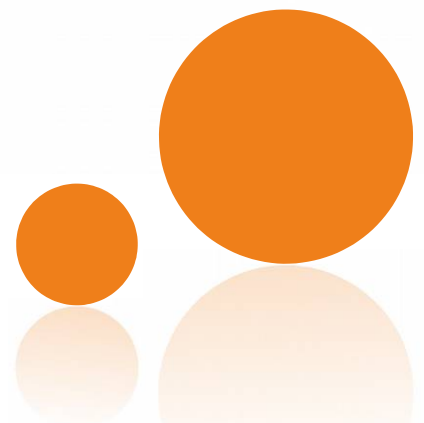# **Multi**Con

simex

Typical
APPLICATIONS
part 2

Measure,
Control and Log Data

Application 50: Set value

Among the numerous modes in which a logic channel can operate, the set value mode is highly appreciated by the **MultiCon** users. The value entered can be either a number or a binary code. The logical channel in the set value mode can also take the form of a button, optionally a mono- or bistable one. This functionality enables to implement complex control algorithms while management of the process of recording is a simple task.

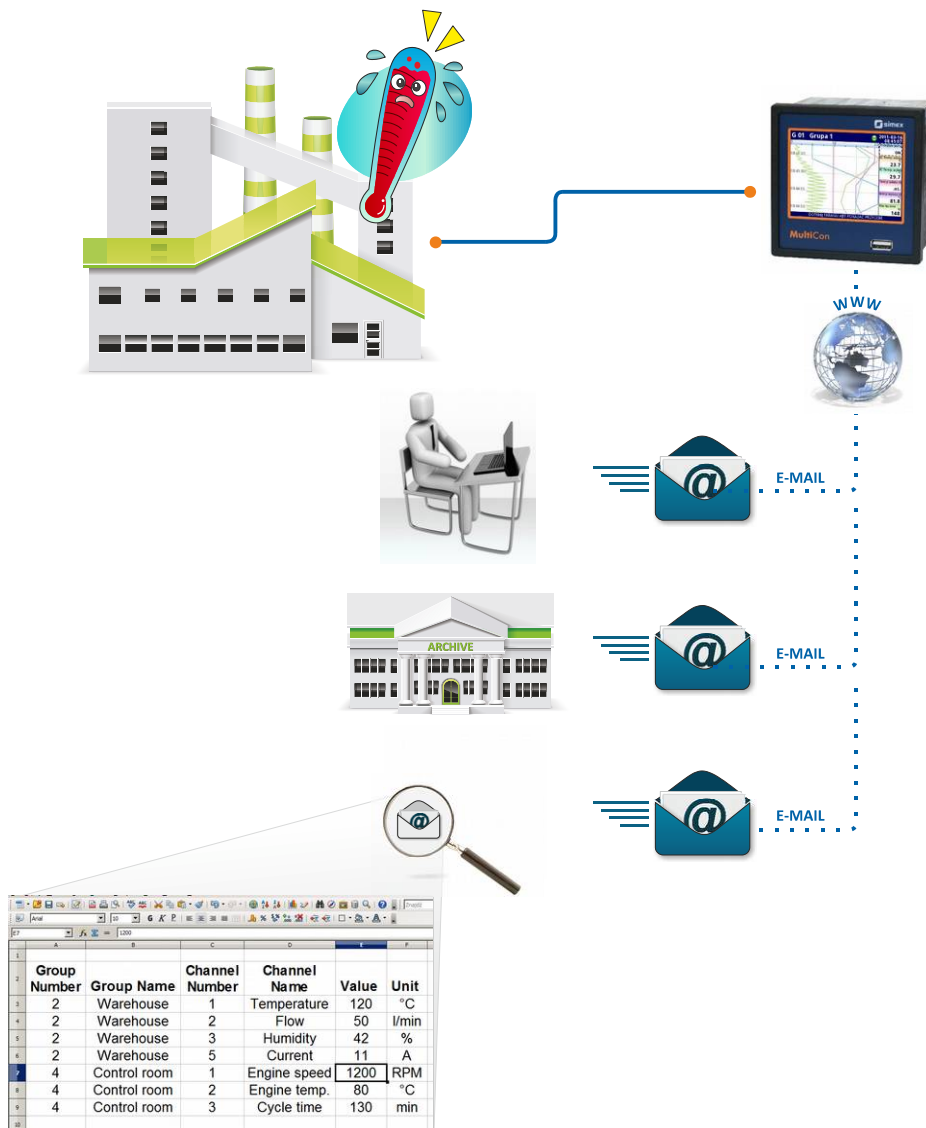## Application 51: Support for the industry of pharmaceuticals

The industry of pharmaceuticals is highly sensitive to the changes of environmental conditions. It is very important for the quality of production as well as employee safety to control temperature, humidity or pressure in particular production processes. Here's where the **MultiCon** comes to assist you. It is capable of measuring any non-electric values while being an ideal dosing system, meter of cycles or an alarm unit. Any information about the collected signals can be stored in the internal 1.5 GB memory.

## Application 52: New functionality: e-mail notifications!

In response to our Customers' demands, the **MultiCon** line devices are now equipped with a brand new function: an "**E-mail notifications**" system. It enables sending e-mails directly from the **MultiCon**, which makes the device even better adapted to high-tech alarm and monitoring systems. The user can define up to 32 different messages to be sent in case of any of the specified events. An e-mail message consists of three elements: topic and text of the message (both with fixed content) and an attachment containing momentary values from the selected groups of or individual measurement channels in the .csv format. Because **MultiCon** supports secure logging (encrypted by TLS or SSL protocol), the account from which notifications are sent can be opened on any e-mail server.

*The "**E-mail notifications**" system functionality requires the license key.*

Group Number	Group Name	Channel Number	Channel Name	Value	Unit
2	Warehouse	1	Temperature	120	°C
2	Warehouse	2	Flow	50	l/min
2	Warehouse	3	Humidity	42	%
2	Warehouse	5	Current	11	A
4	Control room	1	Engine speed	1200	RPM
4	Control room	2	Engine temp.	80	°C
4	Control room	3	Cycle time	130	min

Application 53: Detecting changes in a monitored process (on the example of heating profile)

Recently added mathematic functions, e.g. derivatives or integrals, expanded the functionality of **MultiCon**. Derivatives can be used for example in detecting changes in a measured process. Using derivatives as an incline of a measured value diagram, you can easily detect any changes within the process. Thanks to that, you can read any unwanted temperature decrease or the moment the temperature increase stops (e.g. the moment of furnace heating). Oftentimes, this is the signal to start some other process, to change the heating profile, or to simply register the time of the incident. Furthermore, the user can decide what level of change (rise/fall rate) should trigger a reaction from the controller.

12:53:15 12-05-2015
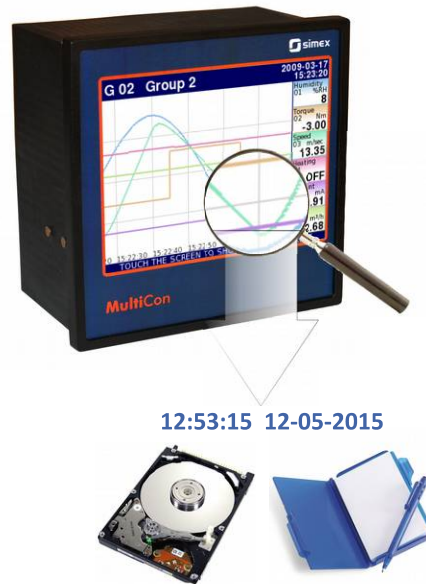
Application 54: MultiCon as a controller of proper use of combustion engines

From numerous applications where **MultiCon** proved to be useful, one of the most interesting ones is the control of the work parameters in combustion engines, used as e.g. drive systems in vehicles and boats, or as redundant power generators. Thanks to its universal design, **MultiCon** can read various non-electric values, e.g. pressure, temperature, or the flow of work factors, as well as the rotational speed of a rotating object with no need for using additional converters. **MultiCon** is password-protected and enables quick registration, which makes it an ideal monitoring device. Remote access allows the administrator to control proper engine work with no need for interference.

Application 55: Using a PC screen as a display

There are numerous ways in which users can remotely access their **MultiCon** line devices. One of them is the ability to use the screen of your PC as a controller display. After configuring an admin password, the built-in webpage displays a hyperlink allowing you to redirect **MultiCon's** screen to the earlier started Xming application on your PC. Thanks to that, operators have direct access to all functionalities of the device from any place.


Application 56: Synchronization with time server

MultiCon devices are often used in applications where the primary requirement is to ensure highly precise process realization in real-time. Currently, **MultiCon** does not require manual set up of time and date, and it features automatic synchronization. After installing the most up-to-date firmware and connecting the device to the Internet, you can enter an NTP (Network Time Protocol) server address. From now on, the device will automatically synchronize the time with the selected server. Thanks to that, **MultiCon** always has the correct time and date set up, and all changes to DST are always applied.

Application 57: Conditional data recording in practice

One of the most popular **MultiCon** functionalities is the data recording feature, where on the level of basic parameters you can define logical channels that are going to be recordered, as well as data recording frequency. It is also a good idea to take a look at the remaining data recording parameters provided by the device. One of them is conditional data recording. After selecting it, the user can decide which channel will trigger the data recording for a particular group of channels. Thanks to that, you can record particular parameters only in critical conditions, e.g. when a certain value exceeds a defined threshold. Another example of the application of conditional data recording (along with time profile) is cyclic data recording, where you can e.g. record only the first minute of each hour.
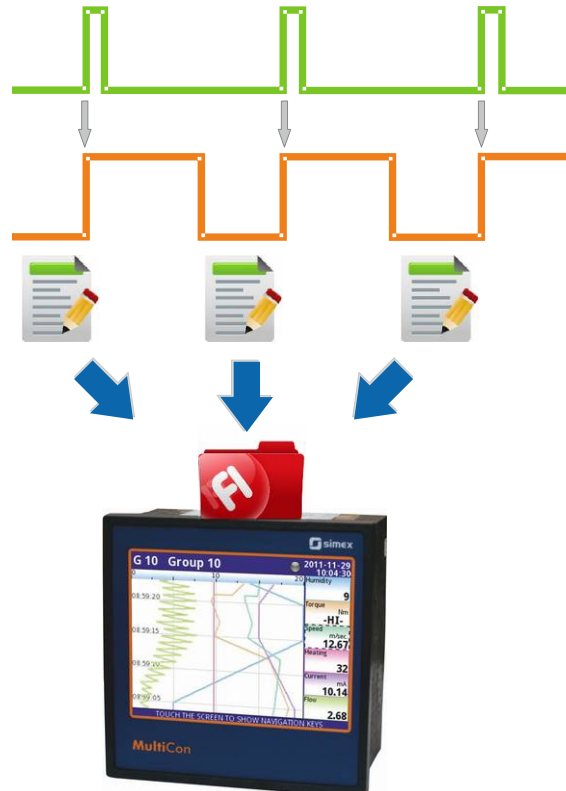

Application 58: Pulse inputs CP2/CP4 - additional functionalities

MultiCon can be equipped with pulse counter inputs. A single card features 2 or 4 inputs, depending on the chosen module. Additionally, **MultiCon** can communicate with external **SLI-8** module (equipped with 8 independent inputs). An interesting solution is to realize two balances using a single physical input. For instance, you can count all pulses received by the device using one logical channel, while counting the pulses during a particular day using the other channel. Such configuration provides users with functionality of two separate counters - a total counter and a daily counter, which can reset (automatically or manually) more often than the total counter.

Application 59: Indicated number of heating profiles

In numerous industrial sites **MultiCon** is used for annealing process management. In such processes, the key is the rate of temperature increase/decrease, as well as the time the elements spend in target temperature-established state. However, there are systems in which the key is not the time, but the number of cycles. Because **MultiCon** is such a flexible device, it can easily handle this type of tasks as well. In a user-friendly way, it allows you to set the number of cycles of your choice for a particular process, as well as the threshold value that will initiate the cycle count. After the specified number of cycles is reached, the device will inform the user via one of the communication channels (e.g. e-mail).

i=300 cycles
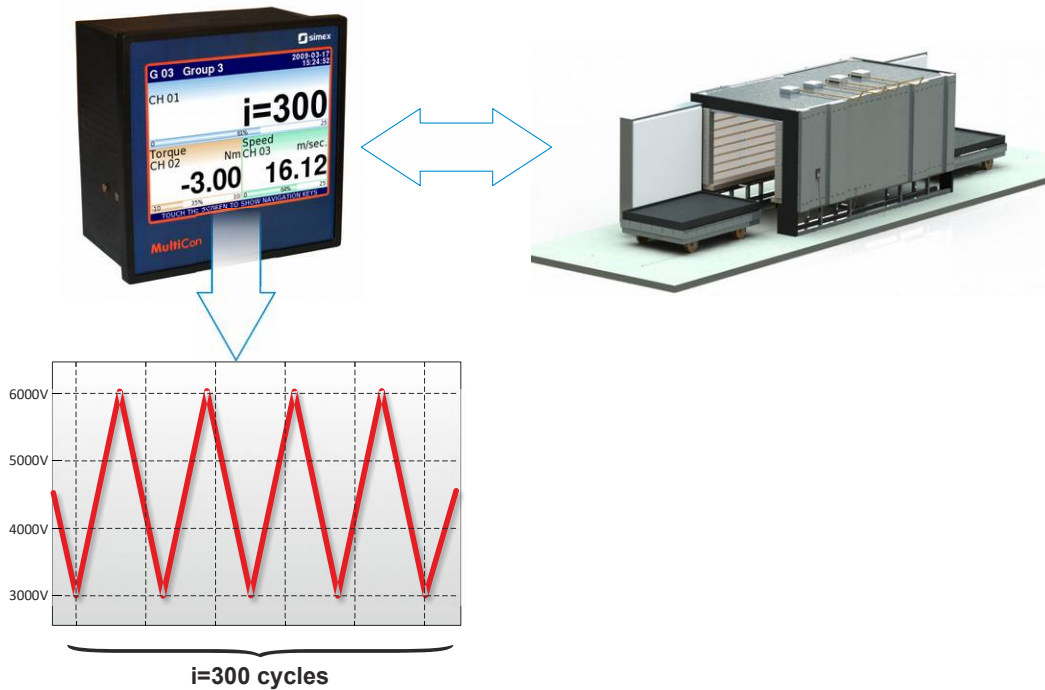
Application 60: Recording single element parameters

One of many ways to use conditional data recording is **recording single element parameters**. For instance, in print applications **MultiCon** together with a slotted sensor or any other presence sensor can save in its own memory samples not only at an indicated frequency, but also every time an object occurs in the sensor zone. Thanks to that, when you connect **MultiCon** with a label detecting sensor and an encoder, you can set up the device in a way to make it read the length of subsequent labels directly from the recording files.


REPORT
1. 15.02 cm
2. 15.04 cm
3. 15.00 cm
4. 15.01 cm

Application 61: MultiCon as a controlling device

Using the counter input (**CP2/CP4**) and the encoder connected with the measurement system of the production line, you can precisely define the amount of material used in production. Scalability allows you to view not only the length but also the grammage of the material (e.g. wire, steel, foil) directly on **MultiCon**. You can set up scalability manually or it can be adjusted automatically. This way of using the device enables controlling the amount of manufactured product against the material used.

Application 62: Hardware output monitor

The logical channel in **MultiCon** devices can be of various forms, one of which is the so-called "**Hardware output monitor**". Depending on the type of output, the device can display the signal in a binary (in 0/1 bit or descriptive form e.g. START, STOP etc.) or analogue (4÷20 mA scaled against engineering units) form. This functionality allows you to use the gathered data to create logical control structures or to run system diagnostics. Thanks to that, you do not need any external controls or meters to visualize output status of a **Multicon**.
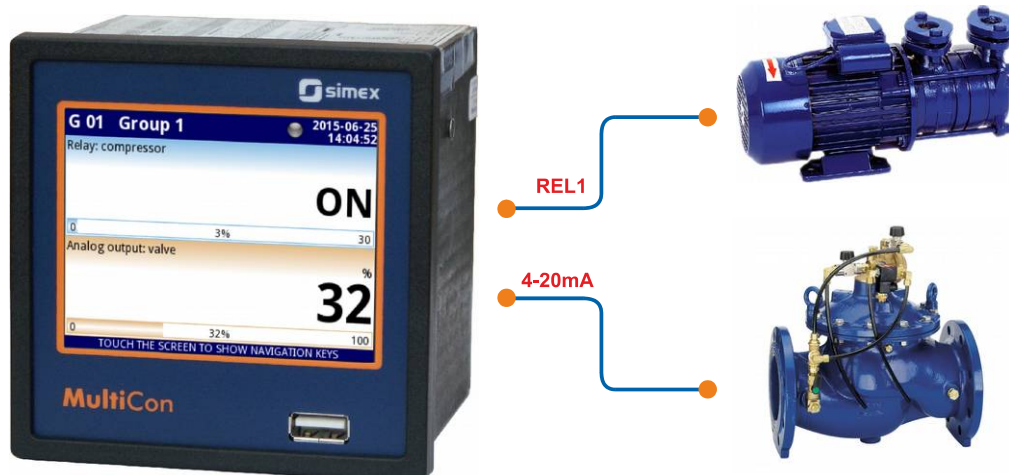
Application 63: MultiCon recorder with MultiPrint printer

Primary use of the **MultiPrint** line thermal printer is to automatically print instantaneous values of parameters measured by the device. After setting up the trigger of the **MultiCon** regulator and defining logical channels and channel groups, the printer automatically prepares prints along with reports. The printing may occur at the time a particular event takes place, or at a time interval, e.g. an hour. It can also be started manually by the operator. You can create up to 8 independent report templates. Thanks to the use of the **Multicon** with the printer, after arriving to the location, an operator has a readymade report at his disposal.


Application 64: Enhanced WWW Server

MultiCon features an enhanced *WWW server* that enables gaining access to numerous functions directly from a web browser. Such functionality enables e.g. previewing logical variable values, the amount of memory left for data storage, or set up parameters of the device. What is more, after signing in as an administrator, you will unlock additional features like: downloading and installing new device setup, Remote Display support that allows you to set up your device directly from you PC. Thanks to that, servicers can diagnose particular problems with an object or remotely re-program the device.

Application 65: MultiCon as a programmable room temperature controller

MultiCon is equipped with the known feature of time profiles that may serve as the temperature setting signals, used mainly to control the baking process. They may also be used for building applications. Time profiles may be triggered by various conditions or initiated at a set time of a given day of the week or month.
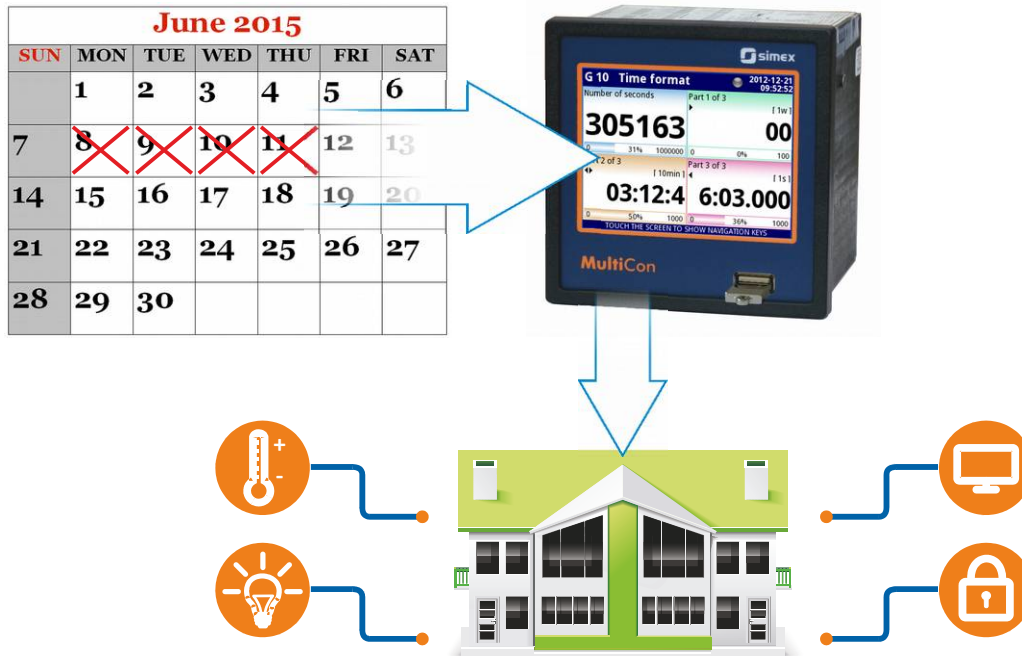
Application 66: Communication with the external SCADA system

MultiCon may successfully serve as the main controller of an independent industrial process or co-operate with other systems. With the numerous communication ports, it may easily communicate with existing controllers. For example, **MultiCon** may be connected through an RS-485/USB converter to a PC with SCADA (*Supervisory Control and Data Acquisition*) software installed. This type of connection supports duplex communication and the integration of **MultiCon** with other automation systems implemented in the facility.
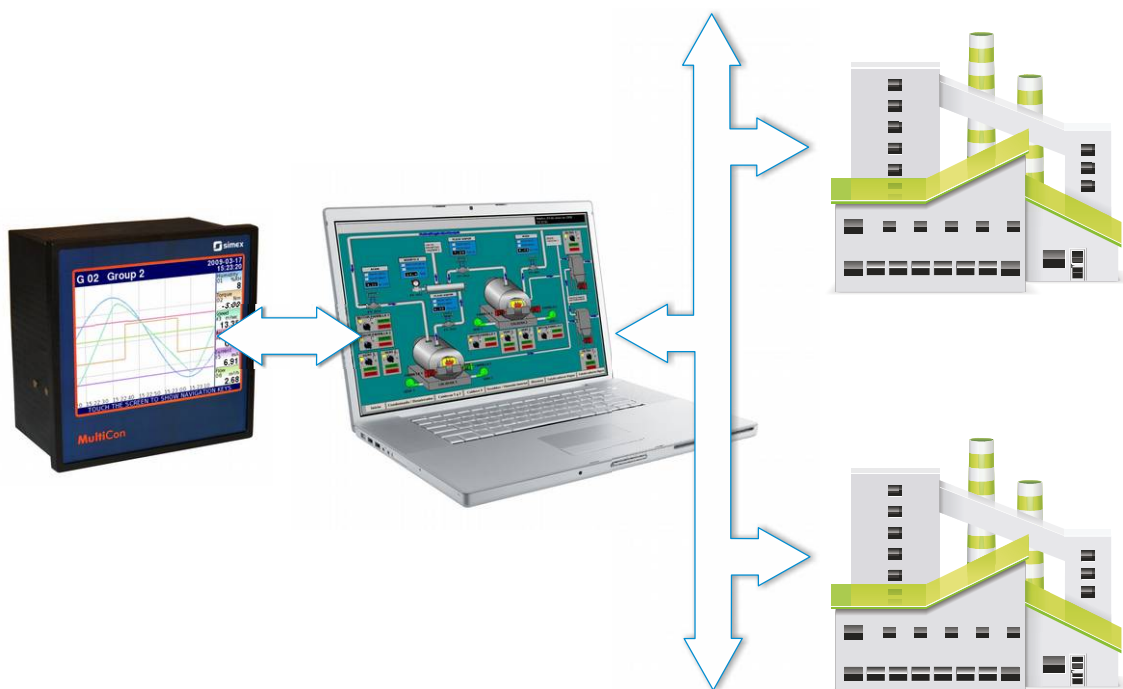
Application 67: MultiCon as the product quality testing device

A data recorder used for strength tests has to be capable of a quick response to specific changes of the tested parameters. Fatigue tests, in turn, involve a repeated application of the same load to the tested object, which requires long-term recording. With the large amount of integrated memory and the option of changing the length of the sampling period, **MultiCon** is suitable for both cases. Equipped with the counter inputs that receive the signal from the proximity sensors, the device can, for instance, monitor pushbutton tests. Pressure transmitter and **MultiCon** with an analog input slot create a useful assembly for pressure tests. In that case, **MultiCon** is also capable of routine data analysis to detect the moment when the yield stress of the tank is exceeded.


Application 68: Graphical presentation of results

Despite the immense potential currently offered by process automation, human involvement is still required. The instinctive interpretation of measurement results cannot be replaced with a combination of mathematical dependencies. In such cases, **MultiCon** can assist the operator by presenting results in the form of bar charts or dial charts. The wide range of colors and available data display arrangements enable parameter presentation adjustment to match the process and user.
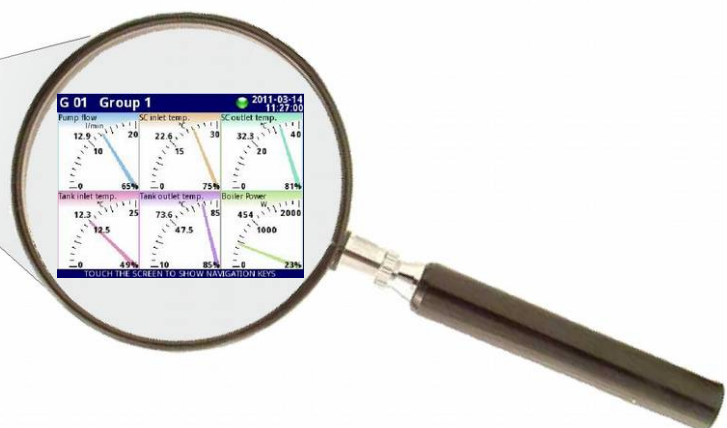
Application 69: Proportional control

In addition to binary relay output modules and fast SSR outputs, **MultiCon** has also been provided with current outputs. These outputs are used for proportional control of servo valve assemblies. Actuators positioned by such valves can operate synchronously, but since the individual analog outputs can be interdependent, groups of such outputs can be used to control more complex positioning systems.
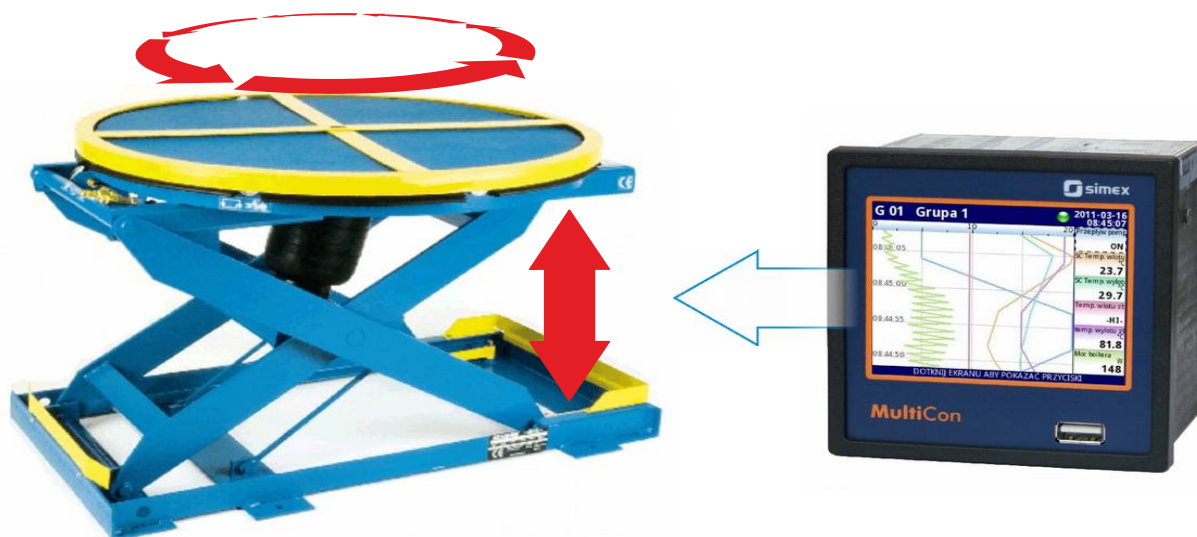
Application 70: Recording of wood drying parameters

Exemplary applications of **MultiCon** include the recording of wood drying parameters. With the multi-channel input modules, the device is capable of monitoring temperature and moisture content, both inside the chamber and of the wood itself. If the process is more demanding, **MultiCon** can also be used to control those parameters, maintaining them at a constant level or implementing the time profile set by the user.
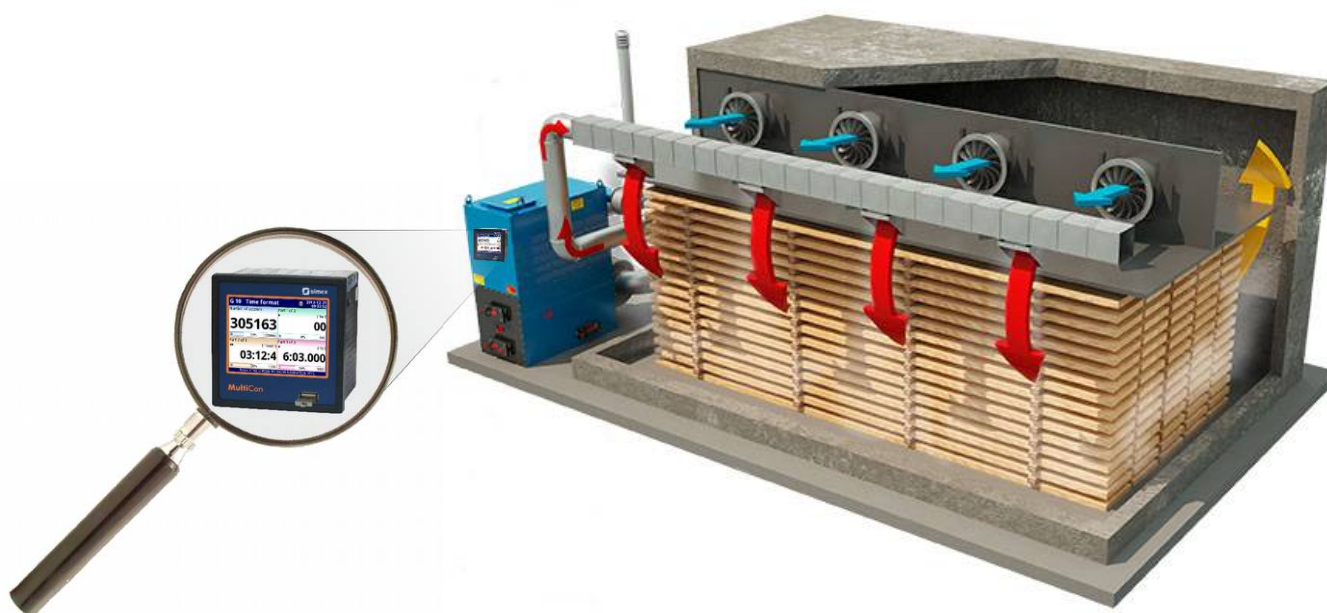
MultiCon

Application 71: Mobile recorder

The functions of the recorder can be used not only in stationary processes. **MultiCon** can, for instance, be installed on a semi-trailer of a tractor carrying goods for which the receiver requires suitable transport conditions. If necessary, the device can be placed in a durable P130 case and the MultiPrint printer can print out an easy-to-read report concerning the entire transport period.


Application 72: USB port

Every device of the **MultiCon** line has at least one USB port at the front or rear of the casing, depending on the configuration. This is the simplest method of connecting a pendrive for the exchange of data with the internal memory. An ordinary flash drive is sufficient to transfer the entire configuration from one device to another device without the need to re-enter the configuration. It can also be used to load the Modbus template of the device to which **MultiCon** will be connected and also copy the recorded data.

Application 73: Remote control

The computer is now a device so common that even people whose profession is unrelated to technology find it indispensable in everyday life. Similarly, control systems are installed not only in industrial establishments, where the personnel in charge of maintenance can monitor the process, but also in places where trained engineers are hard to find. In such situations, the investor requires a fault-free system and efficient, quick operation if the parameters have to be modified, and the personnel installing the system require a reduction of the number of inconvenient trips to the customers. Valuable time can be saved thanks to the remote access to the controller. In the case of the **MultiCon** controller, it is sufficient to equip it with a suitable communication port and provide a permanent connection to the local network, after which, using the remote panel, the configuration can be modified from any place with Internet access.
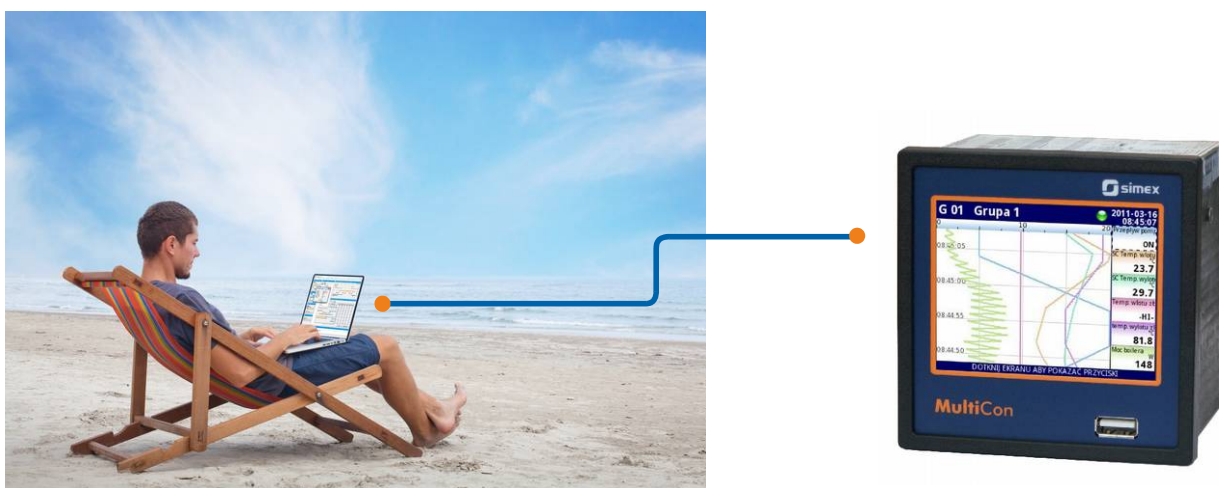
Application 74: MultiCon as the sorting line controller

The simplest form of product sorting consists of an analysis of a single feature of the products. If it is necessary to analyze multiple parameters, the process can be conducted in several simple steps or in a single comprehensive step, but, in such cases, simple logical conditions are no longer sufficient. It is necessary to collect all information about the product and then, using combinations of logical conditions, accordingly control the outputs, which can easily be done by the MultiCon controller equipped with mathematical logic functions. The arguments of those functions can be binary or numerical values, and the large number of logic channels enable the creation of comprehensive combinations of conditions with outputs that affect the behavior of line actuators.

Application 75: Recreation with MultiCon

In addition to the obvious industrial uses of the multi-channel **MultiCon** controller, it has recently become an object of interest to people in lines of business that are not directly associated with control systems - entertainment and recreation. Currently, large entertainment centers can no longer exist without devices that are seemingly simple, ergonomic and uncomplicated but, in reality, are packed with electronic controllers that ensure suitable operation. In addition to the implementation of fixed sequences, such centers frequently have to be able to respond to non-standard situations, which cannot be done without the measurement and recording of key parameters. The function of feedback control can easily be performed by the **MultiCon** equipped with a suitable set of inputs and outputs.


Application 76: MultiCon in the construction industry

Another area where **MultiCon** controllers can be used is the construction industry. Examples of such uses include the control of crane tilt based on analog signals from the tilt sensors. Those signals are scaled and converted in accordance with requirements of the given application. Analog outputs enable the transmission of information about tilt to further components of the control system, and they often directly affect the actuators.

MultiCon

Application 77: Energy Monitoring and Control

Power energy measurement is a key issue for automation process. For some of them, it is extremely important to estimate the consumption of electricity. With counters and grid analysers available in our offer and using a series of mathematical functions implemented, **MultiCon** is a perfect diagnostic tool. It calculates the balance and current energy consumption easily as well as provides information about common parameters, starting from voltage, intensity, the sum of intensities of three phases, energy and ending with the phase and individual harmonic shifts. According to application type and requirements you can choose between two devices, both equipped with RS-485 module for easy communication with **MultiCon**, energy counter or network analyser.
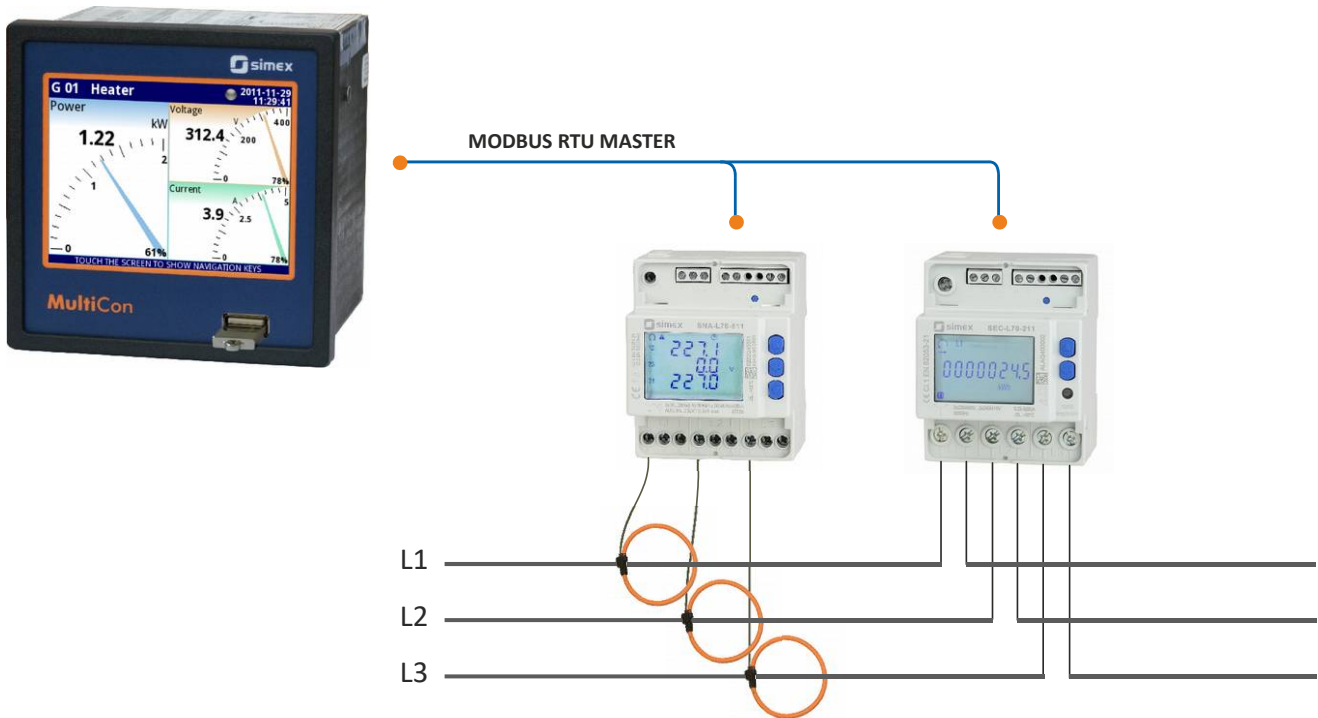
SNA-L70 : multifunction three-phase meter:
- 4 DIN modules compact version
- Fully bi-directional four quadrants measurements for all energies and powers
- Main electrical parameters measured and displayed for a cost-effective consumption analysis
- Version for 1 or 5A CT, for direct connection up to 6A or 80A or for Rogowski coils
- 3 current measurement scales for Rogowski model
- Possibility to connect by PT
- MODBUS RTU/ASCII communication by RS-485 port

SEC-L70 : three phase energy counter with built-in communication:
- Version for 1 or 5A CT, for direct connection up to 6A or 80A
- Fully bi-directional four quadrants measurements for all energies and powers
- For 3 / 4 wire networks with balanced or unbalanced load
- Class B according to EN 50470-3
- S0 output for energy pulse emission
- RS-485 Modbus RTU/ASCII communication

Application 78: "LookUp Table" - user characteristic Tool

The value of every logical channel of **MultiCon** recorder may be converted using many various methods: by linear scaling, transfer with compliance to the user characteristics. In the case of the letter, each point of the characteristics required manual configuration, what extended the process significantly.

The "*LookUp Table*" in the user characteristics function is a great tool which allows entering individual points of the characteristics in the form of a csv file, and then importing them to any **MultiCon** logical channel. Additionally, the edited list may be saved, from the device level, in a new file and used to scale another channel. The new option makes the work on creation of repeatable configurations much more effective and eliminates errors which may occur during manual entry of a large volume of numerical data.

WATCH HERE - the video showing how to add user characteristic using LookUp Table file
DOWNLOAD HERE - the tool to create tables containing all user characteristic points

export csv file

Application 79: MultiCon as the controller in chemical metal treatment processes

The large number of functions of the **MultiCon** makes it suitable for simultaneous recording and control, which may be useful in chemical metal treatment processes. The process engineers in such applications would then be capable of observing all relevant parameters, e.g., the concentration of the individual elements in the bath, pH or temperature, and also to control the parameters that are essential to the given process, e.g., electrical current intensity, etc. In long cycles, the function of conditional recording can also come in handy. It will enable data recording in emergencies or modification of key parameters to ensure transparency of data and facilitate later work. Remote access to the **MultiCon** screen also reduces the time during which the personnel have to remain in unhealthy conditions.
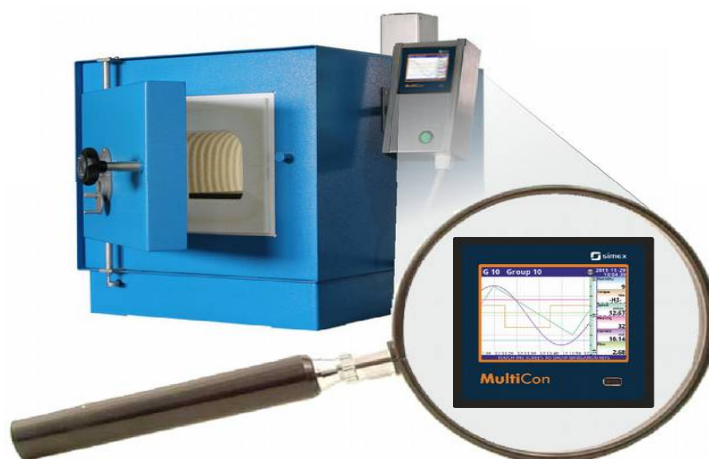
Application 80: License keys

The **MultiCon** is highly adaptable, and it can be adjusted to the requirements of the given application. Apart from the addition and replacement of input/output modules, it is also possible to extend the range of functions without changing the hardware configuration by entering the license key. The first of the keys that are sold introduces the option of data recording in addition to the existing measurement and control functions. The next key is enables the adjustment of access to the modification of settings depending on access rights. The third of the currently available extensions makes it possible for a **MultiCon** that is connected to the network to send notifications by e-mail. Each key is entered once, by typing the relevant sequence of characters.

The list of availables licences:

- LKS - data logging licence key
- MLS - MultiLevel Access licence key
- ENS - "E-mail notifications" licence key

Application 81: **Multicon on a solar boat**

The example of a **MultiCon** controller / recorder application in an innovative project includes the recording of the battery charge level on a solar boat. It is a project of Polish scientists which regularly brings success in the international arena. Thanks to data recorded by **MultiCon**, their authors can carefully analyze the change of battery parameters over time, adjusting its features in a manner that allows to achieve its increasing efficiency.

The **MultiCon** used in the application: **CMC-141-PS32/ETU/E/E/U24-01C**

Signal input
U24 module contains 24 voltage inputs which are used to measure the battery charge level, aiming to store energy which is acquired from solar cells.

Communication
Using ETU module allows to implement a permanent Ethernet recorder communication with boat control system elements.

Special features
Additional front sealing of the device increases resistance up to IP 65 which in combination with a protected PCB results in a safe data logger operation in outdoor areas.

Configuration
22 logical channels are used to read values from 22 voltage inputs, and the results are expressed as a percentage. Recording is activated by a user for a boat test period or for the time of a competition.

Application 82: Alternative data recording in MultiCon

MultiCon enables to adjust data recording parameters depending on the application's conditions. The user has at its disposal two data recording variants: standard - triggered on time basis, and alternative - activated in special, untypical or alarm circumstances. An exemplary usage of the latter is the control of level and filling of ten tanks in a chemical substances production plant.

The **MultiCon** used in the application: **CMC-141-PS32/E/I16/R45/R65-0B1**

Signal inputs
Module **I16** consists of 16 current inputs - with 10 of them used for receiving signals from level transmitters installed in tanks.

Control outputs
2 modules of relay outputs, **R45** and **R65**, serves for controlling valves in particular tanks - opening after drop of level below a minimum value and closing after filling.

Special features
USB port located in the front section of a device facilitates acquisition of recorded data.

Configuration
10 logical channels are used for displaying scaled results of level measurements, next 10 for controlling each relay output. The tank emptying process is relatively slow; therefore, the standard data recording, active all the time, has a 15-second sampling period set. During filling, a valve opening signal also triggers the alternative data recording with a 1-second sampling period. Owing to this, the user obtains full information about the filling process and may, based on this, control the system capacity.

Application 83: Process control redundancy

An example of such process control protection against failure is the use of two parallel control circuits. Multichannel **MultiCon** controllers work perfectly in such an application. In the case of problems with one loop, the second one automatically takes over the control, ensuring the continuity of control. Such a system is used by one of our customers from the food industry, where the hazard of serious defects causing production losses has been significantly reduced.

The application uses two models: **CMC-99-PS32/ACM/R81/E/D8-001**

Signal inputs
Module **D8** consists of 8 digital inputs which receive signals from the minimum level indicators and four maximum level indicators of the semi-product tank.

Control outputs
Relay output module of the **R45** main recorder controls the operation of four tank filling pumps.

Communication
The controllers are connected in the **Modbus** network.

Configuration
One of the MultiCons serves as the main controller. The second one, fed from an independent source, connected into the control circuit in the same way, continuously sends query frames using the Modbus protocol. Lack of response is interpreted as a failure of the first controller. In such a situation, the emergency MultiCon automatically assumes the controller function, ensuring the process continuity.

Application 84: MultiCon in paper industry

An example of the application of **MultiCon** is to control the process of rewinding and cutting a bale of paper in paper mills. Measurement of paper advance and guillotine starting point is performed with the use of a set of encoders ensuring a high accuracy. In order to monitor the production process, the data regarding the produced sheets are registered.

The following model works well in the application: **CMC-99-PS42/E/R45/E/CP4-0B1**

Signal inputs
CP4 module contains four pulse and quadrature counter inputs. They receive pulses from encoders, converting them into the length of the rewound material.

Control outputs
Relay output module of the **R45** controls operation of four guillotines.

Special features
USB port located in the front section of a device facilitates acquisition of recorded data.

Configuration
Each counter input receives an independent signal from the encoder measuring the length of material rewound on one out of four lines. Since the diameter of the rewound bale is continuously changing, encoders generate pulses with different velocity, even up to 5kHz. For each line the user may easily enter the length of the cut off section. These values constitute thresholds for relays which put proper guillotines into operation while closing the contacts. The whole process, including the performance of particular lines and with division into employees shifts is registered in the device's memory.

Application 85: MultiCon at the ski lift

A new example of the usage of a wide range of controller's possibilities is placing it in the control room of two ski lifts. **MultiCon** monitors operating parameters, informs on abnormal situations and controls the actuators of the lift.

The following model works well in the application: **CMC-141-PS42/E/CP2/FT2/HM2-0B1**

Signal inputs

HM2 module consists of two inputs of the operating time counter, which are activated during the outage of the lift.

FT2 module consists of two flowmeter pulse inputs to control snowmaking process and two current inputs to control ambient temperature.

CP2 module consists of two counter inputs used to monitor the number of outages.

Special features

USB port located in the front section of a device facilitates acquisition of recorded data.

Configuration

Each input of the operating time counter (**HM2**) is activated by a signal from the safety system that stops a given lift. Those signals are also counted by counter inputs (**CP2**). Data concerning a respective lift are logged once a day and deleted right after, therefore a report is generated, specifying the number and total duration of outages during a day. Flowmeter inputs (**FT2**) receive signals from the flowmeters placed in snow cannons. Their data logging (in this case with the period of 1 min) is activated only for the operating time of the snow cannons by sending a signal to the digital input built in the supply module. The user receives a report considering the flow rate during the snow cannon operation and the total amount of the water used.

Application 86: MultiCon as a heat meter

One of the hardware configurations of the **MultiCon** meter is ideally suited for applications with heat measurement. **MultiCon** analyses the energy consumption of several objects simultaneously on the basis of temperature indications, flow rates and corresponding calculations - in the following application of four heat exchangers.

The following model works well in the application: **CMC-141-PS42/ETU/I16/IO4/FI4-001**

Signal inputs
The **I16** module has 16 current inputs, which are used to receive signals representing temperature.
The **FI4** module consists of four current inputs dedicated to flow meters.

Control outputs
The **IO4** module has 4 current outputs, each of which provides a proportional signal to the calculated power.

Communication
The **ETU** module features Ethernet port. It is used for communication via the internal network for constant access to measurement data.

Configuration
In each of the four systems, sensors are installed to measure flow and two temperatures - upstream and downstream the heat exchanger. **MultiCon** uses appropriate mathematical formulas to calculate the amount of heat energy absorbed by each of the exchangers. All measured values are recorded in the internal device memory.
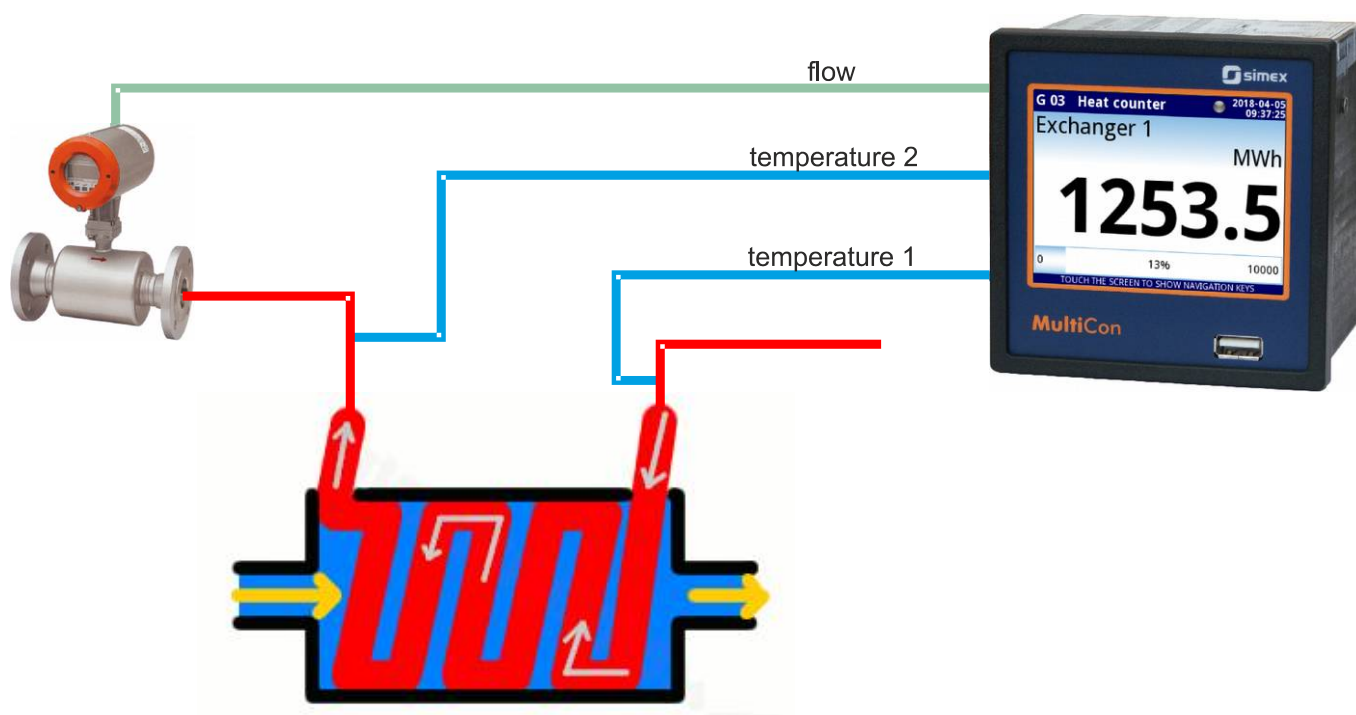
Application 87: Engine parameters data recorder

Another example of how the versatility of the **MultiCon** multichannel device can be used is the application for recording of parameters of the internal combustion engine propelling a fishing boat.

The following model works well in the application: **CMC-141-PS32/E/I16/RT4/FT2-0B1**

Signal inputs
The **I16** module consists of 16 current inputs. One of them is used to receive a signal from the transducer, which measures oil pressure in the system.
The **RT4** module consists of 4 temperature inputs. They are used to receive information on the temperature of oil, flue gas and coolant.
The **FT2** module consists of 2 pulse inputs for flowmeters/tachometers. It is used to monitor diesel consumption on the boat.

Communication
Because of mobility the application does not require permanent connection to the network. The data is downloaded via the USB port.

Configuration
The measured values are visualized on the device panel and, if necessary, scaled in logical channels. The measurements are collected into a single group with active recording. Every exceedance of the permissible parameters is signalled to the operator, which increases the reliability of engine operation.

Special features
For ease of use the **USB** port is located on the front panel of the device.

Application 88: MultiCon for electric energy measurements

Another interesting application of the **MultiCon** line meter is the recording of parameters at a wind power plant. By simultaneous monitoring of multiple parameters, it is possible to control the efficiency of the power plant, detect emerging failures and ensure continuous improvement of the process.

The following model works well in the application: CMC-99-PS42/ETU/UI4/RT4/E-001 operated together with the **SEC-L70-111** energy meter.

Signal inputs

The **UI4** module consists of four current inputs and four voltage inputs, all inputs are used to measure wind speed.
The **RT4** module consists of four RTD inputs used for temperature measurement in control cabinet that accommodate capacitor banks.

Communication

The **ETU** module features USB and Ethernet ports. It is used for communication via the internal network for constant, also remote, access to measurement data. The RS-485 port in the power supply module is used to receive information from the energy meter via Modbus.

Configuration

The device is used to record all the above-mentioned parameters and convert them into ratios that characterize the entire energy conversion process.

Application 89: Autotuning in practice

One of the examples of the practical application of a controller with auto-tuning is the process of controlling the elements annealing furnace. The temperature set point is shown in the form of an appropriate time profile. It usually consists of three stages: **heating**, **annealing**, which means maintaining at a constant temperature and **cooling**. The regulation is based on the **PID** control whose parameters are selected automatically during auto-tuning.

The following model works well in the application: **CMC-141-PS42/E/UN3/E/E-0B1**

Signal inputs
The **UN3** module consists of 3 insulated universal inputs (U/I /RTD/TC/mV). In this case, the temperature input is used. It reads off the temperature measured inside the furnace.

Signal outputs
The **S8** module consists of 8 SSR outputs, one of which is used to control heating in the furnace. Another ones can set the cooling fans in operation, depending on the nature of the process.

Communication
The **USB** module allows you to download data saved during the recording of the entire process.

Configuration
The user can create up to 8 time profiles, i.e 8 "heating programs" customized to the requirements of individual elements. Before starting the process, the appropriate profile is selected.

Special features
The **USB** port, for the convenience of use, is placed on the front of the device.

Application 90: Simultaneous measurement and recording of different process signals

The versatility of the **MultiCon** controller/recorder is particularly manifested in the fact that one device can collect many different signals. Three slots for I/O modules do not limit the user to monitoring only three types of signals. Our offer includes universal and versatile modules that combine, for example, analog and digital inputs on a single expansion card, which is particularly well proven in the food industry.

The following model works well in the application: **CMC-141-PS42/ACM/RT6/UI8D8/FT2-081**

Signal inputs
The **RT6** module consists of 6 RTD inputs used for temperature measurement in tanks with ingredients.
The **UI8D8** module consists of 8 current inputs of type 0/4..20 mA, 8 voltage inputs of type 0/1..5 V, 0/2..10 V and 8 digital inputs.
The **FT2** module consists of 2 digital inputs dedicated to flow meters and 2 current inputs of type 0/4..20 mA for general applications.

Communication
The **ACM** module is equipped with RS-485, RS-485/232, USB and Ethernet ports, providing many alternatives to real-time communication with the device and the possibility of downloading recorded data.

Configuration
The device is used to monitor temperature, pressure and level in 6 process tanks as well as flow across 2 nozzles that fill containers with the final product. MultiCon also monitors production efficiency in real time. Therefore, comprehensive process measurement is provided, taking into account all the quantities that the user finds important. If the system requires expansion, the device still provides a few free measuring inputs for future use.

Special features
The device is designed for operation within an extended temperature range (-20°C to +50°C).

Application 91: MultiCon in distributed systems

MultiCon multichannel controllers and recorders are clearly the right choice for multi-point measurement systems. The support for simultaneous monitoring of various parameters is not limited just to physical integrated inputs. **MultiCon** is also capable of reading measurement signals in a Modbus network through an integrated RS-485 interface so that it can be used in systems with considerable distances between the subsequent measurement points.

The following model works well in the application: **CMC-141-PS42/ACM/UN5/UN5/UN5-0B1**

Signal inputs
Each **UN5** module consists of 5 isolated universal inputs (U/I/RTD/TC/mV). Ten of the available inputs read measurements from temperature sensors whereas the other five from AO transmitters.

Communication
The **ACM** module is equipped with RS-485, RS-485/232, USB and Ethernet ports, providing many options for real-time communication with the device. For instance, the RS-485 interface ensures connection to the Modbus network for on-line measurements transfer, whereas the Ethernet port enables connection to a corporate network to provide a continuous remote preview of the recorded data.

Configuration
The device is designed for recording values both from 15 integrated inputs and 45 other values read from a serial communication network. It, therefore, utilizes its full potential by recording data from 60 measurement channels at the same time.

Special features
For ease of use the USB port is located on the front panel of the device.

Application 92: MultiCon featuring the MultiPrint printer

Multitasking of the **MultiCon** recorder can be extended by equipping it with various accessories. One of them is the **MultiPrint** printer ensuring the simplest possible access to key data in the form of a printout. An example application making use of the printer is parameters registration in pressure tests. The device collects data from eight test stations.

The model used in the application is: **CMC-141-PS42/E/I16/E/E-0B1** working in line with the **MLP-149-001 printer**

Signal inputs

The **I16** module consists of 16 current inputs. Eight of them are used to receive the signal from pressure transducers that measure the pressure in tanks being tested.

Communication

The application does not require a permanent connection to the network because what is important is the data of the entire sample. Data gets downloaded via the **USB** port.

Configuration

Data from pressure transducers is recorded and compared to the standard. Printouts are triggered in two situations:

- information on the current pressure value is printed when the pressure in a tank differs significantly from the reference value,
- the maximum pressure value during the test is printed at the end of the pressure test.

Special features

The **USB** port is located at the front of the device to enable convenient handling.

Each printout consists of:

- header and footer in the form of a file implemented into the device by the user,
- current date and time,
- three pieces of data of a selected channel: name, current value and unit.

Printouts are generated on demand and get triggered by a specific value in the indicated logic channel.

Application 93: Multi-track PID control in the process of soaking welded elements

The **MultiCon** controller features 8 **PID** controllers and each of them can have different settings. Moreover, one controller with prepared settings can be used in many independent processes. An example of such an application is the pipeline preparation process before welding, so called **PWHT (post weld heat treatment)**. The pipeline gets covered with six heating mats that work independently, heating the entire pipeline up to the proper temperature.

The application works with the **CMC-99-PS42/USB/S8/E/TC8-001** model.

Signal inputs

The **TC8** module consists of 8 thermocouple inputs (J, K, S, T, N, R, B, E (PN-EN); L (GOST); ± 25mV, ± 100mV, -10 ÷ 25mV, -10 ÷ 100mV). Thermocouples mounted on the surface of the pipeline are connected to six of them.
The **S8** module consists of 8 SSR outputs that regulate the temperature of the heating mats.

Configuration

One **PID** controller was adapted to the process. The controller settings are selected by the auto-tuning function. The device, based on measured temperature values, implements simultaneous, independent control of six processes. Each of them is temperature regulation of a specific heating mat. Therefore, one of the controllers is used here six times at the same time.

Application 94: Operating logarithmic transducers

Below we can find an interesting example of using the **MultiCon** controller equipped with transducers of non-linear characteristics. This is applicable in a process where, for example, pressure is measured over a very wide range, and where high accuracy is required at low values. The above function is well implemented by a pressure sensor with logarithmic characteristic.

The application features the **CMC-99-PS42/E/R45/IO4/UN3-0B1** model.

Signal inputs

The **UN3** module consists of 3 insulated, universal inputs (U / I / RTD / TC / mV). Each of them is connected to an output signal coming from a pressure transducer of logarithmic characteristics.
The **IO4** module consists of 4 current outputs, three of which send the calculated pressure value to other elements of the control system, where the value is represented in the linear form already.
The **R45** module consists of 4 relay outputs with a load capacity of 5A, used for controlling the main valves.

Communication

The recorded data is downloaded by connecting a portable memory device to the **USB** port.

Configuration

Signals from pressure transducers are sent to the CMC-99, where, according to the introduced mathematical formula, the logarithmic 4-20 mA signal is converted into pressure linear readings. These values get recorded and form the basis for controlling proportional and shut-off valves.

Special features

For convenient operating a **USB** port is provided on the front of the device.

Application 95: MultiCon and remote data acquisition

The **MultiCon** line devices offer the possibility of recording many signals - directly from built-in measuring inputs, and from external modules located round the facility. An example of such an application is monitoring the maximum level in thirty-two tanks containing ethyl alcohol.

The application is featured with the following recorder: **CMC-99-PS42/E/R45/IO4/UN3-0B1** supported with the **SIN-8** binary input modules.

Signal inputs

Four external **SIN-8** modules have been used in this application. Each module contains 8 binary inputs that are used to receive signals from 32 level switches placed inside tanks. SIN-8 modules communicate with the CMC-99 recorder via the RS-485 Modbus RTU interface.

Control outputs

The thirty-two SSR outputs (**S24** and **S8**) built into the CMC-99 recorder are connected to an external control system. Each output duplicates the level indicator condition in particular tanks.

Configuration

The CMC-99 recorder receives signals from all SIN-8 module inputs and records their status in its internal memory. The recorded data is downloaded via a **USB** port placed at the front of the device. A user has a direct view of the process data, locally in the recorder display.
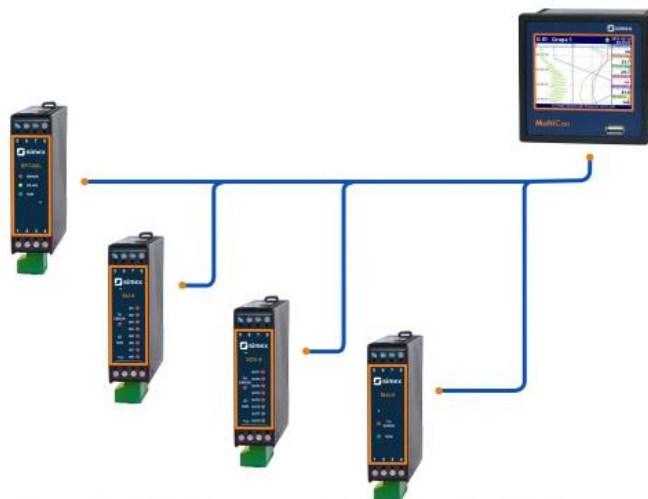
Application 96: 4ControllerView in PID controlling

MultiCon line data loggers feature built-in PID controllers with the possibility of automatic selection of controller settings which are defined as *auto-tuning*. The number of independent regulators that can be implemented in the device is from 1 to 8. One controller can be used in several independent control loops.

In the following application, the **MultiCon** works as a 10-channel controller of a multi-chamber ceramic firing furnace. For greater convenience, the user applies a new data display mode - **4ControllerView**, which is typical for PID controllers. In the following mode, the most important values of **SV** and **PV** are highlighted and easy to read even from long distances.

The application features the following model: **CMC-141-PS32/USB/RT6/RT4/S16-001**

Signal inputs:

There are a total of 10 RTD inputs on the two input modules of **RT6** and **RT4**, each of which receives signals from the Pt100 sensor.

Control outputs:

The **S16** module consists of 16 SSR outputs. This application uses 10 outputs - each of them runs in a control loop with a corresponding temperature sensor.

Configuration:

The device receives signals from all inputs of RT modules and, based on the regulator's calculations, properly controls the SSR outputs. For the convenience of use, the device features 10 groups of logical channels - one for each control loop. The channel status of each group is shown in the **4ControllerView** option, which indicates:

- measured temperature: PV,
- set temperature: SV,
- ambient temperature,
- heating power,
- regulator status,
- state of the relay output.

The differentiation of the weights of individual values results in an intuitive reading of the process parameters, thus facilitating the user's work.