

DDI 222

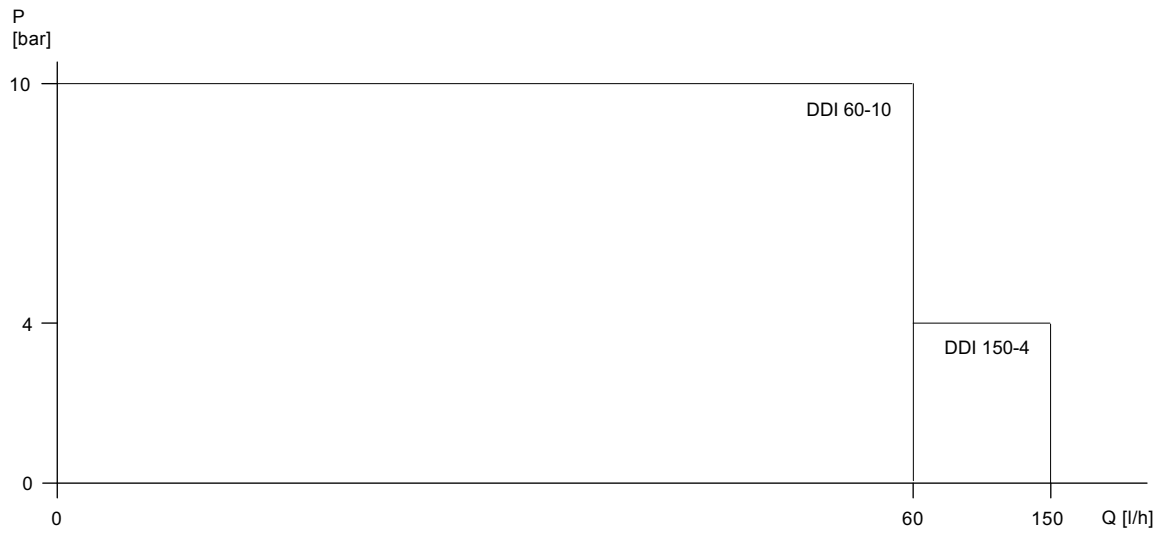
Digital Dosing™



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1. General data

Performance range



TM04 8545 1512

Fig. 1 Performance range

Features and benefits

DDI 222 Digital dosing pumps up to 150 l/h



TM04 8546 1512

Fig. 2 DDI 222

The DDI series is firmly established on the dosing pump market with its combination of innovative drive technology and integrated microelectronics.

Users appreciate how they can simply enter the required dosing rate in litres per hour and let the DDI handle the rest.

Double-diaphragm system for optimum process reliability

Some processes must never be interrupted, not even in the event of a diaphragm rupture. The DDI is equipped with a double-diaphragm system. If the diaphragm fails, the DDI continues dosing thanks to the protective diaphragm.

Turndown ratio of 1:800

The DDI has a turndown ratio ten times better than that of conventional equipment. This allows us to create a complete pump series with just one motor, one gearing system, and two pump head sizes. You get the precision you want every time - and need only a minimum of spare parts and storage capacity.

Compact design

DDI pumps are smaller and quieter than conventional pumps in their class, which makes them easy to install anywhere. Order your DDI according to your wishes, with the control elements and display on the side or at the front.

Full stroke length every time

The DDI uses a full stroke length every time - a feature unique to Grundfos digital dosing pumps. Each stroke is carefully timed to bring you even concentrations in the system and optimum priming throughout the entire operating range.

Brushless DC motor

The brushless DC motor used in the DDI series ensures very smooth, continuous dosing while keeping energy consumption at a record low.

Anti-cavitation function

The SlowMode settings reduce the suction stroke systematically, so that difficult, viscous liquids are dosed with smooth precision. When set at 60 % of the maximum dosing rate, the DDI can dose liquids with a viscosity of up to 1000 mPas. When set at 40 %, the DDI can handle extremely viscous liquids up to 2600 mPas. You no longer need external dilution or treatment systems, but can dose chemicals directly and without waste.

Bus communication

The DDI is also available with a PROFIBUS DP interface.

Switch-mode power supply

DDI pumps can be used worldwide within the range of 110-240 VAC, 50/60 Hz.

FlowMonitor checks for malfunctions

The optional FlowMonitor detects any dosing errors on both the suction and discharge sides and immediately emits an error message if anything is wrong. It can also check for excess pressure: Just enter the maximum counterpressure allowed (in bar) and leave everything to the DDI. If the pressure is exceeded, the pump stops.

Diaphragm leakage detection

If the pump is supplied with diaphragm leakage detection, a differential pressure sensor sends an error signal as notification to replace the diaphragm.

When dosing crystallising media, the pump must be equipped with diaphragm leakage detection.

Examples of applications

- Industrial and municipal water treatment
- Industrial cleaning
- Polymer feed
- Paper production, paper finishing
- Optical technology and chip production
- Chemical industry
- Cleaning-In-Place (CIP) and disinfection
- Galvanic and surface treatment
- Air conditioning, water treatment in cooling towers
- Reverse-osmosis systems
- Semi-conductor industry.

2. Identification

Type key

Example:	DDI	150	-4	AR	-PP	/E	/G	-S	-3	1	B2	B2	F
Type range													Mains plug
DDI													X No plug
Maximum flow [l/h]													F EU
Maximum counterpressure [bar]													B USA, Canada
Control variant													I Australia, New Zealand
AR Standard													E Switzerland
AF AR with FlowMonitor													Connection, suction/discharge
AP AR with PROFIBUS													4 Hose, 6/9 mm
APF AR with FlowMonitor and PROFIBUS													6 Hose, 9/12 mm
Dosing head variant													S Hose, 0.375"/0.5"
PP Polypropylene													Q Hose, 19/27 mm
PV PVDF													B1 Hose, 6/12 mm, pipe cementing Ø12 mm
PVC Polyvinyl chloride													B2 Hose, 13/20 mm, pipe cementing Ø25 mm
SS Stainless steel, DIN 1.4401													A Threaded, Rp 1/4, female
PP-L PP, integrated diaphragm leakage detection													A1 Threaded, Rp 3/4, female
PV-L PV, integrated diaphragm leakage detection													A3 Threaded, 3/4" NPT, female
PVC-L PVC, integrated diaphragm leakage detection													V Threaded, 1/4" NPT, female
SS-L SS, integrated diaphragm leakage detection													A9 Threaded, 1/2" NPT, male
Gasket material													B3 Welding Ø16 mm
E EPDM													B4 Welding Ø25 mm
V FKM													Valve type
T PTFE													1 Standard
Valve ball material													2 Spring-loaded, 0.05 bar opening pressure, suction/discharge
C Ceramic													5 For abrasive media (SS only)
G Glass													6 Spring-loaded (DN 20, SS valve balls), 0.8 bar opening pressure, discharge
T PTFE													Supply voltage
SS Stainless steel, DIN 1.4401													3 1 x 100-240 V, 50/60 Hz
Operating elements													
F Front-mounted													
S Side-mounted													

3. Functions

Overview of functions

	Control variant	APF	AP	AF	AR
General					
Internal stroke-speed and stroke-frequency control		•	•	•	•
Operating elements					
Capacity setting in litres or US gallons		•	•	•	•
LCD display with background light and soft buttons		•	•	•	•
Easy set-up menu		•	•	•	•
Start/Stop button		•	•	•	•
Green LED for operating indication		•	•	•	•
Red LED for fault indication		•	•	•	•
Lock of operating elements		•	•	•	•
Position of operating elements: front or side		•	•	•	•
Operation modes					
Manual control		•	•	•	•
Pulse control (contact signal control) in ml/pulse (ml/contact)		•	•	•	•
Analog control 0/4-20 mA		•	•	•	•
Batch control (pulse-based)		•	•	•	•
Timer batch control		•	•	•	•
Continuous operation (for functional test, self-priming, dosing head deaeration)		•	•	•	•
PROFIBUS control		•	•		
Functions					
SlowMode (anti-cavitation)		•	•	•	•
Calibration		•	•	•	•
Scaling of analog input/output		•	•	•	•
Relay setting: error signal and low-level signal, pulse signal or stroke signals		•	•	•	•
External stop		•	•	•	•
Pressure limitation		•	•	•	•
Memory function for pulse input		•	•	•	•
Diaphragm leakage detection		•	•	•	•
Hall sensor for motor monitoring		•	•	•	•
FlowMonitor		•		•	
Pressure monitoring		•		•	
Inputs/outputs					
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 PROFIBUS		•	•		

Functional description

The DDI has a BLDC (brushless DC) motor and electronic power control.

As shown in the figure below, the duration of each suction stroke is constant while the duration of each discharge stroke varies according to the set capacity.

This has many advantages:

- The full stroke length reduces gas build-up in the dosing head.

- Constant dosing ensures an optimum mixing ratio at the injection point.
- The significant reduction of pressure prevents mechanical stress on wearing parts such as diaphragm, hoses, pipes and connections.
- The installation is less affected by long suction and discharge lines.
- Easier dosing of highly viscous and volatile liquids.

Capacity setting

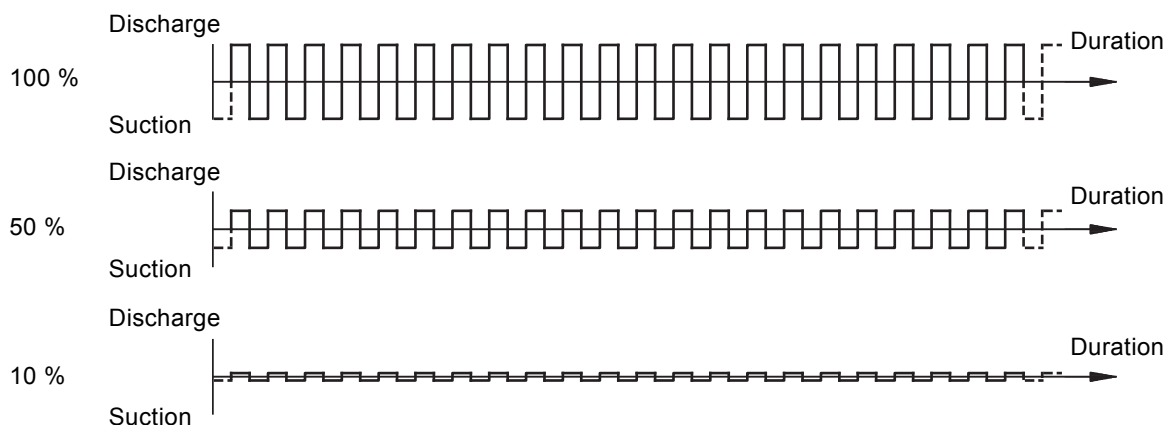


Fig. 3 Relation between discharge stroke speed and capacity

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Operating elements

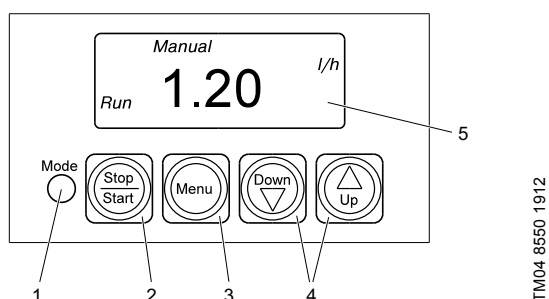


Fig. 4 Operating elements

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Legend

Pos.	Description
1	<p>Mode (LED):</p> <ul style="list-style-type: none"> • Red LED indicates that the pump is not running. • Green LED indicates that the pump is running; the LED is briefly off during a suction stroke. • Yellow LED indicates that the pump has been stopped by an external contact signal. • Red LED is flashing in case of an error signal. • LED is off during access to the configuration menu.
2	<p>Stop/Start (button):</p> <ul style="list-style-type: none"> • Press the button to start and stop the pump.
3	<p>Menu (button):</p> <ul style="list-style-type: none"> • Press the button to switch between operating modes.
4	<p>Down/Up (buttons):</p> <ul style="list-style-type: none"> • Press the button to change the values in the display.
5	LCD display

Menu

Menu, first level

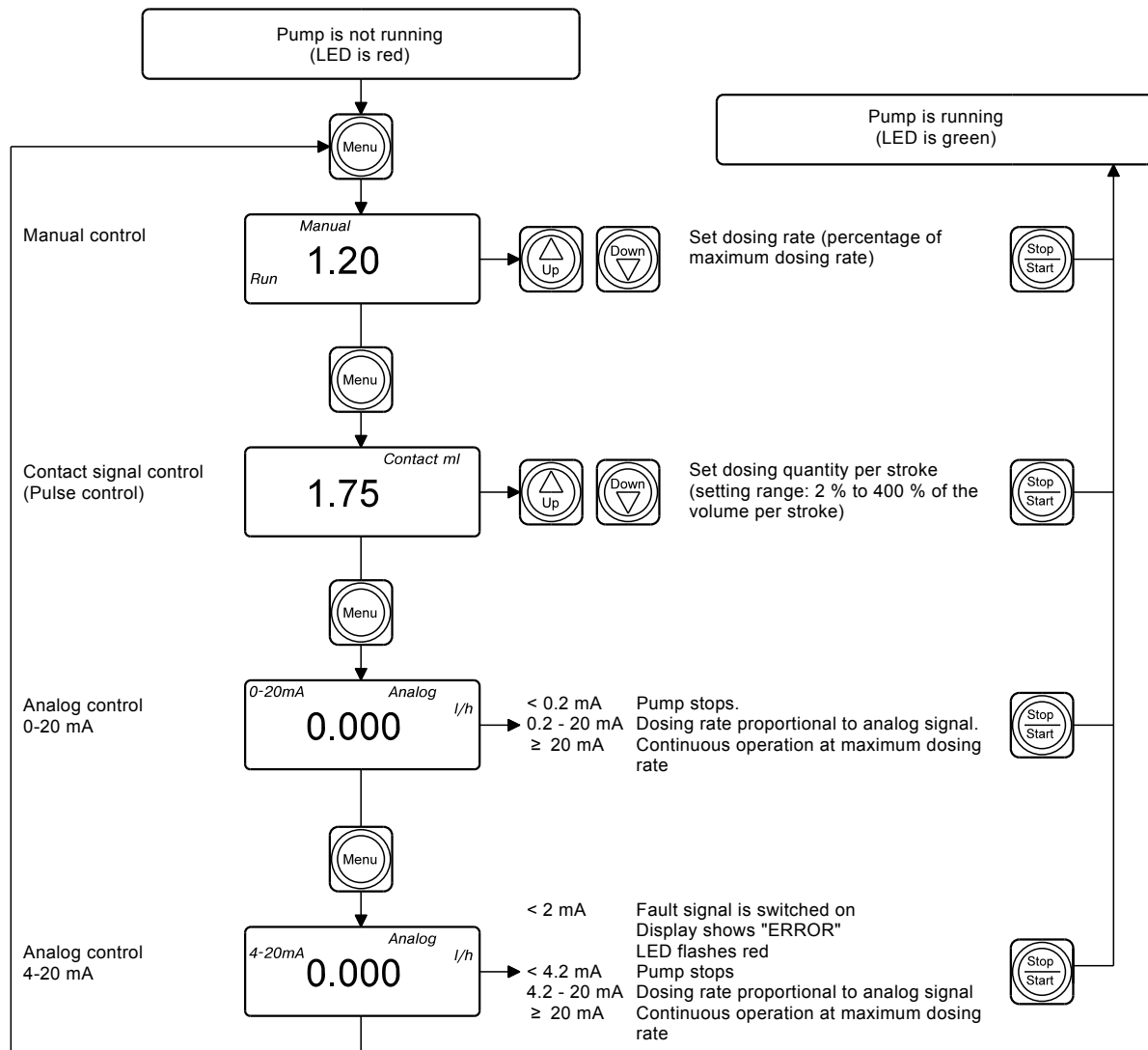


Fig. 5 Menu, first level

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Menu, second level

See the installation and operating instructions of the pump for a detailed overview and instructions for navigating the menu.

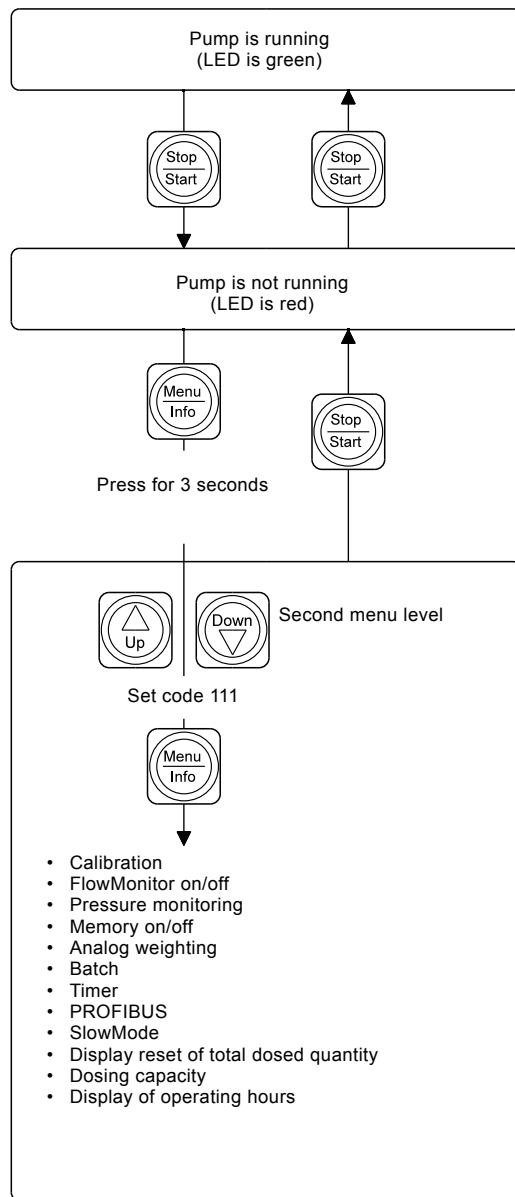


Fig. 6 Menu, second level

Menu, third level

The third level is for setting the pump type and the measuring unit (l/h or gal/h) as well as inputs and outputs.

Operation modes

Manual control

In manual control mode, the flow rate in the display can be set in l/h or gal/h.

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 that the required quantity is dosed for each incoming pulse.

Pump type	V_{\min}	V_{\max}
DDI 60-10	0.111 ml	22.2 ml
DDI 150-4	0.278 ml	55.5 ml

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 function, when activated.

Analog control

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

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

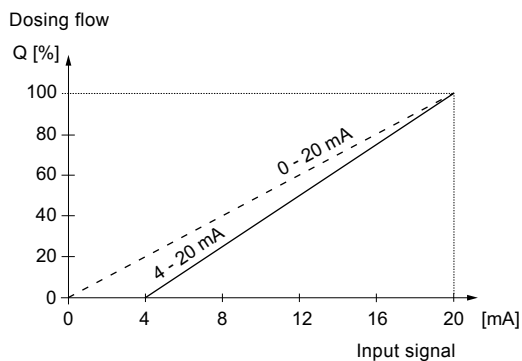


Fig. 7 Analog control

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

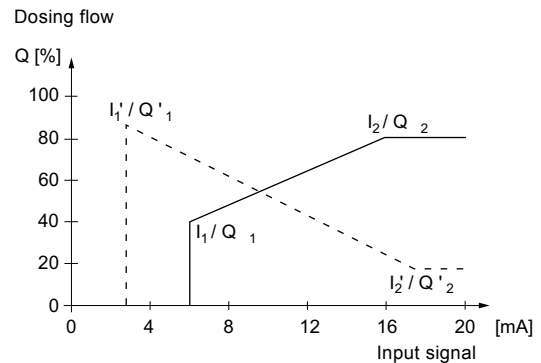


Fig. 8 Analog scaling

Batch control

In batch control, a defined batch quantity is dosed with a defined flow rate. The dosing of a batch can be triggered manually and by pulse.

Timer batch control

The set batch quantity is dosed with a preset interval.

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Functions

SlowMode

When the SlowMode function 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.

SlowMode can be activated in any operating mode.

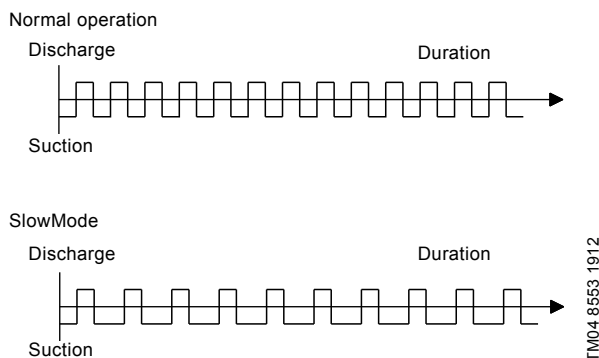


Fig. 9 SlowMode and normal operation

Calibration

At the factory, the pump is calibrated to a counterpressure of 3 bar. Calibration can be used to set the dosing flow to the current operating conditions.

External stop

With the external stop function, the pump can be stopped from a remote place by an external contact signal. If the pump is stopped by an external contact signal, it does not respond to any input signals or to operator inputs.

Exceptions:

- The pump can be stopped manually by pressing [Stop/Start].
- The pump can be set to run continuously by pressing and holding down [Stop/Start].

If the pump is stopped by an external contact signal, the following takes place:

- "Stop" is shown in the display.
- The yellow LED illuminates.
- The pump returns to the state before it was switched off. For example, if the pump was in the "Stop" mode, it returns to the "Stop" mode when switched on again.

Pressure limitation

The pump features an integrated pressure limitation function. If the pump is equipped with a pressure sensor (FlowMonitor option), the pressure is measured directly in the dosing head.

If the pump doesn't have a pressure sensor, the pressure is calculated from the motor current consumption. At a pressure that is defined by the user, the pump is switched off automatically.

Diaphragm leakage detection

Pumps with diaphragm leakage detection have a special dosing head with diaphragm set and pressure switch. The pressure switch is fitted and connected to the pump on delivery.

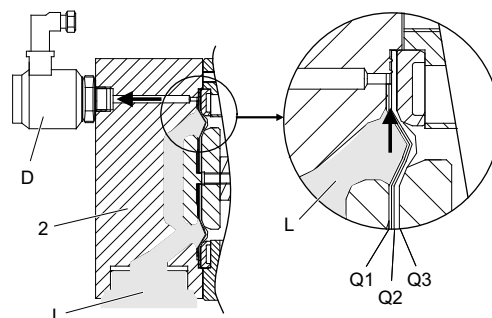


Fig. 10 Dosing head with diaphragm set and pressure switch

Pos.	Component
2	Dosing head
D	Pressure switch
Q1	Working diaphragm
Q2	Signal diaphragm (intermediate layer made of fabric)
Q3	Protection diaphragm
L	Dosing liquid

In the event of a diaphragm leakage:

- Dosing liquid penetrates between the working diaphragm and the protection diaphragm, and is transferred to the pressure switch via the signal diaphragm.
- On the next discharge stroke, pressure is applied to the pressure switch, which is activated. The pump indicates an error but continues running.
- The error relay is triggered.
- In emergency mode, the pump can continue running for a short time.

FlowMonitor

The FlowMonitor keeps the dosing flow constant even if the system pressure varies. Possible dosing faults or the exceeding of the permissible counterpressure are detected reliably and shown in the display or by error message.

A pressure sensor is integrated in the dosing head. Pressure changes are detected by the pressure sensor and the motor speed is adjusted accordingly. Based on the pressure measured by the sensor and on the motor position, an indicator diagram is created, which allows the reliable detection of dosing errors.

The pressure sensor is installed in the dosing head on delivery. Retrofitting is not possible.

Pressure monitoring

The integrated pressure sensor measures the actual pressure of the system. A maximum pressure can be set. If the pressure in the system exceeds the set maximum, the pressure monitoring function stops the dosing process immediately. As soon as the pressure falls below the set maximum, the dosing process is continued. In case the pressure drops below the minimum limit, the pump stops and major chemical spills are prevented.

Relay output

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

Relay 1	Relay 2	Description
Pulse		Every pulse coming in from pulse input
Stroke		Every completed stroke
Low-level		Low level of tank
	Error	Tank empty, diaphragm leakage, motor blocked, cable break, faulty sensor, dosing error, overpressure

Lock of operating elements

The pump can be locked to prevent it from being stopped manually. When the lock is activated (service level), the pump starts running with the current settings and cannot be stopped by means of the [Stop/Start] button.

It is possible to acknowledge error messages by pressing the [Stop/Start] button.

To stop the pump when the lock is activated, proceed as follows:

- If the external stop function is active (the plug is inserted), switch off the pump remotely.
- Disconnect the pump from the power supply.

Bus communication

The pump is also available with a PROFIBUS DP interface.

Connections

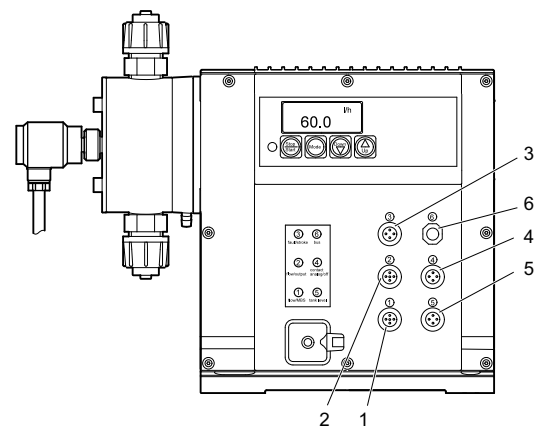


Fig. 11 Connections

Legend

Socket	Description
1	Diaphragm leakage detection and/or FlowMonitor
2	Analog output and/or FlowMonitor
3	Output relays: Relay 1: pulse signal or stroke signal or low-level signal Relay 2: error signal
4	External stop and pulse input or analog input
5	Tank-empty signal or low-level signal and tank-empty signal
6	PROFIBUS (optional)

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4. Construction

General

DDI pumps are digitally controlled dosing pumps.

They are driven by a low-energy BLDC (brushless DC) motor. The speed of the motor is reduced by means of toothed belts. The suction and discharge strokes are generated by the motor.

The operating elements can be mounted at the front or the side of the pump.

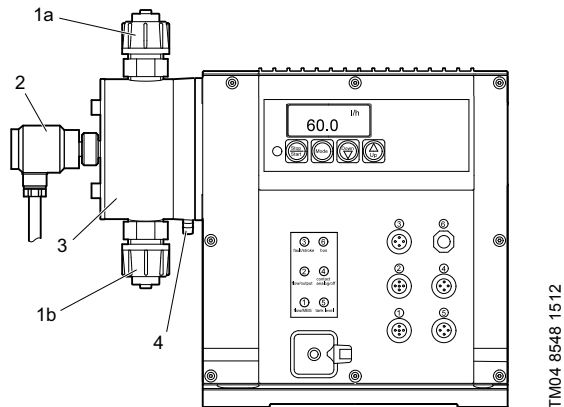


Fig. 12 Components

Legend

Pos.	Component
1a	Discharge valve
1b	Suction valve
2	Diaphragm leakage detection
3	Dosing head
4	Drain hole

Spring-loaded valves

The pump head can be supplied with spring-loaded valves for improved performance when handling viscous liquids. Some of the spring-loaded valves have a larger nominal width and incorporate adapters.

Note: The suction and discharge dimensions of the pump may change when the pump is fitted with spring-loaded valves.

5. Dimensions

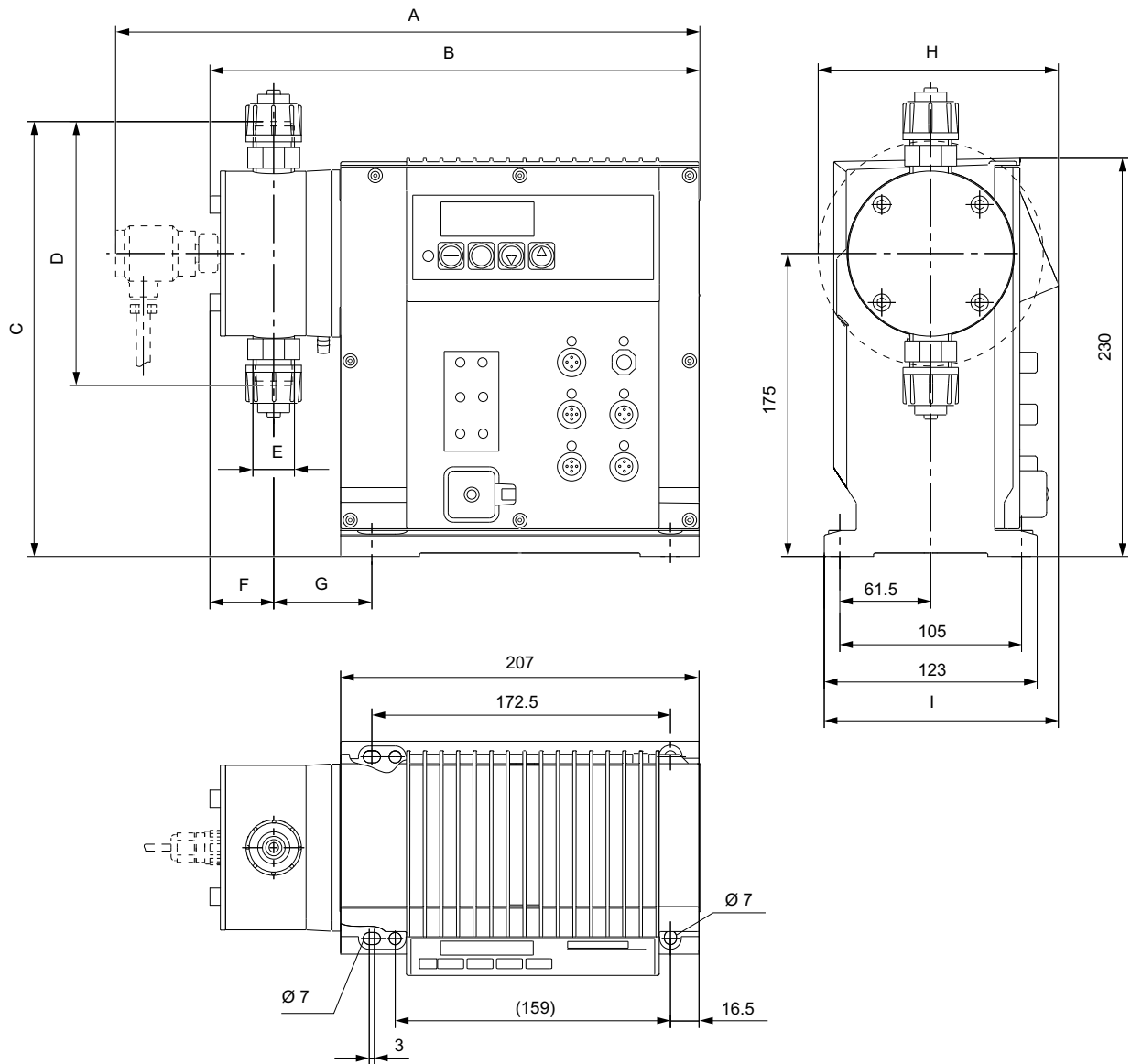


Fig. 13 Dimensions

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Pump	Model	Standard version									Version for high-viscosity liquids (HV)				
		A [mm]	B [mm]	C [mm]	D [mm]	E	F [mm]	G [mm]	H [mm]	I [mm]	C [mm]	D [mm]	E	F [mm]	G [mm]
DDI 60-10	222	326	272	252	153	R 5/8	26	58	-	137	246	143	R 1 1/4	39	90
DDI 150-4	222	372	315	265	179	R 1 1/4	39	90	139	137	265	179	R 1 1/4	39	90

6. Technical data

Data		DDI 60-10	DDI 150-4	
	Stroke volume	[cm] ³	6.63	13.9
	Max. pressure ¹⁾	[bar]	10	4
	Max. dosing flow ²⁾	Normal operation [l/h]	60	150
		SlowMode 1 [l/h]	40	100
		SlowMode 2 [l/h]	25	62
	Control range	[%]	0.125 to 100 of the maximum dosing flow	
	Max. stroke frequency	[strokes/min]	180	180
	Accuracy of repeatability	[%]	+/- 1.5	
	Max. suction lift during operation ³⁾ Liquids with a viscosity similar to water	[m]	6.0	3.0
	Max. suction lift during start up ⁴⁾ Non-degassing liquids with a viscosity similar to water	[m]	1.0	1.0
	Max. permissible viscosity at operating temperature ⁵⁾	Normal operation [mPas]	100	100
		SlowMode 1 [mPas]	200	200
		SlowMode 2 [mPas]	500	500
Mechanical data	Max. permissible viscosity at operating temperature ⁵⁾ Spring-loaded valves ⁶⁾	Normal operation [mPas]	200	200
		SlowMode 1 [mPas]	1000	800
		SlowMode 2 [mPas]	3000	1800
Max. inlet pressure at the suction side of the pump	Normal operation [bar]	2.0	2.0	
	SlowMode 1 [bar]	2.0	2.0	
	SlowMode 2 [bar]	2.0	2.0	
Min. counterpressure at the discharge valve of the pump	Normal operation [bar]	1.0	1.0	
	SlowMode 1 [bar]	1.0	1.0	
	SlowMode 2 [bar]	1.0	1.0	
Permissible temperature of the pumped liquid, p ≤ 10 bar	PVC, PP [°C]	0 to 40		
	Stainless steel DIN1.4571 ⁷⁾ [°C]	-10 to 70		
	PVDF ⁸⁾ [°C]	-10 to 60		
	Permissible ambient temperature [°C]	0 to 40		
	Permissible storage temperature [°C]	-10 to 50		
	Max. relative humidity [%]	92 (non condensing)		
	Material of enclosure (pump and electronics)	PPE-SB (fibre-reinforced Luranyl®) Option: flameproof enclosure		
Electrical data	Power supply [VAC]	110-240 V, 50/60 Hz		
	Power consumption [W]	70		
	Enclosure class	IP65		
Signal input	Minimum pulse length [ms]	10		
	Minimum pause time [ms]	25		
	External stop	< 12 V, 5 mA		
	Tank-empty signal	< 12 V, 5 mA		
	Analog signal [Ω]	< 22		
	Analog signal [Ω]	< 350		
Signal output	Error signal	ohmic load < 50 VDC / 75 VAC, 0.5 A		
	Low-level signal	ohmic load < 50 VDC / 75 VAC, 0.5 A		
	Stroke signal Contact time: 200 ms/stroke	ohmic load < 50 VDC / 75 VAC, 0.5 A		
Weights	PVC, PVDF, PP [kg]	5.0	6.5	
	Stainless steel [kg]	7.0	12.0	
Sound pressure	[dB (A)]	65 ± 5		
Certificates and approvals		CE		

1) Observe the maximum permissible temperatures. When dosing viscous liquids, observe the maximum permissible viscosity.

2) The maximum dosing flow of pump versions for high-viscosity liquids (HV) is reduced by up to 10 %.

3) Dosing head and valves moistened.

4) Deaeration valve open.

5) The specified values are approximate and refer to Newtonian fluids.

6) Pump version for high-viscosity liquids (HV).

7) Short-term (15 min.) resistance to 120 °C at up to 2 bar counterpressure.

8) Increased resistance to 70 °C, if the counterpressure is less than 3 bar.

7. Pump selection

Key to the following tables:

Maximum flow - pressure		[l/h]-[bar]		
Control variant	AR	Standard		
	AF	AR with FlowMonitor		
	AP	AR with PROFIBUS		
	APF	AR with FlowMonitor and PROFIBUS		
Material	Dosing head	PP	PP	
		PV	PVDF	
		PVC	PVC	
		SS	Stainless steel 1.4401	
	Gaskets	PP-L	PP, integrated diaphragm leakage detection	
		PV-L	PVDF, integrated diaphragm leakage detection	
		PVC-L	PVC, integrated diaphragm leakage detection	
		SS-L	SS, integrated diaphragm leakage detection	
		Valve balls	E	EPDM
			V	FKM
T	PTFE			
Operating elements	C	Ceramic		
	G	Glass		
Supply voltage	T	PTFE		
	SS	Stainless steel 1.4401		
Valve type	F	Front-mounted		
	S	Side-mounted		
	1	Standard		
	2	Spring-loaded, 0.05 bar opening pressure, suction/discharge		
	5	For abrasive media (SS only)		
	6	Spring-loaded (DN 20, SS valve balls), 0.8 bar opening pressure, discharge		
Connection, suction/discharge	4	Hose, 6/9 mm		
	6	Hose, 9/12 mm		
	S	Hose, 0.375" / 0.5"		
	Q	Hose, 19/27 mm		
	B1	Hose, 6/12 mm, pipe cementing Ø12 mm		
	B2	Hose, 13/20 mm, pipe cementing Ø25 mm		
	A	Threaded, Rp 1/4, female		
	A1	Threaded, Rp 3/4, female		
	A3	Threaded, 3/4" NPT, female		
	V	Threaded, 1/4" NPT, female		
	A9	Threaded, 1/2" NPT, male		
	B3	Welding Ø16 mm		
	B4	Welding Ø25 mm		
	Mains plug	F	EU	
B		USA, Canada		
I		Australia		
E		Switzerland		
X		No plug		

DDI 60-10, P < 10 bar, DN 8

Max. flow - pressure	Control variant	Material dosing head/gaskets/ valve balls	Operating elements	Supply voltage	Valve type	Connection, suction/discharge	Mains plug
60-10	AR AF AP APF	PP/E/C	F S	3	1 2 5 6	4	F B I E X
		PP/V/C				6	
		PP/V/G				A9	
		PV/T/C				B1	
		PVC/E/C				B3	
		PVC/E/SS				S	
		PVC/V/C				B2★	
		PVC/V/G				B4★	
						Q★	
		SS/T/SS	F	3	1	A9	F
		SS/V/SS	S		2	B6	B
					5	A★	I
					6	A3★	E
							X

★ Only for pump versions for high-viscosity liquids

DDI 150-4, P < 10 bar, DN 20

Max. flow - pressure	Control variant	Material dosing head/gaskets/ valve balls	Operating elements	Supply voltage	Valve type	Connection, suction/discharge	Mains plug
150-4	AR AF AP APF	PP/E/SS	F S	3	1 2 5 6	A7	F B I E X
		PP/E/T				B2	
		PP/V/G				B4	
		PV/T/C				Q	
		PV/T/T					
		PVC/E/SS					
		PVC/E/T					
		PVC/V/C					
		PVC/V/G					
		SS/T/SS	F	3	1	A1	F
		SS/V/SS	S		2	A3	B
					5		I
					6		E
							X

8. 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. Please be careful when handling these liquids.

Pumped liquid (20 °C)			Materials								
			Dosing head				Gasket			Ball	
Description	Chemical formula	Concentration [%]	PP	PVDF	SS 1.4401	PVC	FKM	EPDM	PTFE	Ceramic	Glass
			Acetic acid	CH ₃ COOH	25	•	•	•	•	-	•
60	•	•			•	•	-	○	•	•	•
85	•	•			•	•	-	-	•	•	•
Aluminium chloride	AlCl ₃	40	•	•	-	•	•	•	•	•	
Aluminium sulphate	Al ₂ (SO ₄) ₃	60	•	•	•	•	•	•	•	-	
Ammonia, aqueous	NH ₄ OH	28	•	-	•	•	-	•	•	•	-
Calcium hydroxide ⁷	Ca(OH) ₂		•	•	•	•	•	•	•	•	•
Calcium hypochlorite	Ca(OCl) ₂	20	○	•	-	•	•	•	•	•	•
		10	•	•	•	•	•	•	•	•	•
		30	-	•	-	•	•	○	•	•	•
		40	-	•	-	•	•	-	•	•	•
Chromic acid ⁵	H ₂ CrO ₄	50	-	•	-	•	•	-	•	•	•
		30	•	•	•	•	•	•	•	•	•
Copper sulphate	CuSO ₄	30	•	•	•	•	•	•	•	•	
Ferric chloride ³	FeCl ₃	60	•	•	-	•	•	•	•	•	
Ferric sulphate ³	Fe ₂ (SO ₄) ₃	60	•	•	•	•	•	•	•	•	
Ferrous chloride	FeCl ₂	40	•	•	-	•	•	•	•	•	
Ferrous sulphate	FeSO ₄	50	•	•	•	•	•	•	•	•	
Hydrochloric acid	HCl	< 25	•	•	-	•	○	•	•	•	•
		25-37	•	•	-	•	-	•	•	•	•
Hydrogen peroxide	H ₂ O ₂	30	•	•	•	•	•	•	•	•	•
		10	•	•	•	•	•	•	•	•	•
		30	•	•	•	•	•	•	•	•	•
Nitric acid	HNO ₃	40	○	•	•	•	•	•	•	•	•
		70	-	•	•	-	•	-	•	•	•
		5	•	•	-	•	-	•	•	•	•
Peracetic acid	CH ₃ COOOH	5	•	•	-	•	-	•	•	•	
Potassium hydroxide	KOH	50	•	-	•	•	-	•	•	-	
Potassium permanganate	KMnO ₄	10	•	•	•	•	-	•	•	•	
Sodium chlorate	NaClO ₃	30	•	•	•	•	○	•	•	•	
Sodium chloride	NaCl	30	•	•	-	•	•	•	•	•	
Sodium chlorite	NaClO ₂	20	•	○	-	-	•	•	•	•	•
		20	•	○	•	•	•	•	•	•	-
		30	•	-	•	•	•	•	•	•	-
Sodium hydroxide	NaOH	50	•	-	•	•	•	•	•	-	
Sodium hypochlorite	NaOCl	20	○	•	-	•	•	•	•	•	
Sodium sulphide	Na ₂ S	30	•	•	•	•	•	•	•	-	
Sodium sulphite ⁶	Na ₂ SO ₃	20	•	•	•	•	•	•	•	-	
Sulphurous acid	H ₂ SO ₃	6	•	•	•	•	•	•	•	○	
Sulphuric acid ⁴	H ₂ SO 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.

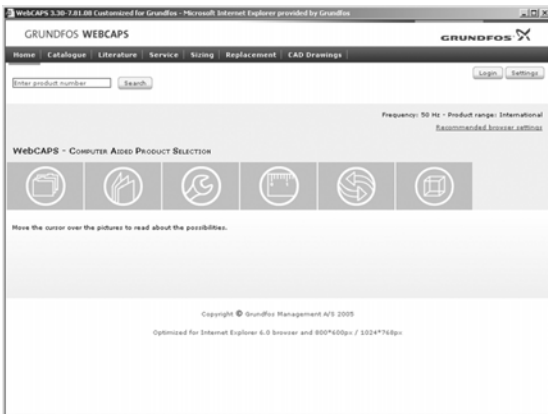
6 In neutral solutions.

7 Saturated solution 0.1 %.

For further information, see "Pumped Liquid Guide".

9. Further product information

WebCAPS

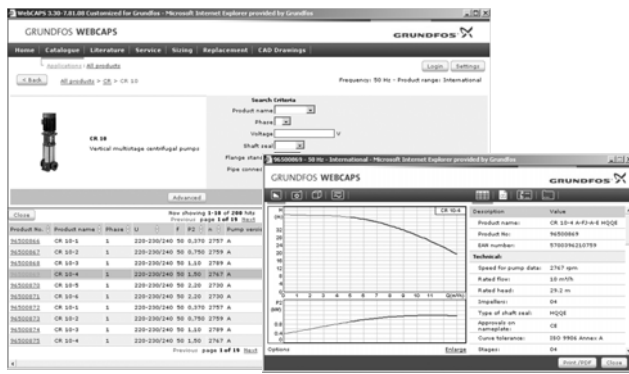


WebCAPS is a **Web-based Computer Aided Product Selection** program available on www.grundfos.com.

WebCAPS contains detailed information on more than 220,000 Grundfos products in more than 30 languages.

Information in WebCAPS is divided into six sections:

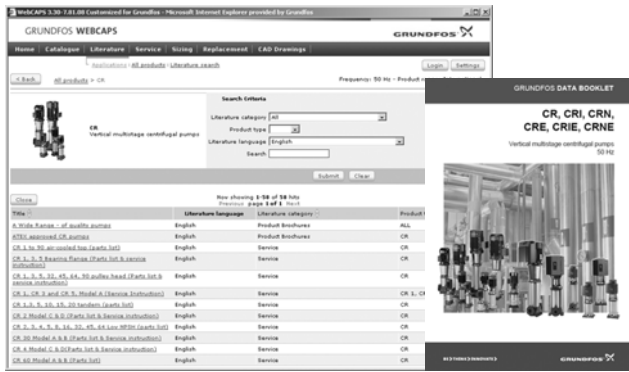
- Catalogue
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



Catalogue

Based on fields of application and pump types, this section contains the following:

- 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

This section contains all the latest documents of a given pump, such as

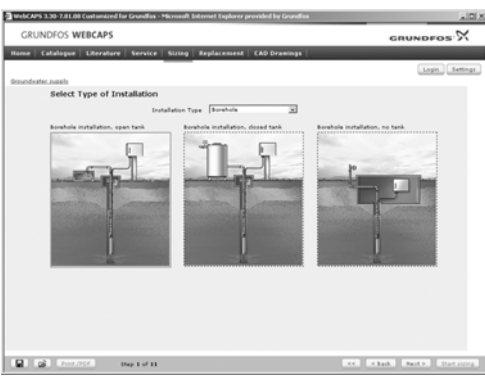
- data booklets
- installation and operating instructions
- service documentation, such as Service kit catalogue and Service kit instructions
- quick guides
- product brochures.



Service

This section contains an easy-to-use interactive service catalogue. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

Furthermore, the section contains service videos showing you how to replace service parts.



Sizing

This section is based on different fields of application and installation examples and gives easy step-by-step instructions in how to size a product:

- Select the most suitable and efficient pump for your installation.
- Carry out advanced calculations based on energy, consumption, payback periods, load profiles, life cycle costs, etc.
- Analyse your selected pump via the built-in life cycle cost tool.
- Determine the flow velocity in wastewater applications, etc.

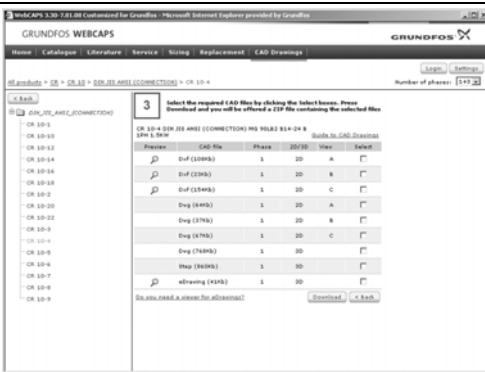


Replacement

In this section you find a guide to selecting and comparing 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. When you have specified the installed pump, the guide will suggest 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.

These 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. 14 WinCAPS DVD

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 220,000 Grundfos products in more than 30 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 DVD and updated once a year.

GO CAPS

Mobile solution for professionals on the GO!



CAPS functionality on the mobile workplace.



Subject to alterations.

be think innovate

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