SMART Digital
DDA, DDC, DDE

DIGITAL DOSING



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Performance range

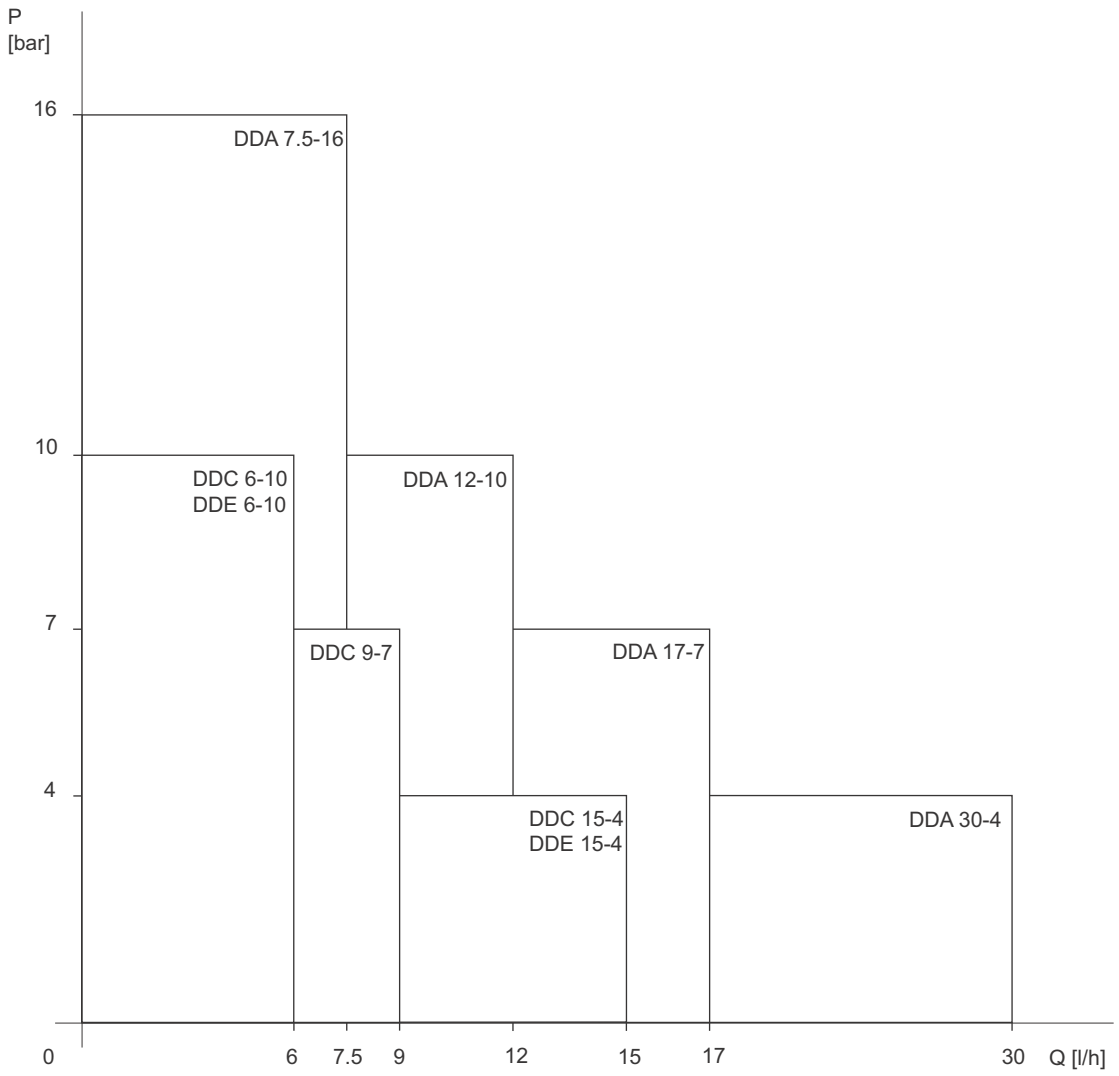


Fig. 1 Performance range

Features at a glance



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Fig. 2 DDA, DDC, DDE

Digital Dosing™

The SMART Digital generation DDA, DDC and DDE with powerful variable-speed stepper motor brings state-of-the-art technology to perfection. Combined expert knowledge and the new patented solutions set future standards. Traditional technologies such as stroke length / stroke frequency adjustment with synchronous motor or solenoid drive become a thing of the past.

Unique flexibility with only a few variants

The included click-stop mounting plate makes the new pump more flexible. Three different positions are possible without using any additional accessories, such as wall brackets. Service and pump exchange can now be done easily and fast just by clicking the pump in and out of the mounting plate.

The control cube on the DDA and DDC pump can be lifted and turned easily into three different positions: front, left or right.



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Fig. 3 Modularity of the control cube

A turn-down ratio of up to 1:3000, a wide supply voltage range (100-240 V; 50/60 Hz), combined connection sets and other features reduce the models and variants to a minimum.

Precise and easy setting / usability and interaction

The operator can easily install the pump and set it to discharge exactly the quantity of dosing liquid required for the application. In the display, the setting of the pump is read out directly, the flow is shown in ml/h, l/h, or gph.

The click wheel (turn-and-push knob) and the graphical LC display with plain-text menu in more than 20 languages make commissioning and operation intuitive. As the LCD is backlit in different colours, the pump status can be seen from a distance (traffic-light concept).



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Fig. 4 Display DDA, DDC

Thanks to a variety of operation modes, signal inputs and outputs, the pump can easily be integrated into every process.

Advanced process reliability

An intelligent drive and microprocessor control ensures that dosing is performed precisely and with low pulsation, even if the pump is dosing high-viscosity or degassing liquids. Malfunctions, caused e.g. by air bubbles, are detected quickly by the maintenance-free FlowControl system and then displayed in the alarm menu. The AutoFlowAdapt function automatically adjusts the pump according to the process conditions, e.g. varying backpressure. The integrated flow measurement makes additional monitoring and control equipment redundant.

Designed to save costs

In general, the investment for a dosing pump installation is low compared to its life cycle costs including the cost of the chemicals. The following features make the SMART Digital DDA, DDC and DDE pumps contribute to low life cycle costs:

- No underdosing or overdosing due to high dosing accuracy and FlowControl
- Longer maintenance intervals thanks to the universal chemical resistance of the full-PTFE diaphragm
- Reduced energy consumption thanks to state-of-the-art drive technology.

General data

Three application-oriented type ranges

DDA: High-end pump range for extended flow and pressure ranges with sensor-based FlowControl and measurement functions for challenging industrial applications, e.g.

- Process water
- Food and beverage
- Ultrafiltration and reverse osmosis
- Pulp and paper
- Boiler feed water
- CIP (Clean-In-Place)

DDC: User-friendly pump range with standard inputs and outputs for common applications, e.g.

- Drinking water
- Waste water
- Swimming pool water
- Cooling tower
- Chemical industry

DDE: Low-budget pump range with basic functions including manual operation or control via PLC for OEM applications, e.g.

- Car wash
- Irrigation

Identification

Type key

Example:	DDA	7.5-	16	AR-	PP	/V	/C	-F	-3	1	U2U2	F	G

Type range

DDE
DDC
DDA

Maximum flow [l/h]

Maximum pressure [bar]

Control variant

B	Basic (DDE)
P	B with pulse mode (DDE)
A	Standard (DDC)
AR	A with alarm relay and analog input
FC	AR with FlowControl (DDA)
FCM	FC with flow measurement (DDA)

Dosing head variant

PP	Polypropylene
PVC	Polyvinyl chloride**
PV	PVDF (polyvinylidene fluoride)
SS	Stainless steel 1.4401

Gasket material

E	EPDM
V	FKM
T	PTFE

Valve ball material

C	Ceramic
SS	Stainless steel 1.4401

Control cube position

F	Front-mounted (change to left and right possible)
X	No control cube (DDE)

Valve type

1	Standard
2	Spring-loaded

0.1 bar suction opening pressure
0.1 bar discharge opening pressure

Supply voltage

3	1 x 100-240 V, 50/60 Hz
I	24-48 VDC (DDC) ***

Installation set*

I001	Hose 4/6 mm (up to 7.5 l/h, 16 bar)
I002	Hose 9/12 mm (up to 60 l/h, 13 bar)
I003	Hose 0.17" x 1/4" (up to 7.5 l/h, 16 bar)
I004	Hose 3/8" x 1/2" (up to 60 l/h, 10 bar)

Connection, suction/discharge

U2U2	Hose 4/6 mm, 6/9 mm, 6/12 mm, 9/12 mm
U7U7	Hose 1/8" x 1/4"; 0.17" x 1/4"; 1/4" x 3/8"; 3/8" x 1/2"
AA	Threaded, Rp 1/4", female (SS)
VV	Threaded, NPT 1/4", female (SS)
XX	No connection

Mains plug

F	EU (Schuko)
B	USA, Canada
G	UK
I	Australia, New Zealand, Taiwan
E	Switzerland
J	Japan
L	Argentina
X	No plug (only 24-48 VDC) ***

Design

G	Grundfos Alldos

* Including 2 pump connections, foot valve, injection unit, 6 m PE discharge hose, 2 m PVC suction hose, 2 m PVC deaeration hose (4/6 mm)

** PVC dosing heads only up to 10 bar

*** Available 2011

Overview of functions

	DDA			DDC		DDE	
	 TM04 1636 2110			 TM04 1637 2110		 TM04 1638 2110	
Control variant:	**FCM**	**FC**	**AR**	**AR**	**A**	**P**	**B**
General							
Digital Dosing: Internal stroke speed and frequency control	●	●	●	●	●	●	●
Mounting plate (basic / wall mounting)	●	●	●	●	●	●	●
Control panel, see page 9							
Control cube mountable in three positions: front, left, right	●	●	●	●	●		
Control panel position: front-fitted						●	●
Transparent protective cover for control elements	●	●	●	●	●		
Capacity setting in millilitres, litres or US-gallons	●	●	●	●	●		
Graphical display with background light in four colours for status indication: white, green, yellow, red	●	●	●	●	●		
Plain-text menu in different languages	●	●	●	●	●		
Turn-and-push knob (click wheel) for easy navigation	●	●	●	●	●		
Capacity adjustment knob (0.1 - 100 %)						●	●
Start / Stop key	●	●	●	●	●		
100 % key (deaearation)	●	●	●	●	●	●	
Operation mode switch (manual / pulse)						●	
Operation modes, see page 11							
Manual speed control	●	●	●	●	●	●	●
Pulse control in ml/pulse	●	●	●	●	●		
Pulse control (1:n)						●	
Analog control 0/4-20 mA	●	●	●	●			
Batch control (pulse-based)	●	●	●				
Dosing timer cycle	●	●	●				
Dosing timer week	●	●	●				
Fieldbus control	●	●	●				
Functions, see page 13							
Auto deaeration also during pump standby	●	●	●				
FlowControl system with selective fault diagnosis	●	●					
Pressure monitoring (min / max)	●	●					
Flow measurement	●						
AutoFlowAdapt	●						
SlowMode (anti-cavitation)	●	●	●	●	●		
Calibration mode	●	●	●	●	●		
Scaling of analog input	●	●	●				
Service information display	●	●	●	●	●		
Relay setting: alarm, warning, stroke signal, pump dosing	●	●	●	●			
Relay setting (additionally): timer cycle, timer week	●	●	●				
Inputs/outputs, see page 14							
Input for external stop	●	●	●	●	●	●	
Input for pulse control	●	●	●	●	●	●	
Input for analog 0/4-20 mA control	●	●	●	●			
Input for low-level signal	●	●	●	●	●		
Input for empty tank signal	●	●	●	●	●	●	
Output relay (2 relays)	●	●	●	●			
Output analog 0/4-20 mA	●	●	●				
Input / Output for GeniBus	●	●	●				
Input / Output for E-box (Profibus DP or additional alarm relays)	●	●	●				

Functional description

The electronically controlled variable-speed motor (stepper motor) of the DDA, DDC and DDE pumps provides optimum control of the stroke speed. The duration of each discharge stroke varies according to the capacity set, resulting in optimum discharge flow in any operating situation, while the duration of each suction stroke is constant (see figure below).

The advantages are as follows:

- The pump always operates at full stroke length, irrespective of the capacity set; this ensures optimum accuracy, priming and suction.
- A capacity range of up to 1:3000 (turndown ratio) reduces variants and spare parts.
- Smooth and continuous dosing ensuring an optimum mixing ratio at the injection point without needing static mixers.
- Significant reduction of pressure peaks, preventing mechanical stress on wearing parts such as diaphragm, tubes, connections, resulting in extended maintenance intervals.
- The installation is less affected by long suction and discharge lines.
- Easier dosing of high-viscosity and degassing liquids (SlowMode).

The optimum dosing control shown below takes place in any operation mode.

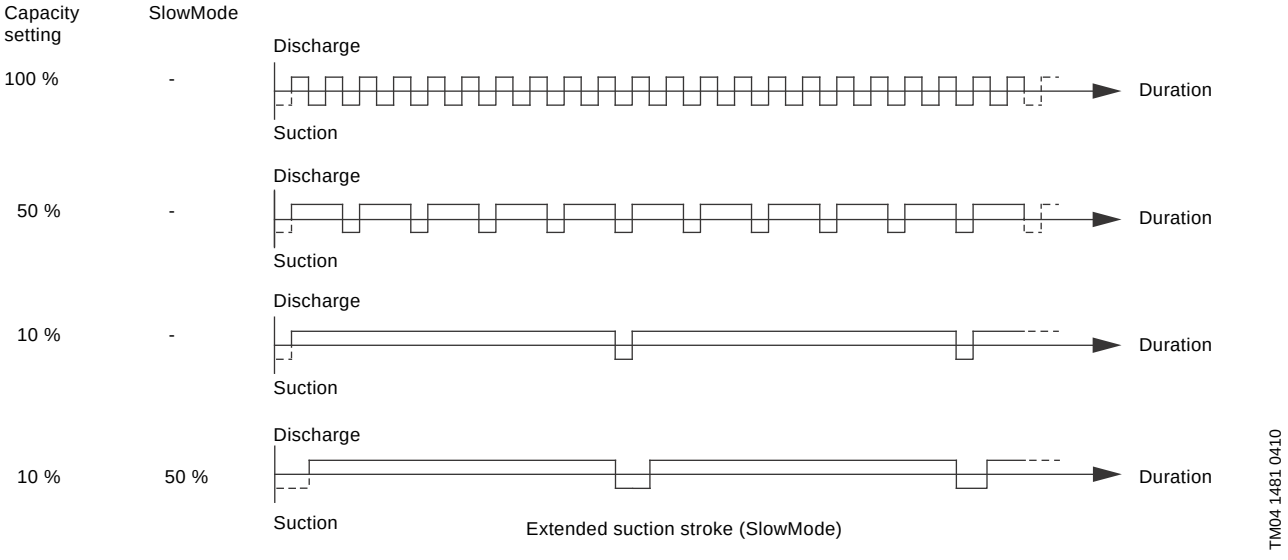


Fig. 5 Relation between stroke-frequency adjustment and capacity

Control cube DDA and DDC

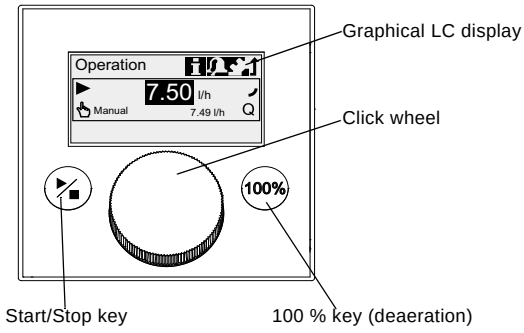
DDA and DDC pumps are supplied with front-mounted control cube. The position of the control cube can easily be changed by unfastening 2 screws, lifting the cube, turning it to the left or to the right and fastening both screws again.



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Fig. 6 Two of three possible control cube positions: at the front or at the left or at the right of the pump

Operating elements DDA and DDC



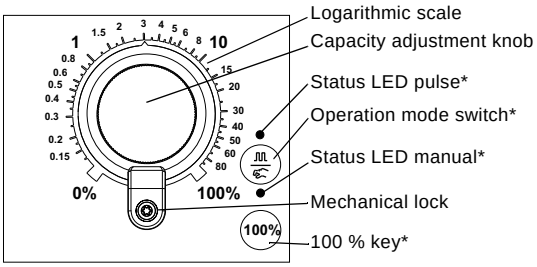
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Fig. 7 Operating elements DDA and DDC

The click wheel guides the user quickly and easily through the plain-text menu.

If the maximum capacity is required over a short period of time, for example during start-up, press the 100 % key. To set the pump to run for a specific number of seconds at maximum capacity, press the 100 % key and turn the click wheel clockwise simultaneously.

Operating elements DDE



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Fig. 8 Operating elements DDE

With the capacity adjustment knob the capacity of the pump can easily be adjusted in % of the maximum flow.

** Applies to DDE-P*

When holding down the operation mode switch, the pump changes from manual operation to pulse mode or vice versa.

If the maximum capacity is required over a short period of time, for example during start-up, press the 100 % key.

Depending on the selected operation mode, the respective status LED (pulse or manual) is activated according to the following table:

LED colour	Pump status
green (flashing)	stopped
green	running
yellow	external stopped
red	empty tank (alarm)
red (flashing)	motor blocked (alarm)

Menu

The DDA and DDC dosing pumps feature a user-friendly plain-text menu. The menu consists of 4 tabs: Operation; Info; Alarm; Setup. During initial start-up, all menu text appears in the English language. The menu can be set to display other languages.

This example applies to DDA pumps:

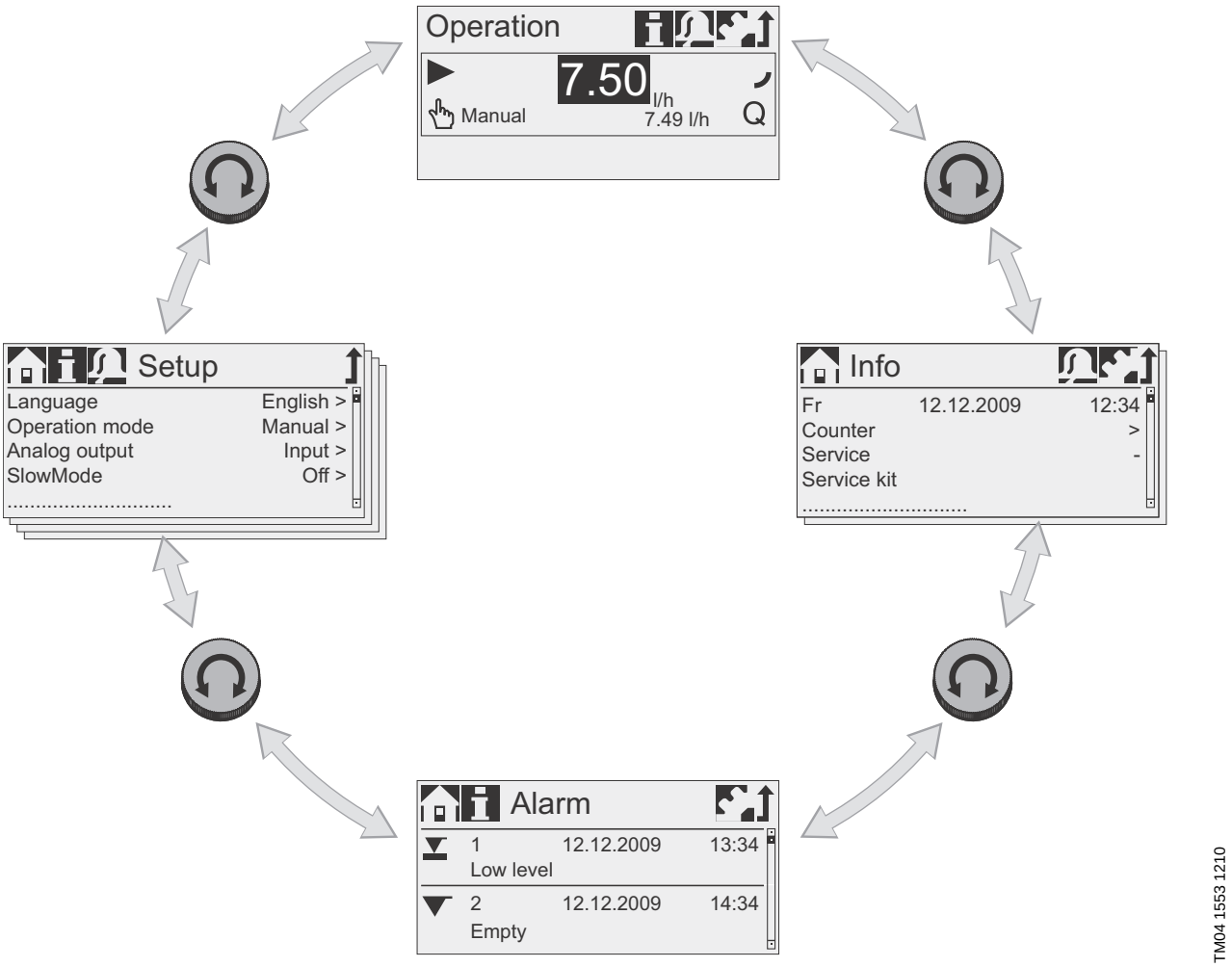


Fig. 9 Menu overview (example of main menus)

The menu text appears in up to 29 languages on a big graphical display, backlit in four different colours according to the traffic light concept.

Display	Fault	Pump status
white	-	stop ■ standby ‖
green	-	running ▶
yellow	warning	stop ■ standby ‖ running ▶
red	alarm	stop ■ standby ‖

Operation modes

Manual control

The pump ensures constant dosing according to the quantity set in l/h or ml/h or gph by means of the click wheel. The pump automatically changes between the measuring units.

Setting range

Pump type	Setting range*	
	From [l/h]	To [l/h]
DDA 7.5-16	0.0025	7.5
DDA 12-10	0.0120	12.0
DDA 17-7	0.0170	17.0
DDA 30-4	0.0300	30.0
DDC 6-10	0.0060	6.0
DDC 9-7	0.0090	9.0
DDC 15-4	0.0150	15.0
DDE 6-10	0.0060	6.0
DDE 15-4	0.0150	15.0

* When the SlowMode function is enabled the max. flow is reduced (see page 13)

Pulse control

The pump doses in proportion to an external potential-free pulse signal, for example from a water meter. There is no direct relation between pulses and dosing strokes. The pump automatically calculates its optimal speed to ensure the required quantity is dosed for each incoming pulse.

Applies to DDA and DDC

The quantity to be dosed is set in ml/pulse. The pump adjusts its speed according to two factors:

- the frequency of external pulses
- the set quantity per pulse.

Setting range

Pump type	Setting range [ml/pulse]
DDA 7.5-16	0.0015 - 14.8
DDA 12-10	0.0029 - 29.0
DDA 17-7	0.0031 - 31.0
DDA 30-4	0.0062 - 62.0
DDC 6-10	0.0016 - 16.2
DDC 9-7	0.0017 - 16.8
DDC 15-4	0.0032 - 31.6

The frequency of external pulses is multiplied by the set quantity. If the product exceeds the maximum flow of the pump, a maximum of 65,000 pulses can be stored for later processing with the Memory pulse function, when activated.

Applies to DDE-P control variant

The dosing quantity per pulse is adjusted with the adjustment knob according to the scale from 0.1 to 100 % of the stroke volume. The pump adjusts its speed according to two factors:

- the frequency of external pulses
- the set percentage of stroke volume.

Setting range, DDE-P

Pump type	Setting range [ml/pulse]
DDE 6-10	0.0008 - 0.81
DDE 15-4	0.0016 - 1.58

Analog 0/4-20 mA control

Applies to DDA and DDC-AR control variant

The pump ensures dosing according to an external analog signal. The dosed capacity is proportional to the input value in mA.

Operation mode	Input signal	Dosing capacity
4-20	≤ 4.1 mA	0 %
	≥ 19.8 mA	100 %
0-20	≤ 0.1 mA	0 %
	≥ 19.8 mA	100 %

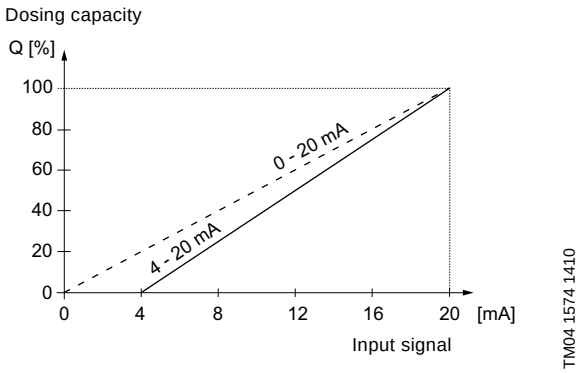


Fig. 10 0/4-20 mA control

Applies to DDA

With the analog scaling function, the curve can be individually drawn between two arbitrary points: I_1/Q_1 and I_2/Q_2.

