

Intelligent solutions in lifting technology

10. 2019



Partner of Experts

STAHL
CraneSystems ®

Technological developments

Industry 4.0

The term Industry 4.0 was coined by the Science and Industry Research Union – an advisory body to the German federal government – in a project as part of the country's high-tech strategy for the future.

It refers to the integration of industrial production with information and communication technology, and the resulting smart value chains.

Industry 4.0 is the fourth industrial revolution. An industrial revolution is characterised by scientific advances and technological developments that trigger rapid changes in production techniques and associated transformations in society. Today, high automation approaches already exist in which machines communicate with each other (M2M). But the key step is the overarching network – enabling smart, automated and integrated communication between processes. Data from sensors, systems and processes is recorded, evaluated and processed in the industrial internet. Relevant data is then available on an interenterprise basis to other businesses in the production chain. Self-organising data systems are created from across processes, and deliver relevant information to participants. While machines learn from each other, people within the enterprise benefit from

knowledge synergies and work together internationally, in multidisciplinary teams. Rigid value chains become flexible value networks. They extend from the idea for an order to product development, manufacturing and delivery, and on to customer service and recycling.

Industry 4.0 has now become an established term.

Despite different focuses or objectives, the understanding of Industry 4.0 is similar around the world.

Internet of Things

The Internet of Things (IoT) is at the heart of Industry 4.0. It enables real and virtual objects as well as sensors to be networked together, and to work together using smart communication technologies.

One aspect of the Internet of Things, for example, is the smart home – where everyday technology becomes intelligent, i.e. smart. But the IoT also comprises much larger application fields. This is partly about the intelligent networking of objects via the internet, and partly about communication between machines.

An even more important aspect is the evaluation of data, which is used to analyse usage behaviour and enable the initiation of individually tailored actions – for example as part of predictive maintenance.

1800

Company founded
by Rafael STAHL

1878

Manufacturing of
electric lifting block

1903

World's tallest
paternoster lift

1908

First industrial revolution

End of the 18th century, mechanisation of production systems aided by water and steam power

Second industrial revolution

End of the 19th century, electrification of manufacturing for mass production based on the division of labour

STAHL CraneSystems – Partners in motion control

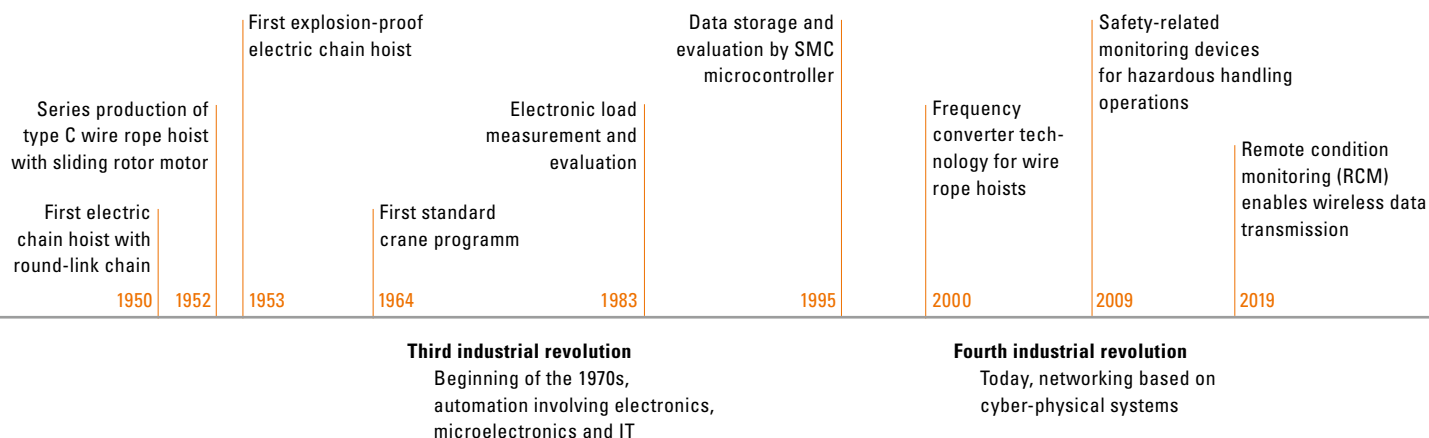
As one of the world’s leading manufacturers of hoist and crane technology, we set an early course for a strong future. We are constantly developing our extensive product portfolio to match modern requirements – the sky is the limit! The programmable SMC multicontroller from STAHL CraneSystems, for example, has long been a key element for intelligent communication and networking between hoist and crane systems, including data analysis and transmission.

