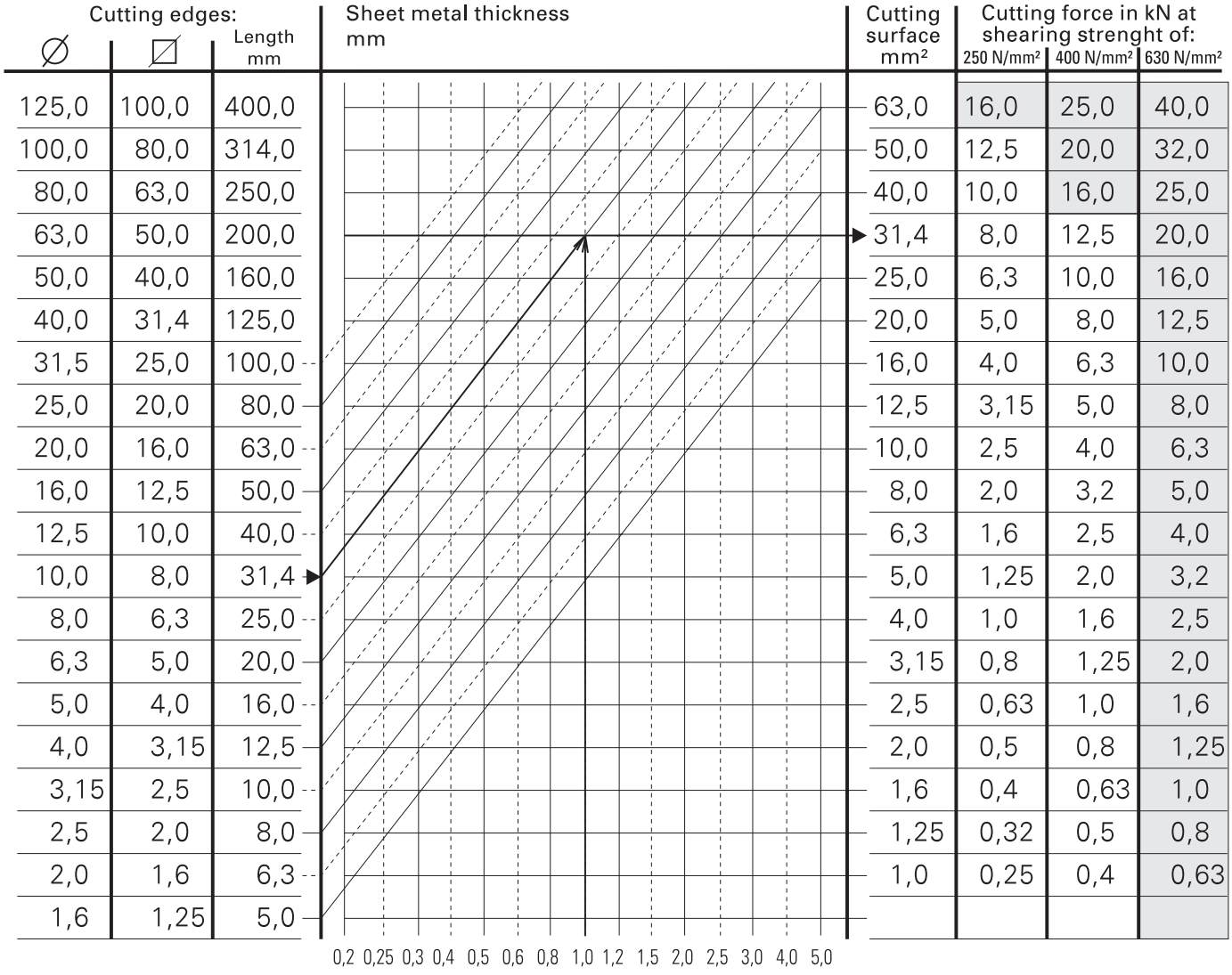
For long lifetime and trouble-free operation, the **HAPRO** Punching Presses are designed for cutting forces of nominal 14kN. A short-term overload is normally without demaging consequence, but should be avoided. For selection of desired application tools and the corresponding cutting forces, the following diagram can be used.

The size of the cutting force depends on the cutting material, the length of its cutting edges, the thickness of material, the shape and condition of the cutting edges of upper and lower die.
The diagram values are valid for parallel cutting edges on upper and lower dies.



∅	⊠	Length mm	Cutting surface mm²	250 N/mm²	400 N/mm²	630 N/mm²
125,0	100,0	400,0	63,0	16,0	25,0	40,0
100,0	80,0	314,0	50,0	12,5	20,0	32,0
80,0	63,0	250,0	40,0	10,0	16,0	25,0
63,0	50,0	200,0	31,4	8,0	12,5	20,0
50,0	40,0	160,0	25,0	6,3	10,0	16,0
40,0	31,4	125,0	20,0	5,0	8,0	12,5
31,5	25,0	100,0	16,0	4,0	6,3	10,0
25,0	20,0	80,0	12,5	3,15	5,0	8,0
20,0	16,0	63,0	10,0	2,5	4,0	6,3
16,0	12,5	50,0	8,0	2,0	3,2	5,0
12,5	10,0	40,0	6,3	1,6	2,5	4,0
10,0	8,0	31,4	5,0	1,25	2,0	3,2
8,0	6,3	25,0	4,0	1,0	1,6	2,5
6,3	5,0	20,0	3,15	0,8	1,25	2,0
5,0	4,0	16,0	2,5	0,63	1,0	1,6
4,0	3,15	12,5	2,0	0,5	0,8	1,25
3,15	2,5	10,0	1,6	0,4	0,63	1,0
2,5	2,0	8,0	1,25	0,32	0,5	0,8
2,0	1,6	6,3	1,0	0,25	0,4	0,63
1,6	1,25	5,0				

Example:
Hole Ø: **10mm ➡** Cutting edges: 31,4mm ➡
Thickness: 1,0mm ➡ Cutting surface: 31,4mm² ➡
Shearing Strength: 250N/mm² **Cutting Force 8kN/mm²**

Working in this area creates trouble and reduces lifetime of tooling.

Shearing strength of sheet metal

Sheet metal grades	Specification	Metal Code No.	Shearing strength N/mm²
Sheel Spring Steel	38Si7	1.5023	944
Sheet Steel, stainles	X5CrNi 18 10	1.4301	480
Sheet Steel, strong	St52-3G	1.0570G	416
Sheet Steel, soft	St37-2G	1.0037G	300
Sheet Brass, hard	CuZn37 (F45)	2.0321	360
Sheet Brass, soft	CuZn37 (F30)	2.0321	240
Sheet Aluminum, hard	AlCuMg1	3.1325	304
Sheet Aluminum, soft	AlMg1	3.3315	112

The quality WS of the HAPRO Punchtools is designed for shearing strength up to 400N/mm². This provides with proper application for long lifetime also on individual production and small-lot runs.