

Process competence in 5-axis machining

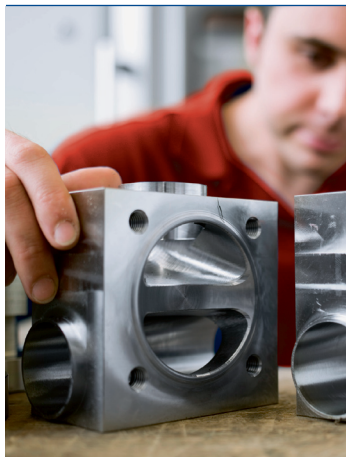
5-axis simultaneous milling shows great promise for the machining of sculptured surfaces, especially in terms of dimensional and shape accuracy and economic efficiency. However, practical utilisation of these high-tech machines is still often thwarted by programming issues.

Therefore HELLER has been developing new milling strategies and performing highly complex 5-axis machining trials on sample workpieces in close co-operation with renowned CAD/CAM providers and tool manufacturers. At METAV, HELLER and CAD/CAM provider Sescoi (WorkNC) and tool manufacturer Ingersoll demonstrated ways in which the

complete process chain can be implemented in practice without any problem. The main focus was on the newly developed 5-axis machining centre FT 4000 with swivel-head unit - a classic workshop machine with direct table loading that is expected to attract a lot of interest from tool and die manufacturers.

Read more on page 2/3

Industry offensive 2010



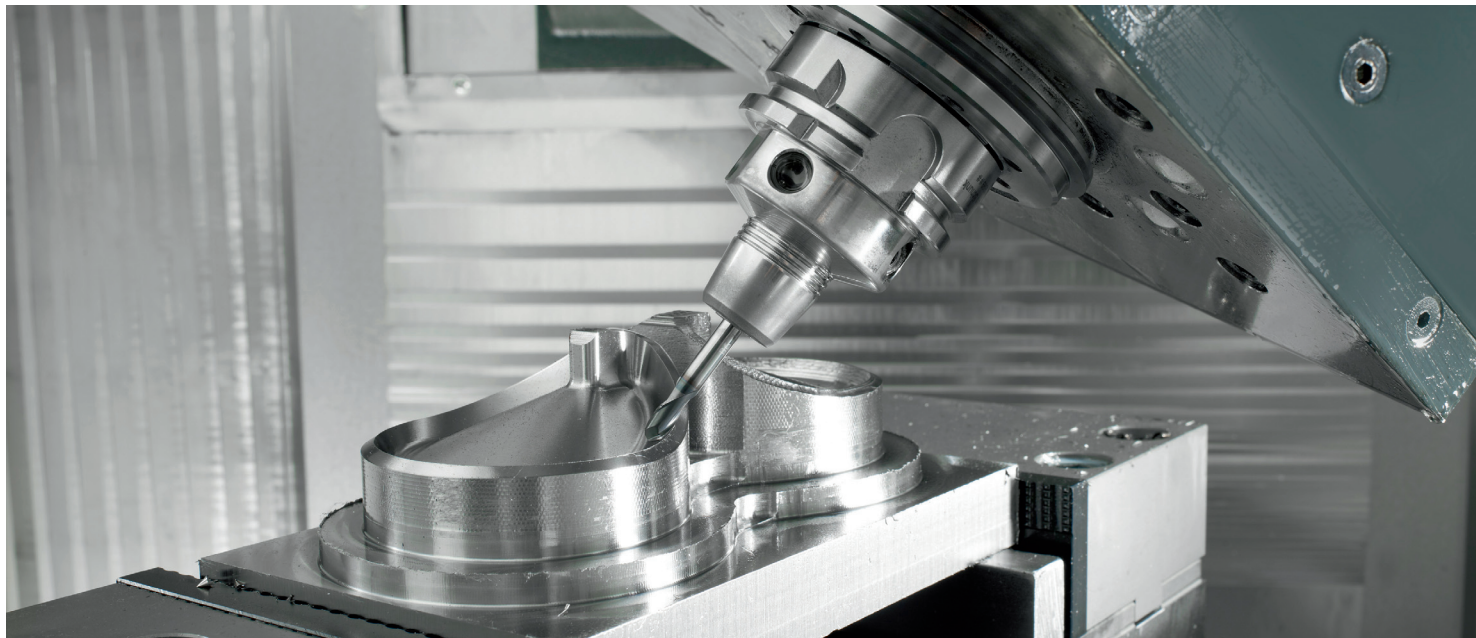
The days when HELLER's customers mainly came from the automotive industry and its suppliers are long past. With a wide range of machining centres, extensive technological know-how and comprehensive solutions for workpiece-specific tasks, HELLER offers persuasive solutions tailored to the needs of many user industries.

HELLER is opening up its process and solution competence to a wide range of industries including general machine and plant engineering, electrical engineering, aerospace industry, power engineering, tool and die manufacturers, job shops and many others

Blue Competence BLUECOMPETENCE

At METAV 2010, 15 companies presented solutions designed to enhance the energy efficiency of machine tools under this heading at VDW's joint booth. Quantifiable data on energy efficiency, as required by the EuP Directive established by the European Commission, are a priority development area - also for Heller.

Please turn over for more information.



Optimised 5-axis machining of complex shapes and geometries

Highly complex shapes and geometries usually imply time-consuming programming in the CAM system. Although high function-

ality CAM systems are available, for instance, for peripheral milling or face milling of sculptured surfaces, the potential of the machines on hand is often not fully utilised.

AT METAV, HELLER demonstrated true solution competence with its newly developed machining centre FT 4000. Together with CAD/CAM

provider Sescoi and tool manufacturer Ingersoll, a mature solution for the implementation of the complete process chain in 5-axis machining was presented. Complementing the FT 4000, SESOI presented WorkNC Auto 5. This revolutionary development in the area of 5-axis milling takes account of the specific kinematics involved. Besides its

complete tool range, Ingersoll also presented a high-feed cutter with extremely soft cutting geometry. These products illustrate what 5-axis machining is all about: combining outstanding surface finish with highest cutting capacity.



Steel component M315 extra Tensile strength 1000 N/mm² Dimensions 200 x 200 x 52 mm

HELLER uses this steel component as an example to illustrate the exceptional cutting performance of the FT 4000. Ingersoll provided 12 tools for the operation. The demonstration comprises the complete range of machining operations – from face milling, pocket milling and drilling through to tapping and thread milling.

Tools from the Ingersoll product range



No.	1	2	3	4
Machining	Face milling	Face milling	Shoulder milling	Groove milling
Ø [mm]	63	63	63	32
z	6	6	6	3
Vc [m/min]	200	200	200	80
fz [mm]	0.35	0.35	0.2	0.15
n [rpm]	1011	1011	1011	796
vf [mm/min]	2123	2123	1213	358
ae [mm]	51	51	51	32
ap [mm]	5	3	10	32

The FT model

- Classic workshop machine for manual loading
- Combination of highest cutting capacity and best surface finish on the market
- For a wide range of parts and materials and low volume production
- For frequently changing tasks and prototype construction
- Unparalleled ease of access to work area through three-part work area door
- Flexible, powerful and highly precise

Technical data FT 4000

- Work area X = 800 mm
Y = 800 mm Z = 1,000 mm
- Table size Ø 720 mm
- Workpiece Ø x height max.
1,200 mm x 1,500 mm
- Max. workpiece weight 1,400 kg
- Chip-to-chip time 3.7 s
- Rapid traverse rate 60 m/min
- Acceleration 6 m/s²
- Spindle tapers SK 40 / HSK 63 / BT 40
- Spindles:
 - PCU 63: 10,000 1/min, 44 kW, 242 Nm
 - SCU/SCT 63: 16,000 1/min, 40 kW, 80 Nm











Workshop machine: HELLER FT 2000/4000 for table loading

The axis drives used for the F series have been amply dimensioned and the 5th axis provided by the tool forms the basis for achieving the

necessary process reliability and handling of high workpiece weights. With a workpiece load of up to 1,400kg and a spacious work area (800mm working range in X and Y axis and 1,000mm in Z direction), the FT 4000 has been practically tailored to the needs of tool and die manufacturers – particularly since HELLER's spindle technology is

cutting-edge in terms of its universality and flexibility. The Speed Cutting Universal SCU 63 swivel head with 40 kW and the Speed Cutting Tilt SCT 63 fork head, also with 40 kW, are available for speed cutting. The Power Cutting Universal PCU 63 swivel head (44 kW and 242 Nm) is the most powerful 5-axis spindle with HSK 63 currently available on

the market and an excellent choice for heavy-duty cutting applications. In terms of control, users also have the freedom of choice: whether they opt for Siemens Sinumerik 840Dsl or Heidenhain iTNC530, both types deliver all the performance they could wish for.

							
5	6	7	8	9	10	11	12
Pocket milling	Pocket milling	Drilling	Drilling	O-ring groove	Chamfering	Thread milling	Tapping
25	25	50	32	21,7	12	30	36
3	7	1	1	4	4	2	5
200	200	180	180	200	200	160	16
1.5	0.65	0.15	0.2	0.1	0.1	0.12	-
2548	2548	1146	1791	2831	5308	1698	140
11466	11466	172	215	1132	2132	408	560
19	19	50	32	2	1	2	2
0.8	0.5	50	32	2	1	21	25

Aluminium component AlMgSi1

Tensile strength 300 N/mm²
Dimensions 210 x 160 x 120 mm

Tools from the Ingersoll product range



No.	1	2	3	4	5
Machining	Continuous roughing in Z	Continuous removal of remaining material in Z	Continuous removal of remaining material in Z	5-axis contours	5-axis finishing
Ø [mm]	32	16	10	6	6
z	3	3	3	2	2
Vc [m/min]	955	477	235	179	179
fz [mm]	0.3	0.2	0.25	0.28	0.2
n [rpm]	9500	9550	7500	9500	9500
vf [mm/min]	8550	5700	5700	5400	3800
ae [mm]	25	12	7	0.5	0.2
ap [mm]	5	1.5	1	0.5	0.3

Process-secure machining of complex sculptured surfaces is a specialty of the FT 4000. To demonstrate this HELLER again uses Ingersoll tools for machining an AlMgSi1 component from tool and die manufacturing. A total of 5 tools is used for rough machining of the aluminium component and eventual 5-axis finishing of contours.



Energy efficiency – always at the top of HELLER's agenda

BLUECOMPETENCE

HELLER has a leading edge in this field. For years, the company has taken a holistic approach in this regard by taking into account individual aspects on component level and by developing energy-efficient processes and procedures and optimised machine concepts. In this context, three elements provide the basis for higher energy efficiency: consumption-optimised machine components, needs-oriented project-planning and optimised machining processes.

The optimisation of energy consumption of the individual machine components is an integral part in the development process of new products at HELLER. This includes independent control of chip conveyors or pressure regu-

lation during coolant unit runtimes and run-on times. Moreover, motors are adjusted to the requirements of the machine allowing to reduce energy consumption by using drive modules with lower power ratings. In terms of machine design, machine concepts with optimised topology provide high material damping. This results in increased process stability and reduced cycle times and power requirements. The thermally stable machine concept illustrates the tremendous energy savings that can be achieved. It minimises thermal growth, reduces warm-up times and eliminates the need for extensive workshop air conditioning. In single-shift operation, energy savings of up to 6% can be achieved simply by reducing the

warm-up phase. Significant savings potentials also result from standby strategies, such as spindle deactivation, recognition of not-operations resulting in switch-off as well as stop at end of shift and warm-up functions. Machining can be optimised by means of control override through adjusting feed override and a tuning cycle for adapting the machining operation to the process by using defined cycles. Tailoring the machine and the process to the individual requirements provides additional savings potential.

This includes optimising the machine design in terms of the range of workpieces to be machined, needs-oriented utilisation and machining requirements. HELLER consistently support their customers in optimising their production processes enabling them to add maximum value and to maximise their energy efficiency. To achieve this, HELLER development engineers contribute their extensive product and process know-how, whilst the customer provides his experience from manufacturing.

usersNEWS

Publisher:
Gebr. Heller
Maschinenfabrik GmbH
72622 Nürtingen
www.heller.biz

Editor:
Marcus Kurringer
Telefon: +49 7022 77-5683
marcus.kurringer@heller.biz

Visit our website:
www.usersnews.de