



SOLUTIONS

HIGH PRESSURE & FILTRATION

解决方案

高压和过滤



M-Tech
machinery

CUSTOMER PROXIMITY + INNOVATION

贴近客户 + 创新

// We are a family enterprise driven by German Engineering.
Our customers appreciate our personal commitment as well as our innovative strength and dedication to excellence.
我们是以德国工程设计为根基的家族企业。我们的客户对我们的个人承诺以及创新优势和对于卓越的奉献精神倍加赞赏。//



Our headquarter is located at the heart of the German automotive industry and medical technology – thus on the pulse of important machining companies and highest-quality precision.

Opportunity and philosophy: We integrate our customers into our processes in order to incorporate current and future customer requirements into our system solutions. Thanks to a highly qualified team, we have evolved into an international supplier of innovative high-pressure solutions for cooling lubricants.

Being not only a pioneer but also the European market leader in compact high-pressure for sliding headstock automatic lathes we strive for excellence and continuously innovate to improve the efficiency of our customers. Today and in future. Experience a new dimension of unique compact energy-efficient high-pressure lubrication systems enabling you sustainably to improve your performance, your margins and your output quality.

我们的总部位于德国汽车行业和医疗技术的中心，因而能时刻了解重要加工公司的动向，提供最高品质的精度。

机遇和理念：我们让客户参与我们的流程，以在系统解决方案中考虑到当前和未来的客户要求。凭借高素质的团队，我们已发展成为冷却润滑剂创新高压解决方案的国际供应商。

在用于纵切自动车床的紧凑型高压领域，我们不仅是先驱，也是欧洲市场的领导者，对卓越孜孜以求，不断创新，改善我们客户的效率。现在和未来。体验独一无二的紧凑型高效高压润滑系统带来的新维度，能够让您持续改善性能，利润率和产品质量。

combiloop: the compact high-pressure lubrication system // combiloop – 紧凑型高压润滑系统

The purity of cooling and lubricating media as well as specific cooling lubrication are essential keys and controlling elements for stable and efficient production processes in the machining industry. As a service partner and manufacturer of special modules, the company founder recognised this fact and invented the first cooling lubricant high-pressure unit: combiloop. Since the late 1990s, cooling lubricant filtration, high-pressure generation and control development have been fields of core competencies and key technologies with and for us.

What is a high-pressure lubrication system?

The use of high pressure provides a lever for more efficient machining. High pressure systems
// **primes contaminated medium from the machine bed**
// **filter and clean the medium to the need of the high-pressure unit**
// **feed the cleaned medium at high pressure into the interior of the machine or the internally cooled tool(s).**
Thanks to innovative filter technology, our high-pressure systems guarantee continuous and perfect working.

What are the benefits of high-pressure with combiloop?

Space-saving, flexible, and up to five-digit cost savings in the production process: The innovative filter technology of our combiloop guarantees continuous and perfect purification of the cooling lubricant of your machining tools and therefore allows for the generation of exceptionally high pressure.
// **Longer tool service life**
// **Higher cutting speeds**
// **Time saving and flexibility**
// **Reduced energy consumption by using eco+ dynamic power concept**
// **Increased quality of output**
// **Lower heat intake by using eco+ dynamic power concept**
// **Increased output**
// **Perfect use of the available space**



冷却和润滑介质的纯度以及特定的冷却润滑是加工行业稳定而高效生产流程的核心关键因素和控制要素。作为特种模块的服务合作伙伴和制造商，公司创始人清楚看到这一事实，并发明了首个冷却润滑剂高压集成系统：combiloop。从 20 世纪 90 年代末开始，冷却润滑剂过滤，高压生成和控制开发一直是我们的核心能力和关键技术的发展领域。

什么是高压润滑系统？

运用高压是为了推动更高效的加工。高压系统
// 从机床中引出受污染的介质
// 根据高压集成系统的要求过滤并净化介质
// 在高压下将净化的介质送入机床内部或内部冷却刀具。
借助创新的过滤器技术，我们的高压系统保证持续而完善的工作。

combiloop 的高压解决方案有什么优势？

节省空间，灵活高效并且在生产流程中最高可实现五位数的成本削减：我们 combiloop 创新的过滤器技术保证持续而完善地净化您机床的冷却润滑剂，因此可以产生极高的压力。
// **更长的刀具使用寿命**
// **更高的切削速度**
// **省时并且灵活**
// **通过运用 eco+ 动态功率理念减少能耗**
// **提升产品质量**
// **通过运用 eco+ 动态功率理念减少热量输入**
// **提升产量**
// **充分利用可用空间**



Performance potentials of combiloop // combiloop 的性能潜力

The preconfigured basic versions of our combiloop system solutions can be individualised. For instance, they can be tuned particularly efficiently to a wide range of requirements, processes and target performance potentials.

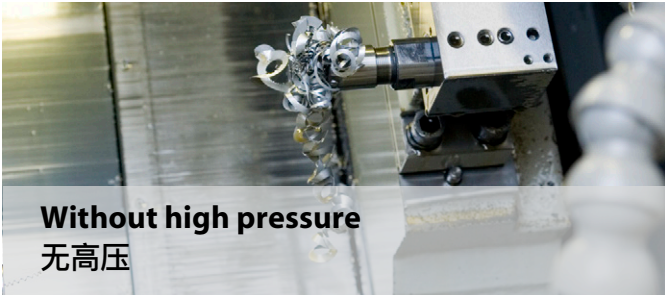
可将我们的 combiloop 系统解决方案的预配置基本版本个性化。例如, 可将它们调节为针对广泛的要求, 流程和目标性能。

Pressure range 压力范围	Material 材料	M-tech solution M-tech 解决方案	Benefit 收益
< 70 bar	Brass Machine steel	combiloop CL1 E / G	// Cooling lubricant purification // Improved cooling and lubrication at the cutting edge // Concentrated washing away of the chips when drilling, turning and milling
	黄铜 机件钢		// 冷却润滑净化 // 改善切削边缘的冷却和润滑 // 在钻孔, 车削和铣削时集中冲走切屑
30–70 bar	+ Copper** + Bronze**	combiloop CL1 E / G combiloop CL2 E / G	// Early breaking of the chips, removal of snarl, ribbon and spiral chips // Drilling possible without clearing out // Deep hole drilling (Ø < 2 mm) possible in one go* // Trouble-free two-shift or three-shift operation
	+ 紫铜** + 青铜**		// 更早折断切屑, 消除缠结, 带状和螺旋状切屑 // 可在不清理的情况下钻孔 // 可一次性钻出深孔 (Ø < 10 mm)* // 可靠的两班或三班运行
70–100 bar	+ Aluminium + Stainless steel	combiloop CL2 E / G combiloop CL3 G	// Good machining of aluminum and stainless steel // Deep hole drilling (Ø < 5 mm) possible in one go*
	+ 铝 + 不锈钢		// 出色的铝和不锈钢加工 // 可一次性钻出深孔 (Ø < 5 mm)*
> 100 bar	+ Hard alloys and titanium + Aluminum alloyed with silicium / copper	combiloop CL3 G	// Deep hole drilling (Ø < 2 mm) possible in one go* // Machining of extremely hard alloys and titanium* // Ideal for aluminum in combination with silicium and copper*
	+ 硬合金与钛 + 铝和硅/紫铜的合金r		// 可一次性钻出深孔 (Ø < 2 mm)* // 加工超硬合金和钛* // 非常适合铝和硅/紫铜的合金*

* using drills with internal cooling // 使用带内冷钻头
** lubricating materials, good machinability from 50 bar // 润滑介质, 50 bar 以上良好的切削加工性

A large number of machining operations requiring high pressures can be mapped in an area between 50 and 70 bar. Aluminium and stainless steel can be easily machined at pressures from 70 to 100 bar. Deep holes can be drilled to 5 mm in a single operation. Especially high-performance cutting demands pressures above 100 bar. The routine work here includes deep holes drilled to 2–5 mm and machining operations on hard alloys.

大量需要高压的加工操作处于 50 到 70 bar 的范围内。可在 70 至 100 bar 压力下便捷加工铝和不锈钢。在单次操作中可钻出最深 5 mm 的深孔。高性能切割, 满足 100 bar 以上的压力需求。日常工作包括钻出达到 2–5 mm 的深孔, 并且可在硬质合金上进行加工操作。



Without high pressure
无高压

// Chips are usually not broken due to the application of pressure below 30 bar. The disadvantages: There are often scratches on the workpiece and long chips in the floor tray. Furthermore, the chips settle on the turret, tool and workpiece.
// 切屑通常不会因为施加 30 bar 以下的压力折断。缺点: 工件上常留下刮痕, 并在底部托盘上留下长切屑。此外, 切屑会落在刀架, 刀具和工件上。



