

MACHINING RECOMMENDATIONS FOR TVH® ALLOYS

GENERAL GUIDELINES

The recommendations for the machining of TVH® materials are based on extensive tests made at the TRAIID VILLARROYA group of companies, which also match the values of a great number of customers.

TVH® materials are basically easy to machine.

Since the cutting speeds so much depend on the type of cutting tools used, on the stiffness and stability of the machine-tools used and on the type of cooling and lubricating liquids used, the recommended machining speeds for TVH® alloys are indicated in the following information.

This information is valid for conventional machine-tools, as well as for CNC and high speed machining (HSC) centres.

Influencing values such as machine-tool rigidity, optimal heat extraction, specific cutting tool configuration and so on play independently from this a big role, which is even more marked with the harder TVH® grades.

Please take notice that the lifetime of the cutting tools for the harder grades will be considerably shorter.

In general all TVH® harder grades, from should be machined from the edge into the material or alternatively the edge can be generously chamfered at an angle of 45°. Non conformance to this rule will lead to breaking of the edge.

Machining tools

The clearance angle α for all TVH® alloys must be set at 6°.

Cooling is as important as lubricating when machining TVH® material,

specially for the hard grade TVH® AL10. Water mixable lubricating coolant are recommended, where the emulsion generally contain 5 to 10% cooling lubricant.

For parts where a high precision is requested, it is recommended to pre-machine first, then wait 48 hours before finish machining is performed. In special cases where the parts require very tight tolerances or for thin wall parts a stress-relieving heat treatment before or even better after the pre-machining can be done. Please ask your local TVH®-office for the necessary temperatures and holding time.

Sawing

The softer TVH® alloys can be sawn with bimetal saw blades.

The hard grades like TVH® AL10 are best sawn with hardmetal saw blades. Depending on the section of the pieces to be cut, the number of sawing teeth will vary between 2 ½ and 3 teeth / inch.

Manufacturer recommendation: hard metal saw blades from WIKUS-Sägenfabrik, (www.wikus.de).

Turning

The cutting tool has to be set up in the centre of the part or up to 0,4 mm below this centre.

For roughing or finishing it is best to use hard metal cutting tool tips in the quality K10 / K20. For

real fine machining (hole-shaft fits) a very good surface condition (N3) can be achieved with diamond tooling (PKD).

To avoid breaking of the edge when turning rings, you should always turn rings from outside of the material to inside of the material when machining the harder grades from TVH® AL10 upwards. Alternatively a generous 45 degree chamfer can be machined before on the edge where the cutting tool will be finishing its turning operation coming out of the material.

Milling

For the milling of TVH®, hard metal tools type K10 – K20 are best suited. To machine curves and cavities the standard hard metal tools with radius type K10 – K20 are best choice.

When using shaft milling tool, corner milling tool and two lips milling tool with hard metal tips it is a must to machine from outside to the inside of the part or otherwise the edges of the part to be machined must be first chamfered under an angle of 45° to avoid breaking of the edge.

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Drilling, sinking and reaming

For the TVH® – grades, hard metal plates drillers or fully hard metal drillers can be used. It is important to pay attention to a good chip removal. For deep holes it is recommended to withdraw the drilling tool and to remove the chip. For through holes it is better to place a steel plate under the part or to drill the hole from both sides in order to avoid a breakage of the part around the exit end of the hole. A very good cooling of the drilling tool is also recommended.

Machining of threads

It is recommended to use thread cutting tools which are relief grinded. Hard metal thread cutting tools are an advantage compared to HSS thread cutting tools; they allow higher cutting speeds and last longer.

Honing

When honing a part made out of TVH® alloy, a geometry precision of the machined part between 0.0005 and 0.015 mm with a surface roughness between 0,5 µm and 1,5 µm can be reached depending on the size and type of the part to be machined. For parts with a diameter between 25 and 130 mm, an undersize of 0.01 up to 0.038 mm must be foreseen for honing, for parts with a diameter greater than 130 mm up to 280 mm an undersize of 0.038 mm up to 0.063 mm must be foreseen.

Grinding and polishing

One of the advantages of the TVH® alloys is that an excellent surface quality can be reached when fine machining. Some TVH® grades can be grinded with feed rates as they are usual for steel. The grinding speed when deburring varies between 30 and 45 m/s, when flat or round grinding between 24 and 25 m/s. For flat or round grinding, silicon carbide grinding wheels will be used. Optimal results are achieved with rotating speeds of 5000 and 6000 RPM for the grinding wheels and when round grinding with a rotating speed of the part itself between 25 and 150 RPM. It is recommended to grind in wet condition.

Polishing

The polishing of TVH® alloys is similar to steel. The parts to be polished will be first prepared by fine machining, for instance by flat grinding, or with grinding paper by hand, grain size 320 up to 500 or by fine grinding with a machine so that the grooves cannot be seen anymore with plain eyes. The parts to be polished will be then high gloss polished with a polishing wheel out of felt (driven by a drilling machine or special machine) and grinding / polishing paste.