Homologation

Cordless Assembly Tools

Model: CLBA303

Serial no.: ILJ1007

Contents

Homologation: CLBA303 SN: ILJ1007

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

Document no: 002/2024
Date: 09.02.2024

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system ☑ Speed = 255 rpm 100,0 %

Single-stage tightening system ☐

Manufacturer: Apex Tool Group Serial no: **ILJ1007**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 14,81 Nm

Hard joint (H) 90,55 Nm / Revolution Angle degree 30°

Soft joint (L) 7,22 Nm / Revolution Angle degree 360°

		H	L
a)	Tolerance down / up	13,33 - 16,29 Nm	13,33 - 16,29 Nm
	Tolerance down / up	10 %	10 %
	Average torque	15,09 Nm	14,44 Nm
	Standard deviation	0,18 Nm	0,10 Nm
	Torque scatter (99,73%)	1,07 Nm	0,57 Nm
	C_m	2,77	5,15
	C_{mk}	2,24	3,87

b) Min. C_m hard/soft (lowest value) 2,77
Min. C_{mk} hard/soft (lowest value) 2,24

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

Note:

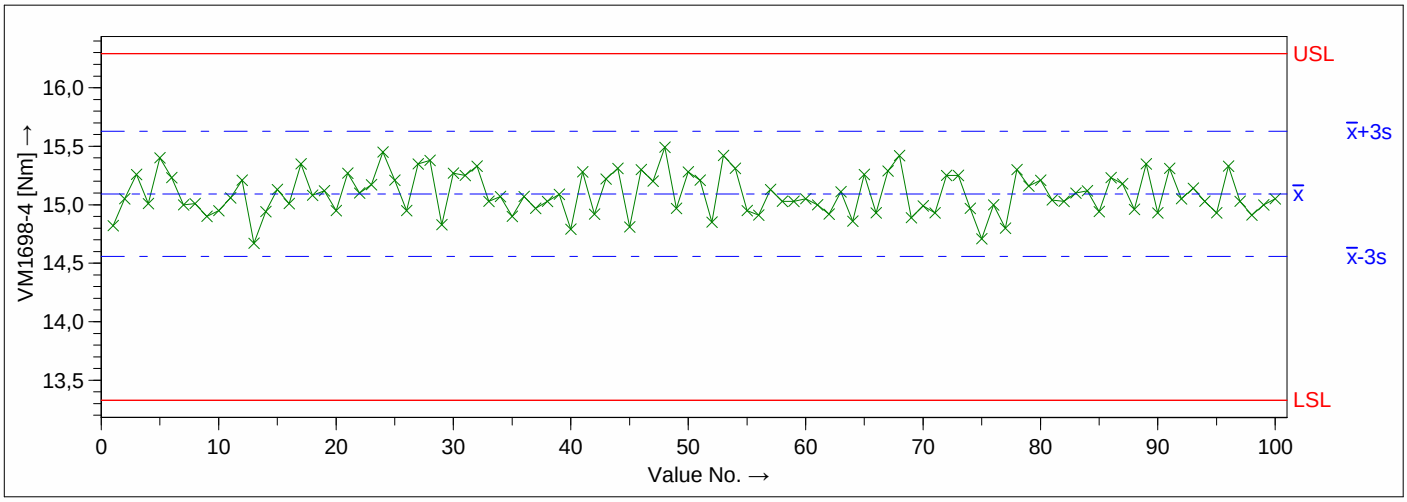
Machine Capability Study
Control System

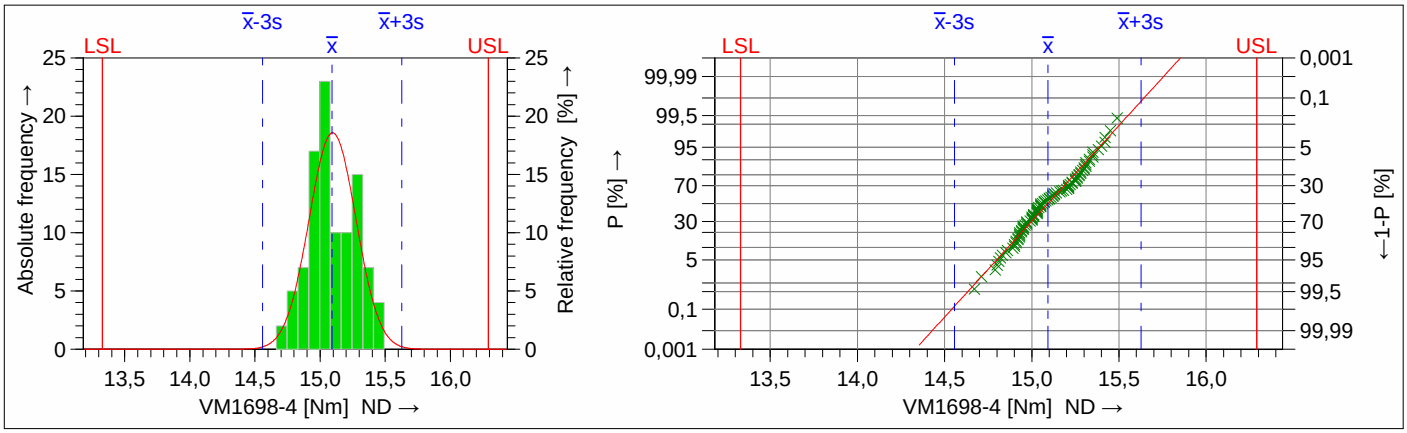
Plant	ATG Westhausen	Operator Name	Sorg
Date	18.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_d	Char.Descr.	VM1698-4	Nom.val. 14,81	1,48 USL 16,29
		Serial No.	1024210	Unit Nm	-1,48 LSL 13,33
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 18.01.2024 10:06:32 to 18.01.2024 10:19:44

Rem. TQ 30% hard +/-10% * Speed 255 rpm





Drawing Values		Collected Values		Statistics	
T_m	14.81			$\bar{x}$	15.0924
LSL	13.33	x_{min}	14.67	$\bar{x}$-3s	14.5576
USL	16.29	x_{max}	15.49	$\bar{x}$+3s	15.6272
T	2.96	R	0.82	6s	1.0695
		$n_{<T>}$	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	2.77
Critical capability index	=	C_{mk}	2.24

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_d	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	14,81
Ord. No.	CLBA303	Serial No.	1024210	LSL	13,33
				USL	16,29
Remark	TQ 30% hard +/-10% * Speed 255 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	14,82	15,05	15,26	15,01	15,40	15,23	15,00	15,01	14,90	14,95
1024210	VM1698-4	Grad	29,75	30,00	30,25	29,75	31,25	31,00	30,00	29,75	29,25	29,75

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	15,06	15,21	14,67	14,94	15,13	15,01	15,35	15,08	15,12	14,95
1024210	VM1698-4	Grad	30,50	30,50	29,25	29,25	29,75	29,75	31,25	30,75	30,25	29,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	15,27	15,10	15,17	15,45	15,21	14,95	15,35	15,38	14,83	15,27
1024210	VM1698-4	Grad	31,25	30,75	31,00	31,75	30,75	30,00	29,75	30,25	28,75	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	15,25	15,33	15,03	15,07	14,90	15,07	14,97	15,03	15,09	14,79
1024210	VM1698-4	Grad	31,00	31,00	30,25	29,75	29,75	30,00	30,00	29,50	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	15,28	14,92	15,22	15,31	14,81	15,30	15,20	15,49	14,97	15,28
1024210	VM1698-4	Grad	30,50	29,00	30,00	30,25	29,25	30,25	29,50	30,75	29,00	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	15,21	14,85	15,42	15,31	14,95	14,91	15,13	15,03	15,03	15,05
1024210	VM1698-4	Grad	30,00	29,00	31,00	30,50	29,75	29,00	30,00	29,25	29,50	29,00

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	15,00	14,92	15,11	14,86	15,26	14,93	15,29	15,42	14,89	14,99
1024210	VM1698-4	Grad	29,50	29,25	30,50	29,50	30,75	28,75	31,00	30,75	30,00	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	14,93	15,25	15,25	14,97	14,71	15,00	14,80	15,30	15,16	15,21
1024210	VM1698-4	Grad	29,25	30,75	30,75	29,75	27,75	30,25	29,25	31,00	29,75	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_d	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	14,81
Ord. No.	CLBA303	Serial No.	1024210	LSL	13,33
				USL	16,29
Remark	TQ 30% hard +/-10% * Speed 255 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	15,04	15,03	15,10	15,12	14,94	15,23	15,18	14,96	15,35	14,93
1024210	VM1698-4	Grad	30,00	30,25	30,75	29,25	30,25	30,50	30,25	29,75	31,00	29,00

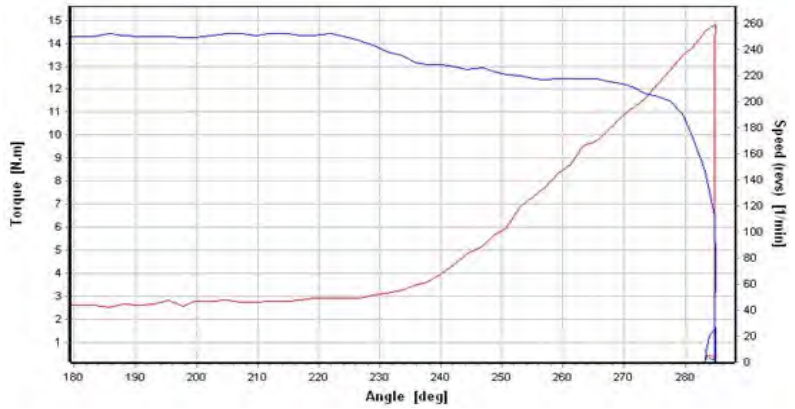
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	15,31	15,05	15,14	15,03	14,93	15,33	15,03	14,91	15,00	15,05
1024210	VM1698-4	Grad	30,25	29,75	29,75	29,75	29,50	31,75	30,50	29,25	30,25	29,75

Torque graphs

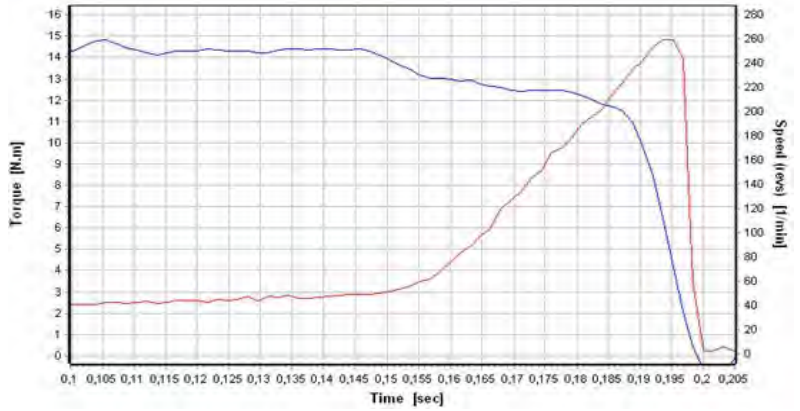
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1007**

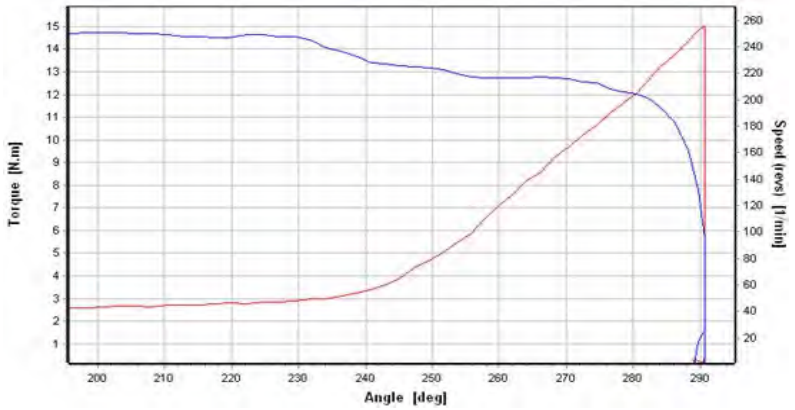
Angle degree: **30°**
Test torque: **14,8 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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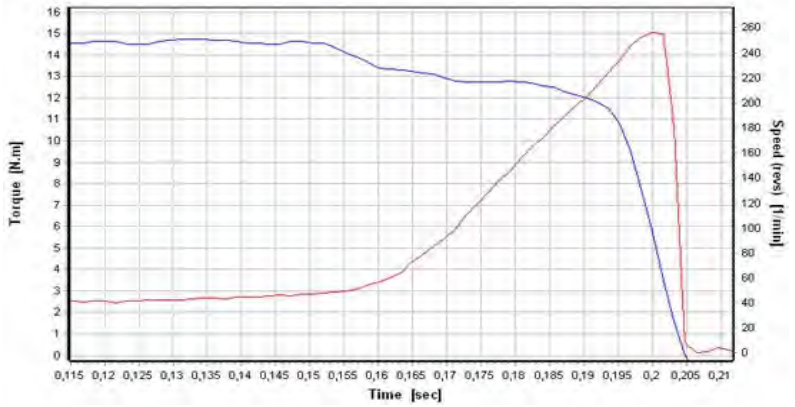
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

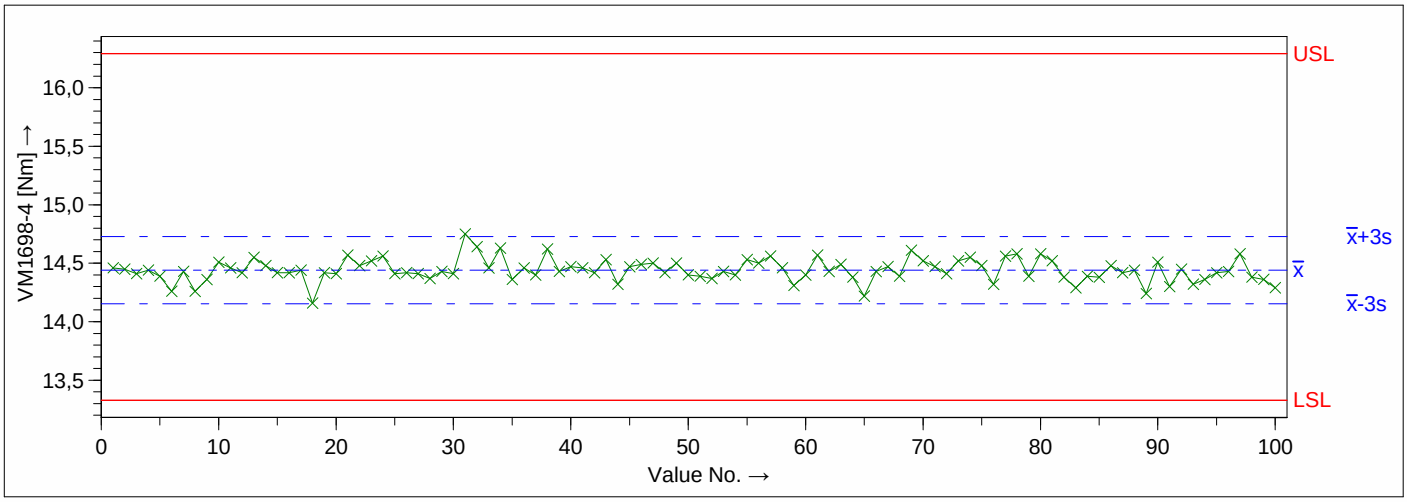
Page 1 / 1

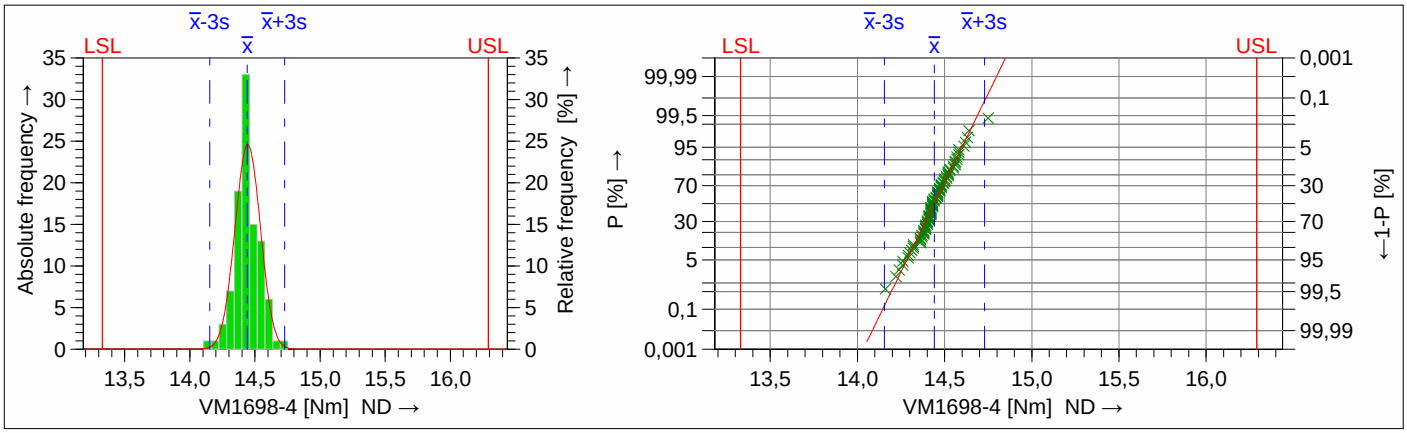
Plant	ATG Westhausen	Operator Name	Sorg
Date	18.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_c	Char.Descr.	VM1698-4	Nom.val. 14,81 1,48	USL 16,29
		Serial No.	1024210	Unit Nm -1,48	LSL 13,33
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 18.01.2024 10:20:17 to 18.01.2024 10:33:29

Rem. TQ 30% soft +/-10% * Speed 255 rpm





Drawing Values		Collected Values		Statistics	
T_m	14.81			x̄	14.4412
LSL	13.33	x_{min}	14.16	x̄-3s	14.1539
USL	16.29	x_{max}	14.75	x̄+3s	14.7285
T	2.96	R	0.59	6s	0.5746
		$n_{<T>}$	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	5.15
Critical capability index	=	C_{mk}	3.87

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_c	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	14,81
Ord. No.	CLBA303	Serial No.	1024210	LSL	13,33
				USL	16,29
Remark	TQ 30% soft +/-10% * Speed 255 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	14,46	14,45	14,41	14,44	14,39	14,26	14,43	14,26	14,36	14,51
1024210	VM1698-4	Grad	356,00	380,00	366,00	362,00	356,50	349,00	350,25	353,00	359,25	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	14,46	14,42	14,55	14,48	14,42	14,42	14,44	14,16	14,42	14,41
1024210	VM1698-4	Grad	351,25	357,75	359,50	365,50	367,00	357,75	352,50	341,50	360,50	359,25

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	14,57	14,48	14,52	14,56	14,41	14,42	14,41	14,37	14,43	14,41
1024210	VM1698-4	Grad	363,75	358,00	368,00	372,25	370,25	353,00	353,50	357,00	360,00	360,00

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	14,75	14,64	14,46	14,63	14,36	14,46	14,40	14,62	14,43	14,47
1024210	VM1698-4	Grad	360,50	361,75	353,25	370,00	357,25	355,50	361,25	368,75	354,00	363,00

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	14,46	14,42	14,53	14,32	14,47	14,49	14,50	14,42	14,50	14,40
1024210	VM1698-4	Grad	358,25	359,25	359,25	346,75	359,75	358,75	363,75	354,00	362,50	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	14,39	14,37	14,43	14,40	14,53	14,50	14,56	14,46	14,31	14,40
1024210	VM1698-4	Grad	359,50	354,00	368,50	357,00	358,00	371,00	381,00	351,75	344,25	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	14,57	14,43	14,49	14,38	14,22	14,43	14,47	14,39	14,61	14,52
1024210	VM1698-4	Grad	356,75	366,00	371,00	347,50	352,00	354,25	354,50	348,50	371,25	350,75

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	14,47	14,41	14,52	14,55	14,48	14,32	14,56	14,58	14,39	14,58
1024210	VM1698-4	Grad	351,75	354,75	366,00	368,50	371,50	344,25	369,25	373,00	350,00	362,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_c	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	14,81
Ord. No.	CLBA303	Serial No.	1024210	LSL	13,33
				USL	16,29
Remark	TQ 30% soft +/-10% * Speed 255 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	14,52	14,38	14,29	14,39	14,38	14,48	14,42	14,44	14,24	14,51
1024210	VM1698-4	Grad	365,00	346,25	345,75	346,50	353,50	359,25	377,50	368,50	353,50	358,50

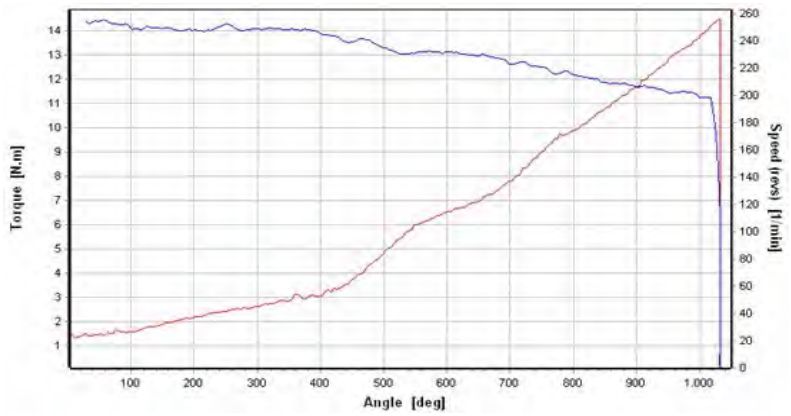
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,30	14,45	14,32	14,36	14,42	14,43	14,58	14,38	14,36	14,29
1024210	VM1698-4	Grad	349,75	374,50	357,25	356,25	365,75	356,50	375,25	364,75	355,00	352,50

Torque graphs

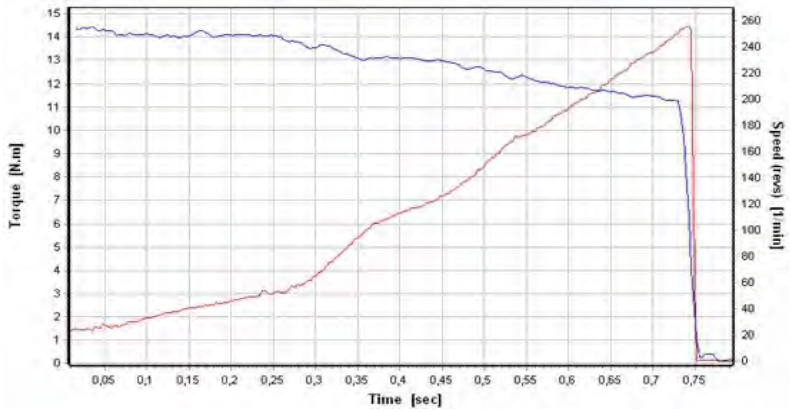
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1007**

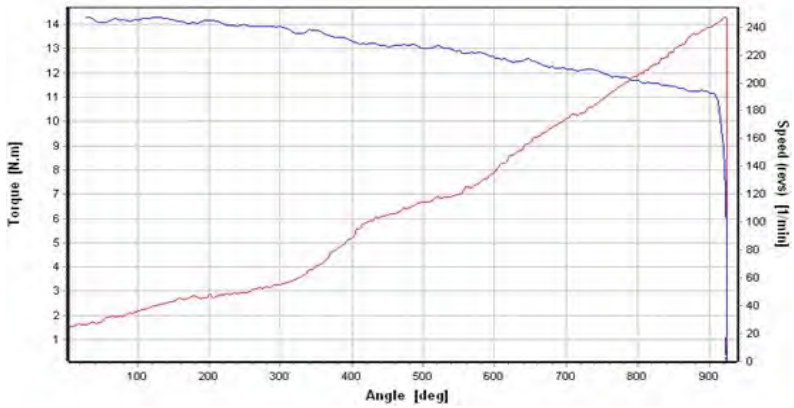
Angle degree: **360°**
Test torque: **14,8 Nm**



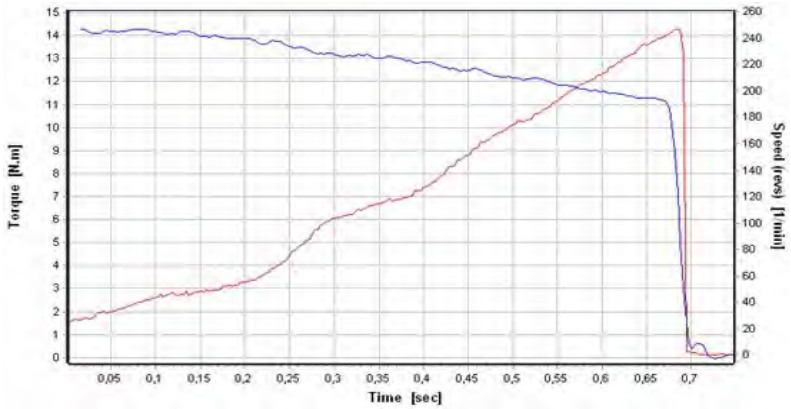
Value no. 1
Graph
Torque / Angle / Speed



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 = 255 rpm 100,0 %

Single-stage tightening system ☐

Manufacturer: Apex Tool Group Serial no: **ILJ1007**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 25,66 Nm

Hard joint (H) 155,07 Nm / Revolution Angle degree 30°

Soft joint (L) 12,65 Nm / Revolution Angle degree 360°

		H	**L**
a)	Tolerance down / up	23,09 28,23 Nm	23,09 - 28,23 Nm
	Tolerance down / up	10 %	10 %
	Average torque	25,85 Nm	25,30 Nm
	Standard deviation	0,30 Nm	0,15 Nm
	Torque scatter (99,73%)	1,82 Nm	0,91 Nm
	C_m	2,82	5,64
	C_{mk}	2,62	4,84

b)	Min. C_m hard/soft (lowest value)	2,82
	Min. C_{mk} hard/soft (lowest value)	2,62

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

Note:

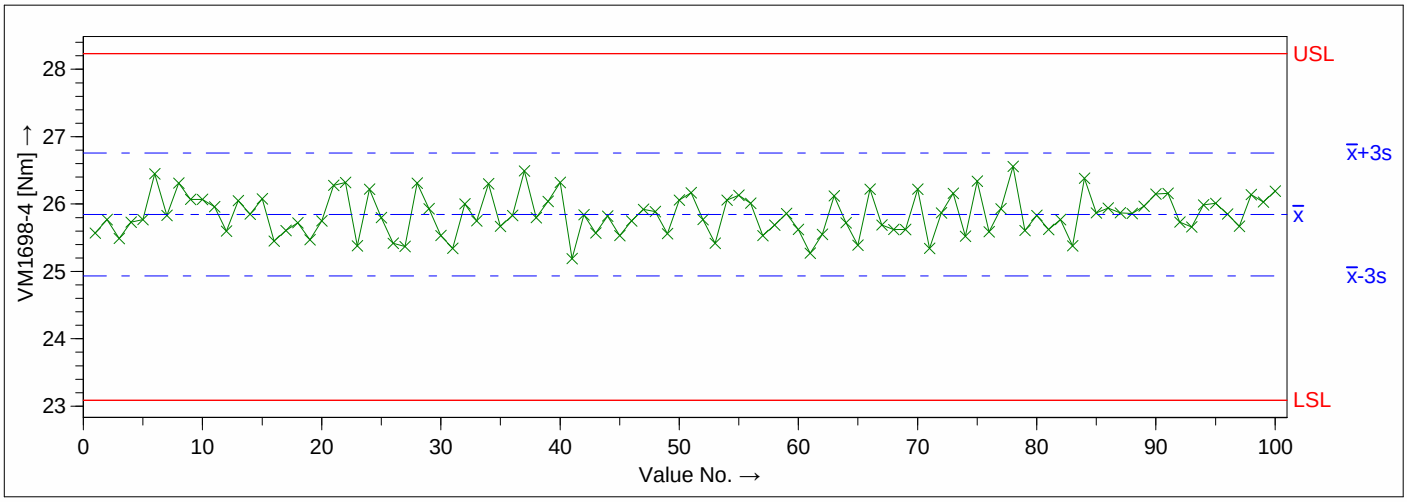
Machine Capability Study
Control System

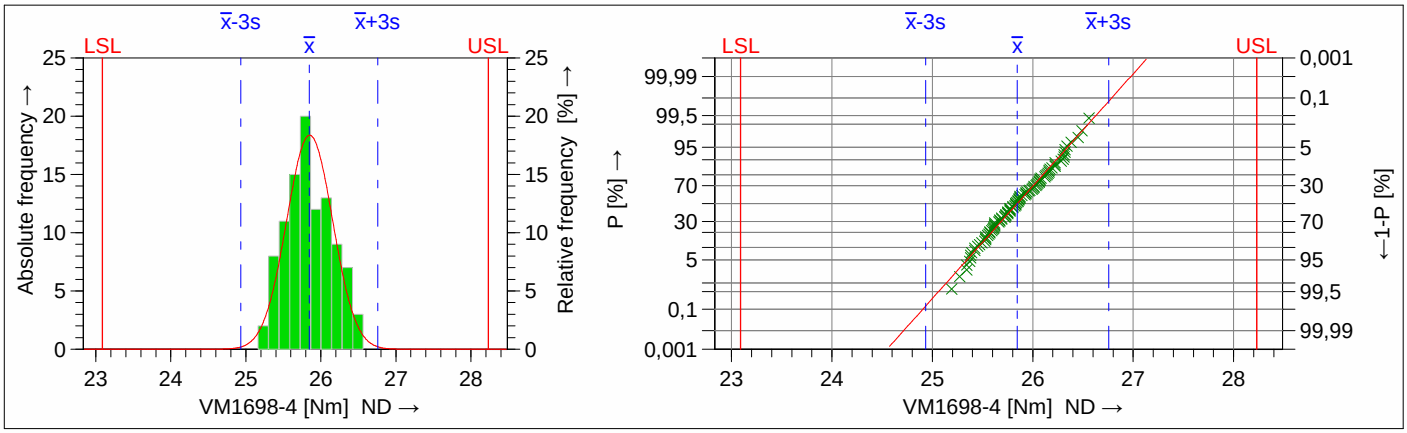
Plant	ATG Westhausen	Operator Name	Sorg
Date	18.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_h	Char.Descr.	VM1698-4	Nom.val. 25,66 2,57	USL 28,23
		Serial No.	1024210	Unit Nm -2,57	LSL 23,09
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 18.01.2024 07:33:50 to 18.01.2024 07:47:02

Rem. TQ 80% hard +/-10% * Speed 255 rpm





Drawing Values		Collected Values		Statistics	
T_m	25.66			x̄	25.8450
LSL	23.09	x_{min}	25.19	x̄-3s	24.9331
USL	28.23	x_{max}	26.56	x̄+3s	26.7569
T	5.14	R	1.37	6s	1.8238
		$n_{<T>}$	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	2.82
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	Sorg	Date 18.01.2024

Serial No.	ILJ1007_h	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,09
				USL	28,23
Remark	TQ 80% hard +/-10% * Speed 255 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	25,57	25,77	25,49	25,73	25,77	26,45	25,83	26,31	26,07	26,07
1024210	VM1698-4	Grad	30,00	29,25	28,75	29,75	29,00	30,75	28,75	30,50	29,50	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	25,96	25,60	26,05	25,85	26,08	25,45	25,61	25,72	25,47	25,75
1024210	VM1698-4	Grad	29,75	29,00	29,75	31,00	29,75	28,50	28,75	28,25	28,75	29,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	26,28	26,32	25,38	26,22	25,80	25,42	25,37	26,31	25,93	25,53
1024210	VM1698-4	Grad	32,25	30,75	28,50	32,00	29,25	28,50	28,75	30,25	29,00	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	25,34	26,00	25,75	26,30	25,67	25,83	26,49	25,80	26,04	26,32
1024210	VM1698-4	Grad	28,50	30,00	30,00	31,00	29,25	30,25	31,75	29,50	30,50	31,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	25,19	25,84	25,57	25,82	25,53	25,75	25,92	25,89	25,56	26,06
1024210	VM1698-4	Grad	27,75	30,00	28,75	31,25	29,50	29,50	31,25	31,25	29,25	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	26,17	25,77	25,42	26,06	26,13	26,01	25,53	25,69	25,86	25,62
1024210	VM1698-4	Grad	30,25	29,75	28,50	30,00	30,25	31,75	29,00	28,75	29,75	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	25,27	25,55	26,12	25,72	25,39	26,22	25,69	25,62	25,62	26,22
1024210	VM1698-4	Grad	28,50	29,00	30,50	29,50	29,25	30,25	31,75	29,00	30,75	32,75

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	25,34	25,87	26,16	25,52	26,34	25,59	25,93	26,56	25,61	25,83
1024210	VM1698-4	Grad	28,00	29,50	30,50	30,50	30,75	29,25	31,50	31,25	28,75	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_h	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,09
				USL	28,23
Remark	TQ 80% hard +/-10% * Speed 255 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	25,62	25,77	25,38	26,38	25,87	25,94	25,87	25,86	25,97	26,15
1024210	VM1698-4	Grad	29,25	29,25	28,50	33,00	32,00	30,00	30,00	31,00	29,75	31,50

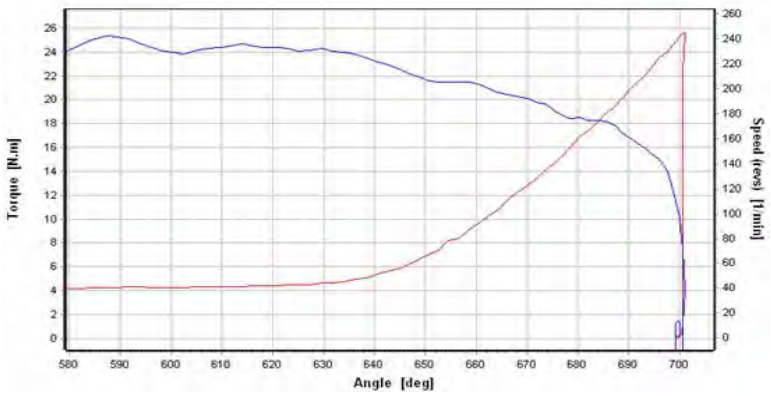
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	26,16	25,73	25,66	25,99	26,01	25,85	25,67	26,14	26,03	26,19
1024210	VM1698-4	Grad	30,25	29,25	29,50	30,25	31,25	31,00	29,00	30,25	29,75	31,75

Torque graphs

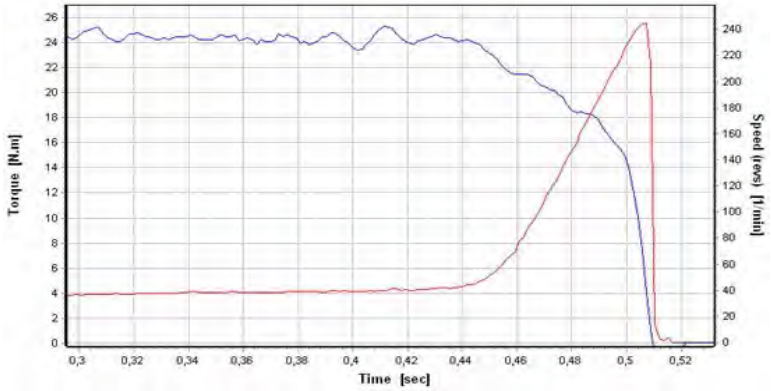
Machine Capability Study 80 %

Model: **CLBA303**
Serial no: **ILJ1007**

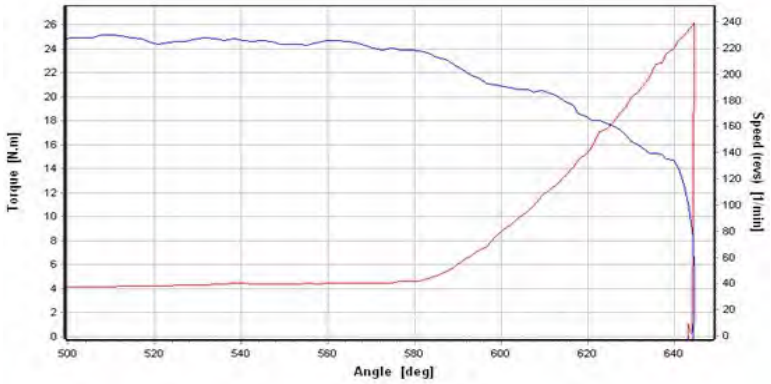
Angle degree: **30°**
Test torque: **25,7 Nm**



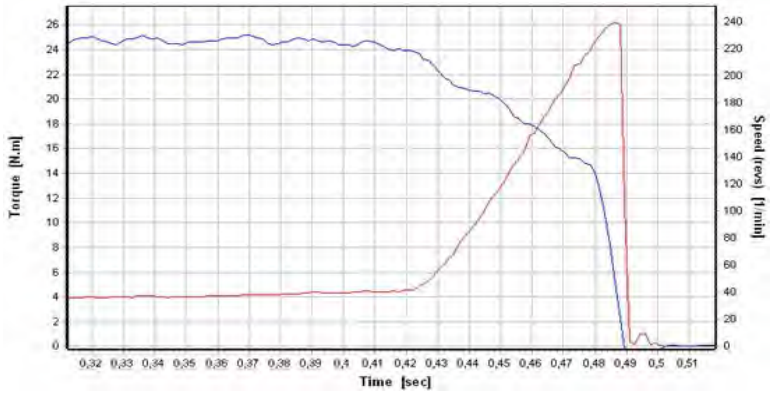
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

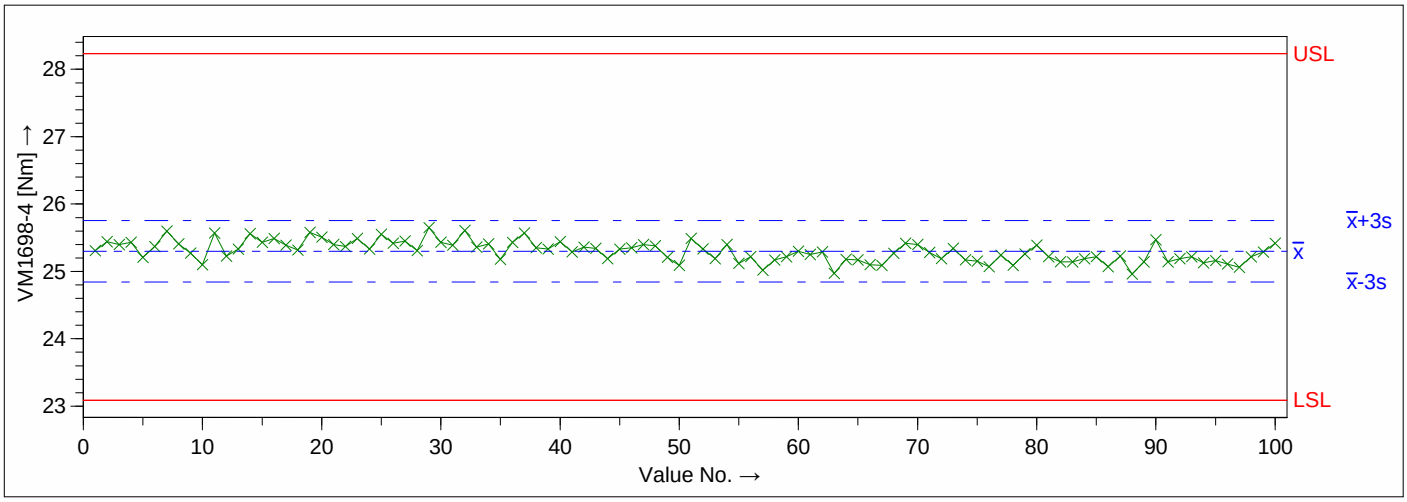
Machine Capability Study
Control System

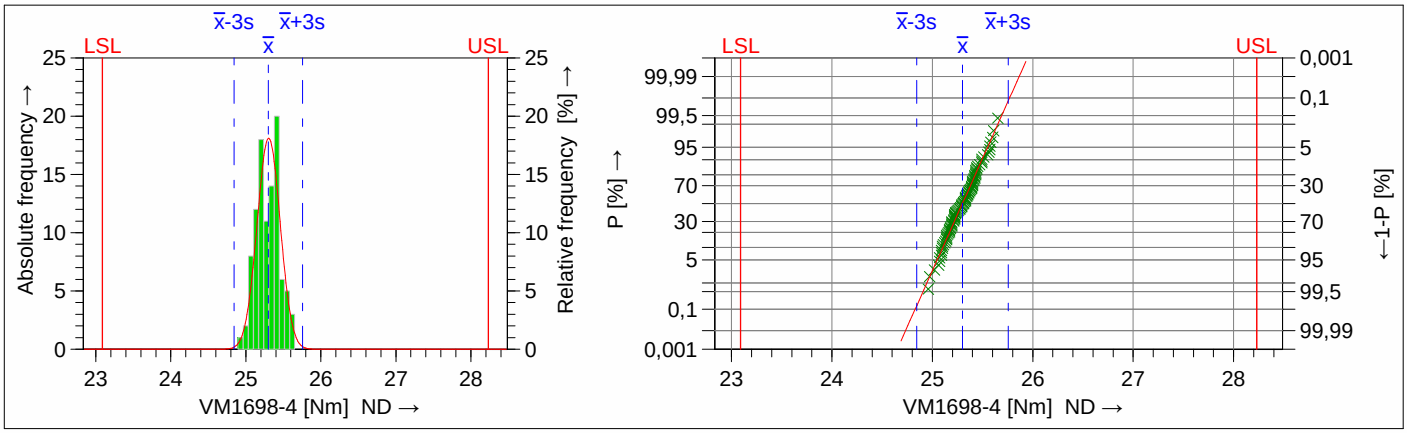
Plant	ATG Westhausen	Operator Name	Sorg
Date	17.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_g	Char.Descr.	VM1698-4	Nom.val. 25,66 2,57	USL 28,23
		Serial No.	1024210	Unit Nm -2,57	LSL 23,09
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 17.01.2024 11:18:50 to 17.01.2024 11:32:03

Rem. TQ 80% soft +/-10% * Speed 255 rpm





Drawing Values		Collected Values		Statistics	
T_m	25.66			$\bar{x}$	25.2986
LSL	23.09	x_{min}	24.96	$\bar{x}$-3s	24.8426
USL	28.23	x_{max}	25.65	$\bar{x}$+3s	25.7546
T	5.14	R	0.69	6s	0.9119
		$n_{<T>}$	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	5.64
Critical capability index	=	C_{mk}	4.84

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 17.01.2024

Serial No.	ILJ1007_g	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,09
				USL	28,23
Remark	TQ 80% soft +/-10% * Speed 255 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	25,31	25,44	25,40	25,43	25,21	25,37	25,60	25,41	25,27	25,10
1024210	VM1698-4	Grad	360,00	368,75	368,75	368,75	364,00	365,75	371,50	373,00	369,75	363,50

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	25,57	25,23	25,33	25,56	25,43	25,49	25,39	25,32	25,58	25,51
1024210	VM1698-4	Grad	370,25	367,50	366,00	369,75	374,50	373,00	369,50	362,00	372,25	368,50

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	25,40	25,37	25,49	25,33	25,55	25,42	25,45	25,31	25,65	25,43
1024210	VM1698-4	Grad	366,75	363,50	370,00	367,00	370,75	359,75	362,00	361,75	372,00	361,25

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	25,39	25,61	25,36	25,41	25,18	25,43	25,57	25,35	25,33	25,44
1024210	VM1698-4	Grad	357,50	365,25	355,75	360,75	353,00	362,50	371,00	360,50	359,50	362,25

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	25,29	25,36	25,34	25,19	25,33	25,35	25,40	25,38	25,21	25,09
1024210	VM1698-4	Grad	354,75	359,00	361,00	353,50	359,25	356,00	363,75	361,25	354,00	352,75

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	25,49	25,33	25,19	25,40	25,12	25,22	25,02	25,17	25,22	25,30
1024210	VM1698-4	Grad	363,75	358,25	357,00	361,25	351,50	354,00	350,00	357,50	358,50	358,75

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	25,25	25,29	24,97	25,18	25,17	25,10	25,09	25,27	25,42	25,40
1024210	VM1698-4	Grad	355,75	355,00	348,75	352,50	352,75	354,25	358,75	365,00	370,25	366,00

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	25,28	25,19	25,34	25,17	25,15	25,07	25,24	25,09	25,26	25,39
1024210	VM1698-4	Grad	360,75	359,75	361,75	358,25	358,25	359,00	361,75	356,00	359,25	363,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 17.01.2024

Serial No.	ILJ1007_g	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,09
				USL	28,23
Remark	TQ 80% soft +/-10% * Speed 255 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	25,22	25,14	25,14	25,19	25,22	25,07	25,23	24,96	25,14	25,47
1024210	VM1698-4	Grad	361,50	359,00	358,00	361,75	360,50	353,75	361,75	356,25	361,75	367,00

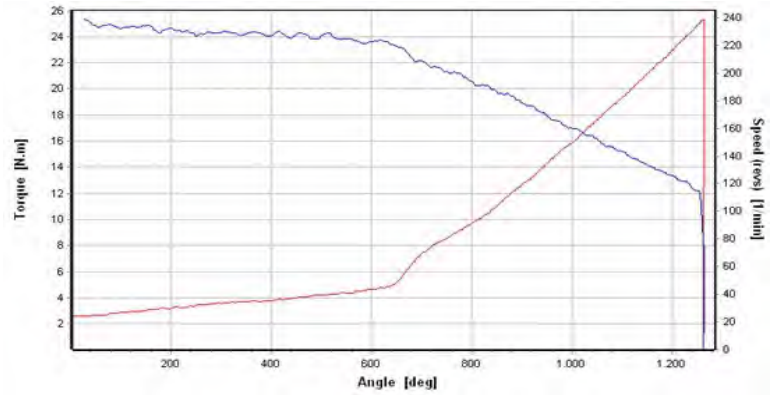
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	25,14	25,19	25,22	25,13	25,16	25,11	25,06	25,22	25,29	25,42
1024210	VM1698-4	Grad	359,50	360,75	362,00	358,50	360,75	359,75	358,50	361,75	365,50	367,00

Torque graphs

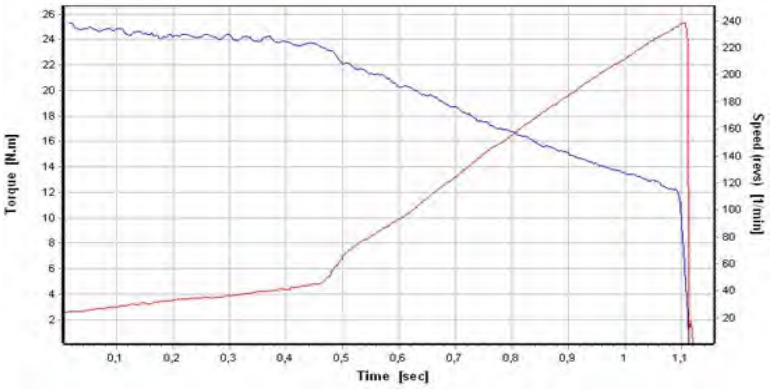
Machine Capability Study 80 %

Model: **CLBA303**
Serial no: **ILJ1007**

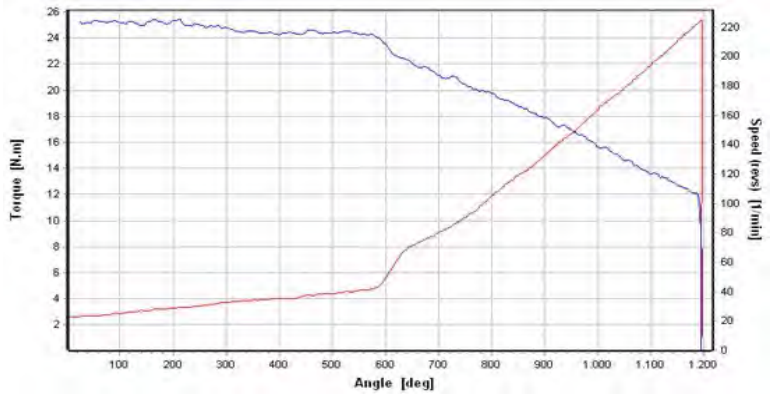
Angle degree: **360°**
Test torque: **25,7 Nm**



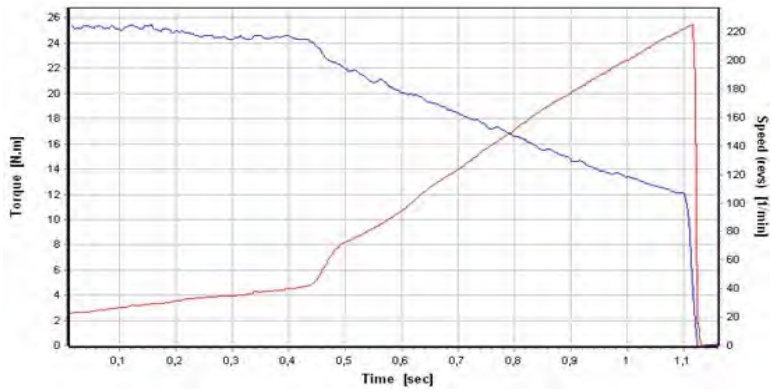
Value no. 1
Graph
Torque / Angle / Speed



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 = 255 rpm	100,0 %
Single-stage tightening system	☐		

Manufacturer: Apex Tool Group Serial no: **ILJ1007**

Test torque: Tq max. 30,00 Nm

Hard joint (H)	179,51	Nm / Revolution	Angle degree	30°
Soft joint (L)	14,66	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	27,00 33,00 Nm	27,00 - 33,00 Nm
	Tolerance down / up	10 %	10 %
	Average torque	29,92 Nm	29,32 Nm
	Standard deviation	0,38 Nm	0,17 Nm
	Torque scatter (99,73%)	2,25 Nm	1,04 Nm
	C_m	2,66	5,77
	C_{mk}	2,59	4,47

b)	Min. C_m hard/soft (lowest value)	2,66
	Min. C_{mk} hard/soft (lowest value)	2,59

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

Note:

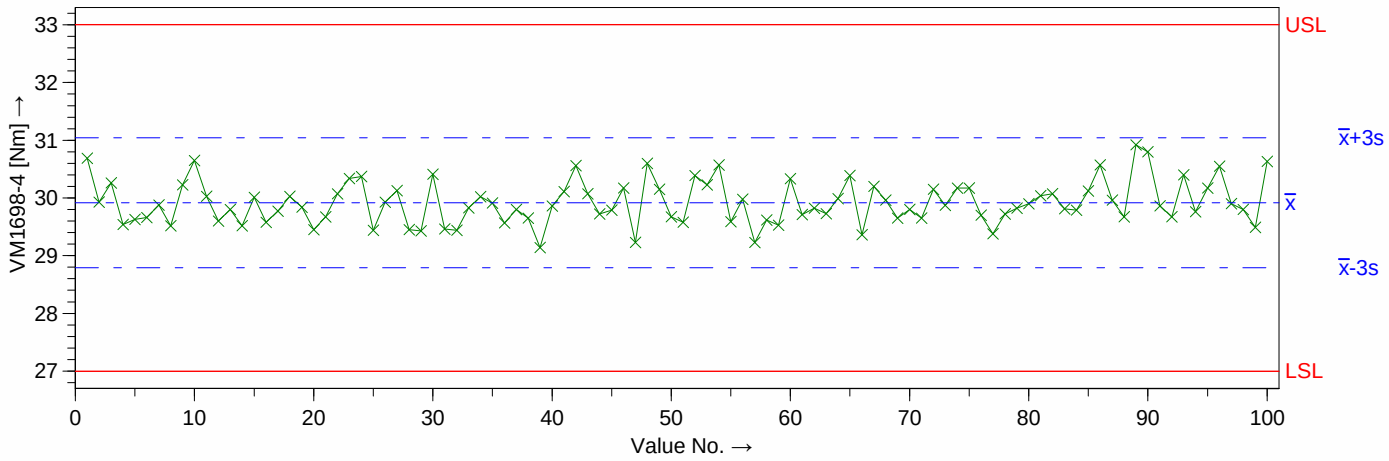
Machine Capability Study
Control System

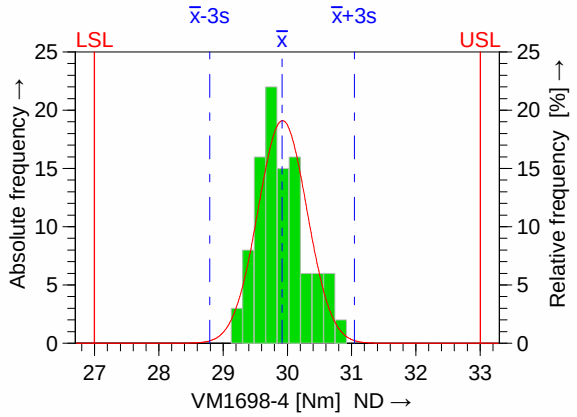
Plant	ATG Westhausen	Operator Name	Sorg
Date	18.01.2024		

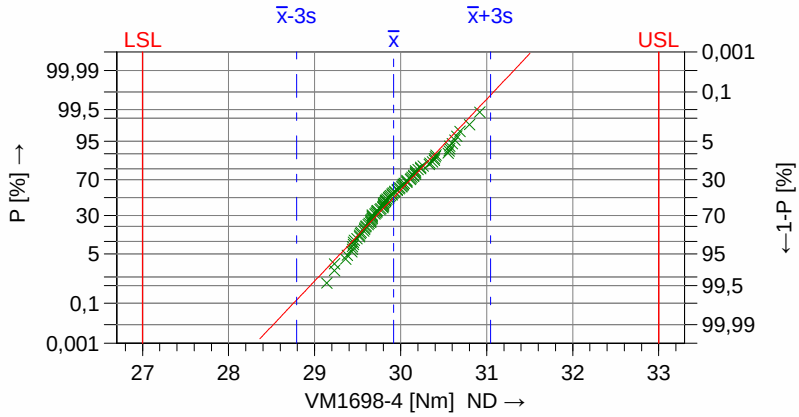
Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_b	Char.Descr.	VM1698-4	Nom.val. 30,00 3,00	USL 33,00
		Serial No.	1024210	Unit Nm -3,00	LSL 27,00
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 18.01.2024 08:30:32 to 18.01.2024 08:43:44

Rem. TQ 100% hard +/-10% * Speed 255 rpm







Drawing Values		Collected Values		Statistics	
T_m	30.00			$\bar{x}$	29.9178
LSL	27.00	x_{min}	29.14	$\bar{x}$-3s	28.7905
USL	33.00	x_{max}	30.92	$\bar{x}$+3s	31.0451
T	6.00	R	1.78	6s	2.2546
		$n_{<T>}$	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	2.66
Critical capability index	=	C_{mk}	2.59

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_b	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	30,00
Ord. No.	CLBA303	Serial No.	1024210	LSL	27,00
				USL	33,00
Remark	TQ 100% hard +/-10% * Speed 255 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	30,69	29,93	30,26	29,54	29,63	29,66	29,88	29,52	30,23	30,65
1024210	VM1698-4	Grad	33,25	31,75	32,00	30,50	30,75	30,50	30,75	30,75	32,00	33,25

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	30,03	29,60	29,80	29,52	30,01	29,58	29,77	30,03	29,84	29,45
1024210	VM1698-4	Grad	31,50	30,50	31,00	30,25	30,75	29,75	30,50	30,50	91,00	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	29,67	30,07	30,34	30,37	29,44	29,93	30,13	29,45	29,43	30,41
1024210	VM1698-4	Grad	30,00	31,00	30,75	31,00	28,75	29,50	30,00	28,75	28,75	30,75

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	29,46	29,44	29,83	30,02	29,91	29,57	29,80	29,65	29,14	29,86
1024210	VM1698-4	Grad	29,00	29,00	29,25	30,25	30,50	29,50	30,00	29,75	29,00	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	30,11	30,56	30,07	29,72	29,79	30,17	29,23	30,60	30,15	29,67
1024210	VM1698-4	Grad	31,25	31,75	30,50	30,00	29,75	31,25	29,00	31,50	30,75	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	29,58	30,39	30,23	30,57	29,59	29,98	29,23	29,62	29,53	30,33
1024210	VM1698-4	Grad	29,75	31,25	31,00	31,50	29,00	30,25	28,75	29,50	29,50	31,00

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	29,71	29,82	29,73	29,99	30,39	29,36	30,20	29,96	29,65	29,80
1024210	VM1698-4	Grad	29,75	29,50	29,25	30,00	31,00	28,50	30,25	30,00	29,50	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	29,65	30,15	29,87	30,17	30,17	29,70	29,38	29,72	29,82	29,90
1024210	VM1698-4	Grad	29,50	30,75	29,75	30,50	30,50	29,50	29,00	29,00	30,25	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_b	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	30,00
Ord. No.	CLBA303	Serial No.	1024210	LSL	27,00
				USL	33,00
Remark	TQ 100% hard +/-10% * Speed 255 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	30,04	30,07	29,81	29,79	30,12	30,57	29,96	29,67	30,92	30,80
1024210	VM1698-4	Grad	30,00	30,00	30,00	29,50	30,25	31,50	29,75	30,25	32,00	31,50

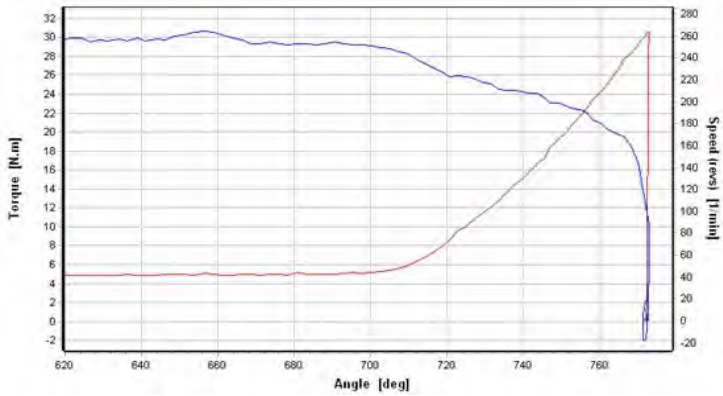
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	29,86	29,67	30,40	29,76	30,17	30,55	29,90	29,80	29,49	30,63
1024210	VM1698-4	Grad	29,50	29,25	30,75	29,25	30,00	30,75	29,50	29,25	29,25	30,75

Torque graphs

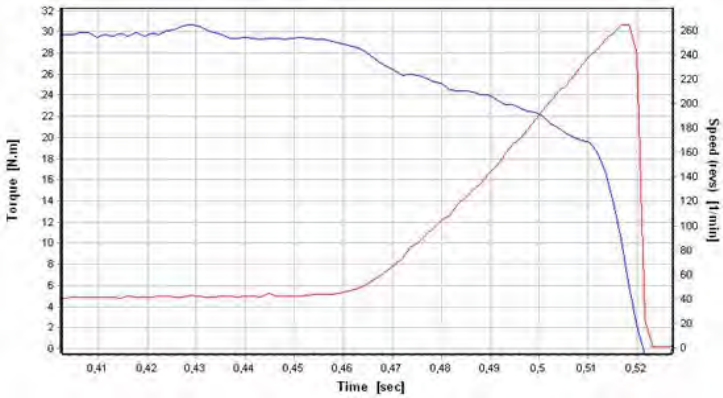
Machine Capability Study 100 %

Model: **CLBA303**
Serial no: **ILJ1007**

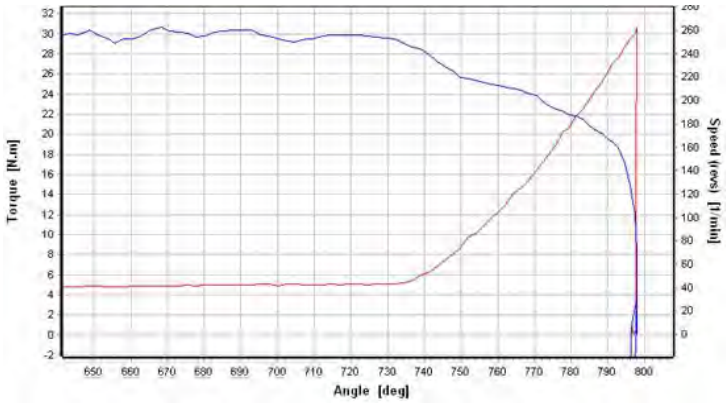
Angle degree: **30°**
Test torque: **30,0 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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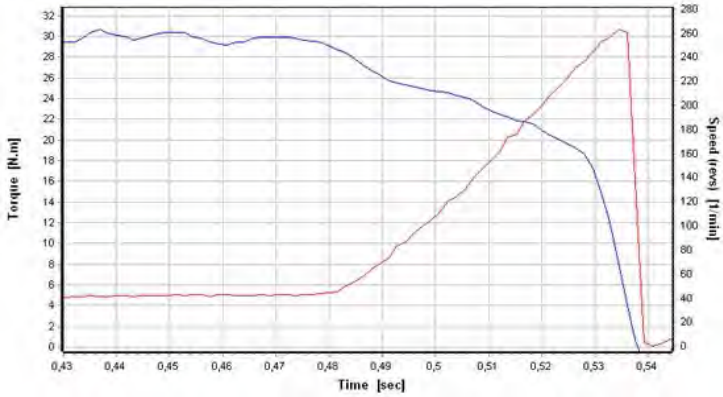
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

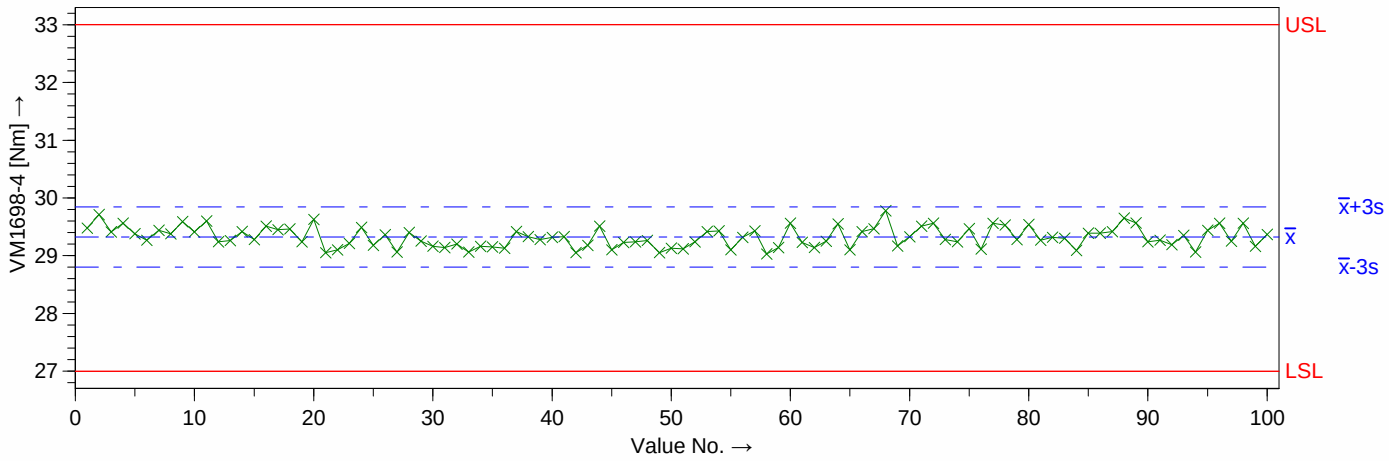
Cleco Production Tools

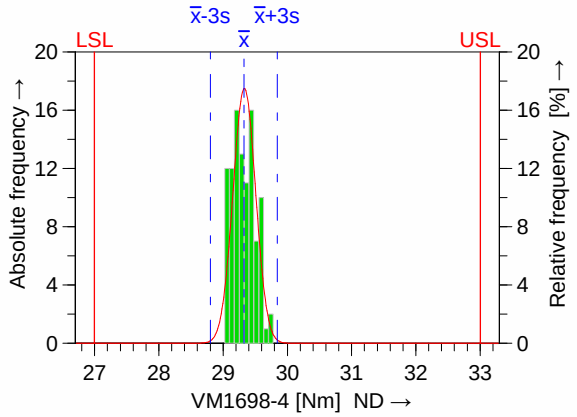
Plant	ATG Westhausen	Operator Name	Sorg
Date	18.01.2024		

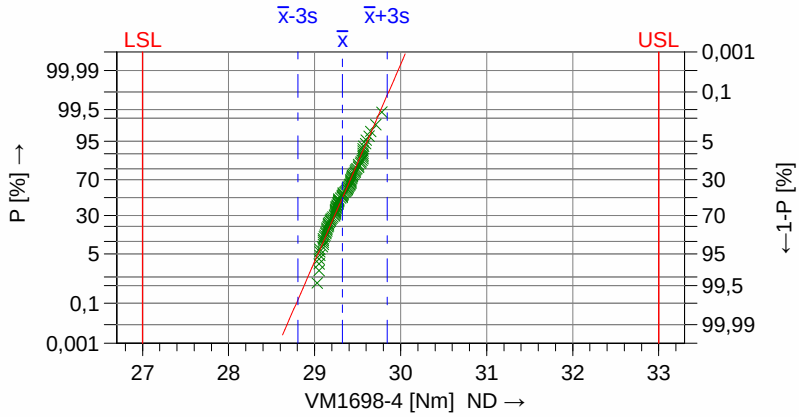
Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1007_a	Char.Descr.	VM1698-4	Nom.val. 30,00	3,00 USL 33,00
		Serial No.	1024210	Unit Nm	-3,00 LSL 27,00
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	---
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 18.01.2024 08:07:39 to 18.01.2024 08:28:04

Rem. TQ 100% soft +/-10% * Speed 255 rpm (Pause 8 s)







Drawing Values		Collected Values		Statistics	
T_m	30.00			$\bar{x}$	29.3241
LSL	27.00	x_{min}	29.03	$\bar{x}$-3s	28.8044
USL	33.00	x_{max}	29.78	$\bar{x}$+3s	29.8438
T	6.00	R	0.75	6s	1.0394
		$n_{<T>}$	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	5.77
Critical capability index	=	C_{mk}	4.47

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_a	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	30,00
Ord. No.	CLBA303	Serial No.	1024210	LSL	27,00
				USL	33,00
Remark	TQ 100% soft +/-10% * Speed 255 rpm (Pause 8 s)				

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	29,48	29,71	29,41	29,56	29,38	29,27	29,44	29,38	29,59	29,41
1024210	VM1698-4	Grad	358,75	365,50	360,25	360,50	357,00	354,75	356,75	355,50	355,00	355,00

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	29,60	29,24	29,26	29,42	29,28	29,51	29,45	29,46	29,24	29,63
1024210	VM1698-4	Grad	357,50	346,00	347,25	354,00	346,50	354,25	356,00	360,00	352,75	359,50

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	29,05	29,10	29,21	29,49	29,18	29,36	29,06	29,40	29,25	29,16
1024210	VM1698-4	Grad	348,25	346,75	352,25	354,50	353,75	369,75	369,50	374,00	376,00	371,25

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	29,14	29,20	29,06	29,16	29,15	29,13	29,42	29,33	29,28	29,32
1024210	VM1698-4	Grad	368,25	370,00	361,25	363,50	362,75	366,50	371,25	370,50	365,75	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	29,33	29,05	29,18	29,51	29,10	29,23	29,24	29,26	29,05	29,13
1024210	VM1698-4	Grad	361,50	354,00	361,00	369,00	353,50	362,75	362,25	359,00	356,75	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	29,12	29,24	29,42	29,43	29,10	29,32	29,43	29,03	29,14	29,56
1024210	VM1698-4	Grad	363,00	363,75	364,75	369,50	360,75	361,75	363,25	362,75	362,25	371,50

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	29,23	29,14	29,25	29,55	29,10	29,42	29,47	29,78	29,17	29,33
1024210	VM1698-4	Grad	367,00	361,00	364,25	372,25	364,75	371,75	367,50	373,25	358,00	363,00

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	29,51	29,56	29,28	29,24	29,47	29,11	29,56	29,53	29,28	29,54
1024210	VM1698-4	Grad	366,50	372,00	366,50	361,75	367,75	358,00	371,00	369,50	366,25	369,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 18.01.2024

Serial No.	ILJ1007_a	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	30,00
Ord. No.	CLBA303	Serial No.	1024210	LSL	27,00
				USL	33,00
Remark	TQ 100% soft +/-10% * Speed 255 rpm (Pause 8 s)				

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	29,27	29,32	29,30	29,09	29,39	29,39	29,42	29,65	29,57	29,24
1024210	VM1698-4	Grad	361,00	362,75	366,00	360,75	363,75	365,00	367,25	371,00	370,50	365,25

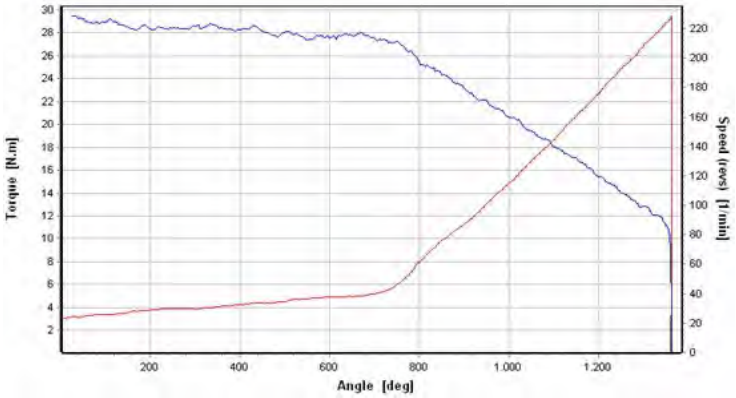
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	29,27	29,19	29,35	29,06	29,44	29,56	29,25	29,56	29,16	29,37
1024210	VM1698-4	Grad	366,50	357,00	362,75	349,75	358,25	367,00	360,00	365,75	358,00	358,75

Torque graphs

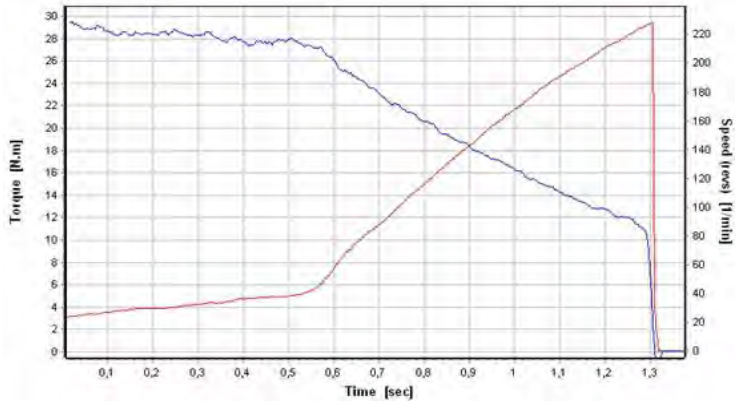
Model: **CLBA303**
Serial no: **ILJ1007**

Machine Capability Study 100 %

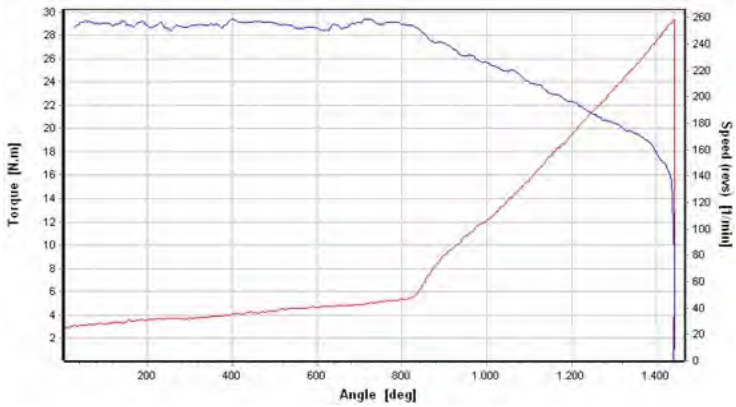
Angle degree: **360°**
Test torque: **30,0 Nm**



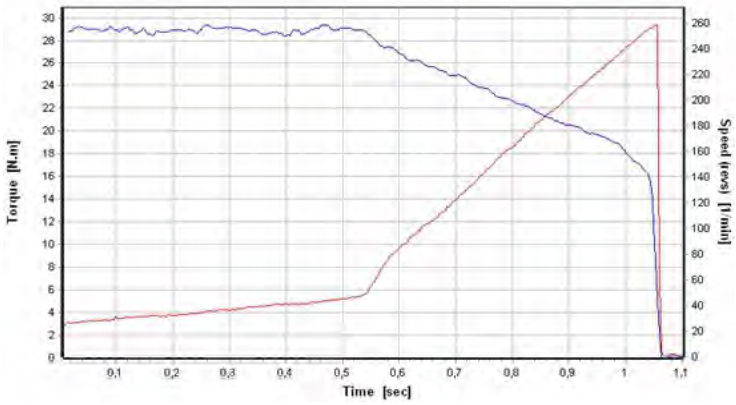
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed