

POROUS BURNER TECHNOLOGY
WWW.PROMEOS.COM



promeos

Simple. Flameless. Better.



SIMPLY HOT!

promeos[®] optimises industrial heating processes.



Flameless gas burners and their easiest integration into the process are a sustainable benefit not only for the process operator, but also for the machine manufacturer – environmentally friendly and resource efficient!

SIMPLY SOLVED!

Separated. Masterfully. Combined.

Burning is a complex process.

Simultaneously optimising the overlapping partial processes of gas and air supply, gas and air mixing, ignition, and flame stabilising and monitoring is only possible to an insufficient extent. That is why heterogeneous temperature fields and complex flow fields are typical for naked flames. Unwanted hot spots, high emission of pollutants and noise, limited dynamics and difficult scalability are the consequences.

It is thus barely possible to efficiently transfer heat, because it is not the heated material that determines the heating concept and design of the plant, but the imperatives dictated by the flame.

promEOS® simplifies the heating processes.

By **separating and "arranging" the most important partial process in a series**, they become easier to control. Thoroughly mixing the gas and air outside the combustion chamber guarantees best conditions for a subsequent clean and silent burning process.

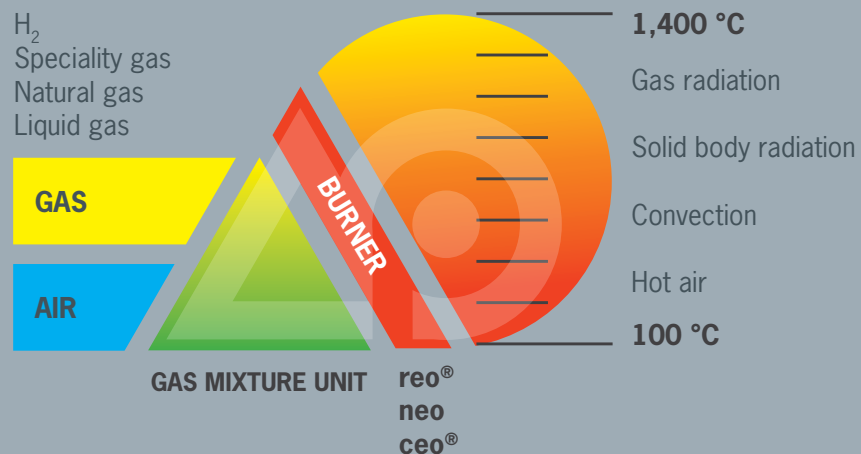
A steady supply and homogeneous distribution of the combustion media ensures safe, repeatable ignition and flame monitoring, regardless of the burner output and dynamics. And because there are neither heterogeneous temperature fields nor complex flow structures, the heating task at hand can be carried out the best possible way by designing and selecting the perfectly suited kind of burner.

The reo®, neo or ceo® burner types are easy to integrate and a radiation and flow structure that is optimised for the task at hand opens up an entirely new range of possibilities for thermo-processing. The heat offered ranges from simple warm or hot air over solid-state IR radiation to high-temperature gas radiation in closed furnace chambers.

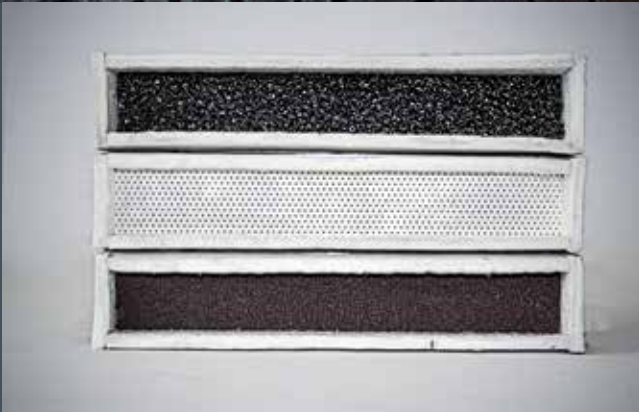
promEOS® heatelligence – technological basis and modular product system for the best possible burning processes in industrial applications.

**Simply thought. Simply made.
Simply genius.**

Simply mixed. Simply burned. Simply hot.



Burner module, simply integrated into the wall of a crucible furnace.



Depending on the requirements, heating solutions are implemented with the flameless reo[®], neo or ceo[®] gas burners by promeos[®].

Solid body IR radiation up to $T=1.400^{\circ}\text{C}$
High-T gas radiation up to $T=1.600^{\circ}\text{C}$
Hot air from $T= 100^{\circ}\text{C}$ to $T= 1.000^{\circ}\text{C}$

SIMPLY UNLIMITED!

Flameless. Smooth. Unlimited.

Simply modular

Stabilising the actual combustion reactions in porous structures and thus in hundreds of small partial flames makes it possible for promeos® to offer fully modular burner systems. By connecting individual components in parallel, entire systems with a burner output of 1 kW to several 1.000 kW are possible. The geometry is always determined by the application, independently of the used burner type - be it reo®, neo or ceo®, punctual, linear or across an entire surface.

Easy scaling and integration

With its modular design, the burner output can be scaled geometrically – more or fewer modules are integrated as needed – making it possible to rescale systems that have already been optimised once with practically no risk. And it is significantly less complex than with conventional burners: Once qualified, the solution is available in all sizes.

The geometric variability – punctual, linear, surface or pattern – makes integrating in existing as well as in new systems as easy as with electrical heating modules.

