Homologation

Cordless Assembly Tools

Model: CLBP12Q

Serial no.: IJJ1005

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Homologation: CLBP12Q SN: IJJ1005

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Document no: 003/23
Date: 16.11.2023

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 600 rpm	85,71 %
Single-stage tightening system	☐	Speed 100 %	700 rpm

Manufacturer: Apex Tool Group Serial no: **IJJ1005**

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

Hard joint (H)	34,84 Nm / Revolution	Angle degree	30°
Soft joint (L)	2,98 Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	5,26 - 6,42 Nm	5,26 - 6,42 Nm
	Tolerance down / up	10 %	10 %
	Average torque	5,81 Nm	5,95 Nm
	Standard deviation	0,02 Nm	0,02 Nm
	Torque scatter (99,73%)	0,12 Nm	0,10 Nm
	C_m	9,69	12,09
	C_{mk}	9,15	9,78

b)	Min. C_m hard/soft (lowest value)	9,69
	Min. C_{mk} hard/soft (lowest value)	9,15

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

Note:

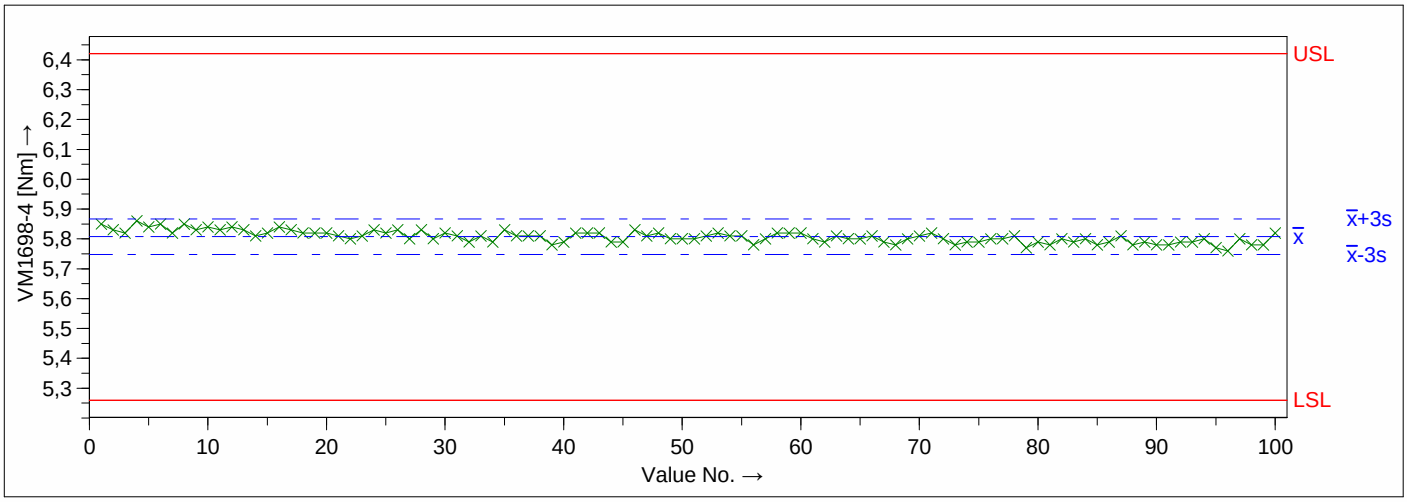
Machine Capability Study
Control System

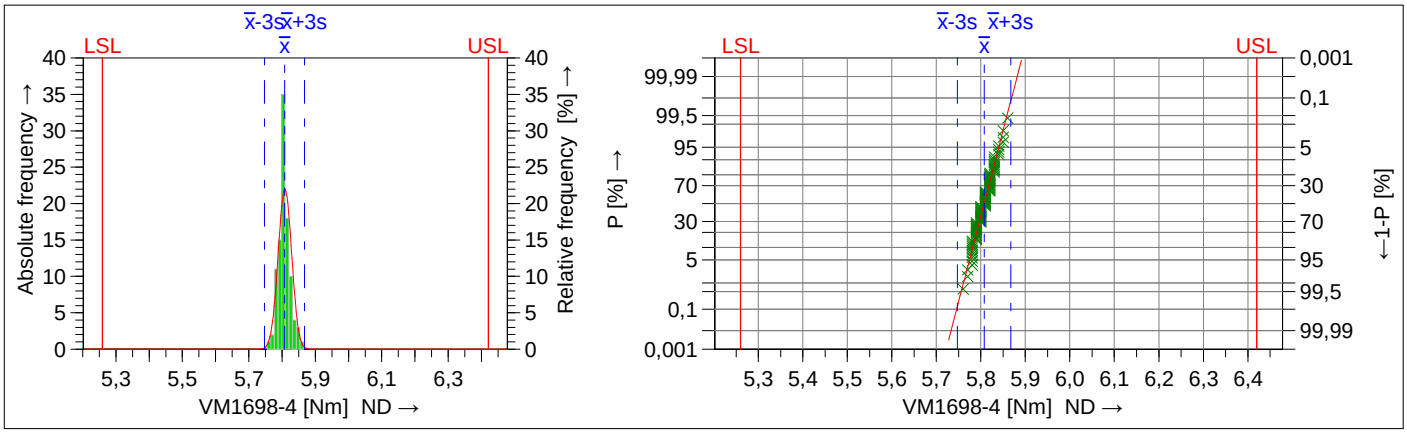
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005d	Char.Descr.	VM1698-4	Nom.val. 5,84 0,58	USL 6,42
		Serial No.	1024210	Unit Nm -0,58	LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 08:29:33 to 03.11.2023 08:41:56

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





Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	5.8073
LSL	5.26	x_{min}	5.76	$\bar{x}$-3s	5.7475
USL	6.42	x_{max}	5.86	$\bar{x}$+3s	5.8671
T	1.16	R	0.10	6s	0.1197
		$n_{<T>}$	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	9.69
Critical capability index	=	C_{mk}	9.15

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

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Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	5,85	5,83	5,82	5,86	5,84	5,85	5,82	5,85	5,83	5,84
1024210	VM1698-4	Grad	31,25	30,50	31,25	30,00	30,25	30,75	30,75	31,50	30,50	31,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	5,83	5,84	5,83	5,81	5,82	5,84	5,83	5,82	5,82	5,82
1024210	VM1698-4	Grad	31,00	30,75	30,75	29,75	30,75	31,00	31,25	30,25	29,75	29,25

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	5,81	5,80	5,81	5,83	5,82	5,83	5,80	5,83	5,80	5,82
1024210	VM1698-4	Grad	30,00	29,75	29,25	30,25	29,50	30,25	29,50	30,50	29,75	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	5,81	5,79	5,81	5,79	5,83	5,81	5,81	5,81	5,78	5,79
1024210	VM1698-4	Grad	30,25	29,50	29,50	29,50	29,75	29,25	30,00	30,75	29,75	29,50

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	5,82	5,82	5,82	5,79	5,79	5,83	5,81	5,82	5,80	5,80
1024210	VM1698-4	Grad	29,50	29,75	30,25	30,00	29,50	30,75	30,25	30,50	30,50	30,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	5,80	5,81	5,82	5,81	5,81	5,78	5,80	5,82	5,82	5,82
1024210	VM1698-4	Grad	30,75	31,25	30,25	30,75	30,25	29,50	29,50	29,25	29,50	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	5,80	5,79	5,81	5,80	5,80	5,81	5,79	5,78	5,80	5,81
1024210	VM1698-4	Grad	29,25	29,25	29,25	30,25	29,50	29,50	29,75	29,25	30,25	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	5,82	5,80	5,78	5,79	5,79	5,80	5,80	5,81	5,77	5,79
1024210	VM1698-4	Grad	29,75	29,50	29,75	29,75	29,75	29,50	30,25	29,75	30,00	29,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	5,78	5,80	5,79	5,80	5,78	5,79	5,81	5,78	5,79	5,78
1024210	VM1698-4	Grad	30,25	29,50	29,50	30,25	29,50	30,50	30,50	29,75	29,25	29,75

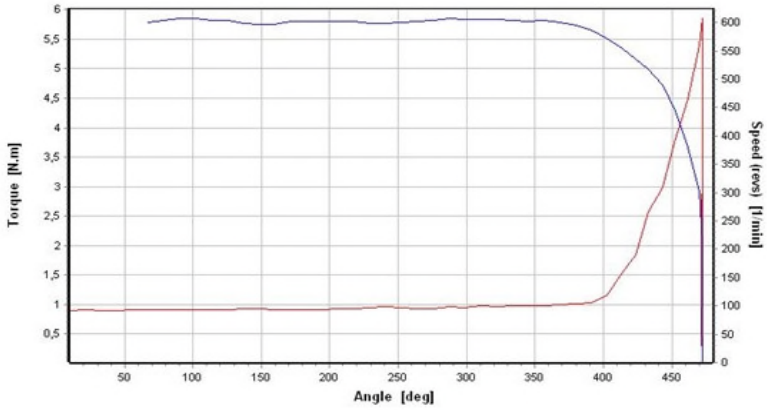
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	5,78	5,79	5,79	5,80	5,77	5,76	5,80	5,78	5,78	5,82
1024210	VM1698-4	Grad	29,25	29,25	29,25	29,00	30,00	29,00	29,50	29,25	30,00	29,75

