

Mahr

Mahr | Metering Systems

Company Presentation



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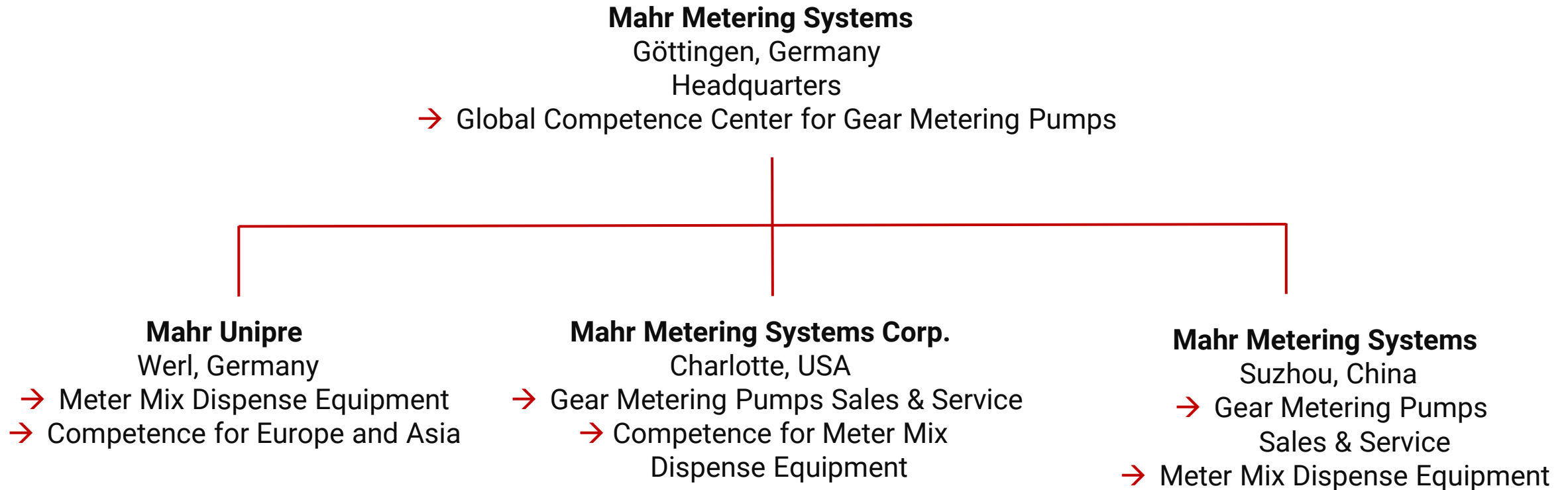
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Mahr Group – **Facts**

1. Business concentration: Metrology, Rotary Stroke Bearings, Gear Metering Pumps, Meter Mix Dispense Technology
2. Established: 1861 in Esslingen, Germany
3. Headquarter: Göttingen, Germany
4. Turnover 2019: approx. 250 million €
5. Employees 2019: approx. 1900 worldwide
6. Subsidiaries: in 18 countries
7. Globally active: >60 countries

Organization



Mahr Group – History

- 1861 Headquarter of Carl Mahr founded in Esslingen, Germany, measuring devices
- 1936 Feinprüf GmbH established in Göttingen, Germany
- 1945 **Start of production: gear metering pumps** and rotary stroke bearings
- 1973 Form and surface measuring devices
- 1983 **Mahr Metering Systems Corporation established in Charlotte, USA**
- 1994 Mahr s. r. o, Probstov, Czech Republic
- 1995 One brand name: Mahr
- 1998 Mahr Precision Metrology, Suzhou, China
- 1999 Mahr Federal, Providence, Rhode Island, USA
- 2001 **Mahr Metering Systems GmbH, Göttingen, Germany**
- 2004 Mahr OKM, Jena, Germany
- 2006 Mahr Helios Metrology, Dörzbach, Germany
- 2013 Mahr Esslingen and Göttingen consolidated to Mahr GmbH Göttingen
- 2015 MWF Roland Friedrich GmbH and ESDI join the Mahr Group
- 2017 Change of names: Mahr Inc. and Mahr MWF GmbH
- 2018 **Acquisition of Unipre GmbH in Werl**, NanoFocus AG and Mahr cooperate

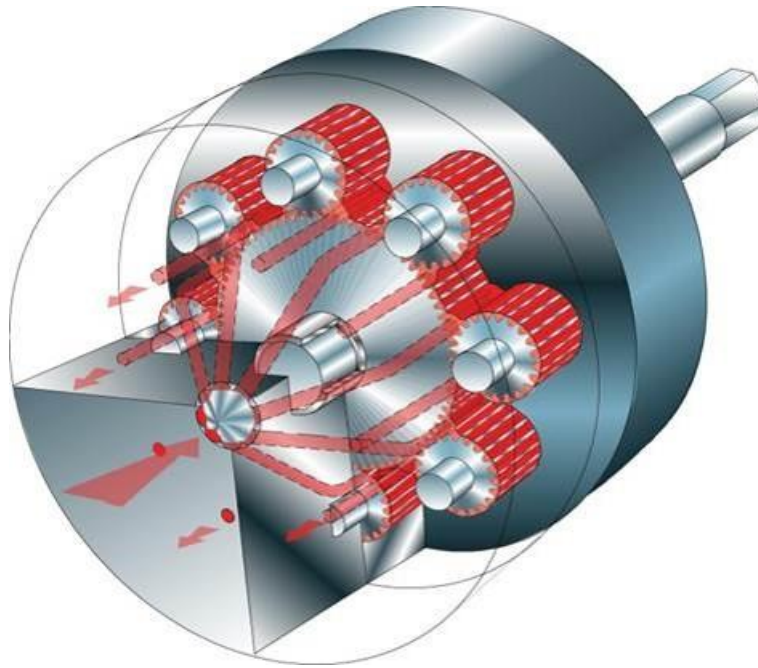
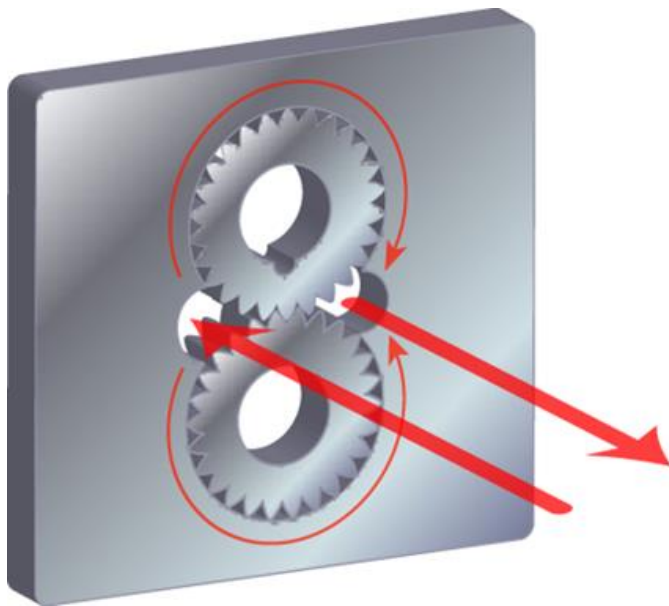


Origins of the company



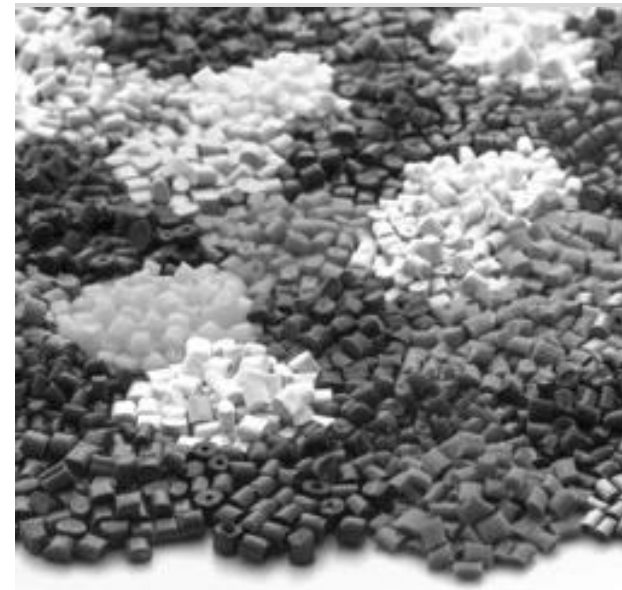
- **1939:** Prof. Schlack develops PA 6, the Perlon fibre. (1936 Nylon PA66)
- **1946:** Mahr Esslingen receives order from Prof. Schlack to develop a high precision gear pump for synthetic fibers. Feinpruef, a Mahr subsidiary, with core competence in design & built metrology equipment started the development of „spinning pumps“.
- **1947:** Feinpruef delivers the first spinning pumps to Hoechst Corp. High precision gear pumps are being used to spin Nylon fibers and to meter polymer. Spinning pumps has been called “Measuring Pumps” because of their high accuracy.
- **1949:** Feinpruef is the first and only supplier who is using HSS steel (F 16) for the pump design. Feinpruef received patent #802492 of Federal Republic of Germany. Different applications of synthetic fibres has been grown rapidly.

Mahr – High Precision Gear Pumps



Applications

- Adhesives
- Chemical Fiber
- Chemicals
- Coating
- Extrusion
- Foil extrusion / Blown film
- Hot Melt
- Liquid metering
- Manufacturing of fibers & filaments
- Pressure increasement
- Spin finish process



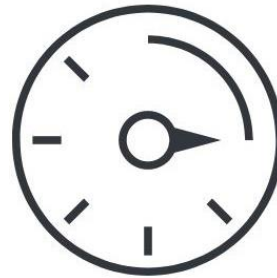
Applications



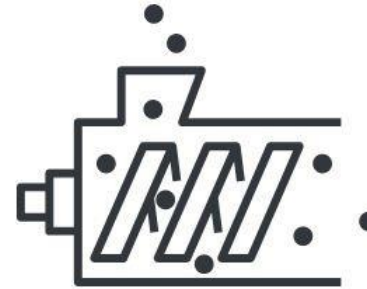
Coating



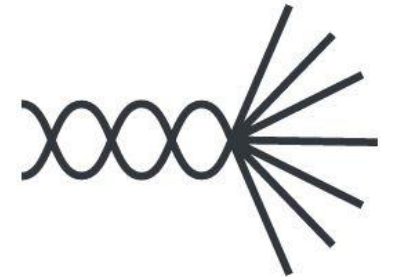
Composites



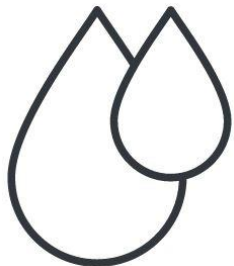
Pressure Increase



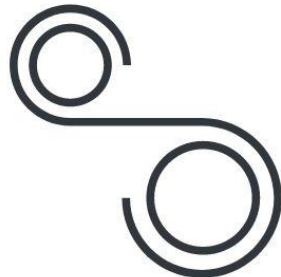
Extrusion



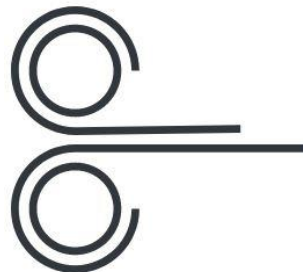
Fibers & Filaments



Liquid Metering



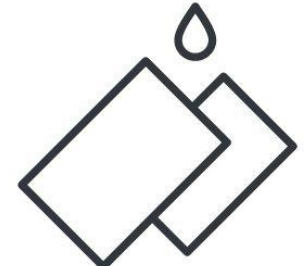
Foil Extrusion



Film Lamination

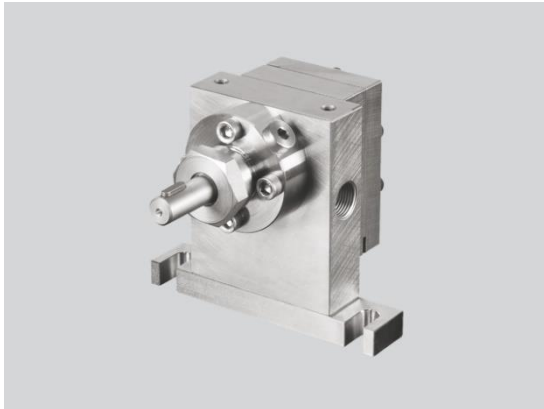


Spin Finish Process

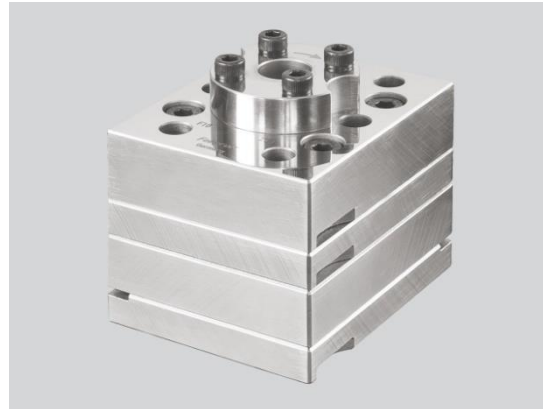


Adhesive Application

Overview: **Gear Metering Pumps**



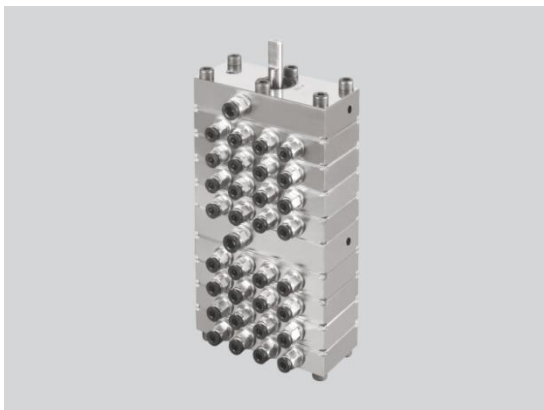
Dosimar
Single Port Gear Metering Pumps



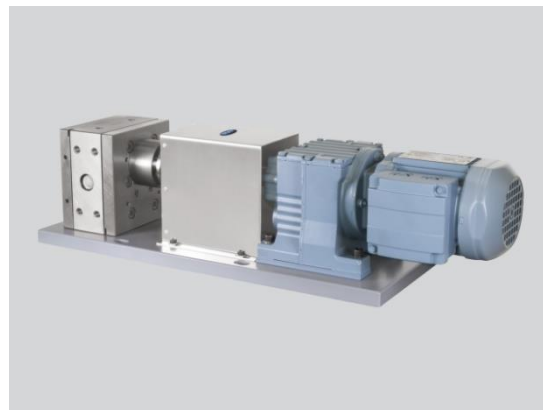
MarSpin
Double-Port Gear Metering Pumps



Mar Spin
Planetary Spinning Pumps



MarFin
Spin Finish Gear Metering Pumps



MarInline
Inline Gear Metering Pumps



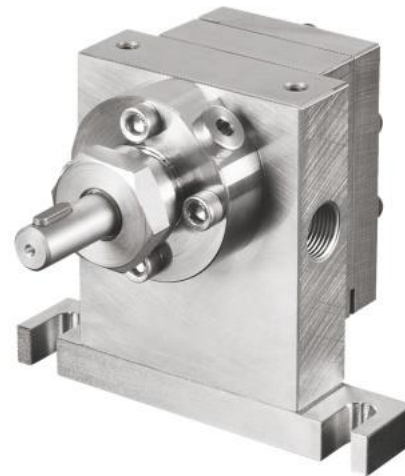
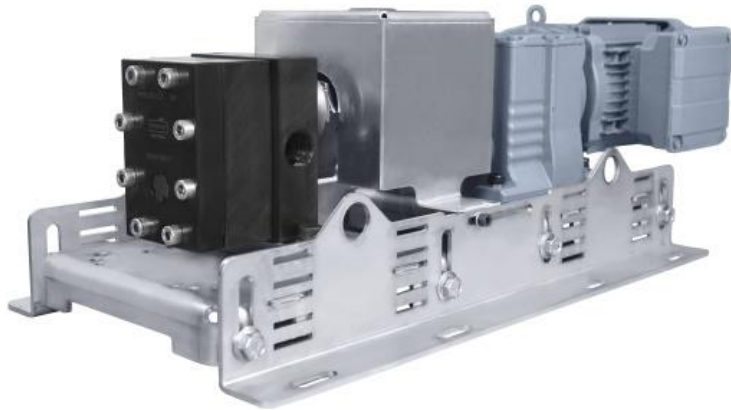
MarChem
Gear Metering Pumps



Discharge and Pressure Increase Pumps

Gear Metering Pumps – **Dosimar** for EP, PUR, etc.

Drive unit consist of:
gear pump
motor
base plate



Dosimar Gear metering pump

Standard Types:

Dimension mm	Flow rate cc/rev.	Counter Pressure bar (max)
55 x 67,5	0,02 – 3	30
75 x 102	0,08 – 6	100
96 x 125	6 – 50	100
100 x 152	70 – 100	100
245 x 260	150 – 200	100
Ø 79	0,08 – 6	100

Gear Metering Pumps – **MarSpin**

The typical first generation spinning pumps:

plug type:

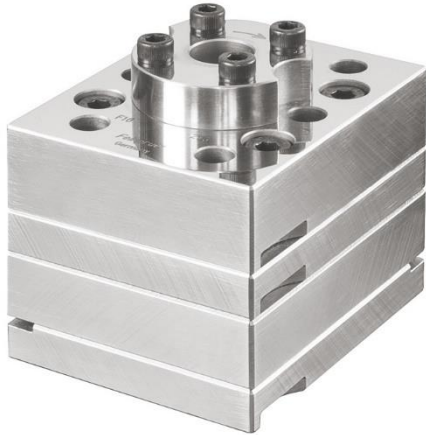


shaft type:



Dimension mm	Flow rate cc/rev.
66 x 70	0,1 – 10
80 x 122	10 – 70
155x200	70 – 250

Double-Port Gear Metering Pumps – MarSnin



Stacked Design:

Dimension mm	Flow rate cc/rev.	Counter Pressure bar (max)
66 x 70	0,1 – 3,3	500
80 x 120	3 – 30	500
80 x 132	3 – 30	500



Three-gear Design:

Dimension mm	Flow rate cc/rev.	Counter Pressure bar (max)
78 x 95	0,1 – 6	500
80 x 145	10 – 30	350
100 x 180	13 – 50	300
160 x 280	50 – 150	300

Planetary Spinning Pumps – MarSpin

The planetary spinning pumps are able to deliver up to 64 uniform streams of polymer fluids.



Dimension mm Ø	Flow rate cc/rev.	Counter Pressure bar (max)	Number of outlets
90	0,1 – 4,8	400	6 – 8
100	0,1 – 4,8	400	2 – 8
120	0,25 – 6	400	2 – 12
130	6 – 12	400	2 – 4
138	0,3 – 4,8	400	8 – 24
146	0,3 – 6	400	8 – 32
160	10 – 30	500	3 – 4
180	0,3 – 2,4	300	24 – 40

Gear Metering Pumps – **MarCoat for Paint Application**

This design is suitable for metering paints and colours.
These pumps are flushable and can be cleaned easily.

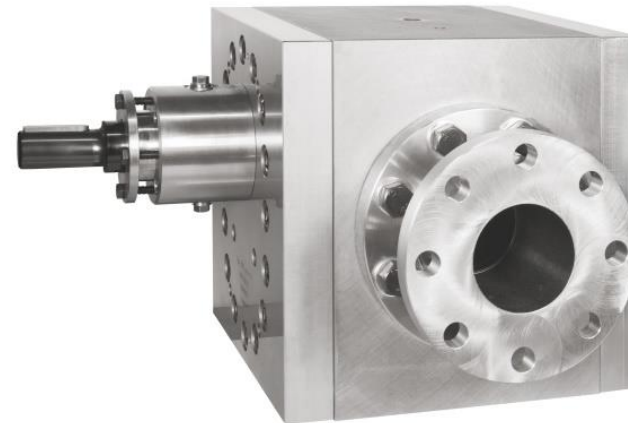
Dimension mm	Flow rate cc/rev.	Counter Pressure bar (max)
48 x 64	0,6 – 6	30
45 x 77	0,6 – 6	75
56 x 71	0,6 – 12	50



Zahnraddosierpumpen – MarChem

MarChem stands for precise and low pulsation metering of liquids as well as high efficiency at low viscosity and back pressure.

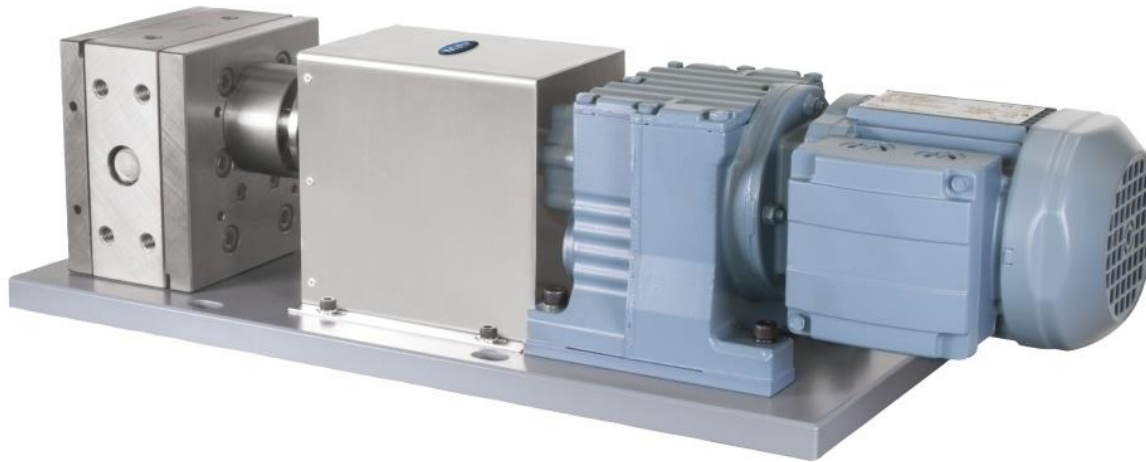
Viscosity mPas	Flow rate cc/rev.	Speed range rpm
0,5 – 100.000	0,01 – 3.000	40 – 200



Inline Zahnraddosierpumpen – **MarInline**

Inline pumps are single stream pumps mounted in-line within the tubes.
Available in different technical designs.

Flow rate cc/rev.	Counter pressure bar (max.)
0,16 – 3.000	700

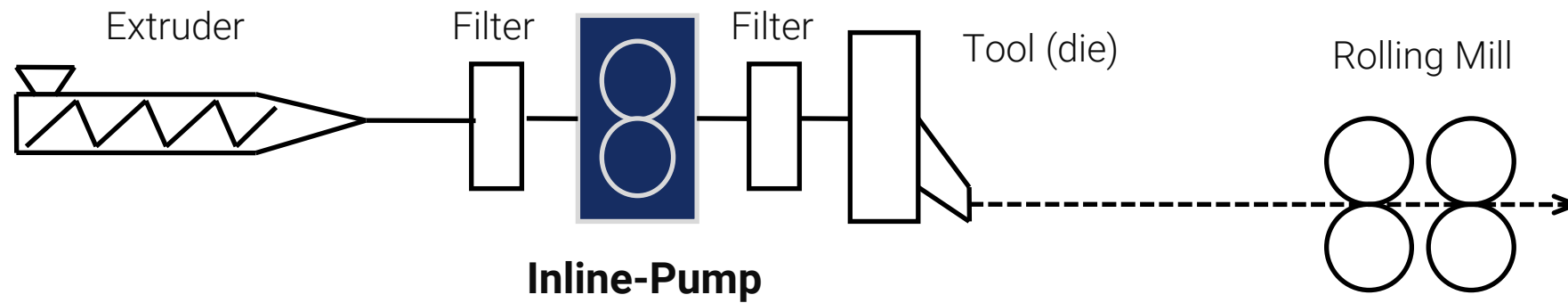


Drive Unit

Consists of:

- Gear metering pump
- Coupling
- Motor
- Base plate

Mahr Gear Metering Pumps – **Foil extrusion**



Spin Finish Metering Pumps – MarFin

Number of discharge ports	Capacity per discharge port [cc/rev]
up to 4	1.2 – 50
up to 6	0.015 – 0.3
up to 8	0.6 – 30
up to 12	0.015 – 1.2
up to 32	0.015 – 0.16

Operating temperature: up to 150°C (300°F).

Outlet pressure: up to 10 bar (140 psi).

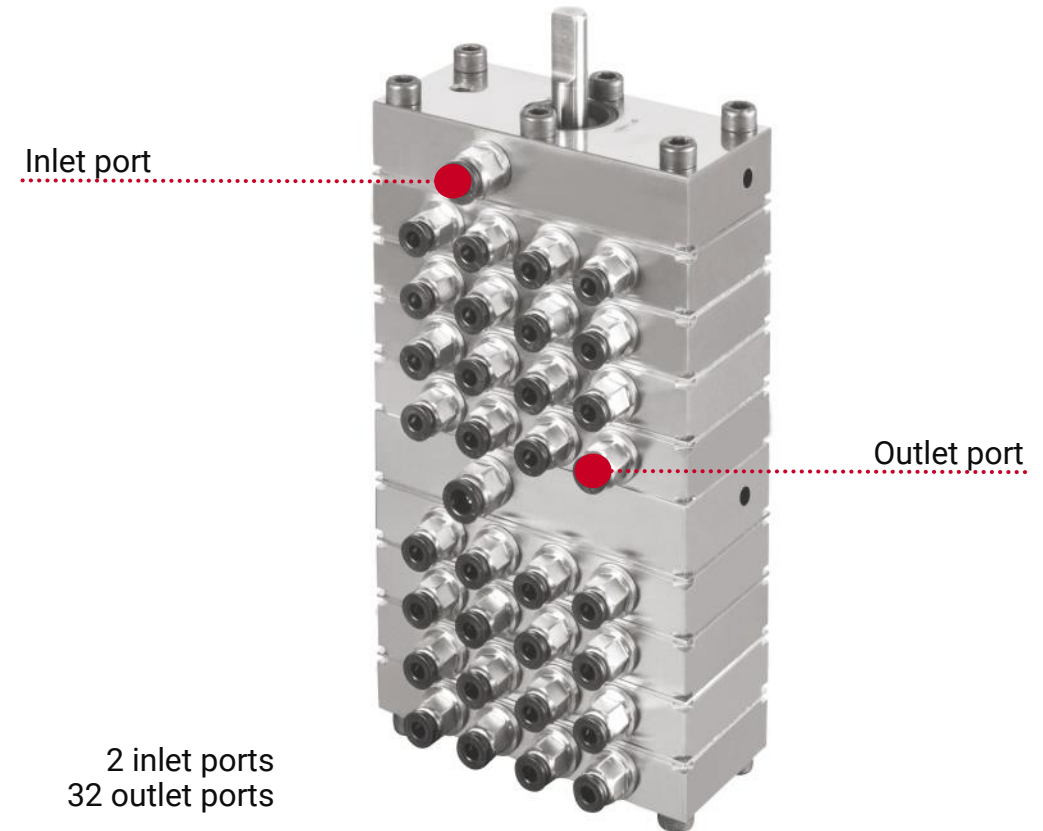
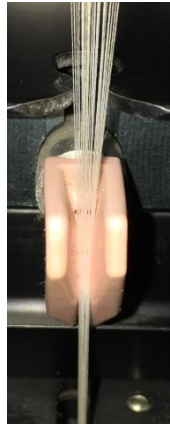
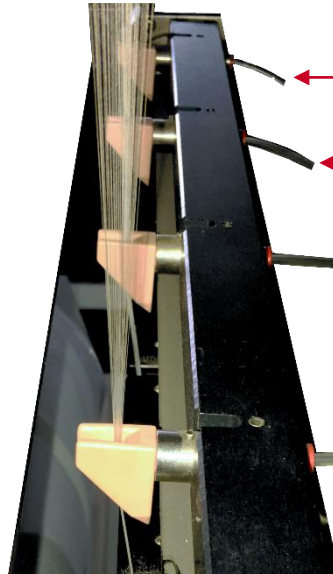


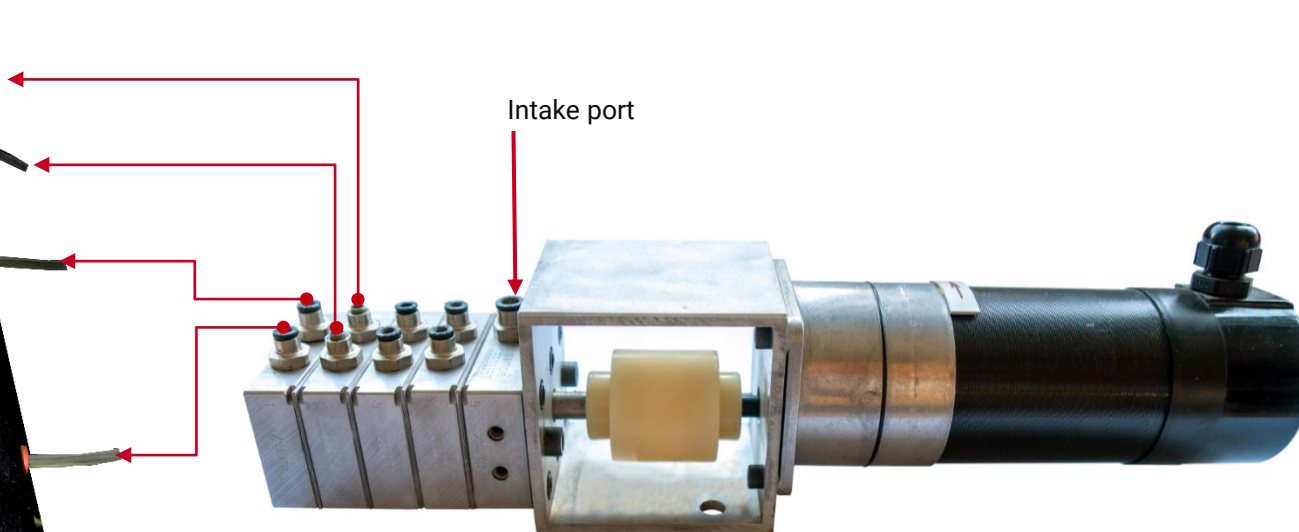
Illustration of a Spin Finish Line



Ceramic
thread
guide

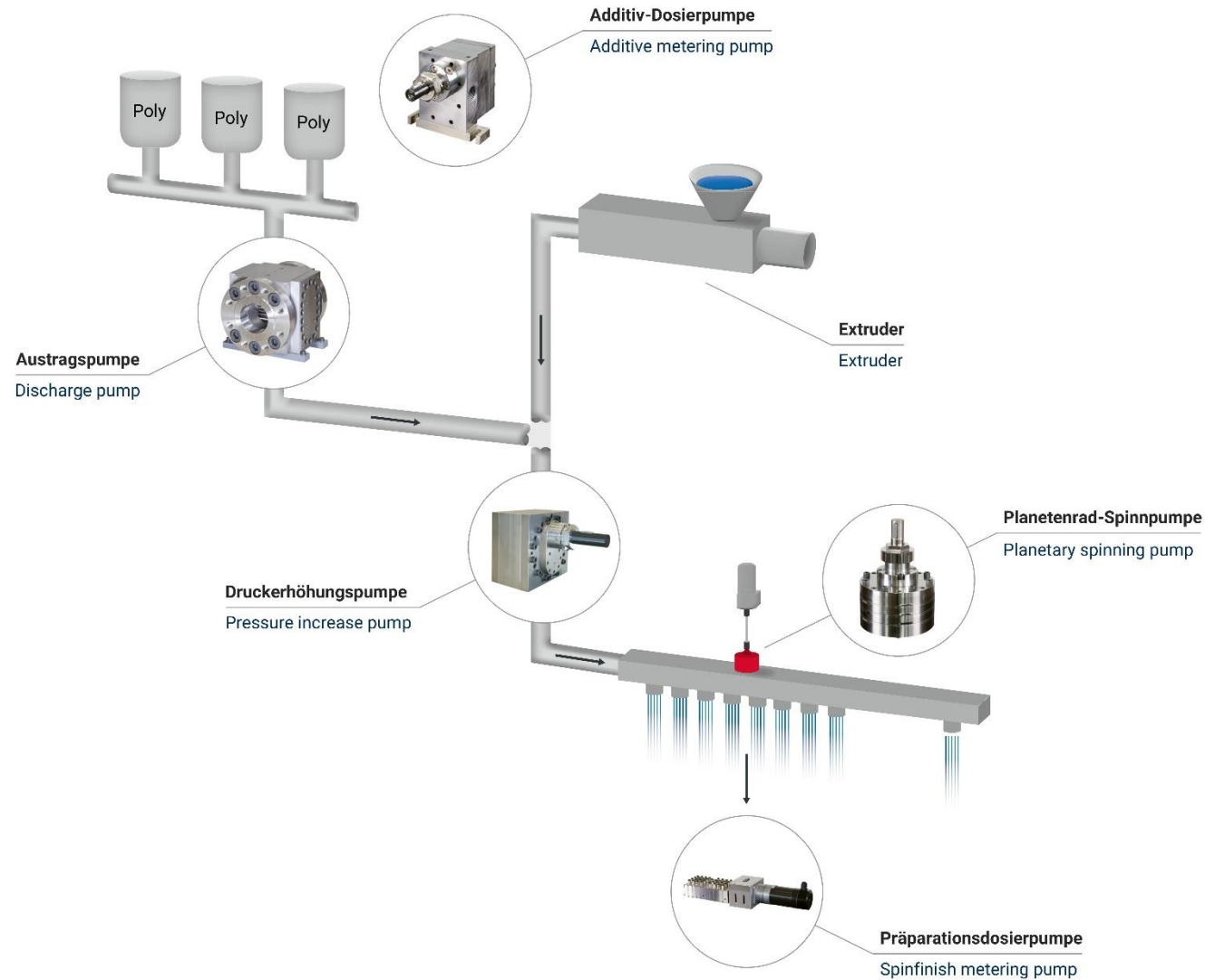


Spin finish lines



Drive unit with spin finish pump (MarFin)
8 outlets

Synthetic Fibre Production Process



- Chip spinning
- Direct spinning
- Dry spinning

Material – Übersicht I

Material	Field of Application	Operating temperature max. °C	Cleaning temperature max. °C
E20 highly chromium alloyed high grade tool steel with additions of vanadium, tungsten and molybdenum	<ul style="list-style-type: none"> for higher flow rates from 30 cc/rev 	400	500
F16 highly tungsten-, vanadium and chromium alloyed high speed steel	<ul style="list-style-type: none"> extremely high wear-resistance exclusively produced for Mahr 	450	550
F24 molybdenum tungsten vanadium and chromium alloyed high speed steel	<ul style="list-style-type: none"> highly wear-resistant 	450	550
Hastelloy acid resistant nickel alloy, additions of molybdenum and chromium	<ul style="list-style-type: none"> very good resistance especially to mineral and organic acids 	250	300
N17 high chromium alloyed stainless steel, additions of nickel, molybdenum and titanium	<ul style="list-style-type: none"> Good resistance and weldability Suitable for higher temperatures Suitable for food and pharmaceutical industries, as well as apparatus and pipeline construction 	300	400

Material – Übersicht II

Material	Field of Application	Operating temperature max. °C	Cleaning temperature max. °C
N19 high chromium alloyed stainless steel, additions of molybdenum and vanadium	<ul style="list-style-type: none"> Optimal combination of resistance to wear and corrosion For use with chemically aggressive media 	180	200
N31 high chromium alloyed stainless steel, additions of molybdenum and vanadium	<ul style="list-style-type: none"> very good resistance and good polishability suitable for food and pharmaceutical industries 	250	300
Stellite S2 cobalt-based alloy with high chromium content and additions of tungsten and nickel Can be used in combination with N31.	<ul style="list-style-type: none"> highly wear resistant corrosion resistant 	depending on material combination	depending on material combination
N33 high chromium alloyed stainless steel, additions of nickel, molybdenum and manganese	<ul style="list-style-type: none"> high degree of hardness with excellent corrosion resistance for highly stressed components 	200	220
N33-4 high chromium alloyed stainless steel, additions of nickel, molybdenum and manganese	<ul style="list-style-type: none"> high degree of hardness with good corrosion resistance suitable for higher temperatures 	350	450

Coating Options

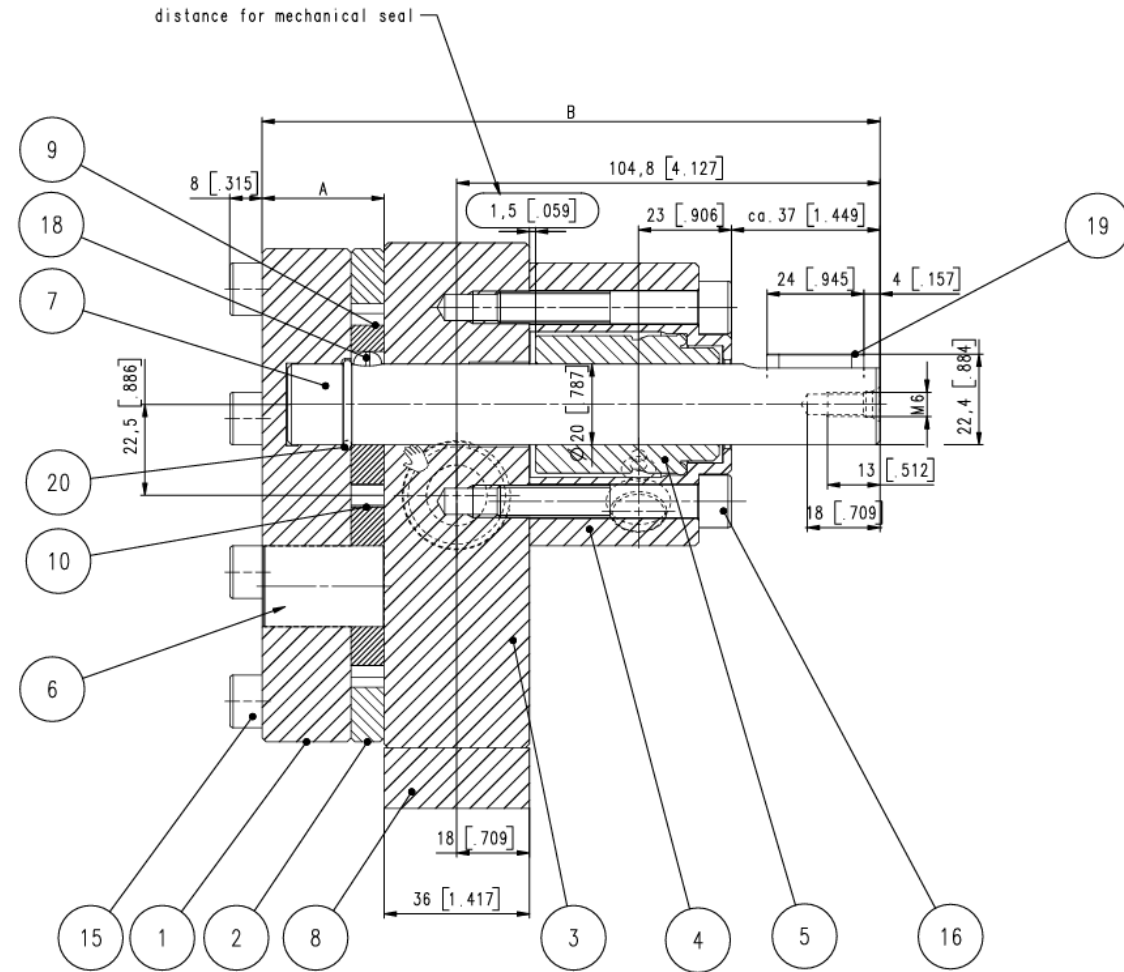
The various coating technologies enlarge the application possibilities of the used base materials. Furthermore, a coating reduces friction, wear and corrosion. In principle, all materials can be coated depending on the specification.

Diamond-Like Carbon (DLC) improves the properties:

- high surface hardness
- high wear protection
- smaller coefficient of friction
- better corrosion reduction to chemical aggressive media
- higher chemical resistance / stability
- non-stick effect (reduced adhesion of polymers and other materials)
- high temperature firmness to 250°C
- excellent accuracy to size (no change of the specific high discharge accuracies)
- high economic efficiency through longer endurance and improvement of the technological properties
- biocompatible and facilitate also the use in the food industry and in the medical field.

Sealing Systems for Gear Pumps

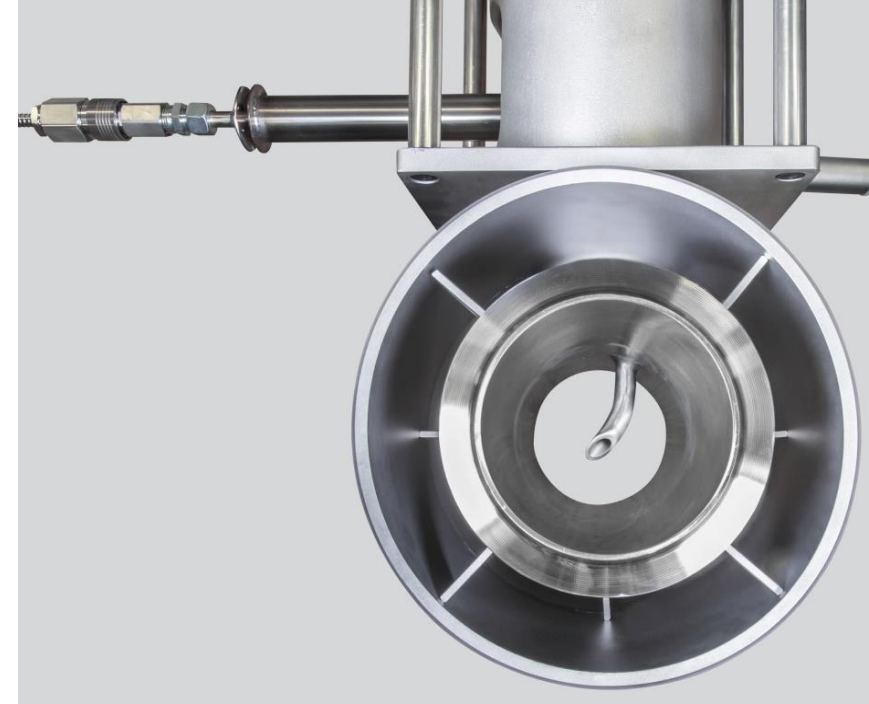
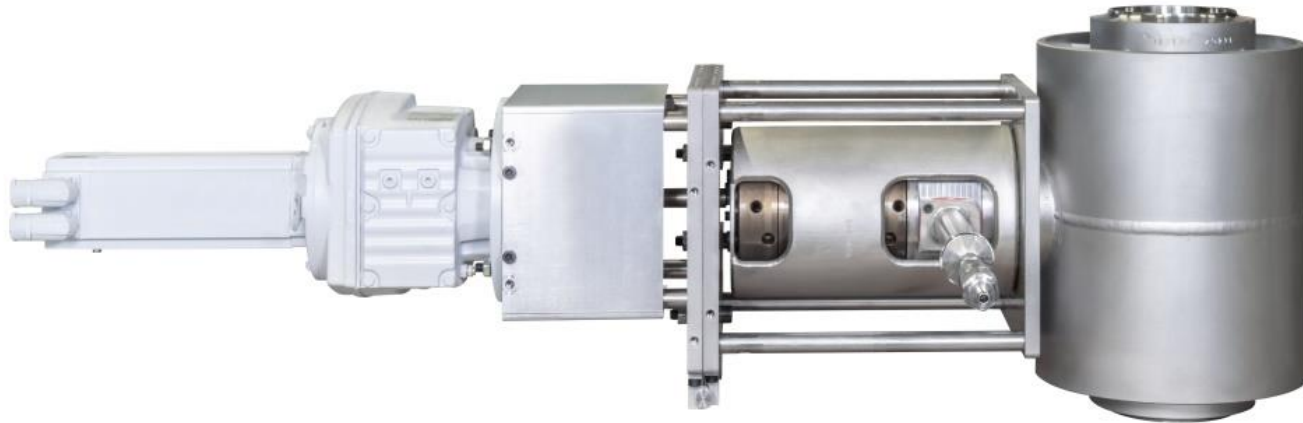
- stuffing box seal
- rotary shaft seal
- labyrinth sealing
- mechanical seal
- magnetic coupling



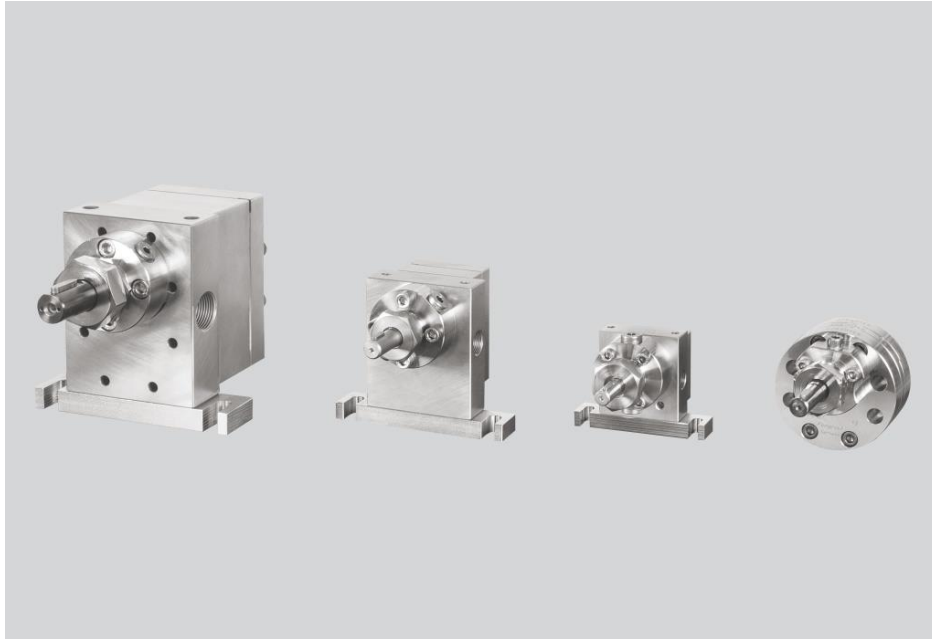
Gear metering pump with mechanical seal

MarVis – Viscosity Metering Device

Process monitoring through online viscosity measurement including display

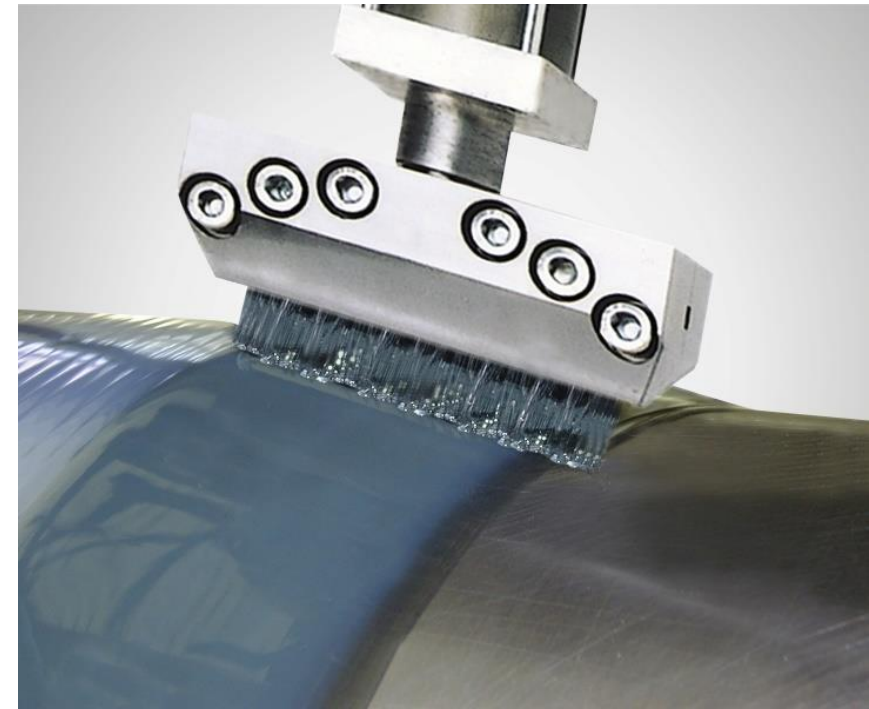
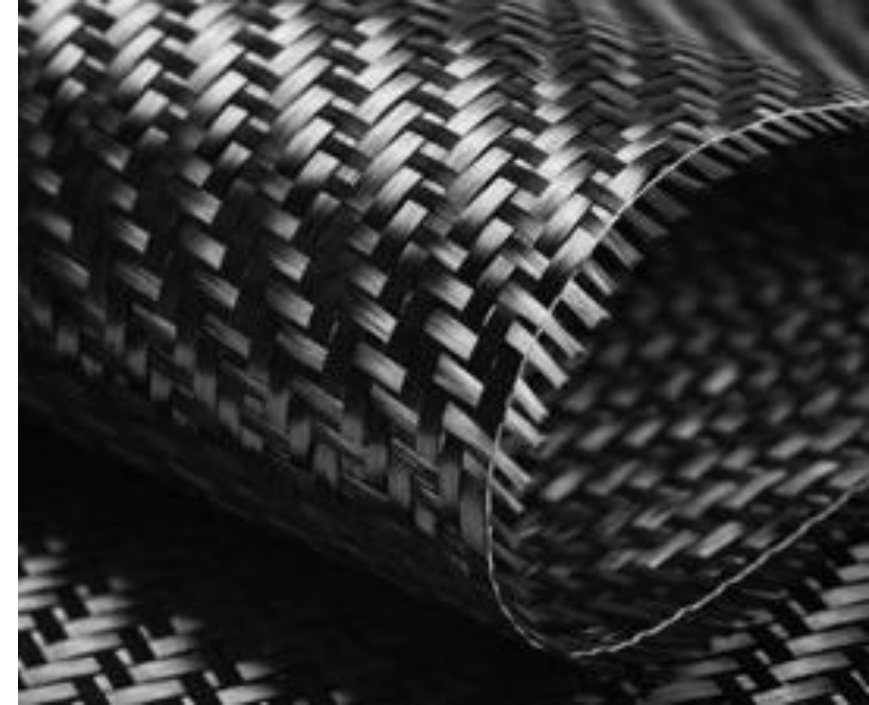


From Gear Pumps to Meter Mix Dispense Technology



Focused on Mixing and Dispensing

- Coating
- Composites
- Converting
- Foaming
- Spraying



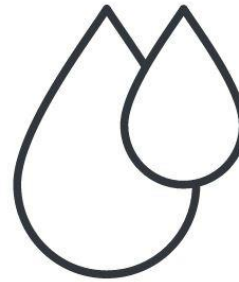
Applications



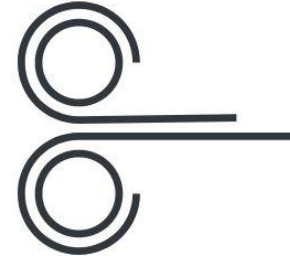
Coating



Composites



Liquid Metering



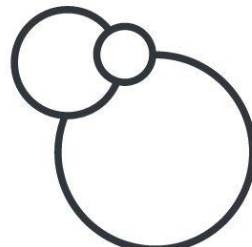
Film Lamination



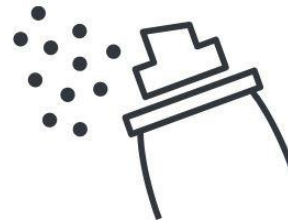
Casting



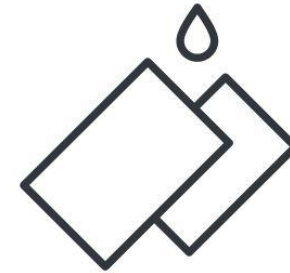
Polyurethan



Foaming



Spraying



Adhesive Application



Mixing

Mahr Unipre – Meter Mix Dispense Machines

MarMax M 12

Lightweight Design



MarMax CP 30

Our Allrounder



MarMax CP 50

Compact and efficient



MarMax CS 50

High capacity



- Meter Mix Dispense Machine

MarMax **M 12**

Two-component machine for low flow rates, e.g. laboratory tests and prototyping.

- Output: 0,1 – 3 l/min
- Mixing ratio: continuously adjustable
- Material tank sizes: 3 or 10 l
- Flushing agent tank size: 10 l



- Meter Mix Dispense Machine

MarMax **CP 30**

Precise mixing and dosing in the next generation

- For 1 up to 4 components available
- Mixing ratio 100:100 up to 100:1
- Flow rate approx. up to 6 l/min
- Viscosity up to 85.000 mPas
- Admissible operating temperature 85°C



- Meter Mix Dispense Machine

MarMax **CP 50**

Two-component metering unit with computer control monitoring.

- Output: 0,1 – 10 l/min
- Mixing ratio: continuously variable
- Material tank sizes: 3 up to 100 l
- Flushing tank sizes: 10 or 19,5 l



- Meter Mix Dispense Machine

MarMax **CS 50**

Two- and multi-component meter/mix machine with computer control for high and very fast material flow rates.

- Output: 0,1 – 40 l/min
- Mixing ratio: automatic computer control on the basis of flow measurement
- Material tank sizes: up to 2000 l volume, depending on application
- Flushing tank sizes: 10 l or 19,5 l
- Continuously heated through heating cabinets



CS-Series – **Spraying Application**



Meter Mix Dispense Machine CS 60

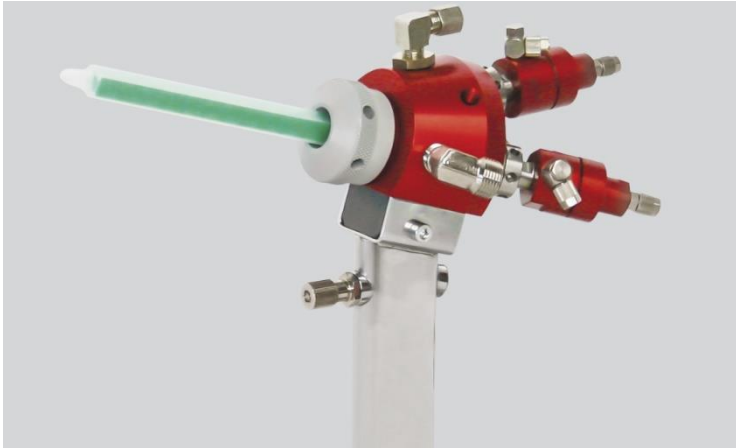


Mixing Head GSP 20



Meter Mix Dispense Machine CS 53

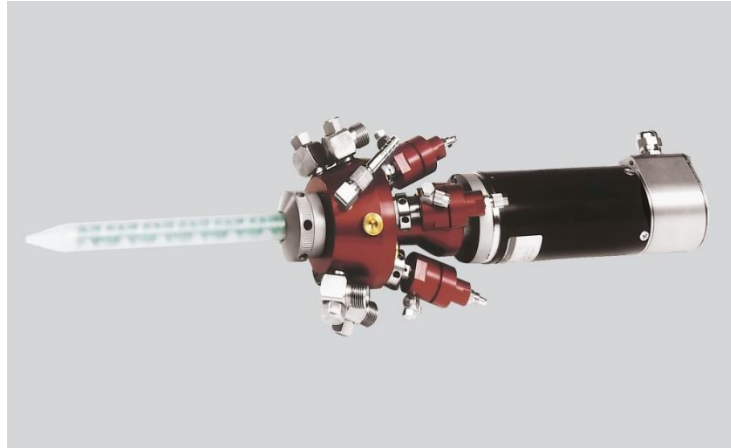
Mixing heads – the mixture makes the difference



Mixing Head GSP 33

Static Mixing Heads

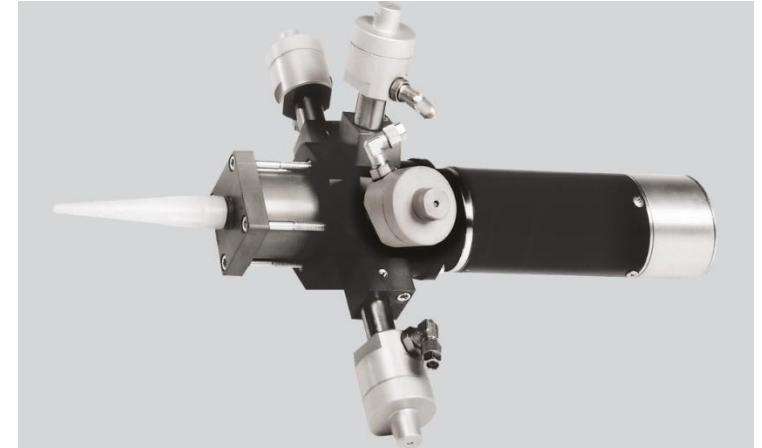
The mixing takes place exclusively through the flow movement of the components and the geometry of the mixing element.



Mixing Head GP 18

Static-Dynamic Mixing Heads

The mixing takes place through the flow movement of the components in cooperation with the geometry and rotation of the mixing element.



Mixing Head GP 50

Dynamic Mixing Heads

The components are mixed by a rotating element in a mixing chamber.

Customized Machine Design

Cast Polyamide PA6 –
6 components including 3 colorants for thermoplastics



Customized Machine Design

Casting unit with bar code mould recognition



Customized Machine Design

Three-Component casting machine with walking platform and swivelling mix head boom



Material Supply



Refilling equipment



Drum Pump Station with Agitator



MarDrum 200 Drum Pump System



MarDrum 200h Drum Pump System

MarDrum 200 – Drum Pump System

MarDrum ensures the automatic raw material supply to the mixing and dosing machine when the media is being supplied in 200 l drums.

- Non heated
- Partially heated
- Fully heated



MarDrum 200

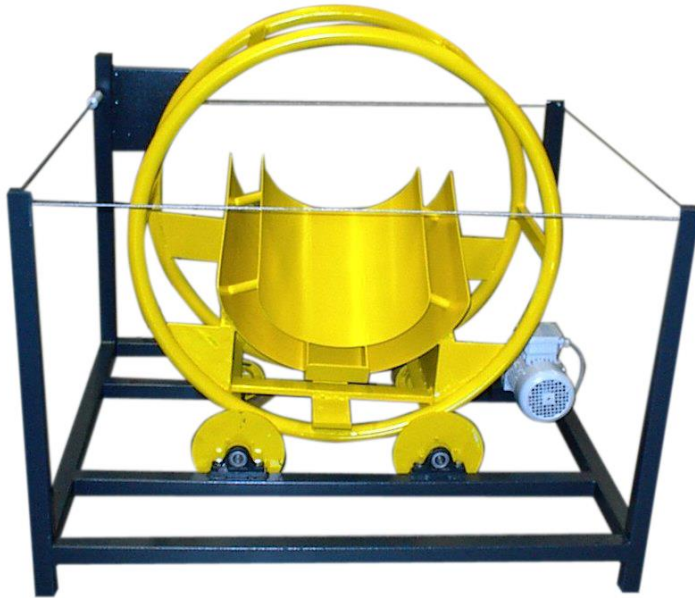
Scope of Delivery:

- MarDrum 200
- Dolly
- Temperature Control Unit

MarMax CP 34 with various supply systems



Material Preparation and Supply Systems



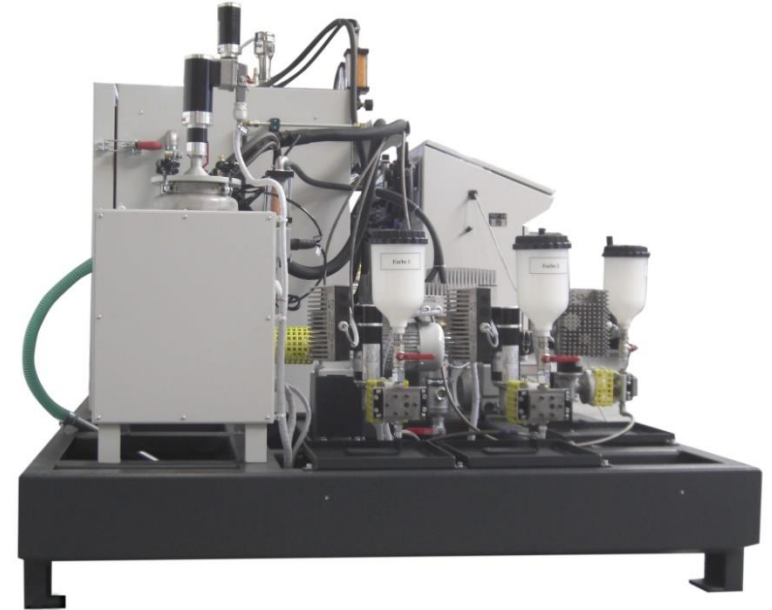
Mixing & Wobbling



Drum tilting device

Additional equipment

- Color and additive unit
- Robot application
- Heating cabinet
- Continuous furnace
- Conveyor Belt
- Positioning





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**Thank you for your
attention!**

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