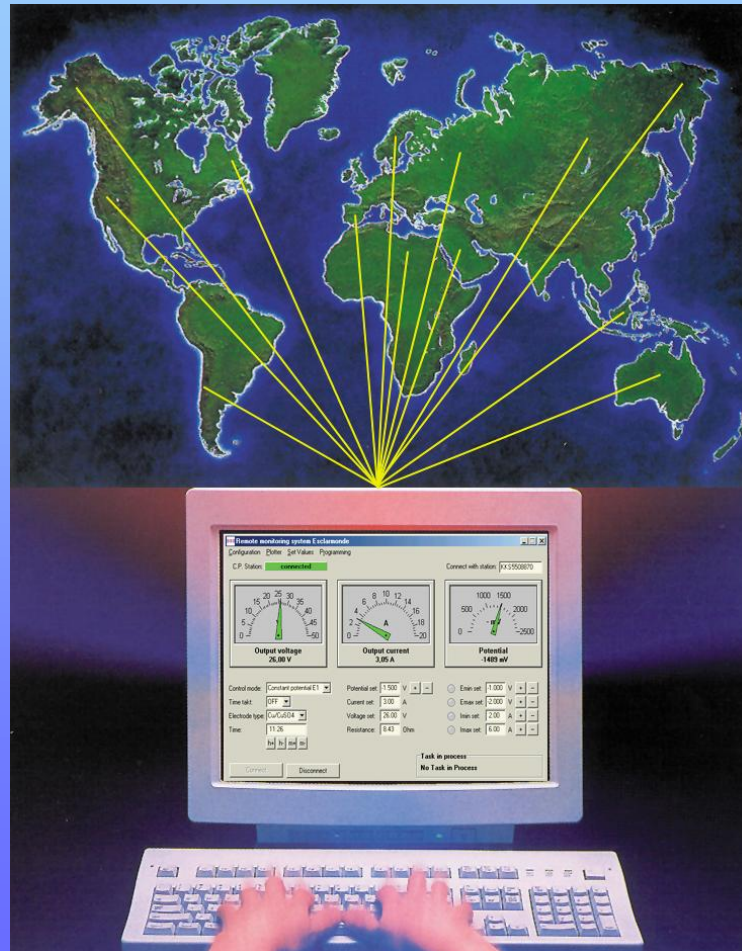


# REMOTE MONITORING AND CONTROL



# 1. Brief introduction of GCP



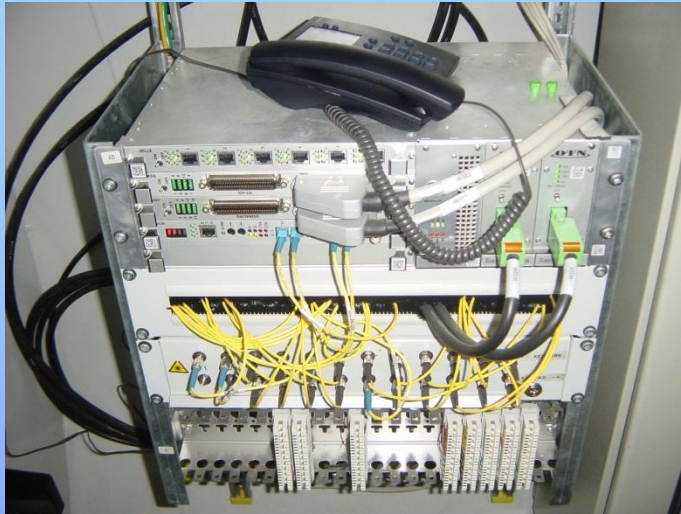
## ***GCP - Competence in Cathodic Corrosion Protection***

***Each metallic structure (e.g. pipelines, plants, harbours, wells, storage tanks) which are surrounded by an electrolyte (e.g. soil, water) will start to corrode sooner or later. Depending on the quality of the metallic structure coating (e.g. bare, epoxy coating, PE coating) the rate of corrosion is higher or lower. Nevertheless, the corrosion process is there. A Cathodic Protection System protects your metallic structures against corrosion on electrochemical basis. Means on active basis (using DC current) and not on passive basis (like painting or coating). GCP is providing the complete range of material and services in the field of Cathodic Protection.***

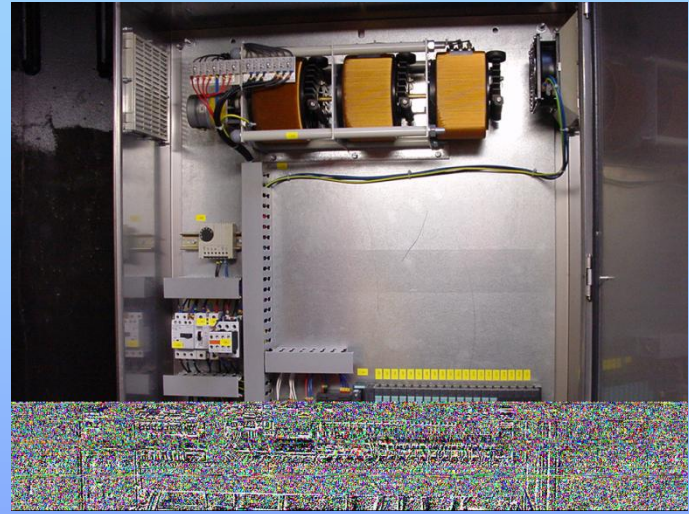
**Some of the objects which are being protected by cathodic protection systems are:**

- Pipelines
- Jetties
- Production wells for oil, gas or water
- Sluices
- Industrial plants
- Harbours
- Oil- and Gas Platforms
- Sheet piling
- Storage tanks
- Steel reinforcement in concrete

## 2. Remote monitoring and control systems in the past



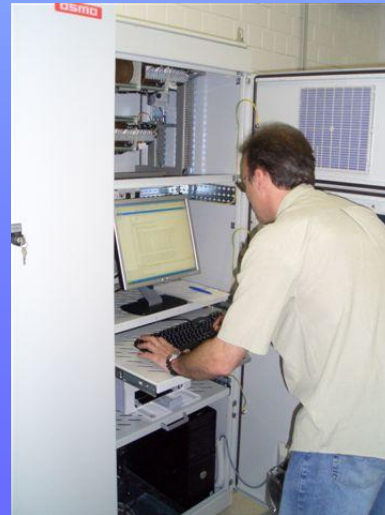
**Kazhakstan / Pipeline project 2004**



**Germany / Harbour project 2001**



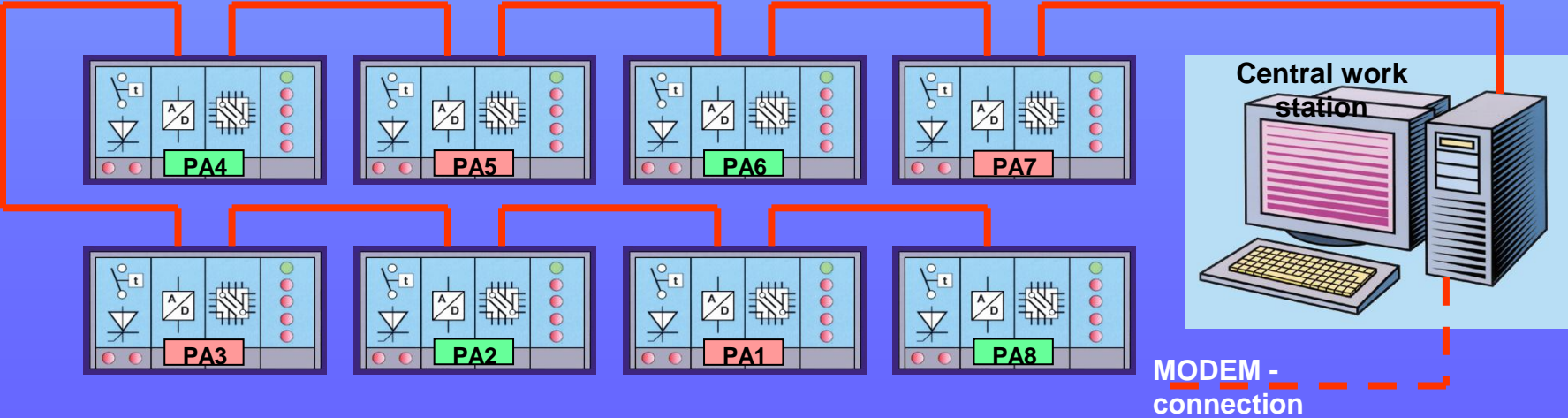
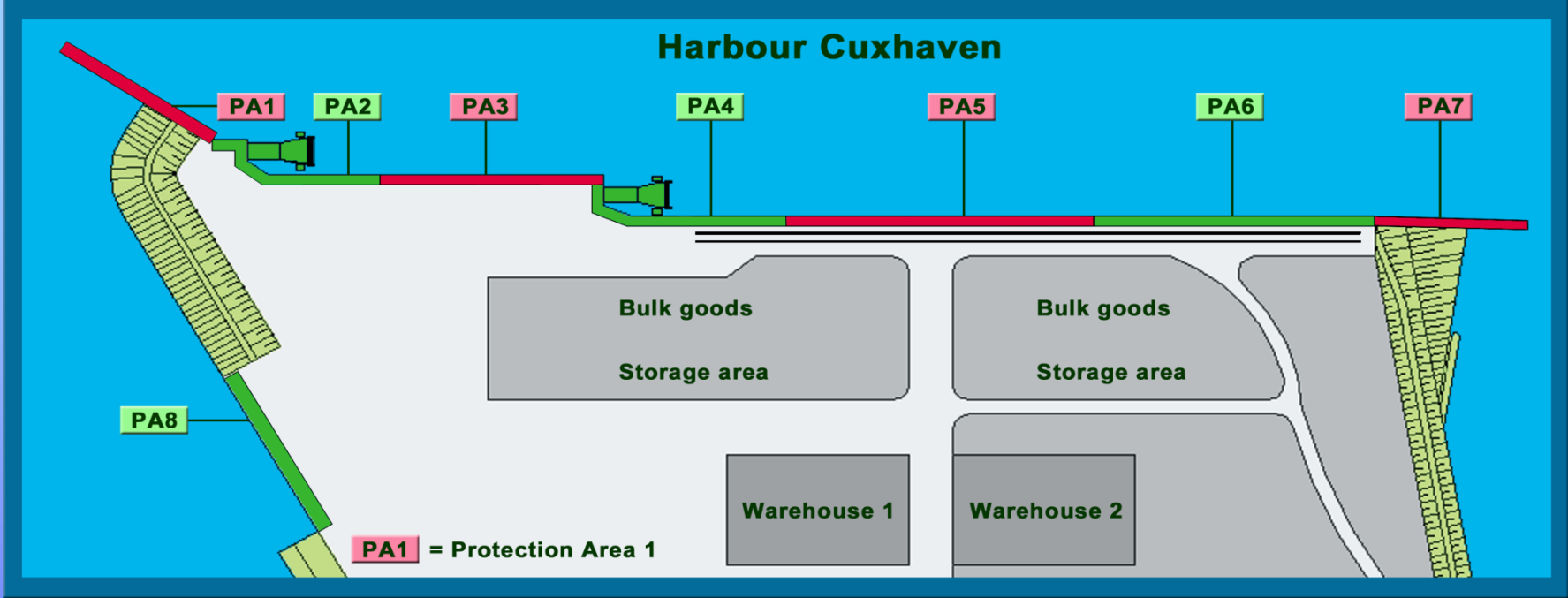
**Panama / Harbour project 2003**



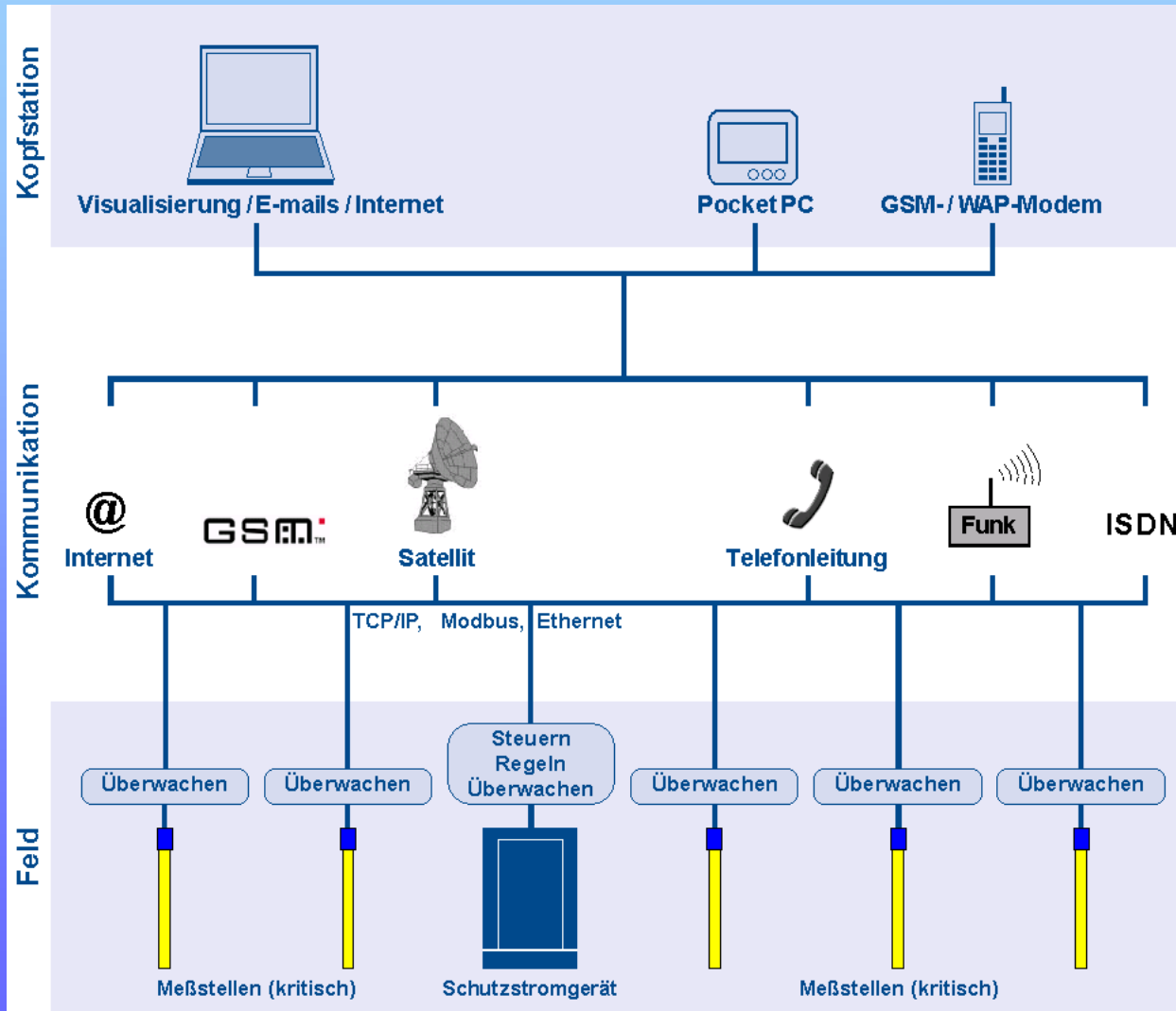
**Germany  
Military Submarine  
Harbour  
2007**

Harbour typical

Harbour Cuxhaven



# Pipeline typical



### 3. New generation of remote monitoring and control systems





**New generation of remote monitoring and control systems are providing a wide range of possibilities to optimize the efficiency of installed CP Systems. Also the fast development in the data transfer possibilities (SCADA, GSM, Ethernet, etc.) makes it easier to connect also remote CP Systems into a “remote monitoring and control system”.**

**The Transformer rectifiers produce by GCP are, as standard, all equipped with an microcomputer “CORROCONTROL” which provides an connection interface for remote monitoring and control systems using**

Depending on the requested possibilities (remote monitoring and control OR only remote monitoring) as well as site conditions (A.C. power available, etc.) two systems are available:



Microcomputer „CORROCONTROL“, where A.C. or D.C. power is available (e.g. 230V AC, 12V DC, 24V DC, etc.) and remote monitoring and control is required. The “CORROCONTROL” adjust the output power of Transformer rectifiers automatically with respect to the selected pre-selections.



Microcomputer „GCP GSM“, where GSM network is available but A.C. or D.C. power not. Due to the fact that this system is normally battery operated it is also an ideal solution to monitor the potentials of remote installed test stations.

4. Cathodic protection computer  
(controller) „GCP CORROCONTROL“



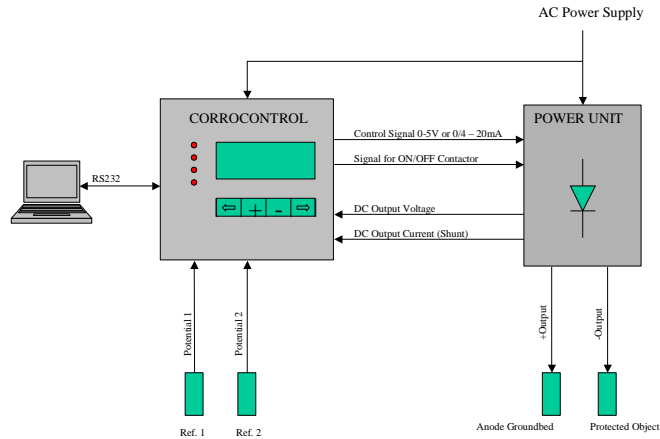
**“CORROCONTROL” is a control unit specially designed for the requirements of cathodic protection systems. CORROCONTROL can be used in all different cathodic protection applications like pipeline protection, well casing protection, plant protection internal and external protection of tanks, protection of off-shore structures, protection of steel in concrete, etc..**

**The main task of CORROCONTROL is the monitoring and control of impressed current systems like transformer-rectifiers or DC/DC units.**

**CORROCONTROL could be operated as a stand alone system with all parameters adjustable using push buttons and display on the controller, or via serial link from remote desktop computer.**

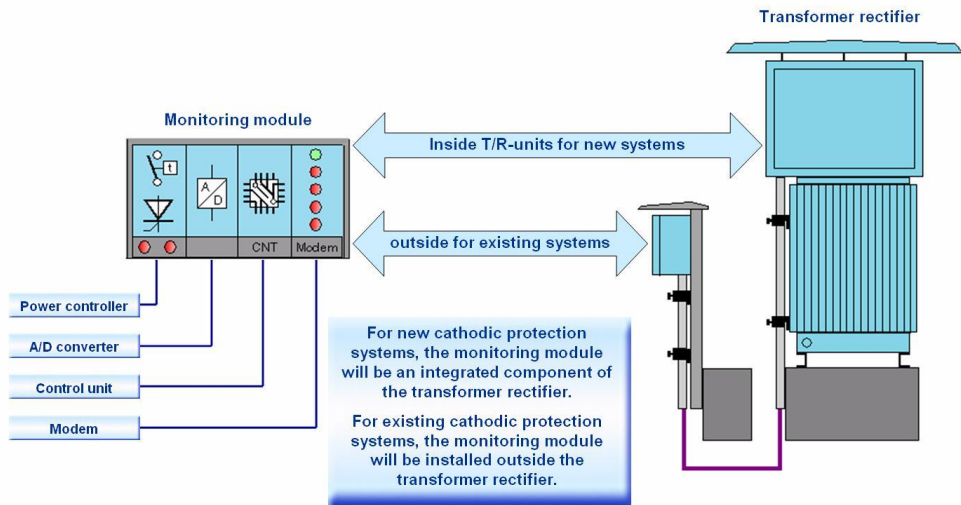
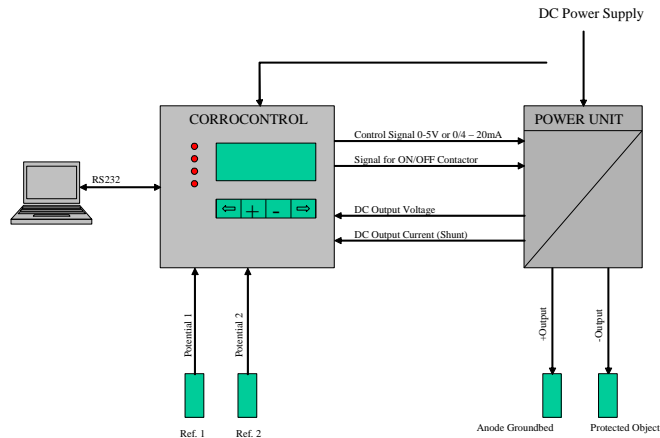
**Different CORROCONTROL units can be connected to one single central computer for a network in order to control every CORROCONTROL unit from one central monitoring and control station.**

Connection Scheme to T/R-Unit



There are different possibilities to connect the CORROCONTROL unit with the main power unit (e.g. transformer rectifier, DC/DC converter). The CORROCONTROL could be installed inside of the same compartment as the main power unit or beside the main power unit.

Connection Scheme to DC/DC Unit



**The CORROCONTROL can be used in applications where a new or existing power source for a cathodic protection impressed current system shall be monitored and controlled.**

**CORROCONTROL provides the possibility to control systems via control signal of 0-5 VDC or 0/4-20 mA current loop to adjust the output voltage of the power source.**

**As an option CORROCONTROL provides the control of systems with a motor driven auto-transformer.**

**CORROCONTROL measures continuously the output voltage, output current as well as the potential of up to two (2) connected reference electrodes (Cu/CuSO<sub>4</sub>, Ag/AgCl, Zinc or MnO<sub>2</sub>).**

**The output voltage will be controlled respectively to the chosen control mode of either constant voltage, constant current or constant potential.**

**If two reference cells are connected to CORROCONTROL and the Electrode IS mode is chosen, the unit checks these cells concerning their accuracy. In case that the difference of reference cells exceeds a preset limit, the unit recognises this fault, indicates this fault and switches to a so called “Intrinsic Safe (IS) Mode”, i.e. the control mode will be switched to a constant current mode as long as the failure has been fixed and acknowledged.**

**This would avoid an overprotection on some structures like coated steel off-shore structures or prestressed steel armour in concrete, where hydrogen embitterment could occur if the potential becomes to negative.**

08.03.2007 08:04:42

### Магистральный газопровод от месторождения газа Шагырлы-Шомышты

**СКЗ – 01 (29.0 км)  
Крановый узел № 2**

Выходное напряжение: 7,23 V  
Выходной ток: 3,38 A  
Потенциал: -1512 mV  
Такт: OFF

REMOTE

**СКЗ – 02 (85.0 км)  
Крановый узел № 4**

Выходное напряжение: 5,32 V  
Выходной ток: 2,76 A  
Потенциал: -1503 mV  
Такт: OFF

REMOTE

Диспетчерская КС-Бейнеу (Дистанционный контроль)

Центральный пункт управления (Дистанционный контроль и управление)

GCP German Cathodic Protection  
Администрация 1  
45307 Essen / Germany  
http://www.gcp.de  
email: email@gcp.de  
Tel.: +49 201 615187 0  
Fax.: +49 201 615187 33

08.03.2007 08:33:07

### Детальная информация по СКЗ - 01 (29.0 км)





Выходное напряжение: 7,23 V  
Выходной ток: 3,38 A  
Потенциал: -1512 mV

Режим управления: Potential E1  
Тип электрода: Zinc  
Прерыватель тока: OFF

Уставка потенциала: -1500 mV  
Уставка тока: 3,00 AA  
Уставка напряжения: 7,00 VV

Дельта U: 30 mV/mV




Emin -1400 mV  
 Emax -1600 mV  
 Imin 0,00 AA  
 Imax 4,00 AA





08.03.2007 08:53:25

### Детальная информация по СКЗ - 01 (29.0 км)




Выходное напряжение: 7,23 V  
Выходной ток: 3,38 A  
Потенциал: -1512 mV

Режим управления: Potential E1  
Тип электрода: Zinc  
Прерыватель тока: OFF

Дельта U: 30 mV/mV

Emin -1400 mV  
 Emax -1600 mV  
 Imin 0,00 AA  
 Imax 4,00 AA

Изменения пределов графика  
 Максимум: 10 A  
 Минимум: 0 A  
 Ok, сохранить новые установки и закончить диалог

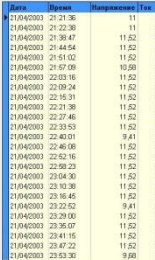
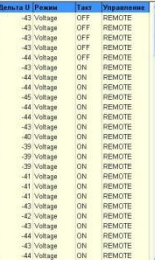





08.03.2007 09:23:32

### Следующие параметры сохранятся

0000h:00m:00s

Дата	Время	Напряжение	Ток	ON E1	ON E2	Результат	Режим	Такт	Управление
21.04.2003	21:21:36	11	0,02	-341	-290	-43	Voltage	OFF	REMOTE
21.04.2003	21:22:30	11	0,02	-341	-290	-43	Voltage	OFF	REMOTE
21.04.2003	21:30:47	11,52	0,02	-341	-290	-43	Voltage	OFF	REMOTE
21.04.2003	21:44:54	11,52	0,02	-341	-290	-43	Voltage	OFF	REMOTE
21.04.2003	21:51:02	11,52	0,02	-341	-297	-44	Voltage	OFF	REMOTE
21.04.2003	21:57:39	10,90	0,02	-341	-290	-43	Voltage	ON	REMOTE
21.04.2003	22:03:16	11,52	0,02	-341	-297	-44	Voltage	ON	REMOTE
21.04.2003	22:09:24	11,52	0,02	-341	-297	-44	Voltage	ON	REMOTE
21.04.2003	22:15:31	11,52	0,02	-341	-296	-43	Voltage	ON	REMOTE
21.04.2003	22:21:38	11,52	0,02	-340	-296	-44	Voltage	ON	REMOTE
21.04.2003	22:27:46	11,52	0,02	-340	-296	-44	Voltage	ON	REMOTE
21.04.2003	22:33:53	11,52	0,02	-327	-294	-43	Voltage	ON	REMOTE
21.04.2003	22:40:01	9,41	0,02	-333	-293	-40	Voltage	ON	REMOTE
21.04.2003	22:46:09	11,52	0,02	-332	-293	-39	Voltage	ON	REMOTE
21.04.2003	22:52:16	11,52	0,01	-332	-293	-39	Voltage	ON	REMOTE
21.04.2003	22:58:23	11,52	0,02	-331	-292	-39	Voltage	ON	REMOTE
21.04.2003	23:04:30	11,52	0,02	-332	-291	-41	Voltage	ON	REMOTE
21.04.2003	23:10:38	11,52	0,02	-332	-291	-41	Voltage	ON	REMOTE
21.04.2003	23:16:45	11,52	0,02	-332	-291	-41	Voltage	ON	REMOTE
21.04.2003	23:22:52	9,41	0,02	-332	-289	-42	Voltage	ON	REMOTE
21.04.2003	23:29:00	11,52	0,02	-331	-289	-42	Voltage	ON	REMOTE
21.04.2003	23:35:07	11,52	0,02	-331	-289	-42	Voltage	ON	REMOTE
21.04.2003	23:41:15	11,52	0,02	-332	-288	-44	Voltage	ON	REMOTE
21.04.2003	23:47:22	11,52	0,02	-331	-288	-43	Voltage	ON	REMOTE
21.04.2003	23:53:30	9,60	0,02	-332	-288	-44	Voltage	ON	REMOTE

An easy to use software (which will be delivered as option as well with the CORRONTRON) allows the operator a nearly „realtime“ overview of all connected Transformer rectifiers and the possibility of remote control of each Transformer rectifier. The software is available in many languages, including Chinese.

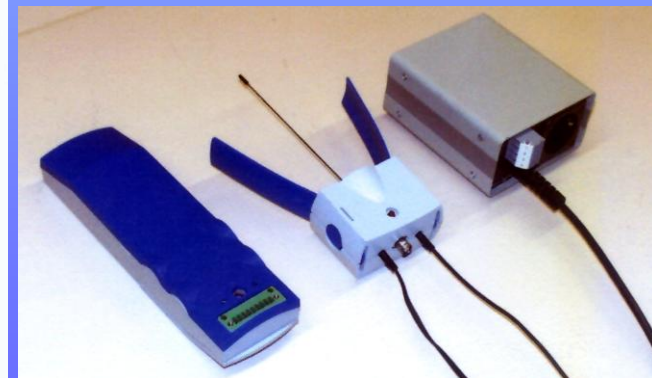
5. Battery operated GSM  
(mobile) data collecting  
monitoring unit „GCP GSM“



**Network irrespective remote monitoring for test stations**

The specially for use in test station constructed radio antenna monitored wirelessly independently ON/OFF Potential, AC voltage, Current and Current microvolt.

The use of battery saving hardware and the latest GSM Wireless technology allows a 3-yearly operating with daily measurements and transfers with one battery pack.



**Complete system with sensor, radio antenna and extern charger**

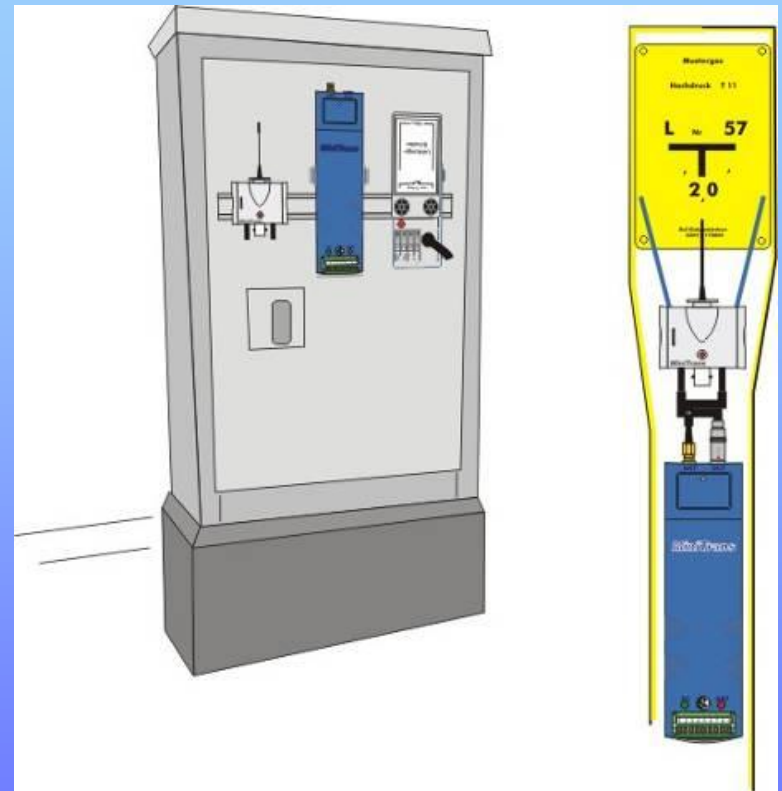
The main components of the system are:

- MiniTrans (Data logging and transmission system)
- GSM/DCF77 antenna
- GPS antenna (optional)
- A/C relay power supply
- WinTrans central software



**The GCP GSM unit can be used either battery operated as for the installation within a test station without A/C power supply, or together with an A/C power supply, mainly used for the installation within a T/R unit.**

**Using Lithium battery pack, the unit can be operated between 2.5 an 3.0 years!**



**The GSM/DCF77 antenna provides on one hand the transmission of any data via the GSM network and on the other hand the time synchronization via DCF77 signal, if the field strength is sufficient. Normally this signal is used within Central Europe and the coverage does not reach up to China. For this case, the use of GPS antenna is recommended, if time synchronization is required.**

**The shape of the antenna was designed in order to fit into a standard type of test post, but fits to most other kind of test posts as well.**



**In order to achieve a standardized time signal outside of the DCF77 area, a GPS antenna could be used.**

**This antenna is connected to the GCP GSM unit instead of the DCF77 antenna and provides the GPS time signal for adjusting the internal reference clock for synchronous measurements.**

**At the moment GPS antenna can be used combined with the relay power supply only, but future release might include the use of GPS antenna for battery operation as well.**



**This relay power supply serves as combined power supply and current switching device for the GCP GSM remote control system.**

**The voltage output of the relay power supply unit implements the power supply of the GCP GSM sensor. The two-pole switching input of the relay power supply unit is driven by the GCP GSM sensor's switching output. The switching power is 30A / 30V.**



The entire control and evaluation of wireless sensors is being affected by software.

All parameters of current remote monitoring operations, like measuring ranges, measuring periods, radio transmission and switching cycles are being administrated by and radioed to wireless sensors.

By means of a comprehensive and powerful database, optimally programmed to suit the monitoring requirements of the CP system, administers control and care of the entire CP test points and rectifier stations.

Beside the use of WinTrans software, the GCP GSM system with their measured values can be integrated into other kind of remote monitoring and/or control systems.

Right you find a screenshot of all GCP GSM systems installed. It is the main screen where all GCP GSM with their actual values and settings are shown and where you can get an overview about all failures and alarms.

The screenshot shows the WinTrans software interface. The main window displays a table of sensor data with columns for Number, Type, Sym, Meter, Site, R-Pipe, DIA, CS, Prio, Sensor, and Comment. The table contains 21 rows of data. On the left side, there is a tree view showing the database structure, including folders for Error Lists, CP-Database, and various sites like FBG, HGW/ GmbH, LKS-Test-Anlagen, etc. The status bar at the bottom right indicates 'Modem inaktiv'.

Number	Type	Sym	Meter	Site	R-Pipe	DIA	CS	Prio	Sensor	Comment
1100	P			Tydd Cote Road North						
1200	TR			Dixon Spain					4726	TR1
1250	P			Dixon Spain Private Road						TR E
1400	P			A17 South						
1600	P			Rear AGI						
1700	P			Rear AGI						
1800	P			Outside AGI Sutton Bridge						
1900	P			Opposite Sutton Bridge AGI						
2000	P			Minor Road south						
2100	P			Minor Road North						
2200	P			South Drove South						
2300	P			South Drove North						
2400	P									Lost
2500	P			B1359 South						
2600	P			B1359 North						
2700	P			Minor Road East Side						
2800	P			Minor Road West Side						
2900	P			Track East Side						
3000	P			Minor Road East Side						
3100	P			Minor Road West Side						
3200	TR			Minor Road West Side					4727	
3250	P			Minor Road West Side						TR E
3300	P			Track North Side						
3400	P			Track South Side						

WinTrans

Files Edit Database MoData GSM View Extras ?

Settings Table Graphic Import Export Receive Mobile Sensor Table Graphic Modem

Object: 6069 MoData: GOSTYD Criteria: -850 mV

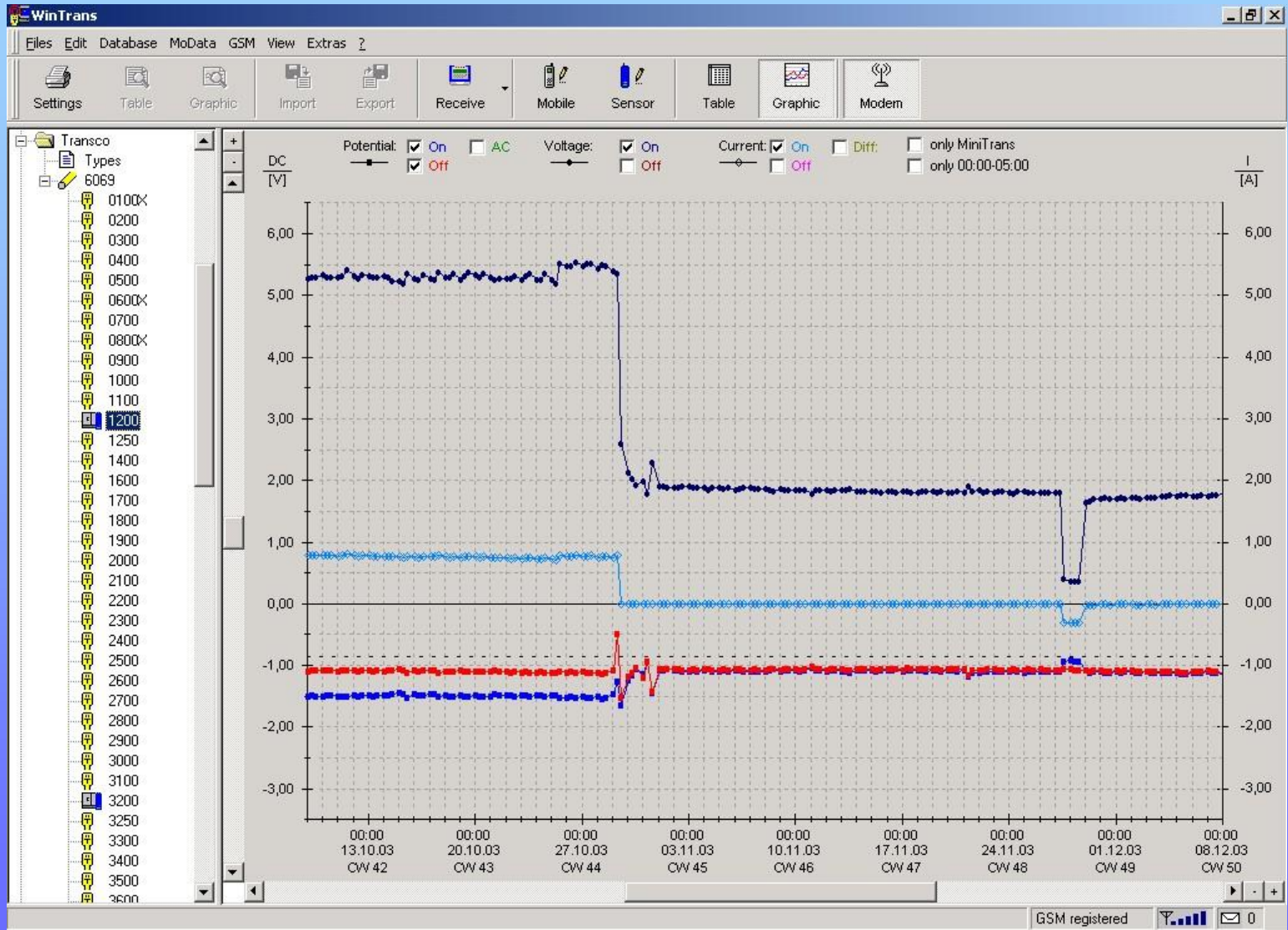
CP MEAS TRESH REMOTE PGM

Number	Type	Sym	Meter	Site	R-Pipe	DIA	CS	Prio	Sensor	Comment
1100	P			Tydd Cote Road North						
1200	TR			Dixon Spain					4726	TR1
1250	P			Dixon Spain Private Road						TR E
1400	P			A17 South						
1600	P			Rear AGI						
1700	P			Rear AGI						
1800	P			Outside AGI Sutton Bridge						
1900	P			Opposite Sutton Bridge AGI						
2000	P			Minor Road south						
2100	P			Minor Road North						
2200	P			South Drove South						
2300	P			South Drove North						
2400	P									Lost
2500	P			B1359 South						
2600	P			B1359 North						
2700	P			Minor Road East Side						
2800	P			Minor Road West Side						
2900	P			Track East Side						
3000	P			Minor Road East Side						
3100	P			Minor Road West Side						
3200	TR			Minor Road West Side					4727	
3250	P			Minor Road West Side						TR E
3300	P			Track North Side						
3400	P			Track South Side						

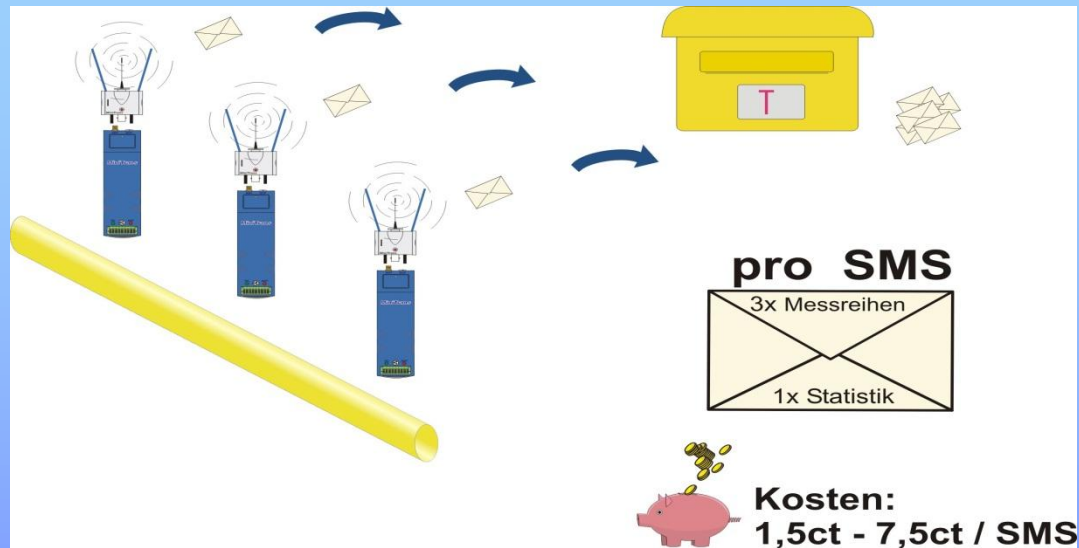
Modem inactiv

## Main overview





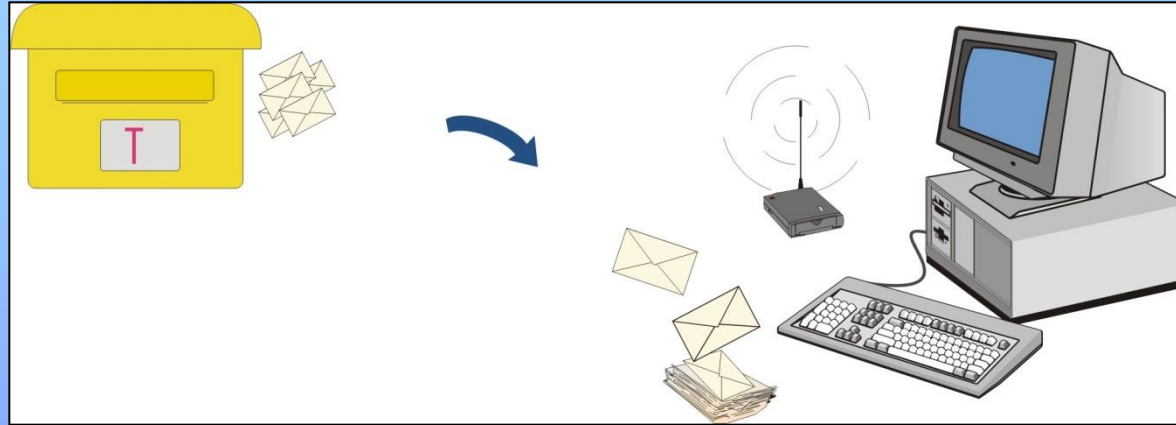
Historical data



After programming the GCP GSM units, each of the unit measures as programmed and stores the result inside of its memory.

Normally once a day the GCP GSM system sends one or more SMS messages containing the measurement results and a status report to the SMS server of the GSM network provider.

Therefore no direct connection to the central PC system is necessary and the relevant measurements are transferred and stored even if the office PC is switched off.



**As soon as the central monitoring and control PC is working and the linked GSM modem has gained access to the GSM network, the collected SMS messages containing the data of the MiniTrans units are automatically transmitted to the PC and stored within the WinTrans database or the alternative control software.**

**Within the central monitoring software all received data are checked against the programmed limit values and any values exceeding the limit values are shown within the alarm protocol.**

**Even all older values can be shown on historical graphs or tables for further interpretation.**

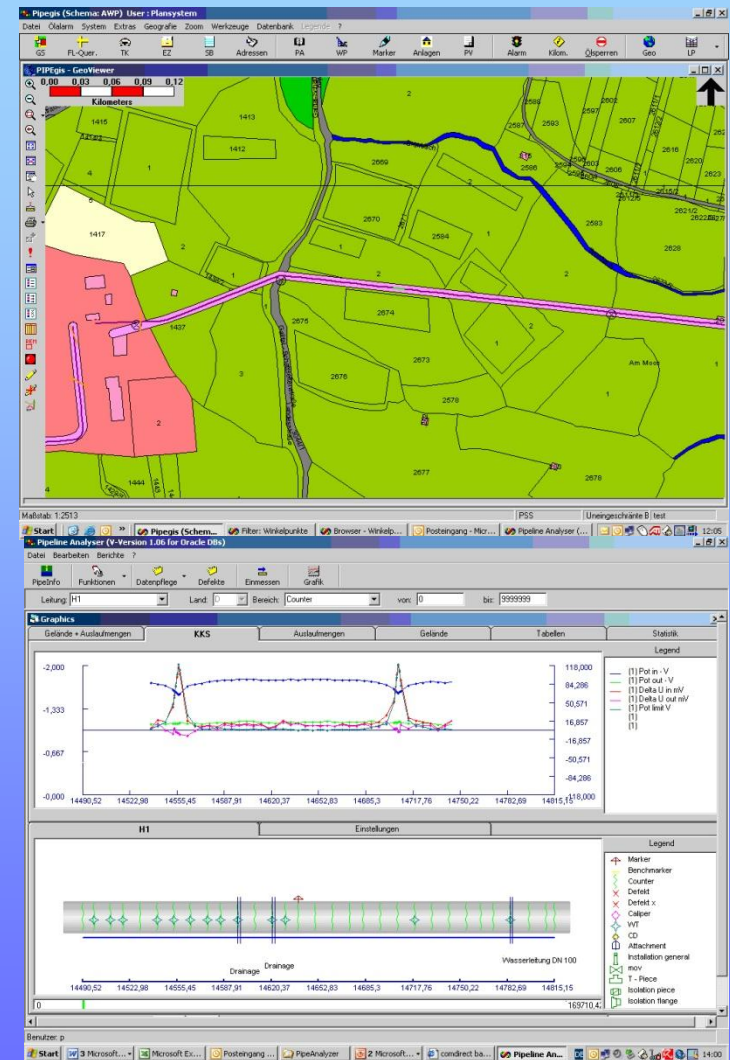
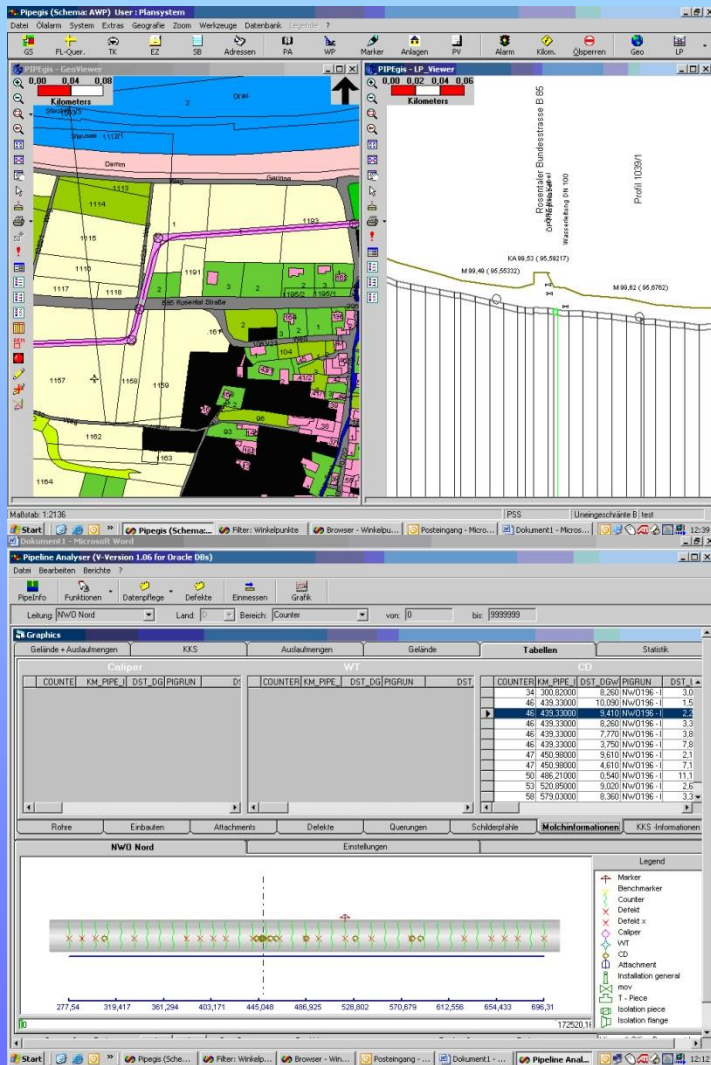
## **CONCLUSION**

**Since the coverage of the GSM network grows day by day and even remote areas get connected to the GSM network, it might be a very attractive and economic solution to monitor the status of a CP system continuously even in areas where it has been too expensive before.**

**Therefore such a system could be used under several different aspects. It could be used for new installations, where no other data transmission network is available, for existing CP system in order to add up the remote monitoring and control of the CP system, or for already remote monitored and/or controlled systems to add up the monitoring of some weak points and where no other data transmission network is available.**

**This proposed system has been installed and used within Europe for several years now a few thousands of installations. It has already proved its reliability and its advantage for a better and more reliable cathodic protection.**

# 6. Data achievement and management



Modern data achievement and management software includes nowadays „GIS“ (GEO INFORMATION SYSTEM) which allows an collecting, archiving and storing data related to map points (GPS coordinates) as well as „google earth maps“.

# OPEN DISCUSSION / QUESTION ROUND

## Thank you for your attention!

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**Website:** [www.gcp.de](http://www.gcp.de)

**Email:** [kahle@gcp.de](mailto:kahle@gcp.de)