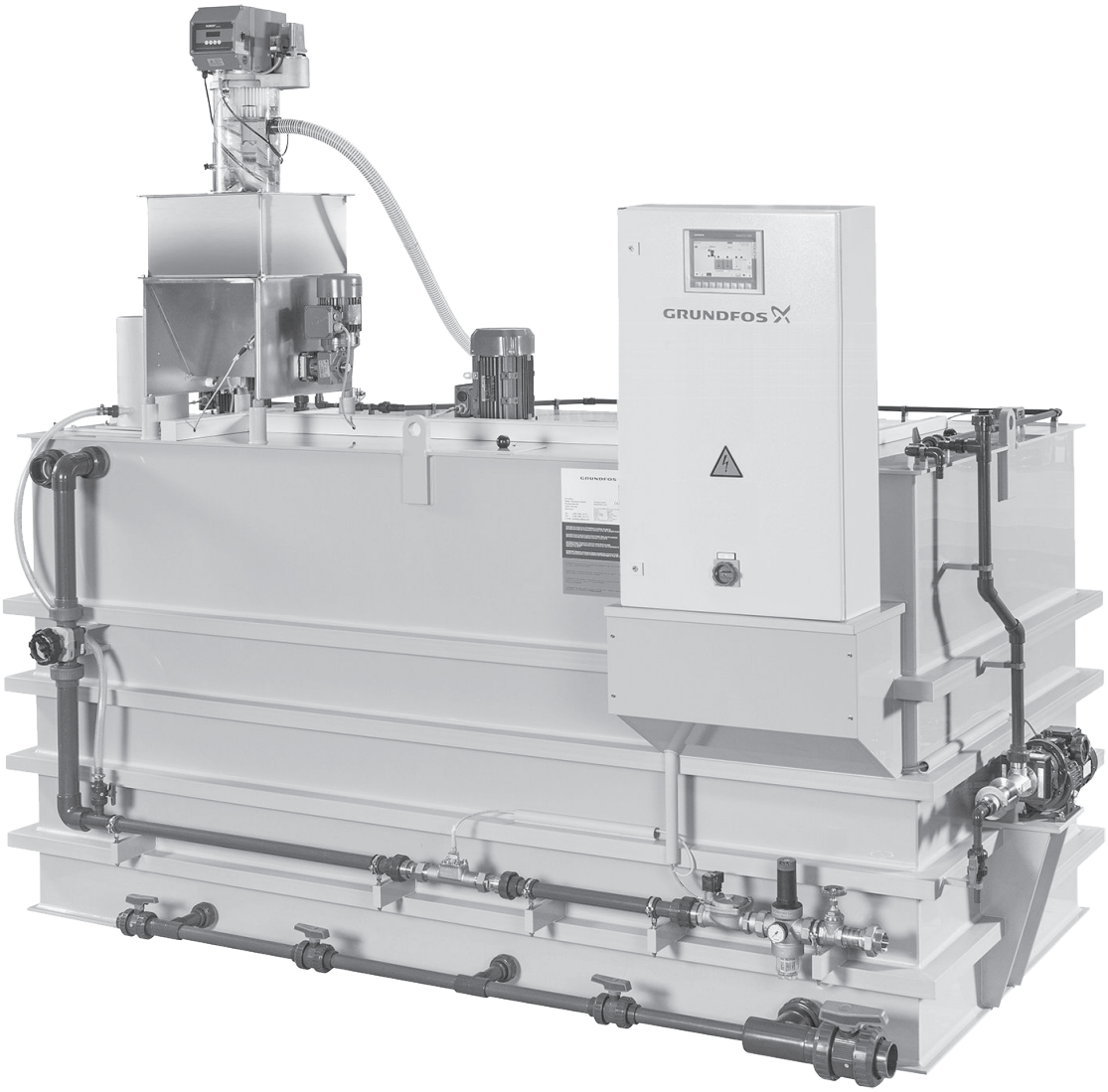
Polydos 412E

Polyelectrolyte preparation system

Installation and operating instructions



Polydos 412E
Installation and operating instructions
(all available languages)
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GRUNDFOS

Polydos 412E

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1. General information

1.1 Documentation package

The documentation supplied with the product comprises:

- Installation and operating instructions
- Wiring diagrams (in control cabinet)

Keep the documentation package available at the installation location at all times.

1.2 Target group

This manual is aimed at authorised and qualified persons responsible for installation, commissioning, operation, maintenance or (temporary) storage of the Polydos 412E system.

The responsible persons must be appropriately qualified for these tasks. Areas of responsibility, levels of authority and the supervision of the persons must be precisely defined by the operating company. If necessary, the persons must be trained.

1.3 Responsibilities

1.3.1 Operating company

The company or person who owns the system is referred to as "operating company" in this document. The operating company has to coordinate the installation of the system in agreement with Grundfos. After installation, commissioning must be done by certified service persons.

Obligations of the operating company

- Observe the local safety regulations.
- Make sure that the regulations for the prevention of accidents are observed at the installation location.
- Keep the documentation package available at the installation location at all times.
- Prepare the installation location according to the installation requirements specified in this document.
- Obtain official approval for storing chemicals, if necessary.
- Make sure that the users are trained before they operate the system.
- Provide the stipulated safety equipment and personal protective equipment.
- Make sure that the labels supplied by the manufacturer with the system are displayed visibly at the installation location.
- Provide the passwords for the operating software only to the persons who have received an appropriate technical training.
- Arrange regular maintenance.

1.3.2 Certified service persons

The persons responsible for commissioning, parametrisation and advanced maintenance of the system are referred to as "certified service persons" in this document. These persons must be trained and certified for these tasks by Grundfos.

Obligations of the certified service persons

- Read this manual thoroughly before starting any work at the system.
- Observe the recognised health and safety regulations as well as the accident prevention regulations.
- Wear protective equipment in accordance with national health and safety regulations when working on the system and handling chemicals.
- Meet the installation requirements specified in this document.
- Perform installation and commissioning in accordance with the knowledge and documents received during the training at Grundfos.
- Train the users in performing the basic maintenance tasks mentioned in this document.
- Parametrise the system according to on-site requirements during commissioning.

1.3.3 Users

The persons responsible for operation and basic maintenance of the system are referred to as "users" in this document. The users must be trained for their tasks by certified service persons.

Obligations of the users

- Read this manual thoroughly before starting any work at the system.
- Read all documents delivered in the documentation package thoroughly before starting any work at the system.
- Obtain instructions from Grundfos specialists on all service work relating to the system.
- Observe the recognised regulations for health, safety and accident prevention.
- Wear protective equipment in accordance with the national health and safety regulations when working on the system and handling chemicals.
- Keep secret the passwords for the operating software.

2. Safety instructions

2.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD
Description of the hazard
Consequence of ignoring the warning
- Action to avoid the hazard.

2.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

Observe these instructions for explosion-proof products.

A blue or grey circle with a white graphical symbol indicates that an action must be taken.

A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

If these instructions are not observed, it may result in malfunction or damage to the equipment.

Tips and advice that make the work easier.

2.3 Symbols on the product

This symbol indicates a danger of electric shock.

All signs and symbols on the product must be observed and maintained legible.

2.4 Working with chemicals

WARNING
Chemical hazard
Death or serious personal injury
- Wear personal protective equipment.
- Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.
- Collect and dispose of all chemicals in a way that is not harmful to persons or the environment.

Make sure that parts in contact with the chemicals are resistant to the chemicals under operating conditions.
Make sure that leaking chemicals do not cause personal injury or damage to property.
The installation of leak monitoring equipment and drip trays is recommended.

2.5 Electrical hazards

WARNING
Electric shock
Death or serious personal injury
- All electrical connections must be carried out by a qualified electrician in accordance with local regulations.
- Switch off the power supply before you start any work on the product. Make sure that the power supply cannot be switched on accidentally.
- Make sure the control cabinet is closed during operation.
- Replace damaged electrical components and lines immediately.

2.6 Mechanical hazards

The dosing screw is located under the safety guard of the dry-material feeder and extends into the dissolving hopper. The dosing screw is started and stopped automatically.

CAUTION
Automatic startup
Minor or moderate personal injury
- Do not reach into the dry-material feeder.
- Do not reach into the dissolving hopper.
- Make sure that the safety guards of the dry-material feeder and the dissolving hopper are installed before starting operation.

The stirrer propellers in the preparation chambers are started and stopped automatically.

CAUTION
Automatic startup
Minor or moderate personal injury
- Switch off the main switch before removing the cover from the inspection opening of a preparation chamber.
- Make sure all inspection openings are closed and locked during operation.

After power failure, the system automatically reverts to the operating state it was in when the power failure occurred. Components can start unexpectedly.

CAUTION
Automatic startup
Minor or moderate personal injury
- In case of power failure, switch off the main switch before starting any work on the system.

3. Storage and handling

3.1 Storage

- Observe the permissible ambient conditions.
- The storage location must be protected from rain, humidity, condensation, direct sunlight and dust.
- The system must be drained completely.
- The system must be cleaned from dry material and liquid concentrate.
- The maximum storage time is 2 years from delivery.

Related information

5.1 Ambient conditions for Polydos 412E systems

3.2 Unpacking

- Mount as soon as possible after unpacking.
- Observe the permissible ambient conditions.
- Do not step on the system. The system is not designed to carry the weight of a person.

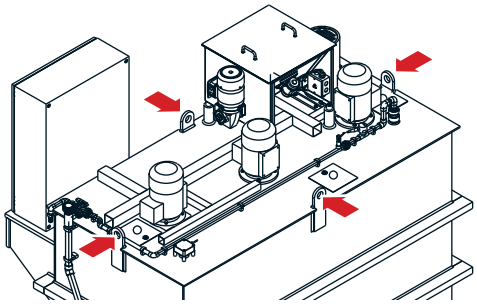
Related information

5.1 Ambient conditions for Polydos 412E systems

3.3 Transport

WARNING
Overhead load
Death or serious personal injury
- Do not walk or stand under or close to a suspended load.

- The system must only be transported by trained persons.
- Wear personal protective equipment (helmet, safety shoes, protective gloves).
- Observe the permissible ambient conditions.
- The system must be drained completely.
- Do not step on the system. The system is not designed to carry the weight of a person.
- Use appropriate lifting and transporting devices.
- Make sure the freight does not sustain any point load during transport.
- Avoid strong impact loads.
- Before lifting check the centre of gravity of the freight.
- Use all lifting eyes and make sure to distribute the weight evenly. Keep the direction of the lifting force as vertical as possible to avoid bending the lifting eyes. Use a traverse for lifting. The length of the traverse must exceed the distance between the facing lifting eyes by 100-200 mm.



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Lifting eyes

- If using forklifts, place the system on an appropriate pallet to support the system frame.
- If using forklifts, use forks that are long enough to cover the entire depth of the freight.
- Secure the system during transport to prevent it from tilting and moving.

Related information

5.1 Ambient conditions for Polydos 412E systems

4. Product description

4.1 Intended use

The Polydos 412E is a fully automatic system for the continuous preparation of polyelectrolyte solution in a defined concentration. Solutions for further dilution as well as ready-to-use solutions can be prepared from dry material or from liquid concentrate.

The system is suitable for many applications, such as:

- Drinking-water treatment
- Wastewater treatment
- Sludge treatment
- Process-water and circulation-water treatment
- Pulp and paper
- Power plants.

Improper use

Applications not described in the intended use section are not permitted. Grundfos accepts no liability for any damage resulting from improper use.

Unauthorised structural modifications to the system may result in serious personal injury and damage to equipment.

Do not dismantle, modify, bridge, remove, bypass or disable components, including safety equipment.

- The system must not be used if it is damaged.
- The system must not be used after improper repair.
- The system must not be used after unauthorised modification.
- The system must not be used in potentially explosive areas.

4.2 Identification

4.2.1 Nameplate of Polydos 412E

Pos.	Description
1	Type designation
2	Product number, Serial number
3	Capacity
4	Voltage, Frequency, Phases, Earth connection, Power input
5	Production code (year and week)
6	Country of origin
7	Marks of approval
8	Project number

4.2.2 Type key of the Polydos 412E system

Type	
PD412E-500-T0-P1-C1-A1-L1-Z1-W1	

Capacity level	
PD412E-**500**-T0-P1-C1-A1-L1-Z1-W1	
500	500 l/h
1000	1000 l/h
2000	2000 l/h
4000	4000 l/h
6000	6000 l/h
10.000	10000 l/h

The capacity level indicates the preparation capacity within the standard maturing time.

Variant	
PD412E-500-**T0**-P1-C1-A1-L1-Z1-W1	
T0	Standard
T1	Customised
T2	T0 with stainless steel tank

Supply voltage	
PD412E-500-T0-**P1**-C1-A1-L1-Z1-W1	
P1	400 VAC, 50 Hz (3ph, N, PE)
P2	460 VAC, 60 Hz (3ph, PE)
P3	380 VAC, 50 Hz (3ph, PE)
P4	400 VAC, 50 Hz (3ph, PE)
P5	415 VAC, 60 Hz (3ph, PE)

Communication module	
PD412E-500-T0-P1-**C1**-A1-L1-Z1-W1	
C1	With Ethernet “Profinet/Modbus TCP”
C2	With Modbus RTU
C3	With Profibus DP

Stirrer in storage chamber	
PD412E-500-T0-P1-C1-**A1**-L1-Z1-W1	
A1	Not included
A2	Included

Liquid polymer	
PD412E-500-T0-P1-C1-A1-**L1**-Z1-W1	
L1	Without liquid polymer connection and without liquid concentrate pump
L2	With liquid polymer connection and without liquid concentrate pump
L3	With liquid polymer connection and with liquid concentrate pump

Certificate	
PD412E-500-T0-P1-C1-A1-L1-**Z1**-W1	
Z1	Without certificate
Z2	With inspection certificate 3.1
Z3	With test report 2.2
Z4	With inspection certificate 3.1 and test report 2.2

Packaging	
PD412E-500-T0-P1-C1-A1-L1-Z1-**W1**	
W1	Wooden pallet
W2	Wooden box

4.2.3 Type key of the Polydos 412E control cabinet

Type
CP412E-05_10-P1-C1-A1-L1

Variant	
CP412E-**05_10**-P1-C1-A1-L1	
05_10	For systems with a maximum preparation capacity of 500-10000 l/h

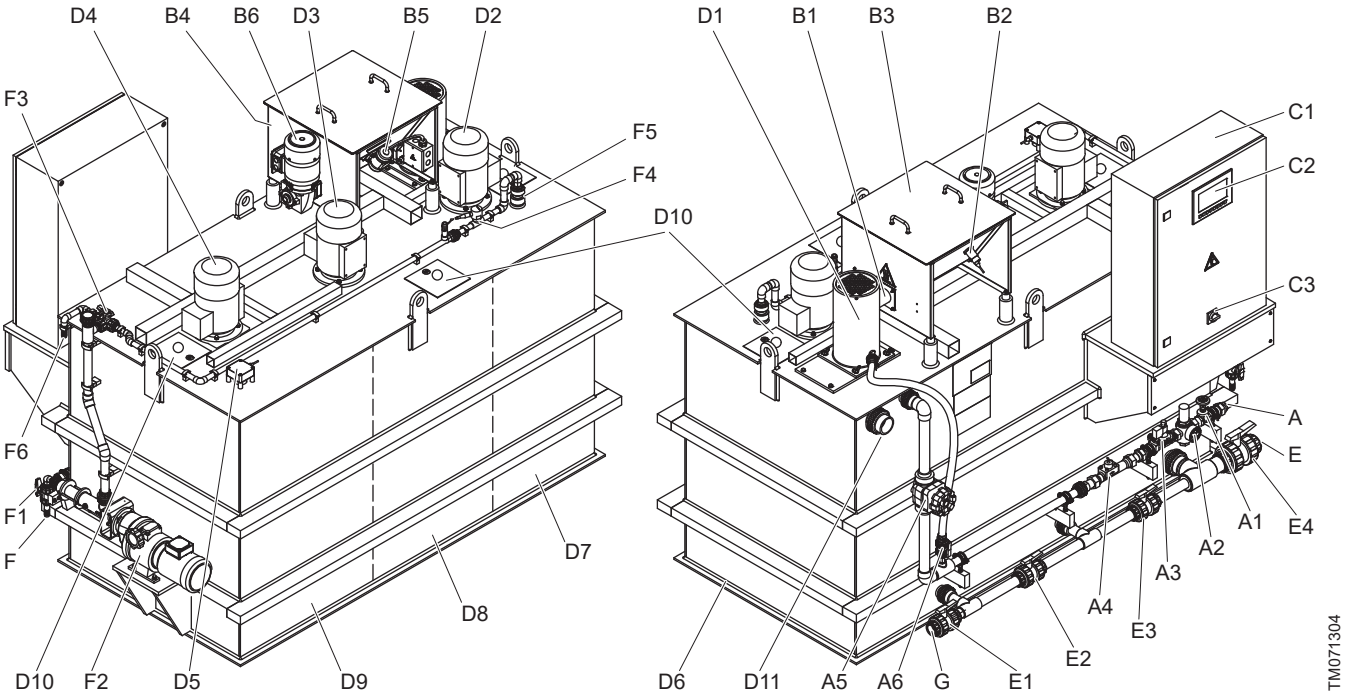
Supply voltage	
CP412E-05_10-**P1**-C1-A1-L1	
P1	400 VAC, 50 Hz (3ph, N, PE)
P2	460 VAC, 60 Hz (3ph, PE)
P3	380 VAC, 50 Hz (3ph, PE)
P4	400 VAC, 50 Hz (3ph, PE)
P5	415 VAC, 60 Hz (3ph, PE)

Communication module	
CP412E-05_10-P1-**C1**-A1-L1	
C1	With Ethernet “Profinet/Modbus TCP”
C2	With Modbus RTU
C3	With Profibus DP

Stirrer in storage chamber	
CP412E-05_10-P1-C1-**A1**-L1	
A1	Not included
A2	Included

Liquid polymer	
CP412E-05_10-P1-C1-A1-**L1**	
L1	Without liquid polymer
L2	With liquid polymer

4.3 Overview and description of components and connections



Pos.	Description	Pos.	Description
A	Water inlet	D5	Ultrasonic level sensor
A1	Shut-off valve	D6	Three-chamber tank
A2	Pressure reducing valve	D7	Mixing chamber
A3	Solenoid valve	D8	Maturing chamber
A4	Flow sensor	D9	Storage chamber
A5	Regulation valve	D10	Inspection holes
A6	Regulation valve for jet mixer	D11	Overflow outlet
B1	Heated dosing pipe	E	Withdrawal connection
B2	Dry-material level sensor	E1	Ball valve
B3	Cover	E2	Ball valve
B4	Dry-material feeder with storage hopper	E3	Ball valve
B5	Vibrator	E4	Ball valve
B6	Gear motor of dry-material dosing screw	F	Liquid-concentrate inlet*
C1	Control cabinet	F1	Ball valve*
C2	Touch screen	F2	Liquid-concentrate pump*
C3	Main switch	F3	3-way ball valve*
D1	Dissolving hopper with jet mixer	F4	Liquid-concentrate flow sensor*
D2	Stirrer 1 (mixing chamber)	F5	Non-return valve*
D3	Stirrer 2 (maturing chamber)	F6	Liquid-concentrate calibration outlet*
D4	Stirrer 3 (storage chamber)*	G	Drain connection

* Optional component

Three-Chamber tank (D6)

The tank has three chambers. In the mixing chamber (D7), the polymer is mixed with water. In the maturing chamber (D8), the polymer solution matures. In the storage chamber (D9), the polymer solution is stored before withdrawal. The partition between the chambers prevents the amalgamation of the different solution phases, enables a constant withdrawal and guarantees the homogeneity of the solution. In the storage chamber (D9), the ultrasonic level sensor (D5) is installed to control start and stop of the preparation process. The overflow outlet (D11) must be connected to a suitable drain. Through the lockable inspection holes (D10) the user can check the level and status in each chamber. The ball valves (E1, E2, E3) are used to drain the chambers via the drain connection (G). The ball valve (E4) is used to shut off the withdrawal connection (E), where the prepared solution is withdrawn from the storage chamber.

Stirrers (D2, D3, D4)

The system is equipped with the stirrers (D2, D3) in the mixing and maturing chamber as a standard. Optionally the third stirrer (D4) in the storage chamber can be ordered. The stirrers mix the prepared solution and enhance the maturing process.

Ultrasonic level sensor (D5)

The contactless and maintenance-free ultrasonic level sensor measures the solution level in storage chamber (D9) continuously to set the minimum and maximum thresholds for starting and stopping the automatic preparation process.

The set limit values start and stop the preparation process automatically.

A limit value for dry run protects the dosing devices from dry-running.

A limit value for overflow prevents overfilling.

Dry-material feeder with storage hopper (B4)

The dry-material feeder can be operated with constant or varying quantities of dry polymer. It is equipped with a 33 l hopper with dosing screw for constant discharge, and a heating to avoid humidity lumps in the hopper.

The level sensor (B2) monitors the level of dry material in the storage hopper. The vibrator (B5) helps to prevent the dry material from bridging in the dry-material feeder.

Water inlet (A)

The water inlet is equipped with shut-off valve (A1), pressure reducing valve (A2), electric solenoid valve (A3) and flowmeter (A4) to supply the system with preparation water. The pressure reducing valve (A2) is equipped with a pressure gauge and a dirt trap. The solenoid valve (A3) automatically opens and closes the water inlet. The regulation valves (A5, A6) are used to adjust the water flow into the mixing chamber and the jet mixer.

Dissolving hopper with jet mixer (D1)

The jet mixer in the dissolving hopper is specially designed to produce a depression during operation (injector effect). This optimises the suction of the dry polymer, prevents the obstruction of the jet mixer, and guarantees the best wetting of the polymer.

Control cabinet (C1)

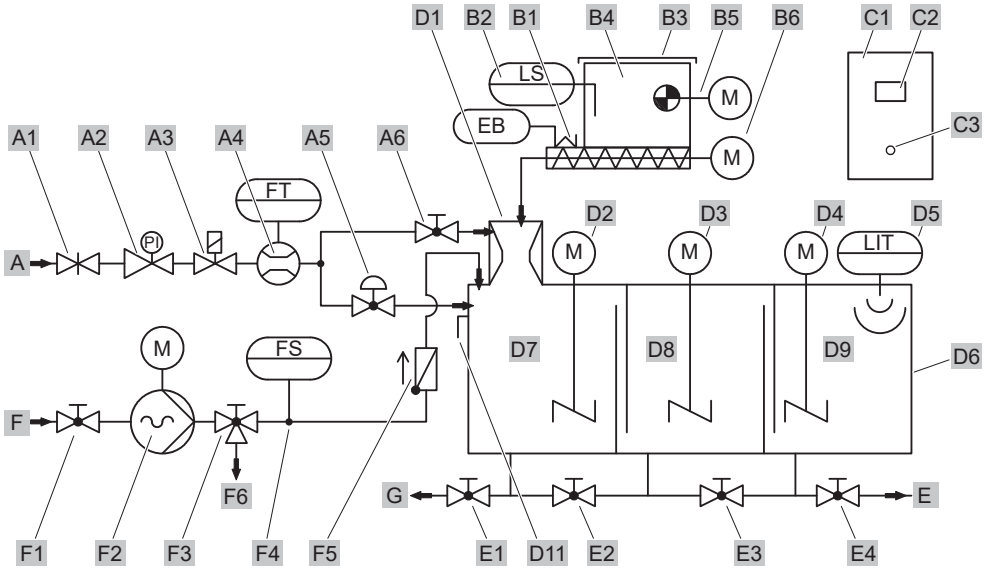
The control cabinet includes:

- 7-inch true-colour touchscreen (C2) with Siemens PLC and multilingual operating software
- Main switch (C3) which serves as an emergency stop at the same time

Liquid-concentrate inlet (F)

The system can be ordered with additional components for preparation from liquid polymer concentrate as an option. In this case the liquid polymer source is connected to inlet (F) which can be shut off with ball valve (F1). The liquid-concentrate pump (F2) doses the liquid polymer into the mixing chamber. The 3-way ball valve (F3) is used for calibration via calibration outlet (F6). The flow sensor (F4) monitors the liquid-concentrate flow into the mixing chamber. The non-return valve (F5) helps to ensure the dosing accuracy.

4.4 Piping and Instrumentation Diagram (PID)



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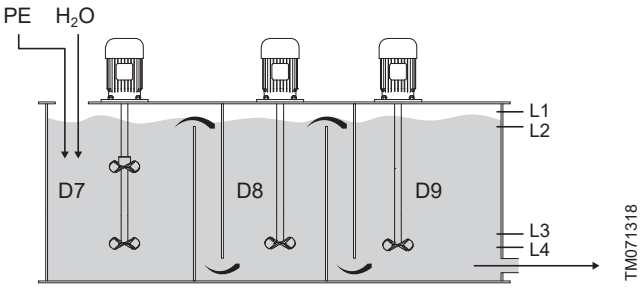
Pos.	Description	Pos.	Description
A	Water inlet	D5	Ultrasonic level sensor
A1	Shut-off valve	D6	Three-chamber tank
A2	Pressure reducing valve	D7	Mixing chamber
A3	Solenoid valve	D8	Maturing chamber
A4	Flow sensor	D9	Storage chamber
A5	Regulation valve	D11	Overflow outlet
A6	Regulation valve for jet mixer	E	Withdrawal connection
B1	Heated dosing pipe	E1	Ball valve
B2	Dry-material level sensor	E2	Ball valve
B3	Cover	E3	Ball valve
B4	Dry-material feeder with storage hopper	E4	Ball valve
B5	Vibrator	F	Liquid-concentrate inlet*
B6	Gear motor of dry-material dosing screw	F1	Ball valve*
C1	Control cabinet	F2	Liquid-concentrate pump*
C2	Touch screen	F3	3-way ball valve*
C3	Main switch	F4	Liquid-concentrate flow sensor*
D1	Dissolving hopper with jet mixer	F5	Non-return valve*
D2	Stirrer 1 (mixing chamber)	F6	Liquid-concentrate calibration outlet*
D3	Stirrer 2 (maturing chamber)	G	Drain connection
D4	Stirrer 3 (storage chamber)*		

* Optional component

4.5 Process description

The Polydos preparation system works fully automatic. It prepares the polymer solution in a combination of continuous preparation and batch preparation.



Functional principal

Pos.	Description
PE	Polymer
H_2O	Service water
D7	Mixing chamber
D8	Maturing chamber
D9	Storage chamber
L1	Overflow alarm level
L2	Max. filling level
L3	Min. filling level
L4	Dry run alarm level

The polymer solution is prepared in a three-chamber tank. The mixing, maturing and withdrawal of the polymer solution runs as a continuous process.

The preparation process starts automatically when the level sensor in the storage chamber detects the minimum filling level (L3). The solenoid valve at the water inlet opens and the preparation water starts flowing into the mixing chamber.

If dry polymer is used, the dry-material feeder starts dosing the dry material into the dissolving hopper with jet mixer, where it is wetted with a part of the preparation water and flushed into the mixing chamber.

If liquid polymer is used, the liquid-concentrate pump starts dosing the liquid concentrate directly into the mixing chamber.

The polymer is dosed in proportion to the dilution water flow. This guarantees an accurate concentration of the prepared solution even in case of fluctuating water pressure.

The mixed solution flows from the mixing chamber through a hydraulic displacement channel to the bottom of the maturing chamber and displaces the matured solution into the storage chamber. The hydraulic displacement prevents fresh polymer from entering the storage chamber.

The stirrer in the maturing chamber stops during the preparation process to ensure that only matured solution is displaced into the storage chamber.

The preparation process stops automatically when the level sensor in the storage chamber detects the maximum filling level (L2). The solenoid valve at the water inlet closes. The stirrer in the maturing chamber starts again.

5. Technical data

5.1 Ambient conditions for Polydos 412E systems

Min./max. ambient temperature [°C]		
	Transport *	-5 / +50
	Transport with lifting eyes	-5 / +40
	Storage *	-5 / +50
	Operation	+5 / +40
Max. relative humidity (non-condensing)		80 %
Max. altitude above sea level [m]		1000

* The system must be drained. For storage temperatures below +5 °C, the whole system including lines and external components must not contain any water.

! Exposure to direct sunlight can cause colour changes, material deformations and cracks.
Do not expose the system to direct sunlight.

! The system must not be transported at temperatures below the specified value for transport. Otherwise, plastic parts may be damaged.

! Freezing and boiling liquids can cause damage.
Observe the freezing and boiling points of the used liquids. The freezing and boiling point of a liquid varies depending on the pressure.

5.2 General data for Polydos 412E

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Max. preparation capacity with standard maturing time [l/h]	500	1000	2000	4000	6000	10000
Standard maturing time [min]	45	45	45	45	45	45
Tank volume [l]	600	1050	1750	3500	5400	8700
Solution concentration [%]	0.05 - 0.5	0.05 - 0.5	0.05 - 0.5	0.05 - 0.5	0.05 - 0.5	0.05 - 0.5

Hydraulic connections

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Water inlet	R 3/4	R 3/4	R 1	R 1 1/2	R 1 1/2	R 2
Drain connection	DN 32	DN 32	DN 32	DN 32	DN 32	DN 32
Overflow outlet	DN 50	DN 50	DN 50	DN 65	DN 65	DN 80
Withdrawal connection	DN 50	DN 50	DN 50	DN 65	DN 65	DN 80
Liquid-concentrate inlet	DN 15	DN 15	DN 15	DN 15	DN 15	DN 15

5.3 Dilution water parameters

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Dilution water flow* [m^3/h]	1-2	2-3	4-6	8-12	12-18	20-25
Dilution water pressure [bar]	3-4	3-4	3-4	3-4	3-4	3-4
Dilution water temperature [°C]	10-45	10-45	10-45	10-45	10-45	10-45

The dilution water temperature and the characteristics of the polymer affect the maturing time. Higher water temperature reduces the maturing time.

Dilution water flow sensor

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Type	VFI 0.3-6	VFI 0.3-6	VFI 0.6-12	VFI 1.3-25	VFI 1.3-25	VFI 1.3-25
Min. flow rate [m^3/h]	0.3	0.3	0.6	1.3	1.3	1.3
Max. flow rate [m^3/h]*	6	6	12	25	25	25

* The maximum flow rate must not be exceeded, otherwise the flow sensor can be damaged.

5.3.1 Water quality specification

Make sure that the water supply conforms to the required standard of drinking water given in the specification below. Ask your local water supplier for the specific values.

Parameter		Value
Max. turbidity	[NTU]	4
Max. particle size	[µm]	100

5.4 Electrical data for Polydos 412E

General data for all variants:

- External fuse: 20 A

The values in the tables are approximate.

Supply voltage variant P1: 400 VAC, 50 Hz (3ph, N, PE)

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Power consumption [kVA]	6.9	6.9	6.9	8.3	11.8	12.5
Rated current [A]	10	10	10	12	17	18

Supply voltage variant P2: 460 VAC, 60 Hz (3ph, PE)

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Power consumption [kVA]	9.6	9.6	9.6	10.4	12.7	14.3
Rated current [A]	12	12	12	13	16	18

Supply voltage variant P3: 380 VAC, 50 Hz (3ph, PE)

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Power consumption [kVA]	7.2	7.2	7.2	8.6	11.2	12.2
Rated current [A]	11	11	11	13	17	18.5

Supply voltage variant P4: 400 VAC, 50 Hz (3ph, PE)

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Power consumption [kVA]	7.3	7.3	7.3	8.7	11.8	12.8
Rated current [A]	10.5	10.5	10.5	12.5	17	18.5

Supply voltage variant P5: 415 VAC, 60 Hz (3ph, PE)

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Power consumption [kVA]	9	9	9	11.5	12.9	14
Rated current [A]	12.5	12.5	12.5	16	18	19.5

5.5 Electrical data for components of the Polydos 412E

Stirrer 1 in mixing chamber

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Rated power [kW]	0.55	0.55	0.55	1.50	1.50	2.20
Speed of rotation at 50 Hz [rpm]	900	900	900	900	900	900
Enclosure class	IP55	IP55	IP55	IP55	IP55	IP55

Stirrers 2 and 3 in maturing and storage chamber

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Rated power [kW]	0.55	0.55	0.55	0.55	1.50	1.50
Speed of rotation at 50 Hz [rpm]	900	900	900	900	900	900
Enclosure class	IP55	IP55	IP55	IP55	IP55	IP55

Dry-material feeder

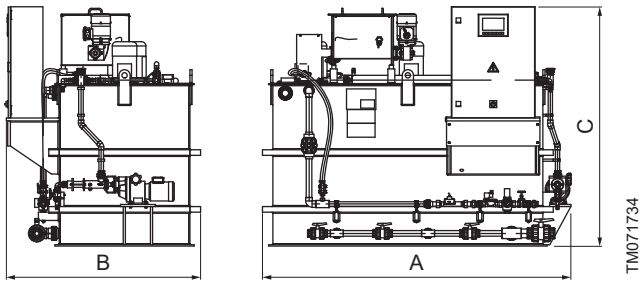
Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Type	423-3	423-3	423-3	423-3	423-3	423-3
Max. capacity [kg/h]	10.0	20.0	39.5	53.0	102.0	253.0
Rated power [kW]	0.25	0.25	0.25	0.25	0.25	0.25
Enclosure class	IP65	IP65	IP65	IP65	IP65	IP65

Liquid-concentrate pump

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Type	PCP	PCP	PCP	PCP	PCP	PCP
Capacity [kg/h]	10-50	10-50	10-50	34-172	34-172	80-450
Rated power [kW]	0.37	0.37	0.37	0.37	0.37	0.37
Enclosure class	IP55	IP55	IP55	IP55	IP55	IP55

5.6 Dimensions and weights of the Polydos 412E

Dimensions



Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
A [mm]	1985	2240	2300	3298	3308	4434
B [mm]	1230	1230	1380	1370	1870	2210
C [mm]	1706	1636	1718	2061	2061	2061

Weights

Type designation: PD412E	-500	-1000	-2000	-4000	-6000	-10.000
Empty [kg]	250	300	350	500	600	850
Filled [kg]	750	1300	2350	4500	6600	10850

5.7 Materials of the Polydos 412E

Tank	PP-H
Withdrawal line and connections	PVC / EPDM
Dry-material feeder	1.4301 (AISI 304)
Stirrers (shaft, propeller)	1.4571 (AISI 316Ti)
Liquid-concentrate pump (rotor, stator)	1.4404 (AISI 316L) / FPM
Liquid-concentrate line	PVC
Water line	PVC / brass

5.8 Technical data of the Polydos 412E control cabinet

The control cabinet contains all the electrical control and command devices necessary for operating the Polydos 412E system.

- Cabinet material: sheet steel
- Enclosure class: IP65
- PLC with complete software for control, operation and signal exchange
- 7-inch true-colour touchscreen with operating software in the following languages:
  - German
  - English
  - French
  - Italian
  - Russian
  - Spanish
  - Turkish
  - Dutch
  - Polish
- Control cabinet wired and tested according to European electrical standards

Potential-free contact input

The system provides a potential-free contact input (see wiring diagram) to start and stop the system in automatic mode. See menu "**Service menu**".

Potential-free contact output

The system provides three potential-free output contacts (see wiring diagram).

- Max. load: 250 VAC (2 A) / 30 VDC (2 A)

The output signal can be adjusted separately for each output via menu "**Service menu**".

Related information

8.8 Service menu

6. Installation

6.1 Installation requirements for Polydos systems

The safety of the overall system is only guaranteed, if the installation requirements are strictly adhered to.

All installation work must only be carried out by qualified and authorised persons.

Separate the system from the power supply before working on the system components and lines.

Wear personal protective equipment.

Do not step on the system. The system is not designed to carry the weight of a person.

The system is delivered completely assembled. On site only the water, withdrawal equipment, drain and power supply must be connected.

To ensure ergonomic refilling with dry material, provide a working platform or use an automatic powder conveyor. A powder conveyor can be purchased as an accessory from Grundfos.

Location

- The installation location must be free of vibrations.
- The installation location must be protected from rain, humidity, condensation, direct sunlight and dust.
- The installation location must be in a solid building.
- The installation location must be sufficiently illuminated to ensure safe handling of the system.
- Observe the permissible ambient conditions.

Foundation

For the installation of the system, provide a solid concreted surface, suitable for the weight and dimensions of the system.

Install the system on a horizontal foundation.

Maximum slope: 1:200

Make sure that the entire system is supported by the foundation. Make sure that no foreign objects are between the foundation and the system.

WARNING
Heavy system weight
Death or serious personal injury
- Observe the maximum floor load.
- The foundation must be based on a sufficiently bearing ground.

Make sure all components are always easily accessible for operation and maintenance.

Water supply

The quality and parameters of the water must comply with the specifications in the technical data section. If the pressure is insufficient, a booster pump is required.

The water supply connections must comply with the respective international standards, e.g. double non-return valves on the inlet connection.

Connective pipework

Make sure that all pipes and fittings of your installation are suitable for drinking water.

Prior to installation, check all pipework and fittings between the components for conformity with the local and international legislation.

Make sure that the dimensions of all hydraulic lines are suitable for the required flow rates.

Drain

An on-site drain for maintenance is required.

The discharged liquid may contain chemicals. Local regulations for the disposal of chemicals must be observed.

Related information

5.1 Ambient conditions for Polydos 412E systems

5.3.1 Water quality specification

5.6 Dimensions and weights of the Polydos 412E

6.2 Electrical connection

All electrical connections must be carried out by a qualified electrician in accordance with local regulations.

All electrical connections must be carried out in accordance with the separate wiring diagrams delivered with the system.

WARNING
Electric shock
Death or serious personal injury
- Switch off the power supply before making any electrical connections.
- Make sure that the power supply cannot be switched on accidentally.
- Check that the supply voltage and frequency correspond to the values stated on the nameplate.
- Make sure all earth connections are established correctly before switching on the power supply.

!

Make sure the sense of rotation is correct for all motors.

Radio shielding for connected consumers must be provided by the customer.

Provide a back-up fuse with correct capacity.

Related information

5.4 Electrical data for Polydos 412E

5.5 Electrical data for components of the Polydos 412E

7. Commissioning

7.1 Commissioning for operation with dry material

!

Commissioning must be done by certified service persons.

Wear personal protective equipment.

Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.

Make sure that all electrical, hydraulic and mechanical installation is done correctly and all system components are ready for operation. The system must be stopped and control mode must be "Local".

Some pre-assembled mechanical and hydraulic connections in the system are loosened for transport. Make sure all connections are tightened before commissioning.

Do not step on the system. The system is not designed to carry the weight of a person.

Required tools: scales to weigh the dry material during calibration of the dry-material feeder.

Initial startup

After switching on the main switch, the PLC and the touch panel perform a self test.

After approximately 40 seconds the menu **System overview** is displayed.

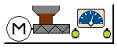
An alarm that indicates wrong input values is displayed, because the system is not yet correctly parametrised and commissioned. Acknowledge the alarm after commissioning.

Commissioning menus

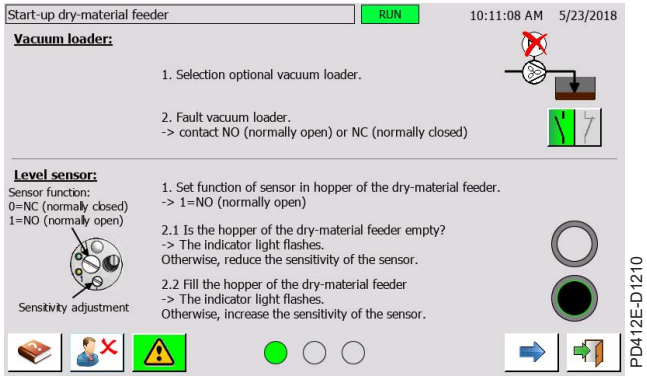
This sequence of menus guides the certified service person through the commissioning procedure.

Menu action	Required user level	
Access menu Change settings	3	**System Service**

To open the first commissioning menu:

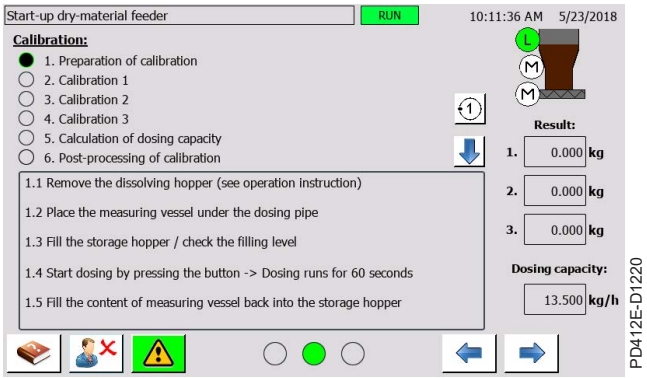
	Push this symbol to open the menu **System menu**.
	Push this symbol to open the menu **Service menu**.
	Push this symbol to open the first commissioning menu.

The first menu guides through the settings of the optional vacuum loader and through the adjustment of the dry-material level sensor.



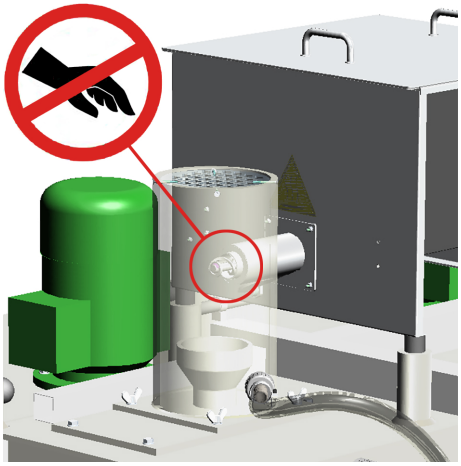
Start-up dry-material feeder

The next menu guides through the calibration of the dry-material feeder.



Start-up dry-material feeder

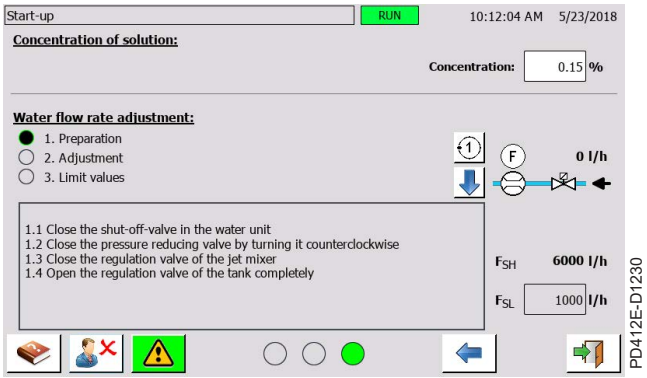
CAUTION
Crushing of hands
Minor or moderate personal injury
- After removing the dissolving hopper, do not reach into the dosing screw. The dosing screw starts running when you switch on the dry-material feeder.



For removing the dissolving hopper, see *9.5 Checking and cleaning the dissolving hopper*

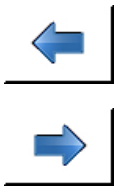
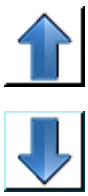
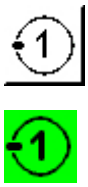
The next menu guides through the concentration adjustment of the prepared solution and through the water flow adjustment.

! Flow rates exceeding the upper limit of the water flow sensor can damage the sensor.



Start-up

Perform the procedure step by step as described in the menus.

Symbol	Description
	Push these symbols to navigate through the menus.
	Push these symbols to navigate through the main steps.
	Indicates that contact type NO (normally open) is active. Push this symbol to switch the contact type.
	Indicates that contact type NC (normally closed) is active. Push this symbol to switch the contact type.
	Push these symbols to switch on or off the dry-material feeder. • Green: Switched on • White: Switched off
	Push this symbol to start the automatic calculation of the dosing capacity.
	Push this symbol to revert to the previous menu.

After commissioning create a backup of your settings.

Related information

8.8.1 Data backup

7.2 Commissioning for operation with liquid concentrate

!
Commissioning must be done by certified service persons.
Wear personal protective equipment.
Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.
Make sure that all electrical, hydraulic and mechanical installation is done correctly and all system components are ready for operation. The system must be stopped and control mode must be "Local".
Some pre-assembled mechanical and hydraulic connections in the system are loosened for transport. Make sure all connections are tightened before commissioning.
Do not step on the system. The system is not designed to carry the weight of a person.
Make sure that the liquid-concentrate line is connected with a foot valve and installed with flooded suction to avoid dry-running of the pump.

Initial startup

After switching on the main switch, the PLC and the touch panel perform a self test.

After approximately 40 seconds the menu **System overview** is displayed.

An alarm that indicates wrong input values is displayed, because the system is not yet correctly parametrised and commissioned. Acknowledge the alarm after commissioning.

Commissioning menus

This sequence of menus guides the certified service person through the commissioning procedure.

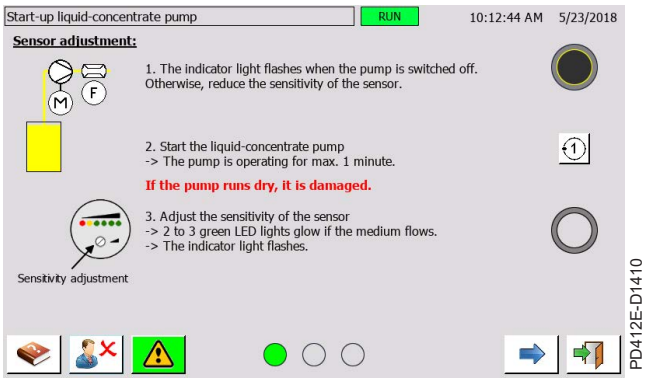
Menu action	Required user level	
Access menu Change settings	3	**System Service**

To open the first commissioning menu:

	Push this symbol to open the menu **System menu**.
	Push this symbol to open the menu **Service menu**.
	Push this symbol to open the first commissioning menu.

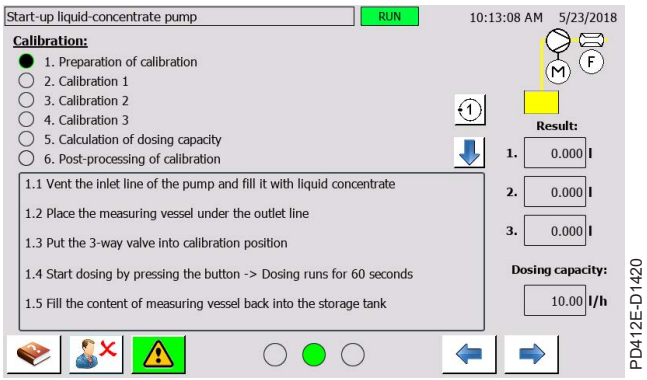
The first menu guides through the adjustment of the liquid-concentrate level sensor.

! Make sure the liquid-concentrate pump does not run dry during commissioning.



Start-up liquid-concentrate pump

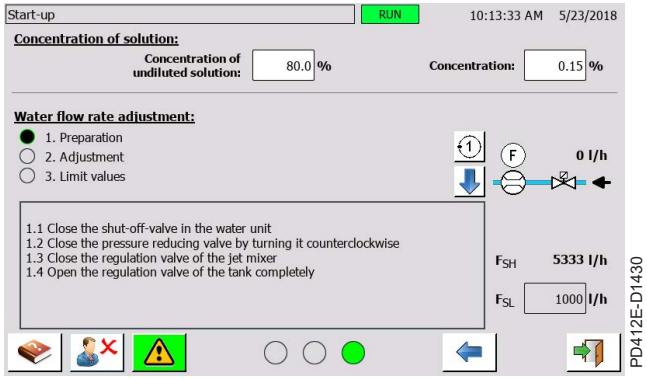
The next menu guides through the calibration of the liquid-concentrate pump.



Start-up liquid-concentrate pump

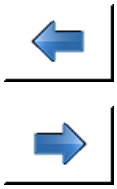
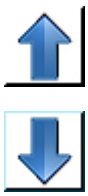
The next menu guides through the concentration adjustment of the prepared solution and through the water flow adjustment.

! Flow rates exceeding the upper limit of the water flow sensor can damage the sensor.



Start-up

Perform the procedure step by step as described in the menus.

Symbol	Description
	Push these symbols to navigate through the menus.
	Push these symbols to navigate through the main steps.
	Indicates that contact type NO (normally open) is active. Push this symbol to switch the contact type.
	Indicates that contact type NC (normally closed) is active. Push this symbol to switch the contact type.
 	Push these symbols to switch on or off the liquid-concentrate pump. • Green: Switched on • White: Switched off
	Push this symbol to start the automatic calculation of the dosing capacity.
	Push this symbol to revert to the previous menu.

After commissioning create a backup of your settings.

Related information

8.8.1 Data backup

8. Operation

8.1 Safety instructions for the operation of Polydos systems

The system must only be operated by authorised and qualified persons.

Wipe up spilled water, polymer or polymer solution immediately to avoid slipping hazard.

Make sure that you have a secure foothold when filling the dry-material feeder. For safety reasons Grundfos strongly recommends the installation of an automatic powder conveying system.

Do not step on the system. The system is not designed to carry the weight of a person.

WARNING
Chemical hazard
Death or serious personal injury
- Wear personal protective equipment.
- Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals. The required actions are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings. The operating company is responsible for ensuring that the safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

Related information

2.4 Working with chemicals

2.5 Electrical hazards

2.6 Mechanical hazards

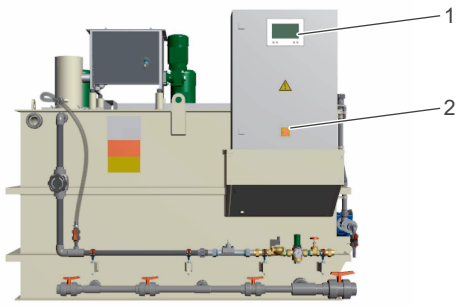
8.2 Work procedures

The system is electronically controlled. Users and certified service persons operate the system via control and display elements at the control cabinet.

Before starting to work, observe the following points:

- Keep the area around the product clean and tidy.
- Provide sufficient light for safe operation.
- If information, symbols and warnings are illegible or unclear, replace them immediately with new ones.
- Make sure that all safety installations are installed correctly and working properly. Do not deactivate or remove any safety installations during operation.
- Make sure the control cabinet is closed during operation.

8.3 Control and display elements



TM070045

Pos.	Description
1	Touchscreen
2	Main switch and emergency stop

Related information

8.3.1 Main switch and emergency stop

8.3.1 Main switch and emergency stop

As a standard the system is delivered with a main switch which serves as an emergency stop at the same time.

In case of emergency, switch off the main switch.

The main switch on the control cabinet switches off the power supply of all components powered via the control cabinet.

Additional components like vacuum loader and dosing stations are supplied separately and are not switched off via the main switch.

Related information

8.3 Control and display elements

8.3.2 Touchscreen

The system is controlled via the touchscreen mounted on the control cabinet.

Pointed or sharp objects can damage the plastic surface of the touchscreen. Operate the touchscreen only with your fingers or with a touch pen.

Touching several operating elements at the same time can trigger unintended actions. Touch only one operating element on the screen at a time.

Changes of the software must only be executed by qualified personnel authorised by Grundfos Water Treatment GmbH!

After unauthorised changes of hardware or software the warranty becomes invalid.

The software stays property of Grundfos Water Treatment GmbH. Copies are not allowed.

Screen saver

If no key is touched within 30 minutes, the brightness of the screen is reduced.

8.3.2.1 Login and Logout

Login to the system

To operate the system, an authorised user must log in to the system. The login dialogue pops up as soon as an action is performed which requires the login.

If a logged-in user is not authorised to operate a certain function, the login dialogue pops up to show that a higher user level is required.

Logout from the system

The system logs out users automatically, if the touchscreen is not operated for a certain time. The system does not revert to the system overview after logout. The time interval until automatic logout can be set individually for each user.

Before leaving the system, always log out to protect the system against unauthorised operation.

Symbol	Description
	Push this symbol to log out.

Related information

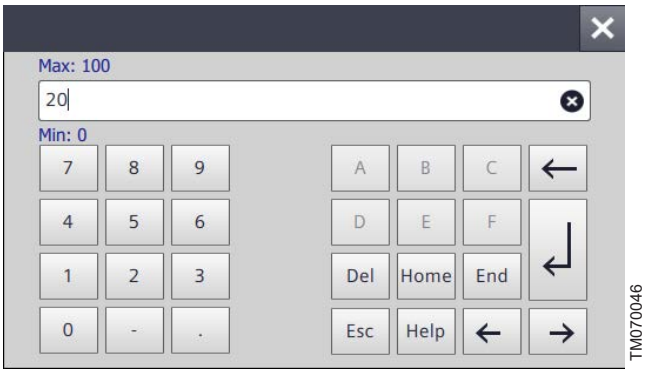
8.7.16 User administration

8.3.2.2 Keyboard on touchscreen

The input is done via a keyboard. All fields with white background are input parameters which can be changed. Fields with grey background cannot be changed.

Touch an input field to open the keyboard. Depending on the required input, either an alphanumeric or a numeric keyboard opens. The assignment of keys corresponds to standard computer keyboards.

Alphanumeric keyboard



Numeric keyboard

Symbol	Description
123	Push this symbol to switch to the numeric keyboard.
ABC	Push this symbol to switch to the alphanumeric keyboard.
^\" #+$	Push this symbols to toggle special characters.
Home	Push this symbol to set the cursor to the start of the input field.

8.3.2.3 Colours of components on touchscreen

The status of the different components is shown with different colours on the touchscreen.

Colour	Description
Grey	Component inactive
White	Component switched off
Green	Component switched on or active without fault
Yellow	Component pre-alarm / warning
Red	Component faulty

8.3.2.4 Help function

The system provides a context-sensitive help function on the touchscreen.

Symbol	Description
	Push this symbol to activate the context-sensitive help function in the active menu. The symbol turns green to indicate the active help function. Touch the element you require help for to see the help information. Push this symbol again to deactivate the help function.

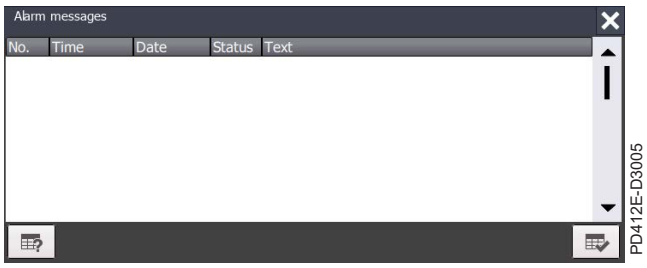
8.3.2.5 Alarms and messages

The system distinguishes several types of messages:

Message type	Description
Alarm	A critical fault has occurred. The system stops.
System message	Message about changes in system status. User has logged off, etc. The system keeps running.
Diagnostic message	Messages generated by the CPU. The system keeps running.

Alarm messages

In case of an alarm, the following dialogue opens and displays a message:



Alarm messages

Symbol	Description
	This symbol flashes in the top right corner of the touchscreen to indicate an active alarm. The number in the symbol shows the number of active alarms. Remedy the causes of all alarms.
	Select a message and push this symbol to acknowledge the message. Close the dialogue with the [X] key.
	Push this symbol in the active menu to reset all alarms.
	Push this symbol to restart the system in automatic mode.

If operation mode "Manual" is active, only the faulty component will be switched off. The operation mode "Manual" stays active.

If operation mode "Automatic" is active, the system stops and the automatic mode will be deactivated.

! As long as a fault is present or not acknowledged, it is not possible to activate the operation mode "Automatic".

System messages

In case of a system message, the following dialogue opens and displays a respective message for 5 seconds:

Active system messages

System messages do not affect the active operation mode. The system keeps running.

Related information

8.7.17 Message administration

12. Fault finding via alarm messages

8.3.2.6 Message status explanation

The status column indicates the status of a message.

There are 3 statuses:

Status	Description
A	Message appeared
Q	Message acknowledged
D	Message disappeared

The status indicators line up from the left to the right in the sequence of appearance.

8.4 Control modes "Local" and "Remote"

The system can either be controlled locally via the touchscreen or remotely via fieldbus communication.

Control mode	Screen symbol	Description
Local		The system is controlled locally via the touchscreen. Remote control is not possible, because no fieldbus connection is available or the system is in manual operation mode.
		Control mode "Local" is active. The system is controlled locally via the touchscreen. Fieldbus communication is available. Push the symbol to activate control mode "Remote" and control the system via the selected fieldbus communication.
Remote		Control mode "Remote" is active. The system is controlled remotely via the selected fieldbus communication. If this mode is active, the system cannot be operated from the touchscreen. Push the symbol to activate control mode "Local".

Related information

8.8.2 Fieldbus communication - control mode "Remote"

8.8.3 Fieldbus communication status and settings

8.5 Operation mode "Automatic"

In operation mode "Automatic" the system runs automatically.

Screen symbol	Description
	Automatic mode is not available. Operation mode "Manual" is active or an alarm is present.
	Automatic mode is available. Push this symbol to activate automatic mode.
	Automatic mode is active. Push this symbol to stop automatic mode. In this operation mode the system can be started and stopped via an external contact. If the symbol flashes, the automatic mode is active but the system is stopped via the external contact. For external contact settings, see menu **Service menu** .

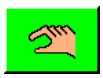
Related information

8.8 Service menu

8.6 Operation mode "Manual"

In manual mode, electrical components can be switched on and off individually by touching the corresponding symbol on the touchscreen.

! There is no protection from faulty operation in this mode.
Make sure not to damage any components.

Screen symbol	Description
	Manual mode is not available. Operation mode "Automatic" or control mode “Remote” is active.
	Manual mode is available. Push this symbol to activate manual mode.
	Manual mode is active. Push this symbol to stop manual mode.

8.7 Menu structure

The following table shows the structure of menus which can be accessed via the main menu **System overview** (*8.7.1 System overview*).

Symbol	Submenu 1	Symbol	Submenu 2	Symbol	Submenu 3
	Dry-material feeder (*8.7.2 Dry-material feeder parameters*)				
			Start-up dry-material feeder (*8.7.3 Dry-material feeder calibration*)		
0.0 l/h F	**Liquid-concentrate pump** (*8.7.4 Liquid-concentrate pump parameters*)				
			Start-up liquid-concentrate pump (*8.7.5 Liquid-concentrate pump calibration*)		
0 l/h F	**Water unit** (*8.7.6 Water unit*)				
		0 l/h F	**Set-up - Flow sensor** (*8.7.7 Set-up - Flow sensor*)		
	Tank (*8.7.8 Tank*)				
		L	**Set-up - Level sensor** (*8.7.9 Set-up - Level sensor*)		
	Trend 1h (*8.7.10 Trend 1h / Trend 24h*)				
			Trend 24h		
	System menu (*8.7.11 System menu*)				
		XX 1234	**Tag number editor** (*8.7.12 Tag number editor*)		
		2225	**Operating hours counter** (*8.7.13 Operating hours counter*)		
			Language selection (*8.7.14 Language selection*)		
			Time / Date (*8.7.15 Time / Date*)		
			User administration (*8.7.16 User administration*)		
			Message administration (*8.7.17 Message administration*)		
			Status PLC inputs / outputs (*8.7.18 Status of PLC inputs/outputs*)		
			Service menu (*8.8 Service menu*)		
					Start-up dry-material feeder (*7.1 Commissioning for operation with dry material*)
					Start-up liquid-concentrate pump (*7.2 Commissioning for operation with liquid concentrate*)
					Data backup (*8.8.1 Data backup*)
				MODBUS TCP	**MODBUS-TCP - Parameters** (*8.8.4 MODBUS-TCP - Parameters*)
				MODBUS RTU	**MODBUS-RTU - Parameters** (*8.8.5 MODBUS-RTU - Parameters*)
					Interface data (*8.8.7 Interface data*)

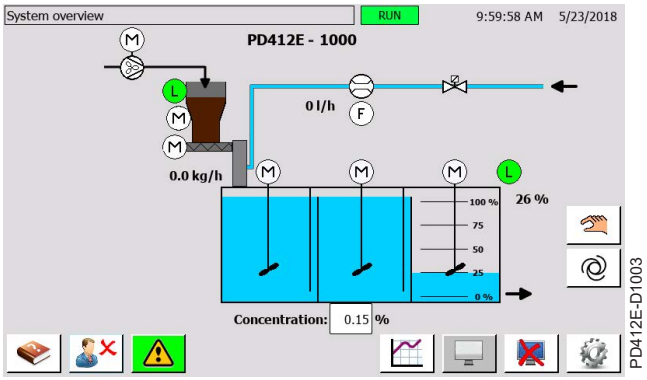
8.7.1 System overview

The menu **System overview** is shown after startup and during normal operation of the system. It shows system information and the status of the system.

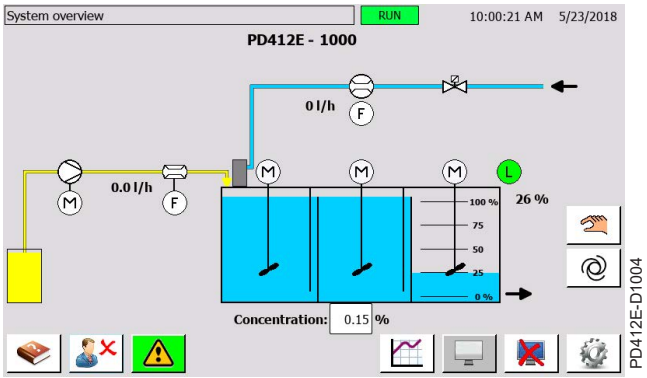
Menu action	Required user level	
Access menu	1	**System Operator**

The touchscreen is divided into different areas:

- Headline: Top of the touchscreen
- Content area: Centre of the touchscreen
- Menu bar: Bottom of the touchscreen



*Menu **System overview** with dry-material feeder*



*Menu **System overview** with liquid-concentrate pump*

Headline

Symbol	Description
RUN	Indicates that the PLC is running.
OFFLINE	Indicates that the PLC is disconnected from the touchscreen.
STOP	Indicates that the PLC is stopped. A restart is required.
	Indicates that the external contact is closed.
	Indicates that the external contact is open.
	Flashes if the system was switched off via the main switch (emergency stop).

Content area

Symbol	Description
	Indicates that dry polymer is present in the dry-material feeder. Push this symbol to open the menu **Dry-material feeder**.
	Indicates the status of the level switch and the level of dry material in the dry-material feeder. • White: Level switch is off • Green: Level switch is on and level is ok • Yellow: Low level • Red: Dry material is empty. The system stops and displays an alarm.
0.0 l/h	Indicates the status of the liquid-concentrate flow switch. • White: No flow • Green: Flow rate ok • Yellow: Flow rate out of limits (pre-warning) • Red: Flow rate alarm. The system stops and displays an alarm. Push this symbol to open the menu **Liquid-concentrate pump**.
	Push this symbol to open the menu **Liquid-concentrate pump**.
	Indicates the status of the liquid-concentrate pump. • White: Pump off • Green: Pump on • Red: Fault. The system stops and displays an alarm.
0 l/h	Indicates the status of the water flow sensor. • White: No flow • Green: Flow rate ok • Yellow: Flow rate out of limits (pre-warning) • Red: Flow rate alarm. The system stops and displays an alarm. Push this symbol to open the menu **Water unit**.
	Indicates the status of the solenoid valve. • White: Valve closed • Green: Valve open • Red: Fault. The system stops and displays an alarm.
	Push this symbol to open the menu **Tank**. The value **Concentration:** displays the concentration of the polymer solution produced by the system.

Symbol	Description
	Indicates the status of the level sensor in the storage chamber. • White: Sensor off • Green: Sensor on and level ok • Yellow: Low or high level in tank. Preparation process starts or stops if automatic mode is active. • Red: Dry run or overflow alarm. The system stops and displays an alarm. Next to this symbol, the filling level of the storage chamber is displayed in percent.
	Indicates the motor status of agitators, dry-material feeder, vibrator and optional vacuum loader. • White: Motor off • Grey: Component is deactivated (vibrator only) • Green: Motor running • Red: Fault. The system stops and displays an alarm.
	Indicates the operation mode. • Grey: Manual mode is not available. • White: Manual mode is available. Push the symbol to activate manual operation. • Green: Manual mode is active. Push the symbol to stop manual mode.
	Indicates the operation mode. • Grey: Automatic mode is not available. • White: Automatic mode is available. Push the symbol to activate automatic operation. • Green: Automatic mode is active. Push the symbol to stop automatic mode.

Menu bar

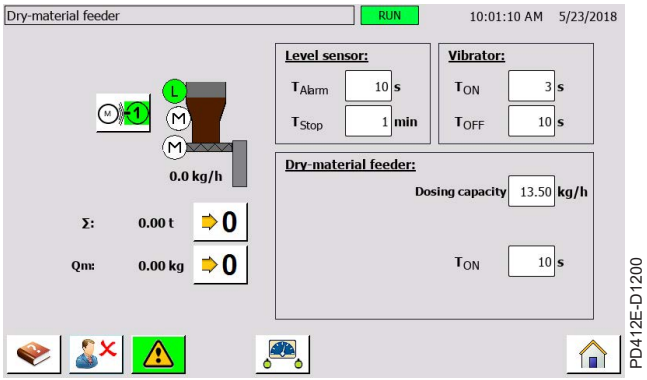
Symbol	Description
	Push this symbol to activate the context-sensitive help function. • White: Help function is not active • Green: Help function is active
	Push this symbol to log out the current user.
	Indicates that no user is logged in.
	Indicates the alarm status. • Green: No messages or alarms are present. • Red: Alarms are present. The system is stopped. Push this symbol to reset all active alarms before the system can be started again.
	Push this symbol to open the menu **Trend 1h**.
	Remote control is not possible because no fieldbus connection is available.

Symbol	Description
	A fieldbus connection is available. Push the symbol to activate control mode "Remote" and control the system via the fielbus connection.
	System is controlled remotely via the fieldbus connection. The system cannot be operated from the touchscreen. Push the symbol to activate control mode "Local".
	Push this symbol to deactivate the touchscreen temporarily to clean it.
	Push this symbol to open the menu **System menu**.

8.7.2 Dry-material feeder parameters

In this menu, the settings of the dry-material feeder can be viewed and changed.

Menu action	Required user level	
Access menu Reset counter **Qm:**	1	**System Operator**
Change settings Reset counter **∑:**	2	**System Parameter**



Dry-material feeder

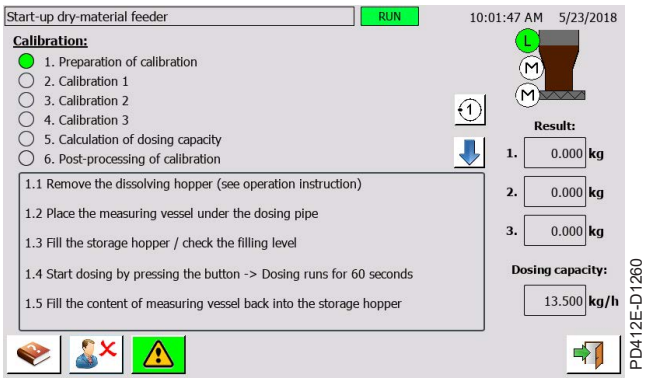
Display text/ Symbol	Description
Level sensor:	The level sensor is mounted in the storage hopper and detects a lack of dry material.
	T Alarm : Time delay from detecting a lack of dry material until a message is displayed on the touchscreen. This is just a pre-warning to refill the hopper. The dry-material feeder is not stopped.
	T Stop : Time delay from detecting a lack of dry material until the dry-material feeder is stopped and the automatic mode is deactivated. To avoid a stop of the system, make sure to refill the hopper before this time has elapsed.
Vibrator:	In automatic mode the vibrator is started and stopped cyclically while the dosing screw is running. The vibrator starts running together with the dosing screw and runs for the time period defined in field **T_{ON}**. Then it stops for the time period defined in field **T_{OFF}**. This cycle is repeated continuously as long as the dosing screw is running.
Dry-material feeder:	The dry-material feeder does not run continuously during the preparation procedure, but with a certain cycle time **T_{ON}**. The value is factory-set to 10 seconds. This means: When water starts flowing in, the dry-material feeder waits until a water amount has flown in which corresponds to a dosing time of 10 seconds. Then it starts dosing until the amount of dosed dry material corresponds to the water amount that has flown in so far. Then it switches off and the cycle starts again. This value should only be changed if no satisfying result can be reached, for example, if the concentration of the withdrawn solution varies considerably.
	Dosing capacity: Dosing capacity of the dry-material feeder. The value is calculated during commissioning.
∑:	Total dry-material consumption counter.
Qm:	Counter for the current dosing quantity (increasing by water flow and decreasing by running dosing screw).

Display text/ Symbol	Description
	Vibrator status. Push this symbol to activate or deactivate the vibrator. If the vibrator is deactivated, the motor symbol at the dry-material feeder is greyed out.
	Push this symbol to open the menu **Start-up dry-material feeder**.
	Push this symbol to reset a counter to zero.
	Push this symbol to revert to the previous menu.

8.7.3 Dry-material feeder calibration

This menu guides you through the calibration procedure for the dry-material feeder.

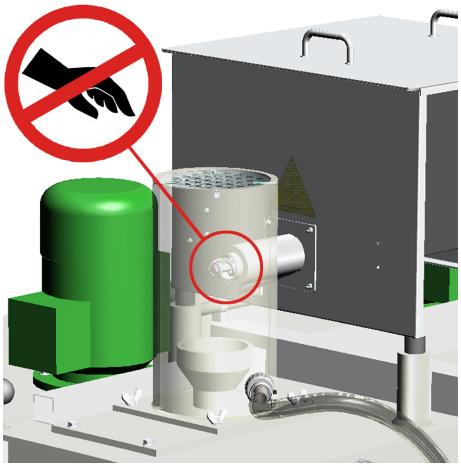
Menu action	Required user level	
Access menu Change settings	1	**System Operator**



Start-up dry-material feeder

CAUTION
Crushing of hands
Minor or moderate personal injury

- After removing the dissolving hopper, do not reach into the dosing screw. The dosing screw starts running when you switch on the dry-material feeder.



For removing the dissolving hopper, see *Checking and cleaning the dissolving hopper*

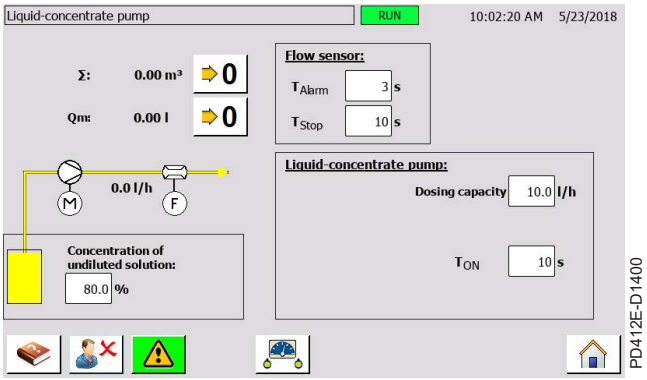
Perform the procedure step by step as described in the menu. Each main step requires several sub steps.

Symbol	Description
	Push these symbols to navigate through the main steps.
	Push these symbols to switch on or off the dry-material feeder. • Green: Switched on • White: Switched off
	Push this symbol to start the automatic calculation of the dosing capacity.
	Push this symbol to revert to the previous menu.

8.7.4 Liquid-concentrate pump parameters

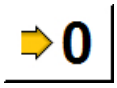
In this menu, the settings of the liquid-concentrate pump can be viewed and changed.

Menu action	Required user level	
Access menu Reset counter **Qm:**	1	**System Operator**
Change settings Reset counter ∑:	2	**System Parameter**



Liquid-concentrate pump

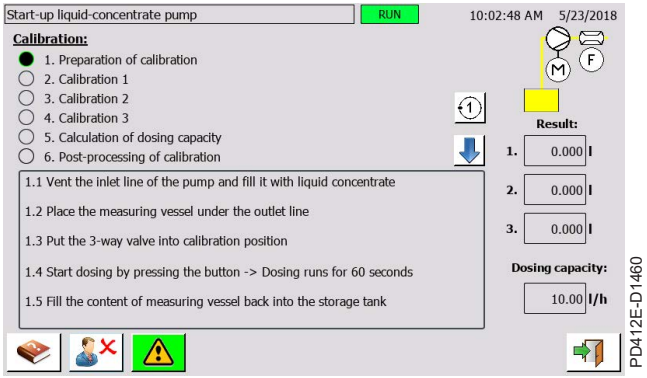
Display text/ Symbol	Description
Flow sensor:	The flow sensor is mounted in the line between the liquid-concentrate pump and the tank inlet and monitors the liquid-concentrate flow when the pump is running.
	T Alarm : Time delay from detecting too low liquid flow until a message is displayed on the touchscreen. This is just a pre-warning. The pump is not stopped.
	T Stop : Time delay from detecting too low liquid flow until the pump is stopped and the automatic mode is deactivated.
Liquid-concentrate pump:	The liquid-concentrate pump does not run continuously during the preparation procedure, but with a certain cycle time **T_{ON}**. The value is factory-set to 10 seconds. This means: When water starts flowing in, the pump waits until a water amount has flown in which corresponds to a dosing time of 10 seconds. Then it starts dosing until the amount of dosed liquid concentrate corresponds to the water amount that has flown in so far. Then it switches off and the cycle starts again. This value should only be changed if no satisfying result can be reached, for example, if the concentration of the withdrawn solution varies considerably.
	Dosing capacity: Dosing capacity of the liquid-concentrate pump. The value is calculated during commissioning.
∑:	Total liquid-concentrate consumption counter.
Qm:	Counter for current dosing quantity (increasing by water flow and decreasing by running pump).

Display text/ Symbol	Description
Concentration of undiluted solution:	Concentration of liquid concentrate.
	Push this symbol to open the menu **Start-up liquid-concentrate pump**.
	Push this symbol to reset a counter to zero.
	Push this symbol to revert to the previous menu.

8.7.5 Liquid-concentrate pump calibration

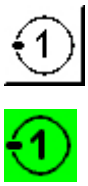
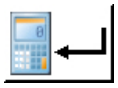
This menu guides you through the calibration procedure for the liquid-concentrate pump.

Menu action	Required user level	
Access menu Change settings	1	**System Operator**



Start-up liquid-concentrate pump

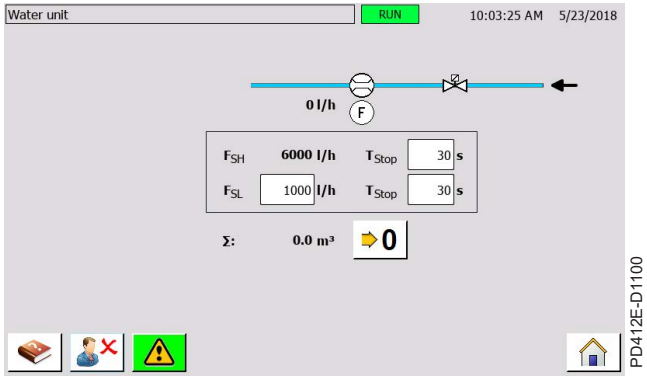
Perform the procedure step by step as described in the menu. Each main step requires several sub steps.

Symbol	Description
	Push these symbols to navigate through the main steps.
	Push these symbols to switch on or off the liquid-concentrate pump. • Green: Switched on • White: Switched off
	Push this symbol to start the automatic calculation of the dosing capacity.
	Push this symbol to revert to the previous menu.

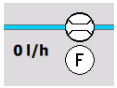
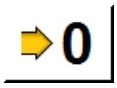
8.7.6 Water unit

In this menu, the settings of the water unit can be viewed and changed.

Menu action	Required user level	
Access menu	1	**System Operator**
Change settings Reset counter	2	**System Parameter**



Water unit

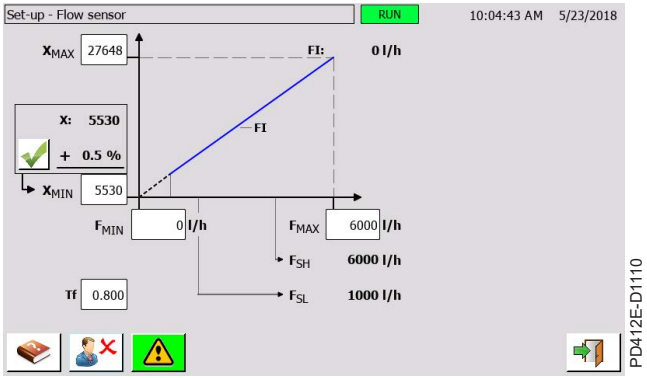
Display text/ Symbol	Description
	Water flow sensor symbol with current water flow rate value. The sensor monitors the water flow into the system. Push this symbol to open the menu **Set-up - Flow sensor**.
F_{SH}	Upper limit of the water flow rate. This value is calculated by the PLC, depending on the dosing concentration and the maximum dosing capacity of the dry-material feeder / liquid-concentrate pump. T_{Stop} : If the flow rate remains outside the limit for the defined time, the solenoid valve closes, the system stops and the automatic mode is deactivated.
F_{SL}	Lower limit of the water flow rate. This value can be modified. T_{Stop} : If the flow rate remains outside the limit for the defined time, the solenoid valve closes, the system stops and the automatic mode is deactivated.
∑:	Total water consumption counter.
	Push this symbol to reset a counter to zero.
	Push this symbol to revert to the previous menu.

8.7.7 Set-up - Flow sensor

In this menu, the water flow sensor signal can be calibrated and the PLC input can be set.

The sensor signal **X** is mapped to the measuring range (**F**) of the sensor.

Menu action	Required user level	
Access menu	3	**System Service**
Change settings	3	**System Service**



Set-up - Flow sensor

Display text/ Symbol	Description
X MAX	Upper limit of sensor input signal (PLC input value)
X:	Actual sensor input signal (PLC input value)
	Push this symbol to start the automatic calculation of the **X_{MIN}** value.
X MIN	Lower limit of sensor input signal (PLC input value)
FI:	Actual water flow rate
F MIN	Minimum flow rate. The value depends on the size of the Polydos and is shown on the sensor name plate.
F MAX	Maximum flow rate. The value depends on the size of the Polydos and is shown on the sensor name plate.
F SH	Upper limit of the water flow rate. See menu **Water unit**.
F SL	Lower limit of the water flow rate. See menu **Water unit**.
Tf	Value for signal smoothing.
	Push this symbol to revert to the previous menu.

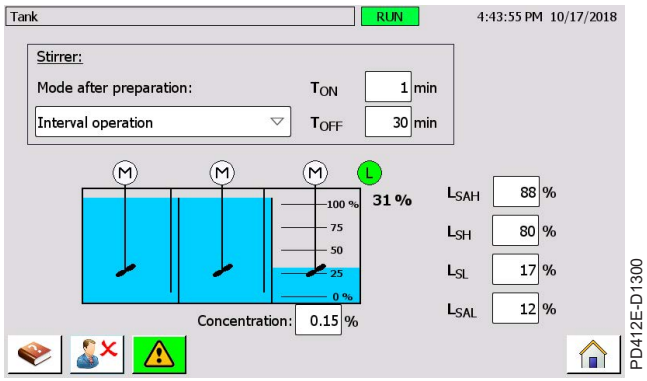
Related information

8.7.6 Water unit

8.7.8 Tank

In this menu, the settings of the tanks and the stirrers can be viewed and changed.

Menu action	Required user level	
Access menu Change settings (stirrer, concentration)	1	**System Operator**
Change settings (tank level)	2	**System Parameter**



Tank

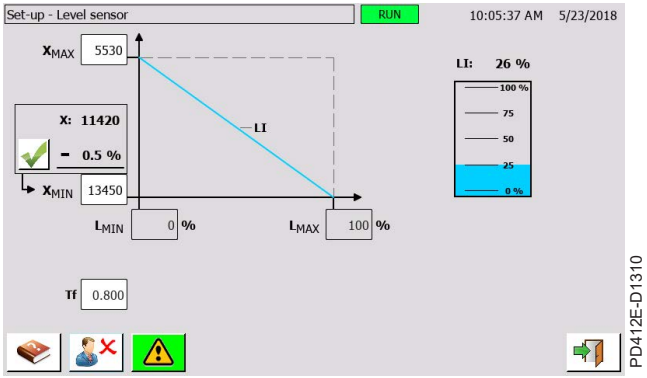
Display text/ Symbol	Description
Mode after preparation:	Defines the behaviour of the stirrers after the preparation phase.
	Stop: All stirrers are switched off after preparation.
	Shut-down delay operation: All stirrers keep running for the time period defined in field **T_{ON}** after preparation.
	Interval operation: All stirrers run for the time period defined in field **T_{ON}**. Then they stop for the time period defined in field **T_{OFF}**. This cycle is repeated continuously.
	Continuous operation: All stirrers keep running after preparation.
	Level sensor. Push this symbol to open the menu **Set-up - Level sensor**. Next to the symbol, the actual filling level of the storage chamber is indicated in %.
LSAH	Filling level that triggers the overflow alarm. This alarm deactivates the automatic mode.
LSH	Filling level that stops the preparation process in automatic mode.
LSL	Filling level that starts the preparation process in automatic mode.
LSAL	Filling level that triggers the dry-run alarm.
Concentration:	Concentration of the polymer solution produced by the system.
	Push this symbol to revert to the previous menu.

8.7.9 Set-up - Level sensor

In this menu, the tank level sensor signal can be calibrated and the PLC input can be set.

The sensor signal **X** is mapped to the tank level range (**L**).

Menu action	Required user level	
Access menu	3	**System Service**
Change settings	3	**System Service**



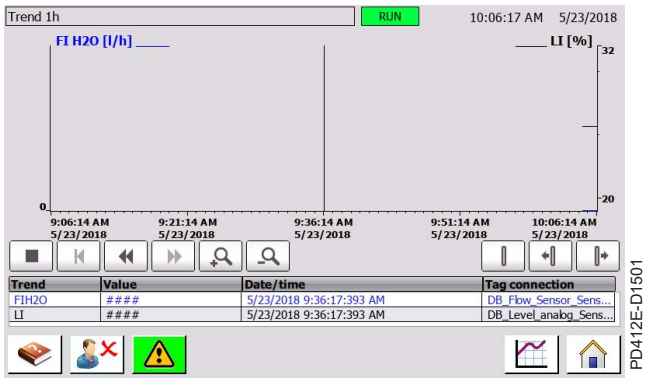
Set-up - Level sensor

Display text/ Symbol	Description
X $_{MAX}$	Upper limit of sensor input signal (PLC input value). The sensor values are inverse, the maximum sensor value represents the minimum tank value and vice versa.
X:	Actual sensor input signal (PLC input value)
	Push this symbol to start the automatic calculation of the X_{MIN} value.
X $_{MIN}$	Lower limit of sensor input signal (PLC input value)
L $_{MIN}$	Minimum tank level
L $_{MAX}$	Maximum tank level
LI:	Actual tank level
Tf	Value for signal smoothing.
	Push this symbol to revert to the previous menu.

8.7.10 Trend 1h / Trend 24h

In these menus, the preparation process trend can be viewed.

Menu action	Required user level	
Access menu	1	**System Operator**



Trend 1h

This menu shows the data for the dilution water flow and the tank level of the past hour or the past 24 hours.

The vertical bar in the middle of the screen defines the point in time for which the two data rows at the bottom display the values. It can be moved left or right.

Symbol	Description
	Push this symbol to switch between the menus **Trend 1h** and **Trend 24h**.
	Push this symbol to revert to the previous menu.

8.7.11 System menu

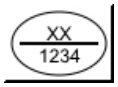
This menu provides information on the manufacturer and the system as well as menus for general settings, management and configuration.

Menu action	Required user level	
Access menu Change display brightness	1	**System Operator**

System menu

Below the address of the manufacturer, the system type and capacity is displayed.

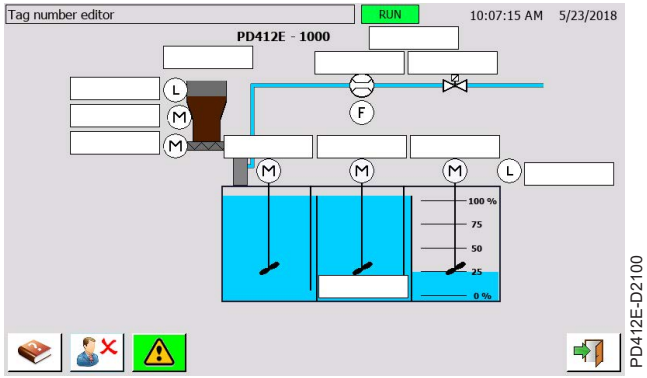
Display text	Description
Software HMI: **Software PLC:**	Product number and version of the installed software
Language:	Display language

Symbol	Description
	Push this symbol to increase the display brightness.
	Push this symbol to decrease the display brightness.
	Push this symbol to open the menu **Tag number editor**.
	Push this symbol to open the menu **Operating hours counter**.
	Push this symbol to open the menu **Language selection**.
	Push this symbol to open the menu **Time / Date**.
	Push this symbol to open the menu **User administration**.
	Push this symbol to open the menu **Service menu**.
	Push this symbol to open the menu **Message administration**.
	Push this symbol to open the menu **Status PLC inputs / outputs**.
	Push this symbol to revert to the previous menu.

8.7.12 Tag number editor

In this menu the electrical components can be named individually. The names are displayed in the menu **System overview**.

Menu action	Required user level	
Access menu Change settings	3	**System Service**



Tag number editor

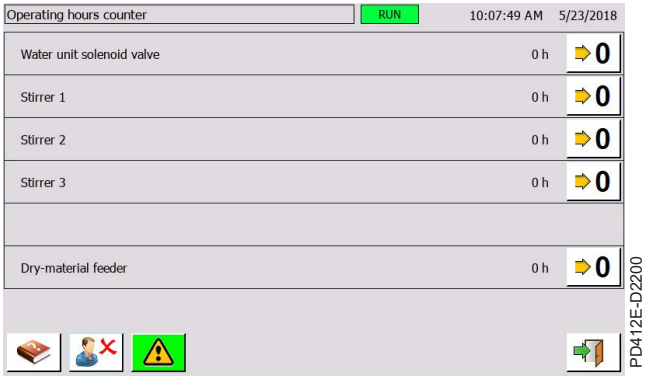
The length of the component names is limited to 10 characters.

Symbol	Description
	Push this symbol to revert to the previous menu.

8.7.13 Operating hours counter

The system has several operating hours counters.

Menu action	Required user level	
Access menu	1	**System Operator**
Reset counter	3	**System Service**



Operating hours counter

Symbol	Description
0	Push this symbol to reset a counter to zero.
	Push this symbol to revert to the previous menu.

8.7.14 Language selection

In this menu, the display language can be set. To set a language, push the respective flag.

Menu action	Required user level	
Access menu Change settings	1	**System Operator**

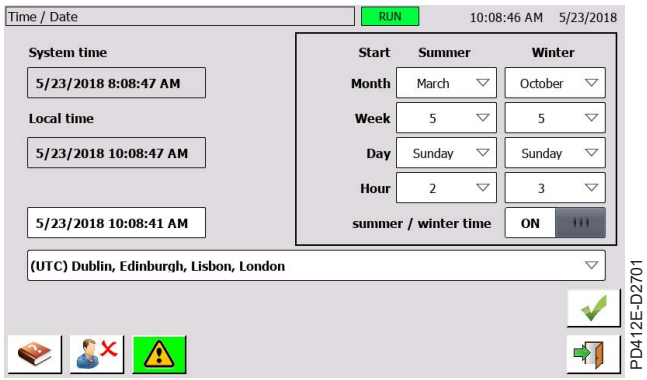
Language selection

Symbol	Description
	Push this symbol to revert to the previous menu.

8.7.15 Time / Date

In this menu, the time and date settings can be viewed and changed.

Menu action	Required user level	
Access menu Change settings	2	**System Parameter**



Time / Date

The value **System time** is calculated as follows:

System time = **Local time** + UTC time zone offset

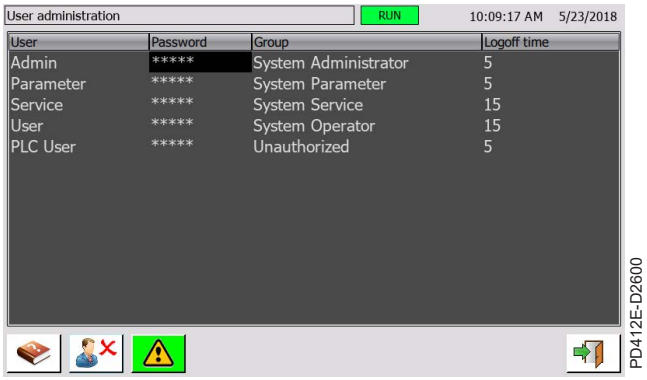
If the automatic summer time is activated, one hour is added to **Local time** in summer.

Display text	Description
System time	System time set in the PLC.
Local time	Local time set in the PLC. To change the time, enter the new time in the input field. To change the UTC time zone, select the new zone in the selection box.
Automatic summer time settings:	
summer / winter time	Push the button next to this text to activate or deactivate the automatic summer time.
Summer	In this column the exact point in time is defined, when the summer time should be activated.
Winter	In this column the exact point in time is defined, when the summer time should be deactivated.
Month	Month of the clock change.
Week	Value from 1-5 for the number of the week within the month in which the clock change should happen.
Day	Weekday of the clock change.
Hour	Hour of the clock change.
	Push this symbol to save the settings. The recalculation can take up to 1 minute.
	Push this symbol to revert to the previous menu.

8.7.16 User administration

In this menu, the user settings can be viewed and changed.

Menu action	Required user level	
Access menu Change settings	4	**System Administrator**



User administration

Each row in this menu represents an individual user of the system. In the first column the user name is defined. It is possible to add more users.

Each user has an individual password, which is defined in the second column. The password can be any kind of string with a minimum length of 3 characters. There are no special requirements for passwords.

In the third column the user group is defined. The user groups are predefined and cannot be changed. Each user group has different permissions.

The last column shows the time of inactivity in minutes before the system automatically logs out the user.

User level	Group	Description
1	**System Operator**	User level for operating persons. This level allows starting and stopping the system, mode selection and setting of preparation parameters. Preset user: User Preset password: 213
2	**System Parameter**	User level with all rights of lower levels plus parametrising rights like time and date settings. Preset user: Parameter Preset password: 321
3	**System Service**	User level with all rights of lower levels plus parametrising rights like limit settings. Preset user: Service Preset password: 423
4	**System Administrator**	User level with all rights of lower levels plus user administration rights. Preset user: Admin Preset password: 345
	Unauthorized	Default user group without any rights, which is applied to newly created users by default.

Symbol	Description
	Push this symbol to revert to the previous menu.

8.7.16.1 Adding and deleting users

! Note down the passwords, especially the parameter input password. It is not possible to operate the system without a valid password.

In case of problems with passwords call Grundfos Water Treatment GmbH.

Adding users

1. Double-touch the free space in the first column and define a new user name.
   A new line with the new user name appears in the list.
2. Set the group and logoff time by touching the field in the respective columns.
3. Double-touch the password field to change the password.

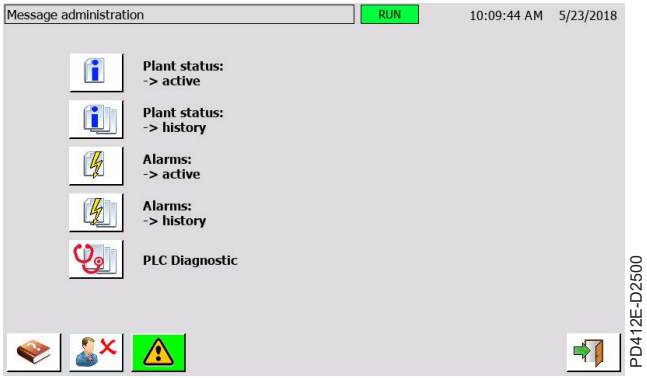
Deleting users

4. Touch the user name and delete it.

8.7.17 Message administration

In this menu, the system messages can be managed.

Menu action	Required user level	
Access menu Access submenu	1	**System Operator**
Delete messages from message buffers	3	**System Service**



Message administration

System messages	
	Push this symbol to open the overview of active messages.
	Push this symbol to open the overview of saved messages. If a message buffer is full, the oldest message will be deleted when a new message appears.
Alarm messages	
	Push this symbol to open the overview of active alarm messages.
	Push this symbol to open the overview of saved alarm messages. If a message buffer is full, the oldest message will be deleted when a new message appears.
Diagnostic messages of the PLC	
	Push this symbol to see the diagnostic buffer of the PLC.

Symbol	Description
	Push this symbol to get further information on a message in a submenu.
	Push this symbol to acknowledge a message in a submenu.
	Push this symbol to delete ALL saved messages in a message buffer.
	Push this symbol to revert to the previous menu.

Related information

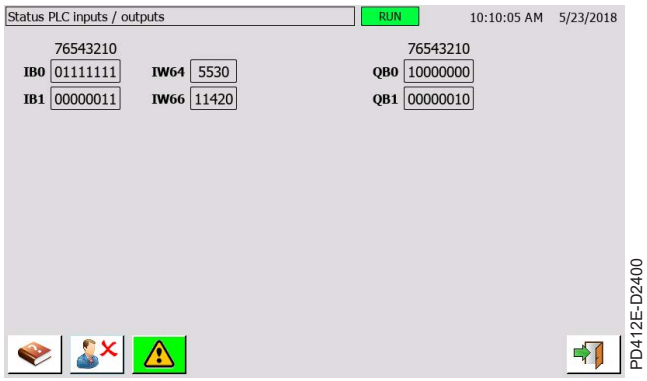
8.3.2.5 Alarms and messages

12. Fault finding via alarm messages

8.7.18 Status of PLC inputs/outputs

This menu shows information on inputs and outputs of the PLC.

Menu action	Required user level	
Access menu	1	**System Operator**



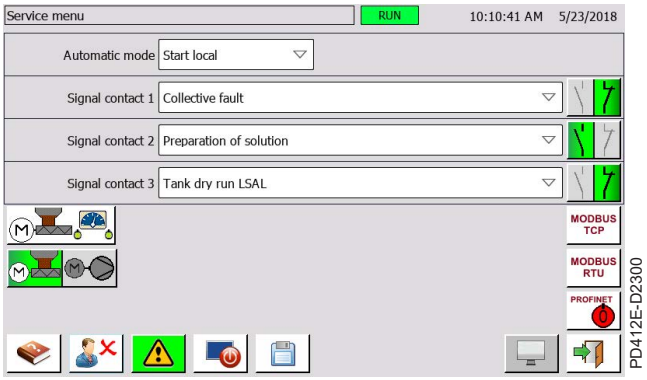
Status PLC inputs / outputs

Symbol	Description
	Push this symbol to revert to the previous menu.

8.8 Service menu

In this menu, the system can be adapted to customer requirements. It is possible to change the output signals, switch on/off fieldbus communication, save or restore settings and switch the system from dry material to liquid polymer dosing (optional).

Menu action	Required user level	
Access menu	2	**System Parameter**
Change settings	3	**System Service**



Service menu

External contact settings

In automatic mode the system can be started and stopped via an external contact.

Observe that this setting affects the system, even if control mode "remote" (fieldbus communication) is activated.

Display text	Description
Automatic mode	**Start local**: The external contact has no influence on the system.
	Start external: The system is controlled via the external contact. The system is stopped while the external contact is open.
External contact	This text appears when the system is set to **Start external**. It indicates the status of the external contact.
	Active (1): External contact is closed.
	Inactive (0): External contact is open.

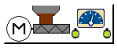
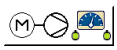
Output signal settings

The system provides three potential-free contacts (see wiring diagram). The output signal can be adjusted separately for each output.

Display text/ Symbol	Description
Signal contact 1	Potential-free contacts for signal output. For details on signals see section *Output signals*.
Signal contact 2	
Signal contact 3	
	Indicates that contact type NO (normally open) is active for the respective output. The contact is closed when the message is FALSE. Push this symbol to switch the contact type.
	Indicates that contact type NC (normally closed) is active for the respective output. The contact is closed when the message is TRUE. Push this symbol to switch the contact type.

General settings

The following general settings are available in the menu.

Symbol	Description
	Push this symbol to access the setup menu of the touch panel to change the IP addresses of the touch panel and the PLC, for example.
	Push this symbol to open the menu **Data backup**.
	See section *8.8.2 Fieldbus communication - control mode "Remote"*
	Push this symbol to revert to the previous menu.
The following symbols are only available, if the system has both a dry-material feeder and a liquid-concentrate pump.	
	Indicates that the system is set to dry material. Push this symbol to switch to liquid concentrate.
	Indicates that the system is set to liquid concentrate. Push this symbol to switch to dry material.
	Push this symbol to open the commissioning menus for dry material.
	Push this symbol to open the commissioning menus for liquid concentrate.

Output signals

The system provides three potential-free contacts (see wiring diagram). The output signal can be adjusted separately for each output. See section *Output signal settings*.

Output signal	Description
Collective fault	Collective fault for all alarms. Set by default for output: **Signal contact 1**
Ready for operation	In control mode "Local", this signal means that the automatic operation mode is active. In control mode "Remote", this signal means that the automatic operation mode is available.
Preparation of solution	Preparation process is running. Set by default for output: **Signal contact 2**
Tank overflow LSAH	Tank overflow alarm.

Output signal	Description
Tank dry run LSAL	Empty tank alarm. Set by default for output: **Signal contact 3**
Lack of dry material LSL / Lack of liquid concentrate FSAL	Level of dry material or liquid concentrate is too low.
Process failure	Collective fault for the following alarms: • **Water flow too high (FSAH)** • **Water flow too low (FSAL)** • **Dry-material feeder empty (LSAL)** • **Flow of liquid concentrate very low (FSAL)**
Circuit breaker tripped	Collective fault for the following alarms: • **Fault motor stirrer 1** • **Fault motor stirrer 2** • **Fault motor stirrer 3** • **Fault motor dry-material feeder** • **Fault motor liquid-concentrate pump** • **Fault vibrator**

Related information

7.1 Commissioning for operation with dry material

7.2 Commissioning for operation with liquid concentrate

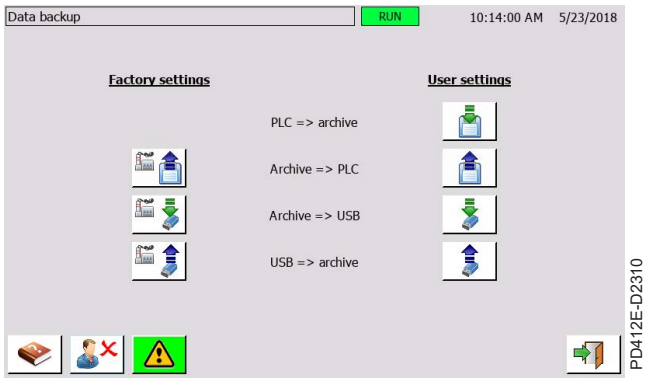
8.8.1 Data backup

8.8.3 Fieldbus communication status and settings

8.8.1 Data backup

In this menu, the factory settings and user settings can be saved or restored.

Menu action	Required user level	
Access menu Change settings	3	**System Service**



Data backup

The factory settings are pre-defined and stored in the factory.

Save individual user settings after commissioning. This enables you to restore the settings in case of PLC or touch panel replacement.

! Do not change stored files. Changed files can damage the PLC or touch panel program.

The USB port is located at the bottom back side of the touch panel inside the control cabinet.

Symbol	Description
	Push this symbol to restore the saved factory settings from the HMI memory. (The settings will be copied from the HMI back to the PLC.)
	Push this symbol to save the factory settings in CSV format to a USB storage device. (The settings will be copied from the HMI to the USB device.)
	Push this symbol to restore the factory settings from a USB storage device. (The settings will be copied from the USB device back to the PLC.)
	Push this symbol to save the current user settings in the HMI memory. (The settings will be copied from the PLC to the HMI.)
	Push this symbol to restore the saved user settings from the HMI memory. (The settings will be copied from the HMI back to the PLC.)
	Push this symbol to save the current user settings in CSV format to a USB storage device. (The settings will be copied from the HMI to the USB device.)
	Push this symbol to restore the saved user settings from a USB storage device. (The settings will be copied from the USB device back to the PLC.)
	Push this symbol to revert to the previous menu.

8.8.2 Fieldbus communication - control mode "Remote"

The system can be connected to a fieldbus network to control it via bus communication in control mode "Remote".

As a standard the system can be connected to:

- PROFINET (S7-communication as server)
- Modbus TCP

Optionally the system can be ordered with an interface for:

- Profibus DP
- Modbus RTU

For Profibus communication a gateway is used to translate the Modbus TCP signal into a Profibus signal.

8.8.2.1 Network configuration factory settings

Factory settings for HMI (touch panel):

IP address	192.168.0.21
Subnet mask	255.255.255.0
Default gateway	0.0.0.0

Factory settings for PLC:

IP address	192.168.0.11
Subnet mask	255.255.255.0

8.8.2.2 Changing the network configuration

Menu action	Required user level	
Access menu Change settings	3	**System Service**

The factory-set network configuration can be changed.

1. Switch off the power supply for HMI.
2. Wait for approximately 5 seconds.
3. Turn on the power supply of the HMI again.
   During the reboot process the “Start Center” (setup menu of the touch panel) appears on the screen for a short period. In this period press the button “Settings”.
4. If this does not work, you can access the setup menu of the touch panel as follows:

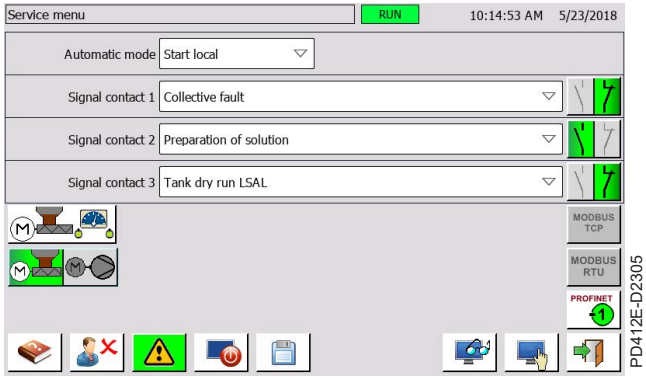
	Push this symbol to open the menu **System menu**.
	Push this symbol to open the menu **Service menu**.
	Push this symbol to access the setup menu of the touch panel.

5. The procedure of changing the network configuration in the setup menu is described in the separate supplier manual of the touch panel.
   https://support.industry.siemens.com/cs/document/90114350/simatic-hmi-hmi-devices-basic-panels-2nd-generation?dti=0&lc=en-WW

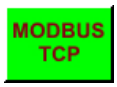
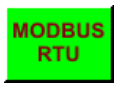
8.8.3 Fieldbus communication status and settings

The fieldbus communication is set via menu **Service menu**.

Menu action	Required user level	
Access menu Select/deselect PROFINET communication	2	**System Parameter**
Change settings	3	**System Service**



Service menu

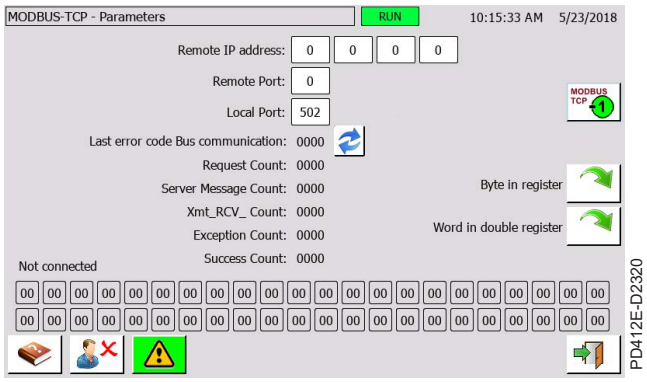
Symbol	Description
  	Indicates the status of the MODBUS-TCP connection. • White: This type of fieldbus communication is available. Push this symbol to open the menu **MODBUS-TCP - Parameters**. • Grey: This type of fieldbus communication is not available or another bus communication type is selected. • Green: This type of fieldbus communication is selected.
	MODBUS-TCP communication is available but not selected. Push this symbol to open the menu **MODBUS-TCP - Parameters**.
	MODBUS-TCP communication is selected. Only one bus communication type can be selected at a time. To be able to select another communication type, push this symbol to deselect the communication type.
  	Indicates the status of the MODBUS-RTU connection. • White: This type of fieldbus communication is available. Push this symbol to open the menu **MODBUS-RTU - Parameters**. • Grey: This type of fieldbus communication is not available or another bus communication type is selected. • Green: This type of fieldbus communication is selected.
	MODBUS-RTU communication is available but not selected. Push this symbol to open the menu **MODBUS-RTU - Parameters**.
	MODBUS-RTU communication is selected. Only one bus communication type can be selected at a time. To be able to select another communication type, push this symbol to deselect the communication type.

Symbol	Description
PROFINET	PROFINET communication is selected. Only one bus communication type can be selected at a time. To be able to select another communication type, push this symbol to deselect the communication type.
PROFINET	PROFINET communication is available but not selected. Observe section *PROFINET (S7-communication as server)*. Push this symbol to select PROFINET communication.
PROFINET	PROFINET communication is not available or another bus communication type is selected.
	Control mode "Local" is active. The system is controlled locally via the touchscreen. Fieldbus communication is available. Push the symbol to activate control mode "Remote" and control the system via the selected fielbus communication.
	Control mode "Remote" is active. The system is controlled remotely via the selected fieldbus communication. If this mode is active, the system cannot be operated from the touchscreen. Push the symbol to activate control mode "Local".
	Control mode "Remote" is not available, because no bus communication type is selected or the system is in operation mode "Manual".
	This symbol is only available if a bus communication type is selected. Push this symbol to open the menu **Interface data**.
	Push this symbol to revert to the previous menu.

8.8.4 MODBUS-TCP - Parameters

In this menu, the bus communication settings for MODBUS-TCP can be viewed and changed.

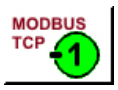
Menu action	Required user level	
Access menu Change settings	3	**System Service**



MODBUS-TCP - Parameters

The display shows the default settings.

Display text/ Symbol	Description
Remote IP address:	IP address of client "0.0.0.0" = any client
Remote Port:	Port of client 0 = any
Local Port:	Local port of server, normally 502
Last error code Bus communication:	Last error code
	Push this symbol to update the field.
Request Count:	Counter for requests from client
Server Message Count:	Counter for messages on server
Xmt_RCV_ Count:	Counter for communication exceptions
Exception Count:	Counter for MODBUS exceptions
Success Count:	Counter for successful communication tasks
Not connected	Status of bus connection. Below this text, the MODBUS TCP buffer is listed.
Connected	
Byte in register	The symbols next to these texts indicate the swapping status of the register/double register.
Word in double register	

Display text/ Symbol	Description
	Swapping is not activated. The sequence of reading and writing of bits is the same. Push the symbol to activate swapping.
	Swapping is activated. The sequence of reading and writing of bits is inverse. Push the symbol to deactivate swapping.
	Push these symbols to select or deselect this type of bus communication.
	Push this symbol to revert to the previous menu.

Technical data of the interface

Number of holding registers for reading (F03): 0 … 9 (40001-40010)

Number of holding registers for writing (F16): 16 … 19 (40017-40020)

The client must be programmed accordingly.

Modbus functions

Registers for reading and writing are separate registers, even if they have the same number.

Depending on the client, it can be possible that the bits in register are inverse (bit 0 of first byte in data block is bit 0 or bit 8 in register “xxx”). Also words of real values can be inverse. In both cases use the swapping function.

Related information

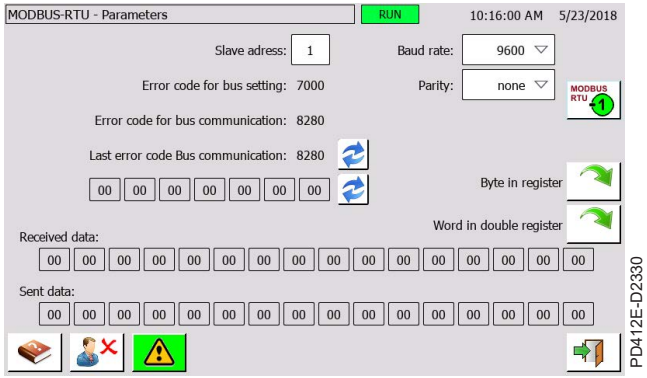
8.8.9 Output addresses (Polydos to SCADA)

8.8.10 Input addresses (SCADA to Polydos)

8.8.5 MODBUS-RTU - Parameters

In this menu, the bus communication settings for MODBUS-RTU can be viewed and changed.

Menu action	Required user level	
Access menu Change settings	3	**System Service**



MODBUS-RTU - Parameters

The display shows the default settings.

Display text/ Symbol	Description
Slave adress:	Station address of the MODBUS slave. Address range: 0-255
Baud rate:	Data transfer rate. Align this value with the setting of the connected bus system.
Error code for bus setting:	Error code for connection establishment
Parity:	Align this value with the setting of the connected bus system.
Error code for bus communication:	Current error code
Last error code Bus communication:	Last error code. Below this text, the MODBUS RTU buffer is listed.
	Push this symbol to update the field.
Received data:	Below these texts, the MODBUS RTU receive and send buffers are listed.
Sent data:	
Byte in register	The symbols next to these texts indicate the swapping status of the register/double register.
Word in double register	

Display text/ Symbol	Description
	Swapping is not activated. The sequence of reading and writing of bits is the same. Push the symbol to activate swapping.
	Swapping is activated. The sequence of reading and writing of bits is inverse. Push the symbol to deactivate swapping.
MODBUS RTU 1 MODBUS RTU 0	Push these symbols to select or deselect this type of bus communication. After using these symbols, restart the PLC by switching the main switch off and on.
	Push this symbol to revert to the previous menu.

Technical data of the interface

Cable type: Shielded twisted-pair cable

Max. cable length: 1000 m

Data bit: 8

Stop bit: 1

Number of holding registers for reading (F03): 0 … 9 (40001-40010)

Number of holding registers for writing (F16): 16 … 19 (40017-40020)

The master must be programmed accordingly.

Modbus functions

Registers for reading and writing are separate registers, even if they have the same number.

Depending on the master, it can be possible that the bits in register are inverse (bit 0 of first byte in data block is bit 0 or bit 8 in register “xxx”). Also words of real values can be inverse. In both cases use the swapping function.

Related information

8.8.9 Output addresses (Polydos to SCADA)

8.8.10 Input addresses (SCADA to Polydos)

8.8.6 PROFINET (S7-communication as server)

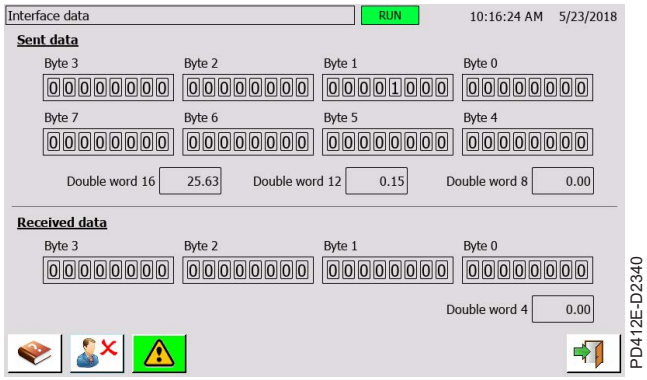
The "Permit access by PUT/GET communication from remote partner" function is activated by default in the properties of the CPU.

! The communication area in the PLC memory is DB100.
Writing into different communication areas can destroy the PLC program.

8.8.7 Interface data

In this menu, the bus communication interface data can be viewed. It shows the status of signal exchange between the SCADA system and the Polydos PLC.

Menu action	Required user level	
Access menu Change settings	3	**System Service**



Interface data

Symbol	Description
	Push this symbol to revert to the previous menu.

8.8.8 PROFIBUS-DP (option)

PROFIBUS DP communication is realised via a gateway to transfer data from “MODBUS TCP Client” to “PROFIBUS Slave”. This enables customers to change all PROFIBUS parameters.

Each device in a PROFIBUS DP network is associated with a Generic Station Description file (GSD file), which describes the implementation of the product. The GSD file is used by the network configuration tool to configure the network.

The current version of the GSD file for the "Anybus" gateway can be downloaded from the HMS website on:

http://www.anybus.com

Use the file „HMSA1837“.

To enable PROFIBUS DP communication, the MODBUS TCP must be selected.

Parameter settings

Remote IP address: 0.0.0.0 = any client

Remote Port: 0 = any

Local Port: 502

Interface data

Features:

- Automatic baud rate detection up to 12 Mbit/s
- No proprietary configuration software is needed. All necessary configuration is made via the built-in web interface.

Recommended adjustments for PROFIBUS:

	Word input	Word output
Control / Status Word:	1	1
Live list	4	
Input address:	16	
Output address:		16
PROFIBUS address (can be changed via webserver in device):	16	

Related information

8.8.9 Output addresses (Polydos to SCADA)

8.8.10 Input addresses (SCADA to Polydos)

8.8.9 Output addresses (Polydos to SCADA)

Data block DB100: Register 0 … 9 (40001 - 40010) = DB100.DBW0 … DBW18

DBW0 - Register 0 / 40001 output word 1

- Format: BOOL
- Type of signal: permanent

Address	Description	State
DB100.DBX0.0	Stirrer 1 in operation	TRUE
DB100.DBX0.1	Stirrer 2 in operation	TRUE
DB100.DBX0.2	Stirrer 3 in operation	TRUE
DB100.DBX0.3	Dry-material feeder in operation	TRUE
DB100.DBX0.4	Liquid-concentrate pump in operation	TRUE
DB100.DBX0.5	Solenoid valve is open	TRUE
DB100.DBX0.6	Vibrator in operation	TRUE
DB100.DBX0.7	RESERVE	TRUE
DB100.DBX1.0	FALSE: Dry-material dosing mode active TRUE: Liquid-concentrate dosing mode active	FALSE / TRUE
DB100.DBX1.1	FALSE: Control mode "Local" active TRUE: Control mode "Remote" active	FALSE / TRUE
DB100.DBX1.2	Operation mode "Automatic" active	TRUE
DB100.DBX1.3	FALSE: External contact is open TRUE: External contact is closed	FALSE / TRUE
DB100.DBX1.4	RESERVE	TRUE
DB100.DBX1.5	RESERVE	TRUE
DB100.DBX1.6	RESERVE	TRUE
DB100.DBX1.7	RESERVE	TRUE

DBW2 - Register 1 / 40002 output word 2

- Format: BOOL
- Type of signal: permanent

Address	Description	State
DB100.DBX2.0	Fault motor stirrer 1	TRUE
DB100.DBX2.1	Fault motor stirrer 2	TRUE
DB100.DBX2.2	Fault motor stirrer 3	TRUE
DB100.DBX2.3	Fault motor dry-material feeder	TRUE
DB100.DBX2.4	Fault motor liquid-concentrate pump	TRUE
DB100.DBX2.5	RESERVE	TRUE
DB100.DBX2.6	RESERVE	TRUE
DB100.DBX2.7	Fault vibrator	TRUE
DB100.DBX3.0	Water flow too low (FSAL)	TRUE
DB100.DBX3.1	Water flow too high (FSAH)	TRUE
DB100.DBX3.2	Lack of dry material (LSL)	TRUE
DB100.DBX3.3	Dry-material feeder empty (LSAL)	TRUE
DB100.DBX3.4	Flow of liquid concentrate very low (FSAL)	TRUE
DB100.DBX3.5	Wrong input of parameter	TRUE
DB100.DBX3.6	Collecting fault	TRUE
DB100.DBX3.7	Fault vacuum loader	TRUE

DBW4 - Register 2 / 40003 output word 3

- Format: BOOL
- Type of signal: permanent

Address	Description	State
DB100.DBX4.0	Tank dry-run (LSAL)	TRUE
DB100.DBX4.1	Tank level low (LSL)	TRUE
DB100.DBX4.2	Tank level high (LSH)	TRUE
DB100.DBX4.3	Tank overflow (LSAH)	TRUE
DB100.DBX4.4	Fault tank level sensor	TRUE
DB100.DBX4.5	Fault water flow sensor	TRUE
DB100.DBX4.6	Process failure	TRUE
DB100.DBX4.7	Circuit breaker tripped	TRUE
DB100.DBX5.0	Emergency stop	TRUE
DB100.DBX5.1	RESERVE	
DB100.DBX5.2	RESERVE	
DB100.DBX5.3	Ready for operation	TRUE
DB100.DBX5.4	RESERVE	
DB100.DBX5.5	RESERVE	
DB100.DBX5.6	RESERVE	
DB100.DBX5.7	RESERVE	

DBW6 - Register 3 / 40004 output word 4

- Format: BOOL

Address	Description	State
DB100.DBX6.0	RESERVE	
DB100.DBX6.1	RESERVE	
DB100.DBX6.2	RESERVE	
DB100.DBX6.3	RESERVE	
DB100.DBX6.4	RESERVE	
DB100.DBX6.5	RESERVE	
DB100.DBX6.6	RESERVE	
DB100.DBX6.7	RESERVE	
DB100.DBX7.0	RESERVE	
DB100.DBX7.1	RESERVE	
DB100.DBX7.2	RESERVE	
DB100.DBX7.3	RESERVE	
DB100.DBX7.4	RESERVE	
DB100.DBX7.5	RESERVE	
DB100.DBX7.6	RESERVE	
DB100.DBX7.7	RESERVE	

DBD8 - Register 4, 5 / 40005, 40006 output double word 5

Address	Description	Format	Type of signal
DB100.DBD8	Water flow value	REAL	Actual flow sensor value [l/h]

DBD12 - Register 6, 7 / 40007, 40008 output double word 7

Address	Description	Format	Type of signal
DB100.DBD12	Setpoint of solution concentration	REAL	Setpoint value [%]

DBD16 - Register 8, 9 / 40009, 40010 output double word 9

Address	Description	Format	Type of signal
DB100.DBD16	Level in storage chamber 3	REAL	Actual value [%]

8.8.10 Input addresses (SCADA to Polydos)

Data block DB100: Register 16 … 19 (40017 - 40020) = Db100.DBW32 … DBW38

DBW32 - Register 16 / 40017 input word 1

- Format: BOOL
- Type of signal: impulse

Address	Description	State
DB100.DBX32.0	Activate control mode "Remote"	TRUE
DB100.DBX32.1	Activate operation mode "Automatic"	TRUE
DB100.DBX32.2	Deactivate operation mode "Automatic"	TRUE
DB100.DBX32.3	Activate dry-material dosing mode	TRUE
DB100.DBX32.4	Activate liquid-concentrate dosing mode	TRUE
DB100.DBX32.5	Write setpoint of solution concentration	TRUE
DB100.DBX32.6	Reset fault	TRUE
DB100.DBX32.7	RESERVE	
DB100.DBX33.0	RESERVE	
DB100.DBX33.1	RESERVE	
DB100.DBX33.2	RESERVE	
DB100.DBX33.3	RESERVE	
DB100.DBX33.4	RESERVE	
DB100.DBX33.5	RESERVE	
DB100.DBX33.6	RESERVE	
DB100.DBX33.7	RESERVE	

DBW34 - Register 17 / 40018 input word 2

- Format: BOOL

Address	Description	State
DB100.DBX34.0	RESERVE	
DB100.DBX34.1	RESERVE	
DB100.DBX34.2	RESERVE	
DB100.DBX34.3	RESERVE	
DB100.DBX34.4	RESERVE	
DB100.DBX34.5	RESERVE	
DB100.DBX34.6	RESERVE	
DB100.DBX34.7	RESERVE	
DB100.DBX35.0	RESERVE	
DB100.DBX35.1	RESERVE	
DB100.DBX35.2	RESERVE	
DB100.DBX35.3	RESERVE	
DB100.DBX35.4	RESERVE	
DB100.DBX35.5	RESERVE	
DB100.DBX35.6	RESERVE	
DB100.DBX35.7	RESERVE	

DBD36 - Register 18, 19 / 40019, 40020 input double word 3

Address	Description	Format	Type of signal
DB100.DBD36	Setpoint of solution concentration	REAL	Value for concentration [%]

9. Maintenance

9.1 Safety instructions for the basic maintenance of Polydos systems

The basic maintenance tasks must be performed by trained users.

Maintenance and repair tasks not described in this manual must only be performed by certified service persons.

Switch off the main switch on the control cabinet before any work on the system components and lines.

Do not open the control cabinet.

Wear personal protective equipment.

Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.

Safety installations, which have been disabled or removed during maintenance, must be enabled or installed again immediately after maintenance.

Wipe up spilled water, polymer or polymer solution immediately to avoid slipping hazard.

WARNING
Electric shock
Death or serious personal injury
Liquids on electrical components can lead to electric shock. Short circuits can cause damage to the equipment.

- Keep all electrical components dry.
- Cover electrical components with a watertight foil during maintenance.

Before reassembling, make sure all parts are clean, dry and undamaged.

Related information

2.4 Working with chemicals
2.5 Electrical hazards
2.6 Mechanical hazards

9.2 Basic maintenance schedule

In the following table, the basic maintenance activities are listed that help to avoid system faults and breakdowns. These activities must be performed by trained users. The intervals for some of the tasks depend on the individual installation and must therefore be defined by the operating company.

! If the result of a check requires change, repair or adjustment which is not described in this manual, call certified service persons.

Interval	Component	Task	See section
To be defined by the operating company	Polydos 412E system	Clean the surfaces of the system.	*9.3 Cleaning the system surface*
Weekly	Pressure reducing valve	Check the strainer. Clean or replace if necessary.	*9.4 Checking and cleaning or replacing the strainer in the pressure reducing valve*
	Dissolving hopper	Check the dissolving hopper for deposits. Clean if necessary.	*9.5 Checking and cleaning the dissolving hopper*
Every 3 months	Dry-material feeder	Check the hopper, the dosing screw and the dosing pipe for deposits. Clean if necessary.	*9.6 Checking and cleaning the dry-material feeder*
In case of malfunction	Solenoid valve	Clean or replace the solenoid valve	*9.7 Cleaning or replacing the solenoid valve*

9.3 Cleaning the system surface

WARNING
Electric shock
Death or serious personal injury
Liquids on electrical components can lead to electric shock. Short circuits can cause damage to the equipment.

- Keep all electrical components dry.
- Do not use water or any other liquid to clean electrical components or electrical lines of the system.
- Do not use a high-pressure cleaner.

1. If necessary, clean all system surfaces with a dry and clean cloth.

9.4 Checking and cleaning or replacing the strainer in the pressure reducing valve

1. Check the strainer visually via the transparent cover at the bottom of the pressure reducing valve.

Cleaning/replacing procedure

2. Switch off the main switch on the control cabinet.
   a. Make sure the main switch cannot be switched on accidentally.
3. Put on the stipulated personal protective equipment. Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.
4. Close the shut-off valve upstream the pressure reducing valve.
5. ! The transparent cover of the strainer is fragile. To unscrew it, use a ring spanner or open-end spanner that fits accurately.

   Carefully unscrew the transparent cover of the strainer at the bottom of the pressure reducing valve.
6. Remove the strainer and clean it with clean water and a soft brush.
   a. If the strainer is damaged, replace it.
7. Insert the clean or new strainer into the pressure reducing valve.
8. Carefully screw in the transparent cover of the strainer at the bottom of the pressure reducing valve.
   a. Make sure the O-ring is positioned correctly.
9. Open the shut-off valve.
10. Make sure the pressure reducing valve does not leak.
11. Switch on the main switch.
12. Put the system back into the operating state that was set before you started your work.

9.5 Checking and cleaning the dissolving hopper

1. Switch off the main switch on the control cabinet.
   a. Make sure the main switch cannot be switched on accidentally.
2. Close the shut-off valve upstream the pressure reducing valve.
3. Put on the stipulated personal protective equipment. Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.
4. Visually inspect the dissolving hopper.
   a. Check that the hopper is completely flushed with water and that no deposits of dry material have formed.

In case of slight deposits:

5. Unscrew the safety guard at the top of the dissolving hopper.
6. Clean the dissolving hopper with clean warm water and a soft brush.
7. Install the safety guard again.

In case of medium or heavy deposits:

8. Manually loosen the union nut at the water connection of the dissolving hopper and disconnect the water supply.
   a. Keep the O-ring.
9. Remove the screws that connect the dissolving hopper to the tank.
10. Remove the dissolving hopper from the tank.
    a. Keep the O-ring.
11. Unscrew the safety guard at the top of the dissolving hopper.
12. Clean the dissolving hopper with clean warm water and a soft brush.
13. Install the safety guard at the top of the dissolving hopper.
14. Install the dissolving hopper on the tank.
    a. Make sure the O-ring is positioned correctly.
15. Connect the water connection of the dissolving hopper.
    a. Make sure the O-ring is positioned correctly.
16. Open the shut-off valve.
17. Switch on the main switch.
18. Put the system back into the operating state that was set before you started your work.

9.6 Checking and cleaning the dry-material feeder

1. Put on the stipulated personal protective equipment. Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.

2. If possible, run the system without refilling the storage hopper of the dry-material feeder until the storage hopper is empty.
3. Switch off the main switch on the control cabinet.
   a. Make sure the main switch cannot be switched on accidentally.
4. Close the shut-off valve upstream the pressure reducing valve.
5. If present, remove the cover from the top of the storage hopper.
6. Unscrew and remove the safety guard from the top of the storage hopper.
   a. If the storage hopper is not yet empty, empty it.
7. Visually inspect the dry-material feeder.
   a. Check that the storage hopper and the level sensor are free from deposits.
   b. Check that the dosing screw is free from deposits.
   c. **CAUTION**
      Hot surface
      Minor or moderate personal injury
      - After switching off the main switch wait at least 15 minutes before touching the heated dosing pipe.

      Check that the heated dosing pipe is free from deposits.

Cleaning procedure

8. Clean the storage hopper, the dosing pipe and the dosing screw with a soft brush.
9. Dry all surfaces with a clean cloth.

Final steps

10. Install the safety guard at the top of the storage hopper.
11. Open the shut-off valve.
12. Switch on the main switch again.
13. Fill the storage hopper with dry material.
14. If present, put the cover back on the storage hopper.
15. Put the system back into the operating state that was set before you started your work.

9.7 Cleaning or replacing the solenoid valve

1. Switch off the main switch on the control cabinet.
   a. Make sure the main switch cannot be switched on accidentally.
2. Put on the stipulated personal protective equipment.
3. Close the shut-off valve upstream the pressure reducing valve.

Cleaning procedure (cleaning can help if the valve does not close):

4. Unscrew the 4 screws at the top part of the solenoid valve.
5. Remove the top part and the spring.
6. Remove and clean the diaphragm.
7. Reassemble in reverse order.

Replacing procedure

8. Carefully unscrew the water connections at the solenoid valve.
9. Unscrew the safety screw of the electrical plug connection.
10. Remove the electrical plug.
11. Place the new solenoid valve in the water line.
    a. Observe the arrow on the housing that indicates the correct flow direction.
    b. Make sure the technical data of the new component matches the requirements.
    c. Before tightening the water connections, check that the gaskets are in place.
12. Tighten the water connections.
13. Plug in the electrical plug and screw in the safety screw.

Final steps

14. Open the shut-off valve
15. Make sure the component does not leak.
16. Switch on the main switch.
17. Put the system back into the operating state that was set before you started your work.

10. Spare parts

In order to get correct spare parts, contact Grundfos and provide the product number and the order data written on the nameplate of your system.

! Some of the spare parts mentioned below must only be replaced by certified service persons. If the replacement is not described in this manual, contact Grundfos service.

Spare parts for the dry-material feeder

- Dosing screw
- Gear motor
- Vibrator
- Level sensor
- Heating band for dosing pipe

Spare parts for the control cabinet

- Touch panel
- PLC

Spare parts for the liquid-concentrate pump and line

- Shaft seal
- Rotor
- Stator
- Flow sensor

Spare parts for the water line

- Solenoid valve
- Pressure reducing valve
- Strainer for pressure reducing valve
- Transparent strainer cover for pressure reducing valve
- Flow sensor

Spare parts for the tank

- Stirrer for the mixing chamber 1
- Stirrer for the maturing chamber 2 or storage chamber 3
- Ultrasonic level sensor

Related information

4.2.1 Nameplate of Polydos 412E

11. Decommissioning

Decommissioning for up to 5 hours

1. Stop the system.

Push this symbol to stop automatic mode.
The symbol background switches to white.

Decommissioning for 5 to 24 hours

2. Stop the system.
3. Switch off the main switch.
4. Make sure the main switch cannot be switched on accidentally.

Decommissioning for more than 24 hours

5. Stop the system.
6. Switch off the main switch.
7. Make sure the main switch cannot be switched on accidentally.

8. Put on the stipulated personal protective equipment. Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.
9. If using dry material, perform the following steps:
   a. Empty the dry-material feeder completely.
   b. Clean the dissolving hopper. See *9.5 Checking and cleaning the dissolving hopper*.
   c. Clean the dry-material feeder. See *9.6 Checking and cleaning the dry-material feeder*.
10. If using liquid concentrate, perform the following steps:
    a. Empty the inlet and outlet lines of the liquid-concentrate pump.
    b. Flush the lines and the pump head with a suitable cleaning solution (observe the safety data sheet of the liquid concentrate).

    ! The liquid concentrate must not come into contact with water, otherwise the pump head and lines can clog.
11. Empty the three-chamber tank via drain connection (G) using ball valves (E1), (E2) and (E3). See *4.3 Overview and description of components and connections*.
12. Flush the three-chamber tank with a suitable cleaning solution.
13. Carefully flush the line to the withdrawal pump.

Related information

3.1 Storage

3.3 Transport

9.5 Checking and cleaning the dissolving hopper

9.6 Checking and cleaning the dry-material feeder

12. Fault finding via alarm messages

WARNING
Chemical hazard
Death or serious personal injury
- Wear personal protective equipment.
- Observe the chemical manufacturer's safety data sheets (SDS) and safety instructions of the used chemicals.

WARNING
Electric shock
Death or serious personal injury
- The fault finding on electrical components must only be done by authorised and qualified electricians.
- Switch off the power supply before you start any work on the product. Make sure that the power supply cannot be switched on accidentally.

Alarm message	Cause	Remedy
Power failure	• The power supply was interrupted, for example due to a power breakdown.	• Reestablish the power supply. **CAUTION** **Automatic startup** Minor or moderate personal injury - In case of power failure, switch off the main switch before starting any work on the system.
Fault motor stirrer 1 **Fault motor stirrer 2** **Fault motor stirrer 3** **Fault motor dry-material feeder** **Fault vibrator** **Fault motor liquid-concentrate pump**	• The motor protection switch has tripped.	• Check motor for overload (mechanical problem). • Check wiring for short circuit damages. • Check the nominal current at the motor protector.
Fault level sensor tank	• The level sensor on the tank provides no signal or an incorrect signal.	• Check the sensor and the wiring.
Fault tank overflow (LSAH)	• The storage chamber is overflowing.	• Check the settings for **LSH** and **LSAH** in menu **Tank**. The two values must not be too close to each other. • Check the level sensor.
Fault tank dry run (LSAL)	• The storage chamber is empty.	• Check the settings for **LSL** and **LSAL** in menu **Tank**. The two values must not be too close to each other. • Make sure that the amount of withdrawn solution does not exceed the preparation capacity. • Check the level sensor.
Fault water flow sensor	• The water flow sensor provides no signal or an incorrect signal.	• Check the sensor and the wiring.
Water flow too low (FSAL)	• The incoming water flow rate is too low.	• Check the water supply.
Water flow too high (FSAH)	• The incoming water flow rate is too high.	• Check shut-off valve and adjustment of pressure reducing valve
Dry-material feeder empty (LSAL)	• The level sensor in the storage hopper indicates a lack of dry material.	• Refill dry material. • Check the level sensor.
Flow of liquid concentrate very low (FSAL)	• Lack of liquid concentrate, flow rate too low.	• Refill liquid concentrate. • Check the flow sensor. • Check the foot valve.

Alarm message	Cause	Remedy
Fault vacuum loader	• The vacuum loader fuse has tripped.	• Check the vacuum loader and the cabling.
Wrong input	• One or more specified parameters are missing. The system is not ready to operate.	• Check all settings, especially for dosing rate and solution concentration.
Emergency stop	• The emergency stop was activated.	• Check the reason for the emergency stop. For systems where the main switch serves as emergency stop, this message appears as well if the main switch was switched off.
Fault water valve	• There is a water flow while the solenoid valve is closed.	• Check the solenoid valve, the flow sensor, and the settings of the flow sensor in menu **Set-up - Flow sensor**. • Clean the diaphragm of the solenoid valve.

Related information

2.4 Working with chemicals

2.5 Electrical hazards

2.6 Mechanical hazards

8.3.2.5 Alarms and messages

13. Disposal

WARNING
Chemical hazard
Death or serious personal injury

- Before dismantling, the system must be completely flushed with water in order to remove the chemicals.
- Collect and dispose of all chemicals in a way that is not harmful to persons or the environment.
- The system must be dismantled by authorised and qualified persons.

This system or parts of it must be disposed of in an environmentally sound way. Use appropriate waste collection services. If this is not possible, contact the nearest Grundfos company or service workshop.

See also end-of-life information at *www.grundfos.com/product-recycling*.

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