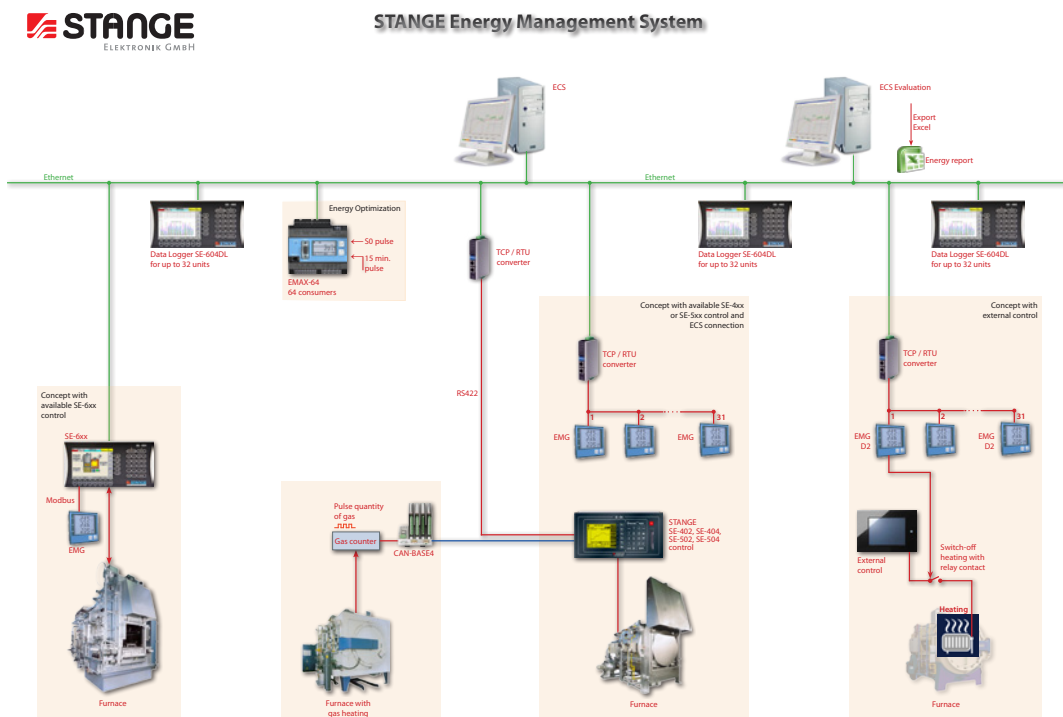


Energy Management System

STANGE Energy Management System (EnMs) according ISO 50001 or respectively EN 16001



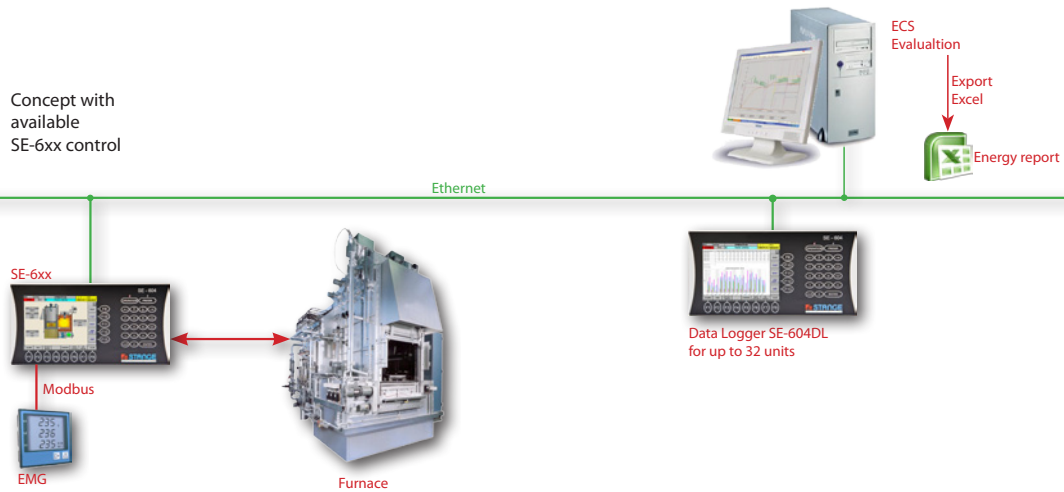
Data acquisition conforming to standards for increasing energy efficiency

The EN 16001 that came into effect in 2009 set EU-wide standardized criteria for an energy management system. This standard specifies the requirements that will enable companies to systematically and continuously reduce their energy consumption. Since January 2009, the Renewable Energy Law allows energy-intensive companies to benefit from a cost reducing recalculation rule if they have an EnMs in place. The EnMs is based on a reproducible and proper collection of energy data.

The core of the STANGE Energy Management concept are SE-604-DL devices which serve as data loggers for 32 furnaces each. It is possible to record up to 16 values (channels) per installation/furnace. The integrated data loggers of the SE-604-DL devices log the energy consumption (electricity and gas) of the furnaces.

The STANGE concept allows you to achieve the following:

- The logging of energy consumption in daily files
- The logging of energy consumption in batch files
- Energy optimization of the peak load



Daily Files

The logging of energy consumption in daily files

Each SE-604-DL can record the measurement data of up to 32 consumers in daily files. By combining several SE-604-DL devices, you can add any number of consumers to be logged. In case of a future expansion of the installations, the energy management system can thus be adapted to the new situation.

If available, the following data will be recorded for each consumer:

- Momentary power value for electrical current logged in 10 sec. intervals over the course of the day as a curve.
- Power consumption electrical current per day logged in 10 sec. intervals
- Momentary power value for gas logged in 10 sec. intervals over the course of the day as a curve
- Power consumption gas per day logged in 10 sec. intervals

A daily file will be created for each consumer in which other values in addition to the energy data can also be recorded (a total of up to 16 measurement values). The added Watts per day for electricity or gas are especially important energy data as they can be used for the later evaluation according to EN 16001 to produce characteristic values (e.g. energy consumption per installation and month / produced kg per installation and month).

The SE-604-DL is connected via Ethernet to a central computer which automatically retrieves and saves the daily files in a central location. The measurement data can be analyzed by the provided graphical evaluation software. An automatic export function to Excel is also provided.

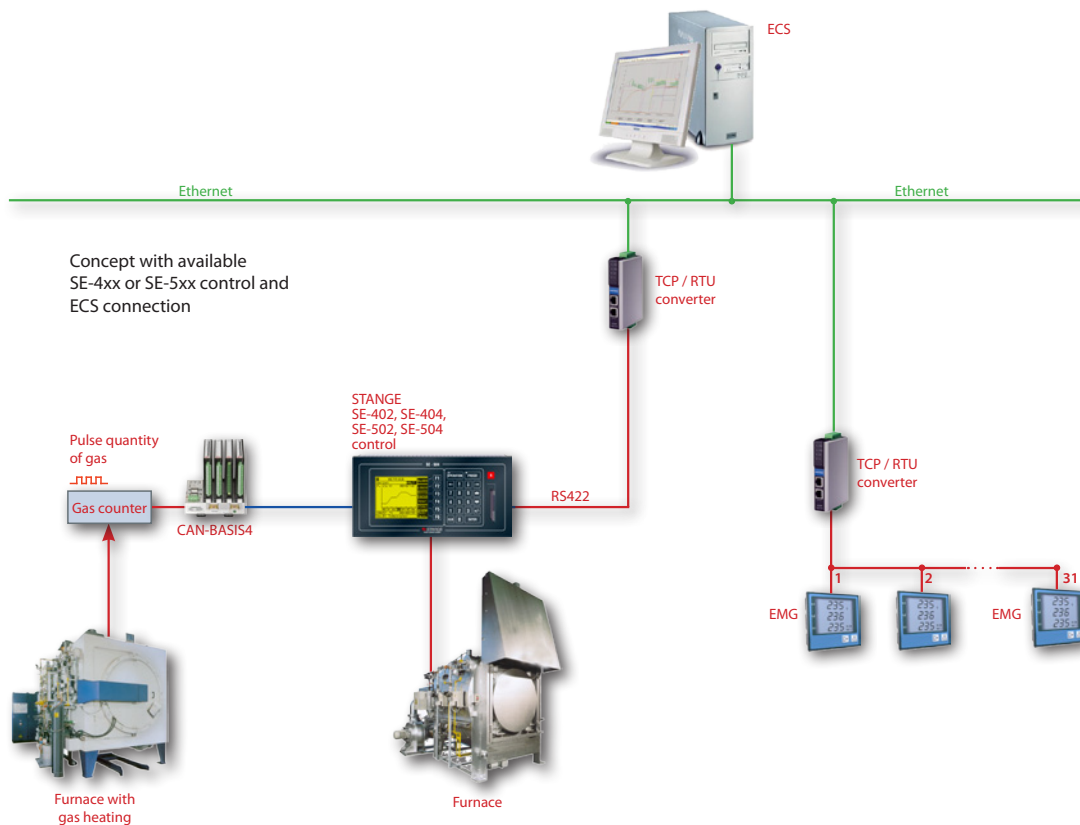
The daily consumption of each gas and electricity consumer is listed in table form so that the monthly, quarterly and yearly energy consumption can be clearly represented.

Each consumer is connected to an energy measurement device (EMG) featuring a Modbus interface. Up to 31 EMGs can then be connected via Ethernet to the respective SE-604-DL via a Modbus-RTU to Modbus TCP/IP converter. The 1200m maximum cable length of the serial Modbus network dictates the required number of Modbus converters. STANGE devices of the SE 6xx series can be connected directly to the SE-604-DL via Ethernet. With this constellation, the EMG can then be directly connected to the SE-6xx of the installation.

The gas consumption per installation is measured by the STANGE I/O system via a gas impulse counter. In case of installations with STANGE process controllers (SE-4xx, SE-5xx, SE-6xx) the measuring takes place via the respective peripheries of the process controller (the required digital inputs must be available and/or the periphery must be extended accordingly). The SE-604-DL devices will then read out these data from the respective SE devices and save them in the corresponding daily files. In case of installations without STANGE process controllers, the gas consumption can also be measured via a STANGE I/O system, which is directly connected to the corresponding SE-604-DL.

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Batch-Wise

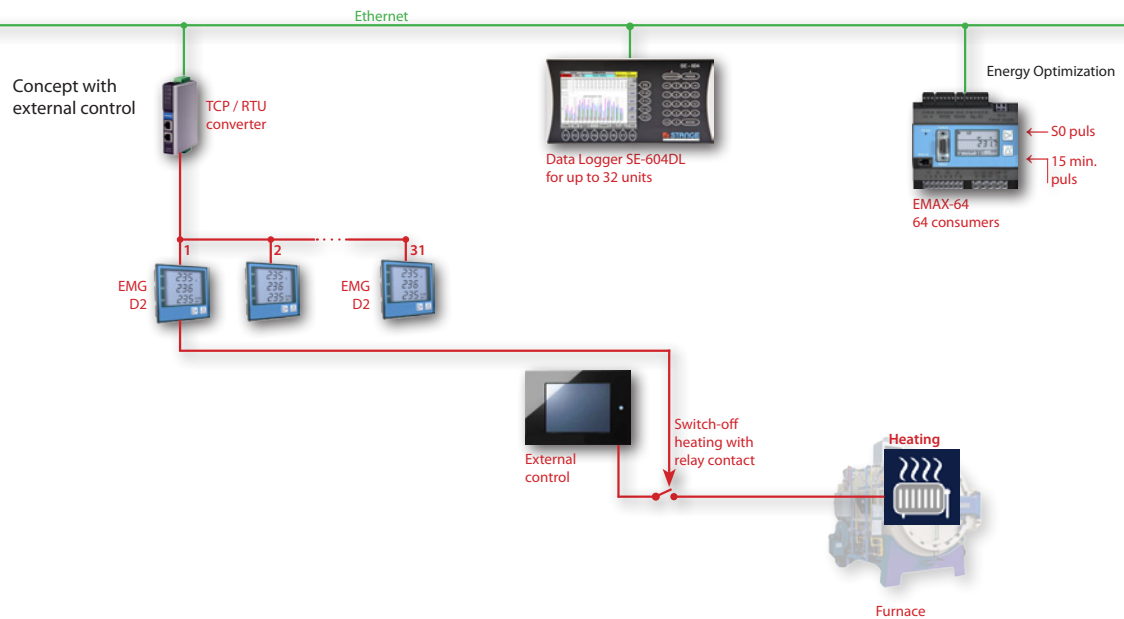
Batch-wise energy logging

The logging of energy on a per batch basis is only possible if a STANGE controller of the series SE-6xx, SE-4xx or SE-5xx is used and the supervision system ECS is provided. In case of installations provided with a SE-6xx the EMG will be directly connected to the SE-6xx via MODBUS. That way the energy data can be saved batch-wise together with the other measurement data (temperature etc.) and transmitted to the supervision system ECS.

In case SE-402, SE-404, SE-502 or SE-504 devices are connected to the supervision system ECS the energy data can be saved on a per batch basis by carrying out the following modification of the connection to the control system:

The STK boxes (interface converter RS422 to RS232) used for the ECS PC's are no longer required. The connection takes place via Ethernet and a TCP-RTU interface so that it is possible to access the connected SE devices from the ECS-PC as well as from a second source. In this case the second source is a SE-604-DL which exchanges data via Ethernet and a TCP-RTU interface with the connected SE devices. The exchanged data are the signals for the "start of batch" as well the "end of batch" transmitted from the SE-4xx/5xx to the SE-604-DL. In the other direction, these are the values for the consumed energy while the batch is processed.

When the values are forwarded to a higher level office system (e.g. AMS from the TTC Company), it is then possible to assign values to the batch parts. Important key data such as energy consumption/Kg for a batch can then be produced.



Optimization

Peak load energy optimization

The existing infrastructure for the logging of energy consumption can also be used to optimize the peak load energy. A EMAX-64 energy optimization device type is then connected to the SE-604-DL via Ethernet. The EMAX-64 can manage up to 64 electrical consumers.

For the peak load energy optimization, the average value of a measurement period (15 Minutes) will be calculated. The measurement period in the EMAX-64 is synchronized with the reset impulse of the electrical energy provider. The power consumption of the entire plant is measured either directly or via a S0 impulse from the energy provider. The EMAX-64 switches off the connected consumers so that a set peak value preprogrammed for the measurement period won't be exceeded.

In case a SE-6xx, SE-5xx or SE-4xx is used for the installation access with the stop command takes place directly via Ethernet between the SE-604-DL and the SE-6xx or via the ISM-BOX in case of a SE-4-4xx/5xx. A "Consumer can be switched off" feedback has been considered. In most cases, this is a control track which is programmed in segments in programs of the installation.

In case of installations without a STANGE process controller the communication also takes place via Ethernet and Modbus to the EMG's. Each EMG features a digital output which allows to directly switch off the heating via a relay downstream of the process controller (that kind of EMG with digital output is more expensive compared to the EMG version used in combination with STANGE controllers).

With this solution, the switch-off will always take place and the "Consumer can be switched off" signal won't be considered. A switch-off occurs only as long as the whole process won't be negatively affected (the maximum switch-off time can be programmed with the EMAX-64).