



Maschinenart : Datum :

Modell Variante :

Hersteller :

Entwicklungs-Nr. :

Entwicklungsstand :

MFU - Typ :

Stufenzahl : Prüfstands - Nr. :



Verschraubungsklasse :

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

Eingabefeld	... bitte gelbe Eingabefelder ausfüllen
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Schalldruckpegel : $L_{pFA} =$ dB(A)

Drehmomentbereich Homologation : **Testmaschinen :** Stück

30%	→	M30%	= $M_{min} + 30\% \times (M_{max} - M_{min}) = $	31,00	Nm
80%	→	M80%	= $M_{min} + 80\% \times (M_{max} - M_{min}) = $	41,00	Nm
Mmax = 100%	→	M100%	= $M_{min} + 100\% \times (M_{max} - M_{min}) = $	45,00	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		
ASW 18-45PC		ScrewdriverType ASW		Spring Rate 0,00 N/mm		f _{mess} = 300 Hz		T _{min} T _{max}		
Serial Number		Variant : 18-45PC		Accuracy-Class 10,0%		Class : 2		T _{range} = 25,00 upto 45,00 Nm		
see Marking below		Mean Value Offset		Transmission: i = 1: 51,04		n _{given} = 130 rpm		U = 18,00 V		
				Anglehead: i _{wk} = 1: 1,60		i _{complete} = 1: 81,67		LoadChanges: 100		
MCS	T _d [Nm]	Angle [°]	T _q [Nm]	ΔT _{q 1/2/3} [Nm]	ΔT _{q 1/3} [Nm]	s [Nm]	C _m [1]	C _{mk} [1]	n [min ⁻¹]	Remarks
1	45,00	030°	45,245			0,796	1,887	1,784	130	2016-03.022504 100,0%
1	45,00	120°	45,043	0,202	0,258	0,664	2,259	2,237	130	
1	45,00	360°	44,987	0,056		0,465	3,226	3,216	130	
1	41,00	030°	40,973			0,729	1,875	1,862	130	80,0%
1	41,00	120°	41,173	-0,200	0,294	0,642	2,129	2,039	130	
1	41,00	360°	40,679	0,494		0,437	3,127	2,883	130	
1	31,00	030°	31,051			0,460	2,246	2,209	130	30,0%
1	31,00	120°	30,971	0,080	0,592	0,530	1,950	1,931	130	
1	31,00	360°	30,459	0,512		0,384	2,691	2,221	130	
1	45,00	030°	45,197			0,806	1,861	1,780	130	2016-03.022505 100,0%
1	45,00	120°	45,527	-0,330	-0,190	0,606	2,475	2,185	130	
1	45,00	360°	45,387	0,140		0,384	3,906	3,570	130	
1	41,00	030°	40,709			0,748	1,827	1,697	130	80,0%
1	41,00	120°	41,203	-0,494	-0,723	0,763	1,791	1,702	130	
1	41,00	360°	41,432	-0,229		0,478	2,859	2,558	130	
1	31,00	030°	31,141			0,561	1,842	1,758	130	30,0%
1	31,00	120°	31,043	0,098	-0,491	0,601	1,719	1,696	130	
1	31,00	360°	31,632	-0,589		0,289	3,576	2,847	130	
1	45,00	030°	45,200			0,724	2,072	1,980	130	2016-03.022508 100,0%
1	45,00	120°	45,031	0,169	0,344	0,709	2,116	2,101	130	
1	45,00	360°	44,856	0,175		0,825	1,818	1,760	130	
1	41,00	030°	40,719			0,667	2,049	1,909	130	80,0%
1	41,00	120°	40,681	0,038	-0,235	0,622	2,197	2,026	130	
1	41,00	360°	40,954	-0,273		0,446	3,064	3,030	130	
1	31,00	030°	31,160			0,531	1,946	1,846	130	30,0%
1	31,00	120°	31,550	-0,390	0,350	0,410	2,520	2,073	130	
1	31,00	360°	30,810	0,740		0,537	1,924	1,806	130	

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.

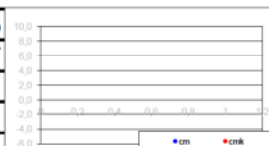
100% : $M_{100\%} = M_{min} + 100\% \cdot (M_{max} - M_{min})$, Waitingtime $\Delta t_{100\%} = 30$ s between the loadchanges.

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} = 1,719 C_{m q} = 2,332 C_{m max} = 3,906 S_{cm} = 0,585
 C_{mk min} = 1,696 C_{mk q} = 2,174 C_{mk max} = 3,570 n_{MFU} = 027



C_{m min} = C_m - Minimum value
 C_{mk min} = C_{mk} - 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_{MFU} = No. of Machine Capability Study (MCS) correction value

Name: Walz Projekt: 6916 : ASW 18-45PC
 C. & E. FEIN GmbH Stage of Development :
 Schwäbisch Gmünd Serie



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 Maschines: piece

$M_{max} =$
 30% → M30% = $M_{min} + 30\% \times (M_{max} - M_{min}) = 31,00$ Nm
 80% → M80% = $M_{min} + 80\% \times (M_{max} - M_{min}) = 41,00$ Nm
 100% → M100% = $M_{min} + 100\% \times (M_{max} - M_{min}) = 45,00$ Nm

Information on all 3 test items

Load level		30%		80%		100%	
Test torque	$M_d =$	31,00		41,00		45,00	
screw joint		hard	soft	hard	soft	hard	soft
		30°	360°	30°	360°	30°	360°
$c_{m, min} =$		2,135	2,886	2,385	2,722	2,219	2,508
$c_{mk, min} =$		2,126	2,794	2,243	2,495	2,084	2,369
torsion angle range		> 0°					

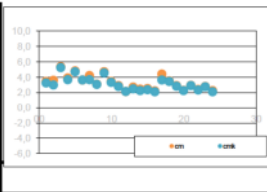
		Name :	Date :
Test performed by	:	M. Mueck	30.03.2020
Test report prepared by	:	M. Burkhardt	31.03.2020

Testbench Measuring		MCA for FEIN-Project : 0		Homologation		Date: 30.03.2020	
ASW 18-45PC		ScrewdriverType ASW	Accuracy-Class 10,0%	Class : 2	$f_{mess} = 300 \text{ Hz}$	M_{min}	M_{max}
Variant :		18-45PC		$M_{range} =$	25,00 up to	45,00 Nm	
				$n_{given} = 175 \text{ rpm}$	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	25,00	360°	25,135		0,242	3,444	3,258	171	0%	
1	25,00	30°	24,584	0,551	0,233	3,577	2,981	167		
1	31,00	360°	31,077		0,193	5,354	5,221	168	30%	
1	31,00	30°	31,183	0,106	0,265	3,899	3,669	168		
1	41,00	360°	41,082		0,285	4,795	4,699	172	80%	
1	41,00	30°	41,027	0,055	0,376	3,635	3,611	170		
1	45,00	360°	44,407		0,356	4,213	3,658	176	100%	
1	45,00	30°	45,079	0,672	0,483	3,106	3,051	172		
2	25,00	360°	24,933		0,178	4,682	4,556	167	0%	
2	25,00	30°	24,896	0,037	0,242	3,444	3,300	164		
2	31,00	360°	31,116		0,356	2,903	2,794	169	30%	
2	31,00	30°	30,987	0,129	0,484	2,135	2,126	165		
2	41,00	360°	40,657		0,502	2,722	2,495	186	80%	
2	41,00	30°	40,682	0,025	0,562	2,432	2,243	172		
2	45,00	360°	44,750		0,598	2,508	2,369	171	100%	
2	45,00	30°	45,273	0,523	0,676	2,219	2,084	168		
3	25,00	360°	24,560		0,190	4,386	3,614	174	0%	
3	25,00	30°	24,954	0,394	0,237	3,516	3,451	170		
3	31,00	360°	31,079		0,358	2,886	2,813	175	30%	
3	31,00	30°	31,064	0,015	0,454	2,276	2,229	174		
3	41,00	360°	41,034		0,468	2,920	2,896	180	80%	
3	41,00	30°	40,860	0,174	0,573	2,385	2,304	170		
3	45,00	360°	44,929		0,539	2,783	2,739	177	100%	
3	45,00	30°	44,681	0,248	0,663	2,262	2,102	174		


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

$C_{m \min} = 2,135$	$C_{m \ q} = 3,270$	$C_{m \ max} = 5,354$	$s_{cm} = 0,889$
$C_{mk \ min} = 2,084$	$C_{mk \ q} = 3,094$	$C_{mk \ max} = 5,221$	$\rho_{MFU} = 24$



$C_{m \ min} = C_m$ - Minimum Value
 $C_{m \ q} = C_m$ - Minimum Value
 $C_{mk \ q} = C_m$ - Mid Value
 $C_{m \ max} = C_m$ - Mid Value
 $C_{mk \ max} = C_m$ - Maximum Value
 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