



Poymatic Plus



Electrofusion control unit

Instruction Manual

1. Variants

NOTE



Device variants

This instruction manual describes the following device variants:

- **Polymatic Plus**

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2. Information about this manual

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Read this instruction manual completely. The handling and use of the product described below are not always self-explanatory. Therefore the knowledge of the technical documentation is obligatory.

Only in this way can you use the product properly, correctly, safely and effectively.

If parts of the technical documentation are damaged, illegible or lost contact your dealer or the manufacturer to obtain the documents again.



Residual risk

This document informs you about remaining residual risks against which construction and protective measures are not or only partially effective.



Errata and technical modifications reserved!

All notes and technical specification in this instructions manual were prepared with all necessary care. The manufacturer reserves all rights for technical modifications of the product or its components without prior notice to customers. Technical modifications cannot always be directly transferred to the documentation.

If you are in doubt about the topicality of the documentation please contact your distributor or the manufacturer.

2.1. Applicable Documents

Document

This product does not have additional documentation.

NOTE



Read the entire documentation!

Using the product or its components without completely reading and understanding the entire documentation shall be considered as improper use and is strictly forbidden.

2.2. Warnings

When using the product, it is always necessary to carry out activities in which danger may occur. In this document, dangerous situations are preceded by warnings, which must be observed under all circumstances.

2.2.1. Description of the structure of the warnings

The warnings are provided with a signal word and one or more symbols. The signal word with the pictogram describes the severity of the danger. Below is an example for clarification.

 CAUTION (A)	
	Hazard description (B) Further explanation on the nature and cause of the danger (C) ➤ Measures to prevent or avoid the danger (D)

Symbol	Information	Content	Example
A	Signal word	Classification of the danger by symbol and signal word	Caution
B	Danger description	What is the danger and when does it occur?	Danger due to hot surface
C	Possible consequences if the danger occurs	What will or can happen if you do not pay attention to the warning?	The hot surface can cause burns.
D	Measures to avoid the danger	What needs to be done? What must be avoided? What protective measures must be taken?	Keep your distance and wear fire resistant gloves.

2.2.2. List of warnings



General remark

This is a remark of a general nature. These advices describe recommended courses of action to enable the user to perform steps quicker and safer. This warning symbol can also indicate important or obligatory general conditions.

NOTE



Potentially harmful situation

This signal word indicates a possible dangerous situation for the product, its components, accessories and / or the environment.

CAUTION



Potentially dangerous situation

This signal word indicates a danger with a low degree of risk. Failure to do so could result in minor or moderate injury.

WARNING



Dangerous situation

This signal word indicates a danger with a medium degree of risk. Failure to do so may result in serious injury or death.

DANGER



Immediate danger

This signal word indicates a danger with a high or very high degree of risk. Failure to do so will result in serious injury or death.

2.3. Symbolism

In this document, various symbols are used as aids. The meaning of each is explained below.

2.3.1. General symbols and signs

Symbol/sign

Explanation



Important information

2.3.2. Warning symbols

Symbol

Explanation



General warning symbol



Warning: Electricity



Warning: Hot surface

2.3.3. Requirement symbols

Symbol/sign	Explanation
	General requirement
	Information about / in the documentation This symbol indicates that special attention must be paid to the technical documentation.
	Wear safety shoes!
	Ground before use!
	Pull out the mains plug!

2.3.4. Prohibition symbols

Symbol/sign	Explanation
	General prohibition
	No reaching in!

3. Warranty and liability

Warranty and liability claims for personal injury and property damage are excluded if they are attributable to one or more of the following causes:

- Improper use of the product and its components outside its scope of application.
- Improper assembly, commissioning, operation, maintenance and improper transport of the product including its components.
- Operation of the product including its components with defective or improperly installed safety devices.
- Failure to follow the instructions in the instruction manual.
- Unauthorized structural changes on the product or its components.
- Poor monitoring of parts that are subject to wear.
- Repairs carried out improperly.
- Disasters due to foreign bodies and force majeure.

4. Identification

4.1. Product labeling

Product description: Electrofusion control unit

Product type: Electrofusion control unit for welding thermoplastic pipelines using fittings with an input voltage below 48 V.

4.2. Information about the manufacturer

PF-Schweißtechnologie GmbH
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DE-36304 Alsfeld
Germany

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Fax.: +49-6631-9652-52
E-Mail: info@pfs-gmbh.com
Web: www.pfs-gmbh.com

4.3. Type plate

The type plate is a unique identifier of the product and is structured as follows:

①	Netz/Supply: 230V~ / 50/60Hz	
②	Leistung/Power: 2800VA/80%ED	
③	Schutzart/Protection: IP54	
	Made in Germany	WEEE: DE27521436
④	 PF-Schweißtechnologie GmbH Karl-Bröger-Str.10 Tel: +49-6631-9652-0 DE-36304 Alsfeld Fax +49-6631-9652-52	
⑤	Heizwendelschweißgerät / Electro Fusion Control Box	
⑥	Typ: Polymatic Plus USB (BT)	
⑦	S/N: 20810093	
⑧	Art.: 3_0308_303	
⑨	DE,GB,FR,ES,PT,IT,RO	

No. Description

- 1 Input voltage / input frequency
- 2 Power at 80% ON time
- 3 IP protection class
- 4 Manufacturer
- 5 Type description of the device
- 6 Device designation
- 7 Serial number
- 8 Product code
- 9 Available display languages

5. Product description



Note

When the term "Electrofusion control unit" is used, this includes all variants of the tool. Otherwise, details of each specific feature will be mentioned separately.

5.1. Purpose and intended use

The electrofusion control units of type Polymatic Plus are solely meant for the welding of thermoplastic pipes (e.g. made of PE-HD, PE80, PE100 or PP) when used with electrofusion fittings that have an input voltage of less than 48 V. These devices are conforming to the standards DVS 2208-1 and ISO 12176-2, of which the applicable standards for the electrofusion fittings to be used are derived from.

5.2. Improper use



Disclaimer!

The product may not be used for any purposes other than those mentioned. The basic conditions mentioned must be adhered to. The use of the product as a whole or parts thereof for purposes other than those mentioned above shall be considered as improper use.

- The operator or user is liable for improper use!

5.3. Modifications and alterations

Modifying the product without prior consulting of the manufacturer is forbidden and shall be considered as improper use.



Constructional modifications are subject to prior approval!

No modifications, additions or conversions of the product or its components may be made without the manufacturer's approval.

In the case of infringements, the warranty and liability claims shall be void.

5.4. Ambient conditions

5.4.1. Environmental conditions

None

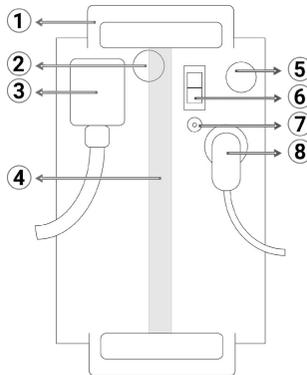
5.4.2. Weight

No special arrangements required.

5.5. Assembly and installation

No special arrangements required.

5.6. Overview and component description



- | | | | |
|---|----------------------------------|---|--------------------|
| 1 | Cable holder and carrying handle | 5 | USB interface |
| 2 | Signal horn | 6 | ON-OFF-switch |
| 3 | Welding cable | 7 | Temperature sensor |
| 4 | Carrying handle | 8 | Mains supply cable |

5.7. Safety features

5.7.1. General

Safety features on the product or its components serve to protect operators. The product may only be used if all safety-related equipment is present and fully functional.

5.7.2. List of safety features on the product

None

6. Safety

Our electrofusion control units are built according to the latest state of the art and the recognized safety regulations and directions. Nevertheless, dangers to the user or other nearby persons, as well as damage to property values, may arise if the use is improper, easy or incorrect.

The electrofusion control unit and its components may only be used when the following preconditions are met:

- The use may only be carried out within the scope of the intended use.
- The electrofusion control unit and its components must be generally and mechanically in perfect condition.

6.1. General safety guidelines for power tools

The basic condition for safely handling and a hassle-free operation of the product is the knowledge about the fundamental safety guidelines and safety regulations. This instruction manual contains essential information on how to handle the product, including its components and accessories, safely. The safety guidelines have to be acknowledged and observed by everyone working with the product. These instructions shall be read and implemented in accordance with the relevant standards, workplace health and safety legislation, installation instructions, Codes of Practice and technical connection guideline in force in your country.

- Read and make sure you understand all safety guidelines and instructions. Failure to follow the safety guidelines and instructions can lead to electric shock, fire and/or serious injury.
- Keep these safety guidelines and instructions for future use.
- The term "power tool" used in the safety guidelines relates to mains-operated power tools (with cord) as well as battery-operated power tools (without cord).

NOTE



Read the provided documentation!

Read the provided documentation thoroughly to prevent applications errors and to work safer and according to the scope of application with the respective product. Reading the documentation thoroughly and completely helps preventing accidents due to improper use and eases the work with the product.



- All users of the product must thoroughly read and understand the provided documentation prior to use.

⚠ DANGER



Danger due to non-compliance with accident prevention regulations!

In order to be able to use the product safely, the knowledge of the applicable accident prevention regulations in your country is absolutely necessary. Working with the product without the knowledge of the valid accident prevention regulations carries a great risk for irreversible injuries and property damage.

- Germany: Familiarize yourself with the general accident prevention regulations (UVV).
- International: International: Familiarize yourself with the standards and regulations for accident prevention in your country. Take note of these and act accordingly.

6.1.1. Duty of care of the operator

NOTE



Minimizing risks

Above all, the safety at the place of installation of the product can only be achieved if all necessary risk-minimizing measures are taken and avoidable risks are ruled out from the outset. This is the duty of care of the operator. All users of the product must thoroughly read and understand the provided documentation prior to use.

The operator is obliged to allow the usage of the product only to people that:

- are familiar with the basic regulations on work safety and accident prevention and are thoroughly instructed in the proper handling of the product, its components and accessories.
- have read and understood the complete documentation of the product, its components and accessories.
- are sufficiently qualified and authorized to use the product as intended.
- are fully trained and familiarized with the process of welding PE pipelines.

Furthermore, the operator must ensure that:

- responsibilities of the staff / user shall be clearly defined with regard to transport, installation, dismantling, commissioning, setting up and adjustment, operation, maintenance and inspection, repair and disassembly.
- the product and its components are used only in accordance with the intended use.
- the product, its components and accessories is used only together with accessories and retrofit parts provided by the manufacturer.
- the product and its components must be in perfect and functional condition.
- the parts of the personal protective equipment necessary for carrying out the work are available and used for the personnel employed.
- the documentation associated with the product and its components is always fully and legibly available on the job site.
- at each change of ownership, or when loaned to other persons, all documentation must be included and its importance pointed out.
- the general and local regulations for accident prevention and environmental protection are provided.
- all safety and danger warnings on the product, its components and accessories are kept in readable condition and renewed if damaged.

Technical condition of the product:

Subsequent requirements are based on the technical condition of the product. Compliance with these requirements must be ensured by the operator.

- The product may only be used as intended.
- The product must be checked for perfect technical condition before each use.
- No unauthorized or arbitrary modifications or manipulations of the product, its components or accessories may be made.
- The full technical documentation must always be kept completely and legibly at the place of use of the product for inspection.

6.1.2. Duty of care of the user

All persons who are instructed to work with the product have the obligation to:

- familiarize themselves with the basic regulations on work safety and accident prevention before starting to work.
- thoroughly read the entire documentation.
- inform oneself about the functioning of the product, its components and accessories.

6.1.3. Safety in the work area

- Keep your work area clean and well lit. Working in cluttered or dark areas can easily lead to accidents. Prevent the electrofusion control unit from unintentional movement or dropping.
- Do not work with the electrofusion control unit **in potentially explosive areas** in which flammable liquids, gases or dust are present. Power tools can produce sparks, which can ignite dust or fumes.
- Keep children and bystanders at distance while operating a power tool. Distractions can cause you to lose control over the electrofusion control unit. Do not allow other people touch the electrofusion control unit or cables and keep them away from your working place. Run cables neatly to avoid trip accidents. It is preferable to elevate cables on cable stands.

