Homologation

Cordless Assembly Tools

Model: CLBP12Q

Serial no.: IJJ1006

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Homologation: CLBP12Q SN: IJJ1006

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Document no: 003/23
Date: 16.11.2023

Test sheet no. 2

Machine Capability Study 30 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1006**

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

Hard joint (H)	34,76	Nm / Revolution	Angle degree	30°
Soft joint (L)	3,00	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	5,26 - 6,42 Nm	5,26 - 6,42 Nm
	Tolerance down / up	10 %	10 %
	Average torque	5,79 Nm	6,01 Nm
	Standard deviation	0,02 Nm	0,02 Nm
	Torque scatter (99,73%)	0,11 Nm	0,10 Nm
	C_m	10,30	12,02
	C_{mk}	9,46	8,54

b)	Min. C_m hard/soft (lowest value)	10,30
	Min. C_{mk} hard/soft (lowest value)	8,54

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

Note:

Machine Capability Study
Control System

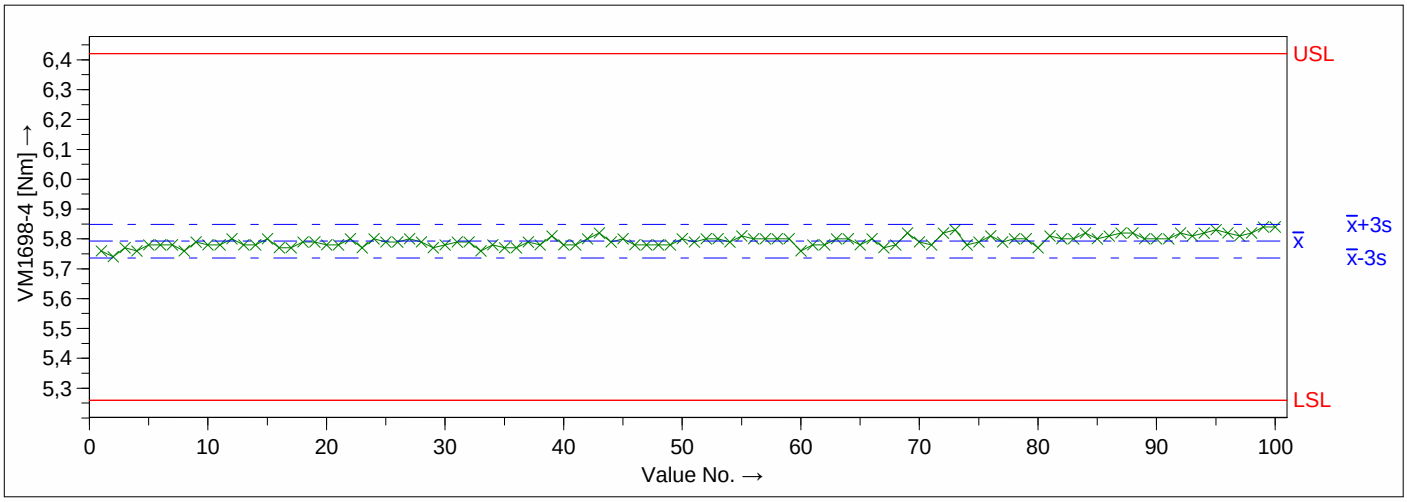
Cleco Production Tools

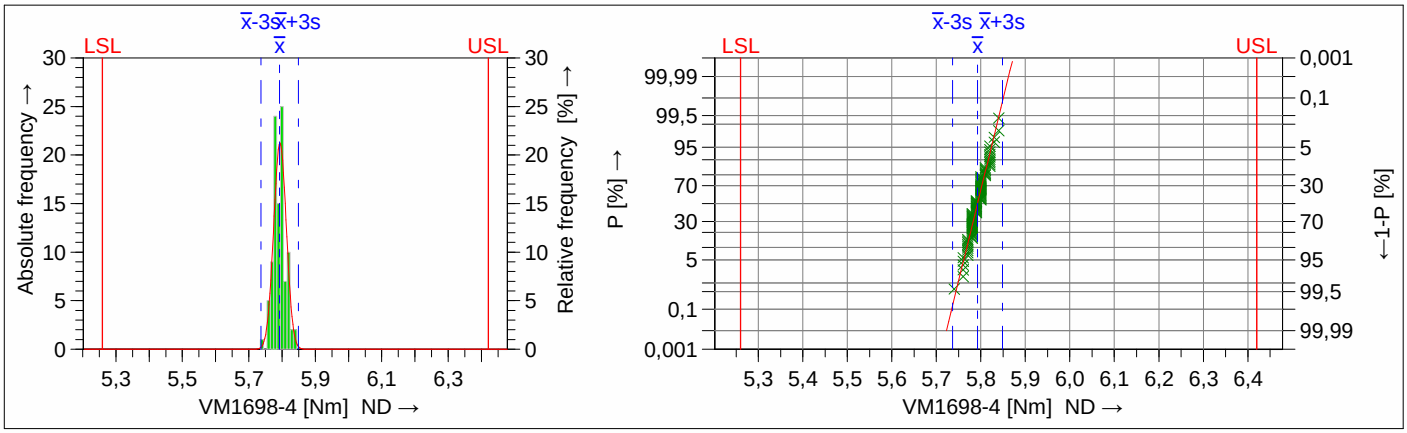
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_d	Char.Descr.	VM1698-4	Nom.val. 5,84 0,58	USL 6,42
		Serial No.	1024210	Unit Nm -0,58	LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 06.11.2023 13:24:00 to 06.11.2023 13:37:12

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





Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	5.7925
LSL	5.26	x_{min}	5.74	$\bar{x}$-3s	5.7362
USL	6.42	x_{max}	5.84	$\bar{x}$+3s	5.8488
T	1.16	R	0.10	6s	0.1126
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	10.30
Critical capability index	=	C_{mk}	9.46

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 06.11.2023

Serial No.	IJJ1006_d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	5,76	5,74	5,77	5,76	5,78	5,78	5,78	5,76	5,79	5,78
1024210	VM1698-4	Grad	29,75	30,50	30,00	29,75	30,50	30,25	30,25	30,00	30,00	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	5,78	5,80	5,78	5,78	5,80	5,77	5,77	5,79	5,79	5,78
1024210	VM1698-4	Grad	30,75	31,00	30,50	30,75	30,50	31,00	31,25	29,75	30,25	31,00

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	5,78	5,80	5,77	5,80	5,79	5,79	5,80	5,79	5,77	5,78
1024210	VM1698-4	Grad	30,50	29,75	30,75	31,00	30,00	31,25	29,75	30,75	30,50	29,50

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	5,79	5,79	5,76	5,78	5,77	5,77	5,79	5,78	5,81	5,78
1024210	VM1698-4	Grad	30,00	30,50	30,50	29,50	31,00	29,75	29,50	30,00	30,00	30,75

Char.No.	Char.Descr.	Unit	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	Nm	5,78	5,80	5,82	5,79	5,80	5,78	5,78	5,78	5,78	5,80
1024210	VM1698-4	Grad	31,50	31,50	30,50	29,25	31,00	29,75	30,75	30,75	29,50	31,00

Char.No.	Char.Descr.	Unit	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	Nm	5,79	5,80	5,80	5,79	5,81	5,80	5,80	5,80	5,80	5,76
1024210	VM1698-4	Grad	30,75	30,50	30,25	30,00	30,25	30,25	30,75	31,25	30,00	30,00

Char.No.	Char.Descr.	Unit	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	Nm	5,78	5,78	5,80	5,80	5,78	5,80	5,77	5,78	5,82	5,79
1024210	VM1698-4	Grad	30,75	30,50	31,00	29,75	30,00	29,75	29,50	30,00	30,25	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	5,78	5,82	5,83	5,78	5,79	5,81	5,79	5,80	5,80	5,77
1024210	VM1698-4	Grad	28,75	29,25	30,00	29,50	31,00	29,75	30,75	30,25	31,50	30,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_d	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	5,81	5,80	5,80	5,82	5,80	5,81	5,82	5,82	5,80	5,80
1024210	VM1698-4	Grad	29,75	29,75	29,50	29,75	29,75	31,00	31,50	30,50	30,25	29,75

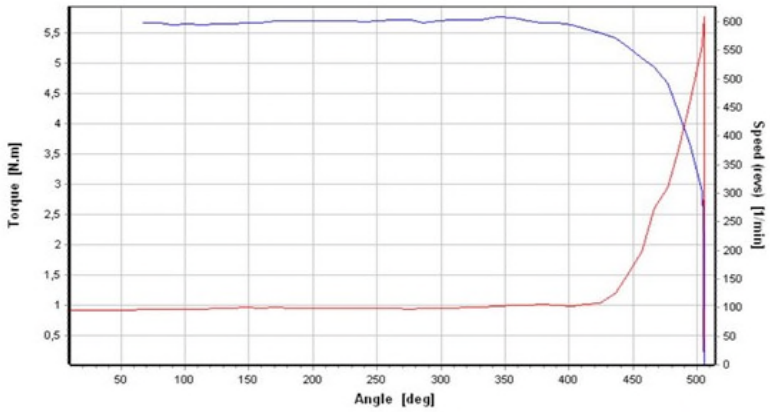
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	5,80	5,82	5,81	5,82	5,83	5,82	5,81	5,82	5,84	5,84
1024210	VM1698-4	Grad	29,75	30,25	31,00	31,50	30,00	30,25	30,00	29,75	30,75	31,25

Torque graphs

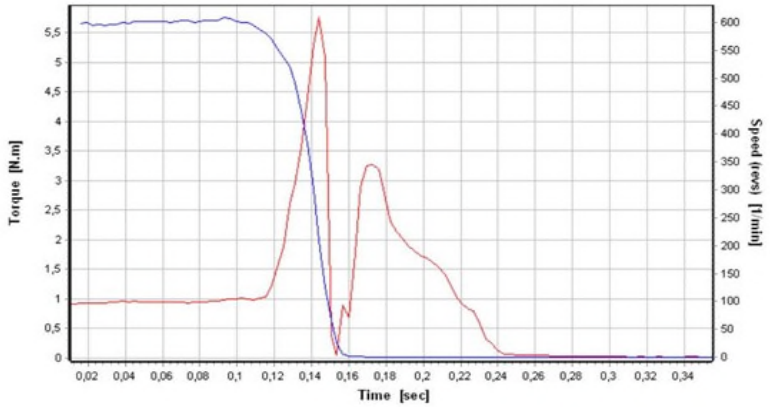
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

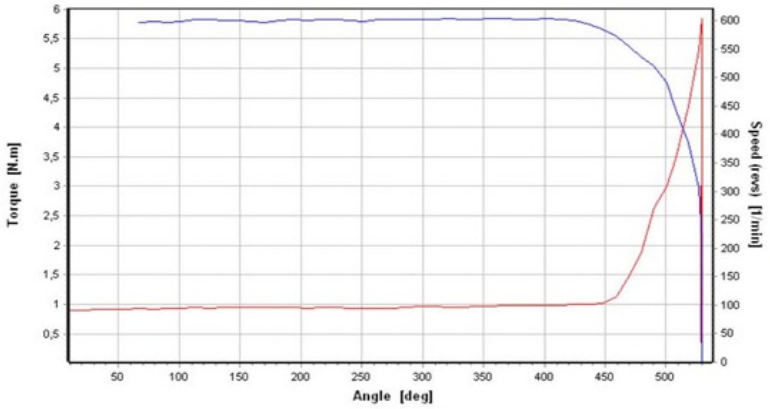
Angle degree: **30°**
Test torque: **5,8 Nm**



Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



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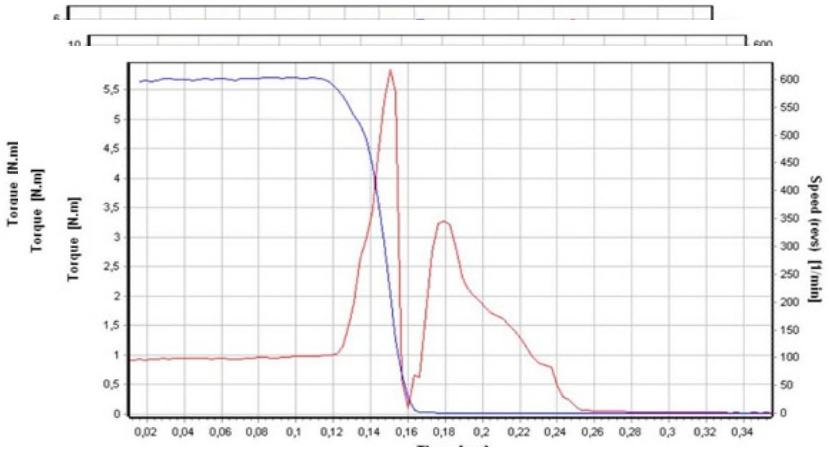
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

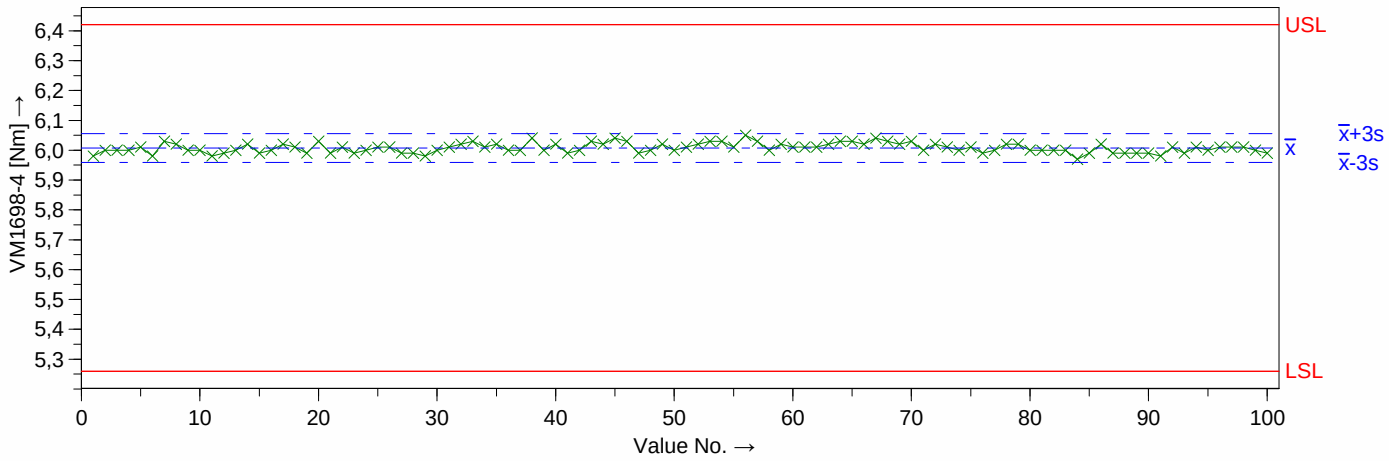
Cleco Production Tools

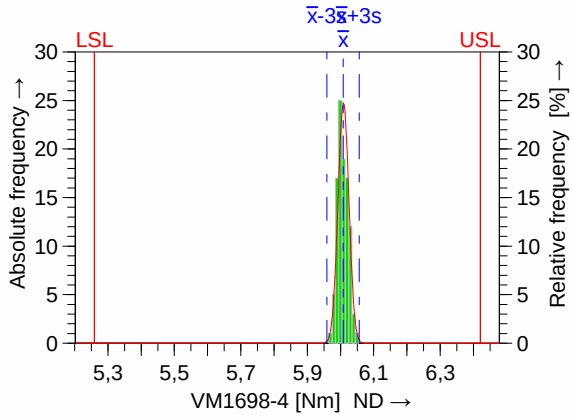
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

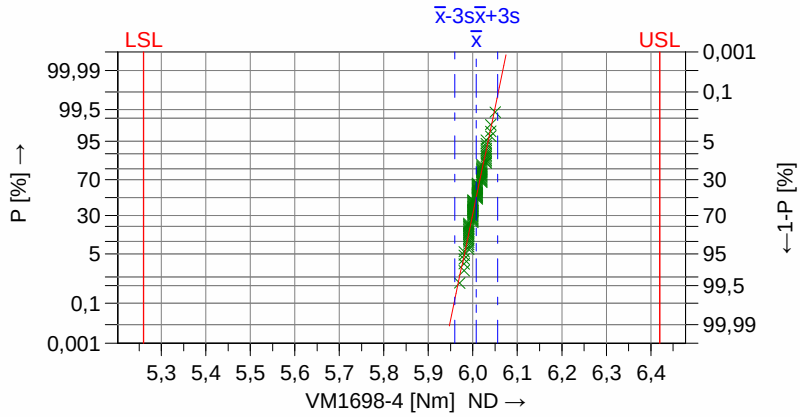
Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_c	Char.Descr.	VM1698-4	Nom.val. 5,84 / 0,58	USL 6,42
		Serial No.	1024210	Unit Nm / -0,58	LSL 5,26
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 06.11.2023 13:05:03 to 06.11.2023 13:19:34

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







Drawing Values		Collected Values		Statistics	
T_m	5.84			$\bar{x}$	6.0076
LSL	5.26	x_{min}	5.97	$\bar{x}$-3s	5.9593
USL	6.42	x_{max}	6.05	$\bar{x}$+3s	6.0559
T	1.16	R	0.08	6s	0.0965
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1.1.4 $\hat{\sigma} = S_{tot}$
Potential Capability index	=	C_m	12.02
Critical capability index	=	C_{mk}	8.54

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 06.11.2023

Serial No.	IJJ1006_c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	5,98	6,00	6,00	6,00	6,01	5,98	6,03	6,02	6,00	6,00
1024210	VM1698-4	Grad	356,00	359,00	357,25	356,75	357,25	355,00	357,50	357,00	356,50	357,50

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	5,98	5,99	6,00	6,02	5,99	6,00	6,02	6,01	5,99	6,03
1024210	VM1698-4	Grad	355,50	365,75	356,75	357,50	355,50	356,25	358,50	355,25	358,00	361,75

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	5,99	6,01	5,99	6,00	6,01	6,01	5,99	5,99	5,98	6,00
1024210	VM1698-4	Grad	358,00	356,25	356,50	355,00	360,00	360,50	360,25	357,25	359,25	361,25

Char.No.	Char.Descr.	Unit	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	Nm	6,01	6,02	6,03	6,01	6,02	6,00	6,00	6,04	6,00	6,02
1024210	VM1698-4	Grad	361,50	360,50	361,50	358,50	359,00	359,50	361,50	360,75	358,50	359,00

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	5,99	6,00	6,03	6,02	6,04	6,03	5,99	6,00	6,02	6,00
1024210	VM1698-4	Grad	358,25	361,25	363,00	361,00	363,75	361,50	359,25	360,25	360,75	359,25

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	6,01	6,02	6,03	6,03	6,01	6,05	6,03	6,00	6,02	6,01
1024210	VM1698-4	Grad	359,00	362,25	360,25	362,00	362,75	364,00	362,25	358,50	362,00	357,75

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	6,01	6,01	6,02	6,03	6,03	6,02	6,04	6,03	6,02	6,03
1024210	VM1698-4	Grad	360,50	363,50	365,50	363,75	364,50	363,50	366,25	365,50	363,00	364,50

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	6,00	6,02	6,01	6,00	6,01	5,99	6,00	6,02	6,02	6,00
1024210	VM1698-4	Grad	362,00	364,25	363,75	362,00	363,75	361,25	363,75	366,25	365,75	384,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_c	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	5,84
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	5,26
				USL	6,42
Remark	TQ 30% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	6,00	6,00	6,00	5,97	5,99	6,02	5,99	5,99	5,99	5,99
1024210	VM1698-4	Grad	386,25	384,50	378,50	376,00	374,75	379,75	369,75	369,50	369,50	372,25

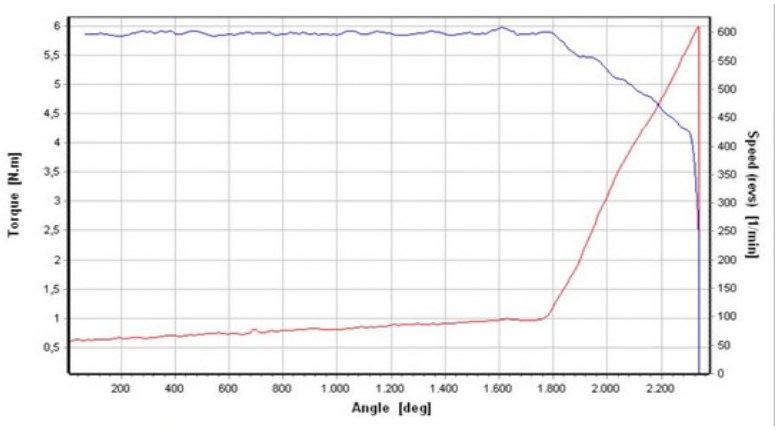
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	5,98	6,01	5,99	6,01	6,00	6,01	6,01	6,01	6,00	5,99
1024210	VM1698-4	Grad	359,00	364,75	358,75	363,50	362,25	360,00	364,25	364,75	363,50	361,00

Torque graphs

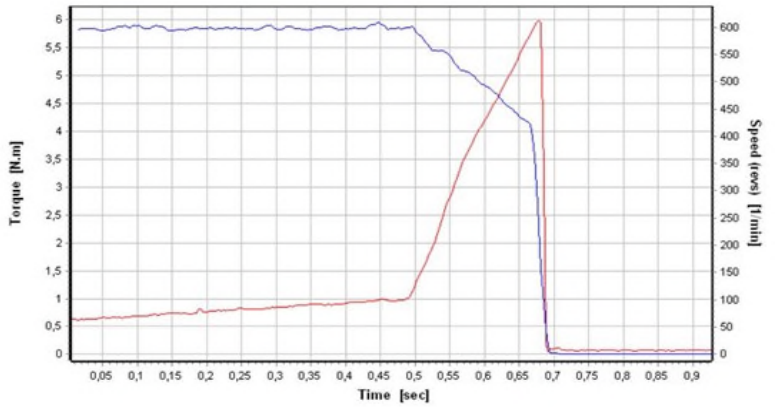
Machine Capability Study 30 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

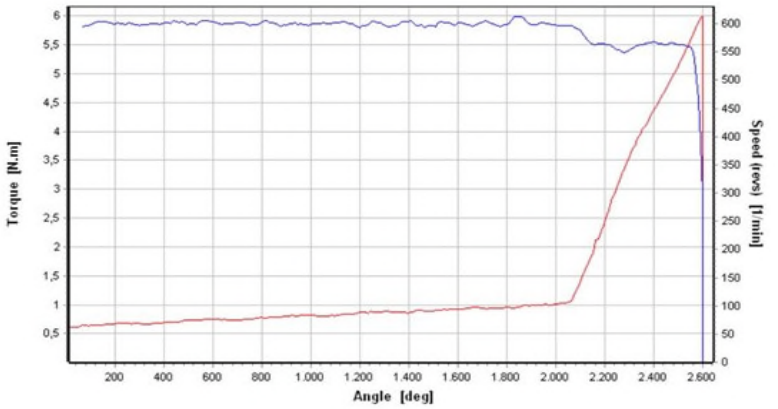
Angle degree: **360°**
Test torque: **5,8 Nm**



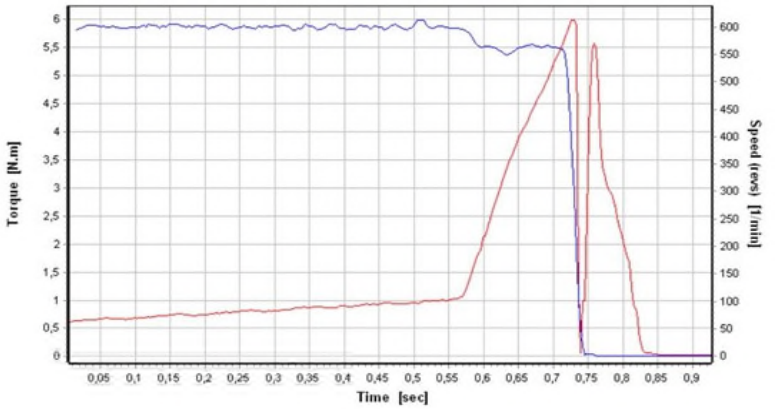
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 3

Machine Capability Study 80 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1006**

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

Hard joint (H)	59,41	Nm / Revolution	Angle degree	30°
Soft joint (L)	5,19	Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	9,22 - 11,26 Nm	9,22 - 11,26 Nm
	Tolerance down / up	10 %	10 %
	Average torque	9,90 Nm	10,39 Nm
	Standard deviation	0,02 Nm	0,01 Nm
	Torque scatter (99,73%)	0,15 Nm	0,09 Nm
	C_m	13,70	23,54
	C_{mk}	9,15	20,14

b)	Min. C_m hard/soft (lowest value)	13,70
	Min. C_{mk} hard/soft (lowest value)	9,15

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

Note:

Machine Capability Study
Control System

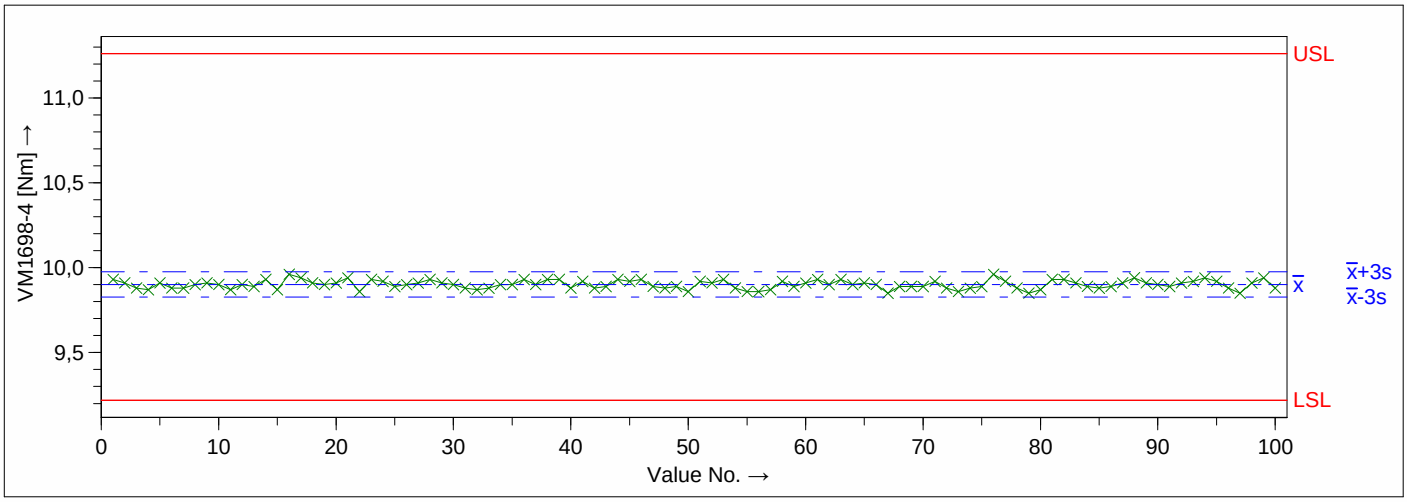
Page 1 / 1

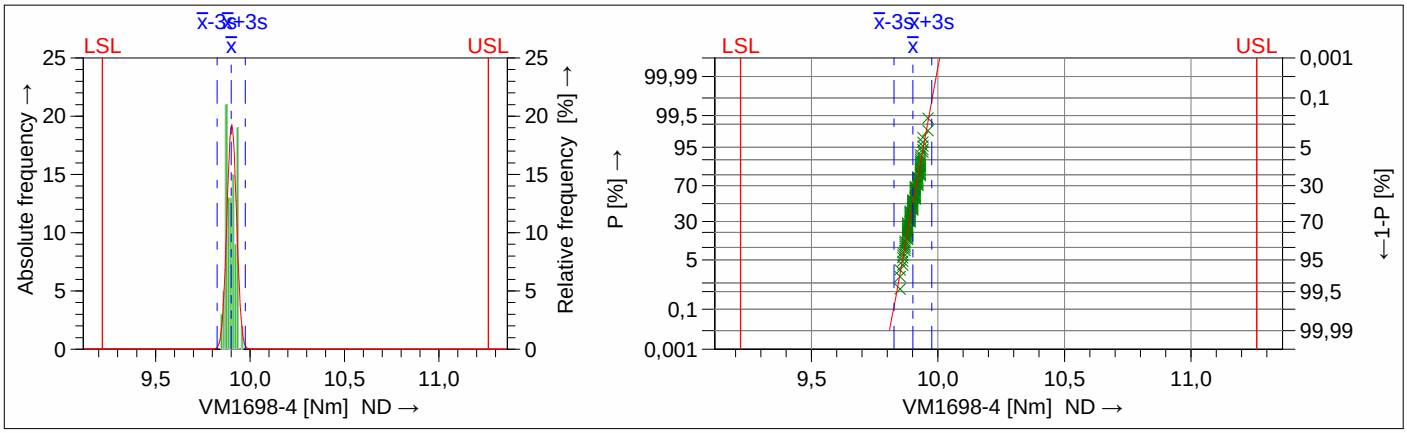
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_h	Char.Descr.	VM1698-4	Nom.val. 10,24 1,02	USL 11,26
		Serial No.	1024210	Unit Nm -1,02	LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 06.11.2023 12:34:25 to 06.11.2023 12:47:37

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





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	9.9011
LSL	9.22	x_{min}	9.85	$\bar{x}$-3s	9.8266
USL	11.26	x_{max}	9.96	$\bar{x}$+3s	9.9756
T	2.04	R	0.11	6s	0.1489
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma}$ = S_{tot}
Potential Capability index	=	C_m	13.70
Critical capability index	=	C_{mk}	9.15

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\AZDEU-DFS01\Europe\Westhausen\Quality\QWE\Messwert\2023\IJJ1006_hM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	9,93	9,91	9,88	9,87	9,91	9,88	9,88	9,90	9,91	9,90
1024210	VM1698-4	Grad	30,00	30,50	29,75	31,50	31,75	31,00	30,00	30,25	30,50	30,50

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	9,87	9,90	9,89	9,93	9,87	9,96	9,94	9,91	9,90	9,91
1024210	VM1698-4	Grad	30,50	29,75	30,50	31,00	30,75	30,50	30,50	32,00	31,75	31,50

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	9,94	9,86	9,93	9,92	9,89	9,90	9,91	9,93	9,91	9,90
1024210	VM1698-4	Grad	30,00	29,75	29,75	29,75	30,25	29,50	29,75	30,00	31,00	29,50

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	9,88	9,87	9,88	9,90	9,90	9,93	9,90	9,93	9,93	9,88
1024210	VM1698-4	Grad	30,75	30,00	31,00	30,50	30,00	30,75	30,25	30,50	30,25	31,50

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	9,92	9,88	9,89	9,93	9,92	9,93	9,89	9,88	9,89	9,86
1024210	VM1698-4	Grad	30,50	31,25	30,50	30,75	30,75	30,25	30,25	31,75	29,50	31,25

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	9,92	9,91	9,93	9,88	9,86	9,86	9,87	9,92	9,89	9,91
1024210	VM1698-4	Grad	31,00	31,00	30,25	30,00	30,75	30,25	30,75	29,50	29,25	30,50

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	9,93	9,90	9,93	9,90	9,91	9,90	9,85	9,89	9,89	9,89
1024210	VM1698-4	Grad	29,75	30,00	29,75	29,25	29,50	29,50	30,00	29,50	30,50	31,00

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	9,92	9,88	9,86	9,88	9,89	9,96	9,92	9,88	9,85	9,87
1024210	VM1698-4	Grad	31,25	30,25	29,25	31,00	30,25	30,50	30,00	30,75	29,75	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_h	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	9,93	9,93	9,91	9,89	9,88	9,89	9,91	9,94	9,91	9,90
1024210	VM1698-4	Grad	30,50	30,00	30,25	30,00	30,50	30,25	29,75	31,00	29,75	30,00

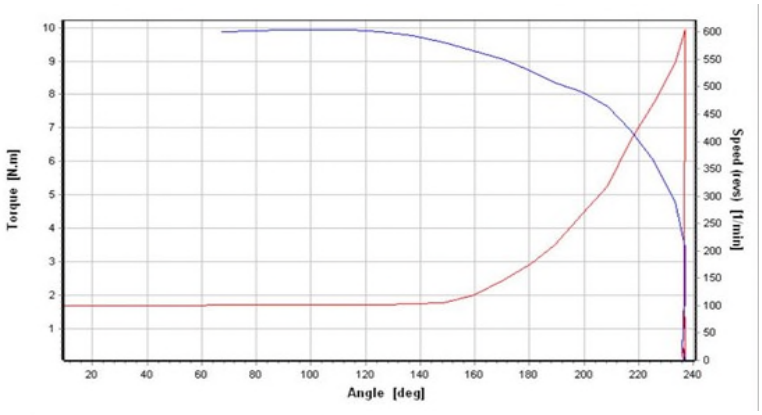
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	9,89	9,91	9,92	9,94	9,92	9,88	9,85	9,91	9,94	9,88
1024210	VM1698-4	Grad	30,50	29,75	30,00	30,75	30,00	29,25	28,75	29,00	29,50	29,25

Torque graphs

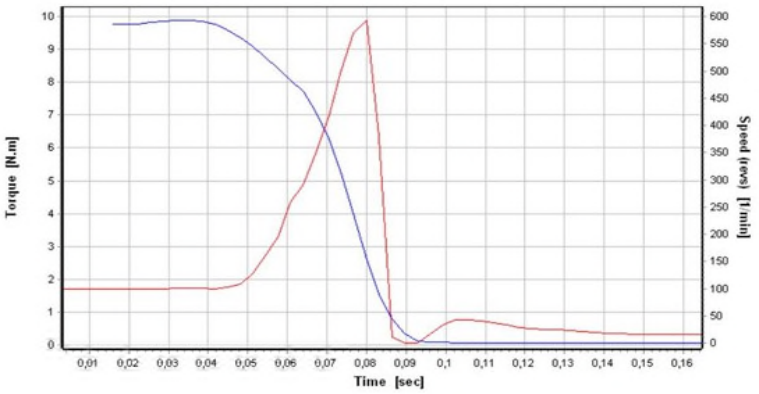
Machine Capability Study 80 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

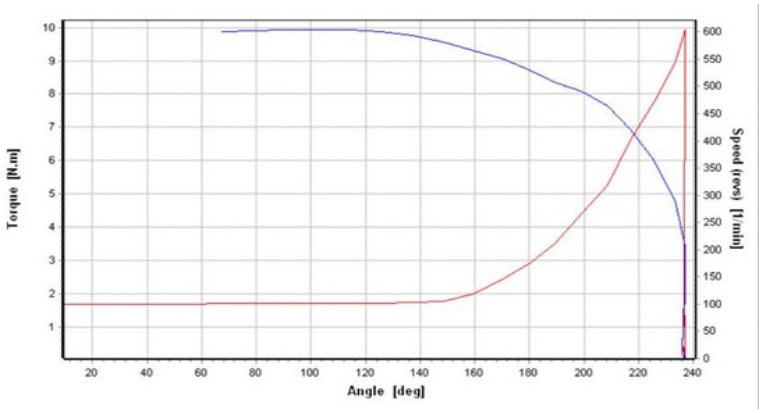
Angle degree: **30°**
Test torque: **10,2 Nm**



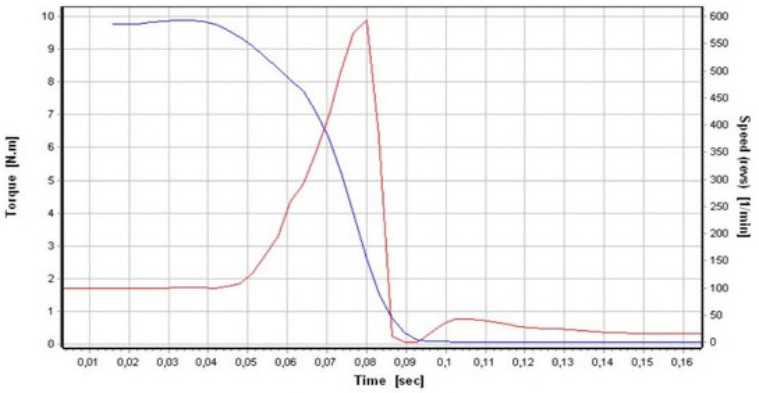
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

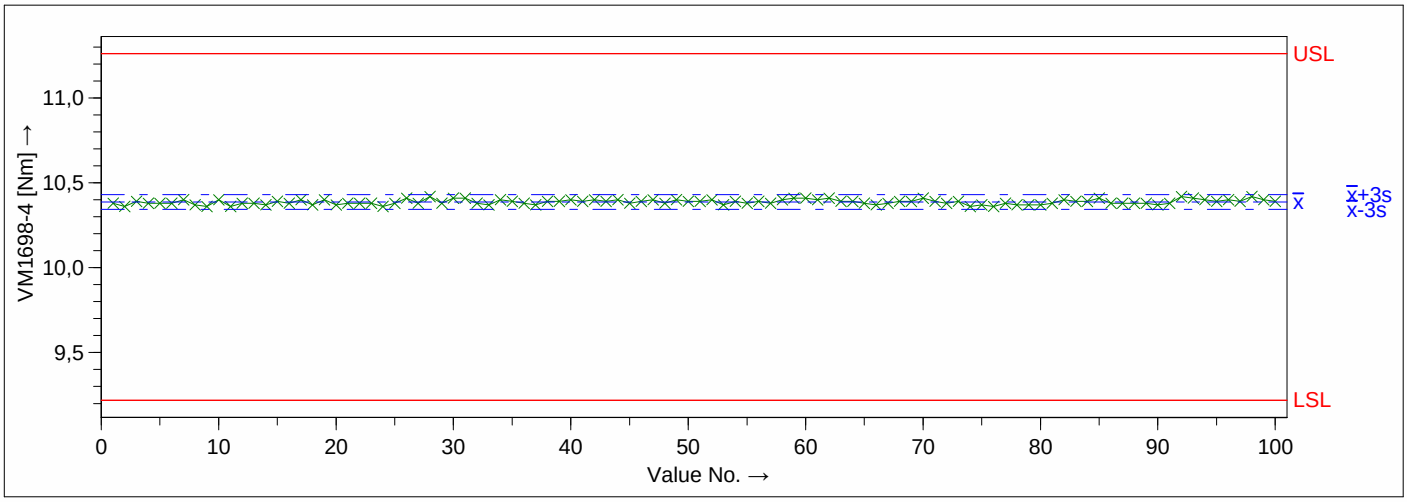
Cleco Production Tools

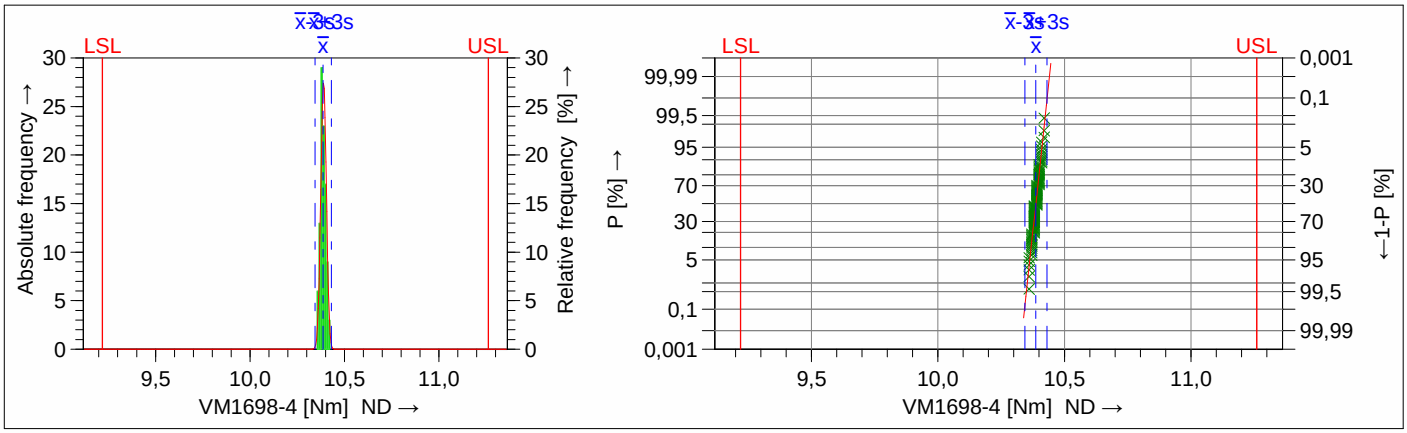
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_g	Char.Descr.	VM1698-4	Nom.val. 10,24 1,02	USL 11,26
		Serial No.	1024210	Unit Nm -1,02	LSL 9,22
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	10/1026388	nges.	100

Evaluation from 06.11.2023 11:36:54 to 06.11.2023 11:50:06

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





Drawing Values		Collected Values		Statistics	
T_m	10.24			$\bar{x}$	10.3871
LSL	9.22	x_{min}	10.36	$\bar{x}$-3s	10.3438
USL	11.26	x_{max}	10.42	$\bar{x}$+3s	10.4304
T	2.04	R	0.06	6s	0.0867
		$n_{<T>}$	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	23.54
Critical capability index	=	C_{mk}	20.14

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 06.11.2023

Serial No.	IJJ1006_g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	10,38	10,36	10,39	10,38	10,38	10,38	10,40	10,37	10,36	10,40
1024210	VM1698-4	Grad	362,50	363,00	362,75	362,00	362,75	365,00	365,50	363,00	363,00	367,25

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	10,36	10,38	10,38	10,37	10,39	10,38	10,40	10,37	10,40	10,37
1024210	VM1698-4	Grad	365,50	367,75	368,25	367,25	367,25	367,25	368,75	361,50	360,75	361,50

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	10,38	10,38	10,38	10,36	10,38	10,41	10,38	10,42	10,38	10,41
1024210	VM1698-4	Grad	359,25	363,00	360,75	359,25	362,00	364,50	362,75	364,50	361,00	362,25

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	10,41	10,38	10,37	10,40	10,39	10,38	10,37	10,39	10,39	10,40
1024210	VM1698-4	Grad	365,00	364,50	363,25	365,50	365,50	363,50	365,25	366,50	367,75	369,50

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	10,39	10,40	10,39	10,40	10,38	10,39	10,40	10,38	10,40	10,39
1024210	VM1698-4	Grad	367,75	362,50	360,25	361,75	360,25	360,75	361,75	360,75	364,25	365,00

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	10,39	10,40	10,37	10,39	10,38	10,39	10,38	10,40	10,41	10,41
1024210	VM1698-4	Grad	366,75	365,50	361,75	363,75	364,75	365,00	363,00	366,50	367,00	365,25

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	10,40	10,41	10,39	10,39	10,38	10,37	10,38	10,39	10,39	10,41
1024210	VM1698-4	Grad	366,50	366,00	366,50	365,25	366,50	365,00	364,00	366,50	366,75	367,25

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	10,39	10,38	10,39	10,36	10,37	10,36	10,38	10,37	10,37	10,37
1024210	VM1698-4	Grad	365,00	365,50	367,25	365,75	365,75	362,50	364,75	364,50	364,50	366,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_g	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	10,24
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	9,22
				USL	11,26
Remark	TQ 80% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	10,38	10,40	10,39	10,39	10,41	10,38	10,38	10,38	10,38	10,37
1024210	VM1698-4	Grad	365,75	367,75	367,25	367,25	369,00	357,25	358,25	360,50	359,00	359,50

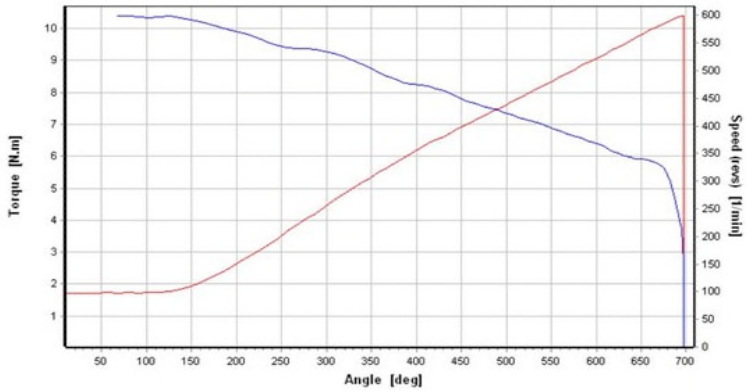
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	10,38	10,42	10,41	10,40	10,39	10,40	10,39	10,42	10,40	10,39
1024210	VM1698-4	Grad	357,75	363,50	363,75	361,75	361,00	360,75	360,00	364,25	361,75	361,25

Torque graphs

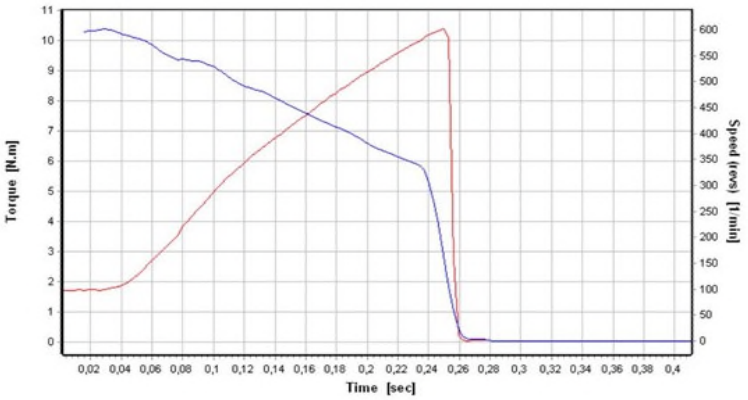
Machine Capability Study 80 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

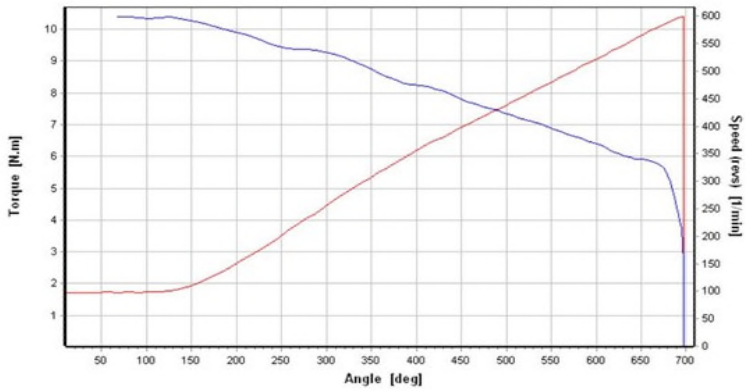
Angle degree: **360°**
Test torque: **10,2 Nm**



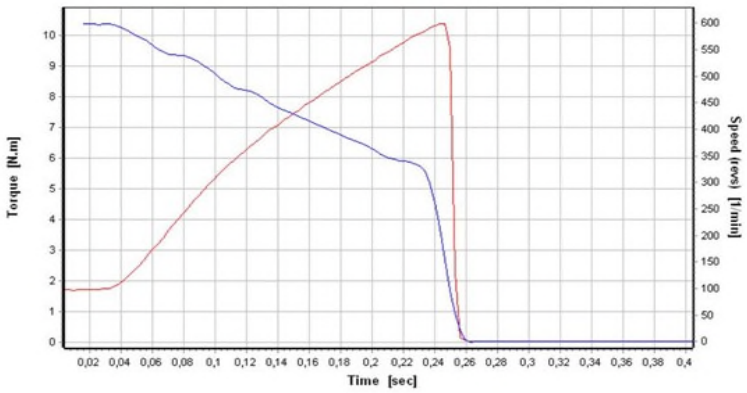
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Test sheet no. 4

Machine Capability Study 100 %

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

Manufacturer: Apex Tool Group Serial no: **IJJ1006**

Test torque: Tq max. 12,00 Nm

Hard joint (H)	69,97 Nm / Revolution	Angle degree	30°
Soft joint (L)	6,06 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	10,80 - 13,20 Nm	10,80 - 13,20 Nm
	Tolerance down / up	10 %	10 %
	Average torque	11,66 Nm	12,13 Nm
	Standard deviation	0,04 Nm	0,03 Nm
	Torque scatter (99,73%)	0,24 Nm	0,16 Nm
	C_m	9,93	15,22
	C_{mk}	7,13	13,62

b)	Min. C_m hard/soft (lowest value)	9,93
	Min. C_{mk} hard/soft (lowest value)	7,13

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

Note:

Machine Capability Study
Control System

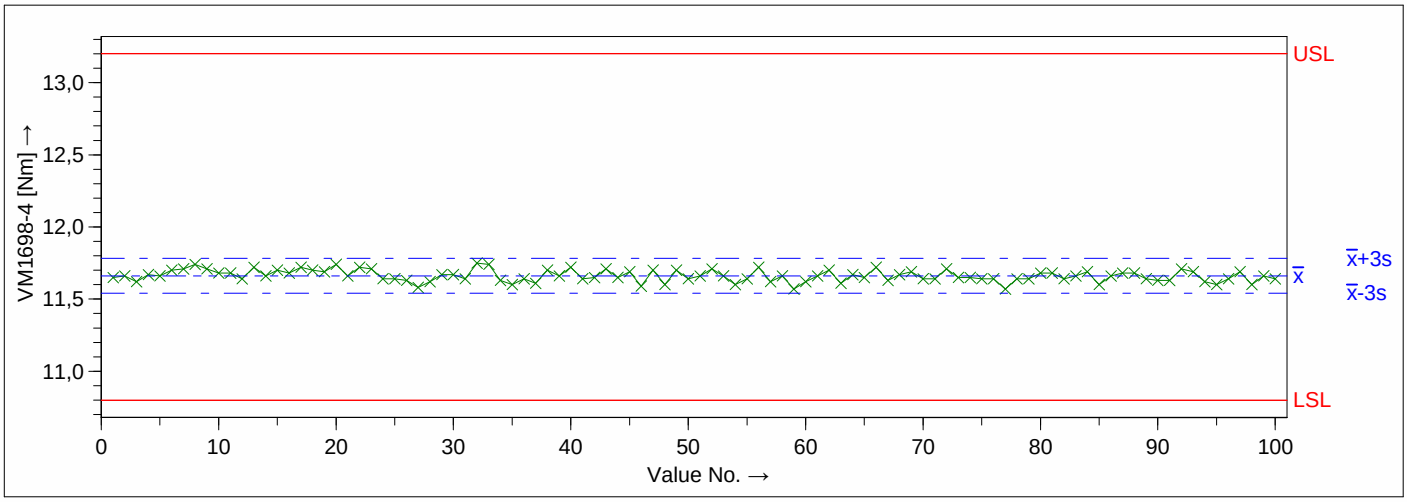
Page 1 / 1

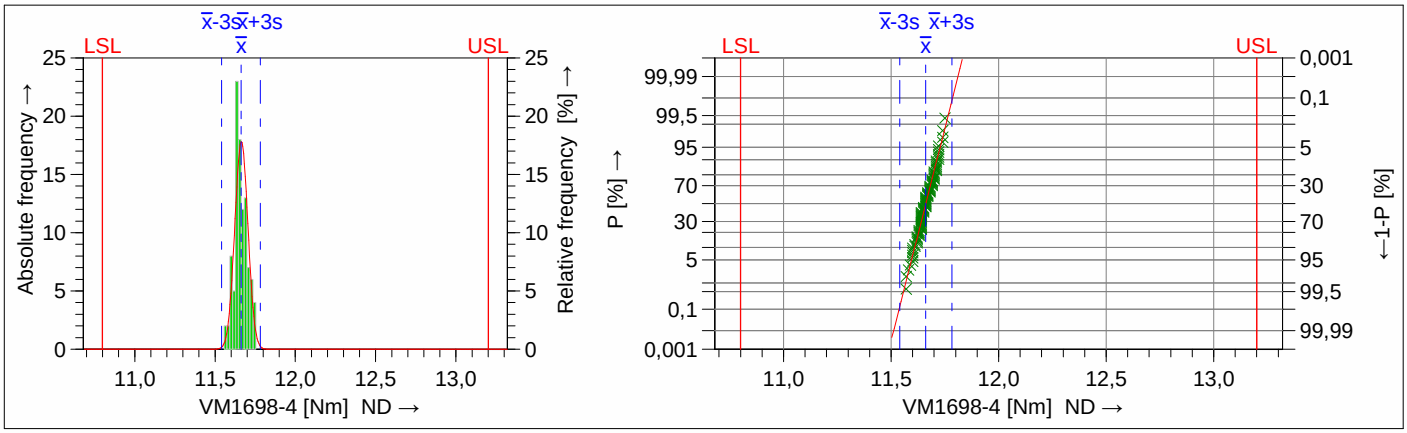
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_b	Char.Descr.	VM1698-4	Nom.val. 12,00 1,20	USL 13,20
		Serial No.	1024210	Unit Nm -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 06.11.2023 10:04:45 to 06.11.2023 10:16:18

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





Drawing Values		Collected Values		Statistics	
T_m	12.00			x̄	11.6613
LSL	10.80	x_{min}	11.57	x̄-3s	11.5405
USL	13.20	x_{max}	11.75	x̄+3s	11.7821
T	2.40	R	0.18	6s	0.2416
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution		Normal Distribution	
Calculation method		M1.1.4 $\hat{\sigma}$ = S_{tot}	
Potential Capability index	=	C_m	9.93
Critical capability index	=	C_{mk}	7.13

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 06.11.2023

Serial No.	IJJ1006_b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	11,65	11,66	11,62	11,67	11,66	11,70	11,71	11,74	11,71	11,68
1024210	VM1698-4	Grad	28,75	30,75	29,50	31,25	32,00	32,50	32,25	32,50	32,75	32,75

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	11,68	11,64	11,72	11,66	11,70	11,68	11,72	11,70	11,69	11,74
1024210	VM1698-4	Grad	32,25	33,00	32,75	31,50	30,75	32,25	32,25	31,75	32,00	33,25

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	11,66	11,72	11,71	11,64	11,64	11,63	11,58	11,62	11,67	11,67
1024210	VM1698-4	Grad	30,00	32,00	31,25	30,00	30,25	29,75	28,75	29,50	29,50	31,50

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	11,64	11,75	11,74	11,63	11,60	11,64	11,61	11,70	11,66	11,72
1024210	VM1698-4	Grad	31,75	32,25	32,00	31,00	30,50	30,25	29,25	31,75	31,75	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	11,64	11,65	11,71	11,65	11,69	11,59	11,70	11,60	11,70	11,64
1024210	VM1698-4	Grad	29,50	30,75	30,75	29,75	31,75	29,00	31,50	29,75	31,50	29,50

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	11,66	11,71	11,66	11,60	11,64	11,72	11,62	11,66	11,57	11,62
1024210	VM1698-4	Grad	31,00	31,25	31,25	30,25	29,50	30,75	29,00	31,50	29,00	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	11,66	11,70	11,61	11,67	11,65	11,72	11,63	11,67	11,69	11,64
1024210	VM1698-4	Grad	31,25	32,00	30,50	31,75	30,75	32,25	30,50	31,50	32,50	31,50

Char.No.	Char.Descr.	Unit	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	Nm	11,64	11,71	11,65	11,65	11,64	11,64	11,57	11,64	11,64	11,68
1024210	VM1698-4	Grad	31,50	32,50	30,50	31,00	31,00	30,75	28,75	31,50	32,25	29,50

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_b	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% hard +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	11,68	11,64	11,66	11,69	11,60	11,66	11,68	11,68	11,64	11,63
1024210	VM1698-4	Grad	31,25	30,00	30,75	31,75	28,25	30,50	30,75	30,00	31,25	30,25

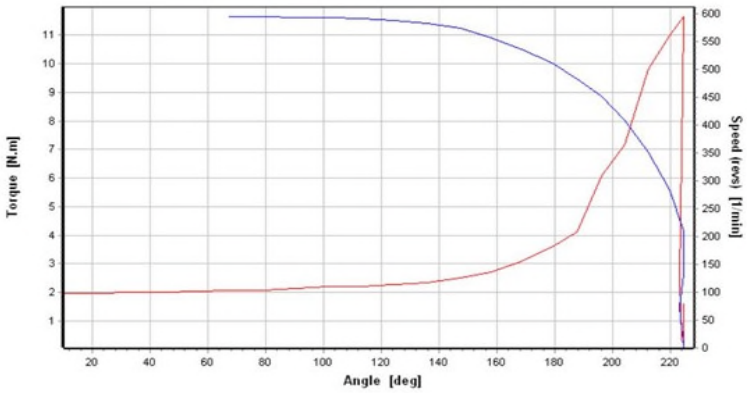
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	11,63	11,71	11,69	11,62	11,60	11,64	11,69	11,60	11,66	11,64
1024210	VM1698-4	Grad	28,25	31,00	30,75	29,00	27,75	30,75	28,75	28,75	30,25	30,00

Torque graphs

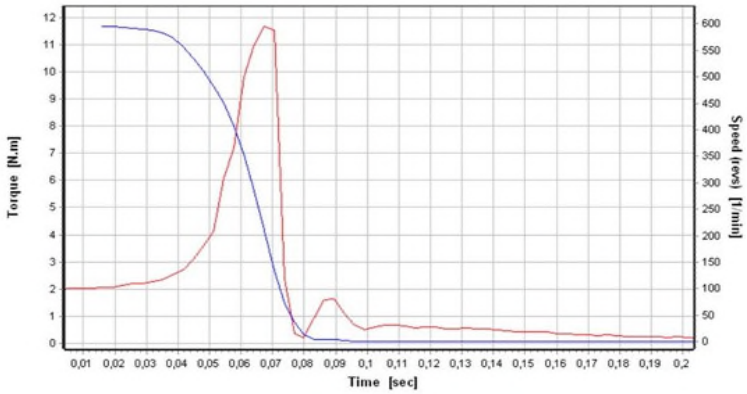
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

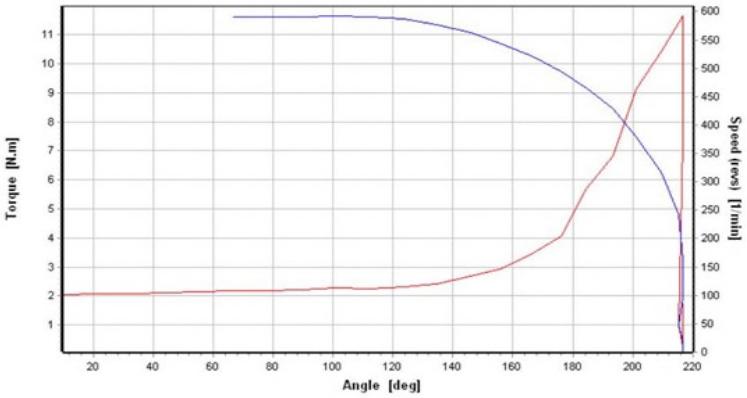
Angle degree: **30°**
Test torque: **12,0 Nm**



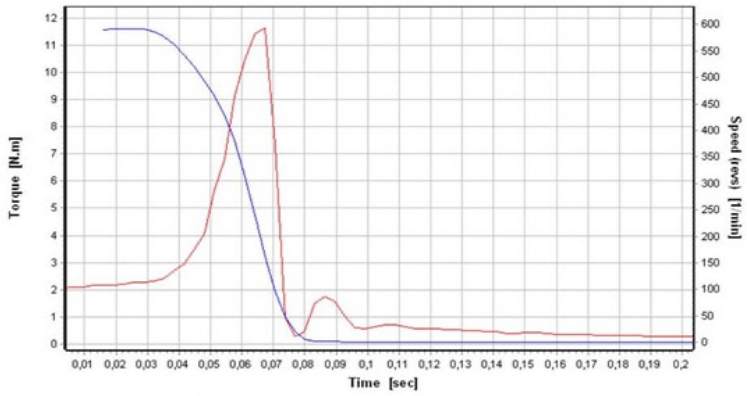
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed

Machine Capability Study
Control System

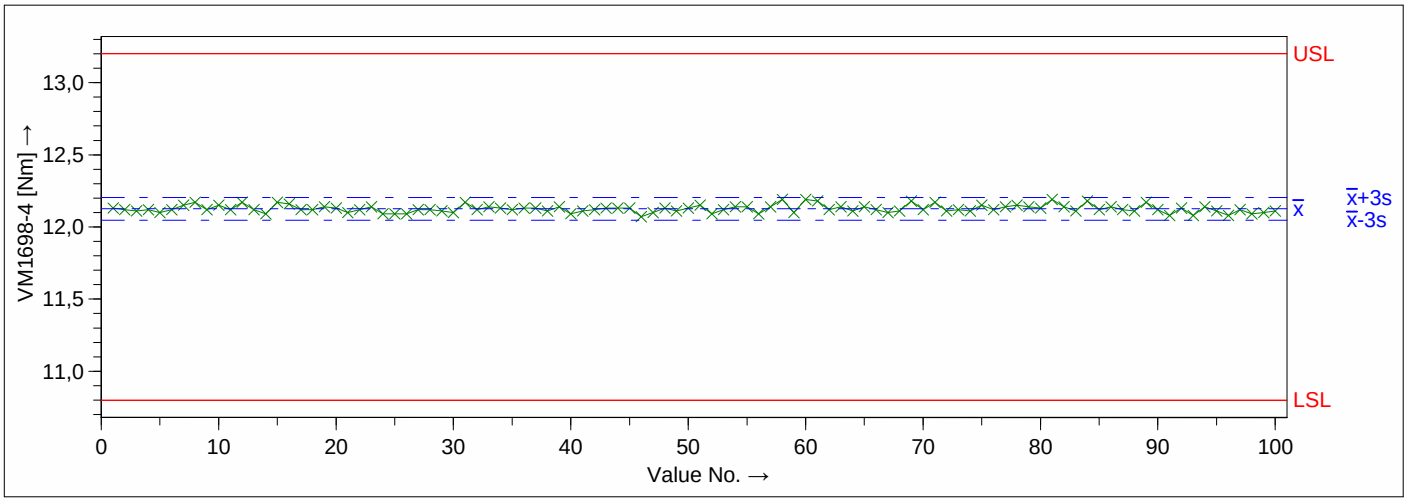
Cleco Production Tools

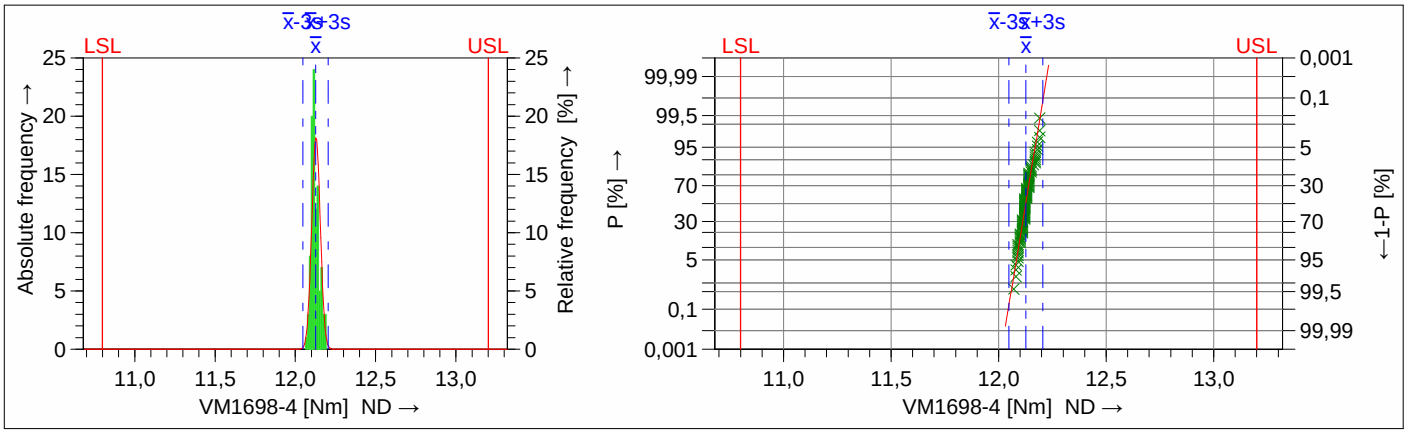
Plant	ATG Westhausen	Operator Name	Ederer
Date	06.11.2023		

Ord. No.	CLBP12Q	Part type	CLBP12Q	Contr.item	yes
Serial No.	IJJ1006_a	Char.Descr.	VM1698-4	Nom.val. 12,00 / 1,20	USL 13,20
		Serial No.	1024210	Unit Nm / -1,20	LSL 10,80
Char.Type	variable			Tolerance value 10 %	Decimal Pl. 2
Cust.Name	ATG	Reference System	VM1698-4	Test Electronic	MPRO400GCD-P
Contr.No.	Homologation	Reference Transducer	50/1024729	nges.	100

Evaluation from 06.11.2023 08:44:06 to 06.11.2023 08:59:48

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





Drawing Values		Collected Values		Statistics	
T_m	12.00			$\bar{x}$	12.1260
LSL	10.80	x_{min}	12.07	$\bar{x}$-3s	12.0471
USL	13.20	x_{max}	12.19	$\bar{x}$+3s	12.2049
T	2.40	R	0.12	6s	0.1577
		$n_{<T>}$	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	15.22
Critical capability index	=	C_{mk}	13.62

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	Nm	12,13	12,12	12,11	12,12	12,10	12,12	12,15	12,17	12,12	12,15
1024210	VM1698-4	Grad	359,25	361,00	360,00	370,00	356,50	362,75	371,00	374,25	368,75	371,50

Char.No.	Char.Descr.	Unit	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	Nm	12,12	12,17	12,12	12,09	12,17	12,16	12,12	12,12	12,14	12,13
1024210	VM1698-4	Grad	351,50	364,50	353,25	352,75	368,25	369,75	357,50	356,50	359,75	370,25

Char.No.	Char.Descr.	Unit	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	Nm	12,10	12,12	12,14	12,09	12,09	12,09	12,12	12,12	12,11	12,10
1024210	VM1698-4	Grad	361,50	364,00	370,25	348,25	356,50	362,75	357,00	361,75	351,75	367,50

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	12,17	12,12	12,14	12,13	12,12	12,13	12,13	12,11	12,14	12,09
1024210	VM1698-4	Grad	374,50	367,50	366,75	365,50	363,00	361,25	356,75	359,00	366,50	359,75

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	12,11	12,12	12,13	12,13	12,13	12,07	12,10	12,13	12,11	12,13
1024210	VM1698-4	Grad	366,50	334,50	363,50	356,50	362,75	355,25	361,25	367,00	357,25	372,75

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	12,15	12,09	12,12	12,14	12,14	12,09	12,14	12,19	12,10	12,19
1024210	VM1698-4	Grad	365,00	363,50	372,00	363,00	367,00	362,75	374,00	375,75	359,75	368,25

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	12,18	12,12	12,14	12,11	12,14	12,12	12,10	12,11	12,18	12,12
1024210	VM1698-4	Grad	369,00	363,25	371,50	360,50	372,50	359,25	370,50	359,00	368,75	369,25

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	12,17	12,11	12,12	12,11	12,15	12,12	12,14	12,15	12,14	12,13
1024210	VM1698-4	Grad	370,25	361,00	366,00	361,50	363,25	357,00	370,75	361,50	371,00	359,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Ederer	Date 06.11.2023

Serial No.	IJJ1006_a	Characteristic			
Part type	CLBP12Q	Char.Descr.	VM1698-4	Nom.val.	12,00
Ord. No.	CLBP12Q	Serial No.	1024210	LSL	10,80
				USL	13,20
Remark	TQ 100% soft +/-10% * Speed: 600 rpm;				

Char.No.	Char.Descr.	Unit	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	Nm	12,19	12,14	12,11	12,18	12,12	12,14	12,12	12,11	12,17	12,12
1024210	VM1698-4	Grad	363,25	354,25	361,25	365,50	358,75	370,00	355,25	361,50	367,50	349,25

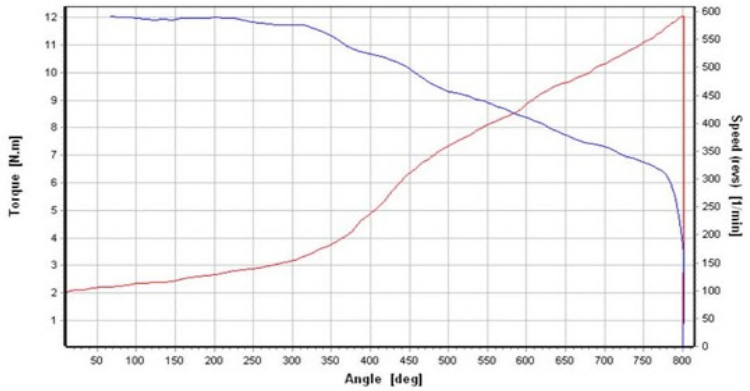
Char.No.	Char.Descr.	Unit	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	Nm	12,08	12,13	12,08	12,14	12,11	12,08	12,12	12,09	12,10	12,11
1024210	VM1698-4	Grad	355,50	348,00	354,25	370,00	355,25	353,00	351,50	356,75	357,50	336,00

Torque graphs

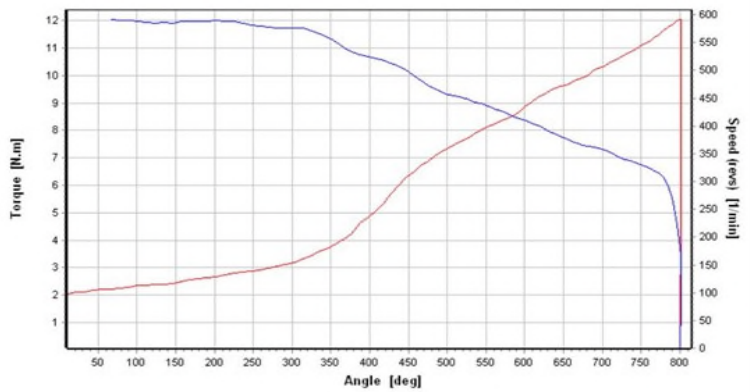
Machine Capability Study 100 %

Model: **CLBP12Q**
Serial no: **IJJ1006**

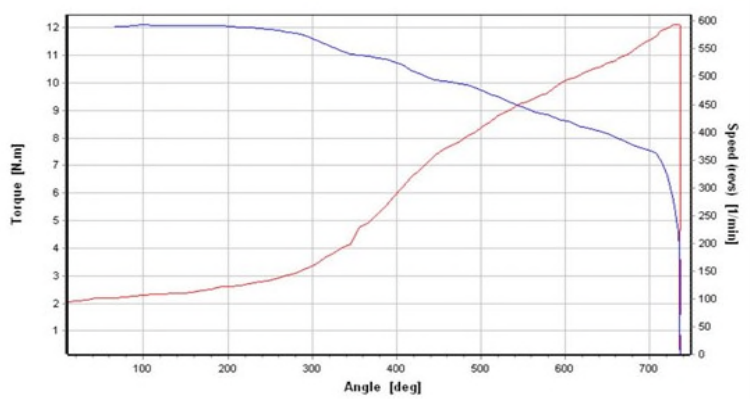
Angle degree: **360°**
Test torque: **12,0 Nm**



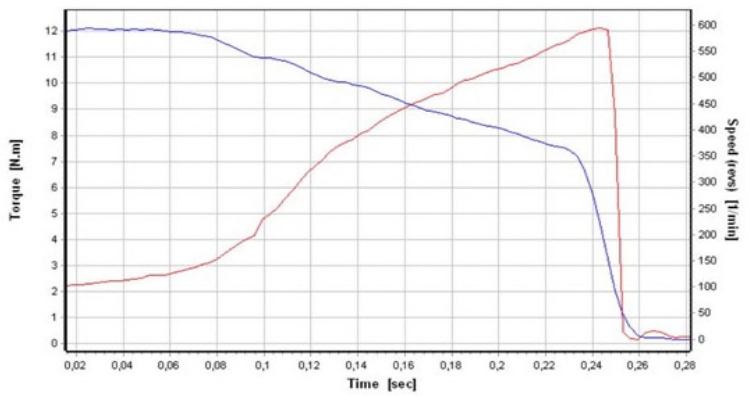
Value no. 1
Graph
Torque / Angle / Speed



Value no. 1
Graph
Torque / Time / Speed



Value no. 100
Graph
Torque / Angle / Speed



Value no. 100
Graph
Torque / Time / Speed