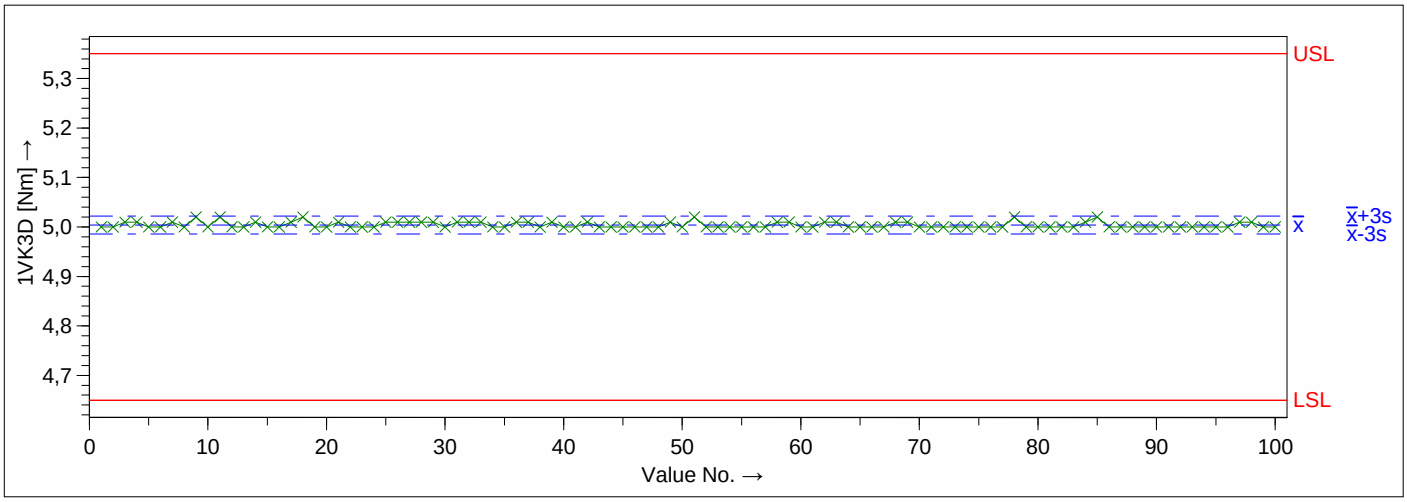
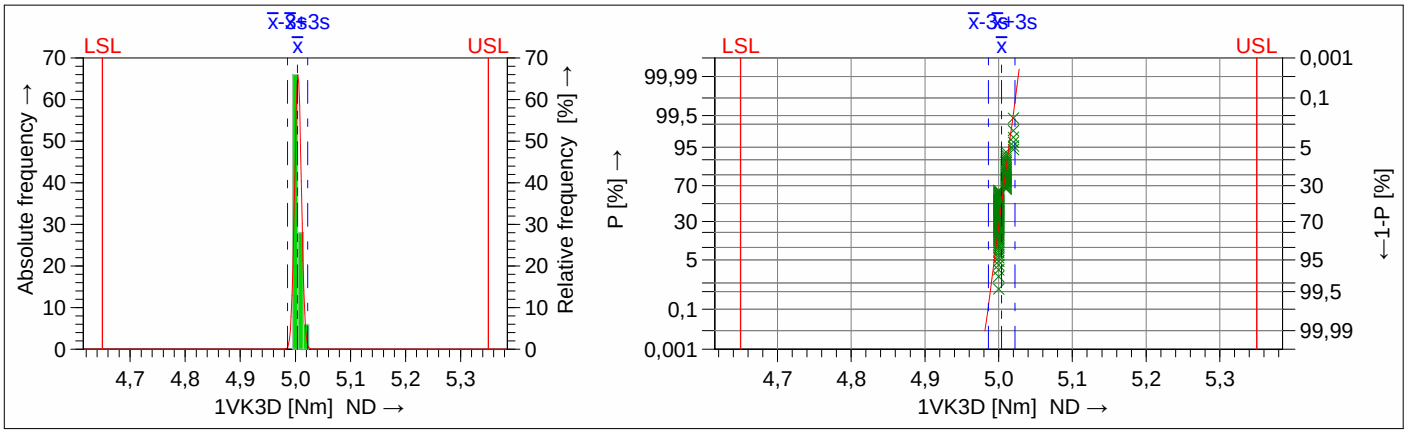
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_c	Char.Descr.	1VK3D	Nom.val. 5,00 / 0,35	USL 5,35
		Serial No.	198081	Unit Nm / -0,35	LSL 4,65
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 14.06.2022 10:50:20 to 14.06.2022 11:08:30

Rem. TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0040
LSL	4.65	x_{min}	5.00	$\bar{x}$-3s	4.9859
USL	5.35	x_{max}	5.02	$\bar{x}$+3s	5.0221
T	0.70	R	0.02	6s	0.0362
		$n_{<T>}$	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	19.35
Critical capability index	=	C_{mk}	19.13

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 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	5,00	5,00	5,01	5,01	5,00	5,00	5,01	5,00	5,02	5,00
198081	1VK3D	Grad	374,00	384,00	383,00	379,00	378,00	376,00	379,00	381,00	382,00	381,00

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}
198081	1VK3D	Nm	5,02	5,00	5,00	5,01	5,00	5,00	5,01	5,02	5,00	5,00
198081	1VK3D	Grad	384,00	379,00	379,00	379,00	385,00	382,00	380,00	377,00	386,00	383,00

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}
198081	1VK3D	Nm	5,01	5,00	5,00	5,00	5,01	5,01	5,01	5,01	5,01	5,00
198081	1VK3D	Grad	378,00	380,00	379,00	376,00	376,00	382,00	390,00	383,00	382,00	387,00

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}
198081	1VK3D	Nm	5,01	5,01	5,01	5,00	5,00	5,01	5,01	5,00	5,01	5,00
198081	1VK3D	Grad	380,00	373,00	375,00	367,00	369,00	377,00	377,00	373,00	366,00	375,00

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}
198081	1VK3D	Nm	5,00	5,01	5,00	5,00	5,00	5,00	5,00	5,00	5,01	5,00
198081	1VK3D	Grad	369,00	378,00	369,00	375,00	374,00	371,00	376,00	375,00	375,00	368,00

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}
198081	1VK3D	Nm	5,02	5,00	5,00	5,00	5,00	5,00	5,00	5,01	5,01	5,00
198081	1VK3D	Grad	375,00	369,00	373,00	380,00	370,00	368,00	368,00	373,00	377,00	378,00

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}
198081	1VK3D	Nm	5,00	5,01	5,01	5,00	5,00	5,00	5,00	5,01	5,01	5,00
198081	1VK3D	Grad	369,00	376,00	373,00	374,00	371,00	372,00	373,00	375,00	371,00	375,00

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}
198081	1VK3D	Nm	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,02	5,00	5,00
198081	1VK3D	Grad	370,00	373,00	368,00	377,00	381,00	369,00	374,00	370,00	373,00	371,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	5,00	5,00	5,00	5,01	5,02	5,00	5,00	5,00	5,00	5,00
198081	1VK3D	Grad	370,00	369,00	375,00	382,00	377,00	371,00	368,00	373,00	376,00	366,00

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}
198081	1VK3D	Nm	5,00	5,00	5,00	5,00	5,00	5,00	5,01	5,01	5,00	5,00
198081	1VK3D	Grad	365,00	375,00	375,00	370,00	377,00	378,00	389,00	377,00	377,00	378,00

Machine Capability Study
Tool System

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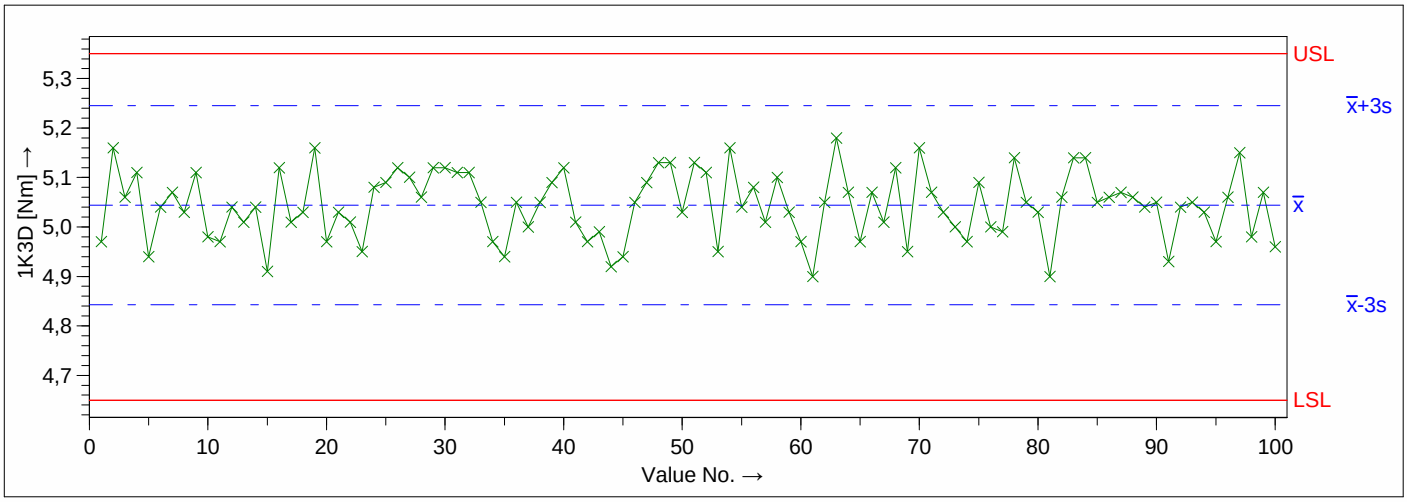
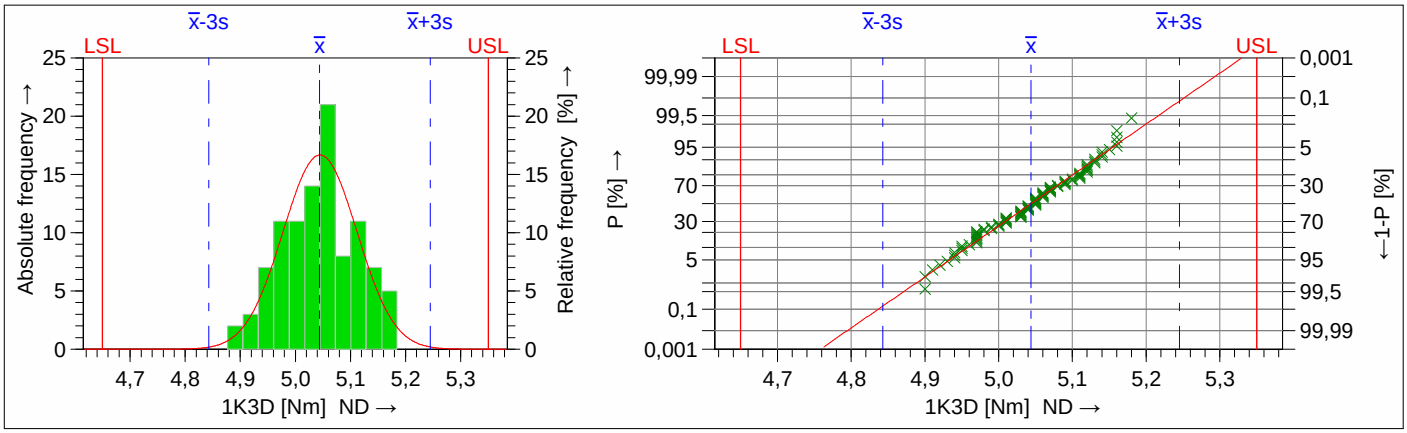
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_c	Char.Descr.	1K3D	Nom.val.	5,00 0,35
		Serial No.	205496	Unit	Nm -0,35
				USL	5,35
				LSL	4,65
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 14.06.2022 10:50:20 to 14.06.2022 11:08:30

Rem. TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0440
LSL	4.65	x_{min}	4.90	$\bar{x}$-3s	4.8430
USL	5.35	x_{max}	5.18	$\bar{x}$+3s	5.2450
T	0.70	R	0.28	6s	0.4021
		$n_{<T>}$	100	$p_{<T>}$	99.99975 %
		$n_{>USL}$	0	$p_{>USL}$	0.00025%
		$n_{<LSL}$	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	1.74
Critical capability index	=	C_{mk}	1.52

The requirements were not met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_c2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	4,97	5,16	5,06	5,11	4,94	5,04	5,07	5,03	5,11	4,98
205496	1K3D	Grad	374,00	384,00	383,00	379,00	378,00	376,00	379,00	381,00	382,00	381,00

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}
205496	1K3D	Nm	4,97	5,04	5,01	5,04	4,91	5,12	5,01	5,03	5,16	4,97
205496	1K3D	Grad	384,00	379,00	379,00	379,00	385,00	382,00	380,00	377,00	386,00	383,00

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}
205496	1K3D	Nm	5,03	5,01	4,95	5,08	5,09	5,12	5,10	5,06	5,12	5,12
205496	1K3D	Grad	378,00	380,00	379,00	376,00	376,00	382,00	390,00	383,00	382,00	387,00

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}
205496	1K3D	Nm	5,11	5,11	5,05	4,97	4,94	5,05	5,00	5,05	5,09	5,12
205496	1K3D	Grad	380,00	373,00	375,00	367,00	369,00	377,00	377,00	373,00	366,00	375,00

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}
205496	1K3D	Nm	5,01	4,97	4,99	4,92	4,94	5,05	5,09	5,13	5,13	5,03
205496	1K3D	Grad	369,00	378,00	369,00	375,00	374,00	371,00	376,00	375,00	375,00	368,00

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}
205496	1K3D	Nm	5,13	5,11	4,95	5,16	5,04	5,08	5,01	5,10	5,03	4,97
205496	1K3D	Grad	375,00	369,00	373,00	380,00	370,00	368,00	368,00	373,00	377,00	378,00

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}
205496	1K3D	Nm	4,90	5,05	5,18	5,07	4,97	5,07	5,01	5,12	4,95	5,16
205496	1K3D	Grad	369,00	376,00	373,00	374,00	371,00	372,00	373,00	375,00	371,00	375,00

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}
205496	1K3D	Nm	5,07	5,03	5,00	4,97	5,09	5,00	4,99	5,14	5,05	5,03
205496	1K3D	Grad	370,00	373,00	368,00	377,00	381,00	369,00	374,00	370,00	373,00	371,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_c	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	5,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	4,90	5,06	5,14	5,14	5,05	5,06	5,07	5,06	5,04	5,05
205496	1K3D	Grad	370,00	369,00	375,00	382,00	377,00	371,00	368,00	373,00	376,00	366,00

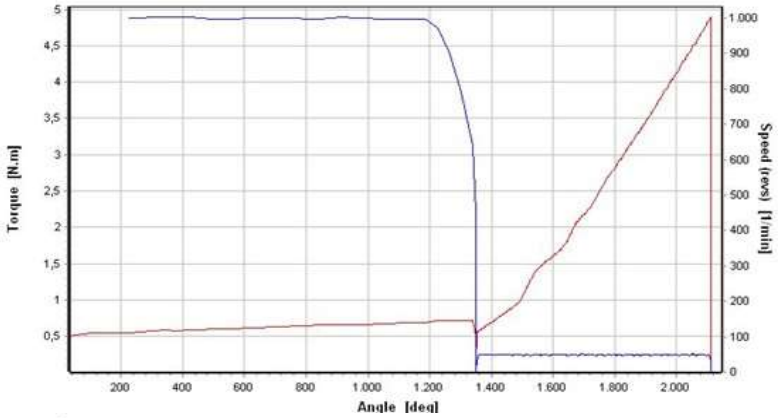
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	4,93	5,04	5,05	5,03	4,97	5,06	5,15	4,98	5,07	4,96
205496	1K3D	Grad	365,00	375,00	375,00	370,00	377,00	378,00	389,00	377,00	377,00	378,00

Torque graphs

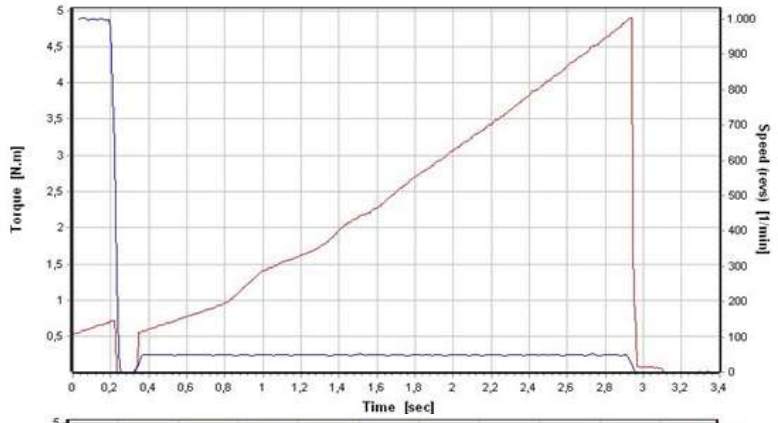
Machine Capability Study 30 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

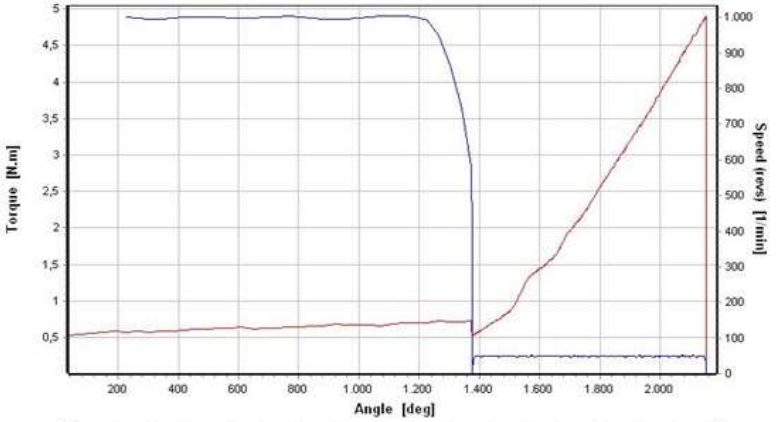
Angle degree: **360°**
Test torque: **5,0 Nm**



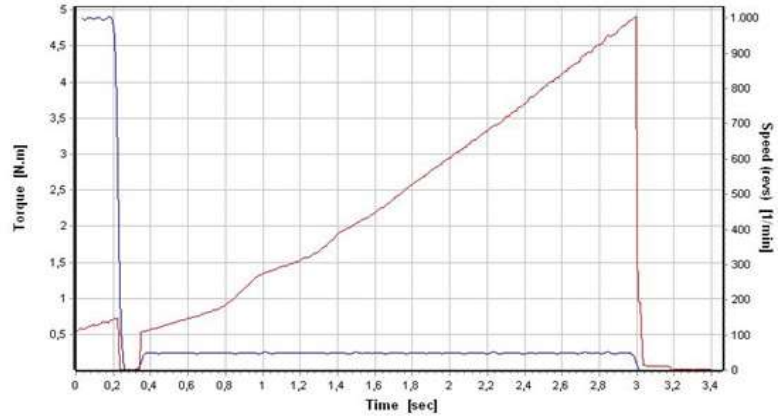
Value no. 1
Graph
Torque / Angle / Speed



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	1,6 %
Single-stage tightening system	☐	Speed 100 %	3152 rpm

Manufacturer: Apex Tool Group Serial no: **755950**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 10,00 Nm

Hard joint (H)	60,16	Nm / Revolution	Angle degree	30°
Soft joint (L)	4,96	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	9,30 - 10,70 Nm	9,30 - 10,70 Nm
	Tolerance down / up	7 %	7 %
	Average torque	10,03 Nm	9,93 Nm
	Standard deviation	0,04 Nm	0,03 Nm
	Torque scatter (99,73%)	0,22 Nm	0,20 Nm
	C_m	6,44	6,94
	C_{mk}	6,18	6,23

b)	Min. C_m hard/soft (lowest value)	6,44
	Min. C_{mk} hard/soft (lowest value)	6,18

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

Note:

Machine Capability Study
Control System

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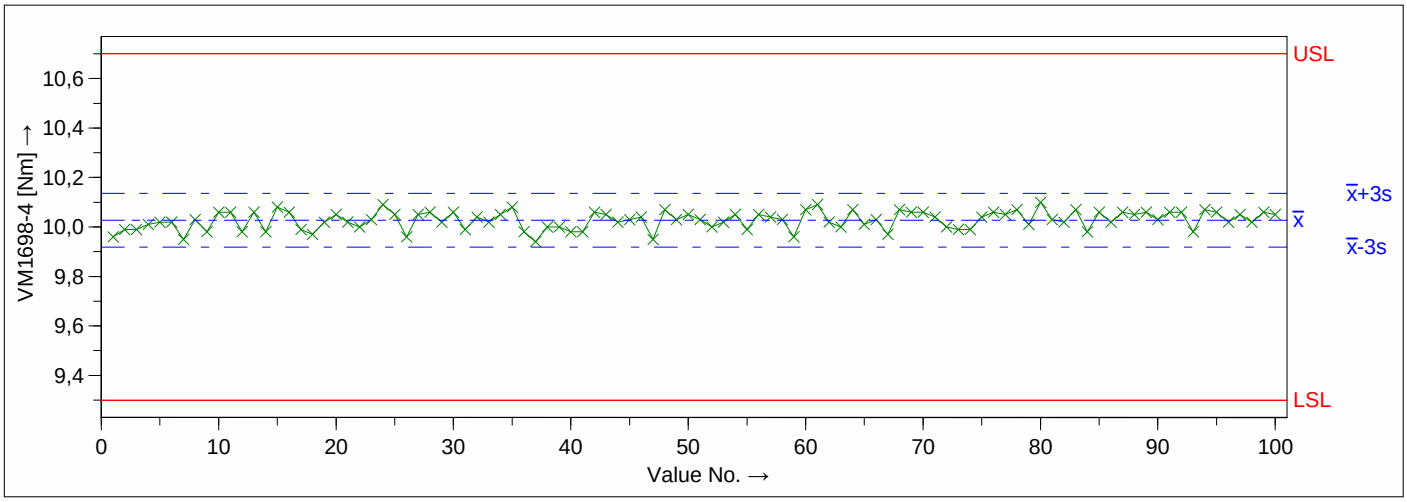
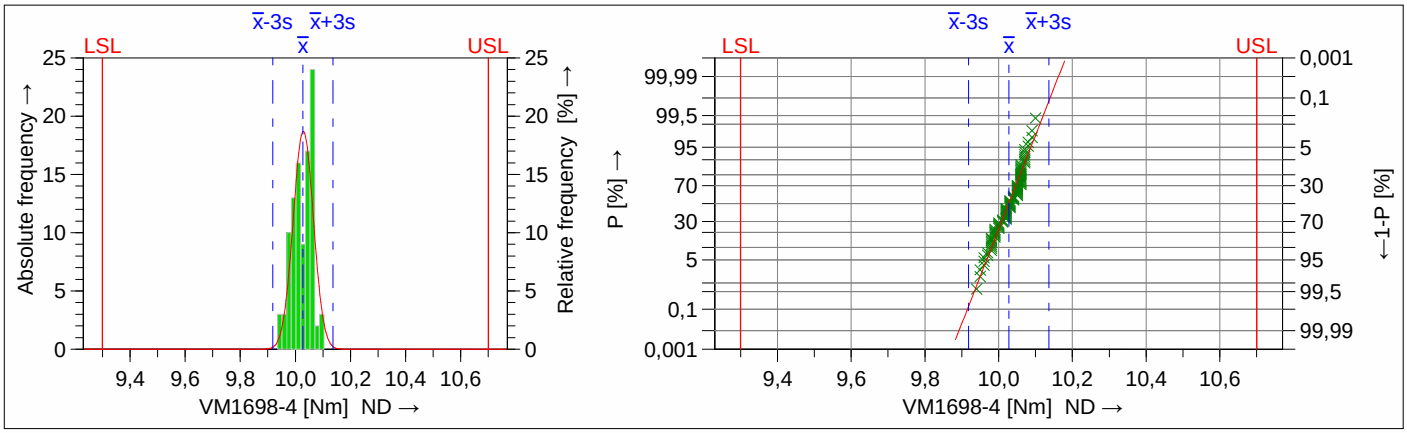
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_h	Char.Descr. VM1698-4	Nom.val.	10,00	0,70	USL 10,70
	Serial No. 1024210	Unit	Nm	-0,70	LSL 9,30
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 14.06.2022 08:55:14 to 14.06.2022 09:13:38

