

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 :




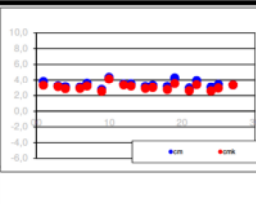
Torque range investigation : Testingmaschine : Stück

30% → M30% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 5,70 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 10,20 Nm
Mmax = 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	
Joints	hard	soft	hard	soft	hard	soft	
	30°	360°	30°	360°	30°	360°	
$c_{m, min} =$		2,923	3,800	3,036	3,119	2,740	3,306
$c_{mk, min} =$		2,590	3,327	2,553	2,847	2,518	2,954

		Name :	Date :
Carried out by	:	Mück	30.05.2017
Test report prepared by	:	Mück	04.07.2017

Testbench Measuring			MCS for FEIN-Project : 7021			Homologation		Date: 30.05.2017	
ASW 18-12 / PC			ScrewdriverType ASW		Accuracy-Class 10,0%	Class : 2	$f_{\text{mess}} = 300 \text{ Hz}$	M_{min}	M_{max}
			Variant : 18-12 / PC				$M_{\text{range}} = 3,00$	up to 12,00 Nm	
							$n_{\text{given}} = 430 \text{ rpm}$	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	5,70	360°	5,629	—	0,050	3,800	3,327	441	2017-05.014387
1	5,70	30°	5,719	0,090	0,059	3,220	3,113	423	
1	10,20	360°	10,111	—	0,109	3,119	2,847	383	
1	10,20	30°	10,153	0,042	0,112	3,036	2,896	383	
1	12,00	360°	11,872	—	0,112	3,571	3,190	382	
1	12,00	30°	12,097	0,225	0,146	2,740	2,518	374	
2	5,70	360°	5,672	—	0,044	4,318	4,106	410	2017-05.014394
2	5,70	30°	5,716	0,044	0,055	3,455	3,358	408	
2	10,20	360°	10,107	—	0,097	3,505	3,186	379	
2	10,20	30°	10,295	0,188	0,107	3,178	2,882	380	
2	12,00	360°	11,896	—	0,121	3,306	3,019	375	
2	12,00	30°	12,164	0,268	0,126	3,175	2,741	377	
3	5,70	360°	5,607	—	0,045	4,222	3,533	442	2017-05.014385
3	5,70	30°	5,765	0,158	0,065	2,923	2,590	429	
3	10,20	360°	10,060	—	0,087	3,908	3,372	379	
3	10,20	30°	10,370	0,310	0,111	3,063	2,553	381	
3	12,00	360°	11,837	—	0,117	3,419	2,954	384	
3	12,00	30°	11,996	0,159	0,119	3,361	3,350	378	
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>									
$C_{m \text{ min}} = 2,740$		$C_{m \text{ q}} = 3,407$		$C_{m \text{ max}} = 4,318$		$s_{cm} = 0,416$			
$C_{mk \text{ min}} = 2,518$		$C_{mk \text{ q}} = 3,085$		$C_{mk \text{ max}} = 4,106$		$n_{MFU} = 18$			
Name: Mück				Project: 7021 : ASW 18-12 / PC					
 C. & E. FEIN GmbH Schwäbisch Gmünd				Stage of Development : Series					
					$C_{m \text{ min}}$ = C_m - Minimum Value $C_{mk \text{ min}}$ = C_m - Minimum Value $C_{m \text{ q}}$ = C_m - Mid Value $C_{mk \text{ q}}$ = C_m - Mid Value $C_{m \text{ max}}$ = C_m - Maximum Value $C_{mk \text{ max}}$ = C_m - Maximum Value s_{cm} = C_m - Standard deviation s_{cmk} = C_{mk} - Standard deviation n_{MCS} = No. of Machine Capability Study (MCS) C = correction Value				

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



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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% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 6,40 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 10,40 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	$M_d =$	6,40		10,40		12,00	
screw joint		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m, min} =$		2,570	2,510	2,088	2,374	1,951	2,273
$c_{mk, min} =$		2,490	2,380	1,813	2,180	1,792	2,063
torsion angle range		> 0°					

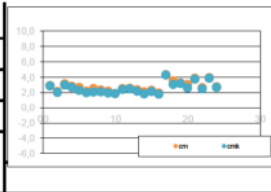
		Name :	Date :
Test performed by	:	M. Mueck	30.03.2020
Test report prepared by	:	M. Burkhardt	31.03.2020

Testbench Measuring		MCA for FEIN-Project : 0		Homologation		Date: 30.03.2020	
ASW 18-12PC		ScrewdriverType ASW	Accuracy-Class 10,0%	Class : 2	$f_{mess} = 300 \text{ Hz}$	M_{min}	M_{max}
Variant : 18-12PC				$M_{range} =$	4,00 up to	12,00	Nm
				$n_{given} = 500 \text{ rpm}$	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	4,00	360°	4,006		0,046	2,899	2,855	506	2017-05.014394	0%	
1	4,00	30°	3,980	0,026	0,063	2,116	2,011	508			
1	6,40	360°	6,364		0,068	3,137	2,961	506		30%	
1	6,40	30°	6,364	0,000	0,076	2,807	2,649	507			
1	10,40	360°	10,546		0,130	2,667	2,292	480		80%	
1	10,40	30°	10,301	0,245	0,160	2,167	1,960	478			
1	12,00	360°	12,210		0,160	2,500	2,063	470		100%	
1	12,00	30°	12,119	0,091	0,173	2,312	2,083	457			
2	4,00	360°	3,954		0,061	2,186	1,934	496		2020-03.014346	0%
2	4,00	30°	4,000	0,046	0,072	1,852	1,852	498			
2	6,40	360°	6,433		0,085	2,510	2,380	497			30%
2	6,40	30°	6,420	0,013	0,083	2,570	2,490	494			
2	10,40	360°	10,315		0,146	2,374	2,180	485	80%		
2	10,40	30°	10,537	0,222	0,166	2,088	1,813	467			
2	12,00	360°	12,072		0,176	2,273	2,136	475	100%		
2	12,00	30°	12,098	0,026	0,205	1,951	1,792	476			
3	4,00	360°	3,998		0,031	4,301	4,280	494	2020-03.014347		0%
3	4,00	30°	4,053	0,055	0,038	3,509	3,044	496			
3	6,40	360°	6,411		0,066	3,232	3,177	512			30%
3	6,40	30°	6,496	0,085	0,070	3,048	2,590	513			
3	10,40	360°	10,428		0,090	3,852	3,748	471		80%	
3	10,40	30°	10,464	0,036	0,131	2,646	2,483	478			
3	12,00	360°	11,985		0,102	3,922	3,873	477		100%	
3	12,00	30°	12,024	0,039	0,146	2,740	2,685	477			

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

$C_{m \min} = 1,852$	$C_{m \ q} = 2,736$	$C_{m \ max} = 4,301$	$s_{cm} = 0,637$
$C_{mk \ min} = 1,792$	$C_{mk \ q} = 2,555$	$C_{mk \ max} = 4,280$	$\rho_{MFU} = 24$



$C_{m \ min}$ = 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
 ρ - correction value

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