

# PERROT

## Satellite

### Two wire decoder control system



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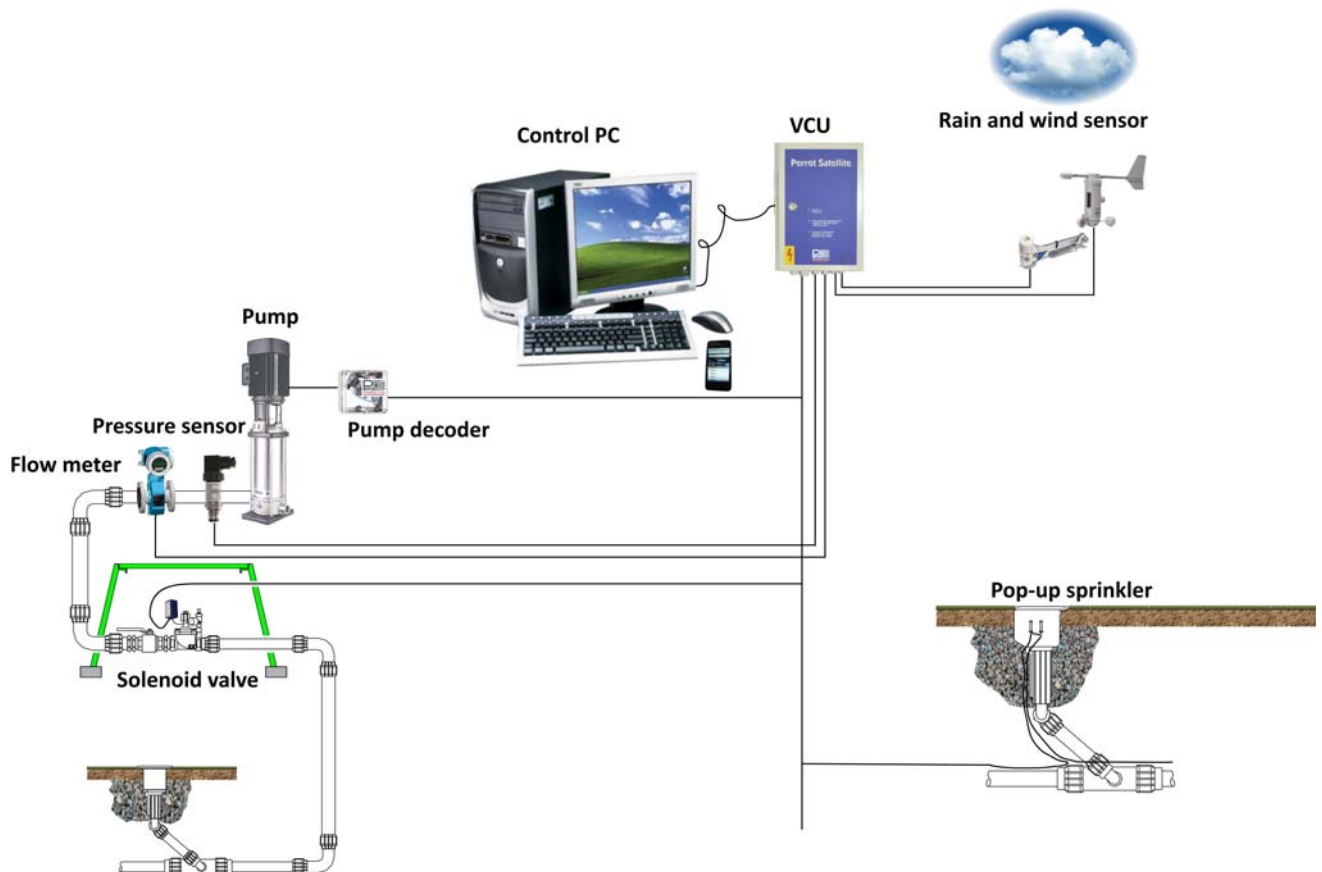
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## 1. Fields of application

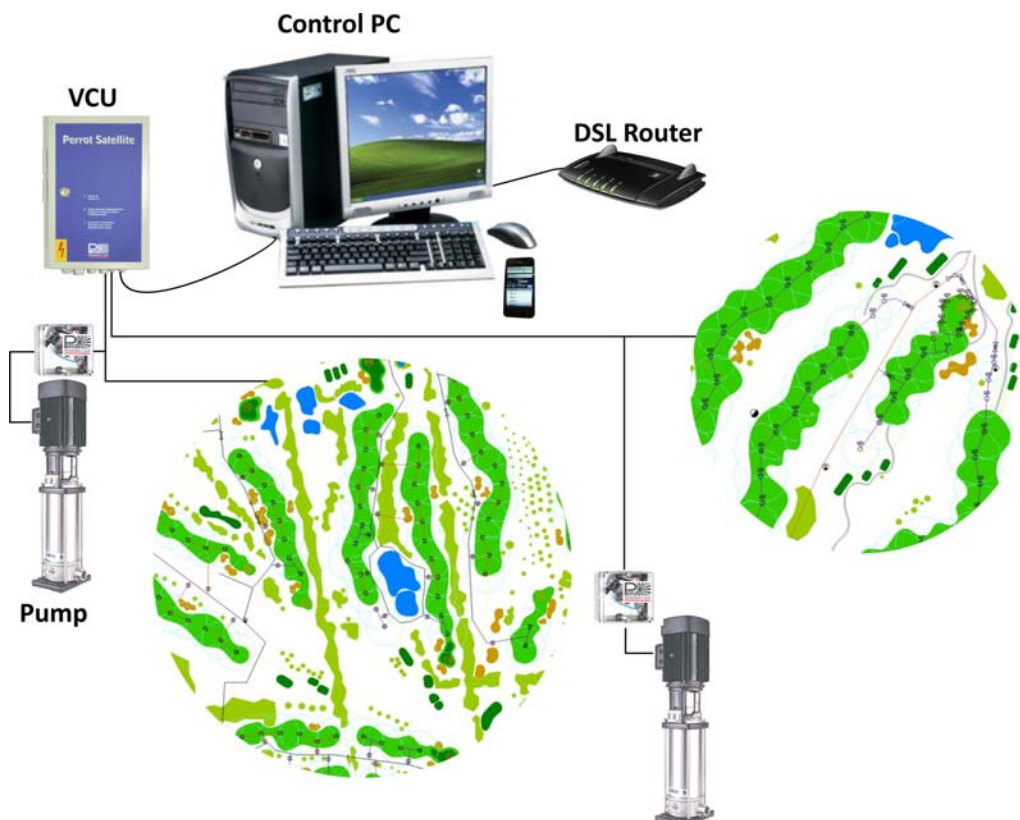
### Control system for irrigation systems

The control system is particularly suitable for the fully automatic irrigation of e.g. golf courses and large public parks, open air swimming pools, amusement parks but also for irrigation systems in agriculture. The control system Perrot Satellite works as a bus system, on which the decoders are controlled by a two wire decoder cable. The decoders open the connected solenoid valves at the time set in the computer program.



## Irrigation control system for several independently working irrigation systems

The control procedures for irrigation are controlled on-line from the PC. The interface (VCU) serves as means of communication for decoders, pumps and sensors for weather and facility values. This program structure allows simultaneous control of 1 or more hydraulic systems with only one valve control unit (VCU), as it is often needed at extensions of a 9-hole course to a 18-hole course.



## Irrigation control system for several decentralized installations e.g. at municipalities

The Web-based structure of the irrigation program allows the simple operation within a Browser (e.g. Internet Explorer) and consequently an independent access through the Internet is possible. Certainly there is the possibility to access directly by a DSL connection. This system is especially suitable for municipalities, which have to control and supervise **several parks** from a central place.

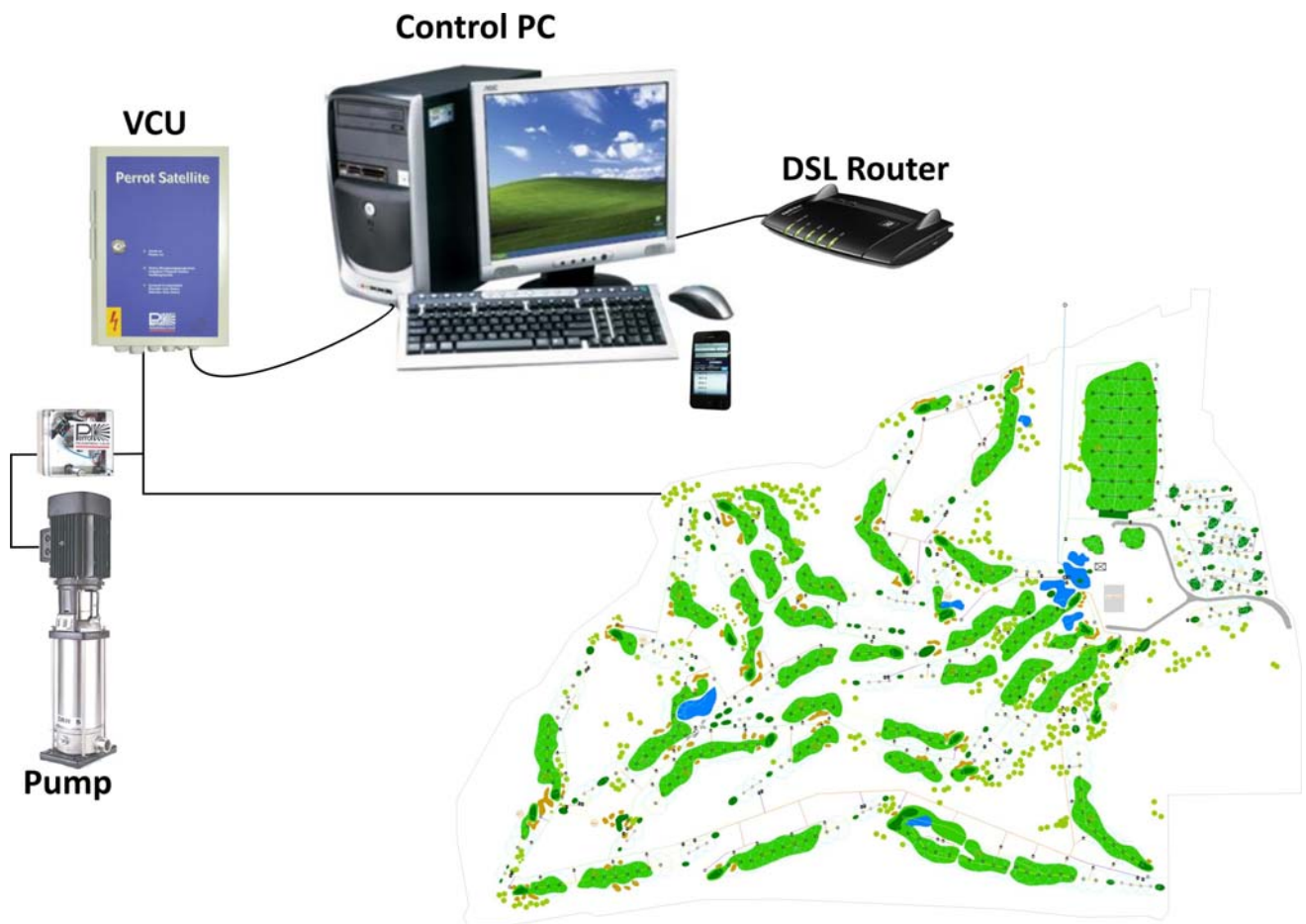
### Advantages of the decoder control system

- ↳ less work, as only a two wire cable for up to 240 stations is necessary  
The two wire cable (decoder cable) is responsible for the electric power supply of the valves as well as for the communication with the decoders
- ↳ System is expandable without any additional earth work, as further stations can be connected at any place of the decoder cable
- ↳ Simple trouble shooting as cabling is easy to overlook
- ↳ Due to the little cable quantity the danger of a lightning strike is very small

## 2. Structure of Decoder Control System Perrot Satellite

for max. 240 stations

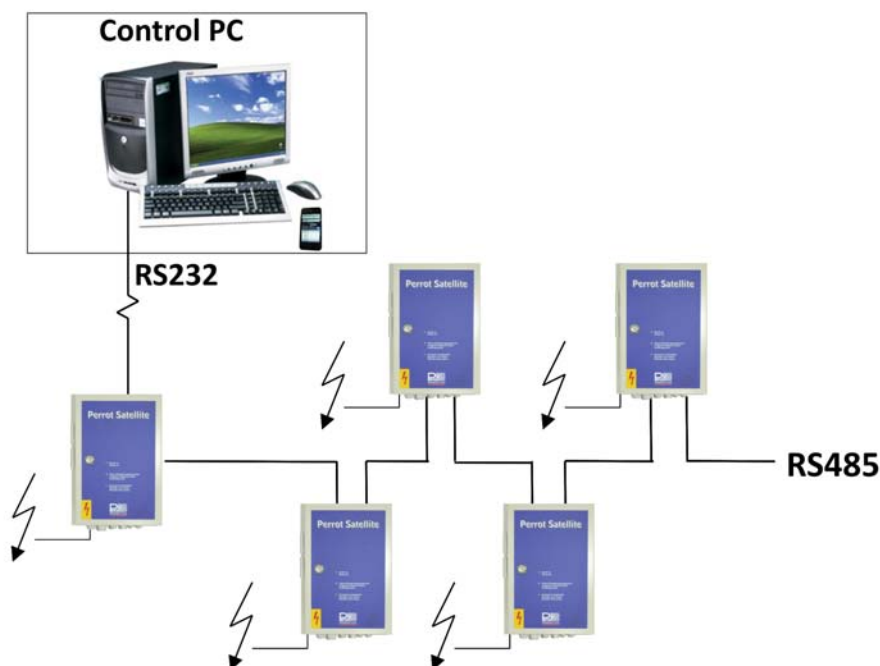
- ↪ Same structure as the proved Greenkeeper Win
- ↪ The Greenkeeper Win System can be upgraded to a Perrot Satellite
- ↪ The PC is connected with RS232 interface to the VCU
- ↪ With one VCU up to 240 stations and several pump stations can be controlled  
Furthermore signal inputs are processed by weather and plant sensors



**for max. 1920 stations**

- ↪ For installation with more than 240 stations further VCU's (up to 8 pieces) can be connected serially. Communication is carried out by RS 485 interface
  - ↪ As indicated, each VCU has the possibility to control 240 stations and to process different signal inputs
  - ↪ Using a screened interface cable with 2x2,5mm<sup>2</sup> the max. distance between serially connected VCU's should not be more than 1200 meters
  - ↪ The control PC works with Win7 (professional). The complete irrigation program is installed on the PC. The PC supports the user by writing the programs
  - ↪ The operating irrigation sequence is controlled online from the PC
  - ↪ The valve control unit (VCU) is responsible for the conversion of PC information into switch signals for the decoders
  - ↪ VCU determines the optimal pump efficiency (pump manager) and switches the pumps on and off as required
  - ↪ The decoder cable transports both, the switch signals for the decoders, and the power output for the coils
  - ↪ The decoders select the signals and implement the instructions which are destined for them.
- The most important instructions are the opening and closing of the connected valves.

## Satellite - Control



### 3. Ways of communication with Perrot Satellite

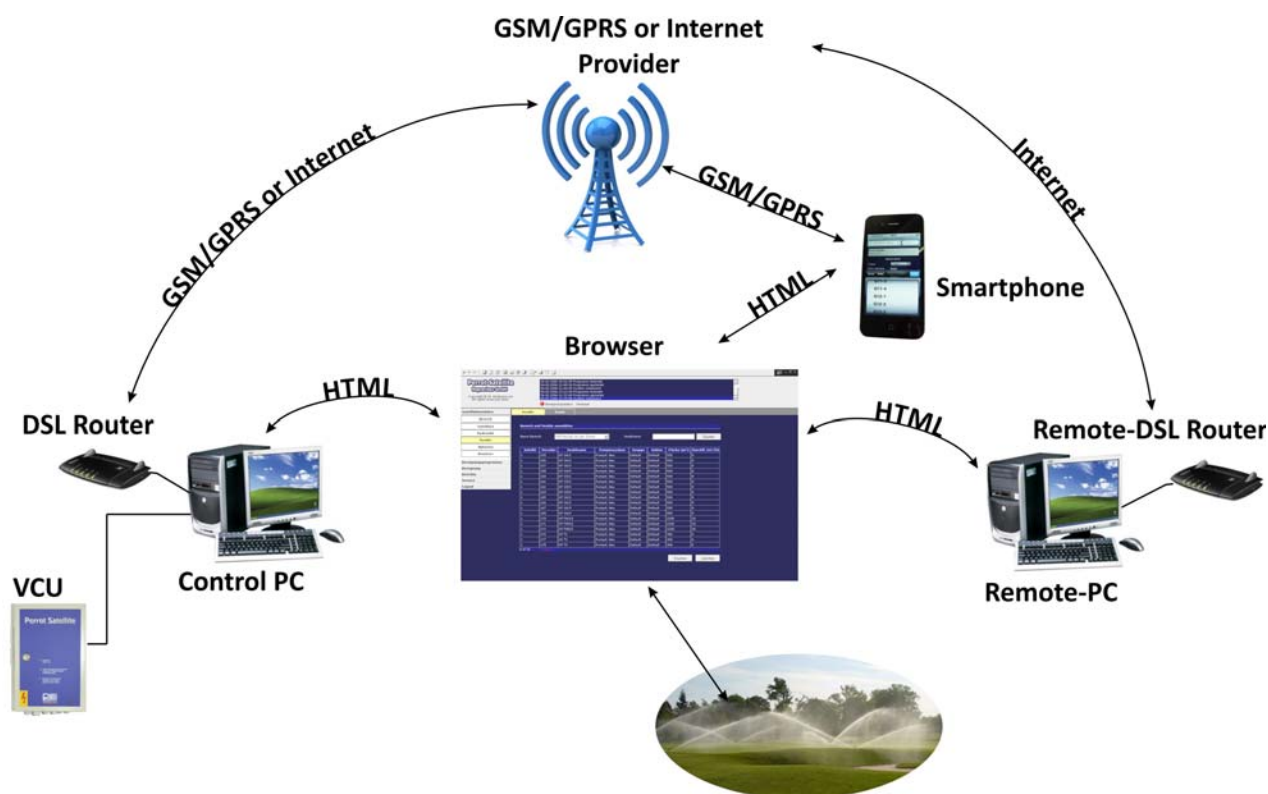
Perrot Satellite is the first irrigation program on WEB basis. Due to this program structure a simple operation within a browser (e.g. Internet Explorer) and thus any access from outside is possible (Remote Access). The irrigation program is installed on the control PC, which acts as a server.

The remote control (Remote Access) with a PC (desktop or laptop) can be carried out through:

- ↳ Internet with firm IP-address of the control PC or by the help of the service „dyndns.org“
- ↳ A digital DSL connection

Remote control (Remote Access) with a Smartphone can be carried out through:

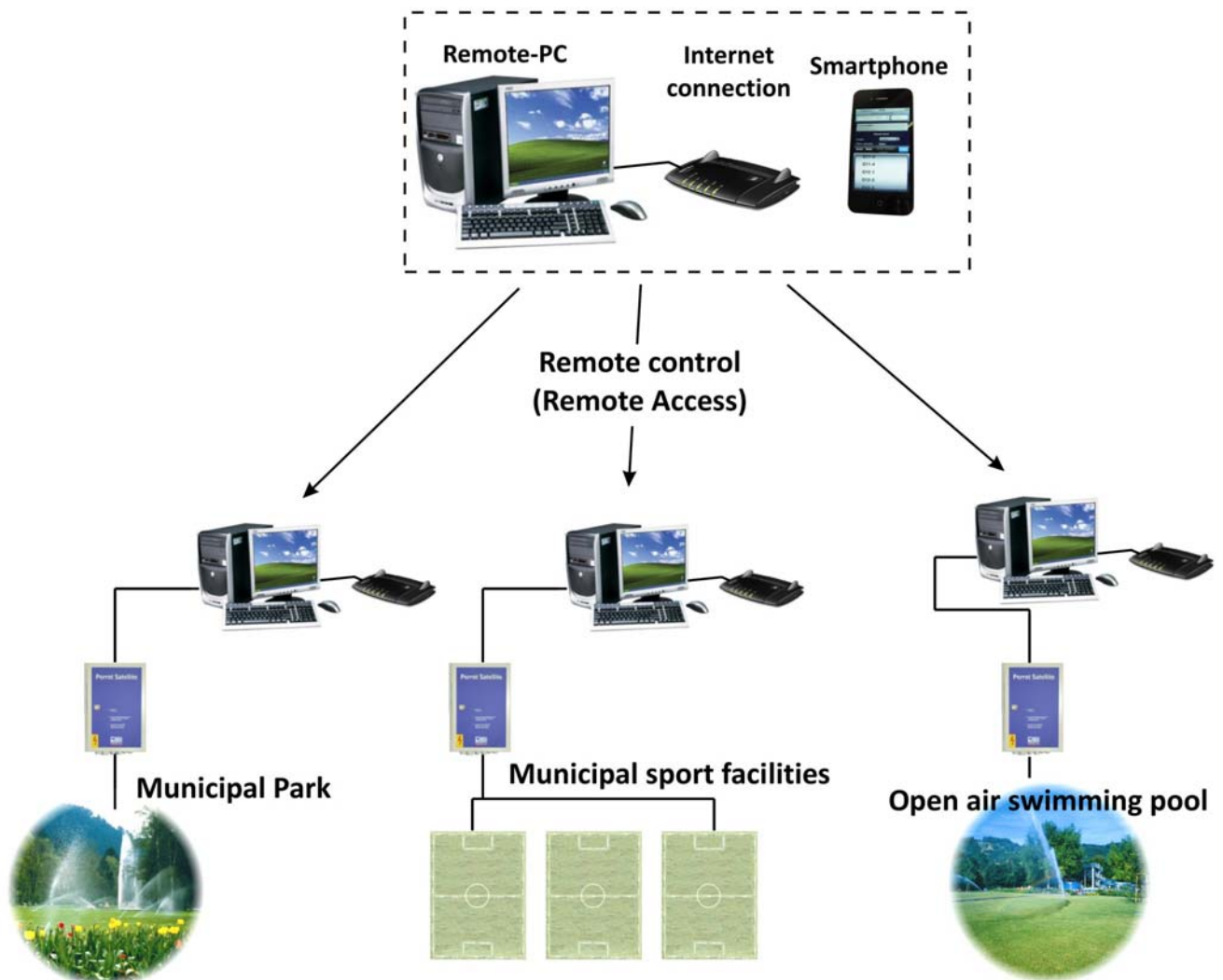
- ↳ A mobile telephone system connection (e.g. GSM) to the control PC
- ↳ Internet (e.g. GPRS)



## Centralisation

- ⇒ The non-restrictive communication possibilities permit that all decentralised irrigation systems can be controlled from one central place
- ⇒ Of course, all functions can also be implemented locally, e.g. if after fertilizing the irrigation must be activated immediately, or if the staff on site calls for action on field work
- ⇒ As each of these irrigation systems can be operated also as an isolated application; it is left to the operator's own resources to specify the optimal concept for a centralization

# Centralisation

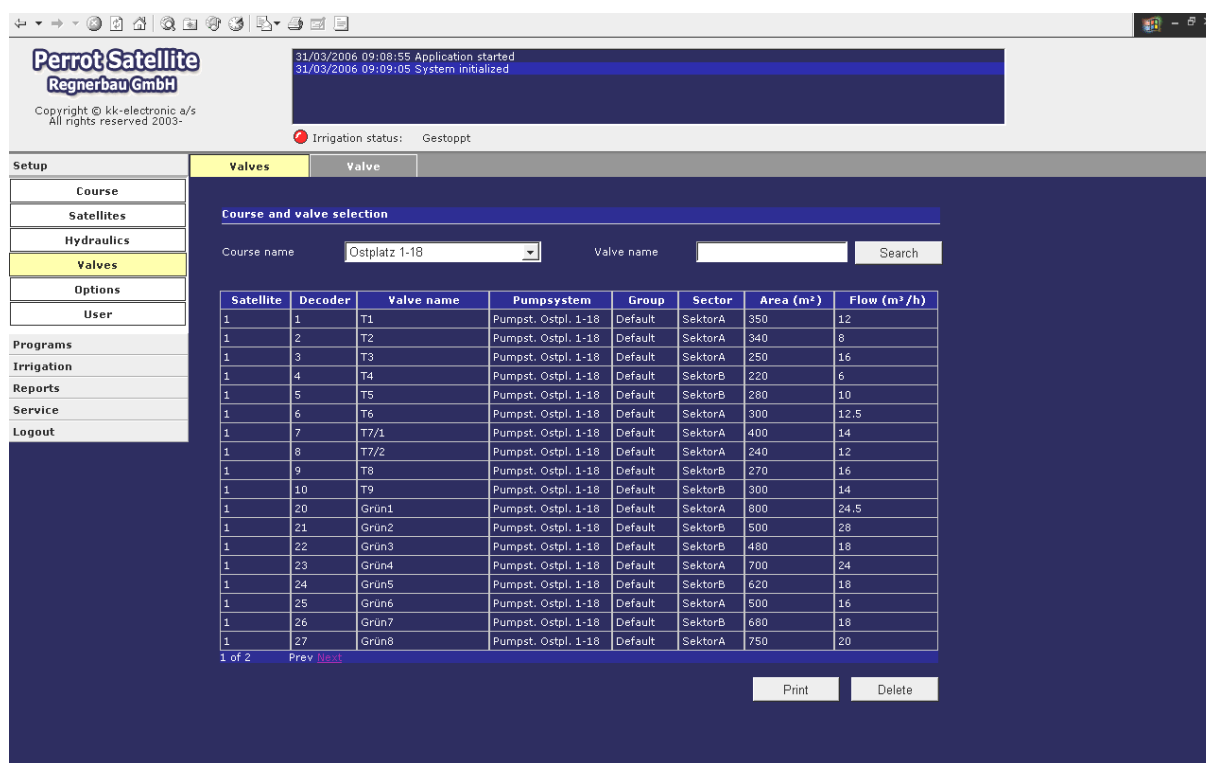




## 4. Software Features

### User friendly program by:

- ↳ Self explaining program construction
- ↳ Clear arranged menu with tab buttons for submenus
- ↳ All menus and functions are mouse supported. Only few key inputs
- ↳ All activated valves, pumps and irrigation programs are shown in tabular form
- ↳ Pull down menus for a better overview for programs, valves or pumps which are to be selected
- ↳ Copy function for easier data inputs for irrigation programmes and valve data
- ↳ Avoiding of irrigation-program overlapping
- ↳ Dialog input avoids mistakes
  - ↳ At the moment Perrot Satellite has a multi-language function and is available in: German, English, Polish, Danish, Dutch and Czech.



The screenshot shows the Perrot Satellite software interface. At the top, there is a status bar with the text "31/03/2006 09:08:55 Application started" and "31/03/2006 09:09:05 System initialized". Below this, the "Irrigation status" is shown as "Gestoppt".

The main interface is divided into a left sidebar menu and a main content area. The sidebar menu includes options like "Setup", "Programs", "Irrigation", "Reports", "Service", and "Logout". The "Setup" menu is currently selected, and the "Valves" sub-menu is active.

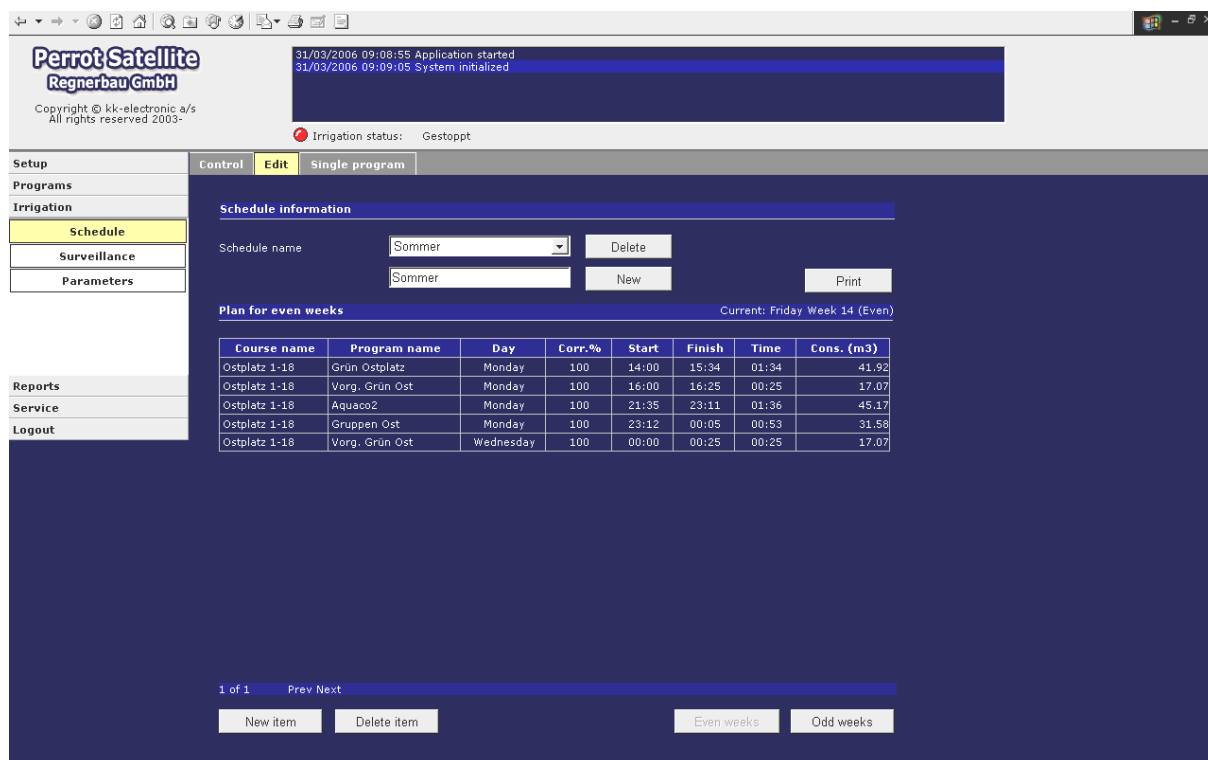
The main content area displays a "Course and valve selection" window. It has a dropdown menu for "Course name" set to "Ostplatz 1-18" and a "Valve name" input field. Below this is a table with the following columns: Satellite, Decoder, Valve name, Pumpsystem, Group, Sector, Area (m²), and Flow (m³/h).

Satellite	Decoder	Valve name	Pumpsystem	Group	Sector	Area (m²)	Flow (m³/h)
1	1	T1	Pumpst. Ostpl. 1-18	Default	SektorA	350	12
1	2	T2	Pumpst. Ostpl. 1-18	Default	SektorA	340	8
1	3	T3	Pumpst. Ostpl. 1-18	Default	SektorA	250	16
1	4	T4	Pumpst. Ostpl. 1-18	Default	SektorB	220	6
1	5	T5	Pumpst. Ostpl. 1-18	Default	SektorB	280	10
1	6	T6	Pumpst. Ostpl. 1-18	Default	SektorA	300	12.5
1	7	T7/1	Pumpst. Ostpl. 1-18	Default	SektorA	400	14
1	8	T7/2	Pumpst. Ostpl. 1-18	Default	SektorA	240	12
1	9	T8	Pumpst. Ostpl. 1-18	Default	SektorB	270	16
1	10	T9	Pumpst. Ostpl. 1-18	Default	SektorB	300	14
1	20	Grün1	Pumpst. Ostpl. 1-18	Default	SektorA	600	24.5
1	21	Grün2	Pumpst. Ostpl. 1-18	Default	SektorB	500	28
1	22	Grün3	Pumpst. Ostpl. 1-18	Default	SektorB	480	18
1	23	Grün4	Pumpst. Ostpl. 1-18	Default	SektorA	700	24
1	24	Grün5	Pumpst. Ostpl. 1-18	Default	SektorB	620	18
1	25	Grün6	Pumpst. Ostpl. 1-18	Default	SektorA	500	16
1	26	Grün7	Pumpst. Ostpl. 1-18	Default	SektorB	680	18
1	27	Grün8	Pumpst. Ostpl. 1-18	Default	SektorA	750	20

At the bottom of the table, there are "Print" and "Delete" buttons. The page number "1 of 2" and navigation links "Prev" and "Next" are also visible.

## Performance features of the Irrigation Program

- ↪ A general log field which is available in all menus, shows all processed functions online as e.g. starting of pumps, opening of decoders, error notes, program starts etc.
- ↪ A graphic symbol in the status line shows menu-independently the condition of the control system
- ↪ 14 days irrigation list, with automatic repeat
- ↪ Unlimited number of program starts and repetitions
- ↪ Arbitrary number of irrigation programs
- ↪ Water budget from 10% to 300%
- ↪ Simultaneous operation of different irrigation programs at different areas (irrigation systems) are possible
- ↪ Classification of system data into several areas (golf courses) is possible and thereby a clearly arranged structuring, also at large number of valves
- ↪ Due to the possibility to create different irrigation calendars a simple adoption on weather conditions and season is possible
- ↪ Search functions for a fast detection of valves names
- ↪ Irrigation program on a web based program structure (can be operated by the Internet)
- ↪ Protection of all installation data by password



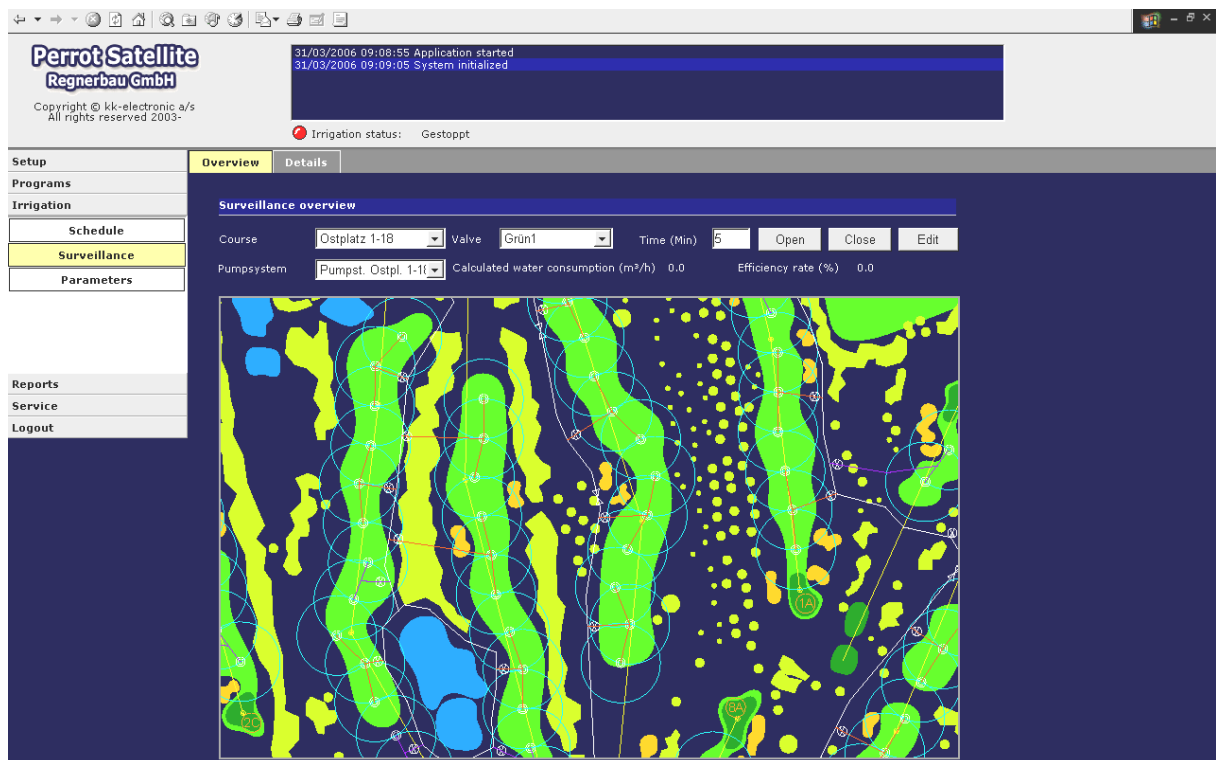
The screenshot shows the 'Perrot Satellite' web interface. The top left corner displays the company logo and copyright information. The main content area is titled 'Edit' and shows 'Schedule information' for a schedule named 'Sommer'. Below this, there is a table titled 'Plan for even weeks' with the following data:

Course name	Program name	Day	Corr. %	Start	Finish	Time	Cons. (m3)
Ostplatz 1-18	Grün Ostplatz	Monday	100	14:00	15:34	01:34	41.92
Ostplatz 1-18	Vorg. Grün Ost	Monday	100	16:00	16:25	00:25	17.07
Ostplatz 1-18	Aquaco2	Monday	100	21:35	23:11	01:36	45.17
Ostplatz 1-18	Gruppen Ost	Monday	100	23:12	00:05	00:53	31.58
Ostplatz 1-18	Vorg. Grün Ost	Wednesday	100	00:00	00:25	00:25	17.07

The interface also includes a sidebar with navigation options like 'Setup', 'Programs', 'Irrigation', 'Reports', 'Service', and 'Logout'. At the bottom, there are navigation buttons for 'New item', 'Delete item', 'Even weeks', and 'Odd weeks'.

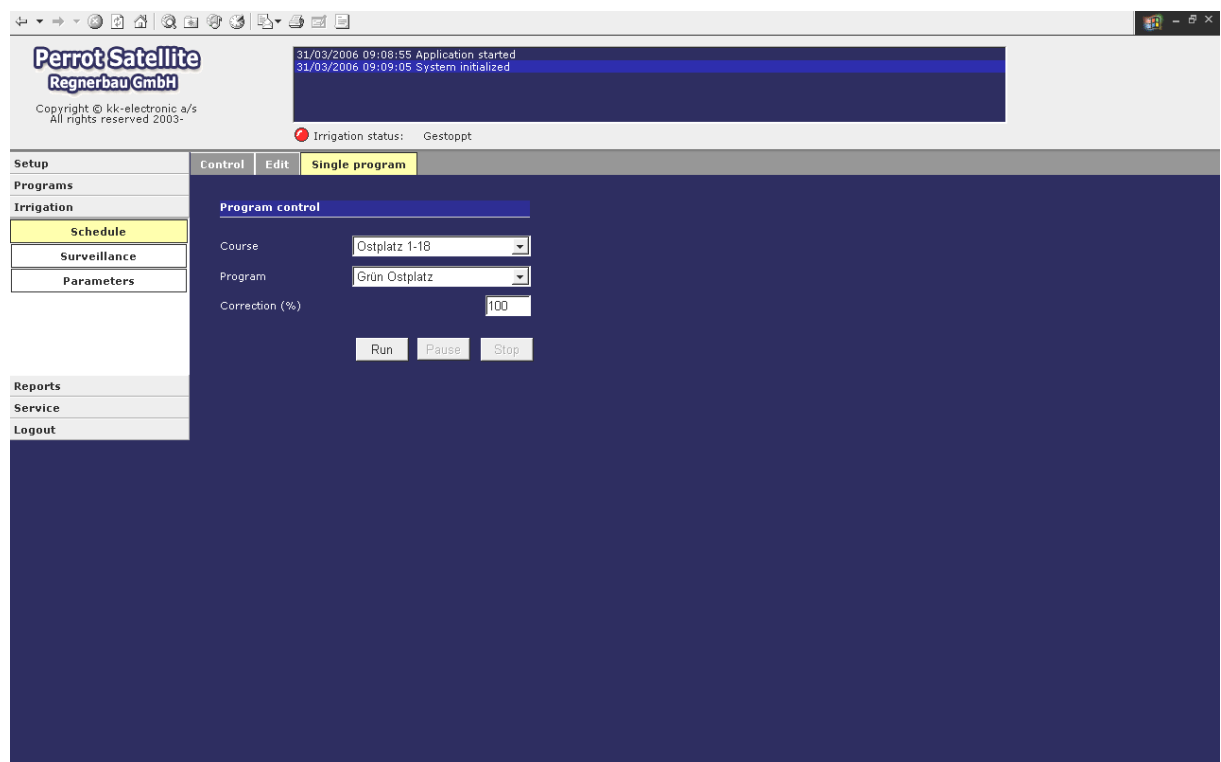
## Graphics

- ↪ **Full-scale** graphic overview of the golf course with exact location of sprinklers
- ↪ Valve symbols can be placed by drag and drop function simply at the desired positions
- ↪ Manual start of valves which can be selected by the interactive symbols of the graphic
- ↪ Opening time for manually opened valves is individually adjustable
- ↪ All activated valves are graphically highlighted
- ↪ Multiple zoom of the graphic possible
- ↪ Display of the water consumption for the selected pumping system
- ↪ For each area a separate graphic can be stored



## Flexible configuration of the irrigation programs

- ↪ Run time of each decoder in minutes or mm (precipitation density)
- ↪ The flow manager calculates by means of the given irrigation quantities the least possible program running time, without overloading the pumps
- ↪ Sequential process of the stations is calculated by the PC or by own configuration
- ↪ Irrigation run, without influence of flow manager for individual desires  
Free choice of pump and valve combinations for each step
- ↪ One-time manual start of irrigation programs without changing the program of irrigation lists
- ↪ Irrigation programs controlled directly by the PC facilitates simultaneous work of several irrigation plants by Perrot Satellite



## Hydraulic optimization

- ↪ Minimization of the pipe friction losses by splitting into hydraulic groups and hydraulic sectors
- ↪ The simulation of the irrigation programs shows:
  - ✘ The running time of irrigation
  - ✘ The sequence of the valve opening and closing times
  - ✘ The pump efficiency rate
- ↪ Flow manager for balancing the system demand at the max. capacity of the pump station
- ↪ VCU controlled pump management also for several pump stations with arbitrary decoder numbers
- ↪ Adjustable interval times for the valve circuit facilitate a low-wear function of the system
- ↪ User-defined limit value designation for hydraulic parameters to protect the system
- ↪ Phone alarm after breakdown of the system

## Irrigation reports

- ↪ Documentation of proceeded irrigation programs as well as program breaks and other disturbances
- ↪ The irrigation period and the irrigation amount is accumulated for each valve for a whole season.

## Perrot Satellite supports service technicians

- ↪ Test program examines consumption of electricity for selected decoders
- ↪ Detailed reports give valuable information for error tracing
- ↪ Detailed problem report with dates

## 5. Hardware

### PC specification



- ↗ AMD Athlon 64 or Intel Pentium 4, min. 1 GHz
- ↗ Min. 1,024 GB RAM, approx. 40 GB free hard disc space
- ↗ Win 7 Professional SP1
- ↗ Microsoft Internet Explorer up to 11
- ↗ Serial interface RS 232 (COM1) for connection of valve control unit
- ↗ Serial interface RS 232 (COM2) for connection of Wireless Transmitter (WT)
- ↗ Network card: Ethernet 100 Mbit
- ↗ VGA colour monitor, resolution 1024 × 768
  - Monitor resolution on lap-tops min. 1280 x 800
- ↗ Optional: remote control via smartphone is only possible with DSL connection using a fixed IP address

## Valve control unit (VCU)



- ↗ Housing in IP 55 design
- ↗ Box size 300 x 400 x 200 (b x h x l)
- ↗ Power supplied with 230V / 50Hz
- ↗ 2 plugs connectors with power supply for the PC with 230V / 50Hz
- ↗ Overload protection for short circuits in the decoder cable
- ↗ Output voltage 48V AC
- ↗ All Inputs/Outputs of the VCU are over voltage resistant up to 8 V min.
- ↗ The unit is EMC checked
- ↗ Connection of up to 240 decoders per valve control unit is possible
- ↗ Following status information is shown by LED:
  - ✘ POWER SUPPLY ON/OFF
  - ✘ IRRIGATION ACTIVE/PASSIV/WAITING
  - ✘ STATUS OF THE DECODER LINE
  
- ↗ There is the possibility to connect external sensors like:
  - ✘ 4 digital inputs, e.g. for a rain gauge
  - ✘ 4 analogue inputs, e.g. for a flow meter, wind sensor or a pressure sensor

The measured data is used for the limit value designation

## Decoder



- ↪ The address of the decoder is **arbitrarily programmable**
- ↪ Holding and pull-in current delivered by the decoder are to be defined for each decoder individually
- ↪ Each decoder can drive max. 2 solenoid valves
- ↪ Multi-station decoder for the control of 4 or 6 stations
- ↪ **Over voltage resistance** up to 4kV
- ↪ Each station has a LED – display which shows following status information:
  - × decoder is off
  - × decoder is power supplied
  - × decoder received a control signal
  - × decoder received a new address
  - × decoder has accepted the new address
- ↪ **Automatic short circuit protection** for possible decoder failures
- ↪ **Waterproof** encapsulation in IP 66



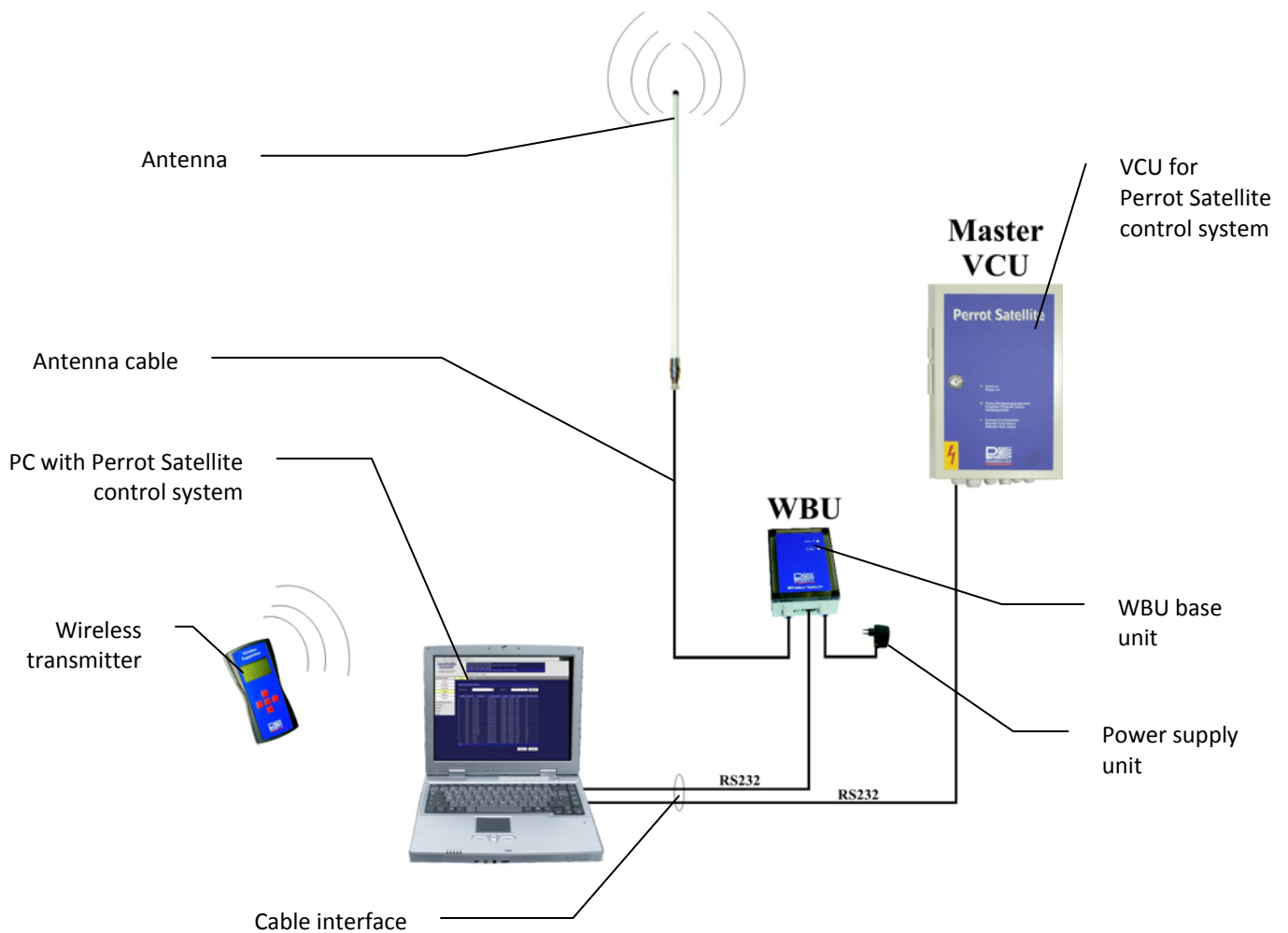
## Wireless remote control by smartphone



- ↪ The main control functions can be done by a Smartphone.
- ↪ Nothing but a connection of the central control PC to the internet is required.
- ↪ The user has an easy access to Perrot Satellite with the storage of the URL in the Smartphone
- ↪ Password protected
- ↪ Following functions of the Perrot Satellite can be activated with the Smartphone:
  - ✗ Manual start of any irrigation program
  - ✗ Activating / deactivating of single valves for adjustable terms
  - ✗ Controlling of running irrigation programs
  - ✗ Creation / modification of irrigation schedule
  - ✗ Status display of:
    - Operating status of VCU
    - Decoder line status
  - ✗ Simple valve searching by alphabetic sorting and by a comfortable scroll modus in the Smartphone.

### Wireless Transmitter (WT)

The WT allows the communication with the control system about an autarkic radio network. The radio network will be installed at site (see picture – scheme drawing). With a free view to the antenna a coverage up to 2km is possible. If there is any obstacle due to the area, buildings or trees you can expand to the requested coverage with the installation of additional repeater stations. The WT can be used in all European countries without radio license.



### Application

- ↪ The WT is very robust and easy to use with only 5 functions keys
- ↪ Ideal for manual watering and functional check of the system



### Features

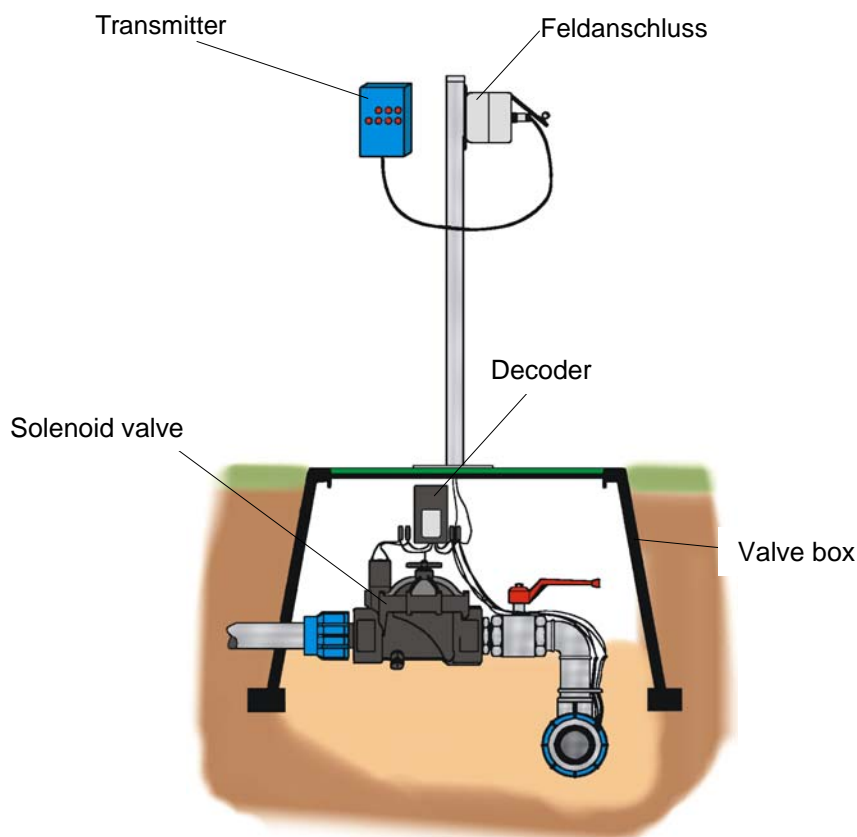
- ↪ „Start/Stop“ of the valves with preset runtime
- ↪ „Start/Stop“ of irrigation programs
- ↪ Easy valve searching by choosing different searching criteria
- ↪ Synchronisation automatically of the program data
- ↪ 3-line LCD display for menu navigation and user support

## Transmitter TM1



- ↪ The transmitter is connected by a field connector (see page 21) with a 2 wire decoder cable
- ↪ By automatic download of the station names, the transmitter can be used with all satellites
- ↪ Size: (l x b x h) 140 x 90 x 30
- ↪ Weight: 350g
- ↪ Liquid – crystal – display with 2 lines and 16 signs
- ↪ Clear identification by text indicator of the valve name  
e.g. 18 - green 9
- ↪ After setting the valve opening time the transmitter can be disconnected from the field connection
- ↪ Information are given on:
  - × Irrigation status
  - × Status of each decoder (opened/closed)
- ↪ Emergency stop function – to switch off all irrigation activities

## Field connection



- ↗ Installation of the field connector preferably on the valve box
- ↗ Stand pipe for plug housing is made of V4A
- ↗ Power outlet in IP 66 as at the transmitter
- ↗ Power outlet is installed in a lockable housing
- ↗ Optionally the transmitter can be connected only over a "cable with plug" to the decoder cable

## Programming unit

- ↗ Programming unit is connected to the VCU
- ↗ LED with function display for decoder



## 6. Perrot Feedback Decoder

### Description

Perrot Satellite can be equipped with feedback decoders instead of the standard decoders (see page 16). Thereby the user is informed reliably whether the equipped station with the feedback decoder works trouble-free. A flow sensor which is installed into each valve group or valve-in-head sprinkler, is periodically queried by the decoder system whether water flows or not.

The Greenkeeper control system compares the nominal and actual value. In case of divergence an error message appears in the program.



In addition to the information **if water flows or not**, the **feedback** decoder can report further state diagnostics to the central office:

- ↻ Valve coil short circuits
- ↻ No coil connection
- ↻ No answer from decoder
- ↻ Supply voltage for decoders is too low

## What to do when-options

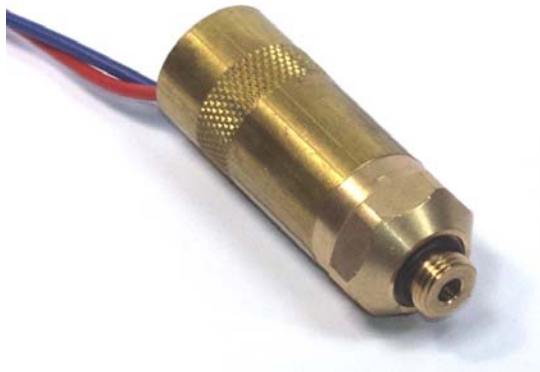
- ↪ Program break off at exceeding a certain numbers of error messages
- ↪ Program break off at pump error message
- ↪ Phone alarm at program break off
- ↪ Phone alarm at pump malfunction

Also for these additional performance characteristics only a 2-core decoder cable is needed.

The feedback decoders are only as an one station decoder available.

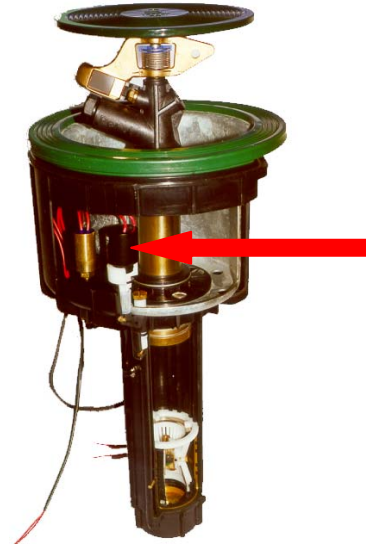
## Hardware

### *Pressure sensor*

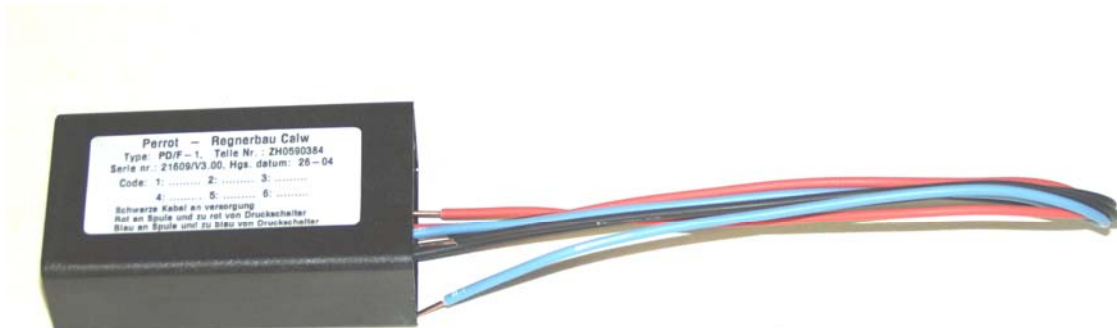


The pressure sensor gives the information to the decoder, whether there is enough pressure at the sprinkler. The pressure threshold is adjusted to 2,5 bar. This is the minimum required pressure for the reliable operation of the sprinkler.

*Pressure sensor is integrated in the valve or valve-in-head sprinkler*



**Feedback Decoder**



The feedback decoder communicates with the control centre in both directions. It can receive information and implement the associated instructions. On the other hand it sends information over the actual condition of the station back to the VCU. It is to be noted that standard and feedback decoders can be mixed in one system.

*We remain at your full disposal for any further information you may require!*