

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 :



Stage of development

MCI - Typ :

Number of steps :

Test bench - ID :

Screw connection class :

Fitting 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 : Testing machine : Stück

$30\% \rightarrow M_{30\%} = M_{min} + 30\% \times (M_{max} - M_{min}) = 5,70$ Nm
 $80\% \rightarrow M_{80\%} = M_{min} + 80\% \times (M_{max} - M_{min}) = 10,20$ Nm
 $M_{max} = 100\% \rightarrow M_{100\%} = M_{min} + 100\% \times (M_{max} - M_{min}) = 12,00$ Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	5,70		10,20		12,00	
Joints		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m min} =$		4,634	5,588	2,982	2,208	3,252	2,778
$c_{mk min} =$		4,553	5,275	2,944	2,175	2,986	2,759

		Name :	Date :
Carried out by	:	M. Mueck	30.08.2019
Test report prepared by	:	M. Burkhardt	08.10.2019

Testbench Measuring		MCS for FEIN-Project : 0		Homologation		Date: 08.10.2019	
ASM 18-12PC		ScrewdriverType ASM		Accuracy-Class 10,0%		Class : 2	
		Variant : 18-12PC		M _{range} = 3,00 up to 12,00 Nm		n _{given} = 480 rpm U = 18,00 V	
						cycles: 100	

MCS	M _d [Nm]	Angle [°]	M _q [Nm]	ΔM _{q,12} [Nm]	s [Nm]	C _m [1]	C _{mk} [1]	n [min ⁻¹]	Remarks		
1	5,70	360°	5,732		0,034	5,588	5,275	485	2019-07.029789	30%	
1	5,70	30°	5,710	0,022	0,041	4,634	4,553	484			
1	10,20	360°	10,185		0,154	2,208	2,175	422		80%	
1	10,20	30°	10,213	0,028	0,114	2,982	2,944	412			
1	12,00	360°	11,992		0,144	2,778	2,759	413		100%	
1	12,00	30°	11,902	0,090	0,123	3,252	2,986	452			
2	5,70	360°	5,714		0,019	10,000	9,754	487	2019-07.029791	30%	
2	5,70	30°	5,708	0,006	0,021	9,048	8,921	486			
2	10,20	360°	10,298		0,054	6,296	5,691	400		80%	
2	10,20	30°	10,233	0,065	0,053	6,415	6,208	401			
2	12,00	360°	11,932		0,097	4,124	3,890	424		100%	
2	12,00	30°	11,930	0,002	0,065	6,154	5,795	406			
3	5,70	360°	5,775		0,024	7,917	6,875	485	2019-07.029792	30%	
3	5,70	30°	5,716	0,059	0,019	10,000	9,719	479			
3	10,20	360°	10,096		0,078	4,359	3,915	428		80%	
3	10,20	30°	10,247	0,151	0,048	7,083	6,757	414			
3	12,00	360°	11,982		0,097	4,124	4,062	408		100%	
3	12,00	30°	11,930	0,052	0,091	4,396	4,139	416			

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).
Measurement based on VDI 2647 February 2013

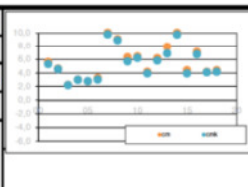
C_{m min} = 2,208 C_{m q} = 5,631 C_{m max} = 10,000 s_{cm} = 2,354

C_{mk min} = 2,175 C_{mk q} = 5,357 C_{mk max} = 9,754 n_{MFLU} = 18

Name: M. Burkhardt Project: 0 : ASM 18-12PC

Stage of Development : Series

 C. & E. FEIN GmbH
Schwäbisch Gmünd



C_{m min} = C_m - Minimum Value
C_{m max} = C_m - Minimum Value
C_{m q} = C_m - Mid Value
C_{mk q} = C_{mk} - Mid Value
C_{m max} = C_m - Maximum Value
C_{mk max} = C_{mk} - Maximum Value
S_{cm} = C_m - Standard deviation
S_{cmk} = C_{mk} - Standard deviation
n_{MCS} = No. Machine Capability Study (MCS)
k_v = Korrekturwert

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



C. & E. FEIN GmbH
Schwäbisch Gmünd
Hans-Fein-Str. 81, D-73529
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% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 5,70 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 10,20 Nm
 100% → M100% = $M_{min} + 100\% \times (M_{max} - M_{min}) =$ 12,00 Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	5,70		10,20		12,00	
screw joint	hard	soft	hard	soft	hard	soft	
	30°	360°	30°	360°	30°	360°	
$c_{m,min} =$		3,585	6,786	2,957	3,333	2,797	2,759
$c_{mk,min} =$		3,031	4,190	2,870	2,343	2,438	2,499
torsion angle range		> 0°					

		Name :	Date :
Test performed by	:	F.Walz	02.03.2020
Test report prepared by	:	M. Burkhardt	31.03.2020

Testbench Measuring		MCA for FEIN-Project : 0	Homologation		Date: 30.03.2020		
ASM 18-12PC		ScrewdriverType ASM	Accuracy-Class 10,0%	Class : 2	$f_{mess} = 300$ Hz	M_{min}	M_{max}
Variant :		18-12PC		$M_{range} =$	3,00 up to	12,00 Nm	
				$n_{given} = 600$ rpm	U = 18,00	V	
				cycles:		100	

MCS	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	3,00	360°	3,011		0,046	2,174	2,094	614	2019-07.029789	0%
1	3,00	30°	3,050	0,039	0,047	2,128	1,773	593		
1	5,70	360°	5,482		0,028	6,786	4,190	609		
1	5,70	30°	5,788	0,306	0,053	3,585	3,031	611		
1	10,20	360°	9,897		0,102	3,333	2,343	535		
1	10,20	30°	10,230	0,333	0,115	2,957	2,870	535		
1	12,00	360°	11,887		0,145	2,759	2,499	542		
1	12,00	30°	12,154	0,267	0,143	2,797	2,438	544		
2	3,00	360°	3,070		0,027	3,704	2,840	609		
2	3,00	30°	3,071	0,001	0,033	3,030	2,313	584		
2	5,70	360°	5,569		0,017	11,176	8,608	611		
2	5,70	30°	5,728	0,159	0,034	5,588	5,314	614		
2	10,20	360°	10,034		0,057	5,965	4,994	526		
2	10,20	30°	10,236	0,202	0,058	5,862	5,655	529		
2	12,00	360°	11,991		0,084	4,762	4,726	533		
2	12,00	30°	12,297	0,306	0,076	5,263	3,961	531		
3	3,00	360°	2,824		0,011	9,091	3,758	608		
3	3,00	30°	3,062	0,238	0,016	6,250	4,958	608		
3	5,70	360°	5,589		0,027	7,037	5,667	609		
3	5,70	30°	5,848	0,259	0,030	6,333	4,689	615		
3	10,20	360°	9,980		0,097	3,505	2,749	536		
3	10,20	30°	10,287	0,307	0,078	4,359	3,987	528		
3	12,00	360°	11,825		0,056	7,143	6,101	545		
3	12,00	30°	12,092	0,267	0,053	7,547	6,969	530		

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

$C_{m\ min} = 2,128$	$C_{m\ q} = 5,131$	$C_{m\ max} = 11,176$	$s_{cm} = 2,251$
$C_{mk\ min} = 1,773$	$C_{mk\ q} = 4,105$	$C_{mk\ max} = 8,608$	$\rho_{MFU} = 24$

Name: M. Mueck Project:

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

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