Homologation

Cordless Assembly Tools

Model: CLBP04Q

Serial no.: IJJ1012

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Homologation: CLBP04Q SN: IJJ1012

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Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 600 rpm	40,00 %
Single-stage tightening system	☐	Speed 100 %	1500 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1012**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 1,97 Nm

Hard joint (H)	11,53	Nm / Revolution	Angle degree	30°
Soft joint (L)	0,98	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	1,77 - 2,17 Nm	1,77 - 2,17 Nm
	Tolerance down / up	10 %	10 %
	Average torque	1,92 Nm	1,95 Nm
	Standard deviation	0,01 Nm	0,01 Nm
	Torque scatter (99,73%)	0,06 Nm	0,06 Nm
	C_m	6,95	6,64
	C_{mk}	5,25	6,11

b)	Min. C_m hard/soft (lowest value)	6,64
	Min. C_{mk} hard/soft (lowest value)	5,25

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

Note:

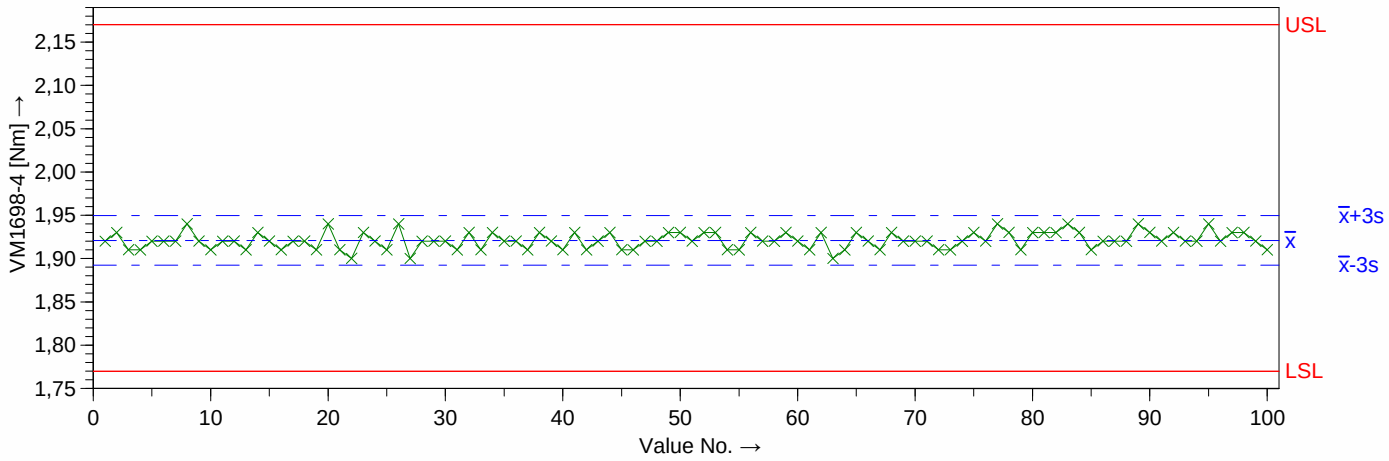
Machine Capability Study
Control System

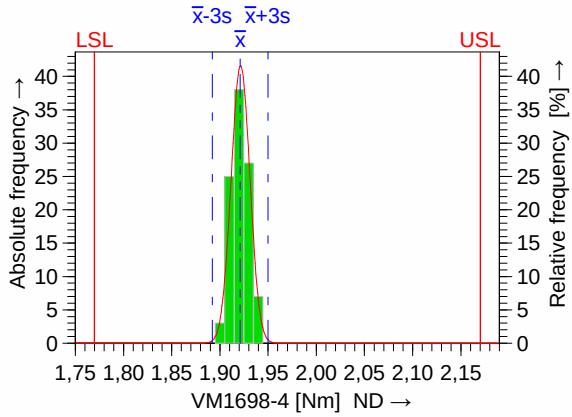
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

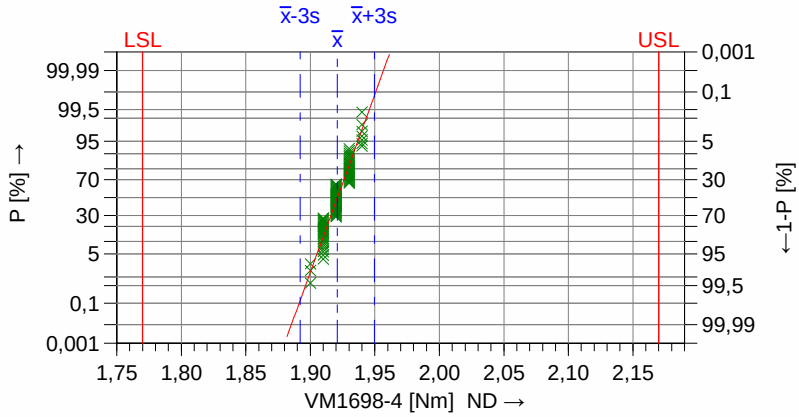
Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_d	Char.Descr.	VM1698-4	Nom.val. 1,97 0,20	USL 2,17
		Serial No.	1024210	Unit Nm -0,20	LSL 1,77
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	2/1033809	nges.	100

Evaluation from 13.11.2023 07:37:32 to 13.11.2023 07:49:55

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







Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	1.9210
LSL	1.77	x_{min}	1.90	$\bar{x}$-3s	1.8922
USL	2.17	x_{max}	1.94	$\bar{x}$+3s	1.9498
T	0.40	R	0.04	6s	0.0575
		$n_{<T>}$	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	6.95
Critical capability index	=	C_{mk}	5.25

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_d	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	1,97
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	1,77
				USL	2,17
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	1,92	1,93	1,91	1,91	1,92	1,92	1,92	1,94	1,92	1,91
1024210	VM1698-4	Grad	29,92	29,92	29,70	30,15	29,70	30,83	29,70	31,05	30,38	29,25

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	1,92	1,92	1,91	1,93	1,92	1,91	1,92	1,92	1,91	1,94
1024210	VM1698-4	Grad	29,70	29,70	30,15	30,15	30,15	29,48	29,70	29,92	29,70	30,60

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	1,91	1,90	1,93	1,92	1,91	1,94	1,90	1,92	1,92	1,92
1024210	VM1698-4	Grad	30,38	29,25	30,15	30,38	29,02	31,05	29,92	30,38	30,38	30,15

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	1,91	1,93	1,91	1,93	1,92	1,92	1,91	1,93	1,92	1,91
1024210	VM1698-4	Grad	29,48	31,05	29,92	30,60	30,83	31,50	29,02	30,83	29,70	30,38

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	1,93	1,91	1,92	1,93	1,91	1,91	1,92	1,92	1,93	1,93
1024210	VM1698-4	Grad	30,60	30,38	30,83	30,38	29,70	29,70	30,38	30,38	31,50	31,73

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	1,92	1,93	1,93	1,91	1,91	1,93	1,92	1,92	1,93	1,92
1024210	VM1698-4	Grad	29,70	30,83	30,60	30,38	29,92	32,63	30,60	30,60	30,83	30,38

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	1,91	1,93	1,90	1,91	1,93	1,92	1,91	1,93	1,92	1,92
1024210	VM1698-4	Grad	30,60	31,05	30,15	30,83	30,38	29,92	29,48	31,05	30,38	29,92

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	1,92	1,91	1,91	1,92	1,93	1,92	1,94	1,93	1,91	1,93
1024210	VM1698-4	Grad	30,60	29,48	29,70	30,15	30,83	29,70	31,05	31,05	30,15	30,83

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_d	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	1,97
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	1,77
				USL	2,17
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	1,93	1,93	1,94	1,93	1,91	1,92	1,92	1,92	1,94	1,93
1024210	VM1698-4	Grad	31,27	29,92	31,05	32,63	30,60	31,95	31,05	30,15	31,50	31,73

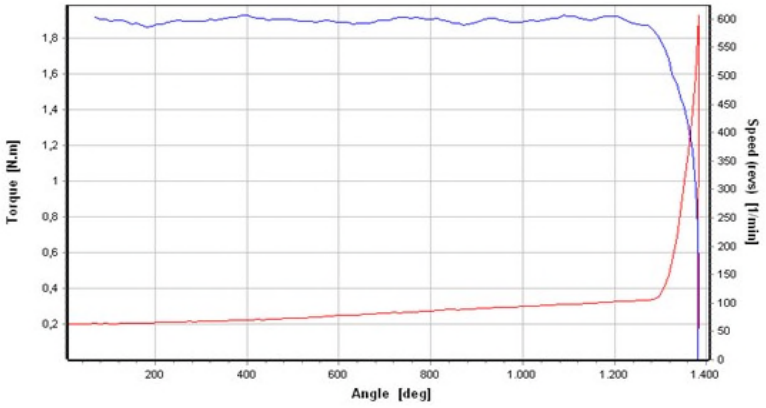
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	1,92	1,93	1,92	1,92	1,94	1,92	1,93	1,93	1,92	1,91
1024210	VM1698-4	Grad	31,50	29,92	29,70	29,48	31,05	29,70	29,70	30,60	30,38	29,70

Torque graphs

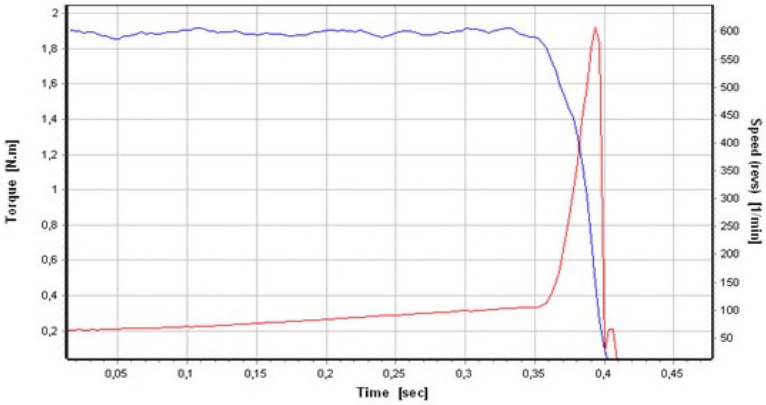
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1012**

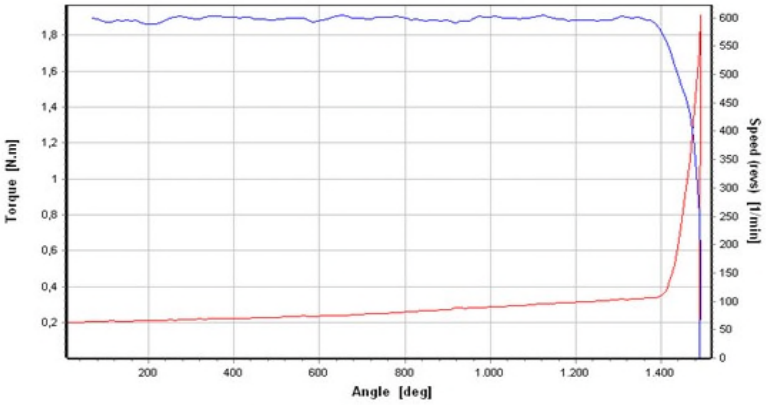
Angle degree: **30°**
Test torque: **2,0 Nm**



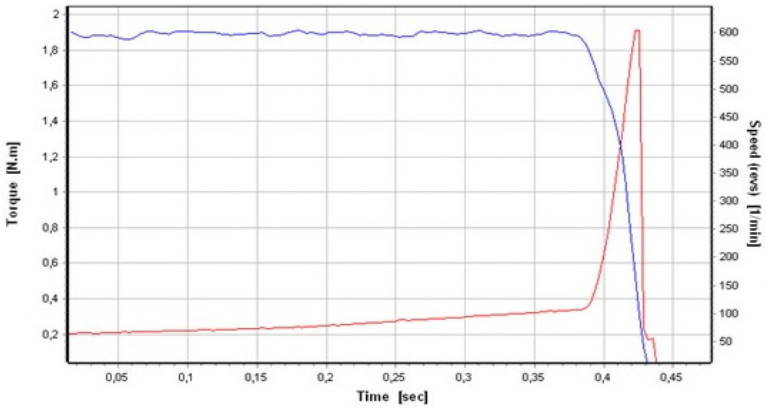
Value no. 1
Graph
Torque / Angle / Speed



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

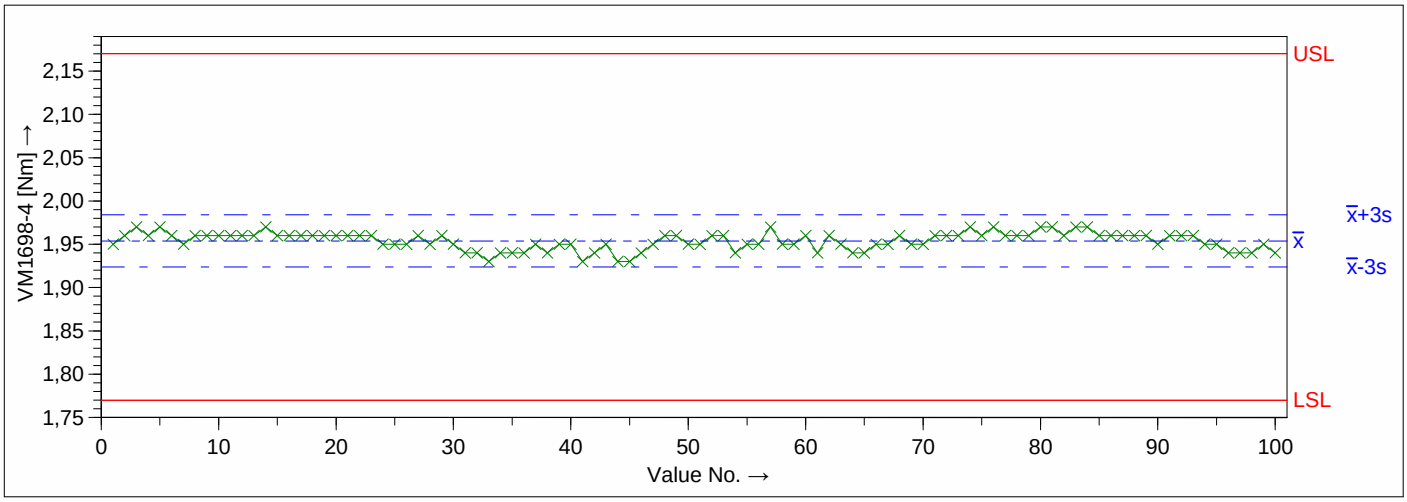
Cleco Production Tools

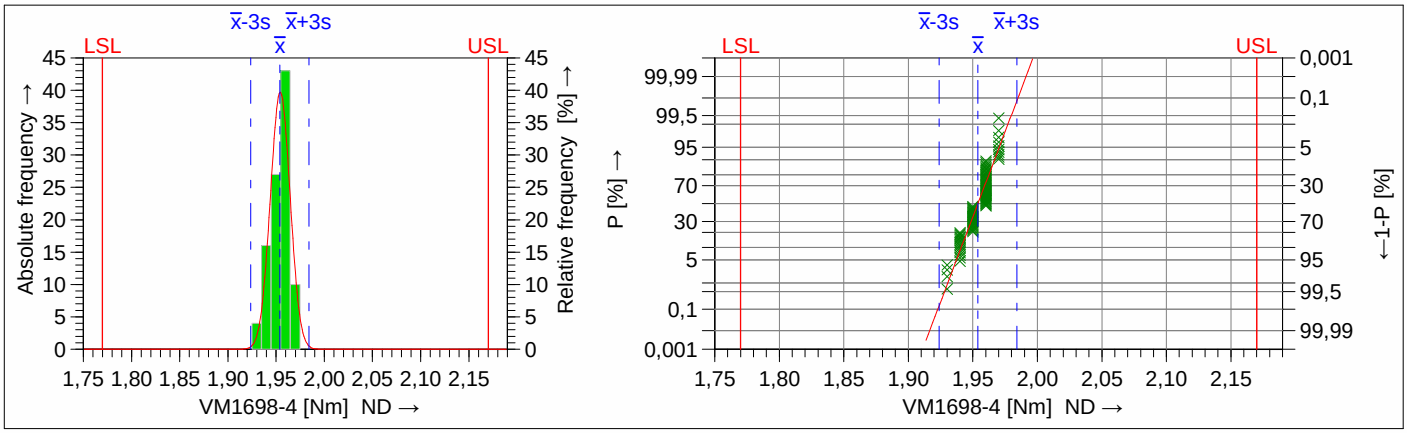
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_c	Char.Descr.	VM1698-4	Nom.val. 1,97 0,20	USL 2,17
		Serial No.	1024210	Unit Nm -0,20	LSL 1,77
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	2/1033809	nges.	100

Evaluation from 13.11.2023 07:22:01 to 13.11.2023 07:34:19

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





Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	1.9539
LSL	1.77	x_{min}	1.93	$\bar{x}$-3s	1.9238
USL	2.17	x_{max}	1.97	$\bar{x}$+3s	1.9840
T	0.40	R	0.04	6s	0.0602
		$n_{<T>}$	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	6.64
Critical capability index	=	C_{mk}	6.11

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

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Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_c	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	1,97
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	1,77
				USL	2,17
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	1,95	1,96	1,97	1,96	1,97	1,96	1,95	1,96	1,96	1,96
1024210	VM1698-4	Grad	358,20	360,90	361,80	359,33	360,00	359,10	358,65	360,45	359,33	359,33

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	1,96	1,96	1,96	1,97	1,96	1,96	1,96	1,96	1,96	1,96
1024210	VM1698-4	Grad	360,45	357,30	359,10	361,13	359,10	358,65	360,90	359,77	362,48	361,13

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	1,96	1,96	1,96	1,95	1,95	1,95	1,96	1,95	1,96	1,95
1024210	VM1698-4	Grad	360,00	360,45	363,83	360,67	356,63	360,23	363,83	360,45	363,60	358,20

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	1,94	1,94	1,93	1,94	1,94	1,94	1,95	1,94	1,95	1,95
1024210	VM1698-4	Grad	357,52	357,08	355,27	355,95	356,63	354,15	358,20	355,05	359,55	359,10

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	1,93	1,94	1,95	1,93	1,93	1,94	1,95	1,96	1,96	1,95
1024210	VM1698-4	Grad	352,35	358,42	358,42	354,83	354,83	355,95	361,13	361,35	360,90	360,23

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	1,95	1,96	1,96	1,94	1,95	1,95	1,97	1,95	1,95	1,96
1024210	VM1698-4	Grad	358,88	362,02	363,15	359,33	361,35	361,35	366,75	360,67	361,58	364,27

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	1,94	1,96	1,95	1,94	1,94	1,95	1,95	1,96	1,95	1,95
1024210	VM1698-4	Grad	359,10	364,50	361,13	357,98	359,10	360,90	361,80	366,08	360,23	362,70

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	1,96	1,96	1,96	1,97	1,96	1,97	1,96	1,96	1,96	1,97
1024210	VM1698-4	Grad	364,27	365,17	370,13	369,45	360,90	363,38	361,13	362,48	360,90	364,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_c	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	1,97
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	1,77
				USL	2,17
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	1,97	1,96	1,97	1,97	1,96	1,96	1,96	1,96	1,96	1,95
1024210	VM1698-4	Grad	362,92	359,77	360,45	362,48	359,55	360,90	360,67	361,13	359,55	359,33

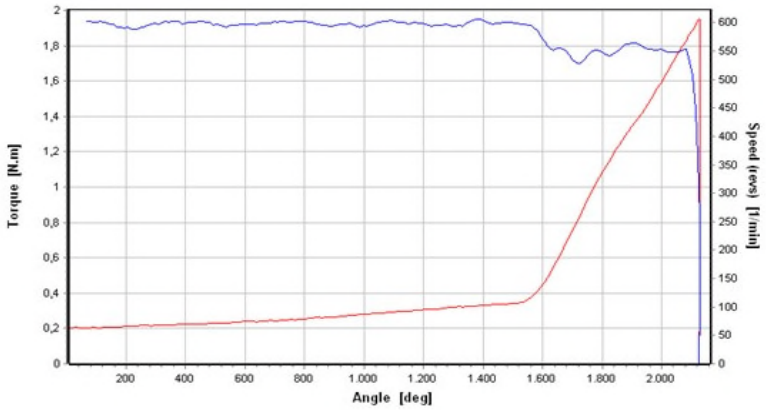
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	1,96	1,96	1,96	1,95	1,95	1,94	1,94	1,94	1,95	1,94
1024210	VM1698-4	Grad	358,88	360,00	360,67	357,30	360,00	355,73	354,15	354,60	357,52	356,40

Torque graphs

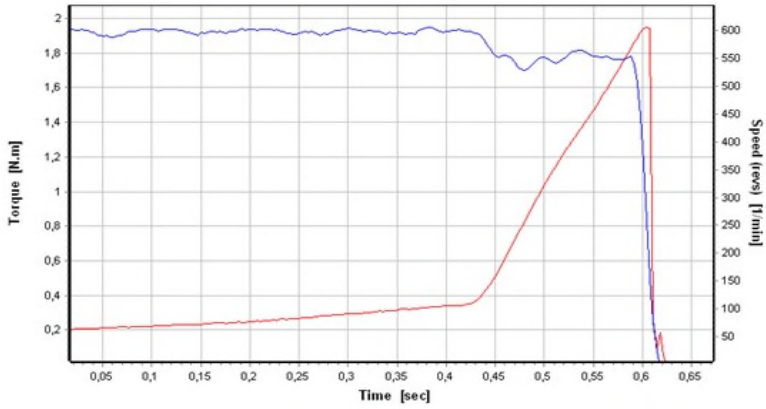
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1012**

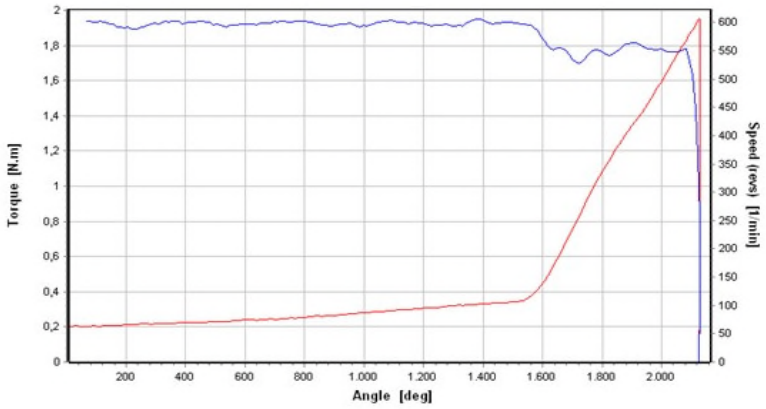
Angle degree: **360°**
Test torque: **2,0 Nm**



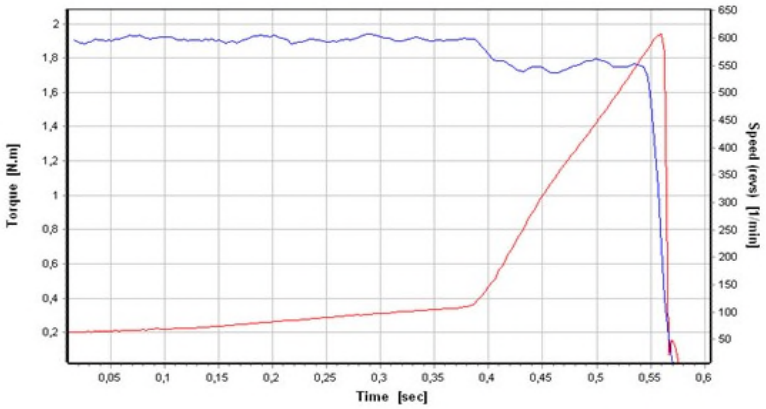
Value no. 1
Graph
Torque / Angle / Speed



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 600 rpm	40,0 %
Single-stage tightening system	☐	Speed 100 %	1500 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1012**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 3,42 Nm

Hard joint (H)	20,22	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,72	Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	3,08 - 3,76 Nm	3,08 - 3,76 Nm
	Tolerance down / up	10 %	10 %
	Average torque	3,37 Nm	3,44 Nm
	Standard deviation	0,01 Nm	0,01 Nm
	Torque scatter (99,73%)	0,08 Nm	0,06 Nm
	C_m	8,73	11,70
	C_{mk}	7,44	11,02

b)	Min. C_m hard/soft (lowest value)	8,73
	Min. C_{mk} hard/soft (lowest value)	7,44

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

Note:

