FLOCCULANT PREPARATION STATION AS–PROCHEM DK

DESIGN, INSTALLATION DOCUMENTS & OPERATION MANUAL

Asio tech ®
Wastewater and water treatment

FLOCCULANT PREPARATION STATION:
AS–PROCHEM DK

DESIGN, INSTALLATION DOCUMENTS AND OPERATION MANUAL

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TABLE OF CONTENTS

These documents are intended as general instructions for design and installation works of discontinuous flocculant preparation stations supplied by ASIO TECH, spol. s r.o. The documents also contain important instructions, information and safety warnings as regards the use, setting, and installation of these stations.

1. INTRODUCTION

These documents are intended as general instructions for design and installation works of the **flocculant preparation stations**, type **AS-PROCHEM DK**. The documents contain important instructions, information and safety warnings as regards the use, setting, and installation of the stations.

These documents are particularly intended for persons:

- performing the tasks of designing and constructing the product (equipment),
- transporting the product (equipment), and
- installing and setting the product (equipment) on site.

In all cases, it is assumed that the relevant persons are holders of necessary professional qualifications, i.e. they are persons duly authorised for carrying out of such activities.

The documents contain important instructions, information, and safety warnings.

Please, read the instruction thoroughly before you start with the design, installation, or any handling with the flocculant preparation station and in case of any doubts or uncertainties contact ASIO TECH, spol. s r.o.

Very important instructions and notices are indicated in the text graphically as follows:

Any non-compliance with the instructions marked by this symbol may be hazardous to human health or property

Forbidden activities

Any non-compliance with these instructions may result in damaged equipment of the plant

Other important instructions

1.1 Document modifications

Any modifications in this document may be performed only by ASIO TECH, spol. s r.o. or after its prior written approval.

2. SAFETY

2.1 Requirements of personal professional competence

General

In order to provide for adequate safety of persons as well as trouble-free operations of the equipment, the individual activities connected with the equipment use must be carried out only by persons who hold adequate professional qualifications.

In order to provide for adequate safety, the operating organization must ensure that the relevant individual activities are carried out by professionally competent persons only.

The operating organization must unambiguously appoint a person(s) responsible for the equipment attendance (hereinafter referred to as the "operators").

The operating organization must clearly appoint a person responsible for the equipment operations.

Any interventions into the equipment electrical parts may be performed only by professionally competent electricians.

Do not smoke, eat, and drink during all activities connected with handling, maintenance and/or servicing the equipment.

2.2 Equipment installation and putting into service

The procedures of the equipment installation and putting into service described in Sections 4 and 5 of this Manual may be performed only by persons meeting the following requirements:

- they are both mentally and physically competent for the described activities,
- they are familiar with this Manual,
- they are familiar with the current general and local operating & safety rules,
- they possess adequate professional qualifications, knowledge and experience for maintenance and repairs of electrical parts of machinery and equipment,
- in the case of interventions into the equipment electrical parts, they hold adequate professional qualifications, knowledge and experience for maintenance and repairs of electrical parts of machinery and equipment,
- they hold adequate professional qualifications, knowledge and experience for operations of process equipment for wastewater treatment, and
- they are authorised by ASIO TECH, spol. s r.o. for the installation and/or putting this equipment into service.

The equipment installation and putting into service is carried out by ASIO TECH, spol. s r.o. or the person(s) (company) trained and authorised by ASIO TECH, spol. s r.o.

Operators

In the scope described in Section 7 of this Manual, the equipment may be attended only by persons meeting the following requirements:

- they are both mentally and physically competent for the described activities,
- they are familiar with this Manual,
- they are familiar with the current general, locally valid operating & safety rules, and
- they have been appointed by the operating organisation for such activities.

Servicing and maintenance

Servicing, maintenance and removal of defects may be carried out only by persons meeting the following requirements:

- they are fully mentally and physically competent for the described activities,
- they are familiar with this Manual,
- they are familiar with the current general and local operating & safety rules,
- they have been appointed by the operating organisation for such activities,
- they hold adequate professional qualifications, knowledge and experience for maintenance and repairs of machinery and equipment, and
- in the case of interventions into the equipment electrical parts, they hold adequate professional qualifications, knowledge, and experience for maintenance and repairs of electrical parts of machinery and equipment.

Servicing and removal of defects in the equipment may be carried out only in the scope described in this Manual. Any servicing over and above this Manual is carried out by ASIO TECH, spol. s r.o. or the person(s) (company) trained and authorised by ASIO TECH, spol. s r.o.

Principles of safe use

Carry out only such activities, to which you are authorised.

In the connection with this equipment, only activities resulting out of this Manual may be performed.

While the equipment is in use, all current general and local operating & safety rules must be observed.

Proceed only according to the generally valid & safety-at-work procedures.

Strictly follow the protective measures preventing the hazards described in this Manual, particularly in its Section 2.4.

Do not use the equipment, if the specified verification inspections and safety element tests are not carried out within the stipulated intervals.

Always use the approved personal protective equipment.

Get familiar with the placement and proper use of the emergency-stop elements.

Never make any interventions into the equipment electrical parts and do not open the panel board, unless this is your work duty and you are

properly qualified to do this.

Any emergency event must be reported to your superior and recorded into the Operating Log, if kept at the wastewater treatment plant.

2.3 Personal protective equipment

The use of personal protective equipment must be stipulated by the operating organization through in-house safety instructions. The expected scope of the use of personal protective equipment is shown in the table below:

Hazard	Protected part	Protection equipment
Chemicals	body, limbs	industrial protective clothing, rubber boots
	palms, fingers	rubber gloves
	head, face	head-piece, protective goggles or face shield
	respiratory system	breathing mask

2.4 Protection against potential hazard / residual risks

General

Although the equipment has been designed in accordance with the current safety codes, legal regulations and good technical procedures, it has not been possible to exclude the below specified hazards resulting out of the equipment nature and purposes of its use.

Weight and dimensions

If, before or after its installation, the equipment is handled incorrectly, there will be a danger of personal injury caused by falling or overturning of the equipment. The equipment handling instruction described in Section 4 herein must be strictly observed.

NEVER use any other way of handling, than that described in Section 4.1 herein.

Access to moving parts

In the course of maintenance procedures, there is a danger of contact with moving parts of the stirrer and the hopper.

If the protective covers are removed because of maintenance procedures, PAY A SPECIAL ATTENTION TO YOUR SAFETY!

While handling or servicing the stirrer and /or the hopper or if any person is working nearby this equipment, the device must be disconnected from its power supply!

Process chemicals

Albeit non-toxic, the flocculant can be removed from all material surfaces only with difficulties and therefore it is necessary to use consistently your personal protective equipment while handling this agent.

If in contact with skin, wash the affected place with warm water. If in eyes, rinse continuously with plenty of clean water.

	***The operators must be acquainted with the instructions set out in the relevant safety data sheets of the used process chemicals. Always keep these documents at hand - at your workplace or storage of the relevant chemicals, as applicable.***

After the work end, wash your hands thoroughly at least with warm water and soap. Keep your working clothes at a suitable place and discard the disposable gloves to the container purported for such type of waste.

	***In all activities connected with handling the chemicals and immediately after their end, do not eat, drink, or smoke. After the work end, wash your hands thoroughly at least with warm water and soap.***
	***Be careful not to contaminate the floor with the flocculant and/or its diluted solution. Slippery surface may be formed resulting in slip, trip and fall hazards. If the chemicals and/or their solutions are swallowed (inhaled), proceed according to the instructions set out in the relevant safety data sheets.*** ***Store the chemicals only at places approved to this purpose.*** ***Strictly follow the current general and local instructions for handling of chemicals.***

Other hazards

Other hazards and protection against them are specified in other parts of this Manual as necessary.

2.5 Unauthorised use

It is strictly forbidden to use the equipment for any other purpose and in any other way than specified in this Manual.

3. TECHNICAL DESCRIPTION

3.1 General

The AS-PROCHEM DK flocculant stations (hereinafter referred to as the “stations”) are intended for automatic preparation of flocculant solution from powder flocculant and their subsequent dosing. The stations are constructed as cylindrical tanks by welding of various structural elements and sheets made of polypropylene (or its copolymers) expanded with blowing agents or extruded sheets.

3.2 Applications

The equipment is designed for discontinuous operations and flocculant mixture preparations and dosing of the mixture to the process:

- Chemical pre-treatment (in front of separation step)
- Sludge dewatering

Flocculant solution is prepared automatically by a combination of water supply (electric valve is opened) and flocculant powder dosage (dosed by an automatic dosing system).

The station type range is designed according to the necessary volumes of the flocculant solutions (ANNEX 1 - CATALOGUE list AS-Prochem D).

The tanks cannot be used for storage of flammable liquids or liquids containing oxidizing agents (such as concentrated nitric acid, halogens, etc.).

The station is designed for storage of water or flocculant solutions.

If the station is filled with another liquid, it may be damaged!

3.3 Structural dimensioning of the flocculant preparation stations, their setting and setting and fixing instructions

Individual types of the station range used for the flocculant preparation do not differ in their design as regards the permissible setting conditions, structural dimensioning, ceiling structures, etc.

As regard the layout, the tanks are **aboveground structures**, i.e. intended for their installations above the ground.

As regards the structural dimensioning, they are **freestanding (self-supporting) structures** and there is no need to secure them structurally after their installation on the site.

Detailed information valid for individual stations is shown in the Catalogue Sheet forming Annex 1.

3.4 Basic technical parameters

The basic technical parameters of the standard flocculant stations are listed in the Catalogue Sheets that form ANNEX 1 - CATALOGUE list AS-Prochem D.

In addition and according to the relevant types, the flocculant preparation tanks may be equipped with process openings for connections of water inlet pipes, penetrations for electrical wiring (level gauge), pump intake pipes, etc. (see Section 5.4).

The flocculant preparation tanks may be also manufactured in non-standard (custom) dimensions subject to a special order.

3.5 Marking

AS-PROCHEM D 033.xxx/DK

Marking specifying the station type

Marking specifying the station nominal size

xxx = 050; 075; 100; 125; 150

Marking of station with automatic hopper version

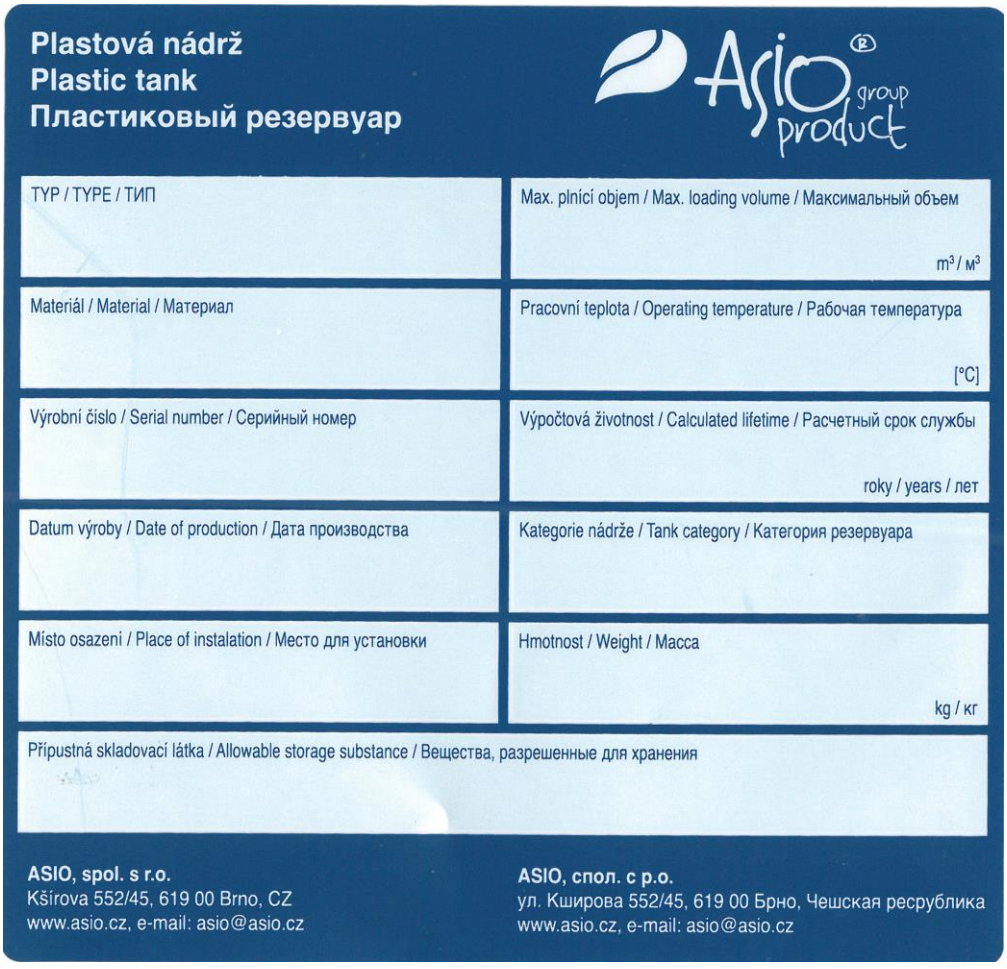
yy = DK

For instance:

AS-PROCHEM D 033.125/DK – is rounded flocculant preparation station of the 1.25 nominal size with hopper for automatic powder dosing

Capacity of each station is described in Chapter 10.

The flocculant preparation stations are fitted with the manufacturer's plates containing the following data:



3.6 Electrical installations

A low-speed stirrer is placed on the ceiling slab of the tank of flocculant preparation station; hopper for powder flocculant dosing is installed as well. The hopper is the same for all types.

Operating characteristics

AS-PROCHEM						
	Units	**DK 0.5**	**DK 0.75**	**DK 1.0**	**DK 1.25**	**DK 1.5**
Maximal capacity of the station*	**l/h**	200	300	350	400	500
Maximal feed worm output ** (50 Hz)	**g/min**	51				
Minimal water flow rate	L/h	1500				
Maximal water flow rate	L/h	3500				

* The capacity of the station is dependent on actual water flow and pressure

** The worm feeder output is indicative only - it is necessary to verify the value

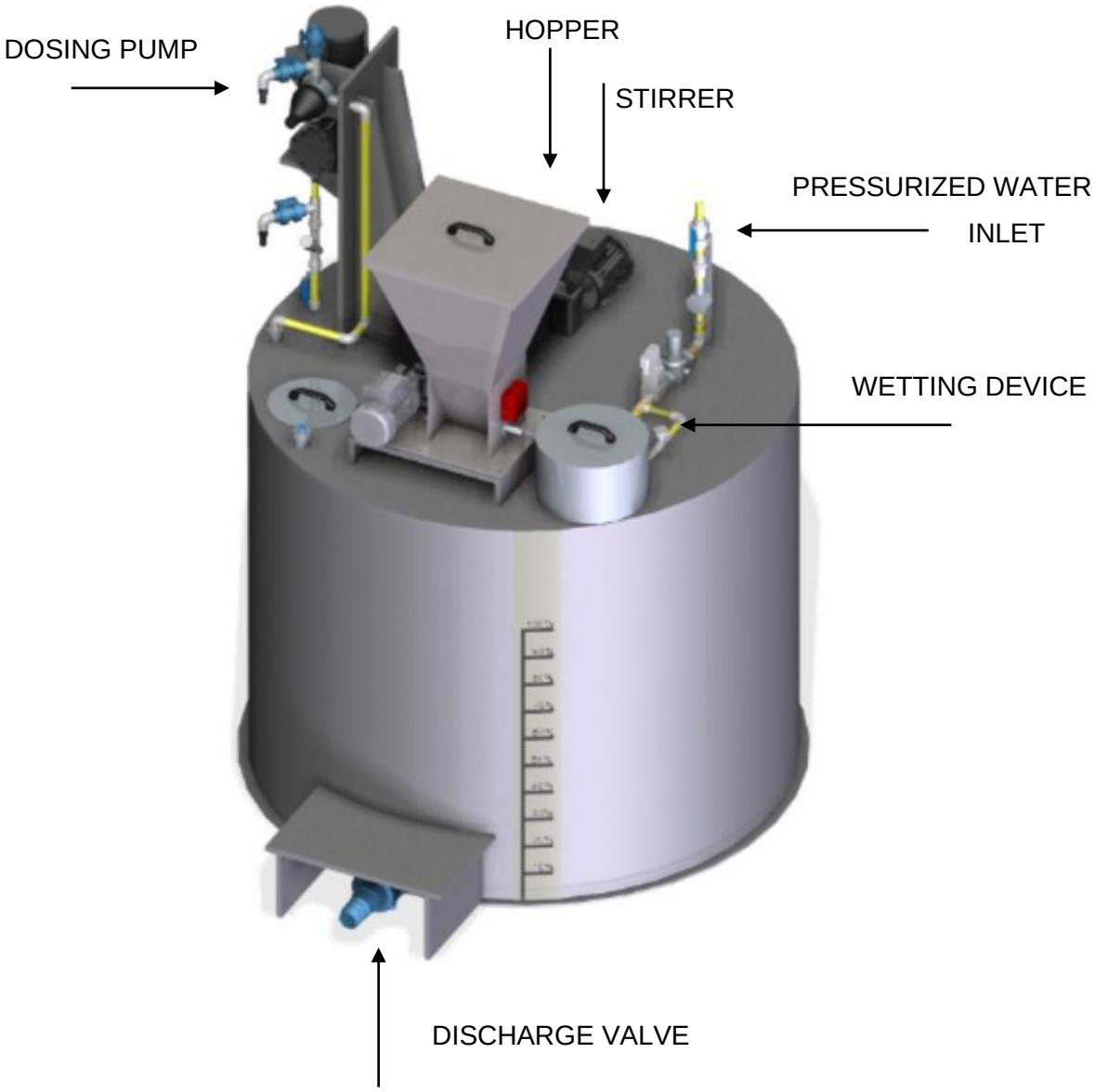
List of electrical equipment							
AS – PROCHEM DK							
Marking	**Electrical equipment**		**DK 0.5**	**DK 0.75**	**DK 1.0**	**DK 1.25**	**DK 1.5**
HS1	Electromagnetic valve	*kW*	0.06				
M2	Stirrer	*kW*	0.25	0.25	0.25	0.25	0.37
M3	Worm feeder	*kW*	0.18				
EH4	Worm heating	*kW*	0.01				

Other (non-electrical) elements

The equipment is provided with a minimal water level sensor so that the minimum flocculant solution level is detected and the operations of the stirrer drive and the pump are protected (optional equipment) against the “dry” run.

List of equipment for non-electrical variables AS – PROCHEM DK 0.5 – DK 1.5			
Measur. circuit	**Setting**	**Measured variables**	**Equipment**
S1	Limiting. min.. level	Minimal level in the flocculant station	Sebmerged probe
S2	Limiting.replenishment. level	Replenishment level in the flocculant station	Sebmerged probe
S3	Limiting. max.level	Maximal level in the flocculant station	Sebmerged probe
S4	Limiting. min. level	Minimal (blocking) level in the hopper	Capacitance de-tector
FIR5		Pulse (flow)	Pulse flowmeter

3.7 Description of basic parts and their connections



4. HANDLING, TRANSPORT AND STORAGE

4.1 Handling

While handling the station, it is necessary to pay a special attention to the parameters of plastic materials (especially their lower resistance against impacts).

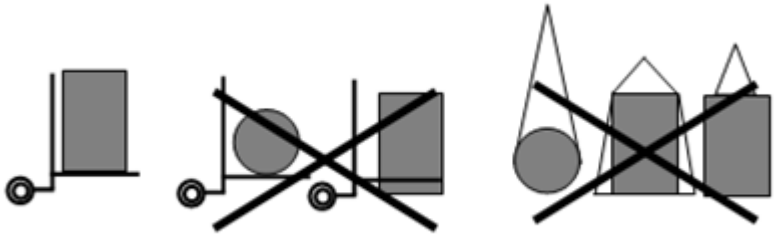
At temperatures under 5°C, any handling with the station plastic tanks is forbidden!

Before handling the station, it is necessary to check the station overall conditions and pay a special attention to ending points (if the station is fitted with them). It is also necessary to make sure that no foreign objects or liquids are present inside the internal space (e.g. rain-water, etc.).

If present, rainwater must be pumped off from the tank before any handling with the flocculant preparation station starts.

While handling the flocculant preparation station, the following rules must be observed:

- select a handling method/equipment suitable for the station weight, size, and shape,
- while setting or hanging the station, follow the rules resulting out of the below picture.



As regards its weight, handling the flocculant preparation station may be performed by the following methods:

- Under the weight of 100 kg, handling is to be performed manually or with the use of a forklift.
- Above the weight of 100 kg, handling is to be performed with the use of a forklift. The handling method can be selected according to the forklift parameters, i.e. its load-bearing capacity, dimensions, and size of the station and, in the first place, with regard to the handling safety.
- If a crane is used, its load-bearing capacity must be at least equal to the station type and weight. Weight of specific station type is described in ANNEX 1 - CATALOGUE list AS-Prochem D

While handling the station, follow the generally applicable rules concerning the occupational health & safety issues.

4.2 Transport and storage

The flocculant preparation stations are supplied as complete systems. Their installation (setting) is carried out at a place specified by the customer and - due to its simplicity - the putting the station into service as well as training of the operators is conducted by the customer as well.

For the transport, use suitable means adequate to the weight and dimensions of the flocculant preparation station.

Place the flocculant preparation station always on the bottom and fix it against any accidental movements.

Do not transport any foreign things inside the tanks of the flocculant preparation station.

Before the station is installed on the intended site, it is necessary to prepare for its temporary placement a suitably flat and paved/hard surface and provide for other conditions protecting the completeness and integrity of the supply against mechanical damage and/or interventions from unauthorised persons. The station must be also suitably secured against potential injuries of unauthorised persons.

During the storage exceeding a period of two months, the plastic tanks of the flocculant preparation station must be shaded against sun radiation.

5. INSTALLATION

5.1 General instructions for installation (setting)

The equipment installation may be carried out only by persons-holders of adequate professional qualifications for construction works. In addition, the installation must be carried out in accordance with the below given instructions and the construction design must be prepared by a person professionally competent for such work.

The builder's works in connection must be prepared according to an approved design drawn up by a professionally competent person; this person will ask the supplier for supporting documents and data.

Pay a special attention to cleanliness of the foundation slab; it must be free of any stones, debris, or other foreign things that could damage the bottom of the flocculant preparation station.

If, nevertheless, any damage to the tank of the flocculant preparation station is found before or during the installation, stop the installation work immediately and contact ASIO TECH, spol. s r.o. or its authorised representative!

5.2 General procedures of the installation of the flocculant preparation station

A suitable space must be prepared for the setting of the flocculant preparation station; its ground-plan dimensions and load-bearing capacity of the floor must be adequate to the weight and dimensions of the relevant type of the flocculant preparation station, including the maximum weight of the liquid charge. The tank of the flocculant preparation station must be placed on a flat surface with the planarity up to ± 5 mm (this means both irregularities as well as out-of-flatness values). The thickness of the concrete foundation slab must be adequate to the structural load-bearing capacity (the same applies to the subgrade) plus the operational weight.

A safe access to the room must be provided with regard to the station installation (i.e. adequate to its weight and dimensions). This also applies to installations opening that may be built up after the installation.

5.3 Fixing and installation procedures

Before the tank of the flocculant preparation station is laid on the foundation slab or floor, fill the tank with water up to ca. 0.4 m level. This enables to fix the station to the supporting surface. Waterproof connections (according to Section 5.4) should be made consequently. Afterwards, make electrical connections according to Section 5.5.

Except for liquid media or stirring effects, it is strictly forbidden to load structurally or in any other way the tank of the flocculant preparation station.

5.4 Table of connections

		AS-PROCHEM D				
Purpose	**Connection type**	**0.5**	**0.75**	**1**	**1.25**	**1.5**
Pressure water	Welded polypropylene	DN20				
Pump suction	Welded polypropylene	DN15				
Pump by-pass	Welded polypropylene	DN15				
Opening for the float	Welded polypropylene	DN40				
Drain valve	Bonded PVC	d50				

5.5 Pressure water inlet

Connect the pressure water supply to a drinking-water distribution system. The pressure water inlet in the station must be at the minimum pressure of 3 bars and minimal flow 1500 L/h.

5.6 Electrical installations

General

Electrical parts of the intrinsic equipment of the flocculant preparation station consist of the electric motor and level gauge. The following steps must be made within the equipment installation works:

- fitting-out of the electrical panel (if it is not a part of the supply of ASIO TECH, spol. s r.o.) according to the specification set out in Article 5.5.4; the panel is equipped with a control unit for automated operations,
- installation of the electrical panel nearby the flocculant preparation station, and
- cabling among the electrical panel and electrical elements (drives).

Electrical installations should be connected in the scope specified by the relevant design documents prepared by a professionally competent person. The design documents must also contain the “Manual for operating the control unit of the flocculant preparation station”.

All electrical installation must be designed and prepared in compliance with ČSN EN 60204-1 (Safety of machinery - Electrical equipment of machines).

Electrical parts

All electrical parts and components must meet the requirements of the relevant European standards and bear the “CE” mark.

Conductor types and cross-sections

The requirements for the conductors are summarised in the table below.

Use	**Type**	**Cross-section** (mm^2)
Connection of electromagnetic valve	CMSM 3x0.75	0.75
Connection of stirrer	CMFM 4x1	1

Connection of hopper	CMFM 4x1	1
Connection of worm heating	CYKY-J 3x1.5	1
Connection of level gauge probes (water)	JYTY 4x1.0	1
Connection of level gauge probe (powder)	JYTY 4x1.0	1
Connection of pulse flowmeter	JYTY 2x1.0	1

Electrical panel

The electrical panel must provide at least for the following functions:

- switching on/off by the use of the power switch,
- switching on/off of automatic running of the stirrer,
- power supply of the level gauge and evaluation of its signals, and
- setting of automatic running of the stirrer in the run/pause mode (e.g. 5/120 minutes).

The electrical panel must be situated at a suitable place enabling safe control of the station.

Emergency stop

An emergency stop element must be a part of the electrical installation. This element must be prepared in accordance with the current technical standards.

6. HANDING OVER TO THE CUSTOMER

The handover procedure is carried out directly with the customer or the first forwarder by signing of the bill of delivery. At the same time, the supplier will hand over to the customer the original technical documentation consisting of:

- leakproof test certificate for the flocculant preparation station, and
- design and installation supporting documents plus the manual.

7. COMMISSIONG OF THE EQUIPMENT

7.1 General

The equipment commissioning (putting into service) will be possible after the installation works described in Section 5 are completed. The following items must be handed over to the operating entity (company) before the putting into service at least:

- this Operation Manual,
- the Manual for operating the equipment control unit and electric drives connected thereto (the manual may be a part of the Electrical Documentation or the Operating Rules for the WWTP),
- Electrical Documentation.

Check for the documentation completeness and, if it is not complete, do not operate the equipment and contact the equipment supplier.

7.2 Checks before starting the equipment up

Before you start the equipment (put it into service) make sure that:

- the equipment is correctly connected to all pipe inlets and outlets,
- the equipment is correctly connected to the electric panel board,
- no spillages are present at the connection points,
- pressure water supply is brought to the equipment,
- no foreign things are present inside the equipment,
- there is enough powder flocculant inside the hopper,
- the discharge valve is closed.

Before the start-up, pay a special attention to the equipment conditions – check for foreign things inside the equipment! It is strictly forbidden to place your hands or other things into/nearby the running equipment, particularly to places with moving parts!

7.3 First start-up and checks of drives

Before you start the equipment, set all the drives to the position OFF. Then switch the main switch ON and check separate units for their correct functions. Switch the check units (drives) to the position MANUAL (ON) and after the check is completed, switch them back to the OFF position (see below).

Correct settings of the equipment operations, including the dives, must be carried out by a professionally competent technician familiar with the equipment. Optimal settings (tuning) will be made during the trial operations.

If any changes in the settings of the drives or the automated operations of the dosing station are necessary, proceed according to the Manual for operating the equipment control unit and electric drives.

Checking of stirrer wiring

Before switching the stirrer ON, fill the station tank with water so that the stirrer paddles are at least 300 mm under the water level. "Dry" running of the stirrers may damage them or the whole station.

Switch the stirrer drive ON, check for its correct running and direction of rotation

(The correct direction of rotation = the stirrer turns clockwise, if viewed from the above)

If incorrect direction of rotation is found, it will be necessary to repair the wiring in the electric panel board. Repairs in the electric panel board may be carried out only by the panel board supplier or its authorised person.

Checking of stirrer wiring

Switch the worm feed drive ON and check for its correct running.

Checking of the wiring of electromagnetic valve

Switch the electromagnetic valve drive ON and check for its correct functioning

Checking of the wiring of level gauges

If there are level-gauge warning lights on the electric panel board, switch all devices to the OFF position and step-by-step immerse the probes into a suitable vessel. If there are no level-gauge warning lights on the electric panel board, the probes must be tested at the standard automatic drive, where it will be necessary to monitor the whole course of filling the chamber and, consequently, discharging (or pumping off) to the minimum level.

Checking of the wiring of worm heating

The wiring check is performed solely a person authorised to intervene with the panel board electric parts.

Checking of the wiring of pulse flowmeter

The wiring check is performed solely a person authorised to intervene with the panel board electric parts. Switch the electromagnetic valve drive ON and fill the tank until the maximal water level is reached. Evaluate the difference between measured volume and parameter set in Operating characteristics. The value should not differ more than 3 %.

7.4 Automated operations

Once the correct wiring of the equipment as well as correct functions of all drives (including the drives connected to or depending on the equipment) is verified, the automated operations of the equipment may start.

In order to validate the automated operations, sufficient quantities of the flocculant powder must be available in the hopper. For the start-up of the equipment ensure following operations:

- switch all the drives to the AUTOMAT position,
- if the flocculant powder is in the hopper or if the minimum level in the hopper is not reached, the process will start up automatically.

Check, in the automated mode, whether all individual pieces of the equipment run correctly and optimise the equipment settings. The initial values are described below.

A change in variable may influence other part of the equipment. Changes in the equipment settings may be carried out only by a professionally trained person.

Changes in the settings of the automated mode are carried out in the electric panel board according to the Manual for operating the equipment control unit.

Basic settings will be specified based on the trial run.

Setting of running and idle periods of the drives outside the preparation of the flocculant solution

Name	Running period setting	Idle period setting
Stirrer	5 minutes	120 minutes

Setting of the drives in the time of the preparation of the flocculant solution

The dosing of the flocculant powder runs for pre-set time and is initiated by the level gauge probe S2. Simultaneously, electromagnetic valve (HS1) is opened until defined volume of water is reached (measured by a pulse flowmeter FIR5). The powder-dosed quantity is regulated by the time of operation, which is pre-set in the electric panelboard. Water flow is measured by a pulse flowmeter (FIR5), which check both function of electromagnetic valve (HS1) and minimal actual flow. Quantities, i.e. concentrations, of the flocculant solution are treated in the design documents according to local conditions.

The actual performance of worm feeder must be measured using a suitable vessel. For various types of powder materials (i.e. flocculants), its performance will be different!

In order to adjust the solution concentration correctly, it will be necessary to measure precisely the worm feeder output, which may differ for various flocculant powder types! Based on such measurements, it will be the possible to specify the running time of the hopper.

In the preparation period of the new flocculant solution, stirrer is switched ON according to the following algorithm:

- Stirrer drive switching on: *simultaneously with a hopper, or electromagnetic valve, as applicable*
- stirrer drive switching off: *60 minutes after electromagnetic valve is switched off*

8. OPERATION

8.1 General

Operations, control, and changes in the settings must be carried out in accordance with the Operation Manual.

8.2 Operational checks

Under operation, it is necessary to check every day:

- for potential failures of the equipment or its parts,
- for potential leakages, and
- for unusual noise and/or vibrations.

If case of any defect found, provide for immediate remedy (in the scope approved by this Manual) or seek professional assistance.

8.3 Emergency stop

The emergency stop button (its stop all the drives) is intended for cases of danger to persons or property.

The emergency stop button is a part of the control unit supply!

8.4 Shutdowns

Short-time shutdowns

In cases of shutdowns shorter than one week, terminate the process as follows:

- stop the equipment (by switching the drives to the OFF position),
- drain the flocculant solution from the station,
- flush the station with a stream of clean water so that no flocculant solution remains in the tank,
- clean the wetting device from the flocculant.

Never use manual washing for cleaning of electrical parts!

Do not place the washing hose near the equipment moving parts under operation!

After the washing procedure, do not leave the hose near the moving parts.

Shutdowns longer than one week

- If the equipment is to be shut down for a longer period than one week, it is necessary to take off all flocculant powder from the hopper. Use a suitable vessel and empty the hopper. The flocculant left in the hopper could moisten and cause problems during next start-up.
- Before longer shutdown, clean the stirrer as well. Stop the equipment (by switching the drive to the OFF position), before you start cleaning procedure.

9. MAINTENANCE

9.1 General

Thoroughly and consistently performed maintenance procedures are the fundamental pre-requisites for long-term, reliable, and safe operations of the equipment. Consistent adherence to the provisions of this Manual will help you:

- to keep the equipment operational and ready at any time,
- to prevent various defects and avoid unnecessary repair costs, and
- to achieve the equipment optimal service life.

Make sure that all maintenance procedures are carried out thoroughly and in stipulated intervals.

9.2 Scope of the maintenance

The scope of the maintenance is described in the table below.

interval						Activity to be performed	Procedure
Daily	Weekly	Monthly	Quarterly	Annually	Other		
x						Overall check	see Article 9.3
	x					Checking of stirrer correct function	see Article 9.3
	x					Checking of correct functions of the worm feeder (hopper)	see Article 9.3
	x					Checking of correct functions and cleaning of the level gauges	see Article 9.3
	x					Checking of correct function of the wetting device	see Article 9.3
	x					Checking of correct functions of the hand-operated valves	see Article 9.3
			x		As needed	Complete cleaning of the equipment	see Article 9.3
				x		Checking of electrical parts	see Article 9.3

9.3 Maintenance procedures

General

Maintenance procedures should be carried out in accordance with the table shown in Section 9.2 herein. If the maintenance procedures are not described in detail in this Manual, use the procedures generally used for equipment and machinery maintenance.

While working, pay a special attention not to get into any contact with moving parts!

Never place your hands, foreign things or otherwise intervene in the tank if the stirrer runs!

Follow all the safety-at-work principles according to this Manual!

Overall check

Run an overall visual check of the equipment and identify changes, if any, such as:

- changed noise level,
- changes in stirrer of revolutions,
- changes in the pressure water quantities,
- leaks around the equipment, and
- unusual contamination of the equipment and/or its neighbourhood.

In addition, also check for:

- the bolt connection tightness,
- leaks of liquids from the equipment,
- unusual noises or vibrations,
- unusual noise of drives and/or their excessive heating or liquid leaks.

Checking of stirrer correct function

In regular intervals, check for correct function of stirrer in the manual mode.

Checking of correct function of the worm feeder

In regular intervals, check the worm feeder for correct function in the manual mode.

Checking of correct functions and cleaning of the level gauges

In regular intervals, check for correct functions of the level gauges by comparing with the level detection display. In regular intervals, clean all level gauges with pressure water or a wet rag.

Checking of correct function of the wetting device

In regular intervals, check the wetting device for correct function. The device should be clean with no deposits of flocculant powder inside. In regular intervals, clean the wetting device to ensure smooth flow of the flocculant.

Checking of correct functions of the hand-operated valves

In regular intervals, turn the hand-operated valves to their end position on both sides in order to prevent their “setting”.

Complete cleaning of the equipment

Due to the possibility of formation of clusters of unmixed flocculant particles that can sediment on the bottom of the equipment and may clog the dosing pump, it is necessary to clean regularly the bottom content of the tank using pressure water and opened discharge valve.

Provide for complete draining of the chamber and be sure that no flocculant residua remain there. Cleaning must be carried at the equipment shutdown.

Checking the electrical parts

In regular intervals, check the electrical installations. This check may be carried out only by a professionally competent person!

10. SERVICE

The station tanks must be visually inspected during the regular service intervals in the following scope: leakproof test for the tank, visual inspections of tank walls and welds. If any defects are found, it will be necessary to repair them by a professionally competent and duly authorised person or put the station out of service. The above-mention inspections are carried out by the equipment operators.

It is strictly forbidden to fill the flocculant preparation station above the maximum level (V_{max}).

The maximum level of the flocculant solution in the tank of the flocculant preparation station is stipulated for 300 mm vertically from the inner face of the tank ceiling.

In order for an easier access, the flocculant preparation station is equipped with an operator's upstand.

In order to identify easily the liquid quantity in the tank of the flocculant preparation station, the tank is fitted with a measuring scale on its vertical transparent line. One graduation line corresponds to 10 % of active tank volume.

V_{max} = 100 % of the tank volume

Δ = 10 % of active tank volume

V_{min} = 40 % of the tank volume

1 graduation line = 10 % of active tank volume

Media volume in litres for specific active volume:

	40 %	50 %	60 %	70 %	80 %	90 %	100 %
AS-PROCHEM D 0.5	181	227	272	318	363	408	454
AS-PROCHEM D 0.75	277	346	415	485	554	623	692
AS-PROCHEM D 1.0	362	452	543	633	723	814	904
AS-PROCHEM D 1.25	458	572	687	801	916	1030	1145
AS-PROCHEM D 1.5	565	707	848	989	1130	1272	1413

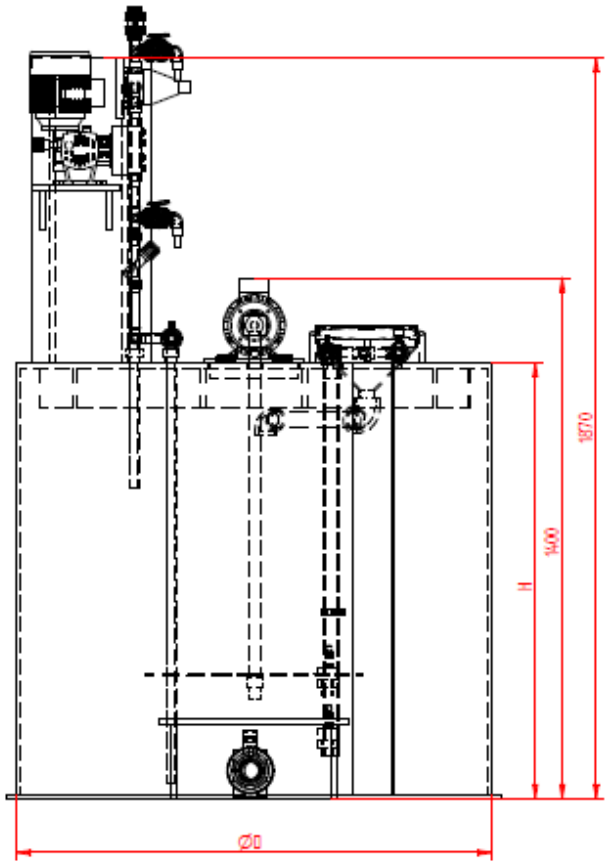
Except for the hydrostatic pressure of the solution and dynamic effects of the stirrer, no other pressures/effects are permissible in the tank of the flocculant preparation station.

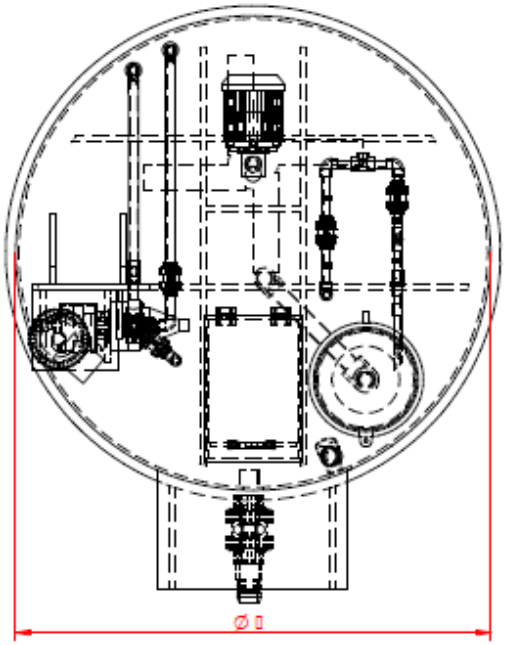
The above-specified requirement must be respected also by the filling system or draining procedures or process connections.

It is strictly forbidden to step/walk on the ceiling or plastic covers of the flocculant preparation stations.

While handling the tank, increased care must be taken. If the tank is handled improperly, the tank stability may be endangered or there will be a risk of injury for handling persons falling or skin scratching.

ANNEX 1 - CATALOGUE LIST AS-PROCHEM D





AS-PROCHEM D

No.	Type	Outer dimensions ØD/H [mm]	Active volume V_{max} [L]	Transport weight (w/o pump) [kg]	Operational weight (w/o pump) [kg]
033.050.xx/yy	AS-PROCHEM D 0.5	Ø850/1100	454	80	720
033.075.xx/yy	AS-PROCHEM D 0.75	Ø1050/1100	692	90	1220
033.100.xx/yy	AS-PROCHEM D 1.0	Ø1200/1100	904	110	1420
033.125.xx/yy	AS-PROCHEM D 1.25	Ø1350/1100	1145	125	1720
033.150.xx/yy	AS-PROCHEM D 1.5	Ø1500/1100	1413	155	2120

xx = 00 ….. basin without base for a dosing pump
xx = 01….. basin including base for OBL dosing pump
xx = 02….. basin including base for Grundfos dosing pump
yy = DK… basin including a hopper for automatic powder dosing

Valid from: 20th September 2019

ANNEX 2 - PROCESS UNIT – CONTROL ALGORITHM

(Note: This is the recommended instruction for setting of the panel-board control system, if it is not supplied by ASIO TECH, spol. s r. o. In the assembly of the panel-board as well as the concrete process design there may be some deviations; please, consult them with the process engineer of ASIO TECH, spol. s r. o.)

The algorithm does not depend on other drives in the whole process equipment and therefore it is not necessary to connect to the panel board other drive except for the equipment drives.

For all drives, the control unit must enable three modes (automatic/OFF/manual). The equipment drives can be started in the manual mode even if no flocculant or pressure water is available.

If the panel board is a part of the supply, then:

The actuators for the mode setting (OFF '0', automatic mode AUTOMAT) and the manual mode (MANUAL) are situated on the panel board door. In the '0' position, the equipment is OFF, in the MANUAL position, the equipment is permanently in operation without the blocking link (blocking is made only from the equipment overcurrent protection). In the AUTOMAT position, the equipment is controlled in the automatic mode and linked to other equipment and pre-set parameters.

In the process flow diagram, illustrated on the panel board, operation failures are indicated as follows (this is applicable only if the panel board is a part of the equipment supply):

- RD panel board live.
- drive operations and failures.
- minimum level in the chamber, and
- minimum level in the flocculant powder hopper.

Description of the automatic control of individual drives of the equipment

The equipment for the preparation of the flocculant solution is an automatic discontinuous system. Flocculant solution is both prepared and stabilized in one chamber.

Preparation of the flocculant solution

Once the replenishment level (S2) in the chamber is reached, the process of preparation of the flocculant solution will start.

First, electromagnetic valve (pressure water) opens and, after some delay, worm feeder will be started. Worm feeder will run for pre-set time only, electromagnetic valve will run for the whole preparation period of the new flocculant solution. Stirrer is switched to the permanent run mode for the whole preparation period.

Worm feeder will be switched off after a defined running time (set in the switchboard), electromagnetic valve will be switched off after defined volume of pressurized water will flow in the tank (number of pulses measured by FIR5 respectively).

Once the preparation of the flocculant solution is completed, stirrer will run in a run-out mode, which can be pre-set in minutes (60 minutes). After the end of the preparation of the flocculant solution and stirrer run-out, the stirrer is switched over to the automated mode (run/idle

periods). The run/idle mode is active until the time of the next preparation of the flocculant solution – i.e. including the time of the unit operations.

Operating conditions:

- Switchovers in the AUT position
- There are no voltage losses
- There are no failures/defects of stirrer drive
- There are no failures/defects of worm feeder drive
- There are no failures/defects of electromagnetic valve
- Minimum quantity of the flocculant in the hopper is not indicated
- There are no failures/defects of level gauges
- Maximal replenishment level in the chamber is not reached

Connecting of the suction pump (not a part of the supply)

The flocculant solution is dosed by the (suction) pump from the tank. The activation of the flocculant solution dosing is possible under the condition that the minimum level in the chamber is not reached; the same applies to the minimum level of the flocculant powder in the hopper. In addition, the pressure water supply from the water mains must be enabled.

Operating conditions:

- Switchovers in the AUT position
- There are no voltage losses
- There are no failures/defects of stirrer drive
- There are no failures/defects of electromagnetic valve
- There are no failures/defects of level gauges
- Maximum replenishment level is not reached
- Minimum quantity of the flocculant powder in the hopper is not indicated

Detection of conditions and interrupted operations

The quantity of the flocculant powder in the hopper is detected by the capacitance probe. Once the minimum level is detected, the failure alarm is activated and the flocculant powder dosing is stopped - a delay in this stopping can be pre-set (initial value: 10 minutes).

There is a level gauge indicating the minimal water level in the tank. Once the minimum level is detected, the equipment shutdown follows incl. the suction pump shutdown.

Individual drives:

1) Electromagnetic valve

Running:

Electromagnetic valve (water supply) is activated by the replenishment level (S2).

Standard interruption:

Electromagnetic valve (pressure water supply) is switched off by the defined number of pulses, measured by the pulse flowmeter (FIR5).

Emergency interruption:

Electromagnetic valve is stopped:

- at reaching the maximal water level in the chamber (S3)
- after a pre-set delay at reaching the minimal powder level in the hopper (S4)
- when minimal water flow is reached (measured by FIR5)

2) Stirrer

Preparation of the flocculant solution

Stirrer drive is activated by the replenishment level (S2) and it runs for the whole preparation period of the flocculant solution. Once the maximum replenishment level is reached, stirrer drive runs on the pre-set run-out time and consequently it is activated in the time intervals.

Operations outside the preparation of the flocculant solution

Stirrer drive runs in the run/idle mode.

3) Worm feeder

Worm feeder is turned on with delay (set in seconds) after replenishment water level is reached (S2). Worm feeder is running for time, pre-set in the panelboard. After this running time the feeder is turned off until another preparation cycle starts.

Feeder is turned off when minimal powder level in the hopper is reached (S4). Feeder is turned off also when the minimal water flow is reached (measured by FIR5).

Blocking of drives and alarms

1) Electromagnetic valve

In the first place, everything is activated and blocked (or, as the case may be, interrupted with a run-out time) by an electromagnetic valve HS1.

2) Level gauges in the tank

The tank is equipped with level gauges that control the preparation of the flocculant solution.

Once the maximum level S3 is reached, electromagnetic valve and worm feeder are blocked. Other drives run in the regular mode of the equipment.

Once the replenishment level S2 is reached, the preparation of the new flocculant solution is activated. The operators are informed about reaching the replenishment level by the white light alarm, which turns off again after the minimum replenishment level is not present any longer.

Once the minimum level S1 is reached, the equipment failure is indicated, and all drives are blocked, including the solution dosing pump. The operators are informed about reaching the minimum level by the red light alarm, which turns off again after the minimum replenishment level is not present any longer.

3) Hopper level gauge

The flocculant powder hopper is equipped with level gauge, which informs the operators by the light alarm about the necessity to replenish the flocculant powder. In the quantity of the powder flocculant is not sufficient, the whole equipment is switched off (after the pre-set delay expiration).

4) Pulse flowmeter

The pressurized water inlet is equipped with a pulse flowmeter, which controls the electromagnetic valve and checks the minimal actual flow. In case the flow is measured while electromagnetic valve is closed, the system will stop the process (except solution dosing pump).

In case the electromagnetic valve is opened, the system evaluates actual water flow. In order to keep constant solution concentration and station capacity, once the minimal water flow is reached, the system will stop the process (except solution dosing pump.)