BOYE

PRODUCT CATALOGUE

Cooling & Control Solutions
for Bar and Wire Rod Mills



Tangshan Boye Technology Co., Ltd.

Product Catalogue

Cooling and control equipment for bar and wire rod mills

BOYE supplies equipment for controlled water cooling, valve actuation, hot metal detection, temperature measurement and process display. This catalogue presents the product range, operating features and selection data for new installations and mill upgrades.

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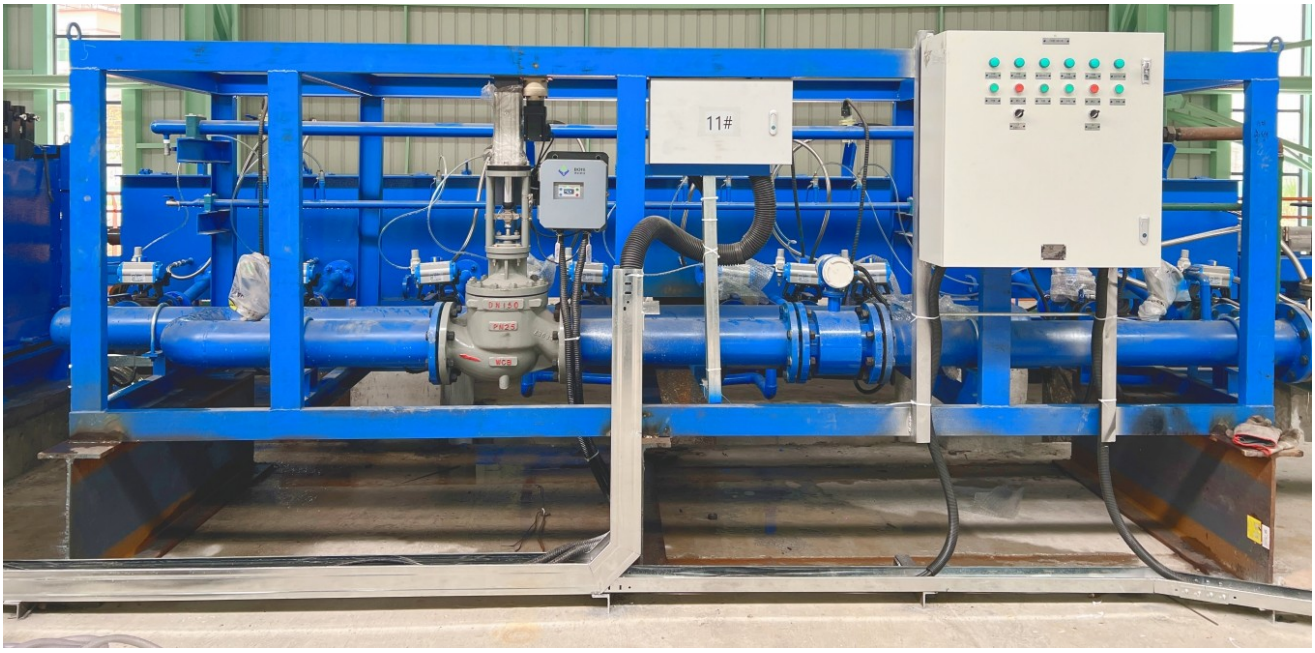
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Company Profile



BOYE cooling water control equipment

Tangshan Boye Technology Co., Ltd. develops process solutions and equipment for bar and wire rod rolling. Its work focuses on controlled cooling for carbon and special steels, combining metallurgical process development with equipment design and manufacturing.

BOYE supplies controlled cooling systems for new lines and upgrades to existing mills. Temperature measurement and servo valve adjustment are combined in a closed-loop system to regulate cooling water flow and improve temperature uniformity along the rolled product. Cooling strategies are developed for the steel grade and operating conditions of each line.

Applications include bearing and gear steels, where the cooling schedule supports the required microstructure and mechanical properties. BOYE serves steel producers in China and supports projects in domestic and overseas markets.

Equipment and project support

The product range includes Water Boxes, guide troughs, all-electric servo valve stations, servo control and on/off valves, hot metal detectors, infrared thermometers and process displays. Project services include equipment design, manufacture, system supply, site commissioning and maintenance support, with the scope agreed for each project.

Product Range

Equipment for water cooling, valve control and process monitoring

Equipment	Product	Function
	Water Box	Applies cooling water to bar and wire rod in a controlled cooling system.
	All-electric servo valve station	Flow regulation and rapid cooling water switching.
	ASV electric servo control valve	Servo positioning with adjustable valve travel speed.
	HSP1000 electric servo on/off valve	Rapid switching with independent opening and closing speeds.
	Guide Trough	Mechanical guiding between mill equipment and through cooling sections.
	HMD-S8W hot metal detector	Infrared detection of hot metal for process sequencing.
	PLK infrared pyrometer	Non-contact temperature measurement with analog and digital interfaces.
	SCD full-color LED temperature display	Large-format display of process measurements and equipment status.

Water Box

Controlled rolling and cooling for bar and wire rod production



Water Box for rolling mill cooling

BOYE Water Boxes apply cooling water to hot-rolled bar and wire rod. In a PLC-based closed-loop cooling system, temperature feedback and servo valve adjustment regulate water flow and the steel temperature profile. The cooling schedule controls grain structure and phase transformation to support strength, hardness and ductility. Suitable steel compositions and cooling schedules can reduce alloy additions.

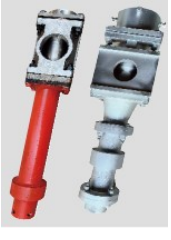
Temperature uniformity For the closed-loop cooling system, BOYE reports reference performance within ±10 °C at the finishing mill entry and ±15 °C at the cooling bed. Results depend on steel grade, product section, rolling speed and cooling conditions.

Closed-loop control Temperature feedback is used to adjust water flow along the line. The system supports control of product temperature, rolling tolerance and coil weight variation, and is intended to help limit roll ring cracking.

Purpose-designed nozzles Annular slit nozzles are designed for the cooling application, checked by fluid simulation and flow-calibrated before shipment. Heat-treated, wear-resistant materials provide reported service throughput of 200,000–400,000 tonnes of steel; actual service life depends on operating conditions.







Valve installation | Cooling line | Cooling nozzles

Guide Trough

Mechanical guiding for bar and wire rod mills



Guide Trough installation and supporting structure

BOYE guide troughs provide a path for hot-rolled steel between mill equipment and through cooling sections. Configuration depends on product size, pass line and installation position. The guide trough provides mechanical guiding; the Water Box applies cooling water.

Installation and operation

Pass-line alignment Check alignment with the mill centre line, adjacent equipment and the required product clearance.

Cooling-section interfaces Coordinate guide sections with Water Boxes and connecting pipework.

Inspection and reset Provide access to guide surfaces and adjustment positions. Record settings after size changes or maintenance.

Configuration requirements

Selection item	Information required
Product and process	Steel grade, product size and line speed
Pass line	Installation position, centre height and pass-line dimensions
Trough and interfaces	Trough length, profile and mounting interfaces
Adjacent equipment	Cooling-water layout, Water Boxes and connecting pipework
Service access	Space for inspection, adjustment and replacement

Reference Applications

The following billet compositions are reference data for HRB400E, a Chinese reinforcing steel grade. They describe the reported cooling applications and do not imply equivalence to another national grade. Composition and cooling schedules are selected for the required product properties.

Twin high speed bar lines

Chemical composition and carbon equivalent in mass percent; diameters in mm. BOYE reports lower composition values for single high-speed bar lines.

Size	Grade	C	Si	Mn	P	S	V	Ceq	Speed
Ø12	HRB400E	0.24-0.255	0.30-0.35	0.85-0.90	≤0.040	≤0.040	0.004-0.006	0.39-0.40	39 m/s
Ø14	HRB400E	0.24-0.255	0.30-0.35	0.90-0.95	≤0.040	≤0.040	0.004-0.006	0.40-0.41	34 m/s
Ø16	HRB400E	0.24-0.255	0.30-0.35	0.95-1.00	≤0.040	≤0.040	0.004-0.006	0.40-0.41	26 m/s
Ø18	HRB400E	0.24-0.255	0.30-0.35	0.95-1.00	≤0.040	≤0.040	0.004-0.006	0.40-0.41	24 m/s
Ø20	HRB400E	0.24-0.255	0.30-0.35	0.95-1.00	≤0.040	≤0.040	0.004-0.006	0.40-0.41	18 m/s
Ø22	HRB400E	0.24-0.255	0.30-0.35	1.00-1.05	≤0.040	≤0.040	0.004-0.006	0.41-0.42	15 m/s
Ø25	HRB400E	0.24-0.255	0.30-0.35	1.00-1.05	≤0.040	≤0.040	0.004-0.006	0.41-0.42	11 m/s

High speed wire rod lines

Size	Grade	C	Si	Mn	P	S	V	Ceq
Ø6-Ø10	HRB400E	0.23-0.25	0.30-0.40	0.60-0.70	≤0.040	≤0.040	/	0.36-0.39

A slash indicates that no value is stated for V in the reference data.

Process applications

Bar Controlled water flow limits temperature variation along the bar. The cooling schedule regulates grain structure and phase transformation to support strength, toughness and wear resistance.

Wire rod Uniform cooling helps limit surface cracking and temperature variation at high rolling speeds, supporting the required surface quality, strength, toughness and ductility.

All Electric Servo Valve Station

Flow regulation and rapid switching for rolling mill cooling water

The all-electric station combines servo control valves for flow regulation with servo on/off valves for rapid switching. Independent opening and closing speed settings allow fast opening and slower closing to suit the cooling sequence and help limit water hammer.

Valve position feedback, automatic calibration, status display and fault diagnostics support plant control and servicing. Electric actuation removes the need for a compressed air supply and its associated control piping.





Pneumatic valve station | All-electric servo valve station

Control functions

Flow regulation ASV valves support local operation, 4–20 mA input and Modbus communication over RS485.

Water switching HSP valves provide digital on/off control and fully open and fully closed status feedback. Full-stroke travel time is less than 0.4 s at maximum speed.

Operation and service A separate controller can be installed in a suitable location away from heat, vibration and dust. Operating status and fault information support commissioning and routine maintenance.

Valve Station Comparison

The comparison below describes typical system arrangements. Pneumatic performance depends on the selected actuator, air circuit and air supply conditions.

Comparison item	Pneumatic valve station	All-electric servo valve station
Basic composition	Control and on/off valves, solenoid valves, filters, pressure regulators, air piping and compressor	Servo control and on/off valves, controllers and electrical circuits
Power source	Compressed air; solenoid valves control the air circuit	Electric motors actuate the valves
Control and actuation	Electrical signals with pneumatic actuation	Electrical control and actuation
System arrangement	Electrical and pneumatic circuits	Electrical circuits; no pneumatic control circuit
Main functions	Flow regulation and switching depend on air supply conditions	Flow regulation, rapid switching, position feedback, calibration and diagnostics
Valve travel time	Affected by air circuit filling, venting and solenoid valve operation	On/off valve full-stroke travel time <0.4 s at maximum speed
Water hammer suppression	Depends on actuator and air circuit configuration	Independent opening and closing speeds allow fast opening and slower closing
Automation interface	Analog and switching signals; digital options depend on configuration	ASV: 4–20 mA and Modbus RS485; HSP: digital control and status feedback
Operating information	Usually provided through the PLC and field instruments	Controller displays setpoint, position, status and faults
System maintenance	Compressor, air treatment, solenoid valves, actuators and air piping	Electrical and mechanical inspection; no compressed air system to service
Energy use	Compressor energy and air leakage losses	Electrical power for actuation and control; no compressed air demand
Site conditions	Moisture, oil and contaminants can affect pneumatic operation	Separate controller can be installed away from heat, vibration and dust
System expansion	Additional positioners, valve islands or accessories may be required	Digital communication, local parameter settings and fault diagnostics support system integration.

Electric Servo Control Valve

ASV Series



The ASV Series uses a servo motor and ball screw to position the valve for precise flow regulation. Adjustable travel speed supports rapid valve movement and gradual changes in cooling water flow in steel and other process applications.

Operating features

Precise positioning Positioning accuracy of <0.1% in local manual and Modbus control modes supports valve position control. Flow performance also depends on the valve characteristic and process conditions.

Fast travel At 100% speed, full-stroke travel time is <2 s for DN100 and <2.5 s for DN125/DN150. Travel time varies with valve size and speed setting.

The fastest <1 s specification applies to DN25–DN32 at 100% speed. Travel time depends on nominal size and speed setting.

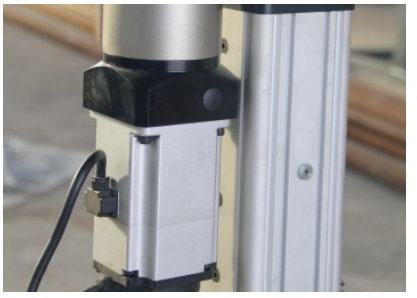
Gradual adjustment At 1% speed, full-stroke travel time exceeds 200 s for DN100 and 250 s for DN125/DN150, supporting gradual changes in cooling water flow.

Control and feedback Local operation, 4–20 mA input and Modbus over RS485 provide interface options. The OLED display shows position, operating mode and faults.

Automatic calibration Calibration torque is adjustable from 5% to 100%. Modular construction supports inspection and specified lubrication.







Actuator assembly | Handwheel | Drive assembly

ASV Specifications and Applications

Parameter	Specification
Nominal sizes	DN25–DN200
Power supply	220 VAC
Power	1 kW
Full-stroke travel time at 100% speed	DN25–DN32: <0.5 s DN40–DN50: <1.5 s DN65–DN100: <2 s DN125–DN200: <2.5 s
Positioning accuracy	<0.1% in local manual and Modbus control modes
Control interfaces	Local operation; 4–20 mA input; Modbus RS485
Display	OLED
Calibration torque setting	5–100%

Process applications

Metallurgy Cooling water flow regulation in rolling and other metallurgical processes, including bar and wire rod lines and continuous casting secondary cooling.

Chemical processing Flow regulation where the valve materials and ratings are suitable for the process medium.

Pharmaceutical applications Cooling water regulation where process and material requirements are met.



Position display | Operating settings | Calibration

Controller photographs show the supplied local interface.

Servo and Pneumatic Control Valves

The ASV Series combines direct electric positioning, adjustable travel speed and digital communication. The following factors help assess valve suitability for the process.

Characteristic	Servo control valve	Pneumatic control valve	Practical difference
Drive mode	Servo motor and ball screw	Compressed air actuator	Direct electric positioning
Full-stroke travel time	DN100 <2 s; DN125/DN150 <2.5 s at 100% speed	Depends on valve and actuator	Adjustable travel speed
Positioning accuracy	<0.1% in local manual and Modbus control modes	Depends on model and test conditions	Accurate valve positioning
Control mode	Local operation; 4–20 mA input; Modbus RS485	4–20 mA input	Choice of analog and digital interfaces
Energy consumption	No compressed air demand	Requires compressed air	No compressor or air supply for valve actuation
Maintenance	Inspection and specified lubrication	Actuator and air system maintenance	No pneumatic circuit to service

Cooling performance

Controlled valve positioning supports repeatable cooling water adjustment. Fast travel helps follow the cooling sequence, while low-speed operation allows gradual changes in flow. The valve and control settings are selected to meet the required cooling capacity and temperature profile.

Selection factors

Assess nominal size, flow capacity, pressure rating, travel time, media compatibility and control interfaces. These factors determine suitability for a new installation or replacement of an existing valve.

ASV Selection and Integration

Alternative valve performance and fail action depend on the specific model and configuration.

Characteristic	ASV Series	Alternative valves
Drive mode	Servo motor and ball screw	Pneumatic or traditional electric actuator
Positioning accuracy	<0.1% in local manual and Modbus control modes	Model-specific specification
Full-stroke travel time	DN100 <2 s; DN125/DN150 <2.5 s at 100% speed	Depends on valve and actuator
Control mode	Local operation, 4–20 mA, Modbus RS485	Interfaces depend on controller and options
Feedback function	OLED display, analog feedback and RS485	Depends on model and configuration
Automatic calibration	Built-in calibration with adjustable torque	Calibration method depends on actuator
Power-off position hold	Holds valve position when power is removed	Fail action depends on actuator design
Maintenance convenience	Modular construction; specified lubrication	Service requirements depend on design
Cost and delivery	Quoted for the selected configuration	Quoted for the selected configuration

Project supply

Equipment price and delivery are quoted for the selected configuration and project scope. Site commissioning, technical support and after-sales service can be arranged as part of the project.

Local, analog and digital interfaces support integration with plant automation. Electric actuation removes the compressed air requirement for the valve, while routine electrical and mechanical inspection and specified lubrication remain part of servicing.

Electric Servo On Off Valve

HSP1000 Series

The HSP1000 Series uses a servo motor and planetary gearbox for rapid on/off flow control. Opening and closing speeds are independently adjustable, allowing fast opening and slower closing to match the cooling sequence.



Designed for repeated switching in rolling mill water cooling systems, the valve provides cooling water when needed and helps limit pressure surges by reducing sudden changes in flow velocity during closing. Fully open and fully closed signals allow the PLC to monitor valve status.

Construction

Valve body The trim opens or closes the flow path.

Planetary gearbox Reduces motor speed and increases the torque available to operate the valve.

Servo motor Provides rapid acceleration and deceleration, with motor response ≤20 ms. Valve full-stroke travel time is <0.4 s at maximum speed.

Coupling Transmits torque between the motor and gearbox and accommodates alignment tolerances.

Mounting bracket Supports and aligns the valve, gearbox and motor assembly.

Water hammer control

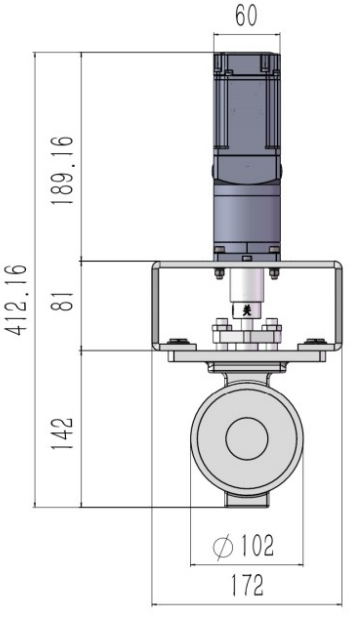
The pressure change is related to $\Delta P = \rho a \Delta V$, where ρ is fluid density, a is pressure-wave velocity and ΔV is the change in flow velocity. Slower closing reduces the rate of change in flow velocity and helps limit pressure surges; the actual surge also depends on the piping system.

The actuator uses 24 or 48 VDC, depending on the model. A separate control cabinet includes an AC input and a DC power supply and can be located away from heat, vibration and dust.

HSP1000 Specifications

Parameter	Specification
Actuator supply	24 or 48 VDC, depending on model
Maximum power	≤1000 W
Control cabinet supply	AC input with DC power supply
Full-stroke travel time	<0.4 s at maximum speed
Motor response	≤20 ms; separate from valve full-stroke travel time
Speed settings	Opening and closing speeds set independently
Control	Digital on/off command
Feedback	Digital fully open and fully closed status
Operating temperature	0–60 °C
Storage temperature	−20 to +70 °C
Ingress protection	IP55 for the mechanical unit
Flange connection	GB/T 9119; nominal sizes DN15–DN80

Sub-zero operation requires a suitable version. Match the flange standard, size and installation dimensions to the plant connection when selecting the valve.

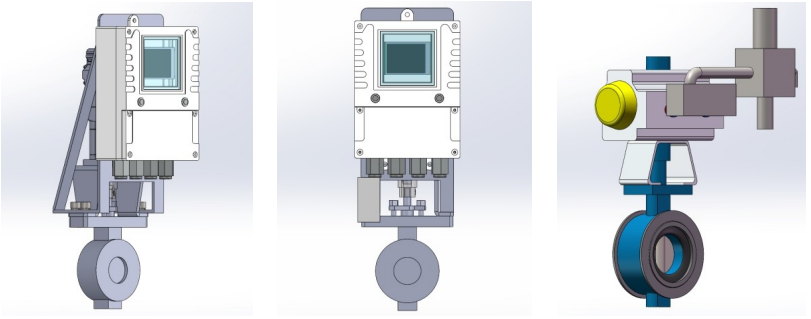


HSP1000 reference assembly drawing

Servo and Pneumatic On Off Valves

Full-stroke travel time describes the valve movement. Motor command response is a separate characteristic and is not a substitute for valve travel time.

Comparison item	Servo on/off valve	Traditional pneumatic on/off valve	Practical difference
Drive mode	Servo motor and planetary gearbox	Pneumatic actuator	Electric actuation; no compressed air supply
Full-stroke travel time	<0.4 s at maximum speed	Depends on air supply, piping and actuator	Rapid switching for rolling mill cooling water
Motor response	≤20 ms	Depends on solenoid valve and air circuit	Separate from full-stroke valve travel time
Switching strategy	Independent opening and closing speeds	Depends on actuator and air circuit settings	Fast opening; slower closing reduces sudden flow changes
Water hammer control	Slower closing helps limit pressure surges	Depends on closing speed and piping system	Water hammer performance depends on the installation
Status feedback	Fully open and fully closed digital signals	Position switches or feedback accessories	Allows the PLC to monitor end positions
Status display	Command, position, speed, current, torque, temperature and faults	Depends on actuator and instruments	Operating data available at the controller
Calibration function	Automatic reference calibration	Depends on actuator design	Supports commissioning and servicing
Power supply	24 or 48 VDC actuator; AC cabinet input	Compressed air; solenoid control supply varies	Actuator and cabinet supplies are distinct
Maintenance	Routine inspection and specified servicing	Actuator seals, solenoid valves, air piping and air quality	No pneumatic circuit to service



Assembly views

Hot Metal Detector

HMD-S8W



The HMD-S8W detects the presence and position of hot metal and provides switching signals to the plant control system. Applications include continuous casting, rolling and heat treatment, including bar detection and cooling water sequencing.

Digital signal processing and automatic gain control adjust sensitivity to the infrared radiation received from the workpiece. Eight automatically selected gain levels and adjustable filtering support detection as signal strength and site conditions change.

Operating principle

The optical system focuses infrared radiation onto an InGaAs sensor. The signal is conditioned and processed digitally, and the detection result is provided through logic, relay and solid-state relay outputs. The 1.54-inch color LCD shows operating status and detection information.

Output interfaces

Output	Rating	Channels
Positive logic	24 V, 100 mA	1
Negative logic	24 V, 100 mA	1
Relay	250 VAC, 2 A / 30 VDC, 2 A	1
Solid-state relay	30 VDC, 100 mA	1

Operation and site checks

A built-in infrared emitter supports self-test. Laser-assisted aiming helps align the detector, and cooling water connections are provided on the housing. Display and output settings support installation, commissioning and maintenance.

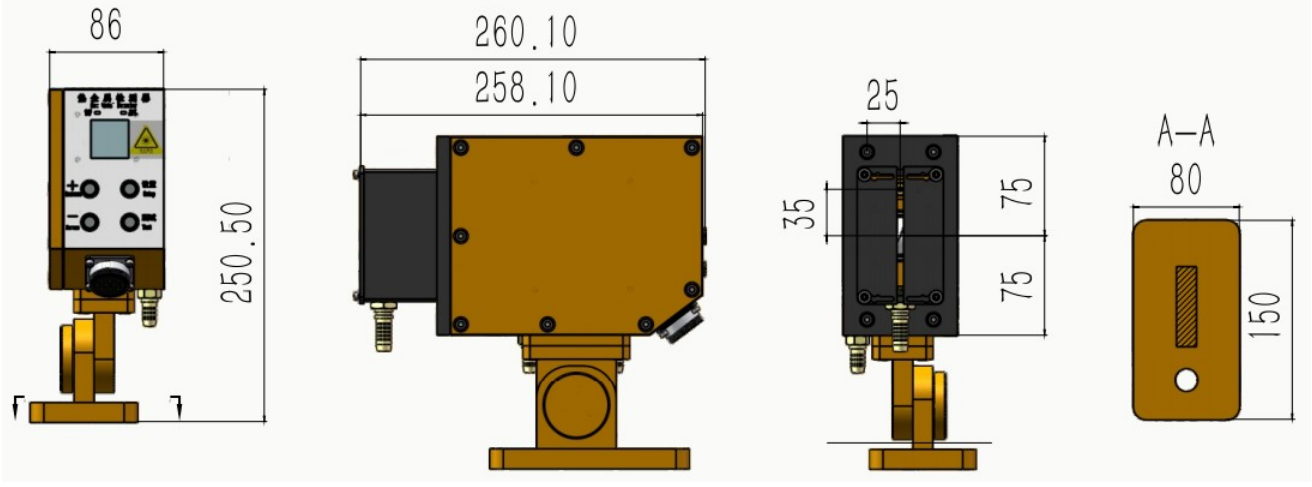


Housing and connection views

HMD Specifications and Mounting

Parameter	Specification
Detection method	Non-contact infrared
Detection temperature	250–1200 °C
Detection distance	0.2–8 m
Response time	<1 ms in single-channel mode
Gain control	AGC with 8 gain levels
Signal processing	Digital
Sensor	InGaAs; diameter 1 mm
Lens	Aspherical; diameter 30 mm
Power supply	24 VDC
Power consumption	≤20 W
Ambient temperature	−25 to +70 °C
Display	1.54-inch color LCD; 240 × 240 pixels
Self-test	Built-in infrared emitter
Aiming	Laser-assisted
Housing	Cooling water connections

Filtering settings can affect output timing.



HMD mounting dimensions from the product drawing

Infrared Pyrometer

PLK Series



The PLK Series is a single-wavelength infrared pyrometer (infrared thermometer) for industrial temperature monitoring. It measures radiation from the target without contacting the hot surface. Applications include steel processing, rolling and casting.

A stainless steel housing and heat-resistant seals protect the instrument. A 32-bit Cortex-M4 processor handles measurement and signal processing. Interfaces include an OLED display, analog output, relay output and RS485 communication.

Measurement and control

High-speed measurement The response time is 0.85 ms in the 600–1200 °C measurement range. Response times for the other measurement ranges are listed on the following page.

Isolated analog output An isolated 4–20 mA output connects to plant monitoring and control systems. The instrument uses a separate 24 VDC power supply.

Digital communication Isolated RS485 with Modbus supports multiple instruments with individual addresses.

Aiming and local operation Laser aiming assists target alignment. The OLED provides a Chinese-language interface for local settings and operation.







Instruments | Local operation | OLED interface

PLK Specifications

Measurement ranges and response times

Measurement range	Response time
600–1200 °C	0.85 ms
300–600 °C	12 ms
300–1200 °C	41 ms

Instrument data

Parameter	Specification
Wavelength	1.6 μm
Accuracy	±0.5% FS (full scale)
Repeatability	±0.5% FS
Emissivity	Adjustable to suit the target surface
Ambient temperature	0–55 °C without cooling
Power supply	24 VDC
Analog output	Isolated 4–20 mA
Digital interface	Isolated RS485 with Modbus
Additional interface	Relay output
Local display	OLED; Chinese-language interface
Housing	Stainless steel
Weight	Approximately 1400 g for the reference configuration
Aiming laser	Class 2; maximum output 1 mW
Ingress protection	IP55

Mounting dimensions depend on the instrument configuration.

PLK Process Applications

Non-contact measurement supports temperature monitoring at points where access to the hot steel surface is limited.



Metallurgy and steel processing

Temperature monitoring during steel processing and rolling supports control of the cooling schedule and product temperature.





Rolling process monitoring | Casting temperature measurement

In casting applications, temperature data supports coordination of the casting and cooling process.

Measurement features

Accuracy and repeatability Specified at ±0.5% FS.

Rapid response 0.85 ms in the 600–1200 °C measurement range.

Target alignment Laser aiming assists alignment with the measurement area.

Non-contact operation The instrument measures target radiation without touching the hot surface.

Full Color LED Temperature Display

SCD Series

The SCD Series displays temperature and other process measurements, as well as equipment status in industrial environments. RGB LEDs provide 24-bit color, equivalent to approximately 16.7 million colors, for long-distance viewing. The serial digital LED bus supports continued data transmission around a failed pixel, limiting the effect of an individual LED fault.



SCD display colors and process values

Signal input and processing

Inputs include 4–20 mA, 0–10 V and Modbus RTU over RS485. A 24-bit ADC and programmable digital filtering process the analog signals. In analog mixed mode, the display alternates between the 4–20 mA and 0–10 V inputs. It supports remote configuration, with applications in process monitoring, equipment status and energy management.

Local and remote settings

Settings are accessible through a local button, infrared remote control or RS485. The display offers 20 preset colors, brightness adjustment from 5% to 100%, and alarm thresholds with color changes or flashing.

Plant visibility

The 250 mm character height and wide viewing angle support reading from the operating area. Wall mounting and circular signal connectors support installation in industrial environments.

SCD Specifications

Parameter	Specification
Color depth	24-bit color; approximately 16.7 million colors
Preset colors	20
Character height	10 inches, approximately 250 mm
Viewing angle	120° horizontal and vertical
Viewing distance	≥50 m
Brightness	Adjustable from 5% to 100%
Power supply	220 VAC, 50 Hz
Power consumption	≤200 W
Power inlet	IEC C14 with locking feature
Power cord	IEC C13 connector; 3 × 1.0 mm²
Signal connector	GX16, 6-pin circular connector
Signal cable	Shielded, 6 × 0.5 mm²
Current input	4–20 mA; impedance ≤250 Ω; 24-bit ADC; ≥50 samples/s
Voltage input	0–10 V; impedance ≥100 kΩ; 24-bit ADC; ≥50 samples/s
Communication	RS485, Modbus RTU; 9600 bps, adjustable
Termination resistance	120 Ω
Filtering	Programmable digital filter
Local control	One button
Infrared remote control	Range ≤8 m
Alarms	Color change or flashing
Mounting	Wall-mounted

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