



# PAUL WURTH

SMS group

## COKE OVEN MACHINES



Cokemaking Technology



## Global player in coke oven technology

Paul Wurth has substantially strengthened its portfolio in coke making technology by successively integrating the coke oven machinery segments of the Germany companies Schalker Eisenhütte Maschinenfabrik and KOCH Industrieanlagen. Based on these double technological assets, Paul Wurth is today in a position to offer comprehensive solutions for top charged as well as stamp charged batteries, including coal charging cars, pusher machines, stamping-charging-pushing machines, stationary stamping systems and charging cars, charging gas transfer cars, coke transfer cars, wet quenching cars, crane systems for dry quenching as well as maintenance and service cars. Today, more than 200 Schalke-branded machines are in operation worldwide, while more than 70 stamp charging units based on Koch design have been put into operation. Gathering and further developing this knowledge makes Paul Wurth a global leader in coke oven machines.

Thanks to this state-of-the-art technology, the most modern and largest coke oven batteries in the world can be equipped with automated coke oven machines which meet the highest standards in terms of coke productivity, emission control, user friendliness and plant safety.

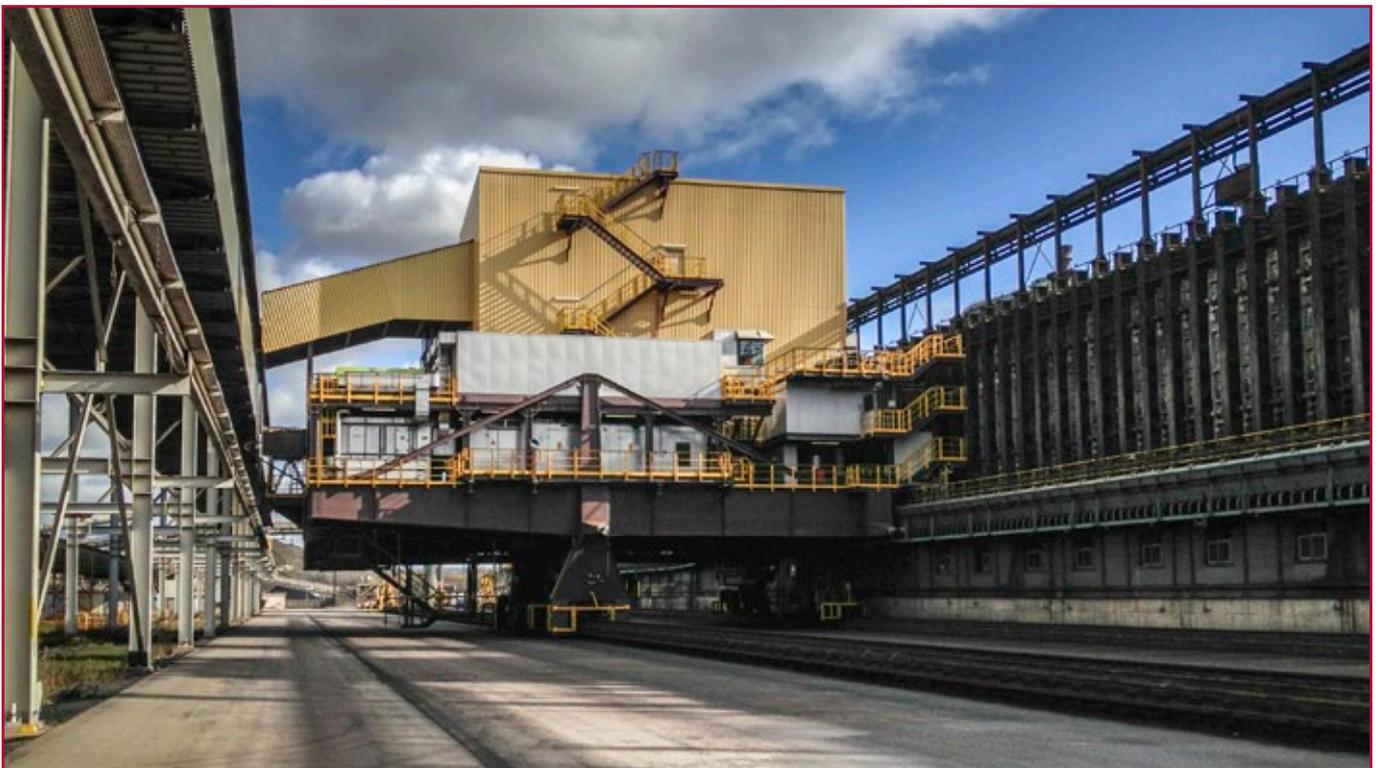
Related automation and control systems, complemented with advanced digital features, ensure the safe operation of the battery with all travelling steps being fully automated and accurately scheduled. All machines are equipped with highly efficient emission control systems, so that the most stringent environmental regulations are met.



