

POLITECNICO DI TORINO
ESAMI DI STATO PER L'ABILITAZIONE ALLA PROFESSIONE DI
INGEGNERE
II SESSIONE - ANNO 1997

Ramo: Ingegneria Gestionale TEMA N. 1

GRUPPO RIDUTTORE MONTATO SULLA RUOTA.

Descrizione del funzionamento

Il sistema di trasmissione con riduttore sulle ruote illustrato in Fig.1 è montato sull'asse di trasmissione di un automezzo pesante da cantiere. Il moto perviene alle ruote dal semialbero (0) il quale attraverso la ruota dentata (17) trasmette il moto ai satelliti (16) del riduttore. Questi trascinano i perni di alloggiamento dei satelliti stessi (19) rinviando il moto al portasatelliti (10) e di qui al mozzo (12), sul quale viene fissato il cerchione della ruota. I satelliti ingranano altresì con la corona (15) ed il disco dentato (13). Questi ultimi sono calettati sulla carcassa fissa (1), mentre il portasatelliti (10) può ruotare con la campana (3) attorno alla carcassa fissa (1) tramite i cuscinetti a rulli conici (7).

QUESITI

Una impresa operante nel settore degli automezzi per trasporto pesante deve costruire e montare il riduttore illustrato nella Fig. 1.

In particolare occorre definire e dimensionare il processo produttivo del componente 1 (escludendo pertanto la bussola 2) illustrato nella fig. 2. Le quote relative al semilavorato ottenuto per stampaggio a semicaldo (temperatura di stampaggio pari a 780 °C, perdite per calo fuoco trascurabili) sono evidenziate nelle Fig. 2 mediante circoletti circoscritti all'indicazione del valore delle quote stesse, mentre il soprametallo di stampaggio è evidenziato con una striscia scura tratteggiata.

Si richiede dunque di:

1. Dimensionare (in termini di forze, lavori e potenze assorbite) i processi di fabbricazione per stampaggio a semicaldo del particolare di Fig. 2, partendo da spezzoni opportunamente dimensionati e ricavati per tranciatura dalla barra.
8. Definire la struttura finale del pezzo dopo il trattamento termico previsto per ottenere la durezza specificata, il mezzo temprante più opportuno ed il tempo necessario per completare il trattamento stesso.
9. Disegnare schematicamente le figure degli stampi, indicando le dimensioni più significative del pezzo in lavorazione e del cordone di bava (ove presente).
10. Dopo aver definito la griglia dei controlli, tracciare il diagramma di flusso del *processo di fabbricazione* del pezzo finito (*comprensivo delle lavorazioni alle macchine utensili*).
11. Tracciare inoltre il diagramma ad albero relativo alle operazioni di *montaggio* dei componenti: semialbero (0), anello elastico (22), satellite (16), ghiera ed anello elastico (20), corona (15), ghiera e anello elastico (14) e (18), disco dentato (13), campana (3), carcassa (1), cuscinetti (6) e (7), viti (33), perno del satellite (19), anello paraolio (2), porta-satellite (10), ruota dentata (17), mozzo (12).
12. Costruire la carta di controllo X-R del perno sulla base dei dati riportati in tabella.
13. Determinare la tolleranza naturale del processo.
8. Determinare la percentuale di prodotto fuori dai limiti di specifica $\Phi 28,7_{-0,016}^{+0,007}$ nell'ipotesi che la popolazione segua una distribuzione normale.
9. Valutare i coefficienti di capacità del processo.
10. Discutere le modalità organizzative e gestionali del controllo e le procedure di gestione e di archiviazione dei dati delle prove.

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DATI

Sono assegnati i dati seguenti:

- Materiale del perno: 39NiCrMo3.
- Diagramma CCT del suddetto materiale.
- Resistenza allo snervamento alla temperatura di 780 °C: 350 MPa.
- UTS alla temperatura di 780 °C: 450 MPa.
- Tabella delle rilevazioni eseguite in determinate ore della giornata nel centro di controllo relative alla quota nominale: $\Phi 28,7_{-0,016}^{-0,007}$:

N.	h 9	h 12	h 14	h 16
1	28,593	28,683	28,685	28,686
2	28,695	28,699	28,694	28,696
3	28,700	28,690	28,693	28,699
4	28,691	28,689	28,690	28,698
4	28,680	28,681	28,680	28,682
6	28,680	28,689	28,688	28,689
7	28,689	28,690	28,688	28,688
8	28,689	28,690	28,692	28,691
9	28,690	28,690	28,691	28,690
10	28,700	28,701	28,689	28,690
11	28,699	28,684	28,686	28,689
12	28,699	28,700	28,699	28,684
13	28,684	28,679	28,683	28,685
14	28,682	28,685	28,686	28,670
15	28,684	28,689	28,686	28,687
16	28,686	28,687	28,687	28,688
17	28,687	28,687	28,686	28,687
18	28,689	28,689	28,690	28,690
19	28,691	28,689	28,687	28,690
20	28,688	28,690	28,691	28,690
21	28,690	28,687	28,690	28,690
22	28,689	28,690	28,690	28,693

NB:

- *Si ricorda di esplicitare sempre le unità di misura.*
- *Eventuali dati mancanti andranno assunti in maniera ragionata, specificando le fonti dalle quali questi sono stati desunti.*

Compartment with documentation requirements
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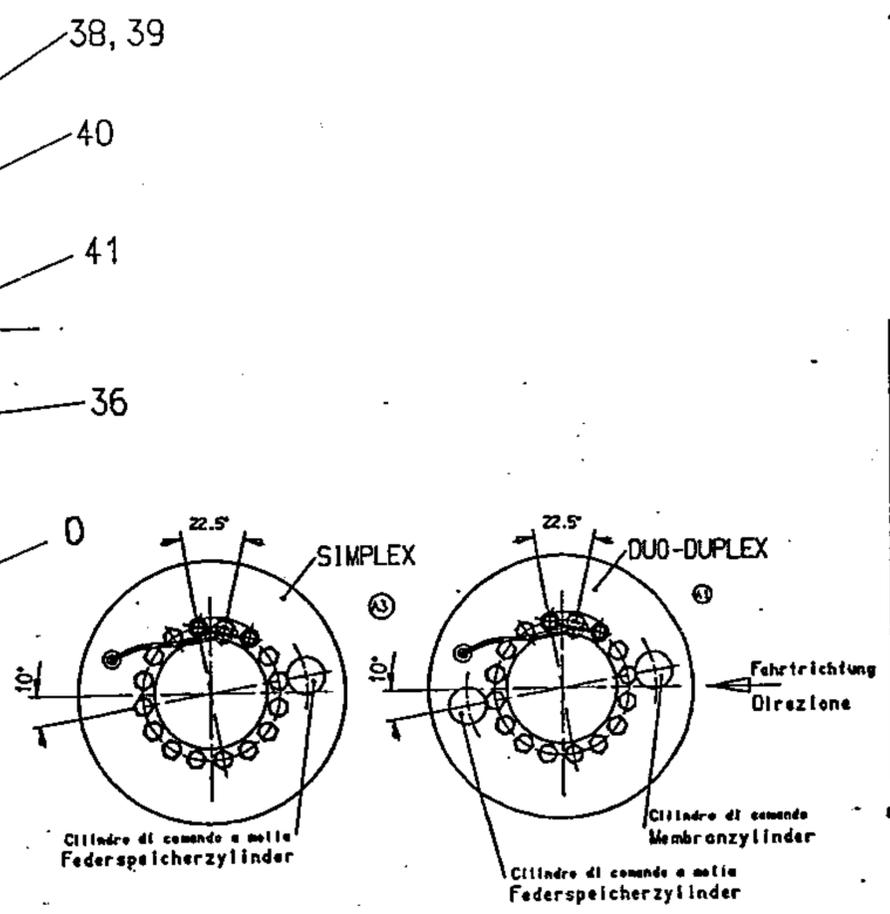
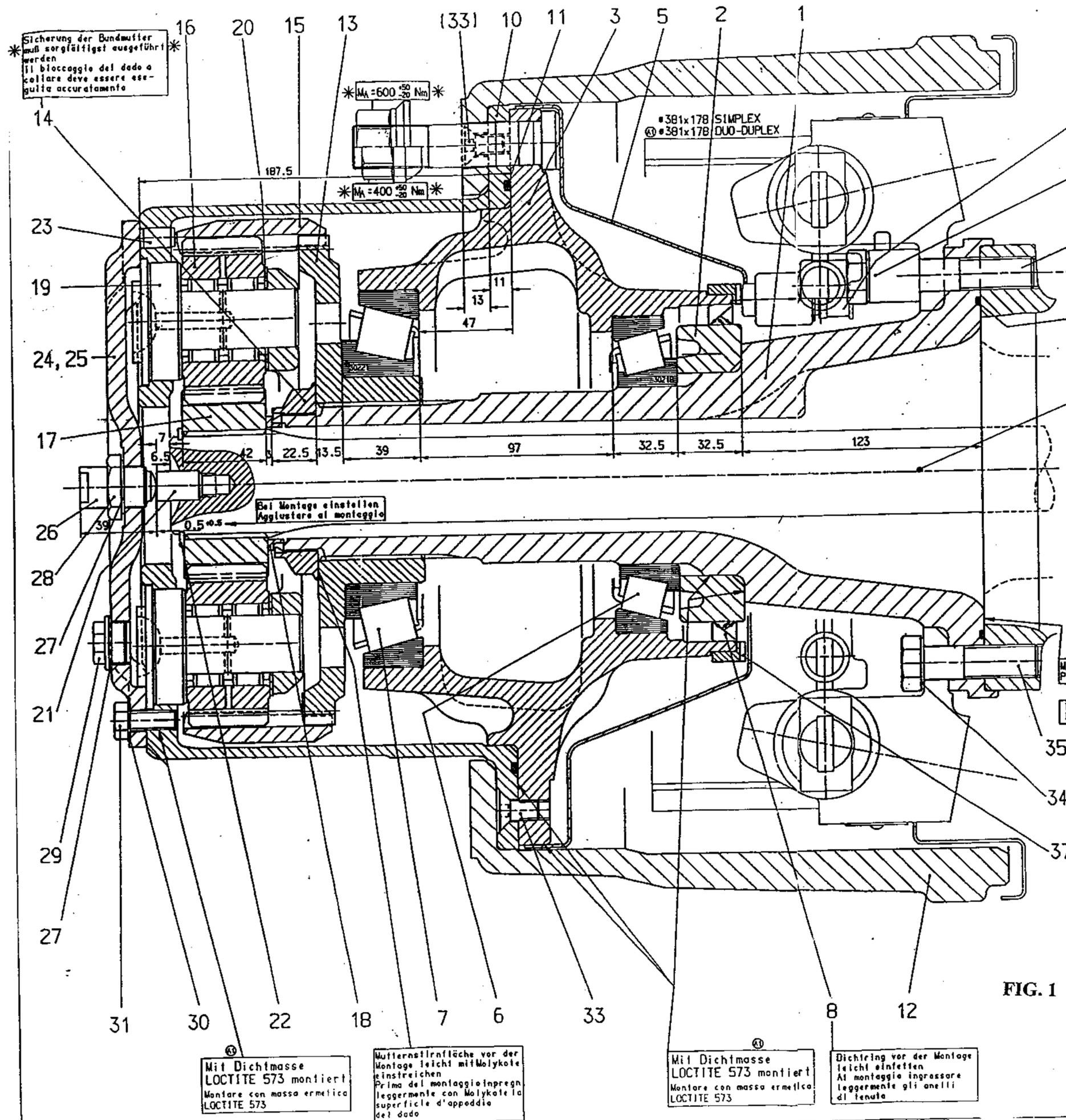


FIG. 1

Mit Lactite AVX eingesetzt
 Plantaggio con Lactite AVX
 Mit Lactite AVX gesichert
 Bloccato con Lactite AVX

Note	

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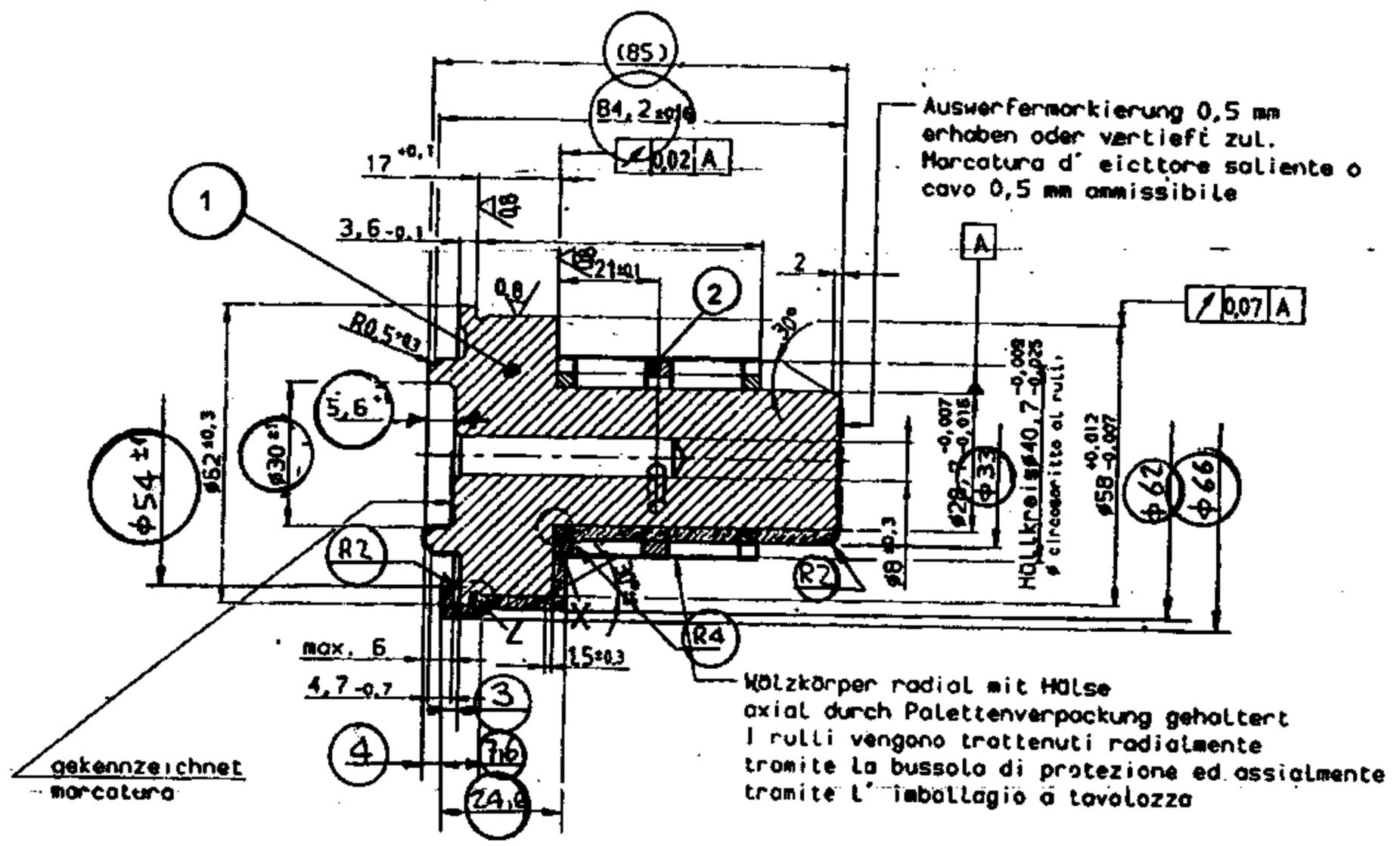


FIG. 2

Materiale 39NiCrMo3
 Temprato e rinvenuto a durezza HV 235
 Profondità di tempra 0.8-0.6

4. M.H.

tl

Acciaio da bonifica 39NiCrMo3

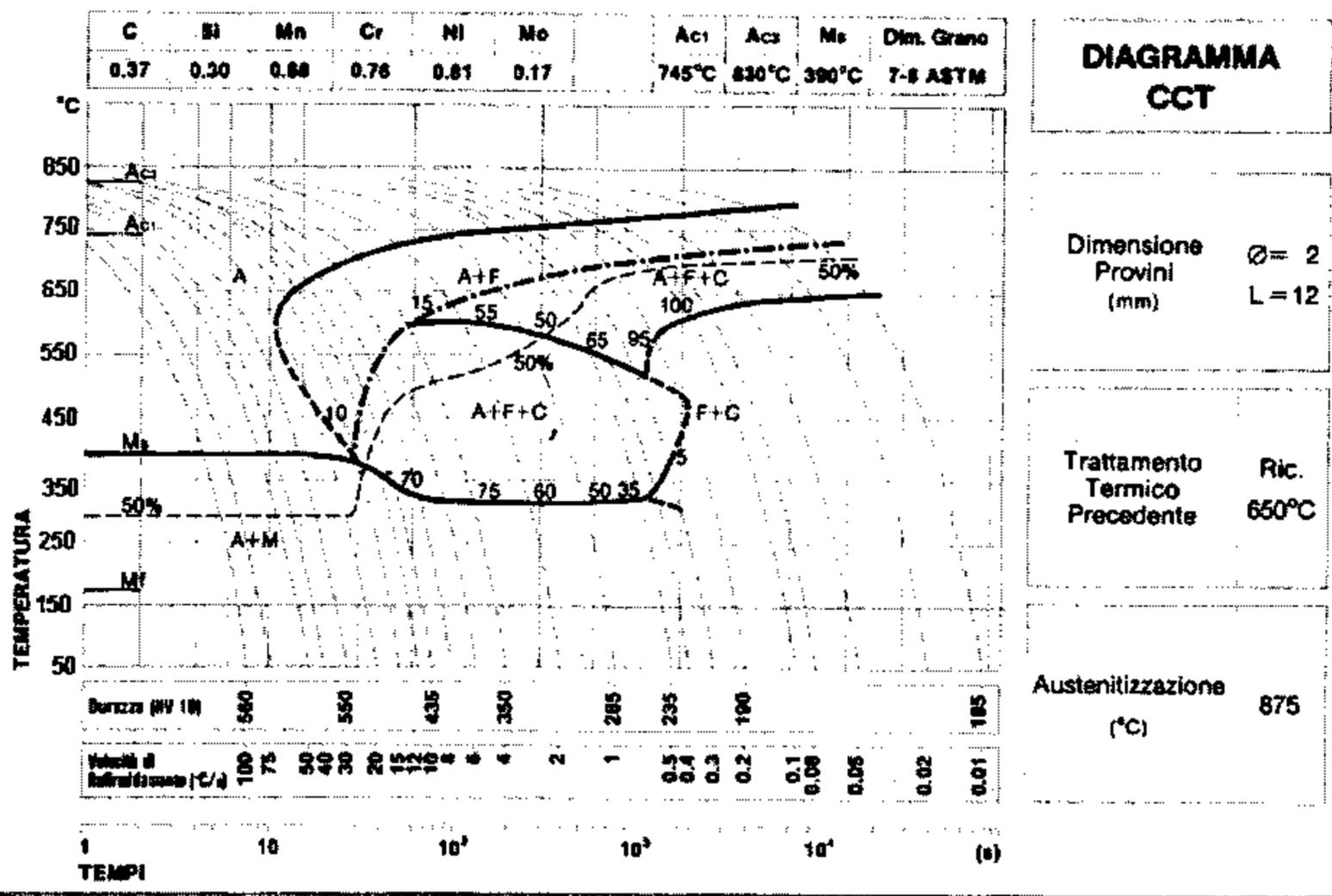


FIG. 3

Nota
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