312780

Part Submission Warrant

MAGNA GETRAG

Part Name:	Ring Gear	Cust. Part No.:	251.1.1243.50
Shown on Drawing No.:	251.1.1243.50	Org. Part No.:	251.1.1243.50
Engineering Change Level:	3 Index "a" (C007030_MIP_1)	Dated:	28/09/2017
Additional Engineering Changes:	na	Dated:	na
Safety and/or Government Regulation:	☐ Yes ☑ No; Purchase Order No.:	Weight (kg):	2.980
Checking Aid No.:	na; Checking Aid Engineering Change Level: na	Dated:	na

ORGANIZATION MANUFACTURING INFORMATION

Getrag S.p.A.
Organization Name & Supplier / Supplier Code

Via dei Ciclamini, 4
Street Address

City	Region	Postal Code	Country
Modugno (Ba)	Puglia	70026	Italy

CUSTOMER SUBMITTAL INFORMATION

Bari assembly line (GPS4)
Customer Name / Division

na
Buyer / Buyer Code

DCT300
Application

MATERIALS REPORTING

Has customer-required Substances of Concern information been reported? ☐ Yes ☐ No ☑ n/a

Submitted by IMDS or other customer format:
(IMDS=International Material Data System)

Are polymeric parts identified with appropriate ISO marking codes? ☐ Yes ☐ No ☑ n/a

REASON FOR SUBMISSION (Check at least one)

- ☑ Initial Submission
- ☐ Engineering Change(s)
- ☐ Tooling: Transfer, Replacement, Refurbishment, or additional
- ☐ Correction of Discrepancy
- ☐ Tooling Inactive > than 1 year
- ☐ Change to Optional Construction or Material
- ☐ Supplier or Material Source Change
- ☐ Change in Part Processing
- ☐ Parts Produced at Other or Additional Location
- ☐ Other - please specify below (e.g. additional specific customer requirement or e.g. change of EP parts

REQUESTED SUBMISSION LEVEL (Check one)

- ☐ Level 1 - Warrant only (and for designated appearance items, an Appearrance Approval Report) submitted to customer.
- ☐ Level 2 - Warrant with product samples and limited supporting data submitted to customer.
- ☑ Level 3 - Warrant with product samples and complete supporting data submitted to customer.
- ☐ Level 4 - Warrant and other requirements as defined by customer.
- ☐ Level 5 - Warrant with product samples and complete supporting data reviewed at organization's manufacturing location.

SUBMISSION RESULTS

The results for: ☑ dimensional measurements ☑ material and functional tests ☐ appearance criteria ☑ statistical process package

These results meet all drawing and specification requirements: ☑ Yes ☐ No (If "NO" - Explanation Required)

Mold / Cavity / Production Process: na

DECLARATION

I hereby affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all Production Part Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the production rate of 163 / 8 hours. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from the declaration below.

EXPLANATION / COMMENTS: - First PPAP Submission (only differences from variant 251.1.1080.50).
- Identification grooves according with change C006077

Is each Customer Tool properly tagged and numbered? ☐ Yes ☐ No ☑ n/a

Organization Authorized Signature: [signature] Date: **18/05/2018**

Print Name: **Tursi Dario Maria** Phone No.: **+39 0805858360** Fax No.:

Title: **7DCT300 Launch Manager** E-Mail: dario.tursi@magna.com

FOR CUSTOMER USE ONLY (If applicable))

Part Warrant Disposition: ☒ Approved ☐ Rejected ☐ Other

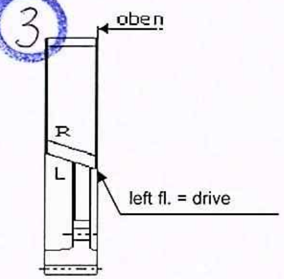
Customer Signature: [signature] Date: 18.05.18

Print Name: F. SPERACANNA Customer Tracking No.:

STIRNRAD / GEAR	außenverzahnt / external
Zähnezahl / Number of teeth z	72
Modul / Normal module m_n	2.600000
Eingriffswinkel / Normal pressure angle α_n	20° 0' 0"
Schrägungswinkel / Helix angle β	23° 21' 0"
Steigungsrichtung / Hand of helix	RECHTS
Profilverschiebungsfaktor / Addendum modification coeff. x	0.037
Teilkreisdurchmesser / Pitch diameter d	203.899
Kopfkreisdurchmesser / Outside diameter d_a	212.50 $_{-0.30}$
Kopfnutzkreisd. theo. max. / Tip diam. usable theo. d_{Na}	212.05
Kopfnutzkreisd. theo. min. / Tip diam. usable theo. d_{Na}	211.70
Fußkreisdurchmesser / Root diameter d_f	196.65 $_{-0.32}$
Fußnutzkreisdurchmesser / Root diameter usable d_{Nf}	200.37
Grundkreisradius / Base circle radius r_b	94.774
Grundkreisdurchmesser / Base diameter d_b	189.548
Normalzahndicke max. / Normal tooth thickness s_n	4.077
Normalzahndicke min. / Normal tooth thickness s_n	4.052
Meßzähnezahl / Number of teeth spanned k	11
Zahnweite max. / Base tangent length W_k	83.930
Zahnweite min. / Base tangent length W_k	83.906
Meßkugeldurchmesser / Ball diameter D_M	4.0000
Diam. Zweikugelmaß max. / Measurement o. balls M_{dK}	208.350
Diam. Zweikugelmaß min. / Measurement o. balls M_{dK}	208.282
Verdrehflankenspiel / Circumferential backlash theo.	0.065 0.168

Toleranzen der Verzahnung (DIN 3961 vom Aug. 1978) gültig für Werte am Einzelzahn (7)
Tolerances of gearing (DIN 3961 of Aug. 1978) valid for values at individual tooth

	linke Fl. / left flank	rechte Fl. / right flank		
Profil-Formabweichung / Profile form error $f_{f\alpha}$	0.005		Eingriffsteilungs-Abweich. / Normal pitch error f_{pe}	0.011
Profil-Gesamtabweichung / Total profile error F_α			Teilungs-Einzelabweichung / Adjacent pitch error f_p	0.011
Profil-Winkelabweichung / Profile angle error $f_{H\alpha}$	- 0.017 ± 0.009	- 0.011 ± 0.009	Teilungssprung / Diff. bet. adjacent pitches f_u	0.014
Flankenl.-Winkelabweich. / Tooth alignment error $f_{H\beta}$	+ 0.005 ± 0.008	0.000 ± 0.008	Teilungs-Summenabweich. / Cumulative circ. pitch error F_{pk}	
Flankenl.-Gesamtabweich. / Total alignment error F_β			Rundlaufabweichung / Radial run-out F_r	0.032
Flankenl.-Formabweich. / Longitudinal alignment err. $f_{f\beta}$	0.005		Zahndickenschwankung / Range of tooth thickn. error R_S	
Teilungs-Gesamtabweich. / Cumulative pitch error F_p	0.045			
Einf.-Wälzabweichung / Tangential composite error F_i'			Zweifl.-Wälzabweichung / Radial composite error F_i''	0.036
Einflanken-Wälzsprung / Tang. tooth to tooth comp. err. f_i'			Zweifl.-Wälzsprung / Radial tooth to tooth comp. err. f_i''	0.016
Radbreite im Meßkreis d_M / Facewidth in meas. diam. b	30.30		Meßkreis Krümmungsradius / Radius of curvature meas. diam. ρ_{dM}	37.83

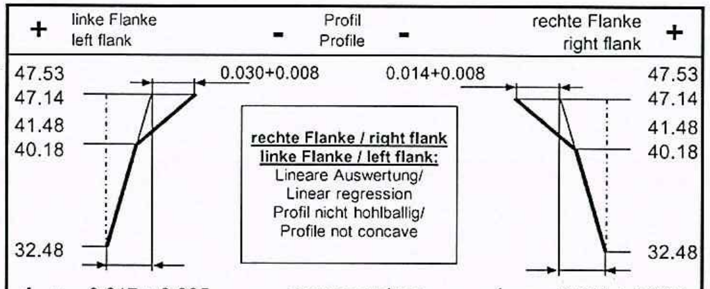


Bezugsprofil-Schleifscheibe
Grinding tool data

Schleifscheibenkopfhöhe / Grinding wheel tip height h_{aP0S} = 3.100
Schleifscheibenkopfradius / Grinding wheel tip radius ρ_{aP0S} = 0.400
Schleifdurchmesser = 198.72 $_{-0.30}$ ≡ 29.84
grinding diameter

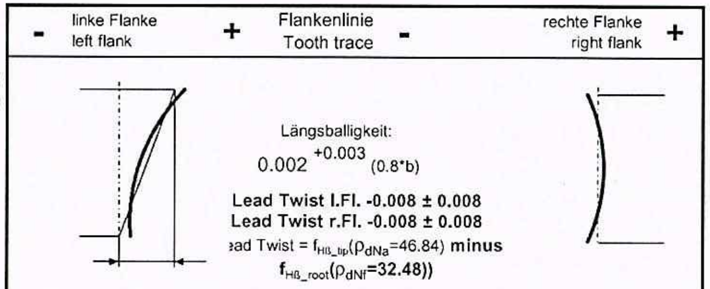
#Waviness evaluation (fitted sine) in profile and helix direction
until 4th gear order to be documented
according to G_00_05_S_0012
Order referenced to the considered gear

(a)



$f_{H\alpha}$ = - 0.017 ± 0.005 average values $f_{H\alpha}$ = - 0.011 ± 0.005

* Schreibbeginn
* Start of checking $\varnothing$ = 198.72 $_{-0.30}$ ≡ 29.84



$f_{H\beta}$ = + 0.005 ± 0.004 average values $f_{H\beta}$ = 0.000 ± 0.004

* ffαf (zwischen dNf und dem Schreibbeginn ds) max ffα/2, jedoch 0.003 zulässig
* ffαf (between dNf and start of checking ds) max ffα/2, 0.003 allowable.

Profil- und Flankenlinienmessung nach G_808006 und VDI/VDE 2612
Flankenlinienprüfbereich Lβ = 0.8*b hochgerechnet auf 1.0*b
Begriffe für Stirnräder nach DIN 868, 3960, 3998

Profile and helix checking according to G_808006 and VDI/VDE 2612
Tooth trace testing area Lβ = 0.8*b calculated to 1.0*b
Terms of the tooth system according to DIN (German Industrial Standards) No. 868, 3960, 3998

Vorbearbeitungsdaten siehe Verzahnungsblatt Vorbearbeitung gleicher Nr.
For pre-machining dimensions, see gear data sheet same number

Wkz-Profil siehe Werkzeugdatenblatt Nr. / For Tooth profile, see tool data sheet number 251.1.1243.50

Buch.	Anz.	Änd.Nr.		Datum	Name
a	1	C011518	See CO	20171108	Cricenti

Abbildungen sind unmaßstäblich.
Diagrams not to scale.

	Datum	Name
gez.	2016-08-04	Cricenti, Fabrizio
gepr.		

Ersatz für

Erstverwendung bei Getriebetype: 251

Verzahnungsblatt Endkontrolle
Final Check Gear Data

Benennung: / Naming: **Zahnkranz**

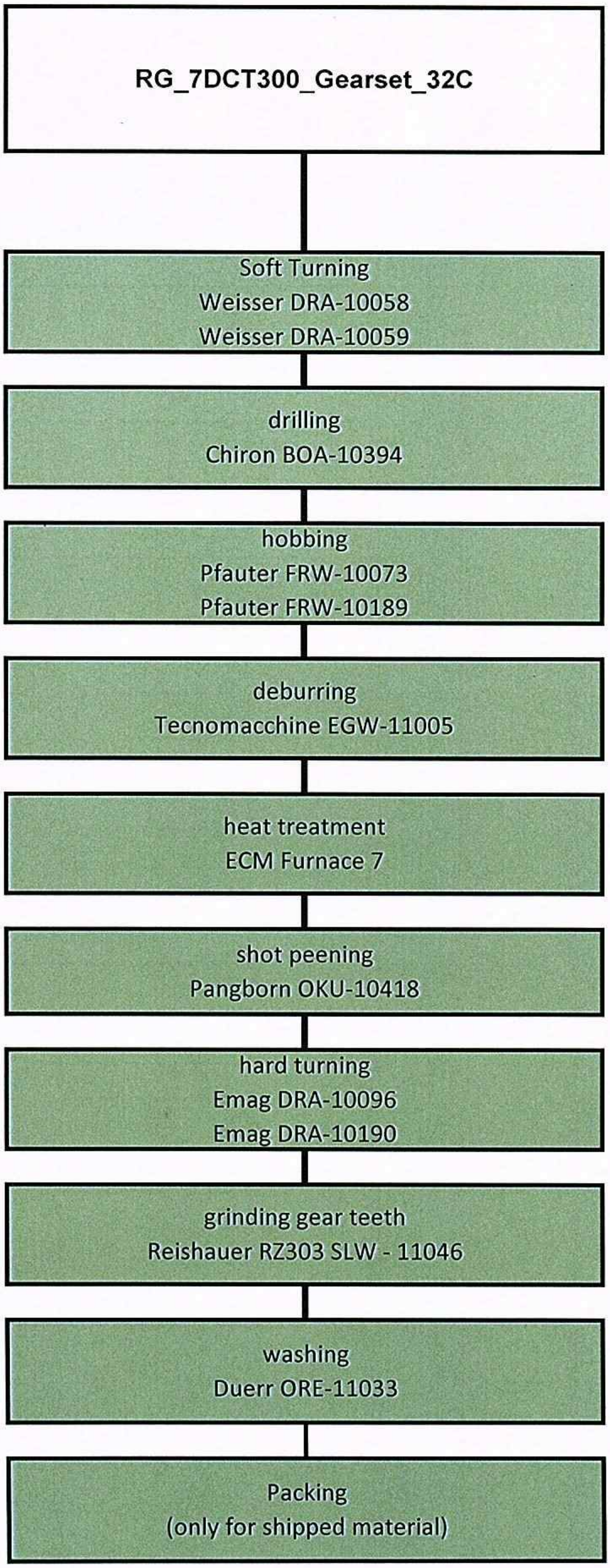
Verteiler:

Schutzvermerk nach ISO 16016 beachten
Protection per ISO 16016

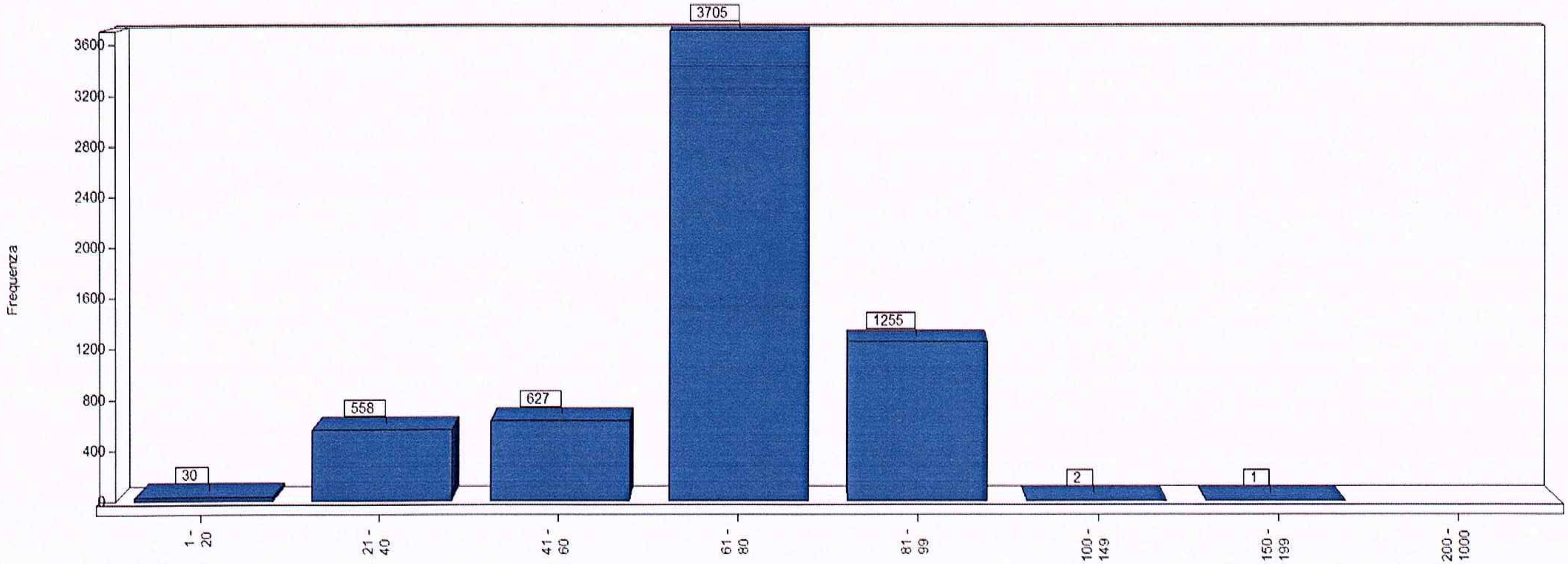
GETRAG
GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer GmbH & Cie KG

Remark:

Zeichnungsnummer:
Drawing number:
251.1.1243.50


RG_7DCT300_Gearset_32C
Soft Turning
Weisser DRA-10058
Weisser DRA-10059
drilling
Chiron BOA-10394
hobbing
Pfauter FRW-10073
Pfauter FRW-10189
deburring
Tecnomacchine EGW-11005
heat treatment
ECM Furnace 7
shot peening
Pangborn OKU-10418
hard turning
Emag DRA-10096
Emag DRA-10190
grinding gear teeth
Reishauer RZ303 SLW - 11046
washing
Duerr ORE-11033
Packing
(only for shipped material)

GETRAG	FMEA Processo		Numero: 1.2.1.1.1.1 Pagina:
Tipo/Modello/Produzione/Lotto: 7DCT300	Numero Disegno: Gearset 1A + 21A + 21H + 32C Stato modifica: -	Responsabile: Getrag Ditta: Getrag	Emesso: 31/08/2015
FMEA/Elemento: GEARSET 7DCT300	Codice dell'operazione: Tutte Stato modifica: -	Responsabile: Papagna, Oscuro, Nitti, Cicirelli, Tanzi T., Terlizzese, Landriscina, Guerra, Sinibaldi, Caponio, Vicenti, Picerno, Pierro, Cacciapaglia, Sisto. Ditta:	Emesso: 13/01/2017 Modificato: 14/05/2018



Actions ongoing for RPN > 100:

Chr. Classification	Project	Component	Operation	Chr. Description	Actual RPN				Action	Resp.	Due date	Min. RPN expected			
					S	O	D	RPN				S	O	D	RPN
<M>	DCT300	SG1	Hard Turning	Clutch body Height	7	4	4	112	Final drawing tolerance review + Dogbody height review on EP	Pierro	31-May-18	7	2	5	(70)
<M>	DCT300	SGRv	Hard Turning	Clutch body Height	7	3	5	105	Final drawing tolerance review + Dogbody height review on EP (100% Check --> Sampling check)	Pierro	30-Jun-18	7	2	5	(70)
std	DCT300	IS2	Diam. Grinding	Spline Fr	8	6	4	192	New operation implementation in order to ground new clamping surface for Diam. grinding operation (100% Check --> Sampling check)	Cacciapaglia	31-Jul-18	8	3	5	(120)
									New machine Junker implementation for Diam. grinding operation		31-Aug-18	8	2	5	(80)

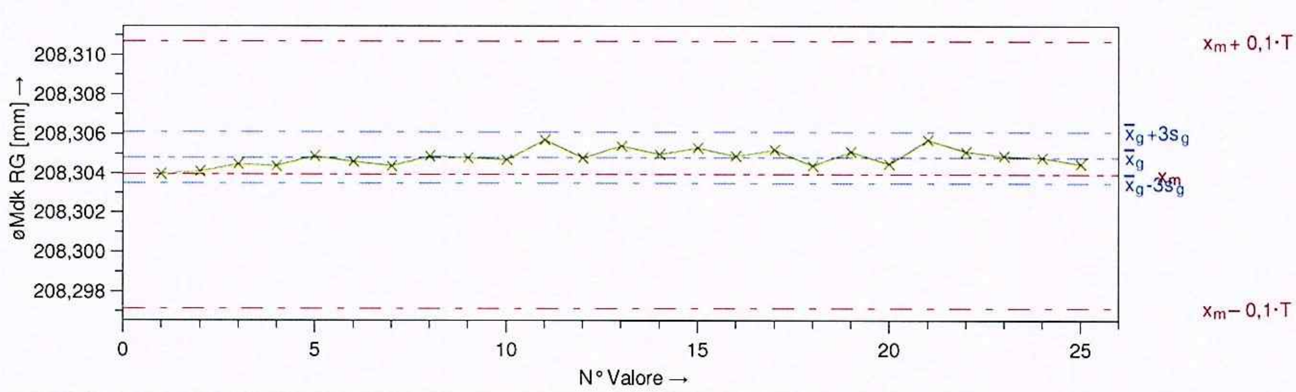
Q-DAS®

Capacità strumenti di misura

Data/ora	26/04/2018	Nome oper.	mario.bozza	Reparto/Area/Prod.	WLQ	Posto di prova	Rettifica denti RG

Calibro		Master		Caratteristica			
Desc. calibro	Banchetto in acciaio	Desc. mast.	Master RG	Desc. Car.	øMdk RG		
N° calibro	MVZ 406001 060	N° master	MVZ 400573 002	N° Caratt.	2511124350_32C		
Ris. calibro	0,0001	Valore reale mast.	208,304	Val. Nom. 208,3160	LSS	208,350	≙ 0,0340
Caus. Pr.	Cg CgK	Unità di misura	mm	Unità di m mm	LSI	208,282	≙ -0,0340

Nota



i	x_i	i	x_i	i	x_i	i	x_i	i	x_i
1	208,3040	6	208,3046	11	208,3057	16	208,3049	21	208,3057
2	208,3041	7	208,3044	12	208,3048	17	208,3052	22	208,3051
3	208,3045	8	208,3049	13	208,3054	18	208,3044	23	208,3049
4	208,3044	9	208,3048	14	208,3050	19	208,3051	24	208,3048
5	208,3049	10	208,3047	15	208,3053	20	208,3045	25	208,3045

Valori a disegno			Valori Calcolati			Statistiche		
$x_m + 0,1 \cdot T$	=	208,310800	$x_{max\,g}$	=	208,3057	$\bar{x}_g + 3s_g$	=	208,306132
x_m	=	208,304000	$x_{min\,g}$	=	208,3040	$\bar{x}_g$	=	208,304824
$x_m - 0,1 \cdot T$	=	208,297200	R_g	=	0,0017	$\bar{x}_g - 3s_g$	=	208,303516
$0,2 \cdot T$	=	0,013600	n_{tot}	=	25	$6s_g$	=	0,002617
T	=	0,0680				s_g	=	0,000436
Unità di misura	=	mm				$\lvert Bi \rvert$	=	0,00082400
						n_{eff}	=	25

Test per Bias			Risultati del test : significativo (α ≤ 0,1%)
Bias	=	1,21%	

Minimo riferimento per sistema di misura capace

Risoluzione	%RE = 0,15%	0 5	$T_{min\,(\%RE)}$	=	0,00200
$C_g = \frac{0,2 \cdot T}{4 \cdot s_g}$	= 5,60 ≤ **7,80** ≤ 9,98	0 1 1,33	$T_{min\,(C_g)}$	=	0,0116
$C_{gk} = \frac{0,1 \cdot T - \lvert \bar{x}_g - x_m \rvert}{2 \cdot s_g}$	= 4,91 ≤ **6,85** ≤ 8,79	0 1 1,33	$T_{min\,(C_{gk})}$	=	0,0198

Sistema di misura capace (%RE,min,C_g,C_{gk})

☐ GETRAG MSA 2017: Capability of measuring system (Type-1 Study)

Data ____________ Firma ____________ Dipartimento ____________

Capacità strumenti di misura

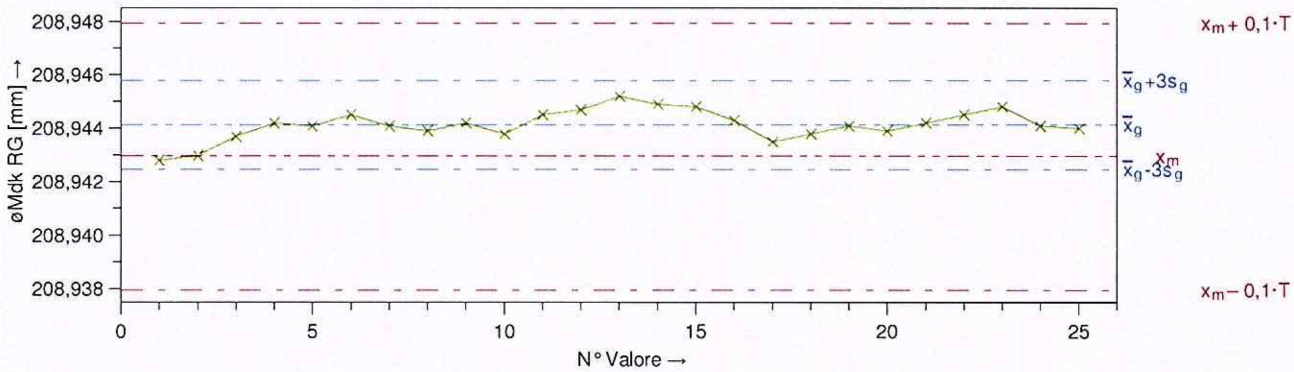
Q-DAS

Pagina 1 / 1

Data/ora	11/06/2018	Nome oper.	mario.bozza	Reparto/Area/Prod.	WLQ	Posto di prova	Dentatura RG

Calibro		Master		Caratteristica			
Desc. calibro	Banchetto in acciaio	Desc. mast.	Master RG	Desc. Car.	øMdk RG		
N° calibro	MVZ 406001 013	N° master	MVZ 400573 001	N° Caratt.	2511124350_32C		
Ris. calibro	0,0001	Valore reale mast.	208,943	Val. Nom. 208,9300	LSS	208,955	$\hat{=}$ 0,0250
Caus. Pr.	Cg CgK	Unità di misura	mm	Unità di m mm	LSI	208,905	$\hat{=}$ -0,0250

Nota



i	x_i	i	x_i	i	x_i	i	x_i	i	x_i
1	208,9428	6	208,9445	11	208,9445	16	208,9443	21	208,9442
2	208,9430	7	208,9441	12	208,9447	17	208,9435	22	208,9445
3	208,9437	8	208,9439	13	208,9452	18	208,9438	23	208,9448
4	208,9442	9	208,9442	14	208,9449	19	208,9441	24	208,9441
5	208,9441	10	208,9438	15	208,9448	20	208,9439	25	208,9440

Valori a disegno			Valori Calcolati			Statistiche		
$x_m + 0,1 \cdot T$	=	208,948000	$x_{max\,g}$	=	208,9452	$\bar{x}_g + 3s_g$	=	208,945808
x_m	=	208,943000	$x_{min\,g}$	=	208,9428	$\bar{x}_g$	=	208,944144
$x_m - 0,1 \cdot T$	=	208,938000	R_g	=	0,0024	$\bar{x}_g - 3s_g$	=	208,942480
$0,2 \cdot T$	=	0,010000	n_{tot}	=	25	$6s_g$	=	0,003328
T	=	0,0500				s_g	=	0,000555
Unità di misura	=	mm				|Bi|	=	0,0011440
						n_{eff}	=	25

Test per Bias			Risultati del test : significativo (α ≤ 0,1%)
Bias	=	2,29%	

Minimo riferimento per sistema di misura capace

Risoluzione	%RE = 0,20%	0 5	$T_{min\,(\%RE)}$	=	0,00200
$C_g = \frac{0,2 \cdot T}{4 \cdot s_g}$	= 3,24 ≤ **4,51** ≤ 5,77	0 1 1,33	$T_{min\,(C_g)}$	=	0,0147
$C_{gk} = \frac{0,1 \cdot T - \lvert \bar{x}_g - x_m \rvert}{2 \cdot s_g}$	= 2,48 ≤ **3,48** ≤ 4,47	0 1 1,33	$T_{min\,(C_{gk})}$	=	0,0262

Sistema di misura capace (%RE,min,C_g,C_{gk})

☐ GETRAG MSA 2017: Capability of measuring system (Type-1 Study)

Data ________________ Firma ________________ Dipartimento ________________

GETRAG Production Part Approval

DIMENSIONAL TEST RESULTS

Organization:	GETRAG	Part Number:	251.1.1243.50
Supplier/Vendor Code:	GETRAG Modugno	Part Name:	Ring Gear
INSPECTION FACILITY:		Design Record Change Level:	3 Index "a"
NA		Engineering Change Documents:	C007030_MIP_1 - 28/09/2017

Organization Measurement Results (Data)

Item	Dimension/Specification	Specification / Limits		Classif.	Qty. Tested	1	2	3	4	5	controllo distruttivo	Ok	Not Ok
1	Teeth Profile & Lead, Pitch	OK	NOK		5	OK	OK	OK	OK	OK		OK	
2	MdK	208.350	208.282	<M>	5	208.325	208.317	208.310	208.320	208.310		OK	
3	df	196.650	196.330		5	196.481	196.496	196.492	196.515	196.404		OK	
4	da	212.500	212.200		5	212.293	212.308	212.308	212.337	212.233		OK	
5	Fr	32	0	<M>	5	12.3	22.0	14.9	16.0	14.9		OK	

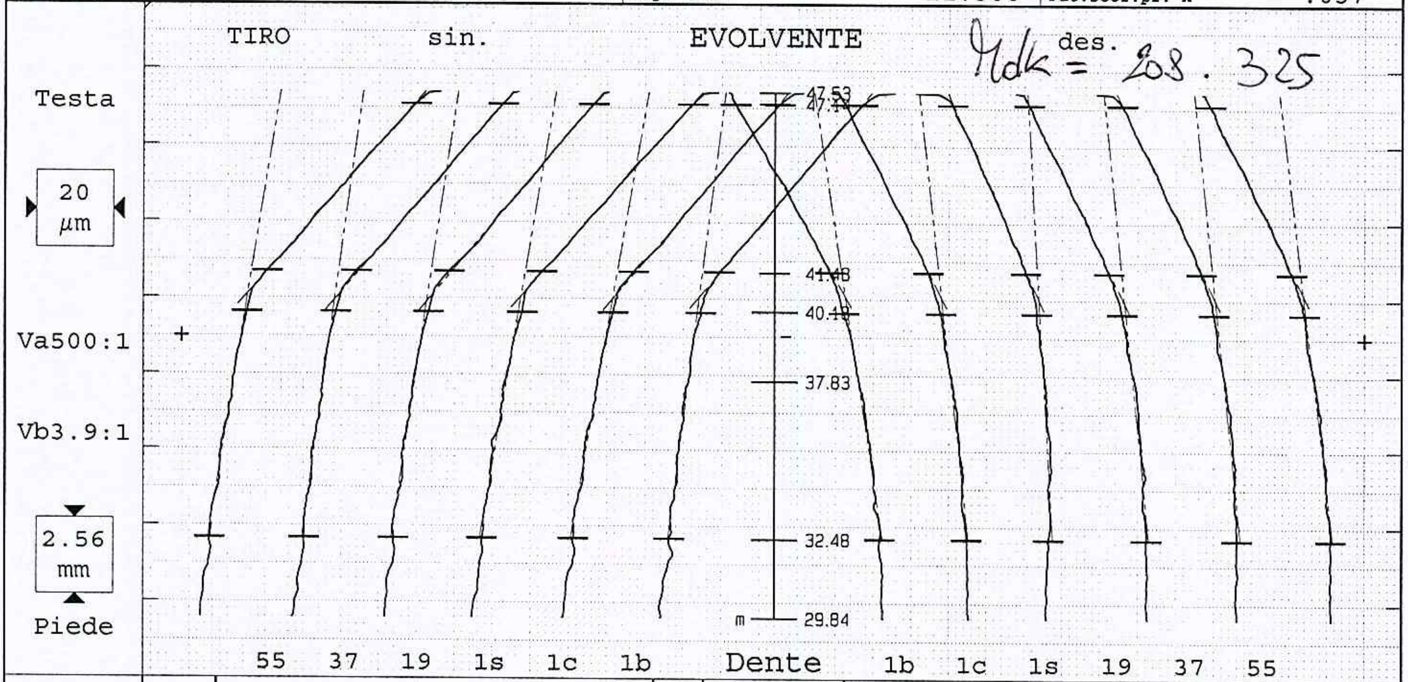
March 2006 CFG-1003

SIGNATURE	TITLE	DATE
Vicenti D.	ME	18/05/2018

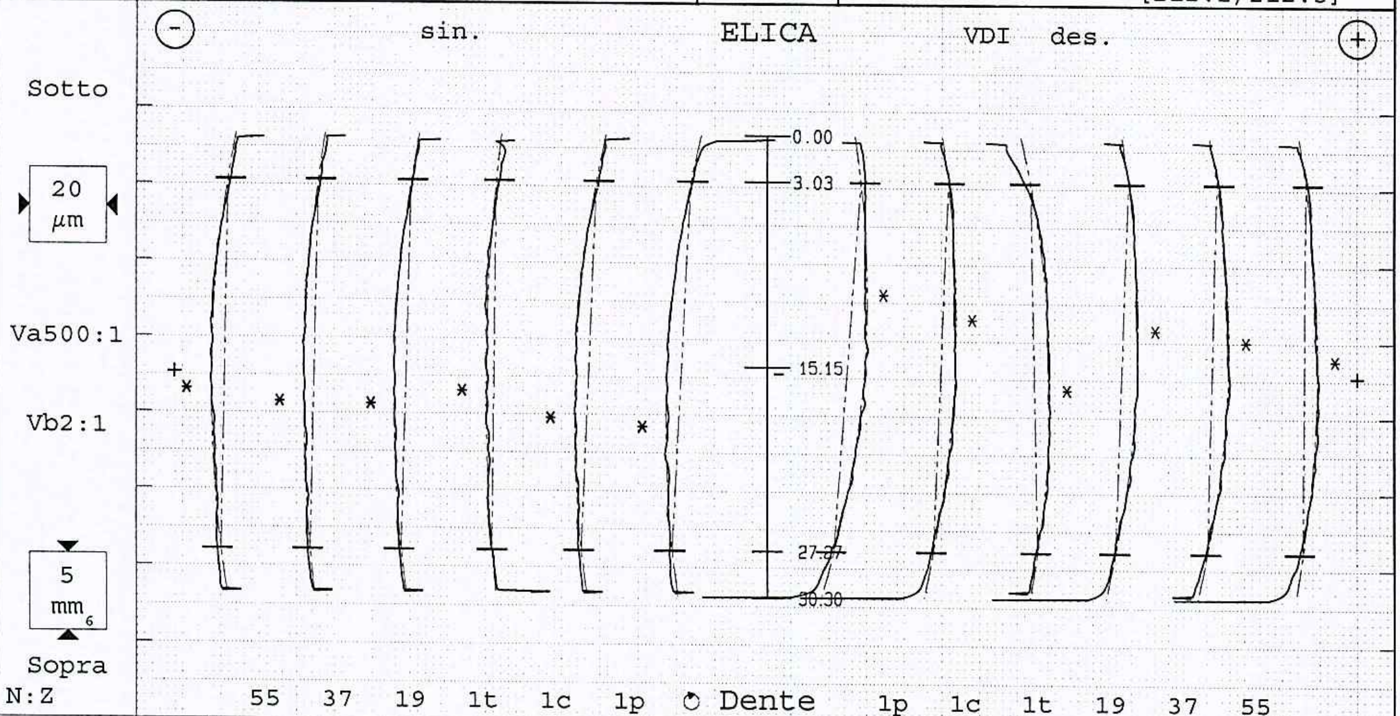
Ruota cilindrica Evolvente/Elica

Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 16:48	
Denominazione: ring gear	Numero denti z 72	Largh.fasc.dent. b 30.3mm	
Numero disegno.: D51.1.1243.50-IF	Modulo m 2.6mm	Tratto evolv. La 7.7mm	
Commessa/serie nr.: 27-1	Angolo pressione 20°	Tratto elica Lß 24.24mm	
Masch.Nr.: M001 Spindel: Formnest	Angolo elica 23.35°	Inizio elab. M1 32.48mm	
Untersuchungszweck: Laufende Messung	Ø Base db 189.5475mm	Palpatore Ø (#2)1mm	
Werkzeug: Charge:	Ang. Base 21.866°	Fat.scor.pr. x .037	

Ødk = 208.325



Tolerance		Medio	55	37	19	1s	1c	1b	Qual	Tolerance	1b	1c	1s	19	37	55	Medio	Qual
fHαm	-17±5	-17.7	Var a 4.0							-11±5	Var a 2.1						-12.5	
fHα	-17±9	-17.7	-18.5	-15.6	-17.1	-19.4	-19.6	-14.5		-11±9	-17.5	-12.7	-6.6	-11.7	-11.9	-13.8	-12.5	
Fα		1.7	1.5	1.5	1.5	2.9	2.2	2.2			4.2	1.9	3.2	2.2	2.0	2.0	2.0	
ffα	5	1.3	1.1	1.3	1.5	2.2	1.4	1.7		5	1.8	1.6	2.0	1.9	1.9	1.4	1.7	
Cα	-38/-30	-36.1	-36.1	-37.5	-36.1	-36.0	-34.5	-36.2		-22/-14	-21.1	-20.0	-19.9	-20.0	-19.2	-18.9	-19.5	
ffαf	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
P/T-ø [mm]		196.481	[196.33/196.65]								212.293				[212.2/212.5]			

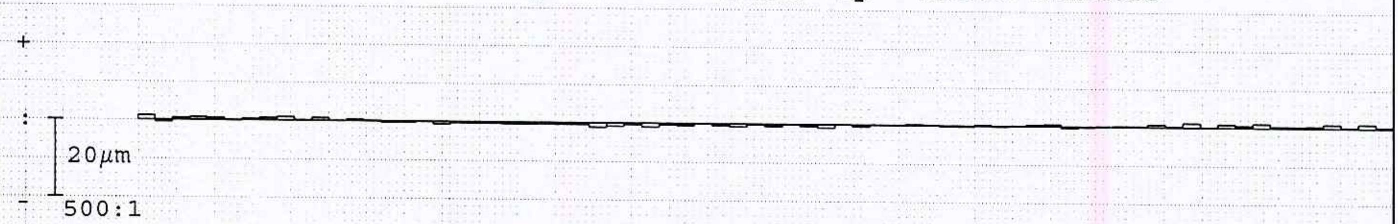


			55	37	19	1t	1c	1p			1p	1c	1t	19	37	55		
fHßm	5±4	3.3	Var ß 2.8							±4	Var ß 4.1						3.3	
fHß	5±8	3.3	2.2	2.7	3.4	1.5	5.0	6.1		±8	9.0	5.0	-2.4	4.2	3.1	0.9	3.3	
Fß		2.4	2.8	2.3	2.1	4.4	2.4	3.0			9.1	5.3	5.0	4.5	4.4	3.1	4.3	
ffß	5	1.4	1.7	1.4	1.2	1.5	1.4	1.4		5	1.8	1.3	2.2	1.2	1.1	1.6	1.3	
Cß	2/5	3.2	3.4	2.7	3.2	2.1	3.4	3.7		2/5	4.6	3.8	4.2	4.0	4.2	3.5	3.9	
Bd	-8±8	-4.6								-8±8							-11.4	

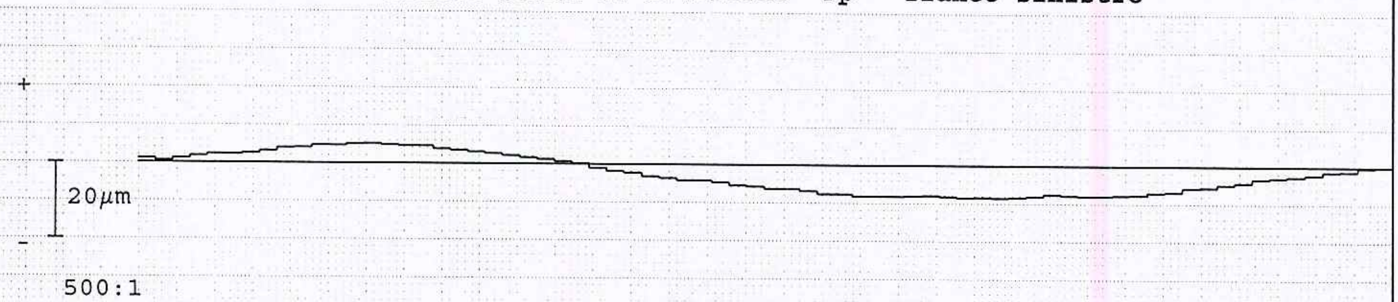
Ruota cilindrica Divisione

Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 16:48	
Denominazione: ring gear	Numero denti z 72	Angolo pressione 20°	
Numero disegno.: D51.1.1243.50-IF	Modulo m 2.6mm	Angolo elica 23.35°	
Commessa/serie nr.: 27	Untersuchungszweck: Laufende Messung		
Masch.Nr.: M001 Spindel: Formmest 1	Werkzeug:	Charge:	

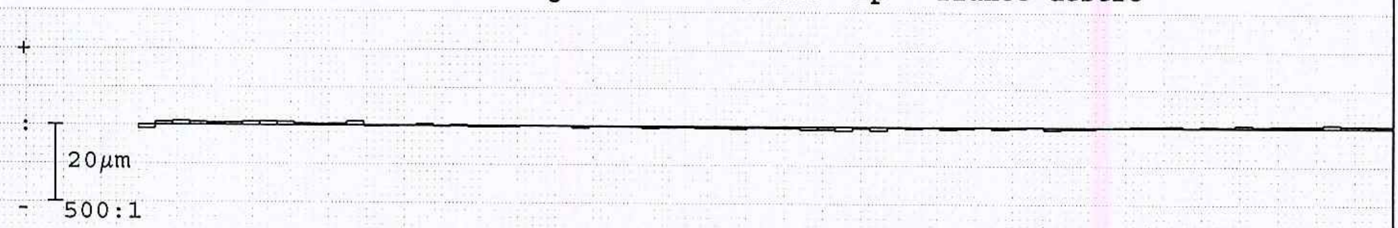
Errori singoli di divisione fp fianco sinistro



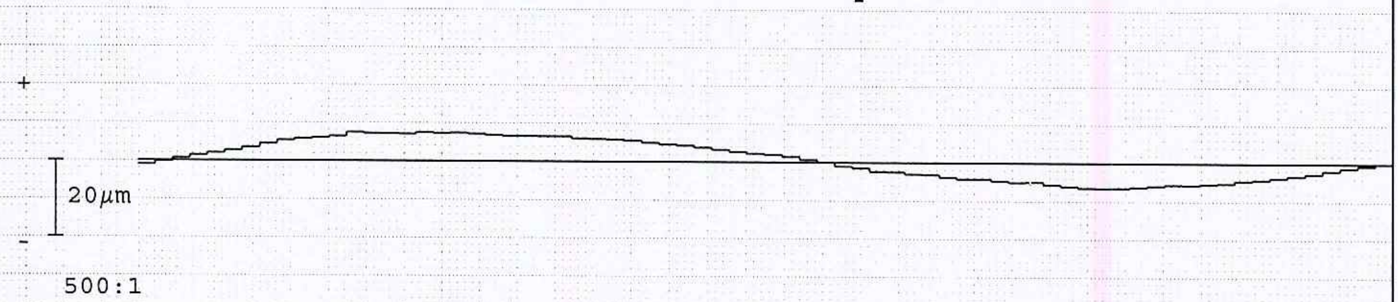
Errore somma di divisione Fp fianco sinistro



Errori singoli di divisione fp fianco destro



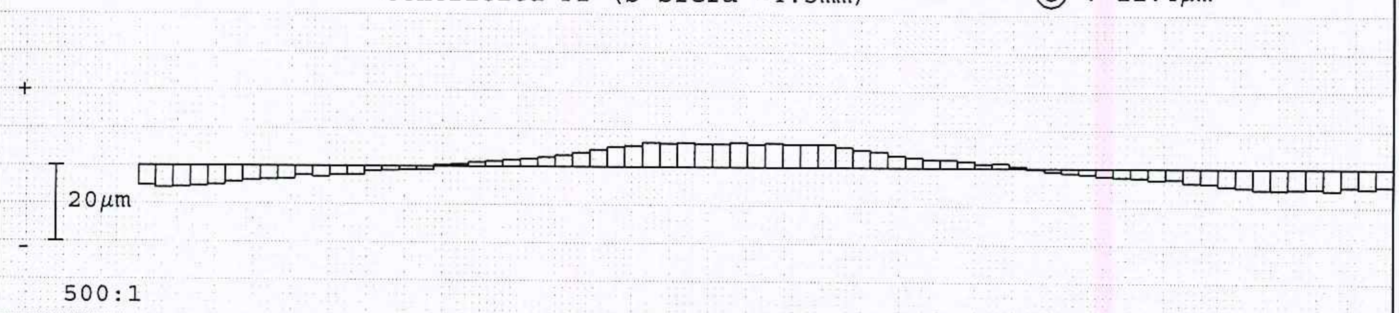
Errore somma di divisione Fp fianco destro



Corsa per misura divis.:204.09 z=15.2mm

		fianco sinistro / TIRO				fianco destro			
		Val.misur	Qual.	Val. amm	Qual.	Val.misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione	fp max	1.2		11.0		1.0		11.0	
Gr. salto di passo	fu max	1.6		14.0		1.7		14.0	
Scarto di divisione	Rp	2.3				2.0			
Err. globale di divisione	Fp	13.8		45.0		14.1		45.0	
Err. cordale di divisione	Fpz/8	5.9				6.8			

Centricitá Fr (Ø-sfera =4.5mm) ◎ : 11.4µm



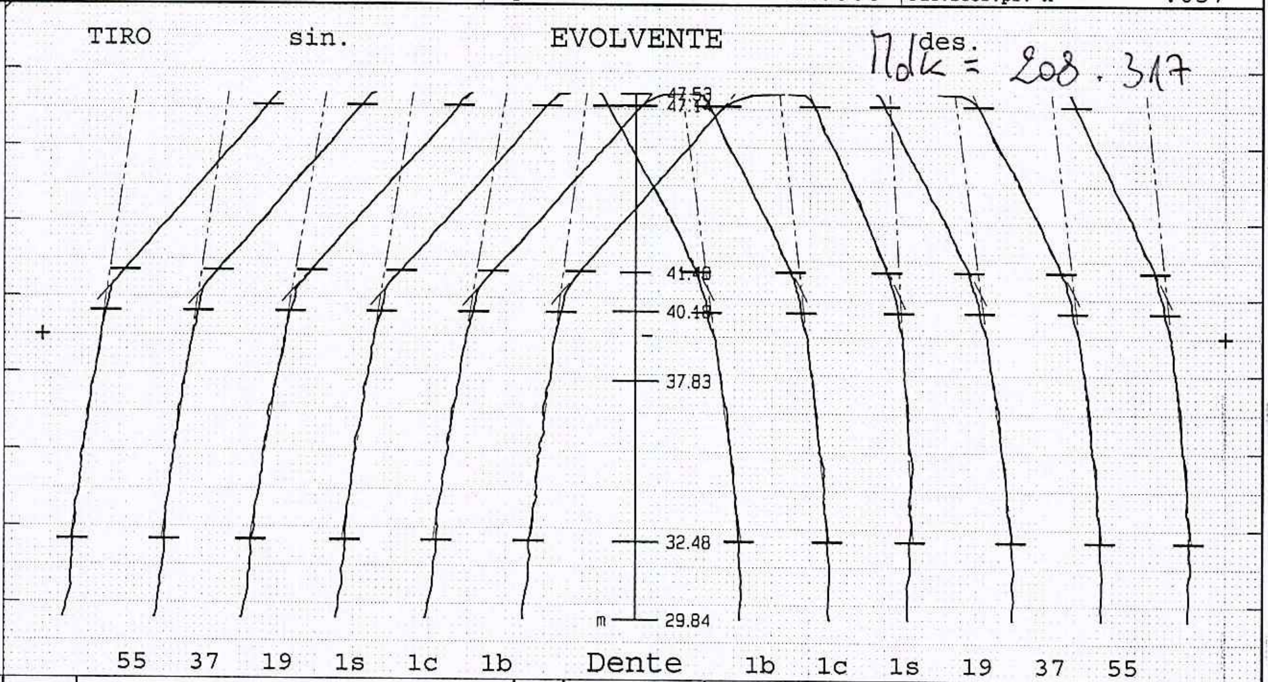
Err. di concentricitá	Fr	12.3	32.0	
Variaz. spessore dente	Rs			

Ruota cilindrica Evolvente/Elica

Nr. prog.: STI0416a04 0	PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 12:45
Denominazione:	ring gear	Numero denti z 72	Largh.fasc.dent. b 30.3mm
Numero disegno.:	D51.1.1243.50-IF	Modulo m 2.6mm	Tratto evolv. La 7.7mm
Commessa/serie nr.:	19-2	Angolo pressione 20°	Tratto elica Lß 24.24mm
Masch.Nr.:	M001 Spindel: Formmeßt1	Angolo elica 23.35°	Inizio elab. Ml 32.48mm
Untersuchungszweck:	Laufende Messung	Ø Base db 189.5475mm	Palpatore Ø (#2)1mm
Werkzeug:	Charge:	Ang. Base 21.866°	Fat.scor.pr. x .037

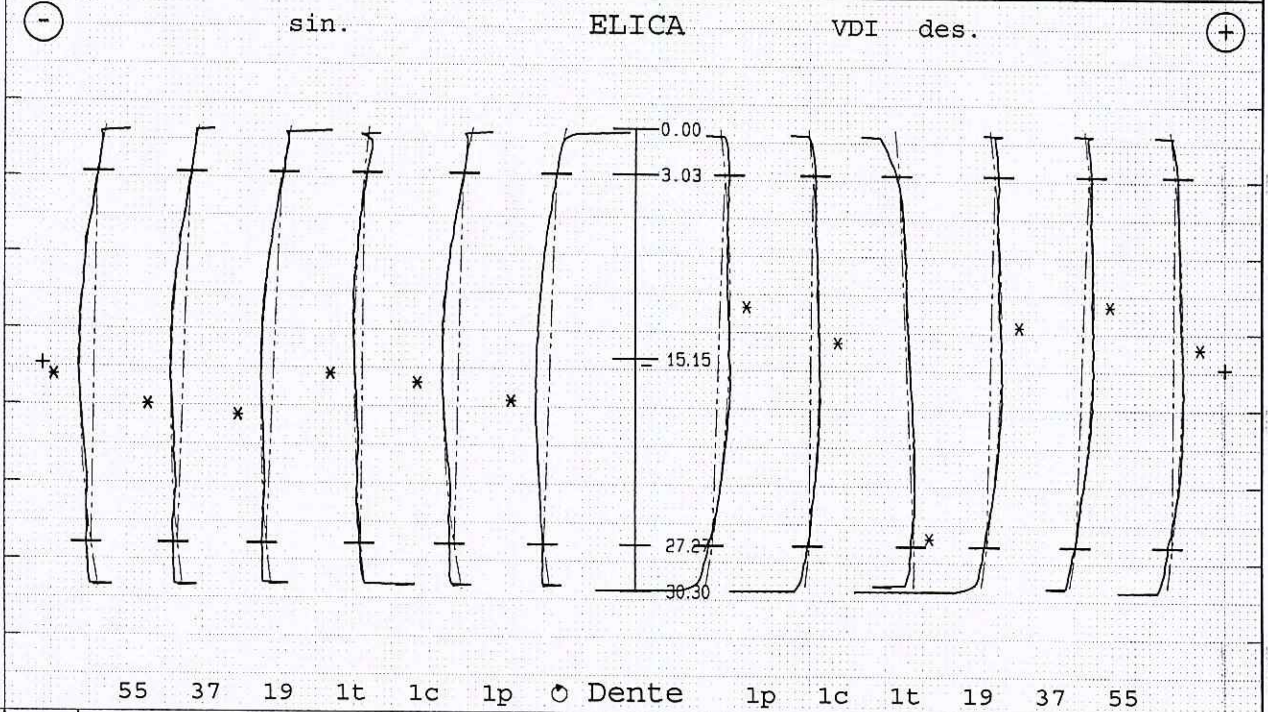
TIRO sin. EVOLVENTE des.

Mdk = 208.317



Tolerance		Medio	Val.misur [µm]						Qual	Tolerance	Val.misur [µm]						Medio	Qual
fHαm	-17±5	-17.9	Var a 2.9							-11±5	Var a 3.3						-13.3	
fHα	-17±9	-17.9	-16.6	-17.1	-19.5	-18.0	-18.4	-14.5		-11±9	-15.3	-12.9	-6.2	-15.1	-13.2	-11.8	-13.3	
Fα		1.7	1.2	1.5	2.0	2.0	1.9	1.9			3.3	2.2	3.2	2.9	2.4	1.9	2.4	
ffα	5	1.4	1.1	1.4	1.6	1.7	1.5	1.5		5	1.9	1.6	1.9	1.8	1.6	1.7	1.7	
Cα	-38/-30	-35.9	-35.6	-35.9	-36.0	-35.7	-36.0	-36.6		-22/-14	-19.8	-19.1	-20.1	-19.1	-19.6	-19.1	-19.2	
ffαf	3	0.0	0.0	0.0	0.0	0.0	0.0	0.1		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
P/T-ø [mm]		196.496	[196.33/196.65]								212.308	[212.2/212.5]						

(-) sin. ELICA VDI des. (+)



Tolerance		Medio	Val.misur [µm]						Qual	Tolerance	Val.misur [µm]						Medio	Qual
fHßm	5±4	3.5	Var ß 3.2							±4	Var ß 3.3						2.1	
fHß	5±8	3.5	1.9	4.2	5.1	1.0	2.8	4.1		±8	4.1	1.0	-5.0	2.5	4.1	0.8	2.1	
Fß		2.6	2.9	2.1	2.2	5.1	3.0	1.7			5.6	2.2	4.2	5.6	5.5	2.6	4.0	
ffß	5	2.0	2.1	1.9	2.0	1.5	2.1	0.7		5	2.1	1.2	1.3	1.7	1.2	2.0	1.5	
Cß	2/5	3.6	3.7	3.2	3.2	2.1	4.1	3.5		2/5	2.9	2.2	1.0	2.8	2.8	2.5	2.6	
Bd	-8±8	-3.1								-8±8							-9.1	

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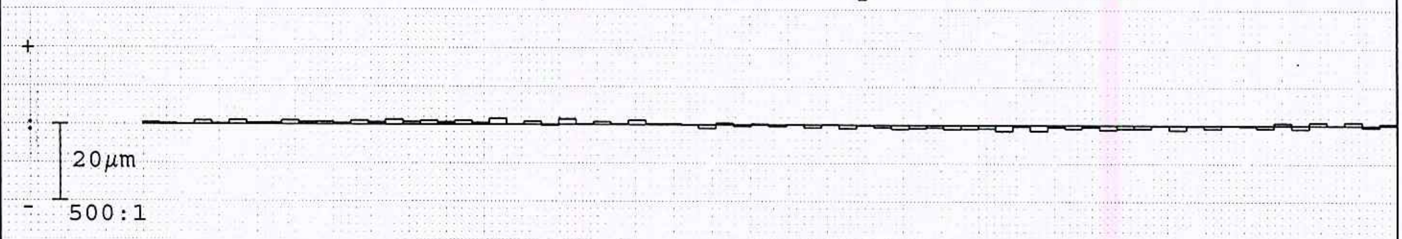
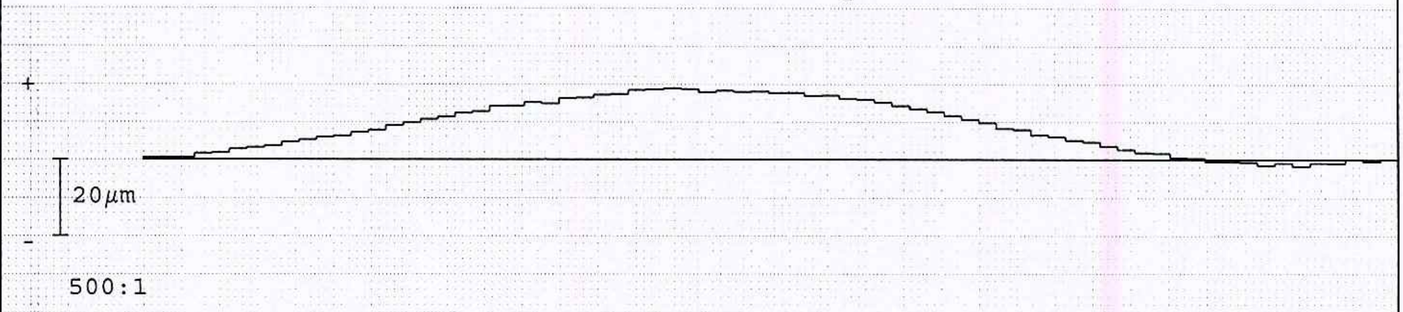
Ruota cilindrica Divisione

Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12		Data: 22.04.2018 12:45
Denominazione: ring gear	Numero denti z	72	Angolo pressione 20°
Numero disegno.: D51.1.1243.50-IF	Modulo m	2.6mm	Angolo elica 23.35°
Commessa/serie nr.: 19	Untersuchungszweck:	Laufende Messung	
Masch.Nr.: M001 Spindel: Formnest 1	Werkzeug:		Charge:

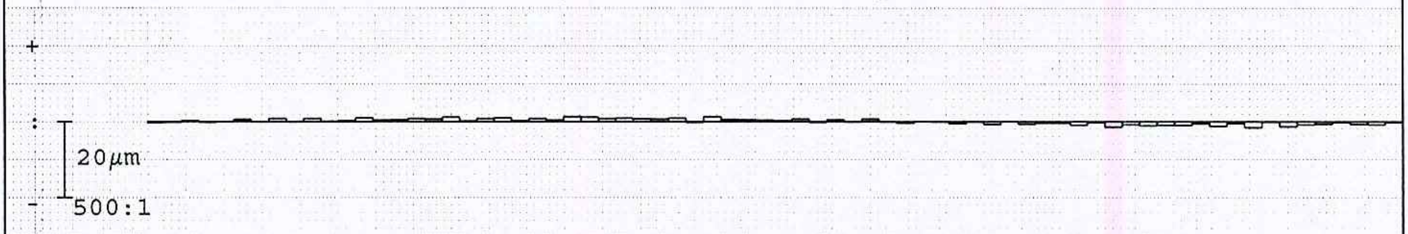
Errori singoli di divisione fp fianco sinistro



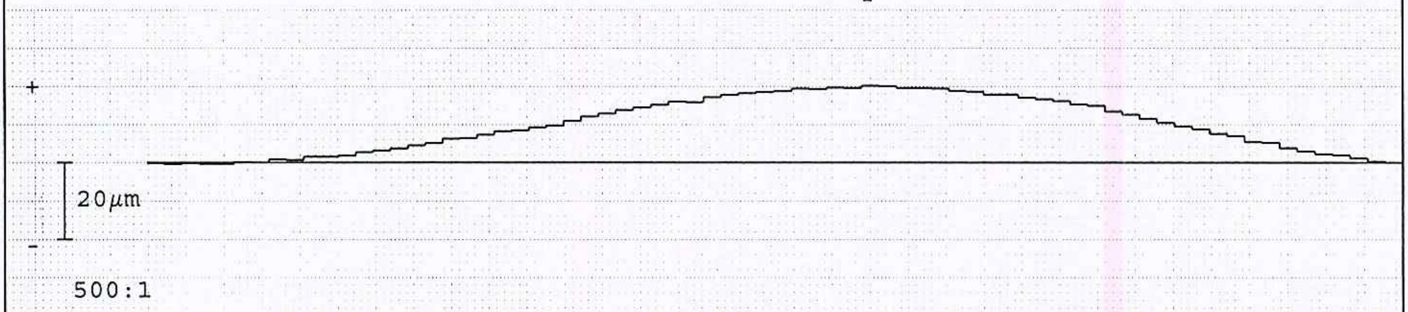
Errore somma di divisione Fp fianco sinistro



Errori singoli di divisione fp fianco destro



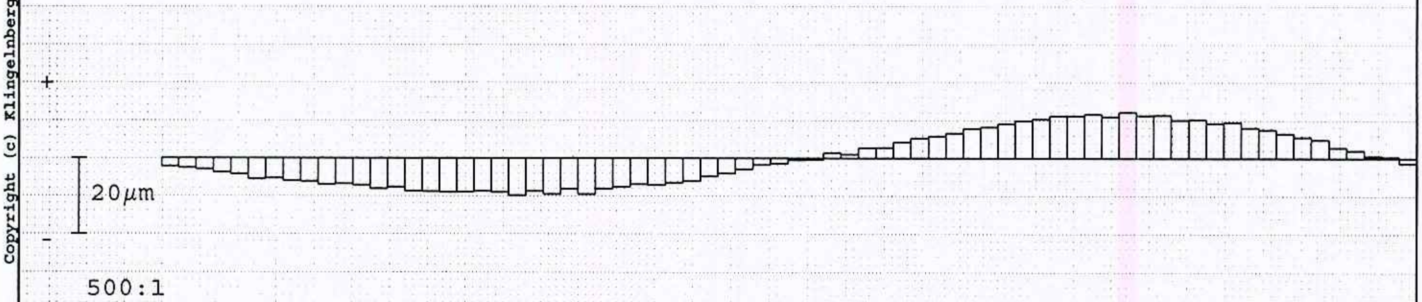
Errore somma di divisione Fp fianco destro



Corsa per misura divis.:204.09 z=15.2mm		fianco sinistro / TIRO				fianco destro			
		Val.misur	Qual.	Val. amm	Qual.	Val.misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione	fp max	1.6		11.0		1.6		11.0	
Gr. salto di passo	fu max	1.8		14.0		1.5		14.0	
Scarto di divisione	Rp	3.1				2.9			
Err. globale di divisione	Fp	20.6		45.0		20.7		45.0	
Err. cordale di divisione	Fpz/8	8.8				9.6			

Centricità Fr (Ø-sfera =4.5mm)

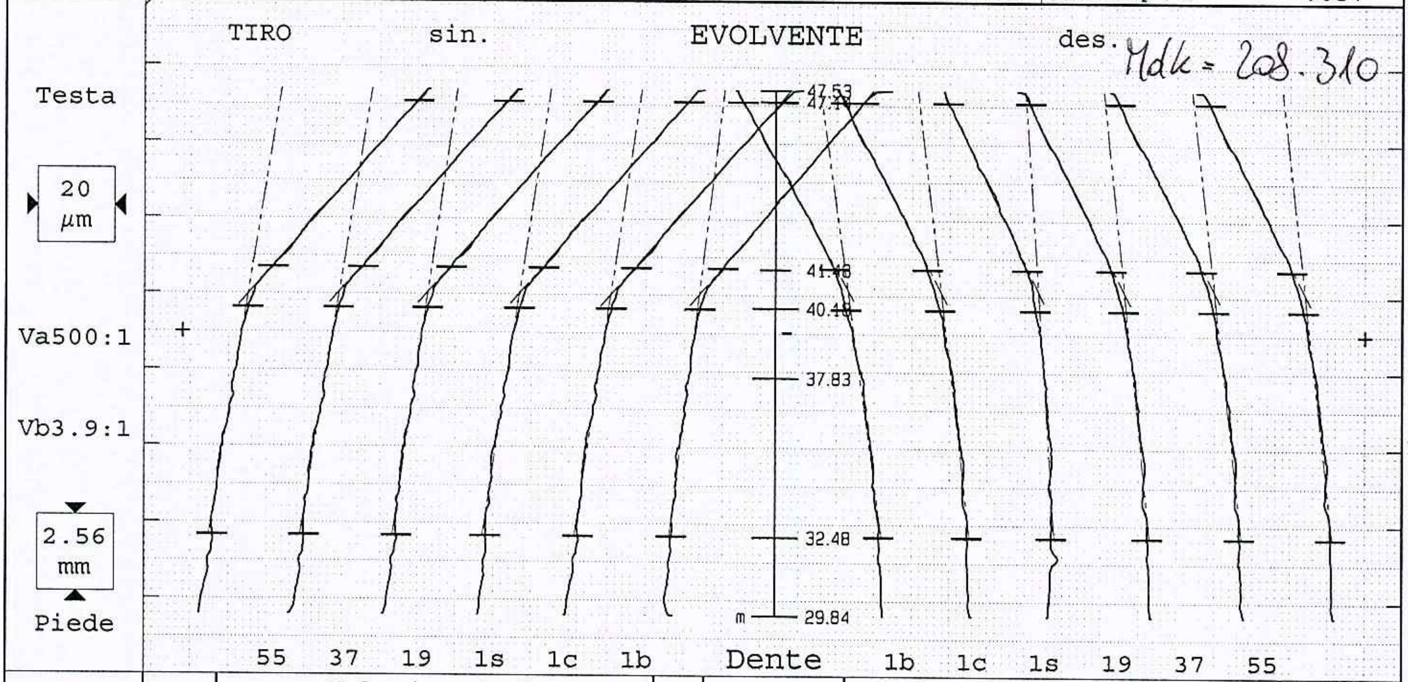
◎ : 20.4µm



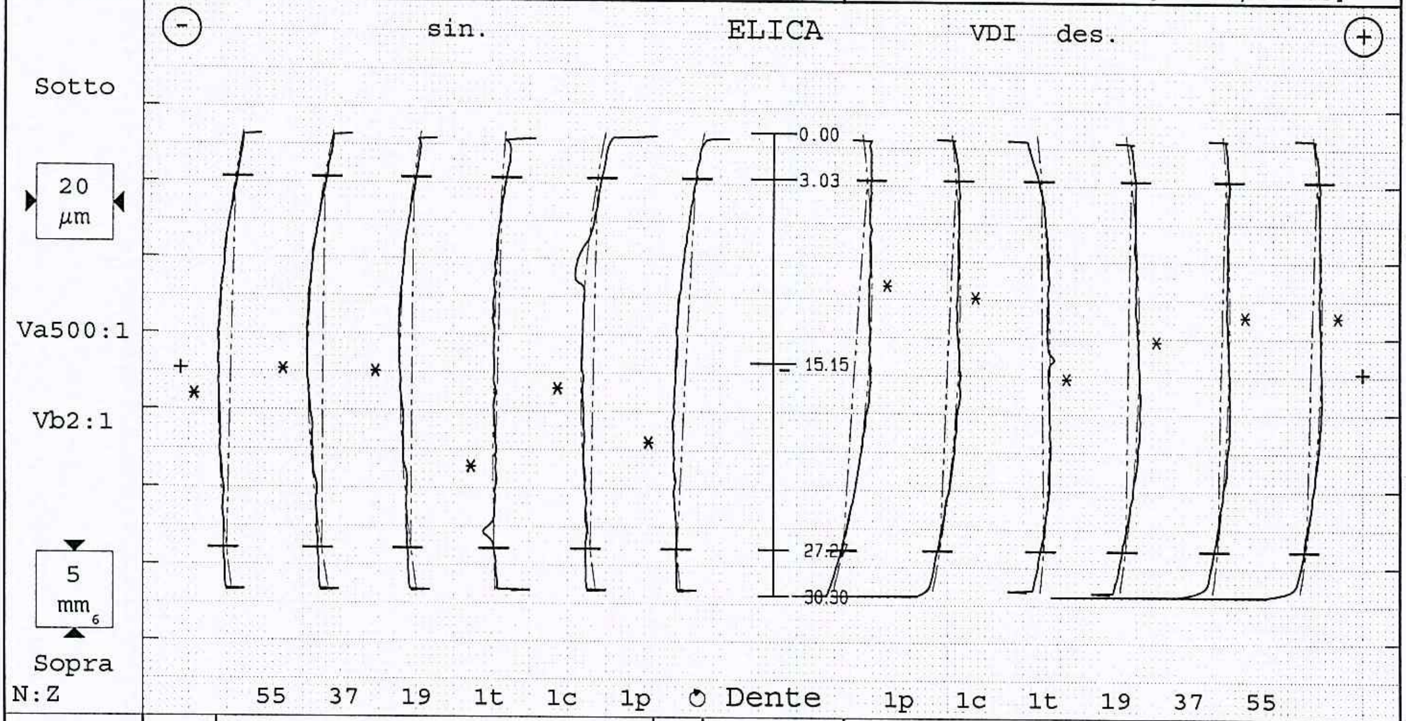
Err. di concentricitá	Fr	22.0	32.0	
Variaz. spessore dente	Rs			

Ruota cilindrica Evolvente/Elica

Nr. prog.: STI0416a04 0	PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 15:11
Denominazione: ring gear		Numero denti z 72	Largh.fasc.dent. b 30.3mm
Numero disegno.: D51.1.1243.50-IF		Modulo m 2.6mm	Tratto evolv. La 7.7mm
Commessa/serie nr.: 24 – 3		Angolo pressione 20°	Tratto elica Lß 24.24mm
Masch.Nr.: M001	Spindel: Formnest 1	Angolo elica 23.35°	Inizio elab. M1 32.48mm
Untersuchungszweck: Laufende Messung		Ø Base db 189.5475mm	Palpatore Ø (#2) 1mm
Werkzeug:	Charge:	Ang. Base 21.866°	Fat.scor.pr. x .037



Tolerance	Medio	55	37	19	1s	1c	1b	Qual	Tolerance	1b	1c	1s	19	37	55	Medio	Qual
		Val.misur[µm]								Val.misur[µm]							
fHαm -17±5	-17.6	Var a 1.9							-11±5	Var a 1.6						-12.8	
fHα -17±9	-17.6	-18.5	-18.4	-16.6	-17.2	-17.0	-13.9		-11±9	-15.8	-13.4	-7.5	-11.8	-12.9	-12.9	-12.8	
Fα	1.7	1.7	1.7	1.7	1.5	1.6	2.2			3.5	2.6	2.5	2.0	2.3	2.5	2.4	
ffα 5	1.6	1.4	1.7	1.6	1.5	1.6	1.5		5	2.2	1.7	2.0	1.8	1.6	1.8	1.7	
Cα -38/-30	-36.7	-36.5	-36.2	-37.0	-36.3	-36.9	-36.9		-22/-14	-20.7	-20.0	-20.5	-20.1	-19.7	-19.9	-19.9	
ffαf 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	
P/T-ø[mm]	196.492			[196.33/196.65]						212.308				[212.2/212.5]			



Tolerance	Medio	55	37	19	1t	1c	1p	Qual	Tolerance	1p	1c	1t	19	37	55	Medio	Qual
fHßm 5±4	1.8	Var ß 2.0							±4	Var ß 3.5						3.3	
fHß 5±8	1.8	2.9	0.9	0.9	2.8	2.4	6.1		±8	8.0	5.3	-0.8	1.8	2.6	3.5	3.3	
Fß	3.4	2.2	3.6	3.2	3.9	4.7	1.9			8.9	5.7	2.1	4.0	4.4	4.2	4.6	
ffß 5	2.3	1.5	2.0	1.8	3.8	3.9	0.8		5	1.8	1.8	2.0	2.1	1.8	1.4	1.8	
Cß 2/5	3.4	3.2	4.0	3.2	1.0	3.3	2.8		2/5	3.8	2.9	2.0	2.9	2.0	2.7	2.6	
Bd -8±8	-3.3								-8±8							-8.8	

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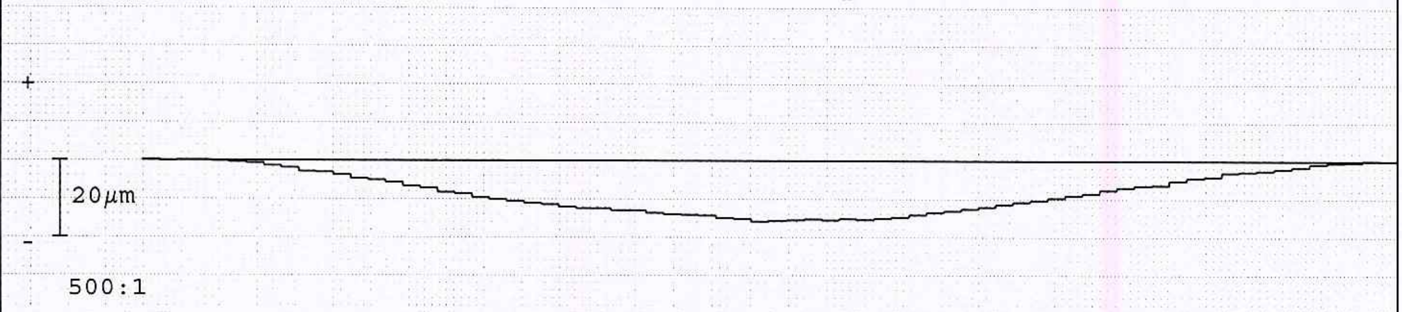
KLINGELNBERG

Ruota cilindrica Divisione

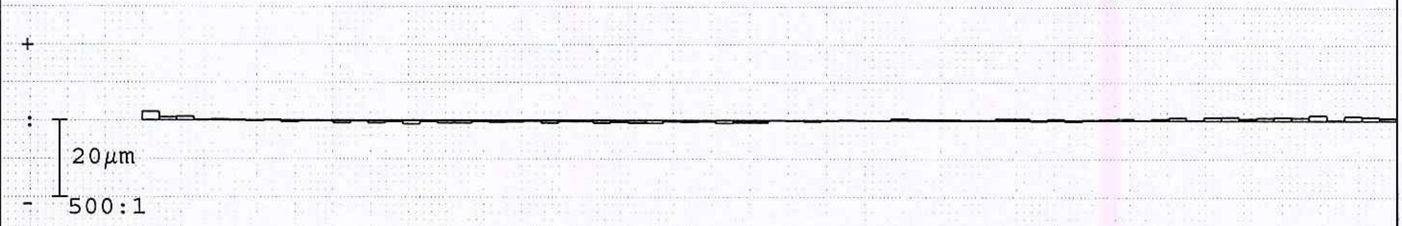
Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12		Data: 22.04.2018 15:11
Denominazione: ring gear	Numero denti z	72	Angolo pressione 20°
Numero disegno.: D51.1.1243.50-IF	Modulo m	2.6mm	Angolo elica 23.35°
Commessa/serie nr.: 24	Untersuchungszweck: Laufende Messung		
Masch.Nr.: M001 Spindel: Formneat 1	Werkzeug:		Charge:

Errori singoli di divisione fp fianco sinistro

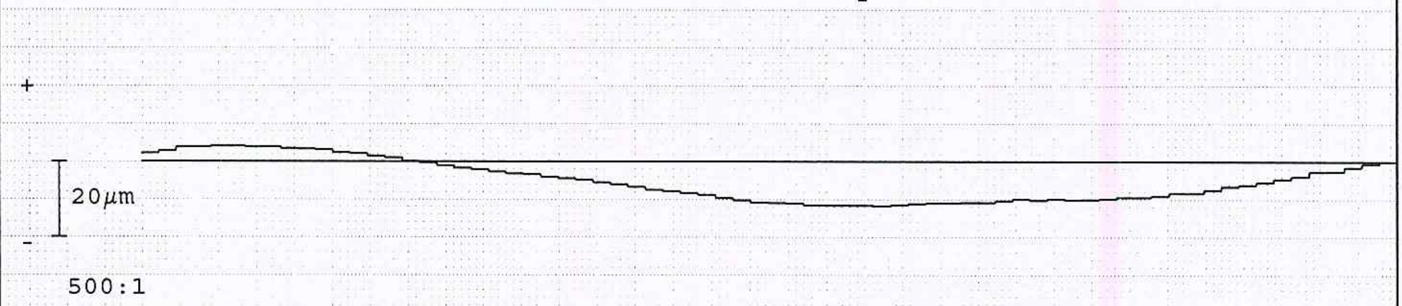
Errore somma di divisione Fp fianco sinistro



Errori singoli di divisione fp fianco destro



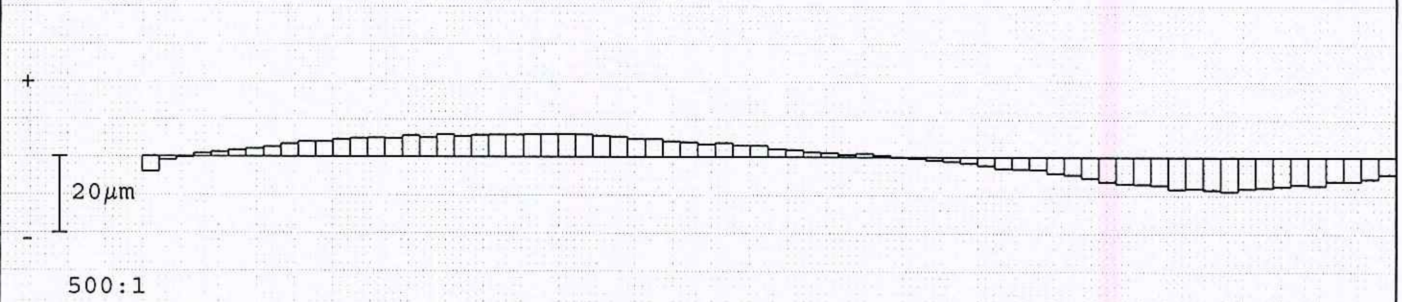
Errore somma di divisione Fp fianco destro



Corsa per misura divis.:204.09 z=15.2mm

		fianco sinistro / TIRO				fianco destro			
		Val.misur	Qual.	Val. amm	Qual.	Val.misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione	fp max	1.2		11.0		2.2		11.0	
Gr. salto di passo	fu max	1.1		14.0		1.6		14.0	
Scarto di divisione	Rp	2.3				3.2			
Err. globale di divisione	Fp	16.0		45.0		15.9		45.0	
Err. cordale di divisione	Fpz/8	6.5				8.5			

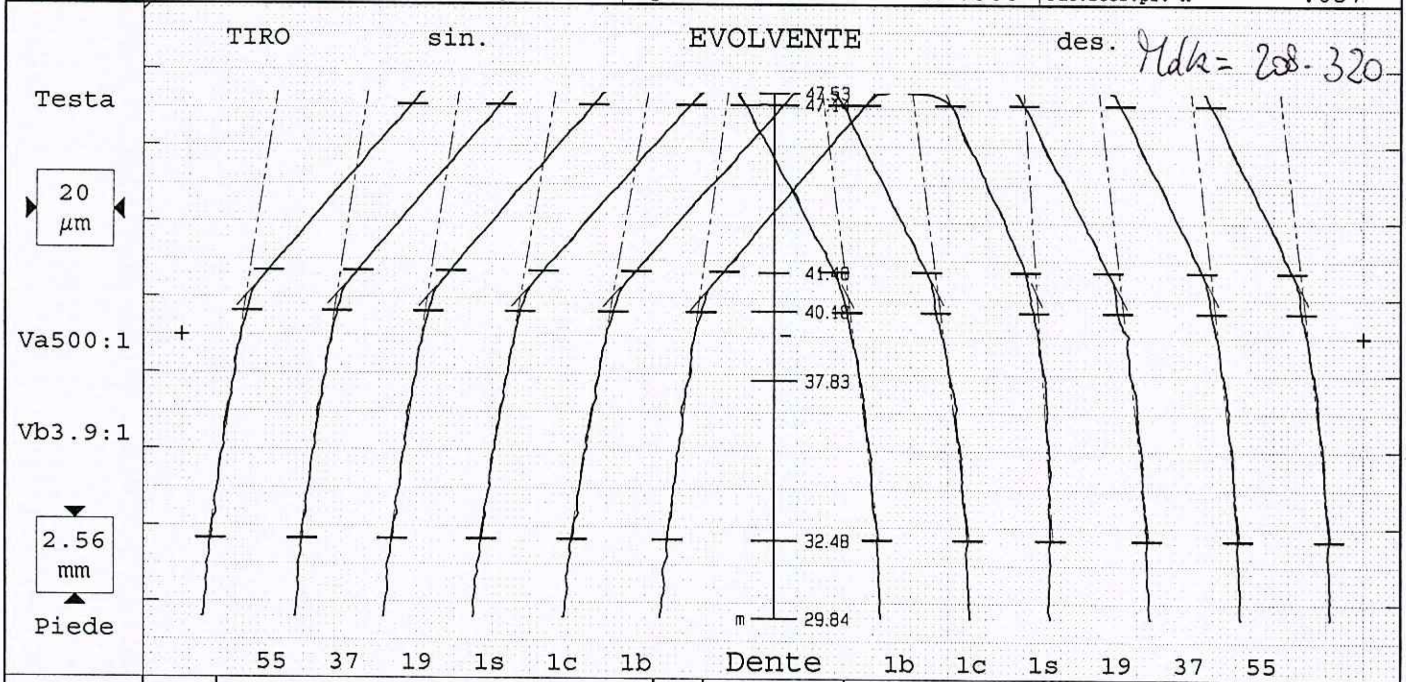
Centricità Fr (Ø-sfera =4.5mm) ◎ : 13.4µm



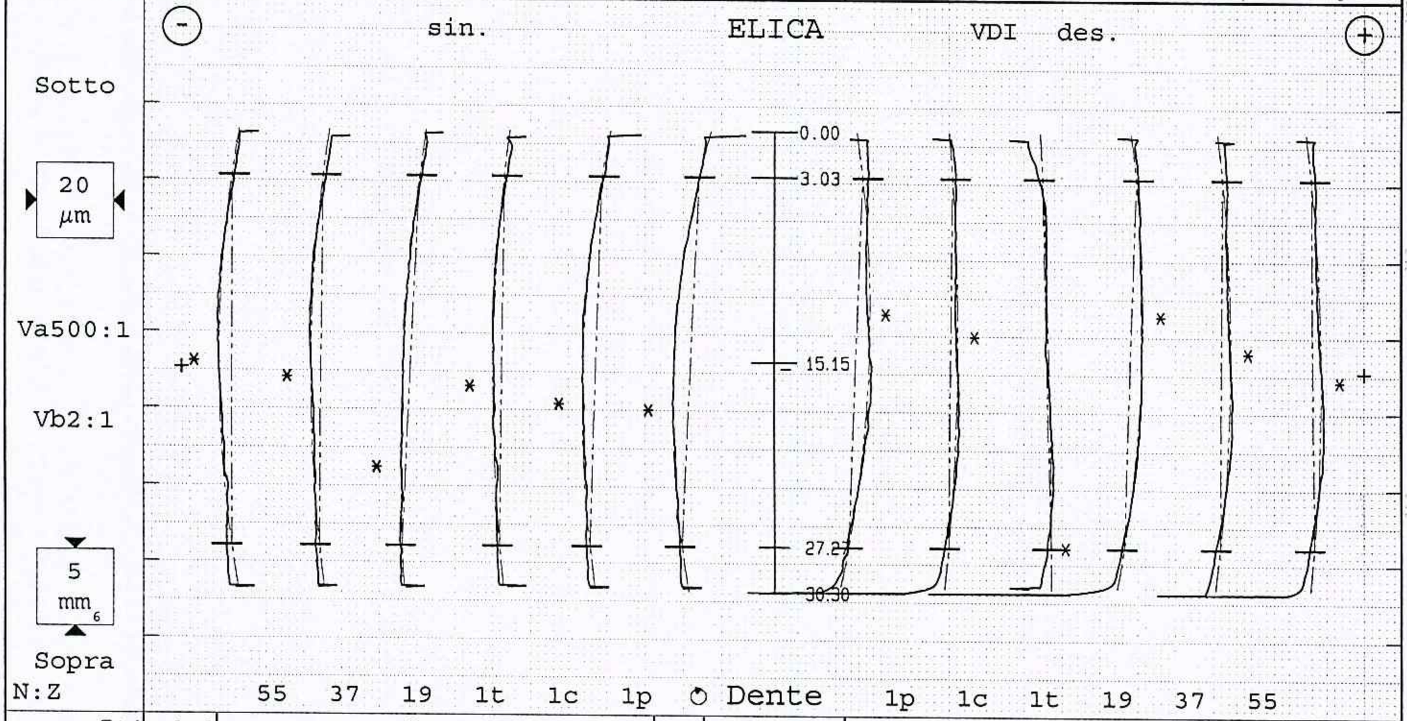
Err. di concentricitá	Fr	14.9	32.0	
Variaz. spessore dente	Rs			

Ruota cilindrica Evolvente/Elica

Nr. prog.: STI0416a04 0	PNC35 B4784	Controllore:	turno 06-12	Data:	22.04.2018 13:22
Denominazione:	ring gear	Numero denti z	72	Largh.fasc.dent. b	30.3mm
Numero disegno.:	D51.1.1243.50-IF	Modulo m	2.6mm	Tratto evolv. La	7.7mm
Commessa/serie nr.:	22 - 4	Angolo pressione	20°	Tratto elica Lß	24.24mm
Masch.Nr.:	M001 Spindel: Formnest 1	Angolo elica	23.35°	Inizio elab. M1	32.48mm
Untersuchungszweck:	Laufende Messung	ø Base db	189.5475mm	Palpatore ø	(#2)1mm
Werkzeug:	Charge:	Ang. Base	21.866°	Fat.scor.pr. x	.037



Tolerance		Medio	55	37	19	1s	1c	1b	Qual	Tolerance	1b	1c	1s	19	37	55	Medio	Qual
fHαm	-17±5	-18.0	Var a 2.3							-11±5	Var a 2.2						-13.4	
fHα	-17±9	-18.0	-17.4	-17.3	-17.5	-19.2	-19.6	-15.6		-11±9	-14.7	-14.8	-7.6	-13.0	-12.6	-13.2	-13.4	
Fα		1.7	1.6	1.4	1.6	1.8	2.2	1.7			2.7	3.1	2.7	2.8	2.1	2.3	2.6	
ffα	5	1.5	1.5	1.4	1.5	1.1	1.4	1.8		5	1.5	2.3	1.9	2.4	1.8	1.7	2.1	
Cα	-38/-30	-36.0	-36.2	-35.8	-36.0	-35.9	-36.1	-36.5		-22/-14	-20.6	-19.0	-19.6	-20.2	-19.0	-18.7	-19.2	
ffαf	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
P/T-ø [mm]		196.515	[196.33/196.65]								212.337	[212.2/212.5]						



N:Z			55	37	19	1t	1c	1p		Dente	1p	1c	1t	19	37	55		
fHßm	5±4	2.8	Var ß 5.7							±4	Var ß 5.0						1.3	
fHß	5±8	2.8	0.1	1.3	5.8	1.6	3.9	5.7		±8	4.7	1.4	-2.9	4.0	0.8	-1.0	1.3	
Fß		2.7	3.9	2.9	2.1	3.4	2.0	2.8			6.7	3.2	3.1	5.2	5.8	2.4	4.2	
ffß	5	1.7	2.2	1.9	1.2	1.5	1.5	1.1		5	2.4	2.0	1.8	1.2	2.3	2.2	1.9	
Cß	2/5	2.9	3.3	2.7	2.0	2.3	3.4	4.3		2/5	3.6	1.9	0.5	3.1	2.5	2.3	2.5	
Bd	-8±8	-4.1								-8±8							-7.6	

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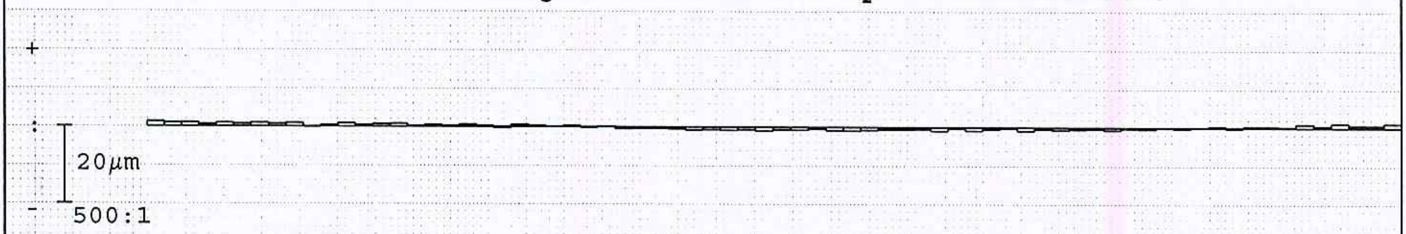
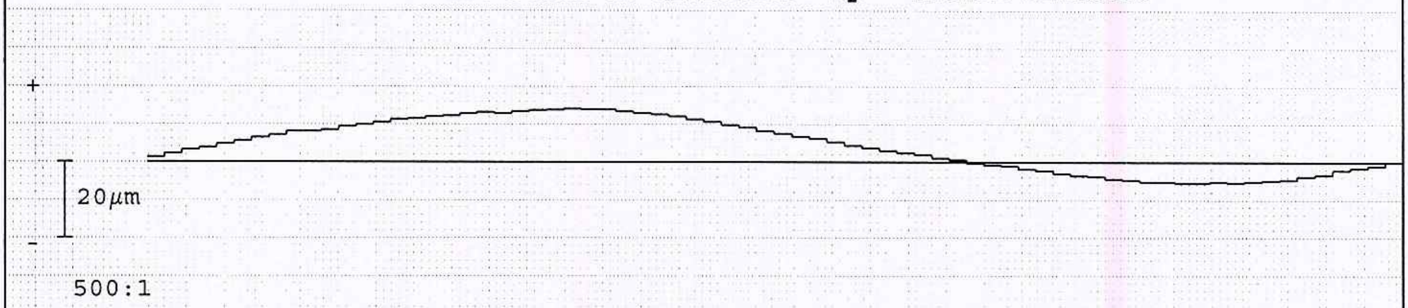
Ruota cilindrica Divisione

Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 13:22	
Denominazione: ring gear	Numero denti z 72	Angolo pressione 20°	
Numero disegno.: D51.1.1243.50-IF	Modulo m 2.6mm	Angolo elica 23.35°	
Commessa/serie nr.: 22	Untersuchungszweck: Laufende Messung		
Masch.Nr.: M001 Spindel: Formnest 1	Werkzeug:	Charge:	

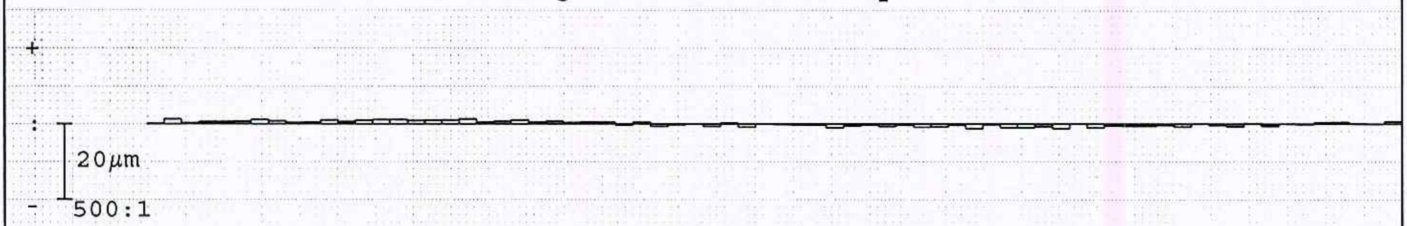
Errori singoli di divisione fp fianco sinistro



Errore somma di divisione Fp fianco sinistro



Errori singoli di divisione fp fianco destro

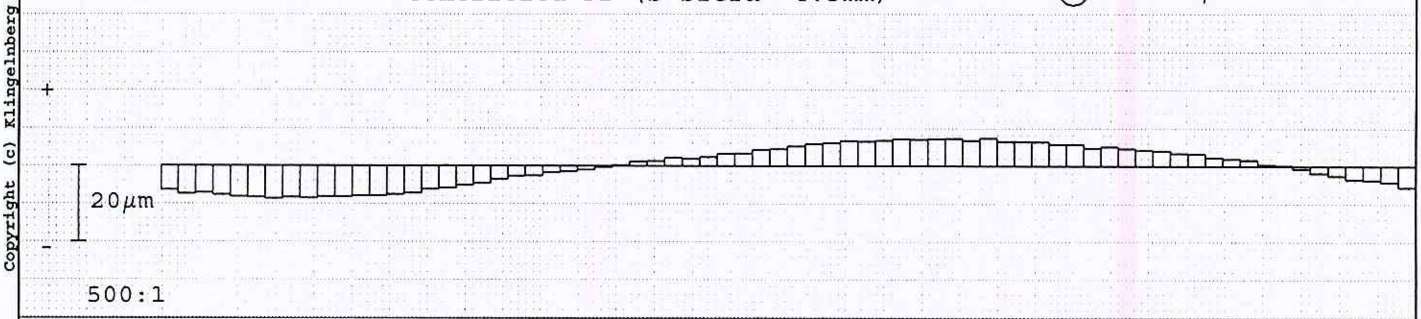


Errore somma di divisione Fp fianco destro

Corsa per misura divis.:204.09 z=15.2mm

		fianco sinistro / TIRO				fianco destro			
		Val.misur	Qual.	Val. amm	Qual.	Val.misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione	fp max	1.2		11.0		1.2		11.0	
Gr. salto di passo	fu max	1.0		14.0		1.2		14.0	
Scarto di divisione	Rp	2.2				2.4			
Err. globale di divisione	Fp	19.5		45.0		19.8		45.0	
Err. cordale di divisione	Fpz/8	8.2				8.5			

Centricità Fr (Ø-sfera =4.5mm) ◎ : 15.2μm



Err. di concentricitá	Fr	16.0	32.0	
Variaz. spessore dente	Rs			

KLINGELNBERG

Ruota cilindrica Evolvente/Elica

Nr. prog.: STI0416a04 0 PNC35 B4784	Controllore: turno 06-12	Data: 22.04.2018 15:26
Denominazione: ring gear	Numero denti z 72	Largh.fasc.dent. b 30.3mm
Numero disegno.: D51.1.1243.50-IF	Modulo m 2.6mm	Tratto evolv. La 7.7mm
Commessa/serie nr.: 13 - 5	Angolo pressione 20°	Tratto elica Lß 24.24mm
Masch.Nr.: M001 Spindel: Formnest	Angolo elica 23.35°	Inizio elab. M1 32.48mm
Untersuchungszweck: Laufende Messung	Ø Base db 189.5475mm	Palpatore Ø (#2)1mm
Werkzeug: Charge:	Ang. Base 21.866°	Fat.scor.pr. x .037

Testa

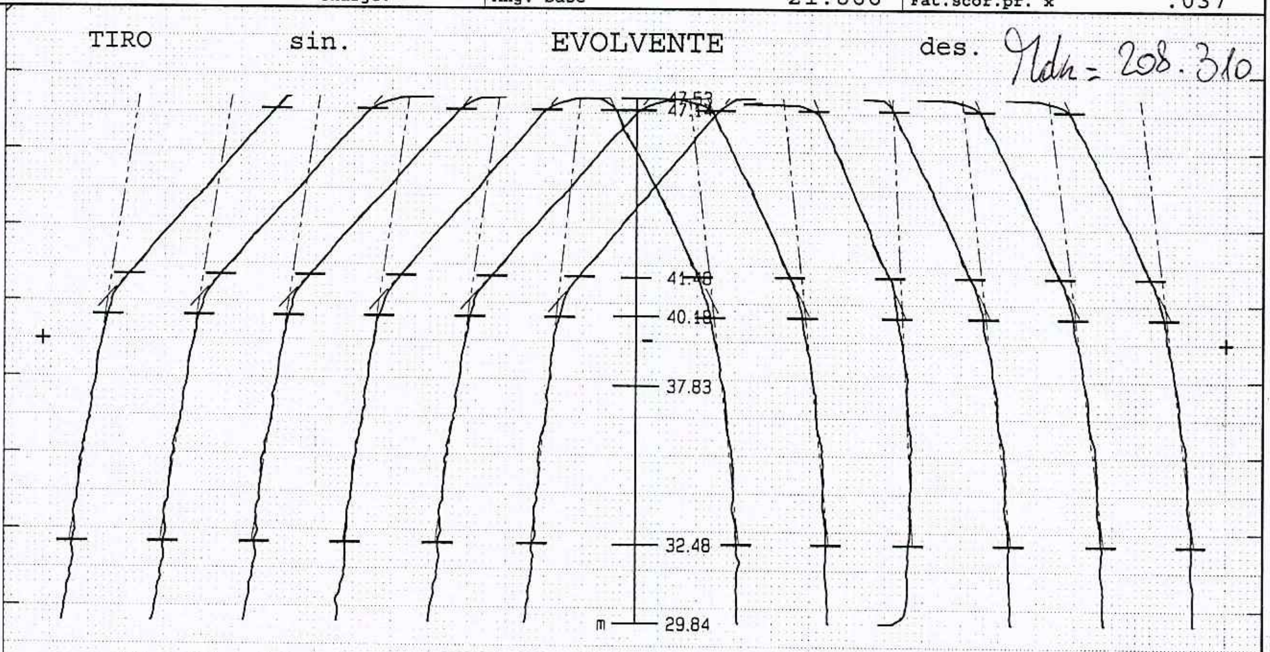
20 µm

Va500:1

Vb3.9:1

2.56 mm

Piede



55 37 19 1s 1c 1b Dente 1b 1c 1s 19 37 55

Tolerance		Medio	55	37	19	1s	1c	1b	Qual	Tolerance	1b	1c	1s	19	37	55	Medio	Qual
			Val.misur[µm]								Val.misur[µm]							
fHαm	-17±5	-17.2	Var a 2.3							-11±5	Var a 2.4						-13.4	
fHα	-17±9	-17.2	-17.6	-18.2	-17.1	-16.6	-15.9	-12.1		-11±9	-13.0	-12.0	-5.6	-12.9	-14.4	-14.2	-13.4	
Fα		1.8	1.6	1.6	1.9	1.2	1.9	3.2			2.4	2.1	4.0	2.3	2.7	2.6	2.4	
ffα	5	1.8	1.7	1.8	1.9	1.1	1.7	1.7		5	1.8	1.8	2.3	1.8	1.8	1.7	1.8	
Cα	-38/-30	-37.1	-36.6	-37.2	-37.4	-36.3	-37.0	-36.9		-22/-14	-19.9	-19.0	-19.7	-18.3	-18.3	-19.0	-18.7	
ffαf	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
P/T-ø [mm]		196.404	[196.33/196.65]								212.233	[212.2/212.5]						

Sotto

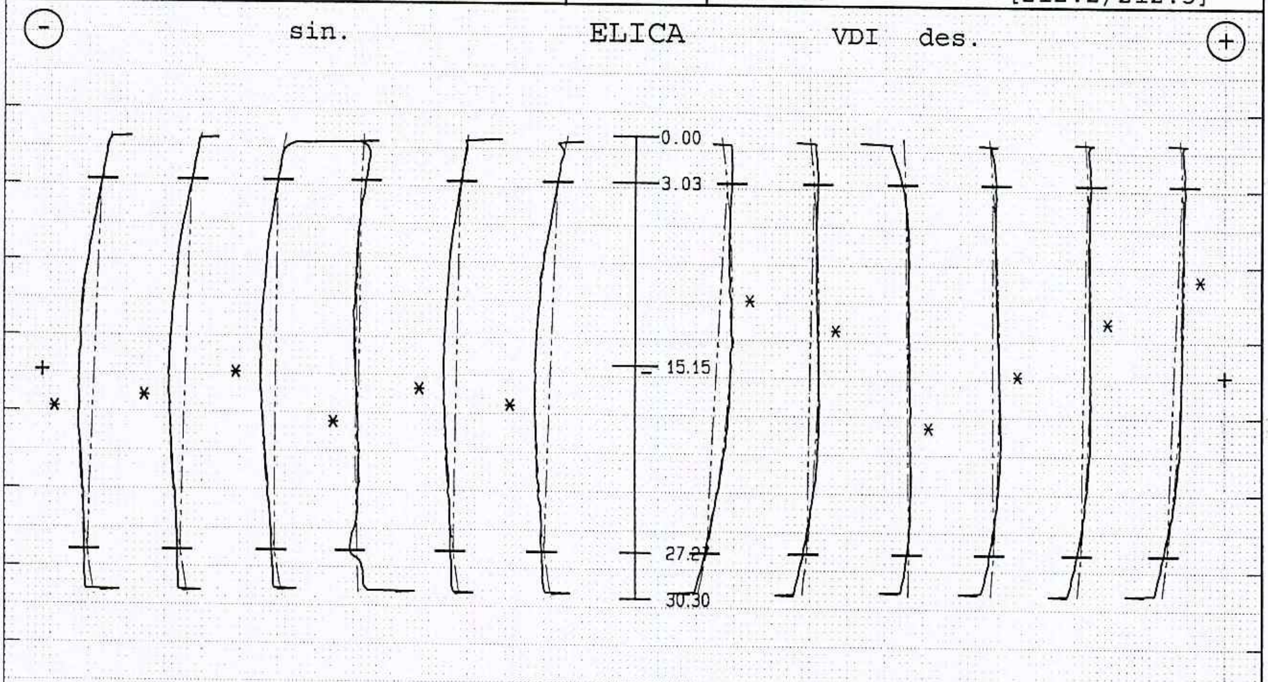
20 µm

Va500:1

Vb2:1

5 mm

Sopra



N:Z 55 37 19 1t 1c 1p Dente 1p 1c 1t 19 37 55

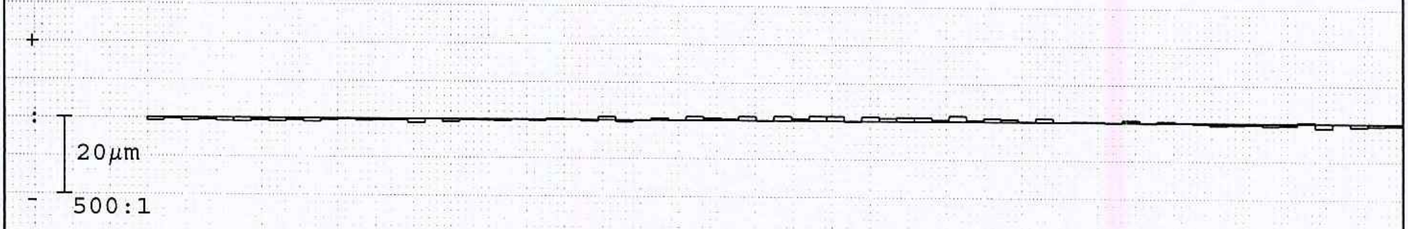
			55	37	19	1t	1c	1p		1p	1c	1t	19	37	55	
fHßm	5±4	2.8	Var ß 3.6						±4	Var ß 5.3						2.2
fHß	5±8	2.8	4.6	3.6	1.0	1.4	2.1	4.2	±8	6.6	2.3	-1.3	-0.4	2.1	4.9	2.2
Fß		2.6	2.2	2.3	3.3	5.8	2.4	2.0		7.9	4.2	1.8	3.0	5.4	7.1	4.9
ffß	5	1.3	1.4	1.2	1.2	3.0	1.3	1.1	5	2.0	2.0	1.3	2.1	2.0	1.8	2.0
Cß	2/5	3.8	3.9	4.1	3.8	0.9	3.2	4.0	2/5	3.7	2.3	0.8	1.7	1.7	2.0	1.9
Bd	-8±8	-2.8							-8±8							-7.9

GCG 808006

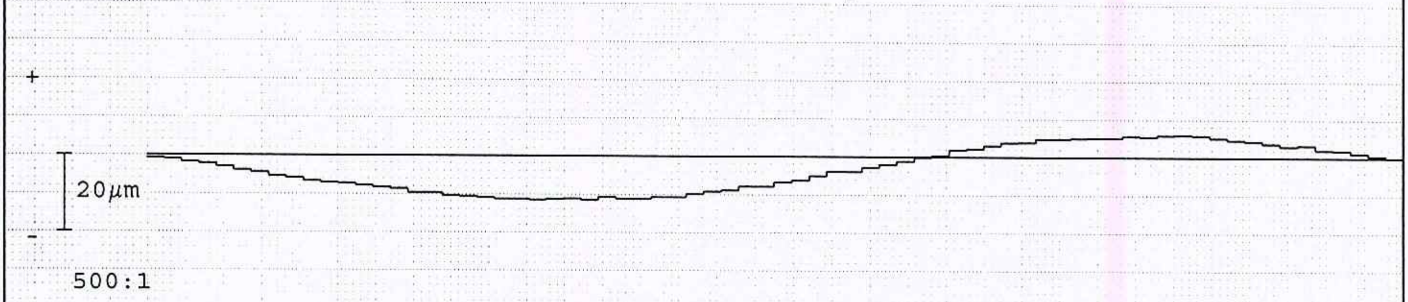
Ruota cilindrica Divisione

Nr. prog.: STI0416a04 0	PNC35 B4784	Controllore:	turno 06-12	Data:	22.04.2018 15:26
Denominazione:	ring gear	Numero denti z	72	Angolo pressione	20°
Numero disegno.:	D51.1.1243.50-IF	Modulo m	2.6mm	Angolo elica	23.35°
Commessa/serie nr.:	13	Untersuchungszweck:	Laufende Messung		
Masch.Nr.:	M001 Spindel: Formnest 1	Werkzeug:		Charge:	

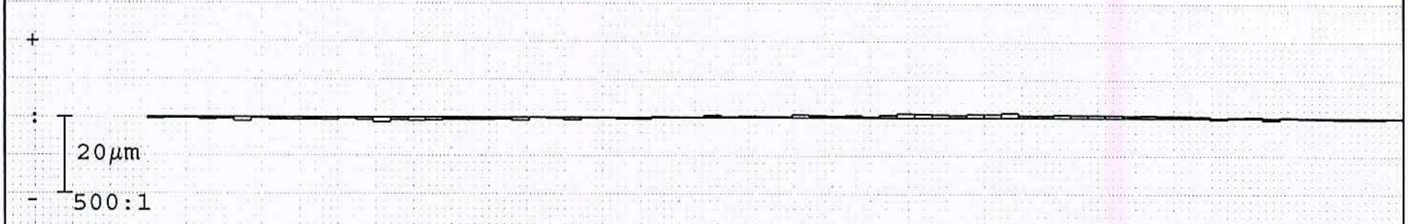
Errori singoli di divisione fp fianco sinistro



Errore somma di divisione Fp fianco sinistro



Errori singoli di divisione fp fianco destro

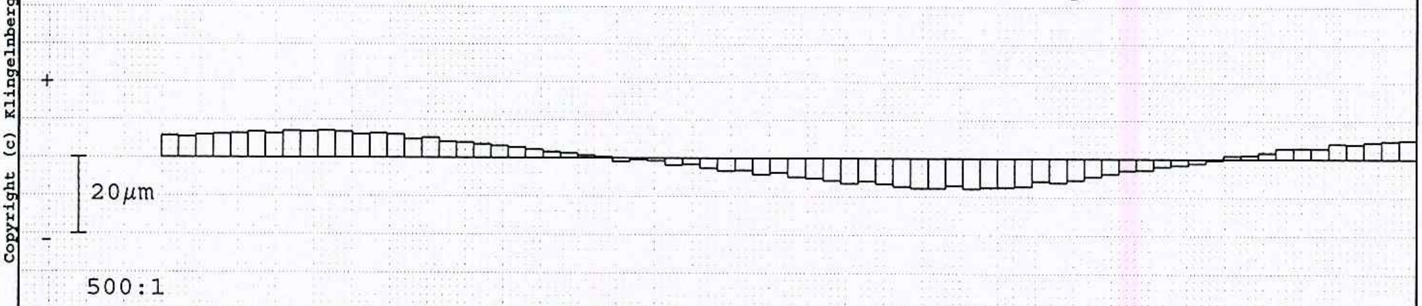


Errore somma di divisione Fp fianco destro

Corsa per misura divis.:204.09 z=15.2mm

		fianco sinistro / TIRO				fianco destro			
		Val.misur	Qual.	Val. amm	Qual.	Val.misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione	fp max	1.5		11.0		1.3		11.0	
Gr. salto di passo	fu max	1.5		14.0		0.8		14.0	
Scarto di divisione	Rp	2.7				2.6			
Err. globale di divisione	Fp	17.4		45.0		18.3		45.0	
Err. cordale di divisione	Fpz/8	8.1				7.8			

Centricità Fr (Ø-sfera =4.5mm) ◎ : 13.7µm



Err. di concentricitá	Fr	14.9	32.0	
Variaz. spessore dente	Rs			

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REPORT 18/070

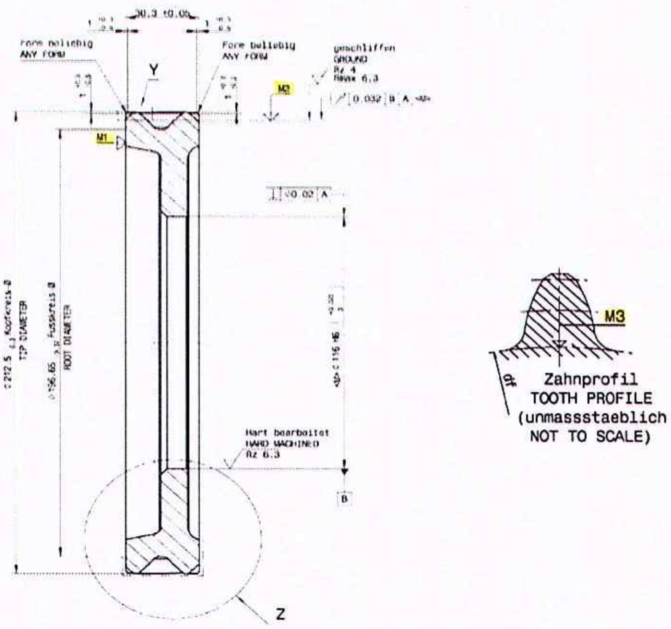
Date: 07/05/2018
Author: V.BUONAROTA

Reason for analysis: *Motivo dell'indagine:*	PPAP
Requester: *Richiedente:*	ME - M. Vicenti

Part Name: *Nome particolare:*	RG
Material: *Materiale:*	GCG_805000 Part 2
State of part: *Stato del particolare:*	Finito
P/N:	251.1.1243.50
S/N:	-
Customer: *Cliente:*	Renault

Result: *Risultato:*	**OK**
Notes: *Note:*	Gearset 32C
Distribution list: *Lista di distribuzione:*	ME - M. Vicenti

Drawing *(disegno)*



Picture 1: posizioni di misura a disegno.

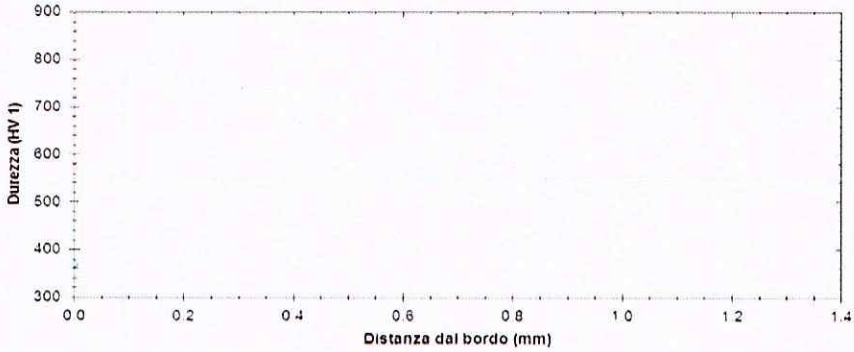
Surface hardness verification *(verifica durezza superficiale)*

Component	Scale	Position	Measured Value	Range
Gear	HRC	M1	60.7	-
Gear	HRA	M1	81.4	80.5 + 2.5

REPORT 18/070	Date: 07/05/2018 Author: V.BUONAROTA

CHD and core hardness verification *(verifica CHD e durezza a cuore)*

Component	Scale	Sample #	Position	Measured Value	Range
Gear	CHD 550 HV1	2070/18	M2 (tooth flank)	0.86	0.5 + 0.4
Gear	Core hardness HV10	2070/18	M4 (tooth core)	369	min 300



Picture 2: profili di durezza

Microstructure analysis *(analisi della microstruttura)*

Sample #	**2070/18**
Gear - Tooth flank surface structure:	Martensite e austenite residua (<5%)
Gear - Tooth base core structure:	Martensite, bainite

Picture 3: Microstruttura sul fianco dente (a sinistra) ed a cuore sulla base dente (a destra).

U N I K A S S E L
V E R S I T Ä T
Institute of Materials Engineering
Metallic Materials
Prof. Dr.-Ing. Berthold Scholtes
Prof. Dr.-Ing. Thomas Niendorf

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-19045-03-00

ZERTECH
Zentrum für
Randschichtanalytik
und -Technik

ZerTech – division of Institute of Materials Engineering, D-34125 Kassel

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Mönchebergstraße 3
D-34125 Kassel

phone: 0049-561/804-3657

telefax: 0049-561/804-3662

our reference	person in charge	phone:	date:
MPT-I011_rep	Dr.-Ing. Django Baunack	0049561/804-3657	28-Jun-18

Order-No. 4500513243

Test Report

Object of examination:

One specimen of each part number has been examined. Residual stress measurements have been performed in according to the test standard of G_804010. Position A has measuring area of approximately 0.5 mm to 1.5 mm above the root form diameter d_{Ff} in a zone of ± 3 mm from the centre of the tooth width (means in active profile of the tooth flank). Position B has a measuring area of approximately 0.5 mm to 1.5 mm below the root form diameter d_{Ff} and in a zone of ± 3 mm from the gear centre means in tooth root area of the gear). The tilt of Ψ-angle occurs in the height of the tooth. The residual stress state is carried out in the distances to the surface shown in table 1.

No.	Part Name	Part/Drawing No.	gear teeth	Measuring Pos.			Depth Profile
				A	B	MP	in µm
1	OS1 (Variante32C)	2516123935	I		X		5 µm, 20 µm, 40 µm, 60 µm, 80 µm.
2	OS1 (Variante32C)	2516123935	I			X	5 µm, 20 µm, 40 µm, 60 µm, 80 µm.
3	RG (Variante 32C)	2511124350	I		X		5 µm, 20 µm, 40 µm, 60 µm, 80 µm.
4	RG (Variante 32C)	2511124350	I			X	5 µm, 20 µm, 40 µm, 60 µm, 80 µm.
5	IS2 (Variante 32C)	2516123335	I		X		5 µm, 20 µm, 40 µm, 60 µm, 80 µm.
6	IS2 (Variante 32C)	2516123335	II		X		5 µm, 20 µm, 40 µm, 60 µm, 80 µm.

Table I: Part list of samples

The residual stress measurements were carried out on a stationary X-ray diffractometer (Manufacturer: Siemens; Type F2). The following list contains the most important measuring parameters.

Measurement details:

Diffractometer:	F1
Radiation:	Cr kα
Crystal lattice:	{211}
Crystal orientation (ψ-angle):	0°; ± 18°; ± 27°; ± 33°; ± 39°; ± 45°
Diffraction angle range (2Θ):	148° - 164°
Step-feeding:	0.1°
Primary aperture:	Ø1.0 mm for measuring point A, F and MP 0.5 x·4.0 mm² for measuring point B
Detector aperture:	symmetrizing slit

Evaluation parameter:

Determination of peak position:	gravitational line method
Calculation of residual stresses:	$\sin^2\Psi$-method
Diffraction angle of stress free crystal lattice:	$\Theta_0 = 78.035°$
X-ray elastic constant:	$½S_2 = 6.09 \cdot 10^{-6}$ mm²/N

Results:

The residual stress values in the tables are rounded by 5 MPa. Standard deviation assigned to the residual stress values is a measure of the reliability of the measurement procedure. The integral width of the interference lines indicates hardening or softening effects, respectively.

Distance from the surface in mm	**Residual stresses σ^{ES} in MPa**	**Integral width IW in degree**
0,004	-845 ± 45	5,98
0,019	-1075 ± 55	5,88
0,041	1140 ± 55	5,90
0,059	-1235 ± 60	5,90
0,079	-1210 ± 60	6,04

Table 1: Residual stresses and integral width; **Pos. 1**

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,006	-915 ± 45	5,89
0,022	-1200 ± 60	5,62
0,042	-1165 ± 60	5,62
0,061	-1090 ± 55	5,89
0,081	-915 ± 50	5,53

Table 2: Residual stresses and integral width; **Pos. 2**

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,004	-730 ± 40	5,70
0,022	-1045 ± 55	5,58
0,038	-1200 ± 60	5,71
0,060	-1250 ± 65	5,63
0,079	-1125 ± 55	5,69

Table 3: Residual stresses and integral width; **Pos. 3**

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,004	-970 ± 45	5,67
0,019	-1170 ± 55	5,61
0,039	-1140 ± 60	5,63
0,059	-905 ± 45	5,93
0,082	-505 ± 25	6,11

Table 4: Residual stresses and integral width; **Pos. 4**

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,004	-545 ± 30	6,12
0,021	-1315 ± 65	5,85
0,039	-1425 ± 70	5,70
0,060	-1370 ± 60	5,81
0,080	-1320 ± 65	5,85

Table 5: Residual stresses and integral width; **Pos. 5**

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,006	-640 ± 40	5,81
0,020	-1095 ± 55	5,67
0,040	-1380 ± 70	5,68
0,060	-1320 ± 10	5,89
0,079	-1020 ± 55	6,10

Table 6: Residual stresses and integral width; **Pos. 6**

As agreed with the customer the residual values are marked with (*), if the shear stress indicator is higher than 80 MPa.

Yours sincerely

Django Baunack

Django Baunack

Person in charge

ZERTECH

Zentrum für Randschichtanalytik und -Technik

Annotations:

ZerTech is accredited to *DIN EN ISO/IEC 17025* referring to procedures of residual stress analysis by X-ray diffraction (XRD) as well as the Hole Drilling Method (HDM). The X-ray diffraction method is descripted in *DIN EN 15305 Non-destructive testing - Test Method for Residual Stress Analysis by X-ray Diffraction*. The proceedings of the Hole Drilling Method are ruled in *ASTM-Designation E837-13a Standard Test Method for Determining Residual Stress by the Hole-drilling Strain Gage Method*.

The experimental data are only valid for the investigated specimen. The work pieces and specimen of disposition will be stored for persistence of 6 month. After that time they will supply to material recycling, if there is no explicit desire by client. A send back is possible. Therefore the client has to take over the postage costs. This procedure is necessary because of our limited stock keeping capacity.

GETRAG

Analisi di similitudine Ppk

Formular Nr:
Datum:
Status: Entwurf
Formular Eigner / Fachbereich:
Prozess-/VA-verweis:

Macchina da confrontare: **SLW11046**
Capability da confrontare Nr.: **02/03/2017**

Data: **18/05/2018**
Owner: **G.Sette**
Abt.: **WLQ1**

Codice Pezzo di riferimento: **251.1.1080.35**

Partnumber in esame: **251.1.1243.35**

	Si	No	
Il grezzo è uguale?	X		Stesso grezzo
Stesso processo di TT?	X		Stesso processo di trattamento termico
Stesso clamping system?	X		Stesso sistema di serraggio
Gli uomini sono gli stessi?	X		Stessi uomini
Il metodo è uguale?	X		Stesso metodo applicato
MSA eseguita e ok?	X		MSA eseguita e ok
Condizioni ambientali ok?	X		Condizioni ambientali adeguate

Esito Correlazione: **Il processo è paragonabile capacità di processo confermata**

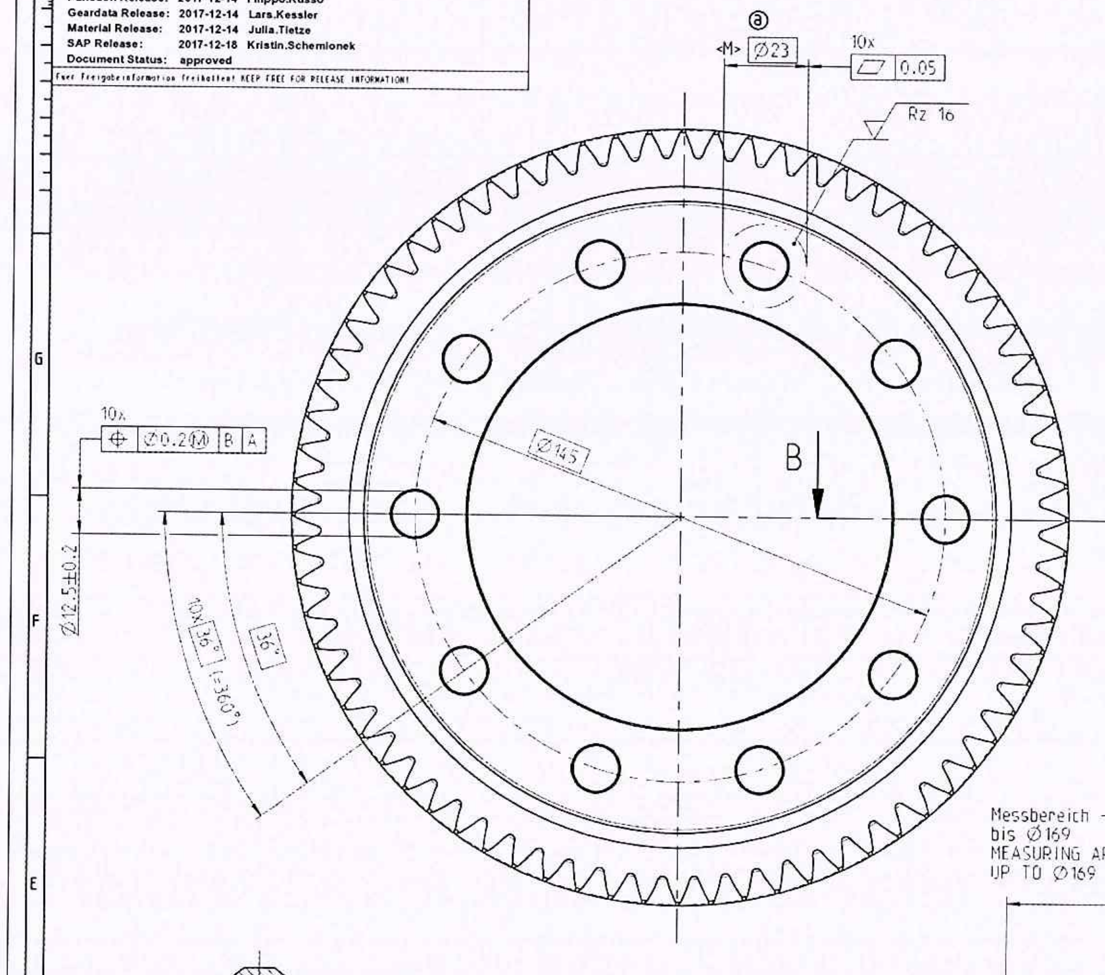
Deviazione Std. Ammessa: ± 25 %

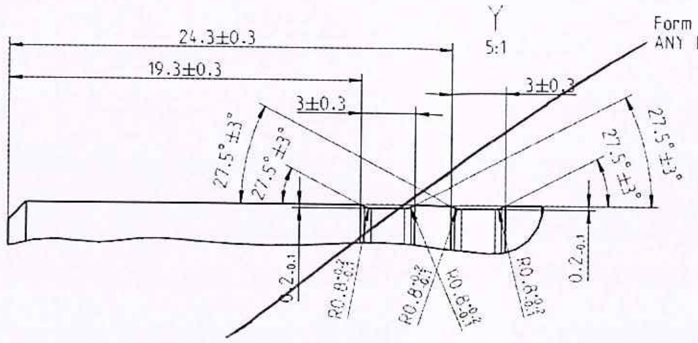
Componente di riferimento					**Componente in esame**					
DIMENSIONI					DIMENSIONI					
Caratteristiche	Unità	**Nominale**		**Deviazione ammessa in %**	**Nominale**		**Deviazione %**	**i.O./n.i.O.**		
numero denti Z	---	71			72			i.O.		
diam.primitivo - Ø	mm	193.496			189.548			i.O.		
Altezza dentatura	mm	30.300			30.300			i.O.		
diam.testa - Ø (da)	mm	216.200			212.500			i.O.		

Studio delle specifiche						Studio delle specifiche					
Caratteristiche	Unità	**Nominale**	**Tolleranza T_1**	P_P	P_{Pk} (solo per caratteristiche unilaterali)	**Nominale**	**Tolleranza T_2**	**Target (1,00/1,33/1,67)**	**i.O./n.i.O.**	**Min. P_p**	**Min. P_{pk}**
Mdk - Ø	mm	211.198	0.071	2.29		208.316	0.068	1.67	i.O	2.19	
Fr (Eccentricità)	µm	0	32	3.35		0	32	1.67	i.O	3.35	
	µm								---		
	µm								---		
	µm								---		
	µm								---		
	µm								---		
...									---		

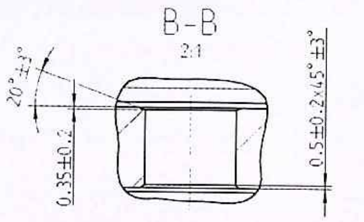
Design Release:	2017-12-14 Lars.Kessler
Function Release:	2017-12-14 Filippo.Russo
Geardata Release:	2017-12-14 Lars.Kessler
Material Release:	2017-12-14 Julia.Tietze
SAP Release:	2017-12-18 Kristin.Schemionek
Document Status:	approved

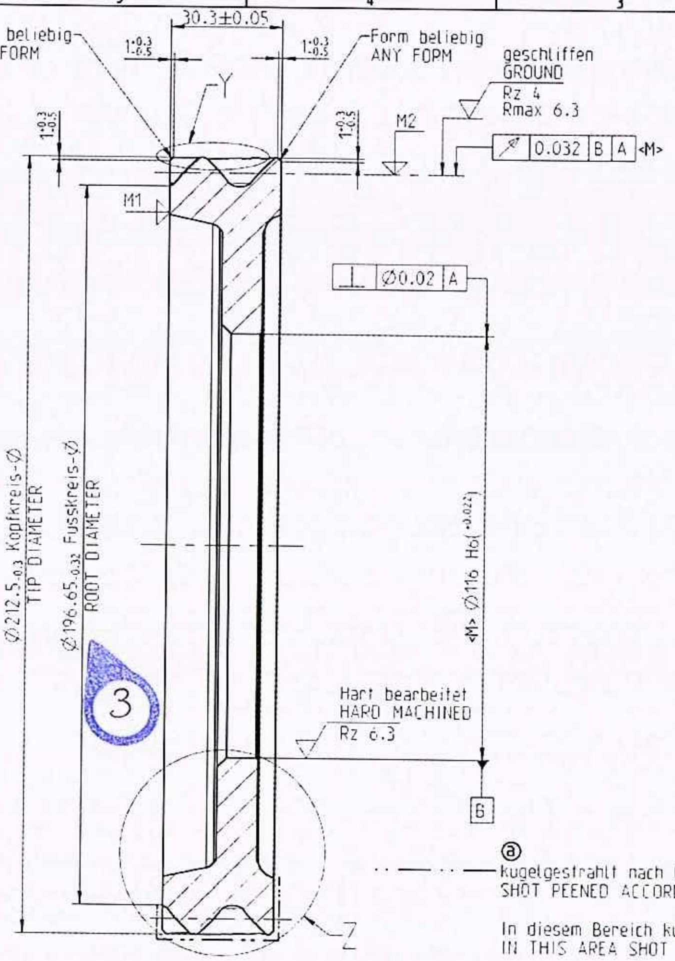
Fuer Freigabeinformation freihalten/ KEEP FREE FOR RELEASE INFORMATION!

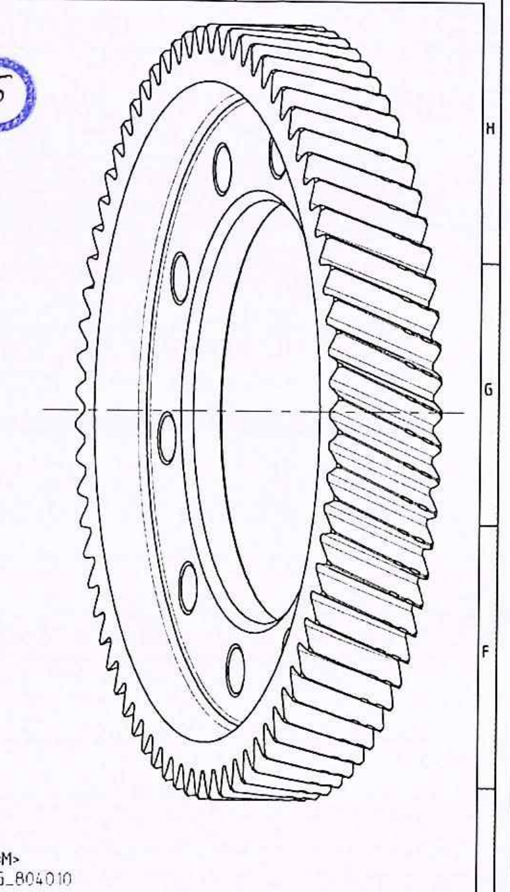


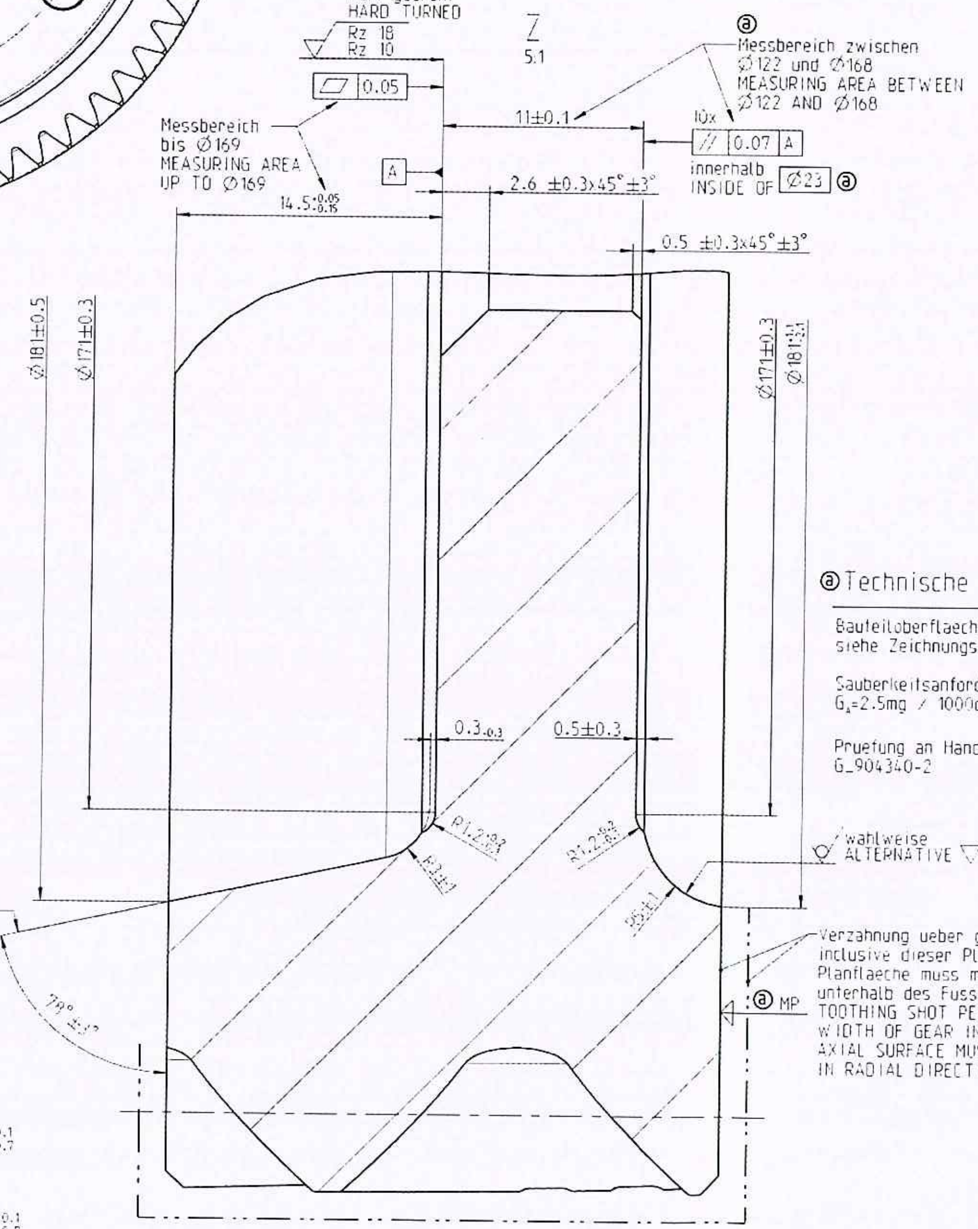


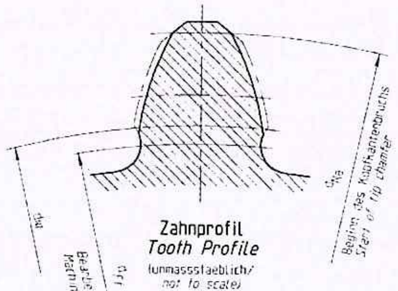
SEE CHANGS C006077











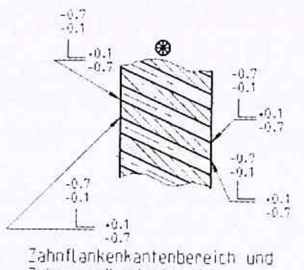
Uebergang der geschliffenen in die vorverzahnte Fussausrundungskurve kerbfrei verlaufend.
Transition of ground to premachined fillet curve without step or notch.

Kanten an Laufverzahnungen / *Tooth chamfers*

unmassstaeblich / *not to scale*

① VERZAHNUNG ENTGRATET NACH G_908101 / GEAR CHAMFERED ACC. TO G_908101
FORM CR - GROESSE siehe ⊛ / FORM CR - SIZE SEE ⊛

Aussenverzahnung / EXTERNAL GEAR		
Zahnwelle/ SPLINE DATA EXTERNAL		
Bezugsdurchmesser / REFERENCE DIAMETER d_B		
Modul / NORMAL MODULE m_n		2.600
Zaehnezahl / NUMBER OF TEETH z		72
Eingriffswinkel / NORMAL PRESSURE ANGLE α_n		20.0°
Schraegungswinkel / HELIX ANGLE β		23.35°
Richtung / HAND OF HELIX		RIGHT, rechts
Bezugsprofil / BASIC RACK		
Profilverschiebung/ADDENDUM MODIFICATION $x\cdot m_n$	Nennmass / NOMINAL	0.097
Qualitaet / GEAR TOOTH QUALITY (DIN3961)		7
Toleranzklasse / TOLERANCE CLASS		
Zahndicke / TOOTH THICKNESS s_n (Lehrenmass / GAGE DIMENSION)	effektive max.	
Zahndicke / TOOTH THICKNESS s_n (Einzelmessung / ACTUAL)	max.	4.077
	min.	4.052
Messkugel-Ø / BALL DIA D_M		4.00
Pruefmass / MEASUREMENT OVER BALLS M_{dk} (Einzelmessung / ACTUAL) ‹M›	max.	208.350
	min.	208.282



Zahnflankenkantenbereich und Zahngrundkantenbereich muss komplett durchgaengig entgratet sein
AREA OF TOOTH FLANK EDGE AND AREA OF TOOTH ROOT EDGE COMPLETELY AND CONTINOUSLY DEBURRED

ⓐ Technische Sauberkeit / TECHNICAL CLEANLINESS:

Bauteiloberflaeche fuer Pruefung / SURFACE TO PROVE:
siehe Zeichnungskopf / SEE DRAWING TITLE BLOCK

Sauberkeitsanforderung / CLEANLINESS REQUIREMENT:
G_x=2.5mg / 1000cm²

Pruefung an Hand der Anweisung / EXAMINATION BASED ON DIRECTIVE:
G_904340-2

wahlweise ALTERNATIVE

Naehere Angaben zur Verzahnung siehe Verzahnungsblatt gleicher Nummer
FURTHER GEAR DATA SEE DATA SHEET SAME NUMBER

Verzahnung ueber gesamte Breite des Zahnkranzes inclusive dieser Planflaeche verfestigungsgestrahlt. Planflaeche muss mindestens 3mm. in radialer Richtung. unterhalb des Fusskreises verfestigungsgestrahlt sein
TOOTHING SHOT PEENED OVER COMPLETE WIDTH OF GEAR INCLUDING THIS AXIAL SURFACE. AXIAL SURFACE MUST BE SHOT PEENED AT LEAST 3mm. IN RADIAL DIRECTION. BELOW THE ROOT OF TEETH

ⓐ MP

Rz 63

ⓐ Kugelgestrahlt nach G_804010 ‹M›
SHOT PEENED ACCORDING TO G_804010

In diesem Bereich kugelgestrahlt nach dem Schleuderrad-Verfahren
IN THIS AREA SHOT PEENED ACCORDING TO CENTRIFUGAL WHEEL PROCESS

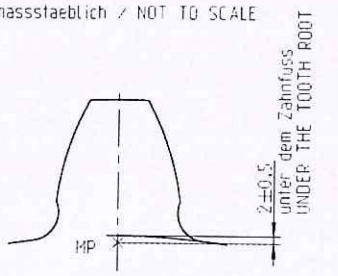
Prozessfolge:
Verzahnung fraesen - haerten - verfestigungsstrahlen - Verzahnungs-Hartbearbeitung
keine Spuren der Hartbearbeitung in der Zahnfussausrundung bzw. im Zahnfuss zulaessig !
PROCESS SEQUENCE:
HOBBING OF TEETH - HARDENING - SHOT-PEENING - TEETH HARD MACHINING
NO MARKS OF HARD MACHINING IN THE ROOT FILLET RESPECTIVELY ROOT PERMISSIBLE !

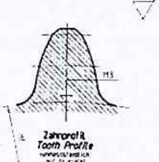
Verzahnung / TOOTHING:
Eigenspannungsklasse 2b. Messpunkt B
RESIDUAL STRESS CLASS 2b. MEASUREMENT POINT B

Planflaeche / AXIAL SURFACE:
Eigenspannungsklasse 1. Messpunkt auf Planflaeche
RESIDUAL STRESS CLASS 1. MEASUREMENT POINT ON AXIAL SURFACE

Messpunkt Planflaeche MP / MEASUREMENT POINT AXIAL SURFACE MP:
2±0.5mm radialer Abstand in axiale Planflaeche.
2±0.5mm RADIAL DISTANCE TO AXIAL SURFACE.
Zu verwendende Blende / APERTURE TO BE APPLIED: 2Ømm

unmassstaeblich / NOT TO SCALE





ⓐ einsatzgehaertet und angelassen nach G_804002
CASE HARDENED AND TEMPERED ACCORDING TO G_804002
M1 (Oberflaechenhaerte/CASE HARDNESS) : 80.5+2.5 HRA
M2 (Zahnflanke/TOOTH FLANK) : CHD (Eht) 550 HV1=0.5+0.4
M3 (Kernhaerte/CORE HARDNESS) : 300min. HV10

GCG_803001 | 5 ‹M› | 0 ‹C› | 0 PTC

Buchst. CHANGE INDEX	Anzahl NUMBER	Aend.-Nr. CHANGE ORDER NO.	Aenderung MODIFICATION	Datum DATE
a	7x	C007030MPR	Ansicht/VIEW: Ø23 +er/WAS Ø25, 2 Ø23 +er/WAS Ø25. Notiz-NOTE geaendert/CHANGED. Messpunkt/MEASUREMENT POINT MP neu/NEW. Technische Sauberkeit/TECHNICAL CLEANLINESS. Kugelstrahlen/SHOT PEENING und/AND einsatzgehaertet und angelassen/CASE HARDENED AND TEMPERED aktualisiert/UPDATED.	20170928
--	--	C005471PR1	Spezifikationsreifegrad 3 erteilt SPECIFICATION MATURITY LEVEL 3 APPROVED	20160712

Massstab / SCALE M. 1:1 (--)

Aenderung ...nur mittels CAD zulaessig. FMEA ueberpruefen... / MODIFICATION --ONLY ALLOWED BY CAD. CHECK FMEA--

Informationen auf dieser Zeichnung sind ohne Angaben zu Verwendung und Freigabe unverbindlich. INFORMATION ON THIS DRAWING PROVIDED WITHOUT OBLIGATION IF USAGE AND RELEASE ARE NOT SHOWN.

Allgemeintoleranzen fuer Laengenmasse, Form und Lage ISO 2768 - mK, gebrochene Kanten, Radien und Winkelmasse ISO 2768 - m / GENERAL TOLERANCES FOR LINEAR DIMENSIONS, FORM AND POSITION ISO 2768 - mK, CHAMFERS, RADII AND ANGULAR DIMENSIONS ISO 2768 - m

Auswertung der Durchmessermessung erfolgt nach der Gauss-Methode (Arithmetischer Mittelwert) / EVALUATION OF THE DIAMETER MEASUREMENT IS CARRIED OUT ACCORDING TO THE GAUSS METHOD (ARITHMETICAL MEAN VALUE)

Form- und Lagetolerierung FORM AND POSITION TOLERANCES EN ISO 1101	Tolerierung TOLERANCING ISO 8015	Oberflaechenangaben SURFACE TEXTURE EN 4005	Werkstueckkanten BREAK EDGES ISO 13715

Werkstoff / MATERIAL: GCG805000-02_20MnCr5S

Halbzeug SEMI-FINISHED

Unbewertete Oberflaeche UN WETTED SURFACE
Gesamtoberflaeche SURFACE AREA 10X/12 mm² | Masse MASS 2.980 kg

Schutzvermerk nach ISO 16016 beachten PROTECTION PER ISO 16016

MAGNA GETRAG GETRAG B.V. & Co. KG

Benennung / ITEM NAME: **Zahnkranz** RING GEAR

Artikel-Nr. / ITEM NO.: **2511124350** | Blatt/SHEET 1 von/OF 1 | Reifegrad MATURITY 3 | Format SIZE A1

CAD-Modell: 2511124350

Ersatz fuer SUBSTITUTE FOR: -

ENTWURF DATA: Lang / DRW: Petra.Kaufmann | CHECKED IN BY: Petra.Kaufmann | MODEL