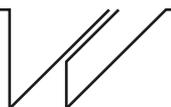
Pushing machine based on Schalke design

These assets strengthen Paul Wurth's position as a global player in the design and construction of complete coke oven plants, coke oven batteries of top charging and stamp charging type, coke oven gas treatment and by-products plants as well as coke quenching facilities.

For coke oven machine projects, Paul Wurth offers all supplies and services from a single source, ranging from consulting, feasibility studies, design, manufacture, supply, erection to commissioning and start-up assistance. Paul Wurth thereby relies on outstanding engineering capabilities in mechanics, hydraulics, pneumatics, electrics and electronics as well as on trustful cooperation with dedicated workshops. This concept results in a concerted engineering, a high degree of flexibility, a minimization of risk interfaces, short delivery times and an efficient after-sales service.



Stamping-Charging-Pushing Machine based on Koch design



## CHARGING CARS

Coal charging cars provided by Paul Wurth distinguish themselves by a robust-design sealed charging as well as fast and controlled charging. More than 85 Schalke-branded charging cars have been supplied to date.

Our charging cars are principally designed as single-spot machines for efficient coke oven charging. In order to meet the requirements of more stringent pollution control standards, specific charging car features and systems have been developed and optimised, such as

### System Schalke® Controlled Charging

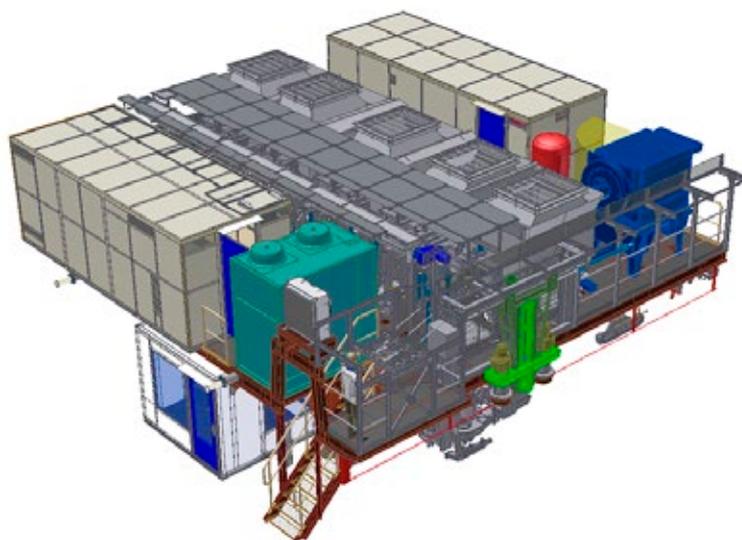
- ▶ Constant volume hoppers
- ▶ Horizontal screw feeder with inverter controlled drive
- ▶ Combined continuous control (weight & volume)

### System Schalke Emission Free Operation

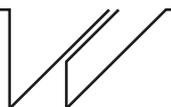
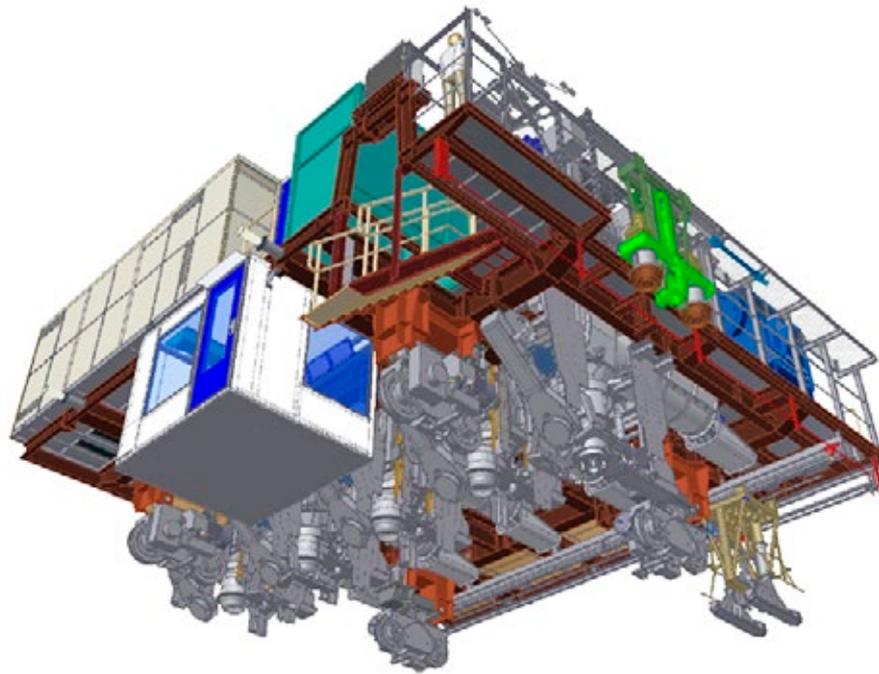
- ▶ Gas tight spillage coal gate
- ▶ Sealed telescope
- ▶ Charging hole frame and lid cleaner
- ▶ Lid luting system
- ▶ Oven top vacuum cleaner

### System Schalke Total Manless Operation

General technical data	Charging cars
Weight	<b>up to 300t</b>
Dimension	<b>up to 17.2 m x 17.1 m x 8.7 m</b>
Travel speed	<b>up to 150 m/min.</b>
Positioning accuracy	<b>up to 3 mm</b>
Chamber height	<b>up to 8.43 m</b>
Charging volume	<b>up to 93 m<sup>3</sup></b>



Charging car



## PUSHER MACHINES

Pusher machines supplied by Paul Wurth are of robust design and have an extremely long service life. To date, more than 60 Schalke-branded pusher machines have been installed worldwide.

Operating in principle as single-spot machines, our pusher machines are optimally designed for door handling, coke pushing and coal levelling. In view of a smoke-free operation and given specific oven or battery conditions, they are optionally equipped with a number of features, such as

### System Schalke For Pusher Machines

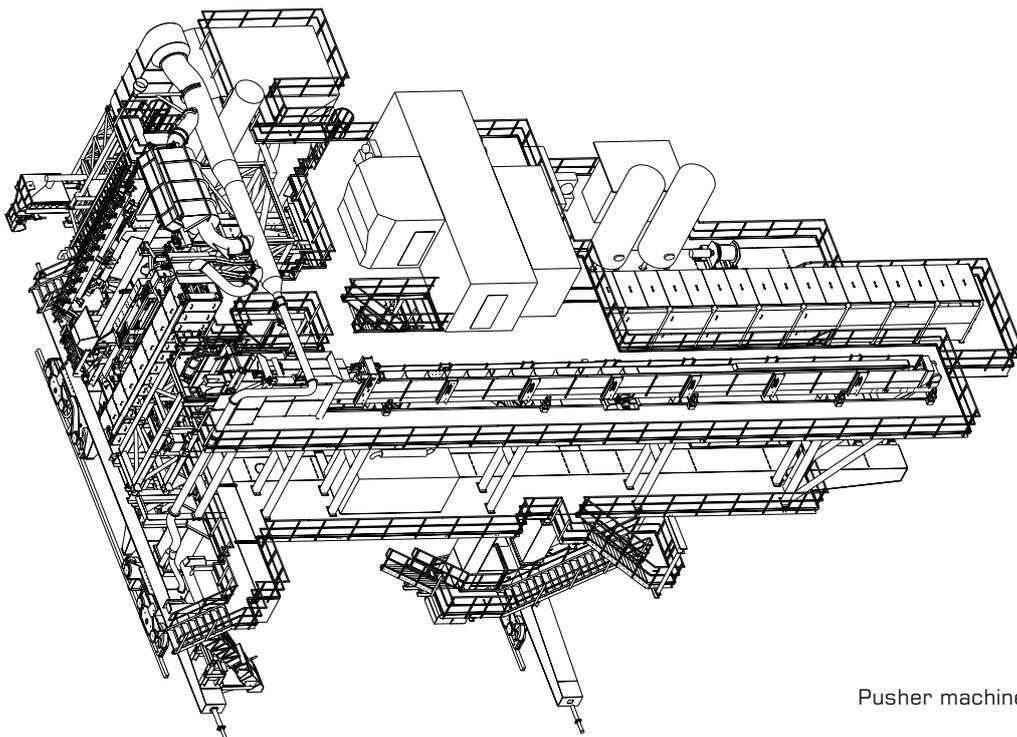
- ▶ Intelligent door extractor for inclined ovens
- ▶ Encapsulated pusher ram
- ▶ Decarbonizing system

### System Schalke Emission Free Operation

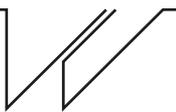
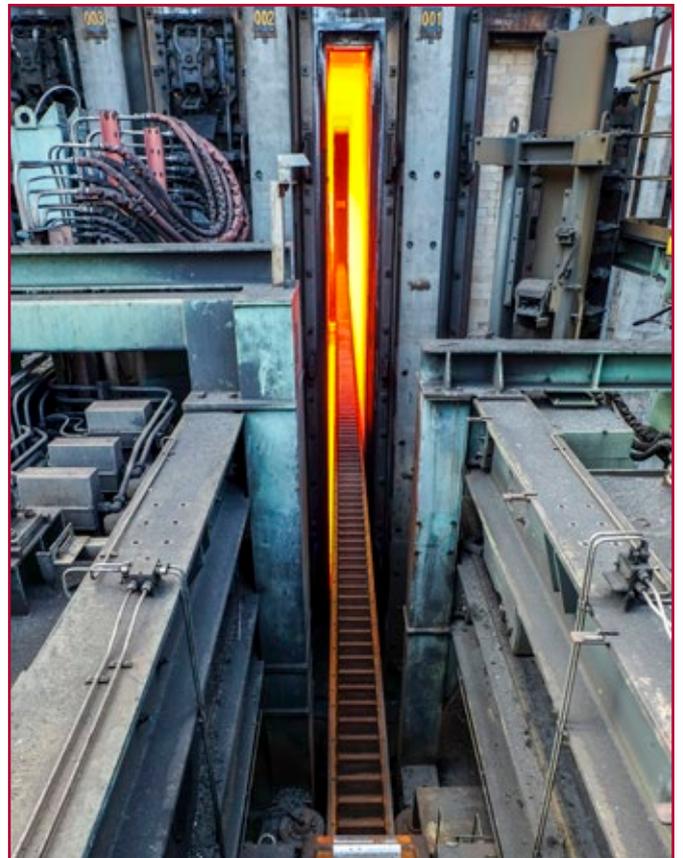
- ▶ Pusher side emission collection and de-dusting
- ▶ Leveller door smoke sleeve
- ▶ Combined hydro-mechanical door cleaner
- ▶ Adaptive frame cleaner
- ▶ Leveller door and frame cleaner
- ▶ Spillage coal and coke collecting systems
- ▶ Vacuum type bench cleaner

### System Schalke Total Manless Operation

General technical data	Pusher machines
Weight	<b>up to 750 t</b>
Dimension	<b>up to 19 m x 41.5 m x 24.5 m</b>
Travel speed	<b>up to 90 m/min.</b>
Pusher bar speed	<b>up to 36 m/min.</b>
Leveller bar speed	<b>up to 90 m/min.</b>
Positioning accuracy	<b>up to 3 mm</b>
Chamber height	<b>up to 8.43 m</b>
Chamber output	<b>up to 55 t coke</b>



Pusher machine



## SCP STAMPING-CHARGING-PUSHING MACHINES

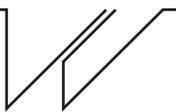
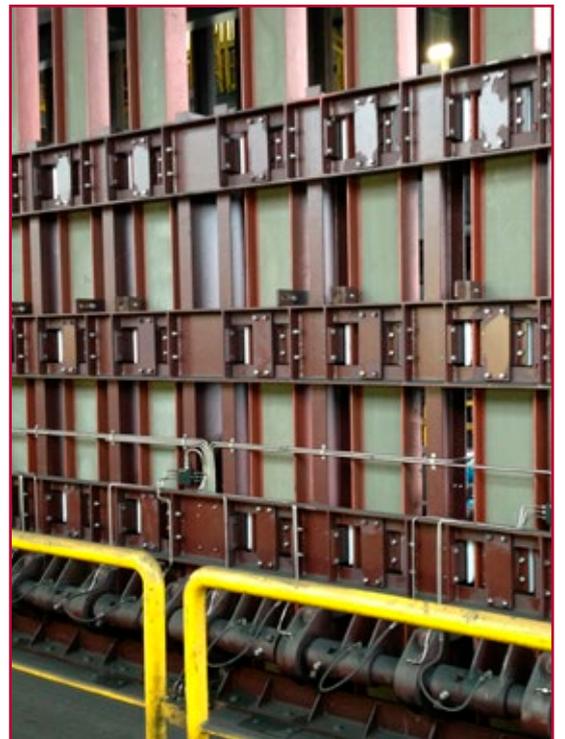
With the take-over of the cokemaking technologies of Koch Industrieanlagen, Paul Wurth covers the design and supply of all equipment required for stamp charging, including stamping-charging-pushing machines, stationary stamping systems and gas transfer cars.

Our equipment is designed tailor-made to meet each customer's requirements and fit available layout.

Paul Wurth machines can be implemented in greenfield projects, but also as retrofit into existing plants. For conversion projects, we design and supply stationary stamping systems along with the dedicated charging cars.

General technical data	SCP machines
Weight:	<b>up to 1400 t</b>
Coal cake data:	<b>over 50t weight over 6 m height</b>
Oven cycles:	<b>over 110 ovens per day</b>
Coal feeding options:	<b>Coal tower or belt feeding</b>





## COKE TRANSFER CARS

Integrated coke transfer cars provided by Paul Wurth are of high dust catching efficiency, when the oven is open during the pushing operation. To date, about 90 Schalke-branded coke transfer cars have been supplied worldwide.

Our single-spot coke transfer cars rely on advanced technology for handling the doors and guiding the pushed coke from the oven into the quenching car. For efficient emission control and in order to meet specific plant requirements, a number of state-of-the-art systems can be used in combination.

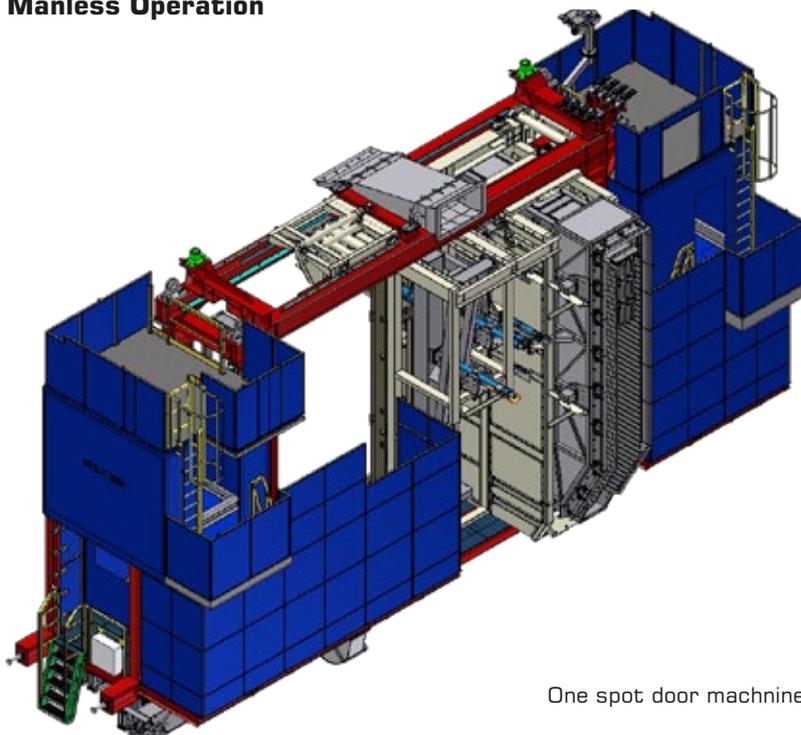
### System Schalke For Transfer Cars

- ▶ Intelligent door extractor for inclined ovens
- ▶ Encapsulated coke guide for inclined ovens
- ▶ Coke temperature detection
- ▶ Coke cake profile detection

### System Schalke Emission Free Operation

- ▶ Complete pushing emission collection with total coverage of quenching car
- ▶ Door emission collection system
- ▶ Combined hydro-mechanical door cleaner
- ▶ Adaptive frame cleaner
- ▶ Spillage coke collection system
- ▶ Vacuum type bench cleaner

### System Schalke Total Manless Operation



### General technical data **Coke Transfer Cars**

Weight **up to 450 t**

Dimension **up to 19.8 m x 19 m x 22 m**

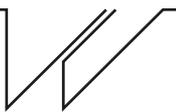
Travel speed **up to 90 m/min.**

Positioning accuracy **up to 3 mm**

Chamber height **up to 8.43 m**

Chamber width **up to 0.62 m**

One spot door machine



## WET QUENCHING CARS

Two different types of wet quenching cars are available, namely for conventional top spray quenching and for coke stabilizing quenching (CSQ). Being of robust design, the quenching cars supplied by Paul Wurth offer the advantage of easily exchangeable wearing parts. In all, more than 60 Schalke-branded conventional and CSQ quenching cars have been installed to date.

Both machines can be self-propelled or locomotive driven. The locomotives are part of the Paul Wurth portfolio.

**The conventional quenching car** is a fixed sloped bottom car with an either pneumatically or hydraulically operated discharge gate. The flap opening mechanism is self-locking, so that no uncontrolled opening of the gates can occur.

### General technical data

#### Conventional Top Spray Quenching

Weight	<b>up to 130t</b>
Dimension	<b>up to 25 m x 6.2 m x 5.8 m</b>
Travel speed	<b>up to 210 m/min.</b>
Positioning accuracy	<b>100 mm</b>
Chamber height	<b>up to 7.63 m</b>
Chamber output	<b>up to 45t coke</b>



## General technical data

### Coke Stabilizing Quenching

Weight **up to 280t**

Dimension **up to 26.8 m x 7.9 m x 7.8 m**

Travel speed **up to 240 m/min.**

Positioning accuracy **5 mm**

Chamber height **up to 8.43 m**

Chamber output **up to 55 t coke**

The **CSQ quenching car** has a fixed sloped bottom and is fitted with all facilities for coke box flooding and quick water drainage. The coke box is closed by two gates. The inner gate holds the coke inside the box, but lets the water drain. The outer gate holds the water inside the box.



## COKE DRY QUENCHING BUCKET CARS

The CDQ bucket car receives the coke from the oven in its rotating bucket and transports the bucket with coke to the CDQ plant. At the CDQ, the crane will pick up the loaded bucket, empty it into the cooling shaft and will return the empty bucket to the bucket car.

The bucket itself has been developed in order to guarantee a maximum of durability.

Paul Wurth is able to supply self-propelled or locomotive driven bucket cars.



### General technical data CDQ Bucket Cars

Weight	<b>up to 200 t</b>
Dimension	<b>up to 22 m x 7.5 m x 8 m</b>
Travel speed	<b>up to 210 m/min.</b>
Positioning accuracy	<b>5 mm</b>
Chamber height	<b>up to 7.63 m</b>
Chamber output	<b>up to 45 t coke</b>

## COKE QUENCHING LOCOMOTIVES

Paul Wurth quenching locomotives are designed to drive conventional wet quenching cars, CSQ quenching cars or non-driven hot coke bucket cars.

They are equipped with all on-board systems necessary to feed power and compressed air to the driven cars and can be operated in four different modes:

- ▶ Manless (Schalke Internal Full Automatic)
- ▶ Semi-automatic
- ▶ Interlocked manual mode
- ▶ Repair/maintenance mode



### General technical data Quenching Locomotives

Weight	<b>up to 165 t</b>
Dimension	<b>14 m x 6.5 m x 7 m</b>
Travel speed	<b>up to 330 m/min.</b>
Positioning accuracy	<b>5 mm</b>

## DOOR SERVICE CARS

To ensure a trouble-free coke plant operation, regular monitoring and maintenance of the oven doors is absolutely essential. For this purpose, it is necessary to undertake all required adjustments and to carry out needed repairs on the individual doors without interrupting the actual operation of the coke ovens.

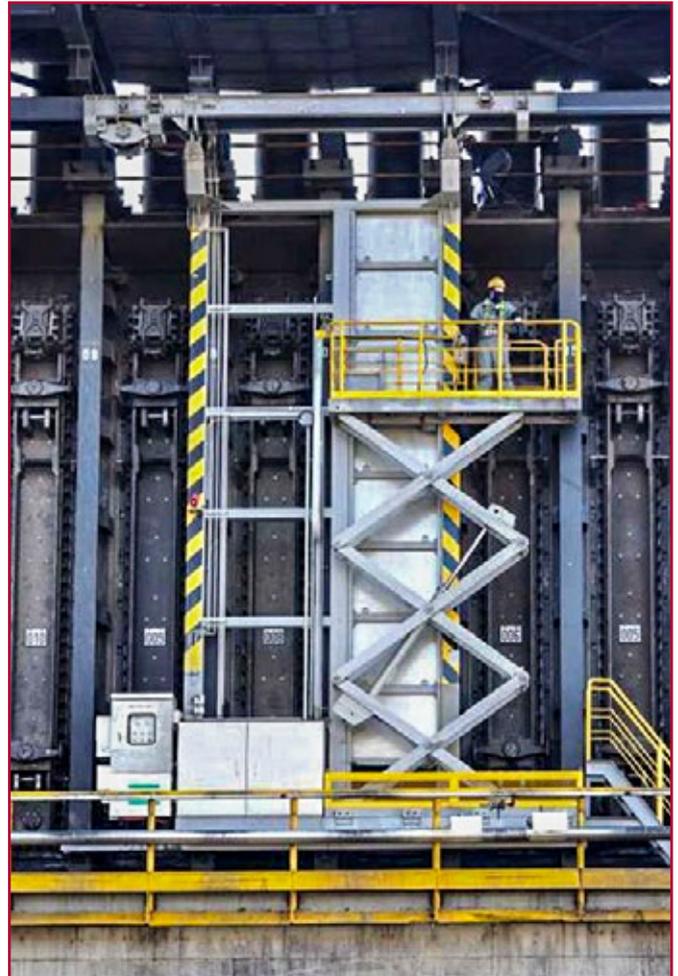
Paul Wurth maintenance cars are equipped with adjustable service platforms which guarantee easy access to any part of the oven doors that needs servicing.

All tools and monitoring devices required for this special kind of work - up to and including an appropriate energy supply - are available on the Paul Wurth maintenance/service car.

### General technical data Door Service Cars

Positioning accuracy **5 mm**

Chamber height **up to 8.43 m**



## PROGRAMME OVERVIEW

- ▶ Complete cokemaking plants
- ▶ Coke oven batteries of top charging and stamp charging typ
- ▶ SOPRECO® Single Oven PREssure COntrol
- ▶ Coke plant automation COKExpert™
- ▶ Coke oven machines
- ▶ Coke quenching (wet and dry system)
- ▶ Coke oven gas treatment plants



# Engineering & Technology worldwide

The Paul Wurth Group is today one of the world leaders in the design and supply of complete plants, systems and processes as well as specialised mechanical equipment for

■ **the iron & steel industry:**

Blast Furnaces & Auxiliary Plants  
Coke Making Plants  
Direct Reduction Plants  
Environmental Protection, Recycling & Energy-Saving Technologies

■ **other industries:**

Valve Solutions for Oil & Gas Downstream Processes  
Solutions for Decentralised Energy Production  
Intralogistics Solutions for Heavy Loads  
Engineering & Project Management for Civil Construction and Infrastructure Projects

**Feasibility Studies – Conceptual, Basic and Detail Engineering – Project Management – Plant and Components Supply – Turnkey Projects – Digital Solutions – Assistance in Plant Assembly and Commissioning – Technology and Operations Consultancy – On-site and Remote Operational Assistance – After-sales Services**

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