Homologation

Cordless Assembly Tools

Model: CLBP08Q

Serial no.: IJJ1002

Contents

Homologation: CLBP08Q SN: IJJ1002

		Page
Cover sheet		1
Contents		2
Test sheet no. 2 (torque determination 30 %)		3
Machine Capability Study, Control System	30 % hard	4
Curves of the 1st and 100th measurement	30 % hard	7
Machine Capability Study, Control System	30 % soft	8
Curves of the 1st and 100th measurement	30 % soft	11
Test sheet no. 3 (torque determination 80 %)		12
Machine Capability Study, Control System	80 % hard	13
Curves of the 1st and 100th measurement	80 % hard	16
Machine Capability Study, Control System	80 % soft	17
Curves of the 1st and 100th measurement	80 % soft	20
Test sheet no. 4 (torque determination 100 %)		21
Machine Capability Study, Control System	100 % hard	22
Curves of the 1st and 100th measurement	100 % hard	25
Machine Capability Study, Control System	100 % soft	26
Curves of the 1st and 100th measurement	100 % soft	29

Document no: 002/2023
Date: 16.11.2023

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 600 rpm	60,91 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1002**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 3,87 Nm

Hard joint (H)	23,17	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,94	Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	3,48 - 4,26 Nm	3,48 - 4,26 Nm
	Tolerance down / up	10 %	10 %
	Average torque	3,86 Nm	3,88 Nm
	Standard deviation	0,03 Nm	0,02 Nm
	Torque scatter (99,73%)	0,15 Nm	0,09 Nm
	C_m	5,18	8,48
	C_{mk}	5,07	8,25

b)	Min. C_m hard/soft (lowest value)	5,18
	Min. C_{mk} hard/soft (lowest value)	5,07

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

Note:

Machine Capability Study
Control System

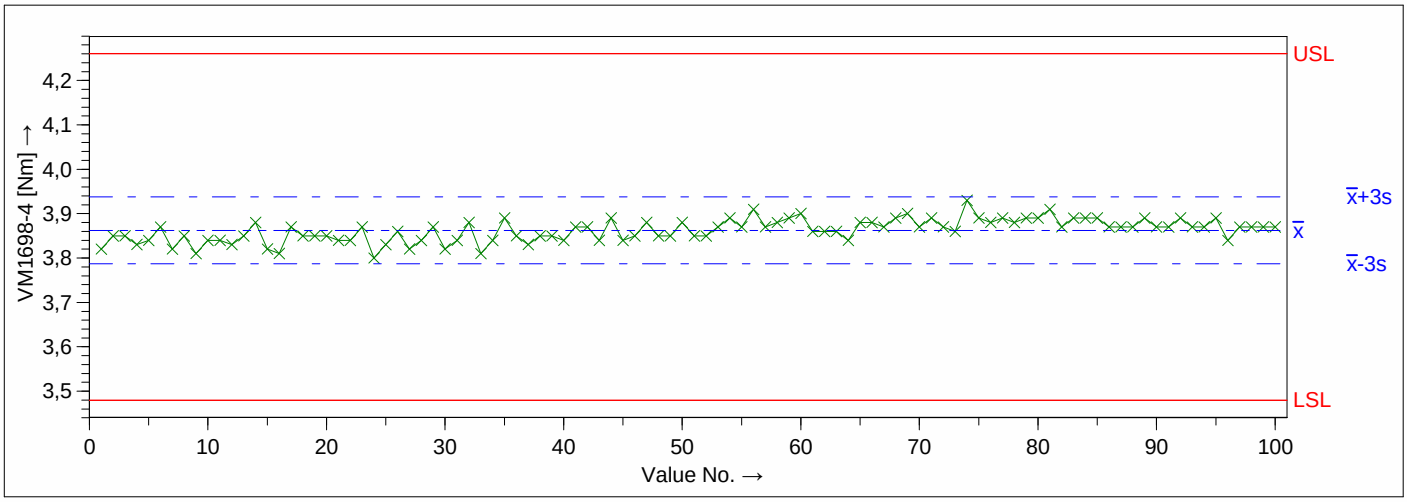
Cleco Production Tools

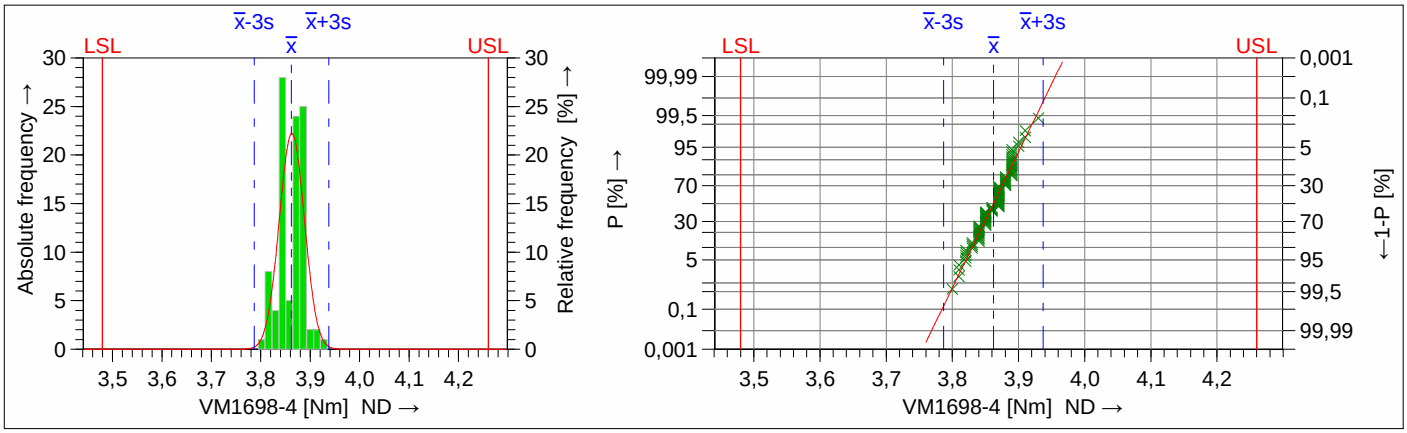
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_d	Char.Descr.	VM1698-4	Nom.val. 3,87 0,39	USL 4,26
		Serial No.	1024210	Unit Nm -0,39	LSL 3,48
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 07.11.2023 13:50:30 to 07.11.2023 14:02:03

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





Drawing Values		Collected Values		Statistics	
T_m	3.87			$\bar{x}$	3.8621
LSL	3.48	x_{min}	3.80	$\bar{x}$-3s	3.7867
USL	4.26	x_{max}	3.93	$\bar{x}$+3s	3.9375
T	0.78	R	0.13	6s	0.1507
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	5.18
Critical capability index	=	C_{mk}	5.07

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_d	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
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}
1024210	VM1698-4	Nm	3,82	3,85	3,85	3,83	3,84	3,87	3,82	3,85	3,81	3,84
1024210	VM1698-4	Grad	31,25	32,25	32,25	33,75	33,75	31,50	33,75	30,75	31,00	31,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	3,84	3,83	3,85	3,88	3,82	3,81	3,87	3,85	3,85	3,85
1024210	VM1698-4	Grad	33,25	31,50	31,50	32,75	31,50	33,25	31,75	32,00	30,75	31,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	3,84	3,84	3,87	3,80	3,83	3,86	3,82	3,84	3,87	3,82
1024210	VM1698-4	Grad	31,50	31,75	32,25	30,75	31,50	31,50	30,25	33,25	32,00	29,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	3,84	3,88	3,81	3,84	3,89	3,85	3,83	3,85	3,85	3,84
1024210	VM1698-4	Grad	32,00	33,00	29,50	30,25	32,00	31,00	31,00	29,75	30,25	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}
1024210	VM1698-4	Nm	3,87	3,87	3,84	3,89	3,84	3,85	3,88	3,85	3,85	3,88
1024210	VM1698-4	Grad	29,50	31,50	30,75	29,50	31,00	32,25	30,00	28,25	31,75	30,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	3,85	3,85	3,87	3,89	3,87	3,91	3,87	3,88	3,89	3,90
1024210	VM1698-4	Grad	28,75	30,50	30,50	32,00	30,25	32,50	29,50	33,00	28,50	28,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	3,86	3,86	3,86	3,84	3,88	3,88	3,87	3,89	3,90	3,87
1024210	VM1698-4	Grad	29,00	29,25	28,50	31,00	29,75	29,25	31,25	30,25	30,25	32,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,89	3,87	3,86	3,93	3,89	3,88	3,89	3,88	3,89	3,89
1024210	VM1698-4	Grad	30,25	28,50	30,50	32,50	28,50	29,75	32,50	28,75	29,75	29,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_d	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
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}
1024210	VM1698-4	Nm	3,91	3,87	3,89	3,89	3,89	3,87	3,87	3,87	3,89	3,87
1024210	VM1698-4	Grad	30,00	32,50	29,75	31,00	29,25	29,25	29,25	30,50	31,25	30,25

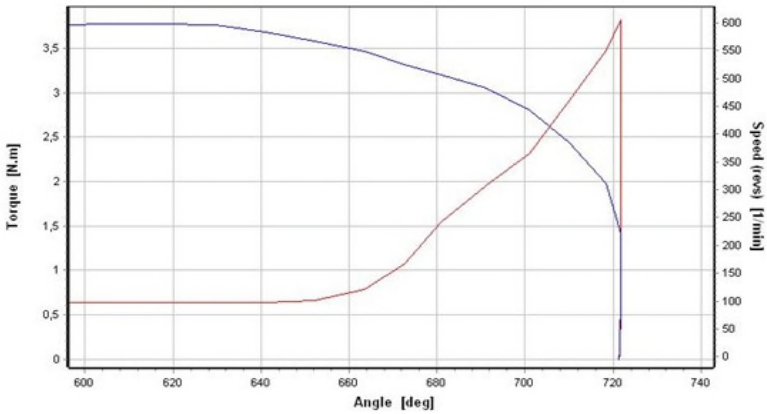
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,87	3,89	3,87	3,87	3,89	3,84	3,87	3,87	3,87	3,87
1024210	VM1698-4	Grad	29,00	31,00	29,75	29,00	29,75	30,00	31,25	31,00	31,00	32,75

Torque graphs

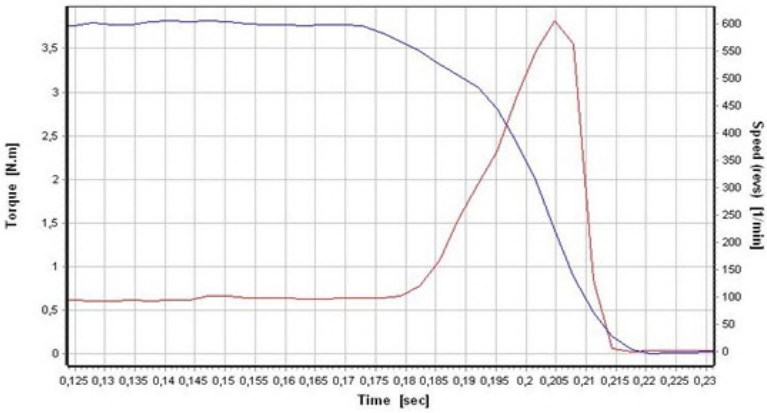
Machine Capability Study 30 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

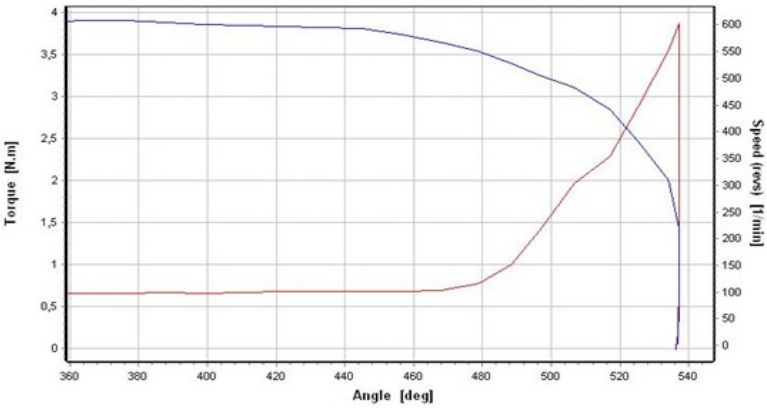
Angle degree: **30°**
Test torque: **3,9 Nm**



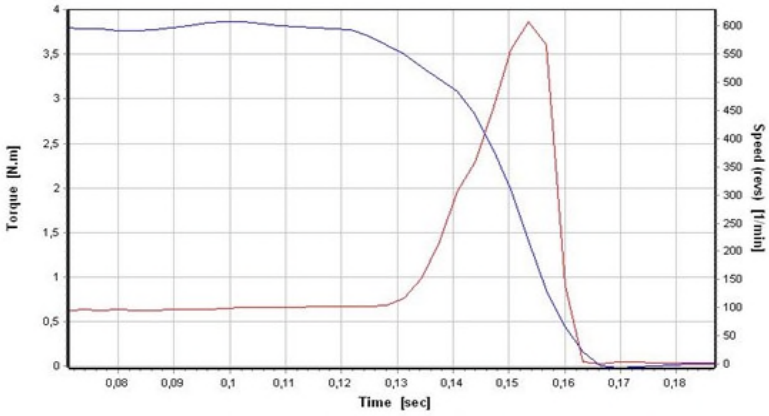
Value no. 1
Graph
Torque / Angle / Speed



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

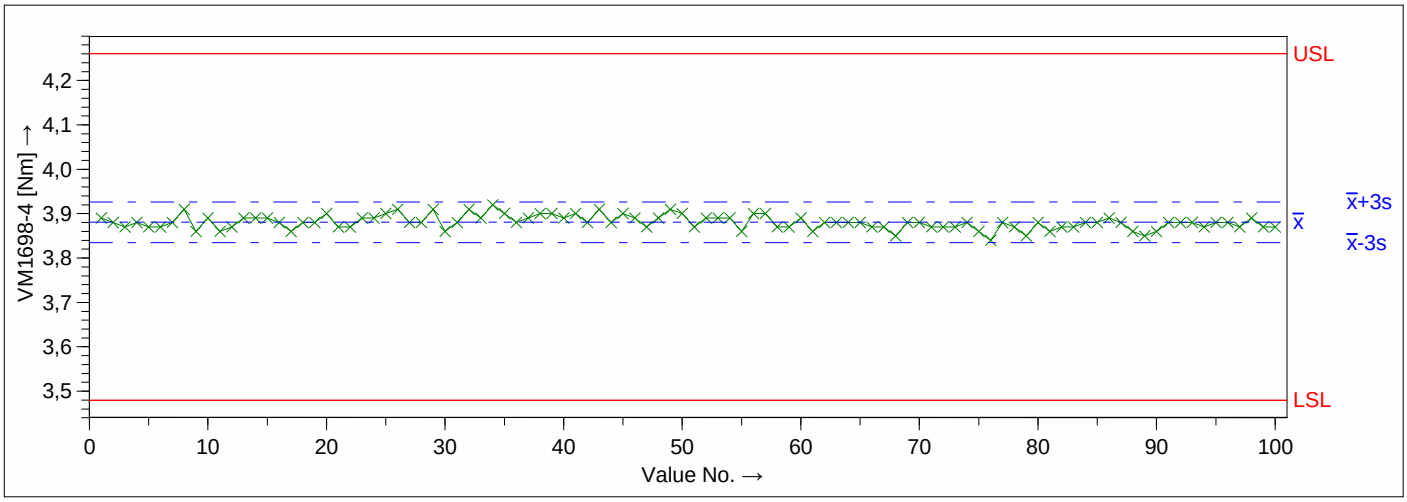
Cleco Production Tools

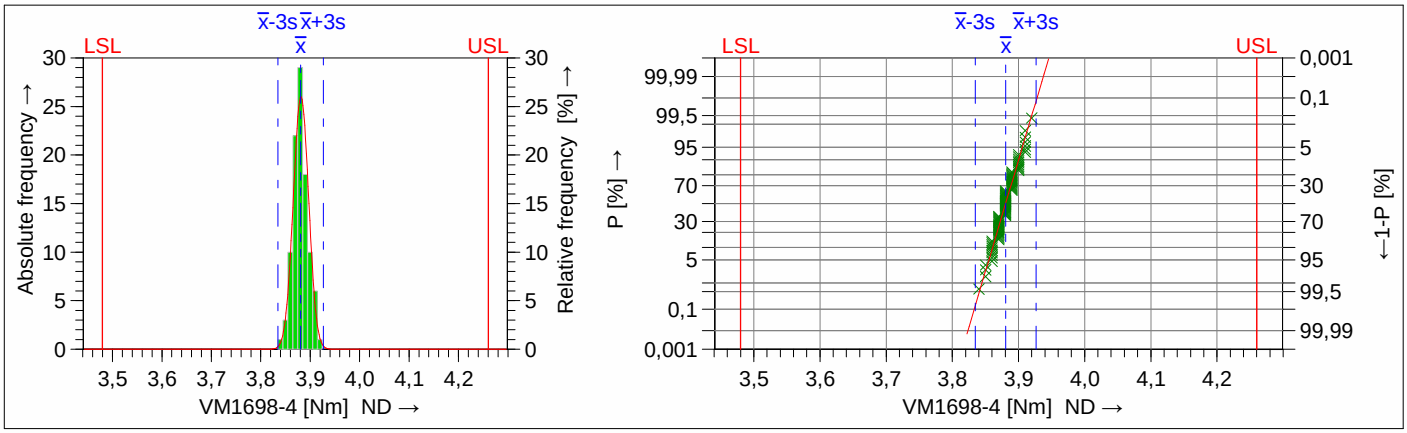
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_c	Char.Descr.	VM1698-4	Nom.val. 3,87 0,39	USL 4,26
		Serial No.	1024210	Unit Nm -0,39	LSL 3,48
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 07.11.2023 13:36:54 to 07.11.2023 13:48:27

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





Drawing Values		Collected Values		Statistics	
T_m	3.87			x̄	3.8805
LSL	3.48	x_{min}	3.84	x̄-3s	3.8345
USL	4.26	x_{max}	3.92	x̄+3s	3.9265
T	0.78	R	0.08	6s	0.0920
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	8.48
Critical capability index	=	C_{mk}	8.25

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_c	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
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}
1024210	VM1698-4	Nm	3,89	3,88	3,87	3,88	3,87	3,87	3,88	3,91	3,86	3,89
1024210	VM1698-4	Grad	357,75	362,25	362,50	363,50	360,75	360,75	362,50	371,50	359,00	369,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	3,86	3,87	3,89	3,89	3,89	3,88	3,86	3,88	3,88	3,90
1024210	VM1698-4	Grad	358,00	362,00	366,00	363,75	366,25	370,50	357,25	361,00	363,00	368,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	3,87	3,87	3,89	3,89	3,90	3,91	3,88	3,88	3,91	3,86
1024210	VM1698-4	Grad	363,25	363,00	362,50	370,00	371,25	367,00	361,50	363,75	370,25	367,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	3,88	3,91	3,89	3,92	3,90	3,88	3,89	3,90	3,90	3,89
1024210	VM1698-4	Grad	362,25	371,50	360,00	368,50	364,75	355,75	364,00	359,25	360,25	361,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	3,90	3,88	3,91	3,88	3,90	3,89	3,87	3,89	3,91	3,90
1024210	VM1698-4	Grad	358,00	357,25	365,50	354,75	360,50	362,50	351,25	359,75	365,25	360,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	3,87	3,89	3,89	3,89	3,86	3,90	3,90	3,87	3,87	3,89
1024210	VM1698-4	Grad	357,00	358,00	358,75	361,00	355,50	364,50	360,25	356,00	358,75	361,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	3,86	3,88	3,88	3,88	3,88	3,87	3,87	3,85	3,88	3,88
1024210	VM1698-4	Grad	356,25	362,25	357,75	366,75	359,50	357,50	359,50	358,75	359,00	362,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,87	3,87	3,87	3,88	3,86	3,84	3,88	3,87	3,85	3,88
1024210	VM1698-4	Grad	356,00	354,75	355,25	362,75	353,25	352,75	356,00	357,75	355,00	357,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_c	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
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}
1024210	VM1698-4	Nm	3,86	3,87	3,87	3,88	3,88	3,89	3,88	3,86	3,85	3,86
1024210	VM1698-4	Grad	353,25	362,25	349,75	360,25	354,00	363,00	357,50	354,50	348,50	357,50

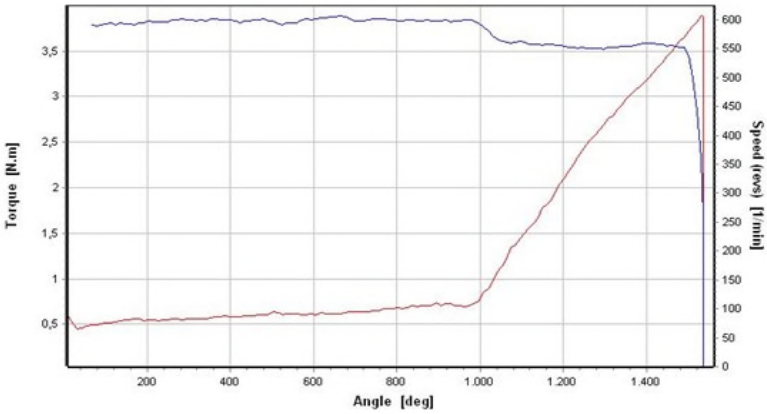
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,88	3,88	3,88	3,87	3,88	3,88	3,87	3,89	3,87	3,87
1024210	VM1698-4	Grad	358,00	357,75	354,50	355,50	365,00	354,25	358,50	358,75	355,75	355,75

Torque graphs

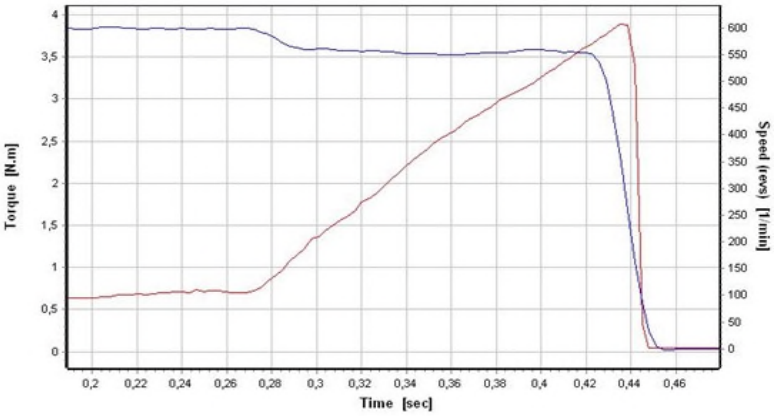
Machine Capability Study 30 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

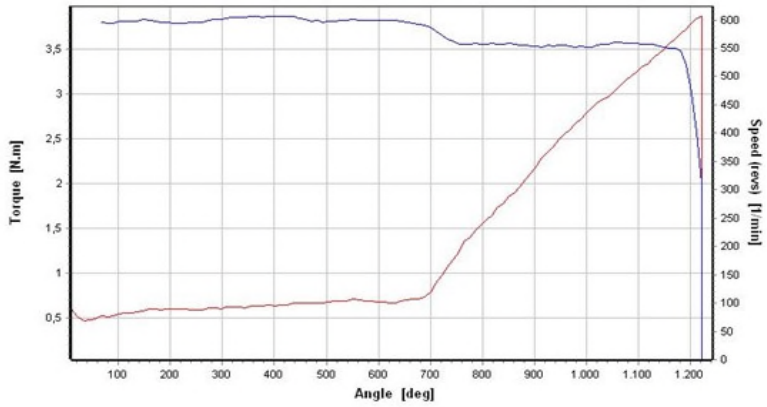
Angle degree: **360°**
Test torque: **3,9 Nm**



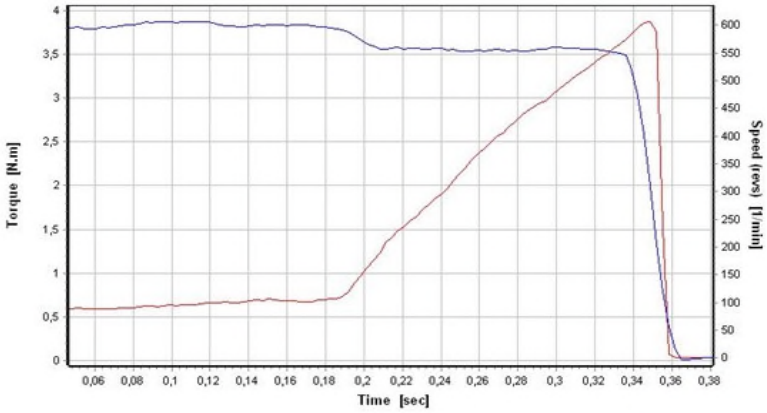
Value no. 1
Graph
Torque / Angle / Speed



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	60,9 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1002**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 6,82 Nm

Hard joint (H)	41,16	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,50	Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	6,14 - 7,50 Nm	6,14 - 7,50 Nm
	Tolerance down / up	10 %	10 %
	Average torque	6,86 Nm	6,99 Nm
	Standard deviation	0,04 Nm	0,03 Nm
	Torque scatter (99,73%)	0,25 Nm	0,21 Nm
	C_m	5,52	6,59
	C_{mk}	5,20	4,92

b)	Min. C_m hard/soft (lowest value)	5,52
	Min. C_{mk} hard/soft (lowest value)	4,92

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

Note:

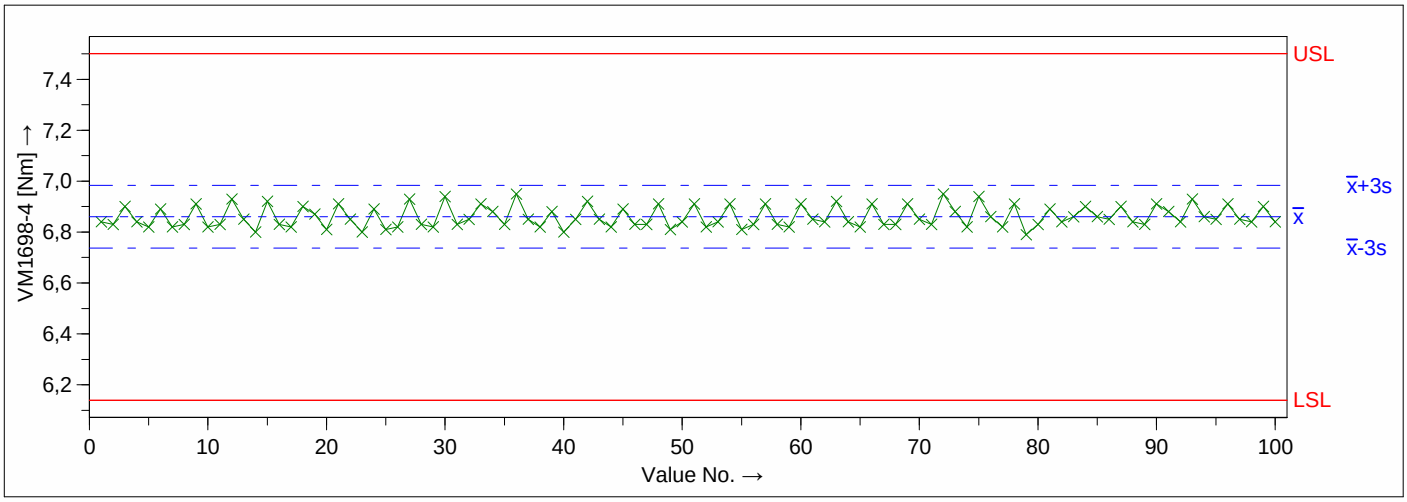
Machine Capability Study
Control System

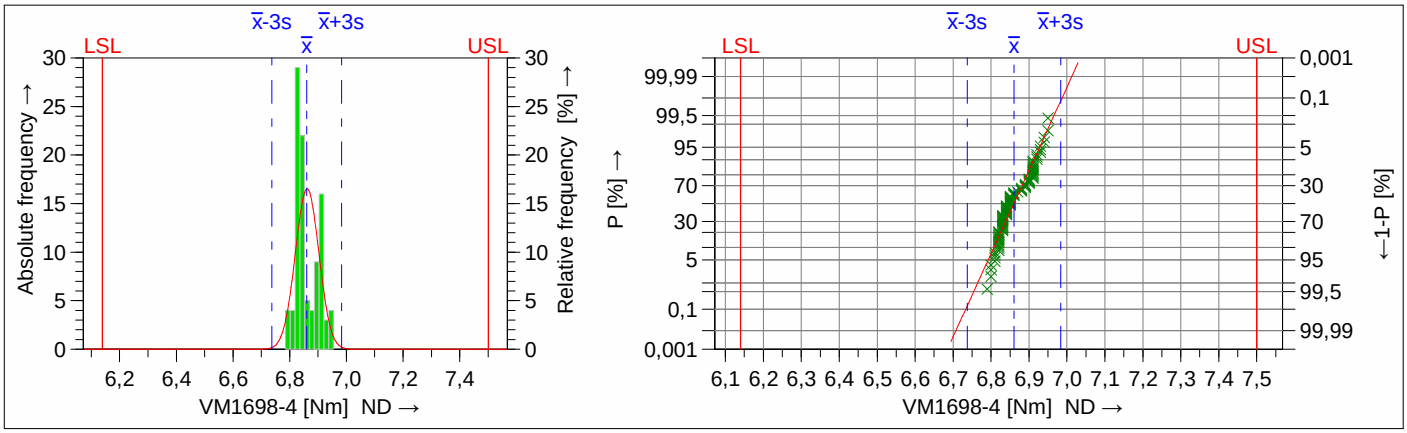
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_h	Char.Descr.	VM1698-4	Nom.val. 6,82 / 0,68	USL 7,50
		Serial No.	1024210	Unit Nm / -0,68	LSL 6,14
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 07.11.2023 13:12:53 to 07.11.2023 13:24:27

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





Drawing Values		Collected Values		Statistics	
T_m	6.82			$\bar{x}$	6.8601
LSL	6.14	x_{min}	6.79	$\bar{x}$-3s	6.7370
USL	7.50	x_{max}	6.95	$\bar{x}$+3s	6.9832
T	1.36	R	0.16	6s	0.2462
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	5.52
Critical capability index	=	C_{mk}	5.20

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_h	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
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}
1024210	VM1698-4	Nm	6,84	6,83	6,90	6,84	6,82	6,89	6,82	6,83	6,91	6,82
1024210	VM1698-4	Grad	31,75	30,00	31,25	29,25	30,25	30,50	29,50	29,75	30,50	29,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	6,83	6,93	6,85	6,80	6,92	6,83	6,82	6,90	6,87	6,81
1024210	VM1698-4	Grad	31,00	31,25	29,25	30,50	29,75	30,50	30,00	30,25	31,00	31,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	6,91	6,85	6,80	6,89	6,81	6,82	6,93	6,83	6,82	6,94
1024210	VM1698-4	Grad	31,75	30,25	30,00	30,25	30,25	29,50	31,25	30,00	31,00	31,50

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	6,83	6,85	6,91	6,88	6,83	6,95	6,85	6,82	6,88	6,80
1024210	VM1698-4	Grad	29,50	30,25	30,00	30,00	29,25	31,25	29,75	29,75	30,25	29,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	6,85	6,92	6,85	6,82	6,89	6,83	6,83	6,91	6,81	6,84
1024210	VM1698-4	Grad	30,75	31,00	28,75	29,25	29,75	28,50	29,50	30,50	29,00	29,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	6,91	6,82	6,84	6,91	6,81	6,83	6,91	6,83	6,82	6,91
1024210	VM1698-4	Grad	29,50	29,50	30,00	29,50	29,00	30,50	30,75	29,50	30,00	30,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	6,85	6,84	6,92	6,84	6,82	6,91	6,83	6,83	6,91	6,85
1024210	VM1698-4	Grad	28,75	30,25	30,25	30,00	30,75	29,75	29,50	29,50	30,50	29,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	6,83	6,95	6,88	6,82	6,94	6,86	6,82	6,91	6,79	6,83
1024210	VM1698-4	Grad	30,50	31,50	30,50	31,00	31,00	31,25	28,75	30,75	30,25	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_h	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
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}
1024210	VM1698-4	Nm	6,89	6,84	6,86	6,90	6,86	6,85	6,90	6,84	6,83	6,91
1024210	VM1698-4	Grad	29,50	29,25	29,75	28,75	29,50	30,25	30,00	29,25	29,75	29,75

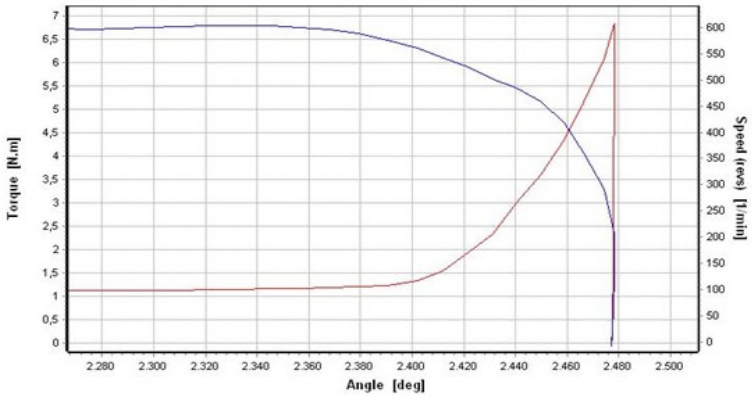
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	6,88	6,84	6,93	6,86	6,85	6,91	6,85	6,84	6,90	6,84
1024210	VM1698-4	Grad	30,25	29,75	31,00	30,00	30,00	30,75	29,50	30,25	30,00	29,75

Torque graphs

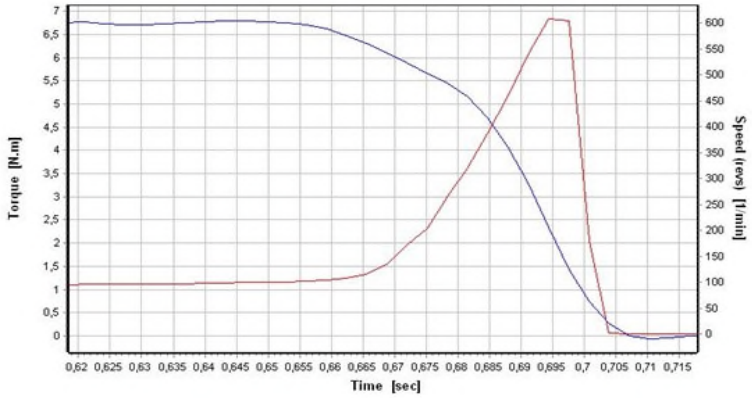
Machine Capability Study 80 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

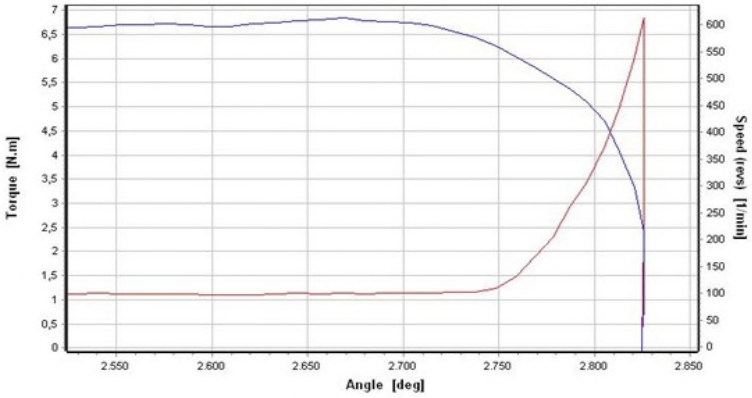
Angle degree: **30°**
Test torque: **6,8 Nm**



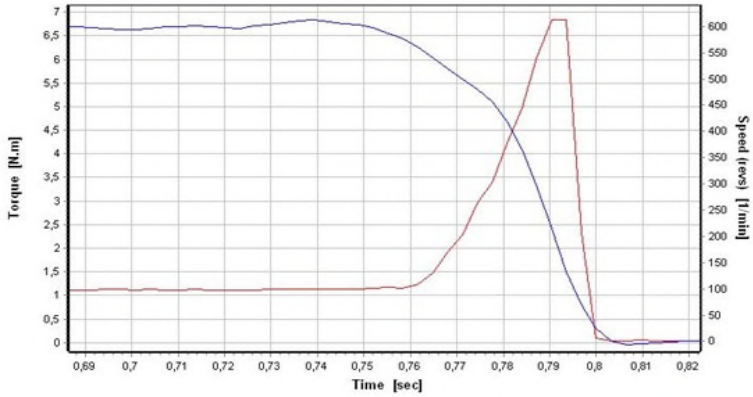
Value no. 1
Graph
Torque / Angle / Speed



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

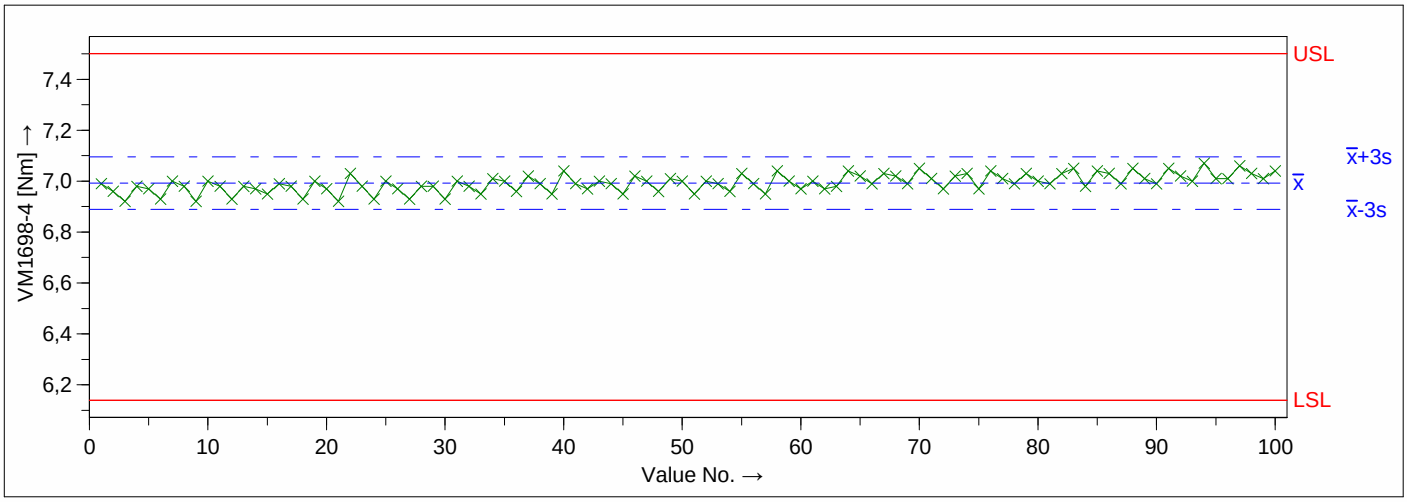
Cleco Production Tools

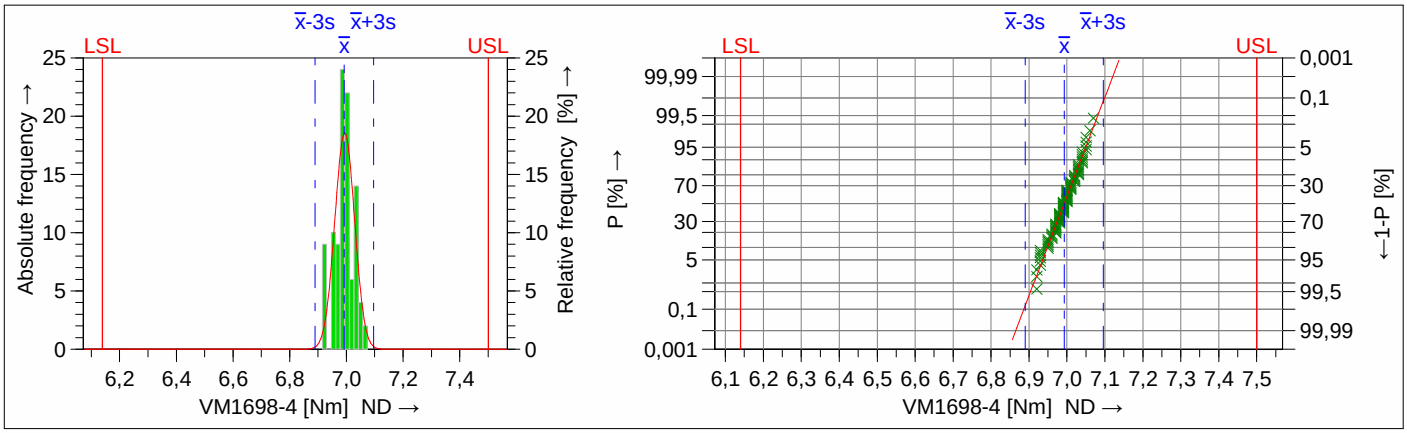
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_g	Char.Descr.	VM1698-4	Nom.val. 6,82 / 0,68	USL 7,50
		Serial No.	1024210	Unit Nm / -0,68	LSL 6,14
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 07.11.2023 12:57:04 to 07.11.2023 13:08:37

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





Drawing Values		Collected Values		Statistics	
T_m	6.82			$\bar{x}$	6.9927
LSL	6.14	x_{min}	6.92	$\bar{x}$-3s	6.8896
USL	7.50	x_{max}	7.07	$\bar{x}$+3s	7.0958
T	1.36	R	0.15	6s	0.2062
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	6.59
Critical capability index	=	C_{mk}	4.92

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_g	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
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}
1024210	VM1698-4	Nm	6,99	6,96	6,92	6,98	6,97	6,93	7,00	6,98	6,92	7,00
1024210	VM1698-4	Grad	367,00	364,25	363,50	367,25	365,25	361,00	366,75	364,25	360,00	366,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	6,98	6,93	6,98	6,97	6,95	6,99	6,98	6,93	7,00	6,97
1024210	VM1698-4	Grad	362,00	361,25	364,25	363,75	362,25	363,25	363,75	359,25	369,00	361,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	6,92	7,03	6,98	6,93	7,00	6,97	6,93	6,98	6,98	6,93
1024210	VM1698-4	Grad	357,50	367,50	365,25	360,75	368,00	364,75	362,50	363,25	364,75	360,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	7,00	6,98	6,95	7,01	7,00	6,96	7,02	6,99	6,95	7,04
1024210	VM1698-4	Grad	367,75	364,50	361,50	370,25	365,25	363,50	369,75	368,00	366,50	369,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	6,99	6,97	7,00	6,99	6,95	7,02	7,00	6,96	7,01	7,00
1024210	VM1698-4	Grad	367,50	367,50	363,25	359,00	356,50	364,50	359,50	357,50	364,50	359,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	6,95	7,00	6,99	6,96	7,03	6,99	6,95	7,04	7,00	6,97
1024210	VM1698-4	Grad	358,00	362,50	360,75	356,25	365,25	359,25	361,00	363,75	362,75	359,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	7,00	6,97	6,98	7,04	7,02	6,99	7,03	7,02	6,99	7,05
1024210	VM1698-4	Grad	365,25	365,00	358,50	365,00	367,25	365,75	368,25	362,25	362,75	368,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	7,01	6,97	7,02	7,03	6,97	7,04	7,01	6,99	7,03	7,00
1024210	VM1698-4	Grad	363,50	360,75	368,25	365,75	360,25	370,00	366,75	363,25	372,00	366,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_g	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
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}
1024210	VM1698-4	Nm	6,99	7,03	7,05	6,98	7,04	7,03	6,99	7,05	7,01	6,99
1024210	VM1698-4	Grad	365,50	371,50	360,50	357,50	361,75	360,25	364,75	364,25	358,25	360,25

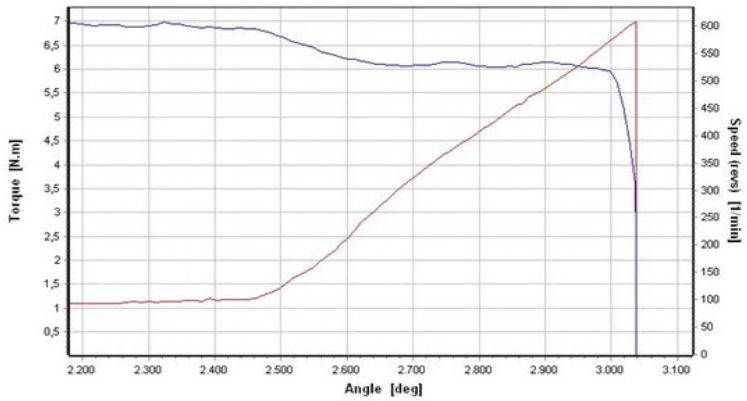
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	7,05	7,02	7,00	7,07	7,01	7,01	7,06	7,03	7,01	7,04
1024210	VM1698-4	Grad	362,75	363,00	360,00	368,75	360,25	360,50	363,00	361,50	364,25	361,00

Torque graphs

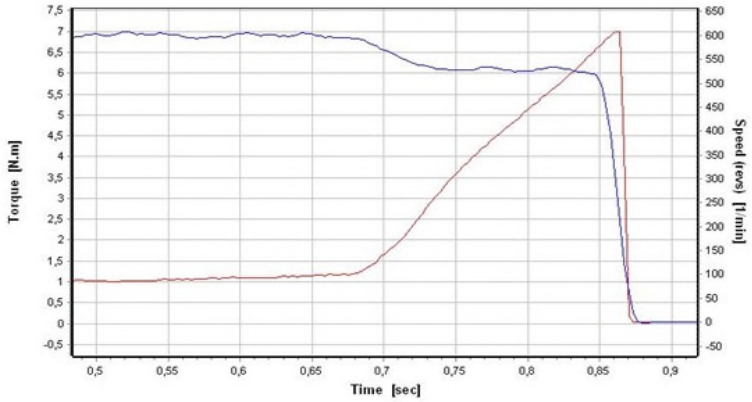
Machine Capability Study 80 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

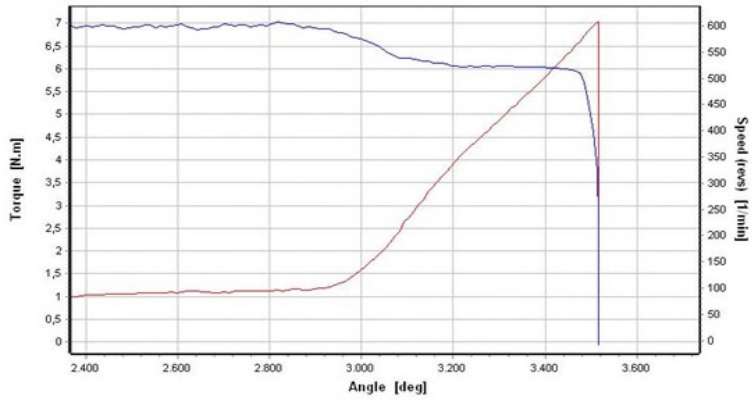
Angle degree: **360°**
Test torque: **6,8 Nm**



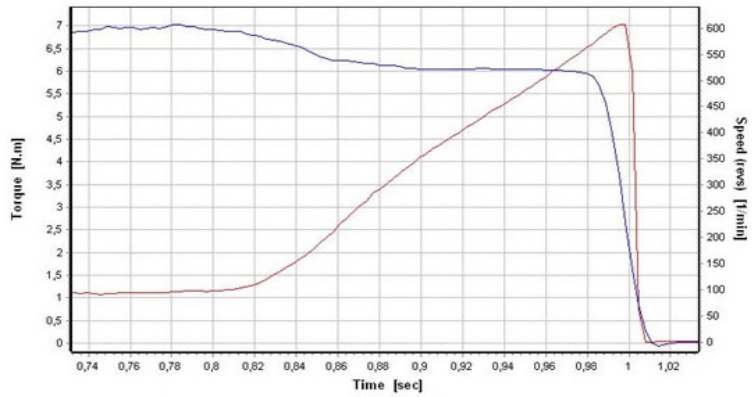
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

Multi-stage tightening system	☑	Speed 600 rpm	60,9 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1002**

Test torque: Tq max. 8,00 Nm

Hard joint (H)	46,61	Nm / Revolution	Angle degree	30°
Soft joint (L)	4,06	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	7,20 - 8,80 Nm	7,20 - 8,80 Nm
	Tolerance down / up	10 %	10 %
	Average torque	7,77 Nm	8,12 Nm
	Standard deviation	0,03 Nm	0,04 Nm
	Torque scatter (99,73%)	0,20 Nm	0,22 Nm
	C_m	7,95	7,34
	C_{mk}	5,65	6,28

b)	Min. C_m hard/soft (lowest value)	7,34
	Min. C_{mk} hard/soft (lowest value)	5,65

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

Note:

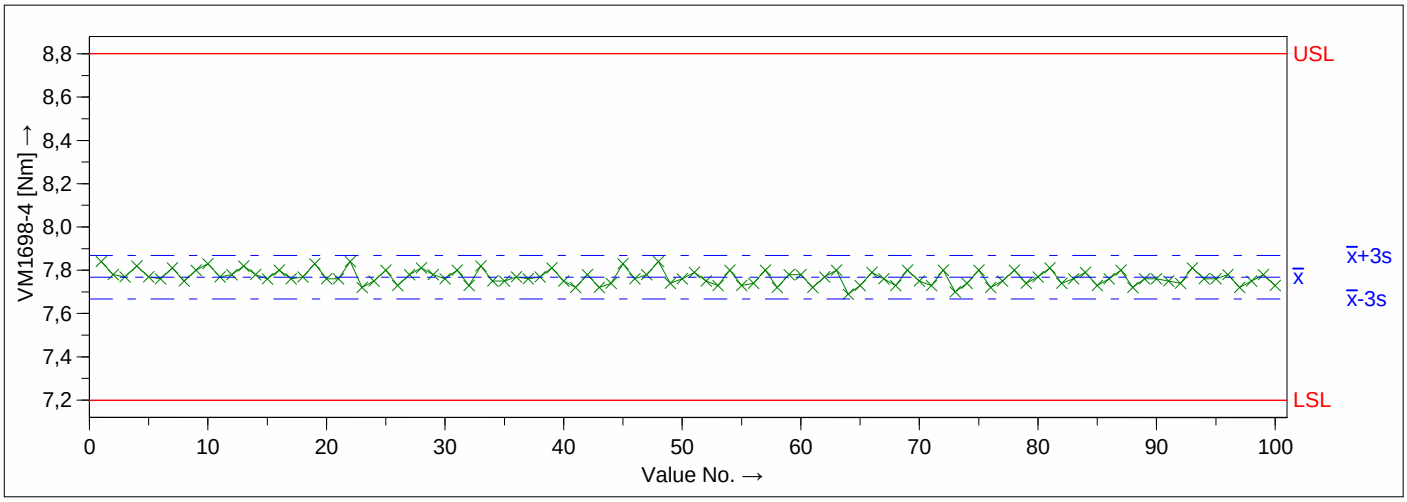
Machine Capability Study
Control System

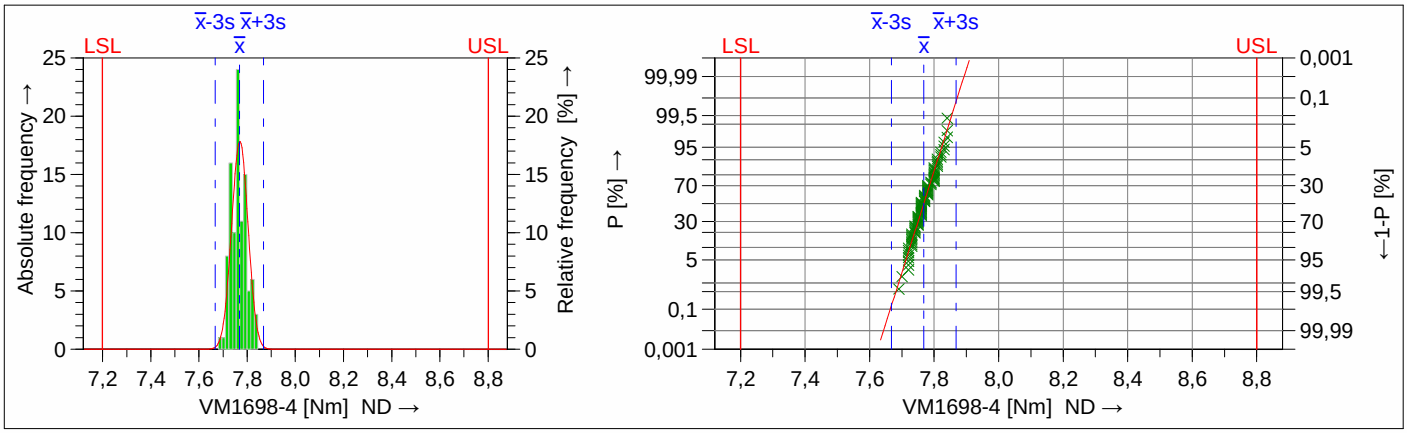
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_b	Char.Descr.	VM1698-4	Nom.val. 8,00 0,80	USL 8,80
		Serial No.	1024210	Unit Nm -0,80	LSL 7,20
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 07.11.2023 11:25:42 to 07.11.2023 11:38:54

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





Drawing Values		Collected Values		Statistics	
T_m	8.00			$\bar{x}$	7.7679
LSL	7.20	x_{min}	7.69	$\bar{x}$-3s	7.6673
USL	8.80	x_{max}	7.84	$\bar{x}$+3s	7.8685
T	1.60	R	0.15	6s	0.2011
		$n_{<T>}$	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	7.95
Critical capability index	=	C_{mk}	5.65

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_b	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
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}
1024210	VM1698-4	Nm	7,84	7,78	7,77	7,82	7,77	7,76	7,81	7,75	7,80	7,83
1024210	VM1698-4	Grad	31,75	30,25	29,75	32,75	31,00	31,50	30,75	31,25	31,75	33,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	7,77	7,78	7,82	7,78	7,76	7,80	7,76	7,77	7,83	7,76
1024210	VM1698-4	Grad	30,25	32,75	32,00	30,50	32,25	32,75	29,75	30,00	31,25	30,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	7,76	7,84	7,72	7,75	7,80	7,73	7,78	7,81	7,78	7,76
1024210	VM1698-4	Grad	32,00	30,75	29,75	29,50	32,75	30,00	30,50	30,75	29,75	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}
1024210	VM1698-4	Nm	7,80	7,73	7,82	7,75	7,75	7,77	7,76	7,77	7,81	7,75
1024210	VM1698-4	Grad	32,25	30,25	30,50	29,25	31,25	30,25	29,75	29,75	31,75	29,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	7,72	7,78	7,72	7,74	7,83	7,76	7,78	7,84	7,74	7,76
1024210	VM1698-4	Grad	29,50	31,75	30,50	30,00	30,00	29,50	30,75	30,50	30,75	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	7,79	7,75	7,73	7,80	7,73	7,74	7,80	7,72	7,78	7,78
1024210	VM1698-4	Grad	30,50	30,50	31,25	30,50	31,00	30,75	31,50	28,75	31,00	30,50

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	7,72	7,77	7,80	7,69	7,73	7,79	7,76	7,73	7,80	7,75
1024210	VM1698-4	Grad	28,75	29,75	30,75	30,25	29,25	29,75	30,50	30,00	30,75	29,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	7,73	7,80	7,70	7,74	7,80	7,72	7,75	7,80	7,74	7,77
1024210	VM1698-4	Grad	29,25	32,00	30,50	30,50	30,00	29,25	29,00	30,50	31,00	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_b	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
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}
1024210	VM1698-4	Nm	7,81	7,74	7,76	7,79	7,73	7,76	7,80	7,72	7,76	7,76
1024210	VM1698-4	Grad	32,00	30,00	30,25	30,25	28,75	31,50	29,75	29,50	30,00	31,25

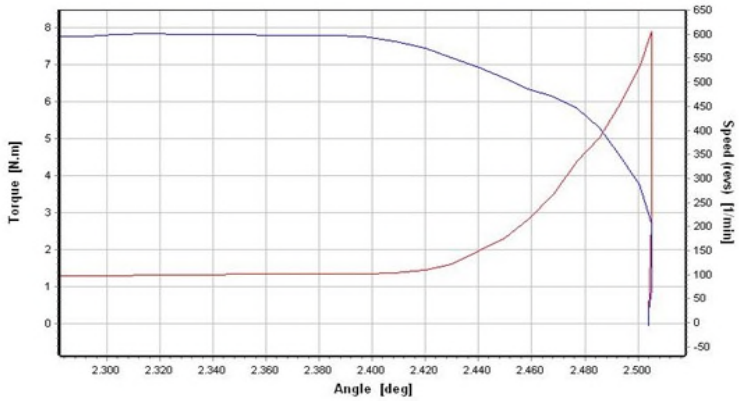
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	7,75	7,74	7,81	7,76	7,76	7,78	7,72	7,75	7,78	7,73
1024210	VM1698-4	Grad	29,50	30,75	32,00	29,25	29,75	30,50	29,50	31,50	31,00	30,00

Torque graphs

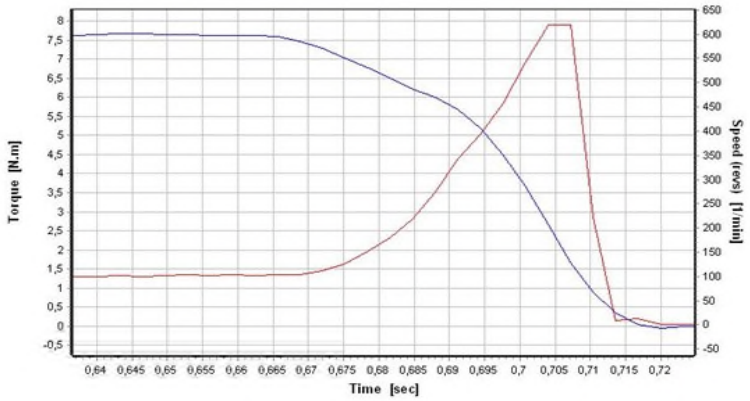
Machine Capability Study 100 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

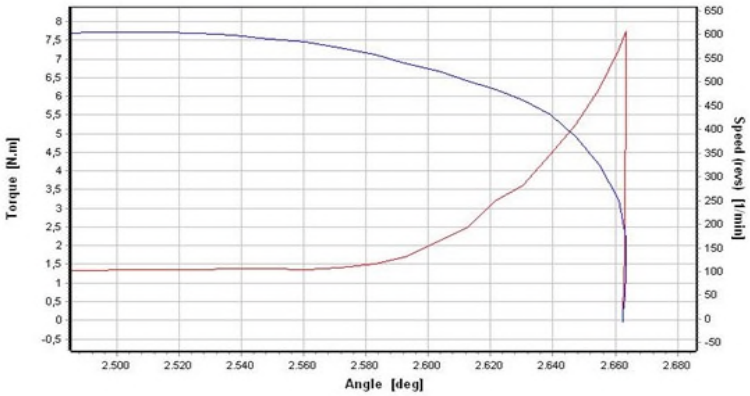
Angle degree: **30°**
Test torque: **8,0 Nm**



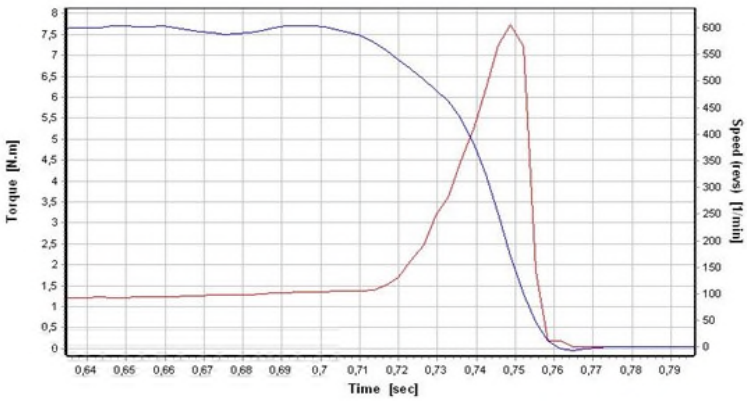
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

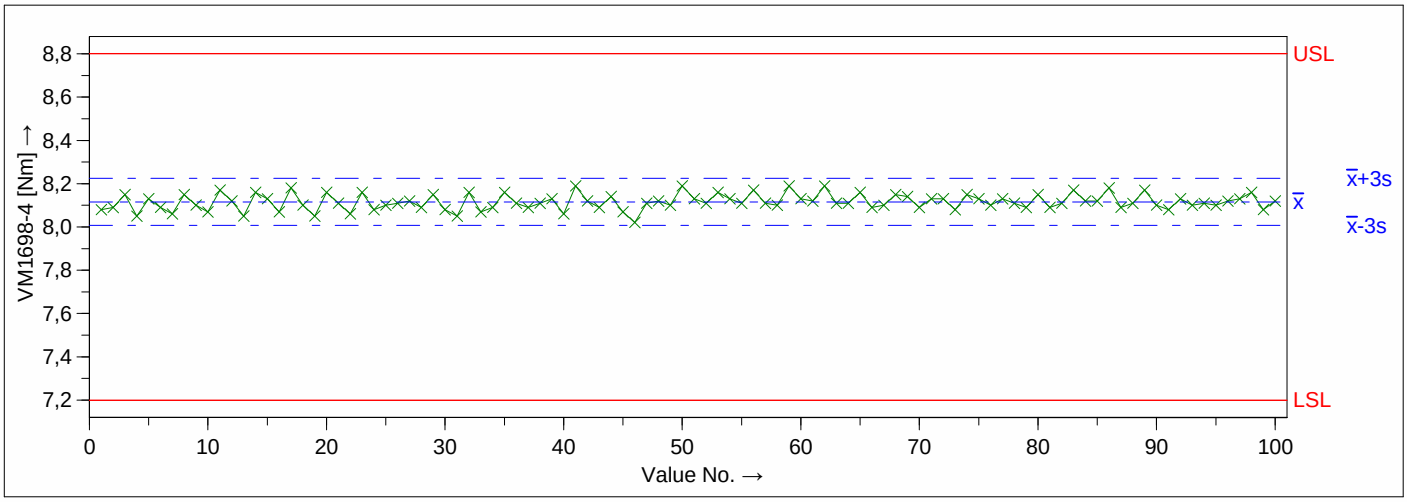
Machine Capability Study
Control System

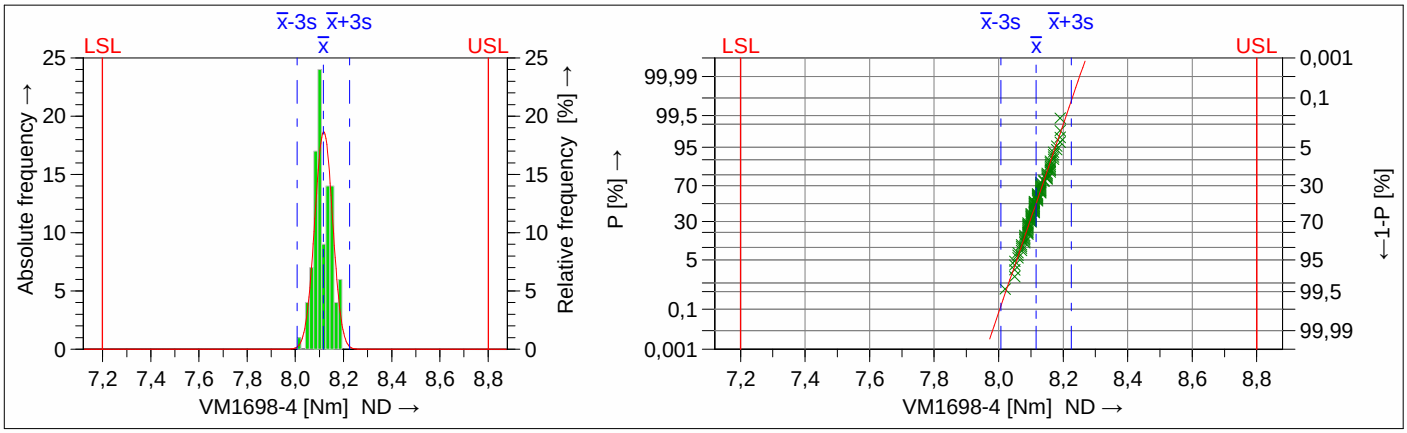
Plant	ATG Westhausen	Operator Name	Ederer
Date	07.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IJJ1002_a	Char.Descr.	VM1698-4	Nom.val. 8,00 0,80	USL 8,80
		Serial No.	1024210	Unit Nm -0,80	LSL 7,20
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 07.11.2023 08:30:59 to 07.11.2023 08:42:32

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





Drawing Values		Collected Values		Statistics	
T_m	8.00			$\bar{x}$	8.1159
LSL	7.20	x_{min}	8.02	$\bar{x}$-3s	8.0069
USL	8.80	x_{max}	8.19	$\bar{x}$+3s	8.2249
T	1.60	R	0.17	6s	0.2179
		$n_{<T>}$	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	7.34
Critical capability index	=	C_{mk}	6.28

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_a	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
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}
1024210	VM1698-4	Nm	8,08	8,09	8,15	8,05	8,13	8,09	8,06	8,15	8,10	8,07
1024210	VM1698-4	Grad	361,25	358,50	364,50	355,50	366,75	361,00	357,50	367,75	361,75	357,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	8,17	8,12	8,05	8,16	8,13	8,07	8,18	8,10	8,05	8,16
1024210	VM1698-4	Grad	365,25	361,50	359,25	366,00	364,50	359,50	367,00	361,50	359,50	367,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	8,11	8,06	8,16	8,08	8,10	8,11	8,12	8,09	8,15	8,08
1024210	VM1698-4	Grad	363,75	361,50	368,75	363,25	364,75	366,50	364,50	359,75	365,25	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}
1024210	VM1698-4	Nm	8,05	8,16	8,07	8,09	8,16	8,11	8,09	8,11	8,13	8,06
1024210	VM1698-4	Grad	363,00	368,75	363,25	359,50	370,25	367,50	365,00	365,75	365,00	363,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	8,19	8,12	8,09	8,14	8,07	8,02	8,11	8,12	8,10	8,19
1024210	VM1698-4	Grad	372,75	366,25	362,25	367,25	363,50	360,50	367,00	368,25	359,75	368,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	8,13	8,11	8,16	8,13	8,11	8,17	8,11	8,10	8,19	8,13
1024210	VM1698-4	Grad	365,50	367,00	367,50	365,00	363,00	369,50	367,75	366,00	370,25	369,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	8,12	8,19	8,11	8,11	8,16	8,09	8,10	8,15	8,14	8,09
1024210	VM1698-4	Grad	362,25	365,00	358,25	358,75	362,00	357,50	356,50	361,75	365,00	359,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	8,13	8,13	8,08	8,15	8,13	8,10	8,13	8,11	8,09	8,15
1024210	VM1698-4	Grad	359,75	359,50	362,25	361,25	360,50	361,75	361,50	357,00	358,50	360,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 07.11.2023

Serial No.	IJJ1002_a	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
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}
1024210	VM1698-4	Nm	8,09	8,11	8,17	8,12	8,12	8,18	8,09	8,11	8,17	8,10
1024210	VM1698-4	Grad	355,25	360,75	363,00	360,00	363,25	365,00	358,25	361,50	364,50	355,50

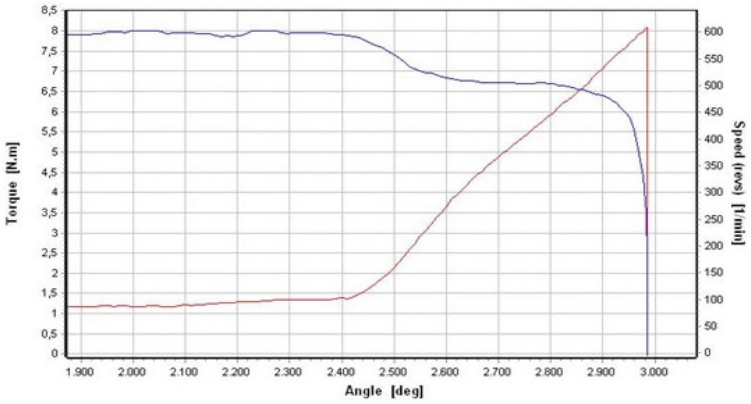
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	8,08	8,13	8,10	8,11	8,10	8,12	8,13	8,16	8,08	8,12
1024210	VM1698-4	Grad	357,25	360,75	357,50	360,75	359,25	362,00	360,25	363,00	355,75	359,00

Torque graphs

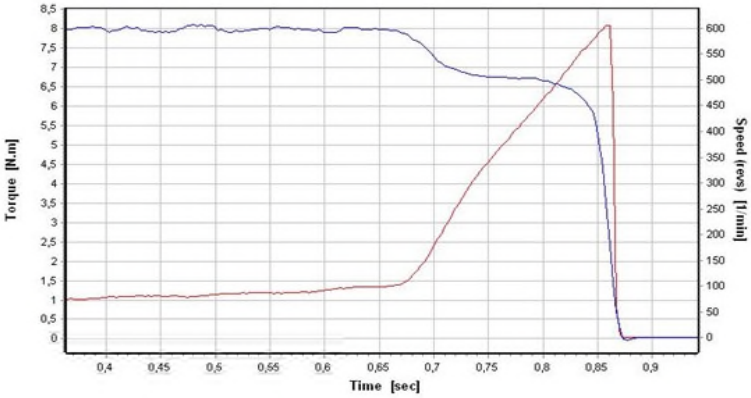
Machine Capability Study 100 %

Model: **CLBP08Q**
Serial no: **IJJ1002**

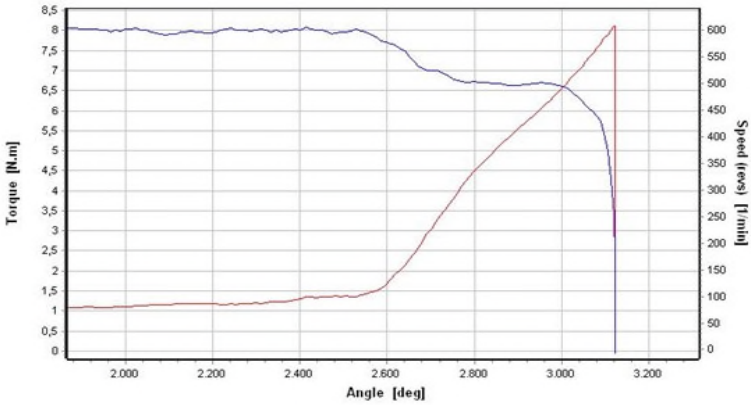
Angle degree: **360°**
Test torque: **8,0 Nm**



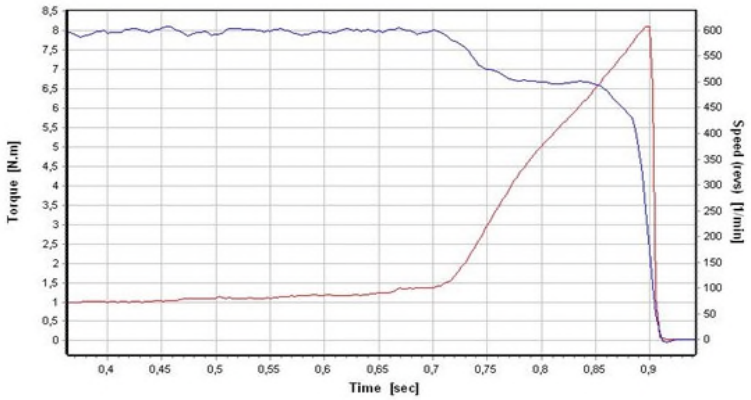
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed