





Warm Press Forming of Stainless Steel Sheets

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田上

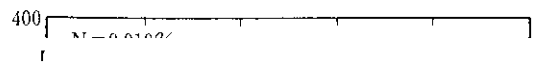
大野

Table 1 Tool dimensions

Tool	Material	Size (mm)	r_p (mm)	r_d (mm)	r_c (mm)	Clearance (mm)	Camber (mm)	Taper on wall
Punch	241M	198.9×268.9	17	—	50	1.1 (side)	700R	2°

Table 2 Stainless steel specimens used

○ Drawn through
● Fractured at neck



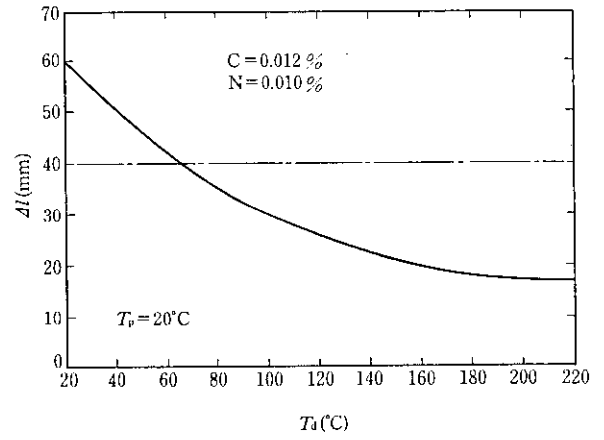
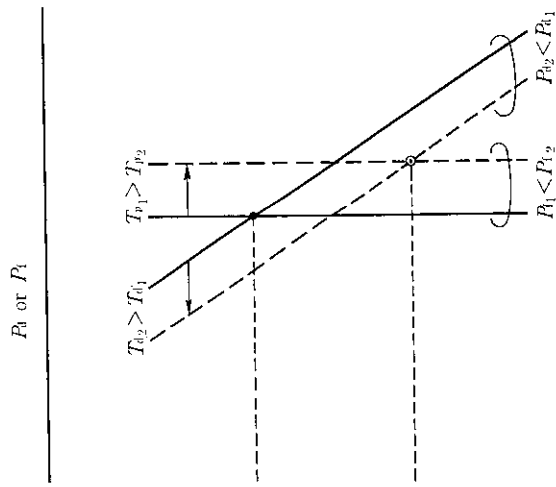
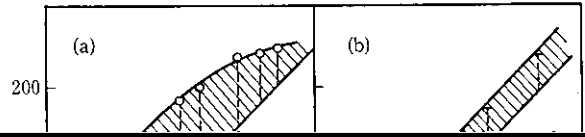
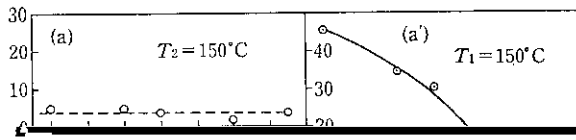


Fig. 10 Change in anisotropic parameter related to residual R





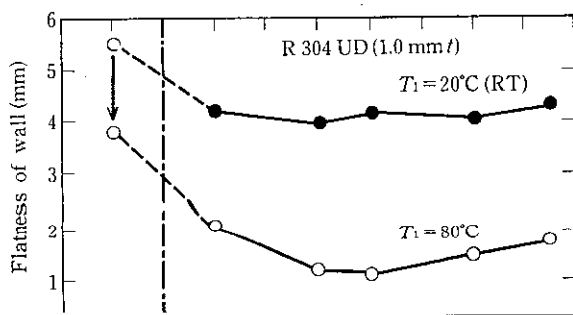


Table 4 Examples of compositions of new water-soluble lubricant with heat resistance

Element	Type	(wt %)		
		A	B	C
Boric trimethyl		10	10	10
Machine oil		—	5	—
Polyethylene glycol		—	—	5
Methanol/1,1,1 trichloroethane		90	85	85

drawn

T_2 (°C)

Fig. 17 Influence of drawing temperature T_1 and restriking

果によれば、温間絞りによってリストライク後フランジ曲げ荷重は大きく低下し、室温加工に比べて最大 25% 程度の荷重減少がもたらされて、これは温間成形によって素材のフランジ部の加工作業が

depth 150 mm)

減殺されるためである。したがって、温間加工は 2 次加工性をも改善することとなる。なお、リストライク温度 T_2 による曲げ荷重の

変化は小さかった。

3.3 耐熱性潤滑剤

Table 5 Lubricating performance of newly developed heat resisting lubricant in warm drawing

(mm)

Material	Temperature (°C)	Reduction Ratio (%)	Drawing Force (kN)	Surface Condition
SUS304	500	75	120	Good
	550	70	130	Good
SUS316	500	75	110	Good
	550	70	120	Good
SUS321	500	75	115	Good
	550	70	125	Good
SUS309	500	75	100	Good
	550	70	110	Good
SUS310	500	75	105	Good
	550	70	115	Good
SUS304L	500	75	118	Good
	550	70	128	Good
SUS316L	500	75	108	Good
	550	70	118	Good
SUS321L	500	75	113	Good
	550	70	123	Good
SUS309L	500	75	98	Good
	550	70	108	Good
SUS310L	500	75	103	Good
	550	70	113	Good