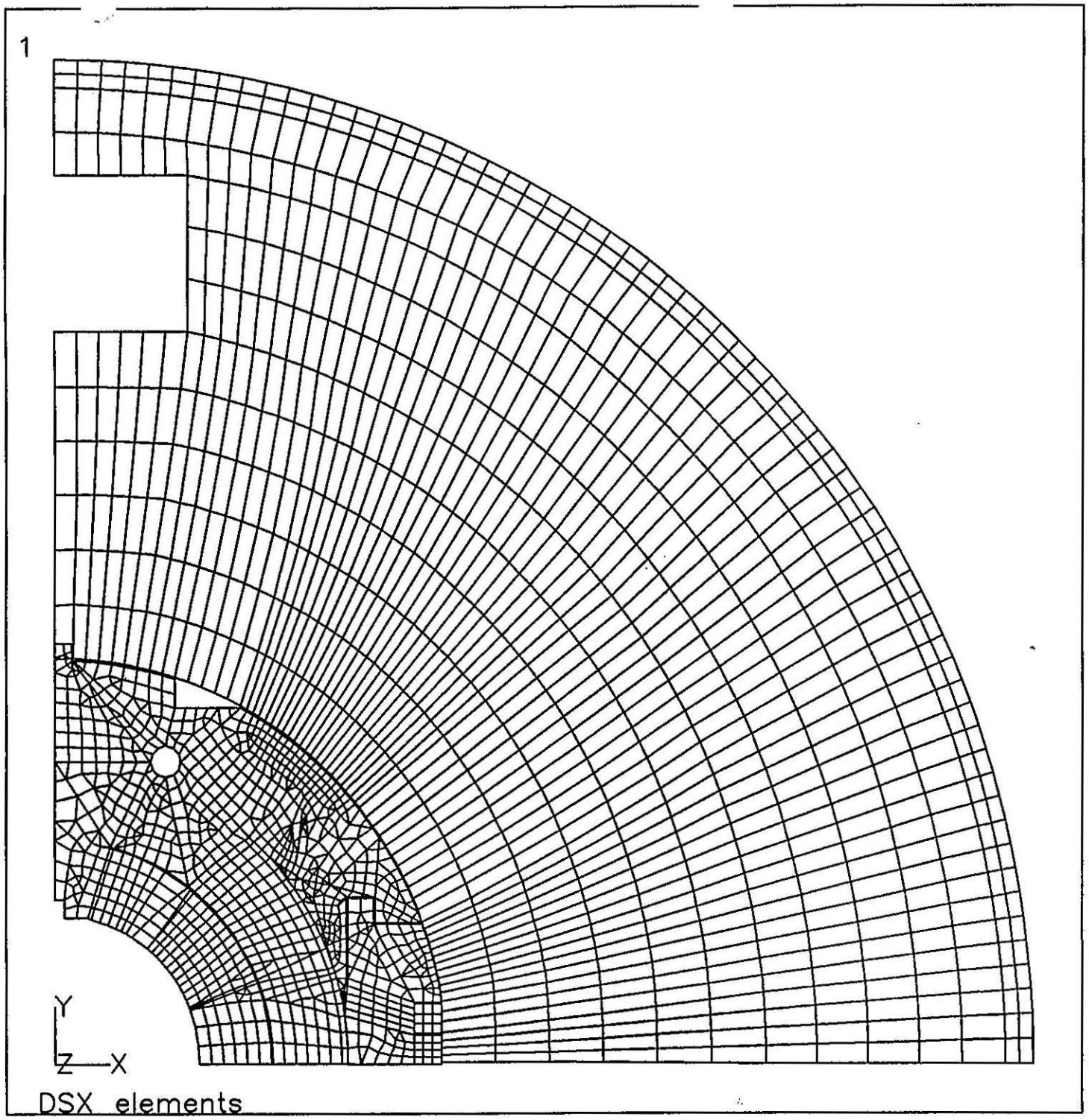
J. Kerby
5/23/90
SSC Task Force Meeting

TS-SSC 90-032

50mm Vertical Split FE Conclusions

- *Collar Deflections correlate well with results of Turner/Spigo*
- *Ovalizing the collar 6.5 mils horizontally and 14 mils vertically provides the desired interference/clearance for the collar/yoke interface*
- *Yoke taper of 1.25mils from inner to outer radii allows for the rotation (bending) of the yoke*
- *Skin preload of 25ksi closes the yoke gap when warm*
- *Collar horizontal deflection due to excitation is 0.7 mils*
- *Approximately ~~50~~ 45% of the Lorentz load is transmitted to the yoke and skin*
- *An increase in skin thickness to 0.25" has no apparent effect on the collar deflections due to Lorentz loading*
- *Coil and coil cavity can be reshaped to account for the mostly horizontal motion to the 0T, 4°K state*



ANSYS 4.4
MAY 21 1990
07:20:33
PLOT NO. 1
PREP7 ELEMENTS
TYPE NUM

ZV =1
DIST=93.5
XF =85
YF =85

Collar Horizontal and Vertical Displacements

4.9mm Skin 13ksi Coil Preload
Varying Skin Prestress

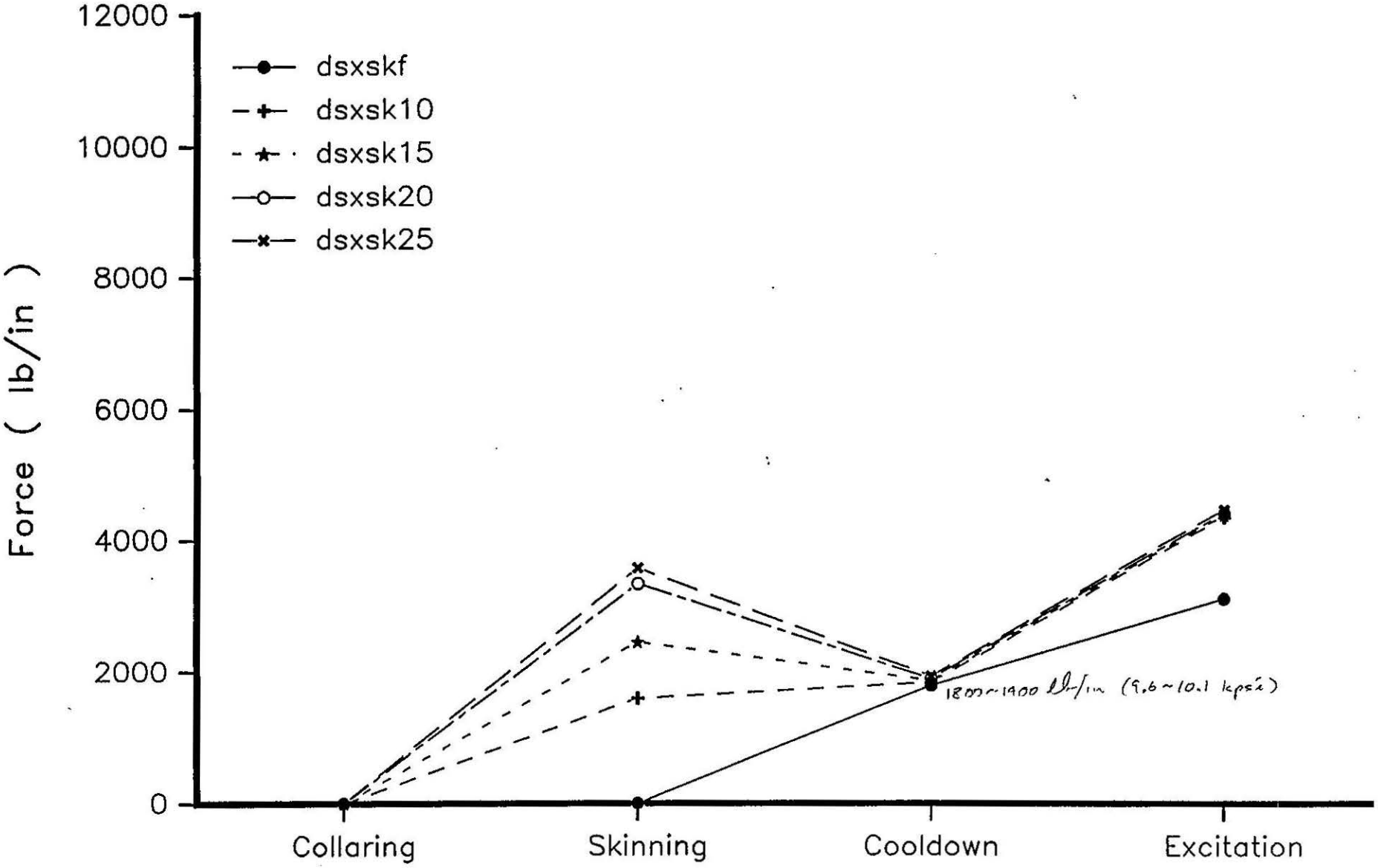
Preload	HORIZONTAL N472	VERTICAL N689
dsxskf	-0.69 (-.017)	4.60 (.117)
dsxsk10 8.4	-0.69 (-.017)	4.60 (.117)
dsxsk15 13.2	-0.69 (-.017)	4:60 (.117)
dsxsk20 17.8	-0.69 (-.017)	4.60 (.117)
dsxsk25 25.9	-0.68 (-.017)	4.60 (.117)

Skinning	N472	N689	ΔH	ΔV	
dsxskf	-0.69 (-.017)	4.60 (.117)	0.00	0.00	
dsxsk10	-3.10 (-.079)	5.93 (.151)	-2.41	1.33	-.552
dsxsk15	-4.39 (-.111)	6.65 (.169)	-3.70	2.05	-.554
dsxsk20	-5.63 (-.143)	7.37 (.187)	-4.94	2.77	-0.561
dsxsk25	-5.98 (-.152)	7.58 (.193)	-5.30	2.98	-0.562

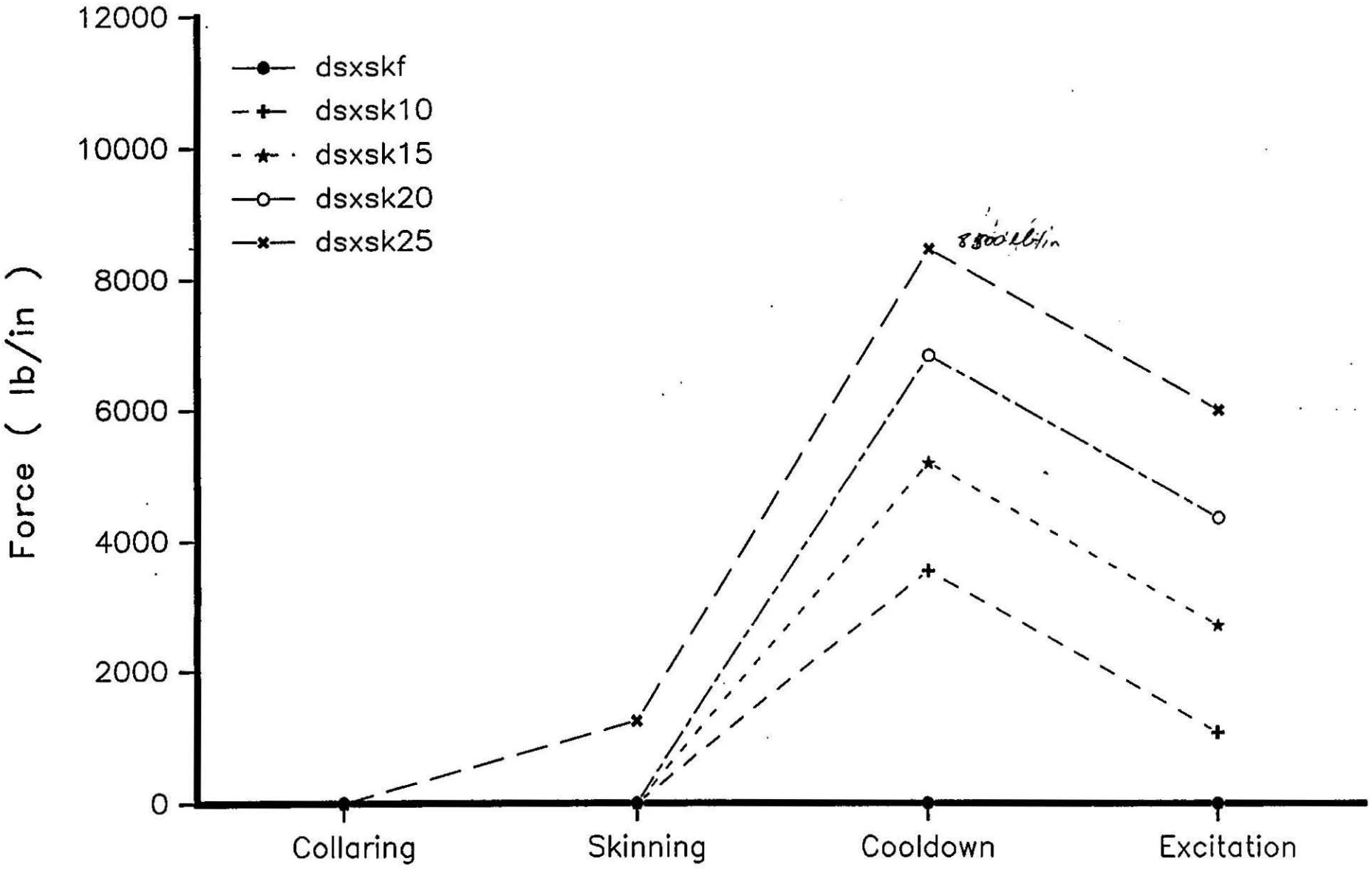
Cooldown	N472	N689	ΔH	ΔV
dsxskf	-11.68 (-.297)	-2.98 (-.076)	-11.0	-7.58
dsxsk10	-11.77 (-.299)	-2.93 (-.074)	-8.67	-8.86
dsxsk15	-11.81 (-.300)	-2.90 (-.074)	-7.42	-9.55
dsxsk20	-11.86 (-.301)	-2.88 (-.073)	-6.23	-10.25
dsxsk25	-11.91 (-.302)	-2.87 (-.073)	-5.93	-10.45

