

Finishes and Welding

Surface Finish

In an ideal world as a machine cutting tool removes material from a part, it leaves no imperfections. Minute clearances in the machine tool, moving parts, vibration of the tool, wear of the cutting insert, small variations in the pressure applied by the machine to the cutting insert and irregularities in the material all affect the final surface finish of the part. Following the cutting process, the surface is characterized by microscopic peaks and valleys.

There are two common methods of expressing roughness. They are the Arithmetic Average Roughness Height (AARH) and the Root Mean Square (RMS) Average. Calculation of the Arithmetic Average Roughness Height involves measuring the distance of the peaks and valleys and performing an arithmetic average of the measurements. Alternately the calculation of Root Mean Square Average involves measuring the distance of peaks and valleys, adding the square of these measurements and calculating the square root of the total. The RMS value is approximately 11% higher than the AARH value.

Flange Face Surface Finish

The American National Standards Institute (ANSI) code for flanges and flanged fittings (B16.5) requires that the flange face has a specific roughness to ensure that this surface be compatible with the gasket and provide a high quality seal. A serrated finish, either concentric or spiral, is required with 30 to 55 grooves per inch and a resultant roughness between 125 and 500 microinches.

Welding

Welding is a process of joining two metals by heating the metals to a suitable temperature. It may be carried out with or without the application of pressure, and with or without a filler metal. If a filler metal is used then it must be compatible with the base materials.

Welds may be a *Full Penetration* or *Partial Penetration*, see figures 1.0 and 1.1 on page 11. A full penetration weld ensures a fully welded interface between the two parts and is generally the strongest joint. A partial penetration weld, on the other hand, consists of a partially welded interface with filler metal being laid on to the surface of the two metals.

Welding is a generic term for several different welding processes. The process may be manual, semiautomatic or automatic. Generally arc welding is implied. Common techniques are Shielded Metal Arc Welding (SMAW), Gas Tungsten Arc Welding (GTAW) and Gas Metal Arc Welding (GMAW).

Alltemp Sensors standard procedure for thermowell welding is GTAW, full penetration welds. This technique provides for an efficient application of weld metal, strong joint, clean weld surface and homogenous weld. Homogeneity is especially important in services where weld voids can lead to hydrogen induced cracking.