Test report: **Machinery capability investigation**
from industry screwdriver

C. & E. FEIN GmbH
Schwäbisch Gmünd
Hans-Fein-Str. 81, D-73529 Schwäbisch Gmünd-Bargau

Maschine typ	:	Mid-mounted handle	**Date** : 18.10.2019
Model variant	:	ASM 18-3-PC	
Manufactorer	:	C.&E. Fein GmbH	

Stage of development	:	Series
MCI - Typ	:	Homologation
Number of steps	:	1-step

Test bench - ID : 1026164

Screw connection class	:	2	1	**2**	3	4	5	6
Fitting tolerance	:	10,0%	5,0%	**10,0%**	12,0%	15,0%	20,0%	25,0%

Torque range	:	M_{min} =	0,50	Nm		M_{max} =	3,00	Nm
Idle speed	:	n =	600	min^{-1}	**Weight incl. Battery** :	m =	1,50	kg
Battery voltage	:	U =	18,0	V	**Sound pressure level** :	L_{pA} =	80	dB(A)
Battery capacity	:	Q =	6000	mAh	**Undervoltage detection** :		☑	

Torque range investigation : **Testing maschine :** 3 **Stück**

	30%	→	M30%	= Mmin + 30% x (Mmax -Mmin) =	1,25 Nm
	80%	→	M80%	= Mmin + 80% x (Mmax -Mmin) =	2,50 Nm
Mmax =	100%	→	M100%	= Mmin + 100% x (Mmax -Mmin) =	3,00 Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	M_d =	1,25		2,50		3,00	
Joints		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m\,min}$ =		2,315	2,976	2,976	3,333	3,030	4,167
$c_{mk\,min}$ =		2,167	2,714	2,845	3,187	3,010	3,958

		Name :	Date :
Carried out by	:	M. Mueck	06.09.2019
Test report prepared by	:	M. Burkhardt	18.10.2019

Testbench Measuring

MCS for FEIN-Project : 0 | **Homologation** | Date: 18.10.2019

f_{mess} = 300 Hz | M_{min} | M_{max}

ASM 18-8PC | ScrewdriverType ASM | Accuracy-Class 10,0% | Class : 2 | M_{range} = 0,50 up to 3,00 Nm

Variant : 18-8PC | n_{given} = 600 rpm | U = 18,00 V

cycles: 100

MCS	M_d [Nm]	Angle [°]	M_q [Nm]	$\Delta M_{q\,i-2}$ [Nm]	s [Nm]	c_m [1]	c_{mk} [1]	n [min^{-1}]			Remarks
1	1,25	360°	1,239		0,014	2,976	2,714	604	2019-07.029782	30%	
				0,002							
1	1,25	30°	1,237		0,017	2,451	2,196	605			
1	2,50	360°	2,511		0,025	3,333	3,187	600		80%	
				0,022							
1	2,50	30°	2,489		0,028	2,976	2,845	602			
1	3,00	360°	2,985		0,024	4,167	3,958	601		100%	
				0,017							
1	3,00	30°	3,002		0,033	3,030	3,010	598			
2	1,25	360°	1,244		0,013	3,205	3,051	605	2019-07.029783	30%	
				0,005							
2	1,25	30°	1,249		0,016	2,604	2,583	608			
2	2,50	360°	2,489		0,011	7,576	7,242	599		80%	
				0,006							
2	2,50	30°	2,483		0,023	3,623	3,377	604			
2	3,00	360°	2,994		0,012	8,333	8,167	603		100%	
				0,035							
2	3,00	30°	3,029		0,019	5,263	4,754	586			
3	1,25	360°	1,251		0,012	3,472	3,444	610	2019-07.029784	30%	
				0,007							
3	1,25	30°	1,258		0,018	2,315	2,167	603			
3	2,50	360°	2,507		0,018	4,630	4,500	609		80%	
				0,010							
3	2,50	30°	2,497		0,022	3,788	3,742	593			
3	3,00	360°	2,977		0,013	7,692	7,103	607		100%	
				0,048							
3	3,00	30°	3,025		0,019	5,263	4,825	599			

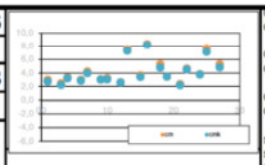
Start of measurement: 09:00

End of measurement: 16:00

Homologation : 3 Machines out of a series, each 30%, 80% and 100% the torque-ranges.
Waitingtime between Load changes 2 sec.
Series of measurement per machine, Nominal Torque and Screwinghardness each 100 Load changes (LW).

Measurment based on VDI 2647 February 2013

$c_{m\ min}$ = 2,315	$c_{m\ q}$ = 4,261	$c_{m\ max}$ = 8,333	s_{cm} = 1,816
$c_{mk\,min}$ = 2,167	$c_{mk\ q}$ = 4,048	$c_{mk\,max}$ = 8,167	n_{MFU} = 18
Name: #WERT!		Project: 0 : ASM 18-8PC	
C. & E. FEIN GmbH Schwäbisch Gmünd		Stage of Development : Series	



$c_{m\ min}$ = c_m - Minimum Value
$c_{mk\ min}$ = c_m - Minimum Value
c_m - Minimum Value
$c_{m\ q}$ = c_m - Mid Value
$c_{mk\ q}$ = c_m - Mid Value
c_m - Mid Value
$c_{m\ max}$ = c_m - Maximum Value
$c_{mk\ max}$ = c_m - Maximum Value
c_m - Maximum Value
s_{cm} = c_m - Standard deviation
s_{cmk} = c_{mk} - Standard deviation
n_{MCS} = No. of Machine Capability Study (MCS)
correktion Value

Testbench Measuring

MCA for FEIN-Project : 0 | **Homologation** | Date: 18.10.2019

f_{mess} = 300 Hz | M_{min} | M_{max}

ASM 18-3PC | ScrewdriverType ASM | Accuracy-Class 10,0% | Class : 2 | M_{range} = 0,50 up to 3,00 Nm

Variant : 18-3PC | n_{given} = 600 rpm | U = 18,00 V

cycles: 100

MCSs	M_d [Nm]	Angle [°]	M_q [Nm]	$\Delta M_{q\,1/2}$ [Nm]	s [Nm]	c_m [1]	c_{mk} [1]	n [min^{-1}]			Remarks
1	0,80	360°	0,793	0,001	0,014	1,975	1,802	614	2019-07.029782	8%	
1	0,80	30°	0,794		0,015	1,839	1,701	607			
1	1,25	360°	1,239	0,002	0,014	2,976	2,714	604		30%	
1	1,25	30°	1,237		0,017	2,451	2,196	605			
1	2,50	360°	2,511	0,022	0,025	3,333	3,187	602		80%	
1	2,50	30°	2,489		0,028	2,976	2,845	601			
1	3,00	360°	2,985	0,017	0,024	4,167	3,958	601		100%	
1	3,00	30°	3,002		0,033	3,030	3,010	598			
2	0,80	360°	0,804	0,001	0,015	1,778	1,689	604	2019-07.029783	8%	
2	0,80	30°	0,805		0,014	1,905	1,786	608			
2	1,25	360°	1,244	0,005	0,013	3,205	3,051	605		30%	
2	1,25	30°	1,249		0,016	2,604	2,583	608			
2	2,50	360°	2,489	0,006	0,011	7,576	7,242	599		80%	
2	2,50	30°	2,483		0,023	3,623	3,377	604			
2	3,00	360°	2,994	0,035	0,012	8,333	8,167	603		100%	
2	3,00	30°	3,029		0,019	5,263	4,754	589			
3	0,80	360°	0,806	0,001	0,010	2,667	2,467	599	2019-07.029784	8%	
3	0,80	30°	0,805		0,011	2,424	2,273	609			
3	1,25	360°	1,251	0,007	0,012	3,472	3,444	610		30%	
3	1,25	30°	1,258		0,018	2,315	2,167	603			
3	2,50	360°	2,507	0,010	0,018	4,630	4,500	609		80%	
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3	3,00	360°	2,977	0,048	0,013	7,692	7,103	607		100%	
3	3,00	30°	3,025		0,019	5,263	4,825	599			

Start of measurement: 09:00

End of measurement: 16:00

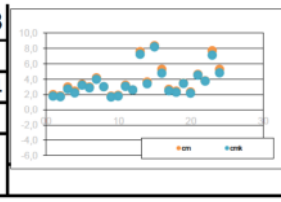
Homologation : 3 Machines out of a series, each 0%, 30%, 80% and 100% the torque-ranges.

Waitingtime between Load cycles 2 sec.

Series of measurements per machine, nominal torque and screw joint density per 100 load cycles (LW).

Measurment based on VDI 2647 February 2013

$c_{m\ min}$ = 1,778	$c_{m\ q}$ = 3,720	$c_{m\ max}$ = 8,333	s_{cm} = 1,838
$c_{mk\,min}$ = 1,689	$c_{mk\ q}$ = 3,524	$c_{mk\,max}$ = 8,167	n_{MFU} = 24



$c_{m\,min}$ = c_m - Minimum Value

$c_{m\,q}$ = c_m - Mid Value

$c_{mk\,q}$ = c_m - Mid Value

$c_{m\,max}$ = c_m - Maximum Value

$c_{mk\,max}$ = c_m - Maximum Value

s_{cm} = c_m - Standard deviation

s_{cmk} = c_{mk} - Standard deviation

$\breve{c}$ = correktion value

Name: M. Mueck | Project:

C. & E. FEIN GmbH Schwäbisch Gmünd | Development Status : Series