



Owner's manual

Type MF

VERSION OCTOBER 2023

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BUSSE-MF MODEL SPECIFICATION

Model	400	500	600	800	1000	1200
Treatment (gal/day)	400	500	600	800	1000	1200
Total Volume (gal)	792	1056	1585	2642*	3963*	5284*
Volume balance tank (gal)	528	528	792	1321*	1982*	2642*
Volume MBR (gal)	365	528	792	1321	1982	2646
cBOD Load (lb/day)	0,8	1,5	2,3	3,0	4,5	6,0

* Minimum Volume

In the event of a power failure it is important to minimize water usage so not to overload the system.

Emergency Telephone Number is printed on system data plate

Owner's manual

1.1 Introduction

Abstract

CONGRATULATIONS! You are the owner of a complete wastewater treatment system that combines aeration, separation of solids and hygienisation in one compact unit. Your system is tested and certified under NSF, International, ANSI/NSF Standard 40, as a Class I system and ANSI/NSF Standard 245.

The wastewater treatment system *BUSSEMF* uses the micro filtration process for the cleaning of domestic wastewater. With over 300 installations in Germany, the use of the Kubota membrane bioreactor (MBR) process developed by BUSSE GmbH is a widely accepted treatment option for residential wastewaters. These plants are highly automated with multiple levels of redundancy to protect from mechanical failures. The *BUSSEMF* system was especially developed for decentralized or rural locations where residential wastewater should be cleaned up to a bathing water quality.

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Models

Type: BUSSE-MF – 400, 500, 600 800, 1000 1200

Technical modifications

We reserve the right to make technical changes to incorporate further technical updates developed by BUSSE Innovative Systeme GmbH.

1.2 Description

This is a model Busse 500. Each of the various model sizes are technically identical. The difference is the amount of wastewater that each size treats. This manual describes the Busse Model 500.

The small-scale membrane bioreactor *BUSSEMF* Type **MF-500** (household unit) has a rated load of 500 gal wastewater per day.

The system utilizes two balance tanks with a screened air-lift pump system that pumps flow into the two MBR tanks, which house 24 half height Kubota flat sheet membranes. The process has been developed for the treatment of wastewater from properties, which are not connected to or cannot be connected to a central sewerage system or where the effluent discharge limits are tighter than can be achieved with currently available technologies.

The Kubota membrane unit's (M-box) is comprised of two sections: the lower section that contains the air pipework and the upper section that contains the membrane panels. The membrane panels consist of an ABS support covered with a felt spacing material and a chlorinated polyethylene membrane. The membrane material has a nominal pore size in the range of 0.1 to 0.4 μm . However, due to the beneficial development of a thin dynamic layer of protein and cellular material on the membrane surface during plant operation, the pore size is reduced to an effective size of $< 0.01 \mu\text{m}$. The membrane units are submerged in activated sludge and are aerated by coarse and a fine bubble systems that provides a cross flow of liquid over the surface of the membrane panels, preventing membrane fouling, and provides the oxygen necessary for the microbial degradation of the organic matter and micro-organisms within the wastewater; as well as securely holding the panels in position the units act as a flume to direct the liquid flow over the membrane panels, providing good mixing and oxygen transfer. The liquid head pressure above the membranes drives the permeate from the mixed liquor through the physical barrier of the membrane where it flows via a manifold through the tank wall and is discharged. Taking advantage of the liquid head pressure in this way means that no additional energy is required to provide the suction otherwise necessary to generate the permeate. The coupling of the membrane process and activated sludge process ensures permeate is of an extremely high quality, almost completely void of solids to the point of disinfection as well as excellent organic and nutrient removal. An ex-change and chemical cleaning of the membranes is typically carried out once every six months.

1.3 Basic system design with flow path

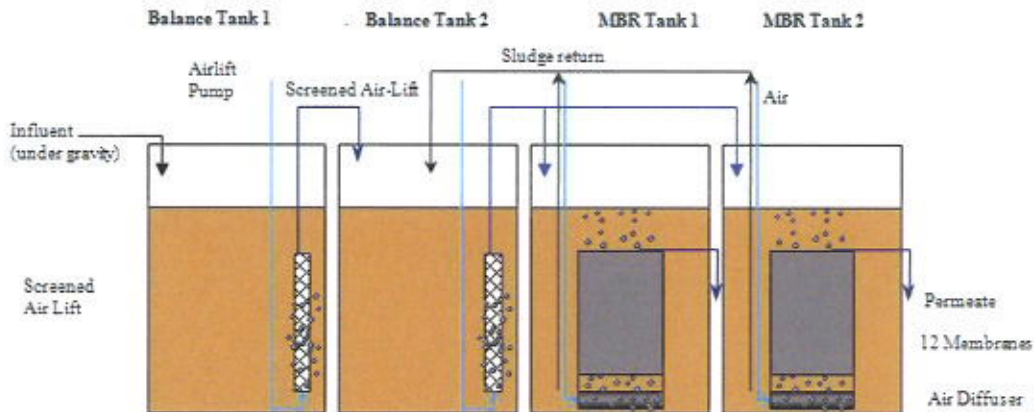


Figure 1: Schematic BUSSEMF Type MF-500

The plant consists of four processes:

- *Balance Process*
Flow balancing (balance tanks 1+2) allows the plant to be based on average flow rather than peak flow. An airlift pump is installed in the balancing tank to ensure the maximum flow passed forward to the MBR zone is does not exceed the design capacity of the unit.
- *Primary Sedimentation Process*
A primary sedimentation tank (balance tank 1) is provided to remove the settleable and floating non-biological degradable solids (coarse matter) prior to the MBR zone and to store surplus activated sludge (balance tank 2), thus decreasing the frequency at which sludge must be removed from the BUSSEMF.
- *Aerated Coarse Matter Separation*
The aerated 3mm mesh screen for coarse matter separation prevents processes of rotting in the balancing tanks.
- *Membrane Bioreactor Process*
The normal operation MLSS range for BUSSE-MF MBR is 12,000 mg/l to 18,000 mg/l. However, due to the low required peak flux through the plant, and the need to reduce site visits the tested operational range has been expanded to from 4,000 mg/l to 30,000 mg/l. A pump for sludge return is installed to maintain the optimum MLSS concentration.

1.4 Scope

The small-scale wastewater treatment system type MF type house sewage plant is constructed for the cleaning of domestic wastewater without addition of any storm water.



DO

- Conserve water to reduce the amount of wastewater that must be treated and disposed
- Repair any leaking faucets and toilets (very important)

1.5 Substances that may adversely affect the system

The following substance may adversely affect the wastewater treatment system or the environment if you use them or try to dispose them in your wastewater treatment system.

Drain pipe cleaner, sanitary and pharmaceutical products, chlorine based cleaning agents, strong bleach and acidic, pesticides, insecticides, cat litter, paint thinners & brush cleaner, plastics, condoms, textiles etc.

In order to prevent malfunctions, and to ensure optimum performance of the system, the following guidelines should be followed:



DO NOT

- Overload the system by introducing wastewater flows greater than the design flow
- Flush excessive amounts of grease, oil or fat into your septic system
- Dump excessive amounts of disinfectants, cleaners or detergents (normal amounts will not harm the system)
- Allow storm water into your septic system (storm water drains should not be connected to the septic tank and landscaping should divert storm water away from the modules)
- Use additives (septic tank additives should not be introduced into the septic tank for grease reduction, stimulation of biological activity or other purposes)
- Dispose of large quantities of organic material through wastewater may organically overload the system and cause more frequent pumping of the septic tank

- Flush cigarettes, tea bags, sanitary napkins, tampons, diapers, condoms and other non biodegradable products capable of blocking pipes or filters into your system
- Dump solvents, oils, paints, thinners, pesticides or poisons down the drain which can disrupt the treatment process and contaminate the groundwater
- Dispose of water softener waste directly into the septic system (where practical design a separate disposal system or balance flows into the septic system)

1.6 Operation Check List

Daily check

- A. Check that all safeguarding and fuses are ON.
- B. Check that warning sensor Alarm is OFF
- C. Check function: If the green light (filtration active) is ON, the compressor is working.
- D. Check that inactive light signal (filtration active), no filtration is taking place.
- E. Check for leakage, excessive noise and smell.

If your system meets the above criterion the daily check (A to E)- There is no malfunction!

1.7 Malfunction

Check the system data plate and call the local Service Representative or Distributor if:

- A. You find any leakage, excessive noise and bad smell produced by the system.
- B. The daily operation time is over 20h
- C. The audio-visual Alarm is ON

The local *BUSSEMF* Service Representative or Distributor who installed your *BUSSEMF* is trained, experienced and properly equipped to handle service and answer any questions. *Your distributor's name and phone number are posted on the cover of your control panel and the system data plate.*

Service Representative

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1.8 Intermittently non-use

Your wastewater treatment system MF is controlled by a PLC. The PLC decides which treatment steps your wastewater needs. If there is no wastewater coming in, PLC starts a subroutine program and fall in an energy saving modus. If you produce wastewater again, the system awake automatically and starts cleaning wastewaters.

Please do not unplug the system in cases of intermittently use (holidays). If you have a longer period of non-use (more than 3 month), please contact your local service representative. It might be necessary to restart your system afterwards.

1.9 Initial and extended service policies

Your Limited Warranty and Inspection/Service Policy are printed on a card accompanying this manual. Maintenance of your *BUSSEMF* is essential to ensure its proper operation and longevity. Please contact an authorized service representative to purchase an Annual Inspection/Service Policy. The Service Representative will inspect your unit at six-month intervals and make any necessary adjustments to the system. He decides how much excess sludge and other residuals need to be removed. He checks all the pumps and pipes, exchanges the membrane module (M-Box) to guarantee a full functional system until the next service is necessary.

NORMAL SERVICE INTERVALS

6-Month Service:

This comprehensive service call includes collection and assessment of a post-treatment sample, inspection, servicing, cleaning, removal of residuals and sludge if necessary, testing and reinstallation of micro-filtration module and aerator by a trained serviceman.

Occasional pumping is required due to accumulation of solids in the first tank or to high concentrations of activated sludge in tank 2 to 4. Also hair has to be removed from the float switches.

12-Month Service:

This call provides all elements of the 6-Month Service as well as exchanging the membrane module.

3-Year Service:

This service provides all steps in the 6- and 12-month service and balance tank pumping.

If you have not renewed your Inspection/Service Policy, you will be charged for the 30- and 36-month service calls.

If you have kept your service policy in force, there will be no charge for membrane module and aerator service.

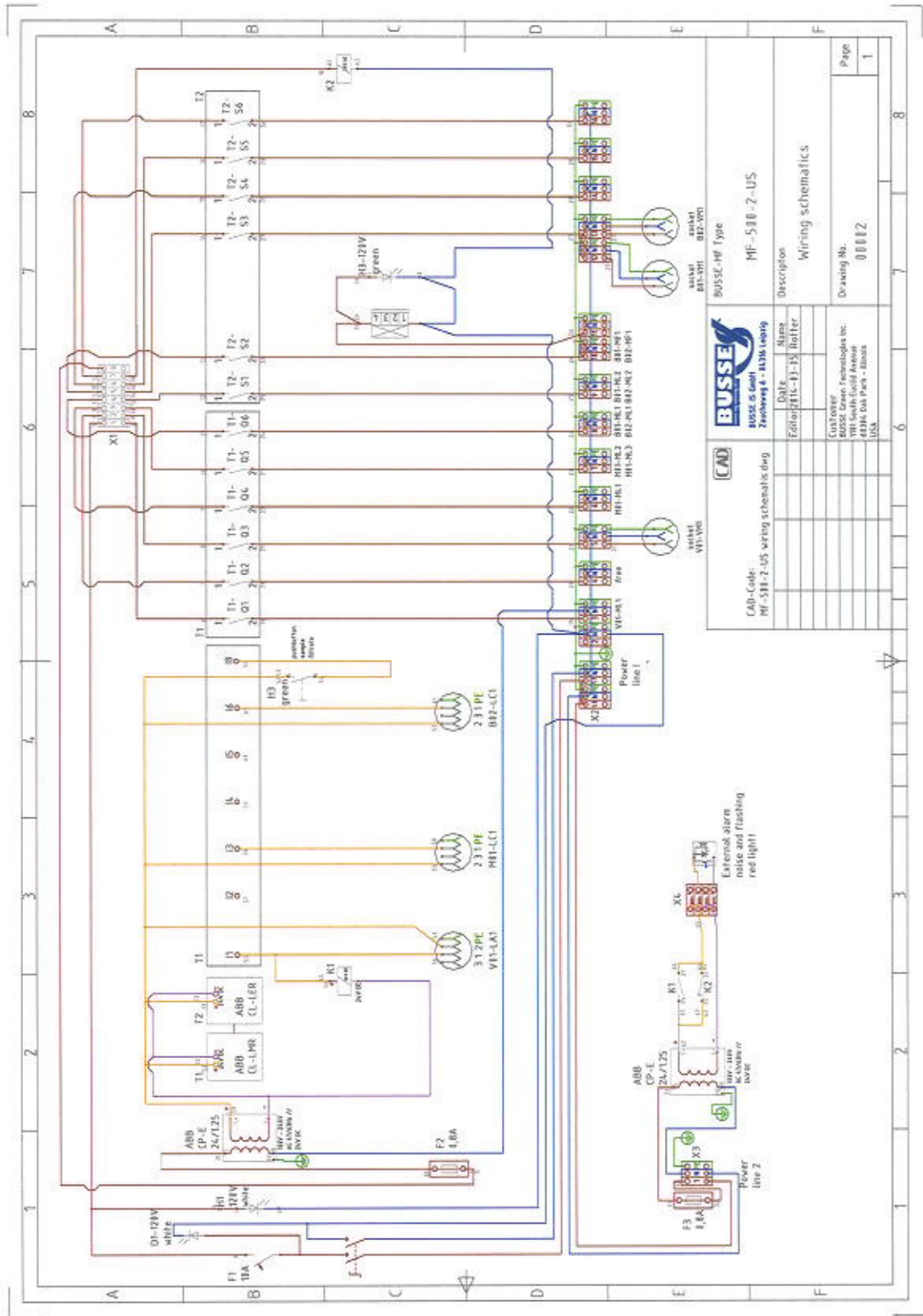
Inspection & Service – 3 Years Cycle						
Service	Months					
	6	12	18	24	30	36
6- Month Inspection/Service	●	●	●	●	●	●
12- Month Inspection/Service		●		●		●
3-Year Service						●

The DEP approval may require additional inspection and sampling. You should discuss the requirements with your service provider.

DETECTION	POSSIBLE CAUSE	ACTION
Experience slow flush but electrics are in good working order	<ol style="list-style-type: none"> 1. Unacceptable level of solids in balance tank 2. Effluent filter blocked 	<ol style="list-style-type: none"> 1. Pump out balance tank 2. Call your Authorized Service Representative
Alarm sounds continuously and influent level rises in the balance tank - this can eventually lead to influent coming throughout the overflow.	<ol style="list-style-type: none"> 1. Pump / compressor failure due to circuit breaker switch being tripped to the off position by an electrical storm or power surge 2. Pump / compressor fails due to faulty system electrics or pump itself is faulty 	<ol style="list-style-type: none"> 1. Conserve water usage, reset circuit breaker and test the alarm - if the problem recurs call your Authorized Service Representative 2. Conserve water usage and call your Authorized Service Representative
Alarm sounds periodically but resets itself (indicating that the pump is still operating) Some states require alarms that are latched (continue to alarm after the alarm event has been corrected) and will not auto-reset themselves in which case it will be necessary to reset the alarm manually	<ol style="list-style-type: none"> 1. High water usage above design capacity activates the alarm float switch 2. Leaking plumbing fixtures 3. Defect pump 4. Defect PLC or incorrect program settings. 5. Latched alarm 	<ol style="list-style-type: none"> 1. Reduce water usage to range within the design capacity. 2. Repair leaking plumbing fixtures 3 and 4. Conserve water usage and call your Authorized Service Representative 5. Reset manually
No alarm warning - effluent is dark brown with suspended solids	<ol style="list-style-type: none"> 1. Effluent filter or pipe in the MBR tank is defect 	<ol style="list-style-type: none"> 1. and 2. Conserve water usage and call your Authorized Service Representative
Effluent odours faecal	<ol style="list-style-type: none"> 1. Defect compressor or aeration system 2. Biological problem by the use off substances that adversely affect the system 	<ol style="list-style-type: none"> 1. and 2. Conserve water usage and call your Authorized Service Representative

1.11

Wiring schematics for the systems electrical components



1.12

Process overview

