Homologation

LiveWire Tool

Type: Cleco-17BPYPB13QL

Serial no.: 737459

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Homologation: Cleco-17BPYPB13QL SN: 737459

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Investigation no.: 010/2017
Date: 25.09.2017

Test sheet no. 2

Machine Capability Study 30 %

Multi-stage tightening system	☑	Speed 50 rpm	5.4 %
Single-stage tightening system	☐	Speed 100 %	629 rpm

Manufacturer: Apex Tool Group GmbH Serial no: **737459**

Test torque: Tq min. + 0.3 (Tq max. - Tq min.) 6.00 Nm with 26 volt battery

Hard joint (H)	35.87 Nm / Revolution	Angle degree	30°
Soft joint (L)	2.92 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	5.58 - 6.42 Nm	5.58 - 6.42 Nm
	Tolerance down / up	7 %	7 %
	Average torque	5.98 Nm	5.84 Nm
	Standard deviation	0.04 Nm	0.02 Nm
	Torque scatter (99,73%)	0.23 Nm	0.11 Nm
	C_m	3.66	7.50
	C_{mk}	3.46	4.64

b)	Min. C_m hard/soft (lowest value)	3.66
	Min. C_{mk} hard/soft (lowest value)	3.46

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

Note:

Machine Capability Study
Control System

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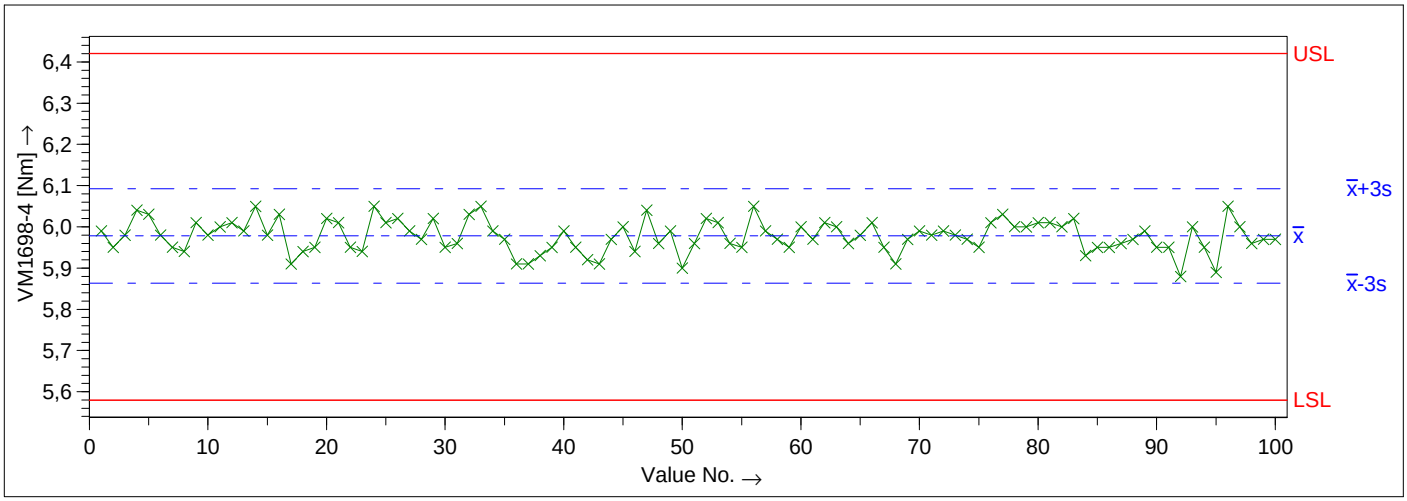
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

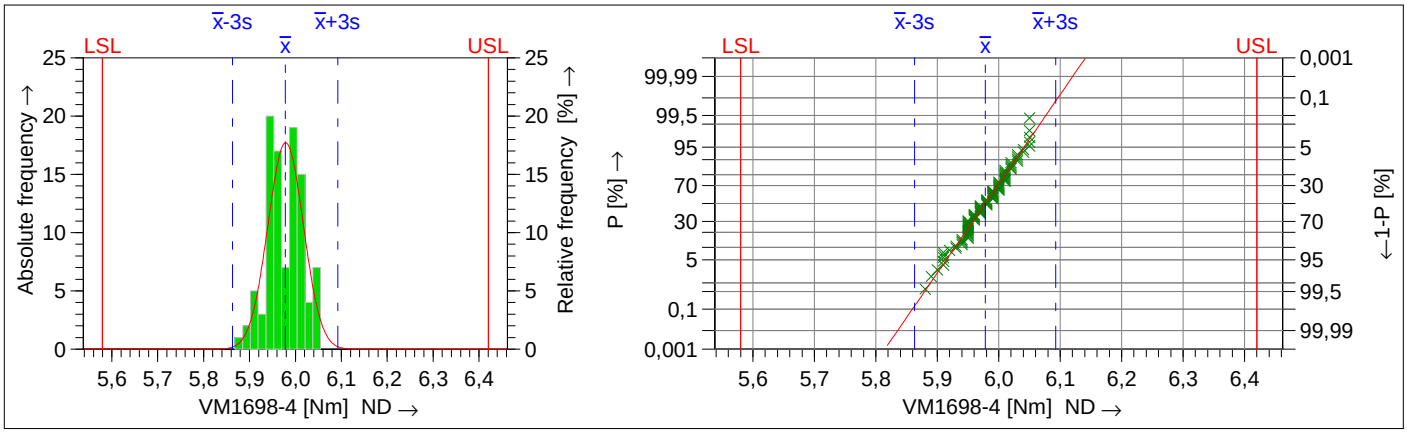
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459d	Char.Descr. VM1698-4	Inspection Val.	6,00	0,42	USL 6,42
	Serial No. 1024210	Unit	Nm	-0,42	LSL 5,58
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100

Evaluation from 20.09.2017 10:28:13 to 20.09.2017 10:48:17

Rem. Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	6.00			$\bar{x}$	5.9779
LSL	5.58	x_{min}	5.88	$\bar{x}$-3s	5.8631
USL	6.42	x_{max}	6.05	$\bar{x}$+3s	6.0927
T	0.84	R	0.17	6s	0.2297
		$n_{<T>}$	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	3.66
Critical capability index	=	C_{mk}	3.46

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459d	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	5,58
				USL	6,42
Remark	Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	5,99	5,95	5,98	6,04	6,03	5,98	5,95	5,94	6,01	5,98
1024210	VM1698-4	30,50	29,75	30,25	30,50	31,00	30,50	30,00	30,25	30,75	30,25

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	6,00	6,01	5,99	6,05	5,98	6,03	5,91	5,94	5,95	6,02
1024210	VM1698-4	30,25	30,25	30,25	31,00	30,25	30,25	29,25	30,00	30,00	31,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	6,01	5,95	5,94	6,05	6,01	6,02	5,99	5,97	6,02	5,95
1024210	VM1698-4	30,50	30,25	29,75	30,75	30,75	31,25	30,50	30,25	30,75	30,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	5,96	6,03	6,05	5,99	5,97	5,91	5,91	5,93	5,95	5,99
1024210	VM1698-4	30,50	31,00	30,75	30,00	30,50	29,75	30,00	30,25	29,75	30,25

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	5,95	5,92	5,91	5,97	6,00	5,94	6,04	5,96	5,99	5,90
1024210	VM1698-4	30,50	29,75	29,75	30,25	30,50	30,25	30,75	30,00	30,75	29,50

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	5,96	6,02	6,01	5,96	5,95	6,05	5,99	5,97	5,95	6,00
1024210	VM1698-4	30,25	30,50	30,75	30,25	30,25	31,50	30,75	30,25	30,00	30,75

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	5,97	6,01	6,00	5,96	5,98	6,01	5,95	5,91	5,97	5,99
1024210	VM1698-4	30,50	30,50	30,75	30,25	30,25	30,50	30,25	30,00	30,00	30,75

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	5,98	5,99	5,98	5,97	5,95	6,01	6,03	6,00	6,00	6,01
1024210	VM1698-4	30,75	30,50	30,25	30,50	30,00	30,75	30,50	30,75	31,00	31,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459d	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	5,58
				USL	6,42
Remark	Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	6,01	6,00	6,02	5,93	5,95	5,95	5,96	5,97	5,99	5,95
1024210	VM1698-4	30,25	30,00	30,25	30,25	30,25	29,75	30,00	29,75	30,50	30,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	5,95	5,88	6,00	5,95	5,89	6,05	6,00	5,96	5,97	5,97
1024210	VM1698-4	30,00	29,00	30,25	29,50	29,50	31,00	30,25	30,00	30,00	30,25

Machine Capability Study
Tool System

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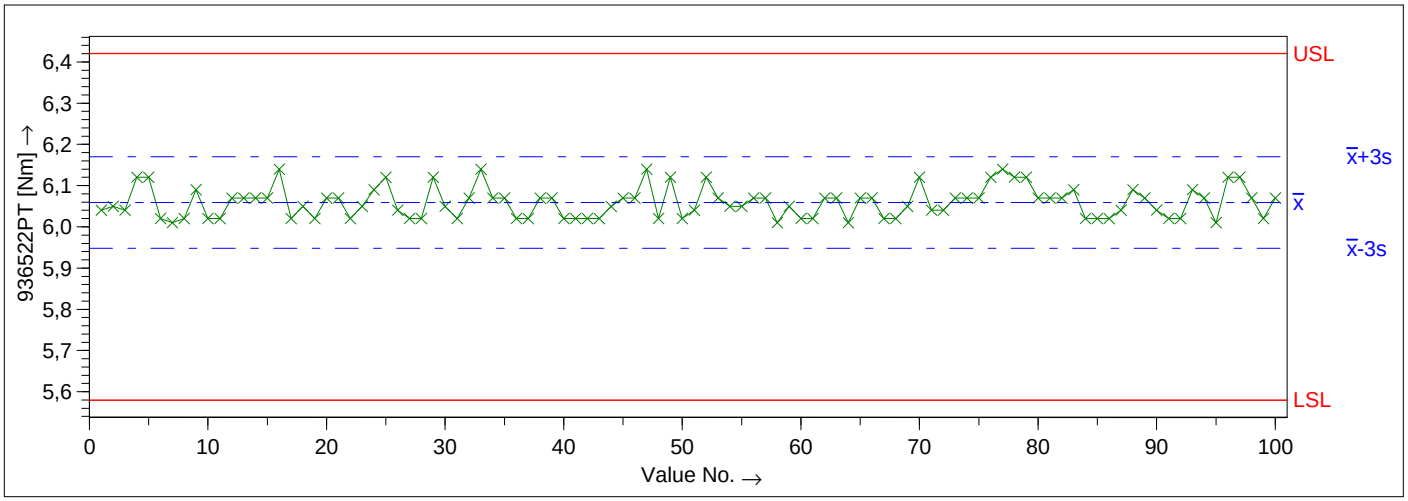
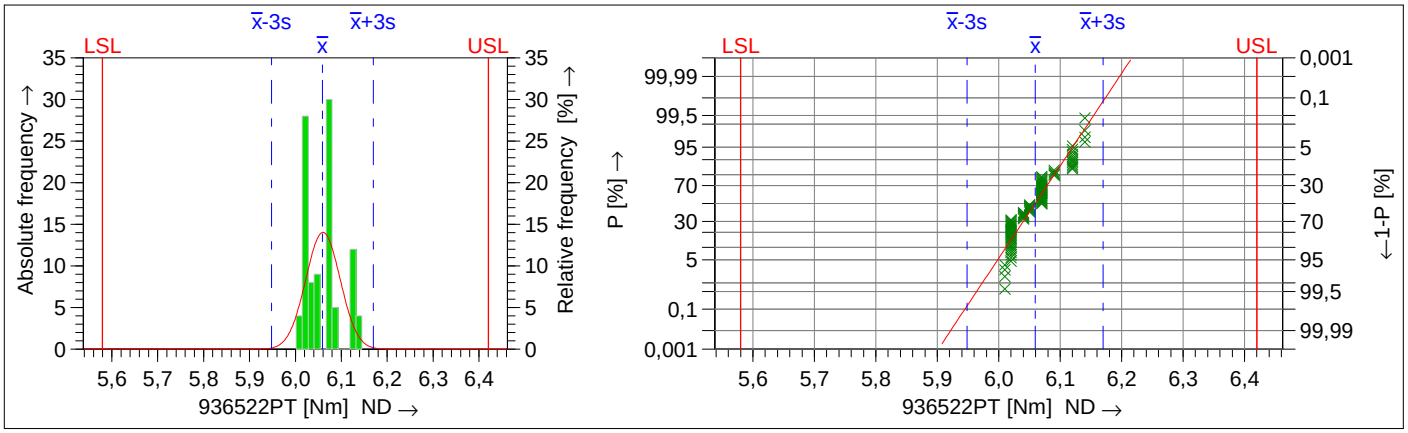
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459d	Char.Descr. 936522PT	Inspection Val.	6,00	0,42	USL 6,42
	Serial No. 154551	Unit	Nm	-0,42	LSL 5,58
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE			
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100			

Evaluation from 20.09.2017 10:28:16 to 20.09.2017 10:48:21

Rem. Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	6.00			$\bar{x}$	6.0592
LSL	5.58	x_{min}	6.01	$\bar{x}$-3s	5.9484
USL	6.42	x_{max}	6.14	$\bar{x}$+3s	6.1700
T	0.84	R	0.13	6s	0.2217
		$n_{<T>}$	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	3.79
Critical capability index	=	C_{mk}	3.26

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459d	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	5,58
				USL	6,42
Remark	Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	6,04	6,05	6,04	6,12	6,12	6,02	6,01	6,02	6,09	6,02
154551	936522PT	31,00	31,00	31,00	31,00	31,00	31,00	31,00	30,00	31,00	30,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	6,02	6,07	6,07	6,07	6,07	6,14	6,02	6,05	6,02	6,07
154551	936522PT	31,00	31,00	30,00	32,00	31,00	31,00	30,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	6,07	6,02	6,05	6,09	6,12	6,04	6,02	6,02	6,12	6,05
154551	936522PT	31,00	31,00	30,00	31,00	32,00	31,00	31,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	6,02	6,07	6,14	6,07	6,07	6,02	6,02	6,07	6,07	6,02
154551	936522PT	31,00	31,00	32,00	31,00	31,00	30,00	31,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	6,02	6,02	6,02	6,05	6,07	6,07	6,14	6,02	6,12	6,02
154551	936522PT	31,00	30,00	31,00	32,00	31,00	31,00	31,00	31,00	31,00	30,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	6,04	6,12	6,07	6,05	6,05	6,07	6,07	6,01	6,05	6,02
154551	936522PT	31,00	31,00	31,00	31,00	31,00	32,00	32,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	6,02	6,07	6,07	6,01	6,07	6,07	6,02	6,02	6,05	6,12
154551	936522PT	31,00	31,00	32,00	31,00	31,00	31,00	31,00	30,00	31,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	6,04	6,04	6,07	6,07	6,07	6,12	6,14	6,12	6,12	6,07
154551	936522PT	31,00	31,00	31,00	31,00	30,00	32,00	31,00	31,00	31,00	31,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459d	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	5,58
				USL	6,42
Remark	Tq. 30% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	6,07	6,07	6,09	6,02	6,02	6,02	6,04	6,09	6,07	6,04
154551	936522PT	31,00	30,00	31,00	31,00	30,00	30,00	31,00	30,00	31,00	31,00

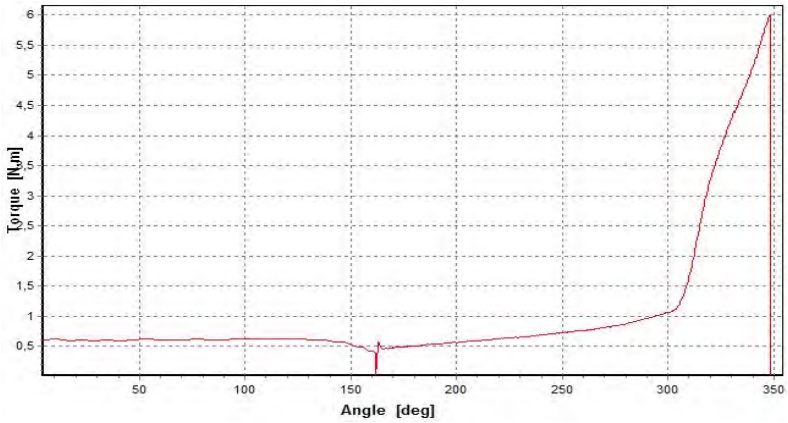
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	6,02	6,02	6,09	6,07	6,01	6,12	6,12	6,07	6,02	6,07
154551	936522PT	31,00	30,00	31,00	31,00	30,00	32,00	31,00	31,00	30,00	30,00

Torque graphs

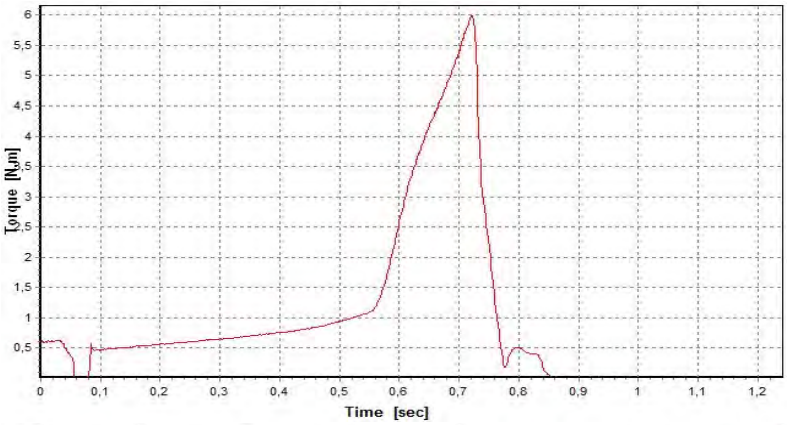
Machine Capability Study 30 %

Model: **17BPYPB13QL**
Serial no: **737459**

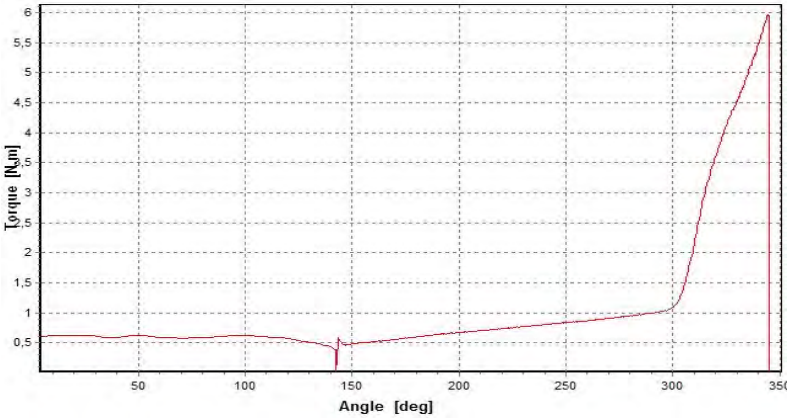
Angle degree: **30°**
Test torque: **6.0 Nm**



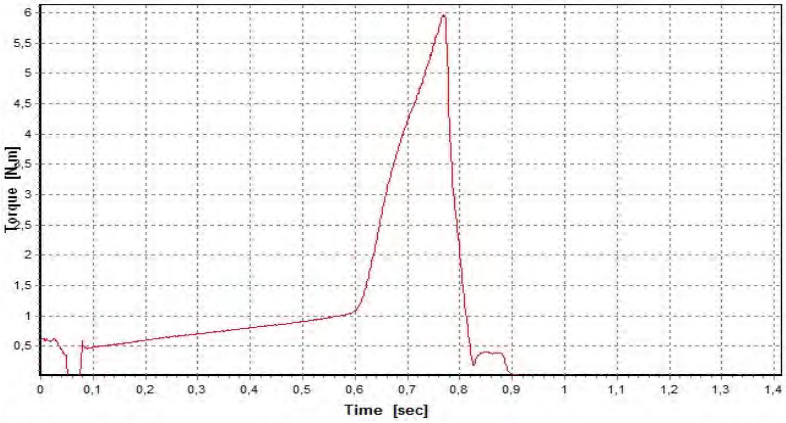
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Machine Capability Study
Control System

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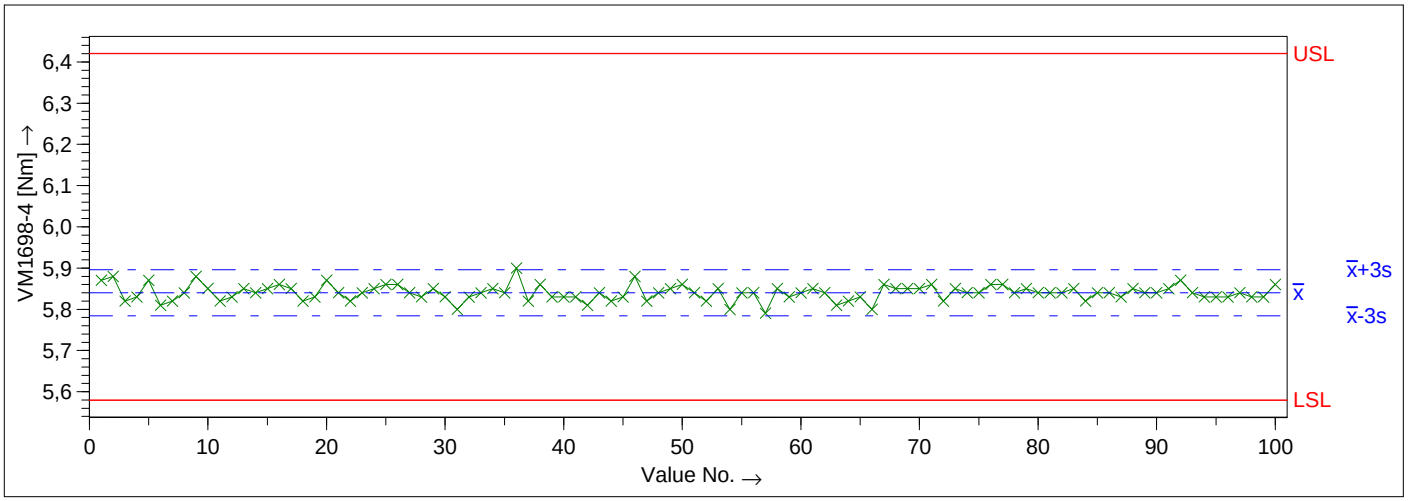
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