Torque graphs

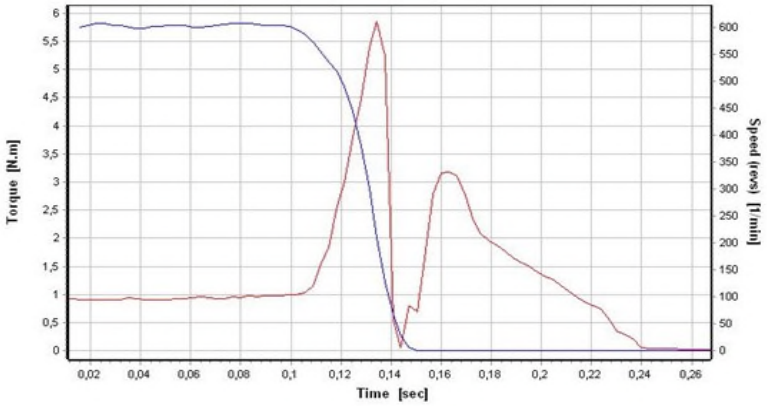
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

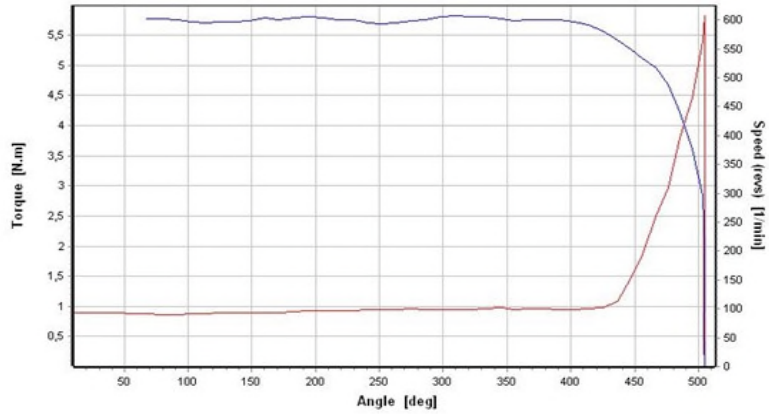
Angle degree: **30°**
Test torque: **5,8 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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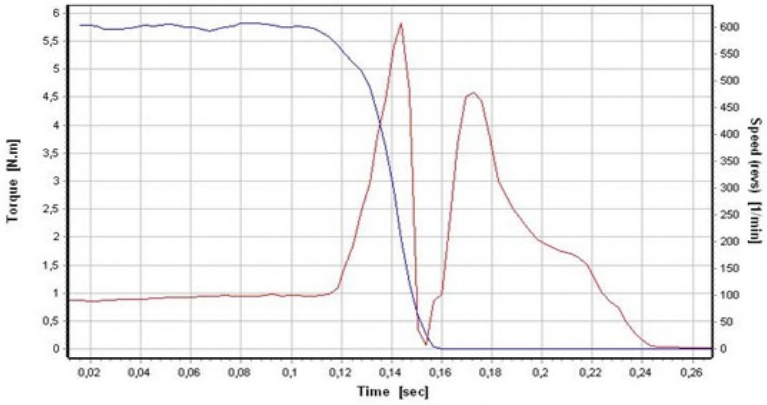
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

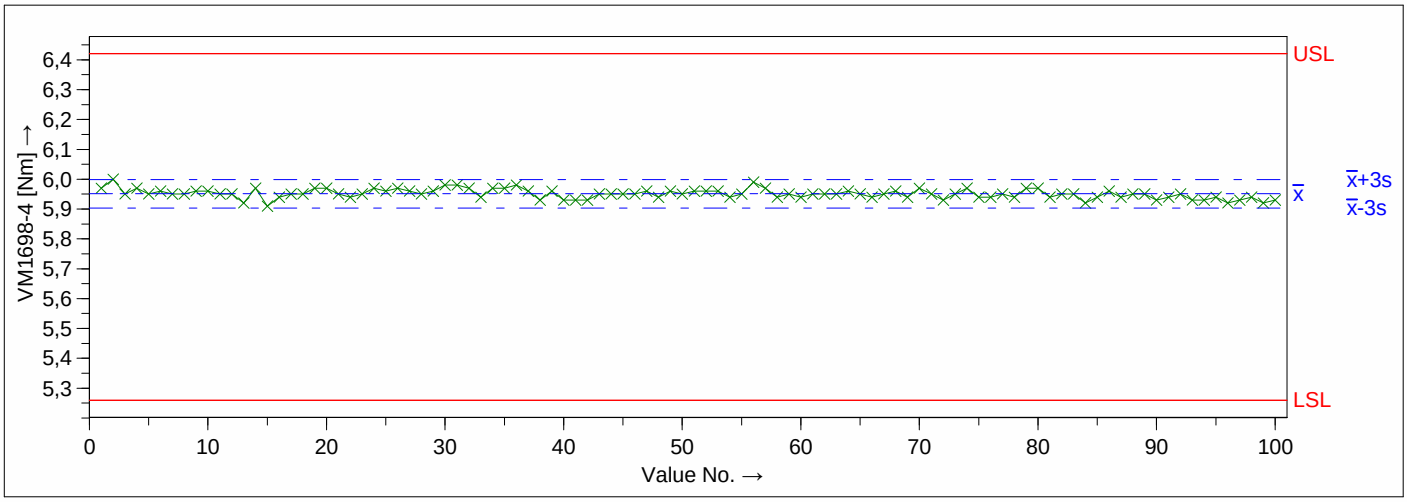
Machine Capability Study
Control System

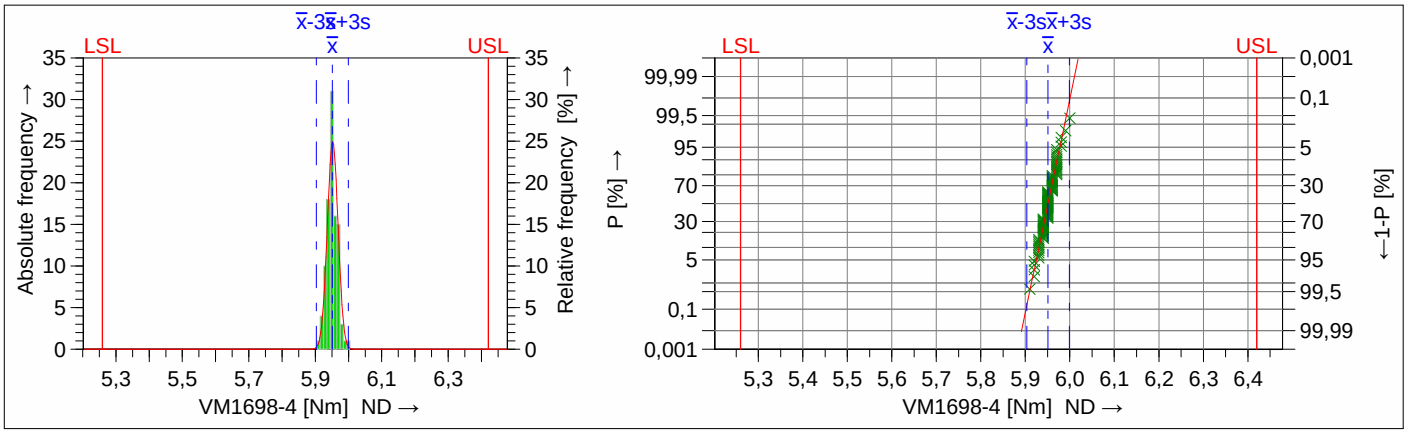
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005c	Char.Descr.	VM1698-4	Nom.val. 5,84	0,58 USL 6,42
		Serial No.	1024210	Unit Nm	-0,58 LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 08:15:33 to 03.11.2023 08:27:59

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





Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	5.9510
LSL	5.26	x_{min}	5.91	$\bar{x}$-3s	5.9030
USL	6.42	x_{max}	6.00	$\bar{x}$+3s	5.9990
T	1.16	R	0.09	6s	0.0959
		$n_{<T>}$	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	12.09
Critical capability index	=	C_{mk}	9.78

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

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Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	5,97	6,00	5,95	5,97	5,95	5,96	5,95	5,95	5,96	5,96
1024210	VM1698-4	Grad	363,00	364,00	362,00	362,00	360,50	360,25	362,25	361,75	363,75	362,75

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	5,95	5,95	5,92	5,97	5,91	5,94	5,95	5,95	5,97	5,97
1024210	VM1698-4	Grad	360,75	360,25	357,75	365,75	355,50	360,50	360,75	362,25	362,25	364,25