6.1.4. Electrical safety

- The plug of the electrofusion control unit must fit in the outlet. Never modify the plug in any way. Do not use any adapters in combination with earthed/grounded electrofusion control units. Unmodified plugs and matching outlets will reduce the risk of electric shock.
- Avoid physical contact with earthed/grounded surfaces or objects such as pipes, radiators, stoves and refrigerators whilst operating power tools. There is an increased risk of electric shock if your body is earthed/grounded.
- Keep electrofusion control units clear of rain and wetness. Water entering a electrofusion control unit will increase the risk of an electric shock.
- Do not misuse the cord of the electrofusion control unit for carrying it, hanging it up or pulling the plug out of the socket. Keep the cord away from heat, oil and sharp edges. Damaged or bent cords increase the risk of an electric shock.
- Do not carry the electrofusion control unit with the finger on the power switch. Pull out the plug when you do not use the electrofusion control unit or when changing the adapters and attachments.
- When operating an electrofusion control unit outdoors, use an extension cord suitable and approved for outdoor use. Usage of a cord suitable for outdoor use reduces the risk of an electric shock.
- Always use a residual current-operated protective device (RCD). Using an RCD reduces the risk of an electric shock.

6.1.5. Personal safety

- Stay alert! Watch what you are doing and use common sense when operating an electrofusion control unit. Do not use an electrofusion control unit while being tired or under the influence of drugs, alcohol or medication. One moment of inattention while operating an electrofusion control unit can cause serious personal injury.
- Use personal protective equipment and always wear eye protection. The use of protective equipment such as a dust mask, non-skid safety shoes, a hard hat or hearing protection, depending on the electric tool and its use will reduce personal injuries.
- Prevent unintentional starting of the device. Make sure that the electrofusion control unit is switched off before connecting it to the mains and/or battery or before picking it up/carrying it. Carrying the electrofusion control unit with a finger on the switch or energising electrofusion control units that are switched on can cause injuries and accidents.

6.1.6. Power tool usage and care

- Do not overload the electrofusion control unit! Use the appropriate electrofusion control unit for your application. When using an appropriate power tool you can work better and more safely in its range of capacity.
- Do not use an electrofusion control unit if the switch is broken. An electrofusion control unit, which cannot be turned on or off, is dangerous and must be repaired.
- Keep and store electrofusion control units away from children. Do not let people, who are not familiar with the electrofusion control unit or have not read and understood the instruction manuals, use it. Electrofusion control units are dangerous if being used by inexperienced users.
- Maintain electrofusion control units with care. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the electrofusion control unit's operation. If damaged, have the electrofusion control unit repaired before use. Many accidents are caused by poorly maintained electrofusion control units.
- Keep your electrofusion control units clean. Follow the servicing instructions and the instructions for changing the tools. Keep oil and grease away from the handles.
- Use the electrofusion control unit, accessories etc. in accordance with these instructions. Take the working conditions and the work to be performed into account. The use of the electrofusion control unit for applications differing from the application scope could result in a hazardous situation.

6.1.7. Service

- Have your electrofusion control unit repaired only by a qualified technician with genuine spare parts. This ensures that the safety of the electrofusion control unit is maintained.

6.2. Specific safety guidelines for the electrofusion control unit

6.2.1. Electrical safety

- The use of a residual current-operated protective device (RCD) is mandatory when working at outdoor construction sites. Note all directives and technical connection regulations in force in your country. It can be mandatory to always use a residual current-operated protective device (RCD).
- According to national and international guidelines, the use of > 230 V AC or higher (or > 110 V AC or higher) in trenches and confined spaces is only permitted if additional security measures are taken. Each electrical device operated in such an environment has to be powered by its own safety isolating transformer or its own insulation protective device.
- Only use accessories, particularly extension cords and generators, that are specified/recommended in this instruction manual. The use of any other accessories can damage the electrofusion control unit and increases your risk of injury.
- Before each use, the user must visually inspect that the electrofusion control unit, its cables and accessories as well as its electrical supply cord to ensure that all parts are free from damage. Damaged protection facilities and device parts must be repaired or replaced by an authorized service agent.
- In accordance with the workplace health and safety legislation in force in your country for connection and usage of electric devices you must ensure that the electrofusion control unit, any extension cords and RCDs are regularly inspected (tested and tagged) by a licensed electrician or other competent person.
- It is very important that there is a Protective Earthing (PE) conductor which is continuous (i.e. <0.5 Ohms) from the earth terminal of the generator to the earth terminal of the plug on the flexible supply cord of the electrofusion control unit. If the protective earthing conductor is interrupted or becomes higher in resistance, there is a risk of electric shock.

6.2.2. Personal safety

- Pipes and other workpieces must be firmly clamped or fixed. Poorly clamped or fixed workpieces may hurt you or affect your safe foothold.
- If the electrofusion control unit is used on a generator, the generator shall be grounded. Otherwise there is a risk of an electric shock.
- The electrofusion control unit shall only be used on a power circuit with a protective earthing conductor. Otherwise there is a risk of an electric shock.

 **WARNING**



Fire hazard / risk of injury from escaping melt

Inadequate preparation of pipes, fitting and welding aread may result in unexpected melt leakage. This creates a risk of fire and injury.

- The pipes must be cut at right angles.
- Check and mark the stab depth and, if possible, close the pipe ends.
- Process the pipes free of mechanical stress and use suitable pipe clamps.
- Clean the pipes thoroughly and use an approved peeling tool.
- Observe the manufacturer's specifications for the gap dimension between the pipe and the fitting.
- Match the welding parameters with the manufacturer's specifications on the fitting.
- Keep a minimum distance of 1 m from the welding zone during the welding process.
- Set a fire watch until after the cooling time has elapsed.

6.3. Personal protective equipment

NOTE



Obligation to use the personal protective equipment!

During transport, assembly, assembly and disassembly of the product, the respective personnel must wear and use the appropriate PPE.

Which parts of the PPE must be used must be evaluated on an individual basis, determined by the operator and announced to the personnel.



The nature and extent of the PPE to be worn must be assessed and determined for the individual case.

The following PPE is recommended when working with this product:



Wear safety shoes!

Wearing safety shoes protects the feet from falling objects and reduces the risk of slipping.

6.4. Qualification of personnel

Only persons with sufficient knowledge in the field of welding PE pipelines may work with this product. This knowledge may have been gained through several years of professional experience, training, instruction or other training. Persons who do not have sufficient knowledge in this area must be supervised and instructed by a person with appropriate knowledge.

 **WARNING**



Danger due to insufficient personnel qualification

If insufficiently skilled operators work with the product or are in the work area, there is a risk of serious injury or property damage.

- Allow only qualified personnel to work with the product.
- Personnel in training may only work with the product under the supervision of an experienced person.

6.5. Deadlines for recurring checks

Action	Interval
Cleaning the product after completion of the work.	Each working day
Check the welding and mains cable for damage.	Each working day
Check the terminals for damage and sufficient contact force.	Each working day
Maintenance by the manufacturer or an authorized service station	Annual

6.6. Dangers during individual work phases

6.6.1. Dangers during transport and assembly

Transport

No special dangers.

Installation

No special dangers.

6.6.2. Dangers during operation

The operator must have been instructed by the operator in the handling of the product. Working with the product without instruction is prohibited. The proof obligation lies with the operator.

Use the product only in accordance with its intended use. Activities that impair safety are to be avoided.

WARNING



Injury due to improper / unintended operation

Incorrect or unintentional operation of the product can lead to injury and / or property damage.

- Before using the product, check that all components are free from damage.
- Never operate the product if it has any damage.

6.6.3. Dangers during removal

The disassembly of the components may only be carried out by trained personnel who have read and understood all parts of the documentation.

6.7. Device specific dangers

DANGER



Danger to life due to electric shock

Depending on the variant, the product is operated with 230 V AC or 110 V AC.

- Always check the supply line for damage before using the tool.
- In the event of damage to the supply line, the tool must not be used before it is professionally repaired.
- Repairs to the supply line may only be carried out by qualified electricians.
- Operation on construction sites may only be carried out by means of a power distributor with a residual current circuit breaker in accordance with VDE 0100.
- General as well as nationally and internationally valid safety guidelines and regulations for handling power tools must be followed.



Pull out the mains plug!

If you are not using the product, disconnect the power plug from the power source.

6.8. Residual risk

Despite all security measures a residual risk remains. Technically non-excludable risks are:

- Grossly negligent handling of live wires and cables of the electrofusion control unit.
- Intentional destruction of live wires and cables of the electrofusion control unit.
- Risks due to subsequent technical modifications of the electrofusion control unit.

7. Scope of delivery



Note

The Polymatic Plus is available in different variants. The scope of delivery differs, depending on the ordered variant. Errata and technical modifications reserved!

	Polymatic Plus		Enclosed
	1 ×	Instruction manual	DE004
	1 ×	2D scanner	1_0120_011 / _013
	1 ×	USB stick	5_5001_512
	1 ×	Bluetooth dongle	2_5100_006
	1 ×	Accessory bag	1_2800_002
	1 ×	Transport box	1_2800_072

A Flightcase is available as alternative to the transport box.

8. Technical data

Polymatic Plus			
General			
Output voltage	[V]	8 to 48 AC	
Data recording		Yes	
Barcode reader		Scanner	
Power (60 % ON time) according to ISO 12176-2		2600 W (72.5 A)	
Operating temperature range	[°C]	-10 to +50	
International protection		IP54	
Appliance class		1	
Conformity		CE	
ISO 12176-2 Class - classification		P ₂ 4 U S ₁ V AK D X	
Input of welding parameters			
Barcode with scanner SmartFuse Manual input of the barcode digits Manual input of the welding parameters (U _{OUT} : 8 to 48 V, t _{WELD} : 0 to 9999 s)			
Input/Mains		230 V devices	110 V devices
Nominal voltage (tolerance)	[V]	230 AC (190 to 300)	110 AC (90 to 150)
Nominal frequency (tolerance)	[Hz]	50/60 (40 to 70)	50/60 (40 to 70)
Power factor cos ρ		0.6 to 0.9 (phase-angle control)	0.6 to 0.9 (phase-angle control)
Nominal current	[A]	16	40
Power consumption	[VA]	3680	3680
Length of cord	[m]	4.5	On request
Plug type		Euro Schuko plug	On request
Output			
Output voltage	[V]	8 to 48 AC	
Output current (max.)		110	
Output current (t → ∞)	[A]	40	
Output current (min.)	[A]	2	
Energy adjustment		Temperature compensation	
Welding cable length	[m]	5, other lengths on request	
Welding cable installation		Fixed, optional detachable	
Welding terminals	[mm]	4.0 (optional 4.7 or universal terminals for 4.0 und 4.7)	
Monitoring functions			
Input		Voltage, current, frequency	
Output		Voltage, current, resistance, contact, short circuit	
Other		System, Working Temperature, Service	
Error messages		Plain Text, Acoustic Signal	
Casing/Display			
Material		Steel plate with plastic frame	
Display		4×20 Characters (alphanum.), background lighting	
Dimensions, weights and packaging			
Product dimensions L×W×H	[mm]	400×300×260	
Product weight (incl. welding cable)	[kg]	20	
Packaging type		Flightcase	Box
Packaging material		Aluminiumframe with composite wood	Wood
Packaging dimensions L×W×H	[mm]	470×380×370	440×340×310
Packaging weight	[kg]	7.5	3.6
Transport weight	[kg]	28	24

The given technical information is valid for the standard setup of the electrofusion control unit. Depending on the ordered setup there may be variations.

8.1. Data recording

The electrofusion control units of type Polymatic Plus provide data recording for approx. 1000 welding cycles and their barcode identifier conforming to ISO 12176-4 (traceability).

Polymatic Plus		
Data recording		
Number of reports		Approx. 1000
Interface		USB stick
Data format		PDF, CSV
Recorded data		
General data		Time, date, report number, ambient temperature, welder name, job number max. 40-digits (alphanumeric)
Fusion data		Voltage, current, energy, nominal and actual welding time, mode, resistance, error messages with 10 voltage and current values
Fitting data		Barcode Information (ISO/TR 13950), Type, Dimension, Manufacturer
Device data		Serial number, inventory number, date of last service, working hours, system configuration
Worker code		Barcode (PF or ISO 12176-3) for operator identification and access to manual input and system configuration
Traceability functions		
Job number		Job number max. 40 digits (alphanumeric), input by barcode or manual
Worker code		ISO 12176-3
Weather condition		DVS 2207 / 2208
Welding Barcode		ISO TR 13950
Traceability barcode of fitting		ISO 12176-4
Traceability Barcode of 1st pipe		ISO 12176-4
Traceability Barcode of 2nd pipe		ISO 12176-4
Traceability barcode of 3rd pipe / infotext		ISO 12176-4 / 40 digits (alphanumeric)
Additional functions		
Output options		Whole memory, selectable by job number
Job code input/selection		Barcode, manual, internal list of job numbers for selection
Input of position data / free text		40 characters, per joint

The given technical information is valid for the standard setup of the electrofusion control unit. Depending on the ordered setup there may be variations.

9. Input of welding parameters

The electrofusion control units of type Polymatic Plus provide the following means for entering the welding parameters:

9.1. Barcode (ISO/TR 13950, Type 2/5i, 24-digits) or QR Code



The barcode or QR code attached on most electro fusion fittings on the market contains all necessary data for processing them. After scanning with the scanner, this data is automatically transferred to the electrofusion unit and evaluated. The code essentially contains the following data: Manufacturer, type, diameter, fusion voltage, fusion time (with temperature correction, if applicable), resistance and resistance tolerance.

9.2. SmartFuse-System*



By reading out the reference resistor in one of the connector pins of the SmartFuse-fitting the control unit automatically determines the welding parameters for the fitting.

9.3. Manual input of the barcode digits



If the barcode on the fitting or the barcode reading device is damaged or defective, it is possible to enter the barcode digits (if available) into the control unit manually.

9.4. Manual input of welding voltage and -time



If no barcode is available, it is possible to enter the fusion parameters provided by the fitting manufacturer (like voltage and time) manually.

*) Not all electrofusion control units feature the SmartFuse-System. Please ask your distributor for further information. Electrofusion control units without the SmartFuse-System can be recognised by the two welding terminals partially covered by black pvc caps. Electrofusion control units with the system have one terminal covered by a red pvc cap and one terminal covered by a black one.

10. Range of fitting dimensions

The range of fitting dimensions for which an electrofusion control unit can be used depends essentially on the power consumption of the used fittings. Since the power consumption of the fittings is different for different fitting manufacturers, it is not possible to provide a general rule which covers all the possible fitting dimensions. When in doubt, each fitting size must be checked separately.



Attention!

For electrofusion control units of type Polymatic Plus when all welding work is performed successively, such that the control unit has pauses in welding that correspond to the preparation time of the next fitting, the following rule applies.

The duration of the pause after each weld must be at least equal to the preparation time for the next welding joint. When you allow only shorter pauses, the electrofusion control unit is put under heavy load and can therefore heat up so much, even when welding smaller fittings, that a longer pause must be allowed for cooling down.

Usage for dimensions **from 20 to 630 mm** without limitation.

When working with dimensions **from 630 mm on**, longer cool-down times must be provided for because otherwise the device might show the "Device too hot" error message. In this case, it is necessary to let the electrofusion control unit cool down before putting it to use again.



Attention!

Before processing fittings in this dimension range, you have to check that the welding current demand of the fitting does not continuously exceed the output current of the device and that the maximum output current is not exceeded.

The statements made above are made under the assumption that the ambient temperature is 20 °C.

11. Bluetooth functionality

The electrofusion control units of type Polymatic Plus can be equipped with an optionally available USB Bluetooth dongle. That makes it possible to control and record the welding procedure with the PFS app "ElectroFusion Studio".

The app for smartphones and tablets is available for Android in the Google Play Store and for iOS in the Apple App Store. When using Bluetooth, the electrofusion control unit can only be used together with this app.



Attention!

To be able to use the app with the electrofusion control unit it is mandatory to have a registered account. Please ask your distributor.



Attention!

If the Bluetooth function in your electrofusion control unit is provided via a Bluetooth dongle, then the dongle must be inserted into the USB interface before switching on electrofusion control unit.

11.1. PFS Scanner App (optional)

With the PFS Scanner app, you can use a smartphone or tablet to read the fitting code and transmit it to the electrofusion control units when using the Bluetooth connection.

The app for smartphones and tablets is available for Android in the Google Play Store and for iOS in the Apple App Store.

12. Spare parts and accessories

Description	Code
2D scanner	1_0120_011 / _013
Terminal contact 4.0 M8 SmartFuse	2_0200_008
Terminal contact 4.0 M8	1_0200_008
Universal terminal, SmartFuse	2_0200_051
Universal terminal, standard	2_0200_052
Adapter 4.0 to 4.7 angular	2_0300_004
Adapter 4.0 to 4.0 angular	2_0300_011
Adapter SmartFuse 4.0 to 4.7	2_0200_007
Adapter 4.0 to 4.7, straight	2_0300_010

13. Transport, Installation and removal, storing



Qualification of personnel

The product may only be transported, installed, removed and stored by persons with relevant professional experience and expertise in using the product.



Safety

User and operator are responsible. Observe all safety instructions in this instruction manual as well as all valid safety regulations.

13.1. Transport damage

Check the product for damage immediately upon receipt. If damage or abnormalities are present, ideally document them with pictures and contact the manufacturer or your dealer.

13.2. Packaging

The electrofusion control unit is packed in a wooden box or flight case.



Damage to the packaging

Damage to the packaging may indicate damage to the product. If in doubt about the condition of the product, contact the manufacturer or your dealer.

13.3. Assembly and installation

Conditions for the installation site

- ❖ Make sure you have enough space and good lighting.
- ❖ The electrofusion control unit must be kept in a dry place.
- ❖ If necessary, set up a tent to protect the work area and the electrofusion control unit from the effects of the weather, such as strong sunlight, rain or moisture.
- ❖ The electrofusion control unit should not be operated in its transport container. (Exception: portable units built into suitcases)

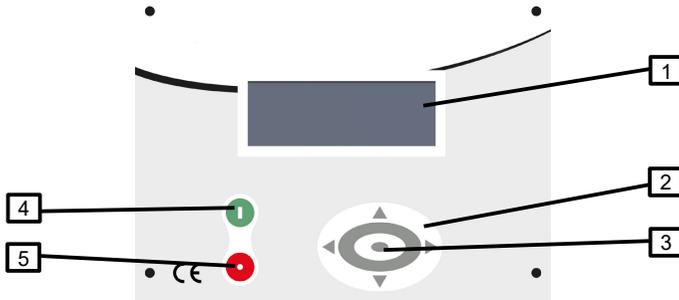
Space requirements

- ❖ The electrofusion control unit should stand freely to ensure the best possible heat dissipation.

13.4. Storage

Store the product in its transport container, protected from the weather. The temperature should be between 5 and 25 °C with a humidity of not more than 60%.

14. Display and control elements



- | | | | |
|---|--------------------|---|--------------------|
| 1 | Display | 4 | Green start button |
| 2 | Arrow buttons ▲▼◀▶ | 5 | Red stop button |
| 3 | Enter button | | |

15. Connection to the power supply

15.1. General

NOTE



Country-specific connection regulations

GERMANY The conditions for connecting the electrofusion control unit in this instruction manual, the technical connection regulations of the local power supply company, the VDE regulations, the regulations for accident prevention as well as other DIN/CEN regulations in force must always be observed.

OTHER COUNTRIES: It is mandatory to observe the connection regulations for the electrofusion control unit in this instruction manual as well as all international and national health and safety regulations and the respective technical connection regulations in force.

Electrofusion control units may only be used by trained and, according to national and international standards, certified personnel.

The user must supervise and observe the electrofusion control unit during the whole welding procedure.

The electrofusion control unit must only be operated within the following operation ranges:

	230 V devices	110 V devices
Input voltage:	190 V to 300 V (AC)	90 V to 150 V
Input Frequency:	50/60 Hz (40 to 70 Hz)	50/60 Hz (40 to 70 Hz)
Ambient temperature:	-10 °C to +50 °C	-10 °C to +50 °C
Minimum Fuse/ Circuit breaker rating	16 A (slow)	40 A (slow)

**Attention!**

Operation of the electrofusion control unit is only allowed if a properly dimensioned and intact RCD is used. The information for proper fuse protection in the circuit are shown in the table above.

The electrofusion control unit's mains supply cord as well as any extension cords must be fully unwound prior to usage.

15.2. Extension lines

**Attention!**

The extension cords must provide a protective earthing contact.

It is forbidden to extend the welding cable.

Always observe all international and national legislation and guidelines for extending mains supply cords.

15.2.1. General

The mains supply cord shall only be extended in accordance with the following specifications.

Line length	Cross Section (230 V)	Cross Section (110 V)
Up to 20 m	3×1.5 mm ²	3×4 mm ²
20-50 m	3×2.5 mm ²	3×4 mm ²
50-100 m	3×4 mm ²	-

15.2.2. For Australia

The extension of the mains cable may only be carried out with approved extension cables. These can be obtained on request from your local distributor of electrofusion control units made by PF-Schweißtechnologie GmbH.

**Attention!**

- For electrofusion control boxes used in Australia only extension cords acknowledged and approved by PF-Schweißtechnologie GmbH, a local distributor or an official PF service station shall be used.
- Using a non-approved extension cord is a health safety risk.
- Using a non-approved extension cord voids the manufacturer's warranty on the unit.

15.3. Generator compatibility



Important notes for the usage together with generators!

- AUSTRALIA: Ensure that the generator is regularly inspected, tested and tagged by a licensed electrician or other competent person in accordance with workplace health and safety legislation and national standards.
- The generator must be grounded!
- The outlet which the electrofusion control unit is used together with must have a protective earthing conductor!
- It is very important that there is a Protective Earthing (PE) conductor which is continuous (i.e. <math><0.5\text{ Ohms}</math>) from the earth terminal of the generator to the earth terminal of the plug on the flexible supply cord of the electrofusion control unit. If the protective earthing conductor is interrupted or becomes higher in resistance, there is a risk of electric shock. For this reason, always ensure that only extension cords of the approved type are used. Ensure that the electrofusion control unit, all accessories and extension cords are regularly inspected, tested and tagged by a licensed electrician or other competent person.
- First start the generator, then plug in the electrofusion control unit.
- No other machine or device must be connected to the generator.
- 400 V devices: The open circuit voltage should be set between 415 V and 430 V.
- Unplug the mains supply cable of the electrofusion control unit before turning the generator off.
- The usable generator power will decrease by 10 % per 1000 m of height above sea level.
- Check the fuel level before starting the welding process.
- The instruction manual of the generator as well as its operating instructions are part of this instruction manual. Always read them carefully!

The electrofusion control units of type Polymatic Plus provide the following features to increase the generator compatibility:

- High tolerance for the input voltage
 - 190 V to 300 V at 230 V nominal
- High tolerance for the input frequency
 - 40 Hz to 70 Hz
- Display of current input voltage and frequency.
- Soft-Start for limitation of the generator load.

Despite these characteristics, the used generators must meet the following requirements and recommendations, in order to avoid damage to the electrofusion control unit. This ensures that the internal monitoring functions of the control unit do not interrupt the welding process:

- Suitable for phase-angle control and able to drive inductive loads
- 230 V:
 - No-load voltage adjustable between 240 V and 260 V
 - Output current of 18 A on one phase
- 110 V:
 - No-load voltage adjustable to 120 V – 130 V
 - Output current of 36 A on one phase
- Stable output voltage and engine RPM even with rapidly changing load
- Synchronous generators with mechanical RPM control preferred
- Voltage peaks must not exceed 800 V

15.3.1. Required generator rated output power



It is not possible to make a statement for the necessary generator output power in each individual case, because every fitting manufacturer has different specifications.

The information in the following table below is to be used only as a guide as it can differ from your actual requirements.

The usable generator power will decrease by 10 % per 1000 m of height above sea level.

For an individual recommendation you can download our App „PFS Barcode Decoder“. With this app you can scan a fitting barcode and get detailed information about the fitting and a recommendation for the necessary generator output power.

Our App „PFS Barcode Decoder“ is available for Android in the Google Play Store as well as for iOS in the iTunes App Store.

Fitting diameter	Output Power
20-160 mm	3.2 kW
180-500 mm	4.5 kW (mechanically controlled) 5 kW (electronically controlled)
> 500 mm	6.5 kW (mechanically controlled) 7.5 kW (electronically controlled)

For generators with a poor control response or for generators with a bad tension stability, the guaranteed output power must be 3 to 3.5 times of the load to ensure a trouble free operation. The suitability of electronically controlled generators must be tested before usage due to the fact that the rotational speed of some generators tend to fluctuate, which results in extreme voltage peaks. Furthermore unexpected shutdown of the generator may occur.

16. Preparation of a welding procedure

The electrofusion control units of type Polymatic Plus offer the option of reading in the welding parameters via barcode using a scanner, entering the barcode digits manually or using the SmartFuse system. The welding parameters "voltage" (8 V to 48 V) and "time" (0 s to 9999 s) can alternatively be entered manually.



Attention!

- The generator must be grounded!
- If the electrofusion control unit is used on a generator which is not grounded or on mains without protective earthing conductor there is a risk of an electric shock.



Qualification of personnel

- All persons involved in the assembly and installation must have read and understood this instruction manual and in particular all safety instructions.



Important information about your safety

You are responsible!

All safety instructions in this instruction manual and the generally applicable measures for accident prevention must be adhered to.

Requirement:

- ! The safety instructions are observed.

16.1. General checks and measures before usage

- ! Check the electrofusion control unit, cables and adapters optically and replace them in case of defects or damage.
- ! The welding cables, mains cable and extension cables must be completely unwound.
- ! Connect the detachable welding cable to the control unit.
- ! Switch off the ON-OFF-switch of the electrofusion control unit.
- ! **Start the generator before plugging in the electrofusion control unit. Wait until the generator output voltage has stabilized.**
- ! Plug in the power cord of the electrofusion control unit.

16.2. Switching the electrofusion control unit on

1. Switch the ON-OFF-switch to "ON" position.
2. The electrofusion control unit signals its readiness by two bleeps. The background lighting of the display turns on automatically. The display shows the following message for approx. 5 seconds.

Polymatic Plus USB	Type
USB 0.02R9	Software version
0 Workings hours	Working hours
999 Reports free	Report memory status

Display after switching on

16.2.1. Other display messages

After the startup display is shown, other messages might be displayed before the main display is shown.

16.2.1.1. System config. at last welding process

If the system configuration is changed before the next restart of the electrofusion control unit, a message in the display is shown which indicates, that the system configuration has been changed and what was changed. This is also stored in a report.

- This message is acknowledged by pressing the red stop button.

16.2.1.2. Error occurred

If an error during or before the last welding has occurred (for example resistor error), a special message will appear in the display as a reminder.

- This message is acknowledged by pressing the red stop button.

Example

The following example is meant to show how the device will indicate that an error has occurred before switching the electrofusion control unit off.

Resistance error during last Welding	Error message
---	---------------

Display after switching on



General remark

These messages do not show current errors/problems. They are only meant to remind the user that an error/ problem occurred before the electrofusion control unit was switched off the last time!

The message is displayed each time after the electrofusion control unit is switched on until a successful weld has been performed.

16.2.1.3. Service

This message is displayed as soon as the service interval has passed. This can happen, if the set time for the service interval (e. g. 12 months) has passed, or, for electrofusion control units with no data recording, after 200 operating hours.

- This message is acknowledged by pressing the red stop button.



Attention!

It is recommended to send the electrofusion control unit in for service as soon as this message appears. The display of this message is a recommendation or reminder to you, that the service interval of the electrofusion control unit is reached. The display of this message does not mean, that the electrofusion control unit cannot be used anymore before service.

By acknowledging with a press on the red stop button the electrofusion control unit switches back to the main display.

16.3. Pairing via Bluetooth



Attention!

- With electrofusion control units made by PF-Schweisstechnologie GmbH the Bluetooth function is only available if either the unit itself has a built-in Bluetooth module or if the optionally available Bluetooth dongle is plugged into the USB interface.
- To use the Bluetooth connection, the option "BT on" must be activated in the system configuration of the electrofusion control unit.
- Pairing is possible only when using the app of the manufacturer of the electrofusion control unit. To use the app and its functions a registration is mandatory. For further information please contact your distributor or PF-Schweißtechnologie GmbH.
- Insert the Bluetooth dongle before switching on the electrofusion control unit. Only then will the unit recognise that it is plugged in.
- Do not manually pair your smartphone or tablet with the electrofusion control unit. Start the EFCC/SmartFuse app when the electrofusion control unit displays "Waiting for app". Only pair the device via the app when prompted to do so. If you have already manually paired the electrofusion control unit with your device before, disconnect the pairing. Pairing only works if it is done via the app.



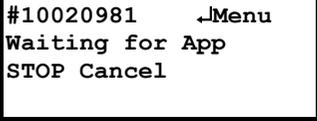
Attention!

If the Bluetooth function in your electrofusion control unit is provided via a Bluetooth dongle, then the dongle must be inserted into the USB interface before switching on electrofusion control unit.

16.3.1. Option „BT on“ active, „BT only“ inactive

Display after switching on, if "BT on" is active

The electrofusion control unit shows the following display. You can now pair your device with the electrofusion control unit via the app.



```
#10020981  ←Menu
Waiting for App
STOP Cancel
```

Identifier of the device to find it via Bluetooth.

The unit is waiting to be paired via the EFCC app.

Device is waiting for Bluetooth pairing

- Press the enter button to enter the system settings. Depending on the setting ("Code Sys" on or off), you need an administrator code to be authorised to access the system.
- Press the red stop button to cancel the pairing and continue without Bluetooth.

16.3.2. Option „BT on“ active, „BT only“ active

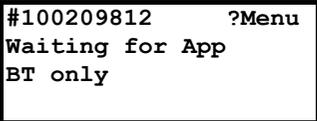


Attention!

With these settings, the unit can only be used via the EFCC app.

Display after switching on, if "BT on" and "BT only" are active

The electrofusion control unit shows the following display. Now you can use the app to pair the electrofusion control unit with your mobile device.



```
#100209812  ?Menu
Waiting for App
BT only
```

Identifier of the device to find it via Bluetooth.

The unit is waiting to be paired via the EFCC app.

Work only possible via EFCC app.

Device is waiting for Bluetooth pairing

- Press the enter button to enter the system settings. Depending on the setting ("Code Sys" on or off), you need an administrator code to be authorised to access the system.

16.3.3. Pairing via Bluetooth is finished

```
#100209812      ?Menu  
Waiting for App  
  
CONNECT
```

Pairing was successful.

Display after pairing

→ Now continue to operate the controller using the "ElectroFusion Studio" app on your mobile device.

```
#10020981      ←Menu  
Waiting for App  
  
BT active
```

Operation via smartphone/tablet.

Display after pairing



Attention!

When using the EFCC app, the entire welding process is controlled by the app.

16.4. Main display

If no fitting is connected, the electrofusion control unit shows the main display.

```
Connect Fitting  
+++++Job number+++++  
  
10
```

Request to connect a fitting.

Display of the currently active job number.

Number of reports in the memory.

Main display

- Press the enter button to enter the system settings.
- Press the right arrow button ► to display device data.
- Connect a fitting to start the welding process.

16.5. Displaying device data

Displaying device data

When the main display is shown you can display device data of the electrofusion control unit by pressing and holding the ► button.

```

Connect Fitting
+++++Job number+++++

                               10
    
```



```

USB 1 oth Clock N S
Ver: 8           +20 C
 236V           50Hz
 1.0V           1.86A
    
```

Main display

Line	Item	Description
1	USB 1	The USB controller was detected.
1	USB 0	The USB controller was not detected.
1	oth	The USB Bluetooth dongle is plugged in.
1	No	The USB Bluetooth dongle is not plugged in.
1	Clock N	Setting of the clock to the northern hemisphere.
1	Clock S	Setting of the clock to the southern hemisphere.
1	S	Summe time
1	W	Winter time
2	Ver: 8	Version of the USB chip
	+20 C	Ambient temperature
3	236 V	Present supply voltage
	50 Hz	Present mains frequency
4	1.0 V	Display of the present voltage between the welding terminals
	1.86A	Display of the last measured current

- Depending on the model, further data such as the total welding time of the unit, the inventory and device number as well as the software version of various hardware components can be displayed by pressing the arrow keys ▲ ▼.
- Press the red stop button to exit the display of device related data and return to the main display.

17. Performing the welding process

17.1. Important information



Note

The contact surfaces of the welding terminals and the pins of the fitting must be clean. Dirty or coated terminals lead to overheating and scorching on the areas of contact inside the welding terminals. The welding terminals must be replaced as soon as they develop a coating on the contact surfaces or a loss of contact force is noticeable.



Attention

- Pay attention to the installation instructions of the fitting, special instructions (ISO, CEN, DVGW, DVS), European and national directives as well as to the instructions of the manufacturers.
- After the welding parameters have been automatically determined it is imperative that you cross check the displayed parameters with the ones shown on the fitting to make sure, that the correct welding parameters are used.

17.2. Connect Fitting

No fitting connected

→ If no fitting is connected, the electrofusion control unit shows the main display.

```
Connect Fitting
+++++Job number++++
                                     10
```

Request to connect a fitting.

Display of the currently active job number.

Number of reports in the memory.

Main display

→ Connect a fitting to start the welding process.



SmartFuse

The SmartFuse measurement always starts when you have connected both welding contacts to a fitting. When you have connected the red welding cable to the red marked welding contact of a SmartFuse-capable fitting, the welding voltage and -time are automatically read out and entered into the electrofusion control unit. If you do not want to work with this functionality, the red welding terminal must not be connected to the fitting contact with the red marking. Alternatively, you can deactivate the SmartFuse functionality in the system configuration.

Fitting is connected

→ This display message indicates the readiness of the device to accept welding parameters by barcode input. Data input can be done by the scanner (barcode on fitting) or manually. Any errors are displayed in the fourth row of the display.

```
Fittingcode
231V   50Hz   +26 C
10.05.2019 11:12:00
                                     10
```

Request to connect a fitting.

Mains frequency, supply voltage and ambient temperature.

Date and time.

Number of reports in the memory.

Prompt for the fittingbarcode

17.3. Welding in Barcode-Mode



Attention

For welding in Barcode-Mode, only read in the barcode label, which is attached to the fitting you want to process.

- It is strictly forbidden to read in the barcode of another fitting as a substitute.

1. Use the scanner to read-in the barcode. If you read in a barcode, which is defect, or invalid the error ("Code error") will be displayed and indicated by a long bleep.
2. Aim for the barcode and push the button on the scanner.
3. When a valid barcode has been successfully read, a beep sounds. The following display is shown.

```

Start
Welding time    30 s
PLA CPL d032   +23°C
```

Press the green start button to start
 Welding time
 Fitting information and ambient temperature
 Possible error messages

Display of the welding parameters

→ The fitting information is taken from the barcode. This information is encrypted according to ISO 13950 as follows:

CPL	Coupler	SAD	Saddle
TEE	T-piece	ERS	Transition
SKT	End cap	BOW	Elbow
RED	Reduction	TDW	Tapping saddle



Attention

It is essential that the parameters displayed in the electrofusion control unit match with the parameters on the fitting to ensure that the correct welding parameters are used.

Starting the welding procedure

1. To start the welding procedure with the displayed parameters press the green start button.

17.3.1. OPTIONAL: Pipe clamping

- After pressing the green start button a display message reminds you of your duty to fix and clamp the pipes. If your electrofusion control unit has this option and you have activated it in the system configuration, the following message will appear in the display:

```
Pipes clamped?  
Welding time    30 s  
PLA CPL d032   +23°C
```

Prompt for confirmation of performed pipe clamping

- By pressing the green start button you confirm that you have clamped the pipes according to the regulations.
- By pressing the red stop button you confirm that you do not have clamped the pipes.



Note

The information given here is stored in the welding report.

17.3.2. Reminder to clamp the pipes

- After pressing the green start button a message will remind you of your duty to fix and prepare the pipes according to the general guidelines.

```
Is the pipe scraped  
and clamped
```

Reminder

- Press the green start button to confirm proper preparation.
- By pressing the red stop button you can cancel the procedure.

Measuring the fitting resistance

1. The electrofusion control unit begins to measure the fitting resistance. Should the measured fitting resistance be out of the valid range, an error message will be shown on the display and the error will be indicated by a bleep. The bleep can be interrupted by pressing the red stop button.

```
0.15<    0.05 <35.00   Range limits and measured resistance  
Nominal time:  
30 s      Nominal welding time  
Report number 3       Report number  
Resistance error      Error message
```

Display when a resistance error has occurred

2. Unplug the welding cable from the fitting. Check that the contacts of the fitting and the welding terminals are clean. Should the fitting, after cleaning the contact surfaces, produce another resistor error then it could be defective. Use another fitting.

No resistance error detected

3. The electrofusion control unit begins the welding procedure automatically if no resistance error occurred.



Attention

Do not touch the fitting or the contact surfaces during the welding process. Keep a minimum safe distance of 1 m to avoid the risk of injury by molten PE mass.

17.3.3. During the welding procedure

- The display shows the actual and nominal welding time:

```
Actual time:
1 s
Nominal time:
30 s
PLA CPL d032
```

Passed actual time
Nominal welding time
Specification of the fitting
Line for possible error messages

Display during the welding procedure

17.3.4. After the end of the welding procedure

1. The welding process will stop automatically when the actual time reaches the nominal time. This will be indicated by two beeps and the following message:

```
Actual time:
30 s
Nominal time:
30 s
Report 3
OK
```

Passed actual time
Nominal welding time
Report number
Line for possible error messages

Display after the welding procedure

2. After completion of the welding procedure, the welding terminals can be unplugged cautiously from the fitting. This will take you back to the main display.



Attention

- Do not forcefully remove the welding terminals from the fitting.
- Before transporting the electrofusion control unit, unplug the welding terminals from the fitting.
- Observe the cooling time, the processing instructions as well as the processing guidelines of the fitting manufacturer as well as those of the pipe manufacturer.

OPTIONAL: Display of weld-related data

1. After completion of the welding procedure, the following information of the welding can be displayed by keeping the ▲-button on the keypad pressed.

2.25 Ohm

40 V

10.596 kJ

10.05.2019 11.12

Measured resistance before the start in Ohm (Ω)

Nominal voltage in Volt (V)

Energy input in kilojoules (kJ)

Date and time

Display of additional data on the completed weld

2. By pressing the enter button you can return to the main display.

17.4. Welding with SmartFuse



Note

To weld with the SmartFuse system the red terminal must be connected to the contact of the fitting that bears a red marking. After a fitting has been connected correctly in this manner, the electrofusion control unit begins to determine the welding parameters based on the built-in resistor in the contact of the fitting.

! A SmartFuse capable fitting is connected.

1. During the measuring process, the display shows the following message. The welding parameters are determined.

SmartFuse measure

231V 50Hz +26 C

10.05.2019 11:12:00

10

Display when SmartFuse measurement is active

2. After the welding parameters have been determined, the electrofusion control unit shows the following information in the display.

Start

Welding time 30 s

PLAS 40V

Detected welding time

Fitting manufacturer and welding voltage

Display of the determined welding parameters



Attention

It is imperative that the parameters displayed match the parameters written on the fitting by its manufacturer.

3. To start the welding procedure with the displayed parameters press the green start button.



Description of the further procedure

The rest of the procedure is identical to that for welding with barcode input. The description of the further steps can be found in chapters 16.3.1 to 16.3.4.

17.5. Welding with manual input of the welding parameters



Attention!

The electrofusion control unit shows the last used welding parameters by default.

Never rely on these shown parameter to be suitable for the currently connected fitting. It is mandatory for you to cross-check the parameters with the specifications of the fitting manufacturer written on the fitting and to set these given parameters accordingly in the electrofusion control unit.

The manufacturer of the electrofusion control unit cannot be held liable for wrong or unsuitable welding parameters that are use to weld a fitting.

→ Make sure that the fitting is not connected in SmartFuse connection mode.

Open function menu

1. When the display shows the prompt "Fittingcode", press the enter button to enter the function menu.
1. Use the arrow keys ▲▼ to select the entry "Man. input" in the function menu.
2. Then press the enter button.



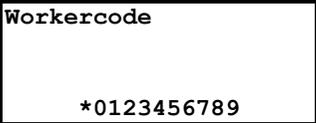
Menu is locked

If the "Code Man." option is activated in the system configuration, a prompt for a foreworker or administrator code appears when attempting to enter manual input. Scan a corresponding code to access the "Man. input" menu.



Manual input of the numbers

Alternatively, the entry can also be made manually with the arrow buttons ◀▲▼▶ and the enter button. Confirm the entry after the last character by pressing the green start button.



Workercode

*0123456789

Number field for the input

Prompt for the foreworker resp. administratorcode

3. After complete input of the digits of a fittingbarcode press the green start button. If you want to abort the input you can press the red stop button at any time. In this case, the main display is shown again.

Manual input of welding parameters

4. After entering the foreworker or administrator code, if "Code Man." is activated, the following display appears.



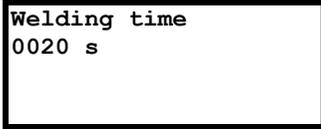
Welding voltage

20.0 V

Setting the welding voltage

Display for manual input of the welding voltage

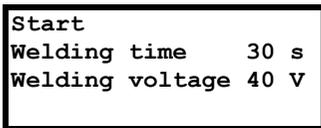
5. When the display is shown, the cursor is active in line 2. The position of the cursor is indicated by regular flashing. Use the arrow buttons ▲▼ to set the desired value for the voltage in volts and the arrow buttons ◀ and ▶ to move the cursor to the next digit of the number.
6. After the desired value for the welding voltage has been set, confirm the input by pressing the green start button.
7. The display for entering the welding time appears.



Setting the welding time

Display for manual entry of the welding time

8. When the display is shown, the cursor is active in line 2. The position of the cursor is indicated by regular flashing. Pushing the arrow buttons ▲ and ▼ will change the value of the currently selected digit of the welding time whereas pushing the arrow buttons ◀ and ▶ will move the cursor to the next digit.
9. After the desired value for the welding time has been set, confirm the input by pressing the green start button.
10. The following display is shown, in which the entered welding parameters are shown once more.



Start by pressing the green start button

Entered welding time

Entered welding voltage

Display for checking the entered parameters

Starting the welding procedure

11. To start the welding procedure with the displayed parameters press the green start button. If you want to cancel the process, you can press the red stop button at any time. In this case, the main display is shown again.



Description of the further procedure

The rest of the procedure is identical to that for welding with barcode input. The description of the further steps can be found in chapters 16.3.1 to 16.3.4.

17.6. Welding with manual input of the fittingcode

→ Make sure that the fitting is not connected in SmartFuse connection mode.

Open function menu

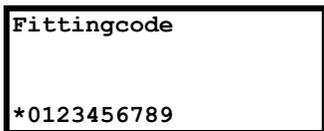
12. When the display shows the prompt "Fittingcode", press the enter button to enter the function menu.

13. Use the arrow keys ▲▼ to select the "Fittingcode" entry in the function menu.

14. Then press the enter button.

Manual input of the fittingbarcode

1. A number field appears for manual entry of the fitting barcode. Put in the numbers of the fitting barcode with the arrow buttons ◀▶ and the enter button. The operation resp. the input of characters with the number field is described in chapter 17.1.



Number field for the input

Number field

2. After complete input of the digits of a fittingbarcode press the green start button. If you want to cancel the process, you can press the red stop button at any time. In this case, the main display is shown again.



Note

If a valid fittingbarcode has been entered, the welding parameters are displayed in the following display. If the welding procedure is complete and the menu entry "Fittingcode" is selected again, the last entered fittingbarcode will still be present and shown in the display. Now you can proceed as follows:

- Pressing the red stop button: This deletes the digits of the last entered fittingbarcode and requires a new input.
- Pressing the green start button: This accepts the shown (last used) fittingbarcode and shows the welding parameters in the next display.



Description of the further procedure

The rest of the procedure is identical to that for welding with barcode input. The description of the further steps can be found in chapters 16.3.1 to 16.3.4.

18. Function menu

The menu contains a list of all available functions. The symbol < is the selection indicator that marks the entry that is selected or activated when the enter button is pressed.

Displaying the function menu

1. Press the enter button while the main display is shown or while you have contacted a fitting.

```

Connect Fitting
+++++Job number+++++
10.05.2019 11:12:00
                                10
  
```

Main display

```

Job no. <
USB
Erase reports
  
```

Function menu

2. The function menu is shown.

- Use the arrow buttons ▲ ▼ to move the selection indicator < up and down.
- Use the enter button to open the entry marked with the selection indicator <.
- Press the red stop button to cancel and return to the main display.

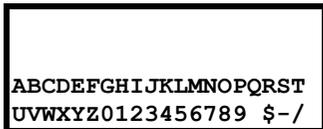
The following table shows the available functions.

Functions	Description	Page
Job no.	Entering a job number (commission number)	47
USB	Data transfer to a USB stick	48
Erase reports	Erasing the reports per job number	51
Man. Input	Manual input of welding voltage and -time	52
Fittingcode	Manual input of the fittingbarcode	53
Contrast	Setting of the display contrast	53
Volume	Setting the volume of the signal horn	54
System configuration	System configuration options	55

18.1. Using the letter field to enter data

To manually enter data a letter field will be displayed. Using the letter field to enter letters or digits is always done in the same way, which is why it is presented here comprehensively.

Using the letter field to enter data



First row for the input

Second row for the input

Available letters and numbers

Available letters and numbers

Letter field

The first two rows display the letters and numbers that have been entered. Depending on the function a default string may already be set. The last two rows list all available letters and numbers.

1. Entering a string of characters

When you begin, the first position is marked. The mark is indicated by flashing. Move the cursor (star *) under the character you want to enter by pressing the arrow buttons ◀ ▲ ▼ ▶. Enter the selected character using the enter button. The selected and entered character appears in the first row of the display at the flashing position. Enter all desired characters one by one.

2. Editing a string of characters

If you want to change a specific position in the displayed character string, move the selection indicator out of the letter field with the arrow button ▲. The star * disappears and you can move the flashing cursor by pressing the ◀ and ▶-buttons to any position in the already entered string. To change the marked character push the enter button to get the star * back in the letter field and proceed as described under 1).

3. Input of a string with a barcode reading device (if your electrofusion control unit has a reading pen/scanner)

You also can enter a string of characters by using a barcode which can be read using a reading pen or scanner. Move the flashing cursor, as described under 2) to the position to which the string in the barcode should be attached to and press the enter button to make the star * cursor appear in the letter field again. Now read in the barcode using a reading pen or scanner. The barcode is attached to the selected position and the cursor is placed behind it. You can read multiple barcodes in a row. If the entered barcode is too long to be attached or entered in the first row, the part which is too long will be ignored and not displayed! You can also use the alphanumerical code table in the appendix of this instruction manual. This code table is also available as an accessory sealed in a waterproof foil.

4. Finishing the input

Finish the input of the string by pressing the green start button. Alternatively, you can leave the letter field by pressing the red stop button to cancel the entry. In this case, your input will not be used for the following process.

18.2. Job no.

In this menu you can select a job number under which the following reports will be stored. Alternatively you can create a new job number with the help of a letter field. The job number may have a maximum of 40 characters.

18.2.1. Entering a job number (commission number)

1. Use the arrow keys ▲▼ to select the "Job no." entry in the function menu.
2. Then press the enter button to select the function.
3. The currently active job number is shown in the display.

+++++Job number+++++	Text of the job number
ABCDEFGHIJKLMNQRST	Available letters and numbers
UVWXYZ0123456789 \$- /	Available letters and numbers

Letter field

- Use the arrow buttons ▲▼ to switch to the already existing job numbers.
- Use the arrow buttons ◀▶ to move the flashing marker.
- Press the red stop button to cancel and return to the main display.
- With the green start button you set the displayed job number active.

18.2.2. Creating a job number (commission number)

1. When the flashing highlight is on a character that you want to change, press the enter button to move the highlight to the letter selection.



Note

When opening a job number, the input marker is already in the letter field. You can directly overwrite the first character. If you want to edit another character, bring the flashing selection into the text by pressing the arrow button ▲.

2. Use the arrow buttons ◀▶▼ to select the character you want to enter in the letter field and press the enter button.
3. The flashing selection automatically jumps one place further. Continue typing until you have entered the desired string. If you want to move the flashing selection during input, press the arrow button ▲ until it appears in the text above.
4. Press the green start button to save the new job number. This is then set as active.

OPTIONAL: Reading in a barcode that contains the job number.

The maximum length of the barcode may not exceed 40 digits (alphanumerical). Preferably, a barcode of type Code128, 2/5i or Code39 extended should be used.

The prompt that follows the successful reading in of a barcode should be acknowledged by pressing the green start button to accept the barcode. It will then be copied to the internal list and set as currently active job number (commission number). Finish your selection by pressing the green start button.

18.3. USB

Under the menu item "USB" you can transfer reports to a USB stick.



Note

Before selecting the menu item "USB", connect the USB stick to the USB interface of the electrofusion control unit.

After selecting the menu entry "USB" the electrofusion control unit checks if a device is connected. If this is not the case, an error will be shown.

Function	Memory	Appearance in PDF
All (short)	Whole memory (all reports)	Tabulated
All (long)	Whole memory (all reports)	1 page per report
Job no. (short)	Per job number	Tabulated
Job no. (long)	Per job number	1 page per report

When transferring the reports to a USB stick two files are created: one PDF file and one file with the extension "log", which contains the reports in CSV format.

PDF-Format

The electrofusion control unit generates a PDF file on the USB stick, which records the already formatted welding records. The PDF file can be opened with Adobe Acrobat Reader (Version 3.0 or higher; www.adobe.com).

CSV-Format

This format contains the report data in a tabular format, in which the report data is stored in one row each. The data fields are separated by semicolons. This file type can be opened by standard spreadsheet or database applications. However, we recommend that you use the EXCEL macro stored on the USB stick to import the data unaltered into an Excel spreadsheet. The macro is located on the enclosed USB stick in the directory </macro/en>. Also, read the manual for this macro, which is stored in the same folder. In addition, the content of the folder should be copied to a computer and the EXCEL macro should only be run from a local hard drive.

The CSV file can also be opened with the Datamatic software. To do so use the function "Open as text file" and select the appropriate file.

Storage location/Filenames: The electrofusion control unit creates a subdirectory </PFS> on the USB stick where the created files are saved. The file names are generated by the electrofusion control unit according to the following syntax: <PFnnnnn.PDF> for PDF files and <PFnnnnn.log> for CVS-files. <nnnnn> stands for an incremental numbering, which ensures that already existing files are not overwritten.



Attention

The USB flash drive is not suitable for permanent storage of data. Backup your data regularly.

18.3.1. Transfer reports to a USB stick



Attention

The functionality of the USB data transfer can only be guaranteed for the supplied USB stick.

If you use a different USB stick, it should match the following specifications to increase the probability of being compatible:

Storage capacity: max. 1 TB

File system: FAT32

1. Insert the supplied USB stick into the USB interface of the device. If you are using another USB stick, make sure that it is not write-protected.
2. Use the arrow keys ▲ ▼ to select the "USB" entry in the function menu.
3. Then press the enter button to select the function. After that, a display with the available printing options is shown.

The menu "USB"



Display in the "USB" menu

- Use the arrow buttons ▲ ▼ to move through the menu items.
 - Use the enter button to start the operation marked with the selection symbol <.
 - Press the red stop button to cancel and return to the main display.
4. Make your selection here. You can choose if you want to print all reports or only those that are stored under a certain job number. Navigate to the desired entry by pressing the ▲- and ▼- buttons and confirm the selection by pressing the enter button to begin data transfer.
 5. If you chose to transfer the reports per job number, select the respective job number with the arrow buttons ▲- and ▼ and confirm your selection with the green start button.
 6. The data transfer begins. During data transfer, the following message appears in the display. (The data shown here are but an example and are different depending on the conditions.)



Display during data transfer

File name

Dots appear when the last file is created

7. After successful data transfer the following display will be shown, if you chose to transfer all reports. This query does not appear in the case of job number-dependent transfer.



All Erase ?

Prompt for deletion after the data transfer

OPTIONAL: Deletion of the transferred reports

The prompt "Erase?", which is shown if all reports were transferred, makes it possible to delete all reports in the electrofusion control unit.

8. If you want to erase the reports, press the green start button. A confirmation prompt "Are you sure?" will be displayed.
9. If you confirm this prompt by pressing the green start button, the respective reports will be erased. The display then shows the function menu again.

OPTIONAL: Leaving the transmitted reports in the device's memory

10. If you do not want to delete the reports and leave them stored in the memory of the device, press the red stop button. The display then shows the function menu again.



Note

The prompt for deletion of the transferred reports only appears if "Secure data" is deactivated in the system configuration.



Attention

To avoid possible errors in the memory management or loss of data, ensure that the electrofusion control unit is not cut off from power during deletion of the reports. This could lead to the destruction of the electronics!

NEVER switch the electrofusion control unit off during the deletion of welding reports.

18.4. Erase reports

This function enables you to delete the reports that are stored in the electrofusion control unit. The reports can be deleted per job number. You can press the red stop button at any time. This will take you back to the main display.



Note

You can lock this option so that you are prompted for an access code when trying to access it. Refer to the chapter "Code Del." of the system configuration.



Attention

If you erase the reports of one job number then you will automatically delete the job number from the memory of the device. If you still need the respective job number, you must enter it again after the deletion.



Attention

To avoid possible errors in the memory management or loss of data, ensure that the electrofusion control unit is not cut off from power during deletion of the reports. This could lead to the destruction of the electronics!

NEVER switch the electrofusion control unit off during the deletion of welding reports.

1. Use the arrow buttons ▲ ▼ to select the "Erase reports?" entry in the function menu.
2. Then press the enter button to select the function.



Locking

You can lock this option so that you are prompted for an access code when trying to access it. Refer to the chapter "Code Del." of the system configuration.

If you have locked the erase function by activating the "Code Del." option in the system configuration you will be prompted for an administrator code. Such an administrator code can be found at the end of this manual. You can also obtain an administrator code on request from your dealer or the manufacturer.

Read in the administrator code using the reading pen/scanner or press the enter button to enter the code by using the letter field. If you use the letter field, press the green start button after the input to confirm the entered code.

If you have not locked the erase function in the system configuration ("Code Del." is deactivated by default) a display with job numbers will be shown after pressing the enter button.

The menu "Erase reports"

3. The following display is shown.

```
Job no.  
+++++Job number+++++
```

Display in the menu "Erase reports"

Erasing of reports that are stored under the selected job number

4. Select the job number that you want to erase and press the green start button.
5. After you have pressed the green start button, the following display will be shown.

```
Job no.  
+++++Job number+++++  
Erase ?
```

Display in the menu "Erase reports"

- Press the green start button to confirm the "Erase?" query.
 - Press the red stop button to cancel and return to the main display.
6. Confirm the following safety prompt "Are you sure ?" by pressing the green start button. The reports stored under the job code are erased and the job number is erased from the memory of the electrofusion control unit.

18.5. Man. Input

The menu item "Man. input" enables you to manually enter the welding parameters "welding voltage" and "welding time". The welding voltage can be set in the range of 8 V to 48 V and the welding time can be set in the range of 1 s to 9999 s.

1. Use the arrow keys ▲ ▼ to select the "Man. input" entry in the function menu.
2. Then press the enter button to select the function.



Menu is locked

If the "Code Man." option is activated in the system configuration, a prompt for a foreworker or administrator code appears when attempting to enter manual input. Scan a corresponding code to access the "Man. input" menu.

```
Welding voltage  
20.0 V
```

Manual setting of the welding parameters

- Use the arrow buttons ▲ ▼ to set the desired value for the voltage in volts.
 - Use the ◀ and ▶ arrow buttons to move the flashing selection to the next digit of the number.
 - Press the green start button to confirm the entry.
 - Press the red stop button to cancel and return to the main display.
3. Enter the desired welding voltage and welding time.



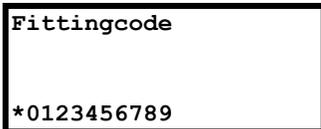
Description of the further procedure

For a description of the further procedure read chapter 16.5.

18.6. Fittingcode

This function offers the possibility to enter the code number of a damaged fittingbarcode manually.

1. Use the arrow keys ▲▼ to select the "Fittingcode" entry in the function menu.
2. Then press the enter button to select the function.
3. A number field appears for manual entry of the fitting barcode. Put in the numbers of the fitting barcode with the arrow buttons ◀▲▼▶ and the enter button. The operation resp. the input of characters with the number field is described in chapter 17.1. The asterisk marks which number will be entered when you press the enter button.



Number field for the input

Number field

- Use the arrow keys ◀▲▼▶ to move the flashing selection to the place you want to enter. After entering the "Fittingcode" menu, the flashing selection is in the first position.
 - Use the enter button to switch to the numbers available for input.
 - Press the green start button to confirm the input of the fittingcode.
 - Press the red stop button to cancel and return to the main display.
4. After entering the numbers of the fitting barcode, press the green start button to confirm. If the code is invalid, a signal will sound. Check the input



Description of the further procedure

For a description of the further procedure read chapter 17.6.

18.7. Contrast (Display)

This function enables you to adjust the display contrast to the lighting condition in your work area.

1. Use the arrow buttons ▲▼ to select the "Contrast" entry in the function menu.
2. Press the enter button to select the function.



Values between 100 and 4000

Setting of the contrast

- Use the arrow keys ▲▼ to set the desired value for the contrast.
 - Press the green start button to confirm the entry.
 - Press the red stop button to cancel and return to the main display.
3. When you have changed the contrast value, confirm this by pressing the green start button.

18.8. Volume

With this function you have the possibility to adjust the volume of the signal horn in three stages. The default setting is high.

1. Use the arrow buttons ▲▼ to select the "Volume" entry in the function menu.
2. Press the enter button to select the function.



Setting of the contrast

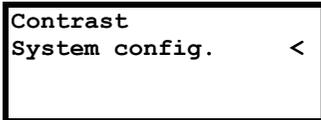
- Use the arrow keys ▲▼ to change to the desired volume.
- Use the enter button to accept the selected volume.
- Press the red stop button to cancel and return to the main display.

19. System config.

In the menu "System config." different settings and functions of the electrofusion control unit can be changed. Depending on the basic configuration of the device, it is possible that an unlocking- resp. administrator code is required to gain access to this menu. This restriction can be deactivated in this menu.

Accessing the system configuration

1. Use the arrow buttons ▲ ▼ to select the entry "System config." in the function menu.



Function menu

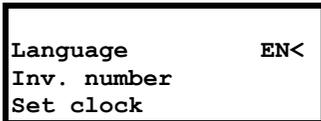
2. Press the enter button to select the function.



Menu is locked

If the "Code Sys." option is activated in the system configuration, a prompt for an administrator code appears when you try to access the system configuration. Scan a corresponding code to access the "System config." menu. Such an administrator code can be found at the end of this manual. You can also obtain an administrator code on request from your dealer or the manufacturer.

The system configuration



System config.

- Use the arrow buttons ▲ ▼ to move the selection indicator < up and down.
- Use the enter button to open the entry marked with the selection indicator <.
- Press the green start button to accept and save the current values and return to the main display.
- Press the red stop button to cancel and return to the main display.

19.1. Menu navigation

The electrofusion control unit has numerous functions that can be activated and deactivated without a submenu.

- Use the arrow buttons ▲ ▼ to move the selection indicator < up and down.

1. Press the enter button to change the status of the option.

- A + means that the option is active.
- A - means that the option is inactive.

2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

The following table shows the available functions.

Functions	Description	Value	Page
Language	Setting the display language	Short code for language	56
Inv. number	Issuing an inventory number for the electrofusion control unit	Number	57
Set clock	Setting of time and date	Time	57
Update	Function for updating the device software via USB	-	57
Memory control	Memory control	ON/OFF	57
Daylight time	Automatic changeover for summer and winter time	ON/OFF	58
Workercode	Mandatory input of a workercode after switching on the electrofusion control unit	ON/OFF	58
Weldername	Prompt for a welder name after switching on the electrofusion control unit	ON/OFF	58
Job no.	Mandatory input of a job number	ON/OFF	58
Weather condition	Mandatory input of the weather conditions	ON/OFF	59
Joint number	Mandatory input of a joint number	ON/OFF	60
Traceab. code	Mandatory input of a traceability code of a fitting	ON/OFF	60
Pipe code	Mandatory input of pipe code 1 and 2 as well as optionally pipe code 3 or geo-information	ON/OFF	61
Pipe length	Mandatory input of the pipe lengths	ON/OFF	61
Trench depth	Mandatory input of the trench depth	ON/OFF	62
South	Summer-/Winter time for the southern hemisphere	ON/OFF	62
Cont. numbers	Consecutive numbering of the reports	ON/OFF	62
SmartFuse	Switch SmartFuse on/off	ON/OFF	62
Code Lock	Activate the locking functions of the controller	ON/OFF	63
Code Sys.	Locking of the system configuration	ON/OFF	63
Code Man.	Mandatory input of an unlocking- resp. administrator code when trying to access manual input of welding parameters	ON/OFF	64
Code Del.	Locking the option for erasure of reports	ON/OFF	64
Secure data	Mandatory input of a code when trying to access report erasing function	ON/OFF	64
BT on	Switching Bluetooth on and off	ON/OFF	65
BT only	Operation of the device only possible by app via Bluetooth	ON/OFF	65

19.2. Language

1. A list of available languages appears.
2. Use the arrow buttons ▲▼ to select the desired language and press the green start button to apply the setting. Confirm the following safety prompt "Are you sure ?" by pressing the green start button.

→ Press the red stop button to cancel and return to the main display.

19.3. Inv. number

The inventory number can be defined to identify the electrofusion control unit in your stock. The inventory number can be defined to identify the electrofusion control unit in your stock. You can use the displayed letter field for input or use a barcode together with the reading pen/scanner. The entered inventory number will be shown on the reports.

1. Use the letter field for input of the desired inventory number.
2. A letter field appears for manual input of the inventory number. Enter the numbers of the inventory number here using the arrow buttons ◀▲▼▶ and the enter button. The operation resp. entry of characters with the letter field is described in detail in chapter 17.1.

- With the green start button the entered inventory number is set active.
- Press the red stop button to cancel and return to the main display.



Setup

By default the device number of the electrofusion control unit is set as inventory number.

19.4. Set clock

After selecting the set clock function from the system configuration menu the display will show the current time and date.

1. The flashing mark is on the first number.
 - Use the arrow keys ▲▼ to change the currently marked value.
 - Use the arrow keys ◀▶ to move the flashing selection to the place you want to enter.
 - Press the green start button to confirm the entry.
 - Press the red stop button to cancel and return to the main display.
2. Set the time and date accordingly.
3. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.5. Update

The update function can be used to update the software of the device in case of a problem. This function is intended for trained personnel only. Should it be necessary to use this function in an exceptional case, you will receive support from your sales partner or PF Schweißtechnologie GmbH.

19.6. Memory control

When the memory control option is activated, the electrofusion control unit will not begin another welding procedure as soon as the internal memory is full. This can help to prevent an unintentional loss of data. In any case, you are warned by a display message when switching the electrofusion control unit on as soon as there less than 50 free report spaces available.

1. Press the enter button to change the status of the option.

19.7. Daylight time

With this option, you can activate or deactivate the automatic changeover for summer and winter time. If the automatic changeover is active on the 21st of March resp. on the 21st of October a prompt "Change time" will be shown each time the device is switched on. If the prompt is confirmed by pressing the green start button the respective changeover will be made. If you press the red stop button, the changeover will not be made and the prompt will reappear the next time the device is switched on.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.8. Workercode

The worker code is used to identify the user of the electrofusion control unit. If the function is activated, only users with a worker code can use the electrofusion control unit. If the welder code prompt is activated, the electrofusion control unit prompts for the welder code after switching on.

The welder code can be obtained in three different authorization levels from the manufacturer:

Level	Permission
Welder	Welding with barcode and SmartFuse system
Foreman	Welding with barcode, SmartFuse-system and manual input of the welding parameters.
Administrator code card	Welding with barcode, SmartFuse-system and manual input of the welding parameters and the right to change settings of the system configuration.



Note

This function requires the user to hold a valid worker code according to manufacturer specifications or ISO 12176-3.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.9. Weldername

If this function is activated, a prompt for entering a welder name is shown after switching on the electrofusion control unit. The can be entered with the help of the displayed letter field.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.10. Job no.

If this function is activated, a prompt for the input/selection of job number, under which the report will be stored, is displayed after connecting a fitting. The job number can consist of numbers and letters.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

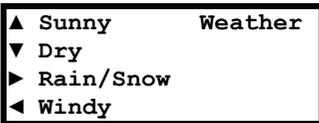
19.11. Weather condition

If this function is activated, it can be used to enter the weather condition and protective measures against it according to DVS 2208. The input in two levels must be done each time the electrofusion control box is switched on:

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

Setting the weather option

After turning on the device, you must first enter the current weather. Press the arrow buttons to select or deselect entries. Active entries are marked by a star.



Prompt for weather condition



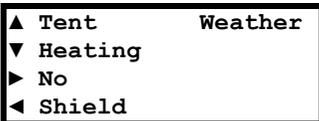
Note

You can select multiple entries. Press the respective arrow button.

→ Press the green start button to confirm the entry.

Entering the protective measures

Mark the entry that describes the applied protective measure best. You can select multiple entries.



Prompt for protective measures

→ Press the green start button to confirm the entry.

19.12. Joint number

If this function is activated, you can manually add a 6-character joint number to a weld.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

Prompt for the joint number

If this function is activated, the input of the joint number is prompted after the input of a fittingcode:

```
Joint number
000001
ABCDEFGHIJKLMNQRST
UVWXYZ0123456789 $-/
```

Prompt for the joint number

3. Enter the joint number with the letter field.



Note

If "Joint number" is activated, the entered joint number will incrementally be increased by 1 for the next weld. You can enter a different joint number anytime.

19.13. Traceability code

If this function is activated, a prompt for the traceability code for the fitting will be shown after the input of a fittingcode (before the welding procedure begins). This code can be used to trace the used fittings from a manufacturer.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

Prompt for the traceability code

```
Traceab. code

*0123456789
```

First row for the input

Second row for the input

Number field

Prompt for the traceability code

When this display is shown, you have the following options to continue.

- Reading in the traceability code as a barcode with a reading pen/scanner.
- Manual input of the traceability code via a number field. Press the enter button to show the letter field. After the input is complete, confirm by pressing the green start button.
- Press the green start button to confirm the entry.

When you have entered the traceability code or skipped its input the display shows the next prompt. Which prompt comes next is highly dependant on the system configuration.

19.14. Pipe code

If this function is activated a prompt for the input of the pipe codes for the pipes to be welded is shown after the input of a fittingcode (before beginning the welding procedure).

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

Prompt for the pipe code

When this display is shown, you have the following options to continue.

- Reading in the pipe code as a barcode with a reading pen/scanner.
- Manual input of the pipe code via a numeric field. Press the enter button to show the letter field. After the input is complete, confirm by pressing the green start button.
- Press the green start button to confirm the entry.

After that, a prompt for the pipe length of the first pipe will be shown, if this function is activated in the system configuration. Alternatively, a prompt for the second pipe code follows. The input procedure is identical to the one for the first pipe code.

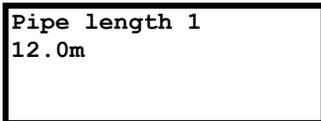
19.15. Pipelength

If this option is activated, a prompt for the input of the pipe length of the first and second pipe is displayed after the input of the fittingcode.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

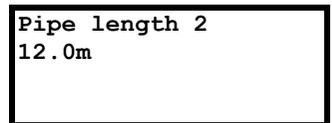
Prompt for the pipe lengths

The length of pipes 1 and 2 are scanned queried after the other.



Pipe length 1
12.0m

Prompt for the first pipe length



Pipe length 2
12.0m

Prompt for the second pipe length

When this display is shown, you have the following options to continue.

- Use the arrow keys ▲ ▼ to change the currently marked value.
- Use the arrow keys ◀ ▶ to move the flashing selection to the place you want to enter.
- Press the green start button to confirm the entry.
- Press the red stop button to cancel and return to the main display.

3. Set the pipe lengths accordingly.
4. To save the setting, confirm your entry with the green start button.

19.16. Trench depth

If this option is activated, a prompt for entry of the trench depth will be displayed before each welding procedure. The entered value for trench depth will be stored in the report for each weld.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

Prompt for trench depth

When this display is shown, you have the following options to continue.

- Use the arrow keys ▲▼ to change the currently marked value.
 - Use the arrow keys ◀▶ to move the flashing selection to the place you want to enter.
 - Press the green start button to confirm the entry.
 - Press the red stop button to cancel and return to the main display.
3. Enter the trench depth for the pipeline.
 4. To save the setting, confirm your entry with the green start button.

19.17. South

If this option is activated the automatic changeover between summer and winter time will be done like on the southern hemisphere. Deactivate this option if you are on the northern hemisphere.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.18. Cont. numbers

If this option is activated, the reports will be numbered consecutively. If this option is deactivated, the numbering for each job number begins at 0001.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.19. SmartFuse

If this option is deactivated, the electrofusion control unit will not try to measure the SmartFuse resistor in the contact of a connected fitting.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.20. Code Lock

When activating this function the controller checks, if already activated locking functions (depending of the type of controller "Code Sys.", "Code Man.", "Code Del." and "Secure Data") are sufficient to ensure, that their deactivation can only be done after entering an administrator code to access the system configuration. That way an efficient security measure can be set to prevent, that locking functions can be easily deactivated (bypassed) in the system configuration.

If "Code Lock" is deactivated, the electrofusion control unit can be freely configured to your liking. It is then possible that, for example, "Code Man." can be activated without locking the system configuration by activating "Code Sys." as well.



Attention

This option can be preset, depending on the device type. Contact your retailer or the manufacturer of the electrofusion control unit before activating this option.

In any case you will need an administrator code for accessing the locked functions if this option is activated and "Code Sys." is also active.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.



Note

Please note, that when activating this option, independently from other options that may already be active, "Code Sys." will automatically also be activated. This prevents, bypassing and deactivating of locking functions in the system configuration without an unlocking- or administrator code.

19.21. Code Sys.

If this option is activated, the system configuration can only be accessed after entering an unlocking- resp. supervisorcode. If this option is deactivated, each user can change the system configuration. By activating this option, only users with the respective access level can change the system configuration.



Attention

This option can be preset, depending on the device type. Contact your retailer or the manufacturer of the electrofusion control unit before activating this option.

In any case you will need an unlocking- or administrator code for accessing the system configuration if this option is activated.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.



Attention

If "Code Lock" and "Code Sys." are active and "Code Sys." is deactivated, "Code Man.", "Code Del." and "Secure data" will be deactivated automatically as well.

This shall show the user that by deactivating "Code Sys." there will be no sufficient safeguard against manipulation anymore. Without the prompt for the administrator code before getting access to the system configuration the locking functions can easily be deactivated by any user.

19.22. Code Del.

If this option is activated you will have to enter an access code when trying to access the "Erase reports" entry in the device menu.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.



Attention

If "Code Lock" is active when "Code Del." is activated, "Code Sys." will be activated automatically. This ensures, that reports can only be deleted from the memory of the electrofusion control unit if an administrator code is entered beforehand. In addition, "Code Sys." prevents access to the system settings without an administrator code.

19.23. Code Man.

If this option is activated, the manual input of the welding parameters "Manual input" can only be displayed after reading in a foreworker or administrator code. By activating this option, only users with the respective access level can enter welding parameters manually.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.



Attention

If "Code Lock" is active when "Code Man." is activated, "Code Sys." will be activated automatically. This ensures that the welding parameters "Welding voltage" and "Welding time" can only be entered manually if an administrator code is entered beforehand. In addition, "Code Sys." prevents access to the system settings without an administrator code.

19.24. Secure data

If this option is enabled, then no prompt appears after the report transmission as to whether the reports just transmitted should be deleted. This prevents deletion by unauthorised personnel.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.



Attention

If "Code Lock" is active when "Secure data" is activated, "Code Sys." and "Code Del." will be activated automatically. This ensures, that reports can only be deleted from the memory of the electrofusion control unit if an administrator code is entered beforehand. In addition, "Code Sys." prevents access to the system settings without an administrator code.

19.25. BT on

If this option is activated, the electrofusion control unit can be detected by other devices via Bluetooth. Pairing with a smartphone or tablet that runs Android or iOS and is connected to the internet is now possible. After successful pairing you can control the electrofusion control unit by using the PFS app.



Attention

Without prior registration, the connection to the electrofusion control unit will not be possible.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

19.26. BT only



Attention

If this option is activated, the electrofusion control unit can only be controlled by the app via Bluetooth. To deactivate this option after a restart, you must have permission to access the system configuration.

- If this option is enabled, the "Code Sys." option is automatically enabled as well.
- If this option is enabled, the "BT on" option is automatically enabled as well.

1. Press the enter button to change the status of the option.
2. To save the setting, confirm your entry and the subsequent security prompt "Are you sure?" with the green start button.

20. Operating the scanner



Attention

Make sure that you use the electrofusion control unit on a socket that provides a protective earthing conductor.

If you work with a generator, make sure that it is grounded.

Otherwise, there may be problems with the scanner when reading a barcode.

1. Press the front button of the scanner. This activates the lighting and shows a red target help line.
2. Press and hold the button and aim vertically at the barcode. Depending on the size of the barcode label, you will have to try different distances until the reading succeeds.
3. If the scan does not succeed immediately, hold the activated scanner close to the label. With the scanner activated, slowly increase the distance to the label. This allows you to determine the correct distance for reading.



Note

The electrofusion control unit has a test code. It is located on the foil keypad. If you have any doubts about the correct operation of the scanner, read the test code while the main display is shown. If the last line says "Test code ok" after reading, the scanner is functional.

21. Maintenance and troubleshooting



Important information about your safety

You are responsible!

All safety instructions in this instruction manual and the generally applicable measures for accident prevention must be adhered to.

The product, its components and accessories must be handled with care and maintained regularly in order to achieve the best possible work result.

NOTE



Maintenance work

All maintenance beyond the removal of simple mechanical disturbances, such as for example disassembling the product into its components, may only be performed by the manufacturer or an authorized service center within the first 24 months of purchase. If you are unsure whether you are allowed to perform a particular activity, please contact your dealer or the manufacturer.

For safety reasons, even after the expiry of the 24 months, we strongly advise that repairs and maintenance be carried out only by the manufacturer or an authorized service station.

Tampering with components of the product without prior consultation of your dealer or the manufacturer may compromise safety and is therefore considered improper use.

In all correspondence, please provide the serial number (S/N) as shown on the type plate of the tool.

21.1. Qualification of personnel



Maintenance and repair

Only personnel with user and specialist knowledge in handling the product may service this according to the specifications.



Cleaning

The personnel responsible for the cleaning must at least have read and understood the safety instructions. Furthermore, it is only necessary that the generally valid procedures and safety regulations are observed when handling power tools.

21.2. Maintenance by laymen

Laymen should not perform any work on the product without the supervision of experienced people or professionals. Under supervision, laymen may carry out the following maintenance work on the product:

- Remove dirt and grime with a soft cloth or cotton bud.
- General cleaning work
- Checking the welding contacts for cleanliness and sufficient contact force

21.3. Maintenance by specialists

The manufacturer and service stations approved by the manufacturer are able to carry out all necessary maintenance and repair work that will bring your product to a technically sound and safe condition. The following activities may only be carried out by the manufacturer or an authorized service station:

- Replacement of components that require disassembly of the product.

21.4. Maintenance cycles for safe operation

Please note that the product is a technically demanding machine for field application. In accordance with the product-specific applicable standards and regulations in your country (eg DGVV V3), this must be regularly checked and maintained. The maintenance interval is 12 months, with heavy use shorter intervals are recommended.



Damage due to poor maintenance

If maintenance and service is omitted and maintenance intervals are exceeded, damage to the product or other property damage may result from product use.

Regular cleaning, checks and maintenance of the maintenance cycle can avoid this.

21.5. Measures after maintenance or servicing

After maintenance or servicing, be sure to inspect all safety features of the product and to ensure that the product functions properly and safely. Do not work with the product without prior checking.

21.6. Cleaning

To achieve an optimum work results the electrofusion control unit has to be handled with care and maintained frequently. Pollution by sand and dirt has to be avoided or, if necessary, removed with a soft cloth or a Q-tip.

21.7. Replacement of the welding terminals



Attention

Switch off the electrofusion control unit and disconnect it from the mains supply or generator!

The welding terminals should be checked on a regular basis and, if necessary, replaced as soon as they are damaged or lose contact force.

Exchange for straight welding terminals

1. Pull off the red resp. black PVC cap.
2. Hold the front part of the brass contact with a pipe wrench and screw the welding terminal out of the brass socket by using a 7 mm wrench.
3. If your electrofusion control unit is SmartFuse-capable, then note that, when changing the welding terminals, the red terminal contains a probe tip! Only use spare parts and welding terminals provided by PFS.
4. Screw a new terminal plug into the brass piece. Check for firm fit.
5. Shove the PVC cap back over the welding terminal. Approximately 15 mm of the terminal must stand out of the PVC cap.

Exchange for angled welding terminals

1. Hold welding terminal and unscrew it using a 7 mm open-end wrench.
2. If your electrofusion control unit is SmartFuse-capable, then note that, when changing the welding terminals, the red terminal contains a probe tip! Only use spare parts and welding terminals provided by PFS.
3. Screw in a new terminal plug. Make sure that the SmartFuse measuring tip is exactly centered.
4. Hand-tighten the welding terminal with the 7 mm open-end wrench.

21.8. Replacing the scanner

You can change the Scanner yourself if it repeatedly fails to read in a valid barcode. Proceed as follows.

1. Unscrew the scanner cable from the coupling on the case of the electrofusion control unit.
2. Screw the cable of the new scanner to the coupling on the case of the electrofusion control unit.
3. Perform a function test with the new scanner. You can use the test code on the front foil of the electrofusion control unit for this purpose.

22. Error messages E1-E30

Error messages are indicated by a bleep. A permanent bleep can be interrupted by pressing the red stop button.

Code	Error	Cause	Reaction
-	Emergency cut-out	Welding was interrupted by pressing the red stop button	Welding is faulty! Start the welding process again with a different fitting.
-	Memory overflow	Report memory is full	Print reports or deactivate the memory control option.
-	System error	Selftest has detected an error in the system.	Immediately disconnect the device from the power supply. Do not connect the device to the power supply. Send it to a service point.
-	Clock error	Internal clock does not work properly	Set clock, change battery if necessary
-	Service	The recommended service interval of 12 months or 200 working hours are exceeded.	The device must be serviced by certified personnel or a service point. The device remains usable. The manufacturer is not liable until the device has undergone maintenance.
E1	Contact error	Invalid SmartFuse resistance value	Clean terminals, use another fitting if possible
E2	Power failure	Last welding was interrupted by a break of the power supply.	Welding is faulty! Prepare pipes again and use new fitting! Consult the dealer or manufacturer.
E3	No contact	No sufficient electrical contact with the fitting	Check connection (welding terminals and welding contacts) to fitting.
		Heating coil or welding cable is defect	Use another fitting Replace welding cable Consult the dealer or manufacturer.
E4	Clean SmartFuse tip	Measuring tip of SmartFuse welding terminal is dirty	Check / clean welding terminal
E5	Code error	Faulty input	Move the reading pen over the barcode in a continuous move with constant speed.
		Barcode defect or error in code structure	Verification by manual input of the barcode digits
E6	Temperature error	Ambient temperature is out of limit (-10 to +50 °C)	Set up tent or take other measures to protect from heat. If the outside temperature is too cold, use heating.
E7	Temp. meas. error	Temperature measurement is faulty Welding cable or temperature sensor damaged/defective	Plug in the removable welding cable again. Switch the device off and on again. Welding cable or sensor defect
E8	Resistance error	Fitting resistance is out of the range of operation	Use a electrofusion control unit suitable for the fitting.
		Fitting resistance is out of the valid working range when using barcode input	Potentially faulty fitting. Use a new fitting. Consult the dealer or manufacturer.
E9	Device too hot	Temperature of transformer is too high	Let the device cool down for about 45 min
E10	Frequency error	Input frequency out of working range (40-70 Hz)	Check generator.
E11	Interturn short circuit	Current increases during welding by more than 15 % Short circuit in the heating coil	Welding is faulty! Consult the dealer or manufacturer.
E12	Input volt. low	Input voltage < 190 V	Fully unwind mains supply cord, use mains supply cord with suitable cross section, readjust generator voltage
E13	Input volt. high	Input voltage > 300 V	Adjust generator voltage to 260 V
E14	Peak Error	Peak value of the input voltage too high	Check generator
E15	Output volt. error	The output voltage deviates from the rated value. Generator RPM fluctuating or power too weak.	Check generator!
E16	Current error (DUALMATIC)	Input voltage too high, resistance of the load too low	Check generator, use new fitting

Code	Error	Cause	Reaction
E17	Current low	Momentary interruption of welding current	Welding is faulty!
		Current drops about 15-20 % within 3 s	Consult the dealer or manufacturer.
E18	Current high	Output current is more than 15% higher than the starting current.	Short-circuit in the heating coil or welding cable If possible, test with another welding cable Consult the dealer or manufacturer.
E19	Stop button	The red stop button was pressed during the welding process.	Welding is faulty! Start the welding process again with a different fitting.
E20	Short circuit	Fault in electronics	Contact service
E21	Power error	Output power too high	Start the welding process again with a different fitting.
E22	CONTACT ERROR	Problem with the welding terminal	Contact service
E23	Input current too high	Input voltage is too low, causing the current to rise.	Check voltage source Use an extension cable with a larger cross-section
E24	BAD CONTACTS	Problem with the welding terminal	Contact service!
E25	Out of range	Power demand of coupler is too high for the controller.	Use a more powerful controller to weld this coupler.
E26	EMI Error1	Electronic out of order or defect	Contact service!
E27	EMI Error2	Electronic out of order or defect	Contact service!
E28	Current too high stage 1	(MAMMUT) Current too high	Contact service!
E29	Current too high stage 2	(MAMMUT) Current too high	Contact service!
E30	Voltage error in output stages	(MAMMUT) Load too high	Check voltage source Increase input voltage Contact service!

22.1. Error messages E250-E285

These are advisory messages that appear after the electrofusion control unit is switched on. These indicate that a change was made to the system settings before the last switch-off. The error code appears as well as information about which system settings have been changed.

22.2. Bluetooth error messages

Errorcode	Cause	Reaction
Checking BT module	Connector loose, defect in Bluetooth module	Restart the device and repeat action.
		Electrofusion control unit must be checked.
BT module not found	Connector loose, defect in Bluetooth module, Bluetooth module not available	Restart the device and repeat action. Electrofusion control unit must be checked.

23. Maintenance and service by the customer service

The maintenance and the related checks are important for your safety and the continuous working reliability and safety of the product. Should the product, its components or accessories fail despite the great care taken in manufacturing and testing it, the necessary repairs should only be carried out by an after-sales service centre authorised by the manufacturer.

Have this product serviced only by a qualified person authorized by the manufacturer and only with original spare parts. This ensures that the safety of the product is maintained.

During maintenance, the product will be upgraded to the current technical standard of our devices and you get a 3-month guarantee on function for the maintained tool, excluding wearing parts.

23.1. Wearing parts

The following components of the product are wearing parts. These components may wear out through use. These parts are not covered by the 24-month warranty or the 3-month functional warranty after maintenance by the manufacturer or a service station authorized by the manufacturer.

- Welding contacts

23.2. Addresses of service stations

Always contact your dealer or the manufacturer of the product.

23.3. Repackaging before transport

If the product is to be transported after use, it must be packed again in the packaging (boxes, suitcases) provided. This ensures that the product is best protected against transport damage.

24. Decommissioning, Disassemble, Disposal

The products, its components and accessories must be disposed of in an environment-friendly way sorted by materials. For products with hydraulic drive: Make sure that hydraulic oil and other lubricants are disposed of properly.

24.1. Environment-friendly disposal

24.1.1. General



EU countries only

According to the European Directive 2012/19/EU, power tools that are no longer usable must be collected and reused in an environmentally friendly manner. According to the European Directive 2006/66/EC, the same applies to defective or used rechargeable batteries/batteries.



All electrical devices of PF Schweißtechnologie GmbH, are marked with the symbol of a crossed-out garbage can. This symbol indicates that this device must not be disposed of with household waste.

PF Schweißtechnologie GmbH is registered with the German registration body EAR under the WEEE registration number 27521436. You are welcome to return your old device to us and we will take care of the disposal. Alternatively, upon request, we will be happy to provide you with the name of the nearest sales partner who can dispose of your old device for you.

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24.1.2. Batteries and accumulators

According to the Battery Ordinance, you as the end user are legally obligated to return all used rechargeable batteries and batteries. Disposal via household waste is prohibited!



The adjacent symbol indicates rechargeable batteries and batteries whose disposal in the household waste is prohibited. The following designations stand for the decisive heavy metal. These are affixed to the batteries and accumulators in question.

Pb = Lead, Cd = Cadmium, Hg = Mercury, Li = Lithium

Always return your used rechargeable batteries and batteries to an authorized collection point. In this way, you fulfill the legal obligations and protect the environment.



Batteries and accumulators with lithium

To dispose of batteries and rechargeable batteries with lithium content, always contact a local specialist company. If disposed of or handled incorrectly, these batteries and accumulators can cause serious injury and fire. Never ship batteries and rechargeable batteries with lithium content without prior consultation with the carrier as well as the recipient.

25. Declaration of conformity

We declare herewith under our sole responsibility, that the product described under "Technical data" is compliant to the following standards or normative documents:

Document	Description	Edition	Classification
2006/95/EEC	Low-voltage directive	2007	D

This declaration loses its validity as soon as changes are made to the product without consulting the manufacturer first.

Technical documentation is available at: Achim Spychalski-Merle, CEO
PF-Schweißtechnologie GmbH
Karl-Bröger-Str.10
36304 Alsfeld
Germany

Place, date Alsfeld, 10.05.2019

The declaration printed here represents only an extract. The full document can be provided to you on request.

26. Alphanumeric code table

		
A	B	C
		
D	E	F
		
G	H	I
		
J	K	L
		
M	N	O
		
P	Q	R
		
S	T	U
		
V	W	X
		
Y	Z	

		
Space	/	1
		
2	3	4
		
5	6	7
		
8	9	0
		
\$	-	

26.1. Administrator code

If access to the system configuration is blocked, you can read in this code to gain access.



27. PLASSON subsidiaries worldwide

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General



Read complete manual!
Observe fitting manufacturer's installation guide!
Follow national and international directives!

Cleaning



Wipe around the pipe!
Use approved cleaning agent!
Use lint-free clothes!

Marking



Do not touch the cleaned welding areas!
Mark insertion depth of fitting!
Use approved markers!

Peeling



Remove dirt from the pipe!
Mark welding area!
Use rotational peeler tools only!

Alignment



Use proper alignment tools!
Avoid mechanical stress on pipes and fitting!
Wait for cooling before pressurising!



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