GRUNDFOS SMART DIGITAL CHEMPAIRING SUITE:

ONLINE MANAGEMENT
OF PRECISION DOSING
AND CHEMICAL HANDLING

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PUMP   CLOUD   SERVICES

Grundfos provides a complete digital solution to optimise your chemical dosing with the Grundfos SMART Digital CHEMPAIRING Suite. In addition to remote monitoring and setting of the dosing pump, the suite also offers the opportunity to adjust performance without compromising efficiency, and it improves operator safety by ensuring that only the right chemicals are used. You also save time and reduce errors in compliance reporting.

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Grundfos SMART Digital DDA-FCM > The ideal 4.0 dosing pump

Thanks to the "FlowControl", the dosing monitoring system integrated in the Grundfos DDA dosing pump, the innovative stepper motor dosing pump provides detailed individual messages via the cloud gateway, so that dosing errors can be detected quickly and reliably from a distance. In the event of an error, this ensures that the problem is quickly rectified, therefore ensuring high system availability.

Directly detectable dosing errors of the Grundfos DDA-FCM dosing pump:
- Air bubbles (due to outgassing media)
- Suction problems (cavitation)
- Positive and negative pressure (e.g. due to hose rupture)
- Defective suction or discharge valve (abrasive wear)
- Deviation from target dosing volume flow
- Pre-empty and empty signal of the container

In addition, the SMART Digital DDA measures the real dosing volume flow, in which the filling level of each individual dosing stroke is calculated via the recorded stroke length pressure diagram in the dosing pump. This type of dosing volume flow measurement thus differs significantly from the less precise mathematical calculation based on the number of strokes x stroke volume over time, as this calculation does not take into account any trapped air, cavitation or back pressure fluctuations.

The Grundfos DDA dosing pump records the signals of the external process volume flow sensor via the pulse or analogue input. This can be a classic water meter with contact output, or a volume flow sensor with analogue output. Using the CHEMPAIRING Install App, the pulse rate or analogue profile of these sensors can be entered so that the CHEMPAIRING Suite can determine the external process volume flow and thus the volume (ml/m^3), or mass concentration (mg/l) is available.

The SMART Digital dosing pump also has a lot of other useful data that can be used in the cloud:

- A time counter for operation, standby, warning and alarm (for systematic plant optimisation in the field)
- Product and serial number (for unique identification of the plant)
- Type key with material code (for a material resistance test)
- Maintenance reminder and spare parts set order number (to increase plant availability)

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Radio contact from deep cellars via narrowband

The SMART Digital CHEMPAIRING Suite uses a gateway with exclusive mobile phone transmission.

A special transmission protocol is used in the selection of the mobile radio standard to meet typical installation requirements. Dosing pumps in particular are often installed in technical rooms that are located deep below the earth's surface and are shielded by several concrete walls and ceilings. Previous mobile radio standards (3G, 4G) fail to penetrate these walls due to their high transmission frequency (in the MHz range).

The special Low Power Wide Area Network (LPWAN) protocols transmit in a longer wavelength frequency range and therefore achieve a greater range and solid object penetration. This eliminates the need for time-consuming and costly laying of antenna cables up to the next cellar window. There are also no restrictions in terms of availability, as the providers can transmit the LPWAN signal via the existing mobile phone masts.
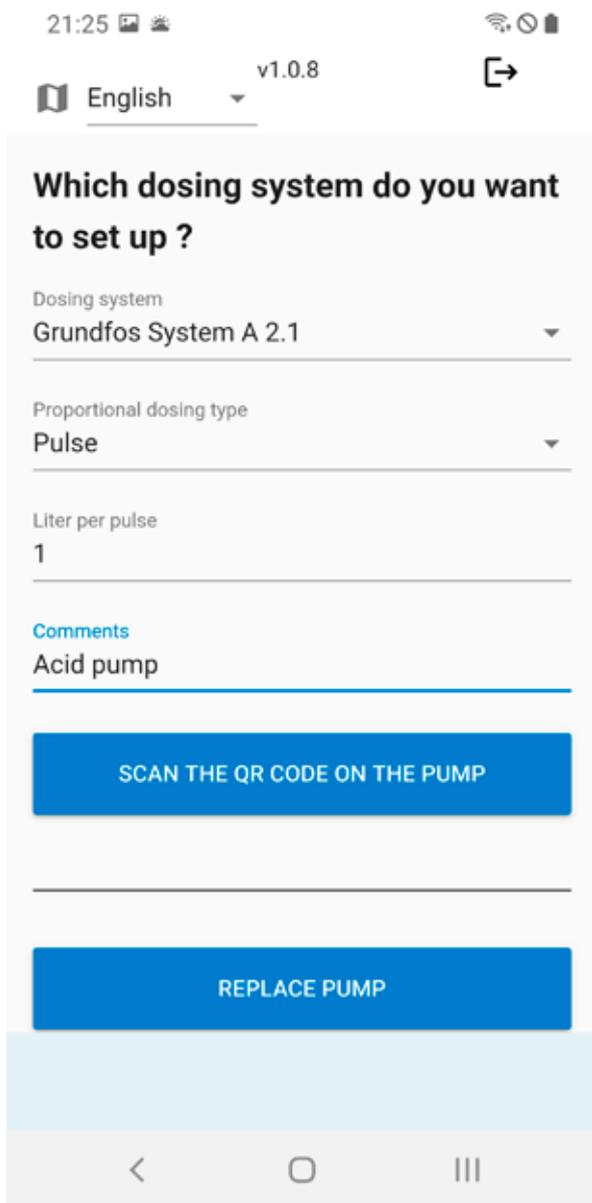
The provider with the strongest reception can be selected quickly and easily on site without having to carry a variety of SIM cards thanks to the eSIM (embedded SIM) card already integrated in the gateway. By using the CHEMPAIRING service, the data transmission costs are already covered.

During commissioning, the last saved geo-position of the smartphone during start-up is transferred to the gateway with the Grundfos Install App and the system is displayed seconds later in the CHEMPAIRING Portal overview map.

The gateway also uses an end-to-end approach to the requirement for increased data security Encryption, i.e. the data is encrypted directly in the gateway and only decrypted again on the cloud server. The data is therefore consistently protected against manipulation and tapping.

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Online in seconds with the CHEMPAIRING Install App

The Grundfos Install App is designed for the enduser or for their chemical supplier to quickly and easily set up the cloud gateway for the connected dosing system without complicated programming or access to a PC.
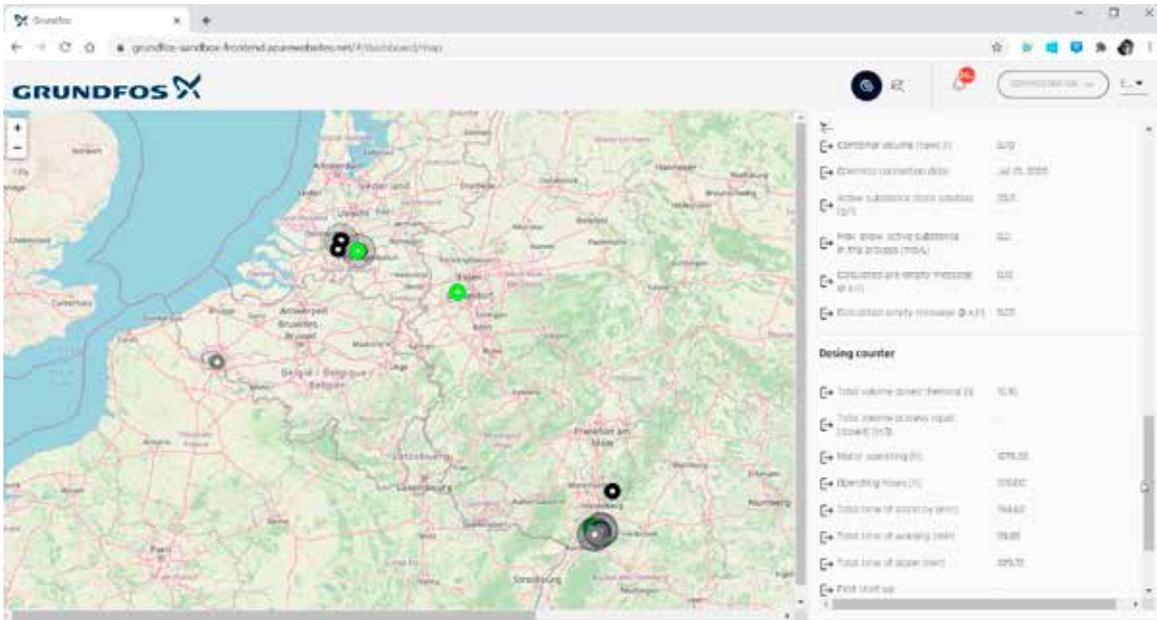
Thanks to the integrated scan function, the QR Code on the back of the Cloud Gateway is scanned and then the desired specific dosing system type is selected from the database. Likewise, the external flow sensor can be parameterised by free input (pulse rate or analogue profile) in order to record the external process volume flow via the dosing pump as well.

The latest firmware and a function block adapted to the connected dosing system are loaded onto the gateway with this information. The function block is used to determine which data points are to be retrieved and transferred to the cloud at what time interval. Algorithms are also stored, e.g. to calculate final concentrations in ml/m^3 or mg/l.

Thanks to the selection field "Change gateway", a defective gateway can be changed by scanning the new gateway in the event of a gateway fault, without losing historical data, or having to completely re-set up the dosing system.

To ensure that the Install App also works in the cellar without mobile phone reception, it is equipped with an offline database. Unsent orders remain stored in the Install App until a mobile phone or WLAN connection is available again.

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The CHEMPAIRING Portal is where you can manage your system

In the SMART Digital CHEMPAIRING Portal, you get access to the status of the connected dosing system quickly and easily, displayed on a map.

By clicking on the respective dosing system, specific information on the respective dosing system can be accessed, whereby the dosing systems are marked with a coloured dot:

Green	Dosing pump in operation
Yellow	Dosing pump warning
Red	Dosing pump alarm
Grey	Dosing pump in stand by
Black	Gateway has not sent any data for 1 hour

Specific information about the dosing system can be edited in the System Information area.

System messages section
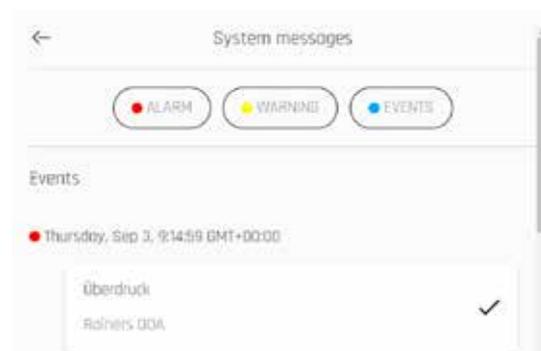In this section, all system messages of the dosing system are recorded with date and time stamp:

Occurrence:
- Change of the dosing concentration with indication of the current volume concentration in ml/m^3
- Container change (via the GO CHEMPAIRING App)

Warnings:
- Pre-empty signal (measured or calculated)
- Low back pressure
- Air bubbles
- Cavitation
- Leakage of the suction or discharge valve
- Deviation from target dosing volume flow
- Service due soon

Alarms:
- Empty signal (measured or calculated)
- Cable break Analogue input

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Remote control section

In addition to reading out data from the dosing pump, commands can also be sent to the dosing pump. For this purpose, bus communication is activated on the dosing pump, so that, depending on the application, it is possible to decide whether only data from the pump should be read or whether the pump should also be remotely controlled via the cloud.

The remote control function can therefore save time-consuming service calls.
The following settings can be adjusted remotely:
- Control mode of the dosing pump (volume-proportional dosing via contact or analogue input)
- Concentration by changing the value ml/contact (dosing in proportion to quantity with contact) or the analogue profile (dosing in proportion to quantity with analogue)
- Start/stop of the dosing pump
- Status and changes of dosing functions (FlowControl):
  + Auto venting (for outgassing media)
  + Change of the suction speed (for outgassing or more viscous media)
  + Specification of the maximum pressure (to limit the maximum system pressure for critical individual components)
  + Min pressure as alarm (alarm and stop in the case of hose breakage)
  + Sensitivity of the FlowControl dosing monitoring
  + AutoFlowAdapt (readjustment in case of deviation from the target dosing volume flow)

System information section

In this section, specific information about the company, the installation location of the system as well as contact persons on site (e.g. the facility manager) can be stored, because in case of contact, a lot of unnecessary time usually passes until the responsible person opens access to the dosing system.

Furthermore, the following data is read from the pump: Product number, serial number, model code and gateway ID number. The read-out material code allows quick conclusions to be drawn regarding the material resistance of the connected chemical.

The implemented operating hours counter records the total operating hours, the motor operating hours as well as the minute times for alarm warnings and stand-by. These values can be used to systematically identify and optimise problem plants in the field in order to optimally fulfil the processing target.

The Service menu item shows the hours until the next service and also the maintenance set for the pump. In this way, upcoming maintenance on the dosing system can be optimally planned in advance.

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Compliant with the dosage report

Thanks to the SMART Digital CHEMPAIRING Suite, a dosage report can be created in any time interval needed, for internal records or for presenting as evidence to authorities if required.

After selecting the desired analysis period, the Suite automatically generates a dosing report with cover sheet, the above-mentioned system information and further information:

- Combined chemicals
- Spent chemicals in l/week
- Container fill level Monday and Sunday
- Dosed drinking water quantity per week with peak volume flow in l/s
- Concentration of the stock solution in g/l
- Target and actual concentration in ml/m^3 and mg/l
- Max. permitted concentration
- System events

Weekly dosing report

18.05.2020-24.05.2020

Connected chemical:

Type:	Chemical A	EAN code:	42358789
Volume credit:	20l	Chemical stock mass concentration (g/l):	150

Consumption:

Chemical dosed per week (l):	**1,123**	Canister level (l) Monday/Sunday:	0,578	19,876
Chemical low peak value (l/h):	0,0252	Chemical high peak value (l/h):	6,35	

Process water/week (m^3):	**292,000**		
Process water low peak value (l/s):	0,068	Process waster high peak value (l/s):	4,16

Concentration:

Target volume concentration σ (ml/m3):	0,0038	Real volume concentration σ (ml/m3):	0,0038
Target mass concentration ρ (mg/l):	0,58	Real mass concentration ρ (mg/l):	0,58
		Max. allowed mass concentration ρ (mg/l):	0,60

Event messages:

23/052020	11:11	🟡	Pre empty
24/05/2020	15:10	🔴	Empty
24/05/2020	08:10	⚪	Canister exchange

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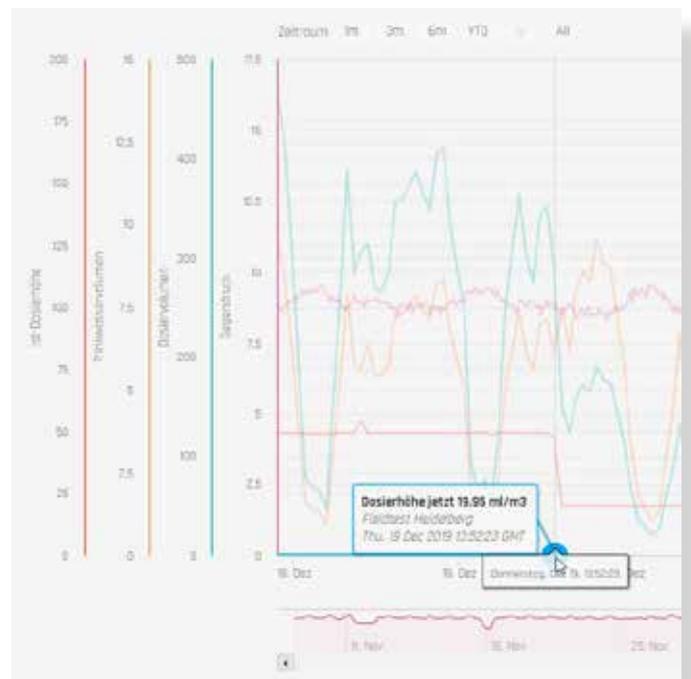
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The trend data

SMART Digital CHEMPAIRING Suite collects the following trend data from the dosing pump:
- Dosed quantity of chemicals (litres per hour)
- Dosed volume of drinking water (m^3 per hour)
- Back pressure (bar)
- Container filling level tendency (l)
- Actual dosing concentration (ml/m^3)

Finally you can use the time zoom to view detailed resolutions of the previously selected period. The respective data values of the SMART Digital can also be selected and deselected.

While the cause of a significant deviation was still a mystery with traditional hydrographs, the CHEMPAIRING Suite has a digital note (individual messages from the dosing pump or other events) for the respective event attached to the x-axis of the trend line diagram. In this way, a connection between deviating data and events can be established very quickly to ensure rapid remedial action.

The GO CHEMPAIRING App for

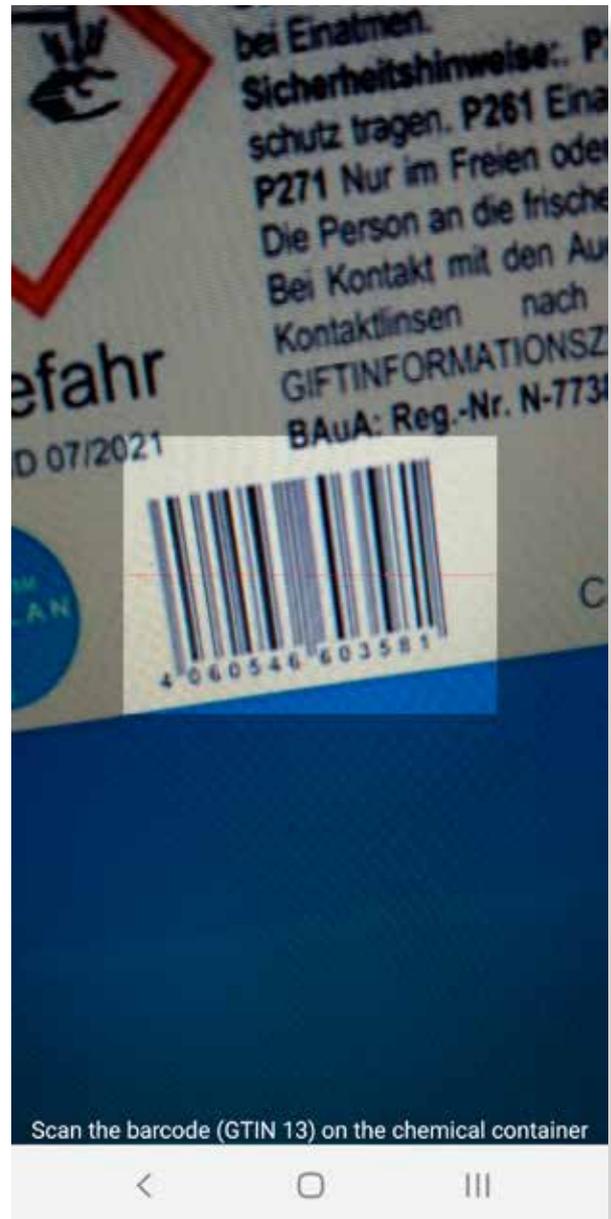be think innovate

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interaction in the field

By using the GO CHEMPAIRING App (Android or iOS), the dosing pump monitoring is significantly enhanced. The app can be used to collect data from the field as well as providing information about the chemicals. The chemicals database in the suite serves as a source of information.

If a container change is pending, scan the QR Code at the dosing pump and then the barcode of the container. If the dosing pump and the container are "married" in the associated chemicals database, the GO CHEMPAIRING app will display a release. If the chemical is not released for the dosing pump, a warning is displayed.

Whereas expensive and sometimes susceptible sensor technology had to be used for the permanent recording of container levels, the GO CHEMPAIRING App takes a different approach.

After scanning, the gross container volume stored in the chemicals database is transferred to the CHEMPAIRING Portal as volume credit. Based on the real dosing volume measurement of the SMART Digital DDA, the dosed quantity is subtracted from the volume credit and displayed as a hydrograph. This cost-effective, uncomplicated and permanent determination of the container filling level is therefore ideal for applications where disposable containers are used.

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Implemented occupational health and safety during the container change

Carelessness or ignorance can lead to dangers and health risks for the user due to the chemical, especially when changing the container.

After scanning the barcode on the container, you can call up important safety-relevant information about the chemical in the "Chemical Information" section of the GO CHEMPAIRING App. In doing so, the GO CHEMPAIRING App obtains the data from the chemical library of the CHEMPAIRING Suite to which only the Super User has access.

The information is available even when a mobile phone connection is not available.

The following information can be provided in the GO CHEMPAIRING App:
- Name of the chemical
- EAN code number
- Photo of the chemical container
- Active substance in the stock solution in g/l
- Maximum permitted final concentration of the active substance in mg/l
- Gross container volume in l
- Calculated pre-empty and empty alarm values in l
- Signal word (warning or danger)
- Hazard statements (H phrases)
- Precautionary statements (P phrases)
- GHS hazard pictogram
- Mandatory sign DIN EN ISO 7010 (e.g. safety glasses, gloves, .)

The provision of the information increases occupational safety.

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