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	5,95	5,94	5,95	5,97	5,96	5,97	5,96	5,95	5,96	5,98
1024210	VM1698-4	Grad	361,00	358,25	361,50	363,25	362,00	363,25	362,25	358,50	361,00	363,25

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	5,98	5,97	5,94	5,97	5,97	5,98	5,96	5,93	5,96	5,93
1024210	VM1698-4	Grad	360,25	365,50	356,50	363,50	364,25	363,50	358,50	358,50	362,75	358,75

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	5,93	5,93	5,95	5,95	5,95	5,95	5,96	5,94	5,96	5,95
1024210	VM1698-4	Grad	359,25	360,50	362,50	362,50	362,50	363,50	362,75	362,50	365,50	365,25

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	5,96	5,96	5,96	5,94	5,95	5,99	5,97	5,94	5,95	5,94
1024210	VM1698-4	Grad	363,00	362,75	363,50	359,50	361,50	365,00	365,00	363,50	361,75	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	5,95	5,95	5,95	5,96	5,95	5,94	5,95	5,96	5,94	5,97
1024210	VM1698-4	Grad	363,50	365,00	362,00	364,75	362,50	363,50	363,50	362,50	358,75	365,50

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	5,95	5,93	5,95	5,97	5,94	5,94	5,95	5,94	5,97	5,97
1024210	VM1698-4	Grad	361,25	361,25	362,00	364,75	358,50	361,75	363,00	359,75	362,25	364,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	5,94	5,95	5,95	5,92	5,94	5,96	5,94	5,95	5,95	5,93
1024210	VM1698-4	Grad	362,00	362,00	365,75	363,25	362,25	366,75	363,00	361,75	365,25	361,75

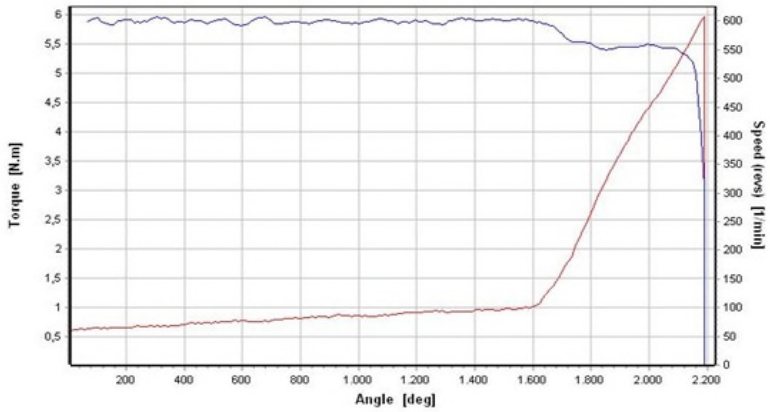
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	5,94	5,95	5,93	5,93	5,94	5,92	5,93	5,94	5,92	5,93
1024210	VM1698-4	Grad	365,25	362,75	359,00	363,75	364,75	360,75	364,50	362,75	362,00	365,00

Torque graphs

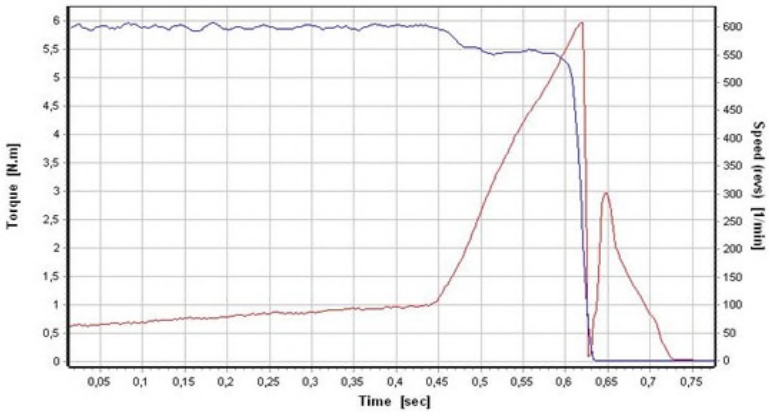
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

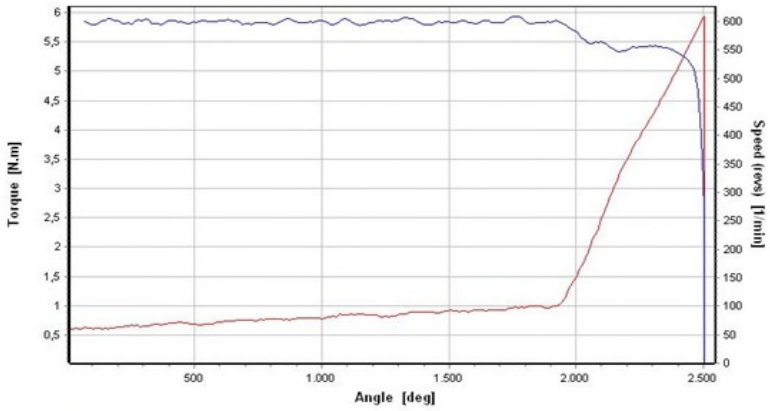
Angle degree: **360°**
Test torque: **5,8 Nm**



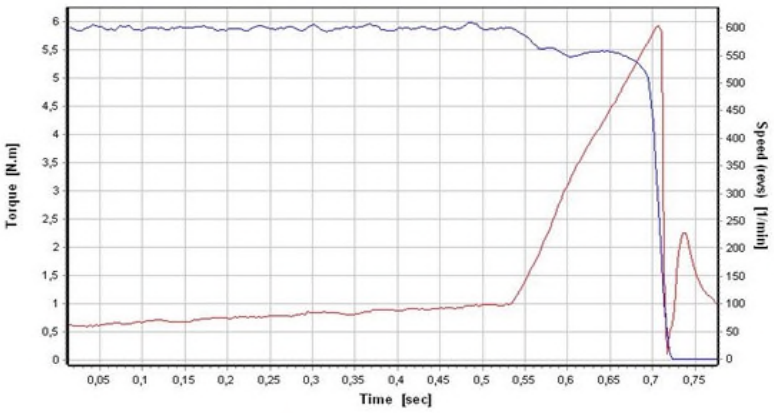
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 3

Machine Capability Study 80 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1005**

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

Hard joint (H)	59,29	Nm / Revolution	Angle degree	30°
Soft joint (L)	5,11	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	9,22 - 11,26 Nm	9,22 - 11,26 Nm
	Tolerance down / up	10 %	10 %
	Average torque	9,88 Nm	10,23 Nm
	Standard deviation	0,03 Nm	0,03 Nm
	Torque scatter (99,73%)	0,15 Nm	0,17 Nm
	C_m	13,23	12,17
	C_{mk}	8,58	12,03

b)	Min. C_m hard/soft (lowest value)	12,17
	Min. C_{mk} hard/soft (lowest value)	8,58

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

Note:

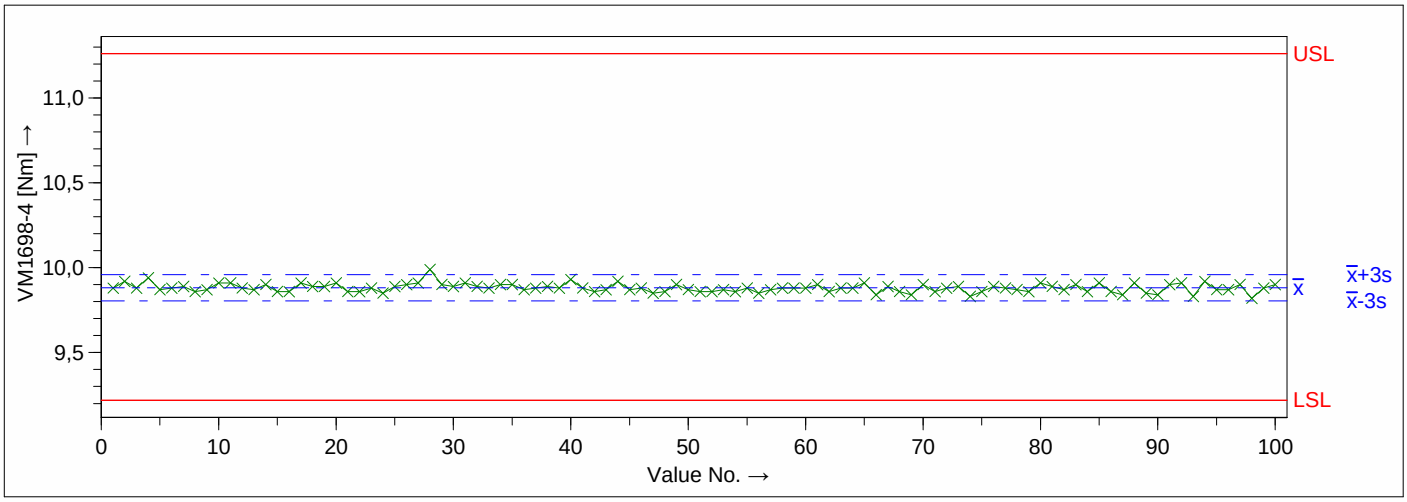
Machine Capability Study
Control System

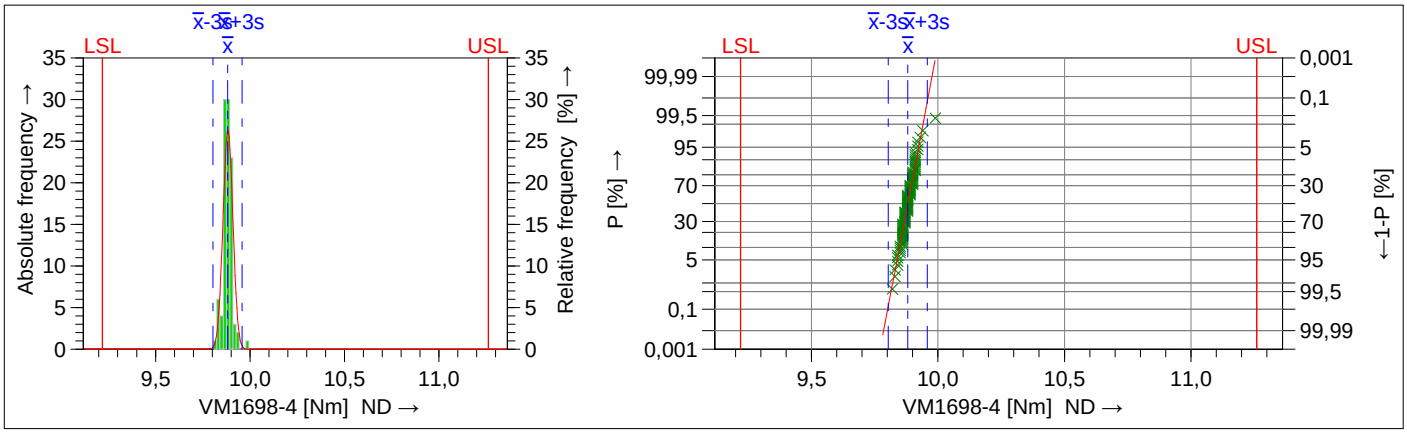
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005h	Char.Descr.	VM1698-4	Nom.val. 10,24 1,02	USL 11,26
		Serial No.	1024210	Unit Nm -1,02	LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 07:12:27 to 03.11.2023 07:26:29

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





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	9.8811
LSL	9.22	x_{min}	9.82	$\bar{x}$-3s	9.8040
USL	11.26	x_{max}	9.99	$\bar{x}$+3s	9.9582
T	2.04	R	0.17	6s	0.1542
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	13.23
Critical capability index	=	C_{mk}	8.58

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 03.11.2023

Serial No.	IJJ1005h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	9,88	9,92	9,88	9,94	9,87	9,88	9,89	9,86	9,87	9,91
1024210	VM1698-4	Grad	31,25	31,25	31,75	31,50	30,50	31,75	31,25	30,75	31,25	31,00

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	9,91	9,88	9,87	9,90	9,86	9,86	9,91	9,89	9,89	9,91
1024210	VM1698-4	Grad	31,25	30,75	31,00	31,50	31,00	30,50	31,50	31,00	31,25	31,75

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	9,86	9,86	9,88	9,85	9,89	9,90	9,91	9,99	9,90	9,89
1024210	VM1698-4	Grad	30,75	30,75	31,00	30,75	30,75	30,75	31,25	32,00	31,00	31,00

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	9,91	9,89	9,88	9,90	9,90	9,87	9,88	9,89	9,88	9,93
1024210	VM1698-4	Grad	31,25	31,25	30,00	31,25	31,25	31,00	30,00	30,50	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	9,88	9,86	9,87	9,92	9,87	9,88	9,85	9,86	9,90	9,87
1024210	VM1698-4	Grad	30,25	30,00	30,50	31,25	30,25	30,25	30,00	30,25	30,25	30,50

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	9,86	9,86	9,87	9,86	9,88	9,85	9,87	9,88	9,88	9,88
1024210	VM1698-4	Grad	30,25	30,50	30,25	30,50	31,75	30,50	31,25	30,50	30,25	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	9,90	9,86	9,88	9,88	9,91	9,84	9,89	9,86	9,84	9,90
1024210	VM1698-4	Grad	31,50	31,75	30,25	29,75	31,75	30,50	30,75	30,50	30,75	30,75

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	9,86	9,88	9,89	9,83	9,86	9,89	9,88	9,87	9,86	9,91
1024210	VM1698-4	Grad	31,50	30,75	30,25	29,25	30,50	29,25	30,75	30,00	30,00	30,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	9,89	9,87	9,90	9,86	9,91	9,86	9,84	9,91	9,85	9,84
1024210	VM1698-4	Grad	30,25	29,00	31,00	30,00	30,75	31,25	30,50	30,75	30,25	30,75

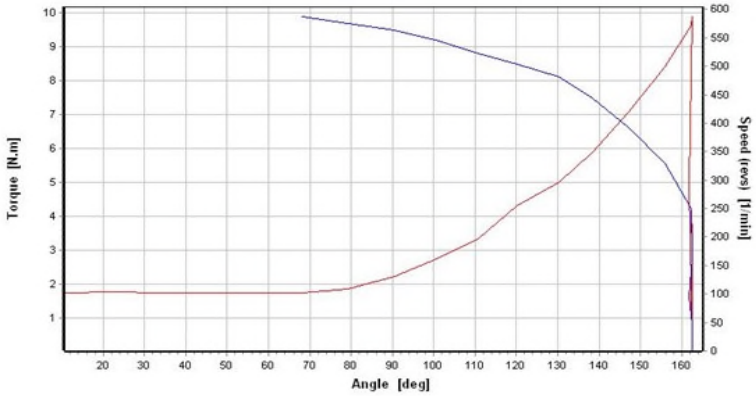
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	9,90	9,91	9,83	9,92	9,87	9,87	9,90	9,82	9,88	9,90
1024210	VM1698-4	Grad	31,25	30,75	30,00	31,00	30,00	31,00	31,50	30,25	31,25	30,75

Torque graphs

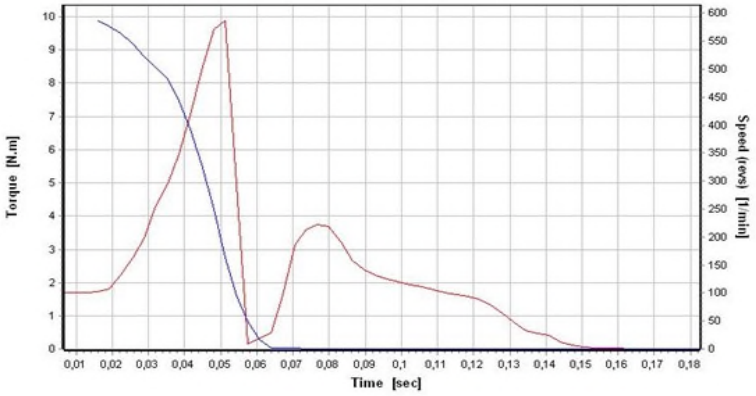
Machine Capability Study 80 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

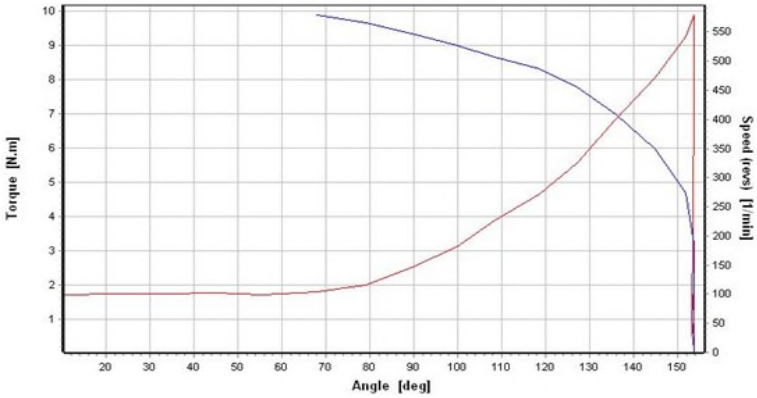
Angle degree: **30°**
Test torque: **10,2 Nm**



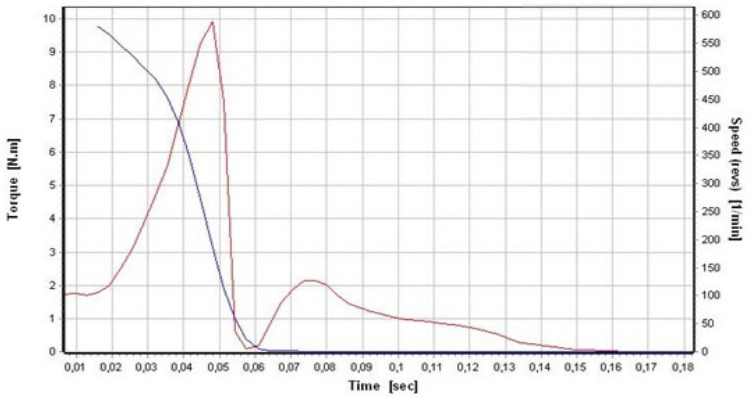
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

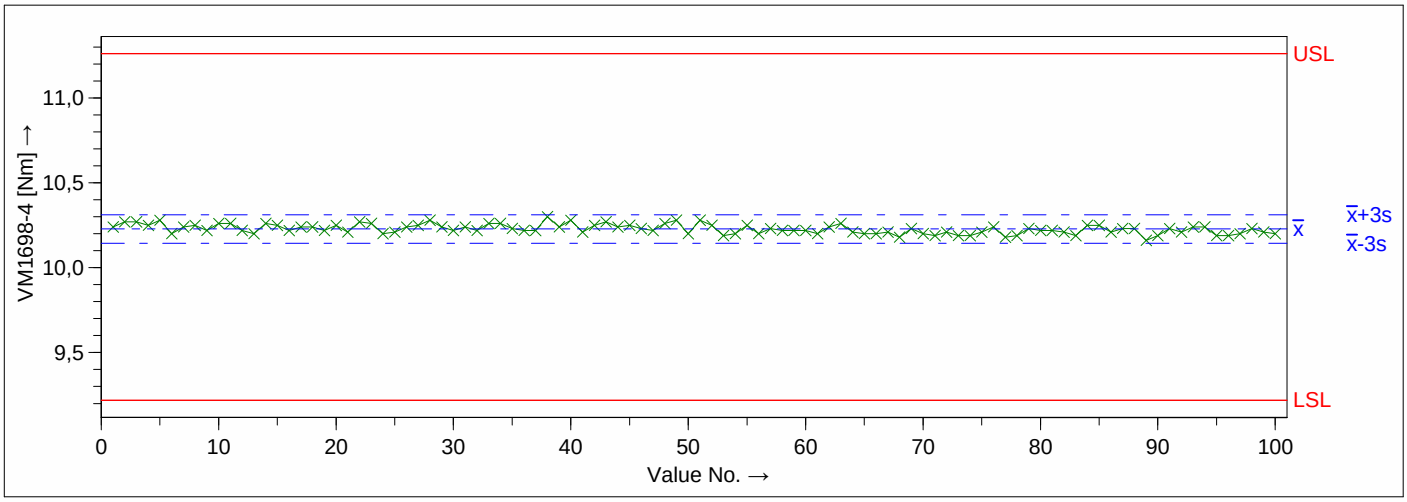
Machine Capability Study
Control System

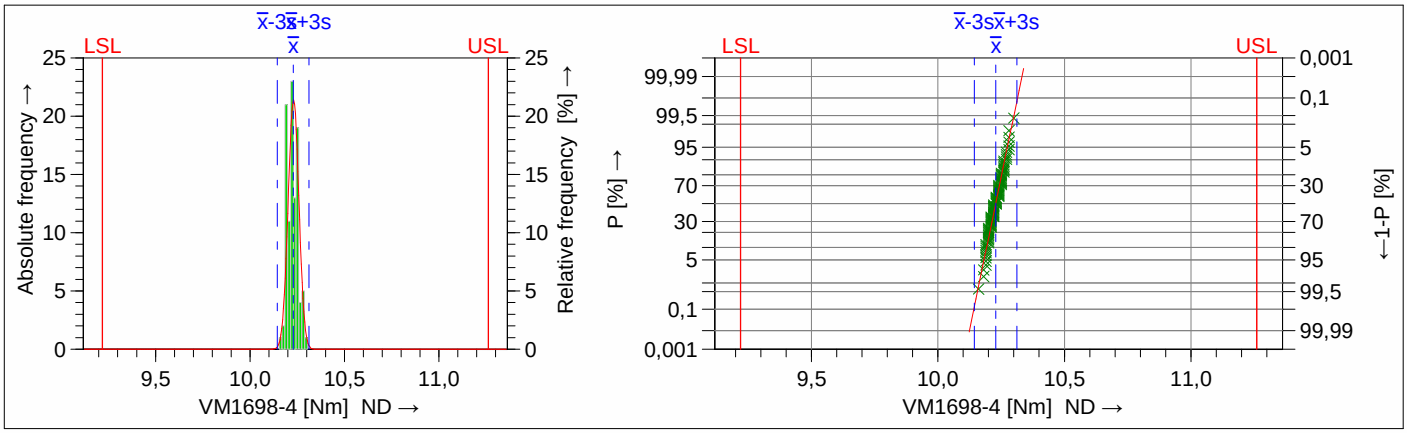
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005g	Char.Descr.	VM1698-4	Nom.val. 10,24 1,02	USL 11,26
		Serial No.	1024210	Unit Nm -1,02	LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 06:39:01 to 03.11.2023 06:53:03

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





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	10.2282
LSL	9.22	x_{min}	10.16	$\bar{x}$-3s	10.1444
USL	11.26	x_{max}	10.30	$\bar{x}$+3s	10.3120
T	2.04	R	0.14	6s	0.1676
		$n_{<T>}$	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	12.17
Critical capability index	=	C_{mk}	12.03

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 03.11.2023

Serial No.	IJJ1005g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	10,24	10,27	10,27	10,25	10,28	10,20	10,24	10,25	10,22	10,26
1024210	VM1698-4	Grad	354,00	356,75	360,75	358,00	363,25	355,50	360,00	362,00	358,50	363,00

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	10,26	10,22	10,20	10,26	10,25	10,22	10,24	10,24	10,22	10,25
1024210	VM1698-4	Grad	361,25	359,50	361,00	361,75	360,25	360,25	362,25	361,00	359,00	364,50

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	10,21	10,27	10,26	10,20	10,21	10,24	10,25	10,28	10,24	10,22
1024210	VM1698-4	Grad	358,75	363,25	362,50	360,75	360,50	363,75	363,25	368,00	364,00	363,75

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	10,24	10,22	10,26	10,26	10,23	10,22	10,22	10,30	10,24	10,28
1024210	VM1698-4	Grad	361,75	362,00	366,25	366,00	363,50	363,75	363,75	371,00	367,25	368,00

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	10,21	10,25	10,27	10,24	10,25	10,23	10,22	10,26	10,28	10,20
1024210	VM1698-4	Grad	358,00	361,25	361,00	358,00	360,00	361,25	358,50	360,50	362,75	356,25

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	10,28	10,25	10,19	10,20	10,25	10,20	10,23	10,22	10,22	10,22
1024210	VM1698-4	Grad	361,50	362,00	358,00	354,25	360,00	357,75	359,00	360,50	359,25	358,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	10,20	10,24	10,26	10,21	10,20	10,20	10,21	10,18	10,23	10,20
1024210	VM1698-4	Grad	358,50	361,75	363,50	358,00	360,25	357,75	357,00	358,00	359,00	357,50

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	10,19	10,21	10,19	10,19	10,21	10,24	10,18	10,19	10,23	10,22
1024210	VM1698-4	Grad	358,50	359,75	359,50	357,50	358,75	359,75	358,75	358,50	359,50	362,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	10,22	10,21	10,19	10,25	10,25	10,21	10,23	10,23	10,16	10,19
1024210	VM1698-4	Grad	361,50	360,50	356,25	361,00	361,25	359,75	361,75	360,00	357,50	358,00

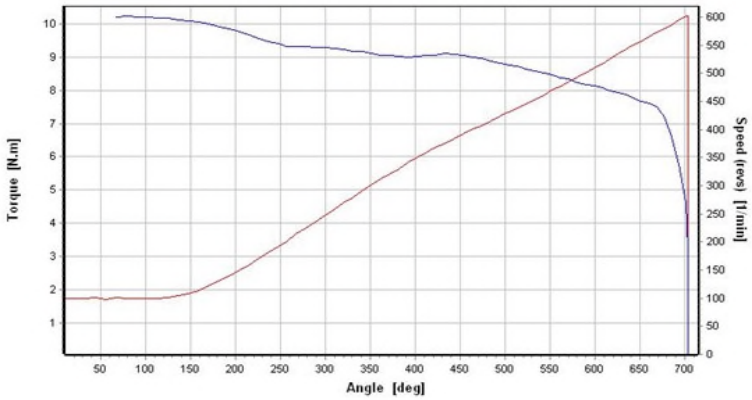
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	10,23	10,21	10,24	10,24	10,19	10,19	10,20	10,23	10,21	10,20
1024210	VM1698-4	Grad	361,75	360,75	360,50	361,25	357,50	360,25	360,25	363,75	360,25	361,25

Torque graphs

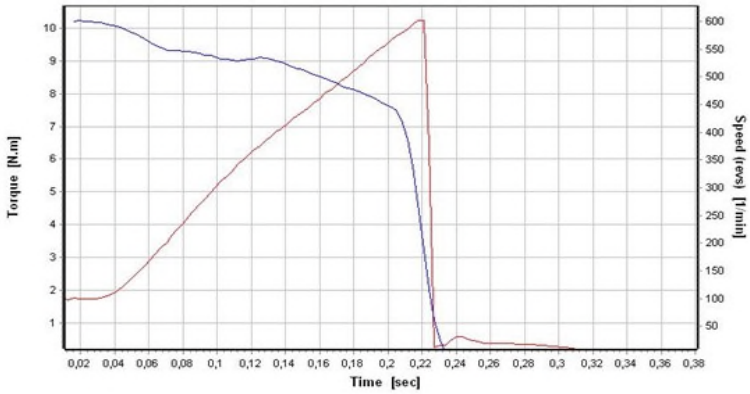
Machine Capability Study 80 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

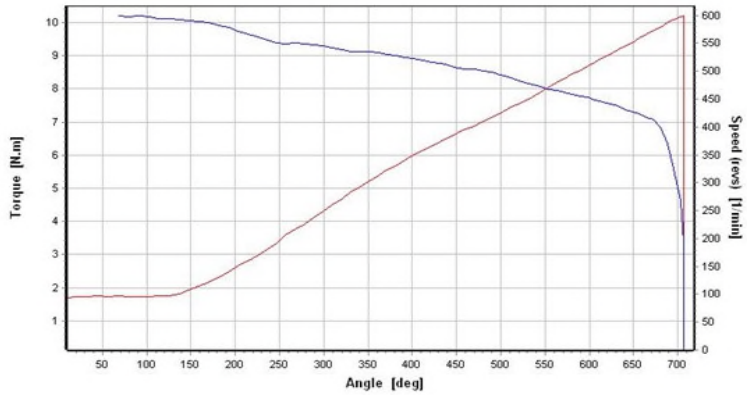
Angle degree: **360°**
Test torque: **10,2 Nm**



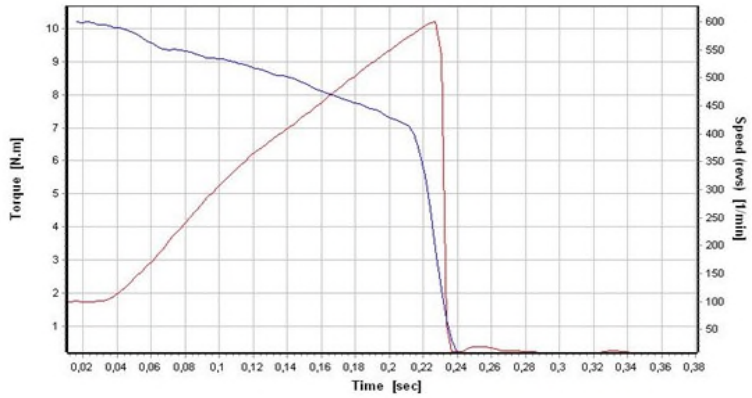
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1005**

Test torque: Tq max. 12,00 Nm

Hard joint (H)	70,49 Nm / Revolution	Angle degree	30°
Soft joint (L)	6,12 Nm / Revolution	Angle degree	360°

		H	**L**
a)	Tolerance down / up	10,80 - 13,20 Nm	10,80 - 13,20 Nm
	Tolerance down / up	10 %	10 %
	Average torque	11,75 Nm	12,23 Nm
	Standard deviation	0,04 Nm	0,07 Nm
	Torque scatter (99,73%)	0,24 Nm	0,42 Nm
	C_m	10,18	5,78
	C_{mk}	8,05	4,66

b)	Min. C_m hard/soft (lowest value)	5,78
	Min. C_{mk} hard/soft (lowest value)	4,66

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

Note:

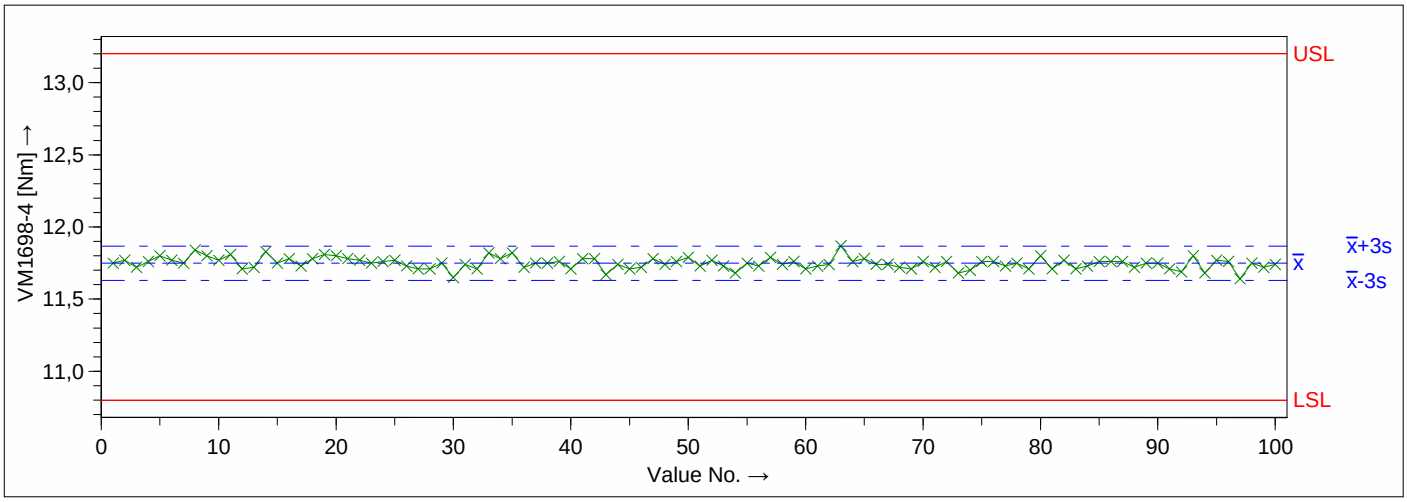
Machine Capability Study
Control System

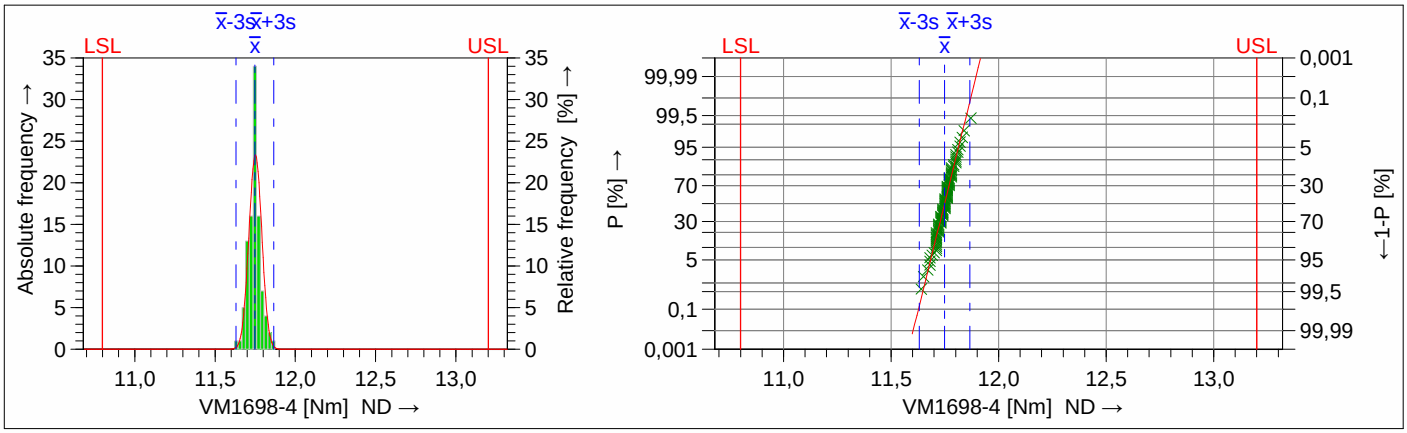
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005b	Char.Descr.	VM1698-4	Nom.val. 12,00 1,20	USL 13,20
		Serial No.	1024210	Unit Nm -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 10:21:43 to 03.11.2023 10:33:20

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





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	11.7485
LSL	10.80	x_{min}	11.64	$\bar{x}$-3s	11.6306
USL	13.20	x_{max}	11.87	$\bar{x}$+3s	11.8664
T	2.40	R	0.23	6s	0.2358
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = s_{tot}
Potential Capability index	=	C_m	10.18
Critical capability index	=	C_{mk}	8.05

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 03.11.2023

Serial No.	IJJ1005b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	11,75	11,77	11,72	11,76	11,80	11,77	11,75	11,84	11,80	11,77
1024210	VM1698-4	Grad	31,25	31,00	28,75	30,75	32,00	32,00	32,50	31,00	31,75	30,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	11,81	11,71	11,72	11,83	11,75	11,78	11,73	11,78	11,81	11,80
1024210	VM1698-4	Grad	32,25	29,75	31,25	31,00	32,25	30,25	31,50	31,25	29,25	30,75

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	11,78	11,77	11,75	11,76	11,77	11,73	11,71	11,71	11,75	11,65
1024210	VM1698-4	Grad	31,75	30,50	29,50	31,50	30,75	29,50	29,75	30,75	28,50	31,25

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	11,74	11,71	11,82	11,78	11,82	11,72	11,75	11,75	11,76	11,71
1024210	VM1698-4	Grad	29,25	30,25	29,50	30,75	32,25	29,50	32,00	29,50	30,75	29,50

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	11,78	11,78	11,67	11,74	11,71	11,72	11,78	11,74	11,76	11,79
1024210	VM1698-4	Grad	29,75	30,25	31,00	30,25	29,00	29,50	30,00	30,00	29,75	30,75

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	11,73	11,77	11,73	11,68	11,75	11,73	11,79	11,74	11,76	11,71
1024210	VM1698-4	Grad	30,25	29,25	30,25	31,75	29,50	29,75	29,75	29,75	31,25	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	11,73	11,74	11,87	11,76	11,78	11,74	11,74	11,72	11,71	11,76
1024210	VM1698-4	Grad	29,50	30,25	30,75	29,75	31,25	31,25	30,75	29,75	31,25	29,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	11,72	11,76	11,68	11,70	11,76	11,76	11,73	11,75	11,71	11,80
1024210	VM1698-4	Grad	29,25	30,75	29,00	29,50	30,00	29,00	30,25	28,75	29,00	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	11,71	11,77	11,71	11,73	11,76	11,76	11,76	11,72	11,75	11,75
1024210	VM1698-4	Grad	31,00	28,75	29,25	29,75	28,50	30,25	30,00	29,25	29,75	30,50

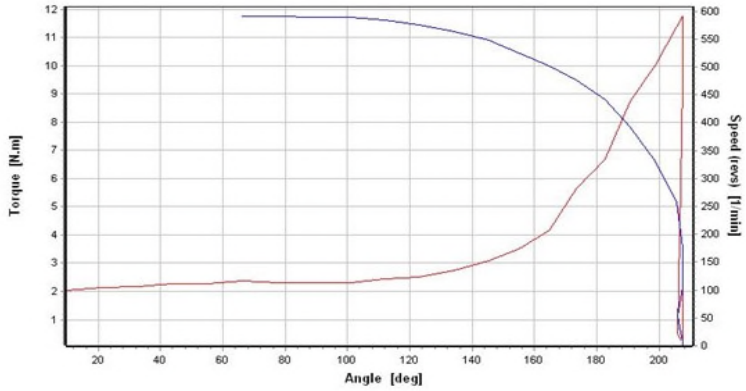
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,71	11,69	11,80	11,68	11,77	11,76	11,64	11,75	11,72	11,74
1024210	VM1698-4	Grad	31,25	29,75	30,25	31,00	29,75	30,25	31,00	29,75	30,75	30,75

Torque graphs

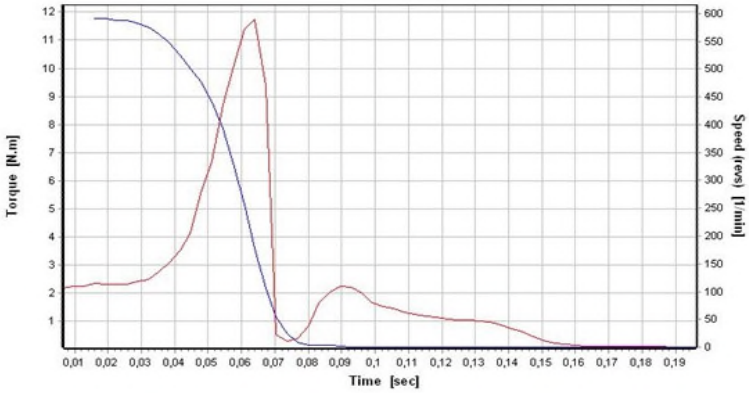
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

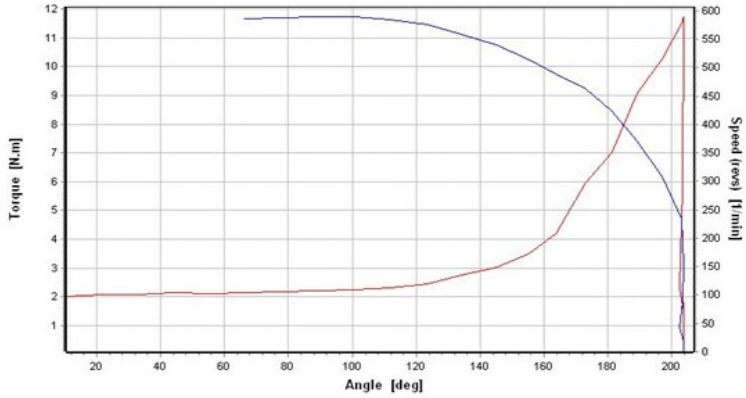
Angle degree: **30°**
Test torque: **12,0 Nm**



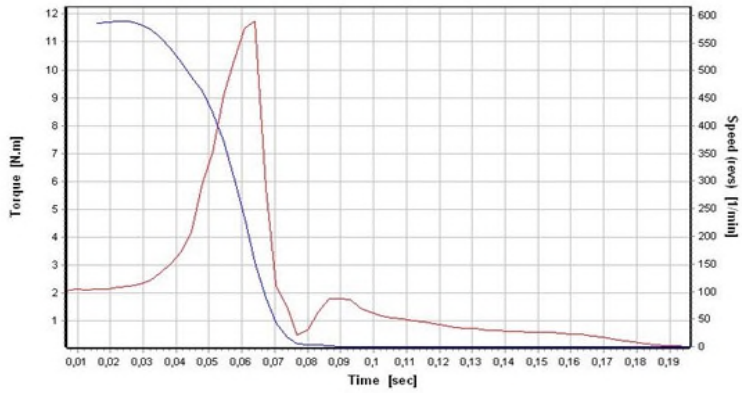
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

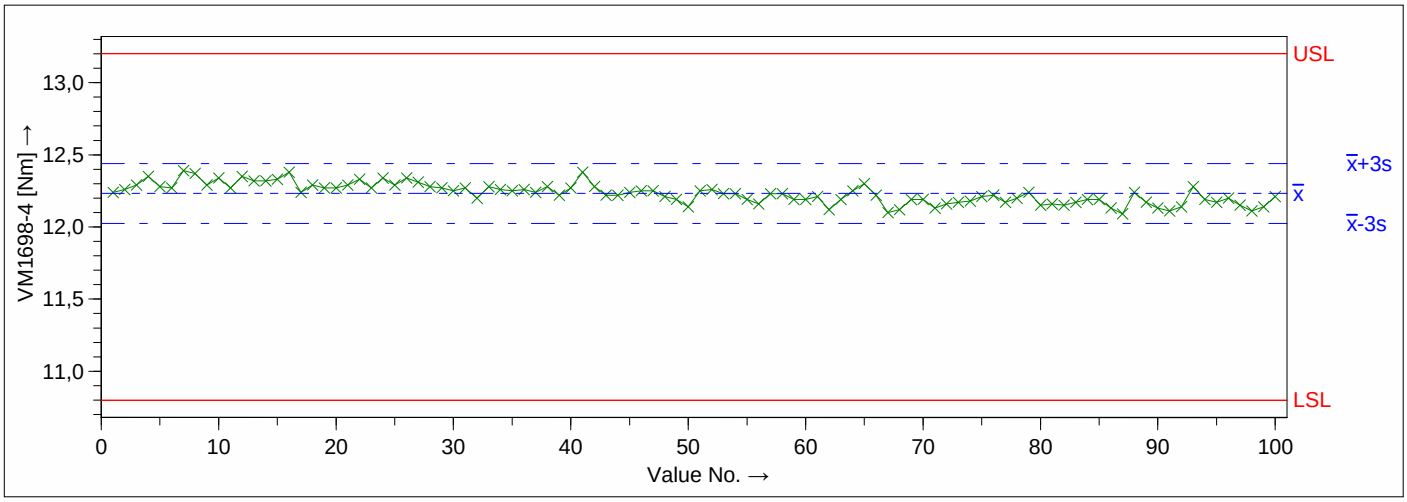
Machine Capability Study
Control System

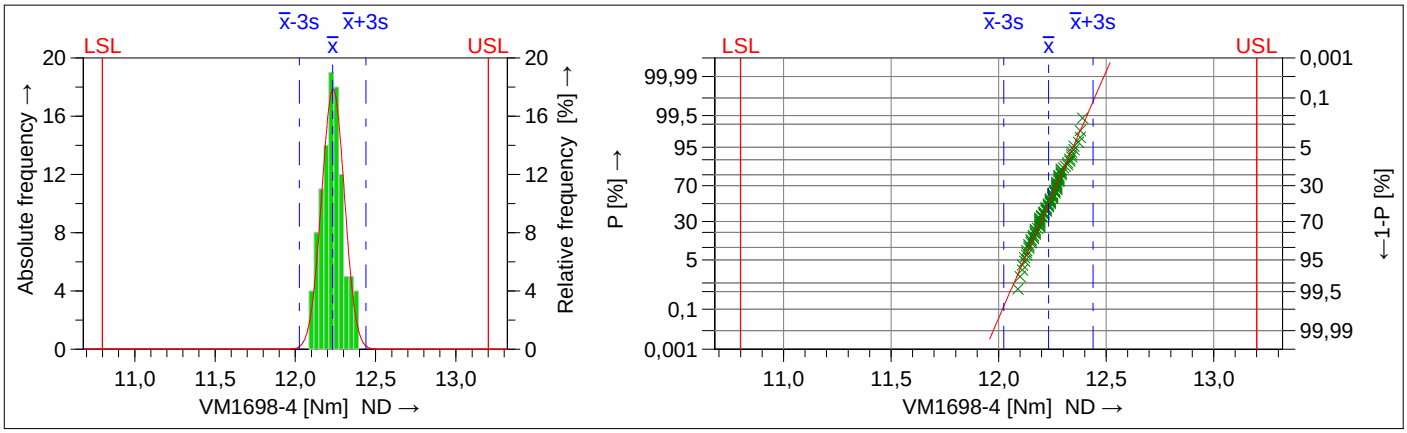
Plant	ATG Westhausen	Operator Name	Stölzle
Date	03.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1005a	Char.Descr.	VM1698-4	Nom.val. 12,00 / 1,20	USL 13,20
		Serial No.	1024210	Unit Nm / -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 03.11.2023 10:02:57 to 03.11.2023 10:14:47

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





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.2320
LSL	10.80	x_{min}	12.09	$\bar{x}$-3s	12.0245
USL	13.20	x_{max}	12.39	$\bar{x}$+3s	12.4395
T	2.40	R	0.30	6s	0.4151
		$n_{<T>}$	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	5.78
Critical capability index	=	C_{mk}	4.66

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 03.11.2023

Serial No.	IJJ1005a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	12,24	12,26	12,29	12,35	12,28	12,27	12,39	12,37	12,29	12,34
1024210	VM1698-4	Grad	360,25	344,50	356,75	358,00	344,50	351,25	361,50	362,00	337,00	347,50

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	12,27	12,35	12,32	12,32	12,33	12,38	12,24	12,29	12,27	12,27
1024210	VM1698-4	Grad	344,00	368,75	382,75	369,25	379,75	349,25	357,25	345,00	351,00	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	12,29	12,33	12,27	12,34	12,29	12,34	12,31	12,28	12,27	12,25
1024210	VM1698-4	Grad	346,00	356,75	356,00	364,75	367,25	347,00	353,75	357,75	361,75	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	12,27	12,20	12,28	12,26	12,25	12,26	12,24	12,28	12,22	12,27
1024210	VM1698-4	Grad	355,25	351,25	357,25	346,00	344,75	361,00	375,50	372,25	351,75	361,00

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	12,38	12,28	12,22	12,22	12,24	12,25	12,25	12,21	12,19	12,14
1024210	VM1698-4	Grad	376,00	357,00	357,75	365,25	365,25	380,00	354,25	352,50	349,00	356,50

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	12,25	12,26	12,23	12,23	12,19	12,16	12,23	12,23	12,19	12,19
1024210	VM1698-4	Grad	361,25	370,50	358,25	353,50	361,25	355,75	373,25	349,50	356,25	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	12,21	12,12	12,19	12,25	12,30	12,22	12,10	12,12	12,19	12,19
1024210	VM1698-4	Grad	367,50	358,00	372,50	367,25	367,25	348,75	356,50	349,25	352,00	353,75

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	12,13	12,16	12,17	12,18	12,21	12,22	12,17	12,20	12,24	12,15
1024210	VM1698-4	Grad	356,50	378,75	346,25	353,50	356,75	369,50	347,25	366,00	366,25	346,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Stölzle	Date 03.11.2023

Serial No.	IJJ1005a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	12,16	12,15	12,17	12,19	12,19	12,13	12,09	12,24	12,17	12,13
1024210	VM1698-4	Grad	351,25	351,50	364,00	375,75	370,25	346,75	346,25	365,25	346,50	352,75

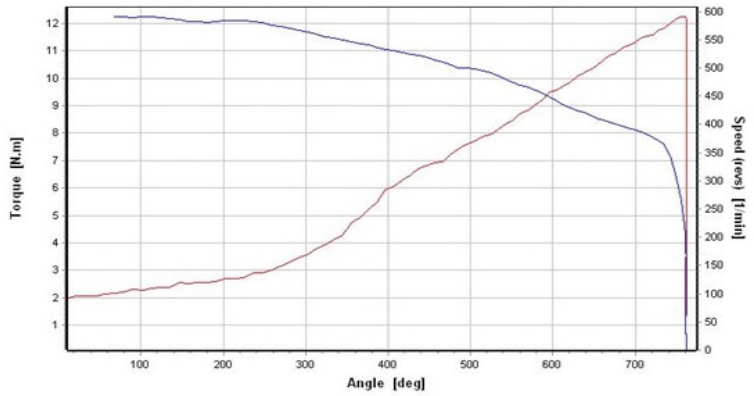
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,11	12,14	12,28	12,19	12,17	12,20	12,15	12,11	12,14	12,21
1024210	VM1698-4	Grad	361,50	364,75	368,25	347,75	350,75	347,00	362,00	351,25	366,00	350,00

Torque graphs

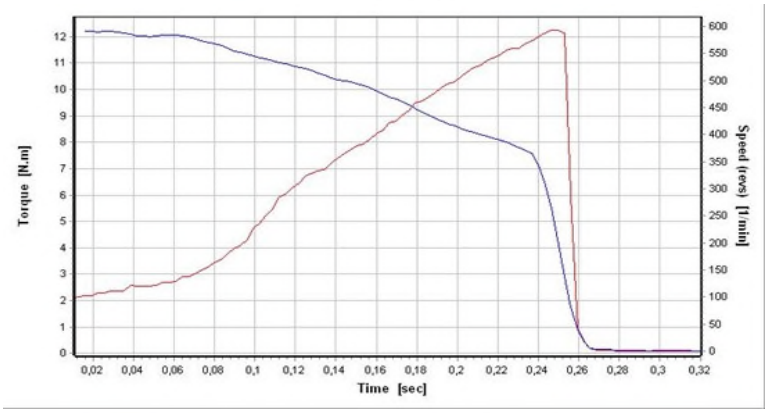
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1005**

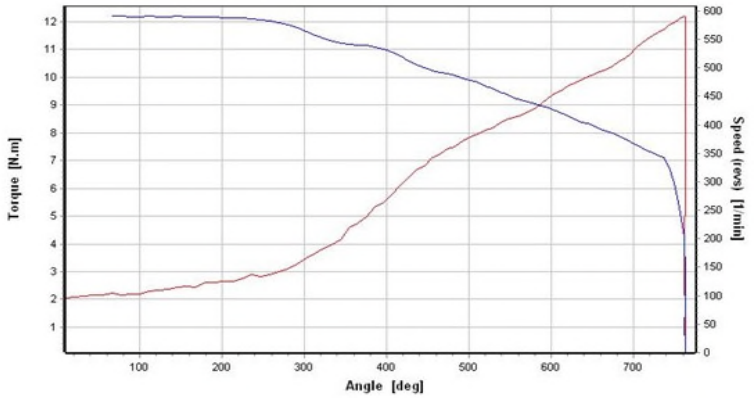
Angle degree: **360°**
Test torque: **12,0 Nm**



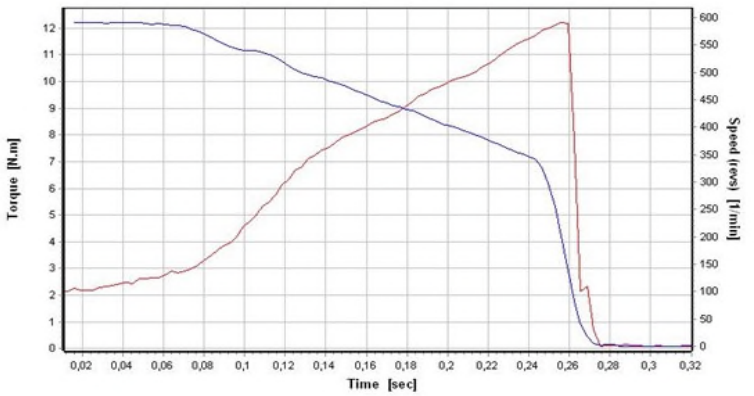
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed