



Engineering progress
Enhancing lives

FUSAPEX® electrofusion fitting

Technical Information



Table of contents

01	Information and safety instructions	04
02	FUSAPEX® electrofusion fitting	06
02.01	Installer Training	06
02.02	FUSAPEX jointing technique	06
02.03	Application area of the pipe system	06
02.04	Properties	07
02.05	Classification of operating conditions in accordance with DIN EN ISO 15875	07
02.06	Chemical resistance	08
02.07	Installation tools	08
02.08	Pipe cutter and pipe retaining clamp	08
02.09	Tips about the welding machine	08
03	FUSAPEX® electrofusion fitting joints	10
03.01	Connecting pipe ends	12
03.01.01	Using pipe sticks	12
03.01.02	Using pipe coils	14
03.02	Notes on welding with FUSAPEX electrofusion fittings	14
04	Protection of the electrofusion fitting with a PE bag	17
05	Transport and storage	17



This Technical Information pertaining to the "FUSAPEX electrofusion fitting" is valid from February 2022 onwards.

Its publication invalidates the previous Technical Information.

You will find our current technical documentation available for download at www.rehau.com/uk-en/epaper.

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All dimensions and weights are guide values. Subject to errors and modifications.

01 Information and safety instructions

Navigation

You will find a detailed table of contents with hierarchical headings and corresponding page numbers at the start of this Technical Information.

Pictograms and logos



Safety information



Legal notice



Important information to observe



Your benefits



Information available online

Currentness of the Technical Information

To ensure your safety and the proper use of our products, please regularly check whether a more recent version of the Technical Information is available. You will find the issue date of your Technical Information on the bottom right-hand side of the back cover or on the inside of the title page. You can obtain the current Technical Information from your REHAU sales office, specialist wholesaler or you can download it from the internet at www.rehau.com/uk-en/epaper.

Intended use

The REHAU pipe systems must only be designed, installed and operated as described in this Technical Information or in the assembly instructions associated with the individual components. Any other use is not in accordance with the specification and is therefore not permitted. For more detailed consulting support, please contact your REHAU Sales Office.

Use in line with specification means compliance with all of the information in this Technical Information as well as the assembly, operating and maintenance instructions. No liability can be accepted for any use which is not in line with the specifications or inadmissible alterations to the product or any consequences resulting from this.

Safety instructions and operating instructions

- For your own safety and the safety of other people, please read through all safety instructions and operating instructions carefully and completely before commencing installation.
- Keep the operating instructions safe and have them available.
- If you do not understand the safety instructions or the individual installation procedures, or if something is unclear, please contact your REHAU Sales Office.
- Failure to follow the safety instructions can result in damage to property, environment or injury.

Observe all national and international pipe laying, installation, accident prevention and safety regulations as well as the notes in this Technical Information when installing pipe systems.

Also observe the applicable laws, standards, guidelines and regulations (e.g. DIN, EN, ISO, DVGW, TRGI, VDE and VDI) as well as regulations on environmental protection, regulations of the Employer's Liability Insurance Association and specifications of the local public utilities companies. Please ensure that the guidelines, standards and regulations are the valid issue in each case.

The planning and installation instructions relate directly to the relevant REHAU product. At points, we will refer to generally applicable standards or regulations. More specific standards, regulations and instructions relating to the planning, installation and operation of drinking water or heating systems or systems for building services must also be observed and do not form part of this Technical Information.

Application areas which are not covered by this Technical Information (special applications) require consultation with our Technical Applications Department. For more detailed consulting support, please contact your REHAU Sales Office.

Prerequisites for personnel

- Our systems must only be installed by authorised and trained persons.
- Only competent and authorised personnel may work on electrical installations or pipework components.

General precautions

- Keep your workplace clean and free of obstructions.
- Ensure that your work space has adequate lighting.
- Keep children, pets and unauthorised persons away from tools and installation areas. This particularly applies to renovations in occupied areas.
- Only use the components intended for your particular REHAU system. The application of components from other systems or the use of tools which do not come from the relevant REHAU installation system can result in accidents or other hazards.

Working clothes

- Wear safety glasses, appropriate working clothes, safety shoes, a protective helmet and, if you have long hair, a hairnet.
- Do not wear loose-fitting clothing or jewellery, as they may become caught in moving parts.

During installation

- Always read and follow the operating instructions for the REHAU installation tool you are using.
- Incorrect handling of tools can cause serious cut injuries, crushing or removal of limbs.

- Incorrect handling of tools can damage connecting components or cause leaks.
- The REHAU pipe cutters have a sharp blade. Store and handle them in such a way that there is no risk of injury from the REHAU pipe cutters.
- When cutting pipes, make sure to maintain the safety gap between the holding hand and the cutting tool.
- During the cutting procedure, never reach into the cutting zone of the tool or touch moving parts.
- During all maintenance or refitting work and when changing installation areas, always unplug the tool and make sure that it cannot be switched on unintentionally.

Operating parameters

- If the operating parameters are exceeded, this leads to overstressing of the pipes and connections. It is therefore not permitted to exceed the operating parameters.
- Compliance with the operating parameters is to be ensured through safety and control systems (e.g. pressure reducer, safety valves and similar).

System-specific safety warnings

- Deburr or remove edges on insulating sleeves in order to prevent possible injury.
- When working with tension belts to fix the pipes, there is a crushing risk. Do not reach into the hazardous areas.

02 FUSAPEX[®] electrofusion fitting

02.01 Installer Training



For the installation of FUSAPEX every installer must complete a specific REHAU training which does include a written test. The training is typically delivered on-site and successful candidates receive a FUSAPEX installer card with their own personal identification number as proof of the training.

Installer must carry the FUSAPEX installer card with them every time they fit FUSAPEX fittings. At the end of every successful FUSAPEX weld, the fitting is to be permanently and legibly labelled with the unique installer ID and the current date of the weld.

To arrange a training date, please contact your local Sales Office.



Fig. 02-1 FUSAPEX installer card

The installation company is responsible to ensure the installation is carried out in line with the current version of this Technical Information.

Only competent and authorised installers must carry out work on electrical or pipe installations.

02.02 FUSAPEX jointing technique



Fig. 02-2 Electrofusion fittings, reducer and flange

02.03 Application area of the pipe system

Using FUSAPEX electrofusion fittings as well as reducers and flanges made of PE-Xa, you can connect the following REHAU PE-Xa pipe types:

- RAUPEX-A, -K, -O, -M and -UV
- RAUTHERM-FW
- RAUTHERMEX
- RAUVITHERM

The following operating conditions must not be exceeded once the pipe system has been completed:

Operating temperature: -40 °C to $+95\text{ °C}$

Operating pressure: Max. 6 bar

Please also read chapter 02.05 Classification of operating conditions in accordance with DIN EN ISO 15875 which gives several examples of temperature collectives with an operating life of 50 years. These collectives can be followed or used as a reference point for other operating conditions.

FUSAPEX[®] is a registered trademark of REHAU Industries SE & Co. KG.

Typical applications for FUSAPEX electrofusion fittings include for example district heating networks, chilled and industrial waters, non-flammable gases and liquids, compressed air and industrial media.



Please note that this chapter is only defining the installation and above given operating conditions for the FUSAPEX electrofusion fittings. Only when the FUSAPEX electrofusion fittings are connected to one of the pipe types above is a pipe system created. To use this pipe system in your application, the respective Technical Information from REHAU must be observed and complied with. For applications outside the scope of our Technical Information, please don't hesitate to contact us. You can access our documentation using the following links.



ePaper:

www.rehau.com/uk-en/epaper

02.04 Properties



Fig. 02-3 FUSAPEX pressure/temperature range

FUSAPEX electrofusion fittings feature an integrated internal resistance wire. By means of electric current, this wire is heated to the required fusion temperature at which the weld is carried out. To create a reliable joint, REHAU welding machines with SMARTFUSE technology are to be used. Once a connection has been established between the electrofusion fitting and the welding machine, the SMARTFUSE technology determines the required welding time automatically. FUSAPEX flange transitions and reducers are made from PE-Xa and can be universally combined with FUSAPEX fittings with an integrated heating coil.

The FUSAPEX product range offers fittings for couplings, angles, reducers, flanges, threaded joints and branches.



- Corrosion resistant in the total plastic system
- Very good resistance against chemicals
- Cost effective
- Modular fitting system to meet the requirements of the construction site
- Pipe size range 32–160 SDR 11

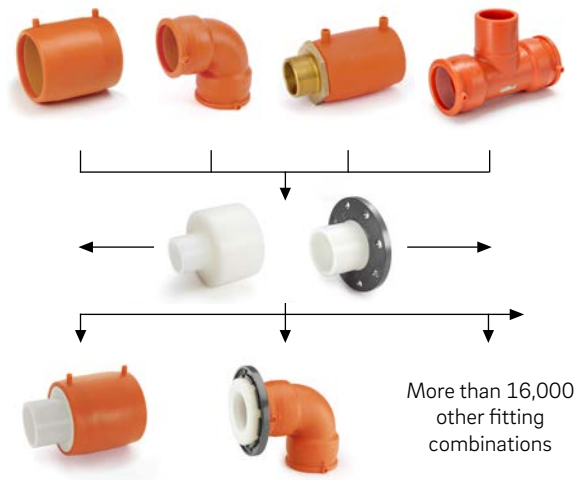


Fig. 02-4 FUSAPEX fitting combinations

02.05 Classification of operating conditions in accordance with DIN EN ISO 15875

Because in the majority of applications the operating temperatures are not constant but vary, a calculation for the temperature collective is advisable. DIN EN ISO 15875 defines several application classes each with its own temperature collective, which are given below. The maximum permissible operating pressure for each of the application classes listed is 6 bar. Each application class takes into account an operating life of 50 years related to the typical range of application. The application classes below are recommendations and are not to be regarded as mandatory.

Class 1: Hot water supply (60 °C)

Temperature	Operating life
60 °C	49 years
80 °C	1 year
95 °C	100 hours
Total	50 years

Tab. 02-1 Temperature collective according to DIN EN ISO 15875 class 1

Class 2: Hot water supply (70 °C)

Temperature	Operating life
70 °C	49 years
80 °C	1 year
95 °C	100 hours
Total	50 years

Tab. 02-2 Temperature collective according to DIN EN ISO 15875 class 2

Class 4: Low-temperature heating systems

Temperature	Operating life
20 °C	2.5 years
40 °C	20 years
60 °C	25 years
70 °C	2.5 years
100 °C	100 hours
Total	50 years

Tab. 02-3 Temperature collective according to DIN EN ISO 15875 class 4

Class 5: High-temperature heating systems

Temperature	Operating life
20 °C	14 years
60 °C	25 years
80 °C	10 years
90 °C	1 year
100 °C	100 hours
Total	50 years

Tab. 02-4 Temperature collective according to DIN EN ISO 15875 class 5

The limitations of use in Tab. 02-1 to 02-4 may vary in specific applications.

02.06 Chemical resistance

The FUSAPEX electrofusion fittings and PE-Xa pipes exhibit very good chemical resistance. Safety margins and temperature resistance depend on the media being transported and may differ from the values for water. If FUSAPEX electrofusion fittings are used for chemical carrying transport media, their suitability for use must be clarified and defined beforehand. The REHAU Applications Engineering Department can support you in making this assessment.

02.07 Installation tools

For installing FUSAPEX, the appropriate tools for the system are available to you. The following are needed:

- A fully automatic welding machine Monomatic or SMARTFUSE 160 BT
- Universal pipe retaining clamps
- A rotational pipe scraper for removing the cover layer on the pipes; depending on the application or dimension of the pipes to be processed, two scrapers are available:
 - SMARTFUSE UNO (63–200 mm)
 - SMARTFUSE DUO (25–75 mm)
 - Circumference measuring tape

Tangit special cleaning agents (Tangit cleaner for PE, type KS and Tangit cleaning cloths for PE, type KS) and a hand pipe scraper are also required.



Fig. 02-5 Monomatic welding machine



Fig. 02-6 SMARTFUSE 160 BT



Fig. 02-7 SMARTFUSE UNO 63-200 pipe scraper



Fig. 02-8 SMARTFUSE DUO 25-75 pipe scraper

02.08 Pipe cutter and pipe retaining clamp

Various tools are available to cut REHAU pipes and to prepare the pipe ends for connection with the electrofusion fitting. Further details on this can be found in the price list.



Fig. 02-9 Pipe cutter



Fig. 02-10 Pipe retaining clamps

02.09 Tips about the welding machine



Maintenance

The welding machines have to be serviced every 12 months or every 200 operating hours (whichever comes first).

Extension cable

The following limits have to be complied with when extending the power supply cable:

Cable length	Cross-section
up to 20 m	3 x 1.5 mm ²
20 – 50 m	3 x 2.5 mm ²
50 – 100 m	3 x 4.0 mm ²

Tab. 02-5 Cable length, extension cable



The welding cable must not be extended!

Using generators

- First start the generator, then plug in the device
- No other devices must be connected to the generator. No-load voltage should be adjusted to around 260 V
- Disconnect the welding device before the generator is switched off
- The useful generator power output decreases by 10% per every 1000m of elevation
- Check the contents of the tank prior to starting the welding process

In order to avoid damage to the welding machine and to ensure that the internal monitoring functions of the welding process are not interrupted, the generators used must meet the following requirements:

- Suitability for phase-control and inductive loads
- No-load voltage can be adjusted to 245 V–260 V
- 18 A output current in one phase
- Stable output voltage or motor speed, even with quickly changing load
- Synchronous generators with mechanical speed control are preferred
- Voltage peaks may not exceed 800 V

Nominal generator output: single phase, 230/240 V, 50/60 Hz

Diameter	Output power
20 - 75 mm	2 kW
90 - 160 mm	3.2 kW
160 - 355 mm	4.5 kW (mechanical control) 5 kW (electronic control)

Tab. 02-6 Required nominal generator output depending on the pipe dimension to be welded

In the case of generators with poor control capability or badly stabilised voltage outputs, the guaranteed output must be 3–3.5 times the load in order to ensure error-free operation. In the case of electronically controlled generators, their suitability should be tested beforehand as different devices tend towards speed oscillations here and this produces extreme peaks in voltage.

03 FUSAPEX[®] electrofusion fitting joints



NOTE: The processing temperature for pipe, fitting and welding devices must be between -10 °C and $+45\text{ °C}$.

To create the FUSAPEX electrofusion fitting joint, you must have been trained and have a valid FUSAPEX installer card. Please keep it at hand.

Use only REHAU tools. The FUSAPEX pipe connection system is comprised of the product, the tools and the qualifications of the installer. REHAU can only be considered the system provider if all three of these components come from REHAU. See the industrial pipe system price list for REHAU tools (www.rehau.com/uk-en/epaper).

Preparing pipe ends for connection



Fig. 03-1 Cut pipe to the required length. The pipe end must be straight, square and free of burrs.

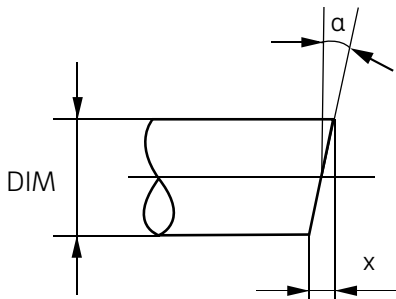


Fig. 03-2 Mark the required scraping depth according to table 03-2

DIM	α	x
32	3.0 °	1.7 mm
40	3.0 °	2.1 mm
50	3.0 °	2.6 mm
63	2.3 °	2.5 mm
75	2.0 °	2.6 mm
90	2.0 °	3.1 mm
110	1.4 °	2.7 mm
125	1.4 °	3.0 mm
140	1.2 °	3.0 mm
160	1.1 °	3.0 mm

Tab. 03-1 Note the permissible deviation of the cross section from the pipe axis.

DIM	Scraping depth
32	37* mm
40	42* mm
50	44* mm
63	54* mm
75	59* mm
90	68* mm
110	71* mm
125	80* mm
140	82* mm
160 coupling, T-piece	92* mm
160 elbow	80* mm

*Tolerance: $+0/-3\text{ mm}$

Tab. 03-2 Scraping depths for FUSAPEX electrofusion fittings



Fig. 03-3a A rotary pipe scraper must be used to scrape the pipe ends. The figure shows the “SMARTFUSE DUO 25-75”. A hand crank or cordless screwdriver can be used to drive it.



Fig. 03-3b The figure shows the “SMARTFUSE UNO 63-200” rotary scraper. See the industrial pipe system price list for a complete overview of tools (www.rehau.com/uk-en/epaper).



Fig. 03-4 Drive the rotary scraper at a consistent high speed. A single continuous swarf will be created. If this is not the case, check the cutting blade and adjust the speed.

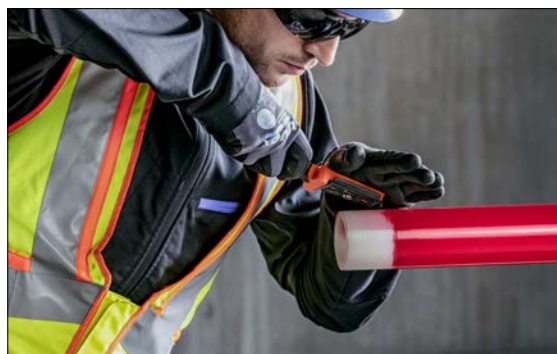


Fig. 03-5 Check the entire scraped section for residual colour. All residual colour must be removed. This applies for all pipe types named in chapter 02.03.



Fig. 03-6 The diameter must not fall below the permitted minimum diameter (as per Tab. 03-3). Before carrying out any further required scraping, check whether the current outer diameter would allow an additional scraping (swarf thickness: 0.1 to 0.3 mm, depending on the rotary scraper). If necessary, remove residual colour with a hand scraper.

DIM	Min. outer diameter
32	31.5 mm
40	39.5 mm
50	49.5 mm
63	62.5 mm
75	74.5 mm
90	89.4 mm
110	109.4 mm
125	124.4 mm
140	139.4 mm
160	159.4 mm

Tab. 03-3 Minimum permissible outer diameter of the fully scraped pipe.

03.01 Connecting pipe ends

03.01.01 Using pipe sticks



Fig. 03-7 Check the pipe end prepared for connection using the circumferential measuring tape if necessary.



Fig. 03-8 The scraped section must be free of dust and grease. Clean with sufficient Tangit cleaner and let it evaporate completely.



Fig. 03-9 Only remove the FUSAPEX electrofusion fitting from the bag at this point. If necessary, clean the fusion fitting with Tangit cleaner on the inside and let it evaporate completely.



Fig. 03-10 Push the FUSAPEX electrofusion fitting onto the pipe end all the way to the end stop.



Fig. 03-11 Prepare the second pipe end in the same way and insert it all the way.



Fig. 03-12 Attach the pipe retaining clamps. The connection must be free of tension during the welding process.



Fig. 03-13 Connect the REHAU welding machine with SMART-FUSE technology (red cable to red contact). The welding parameters are determined automatically.



Fig. 03-14 Secure the welding cable by looping a section of it to prevent it being pulled off inadvertently.



Fig. 03-15 Check the welding parameters in the display and confirm by pressing the start button. Confirm the display again to start the welding process.



Fig. 03-16 An audible double signal can be heard if the welding process was successful. "OK" is shown in the display. The plugs can be removed.



Fig. 03-17 The joint must not be subjected to any loads during the cooling down time specified on the fitting. For pipes under tension (e.g. pipe coils), observe the extended cooling down time in Tab. 03-4. Only then may the pipe retaining clamps be removed.



Fig. 03-18 Record the personal identification number and the current date on the electrofusion fitting with a marker pen.



Fig. 03-19 Before commissioning and pressurisation can take place, you must comply with the extended cooling down time in Tab. 03-4.

DIM	Cooling time
32	18 min
40	25 min
50	34 min
63	38 min
75	50 min
90	48 min
110	67 min
125	70 min
140	85 min
160	96 min

Tab. 03-4 Extended cooling down times.



Fig. 03-20 FUSAPEX joint is complete.

03.01.02 Using pipe coils



Fig. 03-21 In case of greater positional deviations (e.g. pipe coils), the pipe ends must be pre-aligned with additional pipe bending or holding devices before the pipe retaining clamps are installed.

Note:

The pipe retaining clamps are primarily intended for securing purposes and only conditionally for alignment of the pipes. The additional pipe alignment and fixation aids as well as the pipe clamps must only be removed after the extended cooling times according to Tab 03-4.

03.02 Notes on welding with FUSAPEX electrofusion fittings



Fig. 03-22 Do not use the electrofusion fitting for marking.

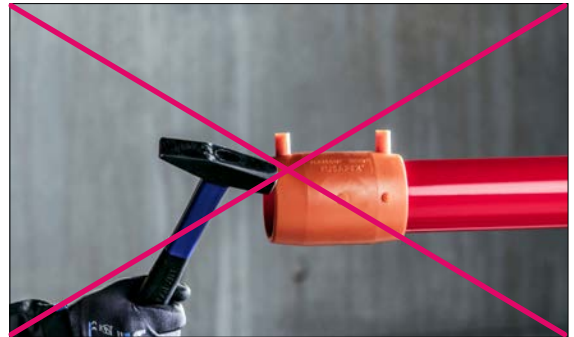


Fig. 03-23 Do not force the electrofusion fitting on.



Fig. 03-24 Do not use a used cloth for cleaning. Use only waterproof, unused, non-dyed, lint-free and absorbent cellulose cloths.



Fig. 03-25 The welding area must not be wet or soiled. If carrying out the work outside, you may need to set up a tent.



Fig. 03-26 Do not touch the welding areas on the pipe ends. If necessary, clean dirty welding areas with Tangit cleaner again.



Fig. 03-27 Do not touch welding areas in the electrofusion fitting. If necessary, clean dirty welding areas with Tangit cleaner prior to welding.

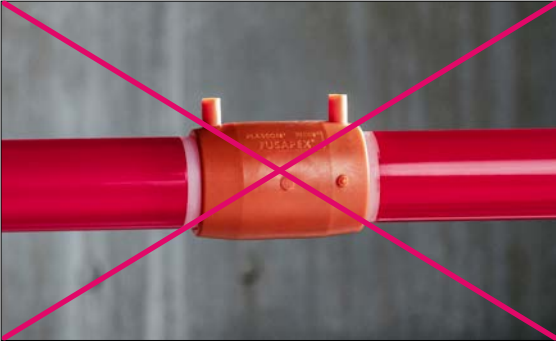


Fig. 03-28 Do not weld any pipes which have not been fully inserted.

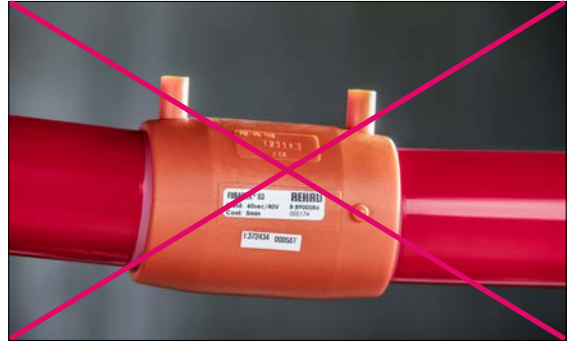


Fig. 03-29 Pipe ends must align and not be under tension. Pipe retaining clamps must be used.



Fig. 03-30 Electrofusion fittings made of PE100 may not be used to connect RAUTHERM-FW pipes.



Fig. 03-31 Flanges and reducers do not need to be scraped, but they do need to be cleaned in each case. Always comply with the minimum diameter as per Tab. 03-3.



Fig. 03-32 The outlet of the T-piece is scraped once. Always comply with the minimum diameter as per Tab. 03-3.



Fig. 03-33 When welding combined components, you must comply with the cooling down times between two connection welds. The following welding sequence has proven effective:

- For a T-piece, connecting passage before outlet
- For reducers, small before large



Fig. 03-34 The electrofusion fitting can also be used as a sleeve coupler. To do so, carefully remove the end stop inside.

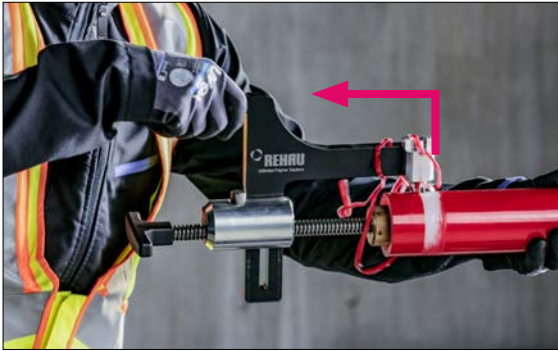


Fig. 03-35 SMARTFUZE UNO 63-200: scraping process ends at the pipe end.

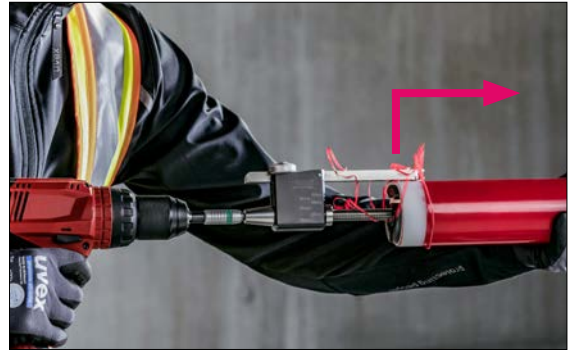


Fig. 03-36 SMARTFUZE DUO 25-75: scraping process begins at the pipe end.

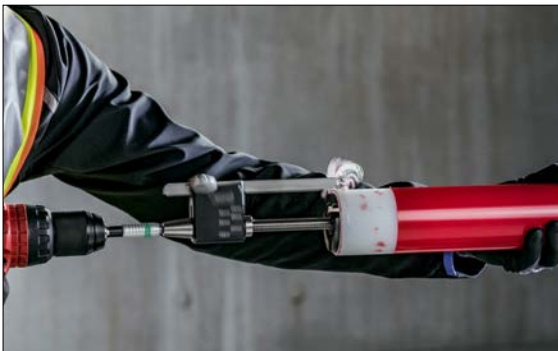


Fig. 03-37 If a second scraping process is possible, it is carried out the same as the first scraping process.

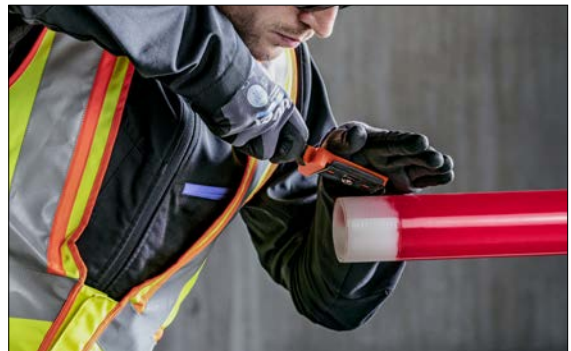


Fig. 03-38 Remove residual colour with the hand scraper. The blade is positioned vertically to the pipe and is pressed on with one hand during the scraping process.

- The processing temperature for the pipe, fitting and welding machine must be between $-10\text{ }^{\circ}\text{C}$ and $+45\text{ }^{\circ}\text{C}$.
- Risers: When welding riser pipes, pipeline ends are to be sealed temporarily to prevent a chimney effect.
- Welding flanges: Secure the pipe in a retaining clamp and press the flange bluntly against the fitting with a second retaining clamp to prevent movement of the flange. Provide additional fixing aids if necessary.
- Should the pipe ends be oval, they are to be rerounded with rerounding clamps before being processed.
- Scraping should result in the creation of a single long and evenly thick swarf with a thickness of 0.15 to 0.3 mm. If this does not occur, check the rotary scraper and change the cutting blade.
- Do not carry out the main scraping of the pipes with a hand scraper; this should only be used for rework following the rotary scraper, if necessary.
- The welds have to be carried out on supported pipes with no axial, lateral and/or angular tension, therefore rounding clamps and holding devices must be used.

- In addition to Tangit cleaner for PE type KS, 99% ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$) can also be used.
- Welding must occur immediately after scraping the pipe ends.
- Do not move the pipes during the welding process.
- Do not remove the mains plug during the welding process.

If an error message is displayed by the welding machine, if there is an interruption to the power supply during the welding process or the welding process is aborted manually, the connection has to be cut out and replaced. The FUSAPEX electrofusion fitting must not be used again.

If the FUSAPEX electrofusion fitting is subjected to mechanical loads during the welding process or within the cooling down time specified on the fitting "cool ... min", the connection has to be cut out and replaced. The FUSAPEX electrofusion fitting must not be used again.

A pressure test is to be carried out upon completion of the installation.

04 Protection of the electrofusion fitting with a PE bag



FUSAPEX fittings may only be removed from the PE bag a short time before jointing.
The FUSAPEX fittings in the PE bag are to be stored away from light (e.g. in a box) in a dry, closed room.

05 Transport and storage

The loading and unloading of REHAU pipes, the FUSAPEX electrofusion fitting, as well as all the system components, are to be supervised by an expert.

Unprotected pipes or fittings should not be dragged on the ground or across concrete floors. They should be stored on a level base, which must not have any sharp edges. Pipes and fittings are to be protected from oil, grease, dyes etc. as well as from direct sunlight, for example through the use of opaque film.

Unprotected storage outside is not advised. We recommend only removing the pipes from the outer packaging a short time before processing.

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