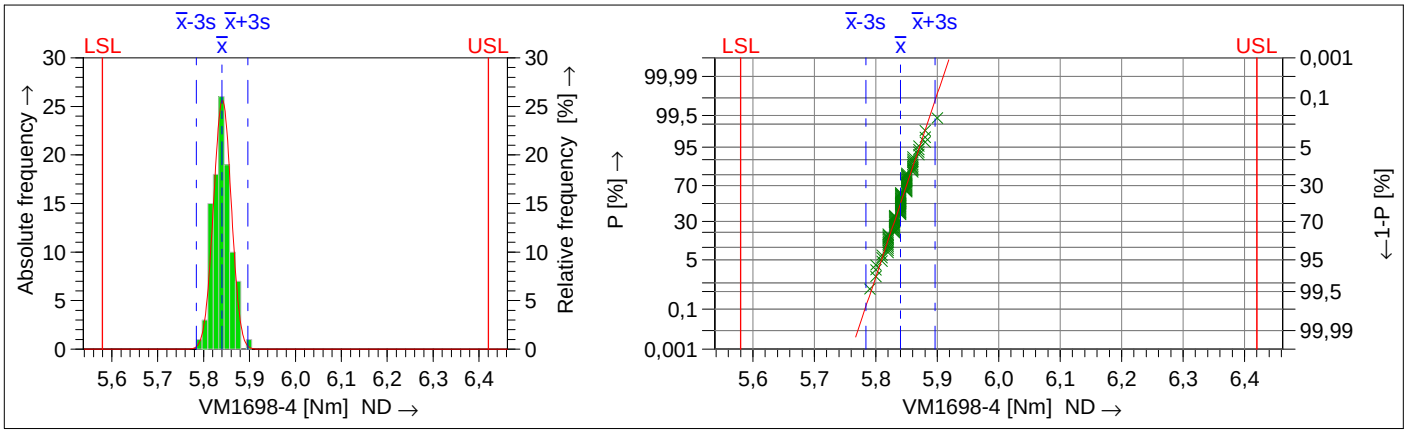
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459c	Char.Descr. VM1698-4	Inspection Val.	6,00	0,42	USL 6,42
	Serial No. 1024210	Unit	Nm	-0,42	LSL 5,58
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100

Evaluation from 20.09.2017 10:50:51 to 20.09.2017 11:12:00

Rem. Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	6.00			$\bar{x}$	5.8401
LSL	5.58	x_{min}	5.79	$\bar{x}$-3s	5.7841
USL	6.42	x_{max}	5.90	$\bar{x}$+3s	5.8961
T	0.84	R	0.11	6s	0.1120
		$n_{<T>}$	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	7.50
Critical capability index	=	C_{mk}	4.64

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2017\737459cM.DFD

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459c	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	5,58
				USL	6,42
Remark	Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	5,87	5,88	5,82	5,83	5,87	5,81	5,82	5,84	5,88	5,85
1024210	VM1698-4	363,75	370,25	362,50	364,00	373,00	362,50	365,50	360,75	371,50	364,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	5,82	5,83	5,85	5,84	5,85	5,86	5,85	5,82	5,83	5,87
1024210	VM1698-4	362,50	365,50	364,50	367,25	368,25	370,25	368,25	358,50	358,50	365,25

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	5,84	5,82	5,84	5,85	5,86	5,86	5,84	5,83	5,85	5,83
1024210	VM1698-4	361,00	359,25	361,50	362,00	363,75	365,75	358,50	362,50	364,75	357,25

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	5,80	5,83	5,84	5,85	5,84	5,90	5,82	5,86	5,83	5,83
1024210	VM1698-4	357,75	361,50	357,25	363,00	362,75	371,00	355,25	363,50	361,75	359,25

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	5,83	5,81	5,84	5,82	5,83	5,88	5,82	5,84	5,85	5,86
1024210	VM1698-4	363,50	355,50	363,25	364,25	355,50	367,75	360,50	364,00	364,75	363,50

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	5,84	5,82	5,85	5,80	5,84	5,84	5,79	5,85	5,83	5,84
1024210	VM1698-4	359,75	361,00	363,75	357,75	359,50	363,75	356,75	366,50	362,50	357,25

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	5,85	5,84	5,81	5,82	5,83	5,80	5,86	5,85	5,85	5,85
1024210	VM1698-4	361,00	360,75	358,75	361,25	354,00	359,25	360,50	365,00	360,00	365,50

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	5,86	5,82	5,85	5,84	5,84	5,86	5,86	5,84	5,85	5,84
1024210	VM1698-4	365,25	359,75	359,25	361,50	361,50	365,25	363,50	361,75	363,25	363,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459c	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	5,58
				USL	6,42
Remark	Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	5,84	5,84	5,85	5,82	5,84	5,84	5,83	5,85	5,84	5,84
1024210	VM1698-4	360,25	362,75	361,50	359,50	363,75	362,25	362,00	362,50	361,75	363,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	5,85	5,87	5,84	5,83	5,83	5,83	5,84	5,83	5,83	5,86
1024210	VM1698-4	365,75	365,25	362,75	363,00	362,25	363,25	361,25	360,25	360,00	364,00

Machine Capability Study
Tool System

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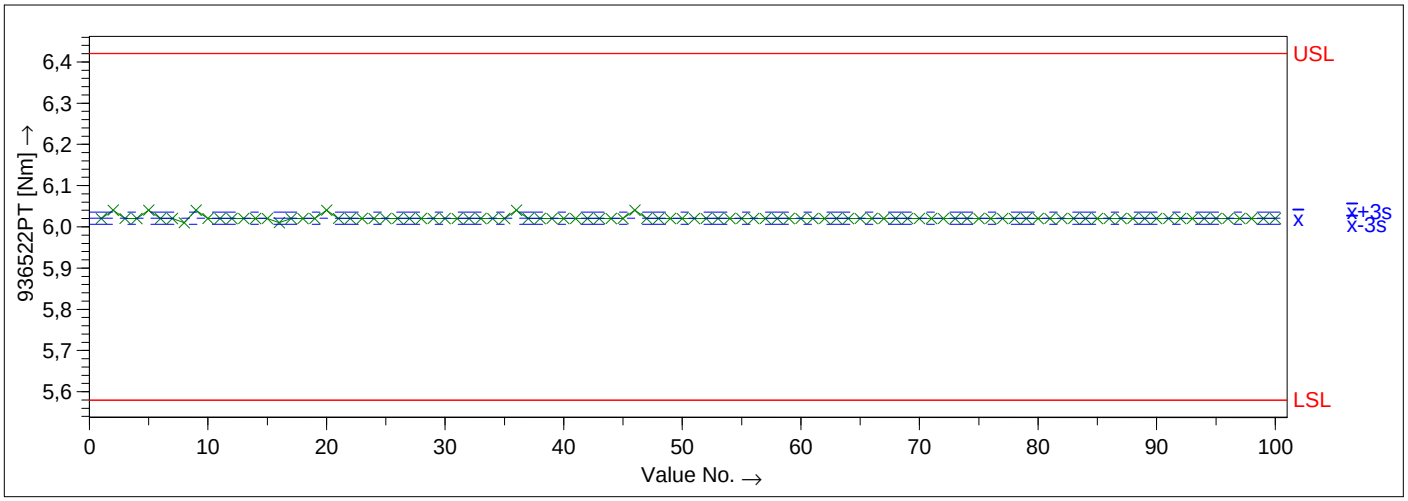
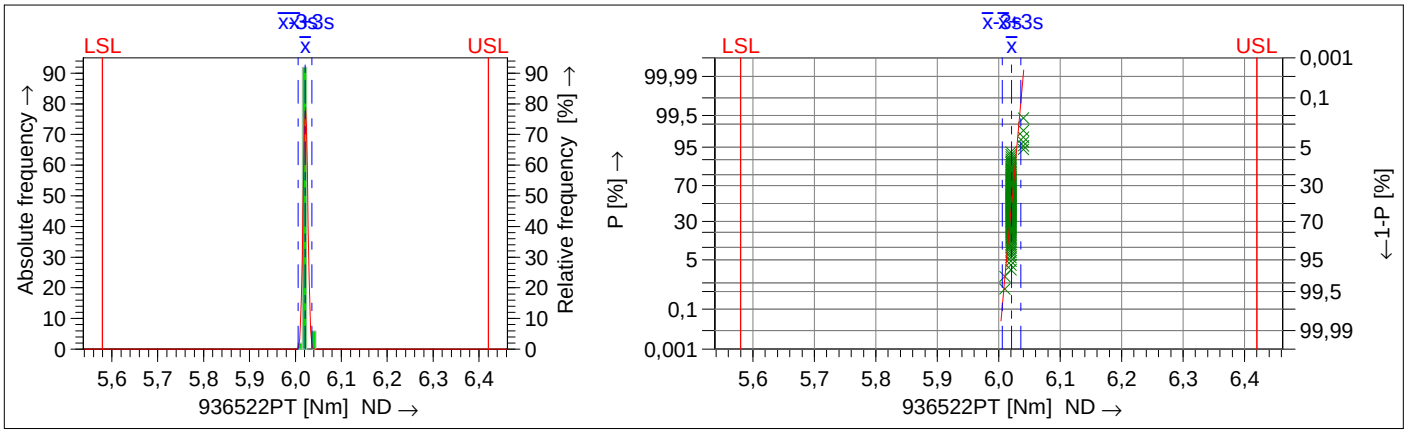
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459c	Char.Descr. 936522PT	Inspection Val.	6,00	0,42	USL 6,42
	Serial No. 154551	Unit	Nm	-0,42	LSL 5,58
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE			
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100			

Evaluation from 20.09.2017 10:50:55 to 20.09.2017 11:12:04

Rem. Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	6.00			$\bar{x}$	6.0210
LSL	5.58	x_{min}	6.01	$\bar{x}$-3s	6.0059
USL	6.42	x_{max}	6.04	$\bar{x}$+3s	6.0361
T	0.84	R	0.03	6s	0.0302
		$n_{<T>}$	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	27.86
Critical capability index	=	C_{mk}	26.47

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2017\737459c1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459c	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	5,58
				USL	6,42
Remark	Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	6,02	6,04	6,02	6,02	6,04	6,02	6,02	6,01	6,04	6,02
154551	936522PT	370,00	370,00	371,00	371,00	371,00	370,00	370,00	368,00	369,00	370,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,01	6,02	6,02	6,02	6,04
154551	936522PT	369,00	371,00	370,00	376,00	376,00	378,00	377,00	362,00	365,00	368,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	369,00	369,00	369,00	369,00	370,00	369,00	367,00	369,00	370,00	369,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,04	6,02	6,02	6,02	6,02
154551	936522PT	363,00	368,00	362,00	370,00	369,00	369,00	362,00	370,00	369,00	364,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,04	6,02	6,02	6,02	6,02
154551	936522PT	369,00	362,00	369,00	370,00	362,00	369,00	364,00	368,00	371,00	368,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	368,00	369,00	370,00	364,00	368,00	369,00	363,00	370,00	370,00	364,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	367,00	369,00	368,00	369,00	361,00	364,00	366,00	369,00	369,00	370,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	376,00	364,00	366,00	369,00	369,00	374,00	369,00	369,00	368,00	370,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459c	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	6,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	5,58
				USL	6,42
Remark	Tq. 30% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	367,00	369,00	368,00	369,00	369,00	369,00	370,00	368,00	369,00	369,00

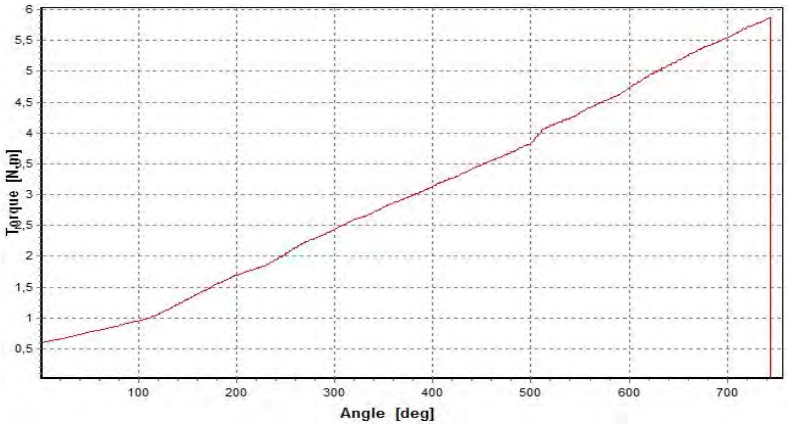
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02	6,02
154551	936522PT	376,00	369,00	370,00	370,00	369,00	375,00	369,00	369,00	368,00	369,00

Torque graphs

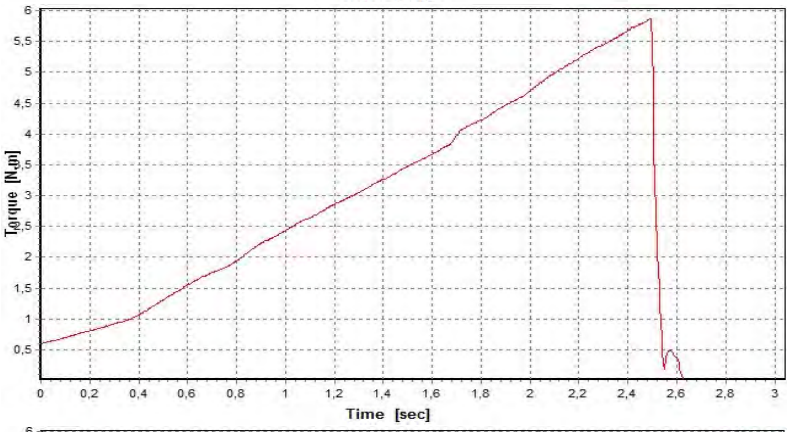
Machine Capability Study 30 %

Model: **17BPYPB13QL**
Serial no: **737459**

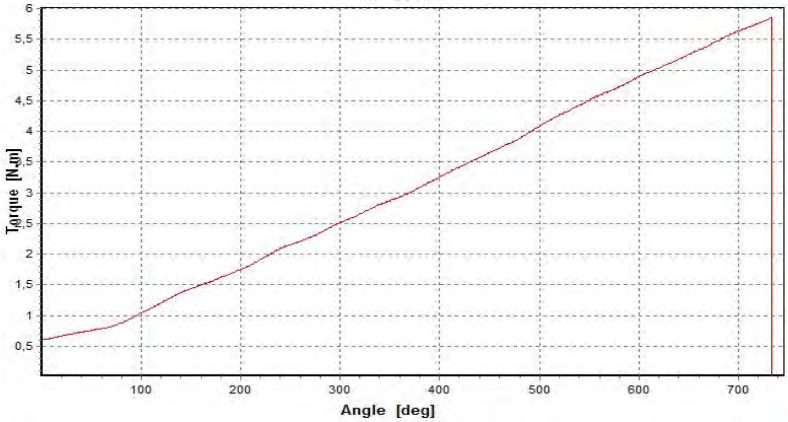
Angle degree: **360°**
Test torque: **6.0 Nm**



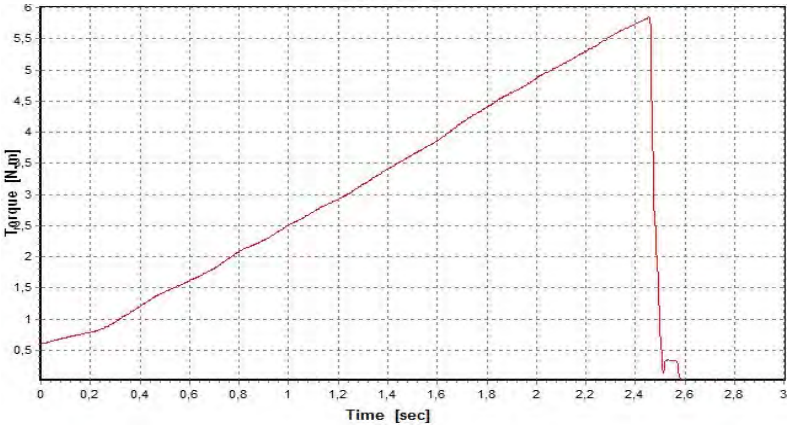
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Investigation no.: 010/2017
Date: 25.09.2017

Test sheet no. 3

Machine Capability Study 80 %

Multi-stage tightening system	☑	Speed 50 rpm	5.4 %
Single-stage tightening system	☐	Speed 100 %	629 rpm

Manufacturer: Apex Tool Group GmbH Serial no: **737459**

Test torque: Tq min. + 0.8 (Tq max. - Tq min.) 11.00 Nm with 26 volt battery

Hard joint (H)	66.21 Nm / Revolution	Angle degree	30°
Soft joint (L)	5.45 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	10.23 - 11.77 Nm	10.23 - 11.77 Nm
	Tolerance down / up	7 %	7 %
	Average torque	11.03 Nm	10.91 Nm
	Standard deviation	0.05 Nm	0.04 Nm
	Torque scatter (99,73%)	0.29 Nm	0.25 Nm
	C_m	5.27	6.04
	C_{mk}	5.04	5.32

b) Min. C_m hard/soft (lowest value) 5.27
Min. C_{mk} hard/soft (lowest value) 5.04

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

Note:

Machine Capability Study
Control System

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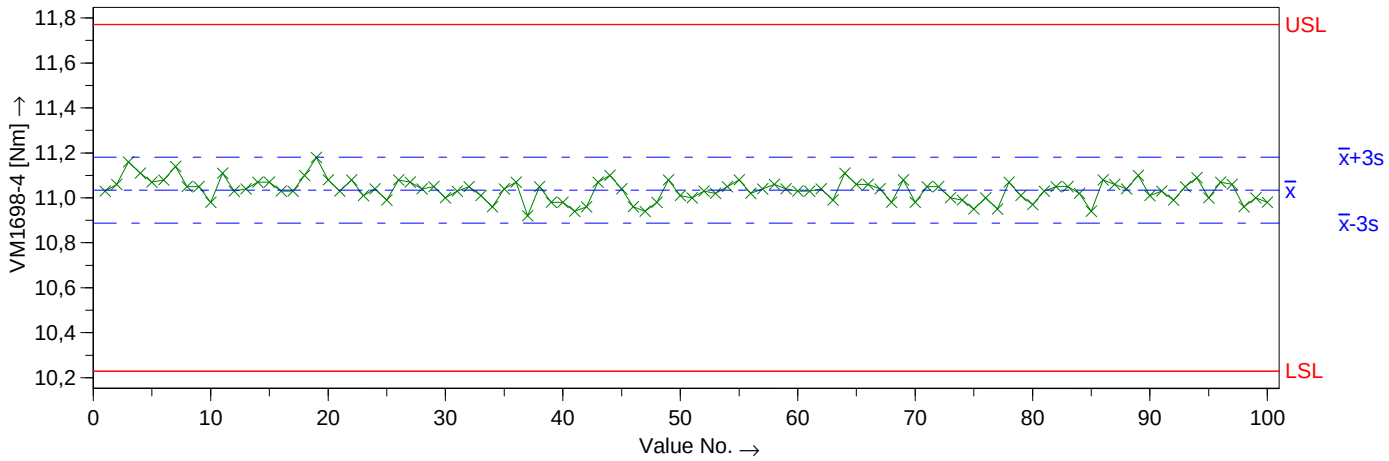
Plant ATG Westhausen		Operator Name Anton Czapla	Date 19.09.2017

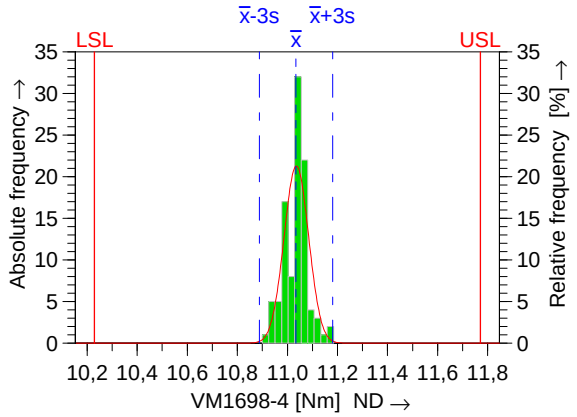
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459h	Char.Descr. VM1698-4	Inspection Val.	11,00	0,77	USL 11,77
	Serial No. 1024210	Unit	Nm	-0,77	LSL 10,23
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

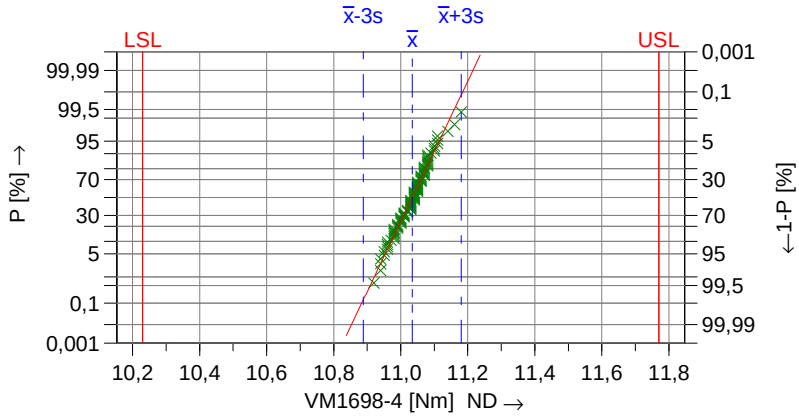
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 19.09.2017 15:25:00 to 19.09.2017 15:44:38

Rem. Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A







Drawing Values		Collected Values		Statistics	
T_m	11.00			$\bar{x}$	11.0342
LSL	10.23	x_{min}	10.92	$\bar{x}$-3s	10.8881
USL	11.77	x_{max}	11.18	$\bar{x}$+3s	11.1803
T	1.54	R	0.26	6s	0.2922
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			$M1_{1,4}$ $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	5.27
Critical capability index	=	C_{mk}	5.04

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459h	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	10,23
				USL	11,77
Remark	Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	11,03	11,06	11,16	11,11	11,07	11,08	11,14	11,05	11,05	10,98
1024210	VM1698-4	30,75	28,50	29,50	30,50	29,25	29,50	30,25	28,50	30,00	30,50

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	11,11	11,03	11,04	11,07	11,07	11,03	11,03	11,10	11,18	11,08
1024210	VM1698-4	29,00	30,50	30,75	29,50	30,00	29,25	30,75	30,00	29,50	30,75

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	11,03	11,08	11,01	11,04	10,99	11,08	11,07	11,04	11,05	11,00
1024210	VM1698-4	30,75	29,25	31,00	30,25	29,75	30,50	29,00	28,75	30,25	30,50

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	11,03	11,05	11,01	10,96	11,04	11,07	10,92	11,05	10,98	10,98
1024210	VM1698-4	31,75	28,75	31,00	32,00	29,50	29,50	31,25	29,50	31,00	32,25

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	10,94	10,96	11,07	11,10	11,04	10,96	10,94	10,98	11,08	11,01
1024210	VM1698-4	30,25	31,50	30,75	29,00	28,00	27,75	30,75	32,00	29,25	29,75

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	11,00	11,03	11,02	11,05	11,08	11,02	11,04	11,06	11,04	11,03
1024210	VM1698-4	31,25	32,00	29,75	29,25	29,75	29,50	28,75	32,50	33,00	30,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	11,03	11,04	10,99	11,11	11,06	11,06	11,04	10,98	11,08	10,98
1024210	VM1698-4	31,25	29,25	31,00	29,25	31,50	28,50	30,75	30,00	29,75	31,25

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	11,05	11,05	11,00	10,99	10,95	11,00	10,95	11,07	11,01	10,97
1024210	VM1698-4	29,00	30,50	28,75	31,25	30,75	28,75	31,25	31,50	30,50	28,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459h	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	10,23
				USL	11,77
Remark	Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	11,03	11,05	11,05	11,02	10,94	11,08	11,06	11,04	11,10	11,01
1024210	VM1698-4	28,50	31,75	29,00	29,25	31,25	30,50	29,25	31,25	31,00	31,50

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	11,03	10,99	11,05	11,09	11,00	11,07	11,06	10,96	11,00	10,98
1024210	VM1698-4	31,75	29,00	31,75	30,00	30,50	29,25	29,00	30,25	28,50	29,75

Machine Capability Study
Tool System

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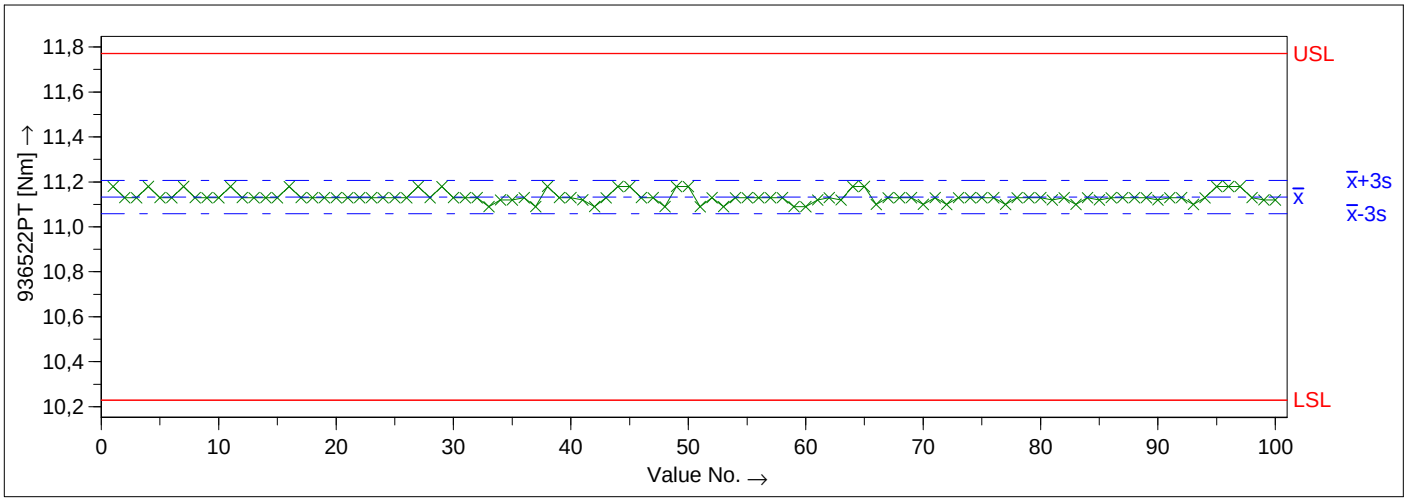
Plant ATG Westhausen		Operator Name Anton Czapla	Date 19.09.2017

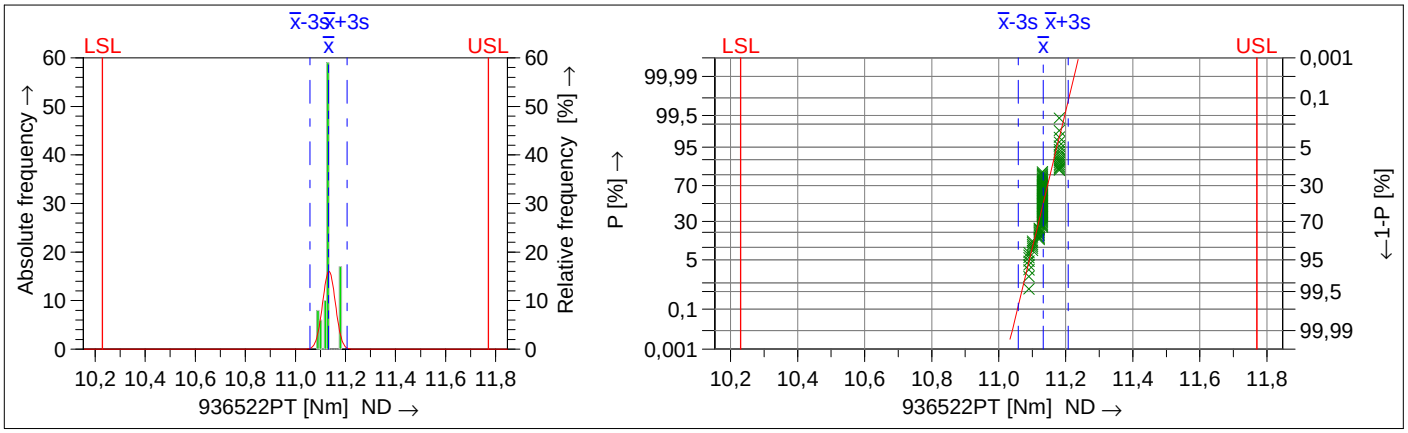
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459h	Char.Descr. 936522PT	Inspection Val.	11,00	0,77	USL 11,77
	Serial No. 154551	Unit	Nm	-0,77	LSL 10,23
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 19.09.2017 15:25:03 to 19.09.2017 15:44:41

Rem. Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	11.00			$\bar{x}$	11.1325
LSL	10.23	x_{min}	11.09	$\bar{x}$-3s	11.0580
USL	11.77	x_{max}	11.18	$\bar{x}$+3s	11.2070
T	1.54	R	0.09	6s	0.1490
		$n_{<T>}$	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	10.33
Critical capability index	=	C_{mk}	8.56

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2017\737459h1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459h	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	10,23
				USL	11,77
Remark	Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	11,18	11,13	11,13	11,18	11,13	11,13	11,18	11,13	11,13	11,13
154551	936522PT	32,00	30,00	30,00	31,00	30,00	30,00	32,00	30,00	31,00	32,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	11,18	11,13	11,13	11,13	11,13	11,18	11,13	11,13	11,13	11,13
154551	936522PT	30,00	32,00	32,00	30,00	31,00	30,00	32,00	31,00	30,00	32,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	11,13	11,13	11,13	11,13	11,13	11,13	11,18	11,13	11,18	11,13
154551	936522PT	32,00	30,00	32,00	31,00	30,00	32,00	30,00	30,00	31,00	32,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	11,13	11,13	11,09	11,12	11,12	11,13	11,09	11,18	11,13	11,13
154551	936522PT	34,00	30,00	32,00	33,00	31,00	31,00	33,00	30,00	32,00	34,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	11,12	11,09	11,13	11,18	11,18	11,13	11,13	11,09	11,18	11,18
154551	936522PT	32,00	32,00	32,00	30,00	29,00	29,00	32,00	34,00	30,00	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	11,09	11,13	11,09	11,13	11,13	11,13	11,13	11,13	11,09	11,09
154551	936522PT	32,00	34,00	31,00	30,00	31,00	30,00	30,00	34,00	34,00	31,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	11,12	11,13	11,12	11,18	11,18	11,10	11,13	11,13	11,13	11,10
154551	936522PT	32,00	30,00	32,00	30,00	32,00	30,00	32,00	31,00	31,00	32,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	11,13	11,10	11,13	11,13	11,13	11,13	11,10	11,13	11,13	11,13
154551	936522PT	30,00	32,00	30,00	32,00	32,00	30,00	32,00	32,00	32,00	30,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459h	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	10,23
				USL	11,77
Remark	Tq. 80% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	11,12	11,13	11,10	11,13	11,12	11,13	11,13	11,13	11,13	11,12
154551	936522PT	30,00	33,00	30,00	30,00	33,00	31,00	30,00	32,00	32,00	33,00

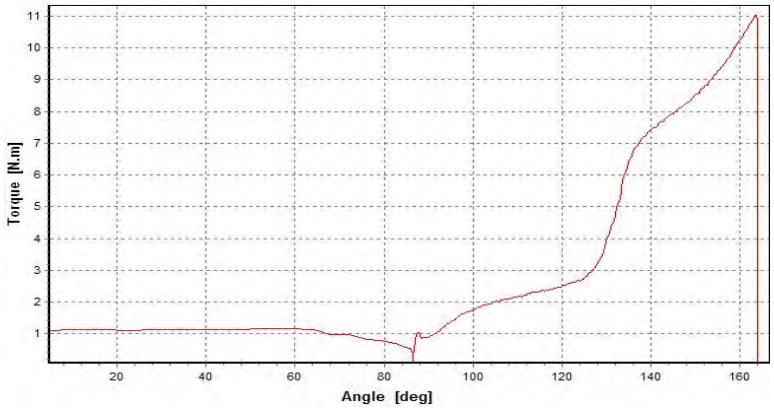
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	11,13	11,13	11,10	11,13	11,18	11,18	11,18	11,13	11,12	11,12
154551	936522PT	33,00	30,00	33,00	31,00	31,00	30,00	30,00	32,00	30,00	31,00

Torque graphs

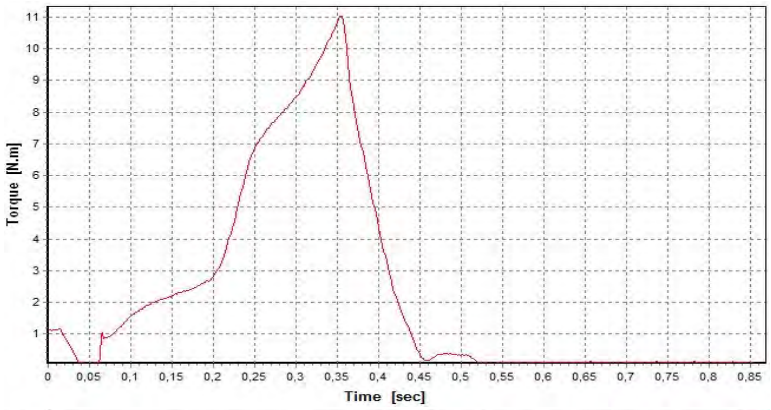
Machine Capability Study 80 %

Model: **17BPYPB13QL**
Serial no: **737459**

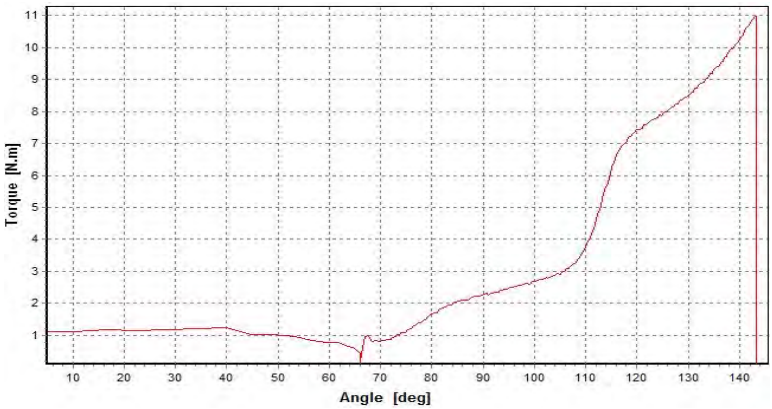
Angle degree: **30°**
Test torque: **11.0 Nm**



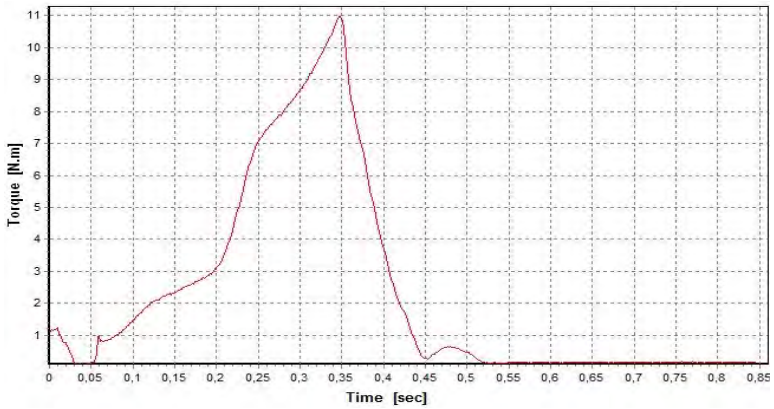
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Machine Capability Study
Control System

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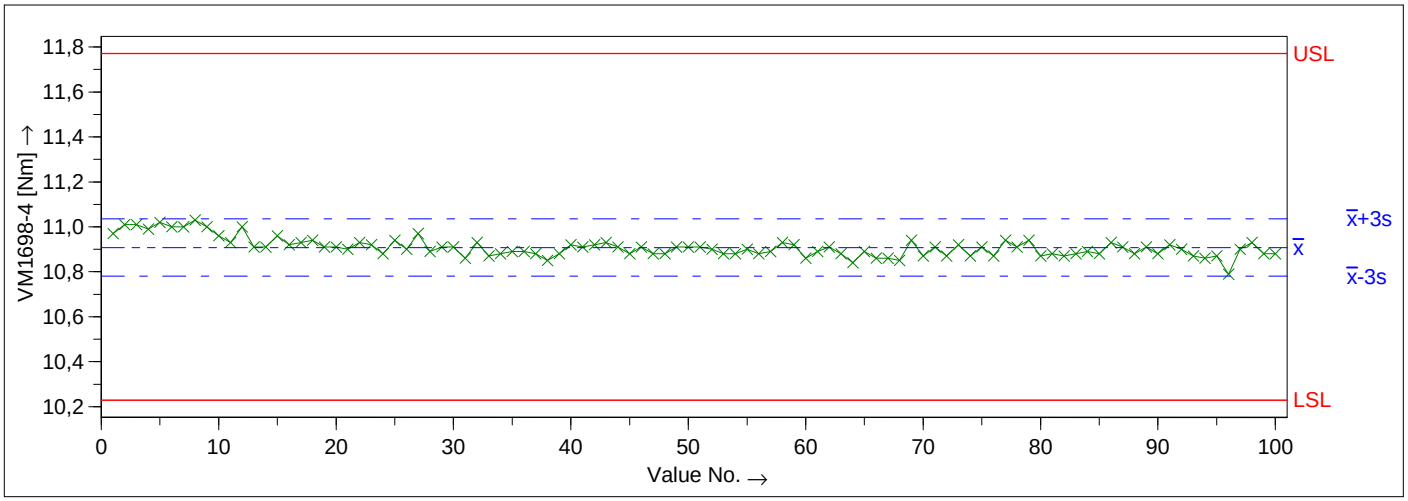
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

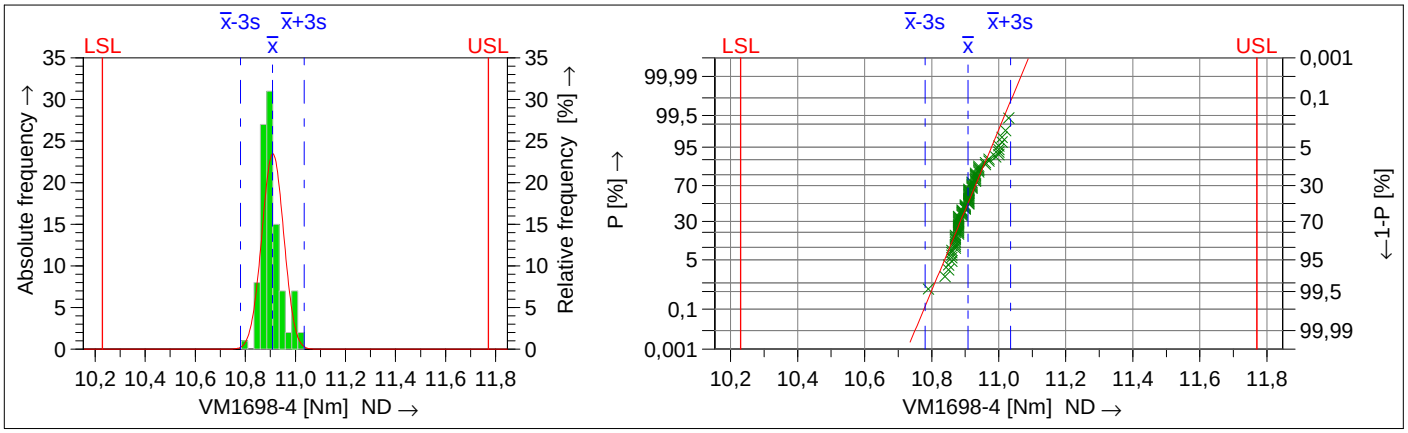
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459g	Char.Descr. VM1698-4	Inspection Val.	11,00	0,77	USL 11,77
	Serial No. 1024210	Unit	Nm	-0,77	LSL 10,23
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 20.09.2017 09:37:42 to 20.09.2017 10:17:00

Rem. Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	11.00			$\bar{x}$	10.9081
LSL	10.23	x_{min}	10.79	$\bar{x}$-3s	10.7807
USL	11.77	x_{max}	11.03	$\bar{x}$+3s	11.0355
T	1.54	R	0.24	6s	0.2548
		$n_{<T>}$	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	6.04
Critical capability index	=	C_{mk}	5.32

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459g	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	10,23
				USL	11,77
Remark	Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	10,97	11,01	11,01	10,99	11,02	11,00	11,00	11,03	11,00	10,96
1024210	VM1698-4	379,50	348,00	362,50	364,75	362,75	335,75	378,50	337,75	379,50	358,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	10,93	11,00	10,91	10,91	10,96	10,92	10,93	10,94	10,91	10,91
1024210	VM1698-4	366,00	380,00	354,00	362,25	364,50	354,75	386,00	359,75	366,75	384,25

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	10,90	10,93	10,92	10,88	10,94	10,90	10,97	10,89	10,91	10,91
1024210	VM1698-4	379,25	361,50	340,50	363,75	352,00	342,25	352,00	343,50	360,25	349,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	10,86	10,93	10,87	10,88	10,89	10,89	10,88	10,85	10,88	10,92
1024210	VM1698-4	359,75	362,00	362,50	356,00	400,00	358,75	380,50	332,75	353,75	361,50

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	10,91	10,92	10,93	10,91	10,88	10,91	10,88	10,88	10,91	10,91
1024210	VM1698-4	366,75	361,75	359,75	354,50	356,25	371,25	330,50	379,25	363,50	330,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	10,91	10,90	10,88	10,88	10,90	10,88	10,89	10,93	10,92	10,86
1024210	VM1698-4	329,00	357,75	377,25	382,50	380,25	360,25	364,25	380,00	403,75	366,75

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	10,89	10,91	10,88	10,84	10,89	10,86	10,86	10,85	10,94	10,87
1024210	VM1698-4	375,00	355,75	345,00	329,00	336,75	357,50	353,75	371,25	353,50	355,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	10,91	10,87	10,92	10,87	10,91	10,87	10,94	10,91	10,94	10,87
1024210	VM1698-4	339,25	357,50	363,75	368,00	369,25	365,25	355,00	398,00	364,50	364,00

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459g	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	10,23
				USL	11,77
Remark	Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	10,88	10,87	10,88	10,89	10,88	10,93	10,91	10,88	10,91	10,88
1024210	VM1698-4	352,75	346,25	353,50	349,00	362,50	371,00	378,50	345,75	332,75	366,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	10,92	10,90	10,87	10,86	10,87	10,79	10,90	10,93	10,88	10,88
1024210	VM1698-4	365,00	342,25	354,75	344,25	363,25	367,75	357,50	361,50	350,00	363,00

Machine Capability Study
Tool System

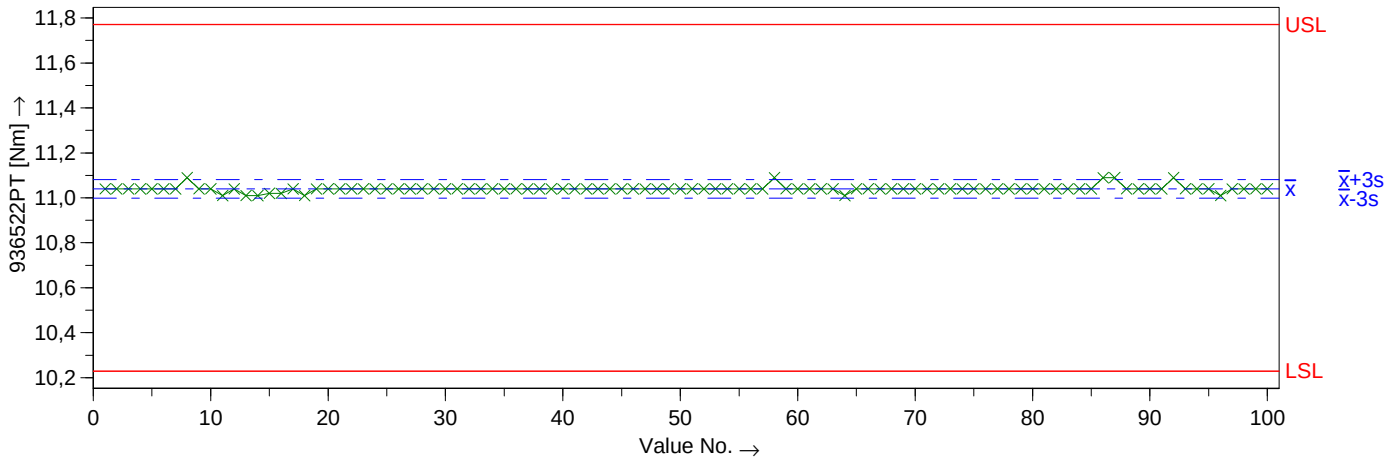
Cleco Production Tools

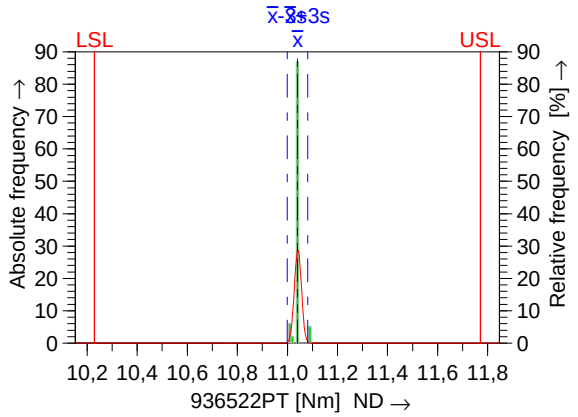
Plant	ATG Westhausen	Operator Name	Anton Czapla
Date	20.09.2017		

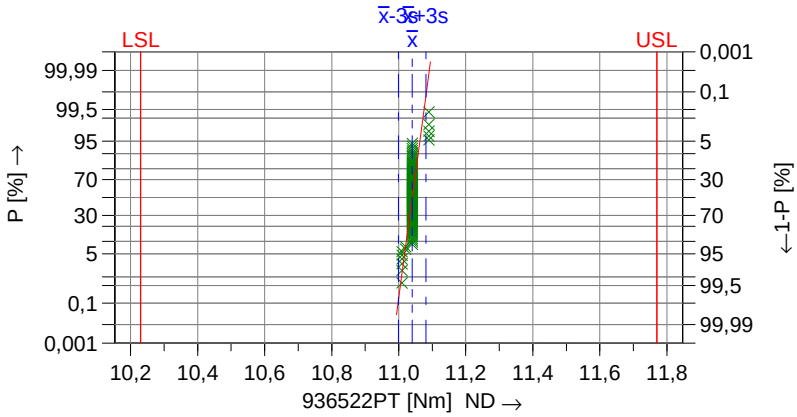
Ord. No.	17BPYPB13QL	Part type	17BPYPB13QL	Contr.item	yes
Serial No.	737459g	Char.Descr.	936522PT	Inspection Val. 11,00 0,77	USL 11,77
		Serial No.	154551	Unit Nm -0,77	LSL 10,23
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Homologation	Reference System	VM1698-4	Test Electronic	MPRO400SE
Contr.No.	816N2152	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 20.09.2017 09:37:46 to 20.09.2017 10:17:03

Rem. Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A







Drawing Values		Collected Values		Statistics	
T_m	11.00			$\bar{x}$	11.0403
LSL	10.23	x_{min}	11.01	$\bar{x}$-3s	10.9991
USL	11.77	x_{max}	11.09	$\bar{x}$+3s	11.0815
T	1.54	R	0.08	6s	0.0824
		$n_{<T>}$	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	18.68
Critical capability index	=	C_{mk}	17.70

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459g	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	10,23
				USL	11,77
Remark	Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,09	11,04	11,04
154551	936522PT	378,00	344,00	360,00	361,00	360,00	334,00	375,00	335,00	377,00	359,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	11,01	11,04	11,01	11,01	11,02	11,02	11,04	11,01	11,04	11,04
154551	936522PT	368,00	377,00	353,00	361,00	366,00	353,00	388,00	366,00	368,00	385,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04
154551	936522PT	380,00	361,00	344,00	366,00	352,00	344,00	352,00	345,00	362,00	352,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04
154551	936522PT	361,00	365,00	367,00	361,00	403,00	359,00	379,00	336,00	354,00	365,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04
154551	936522PT	369,00	361,00	361,00	354,00	359,00	369,00	329,00	381,00	364,00	328,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,09	11,04	11,04
154551	936522PT	329,00	359,00	378,00	386,00	384,00	362,00	364,00	380,00	402,00	369,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	11,04	11,04	11,04	11,01	11,04	11,04	11,04	11,04	11,04	11,04
154551	936522PT	376,00	357,00	345,00	335,00	339,00	361,00	355,00	372,00	357,00	354,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04	11,04
154551	936522PT	342,00	361,00	368,00	372,00	369,00	369,00	358,00	399,00	367,00	364,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459g	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	11,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	10,23
				USL	11,77
Remark	Tq. 80% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	11,04	11,04	11,04	11,04	11,04	11,09	11,09	11,04	11,04	11,04
154551	936522PT	353,00	346,00	355,00	351,00	363,00	374,00	378,00	346,00	334,00	369,00

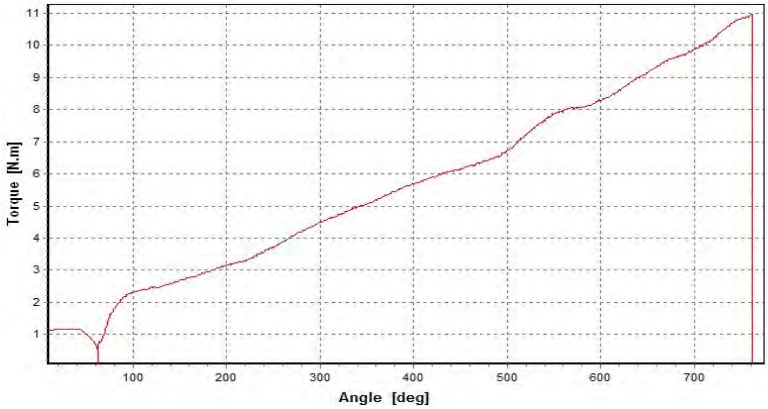
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	11,04	11,09	11,04	11,04	11,04	11,01	11,04	11,04	11,04	11,04
154551	936522PT	367,00	344,00	354,00	344,00	362,00	371,00	360,00	361,00	353,00	364,00

Torque graphs

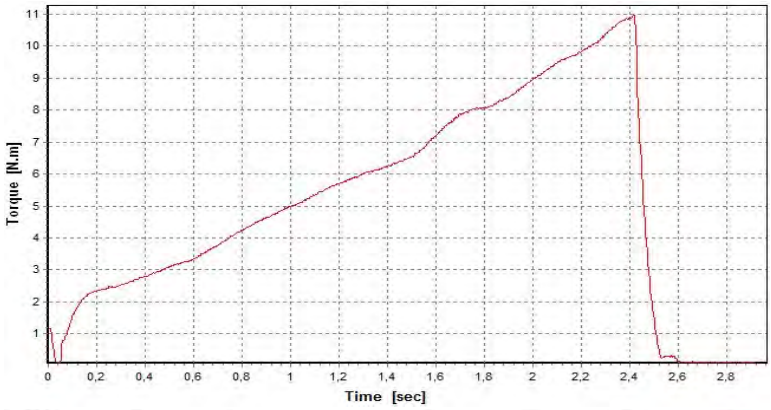
Model: **17BPYPB13QL**
Serial no: **737459**

Machine Capability Study 80 %

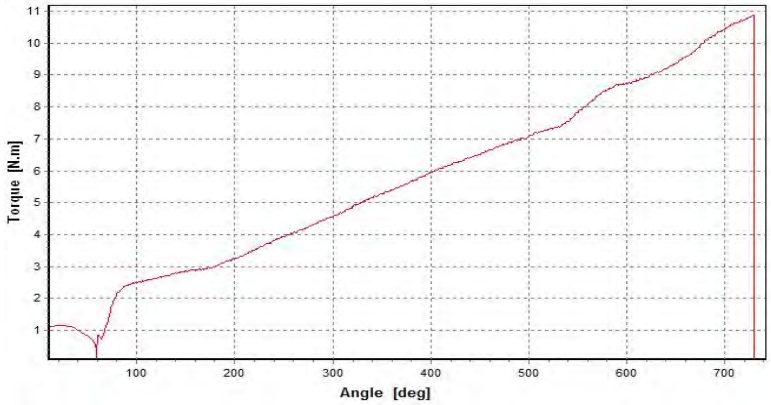
Angle degree: **360°**
Test torque: **11.0 Nm**



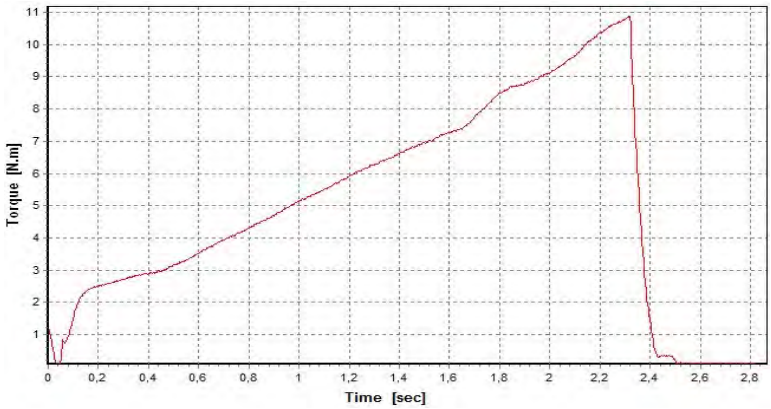
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Investigation no.: 010/2017
Date: 25.09.2017

Test sheet no. 4

Machine Capability Study 100 %

Multi-stage tightening system	☑	Speed 50 rpm	5.4 %
Single-stage tightening system	☐	Speed 100 %	629 rpm

Manufacturer: Apex Tool Group GmbH Serial no: **737459**

Test torque: Tq max. 13.00 Nm with 26 volt battery

Hard joint (H)	78.01 Nm / Revolution	Angle degree	30°
Soft joint (L)	6.40 Nm / Revolution	Angle degree	360°

		H	L
a)	Tolerance down / up	12.09 - 13.91 Nm	12.09 - 13.91 Nm
	Tolerance down / up	7 %	7 %
	Average torque	13.00 Nm	12.79 Nm
	Standard deviation	0.06 Nm	0.05 Nm
	Torque scatter (99,73%)	0.36 Nm	0.28 Nm
	C_m	5.13	6.57
	C_{mk}	5.12	5.09

b)	Min. C_m hard/soft (lowest value)	5.13
	Min. C_{mk} hard/soft (lowest value)	5.09

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

Note:

Machine Capability Study
Control System

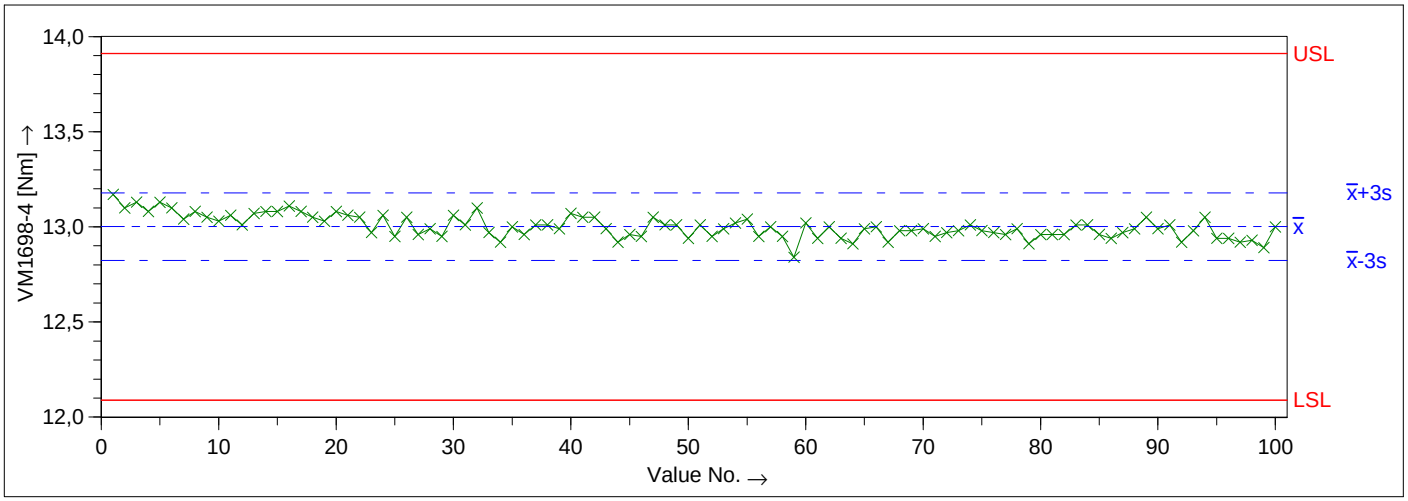
Cleco Production Tools

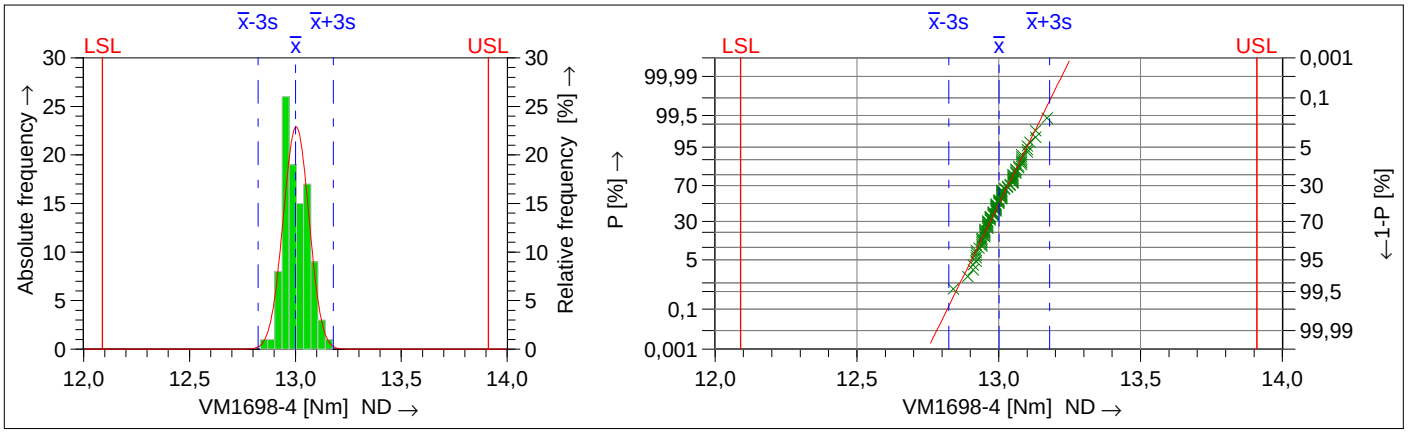
Plant	ATG Westhausen	Operator Name	Anton Czapla
Date	19.09.2017		

Ord. No.	17BPYPB13QL	Part type	17BPYPB13QL	Contr.item	yes
Serial No.	737459b	Char.Descr.	VM1698-4	Inspection Val. 13,00 0,91	USL 13,91
		Serial No.	1024210	Unit Nm -0,91	LSL 12,09
Char.Type	variable			Tolerance value 7 %	Decimal Pl. 2
Cust.Name	Homologation	Reference System	VM1698-4	Test Electronic	MPRO400SE
Contr.No.	816N2152	Reference Transducer	50 / 1024729	nges.	100

Evaluation from 19.09.2017 13:56:14 to 19.09.2017 14:14:10

Rem. Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	13.00			$\bar{x}$	13.0015
LSL	12.09	x_{min}	12.84	$\bar{x}$-3s	12.8240
USL	13.91	x_{max}	13.17	$\bar{x}$+3s	13.1790
T	1.82	R	0.33	6s	0.3551
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			$M1_{1.4}$ $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	5.13
Critical capability index	=	C_{mk}	5.12

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459b	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	12,09
				USL	13,91
Remark	Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	13,17	13,10	13,13	13,08	13,13	13,10	13,04	13,08	13,05	13,03
1024210	VM1698-4	29,75	29,75	29,25	28,75	29,25	28,75	29,00	30,00	29,50	29,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	13,06	13,01	13,07	13,08	13,08	13,11	13,08	13,05	13,03	13,08
1024210	VM1698-4	28,50	29,50	28,75	29,50	30,00	29,25	29,75	29,25	29,50	29,75

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	13,06	13,05	12,97	13,06	12,95	13,05	12,96	12,99	12,95	13,06
1024210	VM1698-4	29,25	29,75	31,00	29,75	31,00	30,00	30,75	30,00	30,00	30,25

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	13,01	13,10	12,97	12,92	13,00	12,96	13,01	13,01	12,99	13,07
1024210	VM1698-4	29,50	31,50	30,50	30,75	30,50	30,75	29,25	29,25	28,75	30,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	13,05	13,05	12,99	12,92	12,96	12,95	13,05	13,01	13,01	12,94
1024210	VM1698-4	30,00	30,25	30,75	31,00	31,25	29,25	28,50	29,50	30,25	31,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	13,01	12,95	12,99	13,02	13,04	12,95	13,00	12,95	12,84	13,02
1024210	VM1698-4	30,00	30,25	30,00	29,75	29,75	30,50	30,50	30,25	31,00	30,25

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	12,94	13,00	12,94	12,91	12,99	13,00	12,92	12,98	12,98	12,99
1024210	VM1698-4	31,25	29,75	31,25	29,75	30,75	30,50	31,00	30,75	31,00	28,75

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	12,95	12,97	12,98	13,01	12,98	12,97	12,96	12,99	12,91	12,96
1024210	VM1698-4	29,25	29,00	29,25	30,75	31,25	29,25	29,50	30,00	30,25	51,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459b	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	12,09
				USL	13,91
Remark	Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	12,96	12,96	13,01	13,01	12,96	12,94	12,97	12,99	13,05	12,99
1024210	VM1698-4	29,75	28,50	29,75	29,75	29,75	29,75	31,25	30,00	30,25	29,75

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	13,01	12,92	12,98	13,05	12,94	12,94	12,92	12,93	12,89	13,00
1024210	VM1698-4	31,00	30,25	29,75	30,00	30,25	30,50	30,25	30,50	30,75	30,00

Machine Capability Study
Tool System

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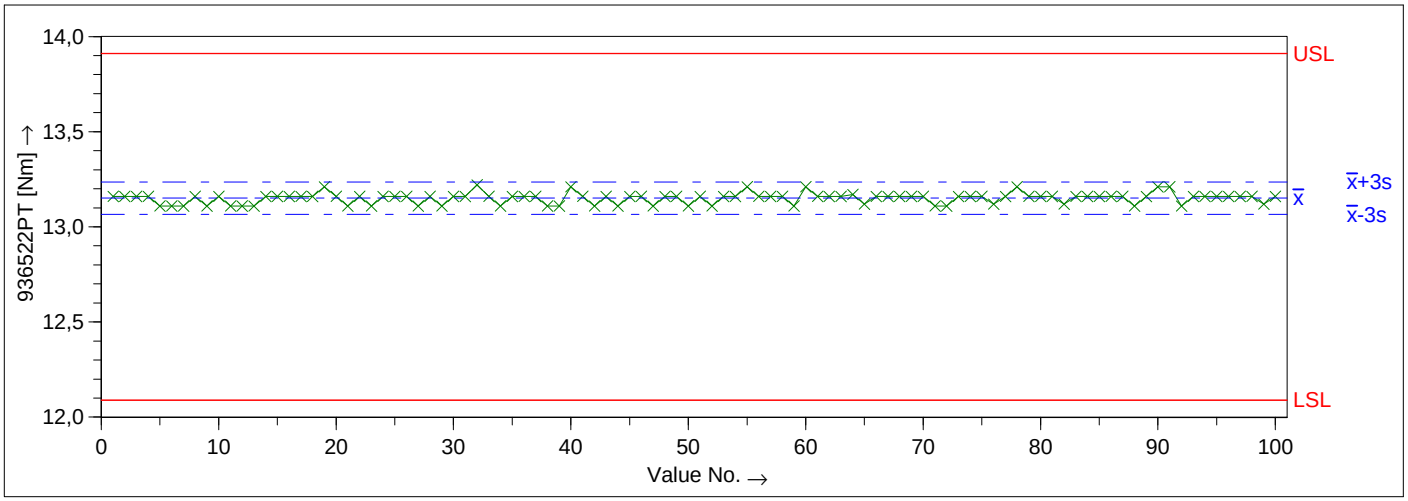
Plant ATG Westhausen		Operator Name Anton Czapla	Date 19.09.2017

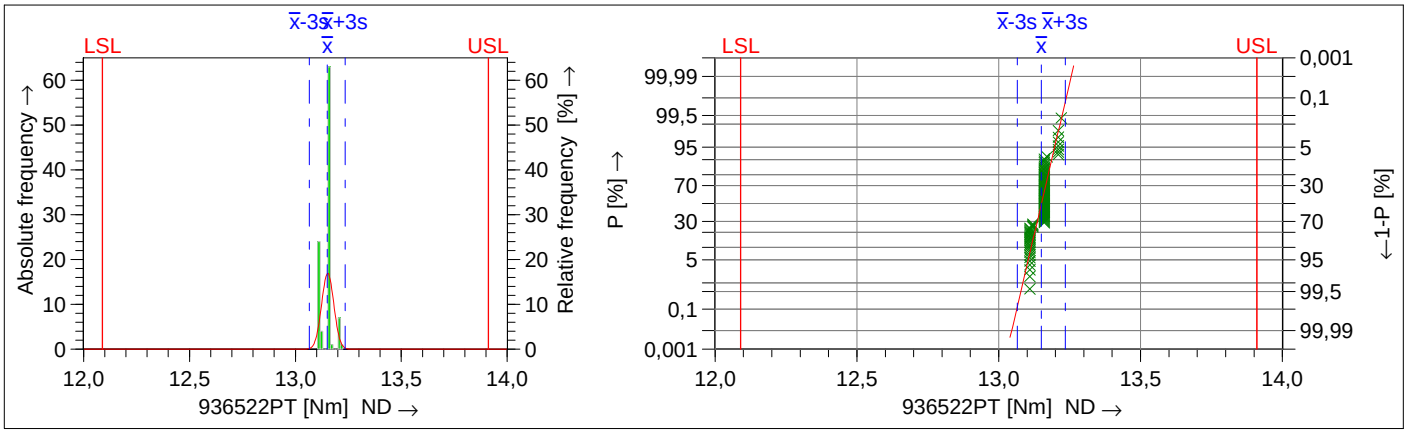
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459b	Char.Descr. 936522PT	Inspection Val.	13,00	0,91	USL 13,91
	Serial No. 154551	Unit	Nm	-0,91	LSL 12,09
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 19.09.2017 13:56:17 to 19.09.2017 14:14:13

Rem. Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	13.00			$\bar{x}$	13.1506
LSL	12.09	x_{min}	13.11	$\bar{x}$-3s	13.0660
USL	13.91	x_{max}	13.22	$\bar{x}$+3s	13.2352
T	1.82	R	0.11	6s	0.1692
		$n_{<T>}$	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	10.75
Critical capability index	=	C_{mk}	8.97

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

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2017\737459b1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459b	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	12,09
				USL	13,91
Remark	Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	13,16	13,16	13,16	13,16	13,11	13,11	13,11	13,16	13,11	13,16
154551	936522PT	31,00	32,00	31,00	31,00	31,00	30,00	31,00	32,00	31,00	31,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	13,11	13,11	13,11	13,16	13,16	13,16	13,16	13,16	13,21	13,16
154551	936522PT	30,00	31,00	30,00	31,00	31,00	31,00	31,00	31,00	31,00	31,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	13,11	13,16	13,11	13,16	13,16	13,16	13,11	13,16	13,11	13,16
154551	936522PT	31,00	32,00	33,00	31,00	32,00	32,00	32,00	32,00	32,00	32,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	13,16	13,22	13,16	13,11	13,16	13,16	13,16	13,11	13,11	13,21
154551	936522PT	31,00	33,00	32,00	32,00	32,00	32,00	31,00	31,00	30,00	32,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	13,16	13,11	13,16	13,11	13,16	13,16	13,11	13,16	13,16	13,11
154551	936522PT	32,00	32,00	32,00	32,00	33,00	31,00	30,00	31,00	32,00	33,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	13,16	13,11	13,16	13,16	13,21	13,16	13,16	13,16	13,11	13,21
154551	936522PT	32,00	32,00	32,00	31,00	31,00	32,00	32,00	32,00	33,00	32,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	13,16	13,16	13,16	13,17	13,12	13,16	13,16	13,16	13,16	13,16
154551	936522PT	33,00	31,00	33,00	32,00	32,00	32,00	32,00	32,00	33,00	31,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	13,11	13,11	13,16	13,16	13,16	13,12	13,16	13,21	13,16	13,16
154551	936522PT	31,00	31,00	31,00	32,00	33,00	31,00	32,00	31,00	31,00	33,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459b	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	12,09
				USL	13,91
Remark	Tq. 100% hard * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	13,16	13,12	13,16	13,16	13,16	13,16	13,16	13,11	13,16	13,21
154551	936522PT	31,00	30,00	31,00	31,00	31,00	31,00	34,00	32,00	31,00	31,00

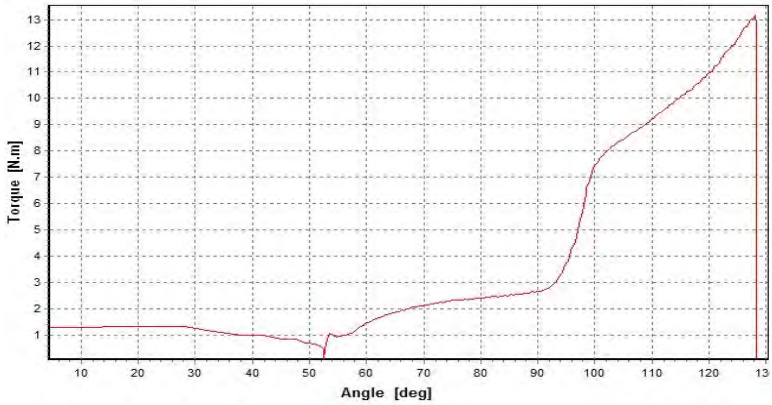
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	13,21	13,11	13,16	13,16	13,16	13,16	13,16	13,16	13,12	13,16
154551	936522PT	32,00	32,00	31,00	32,00	31,00	32,00	32,00	32,00	32,00	31,00

Torque graphs

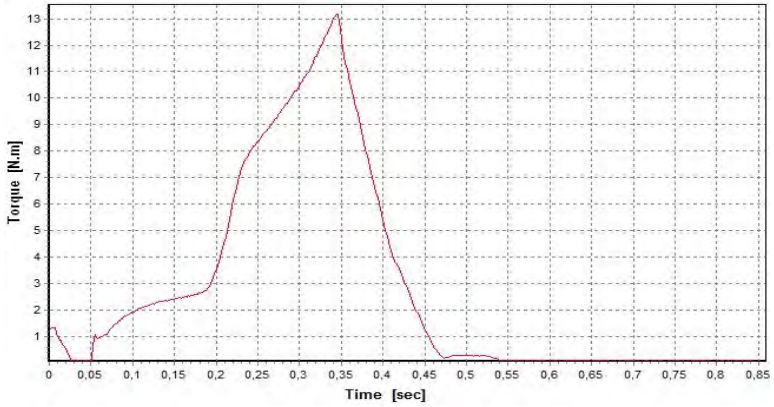
Machine Capability Study 100 %

Model: **17BPYPB13QL**
Serial no: **737459**

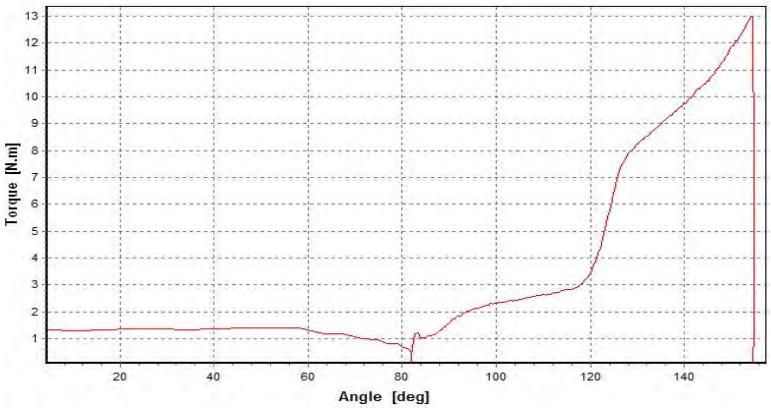
Angle degree: **30°**
Test torque: **13.0 Nm**



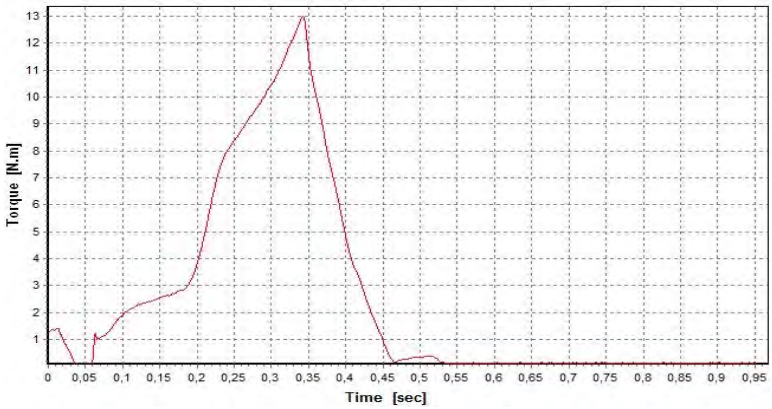
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Machine Capability Study
Control System

Page 1 / 1

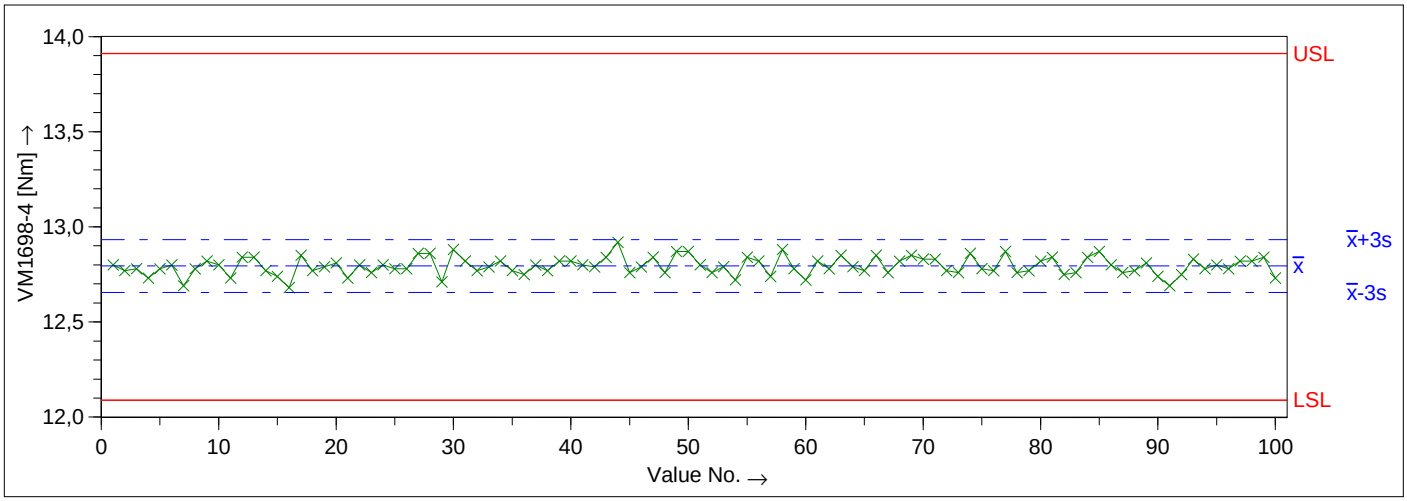
Plant ATG Westhausen		Operator Name Anton Czapla	Date 19.09.2017

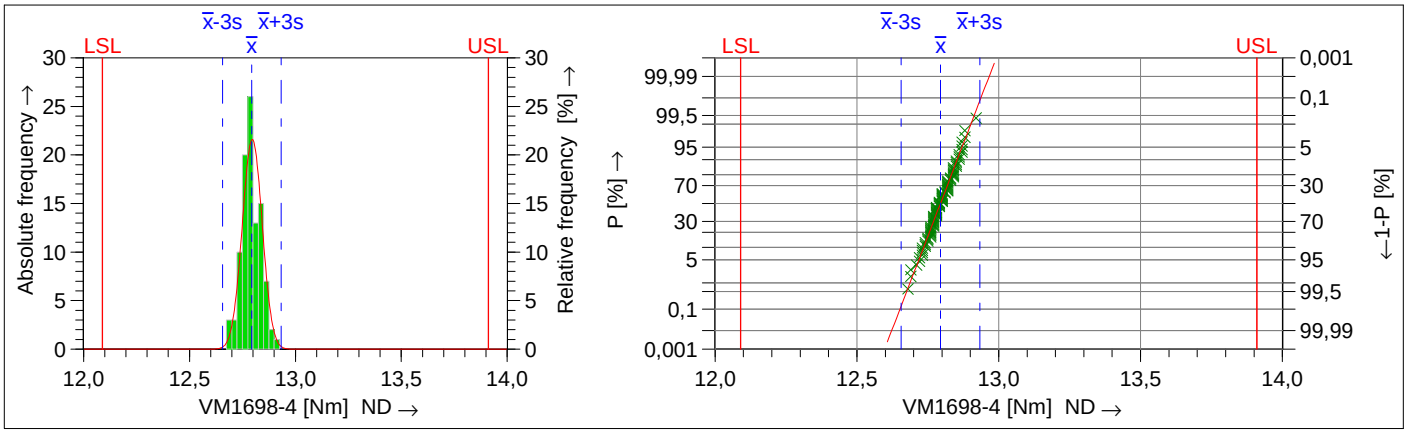
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459a	Char.Descr. VM1698-4	Inspection Val.	13,00	0,91	USL 13,91
	Serial No. 1024210	Unit	Nm	-0,91	LSL 12,09
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 19.09.2017 14:16:35 to 19.09.2017 15:21:19

Rem. Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	13.00			$\bar{x}$	12.7944
LSL	12.09	x_{min}	12.68	$\bar{x}$-3s	12.6559
USL	13.91	x_{max}	12.92	$\bar{x}$+3s	12.9329
T	1.82	R	0.24	6s	0.2769
		$n_{<T>}$	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	6.57
Critical capability index	=	C_{mk}	5.09

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459a	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	12,09
				USL	13,91
Remark	Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	12,80	12,77	12,78	12,73	12,78	12,80	12,69	12,78	12,82	12,80
1024210	VM1698-4	363,25	366,25	385,75	354,75	346,50	383,25	363,50	358,25	377,00	368,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	12,73	12,84	12,84	12,77	12,74	12,68	12,85	12,77	12,79	12,81
1024210	VM1698-4	390,75	367,75	368,50	361,00	360,25	361,25	361,25	370,75	358,00	359,50

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	12,73	12,80	12,76	12,80	12,78	12,78	12,86	12,86	12,71	12,88
1024210	VM1698-4	374,75	372,50	385,50	363,50	378,50	349,50	358,75	357,50	343,25	358,25

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	12,82	12,77	12,79	12,82	12,77	12,75	12,80	12,77	12,82	12,82
1024210	VM1698-4	354,00	353,00	331,50	360,00	363,75	351,25	364,50	371,75	361,25	362,75

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	12,80	12,79	12,84	12,92	12,76	12,79	12,84	12,76	12,87	12,87
1024210	VM1698-4	338,00	359,50	350,00	355,25	380,25	337,25	376,50	383,25	358,50	365,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	12,80	12,76	12,79	12,72	12,84	12,82	12,74	12,88	12,78	12,72
1024210	VM1698-4	365,00	339,75	368,25	362,00	347,00	359,00	341,25	359,25	358,25	336,75

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	12,82	12,78	12,85	12,79	12,77	12,85	12,76	12,82	12,85	12,83
1024210	VM1698-4	377,25	353,25	381,25	349,75	359,75	351,75	381,75	347,25	356,75	394,25

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	12,83	12,77	12,76	12,86	12,78	12,77	12,87	12,76	12,77	12,82
1024210	VM1698-4	355,50	367,50	347,75	374,00	371,25	337,25	375,00	380,50	335,00	342,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459a	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	12,09
				USL	13,91
Remark	Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	12,84	12,75	12,76	12,84	12,87	12,80	12,76	12,77	12,81	12,74
1024210	VM1698-4	365,00	387,25	351,25	343,75	348,00	380,00	371,75	372,50	364,75	361,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	12,69	12,75	12,83	12,78	12,80	12,78	12,82	12,82	12,84	12,73
1024210	VM1698-4	350,50	366,75	358,00	343,50	358,50	359,75	341,75	363,50	361,75	340,75

Machine Capability Study
Tool System

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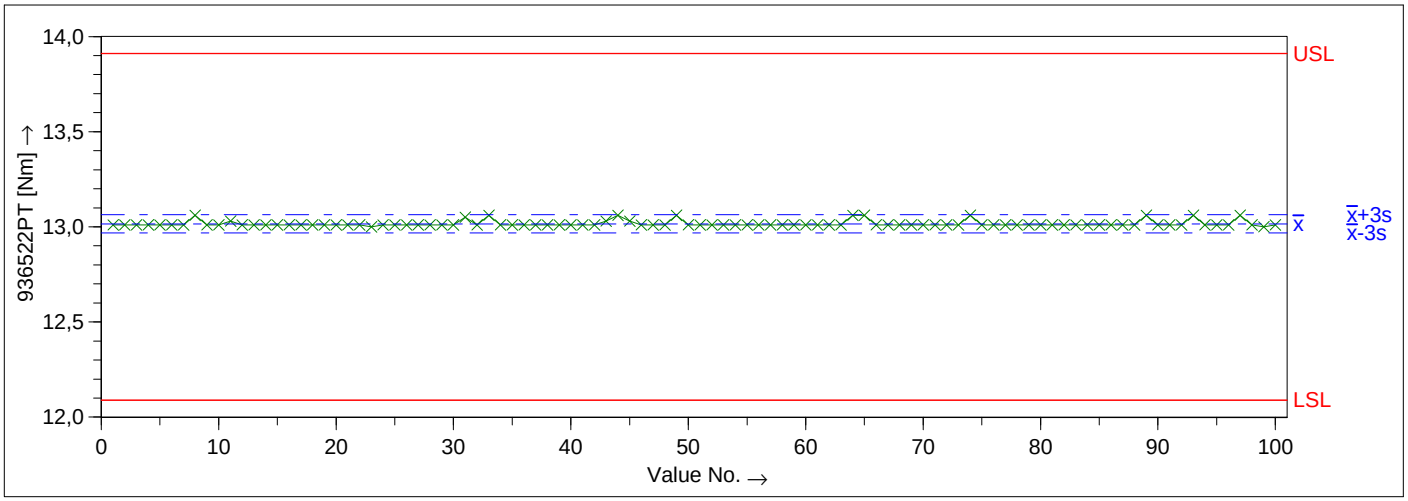
Plant ATG Westhausen		Operator Name Anton Czapla	Date 19.09.2017

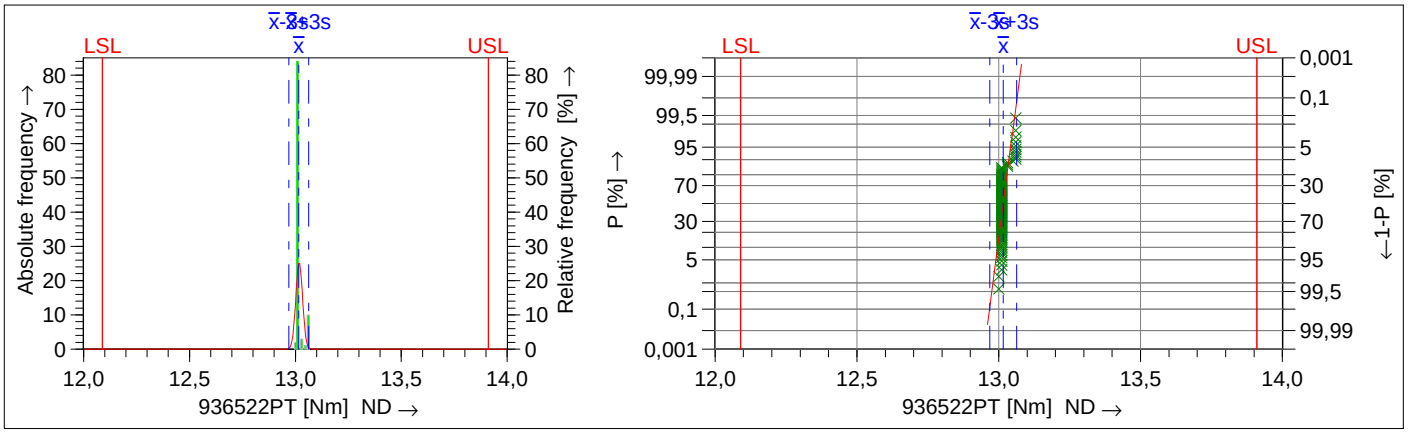
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459a	Char.Descr. 936522PT	Inspection Val.	13,00	0,91	USL 13,91
	Serial No. 154551	Unit	Nm	-0,91	LSL 12,09
Char.Type variable		Tolerance value	7 %		Decimal Pl. 2

Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE
Contr.No. 816N2152	Reference Transducer 50 / 1024729	nges. 100

Evaluation from 19.09.2017 14:16:39 to 19.09.2017 15:21:23

Rem. Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	13.00			$\bar{x}$	13.0158
LSL	12.09	x_{min}	13.00	$\bar{x}$-3s	12.9685
USL	13.91	x_{max}	13.06	$\bar{x}$+3s	13.0631
T	1.82	R	0.06	6s	0.0946
		$n_{<T>}$	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	19.23
Critical capability index	=	C_{mk}	18.89

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459a	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	12,09
				USL	13,91
Remark	Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,06	13,01	13,01
154551	936522PT	370,00	376,00	393,00	365,00	352,00	388,00	377,00	368,00	380,00	373,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	13,03	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01
154551	936522PT	397,00	370,00	374,00	369,00	369,00	371,00	366,00	379,00	369,00	362,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	13,01	13,01	13,00	13,01	13,01	13,01	13,01	13,01	13,01	13,01
154551	936522PT	394,00	378,00	394,00	370,00	389,00	353,00	361,00	360,00	354,00	361,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	13,05	13,01	13,06	13,01	13,01	13,01	13,01	13,01	13,01	13,01
154551	936522PT	360,00	361,00	340,00	362,00	370,00	359,00	365,00	379,00	362,00	368,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	13,01	13,01	13,03	13,06	13,03	13,01	13,01	13,01	13,06	13,01
154551	936522PT	344,00	366,00	353,00	359,00	388,00	346,00	376,00	394,00	361,00	368,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01
154551	936522PT	370,00	344,00	371,00	377,00	353,00	361,00	355,00	366,00	369,00	345,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	13,01	13,01	13,01	13,06	13,06	13,01	13,01	13,01	13,01	13,01
154551	936522PT	379,00	368,00	386,00	354,00	366,00	354,00	388,00	351,00	360,00	402,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	13,01	13,01	13,01	13,06	13,01	13,01	13,01	13,01	13,01	13,01
154551	936522PT	360,00	376,00	353,00	378,00	384,00	344,00	379,00	393,00	345,00	345,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 19.09.2017

Ser.No.	737459a	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	13,00
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	12,09
				USL	13,91
Remark	Tq. 100% soft * +/-7% * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.269 Nm/A				

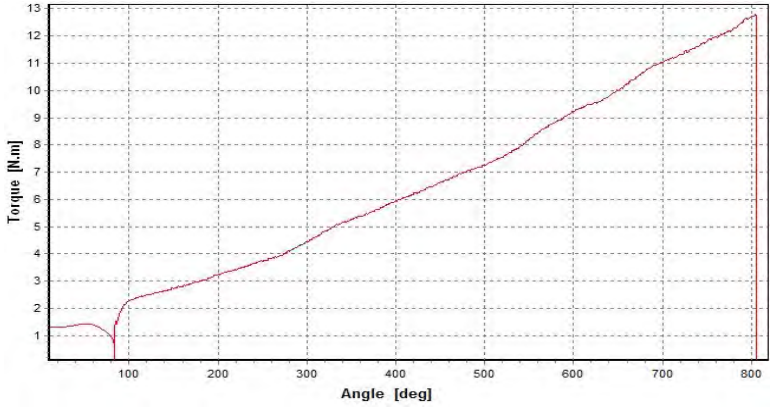
Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,01	13,06	13,01
154551	936522PT	369,00	399,00	362,00	346,00	351,00	385,00	378,00	380,00	376,00	377,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	13,01	13,01	13,06	13,01	13,01	13,01	13,06	13,01	13,00	13,01
154551	936522PT	362,00	377,00	368,00	348,00	368,00	363,00	351,00	369,00	365,00	346,00

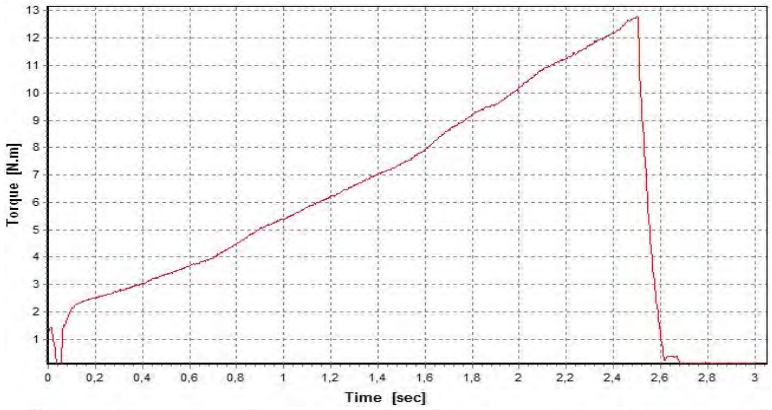
Torque graphs

Model: **17BPYPB13QL**
Serial no: **737459**

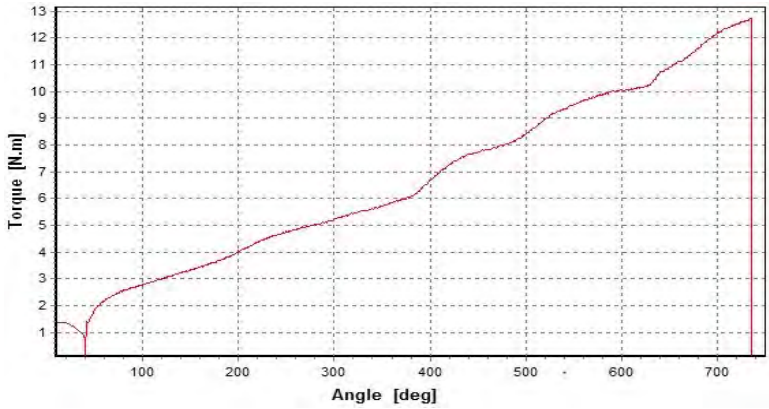
Machine Capability Study 100 %
Angle degree: **360°**
Test torque: **13.0 Nm**



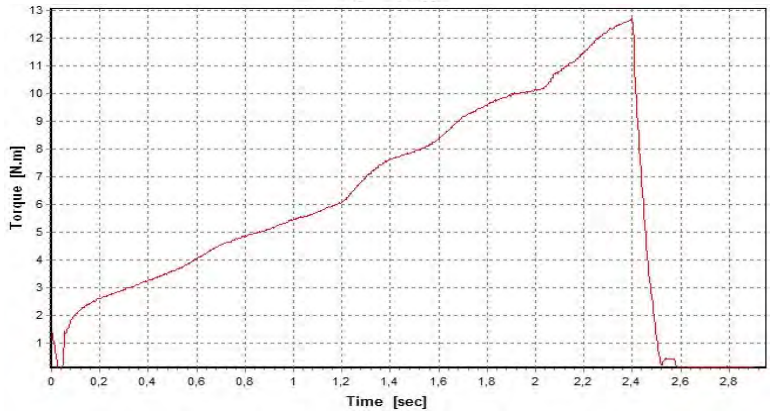
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Investigation no.: 010/2017
Date: 25.09.2017

General Specifications

Manufacturer: Apex Tool Group GmbH **Tool type:** LiveWire Tool

Model: 17BPYPB13QL **Serial no:** 737459

Torque range: **3 Nm to 13 Nm**

Difference evaluation: Reference/Tool at 40° / 60 %

Capability examination

Snugfit value: 2.6 Nm **Torque tolerance ±** 7 %

Target torque: 7.8 Nm Tolerance: 4.05 % ± **2.02 %**

Angle degree: 40° Tolerance: 3.0° ± **1.5°**

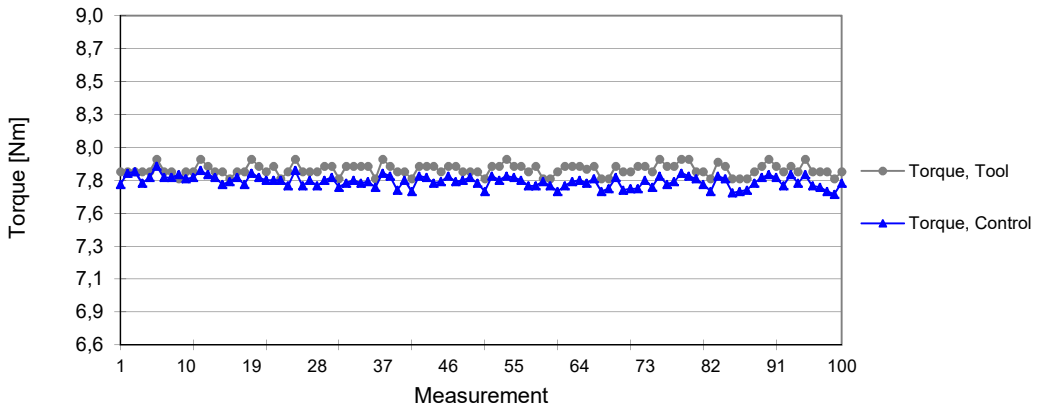
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

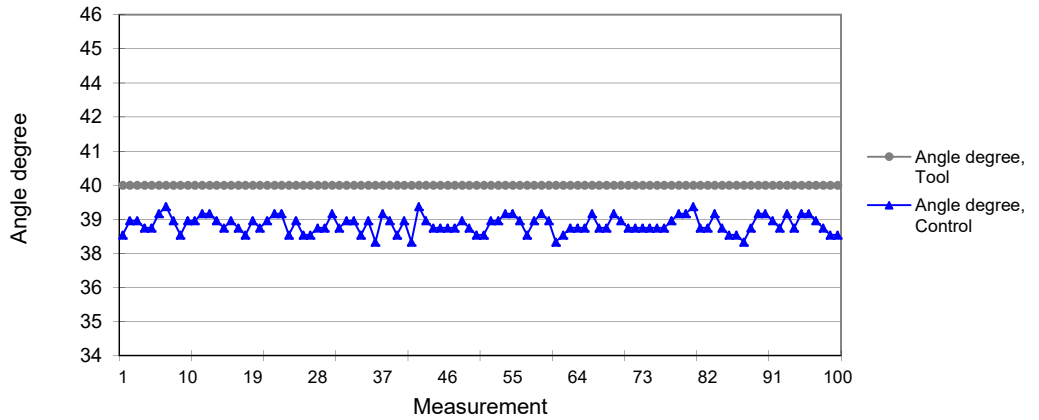
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	7.86	40.00	7.77	38.25	0.09	1.75
2	7.86	40.00	7.85	38.75	0.01	1.25
3	7.86	40.00	7.86	38.75	0.00	1.25
4	7.86	40.00	7.78	38.50	0.08	1.50
5	7.86	40.00	7.82	38.50	0.04	1.50
6	7.95	40.00	7.90	39.00	0.05	1.00
7	7.86	40.00	7.82	39.25	0.04	0.75
8	7.86	40.00	7.82	38.75	0.04	1.25
9	7.81	40.00	7.84	38.25	0.03	1.75
10	7.86	40.00	7.81	38.75	0.05	1.25
11	7.86	40.00	7.82	38.75	0.04	1.25
12	7.95	40.00	7.87	39.00	0.08	1.00
13	7.90	40.00	7.84	39.00	0.06	1.00
14	7.86	40.00	7.82	38.75	0.04	1.25
15	7.86	40.00	7.77	38.50	0.09	1.50
16	7.81	40.00	7.79	38.75	0.02	1.25
17	7.86	40.00	7.82	38.50	0.04	1.50
18	7.86	40.00	7.77	38.25	0.09	1.75
19	7.95	40.00	7.85	38.75	0.10	1.25
20	7.90	40.00	7.82	38.50	0.08	1.50
21	7.86	40.00	7.80	38.75	0.06	1.25
22	7.90	40.00	7.80	39.00	0.10	1.00
23	7.81	40.00	7.80	39.00	0.01	1.00
24	7.86	40.00	7.76	38.25	0.10	1.75
25	7.95	40.00	7.87	38.75	0.08	1.25
26	7.86	40.00	7.76	38.25	0.10	1.75
27	7.86	40.00	7.80	38.25	0.06	1.75
28	7.86	40.00	7.76	38.50	0.10	1.50
29	7.90	40.00	7.80	38.50	0.10	1.50
30	7.90	40.00	7.82	39.00	0.08	1.00
31	7.81	40.00	7.75	38.50	0.06	1.50
32	7.90	40.00	7.78	38.75	0.12	1.25
33	7.90	40.00	7.80	38.75	0.10	1.25
34	7.90	40.00	7.78	38.25	0.12	1.75
35	7.90	40.00	7.79	38.75	0.11	1.25
36	7.81	40.00	7.75	38.00	0.06	2.00
37	7.95	40.00	7.85	39.00	0.10	1.00
38	7.90	40.00	7.83	38.75	0.07	1.25
39	7.86	40.00	7.73	38.25	0.13	1.75
40	7.86	40.00	7.80	38.75	0.06	1.25
41	7.81	40.00	7.72	38.00	0.09	2.00
42	7.90	40.00	7.83	39.25	0.07	0.75
43	7.90	40.00	7.82	38.75	0.08	1.25
44	7.90	40.00	7.78	38.50	0.12	1.50
45	7.86	40.00	7.79	38.50	0.07	1.50
46	7.90	40.00	7.83	38.50	0.07	1.50
47	7.90	40.00	7.79	38.50	0.11	1.50
48	7.86	40.00	7.80	38.75	0.06	1.25
49	7.86	40.00	7.82	38.50	0.04	1.50
50	7.86	40.00	7.78	38.25	0.08	1.75
51	7.81	40.00	7.72	38.25	0.09	1.75
52	7.90	40.00	7.83	38.75	0.07	1.25
53	7.90	40.00	7.80	38.75	0.10	1.25
54	7.95	40.00	7.83	39.00	0.12	1.00
55	7.90	40.00	7.82	39.00	0.08	1.00
56	7.90	40.00	7.80	38.75	0.10	1.25
57	7.86	40.00	7.76	38.25	0.10	1.75
58	7.90	40.00	7.76	38.75	0.14	1.25
59	7.81	40.00	7.79	39.00	0.02	1.00
60	7.81	40.00	7.76	38.75	0.05	1.25
61	7.86	40.00	7.72	38.00	0.14	2.00
62	7.90	40.00	7.76	38.25	0.14	1.75
63	7.90	40.00	7.79	38.50	0.11	1.50
64	7.90	40.00	7.80	38.50	0.10	1.50
65	7.88	40.00	7.78	38.50	0.10	1.50
66	7.90	40.00	7.81	39.00	0.09	1.00
67	7.81	40.00	7.72	38.50	0.09	1.50
68	7.81	40.00	7.74	38.50	0.07	1.50
69	7.90	40.00	7.82	39.00	0.08	1.00
70	7.86	40.00	7.73	38.75	0.13	1.25
71	7.86	40.00	7.74	38.50	0.12	1.50
72	7.90	40.00	7.74	38.50	0.16	1.50
73	7.90	40.00	7.80	38.50	0.10	1.50
74	7.86	40.00	7.75	38.50	0.11	1.50
75	7.95	40.00	7.83	38.50	0.12	1.50
76	7.90	40.00	7.77	38.50	0.13	1.50
77	7.90	40.00	7.79	38.75	0.11	1.25
78	7.95	40.00	7.85	39.00	0.10	1.00
79	7.95	40.00	7.83	39.00	0.12	1.00
80	7.86	40.00	7.81	39.25	0.05	0.75
81	7.86	40.00	7.77	38.50	0.09	1.50
82	7.81	40.00	7.72	38.50	0.09	1.50
83	7.93	40.00	7.83	39.00	0.10	1.00
84	7.90	40.00	7.81	38.50	0.09	1.50
85	7.81	40.00	7.71	38.25	0.10	1.75
86	7.81	40.00	7.72	38.25	0.09	1.75
87	7.81	40.00	7.73	38.00	0.08	2.00
88	7.86	40.00	7.78	38.50	0.08	1.50
89	7.90	40.00	7.82	39.00	0.08	1.00
90	7.95	40.00	7.84	39.00	0.11	1.00
91	7.90	40.00	7.82	38.75	0.08	1.25
92	7.86	40.00	7.76	38.50	0.10	1.50
93	7.90	40.00	7.84	39.00	0.06	1.00
94	7.86	40.00	7.78	38.50	0.08	1.50
95	7.95	40.00	7.84	39.00	0.11	1.00
96	7.86	40.00	7.76	39.00	0.10	1.00
97	7.86	40.00	7.75	38.75	0.11	1.25
98	7.86	40.00	7.72	38.50	0.14	1.50
99	7.81	40.00	7.70	38.25	0.11	1.75
100	7.86	40.00	7.78	38.25	0.08	1.75
				Standard deviation:	**0.032**	**0.296**

Graphical representation

Model:	**17BPYPB13QL**	Serial no:	**737459**
Target torque:	**7.8 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	





Machine Capability Study
Control System

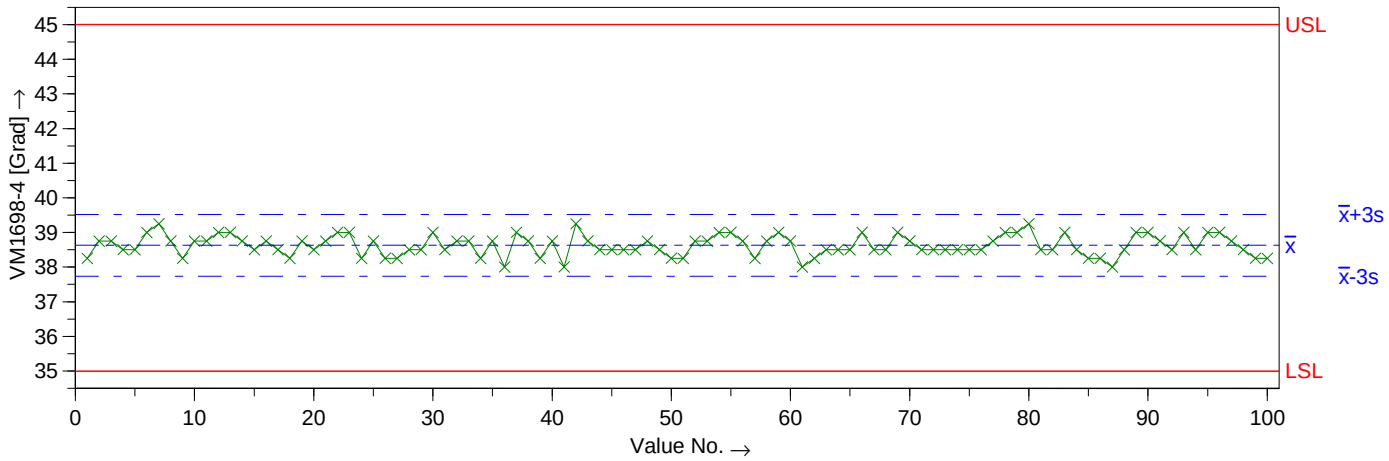
Cleco Production Tools

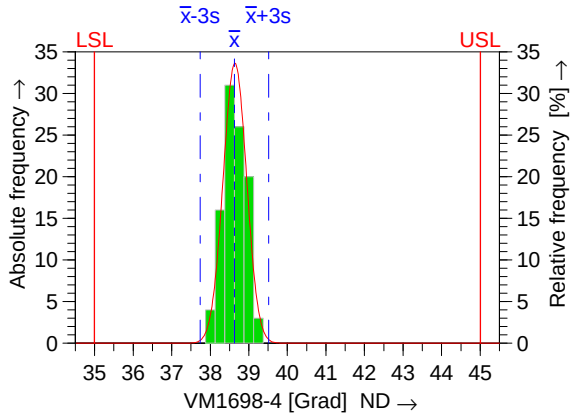
Plant	ATG Westhausen	Operator Name	Anton Czapla
Date	20.09.2017		

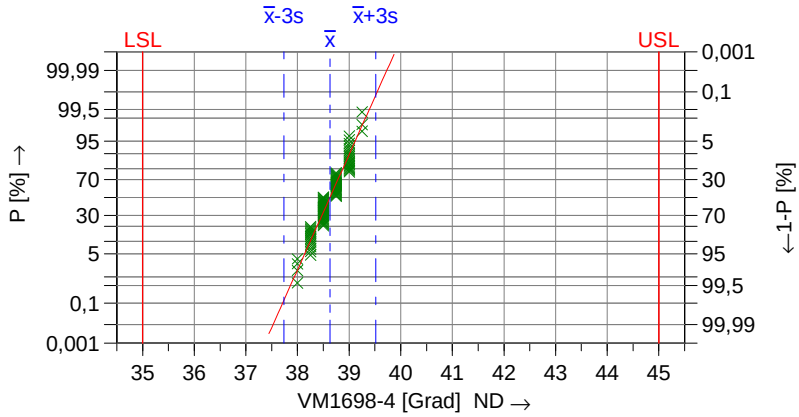
Ord. No.	17BPYPB13QL	Part type	17BPYPB13QL	Contr.item	yes
Serial No.	737459k	Char.Descr.	VM1698-4	Inspection Val. 40,00 5,00	USL 45,00
		Serial No.	1024210	Unit Grad -5,00	LSL 35,00
Char.Type	variable			Tolerance value 12 %	Decimal Pl. 2
Cust.Name	Homologation	Reference System	VM1698-4	Test Electronic	MPRO400SE
Contr.No.	816N2152	Reference Transducer	10 / 1029292	nges.	100

Evaluation from 20.09.2017 12:37:37 to 20.09.2017 12:50:34

Rem. Tq. 60% Angle 40° * +/-5° * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	38.6275
LSL	35.00	x_{min}	38.00	$\bar{x}$-3s	37.7388
USL	45.00	x_{max}	39.25	$\bar{x}$+3s	39.5162
T	10.00	R	1.25	6s	1.7773
		$n_{<T>}$	100	$p_{<T>}$	100.00000 %
		$n_{>USL}$	0	$p_{>USL}$	0.00000%
		$n_{<LSL}$	0	$p_{<LSL}$	0.00000%
		n_{eff}	100		
		n_{tot}	100		

Model distribution			Normal Distribution
Calculation method			M1 1.4 $\hat{\sigma} = s_{tot}$
Potential Capability index	=	C_m	5.63
Critical capability index	=	C_{mk}	4.08

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459k	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	7,94
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	6,11
				USL	9,90
Remark	Tq. 60% Angle 40° * +/-5°* Tq-Cal.: 17.65 N m * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	7,77	7,85	7,86	7,78	7,82	7,90	7,82	7,82	7,84	7,81
1024210	VM1698-4	38,25	38,75	38,75	38,50	38,50	39,00	39,25	38,75	38,25	38,75

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	7,82	7,87	7,84	7,82	7,77	7,79	7,82	7,77	7,85	7,82
1024210	VM1698-4	38,75	39,00	39,00	38,75	38,50	38,75	38,50	38,25	38,75	38,50

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	7,80	7,80	7,80	7,76	7,87	7,76	7,80	7,76	7,80	7,82
1024210	VM1698-4	38,75	39,00	39,00	38,25	38,75	38,25	38,25	38,50	38,50	39,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	7,75	7,78	7,80	7,78	7,79	7,75	7,85	7,83	7,73	7,80
1024210	VM1698-4	38,50	38,75	38,75	38,25	38,75	38,00	39,00	38,75	38,25	38,75

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	7,72	7,83	7,82	7,78	7,79	7,83	7,79	7,80	7,82	7,78
1024210	VM1698-4	38,00	39,25	38,75	38,50	38,50	38,50	38,50	38,75	38,50	38,25

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	7,72	7,83	7,80	7,83	7,82	7,80	7,76	7,76	7,79	7,76
1024210	VM1698-4	38,25	38,75	38,75	39,00	39,00	38,75	38,25	38,75	39,00	38,75

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	7,72	7,76	7,79	7,80	7,78	7,81	7,72	7,74	7,82	7,73
1024210	VM1698-4	38,00	38,25	38,50	38,50	38,50	39,00	38,50	38,50	39,00	38,75

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	7,74	7,74	7,80	7,75	7,83	7,77	7,79	7,85	7,83	7,81
1024210	VM1698-4	38,50	38,50	38,50	38,50	38,50	38,50	38,75	39,00	39,00	39,25

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459k	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	7,94
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	6,11
				USL	9,90
Remark	Tq. 60% Angle 40° * +/-5°* Tq-Cal.: 17.65 N m * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	7,77	7,72	7,83	7,81	7,71	7,72	7,73	7,78	7,82	7,84
1024210	VM1698-4	38,50	38,50	39,00	38,50	38,25	38,25	38,00	38,50	39,00	39,00

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	7,82	7,76	7,84	7,78	7,84	7,76	7,75	7,72	7,70	7,78
1024210	VM1698-4	38,75	38,50	39,00	38,50	39,00	39,00	38,75	38,50	38,25	38,25

Machine Capability Study
Tool System

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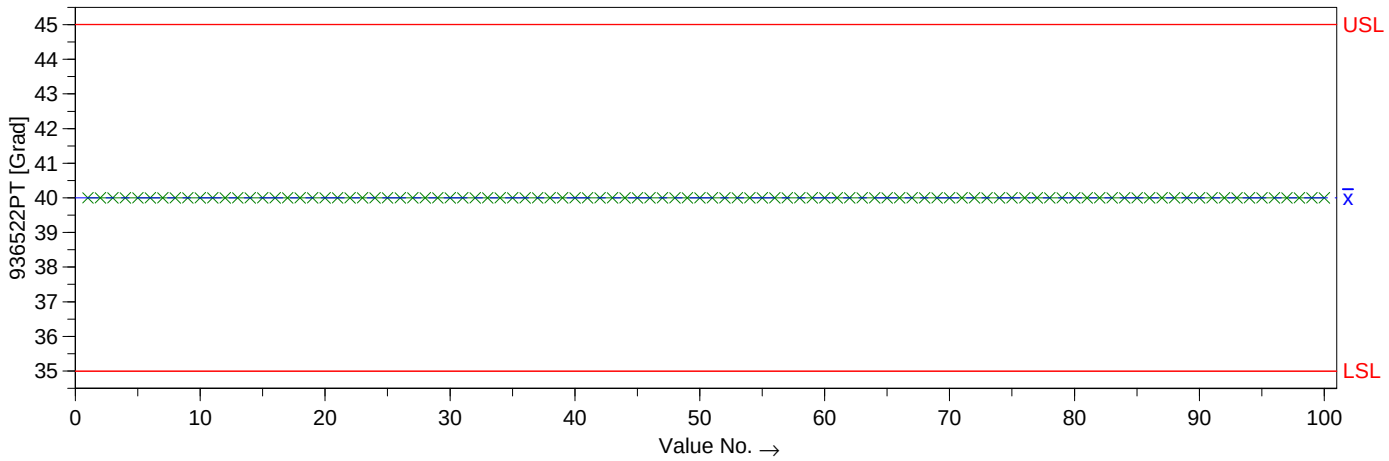
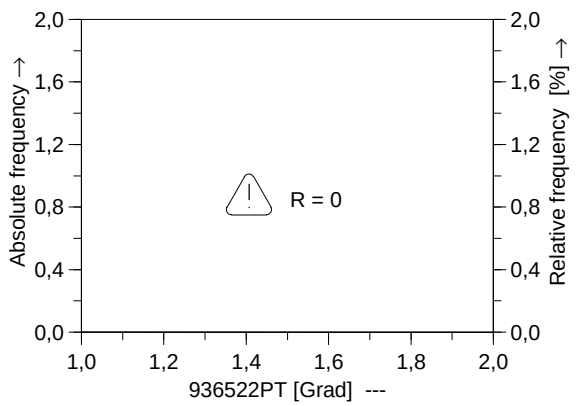
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

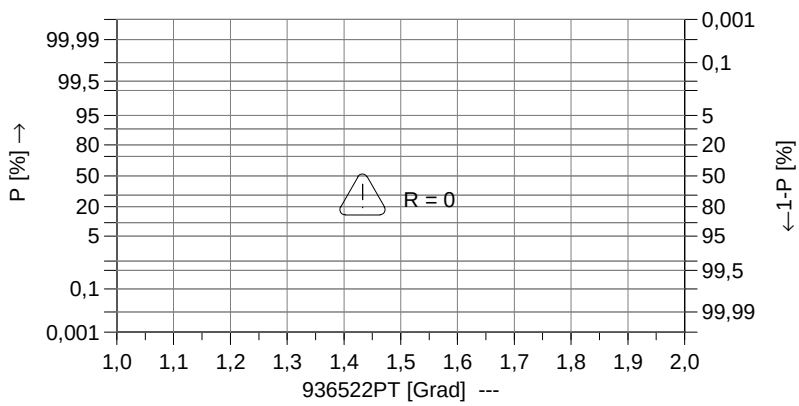
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459k	Char.Descr. 936522PT	Inspection Val.	40,00	5,00	USL 45,00
	Serial No. 154551	Unit	Grad	-5,00	LSL 35,00
Char.Type variable		Tolerance value	12 %		Decimal Pl. 2
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE			
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100			

Evaluation from 20.09.2017 12:37:37 to 20.09.2017 12:50:35

Rem. Tq. 60% Angle 40° * +/-5° * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A







Drawing Values		Collected Values		Statistics	
T_m	40.00			$\bar{x}$	40.0000
LSL	35.00	x_{min}	40.00		
USL	45.00	x_{max}	40.00		
T	10.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Apex Tool Group GmbH \\htwe0006\AppData\QW\QWE\MessWert\2017\737459k1.DFD

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459k	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	4,13
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	0,00
				USL	9,90
Remark	Tq. 60% Angle 40° * +/-5°* Tq-Cal.: 17.65 N m * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	7,86	7,86	7,86	7,86	7,86	7,95	7,86	7,86	7,81	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	7,86	7,95	7,90	7,86	7,86	7,81	7,86	7,86	7,95	7,90
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	7,86	7,90	7,81	7,86	7,95	7,86	7,86	7,86	7,90	7,90
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	7,81	7,90	7,90	7,90	7,90	7,81	7,95	7,90	7,86	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	7,81	7,90	7,90	7,90	7,86	7,90	7,90	7,86	7,86	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	7,81	7,90	7,90	7,95	7,90	7,90	7,86	7,90	7,81	7,81
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	7,86	7,90	7,90	7,90	7,88	7,90	7,81	7,81	7,90	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	7,86	7,90	7,90	7,86	7,95	7,90	7,90	7,95	7,95	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

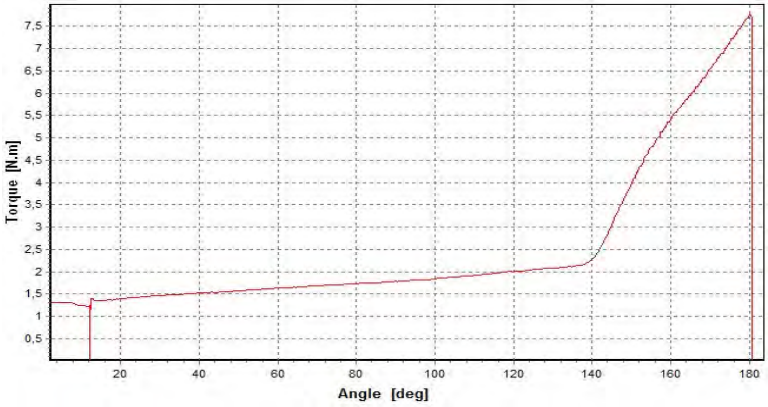
Ser.No.	737459k	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	4,13
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	0,00
				USL	9,90
Remark	Tq. 60% Angle 40° * +/-5°* Tq-Cal.: 17.65 N m * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	7,86	7,81	7,93	7,90	7,81	7,81	7,81	7,86	7,90	7,95
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

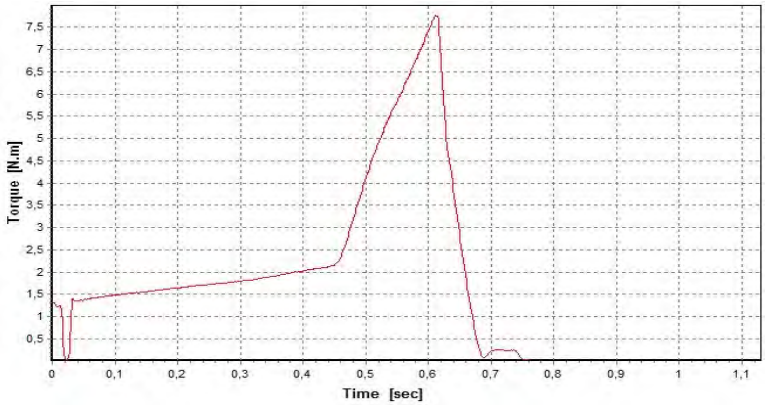
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	7,90	7,86	7,90	7,86	7,95	7,86	7,86	7,86	7,81	7,86
154551	936522PT	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00	40,00

Torque graphs

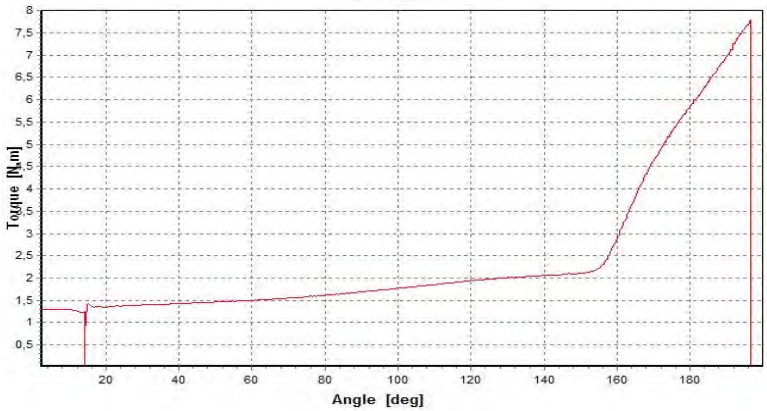
Model:	**17BPYPB13QL**	Serial no:	**737459**
Target torque:	**7.8 Nm**	60 % of max. torque	
Angle degree:	**40°**	Tool without angle correction	



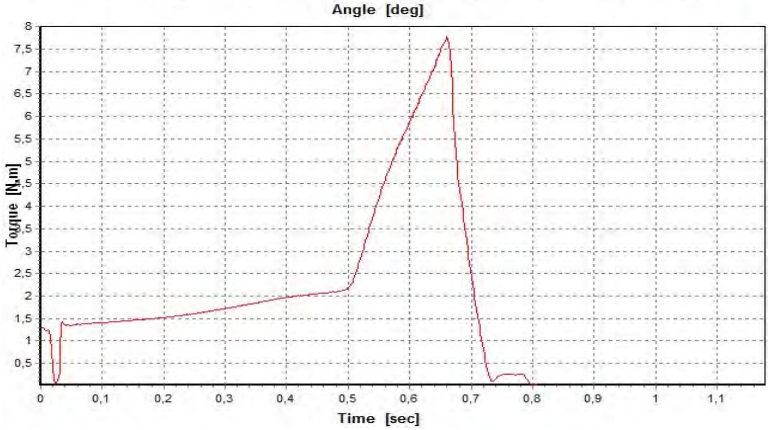
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time

Investigation no.: 010/2017
Date: 25.09.2017

General Specifications

Manufacturer: Apex Tool Group GmbH **Tool type:** LiveWire Tool

Model: 17BPYPB13QL **Serial no:** 737459

Torque range: **3 Nm to 13 Nm**

Difference evaluation: Reference/Tool at 180 ° / 80%

Capability examination

Snugfit value: 2.6 Nm **Torque tolerance ±** 7 %

Target torque: 10.4 Nm Tolerance: 3.00 % ± **1.50 %**

Angle degree: 180° Tolerance: 4.1° ± **2.0°**

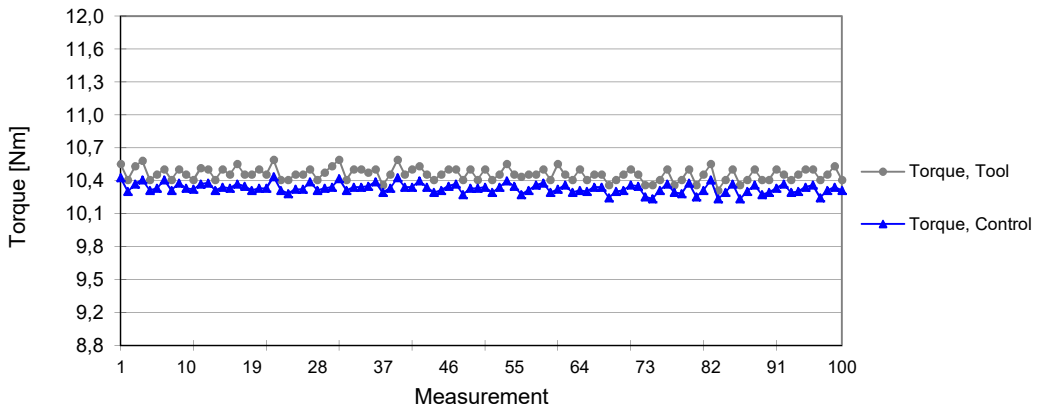
Formula derivation: $C_m = \frac{T}{6\,s}$ $T = C_m * 6\,s$

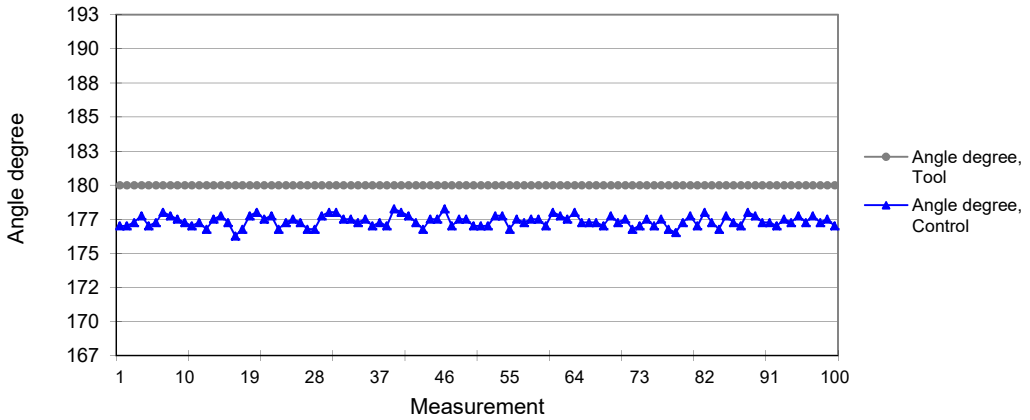
Tool without angle correction

Measurement	Tool data		Control data		Difference	
No.	Torque	Angle	Torque	Angle	Torque	Angle
1	10.56	180.00	10.43	177.00	0.13	3.00
2	10.41	180.00	10.30	177.00	0.11	3.00
3	10.54	180.00	10.37	177.25	0.17	2.75
4	10.59	180.00	10.41	177.75	0.18	2.25
5	10.41	180.00	10.31	177.00	0.10	3.00
6	10.46	180.00	10.33	177.25	0.13	2.75
7	10.51	180.00	10.41	178.00	0.10	2.00
8	10.41	180.00	10.31	177.75	0.10	2.25
9	10.51	180.00	10.38	177.50	0.13	2.50
10	10.46	180.00	10.33	177.25	0.13	2.75
11	10.41	180.00	10.32	177.00	0.09	3.00
12	10.52	180.00	10.37	177.25	0.15	2.75
13	10.51	180.00	10.38	176.75	0.13	3.25
14	10.41	180.00	10.31	177.50	0.10	2.50
15	10.51	180.00	10.34	177.75	0.17	2.25
16	10.46	180.00	10.33	177.25	0.13	2.75
17	10.56	180.00	10.37	176.25	0.19	3.75
18	10.46	180.00	10.35	176.75	0.11	3.25
19	10.46	180.00	10.31	177.75	0.15	2.25
20	10.51	180.00	10.33	178.00	0.18	2.00
21	10.46	180.00	10.33	177.50	0.13	2.50
22	10.60	180.00	10.44	177.75	0.16	2.25
23	10.41	180.00	10.31	176.75	0.10	3.25
24	10.41	180.00	10.28	177.25	0.13	2.75
25	10.46	180.00	10.32	177.50	0.14	2.50
26	10.46	180.00	10.32	177.25	0.14	2.75
27	10.51	180.00	10.39	176.75	0.12	3.25
28	10.41	180.00	10.31	176.75	0.10	3.25
29	10.48	180.00	10.33	177.75	0.15	2.25
30	10.54	180.00	10.34	178.00	0.20	2.00
31	10.60	180.00	10.42	178.00	0.18	2.00
32	10.41	180.00	10.31	177.50	0.10	2.50
33	10.51	180.00	10.34	177.50	0.17	2.50
34	10.51	180.00	10.34	177.25	0.17	2.75
35	10.48	180.00	10.35	177.50	0.13	2.50
36	10.51	180.00	10.39	177.00	0.12	3.00
37	10.36	180.00	10.29	177.25	0.07	2.75
38	10.46	180.00	10.33	177.00	0.13	3.00
39	10.60	180.00	10.43	178.25	0.17	1.75
40	10.46	180.00	10.34	178.00	0.12	2.00
41	10.51	180.00	10.34	177.75	0.17	2.25
42	10.54	180.00	10.40	177.25	0.14	2.75
43	10.46	180.00	10.34	176.75	0.12	3.25
44	10.41	180.00	10.29	177.50	0.12	2.50
45	10.46	180.00	10.31	177.50	0.15	2.50
46	10.51	180.00	10.35	178.25	0.16	1.75
47	10.51	180.00	10.37	177.00	0.14	3.00
48	10.41	180.00	10.27	177.50	0.14	2.50
49	10.51	180.00	10.33	177.50	0.18	2.50
50	10.41	180.00	10.33	177.00	0.08	3.00
51	10.51	180.00	10.34	177.00	0.17	3.00
52	10.41	180.00	10.29	177.00	0.12	3.00
53	10.46	180.00	10.34	177.75	0.12	2.25
54	10.56	180.00	10.40	177.75	0.16	2.25
55	10.46	180.00	10.35	176.75	0.11	3.25
56	10.44	180.00	10.27	177.50	0.17	2.50
57	10.46	180.00	10.31	177.25	0.15	2.75
58	10.46	180.00	10.36	177.50	0.10	2.50
59	10.51	180.00	10.38	177.50	0.13	2.50
60	10.41	180.00	10.29	177.00	0.12	3.00
61	10.56	180.00	10.32	178.00	0.24	2.00
62	10.46	180.00	10.36	177.75	0.10	2.25
63	10.41	180.00	10.29	177.50	0.12	2.50
64	10.51	180.00	10.31	178.00	0.20	2.00
65	10.41	180.00	10.30	177.25	0.11	2.75
66	10.46	180.00	10.34	177.25	0.12	2.75
67	10.46	180.00	10.34	177.25	0.12	2.75
68	10.36	180.00	10.24	177.00	0.12	3.00
69	10.41	180.00	10.30	177.75	0.11	2.25
70	10.46	180.00	10.31	177.25	0.15	2.75
71	10.51	180.00	10.36	177.50	0.15	2.50
72	10.46	180.00	10.35	176.75	0.11	3.25
73	10.36	180.00	10.25	177.00	0.11	3.00
74	10.36	180.00	10.23	177.50	0.13	2.50
75	10.41	180.00	10.31	177.00	0.10	3.00
76	10.51	180.00	10.37	177.50	0.14	2.50
77	10.36	180.00	10.29	176.75	0.07	3.25
78	10.41	180.00	10.28	176.50	0.13	3.50
79	10.51	180.00	10.38	177.25	0.13	2.75
80	10.36	180.00	10.25	177.75	0.11	2.25
81	10.46	180.00	10.31	177.00	0.15	3.00
82	10.56	180.00	10.41	178.00	0.15	2.00
83	10.31	180.00	10.23	177.25	0.08	2.75
84	10.41	180.00	10.29	176.75	0.12	3.25
85	10.51	180.00	10.37	177.75	0.14	2.25
86	10.36	180.00	10.23	177.25	0.13	2.75
87	10.41	180.00	10.30	177.00	0.11	3.00
88	10.51	180.00	10.36	178.00	0.15	2.00
89	10.41	180.00	10.27	177.75	0.14	2.25
90	10.41	180.00	10.29	177.25	0.12	2.75
91	10.51	180.00	10.33	177.25	0.18	2.75
92	10.46	180.00	10.37	177.00	0.09	3.00
93	10.41	180.00	10.29	177.50	0.12	2.50
94	10.46	180.00	10.30	177.25	0.16	2.75
95	10.51	180.00	10.34	177.75	0.17	2.25
96	10.51	180.00	10.36	177.25	0.15	2.75
97	10.41	180.00	10.24	177.75	0.17	2.25
98	10.46	180.00	10.31	177.25	0.15	2.75
99	10.54	180.00	10.34	177.50	0.20	2.50
100	10.41	180.00	10.31	177.00	0.10	3.00
				Standard deviation:	**0.031**	**0.407**

Graphical representation

Model:	**17BPYPB13QL**	Serial no:	**737459**
Target torque:	**10.4 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	





Machine Capability Study
Control System

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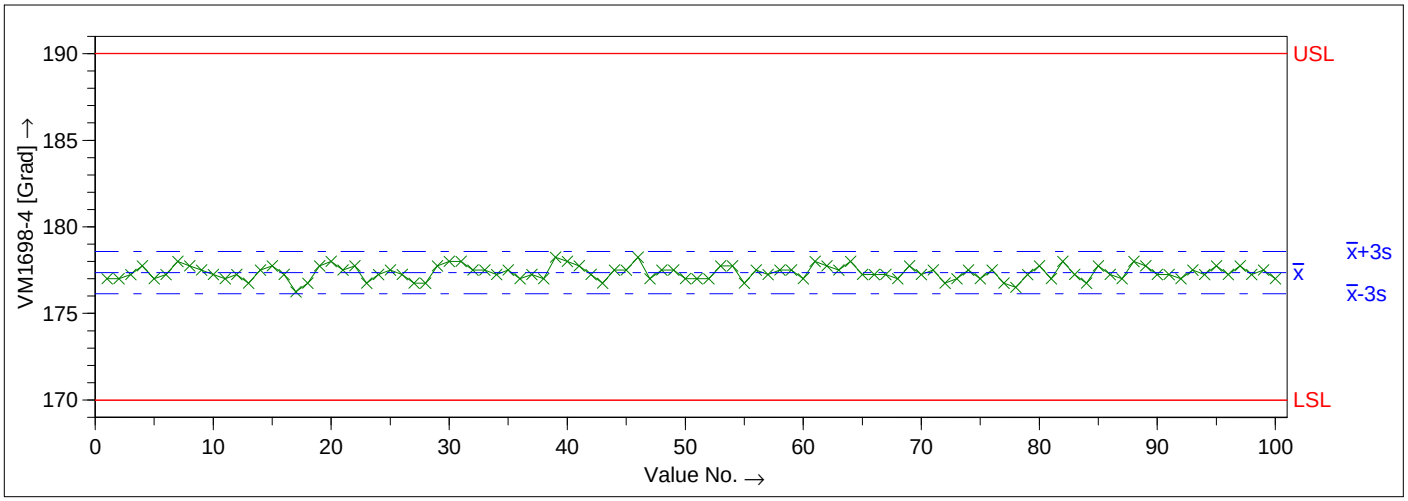
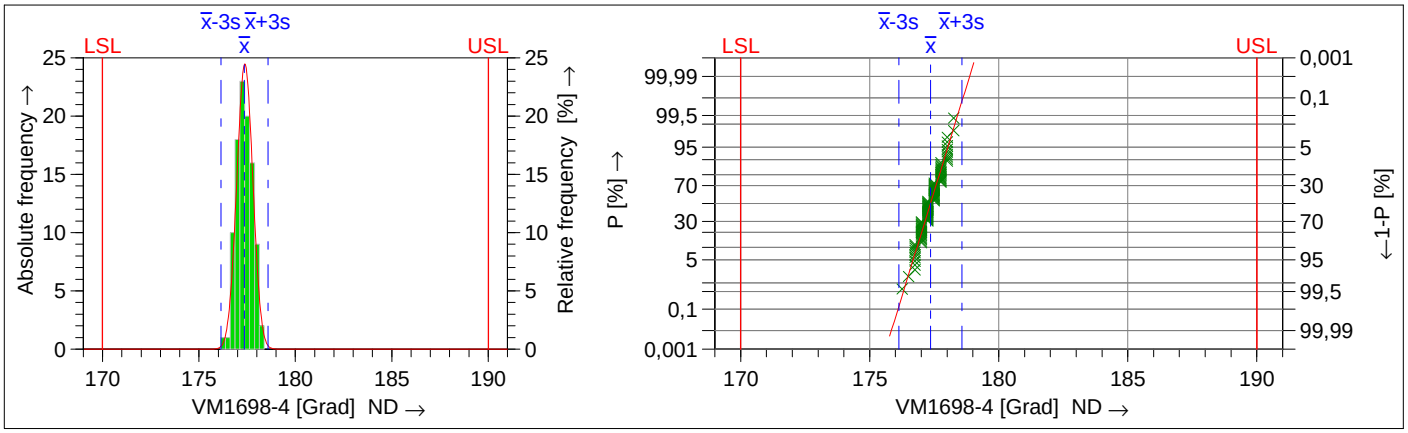
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459l	Char.Descr. VM1698-4	Inspection Val. 180,00	10,00	USL 190,00	
	Serial No. 1024210	Unit Grad	-10,00	LSL 170,00	
Char.Type variable		Tolerance value 6 %		Decimal Pl. 2	
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE			
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100			

Evaluation from 20.09.2017 12:54:08 to 20.09.2017 13:11:55

Rem. Tq. 80% Angle 180° * +/-10° * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A





Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	177.3550
LSL	170.00	x_{min}	176.25	$\bar{x}$-3s	176.1341
USL	190.00	x_{max}	178.25	$\bar{x}$+3s	178.5759
T	20.00	R	2.00	6s	2.4419
		$n_{<T>}$	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	8.19
Critical capability index	=	C_{mk}	6.02

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

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459l	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	10,55
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	8,18
				USL	13,04
Remark	Tq. 80% Angle 180° * +/-10°* Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
1024210	VM1698-4	10,43	10,30	10,37	10,41	10,31	10,33	10,41	10,31	10,38	10,33
1024210	VM1698-4	177,00	177,00	177,25	177,75	177,00	177,25	178,00	177,75	177,50	177,25

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
1024210	VM1698-4	10,32	10,37	10,38	10,31	10,34	10,33	10,37	10,35	10,31	10,33
1024210	VM1698-4	177,00	177,25	176,75	177,50	177,75	177,25	176,25	176,75	177,75	178,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
1024210	VM1698-4	10,33	10,44	10,31	10,28	10,32	10,32	10,39	10,31	10,33	10,34
1024210	VM1698-4	177,50	177,75	176,75	177,25	177,50	177,25	176,75	176,75	177,75	178,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
1024210	VM1698-4	10,42	10,31	10,34	10,34	10,35	10,39	10,29	10,33	10,43	10,34
1024210	VM1698-4	178,00	177,50	177,50	177,25	177,50	177,00	177,25	177,00	178,25	178,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
1024210	VM1698-4	10,34	10,40	10,34	10,29	10,31	10,35	10,37	10,27	10,33	10,33
1024210	VM1698-4	177,75	177,25	176,75	177,50	177,50	178,25	177,00	177,50	177,50	177,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
1024210	VM1698-4	10,34	10,29	10,34	10,40	10,35	10,27	10,31	10,36	10,38	10,29
1024210	VM1698-4	177,00	177,00	177,75	177,75	176,75	177,50	177,25	177,50	177,50	177,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
1024210	VM1698-4	10,32	10,36	10,29	10,31	10,30	10,34	10,34	10,24	10,30	10,31
1024210	VM1698-4	178,00	177,75	177,50	178,00	177,25	177,25	177,25	177,00	177,75	177,25

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
1024210	VM1698-4	10,36	10,35	10,25	10,23	10,31	10,37	10,29	10,28	10,38	10,25
1024210	VM1698-4	177,50	176,75	177,00	177,50	177,00	177,50	176,75	176,50	177,25	177,75

Machine Capability Study
Control System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459l	Characteristic			
Type	17BPYPB13QL	Char.Descr.	VM1698-4	Inspection Val.	10,55
Ord. No.	17BPYPB13QL	Ser.No.	1024210	LSL	8,18
				USL	13,04
Remark	Tq. 80% Angle 180° * +/-10°* Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
1024210	VM1698-4	10,31	10,41	10,23	10,29	10,37	10,23	10,30	10,36	10,27	10,29
1024210	VM1698-4	177,00	178,00	177,25	176,75	177,75	177,25	177,00	178,00	177,75	177,25

Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
1024210	VM1698-4	10,33	10,37	10,29	10,30	10,34	10,36	10,24	10,31	10,34	10,31
1024210	VM1698-4	177,25	177,00	177,50	177,25	177,75	177,25	177,75	177,25	177,50	177,00

Machine Capability Study
Tool System

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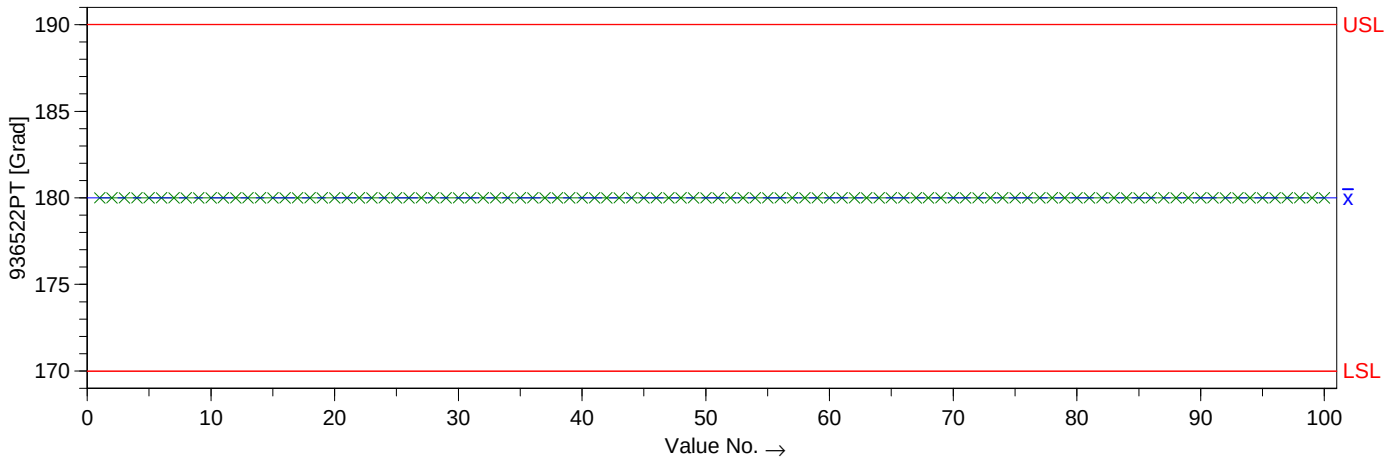
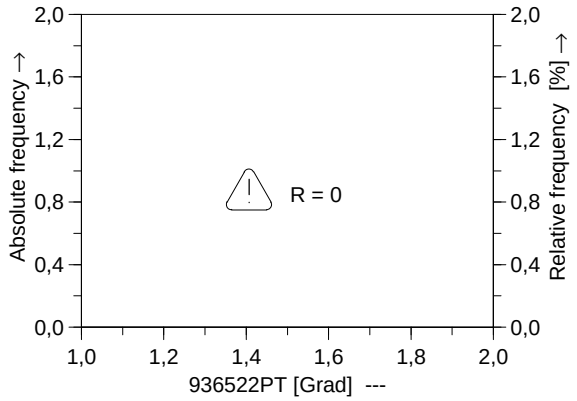
Plant ATG Westhausen		Operator Name Anton Czapla	Date 20.09.2017

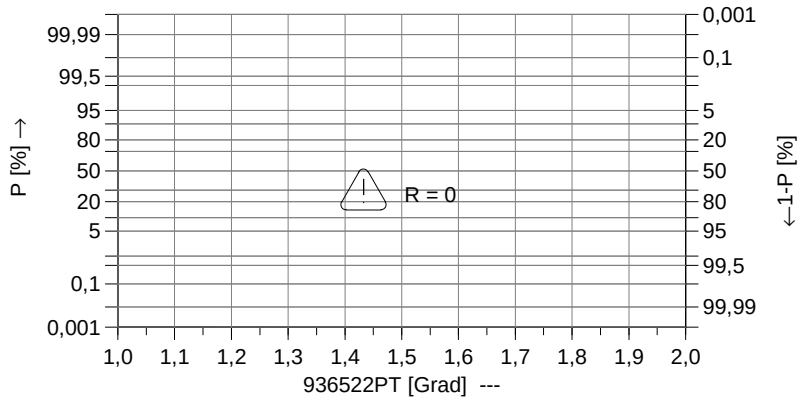
Ord. No. 17BPYPB13QL	Part type 17BPYPB13QL				Contr.item yes
Serial No. 737459l	Char.Descr. 936522PT	Inspection Val. 180,00	10,00	USL 190,00	
	Serial No. 154551	Unit Grad	-10,00	LSL 170,00	
Char.Type variable		Tolerance value 6 %		Decimal Pl. 2	
Cust.Name Homologation	Reference System VM1698-4	Test Electronic MPRO400SE			
Contr.No. 816N2152	Reference Transducer 10 / 1029292	nges. 100			

Evaluation from 20.09.2017 12:54:11 to 20.09.2017 13:11:57

Rem. Tq. 80% Angle 180° * +/-10° * Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A







Drawing Values		Collected Values		Statistics	
T_m	180.00			$\bar{x}$	180.0000
LSL	170.00	x_{min}	180.00		
USL	190.00	x_{max}	180.00		
T	20.00	R	0.00		
		$n_{<T>}$	100		
		$n_{>USL}$	0		
		$n_{<LSL}$	0		
		n_{eff}	100		
		n_{tot}	100		

--- R = 0 ---

APEX VDI/VDE 2647 V0.1

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

Ser.No.	737459l	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	5,43
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	0,00
				USL	13,04
Remark	Tq. 80% Angle 180° * +/-10°* Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
154551	936522PT	10,56	10,41	10,54	10,59	10,41	10,46	10,51	10,41	10,51	10,46
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}
154551	936522PT	10,41	10,52	10,51	10,41	10,51	10,46	10,56	10,46	10,46	10,51
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}
154551	936522PT	10,46	10,60	10,41	10,41	10,46	10,46	10,51	10,41	10,48	10,54
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}
154551	936522PT	10,60	10,41	10,51	10,51	10,48	10,51	10,36	10,46	10,60	10,46
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{41}	x_{42}	x_{43}	x_{44}	x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}
154551	936522PT	10,51	10,54	10,46	10,41	10,46	10,51	10,51	10,41	10,51	10,41
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}
154551	936522PT	10,51	10,41	10,46	10,56	10,46	10,44	10,46	10,46	10,51	10,41
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}	x_{66}	x_{67}	x_{68}	x_{69}	x_{70}
154551	936522PT	10,56	10,46	10,41	10,51	10,41	10,46	10,46	10,36	10,41	10,46
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Char.No	Char.Descr.	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}	x_{76}	x_{77}	x_{78}	x_{79}	x_{80}
154551	936522PT	10,51	10,46	10,36	10,36	10,41	10,51	10,36	10,41	10,51	10,36
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Machine Capability Study
Tool System

Plant	ATG Westhausen		Operator Name	Anton Czapla	Date 20.09.2017

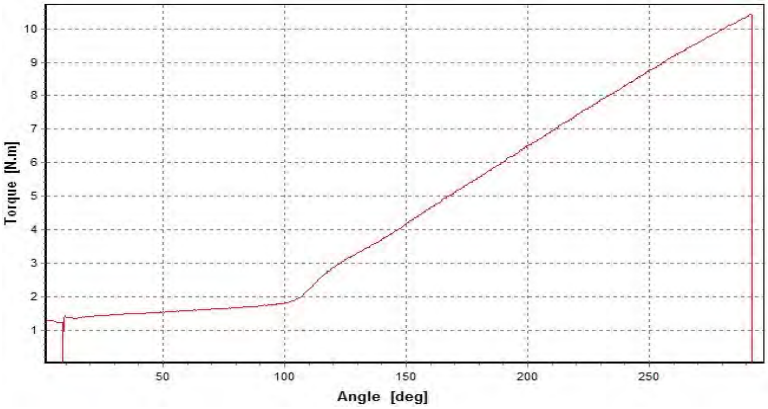
Ser.No.	737459l	Characteristic			
Type	17BPYPB13QL	Char.Descr.	936522PT	Inspection Val.	5,43
Ord. No.	17BPYPB13QL	Ser.No.	154551	LSL	0,00
				USL	13,04
Remark	Tq. 80% Angle 180° * +/-10°* Tq-Cal.: 17.65 Nm * Cur.-Cal.: 0.270 Nm/A				

Char.No	Char.Descr.	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}	x_{86}	x_{87}	x_{88}	x_{89}	x_{90}
154551	936522PT	10,46	10,56	10,31	10,41	10,51	10,36	10,41	10,51	10,41	10,41
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

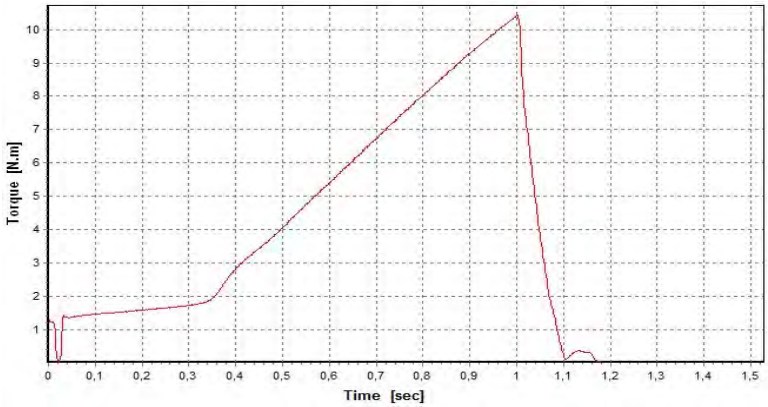
Char.No	Char.Descr.	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}	x_{96}	x_{97}	x_{98}	x_{99}	x_{100}
154551	936522PT	10,51	10,46	10,41	10,46	10,51	10,51	10,41	10,46	10,54	10,41
154551	936522PT	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00	180,00

Torque graphs

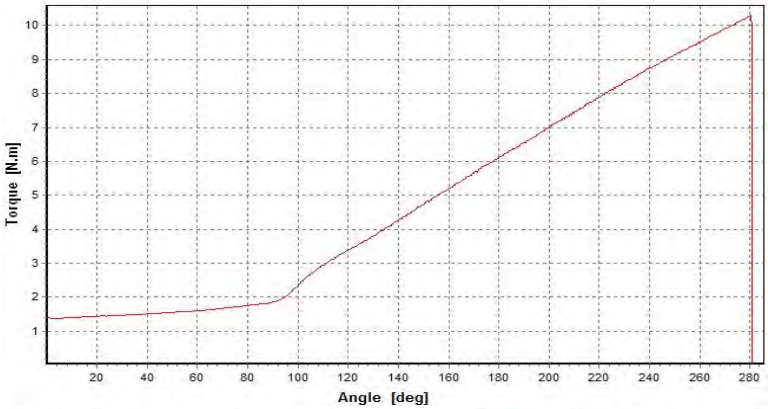
Model:	**17BPYPB13QL**	Serial no:	**737459**
Target torque:	**10.4 Nm**	80 % of max. torque	
Angle degree:	**180°**	Tool without angle correction	



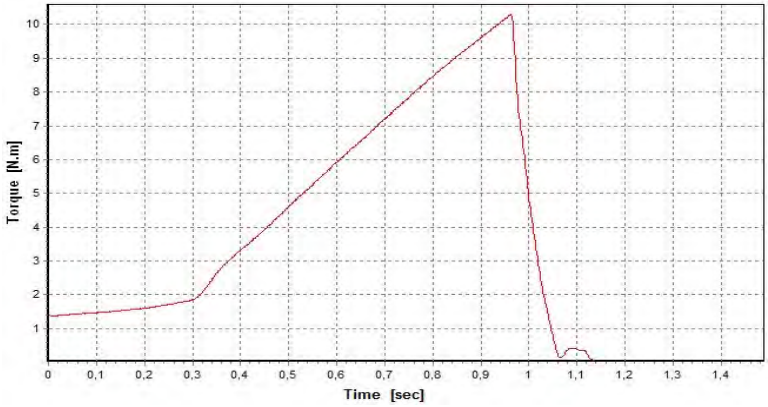
Value no. 1
Graph
Torque / Angle



Value no. 1
Graph
Torque / Time



Value no. 100
Graph
Torque / Angle



Value no. 100
Graph
Torque / Time