Rem. TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			x̄	10.0274
LSL	9.30	x_{min}	9.94	x̄-3s	9.9186
USL	10.70	x_{max}	10.10	x̄+3s	10.1362
T	1.40	R	0.16	6s	0.2175
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	6.44
Critical capability index	=	C_{mk}	6.18

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 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	9,96	9,99	9,99	10,01	10,02	10,02	9,95	10,03	9,98	10,06
1024210	VM1698-4	Grad	30,75	29,75	30,50	30,25	29,50	30,25	29,00	30,75	29,50	31,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	10,06	9,98	10,06	9,98	10,08	10,06	9,99	9,97	10,02	10,05
1024210	VM1698-4	Grad	30,50	31,50	31,00	31,00	31,00	30,75	29,50	30,25	29,50	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	10,02	10,00	10,03	10,09	10,05	9,96	10,05	10,06	10,02	10,06
1024210	VM1698-4	Grad	31,50	31,50	32,00	30,00	29,25	30,50	31,00	31,25	30,50	30,75

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	9,99	10,04	10,02	10,05	10,08	9,98	9,94	10,00	10,00	9,98
1024210	VM1698-4	Grad	29,25	31,50	30,75	31,00	30,75	29,50	29,75	30,25	30,50	30,50

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	9,98	10,06	10,05	10,02	10,03	10,04	9,95	10,07	10,03	10,05
1024210	VM1698-4	Grad	31,50	28,75	31,25	32,00	30,75	29,25	29,50	29,00	30,00	31,50

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	10,03	10,00	10,02	10,05	9,99	10,05	10,04	10,03	9,96	10,07
1024210	VM1698-4	Grad	30,25	29,50	29,00	29,25	30,50	28,75	29,25	30,00	29,75	31,50

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	10,09	10,02	10,00	10,07	10,01	10,03	9,97	10,07	10,06	10,06
1024210	VM1698-4	Grad	28,75	29,00	30,50	29,25	29,50	31,00	31,00	29,50	29,50	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	10,04	10,00	9,99	9,99	10,04	10,06	10,05	10,07	10,01	10,10
1024210	VM1698-4	Grad	30,00	29,75	30,00	30,75	29,50	31,00	29,50	31,50	31,50	30,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	10,03	10,02	10,07	9,98	10,06	10,02	10,06	10,05	10,06	10,03
1024210	VM1698-4	Grad	31,00	29,25	30,50	31,00	29,75	29,50	30,25	30,25	31,75	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	10,06	10,06	9,98	10,07	10,06	10,02	10,05	10,02	10,06	10,05
1024210	VM1698-4	Grad	29,75	29,00	28,75	31,25	30,25	31,25	29,50	30,00	31,25	29,00

Machine Capability Study
Tool System

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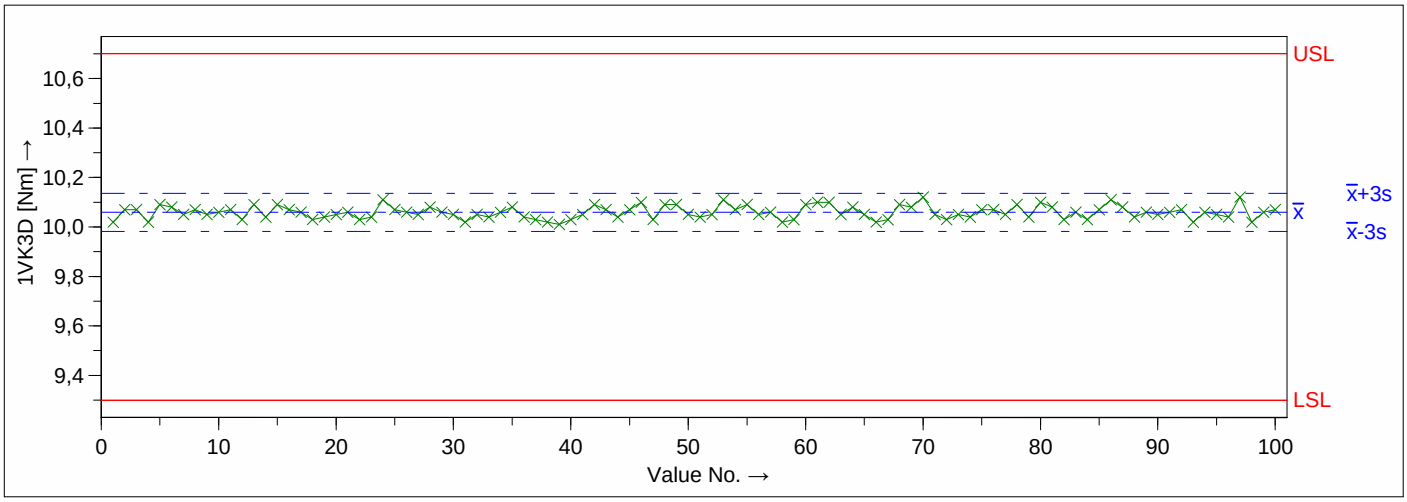
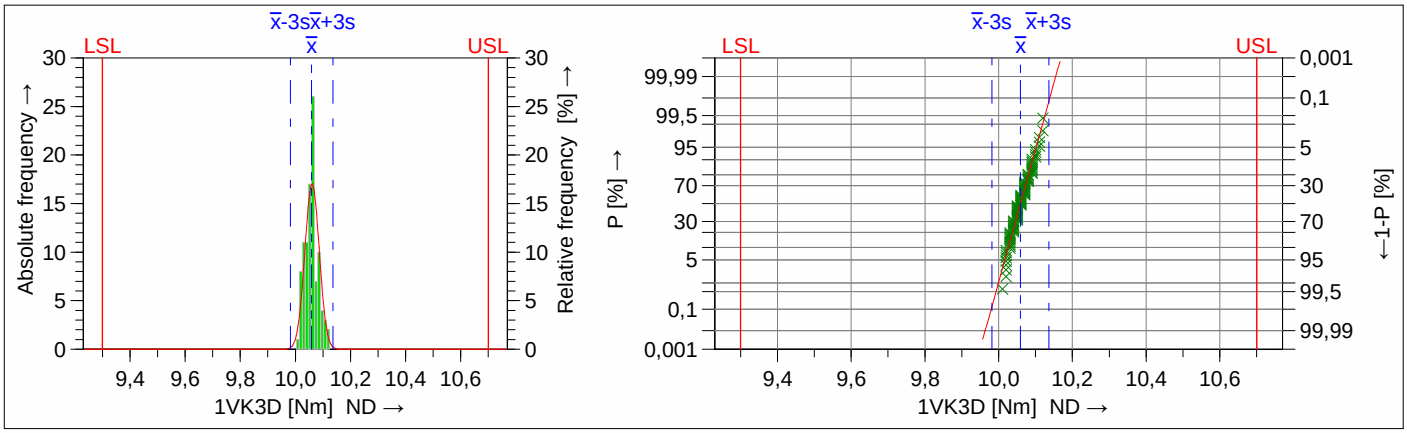
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_h	Char.Descr.	1VK3D	Nom.val. 10,00 / 0,70	USL 10,70
		Serial No.	198081	Unit Nm / -0,70	LSL 9,30
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 14.06.2022 08:55:17 to 14.06.2022 09:13:39

Rem. TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			x̄	10.0592
LSL	9.30	x_{min}	10.01	x̄-3s	9.9820
USL	10.70	x_{max}	10.12	x̄+3s	10.1364
T	1.40	R	0.11	6s	0.1544
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	9.07
Critical capability index	=	C_{mk}	8.30

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_h1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	10,02	10,07	10,07	10,02	10,09	10,08	10,05	10,07	10,05	10,06
198081	1VK3D	Grad	31,00	30,00	31,00	31,00	30,00	31,00	29,00	31,00	30,00	32,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198081	1VK3D	Nm	10,07	10,03	10,09	10,04	10,09	10,07	10,06	10,03	10,04	10,05
198081	1VK3D	Grad	31,00	32,00	32,00	32,00	32,00	31,00	30,00	31,00	30,00	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}
198081	1VK3D	Nm	10,06	10,03	10,04	10,11	10,07	10,06	10,05	10,08	10,06	10,05
198081	1VK3D	Grad	32,00	32,00	33,00	30,00	29,00	31,00	31,00	32,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198081	1VK3D	Nm	10,02	10,05	10,04	10,06	10,08	10,04	10,03	10,02	10,01	10,03
198081	1VK3D	Grad	29,00	32,00	31,00	32,00	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}
198081	1VK3D	Nm	10,05	10,09	10,07	10,04	10,07	10,10	10,03	10,09	10,09	10,05
198081	1VK3D	Grad	32,00	29,00	32,00	32,00	31,00	30,00	30,00	29,00	30,00	32,00

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}
198081	1VK3D	Nm	10,04	10,05	10,11	10,07	10,09	10,05	10,06	10,02	10,03	10,09
198081	1VK3D	Grad	31,00	30,00	29,00	30,00	31,00	29,00	30,00	30,00	30,00	32,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198081	1VK3D	Nm	10,10	10,10	10,05	10,08	10,05	10,02	10,03	10,09	10,08	10,12
198081	1VK3D	Grad	30,00	30,00	31,00	30,00	30,00	31,00	31,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198081	1VK3D	Nm	10,05	10,03	10,05	10,04	10,07	10,07	10,05	10,09	10,04	10,10
198081	1VK3D	Grad	30,00	30,00	31,00	31,00	30,00	31,00	29,00	32,00	32,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	10,08	10,03	10,06	10,03	10,07	10,11	10,08	10,04	10,06	10,05
198081	1VK3D	Grad	31,00	30,00	31,00	31,00	30,00	30,00	30,00	32,00	32,00	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}
198081	1VK3D	Nm	10,06	10,07	10,02	10,06	10,05	10,04	10,12	10,02	10,06	10,07
198081	1VK3D	Grad	30,00	29,00	29,00	31,00	31,00	31,00	30,00	31,00	32,00	30,00

Machine Capability Study
Tool System

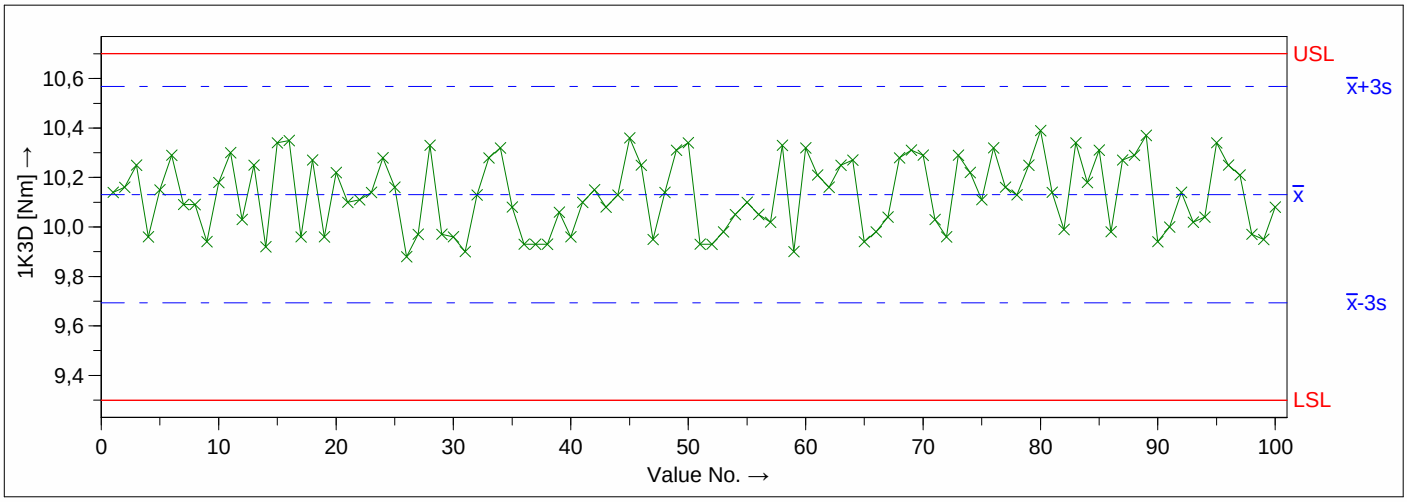
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

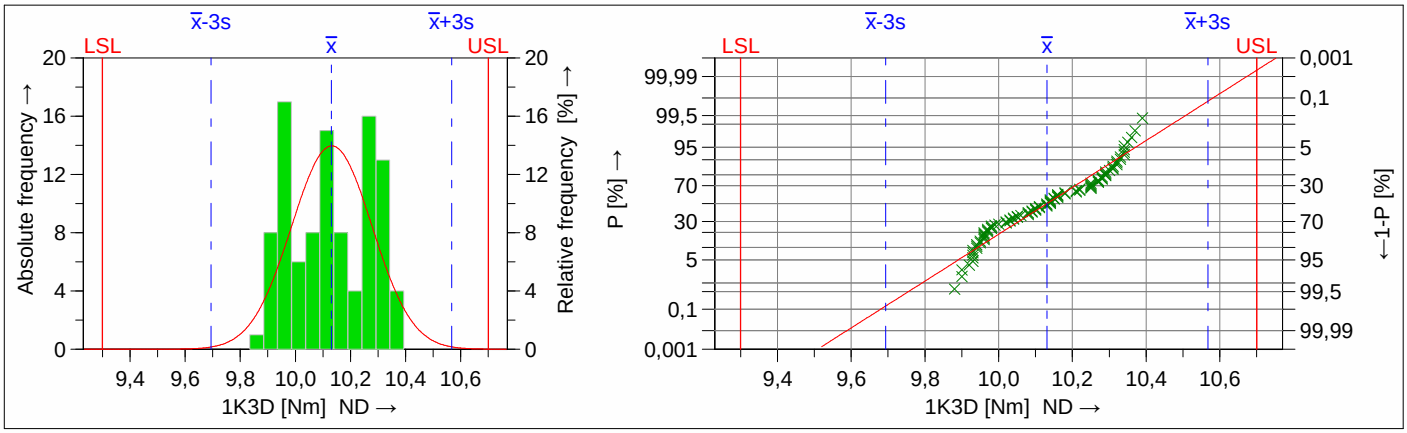
Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_h	Char.Descr.	1K3D	Nom.val.	10,00
		Serial No.	205496	Unit	Nm
				USL	10,70
				LSL	9,30
Char.Type	variable	Tolerance value	7 %	Decimal Pl.	2

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

Evaluation from 14.06.2022 08:55:17 to 14.06.2022 09:13:39

Rem. TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			x̄	10.1309
LSL	9.30	x_{min}	9.88	x̄-3s	9.6936
USL	10.70	x_{max}	10.39	x̄+3s	10.5682
T	1.40	R	0.51	6s	0.8745
		$n_{<T>}$	100	$p_{<T>}$	99.99528 %
		$n_{>USL}$	0	$p_{>USL}$	0.00472%
		$n_{<LSL}$	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	1.60
Critical capability index	=	C_{mk}	1.30

The requirements were not met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	10,14	10,16	10,25	9,96	10,15	10,29	10,09	10,09	9,94	10,18
205496	1K3D	Grad	31,00	30,00	31,00	31,00	30,00	31,00	29,00	31,00	30,00	32,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
205496	1K3D	Nm	10,30	10,03	10,25	9,92	10,34	10,35	9,96	10,27	9,96	10,22
205496	1K3D	Grad	31,00	32,00	32,00	32,00	32,00	31,00	30,00	31,00	30,00	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}
205496	1K3D	Nm	10,10	10,11	10,14	10,28	10,16	9,88	9,97	10,33	9,97	9,96
205496	1K3D	Grad	32,00	32,00	33,00	30,00	29,00	31,00	31,00	32,00	31,00	31,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
205496	1K3D	Nm	9,90	10,13	10,28	10,32	10,08	9,93	9,93	9,93	10,06	9,96
205496	1K3D	Grad	29,00	32,00	31,00	32,00	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}
205496	1K3D	Nm	10,10	10,15	10,08	10,13	10,36	10,25	9,95	10,14	10,31	10,34
205496	1K3D	Grad	32,00	29,00	32,00	32,00	31,00	30,00	30,00	29,00	30,00	32,00

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}
205496	1K3D	Nm	9,93	9,93	9,98	10,05	10,10	10,05	10,02	10,33	9,90	10,32
205496	1K3D	Grad	31,00	30,00	29,00	30,00	31,00	29,00	30,00	30,00	30,00	32,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
205496	1K3D	Nm	10,21	10,16	10,25	10,27	9,94	9,98	10,04	10,28	10,31	10,29
205496	1K3D	Grad	30,00	30,00	31,00	30,00	30,00	31,00	31,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
205496	1K3D	Nm	10,03	9,96	10,29	10,22	10,11	10,32	10,16	10,13	10,25	10,39
205496	1K3D	Grad	30,00	30,00	31,00	31,00	30,00	31,00	29,00	32,00	32,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_h	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	10,14	9,99	10,34	10,18	10,31	9,98	10,27	10,29	10,37	9,94
205496	1K3D	Grad	31,00	30,00	31,00	31,00	30,00	30,00	30,00	32,00	32,00	29,00

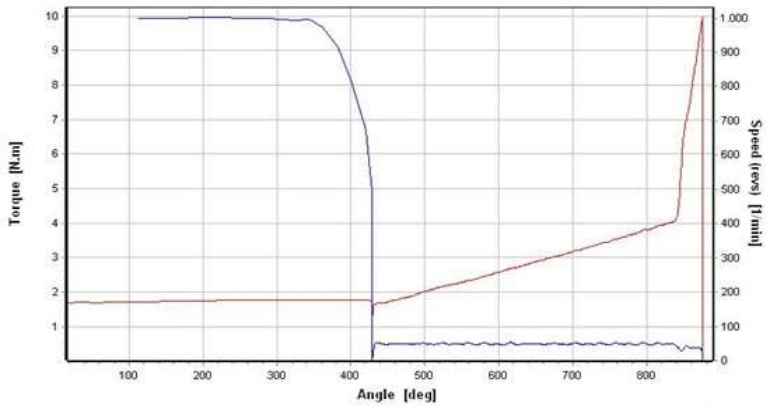
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	10,00	10,14	10,02	10,04	10,34	10,25	10,21	9,97	9,95	10,08
205496	1K3D	Grad	30,00	29,00	29,00	31,00	31,00	31,00	30,00	31,00	32,00	30,00

Torque graphs

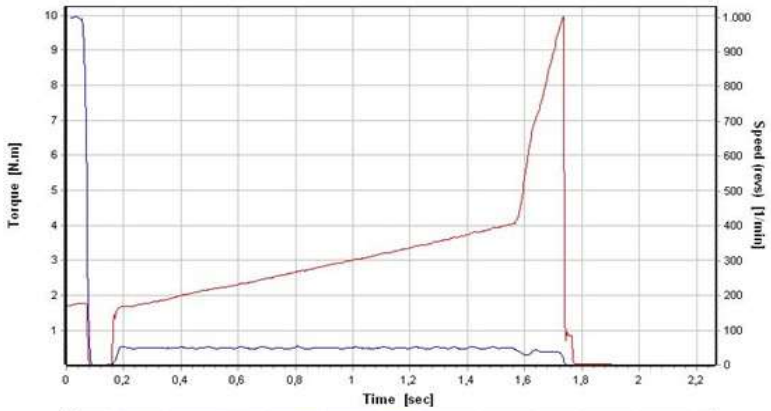
Machine Capability Study 80 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

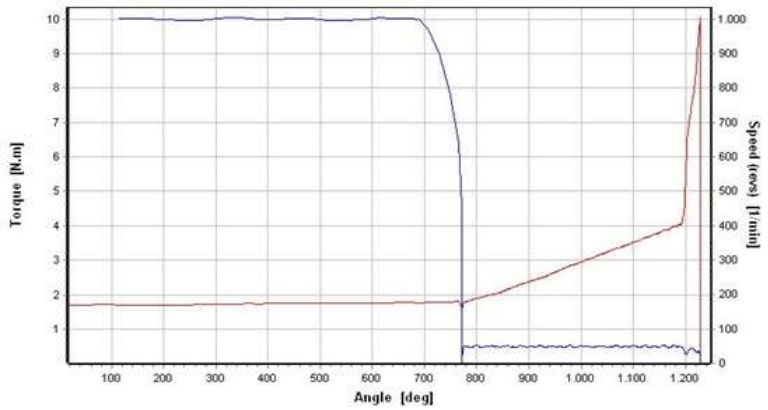
Angle degree: **30°**
Test torque: **10,0 Nm**



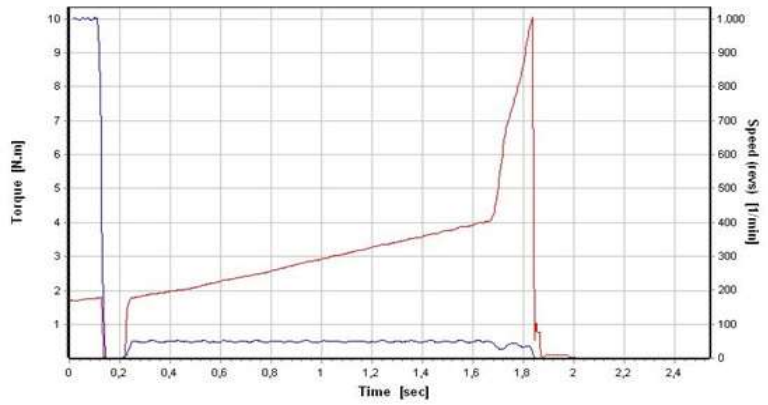
Value no. 1
Graph
Torque / Angle / Speed



