



Maschinenart : Datum :

Modell Variante :

Hersteller :

Entwicklungs-Nr. :

Entwicklungsstand :

MFU - Typ :

Stufenzahl : Prüfstands - Nr. :



Verschraubungsklasse : Verschraubungstoleranz T =

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

Drehmomentbereich : $M_{min} =$ Nm $M_{max} =$ Nm

Leerlaufdrehzahl : $n =$ min^{-1} $n_2 =$ min^{-1}

Akkuspannung : $U =$ V $M_{Schwell} =$ Nm

Akkukapazität : $Q =$ mAh **Unterspannungserkennung :**

Gewicht inkl. Akku : $m =$ kg

Schalldruckpegel : $L_{pFA} =$ dB(A)

Eingabefeld ... bitte gelbe Eingabefelder ausfüllen

Drehmomentbereich Homologation : **Testmaschinen :** Stück

30%	→	M30%	= $M_{min} + 30\% \times (M_{max} - M_{min})$	=	17,40	Nm
80%	→	M80%	= $M_{min} + 80\% \times (M_{max} - M_{min})$	=	26,40	Nm
Mmax = 100%	→	M100%	= $M_{min} + 100\% \times (M_{max} - M_{min})$	=	30,00	Nm

	Name :	Datum :	Unterschrift :
Prüfung durchgeführt durch :	Walz	12.04.2016	
Prüfbericht erstellt durch :	Walz	13.04.2016	

Verteiler :

MAP	KAM	EW	EWD	EWB	EGE
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Testbench Measuring MCS for FEIN-Projekt : 6916 Homologation Date: 13.04.2016

Spring Rate 0,00 N/mm $f_{mess} = 300$ Hz T_{min} T_{max}

ASW 18-30PC ScrewdriverType ASW Accuracy-Class 10,0% Class : 2 $T_{range} = 12,00$ upto 30,00 Nm

Serial Number Variant : 18-30PC Transmission: i = 1: 51,04 $n_{given} = 180$ rpm U = 18,00 V

see below Mean Value Offset Anglehead: $i_{WK} = 1: 1,60$ $i_{complete} = 1: 81,67$ cycles: 100

MCS#	T_d [Nm]	Angle [°]	T_q [Nm]	$\Delta T_{q 1/2/3}$ [Nm]	$\Delta T_{q 1/3}$ [Nm]	s [Nm]	C_m [1]	C_{mk} [1]	n [min ⁻¹]	Remarks
1	30,00	030°	29,960			0,458	2,183	2,154	180	2016-03.022494 100,0%
1	30,00	120°	29,567	0,393	0,620	0,496	2,016	1,725	180	
1	30,00	360°	29,340	0,227		0,340	2,941	2,294	180	
1	26,40	030°	26,435			0,401	2,195	2,165	180	80,0%
1	26,40	120°	26,315	0,120	0,396	0,416	2,115	2,047	180	
1	26,40	360°	26,039	0,276		0,343	2,566	2,215	180	
1	17,40	030°	17,501			0,240	2,417	2,276	180	30,0%
1	17,40	120°	17,238	0,263	0,371	0,232	2,500	2,267	180	
1	17,40	360°	17,130	0,108		0,164	3,537	2,988	180	
1	30,00	030°	30,224			0,466	2,146	1,986	180	2016-03.022495 100,0%
1	30,00	120°	29,821	0,403	0,641	0,419	2,387	2,244	180	
1	30,00	360°	29,583	0,238		0,333	3,003	2,586	180	
1	26,40	030°	26,417			0,397	2,217	2,202	180	80,0%
1	26,40	120°	26,414	0,003	0,084	0,477	1,845	1,835	180	
1	26,40	360°	26,333	0,081		0,312	2,821	2,749	180	
1	17,40	030°	17,571			0,252	2,302	2,075	180	30,0%
1	17,40	120°	17,477	0,094	0,252	0,321	1,807	1,727	180	
1	17,40	360°	17,319	0,158		0,238	2,437	2,324	180	
1	30,00	030°	29,854			0,426	2,347	2,233	180	2016-03.022497 100,0%
1	30,00	120°	29,774	0,080	0,394	0,339	2,950	2,728	180	
1	30,00	360°	29,460	0,314		0,241	4,149	3,402	180	
1	26,40	030°	26,643			0,352	2,500	2,270	180	80,0%
1	26,40	120°	26,530	0,113	0,460	0,346	2,543	2,418	180	
1	26,40	360°	26,183	0,347		0,317	2,776	2,548	180	
1	17,40	030°	17,413			0,234	2,479	2,460	180	30,0%
1	17,40	120°	17,073	0,340	0,559	0,224	2,589	2,103	180	
1	17,40	360°	16,854	0,219		0,177	3,277	2,249	180	

Input of the head-data (grew):
 Input of T_q , s and n (yellow Fields)
 Input of n, Maschinen-Numbers and Marks

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

100% : $M_{100\%} = M_{min} + 100\% \cdot (M_{max} - M_{min})$, Waitingtime $\Delta t_{100\%} = 30$ s between the loadchanges.

80% : $M_{80\%} = M_{min} + 80\% \cdot (M_{max} - M_{min})$, Waitingtime $\Delta t_{80\%} = 15$ s between the loadchanges.

30% : $M_{30\%} = M_{min} + 30\% \cdot (M_{max} - M_{min})$, Waitingtime $\Delta t_{30\%} = 5$ s between the Loadchanges.

Series of measurement per machine, Nominal Torque and Screwinghardness each 100 Load changes (LW).

$C_m \min = 1,807$	$C_m \ q = 2,557$	$C_m \ max = 4,149$	$S_{cm} = 0,507$
$C_{mk} \ min = 1,725$	$C_{mk} \ q = 2,306$	$C_{mk} \ max = 3,402$	$\eta_{MFU} = 027$

Name: Walz Projekt: 6916 : ASW 18-30PC

C. & E. FEIN GmbH Schwäbisch Gmünd Stage of Development : Serie

$C_m \ min$ = C_m - Minimum value
 $C_{mk} \ min$ = C_{mk} - Minimum value
 $C_m \ q$ = C_m - 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
 η_{MCS} = No. of Machine Capability Study (MCS) correction value

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 Machines: piece

$M_{max} =$ 30% → M30% = $M_{min} + 30\% \times (M_{max} - M_{min}) =$ 17,40 Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) =$ 26,40 Nm
 100% → M100% = $M_{min} + 100\% \times (M_{max} - M_{min}) =$ 30,00 Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	17,40		26,40		30,00	
screw joint		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m, min} =$		2,205	2,468	2,178	2,724	2,179	2,439
$c_{mk, min} =$		2,181	1,966	2,083	2,167	2,070	2,260
torsion angle range		> 0°					

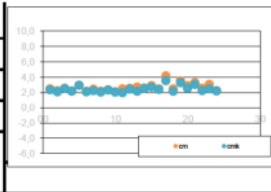
		Name :	Date :
Test performed by	:	M. Mueck	30.03.2020
Test report prepared by	:	M. Burkhardt	31.03.2020

Testbench Measuring		MCA for FEIN-Project : 0		Homologation		Date: 30.03.2020	
ASW 18-30PC		ScrewdriverType ASW	Accuracy-Class 10,0%	Class : 2	$f_{\text{mess}} = 300 \text{ Hz}$	M_{min}	M_{max}
Variant : 18-30PC				$M_{\text{range}} =$	12,00 up to	30,00	Nm
				$n_{\text{given}} = 200 \text{ rpm}$	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	12,00	360°	12,056		0,161	2,484	2,369	200	2016-03.022494	0%	
1	12,00	30°	11,919	0,137	0,178	2,247	2,096	200			
1	17,40	360°	17,377		0,227	2,555	2,521	203		30%	
1	17,40	30°	17,419	0,042	0,263	2,205	2,181	202			
1	26,40	360°	26,410		0,300	2,933	2,922	204		80%	
1	26,40	30°	26,285	0,125	0,404	2,178	2,083	201			
1	30,00	360°	30,220		0,410	2,439	2,260	213		100%	
1	30,00	30°	30,149	0,071	0,459	2,179	2,070	202			
2	12,00	360°	11,994		0,170	2,353	2,341	199		2016-03.022495	0%
2	12,00	30°	12,017	0,023	0,192	2,083	2,054	199			
2	17,40	360°	17,046		0,235	2,468	1,966	208			30%
2	17,40	30°	17,476	0,430	0,227	2,555	2,443	206			
2	26,40	360°	25,860		0,323	2,724	2,167	202	80%		
2	26,40	30°	26,343	0,483	0,340	2,588	2,532	203			
2	30,00	360°	29,796		0,345	2,899	2,701	205	100%		
2	30,00	30°	29,939	0,143	0,406	2,463	2,413	205			
3	12,00	360°	11,826		0,096	4,167	3,563	197	2016-03.022497		0%
3	12,00	30°	11,862	0,036	0,162	2,469	2,185	197			
3	17,40	360°	17,281		0,165	3,515	3,275	198			30%
3	17,40	30°	17,601	0,320	0,200	2,900	2,565	195			
3	26,40	360°	26,220		0,268	3,284	3,060	199		80%	
3	26,40	30°	26,694	0,474	0,346	2,543	2,260	199			
3	30,00	360°	29,427		0,328	3,049	2,466	197		100%	
3	30,00	30°	30,047	0,620	0,448	2,232	2,197	201			

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

$C_{m \text{ min}} = 2,083$	$C_{m \text{ q}} = 2,646$	$C_{m \text{ max}} = 4,167$	$s_{cm} = 0,475$
$C_{mk \text{ min}} = 1,966$	$C_{mk \text{ q}} = 2,445$	$C_{mk \text{ max}} = 3,563$	$\rho_{MFU} = 24$



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

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