

# Kalibrier-Zertifikat Calibration Certificate

# MUSTER

Gegenstand Object	Oszilloskop
Hersteller Manufacturer	Tektronix
Typ Type description	TDS3024B
Serien Nr. Serial no.	12345
Inventar Nr. Inventory no.	---
Prüfmittel Nr. Test equipment no.	---
Equipment Nr. Equipment no.	12345678
Standort Location	---
Auftraggeber Customer	Mustermann GmbH
Kunden Nr. Customer ID no.	DE-12345 Musterhausen
Auftrags Nr. Order no.	654321
Datum der Kalibrierung Date of calibration	14.04.2020
Datum der empfohlenen Rekalibrierung Date of the recommended re-calibration	14.04.2021

Hiermit bestätigen wir, dass das durchführende Kalibrierlabor ein Managementsystem nach ISO 9001:2015, sowie ISO/IEC 17025:2018 eingeführt hat. Die Urkunden finden Sie auf [www.testotis.de](http://www.testotis.de). Die für die Kalibrierung verwendeten Messeinrichtungen werden regelmäßig kalibriert und sind rückführbar auf die nationalen Normale der Physikalisch Technischen Bundesanstalt (PTB) Deutschlands oder auf andere nationale Normale. Wo keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen. Die für diesen Vorgang angefertigte Dokumentation kann eingesehen werden. Alle erforderlichen Messdaten sind in diesem Kalibrier-Zertifikat aufgelistet.

Hereby we confirm that the performing calibration laboratory is working with a management system according to ISO 9001:2015 and ISO/IEC 17025:2018. Accreditation certificates can be found under [www.testotis.de](http://www.testotis.de). The measuring installations used for calibration are regularly calibrated and traceable to the national standards of the German Federal Physical Technical Institute (PTB) or other national standards. Should no national standards exist, the measuring procedure corresponds with the technical regulations and norms valid at the time of the measurement. The documents established for this procedure are available for viewing. All the necessary measured data can be found on the following page(s) of this calibration certificate.

## Konformitätsaussage Conformity

- Messwert(e) innerhalb der zulässigen Abweichung<sup>1)</sup>. Measured value(s) within the allowed deviation<sup>1)</sup>.  
 Messwert(e) außerhalb der zulässigen Abweichung<sup>1)</sup>. Measured value(s) beyond the allowed deviation<sup>1)</sup>.

<sup>1)</sup> Die erweiterte Messunsicherheit wurde nach EA-4-02 M:2013 mit einer Überdeckungswahrscheinlichkeit von 95% berechnet und enthält die Unsicherheit der Referenz, des Verfahrens sowie die Unsicherheit des Prüflings. Die Konformitätsaussage erfolgt in Anlehnung an ISO 14253-1:2017 auf Basis der Entscheidungsregel 'niedriges Vertrauensniveau' gemäß 4\_AA\_00120\_DE.

<sup>1)</sup> The expanded measurement uncertainty was calculated according to EA-4-02 M:2013 with a coverage probability of 95% and contains the uncertainty of the reference, the method and the uncertainty of the unit under test. The statement of conformity is based on ISO 14253-1:2017 in accordance with the decision rule 'niedriges Vertrauensniveau' (low level of confidence) according to 4\_AA\_00120\_DE.

Dieser Kalibrierschein darf nur vollständig weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift und Stempel haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with permission of the issuing laboratory. Calibration certificates without signature and seal are not valid.

V 4.72 / DE

Stempel Seal



Fachverantwortlicher Supervisor

*Max Mustermann*

Max Mustermann

Bearbeiter Technician

*Martina Musterfrau*

Martina Musterfrau



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## Messeinrichtung Measuring equipment

Referenz Reference	Rückführung Traceability	Rekal. Next cal.	Zertifikat-Nr. Certificate-no.	EQ-Nr. EQ-no.
Oscilloscope Calibrator Fluke 5820A-SC2100	15070-01-01 2019-12	2020-12	E110060	10254777
Frequenznormal Fluke 910R	GPS locked ---	---	Support device	11846061
Waveform Generator Agilent 33220A	GPS locked ---	---	Support device	12294806

Referenzzertifikate sind auf [www.primasonline.com](http://www.primasonline.com) abrufbar Reference certificates are available at [www.primasonline.com](http://www.primasonline.com)

## Umgebungsbedingungen Ambient conditions

Temperatur Temperature (23 ± 3) °C  
Relative Luftfeuchte Relative Humidity (20...70) %

## Messverfahren Measuring procedure

Die Kalibrierung erfolgt nach Kalibrieranweisung 4\_AA\_00190\_DE - in Abstimmung nach VDI/VDE/DGQ/DKD 2622  
The calibration is performed according to the 4\_AA\_00190\_DE procedure- in accordance with VDI/VDE/DGQ/DKD 2622

Prüfprozedur Procedure F:Tektronix:TDS:3000er-Serie:5820,33220:IEEE / Rev.:3.4

## Messergebnisse Measuring results

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## Besondere Bemerkungen Special remarks

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<b>Firmwarestand:</b> firmware version:						
v.3.41						
<b>Eingangswiderstand</b> Input resistance						
CH.1						
	50.092 Ohm		50.00 Ohm	±0.5 Ohm	18% pass	0.79 · 10 <sup>-3</sup>
	1.0005 MOhm		1.000 MOhm	±0.01 MOhm	5% pass	0.97 · 10 <sup>-3</sup>
CH.2						
	50.080 Ohm		50.00 Ohm	±0.5 Ohm	16% pass	0.78 · 10 <sup>-3</sup>
	1.0005 MOhm		1.000 MOhm	±0.01 MOhm	5% pass	0.97 · 10 <sup>-3</sup>
CH.3						
	50.090 Ohm		50.00 Ohm	±0.5 Ohm	18% pass	0.78 · 10 <sup>-3</sup>
	0.9996 MOhm		1.000 MOhm	±0.01 MOhm	4% pass	0.97 · 10 <sup>-3</sup>
CH.4						
	50.030 Ohm		50.00 Ohm	±0.5 Ohm	6% pass	0.78 · 10 <sup>-3</sup>
	1.0003 MOhm		1.000 MOhm	±0.01 MOhm	3% pass	0.97 · 10 <sup>-3</sup>
<b>Messbedingung</b> measured condition						
100mV/Div						
<b>Vertikalablenkung</b> Vertical deflection						
CH.1						
into 50Ohm						
1.6 V	1.2000 V	200mV/Div	1.192 V	±0.024 V	33% pass	3.5 · 10 <sup>-3</sup>
into 1MOhm						
8mV	6.0000 mV	1mV/Div	5.900 mV	±0.12 mV	83% pass	3.5 · 10 <sup>-3</sup>
16mV	12.000 mV	2mV/Div	11.88 mV	±0.24 mV	50% pass	3.5 · 10 <sup>-3</sup>
40mV	30.000 mV	5mV/Div	29.83 mV	±0.6 mV	29% pass	3.6 · 10 <sup>-3</sup>
80mV	60.000 mV	10mV/Div	59.80 mV	±1.2 mV	17% pass	3.5 · 10 <sup>-3</sup>
160mV	120.00 mV	20mV/Div	119.9 mV	±2.4 mV	3% pass	3.8 · 10 <sup>-3</sup>



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400mV	300.00 mV	50mV/Div	300.0 mV	±6 mV	0% pass	3.5 · 10 <sup>-3</sup>
800mV	600.00 mV	100mV/Div	600.9 mV	±12 mV	8% pass	3.5 · 10 <sup>-3</sup>
1.6 V	1.2000 V	200mV/Div	1.200 V	±0.024 V	0% pass	3.5 · 10 <sup>-3</sup>
4 V	3.0000 V	500mV/Div	2.990 V	±0.06 V	17% pass	3.5 · 10 <sup>-3</sup>
8 V	6.0000 V	1V/Div	5.980 V	±0.12 V	17% pass	3.5 · 10 <sup>-3</sup>
16 V	12.000 V	2V/Div	12.01 V	±0.24 V	3% pass	3.6 · 10 <sup>-3</sup>
40 V	30.000 V	5V/Div	30.03 V	±0.6 V	5% pass	3.5 · 10 <sup>-3</sup>
80 V	60.000 V	10V/Div	59.60 V	±1.2 V	33% pass	3.5 · 10 <sup>-3</sup>
<b>CH.2</b>						
<b>into 50Ohm</b>						
1.6 V	1.2000 V	200mV/Div	1.194 V	±0.024 V	25% pass	3.6 · 10 <sup>-3</sup>
<b>into 1MOhm</b>						
8mV	6.0000 mV	1mV/Div	6.004 mV	±0.12 mV	3% pass	3.8 · 10 <sup>-3</sup>
16mV	12.000 mV	2mV/Div	12.04 mV	±0.24 mV	18% pass	3.6 · 10 <sup>-3</sup>
40mV	30.000 mV	5mV/Div	30.05 mV	±0.6 mV	8% pass	4.0 · 10 <sup>-3</sup>
80mV	60.000 mV	10mV/Div	59.66 mV	±1.2 mV	28% pass	3.6 · 10 <sup>-3</sup>
160mV	120.00 mV	20mV/Div	119.7 mV	±2.4 mV	11% pass	3.6 · 10 <sup>-3</sup>
400mV	300.00 mV	50mV/Div	299.2 mV	±6 mV	13% pass	3.6 · 10 <sup>-3</sup>
800mV	600.00 mV	100mV/Div	596.3 mV	±12 mV	31% pass	3.6 · 10 <sup>-3</sup>
1.6 V	1.2000 V	200mV/Div	1.196 V	±0.024 V	18% pass	3.9 · 10 <sup>-3</sup>
4 V	3.0000 V	500mV/Div	3.004 V	±0.06 V	7% pass	3.5 · 10 <sup>-3</sup>
8 V	6.0000 V	1V/Div	5.960 V	±0.12 V	33% pass	3.5 · 10 <sup>-3</sup>
16 V	12.000 V	2V/Div	11.97 V	±0.24 V	11% pass	3.5 · 10 <sup>-3</sup>
40 V	30.000 V	5V/Div	29.99 V	±0.6 V	2% pass	4.1 · 10 <sup>-3</sup>
80 V	60.000 V	10V/Div	59.80 V	±1.2 V	17% pass	3.5 · 10 <sup>-3</sup>
<b>CH.3</b>						
<b>into 50Ohm</b>						
1.6 V	1.2000 V	200mV/Div	1.188 V	±0.024 V	50% pass	3.5 · 10 <sup>-3</sup>
<b>into 1MOhm</b>						
8mV	6.0000 mV	1mV/Div	5.980 mV	±0.12 mV	17% pass	3.5 · 10 <sup>-3</sup>
16mV	12.000 mV	2mV/Div	11.98 mV	±0.24 mV	10% pass	3.5 · 10 <sup>-3</sup>
40mV	30.000 mV	5mV/Div	29.93 mV	±0.6 mV	12% pass	3.5 · 10 <sup>-3</sup>
80mV	60.000 mV	10mV/Div	59.80 mV	±1.2 mV	17% pass	4.1 · 10 <sup>-3</sup>
160mV	120.00 mV	20mV/Div	119.2 mV	±2.4 mV	33% pass	3.5 · 10 <sup>-3</sup>

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400mV	300.00 mV	50mV/Div	301.1 mV	±6 mV	19% pass	3.8 · 10 <sup>-3</sup>
800mV	600.00 mV	100mV/Div	596.0 mV	±12 mV	33% pass	3.5 · 10 <sup>-3</sup>
1.6 V	1.2000 V	200mV/Div	1.197 V	±0.024 V	11% pass	3.5 · 10 <sup>-3</sup>
4 V	3.0000 V	500mV/Div	3.000 V	±0.06 V	0% pass	3.5 · 10 <sup>-3</sup>
8 V	6.0000 V	1V/Div	5.980 V	±0.12 V	17% pass	3.5 · 10 <sup>-3</sup>
16 V	12.000 V	2V/Div	11.97 V	±0.24 V	14% pass	3.6 · 10 <sup>-3</sup>
40 V	30.000 V	5V/Div	30.00 V	±0.6 V	0% pass	3.5 · 10 <sup>-3</sup>
80 V	60.000 V	10V/Div	59.20 V	±1.2 V	67% pass	3.5 · 10 <sup>-3</sup>
<b>CH.4</b>						
<b>into 50Ohm</b>						
1.6 V	1.2000 V	200mV/Div	1.193 V	±0.024 V	28% pass	3.6 · 10 <sup>-3</sup>
<b>into 1MOhm</b>						
8mV	6.0000 mV	1mV/Div	6.000 mV	±0.12 mV	0% pass	3.5 · 10 <sup>-3</sup>
16mV	12.000 mV	2mV/Div	12.01 mV	±0.24 mV	3% pass	3.6 · 10 <sup>-3</sup>
40mV	30.000 mV	5mV/Div	30.01 mV	±0.6 mV	2% pass	3.6 · 10 <sup>-3</sup>
80mV	60.000 mV	10mV/Div	59.75 mV	±1.2 mV	21% pass	4.3 · 10 <sup>-3</sup>
160mV	120.00 mV	20mV/Div	119.7 mV	±2.4 mV	13% pass	3.5 · 10 <sup>-3</sup>
400mV	300.00 mV	50mV/Div	299.0 mV	±6 mV	17% pass	3.5 · 10 <sup>-3</sup>
800mV	600.00 mV	100mV/Div	597.6 mV	±12 mV	20% pass	4.1 · 10 <sup>-3</sup>
1.6 V	1.2000 V	200mV/Div	1.196 V	±0.024 V	17% pass	3.5 · 10 <sup>-3</sup>
4 V	3.0000 V	500mV/Div	2.996 V	±0.06 V	7% pass	4.3 · 10 <sup>-3</sup>
8 V	6.0000 V	1V/Div	5.972 V	±0.12 V	23% pass	3.9 · 10 <sup>-3</sup>
16 V	12.000 V	2V/Div	11.98 V	±0.24 V	7% pass	3.8 · 10 <sup>-3</sup>
40 V	30.000 V	5V/Div	29.90 V	±0.6 V	17% pass	3.5 · 10 <sup>-3</sup>
80 V	60.000 V	10V/Div	59.86 V	±1.2 V	12% pass	3.7 · 10 <sup>-3</sup>
<b>Messfunktion measurement function</b>						
Type Ampl						
<b>Messbedingung measured condition</b>						
Coupling DC						
POS = -3 ; t = 400µs ; f = 1kHz						
1 mV/Div -> 5 mV/Div: (BW Limit f = 20 MHz)						
10 mV/Div -> 10 V/Div: (BW Full f = 200 MHz)						
Averaging = 64						
<b>Horizontalablenkung Horizontal deflection</b>						
<b>Funktionstest Function test</b>						



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10ms	1.0000 ms		1.000 ms	±0.002 ms	0% pass	0.58 · 10 <sup>-3</sup>
<b>Messfunktion</b> measurement function Type Period <b>Messbedingung</b> measured condition Averaging = 128 <b>Zeitbasis</b> Timebase 10.000000 MHz 9.999926 MHz ±0.0002 MHz 37% pass 1.0 · 10 <sup>-6</sup> <b>Messverfahren</b> measuring procedure Unterabtastung Undersampling <b>Messbedingung</b> measured condition t= 20ms <b>Vertikalablenkung</b> Vertical deflection 800mV 600.0 mV @1kHz 600 mV ±23 mV 0% pass 3.6 · 10 <sup>-3</sup> <b>Cursordeckung</b> cursor cover - pass <b>Horizontalablenkung</b> Horizontal deflection 10ms 8.000 ms 8.00 ms ±0.05 ms 0% pass 0.72 · 10 <sup>-3</sup> <b>Cursordeckung</b> cursor cover - pass <b>Messfunktion</b> measurement function Delta Curs <b>Anstiegszeit</b> Risetime CH.1 1.159ns <= 1.75ns MU = 45*E-3 pass CH.2 1.085ns <= 1.75ns MU = 45*E-3 pass						



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<b>CH.3</b>						
1.14ns <= 1.75ns	MU = 45*E-3					pass
<b>CH.4</b>						
1.06ns <= 1.75ns	MU = 45*E-3					pass
Messfunktion measurement function Type Rise (10-90%)						
Messbedingung measured condition 250mV @ 1MHz ; Trig Source Ext Scale: 50mV/Div						
Frequenzgang Frequency Response CH.1						
Referenzspannung reference voltage = 0.4201 Vrms @50 kHz						
	0.000 dB	500kHz	0.04 dB	±3 dB		pass 0.20 dB
	0.000 dB	1MHz	0.07 dB	±3 dB		pass 0.20 dB
	0.000 dB	5MHz	0.11 dB	±3 dB		pass 0.20 dB
	0.000 dB	20MHz	0.06 dB	±3 dB		pass 0.20 dB
	0.000 dB	50MHz	0.03 dB	±3 dB		pass 0.20 dB
	0.000 dB	100MHz	-0.14 dB	±3 dB		pass 0.20 dB
	0.000 dB	150MHz	-0.37 dB	±3 dB		pass 0.20 dB
	0.000 dB	200MHz	-0.77 dB	±3 dB		pass 0.20 dB
<b>CH.2</b>						
Referenzspannung reference voltage = 0.4182 Vrms @50 kHz						
	0.000 dB	500kHz	0.02 dB	±3 dB		pass 0.20 dB
	0.000 dB	1MHz	0.07 dB	±3 dB		pass 0.20 dB
	0.000 dB	5MHz	0.11 dB	±3 dB		pass 0.20 dB
	0.000 dB	20MHz	0.05 dB	±3 dB		pass 0.20 dB
	0.000 dB	50MHz	0.03 dB	±3 dB		pass 0.20 dB
	0.000 dB	100MHz	-0.08 dB	±3 dB		pass 0.20 dB
	0.000 dB	150MHz	-0.24 dB	±3 dB		pass 0.20 dB
	0.000 dB	200MHz	-0.59 dB	±3 dB		pass 0.20 dB



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<b>CH.3</b>						
Referenzspannung reference voltage = 0.4185 Vrms @50 kHz						
	0.000 dB	500kHz	0.03 dB	±3 dB	pass	0.20 dB
	0.000 dB	1MHz	0.09 dB	±3 dB	pass	0.20 dB
	0.000 dB	5MHz	0.12 dB	±3 dB	pass	0.20 dB
	0.000 dB	20MHz	0.07 dB	±3 dB	pass	0.20 dB
	0.000 dB	50MHz	0.04 dB	±3 dB	pass	0.20 dB
	0.000 dB	100MHz	-0.11 dB	±3 dB	pass	0.20 dB
	0.000 dB	150MHz	-0.35 dB	±3 dB	pass	0.20 dB
	0.000 dB	200MHz	-0.80 dB	±3 dB	pass	0.20 dB
<b>CH.4</b>						
Referenzspannung reference voltage = 0.4178 Vrms @50 kHz						
	0.000 dB	500kHz	-0.01 dB	±3 dB	pass	0.20 dB
	0.000 dB	1MHz	0.03 dB	±3 dB	pass	0.20 dB
	0.000 dB	5MHz	0.09 dB	±3 dB	pass	0.20 dB
	0.000 dB	20MHz	0.06 dB	±3 dB	pass	0.20 dB
	0.000 dB	50MHz	0.06 dB	±3 dB	pass	0.20 dB
	0.000 dB	100MHz	-0.03 dB	±3 dB	pass	0.20 dB
	0.000 dB	150MHz	-0.16 dB	±3 dB	pass	0.20 dB
	0.000 dB	200MHz	-0.46 dB	±3 dB	pass	0.20 dB
Messfunktion measurement function Type RMS						
Messbedingung measured condition Coupling DC Scale: 200mV/Div						
Tastkopf Abgleich Probe compensation Funktionstest Function test						
	5.0000 V	@1kHz	4.936 V	±0.5 V	13% pass	4.0 · 10 <sup>-3</sup>
Messfunktion measurement function Type Ampl						





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	1.0000 kHz		1.000 kHz	±0.05 kHz	0% pass	0.58 · 10 <sup>-3</sup>
Messfunktion measurement function Type Freq						

zulässige Abweichung gemäß Herstellerangabe.  
allowed deviation in accordance with manufacturer.

Die dimensionslosen Anteile der Messunsicherheit U sind als relative Messunsicherheiten e bezogen auf den Messwert zu verstehen (U = e \* MW).

The non-dimensional fractions of the measuring uncertainty U are relative values e in relation to the indicated value (U = e \* i.v.).

Ausnutzung der zul. Abw. in % = |Abweichung| / zul. Abw.

Utilization of allowed dev. in % = |deviation| / allowed dev.