Industry 4.0 is promoting not only partnerships at production level, but also cooperation between different departments within enterprises and between enterprises. Magnetek is our strong cooperation partner and is also a member of the Columbus McKinnon family. The company is one of America’s largest suppliers of digital drive and motion control systems for industrial cranes and hoists.

Together as partners in motion control, we will boost our innovative capacity and set new future standards for the industry. Networked centres of excellence at various locations will provide the foundation, where engineers and technicians conduct research and development.

Useful links

- ➔ www.bmwi.de/Redaktion/DE/Dossier/industrie-40.html
- ➔ www.bmbf.de/de/zukunftsprojekt-industrie-4-0-848.html
- ➔ www.fraunhofer.de/de/forschung/forschungsfelder/produktion-dienstleistung/industrie-4-0.html
- ➔ www.plattform-i40.de



Digital transparency for intelligent manufacturing

It feels reassuring to know that such convincing technology is inside every STAHL CraneSystems product. All components are optimally matched to each other for consistent performance, long service life, high efficiency and a high level of safety.

As Industry 4.0 progresses, profitable production will become increasingly difficult. Master this challenge through the digital transformation and smart networking of your production systems, so that everything communicates with everything. To offer you convincing solutions here too, we work together with expert partners who meet our quality standards. With the intelligent solutions from STAHL CraneSystems, you are ideally positioned for the future. With the SMC multi-controller, remote condition monitoring (RCM) and the various frequency converters, you can gain the greatest possible benefit from your data, e.g. better facility management, less downtime with predictive maintenance or increasing occupational safety.

Load display

Sensors are used to determine working load and state values. The load can be tared so that different load attachment devices can be used. The values can be sent via the SMC to external load displays and to suitable radio receivers. Large displays in various formats and a load display in the control switch are available for this purpose.

Load early warning

The SMC or frequency converter parameters can be configured so that a warning is issued when the set limit value is reached. Signalling devices such as a lamp, horn or flashing light warn the crane operator of a dangerous situation.

Load monitoring

With dynamic overload protection, load sensors monitor lifting and lowering operations as well as the status of suspended loads. The SMC detects any overloading of the hoist, evaluates the data and responds if the maximum permitted load is exceeded. Then the load can only be lowered.

