# Assembly and operating instructions DULCOMARIN<sup>®</sup> II Function extension with F module



General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

#### Supplementary information

Please read the supplementary information in its entirety.

#### Information



This provides important information relating to the correct operation of the unit or is intended to make your work easier.

#### Warning information

Warning information include detailed descriptions of the hazardous situation.

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

#### More symbols

Symbol	Description
1.	Action, step by step.
⇔	Outcome of an action.
<b>徐</b>	Links to elements or sections of these instructions or other applicable documents.
	List without set order.
[Button]	Display element (e.g. indicators).
	Operating element (e.g. button, switch).
"Display /GUI"	Screen elements (e.g. buttons, assignment of function keys).
CODE	Presentation of software elements and/or texts.

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## 1 Functions in the F module of the Dulcomarin<sup>®</sup> II DXCa

The F module carries out functions for the existing combination of A and P modules together and also expands these functions

The following functions can be covered using the F module. The details concerning these are explained in individual application examples:

- Circulating operation
- Automatic backwashing
- First filtrate
  - Internal circuit
  - Electrical backflow shut-off valve
- Lowering of the water level during standby operation
- Circulation flow control [Flowcontrol]
- Water level control
- Sample water valve
- Heating function
  - Heating control heat exchanger
  - Solar heating
- Gutter cleaning function
- Attractions
  - Cover Open/Close
  - Counterflow system/JetStream
  - Flood/neck shower
  - Massage nozzle
  - Underwater light
- Flow control
  - Actual circulation flow measurement
  - Fresh water top-up measurement
- Control variables for:
  - Disinfection
  - pH (+/-)
  - Flocculation
  - UV System
  - Backwashing emergency emergency-off [RNA], if wateralarm

## 2 Installation of the F module

The F module uses the installation space of the A and P modules. The existing functions in the combination of A and P modules are covered by the F module. To control the hygiene parameters, an M module is always required. The sensors for pH, redox, temperature and sample water flow monitoring are connected to the M module. You can also connect the external DIN contact to the M module.

0/420 mA + -   + -   + - + - + - + - + - + - + -	Alarm E O O O O P_REL 1	L* N PE P_REL 2	L* N PE P_REL 3	L* N PE P_REL 4	L* N PE P_REL 5	L* N PE P_REL 6	L* N PE P_REL 7 90-253 VAC
XA 1 XK 1 XK 2 XK 3	XR 1	XR 2	XR 3	XR 4	XR 5	XR 6	XR 7 XP 1
	123	123	123	123	123	123	1 2 3 L N PE

Fig. 1: Terminal allocation F-module

### 2.1 Naming of the mA outputs

Number	Description	Function
lout1	free	Free. Not used
lout1	CntrlCirc1	Control variable, circulation (circulating pump, filtration circuit 1)
lout2	free	Free. Not used
lout2	CntrlCirc2	Control variable, circulation (circulating pump, filtration circuit 2)
lout2	CntrlChlorination ↑	Control variable, raise chlorine dosing
lout2	Cntrl.pH_increase	Control variable, raise pH value
lout2	Cntrl.pH_reduce	Control variable, reduce pH value

## 2.2 Naming of the PCB digital inputs

Description	Function
free	No function, not assigned.
Liquid level	For 1-stage level control, liquid level low = filling starts for x minutes. See § <i>Chapter 5.6 , "Water level control"" on page 21</i> .
Low flow contact	for 4-stage level control. Raw water tank = liquid level low fault. Circulation stops. See & <i>Chapter 5.6 , "Water level con-</i> <i>trol"" on page 21</i> .
Level min-	for 4-stage level control. Raw water tank = liquid level low, filling starts. See & <i>Chapter 5.6 , "Water level control"" on page 21</i> .
Level max+	for 4-stage level control. Raw water tank = full. Filling stops. See ♦ <i>Chapter 5.6 , "Water level control"" on page 21</i> .
Level ++ Alarm	for 3-stage level control. Raw water tank = overfull. Filling stops, alarm relay switches. See $\bigcirc$ <i>Chapter 5.6 , "Water level control"" on page 21</i> .
Water meter	Connection for contact water meter for recording the fresh water top-up volume. See $\bigcirc$ <i>Chapter 5.6 ,"Water level control"" on page 21</i> .
	Description free Liquid level Low flow contact Level min- Level max+ Level ++ Alarm Water meter

### Installation of the F module

Number	Description	Function
K1 K2	Flow	Circulation volume determination. See & Chapter 5.11 "Flow con- trol" on page 28.
K1, K4	Water_flow_1	For monitoring of the water flow (e.g. a paddle switch), switch 1.
K1 K5	Gutter cleaning	This solenoid valve opens during cleaning of the overflow gutter. As a result chemically contaminated swimming pool water flows away into the drain.
K5	Water_flow_2	For monitoring of the water flow (e.g. a paddle switch), switch 2.
K1 K5	Cover CLOSE	Closes the roller cover.
K1 K5	JetStream on/off	Switches the [JetStream] (counterflow system).
K1 K5	Neck shower on/off	Switches the neck shower on/off.
K1 K5	Massage on/off	Switches the massage nozzles on/off.
K1 K5	Backwash EM STOP	Backwash, EMERGENCY STOP.

## 2.3 Naming of the outputs

Number	Description	Function
P1 P7	free	
P1	Collective alarm	
P6	Circ.1	
P7	Circ.2	
P2, P4	Backwash 1	
P3, P5	Backwash 2	
P4, P6	Water top-up	
P2 P7	Heating enable	
P2 P7	Solar heating enable	
P2 P7	JetStream	
P2 P7	Massage pump	
P2 P7	Neck shower on/off	
P2 P7	Gutter cleaning	
P2 P7	Underwater light	
P2 P7	Sample water valve	
P2 P7	First filtrate <b>1</b>	
P2 P7	First filtrate 2	
P2 P7	Non-return flap valve	
P2 P7	UV enable	
P7	Cover OPEN	

Number	Description	Function
P6	Cover CLOSE	
P2 P7	Internal circuit	
P2 P7	Water level reduction	

### 2.4 Delay periods within the system

Function	Delay in seconds (s)						
	State change of the digital inputs						
	[Not faulty] to [Faulty]	[Faulty] to [Not faulty]					
		CLOSE - OPEN					
Liquid level	10 s	10 s					
Water_flow_1	30 s	1 s					
Water_flow_2	30 s	1 s					
Level	10 s	60 s					
Level -	10 s	10 s					
Level +	10 s	10 s					
Level ++	10 s	600 s					
Cover [CLOSE]	1 s	1 s					
Gutter cleaning	1 s	25 s					
JetStream feedback	1 s	1 s					
Neck shower feedback	1 s	1 s					
Massage pump feedback	1 s	1 s					

### 2.5 Switching of inductive loads



If you connect an inductive load, i.e. a consumer which uses a coil (e.g. an alpha motorised pump), then you must protect your controller with a protective circuit. If in doubt, consult an electrical technician for advice.

The RC member protective circuit is a simple, but nevertheless very effective, circuit. This circuit is also referred to as a snubber or Boucherot member. It is primarily used to protect switching contacts.

When switching off, the connection in series of a resistor and capacitor means that the current can be dissipated in a damped oscillation.

Also when switching on, the resistor acts as a current limiter for the capacitor charging process. The RC member protective circuit is highly suitable for AC voltage supplies.

The magnitude of the resistance R of the RC member is determined according to the following equation:

#### R=U/IL

(Where U= Voltage across the load and  $I_L$  = current through the load)

The magnitude of the capacitor is determined using the following equation:

C=k \* IL

k=0,1...2 (dependent on the application).

Only use capacitors of class X2.

Units: R = Ohm; U = Volt;  $I_L$  = Ampere; C =  $\mu$ F



If consumers are connected which have a high starting current (e.g. plug-in, switched mains power supplies), then a means of limiting the starting current must be provided.

The switching-off process can be investigated and documented using an oscilloscope. The voltage peak at the switch contact depends on the selected RC combination.



Fig. 2: Switching-off process shown on the oscillogram.



Fig. 3: RC protective circuit for the relay contacts

Typical AC current application with an inductive load:

- 1) Load (e.g. alpha motor-driven pump)
- 2) RC-protective circuit
  - Typical RC protective circuit at 230 V AC:
  - Capacitor [0.22µF/X2]
  - Resistance [100 Ohm / 1 W] (metal oxide (pulse resistant))
- 3) Relay contact (XR1, XR2, XR3)

#### 2.6 Terminal allocation variants

#### 2.6.1 "Private pool" possible terminal allocation



Fig. 4: [Private pool] possible terminal allocation

- I. Frequency converter (FU)
- II. Level switch, 1 -stage
- III. Feedback, cover [CLOSE]
- IV. Feedback, counterflow system [ON/OFF]
- V. Level ++
- VI. Solenoid valve, feedback

- VII. Transformer for underwater light
- VIII. Solenoid valve, water top-up
- IX. Counterflow system [JetStream]
- X. Cover [CLOSE]
- XI. Cover [OPEN]

## 3 F module visualisation system



In the F module visualisation only those operating elements of the attractions are displayed that are actually present. This leads to different visualisations.

SYSTEM 3 pool 3	0	7-Aug-2012 14:17:59	
	CONTROL		ProMinent® ProMaqua®
23,0 °C 28,0 °C 28,0 °C	30,5 °C	<b>0</b> 0	
Fig. 5: F module visualisa	tion system		

- **1.** Load the photos of your swimming bath components on to the SD card of the controller.
  - $\Rightarrow$  Directly in to the root without a sub-folder.
- **2.** Minimum requirements of the photos (JPEG):
  - The aspect ratio (e.g. 16:9 or 3:2) of the photo must correspond to that of your output equipment (e.g. monitor).
  - The photograph resolution should be high enough to ensure that it can be output to the output equipment without any loss of clarity.
  - The reproduction quality cannot be any better that the quality of the photos that are to be output.
  - The file names are given in table ♦ *"Assignment: Attraction to file names" on page 11*; the controller can only find the photo if this naming is used.

	File name									
Attraction	pool_1	pool_2	pool_3	pool_4	pool_5	pool_6	pool_7	pool_8	pool_9	pool_10
JetStream	-	-	x	-	-	-	Х	-	Х	х
Massage pump	-	-	-	-	x	-	x	х	-	x
Neck shower	-	x	-	-	-	-	-	x	x	x
Cover CLOSE	-	-	-	-	-	x	-	-	-	-
Under- water light	-	-	-	x	-	-	-	-	-	-
Attraction is ON	х	ON								
Attraction is ON	-	OFF								
	All photos must be in JPEG format									

### Assignment: Attraction to file names

## 4 Set up of the F module

It may be necessary to enter an access code. pH Redox mV 7,12 23 Clcomp Clfree mg/l mg/l 0, 13 0,48System 1 FAUL Qt. m3/h Children's pool 80 Dosing: OFF F4 Global F3 F5 Circ.1 VIS

*Fig. 6: Continuous display of the DULCOMARIN<sup>®</sup> II in control mode.* 

1. Press the ENTER key in the continuous display of the DUL-COMARIN<sup>®</sup> II



⇒ You are now taken to the central menu item



2. Press the [F4] key from the central menu item

 $\Rightarrow$  You are switched to the configuration menu

M DXMa	A F lout	P 1 lout2	CI K1 K	CI 2 K3 I	R (4 K5	P1	2 P3 P4	F1 P5 F	26 P7	1
K1: free       Iout1: Cntrl circulation 1         K1 Type: NO       Iout2: free         K2: Low flow contact       P1: Collective alarm         K3: Level min -       P3: First filtrate 1         K3: Level max +       P5: Heating enable         K4: Level max +       P5: Heating enable         K5: Level ++ Alarm       P7: Underwater light										
Soft. ve	rs. 33	801	seri	al no.		No 20	ode - ID 0403310	94 0	1	
										27
HELP	0	PTIO	N	PAS	SW	U	PDATE		BUS	

*Fig. 8: Configuration menu of the DULCOMARIN<sup>®</sup> II in control mode.* 

- 3. Using the horizontal arrow keys select the [F1] tab
- 4. In the [F1] tab press the ENTER key
  - ⇒ A display appears for setting the individual functions

	F	-1
DXMaF K1: free K1 Type: NO K2: Low flow contact K2 Type: NO K3: Level min - K3 Type: NO K4: Level max + K4 Type: NO K5: Level ++ Alarm K5 Type: NO	lout1: Cntrl circulation 1 lout2: free P1: Collective alarm P2: Backwash 1 P3: First filtrate 1 P4: Water top-up P5: Heating enable P6: JetStream P7: Underwater light	
SERVICE	Circ. 1 CONFIG	127 SAVE

Fig. 9: Configuration menu of the DULCOMARIN® II

- 5. In this menu you can select the value to be set using the arrow keys and then open the configuration menu by pressing the ENTER key
  - $\Rightarrow$  The configuration menu appears.
- 6. In the configuration menu use the vertical arrow keys to select the necessary function and confirm the selection by pressing the ENTER key
  - ⇒ You are returned to the configuration menu and the change has been saved. If necessary, go through all the required functions.

#### Configuration

F1	1
K1: freeIout1: Cntrl circulation 1K1: freeIout2: freeK2: Low flow contactP1: Collective alarmK2: Level min -P2: Backwash 1K3: Level min -P3: First filtrate 1K3: Type: NOP4: Water top-upK4: Level max +P5: Heating enableK4: Level max +P6: JetStreamK5: Level ++ AlarmP7: Underwater light	
Circ. 1	12
SERVICE CONFIG	SAVE

Fig. 10: Configuration menu of the DULCOMARIN® II

- 7. Press the [F3] key
  - ⇒ You are taken to the configuration menu for the [Parameter circulation 1]
- 8. In this menu you can select the value to be set using the arrow keys and then open the Setting menu by pressing the ENTER key
  - $\Rightarrow$  The configuration menu appears.
- **9.** In the configuration menu use the vertical arrow keys to select the necessary function and enter the necessary control values.
  - $\Rightarrow$  Press the ENTER key after each change.
- **10.** Finally to confirm all changes press the *[F5]* key.

Now either press the ENTER key (changes are saved) or the ESC key (changes are deleted)

⇒ You are returned to the configuration menu.

M DXMa K1: free K1 Type K2: Low K3: Leve K3: Leve K4: Leve K4: Type K5: Leve K5: Type Soft. ve	A F lout flow c flow c NO el min e: NO el max NO el ++ A e: NO rs. 33	P 1 lout2 ontact - + Narm	CI K1 K t seri	CI 2 K3 F al no.	R lout1: ( lout2: f P1: C P2: B P3: Fi P4: W P5: H P6: Je P7: U	P1 P1 Cntrl of ree ollectia ackwa rst filt eating etStre nderw No 20	2 P3 P4 circulatio ve alarm ash 1 rate 1 op-up g enable am vater ligh ode - ID 00403310	F1 P5 F n 1 n 9	26 <b>P7</b>	
										27
HELP	0	PTIC	)N	PAS	SW	U	PDATE		BUS	
										A1255

Fig. 11: Configuration menu of the DULCOMARIN<sup>®</sup> II in control mode.

Service

DXMaF K1: free K1 Type: NO K2: Low flow contact K2 Type: NO K3: Level min - K3 Type: NO K4: Level max + K4 Type: NO K5: Level ++ Alarm K5 Type: NO	Iout1: Cntrl circulation Iout2: free P1: Collective alarm P2: Backwash 1 P3: First filtrate 1 P4: Water top-up P5: Heating enable P6: JetStream P7: Underwater light	-1
SERVICE	Circ. 1 CONFIG	127 SAVE

- Fig. 12: Configuration menu of the DULCOMARIN® II
- 11. Press the [F2] key
  - $\Rightarrow$  The service menu appears.



In this service menu you can read-off all set parameters. This menu does not contain additional functions. You can exit the service menu again be pressing the ESC key.

## 5 Application examples for the F module functions

## 5.1 Circulation operation (1 or 2 parallel lines)

Using the F module in Dulcomarin<sup>®</sup> II it is possible to control the available circulating pumps in different ways. There are three control variants:

Total of power consumers no more than 2 kW The total of all power consumers must not exceed 2 kW in total. Where the total power consumption is greater than 2 kW, a sub-distribution system or an extra power supply cabinet must be provided in accordance with the regulations (VDE). Voltage function: On/Off, 230 V, max 1.1 kVA power. Using a frequency converter individually with a 0/4-20 mA signal, circulating pump 230 V or 400 V. Level control, preset levels for 3 functions (filtration, backwashing and eco-mode). This is only possible using an additional module. Circulation On/Off, voltage 230 V The times for the circulation must be set with the [F4] > [CONFIG] > [F2] > [OPTION] > [TIMER]. If no times are set, then the circulation will not run automatically. To control a 230 V circulating pump, check the existing power consumption of the circulating pump. The circulating pump must not exceed the specified values. You can control two circulating pumps independently of each other using terminals P6 and/or P7 on the F module. Setting of the times is carried out in the operating menu of the Dulcomarin<sup>®</sup> II under [OPTIONS]. **1.** Press the *[Config] [F4]* key. 2. Using the arrow keys exit from *[F module 1]* or *[F module 2]*. 3. Press the Enter key. 4. Enter the access code (4444). 5. Using the arrows keys navigate to [P6] or [P7] to activate them. 6. Press the Enter key.  $\Rightarrow$  An entry field appears. 7. In the entry field use the arrow keys to select the [Circulation 1] function. 8. Confirm your entry by pressing Enter.

#### Setting: Circulation 0/4 ... 20 mA



The specific setting parameters for your system depend on the circumstances of your plant installation. Here we give general guidelines. The setting parameters for your specific system may differ from these.

Dependent on the function and hygiene parameters you can control a frequency-driven circulating pump and set each desired circulating rate using a 0 ... 20 mA signal or a 4 ... 20 mA signal. Simultaneously you can also adjust the circulating rate to match the particular hygiene situation in the swimming pool

The analogue outputs for line 1 and/or line 2 are to be connected to terminal *[K1]* and *[K2]*. The respective individual settings of the minimum and maximum values must be made at the Dulcomarin<sup>®</sup> II in the configuration *[F3]*. The adjustment values are selected using the *[UP]* and *[DOWN]* keys. Access the Entry field by pressing the *[ENTER]* key.

Initial situation: You are in the Dulcomarin® II in configuration [F3].

- **1.** First set the start point for [0 mA] or [4 mA].
  - $\Rightarrow$  In most cases the start point is 0 m<sup>3</sup>/h.
- **2.** Set the maximum circulating rate for the pump.
  - ⇒ This specifies the maximum possible circulating rate value, that can appear on the display.
- 3. Set the [Filtration speed] in normal operation

The filtration speed is calculated from the flow rate/filter surface

- ⇒ For private applications set a filtration speed of up to 50 m/h, for public applications up to 30 m/h
- **4.** Enter the *[Backwash speed]*. In most cases this is greater than the filtration speed.

Backwash speeds of up to 60 m/h are possible. Here you can set the optimum backwash speed in manual mode. Increase the backwash speed until the filter sand is lifted and consequently cleaned; however do not set it so high that sand is washed out of the system.

5. Under menu option *[EcoMod speed]* enter the permissible filtration speed. Here, a very low filtration speed can be set for private pools, however in the public area, the specifications of DIN 19643:2011-05 must be observed. The overall length of the overflow gutter is definitive for setting the filtration speed. Continuous flooding of the overflow gutter must be ensured



#### DIN Error

If [DIN Error] is set to [active], the circulation is immediately increased to the maximum value if the set limit values are exceeded. If [DIN Error] is set to [inactive], then, dependent on the setting, the circulation is steadily, but not immediately, changed over to [Normal mode].

The function of redox circulation is to control low- ering mode so that it is proportionate with the measured redox value.
The redox value quickly measures the actual loading and makes possible direct influence on the circulation if redox circulation is activated. If redox circulation is activated, you can enter the start and end values of the lowering in the bottom field of the window, e.g. Start 750 mV (the start value to go from normal mode into lowering mode) and End 800 mV (from this value, the minimum set circula- tion rate is reached, the controller does not lower the rate any further from this level).
If you have deactivated redox control, so-called step lowering is active.
Here two values must be entered:
<ul> <li>Circulation lowering in %, e.g. 5%</li> <li>Circulation lowering time in seconds, e.g. 300 seconds</li> </ul>
If all DIN values are adhered to, the circulation capacity reduces every 300 seconds (= 5 minutes) in 5% steps. Circulation capacity 65%; then after 300 seconds the circulation is lowered to 60%, etc.
For circulation lowering you can also adjust addi-

ORP circulation

For circulation lowering you can also adjust additional conditions in the M module under [Configuration], switch the DIN contact, define the time window during which circulation lowering is permitted and define the DIN values.

### 5.2 Backwashing with 5-way valve



#### WARNING!

Possible consequence: Fatal or very serious injuries.

Cause: With a 230 V power supply to the Dulcomarin<sup>®</sup> II, 230 V exists at the terminals *[P2]* ... P5 after switching on of the relay.

Measure: Disconnect the system before carrying out any work on the power supply. By taking suitable measures, ensure that there is no danger for the entire system arising from the mains voltage at the terminals *[P2]* ... P5.

The times for the circulation must be set with the [F4] > [CONFIG] > [F2] > [OPTION] > [TIMER]. If no times are set, then the circulation will not run automatically.

To permit automatic backwashing, the 5-way valve (rod valve) (line 1) must be connected to terminal *[P2]* or *[P4]* of the F module and 230 V then connected. If you are operating two lines in parallel, the second 5-way valve must be connected to terminal *[P3]* or *[P5]* of the F module.

- Once you have electrically connected the 5-way valve, then set the function of the terminals [P2]... P5 in the [Configuration] operating menu of the Dulcomarin<sup>®</sup> II.
  - You can freely select these functions. A free allocation of all functions to each relay is not universally possible. Please observe our allocation suggestion in the appendix of the operating instructions. In the appendix, you can find a series of the most appropriate application solutions.

#### 5.3 Hydraulic procedure

5.3.1 First filtrate

Dispose of the first filtrate in the drain

So that after backwashing no dirt or contamination can reach the swimming pool, once the filter bed of the filter returns to the normal condition, the first filtrate must be disposed of. The first filtrate valve is activated for a duration of 20 seconds after backwashing. Use of a 3-way rod valve with water or compressed air as its working energy is recommended. Terminal allocations can be made for both first filtrate valves (lines 1 and 2) at the terminals *[P2] ... [P7]*.

#### 5.3.2 Internal circuit

If a swimming pool roll cover is fitted and a contact is made to the digital input [K1] ... [K5] and activated, then the Dulcomarin<sup>®</sup> II switches a valve via the terminals [P2] ... [P7] if the roll cover closes. Consequently either the level in the swimming pool can be reduced and/or an inlet nozzle can be used as a suction line. This ensures internal mixing of the water, without significant evaporation and an open swimming pool.

**Electrical backflow valve** The electrical backflow value is controlled during operation with 230 V mains voltage. If a power failure results in the system going offline, then a spring-loaded check valve closes and prevents overflowing of the surge water tank and the running dry of the swimming pool.

#### 5.3.3 Backflow shut-off valve

Route first filtrate through internal circuit

Function: Treat the first filtrate in an internal circuit, to ensure sufficient mixing in the pool, without pumping this first filtrate into the swimming pool.

Here a valve is opened upon the start of backwashing. The hydraulic piping should now make possible a direct connection from the tank (nozzle inlet line) to the suction line. The consequence of this is that during backflushing a sufficient priming pressure and a water quantity larger than the capacity of the surge water tank is available. Upon completion of backwashing, the first pure water is pumped through the circulating pump into the filter and thus subject to a cleaning process ensuring that any turbidity in the swimming pool is excluded. This valve is connected to terminals *[P2]* ... *[P7]* and then configured in the operating menu of the Dulcomarin<sup>®</sup> II.

#### 5.4 Lowering the water level

Lowering the water level during standby operation of the water treatment system

To avoid overflowing of the swimming pool water into the overflow gutter during standby (evaporation loss and release of chemicals) and to ensure higher safety of the roll cover under severe weather conditions (e.g. storm), it is possible to connect a valve to the terminals *[P2]* ... *[P7]* of the F module. The lower water level is implemented using a connection line (side bypass or bottom drain) of appropriate height and a ventilation opening at the top point. The water volume that is to be lowered flows into the existing surge water tank where it is stored. The function *"Lowering of the water level"* is started by an electrical contact of the roll cover. The contact input is located on the digital input *[K1]* ... *[K5]*.

### 5.5 "Water flow" circulation flow control

To monitor the circulation, as a dry-run protector for the corresponding circulating pump, it is possible to integrate a flow control (*[Water flow 1]* or *[Water flow 2]*), e.g. a paddle switch. The contact of the flow control is connected in the F module to digital input *[K02]* (with 4-point level measurement) or the digital input *[K04]* (with a 1 or 2-stage level switch).



#### Place the system in AUTO mode

CAUTION!

Cause: In the event of an error, the system is not in *[AUTO mode]*.

Possible consequence: Not all safety equipment is in operation.

Measure: Always return the system to *[AUTO mode]*, so that all safety equipment is active. Pressing the *[Start/Stop]* key resets all existing errors. The system is once more in *[AUTO mode]*.

In the event of an error, the circulation is switched to *[Manual Stop]*. The pump can only be restarted in the manual operating status *[Mode]*.

#### 5.6 "Water level control"



The water top-up solenoid valve can be connected to terminals [P4] or [P6] of the F module. If two F modules are used for one swimming pool system, then it is required that the level evaluation unit and the solenoid valve of the water top-up are connected to the same F module. [Water flow 1] to digital input [K04], [Water flow 2] to digital input [K05].

#### 5.6.1 Single stage level function



Please note that the drinking water connection must not be connected to the pool circuit. See the corresponding DVGW (German Gas and Water Association) or FIGAWA (German Federal Association of Gas and Water Companies) regulations or your own national regulations.

Single stage level function (liquid level + low flow contact) for skimmer/surge water tank.

The function *[Liquid level]* is particularly suitable for swimming pools with a skimmer (surface suction device). With a continuous signal from the minimum contact to the digital input *[K03]*, the water top-up solenoid valve switches on. If the water top-up solenoid valve remains open for more than 180 minutes, the control switches to fault and off. To increase the filling water quantity per filling, it is possible to set a filling time of 0 ... 8 minutes.

Fig. 13: Single stage level function

#### 5.6.2 Two level functions, single stage and overflow alarm

This function comprises a single stage level function and a forced switching of the circulating pump at *[Level Max++]*. When used with two level points, the maximum level can be used for switching the circulating pump. The electrical connection is made to digital input K3 *[Liquid level]*, the *[Max ++]* switching point to *[K5]* and the possible flow control signal *[Water flow]* to *[K4]*.

Function: If the circulating function is not active due to the timer, rather normal swimming pool operation mode is active and the surge water tank then overflows due to heavy wave formation, the circulating pump starts automatically for 10 minutes. If the level switch still reports a too high level in the surge water tank, then this process repeats. The solenoid valve is connected to terminal *[P4]* or *[P6]*.



Fig. 14: Two level functions, single stage

#### 5.6.3 Level function with 4 level signallers



A1252

Fig. 15: Level switch



#### Logical function

The four-stage level function is checked for logical function. If the [--] Low flow contact and the [+] Maximum level are active, an error message is output.

Four-stage level function with the functions

- [--] low flow contact
- [-] minimum level
- [+] maximum level
- [++] alarm level

With this version, 4 switching points are monitored. Suitable ProMinent<sup>®</sup> level switches must be used here (part number 1019244 single weight // 1031592 level switch, 1-stage, with PVDF/PE 5 m fixed cable). The [--] contact switches the circulating pump off to protect against "Dry running", if the [--] contact is no longer connected, then the circulating pump automatically restarts. If a [--] low flow contact alarm occurs during backwashing, then the backwashing stops. However the backwashing is not continued until completed, rather backwashing is started later by the normal filter program. If the [-] contact is activated, the top-up water solenoid valve is opened to make-up the missing swimming pool water. The level switching point [+] contact closes the top-up water solenoid valve, while if the [++] contact is reached, an alarm message is output. If the [++] contact is activated during a standstill, [Circulating operation pause], of the circulating pump, then the circulating pump switches on automatically, to transport the high water produced by the wave process back into the swimming pool before it flows into the drain via the overflow. If another paddle switch is connected, that prevents running dry of the circulating pump during a standstill, then this must be connected to the [K01] digital input.

Connection interfaces of the level switches

- [--] contact to [K02]
- [-] contact to [K03]
- [+] contact to [K04]
- *[++]* contact to *[K05]*

### 5.7 Sample water valve: On/Off

If the sample water pump is controlled or a solenoid valve integrated in a free outlet, then this function

[Sample water valve: On/Off] switches the corresponding component [On/Off]. During standstill of the circulation (pause or backwashing), a solenoid valve or a sample water pump in the sample water line must prevent flow of the swimming pool water, because otherwise the swimming pool can run dry. The solenoid valve closes, if no mains voltage is present at the terminals [P3] or [P6].

## 5.8 Heating function "Heating enable"

	<ul> <li>An additional temperature sensor is always required for heating control.</li> </ul>
Heating control-heat exchanger:	The temperature of the swimming pool water is measured using the integrated temperature measurement of the chlorine sensor for compensation of the chlorine measurement. This temperature measurement can also be used to control a valve or pump for heating purposes. Connection of the valve or pump to the terminals [ <i>P2</i> ] [ <i>P7</i> ] of the F module. The setpoints and switching behaviour are set in the operating menu of the Dulcomarin <sup>®</sup> II under [ <i>Parameter</i> ].
Solar heating: "Solar heating enable"	To make possible resource saving operation, a <i>"Solar priority connection"</i> can be activated. If the solar temperature is about 5 °C higher that the swimming pool water temperature, then the solar pump or the solenoid valve is, as necessary, activated and the solar energy used. If the water temperature in the swimming pool water is lower than the desired setpoint, then the normal heater is activated. This control mechanism is implemented until the solar temperature falls below the 5 °C difference with the swimming pool water. It is then possible to heat using the other energy carriers via a heat exchanger, if this is required. Connection of the F module takes place at the terminals <i>[P2] [P7]</i>
	The heating system must be activated in the M module so that it can be set up. The set-up and selection takes place identically to all other modules of the Dulcomarin <sup>®</sup> II. Under <i>[RTD (temperature)]</i> in the M module the parameters, <i>[], [PT100/1000</i> ] or <i>[PT100/TempCL]</i> can be freely adjusted. If the <i>[PT100/1000]</i> sensor is activated, the set temperature can be controlled using a heat exchanger. If <i>[PT 100/TempCL]</i> is activated, the control initially controls, provided there is a sufficiently high temperature in the solar absorber, the heating of the swimming pool using the solar input and only once the difference temperature has fallen below 5°, does the control switch the solar absorber off or switch over to the control variable <i>[Enable heating]</i> . If no output is available for <i>[Enable heating]</i> , then heating of the pool water is only via the solar absorber (solar energy). If the circulation timer is not active and the sun heats the solar absorber above a 5 °C difference, then circulation starts automatically in order to use the energy input and avoid overheating of the solar absorber.

### 5.9 Gutter cleaning function

For a swimming pool with a overflow gutter it is necessary that the gutter is cleaned regularly in accordance with the level of pool usage. Care must be taken to ensure the chemicals used cannot enter the swimming pool water circuit, to prevent this, a solenoid valve is inserted in the drain. This solenoid valve opens during cleaning of the overflow gutter. As a result chemically contaminated swimming pool water flows away into the drain. A contact to terminal *[K01]* ... *[K05]* creates a potential-free contact. If the contact is *[live]*, the circulation is stopped. The solenoid valve can also be connected to the Dulcomarin<sup>®</sup> II; to do this the solenoid valve must be connected to terminal *[P02]* ... *[P07]* (230V). If the solenoid valve is operated with a direct power supply, then the contact must only be made or broken to stop or start circulation. To ensure that the last chemical residues are rinsed out, the solenoid valve closes just 15 seconds after switching on of the circulation.

Digital input and MV active: The switch makes a contact: Circulation off, metering off and switch-on delayed. The solenoid valve control and the potential-free contact must be wired together and activated on the same F module.

#### Function dependencies

- Only digital input active: circulation function and metering off.
- Solenoid valve is active via the key in the visualisation: circulation and metering are off, also switching on of the solenoid valve is delayed.
- The digital input and the solenoid valve are active: the switch makes a contact: Circulation off, metering off and switch-on is delayed.



#### Operation using two F modules

The solenoid valve control and the potential-free contact must be wired together and activated on the same F module.

### 5.10 Attractions



#### Control function and feedback

Control of the attractions and the corresponding feedback must be carried out by the same F module. If two F modules are incorporated in a swimming pool circuit, then the control function and feedback may not be mixed, rather they must be carried out by the same F module.

The following attractions can be controlled using the Dulcomarin<sup>®</sup> II:

#### 5.10.1 Cover "Open/Close"



#### WARNING!

NOTICE!

Danger of drowning

Possible consequence: Fatal or very serious injuries.

Cause: Closing of the cover could result in poolusers being pushed under the water and drowned.

Measure: Only activate the cover when you can see the pool directly. When doing so you must have an overall view of the swimming pool without any dead angles or blind-spots and a complete view of the bottom of the pool. The swimming pool operator is responsible for ensuring that work procedures are such that the safety of pool-users is always ensured.

If relay [*P2*] ... [*P7*] has the function [*Cover "Open/Close"*] assigned to it, then the corresponding function is started upon receipt of a 230 V current pulse. Upon receipt of the second pulse, the cover travels in the [*OPEN*] direction until the limit switch is reached. Then the function stops. Twin pressing of the second function [*CLOSE*] activates automatic closing. The limit switch stops the roll cover. The limit switch (condition: Roll cover completely open) must be wired to the digital inputs [*K01*] ... [*K05*].

All active actions stop if the cover is being closed or is closed. Solely the attraction *[Underwater light]* can be manually switched on again after complete closing of the cover, provided this option is appropriately configured in the controller.

#### 5.10.2 Counterflow system

Ensure that no toys, vacuum cleaners or similar are in the swimming pool during functioning of the counterflow system. These extraneous bodies could damage the counterflow system or irreparably destroy it. Position all devices, objects and garden furniture at a sufficient distance from the counterflow system at the swimming pool.

In parallel, at the existing control boxes of the counterflow system the manual-pneumatic pulse can be simulated by a current pulse (to terminal [*P1*] ... [*P5*]) thus providing a means for remotely switching the attraction on or off. A feedback contact from the control unit to the digital input [*K01*] ... [*K05*] provides the Dulcomarin<sup>®</sup> II with a corresponding feedback signal. This actual state is then displayed in the Dulcomarin<sup>®</sup> II visualisation.

#### 5.10.3 Flood and neck shower

The control and feedback function of the *[Flood and neck shower]* attraction is identical to the control and feedback function of the counterflow system. It is only necessary to ensure the correct naming of the attraction and the feedback assignment so that they correspond to the actual swimming pool installation, as in this way the Dulcomarin<sup>®</sup> II visualisation is also matched. If a flood shower function is activated, then the corresponding symbol appears in the Dulcomarin<sup>®</sup> II visualisation and the key naming is the same as the *[Flood and neck shower]* attraction.

#### 5.10.4 Massage nozzle

The control and feedback function of the *[Massage nozzle]* attraction is identical to the control and feedback function of the counterflow system. It is only necessary to ensure the correct naming of the attraction and the feedback assignment so that they correspond to the actual swimming pool installation, as in this way the Dulcomarin<sup>®</sup> II visualisation is also matched. If a massage function is activated, then the corresponding symbol appears in the Dulcomarin<sup>®</sup> II visualisation and the key naming is the same as the *[Massage nozzle]* attraction.

#### 5.10.5 Underwater light



#### WARNING!

**Transformer interconnection** Cause: Electrical energy in the wet area of a swimming pool

Possible consequence: Death or extremely severe injury

Measure: You must only operate the underwater light using a low voltage. To do this a suitable transformer must be interconnected. Please contact a specialist electrical company.

The underwater light is switched on using a mains voltage of 230 V at the terminals *[P1]* ... *[P5]*. The underwater light is operated using a low voltage transformer. The low voltage transformer is supplied via the 230 V output.

Visualisation on the Dulcomarin<sup>®</sup> II does not appear because the light can readily be seen in-situ.

No digital feedback is processed as visual identification is easily possible. A changed state is shown in the Dulcomarin<sup>®</sup> II and on the visualisation. However the changed state cannot be exactly visualized via an external switch pulse. The change between ON/OFF is nevertheless displayed.

### 5.11 Flow control

Actual measurement of the circulation flow	If a flow meter is integrated, then the value of this flow can be inte- grated in the Dulcomarin <sup>®</sup> II, provided the value can be forwarded using pulse frequencies, so that the actual circulation flow rates are displayed. The advantage of this is that, if the output of the circu- lating pump declines or if there is an increase in the differential pressure across the filter, this state is directly indicated. If the desired flow can no longer be achieved, then using suitable meas- ures, e.g. through initiation of backwashing of the filter, this clog- ging can be removed and the original flow rate achieved again.
	This digital input pulses are processed via terminal <i>[K01]</i> or <i>[K02]</i> . You can parameterise the corresponding parameters in the <i>[Configuration]</i> menu of the Dulcomarin <sup>®</sup> II (1 pulse = 25 litre circu- lation quantity). In this way you receive a precise indication of the flow on the Dulcomarin <sup>®</sup> II display.
Measurement of the fresh-water top- up	To achieve an overview of the quantity of the fresh water top-up, there is an option permitting electronic measuring of the fresh water quantity using a contact water meter integrated in the swimming pool water system. Using an electronic meter, the water consumption since the installation or since resetting of the values is displayed. This function indicates a possible water loss, e.g. due to defective valves/piping or leaks in the swimming pool. The water meter pulses must be matched to the installation situation. 1 pulse = 100 litre water, e.g. 10 pulses = 1m <sup>3</sup> fresh water top-up.

## 5.12 Control variables for disinfection and pH-control

These can be activated under [K2].

Here the following control variable can be set:

- pH
- Redox
- Chlorine
- Combined chlorine
- Temperature

# 6 Troubleshooting

Entry in LOG file	Caused by:	Effect of the action:
"Start (Control,Circ.)!"	"Start/Stop" key	The circulating pump and the control vari- able values are started (automatically), if a timer is active.
"Stop (Control,Circ.)!"	"Start/Stop" key	The circulating pump and the control vari- able values are stopped (manual stop), if a timer is active.
"Circ. STOP MAN. !"	"Circ. stop" key	The circulating pump is stopped (manual stop), if a timer is active.
"Circ. 1 MAN. !" ; "Circ. 2 MAN. !"	"Manual" key	The circulating pump is switched from manual to automatic.
"Circ. 1 AUTO. !" ; "Circ. 2 AUTO. !"	"Auto" key	The circulating pump is switched from auto- matic to manual.
"Circ.1 N.O. MAN. !" ; "Circ. 2 N.O. MAN. !"	"Circ. normal operation" key	The circulating pump is operated in [Manual mode]  → [Normal operation].
"Circ.back wash 1 MAN. !" ; "Circ.back wasch 2 MAN. !"	"Circ. backwash" key	The circulating pump is operated in Manual mode ➡ Backwashing.
"FW. Lev. OK. FW. Time Start !"	Liquid level, level measure- ment	Fresh water top-up is also started with a filling time.
"FW. Stop !"	Liquid level, level measure- ment	Fresh water top-up is ended
"FW. Start !"	Liquid level, level measure- ment	Fresh water top-up is started.
"FW. Checkout time!"	Liquid level, level measure- ment	The control time of 180 minutes fresh water top-up is exceeded.
"Level++> Circ. ON 10 Minutes."	[Level ++]	The circulating pump starts because the <i>[Level ++]</i> is reached.
"Niveau++ Error >Deleted. "	[Level ++]	<i>[Level ++]</i> is no longer active.
"Niveau> Circ. OFF."	[Level]	Function: Dry running protection. Circulation is stopped.
"Niveau> FW. Start !"	[Level - ]	Fresh water top-up is started.
"Niveau+> FW. Stop "	[Level +]	Fresh water top-up is stopped.
"No flow> Circ.1 OFF. " ; "No flow> Circ.2 OFF. "	Paddle switch 1 and 2	Function: Dry running protection. Circulation is stopped. Circulation must be manually restarted.
"Cleaning process start."	Gutter cleaning	Gutter cleaning is started.
"Clening process stopped."	Gutter cleaning	Gutter cleaning is ended.

Entry in LOG file	Caused by:	Effect of the action:
"SET:Backwasch Emergency STOP."	Pumping system is faulty	If the pumping system reports a fault, then no backwashing is carried out until this fault is cleared.
"DELETE:Backwash Emergency STOP."	Pumping system no error	

# 7 Spare parts

Description	Part number	Quantity
Electrical filter control unit	733849	1
Filter control cover	1041840	1
PT bolt KA35x10 Torx	1001364	5
Terminal diagram label	1042906	1
Nameplate	1025496	1
Folding box 267x216x64	1000477	1

## 8 Technical data

## 8.1 Ambient conditions

Description	Value
Working temperature:	- 10 °C + 45 °C
Storage temperature:	- 20 °C + 85 °C
Air humidity:	max. 95 % (non-condensing)
Air pressure:	max. 2000 m (above sea level)

### 8.2 Mechanical data

Description	Value
Weight:	approx. 525 g
Dimension (WxLxH):	approx. 218x172x42 mm

## 8.3 Electrical data

Power supply (at XP1)

Mains voltage: 90-254 V AC 50/60 Hz. Created at terminal XP1.

Current consumption Dependent on the connected loads. The independent requirement of the electronics is max. 30 W. During operation no more than insignificant spikes are to be expected.

Terminal strip XP1-Pin	Signal	Function
1	L	Phase
2	Ν	Neutral conductor
3	PE	Protective earth conductor

Fuses

#### On-board fuses

- F2: 0.63 ampere, slow-acting, (in fuse holder F1) for the electronics internal unit (F module)
- F4: 10 ampere, slow-acting, (in fuse holder F3) for the switched outputs XR2 (relay K2), XR3 (relay K3), XR6 (relay K6).
  - Maximum load: 8 amperes, due to a possible ambient temperature of up to 45 °C
- F6: 10 ampere, slow-acting, (in fuse holder F5) for the switched outputs XR4 (relay K4), XR5 (relay K5), XR7 (relay K7).
  - Maximum load: 8 amperes, due to a possible ambient temperature of up to 45 °C

## 8.4 Inputs and outputs

### Alarm relay

Termir	Ferminal Signal		Description	Function	Protective cir- cuit	Perform- ance	Load type			
XR1	1	C-root	Alarm relay P1	Alarm message	Varistor	Max.	Only ohmic			
	2	N -N/O		potential-free		690VA	1080			
	2	NC				- 5 A				

## Output relay

Terminal		Signal	Function	Protective circuit	Performance	Load type			
XR2	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and inductive (up to cos phi =			
2	2	Ν	v, teeding	varistor - fuse F4	5A) starting				
	3	PE			current, max. 30A for 0.5s	0.4)			
XR3	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and			
	2	Ν	v, reeding	varistor - fuse F4	5A) starting	inductive (up to cos phi =			
	3	PE			current, max. 30A for 0.5s	0.4)			
XR4	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and inductive (up to cos phi = 0.4)			
	2	Ν	v, reeding	varistor - fuse Fo	5A) starting				
	3	PE			current, max. 30A for 0.5s				
XR5	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and			
	2	Ν	v, teeding	Varistor - fuse Fo	5A) starting	to cos phi =			
	3	PE			current, max. 30A for 0.5s	0.4)			
XR6	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and			
	2	Ν	v, reeding	varistor - fuse F4	5A) starting	to cos phi =			
	3	PE			current, max. 30A for 0.5s	0.4)			
XR7	1	L (switched)	Output relay 230	R-C circuit and	Max.	Ohmic and			
	2	Ν	v, reearing	Vansior - Iuse Fo	5A) starting	inductive (up to cos phi =			
	3	PE			current, max. 30A for 0.5s	0.4)			

#### Technical data

#### Digital input

Terminal		Signal	Description	Frequency	Switch	Galvanic Isolation				
XK1	1	+	Digital input 1	Max. 10 kHz	Potential-free mechan-	Isolated to the $\mu$ C				
2 -		-			lector	interfaces				
	3	+	Digital input 2	Max. 10 kHz	Potential-free mechan-	Isolated to the $\mu C$				
	4 -				lector	interfaces				
XK2	1	+	Digital input 3	Max. 10 kHz	Potential-free mechan-	Isolated to the $\mu C$				
	2	-			lector	interfaces				
;	3	+	Digital input 4	Max. 10 kHz	Potential-free mechan-	Isolated to the $\mu C$				
	4	-			lector	interfaces				
XK2	1	+	Digital input 5	Max. 10 kHz	Potential-free mechan-	Isolated to the $\mu$ C				
	2	-			lector	interfaces				
	3									
	4									

Description	Value
Insulation voltage	500 Vpp max.
Output voltage	max. 11 V (electrical strength of the switch)
Short-circuit current (also capacitative discharge currents)	max. 15 mA
Max.switching frequency (hardware)	10 kHz
Max. frequency	Software filter sets the maximum frequency
Type, cable length and installation regulations, that are recommended for ensuring insensitivity to inter- ference	30 m (EMC standard 61326)
Terminal range	0.14 mm <sup>2</sup> 1.5 mm <sup>2</sup>
Contact resistance open	> 100 kΩ
Contact resistance closed	< 100 Ω
Switch	Mechanical contact or open collector (potential-free)
Protective equipment	Against voltage infeeds up to +30 V12 V

### Current output

Termi	nal	Signal	Description	Function	Cut-off fre- quency	Precision	Load	Galvanic Isola- tion		
XK1	1	AN-A +	Analog output 1	0/4-20 mA	Approx. 3Hz	0.5 % of the measuring	Max. 400Ω	Isolated to the $\mu$ C and all other		
	2	AN-A-		output		range		Interfaces		
	3	AN-A +	Analog output 2	0/4-2 0mA	Approx. 3Hz	0.5 % of the measuring	Max. 400Ω	Isolated to the $\mu$ C and all other		
	4	AN-A-		output		range		interfaces		

Description	Value
Insulation voltage:	500Vpp max.
Output voltage max.:	18V (idle)
Overvoltage-resistant up to:	$\pm 50V$ (no function, for output current 0mA, at 21.5mA up to 30V, otherwise overheating of the control transistor is possible)
Ripple max.:	450 ohm at 21.5 mA (alarm), 480 ohm at 20.5 mA
Output current:	0/3.8 – 20.5mA; 21.5mA (alarm)
Cut-off frequency:	approx. 3Hz
Accuracy:	$\pm$ 0.5% of the limit value at device temperature = calibration temperature
Resolution:	>12 bit
PWM frequency:	approx. 200Hz

## 8.5 Standards

Description	Standard
Electrical safety:	EN 61010 Measuring, control, regulating and laboratory devices
EMC:	DIN EN 61326-1 Measuring, control, regulating and laboratory devices

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