With high pressure
有高压

// Chips are broken due to the application of high pressure of over 30 bar. The advantages: Machining space and counter spindle remain free of chips. Besides, short chips are easier to filtrate and to remove.
// 切屑因为施加 30 bar 以上的高压而折断。优势: 加工区域和副主轴保持无切屑。此外, 短小切屑更易于过滤和去除。

Typical customer problems 典型客户问题	Effects 效果	Technical solution 技术解决方案
Snarl chips 缠结切屑	Interrupted process Time loss 流程中断 损失时间	Depending on their types, most chips can be broken quickly by pressures up to 50 bar. 根据切屑的类型, 大多数切屑可能因为高达 50 bar 的压力快速折断。
Higher tool wear/ fracture 更严重的刀具磨损/断裂	Surface damage 表面损坏	High pressure in conjunction with additional medium filtration. 40 – 60 µm is adequate in most cases. 高压结合额外的介质过滤。在大多数情况下 40 – 60 µm 足够满足要求。
Overheated medium 过热介质	Problems with tight tolerances Reject/defect parts 紧公差带来的问题 被拒/缺陷零件	One solution is a greater quantity of medium from an additional tank. Clever planning can eliminate cooling. 一种解决方案是通过额外的液箱供应更大量的介质。明智的计划可消除对冷却的需求。
Deep drilling not possible 无法钻深孔	Outsourcing 外包	High-pressure system up to 130 bar solves the customer's problem. The part can be finished on the machine. 高达 130 bar 的高压系统解决了客户的问题。零件可在机床上完成加工。

combiloop®

Further information and examples online:
更多信息和在线示例:

KERNKOMPETENZEN

核心能力

FILTRATION, HIGH PRESSURE, CONTROL

过滤, 高压, 控制

Filtration is one of our core competencies and your factor of success. The following filtration systems are primarily common and proven on cooling lubricant high-pressure systems:

- // Exchangeable filters
- // Cascading filters
- // Reversing flow automatic filters

过滤是我们的核心能力之一, 也是您的成功因素。以下是最为常见并且在冷却润滑高压系统上经过验证的过滤系统:

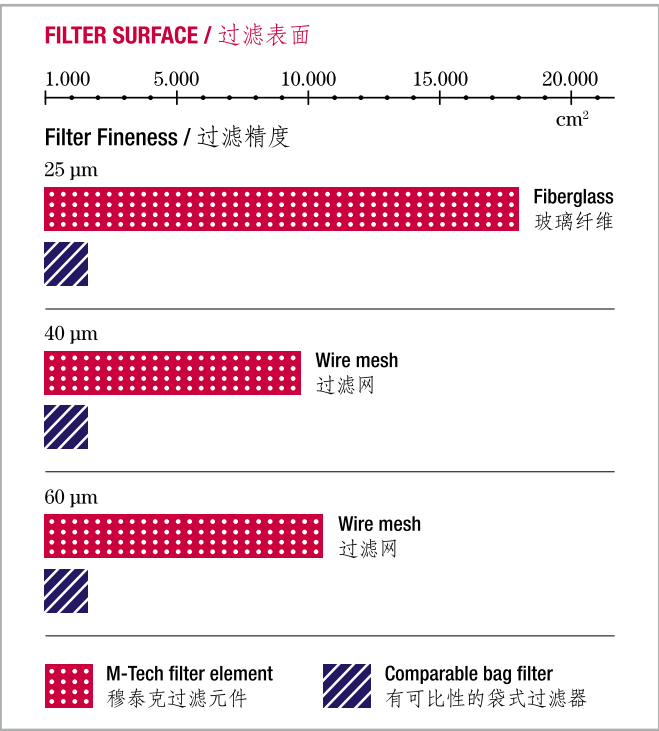
- // 可替换式过滤器
- // 级联过滤器
- // 逆流自动过滤器

Our exchangeable filter element – three-times increased surface for maximum filtration

我们的可替换式过滤元件将表面提升至三倍, 将过滤最大化

Based on our own innovative strength and competence, we've developed our own filter elements for spin-on filters. The conventional commercially available solutions were unable to meet our expectations in terms of service life and medium purity. The M-Tech spin-on filter element is unique in the compact high-pressure units class. The three times larger filter surface guarantees even greater efficiency – because more filter surface means less cleaning! Not only that, but the sintered wire mesh element is washable and can even be cleaned in an ultrasonic bath. No disposal is required, as is needed with bag filters for example. That's sustainable and also reduces operating costs. These filters are standard in the compact cooling lubricant high-pressure filtration solutions.

