CONTROL UNIT GUIDE

Oventrop
REGTRONIC PC

Important!

Please read the instructions carefully before installing and operating the unit!

Failure to do this can void product warranty!
Please keep the instructions in a safe place!

The unit described has been manufactured and inspected according to CE regulations.

Table of Contents:

1 General / Introduction

The REGTRONIC PC system control unit is compatible with a large number of systems.
Systems are either pre-programmed at the factory or can be initialised by customers.
The system deployed is dependent on the hydraulic layout of the system and any ancillary features required.
Generally, the individual functions of a system are independent of the basic layout selected. This document therefore describes them in terms of their general functionality.

This document defines the individual functions available with the REGTRONIC PM.
Apart from the various solar system models, there are a number of ancillary/protective features that are partially or completely integrated into the systems. The scope of these integrated functions can be identified by reading the system layout descriptions.

2 General principles:

As a rule, the system is regulated to the nearest full °C, i.e. 65.0 °C to 65.9 °C would be evaluated as 65 °C. Exceptions here include the tube collector function with delta-T criterion. This must be regulated to 1/10 °C.
The following applies when defining switch-on and switch-off points:
as temperatures measured approach a lower threshold value of xxx °C, switching occurs once the threshold value is exceeded, i.e. xxx – 0.1 °C.
Example: threshold value 40 °C, switching occurs at 39.9 °C. As temperatures measured approach an upper threshold value of xxx °C, switching occurs
when the threshold is reached, i.e. xxx °C. Example : threshold value 40 °C, switching occurs at 40.0 °C.

Where functions are bound to a fixed temperature value – such as the charging of storage tanks to TStmax or the system protection function – switch-on/switch-off occurs once the temperature value has been reached, and switch-off/switch-on once the temperature drops below the temperature value – 1 K (hysteresis).
Example: TStmax = 65 °C. Charging switches off at 65.0 °C and switches on once temperature drops below TStmax – 1K, i.e. 63.9 °C.

3 General control functions

The following describes general control functions that are implemented in addition to basic functionality in all hydraulic layouts.
The functions are configured using the "System Settings" menu.

3.1 Collector protection function

The collector protection function works to protect the collector and heat transfer media from high temperatures to the greatest possible extent.

The function is activated or deactivated in the "System Settings" menu. Start and stop temperatures can be configured.

If all storage tanks are charged to Tmax, then the solar circuit pump is switched off. Once the collector temperature reaches the configured start temperature, the solar circuit pump is started, and runs until the collector temperature has dropped to the configured stop temperature. A portion of the energy is lost via the tube lines; the remainder is released into the configured primary storage tank. This leads to an increase of the storage temperature above the configured maximum temperature. For safety reasons, the function is deactivated once the storage tank reaches 95 ℃ = TStLimit.

3.1.1 In/outputs

Measuring points	Outputs
Collector temperature(s) Storage tank temperature(s)	Solar circuit pump(s)

3.1.2 Data input / parameters

The following terms and parameters are defined to this function:

	Term	Comment
Values displayed	Function active: Coll.Protect	
Programmable values	--	
System Settings	Coll.Protect On / off	
	Start	Start temperature
	Stop	Stop temperature
Internal parameters	--	

3.2 System protection function

Protects the system / tube insulation from high temperatures.

The function is activated or deactivated in the "System Settings" menu. The corresponding start and stop temperatures are configured in the same menu.
The solar circuit pump is switched off once the collector temperature reaches the configured start value. The solar circuit pump is enabled again once the collector temperature drops below the configured stop value.

The value input for the system protection start temperature must be at least 10 K higher than the collector protection start temperature (forced by software).

3.2.1 In/outputs

Measuring points	Outputs
Collector temperature(s)	Solar circuit pump

3.2.2 Data input / parameters

	Term	Comment
Values displayed	Function active: SysProtect	
Programmable values	--	
System Settings	System protection On / off	
	Start	Start temperature
	Stop	Stop temperature
Internal parameters	--	

3.3 Anti-freeze protection function

The function is activated or deactivated in the "System Settings" menu.

For systems that are operated without glycol (or with only small quantities), both the tubing and collector must be protected from freezing. To do so, the (temperature frost protection) sensor measures the temperature on an exposed surface – e.g. bare tube line leading to the collector. If the value measured is below the configured start temperature, the solar circuit pump starts and runs until the configured frost protection stop temperature is reached. The minimum run time for the pump is 5 minutes.
If the temperature of the primary storage tank drops below 5 °C, the function is deactivated for safety reasons.

3.3.1 In/outputs

Measuring points	Outputs
Frost protection temperature Storage tank temperature(s)	Solar circuit pump

3.3.2 Data input / parameters

	Term	Comment
Values displayed	Info: Frost protection	
	Function active: FProtect	
Programmable values	--	
System Settings	Frost protection On / off	
	Start	Start temperature
	Stop	Stop temperature
	Sensor	
Internal parameters	Minimum run time	
	Minimum storage tank temperature	

3.4 Pump protection function

If pumps or valves remain unused for long periods of time, they may seize up. To stop this occurring in actuators attached to the system, pump protection therefore triggers all outputs regularly for a brief period of time (at 00:00 each day).

3.4.1 In/outputs

Measuring points	Outputs
None	All pumps and valves

3.4.2 Data input / parameters

	Term	Comment
Values displayed	Function active: PProtect	
Programmable values	--	
System Settings	--	
Internal parameters	Interval time	
	Pump run time	

3.5 Data logging function

The data logging function can be used to store all readings, output states and errors to an external "SOLAREG DATASTICK" at regular, programmable intervals.

The function is activated automatically if a DataStick internally coded as "LOGGING" is inserted into the DataStick® interface on the REGTRONIC unit.

Once the function is active, both the sampling rate and the recording mode (simple/cyclical) can be configured.

3.6 Energy yield measurement with Grundfos sensor

This uses a Grundfos VFS 2-40 type sensor.
This sensor unit integrates through-flow measurement (measuring range 2-40 litres/minute) and a temperature gauge.
Both measurement values are available as analog signals with a measuring range of 0.5...3.5 V.

Reference values for output measurement are the collector temperature (PT-1000 sensor T1), plus the temperature and through-flow measured by the Grundfos sensor.

Aside from activating output measurement, the following settings must be configured:

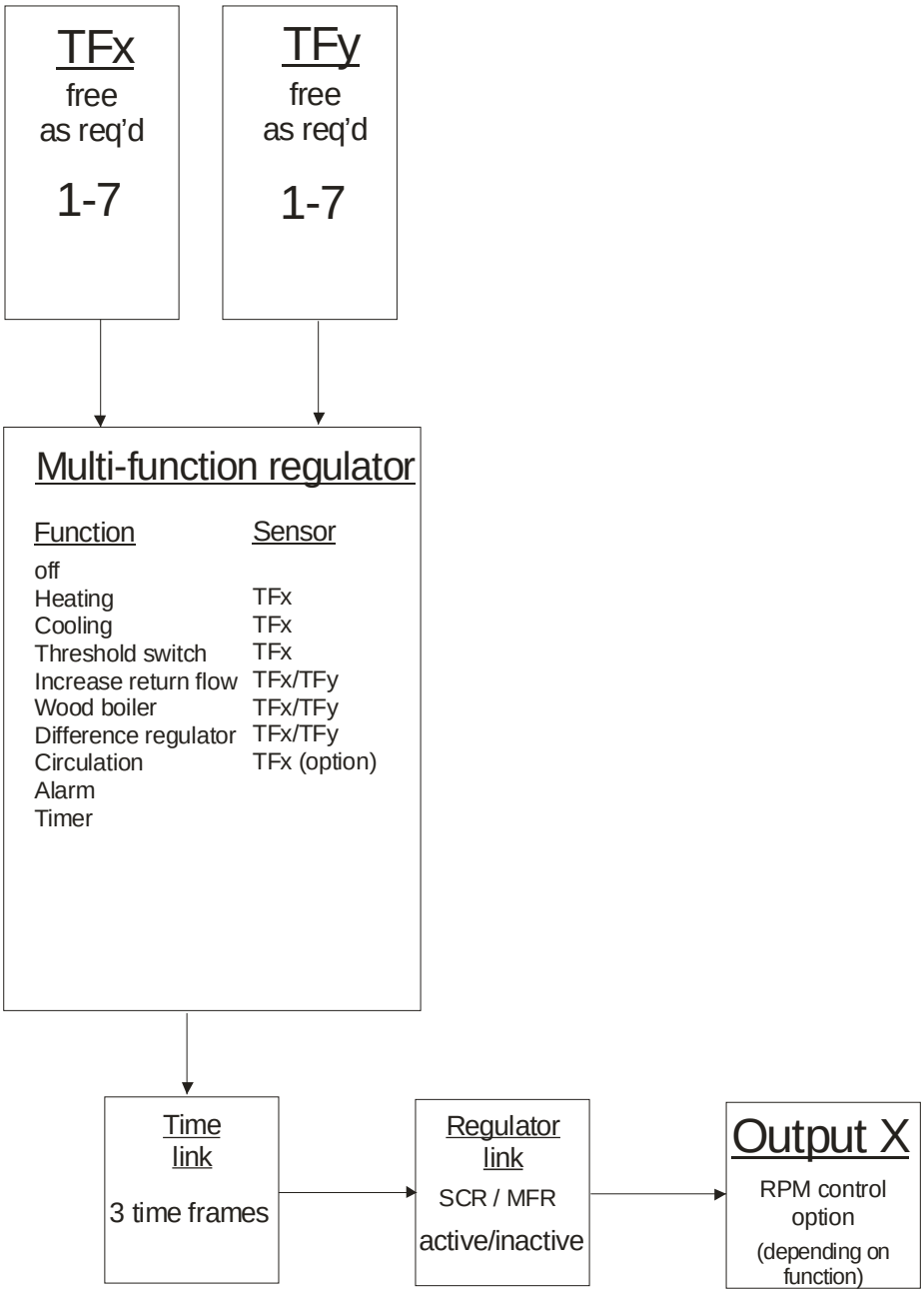
- Selecting the antifreeze compound
- Configuring the mixing ratios
- Selecting the reference sensor for the flow temperature

3.6.1 Data input / parameters

	Term	Comment
Values displayed	Info:	
	Amount T-F	Flow temperature
	Amount T-R	Return flow temperature
	Amount (1/2/3) Date:	Total amount (for storage tank) Daily amount
	Solar circuit flow volume	l/min
Programmable values	--	
System Settings	Yield measurement On / off	
	Function	VFS (not selectable, just as info)
	Glycol type	Various
	Glycol	Glycol proportion in %
	T-Flow	T1 is a preset: any other sensor may also be used
Internal parameters	--	

3.7 Multi-function regulator

The multi-function regulator (MultiReg or MFR) permits the operator to carry out a variety of different functions at an assigned switched output on the control unit.
This option is the most versatile way to implement additional functionality for the unit as regards solar circuit and heating circuit control.



- Both inputs can be freely configured with sensors S1 - S7
- Functional variation by selecting the function required
- Control procedure can be executed within multiple time frames
- Optionally, the MFR can also be linked to other outputs – i.e. the status (none/active/inverse) of another output chosen by the user influences the control procedure of the current MFR
- RPM control option (depending on function)

The following describes the individual functions of the MFR:

3.8 Heating

The function is activated or deactivated as a multi-function regulator in the "System Settings" menu. The thermostat function "Heating" is a control circuit independent of storage tank charging.
One use is therefore to reheat the upper stand-by section of the storage tank independently of the solar circuit function. This function can be run permanently or within programmable time frames.

3.8.1 In/outputs

Measuring points	Outputs
Upper storage tank temperature	Pump / valve reheating function

3.8.2 Data input / parameters

The following terms and parameters are defined to this function:

	Term	Comment
Values displayed	Info: Heating	
	Function active: Heating	
Programmable values	MultiReg: Heating	
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
	Start	
	Stop	
System Settings	MultiReg function: Heating	
Internal parameters	--	

3.9 Cooling

The function is activated or deactivated as a multi-function regulator in the "System Settings" menu. To increase the energy yield of the solar power system, it can be useful to "redirect" solar energy or release it from storage once a specific storage temperature has been achieved.

3.9.1 In/outputs

Measuring points	Outputs
Upper storage tank temperature	Switched output for cooling (pump)

3.9.2 Data input / parameters

The following terms and parameters are defined to this function:

	Term	Comment
Values displayed	Info: Cooling	
	Function active: Cooling	
Programmable values	MultiReg: Cooling	
	Start	
	Stop	
System Settings	MultiReg function: Cooling	
Internal parameters	--	

3.10 Threshold switch

If a programmable value for the input temperature is exceeded, the output will be switched on or off. The switch-on/switch-off point and switch hysteresis are configured by entering a start and stop temperature.
If the start temperature < stop temperature, the result is a heating function.
If the start temperature > stop temperature, the result is a cooling function

3.10.1 In/outputs

Measuring points	Outputs
1 temperature sensors, assigned as required	1 fixed output

3.10.2 Data input / parameters

	Term	Comment
Values displayed	Info: threshold value	
	Function active: threshold value	
Programmable values	MultiReg: threshold value	
	Start	Start temperature
	Stop	Stop temperature
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Threshold	
	MultiReg Sensor	
Internal parameters	--	

3.11 Increased return flow

Increased return flow is a simple method to boost heating functionality, involving the release of energy from the solar circuit or storage tank into the heating return flow line. If the temperature of the heat source is higher than that of the sink + hysteresis, then the changeover valve (or pump) is activated.

3.11.1 In-/outputs

Measuring points	Outputs
Heat source Heat sink (heating return flow)	Changeover valve or pump

3.11.2 Data input / parameters

	Term	Comment
Values displayed	Info: Inc. return flow▲	
	Info: Inc. return flow▼	
	Status: Inc. r-flow.	
Programmable values	MultiReg: Inc. return flow	
	maximum	Maximum temperature for heat target
	minimum	Minimum temperature for heat source
	dTmax	Increased return flow Switch-on difference (dTon)
	dTmin	Increased return flow

		Switch-off difference (dToff)
	Time 1: Start	
	Time 1: Stop	
	Time 1: Start	
	Time 1: Stop	
	Time 1: Start	
	Time 1: Stop	
System Settings	MultiReg function: Inc. r-flow	
	Source sensor▲	
	Sink sensor▼	
Internal parameters	--	

3.12 Wood boiler

Storage tank reheating using a solid fuel boiler. When combined with RPM control, a configurable minimum temperature for the boiler and a configurable temperature difference, there are a number of modes available for storage tank charging using solid fuel boilers.

Note: safety shut-off is triggered if TStorage (TSink) >= TStLimit (usually 95 ℃)!

3.12.1 In/outputs

Measuring points	Outputs
Storage temperature (e.g. upper stand-by section) Boiler temperature	Boiler pump

3.12.2 Data input / parameters

	Term	Comment
Values displayed	Info: Wood boiler▲	Boiler temperature
	Info: Wood boiler▼	Heating target
	Function active: Wood boiler	
Programmable values	MultiReg: Wood boiler	
	Start	Start temperature
	dTmax	
	minimum	
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Wood boiler	
	Source sensor▲	
	Sink sensor▼	
Internal parameters	--	

3.13 Difference regulator

The temperature difference regulators can be configured as required in terms of inputs and parameters. The output assignments are fixed. Since minimum and maximum temperatures can be defined, these can be deployed universally – e.g. for transfer between storage tanks, etc.

3.13.1 In/outputs

Measuring points	Outputs
2 temperature sensors, assigned as required	1 fixed output

3.13.2 Data input / parameters

The following terms and parameters are defined to this function:

	Term	Comment
Values displayed	Info: Diff. regl.▲	
	Info: Diff. regl.▼	
	Function active: Diff. regl.	
Programmable values	MultiReg: Diff. regl.	
	maximum	Maximum sink temperature
	minimum	Minimum source temperature
	dTmax	
	dTmin	
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Diff. regl.	
	Diff. regl. Source sensor▲	
	Diff. regl. Sink sensor▼	
Internal parameters	--	

3.14 Type 1 circulation function: time-controlled

A circulation function is used to make it easier to draw hot water from the system. This enables hot water to be drawn immediately.

The circulation pump is only active during the programmed time frame. The T criterion has no function here.
Simple time control is activated by setting "Circulation Start" and "Circulation Stop" to the same temperature value. In this case, the screen will show "-- ℃".

3.14.1 In/outputs

Measuring points	Outputs
None	Circulation pump

3.14.2 Data input / parameters

	Term	Comment
Values displayed	Info: Circulation	
	Function active: Circulation	
Programmable values	MultiReg: Circulation	
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Circulation	
Internal parameters	--	

3.15 Type 2 circulation function: time-and temperature-controlled

A circulation function is used to make it easier to draw hot water from the system. This enables hot water to be drawn immediately.

The circulation pump is active during the programmed time frame only if the T criterion is also met.

3.15.1 In/outputs

Measuring points	Outputs
Hot water return flow temperature	Circulation pump

3.15.2 Data input / parameters

	Term	Comment
Values displayed	Info: Circulation	
	Function active: Circulation	
Programmable values	MultiReg: Circulation	
	Start	
	Stop	
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Circulation	
Internal parameters	--	

3.16 Alarm

The alarm function is activated or deactivated as an MFR in the "System Settings" menu. If the system under control triggers an error condition – e.g. sensor short-circuit or sensor disruption – and the alarm function is switched on, this activates the output of the corresponding multifunction regulator. If required, this signal can be detected and displayed by a building control system.

3.16.1 In/outputs

Measuring points	Outputs
--	230 V output, e.g. for siren, strobe light

3.16.2 Data input / parameters

	Term	Comment
Values displayed	Function active: Alarm	
Programmable values	MultiReg: Alarm	
	Signal	duration, interval
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Alarm	
Internal parameters	--	

3.17 Timer

The timer function can be used as required to provide time controlled releasing or locking of the output of the respective multi-function regulator. A total of three time frames are available for this control. The locked state can be viewed as an "inverse state" – i.e. the output of the MFR is inactive during the time frame and active outside it

3.17.1 In/outputs

Measuring points	Outputs
--	230 V output (selected as required)

3.17.2 Data input / parameters

	Term	Comment
Values displayed	Function active: Timer	
Programmable values	Timer	
	Function	Release, lock
	Time 1: Start	
	Time 1: Stop	
	Time 2: Start	
	Time 2: Stop	
	Time 3: Start	
	Time 3: Stop	
System Settings	MultiReg function: Timer	
Internal parameters	--	

4 Solar circuit control functions

4.1 Types of storage tank charging

One or more storage tanks will always be charged if the collector or collector flow temperature is at least equal to the storage tank temperature – as measured at the level of the heat exchanger or tapping point (for exterior heat exchangers) – plus switch-on hysteresis.

There are a number of control types available, depending on the system:

- On/off controller (pump capacity 100%)
- Constant temperature difference (controlled pump capacity)
- Target temperature charging (controlled pump capacity)
- Parallel charging (controlled pump capacity)
- Intelligent priority switching

The various control types are virtually independent of the basic system type, and can thus be implemented in systems with one or multiple storage tanks.

4.1.1 Constant temperature difference

Control is essentially the same as with an on/off controller. However, the system adjusts pump capacity with the aim of keeping the temperature difference between the collector and storage tank temperature to a constant value dTTarget. If the difference drops below this value, the pump runs at its lowest possible capacity until the difference drops below dTmin, at which point it switches off.

4.1.2 Parallel charging

Where systems have more than one storage tank, two tanks can be charged simultaneously.
Once the temperature difference between the collector and the primary storage tank reaches a certain (configurable) value, the system activates the pump of the secondary storage tank.

Parallel charging works only in systems with one charging pump per storage tank.

4.1.3 Intelligent priority switching

Where systems have more than one storage tank, it must be possible to charge the various storage tanks to match the energy available. Generally, secondary storage tanks will have temperature levels significantly lower than the primary storage tank. If the system switches to a secondary tank, this will depress the temperature in the collector circuit: the system will be unable to return to the temperature level of the primary tank, even if solar radiation increases.
It is therefore normal to pause secondary tank charging briefly at set intervals, to ensure that the collector temperature can "regenerate" itself. If the collector temperature meets the switch-on criterion for the primary storage, then this tank is charged. Other criteria for pausing charging are a rise in collector temperature by a specific temperature value during secondary storage charging, as well as a drop in the primary storage temperature by a specific temperature value, also during secondary storage charging.
In bypass systems, primary storage tank charging can be triggered by the achievement of a specific flow temperature.
Priority switching can be configured in the "Programming" menu (visible if the system has at least 2 storage tanks).

4.2 Type 1 tube collector functions: time-controlled

With tube collectors, it is sometimes not possible to measure the precise collector temperature on or in the collector. Accordingly, other criteria must be applied for switching on the solar power system.

The solar circuit pump is switched on briefly at specific intervals, so that the heat transfer medium can reach the collector sensor, which is mounted as near as possible to the collector.
A time frame can be configured, setting the period in which the function is active. The time interval between two pump runs can also be configured, as can the pump run time.

4.2.1 In/outputs

Measuring points	Outputs
None	Solar circuit pump

4.2.2 Data input / parameters

	Term	Comment
Values displayed	Function active: tubes	
Programmable values	Tube collectors	
	Time 1: Start	
	Time 1: Stop	
System Settings	Tube collectors On / off	
	Function	Time
	Run time	Pump run time
	Interval	Time interval
Internal parameters	--	

4.3 Type 2 tube collector functions: temperature increase detection

If the collector sensor can be positioned very near to the collecting tube, then it will not show the actual collector temperature, but will be warmed by heat conduction. The control unit detects and evaluates this rise in temperature. The solar circuit pump is then switched on for a (configurable) minimum run time.

4.3.1 In/outputs

Measuring points	Outputs
Collector flow temperature	Solar circuit pump

4.3.2 Data input / parameters

	Term	Comment
Values displayed	Function active: tubes	
Programmable values	--	
System Settings	Tube collectors On / off	
	Function	delta T
	Run time	Pump run time
	delta T	Absolute increase in collector temperature, as measured from last pump run time
Internal parameters	--	