Homologation

Cordless Assembly Tools

Model: CLBP04Q

Serial no.: IJJ1013

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Homologation: CLBP04Q SN: IJJ1013

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Test sheet no. 2

Machine Capability Study 30 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1013**

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

Hard joint (H)	12,16	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,01	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	2,03 Nm	2,03 Nm
	Standard deviation	0,02 Nm	0,02 Nm
	Torque scatter (99,73%)	0,11 Nm	0,13 Nm
	C_m	3,52	3,17
	C_{mk}	2,51	2,28

b)	Min. C_m hard/soft (lowest value)	3,17
	Min. C_{mk} hard/soft (lowest value)	2,28

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

Note:

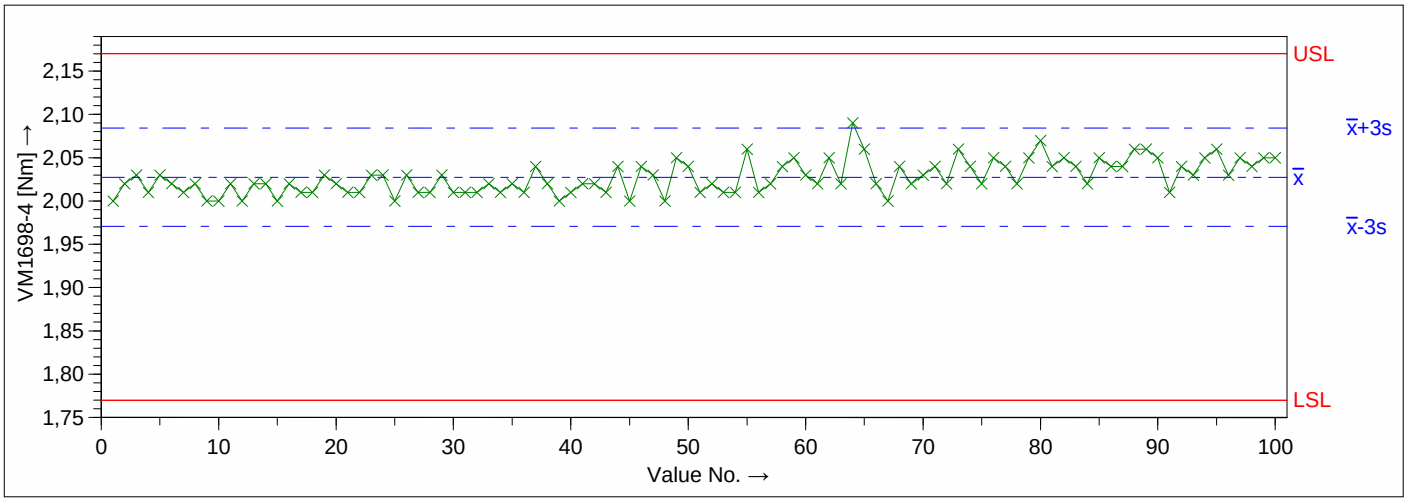
Machine Capability Study
Control System

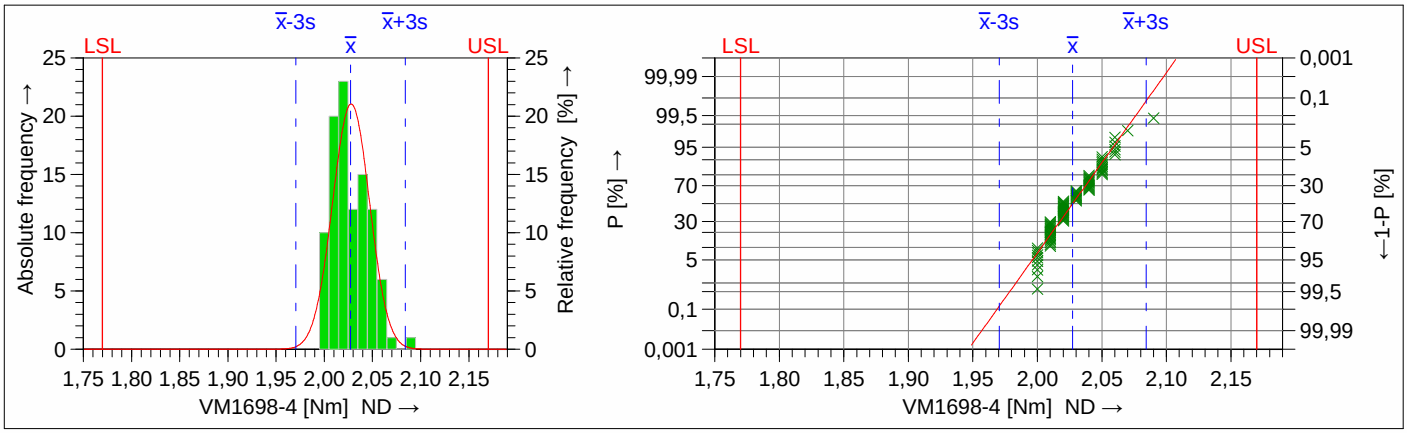
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_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 11:09:04 to 13.11.2023 11:20:37

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





Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	2.0274
LSL	1.77	x_{min}	2.00	$\bar{x}$-3s	1.9706
USL	2.17	x_{max}	2.09	$\bar{x}$+3s	2.0842
T	0.40	R	0.09	6s	0.1137
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	3.52
Critical capability index	=	C_{mk}	2.51

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.	IJJ1013_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	2,00	2,02	2,03	2,01	2,03	2,02	2,01	2,02	2,00	2,00
1024210	VM1698-4	Grad	31,27	31,05	31,27	31,27	32,40	31,05	30,83	31,27	30,60	30,83

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	2,02	2,00	2,02	2,02	2,00	2,02	2,01	2,01	2,03	2,02
1024210	VM1698-4	Grad	30,15	29,92	31,27	30,60	30,38	31,05	31,05	30,60	31,50	32,63

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	2,01	2,01	2,03	2,03	2,00	2,03	2,01	2,01	2,03	2,01
1024210	VM1698-4	Grad	30,83	30,15	30,83	33,30	29,92	30,83	30,38	29,25	30,83	31,95

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	2,01	2,01	2,02	2,01	2,02	2,01	2,04	2,02	2,00	2,01
1024210	VM1698-4	Grad	29,70	29,92	31,05	30,38	30,38	31,27	31,05	31,50	29,70	31,05

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	2,02	2,02	2,01	2,04	2,00	2,04	2,03	2,00	2,05	2,04
1024210	VM1698-4	Grad	30,15	31,73	32,17	31,27	30,15	30,15	30,38	31,05	32,17	30,83

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	2,01	2,02	2,01	2,01	2,06	2,01	2,02	2,04	2,05	2,03
1024210	VM1698-4	Grad	30,38	31,73	31,27	31,05	31,05	29,02	29,02	30,15	31,95	29,70

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	2,02	2,05	2,02	2,09	2,06	2,02	2,00	2,04	2,02	2,03
1024210	VM1698-4	Grad	31,27	29,92	29,02	31,73	29,92	31,73	30,15	31,95	30,38	29,70

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	2,04	2,02	2,06	2,04	2,02	2,05	2,04	2,02	2,05	2,07
1024210	VM1698-4	Grad	30,38	28,13	30,15	29,25	28,58	30,15	29,25	29,02	30,38	30,15

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	2,04	2,05	2,04	2,02	2,05	2,04	2,04	2,06	2,06	2,05
1024210	VM1698-4	Grad	29,25	30,38	30,60	29,92	31,05	29,02	29,92	30,60	30,83	29,70

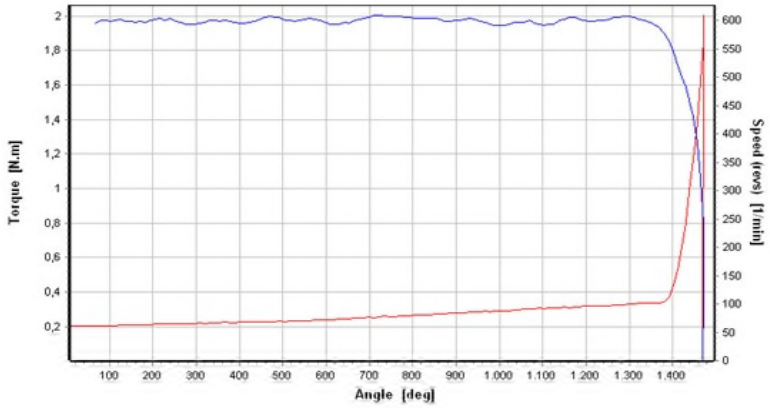
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	2,01	2,04	2,03	2,05	2,06	2,03	2,05	2,04	2,05	2,05
1024210	VM1698-4	Grad	29,70	29,92	30,15	29,25	30,60	29,25	30,15	29,48	31,27	30,38

Torque graphs

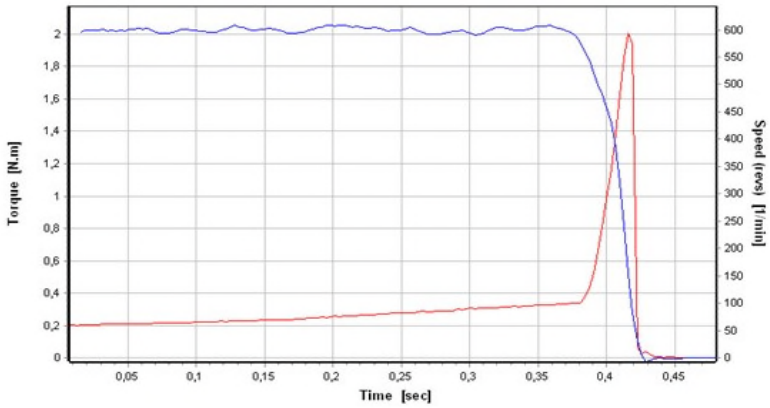
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

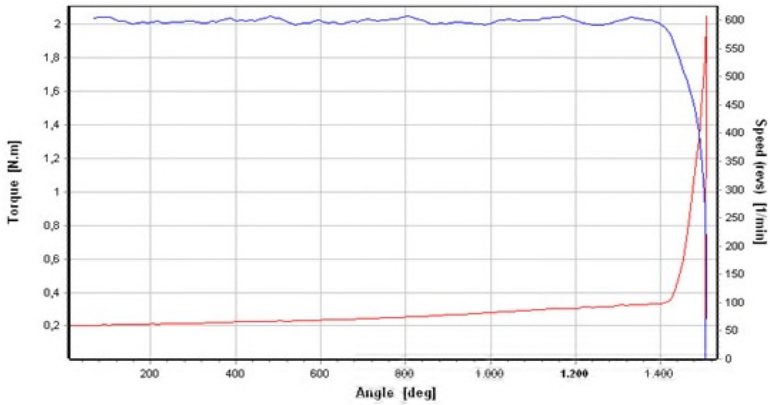
Angle degree: **30°**
Test torque: **2,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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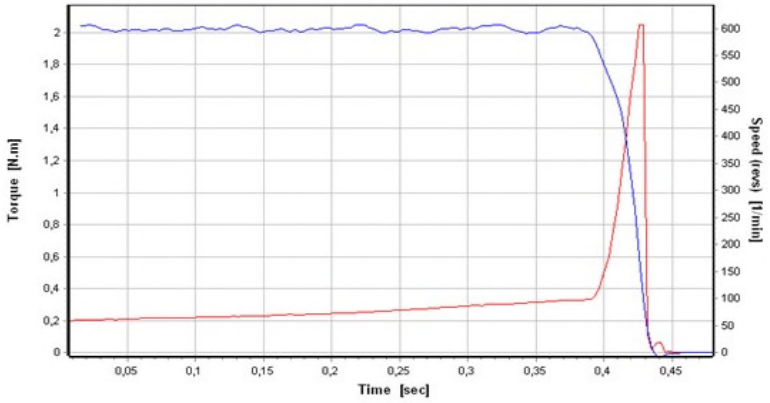
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

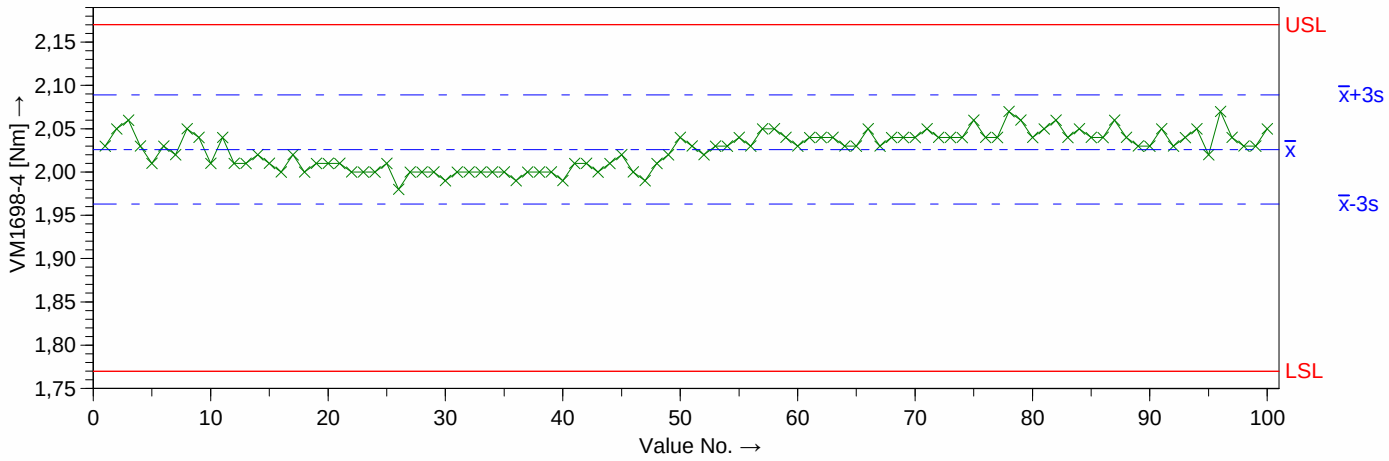
Machine Capability Study
Control System

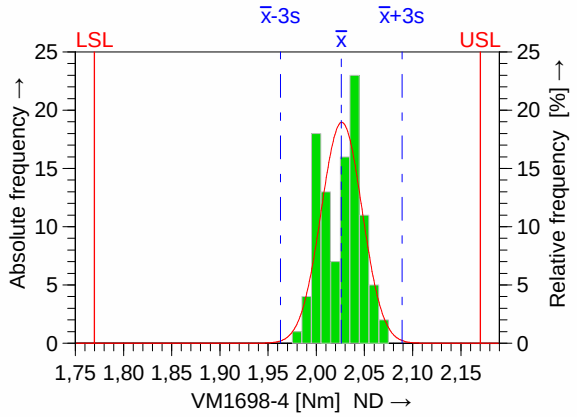
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

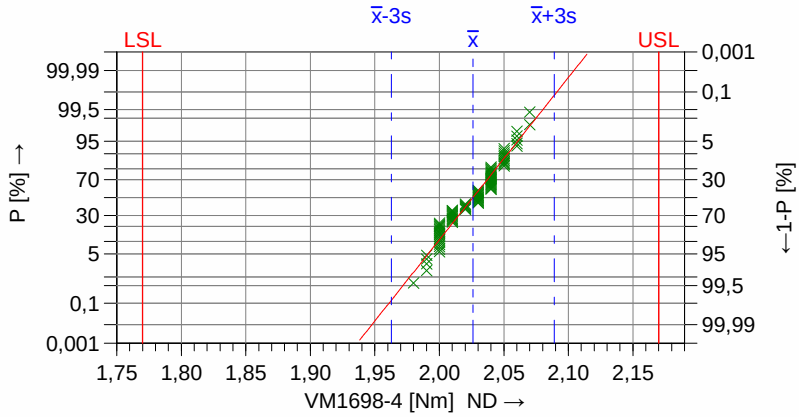
Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_c	Char.Descr.	VM1698-4	Nom.val. 1,97 0,20	USL 2,17
		Serial No.	1024210	Unit Nm -0,20	LSL 1,77
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	2/1033809	nges.	100

Evaluation from 13.11.2023 11:22:54 to 13.11.2023 11:38:26

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







Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	2.0260
LSL	1.77	x_{min}	1.98	$\bar{x}$-3s	1.9629
USL	2.17	x_{max}	2.07	$\bar{x}$+3s	2.0891
T	0.40	R	0.09	6s	0.1262
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	3.17
Critical capability index	=	C_{mk}	2.28

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	2,03	2,05	2,06	2,03	2,01	2,03	2,02	2,05	2,04	2,01
1024210	VM1698-4	Grad	358,65	363,83	368,10	359,33	355,50	357,98	355,05	366,75	361,35	354,38

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	2,04	2,01	2,01	2,02	2,01	2,00	2,02	2,00	2,01	2,01
1024210	VM1698-4	Grad	363,38	352,35	351,67	354,83	350,33	352,35	354,38	350,33	359,33	355,05

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	2,01	2,00	2,00	2,00	2,01	1,98	2,00	2,00	2,00	1,99
1024210	VM1698-4	Grad	357,52	353,70	353,48	355,27	359,33	349,42	354,60	360,23	354,38	355,27

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	2,00	2,00	2,00	2,00	2,00	1,99	2,00	2,00	2,00	1,99
1024210	VM1698-4	Grad	359,55	355,05	356,17	358,65	356,85	352,58	355,95	355,50	358,88	352,80

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	2,01	2,01	2,00	2,01	2,02	2,00	1,99	2,01	2,02	2,04
1024210	VM1698-4	Grad	359,33	361,35	356,40	359,10	362,02	357,30	352,35	360,90	362,48	361,80

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	2,03	2,02	2,03	2,03	2,04	2,03	2,05	2,05	2,04	2,03
1024210	VM1698-4	Grad	357,75	360,00	361,58	363,60	363,38	363,83	365,85	369,23	362,25	361,80

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	2,04	2,04	2,04	2,03	2,03	2,05	2,03	2,04	2,04	2,04
1024210	VM1698-4	Grad	363,60	362,48	362,92	361,35	360,23	369,00	361,58	362,25	363,83	364,05

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	2,05	2,04	2,04	2,04	2,06	2,04	2,04	2,07	2,06	2,04
1024210	VM1698-4	Grad	365,85	365,63	366,75	365,40	372,15	366,30	366,75	373,27	364,50	358,42

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	2,05	2,06	2,04	2,05	2,04	2,04	2,06	2,04	2,03	2,03
1024210	VM1698-4	Grad	360,23	362,25	359,77	358,88	357,52	356,85	367,65	360,00	357,30	353,25

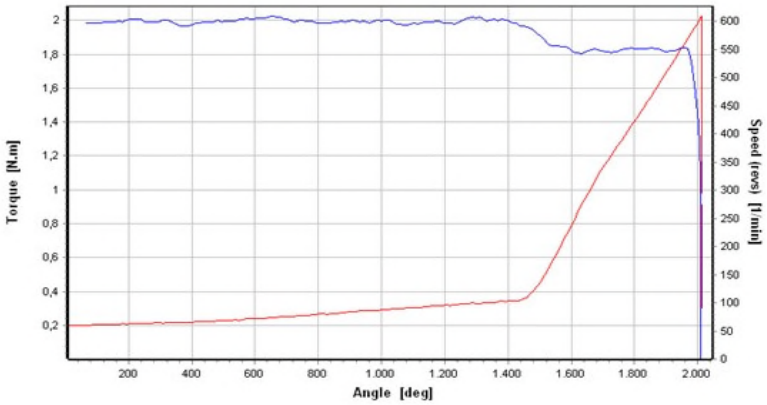
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	2,05	2,03	2,04	2,05	2,02	2,07	2,04	2,03	2,03	2,05
1024210	VM1698-4	Grad	359,10	351,90	357,98	361,35	351,00	365,85	359,33	354,83	353,48	357,52

Torque graphs

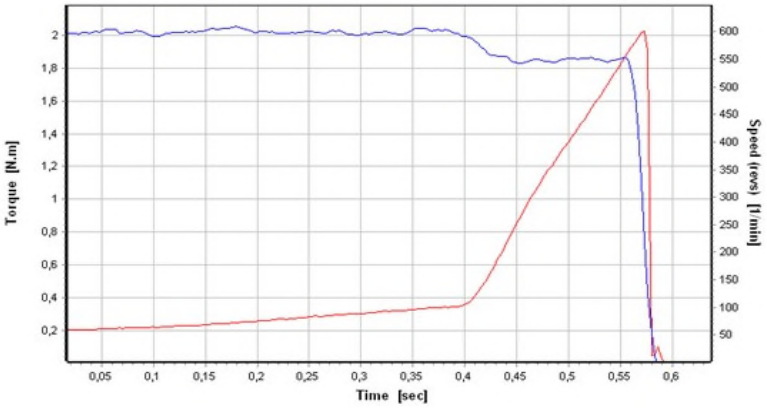
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

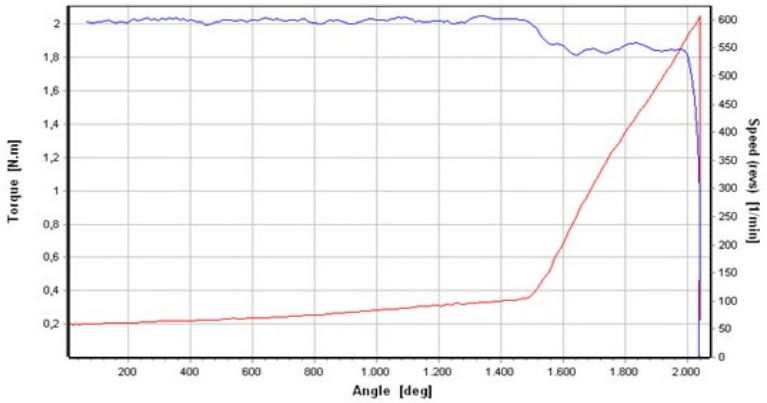
Angle degree: **360°**
Test torque: **2,0 Nm**



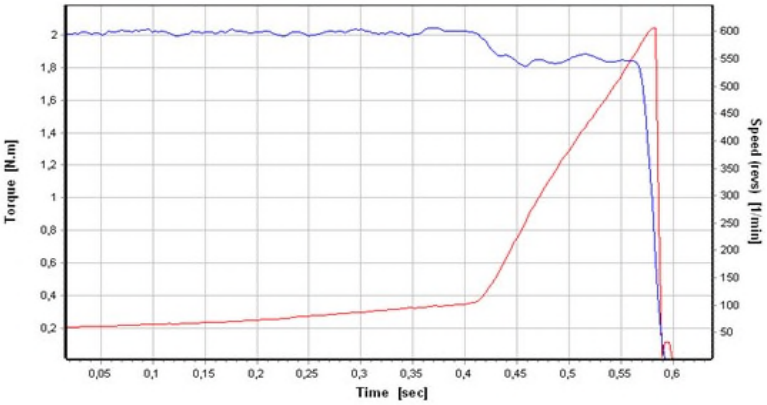
Value no. 1
Graph
Torque / Angle / Speed



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: **IJJ1013**

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

Hard joint (H)	20,23	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,70	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	3,41 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,11 Nm	0,09 Nm
	C_m	5,93	7,67
	C_{mk}	5,09	7,42

b)	Min. C_m hard/soft (lowest value)	5,93
	Min. C_{mk} hard/soft (lowest value)	5,09

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

Note:

Machine Capability Study
Control System

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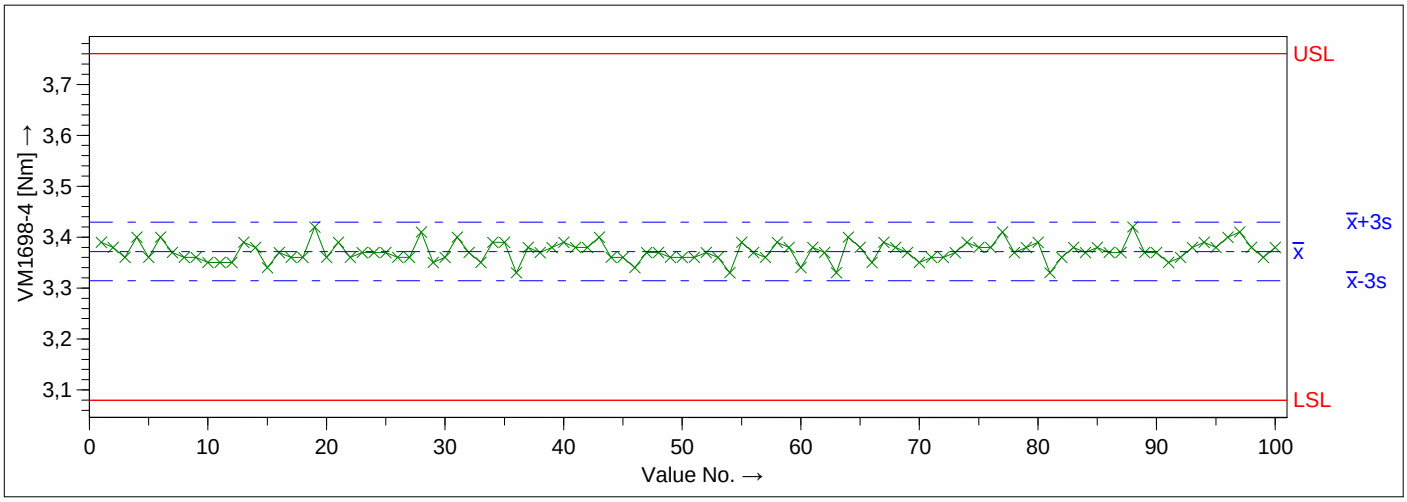
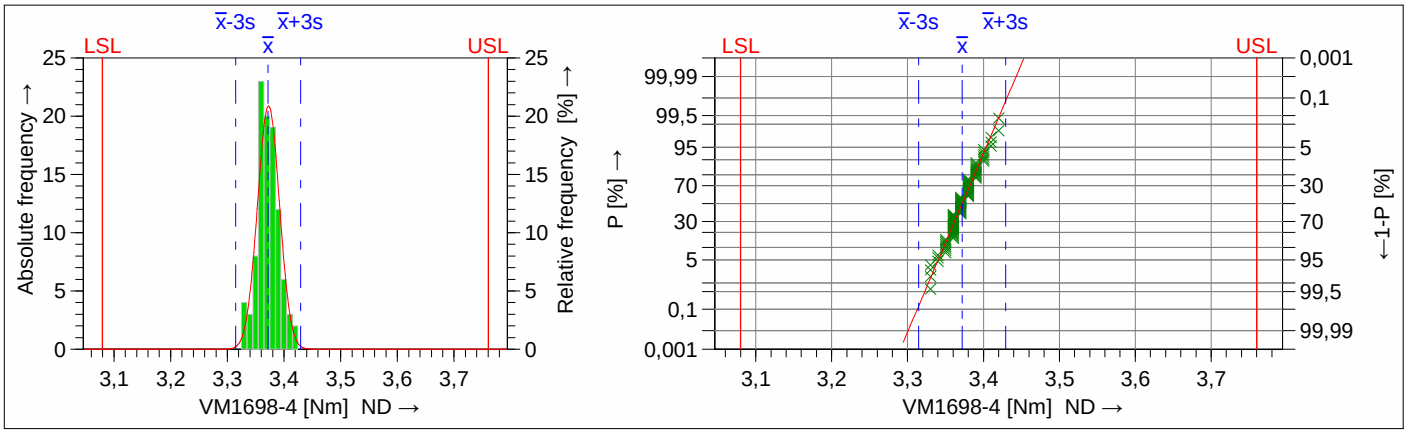
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_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 11:59:02 to 13.11.2023 12:10:35

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.3719
LSL	3.08	x_{min}	3.33	$\bar{x}$-3s	3.3146
USL	3.76	x_{max}	3.42	$\bar{x}$+3s	3.4292
T	0.68	R	0.09	6s	0.1146
		$n_{<T>}$	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	5.93
Critical capability index	=	C_{mk}	5.09

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.	IJJ1013_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	3,39	3,38	3,36	3,40	3,36	3,40	3,37	3,36	3,36	3,35
1024210	VM1698-4	Grad	30,25	30,00	28,00	28,75	29,50	29,50	28,00	30,00	28,25	29,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	3,35	3,35	3,39	3,38	3,34	3,37	3,36	3,36	3,42	3,36
1024210	VM1698-4	Grad	29,25	28,50	30,25	30,75	30,00	28,75	28,75	29,50	30,25	30,50

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	3,39	3,36	3,37	3,37	3,37	3,36	3,36	3,41	3,35	3,36
1024210	VM1698-4	Grad	30,25	28,50	29,50	29,25	30,25	29,50	30,00	31,25	30,00	29,00

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	3,40	3,37	3,35	3,39	3,39	3,33	3,38	3,37	3,38	3,39
1024210	VM1698-4	Grad	31,75	30,75	28,75	30,75	30,25	29,75	30,25	29,00	29,75	30,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	3,38	3,38	3,40	3,36	3,36	3,34	3,37	3,37	3,36	3,36
1024210	VM1698-4	Grad	29,50	30,75	31,25	29,75	30,50	29,00	28,50	97,00	28,50	29,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	3,36	3,37	3,36	3,33	3,39	3,37	3,36	3,39	3,38	3,34
1024210	VM1698-4	Grad	29,00	31,00	29,25	29,75	30,50	29,75	29,50	31,00	30,75	29,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	3,38	3,37	3,33	3,40	3,38	3,35	3,39	3,38	3,37	3,35
1024210	VM1698-4	Grad	29,75	29,25	29,50	30,00	30,25	28,25	29,75	30,75	28,25	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	3,36	3,36	3,37	3,39	3,38	3,38	3,41	3,37	3,38	3,39
1024210	VM1698-4	Grad	29,00	29,25	30,50	30,00	28,50	29,75	30,75	30,25	30,50	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	3,33	3,36	3,38	3,37	3,38	3,37	3,37	3,42	3,37	3,37
1024210	VM1698-4	Grad	30,00	30,25	30,00	28,75	30,75	29,50	29,25	30,25	30,75	30,50

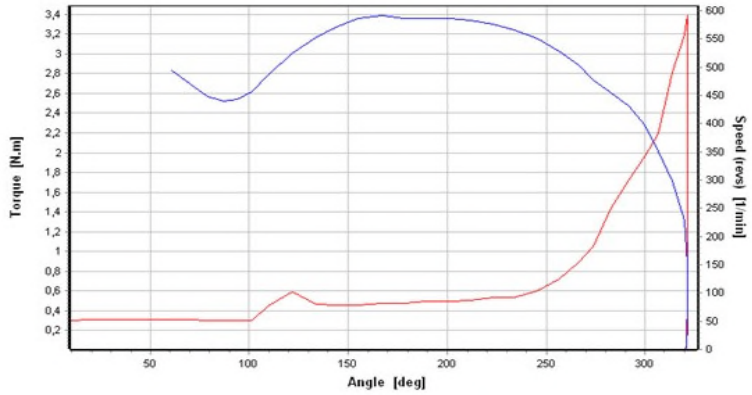
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,35	3,36	3,38	3,39	3,38	3,40	3,41	3,38	3,36	3,38
1024210	VM1698-4	Grad	29,75	30,50	30,25	30,00	30,50	31,00	29,75	30,00	30,00	30,75

Torque graphs

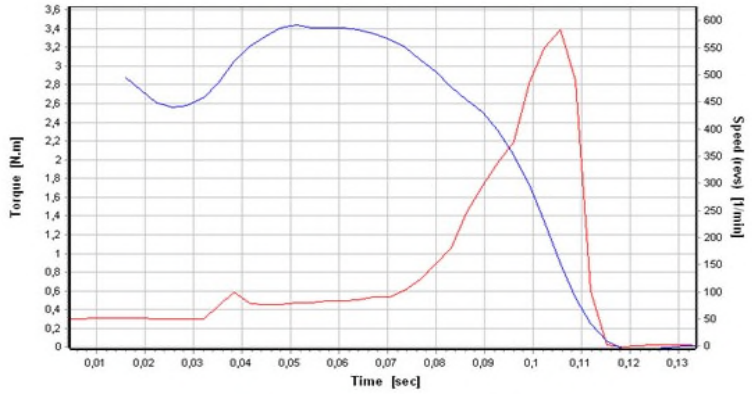
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

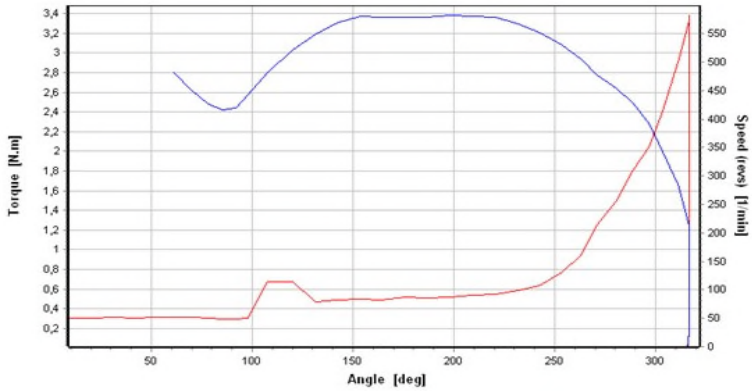
Angle degree: **30°**
Test torque: **3,4 Nm**



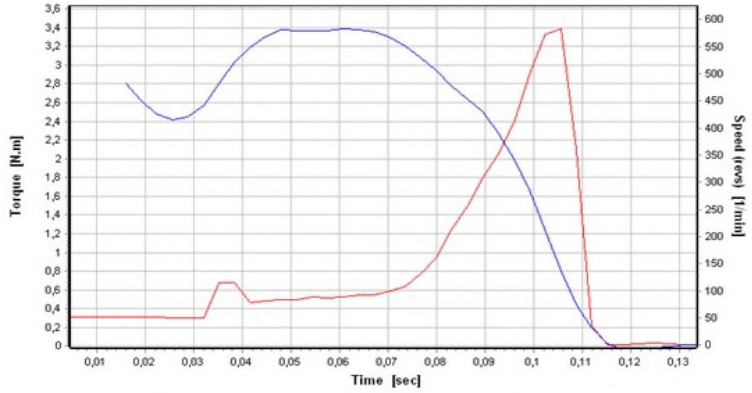
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

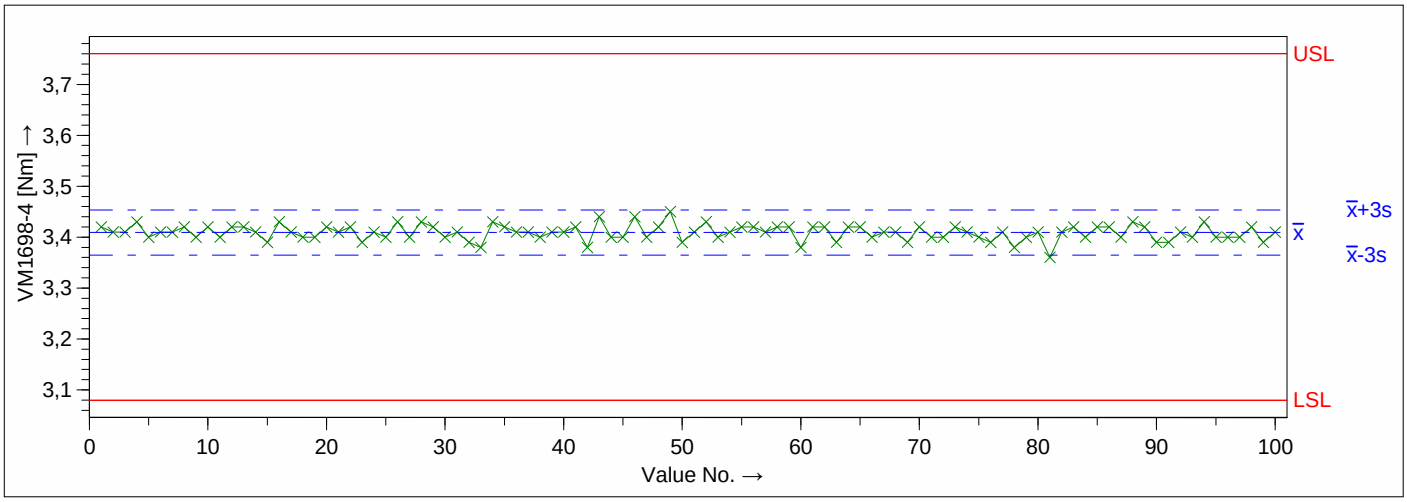
Machine Capability Study
Control System

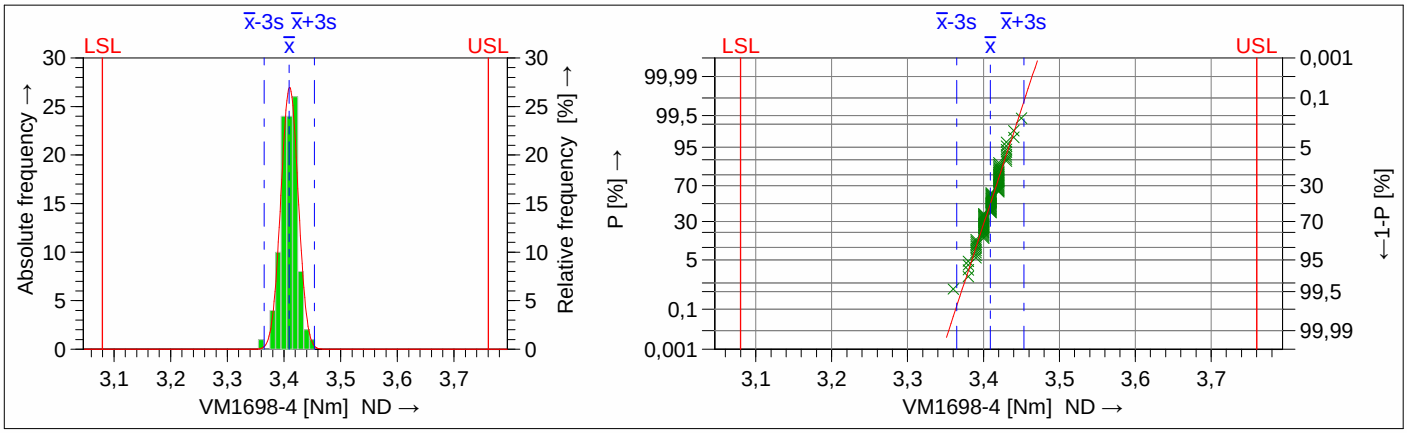
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_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 11:46:34 to 13.11.2023 11:58:07

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.4091
LSL	3.08	x_{min}	3.36	$\bar{x}$-3s	3.3648
USL	3.76	x_{max}	3.45	$\bar{x}$+3s	3.4534
T	0.68	R	0.09	6s	0.0887
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	7.67
Critical capability index	=	C_{mk}	7.42

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.	IJJ1013_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	3,42	3,41	3,41	3,43	3,40	3,41	3,41	3,42	3,40	3,42
1024210	VM1698-4	Grad	361,50	365,50	362,25	363,00	363,50	363,50	367,25	365,00	364,25	365,25

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	3,40	3,42	3,42	3,41	3,39	3,43	3,41	3,40	3,40	3,42
1024210	VM1698-4	Grad	363,50	365,50	371,50	364,50	363,00	370,25	366,00	363,50	368,25	367,00

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	3,41	3,42	3,39	3,41	3,40	3,43	3,40	3,43	3,42	3,40
1024210	VM1698-4	Grad	365,75	371,50	362,75	365,75	364,25	371,75	363,75	367,25	371,00	369,00

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	3,41	3,39	3,38	3,43	3,42	3,41	3,41	3,40	3,41	3,41
1024210	VM1698-4	Grad	368,75	359,00	356,00	360,00	362,75	359,00	358,00	357,50	357,25	364,00

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	3,42	3,38	3,44	3,40	3,40	3,44	3,40	3,42	3,45	3,39
1024210	VM1698-4	Grad	361,00	355,25	366,00	359,50	358,25	361,25	359,50	358,75	368,00	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}
1024210	VM1698-4	Nm	3,41	3,43	3,40	3,41	3,42	3,42	3,41	3,42	3,42	3,38
1024210	VM1698-4	Grad	359,25	363,00	361,50	363,75	363,75	364,25	361,25	369,00	361,25	357,50

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	3,42	3,42	3,39	3,42	3,42	3,40	3,41	3,41	3,39	3,42
1024210	VM1698-4	Grad	360,75	367,75	356,50	362,75	365,75	362,75	364,00	362,25	361,25	367,50

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	3,40	3,40	3,42	3,41	3,40	3,39	3,41	3,38	3,40	3,41
1024210	VM1698-4	Grad	360,25	365,50	365,25	367,00	358,75	358,25	362,00	358,25	364,25	365,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	3,36	3,41	3,42	3,40	3,42	3,42	3,40	3,43	3,42	3,39
1024210	VM1698-4	Grad	357,00	363,75	370,75	362,75	363,00	366,25	363,50	368,00	365,00	360,75

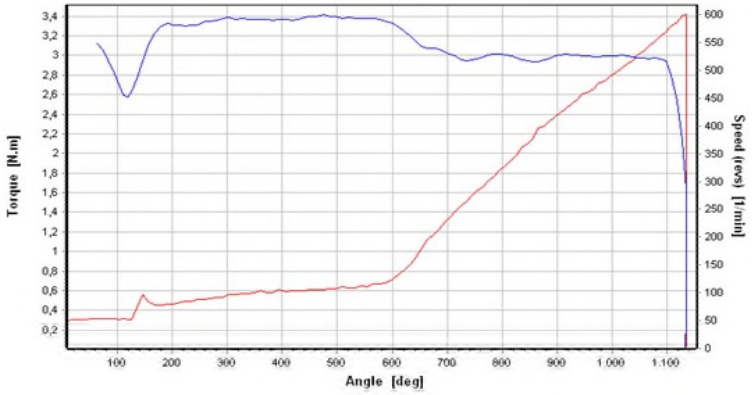
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,39	3,41	3,40	3,43	3,40	3,40	3,40	3,42	3,39	3,41
1024210	VM1698-4	Grad	360,25	366,75	366,00	369,00	359,50	363,00	364,25	364,50	361,00	365,50

Torque graphs

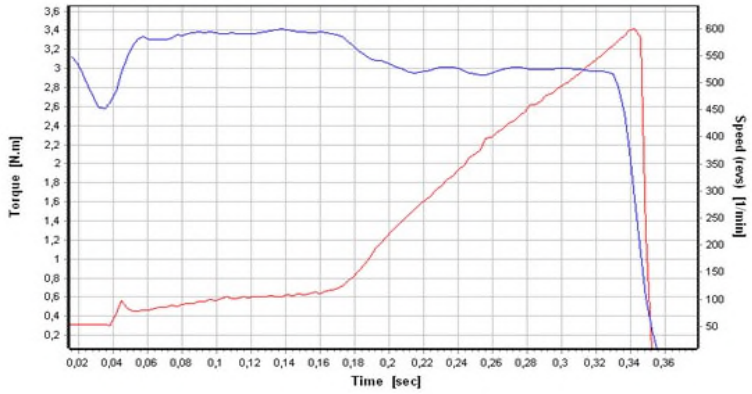
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

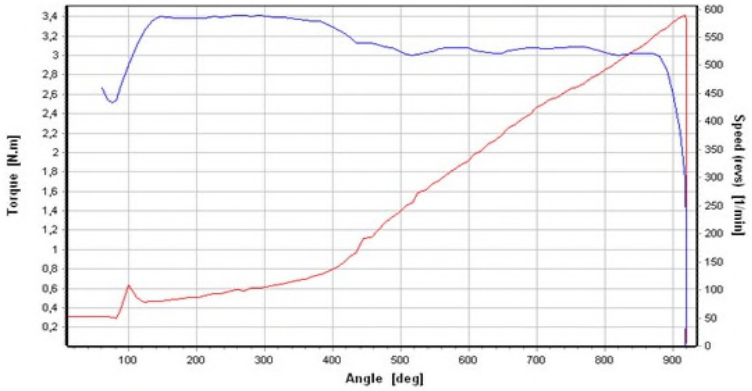
Angle degree: **360°**
Test torque: **3,4 Nm**



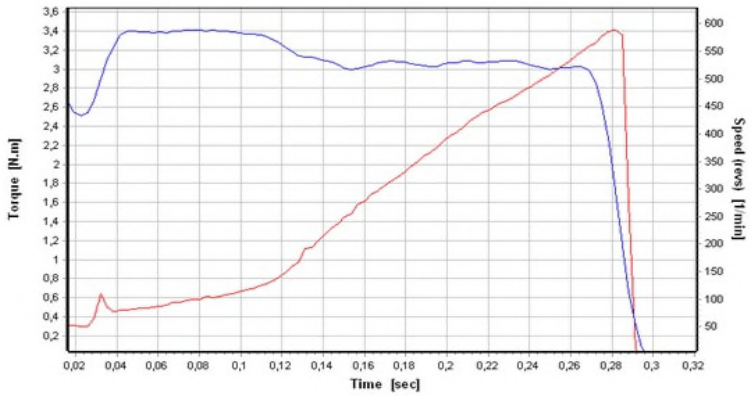
Value no. 1
Graph
Torque / Angle / Speed



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: **IJJ1013**

Test torque: Tq max. 4,00 Nm

Hard joint (H)	23,96 Nm / Revolution	Angle degree	30°
Soft joint (L)	2,04 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	3,99 Nm	4,09 Nm
	Standard deviation	0,02 Nm	0,02 Nm
	Torque scatter (99,73%)	0,13 Nm	0,11 Nm
	C_m	6,30	7,43
	C_{mk}	6,19	5,80

b)	Min. C_m hard/soft (lowest value)	6,30
	Min. C_{mk} hard/soft (lowest value)	5,80

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

Note:

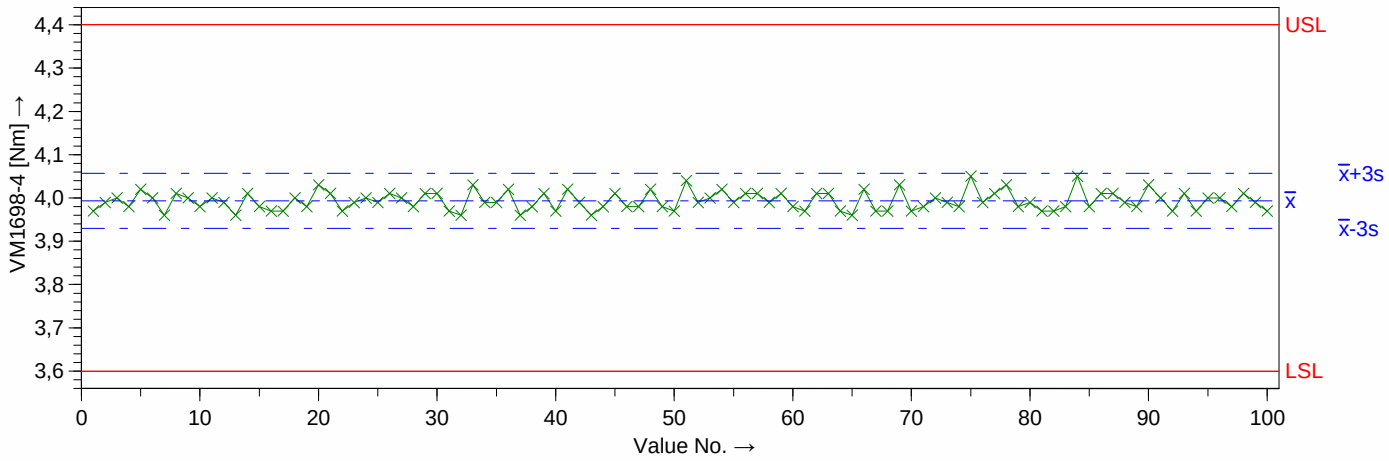
Machine Capability Study
Control System

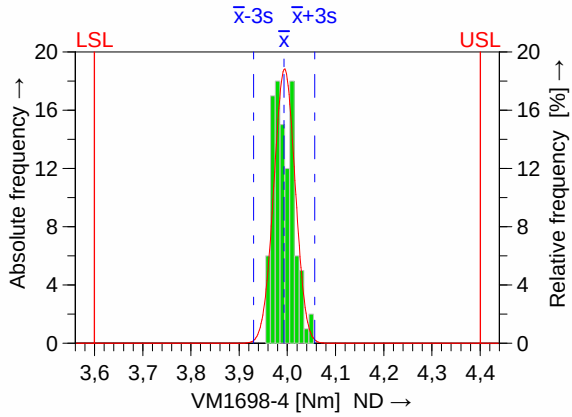
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

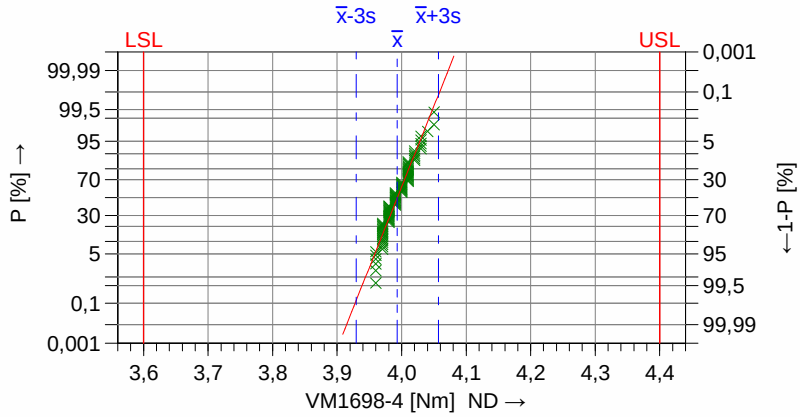
Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_b	Char.Descr.	VM1698-4	Nom.val. 4,00 0,40	USL 4,40
		Serial No.	1024210	Unit Nm -0,40	LSL 3,60
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 12:44:32 to 13.11.2023 12:56:05

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







Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	3.9933
LSL	3.60	x_{min}	3.96	$\bar{x}$-3s	3.9298
USL	4.40	x_{max}	4.05	$\bar{x}$+3s	4.0568
T	0.80	R	0.09	6s	0.1271
		$n_{<T>}$	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	6.30
Critical capability index	=	C_{mk}	6.19

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.	IJJ1013_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	3,97	3,99	4,00	3,98	4,02	4,00	3,96	4,01	4,00	3,98
1024210	VM1698-4	Grad	30,00	30,00	29,75	30,50	29,75	29,00	29,75	30,75	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	4,00	3,99	3,96	4,01	3,98	3,97	3,97	4,00	3,98	4,03
1024210	VM1698-4	Grad	30,00	29,50	30,00	29,75	29,75	29,50	29,25	29,75	28,50	30,00

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	4,01	3,97	3,99	4,00	3,99	4,01	4,00	3,98	4,01	4,01
1024210	VM1698-4	Grad	29,00	30,50	29,50	29,75	30,25	30,25	29,75	30,25	30,75	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}
1024210	VM1698-4	Nm	3,97	3,96	4,03	3,99	3,99	4,02	3,96	3,98	4,01	3,97
1024210	VM1698-4	Grad	29,75	29,25	31,25	29,25	29,50	30,00	29,75	30,00	30,25	30,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	4,02	3,99	3,96	3,98	4,01	3,98	3,98	4,02	3,98	3,97
1024210	VM1698-4	Grad	30,75	30,25	30,00	29,25	30,50	30,25	30,00	31,00	30,25	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}
1024210	VM1698-4	Nm	4,04	3,99	4,00	4,02	3,99	4,01	4,01	3,99	4,01	3,98
1024210	VM1698-4	Grad	30,50	29,75	30,00	30,75	30,00	30,50	29,75	30,50	30,75	29,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	3,97	4,01	4,01	3,97	3,96	4,02	3,97	3,97	4,03	3,97
1024210	VM1698-4	Grad	30,00	29,50	30,00	29,50	30,00	30,25	29,25	30,75	30,00	29,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,98	4,00	3,99	3,98	4,05	3,99	4,01	4,03	3,98	3,99
1024210	VM1698-4	Grad	30,25	29,75	30,25	30,00	30,50	29,50	29,25	30,25	29,25	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	3,97	3,97	3,98	4,05	3,98	4,01	4,01	3,99	3,98	4,03
1024210	VM1698-4	Grad	30,00	30,00	30,25	31,25	29,50	30,75	30,00	30,25	29,50	30,50

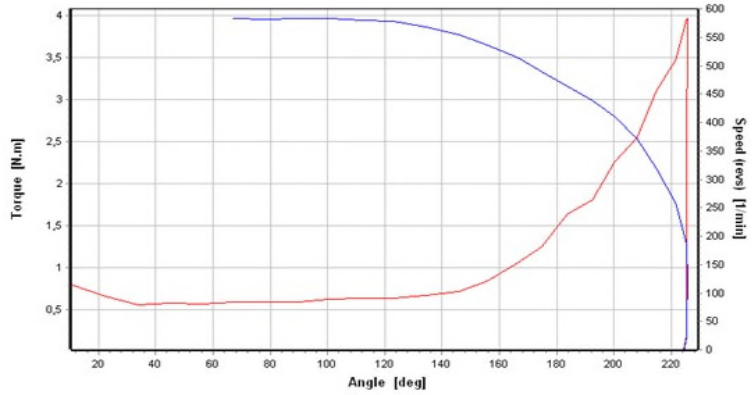
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	4,00	3,97	4,01	3,97	4,00	4,00	3,98	4,01	3,99	3,97
1024210	VM1698-4	Grad	29,50	29,75	29,75	30,50	31,50	28,50	29,00	31,25	29,50	30,25

Torque graphs

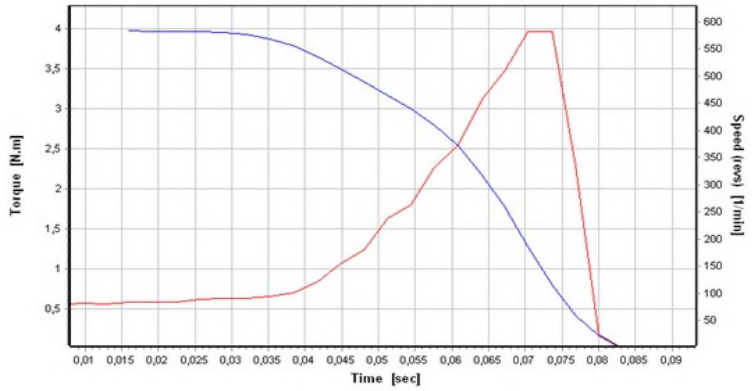
Machine Capability Study 100 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

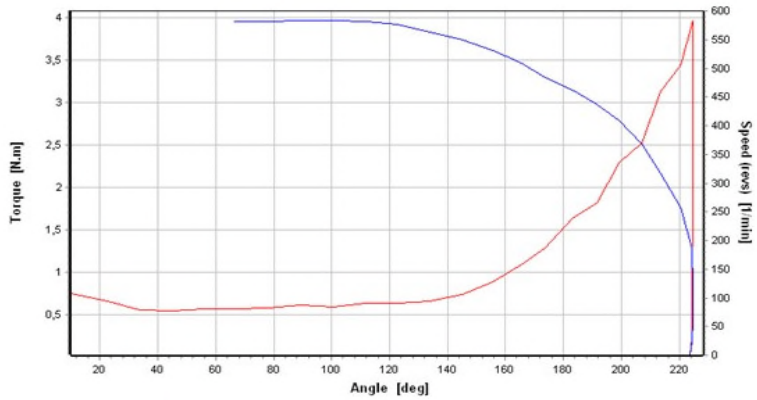
Angle degree: **30°**
Test torque: **4,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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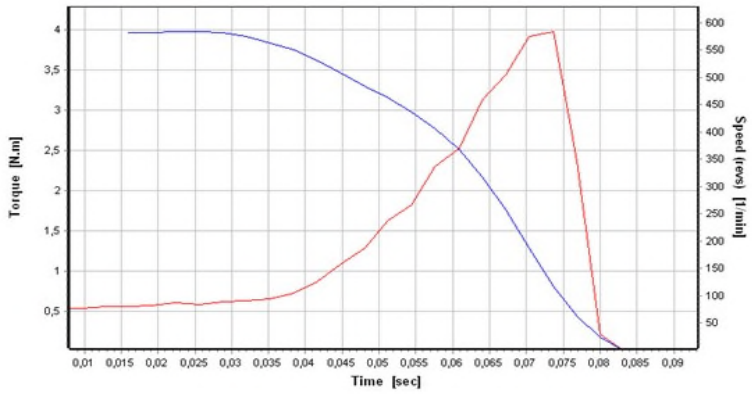
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

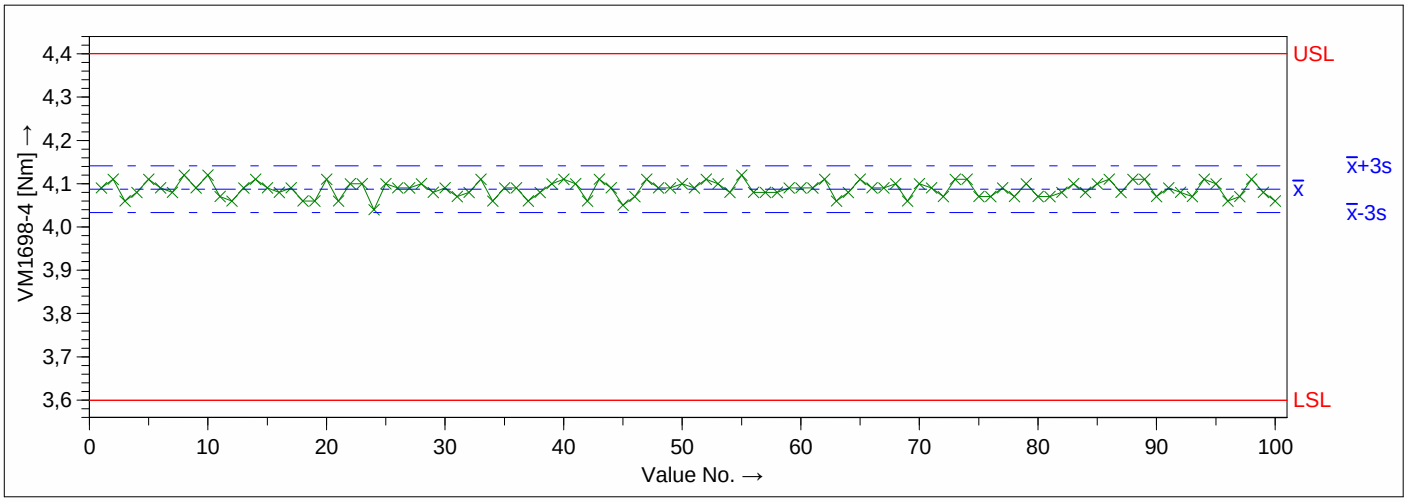
Cleco Production Tools

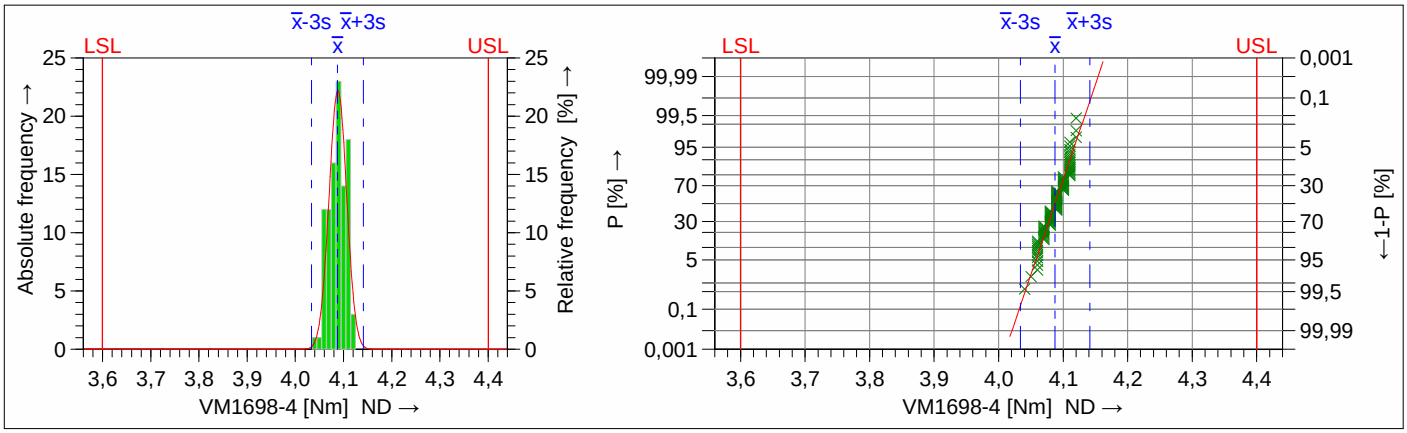
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1013_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 12:31:30 to 13.11.2023 12:43:03

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





Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	4.0874
LSL	3.60	x_{min}	4.04	$\bar{x}$-3s	4.0335
USL	4.40	x_{max}	4.12	$\bar{x}$+3s	4.1413
T	0.80	R	0.08	6s	0.1077
		$n_{<T>}$	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	7.43
Critical capability index	=	C_{mk}	5.80

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.	IJJ1013_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	4,09	4,11	4,06	4,08	4,11	4,09	4,08	4,12	4,09	4,12
1024210	VM1698-4	Grad	355,75	361,75	353,00	359,25	361,50	362,50	356,25	364,50	358,25	363,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	4,07	4,06	4,09	4,11	4,09	4,08	4,09	4,06	4,06	4,11
1024210	VM1698-4	Grad	355,50	352,25	362,00	361,25	362,00	354,50	361,00	357,25	360,50	359,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	4,06	4,10	4,10	4,04	4,10	4,09	4,09	4,10	4,08	4,09
1024210	VM1698-4	Grad	354,50	361,75	359,25	350,50	364,00	358,75	362,50	366,00	357,75	362,75

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	4,07	4,08	4,11	4,06	4,09	4,09	4,06	4,08	4,10	4,11
1024210	VM1698-4	Grad	358,50	358,25	364,25	358,50	362,75	362,50	357,75	361,25	363,50	366,50

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	4,10	4,06	4,11	4,09	4,05	4,07	4,11	4,09	4,09	4,10
1024210	VM1698-4	Grad	359,75	356,75	365,50	361,25	357,50	359,75	363,75	362,00	360,50	362,50

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	4,09	4,11	4,10	4,08	4,12	4,08	4,08	4,08	4,09	4,09
1024210	VM1698-4	Grad	363,75	363,25	364,25	359,00	368,75	360,75	359,25	360,75	363,75	361,25

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	4,09	4,11	4,06	4,08	4,11	4,09	4,09	4,10	4,06	4,10
1024210	VM1698-4	Grad	363,00	366,50	359,50	365,25	365,75	362,00	361,25	363,50	357,00	365,00

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	4,09	4,07	4,11	4,11	4,07	4,07	4,09	4,07	4,10	4,07
1024210	VM1698-4	Grad	361,75	362,25	365,25	365,50	358,75	361,25	362,75	363,75	367,00	360,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1013_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	4,07	4,08	4,10	4,08	4,10	4,11	4,08	4,11	4,11	4,07
1024210	VM1698-4	Grad	359,25	361,75	365,50	361,75	366,75	366,00	359,25	365,75	363,00	357,25

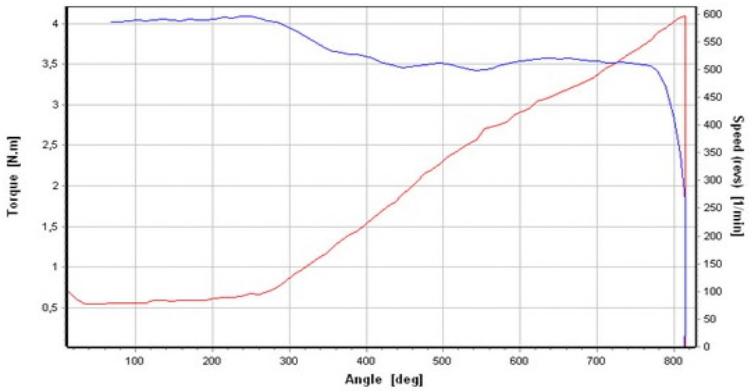
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	4,09	4,08	4,07	4,11	4,10	4,06	4,07	4,11	4,08	4,06
1024210	VM1698-4	Grad	363,50	362,00	359,75	367,50	361,75	359,00	362,25	365,50	359,50	360,00

Torque graphs

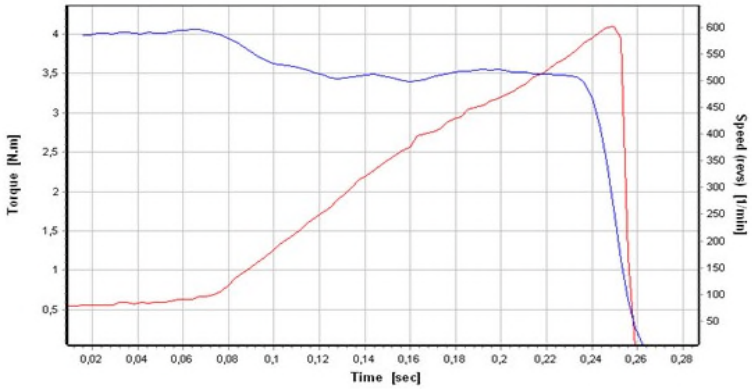
Machine Capability Study 100 %

Model: **CLBP04Q**
Serial no: **IJJ1013**

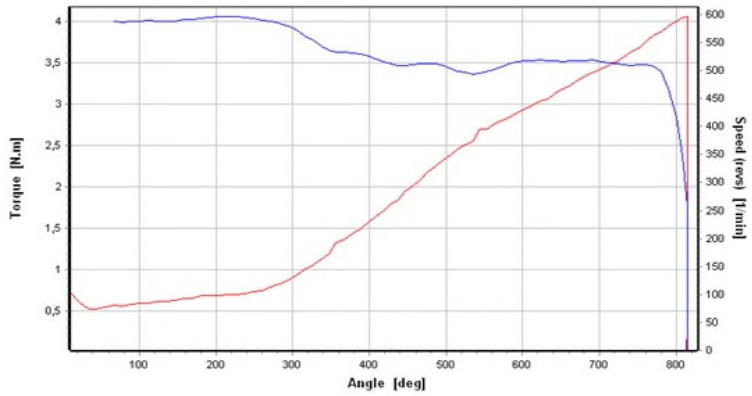
Angle degree: **360°**
Test torque: **4,0 Nm**



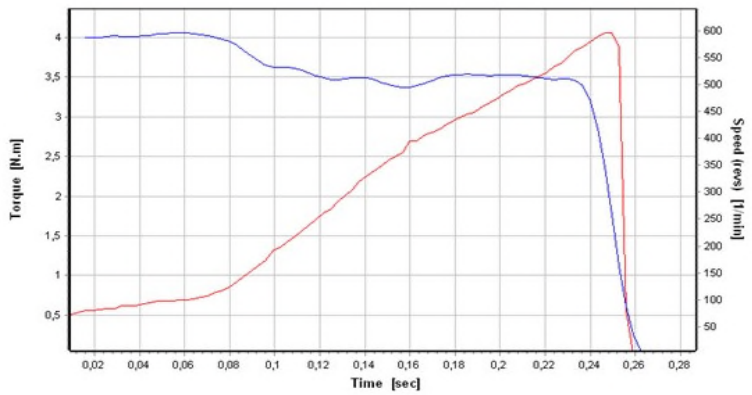
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed