



mkm
we live copper

Copper.
Metal for the world.





PORTRAIT

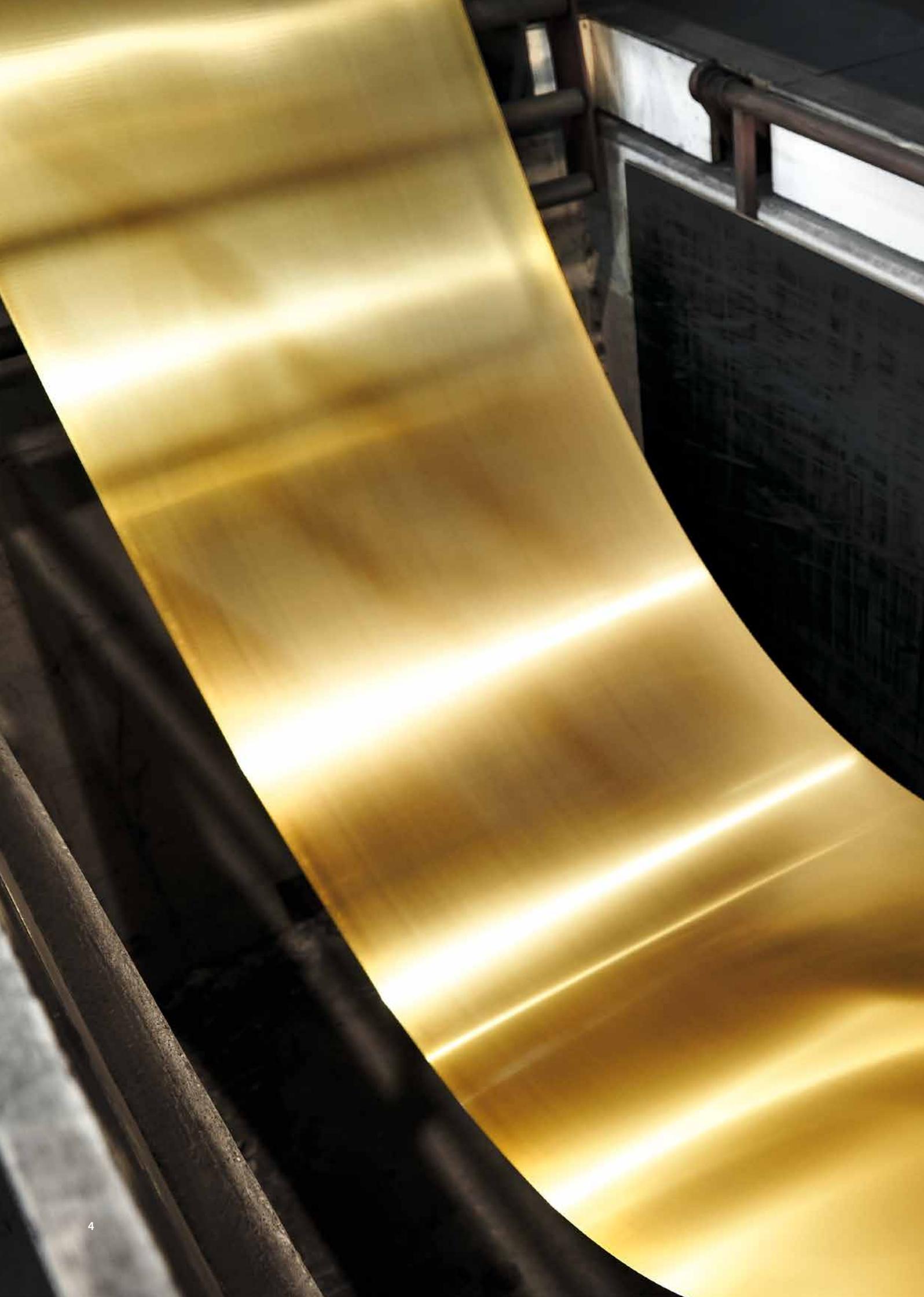
How we sent copper into space? With our feet firmly on the ground.

Tradition and innovation – they really do go hand in hand here. Mining has been taking place in Germany’s Mansfelder Land region for over 1,000 years, and the town of Hettstedt has more than a century’s experience in copper. It’s something that can’t simply be relocated or copied.

Copper has never just been a product to MKM. To many of us here, it is like family, and many of MKM’s staff are already second or third generation. We’re proud of that. The tradition of knowledge is a torch that gets passed down from one generation to the next.

Live local, think global, act glocal: we believe that copper is the material of the future. IT, energy, eMobility and many other markets with great potential swear by the properties of copper.

We constantly strive to develop new material properties. Today, we are one of Europe’s leading producers of copper semi-finished and primary products, and we have set great aims for ourselves. Copper has what it takes to achieve them. So does MKM.



It may not be gold. But it has other allures.

Copper is much more capable than gold, but not nearly as expensive. A strip of gold like this would certainly shine nicely, but then try making a tube bundle heat exchanger out of it – or something else that brings on the future. That’s why it isn’t only us who swear by non-ferrous metal.

MKM produces a complete standard range of primary and semi-finished products made of copper and copper alloys: strips, sheets, plates, wires, tubes and bars. We also specialise in custom products and all kinds of individual solutions.

High-grade standard products are far from boring – at least the way we define them: standard products with that MKM Extra. It might be extra quick delivery, extra special packaging, an extra small or extra large volume, extra services or our extraordinarily wide product range.

We do standard, but we also specialise in freestyle – unconventional solutions that we develop specially for our customers.

And if it works, our customers talk it around; little has changed since 1909 in that respect. Our customer list, however, has certainly changed: customers from A for Arabia to Z for Zambia have joined the books of MKM, many of them decades ago. They may like gold. But they trust copper.



H3 35t B4
Grenzwandabstand 35t

TECHNOLOGY

The universe is expanding. We know where.

Copper is a metal for planet Earth and for outer space. That's why our universe doesn't just end at the factory gate, even if Section A of our factory happens to be the size of 190 football fields and the longest of our numerous factory halls over 1,000 feet long. Our Conti-M® production line extends over 100 metres.

We've invested over €400 million in our factory since 1998, because we want to grow with megatrends: climate change and renewable energies, eMobility, digitalisation, safe drinking water and megacities. Many of these things are new territory for copper. But in all of them we are a partner to industry, contributing our products and our research and development.

To equip us for our intended growth, we have launched another large-scale investment programme – with a strong equity base, naturally. In that sense we're conservative.

Here at Hettstedt, you can see how this metal for the world is made, and the direction in which MKM's world is expanding.





mkm
wir leben kupfer

Modern gesture control? No need.

Ok is our favourite gesture. It's simple and it works where there's lots of heat and noise. Not that there's all that much to say at our production line. Two of the world's most progressive casting and processing plants – the Conti-M® which we developed, and the Contirod® – work around the clock there, using sophisticated technology. They both produce without interruption. Because of this, MKM is the only manufacturer in the world to be able to cast, roll, mill/draw and wind copper in a single working step. That means efficiency, and it guarantees top quality.

Our wide reverse mill also runs relentlessly, apart from brief services. It's the world's biggest operative hot rolling mill in the copper industry, and it gives us enormous competitive advantages in fast-growing industries.

Marketing experts say that our reverse mill is a unique selling point. To us it's simply unique. It's also colossal, and it rolls blocks and slabs weighing up to 11 tonnes. With a rolling width of 4.2 metres and rollers weighing a total of 70 tonnes, it can flatten anything that heavy industry and oversized machine-buildings might need. The reverse mill produces parts for vacuum crucibles, large ship generators, wind turbines and desalination plants, to mention just a few things.

The processes that take place on the reverse mill are archaic: it snorts and fizzles, but it runs like clockwork. Many people want to work on it, but alas, very little changes on the reverse mill roster. Its core team include the Roller and First Machinist. The two of them control the crucial moments of first pass and final inspection. They understand each other without words, using frugal gestures that hark back to the predigital age.



STRIPS

Exactly 754.5° Celsius. A clean bill of health.

Conti-M® ensures that processing thereafter is much easier. We use it to manufacture all of our strip products. The cast-rolling technology we developed works without interruption by transferring metal melted from cathodes into a solid state via a twin-belt casting machine. From there, it goes directly into the hot rolling mill and continues on to become milled hot-rolled strip. The Conti-M® bypasses the conventional stage of hot-rolling bars, thus tying up the first part of the process chain in an innovative way.

Our hot-rolled strip has a maximum width of 1,250 mm and leaves the plant as a coil weighing up to 25 tonnes. The system is designed for all common copper qualities such as SF-Cu, E-Cu, SE-Cu and highly pure OF-Cu and OFE-Cu.

Our large coils are then processed further on our cold rolling line. There, in the second stage of the process chain, strips of copper and copper alloy are rolled down to thicknesses of as little as 0.06 mm. No sooner have they been removed than the next metals wait for application.



WIRE

It's not all hefty. We do delicate too.

MKM manufactures a full range of cast-rolled wire from thick, medium and fine wire all the way to wire rope and stranded wire. Our fully integrated Contirod® technology allows us to offer wire rope made of copper and alloy wire in a wide range of finishes. Wires with very varied combinations of properties have been part of our production and delivery range since 1909. The cross-section of the thinnest is thinner than a hair: 0.05 mm, while our thickest measures 22 mm.

To create stranded cables we connect together fine wires. Numerous thin individual wires go to make up the cross section of a conductor. This increases its flexibility and pliability. Rolled onto a large coil, without torsion but nice and tight and neat, copper wire looks extraordinarily precise.

But before it can reach that stage, each of our various types of wire has to pass through many phases. It's the fine wires you can hear whirring quietly through a hall measuring 10,000 m². With 13 multi-wire drawing systems, each carrying between eight and 24 wires, it's only because of our staff's diligence that things so rarely get tangled up. And when something does occasionally break, it gets recycled. It sits there in the bins looking like angel's hair. Our foundry and Contirod® technology enables us to melt down each separate type of waste without any loss of quality whatsoever.



BARS, TUBES

Bars are underrated. They're hot stuff.

Round bars, flat bars, square bars – okay, we know all of those, but diagram-based profiles can sometimes come in quite remarkable designs. It's fascinating to watch a 600 kg continuous casting bolt at 840° C being pushed through a mini-shaped piece at 3,000 tonnes of pressure. First you see a rough block – and in less than a minute you see an almost completely finished fine component for an energy distribution system.

Energy in the 21st century is demanding, but materials for building also need to return to ecological viability and sustainability. The ancient Egyptians knew that and used copper pipes. Typical advanced civilisation: good taste with a distinguished profile. MKM wasn't around in 2750 B.C. If it had been, we would have advised the people of Abusir to use HETCU® or HETCOOL® tubes – and quoted them on papyrus.



A1 machines. And perfection by hand.

You get jobs that are unique. The customer wants something that's outside every box – not least because it has to be produced only once. That can range from a cymbal, to secular and sacred art, to polygonal discs and exclusive industrial prototypes.

Despite having the latest technology in every hall, we like to be hands-on. Copper's excellent deformation properties make jobs like this hotly sought-after. Fortunately, almost all of the people employed at our production lines are trained and highly skilled workers. MKM is increasingly a supplier of processed and finished components. These components can be supplied cut, surface-finished and drilled. They allow our customers to kill three birds with one stone: they receive an efficient solution to their product, they achieve advantageous material savings and they do a good deed: they make passionate craftsmen happy.

Why

Copper?

SMART COPPER – METAL OF THE FUTURE

The 21st century will be the 'Siglo de Cobre'. Copper and its alloys are all-rounders. This non-ferrous metal promotes energy efficiency, electromobility, information technology and much more. It also helps to ensure clean drinking water – and looks good too. The possibilities are almost endless.



Substance in demand:
By 2050, more than

20%

of copper demand will come
from electromobility.

(Source: Fraunhofer Institute)



Valuable vehicle:
The average amount of
copper in a vehicle will grow
from 24 kg to over

75 kg.



Fresh water:

By 2020, the volume of drinking
water obtained by desalination
will have risen by 50% to

120 Mio. m³.

That means clean water for 450
million people.

(Source: International Desalination Association)



Doubly durable:

A zinc gutter or downpipe lasts
for 40 years, a copper one over

80 years.

(Source: copperalliance, Energy-Saving Guide)



A car is copper-rich.

Wiring harness 44–50%, contacts, switches, alternator, engine 9.0–12% each. Battery cables, sensors, relays 5.0–6.0% each, DC motors 6.0–10%, chassis parts 4.0–4.5%, drive-train 3.0–4.0%, starter motor 1.0–2.0%.



Reliable material:
The perfect water-carrier since time immemorial. Copper pipes are corrosion-free and hold their shape. The oldest copper pipe is from the year
2750 B.C.



Chill factor:
The area covered by air conditioning will have grown by a factor of

2.75

by the year 2035.

(Source: IEA)



Healthy defences:
Copper means

hygiene

It's antimicrobial and reduces the spread of microorganisms and pathogenic bacteria on door handles and in piping installations that supply drinking water.



Fast Internet for all:
Coaxial cables offering up to

5,000 Mbit/s

bandwidth are helping the world grow closer.

DIN

Regardless of manufacturer, copper pipes can always be **combined**.
The same applies to fittings and other connectors because they are subject to European industrial standards.



Endless rebirth:
Germany satisfies more than
50%
of its copper demand using recycled material, and Europe as a whole meets 40%. Copper can be recycled endlessly without loss of quality.

(Source: copperalliance)



Big art:
The Statue of Liberty carries a 2.4 mm layer of copper with a total weight of

27.22 t

The steel body weighs 113.4 t.
(Source: Wikipedia)



Thrifty recycling:
The recycling of copper requires only

20%

of the energy needed to mine it.



Fresh energy:
Onshore wind power
involves up to
six times more
copper than conventional
energy generation.



Heavy savings:
A tonne of copper used in
electrically operated
components or regenerative
thermal applications can save
200 t. of CO₂
each year.

(Source: European Copper Ecobalance 2012 /
copperalliance)



Renewable power:
The amount of copper per
megawatt of nominal output is
five times higher
in photovoltaics than it is in
conventional generation.



Pinpoint accuracy:
Special copper alloys made
into vapour-coated
strip conductors
enable single LEDs to be
controlled in flat screens,
curved TVs and big illuminated
billboards.



Limitless speed:
Microchips
made of copper enable fast,
energy-efficient data to flow
in smartphones, tablets and
laptops.



Expertise: Certified.

Quality begins in the mind. This maxim accompanies our thinking and guides the things we do. A certificate issued by Lloyd's Register Quality Assurance demonstrates that MKM employs a comprehensive quality management system encompassing all of its business processes, as defined in DIN EN ISO 9001:2008. It proves that we execute and fulfil our customers' requirements faultlessly and at a consistent level of quality, all the way from the enquiry stage to the finished product. What the certificate does not mention, however, are our dedicated employees. But we will gladly testify to their expertise and precision at any time.

MKM products are expertly manufactured in compliance with DIN standards, as well as the regulations and standards of European and North American countries – and individual specifications.

The testing this involves can be considerable. For sure, lots of it is mandatory. But our quality standards go far beyond that. Extreme thermal stresses, the most adverse weather conditions – MKM products often have to prove themselves under extremes. In the long term that can only be the result of testing materials to the limits, relentless analysis and meticulous quality control.

At MKM, we utilise high-quality testing equipment at every stage: in production (CAQ), in the chemical lab, in mechanical materials testing, in metallography and in metal physics. Our closed production cycle – which begins in the foundry, progressing to the laboratory, further processing, and on to product-tailored packaging – provides our control system with 100% traceability.



Drilling deep suits us. Even above ground.

Here in Hettstedt, we no longer mine using hammer and pick. But the name of the road on which our headquarters is situated – Lichtlöcherberg – does betray our origins. Narrow, often oval shafts that supplied miners with fresh air underground were referred to as Lichtlöcher – light-holes. They may not have actually provided light, but they did provide oxygen. Fresh air was also needed for the lighting underground, which in the early days was not electrical.

Aeration is a pretty word for what we usually call research and development. In other words: replacing old with new, bringing freshness into something so that we can dig deeper.

Copper and its alloys are prehistoric metals. You would think there would be nothing left to discover about them. But there is.



9/11 MEMORIAL, NEW YORK

Some jobs make you pensive.

Special orders nearly always make us happy. Often there's some tricky issue to resolve that challenges us technically. We then work closely with the client and enjoy making progress. At a certain point, the client is satisfied because we are able to present them with a solution they didn't think possible.

But there was one special order that silenced us. When MKM was commissioned to make the 9/11 Memorial at Ground Zero in New York, we were very proud that the USA trusted our expertise. It was also moving to be able to help to make a memorial of such global significance.

Coordinating everything closely with our customer was a challenge just like other orders. From a technical point of view, the 9/11 Memorial was a challenging project. From an emotional point of view, even more so. We certainly were pleased with the monument at the end, as was our customer. But we celebrated in silence.



The marine weather service is reporting force 9 gusts. So?

High waves and furious spray are one of nature's great spectacles. The forces that the sea and the wind can unleash are extraordinary. And they place considerable demands on the engineering of offshore wind farms. But structural engineering is just one part of the equation. The operation of electrical systems is quite another. Sea air and salt water are anathema to electromechanical drive systems. Only copper can conduct electricity perfectly and stand up to aggressive atmospheres without corroding. A special copper-nickel coating also prevents algae growth, which saves money and minimises the damage potentially caused by maintenance boats.

A ring generator's stator and rotor windings contain several hundred kilometres of flat and round wire. Copper is also used in the transformers, power cables and earthing cables. Up to 30 tonnes of copper can be installed between an offshore wind turbine and its mains connection

point. The same applies to solar power. Aside from its use in wiring, copper is indispensable there because of yet another of its properties: it can be bent without compromising its conductivity. The solar cells used in photovoltaics contain copper-coated conductor strips on films that are curved. No other material will play along so easily.

Practically every new energy road that is being explored leads invariably to copper. It's used in every kind of distribution – high, medium and low voltage networks. More than 60% of all copper applications involve electrical engineering and applications. Copper's net energy balance is also admirable. The relationship between CO₂ consumption in production and CO₂ savings is 1:150. It is gratifying to think that we in Hettstedt can help reduce carbon emissions worldwide. Wind and weather can certainly be harsh, but our copper doesn't hold it against them. It is not a vengeful metal.



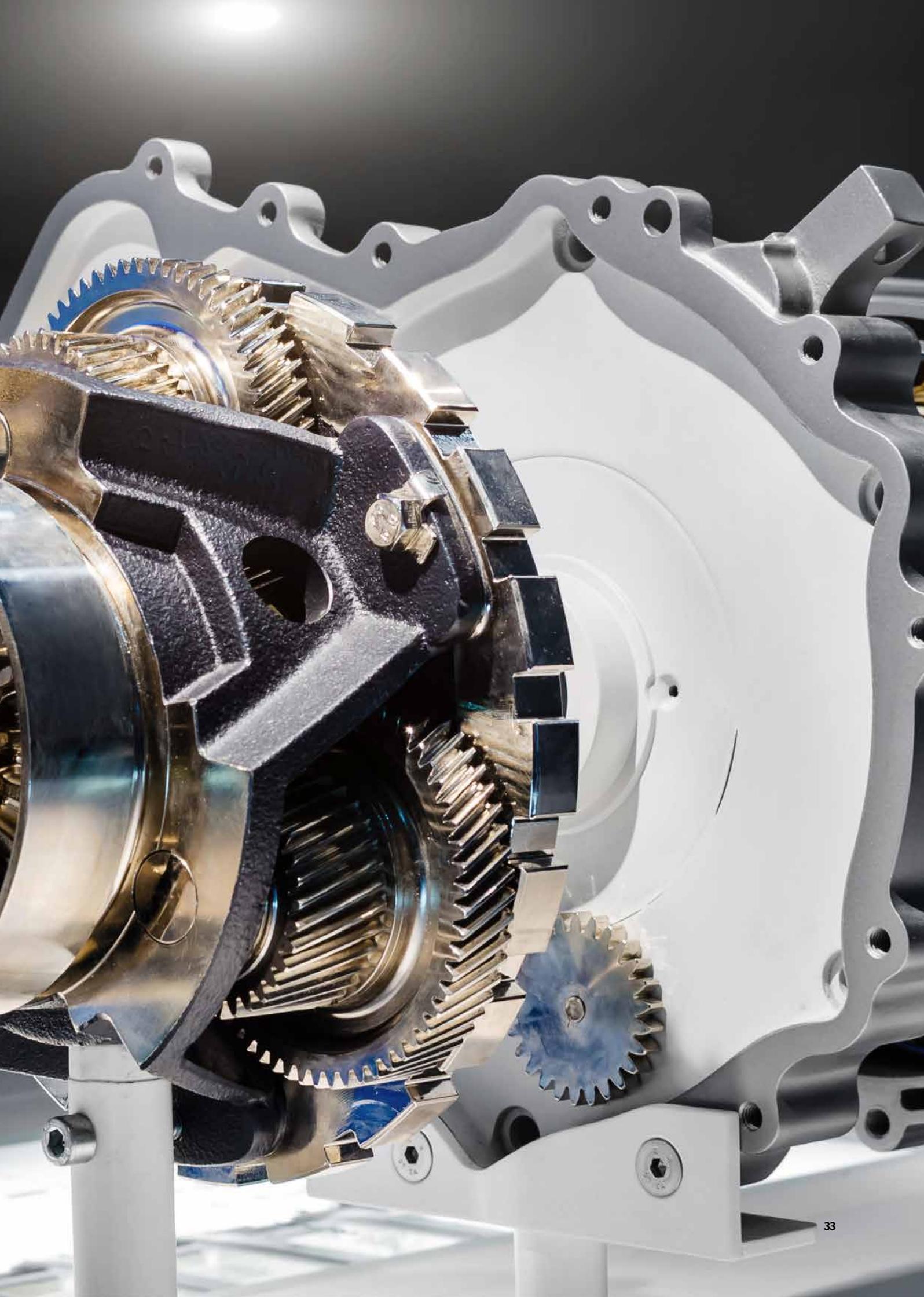
Green traffic. Red copper.

Conflict can be creative, as in the case of the PHEV, short for plug-in-hybrid vehicle. Hard to remember? Then just say hybrid. PHEVs will hopefully achieve a long-awaited turnaround by reducing CO₂ emissions. Neither the pure electric car nor the low-consumption combustion engine have so far managed that. If plug-in hybrids spread everywhere, then traffic could become smog-free worldwide. PHEVs can be charged at your own socket at home and batteries can now cover distances of up to 52 kilometres. Only when that's used up does the vehicle switch to combustion mode. Energy previously dissipated, such as when braking, is fed straight back into the battery.

Once again, it's the red metal, copper, which plays a key part in this green future. That's because every single wheel in a plug-in-hybrid is driven by an electric motor which requires more copper than a normal drive system. The copper contained in a hybrid vehicle is twice as much as a conventional vehicle. Electric and plug-in-hybrid vehicles may even contain as much as three times more. The average amount of copper in a vehicle is set to grow from 24 kg to as much as 75 kg. (Source: Fraunhofer Institute)

According to the Fraunhofer Institute, more than 20% of copper demand will relate to electrical mobility by 2050. And in general terms, there is a greater proportion of copper in a car that you might think. The on-board power supply alone accounts for 44–50% copper, contacts, switches, alternator, engine 9.0–12% each, starter, battery cables, sensors, relays 5.0–6.0% each, DC motors 6.0–10.0%, chassis parts 4.0–4.5%, drive-train 3.0–4.0%, and even the starter motor 1.0–2.0%.

Oh yes, and as well as better emissions, every PHEV vehicle also offers all-wheel drive because of its wheel hub motors. So you get four for the price of two. Not a bad deal at all.





YANBU, SAUDI ARABIA

Seawater solution. Fresh water for the world.

The world's surface may be 71 per cent water, but 800,000,000 people still have no access to drinking water according to a United Nations report. In some regions of the world, seawater desalination is the only answer. More than 17,000 desalination systems are already providing the world with 80 million cubic metres of fresh water a day – which means 80 billion litres, or the equivalent of 400 million bathtubs. That may sound like a lot, but it is still much too little. According to figures published by the International Desalination Association, this volume is set to grow 50 per cent by 2020 to 120 million cubic metres. There's no doubt about it: the world needs more.

California, Israel, the Middle East and even the island of Helgoland already desalinate seawater. Big cruise liners like AIDA vessels, as well as container vessels, have their own small systems on board. What is common to all of these systems (such as MSF and MED) is that they successively heat, vaporise and re-cool seawater at regular intervals. Conventional heat exchangers would not be able to withstand the sea.

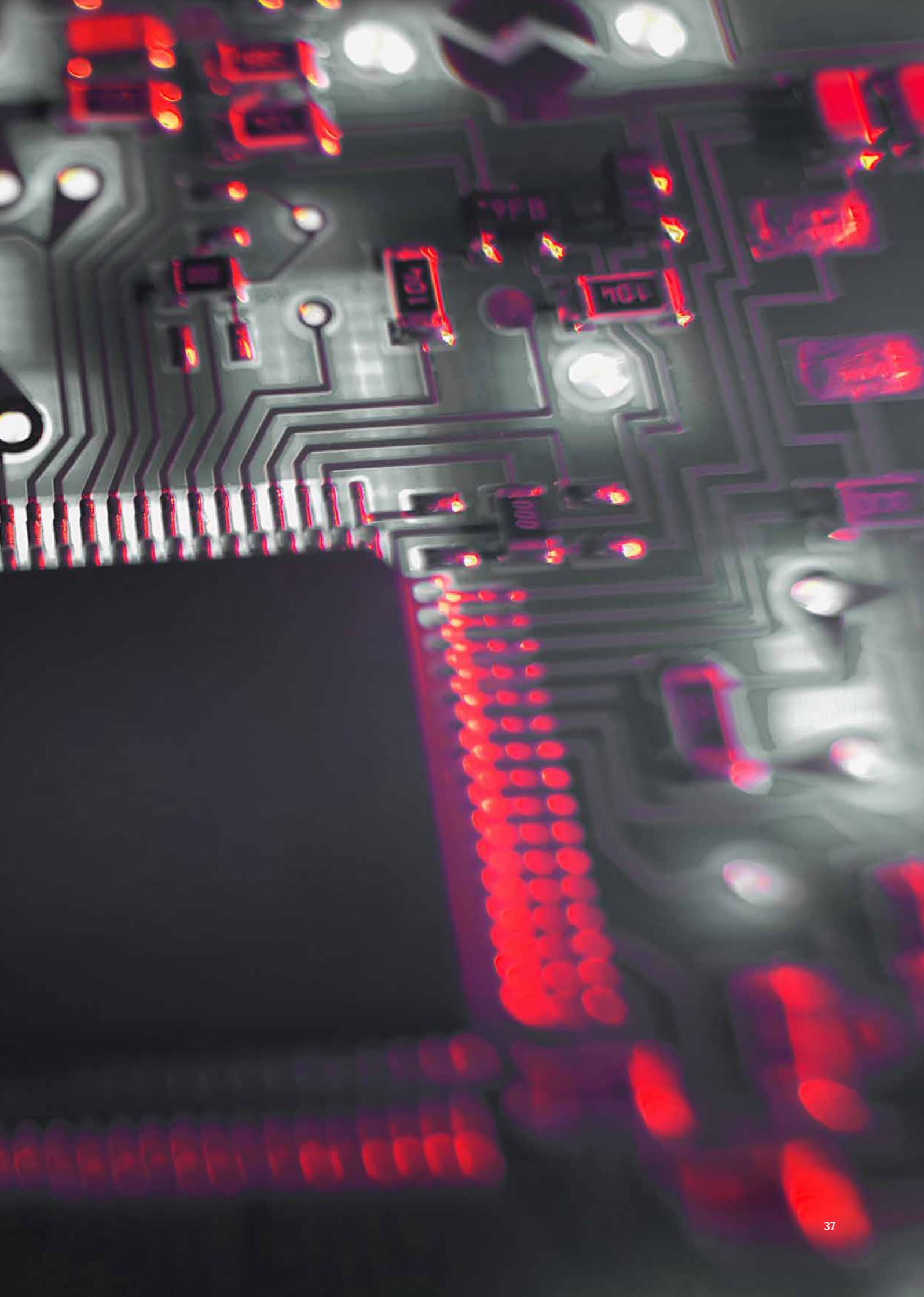
The only alloys able to withstand seawater are copper-aluminium bronzes and copper-nickel alloys. These are used in heat exchangers and in ground tube arrays. We make them in Hettstedt – with diameters of between 20 cm and four metres. The ground arrays we supply ready-made, which means drilled to accommodate the tubes that run through them. Holes like that may actually consist of nothing at all. But that nothing has a very special quality – it gives life.

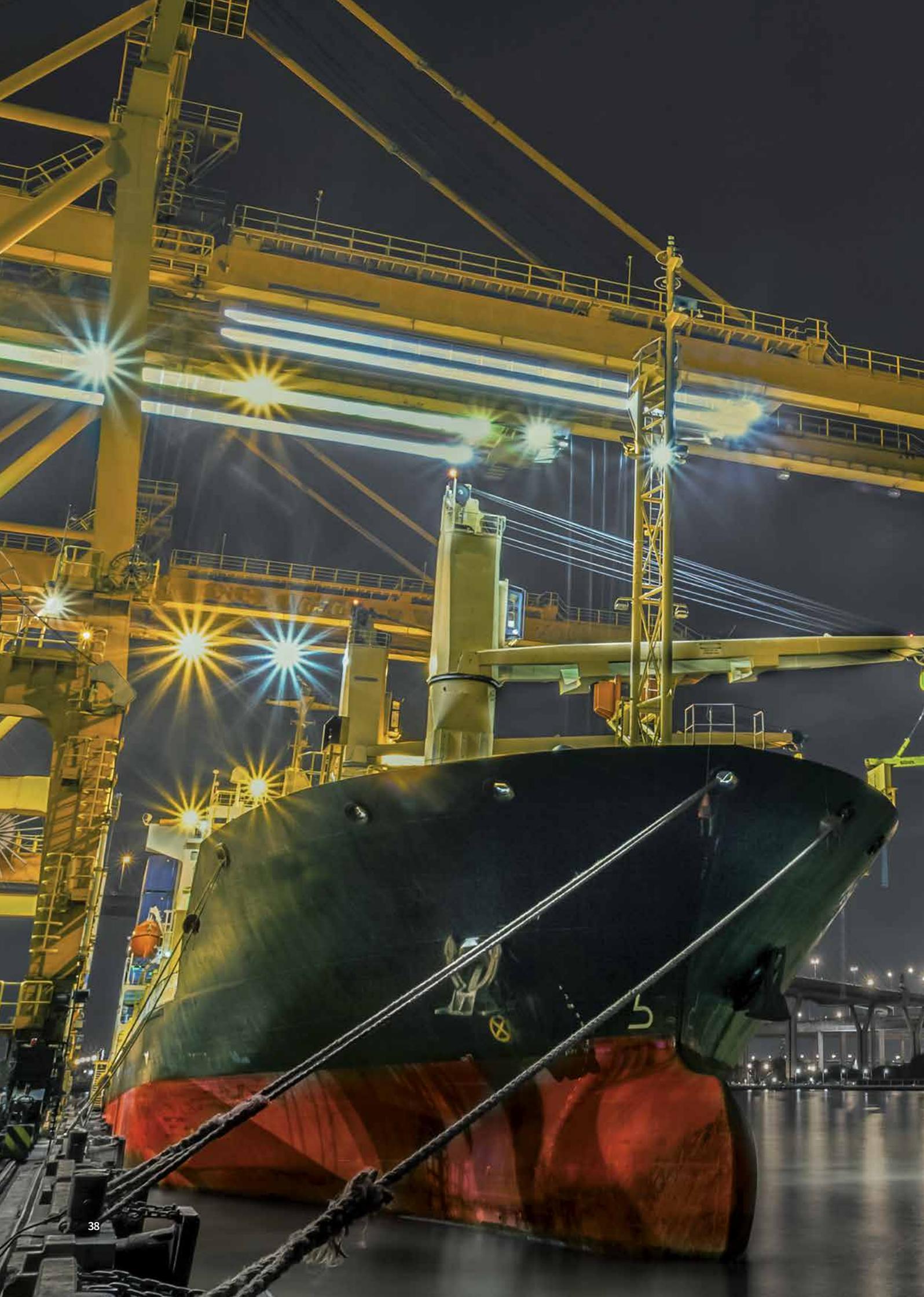
The future will be better off than the present.

Take communication for instance. Big data is enabling customised services, and not least because of ever smaller applications and ever more powerful microchips. Then, there are new areas of use such as vehicle-to-vehicle and machine-to-machine; these also play a role. Sometimes technologies change so fast we can barely keep track of them. Inventors are busy with new applications at this very moment – and it is often innovative copper applications that help them achieve the breakthrough.

Take energy supply as another example. Electricity is converted up to five times between the power station and the consumer: from its 380,000 Volt maximum to 230 Volt low voltage – and at each stage it's a transformer that does it. Coils of wound copper lie at the heart of most transformers, whether giant power converters such as those used in energy supply plants, or tiny transformers in mobile phone chargers. No copper, no connection.

That makes us an elementary part of the network that for the first time is bringing people, machines, sensors and software together. It enables us to measure, analyse and control every single little detail of our everyday lives. In other words, digitalisation is fuelling our growth like nothing else.





Goodbye ... C u again.

If they weren't our own products, we would have to be envious. The places they get to! MKM supplies the whole world and by every means: water, land and air. Fortunately, copper is fully recyclable, again and again, without losing a single bit of quality. According to estimates, 40 percent of all copper applications are newly made from old scrap. So who can say what we will be when we next see each other again?

However, what we can be sure about is that our logistics consider the supply chain as a whole. It doesn't just end at the factory gates. We're experts in customer-oriented logistical concepts right along the entire value-added chain. Our fully integrated production facilities make communication quick and efficient, even if distances are long. Smart logistics near to the customer – no matter where. That reduces costs, increases output and gains us time: time to say goodbye. "We'll meet again..."

