



Applications

examples & advantages

ductile iron solutions
www.trm.at



Table of contents

+ Longstanding System Partner A wide range of advantages from a single source	page	2
+ Drinking Water Pipes Complete protection for our most valuable resource	page	3
+ Disposal of Wastewater Safe and environmentally friendly disposal	page	4
+ Turbine Pipes High pressures for clean energy	page	5
+ Snow-Making Pipes Performance and safety	page	6
+ Extinguishing Water Pipes Reliability in case of emergency	page	7
+ Sponge City Principle Urban climate & trees and underground pipes	page	8
+ Conventional Installation The ideal system for pipe construction	page	9
+ Trenchless Installation Method Safety and speed	page	10
+ Laying on Steep Slopes Ideal even under extreme conditions	page	11
+ Bridge Pipes System solutions to meet all needs	page	12
+ Open-Air Pipes Temporary replacement pipes	page	13
+ Water Crossings Our pipes meet the highest demands	page	14
+ Floating Quality that meets even the most demanding requirements	page	15
+ Pipe on Pile Foundation of pipes	page	16
+ Pile Foundations Safe and flexible foundation element	page	17



Longstanding System Partner

A wide range of advantages from a single source

Tiroler Rohre GmbH has produced ductile iron pipes at its site in Hall in Tyrol since 1947. We are always delighted to pass on our decades of experience with the product, construction-site conditions and designing effective solutions for our customers.

Customer services

- + On-site assistance
- + Planning consulting
- + Prompt field service and application technology throughout the sales area
- + System supplier (pipes, fittings, special products and special solutions)
- + Complete range of fittings
- + Quick, uncomplicated laying

Product quality

- + VRS®-T joint (fully sealed, movable and with restrained joints, can be bent up to 5°)
- + Robust
- + Active and passive corrosion protection
- + Diffusion-resistant
- + Resistant to root penetration
- + Fire-resistant
- + Resistant to aging
- + Lining approved for food-hygiene standards

Sustainability

- + Short transport distances
- + Made from recycled material
- + Environmentally friendly production
- + High safety margins
(type-tested products according to EN 545)
- + Environmental protection, no organic material
- + Low maintenance and servicing costs with a long service life



Drinking Water Pipes

Complete protection for
our most valuable re-
source

Water as a strategic resource for the next millennium. Although it is the basis of all life, it is unequally distributed around the world, so providing people with pure drinking water is a key priority. Those fortunate enough to live in regions with plenty of water should not waste a single drop of this life-giving resource, and one way of doing so, is to construct pipes with fully sealed joints made from materials which guarantee a long service life.

- + Reliable, economical and ecological water supply
- + Hygienic, safe transport of drinking water as a nutritional resource with no diffusion losses
- + Decades of tried-and-tested use
- + High water-supply security
- + Low reinvestment costs due to long service life
- + Resource conservation thanks to quick and simple installation
- + A wide range of products for the ideal pipe system
- + Minimal maintenance required
- + Simple installation
- + Root-resistant material
- + Sustainable production



Disposal of Wastewater

Safe and environmentally friendly disposal

Safe disposal of household and industrial wastewater is an essential part of every modern society. Tiroler Rohre GmbH sewage pipes deliver sewage safely to the sewage treatment plant, providing effective protection from groundwater contamination.

Particularly in inner-city areas, the requirements for a wastewater disposal system are safety, fast and cost-effective installation, and durability. This can also be seen in extreme situations, such as storms, where due to their high load capacity and flexibility, it is often only Tiroler Rohre GmbH sewage pipes that continue to work, thanks to the patented VRS®-T connection. The special inner lining made of high-alumina cement was tested in long-term experiments for its resistance to diluted acids and strong bases, and the results have shown that at pH values between 4.5 and 9, no functional impairments are to be expected in continuous operation.

- + Safe and resilient system from a single cast
- + Special range of wastewater fittings
- + Safe disposal of waste water with special internal linings
- + Resistance to root ingrowth
- + Decades of tried-and-tested use
- + VRS®-T joint for cost-effective installation
- + Sustainable water disposal



Turbine Pipes

High pressures for
clean energy

Clean and environmentally friendly energy from hydropower is becoming increasingly important in our society. Turbine pipes are usually laid in extreme alpine terrain, and TRM pipe systems enable fast and safe installation even in rough terrain and in all weathers. The high operating pressures require a highly reliable pipe system. The excellent strength properties of our ductile iron pipes with VRS®-T connection guarantee that power-station pipes will continue to work without any problems for generations.

- + The VRS®-T restrained locking system absorbs settlement and slope movements and prevents the ingrowth of vegetation
- + Earthquake-proof
- + Operating pressures of up to 100 bar – pressure surge up to 120 bar
- + Type testing up to 155 bar
- + Increased safety requirements – mechanical capabilities and margins of ductile iron
- + Optimized construction time, without the need for time-consuming welding, testing, subsequent surface treatment or keeping pipe trenches open. Simple installation and quick assembly
- + No expensive and costly concrete thrust blocks are required as fixed points for the VRS®-T restrained locking system
- + Can be installed on steep slopes that are difficult to access



Snow-Making Pipes

Performance and safety

Mild winters with low snowfall are becoming increasingly common, and snow-making machines have been installed in many mountain regions to ensure there is sufficient snow for skiing. Fundamental to a successful snow-making system are the expertise that comes from experience and a water pipe that can withstand all the conditions and very high pressures of a mountain environment.

The Tiroler Rohre GmbH ductileiron pipe system has been tried and tested for over 30 years in snow pipes.

- + Easy to install even in difficult terrain – no welding necessary
- + Outstanding safety for operating pressures. Pipes and fittings up to 100 bar
- + Range of longitudinal force-fit pipes and fittings specially adapted for snow-making facilities
- + Temperature-resistant without changing the material properties
- + Pipes and fittings are easy to dismantle
- + Up to 400 m can be laid in one day
- + Can be bent up to 5° – fewer fittings required
- + Global endorsements
- + Decades of experience
- + Product quality monitored to EN standards; member of various quality-assurance associations
- + Consultancy during the planning stage and on-site support by experts
- + Other key services: Inspections, drawing up of material lists, and quick supply of replacement material in case of defects / damage



Extinguishing Water Pipes

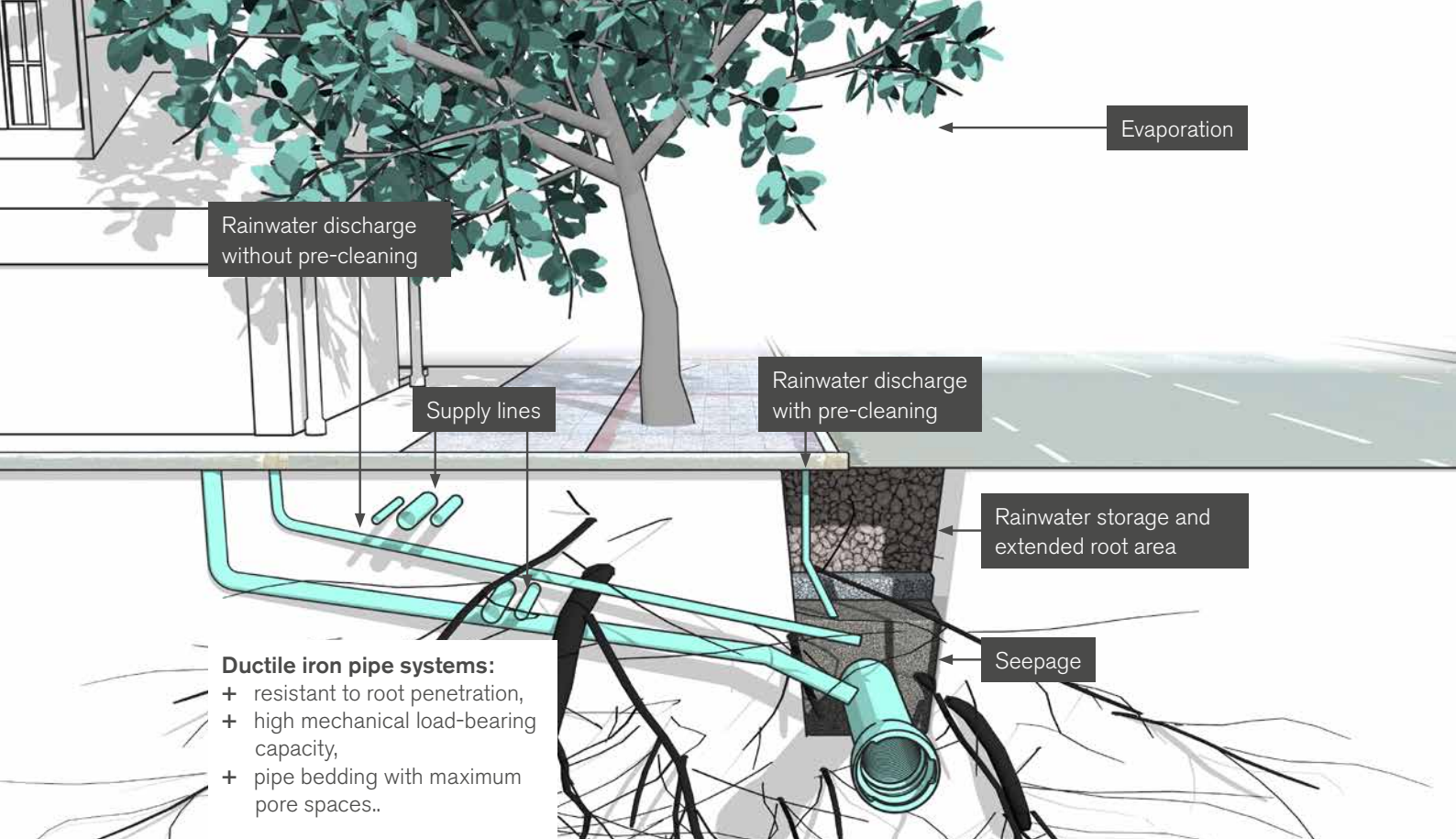
Reliability in case of emergency

A fire-extinguishing system is a technical system which is constantly on standby and which tackles a fire with an extinguishing agent. It is used for protecting and saving human lives. Wherever human lives are protected, attention must be paid to redundancy, safety and margins. A Tiroler Rohre GmbH ductile iron extinguishing water pipe is non-combustible, absorbs stresses and provides sufficient extinguishing water in the event of an emergency.

Ductile iron pipes for fire-extinguishing systems at airports and industrial facilities as well as in road and railroad tunnels:

- + High resistance to internal and external stresses
- + Fire-resistant and robust material
- + Reliable VRS®-T restrained locking system or flange connection, unique flexible fitting range
- + Solutions for design details such as hydrant connections, direction changes and branches

⚠ FM approval is confirmation that our ductile iron pipes meet the requirements of state-of-the-art, reliable fire-extinguishing systems.



Sponge City Principle

Urban climate – trees and underground pipes

The Sponge City principle serves to prevent excessive heat and provide near-natural rainwater management in cities. The cooling capacity of soils and vegetation areas is becoming increasingly important as more and more people realize that green spaces sufficiently supplied with water are the natural "refrigerators" of a city. Cooling capacity can be increased by storing rainwater, implementing soil-improvement measures and continuously watering the vegetation. Promoting the Sponge City principle and developing sustainable storage and irrigation systems are therefore key future tasks for climate-adapted cities.

Decoupling effective drainage areas from existing sewage systems has proven to be an effective approach

- + For reducing hydraulic system loads
- + For improving flood protection
- + For reducing the material and hydraulic water pollution caused by rainwater runoff

Ductile iron pipes with VRS®-T joints are ideally suited for use here:

- + Tried-and-tested root-resistant connections
- + Robust ZMU-Austria coating for use in coarse-grained vegetation areas
- + No heavily compacted pipe bedding, which restricts root growth
- + Diffusion-resistant material



Conventional Installation

The ideal system for pipe construction

Pipes and fittings with the VRS®-T joint are not just used for special installation methods and stresses; they are also the ideal system for conventional installation.

The advantages of the VRS®-T system in conventional installation:

- + Simple and, above all, safe to use
- + No special equipment required for assembly
- + No special sand bedding needed
- + Installation with the open-close method
- + 30 cm of cover height required
- + Can be bent up to 5°
- + Joint can be rotated 360°
- + Restrained locking system up to 100 bar
- + No concrete thrust blocks necessary
- + No welding necessary, VRS®-T joint with clamping ring
- + Complete range of fittings



Trenchless Installation Method

Safety and speed

When building new pipe networks or renovating existing ones, conventional open pipe trenches in urban areas often push the limits of what is feasible. In order to avoid large-scale traffic obstructions in conurbations, trenchless pipe construction methods began to be developed 30 years ago.

Trenchless technologies, with VRS®-T restrained locking systems, cement-mortar coatings, sheet metal cones and sleeve protection, have a lot to offer for renewal or new installation.

- + Pipe relining (pulled or pushed)
- + Horizontal directional drilling (HDD)
- + Press-pull technique
- + Auxiliary pipe method
- + Burst lining
- + Ploughing and milling

Benefits of laying ductile iron pipes without trenches:

- + Very short assembly times
- + Enables small start and target pits
- + Single pipe installation means no elongated construction-site installation areas are necessary

- + Joints can be stressed immediately after assembly
- + Allows very high tensile forces compared to other materials for even better safety!
- + Tensile forces independent of temperature and pull-in time
- + ZMU-Austria offers protection against mechanical and chemical attacks
- + High ring and longitudinal rigidity ensures unlimited service life even in conditions with poor support
- + Shards of the old pipe material and stones are not a problem



Laying on Steep Slopes

Ideal even under
extreme conditions

A pipe system must be able to withstand extreme conditions, especially when laid on steep slopes. The VRS®-T system combines very high tensile forces and operating pressures with simple and very quick installation. In addition, our ZMU-Austria coating eliminates the need for soil replacement, so no costly and time-consuming transport of bedding material is required.

When laying on steep slopes, enormous forces can be generated as a result of:

- + Pipe weight – the pipe's slope downforce pulls at the upper end of the steep slope pipe – high tensile forces
- + Pressure in the pipe – additional forces at both the upper and lower bends
- + Sliding of the trench filling – skin friction between soil and pipe surface – additional forces in the socket joint



Bridge Pipes

System solutions to meet all needs

The technical challenges of bridge structures include accounting for temperature-related length fluctuations and ensuring fast and safe drainage. As cast iron and concrete exhibit approximately equal linear expansion behavior, Tiroler Rohre GmbH pipe systems are ideally suited to these applications.

The following problems have to be taken into account when installing above-ground pipes on bridges:

- + Temperature-related length changes in the structure
- + Risk of the medium freezing in winter
- + Pipe and medium becoming too hot in summer
- + Pipe thrust blocks and fixed points are difficult to install

TRM uses its many years of experience to offer a wide range of solutions for complex problems:

- + Any changes in length can usually be compensated by sockets and fittings, e.g. U fittings to compensate for expansion
- + Special WKG (heat-insulated ductile iron pipes) coating for pipes at risk of frost
- + Special suspension systems for ductile iron pipes
- + Ductile iron pipes with VRS®-T joint for safe pipe operation
- + Only one support per pipe is required



Open-Air Pipes

Temporary replacement pipes

The construction of open-air pipes is one of the most technically challenging methods in pipe construction. At first glance, the planning challenges might not seem too onerous. However, on closer inspection, some very complex and technically demanding details have to be taken into account.

Why a VRS®-T restrained locking system?

- + Simple and quick assembly and disassembly
- + Increased security against vandalism
- + Operating pressures of up to 100 bar
- + Consistent material properties at any temperature
- + UV resistance
- + Interim pipes – multiple reuse of the pipe

Open pipes are pipes that are laid not in the ground but above the surface – the pipe and soil system is interrupted, so to speak. Influences such as temperature changes in the medium or the environment take full effect here. Forces caused by internal pressure – which cannot be transmitted into the ground via the pipe bedding – have to be controlled in some way, and it is in this context that terms such as position securing, interim management and protection against vandalism are often mentioned. On closer inspection, a task that initially seems simple can become a technically complex challenge.



Water Crossings

Our pipes meet the highest demands

Pipes often have to cross under water or buildings, and this are huge requirements to the pipe material. For this reason, only ductile iron pipes with VRS®-T restrained joints and ZMU-Austria coating are generally used for this purpose. These pipes are also known as culverts.

The pipe can be pre-assembled in the dry – the VRS®-T restrained joint enables subsequent installation. Culverts are often lifted with cranes, pulled into prepared channels with winches or installed without trenches using wash drilling.

- + Cast iron gives the pipes high dimensional stability
- + Various coatings provide particularly high corrosion protection
- + Simple application as a complete system



Floating

Quality that meets even the most demanding requirements

This is probably the most unconventional way to lay ductile iron pipes. A pipe with VRS®-T joints and ZMU-Austria coating is drawn into the water, which automatically stretches and seals the joints. The cement lining withstands all attacks from the water bed, which consists mainly of mud.

- ⚠ Depending on weight and volume, ductile iron pipes can float independently and sink when fully filled.
- ⚠ Up to and including DN 200, depending on the wall thickness, additional floating bodies may be required to keep the pipe above water. From DN 250 and above, the pipe can float independently.
- ⚠ Due to unforeseeable loads resulting from wave motion, lowering, subsurface conditions and subsequent subsurface movements, only pipes with VRS®-T restrained joints should be used for floating.
- ⚠ It is not necessary to fix the pipe to the water bed.



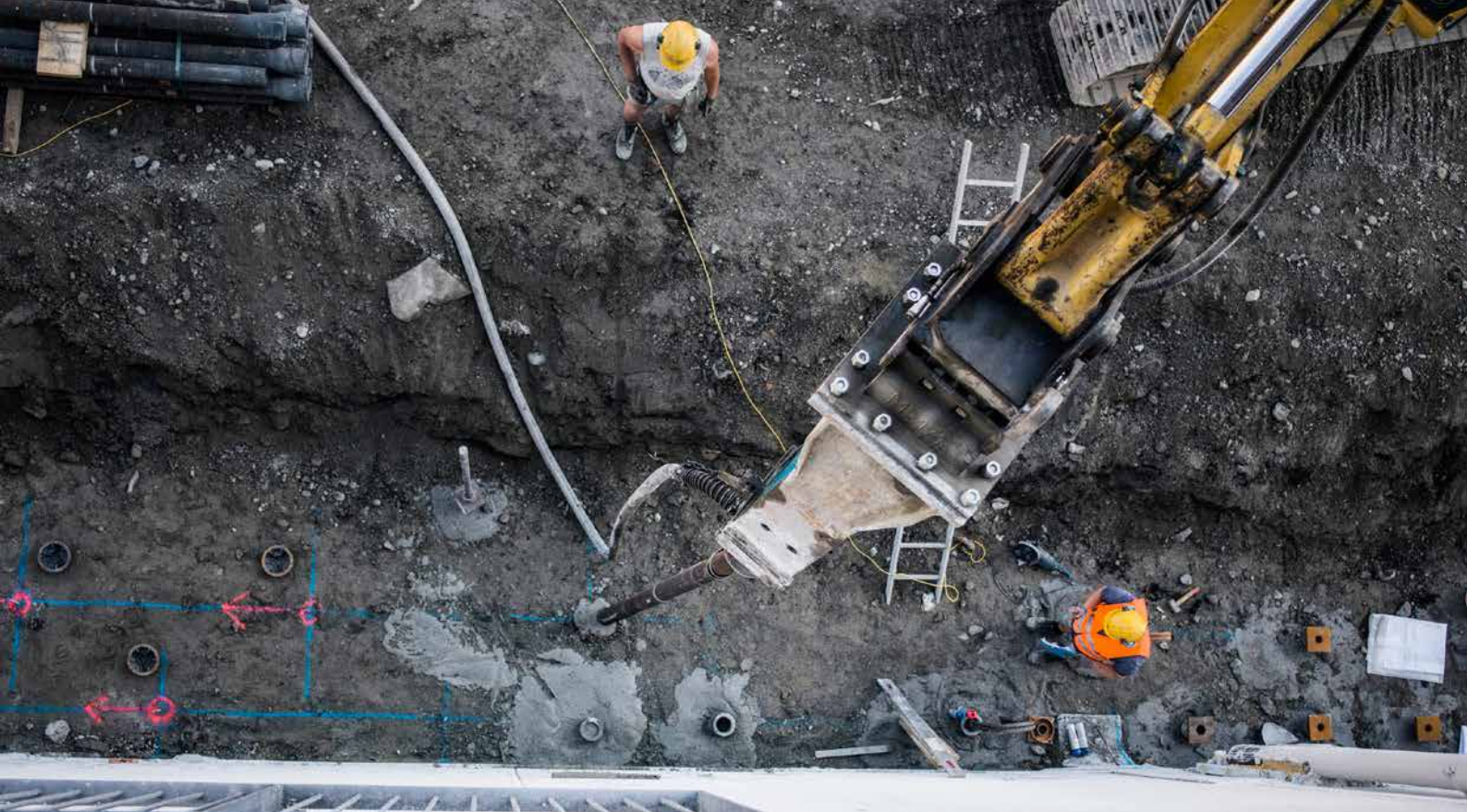
Pipe on Pile

Foundation of pipes

Pipes can be supported on piles in order to ensure a constant pipe gradient even in soils poorly suited for load-bearing.

The pipe absorbs its own weight, the weight of the medium, the soil load and, if necessary, the traffic load and transmits these via special supports developed by Tiroler Rohre GmbH and the piles into the ground.

- + Because of the high load-bearing capacity of the sockets, only one support per pipe is required!
- + When laid at low depths, the pipe wall thickness is increased to limit deflection.
- + Pile tube rests in nominal diameters DN 200 to DN 500



Pile Foundations

Safe and flexible foundation element

The construction industry needs simple, safe and universally usable prefabricated driven-pile systems. Tiroler Rohre GmbH's solid full displacement pile is driven into the ground and effectively transmits the forces from the building into the ground.

The benefits:

- + Cost-effective building site set-up through the use of lightweight and mobile standard equipment
- + Higher corrosion resistance than steel
- + Safe adjustment of the pile lengths to the changing construction-ground conditions. Proof of the exterior load-bearing capacity already during the ramming process
- + Plug&Drive®: Fast and restrained joints for the individual pile tubes without any special tools or welding
- + Almost vibration-free insertion: With a center distance to existing buildings from 50 cm, piles can be prepared even in restricted spaces
- + Excellent cost efficiency: low investment costs, high productivity of up to 400 running meters and more per day
- + No additional costs for the disposal of debris or reworking of pile heads; no trimming losses

With applied load values of up to 2,400 kN, the driven pile is an economical alternative for many deep-foundation methods. The original Plug&Drive® connection system ensures that connections can be made quickly and pile lengths varied without requiring additional working time or cost. Its easy set-up on the building site means the TRM system is not just an ideal solution for medium-sized and smaller construction projects. With its high productivity, it is also an economic solution for large projects. The load is transmitted by end-bearing pressure in ungrouted point-bearing piles and/or additionally by pile skin friction in grouted piles.

PIPE SYSTEMS



Tiroler Rohre GmbH

Innsbrucker Strasse 51

6060 Hall in Tirol

Austria

T +43 5223 503 0

F +43 5223 436 19

E office@trm.at

www.trm.at

April 2019 All information is supplied without liability.

All data subject to changes and errors. Printing and typesetting errors reserved.

All depictions are symbolic images. Color and design may deviate from depicted products.

Publisher: Tiroler Rohre GmbH

Design: LÆWENZAHM.at

Printing: Alpina Druck GmbH