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

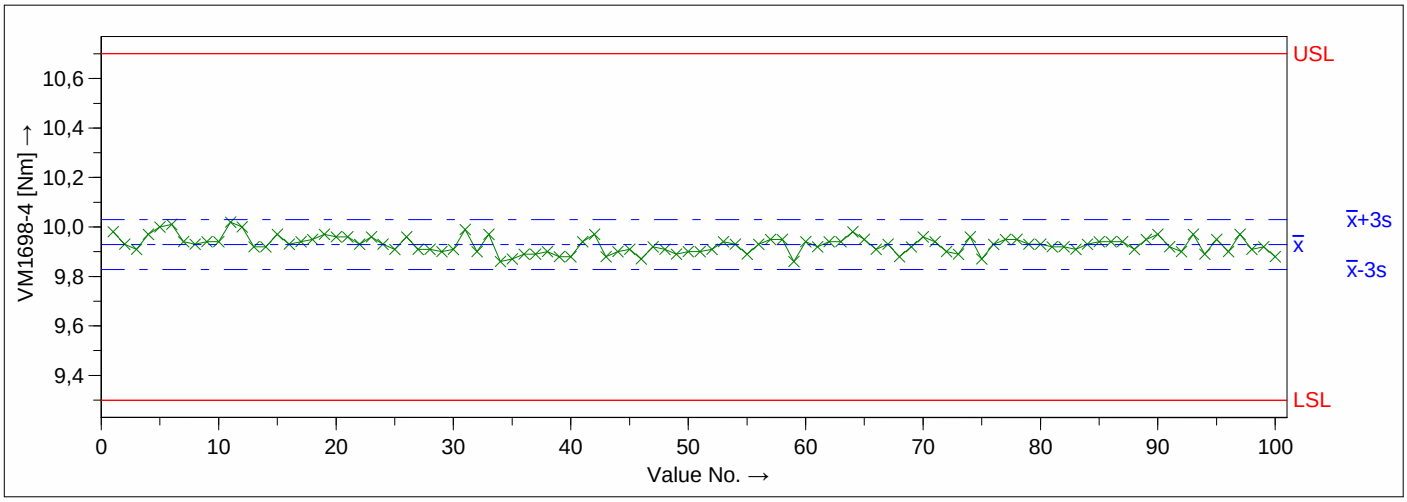
Cleco Production Tools

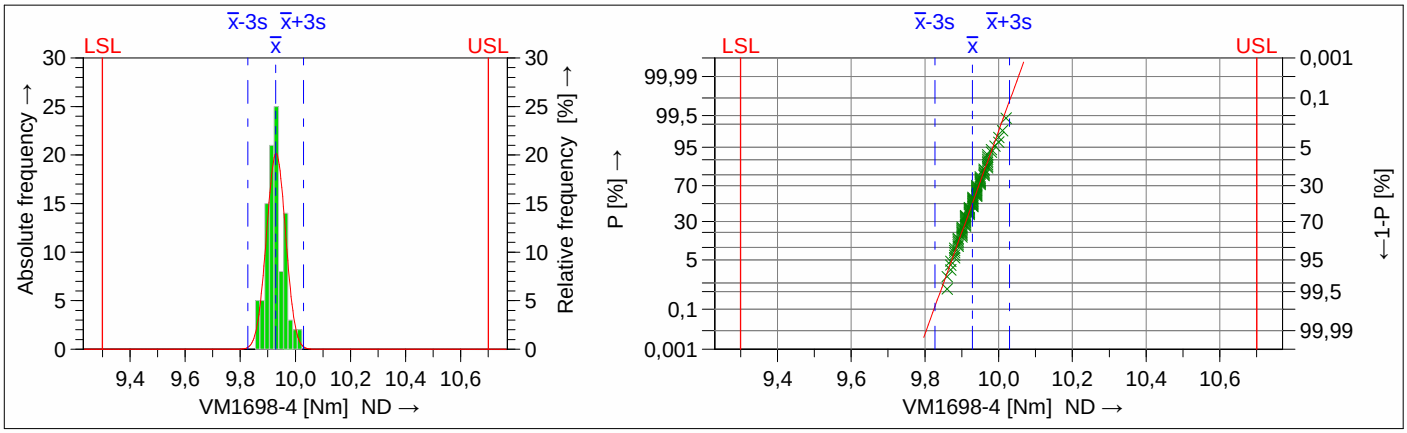
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_g	Char.Descr.	VM1698-4	Nom.val. 10,00 / 0,70	USL 10,70
		Serial No.	1024210	Unit Nm / -0,70	LSL 9,30
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 14.06.2022 09:20:35 to 14.06.2022 09:56:35

Rem. TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	9.9285
LSL	9.30	x_{min}	9.86	$\bar{x}$-3s	9.8277
USL	10.70	x_{max}	10.02	$\bar{x}$+3s	10.0293
T	1.40	R	0.16	6s	0.2017
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	6.94
Critical capability index	=	C_{mk}	6.23

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	9,98	9,93	9,91	9,97	10,00	10,01	9,94	9,93	9,94	9,94
1024210	VM1698-4	Grad	366,50	364,75	357,75	361,75	364,25	367,50	361,50	360,50	360,25	361,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	10,02	10,00	9,92	9,92	9,97	9,93	9,94	9,95	9,97	9,96
1024210	VM1698-4	Grad	371,00	375,50	367,75	361,75	361,00	349,25	358,25	355,75	357,25	357,50

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	9,96	9,93	9,96	9,93	9,91	9,96	9,91	9,91	9,90	9,91
1024210	VM1698-4	Grad	359,25	360,25	361,00	360,25	358,00	362,75	361,75	348,00	357,50	355,00

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	9,99	9,90	9,97	9,86	9,87	9,89	9,89	9,90	9,88	9,88
1024210	VM1698-4	Grad	364,75	357,50	362,00	352,50	351,00	357,25	357,50	353,50	354,75	347,25

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	9,94	9,97	9,88	9,90	9,91	9,87	9,92	9,91	9,89	9,90
1024210	VM1698-4	Grad	358,75	357,25	349,50	353,75	350,50	353,25	364,75	360,75	363,00	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}
1024210	VM1698-4	Nm	9,90	9,91	9,94	9,93	9,89	9,93	9,95	9,95	9,86	9,94
1024210	VM1698-4	Grad	364,25	358,50	367,25	368,00	362,00	370,50	369,50	369,00	354,75	361,50

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	9,92	9,94	9,94	9,98	9,95	9,91	9,93	9,88	9,92	9,96
1024210	VM1698-4	Grad	364,50	363,00	367,75	359,25	357,75	351,00	356,75	352,25	356,75	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}
1024210	VM1698-4	Nm	9,94	9,90	9,89	9,96	9,87	9,93	9,95	9,95	9,93	9,93
1024210	VM1698-4	Grad	360,50	358,50	358,25	359,75	357,75	350,00	360,75	358,25	356,00	353,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	9,92	9,92	9,91	9,93	9,94	9,94	9,94	9,91	9,95	9,97
1024210	VM1698-4	Grad	356,50	358,50	357,75	359,25	362,25	361,25	364,50	348,00	357,25	357,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	9,92	9,90	9,97	9,89	9,95	9,90	9,97	9,91	9,92	9,88
1024210	VM1698-4	Grad	349,00	352,75	361,25	354,25	361,50	359,75	362,00	353,25	360,25	348,75

Machine Capability Study
Tool System

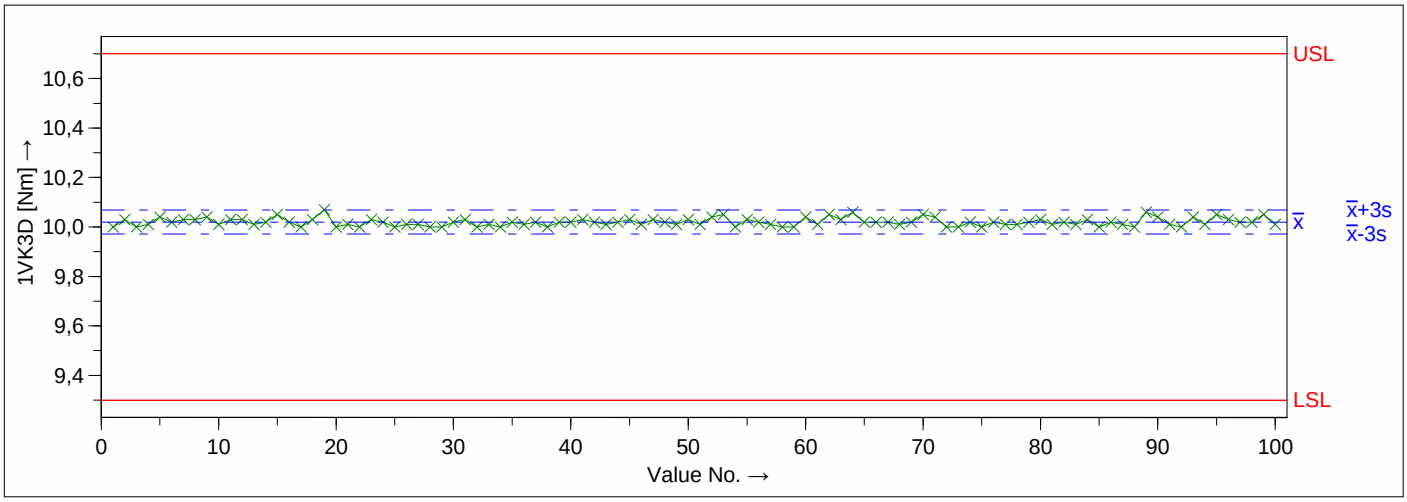
Page 1 / 1

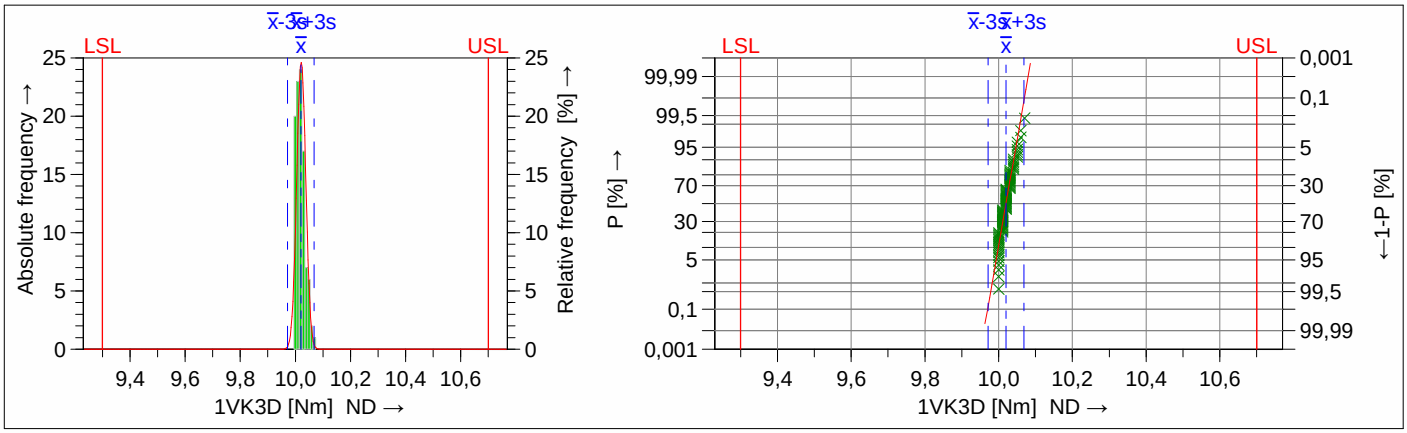
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_g	Char.Descr.	1VK3D	Nom.val.	10,00 / 0,70
		Serial No.	198081	Unit	Nm / -0,70
				USL	10,70
				LSL	9,30
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 14.06.2022 09:20:36 to 14.06.2022 09:56:36

Rem. TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	10.0199
LSL	9.30	x_{min}	10.00	$\bar{x}$-3s	9.9714
USL	10.70	x_{max}	10.07	$\bar{x}$+3s	10.0684
T	1.40	R	0.07	6s	0.0970
		$n_{<T>}$	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	14.43
Critical capability index	=	C_{mk}	14.02

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_g1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	10,00	10,03	10,00	10,01	10,04	10,02	10,03	10,03	10,04	10,01
198081	1VK3D	Grad	370,00	372,00	362,00	365,00	367,00	371,00	370,00	365,00	364,00	365,00

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}
198081	1VK3D	Nm	10,03	10,03	10,01	10,02	10,05	10,02	10,00	10,03	10,07	10,00
198081	1VK3D	Grad	374,00	378,00	374,00	368,00	366,00	359,00	362,00	361,00	361,00	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}
198081	1VK3D	Nm	10,01	10,00	10,03	10,02	10,00	10,01	10,01	10,00	10,00	10,02
198081	1VK3D	Grad	362,00	368,00	365,00	365,00	366,00	366,00	368,00	357,00	362,00	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}
198081	1VK3D	Nm	10,03	10,00	10,01	10,00	10,02	10,01	10,02	10,00	10,02	10,02
198081	1VK3D	Grad	371,00	365,00	366,00	366,00	365,00	364,00	367,00	366,00	365,00	357,00

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}
198081	1VK3D	Nm	10,03	10,02	10,01	10,02	10,03	10,01	10,03	10,02	10,01	10,03
198081	1VK3D	Grad	363,00	361,00	361,00	361,00	362,00	363,00	377,00	366,00	375,00	378,00

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}
198081	1VK3D	Nm	10,01	10,04	10,05	10,00	10,03	10,02	10,01	10,00	10,00	10,04
198081	1VK3D	Grad	370,00	365,00	376,00	375,00	372,00	376,00	374,00	378,00	362,00	367,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198081	1VK3D	Nm	10,01	10,05	10,03	10,06	10,02	10,02	10,02	10,01	10,02	10,05
198081	1VK3D	Grad	372,00	370,00	375,00	363,00	362,00	361,00	363,00	360,00	361,00	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}
198081	1VK3D	Nm	10,04	10,00	10,00	10,02	10,00	10,02	10,01	10,01	10,02	10,03
198081	1VK3D	Grad	365,00	366,00	366,00	362,00	366,00	357,00	365,00	362,00	361,00	361,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	10,01	10,02	10,01	10,03	10,00	10,02	10,01	10,00	10,06	10,04
198081	1VK3D	Grad	362,00	367,00	361,00	363,00	368,00	364,00	370,00	351,00	362,00	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}
198081	1VK3D	Nm	10,01	10,00	10,04	10,01	10,05	10,03	10,02	10,02	10,05	10,01
198081	1VK3D	Grad	359,00	360,00	364,00	363,00	370,00	370,00	368,00	364,00	370,00	359,00

Machine Capability Study
Tool System

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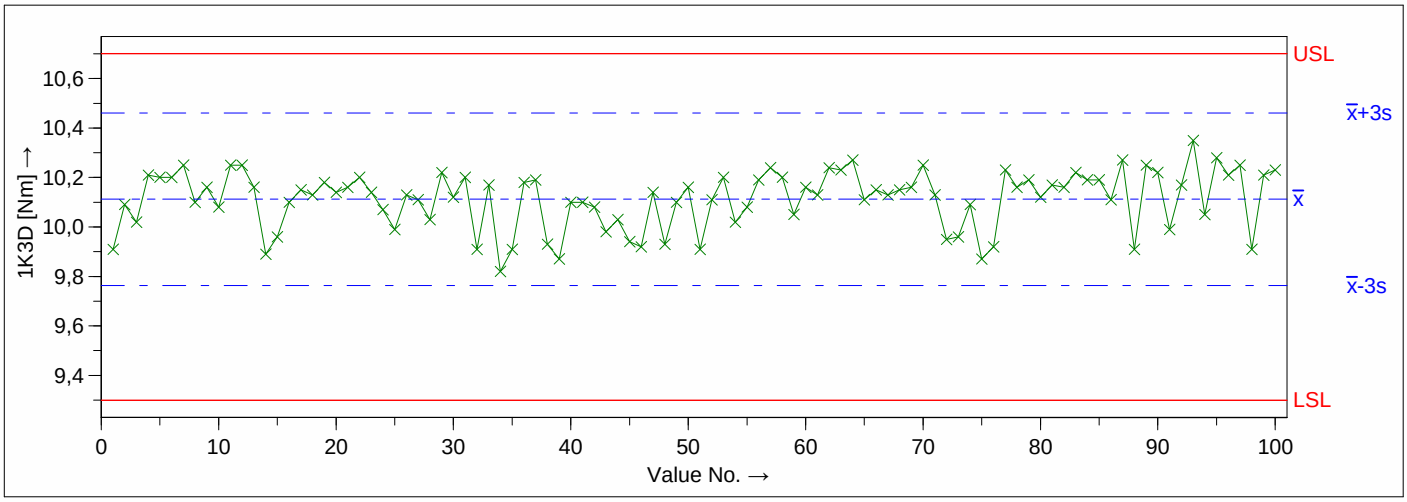
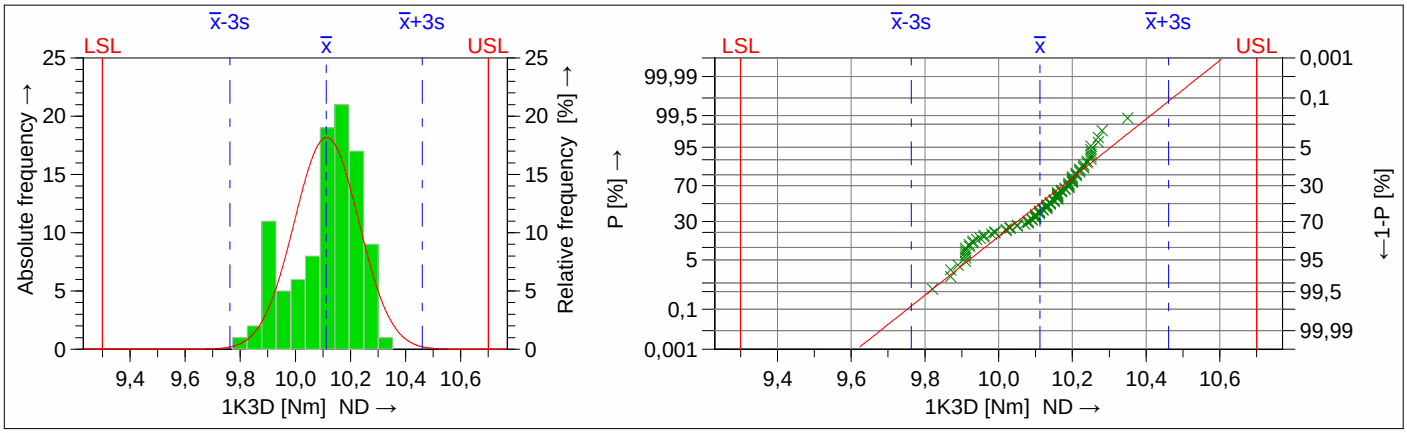
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_g	Char.Descr.	1K3D	Nom.val. 10,00 / 0,70	USL 10,70
		Serial No.	205496	Unit Nm / -0,70	LSL 9,30
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 14.06.2022 09:20:36 to 14.06.2022 09:56:36

Rem. TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			x̄	10.1120
LSL	9.30	x_{min}	9.82	x̄-3s	9.7629
USL	10.70	x_{max}	10.35	x̄+3s	10.4611
T	1.40	R	0.53	6s	0.6983
		$n_{<T>}$	100	$p_{<T>}$	99.99998 %
		$n_{>USL}$	0	$p_{>USL}$	0.00002%
		$n_{<LSL}$	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	2.00
Critical capability index	=	C_{mk}	1.68

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_g2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	9,91	10,09	10,02	10,21	10,20	10,20	10,25	10,10	10,16	10,08
205496	1K3D	Grad	370,00	372,00	362,00	365,00	367,00	371,00	370,00	365,00	364,00	365,00

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}
205496	1K3D	Nm	10,25	10,25	10,16	9,89	9,96	10,10	10,15	10,13	10,18	10,14
205496	1K3D	Grad	374,00	378,00	374,00	368,00	366,00	359,00	362,00	361,00	361,00	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}
205496	1K3D	Nm	10,16	10,20	10,14	10,07	9,99	10,13	10,11	10,03	10,22	10,12
205496	1K3D	Grad	362,00	368,00	365,00	365,00	366,00	366,00	368,00	357,00	362,00	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}
205496	1K3D	Nm	10,20	9,91	10,17	9,82	9,91	10,18	10,19	9,93	9,87	10,10
205496	1K3D	Grad	371,00	365,00	366,00	366,00	365,00	364,00	367,00	366,00	365,00	357,00

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}
205496	1K3D	Nm	10,10	10,08	9,98	10,03	9,94	9,92	10,14	9,93	10,10	10,16
205496	1K3D	Grad	363,00	361,00	361,00	361,00	362,00	363,00	377,00	366,00	375,00	378,00

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}
205496	1K3D	Nm	9,91	10,11	10,20	10,02	10,08	10,19	10,24	10,20	10,05	10,16
205496	1K3D	Grad	370,00	365,00	376,00	375,00	372,00	376,00	374,00	378,00	362,00	367,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
205496	1K3D	Nm	10,13	10,24	10,23	10,27	10,11	10,15	10,13	10,15	10,16	10,25
205496	1K3D	Grad	372,00	370,00	375,00	363,00	362,00	361,00	363,00	360,00	361,00	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}
205496	1K3D	Nm	10,13	9,95	9,96	10,09	9,87	9,92	10,23	10,16	10,19	10,12
205496	1K3D	Grad	365,00	366,00	366,00	362,00	366,00	357,00	365,00	362,00	361,00	361,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_g	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	10,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	10,17	10,16	10,22	10,19	10,19	10,11	10,27	9,91	10,25	10,22
205496	1K3D	Grad	362,00	367,00	361,00	363,00	368,00	364,00	370,00	351,00	362,00	361,00

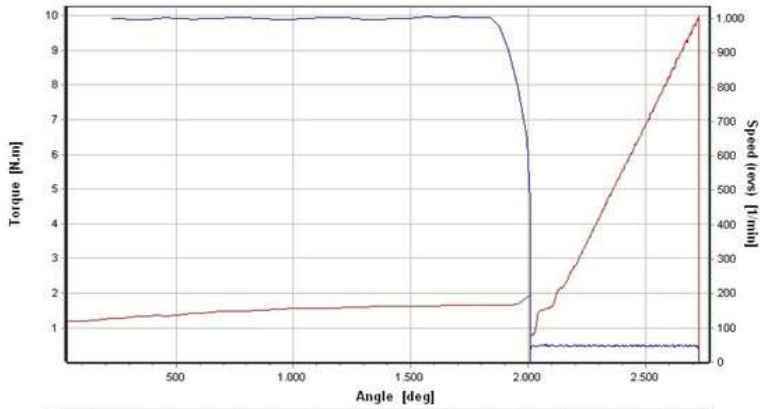
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	9,99	10,17	10,35	10,05	10,28	10,21	10,25	9,91	10,21	10,23
205496	1K3D	Grad	359,00	360,00	364,00	363,00	370,00	370,00	368,00	364,00	370,00	359,00

Torque graphs

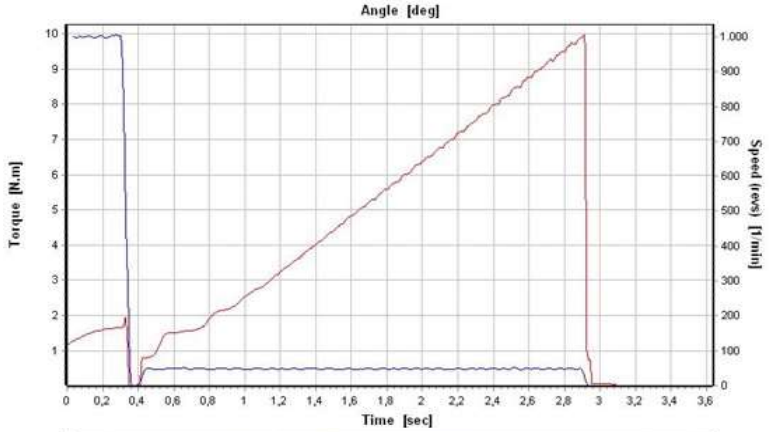
Machine Capability Study 80 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

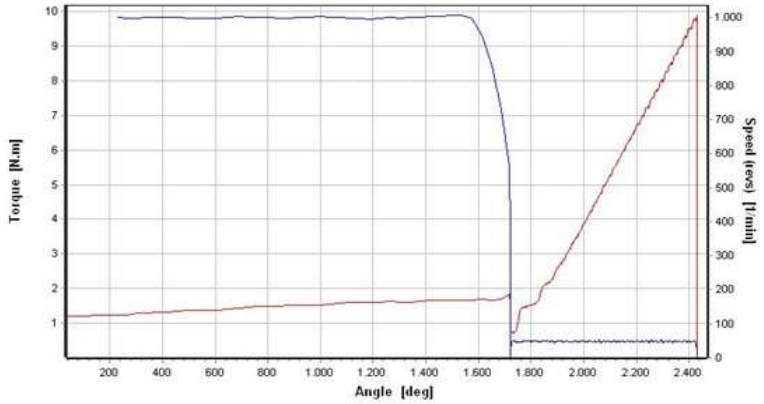
Angle degree: **360°**
Test torque: **10,0 Nm**



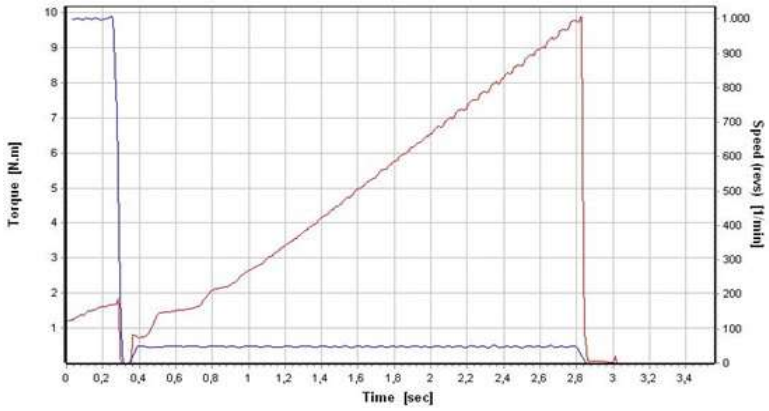
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