Machine Capability Study
Control System

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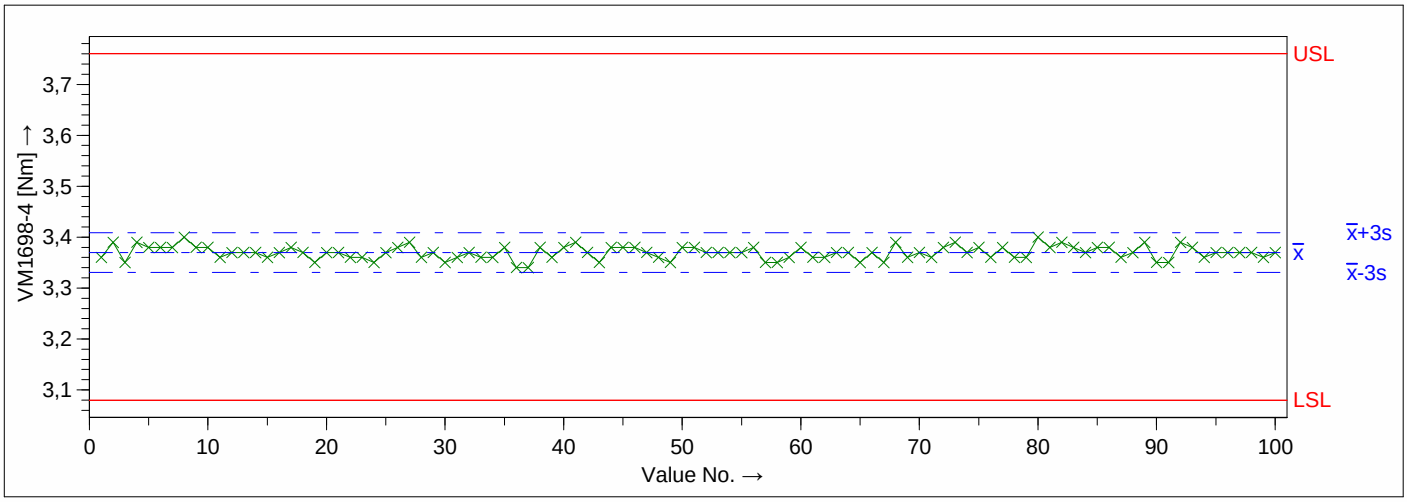
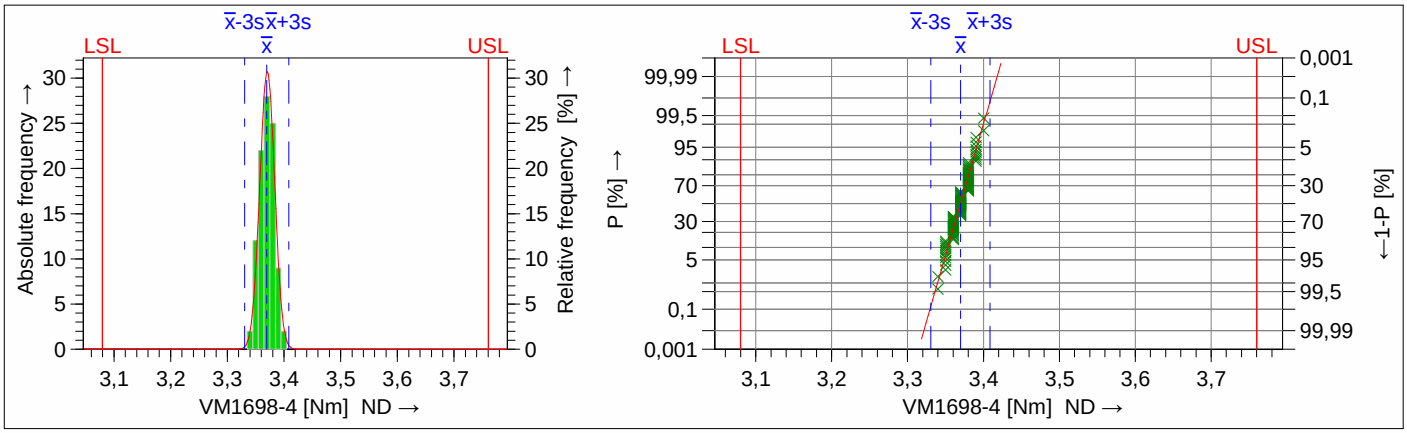
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_h	Char.Descr.	VM1698-4	Nom.val. 3,42 / 0,34	USL 3,76
		Serial No.	1024210	Unit Nm / -0,34	LSL 3,08
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 07:00:28 to 13.11.2023 07:12:02

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.3697
LSL	3.08	x_{min}	3.34	$\bar{x}$-3s	3.3307
USL	3.76	x_{max}	3.40	$\bar{x}$+3s	3.4087
T	0.68	R	0.06	6s	0.0779
		$n_{<T>}$	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	8.73
Critical capability index	=	C_{mk}	7.44

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\AZDEU-DFS01\Europe\Westhausen\Quality\QWE\Messwert\2023\IJJ1012_hM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_h	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	3,42
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,08
				USL	3,76
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	3,36	3,39	3,35	3,39	3,38	3,38	3,38	3,40	3,38	3,38
1024210	VM1698-4	Grad	28,75	29,00	28,75	29,50	29,50	29,00	28,75	29,25	29,50	29,25

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	3,36	3,37	3,37	3,37	3,36	3,37	3,38	3,37	3,35	3,37
1024210	VM1698-4	Grad	29,00	29,75	29,75	30,00	29,50	29,25	29,50	29,50	29,75	29,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	3,37	3,36	3,36	3,35	3,37	3,38	3,39	3,36	3,37	3,35
1024210	VM1698-4	Grad	29,25	29,75	30,00	29,50	29,50	29,75	29,25	30,00	30,50	29,75

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

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	3,39	3,37	3,35	3,38	3,38	3,38	3,37	3,36	3,35	3,38
1024210	VM1698-4	Grad	30,00	30,00	29,50	30,00	29,50	29,75	30,00	29,75	28,75	30,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	3,38	3,37	3,37	3,37	3,37	3,38	3,35	3,35	3,36	3,38
1024210	VM1698-4	Grad	29,25	30,00	30,50	30,25	30,00	30,50	30,00	29,00	30,25	29,50

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	3,36	3,36	3,37	3,37	3,35	3,37	3,35	3,39	3,36	3,37
1024210	VM1698-4	Grad	30,00	30,00	30,00	29,75	29,75	30,25	29,75	30,25	29,50	30,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,36	3,38	3,39	3,37	3,38	3,36	3,38	3,36	3,36	3,40
1024210	VM1698-4	Grad	30,00	29,75	29,50	30,25	30,25	29,00	29,75	29,25	29,25	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_h	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	3,42
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,08
				USL	3,76
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	3,38	3,39	3,38	3,37	3,38	3,38	3,36	3,37	3,39	3,35
1024210	VM1698-4	Grad	29,50	30,25	30,00	30,25	29,50	31,00	29,75	30,00	29,75	30,50

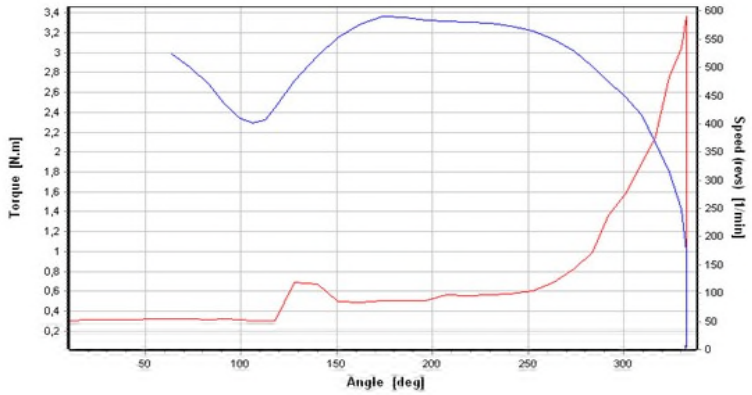
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,35	3,39	3,38	3,36	3,37	3,37	3,37	3,37	3,36	3,37
1024210	VM1698-4	Grad	30,00	30,25	29,25	30,00	29,50	29,50	29,75	29,75	29,25	30,00

Torque graphs

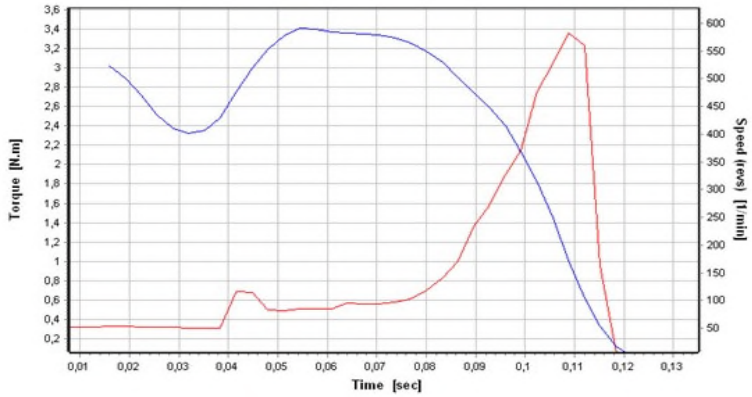
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1012**

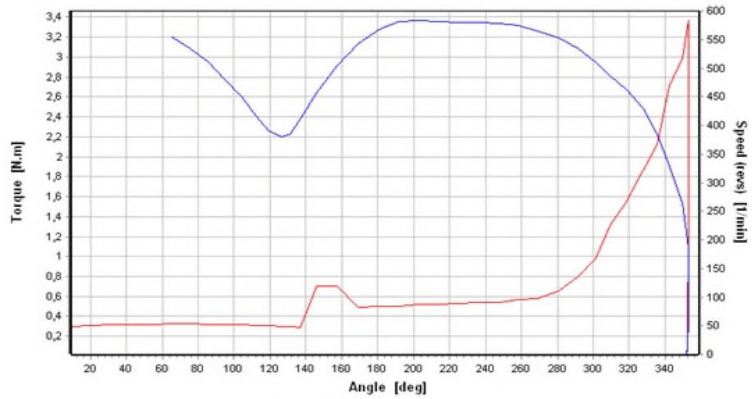
Angle degree: **30°**
Test torque: **3,4 Nm**



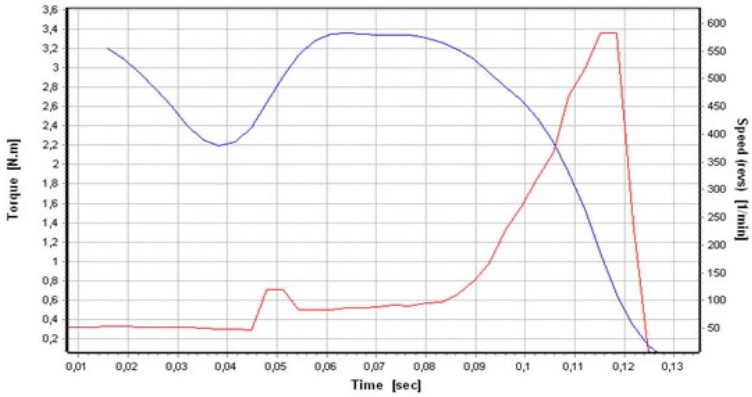
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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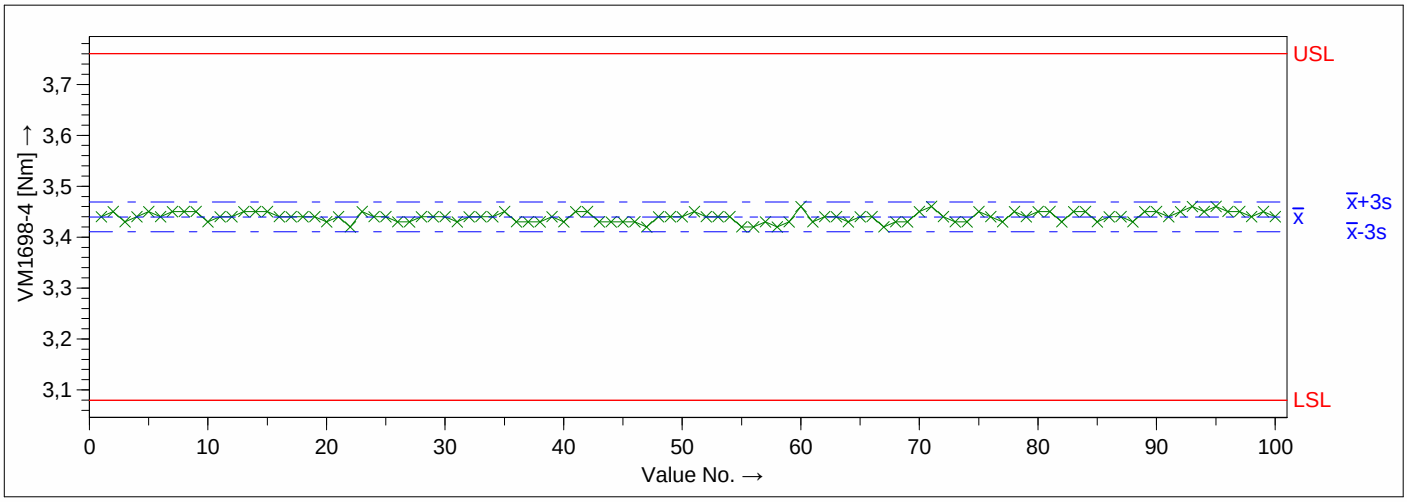
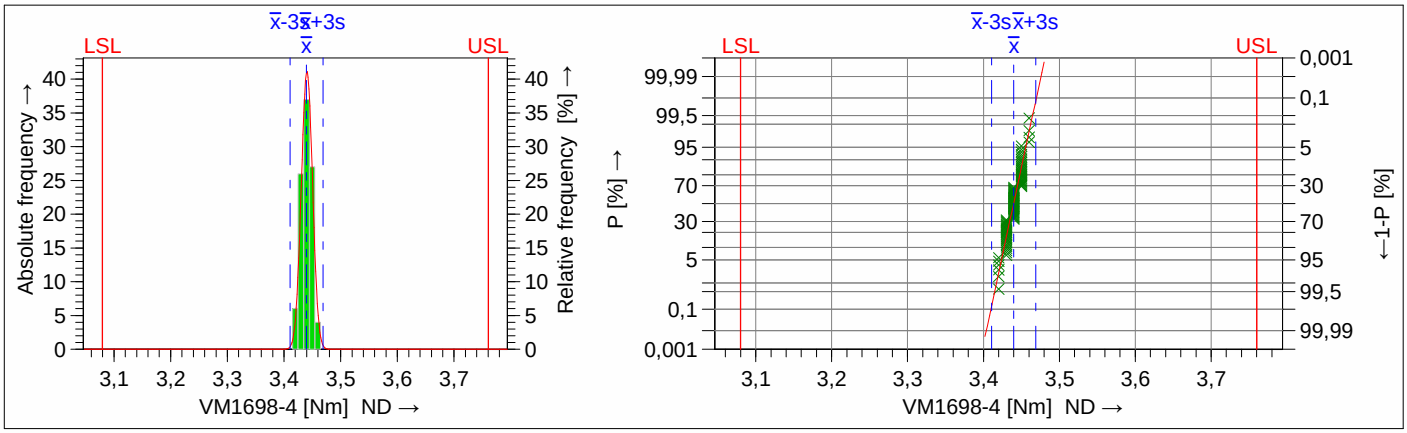
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_g	Char.Descr.	VM1698-4	Nom.val. 3,42 0,34	USL 3,76
		Serial No.	1024210	Unit Nm -0,34	LSL 3,08
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 06:48:06 to 13.11.2023 06:59:39

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.4397
LSL	3.08	x_{min}	3.42	$\bar{x}$-3s	3.4106
USL	3.76	x_{max}	3.46	$\bar{x}$+3s	3.4688
T	0.68	R	0.04	6s	0.0581
		$n_{<T>}$	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	11.70
Critical capability index	=	C_{mk}	11.02

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_g	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	3,42
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,08
				USL	3,76
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	3,44	3,45	3,43	3,44	3,45	3,44	3,45	3,45	3,45	3,43
1024210	VM1698-4	Grad	364,25	368,50	363,50	364,50	368,00	366,25	366,75	368,25	368,00	367,25

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	3,44	3,44	3,45	3,45	3,45	3,44	3,44	3,44	3,44	3,43
1024210	VM1698-4	Grad	368,50	363,25	362,25	360,50	363,25	360,50	359,50	364,00	362,50	360,50

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	3,44	3,42	3,45	3,44	3,44	3,43	3,43	3,44	3,44	3,44
1024210	VM1698-4	Grad	363,50	360,75	362,25	359,00	363,50	361,00	343,50	358,50	363,25	364,25

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	3,43	3,44	3,44	3,44	3,45	3,43	3,43	3,43	3,44	3,43
1024210	VM1698-4	Grad	361,00	359,25	361,25	361,25	364,50	362,25	358,25	360,50	360,25	362,00

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	3,45	3,45	3,43	3,43	3,43	3,43	3,42	3,44	3,44	3,44
1024210	VM1698-4	Grad	362,50	360,50	361,50	360,25	362,75	362,50	361,50	361,25	365,25	360,75

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	3,45	3,44	3,44	3,44	3,42	3,42	3,43	3,42	3,43	3,46
1024210	VM1698-4	Grad	361,50	362,00	365,25	363,75	360,00	361,75	364,00	362,50	362,50	362,75

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	3,43	3,44	3,44	3,43	3,44	3,44	3,42	3,43	3,43	3,45
1024210	VM1698-4	Grad	365,00	363,75	364,75	363,00	364,00	362,75	361,00	359,50	363,75	364,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,46	3,44	3,43	3,43	3,45	3,44	3,43	3,45	3,44	3,45
1024210	VM1698-4	Grad	367,25	366,50	362,25	362,25	360,00	363,00	366,25	363,50	364,25	363,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_g	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	3,42
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,08
				USL	3,76
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	3,45	3,43	3,45	3,45	3,43	3,44	3,44	3,43	3,45	3,45
1024210	VM1698-4	Grad	362,00	363,00	366,00	365,25	363,25	366,00	363,00	363,50	364,50	367,00

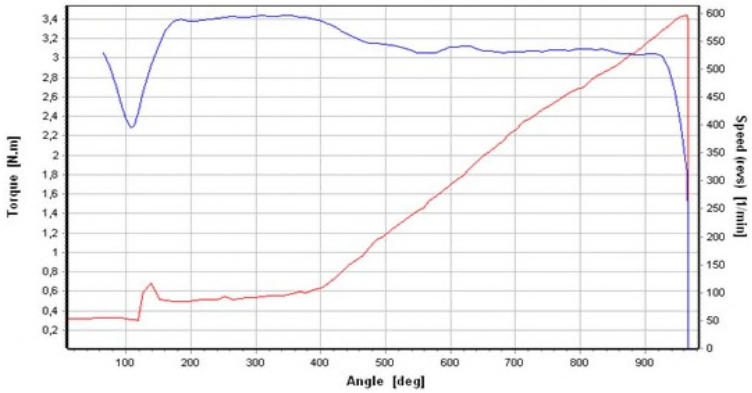
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,44	3,45	3,46	3,45	3,46	3,45	3,45	3,44	3,45	3,44
1024210	VM1698-4	Grad	365,25	366,00	364,25	364,00	366,50	367,00	363,00	368,25	362,75	362,75

Torque graphs

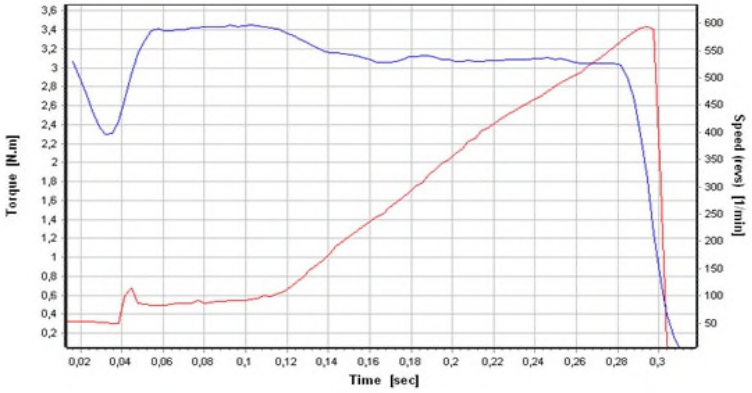
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1012**

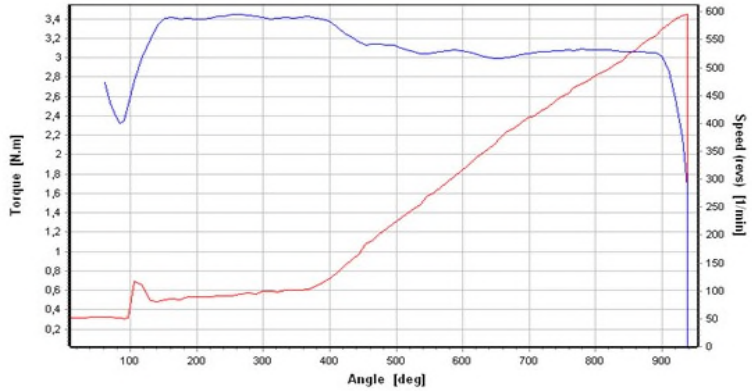
Angle degree: **360°**
Test torque: **3,4 Nm**



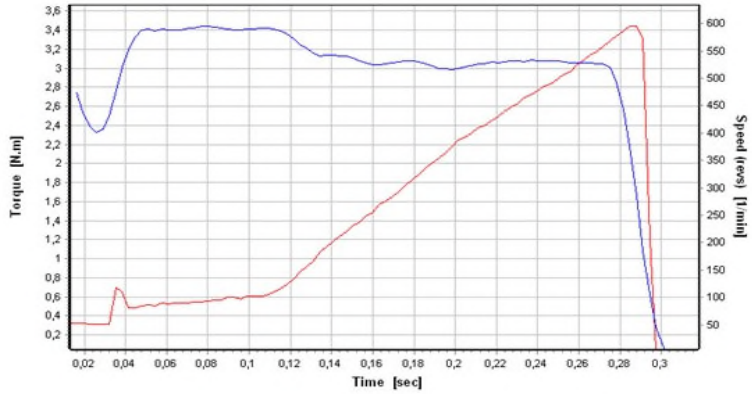
Value no. 1
Graph
Torque / Angle / Speed



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	40,0 %
Single-stage tightening system	☐	Speed 100 %	1500 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1012**

Test torque: Tq max. 4,00 Nm

Hard joint (H)	23,55 Nm / Revolution	Angle degree	30°
Soft joint (L)	2,03 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	3,60 - 4,40 Nm	3,60 - 4,40 Nm
	Tolerance down / up	10 %	10 %
	Average torque	3,92 Nm	4,06 Nm
	Standard deviation	0,03 Nm	0,01 Nm
	Torque scatter (99,73%)	0,15 Nm	0,06 Nm
	C_m	5,25	14,42
	C_{mk}	4,26	12,16

b)	Min. C_m hard/soft (lowest value)	5,25
	Min. C_{mk} hard/soft (lowest value)	4,26

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

Note:

Machine Capability Study
Control System

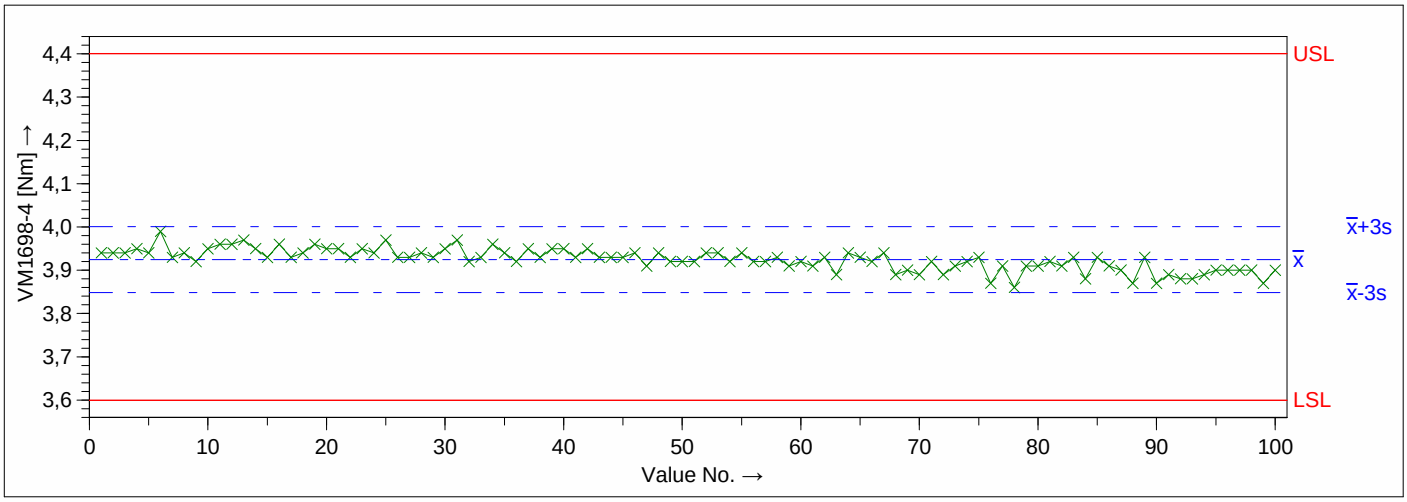
Cleco Production Tools

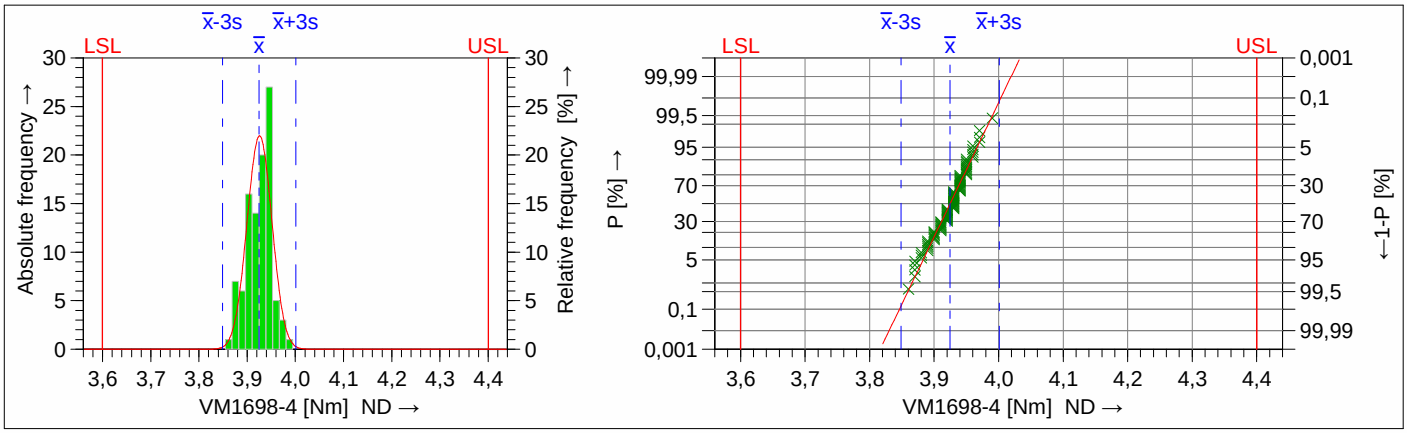
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_b	Char.Descr.	VM1698-4	Nom.val. 4,00 / 0,40	USL 4,40
		Serial No.	1024210	Unit Nm / -0,40	LSL 3,60
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 06:19:12 to 13.11.2023 06:30:46

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





Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	3.9248
LSL	3.60	x_{min}	3.86	$\bar{x}$-3s	3.8486
USL	4.40	x_{max}	3.99	$\bar{x}$+3s	4.0010
T	0.80	R	0.13	6s	0.1524
		$n_{<T>}$	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	5.25
Critical capability index	=	C_{mk}	4.26

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_b	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	4,00
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,60
				USL	4,40
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	3,94	3,94	3,94	3,95	3,94	3,99	3,93	3,94	3,92	3,95
1024210	VM1698-4	Grad	27,50	27,75	28,25	27,75	28,00	27,75	27,75	28,00	27,75	28,00

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	3,96	3,96	3,97	3,95	3,93	3,96	3,93	3,94	3,96	3,95
1024210	VM1698-4	Grad	28,50	28,00	29,00	27,75	27,75	28,25	27,25	29,00	27,75	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}
1024210	VM1698-4	Nm	3,95	3,93	3,95	3,94	3,97	3,93	3,93	3,94	3,93	3,95
1024210	VM1698-4	Grad	28,75	28,50	28,50	28,75	28,75	28,00	28,50	27,50	27,25	28,00

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	3,97	3,92	3,93	3,96	3,94	3,92	3,95	3,93	3,95	3,95
1024210	VM1698-4	Grad	28,00	27,75	28,50	28,25	28,50	27,75	28,00	28,25	28,50	28,00

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	3,93	3,95	3,93	3,93	3,93	3,94	3,91	3,94	3,92	3,92
1024210	VM1698-4	Grad	28,25	29,50	28,75	28,50	29,00	28,25	28,75	28,75	29,25	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	3,92	3,94	3,94	3,92	3,94	3,92	3,92	3,93	3,91	3,92
1024210	VM1698-4	Grad	29,25	29,50	29,75	30,25	29,50	30,00	29,25	29,75	30,00	29,50

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	3,91	3,93	3,89	3,94	3,93	3,92	3,94	3,89	3,90	3,89
1024210	VM1698-4	Grad	29,50	30,00	29,75	30,75	30,00	30,00	30,25	29,75	29,50	28,75

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	3,92	3,89	3,91	3,92	3,93	3,87	3,91	3,86	3,91	3,91
1024210	VM1698-4	Grad	29,75	29,50	30,50	29,75	30,25	29,25	30,00	29,50	29,75	30,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_b	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	4,00
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,60
				USL	4,40
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	3,92	3,91	3,93	3,88	3,93	3,91	3,90	3,87	3,93	3,87
1024210	VM1698-4	Grad	30,25	29,75	30,25	28,75	30,00	29,75	29,75	29,75	30,00	29,00

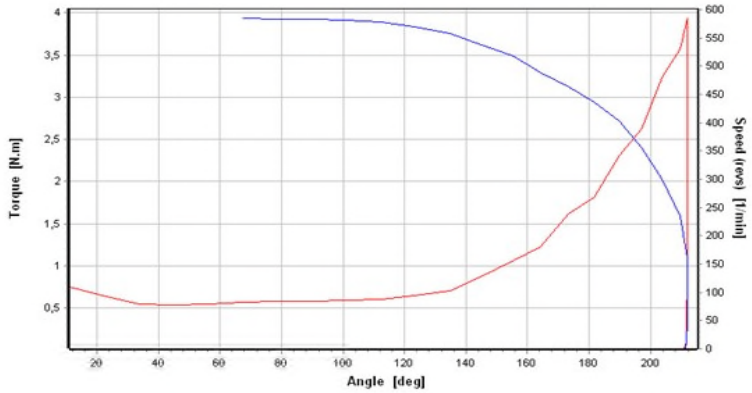
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,89	3,88	3,88	3,89	3,90	3,90	3,90	3,90	3,87	3,90
1024210	VM1698-4	Grad	29,50	28,75	29,50	29,50	29,75	30,25	30,00	30,75	30,25	30,00

Torque graphs

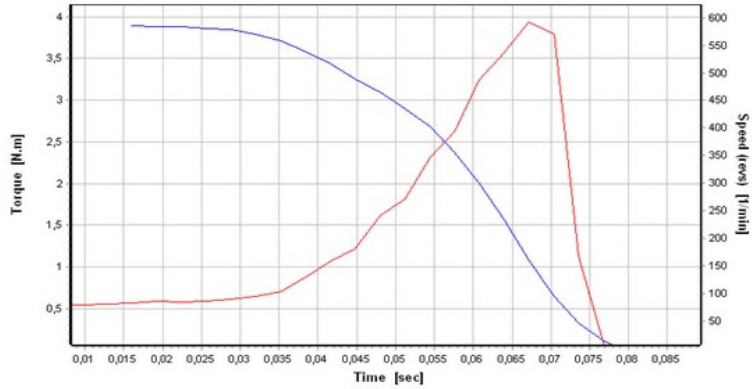
Machine Capability Study 100 %

Model: **CLBP04Q**
Serial no: **IJJ1012**

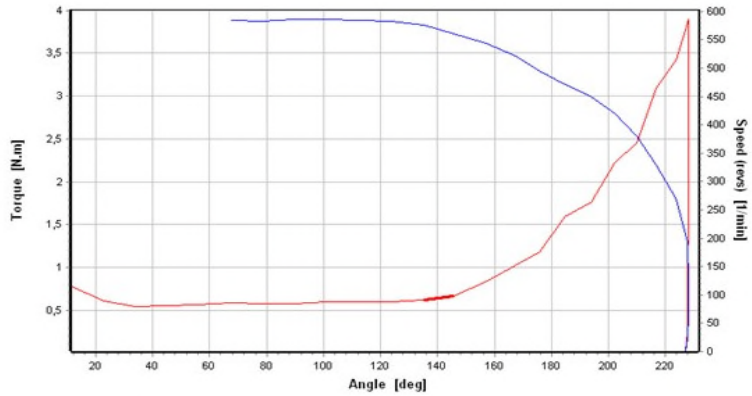
Angle degree: **30°**
Test torque: **4,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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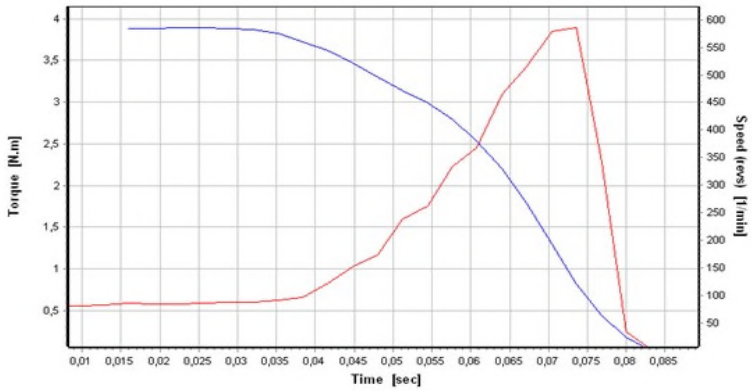
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

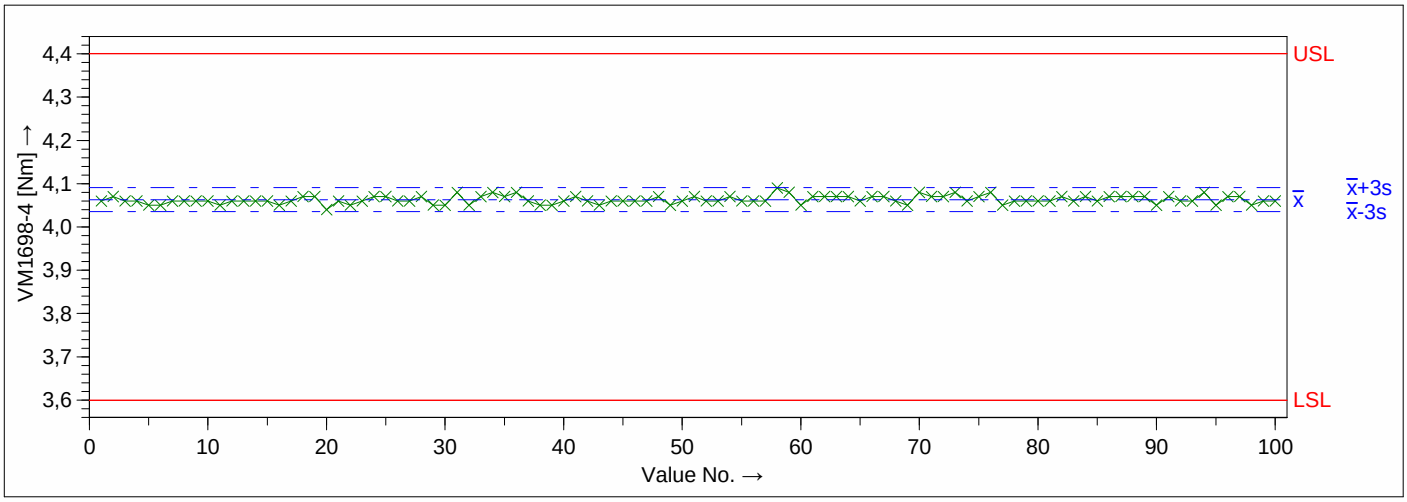
Cleco Production Tools

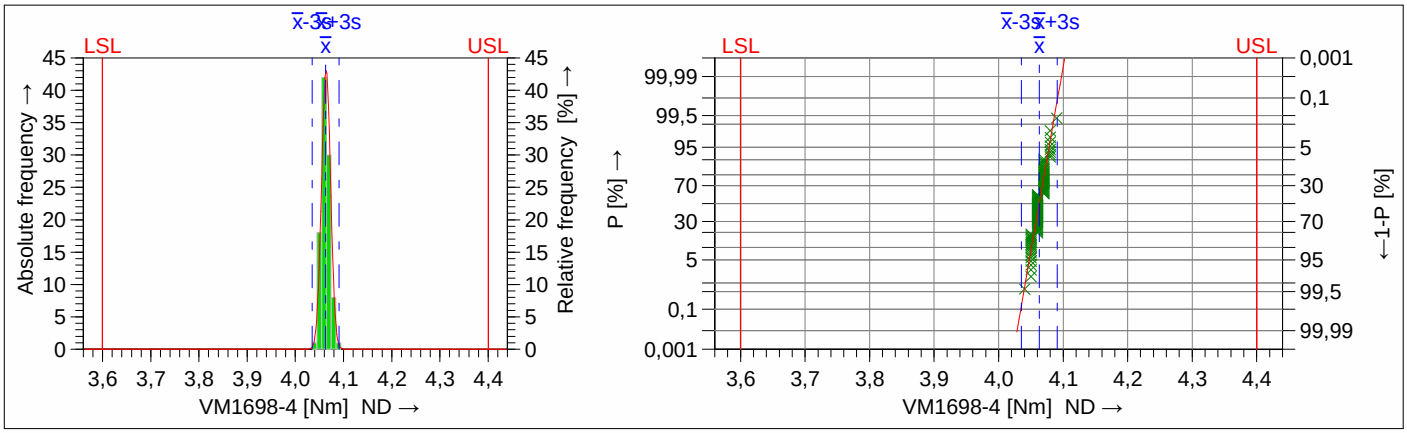
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1012_a	Char.Descr.	VM1698-4	Nom.val. 4,00 0,40	USL 4,40
		Serial No.	1024210	Unit Nm -0,40	LSL 3,60
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 06:06:26 to 13.11.2023 06:18:00

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





Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	4.0629
LSL	3.60	x_{min}	4.04	$\bar{x}$-3s	4.0352
USL	4.40	x_{max}	4.09	$\bar{x}$+3s	4.0906
T	0.80	R	0.05	6s	0.0555
		$n_{<T>}$	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	14.42
Critical capability index	=	C_{mk}	12.16

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_a	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	4,00
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,60
				USL	4,40
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	4,06	4,07	4,06	4,06	4,05	4,05	4,06	4,06	4,06	4,06
1024210	VM1698-4	Grad	368,00	367,25	366,00	364,00	364,75	362,75	361,00	365,75	367,75	367,25

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	4,05	4,06	4,06	4,06	4,06	4,05	4,06	4,07	4,07	4,04
1024210	VM1698-4	Grad	365,50	365,25	359,50	366,25	365,50	361,50	365,25	368,25	367,00	365,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	4,06	4,05	4,06	4,07	4,07	4,06	4,06	4,07	4,05	4,05
1024210	VM1698-4	Grad	363,50	361,75	366,50	367,25	367,50	366,75	366,25	366,00	362,50	365,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	4,08	4,05	4,07	4,08	4,07	4,08	4,06	4,05	4,05	4,06
1024210	VM1698-4	Grad	367,00	366,00	367,25	365,75	367,75	365,75	365,75	365,50	366,75	366,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	4,07	4,06	4,05	4,06	4,06	4,06	4,06	4,07	4,05	4,06
1024210	VM1698-4	Grad	367,25	367,25	363,00	367,00	364,50	364,00	366,50	365,75	364,50	366,75

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	4,07	4,06	4,06	4,07	4,06	4,06	4,06	4,09	4,08	4,05
1024210	VM1698-4	Grad	366,75	367,50	369,50	357,50	364,25	360,25	362,50	363,00	360,75	360,75

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	4,07	4,07	4,07	4,07	4,06	4,07	4,07	4,06	4,05	4,08
1024210	VM1698-4	Grad	359,00	361,25	361,50	357,25	362,25	361,75	363,50	361,25	358,50	362,25

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	4,07	4,07	4,08	4,06	4,07	4,08	4,05	4,06	4,06	4,06
1024210	VM1698-4	Grad	362,25	359,00	364,00	360,50	363,00	363,00	360,25	360,50	364,50	363,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1012_a	Characteristic			
Part type	CLBP04Q	Char.Descr.	VM1698-4	Nom.val.	4,00
Ord. No.	CLBP04Q	Serial No.	1024210	LSL	3,60
				USL	4,40
Remark	TQ 100% soft +/-10% * Speed: 600 rpm				

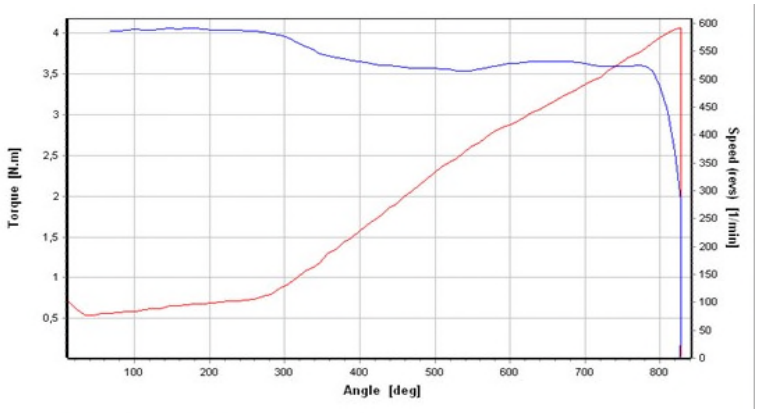
Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	4,06	4,07	4,06	4,07	4,06	4,07	4,07	4,07	4,07	4,05
1024210	VM1698-4	Grad	360,25	364,75	358,50	361,75	358,75	366,50	362,00	365,00	361,75	357,50

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	4,07	4,06	4,06	4,08	4,05	4,07	4,07	4,05	4,06	4,06
1024210	VM1698-4	Grad	365,00	360,50	362,25	367,00	358,50	362,25	361,75	362,50	363,25	360,75

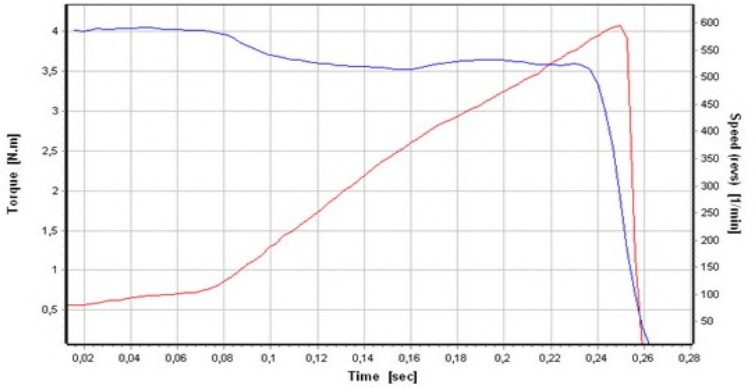
Torque graphs

Model: **CLBP04Q**
Serial no: **IJJ1012**

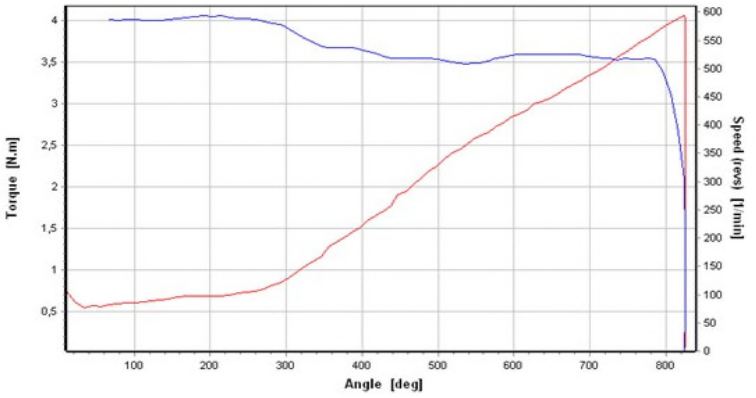
Machine Capability Study 100 %
Angle degree: **360°**
Test torque: **4,0 Nm**



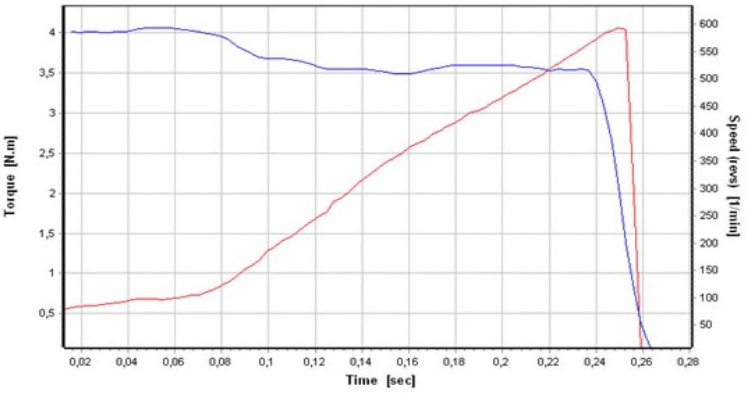
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed