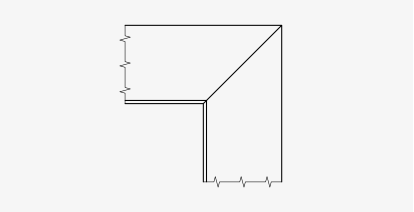
Rectangular lens expansion joints

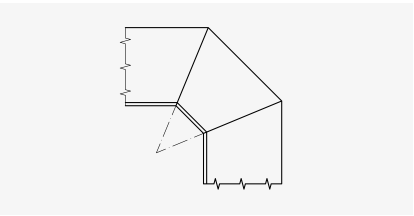
HKS rectangular expansion joints with lens design are not standardised and are individually tailored and manufactured depending on customer requirements. Convolution heights from 50 mm to 300 mm and lengths from 50 mm to 160 mm are common dimensions for individual U-shaped convolutions. The convolution dimension depends strongly on the manufacturing method, the material, the convolution radius and the wall thickness. So-called profile bars with one to three convolutions are produced with a press brake in several steps and joined to form a rectangular, square or oval expansion joint using different corner joining methods. The shape of the corner joint has a crucial influence on the existing tension condition in the critical corner areas and therefore also determines the service life of the expansion joint. The more closely the corner resembles a "round corner", the longer the service life under otherwise equal operating conditions. HKS offers five different corner joining methods.

Method I: Single mitre



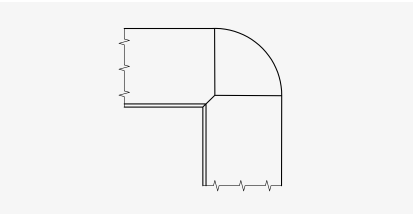
The most simple way of producing a corner joint is the single mitre with 45° mitre cuts on the profile bars. It is used for very low pressure and expansion levels.

Method II: Double mitre



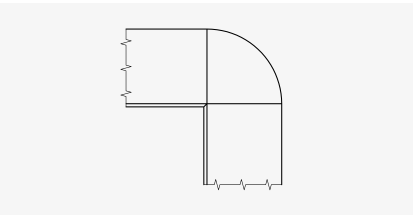
A more beneficial tension distribution in the corners compared to method II is the double mitre version with 22.5° mitre cuts. It is only rarely used, however, due to the elaborate connection.

Method III: Y mitre



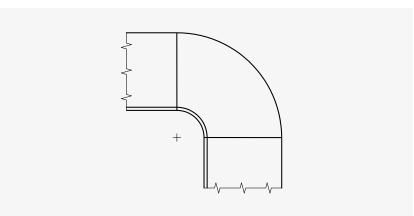
Rectangular on the inside (as method I) and rounded on the outside (inserted corner) is a very frequently applied joining method which is used for higher expansion levels. The channel connection can retain its rectangular shape here and tension distribution is better than with method I.

Method IV: Rounded outside



This version is comparable to profile III and is mainly used where small lengths are available. The disadvantage is in the area of the inner brim where only a small radius is available and where the tip of the inserted corner runs out. This creates high local tension peaks which lead to a reduced service life.

Method V: Fully rounded



With regard to tension distribution, the best choice is the version with rounded inside and outside by inserting a fully rounded corner. The disadvantage is that the channel also has to have a contour with rounded corners.

Frequently used materials in lens manufacturing

Material group	Material designation	
General structural steel	1.0038 1.0330 1.0338	S235JR DC01 DC04
High-temperature steel	1.0425 1.0473 1.5415 1.7335	P265GH P355GH 16Mo3 13CrMo4-5
Fine grained structural steel	1.0565 1.1106	P355NH P355NL2
Stainless austenitic steel	1.4301 1.4404 1.4529 1.4539 1.4541 1.4571	X5CrNi18-10 X2CrNiMo17-12-2 X1NiCrMoCuN25-20-7 X2NiCrMoCu25-20-5 X6CrNiTi18-10 X6CrNiMoTi17-12-2
Heat resistant steel	1.4828 1.4841 1.4876 1.4878	X15CrNiSi20-12 X15CrNiSi25-21 X10NiCrAlTi32-21 X8CrNiTi18-10
Duplex steel	1.4462	X2CrNiMoN22-5-3
Nickel-base alloy	2.4856 2.4858	NiCr22Mo9Nb NiCr21Mo

As a rule, lens expansion joint convolutions can be manufactured from all materials which are suitable for welding and cold forming. The table shows only a small selection of materials.