Homologation

Cordless Assembly Tools

Model: CLBP04Q

Serial no.: IJJ1014

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Homologation: CLBP04Q SN: IJJ1014

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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: **IJJ1014**

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

Hard joint (H)	12,04	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,00	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	2,01 Nm	1,99 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,12 Nm	0,06 Nm
	C_m	3,21	7,24
	C_{mk}	2,62	6,51

b)	Min. C_m hard/soft (lowest value)	3,21
	Min. C_{mk} hard/soft (lowest value)	2,62

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

Note:

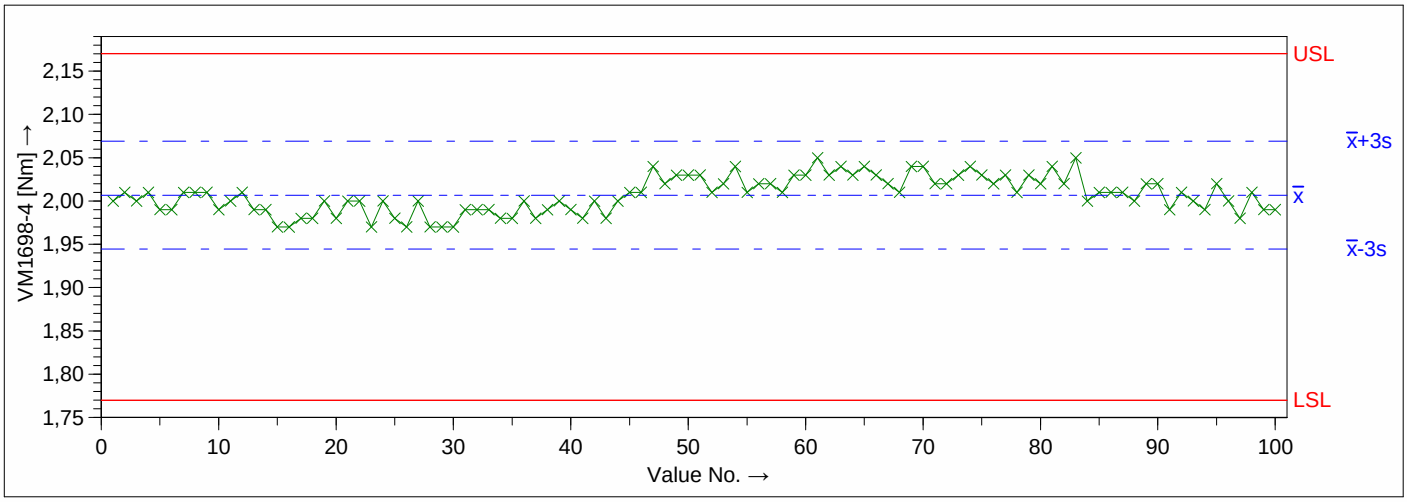
Machine Capability Study
Control System

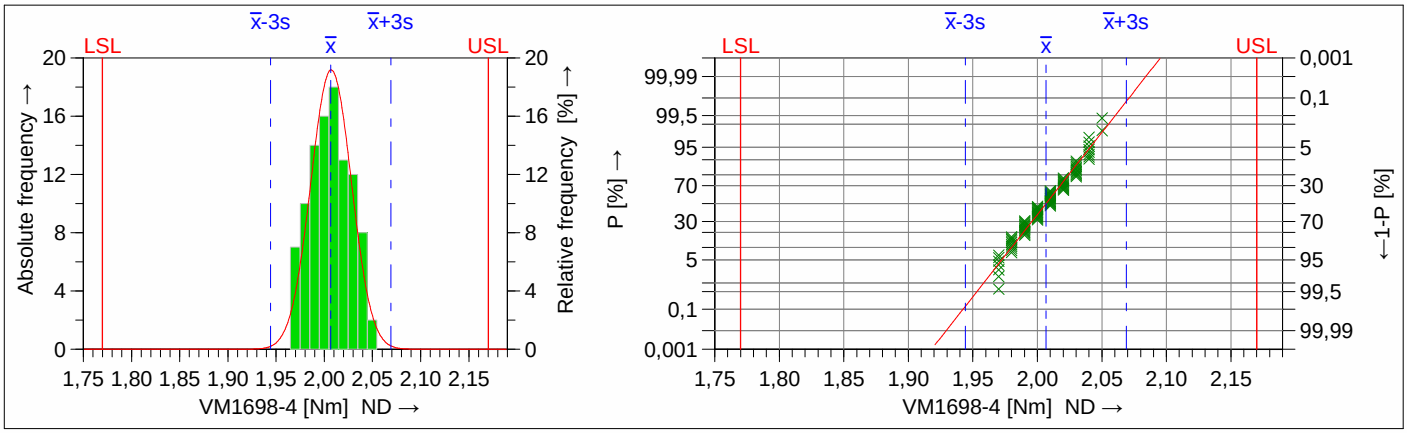
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_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 15:55:51 to 13.11.2023 16:07:23

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





Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	2.0067
LSL	1.77	x_{min}	1.97	$\bar{x}$-3s	1.9443
USL	2.17	x_{max}	2.05	$\bar{x}$+3s	2.0691
T	0.40	R	0.08	6s	0.1248
		$n_{<T>}$	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	3.21
Critical capability index	=	C_{mk}	2.62

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.	IJJ1014_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	2,01	2,00	2,01	1,99	1,99	2,01	2,01	2,01	1,99
1024210	VM1698-4	Grad	29,92	30,60	29,70	31,27	30,15	29,70	29,70	31,05	29,70	31,50

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	2,00	2,01	1,99	1,99	1,97	1,97	1,98	1,98	2,00	1,98
1024210	VM1698-4	Grad	30,38	31,27	29,48	31,50	28,80	29,02	29,92	29,70	30,15	31,05

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	2,00	2,00	1,97	2,00	1,98	1,97	2,00	1,97	1,97	1,97
1024210	VM1698-4	Grad	29,92	29,25	31,50	29,70	29,92	29,92	30,60	29,25	29,02	28,58

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	1,99	1,99	1,99	1,98	1,98	2,00	1,98	1,99	2,00	1,99
1024210	VM1698-4	Grad	29,92	30,15	29,25	29,92	29,92	30,83	29,48	29,92	30,38	29,48

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	1,98	2,00	1,98	2,00	2,01	2,01	2,04	2,02	2,03	2,03
1024210	VM1698-4	Grad	30,15	30,60	29,70	29,70	31,50	31,05	31,95	31,50	30,60	31,27

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	2,01	2,02	2,04	2,01	2,02	2,02	2,01	2,03	2,03
1024210	VM1698-4	Grad	30,83	29,92	31,27	31,50	30,83	30,15	31,05	29,70	30,83	30,60

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	2,05	2,03	2,04	2,03	2,04	2,03	2,02	2,01	2,04	2,04
1024210	VM1698-4	Grad	31,73	31,05	31,27	30,60	30,83	30,15	29,70	31,50	30,38	31,05

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	2,02	2,02	2,03	2,04	2,03	2,02	2,03	2,01	2,03	2,02
1024210	VM1698-4	Grad	30,38	29,92	30,38	31,50	30,83	29,48	30,83	30,15	32,40	30,83

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	2,02	2,05	2,00	2,01	2,01	2,01	2,00	2,02	2,02
1024210	VM1698-4	Grad	29,92	29,25	30,83	28,80	29,70	28,80	28,80	28,35	29,92	30,38

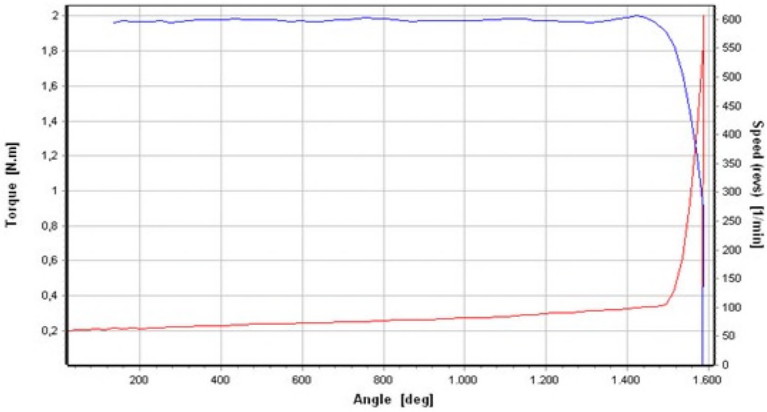
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	1,99	2,01	2,00	1,99	2,02	2,00	1,98	2,01	1,99	1,99
1024210	VM1698-4	Grad	29,48	29,02	29,48	28,80	29,48	29,92	28,80	29,48	28,80	28,80

Torque graphs

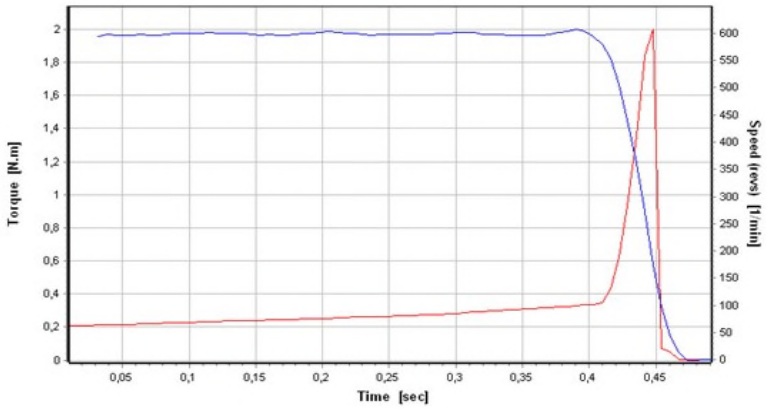
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

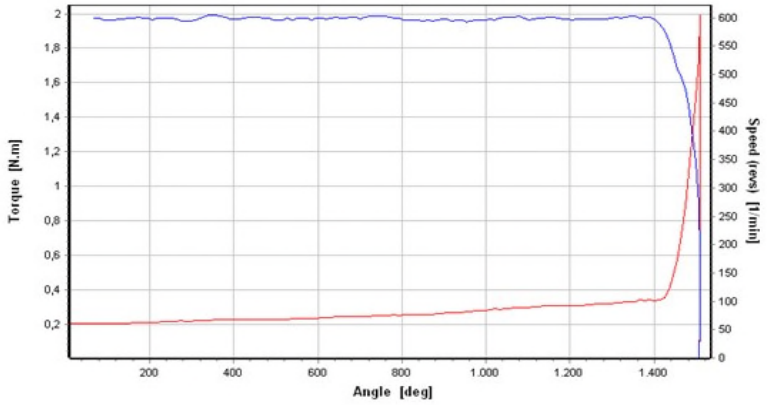
Angle degree: **30°**
Test torque: **2,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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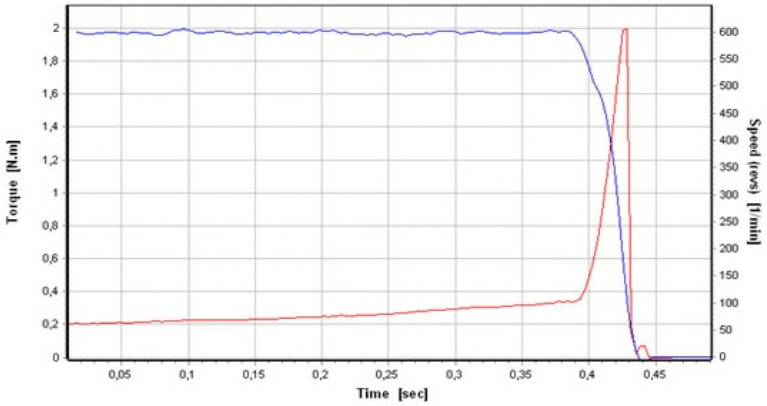
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

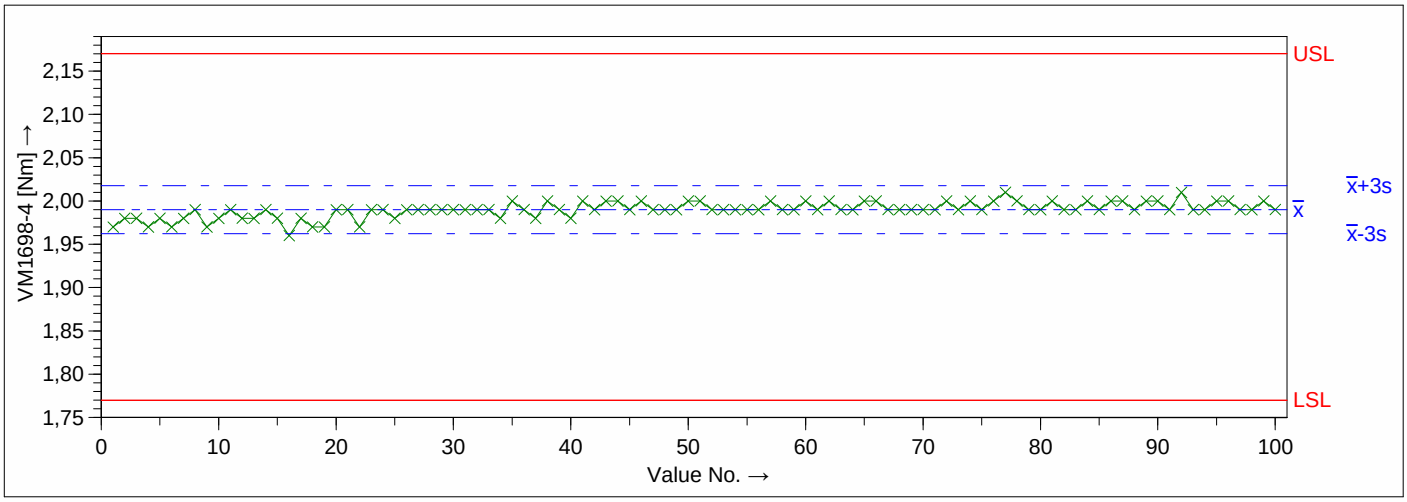
Cleco Production Tools

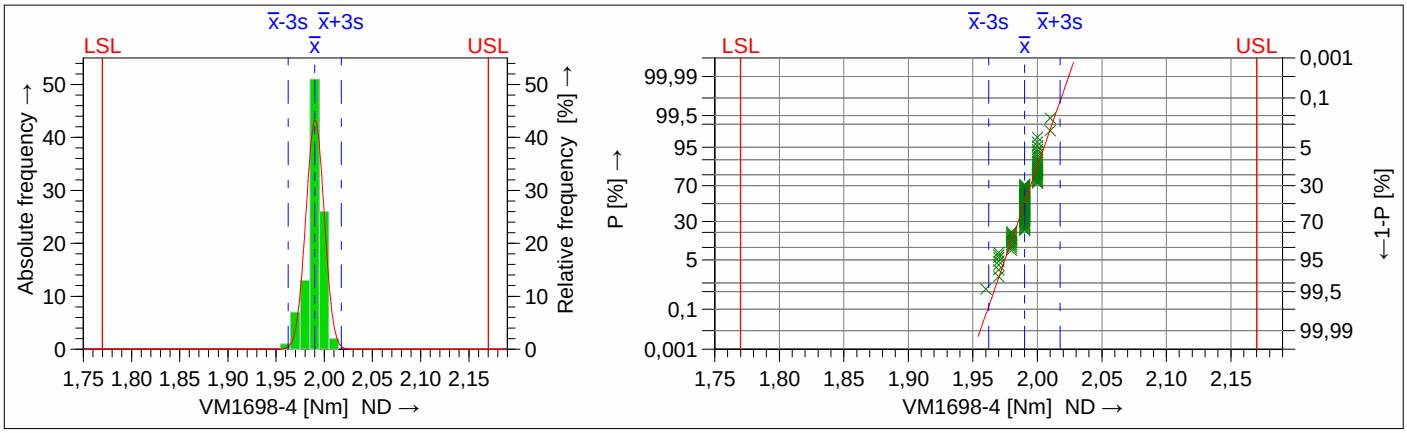
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_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 15:34:56 to 13.11.2023 15:46:30

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





Drawing Values		Collected Values		Statistics	
T_m	1.97			$\bar{x}$	1.9900
LSL	1.77	x_{min}	1.96	$\bar{x}$-3s	1.9624
USL	2.17	x_{max}	2.01	$\bar{x}$+3s	2.0176
T	0.40	R	0.05	6s	0.0553
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	7.24
Critical capability index	=	C_{mk}	6.51

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.	IJJ1014_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	1,97	1,98	1,98	1,97	1,98	1,97	1,98	1,99	1,97	1,98
1024210	VM1698-4	Grad	366,52	366,98	365,40	368,33	364,73	362,25	370,13	369,23	367,20	364,95

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	1,99	1,98	1,98	1,99	1,98	1,96	1,98	1,97	1,97	1,99
1024210	VM1698-4	Grad	368,77	364,50	364,27	365,17	359,77	355,73	363,60	362,02	358,20	369,45

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	1,99	1,97	1,99	1,99	1,98	1,99	1,99	1,99	1,99	1,99
1024210	VM1698-4	Grad	364,05	362,25	368,55	365,40	362,70	366,75	366,75	371,02	371,02	367,20

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	1,99	1,99	1,99	1,98	2,00	1,99	1,98	2,00	1,99	1,98
1024210	VM1698-4	Grad	369,45	359,10	360,90	359,55	369,45	365,63	360,23	362,70	364,27	357,30

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	2,00	1,99	2,00	2,00	1,99	2,00	1,99	1,99	1,99	2,00
1024210	VM1698-4	Grad	370,80	365,40	365,40	363,15	370,80	367,42	365,63	363,38	363,60	367,20

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	2,00	1,99	1,99	1,99	1,99	1,99	2,00	1,99	1,99	2,00
1024210	VM1698-4	Grad	363,38	361,13	364,05	362,70	365,85	361,80	369,00	364,05	363,15	371,48

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	1,99	2,00	1,99	1,99	2,00	2,00	1,99	1,99	1,99	1,99
1024210	VM1698-4	Grad	369,23	367,42	364,05	355,27	356,85	360,67	360,23	357,98	356,17	361,80

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	1,99	2,00	1,99	2,00	1,99	2,00	2,01	2,00	1,99	1,99
1024210	VM1698-4	Grad	360,00	359,10	357,98	361,58	357,52	359,77	363,83	366,30	357,08	356,63

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	2,00	1,99	1,99	2,00	1,99	2,00	2,00	1,99	2,00	2,00
1024210	VM1698-4	Grad	365,40	358,65	357,52	364,73	362,02	362,92	367,20	358,88	358,42	359,10

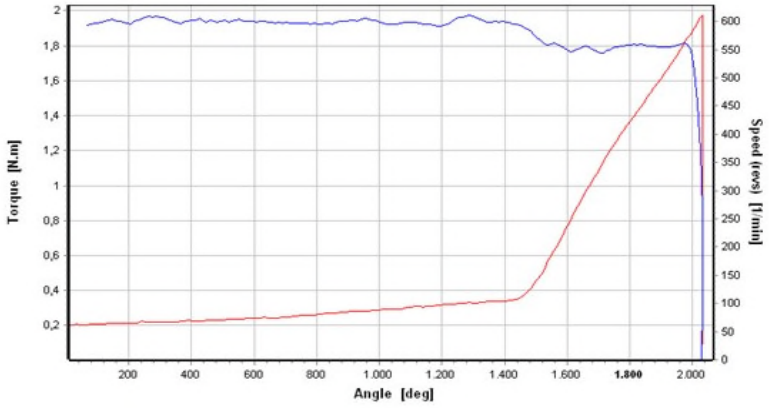
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	1,99	2,01	1,99	1,99	2,00	2,00	1,99	1,99	2,00	1,99
1024210	VM1698-4	Grad	361,58	368,33	366,30	361,58	364,05	362,92	360,23	361,58	365,63	362,92

Torque graphs

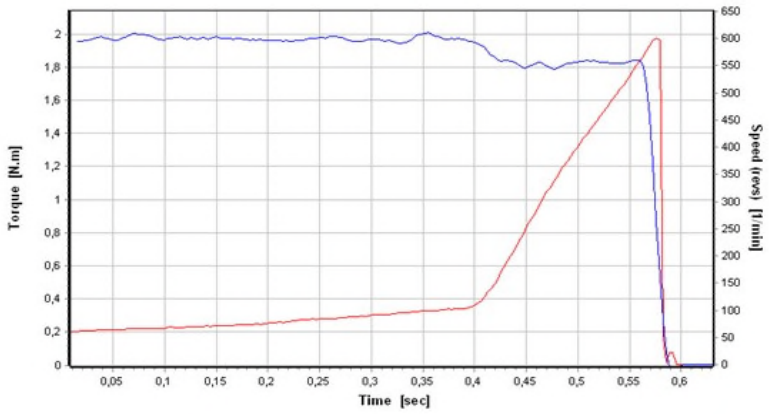
Machine Capability Study 30 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

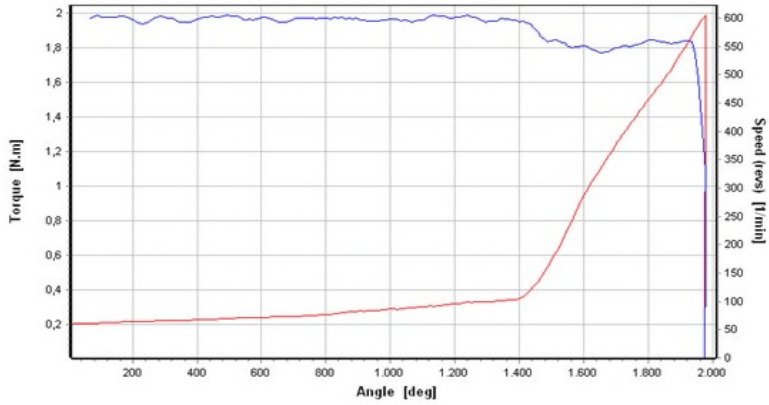
Angle degree: **360°**
Test torque: **2,0 Nm**



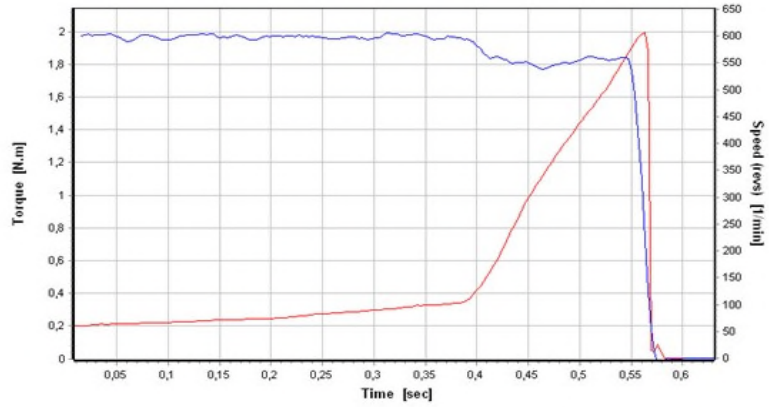
Value no. 1
Graph
Torque / Angle / Speed



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: **IJJ1014**

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

Hard joint (H)	20,60	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,74	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	3,43 Nm	3,48 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,13 Nm	0,08 Nm
	C_m	5,16	8,96
	C_{mk}	4,97	7,49

b)	Min. C_m hard/soft (lowest value)	5,16
	Min. C_{mk} hard/soft (lowest value)	4,97

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

Note:

Machine Capability Study
Control System

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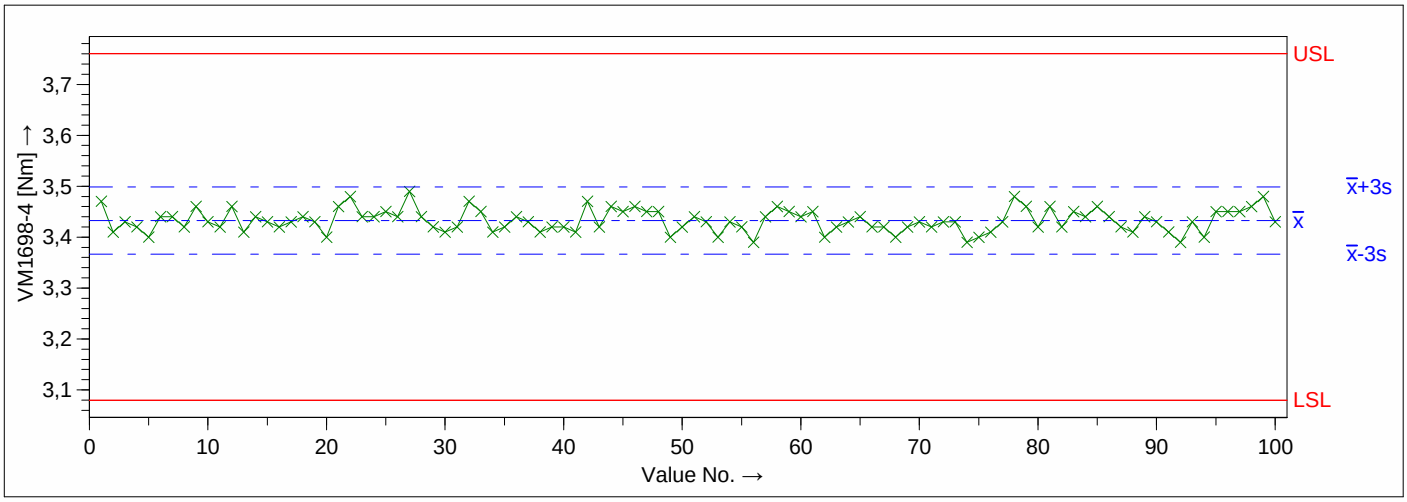
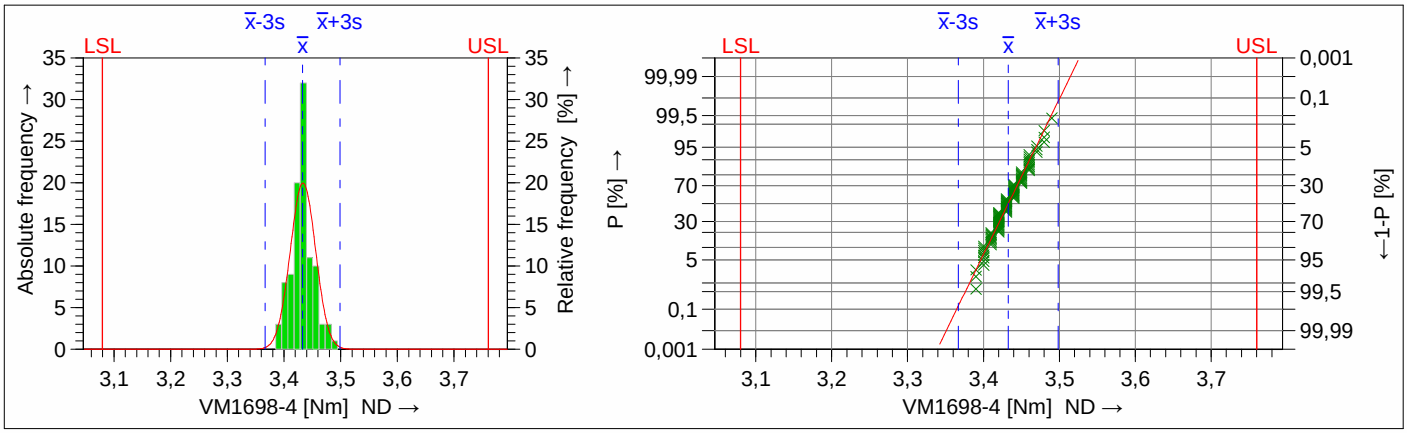
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_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 15:14:00 to 13.11.2023 15:25:34

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.4327
LSL	3.08	x_{min}	3.39	$\bar{x}$-3s	3.3668
USL	3.76	x_{max}	3.49	$\bar{x}$+3s	3.4986
T	0.68	R	0.10	6s	0.1318
		$n_{<T>}$	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	5.16
Critical capability index	=	C_{mk}	4.97

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.	IJJ1014_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	3,47	3,41	3,43	3,42	3,40	3,44	3,44	3,42	3,46	3,43
1024210	VM1698-4	Grad	31,50	31,00	31,25	31,50	30,50	31,50	32,00	31,00	31,75	31,75

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	3,42	3,46	3,41	3,44	3,43	3,42	3,43	3,44	3,43	3,40
1024210	VM1698-4	Grad	31,00	32,50	32,00	31,25	30,25	30,25	30,50	31,00	31,25	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	3,46	3,48	3,44	3,44	3,45	3,44	3,49	3,44	3,42	3,41
1024210	VM1698-4	Grad	30,75	32,50	30,25	30,75	31,25	31,00	31,50	30,00	29,25	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	3,42	3,47	3,45	3,41	3,42	3,44	3,43	3,41	3,42	3,42
1024210	VM1698-4	Grad	29,75	30,50	30,75	29,75	28,25	28,75	28,75	29,75	29,75	29,75

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	3,41	3,47	3,42	3,46	3,45	3,46	3,45	3,45	3,40	3,42
1024210	VM1698-4	Grad	29,75	31,25	30,25	29,00	31,25	31,00	29,50	30,25	29,50	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	3,44	3,43	3,40	3,43	3,42	3,39	3,44	3,46	3,45	3,44
1024210	VM1698-4	Grad	30,50	30,00	30,25	29,50	30,00	29,75	30,00	31,75	30,00	29,25

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	3,45	3,40	3,42	3,43	3,44	3,42	3,42	3,40	3,42	3,43
1024210	VM1698-4	Grad	30,25	28,50	30,25	30,75	29,25	29,75	29,25	29,50	29,50	29,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,42	3,43	3,43	3,39	3,40	3,41	3,43	3,48	3,46	3,42
1024210	VM1698-4	Grad	29,50	29,50	29,00	29,75	28,50	29,25	29,75	30,75	29,50	30,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	3,46	3,42	3,45	3,44	3,46	3,44	3,42	3,41	3,44	3,43
1024210	VM1698-4	Grad	30,25	29,50	30,50	30,75	30,75	30,00	29,50	29,25	31,00	30,00

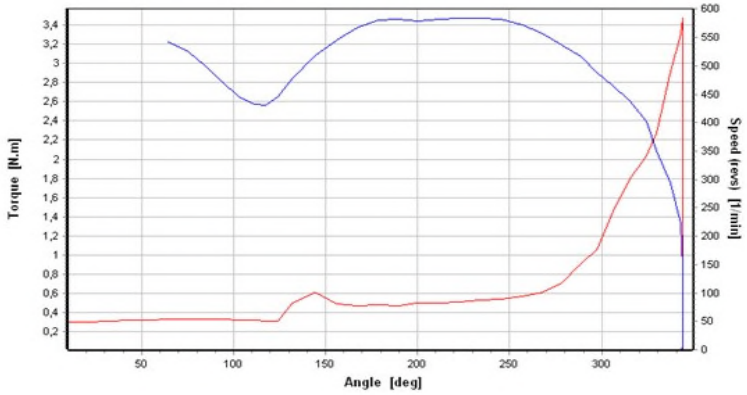
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,41	3,39	3,43	3,40	3,45	3,45	3,45	3,46	3,48	3,43
1024210	VM1698-4	Grad	29,50	29,25	30,00	28,75	29,00	30,00	31,00	30,50	31,75	30,25

Torque graphs

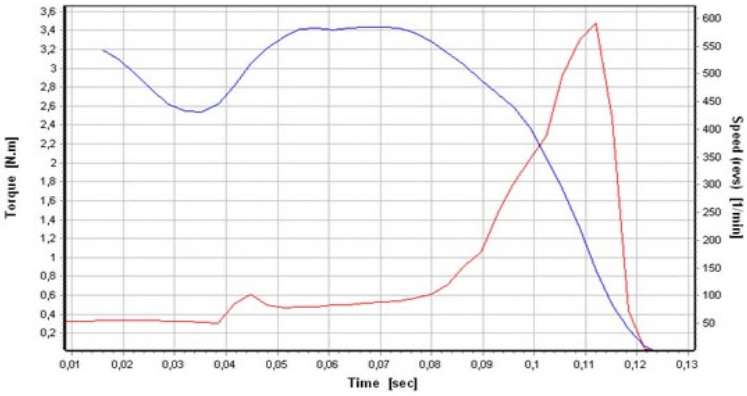
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

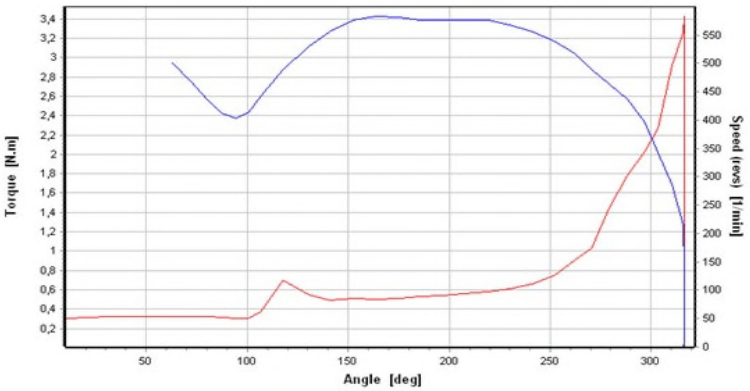
Angle degree: **30°**
Test torque: **3,4 Nm**



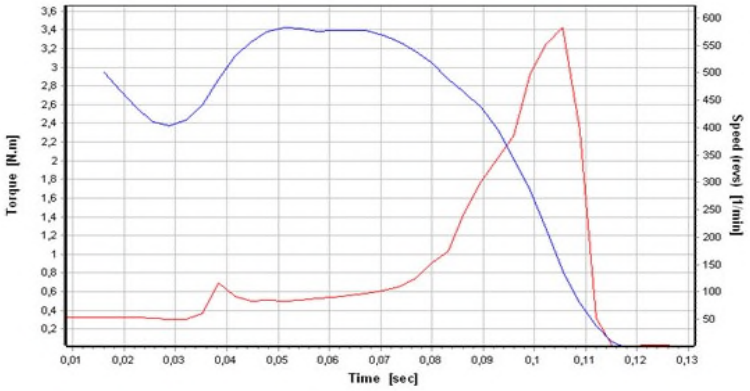
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

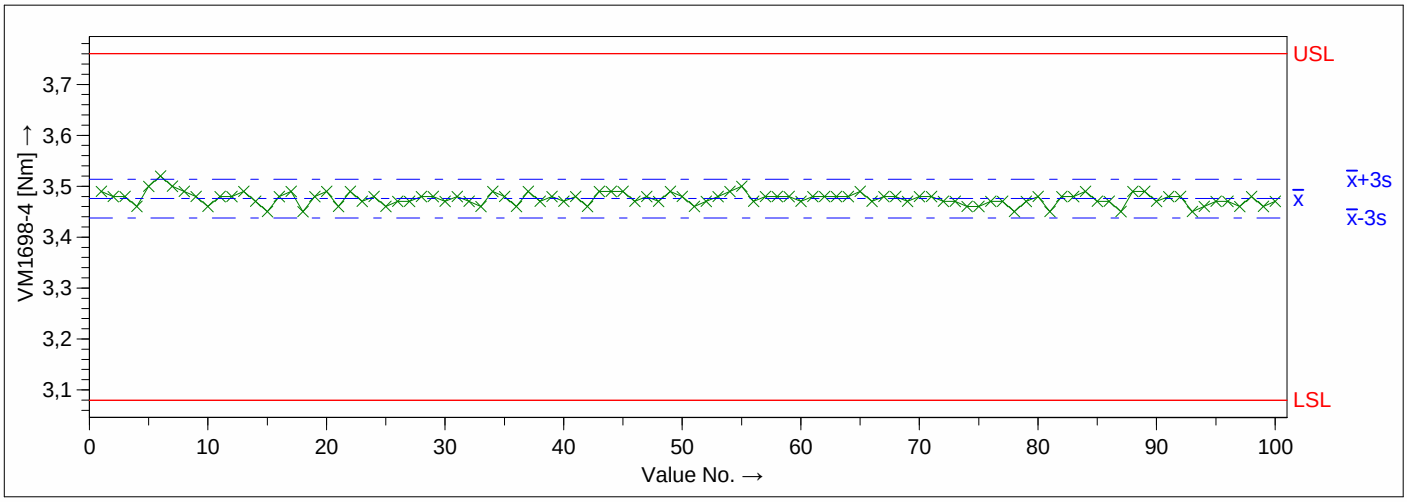
Machine Capability Study
Control System

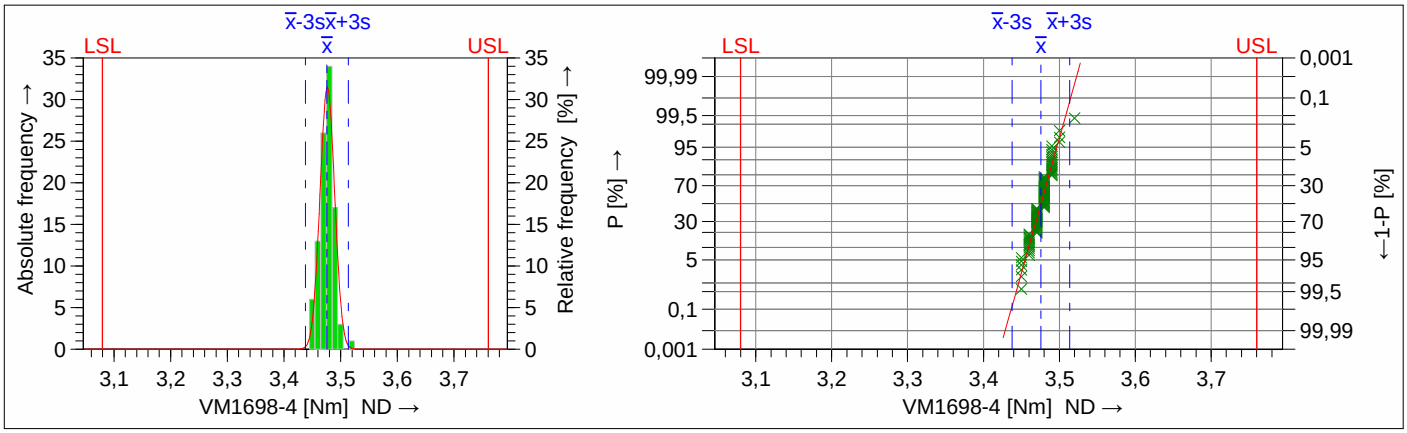
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_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 13:57:37 to 13.11.2023 14:09:10

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





Drawing Values		Collected Values		Statistics	
T_m	3.42			$\bar{x}$	3.4757
LSL	3.08	x_{min}	3.45	$\bar{x}$-3s	3.4377
USL	3.76	x_{max}	3.52	$\bar{x}$+3s	3.5137
T	0.68	R	0.07	6s	0.0759
		$n_{<T>}$	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	8.96
Critical capability index	=	C_{mk}	7.49

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.	IJJ1014_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	3,49	3,48	3,48	3,46	3,50	3,52	3,50	3,49	3,48	3,46
1024210	VM1698-4	Grad	358,00	356,75	356,25	347,75	355,50	361,00	355,25	354,00	356,50	349,25

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	3,48	3,48	3,49	3,47	3,45	3,48	3,49	3,45	3,48	3,49
1024210	VM1698-4	Grad	354,00	352,50	352,25	348,75	340,75	353,75	354,50	354,00	353,50	358,50

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	3,46	3,49	3,47	3,48	3,46	3,47	3,47	3,48	3,48	3,47
1024210	VM1698-4	Grad	358,00	361,00	357,50	361,50	353,00	352,25	349,75	350,75	352,00	352,00

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	3,48	3,47	3,46	3,49	3,48	3,46	3,49	3,47	3,48	3,47
1024210	VM1698-4	Grad	355,25	359,00	355,50	370,00	362,50	358,25	372,50	366,75	368,50	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	3,48	3,46	3,49	3,49	3,49	3,47	3,48	3,47	3,49	3,48
1024210	VM1698-4	Grad	361,25	357,75	362,50	366,50	369,25	360,25	360,25	359,00	361,50	362,00

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	3,46	3,47	3,48	3,49	3,50	3,47	3,48	3,48	3,48	3,47
1024210	VM1698-4	Grad	364,25	361,50	363,25	364,00	368,25	367,50	369,25	363,25	364,50	357,25

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	3,48	3,48	3,48	3,48	3,49	3,47	3,48	3,48	3,47	3,48
1024210	VM1698-4	Grad	368,50	365,00	362,75	363,00	363,25	356,00	362,50	364,50	360,00	358,00

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	3,48	3,47	3,47	3,46	3,46	3,47	3,47	3,45	3,47	3,48
1024210	VM1698-4	Grad	364,50	368,00	365,75	362,50	361,25	362,25	360,75	351,75	362,25	367,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	3,48	3,48	3,49	3,47	3,47	3,45	3,49	3,49	3,47
1024210	VM1698-4	Grad	361,00	360,00	363,50	369,00	361,25	361,25	362,00	363,75	368,00	366,75

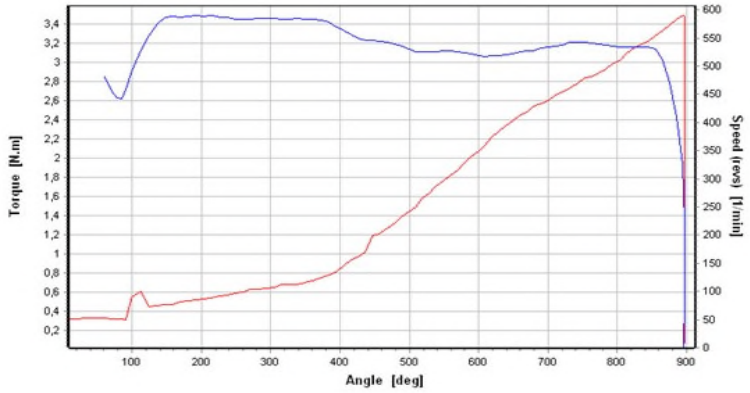
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,48	3,48	3,45	3,46	3,47	3,47	3,46	3,48	3,46	3,47
1024210	VM1698-4	Grad	361,50	366,50	360,50	359,50	362,00	365,50	362,50	363,25	358,75	359,75

Torque graphs

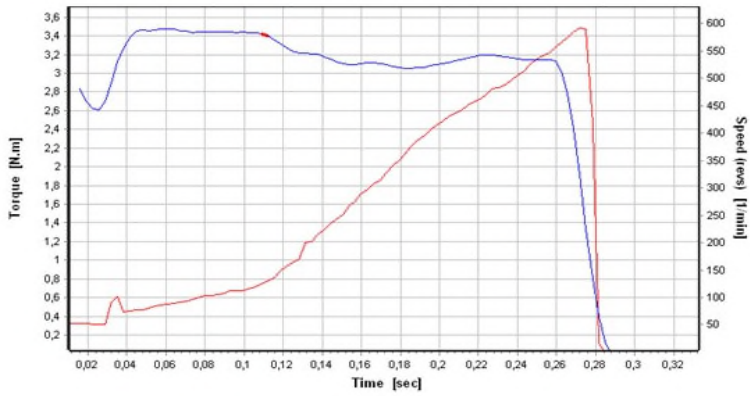
Machine Capability Study 80 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

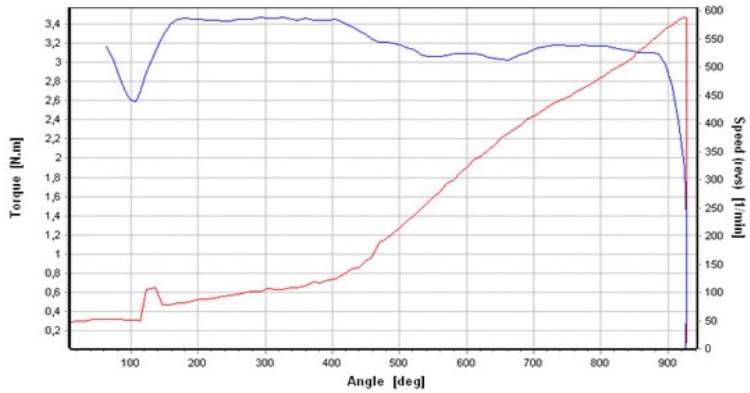
Angle degree: **360°**
Test torque: **3,4 Nm**



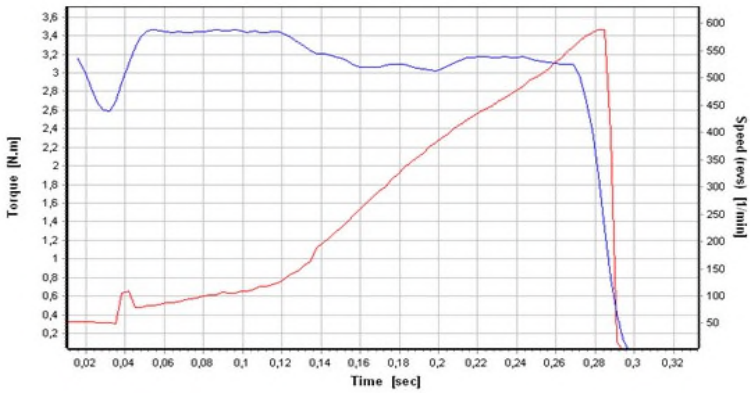
Value no. 1
Graph
Torque / Angle / Speed



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: **IJJ1014**

Test torque: Tq max. 4,00 Nm

Hard joint (H)	23,92 Nm / Revolution	Angle degree	30°
Soft joint (L)	2,06 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	4,13 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,11 Nm	0,08 Nm
	C_m	7,16	9,83
	C_{mk}	6,91	6,74

b)	Min. C_m hard/soft (lowest value)	7,16
	Min. C_{mk} hard/soft (lowest value)	6,74

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

Note:

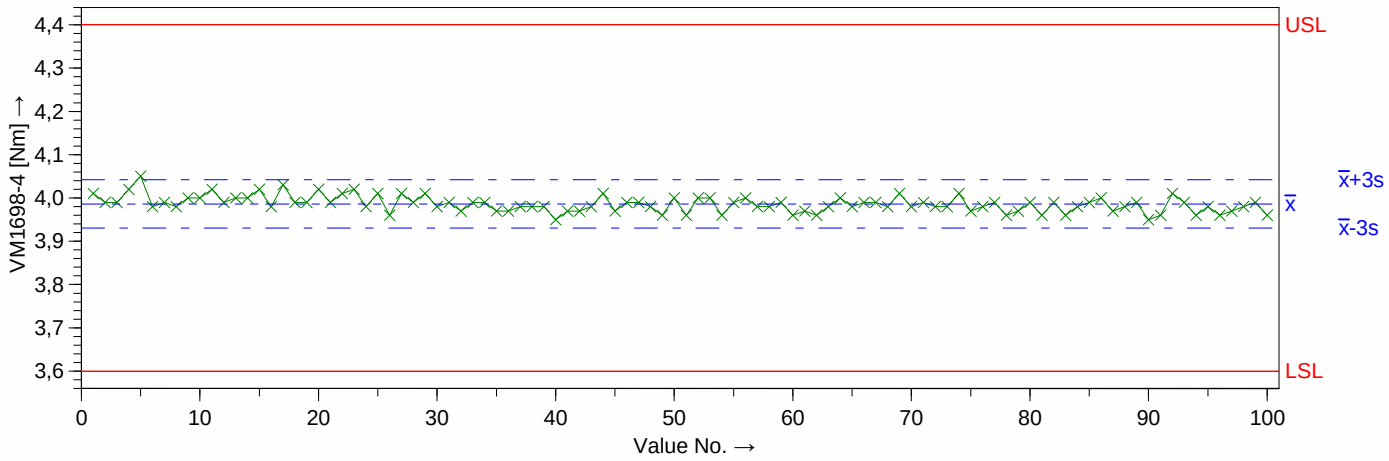
Machine Capability Study
Control System

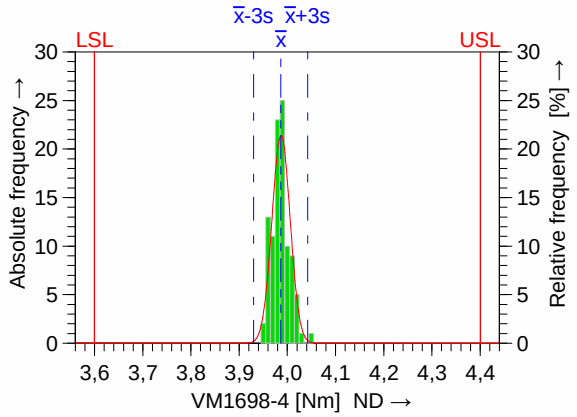
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

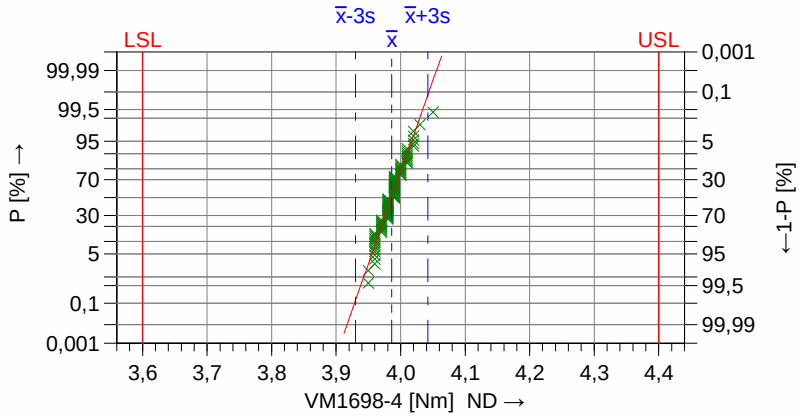
Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_b	Char.Descr.	VM1698-4	Nom.val. 4,00 / 0,40	USL 4,40
		Serial No.	1024210	Unit Nm / -0,40	LSL 3,60
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 13.11.2023 13:27:58 to 13.11.2023 13:39:32

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







Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	3.9861
LSL	3.60	x_{min}	3.95	$\bar{x}$-3s	3.9302
USL	4.40	x_{max}	4.05	$\bar{x}$+3s	4.0420
T	0.80	R	0.10	6s	0.1118
		$n_{<T>}$	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	7.16
Critical capability index	=	C_{mk}	6.91

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.	IJJ1014_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	4,01	3,99	3,99	4,02	4,05	3,98	3,99	3,98	4,00	4,00
1024210	VM1698-4	Grad	29,25	28,00	28,50	29,00	27,50	27,75	28,75	28,00	28,75	28,75

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	4,02	3,99	4,00	4,00	4,02	3,98	4,03	3,99	3,99	4,02
1024210	VM1698-4	Grad	28,00	27,50	28,75	28,50	28,50	29,00	29,25	29,25	29,25	29,50

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

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	3,99	3,97	3,99	3,99	3,97	3,97	3,98	3,98	3,98	3,95
1024210	VM1698-4	Grad	29,50	29,25	30,25	28,50	29,75	29,75	29,75	29,75	30,00	28,75

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	3,97	3,97	3,98	4,01	3,97	3,99	3,99	3,98	3,96	4,00
1024210	VM1698-4	Grad	29,75	29,50	30,00	29,50	30,50	29,50	30,00	29,50	30,00	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	3,96	4,00	4,00	3,96	3,99	4,00	3,98	3,98	3,99	3,96
1024210	VM1698-4	Grad	30,00	29,50	29,75	30,25	29,25	29,75	29,25	29,50	29,75	30,25

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	3,97	3,96	3,98	4,00	3,98	3,99	3,99	3,98	4,01	3,98
1024210	VM1698-4	Grad	29,00	29,50	30,00	29,75	30,00	29,50	29,00	30,00	29,75	30,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,99	3,98	3,98	4,01	3,97	3,98	3,99	3,96	3,97	3,99
1024210	VM1698-4	Grad	30,25	29,50	30,00	30,00	29,75	29,25	29,75	30,75	29,75	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	3,96	3,99	3,96	3,98	3,99	4,00	3,97	3,98	3,99	3,95
1024210	VM1698-4	Grad	30,50	29,25	30,25	29,00	27,75	29,50	30,00	29,50	29,75	30,25

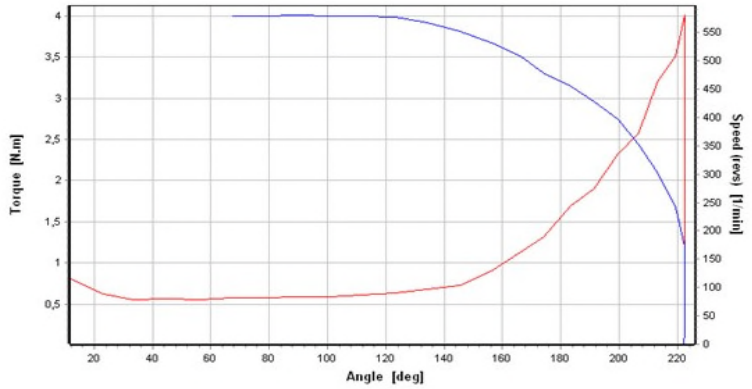
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,96	4,01	3,99	3,96	3,98	3,96	3,97	3,98	3,99	3,96
1024210	VM1698-4	Grad	30,25	30,50	30,25	29,75	30,00	30,75	29,25	30,75	30,00	29,75

Torque graphs

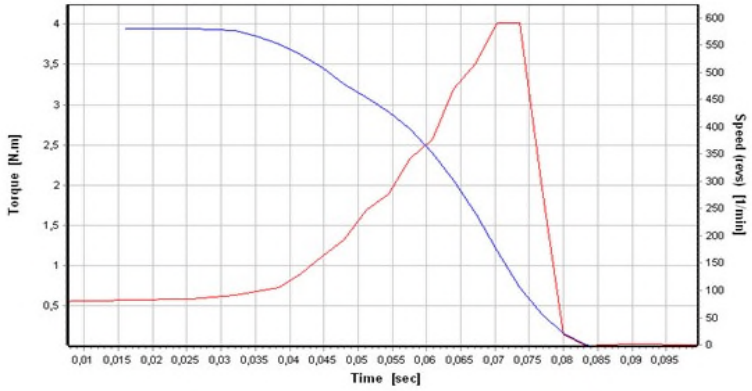
Machine Capability Study 100 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

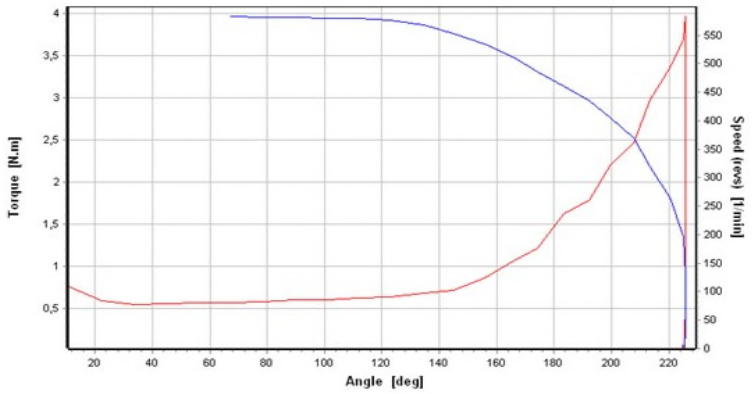
Angle degree: **30°**
Test torque: **4,0 Nm**



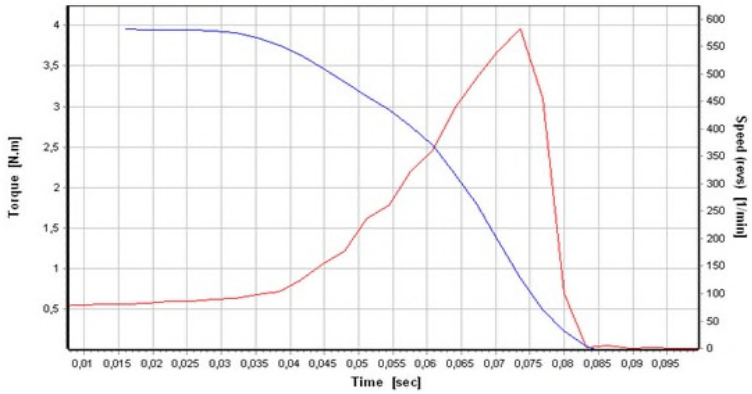
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

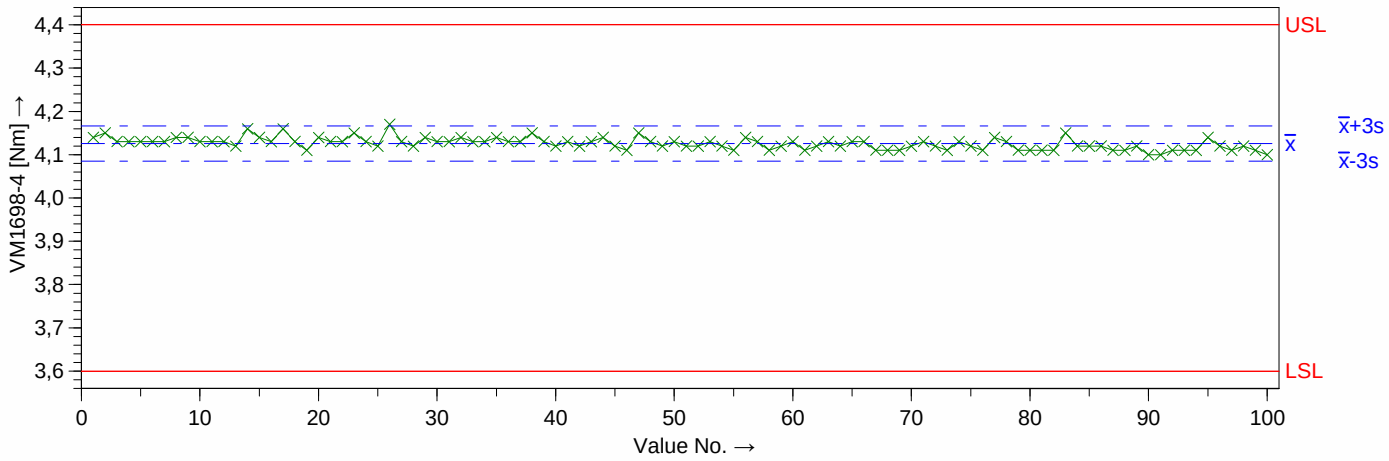
Machine Capability Study
Control System

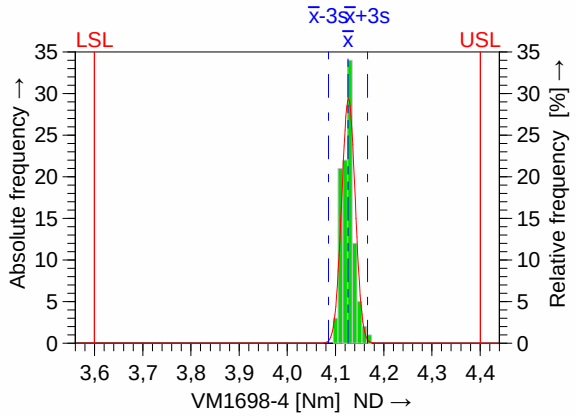
Plant	ATG Westhausen	Operator Name	Stölzle
Date	13.11.2023		

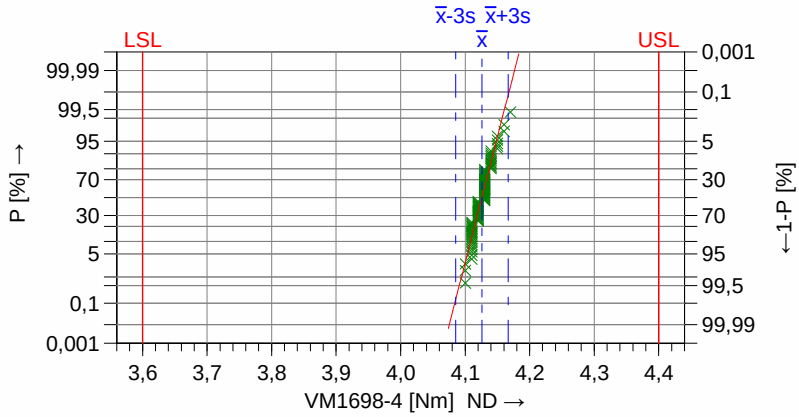
Ord. No.	CLBP04Q	Part type	CLBP04Q	Contr.item	yes
Serial No.	IJJ1014_a	Char.Descr.	VM1698-4	Nom.val. 4,00 0,40	USL 4,40
		Serial No.	1024210	Unit Nm -0,40	LSL 3,60
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic ---	
Contr.No.	Homologation	Reference Transducer	10/1026388	nges. 100	

Evaluation from 13.11.2023 13:15:08 to 13.11.2023 13:26:42

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







Drawing Values		Collected Values		Statistics	
T_m	4.00			$\bar{x}$	4.1259
LSL	3.60	x_{min}	4.10	$\bar{x}$-3s	4.0852
USL	4.40	x_{max}	4.17	$\bar{x}$+3s	4.1666
T	0.80	R	0.07	6s	0.0814
		$n_{<T>}$	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	9.83
Critical capability index	=	C_{mk}	6.74

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.	IJJ1014_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	4,14	4,15	4,13	4,13	4,13	4,13	4,13	4,14	4,14	4,13
1024210	VM1698-4	Grad	359,75	362,75	359,25	357,25	356,50	359,00	358,50	362,75	360,50	358,00

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	4,13	4,13	4,12	4,16	4,14	4,13	4,16	4,13	4,11	4,14
1024210	VM1698-4	Grad	358,25	357,25	357,25	362,25	360,75	357,25	361,50	357,75	354,75	357,75

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	4,13	4,13	4,15	4,13	4,12	4,17	4,13	4,12	4,14	4,13
1024210	VM1698-4	Grad	358,25	358,00	362,25	358,50	357,75	361,75	357,75	355,50	359,00	356,50

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	4,13	4,14	4,13	4,13	4,14	4,13	4,13	4,15	4,13	4,12
1024210	VM1698-4	Grad	356,75	358,50	357,00	355,75	359,25	357,25	354,75	355,50	358,00	352,50

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	4,13	4,12	4,13	4,14	4,12	4,11	4,15	4,13	4,12	4,13
1024210	VM1698-4	Grad	356,25	354,50	355,50	357,75	357,00	355,50	360,00	355,75	354,00	357,00

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	4,12	4,12	4,13	4,12	4,11	4,14	4,13	4,11	4,12	4,13
1024210	VM1698-4	Grad	357,75	355,75	359,75	353,75	352,25	353,50	355,75	350,75	355,00	354,75

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	4,11	4,12	4,13	4,12	4,13	4,13	4,11	4,11	4,11	4,12
1024210	VM1698-4	Grad	354,75	355,50	356,50	353,00	356,00	355,25	352,25	354,25	353,00	352,50

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	4,13	4,12	4,11	4,13	4,12	4,11	4,14	4,13	4,11	4,11
1024210	VM1698-4	Grad	354,50	354,75	353,25	356,25	355,00	354,75	357,50	357,50	351,25	353,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 13.11.2023

Serial No.	IJJ1014_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	4,11	4,11	4,15	4,12	4,12	4,12	4,11	4,11	4,12	4,10
1024210	VM1698-4	Grad	351,00	353,25	360,00	353,50	353,00	352,75	355,25	353,25	354,50	349,75

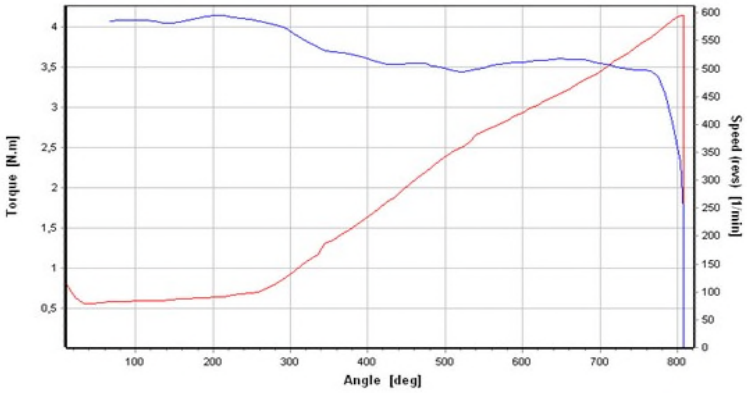
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	4,10	4,11	4,11	4,11	4,14	4,12	4,11	4,12	4,11	4,10
1024210	VM1698-4	Grad	351,25	354,75	353,25	361,00	366,00	362,75	356,75	360,25	361,00	360,00

Torque graphs

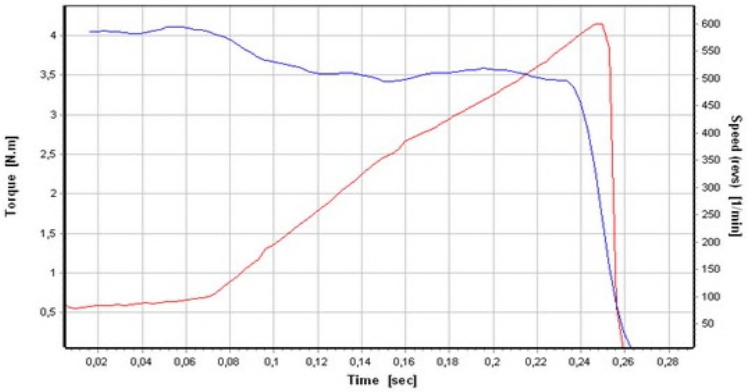
Machine Capability Study 100 %

Model: **CLBP04Q**
Serial no: **IJJ1014**

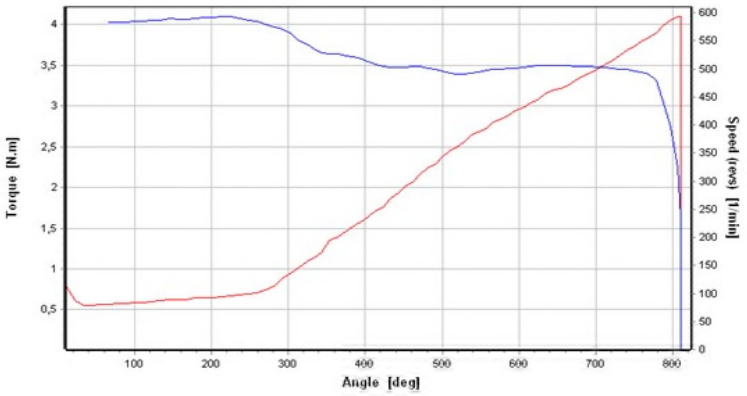
Angle degree: **360°**
Test torque: **4,0 Nm**



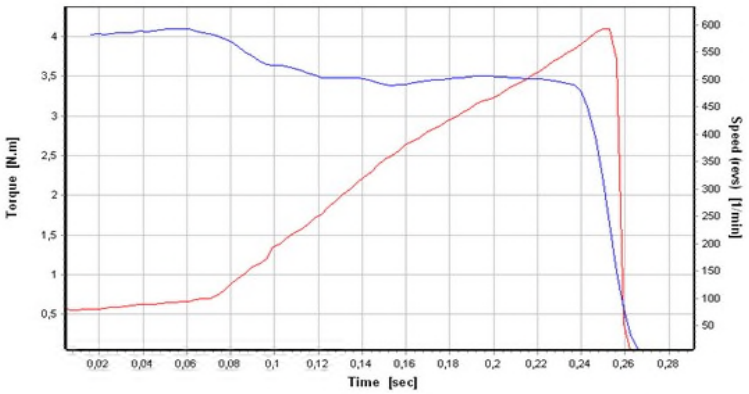
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed