



Turbopuls

410.060

410.080

410.120

410.1209 Twin-Kit



Operating Manual

English

September 24 | Version 1.3



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Version	Revision	Date	Initials
1.0	Created	March 20	fkr
1.1	Several changes	June 20	fkr
1.2	Assembly instructions for the Twin-Kit added	November 23	bbi
1.3	Reduction hose and pull part better described	September 24	bbi

Preface

Dear valued customer,

Thank you for the confidence and trust you've placed in us by purchasing one of our products.

We always appreciate suggestions and new design ideas. Your feedback will help us improve the design of our product and the associated documentation.

If you have any questions or suggestions, please contact our Customer Service Department.

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Feedback form

www.enz.com/en/header/feedback

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We reserve the right to modify and further enhance our products without prior notice as a result of technological advances. Misprints reserved.

Purpose of the document

The purpose of this manual is to instruct you on how to use our product correctly, effectively, safely, and for its intended purpose. The user will be informed about risks, reasonably foreseeable misuse, and residual risks.



Important! Read carefully before use. Keep for later reference.

Please read this operating manual thoroughly before using the cleaning tool. Make sure that all employees who work with the product know how to use it correctly.

The operating manual must be available to all operating personnel at all times. It must be kept in an easily accessible place.

If the manual is misplaced or destroyed, a new copy can be requested from your nearest dealer or from the manufacturer directly.

1 Safety

1.1 Noncompliance with the safety information and its consequences

Disregarding these safety instructions may lead to accidents and severe personal injuries, material damage, and damage to the environment.

The manufacturer cannot be held responsible for any damages resulting from non-compliance with these instructions.

1.2 Target group

This manual is intended for all persons who will be involved in the assembly, start-up, and operation of the pipe cleaning tool.

1.3 User requirements

Personnel intending to assemble, start up and operate the tool must...

- Be familiar with the field of sewer maintenance work and possess the appropriate technical knowledge.
- Be trained and instructed appropriately in the use of the product.
- Have read and understood the operating manual, in particular the section on "Safety"

If your personnel do not possess the necessary knowledge, they must be trained and instructed on it. If necessary, the pipe cleaning tool manufacturer can provide this instruction and training.

Only the maintenance and service activities described in this manual may be performed by users who have met the above-listed requirements. Any additional maintenance and service work may be performed only by qualified specialist personnel from the manufacturer.



Please refer to the section on "**Maintenance**".

1.4 Explanation of general safety instructions

The general safety instructions in this section provide information about potential residual risks, which are inherent to the product and may occur unexpectedly, despite the proper usage of the product.

In order to prevent personal injuries, material damage, and damage to the environment, all personnel working with this product must comply with these safety instructions. It is mandatory for said personnel to read and to understand the information provided in this section.

1.5 Information provided in these operating instructions



DANGER!

Noncompliance may lead to serious injury or **loss of life**.



WARNING!

Noncompliance may lead to serious injury and / or cause a long-term disability.



CAUTION!

Noncompliance may lead to injury and considerable material damage, financial loss or damage to the environment.



Information on the technically correct and efficient use of the product.

1.6 Intended use

The product is designed to clean the insides of pipes (sewer pipes). The following points must be followed to ensure proper use of the product:














The cleaning tool may be used only in pipes or pipe-like sewers. The profile to be cleaned must be free of leaks and surrounded by material.



The tool may be used on the following types of pipes:

- PE pipes
- Steel pipes
- Concrete pipes

-  For use in pipes made of other material, please consult the manufacturer.
-  The product may be operated only in pipes with correctly installed and defect-free connections.
-  Cleaning areas (manholes, pipe branches etc.) need to be sufficiently secured during the operation, including during construction and cleaning work.
-  During the cleaning operation, **no** personnel are allowed inside the pipes or at either end of the pipes.
-  The maximum pressure indicated on the nozzle may **not** be exceeded.
-  Wastewater may **not** be drained into watercourses (creeks, rivers etc.).
-  The product must be inspected to ensure it is in proper working order before every start-up.
-  Defects must be rectified before start-up.
-  Use the tool only as intended. (Use only the correct wrench for nuts).
-  Secure the hose lines in such a way that they cannot become damaged during operation.
-  Only the accessories provided and approved by **enz® technik ag** may be used.

1.7 Safety warnings for modifications

No other changes or modifications to the pipe cleaning tool may be performed. Only parts authorized by the manufacturer may be used. The manufacturer is not liable for damage resulting from unauthorized changes to the product.

1.8 Protective equipment for working in manholes, excavations, and sewer lines

The employer must provide suitable personal protective equipment and ensure that it is worn by the employees during work.

In the following section, the protective equipment prescribed by Schweizerische Unfallversicherung SUVA (the Swiss Accident Insurance Organization) will be described.

For more information on this, refer to the brochure:

Safe entry and working in manholes, excavations, and sewer lines

(in German, French & Italian)

Order number: 44062.d

Suva

Schweizerische Unfallversicherungsanstalt

Arbeitssicherheit

Postfach, 6002 Lucerne, Switzerland

For information:

Phone +41 41 419 51 11

For orders:

www.suva.ch/waswo

Phone +41 41 419 58 51



Respirators

Self-contained respiratory equipment for spending time in dangerous atmospheres and for use during rescue operations.



Respirators

Self-rescue respiratory equipment (devices with compressed air tanks or regeneration devices) for working in sewers and for first aid for injured persons.



Rescue harness

Rescue harness or protective clothing with a loop sewn into the neck. During rescue, the rescue rope will be attached to the neck loop. Injured persons will be lifted out using a rescue lifting device with a self-actuating load brake.



Suitable working clothing

Leak-proof clothing protects the skin from becoming soiled and from possible infections. Visually conspicuous work clothing makes the employee more visible to traffic.







Appropriate footwear

Safety footwear should, in particular, have good grip and be slip-resistant and leak-proof (e.g. rubber boots).






Gloves

Appropriate gloves will protect you from hand injuries and contact with materials that could impair your health and from untreated water.

	<p>Hardhat</p> <p>The hardhat will protect your head from falling objects and from bumping into fixed components and objects.</p>
	<p>Hearing protection</p> <p>If there is noise that could damage your hearing, you must wear, e.g. earmuffs with built-in headphones and microphone.</p>
	<p>Eye protection</p> <p>Your eyes should be protected against grit, sprayed dangerous substances, etc.</p>
	<p>Lighting independent of the power grid</p> <p>For example, you should carry a waterproof flashlight or wear a flashlight attached to your hardhat.</p>

1.9 General safety instructions

	<p>Danger! High-pressure water jets</p> <p>Defects in or unintended use of the product could cause hazards due to pressurized water spray. Never remain in the channel during operation. Ensure that the product is in perfect condition before operation. Highly concentrated water jets can cause serious injury and could even sever limbs.</p>
	<p>Danger! Toxic vapours</p> <p>There can be toxic vapours in sewer lines. Wear the prescribed protective equipment such as gas masks, gas warning devices and rescue harnesses. Inhaling toxic vapours or air that is contaminated with particles could be fatal or lead to serious injuries if the particles enter the lungs.</p>
	<p>Warning! Falling objects</p> <p>Around open manholes, objects can fall down into the manhole and onto the people below. Never remain directly beneath the manhole opening when guiding the products in. Secure the manhole entrance against parts that could fall. Do not throw any tools or objects down into the manhole. Do not enter any manhole where there is a danger of falling. Personnel could become trapped.</p>

Warning! | Chemical burns

There may be unidentified, corrosive, or otherwise harmful substances in the sewer line. Put on appropriate protective clothing. Use the protective equipment prescribed. Otherwise, you could suffer from chemical burns to your skin and eyes or become infected with pathogens.

Warning! | Falls from height

Open manholes are to be expected in the area where you will be working with the product. You must warn people about open manholes. Pay attention to where you are walking.

Warning! | Hand injuries

In case of tampering with the product, there is a risk of hand injury due to getting caught or abrasion. Wear gloves during work. Pay attention to where you grip the product. Always have sufficient people carry heavy or over-sized, equipment. Consequences can include crushing injuries, abrasions or even the loss of a limb.

Caution! | Sharp objects

If the product is tampered with, there is a risk of hand injuries due to sharp edges. Wear gloves during work. Pay attention to where you grip the product. Consequences can include cutting injuries to your hands or other parts of your body.

Caution! | Trip hazards

Lines and other objects are to be expected on the ground in the area around where the product is being used. Pay attention to where you are walking. Keep the area of use tidy. Tripping and falling could cause serious injuries.

2 Legal

2.1 Copyright

This manual shall not be duplicated partially or in its entirety without the prior written permission of **enz® technik ag**. It shall not be photocopied, reproduced, translated, or converted into an electronic or machine-readable format.

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2.2 Exclusion of liability

The manufacturer is not liable for damage that:

- Is caused as a result of unauthorized changes to the product.
- Is caused by not following the safety instructions.

2.3 Warranty conditions

In accordance with our sales and delivery conditions, we offer a warranty. However, the warranty is voided if:

- The product is used under conditions that are not permitted by us.
- Replacement and accessory parts that are not original replacement and accessory parts from enz® technik ag are used.
- If there is damage due to:
 - Improper use
 - Not following the operating manual
 - Unsuitable operating equipment
 - Incorrect or improper routing of the hose or pipelines
 - Unauthorized changes or modifications to or conversions of the product.

3 Introduction

The underlying technology of the Turbopuls vibration nozzle is an off-center rotor, which generates very fast vibrations. The turbine wheel drive enables all Turbopuls nozzles to be operated with recycled water. The vibrations cause deposits to loosen or break up into fragments.

When Turbopuls nozzles are used, a cutter is usually not required.

3.1 Application

Turbopuls nozzles are designed to remove very hard deposits in plastic, steel, or concrete pipes.

**CAUTION**

Do not use Turbopuls nozzle in clay or ceramic pipes. This could rupture the pipe.

**CAUTION**

The strong mechanical pulses and vibrations could damage pipelines. Do not work in one spot for an extended time. Always keep the nozzle moving.

4 Installation

4.1 Installing the tools

The tools are supplied ready for use. After unpacking, check the delivery for completeness.

4.2 Preparatory work

Verify certain information before use. Information regarding the following may be helpful during preparation:

1. Layout of the pipes.
2. Inner diameter of the sewer where work will be performed.
3. Material of the sewer where work will be performed.
4. Type of foreign material in the pipe.
5. Planned flushing direction. → We recommend that you work against the direction of flow.
6. Slopes in the sewer where work will be performed.
7. Sewer access points.

4.3 Setting up the work area

Perform the following before working with the Turbopuls nozzle:

- ⚠ Set up barriers and safety equipment (warning signs, safety barriers, etc.).
- ⚠ Block off and secure the work area such that there is no risk of falling or of danger from traffic.
- ⚠ Obtain information regarding the wastewater entering the manhole (chemicals, gas, vapors, etc.).
- ⚠ Measuring instruments such as explosive gas meters, oxygen meters, and gas warning devices, must be readily available.
- ⚠ Ensure that the appropriate nozzle sizes for cleaning the pipes are available. The application range of each nozzle is listed in “Technical information” on **page 23**.
- ⚠ The layout of the lines (sewer maps) must be known before starting work to prevent the nozzle from emerging at a pipe end. Support personnel must monitor possible emerging points.
- ⚠ Have the customer sign the liability waiver to protect against claims for damages.



Figure 1 Cordoned-off & identified work area

5 Operation

5.1 Operating the Turbopuls

The Turbopuls nozzle is screwed onto the pressure hose of the vehicle. The thread size depends on the size of the Turbopuls and can be found under “Technical information” on **page 23**.

In the standard setup, the nozzle rotates counterclockwise during use, and the connection is reverse threaded. This ensures that the nozzle cannot self-loosen from the hose during operation.

1. Perform pre-cleaning with a Grenade Bomb or pointed nozzle so there is no loose material in the pipe.
2. Push the entire length of the tool into the pipe to be cleaned.
3. Slowly increase the pressure to 100 bar (1450 psi) at the nozzle. This working pressure normally cleans the pipe effectively.
4. Support personnel must monitor the exit manhole if there is not complete clarity of the layout, or if you are working over very long distances.
5. To prevent blockages caused by removed material behind the nozzle, regularly pull the nozzle back and rinse out the loose material.



DANGER

Never exceed the maximum working pressure specified in the technical specifications on **page 23**. This presents a risk to life. If a nozzle bursts, fragments can penetrate the pipe wall, and airborne parts can travel at high speed.



DANGER

The tool can turn around and eject back in large pipes. Use an appropriate safetyliner. Major injury could result.



CAUTION

Regularly pull the tool back and rinse out the removed material. If too much distance is covered at one time, the nozzle can become stuck downstream of the deposits removed.

**CAUTION**

Keep the Turbopuls moving during operation. Leaving the Turbopuls in one place can damage the pipe due to the strong vibrations.



Check the cleaning progress with a camera.

5.2 Cleaning easily damaged pipes

There is a softer accessory impact head for the Turbopuls 410.120A/B. This is recommended to prevent damage to easily damaged pipes.

See **Section 7.4** on **page 28**.

5.3 Completing the work process

Check the clean pipe with a camera. Check for damage and the leakage of fluids into the environment. If necessary, scrape out the remaining margins of deposits with a rope and chain scraper.

5.4 After use

Service the nozzle after each use to ensure a long service life. See **Section 6** on **page 17**.

5.5 Troubleshooting

5.5.1 Insufficient vibration of the Turbopuls 410.080A/B

A rinsing hose that is too heavy can substantially reduce vibration. Working with the reduction hose (Art. No. 95.F100M075150) is recommended.

Please refer to **chapter 7.1** from **page 25** onwards.

5.5.2 The Turbopuls hovers over the deposits

Excessive water at the thrust jets can cause the Turbopuls to lift off. Attaching the pull part (Art. No 30.100Z) to the end of the reduction hose (Art. No. 95.F100M075150) prevents this. Please refer to **chapter 7.2** from **page 25**.

5.5.3 No more vibration

There are several possible causes of the Turbopuls suddenly no longer vibrating properly:

- The turbine wheel is blocked. → Attempt to loosen the blockage by manually turning the turbine wheel with a screwdriver.
- The drive nozzle insert is clogged. → See **page 18**.
- The turbine wheel is worn out. → See **page 20**.

5.5.4 No more forward movement

The Turbopuls stops in front of the deposits and cannot climb them. If this is the case, fit a centre point - see **page 27**.

5.5.5 Deposits are only removed on one side of a pipe

Because of the direction of rotation, the Turbopuls tends to clean to just one side of the pipe in larger pipes. To remove all deposits, we recommend working from both sides.

If this isn't possible, the direction of rotation of the off-center weight can be changed for Turbopuls nozzles 410.080 and 410.120. Follow the conversion instructions on **page 31**.

6 Maintenance

Only operators with the required knowledge may perform the maintenance and service activities described in this operating manual.

6.1 Maintenance after each use

1. Check the nozzle inserts for blockage.
2. Check the tool for wear. Replace defective parts.
3. For corrosion protection and care, treat the tool with OIL SPRAY BIO (Art No. C191).



Figure 2 OIL SPRAY
BIO, 500 mL

6.2 Nozzle inserts

Regularly inspect the nozzle inserts. Wear depends on the degree of contamination of the water used. If recycled water is used, inspect the nozzle inserts **daily** and clean them if necessary.



CAUTION

Worn nozzle inserts impair cleaning results and increase risk when working with high pressure. Inspect the nozzle inserts daily if recycled water is used.

Use JetCalc to determine the diameter of the nozzle inserts if you do not know it.

6.2.1 Replacing the nozzle inserts

1. Remove the defective nozzle inserts.
2. Clean the threaded holes and the new inserts. All threads must be free of lubricant.
3. Coat the threads of the nozzle inserts with Loctite 243 (Art. No. C192).
4. Immediately screw the nozzle inserts into the tool body as far as they will go. Use a socket wrench to slightly tighten the inserts.
5. The compound must cure for at least 24 hours.



CAUTION

Only replace damaged nozzle inserts with identical nozzle inserts of the same diameter. If the tool is not correctly outfitted, the tool or the pipe may be damaged.

If the tool will not be used for an extended period, spray the nozzle openings and the connecting threads with OIL SPRAY BIO (Art. No. C191).

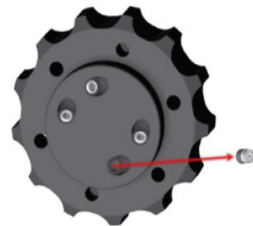
6.2.2 Drive nozzle is clogged

A clogged drive nozzle could be the cause of insufficient Turbopuls vibration. The drive part must be removed to clean out the clog.

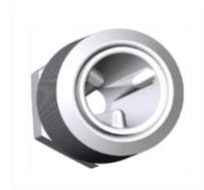
1. Loosen the four cylinder-head screws and remove the drive part.



2. Unscrew the nozzle insert of the drive (apply heat if necessary).



3. Unclog and clean the nozzle insert.



4. Coat the threads of the drive nozzle with Loctite 243. Screw in the drive nozzle.



4. Install the drive part. Coat the four cylinder-head screws with Loctite 243 and tighten them to **38 Nm**. The Loctite must cure for at least 24 hours.



Figure 3 *Maintaining the drive nozzle*



Worn nozzle inserts reduce cleaning efficiency.



If recycled water is used, inspect the nozzle inserts at shorter intervals.

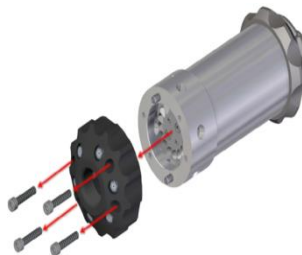
6.3 Wear of the turbine wheel

If the Turbopuls no longer vibrates sufficiently, check the turbine wheel and the nozzle inserts. The figure at right shows a new turbine wheel. If a web (green) is damaged or missing, replace the turbine wheel.



Figure 4 New turbine wheel

1. Loosen the four cylinder-head screws and remove the drive part.



2. Remove both socket-head screws of the turbine wheel.

Caution: Do not apply heat to the screws.



3. Lever the turbine wheel out using two screwdrivers.



4. Install the new turbine wheel and tighten the screws to 10 Nm.



5. Install the drive part. Coat the four cylinder-head screws with Loctite 243 and tighten them to **38 Nm**.
 - The Loctite must cure for at least 24 hours.



Figure 5 Checking the turbine wheel

6.4 Disposal and environmental protection

The tools do not require any special disposal procedure, and they can be disposed of with other scrap metal.

Only clean pipes for which the composition of the wastewater is known (industrial wastewater in particular). Chemicals and other toxic substances shall never be allowed to flow through defective pipes and enter the environment.

Report defective pipes or leaking substances to the supervisory body or appropriate authorities.

Do not use excessive water. This helps conserve natural resources.

7 Technical specifications

Article number	Connection thread	Rotating jet	Thrust jet	For recycled water	Weight	Application range	Dimensions	Min. flow rate at 100 bar (1450 psi)	Max. working pressure
410.060A	1/2"	1x M6	3x M8	✓	2.4 kg	100 – 200 mm	64 x 180 mm	60 L/min (16 US gpm)	200 bar 2900 psi
410.060B	3/4"				5.3 lb	4 – 8 in	2.5 x 7.1 in		
410.080A	1/2"	1x M6	3x M8	✓	4.3 kg	150 – 300 mm	78 x 210 mm	80 L/min (21 US gpm)	200 bar 2900 psi
410.080B	3/4"				9.4 lb	6 – 12 in	3.1 x 8.3 in		
410.080A-G	1/2"	1x M6	3x M8	✓	5.2 kg	150 – 300 mm	100 x 210 mm	80 L/min (21 US gpm)	200 bar 2900 psi
410.080B-G	3/4"				11.5 lb	6 – 12 in	3.9 x 8.3 mm		
410.120A	1"	1x M8	6x M10	✓	14.5 kg	200 – 1000 mm	120 x 320 mm	150 L/min (40 US gpm)	200 bar 2900 psi
410.120B	1 1/4"				32 lb	8 – 39 in	4.7 x 12.6 in		
410.120A-W	1"	1x M8	6x M10	✓	14.6 kg	200 – 1000 mm	120 x 320 mm	150 L/min (40 US gpm)	200 bar 2900 psi
410.120B-W	1 1/4"				32.1 lb	8 – 39 in	4.7 x 12.6 in		



Figure 6 410.060A/B



Figure 7 410.080A/B



Figure 8 410.080A/B-G



Figure 9 410.120A/B



Figure 10 410.120A/B-W

7.1 Reduction hose

The ultra-light 5/8" plastic reduction hose ensures sufficient vibration even when the two "lighter" Turbopuls nozzles are paired with a heavy 1" or 1 1/4" hose. Reduction hose 95.F100M075150 is installed between the vibration nozzle and the rinsing hose on the truck. The rinsing-hose side has 1" female thread, and the nozzle side has 3/4" male thread.



Figure 11 Turbopuls 80 with reduction hose

7.2 Using the pull part

Rinsing hoses with a diameter above 3/4" tend to supply Turbopuls 60/80 nozzles with too much water. The intense thrust causes the vibration nozzles to float, resulting in a marked decrease in the removal rate. The pull part (Art. No. 30.100Z) distributes the available water between the Turbopuls and the pull part. As a result, the nozzle stays on the floor and maintains its strong pulling force. The pull part and reduction hose (Art. No. 95.F100M075150) work together, with the pull part being installed between the rinsing hose on the truck and the reduction hose.



Figure 12 Pull part with reduction hose

7.2.1 Recommendations for using the reduction hose and pull part



Turbopuls 60/80

The use of a pull part and reduction hose is recommended for flow rates ≥ 150 L/min (40 US gpm).

The Turbopuls and pull part specifications must be coordinated with one another. Contact your dealer or use the nozzle calculation program at <https://my.enz.com/>.



CAUTION

The water from the pull part will spray up out of the manhole at the start.



Keep enough distance from the manhole so that you will not be hit by the water jet.



When working with the pull part (Art. No 30.100Z), the diameter of the nozzle inserts in the thrust nozzles must be adapted for the Turbopuls. Use JetCalc for calculation.

7.2.2 Nozzle calculation with a pull part

The use of a pull part is recommended when using the Turbopuls 60/80 at a flow rate of 150 L/min (40 US gpm) or higher. The pull part uses the excess flow for additional thrust. Perform the following steps for calculation:

1. Calculate the pressure loss of the rinsing hose based on the customer's parameters. Note the final pressure at the nozzle.
2. Determine the corresponding Turbopuls 60/80 (net) at 150 L/min (40 US gpm) and the final pressure at the nozzle calculated in step 1.
3. Determine the pull part (net) with the remaining flow rate (l/min) and the final pressure at the nozzle from step 1.

Example:

Flow rate: 250 L/min (66 US gpm)

Pressure: 200 bar (2900 psi)

Hose: 150 m (500 feet), 1", rubber

1. Pressure loss of a 150 m (500 feet), 1" rubber hose at 250 L/min (66 US gal) and 200 bar (2900 psi) = 31.6 bar (450 psi) → final pressure at the nozzle: 200 bar (2900 psi) – 31.6 bar (450 psi) = **168.4 bar (2450 psi)**
2. Turbopuls (net) at 150 L/min (40 US gpm) and 168.4 bar (2450 psi)
3. Pull part (net) at 100 L/min (26 US gpm) and 168.4 bar (2450 psi)

7.3 Pointed center

The pointed center continues the step pattern of the head, thereby facilitating climbing of the deposits to be removed. It is available for every size of the Turbopuls family.

7.3.1 Installing the pointed center

1. Remove the set screw.

2. Coat the threads of the pointed center with Loctite 243. Screw in the pointed center.
The Loctite must cure for at least 24 hours.

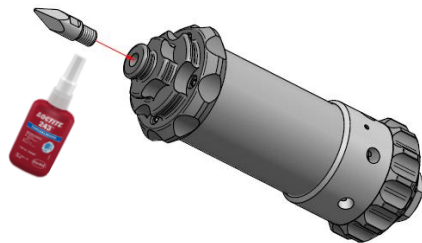
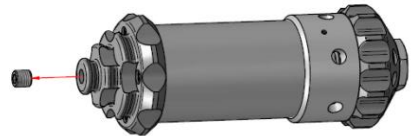


Figure 13 Installing the pointed center



CAUTION

The pointed center can damage the pipe. The pointed center can penetrate the walls of large pipes or pipe bends.



With larger quantities of lime, the centre point acts like a chisel and ensures that brittle layers of lime are chipped off thanks to thrust and vibration forces.

7.4 Replacing the impact head

Impact heads can be swapped out to increase the removal rate performance of the 410.080 and to prevent the 410.120 from damaging delicate pipes.

1. Remove the four cylinder-head screws on the impact head. Remove the head.
2. Install the new impact head. Coat the screws with Loctite 243 and tighten them to **38 Nm**. The Loctite must cure for at least 24 hours.

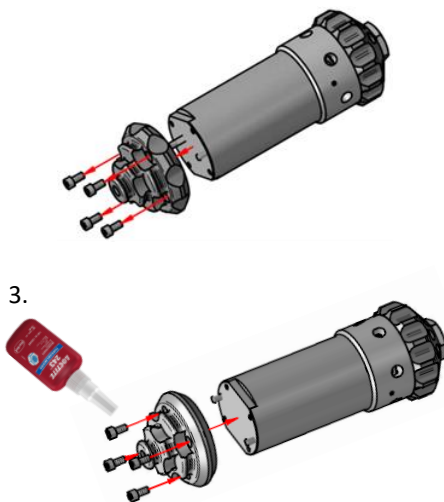


Figure 14 Replacing the impact head



Changing the impact head changes the removal rate performance. Work carefully and keep the Turbopuls moving.

7.5 Twin Kit for Turbopuls 410.120A/B

The Twin Kit can be used in sewer diameters 450 mm (17 inch) and larger. This involves two Turbopuls nozzles operating side by side, which doubles the removal rate performance.

Change the direction of rotation of one of the Turbopuls nozzles to keep the Twin Kit in the center of the pipe. Thus, one off-center weight turns counterclockwise and the other clockwise.

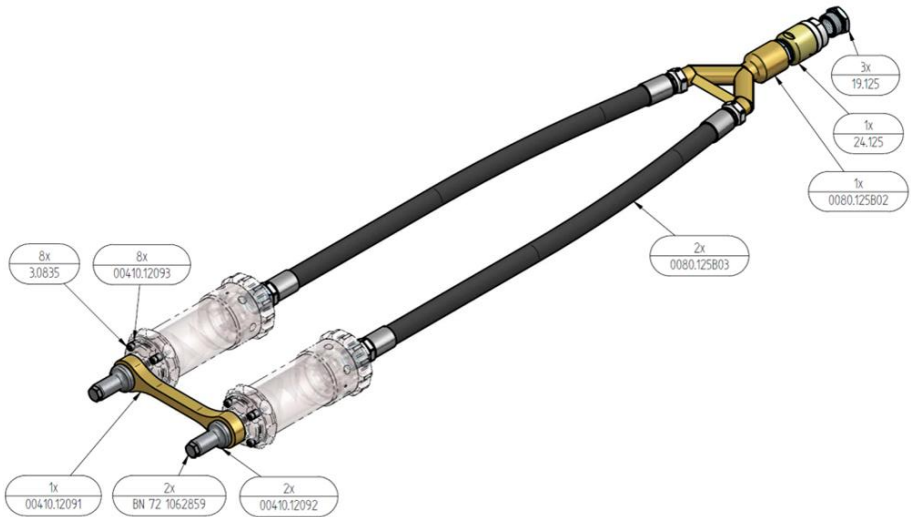


Figure 15 Twin Kit

7.5.1 Installing the Twin Kit

1. Remove the four cylinder-head screws from both impact heads.

2. Coat the cylinder-head screws that came with the Twin Kit with Loc-tite 648 and install them with the sleeves. Tighten the cylinder-head screws to **16 Nm**.



3. Remove the blind plugs on both impact heads.

4. Coat both hex screws with Loctite 648. Place the twin connector on both impact heads and mount it with the taper bushings. Tighten the hex screws to **200 Nm**.

5. Install the hoses, Y-piece, and swivel joint. Ensure leak-tightness of the entire system.

6. The Loctite must cure for at least 24 hours.



Figure 16 Installing the Twin Kit



CAUTION

Change the direction of rotation of one Turbopuls when installing the Twin Kit. Follow the conversion instructions on **page 31**.

7.6 Changing the direction of rotation of the 410.080/410.120

The standard direction of rotation is marked on the thrust cover with a dot (see red arrow in figure). This is the standard insert position. The other three holes are closed with blind plugs.

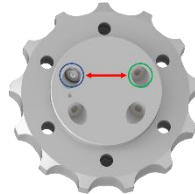
1. Remove the four cylinder-head screws on the drive part. Remove the thrust part.



2. The standard setting for the direction of rotation is marked with a dot.



3. Remove the drive nozzle and one blind plug on the opposite side. Clean the threads, coat them with Loctite 243, and screw each into the other side.



4. Coat the four cylinder-head screws with Loctite 243. Install the thrust cover and tighten it to **38 Nm**.
 - The Loctite must cure for at least 24 hours.



Figure 17 Changing the direction of rotation







CAUTION



Tighten the Turbopuls onto the high-pressure hose with a wrench. The Turbopuls can come loose from the hose by changing the direction.

8 Spare parts and accessories






8.1 Turbopuls 410.060 / 410.080

Figure	Name	Article number
	Pulling eye	258.10
	Pointed center	00410.08010
	Pull part	30.100Z
	Reduction hose	95.F100M075150

8.2 Turbopuls 410.080

Figure	Name	Article number
	Standard impact head	410.0805
	Impact head Ø100 mm	410.08052

8.3 Turbopuls 410.120

Figure	Name	Article number
	Pulling eye	258.16
	Pointed center	00410.12010
	Twin Kit (without Turbopuls)	410.1209
	Standard impact head	410.1205
	Soft impact head	410.12051

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A large, dynamic splash of clear blue water with many bubbles, moving from the right side of the page towards the left, creating a sense of motion and freshness.

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