Multi-stage tightening system	☑	Speed 50 rpm	1,6 %
Single-stage tightening system	☐	Speed 100 %	3152 rpm

Manufacturer: Apex Tool Group Serial no: **755950**

Test torque: Tq max. 12,00 Nm

Hard joint (H)	72,43 Nm / Revolution	Angle degree	30°
Soft joint (L)	6,01 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	11,16 - 12,84 Nm	11,16 - 12,84 Nm
	Tolerance down / up	7 %	7 %
	Average torque	12,07 Nm	12,02 Nm
	Standard deviation	0,03 Nm	0,04 Nm
	Torque scatter (99,73%)	0,21 Nm	0,22 Nm
	C_m	8,15	7,80
	C_{mk}	7,45	7,57

b)	Min. C_m hard/soft (lowest value)	7,80
	Min. C_{mk} hard/soft (lowest value)	7,45

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

Note:

Machine Capability Study
Control System

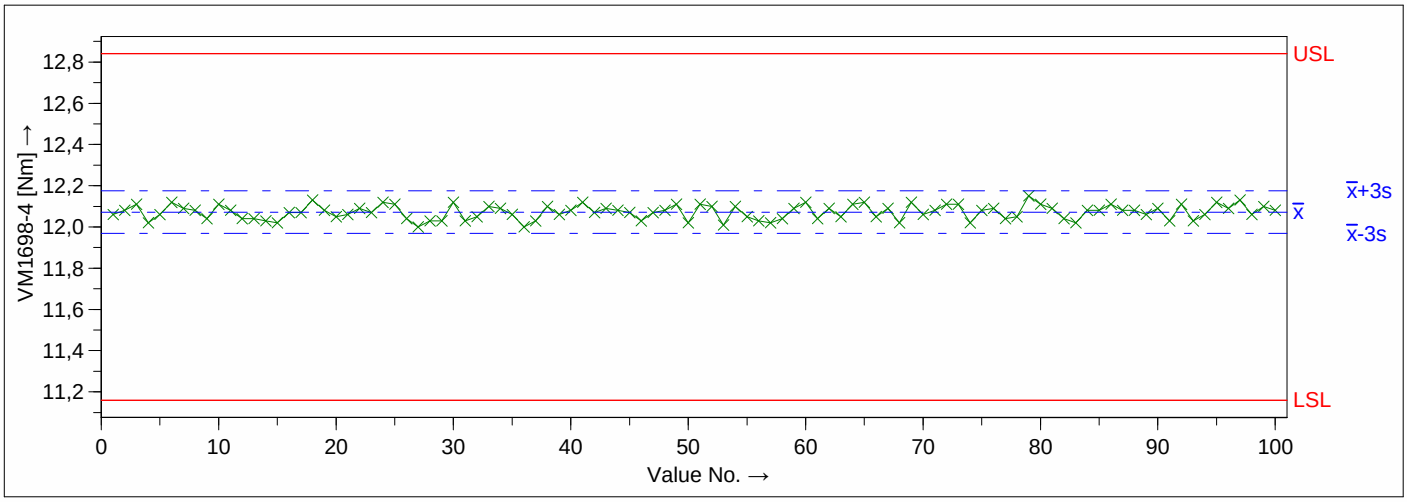
Cleco Production Tools

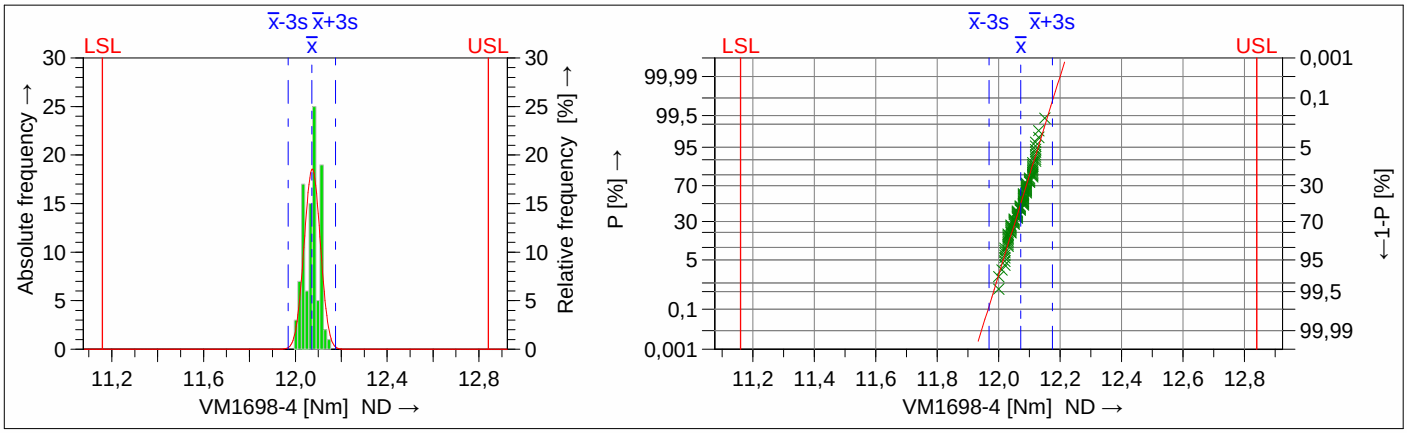
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_b	Char.Descr.	VM1698-4	Nom.val. 12,00	0,84 USL 12,84
		Serial No.	1024210	Unit Nm	-0,84 LSL 11,16
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 14.06.2022 08:05:06 to 14.06.2022 08:18:20

Rem. TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0719
LSL	11.16	x_{min}	12.00	$\bar{x}$-3s	11.9688
USL	12.84	x_{max}	12.15	$\bar{x}$+3s	12.1750
T	1.68	R	0.15	6s	0.2062
		$n_{<T>}$	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	8.15
Critical capability index	=	C_{mk}	7.45

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 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	12,06	12,08	12,11	12,02	12,06	12,12	12,09	12,08	12,04	12,11
1024210	VM1698-4	Grad	27,25	28,75	28,50	29,75	30,50	30,50	29,25	29,50	29,75	30,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	12,08	12,04	12,04	12,03	12,02	12,07	12,07	12,13	12,08	12,05
1024210	VM1698-4	Grad	29,00	30,00	27,75	29,00	29,50	28,75	28,75	28,75	28,00	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	12,06	12,09	12,07	12,12	12,11	12,04	12,00	12,03	12,03	12,12
1024210	VM1698-4	Grad	30,50	27,75	28,50	29,50	32,25	28,50	31,00	29,00	28,75	32,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	12,03	12,05	12,10	12,09	12,06	12,00	12,03	12,10	12,06	12,08
1024210	VM1698-4	Grad	32,00	31,75	31,25	32,50	30,00	30,25	31,25	32,25	28,75	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	12,12	12,07	12,09	12,08	12,07	12,03	12,07	12,08	12,11	12,02
1024210	VM1698-4	Grad	30,50	28,25	30,25	30,50	29,25	29,25	30,75	28,75	29,75	28,75

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	12,11	12,10	12,01	12,10	12,05	12,03	12,02	12,04	12,09	12,12
1024210	VM1698-4	Grad	27,25	30,00	29,75	30,75	30,75	30,00	31,00	30,25	29,75	29,75

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	12,04	12,09	12,05	12,11	12,12	12,05	12,09	12,02	12,12	12,06
1024210	VM1698-4	Grad	31,25	31,00	30,25	29,75	30,25	38,25	34,00	28,75	30,00	27,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	12,08	12,11	12,11	12,02	12,08	12,09	12,04	12,05	12,15	12,11
1024210	VM1698-4	Grad	28,75	30,50	30,00	28,25	29,75	30,25	30,00	29,25	29,75	29,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	12,09	12,04	12,02	12,08	12,08	12,11	12,08	12,08	12,06	12,09
1024210	VM1698-4	Grad	28,75	30,00	29,75	30,00	29,00	30,00	30,00	30,25	29,75	29,25

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	12,03	12,11	12,03	12,06	12,12	12,09	12,13	12,06	12,10	12,08
1024210	VM1698-4	Grad	28,00	30,75	30,25	29,25	31,25	30,75	31,00	29,25	27,25	29,75

Machine Capability Study
Tool System

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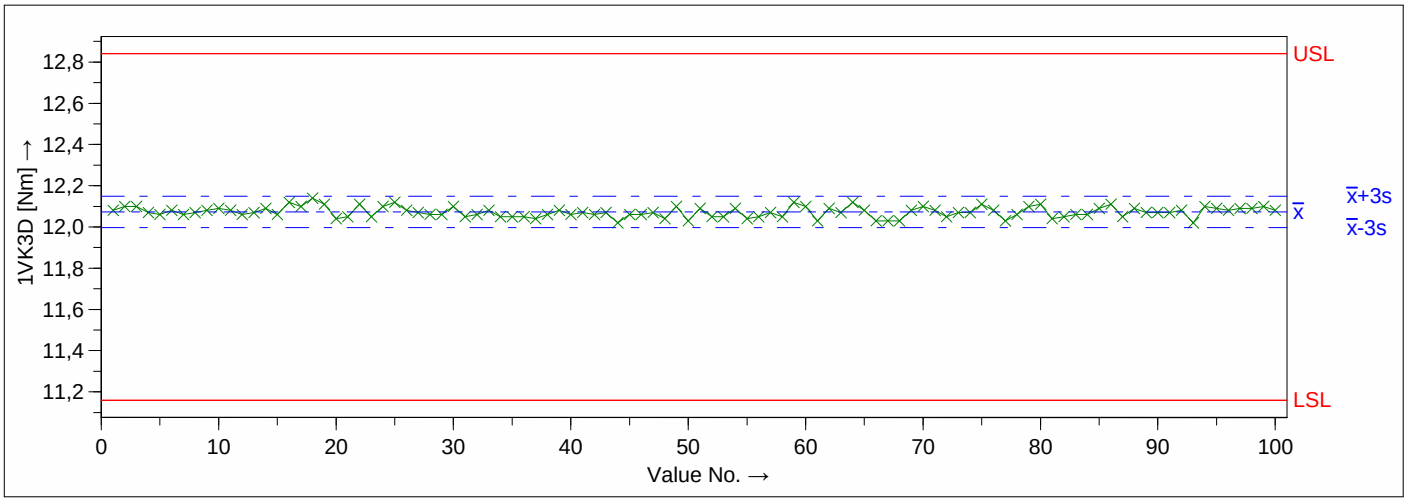
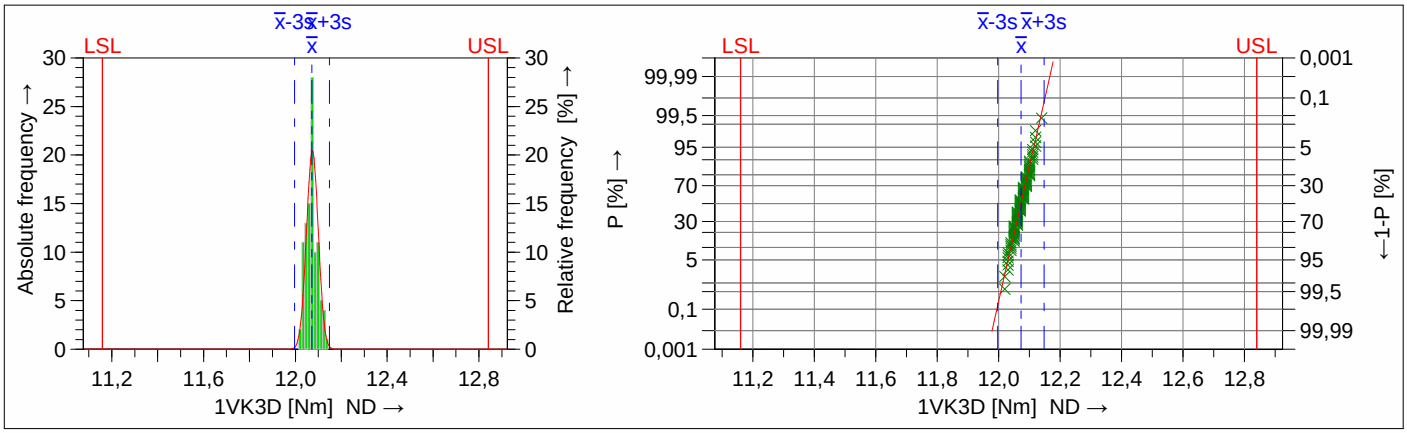
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_b	Char.Descr.	1VK3D	Nom.val. 12,00 0,84	USL 12,84
		Serial No.	198081	Unit Nm -0,84	LSL 11,16
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 14.06.2022 08:05:07 to 14.06.2022 08:18:20

Rem. TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			x̄	12.0724
LSL	11.16	x_{min}	12.02	x̄-3s	11.9965
USL	12.84	x_{max}	12.14	x̄+3s	12.1483
T	1.68	R	0.12	6s	0.1519
		$n_{<T>}$	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	11.06
Critical capability index	=	C_{mk}	10.11

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_b1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	12,08	12,10	12,10	12,07	12,06	12,08	12,06	12,07	12,08	12,09
198081	1VK3D	Grad	27,00	28,00	28,00	29,00	30,00	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}
198081	1VK3D	Nm	12,08	12,06	12,07	12,09	12,06	12,12	12,10	12,14	12,11	12,04
198081	1VK3D	Grad	29,00	30,00	28,00	29,00	29,00	29,00	28,00	28,00	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}
198081	1VK3D	Nm	12,05	12,11	12,05	12,10	12,12	12,08	12,07	12,06	12,06	12,10
198081	1VK3D	Grad	30,00	27,00	28,00	29,00	32,00	28,00	31,00	29,00	29,00	33,00

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}
198081	1VK3D	Nm	12,05	12,06	12,08	12,05	12,05	12,05	12,04	12,06	12,08	12,06
198081	1VK3D	Grad	32,00	32,00	31,00	32,00	30,00	30,00	31,00	32,00	28,00	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}
198081	1VK3D	Nm	12,07	12,06	12,07	12,02	12,06	12,06	12,07	12,04	12,10	12,03
198081	1VK3D	Grad	30,00	28,00	30,00	31,00	29,00	29,00	31,00	29,00	30,00	28,00

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}
198081	1VK3D	Nm	12,09	12,05	12,05	12,09	12,04	12,05	12,07	12,05	12,12	12,10
198081	1VK3D	Grad	27,00	29,00	30,00	30,00	30,00	30,00	31,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198081	1VK3D	Nm	12,03	12,09	12,07	12,12	12,08	12,03	12,03	12,03	12,08	12,10
198081	1VK3D	Grad	31,00	31,00	31,00	29,00	30,00	38,00	34,00	28,00	30,00	27,00

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}
198081	1VK3D	Nm	12,08	12,05	12,07	12,07	12,11	12,08	12,03	12,06	12,10	12,11
198081	1VK3D	Grad	28,00	30,00	30,00	28,00	29,00	30,00	30,00	29,00	29,00	29,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	12,04	12,05	12,06	12,06	12,09	12,11	12,05	12,09	12,07	12,07
198081	1VK3D	Grad	29,00	30,00	30,00	29,00	29,00	30,00	30,00	30,00	30,00	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}
198081	1VK3D	Nm	12,07	12,08	12,02	12,10	12,09	12,08	12,09	12,09	12,10	12,08
198081	1VK3D	Grad	28,00	31,00	30,00	29,00	31,00	31,00	31,00	29,00	27,00	30,00

Machine Capability Study
Tool System

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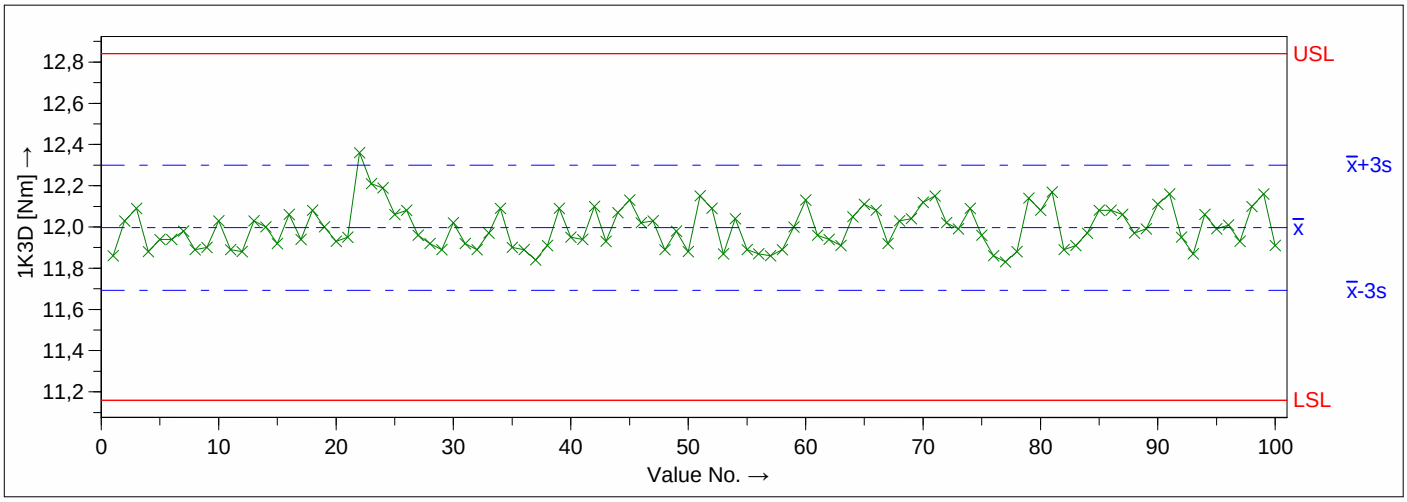
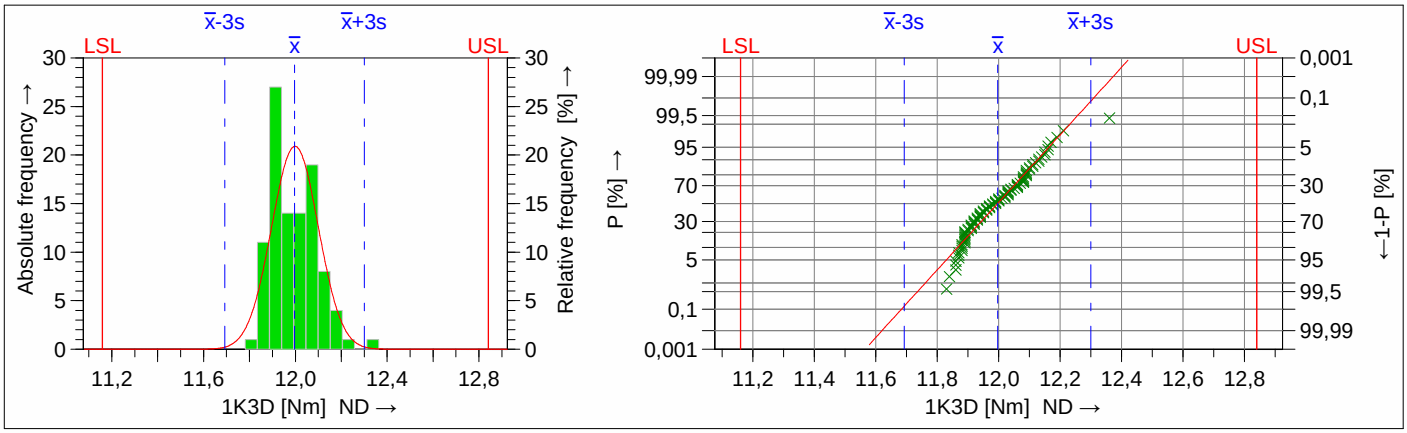
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_b	Char.Descr.	1K3D	Nom.val. 12,00	0,84 USL 12,84
		Serial No.	205496	Unit Nm	-0,84 LSL 11,16
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 14.06.2022 08:05:07 to 14.06.2022 08:18:20

Rem. TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.9965
LSL	11.16	x_{min}	11.83	$\bar{x}$-3s	11.6931
USL	12.84	x_{max}	12.36	$\bar{x}$+3s	12.2999
T	1.68	R	0.53	6s	0.6068
		$n_{<T>}$	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	2.77
Critical capability index	=	C_{mk}	2.76

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_b2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	11,86	12,03	12,09	11,88	11,94	11,94	11,98	11,89	11,90	12,03
205496	1K3D	Grad	27,00	28,00	28,00	29,00	30,00	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}
205496	1K3D	Nm	11,89	11,88	12,03	12,00	11,92	12,06	11,94	12,08	12,00	11,93
205496	1K3D	Grad	29,00	30,00	28,00	29,00	29,00	29,00	28,00	28,00	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}
205496	1K3D	Nm	11,95	12,36	12,21	12,19	12,06	12,08	11,96	11,92	11,89	12,02
205496	1K3D	Grad	30,00	27,00	28,00	29,00	32,00	28,00	31,00	29,00	29,00	33,00

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}
205496	1K3D	Nm	11,92	11,89	11,97	12,09	11,90	11,89	11,84	11,91	12,09	11,95
205496	1K3D	Grad	32,00	32,00	31,00	32,00	30,00	30,00	31,00	32,00	28,00	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}
205496	1K3D	Nm	11,94	12,10	11,93	12,07	12,13	12,02	12,03	11,89	11,98	11,88
205496	1K3D	Grad	30,00	28,00	30,00	31,00	29,00	29,00	31,00	29,00	30,00	28,00

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}
205496	1K3D	Nm	12,15	12,09	11,87	12,04	11,89	11,87	11,86	11,89	12,00	12,13
205496	1K3D	Grad	27,00	29,00	30,00	30,00	30,00	30,00	31,00	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
205496	1K3D	Nm	11,96	11,94	11,91	12,05	12,11	12,08	11,92	12,03	12,04	12,12
205496	1K3D	Grad	31,00	31,00	31,00	29,00	30,00	38,00	34,00	28,00	30,00	27,00

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}
205496	1K3D	Nm	12,15	12,02	11,99	12,09	11,96	11,86	11,83	11,88	12,14	12,08
205496	1K3D	Grad	28,00	30,00	30,00	28,00	29,00	30,00	30,00	29,00	29,00	29,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_b	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	12,17	11,89	11,91	11,97	12,08	12,08	12,06	11,97	11,99	12,11
205496	1K3D	Grad	29,00	30,00	30,00	29,00	29,00	30,00	30,00	30,00	30,00	29,00

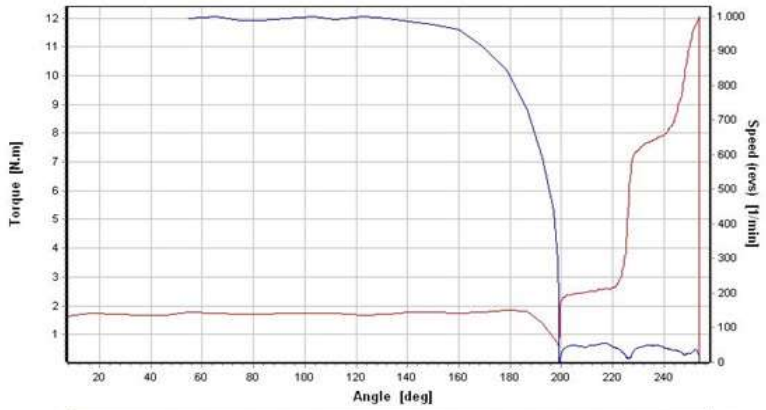
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	12,16	11,95	11,87	12,06	11,99	12,01	11,93	12,10	12,16	11,91
205496	1K3D	Grad	28,00	31,00	30,00	29,00	31,00	31,00	31,00	29,00	27,00	30,00

