SOFTWARE AND HARDWARE

Efficient steelmaking by transforming metallurgical processes into tailor-made software.

welcome to our digital solutions

TABLE OF CONTENT

OUR WORK

Digitalization of a Foundry's Melt Shop

"With qoncept's software, we have finally found a solution that makes our daily work in the melting shop much easier. Thanks to the integration of our own experience into the software, the intuitive usability and the automated processes, we can now fully concentrate on our core tasks.

Johannes Ladinger
voestalpine Gießerei Traisen
Hauptprozessleiter Gussherstellung

OUR WORK

- **voestalpine Gießerei Traisen GmbH:** Level 2/3 software system to control and optimize the production processes in the melt shop. The functionalities include cost-optimized charge calculation, order dressing and planning, as well as metallurgical process management of EAF, AOD, Mg-treatment and casting.

- **Austrian rebar producer:** Software system in combination with our cameras for fully automated tracking of crane/scrap movements and determination of wagon unloading, scrap storage, and the layering in the scrap basket.

OUR WORK

Software | Hardware

Level 2 Software for Stainless Steelmaking

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In order to achieve the planned decarbonization of the industry, the CO_2 balance of steel production plays an essential role. With the help of qontrol, we can map our production process completely digitally, and optimize the CO_2 balance sustainably on the basis of the integrated metallurgical models.

Julian Franek
Breitenfeld Edelstahl AG
Deputy Production Manager Melt Shop

OUR WORK

- **Breitenfeld Edelstahl AG:** qontrol software system for the optimization of the value chain from scrap to the cast ingot including order planning, raw material optimization and process control for EAF, LF, VD/VOD and ingot casting.

- **Italian manufacturer of reinforcing steel and wire rod:** software solution qontrol maps to optimize the use of raw materials, to minimize the EAF energy consumption and CO_2 emissions from day one.

OUR WORK

- **Customer from Austria:** qontrol software system for the management of the various processes of the finishing line, including the management of production-relevant data, the planning of operations, the tracking of individual bars, the control of manufacturing processes and reporting.

- **Stainless steel sheet manufacturer:** Seamless integration of the qontrol software system - for monitoring and controlling the production steps for the final processing of flat steel - into the customer's IT system landscape.

INTRODUCTION

a market-leading and award-winning solution

KEY FEATURES

- qontrol is a **modular software** solution that digitally maps all processes and steps along your value chain.

- qontrol is an industrial software solution, specifically designed to **improve process efficiency** and reduce production costs.

- qontrol allows for efficient planning, production preparation and a seamless flow of information. Everything can be **managed and kept up** to date in the software.

- qontrol can be customized **to meet individual needs**. Integrated by a reliable partner who understands the demands of the production and manufacturing industry.

APPLICATION AREAS

where qontrol is the best choice

- Steel
- Foundries
- Metal Powder Production and Handling
- Rolling and Forging
- Hardening and Heat Treatment
- Finishing
- Machining
- Mineral Processing and Cement
- Nonferrous
- Recycling

BENEFITS

No paperwork
Errors caused by handwritten records are eliminated by integrating the production machines and an automated data recording system.

Maximized Process Efficiency
Standardization, monitoring and optimization of production processes through digital workflows and real-time setpoints.

Minimize Energy, Raw Material Costs and CO_2 Emissions
Mathematics, natural sciences and the ability of a cross-process view of the value chain enable software-assisted optimization of resource-efficient production.

Enhanced Quality Control
The definition of product- and process-specific quality standards, combined with real-time monitoring, ensures the highest quality standards.

Support for Continuous Improvement Processes
Complete transparency, traceability and evaluation of the production processes through digital reporting.

Fully Monitored and Analyzed Processes through AI
Integrated data-driven models (AI) improve production performance by evaluating, monitoring and controlling all relevant and involved processes.

SOFTWARE

01. Raw Material Optimizer

Calculation of the most efficient mix of raw materials for each metallurgical process step, from the scrap yard to casting.

02 Level 2 Software

AI-enhanced metallurgical models packaged in state-of-the-art software for real-time process monitoring, control, and optimization.
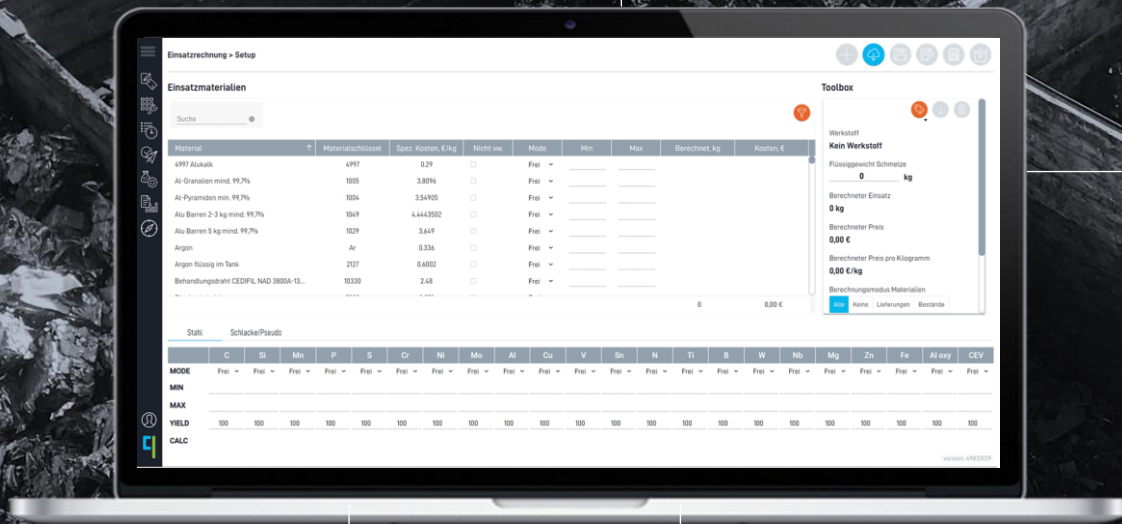
03 Manufacturing Execution System

Achieving intelligent production through customized software and the four core disciplines for maximum process efficiency.

04 Ladle Management

Track, analyze, and monitor your ladles as they move through melting and refractory operations with our advanced ladle management solution.

01. RAW MATERIAL OPTIMIZER

150 kg/t

100 kg/t

250 kg/t

500 kg/t

scrap recycling made easy

qontrol maps is a sophisticated application that calculates the most efficient mix of raw materials for each metallurgical process step, from the scrap yard to casting.

01. RAW MATERIAL OPTIMIZER

The following variables and boundary conditions are taken into account in the raw material optimization:

- Price of raw materials and electrical energy.
- Stock of raw materials on-site.
- Chemical composition of raw materials.
- Bulk density, melting yield and energy demand for each raw material.
- Target specification of the grade to be produced (min, max).
- Direct and indirect CO_2 emissions (Scope 1, 2 and 3).
- Metallurgical reactions.

Consideration of future deliveries

Consideration of current stock

Possibility to do campaign calculations

Control maps

Holistic and cross-process optimization

Consideration of metallurgical processes

Metallurgical intelligence

01. RAW MATERIAL OPTIMIZER

produce the steels you need

WHAT YOU GET

THE FEATURES

- The ideal charge mix to achieve the defined chemistry
- The ability to react quickly to changing conditions (price for energy, raw materials, etc.)
- Full utilization of stock materials
- Minimization of out-of-specification heats
- Reduction of tap-to-tap times
- Leveraging chemical and electrical energy
- Reduction of charging operations
- Reduction of CO_2 emissions.
- Substantial cost reduction of up to 20 €/t.

THE BEST

All features aim to achieve the lowest production cost possible.

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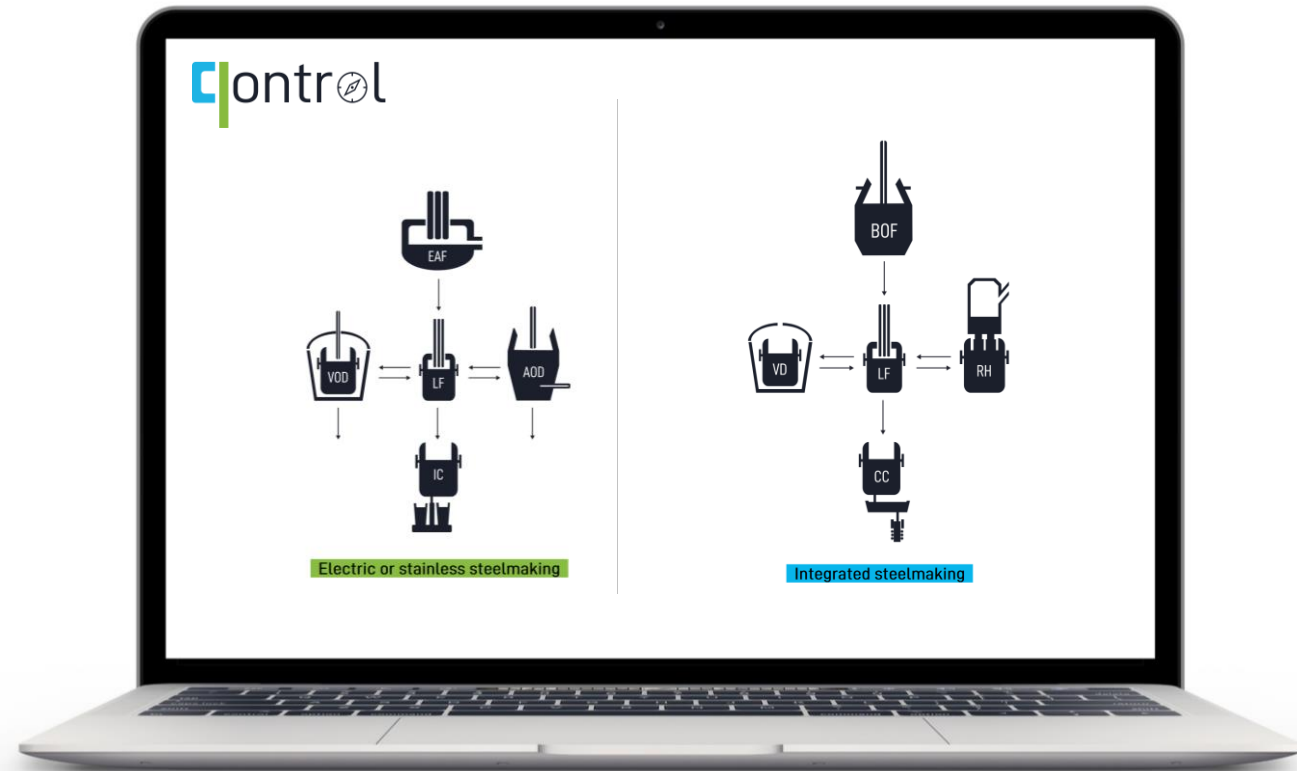
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STEELMAKING

software for high-performance steel production

02. LEVEL 2 SOFTWARE

qontrol can be applied for a single unit or for the entire steelmaking process:

- Scrap Yard (SY) | Optimized Charge Mix
- Electric Arc Furnace (EAF)
- Basic Oxygen Furnace (BOF)
- Ladle Furnace (LF)
- Vacuum Degassing Unit (VD)
- RH Degassing Unit(RH)
- Vacuum Oxygen Decarburization Unit (VOD)
- Argon Oxygen Decarburization Unit (AOD)
- Ingot Casting (IC)
- Continuous Casting (CC)

02. LEVEL 2 SOFTWARE

A deep understanding of metallurgical processes is at the heart of our software-based process control.

$$2[Cr] + 3[O] \rightarrow (Cr_2O_3)$$

$$\Delta G_{Cr} = \Delta G_{Cr}^0 + R \cdot T \cdot \ln\left(\frac{a_{Cr_2O_3}}{a_O^3 \cdot a_{Cr}^2}\right)$$

$$x_{Cr} = \frac{\Delta G_{Cr}/3}{\sum \Delta G_i}$$

02. LEVEL 2 SOFTWARE

materializing efficient steelmaking

Digital process twins
Real-time visualization of the actual state of the melt and slag by modeling the various metallurgical processes (metallurgical intelligence included).

Process standardization and stabilization
Standardization of the production routes and the activities to be carried out by means of operating charts and instructions (treatment recipes) that are easy to set up.

Metallurgical process control
Efficient control of metallurgical processes through dynamic and semi-dynamic generation of setpoints.

Complete overview of the processes in the melt shop
Tracking of heat orders, process data and events, materials (scrap, alloys, slag formers), and operating resources such as ladles and lances.

Process supervision / monitoring
Supervision of the metallurgical processes through the comparison of the planned and actual figures and the evaluation of the quality rules.

Cross-process optimization
Optimization of the process taking into account the economic benefits and the process-related requirements.

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03. MES | LEVEL 3

digitalization where real value is created

03. MES | LEVEL 3

Efficient planning, production preparation
and seamless information flow.

Product Definition
Material, Format, Properties

Production Know-How
Recipes and Templates, Workflows, Quality Management

Production Resources
Materials, Equipment, Stock Management

Production Order Planning
Order Dressing, Order Scheduling

Production Preparation
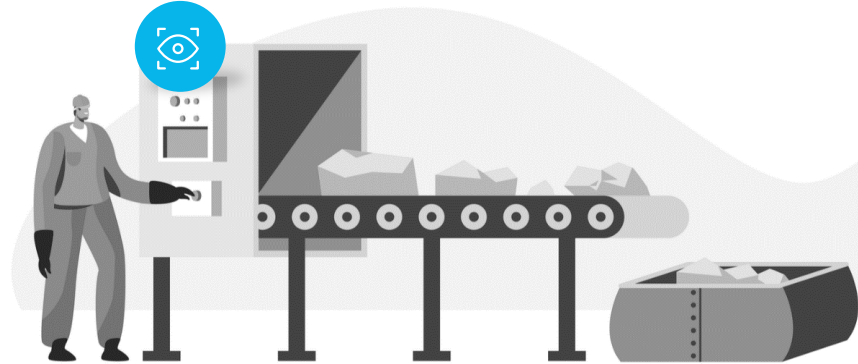Material and Equipment Disposition

Performance Analysis
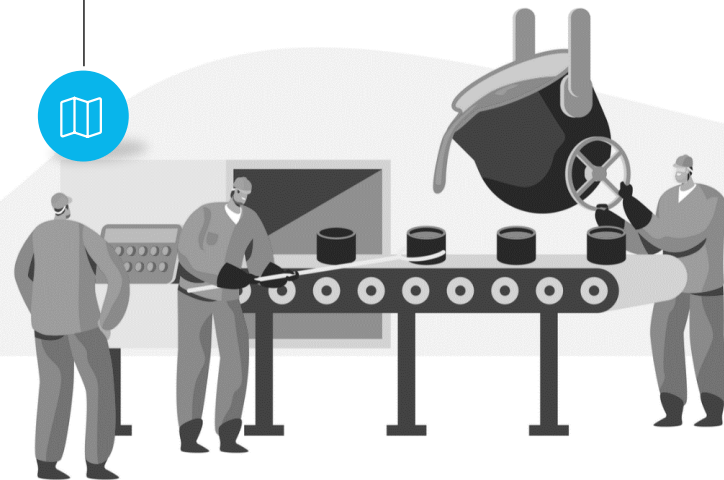Order and Product Reports, Plant-Wide Reporting

03. MES | LEVEL 3

qontrol's shop floor cockpits enable the **four core disciplines** for maximum process efficiency.
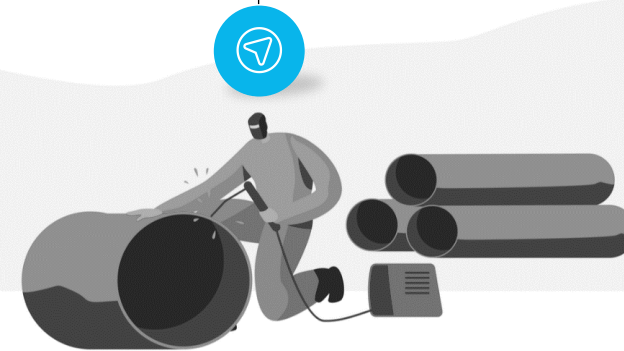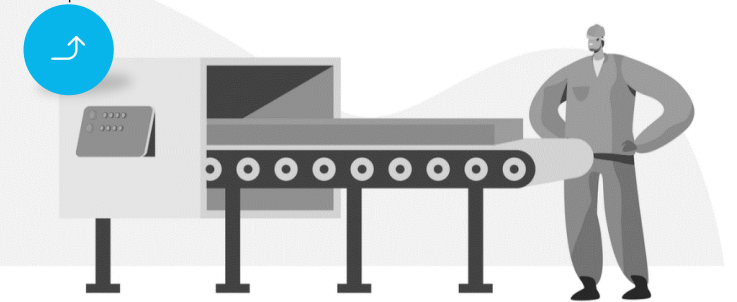
optimization

control

guidance

supervision

03. MES | LEVEL 3

> " qontrol MES promotes a data-driven culture that encourages employees to continuously learn, innovate and improve.

- A modern system developed with latest design principles and a **microservice architecture.**
- Scalable and expandable setup with easy upgrade possibilities.
- Web-based client with responsive design.
- Standardized and well-documented APIs to interface with third-party applications.

best scalability, flexibility and reliability

SOFTWARE

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04. LADLE MANAGEMENT

improved and safer ladle handling

04. LADLE MANAGEMENT

Identification
The system automatically or manually identifies ladles during their journey.

Equipment Management
The system manages and tracks all ladles in the melting shop.
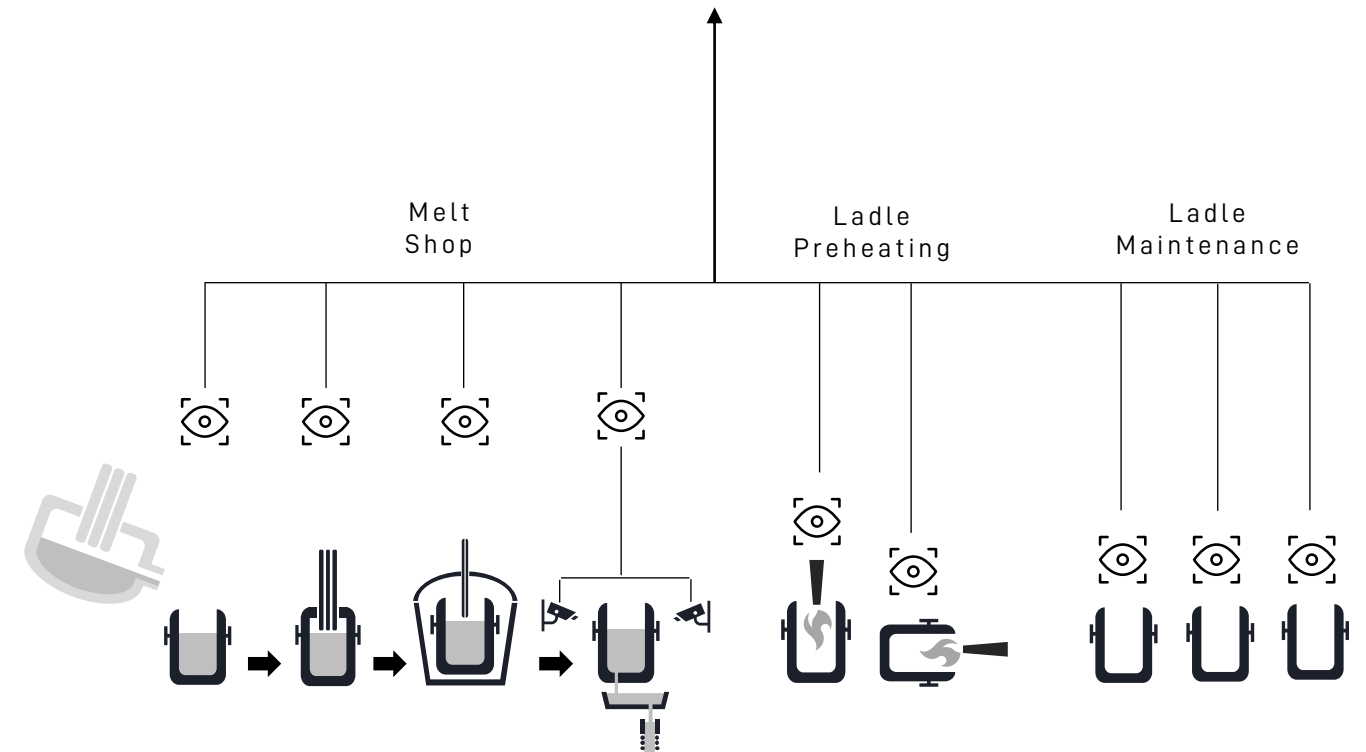
Temperature Calculation
The system predicts and controls the steel bath temperature.

Improving Workplace Safety
The system monitors the ladle surface and identifies potential hot spots to prevent ladle breakouts.

processing and visualization

Melt Shop

Ladle Preheating

Ladle Maintenance

04. LADLE MANAGEME

The ladle management system is available as individual components or as a complete software and hardware package.

C|ontrol

Ladle Management Software

Ladle Tracking (Positioning)

Ladle Conditioning and History

Steel Temperature Prediction

Hot Spot Prediction & Ladle Monitoring

Hardware and Sensors

Manual identification by software (**qontrol**)

Automatic camera-based identification using our **qurve**

Automatic identification u **qoupler** (multi-coupler

04. LADLE MANAGEMENT

The added value / the benefits are

- Increased safety in steel production
- Preventive protection against breakout of molten steel
- Early detection of areas with increased wear
- Cost Savings: Maximized refractory lining life without any safety risks
- Cost Savings: Optimization of tapping temperature and hand-over temperatures
- Optimized maintenance plan and improved maintenance strategy for refractory linings
- Comparison of the efficiency of refractory linings

HARDWARE

05. Intelligent (AI) Sensors

Available as a complete system with qoncept's software solutions or as a stand-alone product.

06. Operating Terminals

Available as a complete system with qoncept's software solutions or as a stand-alone product.
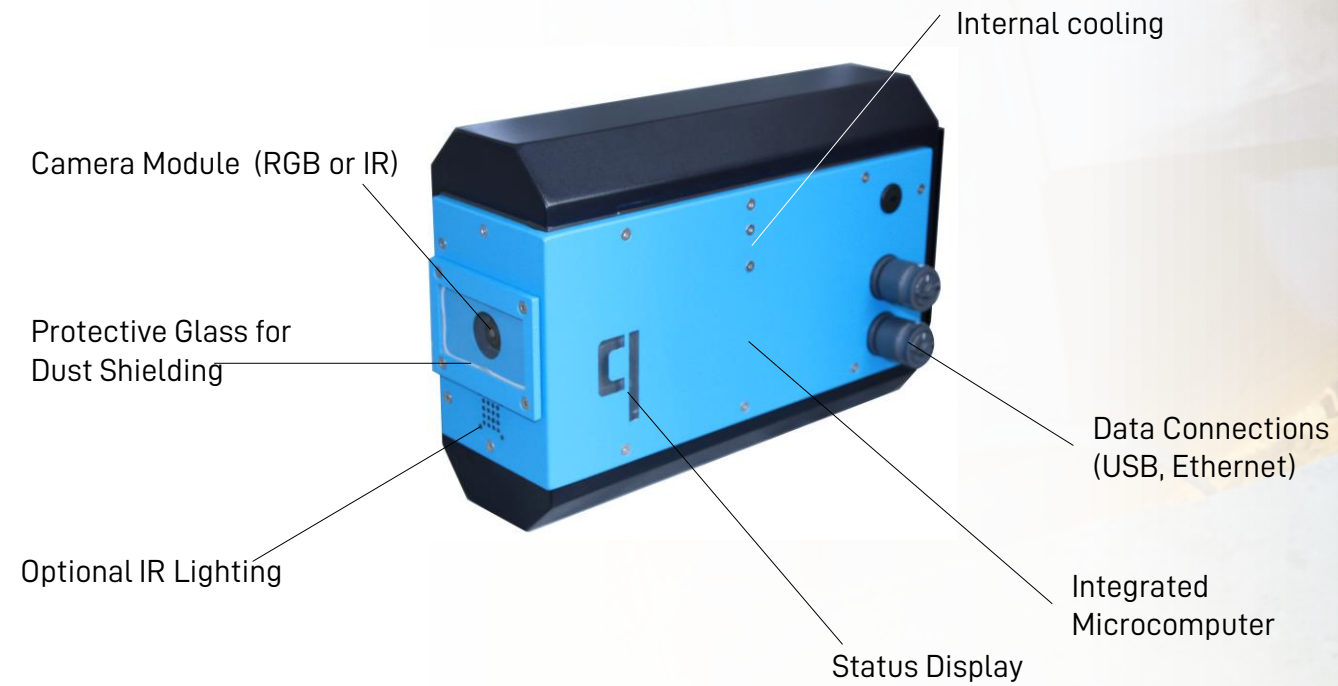
05. INTELLIGENT SENSORS

qurve is a camera-based sensor solution with artificial intelligence (computer vision algorithms) for a wide range of applications.

achieving of transparent and optimized production

05. INTELLIGENT SENSORS

Internal cooling

Camera Module (RGB or IR)

Protective Glass for
Dust Shielding

Optional IR Lighting

Data Connections
(USB, Ethernet)

Integrated
Microcomputer

Status Display

05. INTELLIGENT SENSORS

application areas

Recognition of objects
at specific positions, such as

- Identification of ladles at the individual metallurgical plants, at the preheating stations or in the maintenance area.

- Identification of railroad cars.

- Identification of products such as steel bars in the course of various processing operations (straightening, grinding, testing etc).

- Automatic determination of coordinates of moving objects (e. g. motion profiles of cranes) in real time .

05. INTELLIGENT SENSORS

Special Features

- Plug and play with our software solution qonrol

- Acquisition of data and image processing onboard (mobile computing).

- Identification of objects without the use of invasive methods of marking.

- Condition monitoring of an object and initiation of measures (e.g. preventing of ladle breakouts).

05. INTELLIGENT SENSORS

qurve was designed for applications and conditions in the steel industry:

- The system is robust and resistant to dust and heat.
- It enables on-board data processing in order to minimize heavy network loads.
- qurve is affordable and at the same time has a high degree of failure safety.

COMPONENT / PARAMETER	DESCRIPTION
RGB-Camera	- Resolution 6 MPx or higher, depending on specific project use - 60 frames per second - Global shutter camera
Integrated Single Board Computer	- Hexa-Core Cortex Processor - 4 GB RAM
Environmental protection	- Compressed-air flushed protective glass of the optics (3mm thickness) - IP65 protection, fan-less housing
Housing	- 370 × 270 × 120 mm - ~ 4 kg weight - Powder coated steel sheet (1.5 mm thickness) - Over-pressurization for dust-proofness - 230 VAC with proprietary plug (provided)
Connections	- Ethernet - Compressed air for cooling and optics flushing
Operating System	- Embedded Linux

HARDWARE

05. Intelligent (AI) Sensors

Available as a complete system with qoncept's software solutions or as a stand-alone product.

06. Operating Terminals

Available as a complete system with **qoncept's** software solutions or as a stand-alone product.

06. OPERATING TERMINAL

System highlights

- Multi-touch operator terminal for modern software solutions in full-HD resolution
- Touch operation with finger, pen or special work glove
- Optional additional satellite terminal for ergonomic working conditions
- Robust steel casing for harsh environment in dusty or hot production plants
- Network connectivity by ethernet, wireless or LTE+ connection
- Direct power supply or via PoE
- Optional exchangeable 3 mm protective glass
- Integrated industrial PC (SBC) with free choice of operating system
- Fanless design, 3rd party certification for dust-proof design

06. OPERATING TERMINAL

> " Implement digitization in the melt shop and make daily work easier with qonsole.

designed to be installed in the harshest environment

SOFTWARE | HARDWARE

we digitize where
it gets too hot for
others

qoncept

expect nothing less

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