基于我们的创新力和能力, 我们开发出自己的可替换式过滤器元件。传统的商用解决方案未能达到我们对使用寿命和介质纯度的期望。M-Tech 可替换式过滤元件在紧凑型高压装置中是独一无二的存在。三重过滤表面可确保更高的性能, 因为更多的过滤器表面意味着更少的清洁! 不仅如此, 烧结的金属丝网元件可以水洗, 也可在超声波清洗池中清洁。无需在例如袋式过滤器上一样进行废弃处理。该过程为可持续性过程并由此降低了运营成本。这些过滤器是紧凑型 KSS 高压过滤解决方案的标准。



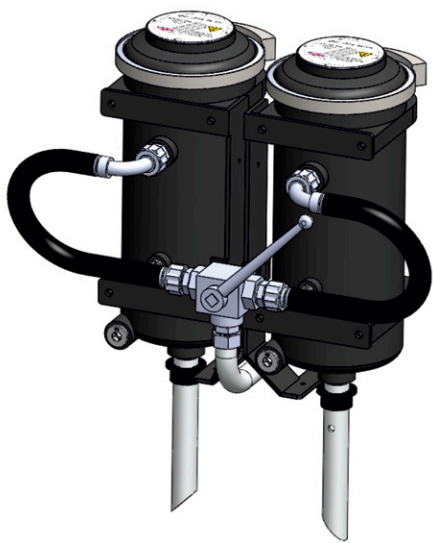
Benefit from our own developed filter element:

我们自行开发的过滤元件的优势:

- // High medium purity (xy – xy µm)
- // 高介质纯度 (xy – xy µm)
- // Improved service life, less machine downtime
- // 更长的使用寿命, 更短的机床停工时间
- // Cost savings, increased efficiency
- // 节省成本, 提高效率
- // No throwing away like with bag filters
- // 无需像袋式过滤器上一样丢弃

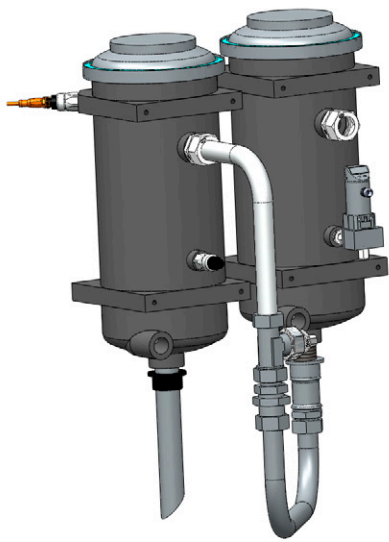


Filtration technologies // 过滤技术



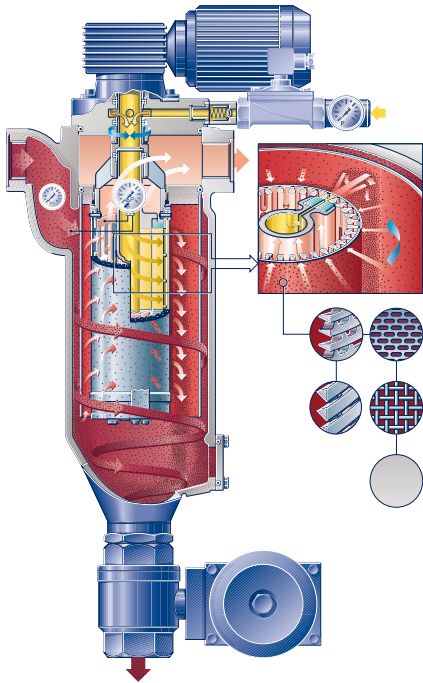
With regard to the acquisition costs, the **exchangeable filter** in the form of cartridges or bag filters are the cheapest alternative. The filtration capacity generally depends on the medium. Depending on load and contamination, the upkeeps may therefore be quite high. Exactly for this reason, the use of exchangeable filters is avoided for the full or partial flow filtration of the machine tank, they are usually used as pre-filters or secondary filters to protect the pump and other devices. With regard to the filter fineness, the exchangeable filter is very flexible with purities of up to 2 µm.

就采购成本而言, 筒式或袋式过滤器形式的可替换式过滤器是成本最低的备选方案。过滤容量一般取决于介质。根据负载和污染情况, 保养费可能相当昂贵。正是由于这个原因, 未将可替换式过滤器用于机床液箱全部或部分流量过滤, 它们通常用作预过滤器或次级过滤器以保护泵和其他装置。就过滤精度而言, 可替换式过滤器非常灵活, 纯度最高可达 2 µm。



The **cascading filter** consists of a pre-filter and a fine filter that clean the medium as it passes through. The medium first passes through the coarse pre-filter (mesh density approx. 500 µm) that must be washed from time to time. This forms a filter cake which increases separation efficiency and filter fineness. In a second step, the pre-cleaned medium passes through the fine filter. Purities up to 20 µm can be obtained. The fine filters used are either washable wire mesh elements or exchangeable units (fibreglass). This filter is designed specifically for high flushing capacities.

级联过滤器由净化经过的介质的预过滤器和精细过滤器组成。介质首先通过必须不时清洗的粗糙预过滤器 (过滤网密度大约为 500 µm)。由此形成滤饼, 提升了分离效率和过滤精度。在第二步骤中, 预先净化的介质通过精细过滤器。最高可达到 20 µm 的纯度。所使用的精细过滤器为可清洗丝网元件或可替换式单元 (玻璃纤维)。该过滤器专门为高冲能力设计。



The nearly maintenance-free, reversing flow **automatic filter** is suitable for full and partial flow filtration of all materials and cooling lubricants. The medium flows through the filter from the outside to the inside, dirt sticks to the outside of the sintered stainless steel braided fabric and falls down. The filter is cleaned automatically by backwashing with air or its own medium. Thanks to different sizes and combinability, both small and very high flowrates can be filtered effectively, in a medium-free and process-safe way.

几乎免维护的逆流自动过滤器适合所有材料和冷却润滑剂的全部和部分流量过滤。介质从外部到内部流经过滤器, 脏污粘附至烧结的不锈钢过滤网的外部并落下。通过以空气或过滤器自身介质的反洗来自动净化过滤器。借助不同的尺寸和组合性, 能够以无介质和流程安全的方式在较低和很高的流速下有效过滤。

Our high-pressure generation – leading efficiency // 我们的高压生成 – 领先的效率

Depending on requirements and applications, we offer different approaches in order to equally improve the efficiency of high-pressure generation in a sustainable way and increase process safety. As we are usually concerned with two cooling media with regard to cooling lubricants, we concentrate on pump technologies which have proven in conjunction with cutting oils and water-based emulsions (minimum oil content of 8 %).

Gear pump technology

Up to 70 bar for flow rates of up to 24 liters per minute we use gear pumps. Together with you we define and dimension the constant pumping capacity in such a way that it accounts for the specific machining application case. This serves to minimize the risk of overdimensioning and increased heat input.

eco+ dynamic power solutions

The **eco+** dynamic power concept of M-Tech stands for energy-efficient pump technology with self-regulating piston pumps or frequency-controlled drives. Advantages of the **eco+** dynamic power concept: increased energy efficiency, low heat input, increased temperature stability, higher efficiency.

Applying the **eco+** dynamic power concept, either regulated piston pumps or frequency-controlled drives are used for pressures of over 80 bar and discharges of clearly over 16 liters per minute. Contrary to constant pumps, the pressure-controlled high-pressure pump delivers precisely the volume required in the machining process with defined pressure, thanks to the integrated control loop. Thus it adapts to the actual requirements in the machining process and ensures stable, efficient processes. The frequency-controlled drive is usually used in conjunction with a constant pump. In this case, the frequency control of the motor, i.e. the number of revolutions, controls the discharge and thus the pressure. An intelligent control of the pump flow rate is achieved in both cases. Altogether the economical drive power, the control effect and the omission of unnecessary cooling capacities (no overdimensioning) result in clear cost savings with increased performance.



根据要求和应用, 我们提供各种方法, 以便以可持续的方式同等改善高压生成的效率并提升过程安全性。由于通常关注两种冷却润滑剂的冷却介质, 我们专注于泵技术, 这些泵技术已在结合切削油和水基切削液 (最小乳化液含量为 8 %) 使用上得到证明。

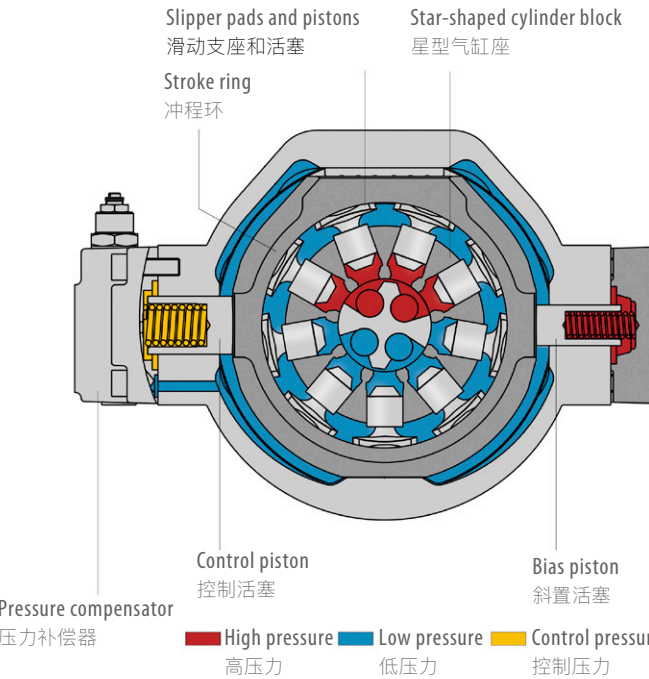
齿轮泵科技

在最高 70 bar 和流速最高 24 升/分钟的情况下, 我们使用齿轮泵。我们和您一起定义和确定恒定压力泵送能力, 使其适合具体的加工应用。这样可以最大程度降低规格过大和热量输入增大造成的风险。

eco+ 动态功率理念

M-Tech 的 **eco+** 动态功率理念代表高能效泵技术, 这种技术采用了自调节活塞泵或频率受控驱动器。**eco+** 动态功率理念: 提升能效, 降低热量输入, 提升温度稳定性, 提升效率。

通过运用 **eco+** 动态功率理念, 将经调节活塞泵或频率受控驱动器用于压力达到 80 bar 以上和排放量明显高出 16 升/分钟的情况。与恒定压力泵相比, 由于集成了控制回路, 压力受控高压泵以定义的压力精准地提供加工流程中所需的量。由此可适应加工流程中的实际要求并确保稳定, 高效的流程。频率受控的驱动器通常结合恒定压力泵使用。在该情况下, 电机的频率控制 (即旋转数) 控制排放并由此控制压力。在两种情况下都实现了泵流速的智能控制。结合经济的驱动功率, 控制效果以及省去不必要的冷却容量 (无超尺寸) 实现明显的成本削减并提升性能。



Self-regulating piston pump // 自调节活塞泵

Control development – ensuring reliable, intelligent operation
控制开发 – 确保可靠, 智能的操作

For us, the essential tasks of the control are an intelligent use of the high-pressure system and a stable communication with the machine tool

- // in order to implement targets of the machinery directive as well as to identify system faults and thus ensure the safety of the machine and the production process.
- // in order to make the production process as energy-efficient as possible thanks to the intelligently designed control possibilities (commands, parameterisation, etc.).

在我们眼中, 控制的基本任务是智能地使用高压系统以及稳定地与机床通信

- // 从而实施机械指令的目标, 确定系统故障并由此确保机床和生产流程的安全性。
- // 从而借助智能设计的控制功能 (命令, 参数化等) 最大化生产流程能效。



We serve you with:
我们为您提供:

- 1 // Electric filter contamination indicator
电动过滤器污染指示器
- 2 // Controllable service connections
可控服务接口
- 3 // Electronic control
电子控件。
- 4 // Pressure control (mechanic / electronic)
压力控件 (机械/电子)
- 5 // Frequency-controlled drive
频率受控的驱动器

Contamination symbols – helpful tool to specify requirements
污染符号 – 指定要求的有用工具

The requirement for a high-pressure system is strongly determined by the degree of machine contamination. With the development of the following symbols we want to allow you to find out the right high-pressure unit with respect to the machine contamination level – more or less at a glance. Due to various possible flow rate and filtration configurations, our high-pressure units can be the right choice for multiple requests. Basically, we distinguish three different degrees of machine contamination resulting from the chip volume and chip types within your machining processes. 高压系统的要求很大程度上由机床污染度确定。通过开发以下符号, 我们希望让您能根据机床污染级别一眼就找到合适的高压集成系统。借助各种可能的流速和过滤配置, 我们的高压集成系统可成为多种需求的正确选择。基本上, 我们根据您加工过程中的切屑量和切屑类型, 划分了三个不同的机床污染度。

Low degree of machine contamination
(e. g. free cutting steel, rough chips, just few fine chips)
低机器污染度 (例如易切削钢, 粗切屑, 仅少量细切屑)

Medium degree of machine contamination
(e. g. free cutting steel, stainless steel, mixed fine / rough chip ratio)
中机器污染度 (例如易切削钢, 不锈钢, 混合的细/粗切屑比率)

High degree of machine contamination
(e. g. aluminum, brass, cast, titanium, mainly fine chips by finishing and milling)
高机器污染度 (例如铝, 黄铜, 铸铁, 钛, 在表面加工和铣削后主要是细切屑)

CONFIGURATION AND INTEGRATION

配置和集成

Frequently asked questions // 常见问题

Which factors determine the design of a high-pressure system?

Amongst other things:

- // High-pressure needs and flow rate
- // Cooling medium (eg. type, viscosity)
- // Type and number of tools
- // High pressure and coolant supply into the machine
- // Local conditions in plant (e. g. temperature)

As your competent partner for high-pressure filtration system solutions, our qualified staff will be happy at any time for a personal consultation and to clarify your individual queries.

What pressure do I need?

Basically, this depends on two factors: first, the material to be cut in connection with the intended advantages, and secondly, the maximum depth for deep hole drilling. Chart (1) depicts the approximate pressures needed to drill deep holes with gun drills.

What flow rate do I need?

The flow rate is significantly influenced by the diameter of the outlet nozzles and their number. Other factors include the viscosity of the medium. And of course, the corresponding high-pressure requirement and how it is integrated in the machine. Chart (2) helps you to find the approximate flow rate required per outlet.

What are the possible consequences when a high-pressure system has not been optimally designed?

- // The most frequent consequence in practice: oversizing. Consequence: wasted resources and failure to achieve the desired potential for rationalisation.
- // Excessive pressure can also have negative effects, e.g. damage to the workpiece surfaces and, in tight spaces, to hoses and cables inside the machine.

How can I calculate flow rate and pressure when using multiple tools?

Just take advantage of our free service and use the flow rate calculator. Scan the adjoining QR code or go to www.m-tech-machinery.cn



哪些因素确定高压系统的设计?

包括但不限于:

- // 高压需求和流速
- // 冷却介质 (例如类型, 粘度)
- // 刀具类型和数量
- // 供应给机床的高压和冷却剂
- // 装置中的局部状况 (例如温度)

作为您高压过滤系统解决方案的得力伙伴, 我们经验丰富的员工欢迎您随时咨询, 我们将为您排忧解难。

我需要什么压力?

基本而言, 这取决于两个因素: 第一, 与预期优势关联的待切削材料; 第二, 深孔的最大钻孔深度。图 (1) 描绘了用枪钻钻出深孔所需的大致压力。

我需要什么流速?

流速受到出口喷嘴直径及其数量的显著影响。其他因素包括介质的粘度。当然还有相应的高压要求和将该要求集成在机床中的方式。图 (2) 帮助您找到每个出口需要的合适流速。

如果没有以最优方式设计高压系统, 则可能有什么后果?

- // 实践中最为常见的后果是规格过大。后果: 浪费资源以及无法实现所需的合理化潜力。
- // 压力过大也可能具有负面效果, 例如损坏工件表面, 并且在狭小的空间中损坏机床内的软管和电缆。

在使用多个刀具时, 我该如何计算流速和压力?

只需利用我们的免费服务和流速计算器。扫描旁边的 QR 码或访问 www.m-tech-machinery.cn



Determining requirements with simple means // 以简单的方式确定要求

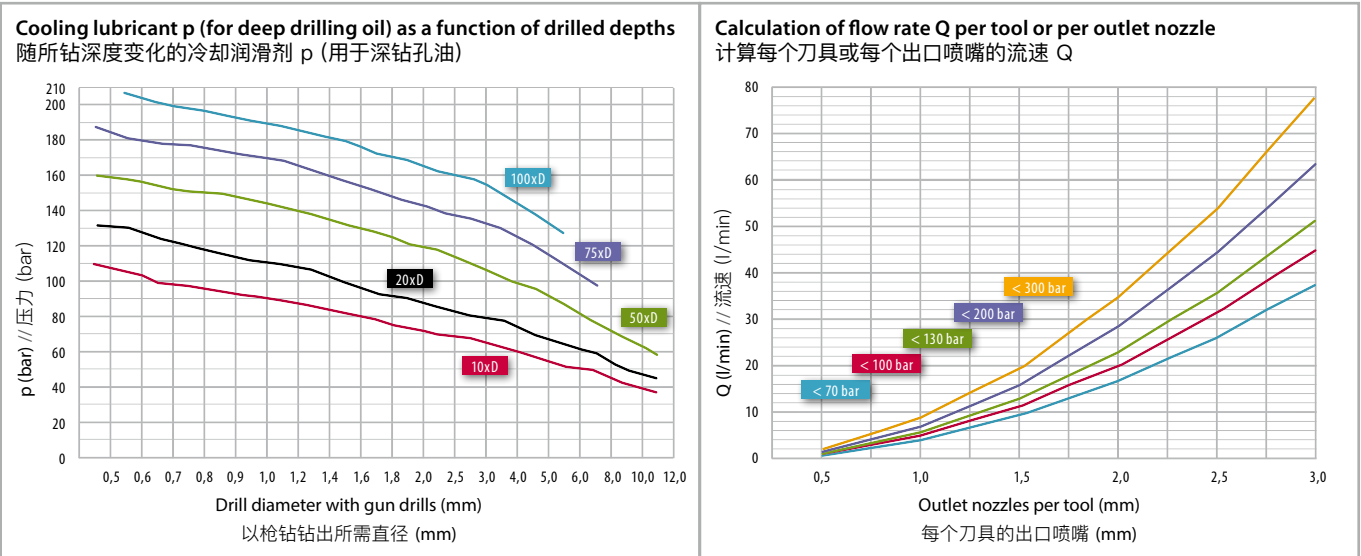


Chart 1: pressure // 图 1: 压力

Chart 2: flow rate // 图 2: 流速

Important notes // 重要说明

What must be observed in particular when connecting a cooling lubricant high-pressure system to a machine tool?

- // Are there enough free machine control codes available for control communication (e.g. M-functions)?
- // Is the work space of the machine in which high pressure is applied protected by means of covers in such a way that nobody can be injured?
- // When using cutting oil a fire extinguishing system should be installed!
- // When applying high pressure, oil or water mist is often generated in the cutting oil or water-based emulsions during machining. In this case, the installation of a mist extraction system is recommended.

Warranty of a process-safe function when machining under high pressure

A) when using water-based emulsions:

- // An oil content in the emulsion of min. 8 % is presumed for effective lubrication.
- // The emulsion must withstand the permanent strain of high pressure and must not segregate. The quality must be coordinated beforehand with the emulsion supplier.

B) when using cutting oils:

- // Does the viscosity of the cutting oil correspond to the machining requirements?
- // When using drills with internal cooling it is recommended to switch to deep drilling oil when the diameter falls below 2 mm.

Important technical prerequisites

- // When using automatic filters, an air supply (approx. 150 l/min for CL3) is required.
- // Viscosity of machining oils 15–22 mm²/s, of deep drilling oils 5–8 mm²/s.

在将冷却润滑剂高压系统连接至机床时, 特别要注意什么?

- // 是否有足够的自由机床控制代码可用于控制通信 (例如 M-功能)?
- // 施加高压的机床工作区域是否有护盖保护并防止附近的人受伤?
- // 在使用切削油时, 必须安装消防系统!
- // 在施加高压时, 加工期间通常会在切削油或水基切削液中产生油雾或水雾。在该情况下, 建议安装雾气抽取系统。

在高压下加工时, 确保有流程安全功能

A) 在使用水基切削液时:

- // 有效的润滑需要保证切削液中乳化液至少达到 8 %。
- // 切削液必须承受高压形成的永久张力并且不得分离。必须和切削液供应商事先商定质量。

B) 在使用切削油时:

- // 切削油的粘度是否符合加工要求?
- // 在搭配内部冷却使用钻头时, 如果直径在 2 mm 以下, 建议改用深钻孔油。

重要的技术前提

- // 在使用自动过滤器时, 需要空气供应 (对于 CL3 大约为 150 l/min)。
- // 加工油的粘度 15–22 mm²/s, 深钻孔油的粘度 5–8 mm²/s。

Handed over by: // 提交:

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