Industeel

Newsletter 05-2024

Machining Superplast® steels

The machinability of steels is a very complex phenomenon, and this is also one of the key points while choosing a steel for a tooling or a mechanical application.

ArcelorMittal

This complexity depends on interactions between the steel, the tool and the milling-grinding machine. In the recent past, the so-called "recommended machining parameters" for steels were presented as tables in data sheets, and were coming from tests in well-defined conditions, but they cannot be strictly applied to all the machining equipment, tools or shapes.

Nowadays, tools manufacturers have extensively developed softwares which consider most of the interactions we spoke previously, and these softwares are ready to simulate very accurate machining parameters based on homogeneous steels, like our **Superplast**® branded grades, which are now being included into one of the most known software.

This is what will be presented in this Newsletter.



What is « Walter GPS »?

Walter GPS is an online database to find optimized recommendations for machining. Thanks to this search tool for a specified steel, you can easily find recommendations for tools and parameters of use tailored to the desired application.

Great news: Superplast® grades are now referenced in this database!

How does it work?

1.Connect to this website: Walter GPS (walter-tools.com)

2.Choose the section: Application-related search3.Choose the specified steel:

Tips: You can adapt the hardness level according to your material!

4.Select a task depending on the desired machining operation:

- Cubical feature
- Rotational feature
- Hole
- Thread

Tips: You can combine several tasks as drilling and threading!

5.Set the parameters for the required machining operation

6.Get the results:

- You can filter the results based on new criteria
- Select the appropriate tool suggested (Walter brand tools but close to another supplier)

• Get cutting data and recommendations for machining depending on tool, material and machine

• You can modify these data according to your machine capacity and extract the recommendations in PDF

Tips: If you create an account on the Walter website (free) you can directly download programming lines adapted (CNC code) to your machine for the milling cutters!

What are the advantages?

The Walter GPS is very easy to use. By setting a few parameters, you can rapidly obtain tool and machining recommendations tailored to your requirements. The more detailed the parameters, the more appropriate the recommendations will be. Moreover, this resource is free and open to all!

GPS Start	K Material classification	Material search		
P Superplast 350 P2.5.Z.HT 350 HB	Walter Extended	superplast		٩
Select task	All > P Steel	Found materials		1-5 of 5 < >
Set machine	K Cast iron	Superplast 350 Arcelor Mittal Superplast 350 Arcelor Mittal	275 300 335 HB 330 350 370 HB	 A Show aliases A Show aliases
Set parameters	Non-ferrous metal	350 HB ~	350	370
Get results	 S Super-alloys and titanium H Hard material 	Supervised 400	250 270 200 HD	Reset Cancel Apply
	O Non ISO	Superplast 450 Arcelor Mittal	410 445 450 HB	 If Show allases If Show allases
		Superplast Stainless Arcelor Mittal	270 300 330 HB	
				*

Selection of the material with hardness adaptation

Note of the set of the	GPS Start	< Options	Parameters	
Internal thread in a hole Universal high-performan. Universal high-performan. 200 kW, 500000 1/min * Right Left System stability • Excellent stability	P Superplast 350 P2.5.Z.HT 350 HB	Hole type Applicability for blind hole	Thread guide *	Thread selection
Universal high-performan. 200 kW, 500000 1/min * j = 2 • 6* Thread length* Image: Clarance distance Image: Clarance distance Set parameters Excellent stability Rigid tapping* Image: Clarance distance Image: Clarance distance Set parameters Excellent stability Rigid tapping* Image: Clarance distance Image: Clarance distance Get results Clarance distance Image: Clarance distance Image: Clarance distance Image: Clarance distance Set parameters Excellent stability Rigid tapping* Image: Clarance distance Image: Clarance distance Get results Clarance distance Image: Clarance distance Image: Clarance distance Image: Clarance distance * parameter is mandatory * parameter is mandatory * parameter is mandatory * parameter is mandatory	(Internal) thread in a hole	Applicability for through hole	Thread tolerance class *	User defined thread size
Set parameters Excellent stability Rigid tapping* Image: Constraint of the stability Good stability Rz roughness value** - 15 µm Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraint of the stability Image: Constraity of the stability Image: Constraint	Universal high-performan 200 kW, 500000 1/min ☆ 3 ⊂ 2 ▲	Right Left System stability	Thread length * Clearance distance	mm
Get results * parameter is mandatory • Empty all fields	Set parameters	Excellent stability Good stability	Rigid tapping [*] Rz roughness value ^{**} ↓	15 μm
	Get results	Con stability	* parameter is mandatory	Empty all fields

Example of parameters to be defined for a thread operation

	GPS Start	Тооі	Product detail ECO Cutting	data Change	e cutting da	ata Edit NOP	Machining strategy	CNC code	Core hole
Р	Superplast 350 P2.5.Z.HT 350 HB	TC620-M8-A1E-WB10TJ Body	Sustainability Bending						
	(Internel) through in a hole	н	Parameters Working engagement	a _e	0.625	mm			
	(internal) thread in a hole	0	Depth of cut	ap	7.5	mm			
	Universal high-performan		Number of passes in AE direction	NOPae	1				
<u>م</u>	200 kW, 500000 1/min		Number of passes in AP direction	NOPap	4				
	∻;= 3∎ ø°		Cutting speed	Vc	95	m/min			
0 2 0	and the trans		Spindle speed	n	4800	1/min			
Ø M 8 6H I 20 mm III √ 15 μm		Feed per tooth	fz	0.0785	mm				
6 Results	Thread Milling Internal Or < 1/3 >	Feed speed in the tool centre	v _f	320	mm/min				
	1 Thread Milling	Feed speed at the contour	v _{fe}	1510	mm/min				
		Cutting power	Pc	0.365	kW				
	TC620-M8-A1E-WB10TJ		Cutting torque	Me	0.725	Nm			
			Maximum chip thickness	h _{ex}	0.0469	mm			
			Material removal rate	Q	7.07	cm ³ /min			
			Total cutting time	T _{c tot}	4	S			
			Tool life length	LifeLength	101.89	m			
			Tool life time	Life _{Time}	68	min			
			← Results	ē					

Example of results obtained with cutting data, change cutting data, CNC code and option to download all data in PDF

Technical tip 1

There is no standardized "universal" test nor unit for defining the machinability.

The most common parameters in milling are the feed rate and the depth of cut and the shape-color of the chips measured in definite conditions.

In such conditions a range of "correct parameters" can be defined but if there is a local evolution in the properties of the steel the range "of correct parameters" will change!

This range is also not the same for users working in similar but not identical conditions.

Technical tip 2

The tool life can be defined by the length of time a tool can be used profitably in nominal conditions.

This is not an absolute value since the real data to be considered for measuring the efficiency is "how much material can I convert into chips using a single tool?"

A tool can have a short life and a very high efficiency!

Conclusions:

The high homogeneity of the structure and of the hardness of the **Superplast**® steels, but as well the repeatability of the production, all those parameters allow to optimize and to compute the detailed machining parameters according to the chosen tool and the kind of job to be done.

In less homogeneous steels as the common P20, 1.2311, 1.2714, 1.2738... the structures and hardness are highly depending on the producer, from the thickness and also from the section of the blocks of steel at the time of the heat treatment. As a consequence, the machining parameters cannot be optimized. Moreover, they are in constant change during the machining of big parts.

The lack of segregation in the **Superplast**® steels lead to a better machinability with all kinds of classical methods.

Some typical enhancements of performances are:

- High ejection rate +20-30%
- Better dimensional stability
- Higher productivity: from +10% in milling to +50% in deep hole drilling

All these topics and a detailed metallurgical approach of the machining will be developed in a short coming webinar.



Your contacts

Jean-Michel Machefert jean-michel.machefert@arcelormittal.com

Carolina Bicego carolina.bicego@arcelormittal.com

Perrine Lavalley perrine.lavalley@arcelormittal.com

industeel.arcelormittal.com



All information in this brochure is for the purpose of information only. Industeel reserves the right to change its product range at any time without prior notice.