Rotating nozzles

RGS | 01.xxx
HRH | 02.xxx
HRV | 03.xxx
KBR | 04.xxx
KBRV | 04.xxxV

Operating manual
English
June 23| Version 1.1

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Version	Revision	Datum	Visum
1.0	created	September 20	fkr
1.1	02.040B & 04.040B removed and design adjusted	June 23	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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Tel. +41 41 676 77 66
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Feedback form
www.enz.com/en/header/feedback

Person responsible for the documentation:
Bryan Bieri (Tech. Support / QM Manager)

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 noncompliance 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.
- Suitable for use in plastic-, concrete-, steel, ceramic, clay, cast, stoneware pipes and inliners.
- 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.

Hardhat

The hardhat will protect your head from falling objects and from bumping into fixed components and objects.

Hearing protection

If there is noise that could damage your hearing, you can wear, e.g. earmuffs with built-in headphones and microphone.

Eye protection

Your eyes should be protected against grit, sprayed dangerous substances, etc.

Lighting independent of the power grid

For example, you should carry a waterproof flashlight or wear a flashlight attached to your hardhat.

1.9 General safety instructions

Danger! | High-pressure water jets

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.

Danger! | Toxic vapors

There can be toxic vapors in sewer lines. Wear the prescribed protective equipment such as gas masks, gas warning devices and rescue harnesses. Inhaling toxic vapors or air that is contaminated with particles could be **fatal** or lead to serious injuries if the particles enter the lungs.

Warning! | Falling objects

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.

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 two people carry heavy 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.

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 Environment

3.1 Disposal

Old devices have valuable recyclable materials that should be recycled. Thus, please dispose of the old device via appropriate collecting points.

3.2 Environmental protection

Please observe that surfaces can only be cleaned where the composition is known. Chemicals or other poisonous substances must never be released to the environment. Take care to avoid excessive use or water. In this way, you help to protect natural resources.

4 Technical data

4.1 Introduction

The enz® standard rotating nozzles stand out because of their versatility. These rotating nozzles are available in five different jet angle variants. The two drive jets and the two brake jets keep the rotational speed constant.

4.2 Application range

The application range for the enz® standard rotating nozzles is entwined with the selection of the RGS, HRH, HRV, KBR, and KBRV jet angle variants. This is described in more detail in the sections below.

4.3 Part names

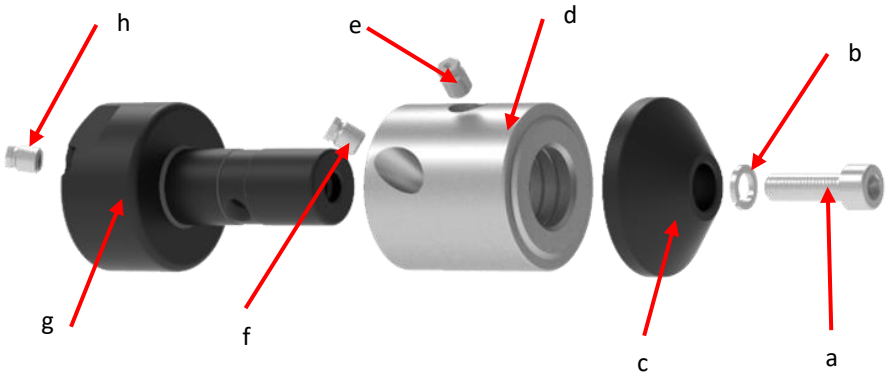


Figure 1: Part names

4.3.1 Key

a:	Screw/front jet	d:	Rotor	g:	Stator
b:	Spring washer	e:	Drive jet	h:	Thrust jet
c:	Cover	f:	Brake jet		

Table 1: Part names

4.4 Key for technical data

	Connection thread ["]		Rotating nozzle/bores
	Weight [kg]		Thrust jet
ØxL	Measures		Application range
max	Maximum working pressure		Min. flow rate at 100 bar
	Front jet		Optional

Table 2: Key for technical data

4.5 01.xxx → RGS → Radial rotating nozzle

Figure 2: RGS

4.5.1 Introduction

enz® RGS nozzles are equipped with four 75°radial jets for pipe cleaning and three thrust jets move the nozzle forward, which at the same time flush away the loosened residues. Pipes of all sorts are fully cleaned, even if they have lateral junctions.

The rotating part of the enz® RGS nozzle moves at a limited speed. These water jets hit the pipe wall directly with great impact, resulting in excellent cleaning capacity.

4.5.2 Application range

- Drain cleaning
- Lateral junction cleaning
- Removal of stubborn deposits

4.5.3 RGS specifications

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
01.028	BSPP 1/4”	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	20	5.3	350	5’000
01.028N	1/4” NPT	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	20	5.3	350	5’000
01.040	BSPP 1/2”	4xM6	3xM6	*	0.6	70-150	2.8-5.9	40x80	1.6x3.1	40	10.6	350	5’000
01.050A	BSPP 1/2”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	350	5’000
01.050B	BSPP 3/4”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
01.060	BSPP 1”	4xM8	3xM8	*	1.6	100-300	3.9-11.8	60x111	2.4x4.4	100	26.0	250	3’600
01.100A	BSPP 1”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600
01.100B	BSPP 1 1/4”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600

Table 3: RGS specifications

4.6 02.xxx → HRH → Rear semi-radial nozzles

Figure 3: HRH

4.6.1 Introduction

enz® semi-radial rotating nozzles with 45° cutting jets provide the cleaning effect and simultaneously thrust the nozzle forward; this means rotation and thrust in one function This minimizes water consumption. However, the tool can also be equipped to operate with thrust jets if there is enough water to do so.

4.6.2 Application range

- Pipe cleaning for CCTV video recordings
- Remove semi-hard limescale and cement slurry
- Remove roots of up to Ø5 mm

4.6.3 Specifications for HRH 1/8”–1/4”

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
02.016A08	BSPP 1/8”	2x0.8 2x0.7	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	10	2.6	350	5’000
02.016A08N	1/8” NPT	2x0.8 2x0.7	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	10	2.6	350	5’000
02.016A13	BSPP 1/8”	2x1.3 2x1.1	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	15	4.0	350	5’000
02.016A13N	1/8” NPT	2x1.3 2x1.1	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	15	4.0	350	5’000
02.016B08	BSPP 1/8”	2x0.8 2x0.7	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	10	2.6	350	5’000
02.016B08N	1/8” NPT	2x0.8 2x0.7	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	10	2.6	350	5’000
02.016B13	BSPP 1/8”	2x1.3 2x1.1	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	15	4.0	350	5’000
02.016B13N	1/8” NPT	2x1.3 2x1.1	-	*	0.05	18-60	0.7-2.4	16x30	0.6x1.2	15	4.0	350	5’000
02.022B	BSPP 1/4”	4xM4	-	*	0.1	25-100	1.0-3.9	23x41	0.9x1.6	10	2.6	350	5’000
02.022BN	1/4” NPT	4xM4	-	*	0.1	25-100	1.0-3.9	23x41	0.9x1.6	10	2.6	350	5’000
02.028A	BSPP 1/4”	4xM4	-	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
02.028AN	1/4” NPT	4xM4	-	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
02.028AS	BSPP 1/4”	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	12	3.2	350	5’000
02.028ASN	1/4” NPT	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	12	3.2	350	5’000
02.028B	BSPP 1/4”	4xM4	-	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
02.028BN	1/4” NPT	4xM4	-	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000

Table 4: Specifications for HRH 1/8”–1/4”

4.6.4 Specifications for HRH 1/2”–1 1/4”

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
02.040A	BSPP 1/2”	4xM6	-	*	0.6	70-150	2.6-5.9	40x80	1.6x3.1	16	4.2	350	5’000
02.040AS	BSPP 1/2”	4xM6	3xM6	*	0.6	70-150	2.6-5.9	40x80	1.6x3.1	20	5.3	350	5’000
02.050A	BSPP 1/2”	4xM6	-	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	30	7.9	350	5’000
02.050AS	BSPP 1/2”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	40	10.6	350	5’000
02.050B	BSPP 3/4”	4xM6	-	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	30	7.9	250	3’600
02.050BS	BSPP 3/4”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	40	10.6	250	3’600
02.060	BSPP 1”	4xM8	3xM8	*	1.6	100-300	3.9-11.8	60x111	2.4x4.4	60	15.9	250	3’600
02.100A	BSPP 1”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600
02.100B	BSPP 1 1/4”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600

Table 5: Specifications for HRH 1/2”– 1 1/4”

4.7 03.xxx → HRV → Front semi-radial nozzles

Figure 4: HRV

4.7.1 Introduction

enz® HRV nozzles with four 45° jets impacting forward onto the pipe wall, a front jet (if requested) and three rear thrust jets work like a corkscrew to penetrate a clogged pipe. As a result, the deposits are broken up, removed by the semi-radial nozzle's rotor and pushed forward. The thrust jets produce the forward motion.

4.7.2 Application range

- Flushing out steel pipes after pipe-jacking
- Flushing of the pipes from the building toward the main line
- Removal of ice in manholes and pipes

4.7.3 HRV specifications

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
03.028	BSPP 1/4”	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	30	7.9	350	5’000
03.028N	1/4” NPT	4xM4	3xM4	*	0.2	30-100	1.2-3.9	28x56	1.1x2.2	30	7.9	350	5’000
03.040	BSPP 1/2”	4xM6	3xM6	*	0.6	70-150	2.8-5.9	40x80	1.6x3.1	50	13.2	350	5’000
03.050A	BSPP 1/2”	4xM6	3xM6	*	1.0	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
03.050B	BSPP 3/4”	4xM6	3xM6	*	1.0	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
03.060	BSPP 1”	4xM8	3xM8	*	1.6	100-300	3.9-11.8	60x111	2.4x4.4	100	26.0	250	3’600
03.100A	BSPP 1”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600
03.100B	BSPP 1 1/4”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600

Table 6: HRV specifications

4.8 04.xxx → KBR → Combination nozzles

Figure 5: KBR

4.8.1 Introduction

enz® KBR nozzles are extremely suitable for pipe cleaning and cleaning lateral pipe connections. They can work at a low pump output, have two 90° radial jets for the pipe wall, and two semi-radial jets that can be aligned toward the rear at less than 45°.

This combination generates thrust and flushes out the material.

4.8.2 Application range

- Removing soft deposits
- Removing grease deposits
- Cleaning heat exchangers

4.8.3 Specifications for KBR 1/8”

Order No.						Q		ØxL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.012K	BSPP 1/8”	2x0.85 2x0.90	-		0.02	13-26	0.5-1.0	12x26	0.5x1.0	15	4.0	350	5’000
04.016A04	BSPP 1/8”	4x0.4	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	6	1.6	350	5’000
04.016A05	BSPP 1/8”	4x0.5	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	7	1.8	350	5’000
04.016A06	BSPP 1/8”	4x0.6	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	9	2.4	350	5’000
04.016A07	BSPP 1/8”	4x0.7	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016A07N	1/8” NPT	4x0.7	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016A08	BSPP 1/8”	4x0.8	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016A08N	1/8” NPT	4x0.8	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016A09	BSPP 1/8”	4x0.9	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016A09N	1/8” NPT	4x0.9	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016A10	BSPP 1/8”	4x1.0	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016A10N	1/8” NPT	4x1.0	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016A11	BSPP 1/8”	4x1.1	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016A11N	1/8” NPT	4x1.1	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016A13	BSPP 1/8”	4x1.3	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	33	8.7	350	5’000
04.016AS	BSPP 1/8”	4x0.8	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.016AS07N	1/8” NPT	4x0.7	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	22	5.8	350	5’000
04.016AS08N	1/8” NPT	4x0.8	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000

Table 7: Specifications for KBR 1/8”

4.8.4 Specifications for KBR 1/4” and 3/8”

Order No.						Q		ØxL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.016B04	BSPP 1/4”	4x0.4	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	6	1.6	350	5’000
04.016B04N	1/4” NPT	4x0.4	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	6	1.6	350	5’000
04.016B05	BSPP 1/4”	4x0.5	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	7	1.8	350	5’000
04.016B06	BSPP 1/4”	4x0.6	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	9	2.4	350	5’000
04.016B07	BSPP 1/4”	4x0.7	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016B07N	1/4” NPT	4x0.7	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016B08	BSPP 1/4”	4x0.8	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016B08N	1/4” NPT	4x0.8	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016B09	BSPP 1/4”	4x0.9	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016B09N	1/4” NPT	4x0.9	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016B10	BSPP 1/4”	4x1.0	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016B10N	1/4” NPT	4x1.0	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016B11	BSPP 1/4”	4x1.1	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016B11N	1/4” NPT	4x1.1	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016B13	BSPP 1/4”	4x1.3	-	*	0.03	18-60	0.7-2.4	16x30	0.6x1.2	33	8.7	350	5’000
04.016BS	BSPP 1/4”	4x0.8	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.016BS07N	1/4” NPT	4x0.7	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	22	5.8	350	5’000
04.016BS08N	1/4” NPT	4x0.8	3x0.8	*	0.03	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.028A	BSPP 1/4”	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
04.028AN	1/4” NPT	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
04.028B	BSPP 3/8”	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000
04.028BN	3/8” NPT	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	10	2.6	350	5’000

Table 8: Specifications for KBR 1/4” and 3/8”

4.8.5 Specifications for KBR 1/2”– 1 1/4”

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.040A	BSPP 1/2”	4xM6	-	*	0.5	70-150	2.8-5.9	40x80	1.6x3.1	20	5.3	350	5’000
04.040AS	BSPP 1/2”	4xM6	3xM6	*	0.5	70-150	2.8-5.9	40x80	1.6x3.1	30	10.6	350	5’000
04.050A	BSPP 1/2”	4xM6	-	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	350	5’000
04.050AS	BSPP 1/2”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	350	5’000
04.050B	BSPP 3/4”	4xM6	-	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
04.050BS	BSPP 3/4”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
04.060	BSPP 1”	4xM8	3xM8	*	1.6	100-300	3.9-11.8	60x111	2.4x4.4	80	21.0	250	3’600
04.100A	BSPP 1”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600
04.100B	BSPP 1 1/4”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600

Table 9: Specifications for KBR 1/2”– 1 1/4”

4.9 04.xxxV → KBRV → Front combination nozzle

Figure 6: KBRV

4.9.1 Introduction

The KBRV nozzle has two semi-radial 45° jets directed forward. As a result, this nozzle needs to be equipped with thrust jets. Without the thrust jets, the nozzle would be mounted on a lance. A large proportion of the deposits are flushed forward.

4.9.2 Application range

- Removing soft deposits
- Cleaning heat exchangers
- Removing grease deposits
- Flushing the pipes from the building toward the main line

4.9.3 Specifications for KBRV 1/8”

Order No.													
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.012V	BSPP 1/8”	2x0.85 2x0.90	-		0.2	13-30	0.5-1.2	12x31	0.5x1.2	15	4.0	350	5’000
04.012NV	1/8” NPT	2x0.85 2x0.90	-		0.2	13-30	0.5-1.2	12x31	0.5x1.2	15	4.0	350	5’000
04.012V07	BSPP 1/8”	4x0.7	-		0.2	13-30	0.5-1.2	12x31	0.5x1.2	12	3.2	350	5’000
04.016AV07	BSPP 1/8”	4x0.7	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016AV07N	1/8” NPT	4x0.7	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016AV08	BSPP 1/8”	4x0.8	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016AV08N	1/8” NPT	4x0.8	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016AV09	BSPP 1/8”	4x0.9	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016AV09N	1/8” NPT	4x0.9	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016AV10	BSPP 1/8”	4x1.0	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016AV10N	1/8” NPT	4x1.0	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016AV11	BSPP 1/8”	4x1.1	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016AV11N	1/8” NPT	4x1.1	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016AVS	BSPP 1/8”	4x0.8	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.016AVS04N	1/8” NPT	4x0.4	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	14	3.2	350	5’000
04.016AVS07N	1/8” NPT	4x0.7	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	22	5.8	350	5’000
04.016AVS08N	1/8” NPT	4x0.8	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000

Table 10: Specifications for KBRV 1/8”

4.9.4 Specifications for KBRV 1/4”

Order No.													
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.016BV07	BSPP 1/4”	4x0.7	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016BV07N	1/4” NPT	4x0.7	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	12	3.2	350	5’000
04.016BV08	BSPP 1/4”	4x0.8	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016BV08N	1/4” NPT	4x0.8	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	14	3.7	350	5’000
04.016BV09	BSPP 1/4”	4x0.9	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016BV09N	1/4” NPT	4x0.9	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	17	4.5	350	5’000
04.016BV10	BSPP 1/4”	4x1.0	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016BV10N	1/4” NPT	4x1.0	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	21	5.5	350	5’000
04.016BV11	BSPP 1/4”	4x1.1	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016BV11N	1/4” NPT	4x1.1	-	*	0.3	18-60	0.7-2.4	16x30	0.6x1.2	25	6.6	350	5’000
04.016BVS	BSPP 1/4”	4x0.8	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.016BVS04N	1/4” NPT	4x0.4	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	14	3.2	350	5’000
04.016BVS07N	1/4” NPT	4x0.7	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	22	5.8	350	5’000
04.016BVS08N	1/4” NPT	4x0.8	3x0.8	*	0.3	18-60	0.7-2.4	16x31	0.6x1.2	24	6.3	350	5’000
04.028AV	BSPP 1/4”	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	20	5.3	350	5’000
04.028AVN	1/4” NPT	4xM4	-	*	0.20	30-100	1.2-3.9	28x56	1.1x2.2	20	5.3	350	5’000

Table 11: Specifications for KBRV 1/4”

4.9.5 Specifications for KBRV 1/2”– 1 1/4”

Order No.						⌀		⌀xL				max	
						mm	inch	mm	inch	l/min	US gpm	bar	psi
04.040AV	BSPP 1/2”	4xM6	3xM6	*	0.5	70-150	2.8-5.9	40x80	1.6x3.1	30	10.6	350	5’000
04.050AV	BSPP 1/2”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	350	5’000
04.050BV	BSPP 3/4”	4xM6	3xM6	*	1.1	100-200	3.9-7.9	50x99	2.0x3.9	70	18.5	250	3’600
04.060V	BSPP 1”	4xM8	3xM8	*	1.6	100-300	3.9-11.8	60x111	2.4x4.4	100	21.0	250	3’600
04.100AV	BSPP 1”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600
04.100BV	BSPP 1 1/4”	4xM10	3xM10	*	7.4	200-600	7.9-24.0	100x180	3.9x7.1	200	53.0	250	3’600

Table 12: Specifications for KBRV 1/2”– 1 1/4”

5 Installation

5.1 Fitting options

To set up the tool on the cleaning vehicle, enz® technik ag needs the following parameters for each order:

• Pump capacity:	l/min	US gpm
• Pump pressure:	bar	psi
• Hose size:	mm	inch
• Hose length:	m	feet
• Hose material:	Plastic or rubber	

If you need to make changes to the parameters, the tool needs to be calibrated accordingly.

5.2 Assembling the tools

The tool is delivered ready for use. Once the items have been unpacked, please check the content to ensure that you have received everything. Then screw the tool onto the pressure hose. The tools have different thread dimensions, which can be viewed in the "Technical Data" section starting on page **3**.
The tool normally rotates counterclockwise as standard so that it cannot unscrew itself from the pressure hose during operation.

Ensure that there is no soiling in the tool when you are screwing it onto the pressure hose. Particles could clog the inserts.

5.3 Preparatory work

It is a good idea to clarify some points before use. Knowledge of the following points is helpful during preparations and when adjusting the tool:

- Layout of the pipes
- Inner pipe diameter of the channel where work will be performed
- Material quality of the channel where work will be performed
- Type of foreign material in the pipe
- Planned flushing direction → We recommend that you work against the direction of flow
- The falls in the channel where work will be performed
- Access points to the channel

5.4 Setting up the work area

Prior to working with standard rotating nozzles, the following actions must be taken:

- Set up barriers and safety equipment (warning triangle, block off the area, etc.).
- The necessary information on the wastewater flowing through the manhole must be obtained (chemicals, gas, vapors, etc.).
- Measuring instruments such as explosive gas meters, oxygen meters, gas warning devices, etc., must be readily available.
- The work area must be blocked off and secured so that there is no risk of falling or danger from traffic.
- Make sure that the appropriate nozzle sizes for cleaning the pipes are available. The application range of each nozzle is listed in the “Technical data” section on Page **12**.
- The layout of the pipes must be known and the drawings must be available before starting the work. This is to avoid the operating nozzle from emerging at a pipe end. Support personnel must be on hand to monitor possible emerging points.
- Have the liability waiver signed to protect against any possible damage claims.

6 Operation

6.1 How standard rotating nozzles work

The rotor (1) is supported on the stator (2) through a thin water film. Standard rotating nozzles have four jets located on the rotor (1). The two drive jets (3) drive the standard rotating nozzle and the two brake jets (4) ensure constant rotation. The three thrust jets (5) move the standard rotating nozzle through the pipe and transport the dislodged deposits back to the manhole.

Figure 7: How standard rotating nozzles work

6.2 Operating a standard rotating nozzle

1. Measure the length of the pipe to be cleaned (mark the hose) and check it during cleaning.
2. Insert the tool into the pipe to be cleaned.
3. Slowly increase the pressure to 100 bar on the nozzle.
4. Move the tool carefully forward until you reach the end of the length of pipe that needs to be cleaned.
5. Slowly remove the tool backward to clean the pipe and wash the dislodged material back to the manhole.
6. When you are finished cleaning, close all the manholes.

DANGER

The maximum working pressure must never be exceeded—it is a threat to life (see “Technical Data” on Page **3**)!

If a nozzle bursts, fragments can penetrate the pipe wall and parts can be catapulted away at tremendous speeds.

WARNING

The tool can reverse in large pipes; this can result in **death** or serious injury.

Use a safety liner to reduce the risk that the tool could reverse in a pipe.

Monitor the cleaning work with a camera at all times.

If pipes are extremely dirty, it is recommended that you pull the tool back at regular intervals to prevent blockages due to fragments and dislodged material.

6.3 Cleaning pipes with minor damage

Slightly damaged pipes usually have cracks in the pipe wall. If detected, always inform the customer or the appropriate authorities.
When working inside a slightly damaged pipe, you must use extreme caution. Use of the tool is always at your own risk. enz® technik ag accepts no liability.

CAUTION!

When cracks are washed out, pipe fragments can break off and the material surrounding the pipe may be washed out. You could end up with collapsed channels and accompanying injuries. If in doubt, you should not use the product.

CAUTION!

If the pressure is too high, the cleaning jet can damage or cause a break in the pipe wall. This could result in interruptions to the work or material damage.

6.4 After use

After finishing the cleaning work, you must pay attention to the following:

1. Check the nozzle inserts for clogging. This is ideally done when you have the tool still attached to the hose and not under water pressure to see if water still escapes.
2. Remove the tool from the hose.
3. Wash the tool with fresh water.
4. Dry out the tool and preserve it with Oil Spray Bio (C191).

7 Maintenance

The maintenance and service activities described in this manual may be performed only by users who have the required knowledge.

7.1 Replacing nozzle inserts

Jet inserts must be checked at regular intervals to ensure optimum cleaning performance. Nozzle wear will depend on the level of contamination in the water used.

CAUTION!

Worn jet inserts impair cleaning performance and increase risk when working with high pressure. Damage to the tool could result.

An additional reason to change the nozzles is that they may need to be modified. If this is the case, please use JetCalc to determine the correct nozzles.

Take the following steps to replace the nozzle inserts:

1. Clean the jet insert. Heat it for about ten seconds with the gas torch (C158).

2. Remove the jet insert with a socket wrench.

Socket wrench:

M4 jet insert	SW 3.5	C104 and C261
M4 jet insert	SW 5.0	C101 and C49
M4 jet insert	SW 7.0	C160 and C260
M10 jet insert	SW 10.0	C131

3. Clean the threaded hole and the new jet insert. You can use acetone to do this.

4. Coat the nozzle insert threads with Loctite No. 243 (C192).

5. Screw in the jet insert with a socket wrench.

6. Let the adhesive bond for at least 24 hours at room temperature (approx. 22° C).

Table 13: Replacing jet inserts

CAUTION!

Jet inserts may be replaced only by nozzle inserts that are identical or as calculated in JetCalc. If the tool is incorrectly assembled or the wrong items fitted, the tool or the pipe may become damaged. This could result in injuries or material damage.

7.1 Maintenance

Spray the surface of the tool with Oil Spray Bio (Art. No. C191) after every use.

If the tool is due to remain unused for an extended period, spray the nozzle holes and the connection threads as well.

8 Spare parts/accessories

8.1 Jet inserts

Figures	Name	Article number
	Jet insert M4	22.04
	Jet insert M6	22.06
	Jet insert M8	22.08
	Jet insert M10	22.10

Table 14: Jet inserts

8.2 Maintenance

	Wiha socket wrench 3.5 mm	C104
	Wiha socket wrench 5 mm	C101
	Wiha socket wrench 7 mm	C160
	Wiha socket wrench 10 mm	C131
	Futuro socket wrench 3.5 mm	C261

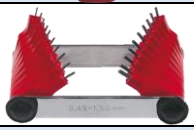
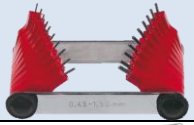
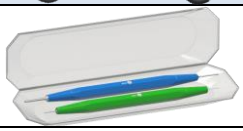
	Futuro socket wrench 5 mm	C149
	Futuro socket wrench 7 mm	C260
	Gas torch	C158
	Oil Spray Bio	C191
	Loctite 243 50 ml	C192
	Nozzle gauge with 20 pins 0.45-1.50 mm	C200
	Nozzle gauge with 16 pins 1.50–3.00 mm	C201
	Nozzle cleaning tool	C202

Table 15: Maintenance accessories

9 Index

9.1 Tables

9.2 Figures

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