Homologation

Fixtured Spindle

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

Serial no.: 755948

Contents

Homologation: 1BD-1B012A-1K3D-1VK3D SN: 755948

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Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 50 rpm	1,59 %
Single-stage tightening system	☐	Speed 100 %	3152 rpm

Manufacturer: Apex Tool Group Serial no: **755948**

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)	2,47 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	4,94 Nm
	Standard deviation	0,03 Nm	0,03 Nm
	Torque scatter (99,73%)	0,18 Nm	0,15 Nm
	C_m	3,93	4,57
	C_{mk}	3,48	3,78

b)	Min. C_m hard/soft (lowest value)	3,93
	Min. C_{mk} hard/soft (lowest value)	3,48

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

Note:

Machine Capability Study
Control System

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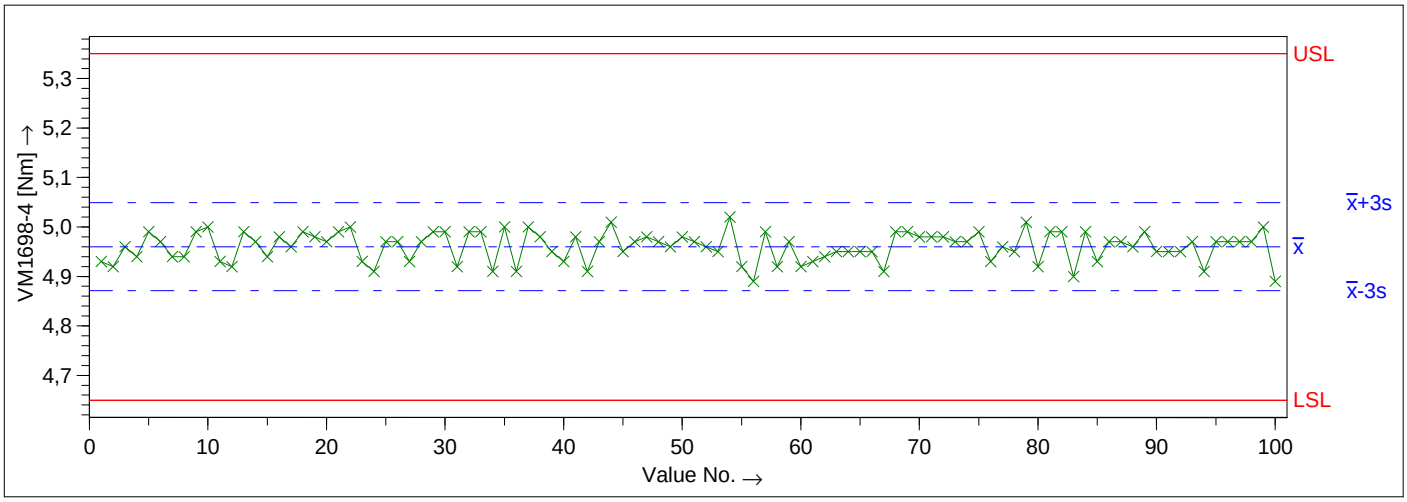
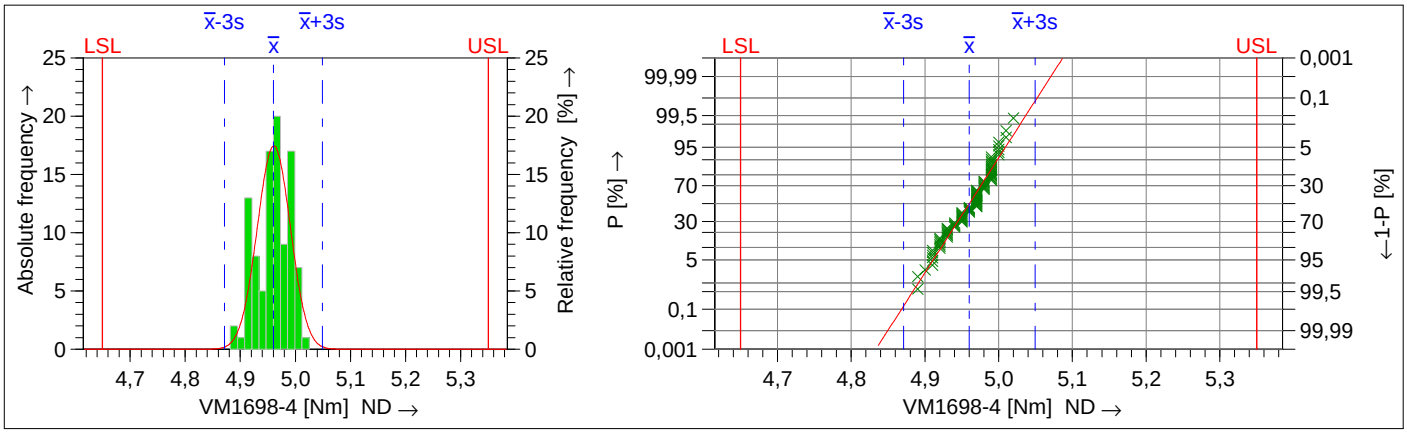
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_d	Char.Descr.	VM1698-4	Inspection 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 09.11.2021 08:22:10 to 09.11.2021 08:39:33

Rem. TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	4.9602
LSL	4.65	x_{min}	4.89	$\bar{x}$-3s	4.8711
USL	5.35	x_{max}	5.02	$\bar{x}$+3s	5.0493
T	0.70	R	0.13	6s	0.1783
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	3.93
Critical capability index	=	C_{mk}	3.48

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_dM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	4,93	4,92	4,96	4,94	4,99	4,97	4,94	4,94	4,99	5,00
1024210	VM1698-4	29,75	29,75	29,00	29,50	30,00	30,00	29,00	29,75	29,75	29,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	4,93	4,92	4,99	4,97	4,94	4,98	4,96	4,99	4,98	4,97
1024210	VM1698-4	29,00	29,00	29,75	30,00	30,50	30,50	30,00	31,00	30,50	30,50

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	4,99	5,00	4,93	4,91	4,97	4,97	4,93	4,97	4,99	4,99
1024210	VM1698-4	31,25	31,00	29,75	28,50	29,50	30,00	30,00	30,00	30,75	30,75

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	4,92	4,99	4,99	4,91	5,00	4,91	5,00	4,98	4,95	4,93
1024210	VM1698-4	29,50	31,00	30,25	29,75	30,75	30,00	30,75	30,50	30,00	30,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	4,98	4,91	4,97	5,01	4,95	4,97	4,98	4,97	4,96	4,98
1024210	VM1698-4	31,00	29,50	30,50	31,25	30,00	30,75	30,75	30,50	30,00	31,50

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	4,97	4,96	4,95	5,02	4,92	4,89	4,99	4,92	4,97	4,92
1024210	VM1698-4	30,50	31,25	30,25	31,00	29,00	28,50	30,25	29,25	30,75	29,75

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	4,93	4,94	4,95	4,95	4,95	4,95	4,91	4,99	4,99	4,98
1024210	VM1698-4	30,00	29,75	30,50	30,50	30,00	30,00	29,00	31,00	30,25	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	4,98	4,98	4,97	4,97	4,99	4,93	4,96	4,95	5,01	4,92
1024210	VM1698-4	30,25	31,25	30,75	30,50	30,25	30,00	30,50	30,75	31,25	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	4,99	4,99	4,90	4,99	4,93	4,97	4,97	4,96	4,99	4,95
1024210	VM1698-4	30,75	30,75	29,50	31,25	30,25	30,75	30,25	30,50	31,75	30,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	4,95	4,95	4,97	4,91	4,97	4,97	4,97	4,97	5,00	4,89
1024210	VM1698-4	30,50	30,50	31,00	29,50	30,50	30,50	30,50	30,50	30,75	29,75

Machine Capability Study
Tool System

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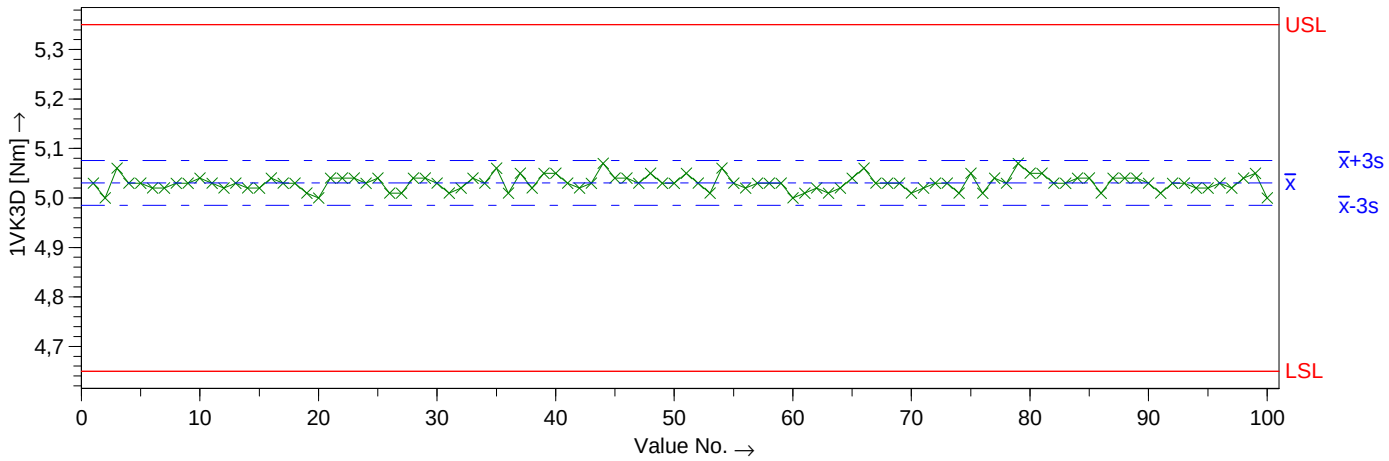
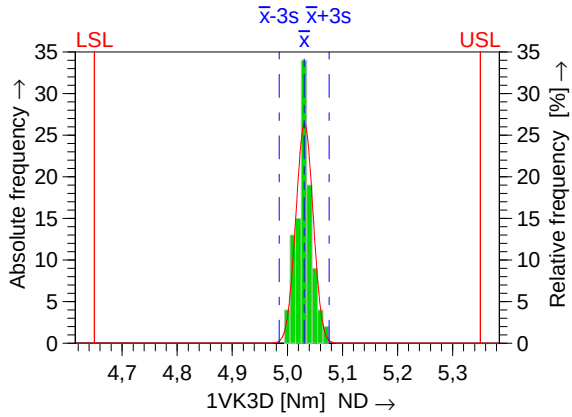
Plant ATG Westhausen		Operator Name Sünder	Date 09.11.2021

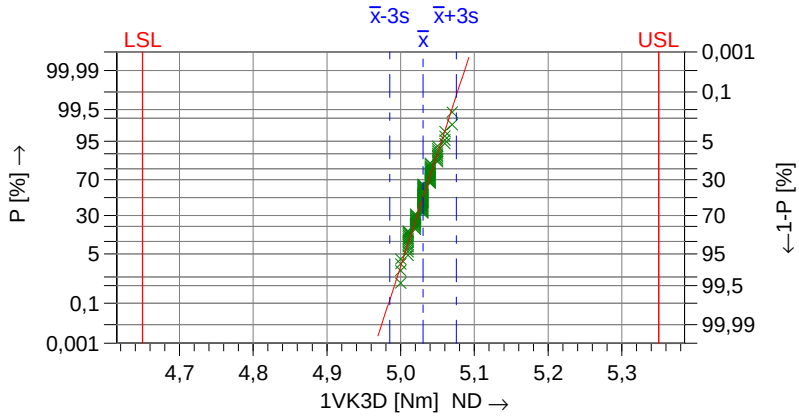
Ord. No. 1BD12T20-A	Part type 1BD-1B012A-1K3D-1VK3D		Contr.item yes
Serial No. 755948_d	Char.Descr. 1VK3D Serial No. 198079	Inspection Val. 5,00 0,35 Unit Nm -0,35	USL 5,35 LSL 4,65
Char.Type variable		Tolerance value 7 %	Decimal Pl. 2
Cust.Name Cleco Contr.No. Homologation	Reference System VM1698-4 Reference Transducer 10 / 1026388	Test Electronic MPRO400GCD-P nges. 100	

Evaluation from 09.11.2021 08:22:11 to 09.11.2021 08:39:34

Rem. TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0304
LSL	4.65	x_{min}	5.00	$\bar{x}$-3s	4.9851
USL	5.35	x_{max}	5.07	$\bar{x}$+3s	5.0757
T	0.70	R	0.07	6s	0.0906
		$n_{<T>}$	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	7.72
Critical capability index	=	C_{mk}	7.05

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 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	5,03	5,00	5,06	5,03	5,03	5,02	5,02	5,03	5,03	5,04
198079	1VK3D	30,00	31,00	30,00	30,00	31,00	30,00	29,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	5,03	5,02	5,03	5,02	5,02	5,04	5,03	5,03	5,01	5,00
198079	1VK3D	29,00	30,00	30,00	30,00	31,00	30,00	30,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	5,04	5,04	5,04	5,03	5,04	5,01	5,01	5,04	5,04	5,03
198079	1VK3D	32,00	31,00	30,00	29,00	30,00	31,00	31,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	5,01	5,02	5,04	5,03	5,06	5,01	5,05	5,02	5,05	5,05
198079	1VK3D	30,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	30,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	5,03	5,02	5,03	5,07	5,04	5,04	5,03	5,05	5,03	5,03
198079	1VK3D	31,00	30,00	31,00	32,00	31,00	32,00	31,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	5,05	5,03	5,01	5,06	5,03	5,02	5,03	5,03	5,03	5,00
198079	1VK3D	31,00	32,00	31,00	31,00	30,00	30,00	31,00	30,00	32,00	30,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	5,01	5,02	5,01	5,02	5,04	5,06	5,03	5,03	5,03	5,01
198079	1VK3D	31,00	30,00	31,00	31,00	30,00	30,00	30,00	31,00	30,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	5,02	5,03	5,03	5,01	5,05	5,01	5,04	5,03	5,07	5,05
198079	1VK3D	30,00	32,00	31,00	31,00	30,00	31,00	31,00	31,00	32,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	5,05	5,03	5,03	5,04	5,04	5,01	5,04	5,04	5,04	5,03
198079	1VK3D	31,00	31,00	30,00	31,00	31,00	31,00	31,00	31,00	33,00	30,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	5,01	5,03	5,03	5,02	5,02	5,03	5,02	5,04	5,05	5,00
198079	1VK3D	31,00	31,00	31,00	30,00	31,00	31,00	31,00	31,00	32,00	31,00

Machine Capability Study
Tool System

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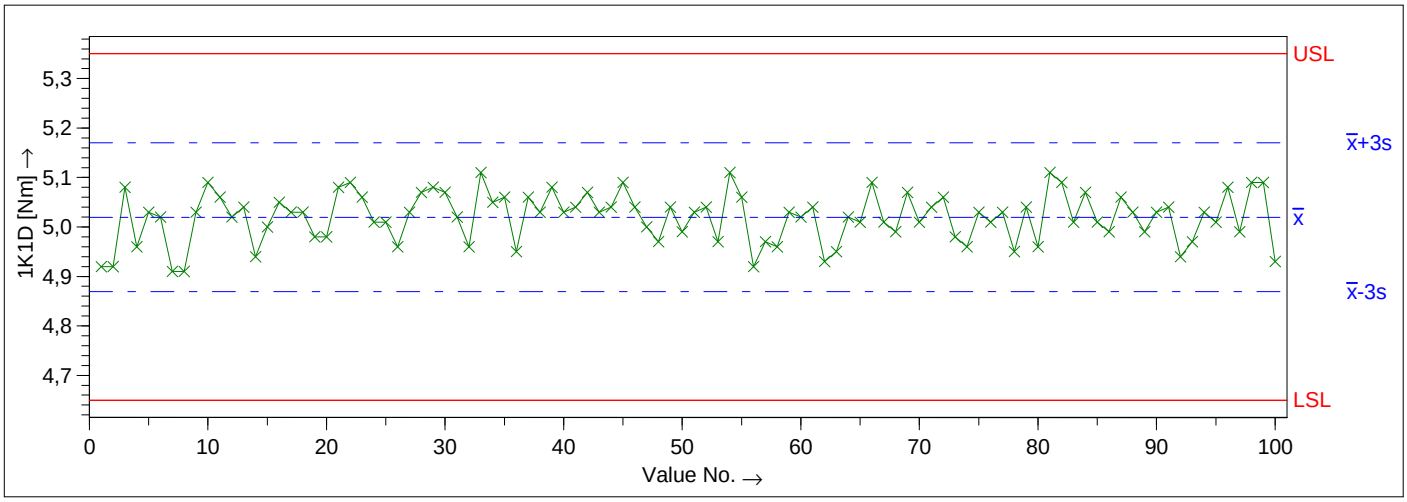
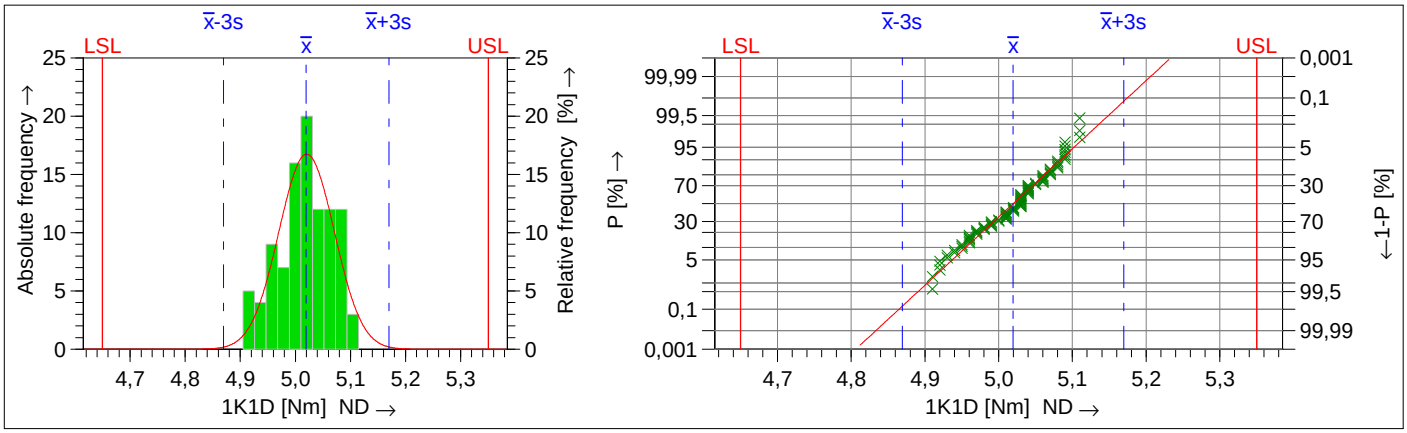
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_d	Char.Descr.	1K1D	Inspection Val. 5,00 0,35	USL 5,35
		Serial No.	198076	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 09.11.2021 08:22:11 to 09.11.2021 08:39:34

Rem. TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0197
LSL	4.65	x_{min}	4.91	$\bar{x}$-3s	4.8695
USL	5.35	x_{max}	5.11	$\bar{x}$+3s	5.1699
T	0.70	R	0.20	6s	0.3004
		$n_{<T>}$	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	2.33
Critical capability index	=	C_{mk}	2.20

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_d2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K1D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K1D	4,92	4,92	5,08	4,96	5,03	5,02	4,91	4,91	5,03	5,09
198076	1K1D	30,00	31,00	30,00	30,00	31,00	30,00	29,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K1D	5,06	5,02	5,04	4,94	5,00	5,05	5,03	5,03	4,98	4,98
198076	1K1D	29,00	30,00	30,00	30,00	31,00	30,00	30,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K1D	5,08	5,09	5,06	5,01	5,01	4,96	5,03	5,07	5,08	5,07
198076	1K1D	32,00	31,00	30,00	29,00	30,00	31,00	31,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K1D	5,02	4,96	5,11	5,05	5,06	4,95	5,06	5,03	5,08	5,03
198076	1K1D	30,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00	30,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K1D	5,04	5,07	5,03	5,04	5,09	5,04	5,00	4,97	5,04	4,99
198076	1K1D	31,00	30,00	31,00	32,00	31,00	32,00	31,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K1D	5,03	5,04	4,97	5,11	5,06	4,92	4,97	4,96	5,03	5,02
198076	1K1D	31,00	32,00	31,00	31,00	30,00	30,00	31,00	30,00	32,00	30,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K1D	5,04	4,93	4,95	5,02	5,01	5,09	5,01	4,99	5,07	5,01
198076	1K1D	31,00	30,00	31,00	31,00	30,00	30,00	30,00	31,00	30,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K1D	5,04	5,06	4,98	4,96	5,03	5,01	5,03	4,95	5,04	4,96
198076	1K1D	30,00	32,00	31,00	31,00	30,00	31,00	31,00	31,00	32,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_d	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K1D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	4,65
				USL	5,35
Remark	TQ 30% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K1D	5,11	5,09	5,01	5,07	5,01	4,99	5,06	5,03	4,99	5,03
198076	1K1D	31,00	31,00	30,00	31,00	31,00	31,00	31,00	31,00	33,00	30,00

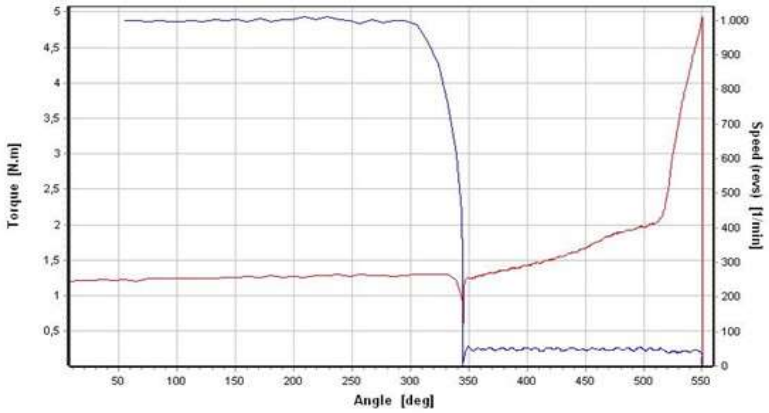
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K1D	5,04	4,94	4,97	5,03	5,01	5,08	4,99	5,09	5,09	4,93
198076	1K1D	31,00	31,00	31,00	30,00	31,00	31,00	31,00	31,00	32,00	31,00

Torque graphs

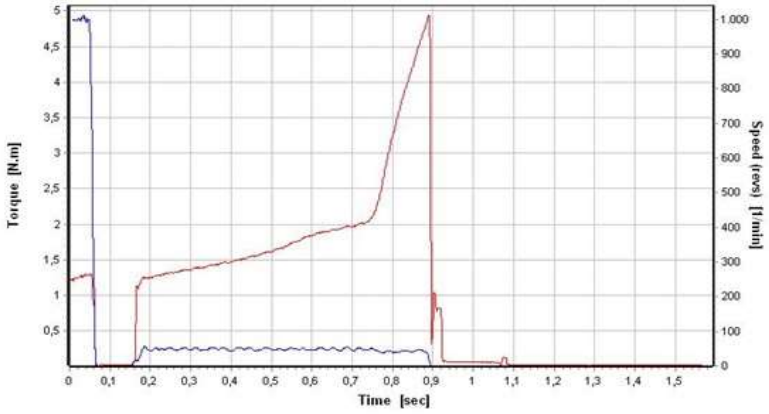
Machine Capability Study 30 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

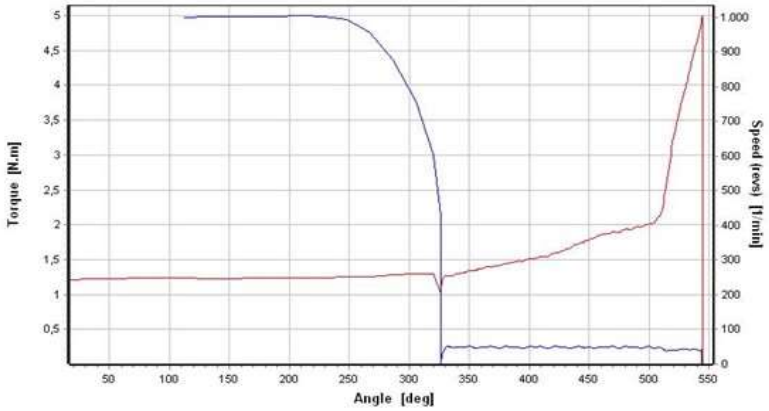
Angle degree: **30°**
Test torque: **5,0 Nm**



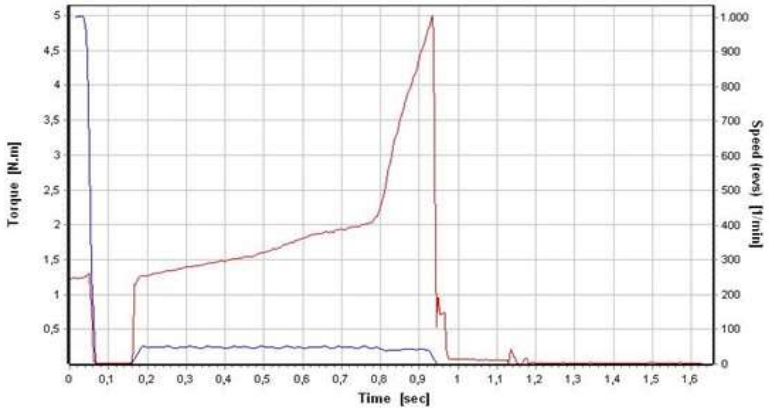
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

