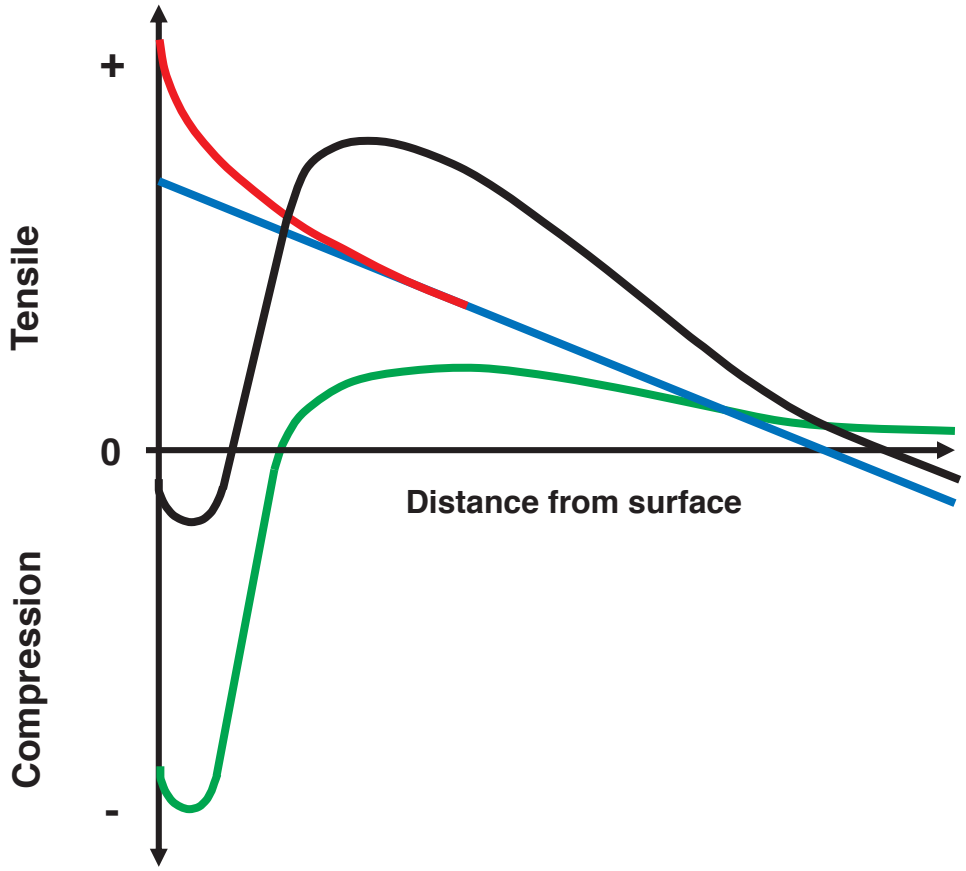
# Optimizing the distribution of residual stress




| | |
|---|---|
| | = bending load |
| | = bending load and percussive load simultaneously |
| | = compressive residual stress by shot peening |
| | = resultant stress distribution, loadet and shot peened |

## Parameters in the shot peening process

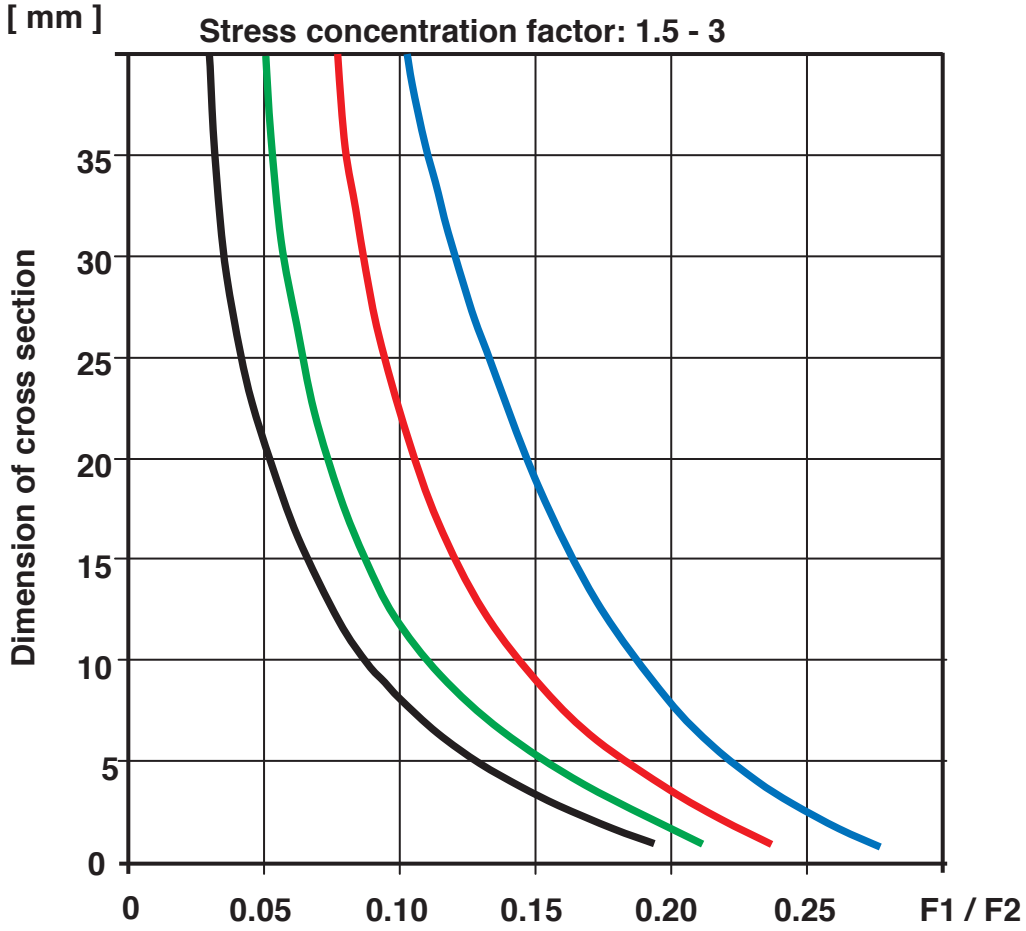
If operational loads, the resultant stress and the level of stress concentration are known, the most effective distribution of compressive stress can be calculated.
If these data are not available, the best distribution of compressive residual stress can be found by tests in the field or on a testing machine.
If bending stress and percussive load act simultaneously (e.g. in percussion drills, vehicles, pneumatic tools and agricultural machines), it is most effective to have the highest residual stress in the surface layer.
DUO shot peening and stress peening induce the highest possible compressive residual stress, up to the compressive yield stress of material, and are extremely valuable in such applications.

# Calculating the depth of induced compressive residual stress layer $S_1$

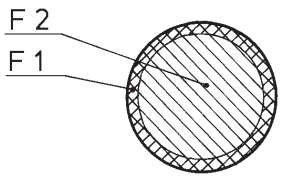
**Strain: bending and torsion**

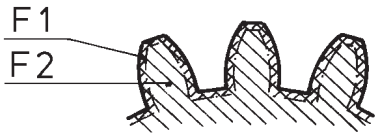
**Material: tempered and very hard steel**

**Stress concentration factor: 1.5 - 3**



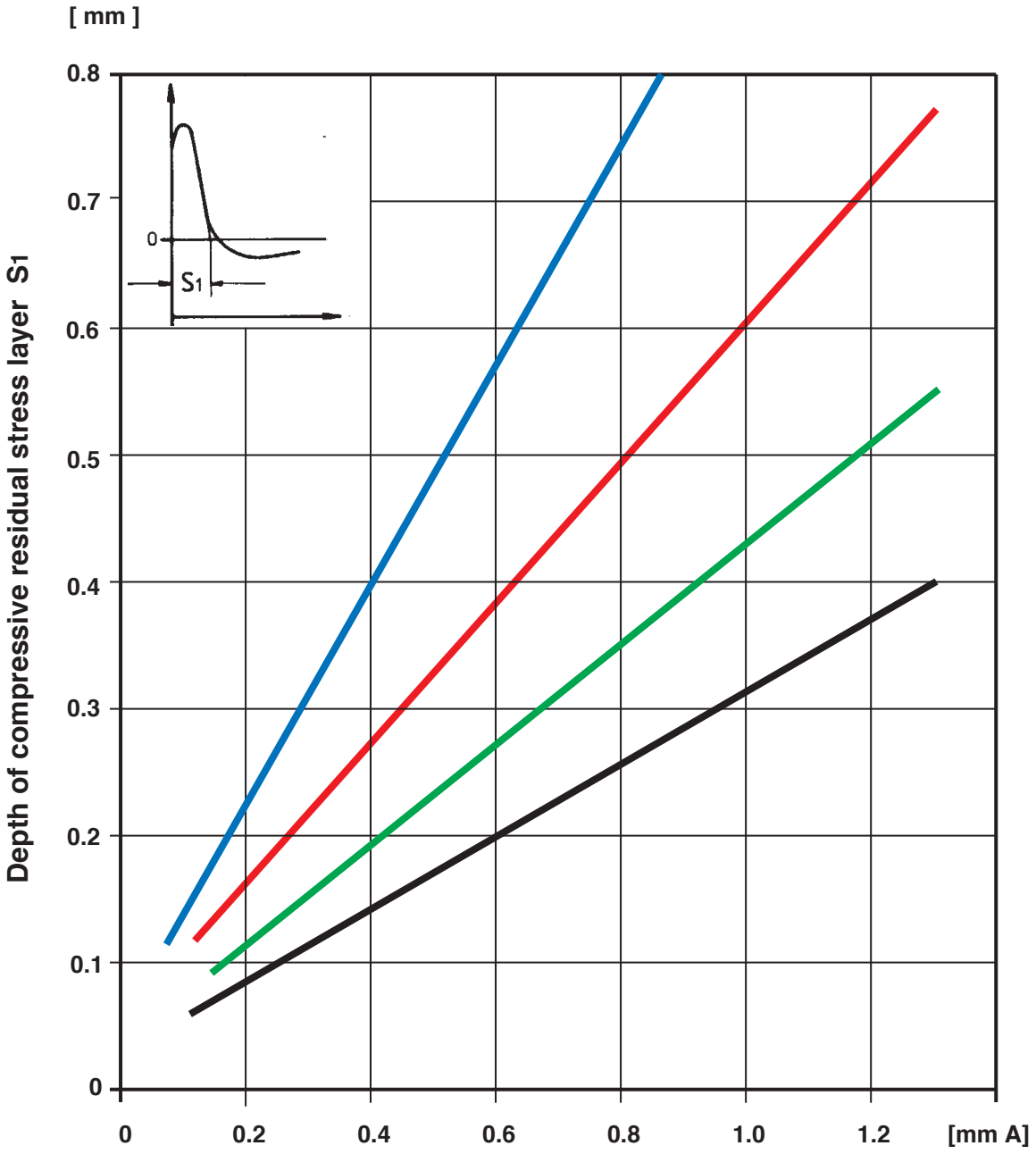

| Line | Ultimate tensile strength |
|---|---|
| | 700 N/mm² |
| | 1000 N/mm² |
| | 1300 N/mm² |
| | 2000 N/mm² |




For parts with a thickness or dimension of the cross section up to 25 mm the most effective depth of the compressive residual stress layer can be obtained by optimizing the ratio F1 to F2, where F1 represents the depth of compressive residual stressed surface layer or the depth of plastically deformed surface layer induced by shot peening.

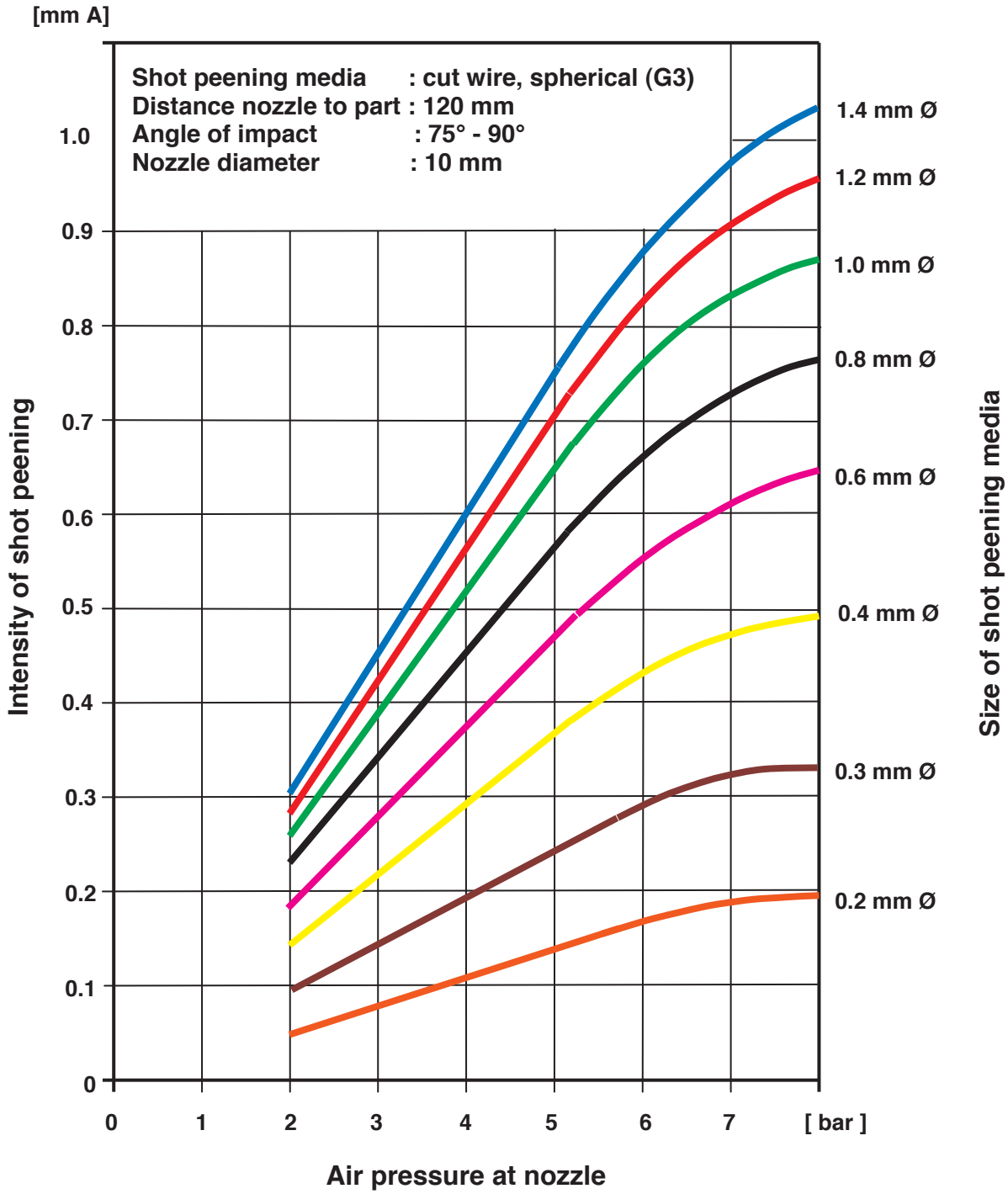
# Selecting the shot peening intensity




| Line | Material hardness |
|---|---|
| | 30 HRC |
| | 40 HRC |
| | 50 HRC |
| | 60 HRC |

The corresponding shot peening intensity can be obtained from this diagram as a function of the depth of the compressive residual stress layer (calculated by use of the ratio F1 to F2 see page 25).

# Selecting the size of shot peening media




The necessary size of shot peening media to obtain the calculated depth of the compressive residual stress layer (see page 26) depends on the density and velocity of the shot peening media.
If different sizes are possible, the smallest radius and the required surface finish of the part will determine the maximum size of shot peening media.
We also recommend: the harder the part, the smaller the shot peening media.