

3M451



Part Name: Double Gear 2nd / Rev Cust. Part No.: 251.1.1223.50
 Shown on Drawing No.: 251.1.1223.50 Org. Part No.: 251.1.1223.50
 Engineering Change Level: 3 Index "b" (C005149_MIP_5) Dated: 27/03/2017
 Additional Engineering Changes: na Dated: na
 Safety and/or Government Regulation: Yes No Purchase Order No.: _____ Weight (kg): 1.561
 Checking Aid No.: na Checking Aid Engineering Change Level: na Dated: na

ORGANIZATION MANUFACTURING INFORMATION

CUSTOMER SUBMITTAL INFORMATION

Getrag S.p.A.
 Organization Name & Supplier / Supplier Code
Via dei Ciclamini, 4
 Street Address
Modugno (Ba) Puglia 70026 Italy
 City Region Postal Code Country

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 Appearance 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 251.1.1083.50).
Sub-component drawing 251.1.1224.50 Lev. 3 Index "a" (C005149_MIP_3) of 27/02/2017
 - Updated Getrag standard for heat treatment measurement points (internal standard for Heat Treatment measurement points already in place. For PPAP validation are used measurement points stated on final
 - Updated Getrag standard for technical cleanliness (already in place)
 - Identification grooves deleted in according with change C006077

Is each Customer Tool properly tagged and numbered? Yes No n/a
 Organization Authorized Signature: _____ Date: 10/01/2018
 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: 10.01.18
 Print Name: _____ Customer Tracking No.: _____

New P/N introduction - 1223,50

Short description: Initial PPAP (only differences from 1083)

PPAP Requirements	Required	Note	PPAP Docs updated
1 Design Records	Yes	Final Drawing + G.D. + VBZ	Yes
2 Authorized Engineering change documents	Yes	see dwg	Yes
3 Customer Engineering approval	n.a.		
4 DFMEA	NO		
5 Process flow diagram(s)	Yes		Yes
6 PFMEA	Yes		Yes
7 Control plan	Yes		Yes
8 Measurement system analysis studies	Yes	Studio Tipo 1 per MdK	Yes
9 Dimensional results	Yes		Yes
10 Records of Material / Performance test results	Yes		Yes
11 Initial process studies	Yes	Ppk for MdK and Fr	Yes
12 Qualified laboratory documentation	NO		
13 Appearance Approval Report (A.A.R.)	n.a.		
14 Sample Production Parts	Yes		Yes
15 Master sample	Yes		Yes
16 Checking aids	n.a.		
17 Customer-Specific Requirements	NO		
18 Part Submission Warrant (PSW)	Yes		Yes

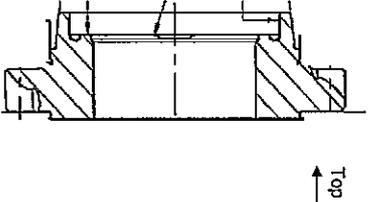
Other requirements		
1 PSW Raw part	NO	
2 PSW E.P. part	NO	
3 PSW Engagement Rings	NO	

10/01/2018

STRICKRAD	außenverzähnt
GEAR	external
Zahnzahl	z
Number of teeth	27
Modul	m_n
Normal module	3,150000
Eingriffswinkel	α_n
Normal pressure angle	17° 30' 0"
Schätzungswinkel	β
Helix angle	20° 0' 0"
Steigungsrichtung	
Hand of helix	RECHTS
Profilverschleißfaktor	x
Addendum modification coeff.	0,395
Talkreisradius	d
Pitch diameter	90,508
Kopfkreisradius	d_a
Outside diameter	102,00 -0,20
Kopfnutkreis, theo. max. d_{ka}	d_{ka}
Tip diam. usable theo.	101,55
Kopfnutkreis, theo. min. d_{ka}	d_{ka}
Tip diam. usable theo.	101,10
Fußkreisradius	d_f
Root diameter	81,50 -0,35
Fußnutkreisradius	d_{fw}
Root diameter usable	86,86
Grundkreisradius	d_g
Base circle radius	42,903
Grundkreisdurchmesser	d_b
Base diameter	85,807
Normalzahnradicke	max. s_n
Normal tooth thickness	5,733
Normalzahnradicke	min. s_n
Normal tooth thickness	5,698
Wälzradzahl	k
Number of teeth spanned	4
Zahnweite	max. W_k
Base tangent length	34,739
Zahnweite	min. W_k
Base tangent length	34,706
Wälzkugeldurchmesser	D_M
Ball diameter	5,0000
Diam. Zweikugelmäß max. M_{kk}	
Measurement o. balls	98,375
Diam. Zweikugelmäß min. M_{kk}	
Measurement o. balls	98,286
Verdrehflankenspiel theo.	0,065
Circumferential backlash	0,175

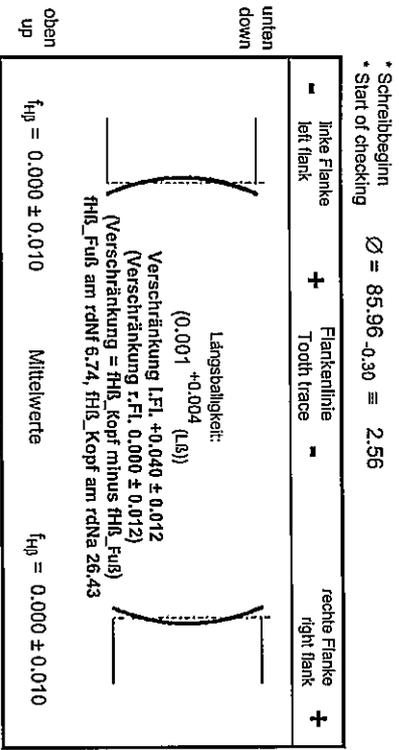
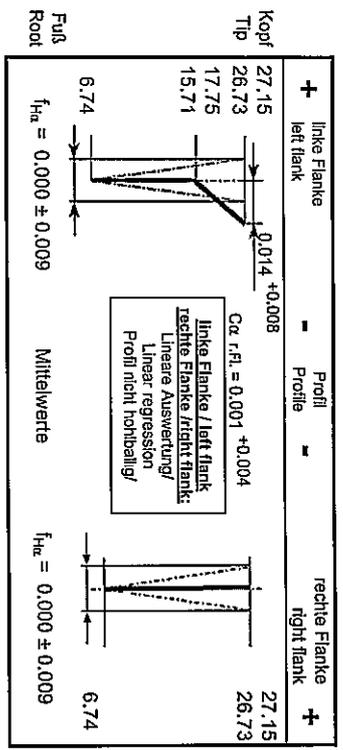
Toleranzen der Verzahnung (DIN 3961 vom Aug. 1978)
gültig für Werte am Einzelzahn
Tolerances of gearing (DIN 3961 of Aug. 1978)
valid for values at individual tooth

Profil-Formabweichung f_{fa}	linke Fl. left flank	rechte Fl. right flank	Eingriffsteilungs-Abweich. f_{fo}
Profil-Form error	0,016		Normal pitch error
Profil-Gesamtabweichung F_{fa}			Teilungs-Einzelabweichung f_p
Total profile error			Adjacent pitch error
Profil-Winkelabweichung $f_{f\alpha}$	0,000	0,000	Teilungsspannung f_d
Profile angle error	± 0,018	± 0,018	Diff. bet. adjacent pitches
Flanken-Winkelabweich. $f_{f\beta}$	0,000	0,000	Teilungs-Summenabweich. F_{pk}
Tooth alignment error	± 0,025	± 0,025	Cumulative circ. pitch error
Flanken-Gesamtabweich. $F_{f\beta}$			Rundlaufabweichung F_f
Total alignment error			Radial run-out
Flanken-Formabweich. $f_{f\theta}$	0,014		Zahndickenschwankung R_s
Flanken-Formabweich. error			Range of tooth thckn. error
Teilungs-Gesamtabweich. F_f	0,071		
Cumulative pitch error			
Einfl.-Wälzabweichung F_r			Zweit.-Wälzabweichung F_r
Tangential composite error			Radial composite error
Einflanken-Wälzspannung f_r			Zweit.-Wälzspannung f_r
Tang. tooth-tooth comp. err.			Radial tooth to tooth comp. err.
Radbreite im Meßkreis d_m	10,5		Meßkreis Krümmungsradius ρ_{km}
Facewidth in meas. diam.			Radius of curvature meas. diam.
			14,70



Top

Profil-Messung Oben beim 8,20 mm
Profil-Messung Unten beim 3,54 mm
Auswerstrecke Flanke $L_f = 4,70$ mm
L.FI. = Zug

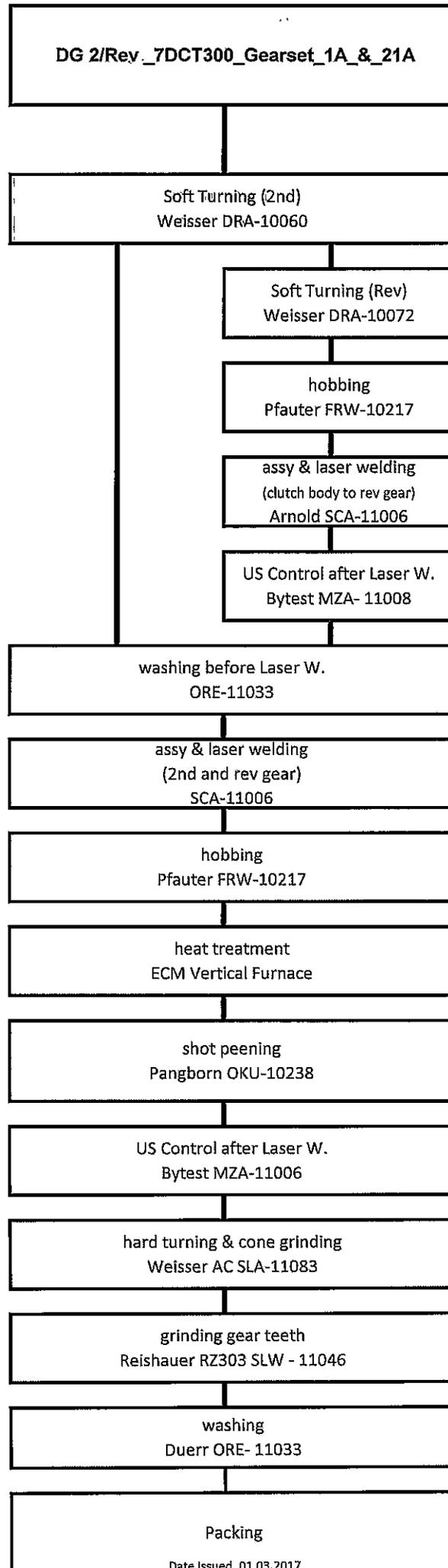


* $f_{f\beta}$ (zwischen dNF und dem Schreibbeginn ds) max $f_{f\beta 2}$, jedoch 0,003 zulässig
* $f_{f\beta}$ (zwischen dNF and start of checking ds) max $f_{f\beta 2}$, 0,003 allowable.
Profil- und Flankenliniennormierung nach G. 808006 und VDI/VDE 2812
Flankenlinienprüfbereich $L_f = 0,8 \cdot b$ hochgerechnet auf 1,0"b
Begriffe für Stirnräder nach DIN 858, 3960, 3998
Profil- und helix checking according to G. 808006 and VDI/VDE 2812
Tooth trace testing area $L_f = 0,8 \cdot b$ calculated to 1,0"b
Terms of the tooth system according to DIN (German Industrial Standards) No. 858, 3960, 3998

Buch, Anz.	Änd.Nr.	Datum	Name
Abbildungen sind unverändertlich, Diagrams not to scale.			
Ersatz für		251/	
Erstverwendung		251/	
Verzahnungsblatt Endkontrolle		Zeitungsnummer	
Final Check Gear Data		Drawing number	
Benennung		Name	
Zahnrad RWG		251.11085.00	
REMARKS			
GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer GmbH & Cie KG			
Schutzmerk nach ISO 16016 beachten Protection per ISO 16016			

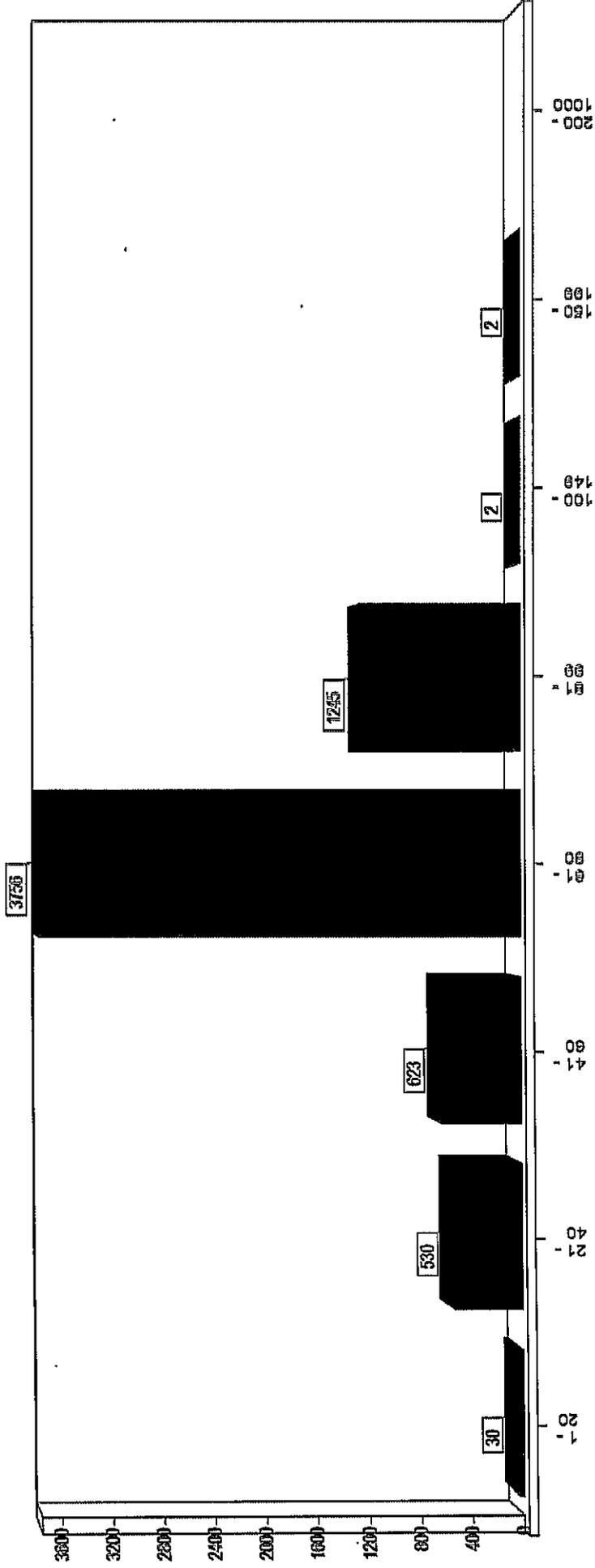
Vorbearbeitungsdaten siehe Verzahnungsblatt Vorbearbeitung gleicher Nr.
For pre-machining dimensions, see gear data sheet same number
Wkz-Profil siehe Werkzeugaufbau Nr.
For tool profile, see tool data sheet number

251.1.1085.00



DCT300 – GEARSSET: PFMEA RPN Status

GETRAG		FMEA Processo		Numero: Pagina: 12.1.1.1.1
Tipologia/Modello/Produzione/Lotto: 7DCT300	Numero Disegno: Gearset 1A + 21A Stato modifica: -	Responsabile: Getrag Ditta: Getrag	Emissor: 31/08/2015	
FMEA/Elemento: GEARSSET 7DCT300	Codice dell'operazione: Tutte Stato modifica: -	Responsabile: Papagna, Oscurio, 105, Ciminelli, Tanzi T., Terlizzone, Lanciscina, Guenna, Santibaldi, Caponio, Vicenti, Pisanò, Piaro Ditta:	Emissor: Modificato: 13/01/2017 20/11/2017	

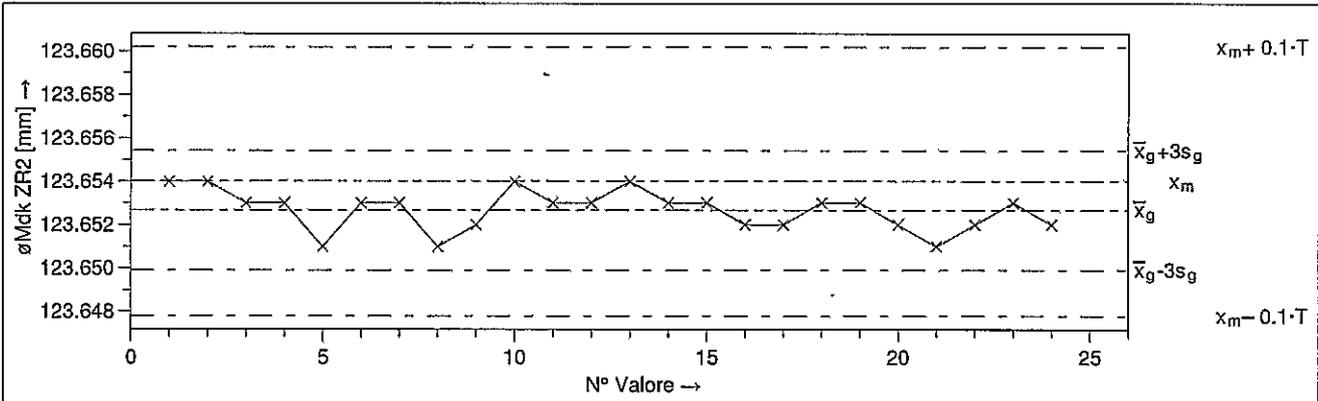


Frequenza



Capacità strumenti di misura

Data/ora	11/11/2017	Nome oper.	G.Sette	Reparto/Area/Prod.	NN	Posto di prova	Rettificanti denti 7D2
Calibro		Master		Caratteristica			
Desc. calibro	Banchetto in acciaio	Desc. mast.	Master Mdk ZR2	Desc. Car.	øMdk ZR2		
N° calibro	MVZ 406001 011	N° master	TBD	N° Caratt.	2511122450		
Ris. calibro	0.001	Valore reale mast	123.654	Val. Nom	123.6540 LSS	123.685	$\hat{\Delta} = 0.0310$
Caus. Pr.	Cg CgK	Unità di misura	mm	Unità di n mm	LSI	123.623	$\hat{\Delta} = -0.0310$
Nota	Banchetto øMdk MVZ 406001 011 per ruote dentate hard						



i	x _i	i	x _i	i	x _i	i	x _i	i	x _i
1	123.6540	6	123.6530	11	123.6530	16	123.6520	21	123.6510
2	123.6540	7	123.6530	12	123.6530	17	123.6520	22	123.6520
3	123.6530	8	123.6510	13	123.6540	18	123.6530	23	123.6530
4	123.6530	9	123.6520	14	123.6530	19	123.6530	24	123.6520
5	123.6510	10	123.6540	15	123.6530	20	123.6520	25	

Valori a disegno		Valori Calcolati		Statistiche	
$x_{m+0.1 \cdot T}$	= 123.660200	$x_{max g}$	= 123.6540	$\bar{x}_g + 3s_g$	= 123.655417
x_m	= 123.654000	$x_{min g}$	= 123.6510	\bar{x}_g	= 123.652667
$x_{m-0.1 \cdot T}$	= 123.647800	R_g	= 0.0030	$\bar{x}_g - 3s_g$	= 123.649916
$0.2 \cdot T$	= 0.012400	n_{tot}	= 25	$6s_g$	= 0.005501
T	= 0.0620			s_g	= 0.000917
Unità di misura	= mm			$ Bi $	= 0.0013333
				n_{eff}	= 24

Test per Bias		Risultati del test : significativo ($\alpha \leq 0.1\%$)
Bias	= 2.15%	

Minimo riferimento per sistema di misura capace		
Risoluzione	%RE = 1.61%	$T_{min} (\%RE) = 0.0200$
$\%EV = \frac{EV}{T}$	= 8.87%	$T_{min} (\%EV) = 0.110$
$C_g = \frac{0.2 \cdot T}{4 \cdot s_g}$	= $2.41 \leq 3.38 \leq 4.35$	$T_{min} (C_g) = 0.0244$
$C_{gk} = \frac{0.1 \cdot T - \bar{x}_g - x_m }{2 \cdot s_g}$	= $1.88 \leq 2.65 \leq 3.43$	$T_{min} (C_{gk}) = 0.0377$

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

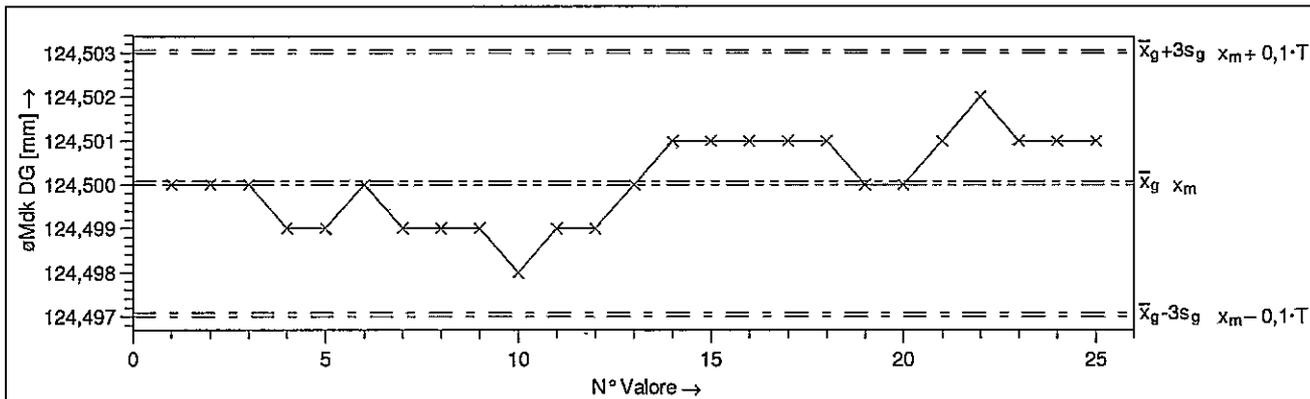
GETRAG MSA 2017: Capability of measuring system (Type-1 Study)



Capacità strumenti di misura

Pagina
1 / 1

Data od.	15/11/2017	Nome oper.	mario.bozza	Reparto/Area/Prod.	NN	Posto di prova	Dentatura DG
Calibro		Master			Caratteristica		
Desc. calibro	Banchetto in acciaio	Desc. mast.	DG	Desc. Car.	øMdk DG		
N° calibro	MVZ 406001 004	N° master	MVZ 400571 001	N° Caratt.	2511122450_21A		
Ris. calibro	0,001	Valore reale mast.	124,5	Val. Nom.	124,195 LSS	124,210	$\hat{=} 0,015$
Caus. Pr.	Cg CgK	Unità di misura	mm	Unità di r mm	LSI	124,180	$\hat{=} -0,015$
Nota	Banchetto øMdk MVZ 406001 004 per ruote dentate DCT 300 soft						



i	x _i	i	x _i	i	x _i	i	x _i	i	x _i
1	124,500	6	124,500	11	124,499	16	124,501	21	124,501
2	124,500	7	124,499	12	124,499	17	124,501	22	124,502
3	124,500	8	124,499	13	124,500	18	124,501	23	124,501
4	124,499	9	124,499	14	124,501	19	124,500	24	124,501
5	124,499	10	124,498	15	124,501	20	124,500	25	124,501

Valori a disegno		Valori Calcolati		Statistiche	
x _m	= 124,50000			x̄ _g	= 124,50008
LSI	= 124,180	x _{min g}	= 124,498	s _g	= 0,000997
LSS	= 124,210	x _{max g}	= 124,502	B _i = x̄ _g - x _m	= 0,000080000
T	= 0,030	R _g	= 0,004		
		n _{tot}	= 25		

Minimo riferimento per sistema di misura capace

$C_g = \frac{0,2 \cdot T}{4 \cdot s_g}$	= 1,51		T _{min} (C _g)	= 0,0264
$C_{gk} = \frac{0,1 \cdot T - \bar{x}_g - x_m }{2 \cdot s_g}$	= 1,46		T _{min} (C _{gk})	= 0,0273
%RE	= 3,33%		T _{min} (%RE)	= 0,0200

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

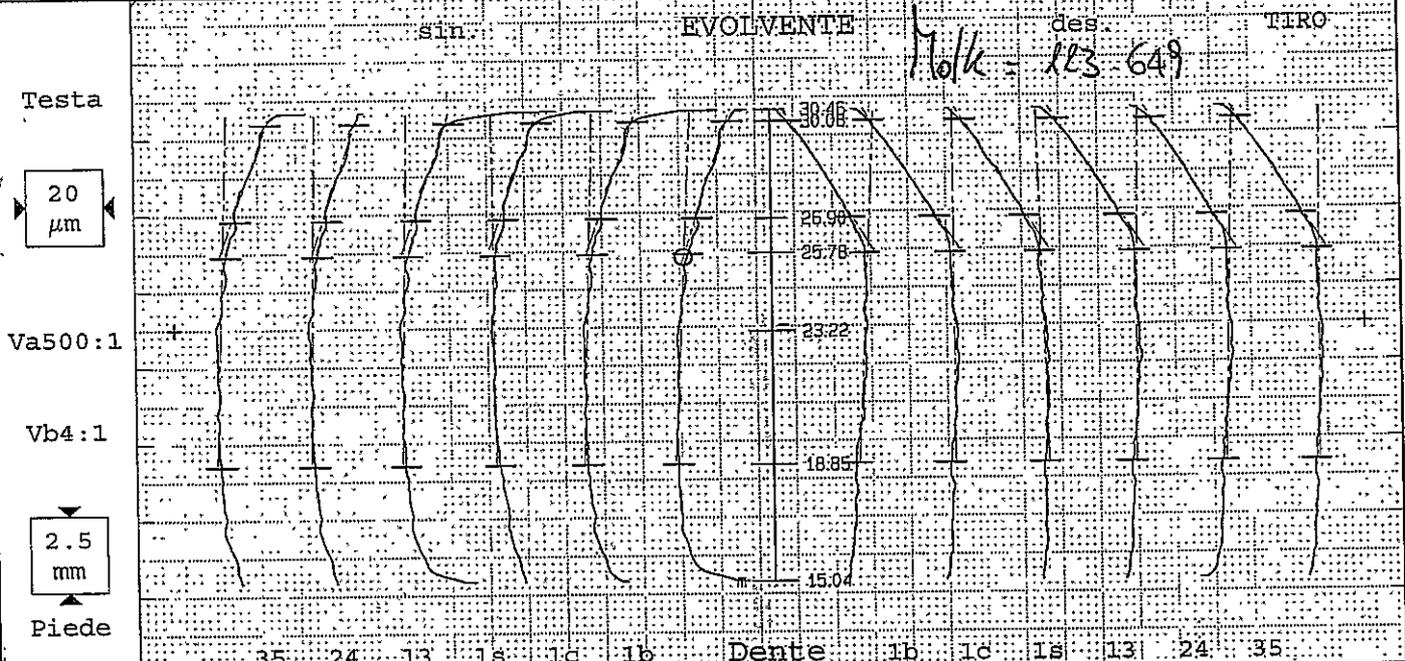


GETRAG 2014 MSA: Verfahren 1

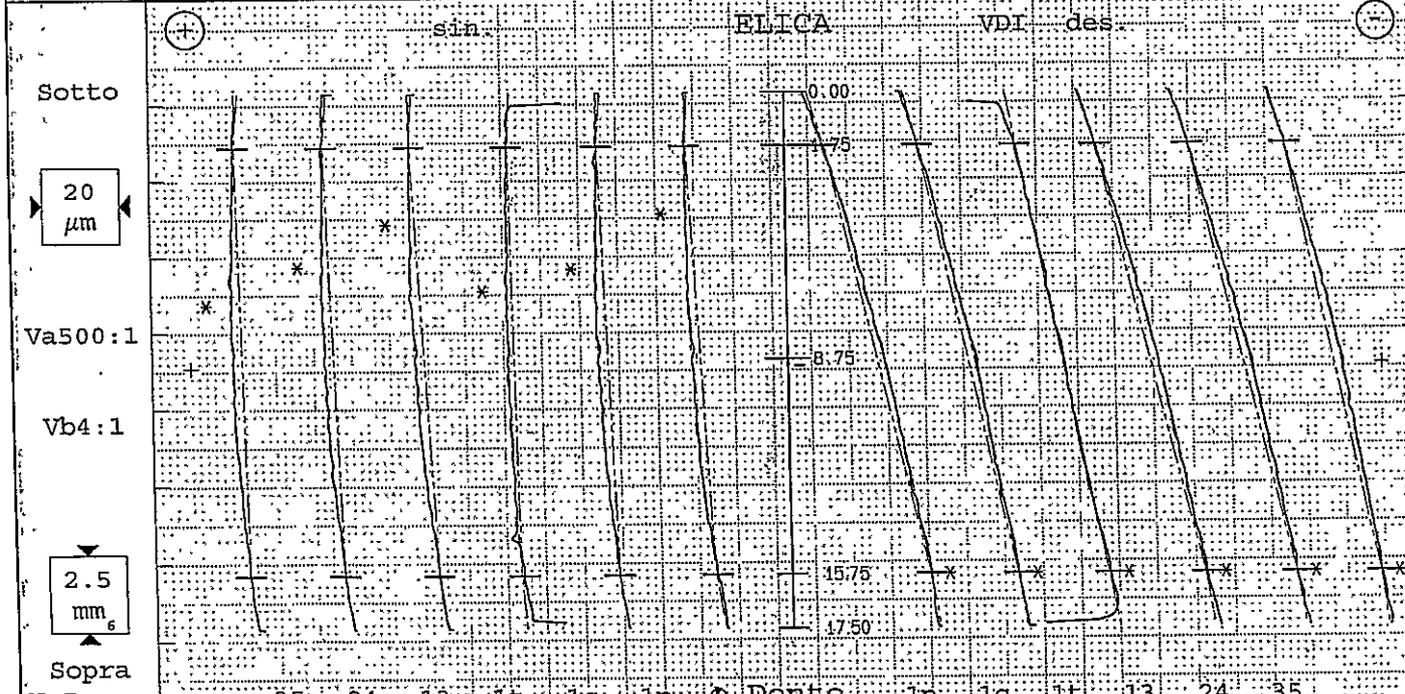
Ruota cilindrica Evolvente/Elica



Nr. prog.: STI0412 06 0	P26 B7590	Controllore: turno b	Data: 07.11.2017 06:31
Denominazione: ZR2		Numero denti z 45	Largh. fasc. dent. b 17.5mm
Numero disegno: D51.1.1224.50-IF		Modulo m 2.35mm	Tratto evolv. La 6.93mm
Comessa/serie nr.: 8 - A		Angolo pressione 20°	Tratto elica Ls 14mm
Masch. Nr.: M001	Spindel: FORME	Angolo elica -26°	Inizio elab. ml 18.85mm
Untersuchungszweck: Laufende Messung		Ø Base db 109.0551mm	Palpatore ø (#2C) 1mm
Werkzeug:	Charge:	Ang. Base -24.326°	Fat. scor. pr. x 185



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual		
fHm	±6	-2.4	Var a 1.7								±6	Var a 2.3							1.0		
fHa	±8	-2.4	-3.3	-1.6	-1.7	0.4	-2.8	-4.4		±8	4.5	0.0	-2.5	1.0	2.3	0.8	1.0				
Fa		2.7	2.8	2.8	2.5	1.9	2.5	3.5			3.4	2.4	2.6	2.8	3.1	2.2	2.6				
ffa	5	2.2	2.3	2.4	2.3	1.8	1.9	1.9		5	1.9	2.4	2.2	2.5	2.4	1.9	2.3				
Ca	-13/-5	-10.5	-10.4	-10.7	-10.5	-10.9	-10.3	-9.6		-25/-17	-21.9	-21.6	-19.6	-21.4	-21.3	-21.4	-21.4				
ffaF	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]		110.993	[110.85/111.2]									125.168	[125.04/125.3]								



N: Z		Var β									Var β									
fHm	5±4	5.3	4.6								30±4	3.5							31.8	
fHs	5±8	5.3	3.1	5.1	7.7	2.5	5.1	7.9		30±8	33.1	30.6	28.1	33.4	33.3	29.9	31.8			
Fβ		2.2	2.2	1.6	3.1	3.9	1.7	3.2			3.3	2.6	2.0	4.2	3.5	1.5	3.0			
ffaβ	5	1.0	0.9	1.0	1.1	2.6	1.1	1.2		5	1.1	1.2	1.1	1.0	0.9	1.1	1.1			
CG	1/5	2.4	2.4	2.4	2.4	1.6	2.4	2.3		1/5	1.7	1.6	0.0	1.9	1.7	1.9	1.8			
bd	-8±8	-5.4									-8±8								-5.0	

GCG 808006

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Ruota cilindrica Divisione



Nr. prog.: STI0412 06 0	P26 B7590	Controllore: turno b	Data: 07.11.2017 06:31
Denominazione: ZR2	Numero denti z: 45	Angolo pressione: 20°	
Numero disegno.: D51.1.1224.50-IF	Modulo m: 2.35mm	Angolo elica: -26°	
Commessa/serie nr.: 8 - A	Untersuchungszweck: Laufende Messung		
Masch.Nr.: M001	Spindel: Formelwerkzeug	Charge:	

Errori singoli di divisione fp fianco sinistro

-20µm										
500:1										

Errore somma di divisione Fp fianco sinistro

-20µm										
500:1										

Errori singoli di divisione fp fianco destro

-20µm										
500:1										

Errore somma di divisione Fp fianco destro

-20µm										
500:1										

Corso per misura divis.: 118.531 z=8.8mm	fianco sinistro				fianco destro / TIRO			
	Val. misur	Qual.	Val. amm	Qual.	Val. misur	Qual.	Val. amm	Qual.
Gr. err. singoli divisione fp max	1.0		10.0		1.1		10.0	
Gr. salto di passo fu max	1.6		12.0		1.1		12.0	
Scarto di divisione fp	2.0				1.9			
Err. globale di divisione fp	4.1		36.0		8.0		36.0	
Err. cordale di divisione fpz/8	2.5				3.3			

Centricità Fr (Ø-sfera =4.25mm) © : 7.3µm

-20µm										
500:1										

Err. di concentricità Fr	8.3	28.0	
Variab. spessore dente Rs			

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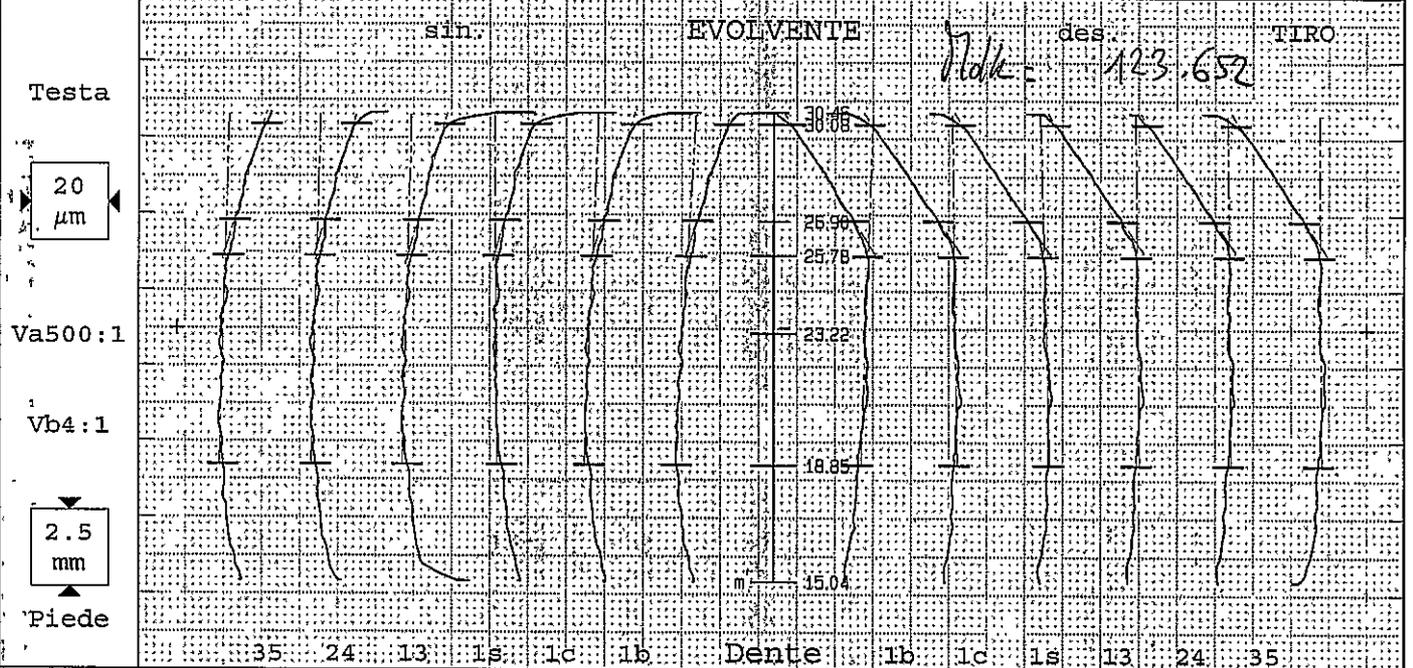
Docum. archiviato elettronicamente. Archiviazione cartacea non necessaria!



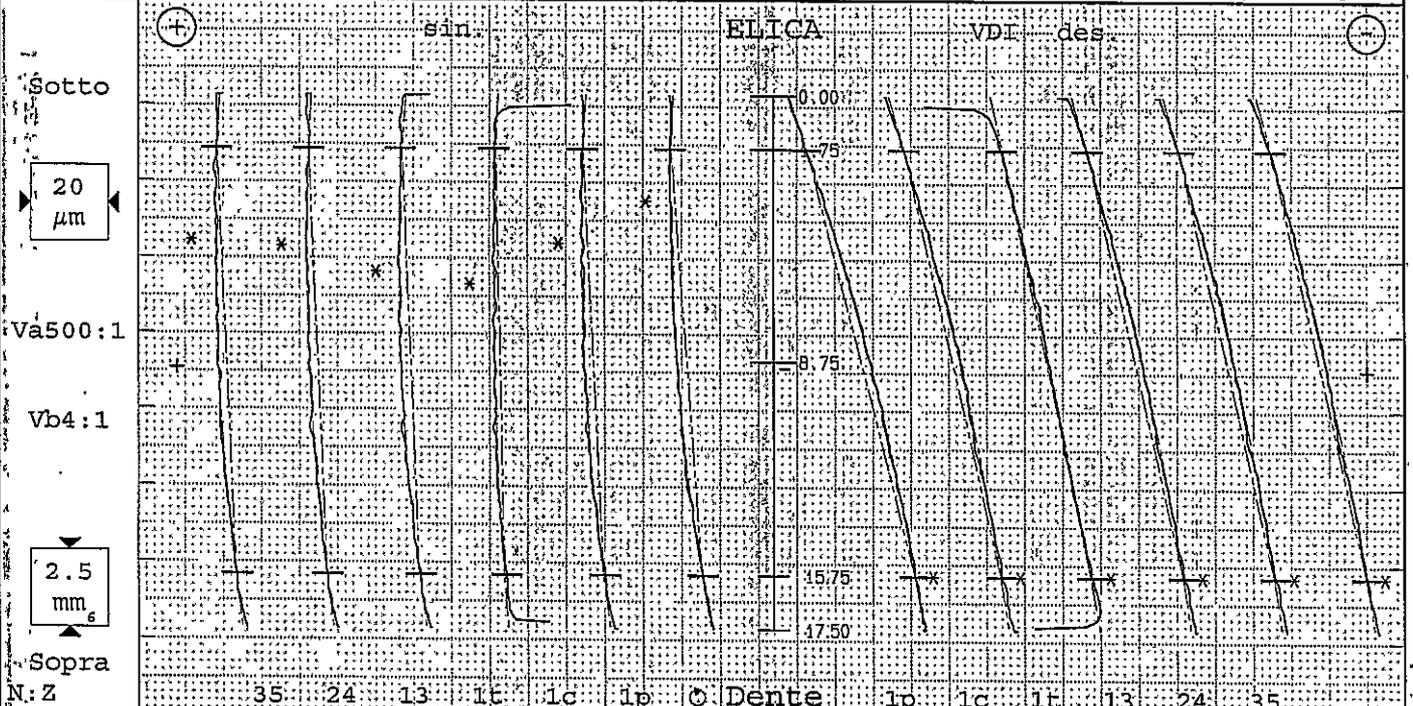
Ruota cilindrica Evolvente/Elica



Nr. prog.: STT0412 06 0	P26 B7590	Controllore: turno a	Data: 07.11.2017 05:14
Denominazione: ZR2		Numero denti z: 45	Largh. fasc. dent. b: 17.5mm
Numero disegno.: D51.1.1224.50-IF		Modulo m: 2.35mm	Tratto evolv. La: 6.93mm
Comessa/serie nr.: 12-2		Angolo pressione: 20°	Tratto elica Ls: 14mm
Masch. Nr.: M001	Spindel: Formata elicoidale	Angolo elicoidale: -26°	Inizio elab. M1: 18.85mm
Untersuchungszweck: Laufende Messung		Ø Base db: 109.0551mm	Palpatore Ø (#2C): 1mm
Werkzeug:	Charge:	Ang. Base: -24.326°	Fat. scor. pr. x: .185



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual	
fHgm	±6	-2.8	Var a 1.3								±6	Var a 0.7							-1.0	
fHga	±8	-2.8	-2.5	-2.4	-2.4	0.6	-3.7	-5.5		±8	3.1	-1.3	-2.4	-1.0	-0.9	-0.6	-1.0			
fka		2.8	2.7	2.6	2.6	2.0	3.1	3.9			2.9	2.4	2.4	2.0	1.8	1.9	2.0			
ffa	5	2.1	1.7	2.2	2.2	1.8	2.1	1.6		5	2.2	2.2	1.7	2.2	1.8	2.0	2.1			
Ca	-13/-5	-8.8	-9.1	-8.7	-8.7	-9.7	-8.7	-8.2		-25/-17	-21.3	-21.3	-20.6	-20.9	-20.7	-21.2	-21.0			
ffaaf	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]		110.993	[110.85/111.2]									125.171	[125.04/125.3]							



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual	
fHgm	5±4	6.0	Var β 0.9								30±4	Var β 0.6							31.5	
fHs	5±8	6.0	6.1	6.0	5.5	2.7	-6.4	9.8		30±8	35.5	31.8	28.9	31.4	31.2	31.4	31.5			
fB		2.6	2.3	2.4	2.9	2.3	2.8	4.7			5.2	3.5	1.9	2.5	2.2	2.5	2.7			
ffa	5	1.4	1.5	1.3	1.3	1.5	1.5	1.0		5	1.0	1.5	1.5	1.1	1.6	1.3	1.4			
CB	1/5	2.3	2.2	2.2	2.6	1.5	2.3	2.6		1/5	2.2	1.8	0.5	1.7	1.8	1.5	1.7			
fd	-8±8	-7.1								-8±8										

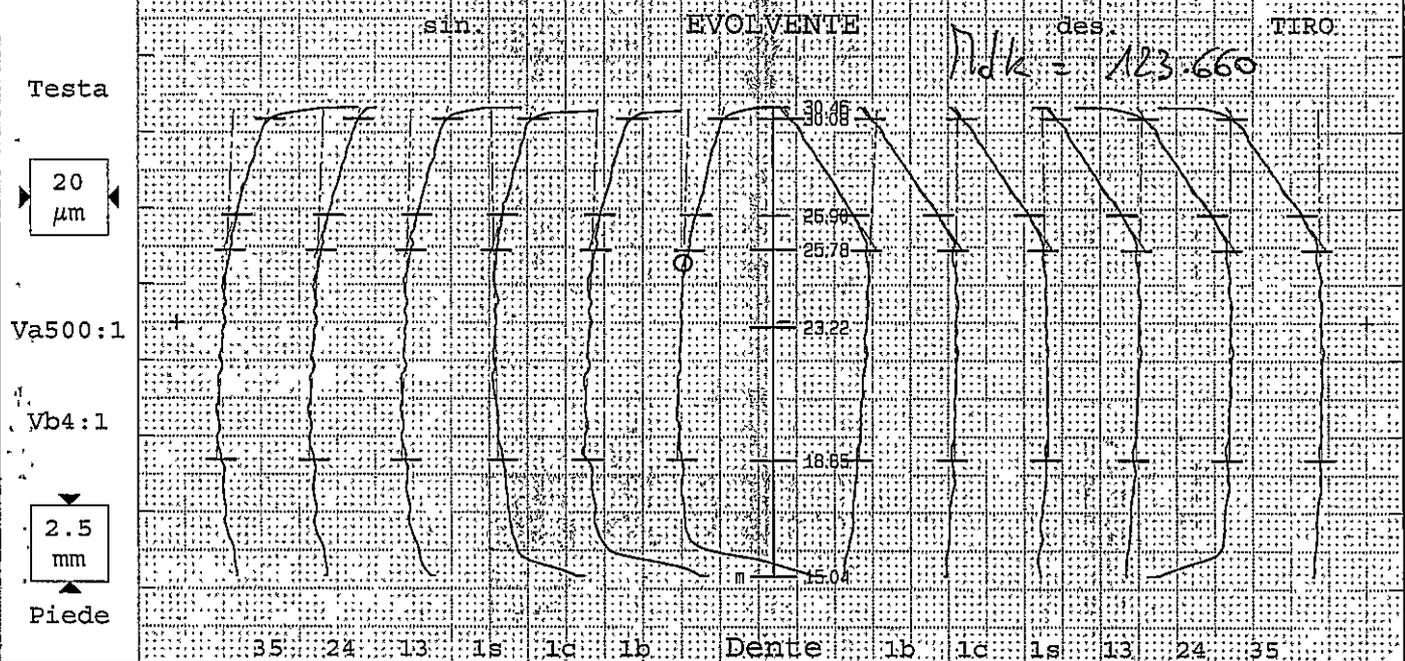


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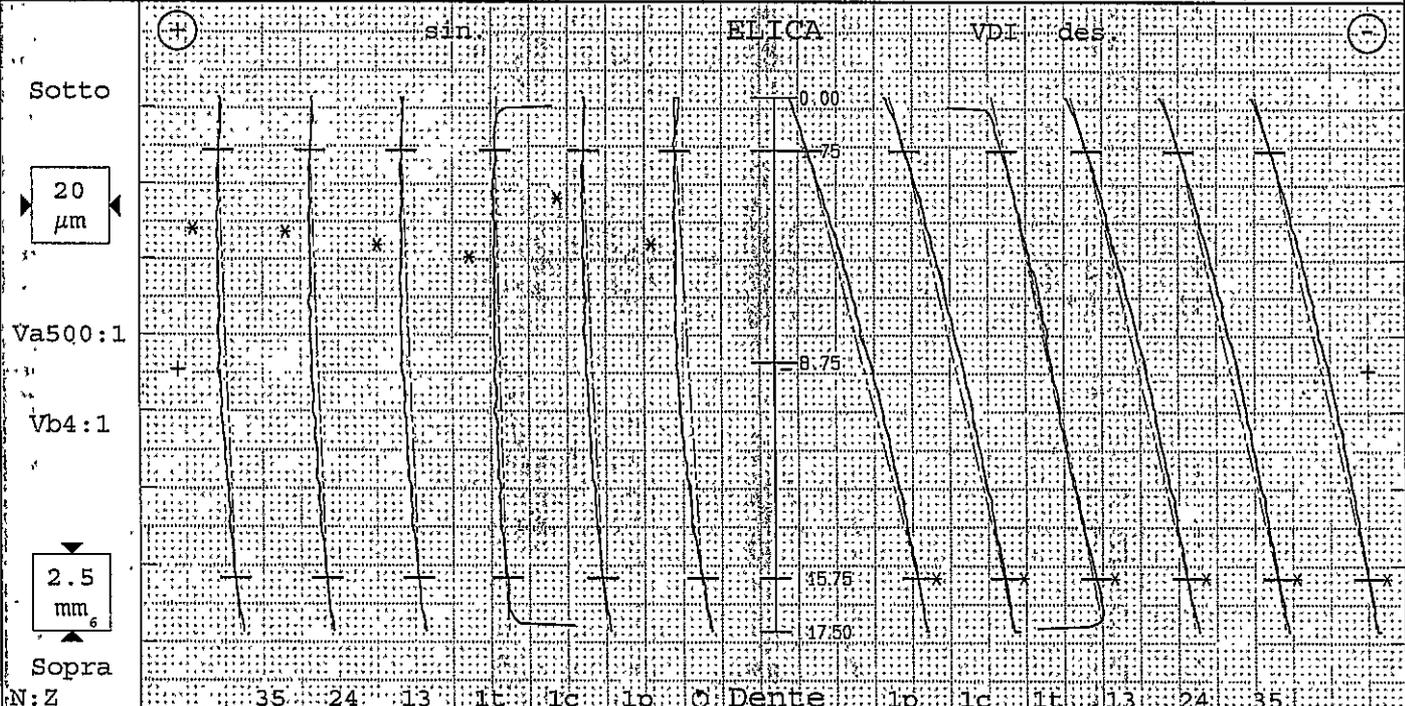
Ruota cilindrica Evolvente/Elica



Nr. prog.: STI0412 06 0	P26 B7590	Controllore: turno a	Data: 07.11.2017 04:35
Denominazione: ZR2		Numero denti: 45	Largh. fasc. dent. b: 17.5mm
Numero disegno.: D51.1.1224.50-IF		Modulo m: 2.35mm	Tratto evolv. La: 6.93mm
Commessa/serie nr.: 14 - 3		Angolo pressione: 20°	Tratto elica Ls: 14mm
Masch.Nr.: M001	Spindel: Forme elicoidale	-26°	Inizio elab. M1: 18.85mm
Untersuchungszweck: Laufende Messung	Ø Base db: 109.0551mm		Palpatore Ø (#2C) 1mm
Werkzeug: Charge:	Ang. Base: -24.326°		Fat. scor. pr. x: .185



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual		
fHm	±6	-3.5	Var a: 1.9								±6	Var a: 2.4							0.5		
fHa	±8	-3.5	-4.3	-3.7	-2.4	1.8	-3.4	-2.9		±8	4.7	1.0	-1.4	1.6	0.3	-0.8	0.5				
Fa		3.3	3.6	3.4	2.7	2.7	3.5	3.3			3.4	2.0	1.5	2.2	2.0	1.9	2.0				
ffa	5	1.9	1.9	2.0	1.9	2.3	1.8	2.0		5	1.8	1.8	1.2	1.9	1.9	1.7	1.8				
Ca	-13/-5	-8.7	-8.7	-9.0	-8.9	-10.0	-8.0	-8.7		-25/-17	-22.4	-22.6	-21.0	-22.4	-22.3	-22.3	-22.4				
ffaF	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3	0.0	0.3	0.0	0.0	0.1	0.0	0.0				
P/T-Ø [mm]		110.967	[110.85/111.2]									125.143	[125.04/125.3]								



N:Z	35	24	13	1s	1c	1b	1a	1b	1c	1s	13	24	35					
fHm	5±4	5.4	Var B: 1.0							5.4	Var B: 0.8							32.2
fHs	5±8	5.4	5.3	5.0	5.1	3.2	6.0	7.9	5.4	3.2	29.1	32.6	32.0	31.8	32.2			
fR		1.4	1.4	1.3	1.4	2.1	1.5	3.7	1.4	1.5	2.1	3.1	2.5	2.7	3.1			
ffa	5	1.0	1.1	0.9	1.0	1.1	0.9	1.0	1.0	0.8	1.8	1.0	0.9	0.9	0.9			
CS	1/5	1.7	1.7	1.6	1.9	1.3	1.6	2.9	1.7	1.7	0.6	1.7	1.8	1.8	1.8			
Bd	-8±8	-4.7								-4.7								-6.7

GGG 808006

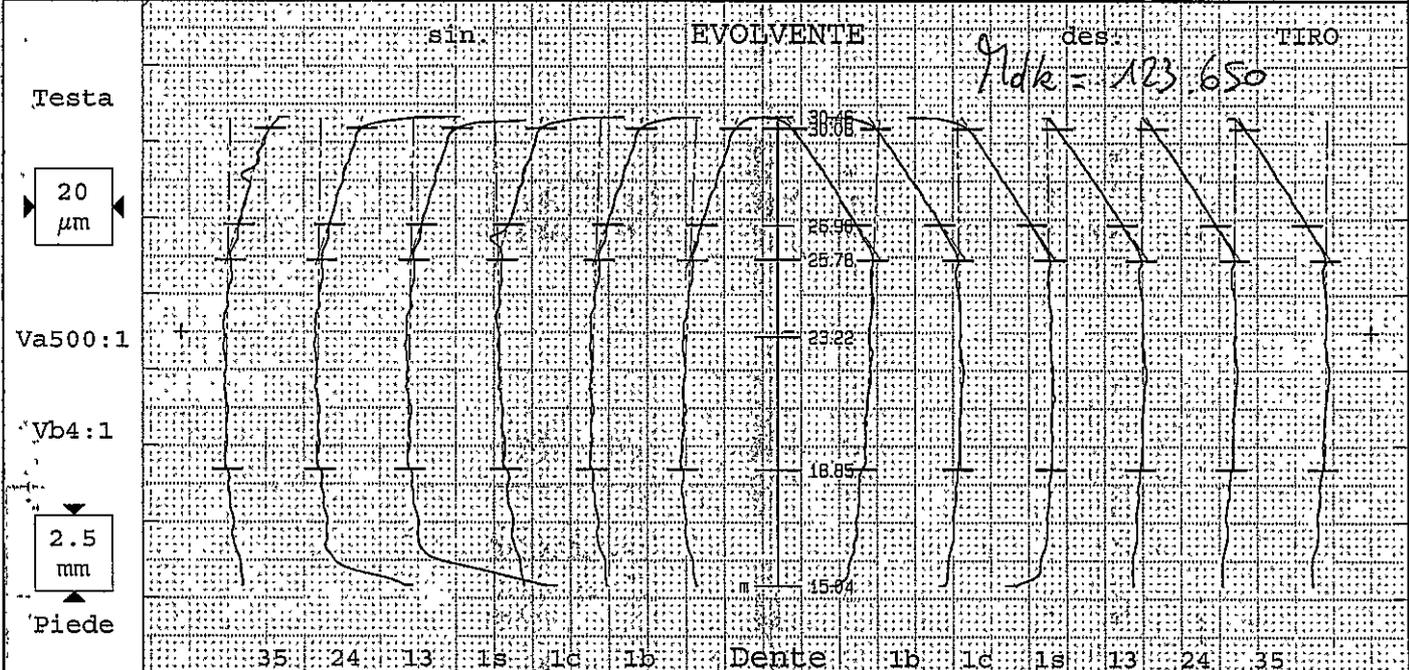
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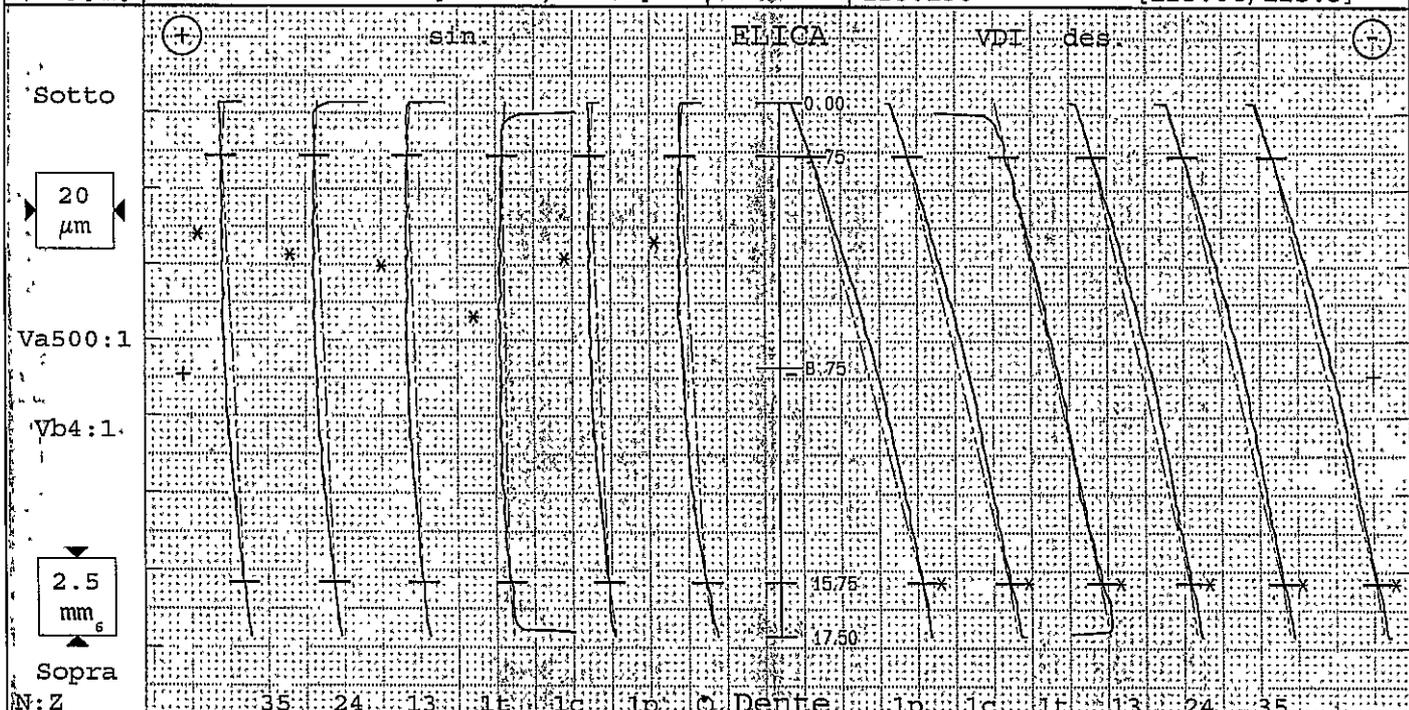
Ruota cilindrica Evolvente/Elica



Nr. prog.: STI0412 06 0	P26 B7590	Controllore: turno a	Data: 07.11.2017 05:51
Denominazione: ZR2		Numero denti: 45	Largh. fasc. dent. b 17.5mm
Numero disegno: D51.1.1224.50-IF		Modulo m 2.35mm	Tratto evolv. La 6.93mm
Commessa/serie nr.: 10 -4		Angolo pressione 20°	Tratto elica Ls 14mm
Masch.Nr.: M001	Spindel: Form. elica	Angolo elica -26°	Inizio elab. Ml 18.85mm
Untersuchungszweck: Laufende Messung	Ø Base ab 109.0551mm		Palpatore Ø (#2C) 1mm
Werkzeug: Charge:	Ang. Base -24.326°		Fat. scor. pr. x .185



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual	
fHm	±6	-1.8	Var a 1.9								±6	Var a 1.4							-0.2	
fHa	±8	-1.8	-1.5	-1.0	-1.6	2.0	-2.9	-4.1		±8	3.8	-0.8	-1.5	-0.7	0.3	0.6	-0.2			
Fa		2.4	2.3	2.3	2.5	4.0	2.6	3.3			3.1	2.1	1.9	2.0	1.6	1.8	1.9			
ffa	5	2.1	2.1	2.1	2.2	3.0	1.9	1.8		5	1.6	1.9	1.4	1.8	1.7	1.9	1.8			
Ca	-13/-5	-10.0	-9.5	-10.1	-10.1	-11.5	-10.1	-9.8		25/-17	-22.4	-21.4	-20.5	-21.8	-21.3	-21.4	-21.5			
ffaF	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]		110.978	[110.85/111.2]									125.156	[125.04/125.3]							



Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual	
fHm	5±4	5.7	Var β 1.9								30±4	Var β 2.4							32.6	
fHR	5±8	5.7	6.6	6.0	4.7	1.9	5.6	7.8		30±8	36.2	33.1	30.1	31.4	32.0	33.8	32.6			
fR		1.9	2.3	1.9	1.4	2.6	1.8	3.9			5.3	4.5	2.8	2.4	2.7	4.8	3.6			
ffa	5	1.0	1.0	0.9	1.0	0.9	0.9	1.0		5	0.7	1.0	1.6	1.1	1.0	0.9	1.0			
Ca	1/5	2.2	2.1	2.3	2.0	1.6	2.2	2.7		1/5	2.4	2.2	0.6	2.2	2.1	1.9	2.1			
Bd	-8±8	-5.9									-8±8								-6.1	

GCG 808006

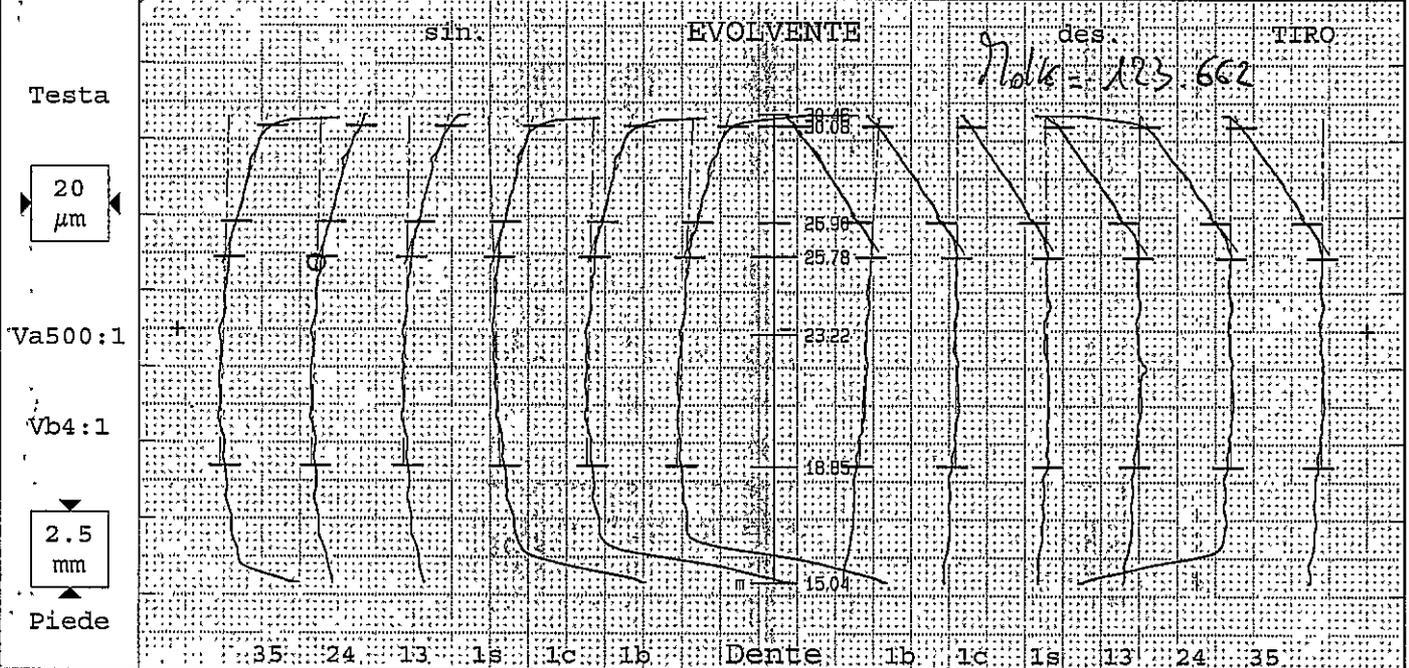
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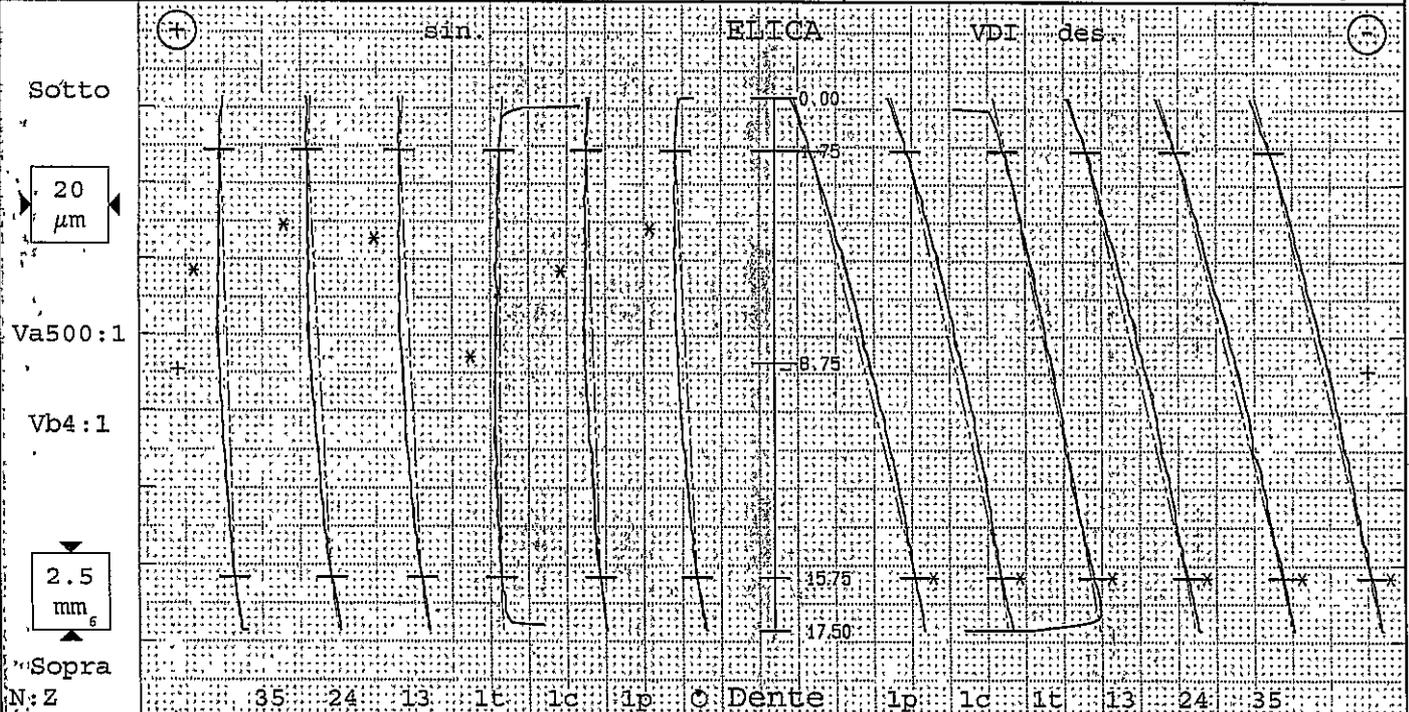
Ruota cilindrica Evolvente/Elica



Nr. prog.: STI0412 06 0	P26 B7590	Controllore: turno b	Data: 07.11.2017 07:10
Denominazione: ZR2		Numero denti z 45	Largh.fasc.dent. b 17.5mm
Numero disegno.: D51.1.1224.50-IF		Modulo m 2.35mm	Tratto evolv. La 6.93mm
Comessa/serie nr.: 6-5		Angolo pressione 20°	Tratto elica lE 14mm
Masch.Nr.: M001	Spindel: Forming	Angolo elica -26°	Inizio elab. M1 18.85mm
Untersuchungszweck: Laufende Messung		Ø Base db 109.0551mm	Palpatore Ø (#2C) 1mm
Werkzeug:	Charge:	Ang. Base -24.326°	Fat.scor.pr. x .185

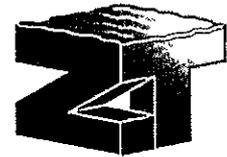


Tolerance	Medio	Val. misur [µm]							Qual	Tolerance	Val. misur [µm]							Medio	Qual
fHm ±6	-2.0	Var a 0.9								±6	Var. a 0.6							0.4	
fHa ±8	-2.0	-2.3	-2.5	-1.6	2.8	-1.7	-4.2		±8	5.1	0.6	-0.6	0.4	0.0	0.5	0.4			
Fa	2.8	2.9	3.1	2.7	3.1	2.6	3.3			4.2	1.9	1.7	3.4	1.7	1.8	2.2			
ffa 5	2.3	2.5	2.3	2.1	2.3	2.4	2.1		5	1.6	1.8	1.8	3.3	1.7	1.7	2.1			
Ca -13/-5	-9.5	-9.4	-9.5	-9.6	-10.8	-9.4	-8.7		-25/-17	-21.6	-20.8	-19.5	-21.2	-21.4	-21.2	-21.2			
ffaf 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]	110.982	[110.85/111.2]								125.156	[125.04/125.3]								



N: Z	35	24	13	1t	1c	1p	Ø	Dente	1p	1c	1t	13	24	35	
fHm 5±4	5.7	Var β 3.1						30±4	Var β 4.1						32.9
fHs 5±8	5.7	4.5	7.3	6.6	0.1	4.2	6.8	30±8	34.3	30.7	28.1	33.0	34.8	32.9	32.9
Fβ	2.2	1.6	3.0	2.8	3.6	1.5	2.1		4.1	2.7	2.1	3.8	4.9	4.0	3.9
FFβ 5	0.9	0.9	1.0	0.8	1.2	1.0	0.7		5	1.1	1.0	1.6	1.3	1.4	1.2
Cβ 1/5	2.2	2.1	2.3	2.3	1.3	2.0	2.2		1/5	1.8	2.0	0.6	1.8	1.5	1.7
Bd -8±8	-6.7							-8±8							-6.2





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

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Attn. to Mr. Blasotta
Forniture Tecniche Meridionali
Via di San Giuliano 47
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delivery address: Sophie-Henschel-Haus
Mönchebergstraße 3
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phone: 0049-561/804-3657

telefax: 0049-561/804-3662

our reference
MPT-I2_rep

person in charge
Dipl.-Ing. Django Baunack

phone: 0049561/804-
3657

date:
17 November 2017

Order-No. 4500495530

Test Report

Object of examination:

One specimen of each part number has been examined. Residual stress measurements have been performed in accordance 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.

Pos.	Part name	Part number	Gear teeth to be checked	Measuring Pos.			Depth Profile in μm
				A	B	C	
1	Input shaft outer	2516121835	I		X		5, 20, 40, 60, 80
2	Input shaft outer	2516121835	I		X		5, 20, 40, 60, 80
3	Double Gear	25111122350	II	X			5, 20, 40, 60, 80

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:

<u>Diffractometer:</u>	F2
Radiation:	Cr $k\alpha$
Crystal lattice:	{211}
Crystal orientation (ψ -angle):	0°; $\pm 18^\circ$; $\pm 27^\circ$; $\pm 33^\circ$; $\pm 39^\circ$; $\pm 45^\circ$
Diffraction angle range (2θ):	148° - 164°
Step-feeding:	0.1°
Primary aperture:	$\varnothing 1.0$ mm for measuring point A and F 0.5 x 4.0 mm ² 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:	$\Theta_0 = 78.035^\circ$
X-ray elastic constant:	$\frac{1}{2}S_2 = 6.09 \cdot 10^{-6}$ mm ² /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
0.005	-740 +-38	5,88
0.020	-950 +-48	5,36
0.040	-1135 +-56	6,10
0,060	-1110 +-57	5,99
0,080	-1055 +-52	6,15

Table 1: Residual stresses and integral width; Input shaft outer; 2516121835; Position B

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,004	-695 +-30	5,96
0,021	-705 +-35	5,86
0,041	-930 +-45	5,93
0,060	-1055 +-50	5,93
0,080	-865 +-45	5,92

Table 2: Residual stresses and integral width; Input shaft outer; 2516121835; Position B

Distance from the surface in mm	Residual stresses σ^{ES} in MPa	Integral width IW in degree
0,004	-805 +-45	5,77
0,022	-1030 +-55	5,92
0,040	-1070 +-50	5,86
0,062	-1145 +-50	5,96
0,080	-960 +-45	6,09

Table 3: Residual stresses and integral width; Double Gear; 25111122350; Position A

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



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 described 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.

REPORT 18/004

Date 04/01/2018
Author: R. Padolecchia

Reason for analysis: <i>Motivo dell'indagine:</i>	PPAP
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Requester: <i>Richiedente:</i>	WLQ - M. Vicenti
-----------------------------------	------------------

Part Name: <i>Nome particolare:</i>	DG
Material: <i>Materiale:</i>	GCG_805000 Part 2
State of part: <i>Stato del particolare:</i>	Finito

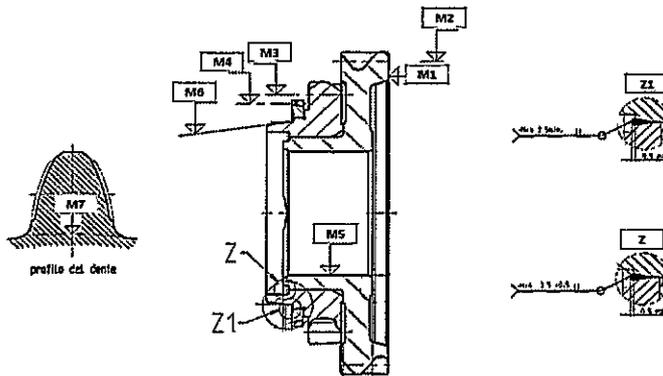
P/N:	251.1.1223.50
S/N:	-
Customer: <i>Cliente:</i>	Renault

Result: <i>Risultato:</i>	OK
------------------------------	----

Distribution list: <i>Lista di distribuzione:</i>	WLQ - M. Vicenti
--	------------------

Notes: <i>Note:</i>	Versione 21 A
------------------------	---------------

Drawing (Disegno)



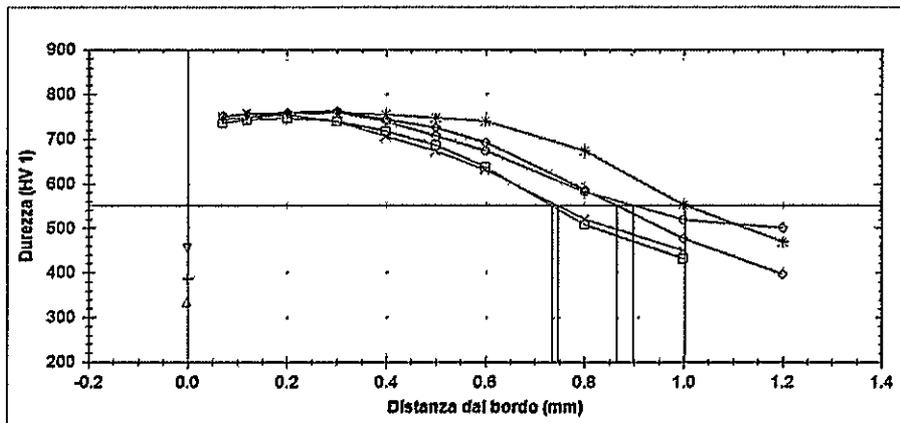
Picture 1: posizioni di misura a disegno.

Surface hardness verification (verifica durezza superficiale)

Component	Scale	Position	Measured Value	Range
Gear	HRC	M1	60,8	-
Gear	HRA	M1	82,5	80,5 + 2,5

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

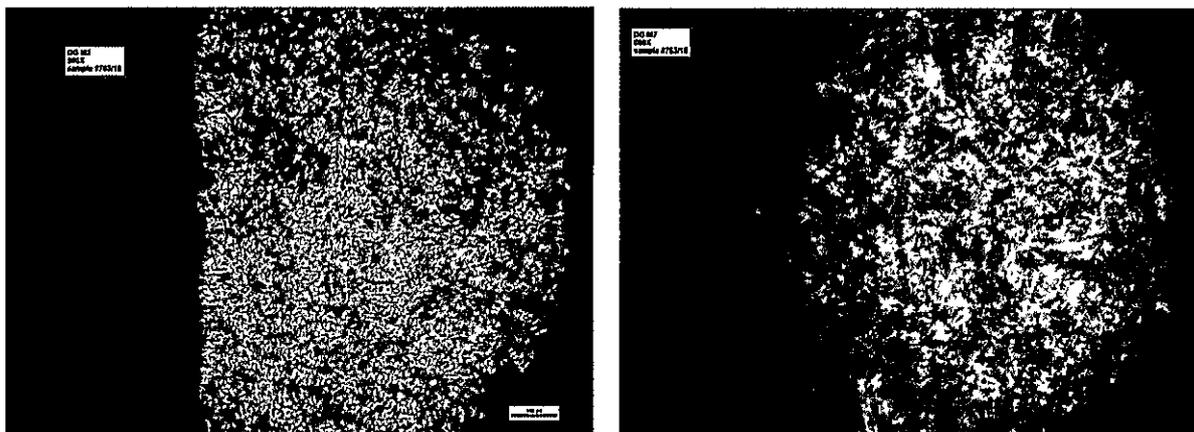
Component	Scale	Sample #	Position	Measured Value	Range
Gear	CHD 550 HV1	763/18	M2 (tooth flank)	0.89	0.5 + 0.4 mm
Gear	CHD 550 HV1	763/18	M3 (tooth flank)	0.87	0.5 + 0.4 mm
Gear	CHD 550 HV1	763/15	M4 (tooth flank)	1.00	0.5 mm min.
Gear	CHD 550 HV1	763/18	M5 (Bore)	0.75	0.3 mm min.
Gear	CHD 550 HV1	763/18	M6 (Cone)	0.73	0.40 mm min.
Core Hardness	Core hardness HV10	763/18	M7 (tooth core G2nd)	435	≥ 300
Core Hardness	Core hardness HV10	763/18	M7 (tooth core DG_Rev)	334	≥ 300
Core Hardness	Core hardness HV10	763/18	M7 (tooth core KK)	387	≥ 300



Picture 2: profili di durezza

Microstructure analysis (analisi della microstruttura)

Sample #	360/18
Gear - Tooth flank surface structure:	Martensite e austenite residua (5-10%)
Gear - Tooth base core structure:	Martensite, bainite



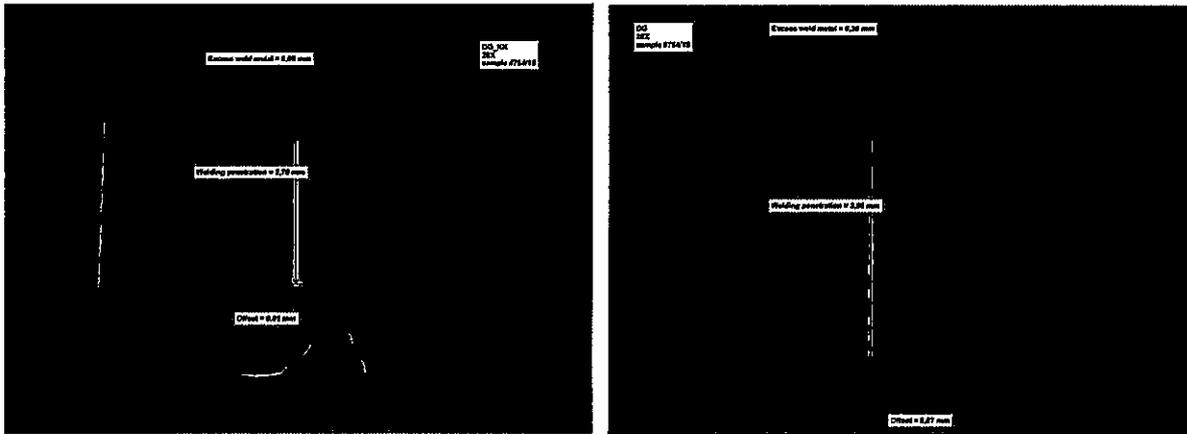
Picture 3: Microstruttura sul fianco dente (a sinistra) ed a cuore sulla base dente (a destra).

REPORT 18/004

Date 04/01/2018
 Author: R. Padolecchia

Analysis at Stereomicroscope (Analisi allo Stereomicroscopio)

Part	Radial Offset [mm]	Penetration [mm]	Excess weld metal	Sample#
DG 2nd_Rev (Z)	0.07	3.98	0.3	764/18
Range	max 0.1	3.5 + 0.5 mm	max 0.5	
DG_KK (Z1)	0.05	3.05	0.08	764/18
Range	max 0.1	2.5 min	max 0.5	



Picture 4: Sezione saldatura, posizione Z (a sinistra), posizione Z1 (a destra)

REPORT 18/009

Date: 04/01/18
Author: R. Padolecchia

Reason for analysis: PPAP
Motivo dell'indagine: G_904340-2 part compliance control

Requester: WLQ - Stefano Picerno
Richiedente:

Part Name: 7 DCT 300 gearset - 21A variant
Nome particolare:
Material: GCG_805000 Part 2
Materiale:
State of part: Finished
Stato del particolare:

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

Result: OK
Risultato:

Distribution list: WLQ - S. Picerno
Lista di distribuzione: ME - L. Landriscina

Notes:
Note:
Spray equipment: Flushing cabinet Hydac CTU-1230-M-Z-R
Spray method: QPS 130033 (gears)
QPS 130034 (shafts)
Membrane material: cellulose nitrate
Pore size [mm]: 5,0

Cleanliness Analysis (Analisi della Pulizia)

Part	P/N	Washing Machine	Detergent	Sampling date	Wetted surface [cm2]	Gravimetric evaluation [mg/1000cm ²]	Max Allowable [mg/1000cm ²]
SG1	251.1.1081.50	ORE 11033	NC 3300	21/12/17	627.41	0.70	2.5
DG	251.1.1223.50	ORE 11033	NC 3300	18/12/17	613.40	1.40	2.5
SG3	251.1.1225.50	ORE 11033	NC 3300	21/12/17	401.6	1.80	2.5
SG4	251.1.1226.50	ORE 11033	NC 3300	21/12/17	344.46	1.05	2.5
SG5	251.1.1228.50	ORE 11033	NC 3300	20/12/17	340.18	1.16	2.5
SG6	251.1.1230.50	ORE 11033	NC 3300	20/12/17	277.62	1.02	2.5
SG7	251.1.1232.50	ORE 11033	NC 3300	20/12/17	152.64	0.85	2.5
REV	251.1.1094.50	ORE 11033	NC 3300	02/01/18	434.08	1.04	2.5
RG	251.1.1080.50	ORE 11033	NC 3300	02/01/18	1036.22	1.25	2.5
DG_Fix	251.1.1220.35	ORE 11033	NC 3300	02/01/18	561.69	1.55	2.5
IS1	251.6.1073.35	ORE 11033	NC 3300	03/01/18	416.99	2.03	2.5
IS2	251.6.1218.35	ORE 11033	NC 3300	03/01/18	671.89	1.09	2.5
OS1	251.6.1076.35	ORE 11033	NC 3300	04/01/18	610.51	1.98	2.5
OS2	251.6.1078.35	ORE 11033	NC 3300	04/01/18	514.21	1.51	2.5