Excitation	N472	N689	ΔH	ΔV
dsxskf	-9.21 (-.234)	-5.18 (-.131)	2.47	-2.20
dsxsk10	-11.06 (-.281)	-4.15 (-.105)	0.71	-1.22
dsxsk15	-11.11 (-.282)	-4.11 (-.105)	0.70	-1.21
dsxsk20	-11.16 (-.284)	-4.09 (-.104)	0.70	-1.21
dsxsk25	-11.21 (-.285)	-4.06 (-.103)	0.70	-1.19

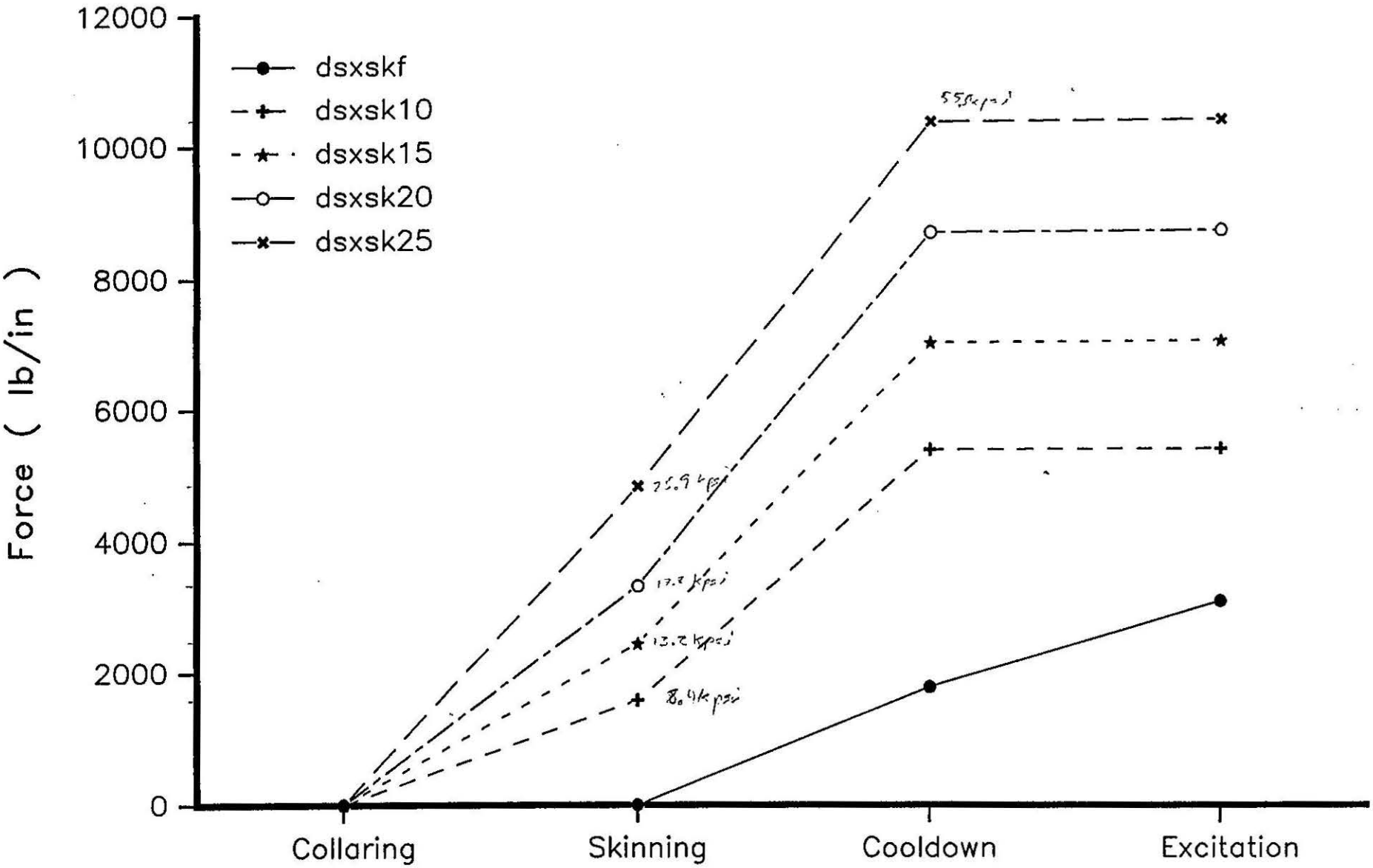
Collar / Yoke Forces



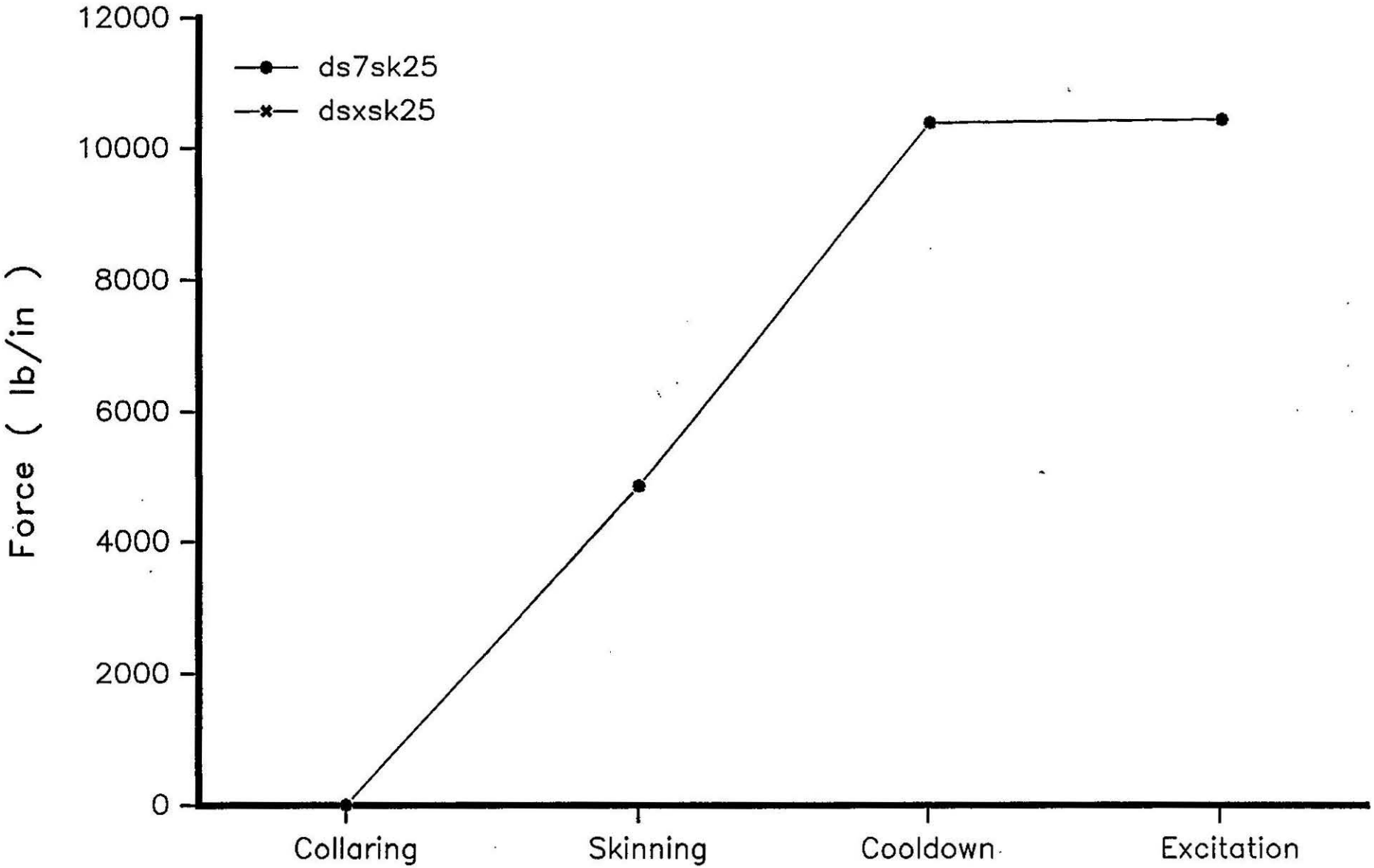
Yoke Gap Forces



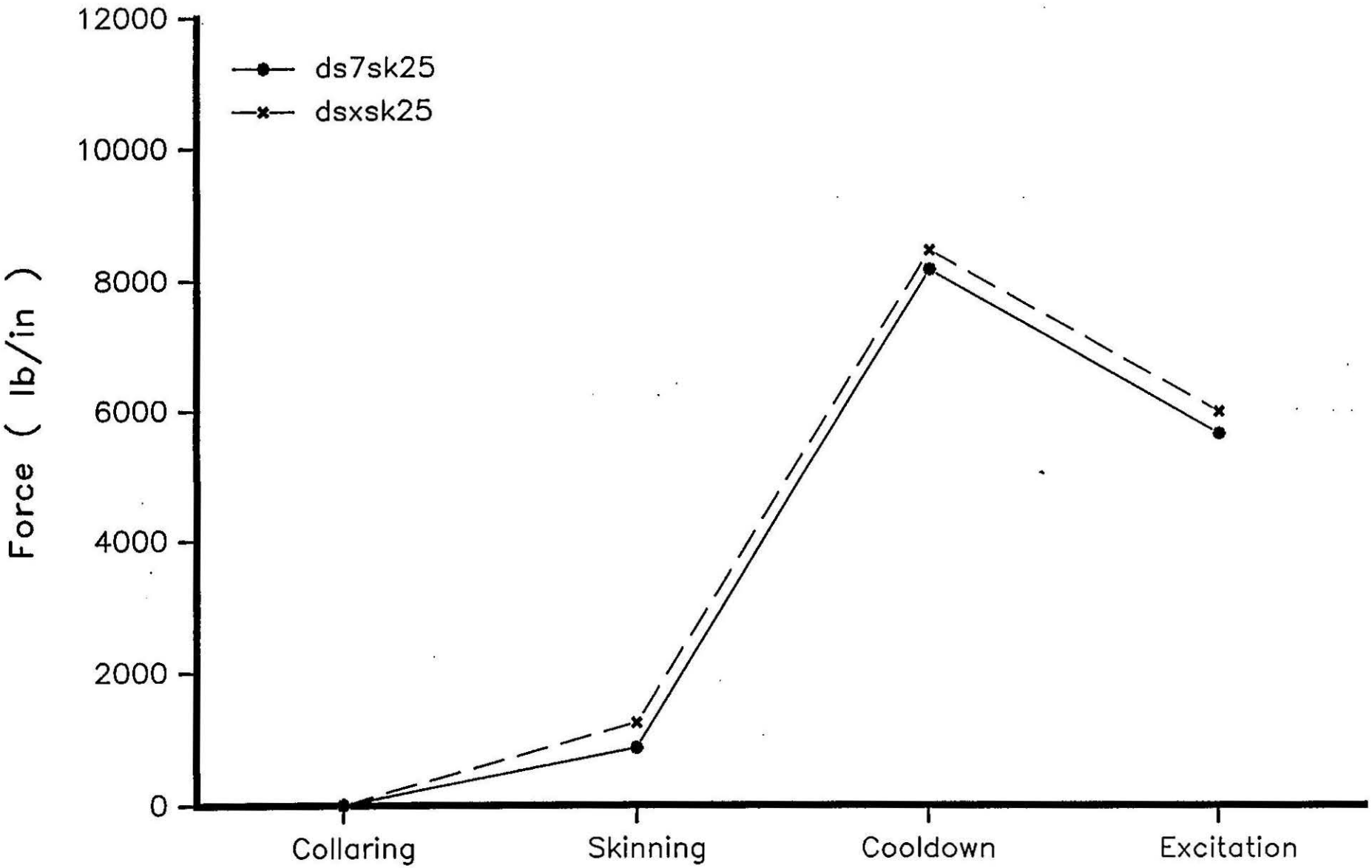
Skin Forces


12000
10000
8000
6000
4000
2000
0
Force (lb/in)
dsxskf
dsxsk10
dsxsk15
dsxsk20
dsxsk25
55.8kpsi
25.9 kpsi
17.7 kpsi
13.2 kpsi
8.4kpsi
Collaring
Skinning
Cooldown
Excitation

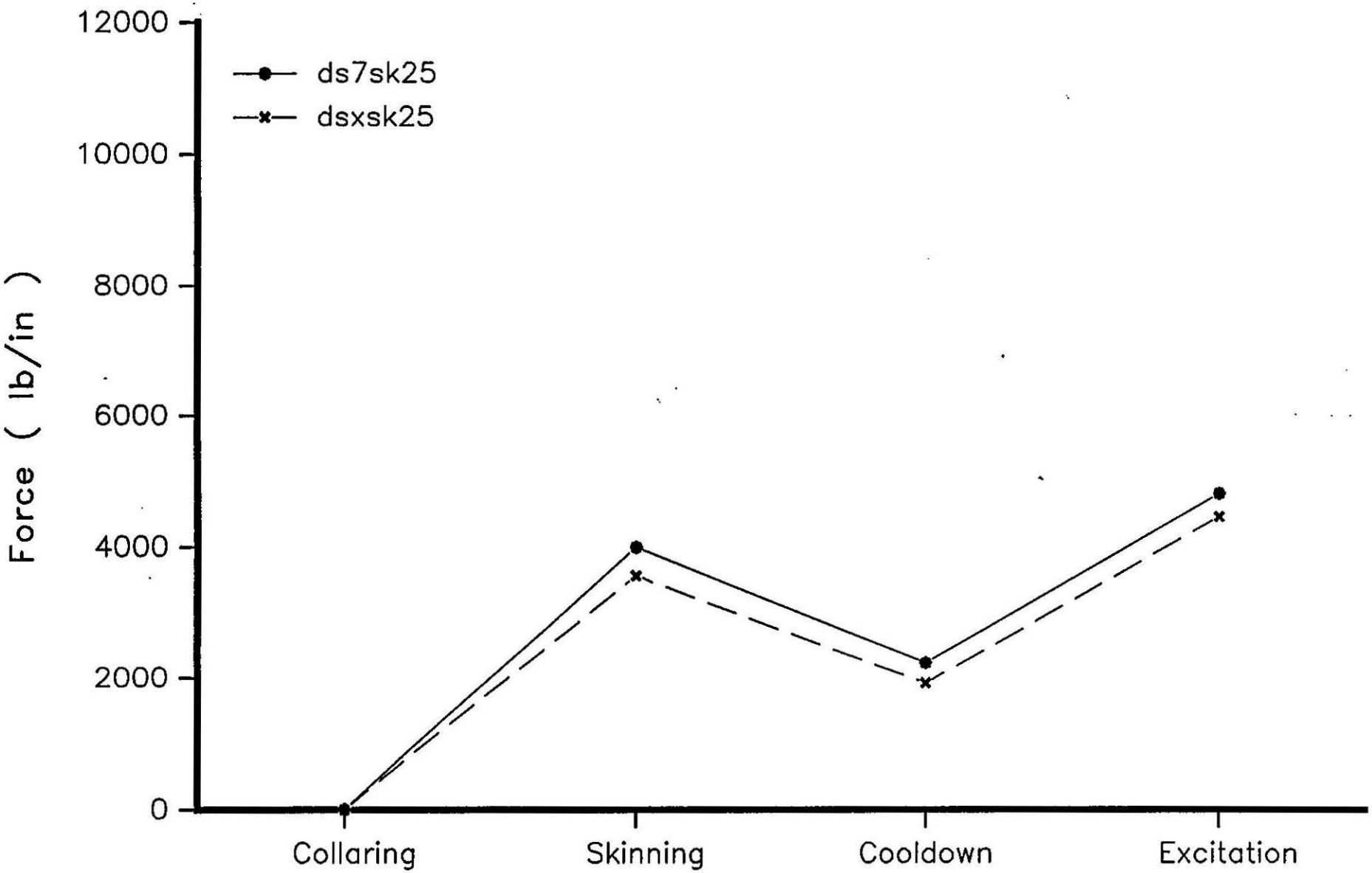
Skin Forces


12000
10000
8000
6000
4000
2000
0
Force (lb/in)
ds7sk25
dsxsk25
Collaring
Skinning
Cooldown
Excitation

Yoke Gap Forces



Collar / Yoke Forces



Collar Horizontal and Vertical Displacements

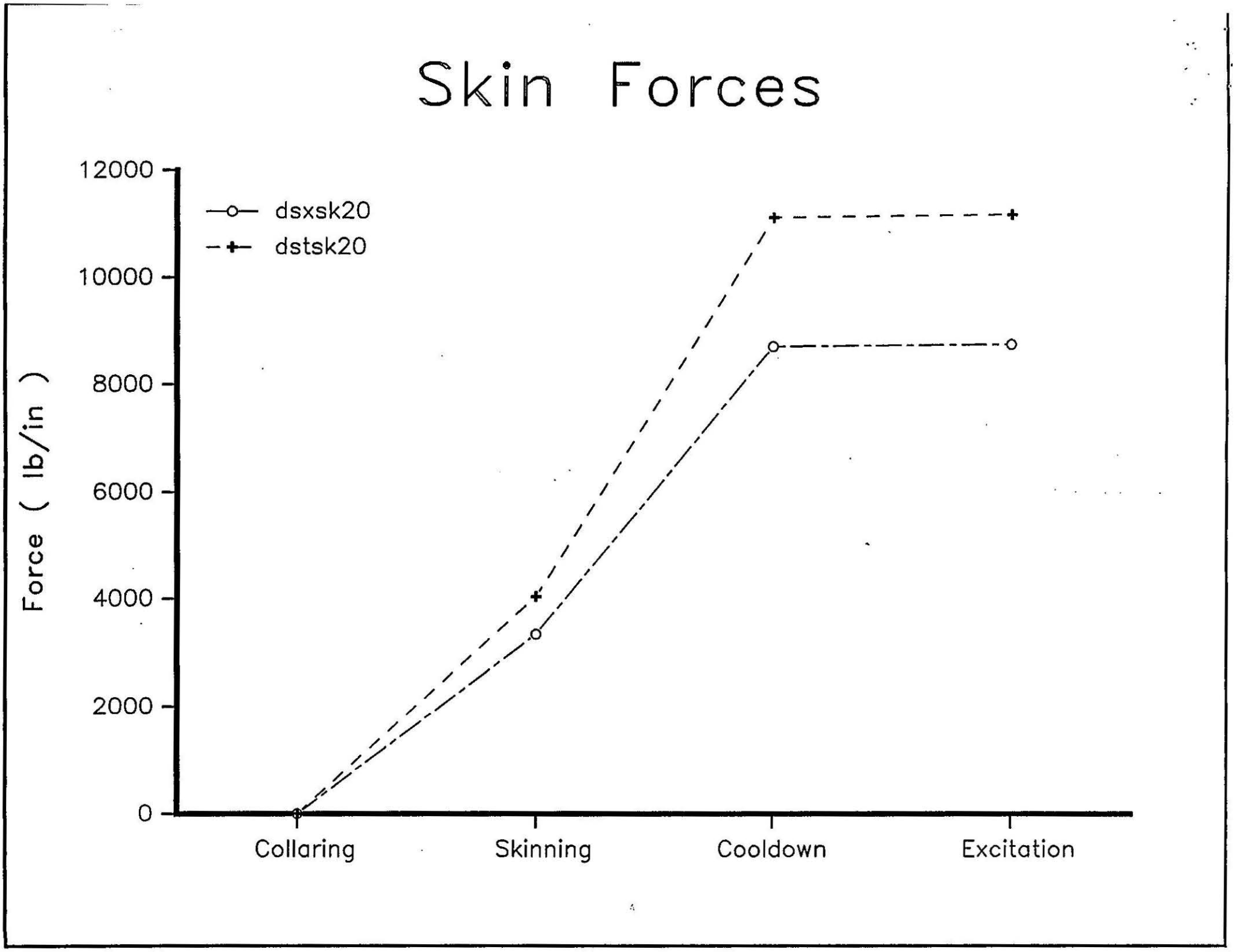
Varying Coil Preload
4.9mm Skin 25 ksi Prestress

Preload	N472	N689
7. ksi coil	-0.37 (-.009)	2.48 (.063)
13. ksi coil	-0.68 (-.017)	4.60 (.117)

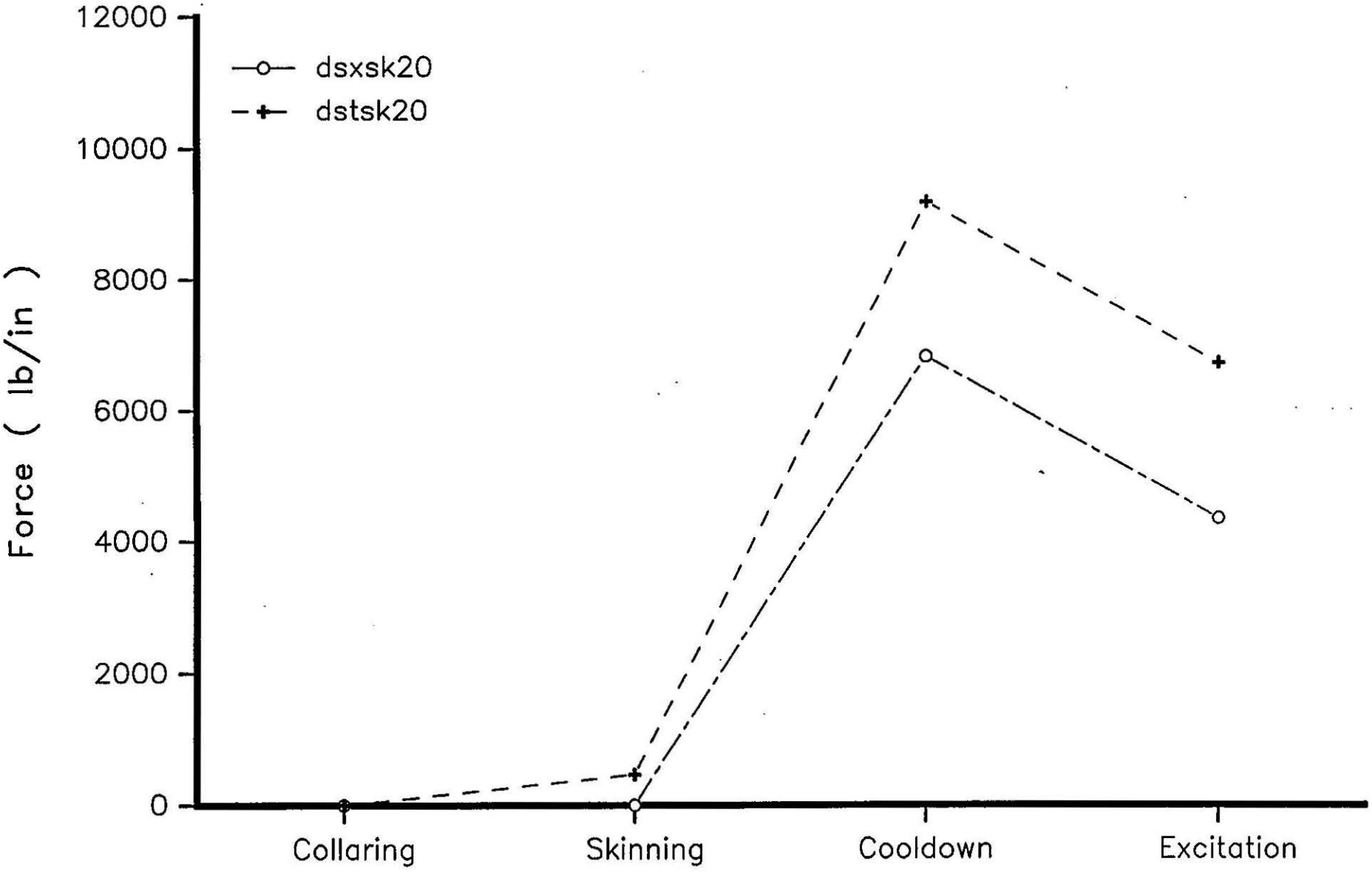
Skinning	N472	N689	ΔH	ΔV
7. ksi coil	-5.83 (-.148)	5.71 (.145)	-5.46	3.23
13. ksi coil	-5.98 (-.152)	7.58 (.193)	-5.30	2.98

Cooldown	N472	N689	ΔH	ΔV
7. ksi coil	-11.76 (-.299)	-4.77 (-.121)	-5.93	-10.48
13. ksi coil	-11.91 (-.302)	-2.87 (-.073)	-5.93	-10.45

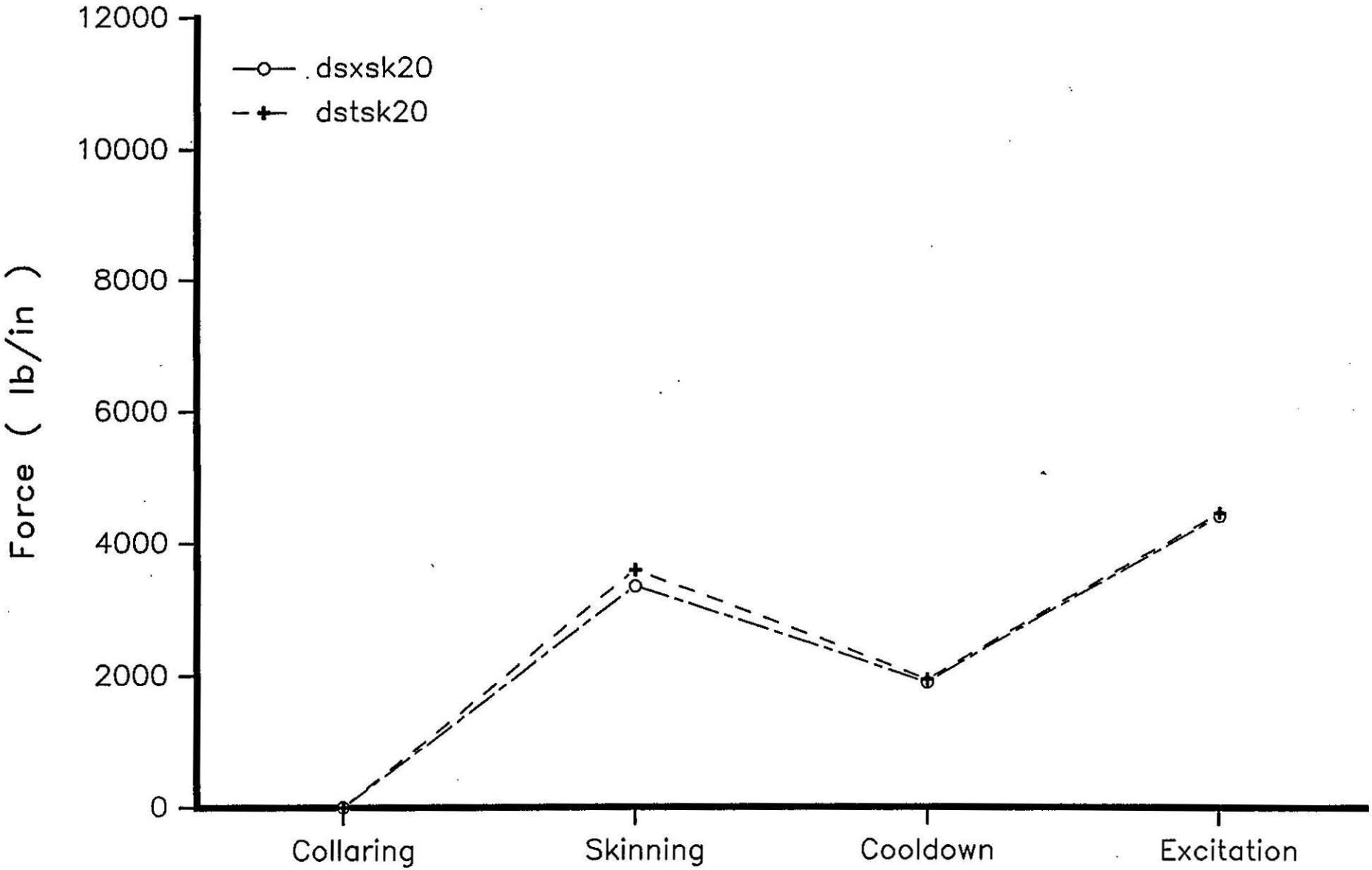
Excitation	N472	N689	ΔH	ΔV
7. ksi coil	-11.11 (-.282)	-5.94 (-.151)	0.65	-1.17
13. ksi coil	-11.21 (-.285)	-4.06 (-.103)	0.70	-1.19


Skin Forces
dsxsk20
dstsk20
Force (lb/in)
12000
10000
8000
6000
4000
2000
0
Collaring
Skinning
Cooldown
Excitation

Yoke Gap Forces



Collar / Yoke Forces



Collar Horizontal and Vertical Displacements

Varying Skin Thickness

Preload	N472	N689
4.90 mm skin	-0.69 (-.017)	4.60 (.117)
6.35 mm skin	-0.69 (-.017)	4.60 (.117)

Skinning	N472	N689	ΔH	ΔV
4.90 mm skin	-5.63 (-.143)	7.37 (.187)	-4.94	2.77
6.35 mm skin	-5.95 (-.151)	7.56 (.192)	-5.27	2.96

Cooldown	N472	N689	ΔH	ΔV
4.90 mm skin	-11.86 (-.301)	-2.88 (-.073)	-6.23	-10.25
6.35 mm skin	-11.93 (-.303)	-2.84 (-.072)	-5.98	-10.40

Excitation	N472	N689	ΔH	ΔV
4.90 mm skin	-11.16 (-.284)	-4.09 (-.104)	0.70	-1.21
6.35 mm skin	-11.23 (-.285)	-4.05 (-.103)	0.70	-1.21

Collar Horizontal and Vertical Displacements

Preload	N472	N689
collar	-0.67 (-.017)	4.59 (.117)
dsxsk25	-0.68 (-.017)	4.60 (.117)

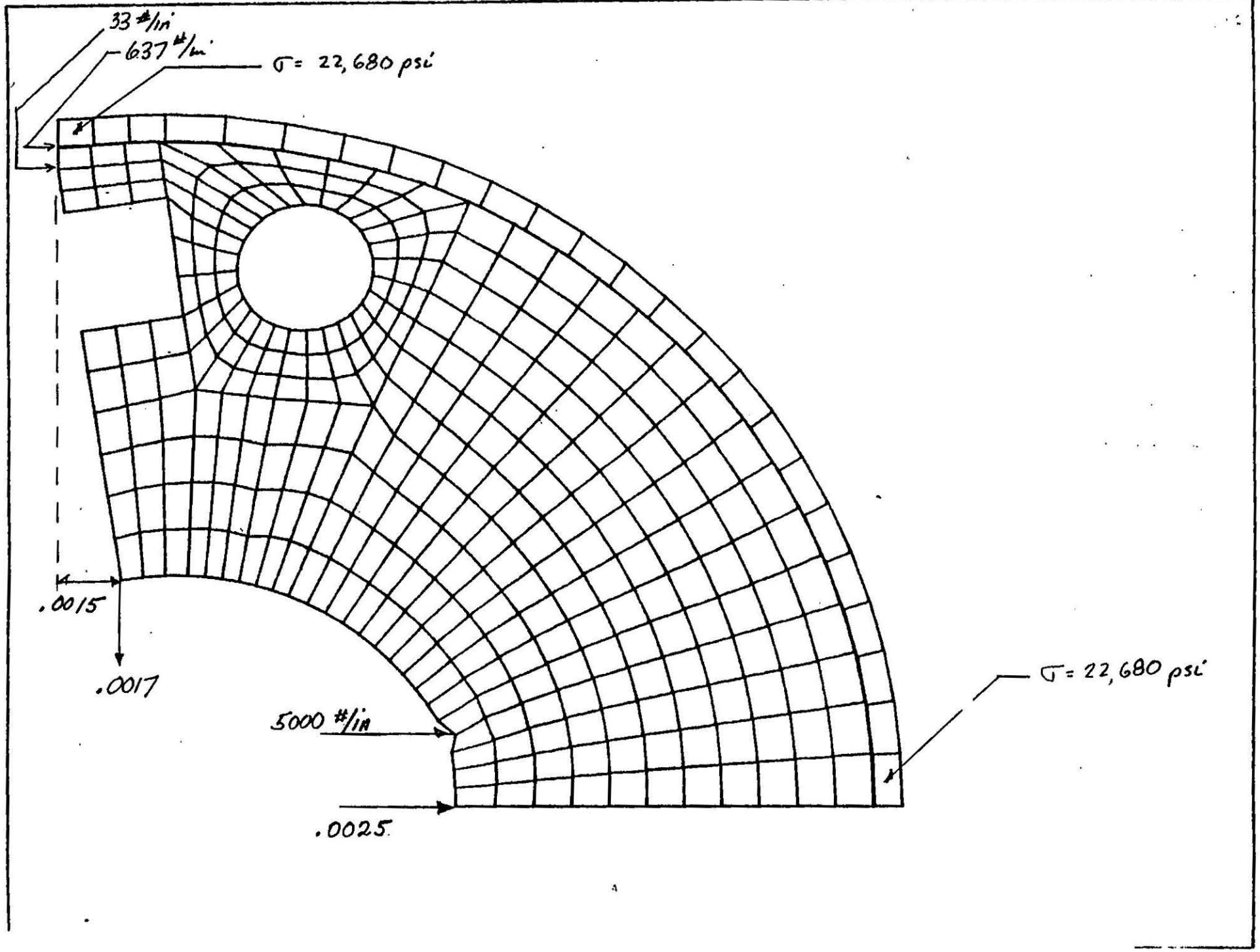
Skinning	N472	N689	ΔH	ΔV
collar	-0.67 (-.017)	4.59 (.117)	0.00	0.00
dsxsk25	-5.98 (-.152)	7.58 (.193)	-5.30	2.98

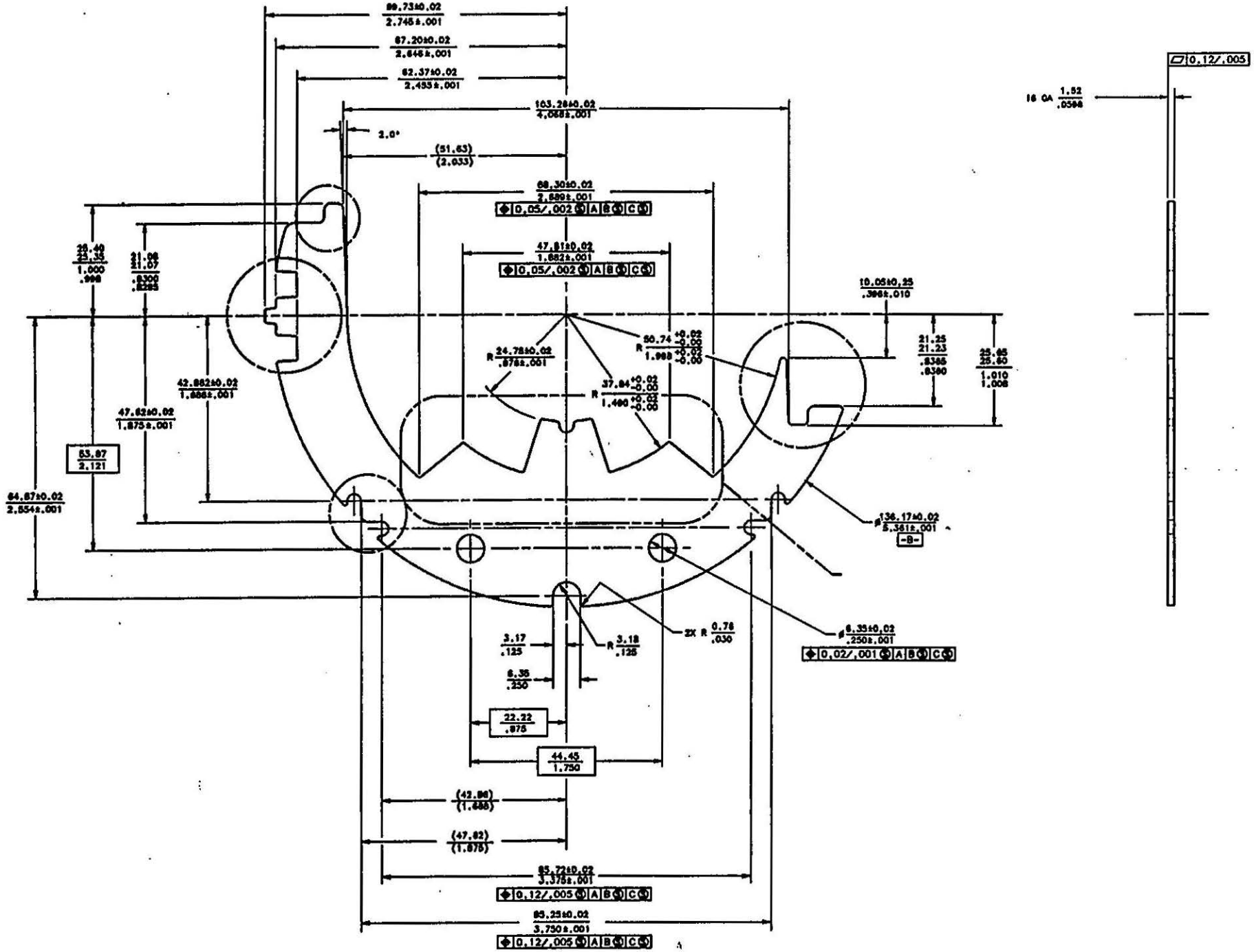
Cooldown	N472	N689	ΔH	ΔV
collar	-8.99 (-.228)	-4.47 (-.114)	-8.32	-9.06
dsxsk25	-11.91 (-.302)	-2.87 (-.073)	-5.93	-10.45
SAPIV			-5.8	

Excitation	N472	N689	ΔH	ΔV
collar	-4.35 (-.111)	-7.81 (-.198)	4.64	-3.34
dsxsk25	-11.21 (-.285)	-4.06 (-.103)	0.70	-1.19
SAPIV			2.5	-1.7

Figure 3

VERTICAL SPLIT YOKE (1/4 INCH SHELL, LORENTZ FORCE EFFECT, COLD)




69.73±0.02
2.745±.001
67.20±0.02
2.646±.001
62.37±0.02
2.455±.001
103.28±0.02
4.068±.001
2.0°
(51.63)
(2.033)
68.30±0.02
2.689±.001
0.05/.002 A B C
47.81±0.02
1.882±.001
0.05/.002 A B C
28.40
28.36
1.000
.998
21.08
21.07
.8300
.8295
42.862±0.02
1.688±.001
47.62±0.02
1.875±.001
53.87
2.121
64.87±0.02
2.554±.001
R 24.78±0.02
.976±.001
R 50.74 +0.02 -0.00
1.998 +0.02 -0.00
R 37.84 +0.02 -0.00
1.490 +0.02 -0.00
10.05±0.25
.396±.010
21.25
21.23
.8366
.8360
25.65
25.60
1.010
1.008
ø136.17±0.02
5.361±.001
-B-
2X R 0.76
.030
ø6.35±0.02
.250±.001
0.02/.001 A B C
3.17
.125
R 3.18
.125
6.35
.250
22.22
.875
44.45
1.750
(42.86)
(1.688)
(47.62)
(1.875)
95.72±0.02
3.768±.001
0.12/.005 A B C
95.25±0.02
3.750±.001
0.12/.005 A B C
16 GA 1.52
.0598
0.12/.005