

# Grouting solutions

The ultimate ground treatment methods to seal mines and tunnels and to improve ground properties





# The invisible support

Epiroc has been in grouting since 1921. Over the years, our concepts have gradually matured into today's range of grouting equipment. With Epiroc you can get all the equipment you need for drilling and grouting from one source.

As humans in the modern world, we all depend on mining and infrastructure. This dependency also means we are exposed to risk. New and improved technologies and engineering solutions allow us to effectively control the risks.

Today, engineers and managers in the mining and construction industry are facing new challenges. There is a lot to consider in terms of risk management in order to optimize the financial, safety and environmental impacts.

Grouting is a ground treatment method with a long history. The method is widely used around the globe in numerous surface and underground applications as a means to address different challenges. Grouting supports the foundation upon which our infrastructure is built. It is used to seal mines and tunnels from water

ingress and to improve ground properties. Grouting literally carries the weight of the world.

Hidden underground, grouting helps to guarantee the safety of countless mines and civil structures and, most importantly, the safety of billions of people. Therefore, it is becoming increasingly important to control and record the entire grouting operation, from batching to injection and stopping.

With a full range of drilling and grouting equipment and tooling, we offer you a one-source, long-term partner, as solid as the grouting solutions we provide. With our worldwide presence, we are never far away – ready to assist you in your projects and to help you get the most out of your investment.



## A wide range of applications

Epiroc grouting equipment is being utilized in thousands of projects around the world. We proudly support project stakeholders in selecting, operating and maintaining their equipment to achieve the best overall result. While suitable for a diversity of applications, grouting is most widely used within the following key segments.

### Tunneling

The tunneling industry is facing major challenges. Increased demands on water resources management, higher safety standards, unfavourable ground conditions and more urban tunnels, to name but a few. Grouting is a well-established technology and is emerging as a key method in tunneling projects to fulfill a variety of purposes, including water ingress control (pre-/post grouting) and stabilization (pipe-roofing, bolting).



### Dams

Water is a vital natural resource. New dams are being planned for construction and many existing ones need renovation. Grouting plays an important role in numerous dam projects and is commonly used for sealing, strengthening and filling, for example in curtain grouting, ground consolidation as well as bolting/anchoring and contact grouting.



### Surface geotechnical

Various grouting methods play a crucial part in virtually every field of application in surface geotechnical works, for both permanent and temporary purposes. These include, but are not limited to, foundation works (piling and micro-piling, consolidation grouting), road works (slope stabilization) and work site preparation (retaining walls and anchoring).



### Mining

For decades, grouting has been a preferred method in mining applications such as water ingress control and bolting. In recent years, we have also seen a growing demand for grouting as a method to address new mining challenges in the wake of more stringent safety and environmental control.



# Why grouting? Managing risk

Grouting is an engineering method used globally for the treatment of ground and structures in order to achieve the required characteristics. In many cases, it all comes down to risk management and avoiding disastrous accidents or hazards in mining and civil engineering projects, whether in construction or in operation.

## Grouting and its purposes

Although chemicals are covered by the term, cement-based mixtures are most commonly used in grouting due to their cost efficiency, availability and adaptability to different application requirements. Grouting is primarily used for sealing, strengthening/stabilizing or filling purposes – or a combination of these. Key elements in grouting design include the density

of grout holes (extensiveness of grouting), mix design (water/cement ratio, cement type and additives) and penetration (injection pressure and time). Some of these parameters impact each other, which must also be taken into account in grout design.

## Sealing

Water is a crucial resource that needs protecting. On the other hand, water may cause risk and difficulty in mining and construction operations. Grouting reduces permeability, which minimizes the impact of excavation on the ground water, while reducing risk and de-watering costs during construction and operation. Whether it's about sealing the rock mass around a tunnel or underground structure (e.g. pre-grouting), beneath a dam (e.g. curtain grouting) or in a mine. This type of grouting is generally most extensive and demanding. Success factors in sealing include:

- Top quality grout mix
- Independent control of flow and pressure
- Wide range of injection pressures
- Intensive control and recording
- High productivity
- Serviceability and easy cleaning

## Filling

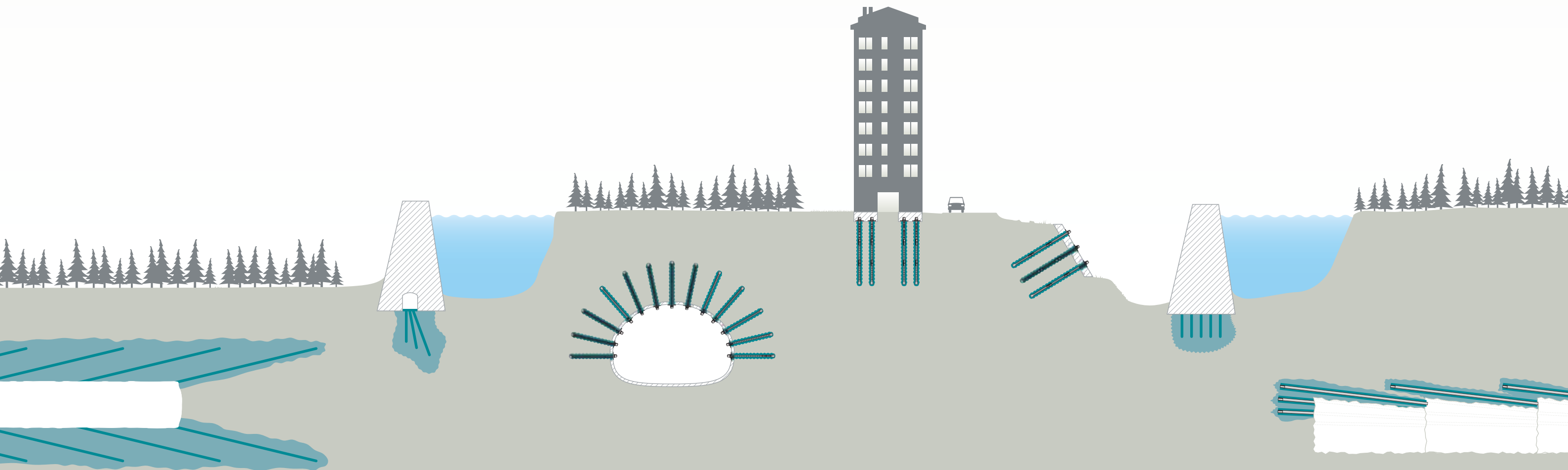
Sometimes grouting is used to fill a hole, gap or similar. In this category, common applications include bolting/anchoring, contact grouting/backfilling, piling or micro-piling, cavity grouting, etc. Key criteria in grouting for filling purposes include:

- Good mix quality
- Thick grout mix with low bleeding (generally)
- Using admixtures, e.g. sand (occasionally)
- Flexibility and good manoeuvrability
- Serviceability and easy cleaning

## Strengthening/stabilizing

Natural ground conditions do not always meet the full construction specification. Among other methods, grouting is applied to improve ground characteristics. In almost any civil works – tunneling, roads, dam construction, foundations and mining – there is a need to improve the rock or soil using e.g. consolidation grouting. Success factors in strengthening and stabilizing include:

- High quality grout mix
- Independent control of flow and pressure
- Low to medium injection pressure
- High control and recording
- Serviceability and easy cleaning





# Our offering

Epiroc’s grouting portfolio of versatile yet robust and reliable units serves the needs of a wide base of customers. Our Unigrout units are complete grouting solutions, designed to minimize mobilization, simplify usage and maximize grouting efficiency. Standalone units are offered to customers requiring an alternative grouting setup. Add our extensive range of packers and accessories – and you have all you need for a complete and efficient grouting operation.

### Unigrout

Unigrout is a range of grouting plants optimized to suit different applications and needs. They include a mixer, agitator, injection pump and power unit as the standard setup and additional systems or components depending on demands and models. Unigrout comes ready to plug in and use. Key benefits are:

- Complete grouting setup
- Optimized design
- Safe and easy operation and control
- Quick and easy to move and mobilize



### Standalone products

Choose between a full range of standalone grouting products, including mixers, agitators, pumps and recorders. Each product is the result of continuous improvement based on Epiroc’s engineering excellence and attentiveness to our customers’ input over almost a century of research, design and development.

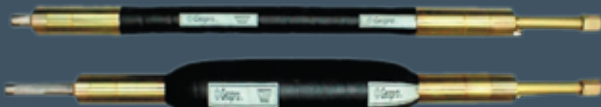
- Cemix mixers
- Cemag agitators
- Pumpac pumps
- Logac recorder
- Additive dosing pump\*



### Packers and accessories

Packers are a crucial part of a total grouting solution. They are widely used for grouting works as well as for water tests. We offer a wide range of packers along with the necessary accessories. Our range includes:

- Mechanical or inflatable packers
- One-time or reusable
- Single or double packers
- Packer inflation equipment
- Other accessories



\* Requires Logac recorder

## Unigrout selection guide

Your choice of Unigrout system depends primarily on three main selection criteria: the grouting type/application, the grouting capacity required and the degree of automation you need for your operation.

### Grouting type/application

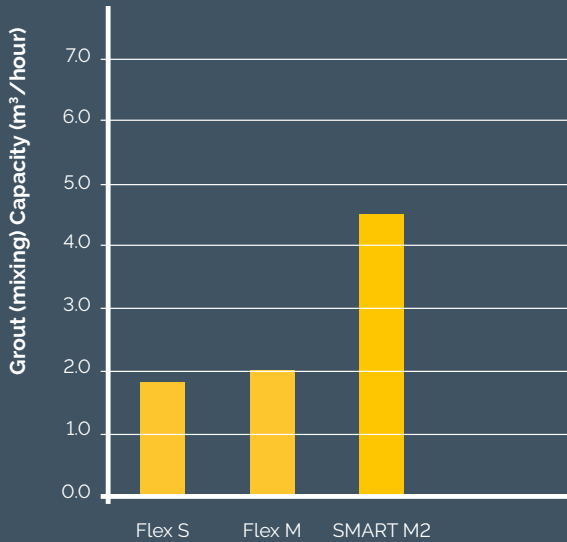
Your selection is influenced mainly by the type of grouting to be performed and by the size of the work place.

### Grouting Capacity

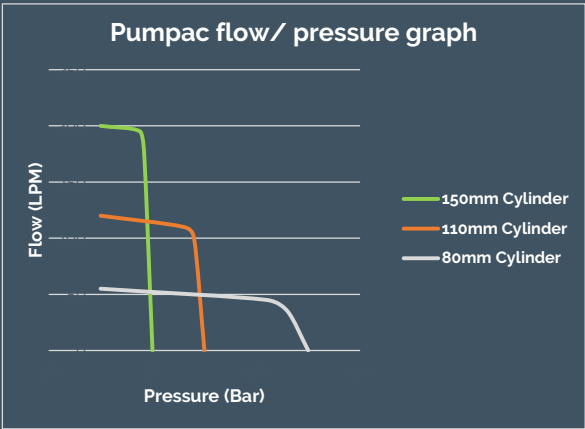
Pumping capacity is often understood as grouting capacity, but in reality these can differ substantially. Actual grouting capacity always depends on the availability of grout and this is determined by the mixing capacity. For short-time and non-continuous grouting, there are ways to increase the actual capacity, but for continuous injection, mixing capacity is the key. Continuous mixing capacity is the result of several factors such as type and size of mixer, grout mix design, supply of water and cement, and last but not least, whether manual or automated batching/feeding is used.

### Automation

Unigrout M2 S with automated batching is the right choice when it is desirable to improve batching accuracy and increase mixing capacity by reducing human error and fatigue.



The chart above shows theoretical mixing capacities based on the following criteria: W/C-1, good water supply, cement feeding rate of 40 kg/min (manual) and 300 kg/min (automatic with silo and screw feeder), and worker skills and performance levels.



MODEL			Pressure max, bar	Flow max, L/min	Cylinder Ø mm
	HP High Pressure	HP1	200	50	80
		HP2	100	100	110
	LP Low Pressure	LP1	100	100	110
		LP2	50	200	150
	Progressive cavity pump Flex S (option)		10	60	



# Unigrout

Epiroc's grouting rigs are offered as two sub-families: Unigrout M2 and Flex. These grouting rigs always include two major well-known features: the Cemix mixing unit and the Pumpac grout pump. The Cemix mixes everything from standard Portland cement to micro cement. The Pumpac is a double acting, piston operated grout pump, featuring three different cylinder alternatives for optimized operation.

This will meet customer needs for capacity, versatility and flexibility. We can also tailor platforms to your needs.



Unigrout M2

Unigrout M2 combines compact design with automation, offering superb versatility, accuracy and automated batching to ensure the most accurate mixing capacity. This Unigrout range is suitable for applications requiring high quality control and operational excellence. The product layout includes silo for storage of dry cement, the possibility to add up to two different additives into the mix plus one additive that can be mixed in at the packers.

The Unigrout M2 comes in two versions, the basic unit with manual operation of grouting from the operator platform and the Unigrout M2 S that has the same mechanical platform but uses Epiroc RCS (Rig Control System). This means that we can transfer information from the drill rig directly to the Unigrout M2 S. All operations are performed from the touch panel. All grouting process data is recorded and can be sent to Epiroc Underground Manager for evaluation, storage and reporting.

**Models:**  
Unigrout M2  
Unigrout M2 S



Unigrout Flex

Unigrout Flex is our base line workhorse that truly lives up to its name. The standard configuration of the Flex range uses manual operation for batching and controlling process. Digital water dosing system is standard on the Flex M and optional on the Flex S. This is to assist in operation and increase grout mixing accuracy.

The Logac recording system and an additive dosing pump can be added as standalone features. This enables monitoring and recording of the grouting process as well as injection of additive directly through mounted packers. The grouting unit comes on a mounting frame with lifting lugs and cut outs for fork lift use.

**Models:**  
Unigrout Flex S  
Unigrout Flex M

## A comprehensive service offering

Even the best equipment needs to be serviced regularly to make sure it sustains peak performance. An Epiroc service solution offers peace of mind, maximizing availability and performance throughout the lifetime of your equipment. We focus on safety, productivity and reliability.

By combining genuine parts and an Epiroc service from our certified technicians, we safeguard your productivity – wherever you are.

# Standalone grouting products

Main grouting components such as mixer, agitator and pump are available as separate (standalone) units. Available in different sizes and variations, our standalone products will meet your requirements and deliver the quality you need.



Cemix

High-speed colloidal type mixer with high-shear performance and tight tolerance which produces superior-quality grout. The result is a thoroughly uniform mix, free of lumps or aggregates, with every cement particle effectively wetted. The Cemix can also be used with micro cements, bentonite and additives.

**Models:**  
Cemix S (100 l)  
Cemix M (200 l)  
Cemix L (400 l)



Cemag

This agitator serves as an intermediate vessel between the mixer and the pump. It ensures that grout is always available for continuous injection, as grouting and mixing are carried out simultaneously. Cemag maintains and improves the quality of the grout thanks to counter currents. This keeps the mixture in suspension and releases air bubbles from the grout.

**Models:**  
Cemag S (200 l)  
Cemag M (400 l)  
Cemag L (800 l)



Pumpac

The grout pump is at the heart of any grouting solution and provides the specified flow and pressure in a controlled manner. The Pumpac features a robust design based on a single piston, double-action pumping principle.

Pumpac comes with three different cylinder sizes (80, 110 and 150 mm), offering several flow-pressure configurations and the possibility to shift between them.

See flow/pressure graph on page 7.



Logac

The de-facto industry standard in computerized logging and recording. Logac controls grouting and water test operations and stores all data for best-quality assurance. This recorder is characterized by excellent operational reliability, simplicity and robustness for use in harsh worksite environments. Logac can control up to four grout lines or holes and stores data such as pressure, flow, volume and time, together with the worksite and grout-hole identification.



Additive system

When additive is needed as hardener, the best way is to inject it at the packer, just before injecting the grout into the hole. To ensure the desired additive/grout ratio, the Logac and the additive system are connected. The additive system gets information about flow and flow from the Logac, and can thereby adjust the need of additive.

This system can be added to both the Unigrout M2 as well as the Flex series.



Technical specifications

● - Standard    ○ - Option  
A - Unigrout Flex S   B - Unigrout Flex M   C - Unigrout M2   D - Unigrout M2 S

Mixer	A	B	C	D
100 l tank volume (Cemix 103H)	●			
200 l tank volume (Cemag 203H)		●	●	●
1800 rpm rotation speed	●	●	●	●

Agitator	A	B	C	D
200 l tank volume (Cemag 203H)	●			
400 l tank volume (Cemag 403H)		●	○	○
2 x 400 l tank volume (2 x Cemag 403H)			●	●
800 l tank volume (Cemag 803H)			○	○
60 rpm rotation speed	●	●	●	●

Grout pump	A	B	C	D
50 bar pressure, 200 l/min flow (Pumpac)	○	○	○	○
100 bar pressure, 100 l/min flow (Pumpac)	○	○	○	○
200 bar pressure, 50 l/min flow (Pumpac)	○	○	○	○
10 bar pressure, 60 l/min flow (Progressive cavity pump)	○			

Silo	A	B	C	D
1.3 tonnes			●	●
2.3 tonnes			○	○

Additive tank system	A	B	C	D
24 l dosing tank + 200 l storage tank			○	○
2 x 24 l dosing tank + 2 x 200 l storage tank			●	●

Power unit	A	B	C	D
15 kW installed power	●			
22 kW installed power		●		
45 kW installed power			●	●
380-690 V voltage	●	●	●	●
1 000 V voltage		○	○	○
Soft start 400-460 V voltage		○		
50/60 Hz frequency	●	●	●	●

Electrical control system	A	B	C	D
Dosac			●	
Logac	○	○	●	
RCS				●

Water dosing system	A	B	C	D
Digital water dosing kit	○	●		
Mechanical water flow meter	●			

Optional equipment	A	B	C	D
Hydraulic legs			○	○
Additive dosing pump (Logac required)	○	○	○	○
WLAN kit			○	○
Water dosing tank (160 l)		○		

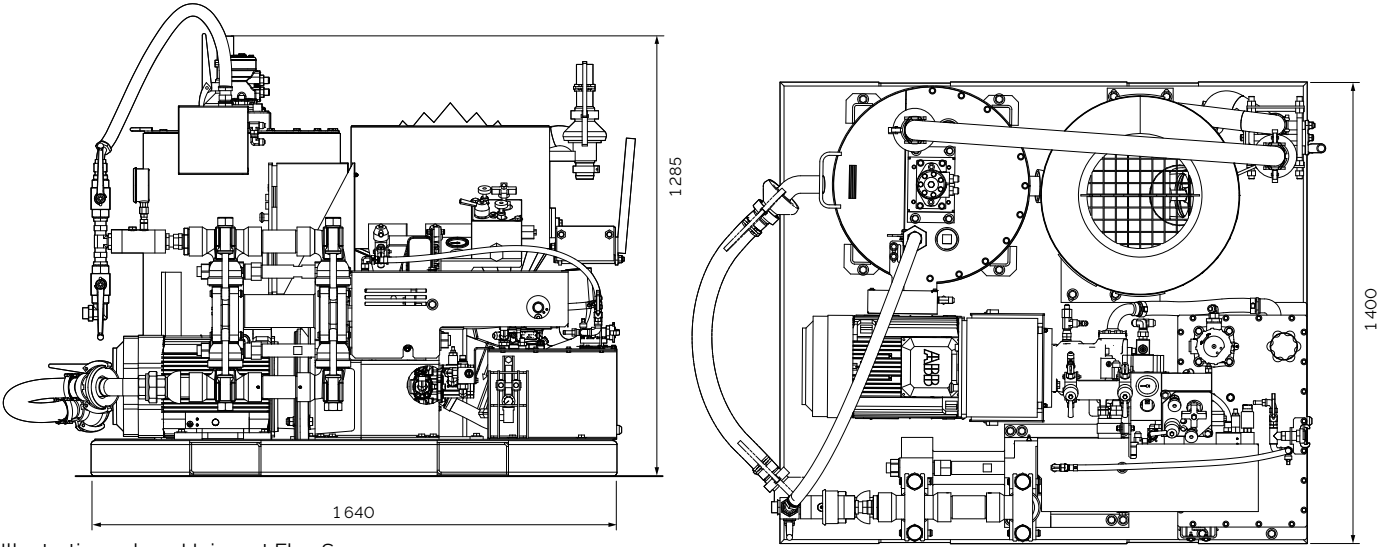
Weight	
Unigrout Flex S	930 kg
Unigrout Flex M	1 135 kg
Unigrout M2	5 000 kg
Unigrout M2 S	5 000 kg

## Sound and vibrations

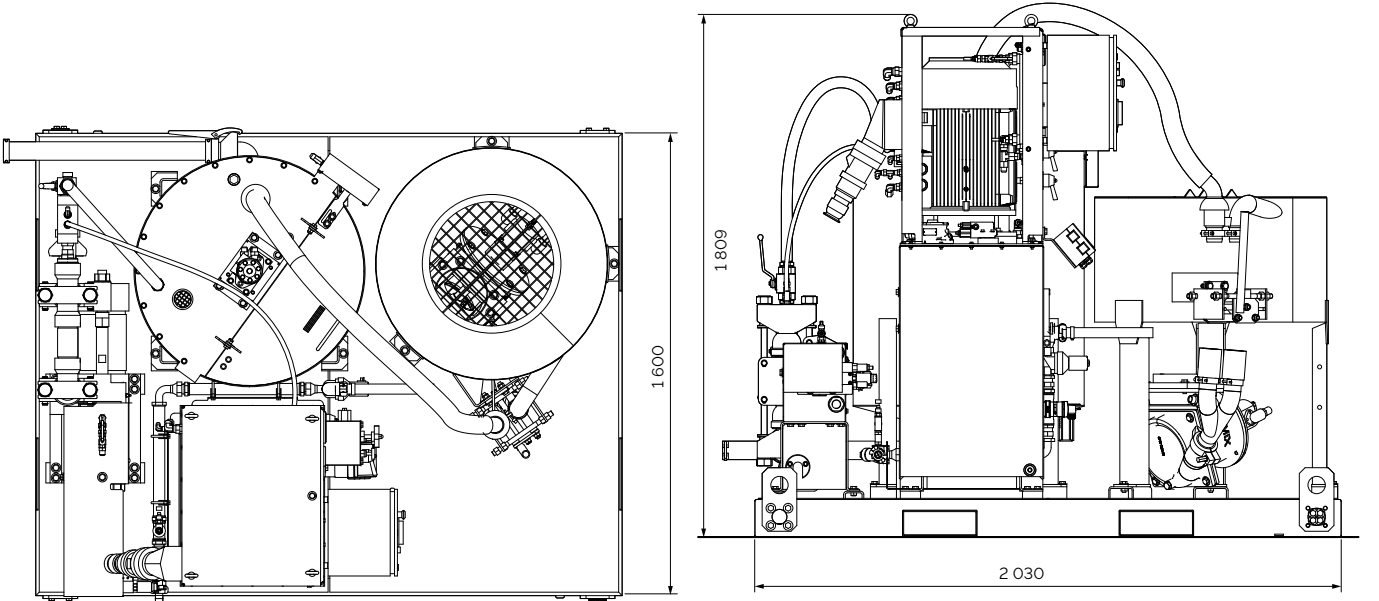
Unigrout Flex S	83 dB(A)	N/A
Unigrout Flex M	83 dB(A)	0.11 mm/s <sup>2</sup>
Unigrout M2	86 dB(A)	0.15 mm/s <sup>2</sup>
Unigrout M2 S	86 dB(A)	0.15 mm/s <sup>2</sup>

Technical specifications

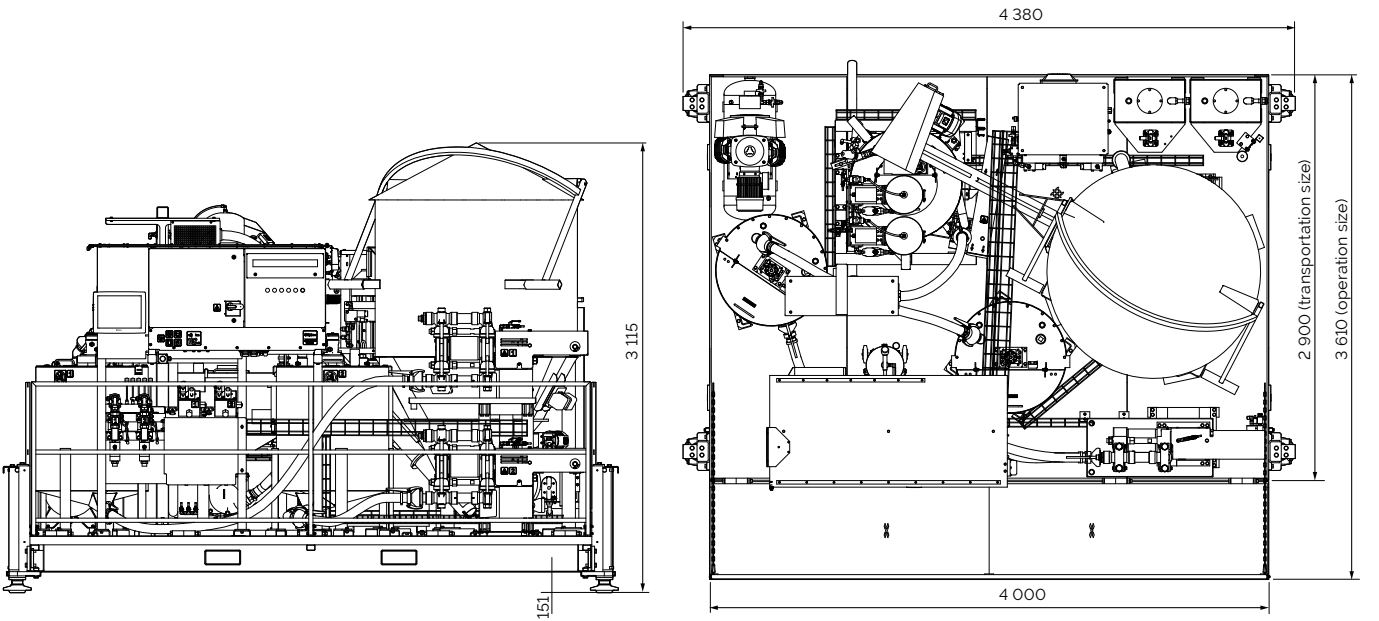
Measurements in millimeters



Illustrations show Unigrout Flex S.



Illustrations show Unigrout Flex M.



Illustrations show Unigrout M2 and Unigrout M2 S.



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## United in performance. Inspired by innovation.

Performance unites us, innovation inspires us, and commitment drives us to keep moving forward. Count on Epiroc to deliver the solutions you need to succeed today and the technology to lead tomorrow.  
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