



# Machine tool

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## Introduction:

Pump operation plays an important role in any efficient operating machine centre. In general, pumps have three functions in a machine centre: to cool the process, to lubricate the tools and finally to bring the liquid to the filter and back. These processes are very important because they are an integral part of maintaining a fast production and prolonging tool life. In addition, they must be done with energy efficiency and at the lowest possible total cost.

## Purpose:

The purpose of this White Paper is to present some of the ways you can operate a pump in a machine tool centre, and some of the functions in a frequency converter that will make a difference. Finally, we will look at some of the available mechanical solutions and their application to daily operation of a pump in a machine centre.

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## From speed controlled pumps to intelligent pumps

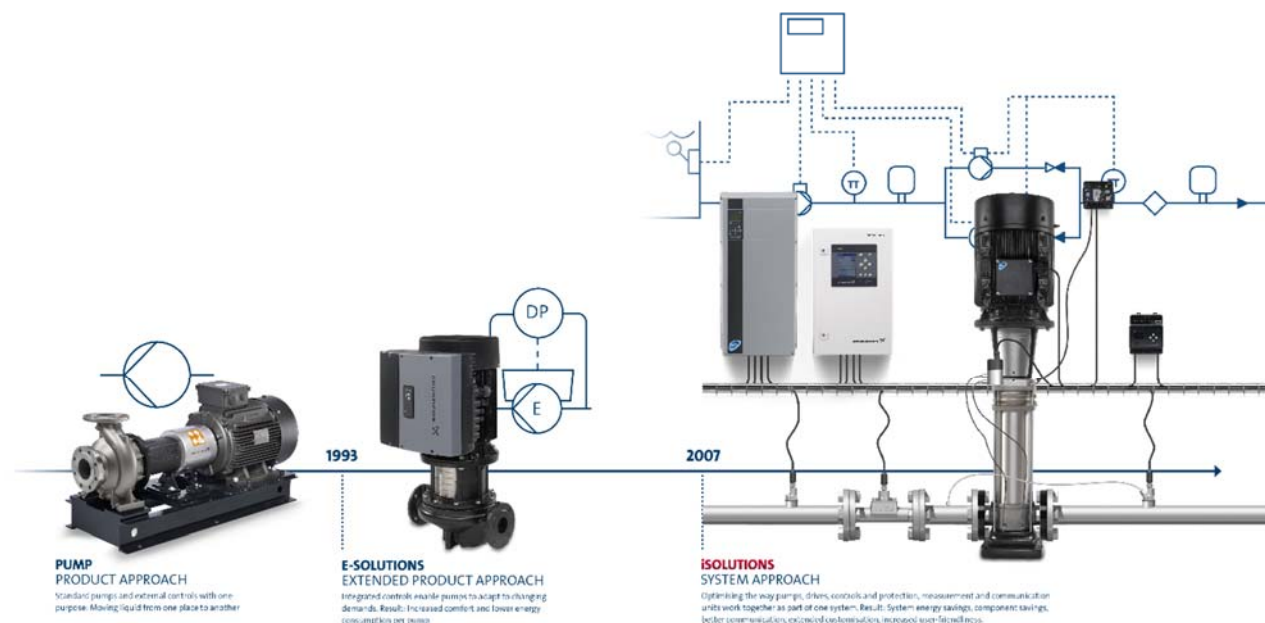
In a machine centre it is very important that especially the pumps used for cooling and lubrication are fast reacting and precise, so that the tools can operate at maximum speed and without unnecessary wear. This is where Grundfos iSOLUTIONS comes into play.

**Grundfos iSOLUTIONS is the intelligent approach** to optimal pump system and application performance. It offers all the benefits of our pump E-Solutions, but adds a whole range of new features based on your specific demands. The result is improved reliability, performance and energy efficiency.

### Supreme speed control

Speed control is an essential part of an iSOLUTION. The frequency converter simply adjusts the pump's speed according to the actual demand to offer a variety of benefits:

- Faster production. So you can get the needed pressure and flow at the tool the second you need it, leading to faster production
- Longer tool life. Speed control gives you the right flow and pressure when you need it; this leads to correct temperature and lubrication of the tools and thus longer life.
- Energy savings. Speed control reduces energy consumption – and CO<sub>2</sub> emissions.
- Reduced total cost. Speed control can replace regulating valves, sensors and process equipment, and the quick installation contributes to bringing down the total cost.



## Customisation your way

With an iSOLUTION your pump can be perfected to suit even very detailed requirements. The customisation options include a choice of materials, connection options and special software. The latest advances in software allow our designers to target your specific challenges with extreme accuracy. See below how an E-solution or iSOLUTION pump matches the specific requirements of the machining industry.

### GRUNDFOS E-SOLUTIONS - INTEGRATED INTELLIGENCE

A Grundfos E-solution features pump, motor and frequency drive all combined into one product. As the frequency drive constantly adapts pump speed according to demand, it is possible to achieve significant pump energy savings.

#### Constant pressure

The E-pump is able to start quickly and deliver constant pressure to match any operating point required by selected tools.

#### High speed – over synchronous operation

High rpm for very compact pump design, suitable for installations where space is limited i.e. installation in cabinets or machine centres.

#### Pre-set operating points

Set up the E-pump to operate with several predefined set points to provide the necessary pressure for various demands.

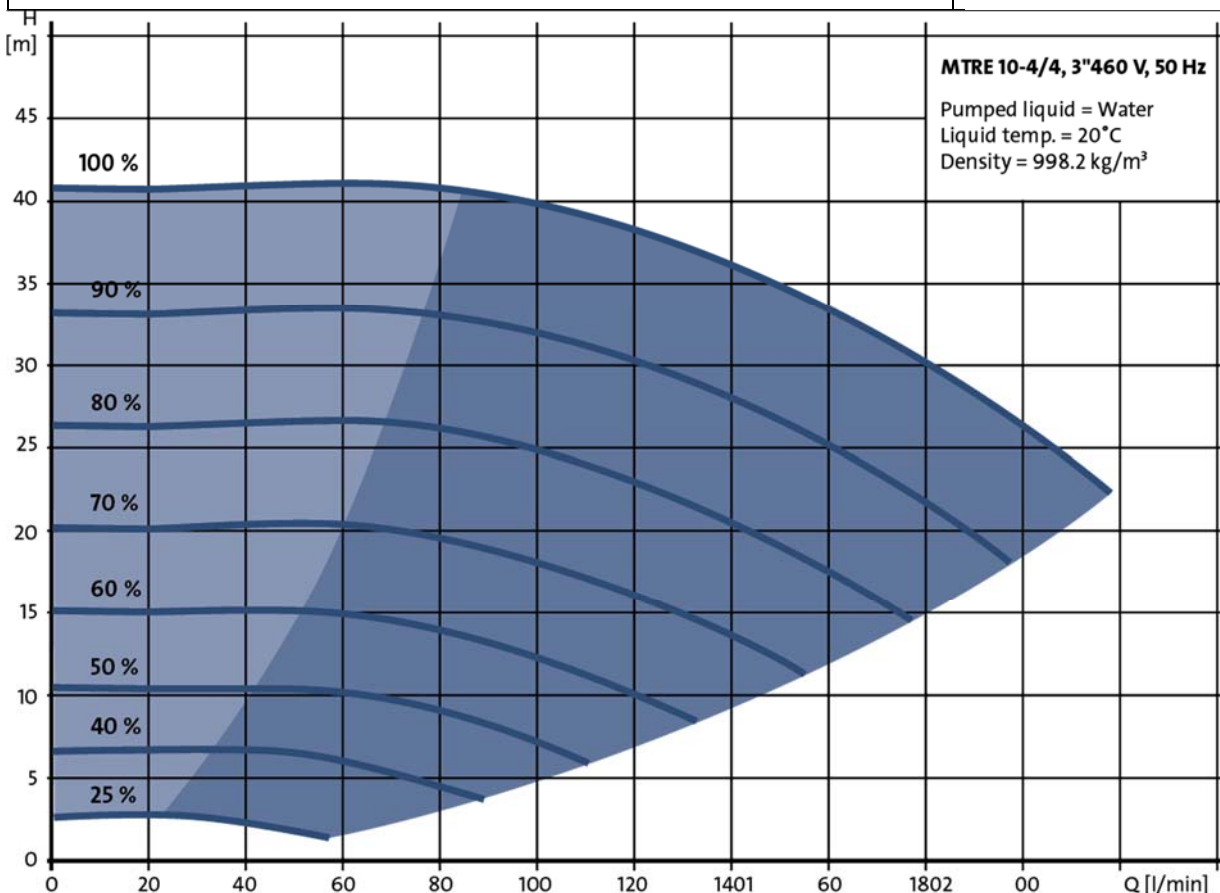
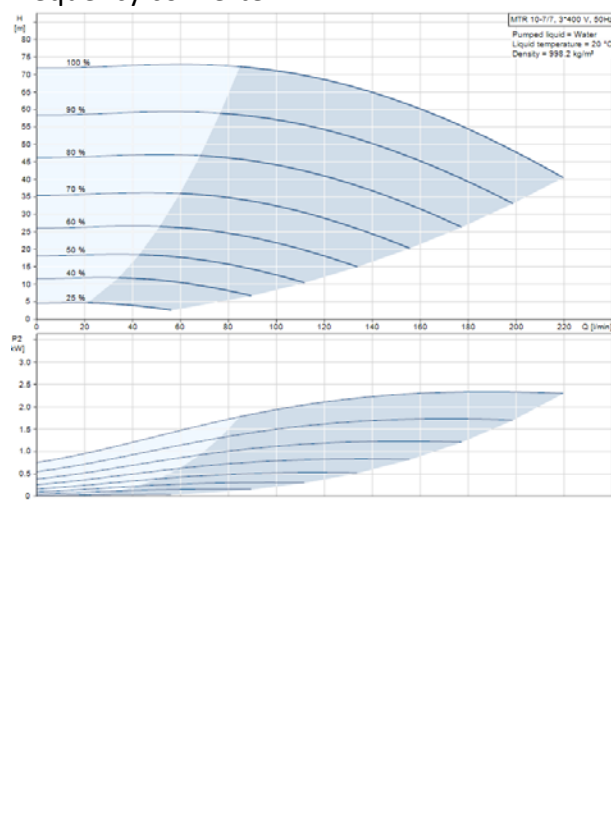


Figure 1 Pump curve showing the performance area of a pump operated with built-on frequency converter (or for that matter a traditional wall mounted frequency converter).

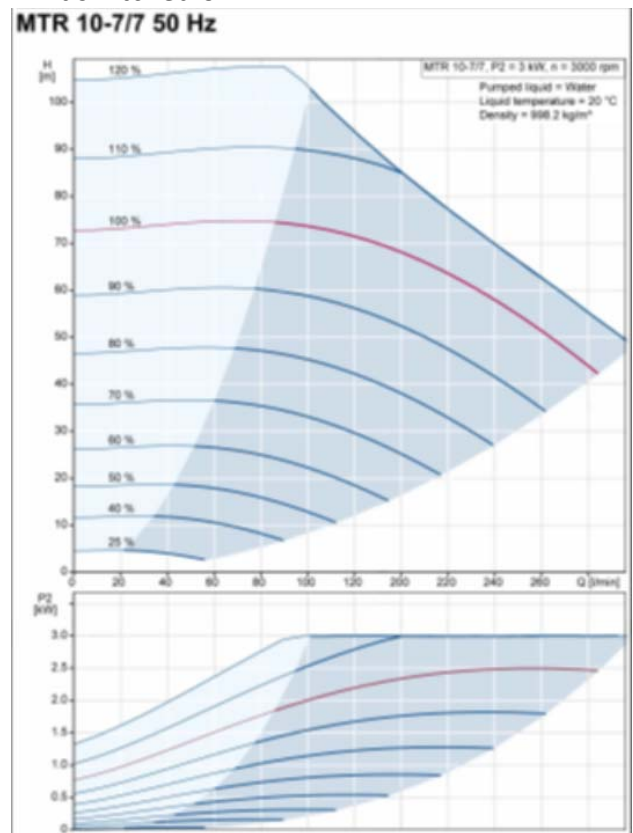
## ISOLUTIONS

- **Limit exceed**  
Enable your system to change operating patterns or notify you directly if a specific process parameter exceeds a pre-set limit.
- **Set point influence**  
Avoid cavitation or excess pressure across the chamber stack by adjusting the set point of the pump. Influence parameters include pressure, flow, etc.
- **Run at power limit**  
Get full load power output, but optimal overload protection. Allows for operation with undersized motors or to get more pressure out of the same pump

Example of an MTR 10-7/7 with traditional frequency converter.



Same pump but now with the function power limit switched on.



### Grundfos GO at your disposal

If you wish to carry out adjustments yourself, we provide either a display solution or app based solution for your smartphone called Grundfos GO. This fully enables you to optimise your software in any way you want. We are also more than happy to provide customised code if you prefer to leave the programming to us. With decades of experience we know about the challenges you face and are able to provide you with solutions that will meet them.

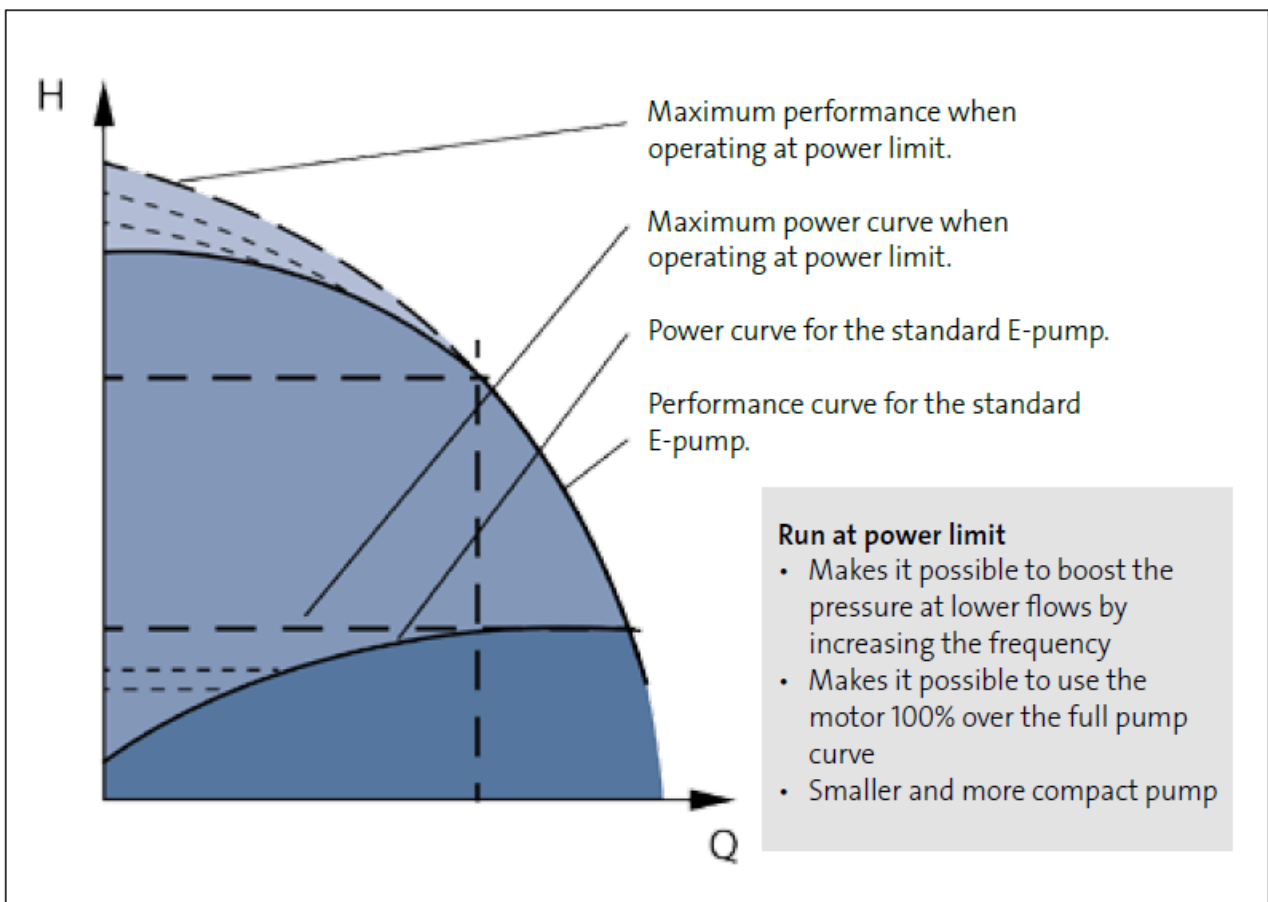


Figure 2 The pump curve shows how the different available software functions affect the pump curve.

## Mechanical solutions

There are many challenges for pumps operating in a machine centre and because of this, there are many pump versions available to cope with these challenges. The picture below shows some of the pump types often used.



MTR	The MTR range offers a broad range of high efficiency pumps of different immersible length for varying flow and pressure requirements of up to 102 m <sup>3</sup> /h (1700 l/min) and pressures up to 35 bar. MTR pumps are available as a customised solution in cast iron or stainless steel and in number of variants.
MTRE	An E-solution means electronic control and energy savings. This all-in-one solution with pump, motor and integrated frequency converter is packed with intelligent features that makes installation, operation, and service exceptionally easy and performance much more efficient and reliable. The compact, integrated design comes with one drive for use worldwide and complies with all international standards.
MTH	The MTH range of immersible pumps with the motor and pump in one unit is very compact, increasing the ease of installation. Available in cast iron or stainless steel, the MTH range can be supplied in different immersible lengths for varying flow and pressure requirements. The MTH pump comes with dual frequency 50/60 Hz as standard. The MTH range is ideal for machine tool, wash & clean and chiller applications.
MTA	The MTA range of single-stage immersible pumps has been designed especially for filtering systems in the machine tool industry. The semi-open impellers allow the passing of chips up to 10 mm, making the pumps ideal for removing liquid from any machining process – from boring and milling to grinding. The compact MTA pumps efficiently transport liquid containing chips, fibres and abrasive particles on to the filtering unit.
MTS	Grundfos MTS pumps are screw pumps designed for high pressure pumping of cooling lubricants and cutting oils for machine tool applications. These pumps come with various pump sizes and screw pitches to provide the flow and pressure required. Using MTS screw pumps in machine tool applications, where high pressure is required, results in an increased surface quality and a decreased machining time. The MTS pump is available in different installation variants, such as tank top, in-tank and dry installation, all with a range of connection options.

Among the typical challenges of machining pumps, they face more start/stop cycles than in any other application. This means huge stress on both pump and motor. (The pump is stressed because it frequently goes from no pressure to max pressure.) Due to this, the pumps are designed more robustly for machine tool operations than, for example, standard water pumping. On the other hand, the motor is stressed if it doesn't get sufficient cooling -simply because it doesn't operate long enough for the cooling fan to become effective.

Another common problem is that the shaft seal wears out quickly because the liquid pumped is seldom completely clean, but often contains small particles. This can be a problem: when the shaft seal wears out it starts to leak more, meaning liquid will be running/spraying out onto the top of the tank.

Leak-free pumps are often a top priority in any industrial process, because leaking pumps may lead to costly downtime and in turn affect production costs. Grundfos have therefore developed the MTR pump with drainage back to tank.

The MTR DBT (Drainage Back to Tank) pump effectively eliminates this risk, as the liquid remains in the tank where it is supposed to be – even if the shaft seal is worn out and starts to leak.

- Downtime risk due to leakage is eliminated
- No risk of contamination
- Longer service intervals
- Reduction of part costs
- Non-sticking solution for the shaft seal on start up



## Conclusion

As explained in this white paper there are a lot of challenges when it comes to pumping tasks in a machining centre. Some of them are mechanical in nature, and can be dealt with by using the right pump in the right solution. But when it comes to optimising the process as a whole, then a lot can be done by using E-solutions or iSOLUTIONS and optimising the pump performance software features.

Some are basic pump features that are already widely used in other applications as well but there are also newer functions that fit perfectly the needs of a machining centre. For example, by using a modern MTR pump at over synchronous speed, you can get more pressure out compared to just operating at the traditional frequency. This offers the possibility of using a much wider range of tools with different demands to flow/pressure with the same pump. Furthermore, the new electronic on-board frequency converter makes it possible to react even faster and more precisely to specific needs than ever seen before.

So to sum up, by using the right mechanical pump and utilising the possibilities available in iSOLUTIONS you will get the following benefits in your machine centre:

- **Faster production**
- **Longer tool life**
- **Energy savings**
- **Less maintenance**
- **Reduced total cost**

If you are interested in the range of machining solutions from Grundfos then visit our homepage [www.Grundfos.com](http://www.Grundfos.com) where you will find even more information both about the pumps and application as well as more details about the many possibilities Grundfos iSOLUTIONS can offer.