Follow me function

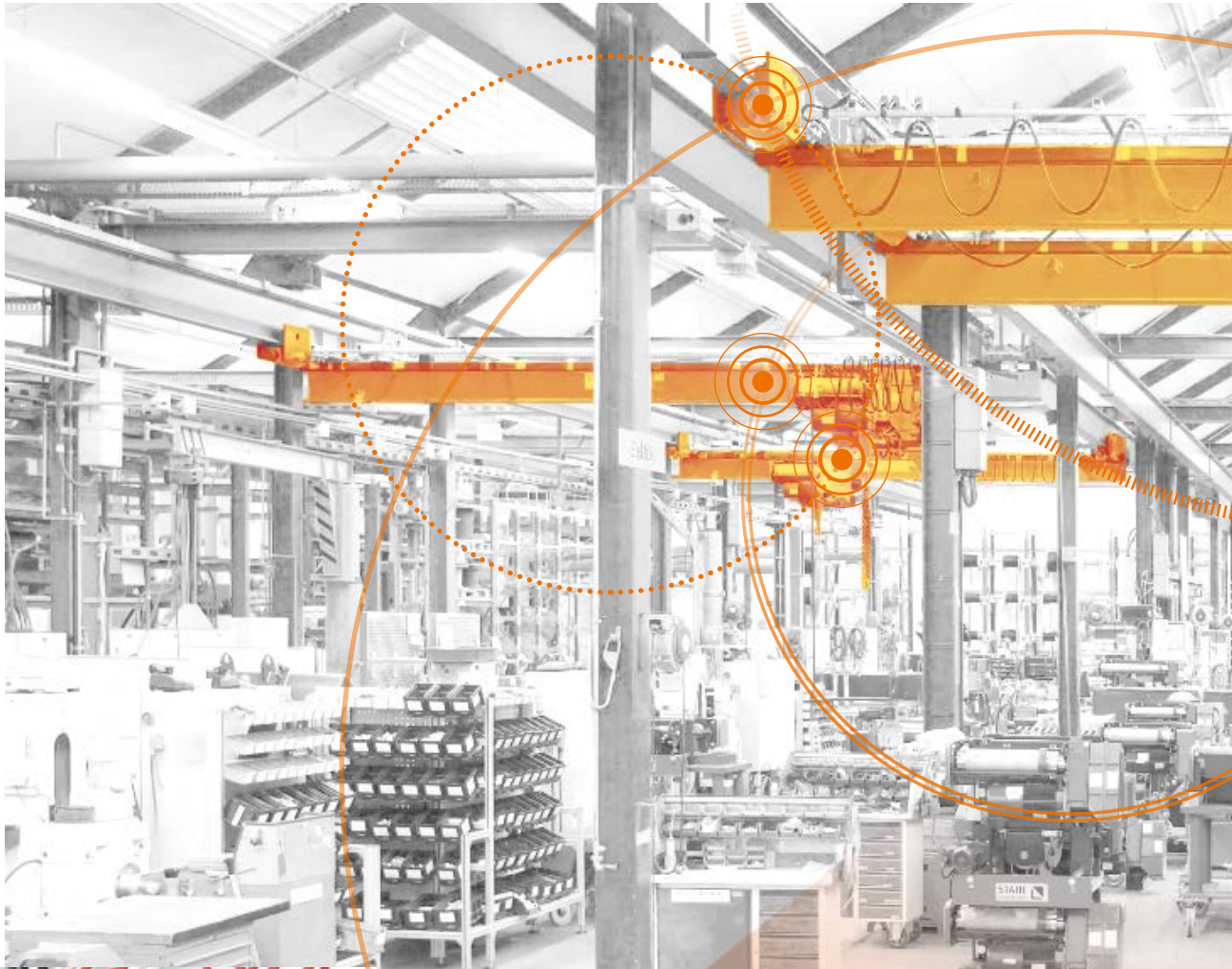
Fast, effective working even with large crane systems is possible with the follow me function. Sensors measure the displacement of the empty hook, which is pulled by the operator. Via the control unit, this data is evaluated and the crane follows the hook.

Operating data acquisition

The SMC records a number of operating data, e.g. total operating hours, number of motor switching operations, duty cycle (DC), switching operations per hour (c/h), number of overloads, number of temperature cut-off, number of load cycles and the resulting full-load cycles and number of system restarts. With pole-changing motors, the operating data is recorded separately for the slow and fast speeds. Using a PC/laptop and the ConfigTool from STAHL CraneSystems, all operating data can be read out, analysed in detail and archived. With remote condition monitoring (RCM) it can also be used for digitally networked systems and production processes.

Load spectrum recorder

The SMC creates a failsafe record of the actual use of the hoist, in accordance with FEM 9.755. Taking the load, operating time and lifting speed into account, the recorded data is used to calculate the full load hours and the remaining service life. When the limit value for the load spectrum for the respective mechanism group is reached, the SMC outputs a message.

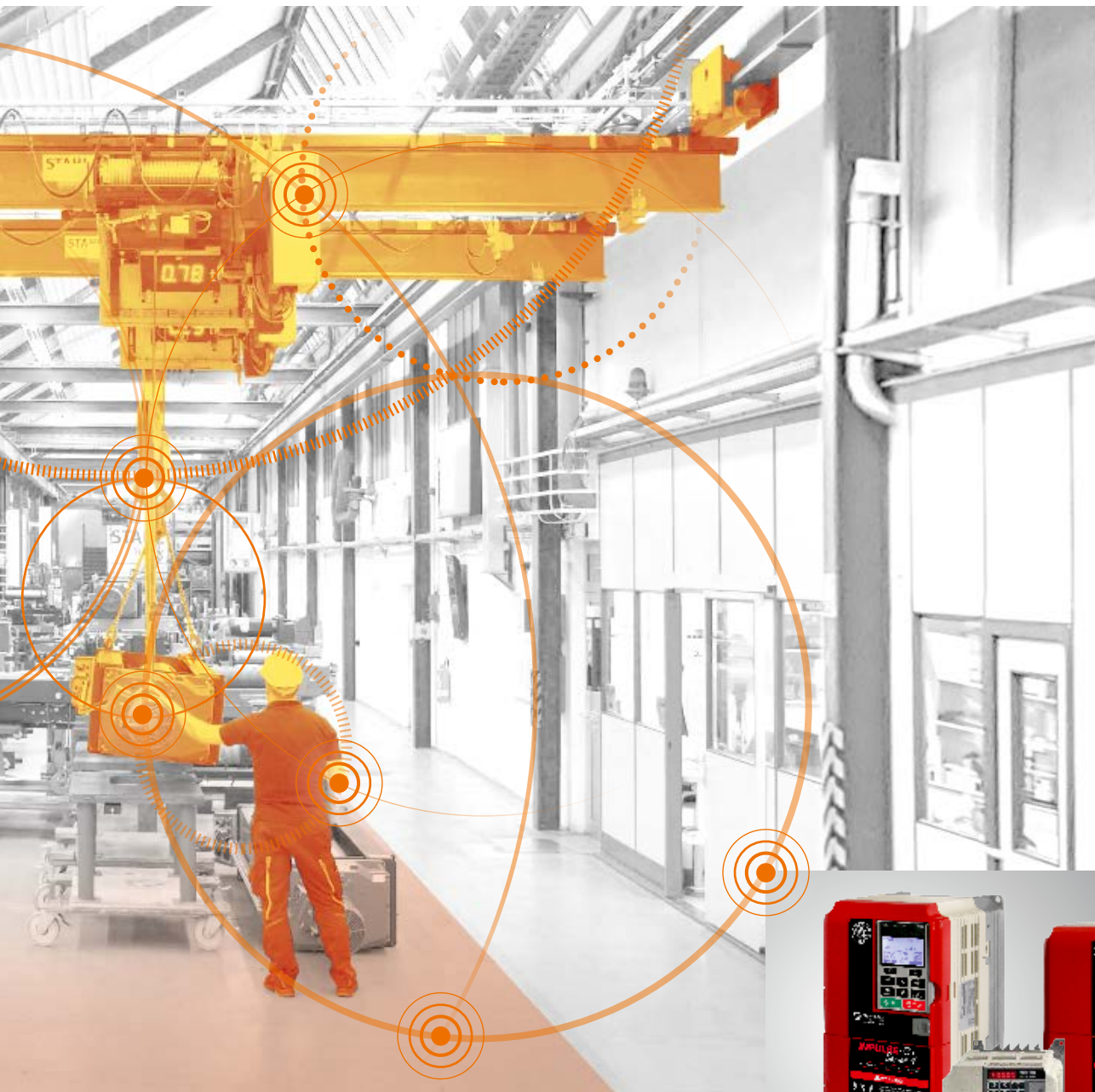


SMC multicontroller

The SMC multicontroller from STAHL CraneSystems is used whenever maximum working safety and process reliability are required in crane operations, together with intelligent networking. It is a programmable control and evaluation device for hoist and crane technology.

Remote condition monitoring (RCM)

Remote condition monitoring (RCM) enables wireless data transmission of operating data recorded by the SMC, to a global server via a GSM connection. Authorised persons can access this operating data worldwide. It is possible to retrofit all crane systems equipped with SMC, back to the first generation.



Frequency inverters

Other components for the intelligent networking of crane systems are the latest generation of frequency converters from Magnetek. They can be configured via external software or directly via inputs on the display.



Tandem operation

SMCs from multiple hoists are networked with each other via the CAN bus protocol. For tandem operation, the operating statuses of the hoists and the control signals for the hoist and travel movements are compared. The lifting speeds are synchronised via frequency converters. Even with asymmetrical load distribution, synchronisation is guaranteed thanks to the permanent monitoring. This prevents improper use, and boosts productivity and safety. It is possible to connect an optional load display for the individual and total load.



Brake monitoring

Brake function and wear can be monitored both with the SMC multicontroller and with the frequency converters. The data is recorded, evaluated and forwarded to the operator via the remote condition monitoring (RCM). This is an important tool for predictive maintenance and for minimising downtimes.



Extended speed range (ESR)

Extended speed range (ESR) is the load-dependent speed regulation, in regard to higher hoisting speeds with partial load. The increased speed of 150% enables efficient, cost-effective working. Using a frequency converter to reduce the hoisting speed enables precise positioning and allows the load to be set down gently.



Efficient power recovery

To enhance energy efficiency, frequency converters with a regeneration unit can be used to feed the potential energy from lowering the load back into the mains supply. Regeneration units absorb the load's potential energy via the hoist motor, which acts as a generator, and convert it into mains power. With pole-changing motors, power recovery is provided as standard.



Automatic load control (ALC)

To prevent load spikes when fastening and picking up loads, automatic load control (ALC) is implemented via the SMC or frequency converter. The response of the ALC function adapts to the respective application via four dynamic stages. An impermissible increase in the load causes the lifting speed to be reduced, to prevent excessive vibrations in the crane system. Once the load is vibration-free again, all speeds are permitted.



Motor management

Easy and exact load positioning is achieved with intelligent motor management. Jog mode suppression prevents the drive motors overheating, and reduces stress and wear on the hoists. If a frequency converter is used, the load is kept suspended without the brake being activated.



Slack rope monitoring

The SMC detects the release of tension on the rope when the load reaches its position, and automatically stops the lowering operation. This prevents the load attachment device from touching or falling over onto the load. Now the hoist can only be activated in the upwards direction.



Crane interlock

A crane interlock makes it possible to connect different working areas with suspension cranes, so that hoists can cross over with or without loads. In this way it is possible to reach any and every point in a combined system. Crossing onto a spur rail is also possible.



Work area limits

Work area limits are installed to take pressure off the crane operator and increase working safety. These are defined areas into which the crane is not allowed to travel. Travelling over the area limits requires approval by the crane operator. Depending on the application or due to the structural design of the building, it may be necessary to keep a certain distance between travel carriages and/or cranes. Crane and crab distance protection as well as area limits are implemented using photo-electric barriers or laser measurement systems. PLC units and touch panels can be added as options.



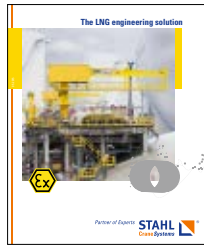
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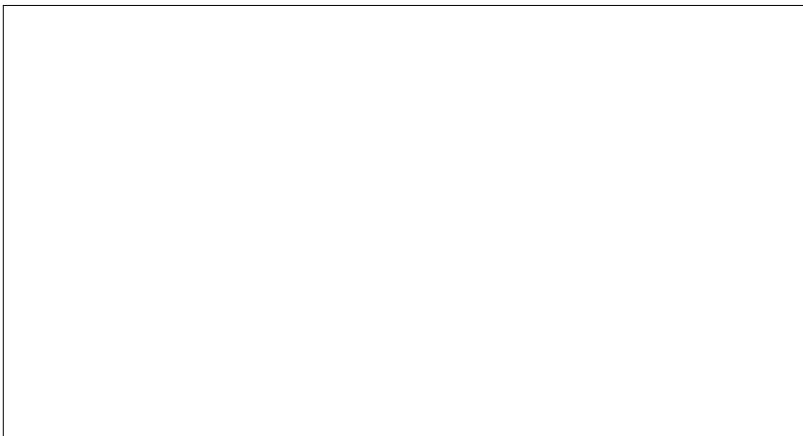
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