

<b>GETRAG</b>		<b>Geardata-Sheet</b>			D-No.: <b>251.1.1080.50</b>		z = <b>71</b>																																
		External gearing			Remark:																																		
Mating gear: ./.		i <b>0 / 71</b>		a ./.		Type: <b>251</b>		Speed: Ring gear																															
		i /		a		Customer: <b>RSA</b>																																	
z <b>71</b>		m <sub>n</sub> <b>2.680000</b>		α <b>20 ° 0 ' 0 "</b>		β <b>24 ° 0 ' 0 "</b>		<b>RIGHT</b>																															
x <b>-0.168</b>		d <b>208.287</b>		d <sub>b</sub> <b>193.496</b>		d <sub>a</sub> <b>216.20<sub>-0.26</sub></b>		d <sub>f</sub> <b>200.15<sub>-0.30</sub></b>																															
Gear quality; Tolerance zone					Tooth thickn. sn [ <b>3.803 ÷ 3.778</b> ]																																		
Test group acc. to DIN 3961 of Aug. 78					Base tangent length over 10 teeth																																		
Radial composite err. F <sub>i</sub> ''		Tangent. comp. err. F <sub>i</sub> '		finished: [ <b>78.226 ÷ 78.202</b> ]																																			
Rad. tooth to tooth comp. err. f <sub>i</sub> ''		Tang. tooth to tooth comp. err. f <sub>i</sub> '		shaped: <b>78.438 ÷ 78.403</b>																																			
Profile form error f <sub>fα</sub>		Profile angle error fHα		hobbed: <b>78.438 ÷ 78.403</b>																																			
Total profile error F <sub>α</sub>		Adjacent pitch err. f <sub>p</sub>		ground: <b>÷</b>																																			
Normal pitch error f <sub>pe</sub>		Diff. bet. adj. pitch. f <sub>u</sub>		Measurement over 2 balls DM= 4.00																																			
Cumulative pitch error F <sub>p</sub>		Cum. circ. pitch err. F <sub>pk</sub>		finished: [ <b>211.233 ÷ 211.162</b> ]																																			
Cum. circ. pitch err. 1/8 extent F <sub>pz/8</sub>		Radial run-out F <sub>r</sub>		shaped: <b>211.866 ÷ 211.761</b>																																			
Range of tooth thickn. error R <sub>s</sub>		Longit. alignm. err. f <sub>fβ</sub>		hobbed: <b>211.866 ÷ 211.761</b>																																			
Tooth alignment err. f <sub>Hβ</sub>		Total alignment err. F <sub>β</sub>		ground: <b>÷</b>																																			
Tool		FRW -		m <sub>n0</sub> <b>2.680000</b>		α <sub>n0</sub> <b>19.8580 °</b>		β <sub>0</sub> <b>24.0000 °</b>																															
grinding wheel		h <sub>aP0</sub> <b>3.200</b>		ρ <sub>aP0</sub> <b>0.800</b>		usable diameter d <sub>Na</sub> <b>215.06</b> d <sub>Nf</sub> <b>204.21</b>																																	
						rad. of curvature p <sub>dNa</sub> <b>46.93</b> p <sub>dNf</sub> <b>32.64</b>																																	
<b>FOR PREMACHINING ONLY (HARD CONDITION) !</b>																																							
Final measurement dimensions (gear errors and modifications) see final check gear data !																																							
Correction dimensions for machining in hard and soft condition in accordance with final measurement dim. !																																							
Root diam. (soft): d <sub>f</sub> = 200.10 -0.20 Premachining with comma chip (soft): f <sub>Hα</sub> = 15 μm Measurement according to the tool data, f <sub>Hα</sub> ca. 0 μm																																							
Feedback soft - hard analysis necessary?																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Ch.ind.</td> <td>Ch. No.</td> <td colspan="4">Changes</td> <td>Date</td> <td colspan="3">Name</td> </tr> <tr> <td> </td> <td> </td> <td colspan="4"> </td> <td> </td> <td colspan="3"> </td> </tr> <tr> <td> </td> <td> </td> <td colspan="4"> </td> <td> </td> <td colspan="3"> </td> </tr> </table>										Ch.ind.	Ch. No.	Changes				Date	Name																						
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VBL created: CRICENTI Date: 2015-12-08 Subst. for:																																							

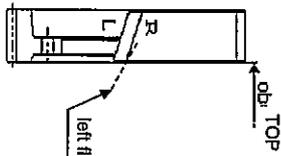
soft- hard analysis on date:

no

yes X

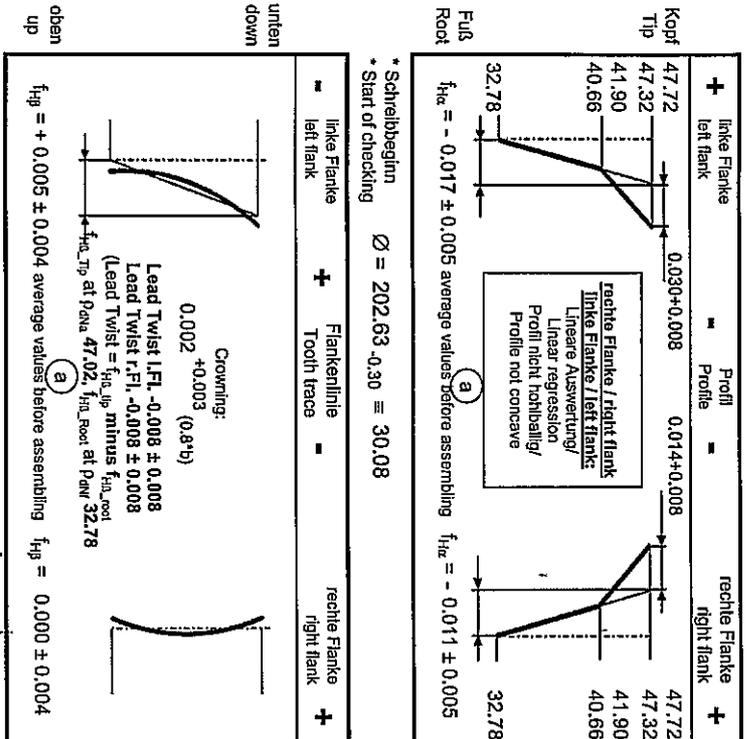
Feedback soft - hard analysis necessary?

<b>STRINRAD</b> GEAR	außenverzähnt external	Toleranzen der Verzahnung (DIN 3961 von Aug. 1978) gültig für Module bis 10 Toleranzen of gearing (DIN 3961 of Aug. 1978) valid for values of individual tooth	
Zahnezahl Number of teeth	71	linke Fl. left flank	rechte Fl. right flank
Normal module Modul	2.680000	0.005	0.011
Engrißwinkel Normal pressure angle	20° 0' 0"		0.011
Schrägungswinkel Helix angle	24° 0' 0"		0.014
Steigungsrichtung Hand of helix	RECHTS		
Profilverschiebungsfaktor Addendum modification coef.	-0.168		0.032
Teilkreisdurchmesser Pitch diameter	208.287	0.005	
Kopfkreisdurchmesser Outside diameter	216.20 -0.26	0.045	
Kopfnutzkreis, theo. max. $d_{ka}$ Tip diam. usable theo.	215.75		0.036
Kopfnutzkreis, theo. min. $d_{ka}$ Tip diam. usable theo.	215.40		0.016
Fußkreisdurchmesser Root diameter	200.15 -0.30	30.30	37.31
Fußnutkreisdurchmesser Root diameter usable	204.30		
Grundkreisradius Base circle radius	96.748		
Grundkreisdurchmesser Base diameter	193.496		
Normalzahnstärke Normal tooth thickness	3.803		
Normalzahnstärke Normal tooth thickness	3.778		
Meßzahnanzahl Number of teeth spanned	10		
Zahnweite Base tangent length	78.226		
Zahnweite Base tangent length	78.202		
Meßkugeldurchmesser Ball diameter	4.0000		
Diam. Zweikugelmäß max. $M_{\alpha k}$ Measurement o. balls	211.233		
Measurement o. balls	211.162		
Verdriftankenspiel Circumferential backlash	0.107 0.041		



df ist shot peened, must not be ground

**Bezugsprofil-Schleifscheibe**  
Grinding tool data  
Schleifscheibenkopfhöhe  $h_{sc} = 3.300$   
Grinding wheel tip height  
Schleifscheibenkopfradius  $par_{sc} = 1.100$   
Grinding wheel tip radius  
Schleifdurchmesser = 202.63 -0.30  $\approx 30.08$   
grinding diameter



Profil- und Flankenlinienmessung nach G. 808006 und VDI/VDE 2612  
Flankenlinienprübereich  $L_p = 0.8 \cdot b$  hochgerechnet auf 1,0"  $b$   
Begriffe für Strinräder nach DIN 868, 3960, 3998

Profile and helix checking according to G. 808006 and VDI/VDE 2612  
Tooth trace testing area  $L_p = 0.8 \cdot b$  calculated to 1,0"  $b$   
Terms of the tooth system according to DIN (German Industrial Standards) No. 868, 3960, 3998

Abbildungen sind unmaßstäblich. Diagrams not to scale.	Datum 2015-12-08	Name Cricenti, Fabrizio
Ersetzt für Ersatzverwendung bei Getriebeprüf.	2	Änd.Nr. 004587
Verzahnungsblatt Endkontrolle Final Check Gear Data	251	See CO
Verzahnungsblatt Zahnanzahl		
Zeichnungsnummer Drawing number	251.1.1080.50	

Wkz-Profil siehe Werkzeugdatenblatt Nr.  
For Tooth profile, see tool data sheet number

251.1.1080.50

Verteiler:  
Schutzvermerk nach ISO 16016 beachten  
Protection per ISO 16016  
**GETRAG**  
GETRAG Getriebe- und Zahnradfabrik  
Hermann Hagemeyer GmbH & Cie KG  
Remark:

REPORT 16/238

Date: 18/10/2016  
Author: Padolecchia Raffaele

Reason for analysis: PPAP  
Motivo dell'indagine:

Requester: WLQ5 - D'Elia Luca  
Richiedente:

Part Name: RING GEAR  
Nome particolare:  
Material: GCG\_805000\_Part 2  
Materiale:  
State of part: Finished  
Stato del particolare:

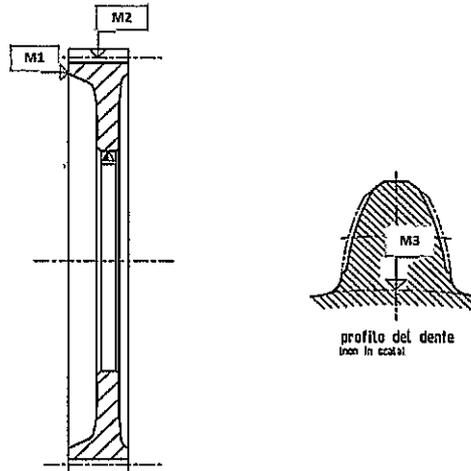
P/N: 251.1.1080.50  
S/N: -  
Customer: -  
Cliente:

Result: OK  
Risultato:

Distribution list: WLQ5 - D'Elia Luca  
Lista di distribuzione: WLQ - S. Picerno

Notes: Carica 49670 - forno #6  
Note: Colata: A

**Drawing (Disegno)**



Picture 1: estratto del disegno del particolare, posizione dei punti di misura per le caratteristiche metallurgiche.

**Cleanliness Analysis (Analisi della Pulizia)**

Sampler	G. Ferrara	Spray equipment	Flushing cabinet Hydac CTU-1230-M-Z-R
Sampling point	ORE 10160 washing machine outlet	Spray method	QPS WLQ2_034
Sampling date & time	18/10/2016 - 10:00	Membrane material	cellulose nitrate
Wetted surface [cm <sup>2</sup> ]	1037,13	Pore size [µm]	5,0
Gravimetric evaluation [mg/1000cm <sup>2</sup> ]	2,00	Max allowable residual dirt [mg/1000cm <sup>2</sup> ]	2,5

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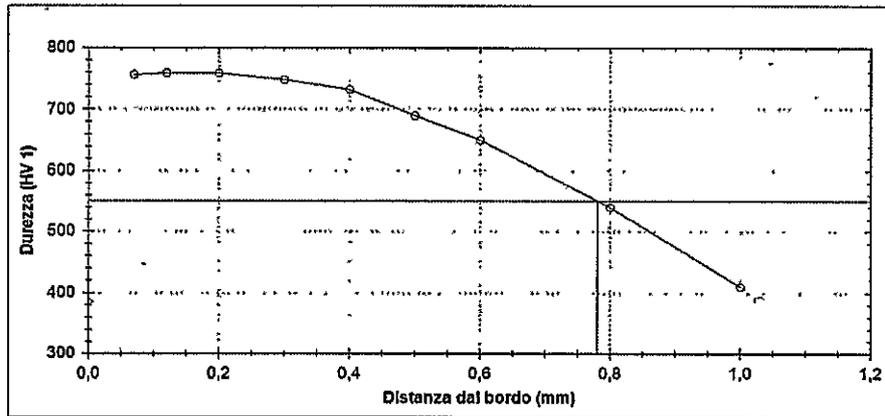
Date: 18/10/2016  
Author: Padolecchia Raffaele

*Surface Hardness Verification (Verifica Durezza Superficiale)*

Scale	Position	Values [mm]	Range	Component
HRC	M1	62,1	-	Gear
HRA	M1	82,6	80.5 + 2.5	Gear

*CHD and Core Hardness Verification (Verifica CHD e Durezza a Cuore)*

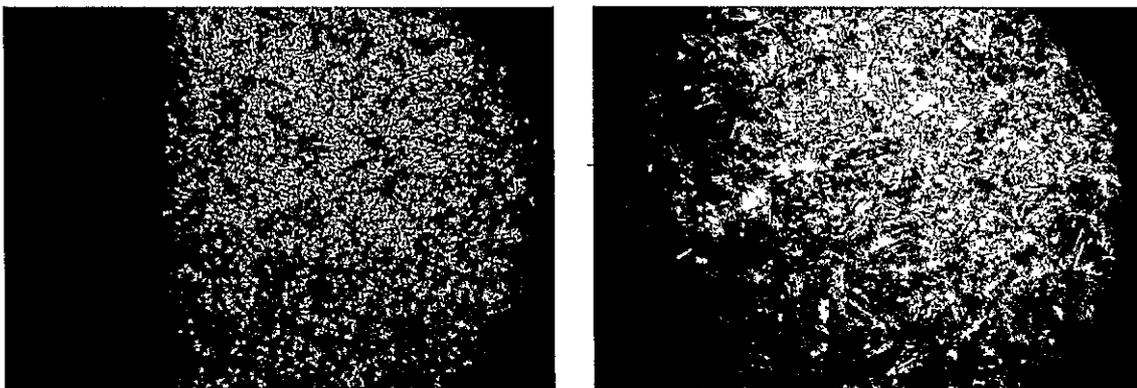
Scale	Sample	Position	Measured Value	Range
CHD 550 HV1	3219/16	M2	0,78	0.5 + 0.4 mm
HV10	3219/16	M3	384	min 300 HV10



Picture 1: hardness curves.

*Analysis at Metallographic Microscope (Analisi al Microscopio Metallografico)*

Sample # 3219/15	
Gear - Tooth flank surface structure:	Martensite + <5% retained austenite (OK)
Gear - Tooth base core structure:	Martensite + bainite (OK)



Picture 2: Gear - Surface microstructure at tooth flank (left) and at tooth root (right)