Homologation

Cordless Assembly Tools

Model: CLBA303

Serial no.: ILJ1006

Contents

Homologation: CLBA303 SN: ILJ1006

		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: **ILJ1006**

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

Hard joint (H) 89,93 Nm / Revolution Angle degree 30°

Soft joint (L) 6,67 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	14,99 Nm	13,34 Nm
	Standard deviation	0,15 Nm	0,11 Nm
	Torque scatter (99,73%)	0,87 Nm	0,67 Nm
	C_m	3,40	4,39
	C_{mk}	2,99	3,01

b) Min. C_m hard/soft (lowest value) 3,40
Min. C_{mk} hard/soft (lowest value) 2,99

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

Note:

Machine Capability Study
Control System

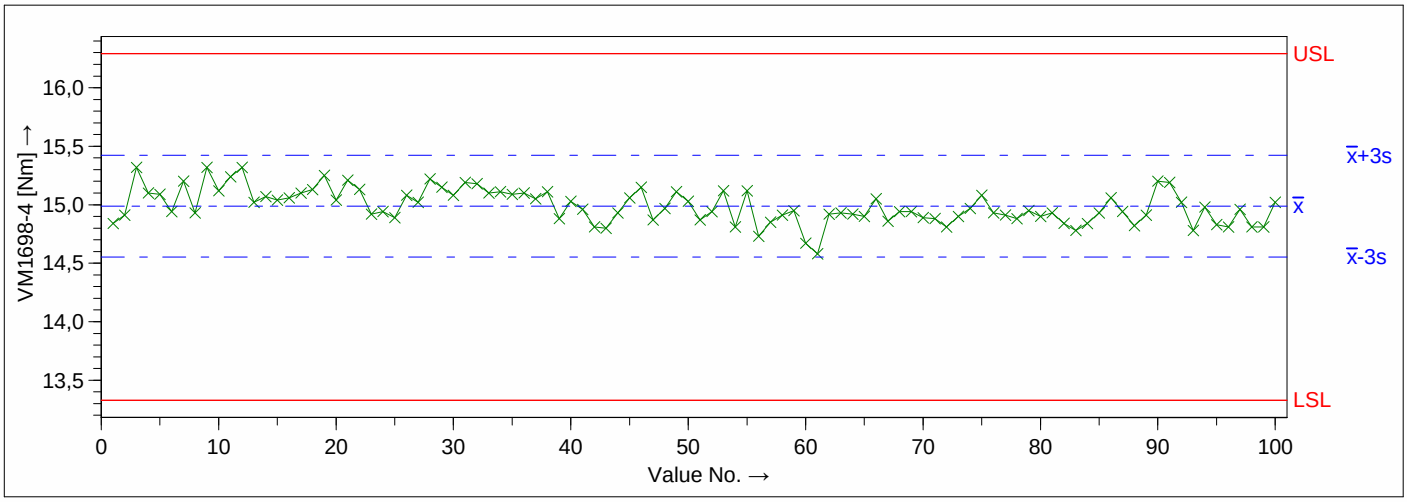
Cleco Production Tools

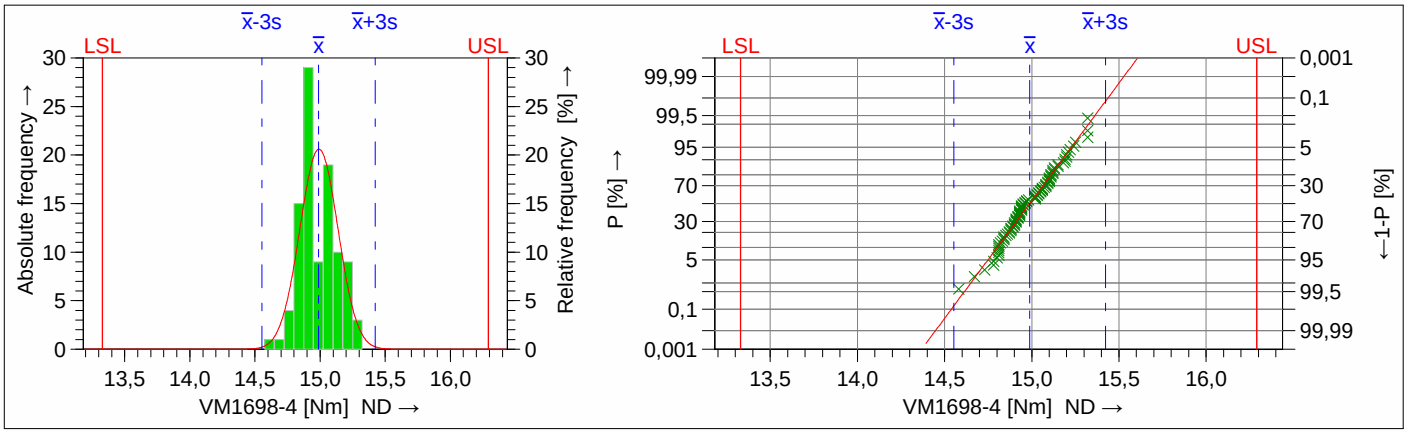
Plant	ATG Westhausen	Operator Name	Sorg
Date	16.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1006_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 16.01.2024 09:00:46 to 16.01.2024 09:12:19

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





Drawing Values		Collected Values		Statistics	
T_m	14.81			x̄	14.9878
LSL	13.33	x_{min}	14.58	x̄-3s	14.5523
USL	16.29	x_{max}	15.32	x̄+3s	15.4233
T	2.96	R	0.74	6s	0.8711
		$n_{<T>}$	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	3.40
Critical capability index	=	C_{mk}	2.99

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 16.01.2024

Serial No.	ILJ1006_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	14,84	14,91	15,32	15,10	15,09	14,94	15,20	14,93	15,32	15,12
1024210	VM1698-4	Grad	29,75	30,00	30,75	30,25	30,25	30,00	30,50	29,25	31,50	30,75

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	15,24	15,32	15,02	15,07	15,04	15,06	15,10	15,13	15,25	15,04
1024210	VM1698-4	Grad	30,50	30,75	30,25	31,00	30,00	30,75	31,00	31,00	30,75	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	15,21	15,13	14,92	14,94	14,89	15,08	15,02	15,22	15,15	15,08
1024210	VM1698-4	Grad	30,50	31,50	30,50	30,25	30,00	31,00	30,75	30,50	30,75	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	15,19	15,18	15,10	15,11	15,09	15,10	15,05	15,11	14,88	15,03
1024210	VM1698-4	Grad	30,50	30,75	30,00	30,25	30,00	29,75	29,75	30,25	29,50	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	14,96	14,81	14,80	14,93	15,06	15,15	14,87	14,97	15,11	15,03
1024210	VM1698-4	Grad	29,75	29,25	29,00	29,50	30,00	30,75	29,50	29,75	30,25	30,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	14,87	14,94	15,12	14,81	15,12	14,73	14,85	14,91	14,95	14,67
1024210	VM1698-4	Grad	30,50	29,25	30,50	29,50	30,75	29,25	30,25	29,75	30,75	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	14,58	14,92	14,93	14,92	14,90	15,05	14,86	14,94	14,94	14,89
1024210	VM1698-4	Grad	29,50	29,50	30,00	29,50	29,75	30,00	29,75	29,25	30,75	29,75

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	14,88	14,81	14,90	14,97	15,08	14,93	14,91	14,88	14,95	14,90
1024210	VM1698-4	Grad	30,75	29,00	30,25	30,00	30,75	29,75	30,75	29,50	29,75	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 16.01.2024

Serial No.	ILJ1006_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	14,93	14,84	14,78	14,84	14,93	15,06	14,94	14,82	14,91	15,20
1024210	VM1698-4	Grad	31,00	29,75	30,00	30,00	30,25	29,75	30,00	30,25	31,00	30,50

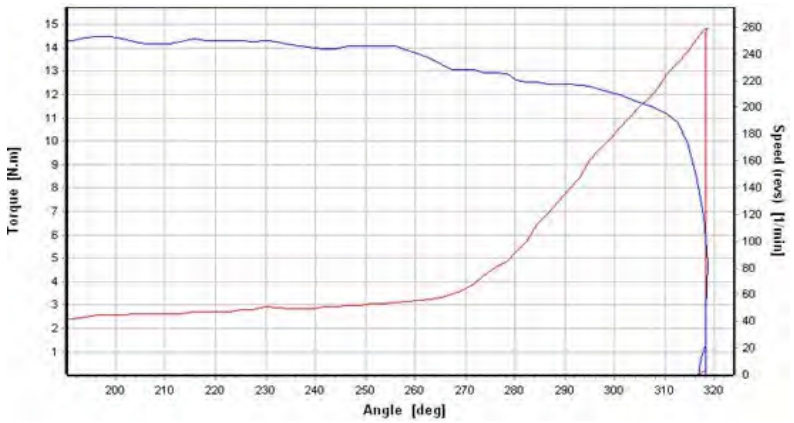
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	15,19	15,02	14,78	14,98	14,83	14,81	14,96	14,81	14,81	15,02
1024210	VM1698-4	Grad	30,75	29,75	29,75	30,00	29,50	29,00	29,25	30,00	29,50	30,25

Torque graphs

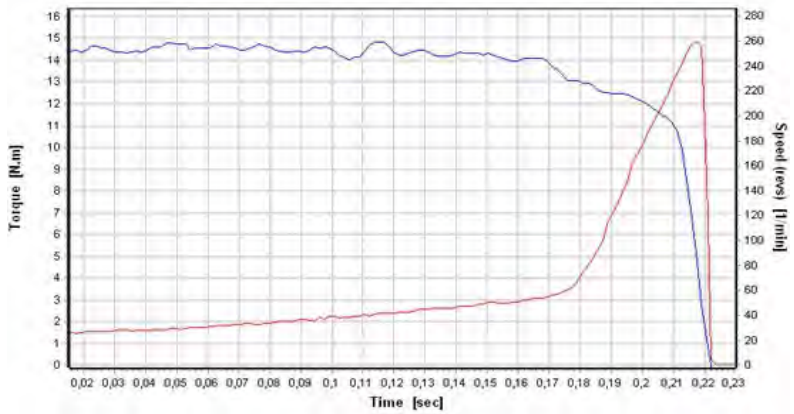
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1006**

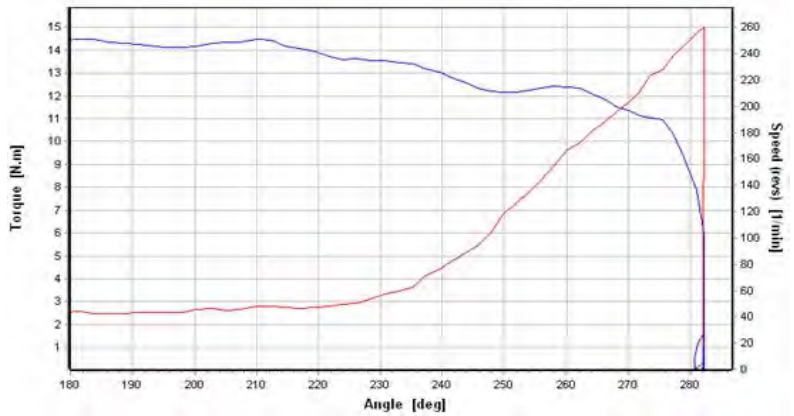
Angle degree: **30°**
Test torque: **14,8 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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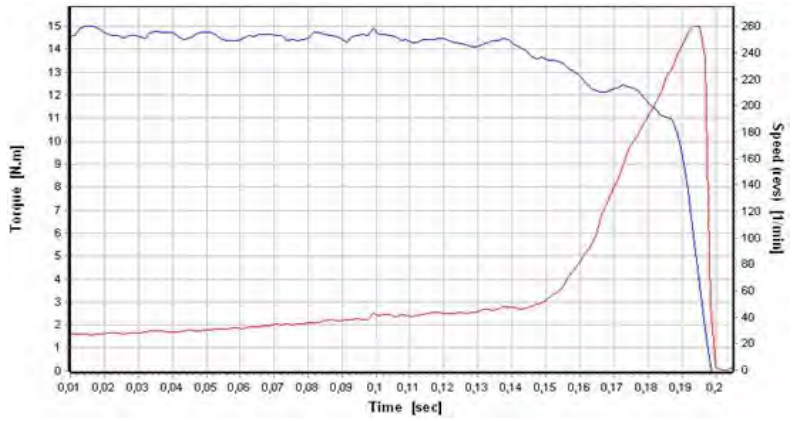
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

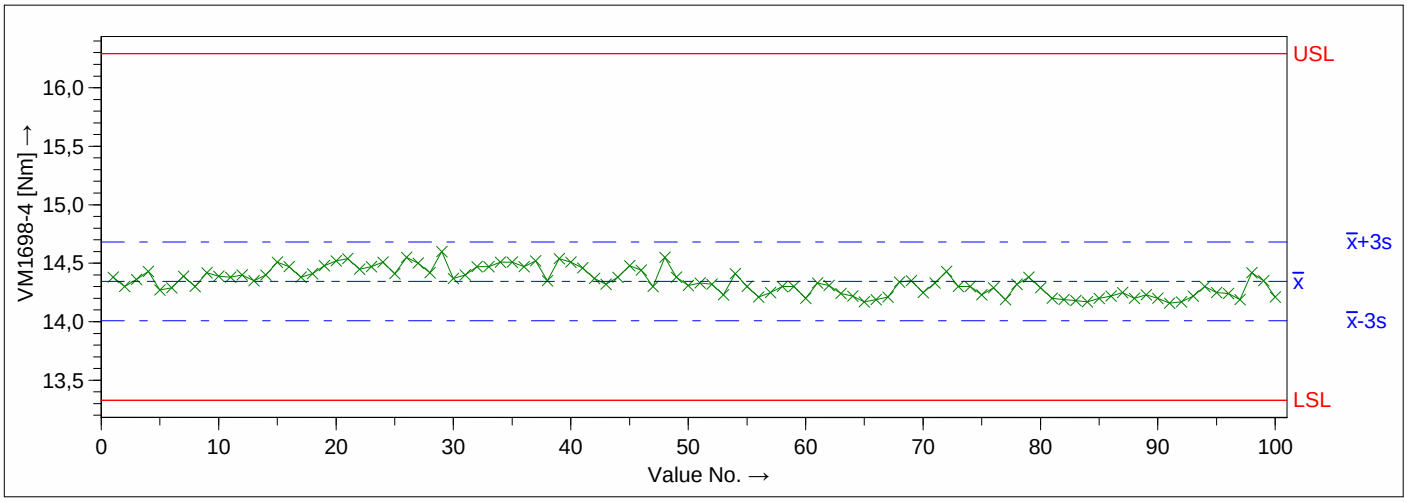
Cleco Production Tools

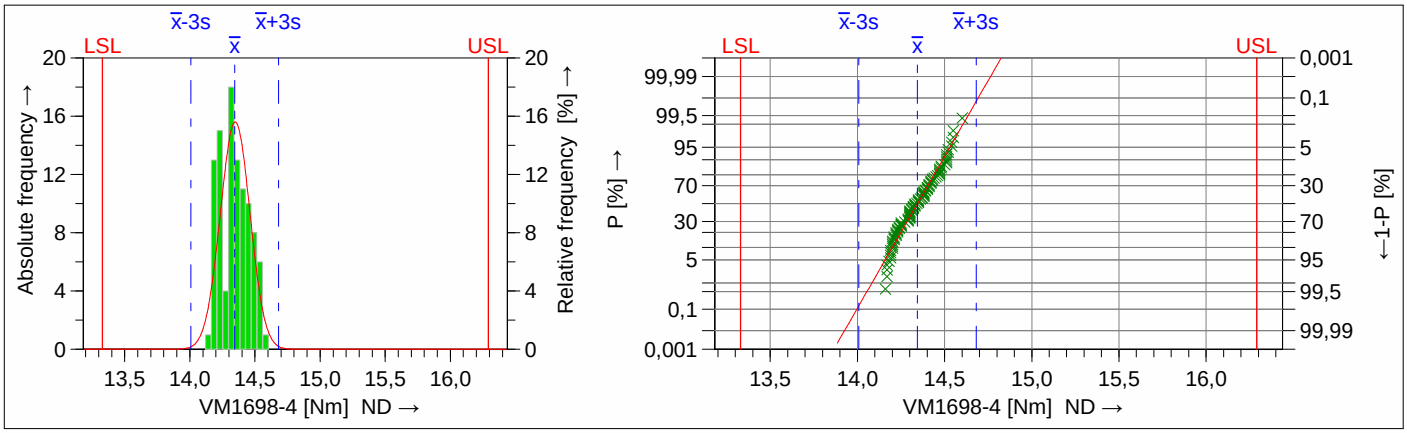
Plant	ATG Westhausen	Operator Name	Sorg
Date	16.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1006_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 16.01.2024 09:24:27 to 16.01.2024 09:36:00

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





Drawing Values		Collected Values		Statistics	
T_m	14.81			$\bar{x}$	14.3446
LSL	13.33	x_{min}	14.16	$\bar{x}$-3s	14.0072
USL	16.29	x_{max}	14.60	$\bar{x}$+3s	14.6820
T	2.96	R	0.44	6s	0.6748
		$n_{<T>}$	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	4.39
Critical capability index	=	C_{mk}	3.01

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 16.01.2024

Serial No.	ILJ1006_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	14,38	14,30	14,36	14,43	14,27	14,29	14,39	14,30	14,42	14,39
1024210	VM1698-4	Grad	352,75	355,75	354,00	365,75	354,50	356,25	355,25	353,75	362,00	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	14,38	14,40	14,35	14,40	14,51	14,47	14,38	14,41	14,48	14,52
1024210	VM1698-4	Grad	355,50	360,75	358,00	355,75	361,00	360,50	356,50	353,00	363,50	364,00

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	14,54	14,45	14,47	14,51	14,41	14,55	14,50	14,42	14,60	14,37
1024210	VM1698-4	Grad	356,25	359,00	365,50	360,00	362,00	360,00	356,75	361,75	369,75	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	14,40	14,47	14,47	14,51	14,51	14,47	14,52	14,35	14,54	14,51
1024210	VM1698-4	Grad	357,25	360,00	359,00	368,75	367,00	366,75	359,75	360,50	370,00	367,25

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	14,46	14,37	14,32	14,38	14,48	14,44	14,30	14,55	14,38	14,31
1024210	VM1698-4	Grad	366,75	359,25	356,00	366,75	372,25	365,00	359,75	366,00	359,25	359,00

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	14,33	14,32	14,23	14,41	14,30	14,21	14,25	14,30	14,30	14,20
1024210	VM1698-4	Grad	364,50	365,50	362,75	369,75	359,75	358,25	367,00	357,00	356,25	356,50

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	14,33	14,31	14,24	14,22	14,17	14,19	14,21	14,34	14,35	14,25
1024210	VM1698-4	Grad	363,25	362,50	360,75	361,50	360,75	356,50	359,75	366,25	365,75	358,75

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	14,33	14,43	14,30	14,30	14,23	14,29	14,19	14,32	14,38	14,29
1024210	VM1698-4	Grad	365,00	367,25	360,00	361,25	360,25	366,50	360,75	368,50	367,25	362,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 16.01.2024

Serial No.	ILJ1006_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	14,20	14,19	14,18	14,17	14,20	14,22	14,25	14,20	14,23	14,20
1024210	VM1698-4	Grad	354,50	356,50	364,50	361,75	362,75	358,00	363,50	358,00	368,25	364,00

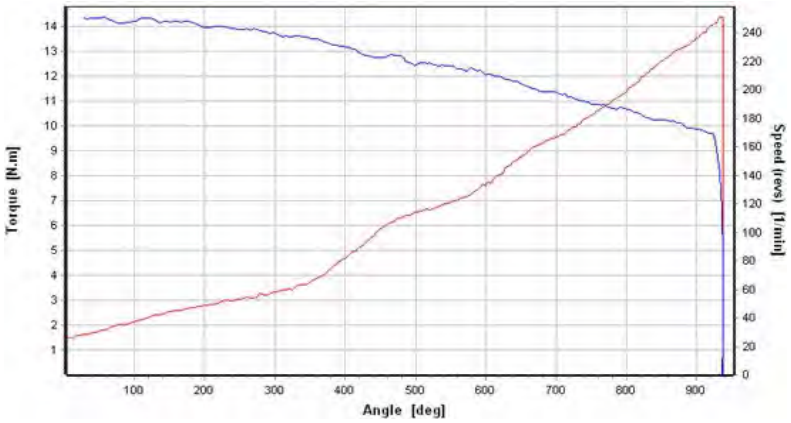
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	14,16	14,17	14,22	14,30	14,25	14,24	14,19	14,42	14,35	14,21
1024210	VM1698-4	Grad	355,75	364,50	367,50	365,75	362,75	364,25	357,25	365,75	366,25	362,50

Torque graphs

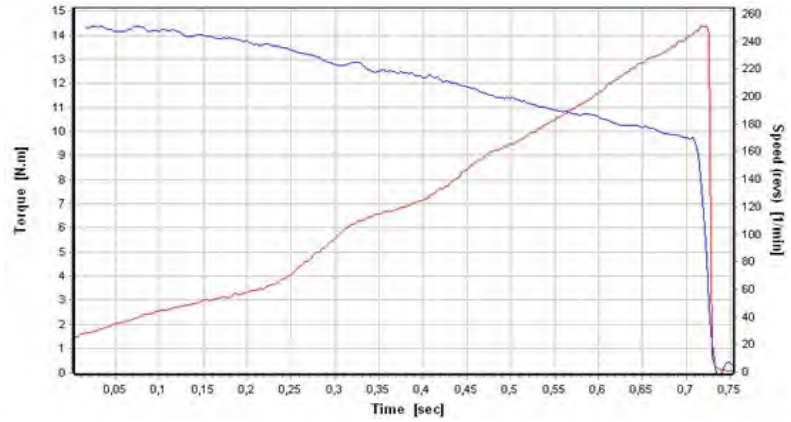
Machine Capability Study 30 %

Model: **CLBA303**
Serial no: **ILJ1006**

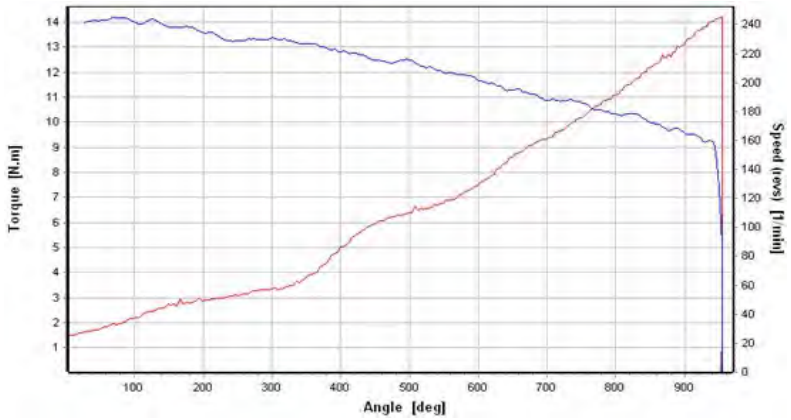
Angle degree: **360°**
Test torque: **14,8 Nm**



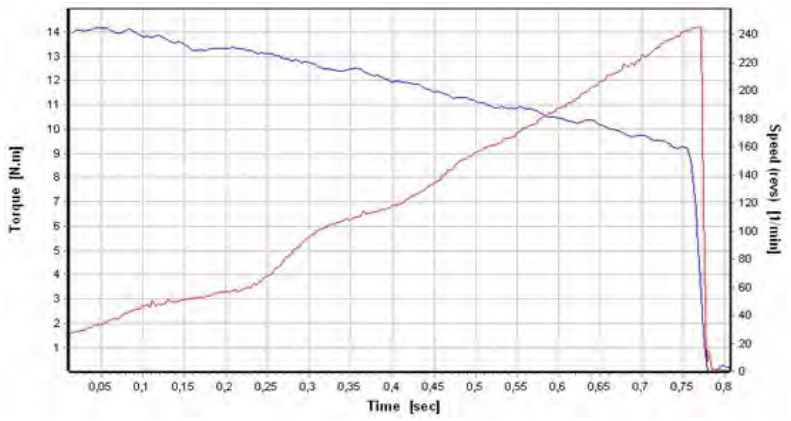
Value no. 1
Graph
Torque / Angle / Speed



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: **ILJ1006**

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

Hard joint (H) 155,47 Nm / Revolution Angle degree 30°

Soft joint (L) 12,74 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	25,91 Nm	25,49 Nm
	Standard deviation	0,31 Nm	0,19 Nm
	Torque scatter (99,73%)	1,86 Nm	1,13 Nm
	C_m	2,77	4,56
	C_{mk}	2,50	4,25

b) Min. C_m hard/soft (lowest value) 2,77
Min. C_{mk} hard/soft (lowest value) 2,50

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

Note:

Machine Capability Study
Control System

Page 1 / 1

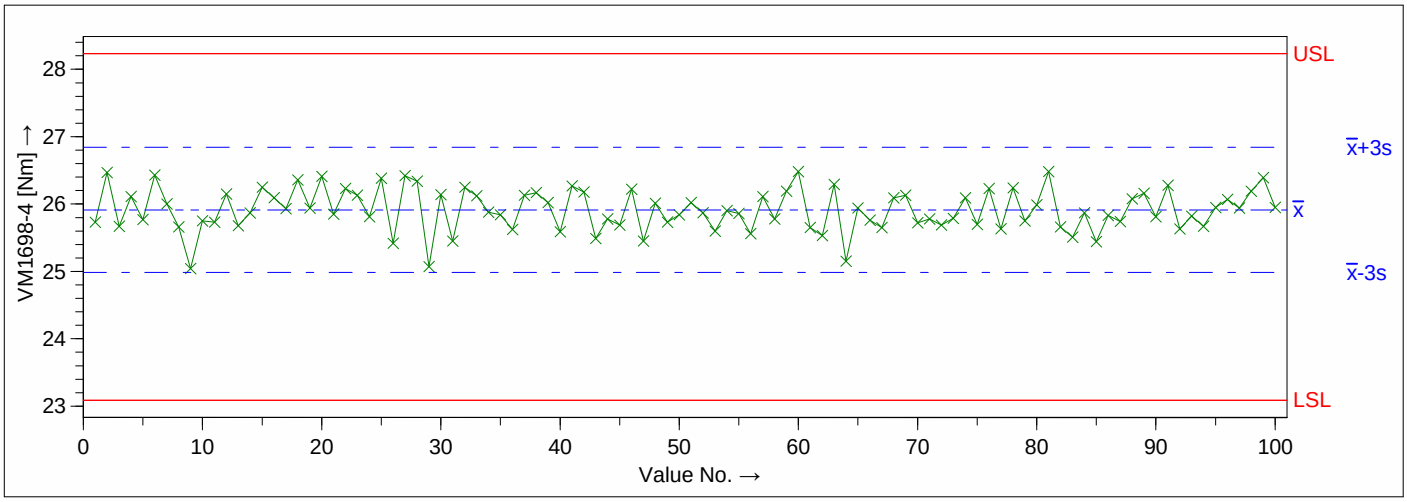
Plant ATG Westhausen		Operator Name Sorg	Date 16.01.2024

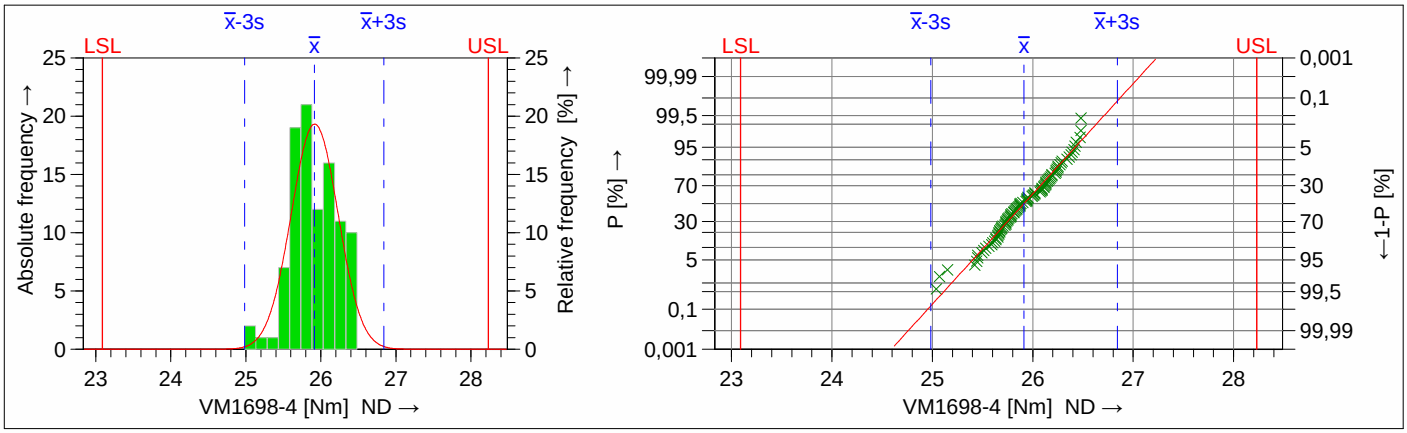
Ord. No. CLBA303	Part type CLBA303				Contr.item yes
Serial No. ILJ1006_h	Char.Descr. VM1698-4	Nom.val.	25,66	2,57	USL 28,23
	Serial No. 1024210	Unit	Nm	-2,57	LSL 23,09
Char.Type variable		Tolerance value	10 %		Decimal Pl. 2

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

Evaluation from 16.01.2024 10:05:41 to 16.01.2024 10:17:15

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





Drawing Values		Collected Values		Statistics	
T_m	25.66			$\bar{x}$	25.9120
LSL	23.09	x_{min}	25.04	$\bar{x}$-3s	24.9830
USL	28.23	x_{max}	26.48	$\bar{x}$+3s	26.8410
T	5.14	R	1.44	6s	1.8580
		$n_{<T>}$	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}	2.50

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 16.01.2024

Serial No.	ILJ1006_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	25,73	26,47	25,67	26,11	25,77	26,43	26,00	25,66	25,04	25,75
1024210	VM1698-4	Grad	32,75	34,50	32,25	33,50	32,75	33,75	32,50	32,25	31,25	32,25

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	25,73	26,15	25,68	25,87	26,25	26,09	25,93	26,36	25,94	26,41
1024210	VM1698-4	Grad	32,25	33,75	32,50	31,25	32,75	31,50	32,25	33,25	30,75	32,25

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	25,85	26,23	26,13	25,81	26,38	25,42	26,42	26,34	25,07	26,14
1024210	VM1698-4	Grad	31,00	31,75	31,75	31,00	32,50	30,00	31,75	31,25	28,75	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	25,45	26,25	26,12	25,88	25,84	25,62	26,13	26,17	26,02	25,59
1024210	VM1698-4	Grad	29,25	31,25	30,25	29,75	30,25	29,75	30,75	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	26,27	26,18	25,49	25,78	25,69	26,22	25,45	26,01	25,73	25,84
1024210	VM1698-4	Grad	31,25	30,75	28,75	30,25	30,00	31,00	29,25	31,00	29,75	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	26,02	25,87	25,60	25,90	25,86	25,56	26,11	25,78	26,19	26,48
1024210	VM1698-4	Grad	30,75	30,50	29,50	30,75	29,75	28,00	30,00	29,75	31,00	31,25

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	25,65	25,53	26,29	25,15	25,94	25,76	25,65	26,09	26,13	25,72
1024210	VM1698-4	Grad	29,25	29,75	31,00	29,25	30,50	30,00	29,75	30,50	31,00	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	25,78	25,69	25,79	26,09	25,70	26,23	25,63	26,24	25,75	25,99
1024210	VM1698-4	Grad	30,25	30,50	30,75	30,25	29,75	31,50	29,75	31,50	29,50	30,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 16.01.2024

Serial No.	ILJ1006_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	26,48	25,66	25,51	25,87	25,44	25,83	25,74	26,08	26,16	25,81
1024210	VM1698-4	Grad	31,50	30,00	30,00	30,50	29,50	31,00	30,00	31,00	31,50	30,75

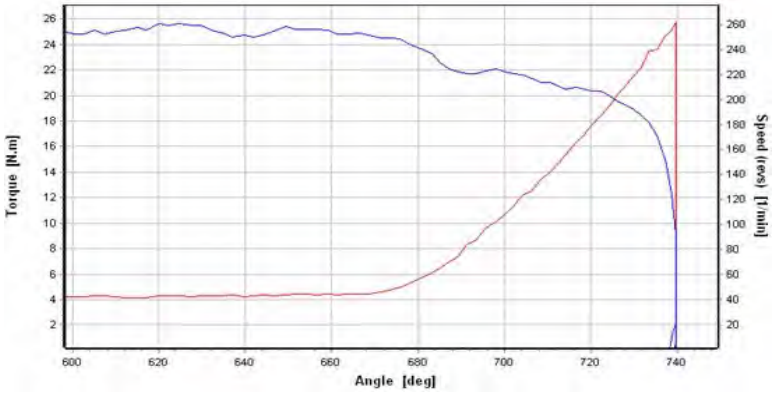
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	26,28	25,63	25,82	25,67	25,95	26,07	25,94	26,19	26,39	25,95
1024210	VM1698-4	Grad	30,75	29,50	30,50	29,75	30,50	30,00	29,25	30,50	30,75	29,00

Torque graphs

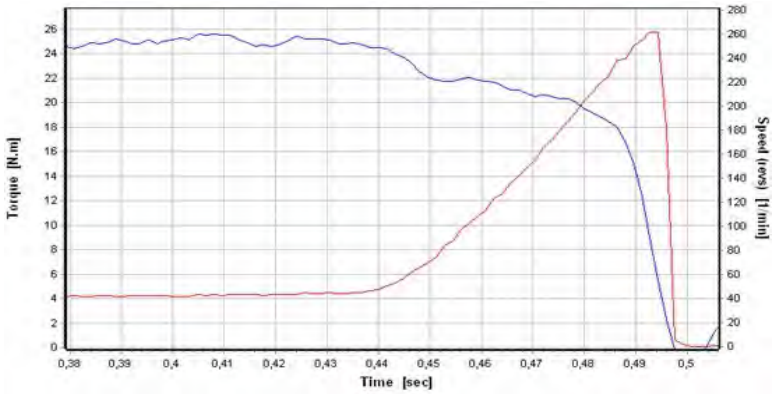
Machine Capability Study 80 %

Model: **CLBA303**
Serial no: **ILJ1006**

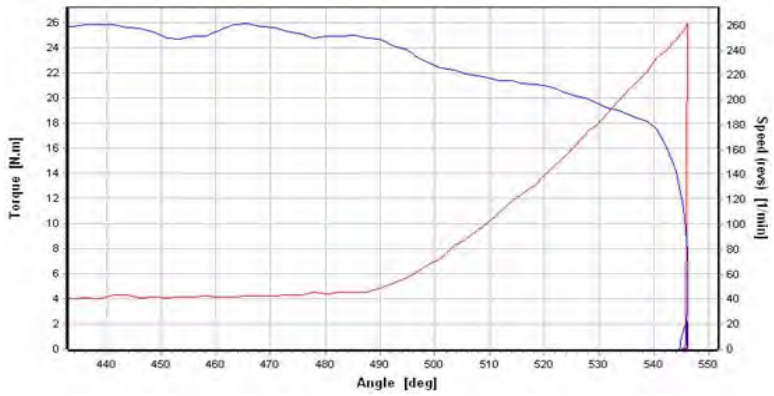
Angle degree: **30°**
Test torque: **25,7 Nm**



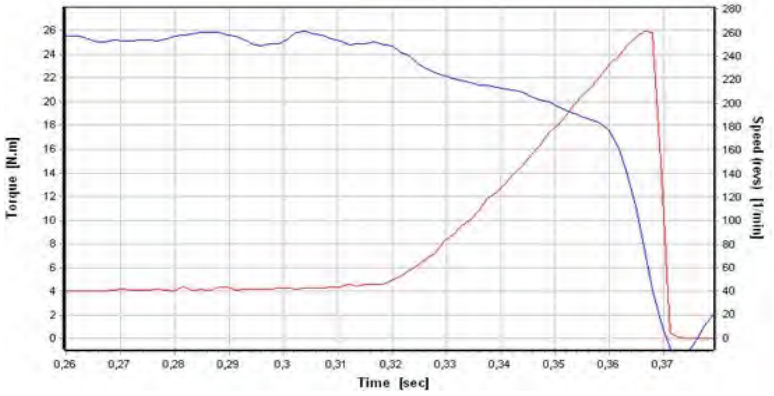
Value no. 1
Graph
Torque / Angle / Speed



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

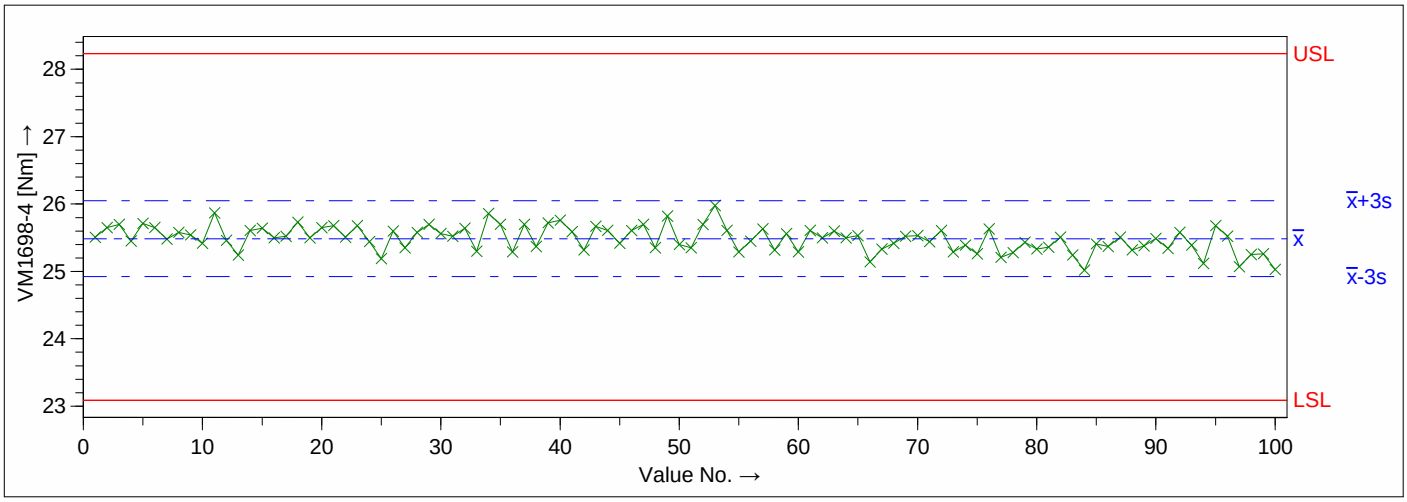
Plant ATG Westhausen		Operator Name Sorg	Date 16.01.2024

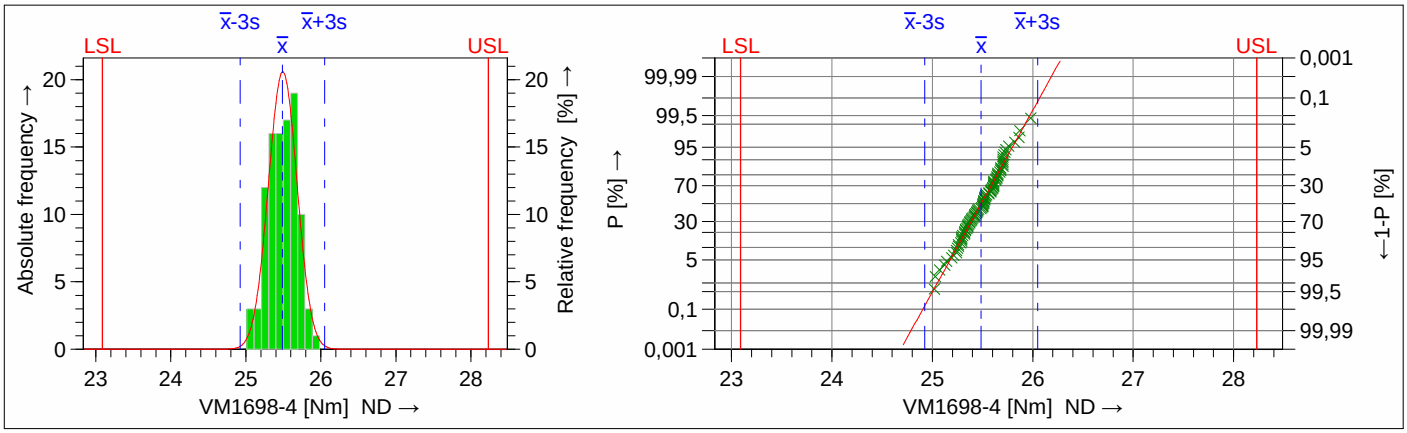
Ord. No. CLBA303	Part type CLBA303				Contr.item yes
Serial No. ILJ1006_g	Char.Descr. VM1698-4	Nom.val.	25,66	2,57	USL 28,23
	Serial No. 1024210	Unit	Nm	-2,57	LSL 23,09
Char.Type variable		Tolerance value	10 %		Decimal Pl. 2

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

Evaluation from 16.01.2024 09:51:35 to 16.01.2024 10:03:08

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





Drawing Values		Collected Values		Statistics	
T_m	25.66			x̄	25.4863
LSL	23.09	x_{min}	25.02	x̄-3s	24.9224
USL	28.23	x_{max}	25.98	x̄+3s	26.0502
T	5.14	R	0.96	6s	1.1277
		$n_{<T>}$	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	4.56
Critical capability index	=	C_{mk}	4.25

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 16.01.2024

Serial No.	ILJ1006_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	25,51	25,65	25,70	25,45	25,71	25,65	25,48	25,58	25,54	25,42
1024210	VM1698-4	Grad	354,00	362,50	364,00	361,25	364,50	361,50	356,50	362,25	358,25	351,75

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	25,87	25,46	25,24	25,61	25,64	25,50	25,52	25,73	25,50	25,65
1024210	VM1698-4	Grad	366,00	353,75	351,75	359,25	362,50	357,75	351,25	358,50	352,50	357,00

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	25,68	25,51	25,68	25,44	25,19	25,60	25,35	25,58	25,70	25,56
1024210	VM1698-4	Grad	362,25	354,00	357,00	352,25	353,75	356,25	346,00	357,75	363,00	356,00

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	25,52	25,64	25,30	25,86	25,70	25,29	25,70	25,37	25,72	25,76
1024210	VM1698-4	Grad	357,75	360,75	348,00	362,25	361,75	348,75	360,50	346,25	360,25	359,50

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	25,59	25,32	25,67	25,61	25,42	25,61	25,70	25,35	25,82	25,40
1024210	VM1698-4	Grad	359,00	342,75	358,50	360,00	354,00	357,75	359,75	350,75	364,25	353,00

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	25,35	25,70	25,98	25,61	25,29	25,45	25,63	25,32	25,56	25,29
1024210	VM1698-4	Grad	350,50	359,50	364,00	355,75	350,25	351,50	359,50	349,00	354,75	345,75

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	25,61	25,50	25,60	25,50	25,53	25,14	25,33	25,42	25,52	25,53
1024210	VM1698-4	Grad	362,00	359,25	362,50	362,00	362,50	349,50	363,25	354,50	360,50	362,75

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	25,44	25,61	25,29	25,39	25,26	25,63	25,21	25,28	25,43	25,33
1024210	VM1698-4	Grad	359,75	368,00	353,00	356,50	358,00	365,75	348,25	352,50	356,75	362,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 16.01.2024

Serial No.	ILJ1006_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	25,36	25,51	25,24	25,02	25,41	25,37	25,51	25,32	25,38	25,49
1024210	VM1698-4	Grad	355,50	362,75	353,25	355,00	357,00	355,00	365,25	356,50	352,50	360,50

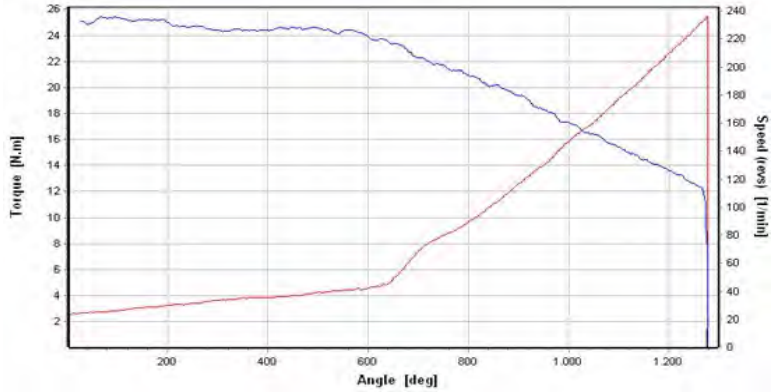
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	25,34	25,58	25,39	25,12	25,68	25,52	25,07	25,25	25,26	25,03
1024210	VM1698-4	Grad	357,75	361,75	353,00	346,50	361,50	359,75	348,00	353,75	352,50	355,50

Torque graphs

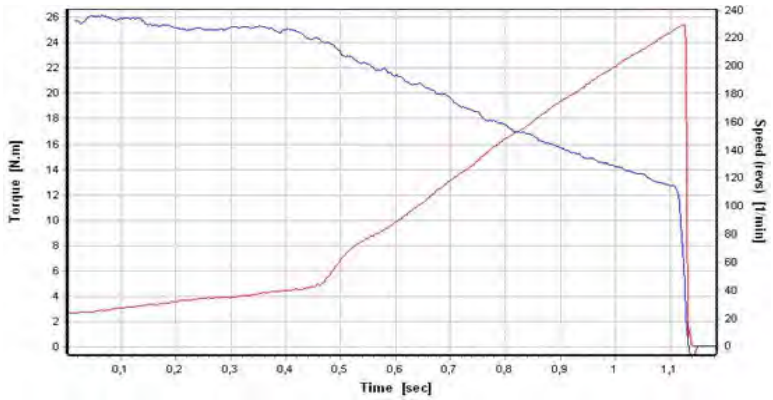
Machine Capability Study 80 %

Model: **CLBA303**
Serial no: **ILJ1006**

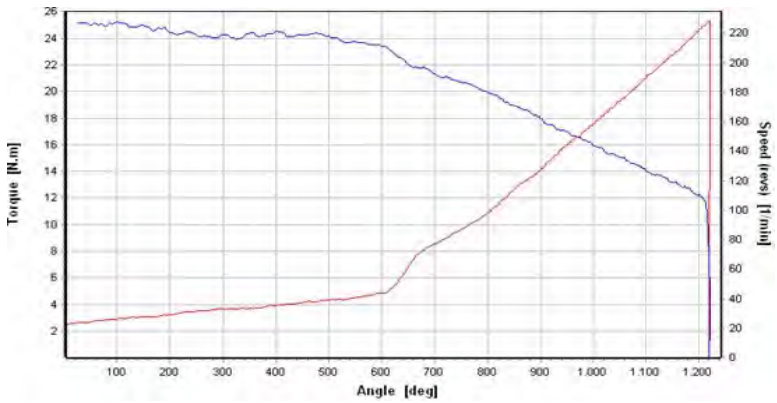
Angle degree: **360°**
Test torque: **25,7 Nm**



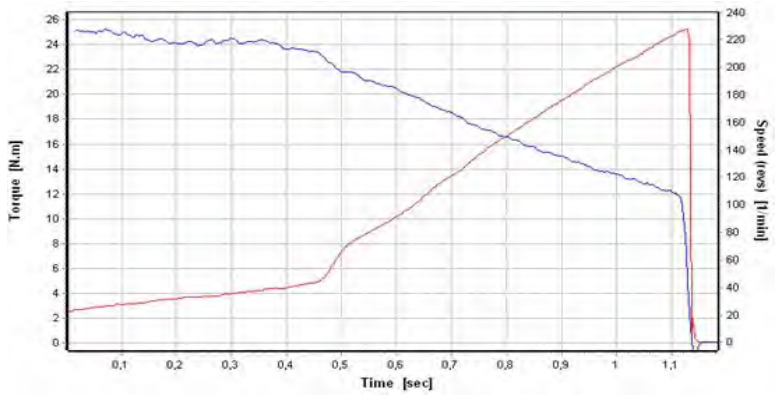
Value no. 1
Graph
Torque / Angle / Speed



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: **ILJ1006**

Test torque: Tq max. 30,00 Nm

Hard joint (H)	179,34 Nm / Revolution	Angle degree	30°
Soft joint (L)	14,61 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	29,89 Nm	29,23 Nm
	Standard deviation	0,34 Nm	0,16 Nm
	Torque scatter (99,73%)	2,02 Nm	0,94 Nm
	C_m	2,98	6,39
	C_{mk}	2,87	4,75

b)	Min. C_m hard/soft (lowest value)	2,98
	Min. C_{mk} hard/soft (lowest value)	2,87

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

Note:

Machine Capability Study
Control System

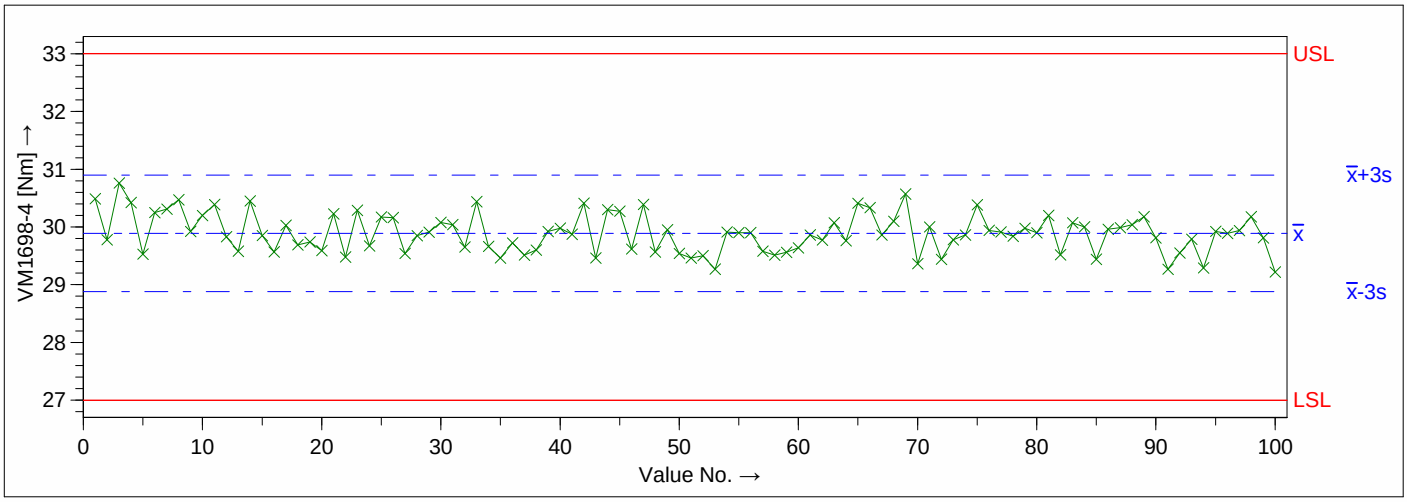
Cleco Production Tools

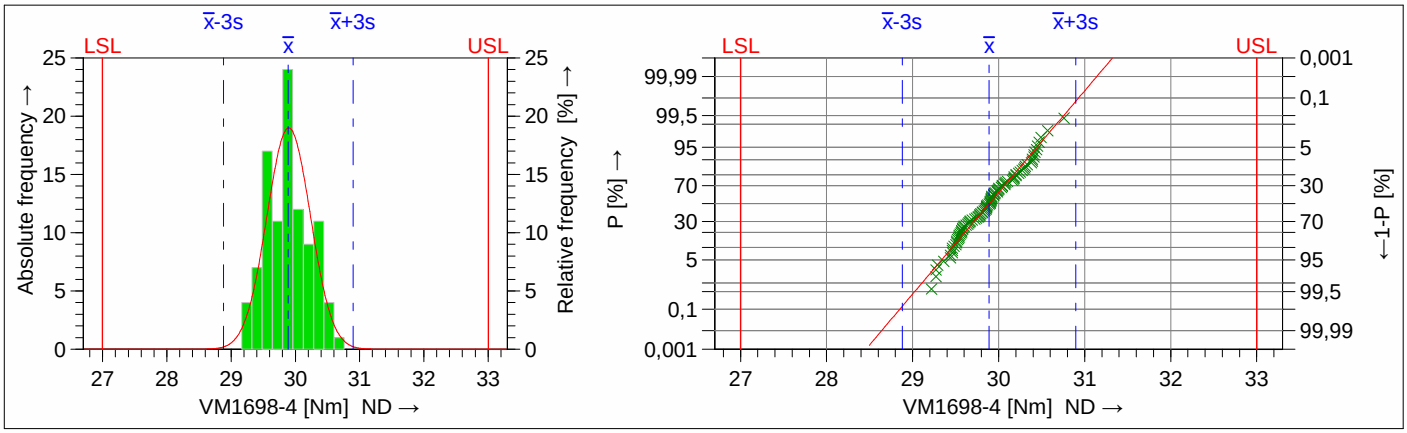
Plant	ATG Westhausen	Operator Name	Sorg
Date	26.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1006_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 26.01.2024 09:38:38 to 26.01.2024 09:51:50

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





Drawing Values		Collected Values		Statistics	
T_m	30.00			x̄	29.8901
LSL	27.00	x_{min}	29.22	x̄-3s	28.8819
USL	33.00	x_{max}	30.76	x̄+3s	30.8983
T	6.00	R	1.54	6s	2.0164
		$n_{<T>}$	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	2.98
Critical capability index	=	C_{mk}	2.87

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 26.01.2024

Serial No.	ILJ1006_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	30,49	29,78	30,76	30,42	29,53	30,25	30,31	30,47	29,92	30,20
1024210	VM1698-4	Grad	30,75	29,75	32,50	31,50	29,50	31,75	31,50	31,75	30,50	30,75

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	30,39	29,83	29,58	30,45	29,85	29,57	30,03	29,69	29,74	29,59
1024210	VM1698-4	Grad	31,50	30,50	29,75	31,75	30,25	29,75	30,75	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	30,23	29,48	30,29	29,67	30,17	30,16	29,54	29,85	29,91	30,08
1024210	VM1698-4	Grad	31,00	29,50	30,50	29,25	30,50	30,00	29,25	29,50	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	30,04	29,65	30,44	29,66	29,46	29,72	29,51	29,60	29,92	29,98
1024210	VM1698-4	Grad	29,50	29,00	30,25	29,25	29,25	29,50	29,50	29,75	30,50	29,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	29,87	30,41	29,46	30,30	30,27	29,62	30,39	29,57	29,95	29,54
1024210	VM1698-4	Grad	29,75	30,75	29,50	30,75	31,00	30,00	31,00	30,25	30,25	30,25

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	29,46	29,50	29,27	29,91	29,90	29,90	29,58	29,51	29,56	29,64
1024210	VM1698-4	Grad	29,50	29,50	29,75	30,00	30,00	29,75	29,50	29,25	29,25	29,75

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	29,86	29,77	30,07	29,76	30,41	30,33	29,86	30,10	30,57	29,36
1024210	VM1698-4	Grad	29,75	29,50	30,00	29,75	30,75	30,25	29,00	30,25	31,00	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	30,00	29,44	29,78	29,86	30,38	29,94	29,91	29,84	29,98	29,90
1024210	VM1698-4	Grad	30,25	29,25	30,25	29,50	30,00	30,00	29,00	29,25	29,75	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 26.01.2024

Serial No.	ILJ1006_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	30,20	29,52	30,07	30,00	29,44	29,96	29,99	30,04	30,18	29,81
1024210	VM1698-4	Grad	30,50	28,50	30,25	30,00	29,50	30,25	30,50	29,75	30,25	29,25

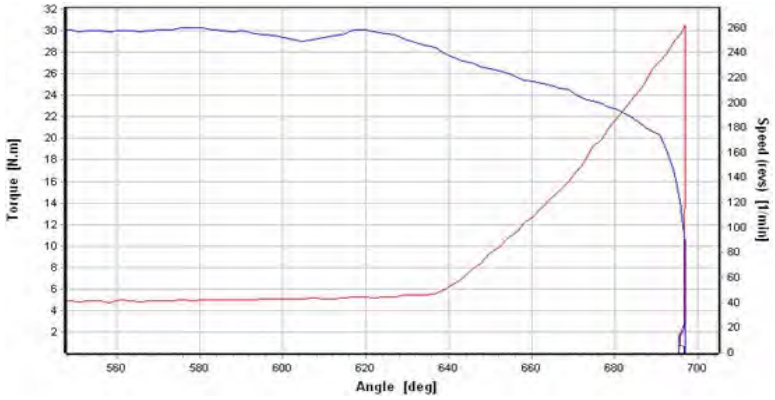
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	29,27	29,55	29,79	29,29	29,92	29,89	29,94	30,18	29,81	29,22
1024210	VM1698-4	Grad	28,50	29,25	30,00	28,50	29,75	30,00	30,50	30,75	30,50	29,00

Torque graphs

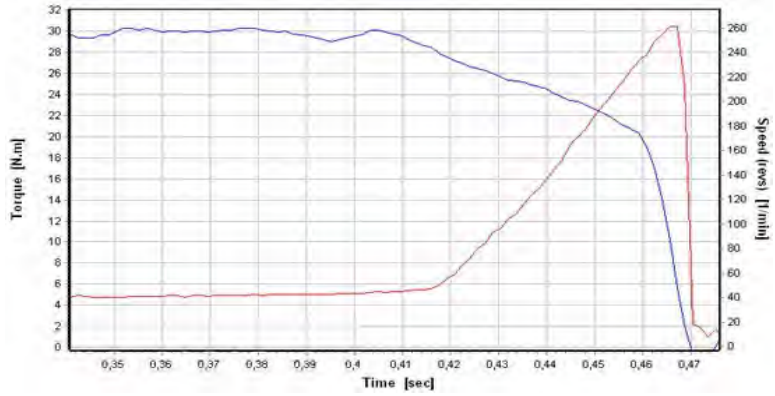
Machine Capability Study 100 %

Model: **CLBA303**
Serial no: **ILJ1006**

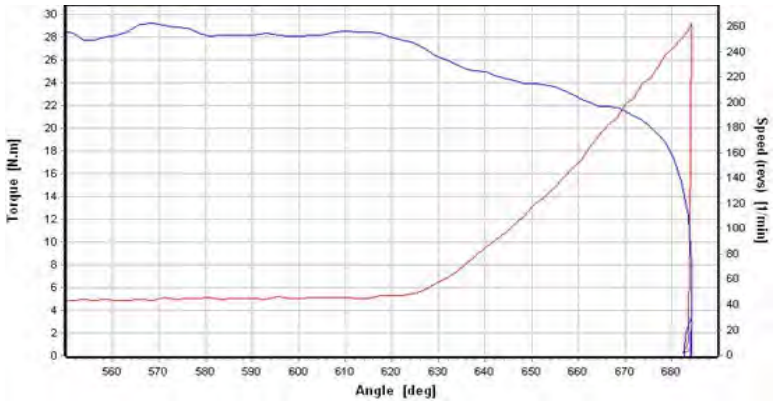
Angle degree: **30°**
Test torque: **30,0 Nm**



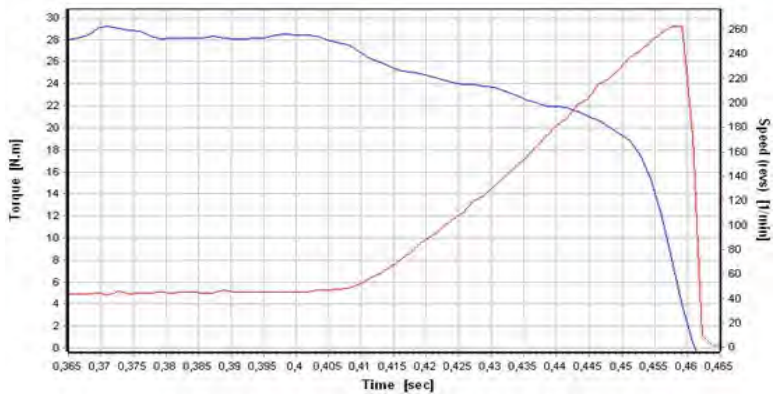
Value no. 1
Graph
Torque / Angle / Speed



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

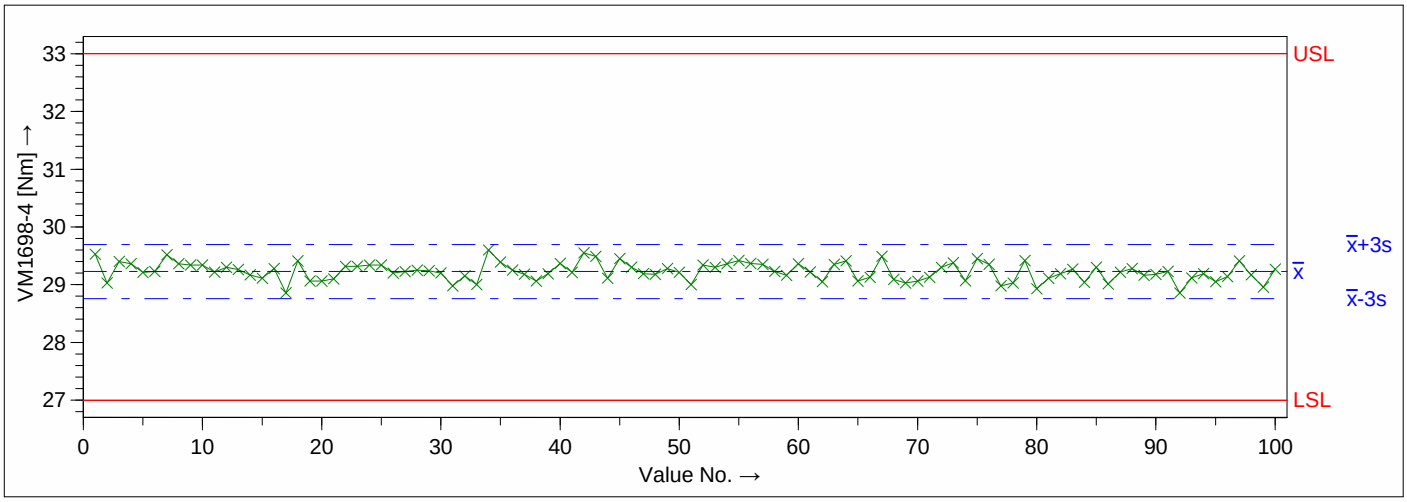
Page 1 / 1

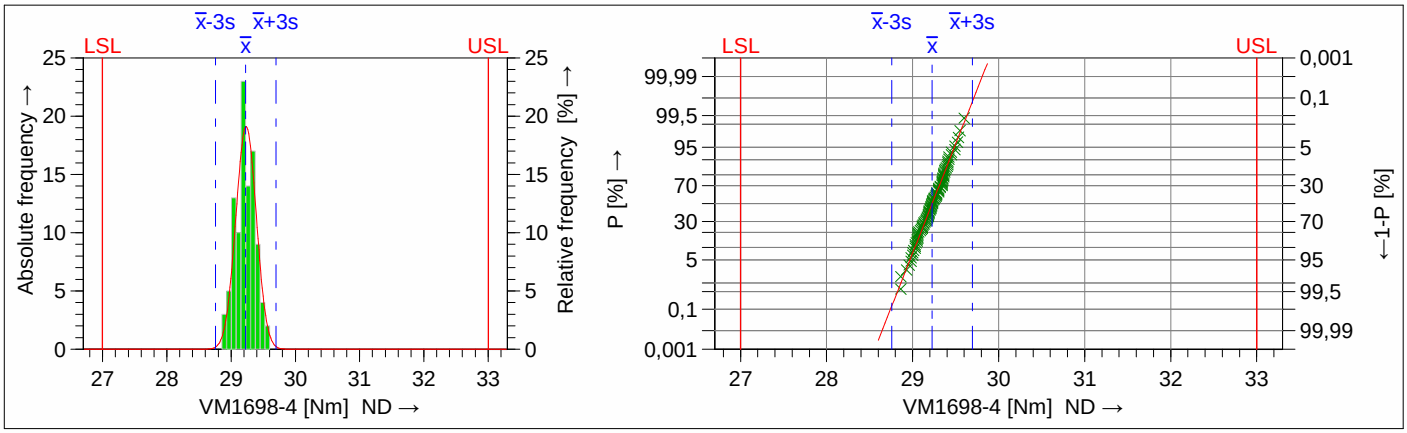
Plant	ATG Westhausen	Operator Name	Sorg
Date	26.01.2024		

Ord. No.	CLBA303	Part type	CLBA303	Contr.item	yes
Serial No.	ILJ1006_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 26.01.2024 10:27:23 to 26.01.2024 10:47:11

Rem. TQ 100% soft +/-10% * Speed 255 rpm, Pause 8 sec





Drawing Values		Collected Values		Statistics	
T_m	30.00			$\bar{x}$	29.2271
LSL	27.00	x_{min}	28.86	$\bar{x}$-3s	28.7579
USL	33.00	x_{max}	29.60	$\bar{x}$+3s	29.6963
T	6.00	R	0.74	6s	0.9385
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	6.39
Critical capability index	=	C_{mk}	4.75

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 26.01.2024

Serial No.	ILJ1006_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 sec				

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	29,53	29,03	29,40	29,36	29,21	29,23	29,52	29,36	29,34	29,34
1024210	VM1698-4	Grad	360,75	351,50	359,00	357,00	353,25	350,50	354,50	352,75	357,00	357,00

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	29,22	29,30	29,26	29,17	29,11	29,28	28,86	29,41	29,06	29,06
1024210	VM1698-4	Grad	350,00	357,00	356,00	351,75	350,75	352,25	346,50	357,50	356,25	351,25

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	29,10	29,32	29,32	29,34	29,34	29,20	29,23	29,25	29,24	29,20
1024210	VM1698-4	Grad	354,50	362,75	365,25	362,50	362,25	356,50	357,75	355,00	357,75	356,25

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	28,98	29,15	29,00	29,60	29,39	29,25	29,18	29,06	29,19	29,37
1024210	VM1698-4	Grad	353,25	355,25	357,25	363,75	360,25	354,75	356,00	351,75	354,00	356,25

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	29,21	29,55	29,49	29,11	29,45	29,30	29,19	29,18	29,28	29,21
1024210	VM1698-4	Grad	361,50	370,25	366,75	356,25	361,00	361,75	356,00	362,75	362,25	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	29,00	29,34	29,30	29,36	29,42	29,37	29,35	29,23	29,16	29,36
1024210	VM1698-4	Grad	354,50	360,75	362,00	361,75	362,00	359,50	362,75	360,25	355,50	361,00

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	29,22	29,05	29,35	29,41	29,06	29,13	29,49	29,09	29,03	29,06
1024210	VM1698-4	Grad	360,00	352,25	357,50	361,25	352,75	362,25	369,50	355,75	356,00	353,00

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	29,13	29,30	29,38	29,07	29,45	29,35	28,98	29,03	29,42	28,93
1024210	VM1698-4	Grad	355,00	363,25	364,75	356,75	361,75	361,00	353,00	355,25	359,50	356,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Sorg	Date 26.01.2024

Serial No.	ILJ1006_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 sec				

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	29,11	29,19	29,27	29,04	29,30	29,01	29,22	29,28	29,16	29,18
1024210	VM1698-4	Grad	358,50	361,00	358,25	355,50	361,00	354,50	358,75	359,75	357,25	357,50

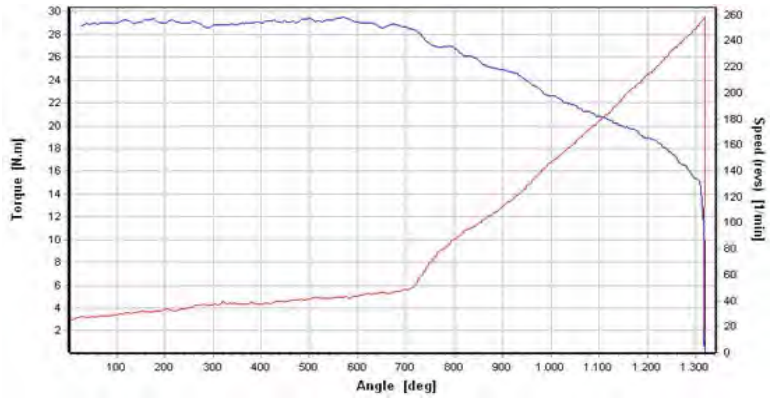
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	29,23	28,86	29,12	29,19	29,05	29,14	29,41	29,17	28,96	29,27
1024210	VM1698-4	Grad	356,75	348,50	354,25	357,25	350,50	355,00	358,25	353,75	352,25	359,00

Torque graphs

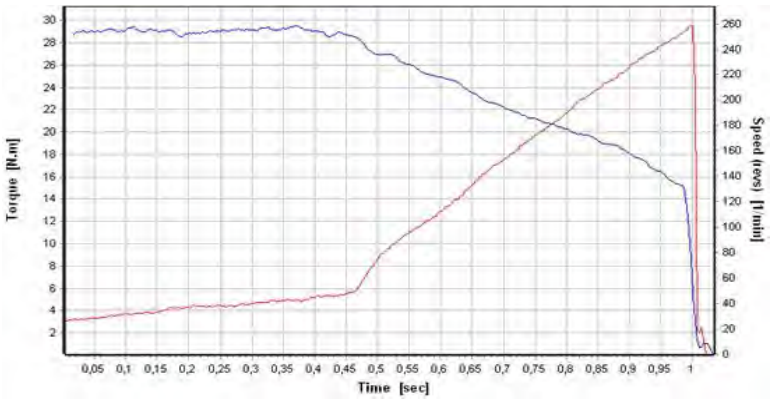
Machine Capability Study 100 %

Model: **CLBA303**
Serial no: **ILJ1006**

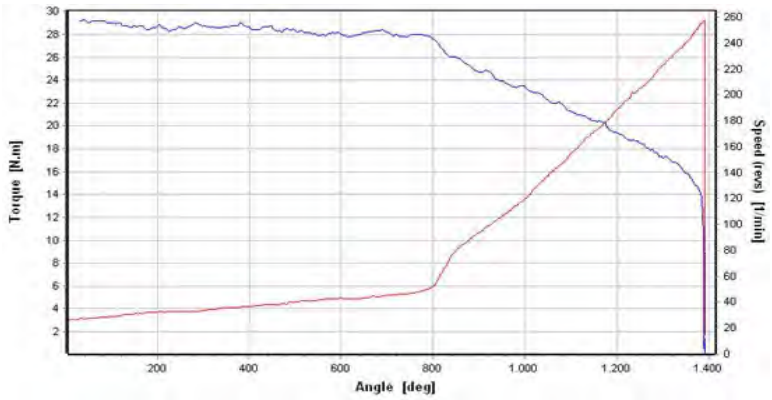
Angle degree: **360°**
Test torque: **30,0 Nm**



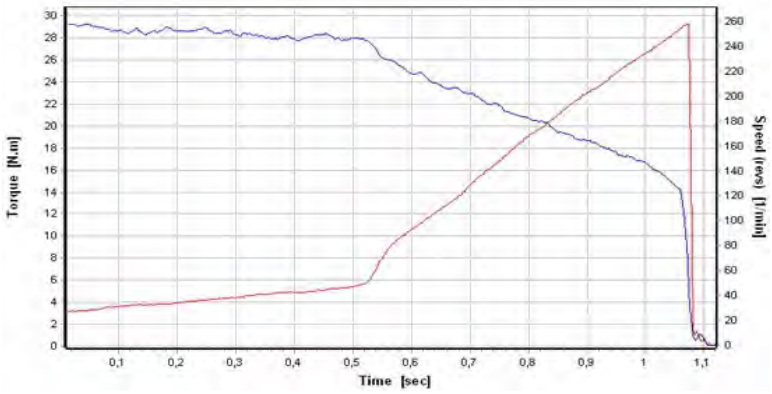
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed