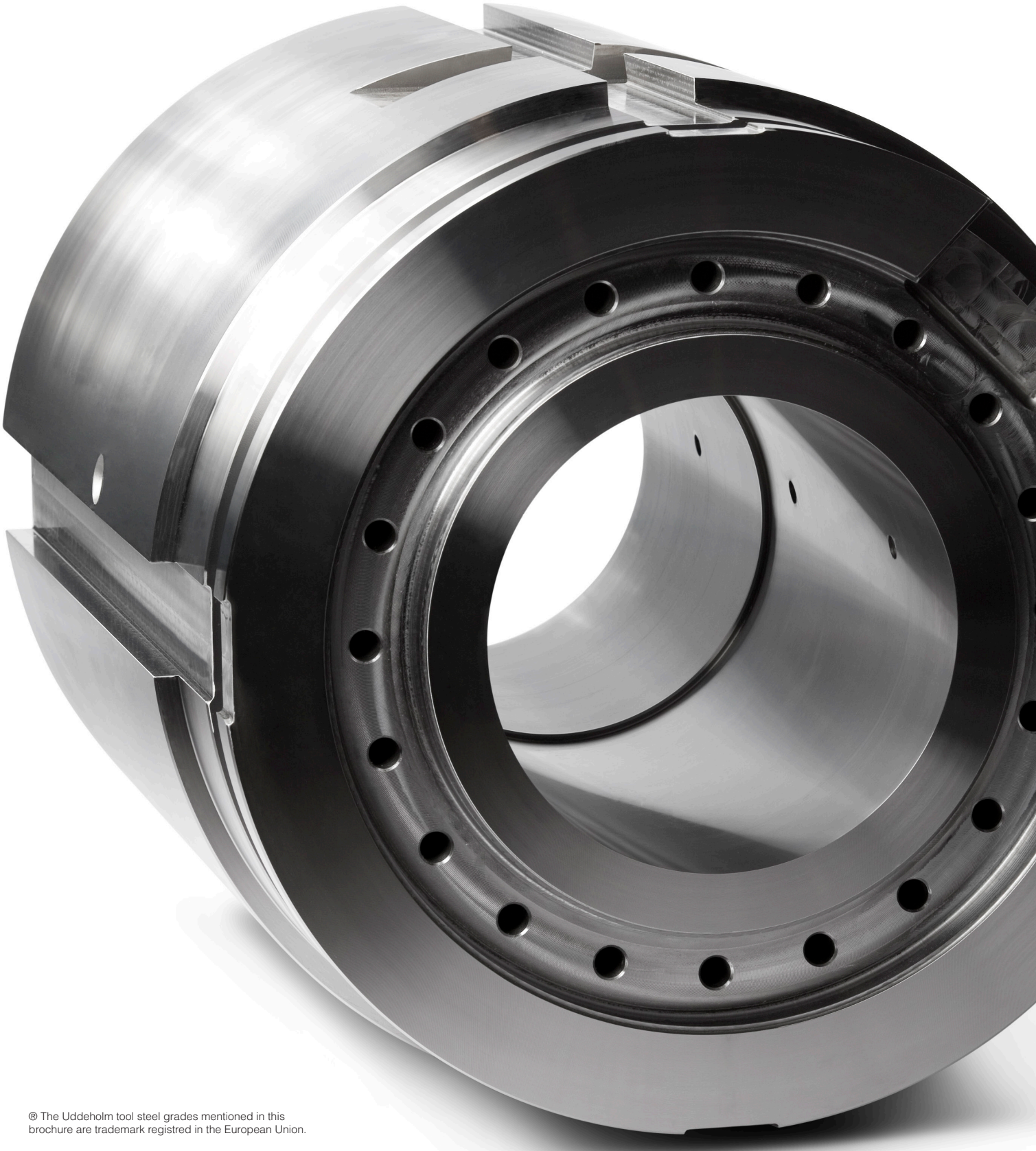
Engineering and support from

Uddeholm Machining

ADVANCED COMPONENTS FOR THE EXTRUSION INDUSTRY

UDDEHOLM
a voestalpine company



This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose.
Classified according to EU Directive 1999/45/EC
For further information see our “Material Safety Data Sheets”.

2022

2024

ENGINEERING AND SUPPORT FROM UDDEHOLM MACHINING

What really drives us is the ongoing dialogue with customers, whereby together we improve the finished product and production economy. Because at the end of the day, extrusion components are simply a way of meeting technical and financial requirements from our customers' customers.

The extrusion industry requires materials and components that can cope with extremely difficult conditions. Having worked together with extrusion plants for more than 30 years, we have seen many problems and success stories and have definitely learned a lot.

High quality and creative solutions stem from the combination of the experience at Uddeholm Machining and the highly qualified researchers and application engineers of our Uddeholm sister companies.

Market-leading companies have chosen Uddeholm Machining as their business partner. We design and produce extrusion components. These are often delivered as parts of a system, complete with heating and cooling systems, as well as an on-going service committment. For example, when the extrusion container needs reconditioning, Uddeholm Machining carries out a service at its plant in Hagfors, Sweden. We also keep a log of our customers' tools, making it easy to amass knowledge over time and monitor the customer's tool and any servicing carried out. This is a service we know is valuable.

Let us be your partner in the never-ending search for highest performance and lowest cost per produced unit.
Together we find the causes of any issue and advise you to appropriate countermeasures. In addition to advice, we also provide drawings, engineering support and components or systems.

CONTAINERS AND RELINING

Containers can be built in two or three parts. A two-part container consists of a mantle and a liner, while a three-part one comprises a mantle, an intermediate liner and a liner proper.

The function of the container is to take up the hydrostatic and tangential stresses derived from the extrusion force. Nowhere in the container should these stresses exceed the elastic limit, i.e. the working stress range is similar to that for a dummy block with the qualification that liner and mantle are at different temperatures and will thus be characterized by different stress-strain curves.

WHAT COULD GO WRONG?

If the elastic limit for the steel in the mantle is exceeded, the whole container will deform plastically to an extent that it may go out of tolerance. In an extreme loading situation, the entire container might crack. Containers subjected to heavy loads are thus normally built in three parts. While this is obviously more expensive, it does give the advantage that the stress levels in each individual part are reduced appreciably at a given extrusion pressure, when compared to a two-part container.

The container is, in many ways, the heart of the extrusion process. It represents a substantial initial investment, as well as a delicate balance between the cost of maintenance and the cost of production disruption. Life-cycle economy requires in-depth nowledge of steel grades, design, and heating systems. As well as close on-going monitoring to minimize service costs without risking disruptions.

WHY UDDEHOLM MACHINING?

Our container production is based on a profound knowledge about the performance of steel, the conditions in metal extrusion and the experience and skill of our people.

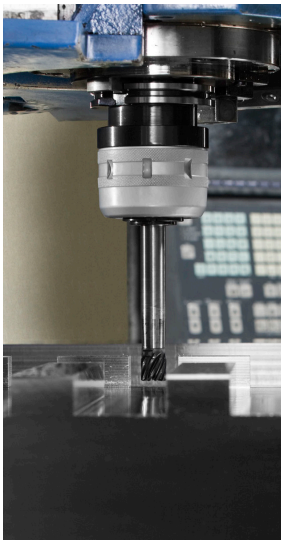
- We provide the best steel whatever grade you choose
- We advise and assist you if changes are going to be made
- We install modern heating systems

Our commitment does not end as the new-built container is delivered. During the container's lifetime, thousands of billets pass through it. Both container and liner are subjected to a number of factors that affect life-cycle profitability, production economy and quality of the end result.

We work closely with our customers to prevent premature breakages, unjustifiable production stops and to improve production profitability. A first step is to trust us with relining.

We produce and fit the liners according to our long experienced standards. And when doing so, we check the container thoroughly and document its status. This means that at every new relining, we can compare the present status with previous. That allows us to forecast the life of the container and advise on how to counteract.

Uddeholm Machining containers and liners perform well because they are fitted to each other carefully with thermal load, press forces and present status taken into consideration. Container status is well documented and evaluated and forms a solid base for preventive actions, planned changes and trouble-fee production.



SHEAR BLADES

Oxides and other impurities of aluminium typically contaminate the radial surface of the billet. Eventually, impurities and oxides end up at the butt end of the billet. If the butt end is not removed from the billet prior to loading another billet, impurities and oxides will find their way into the extrusion.

WHAT COULD GO WRONG?

Shear blades are subjected to wear at elevated temperatures. Often inadequate steel or design results in excessive damage to the knife. Which in turn means increased costs for blades, unnecessary labour costs, as well as lower aluminium yield.

TYPICAL PROBLEMS

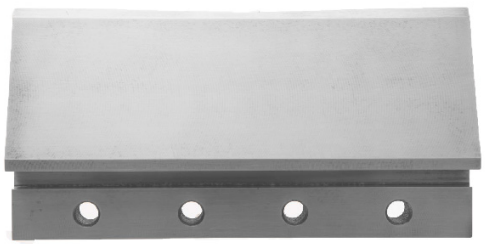
As the butt is being sheared at the face of the die, aluminium is pulled from the ports of both hollow and feeder plate dies which leave voids to entrap air when the next billet is pressed against the die and air blisters will easily appear on a large portion of extrusions.

Extensive aluminium build-up on the face of die, die ring, and container face is caused by the tendency of the butt shear blade to be forced away from the die during the shearing operation. Additionally, shear blades tend to tear the butt off rather than clearly shearing it. Thus, the aluminium left on the die face is rough and uneven. When the container, holding another billet comes into contact with the aluminium left on the die face, air voids are created between the billets. These air voids cause blisters in the extruded products. The uneven sealing surface, caused by the partly displaced aluminium, can cause the container to tilt in various planes as it attempts to seal against the die face. This creates misalignment and puts stress into the press frame and all included press tooling.

WHY UDDEHOLM MACHINING?

We developed Attila in order to help our customers prevent these costly problems, and also to reduce work and downtime associated with the changing of knives.

Attila is made from Uddeholm hot work steel, with a special design from Uddeholm Machining means that it is easy to change. Also, only the working part is changed which saves tune as well as material. Uddeholm machining also produce cutting components to customers' specifications, contributing with in-depth knowledge of steel grades, design and workability. And, of course, a skilled workforce and state-of-the art production lines to ensure the right quality and hassle-free production.



STEMS

The stem transfers the power of the main cylinder onto the billet, via a dummy block. Stems are subjected to high pressure during extrusion but their working temperature is relatively low, as they are not in contact with the billet. The stem must not bend, deform or crack during operation.

WHAT COULD GO WRONG?

Stems operate under high pressure loads, why centering is key and all centering adjustments must be monitored regularly. Unbalance may result in cracks and bending of the stem.

With high-pressure stems, finally the front of the stem may deform and expand laterally. The surface will also harden due to repeated impact with the dummy block, which eventually could lead to micro cracking. Such breakages must be prevented, or they may harm the press equipment, cause down-time and, potentially, serious personal injuries.

WHY UDDEHOLM MACHINING?

Uddeholm Machining produce stems in hardness range 46-50 HRC. Independent of what material is to be extruded, we commonly use Uddeholm Orvar 2 Microdized, Uddeholm Dievar or Uddeholm Formvar tool steel.

Due to the high pressure and a dangerous environment, it is of great importance to regularly inspect the stem in respect of parallelism between the planes, straightness and surface condition. Uddeholm Machining offers a maintenance program for stems, which includes regular check-ups.

DUMMY BLOCKS

The dummy block is the extension of the stem, transmitting force to the billet – over and over again. It needs to expand immediately under load and on return separate from the billet and contract instantly.

WHAT COULD GO WRONG?

It is no wonder that dummy blocks wear. The problem is that they often wear too fast, which drives costs for loss of production time and manpower as well as cost for the dummy blocks themselves.

Unassuming as it may appear, the dummy block has a profound impact on quality and productivity. Malfunction causes bad quality in the finished products as well as disruptions, whereas a good dummy block works perfectly throughout the production run and even compensates for e.g. minor misalignments of the press equipment.

WHY UDDEHOLM MACHINING?

We work closely with our customers to develop and manufacture the perfect dummy block for each application and specific needs. By using an adapter your stem can easily be adjusted to fit our dummy blocks.

Learnings are continuously fed into the process and whether we produce to customers' design or provide our own, our aim is always to contribute to a hassle-free and efficient production process.

Over the years, we have faced and analyzed most of the problems normally associated with faulty dummy blocks. Let us be your partner in the never-ending search for highest performance and lowest cost per produced unit. By using our expertice you can optimize the process between press and die.

PRODUCT PROGRAMME FOR THE EXTRUSION INDUSTRY

GENERAL DESCRIPTION

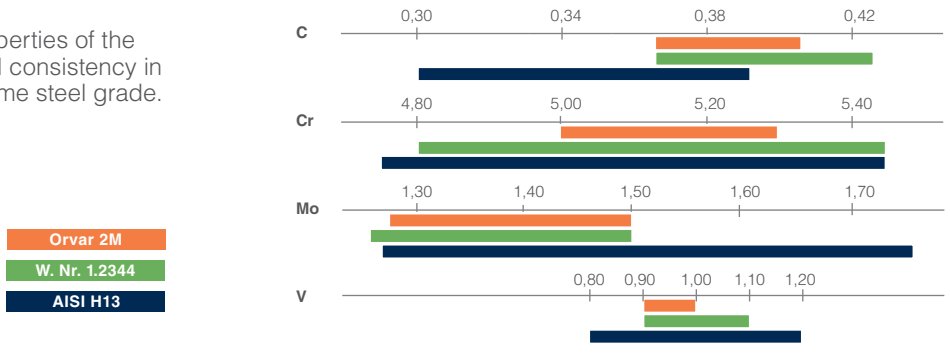
UDDEHOLM TOOL STEEL	GENERAL DISCRIPTION
Orvar 2 Microdized W. Nr. 1.2344 (AISI H13)	A Cr-Mo-V-alloyed hot work steel with good high temperature strength and good reistance to abraison. Recommended in most cases for tooling components and dies in aluminium extrusion which come into direct contact with the hot billet.
Vidar 1 W. Nr. 1.2343 (AISI H11)	A Cr-Mo-V-alloyed hot-work steel with good combination of high temperature strength, good toughness and good resistance to abraison.
QRO 90 Supreme	A premium hot work steel with very good strength and hot hardness at elevated temperatures. Recommended for dies and all types of extrusion tooling subjected to maximum working temperatures.
Formvar	A high performance hot work tool steel with very good resistance to hot wear and plastic deformation.
Dievar	A premium Cr-Mo-V hot work steel with good high temperature strength and excellent toughness and ductility in all directions. Recommended in dies and extrusion components where the demands on toughness and ductility are the highest.
Unimax	A premium Cr-Mo-V-alloyed steel with good toughness and ductility up to a hardness of 58 HRC.
Alvar 14 W. Nr. 1.2714	Cr-Ni-Mo-alloyed hot work steel. Recommended for support tooling in extrusion, e.g. bolsters and wedge blocks.
Impax Supreme W. Nr. 1.2738 (AISI P20)	Prehardened Ni-Cr-Mo-alloyed steel supplied at approx. 310 HB, with good machinability. Suitable for wedge blocks and other support tools, mantles and intermediate liners, at lower temperature.

CHEMICAL COMPOSITION (ANALYSIS %)

UDDEHOLM TOOL STEEL	AISI	C	Si	Mn	Cr	Mo	V	Ni
Orvar 2 Microdized	H13 (W. Nr. 1.2344)	0.39	1.0	0.4	5.3	1.3	0.9	-
Vidar 1	H11 (W. Nr. 1.2343)	0.38	1.0	0.4	5.0	1.3	0.4	-
QRO 90 Supreme	-	0.38	0.3	0.8	2.6	2.3	0.9	-
Formvar	-	0.35	0.2	0.5	5.0	2.3	0.6	-
Dievar	-	0.35	0.2	0.5	5.0	2.3	0.6	-
Unimax		0.50	0.2	0.5	5.0	2.3	0.5	-
Alvar 14	(W. Nr. 1.2714)	0.55	0.3	0.7	1.1	0.5	0.1	1.7
Impax Supreme	P20 (W. Nr. 1.2738)	0.37	0.3	1.4	2.0	0.2	-	1.0

UDDEHOLM ANALYSIS LIMITS COMPARED TO W. NR. AND AISI

Tight limits increase quality and properties of the steel in all aspects and remain good consistency in the production of the parts in the same steel grade.



STEEL SELECTION FOR DIFFERENT EXTRUSION APPLICATIONS

TOOLING COMPONENT	EXTRUDED MATERIAL		
	ALUMINIUM/MAGNESIUM	COPPER ALLOYS	STEEL
SUPPORT TOOLS (pressure plates)	Orvar 2 Microdized Vidar 1	Orvar 2 Microdized Vidar 1	Orvar 2 Microdized Vidar 1
BOLSTER	Alvar 14	Alvar 14	Alvar 14
DIE RING	Formvar QRO 90 Supreme	QRO 90 Supreme	QRO 90 Supreme
DIE	Formvar Vidar 1 Orvar 2 Microdized QRO 90 Supreme Dievar Unimax	QRO 90 Supreme	QRO 90 Supreme
INTERMEDIATE LINER	Orvar 2 Microdized Vidar 1 W. Nr. 1.2343 W. Nr. 1.2344 W. Nr. 1.2367	Orvar 2 Microdized Vidar 1 Formvar W. Nr. 1.2343 W. Nr. 1.2344 W. Nr. 1.2367	Orvar 2 Microdized Vidar 1 W. Nr. 1.2343 W. Nr. 1.2344 W. Nr. 1.2367
LINER	Orvar 2 Microdized QRO 90 Supreme Vidar 1 Dievar Formvar	QRO 90 Supreme Formvar Inconel 718 W. Nr. 1.2779	Orvar 2 Microdized
DUMMY BLOCK	Dievar Orvar 2 Microdized	QRO 90 Supreme	QRO 90 Supreme
MANTLE	W. Nr. 1.2714 W. Nr. 1.2343 W. Nr. 1.2344	W. Nr. 1.2714 W. Nr. 1.2343 W. Nr. 1.2344	W. Nr. 1.2714 W. Nr. 1.2343 W. Nr. 1.2344
FASTENERS FOR FIXED DUMMY BLOCK	Impax Supreme Orvar 2 Microdized	-	-
STEM	Orvar 2 Microdized Dievar Formvar	Orvar 2 Microdized	Orvar 2 Microdized
MANDREL	Orvar 2 Microdized Formvar QRO 90 Supreme	QRO 90 Supreme Formvar Dievar	QRO 90 Supreme Formvar

QUALITATIVE COMPARISON OF CRITICAL PROPORTIES (THE LONGER THE BAR, THE BETTER)

UDDEHOLM TOOL STEEL	TEMPER RESISTANCE	HOT STRENGTH HOT HARDNESS	CREEP STRENGTH COMPRESSIVE STRENGTH	DUCTILITY TOUGHNESS
Orvar 2M				
Vidar 1				
QRO 90 Supreme				
Formvar				
Dievar				
Unimax				

UDDEHOLM TOOL STEEL	HOT WEAR	PLASTIC DEFORMATION	PREMATURE CRACKING	HEAT CHECKING
Orvar 2M				
Vidar 1				
QRO 90 Supreme				
Formvar				
Dievar				
Unimax				

UDDEHOLM
a voestalpine company