

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 : Date :

Model variant :

Manufacturer :

Development No. :

Stage of development

MCI - Typ :

Number of steps : Test bench - ID :

Screw connection class :

1	2	3	4	5	6
5,0%	10,0%	12,0%	15,0%	20,0%	25,0%

Fitting tolerance :

Torque range : $M_{min} =$ Nm $M_{max} =$ Nm

Idle speed : $n =$ min⁻¹ Weight incl. Battery : $m =$ kg

Battery voltage : $U =$ V Sound pressure level : $L_{pA} =$ dB(A)

Battery capacity : $Q =$ mAh Undervoltage detection :




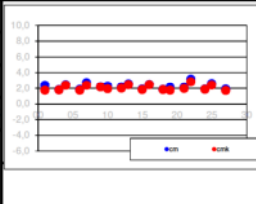
Torque range investigation : Testingmaschine : Stück

30% → M30% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 9,60 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 15,60 Nm
 Mmax = 100% → M100% = $M_{min} + 100\% \times (M_{max} - M_{min}) =$ 18,00 Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	9,60		15,60		18,00	
Joints	hard	soft	hard	soft	hard	soft	
	30°	360°	30°	360°	30°	360°	
$c_{m \min} =$		1,818	2,092	1,844	2,453	1,835	2,500
$c_{mk \min} =$		1,782	1,728	1,752	2,381	1,707	2,386

		Name :	Date :
Carried out by	:	Mück	31.05.2017
Test report prepared by	:	Mück	04.07.2017

Testbench Measuring			MCS for FEIN-Project : 7021			Homologation		Date: 04.07.2017		
ASW 18-18 / PC			ScrewdriverType ASW		Accuracy-Class 10,0%	Class : 2	M _{range} =	M _{min}	M _{max}	
			Variant : 18-18 / PC				n _{given} = 375 rpm	up to 6,00	18,00 Nm	
								U = 18,00	V	
								cycles: 100		
MCS	M _d [Nm]	Angle [°]	M _q [Nm]	ΔM _{q1/2} [Nm]	s [Nm]	C _m [1]	C _{mk} [1]	n [min ⁻¹]	Remarks	
1	9,60	360°	9,345	0,236	0,134	2,388	1,754	334	2017-05.021100	30%
1	9,60	30°	9,581		0,176	1,818	1,782	328		
1	15,60	360°	15,554	0,124	0,212	2,453	2,381	332		80%
1	15,60	30°	15,678		0,282	1,844	1,752	331		
1	18,00	360°	17,782	0,191	0,221	2,715	2,386	335		100%
1	18,00	30°	17,973		0,275	2,182	2,149	329		
2	9,60	360°	9,467	0,198	0,142	2,254	1,941	329	2017-05.021095	30%
2	9,60	30°	9,665		0,149	2,148	2,002	325		
2	15,60	360°	15,546	0,108	0,204	2,549	2,461	333		80%
2	15,60	30°	15,654		0,276	1,884	1,819	333		
2	18,00	360°	17,961	0,001	0,240	2,500	2,446	333		100%
2	18,00	30°	17,960		0,327	1,835	1,794	333		
3	9,60	360°	9,433	0,102	0,153	2,092	1,728	335	2017-05.021093	30%
3	9,60	30°	9,535		0,153	2,092	1,950	333		
3	15,60	360°	15,423	0,194	0,164	3,171	2,811	336		80%
3	15,60	30°	15,617		0,276	1,884	1,864	332		
3	18,00	360°	17,870	0,286	0,232	2,586	2,399	335		100%
3	18,00	30°	18,156		0,321	1,869	1,707	335		
Start of measurement: 09:00					End of measurement: 16:00					
<p>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). Measurement based on VDI 2647 February 2013</p>										
C _{m min} = 1,818		C _{m q} = 2,237		C _{m max} = 3,171		S _{cm} = 0,364				
C _{mk min} = 1,707		C _{mk q} = 2,063		C _{mk max} = 2,811		n _{MFU} = 18				
Name: Mück			Project: 7021 : ASW 18-18 / PC			Stage of Development :				
 C. & E. FEIN GmbH Schwäbisch Gmünd			Series							
						C _{m min} = C _m - Minimum Value C _{mk min} = C _{mk} - Minimum Value C _m = C _m - Minimum Value C _{m q} = C _m - Mid Value C _{mk q} = C _{mk} - Mid Value C _m = C _m - Mid Value C _{m max} = C _m - Maximum Value C _{mk max} = C _{mk} - Maximum Value C _m = C _m - Maximum Value S _{cm} = C _m - Standard deviation C _{mk} = C _{mk} - Standard deviation n _{MFU} = No. of Machine Capability Study (MCS) C = correction Value				

Test report: **Machine capability study (MFU) of battery-powered industrial screwdrivers**



C. & E. FEIN GmbH
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 Schwäbisch Gmünd-Bargau

Maschine type :

Date:

Model variant:

Manufacturer:

Development status

MCI - Typ:

Number of steps :

Test bench - ID:

Screw connection class :
 Screw joint tolerance

1	2	3	4	5	6
5,0%	10,0%	12,0%	15,0%	20,0%	25,0%

Torque range: $M_{min} =$ Nm $M_{max} =$ Nm

Idle speed: $n =$ min⁻¹ Weight incl. battery: $m =$ kg

Battery voltage: $U =$ V Sound pressure level: $L_{pA} =$ dB(A)

Battery capacity: $Q =$ mAh Undervoltage detection:

Torque range investigation : Test Maschinen: piece

$M_{max} =$ 30% → M30% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 9,60 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 15,60 Nm
 100% → M100% = $M_{min} + 100\% \times (M_{max} - M_{min}) =$ 18,00 Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	9,60		15,60		18,00	
screw joint		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m, min} =$		2,177	2,500	2,574	2,574	2,326	2,469
$c_{mk, min} =$		1,894	2,164	2,282	2,279	2,136	2,412
torsion angle range		> 0°					

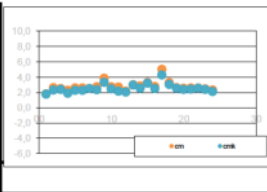
		Name :	Date :
Test performed by	:	M. Mueck	30.03.2020
Test report prepared by	:	M. Burkhardt	31.03.2020

Testbench Measuring		MCA for FEIN-Project : 0		Homologation		Date: 30.03.2020	
ASW 18-18PC		ScrewdriverType ASW	Accuracy-Class 10,0%	Class : 2	$f_{mess} = 300 \text{ Hz}$	M_{min}	M_{max}
Variant : 18-18PC				$M_{range} =$	6,00 up to	18,00	Nm
				$n_{given} = 470 \text{ rpm}$	U =	18,00	V
						cycles:	100


MCS	M_d [Nm]	Angle [°]	M_q [Nm]	$\Delta M_{q1/2}$ [Nm]	s [Nm]	C_m [1]	C_{mk} [1]	n [min ⁻¹]	Remarks	
1	6,00	360°	6,012		0,109	1,835	1,798	459	7021-05.021093	0%
1	6,00	30°	5,932	0,080	0,076	2,632	2,333	455		
1	9,60	360°	9,635		0,128	2,500	2,409	430		
1	9,60	30°	9,770	0,135	0,139	2,302	1,894	434		
1	15,60	360°	15,421		0,202	2,574	2,279	431		
1	15,60	30°	15,416	0,005	0,201	2,587	2,282	423		
1	18,00	360°	17,997		0,239	2,510	2,506	426		
1	18,00	30°	18,257	0,260	0,218	2,752	2,359	435		
2	6,00	360°	5,915		0,052	3,846	3,301	460		
2	6,00	30°	5,943	0,028	0,073	2,740	2,479	457		
2	9,60	360°	9,794		0,118	2,712	2,164	435		
2	9,60	30°	9,539	0,255	0,147	2,177	2,039	437		
2	15,60	360°	15,579		0,173	3,006	2,965	433		
2	15,60	30°	15,764	0,185	0,182	2,857	2,557	429		
2	18,00	360°	18,044		0,182	3,297	3,216	430		
2	18,00	30°	18,166	0,122	0,216	2,778	2,522	425		
3	6,00	360°	6,085		0,040	5,000	4,292	455		
3	6,00	30°	6,039	0,046	0,061	3,279	3,066	454		
3	9,60	360°	9,626		0,122	2,623	2,552	423		
3	9,60	30°	9,655	0,029	0,126	2,540	2,394	422		
3	15,60	360°	15,527		0,202	2,574	2,454	431		
3	15,60	30°	15,587	0,060	0,202	2,574	2,553	430		
3	18,00	360°	17,958		0,243	2,469	2,412	422		
3	18,00	30°	17,853	0,105	0,258	2,326	2,136	430		

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).
Measurement based on VDI 2647 February 2013

$C_{m \min} = 1,835$	$C_{m \ q} = 2,770$	$C_{m \ max} = 5,000$	$s_{cm} = 0,607$
$C_{mk \ min} = 1,798$	$C_{mk \ q} = 2,540$	$C_{mk \ max} = 4,292$	$\rho_{MFU} = 24$



$C_{m \ min} = C_m$ - Minimum Value
 $C_{m \ q} = C_m$ - Minimum Value
 $C_{mk \ q} = C_m$ - Mid Value
 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
 C_m - Maximum Value
 $S_{cm} = C_m$ - Standard deviation
 $S_{cmk} = C_m$ - Standard deviation
 ρ - correction value

Name: M. Mueck Project:
 **C. & E. FEIN GmbH**
Schwäbisch Gmünd Development Status :
Series