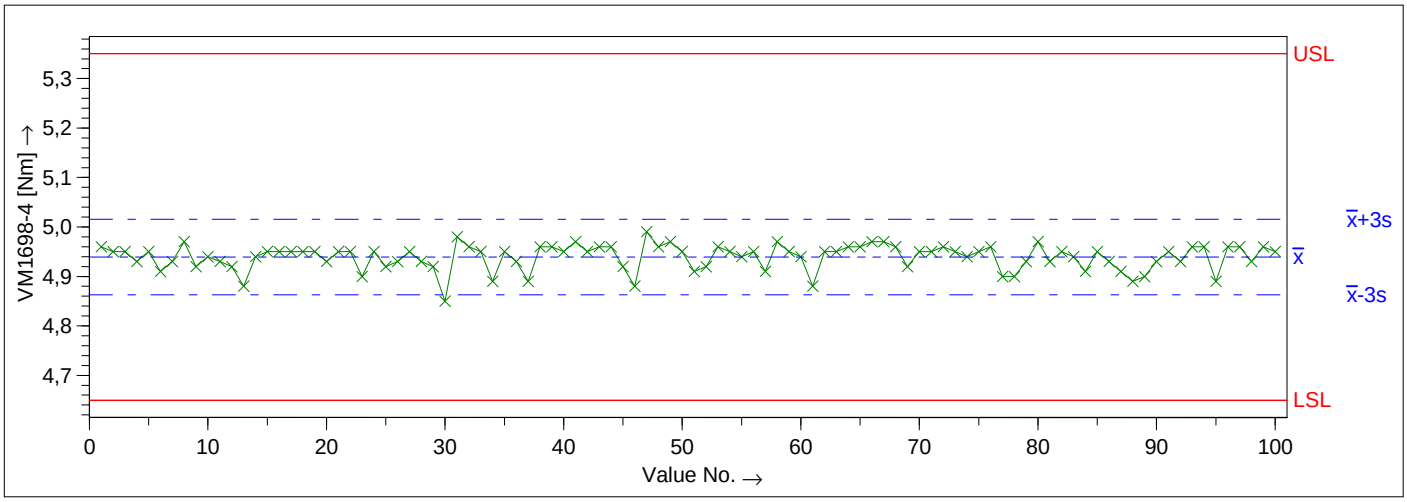
Machine Capability Study
Control System

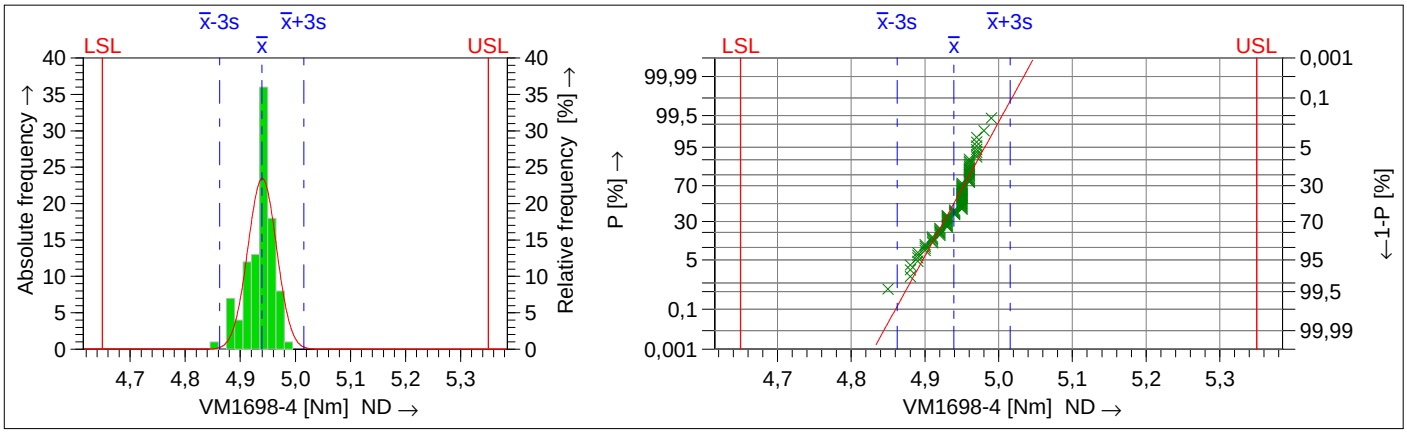
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_c	Char.Descr.	VM1698-4	Inspection 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 09.11.2021 08:52:15 to 09.11.2021 09:11:34

Rem. TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	4.9391
LSL	4.65	x_{min}	4.85	$\bar{x}$-3s	4.8626
USL	5.35	x_{max}	4.99	$\bar{x}$+3s	5.0156
T	0.70	R	0.14	6s	0.1531
		$n_{<T>}$	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	4.57
Critical capability index	=	C_{mk}	3.78

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 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	4,96	4,95	4,95	4,93	4,95	4,91	4,93	4,97	4,92	4,94
1024210	VM1698-4	358,75	358,75	360,25	357,50	358,50	352,00	357,25	367,75	356,75	358,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	4,93	4,92	4,88	4,94	4,95	4,95	4,95	4,95	4,95	4,93
1024210	VM1698-4	358,25	361,25	360,75	365,25	365,50	364,00	366,25	367,75	370,75	362,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	4,95	4,95	4,90	4,95	4,92	4,93	4,95	4,93	4,92	4,85
1024210	VM1698-4	363,00	361,75	359,25	367,50	360,25	359,75	367,00	364,25	365,50	359,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	4,98	4,96	4,95	4,89	4,95	4,93	4,89	4,96	4,96	4,95
1024210	VM1698-4	361,25	372,00	368,50	361,00	366,25	373,00	361,25	368,75	372,00	369,50

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	4,97	4,95	4,96	4,96	4,92	4,88	4,99	4,96	4,97	4,95
1024210	VM1698-4	368,00	363,75	366,00	365,25	365,00	355,75	369,25	364,50	365,00	364,75

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	4,91	4,92	4,96	4,95	4,94	4,95	4,91	4,97	4,95	4,94
1024210	VM1698-4	358,50	359,75	357,00	365,25	368,75	365,50	361,00	368,00	370,00	365,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	4,88	4,95	4,95	4,96	4,96	4,97	4,97	4,96	4,92	4,95
1024210	VM1698-4	358,25	367,50	364,50	372,25	370,75	368,00	360,50	360,25	357,75	361,25

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	4,95	4,96	4,95	4,94	4,95	4,96	4,90	4,90	4,93	4,97
1024210	VM1698-4	360,75	368,50	359,25	359,75	369,25	366,50	349,75	357,75	362,75	361,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	4,93	4,95	4,94	4,91	4,95	4,93	4,91	4,89	4,90	4,93
1024210	VM1698-4	357,75	366,25	364,75	355,50	363,00	357,75	354,75	359,25	358,75	363,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	4,95	4,93	4,96	4,96	4,89	4,96	4,96	4,93	4,96	4,95
1024210	VM1698-4	362,50	361,75	367,00	366,25	357,00	365,00	361,00	349,75	362,00	360,00

Machine Capability Study
Tool System

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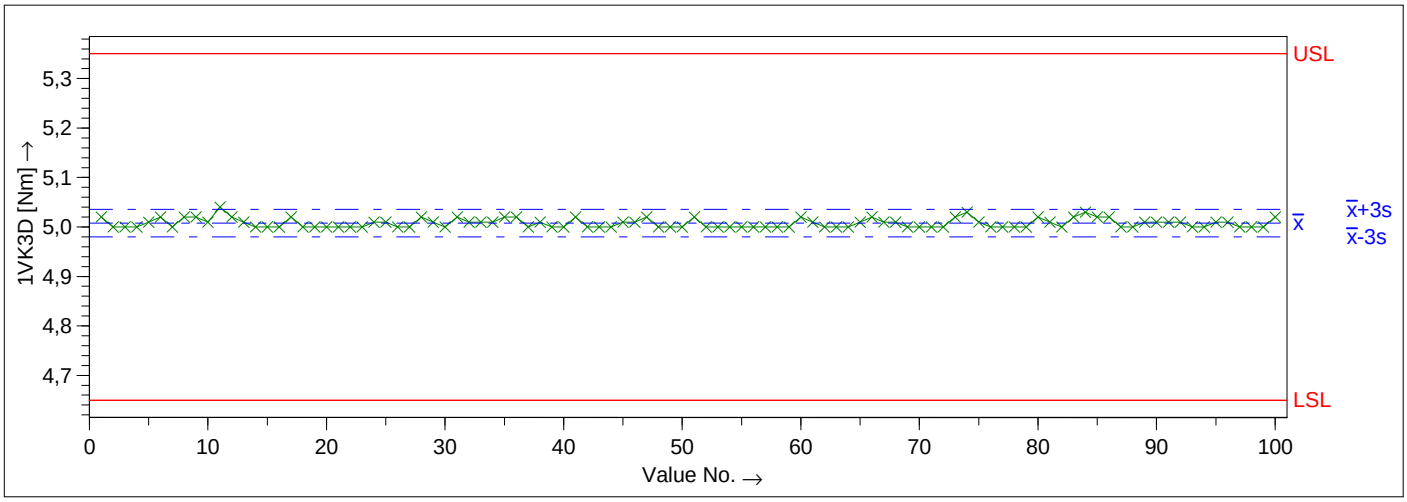
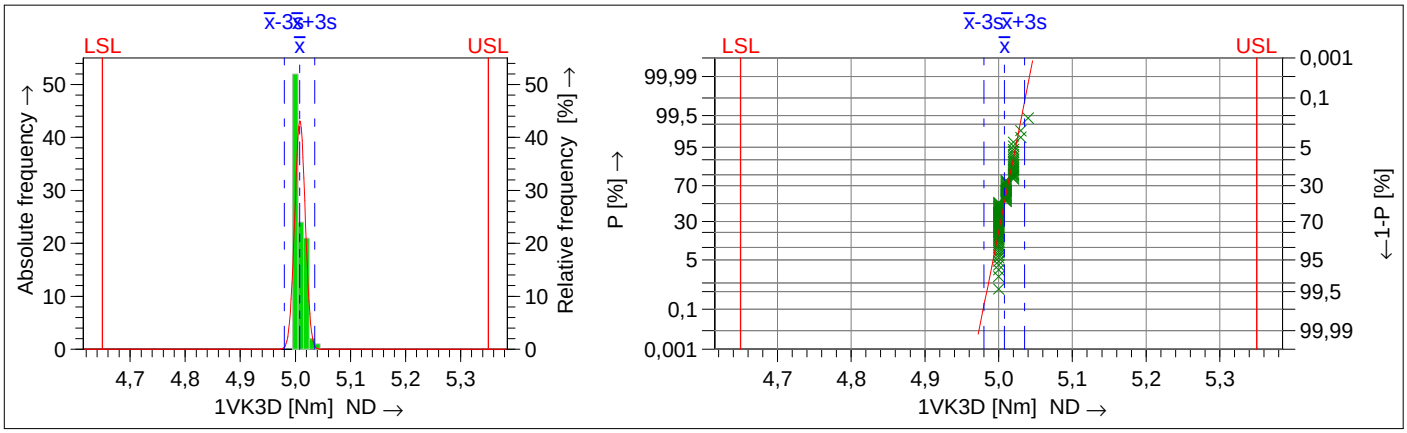
Plant ATG Westhausen		Operator Name Sünder	Date 09.11.2021

Ord. No. 1BD12T20-A	Part type 1BD-1B012A-1K3D-1VK3D				Contr.item yes
Serial No. 755948_c	Char.Descr. 1VK3D	Inspection Val.	5,00	0,35	USL 5,35
	Serial No. 198079	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 09.11.2021 08:52:16 to 09.11.2021 09:11:35

Rem. TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0076
LSL	4.65	x_{min}	5.00	$\bar{x}$-3s	4.9799
USL	5.35	x_{max}	5.04	$\bar{x}$+3s	5.0353
T	0.70	R	0.04	6s	0.0553
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			$M1_{1.4}$ $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	12.65
Critical capability index	=	C_{mk}	12.37

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 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	5,02	5,00	5,00	5,00	5,01	5,02	5,00	5,02	5,02	5,01
198079	1VK3D	368,00	362,00	370,00	367,00	368,00	368,00	368,00	369,00	365,00	365,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	5,04	5,02	5,01	5,00	5,00	5,00	5,02	5,00	5,00	5,00
198079	1VK3D	374,00	374,00	372,00	369,00	369,00	372,00	369,00	371,00	373,00	371,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	5,00	5,00	5,00	5,01	5,01	5,00	5,00	5,02	5,01	5,00
198079	1VK3D	371,00	371,00	371,00	372,00	370,00	370,00	370,00	374,00	377,00	376,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	5,02	5,01	5,01	5,01	5,02	5,02	5,00	5,01	5,00	5,00
198079	1VK3D	368,00	378,00	377,00	372,00	369,00	378,00	372,00	376,00	375,00	375,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	5,02	5,00	5,00	5,00	5,01	5,01	5,02	5,00	5,00	5,00
198079	1VK3D	371,00	372,00	374,00	368,00	371,00	369,00	375,00	373,00	374,00	368,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	5,02	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,02
198079	1VK3D	373,00	369,00	359,00	368,00	378,00	369,00	369,00	372,00	376,00	370,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	5,01	5,00	5,00	5,00	5,01	5,02	5,01	5,01	5,00	5,00
198079	1VK3D	371,00	375,00	374,00	378,00	378,00	372,00	367,00	368,00	368,00	368,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	5,00	5,00	5,02	5,03	5,01	5,00	5,00	5,00	5,00	5,02
198079	1VK3D	369,00	371,00	367,00	369,00	377,00	368,00	368,00	363,00	366,00	367,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	5,01	5,00	5,02	5,03	5,02	5,02	5,00	5,00	5,01	5,01
198079	1VK3D	368,00	375,00	373,00	375,00	374,00	365,00	366,00	370,00	368,00	375,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	5,01	5,01	5,00	5,00	5,01	5,01	5,00	5,00	5,00	5,02
198079	1VK3D	372,00	371,00	375,00	374,00	371,00	369,00	370,00	360,00	368,00	368,00

Machine Capability Study
Tool System

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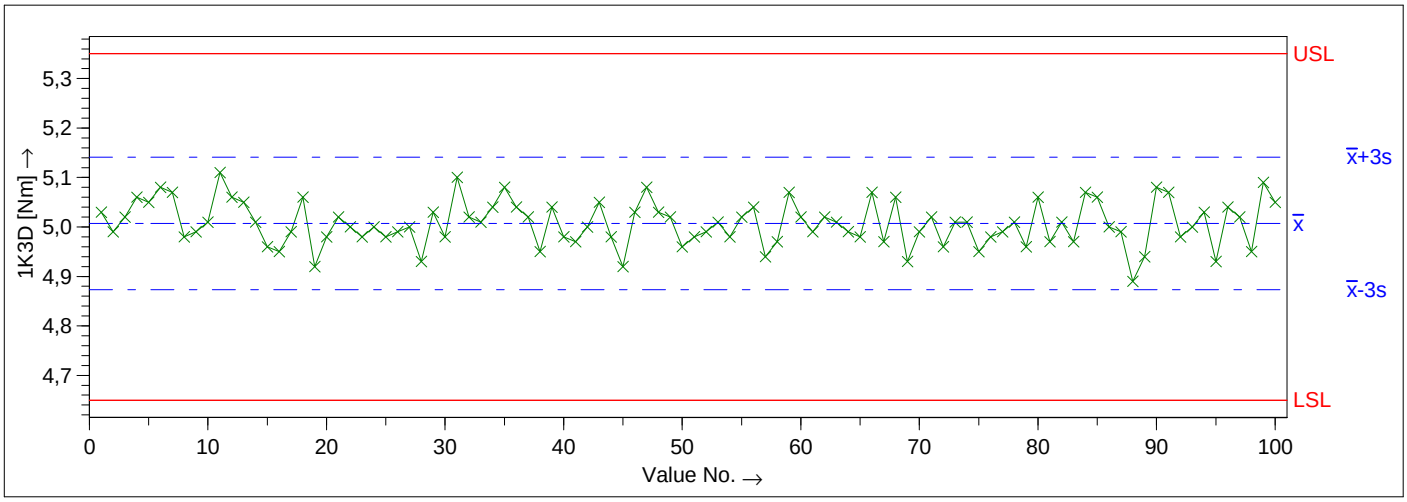
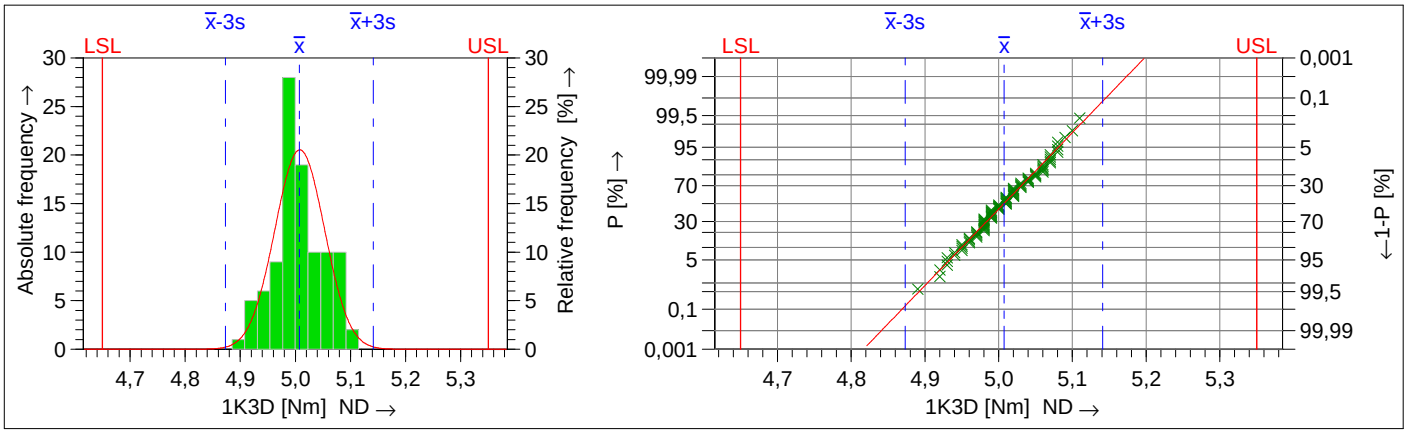
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_c	Char.Descr.	1K3D	Inspection Val. 5,00 0,35	USL 5,35
		Serial No.	198076	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 09.11.2021 08:52:16 to 09.11.2021 09:11:35

Rem. TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.00			$\bar{x}$	5.0072
LSL	4.65	x_{min}	4.89	$\bar{x}$-3s	4.8732
USL	5.35	x_{max}	5.11	$\bar{x}$+3s	5.1412
T	0.70	R	0.22	6s	0.2681
		$n_{<T>}$	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	2.61
Critical capability index	=	C_{mk}	2.56

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_c2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	5,03	4,99	5,02	5,06	5,05	5,08	5,07	4,98	4,99	5,01
198076	1K3D	368,00	362,00	370,00	367,00	368,00	368,00	368,00	369,00	365,00	365,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	5,11	5,06	5,05	5,01	4,96	4,95	4,99	5,06	4,92	4,98
198076	1K3D	374,00	374,00	372,00	369,00	369,00	372,00	369,00	371,00	373,00	371,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	5,02	5,00	4,98	5,00	4,98	4,99	5,00	4,93	5,03	4,98
198076	1K3D	371,00	371,00	371,00	372,00	370,00	370,00	370,00	374,00	377,00	376,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	5,10	5,02	5,01	5,04	5,08	5,04	5,02	4,95	5,04	4,98
198076	1K3D	368,00	378,00	377,00	372,00	369,00	378,00	372,00	376,00	375,00	375,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	4,97	5,00	5,05	4,98	4,92	5,03	5,08	5,03	5,02	4,96
198076	1K3D	371,00	372,00	374,00	368,00	371,00	369,00	375,00	373,00	374,00	368,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	4,98	4,99	5,01	4,98	5,02	5,04	4,94	4,97	5,07	5,02
198076	1K3D	373,00	369,00	359,00	368,00	378,00	369,00	369,00	372,00	376,00	370,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	4,99	5,02	5,01	4,99	4,98	5,07	4,97	5,06	4,93	4,99
198076	1K3D	371,00	375,00	374,00	378,00	378,00	372,00	367,00	368,00	368,00	368,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	5,02	4,96	5,01	5,01	4,95	4,98	4,99	5,01	4,96	5,06
198076	1K3D	369,00	371,00	367,00	369,00	377,00	368,00	368,00	363,00	366,00	367,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_c	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	5,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	4,65
				USL	5,35
Remark	TQ 30% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	4,97	5,01	4,97	5,07	5,06	5,00	4,99	4,89	4,94	5,08
198076	1K3D	368,00	375,00	373,00	375,00	374,00	365,00	366,00	370,00	368,00	375,00

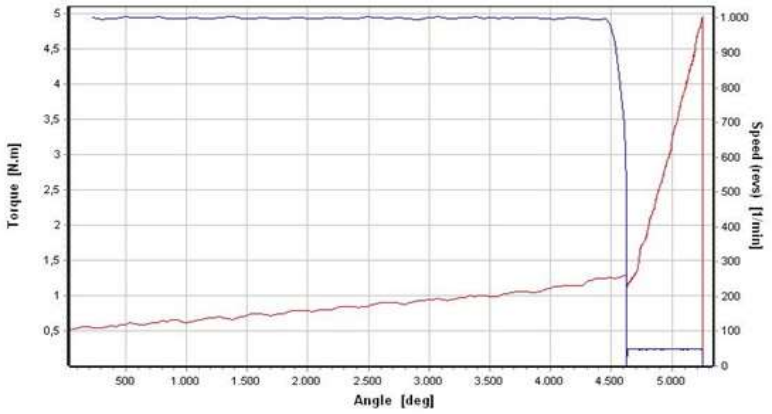
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	5,07	4,98	5,00	5,03	4,93	5,04	5,02	4,95	5,09	5,05
198076	1K3D	372,00	371,00	375,00	374,00	371,00	369,00	370,00	360,00	368,00	368,00

Torque graphs

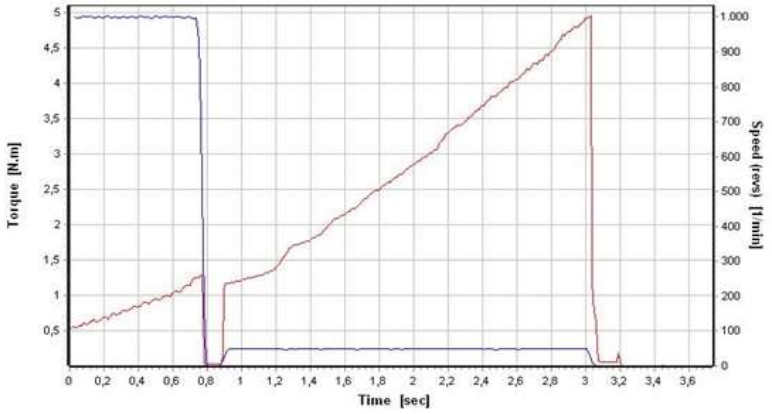
Machine Capability Study 30 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

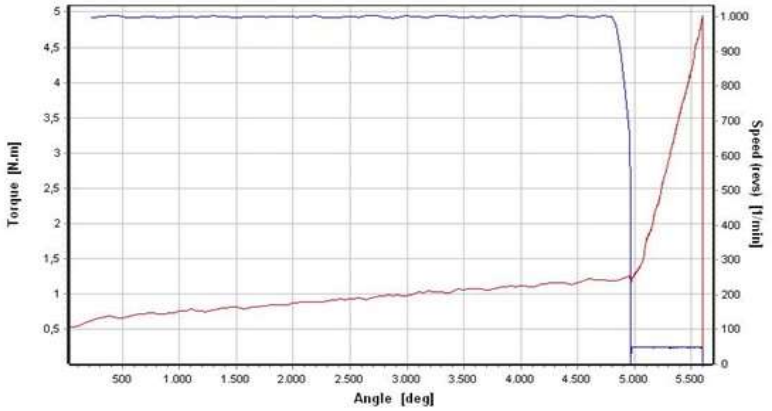
Angle degree: **360°**
Test torque: **5,0 Nm**



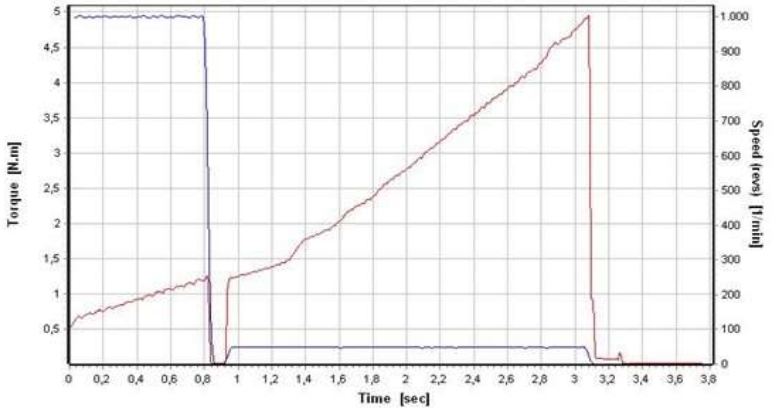
Value no. 1
Graph
Torque / Angle / Speed



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: **755948**

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

Hard joint (H)	59,81	Nm / Revolution	Angle degree	30°
Soft joint (L)	4,95	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	9,97 Nm	9,90 Nm
	Standard deviation	0,03 Nm	0,03 Nm
	Torque scatter (99,73%)	0,18 Nm	0,18 Nm
	C_m	7,58	7,87
	C_{mk}	7,23	6,69

b)	Min. C_m hard/soft (lowest value)	7,58
	Min. C_{mk} hard/soft (lowest value)	6,69

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

Note:

Machine Capability Study
Control System

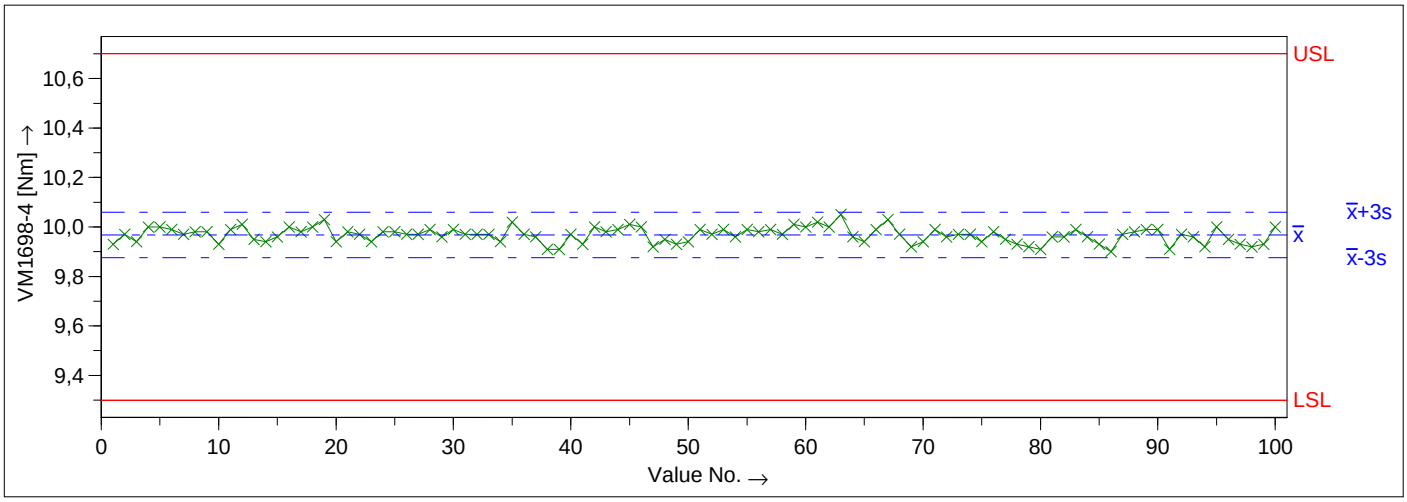
Cleco Production Tools

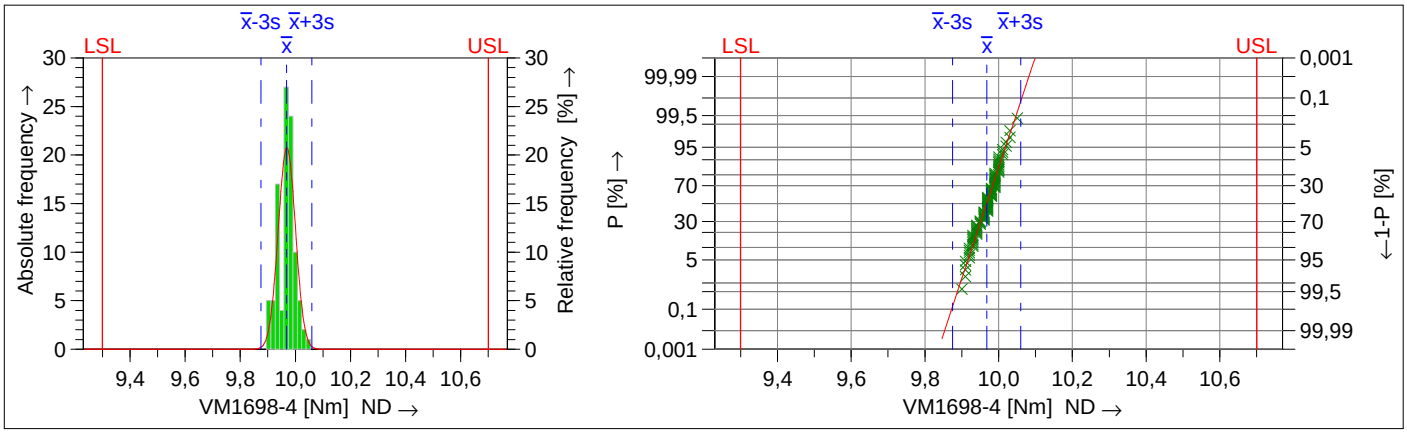
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_h	Char.Descr.	VM1698-4	Inspection Val.	10,00 0,70
		Serial No.	1024210	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 09.11.2021 07:16:47 to 09.11.2021 07:33:25

Rem. TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			x̄	9.9677
LSL	9.30	x_{min}	9.90	x̄-3s	9.8754
USL	10.70	x_{max}	10.05	x̄+3s	10.0600
T	1.40	R	0.15	6s	0.1847
		$n_{<T>}$	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	7.58
Critical capability index	=	C_{mk}	7.23

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 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	9,93	9,97	9,94	10,00	10,00	9,99	9,97	9,98	9,98	9,93
1024210	VM1698-4	30,50	30,75	30,00	29,50	29,75	29,25	29,75	30,75	31,00	30,25

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	9,99	10,01	9,95	9,94	9,96	10,00	9,98	10,00	10,03	9,94
1024210	VM1698-4	31,00	30,75	31,00	30,50	30,50	30,50	29,25	29,50	29,50	29,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	9,98	9,97	9,94	9,98	9,98	9,97	9,97	9,99	9,96	9,99
1024210	VM1698-4	30,50	29,50	29,75	29,50	30,25	30,25	30,75	30,25	30,75	30,50

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	9,97	9,97	9,97	9,94	10,02	9,97	9,96	9,91	9,91	9,97
1024210	VM1698-4	30,50	29,25	29,75	30,25	30,25	29,50	30,00	29,00	30,50	30,50

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	9,93	10,00	9,98	9,99	10,01	10,00	9,92	9,95	9,93	9,94
1024210	VM1698-4	30,00	31,25	30,25	30,75	30,75	29,50	30,00	30,75	29,75	30,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	9,99	9,97	9,99	9,96	9,99	9,98	9,99	9,97	10,01	10,00
1024210	VM1698-4	31,00	30,00	31,00	30,25	30,75	30,00	30,25	30,75	30,50	30,50

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	10,02	10,00	10,05	9,96	9,94	9,99	10,03	9,97	9,92	9,94
1024210	VM1698-4	30,75	31,00	31,00	30,75	31,00	30,50	31,00	30,00	30,25	30,50

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	9,99	9,96	9,97	9,97	9,94	9,98	9,95	9,93	9,92	9,91
1024210	VM1698-4	30,00	30,25	30,00	31,50	29,25	30,00	30,75	30,25	29,50	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	9,96	9,96	9,99	9,96	9,93	9,90	9,97	9,98	9,99	9,99
1024210	VM1698-4	30,75	30,25	31,00	30,00	30,25	29,25	30,25	31,00	30,00	30,50

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	9,91	9,97	9,96	9,92	10,00	9,95	9,93	9,92	9,93	10,00
1024210	VM1698-4	30,50	31,00	28,75	30,00	30,25	30,25	30,25	30,00	30,50	30,75

Machine Capability Study
Tool System

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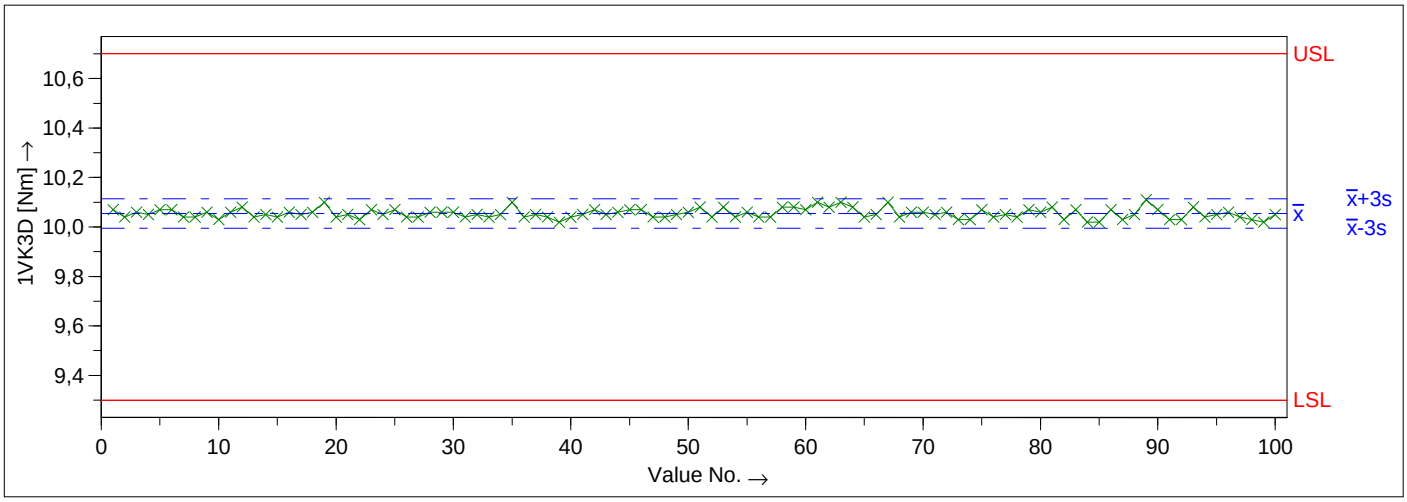
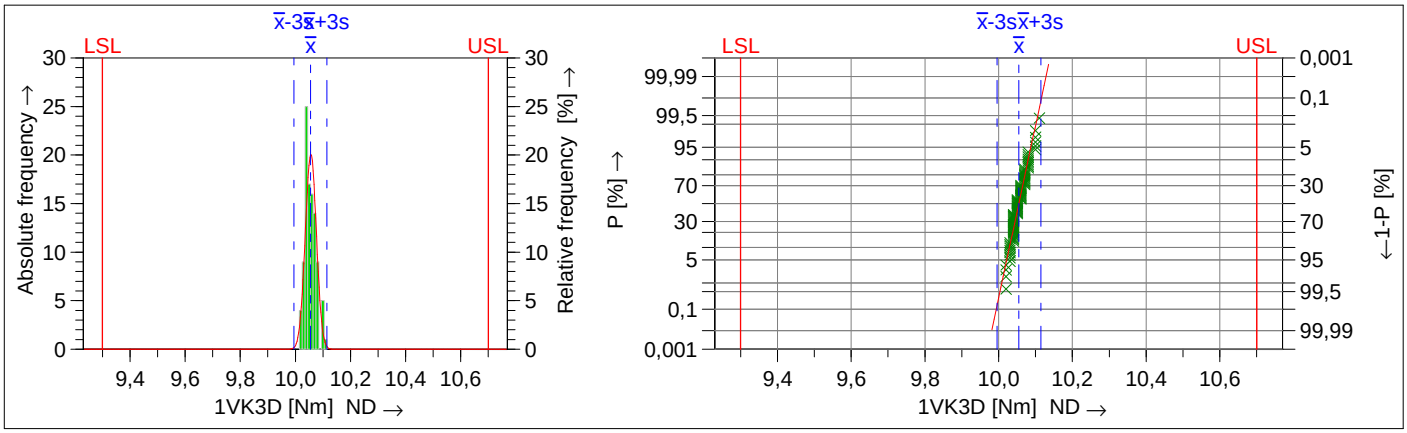
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_h	Char.Descr.	1VK3D	Inspection Val. 10,00 0,70	USL 10,70
		Serial No.	198079	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 09.11.2021 07:16:47 to 09.11.2021 07:33:25

Rem. TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	10.0547
LSL	9.30	x_{min}	10.02	$\bar{x}$-3s	9.9952
USL	10.70	x_{max}	10.11	$\bar{x}$+3s	10.1142
T	1.40	R	0.09	6s	0.1189
		$n_{<T>}$	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	11.77
Critical capability index	=	C_{mk}	10.85

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_h1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	10,07	10,04	10,06	10,05	10,07	10,07	10,04	10,04	10,06	10,03
198079	1VK3D	32,00	31,00	31,00	30,00	31,00	30,00	30,00	32,00	32,00	31,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	10,06	10,08	10,04	10,05	10,04	10,06	10,05	10,06	10,10	10,04
198079	1VK3D	32,00	31,00	32,00	31,00	31,00	31,00	30,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	10,05	10,03	10,07	10,05	10,07	10,04	10,04	10,06	10,06	10,06
198079	1VK3D	31,00	30,00	31,00	30,00	31,00	31,00	31,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	10,04	10,05	10,04	10,05	10,10	10,04	10,05	10,04	10,02	10,04
198079	1VK3D	32,00	31,00	31,00	31,00	31,00	30,00	31,00	30,00	31,00	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	10,05	10,07	10,05	10,06	10,07	10,07	10,04	10,04	10,05	10,06
198079	1VK3D	31,00	32,00	31,00	31,00	31,00	30,00	31,00	32,00	30,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	10,08	10,04	10,08	10,04	10,06	10,04	10,04	10,08	10,08	10,07
198079	1VK3D	32,00	31,00	32,00	31,00	32,00	31,00	31,00	32,00	31,00	31,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	10,10	10,08	10,10	10,08	10,04	10,05	10,10	10,04	10,06	10,06
198079	1VK3D	31,00	32,00	32,00	32,00	32,00	31,00	32,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	10,05	10,06	10,03	10,03	10,07	10,04	10,05	10,04	10,07	10,06
198079	1VK3D	30,00	31,00	31,00	32,00	30,00	31,00	32,00	31,00	31,00	32,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	10,08	10,03	10,07	10,02	10,02	10,07	10,03	10,05	10,11	10,07
198079	1VK3D	32,00	31,00	32,00	31,00	31,00	30,00	31,00	31,00	32,00	32,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	10,03	10,03	10,08	10,04	10,05	10,06	10,04	10,03	10,02	10,05
198079	1VK3D	31,00	32,00	30,00	31,00	31,00	31,00	32,00	31,00	31,00	31,00

Machine Capability Study
Tool System

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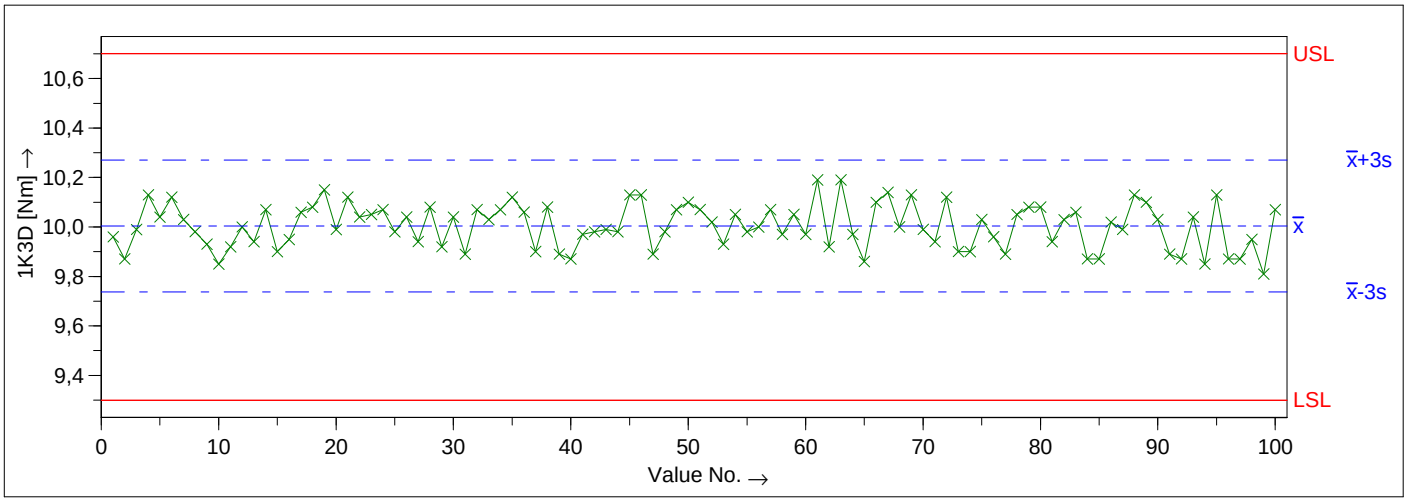
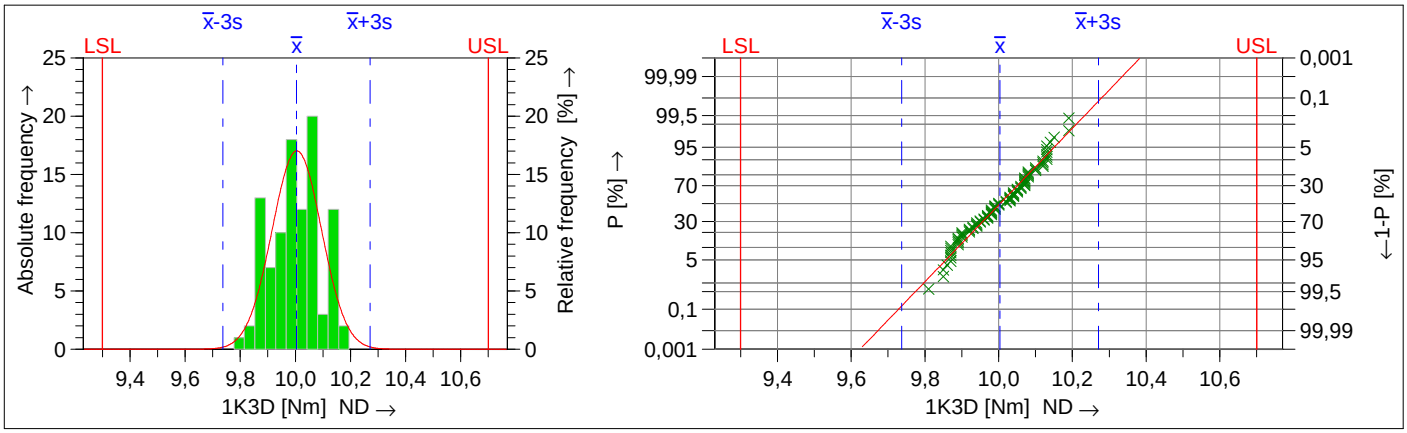
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_h	Char.Descr.	1K3D	Inspection Val.	10,00 0,70
		Serial No.	198076	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 09.11.2021 07:16:47 to 09.11.2021 07:33:26

Rem. TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	10.0038
LSL	9.30	x_{min}	9.81	$\bar{x}$-3s	9.7367
USL	10.70	x_{max}	10.19	$\bar{x}$+3s	10.2709
T	1.40	R	0.38	6s	0.5342
		$n_{<T>}$	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	2.62
Critical capability index	=	C_{mk}	2.61

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_h2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	9,96	9,87	9,99	10,13	10,04	10,12	10,03	9,98	9,93	9,85
198076	1K3D	32,00	31,00	31,00	30,00	31,00	30,00	30,00	32,00	32,00	31,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	9,92	10,00	9,94	10,07	9,90	9,95	10,06	10,08	10,15	9,99
198076	1K3D	32,00	31,00	32,00	31,00	31,00	31,00	30,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	10,12	10,04	10,05	10,07	9,98	10,04	9,94	10,08	9,92	10,04
198076	1K3D	31,00	30,00	31,00	30,00	31,00	31,00	31,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	9,89	10,07	10,03	10,07	10,12	10,06	9,90	10,08	9,89	9,87
198076	1K3D	32,00	31,00	31,00	31,00	31,00	30,00	31,00	30,00	31,00	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	9,97	9,98	9,99	9,98	10,13	10,13	9,89	9,98	10,07	10,10
198076	1K3D	31,00	32,00	31,00	31,00	31,00	30,00	31,00	32,00	30,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	10,07	10,02	9,93	10,05	9,98	10,00	10,07	9,97	10,05	9,97
198076	1K3D	32,00	31,00	32,00	31,00	32,00	31,00	31,00	32,00	31,00	31,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	10,19	9,92	10,19	9,97	9,86	10,10	10,14	10,00	10,13	9,99
198076	1K3D	31,00	32,00	32,00	32,00	32,00	31,00	32,00	31,00	32,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	9,94	10,12	9,90	9,90	10,03	9,96	9,89	10,05	10,08	10,08
198076	1K3D	30,00	31,00	31,00	32,00	30,00	31,00	32,00	31,00	31,00	32,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_h	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	9,30
				USL	10,70
Remark	TQ 80% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	9,94	10,03	10,06	9,87	9,87	10,02	9,99	10,13	10,10	10,03
198076	1K3D	32,00	31,00	32,00	31,00	31,00	30,00	31,00	31,00	32,00	32,00

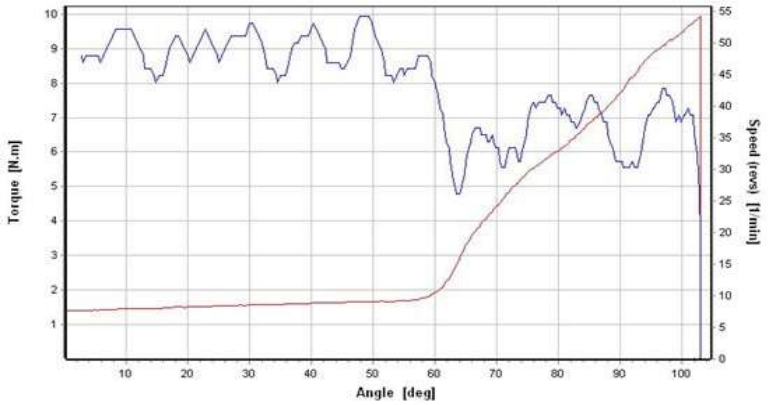
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	9,89	9,87	10,04	9,85	10,13	9,87	9,87	9,95	9,81	10,07
198076	1K3D	31,00	32,00	30,00	31,00	31,00	31,00	32,00	31,00	31,00	31,00

Torque graphs

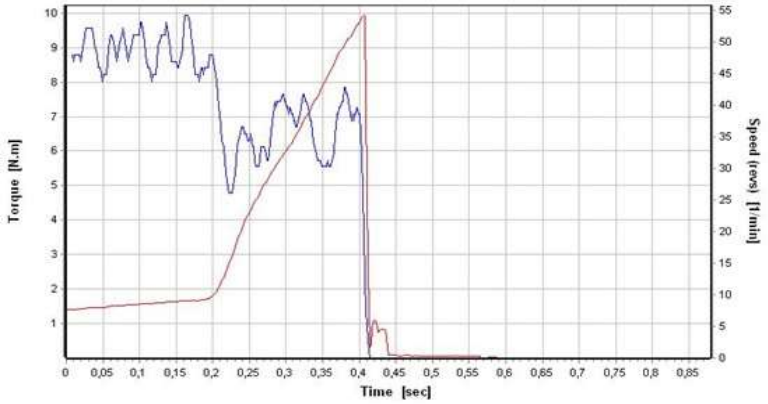
Machine Capability Study 80 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

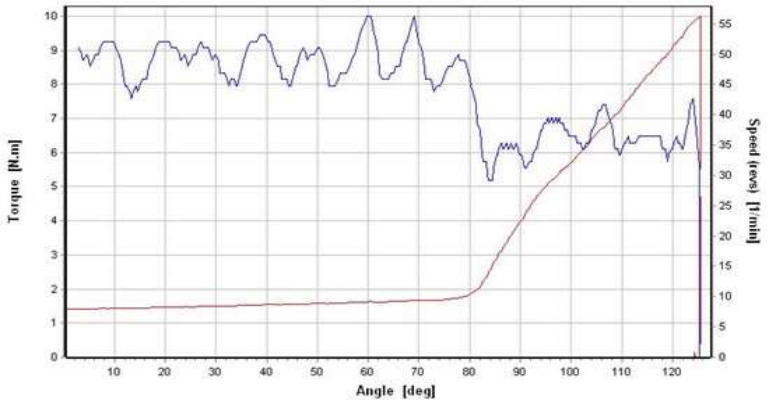
Angle degree: **30°**
Test torque: **10,0 Nm**



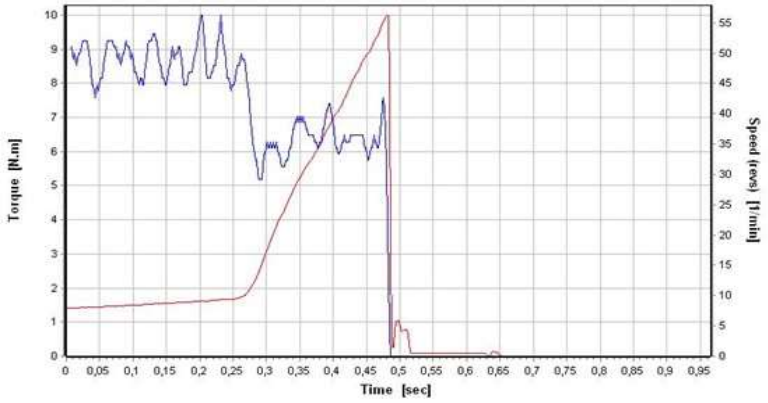
Value no. 1
Graph
Torque / Angle / Speed



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

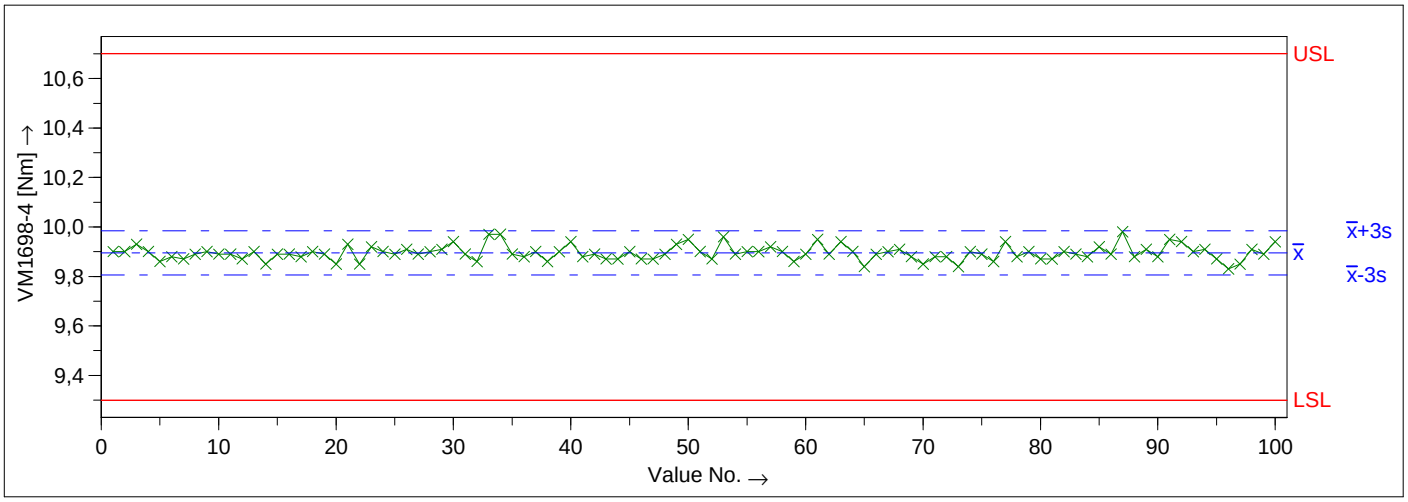
Cleco Production Tools

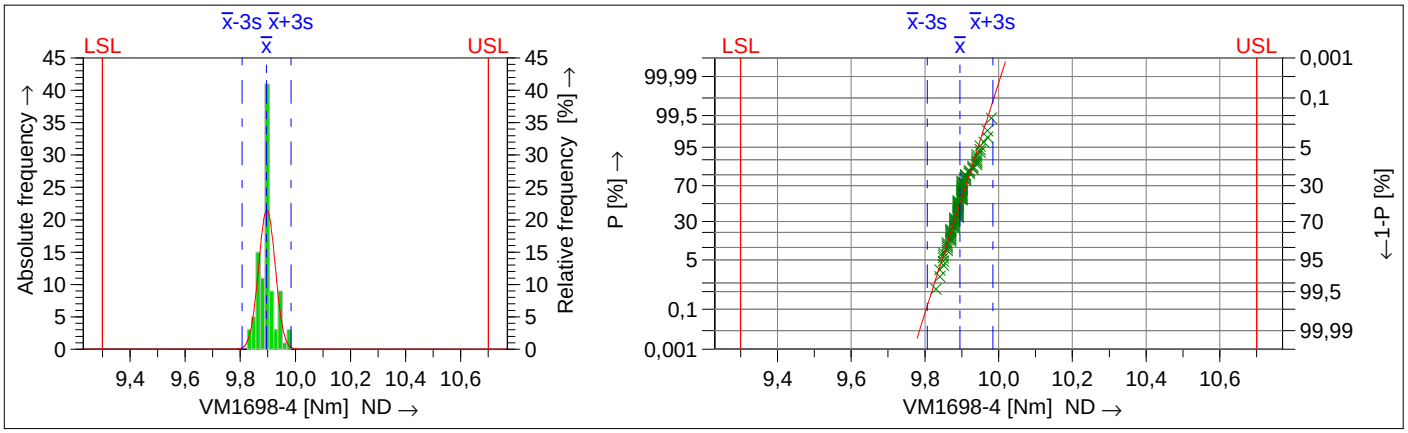
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_g	Char.Descr.	VM1698-4	Inspection Val.	10,00 0,70
		Serial No.	1024210	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 09.11.2021 07:42:08 to 09.11.2021 08:18:29

Rem. TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	9.8952
LSL	9.30	x_{min}	9.83	$\bar{x}$-3s	9.8062
USL	10.70	x_{max}	9.98	$\bar{x}$+3s	9.9842
T	1.40	R	0.15	6s	0.1780
		$n_{<T>}$	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	7.87
Critical capability index	=	C_{mk}	6.69

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 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	9,90	9,90	9,93	9,90	9,86	9,88	9,87	9,89	9,90	9,89
1024210	VM1698-4	365,25	361,00	372,00	369,00	366,75	367,00	369,00	362,00	363,00	358,50

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	9,89	9,87	9,90	9,85	9,89	9,89	9,88	9,90	9,89	9,85
1024210	VM1698-4	363,25	364,25	365,75	362,00	364,75	367,50	364,75	361,25	371,50	371,75

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	9,93	9,85	9,92	9,90	9,89	9,91	9,89	9,90	9,91	9,94
1024210	VM1698-4	378,25	371,00	362,75	363,00	372,75	360,50	367,00	361,75	369,50	364,25

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	9,89	9,86	9,97	9,97	9,89	9,88	9,90	9,86	9,90	9,94
1024210	VM1698-4	363,00	365,25	374,00	368,00	363,00	361,25	364,00	357,00	363,25	362,50

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	9,88	9,89	9,87	9,87	9,90	9,87	9,87	9,89	9,93	9,95
1024210	VM1698-4	358,25	361,50	363,00	360,25	366,50	353,75	351,50	356,00	359,25	359,75

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	9,90	9,87	9,96	9,89	9,90	9,90	9,92	9,90	9,86	9,89
1024210	VM1698-4	359,50	358,00	368,25	361,00	362,50	363,00	366,50	359,50	357,75	359,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	9,95	9,89	9,94	9,90	9,84	9,89	9,90	9,91	9,88	9,85
1024210	VM1698-4	362,25	360,75	360,25	362,25	354,75	358,25	360,00	358,75	353,75	358,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	9,88	9,88	9,84	9,90	9,89	9,86	9,94	9,88	9,90	9,87
1024210	VM1698-4	358,50	356,00	358,25	359,50	359,50	356,75	365,25	359,25	365,25	358,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	9,87	9,90	9,89	9,88	9,92	9,89	9,98	9,88	9,91	9,88
1024210	VM1698-4	360,25	360,75	364,75	357,50	359,75	360,25	365,00	363,25	363,75	361,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	9,95	9,94	9,90	9,91	9,87	9,83	9,85	9,91	9,89	9,94
1024210	VM1698-4	362,25	363,50	359,75	358,25	359,00	353,50	358,50	358,50	361,00	363,75

Machine Capability Study
Tool System

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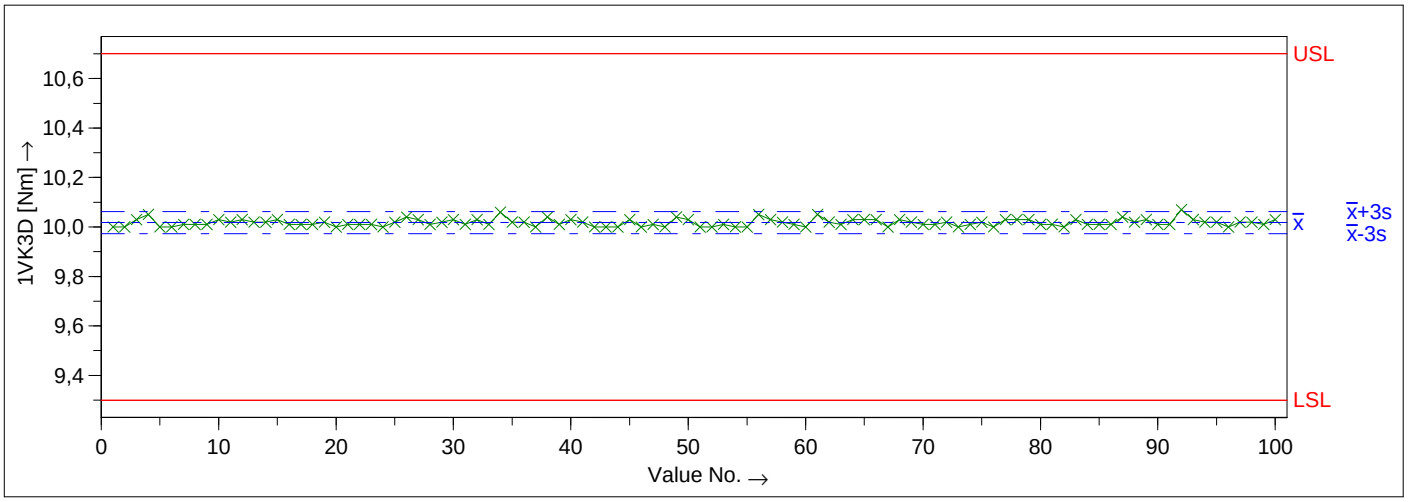
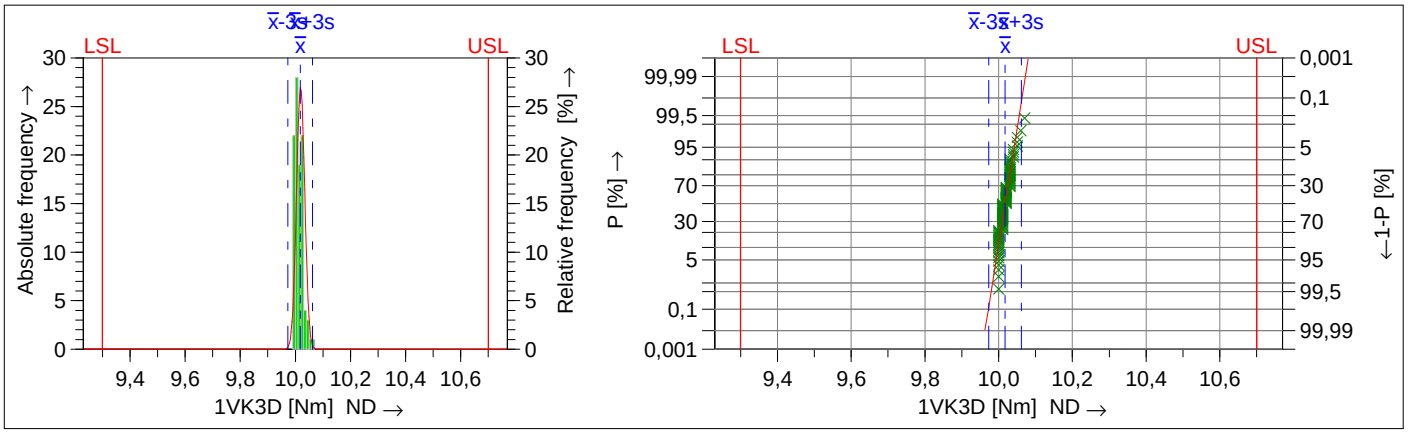
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_g	Char.Descr.	1VK3D	Inspection Val.	10,00 / 0,70 / -0,70
		Serial No.	198079	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 09.11.2021 07:42:09 to 09.11.2021 08:18:30

Rem. TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	10.0176
LSL	9.30	x_{min}	10.00	$\bar{x}$-3s	9.9733
USL	10.70	x_{max}	10.07	$\bar{x}$+3s	10.0619
T	1.40	R	0.07	6s	0.0887
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			$M1_{1,4}$ $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	15.79
Critical capability index	=	C_{mk}	15.39

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_g1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	10,00	10,00	10,03	10,05	10,00	10,00	10,01	10,01	10,01	10,03
198079	1VK3D	369,00	371,00	380,00	378,00	371,00	374,00	377,00	368,00	371,00	368,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	10,02	10,03	10,02	10,02	10,03	10,01	10,01	10,01	10,02	10,00
198079	1VK3D	368,00	375,00	375,00	371,00	376,00	377,00	372,00	369,00	378,00	382,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	10,01	10,01	10,01	10,00	10,02	10,04	10,03	10,01	10,02	10,03
198079	1VK3D	385,00	381,00	371,00	369,00	380,00	366,00	374,00	371,00	376,00	368,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	10,01	10,03	10,01	10,06	10,02	10,02	10,00	10,04	10,01	10,03
198079	1VK3D	369,00	376,00	375,00	377,00	369,00	368,00	369,00	368,00	373,00	367,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	10,02	10,00	10,00	10,00	10,03	10,00	10,01	10,00	10,04	10,03
198079	1VK3D	368,00	370,00	371,00	367,00	376,00	363,00	362,00	366,00	367,00	365,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	10,00	10,00	10,01	10,00	10,00	10,05	10,03	10,02	10,01	10,00
198079	1VK3D	368,00	365,00	370,00	371,00	366,00	368,00	371,00	367,00	364,00	368,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	10,05	10,02	10,01	10,03	10,03	10,03	10,00	10,03	10,02	10,01
198079	1VK3D	368,00	371,00	368,00	375,00	365,00	363,00	368,00	368,00	364,00	365,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	10,01	10,02	10,00	10,01	10,02	10,00	10,03	10,03	10,03	10,01
198079	1VK3D	367,00	367,00	369,00	367,00	368,00	365,00	368,00	367,00	371,00	364,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	10,01	10,00	10,03	10,01	10,01	10,01	10,04	10,02	10,03	10,01
198079	1VK3D	367,00	368,00	371,00	367,00	366,00	367,00	367,00	372,00	368,00	370,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	10,01	10,07	10,03	10,02	10,02	10,00	10,02	10,02	10,01	10,03
198079	1VK3D	366,00	368,00	368,00	366,00	374,00	366,00	367,00	362,00	368,00	368,00

Machine Capability Study
Tool System

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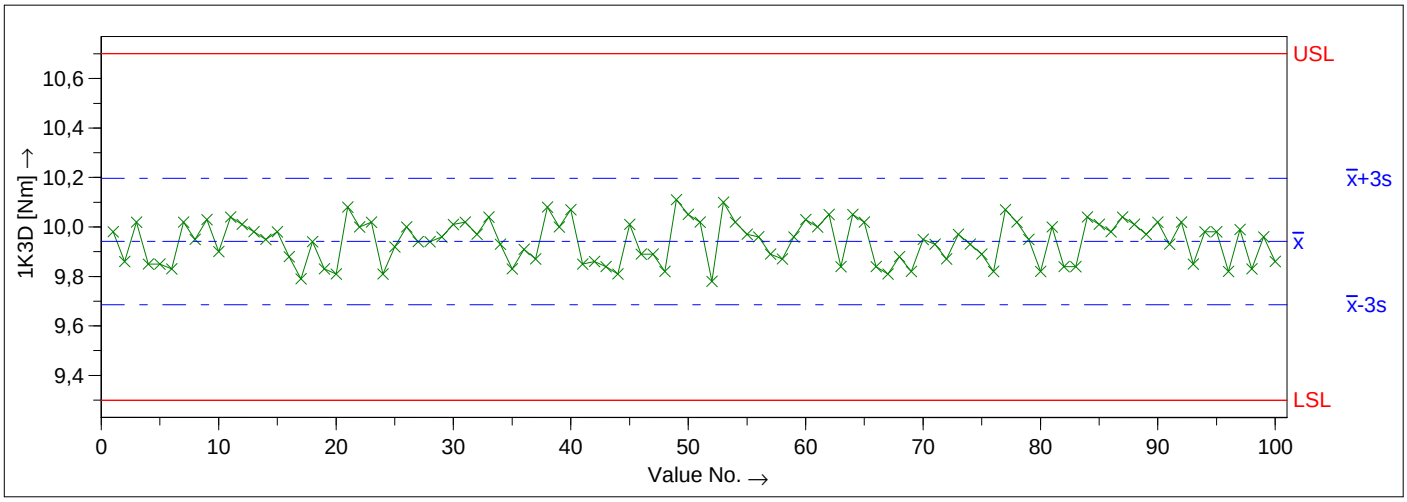
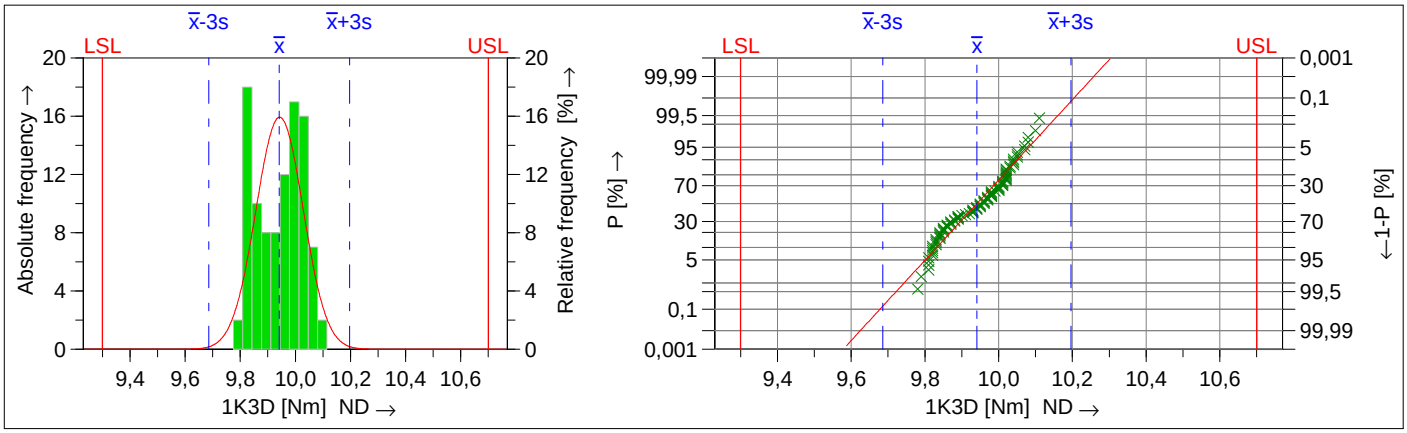
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_g	Char.Descr.	1K3D	Inspection Val.	10,00 0,70
		Serial No.	198076	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 09.11.2021 07:42:09 to 09.11.2021 08:18:30

Rem. TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.00			$\bar{x}$	9.9413
LSL	9.30	x_{min}	9.78	$\bar{x}$-3s	9.6860
USL	10.70	x_{max}	10.11	$\bar{x}$+3s	10.1966
T	1.40	R	0.33	6s	0.5106
		$n_{<T>}$	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	2.74
Critical capability index	=	C_{mk}	2.51

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_g2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	9,98	9,86	10,02	9,85	9,85	9,83	10,02	9,95	10,03	9,90
198076	1K3D	369,00	371,00	380,00	378,00	371,00	374,00	377,00	368,00	371,00	368,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	10,04	10,01	9,98	9,95	9,98	9,88	9,79	9,94	9,83	9,81
198076	1K3D	368,00	375,00	375,00	371,00	376,00	377,00	372,00	369,00	378,00	382,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	10,08	10,00	10,02	9,81	9,92	10,00	9,94	9,94	9,96	10,01
198076	1K3D	385,00	381,00	371,00	369,00	380,00	366,00	374,00	371,00	376,00	368,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	10,02	9,97	10,04	9,93	9,83	9,91	9,87	10,08	10,00	10,07
198076	1K3D	369,00	376,00	375,00	377,00	369,00	368,00	369,00	368,00	373,00	367,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	9,85	9,86	9,84	9,81	10,01	9,89	9,89	9,82	10,11	10,05
198076	1K3D	368,00	370,00	371,00	367,00	376,00	363,00	362,00	366,00	367,00	365,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	10,02	9,78	10,10	10,02	9,97	9,96	9,89	9,87	9,96	10,03
198076	1K3D	368,00	365,00	370,00	371,00	366,00	368,00	371,00	367,00	364,00	368,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	10,00	10,05	9,84	10,05	10,02	9,84	9,81	9,88	9,82	9,95
198076	1K3D	368,00	371,00	368,00	375,00	365,00	363,00	368,00	368,00	364,00	365,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	9,93	9,87	9,97	9,93	9,89	9,82	10,07	10,02	9,95	9,82
198076	1K3D	367,00	367,00	369,00	367,00	368,00	365,00	368,00	367,00	371,00	364,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_g	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	10,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	9,30
				USL	10,70
Remark	TQ 80% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	10,00	9,84	9,84	10,04	10,01	9,98	10,04	10,01	9,97	10,02
198076	1K3D	367,00	368,00	371,00	367,00	366,00	367,00	367,00	372,00	368,00	370,00

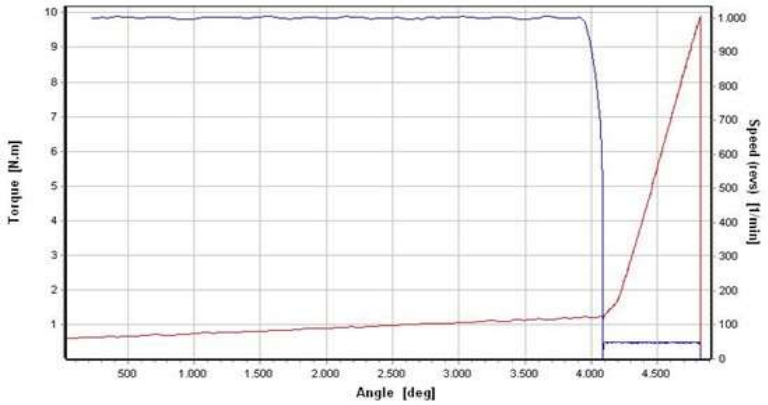
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	9,93	10,02	9,85	9,98	9,98	9,82	9,99	9,83	9,96	9,86
198076	1K3D	366,00	368,00	368,00	366,00	374,00	366,00	367,00	362,00	368,00	368,00

Torque graphs

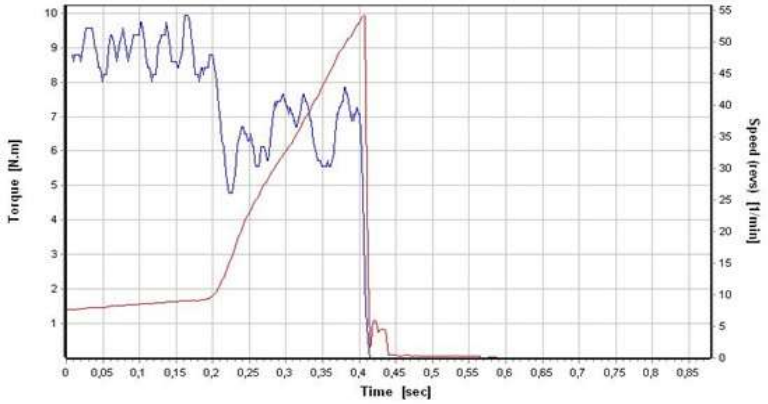
Machine Capability Study 80 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

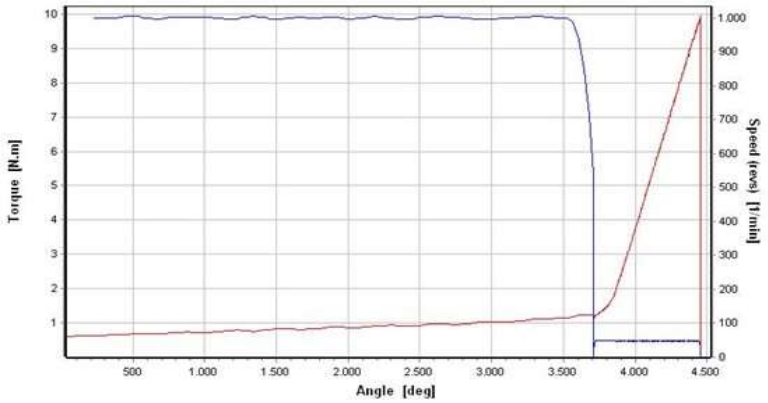
Angle degree: **360°**
Test torque: **10,0 Nm**



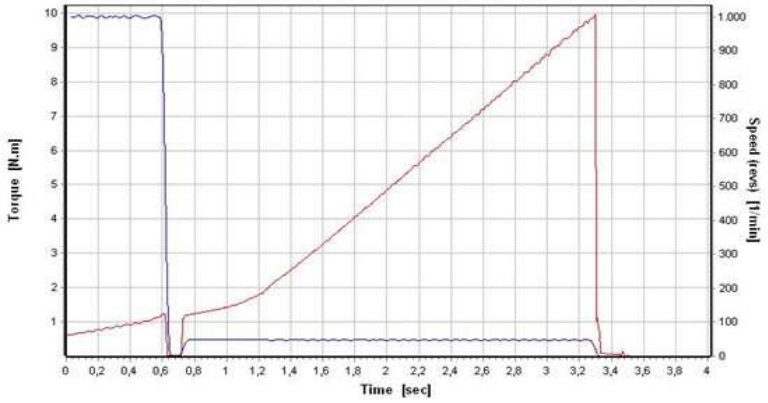
Value no. 1
Graph
Torque / Angle / Speed



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: **755948**

Test torque: Tq max. 12,00 Nm

Hard joint (H)	71,90 Nm / Revolution	Angle degree	30°
Soft joint (L)	5,97 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	11,98 Nm	11,93 Nm
	Standard deviation	0,04 Nm	0,04 Nm
	Torque scatter (99,73%)	0,25 Nm	0,24 Nm
	C_m	6,61	6,91
	C_{mk}	6,48	6,35

b)	Min. C_m hard/soft (lowest value)	6,61
	Min. C_{mk} hard/soft (lowest value)	6,35

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

Note:

Machine Capability Study
Control System

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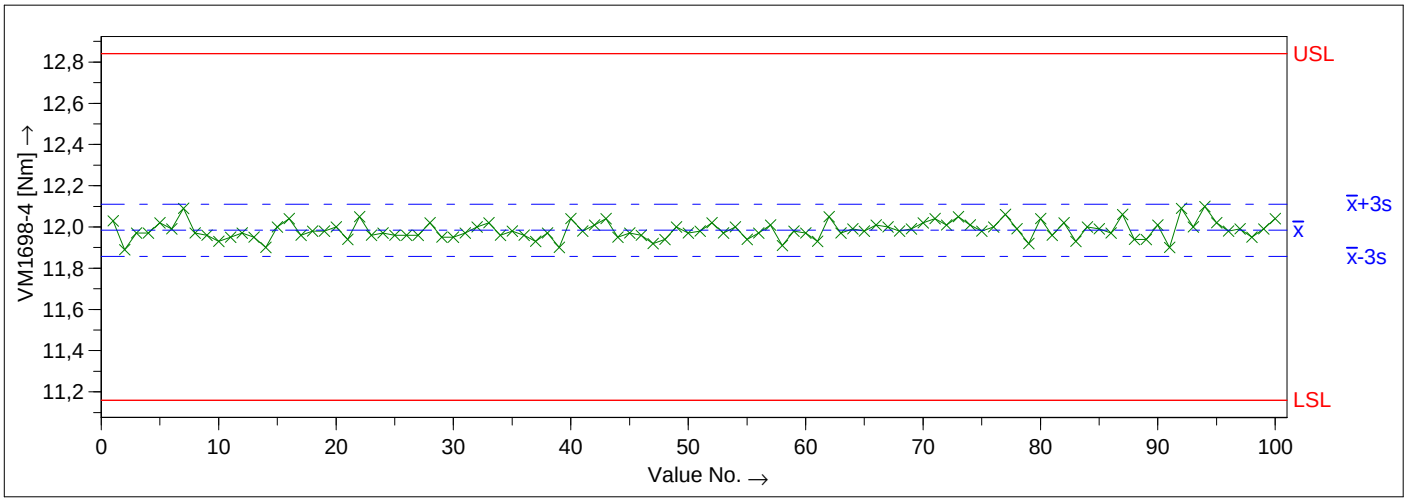
Plant ATG Westhausen		Operator Name Sünder	Date 08.11.2021

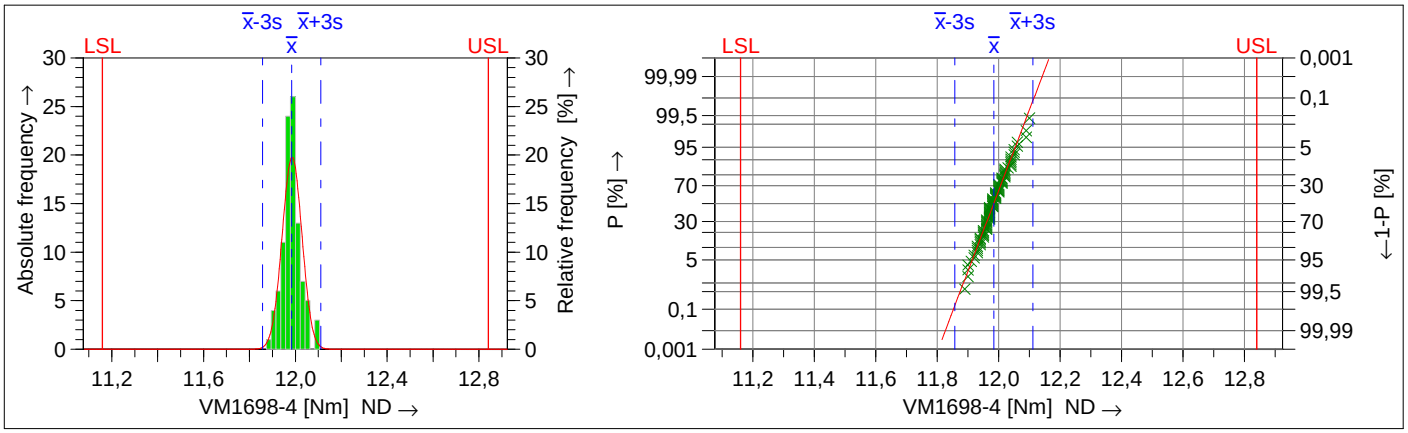
Ord. No. 1BD12T20-A	Part type 1BD-1B012A-1K3D-1VK3D				Contr.item yes
Serial No. 755948_b	Char.Descr. VM1698-4	Inspection Val.	12,00	0,84	USL 12,84
	Serial No. 1024210	Unit	Nm	-0,84	LSL 11,16
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

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

Evaluation from 08.11.2021 14:26:58 to 08.11.2021 14:41:01

Rem. TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.9839
LSL	11.16	x_{min}	11.89	$\bar{x}$-3s	11.8568
USL	12.84	x_{max}	12.10	$\bar{x}$+3s	12.1110
T	1.68	R	0.21	6s	0.2543
		$n_{<T>}$	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	6.61
Critical capability index	=	C_{mk}	6.48

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 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	12,03	11,89	11,97	11,97	12,02	11,99	12,09	11,97	11,96	11,93
1024210	VM1698-4	28,50	29,50	30,75	29,25	30,50	30,00	29,50	30,25	29,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	11,95	11,97	11,95	11,90	12,00	12,04	11,96	11,98	11,98	12,00
1024210	VM1698-4	29,75	29,75	30,50	30,00	29,50	30,50	29,00	30,25	30,25	29,25

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	11,94	12,05	11,96	11,97	11,96	11,96	11,96	12,02	11,95	11,95
1024210	VM1698-4	29,00	29,50	29,00	29,00	29,25	30,25	30,25	30,25	29,50	29,75

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	11,97	12,00	12,02	11,96	11,98	11,96	11,93	11,97	11,90	12,04
1024210	VM1698-4	28,75	30,00	31,00	31,00	30,50	30,00	31,00	30,50	30,25	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	11,98	12,01	12,04	11,95	11,97	11,96	11,92	11,94	12,00	11,97
1024210	VM1698-4	29,50	30,00	31,00	30,75	30,75	30,00	30,00	30,25	30,75	30,50

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	11,98	12,02	11,97	12,00	11,94	11,97	12,01	11,91	11,98	11,97
1024210	VM1698-4	30,25	30,25	30,25	29,75	30,75	29,50	30,25	29,75	30,00	30,50

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	11,93	12,05	11,97	11,99	11,98	12,01	12,00	11,98	11,99	12,02
1024210	VM1698-4	29,75	30,75	30,00	30,50	29,00	29,75	30,25	29,00	31,00	30,50

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	12,04	12,01	12,05	12,01	11,98	12,00	12,06	11,99	11,92	12,04
1024210	VM1698-4	29,25	31,25	30,50	30,00	29,50	29,00	30,25	30,50	30,00	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	11,96	12,02	11,93	12,00	11,99	11,97	12,06	11,94	11,94	12,01
1024210	VM1698-4	29,00	30,00	30,50	30,25	30,50	30,50	30,50	29,50	30,00	30,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	11,90	12,09	12,00	12,10	12,02	11,98	11,99	11,95	11,99	12,04
1024210	VM1698-4	30,75	30,00	30,00	30,00	31,25	31,00	29,75	31,25	30,50	31,25

Machine Capability Study
Tool System

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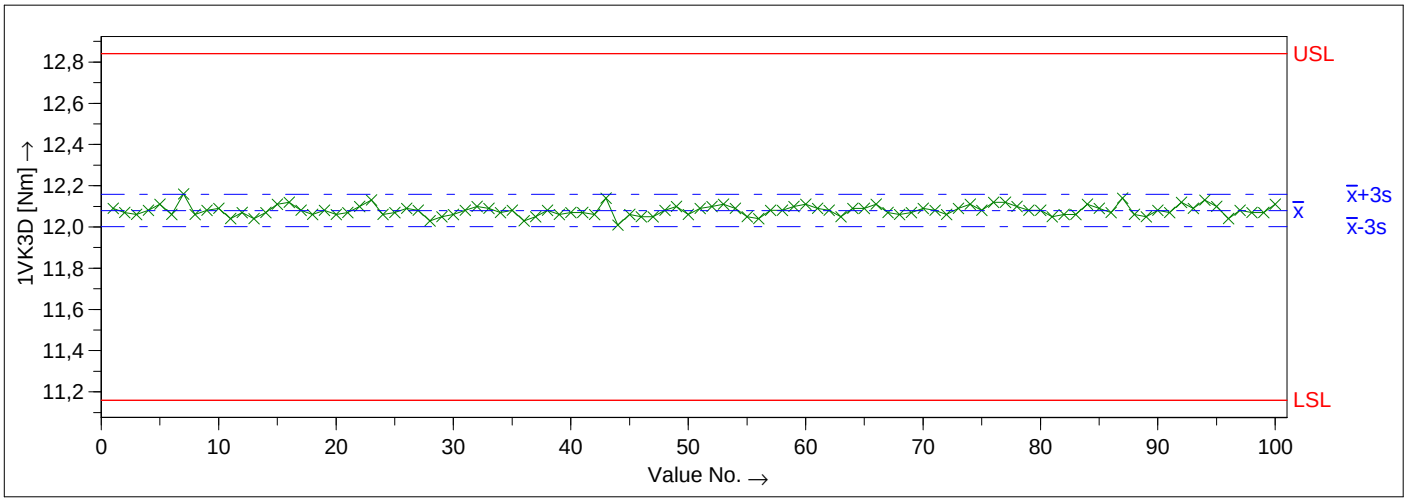
Plant ATG Westhausen		Operator Name Sünder	Date 08.11.2021

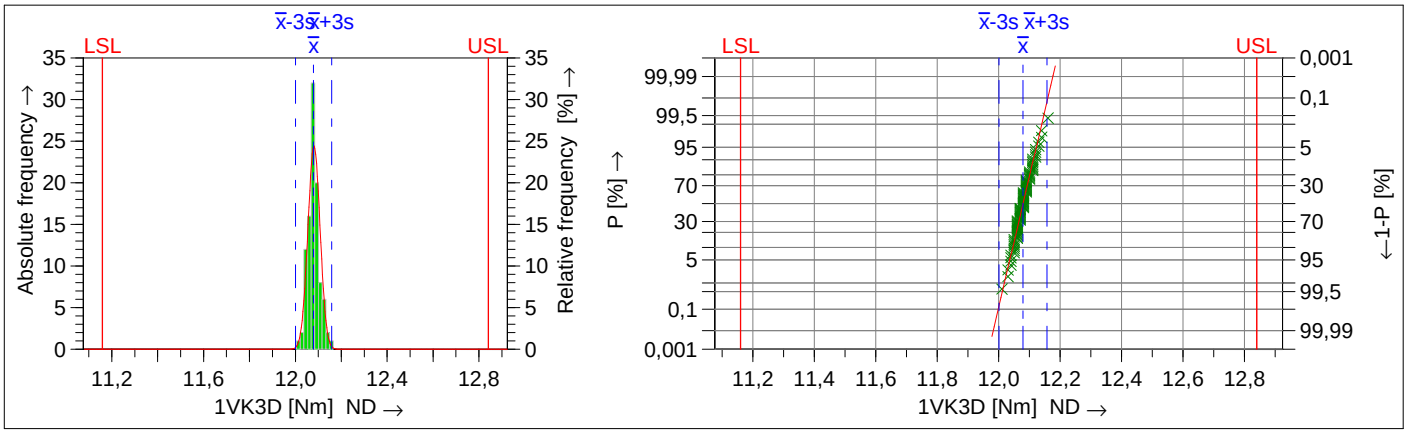
Ord. No. 1BD12T20-A	Part type 1BD-1B012A-1K3D-1VK3D				Contr.item yes
Serial No. 755948_b	Char.Descr. 1VK3D	Inspection Val.	12,00	0,84	USL 12,84
	Serial No. 198079	Unit	Nm	-0,84	LSL 11,16
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

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

Evaluation from 08.11.2021 14:26:58 to 08.11.2021 14:41:01

Rem. TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0794
LSL	11.16	x_{min}	12.01	$\bar{x}$-3s	12.0010
USL	12.84	x_{max}	12.16	$\bar{x}$+3s	12.1578
T	1.68	R	0.15	6s	0.1567
		$n_{<T>}$	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	10.72
Critical capability index	=	C_{mk}	9.70

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_b1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	12,09	12,07	12,06	12,08	12,11	12,06	12,16	12,06	12,08	12,09
198079	1VK3D	30,00	29,00	30,00	29,00	30,00	30,00	30,00	30,00	29,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	12,04	12,07	12,04	12,07	12,11	12,12	12,08	12,06	12,08	12,06
198079	1VK3D	30,00	30,00	30,00	30,00	29,00	30,00	29,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	12,07	12,10	12,13	12,06	12,07	12,09	12,08	12,03	12,05	12,06
198079	1VK3D	28,00	30,00	29,00	29,00	29,00	30,00	30,00	30,00	29,00	30,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	12,08	12,10	12,09	12,07	12,08	12,03	12,05	12,08	12,06	12,07
198079	1VK3D	30,00	30,00	31,00	31,00	31,00	30,00	31,00	30,00	30,00	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	12,07	12,06	12,14	12,01	12,06	12,05	12,05	12,08	12,10	12,06
198079	1VK3D	29,00	30,00	31,00	31,00	31,00	30,00	30,00	30,00	31,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	12,09	12,10	12,11	12,09	12,05	12,04	12,08	12,08	12,10	12,11
198079	1VK3D	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	12,09	12,08	12,05	12,09	12,09	12,11	12,07	12,06	12,07	12,09
198079	1VK3D	30,00	31,00	30,00	30,00	29,00	30,00	30,00	29,00	31,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	12,08	12,06	12,09	12,11	12,08	12,12	12,12	12,10	12,08	12,08
198079	1VK3D	30,00	31,00	31,00	30,00	30,00	29,00	30,00	31,00	31,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	12,05	12,06	12,06	12,11	12,09	12,07	12,14	12,06	12,05	12,08
198079	1VK3D	29,00	30,00	30,00	30,00	31,00	31,00	31,00	29,00	30,00	30,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	12,07	12,12	12,09	12,13	12,10	12,04	12,08	12,07	12,07	12,11
198079	1VK3D	31,00	30,00	30,00	30,00	31,00	31,00	29,00	32,00	31,00	31,00

Machine Capability Study
Tool System

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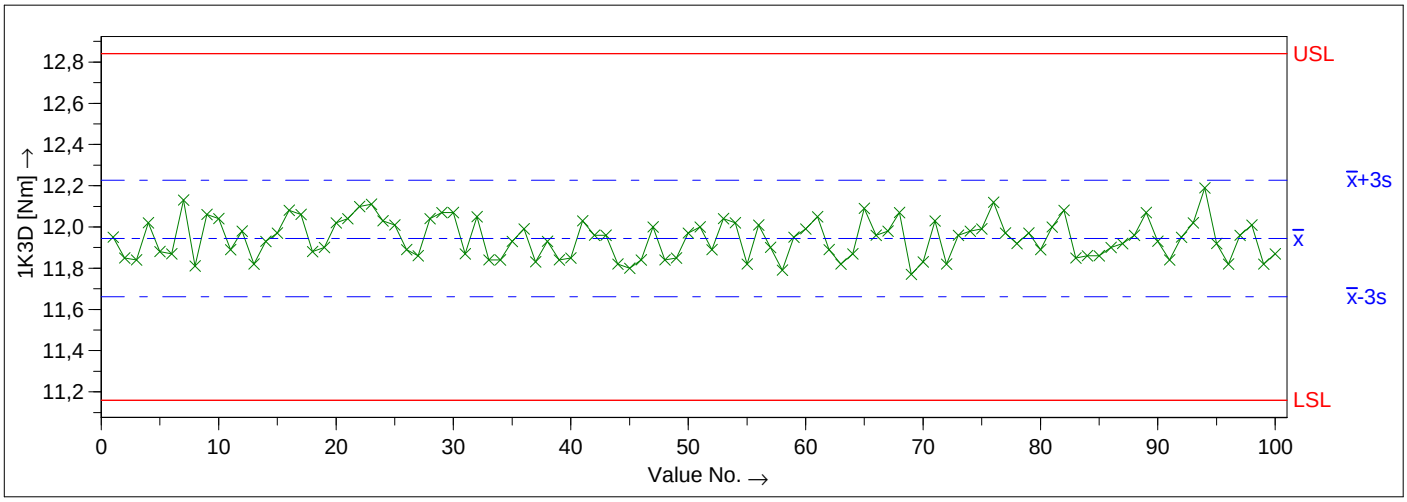
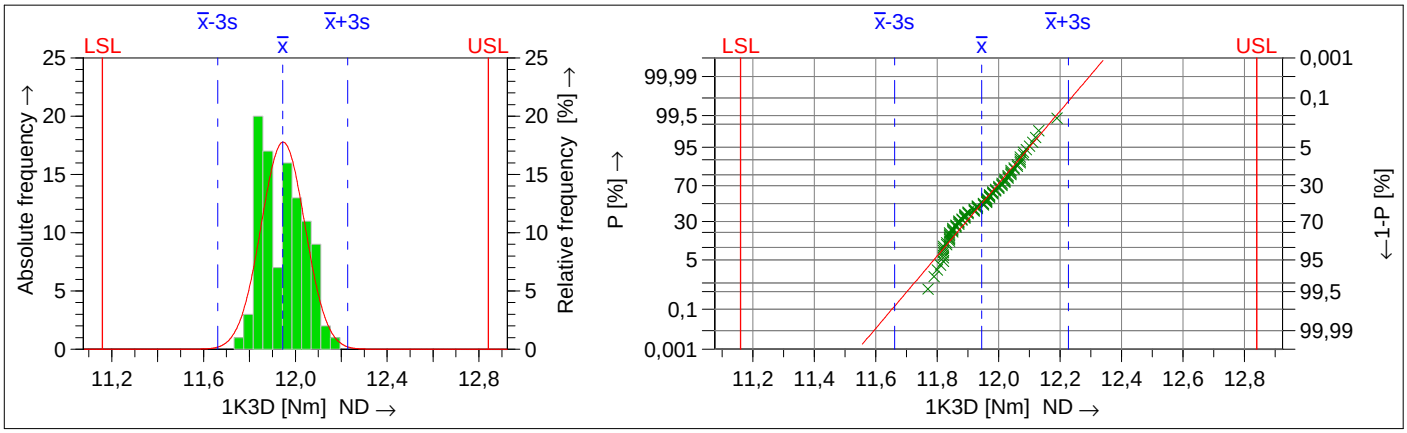
Plant	ATG Westhausen	Operator Name	Sünder
Date	08.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_b	Char.Descr.	1K3D	Inspection Val. 12,00 0,84	USL 12,84
		Serial No.	198076	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 08.11.2021 14:26:58 to 08.11.2021 14:41:01

Rem. TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.9446
LSL	11.16	x_{min}	11.77	$\bar{x}$-3s	11.6618
USL	12.84	x_{max}	12.19	$\bar{x}$+3s	12.2274
T	1.68	R	0.42	6s	0.5656
		$n_{<T>}$	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	2.97
Critical capability index	=	C_{mk}	2.77

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 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	11,95	11,85	11,84	12,02	11,88	11,87	12,13	11,81	12,06	12,04
198076	1K3D	30,00	29,00	30,00	29,00	30,00	30,00	30,00	30,00	29,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	11,89	11,98	11,82	11,93	11,97	12,08	12,06	11,88	11,90	12,02
198076	1K3D	30,00	30,00	30,00	30,00	29,00	30,00	29,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	12,04	12,10	12,11	12,03	12,01	11,89	11,86	12,04	12,07	12,07
198076	1K3D	28,00	30,00	29,00	29,00	29,00	30,00	30,00	30,00	29,00	30,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	11,87	12,05	11,84	11,84	11,93	11,99	11,83	11,93	11,84	11,85
198076	1K3D	30,00	30,00	31,00	31,00	31,00	30,00	31,00	30,00	30,00	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	12,03	11,96	11,96	11,82	11,80	11,84	12,00	11,84	11,85	11,97
198076	1K3D	29,00	30,00	31,00	31,00	31,00	30,00	30,00	30,00	31,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	12,00	11,89	12,04	12,02	11,82	12,01	11,90	11,79	11,95	11,99
198076	1K3D	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	12,05	11,89	11,82	11,87	12,09	11,96	11,98	12,07	11,77	11,83
198076	1K3D	30,00	31,00	30,00	30,00	29,00	30,00	30,00	29,00	31,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	12,03	11,82	11,96	11,98	11,99	12,12	11,97	11,92	11,97	11,89
198076	1K3D	30,00	31,00	31,00	30,00	30,00	29,00	30,00	31,00	31,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_b	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	11,16
				USL	12,84
Remark	TQ 100% hard +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	12,00	12,08	11,85	11,86	11,86	11,90	11,92	11,96	12,07	11,93
198076	1K3D	29,00	30,00	30,00	30,00	31,00	31,00	31,00	29,00	30,00	30,00

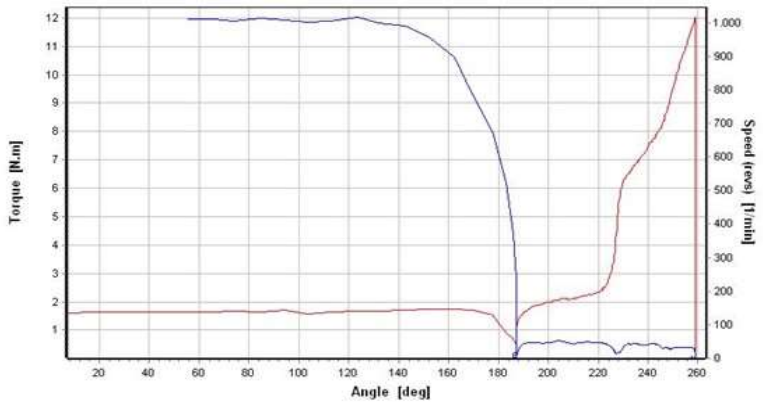
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	11,84	11,95	12,02	12,19	11,92	11,82	11,96	12,01	11,82	11,87
198076	1K3D	31,00	30,00	30,00	30,00	31,00	31,00	29,00	32,00	31,00	31,00

Torque graphs

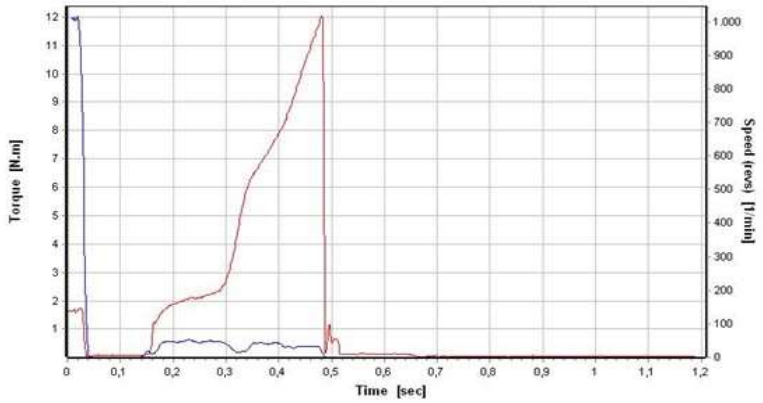
Machine Capability Study 100 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

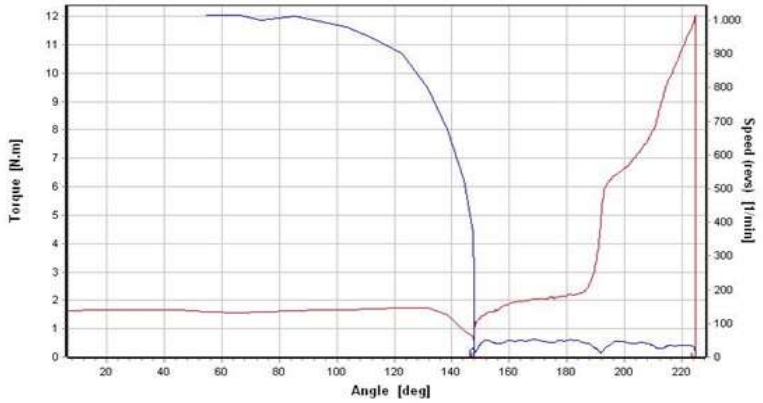
Angle degree: **30°**
Test torque: **12,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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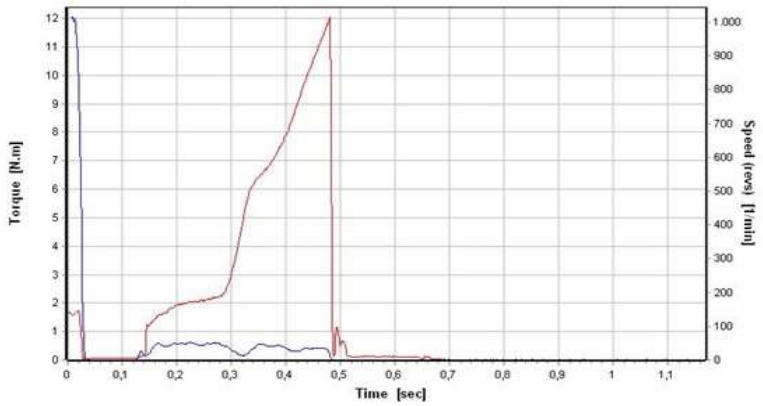
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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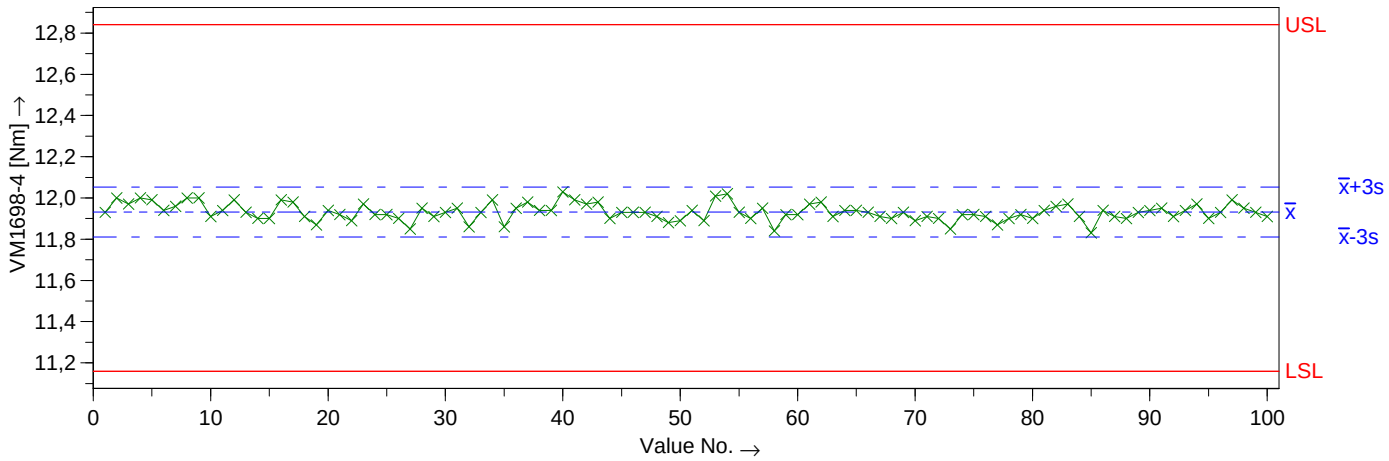
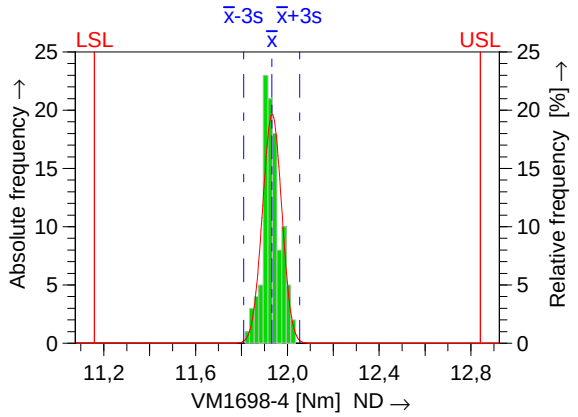
Plant	ATG Westhausen	Operator Name	Sünder
Date	08.11.2021		

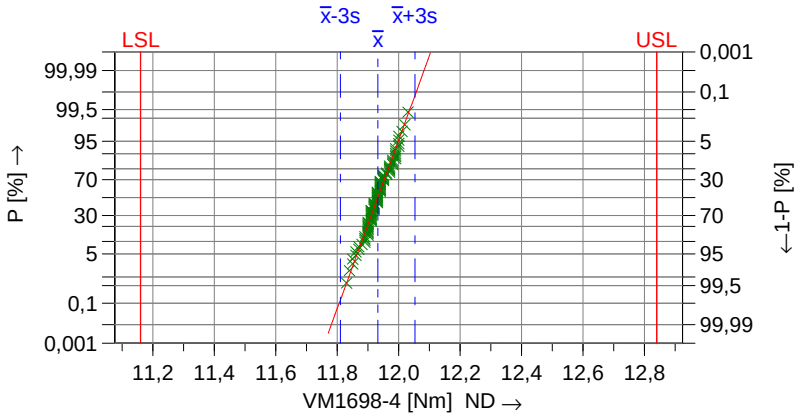
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_a	Char.Descr.	VM1698-4	Inspection Val. 12,00 0,84	USL 12,84
		Serial No.	1024210	Unit Nm -0,84	LSL 11,16
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 08.11.2021 15:34:11 to 08.11.2021 16:57:29

Rem. TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.9318
LSL	11.16	x_{min}	11.83	$\bar{x}$-3s	11.8102
USL	12.84	x_{max}	12.03	$\bar{x}$+3s	12.0534
T	1.68	R	0.20	6s	0.2432
		$n_{<T>}$	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	6.91
Critical capability index	=	C_{mk}	6.35

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 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	11,93	12,00	11,97	12,00	11,99	11,94	11,96	12,00	12,00	11,91
1024210	VM1698-4	358,25	354,25	356,25	367,75	363,00	356,00	377,50	359,00	366,25	357,25

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	11,94	11,99	11,93	11,90	11,90	11,99	11,98	11,91	11,87	11,94
1024210	VM1698-4	373,50	367,50	364,75	355,50	377,75	358,50	364,00	356,50	355,00	357,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	11,92	11,89	11,97	11,92	11,92	11,90	11,85	11,95	11,91	11,93
1024210	VM1698-4	357,00	366,25	369,75	366,50	360,75	360,00	369,50	380,25	359,25	380,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	11,95	11,86	11,93	11,99	11,86	11,95	11,98	11,94	11,94	12,03
1024210	VM1698-4	355,50	361,75	360,75	384,75	365,00	359,75	376,75	359,50	364,25	357,25

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	11,99	11,97	11,98	11,90	11,93	11,93	11,93	11,91	11,88	11,89
1024210	VM1698-4	358,25	357,75	356,75	356,50	359,50	362,00	353,00	359,00	357,25	358,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	11,94	11,89	12,01	12,02	11,93	11,90	11,95	11,84	11,92	11,92
1024210	VM1698-4	361,00	355,25	357,00	360,75	368,00	348,50	357,00	349,00	355,00	359,25

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	11,97	11,98	11,91	11,94	11,94	11,93	11,91	11,90	11,93	11,89
1024210	VM1698-4	381,50	367,50	356,50	358,25	372,00	358,25	360,00	351,00	347,75	356,75

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	11,91	11,90	11,85	11,92	11,92	11,91	11,87	11,90	11,92	11,90
1024210	VM1698-4	360,50	364,75	348,00	348,25	356,00	356,75	351,00	349,25	361,50	367,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	11,94	11,96	11,97	11,91	11,83	11,94	11,91	11,90	11,93	11,94
1024210	VM1698-4	356,25	380,50	357,75	357,00	349,75	356,00	359,00	351,75	360,75	361,75

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	11,95	11,91	11,94	11,97	11,90	11,93	11,99	11,95	11,93	11,91
1024210	VM1698-4	357,50	349,75	359,75	371,00	350,00	383,00	370,00	343,75	360,50	340,25

Machine Capability Study
Tool System

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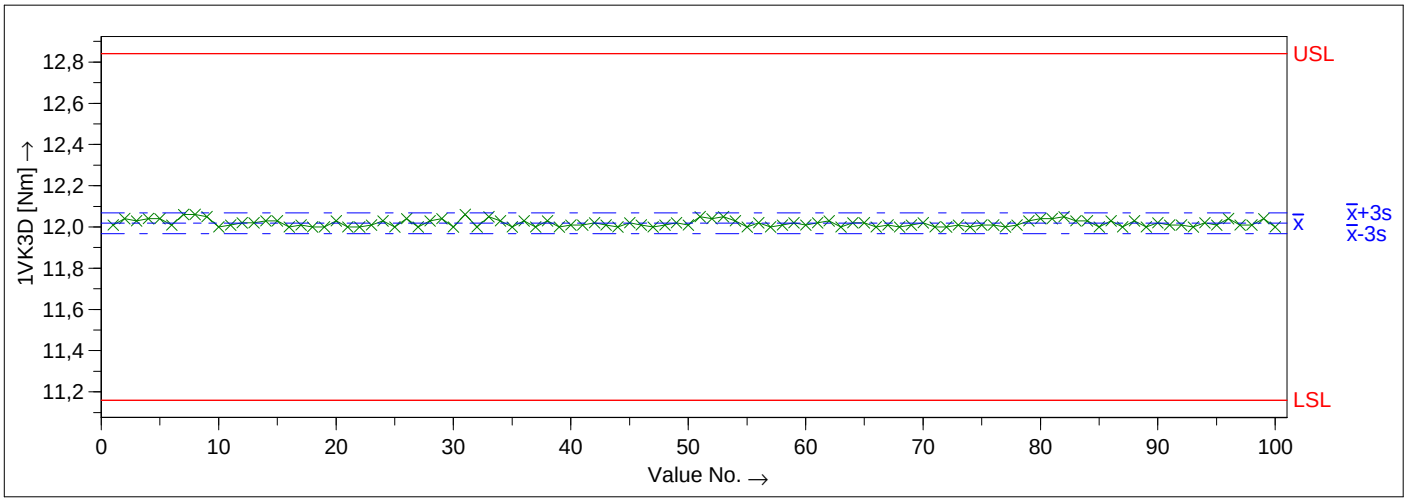
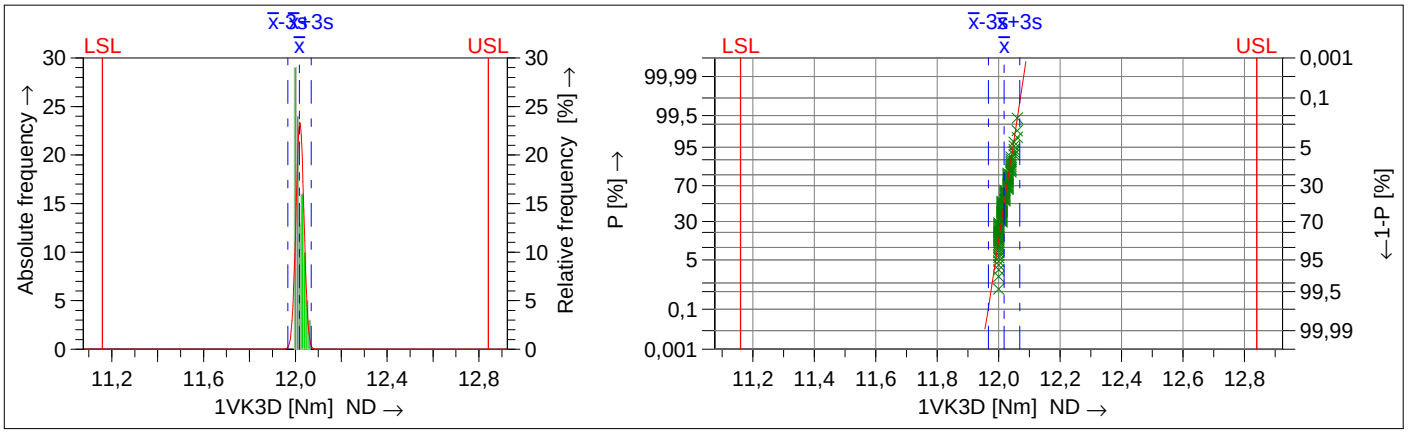
Plant	ATG Westhausen	Operator Name	Sünder
Date	08.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_a	Char.Descr.	1VK3D	Inspection Val.	12,00 0,84 -0,84
		Serial No.	198079	Unit	Nm
				USL	12,84
				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 08.11.2021 15:34:12 to 08.11.2021 16:57:30

Rem. TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0181
LSL	11.16	x_{min}	12.00	$\bar{x}$-3s	11.9672
USL	12.84	x_{max}	12.06	$\bar{x}$+3s	12.0690
T	1.68	R	0.06	6s	0.1019
		$n_{<T>}$	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	16.49
Critical capability index	=	C_{mk}	16.14

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 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	12,01	12,04	12,03	12,04	12,04	12,01	12,06	12,06	12,05	12,00
198079	1VK3D	361,00	354,00	359,00	368,00	363,00	357,00	380,00	363,00	366,00	359,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	12,01	12,02	12,02	12,03	12,03	12,00	12,01	12,00	12,00	12,03
198079	1VK3D	374,00	367,00	367,00	358,00	381,00	358,00	364,00	357,00	358,00	359,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	12,00	12,00	12,01	12,03	12,00	12,04	12,00	12,03	12,04	12,00
198079	1VK3D	358,00	370,00	370,00	370,00	363,00	363,00	374,00	380,00	364,00	380,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	12,06	12,00	12,05	12,03	12,00	12,03	12,00	12,03	12,00	12,01
198079	1VK3D	358,00	367,00	362,00	386,00	369,00	361,00	377,00	364,00	365,00	357,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	12,01	12,02	12,01	12,00	12,02	12,01	12,00	12,01	12,02	12,01
198079	1VK3D	359,00	358,00	356,00	360,00	361,00	363,00	357,00	361,00	363,00	360,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	12,05	12,04	12,05	12,03	12,00	12,02	12,00	12,01	12,02	12,01
198079	1VK3D	364,00	357,00	357,00	363,00	368,00	351,00	358,00	351,00	357,00	360,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	12,02	12,03	12,00	12,02	12,02	12,00	12,01	12,00	12,01	12,02
198079	1VK3D	381,00	367,00	359,00	359,00	374,00	364,00	361,00	355,00	354,00	358,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	12,00	12,00	12,01	12,00	12,01	12,01	12,00	12,01	12,03	12,04
198079	1VK3D	362,00	367,00	355,00	350,00	356,00	358,00	352,00	353,00	366,00	374,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	12,04	12,05	12,03	12,03	12,00	12,03	12,00	12,03	12,00	12,02
198079	1VK3D	358,00	383,00	359,00	357,00	354,00	360,00	360,00	353,00	363,00	363,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	12,01	12,01	12,00	12,02	12,01	12,04	12,01	12,01	12,04	12,00
198079	1VK3D	360,00	350,00	362,00	371,00	354,00	384,00	367,00	344,00	363,00	343,00

Machine Capability Study
Tool System

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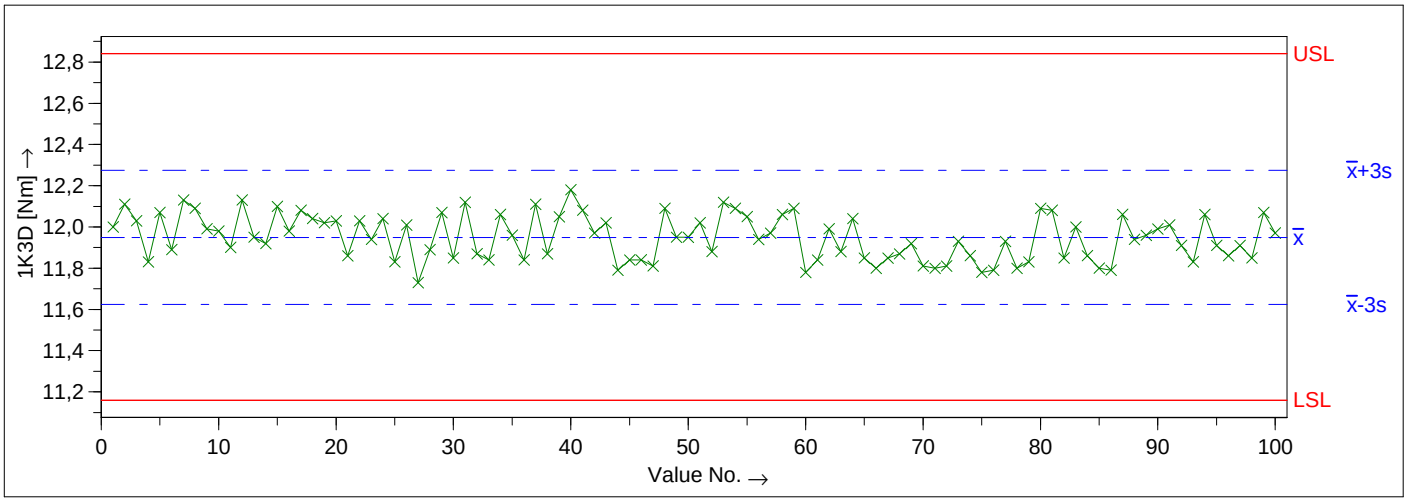
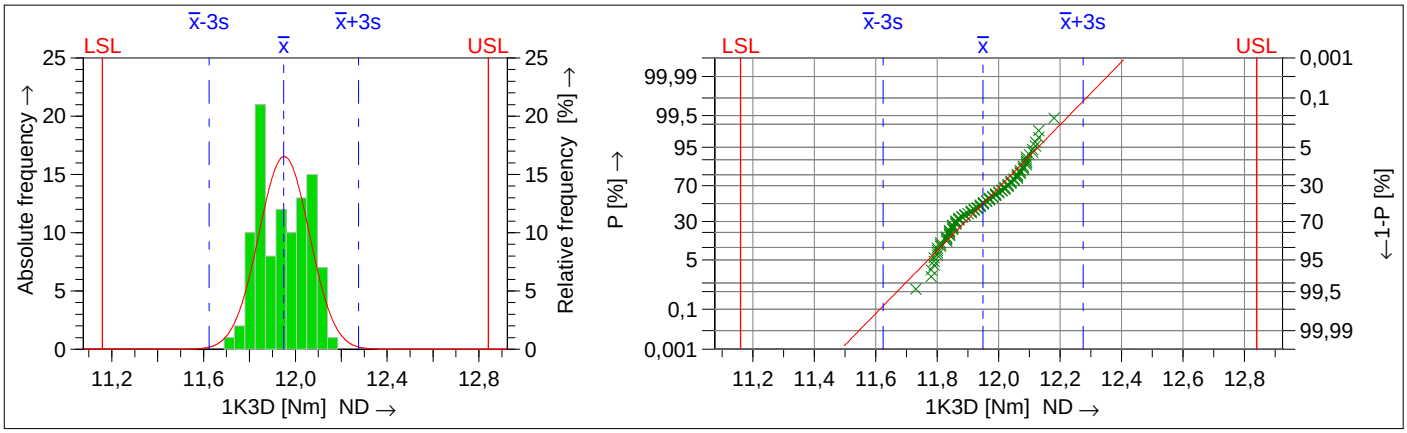
Plant	ATG Westhausen	Operator Name	Sünder
Date	08.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_a	Char.Descr.	1K3D	Inspection Val. 12,00 0,84	USL 12,84
		Serial No.	198076	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 08.11.2021 15:34:12 to 08.11.2021 16:57:30

Rem. TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.9494
LSL	11.16	x_{min}	11.73	$\bar{x}$-3s	11.6237
USL	12.84	x_{max}	12.18	$\bar{x}$+3s	12.2751
T	1.68	R	0.45	6s	0.6513
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			$M1_{1.4}$ $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	2.58
Critical capability index	=	C_{mk}	2.42

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_a2.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	12,00	12,11	12,03	11,83	12,07	11,89	12,13	12,09	11,99	11,98
198076	1K3D	361,00	354,00	359,00	368,00	363,00	357,00	380,00	363,00	366,00	359,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	11,90	12,13	11,95	11,92	12,10	11,98	12,08	12,04	12,02	12,03
198076	1K3D	374,00	367,00	367,00	358,00	381,00	358,00	364,00	357,00	358,00	359,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	11,86	12,03	11,94	12,04	11,83	12,01	11,73	11,89	12,07	11,85
198076	1K3D	358,00	370,00	370,00	370,00	363,00	363,00	374,00	380,00	364,00	380,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	12,12	11,87	11,84	12,06	11,96	11,84	12,11	11,87	12,05	12,18
198076	1K3D	358,00	367,00	362,00	386,00	369,00	361,00	377,00	364,00	365,00	357,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	12,08	11,97	12,02	11,79	11,84	11,84	11,81	12,09	11,95	11,95
198076	1K3D	359,00	358,00	356,00	360,00	361,00	363,00	357,00	361,00	363,00	360,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	12,02	11,88	12,12	12,09	12,05	11,94	11,97	12,06	12,09	11,78
198076	1K3D	364,00	357,00	357,00	363,00	368,00	351,00	358,00	351,00	357,00	360,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	11,84	11,99	11,88	12,04	11,85	11,80	11,85	11,87	11,92	11,81
198076	1K3D	381,00	367,00	359,00	359,00	374,00	364,00	361,00	355,00	354,00	358,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	11,80	11,81	11,93	11,86	11,78	11,79	11,93	11,80	11,83	12,09
198076	1K3D	362,00	367,00	355,00	350,00	356,00	358,00	352,00	353,00	366,00	374,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Sünder	Date 08.11.2021

Ser.No.	755948_a	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	12,00
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	11,16
				USL	12,84
Remark	TQ 100% soft +/-7% * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 1000/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	12,08	11,85	12,00	11,86	11,80	11,79	12,06	11,94	11,96	11,99
198076	1K3D	358,00	383,00	359,00	357,00	354,00	360,00	360,00	353,00	363,00	363,00

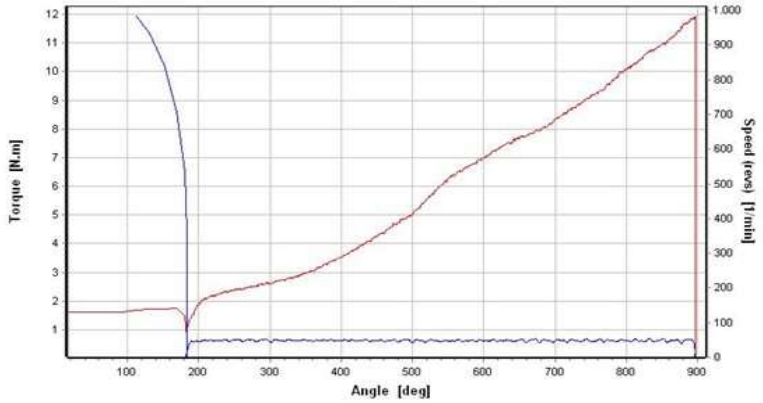
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	12,01	11,91	11,83	12,06	11,91	11,86	11,91	11,85	12,07	11,97
198076	1K3D	360,00	350,00	362,00	371,00	354,00	384,00	367,00	344,00	363,00	343,00

Torque graphs

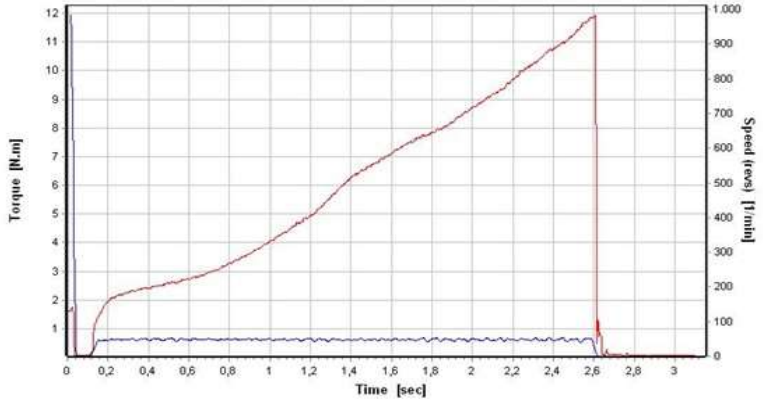
Machine Capability Study 100 %

Model: **1BD-1B012A-1K3D-1VK3D**
Serial no: **755948**

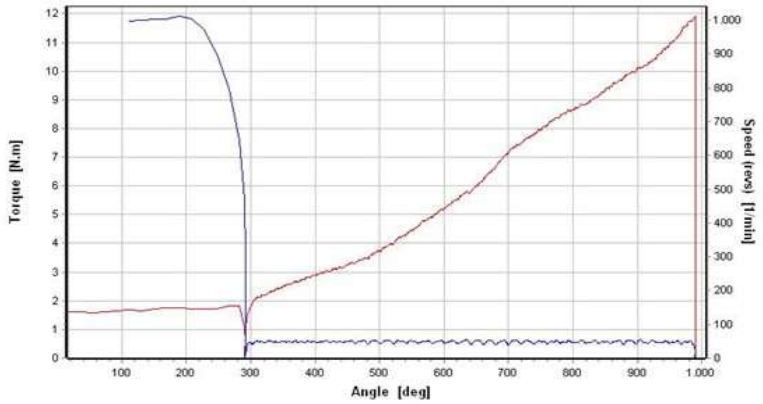
Angle degree: **360°**
Test torque: **12,0 Nm**



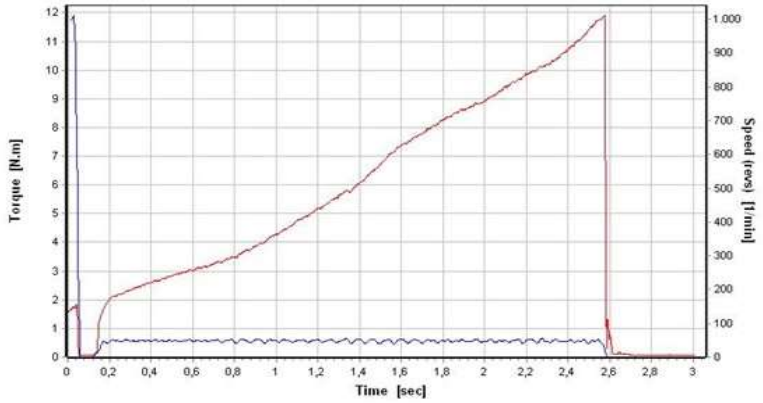
Value no. 1
Graph
Torque / Angle / Speed



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:** 755948

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: 2,94 % ± **1,47 %**

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

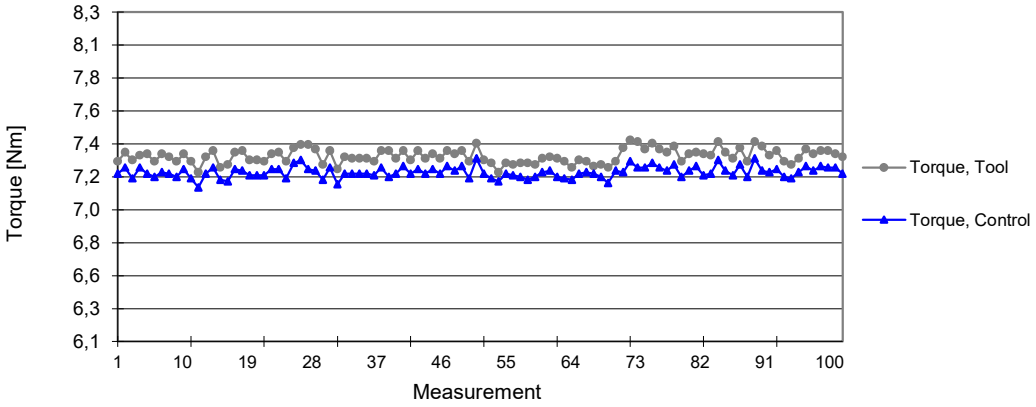
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

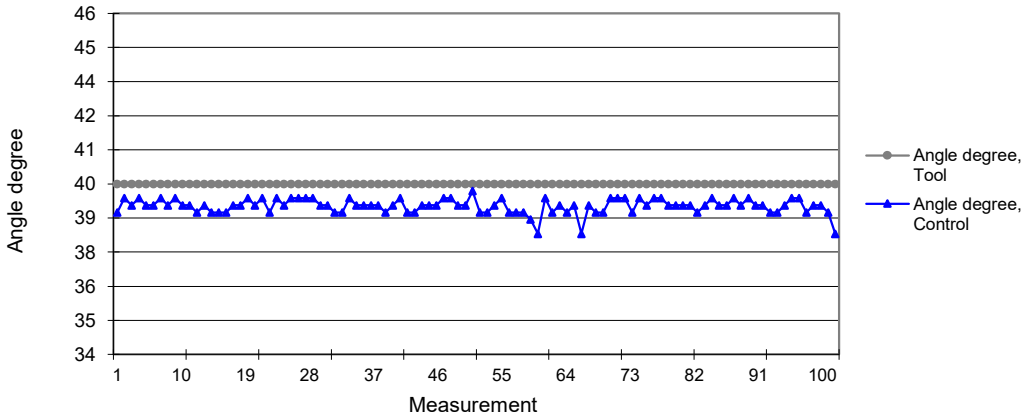
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	7,30	40,00	7,22	39,00	0,08	1,00
2	7,36	40,00	7,26	39,50	0,10	0,50
3	7,31	40,00	7,19	39,25	0,12	0,75
4	7,34	40,00	7,26	39,50	0,08	0,50
5	7,35	40,00	7,22	39,25	0,13	0,75
6	7,30	40,00	7,20	39,25	0,10	0,75
7	7,35	40,00	7,23	39,50	0,12	0,50
8	7,33	40,00	7,22	39,25	0,11	0,75
9	7,30	40,00	7,20	39,50	0,10	0,50
10	7,35	40,00	7,25	39,25	0,10	0,75
11	7,30	40,00	7,19	39,25	0,11	0,75
12	7,23	40,00	7,13	39,00	0,10	1,00
13	7,33	40,00	7,22	39,25	0,11	0,75
14	7,37	40,00	7,26	39,00	0,11	1,00
15	7,26	40,00	7,18	39,00	0,08	1,00
16	7,28	40,00	7,17	39,00	0,11	1,00
17	7,36	40,00	7,25	39,25	0,11	0,75
18	7,37	40,00	7,24	39,25	0,13	0,75
19	7,31	40,00	7,21	39,50	0,10	0,50
20	7,31	40,00	7,21	39,25	0,10	0,75
21	7,30	40,00	7,21	39,50	0,09	0,50
22	7,35	40,00	7,25	39,00	0,10	1,00
23	7,36	40,00	7,25	39,50	0,11	0,50
24	7,30	40,00	7,19	39,25	0,11	0,75
25	7,39	40,00	7,29	39,50	0,10	0,50
26	7,41	40,00	7,31	39,50	0,10	0,50
27	7,41	40,00	7,25	39,50	0,16	0,50
28	7,38	40,00	7,24	39,50	0,14	0,50
29	7,28	40,00	7,18	39,25	0,10	0,75
30	7,37	40,00	7,26	39,25	0,11	0,75
31	7,25	40,00	7,15	39,00	0,10	1,00
32	7,33	40,00	7,22	39,00	0,11	1,00
33	7,32	40,00	7,22	39,50	0,10	0,50
34	7,32	40,00	7,22	39,25	0,10	0,75
35	7,32	40,00	7,22	39,25	0,10	0,75
36	7,30	40,00	7,21	39,25	0,09	0,75
37	7,37	40,00	7,26	39,25	0,11	0,75
38	7,37	40,00	7,20	39,00	0,17	1,00
39	7,32	40,00	7,22	39,25	0,10	0,75
40	7,37	40,00	7,27	39,50	0,10	0,50
41	7,31	40,00	7,22	39,00	0,09	1,00
42	7,37	40,00	7,25	39,00	0,12	1,00
43	7,32	40,00	7,22	39,25	0,10	0,75
44	7,35	40,00	7,25	39,25	0,10	0,75
45	7,32	40,00	7,22	39,25	0,10	0,75
46	7,37	40,00	7,27	39,50	0,10	0,50
47	7,35	40,00	7,24	39,50	0,11	0,50
48	7,37	40,00	7,27	39,25	0,10	0,75
49	7,30	40,00	7,19	39,25	0,11	0,75
50	7,42	40,00	7,32	39,75	0,10	0,25
51	7,31	40,00	7,22	39,00	0,09	1,00
52	7,29	40,00	7,19	39,00	0,10	1,00
53	7,23	40,00	7,17	39,25	0,06	0,75
54	7,29	40,00	7,22	39,50	0,07	0,50
55	7,28	40,00	7,21	39,00	0,07	1,00
56	7,29	40,00	7,20	39,00	0,09	1,00
57	7,29	40,00	7,18	39,00	0,11	1,00
58	7,28	40,00	7,20	38,75	0,08	1,25
59	7,32	40,00	7,23	38,25	0,09	1,75
60	7,33	40,00	7,24	39,50	0,09	0,50
61	7,32	40,00	7,20	39,00	0,12	1,00
62	7,30	40,00	7,19	39,25	0,11	0,75
63	7,26	40,00	7,18	39,00	0,08	1,00
64	7,31	40,00	7,22	39,25	0,09	0,75
65	7,30	40,00	7,23	38,25	0,07	1,75
66	7,27	40,00	7,22	39,25	0,05	0,75
67	7,28	40,00	7,20	39,00	0,08	1,00
68	7,26	40,00	7,16	39,00	0,10	1,00
69	7,30	40,00	7,24	39,50	0,06	0,50
70	7,39	40,00	7,23	39,50	0,16	0,50
71	7,44	40,00	7,30	39,50	0,14	0,50
72	7,43	40,00	7,26	39,00	0,17	1,00
73	7,38	40,00	7,26	39,50	0,12	0,50
74	7,42	40,00	7,29	39,25	0,13	0,75
75	7,38	40,00	7,26	39,50	0,12	0,50
76	7,36	40,00	7,24	39,50	0,12	0,50
77	7,40	40,00	7,28	39,25	0,12	0,75
78	7,30	40,00	7,20	39,25	0,10	0,75
79	7,35	40,00	7,24	39,25	0,11	0,75
80	7,36	40,00	7,27	39,25	0,09	0,75
81	7,35	40,00	7,21	39,00	0,14	1,00
82	7,34	40,00	7,22	39,25	0,12	0,75
83	7,43	40,00	7,31	39,50	0,12	0,50
84	7,36	40,00	7,24	39,25	0,12	0,75
85	7,32	40,00	7,21	39,25	0,11	0,75
86	7,39	40,00	7,28	39,50	0,11	0,50
87	7,30	40,00	7,20	39,25	0,10	0,75
88	7,43	40,00	7,32	39,50	0,11	0,50
89	7,40	40,00	7,24	39,25	0,16	0,75
90	7,34	40,00	7,23	39,25	0,11	0,75
91	7,37	40,00	7,25	39,00	0,12	1,00
92	7,30	40,00	7,20	39,00	0,10	1,00
93	7,28	40,00	7,19	39,25	0,09	0,75
94	7,32	40,00	7,23	39,50	0,09	0,50
95	7,38	40,00	7,27	39,50	0,11	0,50
96	7,35	40,00	7,24	39,00	0,11	1,00
97	7,37	40,00	7,27	39,25	0,10	0,75
98	7,37	40,00	7,26	39,25	0,11	0,75
99	7,35	40,00	7,26	39,00	0,09	1,00
100	7,33	40,00	7,22	38,25	0,11	1,75
				Standard deviation:	**0,021**	**0,262**

Graphical representation

Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755948**
Target torque:	**7,20 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





Machine Capability Study
Control System

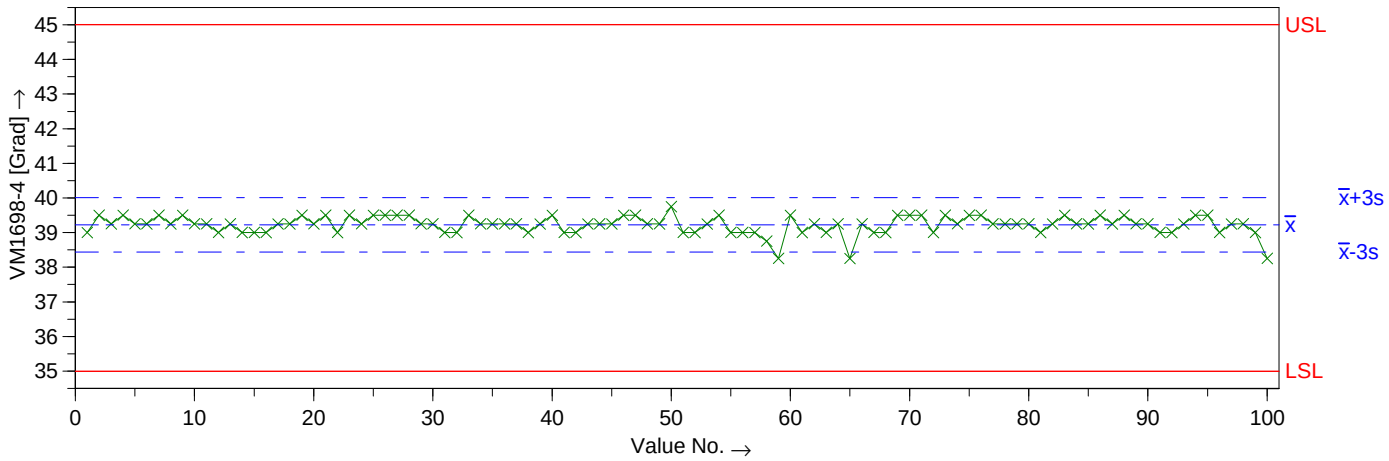
Page 1 / 1

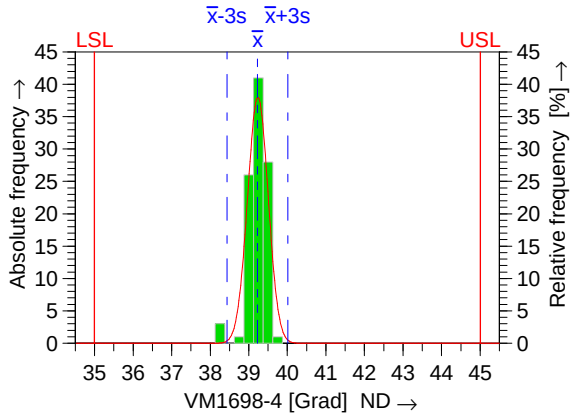
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

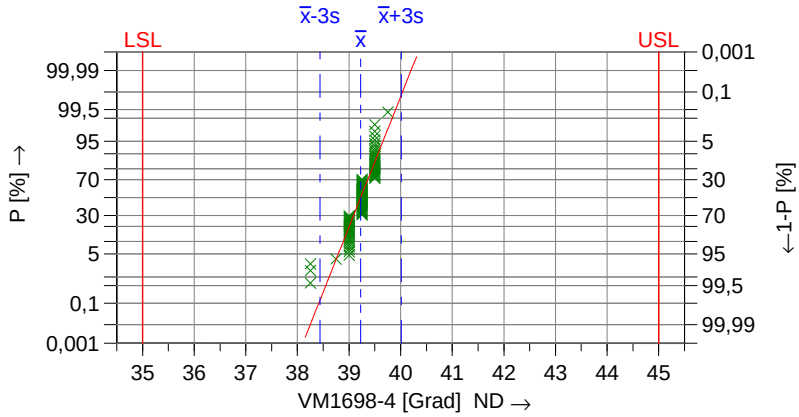
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_k	Char.Descr.	VM1698-4	Inspection Val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 09.11.2021 09:24:02 to 09.11.2021 09:38:35

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	39.2250
LSL	35.00	x_{min}	38.25	$\bar{x}$-3s	38.4380
USL	45.00	x_{max}	39.75	$\bar{x}$+3s	40.0120
T	10.00	R	1.50	6s	1.5739
		$n_{<T>}$	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	6.35
Critical capability index	=	C_{mk}	5.37

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2021\755948_kM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	7,22	7,26	7,19	7,26	7,22	7,20	7,23	7,22	7,20	7,25
1024210	VM1698-4	39,00	39,50	39,25	39,50	39,25	39,25	39,50	39,25	39,50	39,25

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	7,19	7,13	7,22	7,26	7,18	7,17	7,25	7,24	7,21	7,21
1024210	VM1698-4	39,25	39,00	39,25	39,00	39,00	39,00	39,25	39,25	39,50	39,25

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	7,21	7,25	7,25	7,19	7,29	7,31	7,25	7,24	7,18	7,26
1024210	VM1698-4	39,50	39,00	39,50	39,25	39,50	39,50	39,50	39,50	39,25	39,25

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	7,15	7,22	7,22	7,22	7,22	7,21	7,26	7,20	7,22	7,27
1024210	VM1698-4	39,00	39,00	39,50	39,25	39,25	39,25	39,25	39,00	39,25	39,50

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	7,22	7,25	7,22	7,25	7,22	7,27	7,24	7,27	7,19	7,32
1024210	VM1698-4	39,00	39,00	39,25	39,25	39,25	39,50	39,50	39,25	39,25	39,75

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	7,22	7,19	7,17	7,22	7,21	7,20	7,18	7,20	7,23	7,24
1024210	VM1698-4	39,00	39,00	39,25	39,50	39,00	39,00	39,00	38,75	38,25	39,50

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	7,20	7,19	7,18	7,22	7,23	7,22	7,20	7,16	7,24	7,23
1024210	VM1698-4	39,00	39,25	39,00	39,25	38,25	39,25	39,00	39,00	39,50	39,50

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	7,30	7,26	7,26	7,29	7,26	7,24	7,28	7,20	7,24	7,27
1024210	VM1698-4	39,50	39,00	39,50	39,25	39,50	39,50	39,25	39,25	39,25	39,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	7,21	7,22	7,31	7,24	7,21	7,28	7,20	7,32	7,24	7,23
1024210	VM1698-4	39,00	39,25	39,50	39,25	39,25	39,50	39,25	39,50	39,25	39,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	7,25	7,20	7,19	7,23	7,27	7,24	7,27	7,26	7,26	7,22
1024210	VM1698-4	39,00	39,00	39,25	39,50	39,50	39,00	39,25	39,25	39,00	38,25

Machine Capability Study
Tool System

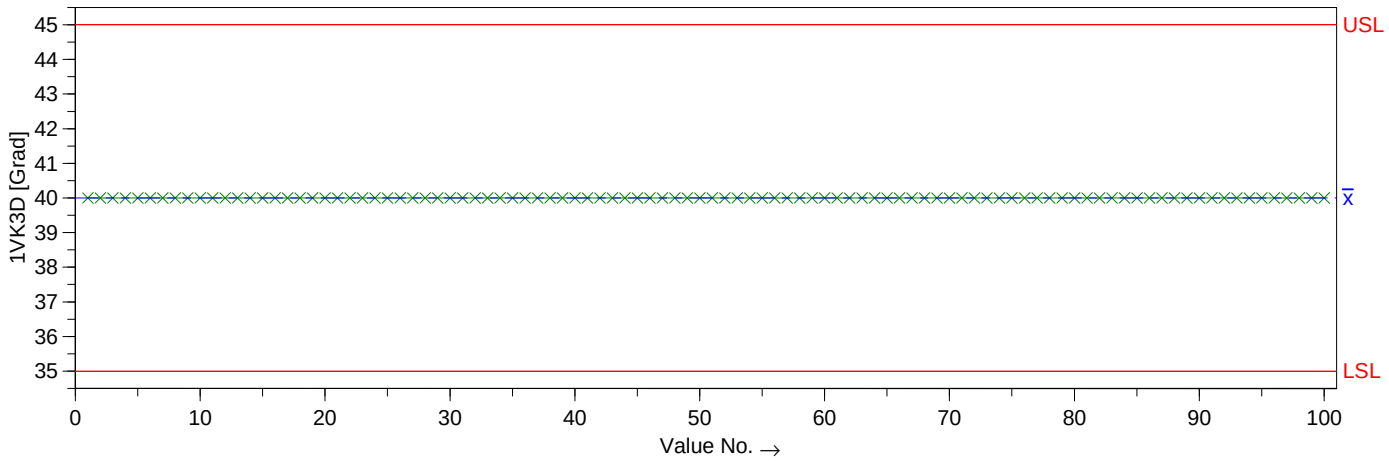
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

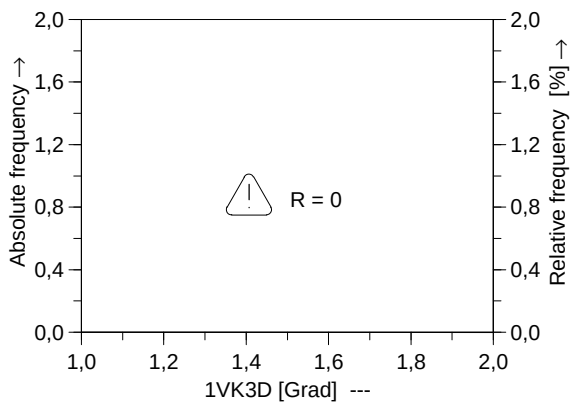
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D			Contr.item yes
Serial No.	755948_k	Char.Descr.	1VK3D	Inspection Val.	40,00 5,00	USL 45,00
		Serial No.	198079	Unit	Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value	12 %	Decimal Pl. 2

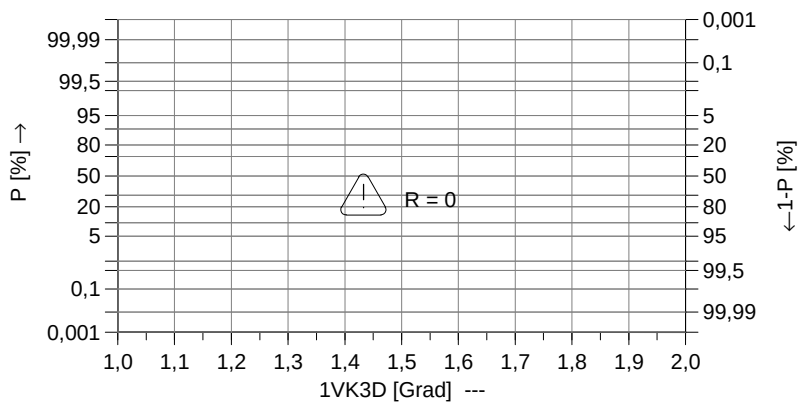
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 09.11.2021 09:24:02 to 09.11.2021 09:38:34

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 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 09.11.2021

Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	7,30	7,36	7,31	7,34	7,35	7,30	7,35	7,33	7,30	7,35
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	7,30	7,23	7,33	7,37	7,26	7,28	7,36	7,37	7,31	7,31
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	7,30	7,35	7,36	7,30	7,39	7,41	7,41	7,38	7,28	7,37
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	7,25	7,33	7,32	7,32	7,32	7,30	7,37	7,37	7,32	7,37
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	7,31	7,37	7,32	7,35	7,32	7,37	7,35	7,37	7,30	7,42
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	7,31	7,29	7,23	7,29	7,28	7,29	7,29	7,28	7,32	7,33
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	7,32	7,30	7,26	7,31	7,30	7,27	7,28	7,26	7,30	7,39
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	7,44	7,43	7,38	7,42	7,38	7,36	7,40	7,30	7,35	7,36
198079	1VK3D	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 09.11.2021

Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	7,35	7,34	7,43	7,36	7,32	7,39	7,30	7,43	7,40	7,34
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	7,37	7,30	7,28	7,32	7,38	7,35	7,37	7,37	7,35	7,33
198079	1VK3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

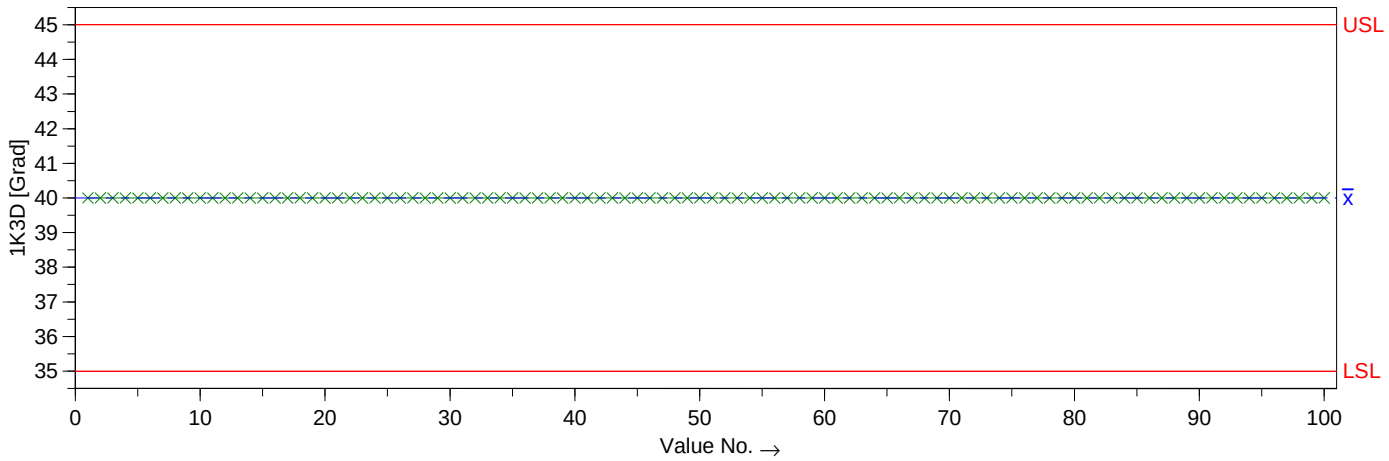
Machine Capability Study
Tool System

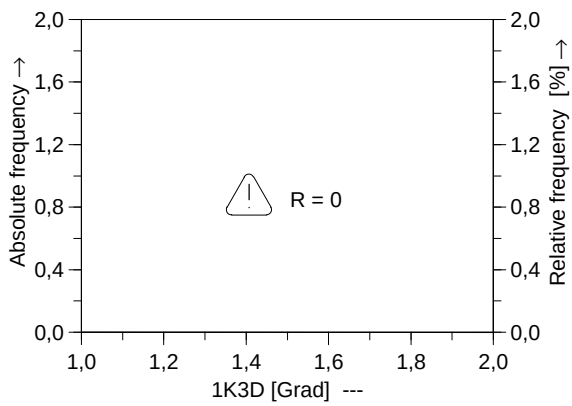
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

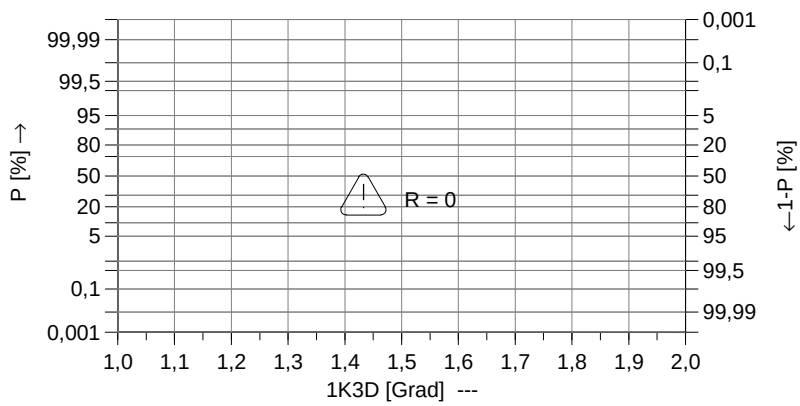
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D			Contr.item yes
Serial No.	755948_k	Char.Descr.	1K3D	Inspection Val.	40,00 5,00	USL 45,00
		Serial No.	198076	Unit	Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value	12 %	Decimal Pl. 2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P	
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100	

Evaluation from 09.11.2021 09:24:02 to 09.11.2021 09:38:34

Rem. TQ 60% Angle 40° +/-5° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 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 09.11.2021

Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	7,21	7,22	7,22	7,33	7,31	7,20	7,17	7,26	7,23	7,28
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	7,13	7,16	7,24	7,34	7,11	7,28	7,32	7,30	7,25	7,27
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	7,25	7,30	7,25	7,15	7,35	7,43	7,30	7,35	7,20	7,32
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	7,14	7,35	7,16	7,18	7,35	7,21	7,30	7,25	7,18	7,35
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	7,15	7,20	7,32	7,30	7,24	7,27	7,30	7,35	7,15	7,42
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	7,35	7,18	7,11	7,26	7,17	7,30	7,15	7,30	7,26	7,21
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	7,22	7,14	7,18	7,25	7,26	7,15	7,15	7,13	7,21	7,30
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	7,35	7,31	7,32	7,35	7,25	7,22	7,33	7,12	7,20	7,26
198076	1K3D	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 09.11.2021

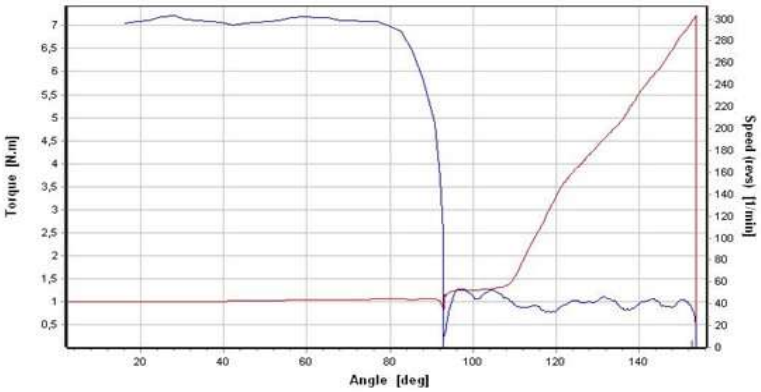
Ser.No.	755948_k	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	7,20
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	6,70
				USL	7,70
Remark	TQ 60% Angle 40°+/-5°* TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	7,26	7,21	7,40	7,37	7,16	7,30	7,17	7,43	7,28	7,20
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

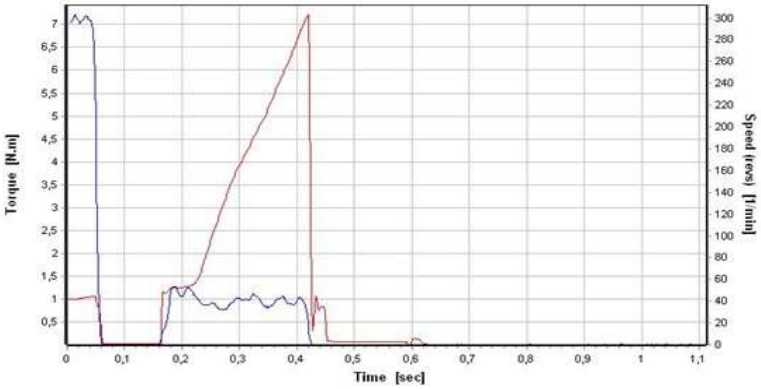
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	7,35	7,21	7,16	7,19	7,19	7,30	7,31	7,32	7,31	7,22
198076	1K3D	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

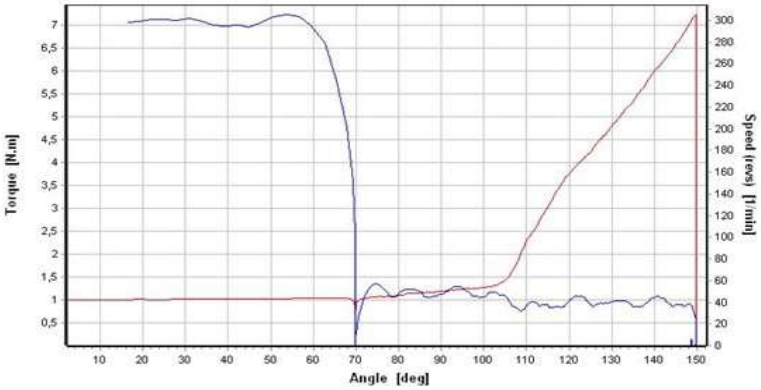
Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755948**
Target torque:	**7,20 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



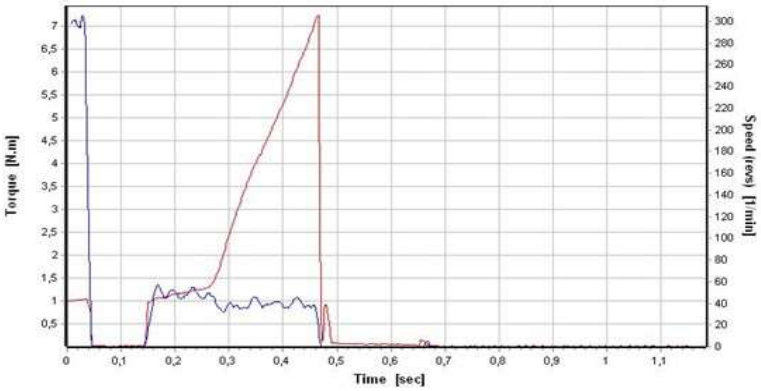
Value no. 1
Graph
Torque / Angle / Speed



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:** 755948

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: 3,85 % ± **1,92 %**

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

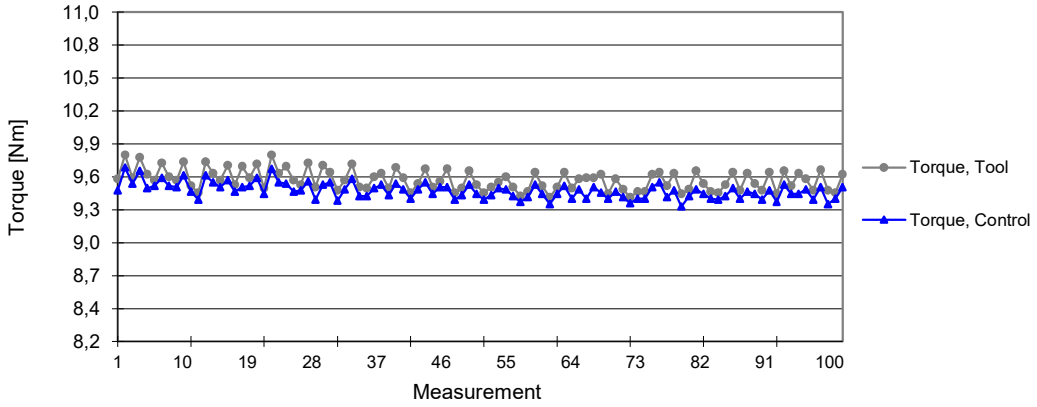
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

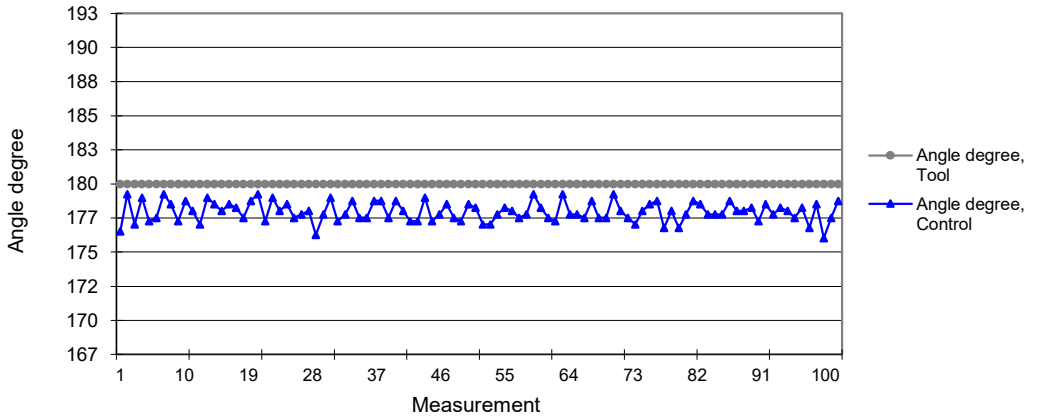
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	9,58	180,00	9,48	176,50	0,10	3,50
2	9,79	180,00	9,68	179,25	0,11	0,75
3	9,59	180,00	9,54	177,00	0,05	3,00
4	9,77	180,00	9,65	179,00	0,12	1,00
5	9,62	180,00	9,50	177,25	0,12	2,75
6	9,57	180,00	9,52	177,50	0,05	2,50
7	9,72	180,00	9,59	179,25	0,13	0,75
8	9,60	180,00	9,52	178,50	0,08	1,50
9	9,57	180,00	9,51	177,25	0,06	2,75
10	9,73	180,00	9,61	178,75	0,12	1,25
11	9,52	180,00	9,47	178,00	0,05	2,00
12	9,46	180,00	9,40	177,00	0,06	3,00
13	9,73	180,00	9,61	179,00	0,12	1,00
14	9,63	180,00	9,55	178,50	0,08	1,50
15	9,57	180,00	9,51	178,00	0,06	2,00
16	9,70	180,00	9,57	178,50	0,13	1,50
17	9,53	180,00	9,47	178,25	0,06	1,75
18	9,69	180,00	9,51	177,50	0,18	2,50
19	9,59	180,00	9,52	178,75	0,07	1,25
20	9,71	180,00	9,59	179,25	0,12	0,75
21	9,50	180,00	9,45	177,25	0,05	2,75
22	9,79	180,00	9,67	179,00	0,12	1,00
23	9,63	180,00	9,55	178,00	0,08	2,00
24	9,69	180,00	9,54	178,50	0,15	1,50
25	9,57	180,00	9,47	177,50	0,10	2,50
26	9,53	180,00	9,48	177,75	0,05	2,25
27	9,72	180,00	9,56	178,00	0,16	2,00
28	9,51	180,00	9,40	176,25	0,11	3,75
29	9,70	180,00	9,53	177,75	0,17	2,25
30	9,64	180,00	9,55	179,00	0,09	1,00
31	9,48	180,00	9,39	177,25	0,09	2,75
32	9,57	180,00	9,49	177,75	0,08	2,25
33	9,71	180,00	9,58	178,75	0,13	1,25
34	9,51	180,00	9,43	177,50	0,08	2,50
35	9,50	180,00	9,43	177,50	0,07	2,50
36	9,60	180,00	9,50	178,75	0,10	1,25
37	9,63	180,00	9,53	178,75	0,10	1,25
38	9,50	180,00	9,44	177,50	0,06	2,50
39	9,68	180,00	9,54	178,75	0,14	1,25
40	9,59	180,00	9,49	178,00	0,10	2,00
41	9,46	180,00	9,41	177,25	0,05	2,75
42	9,54	180,00	9,49	177,25	0,05	2,75
43	9,67	180,00	9,55	179,00	0,12	1,00
44	9,51	180,00	9,45	177,25	0,06	2,75
45	9,56	180,00	9,51	177,75	0,05	2,25
46	9,67	180,00	9,51	178,50	0,16	1,50
47	9,46	180,00	9,40	177,50	0,06	2,50
48	9,50	180,00	9,44	177,25	0,06	2,75
49	9,65	180,00	9,53	178,50	0,12	1,50
50	9,53	180,00	9,45	178,25	0,08	1,75
51	9,46	180,00	9,40	177,00	0,06	3,00
52	9,51	180,00	9,44	177,00	0,07	3,00
53	9,55	180,00	9,50	177,75	0,05	2,25
54	9,60	180,00	9,49	178,25	0,11	1,75
55	9,51	180,00	9,43	178,00	0,08	2,00
56	9,43	180,00	9,38	177,50	0,05	2,50
57	9,47	180,00	9,42	177,75	0,05	2,25
58	9,64	180,00	9,53	179,25	0,11	0,75
59	9,52	180,00	9,45	178,25	0,07	1,75
60	9,42	180,00	9,36	177,50	0,06	2,50
61	9,51	180,00	9,45	177,25	0,06	2,75
62	9,64	180,00	9,52	179,25	0,12	0,75
63	9,50	180,00	9,41	177,75	0,09	2,25
64	9,58	180,00	9,49	177,75	0,09	2,25
65	9,59	180,00	9,41	177,50	0,18	2,50
66	9,59	180,00	9,51	178,75	0,08	1,25
67	9,62	180,00	9,46	177,50	0,16	2,50
68	9,45	180,00	9,41	177,50	0,04	2,50
69	9,58	180,00	9,47	179,25	0,11	0,75
70	9,49	180,00	9,42	178,00	0,07	2,00
71	9,42	180,00	9,37	177,50	0,05	2,50
72	9,47	180,00	9,41	177,00	0,06	3,00
73	9,47	180,00	9,41	178,00	0,06	2,00
74	9,62	180,00	9,51	178,50	0,11	1,50
75	9,64	180,00	9,55	178,75	0,09	1,25
76	9,52	180,00	9,42	176,75	0,10	3,25
77	9,63	180,00	9,48	178,00	0,15	2,00
78	9,45	180,00	9,34	176,75	0,11	3,25
79	9,49	180,00	9,43	177,75	0,06	2,25
80	9,65	180,00	9,49	178,75	0,16	1,25
81	9,54	180,00	9,45	178,50	0,09	1,50
82	9,47	180,00	9,41	177,75	0,06	2,25
83	9,46	180,00	9,40	177,75	0,06	2,25
84	9,53	180,00	9,43	177,75	0,10	2,25
85	9,64	180,00	9,50	178,75	0,14	1,25
86	9,48	180,00	9,41	178,00	0,07	2,00
87	9,63	180,00	9,47	178,00	0,16	2,00
88	9,54	180,00	9,45	178,25	0,09	1,75
89	9,48	180,00	9,40	177,25	0,08	2,75
90	9,64	180,00	9,48	178,50	0,16	1,50
91	9,45	180,00	9,38	177,75	0,07	2,25
92	9,65	180,00	9,53	178,25	0,12	1,75
93	9,52	180,00	9,45	178,00	0,07	2,00
94	9,63	180,00	9,45	177,50	0,18	2,50
95	9,58	180,00	9,49	178,25	0,09	1,75
96	9,48	180,00	9,40	176,75	0,08	3,25
97	9,66	180,00	9,51	178,50	0,15	1,50
98	9,48	180,00	9,36	176,00	0,12	4,00
99	9,46	180,00	9,41	177,50	0,05	2,50
100	9,62	180,00	9,51	178,75	0,11	1,25
				Standard deviation:	**0,037**	**0,728**

Graphical representation

Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755948**
Target torque:	**9,60 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





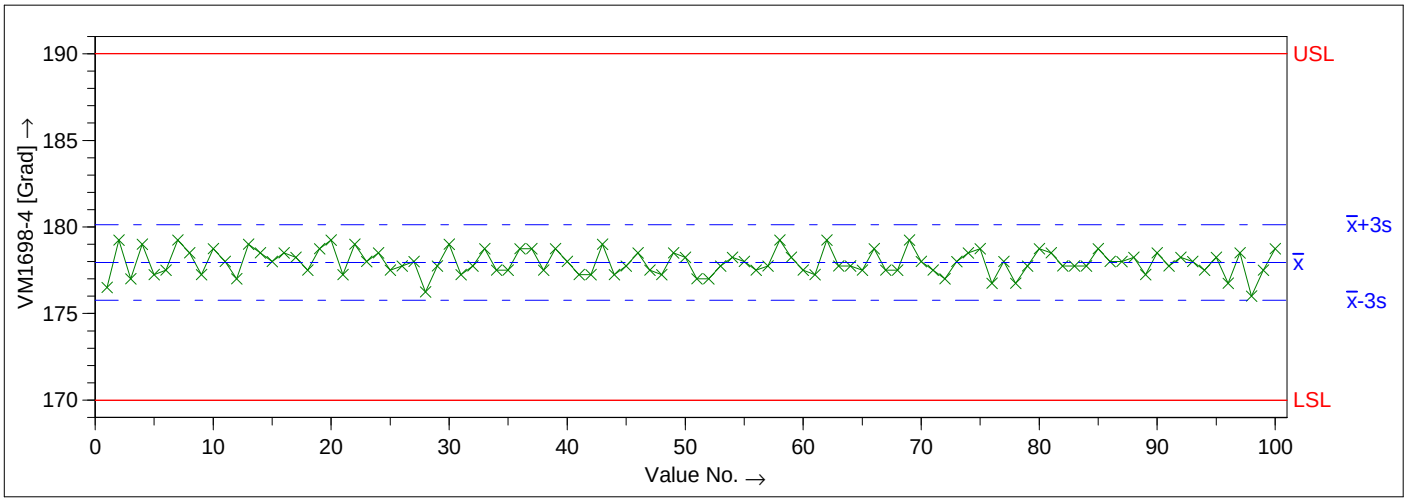
Machine Capability Study
Control System

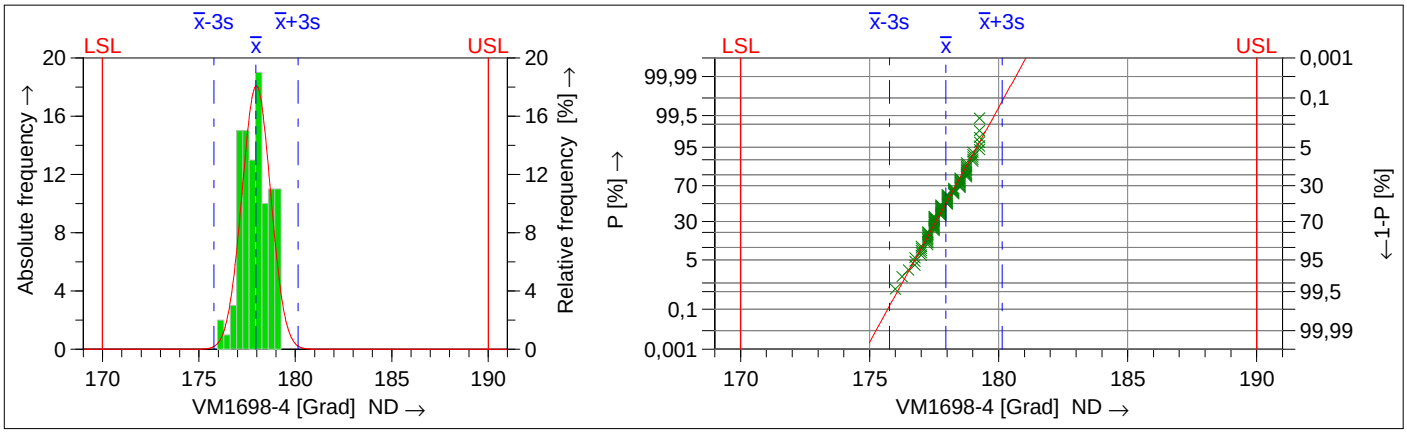
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_l	Char.Descr.	VM1698-4	Inspection Val.	180,00 10,00
		Serial No.	1024210	Unit	Grad -10,00
				USL	190,00
				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 09.11.2021 10:01:54 to 09.11.2021 10:19:48

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	177.9525
LSL	170.00	x_{min}	176.00	$\bar{x}$-3s	175.7686
USL	190.00	x_{max}	179.25	$\bar{x}$+3s	180.1364
T	20.00	R	3.25	6s	4.3677
		$n_{<T>}$	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	4.58
Critical capability index	=	C_{mk}	3.64

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 09.11.2021

Ser.No.	755948_I	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	9,48	9,68	9,54	9,65	9,50	9,52	9,59	9,52	9,51	9,61
1024210	VM1698-4	176,50	179,25	177,00	179,00	177,25	177,50	179,25	178,50	177,25	178,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	9,47	9,40	9,61	9,55	9,51	9,57	9,47	9,51	9,52	9,59
1024210	VM1698-4	178,00	177,00	179,00	178,50	178,00	178,50	178,25	177,50	178,75	179,25

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	9,45	9,67	9,55	9,54	9,47	9,48	9,56	9,40	9,53	9,55
1024210	VM1698-4	177,25	179,00	178,00	178,50	177,50	177,75	178,00	176,25	177,75	179,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	9,39	9,49	9,58	9,43	9,43	9,50	9,53	9,44	9,54	9,49
1024210	VM1698-4	177,25	177,75	178,75	177,50	177,50	178,75	178,75	177,50	178,75	178,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	9,41	9,49	9,55	9,45	9,51	9,51	9,40	9,44	9,53	9,45
1024210	VM1698-4	177,25	177,25	179,00	177,25	177,75	178,50	177,50	177,25	178,50	178,25

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	9,40	9,44	9,50	9,49	9,43	9,38	9,42	9,53	9,45	9,36
1024210	VM1698-4	177,00	177,00	177,75	178,25	178,00	177,50	177,75	179,25	178,25	177,50

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	9,45	9,52	9,41	9,49	9,41	9,51	9,46	9,41	9,47	9,42
1024210	VM1698-4	177,25	179,25	177,75	177,75	177,50	178,75	177,50	177,50	179,25	178,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	9,37	9,41	9,41	9,51	9,55	9,42	9,48	9,34	9,43	9,49
1024210	VM1698-4	177,50	177,00	178,00	178,50	178,75	176,75	178,00	176,75	177,75	178,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 09.11.2021

Ser.No.	755948_I	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	VM1698-4	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	1024210	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	9,45	9,41	9,40	9,43	9,50	9,41	9,47	9,45	9,40	9,48
1024210	VM1698-4	178,50	177,75	177,75	177,75	178,75	178,00	178,00	178,25	177,25	178,50

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	9,38	9,53	9,45	9,45	9,49	9,40	9,51	9,36	9,41	9,51
1024210	VM1698-4	177,75	178,25	178,00	177,50	178,25	176,75	178,50	176,00	177,50	178,75

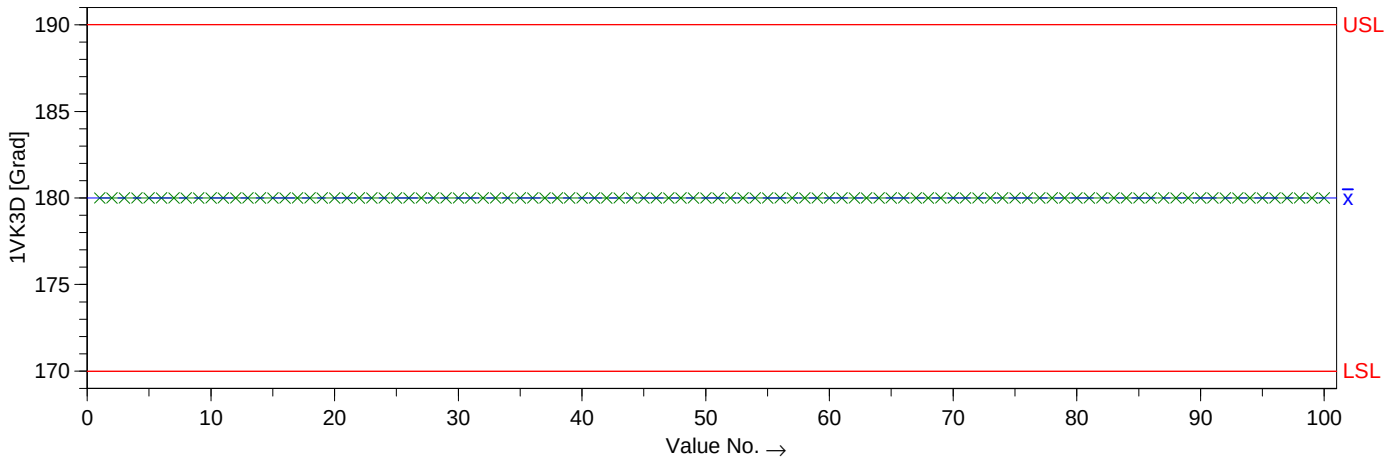
Machine Capability Study
Tool System

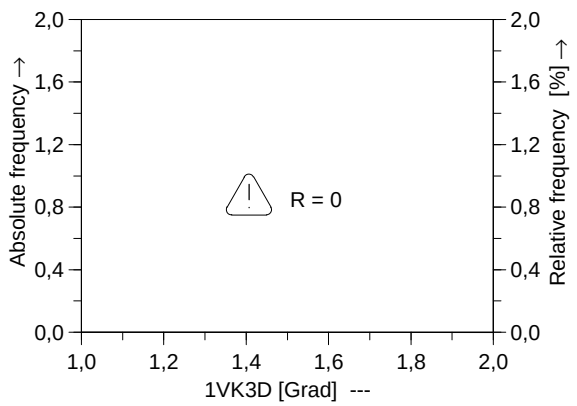
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

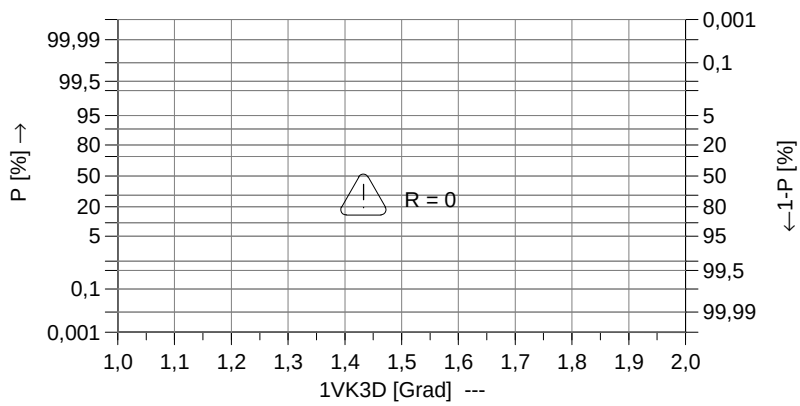
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_l	Char.Descr.	1VK3D	Inspection Val.	180,00 10,00
		Serial No.	198079	Unit	Grad -10,00
				USL	190,00
				LSL	170,00
Char.Type	variable			Tolerance value	6 %
				Decimal Pl.	2
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 09.11.2021 10:01:54 to 09.11.2021 10:19:48

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 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 09.11.2021

Ser.No.	755948_I	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198079	1VK3D	9,58	9,79	9,59	9,77	9,62	9,57	9,72	9,60	9,57	9,73
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198079	1VK3D	9,52	9,46	9,73	9,63	9,57	9,70	9,53	9,69	9,59	9,71
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198079	1VK3D	9,50	9,79	9,63	9,69	9,57	9,53	9,72	9,51	9,70	9,64
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198079	1VK3D	9,48	9,57	9,71	9,51	9,50	9,60	9,63	9,50	9,68	9,59
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198079	1VK3D	9,46	9,54	9,67	9,51	9,56	9,67	9,46	9,50	9,65	9,53
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198079	1VK3D	9,46	9,51	9,55	9,60	9,51	9,43	9,47	9,64	9,52	9,42
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198079	1VK3D	9,51	9,64	9,50	9,58	9,59	9,59	9,62	9,45	9,58	9,49
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198079	1VK3D	9,42	9,47	9,47	9,62	9,64	9,52	9,63	9,45	9,49	9,65
198079	1VK3D	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 09.11.2021

Ser.No.	755948_I	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1VK3D	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	198079	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198079	1VK3D	9,54	9,47	9,46	9,53	9,64	9,48	9,63	9,54	9,48	9,64
198079	1VK3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198079	1VK3D	9,45	9,65	9,52	9,63	9,58	9,48	9,66	9,48	9,46	9,62
198079	1VK3D	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

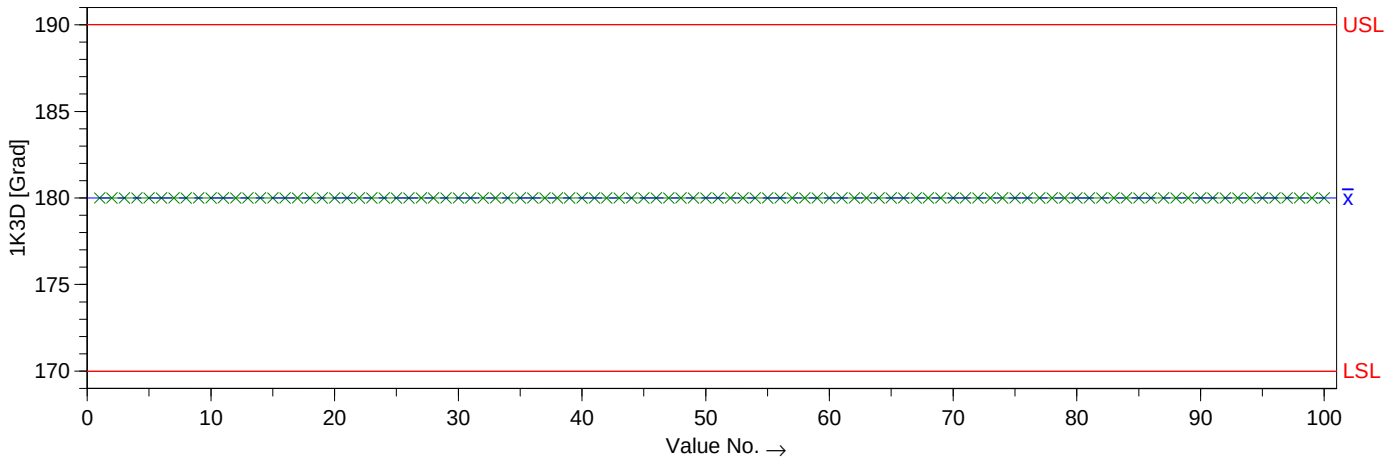
Plant	ATG Westhausen	Operator Name	Sünder
Date	09.11.2021		

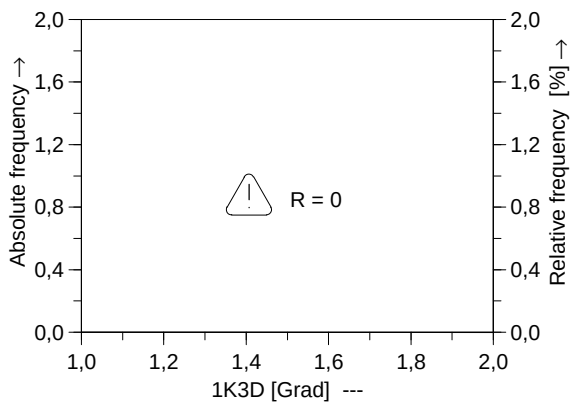
Ord. No.	1BD12T20-A	Part type	1BD-1B012A-1K3D-1VK3D	Contr.item	yes
Serial No.	755948_l	Char.Descr.	1K3D	Inspection Val.	180,00 10,00
		Serial No.	198076	Unit	Grad -10,00
Char.Type	variable			Tolerance value	6 %
				USL	190,00
				LSL	170,00
				Decimal Pl.	2

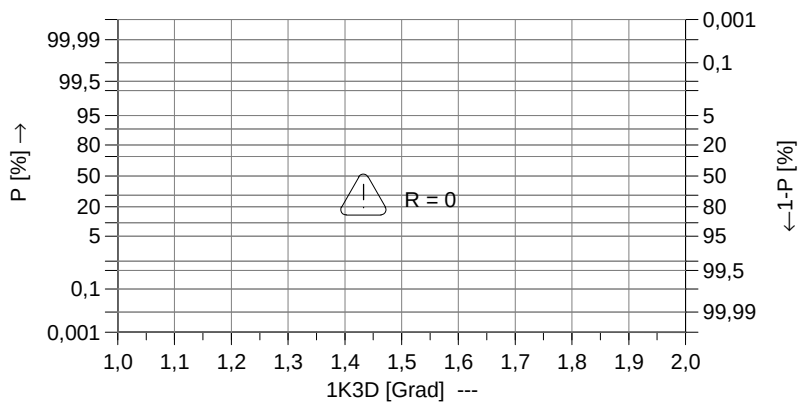
Cust.Name	Cleco	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10 / 1026388	nges.	100

Evaluation from 09.11.2021 10:01:54 to 09.11.2021 10:19:48

Rem. TQ 80% Angle 180° +/-10° * TQ-Cal 1+2.: 12 Nm; Cur-Cal.: 0.8889 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 09.11.2021

Ser.No.	755948_l	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
198076	1K3D	9,67	9,70	9,58	9,73	9,65	9,44	9,69	9,64	9,49	9,72
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
198076	1K3D	9,50	9,56	9,66	9,49	9,54	9,67	9,66	9,54	9,48	9,60
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
198076	1K3D	9,58	9,63	9,52	9,65	9,46	9,59	9,72	9,50	9,63	9,67
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
198076	1K3D	9,42	9,60	9,70	9,52	9,44	9,52	9,46	9,37	9,70	9,60
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
198076	1K3D	9,36	9,53	9,49	9,56	9,45	9,48	9,50	9,41	9,71	9,42
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
198076	1K3D	9,44	9,39	9,62	9,55	9,57	9,41	9,47	9,54	9,32	9,34
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
198076	1K3D	9,44	9,55	9,34	9,58	9,64	9,49	9,57	9,36	9,46	9,35
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
198076	1K3D	9,37	9,46	9,60	9,55	9,51	9,52	9,59	9,37	9,36	9,64
198076	1K3D	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 09.11.2021

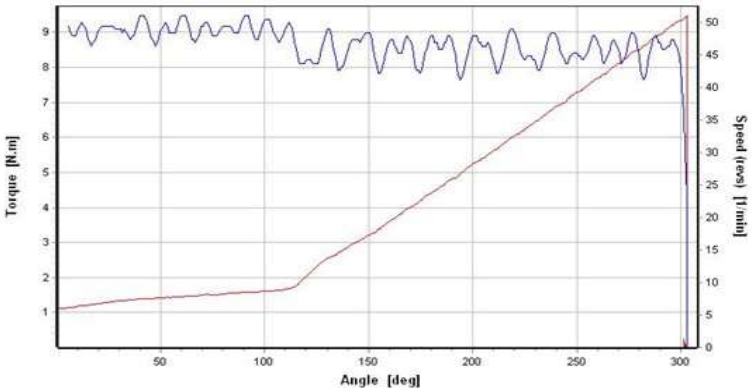
Ser.No.	755948_l	Characteristic			
Type	1BD-1B012A-1K3D-1VK3D	Char.Descr.	1K3D	Inspection Val.	9,60
Ord. No.	1BD12T20-A	Ser.No.	198076	LSL	8,93
				USL	10,27
Remark	TQ 80% Angle 180°+/-10°* TQ-Cal 1+2.: 12 Nm ; Cur-Cal.: 0.8889 Nm/A; Speed: 300/50 rpm;				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
198076	1K3D	9,41	9,53	9,36	9,51	9,62	9,51	9,69	9,38	9,39	9,58
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

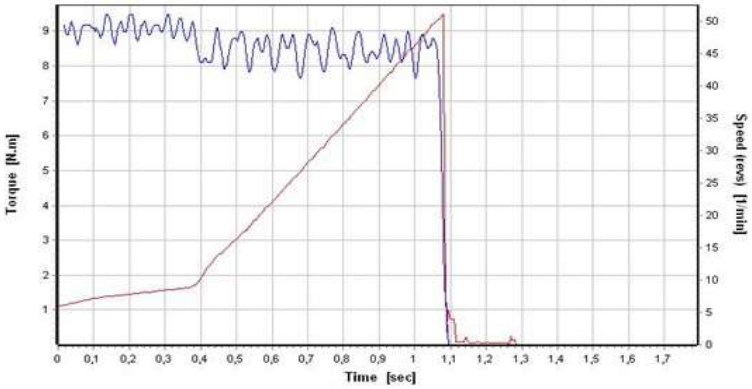
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
198076	1K3D	9,40	9,62	9,42	9,46	9,64	9,41	9,56	9,43	9,34	9,59
198076	1K3D	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

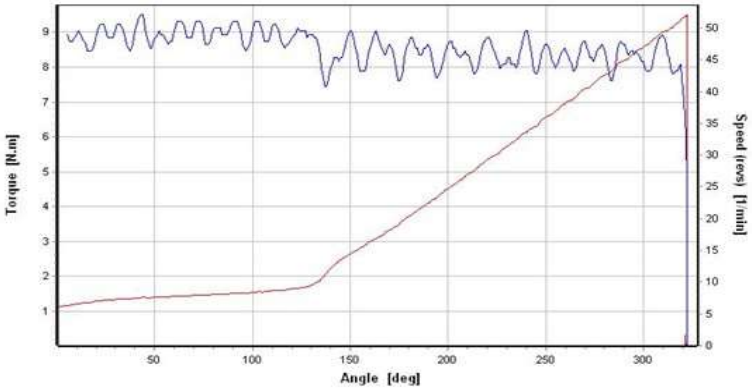
Model:	**1BD-1B012A-1K3D-1VK3D**	Serial no:	**755948**
Target torque:	**9,60 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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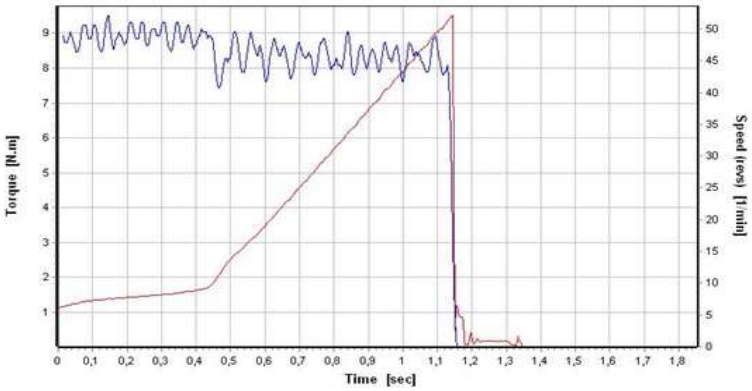
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed