Homologation

Cordless Assembly Tools

Model: CLBA303

Serial no.: ILJ1008

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Homologation: CLBA303 SN: ILJ1008

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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: **ILJ1008**

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

Hard joint (H) 89,19 Nm / Revolution Angle degree 30°

Soft joint (L) 7,15 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	14,87 Nm	14,31 Nm
	Standard deviation	0,12 Nm	0,09 Nm
	Torque scatter (99,73%)	0,69 Nm	0,52 Nm
	C_m	4,26	5,65
	C_{mk}	4,10	3,73

b) Min. C_m hard/soft (lowest value) 4,26
Min. C_{mk} hard/soft (lowest value) 3,73

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

Note:

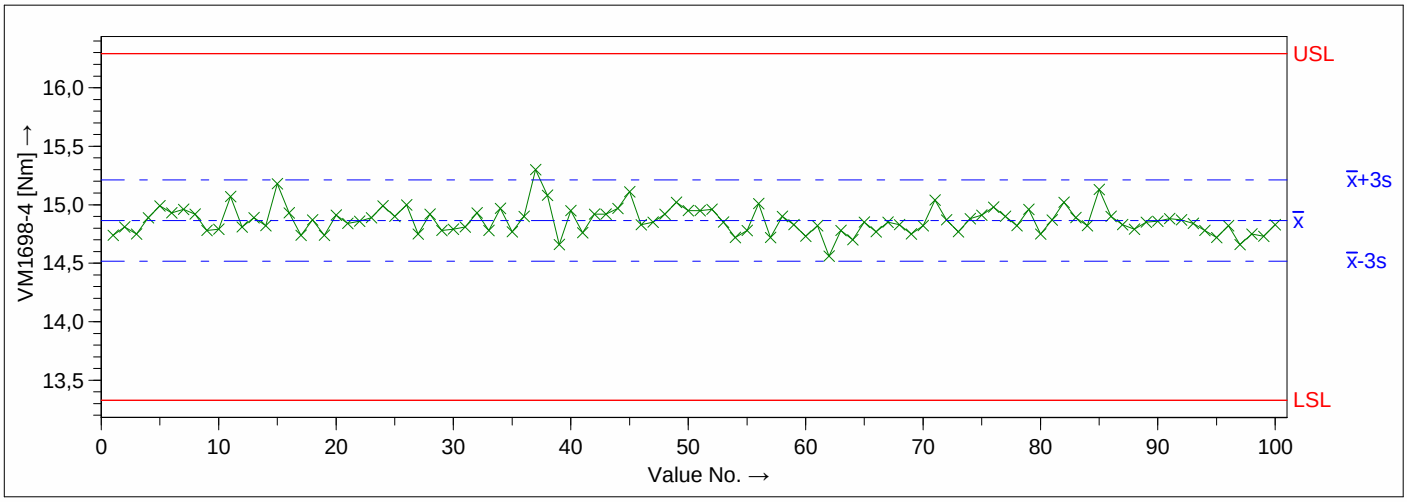
Machine Capability Study
Control System

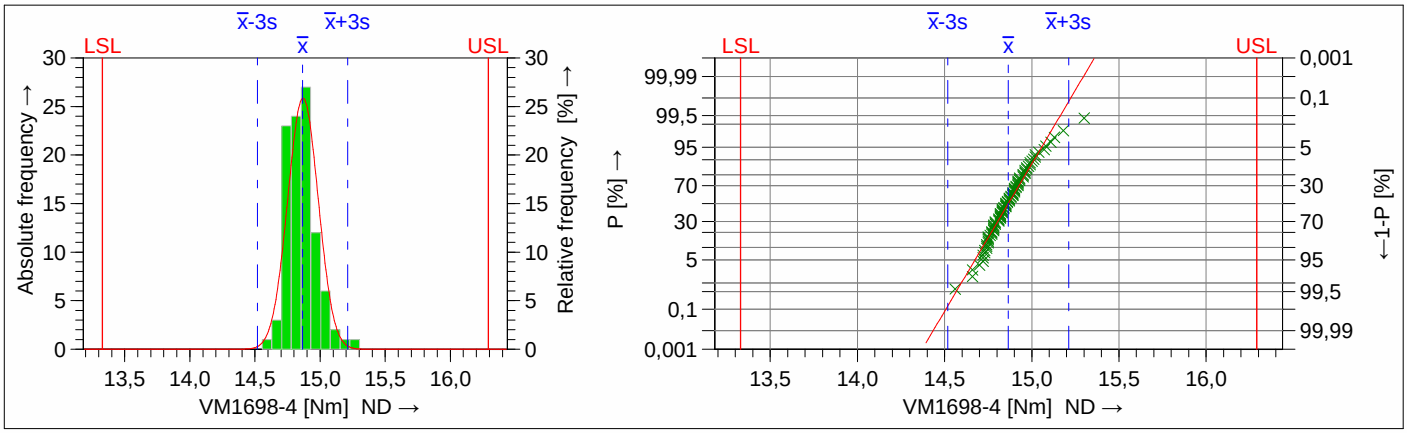
Plant	ATG Westhausen	Operator Name	Sorg
Date	19.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1008_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 19.01.2024 09:51:21 to 19.01.2024 10:04:33

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





Drawing Values		Collected Values		Statistics	
T_m	14.81			x̄	14.8654
LSL	13.33	x_{min}	14.56	x̄-3s	14.5182
USL	16.29	x_{max}	15.30	x̄+3s	15.2126
T	2.96	R	0.74	6s	0.6944
		$n_{<T>}$	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	4.26
Critical capability index	=	C_{mk}	4.10

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

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Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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	14,74	14,81	14,75	14,89	14,99	14,93	14,96	14,92	14,78	14,79
1024210	VM1698-4	Grad	29,00	29,50	29,25	29,25	30,00	29,00	30,00	29,50	28,75	29,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	15,07	14,81	14,89	14,82	15,18	14,93	14,74	14,87	14,74	14,91
1024210	VM1698-4	Grad	29,50	29,75	30,00	29,25	30,50	30,00	30,00	29,75	29,75	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	14,84	14,86	14,89	14,99	14,90	15,00	14,75	14,92	14,78	14,79
1024210	VM1698-4	Grad	29,75	30,50	30,25	30,00	29,75	31,00	30,00	30,25	29,50	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	14,81	14,93	14,78	14,97	14,77	14,90	15,30	15,08	14,66	14,95
1024210	VM1698-4	Grad	30,75	30,00	29,75	30,50	30,00	30,50	31,75	30,50	30,25	30,00

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	14,76	14,92	14,92	14,97	15,11	14,83	14,85	14,92	15,02	14,95
1024210	VM1698-4	Grad	30,25	30,25	30,75	31,25	31,25	30,50	30,75	30,75	30,50	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	14,95	14,96	14,85	14,72	14,78	15,01	14,72	14,90	14,83	14,73
1024210	VM1698-4	Grad	30,25	30,00	29,75	29,75	29,25	30,50	29,25	30,00	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	14,82	14,56	14,78	14,70	14,85	14,77	14,85	14,83	14,75	14,82
1024210	VM1698-4	Grad	30,25	29,25	30,50	30,00	30,75	30,25	30,25	31,50	30,00	30,50

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	15,04	14,87	14,77	14,88	14,91	14,98	14,90	14,82	14,96	14,75
1024210	VM1698-4	Grad	30,75	29,75	30,75	30,50	30,75	31,00	30,75	30,25	30,50	29,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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	14,87	15,02	14,89	14,82	15,13	14,90	14,83	14,79	14,85	14,86
1024210	VM1698-4	Grad	30,50	30,50	30,50	30,25	30,00	29,75	30,00	29,50	29,50	30,00

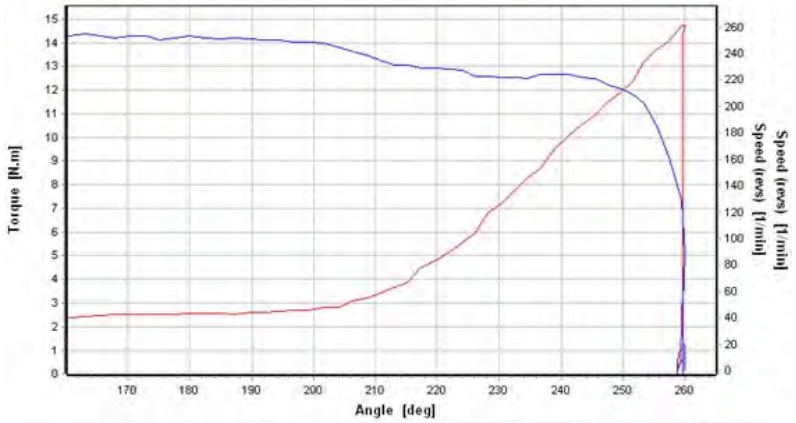
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,88	14,87	14,84	14,78	14,72	14,82	14,66	14,75	14,73	14,83
1024210	VM1698-4	Grad	29,50	30,25	30,00	30,00	30,25	30,00	29,75	29,25	29,50	29,75

Torque graphs

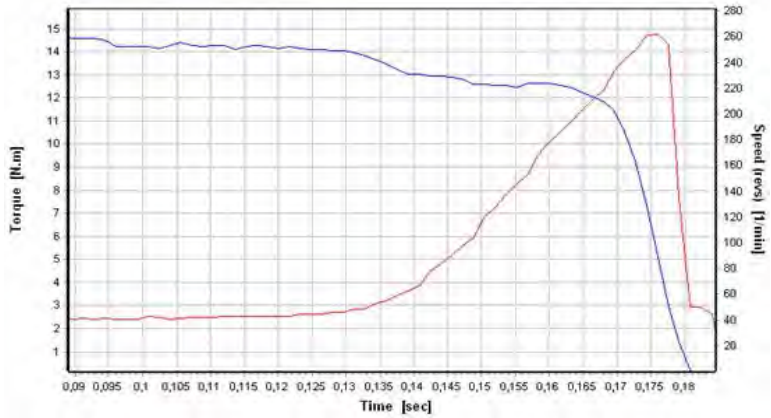
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1008**

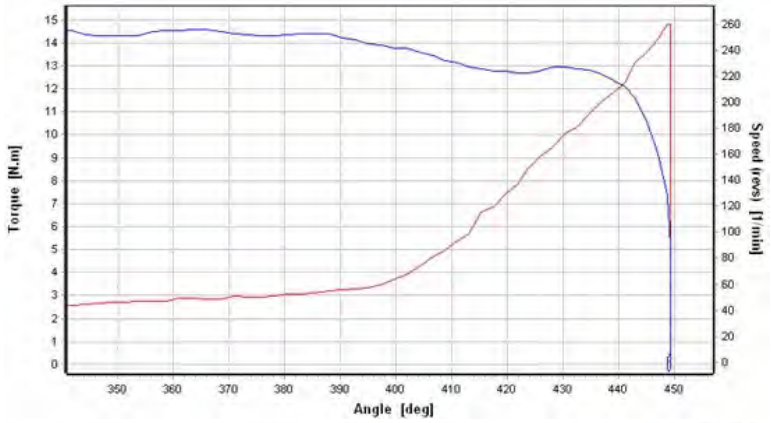
Angle degree: **30°**
Test torque: **14,8 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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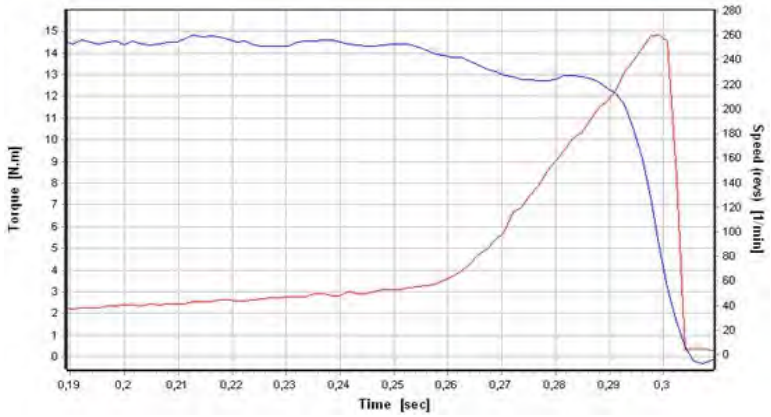
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

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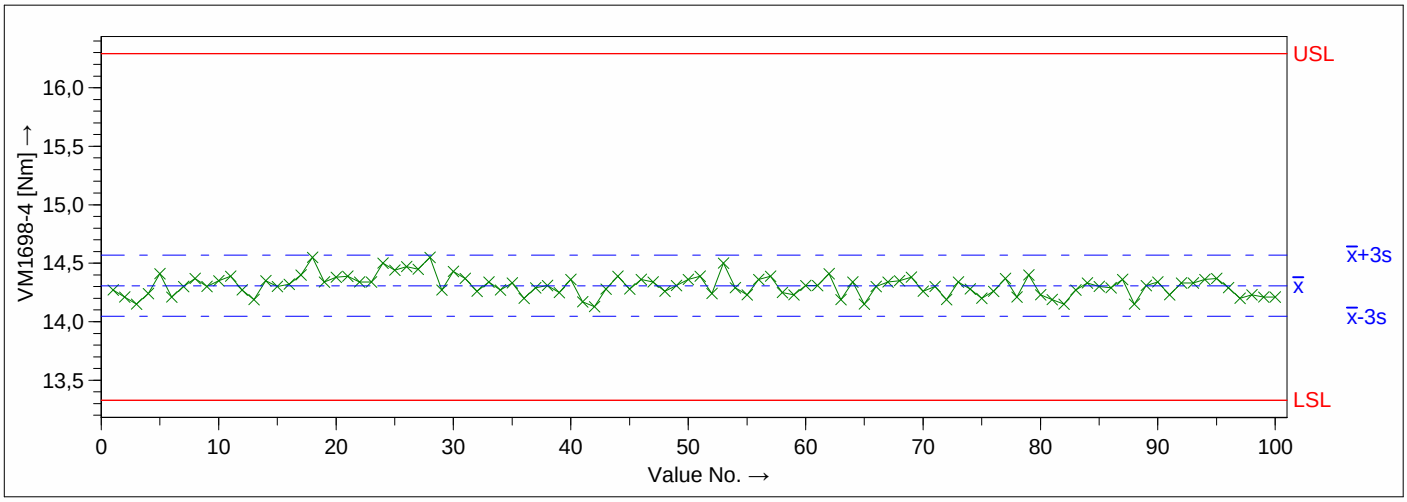
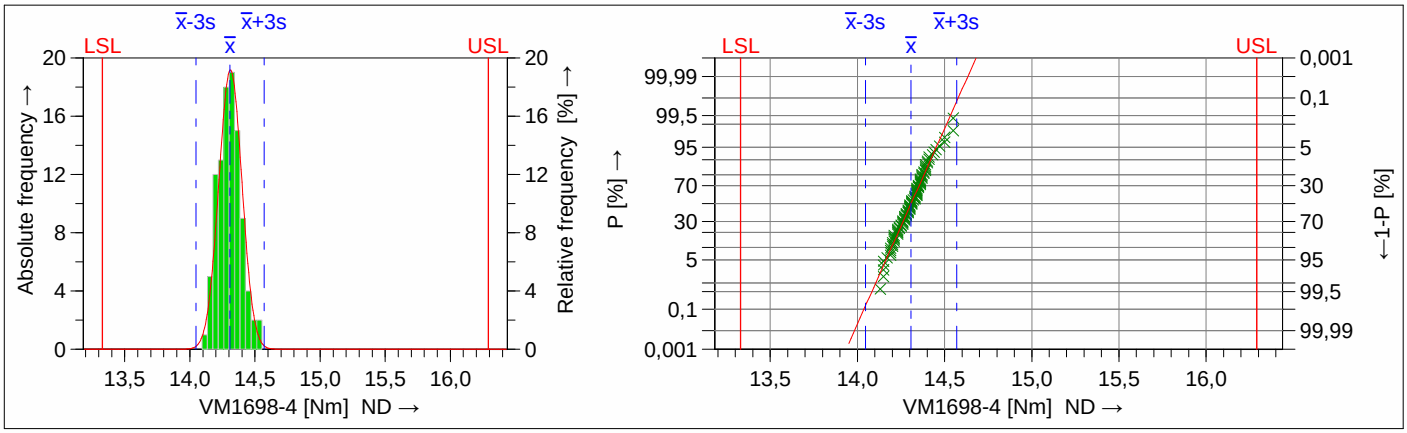
Plant	ATG Westhausen	Operator Name	Sorg
Date	19.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1008_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 19.01.2024 10:05:53 to 19.01.2024 10:19:05

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





Drawing Values		Collected Values		Statistics	
T_m	14.81			$\bar{x}$	14.3079
LSL	13.33	x_{min}	14.13	$\bar{x}$-3s	14.0458
USL	16.29	x_{max}	14.55	$\bar{x}$+3s	14.5700
T	2.96	R	0.42	6s	0.5242
		$n_{<T>}$	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	5.65
Critical capability index	=	C_{mk}	3.73

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

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Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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	14,27	14,21	14,15	14,24	14,41	14,21	14,30	14,37	14,30	14,35
1024210	VM1698-4	Grad	347,50	362,75	375,25	343,75	368,00	361,00	357,25	353,25	343,00	362,25

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	14,39	14,27	14,19	14,35	14,30	14,32	14,40	14,55	14,34	14,38
1024210	VM1698-4	Grad	370,50	364,00	359,75	352,75	347,25	344,25	355,00	351,75	360,25	380,00

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	14,39	14,34	14,34	14,50	14,44	14,47	14,45	14,55	14,27	14,43
1024210	VM1698-4	Grad	383,25	377,50	359,50	356,25	353,25	353,50	348,75	357,00	351,00	359,00

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	14,37	14,26	14,34	14,27	14,33	14,20	14,29	14,31	14,25	14,36
1024210	VM1698-4	Grad	364,75	376,75	372,50	353,50	376,75	352,75	349,00	352,25	354,00	371,50

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	14,17	14,13	14,28	14,39	14,28	14,36	14,34	14,26	14,31	14,36
1024210	VM1698-4	Grad	374,25	350,75	344,00	360,75	351,00	360,00	365,25	380,50	373,75	356,75

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	14,39	14,24	14,50	14,29	14,23	14,36	14,39	14,25	14,23	14,31
1024210	VM1698-4	Grad	356,50	349,50	358,25	344,00	359,00	379,50	356,75	342,00	353,75	346,00

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	14,31	14,41	14,19	14,34	14,15	14,30	14,34	14,35	14,38	14,26
1024210	VM1698-4	Grad	361,00	377,00	345,00	349,75	348,25	354,00	357,25	368,75	383,75	377,50

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	14,30	14,19	14,34	14,28	14,20	14,26	14,37	14,21	14,40	14,23
1024210	VM1698-4	Grad	347,25	353,75	349,00	368,00	368,25	344,25	344,50	350,00	357,00	353,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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	14,19	14,15	14,27	14,33	14,30	14,29	14,36	14,15	14,31	14,34
1024210	VM1698-4	Grad	366,25	366,25	354,75	349,75	360,00	359,25	371,50	346,00	362,25	379,75

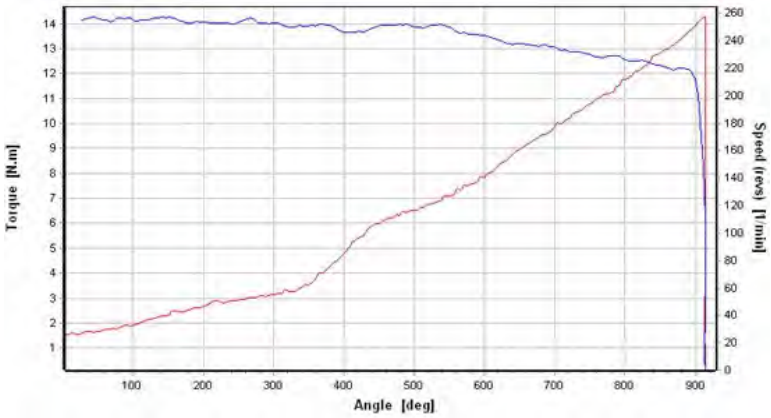
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,23	14,33	14,33	14,36	14,37	14,29	14,20	14,23	14,21	14,21
1024210	VM1698-4	Grad	352,00	347,50	348,75	362,25	364,00	361,00	376,00	356,25	352,50	368,50

Torque graphs

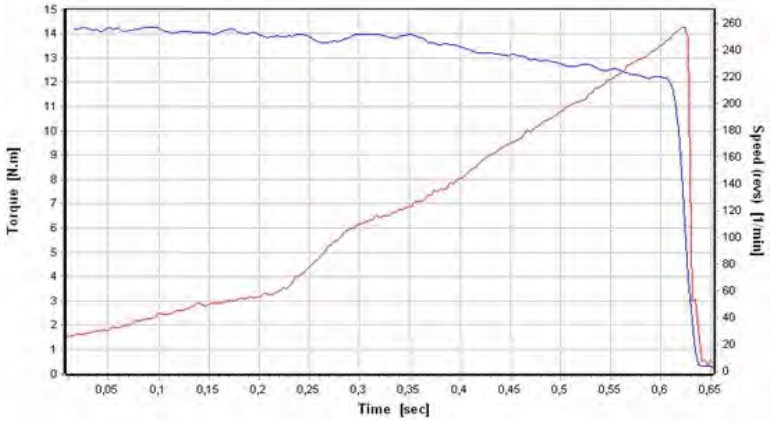
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1008**

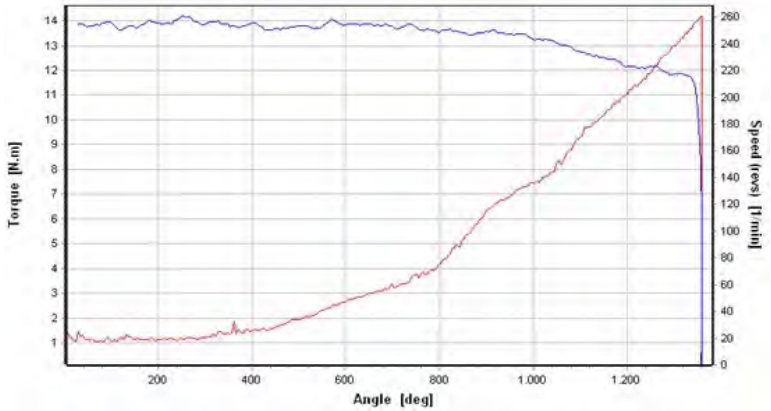
Angle degree: **360°**
Test torque: **14,8 Nm**



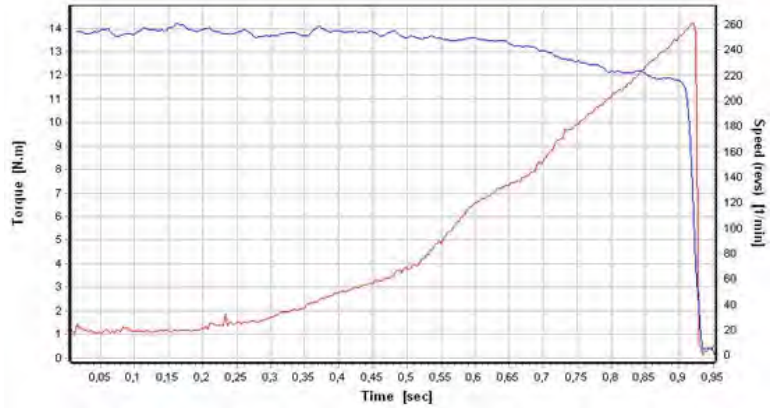
Value no. 1
Graph
Torque / Angle / Speed



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: **ILJ1008**

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

Hard joint (H)	157,48	Nm / Revolution	Angle degree	30°
Soft joint (L)	12,83	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	26,25 Nm	25,66 Nm
	Standard deviation	0,19 Nm	0,16 Nm
	Torque scatter (99,73%)	1,14 Nm	0,96 Nm
	C_m	4,51	5,36
	C_{mk}	3,50	5,33

b)	Min. C_m hard/soft (lowest value)	4,51
	Min. C_{mk} hard/soft (lowest value)	3,50

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

Note:

Machine Capability Study
Control System

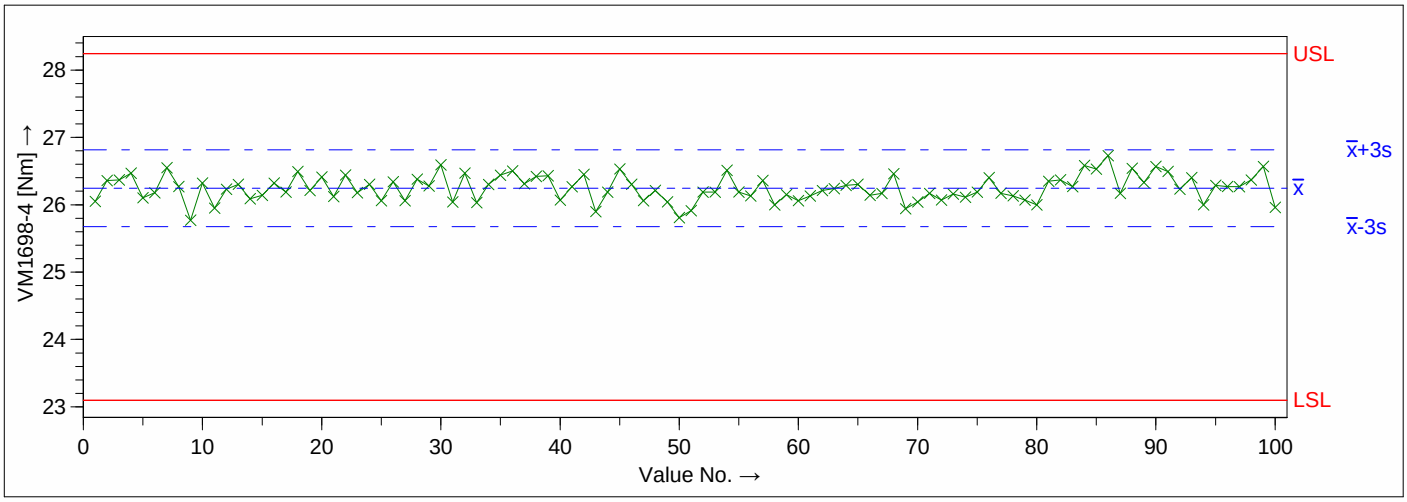
Cleco Production Tools

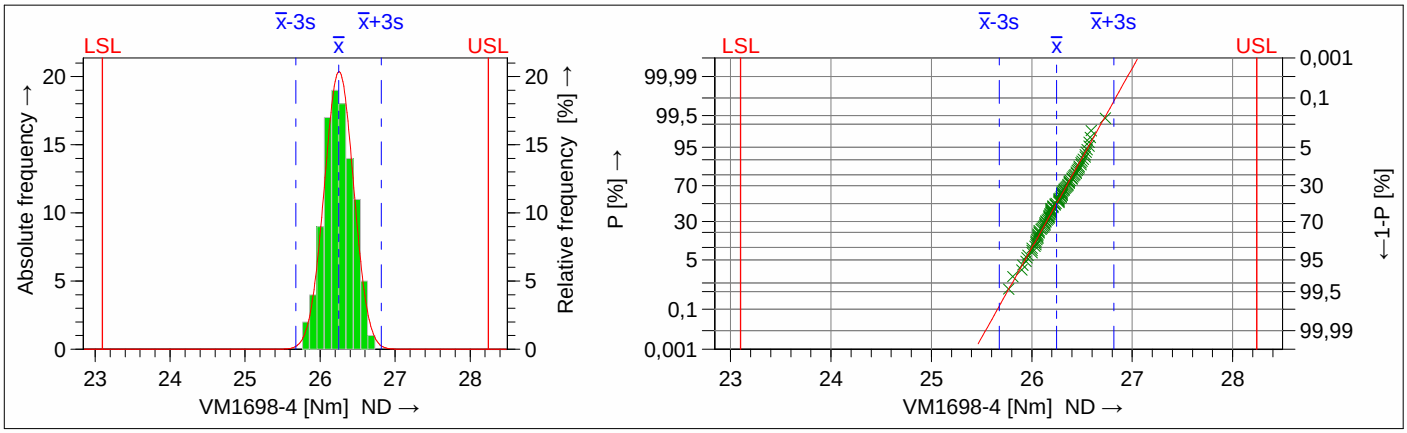
Plant	ATG Westhausen	Operator Name	Sorg
Date	19.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1008_h	Char.Descr.	VM1698-4	Nom.val. 25,66 2,58	USL 28,24
		Serial No.	1024210	Unit Nm -2,56	LSL 23,10
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 19.01.2024 10:43:27 to 19.01.2024 10:56:39

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





Drawing Values		Collected Values		Statistics	
T_m	25.67			$\bar{x}$	26.2466
LSL	23.10	x_{min}	25.77	$\bar{x}$-3s	25.6765
USL	28.24	x_{max}	26.73	$\bar{x}$+3s	26.8167
T	5.14	R	0.96	6s	1.1402
		$n_{<T>}$	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	4.51
Critical capability index	=	C_{mk}	3.50

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 19.01.2024

Serial No.	ILJ1008_h	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,10
				USL	28,24
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	26,05	26,36	26,37	26,47	26,10	26,18	26,55	26,27	25,77	26,32
1024210	VM1698-4	Grad	30,00	30,75	30,50	30,00	29,25	30,00	31,25	29,75	29,75	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	25,95	26,23	26,30	26,09	26,14	26,32	26,19	26,49	26,21	26,41
1024210	VM1698-4	Grad	29,75	30,50	31,00	29,75	30,25	30,50	29,50	31,00	29,00	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	26,12	26,44	26,18	26,30	26,06	26,34	26,06	26,38	26,28	26,59
1024210	VM1698-4	Grad	28,75	30,50	29,25	30,25	29,00	30,00	29,25	30,00	29,50	30,50

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	26,04	26,47	26,03	26,30	26,44	26,50	26,31	26,42	26,43	26,07
1024210	VM1698-4	Grad	29,50	30,50	29,50	30,00	29,75	30,25	29,50	30,00	30,00	29,00

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	26,27	26,45	25,90	26,19	26,53	26,30	26,06	26,21	26,04	25,81
1024210	VM1698-4	Grad	30,25	31,00	29,25	30,00	30,50	30,25	30,00	30,25	29,75	29,00

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	25,91	26,19	26,19	26,51	26,19	26,13	26,36	26,00	26,15	26,06
1024210	VM1698-4	Grad	30,00	30,50	29,50	30,00	29,75	29,00	30,25	29,50	29,50	28,50

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	26,13	26,21	26,24	26,29	26,30	26,14	26,17	26,46	25,94	26,04
1024210	VM1698-4	Grad	29,25	29,50	29,75	29,00	30,00	29,75	30,00	30,00	29,25	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	26,17	26,07	26,16	26,11	26,19	26,40	26,17	26,13	26,07	26,00
1024210	VM1698-4	Grad	29,75	29,75	30,00	30,00	30,25	30,00	29,75	30,00	29,75	29,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_h	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,10
				USL	28,24
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	26,35	26,37	26,27	26,58	26,53	26,73	26,17	26,54	26,33	26,57
1024210	VM1698-4	Grad	30,00	30,75	30,25	30,50	30,75	31,50	29,25	30,50	30,00	30,75

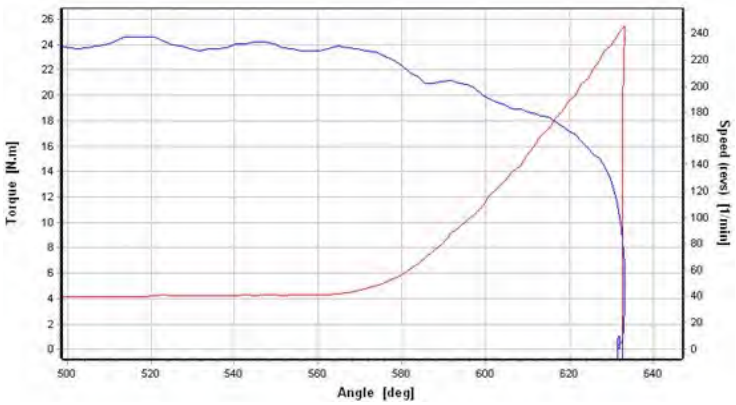
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	26,49	26,23	26,40	26,00	26,29	26,27	26,27	26,37	26,57	25,96
1024210	VM1698-4	Grad	27,75	29,50	29,75	29,75	29,50	29,75	30,00	30,50	30,50	29,00

Torque graphs

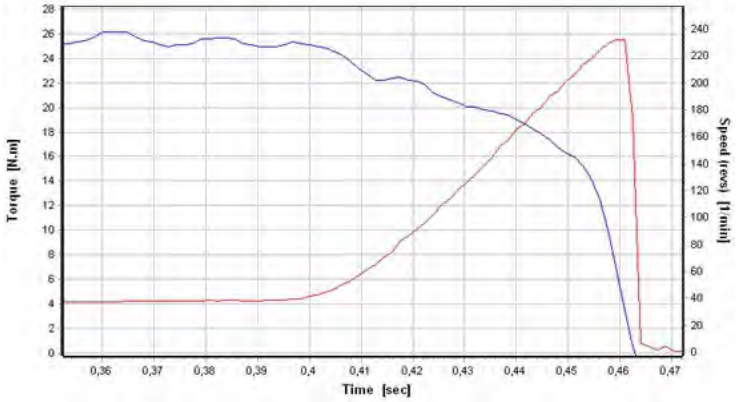
Model: **CLBA303**
Serial no: **ILJ1008**

Machine Capability Study 80 %

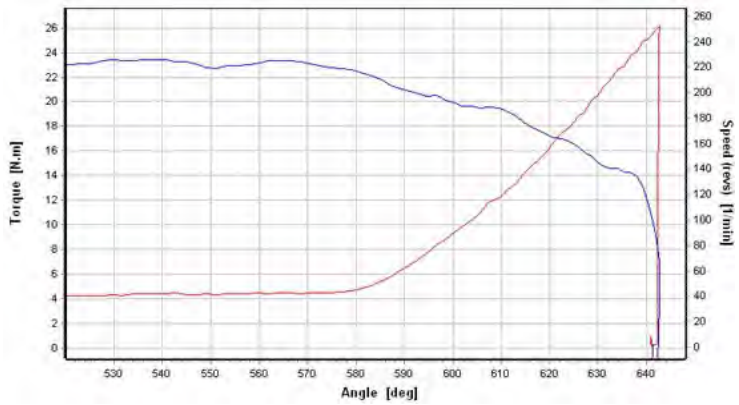
Angle degree: **30°**
Test torque: **25,7 Nm**



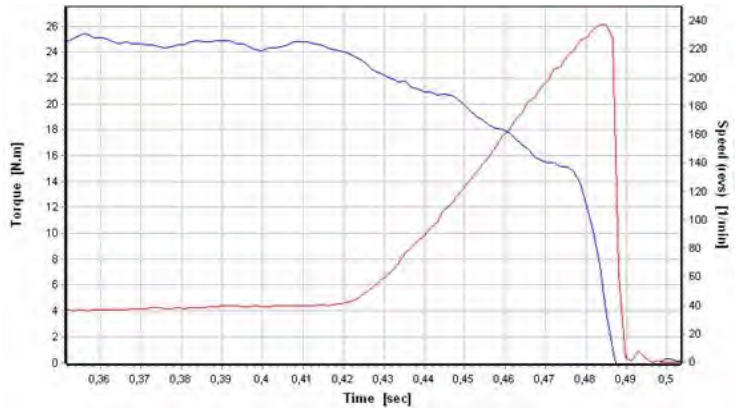
Value no. 1
Graph
Torque / Angle / Speed



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

Page 1 / 1

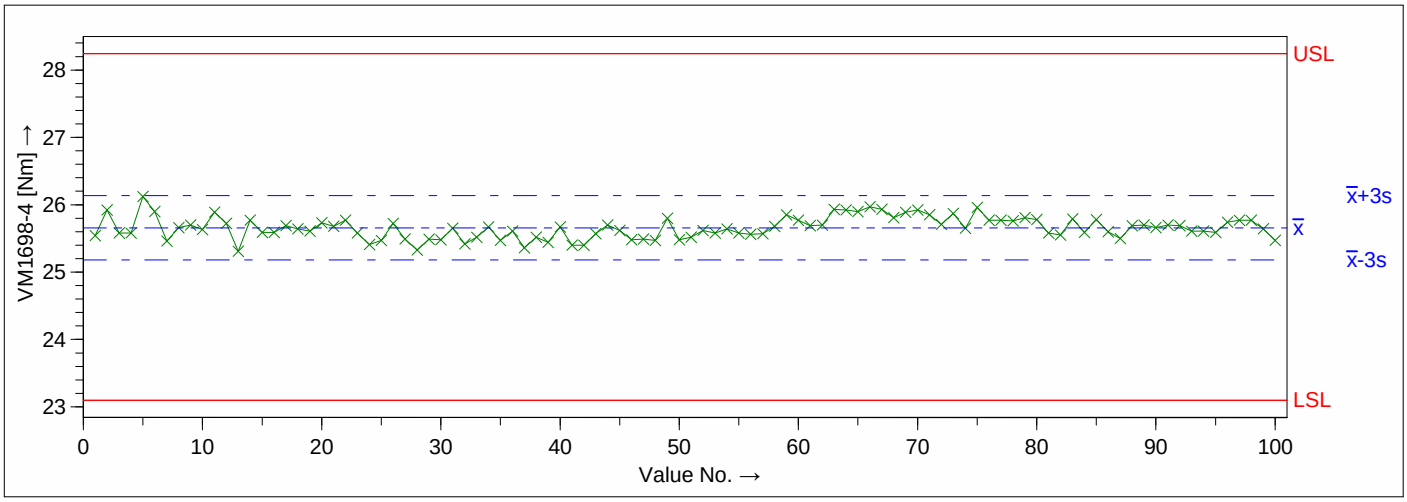
Plant ATG Westhausen		Operator Name Sorg	Date 19.01.2024

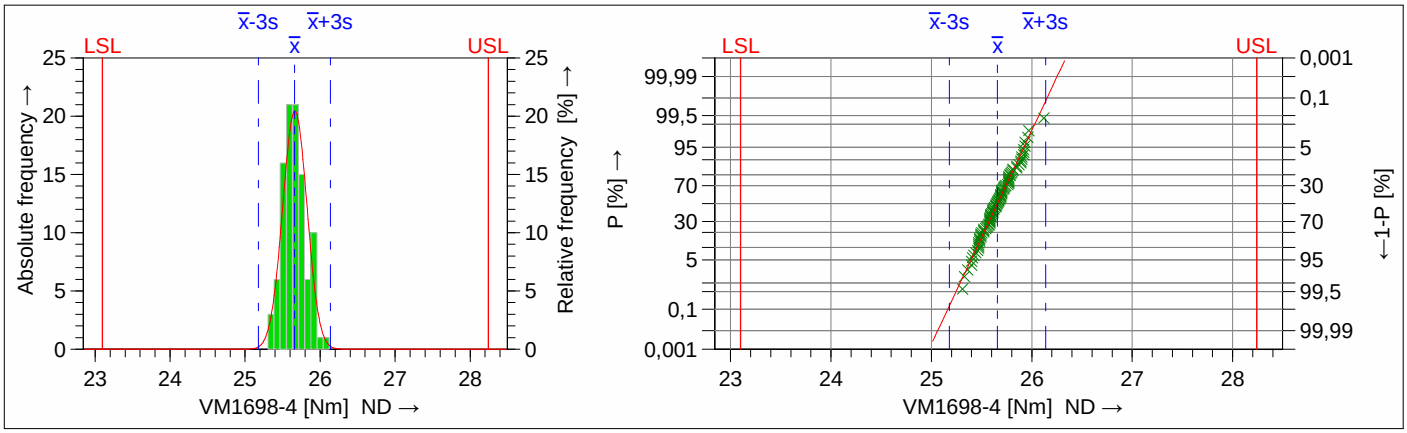
Ord. No. CLBA303	Part type CLBA303				Contr.item yes
Serial No. ILJ1008_g	Char.Descr. VM1698-4	Nom.val.	25,66	2,58	USL 28,24
	Serial No. 1024210	Unit	Nm	-2,56	LSL 23,10
Char.Type variable		Tolerance value	10 %		Decimal Pl. 2

Cust.Name ATG	Reference System VM1698-4	Test Electronic ---
Contr.No. Homologation	Reference Transducer 50/1024729	nges. 100

Evaluation from 19.01.2024 10:29:42 to 19.01.2024 10:42:54

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





Drawing Values		Collected Values		Statistics	
T_m	25.67			$\bar{x}$	25.6578
LSL	23.10	x_{min}	25.31	$\bar{x}$-3s	25.1783
USL	28.24	x_{max}	26.12	$\bar{x}$+3s	26.1373
T	5.14	R	0.81	6s	0.9590
		$n_{<T>}$	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	5.36
Critical capability index	=	C_{mk}	5.33

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 19.01.2024

Serial No.	ILJ1008_g	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,10
				USL	28,24
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	25,54	25,92	25,58	25,58	26,12	25,90	25,46	25,66	25,70	25,63
1024210	VM1698-4	Grad	358,00	362,50	355,25	357,00	363,50	364,25	349,75	358,50	360,50	354,00

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	25,89	25,72	25,31	25,77	25,59	25,59	25,69	25,64	25,61	25,73
1024210	VM1698-4	Grad	359,25	359,50	349,75	360,25	357,25	351,50	356,25	356,00	354,50	358,75

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	25,68	25,77	25,58	25,41	25,47	25,72	25,49	25,33	25,49	25,48
1024210	VM1698-4	Grad	357,50	362,00	354,25	349,75	353,00	355,50	351,75	348,50	358,75	357,75

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	25,65	25,42	25,52	25,67	25,47	25,61	25,36	25,52	25,44	25,67
1024210	VM1698-4	Grad	361,25	354,00	361,25	359,75	358,00	361,50	352,75	357,75	355,25	365,00

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	25,40	25,40	25,57	25,70	25,62	25,48	25,49	25,47	25,80	25,48
1024210	VM1698-4	Grad	353,75	354,75	355,00	364,00	363,00	356,75	360,50	355,50	362,25	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	25,52	25,62	25,58	25,64	25,58	25,56	25,57	25,68	25,85	25,77
1024210	VM1698-4	Grad	360,75	363,00	359,00	364,75	358,75	357,00	361,00	361,50	367,25	366,75

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	25,69	25,70	25,93	25,92	25,90	25,97	25,93	25,81	25,89	25,92
1024210	VM1698-4	Grad	366,75	359,75	372,00	367,75	370,25	371,50	369,75	365,00	363,25	359,75

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	25,85	25,71	25,87	25,65	25,96	25,77	25,77	25,76	25,81	25,78
1024210	VM1698-4	Grad	364,00	356,75	365,25	355,00	363,00	356,25	360,25	356,25	356,25	361,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_g	Characteristic			
Part type	CLBA303	Char.Descr.	VM1698-4	Nom.val.	25,66
Ord. No.	CLBA303	Serial No.	1024210	LSL	23,10
				USL	28,24
Remark	TQ 80% soft +/-10% * Speed 255 rpm				

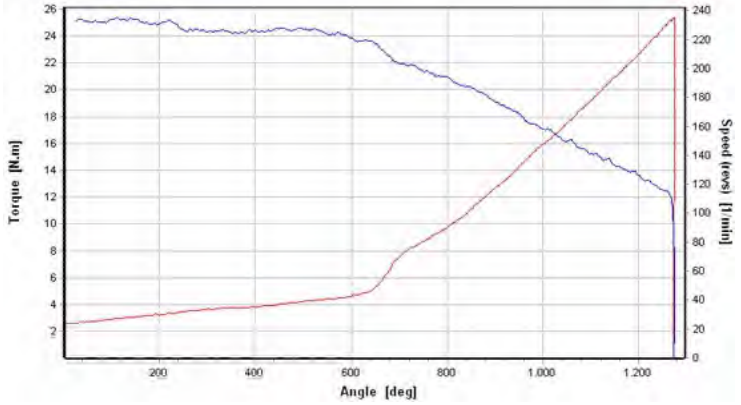
Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	25,58	25,55	25,79	25,59	25,78	25,60	25,50	25,69	25,70	25,66
1024210	VM1698-4	Grad	352,75	355,50	357,00	354,25	360,50	357,00	353,25	354,00	355,50	353,75

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	25,70	25,69	25,61	25,61	25,59	25,74	25,77	25,77	25,64	25,47
1024210	VM1698-4	Grad	360,50	355,50	354,50	351,25	353,00	364,50	356,50	356,50	357,00	349,25

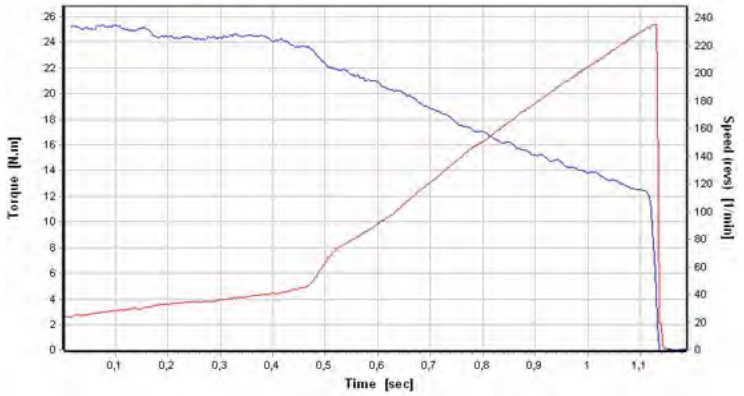
Torque graphs

Model: **CLBA303**
Serial no: **ILJ1008**

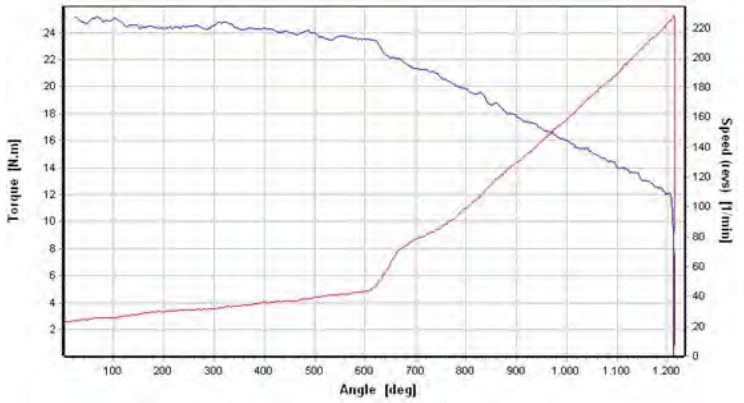
Machine Capability Study 80 %
Angle degree: **360°**
Test torque: **25,7 Nm**



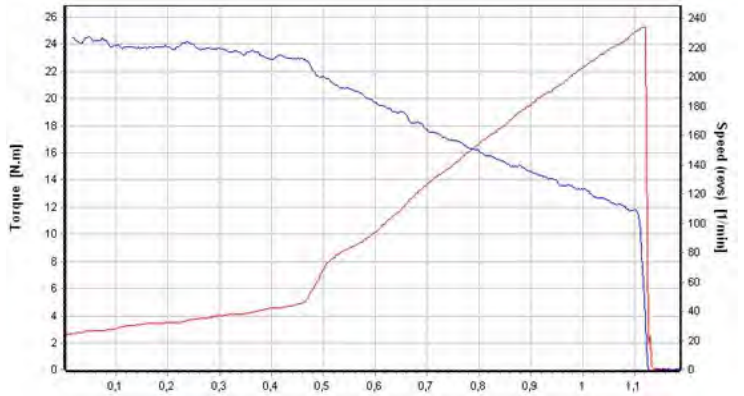
Value no. 1
Graph
Torque / Angle / Speed



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: **ILJ1008**

Test torque: Tq max. 30,00 Nm

Hard joint (H)	180,90	Nm / Revolution	Angle degree	30°
Soft joint (L)	14,82	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	30,15 Nm	29,65 Nm
	Standard deviation	0,30 Nm	0,22 Nm
	Torque scatter (99,73%)	1,81 Nm	1,31 Nm
	C_m	3,32	4,57
	C_{mk}	3,15	4,04

b)	Min. C_m hard/soft (lowest value)	3,32
	Min. C_{mk} hard/soft (lowest value)	3,15

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

Note:

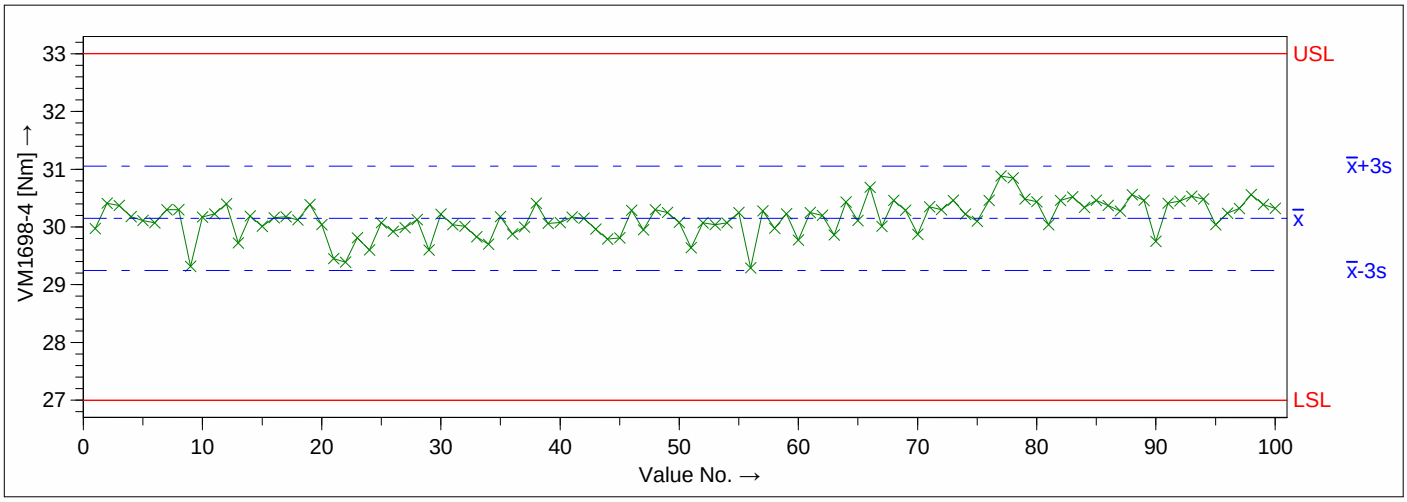
Machine Capability Study
Control System

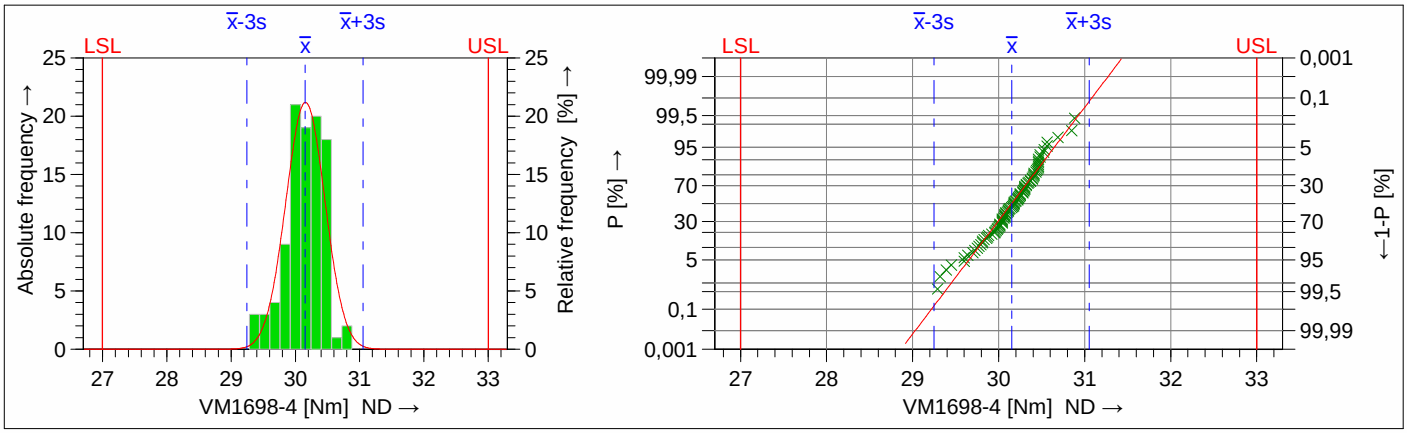
Plant	ATG Westhausen	Operator Name	Sorg
Date	19.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1008_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 19.01.2024 11:08:28 to 19.01.2024 11:21:40

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





Drawing Values		Collected Values		Statistics	
T_m	30.00			$\bar{x}$	30.1507
LSL	27.00	x_{min}	29.29	$\bar{x}$-3s	29.2471
USL	33.00	x_{max}	30.88	$\bar{x}$+3s	31.0543
T	6.00	R	1.59	6s	1.8072
		$n_{<T>}$	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	3.32
Critical capability index	=	C_{mk}	3.15

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 19.01.2024

Serial No.	ILJ1008_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	29,97	30,41	30,37	30,18	30,11	30,07	30,30	30,30	29,32	30,17
1024210	VM1698-4	Grad	28,75	30,00	30,00	29,25	29,25	29,25	29,50	29,25	27,75	29,25

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	30,23	30,40	29,72	30,19	30,01	30,16	30,18	30,12	30,39	30,04
1024210	VM1698-4	Grad	29,50	29,25	28,50	29,75	29,25	29,75	29,50	30,00	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	29,45	29,39	29,81	29,60	30,07	29,92	29,99	30,13	29,60	30,22
1024210	VM1698-4	Grad	28,50	28,50	29,50	29,25	30,25	29,75	30,25	29,75	29,00	30,50

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	30,04	30,01	29,83	29,70	30,18	29,88	30,00	30,41	30,06	30,08
1024210	VM1698-4	Grad	30,00	30,00	29,50	29,50	30,75	29,25	29,00	30,50	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	30,17	30,15	29,96	29,79	29,81	30,29	29,95	30,30	30,25	30,08
1024210	VM1698-4	Grad	29,75	30,25	29,25	29,00	29,50	30,00	30,00	30,25	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	29,64	30,07	30,04	30,07	30,25	29,29	30,28	29,98	30,23	29,77
1024210	VM1698-4	Grad	29,00	30,00	30,75	30,00	30,00	28,75	30,75	29,75	30,50	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	30,25	30,20	29,86	30,43	30,11	30,69	30,01	30,46	30,29	29,87
1024210	VM1698-4	Grad	30,50	30,25	30,00	31,00	30,50	31,25	30,50	31,50	30,75	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	30,35	30,30	30,46	30,22	30,10	30,46	30,88	30,85	30,48	30,44
1024210	VM1698-4	Grad	30,75	30,50	30,25	30,50	29,75	30,00	30,75	30,75	30,50	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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	30,46	30,52	30,34	30,46	30,37	30,28	30,56	30,46	29,75
1024210	VM1698-4	Grad	29,75	30,25	30,25	30,50	30,50	30,50	29,75	30,75	30,25	29,25

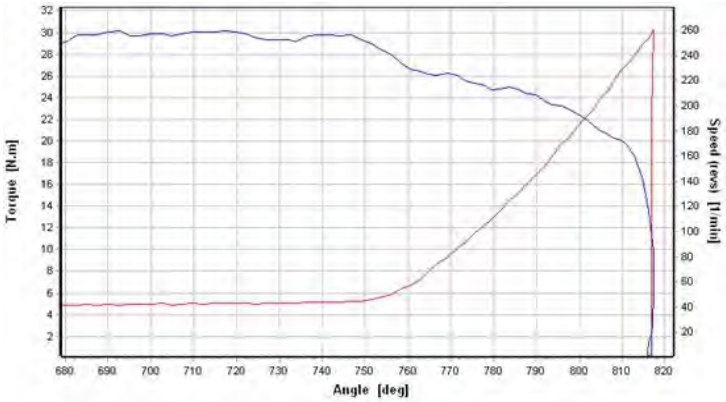
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	30,41	30,45	30,53	30,48	30,04	30,24	30,32	30,56	30,39	30,32
1024210	VM1698-4	Grad	30,25	29,75	30,50	30,75	29,50	30,00	30,50	30,75	31,00	30,25

Torque graphs

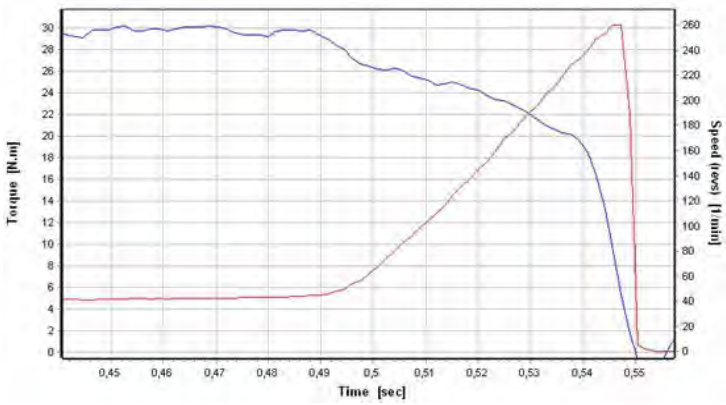
Machine Capability Study 100 %

Model: **CLBA303**
Serial no: **ILJ1008**

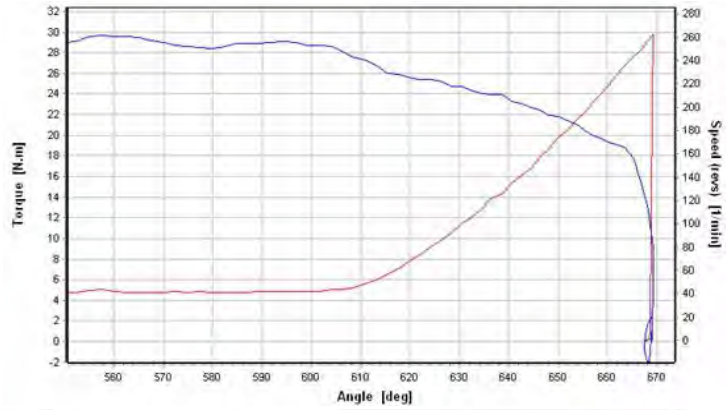
Angle degree: **30°**
Test torque: **30,0 Nm**



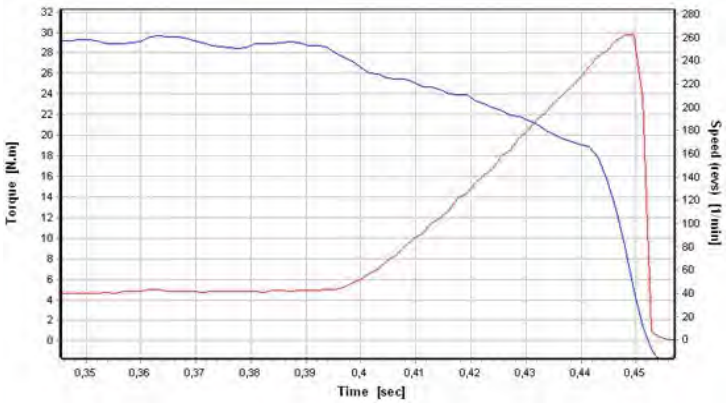
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

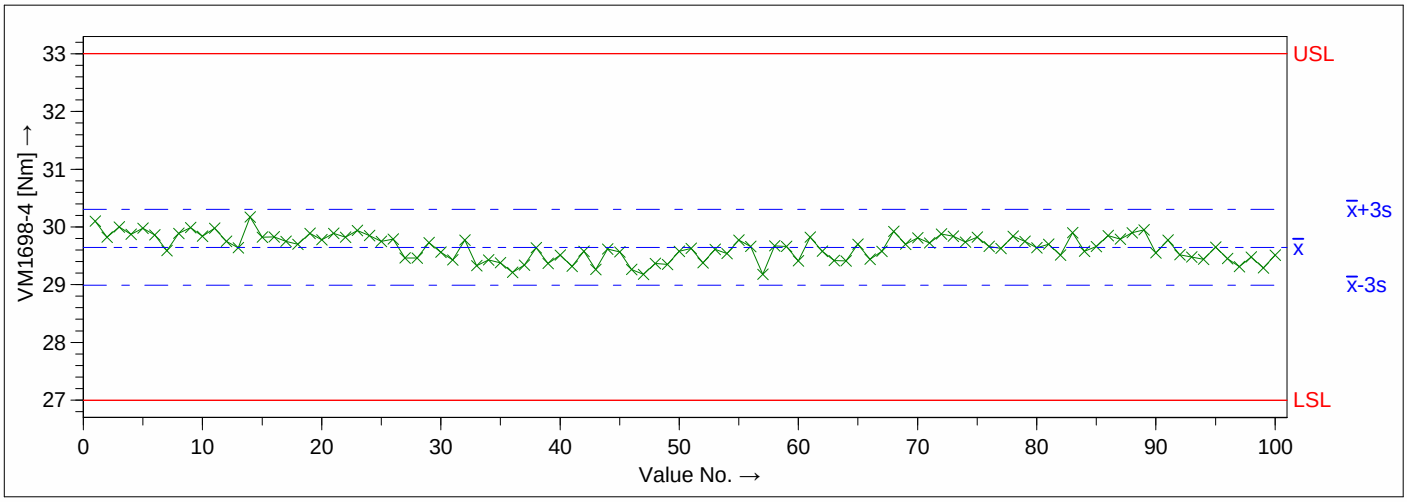
Page 1 / 1

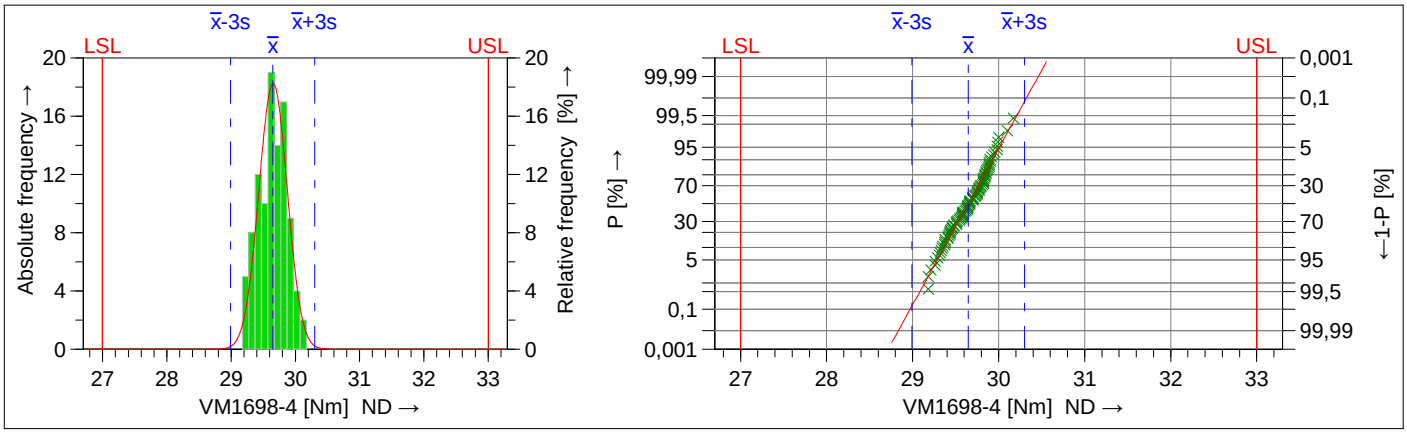
Plant ATG Westhausen		Operator Name Sorg	Date 19.01.2024

Ord. No. CLBA303	Part type CLBA303				Contr.item yes
Serial No. ILJ1008_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 19.01.2024 11:22:23 to 19.01.2024 11:42:10

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





Drawing Values		Collected Values		Statistics	
T_m	30.00			$\bar{x}$	29.6470
LSL	27.00	x_{min}	29.18	$\bar{x}$-3s	28.9912
USL	33.00	x_{max}	30.17	$\bar{x}$+3s	30.3028
T	6.00	R	0.99	6s	1.3115
		$n_{<T>}$	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	4.57
Critical capability index	=	C_{mk}	4.04

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 19.01.2024

Serial No.	ILJ1008_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				

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	30,10	29,82	30,00	29,87	29,98	29,86	29,59	29,89	29,99	29,84
1024210	VM1698-4	Grad	369,50	362,25	364,75	356,25	355,75	357,25	352,75	356,75	359,50	360,00

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	29,98	29,75	29,64	30,17	29,82	29,83	29,75	29,70	29,89	29,78
1024210	VM1698-4	Grad	360,25	354,50	348,00	363,00	361,00	355,50	352,25	352,25	360,00	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	29,89	29,82	29,94	29,85	29,75	29,79	29,46	29,46	29,73	29,56
1024210	VM1698-4	Grad	352,50	356,75	358,25	357,50	355,50	350,75	349,00	350,00	354,75	348,25

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	29,43	29,77	29,33	29,43	29,38	29,21	29,34	29,64	29,37	29,51
1024210	VM1698-4	Grad	354,75	360,50	351,25	356,50	351,75	345,00	350,75	358,50	361,00	363,25

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	29,32	29,58	29,26	29,62	29,57	29,26	29,18	29,37	29,35	29,58
1024210	VM1698-4	Grad	355,00	359,50	353,00	360,75	358,25	357,25	353,00	352,25	356,00	366,50

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	29,63	29,38	29,61	29,54	29,77	29,66	29,18	29,67	29,66	29,41
1024210	VM1698-4	Grad	363,00	358,25	362,75	364,25	367,75	362,25	353,50	363,50	361,75	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	29,82	29,58	29,42	29,41	29,70	29,44	29,58	29,92	29,70	29,81
1024210	VM1698-4	Grad	367,75	365,50	356,50	356,00	366,25	361,50	361,75	369,50	366,00	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	29,72	29,88	29,84	29,74	29,82	29,66	29,63	29,84	29,75	29,64
1024210	VM1698-4	Grad	365,00	367,50	368,00	369,00	367,00	365,50	362,25	369,25	369,00	364,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 19.01.2024

Serial No.	ILJ1008_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				

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	29,70	29,51	29,90	29,58	29,66	29,85	29,79	29,90	29,95	29,55
1024210	VM1698-4	Grad	362,75	357,25	371,00	364,00	366,75	368,50	363,00	365,00	366,50	356,25

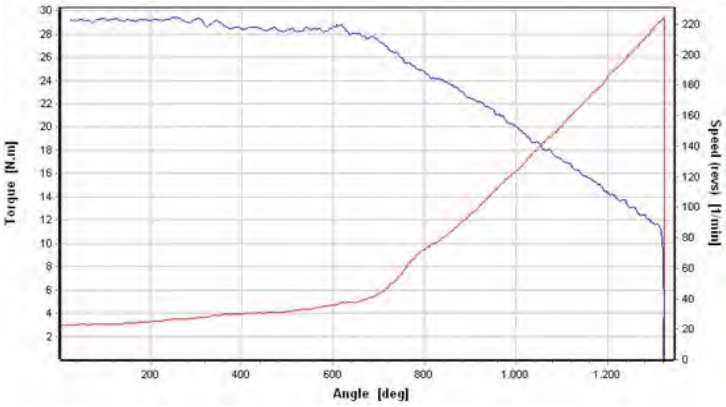
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	29,77	29,52	29,48	29,44	29,65	29,45	29,31	29,48	29,29	29,51
1024210	VM1698-4	Grad	360,00	352,50	353,75	355,50	358,75	353,50	353,75	354,75	349,50	353,25

Torque graphs

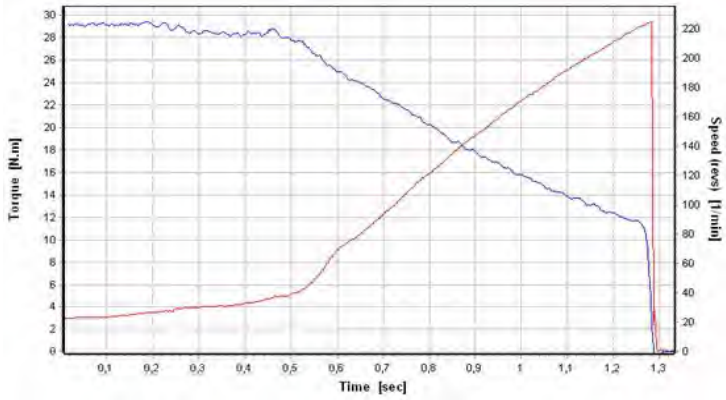
Machine Capability Study 100 %

Model: **CLBA303**
Serial no: **ILJ1008**

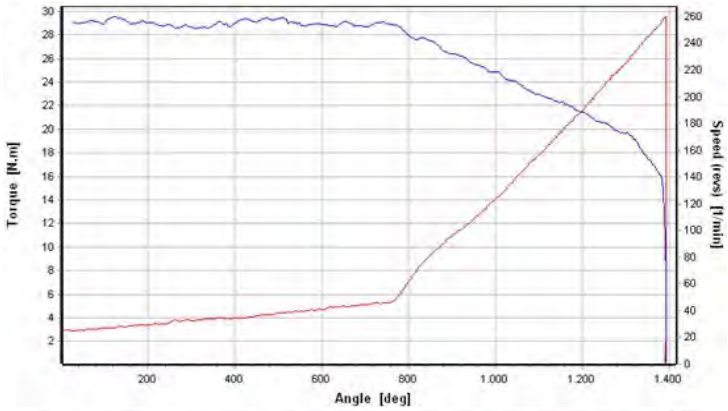
Angle degree: **360°**
Test torque: **30,0 Nm**



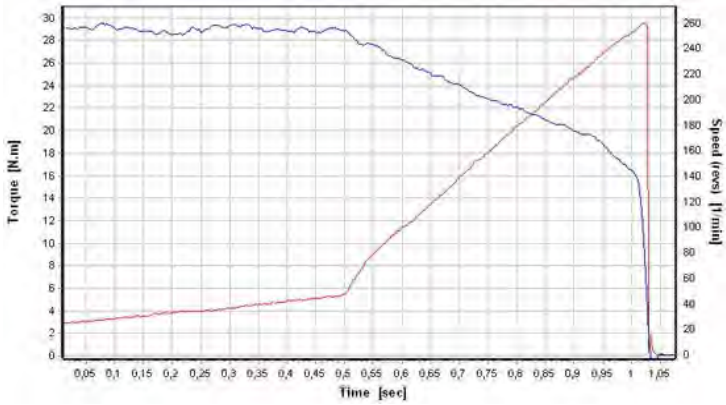
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed