

Operating instructions

Biogas feed system



We are Fliegl.



**Read these operating instructions before start-up and observe them at all times!
Retain for future reference!**

Contents

Contents	3
Identification	7
EC Declaration of Conformity	8
1. User instructions	9
1.1 Purpose of this document.....	9
1.2 Locations in the operating instructions	10
1.3 Duty to inform	10
1.4 Illustrations used.....	10
1.5 Cross references	10
1.6 Terminology: "machine".....	10
1.7 Figures.....	10
1.8 Conversions or modifications	11
1.9 Replacement and wear parts and auxiliary materials	11
1.10 Product monitoring	11
1.11 Presentation of safety instructions	11
1.12 Liability and damages.....	12
1.13 Duty to inform	12
2. Basic safety instructions.....	13
2.1 Designated use.....	14
2.2 Reasonably foreseeable misuse	15
2.3 Service life of the machine	15
2.4 Risks when working with the machine.....	16
2.5 Overview – warnings and hazards	16
2.5.1 Warning against hazardous electrical voltage.....	16
2.5.2 Warning against automatic start-up.....	16
2.5.3 Warning against crushing hazard.....	16
2.5.4 Warning against trip and fall hazard.....	17
2.5.5 Warning against potentially explosive atmosphere	17
2.5.6 Risk of eye damage.....	17
2.5.7 Danger due to residual energy	18
2.6 Residual risks	18
2.7 Obligations of the operating company.....	18
2.8 Obligations of personnel.....	18
2.9 Qualification of operating personnel.....	19
2.10 Qualification of specialist personnel	19
2.11 Personal protective equipment.....	20
2.12 Operational safety	20
2.12.1 Operation without correct start-up	20

Contents

2.12.2	Safeguarding perfect technical condition.....	20
2.12.3	Danger due to machine damage	20
2.12.4	Technical limits	21
2.13	Safety and protective devices.....	21
2.13.1	Location of the Safety and Monitoring Equipment.....	21
2.13.2	Emergency stop device.....	21
2.13.3	Description of additional safety and protective devices.....	21
2.13.4	Faulty protective devices	22
2.13.5	Inspecting safety and protective devices	22
2.14	Workstation of operating personnel.....	22
2.15	Danger areas	22
2.15.1	Hazards on the feed system	23
2.16	Machine labelling	24
3.	Description of the machine.....	25
3.1	Applications	25
3.2	Design variants	25
3.2.1	SteelPro container in steel.....	25
3.2.2	PolyPro container in plastic	27
3.2.3	Rondomat or double Rondomat	29
3.2.4	Ökomat container in steel.....	30
3.2.5	Ökomat container in stainless steel.....	30
3.2.6	Hydraulic unit	31
3.3	Scope of delivery	31
3.4	Functional description.....	32
3.5	Layout of the machine	32
3.5.1	Overview – assemblies and components.....	33
3.5.2	Assembly 7	33
3.5.3	Push-off system.....	34
3.5.4	Feed process	34
3.5.5	Control system.....	34
3.6	Technical data – standard equipment	35
4.	Transport and installation	36
4.1	Transporting the machine to the installation location	36
4.1.1	Means of transport.....	36
4.1.2	Before transport	36
4.1.3	Transporting the machine	36
4.2	Setting up and assembling the machine.....	37
4.2.1	Setup.....	37
4.2.2	Assembly	37
5.	Supply and installation	39

5.1	Electrical connection.....	39
5.1.1	Procedure	39
5.2	Hydraulic connections	39
5.2.1	Procedure	39
5.2.2	General safety instructions for the hydraulic system.....	40
6.	Start-up.....	41
6.1	First-time start-up	41
6.1.1	Safe start-up of the biogas plant	42
6.2	Check before start-up	42
6.3	Returning to service.....	42
7.	Preparation and setup.....	43
7.1	General information	43
7.2	Feeder auger	43
8.	Control and display elements.....	44
8.1	Location of the control and display elements	44
8.1.1	Mains isolator	44
8.1.2	List of control faults.....	44
9.	Use and operation.....	45
9.1	Before operation	45
9.2	Switching the machine on and off	45
9.2.1	Switching on the machine	45
9.2.2	Switching off the machine	46
9.3	What to do in an emergency	46
9.3.1	Emergency stop.....	46
9.3.2	Emergency switch-on	46
9.4	Operating modes	47
9.4.1	Reversing the push-off system (manual mode)	47
9.4.2	Automatic.....	47
9.4.3	Electric control monitoring options	47
9.4.4	Display types	48
9.5	Working with the machine	48
9.5.1	General safety and operating instructions.....	48
9.6	Conducting a trial run	50
10.	Service and maintenance	51
10.1	Customer service.....	51
10.2	Replacement parts	51
10.3	Instructions for maintenance	51
10.4	Operational maintenance	52
10.4.1	General instructions for maintenance.....	52
10.4.2	Cleaning the machine.....	53

Contents

10.4.3	Checking the safety devices	54
10.4.4	Checking the display elements	54
10.4.5	Checking the monitoring equipment	54
10.4.6	Auxiliary and operating materials	55
10.4.7	Lubricating points with lubricating nipples	55
10.5	Replacing the lower bearing of the feeder auger (option)	56
10.6	Replacing the feed pipe and feeder auger	56
10.7	Tightening torque for screws	57
10.8	Troubleshooting and fault elimination	58
10.8.1	List of warning and fault signals	58
10.8.2	Control unit activation not possible	60
10.8.3	Start activation not possible	60
10.8.4	Automatic start not possible	60
10.9	Decommissioning	61
10.9.1	Temporary shutdown	61
10.9.2	Storage conditions	61
10.9.3	Disassembly and final shutdown	61
10.9.4	Scrapping and recycling	61
11.	Appendix	62
11.1	Conversion table	62
	Permit for potentially explosive areas	63
	Index	64

Identification

Machine identification data

Manufacturer:	Fliegl Agrartechnik GmbH
Product:	Biomat, Rondomat and Ökomat
Type:	SteelPro Polypro (Double) Rondomat Ökomat

Manufacturer

Fliegl Agrartechnik GmbH
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 0
Fax: +49 (0)8631 / 307 - 550
E-mail: info@fliegl.com
Website: www.fliegl-agrartechnik.de

Back office & technical support

Fliegl Dosiertechnik
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 351
Fax: +49 (0)8631 / 307 - 552
E-mail: dosiertechnik@fliegl.com
Website: www.fliegl-dosiertechnik.de

Service & assembly

Service:

Fliegl Dosiertechnik
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 351
Fax: +49 (0)8631 / 307 - 552
Mobile: +49 (0)178 / 2008800
E-mail: dosiertechnik@fliegl.com

Local dealer & customer service:

<div>Enter dealer & customer service contact details here</div>

Formal details of operating instructions

Document no.:	7-600B04212.0
Version/revision:	2.0
Creation date:	28/11/2010
Last revision:	23/11/2021

©Copyright Fliegl, 2021 All rights reserved. Reproduction, in whole or in part, is only permitted with the approval of Fliegl.
We are constantly developing and enhancing our products and therefore reserve the right to make changes to them without prior notice.
This may result in differences in the illustrations and descriptions in this document.

Declaration of conformity

EC Declaration of Conformity

As stipulated in EC Machinery Directive 2006/42/EC, Annex II, 1.A (ORIGINAL)

Manufacturer:

Fliegl Agrartechnik GmbH
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Person residing in the European Community authorised to compile the relevant technical documentation:

Josef Fliegl jun.
Fliegl Agrartechnik GmbH
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Description and identification:

Product: Biomat, Rondomat and Ökomat

Type: SteelPro, Polypro, (Double) Rondomat, Ökomat

Serial number: BIOXXXXxxxxx (FXXXXX) [X = placeholder for letters/numbers]

Project designation: Biogas feed system

Trade name: Solid matter container for biogas plants

Function: Storage and delivery of different substances and solid materials to the biogas fermenter

It is expressly stated that this machine complies with all relevant provisions of the following EC directives:

2006/42/EC:2006-05-17	EC Machinery Directive 2006/42/EC
2014/34/EU:	Directive 2014/34/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast)
2014/35/EU:	Directive 2014/35/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
2014/30/EU:	Directive 2014/30/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)

Source of the harmonised standards applied in accordance with Article 7(2):

EN ISO 12100:2010-11	Safety of machinery – General principles for design – Risk assessment and risk reduction (ISO 12100:2010)
EN DIN 50495:2010	Safety devices required for the safe functioning of equipment with respect to explosion risks
EN DIN 60079-20-1:2010	Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data
EN DIN 62031:2013	LED modules for general lighting – Safety specifications (IEC62031:2008+A1:2012)
EN DIN 61204-7:2007-07	Low-voltage switch mode power supplies – Part 7: Safety requirements (IEC 61204-7:2006)
EN DIN 15089:2009-07	Explosion isolation systems
EN DIN 1127-1:2011-10	Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology
EN DIN 60079-18:2015-10	Explosive atmospheres – Part 18: Equipment protection by encapsulation "m" (IEC 60079-18:2015)
EN DIN 60079-7:2014-04	Explosive atmospheres – Part 7: Equipment protection by increased safety "e" (IEC 31/973/CD:2011).

Source of other technical standards and specifications applied:

EN DIN 60204-1:2014-10	Safety of machinery – Electrical equipment of machines – Part 1: General requirements (IEC 44/709/CDV:2014).
------------------------	--

Mühldorf am Inn

23/11/2021

Place,

date


Fliegl Agrartechnik GmbH
Bürgermeister-Boch-Str. 1
D-84453 Mühldorf a. Inn
Tel. +49 (0) 8631 307-0
Fax +49 (0) 8631 307-550
Josef Fliegl jun., Geschäftsführer

1. User instructions

This manual provides information about the:

- Layout
- Function
- Operation
- Maintenance
- Accessory parts

of the feed system and ensures long, problem-free operation if it is carefully observed.

In case of malfunctions, it can be used to troubleshoot and rectify errors.

The purpose of the safety instructions is to prevent personal injury and damage to the feed system.

All operators are required to read these safety instructions and comply with them at all times.

The regulations of agricultural employers' liability insurance associations also apply.

Fliegl assumes no liability and honours no warranty for damage and malfunctions resulting from failure to comply with the operating instructions.

This information is required to ensure a smooth replacement parts ordering process:

Copy the relevant information from the type plate into the box below:

Machine ID no. (serial number)	
Type	
Initial commissioning	
Order no.	

Contact:

Fliegl Dosiertechnik
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 351

Fax: +49 (0)8631 / 307 - 552

E-mail: dosiertechnik@fliegl.com

Website: www.fliegl-dosiertechnik.de



Replacement parts must satisfy the technical requirements stipulated by the manufacturer as a minimum. This requirement is always met when using Fliegl original replacement parts.

1.1 Purpose of this document

These operating instructions:

- Describe the function, operation and maintenance of the machine.
- Provide important advice for safe and efficient handling of the machine.

1.2 Locations in the operating instructions

All directions and locations in these instructions are based on the operator's workstation.

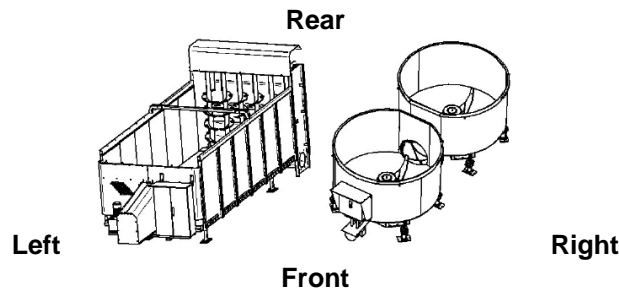


Fig. 1: Locations in the operating instructions

1.3 Duty to inform

These operating instructions are to be considered part of the machine.

If the machine is passed on to another party by the customer, the operating instructions must also be passed on and the party receiving the machine must be instructed regarding the regulations cited above. Only the procedures described in these operating instructions are safe.

- Read and observe the contents of chapter 2 Basic safety instructions before first using the machine.
- Before performing any work with the machine, always read and observe the contents of the relevant sections of the operating instructions.
- The operating instructions must be stored such that they are always on hand for the machine user.

1.4 Illustrations used

Instructions and system responses

The steps to be taken by operating personnel are presented in the form of a (numbered) list. These steps must be followed in the correct order. The system response to each operator action is marked with an arrow. Example:

Operator action step 1

➔ System response to operator action step 1

1.5 Cross references

Cross references to other points in the operating instructions appear in the text along with the relevant chapter and subchapter or section.

1.6 Terminology: "machine"

Within this document, the feed system is also referred to as the "machine".

1.7 Figures

The figures in this document do not always depict the exact machine type.

The information relating to the figures always corresponds to the machine type described in this document.

1.8 Conversions or modifications

Any unauthorised modifications and changes to the machine (such as welding onto bearing parts) *will void all liabilities and the manufacturer's warranty.*

Additions or modifications of any kind can affect the electro-magnetic behaviour of the machine. Therefore, do not make any changes or add anything to the machine without consulting and receiving written agreement from the manufacturer.

1.9 Replacement and wear parts and auxiliary materials

The use of replacement and wear parts or auxiliary materials from third parties can lead to dangers. The manufacturer accepts no liability for damage resulting from the use of these parts. Therefore, use only original parts or parts approved by the manufacturer.

1.10 Product monitoring

Please inform us as soon as possible if you encounter faults or problems when operating the feed system, or if accidents occur or are narrowly avoided. We will endeavour to establish a solution to the problem, potentially with your assistance, and incorporate our findings in our ongoing work. Refer to page 9 for the relevant contact details.

1.11 Presentation of safety instructions



Danger! Imminent risk that will lead to serious bodily harm or death.



Warning! Potentially hazardous situation that could lead to serious bodily harm or death.

Caution! Potentially hazardous situation that could lead to minor bodily harm. Also warns against potential damage to property.



Notice! Potentially harmful situation in which the product or other property in its vicinity could be damaged.



Important! For usage instructions and other helpful information.

1.12 Liability and damages

The product must only be operated by persons who are familiar with the operating instructions, the product and national laws, directives and regulations relating to health and safety at work as well as accident prevention. We accept no liability for personal or material damage caused, or contributed to, by untrained persons due to non-compliance with regulations regarding health and safety at work as well as accident prevention.

Based on the specifications in these operating instructions, Fliegl Agrartechnik GmbH assumes no liability for direct or consequential damage attributable to improper operation or maintenance.

For your own safety, you should only use original replacement parts and accessory products.

Fliegl Agrartechnik GmbH assumes no liability for the use of other products and any resulting damage.

No claims for modification of delivered products can be made on the basis of the information, images and descriptions provided in this manual.

1.13 Duty to inform

These operating instructions are to be considered part of the machine.

If the machine is passed on to another party by the customer, the operating instructions must also be passed on and the party receiving the machine must be instructed regarding the regulations cited above.

Only the procedures described in these operating instructions are safe.

- Read and observe the contents of chapter 2 Basic safety instructions before first using the machine.
- Before performing any work with the machine, always read and observe the contents of the relevant sections of the operating instructions.
- The operating instructions must be stored such that they are always on hand for the machine user.

2. Basic safety instructions



Failure to observe the safety instructions and warnings can pose a risk to persons, property and the environment.



- The machine must be set up by specialist personnel.
- All safety instructions are provided in the operating instructions.
- In addition, personnel must always wear personal protective equipment when operating the machine.



- The feed system must only be used to convey or feed renewable raw materials into biogas plants.
- Observe the warning and information signs attached to the feed system.



- Changes to the machine must only be carried out following consultation and with express permission of the manufacturer.
- In the case of damage that affects safety, have the machine repaired immediately.
- In the event of any faults that affect safety, the machine must be stopped immediately. Take measures to prevent reactivation.
- Use only original replacement parts.
- In addition to this manual, the operating instructions included for third-party components must be observed.



- **Instruct unauthorised persons to leave the danger area.**
- **Protective devices must not be removed or modified.**



- All installation and maintenance work performed on machines in potentially explosive atmospheres must comply with the German Ordinance on Industrial Safety and Health ("Betriebssicherheitsverordnung – BetrSichV") as well as the safety, installation and maintenance instructions in this manual.
- Any work that is relevant to explosion protection must be carried out by a trained specialist or by Fliegl Agrartechnik GmbH.
- Where applicable, the permit (see page 64) must be completed before conducting any work on the feed system and signed by the relevant responsible person.



- Entering or remaining in the machine is only permitted when it is stopped and the main switch is locked.



- Operators with electr. implants, such as cardiac pacemakers, must not work with the machine.
- The manufacturer must instruct personnel in machine operation before start-up.
- The system must be installed in accordance with the relevant Ex zones and the corresponding protective measures.

2.1 Designated use

The machine is constructed according to the EC Machinery Directive using the latest technology and in accordance with the recognised safety regulations.

However, during use there is a risk to life and limb for the user or third parties, or risk of damage to the attachment or other property.



**The feed system must only be used as intended and when in good and safe working condition.
Operational safety of the machine is guaranteed only if it is used as intended.**

Any overload or excess strain (i.e. exceeding the specifications) can cause damage to the feed system for which *Fliegl Agrartechnik GmbH* shall assume no liability. The feed system must only be used to convey or feed renewable raw materials into the elevated tank (slurry pit, fermenter) of biogas plants.

Designated use also includes:

- Observing all information in these operating instructions.
- Completing inspection and maintenance tasks as required.
- Using only original parts.
- Installation and operation outside the EX zones of biogas plants.
- Operating the feed system only with monitoring of the substrate level.

The machine is intended solely for agricultural use and must only be used if:

- All safety equipment specified in the operating instruction is present and in the safety position
- All safety instructions in the operating instructions are observed and complied with, including the information in the chapter "Basic safety instructions" as well as the specific instructions in the individual chapters

The operating instructions form part of the machine and must remain with the machine at all times. The machine must only be operated following appropriate instruction and in strict compliance with these operating instructions. Any use of the machine not described in the operating instructions can result in serious injury or death and may also lead to machine and property damage. Unauthorised changes to the feed system can have a negative impact on the machine properties or impair its correct function. Unauthorised changes will therefore release the manufacturer from any resulting liability. Designated use also includes compliance with the operating, maintenance, cleaning and repair instructions prescribed by the manufacturer.

2.2 Reasonably foreseeable misuse

Any use other than the defined "designated use" or any use which exceeds this shall be defined as misuse. *The manufacturer/supplier accepts no liability for any resulting damage.*



Misuse can be dangerous.

Examples of such misuse are:

- Exceeding the permissible working capacity.
- Operating the control cabinet and the hydraulic units in explosive atmospheres.
- Failure to observe safety stickers on the machine and safety information in the operating instructions.
- Performing troubleshooting, adjustments, cleaning, repairs and maintenance contrary to the specifications in the operating instruction.
- Unauthorised changes to the machine.
- Attachment of additional equipment that has not been authorised or approved
- Use of non-original FLIEGL replacement parts.
- The following goods must not be used in the feed system:
 - Bulky solid materials
 - Whole or roughly chopped round or square bales; only in combination with a Multimix vertical mixer.
 - Sharp-edged goods, which could damage the seals of the feed system.

2.3 Service life of the machine

- The service life of this machine greatly depends on its correct use and maintenance as well as the specific applications and operating conditions.
- Following the instructions and information in these operating instructions will safeguard the operational readiness of the machine and maximise its service life.
- After each season of use, the machine must be checked thoroughly for signs of wear and other damage.
- Damaged or worn parts must be replaced before any subsequent use of the machine.
- Following a prescribed, type-specific period of use, the machine must be subjected to a comprehensive technical inspection. A decision as to the continued use of the machine must then be made based on the results of this inspection.
- The service life of the machine is theoretically unlimited since all worn or damaged parts can be replaced.

2.4 Risks when working with the machine

Risks and impairments can arise when using the machine:

- Risk to life and limb of the operator or third parties
- Risks for the machine itself
- Risks for other material assets

Safe and fault-free operation of the machine requires knowledge of the safety and user instructions set out in this manual.



Always store the operating instructions at the usage location of the machine. The operating instructions must be readily accessible to operating personnel. Also be aware of the following:

- General and location-specific regulations regarding accident prevention and environmental protection.

2.5 Overview – warnings and hazards

2.5.1 Warning against hazardous electrical voltage



Any electrical work that is not described in these operating instructions must only be performed by qualified electricians.

- Work on the electrical system must only be performed when the system is de-energised.
- Deactivate the main switch before commencing work and secure it with a padlock to prevent accidental reactivation. (Remove the key) and apply warning signs.
- Use only electrically insulated tools.
- After commissioning, maintenance, testing, adjustment and repair work, check the function of the electrical equipment as well as all safety-relevant circuits and components. Re-attach any loose connections and replace damaged lines.

2.5.2 Warning against automatic start-up



Risk of injury due to moving and rotating parts (such as the push-off system and screw conveyors).

- There must be no persons inside the housing of the feed system during operation.
- Do not open the feed system during operation (e.g. safety grids, covers, etc.).

2.5.3 Warning against crushing hazard



Risk of injury due to the moving push-off floor and/or moving panel.

- There must be no persons inside the housing of the feed system during operation.
- Do not open the feed system during operation.

2.5.4 Warning against trip and fall hazard



Risk of injury due to tripping on the push-off floor or on the sliding axle.



Risk of injury due to falling from the housing of the feed system (when machine is open) and during assembly or maintenance work.

- There must be no persons on the housing of the feed system during operation.

2.5.5 Warning against potentially explosive atmosphere



Gas can escape from the fermenter.
Increased risk of explosion!

- Under no circumstances must the feed system be installed within 3 m of a fermenter opening that is not permanently sealed. The zoning of the biogas plant (to be created by the plant owner) must be observed in this case (see BetrSichV [Germany]).
- The feed opening must be permanently sealed off from the fermenter and checked for leaks every six months using a leak detector spray.
- The level switch for deactivating the feed system (when the feed pipe is not submerged to a depth of at least 1 m) is not supplied by Fliegl Agrartechnik GmbH and must be installed in the fermenter by the customer and connected to the control system.
- Gas can escape when opening or dismantling the feed system. Increased risk of explosion!
- Do not introduce any ignition sources (e.g. non-explosion-protected electrical equipment).
- Always use non-sparking tools.
- No smoking and no open flames in the area of the pit!
- Toxic gases can escape from the fermenter.
- Ensure sufficient ventilation of the pit before conducting any installation or maintenance work.
- Observe the applicable regulations for biogas plants.

2.5.6 Risk of eye damage



Hydraulic oil can escape if hydraulic lines or screw joints are opened or damaged. Always use eye protection!

2.5.7 Danger due to residual energy



Residual mechanical and hydraulic energy may be encountered on the feed system during maintenance and repair work. This residual energy must be dissipated in a safe manner. Operating personnel must be instructed accordingly.

- Any system sections and pressure lines to be opened must be depressurised before commencing repair work.
- Work on hydraulic systems must only be performed by persons with specific knowledge and experience of hydraulics.
- Unauthorised assembly and installation work is prohibited. Significant hazards can arise as a result of incorrect installation work.
- Note the following when working on the hydraulic system:
 - Depressurise and bleed the hydraulic system before performing any inspection, maintenance or repair work. Be aware of potential residual energy.
 - After completing repair and maintenance work on the hydraulic system, the functionality of the system must be checked before resuming operation.

2.6 Residual risks

The machine is built according to the state of the art and recognised safety rules. However, during use there is a risk to life and limb for the user or third party, or risk of damage to the machine or other property. In addition to the manufacturer's countermeasures against dangers caused by residual energy, the operator must also take appropriate countermeasures. Personnel must be briefed about these dangers and the measures to be taken to prevent them.

2.7 Obligations of the operating company

The operating company is required to instruct its personnel regarding:

- Basic regulations regarding work safety and accident prevention.
- Correct operation of the machine.
- The operating instructions (ensure that personnel have read and understood them).

The operator is obligated to:

- Keep all hazard symbols on the machine in legible condition.
- Replace any damaged or removed hazard symbols.



The requirements of the EC Directive for the use of work equipment 89/655/EEC must be observed.

2.8 Obligations of personnel

Before starting work, all personnel tasked with working on the machine undertake to:

- Comply with the basic regulations regarding work safety and accident prevention.
- Read and comply with the safety section and warnings in these operating instructions.
- Please contact the manufacturer with any questions; see page 9.

2.9 Qualification of operating personnel

To avoid accidents, any person working with the machine must meet the following minimum requirements:

- He or she must be physically capable of controlling the machine.
- He or she can perform their work with the machine safely and in compliance with these operating instructions.
- He or she understands the function of the machine within the context of their duties and can recognise and avert the dangers arising from their work.

2.10 Qualification of specialist personnel

If the required work on the machine (assembly, alteration, conversion, extension, repairs, retrofits) is performed incorrectly, this can lead to serious injury or death. To avoid accidents, any person performing work in accordance with these operating instructions must meet the following minimum requirements:

- He or she is a qualified specialist with the requisite training.
- Based on their technical expertise, he or she is able to assemble the (partially) disassembled machine as described in the manufacturer's assembly instructions.
- Based on their technical expertise, he or she is able to expand, alter or restore the function of the machine as prescribed in the relevant instructions of the manufacturer.
- He or she can perform the work described in these operating instructions in a safe manner.
- He or she understands the function of the required work as well as the machine and can recognise and avert the dangers arising from this work.
- He or she has read these operating instructions and can apply the information contained therein in an appropriate manner.



Maintenance and repair work indicated by this symbol must only be performed by a specialist workshop. The personnel of the specialist workshop must have the requisite knowledge and appropriate equipment (tools etc.) to maintain and/or repair the machine in a safe and professional manner.



2.11 Personal protective equipment

The operating company must provide the following personal protective equipment.

- Safety footwear with protective toe caps
- Close-fitting protective clothing
- Work gloves
- Safety and protective devices
- Head protection



The machine must only be operated if all safety and protective devices are complete and fully functional.

2.12 Operational safety

2.12.1 Operation without correct start-up

Without a correct start-up in accordance with these operating instructions (section 6), the operational safety of the machine is not guaranteed. This can result in accidents involving personal injury.

2.12.2 Safeguarding perfect technical condition

Incorrect maintenance and adjustments can impair the operational safety of the machine and lead to accidents involving personal injury.

- All maintenance and adjustment work must be performed as described in the relevant sections.
- Shut down and secure the machine before performing any maintenance and adjustment work.

2.12.3 Danger due to machine damage

Damage to the machine can impair its operational safety and lead to accidents involving personal injury. The following machine components are particularly safety-relevant:

- Safety devices
- EMERGENCY STOP systems

In the case of doubts regarding the operational safety of the machine, e.g. due to leaking fluids, visible damage or unexpected changes in machine behaviour:

- Shut down and secure the machine.
- Eliminate potential causes of damage immediately, e.g. remove dirt and debris or tighten loose screws.
- Establish the cause of the damage as per these operating instructions.
- Repair the damage as per these operating instructions.
- In the case of damage that cannot be rectified independently based on these operating instructions:
 - Have the damage repaired by a qualified workshop.

2.12.4 Technical limits

If the technical limits of the machine are not maintained, this can lead to machine damage. This can result in accidents involving personal injury. Compliance with the following technical limits is particularly important from a safety perspective:

- Maximum permissible operating pressure of the hydraulic system.
- Maximum permissible power requirement.

2.13 Safety and protective devices

2.13.1 Location of the Safety and Monitoring Equipment

The following figure provides an overview of the most important safety devices and monitoring equipment and shows where they are installed on the machine:



Fig. 2: Small control cabinet



Fig. 3: Large control cabinet

2.13.2 Emergency stop device

The machine features command devices for stopping the system in the event of an emergency:

EMERGENCY STOP button



Fig. 4: EMERGENCY STOP

Lockable main switch



Fig. 5: EMERGENCY OFF

2.13.3 Description of additional safety and protective devices

An additional level switch, which operates the EMERGENCY STOP in the case of an insufficient substrate level, can be connected in the control cabinet:

- External EMERGENCY STOP actuation; see circuit diagram in system control cabinet.
- EMERGENCY STOP based on fermenter fill level (EMERGENCY STOP is triggered if the substrate drops below the minimum value).

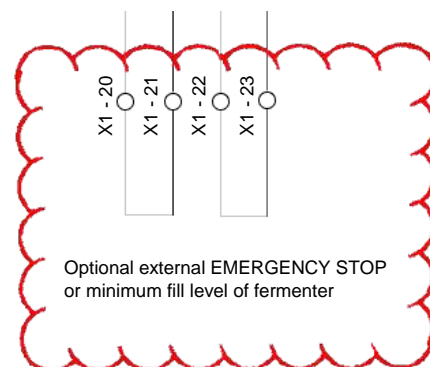


Fig. 6: Circuit diagram (section)

2.13.4 Faulty protective devices

Defective safety equipment can lead to dangerous situations. Therefore:

- Switch off the machine immediately.
- Protect it against being turned on again.
- If necessary, disconnect the hydraulics and electrical supply.

2.13.5 Inspecting safety and protective devices

All safety and protective devices must be checked regularly prior to start-up.

Inspection intervals according to table:



Safety device	Inspection interval
Complete system	Visual inspection before each use
Sealing between system and fermenter	Weekly

2.14 Workstation of operating personnel

The machine is designed to be used by one person only. The main workstations are:

The control cabinet of the feed system



Fig. 7: Small control cabinet



Fig. 8: Large control cabinet

Fig. 9: Workstation on the machine

2.15 Danger areas



Within the danger area of the machine, danger points exist that pose either a permanent hazard or are a potential source of unexpected risks. These danger points are indicated by warning symbols, which highlight residual risks that cannot be eliminated by design. The specific safety guidelines of the relevant sections apply in this case.

A danger zone exists around the machine when in use. To ensure that no persons enter this danger zone, the minimum safety distance must be observed.

If this safety distance is not maintained, this can result in accidents involving personal injury.

- Switch on the attachment only if there are no persons within the danger zone.
- Cease operation immediately if persons enter the danger zone.
- The applicable safety distances must be maintained in line with local regulations.

The prescribed distances are minimum safety distances based on designated use of the machine.

These values depend on the individual application and environmental conditions and must be increased where necessary. The machine must be shut down and secured for all work performed within the danger zone, including brief checks.

Other relevant specifications in all applicable operating instructions must be observed:






- The operating instructions of the machine.
- The operating instructions of other components.

2.15.1 Hazards on the feed system

Danger point	Hazard	Action
Screw conveyors	Risk of entanglement and crushing due to automatic start-up.	When working inside the housing, deactivate the main switch and secure it against reactivation.
Push-off floor and moving panel	After removing the front panel, there is a risk of crushing injuries due to movement of the push-off cylinders.	Never reach into moving parts during the extension and retraction of the push-off cylinders.
	When working inside the housing, there is risk of crushing injuries due to automatic start-up of the push-off system.	When working inside the housing, deactivate the main switch and secure it against reactivation.
Push-off floor	There is a risk of tripping when working inside the housing.	
Push-off cylinders and hydraulic lines	When working on the outside of the system at the rear, there is risk of catching on the push-off cylinders and hydraulic lines.	
Housing	There is a risk of falling when climbing onto the feed system.	Use suitable climbing aids. Deactivate the main switch and secure it against reactivation.
Hydraulic system	There is a risk of injury in the area of the entire hydraulic system due to hydraulic oil escaping under pressure.	Use eye protection. Regularly check the hydraulic connections and lines for leaks and damage. The hydraulic pressure must not exceed 185 bar.
Rondomat extractor blade	Risk of entanglement and crushing due to automatic start-up of blade.	When working inside the housing, deactivate the main switch and secure it against reactivation.
Multimix vertical mixer	After climbing into the container, there is a risk of cutting and crushing injuries due to the blades of the vertical auger.	Never climb or reach into the container while the vertical auger is running. When working inside the housing, deactivate the main switch and secure it against reactivation.
PTO drive on Rondomat and vertical mixer		Never reach or climb under the feed system while it is running. When working under the feed system, deactivate the main switch and secure it against reactivation.



2.16 Machine labelling

There are warning signs on the machine to warn of the following residual dangers which cannot be eliminated:

Notice regarding hazard symbols: <ul style="list-style-type: none"> - The hazard symbols must be kept clean and must be clearly visible at all times - Damaged or missing hazard symbols must be replaced - When attaching additional devices, add the corresponding hazard symbols if necessary - Consult with the manufacturer where necessary 		Risks due to electrical voltage. Electrical work on the machine must only be performed by qualified electricians.
		Explosion protection of drive motors. See also type plate on motor.
		Attention! Exercise special caution when handling or touching.
		Observe the local explosion protection zones.
		Company logo

Observe all *warnings and safety instructions* on the machine as well as other labelling such as turning and transport directions.

The following identifications are also located on the machine:

	<p>CE identification number</p> <p>Indicates conformity with applicable EU directives related to the product, which also require a CE marking. (Located on type plate.)</p>
	<p>Type plate to specifically identify the machine.</p>

3. Description of the machine

This section gives a complete overview of the layout and function of the machine.

If possible, read it at the machine. That is the best way for you to familiarise yourself with the machine.

3.1 Applications

The feed system must only be used to convey, compact or feed renewable raw materials into the elevated tank (slurry pit, fermenter) of a biogas plant.

- Solid matter storage
- Transport of filled material into the fermenter

3.2 Design variants

3.2.1 SteelPro container in steel

Solid matter container for storing and delivering various substrates and solid materials (e.g. corn, grass, whole crop silage (WCS) and manure).

Included as standard:

PLC control – dosing by time. External width 2.55 m or 3.02 m.

Benefits

Maximum gas yield thanks to uniform and reliable dosing.

Energy-efficient: approx. 0.41 kW power requirement per tonne. Low-maintenance thanks to robust construction with low-wear shaft-mounted gear motor (electric); reliable push-off technology tried-and-tested in agricultural applications. Rear gutter for fluids with connection facility for drain outlet (Ø 125 mm).

Technology

Two-part push-off system, moving panel with replaceable lateral and bottom PU seals, sliding floor with replaceable plastic guide as wear material, skeleton frame material: steel (galvanised or primed/painted), side wall material: S 235 JR, side wall thickness: 6 mm, floor material: S 235 JR, floor thickness: 8 mm, moving panel wear rail material: PVC, sliding floor wear rail material: PE 300, wear rail thickness: 15 mm, max. bulk density: approx. 700 kg/m³, push-off quantity depending on dosing unit requirement.

Dosing and crushing unit for Steelpro/Polypro

Duplex narrow:

Height 2000 mm, width 2380 mm

Duplex:

Height 2000 mm, width 2850 mm

Duplex Mega:

Height 2800 mm, width 2850 mm

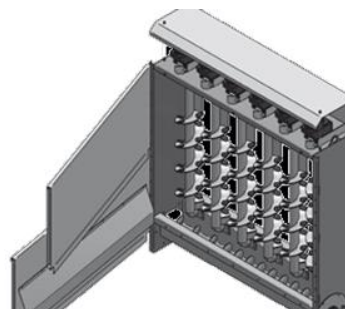


Fig. 10: Dosing and crushing unit

Description of the machine

"MULTI MIX" crushing attachment for Steelpro/Polypuro

Duplex narrow:

Height 2000 mm, width 2380 mm

Duplex:

Height 2000 mm, width 2850 mm

Duplex Mega:

Height 2800 mm, width 2850 mm

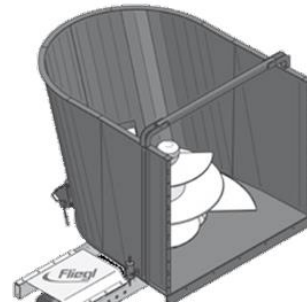


Fig. 11: Crushing attachment

Rondomat attachment for Steelpro/Polypuro

Rondomat attachment Ø 2400 mm:

Volume approx. 14 m³, inside/outside Ø 2400/2500 mm;
internal/external height 2000/2700 mm

Rondomat attachment Ø 3000 mm:

Volume approx. 17 m³, inside/outside Ø 2900/3000 mm;
internal/external height 2000/2700 mm

Rondomat Mega attachment Ø 3000 mm, height 2800 mm:

Volume approx. 23 m³, inside/outside Ø 2900/3000 mm;
internal/external height 2800/3500 mm

Rondomat attachment for Smart:

Volume approx. 10 m³, inside/outside Ø 2400/2500 mm;
internal/external height 1500/2200 mm

Version V2A (1.4301) or steel (S 235 JR)

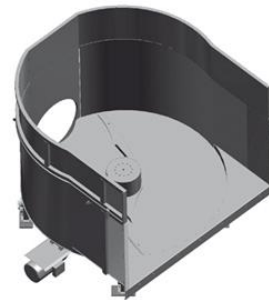


Fig. 12: Rondomat attachment

3.2.2 PolyPro container in plastic

Solid matter container for storing and delivering various substrates and solid materials (e.g. corn, grass, whole crop silage (WCS) and manure).

Included as standard:

PLC control – dosing by time. External width 2.55 m or 3.02 m.

Benefits

Maximum gas yield thanks to uniform and reliable dosing, energy-efficient: approx. 0.41 kW power requirement per tonne. Low-maintenance: robust construction with low-wear shaft-mounted gear motor (electric), reliable push-off technology tried-and-tested in agricultural applications, more than thirty years experience in the use of plastic with abrasive materials in wastewater treatment technology, polyethylene floor and side walls are joined by means of a special welding method which makes them impermeable, with robust external steel frame and supporting feet, rear gutter for fluids with connection facility.

- For drain outlet (Ø 125 mm)
- Push-off container made from shatter-proof PE plastic
- Water-resistant
- Alcohol-resistant
- Acid-resistant
- Alkali-resistant
- UV-radiation-resistant
- Temperature-resistant from -85°C to +90°C
- Two-part push-off system

Technology

Moving panel with replaceable lateral and bottom PU seals, sliding floor with replaceable plastic guide as wear material, skeleton frame material: steel (galvanised or primed/painted), side wall material: PE 300, side wall thickness: 20 mm, floor material: PE 500, floor thickness: 20 mm, moving panel wear rail material: PVC, sliding floor wear rail material: PE 300, wear rail thickness: 15 mm, max. bulk density: approx. 700 kg/m³, push-off quantity depending on dosing unit requirement. The hydraulic unit is mounted on the container (front side) as standard.

Dosing and crushing unit for Steelpro/Polypro

Duplex narrow:

Height 2000 mm, width 2380 mm

Duplex:

Height 2000 mm, width 2850 mm

Duplex Mega:

Height 2800 mm, width 2850 mm

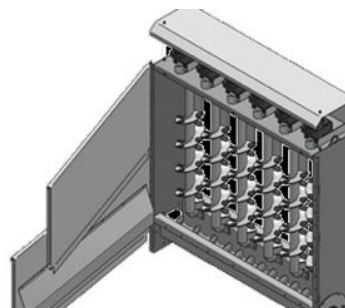


Fig. 13: Dosing and crushing unit

Description of the machine

"MULTI MIX" crushing attachment for Steelpro/Polypuro

Duplex narrow:

Height 2000 mm, width 2380 mm

Duplex:

Height 2000 mm, width 2850 mm

Duplex Mega:

Height 2800 mm, width 2850 mm

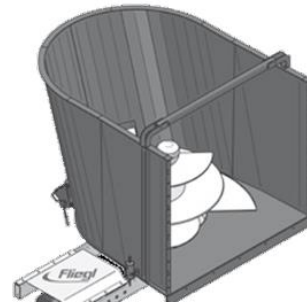


Fig. 14: Crushing attachment

Rondomat attachment for Steelpro/Polypuro

Rondomat attachment Ø 2400 mm:

Volume approx. 14 m³, inside/outside Ø 2400/2500 mm;
internal/external height 2000/2700 mm

Rondomat attachment Ø 3000 mm:

Volume approx. 17 m³, inside/outside Ø 2900/3000 mm;
internal/external height 2000/2700 mm

Rondomat Mega attachment Ø 3000 mm, height 2800 mm:

Volume approx. 23 m³, inside/outside Ø 2900/3000 mm;
internal/external height 2800/3500 mm

Rondomat attachment for Smart:

Volume approx. 10 m³, inside/outside Ø 2400/2500 mm;
internal/external height 1500/2200 mm

Version V2A (1.4301) or steel (S 235 JR)

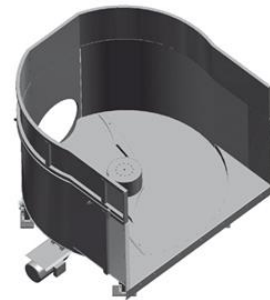


Fig. 15: Rondomat attachment

3.2.3 Rondomat or double Rondomat

Extremely low-maintenance and durable stainless steel container (or optional steel version).
The slow-turning extractor blade has a very low energy requirement.
The Ø 3 m container has a low loading sill height of just 2.10 m for optimal filling.

Included as standard:

PLC control – dosing by time.



Fig. 16: Rondomat



Fig. 17: Double Rondomat

Technology	
Height, internal/external	1500/2100 mm
Width	Ø 3000 mm
Net weight	approx. 2.8 t
Total weight	approx. 10 t
Capacity per container / total	approx. 10.5 m ³ / approx. 21 m ³
Container material	4 mm / V2A
Floor material:	6 mm / V2A
Extractor blade thickness	approx. 20 mm
Control system	Automatic control by time or via optional weighing system

Description of the machine

3.2.4 Ökomat container in steel

Solid matter container and dosing unit, for storing and dosing various chopped substrates and materials, e.g. corn, grass, whole crop silage (WCS).

Included as standard:

PLC control for dosing by time and 3 kW hydraulic unit.

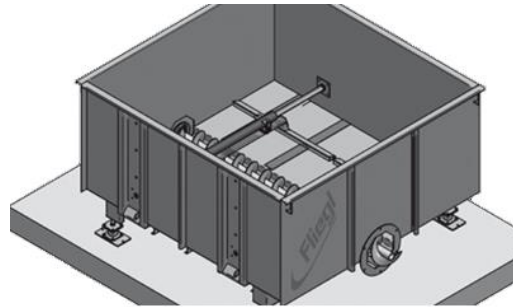


Fig. 18: Ökomat

Ökomat 140 – steel/V2A version

Solid matter dosing system with 4 feed mechanisms for transporting the substrate into the trough auger

- Torsion-resistant trough auger
- Length: 3000 mm
- 2 hydraulic cylinders
- Internal/external length: 3000/3180 mm
- Internal/external width: 2820/3000 mm
- Internal/external height with supporting feet: 1400 mm / approx. 2000 mm
- Net weight: approx. 4.5 t
- Total weight: approx. 15 t

Ökomat 200 – steel/V2A version

Solid matter dosing system with 4 feed mechanisms for transporting the substrate into the trough auger

- Torsion-resistant trough auger
- Length: 3000 mm
- 2 hydraulic cylinders
- Internal/external length: 3000/3180 mm
- Internal/external width: 2820/3000 mm
- Internal/external height with supporting feet: 2200 mm / approx. 2670 mm
- Structure S 235 JR, 1 x 800 mm
- Net weight: approx. 5.2 t
- Total weight: approx. 20.5 t

3.2.5 Ökomat container in stainless steel

Solid matter container and dosing unit, for storing and dosing various chopped substrates and materials, e.g. corn, grass, whole crop silage (WCS).

Included as standard:

PLC control for dosing by time and 3 kW hydraulic unit.

See section 3.2.4 for description.

3.2.6 Hydraulic unit

The hydraulic pressure is generated by the fitted hydraulic unit.
 The hydraulic hoses are connected to the hydraulic unit via quick couplers (SVK coupling).
 The sliding carriage is moved forwards by a hydraulic cylinder on the sliding floor.
 The moving panel is controlled by two hydraulic cylinders positioned one behind the other.
 The extension sequence of the hydraulic cylinders cannot be controlled.
 A pressure gauge on the hydraulic unit indicates the feed pressure. The pressure can be adjusted via the pressure relief valve when necessary. The unit is controlled via the overall device control.

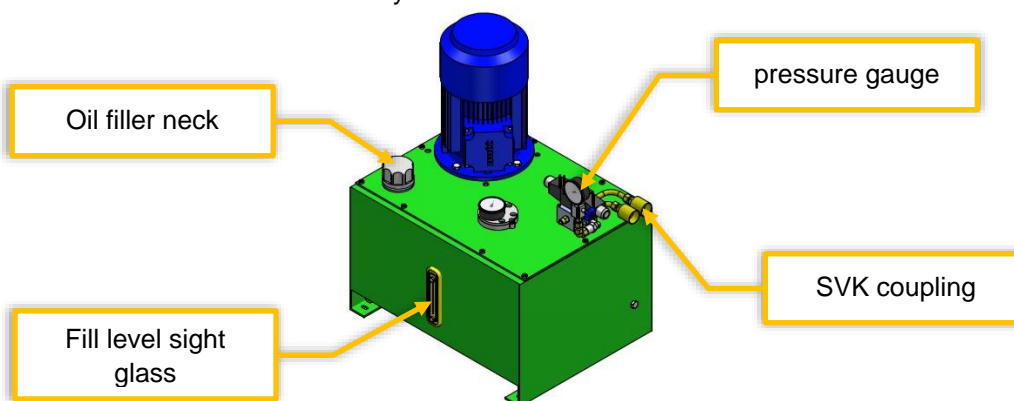


Fig. 19: Hydraulic unit (approx. 90 l, HLP 46)

3.3 Scope of delivery

Description	Quantity
Feed system (incl. dosing unit (Rondomat / duplex dosing / Multimix vertical mixer) / screw conveyors / drives / bearings / hydraulics)	1
Supporting feet (incl. 2 anchors for each foot)	Depending on container size
Inclined screw conveyor w. 90° transfer joint (only for inclined feed)	1
Feeder auger with 45° transfer joint	1
Trough auger incl. trough, if applicable	1
Feed pipe with 45° opening flange + Ø 95 end bearing	1
- Sealing material (Sikaflex)	6
- Mounting material (heavy-duty anchors)	42
Control cabinet (incl. control cables / protective roof)	1
Control unit	1
Hydraulic unit	1



The scope of delivery depends on the machine version and type.

3.4 Functional description

Loading the machine

Using suitable loading equipment (wheel loader, front loader, etc.), the operator loads the material:

- Manually into the container

Unloading the machine

The feed takes place automatically, controlled either by time or weight.

3.5 Layout of the machine

The following figure provides an overview of the most important components and assemblies and shows where they are installed on the machine:

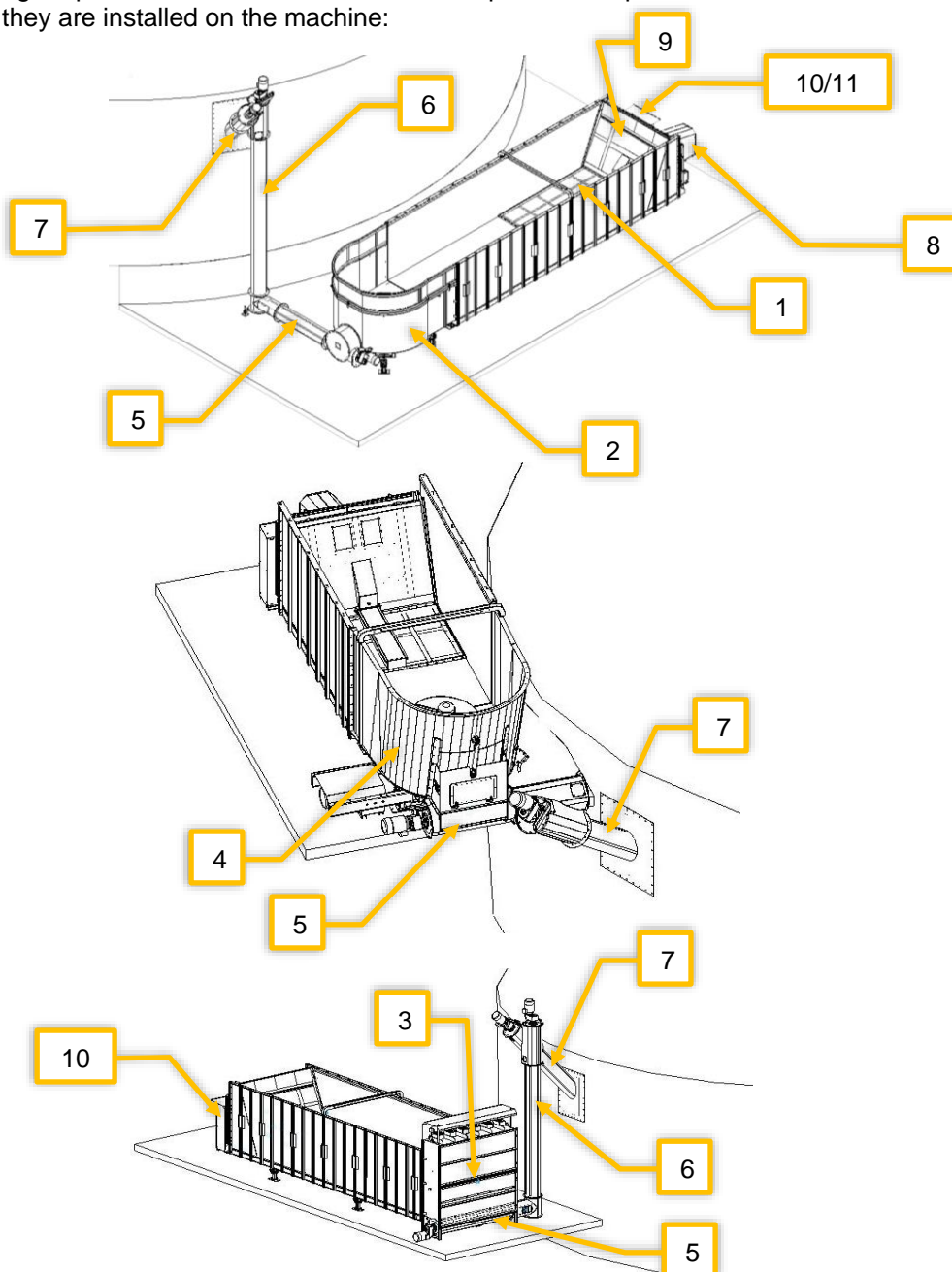


Fig. 20: Assemblies and components

3.5.1 Overview – assemblies and components

Item	Description
1	Biomat
2	Rondomat
3	Duplex dosing
4	Multimix vertical mixer
5	Trough auger
6	Inclined screw conveyor
7	Feeder auger
8	Front panel
9	Sliding carriage
10	Main control cabinet
11	Hydraulic unit

3.5.2 Assembly 7

Insert the flange before the fermenter opening and align it. Then apply the "Sikaflex TS plus" sealant to the underside of the flange while following the corresponding instructions.

- Slide the feeder auger tube into the flange opening and check the feed pipe depth in the fermenter.
- Weld tight to seal.
- Fix the flange in place before tightening evenly.

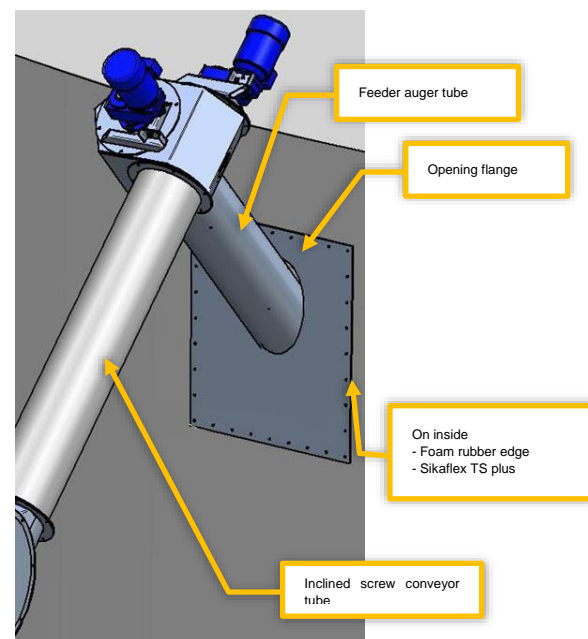


Fig. 21: Assembly 7

Description of the machine

3.5.3 Push-off system

The push-off system (Biomat) pushes the filled material into the Rondomat trough (2) / duplex dosing unit (3) or into the Multimix vertical mixer (4) and the latter conveys the substrate into the trough auger (5) at the rear of the machine. To supply the container, the sliding carriage (9) must be moved to the front end position.

The push-off system moves the required material to the screw conveyors at adjustable intervals or upon operation of the controls. When the amperage of the trough auger or one of the dosing augers rises, the push-off process stops automatically.

Once the material build-up has been broken down, the push-off process continues after the set interval. Once the end position has been reached and the last portion feed completed, the push-off floor and moving panel return to their initial position.

The moving panel is mounted on the sliding floor. A trapezoidal bearing in the push-off floor guides the moving panel during the push-off process.

The sliding carriage rests on the container floor with the slide rails. The sealing strips are located on both sides of the container wall and in the lower front section of the sliding floor.

The sealing strips prevent any material leakage. The front panel (8) protects the container and push-off system against unauthorised access.

3.5.4 Feed process

The agitator blade in the Rondomat conveys the material to the trough auger (5), which then pushes it into the inclined screw conveyor (6) via the transfer point.

The inclined screw conveyor transfers the material to the feeder auger (7), which conveys the substrate into the elevated tank (fermenter). In the case of a bottom feed system, no inclined screw conveyor is used and the trough auger instead transfers the material straight to the feeder auger.

Due to the explosion risk presented by escaped methane gas, the feed pipe extends below the substrate surface in the fermenter.

The dosing augers of the duplex dosing unit convey the material to the trough auger (5), which then pushes it into the inclined screw conveyor (6) via the transfer point.

The inclined screw conveyor transfers the material to the feeder auger (7), which conveys the substrate into the elevated tank (fermenter). In the case of a bottom feed system, no inclined screw conveyor is used and the trough auger instead transfers the material straight to the feeder auger.

Due to the explosion risk presented by escaped methane gas, the feed pipe extends below the substrate surface in the fermenter.

The vertical auger of the Multimix vertical mixer conveys the material to the trough auger (5), which then transfers it to the downstream augers and into the fermenter, as described for the other feed systems above.

3.5.5 Control system

The feed system is controlled automatically via the higher-level PLC (master control) in the main control cabinet (10). In addition, the push-off system can be moved forwards and backwards manually via the control unit, while additional feed portions can also be introduced.

Once the feed container has been switched on, the feeder auger (7) starts with an adjustable start-up time. Once this start-up time has elapsed, the inclined screw conveyor starts, followed by the trough auger. Following an additional start-up time, the push-off system moves forward in a time-controlled cycle (depending on the amperage of the augers). The operator can adjust this cycle to suit the filled material and the requirements of the biogas plant. After the interval time, the feed system resumes operation automatically or as dictated by the control system. Upon completion of the feed portion, the augers shut down in the reverse order to start-up.

Limit switches monitor the foremost and rearmost position of the sliding carriage.

When the end position is reached, the push-off system switches off automatically (other behaviour possible via control system).

3.6 Technical data – standard equipment

Type	External length (mm)	Internal length (mm)	Width (mm)	Internal height (mm)	Total height (mm)	Volume (approx. m³)
Ökomat 140	3180	3000	2820	1400	1900	14
Ökomat 200	3180	3000	2820	2200	2700	20
SteelPro/PolyPro 18	6400	3800	2380	2000	2700	18
SteelPro/PolyPro 22	7400	4800	2380	2000	2700	22
SteelPro/PolyPro 25	7900	5300	2380	2000	2700	25
SteelPro/PolyPro 27	7400	4800	2850	2000	2700	27
SteelPro/PolyPro 30	7900	5300	2850	2000	2700	30
SteelPro/PolyPro 36	8900	6300	2850	2000	2700	36
SteelPro/PolyPro 39	10900	8300	2380	2000	2700	39
SteelPro/PolyPro 42	9900	7300	2850	2000	2700	42
SteelPro/PolyPro 45	11900	9300	2380	2000	2700	45
SteelPro/PolyPro 48	10900	8300	2850	2000	2700	48
SteelPro/PolyPro 54	11900	9300	2850	2000	2700	54
SteelPro/PolyPro 60	11900	9300	2850	2300	3000	60
SteelPro/PolyPro 75	11900	9300	2850	2800	3500	75
SteelPro/PolyPro 82	11900	10300	2850	2800	3500	82
SteelPro/PolyPro 90	11900	11300	2850	2800	3500	90
SteelPro/PolyPro 100	11900	12300	2850	2800	3500	100
Vertical mixer attachment	+ 3250	+ 3200	+ 2340	+ 1710	+ 2700	9

Electrical data	Operating voltage	400 V (AC)
	Control voltage	12 – 24 V (DC)
	Power consumption	Dependent on the number of drive motors
	Mains fuse	Operator's responsibility
Hydraulic supply	Hydraulic unit(s)	Included with delivery
PLC control unit	Control cabinet	Included with delivery
Sound power level	75 dBA	



For detailed technical data, refer to the separate manual in the documentation folder of the machine or the supplier documentation.

4. Transport and installation



Observe all warnings!

4.1 Transporting the machine to the installation location



Must be observed; risk of serious transport damage!

4.1.1 Means of transport

The following means of transport are needed to transport the machine:

- Truck-mounted crane or similar
- Suitable lifting gear

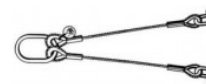


Fig. 22: Means of transport

4.1.2 Before transport



The exact installation positions of the individual components are specified in the installation diagram (explosion protection plan) or the order drawing.

- Determine the exact installation location and mark it.
- Determine the transport route and remove any obstacles.
- Keep unauthorised persons away from the transport route and set-up location. Close off the area.

4.1.3 Transporting the machine

- The feed system must only be lifted from the rear using a suitable forklift truck or crane applied to the designated points.
- Attach the lifting gear for crane transport to the designated suspension eyes.
- Ensure that the lifting gear does not damage any attachments.
- When working with an indoor crane, use one trolley each for the two front and two rear suspension eyes.
 - Raise the machine carefully and only slightly off the ground. Ensure that the centre of gravity is balanced.
 - If necessary, adjust the rope lengths so that the machine hangs straight on the crane.
 - Transport the machine to the installation location as close to the ground as possible.
 - Lower the machine carefully and slowly.

4.2 Setting up and assembling the machine



Please have the system inspected/assembled by Fliegl Agrartechnik GmbH customer service.



4.2.1 Setup



Ensure that the machine is installed level.

- The machine must be set up horizontally in both directions.
- Align all components with one another according to the installation diagram or order drawing.
- Finally, use a spirit level to ensure correct installation.

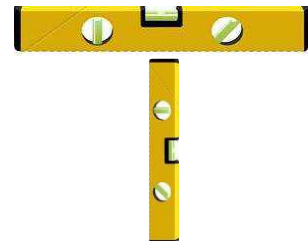


Fig. 23: Measuring aids

- To ensure trouble-free operation, the feed system must be positioned on a solid, level surface with a suitable foundation.
- A 1200 x 800 mm opening is required in the container wall in order to install the feed system. In addition, a 1700 x 1400 mm section must be removed from the outer insulation.

4.2.2 Assembly

- The machine is delivered by the manufacturer in partially assembled state. Final assembly takes place on-site.
- The supporting feet are anchored to the ground with bolts.
- All cables and lines must be routed close to the machine in a cable duct or mesh cable guide.
- The machine must only be installed on firm, level ground (concrete or asphalt).
- The machine must only be assembled and set up by specially trained personnel.
- The electrical supply must only be installed by qualified and authorised electricians.



The machine must be installed in a monitored area, and the system owner must ensure that no unauthorised persons are within this area.

Procedure

The machine must be set up horizontally in both directions.
For this purpose, the subframe of the machine features adjustable levelling elements.

Their number depends on the feed system version

1. Align all components with one another as per the installation diagram.
2. Place a machine spirit level on the subframe of the machine.
3. Undo the lock nuts on all levelling elements.
4. Adjust the height via the hexagonal nuts.
5. Turn clockwise to increase the height.
6. Turn anticlockwise to reduce the height.
7. Rotate the machine spirit level by 90°.
8. Align the machine horizontally in this direction.
9. Rotate the machine spirit level by a further 90°.
Check the alignment and adjust it if necessary.
10. Once the unit is perfectly level in both directions, tighten the lock nuts.

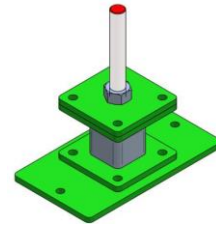


Fig. 24: Supporting foot

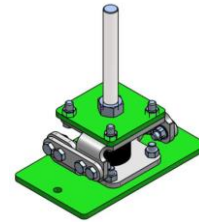


Fig. 25: Supporting foot with load cell

5. Supply and installation



All installations must be implemented by authorised specialist personnel. Fliegl accepts no liability for damage resulting from improper installation of supplied parts by external companies.

5.1 Electrical connection



The wiring in the control cabinet and outside the machine must only be installed by qualified electricians.



The electrical supply is connected in the control cabinet.
The connection must be established at the installation location according to the applicable standards and guidelines and based on the electrical circuit diagram.
For voltage and current consumption, refer to section 3.6.

5.1.1 Procedure

1. Insert the supply line into the control cabinet via the fitting on the underside of the cabinet.
 2. Connect the supply line to the labelled terminal block in the control cabinet.
 3. Check the power supply.
- Establish the connections as shown in the electrical circuit diagram.
 - Ensure that the cables do not present any trip hazards.
 - Protect the cables against damage.

5.2 Hydraulic connections



The installation must only be performed by qualified specialists.



The hydraulic unit(s) is/are included in the scope of delivery. Power is provided via the supplied control cabinet of the feed system.

5.2.1 Procedure

1. Connect the two SVK plugs of the container to the two SVK sockets on the hydraulic unit, making sure that they engage correctly.
2. Connect the supply line to the designated terminal block in the control cabinet (see circuit diagram).
3. Check the power supply.

5.2.2 General safety instructions for the hydraulic system

1. The hydraulic system is under high pressure.
2. Check hydraulic hoses and couplings regularly and replace them if they are damaged or old (at least every 6 years).
3. The replacement hoses must meet the requirements of the machine manufacturer.
4. When locating leaks, use suitable aids due to the risk of injury.
5. Never try to close leaks with your finger.
6. Liquids (hydraulic oil) escaping under high pressure can penetrate the skin and cause serious injuries.
7. In case of injuries, consult a physician immediately → risk of infection!
8. Before working on the hydraulic system, depressurise it and switch off the machine.
9. Only specialist workshops are permitted to perform repair work on the hydraulic system.
10. Ensure that the oil is of the required grade.
11. **Caution when draining hot oil → risk of burns!**



Ensure that any electrical and electronic components installed at a later stage comply with the EMC Directive 2014/30/EU, as amended over time, and bear the CE mark.

6. Start-up

6.1 First-time start-up



- Start-up must take place in the presence of Fliegl customer service.
- All setting and adjusting tasks must be performed for first-time start-up.
- Before starting work, the operator must familiarise himself with all actuating devices and their function.
- It is too late to do so once work has started.
- Check the operational safety of the machine before every start-up.
- Before start-up, instruct persons to leave the danger area.
- Before starting up the machine, ensure that there are no persons in the danger area.
- Also comply with the instructions in the relevant sections and in the appendix of these operating instructions.



The following steps must be completed for first-time start-up:

- Check the setup.
- Check the power supply.
- Test EMERGENCY STOP systems.
- Fill and/or check auxiliary and operating materials.



The control system must only be configured by authorised personnel or under the direction or on the part of the manufacturer.

Alteration of the control parameters can result in significant dangers.

- Only the timer for the interval time of the feed cycle may be adjusted to the material and the specific conditions of the biogas plant.
- Significant hazards can arise if other parameters are altered.
- Non-compliance will render the warranty null and void.
- For details on adjusting the push-off cycle, refer to the operating instructions for the control cabinet. By default, the capacity of the feed system is set to one filling operation per day.
- The timer for the interval time of the feed cycle can be adjusted via the control cabinet. This setting depends on the performance and size of the biogas plant.

The start-up process for the control system is covered in a separate manual.

It can be found in the documentation folder in the machine control cabinet.

6.1.1 Safe start-up of the biogas plant

Fill the fermenter with raw slurry (min. 60% of working volume). Heat the fermenter to the required operating temperature. Once the target temperature has been reached, inoculate the medium by adding fermenter content / digestate from an active biogas plant (approx. 20% of working volume). The material should come from a plant with a similar function and substrate composition.

The first substrate feed should take place when a 50% methane content in the produced biogas is substantially exceeded. The feed should ideally represent the planned substrate mix from the outset.

Increase the volumetric load based on the start-up plan while continuously monitoring the process data – guideline: 0.3 to 0.4 [kg oTS/m³*d] increase in volumetric load per week. As a rule, the rate of growth should be reduced as the volumetric load increases.

Potential hazards, emissions and errors during start-up of a biogas plant:

Before first filling the fermenter, all work on the fermenter and the associated pipelines must be completed in order to prevent damage.

An accurate assessment of the system load requires correct weighing of the feedstock.

This is particularly important both for the start-up procedure and for the ongoing process control.

Failure to perform regular chemical analyses of the feedstock and, in particular, the fermentation mixture can impair the speed and safety of the start-up process.

Increasing the volumetric load too quickly will soon overload the process when establishing the fermentation biology, and this in turn can greatly extend the duration of the start-up process.

Low-emission start-up:

Partially filled containers can result in uncontrolled escape of biogas. Therefore, a suitable fill level must be ensured during filling so that the substrate feed technology is fully submersed in the liquid phase. During system start-up, the increased methane content in the biogas temporarily produces a potentially explosive mixture (at approx. 4 to 17% CH₄ by volume).

It is therefore advantageous if the headspace accounts for a low proportion of the container volume.



The fermenter must be GAS-TIGHT!

6.2 Check before start-up

The points below will facilitate machine start-up.

For more detailed information, refer to the relevant sections in the operating instructions.

Check to ensure that all safety devices (covers, panels etc.) are in proper condition and are applied to the machine in protective position.

- Check the interior of the machine for loose parts.
- Then check the tightness of all screw connections.
- Lubricate the machine according to the lubrication schedule.
- Check the hydraulic system for leaks.
- Check the oil level of the gearbox and inspect it for leaks.
- Connect all connecting lines (e.g. hydraulics) correctly and secure them.

6.3 Returning to service

After an extended storage period, the same steps as for first time start-up must be completed.

See section 6.1.

7. Preparation and setup

7.1 General information

The machine can be retrofitted or upgraded with a range of components.

- Hopper attachment
- Central lubricating station for bearings
- Electronic weighing system with different displays
- Roof structure for Biomat



The components can be individually combined.
Please contact us for more information (see page 9).

7.2 Feeder auger

Objective

Feeding the substrate into the biogas fermenter.

Prerequisites

- Fermenter is ready for operation
- Feeder auger is assembled gas-tight
- Feed system is ready for operation



Fig. 26: Feeder auger versions

8. Control and display elements

8.1 Location of the control and display elements

The control cabinet is usually located at the front of the system, outside the EX zone.

An overview (see section 3.5) of the main operating and display elements and their installation location on the machine can be found here:

A detailed description of the individual control and display elements is provided in the system control cabinet.

8.1.1 Mains isolator

Switches the power supply for the machine on or off.

In position 0, the mains isolator can be locked using a separate padlock.

- Position 0: power supply off
- Position 1: power supply on



Fig. 27: Mains isolator

8.1.2 List of control faults

Display		Possible causes	Action
Sammelstörung	Always displayed in the event of a fault	A fault exists	View errors under "Alarme" [Alarms] display
Störung Einbringschnecke	Motor circuit breaker has tripped	Screw conveyor jammed / electric motor defective	Activate circuit breaker, check motor
Störung Einbring rechts			
Störung Einbring-Einbring rechts			
Störung Hochförderchnecke			
Störung Trogchnecke			
Störung Dosierschnecke1-6			
Störung Hydraulikaggregat			
Störung Sicherung Ventile	Fuse Q.. has tripped	Coil short-circuit, hydr. or valve connector defective	Replace coil or connector, check for moisture
Störung Mischer I	Motor circuit breaker has tripped	Motor sluggish	Check material, possible foreign bodies (paving stones / tyres)
Störung Mischer II			
Störung Abschaltung nach Zeit	Feed by timer (dosing time has passed)	Set dosing time too short	Increase dosing time
Störung Mischermotor FU	Frequency inverter fault	Power failure / overload etc.	Check error code in FI instructions
Störung CAN Master	Touch panel fault		Contact Fliegl Service
Störung CAN FU Mischer	Fault in connection between FI and CAN master	Patch cable / plug connection faulty	Check patch cable
Störung Abschaltung nach Zeit	Timer dosing time has interrupted feed	Set timer dosing time too short	Set longer dosing time
Störung Phoenix	Fault with Phoenix PLC	Phoenix PLC or connection faulty	Contact Fliegl Service
Störung Notaus		EMERGENCY OFF button pressed	Unlock EMERGENCY OFF button

9. Use and operation



Read carefully. If there is anything you do not understand, contact the manufacturer to exclude the possibility of operating errors.



Risk of personal injury, property or environmental damage.
The controls must only be operated by trained personnel.



Toxic, flammable or explosive gases can escape from the fermenter.
No smoking and no open flames!



Risk of damage to the feed system!
Do not operate the feed system during filling and emptying.
Be aware of any unusual noises during operation, which could indicate issues such as lacking lubrication, loose parts as well as motor, gearbox, bearing or shaft damage.

9.1 Before operation



- Instruct unauthorised persons away from the machine.
- Carry out a visual inspection of the entire machine and the tools.
- Check the fill levels of lubricants and auxiliary materials.
- Unlock all devices used for stopping in an emergency (EMERGENCY STOP button)
- The operator is responsible for replacing the labels if they should be lost or become unreadable.
- Otherwise, this could result in incorrect connections etc.

9.2 Switching the machine on and off

9.2.1 Switching on the machine

1. Activate the mains isolator (main switch).
2. Press "OK" on the weight display of the main control cabinet.
Activate the control system.
3. To do so, press the "BETRIEB EIN" [Operation on] button on the control cabinet.
4. Switch on the Start Enable. To do so, activate the display "EIN" [On] switch on the control cabinet.
5. The Start Enable is activated and the "BETRIEB" [ACTIVE] indicator lamp lights up.

9.2.2 Switching off the machine

1. Stop the substrate supply. If the machine is not in initial position, manually return it to this position.
2. Switch off the display.
To do so, turn the display switch on the control cabinet to "AUS" [OFF].
3. Deactivate the control system. To do so, set the main switch on the control cabinet to "AUS" [OFF]. The control voltage is deactivated and the "BETRIEB" [ACTIVE] indicator lamp extinguishes.
4. Deactivate the mains isolator.
→ The machine is switched off

9.3 What to do in an emergency

The correct response in an emergency involves one or more of the following:

- Emergency stop
- Emergency shutdown
- Emergency switch-on

9.3.1 Emergency stop

An action performed in an emergency in order to stop a process or movement that would otherwise present a risk.

→ Press the EMERGENCY STOP button on the control panel (control cabinet)

9.3.2 Emergency switch-on

An action performed in an emergency in order to activate the electrical power supply to a part of the system that is required in emergency situations.



Before reactivating the machine after an emergency stop:

- Identify the cause for the emergency stop.
- Eliminate the risk.

1. Remove all obstacles from the machines.
2. Check again that all risks have been eliminated.
3. Check the tools. There may be damage to any tools that were active at the time of the emergency stop.
4. Unlock the device used to perform the emergency stop. Depending on the version, this will involve:
 - Rotating the switch knob a quarter turn in clockwise direction and
 - Pulling the switch knob upwards
5. Select MANUAL MODE.
6. Move the machine into initial position. To do this, press the GRUNDSTELLUNG [Home position] button on the control panel.
→ You can now resume normal operation.

9.4 Operating modes

9.4.1 Reversing the push-off system (manual mode)



Risk of damage to the feed system!
There must be no foreign bodies in the safety grid.

The push-off floor and the moving panel can only be moved forwards and backwards manually at the same time.

- Turn the "Hand – O – Auto" [Manual – O – Auto] lever to "Hand" [Manual].
- Touch display "manual mode" => see "Display overview"
- Deactivate automatic mode on the control cabinet (switch to manual mode).
- Move the push-off floor and moving panel all the way back to home position.

9.4.2 Automatic



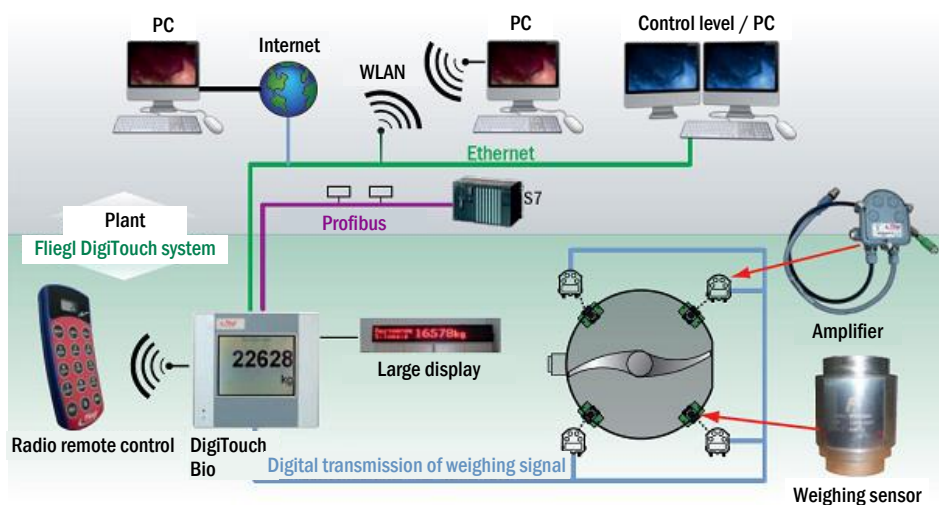
Please read the operating instructions for the touch panel settings, which can be found in the machine control cabinet.

Automatic mode enables automated substrate feed by time or with optional weight control.

Conditions for operation

- Machine switched on
- Machine in initial position
- No error messages present

9.4.3 Electric control monitoring options



9.4.4 Display types



9.5 Working with the machine

9.5.1 General safety and operating instructions

The following section contains some general notes on safety and operation for working with the machine, repeated and summarised for better clarity:

1. Operators with electr. implants, such as cardiac pacemakers, must not work with the machine.
2. Entering or climbing into the filling system is prohibited.
3. The system must be installed in accordance with the relevant Ex zones and the corresponding protective measures.
4. The machine must not be transported, set up, commissioned, operated or maintained/repared by persons who are under the influence of alcohol, drugs or medication.
5. Operating personnel must be at least 18 years of age.
6. Observe the warning and information signs attached to the feed system.
7. Close-fitting clothing must be worn when operating, maintaining or repairing the feed system.
8. When working on or with the feed system, use the required personal protective equipment where necessary.
9. Never activate the machine if it is not attached to the pit opening or if there are persons inside the feed system or in the pit.
10. Do not remove the pit cover or open the inspection cover, fermenter access or safety grid on the feed system until directly before commencing installation or maintenance work.
11. Always re-apply the pit cover or close the inspection cover, fermenter access or safety grid immediately after completing installation or maintenance work.
12. Never leave the machine unattended during installation or maintenance work.
13. When working on the feed system, the machine must be disconnected from the mains and secured against reactivation.
14. The feed system must not be commissioned or operated without the safety devices and protective covers fitted by the manufacturer or installed on-site
15. Any faults that occur must be reported immediately. In the case of faults that affect safety, the feed system must not be operated until the relevant issue has been rectified.
16. In the case of a fault, the feed system must be shut down immediately.
17. Defects on the feed system must be rectified immediately. Operation of the feed system must only resume once all problems have been rectified.
18. Keep persons and animals away from the pit and the working area of the machine during all installation and maintenance work.
19. Particular caution is advised if children are present!
20. All installation and maintenance work performed on machines in potentially explosive atmospheres must comply with the German Ordinance on Industrial Safety and Health ("Betriebssicherheitsverordnung – BetrSichV" [Germany]) as well as the safety, installation and maintenance instructions in this manual.
Any work that is relevant to explosion protection must be carried out by a trained specialist or by Fliegl Agrartechnik GmbH.

21. Any work that is not performed by Fliegl Agrartechnik GmbH must be conducted and approved by an expert.
This expert must issue a written certificate and/or apply his test mark to the machine.
22. Do not make any changes or conversions to the feed system:
Any unauthorised changes will render the manufacturer's declaration or declaration of conformity invalid.
23. The maintenance intervals specified in the operating instructions must be observed.
24. To ensure machine safety and maintain functionality as well as explosion protection (where applicable), faulty components must only be replaced with original parts with the same electrical and mechanical properties.
25. All safety equipment (e.g. safety grids), fastenings, electrical and hydraulic connections and lines must be checked on a regular basis to ensure they are in good and safe working condition.
26. Overriding or bypassing safety-relevant components is prohibited.
27. The position of safety guards must not be altered.
28. Work on the hydraulic system must only be performed by trained specialists.
29. All hydraulic components, lines, hoses and screw connections must be checked for leaks and visible signs of damage on a regular basis.
30. Any leaks and damage must be rectified immediately.
31. The hydraulic hoses must be replaced every 6 years at the latest (starting from the date of feed system installation).
32. It is essential that no lubricants, hydraulic or gear oils enter the ground, water or fermenter.
33. Under no circumstances must the feed system be installed within 3 m
34. of a fermenter opening that is not permanently sealed. The zoning of the biogas plant (to be created by the plant owner) must be observed in this case (see BetrSichV [Germany]).
35. Toxic, flammable or explosive gases can escape from the fermenter.
36. Gas can escape when opening or dismantling the feed system.
Increased risk of explosion!
37. Do not introduce any ignition sources (e.g. non-explosion-protected electrical equipment).
38. Always use non-sparking tools.
39. No smoking and no open flames in the area of the pit!
40. Toxic gases can escape from the fermenter.
41. Ensure sufficient ventilation of the pit before conducting any installation or maintenance work.
42. Observe the applicable regulations for biogas plants.
43. There must be no foreign bodies in the safety grid.



9.6 Conducting a trial run

After the machine is set up and prepared and before work begins, a trial run must be conducted in *unloaded condition*.

Objective

Check to ensure the attachment is set up correctly and functioning properly.

Prerequisites

- Machine is ready for operation
- Machine is fully set up
- Correct substrates are available



Before the trial run, familiarise yourself with the basic safety information specified in the relevant operating instructions as well as the information regarding first-time start-up and take all the prescribed safety precautions.

Procedure

- Turn on the machine as specified.
- For other settings, refer to the operating instructions for the display in the control cabinet.

10. Service and maintenance

Switch off the machine and secure it against reactivation. Read the operating instructions.

Below you will find information on troubleshooting and maintenance of the machine.

Regular maintenance in accordance with the maintenance plan is essential to the efficient use of the machine.

10.1 Customer service

Please contact:

Fliegl Dosiertechnik
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 351
Fax: +49 (0)8631 / 307 - 552
Mobile: +49 (0)178 / 2008800
E-mail: dosiertechnik@fliegl.com

10.2 Replacement parts



For a detailed list of all relevant replacement parts, refer to the replacement parts list. This is available at: <https://support.fliegl.com/de/dosiertechnik/zeichnungen-masse>

For replacement part orders, please contact:

Fliegl Dosiertechnik
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn, Germany

Tel.: +49 (0)8631 / 307 - 351
Fax: +49 (0)8631 / 307 - 552
Mobile: +49 (0)178 / 2008800
E-mail: dosiertechnik@fliegl.com



When ordering replacement parts, note also the instructions in section 1 and specify the relevant data from the type plate of your device in the order.

10.3 Instructions for maintenance

Rondomat planetary gear: We recommend that you replace the gear oil after no more than 6 months and approx. every 2 years thereafter.

Hydraulic unit: We recommend that you replace the oil after 6 months.
Whenever you change the oil, you should also replace the intake and return filter.

Rondomat extractor blade: You should regularly tighten the mounting bolts (x12) on the extractor blade to prevent any consequential damage caused by loosening or breakage of the screws.

10.4 Operational maintenance

10.4.1 General instructions for maintenance

Operational maintenance helps to ensure trouble-free and efficient use of the machine.

Operating personnel can perform this work after receiving appropriate instruction.

Maintenance task	Interval											
	After first 10 oper. hours	After first 50 oper. hours	Daily	Weekly	50 oper. hours	100 oper. hours	200 oper. hours	Quarterly	Biannually	Annually	During maintenance	
Check general condition			x									x
Check the safety devices			x									x
Clean the machine				x								x
Check that all screw connections on the machine are securely fastened	x				x							
Check the hose guide for contamination			x									
Change the hydraulic oil		x								x		
Replace the intake filter in the hydraulic unit		x								x		
Replace the return oil filter in the hydraulic unit		x								x		
Check the hydraulic system for leaks ¹⁾	x		x									
Lubricate all lubricating points on the machine	x				x							x
Check the seals on the moving panel and push-off floor						x						
Check the slide rails of the moving panel and sliding floor						x						
Check the screw conveyors for wear						x						
Check the gear oil levels and top up if necessary							x					
Check the hydraulic oil levels and top up if necessary					x							
Check the flange bearings for wear or cracked housings								x				
Check the flange cover on the fermenter for leaks									x			
Check the locking ring of the feeder auger for wear or breakage									x			
Check the feeder auger bearing										x		x

General instructions:

- On new machines, check the screw connections after the first 10 operating hours
- Retighten all loose screw connections as necessary
- W = workshop task
- Or weekly
- Or quarterly
- ¹⁾ Replace hydraulic hoses every 6 years



Some of the above tasks depend greatly on the type of use and the ambient conditions. The cycles specified above are the minimum requirement. Different maintenance cycles may be needed in individual cases.

In this case:



- Correct the operating instructions accordingly.
- Inform operating personnel about the applicable changes.

10.4.2 Cleaning the machine



There is a risk of injury on movable parts when cleaning the machine. When performing cleaning work, switch off the machine and secure it against reactivation. Empty the machine completely before cleaning the inside.

During the first four weeks, clean the machine only with clear water and do not use a high-pressure cleaner.

Note the following rules for upkeep of the machine:

- Wash the machine only with clear water without any cleaning additives to prevent paint damage. Repair any paint damage immediately.
- When cleaning with a high-pressure cleaner, maintain a distance of at least 400 mm with the spray nozzle.
- The water temperature must not exceed 60° when cleaning.

Assemblies/components to be cleaned:

- Outside of machine, drain channel
- Space between moving panel and front panelling
- Accessed by removing the front panelling

Note the following rules for cleaning and maintaining the electrical connections:

As a rule, electrical connections must not be cleaned with water or mechanical objects.

We recommend that you use compressed air at 6 to 8 bar in combination with an air blow gun.



Some of the above tasks depend greatly on the type of use and the ambient conditions. The cycles specified above are the minimum requirement. Different maintenance cycles may be needed in individual cases.

In this case:



- Correct the operating instructions accordingly.
- Inform operating personnel about the applicable changes.

10.4.3 Checking the safety devices



Check all devices for emergency stopping and check the guard doors individually and separately from each other. In the case of faulty safety devices, stop the machine immediately and secure it against reactivation.

Functional check of the emergency stop device

1. Switch on the machine.
2. Operate the emergency stop device.

→ Operating the device for stopping in an emergency must result in the deactivation of all machine functions:

- Start enable
- Motors and pumps
- Pneumatically operated parts

Checking the limit switch function

1. Switch on the machine.
2. Manually actuate the limit switches.

→ The slider moves to home position.

- Start enable
- Motors
- Pneumatically operated parts

10.4.4 Checking the display elements

1. Check the lamps on the control cabinet.

→ All indicator lights on the control cabinet and on the control panels must light up.

10.4.5 Checking the monitoring equipment

The following monitoring equipment affects the control and correct operation of the machine and must therefore be checked on a regular basis.



For optional devices, refer to the operating instructions in the control cabinet.

10.4.6 Auxiliary and operating materials

Component	Type	Quality
Hydraulics	Hydraulic oil HPL ISO VG 46	51524-2
Gears	Mineral oil ISO VG 220	DIN 51 354
Lubricating points in general	Grease (e.g. SM11 K2E-20, L 71V, FAG, ISO VG 100 or biodegradable lubricating grease CEC test L-33 T-33)	DIN 51 825-1 to 4
Flange bearing	Standard grease for bearings ISO VG 100 (-30 to +140°C)	DIN 51502

10.4.7 Lubricating points with lubricating nipples


Notice!

There is a risk of injury due to rotating and movable parts when lubricating. Before lubricating, switch off the machine and secure it against reactivation.

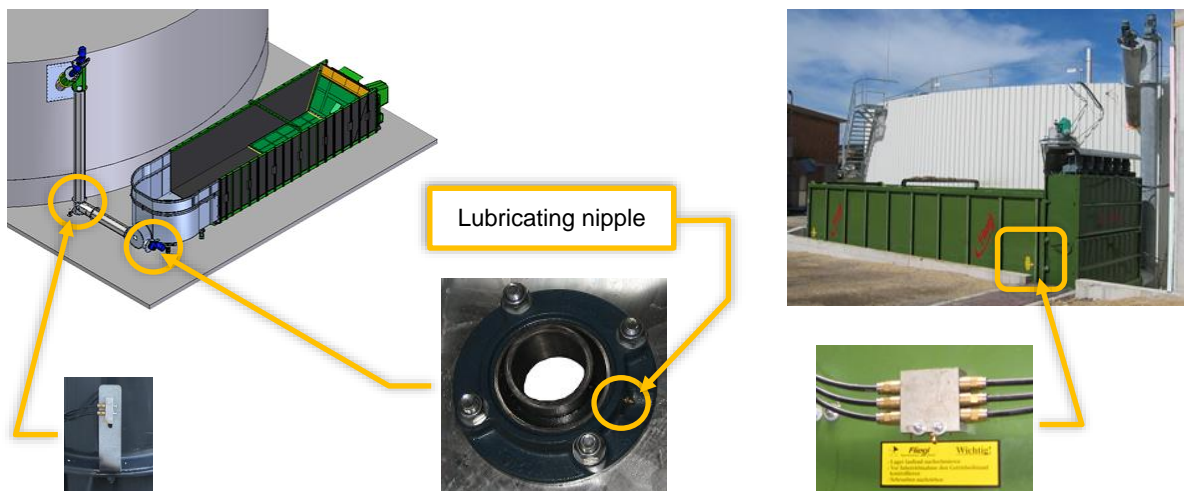


Fig. 28: (Central) lubrication points

10.5 Replacing the lower bearing of the feeder auger (option)



- Do not remove the pit cover or open the inspection cover or fermenter access on the feed system until directly before commencing installation or maintenance work.
- Always re-apply the pit cover or close the inspection cover or fermenter access immediately after completing installation or maintenance work.
- The pit must be empty, ventilated and clean.
- Always use the necessary personal protective equipment when working in the pit (see BetrSichV).

Procedure

1. The fermenter must be empty, free of gas and well ventilated.
2. Retract the push-off system (see "Reversing the push-off system (manual mode)"), switch off the feed system and empty the housing.
3. Detach the feeder auger at the top, raise it approx. 500 mm and secure it. Then unscrew the lower feeder auger bearing from its mounting before removing and replacing it.
4. Re-attach the auger.



Fig. 29: Lower bearing

10.6 Replacing the feed pipe and feeder auger



- Risk of personal injury and property damage!
- The feed pipe and feeder auger must only be replaced by Fliegl Agrartechnik GmbH.
- Non-compliance will render the warranty null and void.
- The fermenter pit must be empty, ventilated and clean.
- When working in the pit, you must observe all applicable accident prevention regulations and use the necessary personal protective equipment (see also the operation instructions of the biogas plant).
- The feeder auger must always be replaced together with the flange bearing, gear motor and lower bearing.



Risk of explosion due to escaped methane gas!



After sealing off the container opening, check for leaks using leak detector spray and reseal if necessary.

10.7 Tightening torque for screws

Coarse thread	Dimension	Pre-tension force (kN)					Tightening torque (Nm)				
	Strength class	4.6	5.6	8.8	10.9	12.9	4.6	5.6	8.8	10.9	12.9
	M 4 x 0.70	1.29	1.71	3.9	5.7	6.7	1.02	1.37	3.0	4.4	5.1
	M 5 x 0.80	2.1	2.79	6.4	9.3	10.9	2.0	2.7	5.9	8.7	10
	M 6 x 1.00	2.96	3.94	9.0	13.2	15.4	3.5	4.6	10.0	15.0	18.0
	M 8 x 1.25	5.42	7.23	16.5	24.2	28.5	8.4	11.0	25.0	36.0	43.0
	M 10 x 1.50	8.64	11.5	26.0	38.5	45.0	17.0	22.0	49.0	72.0	84.0
	M 12 x 1.75	12.6	16.8	38.5	56.0	66.0	29.0	39.0	85.0	125.0	145.0
	M 14 x 2.00	17.3	23.1	53.0	77.0	90.0	46.0	62.0	135.0	200.0	235.0
	M 16 x 2.50	23.8	31.7	72.0	106.0	124.0	71.0	95.0	210.0	310.0	365.0
	M 18 x 2.50	28.9	38.6	91.0	129.0	151.0	97.0	130.0	300.0	430.0	500.0
	M 20 x 2.50	37.2	49.6	117.0	166.0	190.0	138.0	184.0	425.0	610.0	710.0
	M 22 x 2.50	46.5	62.0	146.0	208.0	243.0	186.0	250.0	580.0	830.0	970.0
	M 24 x 3.00	53.6	71.4	168.0	239.0	280.0	235.0	315.0	730.0	1050.0	1220.0
	M 27 x 3.00	70.6	94.1	221.0	315.0	370.0	350.0	470.0	1100.0	1550.0	1800.0
	M 30 x 3.50	85.7	114.5	270.0	385.0	450.0	475.0	635.0	1450.0	2100.0	2450.0
	M 33 x 3.50	107.0	142.5	335.0	480.0	560.0	645.0	865.0	2000.0	2800.0	3400.0
	M 36 x 4.00	125.5	167.5	395.0	560.0	680.0	1080.0	1440.0	2600.0	3700.0	4300.0
	M 39 x 4.00	151.0	201.0	475.0	670.0	790.0	1330.0	1780.0	3400.0	4800.0	5600.0

Fine thread	Dimension	Pre-tension force (kN)			Tightening torque (Nm)		
	Strength class	8.8	10.9	12.9	8.8	10.9	12.9
	M 8 x 1.00	18.1	26.5	31.0	27.0	40.0	47.0
	M 10 x 1.25	28.5	41.5	48.5	54.0	79.0	93.0
	M 12 x 1.25	43.0	64.0	74.0	96.0	140.0	165.0
	M 12 x 1.50	40.5	60.0	70.0	92.0	135.0	155.0
	M 14 x 1.50	58.0	86.0	100.0	150.0	220.0	260.0
	M 16 x 1.50	79.0	116.0	136.0	230.0	340.0	390.0
	M 18 x 1.50	106.0	152.0	177.0	350.0	490.0	580.0
	M 20 x 1.50	134.0	191.0	224.0	480.0	690.0	800.0
	M 22 x 1.50	166.0	236.0	275.0	640.0	920.0	1070.0
	M 24 x 2.00	189.0	270.0	315.0	810.0	1160.0	1350.0
	M 27 x 2.00	245.0	350.0	410.0	1190.0	1700.0	2000.0
	M 30 x 2.00	309.0	440.0	515.0	1610.0	2300.0	2690.0

10.8 Troubleshooting and fault elimination



Special caution when rectifying faults.

- **Consult trained service personnel or**
- **visit a specialist workshop.**
- **If necessary, contact the manufacturer's customer service department.**

10.8.1 List of warning and fault signals

Fault / error message	Possible cause(s)	Remedy
Feed rate is too low	Feed/interval time set incorrectly	Consult the manufacturer's customer service
	Screw conveyor jammed or blocked by foreign body (e.g. wood, stone, tyre etc.)	Remove foreign body
	Hydraulic pressure too low	Check hydraulic system and perform any necessary repairs (or have repairs carried out)
	Dosing/screw conveyors are worn or damaged	Repair
Hydraulic motor, gearbox or bearings get too hot	Internal malfunction	Consult the manufacturer's customer service, a specialist company or your dealer
Gearbox losing oil from bleed screw (during operation)	Fill level too high	Reduce fill level
	Pressure vent defective	Replace bleed screw, top up lubricant if necessary
Gearbox losing oil from seals (during operation)	Hardening of seal due to prolonged storage	Clean the affected area and check for leaks again after a few days. If leak persists, contact the manufacturer, a specialist company or your dealer
	Seal damaged or worn	Consult the manufacturer's customer service, a specialist company or your dealer



Fault / error message	Possible cause(s)	Remedy
Motor circuit breaker of feeder auger trips repeatedly	Material build-up below feeder auger	Extend agitator runtime, remove build-up with external agitator if necessary
Flange bearing of feeder auger moves up and down		
Hydraulic unit motor running but no pressure is built up	Hydraulic cylinder leaking	Disconnect hydraulic hoses from SVK connector and switch on the machine
	Control/actuation of 4/3-way valve faulty	If the control cable diodes do not light up, consult the manufacturer's customer service
	Magnets of 4/3-way valve faulty	Move slider forward or back in manual mode, replace connector on solenoid valve if necessary, then consult the manufacturer's customer service
	Hydraulic coupling inside tank loose or leaking	Open (unscrew) hydraulic tank, raise lid slightly, short trial run (pump must remain in hydraulic oil), tighten screw connections.
	Set feed/interval time too short; no push-off takes place since runtime is too short	Consult the manufacturer's customer service
Hydraulic unit motor creaks and builds up very little pressure, or none at all	Oil intake and return filter contaminated	Clean oil intake and return filter with benzine, replace if necessary
	Pump faulty	Consult the manufacturer's customer service, a specialist company or your dealer
No function	Limit switch misaligned or faulty	Re-align limit switch and use magnets to test whether diode lights up. If necessary, consult the manufacturer's customer service, a specialist company or your dealer
	Motor circuit breaker has tripped, system switches to fault mode	Operate the motor circuit breaker cyclically, identify reason for tripping. Resume system operation. If tripping persists, consult the manufacturer's customer service



The machine must be switched off before performing any maintenance, repair or conversion work. Secure the machine against reactivation.

10.8.2 Control unit activation not possible

The control unit cannot be switched on.

Possible causes	Remedy
No power supply voltage	Determine causes for lack of power supply voltage. Apply power supply voltage.
Engine protection circuit breaker or fuse tripped Engine faulty Mechanism blocked Defective cable	Determine the causes for the blown fuse. Rectify the fault. Turn on engine protection circuit breaker or fuse.
Control unit fault	Contact the manufacturer's customer service. Contact a specialist for electronic control systems.



10.8.3 Start activation not possible

The start enable cannot be switched on.

Possible causes	Remedy
Emergency stop device operated	Identify the cause for tripping of the emergency stop device. Eliminate the risk. Unlock the emergency stop device; see section 9.3.2.
Safety door or maintenance door open	Close the doors. Check the safety switch.
Control unit fault	Contact the manufacturer's customer service. Contact a specialist for electronic control systems.



10.8.4 Automatic start not possible

The machine cannot be started in automatic mode.

Possible causes	Remedy
Control not activated	Activate the control.
Start enable not activated	Activate start enable.
Machine not in initial position	Move the machine to its initial position.
Machine not in AUTOMATIC mode	Set the AUTOMATIC selection switch to position 1.

10.9 Decommissioning



Decommissioning includes the correct deactivation and disconnection of the connecting and supply parts.

10.9.1 Temporary shutdown

Switch off the machine and all attached assemblies. (See section 9.2.2.)
Clean and maintain the machine. (See section 10.4.)



After a temporary shutdown, a new start-up must take place.
(See section 6.2.)

10.9.2 Storage conditions

For short and medium periods (up to 2 years), the machine can be stored without special measures in the ambient conditions specified in the technical data.
For long-term storage, measures must be taken to prevent corrosion:

1. Thoroughly clean the entire machine inside and out, then leave to dry.
2. Switch off the hydraulic and electrical supply to the attachment. Protect connections.
3. Lubricate the machine (see lubrication plan).

10.9.3 Disassembly and final shutdown

1. Switch off the machine.
2. Disconnect the power line from the control cabinet or disconnect the plugs, roll up the supply line cable and secure it on the machine.
3. Drain the auxiliary materials.
5. Disassembly of the machine is performed in the reverse order to assembly, or as described in the disassembly instructions.

10.9.4 Scrapping and recycling

Separate machine parts and electrical parts and dispose of them in the correct manner.



Separate all parts, auxiliary materials and working materials of the machine and dispose of them according to local regulations and directives.



If you have any questions about scrapping/recycling, please contact the manufacturer.

11. Appendix

11.1 Conversion table

The following table facilitates the conversion of specific units.

Variable	SI units (metric)		Factor	Imperial units	
	Unit name	Abbreviation		Unit name	Abbreviation
Area	Hectare	ha	2.47105	Acre	acres
Volume flow rate	Litres per minute	l/min	0.2642	US gallons per minute	gpm
	Cubic metres per hour	m ³ /h	4.4029		
Force	Newton	N	0.2248	Pound-force	lbf
Length	Millimetre	mm	0.03937	Inch	in.
	Metre	m	3.2808	Foot	ft.
Power	Kilowatt	kW	1.3410	Horse power	hp
Pressure	Kilopascal	kPa	0.1450	Pounds per square inch	psi
	Megapascal	MPa	145.0377		
	Bar (non-SI)	bar	14.5038		
Torque	Newton metre	Nm	0.7376	Pound-foot or foot-pound	ft·lbf
			8.8507	Pound-inch or inch-pound	in·lbf
Temperature	Degrees Celsius	°C	°C x 1.8 + 32	Degrees Fahrenheit	°F
Speed	Metres per minute	m/min	3.2808	Feet per minute	ft/min
	Metres per second	m/s	3.2808	Feet per second	ft/s
	Kilometres per hour	km/h	0.6215	Miles per hour	mph
Volume	Litre	L	0.2642	US gallon	US gal.
	Millilitre	ml	0.0338	US ounce	US oz.
	Cubic centimetre	cm ³	0.0610	Cubic inch	in ³
Weight	Kilogramme	kg	2.2046	Pound	lbs

Permit for potentially explosive areas

Tick where appropriate. Delete as appropriate in ticked lines.

Permit for welding, hot work and other spark-producing activities, for drilling grinding, breaking and cutting work as well as for the use of non-explosion-protected equipment.

A

1. Ordering party: Construction: Tel.: Foreman:

2. Location and type of work

.....

4. For workshop/company Construction Foreman

B Danger points in the environment

Workplace, structures, equipment, etc.	Person(s) responsible	Construction	Tel.
1.			
2.			
3.			
4.			

C Safety measures To be performed/implemented by: Completed

1. Check pipelines and equipment in the vicinity of the workplace for leaks -

2. Fire-extinguishing measures and other safety measures

a. Provide fire water and fire extinguishers at workplace -

b. Connect fire hose -

c. Set up safety posts -

- Tradesman - Employee - Supervisor - Fireman

d. Remove flammable materials, vapours, gases or dust deposits -

e. -

3. Workplace identification (road, railway track, etc.)

a. With red flags (20 m either side of workplace) -

b. With signs (e.g. hot work on pipe bridge) -

c. Barriers, diversion for tankers, closure for rail vehicles -

4. Safeguarding the environment against welding sparks

a. Cover adjacent lines -

b. Use screens, protect roof membrane, keep damp if necessary -

c. Cease work in case of train traffic -

d. Maintain safety distance of m from combustible tank wagons, fuel depots, etc. -

e. Cover or seal off pipe openings, gratings, lightwells and manholes -

f. -

5. For work in and on containers, equipment, pits, pipelines, on dismantled system parts, in confined spaces, etc., additional measures acc. to:

a. Access permit No. Dated -

b. Work permit No. Dated -

c. Safety certificate for electrical equipment No. Dated -

d. -

6.

a. Before commencing work, report **daily** to B 1, 2, 3, 4 -

b. After completing work, report **daily** to B 1, 2, 3, 4 -

7.

a. Check of ticked safety measures by (name) -

b. Check of workplace upon work completion by (name) -

D Agreement regarding responsibilities for danger points

Commencement of work reported on: by:

For B 1 measures C number

For B 2 measures C number

For B 3 measures C number

For B 4 measures C number

Permit issued

Date

Signature of operations manager

Index

A

Applications	25
Assemblies	33
Automatic	47

B

Basic safety instructions	13
Biogas plant	42

C

Cleaning	53
Component	33
Control cabinet	21
Control system	41
Customer service	51

D

Decommissioning	61
Design variants	25
Dimensions	35

E

Electrics	35; 39
Emergency	46

F

Fault	44
Functional description	32

H

Hazards	16; 23
Hydraulics	35; 39

I

Illustrations	10
Installation location	36

L

Layout	32
Lubricating points	55

M

Mains isolator	44
Maintenance	51; 52
Maintenance instructions	51
Manual mode	47
Misuse	15

O

Operation	45
-----------------	----

P

Personal protective equipment	20
PLC control unit	35

R

Recycling	61
Replacement parts	9; 51
Risk of explosion	56

S

Safety devices	21
Sound power level	35
Start-up	41
Supporting foot	38

T

Timer	41
Troubleshooting	58

U

Use	14
-----------	----

V

Volume	35
--------------	----

W

Warning	16
Warning signals	58
Warnings	24
Workstation of operating personnel	22



► **Fliegl Dosiertechnik**

Bürgermeister-Boch-Str. 1

D-84453 Mühldorf a. Inn

Tel.: +49 (0) 86 31 307-0

Fax: +49 (0) 86 31 307-550

e-Mail: info@fliegl.com

We are Fliegl.