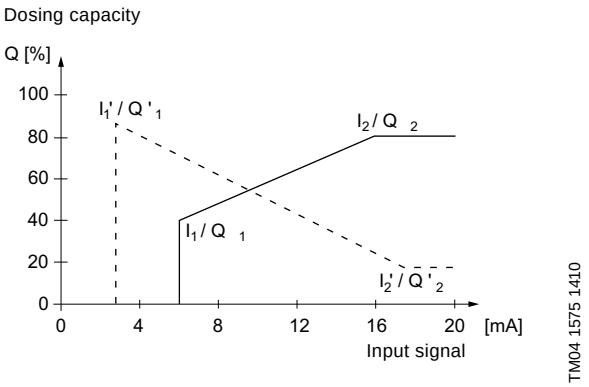


Fig. 11 Analog scaling

Pulse-based batch control

Applies to DDA

The set quantity is dosed in batches within the set dosing time (t_1). A batch is dosed every time the pump receives an external pulse. If the pump receives new pulses before a batch is completed, these pulses will be ignored. In the event of interrupts such as external stop or alarm, incoming pulses will also be ignored. After ending of the interrupts, a new batch will be dosed with the next incoming pulse.

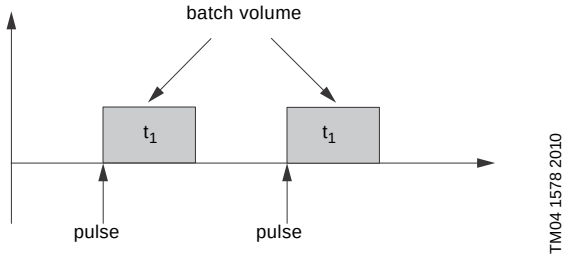


Fig. 12 Pulse-based batch control

Setting range

Pump type	Setting range		
	From [ml/batch]	To [l/batch]	Resolution* [ml]
DDA 7.5-16	0.74	999	0.09
DDA 12-10	1.45	999	0.18
DDA 17-7	1.55	999	0.19
DDA 30-4	3.10	999	0.39

* Due to the digital motor control, down to 1/8 of the stroke volume of the pump can be dosed.

Dosing timer cycle

Applies to DDA

After a start delay (t_2) the set batch volume is repeatedly dosed in the set cycle time (t_3). The dosing time (t_1) can be adjusted. The cycle time (t_3) must be longer than the dosing time (t_1), otherwise the next batch will be ignored. Batch dosing is stopped during any interrupt, e.g. power supply failure or external stop while the time continues running in the background (real-time clock). After ending of the interrupt, batch dosing proceeds according to the current status in the timeline.

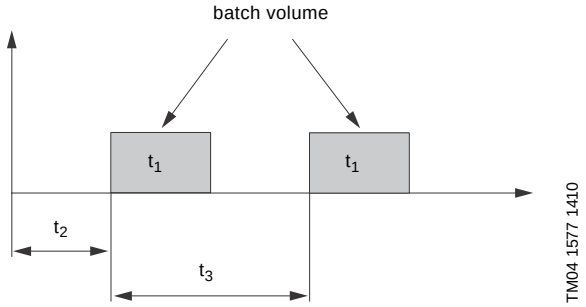


Fig. 13 Dosing timer cycle

Setting range

The batch volume setting range corresponds to the pulse-based batch control setting range.

Dosing timer week

Applies to DDA

The integrated real-time clock features also batch dosing based on a weekly period. There is a maximum of 16 procedures per week. Each dosing procedure consists of:

- Batch volume
- Dosing time
- Start time
- 1 to 7 weekdays (Monday to Sunday).

In case several procedures are overlapping, the procedure with the highest flow rate has the highest priority. Batch dosing is stopped during any interrupt, e.g. power supply failure or external stop, while the time continues running in the background (real-time clock). After ending of the interrupt, batch dosing proceeds according to the current status in the timeline.

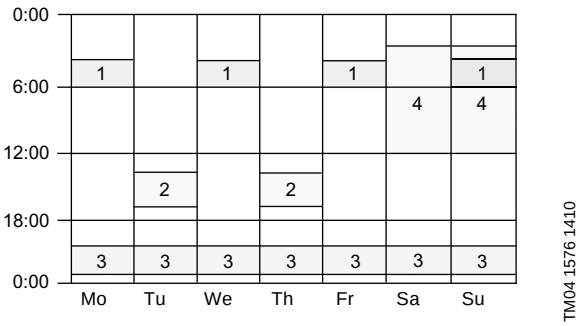


Fig. 14 Dosing timer week (example with 4 procedures)

Setting range

The batch volume setting range corresponds to the pulse-based batch control setting range.

Functions

SlowMode

Applies to DDA, DDC

When the SlowMode function (anti-cavitation) is selected, the pump extends and smooths its suction stroke. This results in a softer suction stroke.

The SlowMode function is used in these situations:

- when pumping high-viscosity liquids
- when pumping degassing liquids
- when the suction line is long
- when the suction lift is high.

Depending on the application, the motor speed during the suction stroke can be reduced individually to approximately 50 % or 25 % of the normal motor speed.

The maximum pump capacity is reduced accordingly. See pages 25 and 26 for further details.

Auto deaeration

Applies to DDA

The auto deaeration function avoids breakdown of the dosing process due to air-locking, when dosing degassing liquids such as sodium hypochlorite. During long dosing breaks, e.g. at the weekend or overnight, air-bubbles can form in the suction line and get into the dosing head. If too much air is in the dosing head, and the dosing process is started again, no liquid will be dosed (air-lock). Software-controlled diaphragm movements at regular intervals encourage the air bubbles to rise and finally to be displaced out of the dosing head.

These movements are executed

- when the pump is not stopped and
- during dosing breaks (e.g. external stop or no incoming pulses).

Calibration

Applies to DDA and DDC

The pump is calibrated in the factory at the nominal pressure of the respective pump type (see maximum pressure Technical data page 25, 26). After start-up, the dosing pump can be calibrated for the actual installation to ensure that the displayed value (ml, l or gph) is correct. A calibration program in the setup menu facilitates this process. The AutoFlowAdapt function keeps the dosing precision (DDA-FCM control variant), even if the backpressure changes. For the description of the AutoFlowAdapt function, see page 18.

External stop

Applies to DDA, DDC and DDE-P control variant

With the external stop function, the pump can be stopped from a remote place by an external contact signal. It is not recommended to switch on and off the power supply as it was usual when working with a conventional dosing pump. When working with microprocessor-controlled digital dosing pumps, the external stop signal has to be used, in order to keep the optimal dosing precision and to prevent damages to the electronics.

When activating the external stop contact, the pump changes from running ▶ to standby ❚❚. The operation display shows an activated external stop ▶❚❚. The signal input can be set to normally open (default) or normally closed contact.

Counters

Applies to DDA and DDC

The pump displays resettable and non-resettable counters in the info menu tab.

Counter	Description	Resettable
Volume	Accumulated dosed quantity in litres or US gallons	Yes
Operating hours	Accumulated number of operating hours (power-on)	No
Motor runtime	Accumulated number of motor runtime hours	No
Strokes	Accumulated number of dosing strokes	No
Power on/off	Accumulated number of times the mains supply has been switched on	No

Service display

Applies to DDA, DDC

Due to the optimized construction and the smooth digital dosing principle, the service periods are more than twice as long, if compared to conventional pumps. However, the wear parts have to be exchanged in regular intervals in order to keep the dosing precision and the process reliability at a high level. The service display in the pump shows when service of the wear parts is required. The displayed service kit product number makes service more convenient. The following information is displayed in the Info display:

Display		Description
Service	- soon now	no service required order parts to service soon service must be performed
Service kit	8-digit Grundfos product number	The service kit contains all parts needed for standard maintenance: diaphragm + valves
Reset service system		After performing the service, reset the system

The following service messages appear, depending on what happens first:

Display	Motor runtime [h]	Regular intervals [months]
Service soon	7,500	23
Service now	8,000	24

In case of difficult liquids, e.g. with abrasive particles, the service intervals can be shorter and service has to be performed earlier.

Level control

Applies to DDA and DDC

The pump can be connected to a dual level control unit for monitoring of the chemical level in the tank. The pump can react to two level signals:

Level sensors	Pump reaction*
Low-level signal (pre-empty)	• Display is yellow (Warning) • ▼ is flashing • Pump continues running
Empty tank signal	• Display is red (Alarm) • ▼ is flashing • Pump stops

* Depending on the pump model and settings, the relay outputs can be activated (see *Relay output*, page 14)

Applies to DDE-P control variant

The pump can be connected to a one-level control unit (empty tank signal). The pump reacts with a red LED and the pump stops in case the tank runs empty.

Relay output

Applies to DDA and DDC-AR control variant

The pump can activate 2 external signals by means of built-in relays switched via internal potential-free contacts. Depending on the process control requirements, the following relay output settings can be chosen:

Signal		Description
Relay 1	Relay 2	
Alarm*	Alarm	Display red, pump stopped (e.g. empty tank signal, etc.)
Warning*	Warning	Display yellow, pump running (low level signal, etc.)
Stroke signal	Stroke signal*	Every completed stroke
Pump dosing	Pump dosing	Pump is running and dosing
Bus control	Bus control	Set by a command in the Bus communication function (page 15)
	Timer cycle	Timer can be set in menu: on-time, cycle-time, start delay (only DDA)
	Timer week	Timer can be set in menu: procedure, on-time, start time and weekdays (only DDA)
Contact type		
NO*	NO*	Normally Open Contact
NC	NC	Normally Closed Contact

* default setting

Analog output

Applies to DDA

In addition to the analog input (operation mode: analog 0/4-20 mA) the pump is also equipped with an analog 0/4-20 mA output signal. Depending on the process control requirements, the following analog output settings are available:

Setting	Description of analog output signal	Control variant		
		FCM	FC	AR
Output = Input	Mapped 1:1 to the analog input, e.g. used in master-slave applications	X	X	X
Actual flow	Flow measured in the dosing head (Flow Measurement page 18)	X	X*	X*
Backpressure	Backpressure measured in the dosing head (Pressure monitoring page 18)	X	X	
Bus control	Set by a command in the bus communication (see below)	X	X	X

* Output signal is calculated based on motor speed and pump status (target flow rate)

Bus communication

BUS

Applies to DDA

The pump is equipped with a built-in module for Genibus communication. With the additional E-Box module (extension box: retrofit possible) the pump can be integrated in a Profibus DP network.

The bus communication possibilities enable remote monitoring and setting via the fieldbus system. The Profibus GSD-file can be downloaded from www.grundfosalldos.com.



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Fig. 15 DDA with E-box

Key lock and mechanical lock

Applies to DDA and DDC

To protect the pump from maloperation, a key lock can be set by entering a 4-digit PIN-code. When the pump is locked, it is still possible to navigate through the menus Alarm and Info and to acknowledge alarms. Two levels of protection are available:

- Settings: the keys and 100% are still available.
- Settings + keys: the keys and 100% are also locked.

For temporary (2 minutes) or final deactivation the pre-set 4-digit pin-code has to be entered again.

Applies to DDE

The adjustment knob can be locked with a locking screw to fix the current setting.

Basic settings

Applies to DDA, DDC

With load factory settings, the pump can be reset to the default settings. In addition, with save customer settings, the current configuration of the pump is stored and can be activated later by load customer settings. The latest saved configuration is stored in the memory.

Units

Applies to DDA, DDC

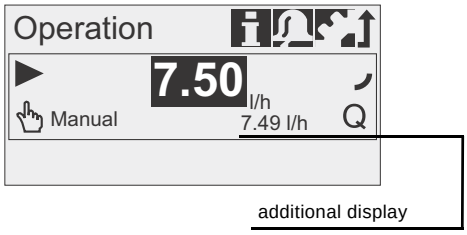
It is possible to select metric units (litre/millilitre/bar) or US units (US gallons/psi). Depending on the operation mode and menu, the following units are displayed:

Operation mode / Function	Metric units	US units
Manual control	ml/h or l/h	gph
Pulse control	ml/⊓	ml/⊓
Analog 0/4-20 mA control	ml/h or l/h	gph
Batch control (pulse- or timer-based)	ml or l	gal
Calibration	ml	ml
Volume counter	l	gal
Pressure monitoring	bar	psi

Additional display

Applies to DDA, DDC

The additional display function provides further useful status information, e.g. the target flow rate as well as the actual flow rate. The value is shown in the operation display together with the corresponding symbol.



TM04 1633 1810

Fig. 16 Additional display

The following additional information can be selected:

Settings		Description
Default display		Depending on the operation mode:
	Q	actual flow (manual, pulse) [1]
	Q	target flow (pulse)
		input current (analog) [4]
		remaining batch volume (batch, timer) [3]
	t	time until next batch (timer) [3]
Dosed volume	V	Total dosed volume (Counters see page 13)
Actual flow	Q	Actually measured flow [1]
Backpressure	P	Current backpressure in the dosing head [2]

[1] only DDA-FCM control variant
[2] only DDA-FCM/FC control variant
[3] only DDA pumps control variant
[4] only DDA pumps and DDC-AR control variant

FlowControl

Applies to DDA-FC/FCM control variant



TM04 1641 2110

Fig. 17 DDA FlowControl

The pump monitors the dosing process of liquids when the FlowControl function is activated. Although the pump is still operating, some influences such as air bubbles may cause reduced flow rates or even stop the dosing process. For optimal process safety and reliability, the activated FlowControl function immediately detects and displays the following malfunctions:

- Overpressure
- Discharge line burst
- Air bubbles in the dosing head
- Cavitation at the suction side
- Suction valve leakage
- Dischare valve leakage

The unique FlowControl is based on an intelligent and maintenance-free sensor integrated in the dosing head. During the dosing process, the sensor measures the actual pressure and sends the measured value to the microprocessor in the pump. An internal indicator diagram is generated combining the actual pressure value with the diaphragm position (stroke length). With it, the dosing process is monitored, as the different malfunctions can immediately be detected due to their specific deviations in the curve. Compressible air bubbles, for instance, will reduce the discharge phase and the stroke volume (see fig. 18 below).

The sensitivity and the delay of the FlowControl function can be adjusted individually.

FlowControl requires a minimum backpressure of 2 bar. Grundfos recommend an additional spring-loaded valve (appox. 3 bar) on the discharge side for dosing low capacities (< 1 l/h) (please see data booklet Pump Accessories).

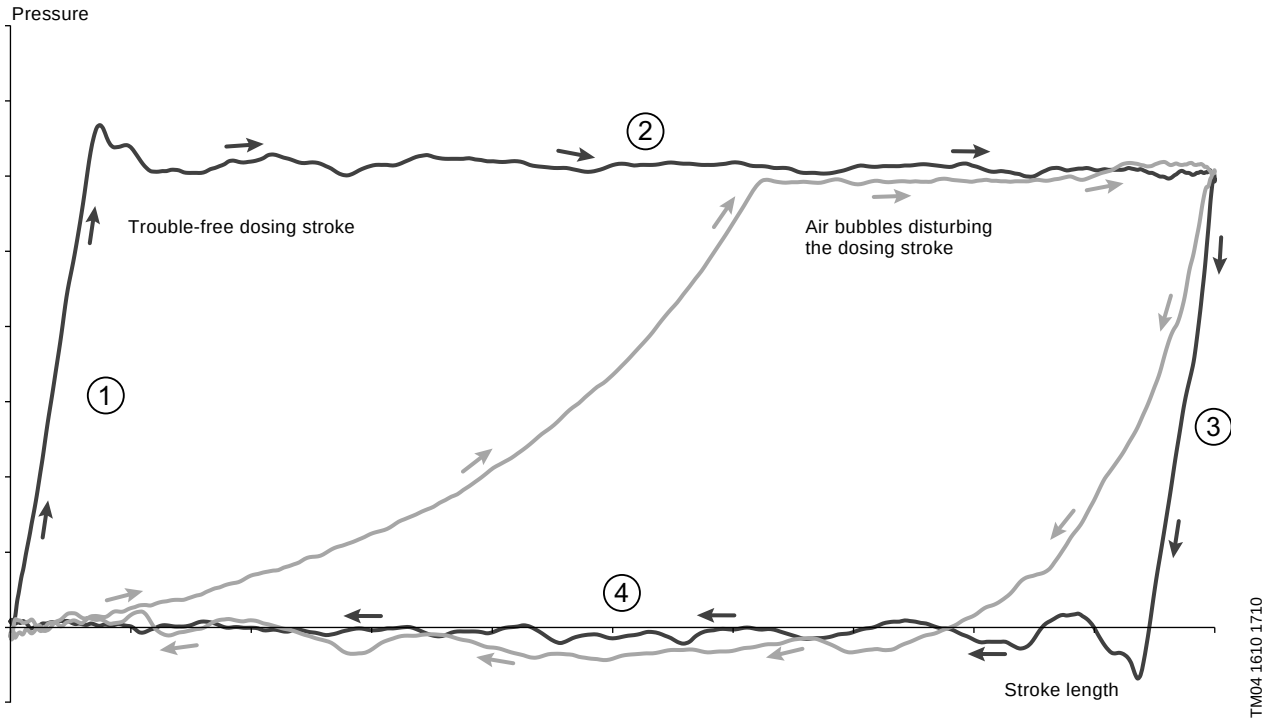


Fig. 18 Indicator diagram

1	Compression phase
2	Discharge phase
3	Expansion phase
4	Suction phase

Pressure monitoring

Applies to DDA-FC/FCM control variant

The integrated pressure sensor measures the actual pressure of the system, which is shown in the display. A maximum pressure can be set. If the pressure in the system exceeds the set maximum (e.g. caused by a closed valve), the pressure monitoring function stops the dosing process immediately. As soon as the backpressure falls below the set maximum, the dosing process is continued. In case the pressure drops below the minimum limit (e.g. caused by a burst discharge line) the pump stops and major chemical spills are prevented.

Pressure setting range

Pump type	Fixed min. pressure* [bar]	Adjustable max. pressure [bar]
DDA 7.5-16	< 2	3 ... 17 (default)
DDA 12-10	< 2	3 ... 11 (default)
DDA 17-7	< 2	3 ... 8 (default)
DDA 30-4	< 2	3 ... 5 (default)

*Can be either set as a warning (pump keeps running) or as an alarm (pump stops).

Flow measurement

Applies to DDA-FCM control variant

The pump can precisely measure and display the actual dosing flow. Via the analog 0/4-20 mA output, the actual flow signal can easily be integrated in any process control system, without needing any additional measurement equipment.

The Flow measurement function is based on an indicator diagram as described in Flow control (page 16). Accumulating the length of each discharge stroke phase and multiplying it with the stroke frequency results in the displayed actual flow. Any malfunctions, such as air bubbles or lower backpressure, will result in a reduced or increased actual flow rate. When the AutoFlowAdapt function (page 18) is activated, the pump compensates these influences by correcting the stroke frequency.

AutoFlowAdapt

Applies to DDA-FCM control variant

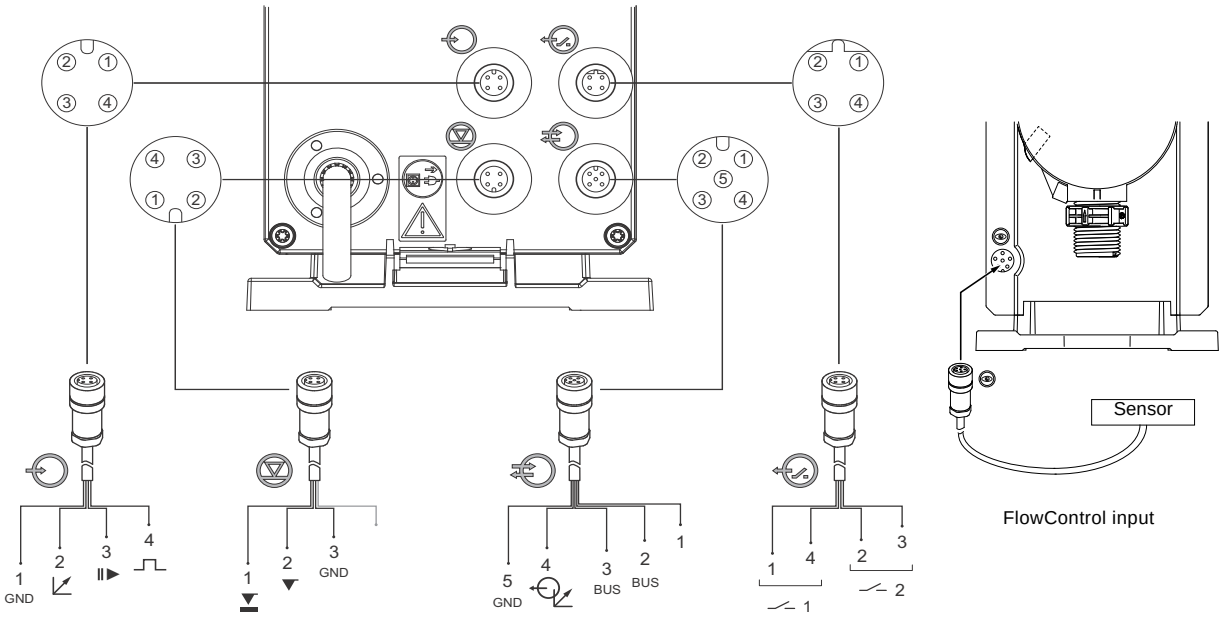
When activating the AutoFlowAdapt function even environmental changes will be compensated, so that the required target flow rate will be achieved. The integrated AutoFlowAdapt makes additional monitoring and control devices redundant. The AutoFlowAdapt function is based on:

- FlowControl: malfunctions are detected
- Pressure monitoring: system pressure changes are detected
- Flow measurement: deviations in the target flow are detected.

Examples:

- FlowControl detects air bubbles in the system. Due to a special motor drive strategy and a certain speed increase, the pump will try to keep the flow rate constant. This is especially important when dosing degassing liquids.
- In general, increasing system pressure reduces the stroke volume whereas falling system pressure increases the stroke volume. The AutoFlowAdapt function compensates this by automatically and continuously adapting the motor speed. Despite fluctuating system pressure, dosing accuracy is maintained.

Wiring diagram, DDA



FlowControl input

TM04 1121 0110; TM04 1552 1210

Cable 1
Analog/external stop/pulse
Product No.
2 m cable: 96609014
5 m cable: 96609016

Cable 2
Level input
Product No.
2 m cable: 96609014
5 m cable: 96609016

Cable 3
Genibus, analog output
Product No.
2 m cable: 96632921
5 m cable: 96632922

Cable 4
Relay output
Product No.
2 m cable: 96609017
5 m cable: 96609019

Cable 1: Analog, external stop and pulse input

	Function	Pin holes				Plug type
		1/brown	2/white	3/blue	4/black	
	Analog	GND/ (-) mA	(+) mA			mA signal
	External stop	GND		X		contact
	Pulse	GND			X	contact

Cable 2: Level input

	Function	Pin holes				Plug type
		1/brown	2/white	3/blue	4/black	
	Low level	X		GND		contact
	Empty tank		X	GND		contact

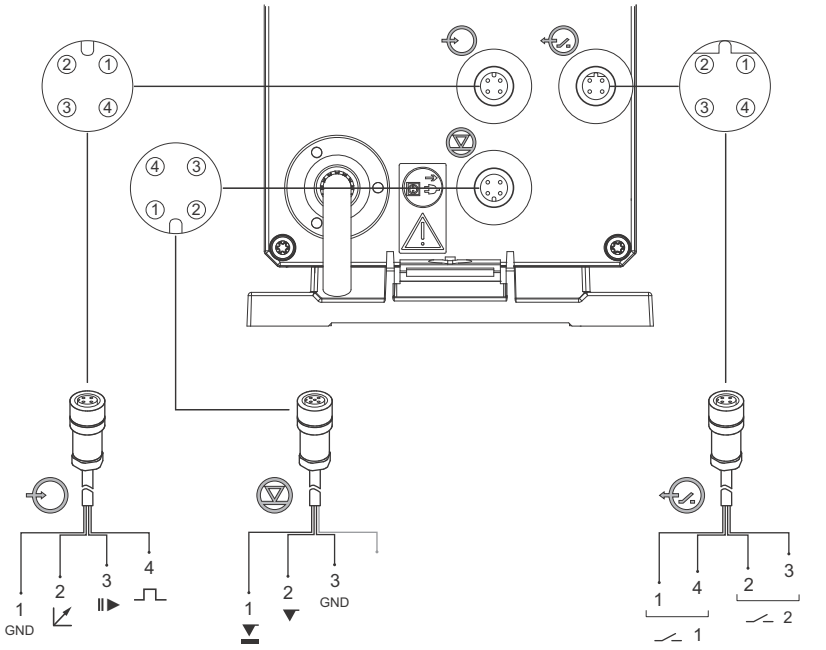
Cable 3: Genibus, analog output

	Function	Pin holes					Plug type
		1/brown	2/white	3/blue	4/black	5/yellow-green	
	Genibus	+30 V	GENI bus TXD	GENI bus RXD		GND	Bus
	Analog output				(+) mA	GND/ (-) mA	mA signal

Cable 4: Relay output

	Function	Pin holes				Plug type
		1/brown	2/white	3/blue	4/black	
	Relay 1	X			X	contact
	Relay 2		X	X		contact

Wiring diagram, DDC



Cable 1
Analog/external stop/pulse
Product No.
2 m cable: 96609014
5 m cable: 96609016

Cable 2
Level input
Product No.
2 m cable: 96609014
5 m cable: 96609016

Cable 4
Relay output
Product No.
2 m cable: 96609017
5 m cable: 96609019

TM04 1531 1010

Cable 1: Analog, external stop and pulse input

Function	Pin holes				Plug type
	1/brown	2/white	3/blue	4/black	
Analog*	GND/ (-) mA	(+) mA			mA signal
External stop	GND		X		contact
Pulse	GND			X	contact

Cable 2: Level input

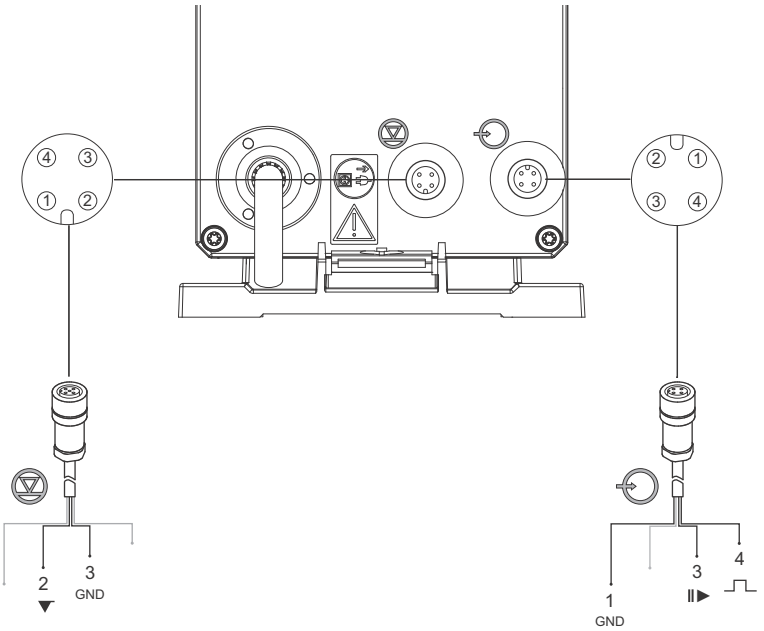
Function	Pin holes				Plug type
	1/brown	2/white	3/blue	4/black	
Low level	X		GND		contact
Empty tank		X	GND		contact

Cable 4: Relay output*

Function	Pin holes				Plug type
	1/brown	2/white	3/blue	4/black	
Relay 1	X			X	contact
Relay 2		X	X		contact

* applies to DDC-AR control variant

Wiring diagram, DDE-P



Cable 2
Level input
Product No.
2 m cable: 96609014
5 m cable: 96609016

Cable 1
External stop/pulse
Product No.
2 m cable: 96609014
5 m cable: 96609016

TM04 1532 1010

Cable 1: External stop and pulse input*

Function	Pin holes				Plug type
	1/brown	2/white	3/blue	4/black	
External stop	GND		X		contact
Pulse	GND			X	contact

Cable 2: Level input*

Function	Pin holes				Plug type
	1/brown	2/white	3/blue	4/black	
Empty tank		X	GND		contact

* applies to DDE-P control variant

DDA and DDC

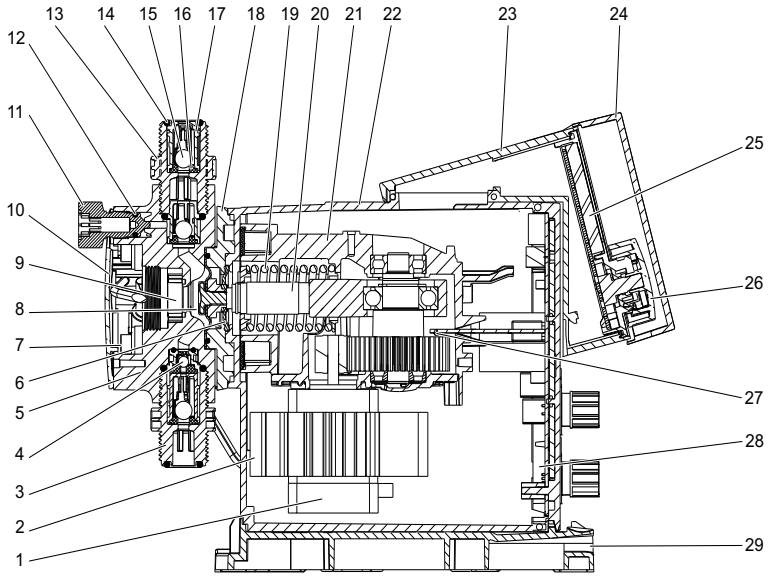


Fig. 19 Sectional drawing, DDA

Construction

The DDA and DDC pumps are motor-driven diaphragm dosing pumps consisting of the following main parts:

Dosing head: Patented design with a minimum of clearance space optimised for degassing liquids. With integrated deaeration valve for priming and venting complete with connection for a 4/6 mm or 0.17" x 1/4" tubing. DDA-FCM/FC pumps have an integrated pressure sensor in the dosing head.

Valves: Double-ball discharge and suction valve* design for less clearance space - optimised for degassing liquids. Spring-loaded valves for higher viscosities are available as an option.

Connections: Robust and easy-to-use connection packages for various sizes of tubing or pipes.

Diaphragm: Full PTFE diaphragm designed for long life and universal chemical resistance.

Flange: With separation chamber, safety diaphragm and drain hole.

Drive unit: Positive return crank with patented noiseless spur gear drive, energy recovery spring for high efficiency (only DDA), stepper motor, all mounted in a robust gear housing.

Control cube: Containing operation electronics with display, keys, click-wheel and protective cover.

Housing: Containing drive unit and power electronics with robust signal sockets. The housing can be clicked on the mounting plate.

Material specification

Pos.	Description	Material options
1	Stepper motor	–
2	Cooling element**	Aluminium
3	Suction valve, complete***	–
4	Valve ball, DN 4*	Ceramics Al2O3 99.5 %, SS 1.4401
5	Dosing head	PP, PVC, PVDF, SS 1.4435
6	Safety diaphragm	EPDM
7	Dosing head screw	SS 1.4301
8	Diaphragm	full PTFE
9	Pressure sensor	–
10	Dosing head cover	PP, SS 1.4301
11	Deaeration valve	PP, PVC, PVDF
12	Deaeration valve O-ring	EPDM/FKM
13	Discharge valve, complete***	–
14	Discharge valve O-ring	EPDM, FKM, PTFE
15	Discharge valve ball, DN 8	Ceramics Al2O3 99.5 %, SS 1.4401
16	Discharge valve seat	EPDM, FKM, PTFE
17	Discharge valve ball cage	PP, PVC, PVDF, SS 1.4435
18	Flange	PPO/PS 20 % gf
19	Energy recovery spring**	EN 10270-2/VD SiCr
20	Connecting rod	PA 6.6 30 % gf
21	Gear box	PPO/PS 20 % gf
22	Housing	PPO/PS 20 % gf
23	Control cube	PPO/PS 20 % gf
24	Display cover	PC
25	Operation PCB	–
26	Click wheel	PPO/PS 20 % gf
27	Hall sensor	–
28	Power PCB	–
29	Mounting plate	PPO/PS 20 % gf

* Only for pumps up to 7.5 l/h with standard valves

** Only for DDA

*** Pump can be supplied with spring-loaded valves (Material: Tantal)

DDE

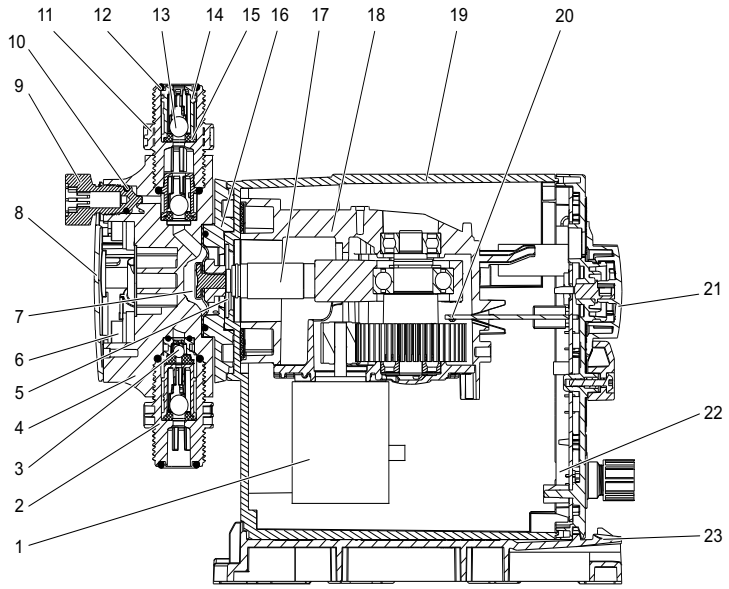


Fig. 20 Sectional drawing, DDE

Construction

The DDE pump is a motor-driven diaphragm dosing pump consisting of the following main parts:

Dosing head: Patented design with a minimum of clearance space optimised for degassing liquids. With integrated deaeration valve for priming and venting complete with connection for a 4/6 mm or 0.17" x 1/4" tubing.

Valves: Double-ball discharge and suction valve* design for less clearance space - optimised for degassing liquids. Spring-loaded valves for higher viscosities are available as an option.

Connections: Robust and easy-to-use connection packages for various sizes of tubing or pipes.

Diaphragm: Full PTFE diaphragm designed for long life and universal chemical resistance.

Flange: With separation chamber, safety diaphragm and drain hole.

Drive unit: Positive return crank with patented noiseless spur gear drive, stepper motor, all mounted in a robust gear housing.

Housing: Containing drive unit, control panel and electronics with robust signal sockets. The housing can be clicked on the mounting plate.

Material specification

Pos.	Description	Material options
1	Stepper motor	–
2	Suction valve, complete**	–
3	Valve ball, DN 4*	Ceramics Al2O3 99.5 %, SS 1.4401
4	Dosing head	PP, PVC, PVDF, SS 1.4435
5	Safety diaphragm	EPDM
6	Dosing head screw	SS 1.4301
7	Diaphragm	full PTFE
8	Dosing head cover	PP, SS 1.4301
9	Deaeration valve	PP, PVC, PVDF
10	Deaeration valve O-ring	EPDM/FKM
11	Discharge valve, complete**	–
12	Discharge valve O-ring	EPDM, FKM, PTFE
13	Discharge valve ball, DN 8	Ceramics Al2O3 99.5 %, SS 1.4401
14	Discharge valve ball cage	PP, PVC, PVDF, SS 1.4435
15	Discharge valve seat	EPDM, FKM, PTFE
16	Flange	PPO/PS 20 % gf
17	Connecting rod	PA 6.6 30 % gf
18	Gear box	PPO/PS 20 % gf
19	Housing	PPO/PS 20 % gf
20	Hall sensor	–
21	Capacity adjustment knob	PPO/PS 20 % gf
22	Power PCB	–
23	Mounting plate	PPO/PS 20 % gf

* Only for pumps up to 6 l/h with standard valves

** Pump can be supplied with spring-loaded valves (Material: Tantal)

Dimensions

DDA and DDC

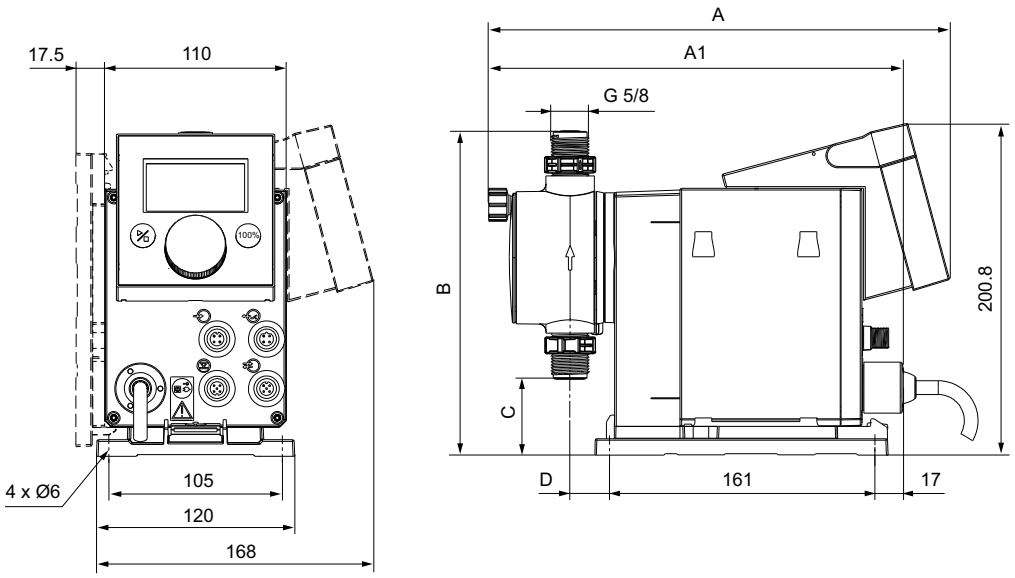


Fig. 21 DDA and DDC with front-fitted or side-fitted control cube (--- option: wall-mounted)

DDE

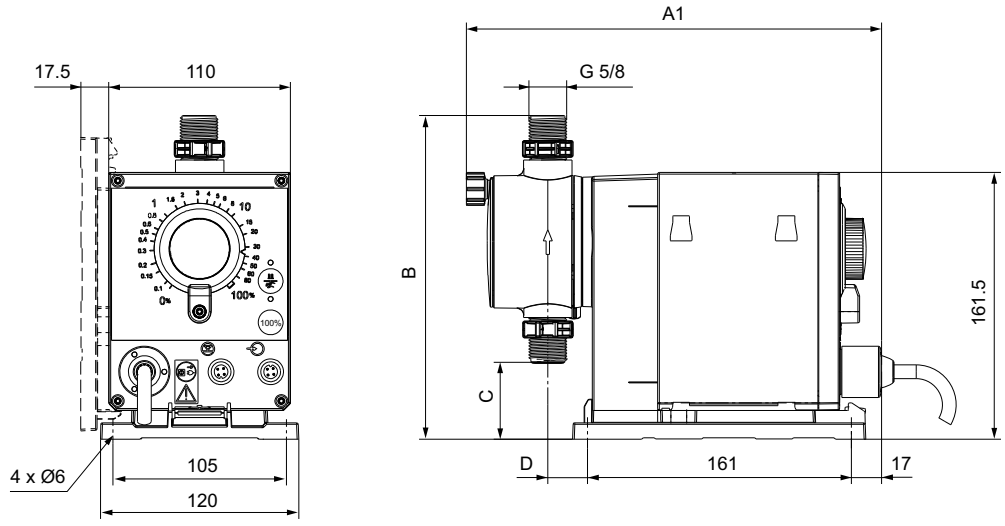


Fig. 22 DDE front fitted control elements (--- option: wall-mounted)

Pump type	A [mm]	A1 [mm]	B [mm]	C [mm]	D [mm]
DDA 7.5-16 DDC 6 - 10 DDC 9 - 7 DDE 6-10	280	251	196	46.5	24
DDA 12-10 DDA 17-7 DDC 15-4 DDE 15-4	280	251	200.5	39.5	24
DDA 30-4	295	267	204.5	35.5	38.5

DDA

Pump type	DDA		7.5-16	12-10	17-7	30-4
Mechanical data	Max. turn-down ratio	[1:X]	3000	1000	1000	1000
	Max. dosing flow	[l/h]	7.5	12.0	17.0	30.0
		[gph]	2.0	3.1	4.5	8.0
	Max. dosing flow with SlowMode 50 %	[l/h]	3.75	6.00	8.50	15.00
		[gph]	1.00	1.55	2.25	4.00
	Max. dosing flow with SlowMode 25 %	[l/h]	1.88	3.00	4.25	7.50
		[gph]	0.50	0.78	1.13	2.00
	Min. dosing flow	[l/h]	0.0025	0.0120	0.0170	0.0300
		[gph]	0.0007	0.0031	0.0045	0.0080
	Max. operating pressure	[bar]	16	10	7	4
		[psi]	230	150	100	60
	Max. stroke frequency [1]	[stroke/min]	190	155	205	180
	Stroke volume	[ml]	0.74	1.45	1.55	3.10
	Max. suction lift during operation [2]	[m]	6			
	Max. suction lift when priming with wet valves [2]	[m]	2	3	3	2
	Min. pressure difference between suction and discharge valve	[bar]	1 (FC and FCM: 2)			
	Max. admission pressure at suction valve	[bar]	2			
	Max. viscosity in SlowMode 25 % with spring-loaded valves [3]	[mPas] (= cP)	2500	2500	2000	1500
	Max. viscosity in SlowMode 50 % with spring-loaded valves [3]	[mPas] (= cP)	1800	1300	1300	600
	Max. viscosity without SlowMode with spring-loaded valves [3]	[mPas] (= cP)	600	500	500	200
	Max. viscosity without spring-loaded valves [3]	[mPas] (= cP)	50	300	300	150
	Min. internal hose/pipe diameter suction/discharge side [4, 2]	[mm]	4	6	6	9
	Min. internal hose/pipe diameter suction side (high viscosity)[4]	[mm]	9			
	Min. internal hose/pipe diameter discharge side (high viscosity)[4]	[mm]	9			
	Max. liquid temperature	[°C]	45			
	Min. liquid temperature	[°C]	-10			
	Max. ambient temperature	[°C]	45			
	Min. ambient temperature	[°C]	0			
	Accuracy of repeatability	[%]	±1			
Electrical data	Supply voltage	[V]	100-240 V, 50-60 Hz			
	Length of power supply cable	[m]	1.5			
	Max. inrush current at 100 V	[A]	8			
	Max. inrush current at 230 V	[A]	25			
	Max. power consumption P1 [5]	[W]	18			
	Enclosure class		IP 65, Nema 4X			
	Electrical safety class		II			
Signal input	Max. rating low-level / empty tank / pulse / external stop input		12 V, 5 mA			
	Min. pulse length	[ms]	5			
	Max. pulse frequency	[Hz]	100			
	Impedance in analog 0/4-20 mA input	[Ω]	15			
	Max. loop resistance in level signal circuit	[Ω]	1000			
	Max. loop resistance in pulse signal circuit	[Ω]	1000			
Signal output	Max. load of relay output, at ohmic load	[A]	0.5			
	Max. voltage, relay output	[V]	30 VDC / 30 VAC			
	Max. impedance in analog 0/4-20 mA output	[Ω]	500			
Weight and size	Weight PVC, PP, PVDF	[kg]	2.4	2.4		2.6
	Weight stainless steel	[kg]	3.2	3.2		4.0
	Diaphragm diameter	[mm]	44	50		74
Sound pressure	Max. sound pressure level	[dB(A)]	60			
Approvals			CE, CSA-US, NSF61, GHOST, PSE/cosmos, C-Tick			

1) The max. stroke frequency varies according to calibration

2) Data based on measurement with water

3) Max. suction lift: 1 m and reduced maximum flow (approx. 30 %)

4) Length of suction hose: 1.5 m / Length of discharge hose: 10 m (at max. viscosity)

5) With E-box: 24 W

DDC

Pump type	DDC		6-10	9-7	15-4
Mechanical data	Max. turn-down ratio	[1:X]	1000	1000	1000
	Max. dosing flow	[l/h]	6.0	9.0	15.0
		[gph]	1.5	2.4	4.0
	Max. dosing flow with SlowMode 50 %	[l/h]	3.00	4.50	7.50
		[gph]	0.75	1.20	2.00
	Max. dosing flow with SlowMode 25 %	[l/h]	1.50	2.25	3.75
		[gph]	0.38	0.60	1.00
	Min. dosing flow	[l/h]	0.0060	0.0090	0.0150
		[gph]	0.0015	0.0024	0.0040
	Max. pressure	[bar]	10	7	4
		[psi]	150	100	60
	Max. stroke frequency [1]	[stroke/min]	140	200	180
	Stroke volume	[ml]	0.81	0.84	1.58
	Max. suction lift during operation [2]	[m]	6		
	Max. suction lift when priming with wet valves [2]	[m]	2	2	3
	Min. pressure difference between suction and discharge valve	[bar]	1		
	Max. admission pressure at suction valve	[bar]	2		
	Max. viscosity in SlowMode 25 % with spring-loaded valves [3]	[mPas] (= cP)	2500	2000	2000
	Max. viscosity in SlowMode 50 % with spring-loaded valves [3]	[mPas] (= cP)	1800	1300	1300
	Max. viscosity without SlowMode with spring-loaded valves [3]	[mPas] (= cP)	600	500	500
	Max. viscosity without spring-loaded valves [3]	[mPas] (= cP)	50	50	300
	Min. internal hose/pipe diameter suction/discharge side [4, 2]	[mm]	4	6	6
	Min. internal hose/pipe diameter suction side (high viscosity)[4]	[mm]	9		
	Min. internal hose/pipe diameter discharge side (high viscosity)[4]	[mm]	9		
	Max. liquid temperature	[°C]	45		
	Min. liquid temperature	[°C]	-10		
	Max. ambient temperature	[°C]	45		
	Min. ambient temperature	[°C]	0		
	Accuracy of repeatability	[%]	±1		
Electrical data	Supply voltage AC	[V]	100-240 V, 50-60 Hz		
	Supply voltage DC (option)	[V]	24-48 VDC		
	Length of power supply cable	[m]	1.5		
	Max. inrush current at 100 V	[A]	8		
	Max. inrush current at 230 V	[A]	25		
	Max. power consumption P1	[W]	14		
	Enclosure class		IP 65, Nema 4X		
	Electrical safety class		II		
Signal input	Max. rating low-level / empty tank / pulse / external stop input		12 V, 5 mA		
	Min. pulse length	[ms]	5		
	Max. pulse frequency	[Hz]	100		
	Max. loop resistance in level signal circuit	[Ω]	1000		
	Max. loop resistance in pulse signal circuit	[Ω]	1000		
Signal output	Max. load of relay output, at ohmic load	[A]	0.5		
	Max. voltage, relay output	[V]	30 VDC / 30 VAC		
Weight and size	Weight PVC, PP, PVDF	[kg]	2.4		2.4
	Weight stainless steel	[kg]	3.2		3.2
	Diaphragm diameter	[mm]	44		50
Sound pressure	Max. sound pressure level	[dB(A)]	60		
Approvals			CE, CSA-US, NSF61, GHOST, PSE/cosmos, C-Tick		

1) The max. stroke frequency varies according to calibration

2) Data based on measurement with water

3) Max. suction lift: 1 m and reduced maximum flow (approx. 30 %)

4) Length of suction hose: 1.5 m / Length of discharge hose: 10 m (at max. viscosity)

DDE

Pump type	DDE		6-10	15-4
Mechanical data	Max. turn-down ratio	[1:X]	1000	1000
	Max. dosing flow	[l/h]	6.0	15.0
		[gph]	1.5	4.0
	Min. dosing flow	[l/h]	0.0060	0.0150
		[gph]	0.0015	0.0040
	Max. pressure	[bar]	10	4
		[psi]	150	60
	Max. stroke frequency [1]	[stroke/min]	140	180
	Stroke volume	[ml]	0.81	1.58
	Max. suction lift during operation [2]	[m]	6	
	Max. suction lift when priming with wet valves [2]	[m]	2	3
	Min. pressure difference between suction and discharge valve	[bar]	1	
	Max. admission pressure at suction valve	[bar]	2	
	Max. viscosity with spring-loaded valves [3]	[mPas] (= cP)	600	500
	Max. viscosity without spring-loaded valves [3]	[mPas] (= cP)	50	50
	Min. internal hose/pipe diameter suction/discharge side [4, 2]	[mm]	4	6
	Min. internal hose/pipe diameter suction side (HV)[4]	[mm]	9	
	Min. internal hose/pipe diameter discharge side (HV)[4]	[mm]	9	
	Max. liquid temperature	[°C]	45	
	Min. liquid temperature	[°C]	-10	
	Max. ambient temperature	[°C]	45	
	Min. ambient temperature	[°C]	0	
	Accuracy of repeatability	[%]	±5	
Electrical data	Supply voltage	[V]	100-240 V, 50-60 Hz	
	Length of power supply cable	[m]	1.5	
	Max. inrush current at 100 V	[A]	8	
	Max. inrush current at 230 V	[A]	25	
	Max. power consumption P1	[W]	12	
	Enclosure class		IP 65, Nema 4X	
	Electrical safety class		II	
Signal input	Max. rating empty tank / pulse / external stop input		12 V, 5 mA	
	Min. pulse length	[ms]	5	
	Max. pulse frequency	[Hz]	100	
	Max. loop resistance in level signal circuit	[Ω]	1000	
	Max. loop resistance in pulse signal circuit	[Ω]	1000	
Weight and size	Weight PVC, PP, PVDF	[kg]	2.4	2.4
	Weight stainless steel	[kg]	3.2	3.2
	Diaphragm diameter	[mm]	44	50
Sound pressure	Max. sound pressure level	[dB(A)]	60	
Approvals			CE, CSA-US, NSF61, GHOST, PSE/cosmos, C-Tick	

1) The max. stroke frequency varies according to calibration

2) Data based on measurement with water

3) Max. suction lift: 1 m and reduced maximum flow (approx. 30 %)

4) Length of suction hose: 1.5 m / Length of discharge hose: 10 m (at max. viscosity)

DDA, standard range

Power supply: 1 x 100-240 V, 50/60 Hz (switch mode)
Mains plug: EU (Schuko)
Valves: Standard
Connection set: Hose, 4/6 mm, 6/9 mm, 6/12 mm, 9/12 mm

Max. flow [l/h]	Max. pressure [bar]	Materials			Installation set*	Type designation**	Product number		
		Dosing head	Gaskets	Valve balls			AR	FC	FCM
7.5	16	PP	EPDM	Ceramic	no	DDA 7.5-16 **AR**-PP/E/C-F-31U2U2FG	97721938	97721972	97722006
					yes	DDA 7.5-16 **AR**-PP/E/C-F-31I001FG	97721939	97721973	97722007
			FKM	Ceramic	no	DDA 7.5-16 **AR**-PP/V/C-F-31U2U2FG	97721942	97721976	97722010
					yes	DDA 7.5-16 **AR**-PP/V/C-F-31I001FG	97721943	97721977	97722011
		PVC***	EPDM	Ceramic	no	DDA 7.5-16 **AR**-PVC/E/C-F-31U2U2FG	97721946	97721980	97722014
					yes	DDA 7.5-16 **AR**-PVC/E/C-F-31I001FG	97721947	97721981	97722015
			FKM	Ceramic	no	DDA 7.5-16 **AR**-PVC/V/C-F-31U2U2FG	97721950	97721984	97722018
					yes	DDA 7.5-16 **AR**-PVC/V/C-F-31I001FG	97721951	97721985	97722019
		PVDF	PTFE	Ceramic	no	DDA 7.5-16 **AR**-PV/T/C-F-31U2U2FG	97721966	97722000	97722034
					yes	DDA 7.5-16 **AR**-PV/T/C-F-31I001FG	97721967	97722001	97722035
		SS	PTFE	SS 1.4401	no	DDA 7.5-16 **AR**-SS/T/SS-F-31AAFG	97721970	97722004	97722038
12	10	PP	EPDM	Ceramic	no	DDA 12-10 **AR**-PP/E/C-F-31U2U2FG	97722040	97722074	97722108
					yes	DDA 12-10 **AR**-PP/E/C-F-31I002FG	97722041	97722075	97722109
			FKM	Ceramic	no	DDA 12-10 **AR**-PP/V/C-F-31U2U2FG	97722044	97722078	97722112
					yes	DDA 12-10 **AR**-PP/V/C-F-31I002FG	97722045	97722079	97722113
		PVC	EPDM	Ceramic	no	DDA 12-10 **AR**-PVC/E/C-F-31U2U2FG	97722048	97722082	97722116
					yes	DDA 12-10 **AR**-PVC/E/C-F-31I002FG	97722049	97722083	97722117
			FKM	Ceramic	no	DDA 12-10 **AR**-PVC/V/C-F-31U2U2FG	97722052	97722086	97722120
					yes	DDA 12-10 **AR**-PVC/V/C-F-31I002FG	97722053	97722087	97722121
		PVDF	PTFE	Ceramic	no	DDA 12-10 **AR**-PV/T/C-F-31U2U2FG	97722068	97722102	97722136
					yes	DDA 12-10 **AR**-PV/T/C-F-31I002FG	97722069	97722103	97722137
		SS	PTFE	SS 1.4401	no	DDA 12-10 **AR**-SS/T/SS-F-31AAFG	97722072	97722106	97722140
17	7	PP	EPDM	Ceramic	no	DDA 17-7 **AR**-PP/E/C-F-31U2U2FG	97722142	97722176	97722210
					yes	DDA 17-7 **AR**-PP/E/C-F-31I002FG	97722143	97722177	97722211
			FKM	Ceramic	no	DDA 17-7 **AR**-PP/V/C-F-31U2U2FG	97722146	97722180	97722214
					yes	DDA 17-7 **AR**-PP/V/C-F-31I002FG	97722147	97722181	97722215
		PVC	EPDM	Ceramic	no	DDA 17-7 **AR**-PVC/E/C-F-31U2U2FG	97722150	97722184	97722218
					yes	DDA 17-7 **AR**-PVC/E/C-F-31I002FG	97722151	97722185	97722219
			FKM	Ceramic	no	DDA 17-7 **AR**-PVC/V/C-F-31U2U2FG	97722154	97722188	97722222
					yes	DDA 17-7 **AR**-PVC/V/C-F-31I002FG	97722155	97722189	97722223
		PVDF	PTFE	Ceramic	no	DDA 17-7 **AR**-PV/T/C-F-31U2U2FG	97722170	97722204	97722238
					yes	DDA 17-7 **AR**-PV/T/C-F-31I002FG	97722171	97722205	97722239
		SS	PTFE	SS 1.4401	no	DDA 17-7 **AR**-SS/T/SS-F-31AAFG	97722174	97722208	97722242
30	4	PP	EPDM	Ceramic	no	DDA 30-4 **AR**-PP/E/C-F-31U2U2FG	97722244	97722278	97722313
					yes	DDA 30-4 **AR**-PP/E/C-F-31I002FG	97722245	97722279	97722314
			FKM	Ceramic	no	DDA 30-4 **AR**-PP/V/C-F-31U2U2FG	97722248	97722282	97722317
					yes	DDA 30-4 **AR**-PP/V/C-F-31I002FG	97722249	97722283	97722318
		PVC	EPDM	Ceramic	no	DDA 30-4 **AR**-PVC/E/C-F-31U2U2FG	97722252	97722286	97722331
					yes	DDA 30-4 **AR**-PVC/E/C-F-31I002FG	97722253	97722288	97722332
			FKM	Ceramic	no	DDA 30-4 **AR**-PVC/V/C-F-31U2U2FG	97722256	97722291	97722335
					yes	DDA 30-4 **AR**-PVC/V/C-F-31I002FG	97722257	97722292	97722336
		PVDF	PTFE	Ceramic	no	DDA 30-4 **AR**-PV/T/C-F-31U2U2FG	97722272	97722307	97722351
					yes	DDA 30-4 **AR**-PV/T/C-F-31I002FG	97722273	97722308	97722352
		SS	PTFE	SS 1.4401	no	DDA 30-4 **AR**-SS/T/SS-F-31AAFG	97722276	97722311	97722355

* Installation set includes: 2 pump connections, foot valve, injection unit, 6 m PE discharge hose, 2 m PVC suction hose, 2 m PVC deaeration hose (4/6 mm)
** Also available in **FC**- and **FCM**-control version
*** PVC dosing heads only up to 10 bar

DDC, standard range

Power supply: 1 x 100-240 V, 50/60 Hz (switch mode)
Mains plug: EU (Schuko)
Valves: Standard
Connection set: Hose, 4/6 mm, 6/9 mm, 6/12 mm, 9/12 mm

Max. flow [l/h]	Max. pressure [bar]	Materials			Installation set*	Type designation**	Product number	
		Dosing head	Gaskets	Valve balls			A	AR
6	10	PP	EPDM	Ceramic	no	DDC 6-10 **A**-PP/E/C-F-31U2U2FG	97721324	97721358
					yes	DDC 6-10 **A**-PP/E/C-F-31I001FG	97721325	97721359
			FKM	Ceramic	no	DDC 6-10 **A**-PP/V/C-F-31U2U2FG	97721328	97721362
					yes	DDC 6-10 **A**-PP/V/C-F-31I001FG	97721329	97721363
		PVC	EPDM	Ceramic	no	DDC 6-10 **A**-PVC/E/C-F-31U2U2FG	97721332	97721366
					yes	DDC 6-10 **A**-PVC/E/C-F-31I001FG	97721333	97721367
			FKM	Ceramic	no	DDC 6-10 **A**-PVC/V/C-F-31U2U2FG	97721336	97721370
					yes	DDC 6-10 **A**-PVC/V/C-F-31I001FG	97721337	97721371
		PVDF	PTFE	Ceramic	no	DDC 6-10 **A**-PV/T/C-F-31U2U2FG	97721352	97721387
					yes	DDC 6-10 **A**-PV/T/C-F-31I001FG	97721353	97721388
		SS	PTFE	SS 1.4401	no	DDC 6-10 **A**-SS/T/SS-F-31AAFG	97721356	97721391
9	7	PP	EPDM	Ceramic	no	DDC 9-7 **A**-PP/E/C-F-31U2U2FG	97721393	97721427
					yes	DDC 9-7 **A**-PP/E/C-F-31I002FG	97721394	97721428
			FKM	Ceramic	no	DDC 9-7 **A**-PP/V/C-F-31U2U2FG	97721397	97721431
					yes	DDC 9-7 **A**-PP/V/C-F-31I002FG	97721398	97721432
		PVC	EPDM	Ceramic	no	DDC 9-7 **A**-PVC/E/C-F-31U2U2FG	97721401	97721435
					yes	DDC 9-7 **A**-PVC/E/C-F-31I002FG	97721402	97721436
			FKM	Ceramic	no	DDC 9-7 **A**-PVC/V/C-F-31U2U2FG	97721405	97721439
					yes	DDC 9-7 **A**-PVC/V/C-F-31I002FG	97721406	97721440
		PVDF	PTFE	Ceramic	no	DDC 9-7 **A**-PV/T/C-F-31U2U2FG	97721421	97721455
					yes	DDC 9-7 **A**-PV/T/C-F-31I002FG	97721422	97721456
		SS	PTFE	SS 1.4401	no	DDC 9-7 **A**-SS/T/SS-F-31AAFG	97721425	97721459
15	4	PP	EPDM	Ceramic	no	DDC 15-4 **A**-PP/E/C-F-31U2U2FG	97721461	97721495
					yes	DDC 15-4 **A**-PP/E/C-F-31I002FG	97721462	97721496
			FKM	Ceramic	no	DDC 15-4 **A**-PP/V/C-F-31U2U2FG	97721465	97721499
					yes	DDC 15-4 **A**-PP/V/C-F-31I002FG	97721466	97721500
		PVC	EPDM	Ceramic	no	DDC 15-4 **A**-PVC/E/C-F-31U2U2FG	97721469	97721503
					yes	DDC 15-4 **A**-PVC/E/C-F-31I002FG	97721470	97721504
			FKM	Ceramic	no	DDC 15-4 **A**-PVC/V/C-F-31U2U2FG	97721473	97721507
					yes	DDC 15-4 **A**-PVC/V/C-F-31I002FG	97721474	97721508
		PVDF	PTFE	Ceramic	no	DDC 15-4 **A**-PV/T/C-F-31U2U2FG	97721489	97721523
					yes	DDC 15-4 **A**-PV/T/C-F-31I002FG	97721490	97721524
		SS	PTFE	SS 1.4401	no	DDC 15-4 **A**-SS/T/SS-F-31AAFG	97721493	97721527

* Installation set includes: 2 pump connections, foot valve, injection unit, 6 m PE discharge hose, 2 m PVC suction hose, 2 m PVC deaeration hose (4/6 mm)
** Also available in **AR**-control version

DDE, standard range

Power supply: 1 x 100-240 V, 50/60 Hz (switch mode)
Mains plug: EU (Schuko)
Valves: Standard
Connection set: Hose, 4/6 mm, 6/9 mm, 6/12 mm, 9/12 mm

Max. flow [l/h]	Max. pressure [bar]	Materials			Installation set*	Type designation**	Product number	
		Dosing head	Gaskets	Valve balls			B	P
6	10	PP	EPDM	Ceramic	no	DDE 6-10 **B**-PP/E/C-X-31U2U2FG	97720905	97720949
					yes	DDE 6-10 **B**-PP/E/C-X-31I001FG	97720906	97720950
			FKM	Ceramic	no	DDE 6-10 **B**-PP/V/C-X-31U2U2FG	97720909	97720953
					yes	DDE 6-10 **B**-PP/V/C-X-31I001FG	97720910	97720954
		PVC	EPDM	Ceramic	no	DDE 6-10 **B**-PVC/E/C-X-31U2U2FG	97720923	97720957
					yes	DDE 6-10 **B**-PVC/E/C-X-31I001FG	97720924	97720958
			FKM	Ceramic	no	DDE 6-10 **B**-PVC/V/C-X-31U2U2FG	97720927	97720961
					yes	DDE 6-10 **B**-PVC/V/C-X-31I001FG	97720928	97720962
		PVDF	PTFE	Ceramic	no	DDE 6-10 **B**-PV/T/C-X-31U2U2FG	97720943	97720977
					yes	DDE 6-10 **B**-PV/T/C-X-31I001FG	97720944	97720978
		SS	PTFE	SS 1.4401	no	DDE 6-10 **B**-SS/T/SS-X-31AAFG	97720947	97720981
15	4	PP	EPDM	Ceramic	no	DDE 15-4 **B**-PP/E/C-X-31U2U2FG	97720983	97721017
					yes	DDE 15-4 **B**-PP/E/C-X-31I002FG	97720984	97721018
			FKM	Ceramic	no	DDE 15-4 **B**-PP/V/C-X-31U2U2FG	97720987	97721021
					yes	DDE 15-4 **B**-PP/V/C-X-31I002FG	97720988	97721022
		PVC	EPDM	Ceramic	no	DDE 15-4 **B**-PVC/E/C-X-31U2U2FG	97720991	97721025
					yes	DDE 15-4 **B**-PVC/E/C-X-31I002FG	97720992	97721026
			FKM	Ceramic	no	DDE 15-4 **B**-PVC/V/C-X-31U2U2FG	97720995	97721029
					yes	DDE 15-4 **B**-PVC/V/C-X-31I002FG	97720996	97721030
		PVDF	PTFE	Ceramic	no	DDE 15-4 **B**-PV/T/C-X-31U2U2FG	97721011	97721045
					yes	DDE 15-4 **B**-PV/T/C-X-31I002FG	97721012	97721046
		SS	PTFE	SS 1.4401	no	DDE 15-4 **B**-SS/T/SS-X-31AAFG	97721015	97721049

* Installation set includes: 2 pump connections, foot valve, injection unit, 6 m PE discharge hose, 2 m PVC suction hose, 2 m PVC deaeration hose (4/6 mm)
** Also available in **P**-control version

DDA, DDC, DDE, non-standard range

Key to the designations of the three following tables:

Max. flow & press.	Control variant	Materials of dosing head, gaskets and valve balls	Control cube position	Supply voltage	Valve type	Connection / Installation set	Mains plug	Design
[l/h] - [bar]	See page 7	*Head:* PP: Polypropylene PVC: Polyvinyl chloride** PV: PVDF SS: Stainless steel 1.4401 *Gaskets:* E: EPDM V: FKM T: PTFE *Valve balls:* C: Ceramic SS: Stainless steel 1.4401	F: Front-mounted (change to left and right possible) X: No control cube (only DDE)	3: 1 x 100-240 V, 50/60 Hz I: 24-48 VDC (DDC)	1: Standard 2: Spring-loaded (HV version)	*Suction/discharge connection:* U2U2: Hose, 4/6 mm, 6/9 mm, 6/12 mm, 9/12 mm U7U7: Hose, 1/8" x 1/4", 0.17" x 1/4", 1/4" x 3/8", 3/8" x 1/2" AA: Threaded, Rp 1/4", female (SS) VV: Threaded, NPT1/4", female (SS) XX: Without connection *Installation set** I001: 4/6 mm up to 7.5 l/h, 16 bar I002: 9/12 mm up to 60 l/h, 13 bar I003: 0.17" x 1/4" up to 7.5 l/h, 16 bar I004: 3/8" x 1/2" up to 60 l/h, 10 bar	F: EU (Schuko) B: USA, Canada G: UK I: Australia, New Zealand, Taiwan E: Switzerland J: Japan L: Argentina X: No plug	G: Grundfos Alldos

* Installation set includes 2 pump connections, foot valve, injection unit, 6 m PE discharge hose, 2 m PVC suction hose, 2 m PVC deaeration hose (4/6 mm)
** PVC dosing heads only up to 10 bar

DDA

Max. flow & press.	Control variant	Materials			Control cube position	Supply voltage	Valve type	Connection / Installation set	Mains plug	Design
		Head	Gaskets	Balls						
7.5-16	AR FC FCM	PP	E V	C	F	3	1 2	U2U2 U7U7 XX I001 I003	F B G I E J L	G
		PVC PV	E V T	C						
		SS	T	SS	F	3	1 2	AA VV XX		
12-10 17-7 30-4	AR FC FCM	PP	E V	C	F	3	1 2	U2U2 U7U7 XX I002 I004		
		PVC PV	E V T	C						
		SS	T	SS	F	3	1 2	AA VV XX		

DDC

Max. flow & press.	Control variant	Materials			Control cube position	Supply voltage	Valve type	Connection / Installation set	Mains plug	Design
		Head	Gaskets	Balls						
6-10	A AR	PP	E V	C	F	3 I	1 2	U2U2 U7U7 XX I001 I003	F B G I E J L	G
		PVC PV	E V T	C						
		SS	T	SS	F	3 I	1 2	AA VV XX		
9-7 15-4	A AR	PP	E V	C	F	3 I	1 2	U2U2 U7U7 XX I002 I004		
		PVC PV	E V T	C						
		SS	T	SS	F	3 I	1 2	AA VV XX		

DDE

Max. flow & press.	Control variant	Materials			Control cube position	Supply voltage	Valve type	Connection / Installation set	Mains plug	Design
		Head	Gaskets	Balls						
6-10	B P	PP	E V	C	X	3	1 2	U2U2 U7U7 XX I001 I003	F B G I E J L	G
		PVC	E V T	C						
		PV								
		SS	T	SS	X	3	1 2	AA VV XX		
15-4	B P	PP	E V	C	X	3	1 2	U2U2 U7U7 XX I002 I004		
		PVC	E V T	C						
		PV								
		SS	T	SS	X	3	1 2	AA VV XX		

Pumped liquids

List of pumped liquids

The resistance table below is intended as a general guide for material resistance (at room temperature), and does not replace testing of the chemicals and pump materials under specific working conditions.

The data shown are based on information from various sources available, but many factors (purity, temperature, abrasive particles, etc.) may affect the chemical resistance of a given material.

Note: Some of the liquids in this table may be toxic, corrosive or hazardous.

Note: Please be careful when handling these liquids.

Pumped liquid (20 °C)			Material							
			Dosing head				Gasket			Ball
Description	Chemical formula	Concentration %	PP	PVDF	SS 1.4401	PVC	FKM	EPDM	PTFE	Ceramic
Acetic acid	CH_3COOH	25	●	●	●	●	–	●	●	●
		60	●	●	●	●	–	❍	●	●
		85	●	●	●	–	–	–	●	●
Aluminium chloride	$AlCl_3$	40	●	●	–	●	●	●	●	●
Aluminium sulphate	$Al_2(SO_4)_3$	60	●	●	●	●	●	●	●	●
Ammonia, aqueous	NH_4OH	28	●	●	●	●	–	●	●	●
Calcium hydroxide★[7]	$Ca(OH)_2$		●	●	●	●	●	●	●	●
Calcium hypochlorite	$Ca(OCl)_2$	20	❍	●	–	●	●	●	●	●
Chromic acid★[5]	H_2CrO_4	10	●	●	●	●	●	●	●	●
		30	–	●	–	●	●	❍	●	●
		40	–	●	–	●	●	–	●	●
		50	–	●	–	●	●	–	●	●
Copper sulphate	$CuSO_4$	30	●	●	●	●	●	●	●	●
Ferric chloride★[3]	$FeCl_3$	100	●	●	–	●	●	●	●	●
Ferric sulphate★[3]	$Fe_2(SO_4)_3$	100	●	●	●	●	●	●	●	●
Ferrous chloride	$FeCl_2$	100	●	●	–	●	●	●	●	●
Ferrous sulphate	$FeSO_4$	50	●	●	●	●	●	●	●	●
Hydrochloric acid	HCl	< 25	●	●	–	●	❍	●	●	●
		25-37	●	●	–	●	–	●	●	●
Hydrogen peroxide	H_2O_2	30	●	●	●	●	●	●	●	●
Nitric acid	HNO_3	10	●	●	●	●	●	●	●	●
		30	●	●	●	●	●	●	●	●
		40	❍	●	●	●	●	●	●	●
		70	–	●	●	–	●	–	●	●
Peracetic acid	CH_3COOOH	5	●	●	–	●	–	●	●	●
Potassium hydroxide	KOH	50	●	–	●	●	–	●	●	●
Potassium permanganate	$KMnO_4$	10	●	●	●	●	–	●	●	●
Sodium chlorate	$NaClO_3$	30	●	●	●	●	❍	●	●	●
Sodium chloride	NaCl	30	●	●	–	●	●	●	●	●
Sodium chlorite	$NaClO_2$	20	●	❍	–	–	●	●	●	●
Sodium hydroxide	NaOH	20	●	❍	●	●	●	●	●	●
		30	●	–	●	●	●	●	●	●
		50	●	–	●	●	●	●	●	●
Sodium hypochlorite	NaOCl	20	❍	●	–	●	●	●	●	●
Sodium sulphide	Na_2S	30	●	●	●	●	●	●	●	●
Sodium sulphite★[6]	Na_2SO_3	20	●	●	●	●	●	●	●	●
Sulphurous acid	H_2SO_3	6	●	●	●	●	●	●	●	●
Sulphuric acid★[4]	H_2SO_4	< 80	●	●	–	❍	●	❍	●	●
		80-98	❍	●	–	–	●	–	●	●

● Resistant

❍ Limited resistance

– Not resistant

★[3] Risk of crystallisation.

★[4] Reacts violently with water and generates much heat.
(Pump should be absolutely dry before dosing sulphuric acid.)

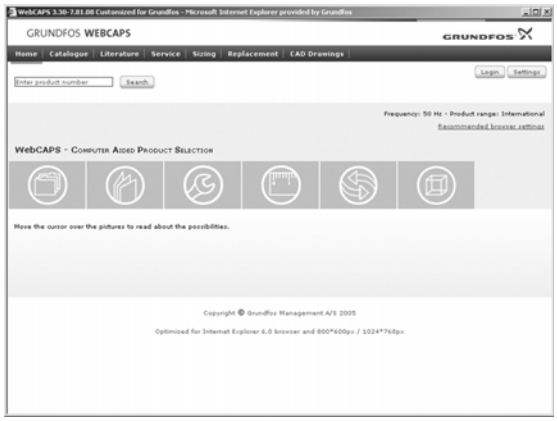
★[5] Must be fluoride-free when glass balls are used.

★[6] In neutral solutions.

★[7] Saturated solution 0.1 %.

For further information see 'Pumped liquid guide'

WebCAPS



WebCAPS is a **Web**-based **C**omputer **A**ided **P**roduct **S**election program available on www.grundfos.com.

WebCAPS contains detailed information on more than 185 000 Grundfos products in more than 20 languages.

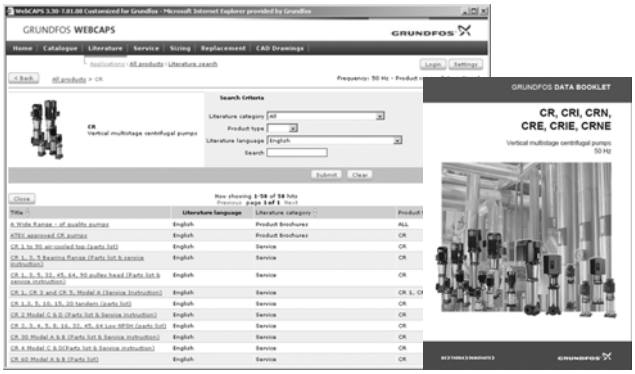
In WebCAPS, all information is divided into 6 sections:

- Catalogue
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



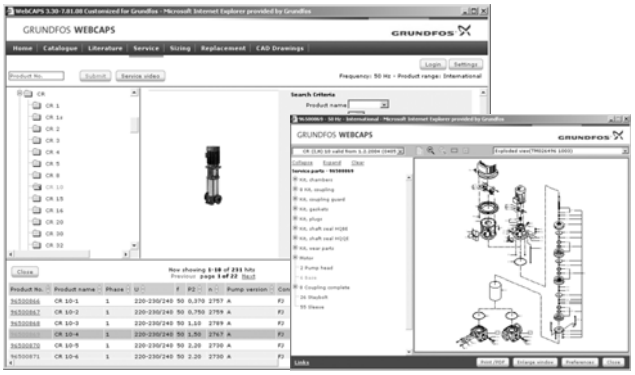
Catalogue

With a starting point in areas of applications and pump types, this section contains
- technical data
- curves (QH, Eta, P1, P2, etc) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



Literature

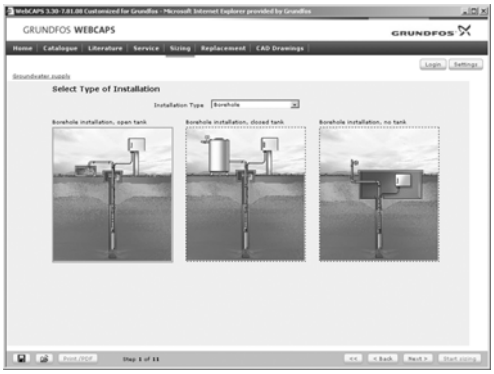
In this section you can access all the lestest documents of a given pump, such as
- data booklets
- Installation and operating instructions
- service documentation, such as Service kit catalogue and Service kit instructions
- quick guides
- product brochures, etc.



Service

This section contains an easy-to-use interactive service catalogue. Here you can find and identify service parts of both existing and cancelled Grundfos pumps.
Furthermore, this section contains service videos showing you how to replace service parts.

Further product documentation



Sizing

With a starting point in different application areas and installation examples, this section gives easy step-by-step instructions in how to

- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, lifecycle costs, etc.
- analyse your selected pump via the built-in lifecycle cost tool
- determine the flow velocity in wastewater applications, etc.



Replacement

In this section you find a guide to select and compare replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump.
The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. After having specified the installed pump, the guide suggests a number of Grundfos pumps which can improve both comfort and efficiency.



CAD drawings

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

The following formats are available in WebCAPS:

2-dimensional drawings
- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings
- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

WinCAPS



Fig. 23 WinCAPS CD-ROM

WinCAPS is a **Win**dows-based **C**omputer **A**ided **P**roduct **S**election program containing detailed information on more than 185,000 Grundfos products in more than 22 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

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Subject to alterations.

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