Torque graphs

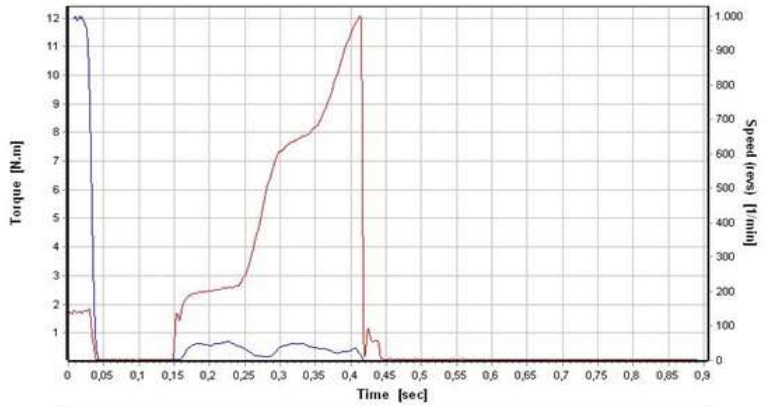
Machine Capability Study 100 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

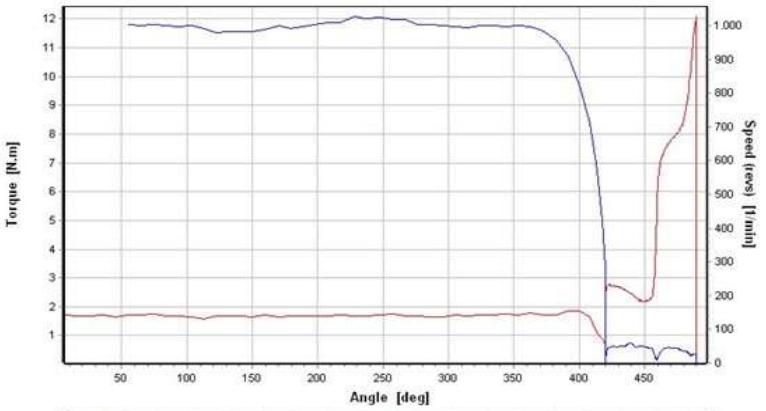
Angle degree: **30°**
Test torque: **12,0 Nm**



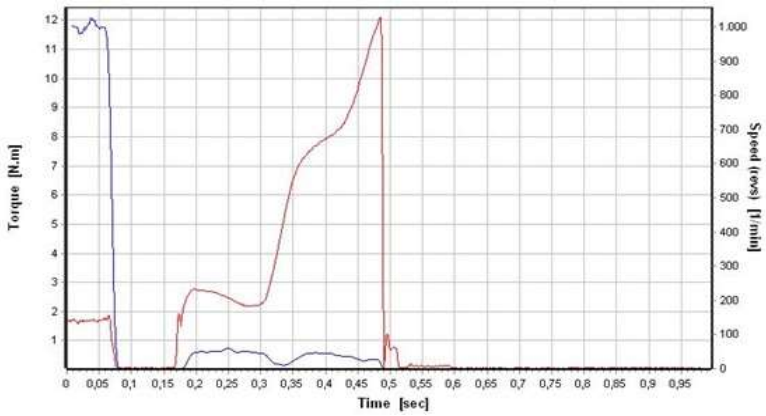
Value no. 1
Graph
Torque / Angle / Speed



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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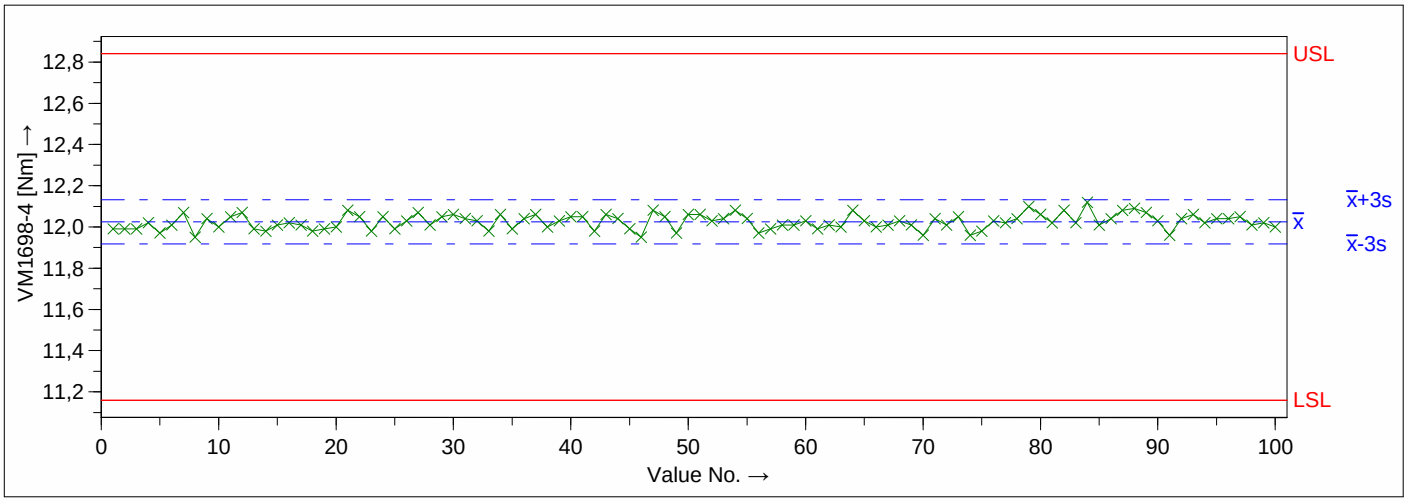
Plant ATG Westhausen		Operator Name Sünder	Date 13.06.2022

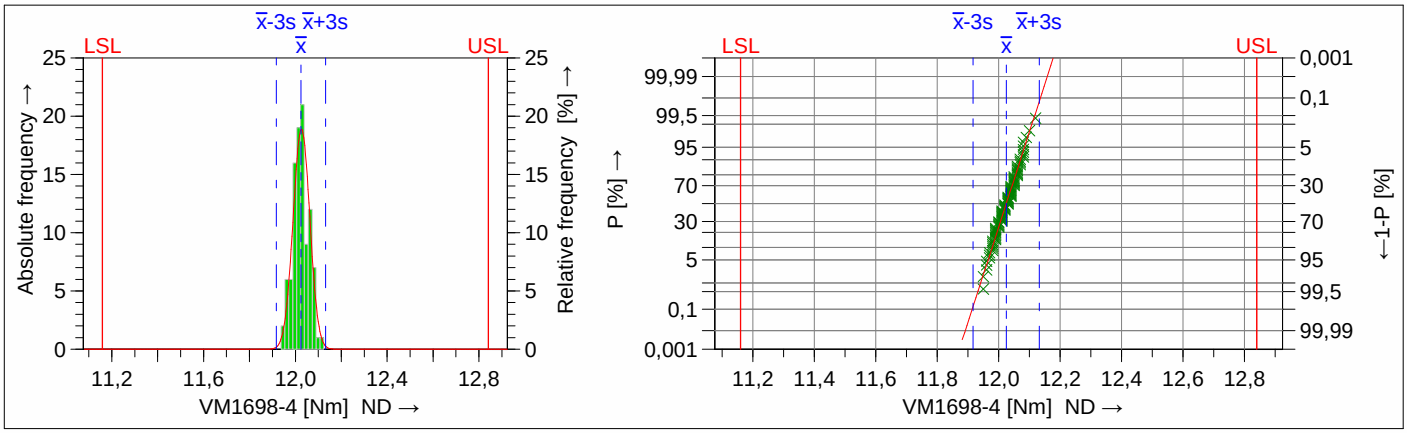
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_a	Char.Descr. VM1698-4	Nom.val.	12,00	0,84	USL 12,84
	Serial No. 1024210	Unit	Nm	-0,84	LSL 11,16
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Cleco	Reference System VM1698-4	Test Electronic MPRO400GCD-P
Contr.No. Homologation	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 13.06.2022 15:53:03 to 13.06.2022 16:49:33

Rem. TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0248
LSL	11.16	x_{min}	11.95	$\bar{x}$-3s	11.9171
USL	12.84	x_{max}	12.12	$\bar{x}$+3s	12.1325
T	1.68	R	0.17	6s	0.2153
		$n_{<T>}$	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	7.80
Critical capability index	=	C_{mk}	7.57

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 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	11,99	11,99	11,99	12,02	11,97	12,01	12,07	11,95	12,04	12,00
1024210	VM1698-4	Grad	370,00	362,50	356,25	363,25	358,50	349,50	360,50	349,00	330,75	326,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	12,05	12,07	11,99	11,98	12,01	12,02	12,01	11,98	11,99	12,00
1024210	VM1698-4	Grad	336,25	336,00	337,00	315,50	331,50	349,25	325,50	337,50	342,00	343,00

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	12,08	12,05	11,98	12,05	11,99	12,03	12,07	12,01	12,05	12,06
1024210	VM1698-4	Grad	360,75	376,25	336,50	376,50	353,50	350,00	368,25	339,50	345,00	373,25

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	12,04	12,03	11,98	12,06	11,99	12,04	12,06	12,00	12,03	12,05
1024210	VM1698-4	Grad	338,00	348,75	350,25	376,00	351,75	351,75	357,00	359,00	373,25	372,25

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	12,05	11,98	12,06	12,04	11,99	11,95	12,08	12,05	11,97	12,06
1024210	VM1698-4	Grad	358,50	353,25	360,00	382,00	345,75	370,75	359,50	366,00	364,25	356,75

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	12,06	12,03	12,04	12,08	12,04	11,97	11,99	12,01	12,01	12,03
1024210	VM1698-4	Grad	366,00	362,75	366,75	389,00	360,50	345,00	342,25	356,00	353,50	354,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	11,99	12,01	12,00	12,08	12,03	12,00	12,01	12,03	12,01	11,96
1024210	VM1698-4	Grad	363,75	367,25	361,00	400,25	385,25	360,25	350,25	367,00	349,75	353,00

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	12,04	12,01	12,05	11,96	11,98	12,03	12,02	12,04	12,10	12,06
1024210	VM1698-4	Grad	363,50	361,25	367,25	390,75	385,25	354,00	380,50	377,00	352,50	373,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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	12,02	12,08	12,02	12,12	12,01	12,04	12,08	12,09	12,07	12,03
1024210	VM1698-4	Grad	370,00	362,50	382,00	386,00	369,25	363,25	368,00	358,50	364,25	354,00

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,96	12,04	12,06	12,02	12,04	12,04	12,05	12,01	12,02	12,00
1024210	VM1698-4	Grad	354,75	347,50	341,25	347,50	399,75	385,00	360,00	389,25	371,00	348,75

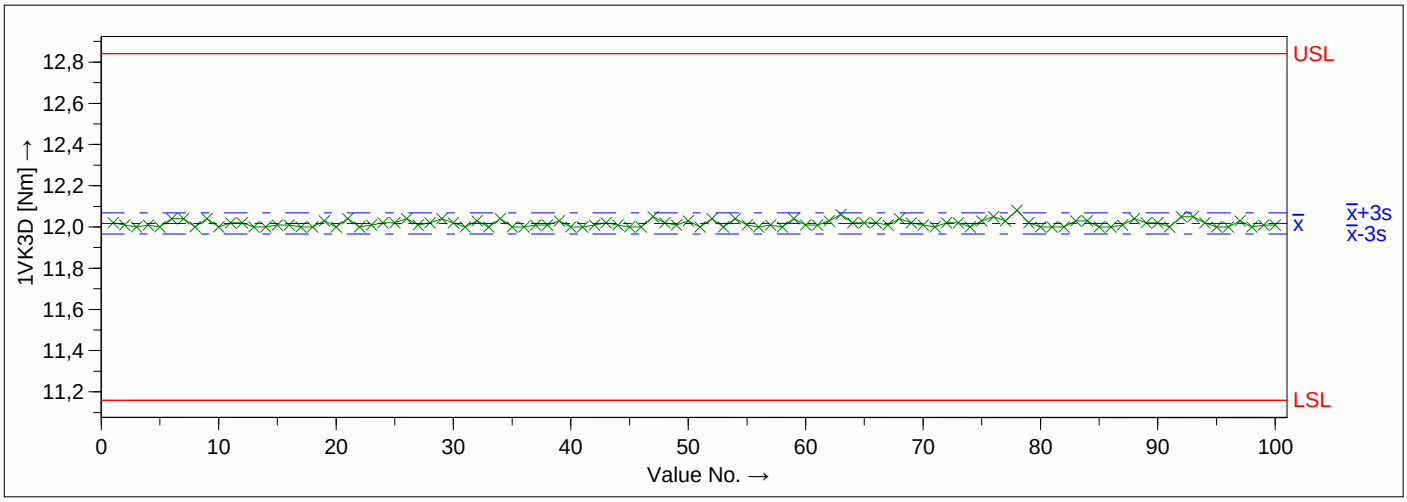
Machine Capability Study
Tool System

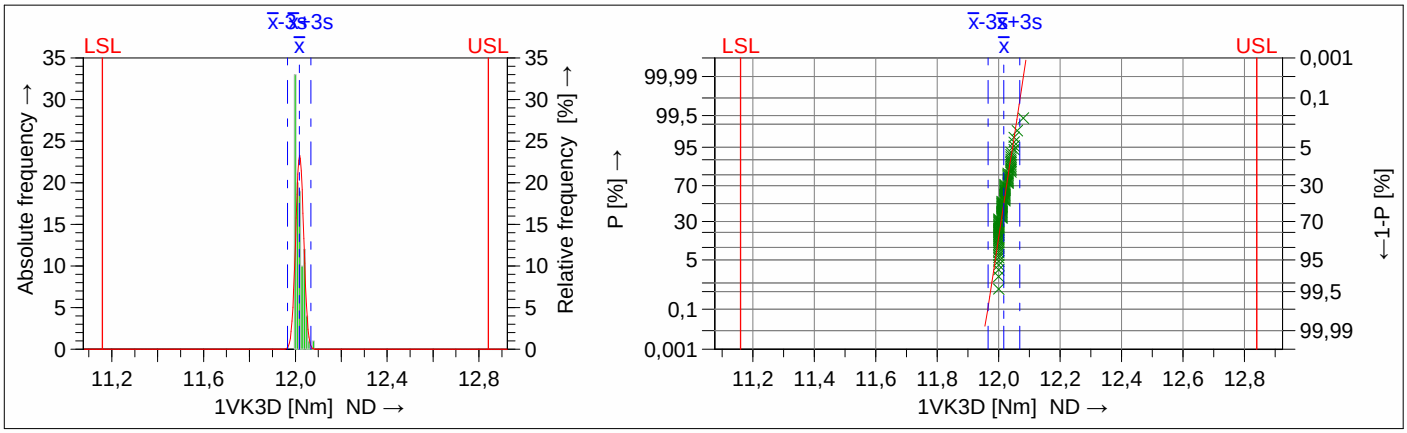
Plant	ATG Westhausen	Operator Name	Sünder
Date	13.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_a	Char.Descr.	1VK3D	Nom.val. 12,00 / 0,84	USL 12,84
		Serial No.	198081	Unit Nm / -0,84	LSL 11,16
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 13.06.2022 15:53:04 to 13.06.2022 16:49:34

Rem. TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0170
LSL	11.16	x_{min}	12.00	$\bar{x}$-3s	11.9657
USL	12.84	x_{max}	12.08	$\bar{x}$+3s	12.0683
T	1.68	R	0.08	6s	0.1025
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	16.39
Critical capability index	=	C_{mk}	16.06

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 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	12,02	12,01	12,00	12,01	12,00	12,04	12,04	12,00	12,04	12,00
198081	1VK3D	Grad	370,00	363,00	357,00	356,00	360,00	354,00	359,00	347,00	328,00	326,00

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}
198081	1VK3D	Nm	12,02	12,02	12,00	12,00	12,01	12,01	12,00	12,00	12,03	12,00
198081	1VK3D	Grad	334,00	331,00	332,00	311,00	326,00	348,00	327,00	338,00	340,00	340,00

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}
198081	1VK3D	Nm	12,04	12,00	12,01	12,02	12,02	12,04	12,01	12,02	12,04	12,02
198081	1VK3D	Grad	360,00	370,00	338,00	374,00	354,00	351,00	366,00	339,00	344,00	368,00

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}
198081	1VK3D	Nm	12,00	12,03	12,00	12,04	12,00	12,00	12,01	12,01	12,03	12,00
198081	1VK3D	Grad	334,00	349,00	351,00	374,00	352,00	349,00	354,00	359,00	370,00	367,00

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}
198081	1VK3D	Nm	12,00	12,01	12,02	12,01	12,00	12,00	12,05	12,02	12,01	12,03
198081	1VK3D	Grad	357,00	353,00	357,00	377,00	349,00	371,00	358,00	364,00	365,00	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}
198081	1VK3D	Nm	12,00	12,04	12,00	12,04	12,01	12,00	12,01	12,00	12,04	12,01
198081	1VK3D	Grad	362,00	362,00	363,00	384,00	359,00	346,00	342,00	355,00	356,00	356,00

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}
198081	1VK3D	Nm	12,01	12,03	12,06	12,02	12,02	12,02	12,01	12,04	12,02	12,01
198081	1VK3D	Grad	365,00	367,00	361,00	398,00	377,00	361,00	351,00	365,00	352,00	355,00

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}
198081	1VK3D	Nm	12,00	12,02	12,02	12,00	12,03	12,05	12,03	12,08	12,02	12,00
198081	1VK3D	Grad	361,00	361,00	365,00	393,00	387,00	356,00	383,00	376,00	349,00	369,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
198081	1VK3D	Nm	12,00	12,00	12,03	12,03	12,00	12,00	12,01	12,04	12,02	12,02
198081	1VK3D	Grad	362,00	357,00	382,00	384,00	365,00	359,00	360,00	353,00	359,00	355,00

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}
198081	1VK3D	Nm	12,00	12,05	12,05	12,02	12,00	12,00	12,03	12,00	12,01	12,01
198081	1VK3D	Grad	356,00	345,00	340,00	348,00	377,00	373,00	357,00	391,00	368,00	349,00

Machine Capability Study
Tool System

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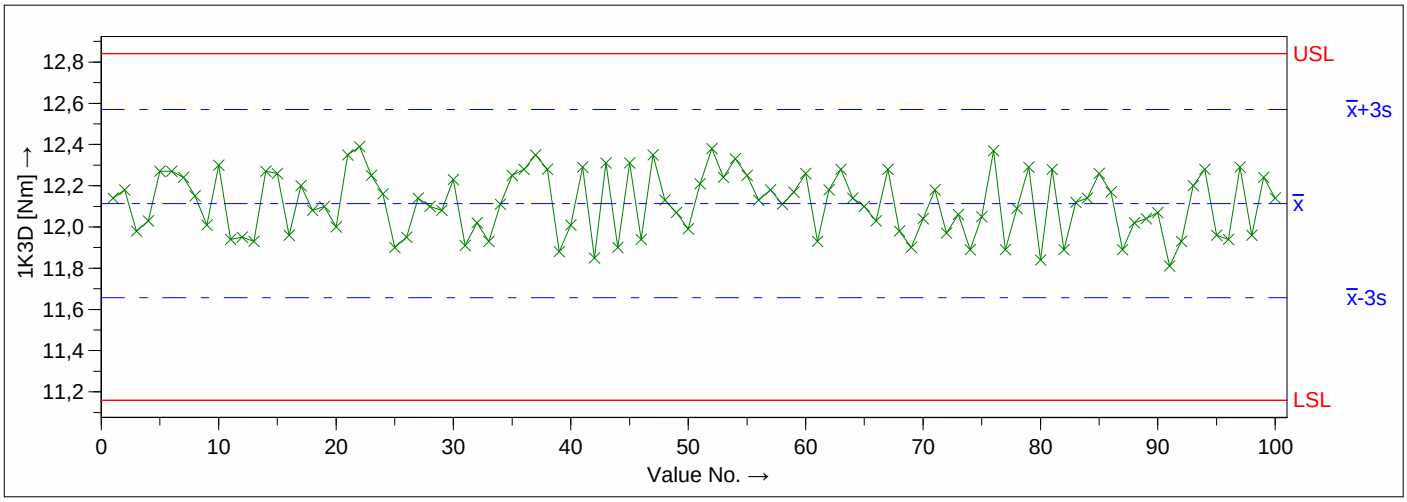
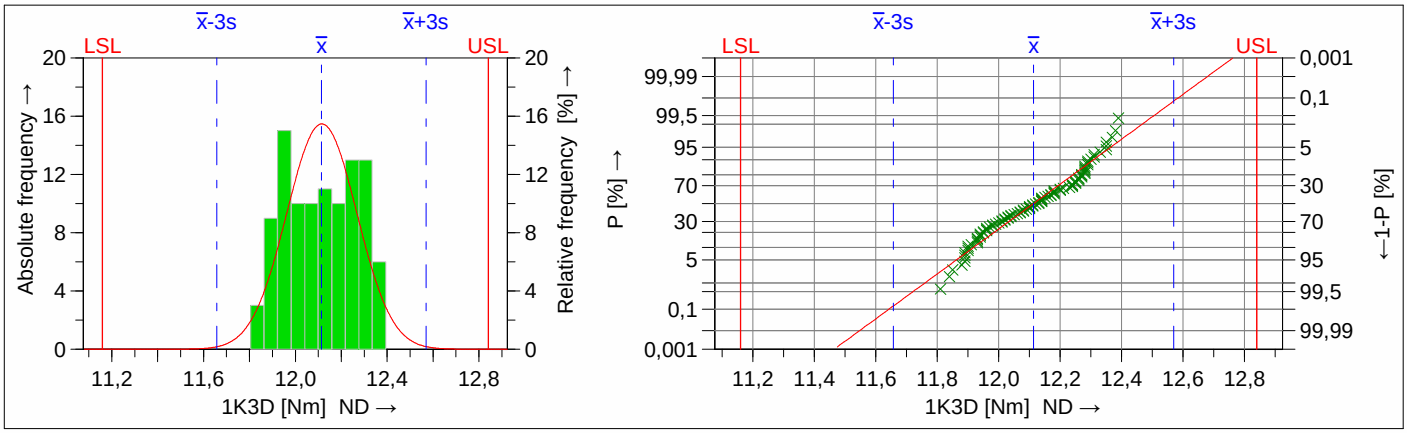
Plant	ATG Westhausen	Operator Name	Sünder
Date	13.06.2022		

Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_a	Char.Descr.	1K3D	Nom.val. 12,00	0,84 USL 12,84
		Serial No.	205496	Unit Nm	-0,84 LSL 11,16
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 13.06.2022 15:53:04 to 13.06.2022 16:49:34

Rem. TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			x̄	12.1135
LSL	11.16	x_{min}	11.81	x̄-3s	11.6571
USL	12.84	x_{max}	12.39	x̄+3s	12.5699
T	1.68	R	0.58	6s	0.9128
		$n_{<T>}$	100	$p_{<T>}$	99.99991 %
		$n_{>USL}$	0	$p_{>USL}$	0.00009%
		$n_{<LSL}$	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	1.84
Critical capability index	=	C_{mk}	1.59

The requirements were not met (C_m,C_{mk})

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_a2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	12,14	12,18	11,98	12,03	12,27	12,27	12,24	12,15	12,01	12,30
205496	1K3D	Grad	370,00	363,00	357,00	356,00	360,00	354,00	359,00	347,00	328,00	326,00

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}
205496	1K3D	Nm	11,94	11,95	11,93	12,27	12,26	11,96	12,20	12,08	12,10	12,00
205496	1K3D	Grad	334,00	331,00	332,00	311,00	326,00	348,00	327,00	338,00	340,00	340,00

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}
205496	1K3D	Nm	12,35	12,39	12,25	12,16	11,90	11,95	12,14	12,10	12,08	12,23
205496	1K3D	Grad	360,00	370,00	338,00	374,00	354,00	351,00	366,00	339,00	344,00	368,00

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}
205496	1K3D	Nm	11,91	12,02	11,93	12,11	12,25	12,28	12,35	12,28	11,88	12,01
205496	1K3D	Grad	334,00	349,00	351,00	374,00	352,00	349,00	354,00	359,00	370,00	367,00

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}
205496	1K3D	Nm	12,29	11,85	12,31	11,90	12,31	11,94	12,35	12,13	12,07	11,99
205496	1K3D	Grad	357,00	353,00	357,00	377,00	349,00	371,00	358,00	364,00	365,00	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}
205496	1K3D	Nm	12,21	12,38	12,24	12,33	12,25	12,13	12,18	12,11	12,17	12,26
205496	1K3D	Grad	362,00	362,00	363,00	384,00	359,00	346,00	342,00	355,00	356,00	356,00

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}
205496	1K3D	Nm	11,93	12,18	12,28	12,14	12,10	12,03	12,28	11,98	11,90	12,04
205496	1K3D	Grad	365,00	367,00	361,00	398,00	377,00	361,00	351,00	365,00	352,00	355,00

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}
205496	1K3D	Nm	12,18	11,97	12,06	11,89	12,05	12,37	11,89	12,09	12,29	11,84
205496	1K3D	Grad	361,00	361,00	365,00	393,00	387,00	356,00	383,00	376,00	349,00	369,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 13.06.2022

Serial No.	755950_a	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	12,00
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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}
205496	1K3D	Nm	12,28	11,89	12,12	12,14	12,26	12,17	11,89	12,02	12,04	12,07
205496	1K3D	Grad	362,00	357,00	382,00	384,00	365,00	359,00	360,00	353,00	359,00	355,00

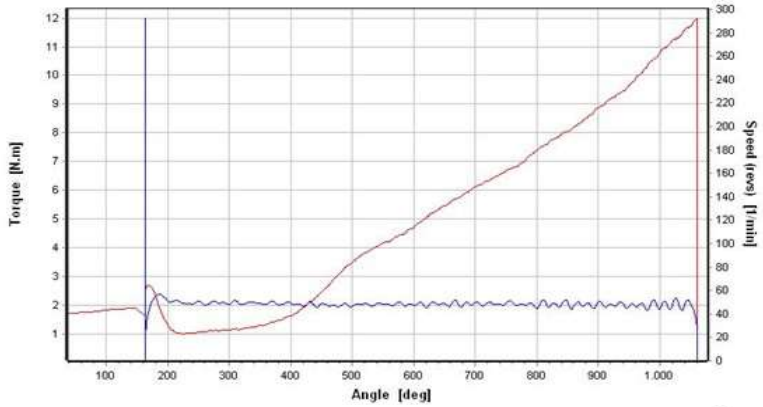
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	11,81	11,93	12,20	12,28	11,96	11,94	12,29	11,96	12,24	12,14
205496	1K3D	Grad	356,00	345,00	340,00	348,00	377,00	373,00	357,00	391,00	368,00	349,00

Torque graphs

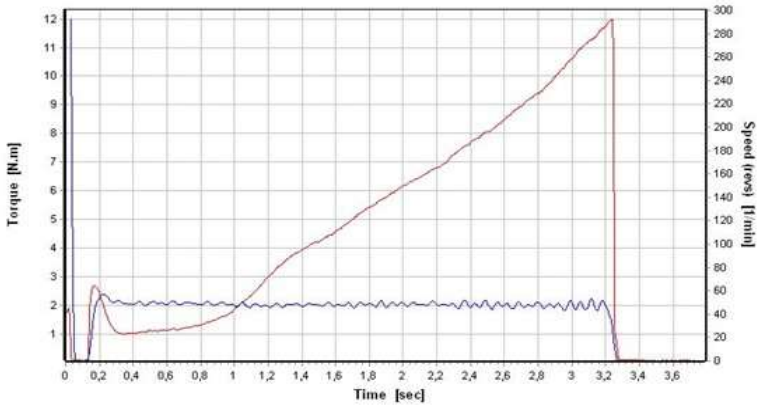
Machine Capability Study 100 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755950**

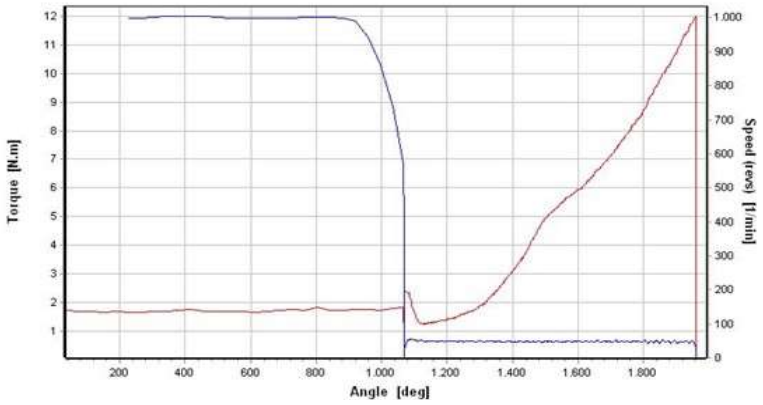
Angle degree: **360°**
Test torque: **12,0 Nm**



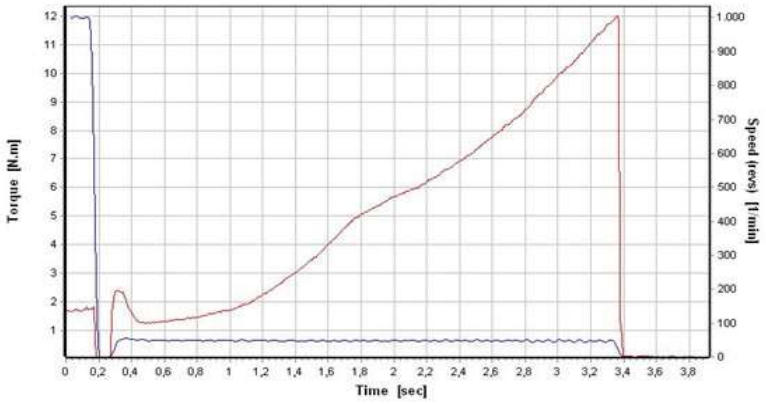
Value no. 1
Graph
Torque / Angle / Speed



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:** Fixtured Spindle

Model: 1BD-1B012A-1K3D-1VK3D **Serial no:** 755950

Torque range: **2 Nm to 12 Nm**

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

Capability examination

Snugfit value: 2,4 Nm **Torque tolerance ±** 7 %

Target torque: 7,2 Nm Tolerance: 3,02 % ± **1,51 %**

Angle degree: 40° Tolerance: 2,4° ± **1,2°**

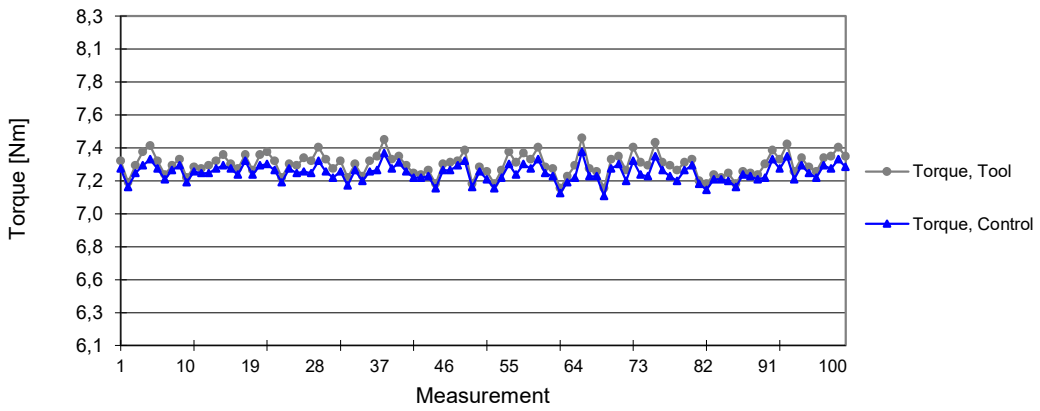
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

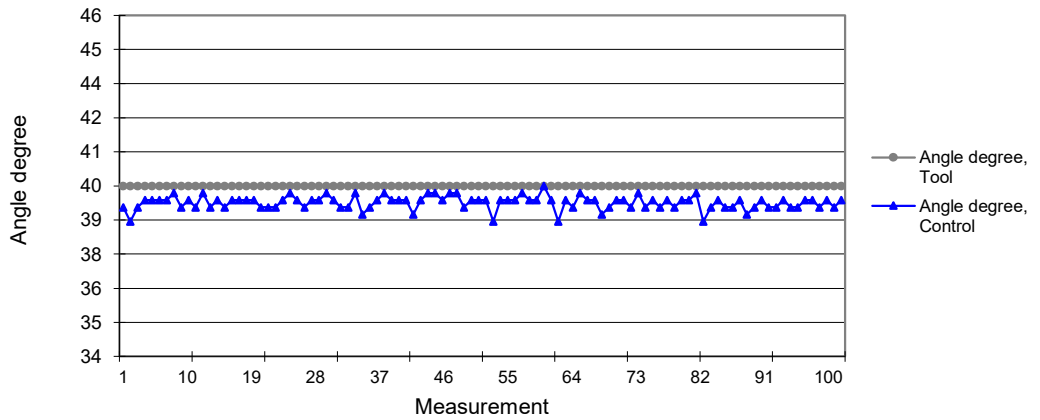
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	7,33	40,00	7,28	39,25	0,05	0,75
2	7,19	40,00	7,16	38,75	0,03	1,25
3	7,30	40,00	7,25	39,25	0,05	0,75
4	7,39	40,00	7,30	39,50	0,09	0,50
5	7,43	40,00	7,34	39,50	0,09	0,50
6	7,33	40,00	7,28	39,50	0,05	0,50
7	7,24	40,00	7,21	39,50	0,03	0,50
8	7,30	40,00	7,27	39,75	0,03	0,25
9	7,34	40,00	7,30	39,25	0,04	0,75
10	7,22	40,00	7,19	39,50	0,03	0,50
11	7,29	40,00	7,26	39,25	0,03	0,75
12	7,28	40,00	7,25	39,75	0,03	0,25
13	7,30	40,00	7,25	39,25	0,05	0,75
14	7,33	40,00	7,28	39,50	0,05	0,50
15	7,37	40,00	7,30	39,25	0,07	0,75
16	7,31	40,00	7,28	39,50	0,03	0,50
17	7,28	40,00	7,24	39,50	0,04	0,50
18	7,37	40,00	7,33	39,50	0,04	0,50
19	7,27	40,00	7,24	39,50	0,03	0,50
20	7,37	40,00	7,30	39,25	0,07	0,75
21	7,39	40,00	7,31	39,25	0,08	0,75
22	7,33	40,00	7,27	39,25	0,06	0,75
23	7,22	40,00	7,19	39,50	0,03	0,50
24	7,31	40,00	7,28	39,75	0,03	0,25
25	7,30	40,00	7,25	39,50	0,05	0,50
26	7,35	40,00	7,26	39,25	0,09	0,75
27	7,33	40,00	7,25	39,50	0,08	0,50
28	7,42	40,00	7,33	39,50	0,09	0,50
29	7,34	40,00	7,26	39,75	0,08	0,25
30	7,28	40,00	7,22	39,50	0,06	0,50
31	7,33	40,00	7,26	39,25	0,07	0,75
32	7,22	40,00	7,17	39,25	0,05	0,75
33	7,31	40,00	7,27	39,75	0,04	0,25
34	7,23	40,00	7,20	39,00	0,03	1,00
35	7,33	40,00	7,26	39,25	0,07	0,75
36	7,36	40,00	7,27	39,50	0,09	0,50
37	7,47	40,00	7,38	39,75	0,09	0,25
38	7,34	40,00	7,28	39,50	0,06	0,50
39	7,36	40,00	7,32	39,50	0,04	0,50
40	7,30	40,00	7,26	39,50	0,04	0,50
41	7,25	40,00	7,22	39,00	0,03	1,00
42	7,24	40,00	7,22	39,50	0,02	0,50
43	7,27	40,00	7,23	39,75	0,04	0,25
44	7,18	40,00	7,15	39,75	0,03	0,25
45	7,31	40,00	7,27	39,50	0,04	0,50
46	7,32	40,00	7,27	39,75	0,05	0,25
47	7,33	40,00	7,30	39,75	0,03	0,25
48	7,40	40,00	7,33	39,25	0,07	0,75
49	7,18	40,00	7,16	39,50	0,02	0,50
50	7,29	40,00	7,26	39,50	0,03	0,50
51	7,26	40,00	7,21	39,50	0,05	0,50
52	7,18	40,00	7,15	38,75	0,03	1,25
53	7,27	40,00	7,22	39,50	0,05	0,50
54	7,39	40,00	7,31	39,50	0,08	0,50
55	7,32	40,00	7,24	39,50	0,08	0,50
56	7,38	40,00	7,31	39,75	0,07	0,25
57	7,34	40,00	7,28	39,50	0,06	0,50
58	7,42	40,00	7,34	39,50	0,08	0,50
59	7,29	40,00	7,25	40,00	0,04	0,00
60	7,28	40,00	7,23	39,50	0,05	0,50
61	7,15	40,00	7,12	38,75	0,03	1,25
62	7,23	40,00	7,19	39,50	0,04	0,50
63	7,30	40,00	7,22	39,25	0,08	0,75
64	7,48	40,00	7,39	39,75	0,09	0,25
65	7,28	40,00	7,23	39,50	0,05	0,50
66	7,26	40,00	7,23	39,50	0,03	0,50
67	7,15	40,00	7,10	39,00	0,05	1,00
68	7,34	40,00	7,28	39,25	0,06	0,75
69	7,36	40,00	7,31	39,50	0,05	0,50
70	7,27	40,00	7,20	39,50	0,07	0,50
71	7,42	40,00	7,33	39,25	0,09	0,75
72	7,32	40,00	7,24	39,75	0,08	0,25
73	7,30	40,00	7,23	39,25	0,07	0,75
74	7,45	40,00	7,36	39,50	0,09	0,50
75	7,32	40,00	7,27	39,25	0,05	0,75
76	7,30	40,00	7,23	39,50	0,07	0,50
77	7,27	40,00	7,20	39,25	0,07	0,75
78	7,32	40,00	7,27	39,50	0,05	0,50
79	7,34	40,00	7,30	39,50	0,04	0,50
80	7,20	40,00	7,18	39,75	0,02	0,25
81	7,18	40,00	7,14	38,75	0,04	1,25
82	7,24	40,00	7,21	39,25	0,03	0,75
83	7,22	40,00	7,21	39,50	0,01	0,50
84	7,25	40,00	7,20	39,25	0,05	0,75
85	7,18	40,00	7,16	39,25	0,02	0,75
86	7,26	40,00	7,24	39,50	0,02	0,50
87	7,25	40,00	7,23	39,00	0,02	1,00
88	7,24	40,00	7,21	39,25	0,03	0,75
89	7,31	40,00	7,22	39,50	0,09	0,50
90	7,40	40,00	7,34	39,25	0,06	0,75
91	7,34	40,00	7,28	39,25	0,06	0,75
92	7,44	40,00	7,36	39,50	0,08	0,50
93	7,26	40,00	7,21	39,25	0,05	0,75
94	7,35	40,00	7,30	39,25	0,05	0,75
95	7,29	40,00	7,25	39,50	0,04	0,50
96	7,26	40,00	7,22	39,50	0,04	0,50
97	7,35	40,00	7,30	39,25	0,05	0,75
98	7,36	40,00	7,28	39,50	0,08	0,50
99	7,42	40,00	7,34	39,25	0,08	0,75
100	7,36	40,00	7,29	39,50	0,07	0,50
				Standard deviation:	**0,022**	**0,236**

Graphical representation

Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755950**
Target torque:	**7,20 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





Machine Capability Study
Control System

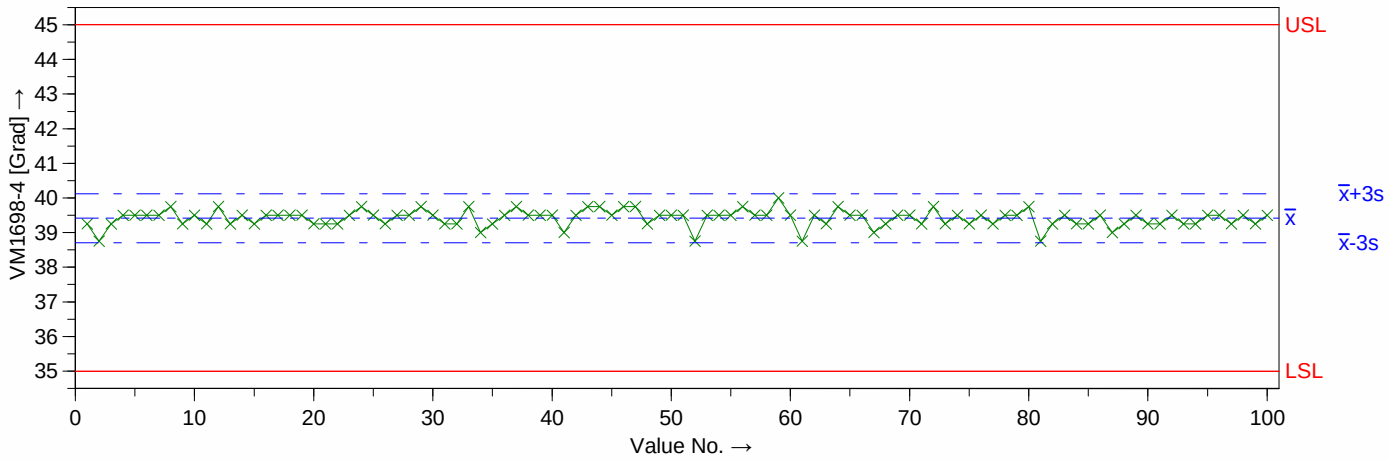
Page 1 / 1

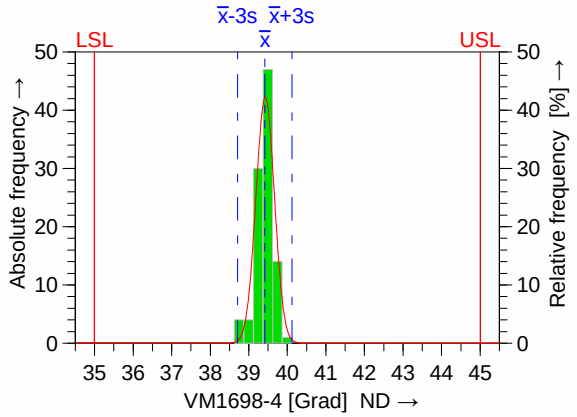
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

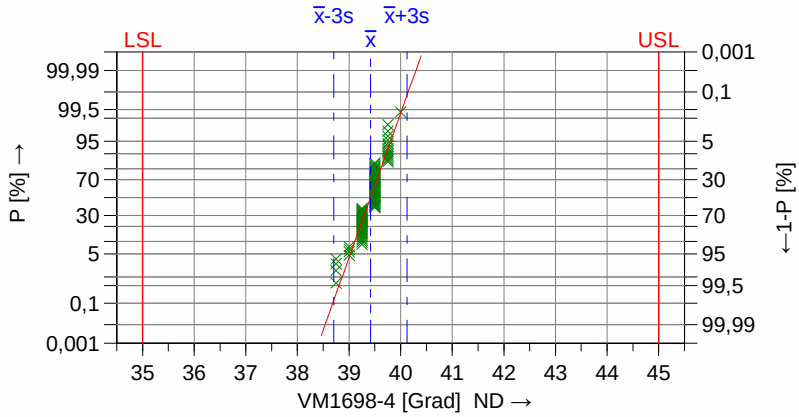
Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_k	Char.Descr.	VM1698-4	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 14.06.2022 11:13:50 to 14.06.2022 11:27:59

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	39.4150
LSL	35.00	x_{min}	38.75	$\bar{x}$-3s	38.7061
USL	45.00	x_{max}	40.00	$\bar{x}$+3s	40.1239
T	10.00	R	1.25	6s	1.4177
		$n_{<T>}$	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	7.05
Critical capability index	=	C_{mk}	6.23

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_kM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	7,34
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	5,67
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 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	7,28	7,16	7,25	7,30	7,34	7,28	7,21	7,27	7,30	7,19
1024210	VM1698-4	Grad	39,25	38,75	39,25	39,50	39,50	39,50	39,50	39,75	39,25	39,50

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	7,26	7,25	7,25	7,28	7,30	7,28	7,24	7,33	7,24	7,30
1024210	VM1698-4	Grad	39,25	39,75	39,25	39,50	39,25	39,50	39,50	39,50	39,50	39,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	7,31	7,27	7,19	7,28	7,25	7,26	7,25	7,33	7,26	7,22
1024210	VM1698-4	Grad	39,25	39,25	39,50	39,75	39,50	39,25	39,50	39,50	39,75	39,50

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	7,26	7,17	7,27	7,20	7,26	7,27	7,38	7,28	7,32	7,26
1024210	VM1698-4	Grad	39,25	39,25	39,75	39,00	39,25	39,50	39,75	39,50	39,50	39,50

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	7,22	7,22	7,23	7,15	7,27	7,27	7,30	7,33	7,16	7,26
1024210	VM1698-4	Grad	39,00	39,50	39,75	39,75	39,50	39,75	39,75	39,25	39,50	39,50

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	7,21	7,15	7,22	7,31	7,24	7,31	7,28	7,34	7,25	7,23
1024210	VM1698-4	Grad	39,50	38,75	39,50	39,50	39,50	39,75	39,50	39,50	40,00	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	7,12	7,19	7,22	7,39	7,23	7,23	7,10	7,28	7,31	7,20
1024210	VM1698-4	Grad	38,75	39,50	39,25	39,75	39,50	39,50	39,00	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	7,33	7,24	7,23	7,36	7,27	7,23	7,20	7,27	7,30	7,18
1024210	VM1698-4	Grad	39,25	39,75	39,25	39,50	39,25	39,50	39,25	39,50	39,50	39,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	7,34
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	5,67
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 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	7,14	7,21	7,21	7,20	7,16	7,24	7,23	7,21	7,22	7,34
1024210	VM1698-4	Grad	38,75	39,25	39,50	39,25	39,25	39,50	39,00	39,25	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	7,28	7,36	7,21	7,30	7,25	7,22	7,30	7,28	7,34	7,29
1024210	VM1698-4	Grad	39,25	39,50	39,25	39,25	39,50	39,50	39,25	39,50	39,25	39,50

Machine Capability Study
Tool System

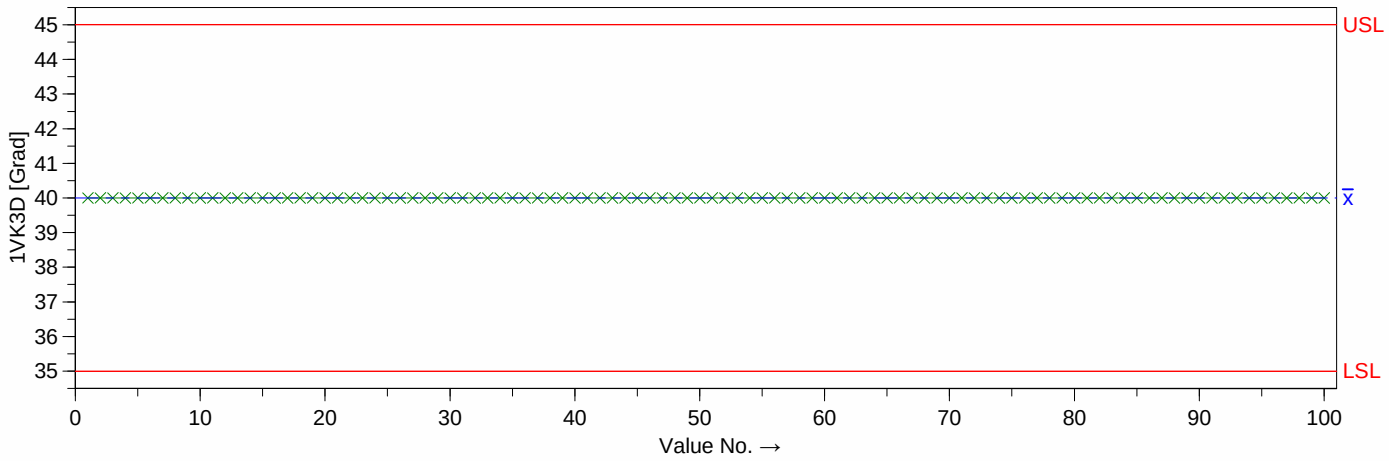
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

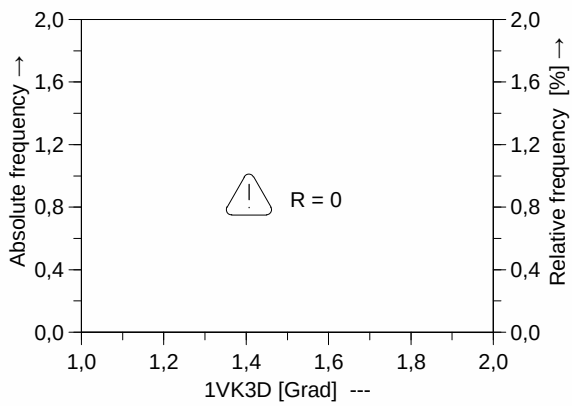
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_k	Char.Descr. 1VK3D	Nom.val.	40,00	5,00	USL 45,00
	Serial No. 198081	Unit	Grad	-5,00	LSL 35,00
Char.Type variable		Tolerance value	12 %		Decimal Pl. 2

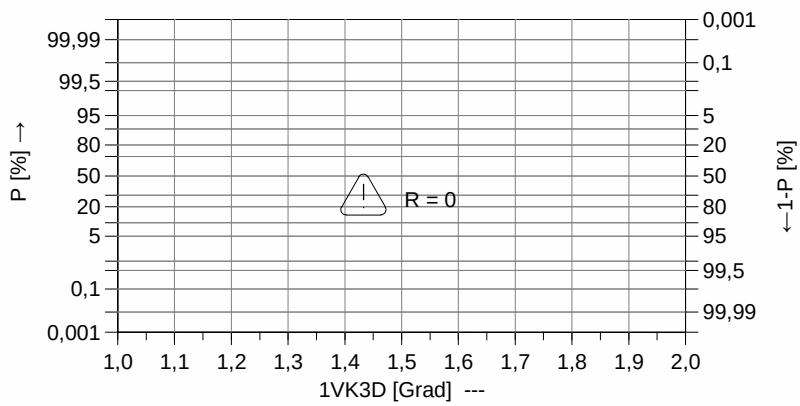
Cust.Name Cleco	Reference System VM1698-4	Test Electronic MPRO400GCD-P
Contr.No. Homologation	Reference Transducer 10 / 1026388	nges. 100

Evaluation from 14.06.2022 11:13:50 to 14.06.2022 11:28:00

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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 14.06.2022

Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	3,79
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	0,00
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 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}
198081	1VK3D	Nm	7,33	7,19	7,30	7,39	7,43	7,33	7,24	7,30	7,34	7,22
198081	1VK3D	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}
198081	1VK3D	Nm	7,29	7,28	7,30	7,33	7,37	7,31	7,28	7,37	7,27	7,37
198081	1VK3D	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}
198081	1VK3D	Nm	7,39	7,33	7,22	7,31	7,30	7,35	7,33	7,42	7,34	7,28
198081	1VK3D	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}
198081	1VK3D	Nm	7,33	7,22	7,31	7,23	7,33	7,36	7,47	7,34	7,36	7,30
198081	1VK3D	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}
198081	1VK3D	Nm	7,25	7,24	7,27	7,18	7,31	7,32	7,33	7,40	7,18	7,29
198081	1VK3D	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}
198081	1VK3D	Nm	7,26	7,18	7,27	7,39	7,32	7,38	7,34	7,42	7,29	7,28
198081	1VK3D	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}
198081	1VK3D	Nm	7,15	7,23	7,30	7,48	7,28	7,26	7,15	7,34	7,36	7,27
198081	1VK3D	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}
198081	1VK3D	Nm	7,42	7,32	7,30	7,45	7,32	7,30	7,27	7,32	7,34	7,20
198081	1VK3D	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 14.06.2022

Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	3,79
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	0,00
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 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}
198081	1VK3D	Nm	7,18	7,24	7,22	7,25	7,18	7,26	7,25	7,24	7,31	7,40
198081	1VK3D	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}
198081	1VK3D	Nm	7,34	7,44	7,26	7,35	7,29	7,26	7,35	7,36	7,42	7,36
198081	1VK3D	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

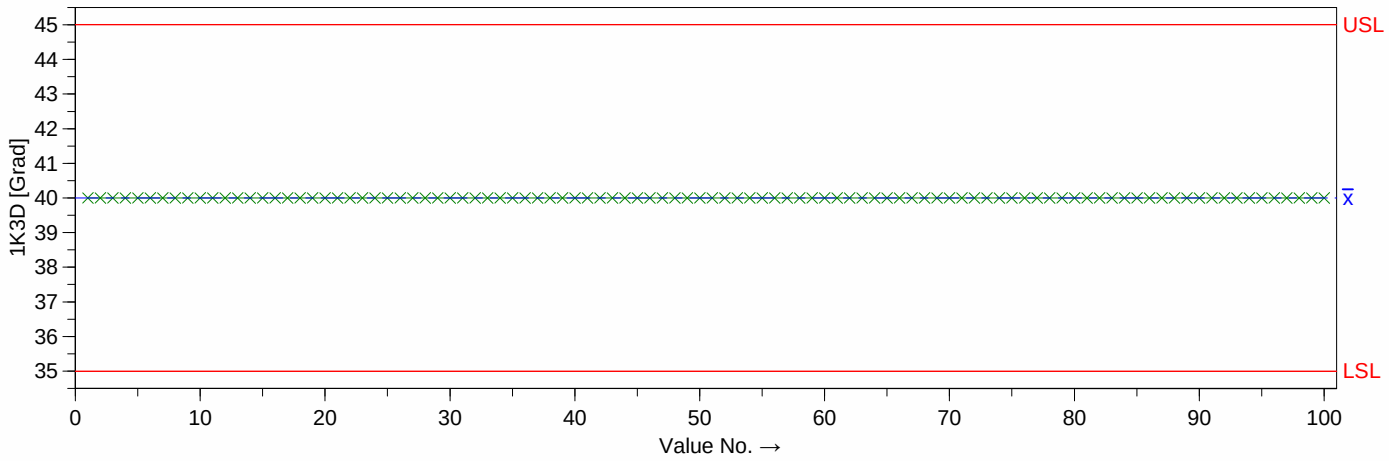
Machine Capability Study
Tool System

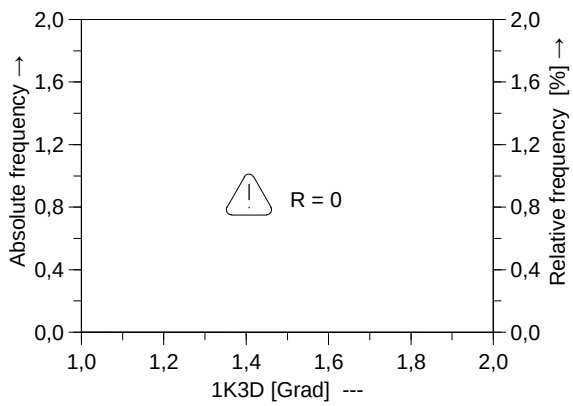
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

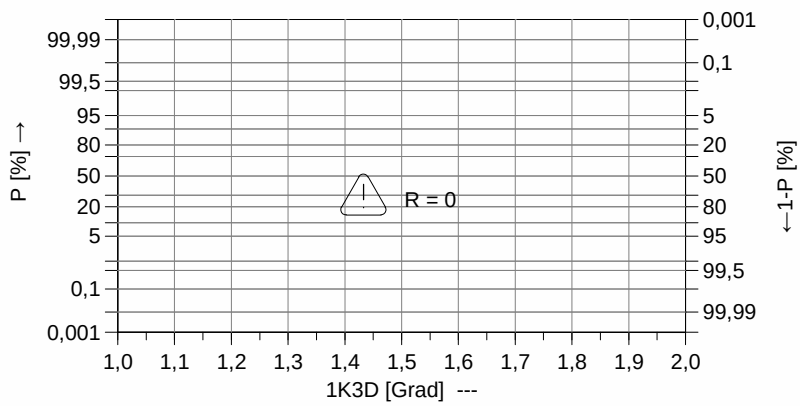
Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_k	Char.Descr.	1K3D	Nom.val. 40,00 5,00	USL 45,00
		Serial No.	205496	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 14.06.2022 11:13:50 to 14.06.2022 11:28:00

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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 14.06.2022

Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	3,79
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	0,00
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 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}
205496	1K3D	Nm	7,42	7,28	7,31	7,32	7,47	7,39	7,16	7,35	7,48	7,23
205496	1K3D	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}
205496	1K3D	Nm	7,50	7,24	7,29	7,52	7,52	7,45	7,21	7,49	7,21	7,40
205496	1K3D	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}
205496	1K3D	Nm	7,38	7,31	7,24	7,32	7,20	7,40	7,27	7,43	7,29	7,21
205496	1K3D	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}
205496	1K3D	Nm	7,48	7,13	7,34	7,40	7,24	7,41	7,52	7,44	7,47	7,48
205496	1K3D	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}
205496	1K3D	Nm	7,45	7,27	7,28	7,18	7,23	7,41	7,50	7,47	7,16	7,40
205496	1K3D	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}
205496	1K3D	Nm	7,19	7,18	7,25	7,56	7,21	7,30	7,36	7,45	7,27	7,28
205496	1K3D	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}
205496	1K3D	Nm	7,13	7,20	7,19	7,50	7,26	7,23	7,09	7,36	7,51	7,20
205496	1K3D	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}
205496	1K3D	Nm	7,49	7,43	7,23	7,58	7,35	7,20	7,22	7,21	7,46	7,21
205496	1K3D	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 14.06.2022

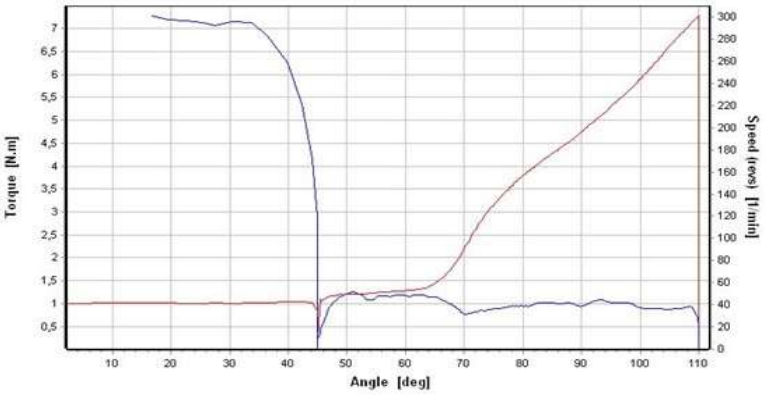
Serial No.	755950_k	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	3,79
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	0,00
				USL	9,10
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal.: 12 Nm; Cur- Cal.: 0.8804 Nm/A; Speed: 300/50 rpm;				

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}
205496	1K3D	Nm	7,15	7,35	7,42	7,20	7,28	7,41	7,36	7,32	7,17	7,51
205496	1K3D	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

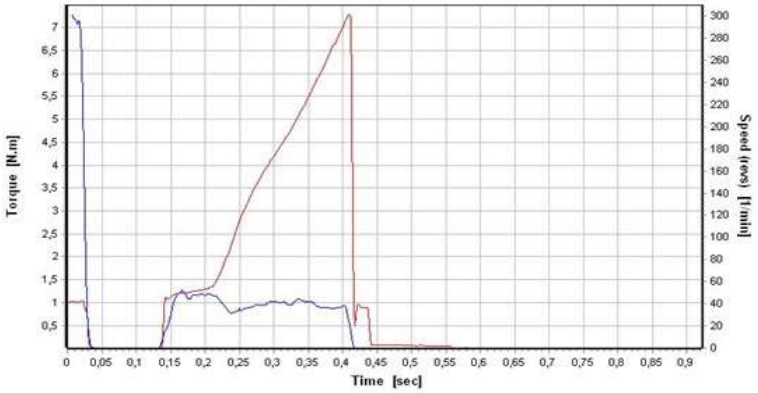
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	7,26	7,50	7,21	7,52	7,48	7,44	7,53	7,33	7,46	7,29
205496	1K3D	Grad	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

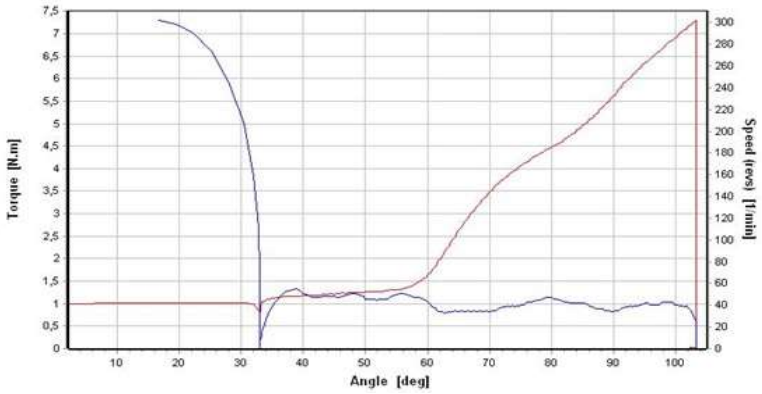
Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755950**
Target torque:	**7,20 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



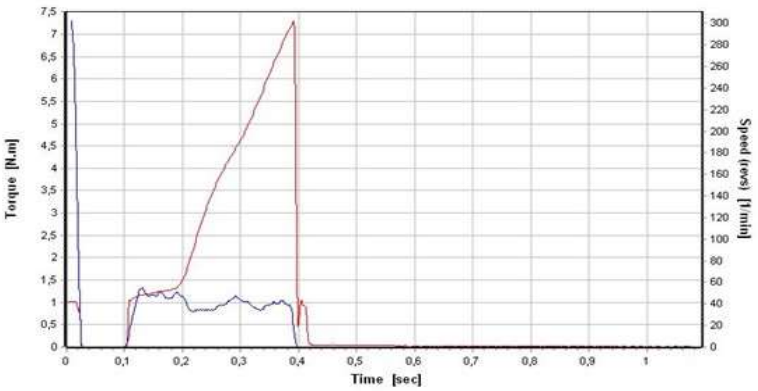
Value no. 1
Graph
Torque / Angle / Speed



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:** Fixtured Spindle

Model: 1BD-1B012A-1K3D-1VK3D **Serial no:** 755950

Torque range: **2 Nm to 12 Nm**

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

Capability examination

Snugfit value: 2,4 Nm **Torque tolerance ±** 7 %

Target torque: 9,6 Nm Tolerance: 3,81 % ± **1,90 %**

Angle degree: 180° Tolerance: 3,4° ± **1,7°**

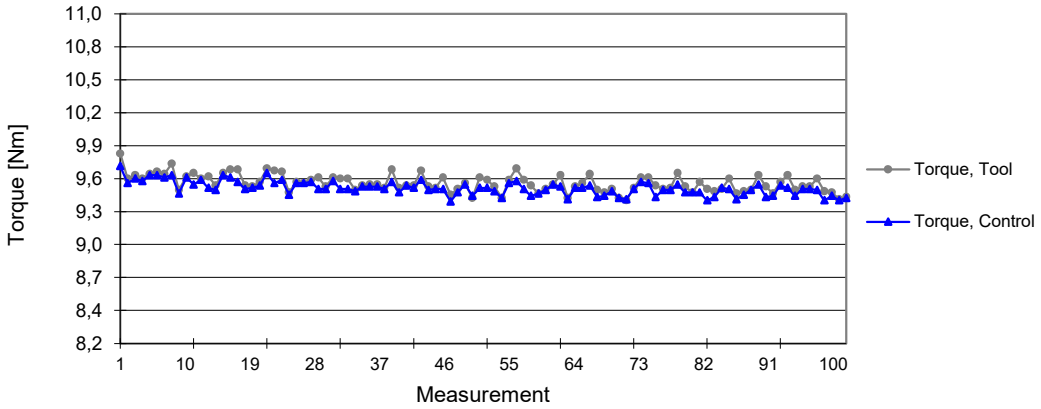
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

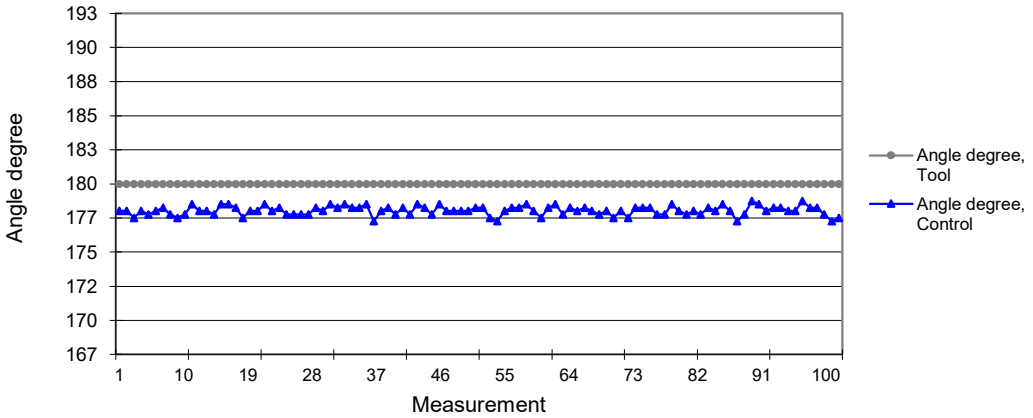
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,82	180,00	9,71	178,00	0,11	2,00
2	9,60	180,00	9,56	178,00	0,04	2,00
3	9,63	180,00	9,60	177,50	0,03	2,50
4	9,60	180,00	9,58	178,00	0,02	2,00
5	9,64	180,00	9,63	177,75	0,01	2,25
6	9,66	180,00	9,63	178,00	0,03	2,00
7	9,64	180,00	9,61	178,25	0,03	1,75
8	9,73	180,00	9,63	177,75	0,10	2,25
9	9,50	180,00	9,47	177,50	0,03	2,50
10	9,62	180,00	9,61	177,75	0,01	2,25
11	9,65	180,00	9,55	178,50	0,10	1,50
12	9,60	180,00	9,59	178,00	0,01	2,00
13	9,62	180,00	9,52	178,00	0,10	2,00
14	9,54	180,00	9,50	177,75	0,04	2,25
15	9,65	180,00	9,63	178,50	0,02	1,50
16	9,68	180,00	9,61	178,50	0,07	1,50
17	9,68	180,00	9,57	178,25	0,11	1,75
18	9,54	180,00	9,51	177,50	0,03	2,50
19	9,53	180,00	9,52	178,00	0,01	2,00
20	9,57	180,00	9,54	178,00	0,03	2,00
21	9,69	180,00	9,65	178,50	0,04	1,50
22	9,67	180,00	9,56	178,00	0,11	2,00
23	9,66	180,00	9,59	178,25	0,07	1,75
24	9,48	180,00	9,46	177,75	0,02	2,25
25	9,57	180,00	9,56	177,75	0,01	2,25
26	9,56	180,00	9,56	177,75	0,00	2,25
27	9,59	180,00	9,57	177,75	0,02	2,25
28	9,61	180,00	9,51	178,25	0,10	1,75
29	9,53	180,00	9,51	178,00	0,02	2,00
30	9,61	180,00	9,58	178,50	0,03	1,50
31	9,60	180,00	9,51	178,25	0,09	1,75
32	9,60	180,00	9,51	178,50	0,09	1,50
33	9,50	180,00	9,49	178,25	0,01	1,75
34	9,54	180,00	9,53	178,25	0,01	1,75
35	9,55	180,00	9,53	178,50	0,02	1,50
36	9,55	180,00	9,53	177,25	0,02	2,75
37	9,52	180,00	9,51	178,00	0,01	2,00
38	9,68	180,00	9,57	178,25	0,11	1,75
39	9,52	180,00	9,48	177,75	0,04	2,25
40	9,54	180,00	9,54	178,25	0,00	1,75
41	9,54	180,00	9,52	177,75	0,02	2,25
42	9,67	180,00	9,59	178,50	0,08	1,50
43	9,53	180,00	9,50	178,25	0,03	1,75
44	9,52	180,00	9,51	177,75	0,01	2,25
45	9,61	180,00	9,51	178,50	0,10	1,50
46	9,46	180,00	9,40	178,00	0,06	2,00
47	9,51	180,00	9,48	178,00	0,03	2,00
48	9,56	180,00	9,55	178,00	0,01	2,00
49	9,43	180,00	9,45	178,00	0,02	2,00
50	9,61	180,00	9,52	178,25	0,09	1,75
51	9,59	180,00	9,52	178,25	0,07	1,75
52	9,53	180,00	9,49	177,50	0,04	2,50
53	9,43	180,00	9,43	177,25	0,00	2,75
54	9,59	180,00	9,56	178,00	0,03	2,00
55	9,69	180,00	9,58	178,25	0,11	1,75
56	9,59	180,00	9,51	178,25	0,08	1,75
57	9,54	180,00	9,45	178,50	0,09	1,50
58	9,47	180,00	9,47	178,00	0,00	2,00
59	9,51	180,00	9,50	177,50	0,01	2,50
60	9,55	180,00	9,55	178,25	0,00	1,75
61	9,63	180,00	9,53	178,50	0,10	1,50
62	9,43	180,00	9,42	177,75	0,01	2,25
63	9,53	180,00	9,52	178,25	0,01	1,75
64	9,56	180,00	9,52	178,00	0,04	2,00
65	9,64	180,00	9,54	178,25	0,10	1,75
66	9,50	180,00	9,44	178,00	0,06	2,00
67	9,48	180,00	9,45	177,75	0,03	2,25
68	9,51	180,00	9,49	178,00	0,02	2,00
69	9,43	180,00	9,43	177,50	0,00	2,50
70	9,41	180,00	9,42	178,00	0,01	2,00
71	9,52	180,00	9,51	177,50	0,01	2,50
72	9,61	180,00	9,57	178,25	0,04	1,75
73	9,61	180,00	9,56	178,25	0,05	1,75
74	9,54	180,00	9,44	178,25	0,10	1,75
75	9,51	180,00	9,50	177,75	0,01	2,25
76	9,52	180,00	9,50	177,75	0,02	2,25
77	9,65	180,00	9,55	178,50	0,10	1,50
78	9,53	180,00	9,48	178,00	0,05	2,00
79	9,48	180,00	9,48	177,75	0,00	2,25
80	9,57	180,00	9,48	178,00	0,09	2,00
81	9,51	180,00	9,41	177,75	0,10	2,25
82	9,49	180,00	9,44	178,25	0,05	1,75
83	9,51	180,00	9,52	178,00	0,01	2,00
84	9,60	180,00	9,51	178,50	0,09	1,50
85	9,47	180,00	9,42	178,00	0,05	2,00
86	9,49	180,00	9,46	177,25	0,03	2,75
87	9,50	180,00	9,50	177,75	0,00	2,25
88	9,63	180,00	9,55	178,75	0,08	1,25
89	9,53	180,00	9,44	178,50	0,09	1,50
90	9,47	180,00	9,45	178,00	0,02	2,00
91	9,57	180,00	9,54	178,25	0,03	1,75
92	9,63	180,00	9,52	178,25	0,11	1,75
93	9,50	180,00	9,45	178,00	0,05	2,00
94	9,53	180,00	9,51	178,00	0,02	2,00
95	9,53	180,00	9,51	178,75	0,02	1,25
96	9,60	180,00	9,50	178,25	0,10	1,75
97	9,49	180,00	9,41	178,25	0,08	1,75
98	9,48	180,00	9,45	177,75	0,03	2,25
99	9,42	180,00	9,41	177,25	0,01	2,75
100	9,44	180,00	9,43	177,50	0,01	2,50
				Standard deviation:	**0,036**	**0,341**

Graphical representation

Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755950**
Target torque:	**9,60 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





Machine Capability Study
Control System

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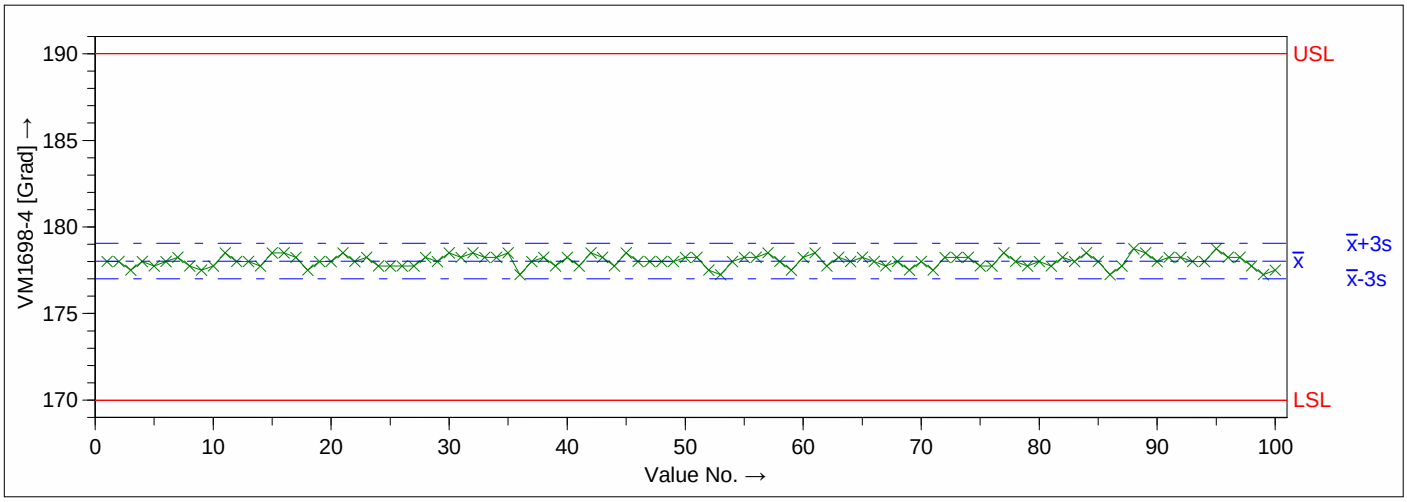
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

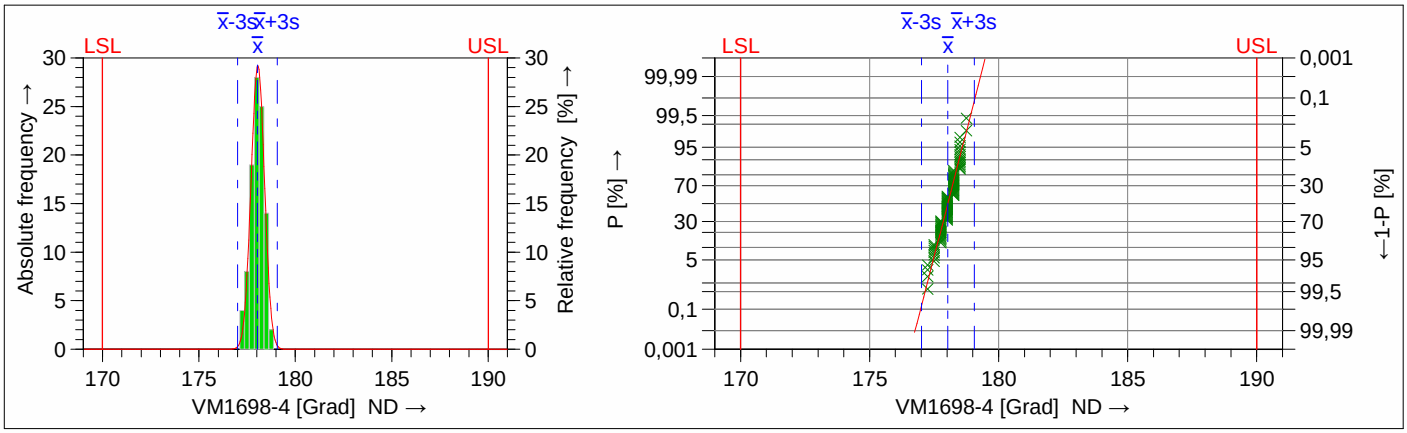
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_l	Char.Descr. VM1698-4	Nom.val.	180,00	10,00	USL 190,00
	Serial No. 1024210	Unit	Grad	-10,00	LSL 170,00
Char.Type variable		Tolerance value	6 %		Decimal Pl. 2

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

Evaluation from 14.06.2022 11:32:34 to 14.06.2022 11:48:10

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	178.0300
LSL	170.00	x_{min}	177.25	$\bar{x}$-3s	177.0060
USL	190.00	x_{max}	178.75	$\bar{x}$+3s	179.0540
T	20.00	R	1.50	6s	2.0481
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	9.77
Critical capability index	=	C_{mk}	7.84

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\Appdata\QW\QWE\Messwert\2022\755950_lM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	9,65
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	7,52
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 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	9,71	9,56	9,60	9,58	9,63	9,63	9,61	9,63	9,47	9,61
1024210	VM1698-4	Grad	178,00	178,00	177,50	178,00	177,75	178,00	178,25	177,75	177,50	177,75

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	9,55	9,59	9,52	9,50	9,63	9,61	9,57	9,51	9,52	9,54
1024210	VM1698-4	Grad	178,50	178,00	178,00	177,75	178,50	178,50	178,25	177,50	178,00	178,00

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	9,65	9,56	9,59	9,46	9,56	9,56	9,57	9,51	9,51	9,58
1024210	VM1698-4	Grad	178,50	178,00	178,25	177,75	177,75	177,75	177,75	178,25	178,00	178,50

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	9,51	9,51	9,49	9,53	9,53	9,53	9,51	9,57	9,48	9,54
1024210	VM1698-4	Grad	178,25	178,50	178,25	178,25	178,50	177,25	178,00	178,25	177,75	178,25

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	9,52	9,59	9,50	9,51	9,51	9,40	9,48	9,55	9,45	9,52
1024210	VM1698-4	Grad	177,75	178,50	178,25	177,75	178,50	178,00	178,00	178,00	178,00	178,25

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	9,52	9,49	9,43	9,56	9,58	9,51	9,45	9,47	9,50	9,55
1024210	VM1698-4	Grad	178,25	177,50	177,25	178,00	178,25	178,25	178,50	178,00	177,50	178,25

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	9,53	9,42	9,52	9,52	9,54	9,44	9,45	9,49	9,43	9,42
1024210	VM1698-4	Grad	178,50	177,75	178,25	178,00	178,25	178,00	177,75	178,00	177,50	178,00

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	9,51	9,57	9,56	9,44	9,50	9,50	9,55	9,48	9,48	9,48
1024210	VM1698-4	Grad	177,50	178,25	178,25	178,25	177,75	177,75	178,50	178,00	177,75	178,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 14.06.2022

Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	VM1698-4	Nom.val.	9,65
Ord. No.	1BD12T2O-A	Serial No.	1024210	LSL	7,52
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 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	9,41	9,44	9,52	9,51	9,42	9,46	9,50	9,55	9,44	9,45
1024210	VM1698-4	Grad	177,75	178,25	178,00	178,50	178,00	177,25	177,75	178,75	178,50	178,00

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	9,54	9,52	9,45	9,51	9,51	9,50	9,41	9,45	9,41	9,43
1024210	VM1698-4	Grad	178,25	178,25	178,00	178,00	178,75	178,25	178,25	177,75	177,25	177,50

Machine Capability Study
Tool System

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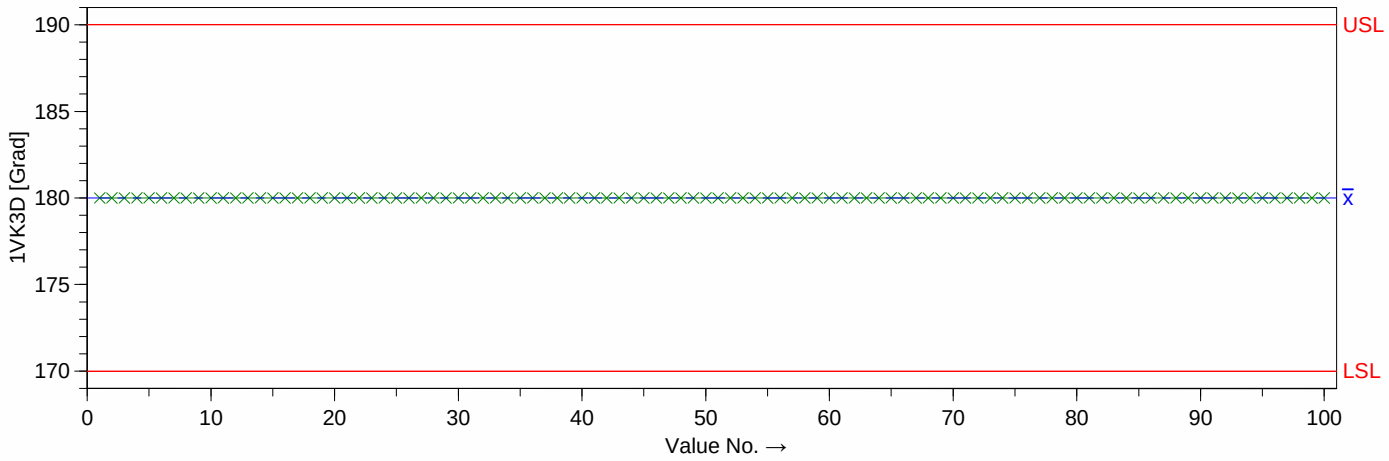
Plant ATG Westhausen		Operator Name Sünder	Date 14.06.2022

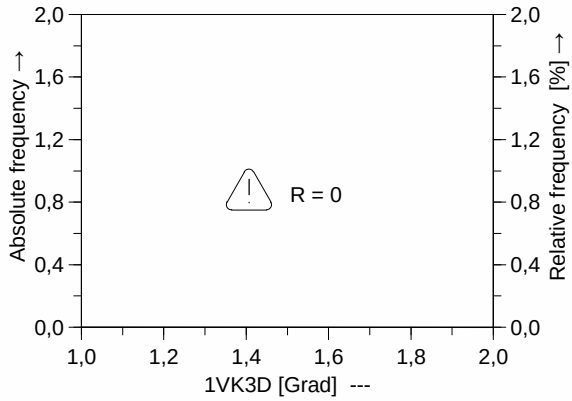
Ord. No. 1BD12T2O-A	Part type 1BD-1B012A-1K3D-1ZB				Contr.item yes
Serial No. 755950_l	Char.Descr. 1VK3D	Nom.val.	180,00	10,00	USL 190,00
	Serial No. 198081	Unit	Grad	-10,00	LSL 170,00
Char.Type variable		Tolerance value	6 %		Decimal Pl. 2

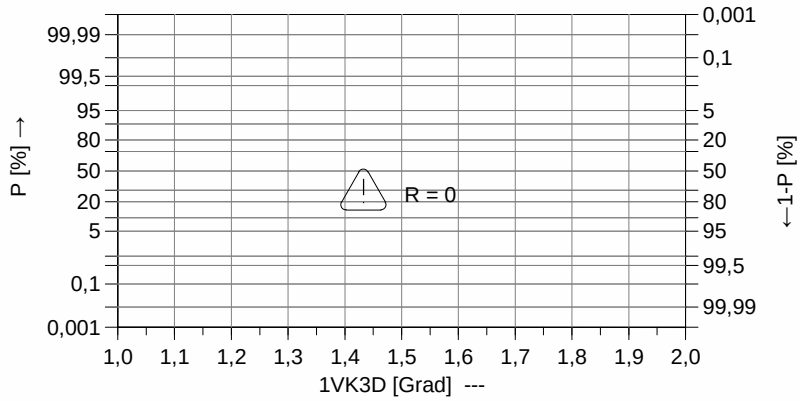
Cust.Name Cleco	Reference System VM1698-4	Test Electronic MPRO400GCD-P
Contr.No. Homologation	Reference Transducer 10 / 1026388	nges. 100

Evaluation from 14.06.2022 11:32:34 to 14.06.2022 11:48:11

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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 14.06.2022

Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	4,95
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	0,00
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 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}
198081	1VK3D	Nm	9,82	9,60	9,63	9,60	9,64	9,66	9,64	9,73	9,50	9,62
198081	1VK3D	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}
198081	1VK3D	Nm	9,65	9,60	9,62	9,54	9,65	9,68	9,68	9,54	9,53	9,57
198081	1VK3D	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}
198081	1VK3D	Nm	9,69	9,67	9,66	9,48	9,57	9,56	9,59	9,61	9,53	9,61
198081	1VK3D	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}
198081	1VK3D	Nm	9,60	9,60	9,50	9,54	9,55	9,55	9,52	9,68	9,52	9,54
198081	1VK3D	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}
198081	1VK3D	Nm	9,54	9,67	9,53	9,52	9,61	9,46	9,51	9,56	9,43	9,61
198081	1VK3D	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}
198081	1VK3D	Nm	9,59	9,53	9,43	9,59	9,69	9,59	9,54	9,47	9,51	9,55
198081	1VK3D	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}
198081	1VK3D	Nm	9,63	9,43	9,53	9,56	9,64	9,50	9,48	9,51	9,43	9,41
198081	1VK3D	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}
198081	1VK3D	Nm	9,52	9,61	9,61	9,54	9,51	9,52	9,65	9,53	9,48	9,57
198081	1VK3D	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 14.06.2022

Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1VK3D	Nom.val.	4,95
Ord. No.	1BD12T2O-A	Serial No.	198081	LSL	0,00
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 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}
198081	1VK3D	Nm	9,51	9,49	9,51	9,60	9,47	9,49	9,50	9,63	9,53	9,47
198081	1VK3D	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}
198081	1VK3D	Nm	9,57	9,63	9,50	9,53	9,53	9,60	9,49	9,48	9,42	9,44
198081	1VK3D	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

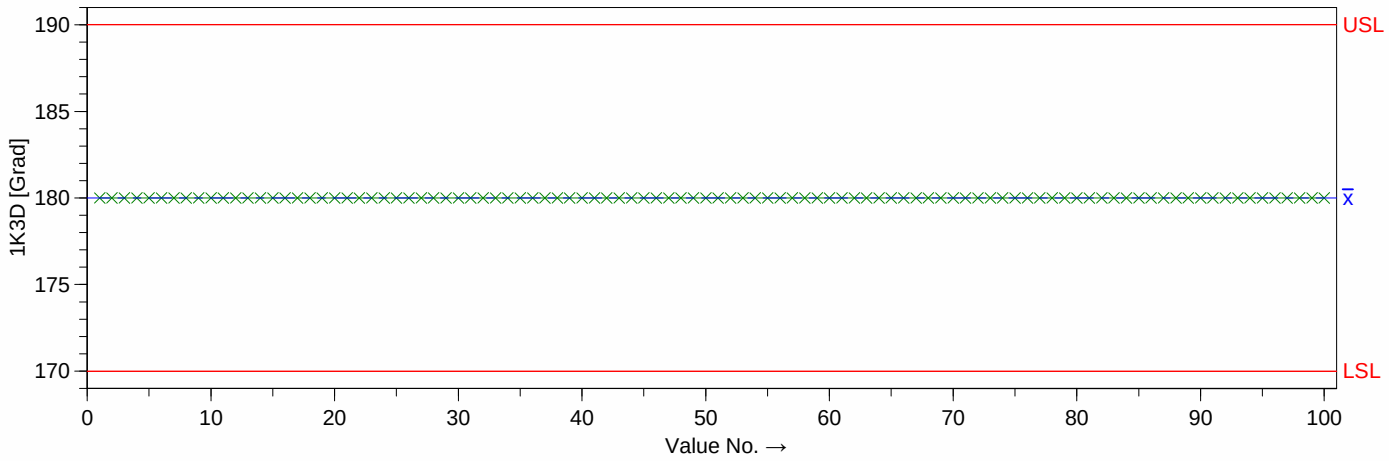
Machine Capability Study
Tool System

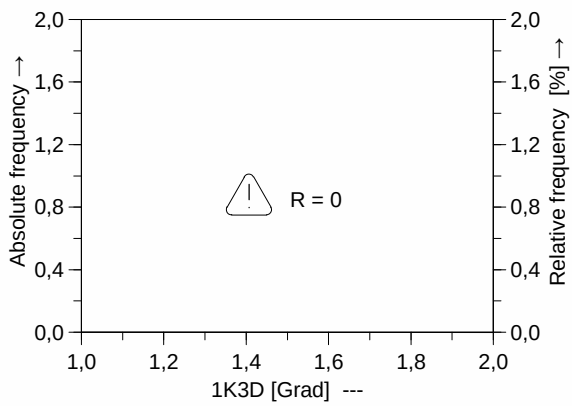
Plant	ATG Westhausen	Operator Name	Sünder
Date	14.06.2022		

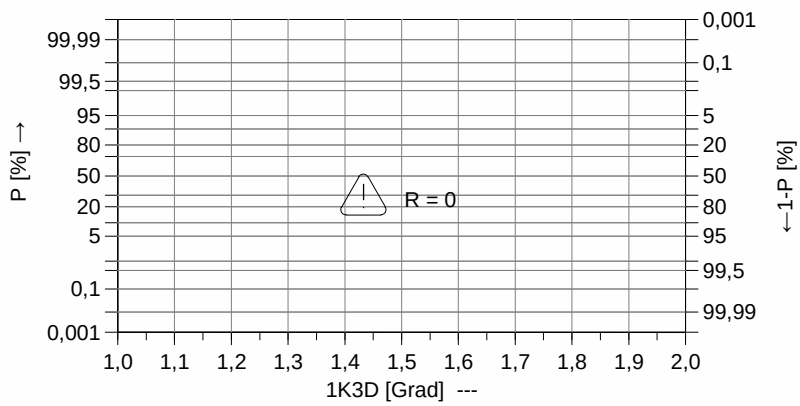
Ord. No.	1BD12T2O-A	Part type	1BD-1B012A-1K3D-1ZB	Contr.item	yes
Serial No.	755950_l	Char.Descr.	1K3D	Nom.val. 180,00 10,00	USL 190,00
		Serial No.	205496	Unit Grad -10,00	LSL 170,00
Char.Type	variable			Tolerance value 6 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 14.06.2022 11:32:34 to 14.06.2022 11:48:11

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal.: 12 Nm; Cur-Cal.: 0.8804 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 14.06.2022

Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	4,95
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	0,00
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 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}
205496	1K3D	Nm	9,82	9,67	9,62	9,54	9,57	9,59	9,75	9,78	9,70	9,79
205496	1K3D	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}
205496	1K3D	Nm	9,86	9,68	9,62	9,60	9,73	9,88	9,57	9,50	9,52	9,70
205496	1K3D	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}
205496	1K3D	Nm	9,89	9,74	9,80	9,70	9,71	9,53	9,79	9,82	9,57	9,58
205496	1K3D	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}
205496	1K3D	Nm	9,76	9,83	9,53	9,86	9,67	9,74	9,71	9,91	9,41	9,54
205496	1K3D	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}
205496	1K3D	Nm	9,60	9,71	9,50	9,60	9,76	9,65	9,74	9,71	9,72	9,62
205496	1K3D	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}
205496	1K3D	Nm	9,80	9,47	9,71	9,54	9,64	9,60	9,72	9,55	9,62	9,46
205496	1K3D	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}
205496	1K3D	Nm	9,70	9,53	9,42	9,74	9,52	9,76	9,52	9,57	9,46	9,48
205496	1K3D	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}
205496	1K3D	Nm	9,70	9,62	9,67	9,65	9,60	9,65	9,62	9,51	9,44	9,78
205496	1K3D	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 14.06.2022

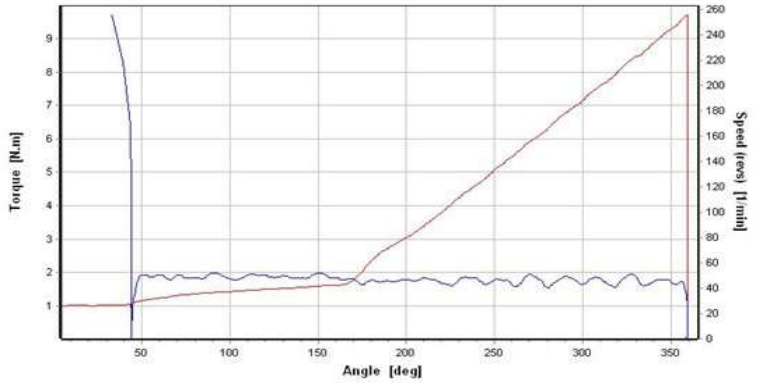
Serial No.	755950_I	Characteristic			
Part type	1BD-1B012A-1K3D-1ZB	Char.Descr.	1K3D	Nom.val.	4,95
Ord. No.	1BD12T2O-A	Serial No.	205496	LSL	0,00
				USL	11,89
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal.: 12 Nm; Cu r-Cal.: 0.8804 Nm/A; Speed: 300/50 rpm;				

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}
205496	1K3D	Nm	9,47	9,44	9,75	9,54	9,67	9,47	9,64	9,53	9,71	9,40
205496	1K3D	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

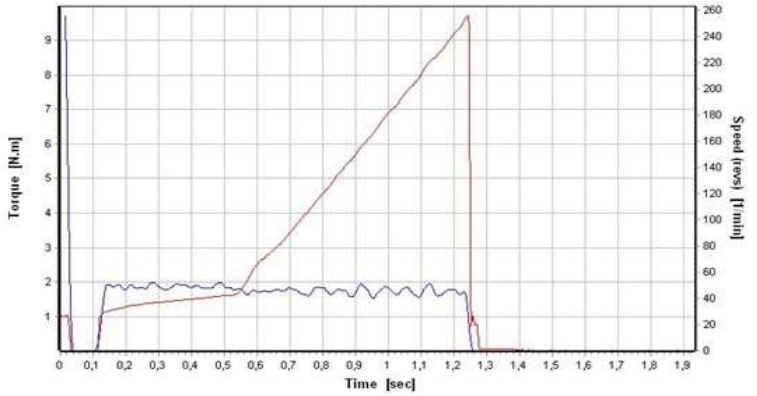
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
205496	1K3D	Nm	9,53	9,42	9,41	9,51	9,50	9,47	9,69	9,57	9,69	9,68
205496	1K3D	Grad	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

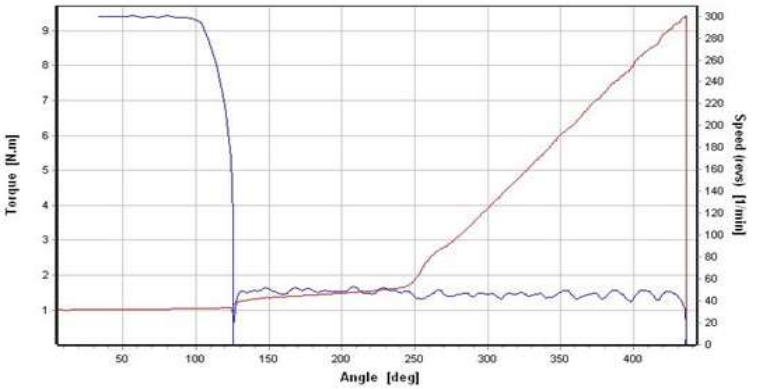
Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755950**
Target torque:	**9,60 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



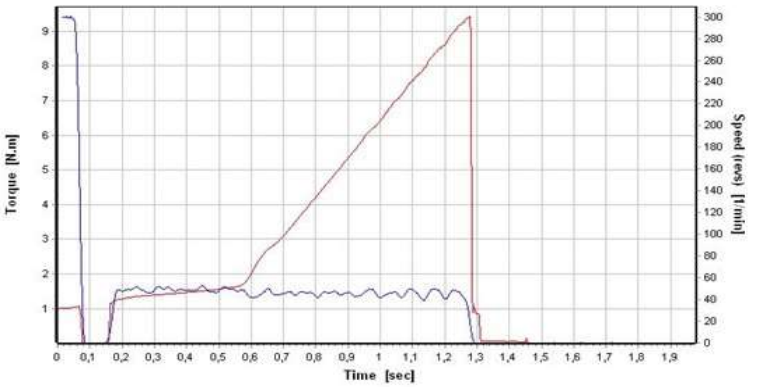
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed