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INDUSTRIAL FURNACES TECHNOLOGY NEWS
SİSTEM TEKNİK YAYINIDIR

Grand Holder: **Mehmet Özdeşlik** - Managing Editor: **Beste Özdeşlik** - Issue Time: **Once Every Four Months** - Issue Name: **INDUSTRIAL FURNACES TECHNOLOGY NEWS**
Publishing Place: **Dinamik Basım Matbaacılık Promosyon İnş. Tur. San. ve Tic. Ltd. Şti.** Osman Yılmaz Mahallesi Kızılay Caddesi No: 49/A Gebze / KOCAELİ
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SISTEM TEKNIK CELEBRATES 45 YEARS!

"Our roots represent our past, our trunk symbolizes our generation, and our branches reflect our ever-growing impact..."

Sistem Teknik, a company that has made significant contributions to the automotive, aerospace, defense, foundry, and energy industries for nearly half a century, celebrated its 45th anniversary with a spectacular event.

Founded in Ankara by three young Turkish engineers, Sistem Teknik has grown into a global giant, recognized worldwide, with over 700 furnaces across six continents.

In his opening speech, Chairman of the Board Mehmet Özdeşlik shared the company's success story, emphasizing the motto of the evening by saying, **"Our roots represent our past, our trunk symbolizes our generation, and our branches reflect our ever-growing impact."**

The event, attended by suppliers and customers, was graced by the presence of former Deputy Minister of Industry and Technology Dr. Hasan Büyükdede, President of the Kocaeli Chamber of Industry Hasan Tahsin Tuğrul, Board Member of the Machinery Exporters' Association Ali Eren, Vice President of TOBB Women Entrepreneurs Fatma Aydoğdu, distinguished figures from the business world, and Sistem Teknik employees.

As part of the celebration, employees who have contributed to the company's international success for 5, 10, and 15 years were honored with seniority awards. These awards were presented by Chairman of the Board Mehmet Özdeşlik, along with Board Members Beril Özdeşlik and Beste Özdeşlik, in a ceremony led by Human Resources Manager Nazlı Keskin.

Dr. Hasan Büyükdede, the former Deputy Minister of Industry and Technology, and MAIB Board Member Ali Eren delivered short speeches congratulating the Özdeşlik family and the employees, and celebrating Sistem Teknik's 45th anniversary.

At the 45th-anniversary celebration held in the ballroom of the Crowne Plaza Istanbul Asia Hotel in Kurtköy, the "Level Up" awards were presented by Board Member Beste Özdeşlik. The award for contributing to the advancement of Turkey's machinery industry by believing in and ordering the first vacuum furnace produced by Sistem Teknik was given to Mr. Levent Ganiyusufoğlu, Chairman of the Board of ASSAB Korkmaz, by Sistem Teknik's Chairman Mehmet Özdeşlik.

In the Aerospace and Defense industry, the award was presented to Mr. Selçuk Kılıçarslan, Head of Special Processes at TEI TUSAŞ Motor Sanayii A.Ş., a company that is a source of pride for Turkey.

Following the award presentations, Sistem Teknik employees surprised the audience with a choral performance. The 45th Anniversary Sistem Teknik Revan Choir, conducted by State Opera Artist Özlem Abacı, mesmerized the audience with their performance. Board Member Beril Özdeşlik, who received a standing ovation for her solo performances, expressed her feelings by saying, "It is very meaningful for us to be on stage with our team on this special day. There was a lot of hard work behind the scenes, and every moment we spent together not only showed us the strength and potential of our unity but also strengthened our friendship while having fun. As the Sistem Teknik family, we are proud to carry our success and unity, which have lasted for 45 years, into many more years to come."

The 45th-anniversary celebration once again highlighted the company's great achievements and spirit of unity.

Mehmet Özdeşlik's 45th Year Speech

I am truly grateful to all of you for joining us today as we celebrate the 45th anniversary of our company, Sistem Teknik. Your presence here honors us deeply. Forty-five years is a significant milestone—not only in the life of a person but especially in the life of a company. In our country, maintaining growth and relevance over such a long period is no small feat. Companies, like great trees, must continue to grow, establish strong roots, and provide value to their surroundings for many years to come. For our 45th anniversary, Beste offered a wonderful analogy, likening our company to a tree. Our roots represent our past, our trunk symbolizes our present, and our leaves depict our young employees and our future.

As one of the three founders of Sistem Teknik, I find it fitting to speak about these roots. I was born in 1955 in Eskişehir, coming from a Balkan immigrant family. My paternal side descends from Tatar Turks who migrated from Romania due to increasing pressures during the Balkan Wars in the early 1900s. My grandfather, after working as a cart driver, was conscripted and served for four years in Yemen, which was still

part of the Ottoman Empire at the time. Later, he fought in the Gallipoli campaign and, despite being wounded in six places, survived miraculously. When he returned home, my uncle, then a young child, met his father for the first time. My father, in turn, grew up in difficult circumstances. He started as an apprentice in a blacksmith shop due to poverty but later pursued his education at my grandmother's insistence. He became a highly skilled technician and was the chief designer and job preparation chief at the Ankara Sugar Factories Machinery Factory. His technical expertise and determination were instrumental in laying the foundations for our company's success in the furnace business.

My mother, on the other hand, was born in Bulgaria, and her family migrated to Istanbul before World War II due to the pressures they faced. Although her formal education was limited, she had an incredible drive for self-improvement and instilled in my brother and me a love for learning. Thanks to her efforts, I was able to attend Eskişehir Maarif College, and my brother went on to study at Ankara Atatürk High School.

In 1973, I entered the Electrical Engineering department at METU with high marks, and I was fortunate enough to receive a prestigious scholarship from CENTO. My dream was to become a professor. During my university years, two of my closest friends were Orhan and Erdoğan, who would later become my business partners. During those times, the university was often under long-term boycotts, which gave us a chance to work outside and gain practical experience alongside our theoretical studies. After graduating in 1978, I was accepted as a research assistant and began my master's degree. Meanwhile, Orhan and Erdoğan started working in electronics companies where they had been employed as students. About a year later, they came to me with the idea of starting our own company. After weighing the risks and possibilities, we decided to take the leap. On April 1, 1979, we founded Sistem Teknik. At that time, we had no business plan, no projects, and no capital—just confidence in ourselves.

We began by producing electronic devices for universities such as ITU and Hacettepe, then moved on to developing electronic measurement and control devices for the industry. This shift eventually led us to the furnace business. When Alarko Almim, a major player in the furnace sector, withdrew, we saw an opportunity to enter the field. My father's expertise was invaluable in this transition; he would spend his evenings drawing up our project plans. His support allowed us to excel in both mechanical and automation fields from the very start. Over time, this dedication earned us prestige and recognition in the industry. Today, we have installed over a thousand furnaces in sectors such as

automotive, aviation, iron and steel, aluminum, composite, and glass casting, both domestically and internationally. Nearly all of them are still operational, and wherever I go, people are familiar with the name Sistem Teknik.

I must also take a moment to acknowledge the profound impact of my late partner, Orhan. Coming from a Greek immigrant family, he played a pivotal role in our company's formation with his determination, hard work, and meticulous approach. We faced many difficulties, including periods of severe financial hardship. It would have been easier to take a more secure path as a top executive or academic, but Orhan's unwavering commitment pushed us forward. Our partnership grew, and in 2009, we decided to divide our main operations into two parts: steel and aluminum furnaces. I took charge of the steel side, while Orhan handled aluminum. Tragically, in 2017, Orhan passed away in a boating accident. However, his spirit continues to drive the second generation, who are successfully leading the business today.

Our third partner, Erdoğan, was unique among us in that his father was self-employed. His late uncle was a meticulous radio repairman and an excellent tradesman, and from him, we learned about bookkeeping and bank relations. Erdoğan was not only an outstanding engineer but also set up a strong accounting system for us from the very beginning. After 1985, he continued his journey independently in Ankara with his company, Sistek.

January 24, 1980, was a significant turning point for the Turkish economy, marking the beginning of a shift from a mixed and closed economy to a more liberal and export-oriented one. In adapting to this new economic environment, we opened our branch in Istanbul in 1985. Then, in 1989, we moved Sistem Teknik entirely to Istanbul, focusing on new opportunities and leaving the electronics manufacturing to Erdoğan.

The economic crisis of 1994 was a hard lesson that taught us the importance of exports. We set our sights on Germany as a key export market and, with the support of our consultant Peter Shmetz, began R&D on vacuum furnaces in 2004. Our first major order came from Mr. Levent Ganiyusufoğlu of Assap Korkmaz, who trusted us even before the product was fully developed. This confidence translated into success, earning us the TÜBİTAK TTGV TÜSİAD Technology Award in 2005.

In 2008, we relocated to the TOSB Automotive Specialized Industrial Zone by building our own facility. Today, we are among the top three in the world in certain niche markets, exporting to over 25 countries. Our journey has been marked by numerous awards and patents, a testament to our ongoing commitment to innovation and quality.

During the pandemic in 2020, we launched 'Furnace News,' a magazine that includes scientific and technical articles to maintain our connection with our customers. It has been very well-received, thanks to the suggestion of Mr. Gökhan. As I reflect on our roots and growth, I am proud to say that we have built a prestigious and respected brand in our industry. I am confident that our young generation, along with our dedicated employees, will continue to elevate the Sistem Teknik brand and achieve even greater heights.

Before I conclude, I want to extend my deepest thanks to all our employees who have contributed to our journey, to my dear wife who has supported me unconditionally, and to my daughters who have taken care of this legacy. Finally, I express my heartfelt gratitude to all of you, dear friends, for being with us on this meaningful day.

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- -DC Fan Driven Oil Coolers
- -Heat Coils
- -Serpantines/Radiators/ Economizers

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- -Water Storage Tanks
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- -Gear Pumps
- -Magnetic Drive Pumps/Thermoplastic Pumps
- -Dosing Pumps
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- -Drum Pumps
- -Monopumps
- -Peristaltic(Hose)Pumps
- -Centrifugal Blowers
- -Roots Blowers
- -Turbo Blowers

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- -Globe Valves
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- -Actuators
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DOKTAS INTERVIEW

Welcome. First of all, we would like to introduce you to our readers. Could you tell us about Döktaş and your role here?

Welcome, my name is Birol Yılmaz. I was born in Bursa in 1980 and graduated from Balıkesir University with a degree in Industrial Automation. I have been working with the Döktaş family since December 2004. My role at Döktaş is as a Maintenance Foreman for the Electrical/Electronic Completion Department.

What sectors does Döktaş serve? In which areas do you support your customers?

Döktaş Dökümcülük Ticaret ve San. A.Ş. is a leading company in Turkey, specializing in the supply of cast iron, spheroidal graphite, and aluminum cast parts for the automotive, heavy commercial vehicles, construction and agricultural machinery, and machine manufacturing sectors. Our Orhangazi plant, established in 1973, is involved in cast iron, spheroidal graphite casting, and machining activities and is known as Turkey's leading iron casting facility.

How did you come into contact with Sistem Teknik? We would like to hear your story about how you met.

Our paths crossed with Sistem Teknik when our factory needed to commission new products. Our customers usually require that new parts undergo heat treatment (what we call annealing), and due to increased capacity, we needed a new annealing furnace.

Which products and services of Sistem Teknik do you use? What would you like to say about the quality of the products and services you received? What were your expectations, and how were they met?

We benefit from Sistem Teknik's annealing furnace service. During the machine installation, it was clearly conveyed to us that the personnel's priority is occupational health and safety (OHS). The meetings we had at the Sistem Teknik office were very professional and friendly. Our expectation was for the annealing furnace to be commissioned smoothly and on time, and our expectations were met.

Birol Yılmaz
Electrical/Electronic Maintenance Foreman

What factors influenced your decision to make this investment? Are there any new investments or collaborations in the works?

The primary reason for this investment decision was to support the Turkish manufacturer GÜRİŞ Holding, with special emphasis on this point conveyed to us, as well as references from GÜRİŞ companies.

What are your goals for the new year? What can we expect for Döktaş in 2024?

As Döktaş, our primary goal is to have a year without workplace accidents. In 2024, we aim to attract new customers, advance the Döktaş name further in the global sector, and elevate our supply chain.

Finally, do you have a message you would like to share with our readers?

We must work harder and produce more to have a significant presence in the global market. We need to leave a stronger Turkey for future generations.

ORDEL
"Yeni Nesil Teknoloji"

Temperature Sensors
(Thermocouple - Resistance Thermometer - Thermowell)

ORDEL produces Thermocouple and Resistance thermometers as temperature sensors.
Thermocouples are manufactured in accordance with DIN 43710 and IEC 584 standards for many different processes from -200°C to +1800°C. Thermocouples are manufactured for different processes from 0.5 mm diameter to 55 mm outer protective diameter.

- Straight type thermocouples
- Inset and Inset Type Thermocouples
- L type Thermocouples
- Mineral Insulated Thermocouples (Flexible Type)
- Exhaust type thermocouples
- Portable and Record type thermocouples
- Bayonet type thermocouples
- Socket connected Thermocouples
- All kinds of special thermocouple production upon customer request

Resistance thermometers are manufactured in accordance with DIN 43760 and IEC 751 Standards for many different processes up to -200°C … +850°C.

Temperature sensors with resistance thermometer elements such as Pt-100, Pt-50, Pt-500, Pt-1000, Ni-100, Ni-120, Ni-1000 etc. are manufactured.

Resistance thermometers with outer cover pipe and mineral insulated (flexible) are manufactured from 1.5 mm diameter to 30 mm diameter. Production of all kinds of special resistance thermometers upon customer request, except for the Standard types specified in the ORDEL catalog.

ORDEL

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As of 2024, ORDEL will be with you in all processes and conditions with its experience of more than 40 years and its quality product range in accordance with world standards.

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AICHELIN GROUP AND SISTEM TEKNIK SIGN JOINT VENTURE AGREEMENT.

Wolfgang Brosche **Erwin Strauszberger** **Beril Özdeşlik** **Beste Özdeşlik** Board Member **Gökhan Lale** **Levent Sindel**

Christian Grosspointner CEO AICHELIN Group **Mehmet Özdeşlik** CEO Sistem Teknik

Mödling. The AICHELIN Group and Sistem Teknik have signed an agreement to establish a joint venture in Austria. This joint venture will produce and distribute industrial vacuum heat treatment technologies and services in Europe. The AICHELIN Group is thus adding a promising segment to its existing product portfolio.

"As one of the global market leaders in the production of industrial furnaces for industrial heat treatment, we want to become an even stronger partner in the supply of vacuum furnaces for industry. The joint venture combines the best of two worlds: With the products developed by Sistem Teknik and our global after-sales and service network, we create maximum customer focus - a perfect combination to better meet the increasing demand for vacuum solutions in the future," states Christian Grosspointner, CEO of the AICHELIN Group.

"The motivation of our joint venture is to offer the best possible technology that fits our time, which inevitably demands environmental efficiency and sustainability. We have noticed that there is a strong market for megatrends such as carbon footprint, electromobility and lean production. With our vacuum furnaces, we aim to provide solutions that ensure low carbon emissions and maximum process quality. I am very confident that this collaboration will not only bring innovation, but also benefit our industry," says Mehmet Özdeşlik, CEO of Sistem Teknik.

About the AICHELIN Group

The AICHELIN Group, which belongs to Berndorf AG and is based in Mödling near Vienna, is one of the world's leading providers of heat treatment solutions. These include industrial furnaces, industrial heating systems, control and automation systems, Industry 4.0 solutions and services. The company's roots go back to 1868. In addition to the traditional AICHE-

LIN brand, AFC-Holcroft, SAFED, BOSIO and NOXMAT belong to the Group, which is one of the top 3 heat treatment companies in the world with over 1,000 employees. In Europe, AICHELIN is represented by subsidiaries in Austria, Germany, Slovenia and France, while its global presence includes subsidiaries and branches in China, India and the USA, as well as a sales network in a further 22 countries.
www.aichelin.com

About Sistem Teknik

As a leading manufacturer of industrial furnaces in Turkey, celebrating its 45th anniversary this year, Sistem Teknik offers its customers the best heat treatment solutions with innovative design and effective technology for the steel and composite industries. Thanks to Sistem Teknik's research and development center and innovative approach, the company provides know-how and experience to its customers and offers high-tech heat treatment equipment as well as supervision of equipment installation, commissioning, and training.
www.sistemteknik.com

Christian Grosspointner
CEO AICHELIN Group

Mehmet Özdeşlik
CEO Sistem Teknik

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JUMO THYRISTOR POWER CONTROL UNITS

Thyristor power controllers are used wherever electrical energy is converted to heat or utilized for industrial heat production. The demand for high-performance and flexible power control devices in industrial processes is increasing. Energy-efficient controllers, which allow for sustainable and cost-focused production, are particularly important.

With 75 years of field experience, an extensive sales and service network, and a skilled team, JUMO stands out in the production of high-quality and advanced thyristor power control devices. Through direct communication with customers, JUMO continuously develops and adapts its proven, application-oriented products to new requirements.

This article discusses the technical specifications of JUMO's TYA-200 series power control units, their innovative communication protocols, and advantages in industrial automation processes.

TYA-200 Series Power Controllers:

The JUMO thyristor power controller series is the result of consistent development in power control technology, switching resistive and resistive/inductive (transformer) loads via single or three-phase circuits. The TYA 201 series is designed for single-phase operation, TYA 202 for three-phase economy circuits, and TYA 203 for full three-phase operation. With the TYA 201 version, single-phase connections can be applied (Phase-Neutral, Phase-Phase), while the TYA 203 version supports Star Connection (with or without Neutral), Delta connection, and Open Delta connection.

The devices can be configured according to need for Current (I, I^2), Voltage (U, U^2), or Power (P) control. Additionally, loads can be smoothly driven with Burst Firing, Phase-Angle, or Half-Wave control modes. In some specific cases, soft start functions and current limiting features prevent damage to the loads. With models that allow Current (I, I^2) and Power (P) control, faults such as breakage or short circuits in heaters can be instantly detected and reported as alerts.

High-temperature furnaces (above 1400°C) using heating elements with special electrical properties, such as silicon carbide (SiC) and molybdenum disilicide (MoSi2), require precise control. The advanced control algorithms of the TYA-200 series thyristor power control units enable these heating elements to be driven safely and comfortably, significantly extending their service life and minimizing downtime, resulting in significant cost savings and increased efficiency.

The integrated backlit LCD displays provide quick access to all process data, offering a fast overview of the system status, allowing users to control and adjust all process parameters, operating modes, and setpoint values. Parameter settings can be made directly through the LCD display or via PC using configuration software connected through a USB port. During this process, the device is powered directly through the USB without the need for an external power connection, making it easy to configure in an office environment before field deployment. This software program allows for rapid serial configuration of multiple devices, and JUMO's experienced team can also assist with remote configuration if needed.

Special Functions:

JUMO's thyristor power controllers come equipped with dual energy management to ensure equal

distribution of energy across the grid voltage. This feature coordinates the output of multiple power control units to prevent peak currents from coinciding, helping to reduce energy costs.

With the “Teach-in” function, the initial values of loads connected to the device are recorded, and in case of significant changes during the process, an alert can be triggered or the system can be shut down based on the configuration.

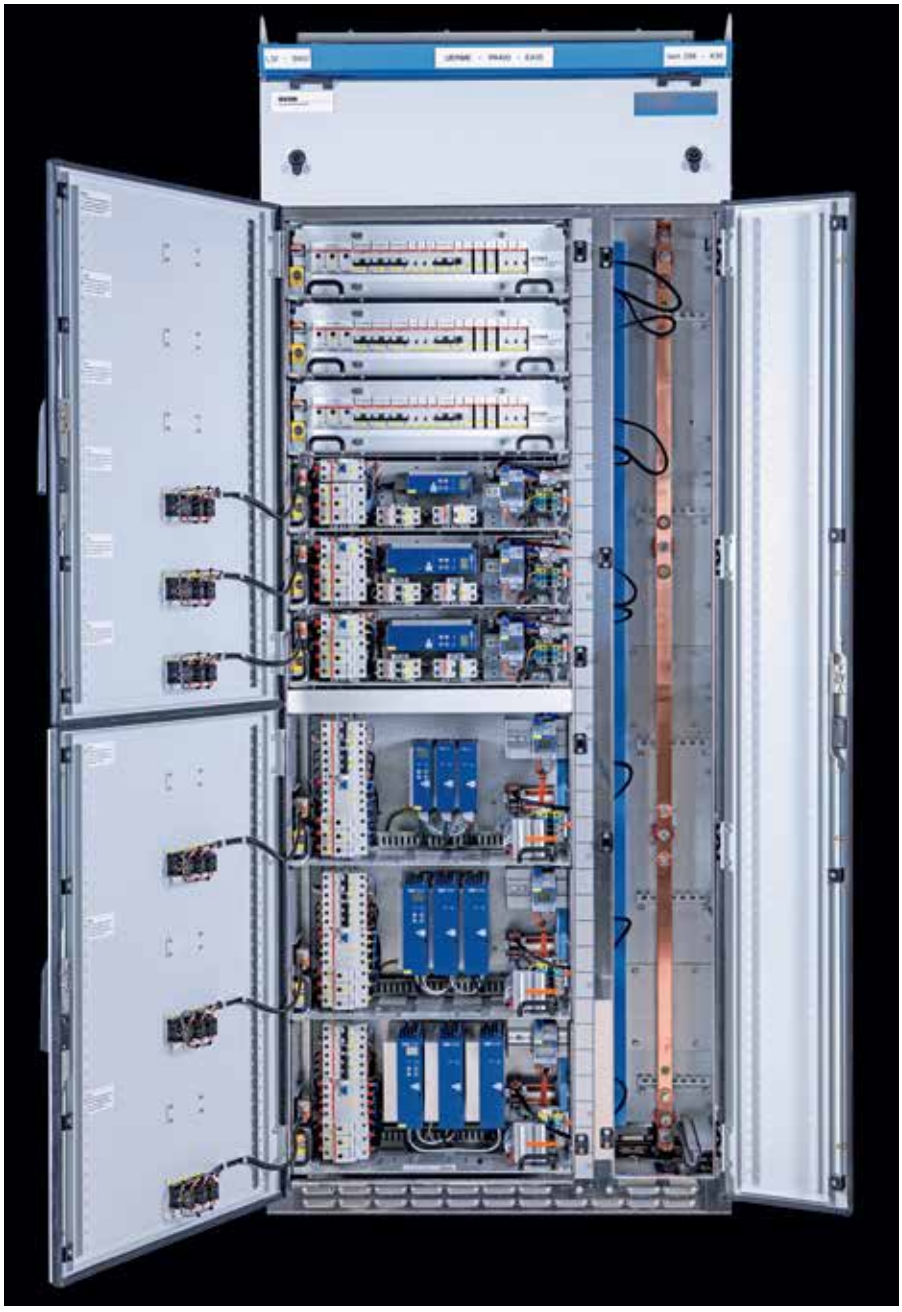
Thanks to current, voltage, or power control modes, a stable output variable is guaranteed even when the mains voltage fluctuates.

The devices are available in current ranges between 20 and 250 A, and operating and device parameters can be easily transferred to other systems through optional interfaces.

Innovative Communication Protocols:

In addition to RS422/RS485 (Modbus RTU) and PROFIBUS-DP interfaces, JUMO’s TYA-200 series power controllers are equipped with real-time communication protocols like EtherCAT and PROFINET. These protocols allow the devices to operate synchronously and enable faster data transfer. Process data such as load current, load voltage, and impedance can be continuously monitored. Additionally, diagnostic functions can effectively alert users to issues such as energy consumption , short circuits, and heater failures.

The EtherCAT protocol facilitates device setup via TwinCAT software without requiring additional configuration software. It is also important for reducing energy costs and increasing system efficiency by synchronizing multiple power control devices and managing load current.



The PROFINET protocol stands out with its reduced wiring requirements and fast commissioning processes, making it highly advantageous in industrial environments where quick setup is required. Additionally, the lack of need for analog inputs and outputs provides more economical solutions by reducing costs.

Conclusion: High Performance and Flexibility

JUMO’s TYA-200 series combines high performance and flexibility in industrial automation processes with its innovative features and advanced communication protocols. This series offers a wide range of applications, from high-temperature requirements to energy management, providing advantages such as reducing energy costs and increasing efficiency. Equipped with protocols like EtherCAT and PROFINET, the TYA-200 series power controllers have become an indispensable part of modern industrial automation systems.

JUMO

Insistently reliable...

- Load monitoring for the detection of partial load failure or load short-circuit "Teach-In"
- Easy configuration via USB connection without requiring device power supply
- Current limiting and soft start function
- Integrated control loops (U^2, U, I^2, I, P)
- Analog output (current, power, voltage)
- RS422/485 interface , PROFIBUS DP, EtherCAT, PROFINET
- UL 508 approvel

MORE THAN SENSORS AND AUTOMATION

PROFINET EtherCAT

JUMO TYA 203 Three-phase Thyristor power controller

The JUMO TYA 203 is the result of consistent development of JUMO power controller technology and switches resistive and resistive/inductive (transformer) loads via a three-wire circuit. It enables the wiring of the load in a star connection (with and without N conductor) or a delta connection. An open delta connection (six-conductor connection) can also be implemented. The microprocessor controlled power controller displays all parameters in an LCD display with background lighting. It can be operated using the four keys at the front.

With 75 years of industry experience, we offer you German quality.

Welcome to JUMO.

JUMO Ölçü Sistemleri ve Otomasyon San. ve Tic. Ltd. Şti.

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NEWS FROM US

Another Investment in the Energy Sector! 1

Another investment in the energy sector!
The installation of our Transformer drying furnace in Balıkesir continues rapidly.

Bodycote Finland 2

We have successfully commissioned our Vacuum Tempering Furnace in Bodycote Finland.

Giant Vacuum 3

We have exported the giant vacuum furnace with 1600 x 1600 x 1000 useful dimensions.

SİSTEM TEKNİK
SANAYİ FIRINLARI A.Ş

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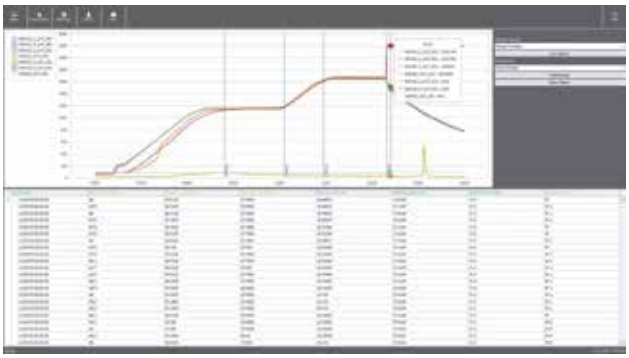

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Energy and CO_2 Emission Evaluation of a Vacuum Gas Quenching Process

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Heat treatment of dies is an important step that provides key performance in the aspect of sustainability of production capacity of the plastic and metal injection sector. The heat treatment of machined die consists of two different stages as hardening and tempering. Hardening is the first step that allows the material fully hardened to the desired hardness level and reorganize the grain structure. In order to make the hardening process in clean environment with minimum distortion while avoiding cracking, vacuum gas quenching furnaces are widely used. This study delineates the system boundaries for vacuum gas quenching process of H13 tool steel with 484.5 kg, scrutinizing temperature profiles, energy, and quenching gas consumption across operational stages within established GHG scopes. A methodological analysis examines CO2eq emissions alterations in line with the CBAM framework's transitional benchmarks. The examination across selected national grids reveals marked variations in Scope 2 emissions, with total CO2eq/kg product ranging from a 0.0002 for Iceland to 0.748 for the Czech Republic. Within the CBAM context, emissions from the vacuum furnace process constitute 8% to 13% of the default total emission values for similar steel products.

Keywords: Vacuum Heat Treatment, Hardening, Quenching, CO2 Emission, Energy Consumption

Detailed Process and CO_2 emissions Evaluation Methodology of a Vacuum Furnace

1- **Process details:** The vacuum furnace process was conducted on August 10, 2022, at BGH Edelstahlwerke Türkiye, located in Dilovası, Kocaeli. The total duration of the process, encompassing vacuuming, heating, and cooling, was 8 hours, 32 minutes. Initially, the temperature in a 15 cubic meter water tank was recorded at 38.8°C. The maximum temperature observed in the tank during the process was 36.8°C, indicating the cooling system's effectiveness. The cooling system, an open-type water tower, has a maximum cooling capacity of 250 kW. The nitrogen buffer tank, crucial for gas supply to the furnace, has a volume of 10 cubic meters, with an initial pressure of 13 barg at the process start. The furnace has an internal volume of 6 cubic meters.

The process is divided into 11 steps, meticulously designed to achieve the desired material properties by controlling the furnace environment's temperature and pressure.

1- **Initial Vacuuming:** The furnace is vacuumed to ambient temperature using a 4 kW mechanical vacuum pump until the pressure drops below 30 mbara. A Roots pump (5.5 kW) is then activated for deeper vacuuming, aiming for a preset value of 0.5 mbara. Once reached, the vacuum valve closes after 3 minutes, halting the Roots pump, though the mechanical pump continues throughout the process for cooling.

- **Temperature:** Ambient (~20°C)
- **Duration:** 3 minutes
- The furnace is evacuated using a 4 kW mechanical vacuum pump, reducing the pressure below 30 mbara. Once the pressure reaches 0.5 mbara, the Roots pump (5.5 kW) stops, but the mechanical pump continues to operate throughout the entire process.

2- **Nitrogen Filling and Initial Heating:** The furnace is filled with nitrogen up to 1500 mbar. Heating elements are activated, setting the temperature to 650°C. The process monitors the furnace temperature through a control thermocouple, with a "GSOAK" value of 20°C, indicating completion at 630°C. A convection fan enhances heat transfer until the sixth step.

- **Temperature:** Ramped to 650°C at 9.55°C/min over 66 minutes
- **Pressure:** Filled to 1500 mbara
- **Heating:** 76.64 kWh energy consumed
- The furnace is filled with nitrogen to a pressure of 1500 mbara. The heating elements are activated and a convection fan (2.2 kW, running at 40 Hz initially and 50 Hz normally) is turned on to distribute the heat evenly.

3- **Holding Phase for Initial Set Temperature:** This stage waits until the temperature, as measured by the least of three thermocouples, decreases to 620°C from the set 650°C, maintaining the furnace at the set temperature.

- **Temperature:** Held at 650°C for 5 minutes
- The furnace maintains the temperature slightly above the minimum thermocouple reading until it stabilizes.

4- **Second Heating Phase:** Similar to step 2 but with a set temperature of 850°C.

- **Temperature:** Ramped to 850°C at 10°C/min over 20 minutes
- **Heating:** 47.55 kWh energy consumed
- The process repeats the heating and convection fan operation as in step 2, with the set tempera-
- ture now increased to 850°C.

5- **Holding Phase for Second Set**

- **Temperature:** Held at 850°C for 5 minutes
- The furnace continues to maintain the set temperature, with the convection fan aiding in temperature stabilization.

6- **Partial Vacuum and Heating:** The concept is similar to step 2 but with a set temperature of 930°C and a decrease in pressure to 1000 mbar before engaging the vacuum system. Nitrogen is then supplied to maintain a "Partial Pressure" of 2 mbara, with a tolerance of 0.1 mbara.

- **Temperature:** Increased to 930°C at 9°C/min over ~9 minutes
- **Partial Pressure:** 2 mbara with a 0.1 mbara tolerance
- **Heating:** 13.87 kWh energy consumed
- The furnace is partially evacuated and then heated to 930°C while maintaining a precise partial pressure with nitrogen.

7- **Holding Phase for Third Set Temperature:** Similar to step 3, with adjustments for the set temperature of 930°C and partial pressure.

- **Temperature:** Held at 930°C for 5 minutes
- The set temperature and partial pressure are maintained, ensuring the material properties are consistent.

8- **Fourth Heating Phase:** Repeats the concept of step 6 with a set temperature of 1030°C.

- **Temperature:** Ramped to 1030°C at 10°C/min over 10 minutes
- The set temperature and partial pressure are maintained,
- ensuring the material properties are consistent.

9- **Holding Phase for Fourth Set Temperature:** As in step 7, adjusted for 1030°C.

- **Temperature:** Held at 1030°C for 5 minutes
- The furnace continues to maintain the set temperature to achieve the desired metallurgical effects.

10- **Final Heating and Holding Phase:** This step mirrors step 9 but shifts the reference from "MIN" to "FURNACE" (furnace control thermocouple) with a 30-minute wait time.

- **Temperature:** Held at 1030°C for 30 minutes
- **Heating:** 19.76 kWh energy consumed
- This step is crucial for ensuring the uniformity of the temperature throughout the material, using the control thermocouple as the reference.

- 11- **Cooling:** After the final heating phase, nitrogen fills the furnace until it reaches 900 mbar, then a cooling fan activates. Nitrogen continues to fill until reaching 4000 mbar, with the cooling process aiming for a target temperature of 70°C. Flaps in the cooling system alternate every 10 seconds to ensure homogeneous cooling and minimize dimensional distortion. After reaching 70°C, the system holds for an additional 30 minutes before concluding the process.
- **Temperature:** Cooled to 70°C with rapid cooling initiated
- **Pressure:** Nitrogen fills the furnace to 4000 mbara

- **Cooling:** 49.93 kWh energy consumed
- The cooling fan (running at 1500 rpm) and flaps are engaged to cool the furnace down to 70°C. The cooling system ensures even temperature dissipation to avoid material distortion.

The total energy consumed throughout the process is approximately 474.29 kWh, with the total nitrogen used being 4.62 cubic meters. The process parameters and energy consumption are consistent with the values obtained from the energy meter, indicating a well-controlled and efficient operation.
İşlem boyunca tüketilen toplam enerji yaklaşık 474.29 kWh olup, kullanılan toplam azot miktarı 4.62 metreküptür. Süreç parametreleri ve enerji tüketimi, enerji ölçüm cihazından elde edilen değerlerle tutarlıdır, bu da iyi kontrol edilen ve verimli bir operasyon olduğunu gösterir.

2- **Understanding process system boundaries and scope:**
In delineating the system boundaries and scope for the vacuum furnace process, it's essential to adopt a comprehensive perspective that encapsulates direct and indirect emissions. The system boundaries should be fixed to include all relevant operational stages such as vacuuming, heating, cooling, and nitrogen management. Specifically, the boundaries must incorporate Scope 1 emissions from direct fuel usage, Scope 2 emissions from purchased electricity, and the pertinent elements of Scope 3 emissions, including upstream activities such as the production and transport of purchased nitrogen and other supplies which used directly in the process. In that application since there is no direct combustion (Scope 1) involved, this calculation will be not involved to approach of the methodology.
The approach mirrors the principles set forth in the Sustainable STEEL Principles briefing (https://climatealignment.org/wp-content/uploads/2022/06/fixed_system_boundary_briefing.pdf) , which emphasizes consistency in emissions accounting. By aligning the investigated process steps within these standardized boundaries, ensuring the emissions profile is comparable and consistent with industry benchmarks. This alignment is also in concordance with the Carbon Border Adjustment Mechanism (CBAM), which provides a framework for assessing the carbon content of imported goods, further emphasizing the necessity for precise emissions accounting within the defined system boundaries of industrial processes. In CBAM applications for calculating the goods emissions the process involves more than one process which is related to steel production from beginning to end. While in the most examples shown from European Commission (https://customs-taxation.learning.europa.eu/pluginfile.php/31772/mod_resource/content/1/Carbon%20Border%20Adjustment%20Mechanism%20(CBAM)%20Iron%20and%20Sector%20Presentation.pdf) involves more than one process, embedded emissions and precursors this approach and boundaries makes a specialized focused approach on the vacuum heat treatment process which is a one step of the manufacturing processes in iron and steel industry. For improving the heat treatment process according to the result in a lower CO2 equivalent emission prospect each step and phase deeply investigated. The process separated in the phases and each phase connected to related emission scopes.
Since in this process the steel product is the input of the process, it is considered as a Scope3 upstream. The input product which can possibly be produced by the same steel manufacturer or imported from another manufacturer must be considered as an embedded emission due to upstream for being align with the CABM application. Nitrogen is used to create protective atmosphere, and assumed with its inert nature doesn't involve any chemical reaction and caused waste fume gases. In the next applications, the waste gas emission measurements will be a direct emission measurement of the nitrogen input.

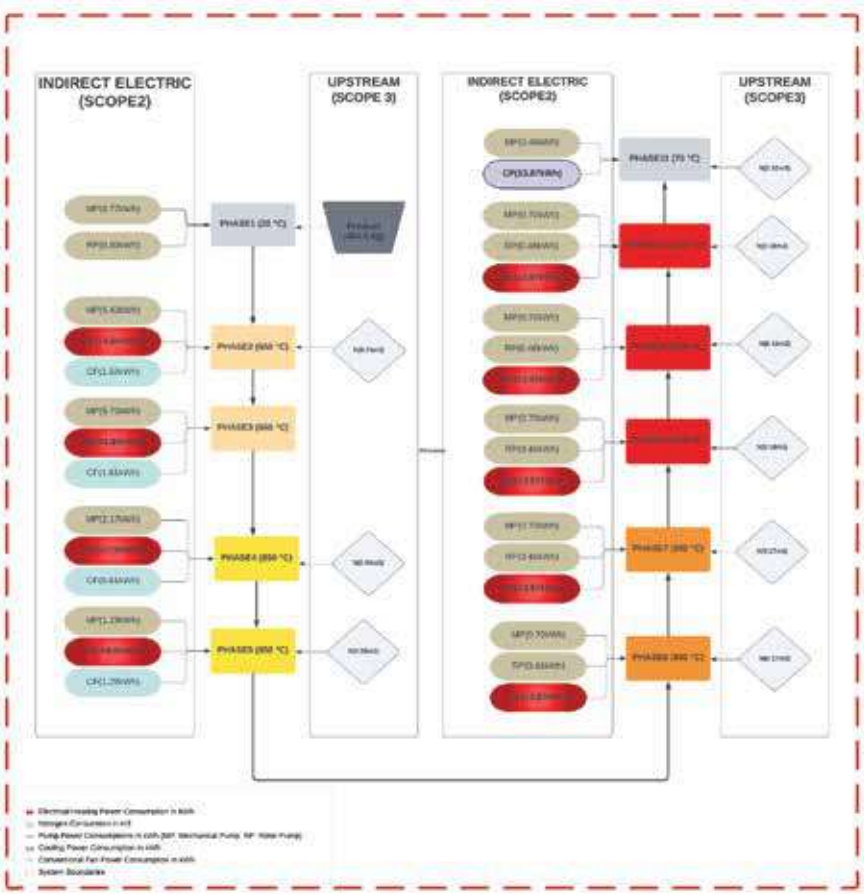

Figure 1: System boundaries of Vacuum Heat Treatment with detailed phases.(Cooling water cycle neglected)

3- **Calculating the CO2 emissions under the CBAM regulations:**

First, all calculations must be made in accordance with Scope separation. During the transitional phase until 2026 CBAM has 3 main scopes as shown in the graph.

(IRON & STEEL SECTOR European Comission, https://customs-taxation.learning.europa.eu/plugin-file.php/31772/mod_resource/content/1/Carbon%20Border%20Adjustment%20Mechanism%20(CBAM)%20Iron%20and%20Sector%20Presentation.pdf)

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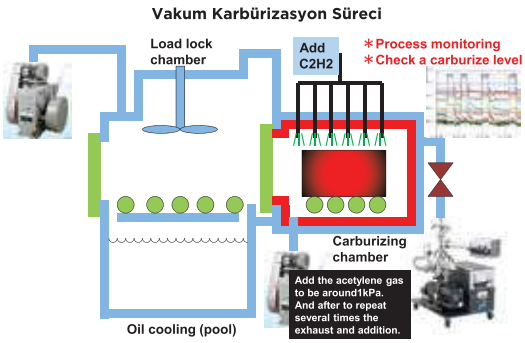

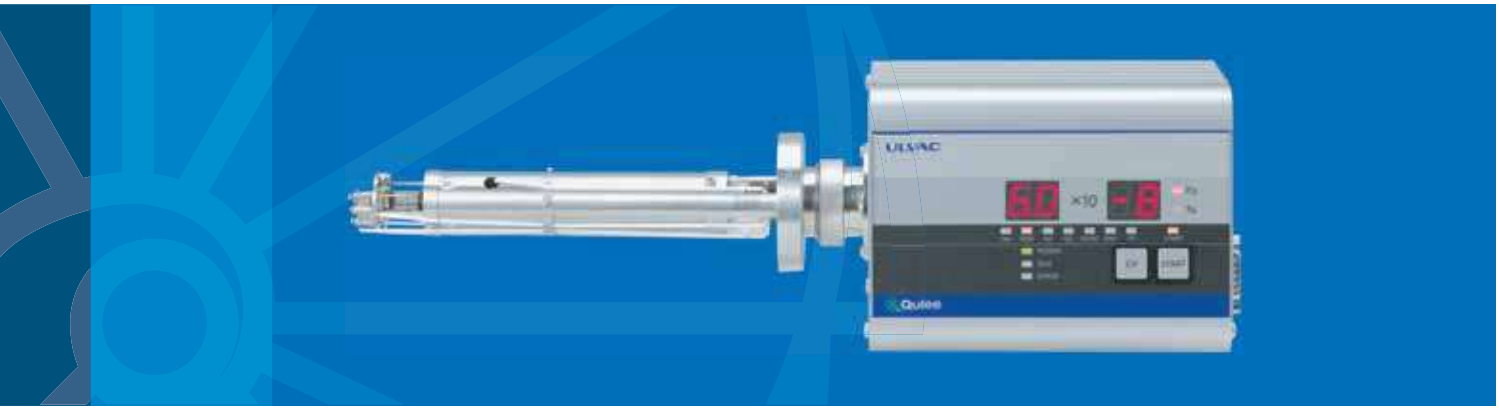

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$AttrEm_{dir} = DirEm^{*} + EmH_{,import} - EmH_{,export} + WG_{corr,import} - WG_{corr,export} - Emel_{,produced}$

- **AttrEmdir:** Attributed direct emissions of the production process. This is the total direct emissions that are attributed to the entity (e.g., a company) after adjustments for heat and waste gas imports and exports, and for electricity produced.
- **DirEm*DirEm*:** Directly attributable emissions as linked to source streams (exceptions for heat and waste gases). This is the baseline direct emissions from the production process without considering imports and exports of heat and waste gases.
- **EmH,importEmH,import:** Emissions related to the attribution of measurable heat imported. These are emissions associated with any heat that is imported into the production process from external sources.
- **EmH,exportEmH,export:** Emissions related to the attribution of measurable heat exported. These are emissions associated with any heat that is exported from the production process to external sources.
- **WGcorr,importWGcorr,import:** Correction for imported waste gases. This adjusts the direct emissions for any waste gases that are imported into the production process.
- **WGcorr,exportWGcorr,export:** Correction for exported waste gases. This adjusts the direct emissions for any waste gases that are exported from the production process.
- **Emel,producedEmel,produced:** Emissions related to electricity production. This term represents the emissions associated with any electricity that is generated as part of the production process and used internally or exported.

Direct Emissions (Scope 1):
Direct emissions are typically from sources that are owned or controlled by the company. In this case, if the nitrogen is not combusted or converted in any way that releases CO_2, it does not contribute to direct emissions. Since nitrogen is inert and used as a shielding gas in the vacuum furnace, it is assumed to not chemically react or combust to produce CO2 or other GHGs. Therefore, there would be no direct emissions (Scope 1) associated with the use of nitrogen in this process.

Indirect Emissions (Scope 2):
Indirect emissions are associated with the generation of purchased electricity that is consumed by the company's operations. The formula based on the calculation-based methodology for Scope 2 emissions using the data provided would be:

AttrEm_indir = E_el,cons × EF_el

Where:

$$AttrEm_{indir} = E_{el,cons} \times EF_{el}$$

$AttrEm_{indir}$ = Attributed indirect emissions of the production process
$E_{el,cons}$ = Electricity consumed (in kWh)
EF_{el} = Emission factor of electricity (in kgCO2eq per kWh)

Given the emission factor (EF_el) of 0.440 kgCO2eq/kWh which declared form Turkish Ministry of Energy in 2022 (https://enerji.gov.tr/Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/EmisyonFaktorleri/BilgiFormu.pdf) , calculation of the CO_2 emissions for each phase by multiplying the energy consumed in that phase by the emission factor.

For each phase the total electric energy consumption and kgCO_2eq given as the Figure 2;

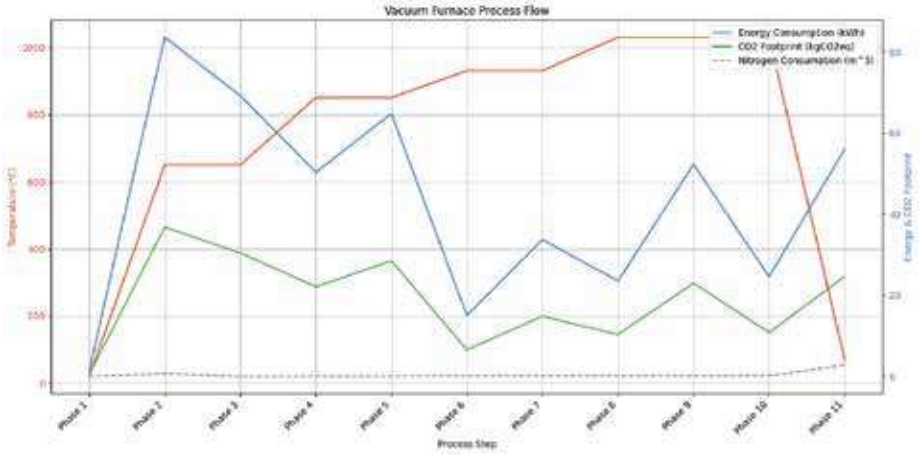


Figure 2: Vacuum Heat Treatment Process Flow by energy consumption(kWh), CO_2eq emission, Temperature and Nitrogen Consumption

To calculate the total CO_2 emissions for the entire process, summing up the CO_2 emissions from each phase the total CO_2eq emissions, power and by kg product characteristics has been shown in Table 1.

PARAMETERS	*UNIT*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
Temperature	°C	20.000	650	650	850	850	930	930	1030	1030	1030	70
Total Energy Consumption by	kWh	1.271	83.601	69.170	50.327	64.766	15.025	33.719	23.545	52.283	24.589	55.997
Total Energy Consumption	kWh	474.292										
CO2eq (EF: 0.440 kgCO2eq/ kWh)	kgCO2eq	0.559	36.784	30.435	22.144	28.497	6.611	14.836	10.360	23.004	10.819	24.639
Total kg CO2eq	kgCO2eq	208.689										
Total Product	kg	484.500										
CO2eq per kg goods	kgCO2eq/ kg	0.431										

Table 1: CO_2eq emissions by each phase during the operation.

Scope 3 Emissions:

The Scope 3 include all other indirect emissions that are a consequence of the company's activities but occur from sources not owned or controlled by the company, such as the production and delivery of nitrogen or other imbedded emissions which is related to the product itself.

In the context of the Carbon Border Adjustment Mechanism (CBAM), a precursor is a raw material or an intermediate product that is used in the production of a final good. The specific embedded emissions (SEE) related to a precursor are the greenhouse gas emissions that are released into the atmosphere as a direct or indirect result of producing that precursor. For example, in the iron and steel industry, pig iron is a precursor to finished steel products. The SEE of pig iron would include emissions from the coke and lime used in the blast furnace, as well as emissions from any coal, oil, or alternative reductants used in the production process. If pig iron is imported to be used in the further production of steel goods, its production emissions are considered embedded emissions in the final product.

In the vacuum furnace process of this study using nitrogen as a protective atmosphere and feeding steel for the process if needed to be evaluated in a deep understanding; nitrogen in the process is not a precursor as defined by CBAM. It does not undergo any chemical transformation that contributes to the final product's properties; it is used to create an inert atmosphere for the heat treatment process. However, the production of nitrogen itself has associated emissions which could be considered as upstream (Scope 3) emissions if the aim is accounting for the full lifecycle emissions of the process.

The input steel that is used for the process is our final product and raw material. The emissions embedded in this steel include all the direct and indirect emissions from its production process, including the emissions from producing any raw materials used to make the steel, the emissions from the energy used in the steel-making process, and any other related emissions up to the point of import into the furnace application. In the furnace heat treatment application since the input and output material has the same quantity and the label, only additional emission will become from the combustion, electric and process energy consumptions.

To calculate the SEE of the application, the need of follow the formula provided in the CBAM

Documentation:

$$= SEE_g = \frac{AttrEm_g}{AL_g} = \frac{208.689 kgCO2e}{484.5\ kg} = 0.431 \frac{kgCO2eq}{kg} \text{ürün}$$

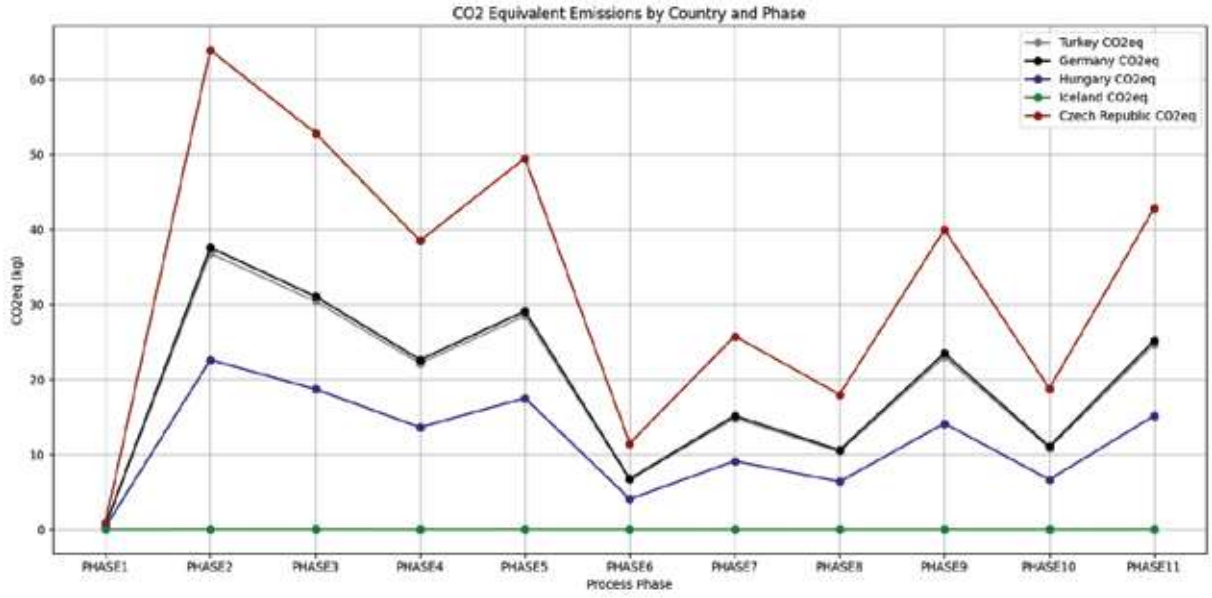
- SEE_g = Specific embedded emissions (direct or indirect)
- $AttrEm_g$ = Attributed emissions (direct or indirect)
- AL_g = Amount of goods produced

Comparison of the different countries Electricty Grid Emission factors :

Country	Elektrik Faktörü ($kgCO_2eq/kWh$)	Referans
Turkey	0.440	(1)
Germany	0.44912	(2)
Hungary	0.27037	(2)
Iceland	0.00017	(2)
Czech Republic	0.76413	(2)

According to the electricity grid factors given references the comparison made for some target countries which are Turkey, Germany, Hungary, Iceland and Czech Republic. Their 2023 Electricity Factors are 0.440, 0.44912, 0.27037 ,0.00017 and 0.76413 kgCO2eq/kWh.Since countries grid electricity factor is the highest influencing factor to Indirect Scope 2 emissions, the highest CO2eq emissions belong to Czech Republic and Germany.

PARAMETERS	*Unit*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*Total*	*CO2eq /kg*
Temperature	°C	20	650	650	850	850	930	930	1030	1030	1030	70		
Total Energy Consumption by Phases	kWh	1.271	83.601	69.17	50.327	64.766	15.025	33.719	23.545	52.283	24.589	55.997	474.292	
Total Energy Consumption	kWh	474.292												
Turkey EF: 0.440	kgCO 2eq	0.559	36.784	30.435	22.144	28.497	6.611	14.836	10.360	23.004	10.819	24.639	208.688	0.431
Germany EF: 0.44912	kgCO 2eq	0.571	37.547	31.066	22.603	29.088	6.748	15.144	10.575	23.481	11.043	25.149	213.014	0.440
Hungary EF: 0.27037	kgCO 2eq	0.344	22.603	18.701	13.607	17.511	4.062	9.117	6.366	14.136	6.648	15.140	128.235	0.265
Iceland EF: 0.00017	kgCO 2eq	0.000	0.014	0.012	0.009	0.011	0.003	0.006	0.004	0.009	0.004	0.010	0.081	0.000
Czech Republic EF: 0.76413	kgCO 2eq	0.971	63.882	52.855	38.456	49.490	11.481	25.766	17.991	39.951	18.789	42.789	362.422	0.748
Total Product	kg	484.5												



Comparison with the CBAM Default Values:
For instance according to the default values which presented by
Indirect Taxation and Tax Administration CBAM, Energy and Green Taxation default values the product which evaluated in the system is belongs to group CN code 7224 semi-finished products of other alloy steel the default value will be in total emissions 3.20 ton CO2eq/ton goods (3.20 kgCO2eq/kg goods). In this case the vacuum furnace process will correspondingly equal to %8-13 of the total emissions given in default values.

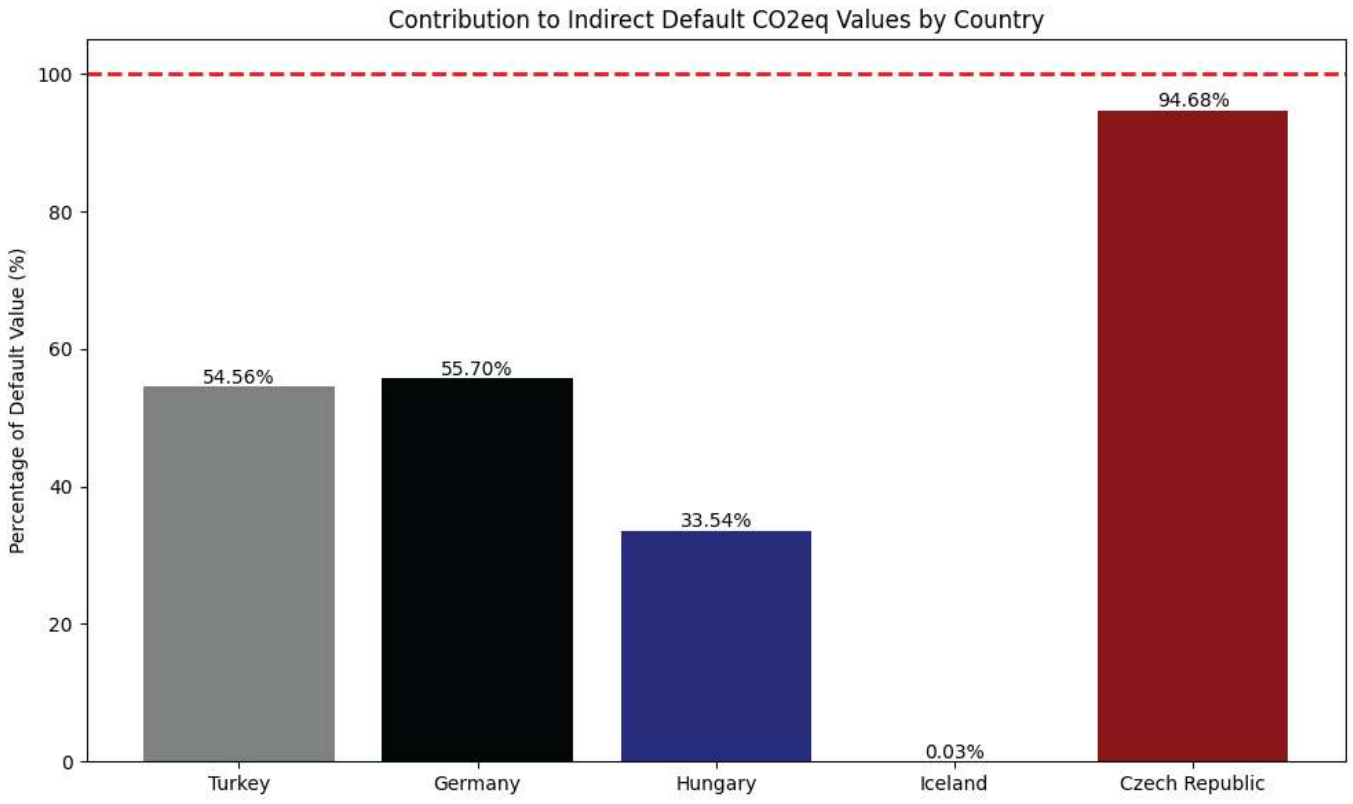
For each category the given default values for indirect and total tonCO2eq/tongoods are compared with the studies result for understanding the percentage of vacuum furnace process in the final carbon equivalent values.
For selected countries the CO2eq Default Values For The Transitional Period Of The CBAM (01.10.2023 - 31.12.2025) (3)

For CN 7224 Other alloy steel in ingots or other primary forms; semi-finished products of other alloy steel the category evaluated as follows;

CN code	Default Value Indirect (tonne CO2e/tonne goods)	Default Value Total (tonne CO2e/tonne goods)
7224 10 – 90 18, 90	0,79	3,20

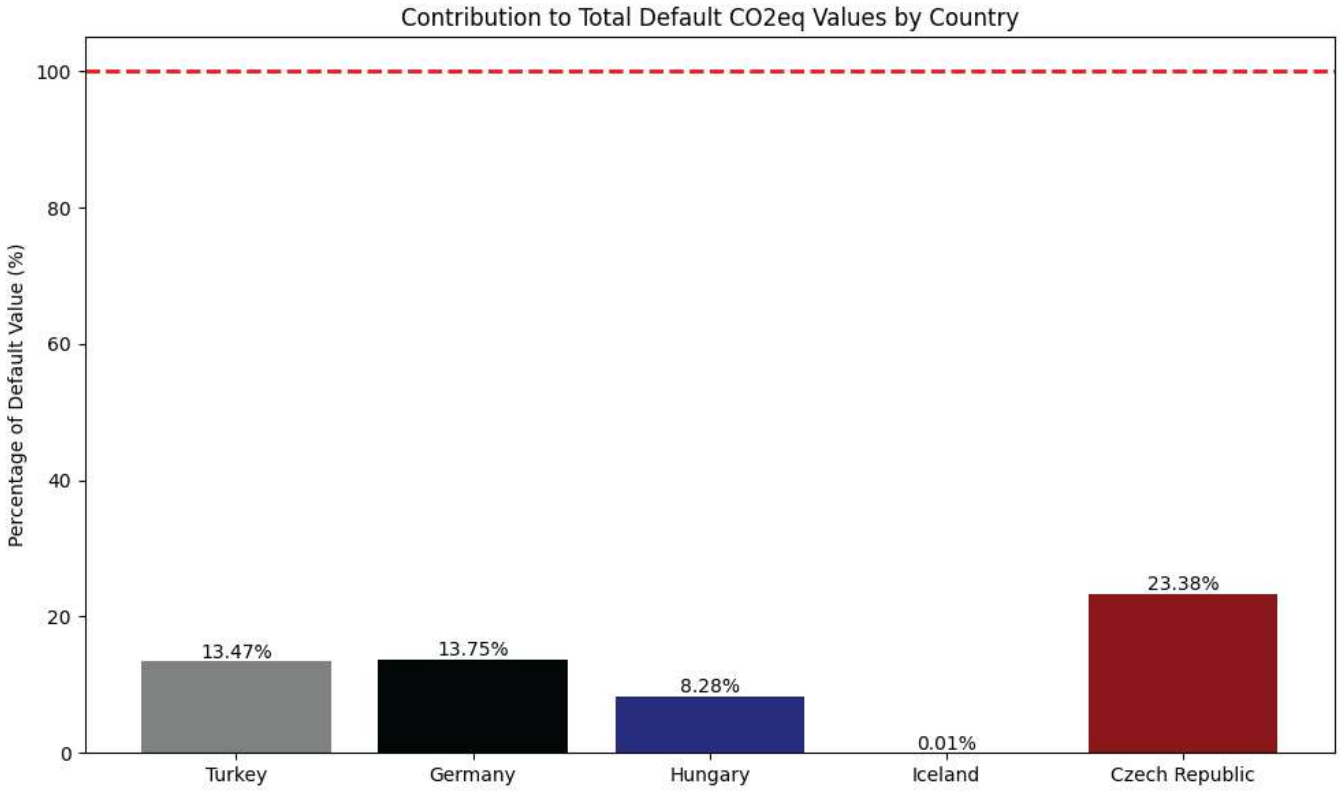
Comparison made by the country's ton CO2e/ton goods with Default Values for Indirect Emissions

CN code	**Default Value Indirect**	***Turkey***	***Germany***	***Hungary***	***Iceland***	***Czech Republic***
t CO2e/t goods		***0.431***	***0.437***	***0.265***	***0.0002***	***0.748***
7224 10 – 90 18, 90	0.79	54.56%	55.32%	33.54%	0.03%	94.68%



Comparison made by the countries ton CO2e/ton goods with Default Values for Total Emission

CN code	Default Value Total	*Turkey*	*Germany*	*Hungary*	*Iceland*	*Czech Republic*
tCO2e/t goods		***0.431***	***0.437***	***0.265***	***0.0002***	***0.748***
7224 10 – 90 18, 90	3.2	13.47%	13.66%	8.28%	0.01%	23.38%



From total default values given the CN code 7224 10 – 90 18, 90 Chezch Republic has filled %24 of default value with given vacuum process since the country's grid factor is almost 2 times higher than the others. Generally, for given countries for the total default values vacuum furnace process is corresponding to %8-14, while for the indirect default values %33-55. For Iceland since the grid electricity factor is so low, the total emission from the process is 0.081 kgCO2eq and corresponding to %0.01 of total default value emissions.

(1) https://enerji.gov.tr/Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/EmisyonFaktorleri/BilgiFormu.pdf
(2) CarbonFootprint Ltd/ 2023 Country Specific Electricity Grid Greenhouse Gas Emissions 2023, Release Date: 30 July 2023 - 2023_07_international_factors_release_1.xls
(3) CBAM EUROPEAN COMMISSION
(4) DIRECTORATE-GENERAL TAXATION AND CUSTOMS UNION Indirect Taxation and Tax Administration CBAM, Energy and Green Taxation DEFAULT VALUES FOR THE TRANSITIONAL PERIOD OF THE CBAM BETWEEN 1 OCTOBER 2023 AND 31 DECEMBER 2025 https://taxation-customs.ec.europa.eu/system/files/2023-12/Default%20values%20transitional%20period.pdf

The Role of Hydrogen as a Fuel in Reducing Carbon Footprint

As environmental challenges like climate change and pollution continue to escalate, the need to shift towards clean energy sources has become increasingly critical. In this context, the use of hydrogen as a fuel plays a significant role in reducing the carbon footprint.

Hydrogen is the most abundant element in the universe and, when used as a fuel, it produces only water and energy as clean combustion byproducts. These characteristics make hydrogen a powerful tool for reducing carbon emissions and contributing to a sustainable energy future.

Unlike traditional fuels, hydrogen combustion does not release harmful gases into the atmosphere. This means that, unlike fossil fuels, the use of hydrogen will significantly reduce greenhouse gas emissions.

Another advantage of using hydrogen as a fuel is its ability to serve as a storable energy source. This capability can help make energy systems more reliable and sustainable.

In conclusion, the use of hydrogen as a fuel is a key factor in reducing the carbon footprint. Its widespread use, especially in industrial processes, offers vast application opportunities and is a crucial step towards solving environmental challenges. Therefore, the development and promotion of a hydrogen economy is an essential stride toward a greener and more sustainable future.

Key Points on Hydrogen

Hydrogen Combustion Reaction:

Natural Gas: $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$ + energy

Hydrogen: $2\ H_2 + O_2 \rightarrow 2\ H_2O$ + energy

Hydrogen Combustion Properties:

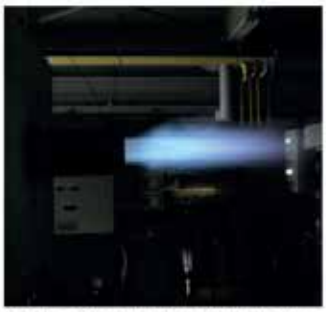
- Hydrogen is the lightest and smallest element on the Periodic Table.
- It is 8 times lighter than natural gas (2 g/mol).
- Its calorific value factor is 3 to 3.5 times lower than most commercial natural gases.
- The Wobbe index of hydrogen is close to that of natural gas.
- It has an extremely wide flammability range (4-77 vol% compared to 4-16% for natural gas).
- The spark energy required to ignite hydrogen is 15 times lower than that for natural gas (0.02 mJ).
- Hydrogen is colorless, odorless, and tasteless.
- It requires special attention to leaks.
- Hydrogen flames burn approximately 8 times faster than natural gas flames.

Honeywell Thermal Solutions and Hydrogen

Honeywell Thermal Solutions has prepared its product portfolio for hydrogen to cater to a broad market and range of applications. Honeywell's complete range of solutions for hydrogen combustion includes:

100% natural gas

Ratio of natural gas/hydrogen 40/60



Ratio of natural gas/hydrogen 20/80

100% hydrogen

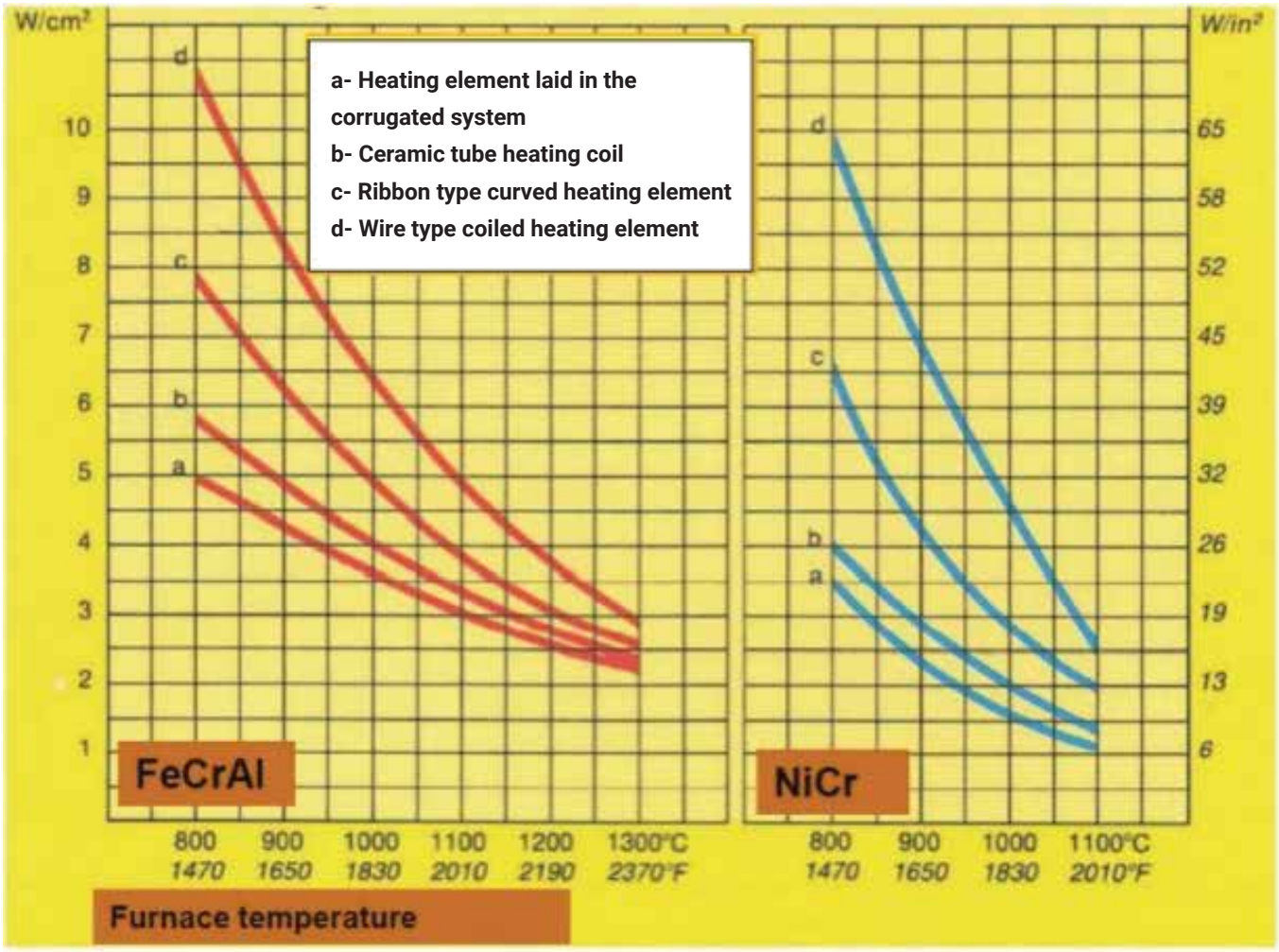
Honeywell's complete solutions for Hydrogen combustion:

- Mixer Systems
- Burner Control Panels
- Burner Management Systems
- CFD Analysis
- Combustion Chambers
- Flame Monitoring Systems designed for multi-flame detection
- Fuel/Air Ratio Control Systems
- Fuel Train Equipment
- Functional Safety Analysis
- Gas Sensors
- Piping Systems
- Service Offerings

TRANSITION TO ELECTRICITY IN INDUSTRIAL FURNACES

Selin Şahin / Project Manager SARVION

Traditionally, gases used in the burning process in the industry, such as CO_2, NOx, and SOx, are significant pollutants. As the world becomes increasingly polluted, the need for green organizations is felt more than ever. Globally, due to climate change, interest in calculating the carbon emissions of a product or service has increased. With the rise in these emissions, efforts are being made in our industry to reduce the carbon footprint by replacing gases that play a significant role with alternatives, and one of the most effective and currently feasible options is electricity.



Converting from gas to electric heaters in industrial furnaces has many positive effects, including:

Environmental: Reduction of emissions
Efficiency: Higher thermal efficiency compared to gas systems
Lower cost: Easier installation compared to gas heaters and reduced facility expenses due to lower maintenance and operational costs
Thermal homogeneity: The controls and layout of electric heaters allow for more precise temperature control, providing better thermal homogeneity in the production environment

Transition from Burners to Electric Heaters

To convert burners in industrial furnaces to electric heaters, the system's applicability must be evaluated. Necessary calculations should be made, and the most suitable design and control for the process should be determined.

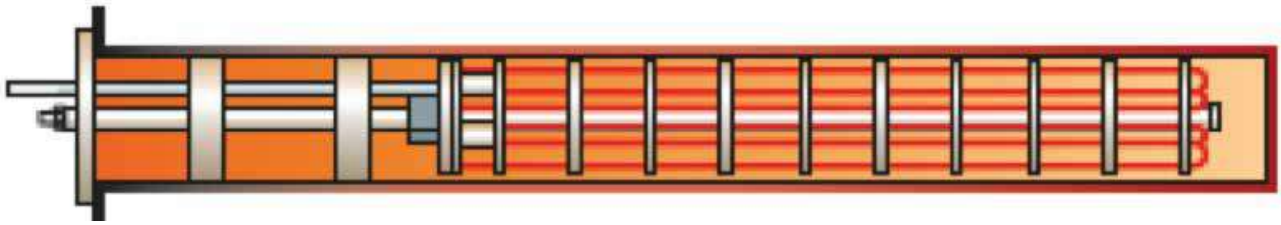
An important point to consider here is the furnace temperature. The critical factor to consider when deciding whether to use nickel alloys or iron-chromium-aluminum alloys commonly used in the industry is this.

To calculate thermal efficiency, data on the carbon footprints of both the old and new systems, the technical specifications of the existing burners, consumption values, and charge information are needed.

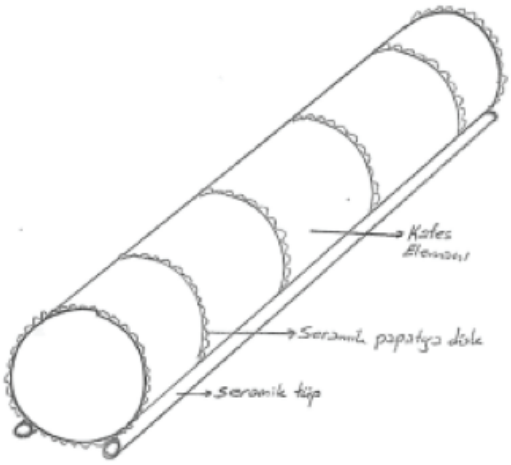
In the system, decisions on element type (atmospheric, radiant tube type, or flat), section dimensions, radiant tube measurements, insulation thickness, heater mounting type (horizontal or vertical), total heating power, supply voltage, and the electric project are made according to the specifications and can be applied.

Selection of Auxiliary Equipment in Electric Heaters

1. As crucial as the selection of electric heaters is, the selection of auxiliary equipment is equally important. For radiant tube heaters, where burners are replaced with 'Cage' type resistors, thermocouples should be used to prevent overheating of the element wire. This allows the control of the element wire's temperature, prolonging the wire's lifespan.



2. When electric heaters are mounted horizontally, bending due to temperature can occur. To prevent these deflections, support elements should be used during assembly. If a 'Cage' element is not used inside the tube, the tube should be supported with ceramic tubes from underneath. If used inside the tube, it should be supported with a hanging apparatus.



3. Electric heaters allow for more precise control compared to burners. This results in better homogeneity than that achieved by burners. This precise control is ensured with an SCR (Silicon Controlled Rectifier). When selecting an SCR, the type of resistance wire, maximum temperature, the power to be controlled, and current values must be chosen correctly.

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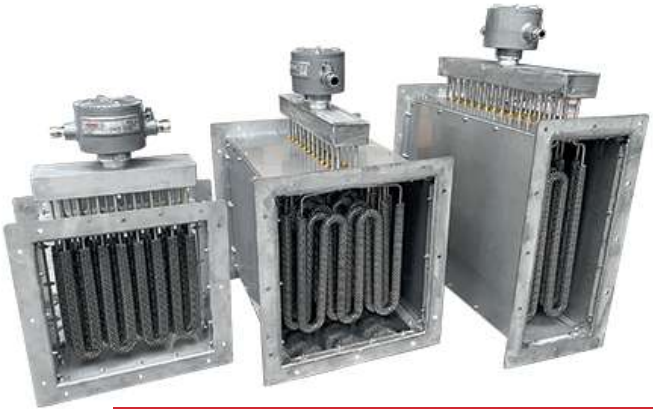

Since 1970, Baykal Rezistans is serving unlimited and excellent services to his customers. Now, our company is just producing industrial heating element for his special customers.
Baykal Rezistans presents high level engineering services to approximately ten thousand customers all around the world, with boutique and customer based exclusive service philosopy.

Finally, the company Baykal Rezistans, with his excellent customer service understanding, will continue to serve his good quality products in next years, to his customers from all over the World.

ATEX CERTIFIED HEATERS MANUFACTURING IN TURKEY WE EXPERIENCE THE JUSTIFIED PRIDE OF BEING THE FIRST AND ONLY

Exproof Heaters Exproof Tubular Heaters can be used for a wide variety of purposes. It is used safely in the chemical and petrochemical industry, in industrial processes, oil platforms, military facilities and many other places, in areas where an explosive atmosphere may occur, in environments where substances are stored, processed or produced.
As Baykal Rezistans, we are the pioneer and only company in Turkey in the production of Atex-certified industrial heaters.

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ELECTRICAL HEATING ELEMENTS

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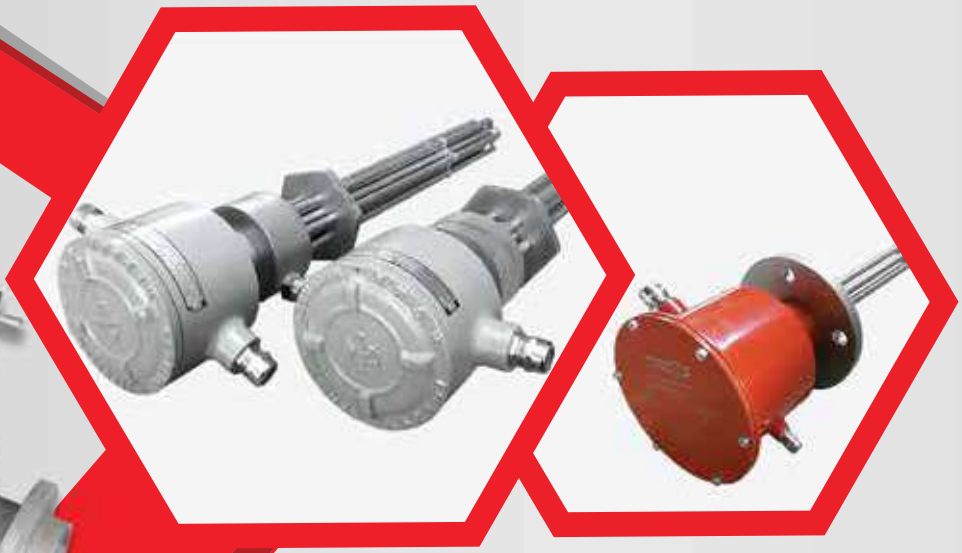

OUR PRODUCTS

- *Tubular Heating Elements*
- *Finned Heating Elements*
- *Industrial Furnace Heaters*
- *Explosion Proof Heaters*

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FOR ENGINEERING SOLUTIONS AND BOUTIQUE PRODUCTION PREFER **BAYKAL REZISTANS**

Industrial Heating Elements Most Preferred Producer of Turkey

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*Industrial Furnace Heater

Industrial Furnace Heating Elements are heat treatment systems that enable the internal environments of the furnaces to reach the desired temperature values. are the types of heaters used in the oven. Oven interior use at the same time in different types and usage sizes Production is carried out in the quality of Baykal Rezistans, according to the temperatures.

Types of Heaters According to Maximum Temperatures in the Oven

» Tubular Heaters (Maximum 700°C)
» Spiral Wound Heaters (Maximum 1100°C)
» Metal Sheathed Ceramic Carrier Supported Heaters (Maximum 1200 °C)
» Silicon Carbide Heaters (Maximum 1400 °C)

*Industrial Furnace Heater

A wide range of customer needs in all your processes that require heat treatment from the best manufactured products that you will prefer as a welcome tool.
You can use it as one of these types of customers together with its expert personnel. You can work with Baykal Rezistans, our team that offers expert solutions in terms of experience. A strong infrastructure and With its 100% solution-oriented approach, you can always manufacture industrial furnaces and equipment. Take advantage of the right furnace heater types in your processes. A heat treatment furnace, also known as a high-temperature heater Today, the heaters are up to 1400 degrees Celsius with a special ceramic material and high degree structure. It is produced by being manufactured from resistance wire together. Today, according to the types of furnaces, suitable for the desired projects As Baykal Rezistans, we provide the production in the dimensions you want. Anything you want at the special production point you can reach anytime, you can also stay in touch for information and support.

ENGINEERING SOLUTIONS ON BOUTIQUE PRODUCTION TO **BAYKAL REZISTANS**

Industrial Heating Elements Most Preferred Producer of Turkey

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*Aluminium Cast-in Heaters

Aluminium Cast-in Heaters

This type of heating elements provides a homogeneous and stable perfect temperature transfer to the surface to be heated together as aluminum cast or bronze. These heaters are specially manufactured according to the demand of the users and designed to last for many years.
There are various types of cable out options are available: high temperature resistant cables, plugs and sockets can be used. Water/oil cooled or air cooled options can be made in cast heaters.

Usage Areas:
- Extruder hives
- Extrusion head molds
- Plastic puffing
- Packaging
- Food heating glue crucibles
- Rubber presses
- PVC processing machines
- Transfer printing machines

WEG Gear Systems

motive

ADEN

unimec

Strengthening leading brands in the field such as Motive, Unimec and Zambello, especially Wattdrive Weg Group, which changed its name to WEG Gear System, with its industrial market experience in Turkey, Aden Industrial offers customized solutions for power transmission needs in every area of production.

The company, which makes a difference in its field and has a portfolio of special products, has started domestic production in the worm gearbox group with the ADEN brand. Aden Endüstriyel brings together its 20 years of experience, expert staff, honest business approach, uncompromising quality standards, reasonable pricing policy, innovative and creative solutions and effective after-sales service, and offers solutions that strengthen the Turkish industry, in addition to establishing partnerships with the world's most important companies.

The company keeps up with developing industrial technologies and provides services in a wide range of sectors with its leading brands in the power transmission sector, in addition to product supply and also offers service, maintenance and repair services to all brands in its assembly factory with a closed area of 1600 m2.

Brands introduced by Aden to the Turkish market:

WEG Gear System, Wattdrive Weg Group, the geared motors group provides advantages to its unique and special design. There are 2 main series: MAS Series and WG20 Series, including helical-worm gear, helical gear, helical-bevel gear, and parallel shaft geared motors. While providing high conversion ratios in 2-stage gearbox, it also contributes to long-lasting use, gear quality and silent operation with a 3 Arc min backlash. The company's Eusas motors are offered with a special terminal box consisting of 9 connection bolts as standard. The motor's special wide-range winding thus allows four different voltage levels (star, delta, double star and double delta) to be selected via 12 connecting wires on the 9-bolt terminal block. This feature enables modular motors to be used with almost all main voltages and frequencies in the world. Eusas motors have the ability to operate without losing torque with frequency inverters up to 100 Hz. In addition since they are modular system motors, they also provide easy replacement with flexible installation of motor options (brake, encoder, extra fan, backstop, terminal box).

Motive Aluminum Worm Gearboxes; the Italian-origin Motive group geared motors consist of aluminum worm gearbox. Reflecting Italian aesthetics to its products, Motive paves the way for compact images in terms of design. Motive geared motors have self-lubricating capped bearings, making them very suitable for use in changeable mounting positions.

Unimec Screw Jack and Bevel Gearboxes, Aden Endustriyel's Italian Unimec product group consists of trapezoidal screw jack systems, ball screw screw jack systems and direction changers. Unimec Trapezoidal Screw Jacks perform many functions such as lifting, lowering, sorting, playing and pulling with a perfect synchronization that cannot be compared with other solutions. K Series Ball Screw Screw Jacks are perfect for instant, fast and precise positioning. Unimec Gearboxes have been serving as innovative products that truly represent the cutting edge of technology for 25 years.

Zambello Extruder Gearboxes, It has exdruder gearboxes that have been produced in Italy since 1957 for use in extruder machines, are preferred worldwide and are pioneers in their sector. While it provides services with its single screw and double screw gearbox especially in the plastics industry, it is also used in blow molding, pipe and profile line, thermoforming, masterbatch, feed, chemical, petrochemical and recycling industries.

Aden Industrial continues to add innovations to its work every day in order to offer the best solutions to its business partners with its wide range of quality brands.

You can quickly access the company's wide range of products and options with product selection configurators, and easily access your drawings. You can examine Aden Industrial products at www.adenindustrial.com and get support from their expert engineering team regarding your product requests.

Rated voltages for motor series 11N, 11P (IEC frame sizes 63 to 100)					
Possible connection		Rated power P_N	Increased rated power 1,2 x P_N	Frequency inverter operation	
△	Delta	220 - **230** - 240 V at 50 Hz 220 - **265** - 277 V at 60 Hz	- 254 - 265 - 277 V at 60 Hz	△	400 V, 87 Hz
△△	Delta - Delta	110 - **115** - 120 V at 50 Hz 110 - **132** - 138 V at 60 Hz	- 127 - 132 - 138 V at 60 Hz	△△	230 V, 100 Hz
Y	Star (basic connection)	380 - **400** - 420 V at 50 Hz 380 - **460** - 480 V at 60 Hz	- 440 - 460 - 480 V at 60 Hz	Y	400 V, 100 Hz
YY	Star - Star	190 - **200** - 210 V at 50 Hz 190 - **230** - 240 V at 60 Hz	- 220 - 230 - 240 V at 60 Hz	YY	460 V, 120 Hz

Rated voltages for motor series 11P and 22P (IEC frame sizes 112 to 180)					
Possible connection		Rated power P_N	Increased rated power 1,2 x P_N	Frequency inverter operation	
△	Delta (basic connection)	380 - **400** - 420 V at 50 Hz 380 - **460** - 480 V at 60 Hz	- 440 - 460 - 480 V at 60 Hz	△△	400 V, 100 Hz
△△	Delta - Delta	190 - **200** - 210 V at 50 Hz 190 - **230** - 240 V at 60 Hz	- 220 - 230 - 240 V at 60 Hz		
Y	Star	660 - **690** - (730) V at 50 Hz 660 - **(796)** - (830) V at 60 Hz	- (760) - (796) V at 60 Hz	△△	460 V, 120 Hz
YY	Star - Star	330 - **346** - 365 V at 50 Hz 330 - **400** - 415 V at 60 Hz	- 380 - 400 - 415 V at 60 Hz		

ADEN

ADEN ENDÜSTRİYEL ÜRÜNLER SANAYİ ve DIŞ TİCARET A.Ş.

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