



## INSPECTION CERTIFICATES INTEGRALLY GEARED BOOSTER AIR COMPRESSOR FOR

AIR LIQUIDE AGS GMBH, KREFELD(DE) FOR US STEEL KOSICE, KOSICE(SLOVAKIA)

CLIENTS P.O. NO. : 2912  
MAN TURBO JOB CODE : KOSBOOST  
MAN TURBO JOB NO. : 312411  
MACHINE NUMBER : 26-1152

CERTIFICATION ACCORDING TO INSPECTION PLAN MAN TURBO DOC NO.: 10000195926

### INDEX 6 IMPELLER-OPEN DESIGN

COMPONENT / CERTIFICATE	RECORD NO.
MATERIAL CERTIFICATE	6.1
IMPELLER OVERSPEED TEST	6.2
SURFACE CRACK TEST	6.3

**forge monchieri** *fm*  
forging heat-treating and machining of stainless steels and special alloys

12 NOV. 2004  
Ruppert  
TPB32

COMPANY WITH  
INTEGRATED MANAG-  
SYSTEM CERTIFIED BY  
ISO 9001:20  
ISO 14001:11

03-nov-04

Civate Camuno, li  
Date

foglio  
Pag. WAREHOUSE

97001583

**RAPPORTO D'ISPEZIONE** / **Inspection report**  
Inspection report according to EN10204 3.1.B

12 Nov. 2004

13227 /04

EINGEGANGEN

Cliente - Client

MAN Turbo AG

Ordine - Order

M13/4500182734 of 25-set-04

Nostra commessa  
Job N.

523 /04

Materiale  
Material

X3CrNiMo13-4 (1.4313) + QT930  
Quenched & Tempered

Specifica  
Specification

TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1

Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :

Pos./Item	Q.ty	Description	Prova/Test	Colata/Heat
00010	1	Stück	Dwg Ø350 x 3000mm	Kontierung : 97001583
				2311 400011

**LISTA DEI CERTIFICATI / List of enclosed certificates**

Rapporto d'ispezione	Inspection report	n.	13227
Analisi chimica	Chemical analysis	n.	13228
Prove meccaniche	Mechanical test	n.	13229
Prova di durezza	Hardness test	n.	13229
Esame ultrasuoni	Ultrasonic test	n.	13231
Esame magnetoscopico	Magnetic test	n.	
Esame liquidi penetranti	Liquid penetrant test	n.	
Controllo dimensionale	Dimensional check	n.	13233
Trattamento termico	Heat treatment	n.	13230
Esame micrografico	Micrographic examination	n.	
Esame macrografico	Macrographic examination	n.	
Controllo Inclusionale	Inclusion Content	n.	13232
Prova Jominy	Jominy test	n.	
Prova di corrosione	Intergranular corrosion test	n.	
Prova di ctod	Ctod test	n.	
Prova di drop weight	Drop weight test	n.	
Prova di permeabilità	Magnetic Permeability	n.	

I controlli eseguiti sono conformi all'ordine e specifiche del materiale  
Drawn up on behalf of TUV Bayern (06.1992)

☒ Conforme alla specifica - Acc. to specification

☐ Non conforme alla specifica - Not Acc. to specification

note  
notes

Beleg-Nr.  
record no. 6.1  
Blatt  
sheet 1 von  
of 8

Operatore  
Operator

Enti collaudatori  
Inspection Authorities

Responsabile controllo qualità  
Quality control manager

**FORGE MONCHIERI S.p.A.**  
Ing. Giovanni Fantini

03-nov-04

Cividate Camuno, li  
Date

foglio  
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of

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## ANALISI CHIMICA

## Chemical Analysis report

N.

13228 /04

Inspection report according to EN10204 3.1.B

**Cliente - Client**

### Ordine - Order

**MAN Turbo AG**

M13/4500182734 of 25-set-04

Nostra commessa  
*Job N.*

523 /04

**Materiale**  
***Material***

**X3CrNiMo13-4 (1.4313) + QT930**

## Quenched & Tempered

## Specifica Specification

**TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1**

*Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :*

**Pos./Item**  
**00010**

Q.ty

Stück

### Description

Dwg Ø350 x 3000mm

Kontierung : 97001583

Prova/Test	Colata/Hea
2311	400011

2311

400011

[illegible]

☒ Conforme alla specifica - *Acc. to specification*

☐ Non conforme alla specifica - *Not Acc. to specification*

note Acciaio elaborato al forno elettrico + AOD  
notes Steel made by electric furnace process + AOD.

Beleg-Nr. 6.1  
record no.  
Blatt 2 von 8  
sheet of

Operatore  
*Operator*

**Enti collaudatori**  
**Inspection Authorities**

**Responsabile controllo qualità**  
*Quality control manager*

**FORGE MONCHIERI S.p.A.**  
— Ing. Giovanni Fagnini —

Civate Camuno, li 03-nov-04 ..... foglio 1 di 2  
Date Page of

**PROVE MECCANICHE** / **Mechanical Test report** N. **13229 /04**  
 Inspection report according to EN10204 3.1.B

**Cliente - Client**

**MAN Turbo AG**

Ordine - *Order*

**M13/4500182734 of 25-set-04**

Nostra commessa  
Job N.

523 /04

**Materiale**  
**Material**

**X3CrNiMo13-4 (1.4313) + QT930**  
**Quenched & Tempered**

## Specifica Specification

**TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1**  
**DIN EN 10088-3**

*Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :*

Pos./Item	Q.ty		Description		Prova/Test	Colata/Heat
00010	1	Stück	Dwg Ø350 x 3000mm	Kontierung : 97001583	2311	400011

[illegible]

☒ Conforme alla specifica - *Acc. to specification*

☐ Non conforme alla specifica - *Not Acc. to specification*

ote *Forging ratio*  $> 4$ .

otes The residual magnetism at delivery is less than 400 A/m

Belsg-Nr.  
record no. 6.1

Blatt sheet 3	von of 8
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peratore  
*perator*

**Enti collaudatori**  
***Inspection Authorities***

**Responsabile controllo qualità**  
*Quality control manager*

**FORGE MONCHIERI S.p.A.**  
*Ing. Giovanni Fantini —*

**PROVE MECCANICHE** / **Mechanical Test report** N. **13229 /04**  
Inspection report according to EN10204 3.1.B

M13/4500182734 of 25-set-04

**X3CrNiMo13-4 (1.4313) + QT930**  
**Quenched & Tempered**

**TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1**  
**DIN EN 10088-3**


Pos./Item	Q.ty	Description	Prova/Test	Colata/Hea
00010	1	Dwg Ø350 x 3000mm Kontierung :	97001583	2311 400011

☐ Non conforme alla specifica - Not Acc. to specification

Beleg-Nr. record no.		6.1
Blatt sheet	4	von of 8

**Responsabile controllo qualità**  
*Quality control manager*

**FORGE MONCHIERI S.p.A.**  
— Ing. Giovanni Fontini —

**forge monchieri** 

forging heat-treating and machining of stainless steels and special alloys

COMPANY WITH  
INTEGRATED MANA  
SYSTEM CERTIFIED  
= ISO 9001:2  
ISO 14001:2

03-nov-04  
Cividate Camuno, li ..... foglio 1 di 1  
Date Page of

**TRATTAMENTO TERMICO / Report of Heat Treatment** N. 13230 /04  
Inspection report according to EN10204 3.1.B

Cliente - Client

MAN Turbo AG

Ordine - Order

M13/4500182734 of 25-set-04

Nostra commessa  
Job N.

523 /04

Materiale  
Material

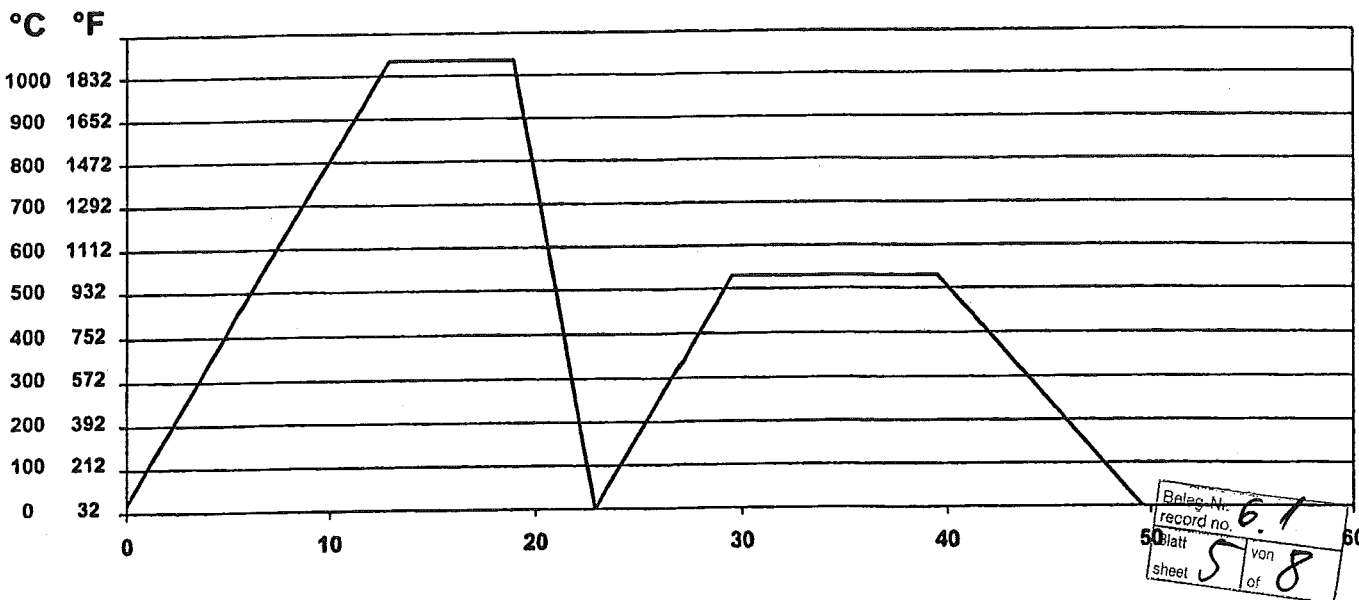
X3CrNiMo13-4 (1.4313) + QT930  
Quenched & Tempered

Specifica  
Specification

TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1  
DIN EN 10088-3

Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :

Pos./Item	Q.ty	Description	Prova/Test	Colata/He
00010	1	Stück Dwg Ø350 x 3000mm Kontierung : 97001583	2311	400011



Blatt N. 6.1  
record no. 5  
sheet 5 of 8

☒ Conforme alla specifica - Acc. to specification

☐ Non conforme alla specifica - Not Acc. to specification

note  
notes

Tratt. Termico Heat treatment	Salita a Heating to	Permanenza Holding time	Raffreddamento Cooling	Gradiente Termico Heating rate
Austenitizz. - Austenitize	1035 °C 1895 °F	6 h	Aria Air	80 °C/h 144 °F/h
Rinvenimento - Tempering	530 °C 986 °F	10 h	Aria Air	80 °C/h 144 °F/h
	°C °F	h		°C/h °F/h

Operatore  
Operator

Enti collaudatori  
Inspection Authorities

Responsabile controllo qualità  
Quality control manager

**FORGE MONCHIERI S.p.A.**  
Ing. Giovanni Mantini



Civate Camuno, li 03-nov-04 foglio 1 di 1  
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COMPANY WITH  
INTEGRATED MANAGE  
SYSTEM CERTIFIED B  
= ISO 9001:20  
ISO 14001:1

# ESAME ULTRASONORO / Ultrasonic Test report N. 13231 /04

Inspection report according to EN10204 3.1.B

Cliente - Client

MAN Turbo AG

Ordine - Order

M13/4500182734 of 25-set-04

Nostra commessa  
Job N.

523 /04

Materiale  
Material

X3CrNiMo13-4 (1.4313) + QT930  
Quenched & Tempered

Specifica  
Specification

TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1  
SEP 1923 A3-A8 Cl.2b

Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :

Pos./Item	Q.ty	Description	Kontierung :	Prova/Test	Colata/Hea
00010	1	Stück Dwg Ø350 x 3000mm	97001583	2311	400011

Condizioni Superficiali - Surface condition <input checked="" type="checkbox"/> Grezzo - As forged <input checked="" type="checkbox"/> Sgrossato - Machined				Accoppiante - Couplage <input checked="" type="checkbox"/> Olio SAE 30 - Oil SAE 30 <input checked="" type="checkbox"/> Metilcellulosa - Methylcellulose			
<input checked="" type="checkbox"/> USM3S - Krautkramer Matricola N.30178/928				<input type="checkbox"/> USIP 11 - Krautkramer Matricola N.20178-5492			
<input checked="" type="checkbox"/> AVG Diagramma AVG Diagramm				<input type="checkbox"/> Eco di Riferimento Reference Eco			
<input type="checkbox"/> Blocchi di Calibrazione Calibration Blocks				<input checked="" type="checkbox"/> Ø 2mm			
<input checked="" type="checkbox"/> Blocco V1 Block V1				<input type="checkbox"/> Blocco V2 Block V2			
Sonde - Probes	Tipo Type	Frequenza Frequency	Angolo Angle	Amplificazione Amplification	Potenza Damping	Note Note	
	<input checked="" type="checkbox"/> B2SN Ø 24 mm.	2 Mhz	0°	dB			
	<input checked="" type="checkbox"/> B4SN Ø 24 mm.	4 Mhz	0°	dB			
	<input type="checkbox"/> DD25/2 Ø 24 mm.	2 Mhz	0°	dB			
	<input type="checkbox"/> MB4SN Ø 10 mm.	4 Mhz	0°	dB			
	<input type="checkbox"/> WB35N2 20x22 mm.	2 Mhz	35°	dB			
	<input type="checkbox"/> MWB35N2 8x9 mm.	2 Mhz	35°	dB			
	<input checked="" type="checkbox"/> WB45N2 20x22 mm.	2 Mhz	45°	dB			
<input type="checkbox"/> MWB45N2 8x9 mm.	2 Mhz	45°	dB				

☒ Conforme alla specifica - Acc. to specification

☐ Non conforme alla specifica - Not Acc. to specification

note L'esame è stato eseguito sul 100% del volume. Nessuna indicazione rilevata.

notes The ultrasonic examination has been carried out on 100% of volume. No indication has been detected

Beleg-Nr.  
record no. 6.1  
Blatt 6 von 8  
sheet of

Operatore  
Operator

QUALITY CONTROL

Morandini Dario  
II° LEVEL UT-MT-LP

Enti collaudatori  
Inspection Authorities

Responsabile controllo qualità  
Quality control manager

FORGE MONCHIERI S.p.A.  
Ing. Giovanni Fantini

Civate Camuno, li 03-nov-04 foglio 1 di 1  
Date Page of

**ESAME MICROGRAFICO / Micrographic Examination report N. 13232 /04**  
Inspection report according to EN10204 3.1.B

Cliente - Client

MAN Turbo AG

Ordine - Order

M13/4500182734 of 25-set-04

Nostra commessa  
Job N.

523 /04

Materiale  
Material

X3CrNiMo13-4 (1.4313) + QT930  
Quenched & Tempered

Specifica  
Specification

TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1  
DIN 50602

*Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :*

Pos./Item	Q.ty	Description	Prova/Test	Colata/Heat
00010	1	Stück	Kontierung : 97001583	2311 400011

Determinazione del contenuto di inclusioni nell'acciaio Determining the inclusion content of steel				
Conforme DIN 50602 Ed.1985 Metodo K Conform to DIN 50602 Ed.1985 method K				
Colata Heat	Gruppo - Type			
	SS	OA	OS	OG
	(Solfuri) (Sulfides)	(Allumina) (Alumina)	(Silicati) (Silicates)	(Ossidi) (Oxides)
400011				
				GRADO Grade K4 6,9

☒ Conforme alla specifica - Acc. to specification

☐ Non conforme alla specifica - Not Acc. to specification

note  
notes

Beleg-Nr.  
record no. 6.1  
Blatt 7 von 8  
sheet of

Operatore  
Operator

Enti collaudatori  
Inspection Authorities

Responsabile controllo qualità  
Quality control manager

**FORGE MONCHIERI S.p.A.**  
*Ing. Giovanni Fantini*



**ESAME VISIVO DIMENSIONALE / Dimensional and Visual check report N. 13233 /04**  
Inspection report according to EN10204 3.1.B

Cliente - Client

MAN Turbo AG

Ordine - Order

M13/4500182734 of 25-set-04

Nostra commessa  
Job N.

523 /04

Materiale  
Material

X3CrNiMo13-4 (1.4313) + QT930  
Quenched & Tempered

Specifica  
Specification

TLV 1100 / Blatt 000 / Rev.00 - EN 10088-1

*Forgiati sgrossati di macchina atti ad ottenere quanto segue / Forgings rough machined to obtain as following :*

Pos./Item	Q.ty	Description	Prova/Test	Colata/Heat
00010	1	Stück Dwg Ø350 x 3000mm Kontierung : 97001583	2311	400011

Il controllo visivo dimensionale eseguito sui pezzi in oggetto ha dato esito favorevole. <i>The visual and dimensional check has been satisfactory carried out on the above mentioned pieces</i>	
Marcatura - Marking	
Ordine / Order	M13/4500182734
Disegno / Drawing	Ø350 x 3000mm
Materiale / Material	X3CrNiMo13-4 (1.4313) + QT930
Colata / Heat	400011
Prova / Test	2311
Matricola / Identification	97001583
Marchio del "Fornitore" / Forge master stamp	
Marchio dell'ispettore esterno / Inspector stamp	



☒ Conforme alla specifica - Acc. to specification

☐ Non conforme alla specifica - Not Acc. to specification

note The forgings are free from cracks  
notes

Beleg-Nr. record no	6.1
Blatt sheet	8 von 8

Operatore  
Operator

Enti collaudatori  
Inspection Authorities

Responsabile controllo qualità  
Quality control manager

**FORGE MONCHIERI S.p.A.**  
Ing. Giovanni Fantini

# Abnahmeprüfzeugnis / Inspection Certificate

EN 10204 - 3.1B

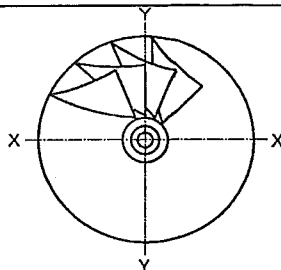
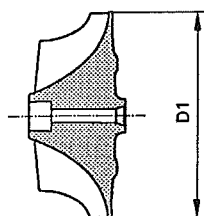
## Überdrehzahltest / Overspeed test



MAN TURBO AG

Verteiler:  
Distributor

Bezeichnung: Designation:	LAUFRAD IMPELLER	Auftrags Nr.: Job no	312410
Bemerkung: Remark		Kennwort: Code	KOSBOOST
FAUF-Nr. Production job no	1081135	Stufe Nr.: Stage no	1
Schleudernanlage Typ: Overspeed test machine type	BIU 4	PSP-Element: Assembly group	312411.11
Standort / Inv. Nr.: Workshop / Inv. no	TPB35 / ABF 0031	Zeichnung Nr.: Drawing no	10000208160



max. Betriebsdrehzahl (max. continuous speed)  
 $n_{max} = 21261 \text{ min}^{-1}$   
 Überdrehzahl (Overspeed)  
 $n_{over} = 24450 \text{ min}^{-1}$   
 Haltezeit (Duration)  
 $t_{over} = \text{min}$

Meßstelle Measuring point	Abmessungen vor dem Test Dimensions before overspeed test		Abmessungen nach dem Test Dimensions after overspeed test	
	X - X	Y - Y	X - X	Y - Y
D1 Radscheibe (mm) Hub disc	309.99	309.99 f 10.2.05	309.99	309.99

zul. bleibende Verformungen: 312411.11.2441  
 perm. permanent deformations in acc. with AA-09-432/A, 11.2441  
 Außen-Drm./Outer diam. max. 1%  
 Wellen-Bohr./Shaft bore max. 0,1 %  
 zul. Maßabweichung infolge Meßunsicherheit: 0,05 ‰ + 0,01 mm  
 perm. dimensional variation based on inaccuracy of measurement

Beleg-Nr. record no.	6-2
Blatt page	1 von 1

Ergebnis der Maßprüfung nach dem Überdrehzahltest: Keine bleibenden Verformungen  
 Result of the dimension check after overspeed test no permanent deformations

	Prüfer Inspector	Werksachverständiger Works Authorized Inspector	Sachverständiger / Kunde Independent Inspector / Customer
Unterschrift Signature	Schumann	MAN TURBO TQB	
Stempel Stamp	09. MAI 2005 10603	07. JUNI 2005	Witnessed Reviewed by: D. DEBROUX date: 9.5.05
Datum Date	9.5.05	APPROVED	INTERNATIONAL

# Abnahmeprüfzeugnis 3.1.B nach DIN EN 10204

Inspection certificate / Certificat de réception

## Eindringprüfung

Penetrant examination

Contrôle par ressuage



MAN Turbomaschinen AG

VERTEILER Copy to Distributor	ANZAHL / BEZEICHNUNG: Quantity / Part name Quantité / Désignation		Lauftrad / impeller / turbine Stufe/Stage 1	
	KUNDENAUFTRAGS-NR.: Customer's order no. N° de commande du client	312410	MASCHINEN-NR.: Machine No. N° de machine	26-1152
	KENNWORT: Code Code	KOSBOOST	FERTIGUNGS-AUFTRAGS-NR.: Manufacturing order no. N° de commande d'usinage	1081135
	PROJEKTSTRUKTURPLAN (PSP): Project structure plan Plan de structure du projet	312411.11.2441	MATERIAL-NR.: Material no. N° de matériau	200257940
	SCHWEIßNAHT-NR.: Weld seam No: N° de soudure	---	WERKSTOFF: Material Matériau	X3CrNiMo13-4
	OBERFLÄCHENZUSTAND: Surface Condition État de surface <input checked="" type="checkbox"/> BEARBEITET Machined Étude terminée <input type="checkbox"/> UNBEARBEITET Unmachined Non étudié		ABNAHME NACH: Acceptance according to Réception conforme à	
	PRÜFUMFANG/-BEREICH: Scope of test / Test area Etendue de l'essai / domaine 100% / <input checked="" type="checkbox"/> INNEN Internal À l'intérieur <input checked="" type="checkbox"/> AUSSEN Outside Dehors		PRÜFUNG NACH: Testing according to Examen conforme à	
	PRÜFZEITPUNKT: Test moment Moment de contrôle <input checked="" type="checkbox"/> GESCHLEUDERT Overspeed tested Essayé survitesse <input type="checkbox"/> GEWUCHTET Blanced Équilibré		<input checked="" type="checkbox"/> WÄRMEBEHANDELT Heat treated Traitement thermique <input type="checkbox"/> FERTIG BEARBEITET Final machined Fin	

EINDRINGSYSTEM (EN 571-1): Penetrant system Type de pénétrant		EN 571-1-IIAd-2		PRÜFTEMPERATUR (°C): Test temperature Température d'essai		15 < T < 15 <input type="checkbox"/> T < 50 <input checked="" type="checkbox"/> T > 50 <input type="checkbox"/>
EINDRINGMITTEL: Penetrant Pénétrant	TYP / Type / Type	HERSTELLER / Manufacturer / Fabricant	CHARGE / Batch / numéro du lot			
	Standard-Check	Fa. Helling	2414			
ZWISCHENREINIGER: Penetrant remover Produit de lavage	Wasser/Water/Eau	---	---			
ENTWICKLER: Developer Révélateur	Standard-Check	Fa. Helling	8117			
EINDRINGDAUER: Dwell time Durée d'imprégnation	30 min	ENTWICKLUNGSDAUER: Developing time Temps de révélateur	30 min			
BEURTEILUNGSZEITPUNKT (min): Evaluation time Moment de l'examen	≤ 10	15	30	60	BETRACHTUNGSBEDINGUNGEN / Viewing conditions / Conditions d'observation	
WESENTLICHE ÄNDERUNGEN: Major changes Changements principaux	ja/yes/oui				<input type="checkbox"/> TAGESLICHT Day light Du jour <input checked="" type="checkbox"/> KÜNSTL. LICHT Artificial light Artificielle <input type="checkbox"/> UV-LICHT UV light Ultra violets	
	nein/no/non	X		X		

Bemerkungen: Prüfung im Beisein des Kunden / Examination in the presence of the customer  
Remarks  
Remarque

Beleg-Nr. record no.	6-3
Blatt sheet	1 von 1

PRÜFERGEBNIS: Test result Résultat de l'épreuve	<input checked="" type="checkbox"/> ERFÜLLT Acceptable Conforme	<input type="checkbox"/> MIT REGISTRIERPFLICHTIGEN ANZEIGEN With recordable indications Avec indications à archiver
PRÜFER Inspector Examiné par	PRÜFAUFSICHT Inspection supervisor Visé par	WERKSACHVERSTÄNDIGER Manufacturer's authorized representative Expert de fabrication
UNTERSCHRIFT Signature Signature	gez. Michallik L-120-22184 / Level 2	Seeger 04-502-1066 / Level 3
STEMPEL / NAME Stamp / Name Cachet / Nom		MAN TURBO TQB 09. MAI 2005 Liebmann
DATUM Date Date	09. Mai 2005	09. Mai 2005
		APPROVED <i>Cal</i>
		Witnessed by: D. DEBROUX Reviewed date: 9/5/05 INTERNATIONAL