All gases

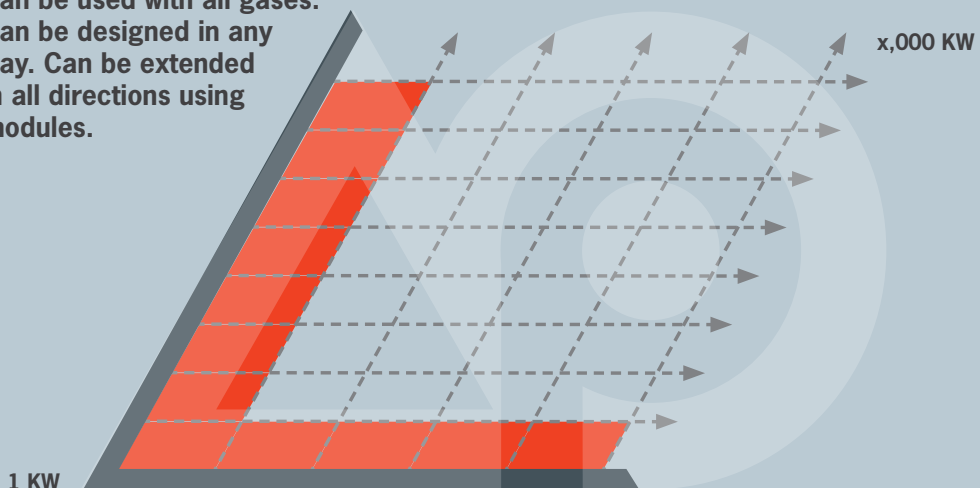
The volumetric stabilisation of the burning process in promeos® burners makes it possible to use speciality gases in addition to the conventional gas from the pipeline or liquid gas, for example process and pyrolysis gas, biogas and other lean gases.

promeos® goes further

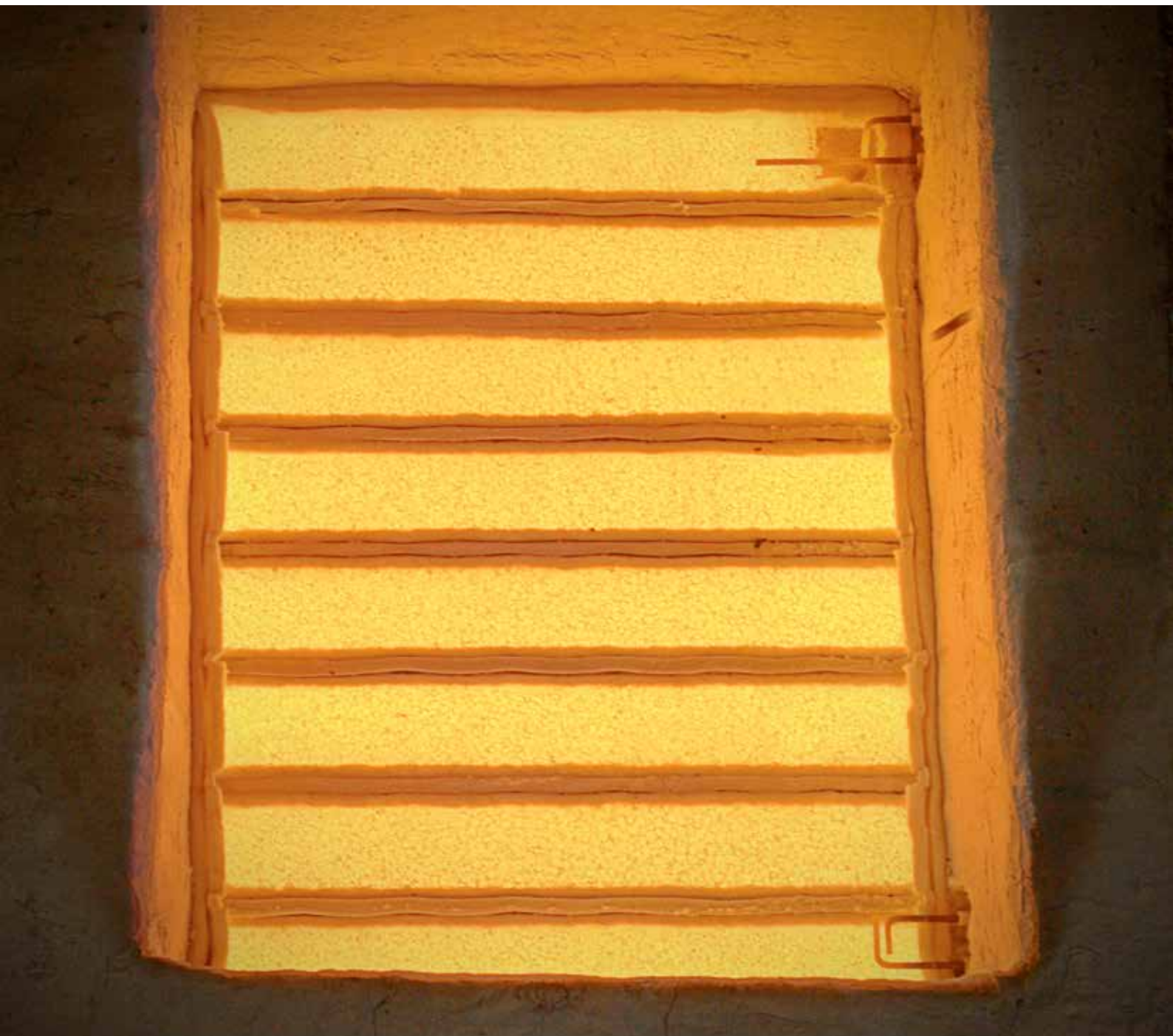
Resource efficiency and renewable energies must go hand in hand. Storing renewable energy makes hydrogen (H_2) a strategic source of energy. promeos® supports this development and invests in scaling its small output H_2 burners.

For a H_2 APPY environment, simply logical!

Can be used with all gases.
Can be designed in any way. Can be extended in all directions using modules.



Burner, modular surface.
W x H = 0.4 m x 0.5 m, output 500 kW



Burner, linear modular design.
W x H = 5.5 m x 0.1 m, output 500 kW

SIMPLY STRESS-FREE!

Homogeneous. Relaxed. Designed.

Less stress prolongs life – of man and machine!

Applied to heat transfer, this entails a decisive requirement: unnecessary heterogeneity must be avoided or at least reduced. That applies not only to the material that is to be heated, but to the components of the system as well.

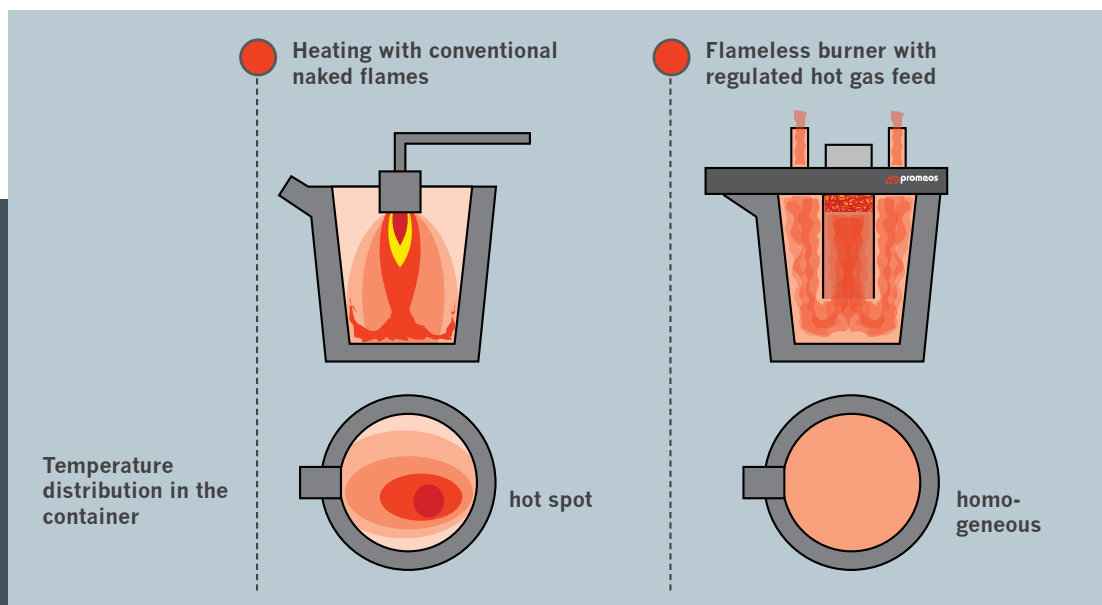
Up to now, the **desired homogeneity** was achieved by investing in expensive electricity. In smelting and holding furnaces, this meant that the standing time of melting crucibles was doubled. However, as long as the electricity from the grid causes increased operating costs and considerably more CO₂ pollution than the homogeneous combustion of gas, there are barely any arguments in favour of the expensive and environmentally unfriendly electricity-generated heat.

Homogeneous gas heating is the solution, regardless of whether it is hot air or an IR radiator – **more power, increased benefit, less CO₂!**

By using flameless gas burners, promeos® combines the advantages of conventional homogeneous electric heaters with the ecological and economical advantage of gas burners. There are no hot spots nor significant flow gradients, as they are unavoidably occur in punctual sources, that have to be "tamed".

Instead, the optimal **regulation of temperature and flow** prevent the unwanted complexity and "unhealthy" tensions – even at a higher output and significantly increased efficiency ranges.

Almost too good to be true – but only almost.



Flammelessly heated holding crucible furnace for Al.



Warning! Paradigm change ahead!

High T-gradients and high speed (re or nu numbers) are as bad of a base for efficient heat transfer like using O_2 ! Simply make the experiment shown to the left and see it for yourself. By the way, that also works with an O_2 flame cutter!

SIMPLY INTEGRATED!

Understood. Improved. Implemented.

Improvement is change

Changing existing processes and plants requires convincing arguments and a convincing concept. promeos® offers both – sustainable customer benefit and easy implementation.

Combining the **energetic advantages** of up to 75 % energy savings **with significant increases in productivity** by reducing the rejection rate or increasing productive capacity motivates customers from various industries to join us on our path to change. Switching from flames or electricity to the flameless promeos® burner can be done in a sustainable way and has been successfully documented in far more than 400 projects to date. This is due to three main reasons:

The right perspective

We are passionate about understanding processes. This is the only way we can generate industry-specific application knowledge that makes it possible to use the right tools in the right places. That is why we approach our tasks from the perspective of the material that is to be heated and use this as a basis to build the perfect solution.

The right product

Whether it be individual burner systems or entire furnace installations – the respective process determines the necessity. Integrating new plants or furnaces in the existing manufacturing process, and integrating burner systems in existing plants can be the perfect choice – a choice we live up to.

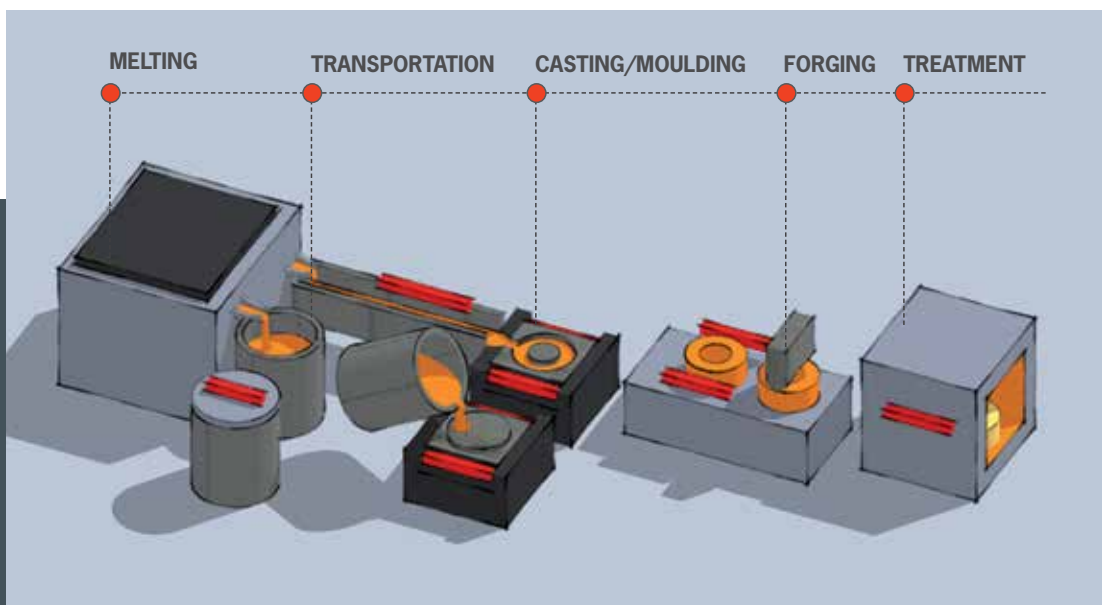
Easy and scalable design

Tailor-made solutions in the right size are the key for smooth integration. The modular design and geometric flexibility of all promeos® burner systems offer just that.

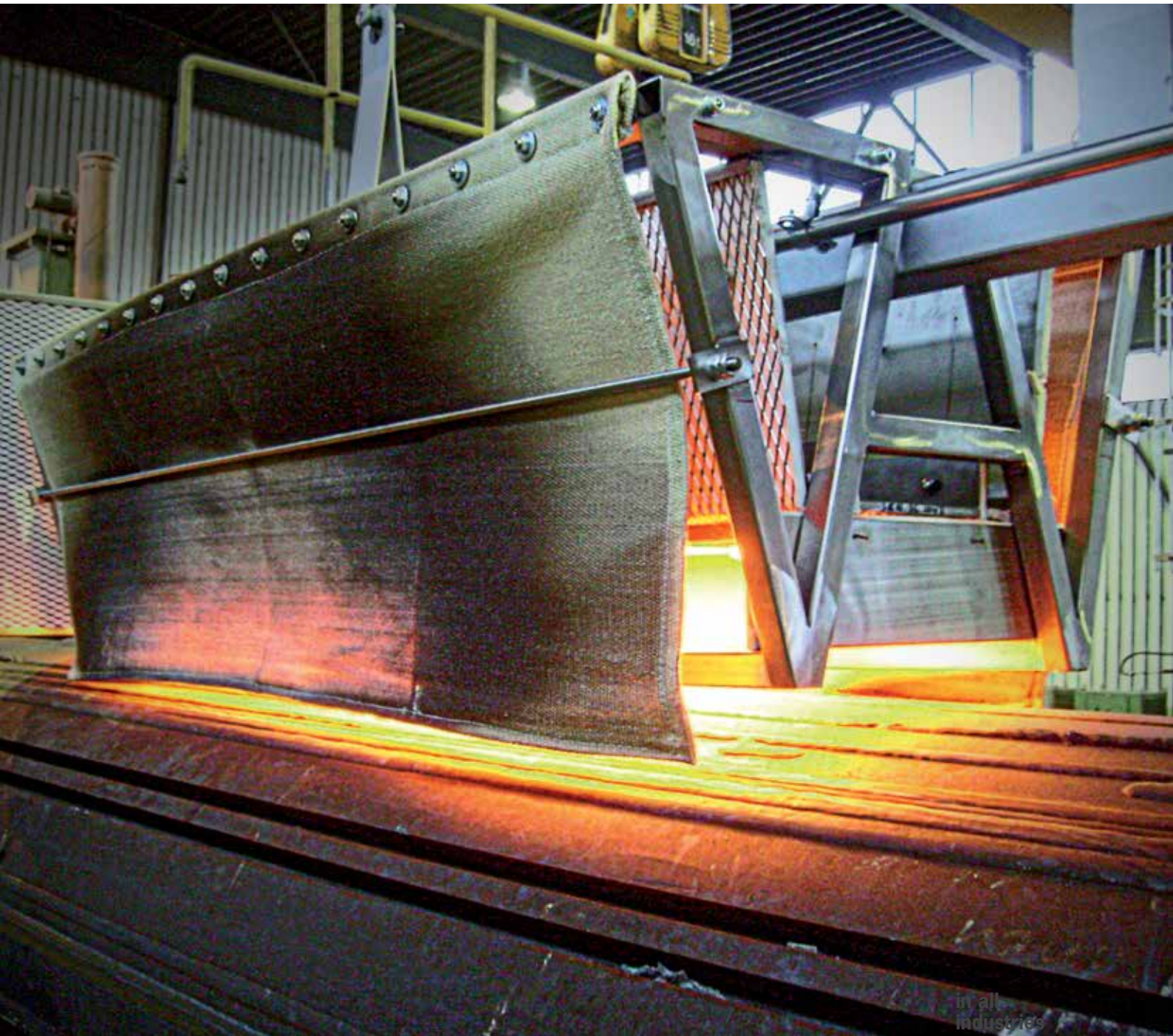
All of this makes it possible for established plant manufacturers to leave the trodden path and to change over to promeos® technology without incurring any greater risk.

Evolution instead of revolution. Together with the users and partners, we find the best solutions along the process chain – experienced and yet curious, methodological and yet pragmatic – **simply together!**

Example casting process: Integration where it generates benefit.



Burner system used to preheat axial welding seams in a pipeline manufacturing plant.
Output: 360 kW



PROCESS	SOLUTIONS	MEASURES	SERVICES	TARGET GROUPS
<ul style="list-style-type: none">• Melting• Transportation• Casting• Forging• Heat treatment• Drying	<ul style="list-style-type: none">• Gas burners• Heating systems• Heating plants• Industrial furnaces	<ul style="list-style-type: none">• New buildings• Supplements• Expansion• Retrofitting	<ul style="list-style-type: none">• Consulting• Planning• Engineering• Assembly• Commissioning• Maintenance• Training	<ul style="list-style-type: none">• Plant manufacturer• Plant operator

SIMPLY EVERYWHERE!

All you can heat.

A full-grown **technology tree** has many branches, and the promeos® tree is no exception. No longer a delicate little plant, it now extends its branches into many directions.

Born out of the necessity of finding "early innovators" in the target market, promeos® has been following its "all you can heat" strategy for many years. Broad growth, however, is not a goal in itself. The goal is to consistently use complementary knowledge and supplementary references from many different markets and applications to the benefit of each individual user.

That is why today, we are able to equip steel mills with rugged continuous casting heating systems and introduce new smelting furnaces for light metals and at the same time be a serial supplier of hot air systems for globally leading plant manufacturers from the packaging industry and develop new products such as baking ovens or hydrogen burners.

Being independent from markets, industries and specific customer groups is a great asset - not only for promeos®, but also for its customers and partners. Because accumulated knowledge about the processes surrounding all imaginable materials such as metals, glass, ceramics, plastics, rubber, textiles, paper and basic food stuffs leads to technical competence which, in the end, benefits every single project and thus each individual customer.

It is easy to develop monocultures from stable mixed crops – not the other way around! Caring for them and further developing them is a significant aspect of our corporate strategy. Because we love the diversity of our tasks and the diversity of people we encounter in the process. We grow in diversity – in our tasks, in many directions.



Growth in many branches

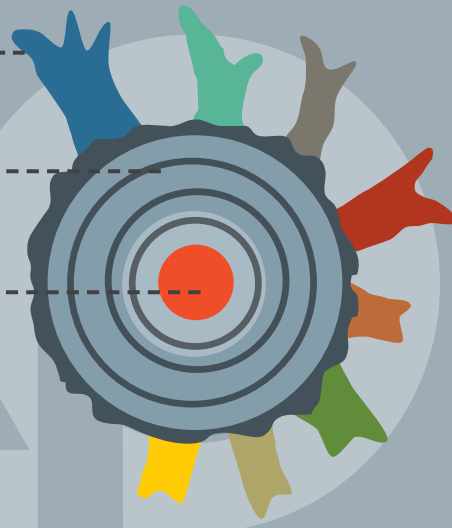


Process know-how, plants and furnace manufacturing



Burner systems, basic technology

The promeos® tree – a strong trunk supports many branches.



Burner system to homogenise
the temperature of the glass output feed.
Output: 300 kW



METAL



GLASS
CERAMICS



PLASTICS
RUBBER



TEXTILES



FOOD STUFF



CHEMISTRY



PAPER



ENERGY

HEATING SOLUTIONS

SIMPLY DIVERSE!

Individual. Tailored. Fitting.

BURNER SYSTEMS (Examples)



Burner system (hot air blower)
for foil packaging plants.
Output: 40, 60 and 80 kW



Burner system (hot air generator).
Output: 1,500 kW



Burner system for a
glass annealing furnace.
Output: 150 kW



Burner system for a
chamber furnace.
Output: 150 kW

HEATING SYSTEMS (Examples)



Heating system for
transportation ladles.
Output: 100 kW



Heating system for a
steel continuous casting plant.
Output: 120, 360 and 720 kW



Heating system for a
profile pipe extrusion line.
Output: 400 kW



Heating system for laundries.
Output: 200 kW

One technology – many options

To be able to offer the best solution for each and every one of our customers, promeos® has developed a wide range of products. From simple burner tips and integrated burner system over heating systems to complete industrial furnaces. Every day, we meet new challenges and show that there are better solutions: Open the eyes – persuade – create references – communicate enthusiasm – change markets

sustainably. Furthermore, the many competences we have acquired in the areas of metal and refractory engineering, measuring and controlling technology as well as the safety and controlling-related integration into customer production sequences make it possible for us to be on equal footing when communicating with plant manufacturers. Together, we always find the best possible product – **easy, together and fitting.**



Burner system for a
tool heating plant.
Output: 100 kW



Burner system for a
smelting furnace.
Output: 2x 350 kW



Burner system for a
convection furnace.
Output: 100 kW



Burner system to
burn pure H₂.
Output: 11 kW



Heating system to dry
rug cloth webs.
Output: 1.500 kW



Heating system for a
plastics recycling plant.
Output: 200 kW



Burner system for a
magnesium smelting furnace.
Output: 3x 350 kW



Heating system to preheat induction
smelting furnaces.
Output: 200 kW



We deliver burner and heating systems with
high value, especially for furnace and plant
manufacturers.



HEATING SOLUTIONS

HEATING SYSTEMS (Examples)



Heating system to preheat casting tools in wheel rim casting.
Output: 100 kW



Heating system to dry 50 t steel ladle.
Output: 1.500 kW



Heating system to dry and pre-heat ladle.
Output: 100 kW



Heating system to keep the fluid melt warm.
Output: 350 kW

INDUSTRIAL FURNACES (Examples)



Bogie hearth furnace for the thermal post-processing of steels.
Output: 2.500 kW



Holding furnaces for Aluminium.
Output: 50 kW



Furnaces to preheat pipes.
Output: 360 kW



Drying ovens.
Output: 120 kW

Improving processes requires improved solutions. Each application defines the best solution for each individual case itself. In order to be able to offer this to our customers without restrictions, promeos® has developed to become a plant and furnace manufacturer. Wherever no solutions can be offered with well-established partners, promeos® delivers its own plants or industrial furnaces in almost all shapes and sizes for all markets.

Furthermore, we want to convince established plant manufacturers of how simple our solutions are. For a good cooperation as partners to the benefit of the user and the environment – **we simply offer diversity together.**



Heating system to preheat forging dies.
Output: 500 kW



Heating system with a station to preheat pouring spouts.
Output: 350 kW



Heating system to preheat die casting tools.
Output: 360 kW



Heating system to partially heat webbed materials.
Output: 300 kW



Crucible furnaces to melt non-ferrous metals.
Output: 350 kW



Chamber furnace.
Output: 60 kW



Crucible furnace to refine lead.
Output: 250 kW



Belt dryer for textiles.
Output: 70, 120 and 250 kW



We are development partners and suppliers
of heating systems and industrial furnaces
for project developers, investors, manufactur-
ing companies and trade groups.



REFERENCES

SIMPLY TOGETHER!

In more than 20 countries. More than 400 projects.



The path takes shape by the steps we make.

Germany, as an industrial site, is the perfect home market. It is here that promeos® learned to walk - with the help of both a great number of users as well as with the cooperation of globally leading plant manufacturers. Our curiosity, market globalisation and our internationally-oriented team have allowed us to travel

across the entire globe – Greentech made in Germany by promeos® benefits everyone all over the world. We will continue on the road we are on, because we enjoy it and because reducing CO₂ does not know any language barriers. There still is much to do – together with our team and with our high-esteemed partners – **simply keep going!**



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promeos

Global. Sustainable. Social.



GOOD TO KNOW!

promeos[®] is walking in the footsteps of prometheus¹⁾, friend of humanity and founder of culture. To turn his fire into eos²⁾, homogeneous heat to be experienced every day, is our mission.



Deeply rooted in fertile ground, we have the strong trunk that gives us the necessary stability. Our branches have grown in all directions to form a protective roof over our heads. This is how we want to continue growing and shaping our future together: in an ecological, economical and social way.

¹⁾ In Greek mythology, Prometheus, "the forethought", is the bringer of culture and benefactor of mankind. He brought us fire!

²⁾ eos, the goddess of dawn.

COMPANY

KNOWLEDGE SPARKS INNOVATION!

Founded. Developed. Expanded

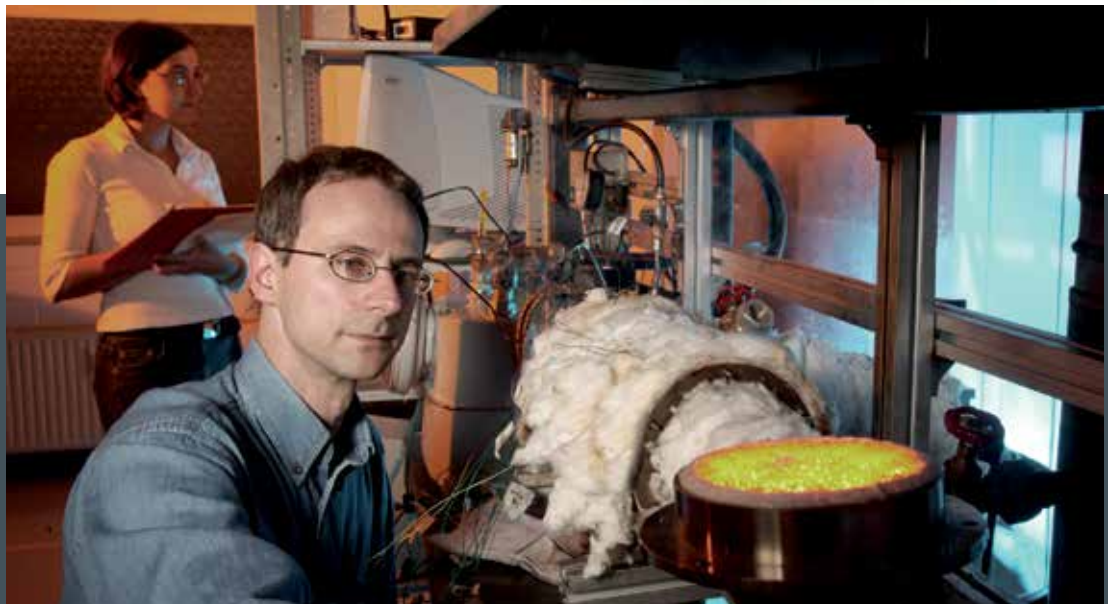
promeos® stands for successful **technology transfer**. Like many groundbreaking innovations, porous burners were developed in the spirit of scientific freedom, free from industrial or economic constraints. This technology was conceived by Prof. Franz Durst and Prof. Dimosthenis Trimis. In 2003, after it was examined in the laboratory of the Friedrich-Alexander University of Erlangen Nuremberg (FAU), Dr. Jochen Volkert took up the idea and set out to cultivate this delicate plant by founding promeos®.

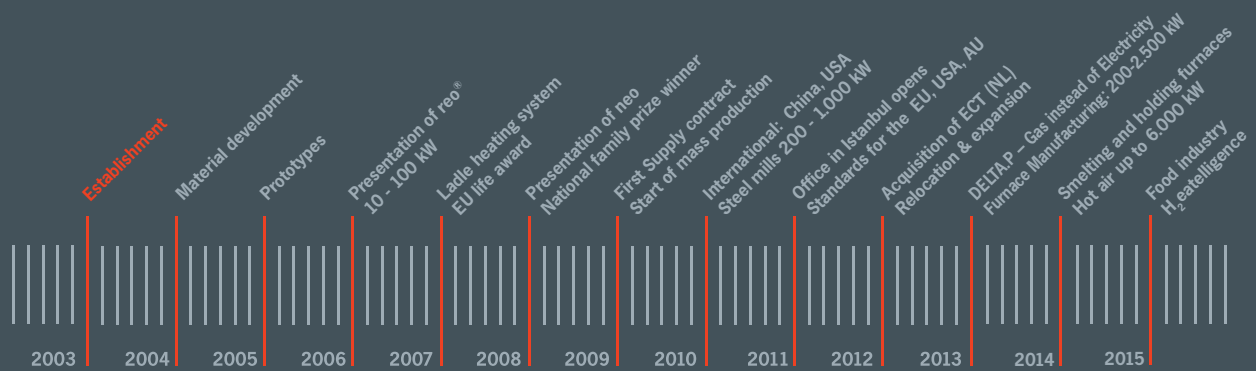
The continuous development of material, process and methodological competences on the one hand, and the successful **cooperation with experienced partners from industry and business** on the other, have let this plant grow and thrive and created a company that now sets new international energy efficiency standards in many areas of thermo-processing technology.

Knowledge can only express itself through action. We do all we can to generate true, sustainable value for our customers, partners, employees and the environment.



German
Founders Award
2004





VISION

KNOWING THE WAY!

Global. Ecological. Pioneer.

If you don't know the goal, you won't find the right way.

promeos® wants to be the global technology leader for premixing gas burner systems and the driver of innovation for all gas-heated thermo-processing plants in the respective target product segments. We work towards this goal with heart and mind.

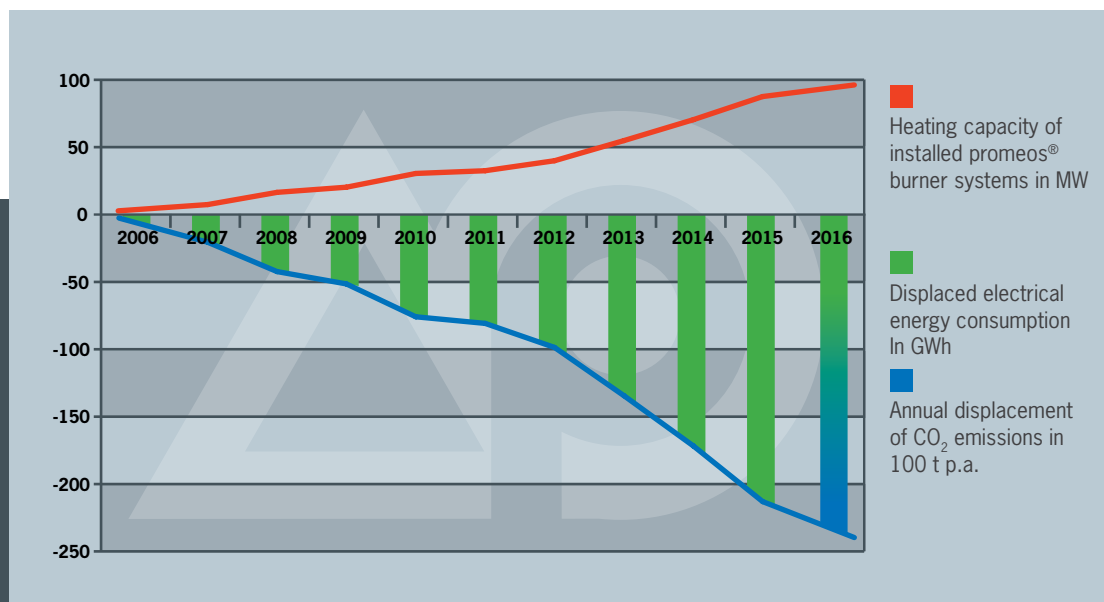
It is a privilege for us to put all of our creative energy to the service of ecological renewal and we are proud of what we have achieved to date. Nevertheless, we are just at the beginning and the path that lies ahead of us is long. Measured by the global energy savings potential in industrial production processes, we are nought but a small, yet bright light – with special emphasis on "bright" of course.

That's why we want the "hot spot" promeos® to become a global technology leader. For this, we move ever faster and ever further. And we are happy to welcome our partners to this mission.

Cooperating with globally leading plant manufacturers creates powerful synergies. When innovative power and strength of implementation join hands, everyone – including our unique planet – can benefit.

Together. Faster. Protecting the environment.

promeos® heating systems reduce CO₂ emissions worldwide.






GREENTECH
Made in Germany


**UM
WELT
PAKT
BAYERN**

VALUES

KNOWING WHAT FOR!

Environment. Values. Family.

Doing justice to the **three pillars of sustainability** is the basis of everything.

That is why we exclusively develop products that demonstrably **reduce the environmental impact**. Increased energy efficiency as well as clean and quiet burning are the trademarks of our solutions. However, industrial products do not sell due to their brilliant technology or the clearly demonstrated energy savings. It is the economic benefit that makes customers invest.

That is why promeos® is all about customer benefit. If the customer benefit is convincing enough, then an investment will be made and energy will be saved. Thus, it is the **economic advantage** for our customers with pay-off periods of up to a maximum of 24 months that motivates them to invest and lets us grow – the second important pillar.

And finally, we ensure fair and **social cooperation**. Support and challenges characterises our human resources development, honest partnership the cooperation with our customers and partners.

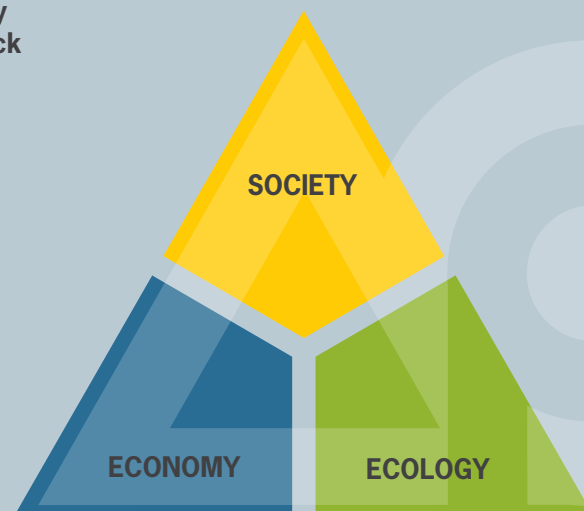
promeos®

- supports women in managerial positions
- employs people from 12 countries
- integrates handicapped employees
- integrates long-term unemployed people and employees over 50

The diversified cooperation in a heterogeneous and multinational team enriches our everyday working life in all respects. And a good work-life balance has been a prime concern for us ever since our establishment.



Sustainability
is our bedrock





Little rascals at promeos® – family is always around.

KNOWING HOW!

Sustainable. Together. International.

Heart and mind is to character as **prom** and **eos** is to promeos®. In order for a technology company to hold its ground in established markets, it needs many things that at first might seem contradictory: cheeky curiosity and wise composure. Cultivating both traits makes us grow and keeps us young.

Self-confidence and humility

We see ourselves as the "openers" or

self-critical eye on your own skills automatically leads to the continuous further development of your own professional and methodological competence. Continuous learning is a matter of fact for us.

Creative freedom and discipline

If you open yourself to creativity, you reinforce discipline where it is most needed. Our multi-project management follows clear process specifications, because only then will good quality be possible.

Youth and experience

A company can only perform as well as its top performers. It can only be as innovative as its drivers of innovation. That is why professional training and involving qualified students and graduates are one of the pillars of our HR policy.

Made in Germany, entirely global

International success is not possible if you don't speak the native language. That's why men and women from over 10 countries and 3 continents are actually working for promeos®.

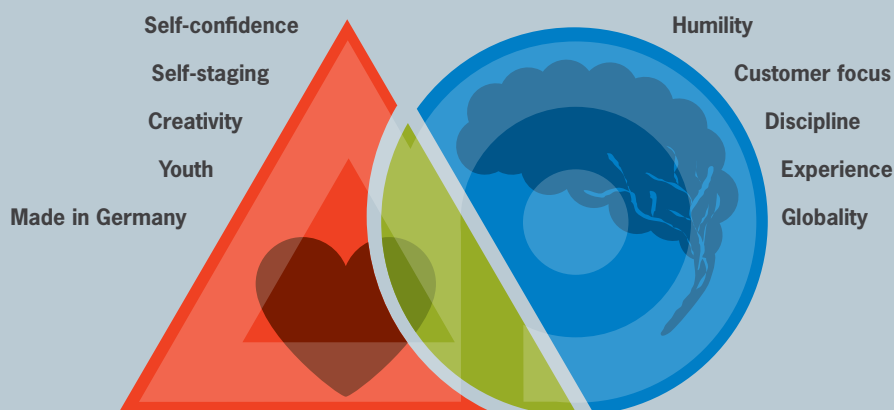
KNOWLEDGE

"bringers of change" who bravely stand up to the keepers of the status quo. We champion this idea with ardour and stamina. And yet, we are humble when affronting arising challenges. That keeps us alert to possible risks and new opportunities.

Self-staging and customer focus

If you do not know what you can do, you cannot offer what is needed. Always keeping a

Heart and mind are to character
as **prom** and **eos** are to promeos.





”

Getting together is the beginning. “
Staying together is progress.
Shaping the future together is success.