Homologation

Cordless Assembly Tools

Model: CLBP08Q

Serial no.: IIJ1008

Contents

Homologation: CLBP08Q SN: IIJ1008

		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: 002/2023
Date: 16.11.2023

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 600 rpm	60,9 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IIJ1008**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 3,87 Nm

Hard joint (H)	23,49	Nm / Revolution	Angle degree	30°
Soft joint (L)	1,92	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	3,48 - 4,26 Nm	3,48 - 4,26 Nm
	Tolerance down / up	10 %	10 %
	Average torque	3,92 Nm	3,84 Nm
	Standard deviation	0,03 Nm	0,03 Nm
	Torque scatter (99,73%)	0,16 Nm	0,17 Nm
	C_m	4,97	4,66
	C_{mk}	4,38	4,30

b)	Min. C_m hard/soft (lowest value)	4,66
	Min. C_{mk} hard/soft (lowest value)	4,30

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

Note:

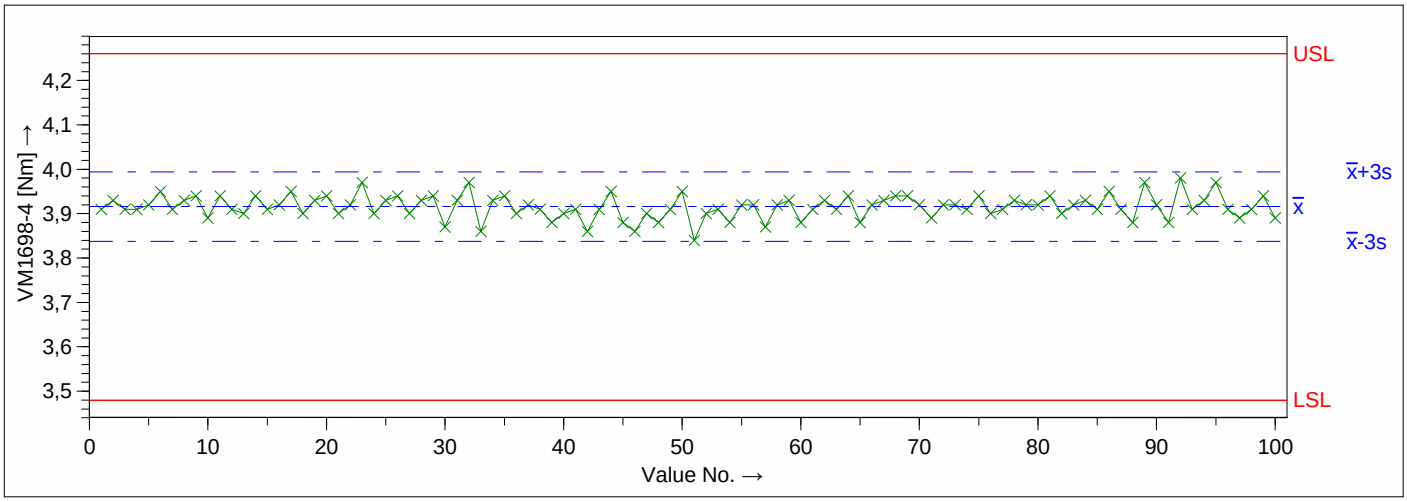
Machine Capability Study
Control System

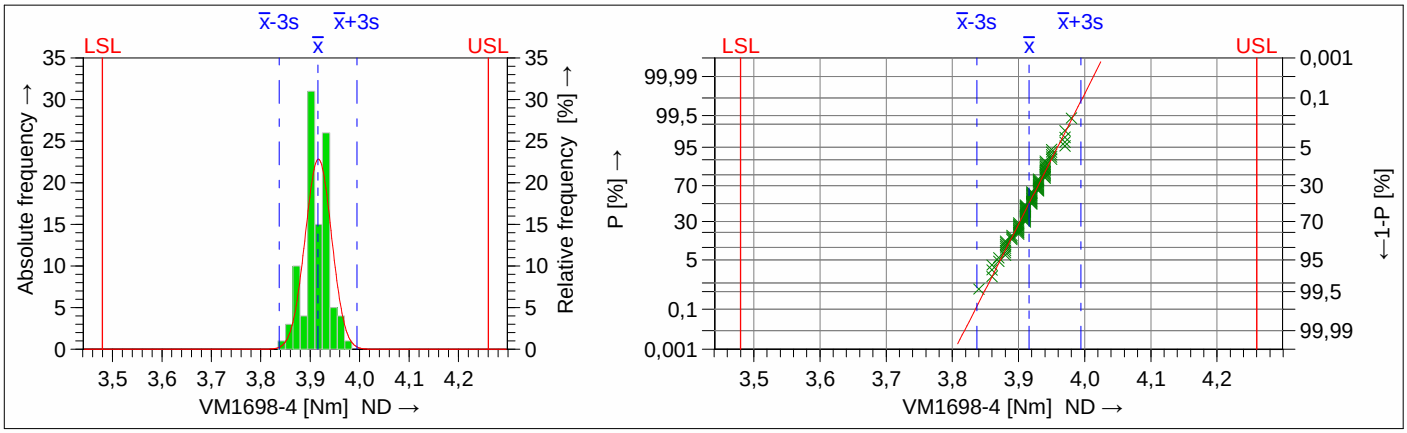
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_d	Char.Descr.	VM1698-4	Nom.val. 3,87 0,39	USL 4,26
		Serial No.	1024210	Unit Nm -0,39	LSL 3,48
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 11:47:50 to 08.11.2023 11:59:43

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





Drawing Values		Collected Values		Statistics	
T_m	3.87			$\bar{x}$	3.9158
LSL	3.48	x_{min}	3.84	$\bar{x}$-3s	3.8373
USL	4.26	x_{max}	3.98	$\bar{x}$+3s	3.9943
T	0.78	R	0.14	6s	0.1571
		$n_{<T>}$	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	4.97
Critical capability index	=	C_{mk}	4.38

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_d	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	3,91	3,93	3,91	3,91	3,92	3,95	3,91	3,93	3,94	3,89
1024210	VM1698-4	Grad	31,00	35,25	30,25	29,50	29,75	29,25	33,75	29,50	30,50	31,00

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	3,94	3,91	3,90	3,94	3,91	3,92	3,95	3,90	3,93	3,94
1024210	VM1698-4	Grad	29,00	30,00	28,25	29,00	30,00	36,00	29,50	30,00	29,75	31,25

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	3,90	3,92	3,97	3,90	3,93	3,94	3,90	3,93	3,94	3,87
1024210	VM1698-4	Grad	29,50	29,25	29,25	33,25	31,25	30,75	28,50	29,50	28,75	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	3,93	3,97	3,86	3,93	3,94	3,90	3,92	3,91	3,88	3,90
1024210	VM1698-4	Grad	30,25	30,25	28,75	30,50	29,50	29,25	29,00	29,50	28,75	28,50

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	3,91	3,86	3,91	3,95	3,88	3,86	3,90	3,88	3,91	3,95
1024210	VM1698-4	Grad	29,00	28,25	30,00	30,00	31,25	31,50	29,50	33,25	28,25	34,25

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	3,84	3,90	3,91	3,88	3,92	3,92	3,87	3,92	3,93	3,88
1024210	VM1698-4	Grad	28,00	29,50	30,25	28,50	35,00	35,25	28,50	29,50	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	3,91	3,93	3,91	3,94	3,88	3,92	3,93	3,94	3,94	3,92
1024210	VM1698-4	Grad	29,25	33,50	28,75	28,50	29,25	29,75	30,25	29,00	29,50	34,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,89	3,92	3,92	3,91	3,94	3,90	3,91	3,93	3,92	3,92
1024210	VM1698-4	Grad	29,25	29,50	35,25	29,25	29,00	30,25	31,25	30,00	29,25	29,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_d	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	3,94	3,90	3,92	3,93	3,91	3,95	3,91	3,88	3,97	3,92
1024210	VM1698-4	Grad	29,75	31,75	34,25	30,25	29,75	29,50	28,50	29,50	30,75	27,50

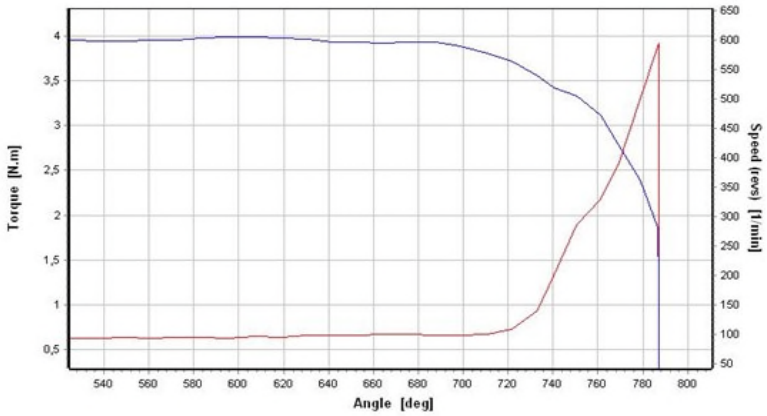
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,88	3,98	3,91	3,93	3,97	3,91	3,89	3,91	3,94	3,89
1024210	VM1698-4	Grad	31,00	30,00	31,00	29,00	30,00	28,75	28,50	29,25	30,00	29,75

Torque graphs

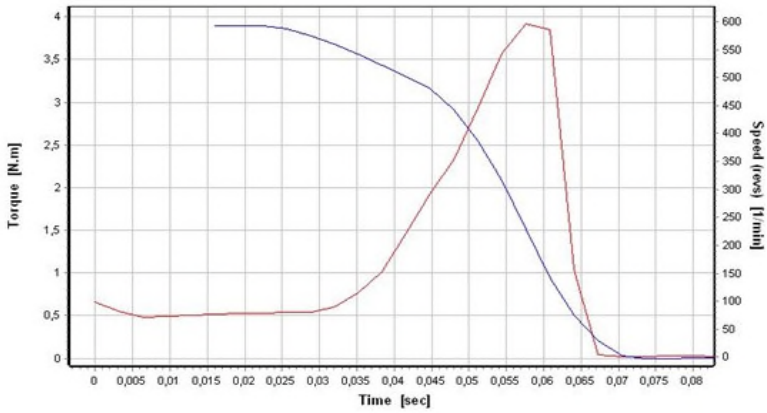
Machine Capability Study 30 %

Model: **CLBP08Q**
Serial no: **IIJ1008**

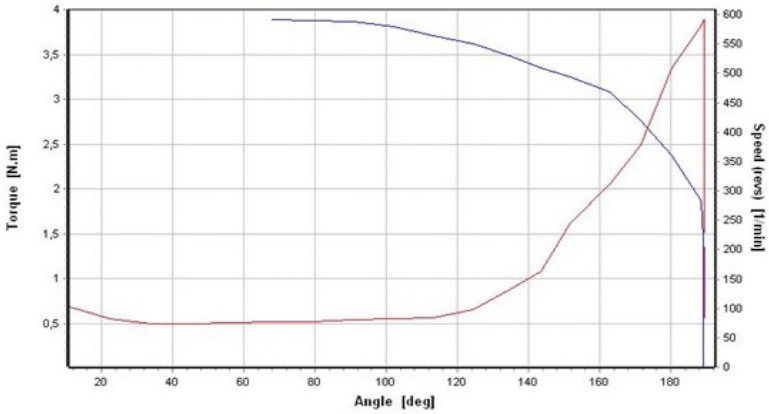
Angle degree: **30°**
Test torque: **3,9 Nm**



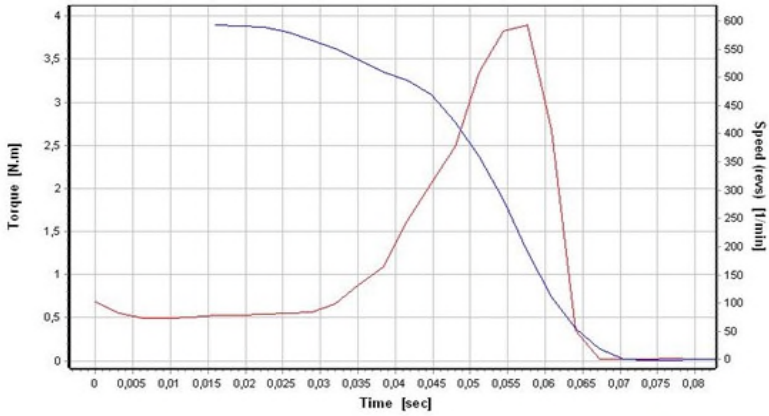
Value no. 1
Graph
Torque / Angle / Speed



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

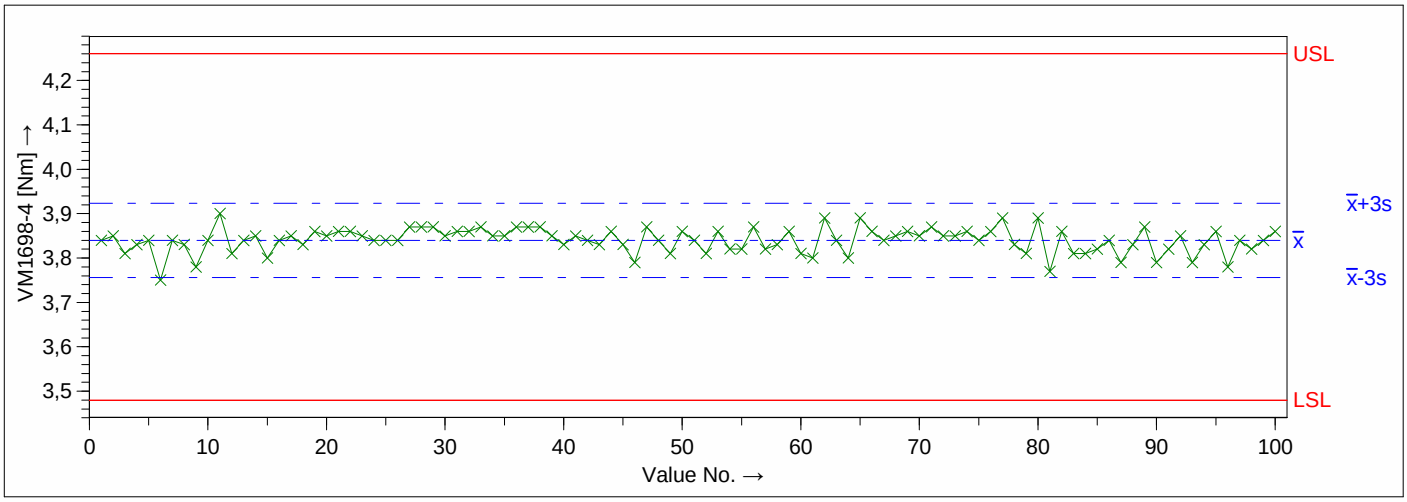
Cleco Production Tools

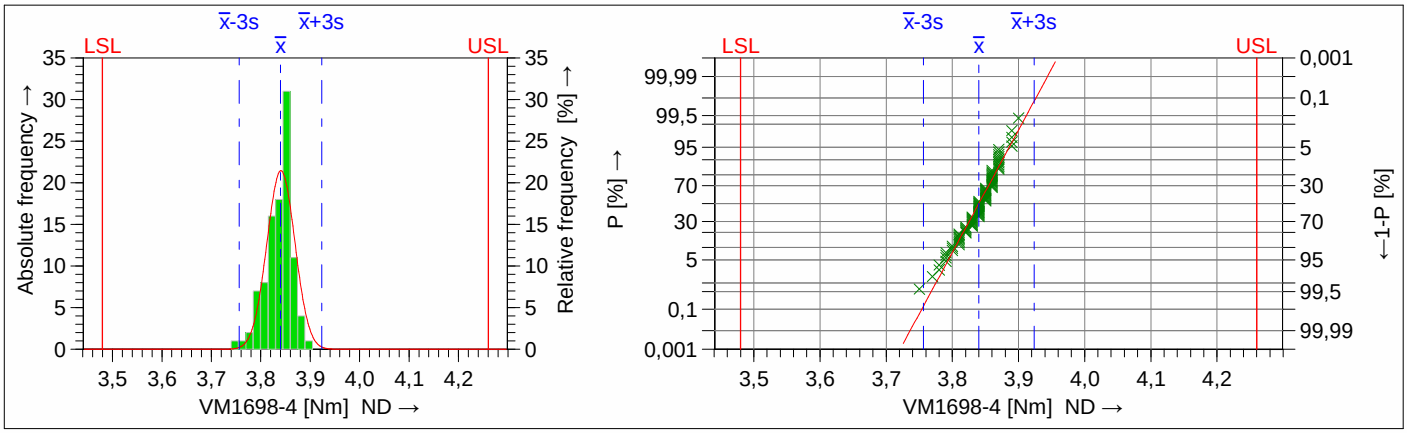
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_c	Char.Descr.	VM1698-4	Nom.val.	3,87 0,39 USL 4,26
		Serial No.	1024210	Unit	Nm -0,39 LSL 3,48
Char.Type	variable			Tolerance value	10 % Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 11:31:53 to 08.11.2023 11:44:15

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





Drawing Values		Collected Values		Statistics	
T_m	3.87			x̄	3.8400
LSL	3.48	x_{min}	3.75	x̄-3s	3.7563
USL	4.26	x_{max}	3.90	x̄+3s	3.9237
T	0.78	R	0.15	6s	0.1673
		$n_{<T>}$	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	4.66
Critical capability index	=	C_{mk}	4.30

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_c	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
Remark	TQ 30% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	3,84	3,85	3,81	3,83	3,84	3,75	3,84	3,83	3,78	3,84
1024210	VM1698-4	Grad	361,50	361,00	352,75	355,50	358,50	342,75	363,00	353,00	350,25	355,50

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	3,90	3,81	3,84	3,85	3,80	3,84	3,85	3,83	3,86	3,85
1024210	VM1698-4	Grad	369,50	355,50	361,25	359,25	352,00	359,25	353,75	359,75	360,50	363,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	3,86	3,86	3,85	3,84	3,84	3,84	3,87	3,87	3,87	3,85
1024210	VM1698-4	Grad	362,00	360,00	361,25	358,25	359,25	361,75	363,75	361,50	368,50	359,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	3,86	3,86	3,87	3,85	3,85	3,87	3,87	3,87	3,85	3,83
1024210	VM1698-4	Grad	361,00	365,00	365,50	359,50	360,75	366,50	369,75	361,75	359,00	360,25

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	3,85	3,84	3,83	3,86	3,83	3,79	3,87	3,84	3,81	3,86
1024210	VM1698-4	Grad	362,25	356,50	360,00	363,50	357,50	352,00	364,00	360,75	358,25	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	3,84	3,81	3,86	3,82	3,82	3,87	3,82	3,83	3,86	3,81
1024210	VM1698-4	Grad	359,00	356,75	363,00	351,75	360,25	363,50	358,00	359,50	362,25	353,00

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	3,80	3,89	3,84	3,80	3,89	3,86	3,84	3,85	3,86	3,85
1024210	VM1698-4	Grad	350,75	373,75	363,25	351,50	369,75	365,75	361,25	363,00	366,00	360,25

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	3,87	3,85	3,85	3,86	3,84	3,86	3,89	3,83	3,81	3,89
1024210	VM1698-4	Grad	362,00	361,25	365,00	363,00	361,75	361,50	365,75	357,50	354,75	371,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_c	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	3,87
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	3,48
				USL	4,26
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	3,77	3,86	3,81	3,81	3,82	3,84	3,79	3,83	3,87	3,79
1024210	VM1698-4	Grad	350,50	365,50	358,00	361,75	361,25	359,75	354,00	359,50	363,25	356,50

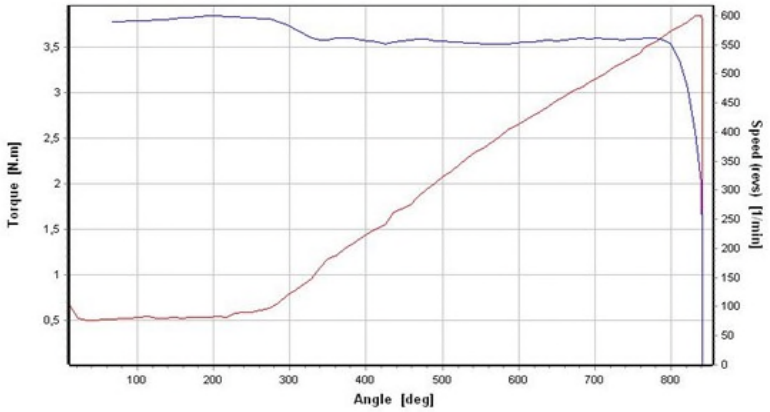
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	3,82	3,85	3,79	3,83	3,86	3,78	3,84	3,82	3,84	3,86
1024210	VM1698-4	Grad	357,50	358,00	355,75	360,00	361,25	350,75	362,25	358,25	361,00	367,75

Torque graphs

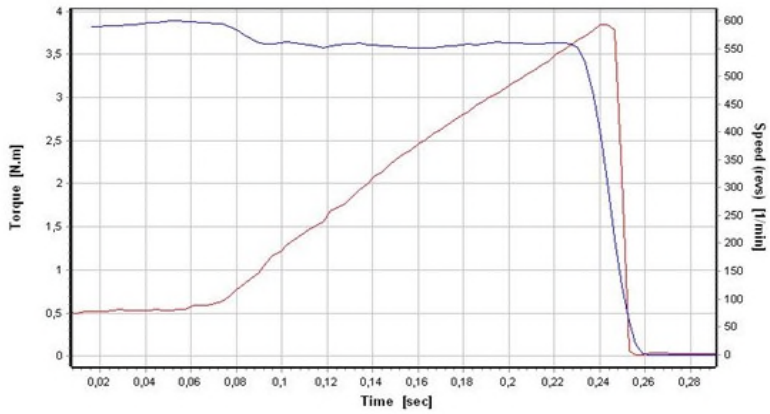
Machine Capability Study 30 %

Model: **CLBP08Q**
Serial no: **IIJ1008**

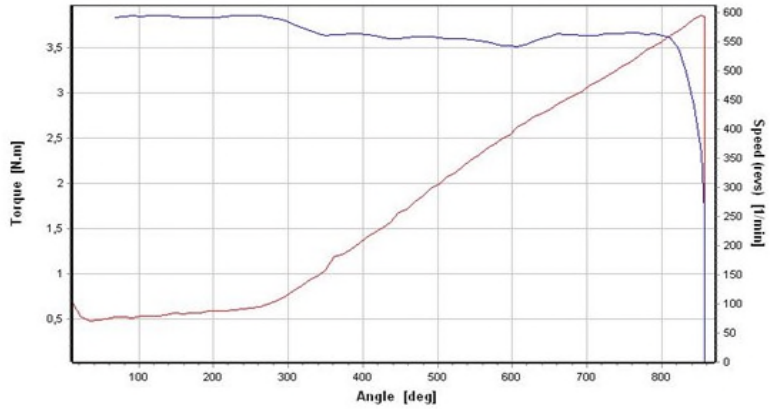
Angle degree: **360°**
Test torque: **3,9 Nm**



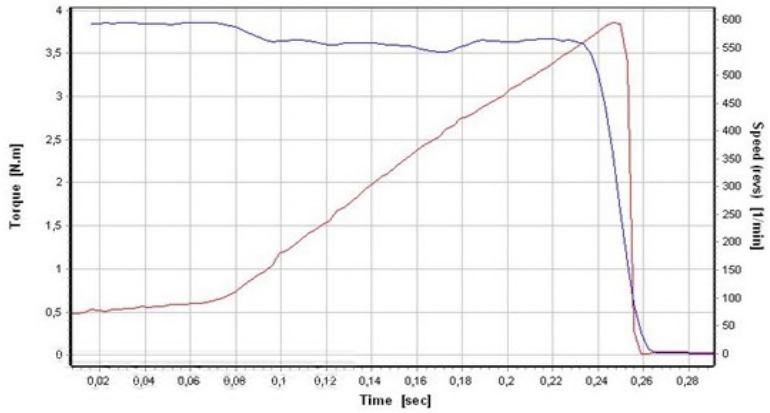
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 3

Machine Capability Study 80 %

Multi-stage tightening system	☑	Speed 600 rpm	60,9 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IIJ1008**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 6,82 Nm

Hard joint (H)	41,06	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,43	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	6,14 - 7,50 Nm	6,14 - 7,50 Nm
	Tolerance down / up	10 %	10 %
	Average torque	6,84 Nm	6,86 Nm
	Standard deviation	0,07 Nm	0,06 Nm
	Torque scatter (99,73%)	0,39 Nm	0,38 Nm
	C_m	3,46	3,61
	C_{mk}	3,34	3,41

b)	Min. C_m hard/soft (lowest value)	3,46
	Min. C_{mk} hard/soft (lowest value)	3,34

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

Note:

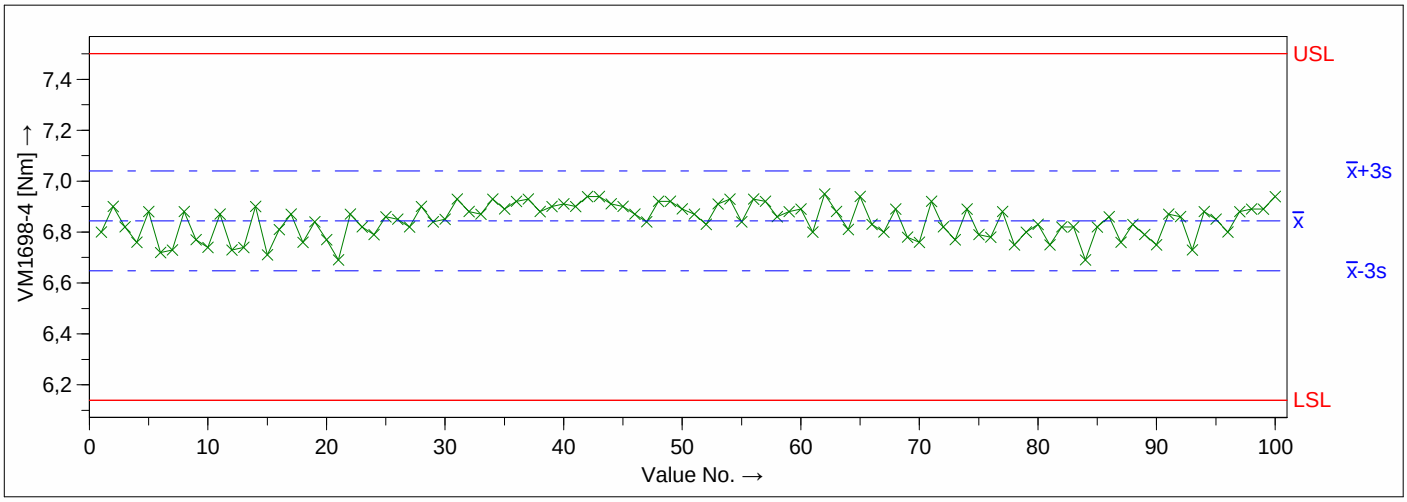
Machine Capability Study
Control System

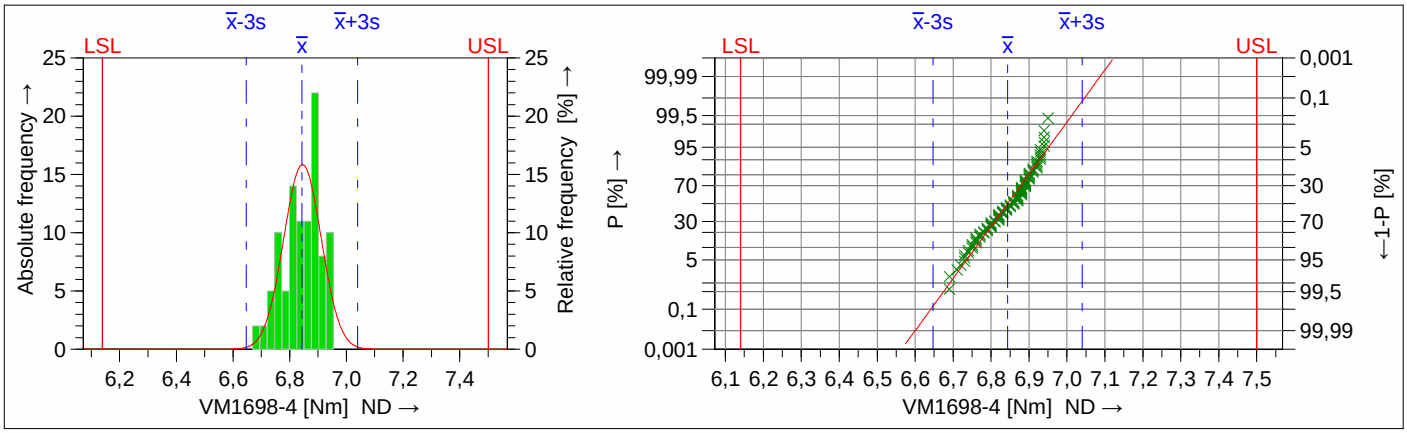
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_h	Char.Descr.	VM1698-4	Nom.val. 6,82 / 0,68	USL 7,50
		Serial No.	1024210	Unit Nm / -0,68	LSL 6,14
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 11:01:06 to 08.11.2023 11:14:18

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





Drawing Values		Collected Values		Statistics	
T_m	6.82			$\bar{x}$	6.8437
LSL	6.14	x_{min}	6.69	$\bar{x}$-3s	6.6472
USL	7.50	x_{max}	6.95	$\bar{x}$+3s	7.0402
T	1.36	R	0.26	6s	0.3929
		$n_{<T>}$	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	3.46
Critical capability index	=	C_{mk}	3.34

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_h	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	6,80	6,90	6,82	6,76	6,88	6,72	6,73	6,88	6,77	6,74
1024210	VM1698-4	Grad	30,50	31,25	30,75	27,50	30,25	29,75	30,25	28,25	30,25	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	6,87	6,73	6,74	6,90	6,71	6,81	6,87	6,76	6,84	6,77
1024210	VM1698-4	Grad	30,50	30,50	30,25	31,75	28,00	30,75	30,00	29,75	30,25	30,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	6,69	6,87	6,82	6,79	6,86	6,85	6,82	6,90	6,84	6,85
1024210	VM1698-4	Grad	29,75	30,50	29,00	30,00	28,75	30,00	31,00	31,25	31,00	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	6,93	6,88	6,87	6,93	6,89	6,92	6,93	6,88	6,90	6,91
1024210	VM1698-4	Grad	32,00	29,75	30,25	30,50	28,00	30,00	29,25	28,50	30,75	32,25

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	6,90	6,94	6,94	6,91	6,90	6,87	6,84	6,92	6,92	6,89
1024210	VM1698-4	Grad	29,25	31,75	29,00	31,00	28,75	29,50	30,25	31,50	30,75	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	6,87	6,83	6,91	6,93	6,84	6,93	6,92	6,86	6,88	6,89
1024210	VM1698-4	Grad	28,00	29,75	29,75	30,75	31,75	32,25	31,25	30,00	29,50	31,50

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	6,80	6,95	6,88	6,81	6,94	6,83	6,80	6,89	6,78	6,76
1024210	VM1698-4	Grad	31,75	29,50	31,75	31,50	32,25	29,00	31,00	31,00	29,25	29,00

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	6,92	6,82	6,77	6,89	6,79	6,78	6,88	6,75	6,80	6,83
1024210	VM1698-4	Grad	28,75	28,75	30,00	31,25	28,50	29,50	31,50	29,50	28,75	27,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_h	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,75	6,82	6,82	6,69	6,82	6,86	6,76	6,83	6,79	6,75
1024210	VM1698-4	Grad	27,75	28,25	31,00	29,00	28,50	30,25	31,25	31,75	29,50	29,25

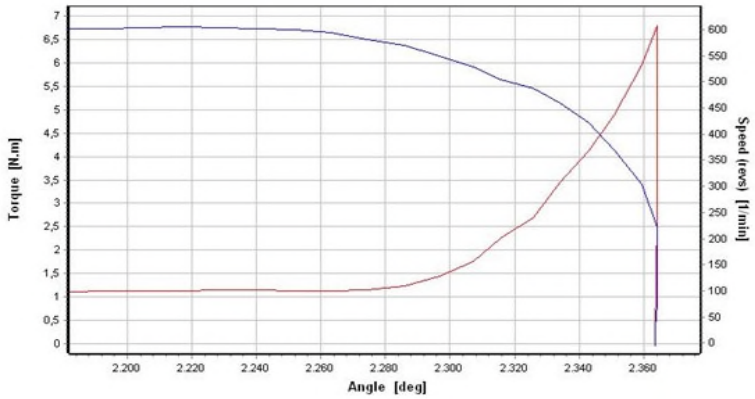
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	6,87	6,86	6,73	6,88	6,85	6,80	6,88	6,89	6,89	6,94
1024210	VM1698-4	Grad	32,50	32,00	29,00	29,25	30,75	31,00	31,50	31,25	29,50	29,75

Torque graphs

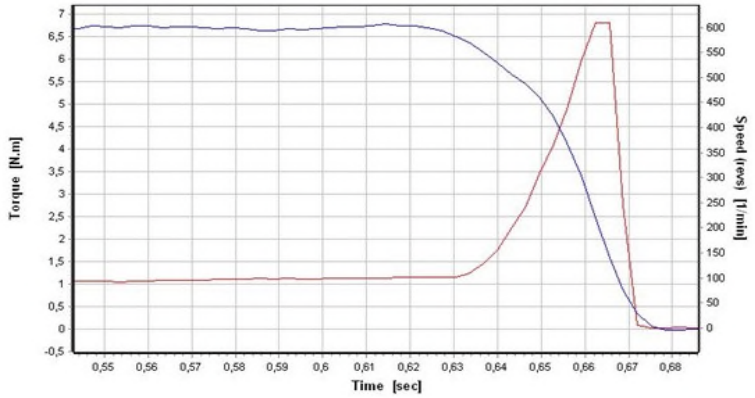
Machine Capability Study 80 %

Model: **CLBP08Q**
Serial no: **IIJ1008**

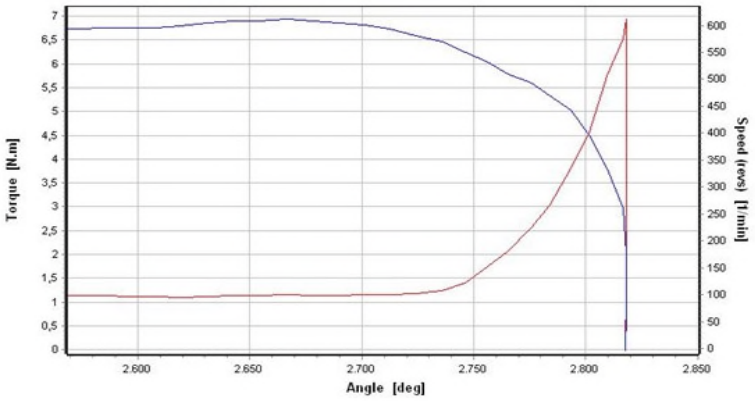
Angle degree: **30°**
Test torque: **6,8 Nm**



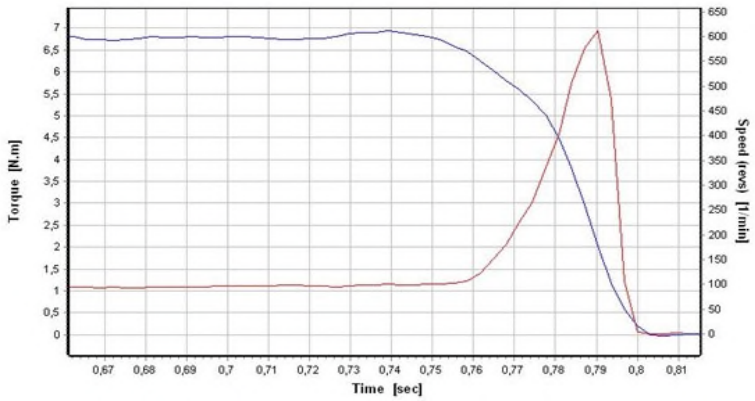
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

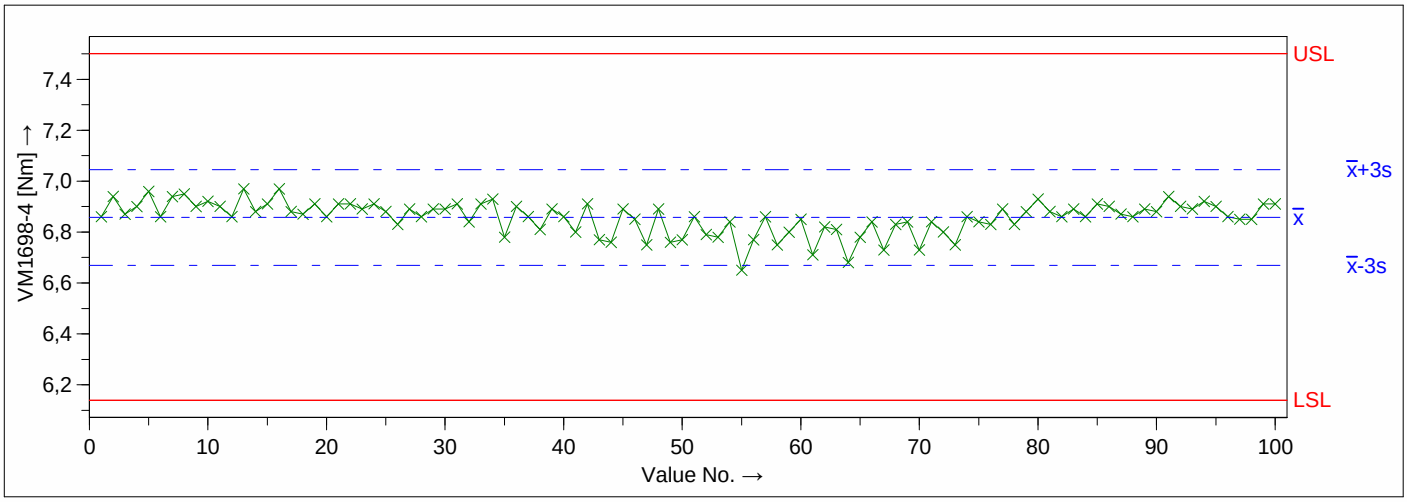
Cleco Production Tools

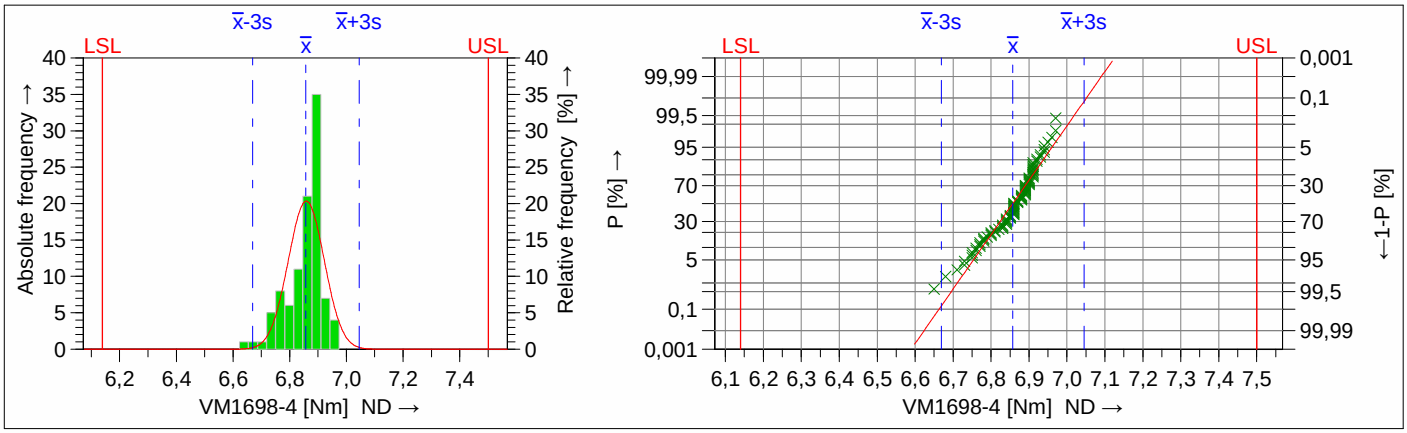
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_g	Char.Descr.	VM1698-4	Nom.val. 6,82 / 0,68	USL 7,50
		Serial No.	1024210	Unit Nm / -0,68	LSL 6,14
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 10:44:38 to 08.11.2023 10:57:50

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





Drawing Values		Collected Values		Statistics	
T_m	6.82			x̄	6.8571
LSL	6.14	x_{min}	6.65	x̄-3s	6.6687
USL	7.50	x_{max}	6.97	x̄+3s	7.0455
T	1.36	R	0.32	6s	0.3767
		$n_{<T>}$	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	3.61
Critical capability index	=	C_{mk}	3.41

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_g	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	6,86	6,94	6,87	6,90	6,96	6,86	6,94	6,95	6,90	6,92
1024210	VM1698-4	Grad	357,50	364,50	357,00	360,00	367,75	357,75	364,25	365,50	360,50	364,75

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	6,90	6,86	6,97	6,88	6,91	6,97	6,88	6,87	6,91	6,86
1024210	VM1698-4	Grad	361,75	357,75	364,75	360,50	362,50	364,75	357,50	358,25	358,75	355,75

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	6,91	6,91	6,89	6,91	6,88	6,83	6,89	6,86	6,89	6,89
1024210	VM1698-4	Grad	360,75	359,25	356,50	359,00	357,50	354,50	361,00	355,75	356,50	361,50

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	6,91	6,84	6,91	6,93	6,78	6,90	6,86	6,81	6,89	6,86
1024210	VM1698-4	Grad	356,25	353,50	358,25	362,75	348,50	360,00	355,75	350,75	361,75	360,50

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	6,80	6,91	6,77	6,76	6,89	6,85	6,75	6,89	6,76	6,77
1024210	VM1698-4	Grad	352,25	363,25	350,00	348,25	358,00	357,00	348,50	359,00	346,75	347,50

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	6,86	6,79	6,78	6,84	6,65	6,77	6,86	6,75	6,80	6,85
1024210	VM1698-4	Grad	360,50	358,75	353,75	362,75	342,75	357,25	364,75	352,75	358,25	363,75

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	6,71	6,82	6,81	6,68	6,78	6,84	6,73	6,83	6,84	6,73
1024210	VM1698-4	Grad	350,25	359,75	360,50	346,50	356,00	361,00	352,75	360,50	361,75	351,50

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	6,84	6,80	6,75	6,86	6,84	6,83	6,89	6,83	6,88	6,93
1024210	VM1698-4	Grad	358,50	359,25	353,00	361,75	361,25	360,25	367,50	359,50	367,75	368,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_g	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	6,82
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	6,14
				USL	7,50
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

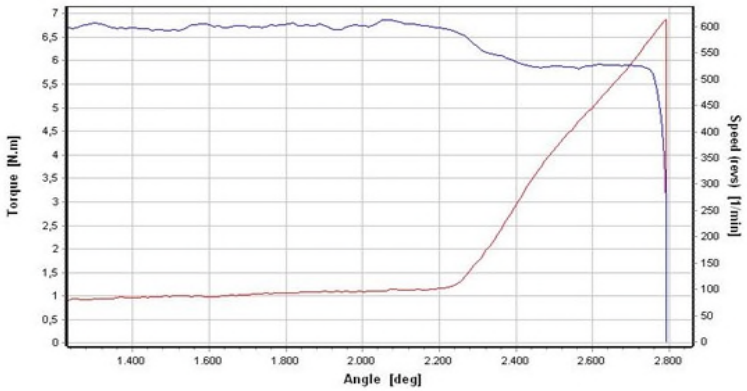
Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,88	6,86	6,89	6,86	6,91	6,90	6,87	6,86	6,89	6,88
1024210	VM1698-4	Grad	366,50	363,75	368,50	363,75	372,50	368,00	358,75	358,25	362,25	360,50

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	6,94	6,90	6,89	6,92	6,90	6,86	6,85	6,85	6,91	6,91
1024210	VM1698-4	Grad	365,75	361,50	361,50	365,75	362,00	357,75	358,50	355,50	363,25	363,75

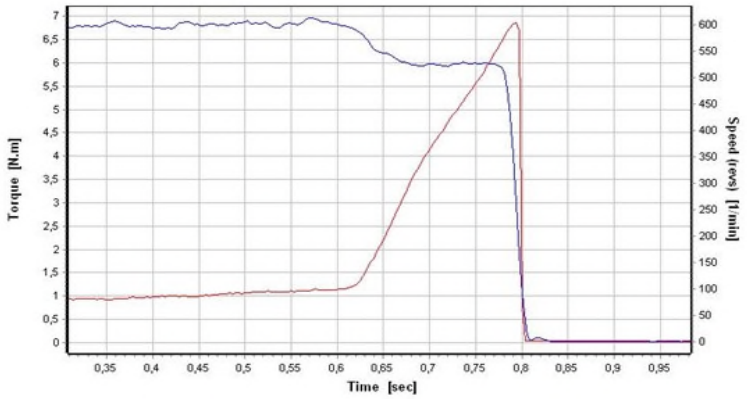
Torque graphs

Model: **CLBP08Q**
Serial no: **IIJ1008**

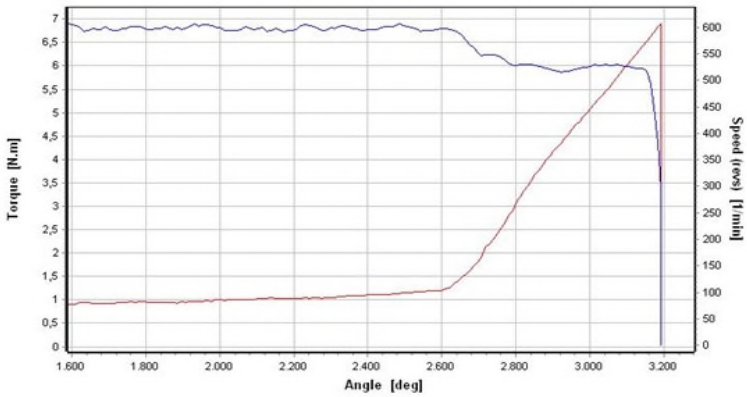
Machine Capability Study 80 %
Angle degree: **360°**
Test torque: **6,8 Nm**



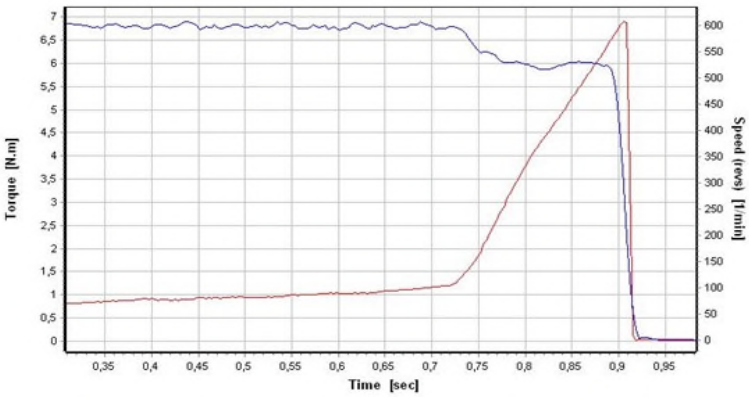
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

Multi-stage tightening system	☑	Speed 600 rpm	60,9 %
Single-stage tightening system	☐	Speed 100 %	985 rpm

Manufacturer: Apex Tool Group Serial no: **IIJ1008**

Test torque: Tq max. 8,00 Nm

Hard joint (H)	47,34	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,96	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	7,20 - 8,80 Nm	7,20 - 8,80 Nm
	Tolerance down / up	10 %	10 %
	Average torque	7,89 Nm	7,91 Nm
	Standard deviation	0,06 Nm	0,08 Nm
	Torque scatter (99,73%)	0,38 Nm	0,46 Nm
	C_m	4,18	3,46
	C_{mk}	3,60	3,08

b)	Min. C_m hard/soft (lowest value)	3,46
	Min. C_{mk} hard/soft (lowest value)	3,08

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

Note:

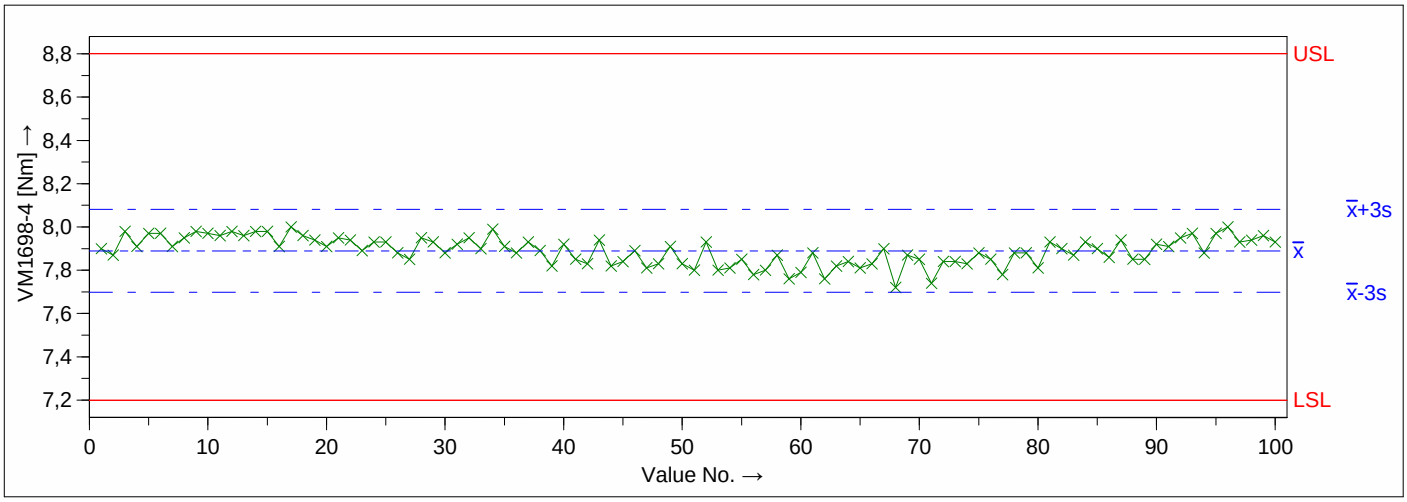
Machine Capability Study
Control System

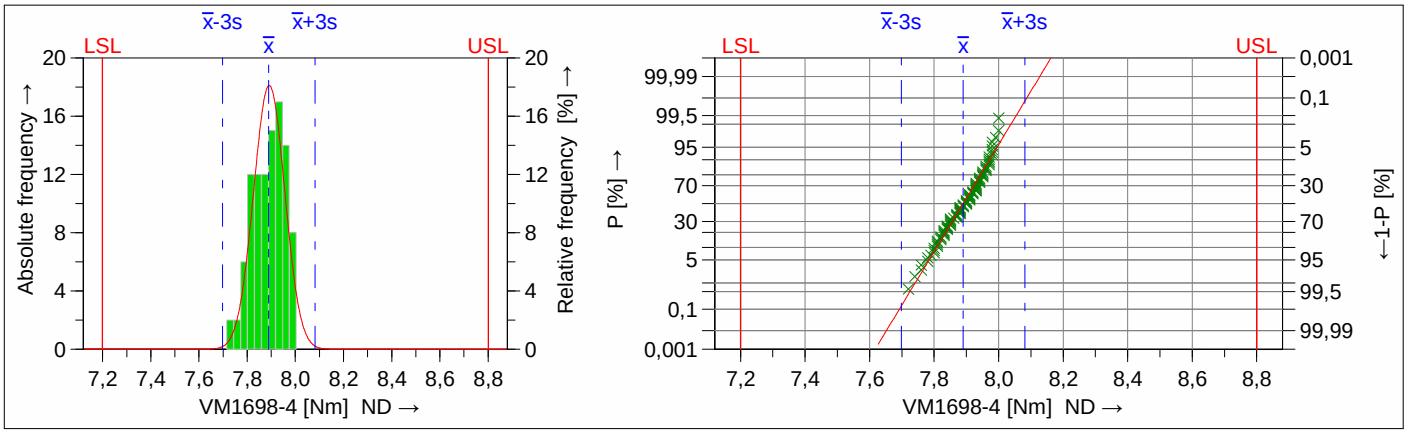
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_b	Char.Descr.	VM1698-4	Nom.val. 8,00 0,80	USL 8,80
		Serial No.	1024210	Unit Nm -0,80	LSL 7,20
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 09:47:47 to 08.11.2023 09:59:20

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





Drawing Values		Collected Values		Statistics	
T_m	8.00			$\bar{x}$	7.8897
LSL	7.20	x_{min}	7.72	$\bar{x}$-3s	7.6981
USL	8.80	x_{max}	8.00	$\bar{x}$+3s	8.0813
T	1.60	R	0.28	6s	0.3831
		$n_{<T>}$	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	4.18
Critical capability index	=	C_{mk}	3.60

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_b	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	7,90	7,87	7,98	7,91	7,97	7,97	7,91	7,95	7,98	7,97
1024210	VM1698-4	Grad	29,50	30,75	28,50	29,25	30,00	31,75	29,50	29,00	31,25	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	7,96	7,98	7,96	7,98	7,98	7,91	8,00	7,96	7,94	7,91
1024210	VM1698-4	Grad	30,75	28,50	30,00	31,00	31,50	30,75	31,25	29,25	28,25	30,75

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	7,95	7,94	7,89	7,93	7,93	7,88	7,85	7,95	7,93	7,88
1024210	VM1698-4	Grad	31,50	28,50	30,00	30,25	29,00	30,75	29,50	31,25	30,00	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	7,92	7,95	7,90	7,99	7,91	7,88	7,93	7,89	7,82	7,92
1024210	VM1698-4	Grad	31,25	31,25	29,25	30,50	28,75	31,25	31,50	29,00	28,75	30,50

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	7,85	7,83	7,94	7,82	7,84	7,89	7,81	7,83	7,91	7,83
1024210	VM1698-4	Grad	29,50	30,75	30,75	30,75	29,50	28,00	30,50	27,50	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	7,80	7,93	7,80	7,81	7,85	7,78	7,80	7,87	7,76	7,79
1024210	VM1698-4	Grad	28,00	29,25	28,75	30,00	28,50	29,25	30,50	32,25	30,25	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	7,88	7,76	7,82	7,84	7,81	7,83	7,90	7,72	7,87	7,85
1024210	VM1698-4	Grad	30,00	30,75	30,50	30,00	28,50	31,00	32,50	28,50	31,25	31,75

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	7,74	7,84	7,84	7,83	7,88	7,85	7,78	7,88	7,88	7,81
1024210	VM1698-4	Grad	30,00	28,75	30,25	30,00	31,00	30,50	28,25	30,50	30,00	30,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_b	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	7,93	7,90	7,87	7,93	7,90	7,86	7,94	7,85	7,85	7,92
1024210	VM1698-4	Grad	32,00	29,50	29,50	30,75	30,25	31,00	31,50	30,50	29,25	30,25

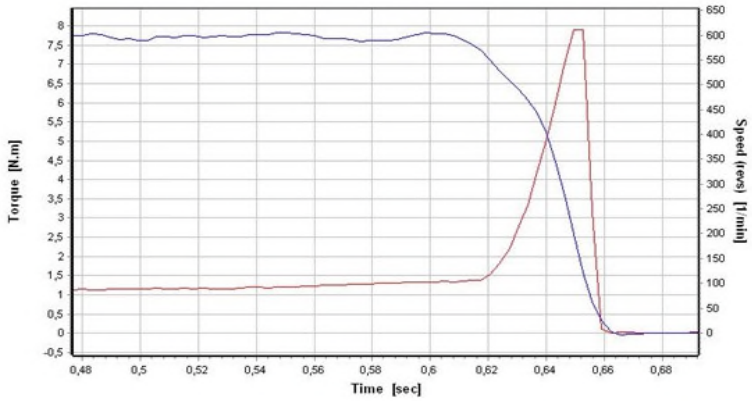
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	7,91	7,95	7,97	7,88	7,97	8,00	7,93	7,94	7,96	7,93
1024210	VM1698-4	Grad	30,00	30,50	32,00	29,25	31,50	29,50	29,50	30,25	30,50	29,75

Torque graphs

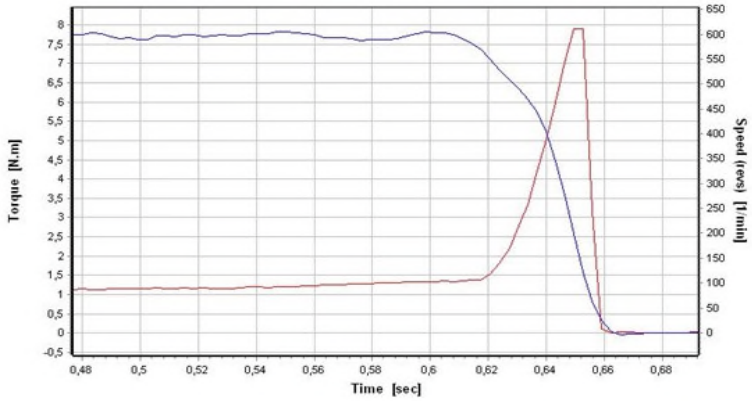
Machine Capability Study 100 %

Model: **CLBP08Q**
Serial no: **IIJ1008**

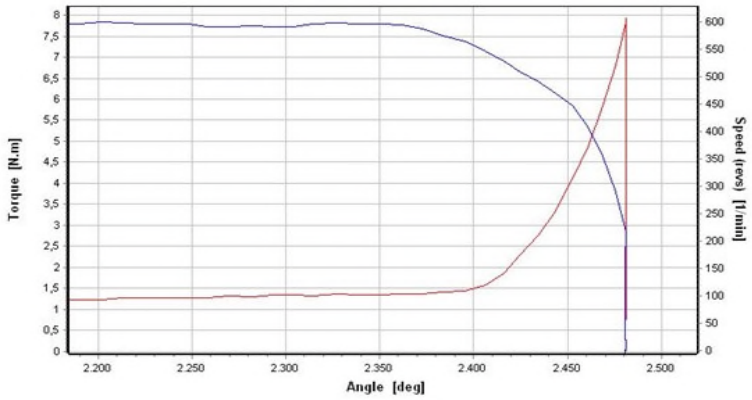
Angle degree: **30°**
Test torque: **8,0 Nm**



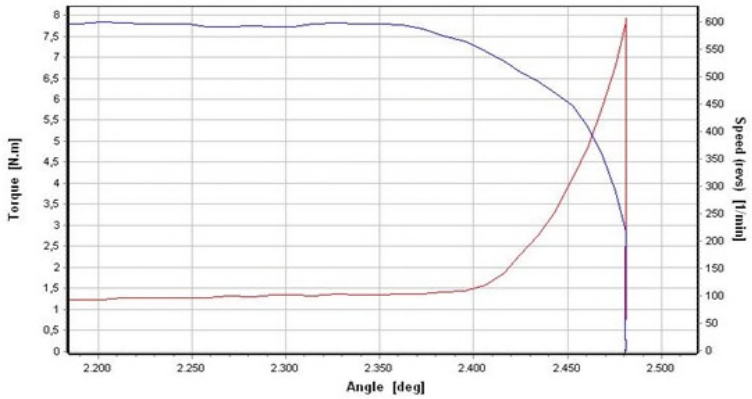
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

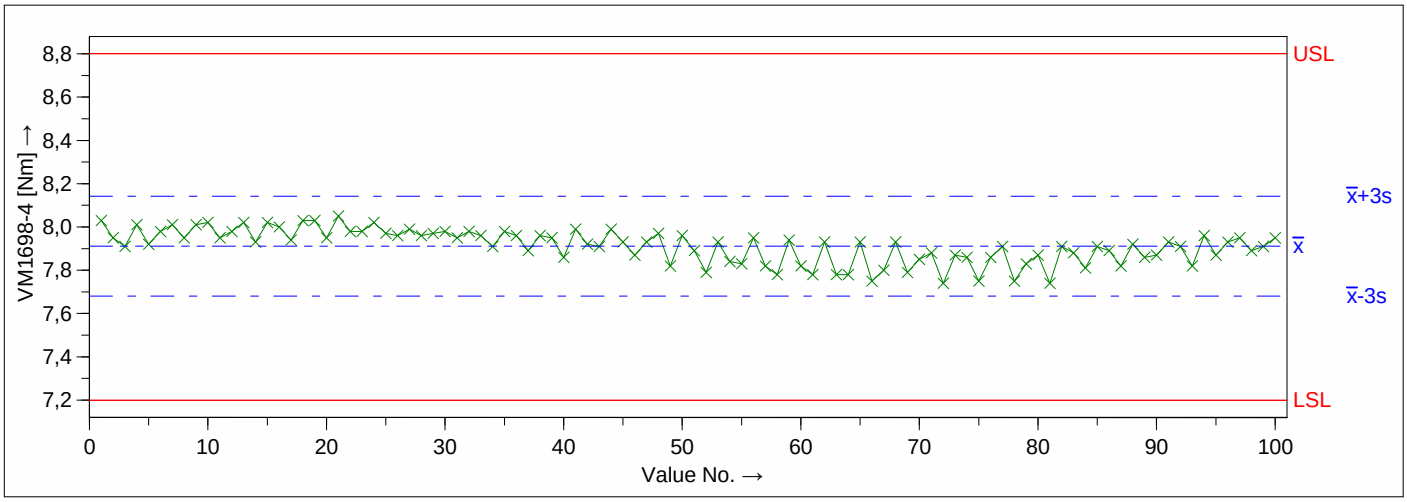
Machine Capability Study
Control System

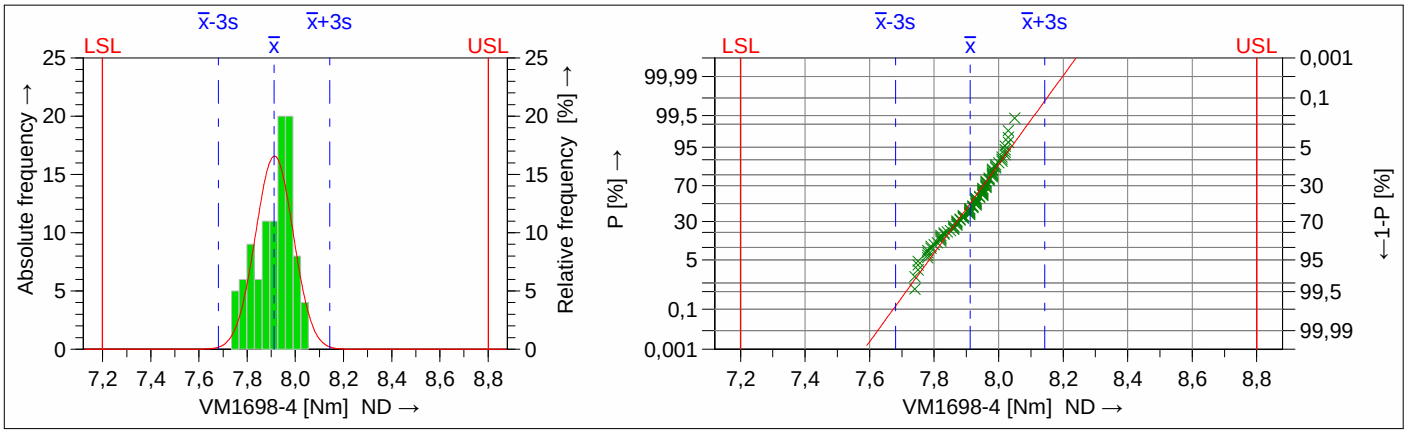
Plant	ATG Westhausen	Operator Name	Ederer
Date	08.11.2023		

Ord. No.	CLBP08Q	Part type	CLBP08Q	Contr.item	yes
Serial No.	IIJ1008_a	Char.Descr.	VM1698-4	Nom.val. 8,00 0,80	USL 8,80
		Serial No.	1024210	Unit Nm -0,80	LSL 7,20
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 08.11.2023 09:24:20 to 08.11.2023 09:35:54

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





Drawing Values		Collected Values		Statistics	
T_m	8.00			$\bar{x}$	7.9115
LSL	7.20	x_{min}	7.74	$\bar{x}$-3s	7.6804
USL	8.80	x_{max}	8.05	$\bar{x}$+3s	8.1426
T	1.60	R	0.31	6s	0.4621
		$n_{<T>}$	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	3.46
Critical capability index	=	C_{mk}	3.08

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_a	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	8,03	7,95	7,91	8,01	7,92	7,98	8,01	7,95	8,01	8,02
1024210	VM1698-4	Grad	360,75	353,75	352,25	359,75	354,00	357,25	359,50	354,75	361,25	360,50

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	7,95	7,98	8,02	7,93	8,02	8,00	7,94	8,03	8,03	7,95
1024210	VM1698-4	Grad	354,00	359,50	361,75	356,75	364,50	362,00	357,00	362,00	361,50	356,25

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	8,05	7,98	7,98	8,02	7,97	7,96	7,99	7,96	7,97	7,98
1024210	VM1698-4	Grad	364,25	360,50	360,25	364,75	357,50	359,25	360,75	358,75	359,25	363,75

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	7,95	7,98	7,96	7,91	7,98	7,96	7,89	7,96	7,95	7,86
1024210	VM1698-4	Grad	357,25	361,75	361,75	355,75	363,00	360,50	356,50	361,25	358,00	353,75

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	7,99	7,92	7,91	7,99	7,93	7,87	7,93	7,97	7,82	7,96
1024210	VM1698-4	Grad	363,50	359,25	358,25	363,50	359,75	354,00	359,00	362,75	349,25	362,50

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	7,89	7,79	7,93	7,84	7,83	7,95	7,82	7,78	7,94	7,82
1024210	VM1698-4	Grad	353,00	349,25	359,50	353,50	352,75	362,50	349,75	344,75	362,75	357,00

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	7,78	7,93	7,78	7,78	7,93	7,75	7,80	7,93	7,79	7,85
1024210	VM1698-4	Grad	352,25	364,50	353,25	352,00	363,00	351,50	356,25	364,50	354,50	356,75

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	7,88	7,74	7,87	7,86	7,75	7,86	7,91	7,75	7,83	7,87
1024210	VM1698-4	Grad	363,00	351,00	361,75	361,50	352,50	359,25	364,50	353,50	360,75	363,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 08.11.2023

Serial No.	IIJ1008_a	Characteristic			
Part type	CLBP08Q	Char.Descr.	VM1698-4	Nom.val.	8,00
Ord. No.	CLBP08Q	Serial No.	1024210	LSL	7,20
				USL	8,80
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	7,74	7,91	7,88	7,81	7,91	7,89	7,82	7,92	7,86	7,87
1024210	VM1698-4	Grad	352,25	365,25	362,75	357,00	366,50	364,25	357,75	367,50	364,25	364,75

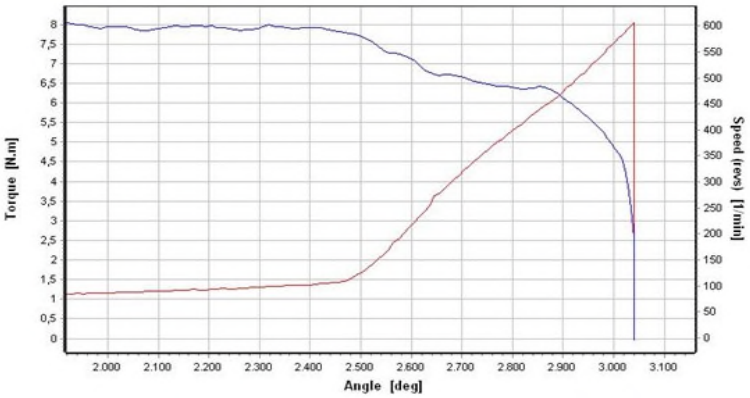
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	7,93	7,91	7,82	7,96	7,87	7,93	7,95	7,89	7,91	7,95
1024210	VM1698-4	Grad	368,25	364,75	361,25	371,75	362,75	367,75	367,50	362,50	365,25	367,75

Torque graphs

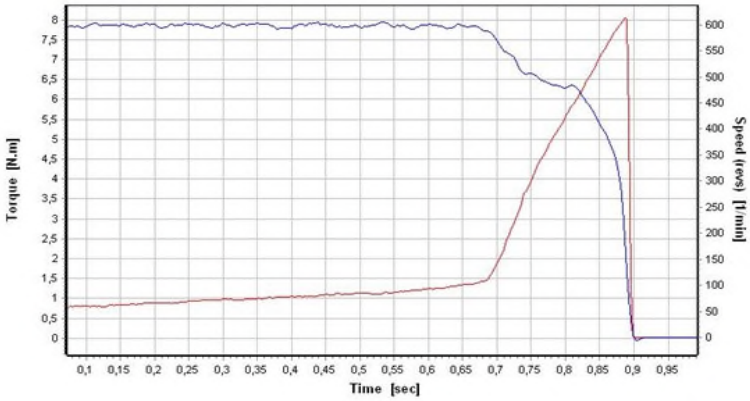
Machine Capability Study 100 %

Model: **CLBP08Q**
Serial no: **IIJ1008**

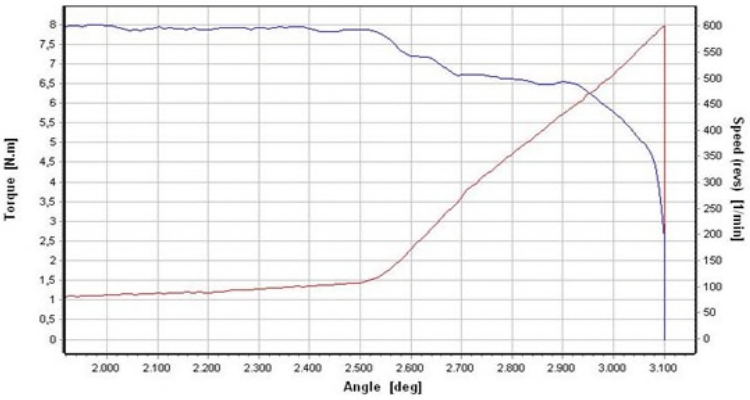
Angle degree: **360°**
Test torque: **8,0 Nm**



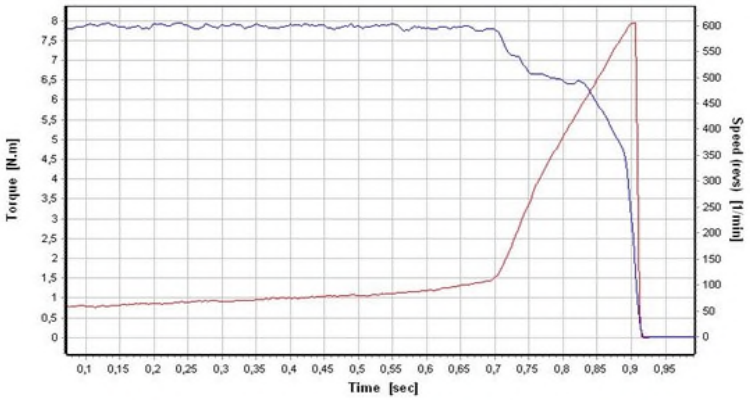
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed