Homologation

Cordless Assembly Tools

Model: CLBP12Q

Serial no.: IJJ1008

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Homologation: CLBP12Q SN: IJJ1008

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Document no: 003/23
Date: 16.11.2023

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 600 rpm	85,7 %
Single-stage tightening system	☐	Speed 100 %	700 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1008**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 5,84 Nm

Hard joint (H)	34,71	Nm / Revolution	Angle degree	30°
Soft joint (L)	2,92	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	5,26 - 6,42 Nm	5,26 - 6,42 Nm
	Tolerance down / up	10 %	10 %
	Average torque	5,78 Nm	5,84 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,11 Nm	0,09 Nm
	C_m	10,99	13,14
	C_{mk}	9,93	13,12

b)	Min. C_m hard/soft (lowest value)	10,99
	Min. C_{mk} hard/soft (lowest value)	9,93

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

Note:

Machine Capability Study
Control System

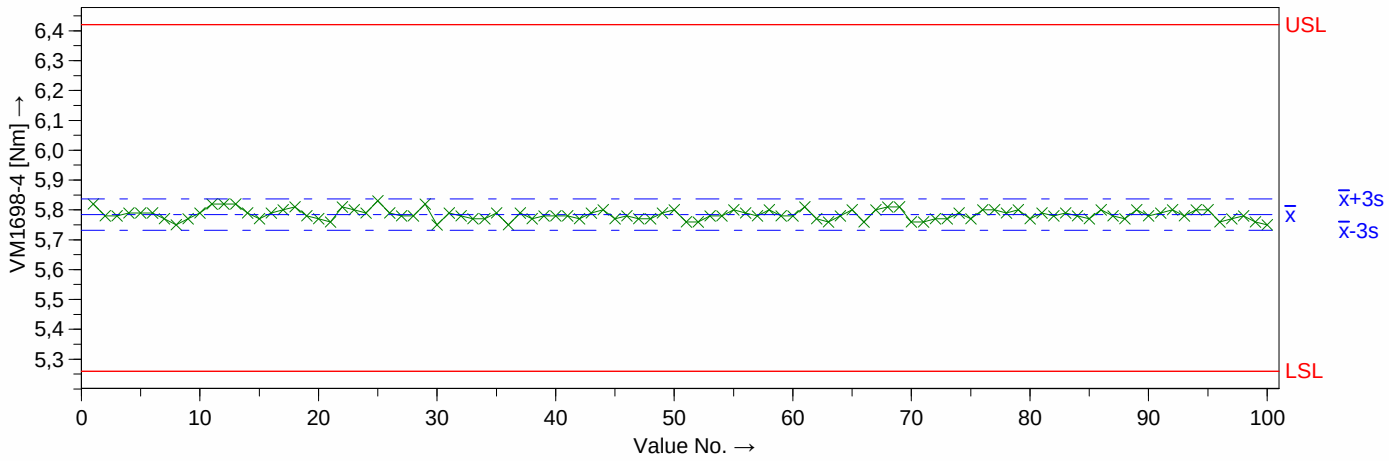
Cleco Production Tools

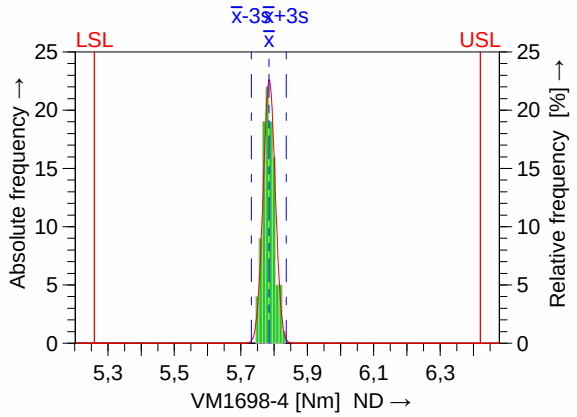
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

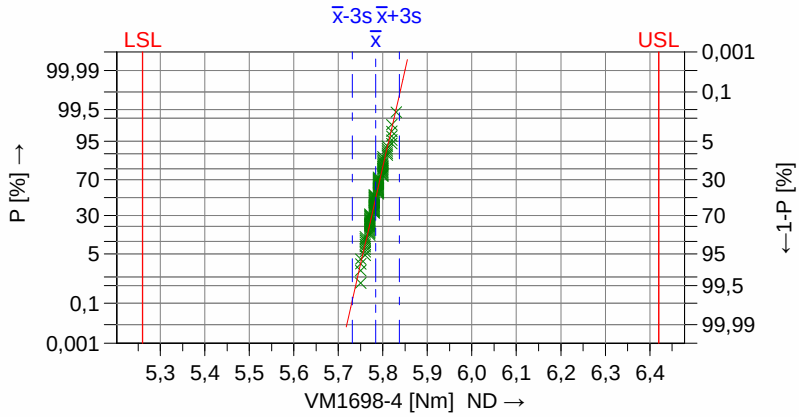
Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_d	Char.Descr.	VM1698-4	Nom.val. 5,84 0,58	USL 6,42
		Serial No.	1033809	Unit Nm -0,58	LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/ 1026388	nges.	100

Evaluation from 02.11.2023 10:50:39 to 02.11.2023 11:03:22

Rem. TQ 30% hard +/-10% * Speed: 600 rpm;







Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	5.7842
LSL	5.26	x_{min}	5.75	$\bar{x}$-3s	5.7314
USL	6.42	x_{max}	5.83	$\bar{x}$+3s	5.8370
T	1.16	R	0.08	6s	0.1055
		$n_{<T>}$	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	10.99
Critical capability index	=	C_{mk}	9.93

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 02.11.2023

Serial No.	IJJ1008_d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	5,82	5,78	5,78	5,79	5,79	5,79	5,77	5,75	5,77	5,79
1033809	VM1698-4	Grad	31,75	30,25	29,50	30,25	29,75	30,50	30,50	30,00	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	5,82	5,82	5,82	5,79	5,77	5,79	5,80	5,81	5,78	5,77
1033809	VM1698-4	Grad	30,00	31,00	29,75	30,00	31,25	30,25	30,75	30,75	29,50	29,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	5,76	5,81	5,80	5,79	5,83	5,79	5,78	5,78	5,82	5,75
1033809	VM1698-4	Grad	30,25	29,50	29,00	29,00	29,25	29,50	30,25	29,50	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	5,79	5,78	5,77	5,77	5,79	5,75	5,79	5,77	5,78	5,78
1033809	VM1698-4	Grad	30,25	29,75	30,00	30,00	31,00	30,00	29,25	30,00	29,50	30,50

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	5,78	5,77	5,79	5,80	5,77	5,78	5,77	5,77	5,79	5,80
1033809	VM1698-4	Grad	30,25	30,25	29,50	30,75	30,25	30,25	29,00	29,75	29,75	30,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	5,76	5,76	5,78	5,78	5,80	5,79	5,78	5,80	5,78	5,78
1033809	VM1698-4	Grad	30,50	29,50	29,75	30,00	30,50	29,50	29,50	29,50	28,75	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	5,81	5,77	5,76	5,78	5,80	5,76	5,80	5,81	5,81	5,76
1033809	VM1698-4	Grad	30,25	29,50	30,50	30,25	29,00	30,00	29,50	31,00	30,25	30,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	5,76	5,77	5,77	5,79	5,77	5,80	5,80	5,79	5,80	5,77
1033809	VM1698-4	Grad	30,25	30,75	30,25	29,50	29,50	30,25	30,00	31,25	30,00	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	5,79	5,78	5,79	5,78	5,77	5,80	5,78	5,77	5,80	5,78
1033809	VM1698-4	Grad	30,50	29,75	30,00	30,00	30,25	31,25	30,50	30,50	30,50	30,75

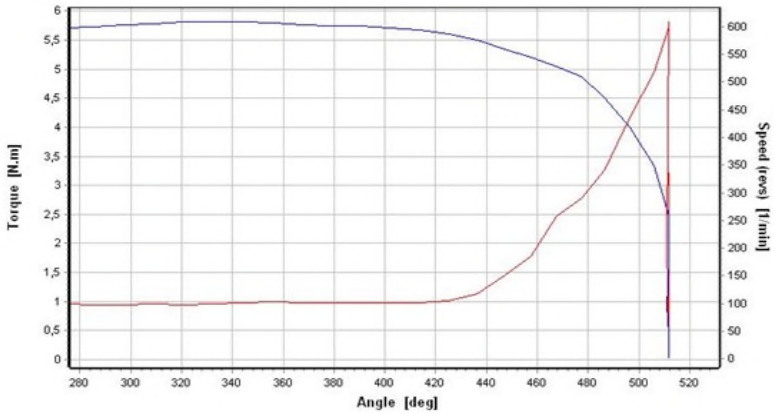
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	5,79	5,80	5,78	5,80	5,80	5,76	5,77	5,78	5,76	5,75
1033809	VM1698-4	Grad	30,75	30,25	30,25	29,75	29,50	30,75	29,25	29,75	30,25	30,25

Torque graphs

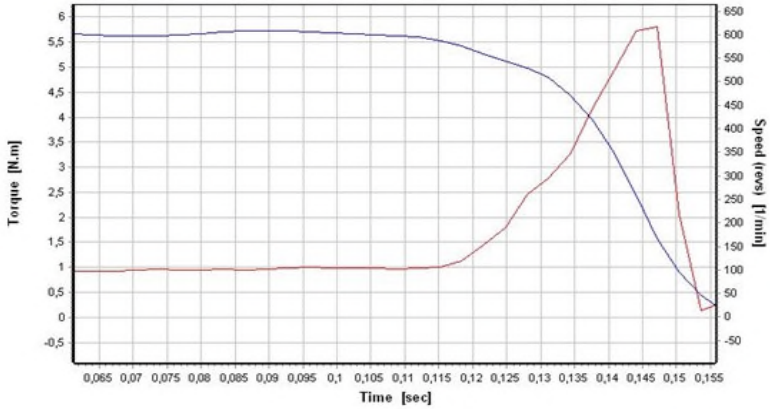
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1008**

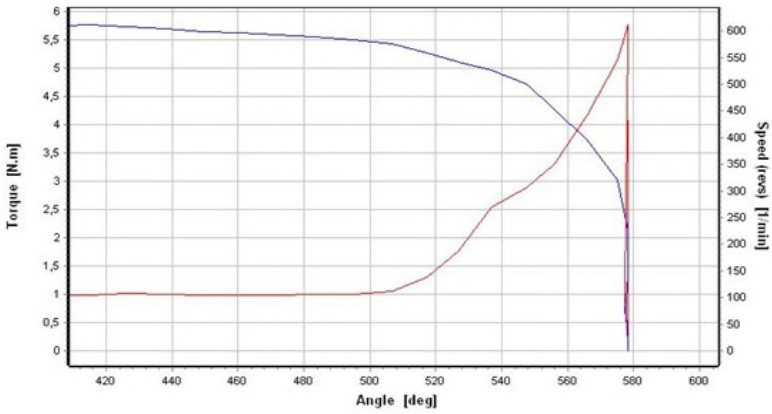
Angle degree: **30°**
Test torque: **5,8 Nm**



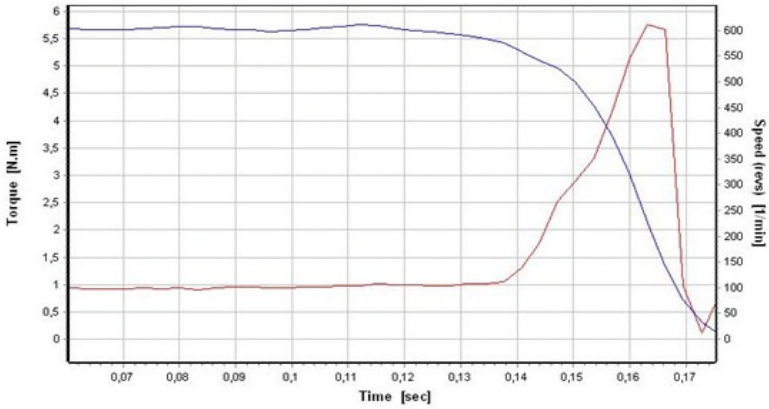
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

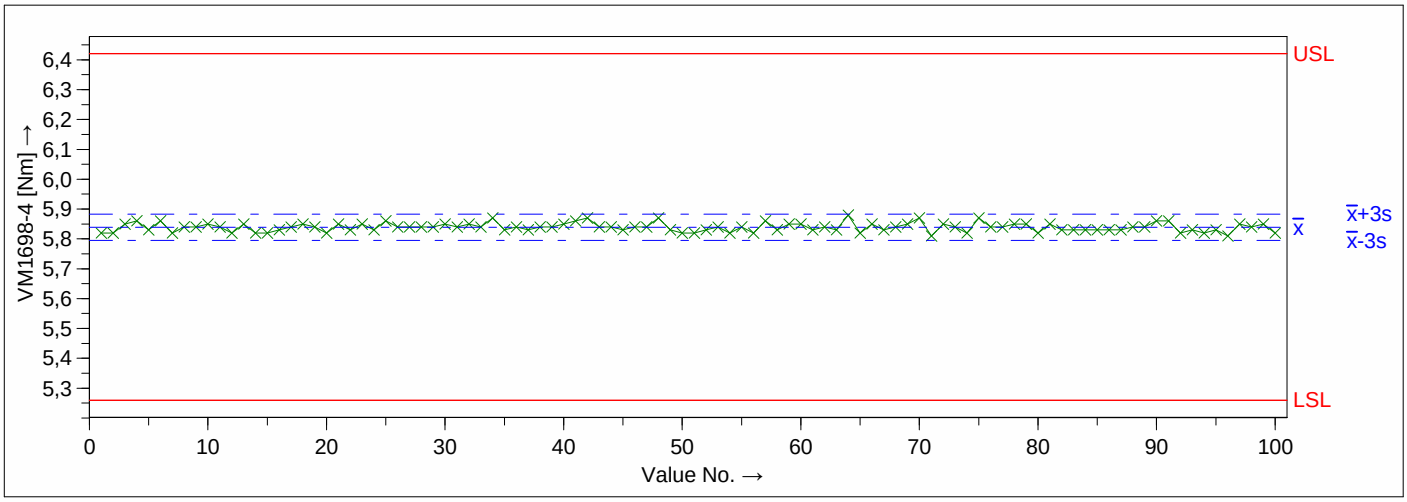
Machine Capability Study
Control System

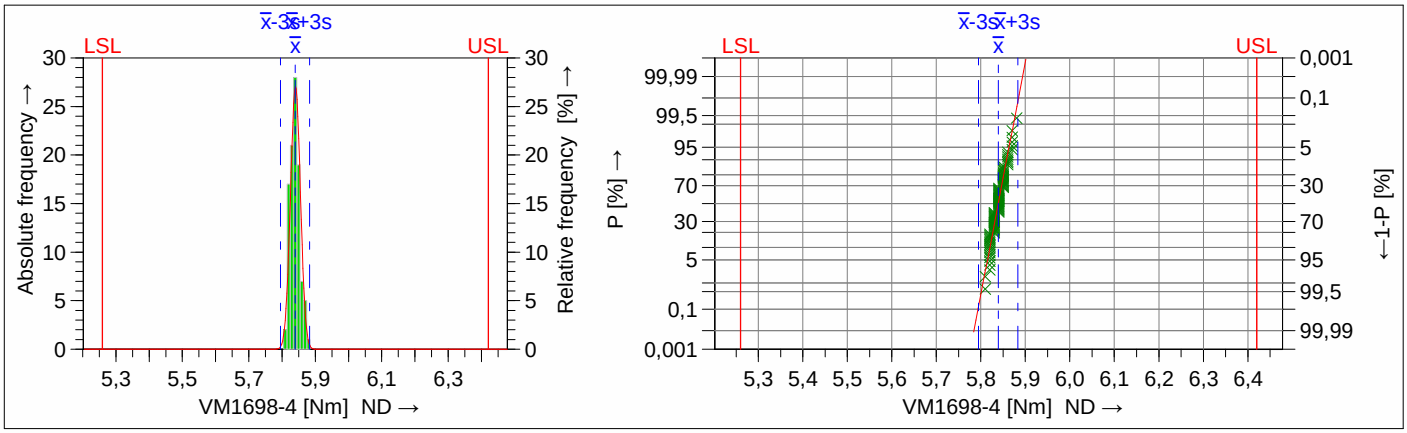
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_c	Char.Descr.	VM1698-4	Nom.val. 5,84 0,58	USL 6,42
		Serial No.	1033809	Unit Nm -0,58	LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/ 1026388	nges.	100

Evaluation from 02.11.2023 11:22:51 to 02.11.2023 11:36:03

Rem. TQ 30% soft +/-10% * Speed: 600 rpm;





Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	5.8391
LSL	5.26	x_{min}	5.81	$\bar{x}$-3s	5.7950
USL	6.42	x_{max}	5.88	$\bar{x}$+3s	5.8832
T	1.16	R	0.07	6s	0.0883
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	13.14
Critical capability index	=	C_{mk}	13.12

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 02.11.2023

Serial No.	IJJ1008_c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	5,82	5,82	5,85	5,86	5,83	5,86	5,82	5,84	5,84	5,85
1033809	VM1698-4	Grad	365,25	359,75	364,25	363,00	363,00	363,75	360,25	362,00	364,75	362,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	5,84	5,82	5,85	5,82	5,82	5,83	5,84	5,85	5,84	5,82
1033809	VM1698-4	Grad	360,00	359,25	361,25	360,00	359,25	356,50	362,50	361,00	358,75	359,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	5,85	5,83	5,85	5,83	5,86	5,84	5,84	5,84	5,84	5,85
1033809	VM1698-4	Grad	363,25	363,25	365,25	362,75	363,75	363,50	362,50	362,00	358,50	366,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	5,84	5,85	5,84	5,87	5,83	5,84	5,83	5,84	5,84	5,85
1033809	VM1698-4	Grad	364,50	363,00	362,50	366,50	362,75	360,50	359,75	362,50	361,00	363,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	5,86	5,87	5,84	5,84	5,83	5,84	5,84	5,87	5,83	5,82
1033809	VM1698-4	Grad	363,50	366,25	361,25	359,50	359,50	361,00	361,50	363,25	361,75	358,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	5,82	5,83	5,84	5,82	5,84	5,82	5,86	5,83	5,85	5,85
1033809	VM1698-4	Grad	358,25	360,50	358,75	359,25	360,75	357,75	363,50	362,25	361,50	360,50

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	5,83	5,84	5,83	5,88	5,82	5,85	5,83	5,84	5,85	5,87
1033809	VM1698-4	Grad	359,00	360,75	358,50	367,00	360,00	359,50	362,00	361,50	362,25	364,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	5,81	5,85	5,84	5,82	5,87	5,84	5,84	5,85	5,85	5,82
1033809	VM1698-4	Grad	360,50	360,50	358,75	357,75	362,75	363,00	361,50	362,50	362,00	356,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	5,85	5,83	5,83	5,83	5,83	5,83	5,83	5,84	5,84	5,86
1033809	VM1698-4	Grad	362,25	359,00	357,00	358,75	356,50	359,50	359,00	357,25	360,75	360,00

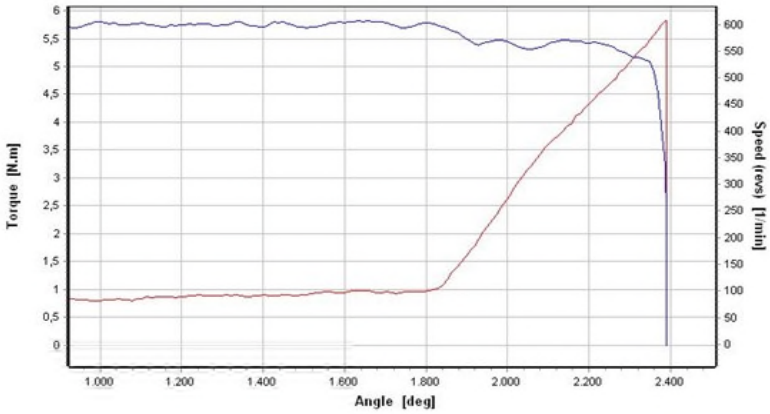
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	5,86	5,82	5,83	5,82	5,83	5,81	5,85	5,84	5,85	5,82
1033809	VM1698-4	Grad	360,00	357,25	218,00	355,75	366,25	366,75	371,00	369,00	358,50	361,00

Torque graphs

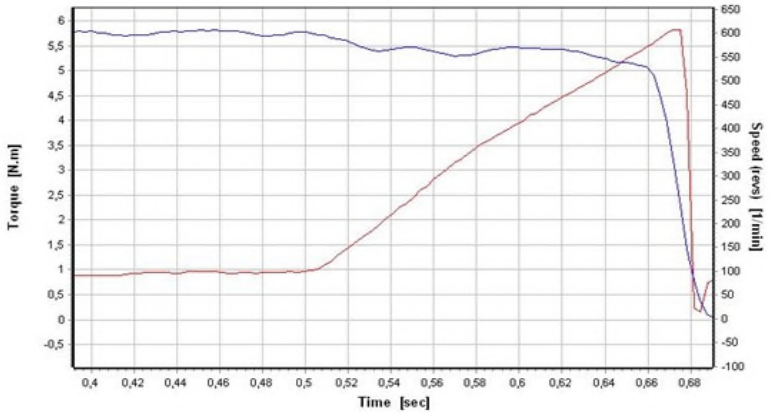
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1008**

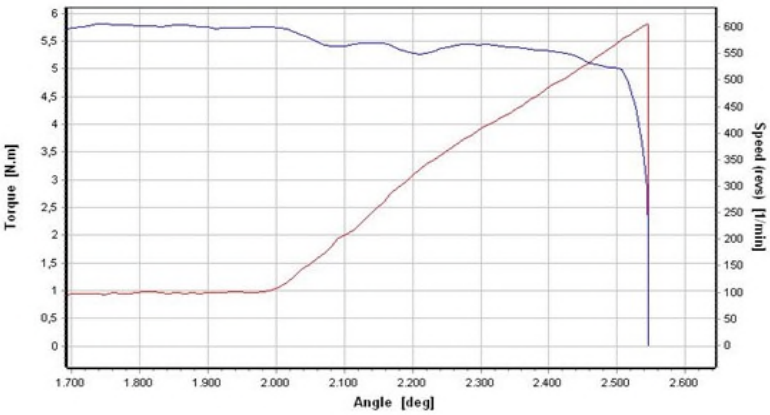
Angle degree: **360°**
Test torque: **5,8 Nm**



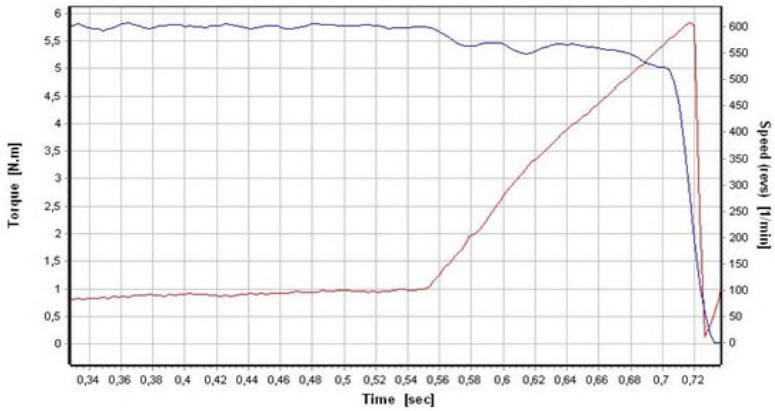
Value no. 1
Graph
Torque / Angle / Speed



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 600 rpm	85,7 %
Single-stage tightening system	☐	Speed 100 %	700 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1008**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 10,24 Nm

Hard joint (H)	61,14	Nm / Revolution	Angle degree	30°
Soft joint (L)	5,09	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	9,22 - 11,26 Nm	9,22 - 11,26 Nm
	Tolerance down / up	10 %	10 %
	Average torque	10,19 Nm	10,19 Nm
	Standard deviation	0,02 Nm	0,02 Nm
	Torque scatter (99,73%)	0,13 Nm	0,11 Nm
	C_m	15,27	17,96
	C_{mk}	14,52	17,00

b)	Min. C_m hard/soft (lowest value)	15,27
	Min. C_{mk} hard/soft (lowest value)	14,52

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

Note:

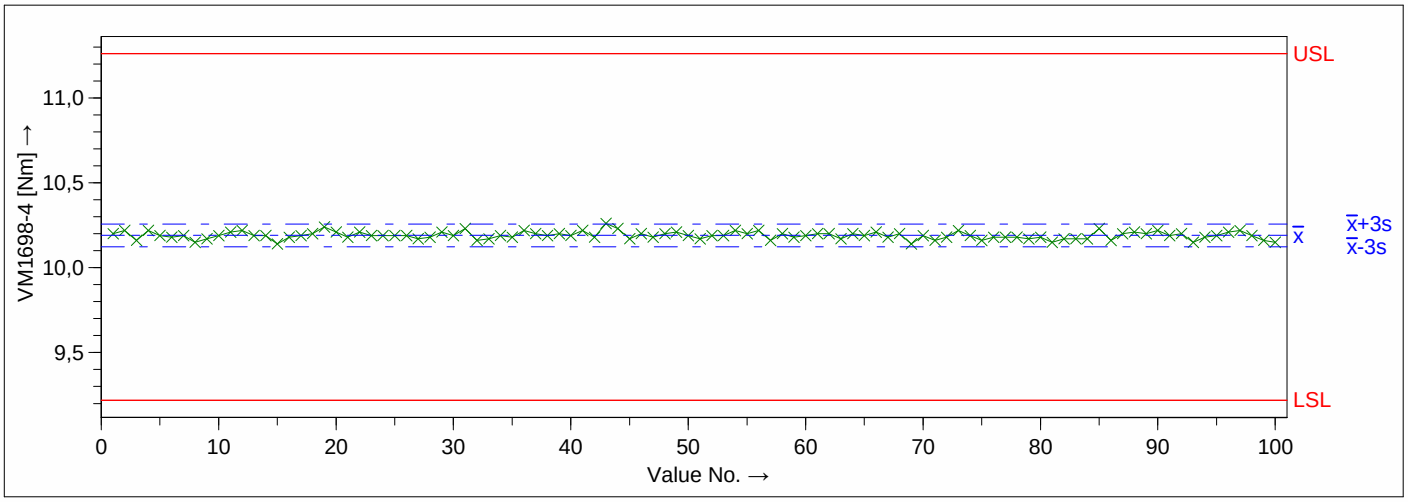
Machine Capability Study
Control System

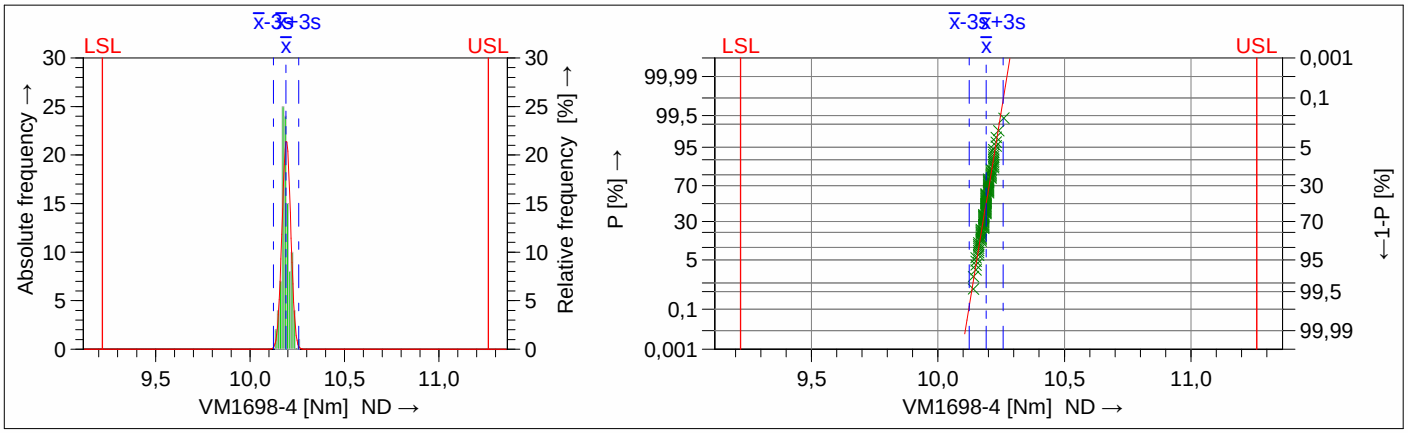
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_h	Char.Descr.	VM1698-4	Nom.val. 10,24 1,02	USL 11,26
		Serial No.	1033809	Unit Nm -1,02	LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/ 1026388	nges.	100

Evaluation from 02.11.2023 09:55:54 to 02.11.2023 10:09:55

Rem. TQ 80% hard +/-10% * Speed: 600 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	10.1903
LSL	9.22	x_{min}	10.14	$\bar{x}$-3s	10.1235
USL	11.26	x_{max}	10.26	$\bar{x}$+3s	10.2571
T	2.04	R	0.12	6s	0.1336
		$n_{<T>}$	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	15.27
Critical capability index	=	C_{mk}	14.52

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 02.11.2023

Serial No.	IJJ1008_h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	10,20	10,22	10,16	10,22	10,19	10,18	10,19	10,15	10,17	10,19
1033809	VM1698-4	Grad	33,75	33,75	34,25	34,50	33,25	34,25	34,50	34,25	33,50	33,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	10,21	10,22	10,19	10,19	10,14	10,18	10,19	10,20	10,24	10,21
1033809	VM1698-4	Grad	34,00	33,75	33,50	32,50	33,75	33,50	32,75	33,25	34,00	35,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	10,18	10,21	10,19	10,19	10,19	10,19	10,17	10,18	10,21	10,19
1033809	VM1698-4	Grad	33,50	32,50	33,00	32,75	31,75	31,50	31,75	32,50	32,75	33,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	10,23	10,16	10,17	10,19	10,18	10,22	10,20	10,19	10,20	10,19
1033809	VM1698-4	Grad	32,00	32,75	33,00	32,75	34,25	33,25	33,50	32,50	34,50	33,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	10,22	10,18	10,26	10,23	10,17	10,20	10,18	10,20	10,21	10,19
1033809	VM1698-4	Grad	34,50	33,50	33,75	33,50	33,75	32,50	33,75	33,00	33,50	33,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	10,17	10,19	10,19	10,22	10,20	10,22	10,16	10,20	10,18	10,19
1033809	VM1698-4	Grad	34,00	33,25	33,50	32,50	34,00	33,75	33,75	34,00	32,50	32,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	10,20	10,20	10,17	10,20	10,19	10,21	10,18	10,20	10,14	10,19
1033809	VM1698-4	Grad	32,25	32,00	32,50	32,25	31,50	32,25	32,25	33,00	31,25	32,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	10,16	10,18	10,22	10,19	10,16	10,18	10,18	10,18	10,17	10,18
1033809	VM1698-4	Grad	32,00	32,25	33,25	34,25	32,75	32,25	32,25	33,00	32,50	32,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	10,15	10,17	10,17	10,17	10,23	10,16	10,20	10,21	10,20	10,22
1033809	VM1698-4	Grad	32,75	33,00	32,50	33,50	32,50	34,25	33,50	31,75	32,25	33,00

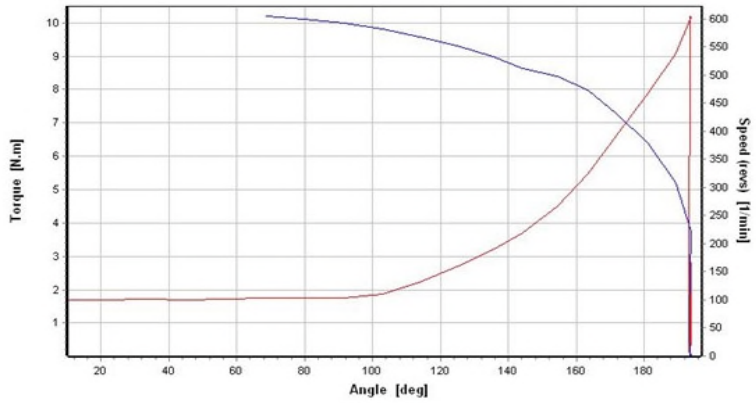
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	10,19	10,20	10,15	10,18	10,19	10,21	10,22	10,19	10,16	10,15
1033809	VM1698-4	Grad	31,75	33,25	33,00	32,75	32,25	31,50	32,25	32,25	32,25	32,75

Torque graphs

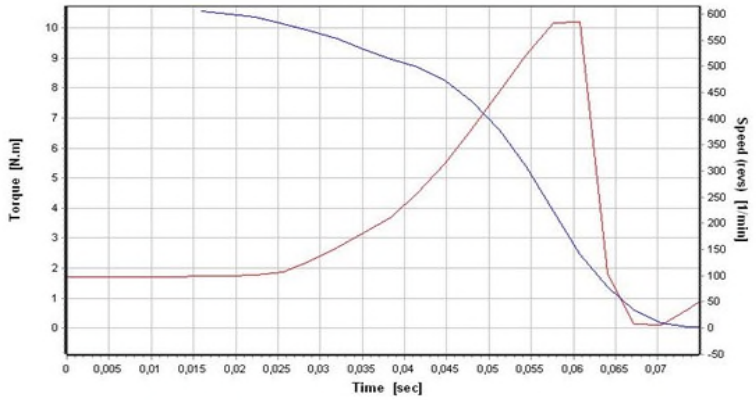
Machine Capability Study 80 %

Model: **CLBP12Q**
Serial no: **IJJ1008**

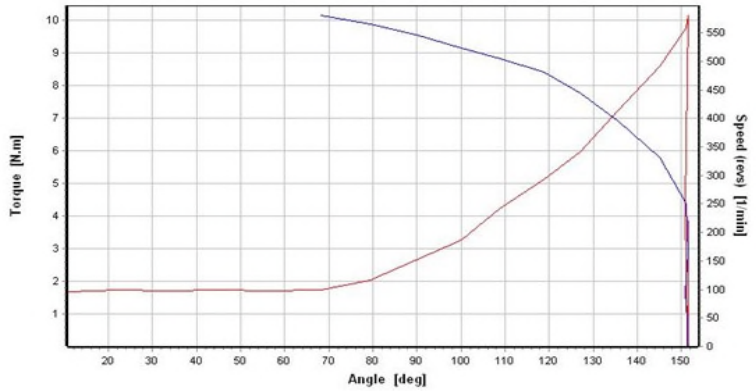
Angle degree: **30°**
Test torque: **10,2 Nm**



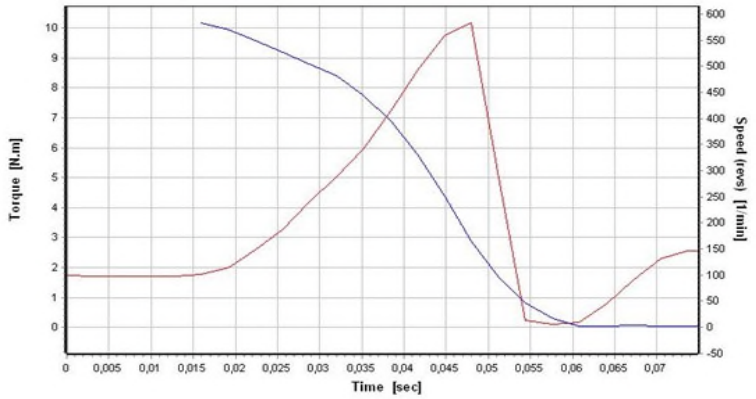
Value no. 1
Graph
Torque / Angle / Speed



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

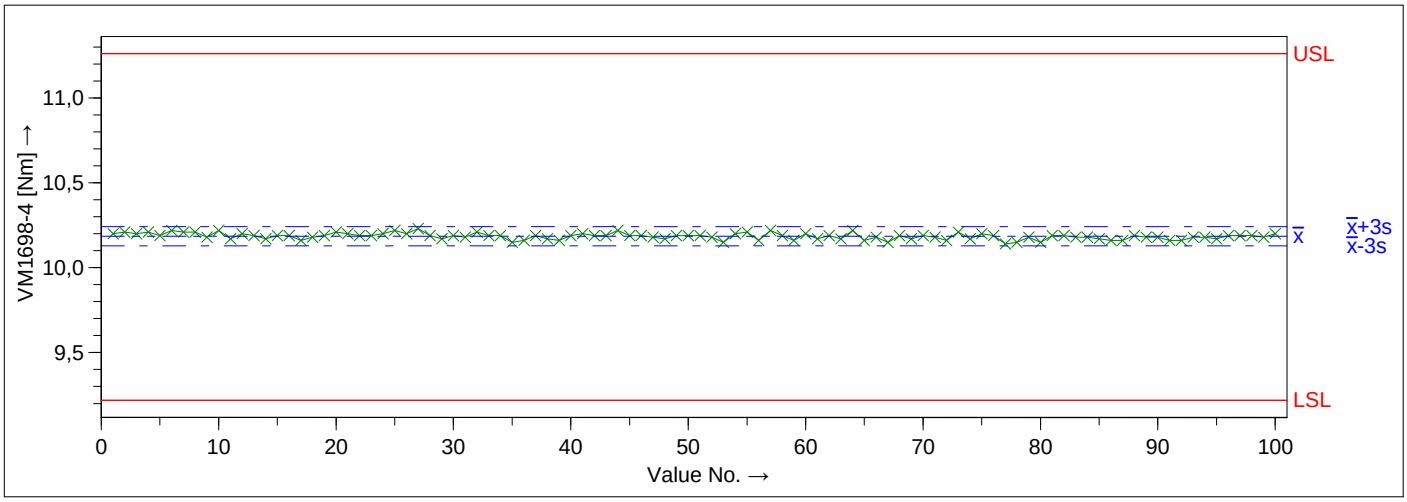
Cleco Production Tools

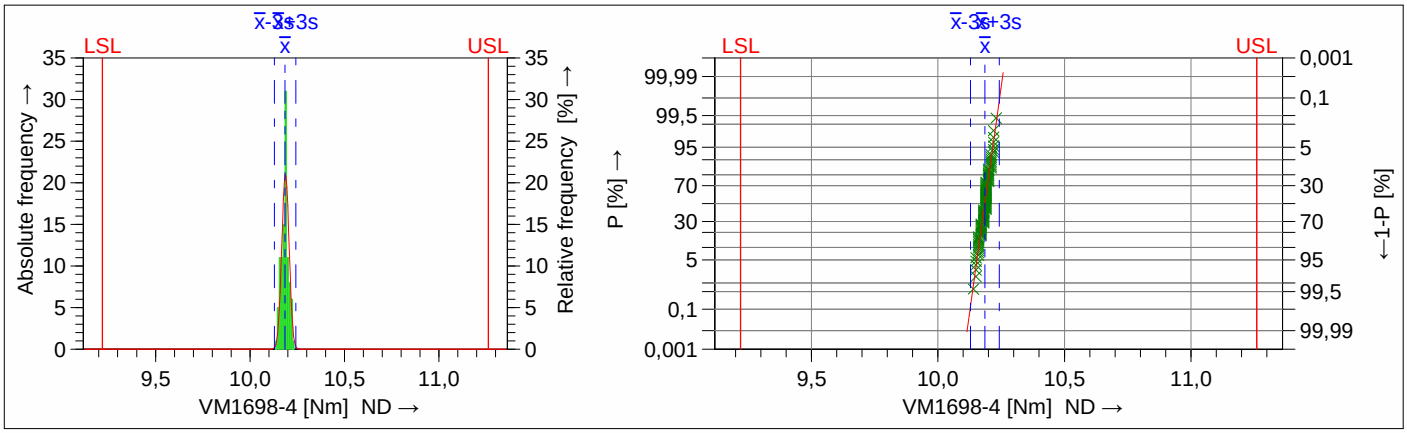
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_g	Char.Descr.	VM1698-4	Nom.val. 10,24	1,02 USL 11,26
		Serial No.	1033809	Unit Nm	-1,02 LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/ 1026388	nges.	100

Evaluation from 02.11.2023 10:18:51 to 02.11.2023 10:32:53

Rem. TQ 80% soft +/-10% * Speed: 600 rpm;





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	10.1854
LSL	9.22	x_{min}	10.14	$\bar{x}$-3s	10.1286
USL	11.26	x_{max}	10.23	$\bar{x}$+3s	10.2422
T	2.04	R	0.09	6s	0.1136
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	17.96
Critical capability index	=	C_{mk}	17.00

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 02.11.2023

Serial No.	IJJ1008_g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	10,20	10,21	10,20	10,21	10,19	10,22	10,21	10,21	10,18	10,22
1033809	VM1698-4	Grad	359,50	359,00	359,25	363,00	359,75	364,00	363,25	362,50	359,50	365,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	10,17	10,20	10,19	10,17	10,19	10,19	10,16	10,18	10,19	10,21
1033809	VM1698-4	Grad	359,00	362,00	365,00	361,25	364,50	363,25	362,50	365,75	367,75	371,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	10,20	10,19	10,19	10,20	10,22	10,20	10,23	10,19	10,17	10,19
1033809	VM1698-4	Grad	368,00	368,50	362,25	363,00	365,50	366,50	367,25	365,50	363,00	364,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	10,18	10,21	10,19	10,19	10,15	10,16	10,19	10,17	10,16	10,19
1033809	VM1698-4	Grad	367,25	368,25	364,00	364,50	363,25	364,75	365,25	365,00	365,25	367,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	10,20	10,19	10,19	10,22	10,19	10,19	10,18	10,17	10,19	10,19
1033809	VM1698-4	Grad	367,00	367,25	368,00	369,50	367,50	367,75	360,25	361,75	362,25	363,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	10,19	10,18	10,15	10,20	10,21	10,16	10,22	10,19	10,16	10,20
1033809	VM1698-4	Grad	361,75	362,00	360,00	364,00	363,00	360,25	364,50	363,00	359,75	362,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	10,17	10,19	10,17	10,22	10,16	10,18	10,15	10,19	10,17	10,19
1033809	VM1698-4	Grad	360,50	364,75	361,75	363,25	362,25	365,00	361,50	362,50	362,00	364,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	10,18	10,16	10,21	10,17	10,20	10,19	10,14	10,15	10,18	10,15
1033809	VM1698-4	Grad	362,25	362,25	365,25	362,75	368,00	363,50	358,50	361,25	361,75	363,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

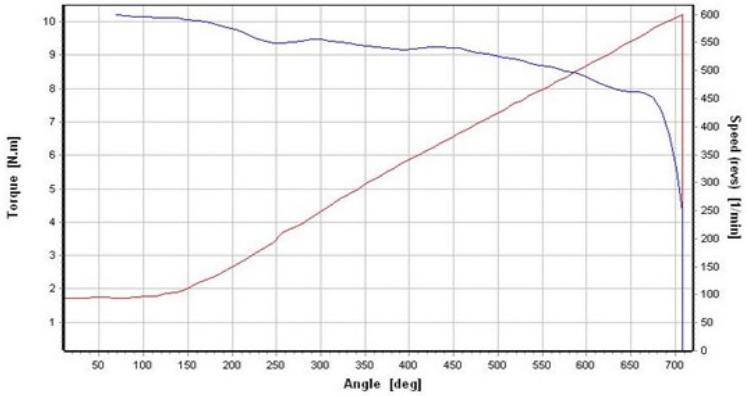
Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	10,19	10,19	10,18	10,18	10,17	10,16	10,16	10,19	10,18	10,18
1033809	VM1698-4	Grad	364,50	364,75	365,25	364,50	364,50	361,75	361,75	365,50	364,25	363,75

Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	10,16	10,16	10,18	10,18	10,17	10,19	10,19	10,19	10,18	10,20
1033809	VM1698-4	Grad	362,25	363,00	362,00	365,50	362,00	363,50	363,75	367,75	364,50	364,75

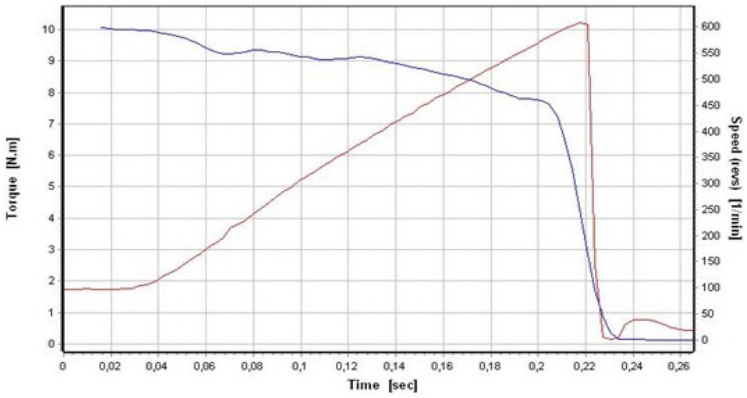
Torque graphs

Model: **CLBP12Q**
Serial no: **IJJ1008**

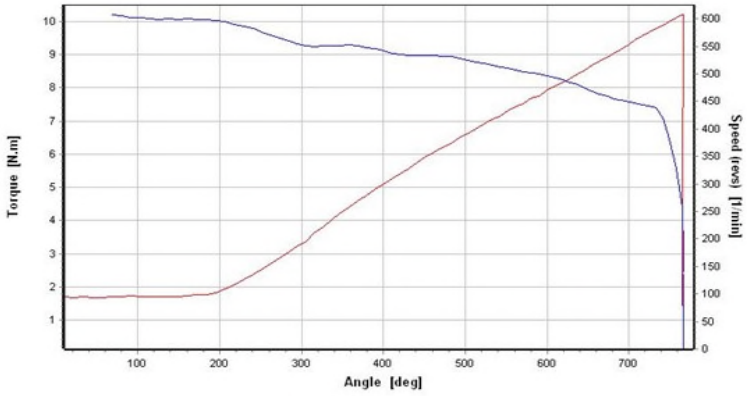
Machine Capability Study 80 %
Angle degree: **360°**
Test torque: **10,2 Nm**



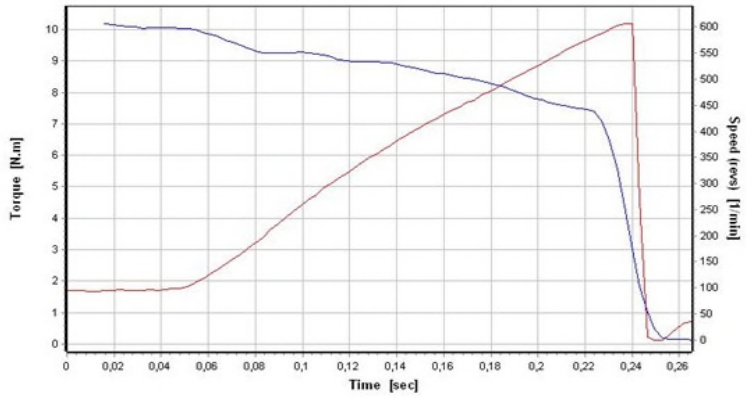
Value no. 1
Graph
Torque / Angle / Speed



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 600 rpm	85,7 %
Single-stage tightening system	☐	Speed 100 %	700 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1008**

Test torque: Tq max. 12,00 Nm

Hard joint (H)	71,40 Nm / Revolution	Angle degree	30°
Soft joint (L)	6,01 Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	10,80 - 13,20 Nm	10,80 - 13,20 Nm
	Tolerance down / up	10 %	10 %
	Average torque	11,90 Nm	12,02 Nm
	Standard deviation	0,05 Nm	0,03 Nm
	Torque scatter (99,73%)	0,33 Nm	0,17 Nm
	C_m	7,37	14,10
	C_{mk}	6,75	13,85

b)	Min. C_m hard/soft (lowest value)	7,37
	Min. C_{mk} hard/soft (lowest value)	6,75

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

Note:

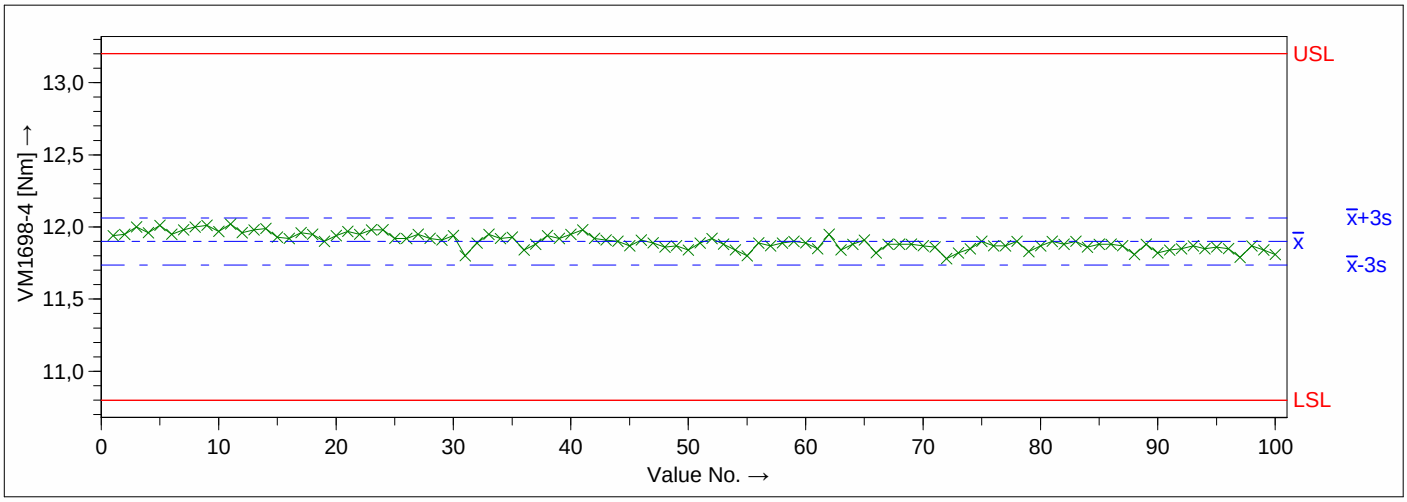
Machine Capability Study
Control System

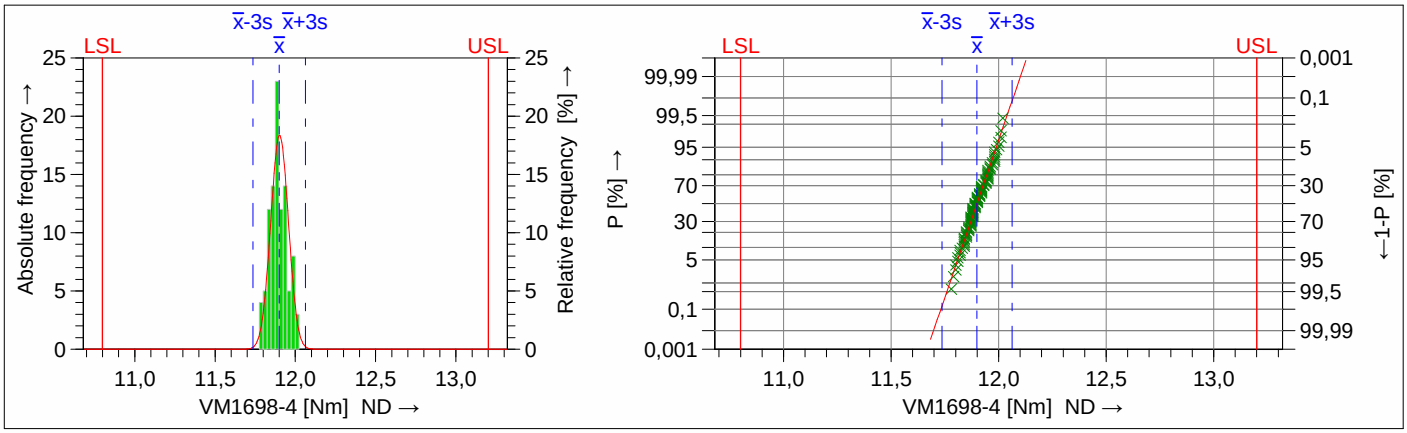
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_b	Char.Descr.	VM1698-4	Nom.val. 12,00 / 1,20	USL 13,20
		Serial No.	1033809	Unit Nm / -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50/ 1024729	nges.	100

Evaluation from 02.11.2023 08:14:26 to 02.11.2023 08:26:28

Rem. TQ 100% hard +/-10% * Speed: 600 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.8992
LSL	10.80	x_{min}	11.78	$\bar{x}$-3s	11.7363
USL	13.20	x_{max}	12.02	$\bar{x}$+3s	12.0621
T	2.40	R	0.24	6s	0.3258
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	7.37
Critical capability index	=	C_{mk}	6.75

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 02.11.2023

Serial No.	IJJ1008_b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	11,94	11,95	12,00	11,96	12,01	11,95	11,98	12,00	12,01	11,97
1033809	VM1698-4	Grad	29,00	29,50	31,25	31,75	32,25	31,25	33,00	33,00	32,75	32,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	12,02	11,96	11,98	11,99	11,93	11,92	11,96	11,95	11,90	11,94
1033809	VM1698-4	Grad	33,50	33,00	33,00	34,25	32,50	33,00	33,50	32,75	32,75	33,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	11,97	11,95	11,98	11,98	11,92	11,92	11,95	11,92	11,91	11,94
1033809	VM1698-4	Grad	32,50	32,75	33,75	32,75	31,75	32,00	33,00	33,00	31,75	31,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	11,80	11,89	11,95	11,92	11,93	11,84	11,88	11,94	11,92	11,95
1033809	VM1698-4	Grad	30,75	31,50	32,25	33,00	31,75	31,50	32,50	33,25	31,50	32,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	11,98	11,92	11,91	11,90	11,87	11,91	11,89	11,86	11,87	11,84
1033809	VM1698-4	Grad	32,50	32,75	31,75	31,25	30,75	31,50	32,25	31,50	31,00	30,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	11,89	11,92	11,88	11,84	11,80	11,89	11,87	11,89	11,90	11,89
1033809	VM1698-4	Grad	31,00	31,00	29,50	30,25	30,25	29,75	28,75	30,25	30,50	30,50

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	11,85	11,95	11,84	11,88	11,91	11,82	11,88	11,88	11,88	11,87
1033809	VM1698-4	Grad	30,25	30,75	29,75	30,75	30,50	30,00	30,50	30,25	30,25	29,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	11,86	11,78	11,82	11,85	11,90	11,87	11,87	11,90	11,83	11,87
1033809	VM1698-4	Grad	30,25	30,50	30,25	30,75	30,00	30,00	31,00	31,00	30,25	30,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	11,90	11,88	11,90	11,86	11,88	11,88	11,87	11,81	11,88	11,82
1033809	VM1698-4	Grad	30,50	30,75	31,50	31,00	30,75	31,00	30,25	30,50	30,25	30,00

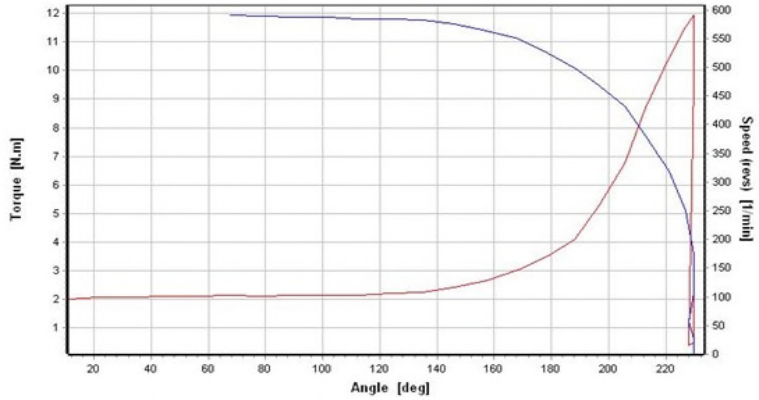
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	11,84	11,85	11,87	11,85	11,86	11,85	11,79	11,87	11,84	11,81
1033809	VM1698-4	Grad	29,25	30,00	31,25	30,25	30,00	30,50	29,75	30,75	29,75	29,50

Torque graphs

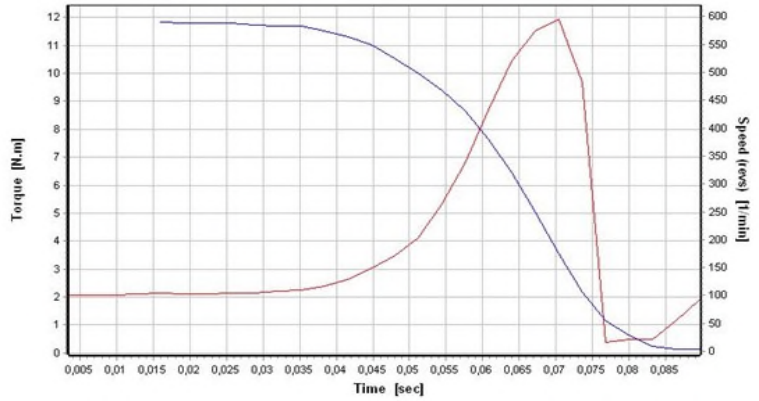
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1008**

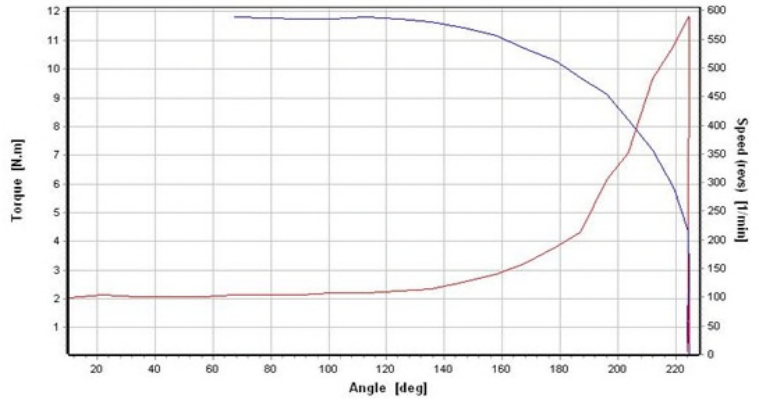
Angle degree: **30°**
Test torque: **12,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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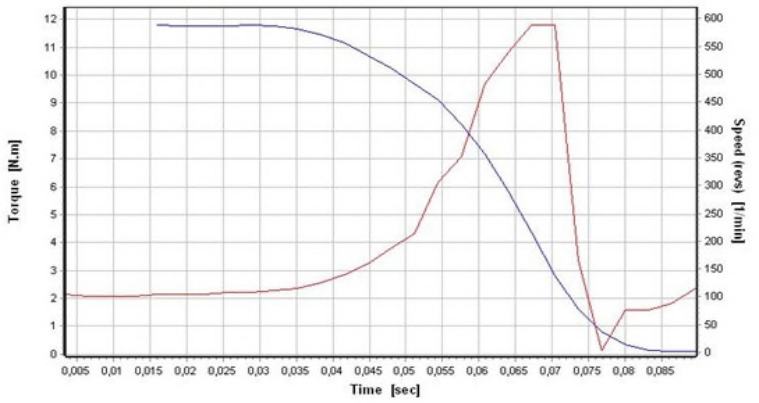
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

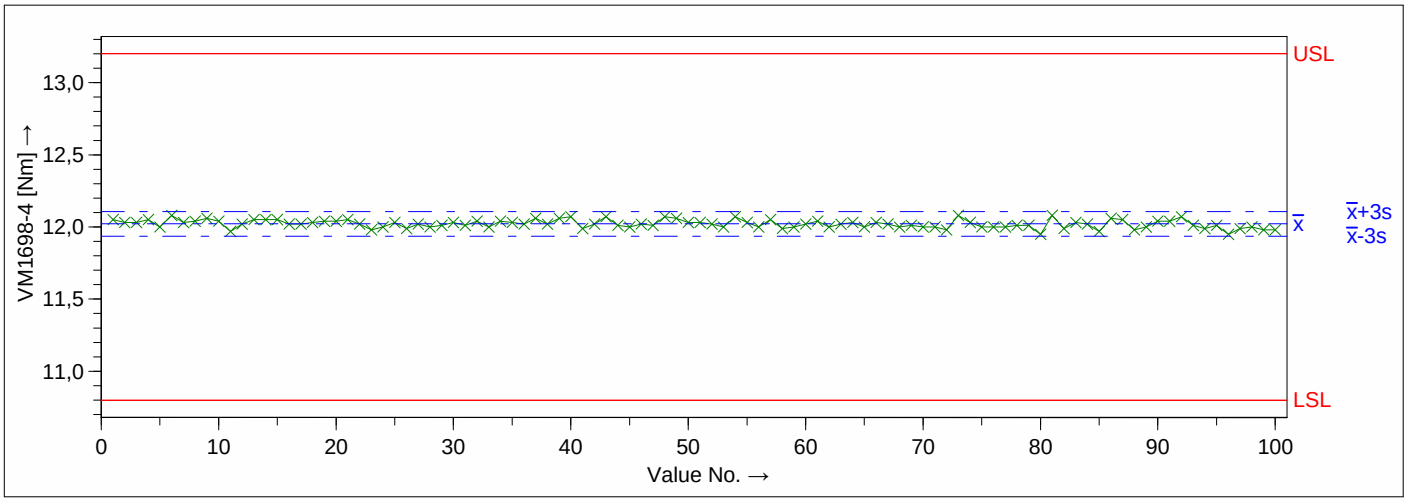
Machine Capability Study
Control System

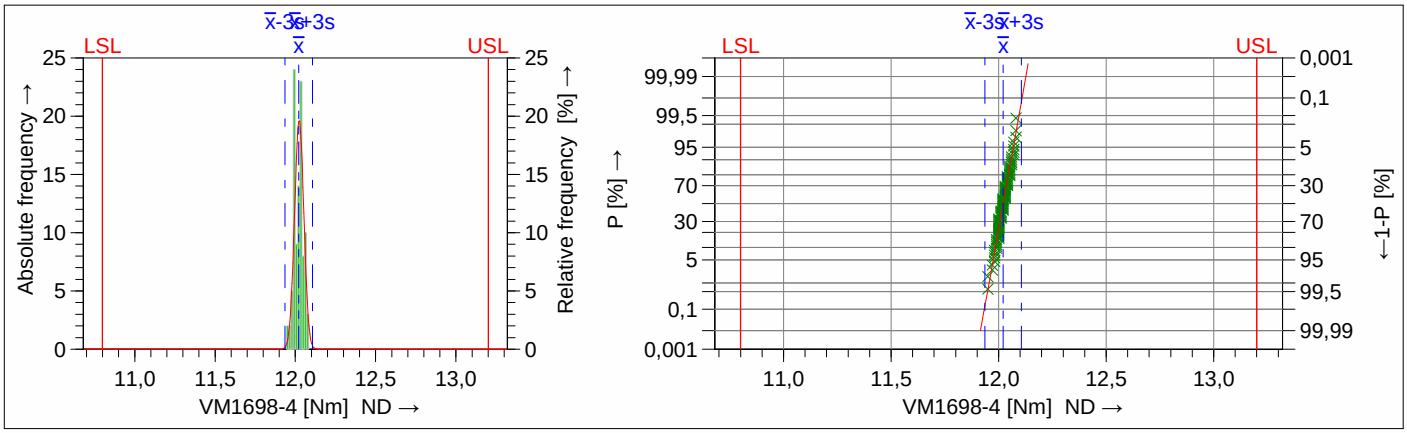
Plant	ATG Westhausen	Operator Name	Sünder
Date	02.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1008_a	Char.Descr.	VM1698-4	Nom.val. 12,00 / 1,20	USL 13,20
		Serial No.	1033809	Unit Nm / -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50/ 1024729	nges.	100

Evaluation from 02.11.2023 08:39:02 to 02.11.2023 08:51:24

Rem. TQ 100% soft +/-10% * Speed: 600 rpm;





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.0212
LSL	10.80	x_{min}	11.95	$\bar{x}$-3s	11.9361
USL	13.20	x_{max}	12.08	$\bar{x}$+3s	12.1063
T	2.40	R	0.13	6s	0.1702
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	14.10
Critical capability index	=	C_{mk}	13.85

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 02.11.2023

Serial No.	IJJ1008_a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1033809	VM1698-4	Nm	12,05	12,03	12,03	12,05	12,00	12,08	12,03	12,04	12,06	12,04
1033809	VM1698-4	Grad	360,75	365,50	360,75	364,00	367,50	362,75	364,25	363,75	370,00	366,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1033809	VM1698-4	Nm	11,97	12,02	12,05	12,05	12,05	12,02	12,02	12,03	12,04	12,04
1033809	VM1698-4	Grad	362,50	360,00	368,25	363,75	361,25	367,75	360,75	365,50	365,25	371,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1033809	VM1698-4	Nm	12,05	12,02	11,98	12,00	12,03	11,99	12,02	12,00	12,01	12,03
1033809	VM1698-4	Grad	360,50	366,75	359,25	363,25	372,00	362,00	368,25	364,25	370,75	357,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1033809	VM1698-4	Nm	12,01	12,04	12,00	12,04	12,03	12,02	12,06	12,02	12,06	12,07
1033809	VM1698-4	Grad	367,25	374,50	368,25	376,75	359,75	352,00	366,25	365,75	365,25	360,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1033809	VM1698-4	Nm	11,99	12,02	12,07	12,01	12,00	12,02	12,01	12,07	12,06	12,03
1033809	VM1698-4	Grad	362,75	367,75	364,00	371,00	364,75	372,50	358,75	355,25	359,25	358,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1033809	VM1698-4	Nm	12,03	12,02	12,00	12,07	12,03	12,00	12,05	11,99	12,00	12,02
1033809	VM1698-4	Grad	365,25	358,50	357,00	365,50	357,75	356,25	352,75	357,25	354,00	356,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1033809	VM1698-4	Nm	12,04	12,00	12,02	12,03	12,00	12,03	12,02	12,00	12,01	12,00
1033809	VM1698-4	Grad	361,75	359,50	360,25	358,25	344,50	340,25	354,75	364,75	359,00	363,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1033809	VM1698-4	Nm	12,00	11,98	12,08	12,03	12,00	12,00	12,00	12,01	12,01	11,95
1033809	VM1698-4	Grad	354,75	359,00	365,75	357,75	365,50	358,25	359,50	362,25	364,25	359,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sünder	Date 02.11.2023

Serial No.	IJJ1008_a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1033809	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1033809	VM1698-4	Nm	12,08	11,99	12,03	12,02	11,97	12,06	12,05	11,98	12,00	12,04
1033809	VM1698-4	Grad	360,25	352,75	360,50	362,25	361,25	361,00	356,75	360,25	349,75	367,00

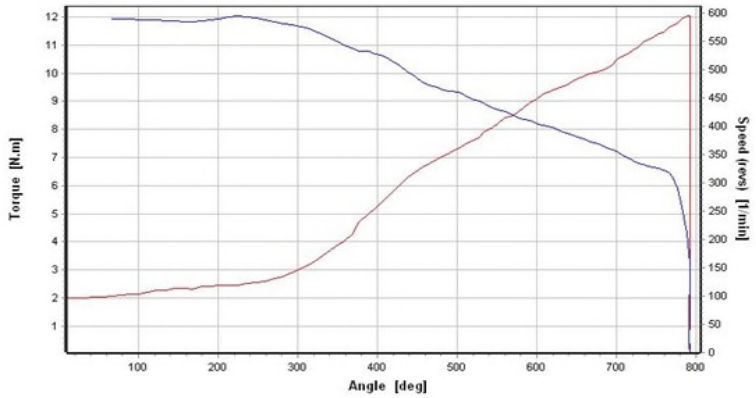
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1033809	VM1698-4	Nm	12,04	12,07	12,01	11,99	12,01	11,95	11,99	12,00	11,98	11,98
1033809	VM1698-4	Grad	359,00	357,25	361,75	363,00	358,25	349,00	362,25	354,25	353,50	348,75

Torque graphs

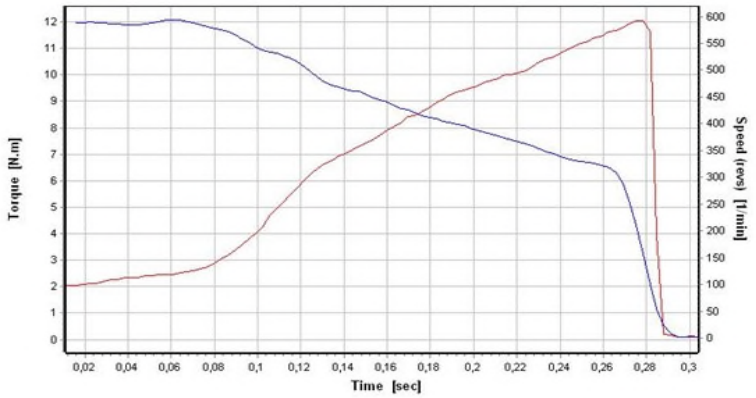
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1008**

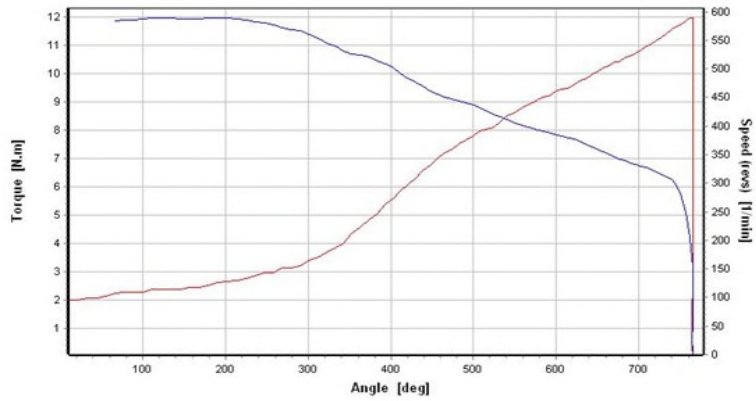
Angle degree: **360°**
Test torque: **12,0 Nm**



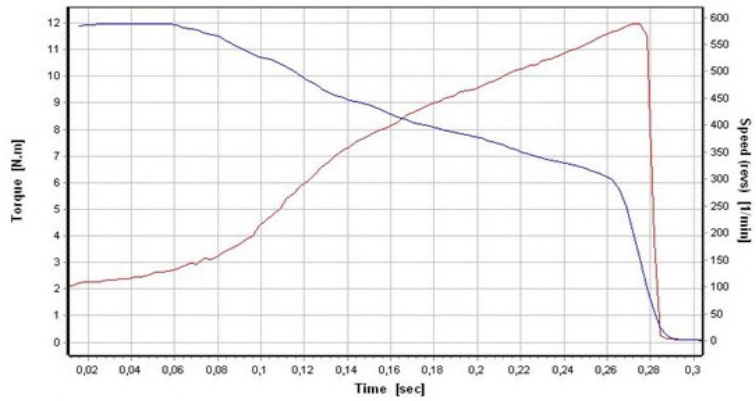
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed