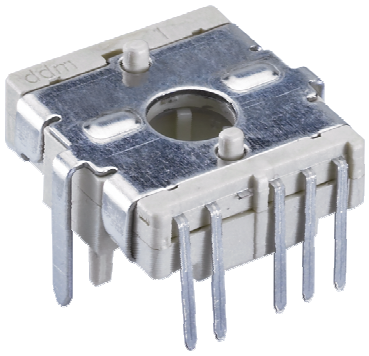
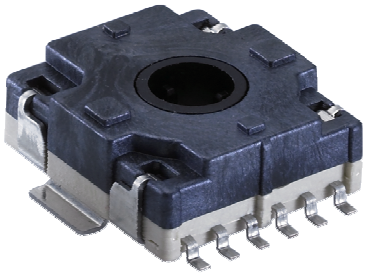
ddm hopt+schuler GmbH&Co.KG
Königsberger Straße 12
78628 Rottweil | Germany

www.hopt-schuler.com

512 ENCODER





Umwelt-management ISO 14001 DEKRA zertifiziert

Qualitäts-management ISO 9001 DEKRA zertifiziert

512

AUSFÜHRUNG

- Miniatur-Encoder mit Gray- oder Inkrementalcode
- 16 oder 18 Schaltstellungen
- Vertikale Betätigung
- Verschiedene Drehmomente
- Ohne oder mit Tastschalter

ANSCHLÜSSE

SMD- oder THT- Ausführung

ABMESSUNGEN

18 x 19,5 x 7,6 mm

CONSTRUCTION

- *Miniature encoder with gray or incremental code*
- *16 or 18 positions*
- *Operated vertically*
- *Various torques*
- *Without or with pushbutton switch*

PINING

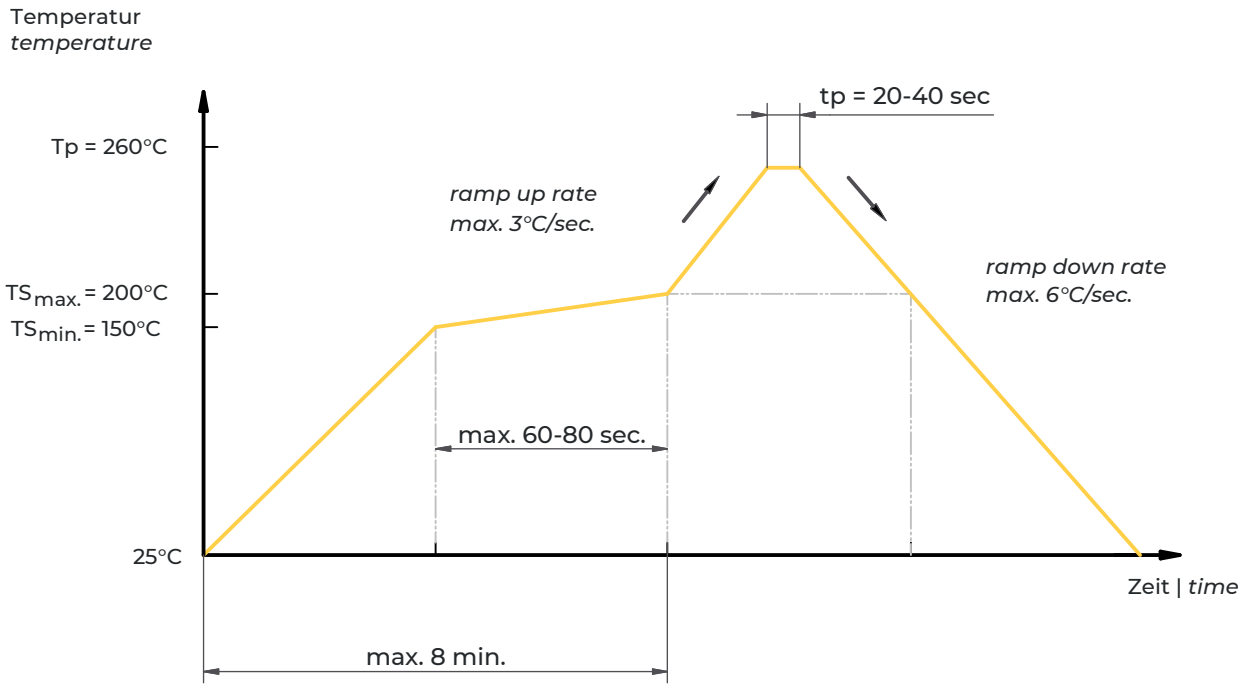
SMD or THT design

DIMENSIONS

18 x 19.5 x 7.6 mm

AUSFÜHRUNG *CONSTRUCTION*	Schaltweise	Interruptive	*Function*
	Anschlußmaße	See drawing	*Pitch*
	Abmessungen	See drawing	*Outline Dimensions*
ISOLIERWERKSTOFFE *INSULATION MATERIAL*	Gehäuse	Thermoplastic-UL-94-V0	*Housing*
	Kontaktträger	Thermoplastic-UL-94-V0	*Contact Body*
	Blechbügel	Nirosta	*Metal Cover*
KONTAKTWERKSTOFFE *CONTACT MATERIAL*	Festkontakte	CuNi gal. min. 0.5 µm Au or silver as an alternative	*Fixed Contacts*
	Schaltkontakte	CuSn6 gal. 0.5 µm Au, silver or NiPd with Au-flash	*Sliding Contacts*
	Lötanschlüsse	CuNi gal. min 2 µm Sn	*Pins*
ELEKTRISCHE DATEN *ELECTRICAL DATA*	Schaltspannung	Max. 24 VDC	*Switching Voltage*
	Schaltstrom	Max. 100 mA	*Switching Current*
	max. Schaltleistung	0.6 VA	*Electrical Power*
	Übergangswiderstand	< 100 mOhm	*Contact Resistance*
	Isolierwiderstand	> 100 MOhm	*Insulation Resistance*
	Prellung und Signaleinbruch	< 6 ms	*Bouncing*
MECHANISCHE DATEN *MECHANICAL DATA*	Lebensdauer	> 10000 operations	*Life Expectancy*
	Betriebstemperatur	-50 °C to +125 °C	*Operating Temperature*
	Lagertemperatur	-55 °C to +135 °C	*Storage Temperature*
	Betätigungskraft	6 N	*Operating Force*
	Betätigungsmoment	1-6 Ncm	*Operating Torque*
	Vibrationsfestigkeit	acc. to IEC 60 068-2-6: 10g from 30-300 Hz	*Vibration Resistance*
	Dichtigkeit	IP54	*Sealing*
LÖTBEDINGUNGEN/ART *SOLDERING TIME / CONDITIONS*	SMD	acc. to IPC/JEDEC J-STD-020D Tab. 4-2 (max. peak temperature +260°)	*SMD*
	THT	JESD22-B106D/single wave	*THT*

Empfohlene Reflow Temperaturkurve
recommended reflow temperature pofile



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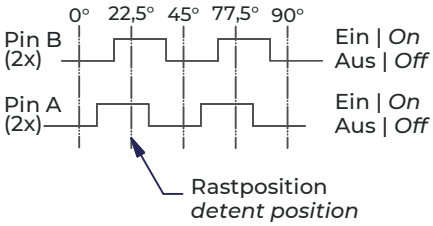
Pos. 5 SCHALTERCODIERUNG | *SWITCH CODING*

5	1	2	-	**5**				0	0	0	0	0	

2Bit Inkrementalcode 16 Pos.
2Bit incremental code 16 Pos.



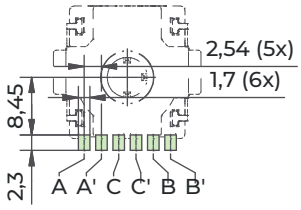
Graycode 16 Pos.
Graycode 16 Pos.

	Spur/*track*			
Pos.	1	2	4	8
0				
1	■			
2	■	■		
3		■		
4		■		■
5	■	■		■
6	■			■
7				■
8			■	■
9		■	■	■
10	■	■	■	■
11	■		■	■
12	■	■	■	
13	■	■	■	
14		■	■	
15			■	

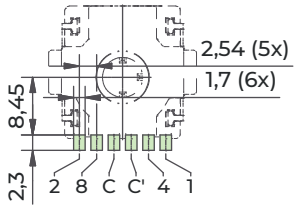
Graycode 18 Pos.
Graycode 18 Pos.

	Spur/*track*				
Pos.	1	2	4	8	16
0					
1	■				
2	■	■			
3		■			
4		■	■		
5	■	■	■		
6	■		■		
7			■		
8			■	■	
9	■		■	■	
10	■	■	■	■	
11		■	■	■	
12		■		■	
13	■	■		■	
14	■			■	
15				■	
16				■	■
17					■

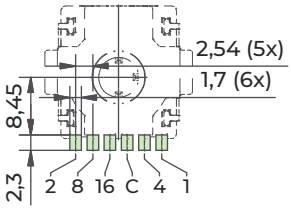
Pinbelegung
pin assignment



Pinbelegung
pin assignment



Pinbelegung
pin assignment



in Silber *silver-plated*	in Gold *gold-plated*	in NiPd, Au-flash *NiPd, Au-flash*	
1	**2**	-	Inkremental Code, 16 Pos. *incremental code, 16 Pos.*
7	**5**	**A**	Graycode, 16 Positions *Graycode, 16 Positions*
8	**6**	**B**	Graycode, 18 Positions *Graycode, 18 Positions*

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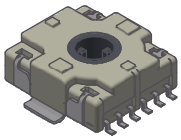
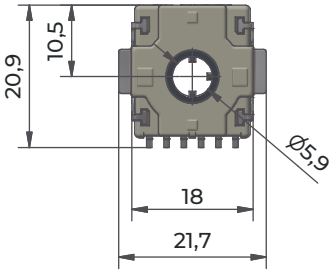
Pos. 6 SCHALTERAUSFÜHRUNG | *SWITCH VERSION*

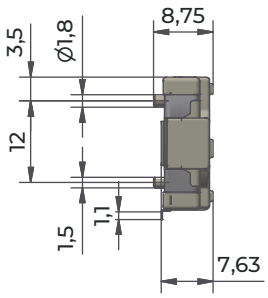
6

5	1	2	-				0	0	0	0	0	

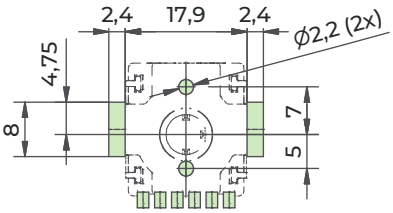
4 Vertikale Betätigung SMD
vertical version SMD

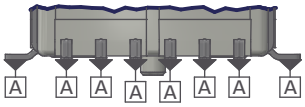






Löt-Pad-Anordnung
SMD soldering pad

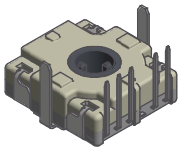


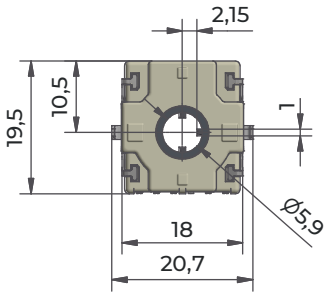


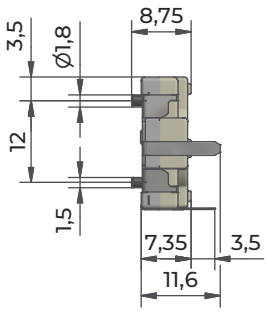
8 x A
gemeinsame Toleranzzone
common zone

▱	0,05	A

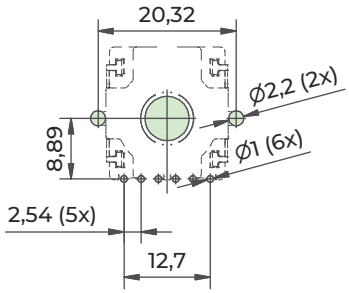
5 Vertikal hängend THT
vertically hanging THT







Löt-Pad-Anordnung
SMD soldering pad



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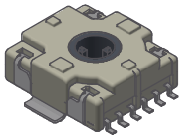
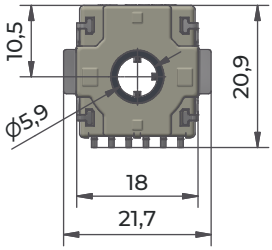
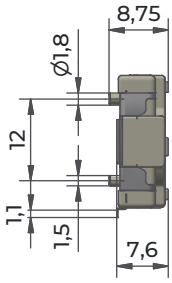
Pos. 7 TASTSCHALTER | *PUSHBUTTON SWITCH*

7												
5	1	2	-			0		0	0	0	0	0

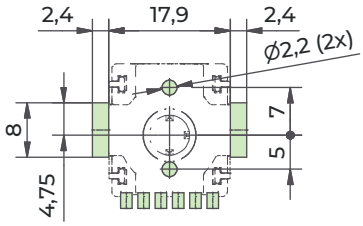
0 Ohne Tastschalter
without pushbutton switch





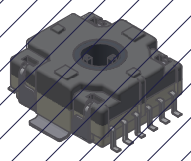


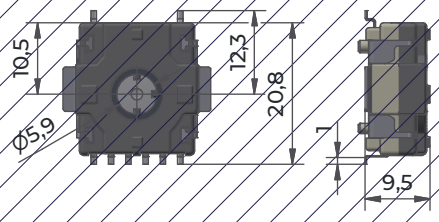
Löt-Pad-Anordnung
SMD soldering pad



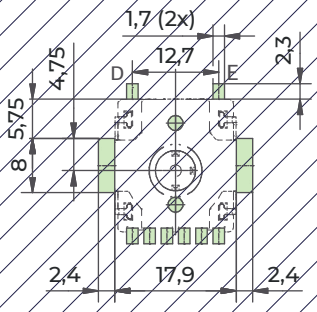
Variante mit Tastschalter nur auf Anfrage!
Variant with push-button switch only on request!

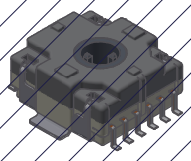
	6N Tastkraft / 6N actuating force	3N Tastkraft / 3N actuating force
1	**2**	mit Tastschalter, ohne durchgehende Öffnung *with pushbutton switch, without throughout opening*
3	**4**	mit Tastschalter, mit durchgehender Öffnung *with pushbutton switch, with throughout opening*

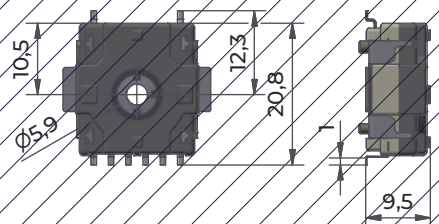




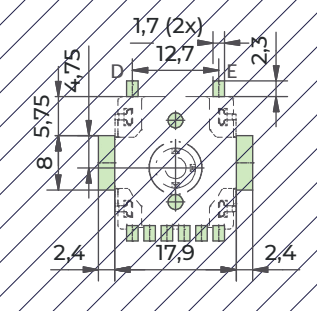
Löt-Pad-Anordnung
SMD soldering pad







Löt-Pad-Anordnung
SMD soldering pad



Schaltbild des Tastschalters
circuit diagram of the pushbutton switch

Pos. 8 RASTUNG | *DETENT*

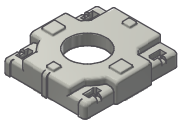
5	1	2	-				8		0	0	0	0	0	

- **1** Rastung 1,5 Ncm *detent 1,5 Ncm*
- **2** Rastung 2,5 Ncm *detent 2,5 Ncm*
- **5** Rastung 4-5 Ncm *detent 4-5 Ncm*
- **6** Rastung 6 Ncm *detent 6 Ncm*

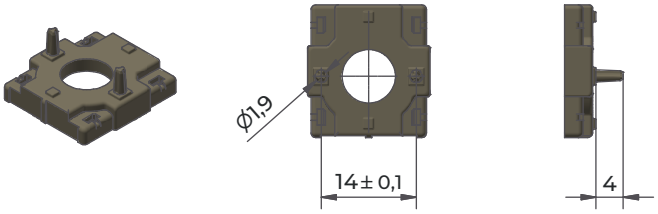
Pos. 9 GEHÄUSEAUSFÜHRUNG | *HOUSING VERSION*

5	1	2	-					9	0	0	0	0	0	

- **0** Gehäuse flach | *housing flat*



- **1** Deckel mit Zentrierzapfen | *top with centring pin*



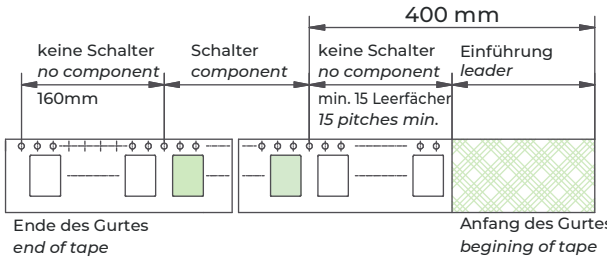
WERKSTOFFE *MATERIALS*	Blistergurt	PS	*Embossed tape*
	Abdeckband	PET	*Reel*
	Zugkraft	min. 10 N	*Embossed tape pull strength*
ABDECKBAND *TOP COVER TAPE*	Abzugswinkel	165° - 180°	*Peel - off angle*
	Abzugsgeschwindigkeit	300 mm / min.	*Peel - off speed*
	Abzugskraft	0.1 - 0.7 N	*Peel - off force*

Pos. 15 VERPACKUNG | *PACKAGING*

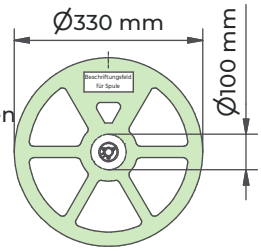
5	1	2					0	0	0	0	0	**15**

2 Gurt (SMD) | *embossed tape (SMD)*

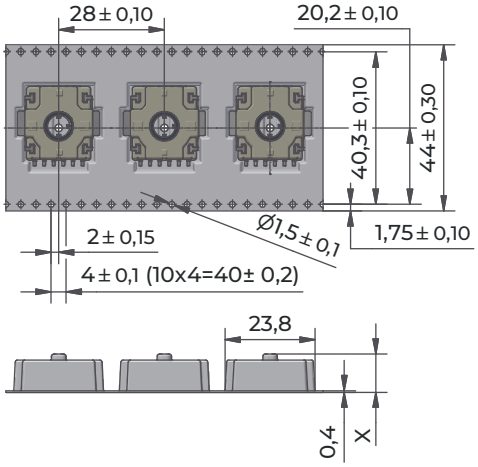
Blistergurtabmessungen
embossed tape dimensions

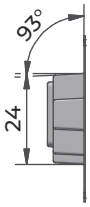


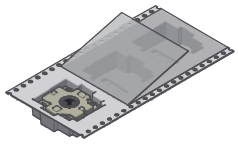
Spulenabmessungen
reel dimensions

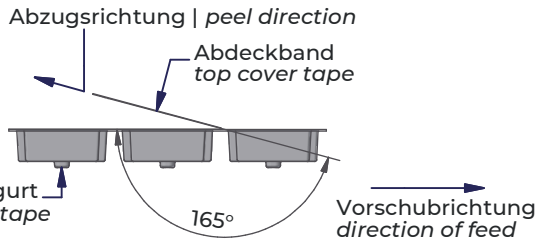


Maß "X" *dimension "X"*	max. Stückzahl *number of pieces*	Ausführung *version*
10,1	250	ohne Endschalter | *without end-switch*
12	200	mit Endschalter | *with end-switch*

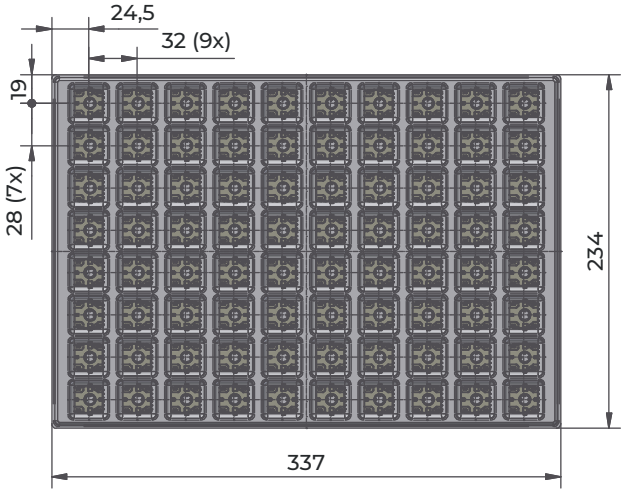


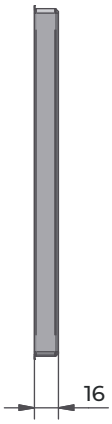






1 Palette (THT) | *palette (THT)*



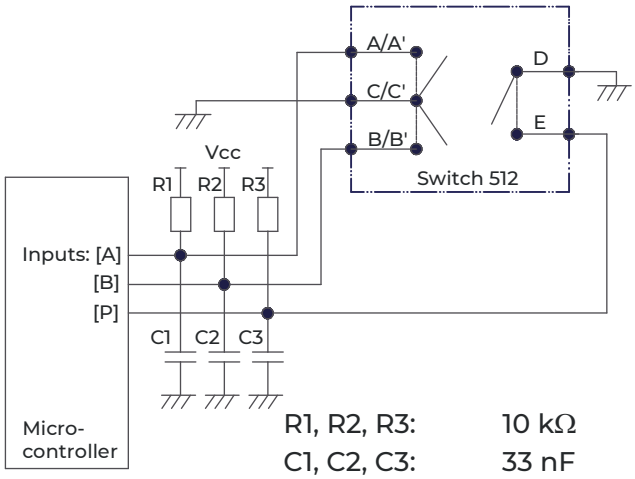


Daten der Palette
properties of the palette

max. Stückzahl *number of pieces*
80

Werkstoffe | *Materials*	
Palette | *palette*	PS
Deckel | *cover*	PVC

Dieses Schema zeigt, wie ein Schalter 512 mit einem Mikrocontroller angeschlossen wird.
In order to minimize effect of spikes or bounds, this schema shows an example with a switch 512 connected to a micro-controller.



R1, R2, R3: 10 kΩ
C1, C2, C3: 33 nF

Anwendung

Dieser Algorithmus ist ein umfassendes Software Beispiel im Mikrocontroller für die Abfragung der Antriebe, die durch diesen Schalter gegeben werden.

Application notes

This algorithm is a software example to include into a micro-controller for the detection of impulses given by this switch.

CCW ← Direction → CW

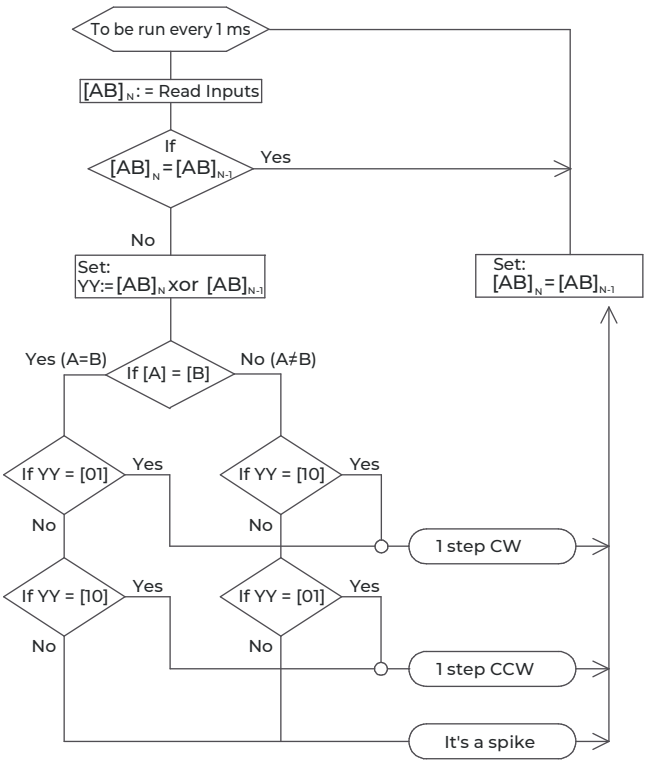
Steps	N-3	N-2	N-1	N	N+1	N+2	N+3	N+4
[AB]	[10]	[11]	[01]	[00]	[10]	[11]	[01]	[00]
A xor B	1	0	1	0	1	0	1	0
$[AB]_N$ xor $[AB]_{N-1}$	[10]	[01]	[10]	[01]	[10]	[01]	[10]	[01]
$[AB]_{N+1}$ xor $[AB]_N$	[01]	[10]	[01]	[10]	[01]	[10]	[01]	[10]

Inputzustände:

Wir betrachten hier jeden Step wie
wenn eine Position [AB] = [00] or [AB] = [11]
wenn ein Übergang [AB] = [10] or [AB] = [01]

Input states:

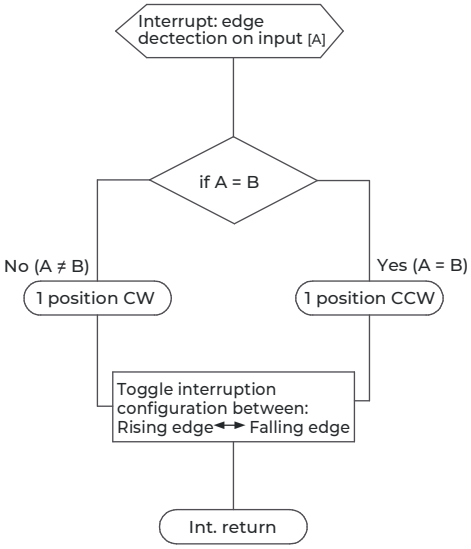
We consider here each step as
a position when [AB] = [00] or [AB] = [11]
a transition when [AB] = [10] or [AB] = [01]



Algorithmus zum Erhalten des Stepzählimpulses und -richtung
Algorithm to get steps count and direction:

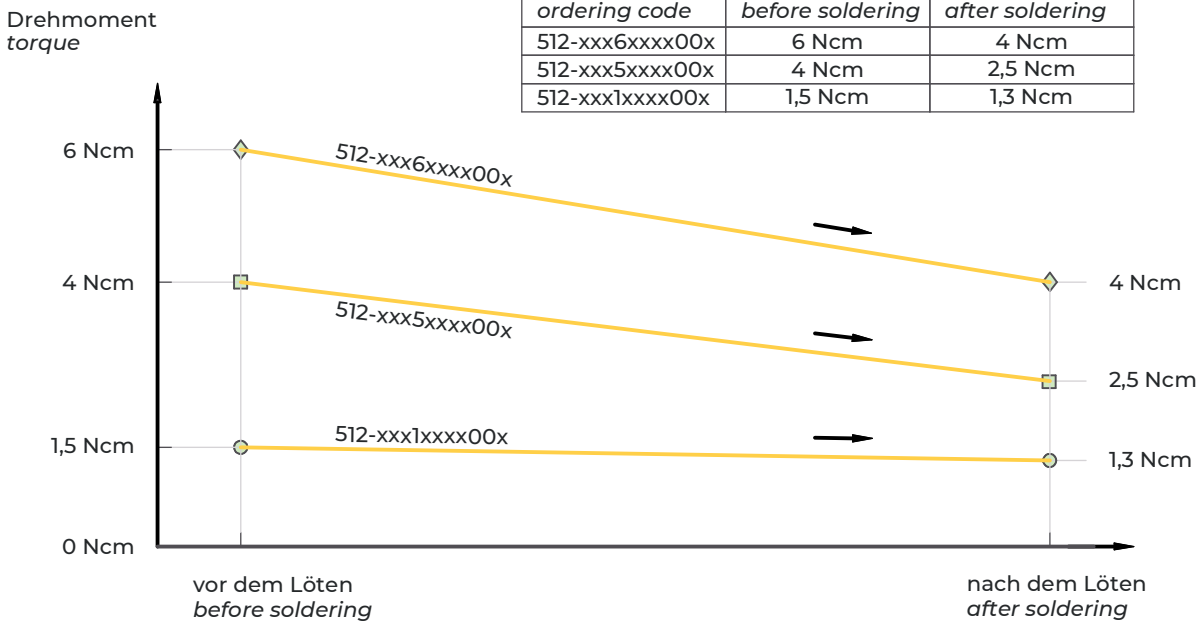
Wenn ein Schalterpin an eine Unterbrechung Input des Mikrocontrollers angeschlossen wird und die Unterbrechung an fallender und steigender Flanke konfiguriert werden kann, sollte folgender Algorithmus einfacher einzuführen sein.

If one of the switch pin is connected to an interrupt input of the micro-controller, and the interruption can be configured at both falling and rising edge, the following algorithm should be easier to implement.



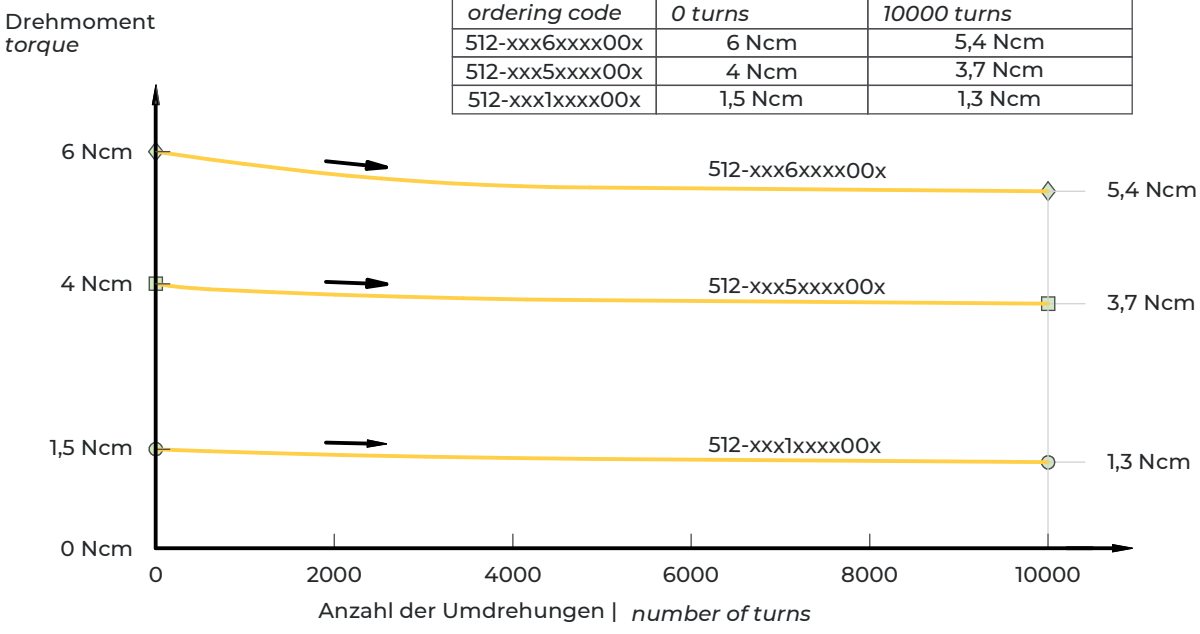
Typische Relaxion des Drehmomentes nach dem Reflow-Löten
typical relaxation of the torque after reflow soldering

Bestellschlüssel *ordering code*	Drehmoment | *torque* vor dem Löten *before soldering*	nach dem Löten *after soldering*
512-xxx6xxxx00x	6 Ncm	4 Ncm
512-xxx5xxxx00x	4 Ncm	2,5 Ncm
512-xxx1xxxx00x	1,5 Ncm	1,3 Ncm



Typisches Nachlassen des Drehmomentes über die Lebensdauer (10000 Umdrehungen)
typical decrease of the torque during life-time (10000 turns)

Bestellschlüssel *ordering code*	Drehmoment | *torque* 0 Umdrehungen *0 turns*	10000 Umdrehungen *10000 turns*
512-xxx6xxxx00x	6 Ncm	5,4 Ncm
512-xxx5xxxx00x	4 Ncm	3,7 Ncm
512-xxx1xxxx00x	1,5 Ncm	1,3 Ncm



Anschrift | *Address*

Firma: *Company:*		Datum: *Date:*	
Adresse: *Address:*		Tel.: *Phone:*	
Name: *Name:*		Fax: *Fax:*	
Kundennr.: *Customer No.:*		E-Mail: *E-Mail:*	

Bestellschlüssel | *ordering code*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5	**1**	**2**	**-**						**0**	**0**	**0**	**0**	**0**	

Anzahl der Rastpositionen
number of detent positions

Schalterausführung
switch version

Tastschalter
tactile pushbutton switch

Rastung
detent

Gehäuseausführung
housing version

Verpackung
packaging

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