Regulus RF / RD

PID Program Controller

Ultra Fast, Intelligent and Precise Control of Process Heating Applications:

- Induction surface hardening
- Induction heating
- Induction soldering
- Inductive annealing
- Inductive heat shrinking
- Inductive melting
- Conductive heating treatment

- **Extremely fast sampling time of 100 µs**
- **990 program steps within 26 programs**
- **Automatic detection of up to 2 Sensortherm pyrometers**
- **Thermo couple inputs optional**
- **Measurement range overlap control**
- **AutoTune function for automatic P and I value detection**
- **Multiple I/O's: 7 digital outputs and 6 digital inputs**
- **Emissivity adjustable for every program step**
- **Easy programming via software**
- **Also for modernization of existing plants with control input**

Overview

Regulus RF and RD are programmable PID temperature controllers for panel-mounting or as bench model. They are optimized for use with Sensortherm pyrometers.
When using two pyrometers (Regulus RD) a second measuring point can be used for a redundant measurement. Selecting pyrometers with different measuring ranges, these can be combined to an expanded and thus very large total measuring range. Instead of a second pyrometer also a model with additional thermocouple input type K or S can be selected.

Pyrometer for Temperature Reading

The rapid response time of Sensortherm pyrometers coupled with the ultra-fast sensing and control capability of the Regulus PID program controller make them the ideal solution for detecting and regulating fluctuations in temperature instantaneously.

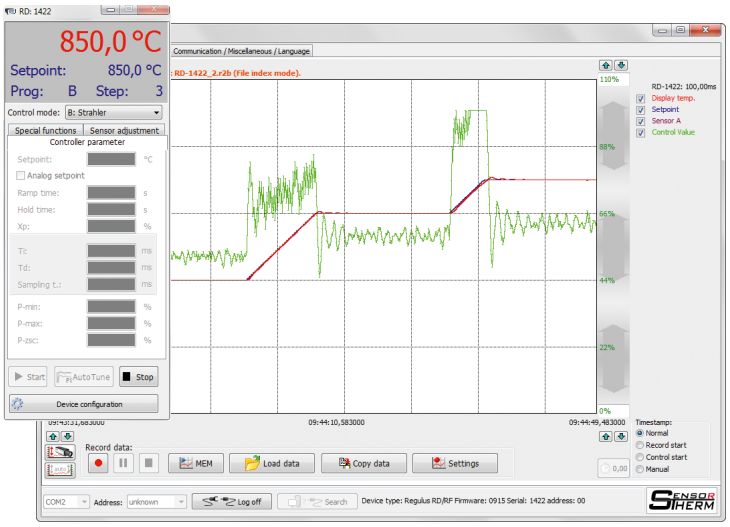
Optimized Control Processes

The advantages provided by an optimized control process are evident: increased productivity, reduced scrap rates and higher yield. The Regulus RD and RF were developed to control and monitor processes and to perform control functions. The extensive logging functions of the *SensorTools* software is ideal for “online” monitoring and for subsequent analysis of the processes. The full potential of the Regulus controller is demonstrated by its trouble-free ability to manage the demanding requirements of multiple heating application processes

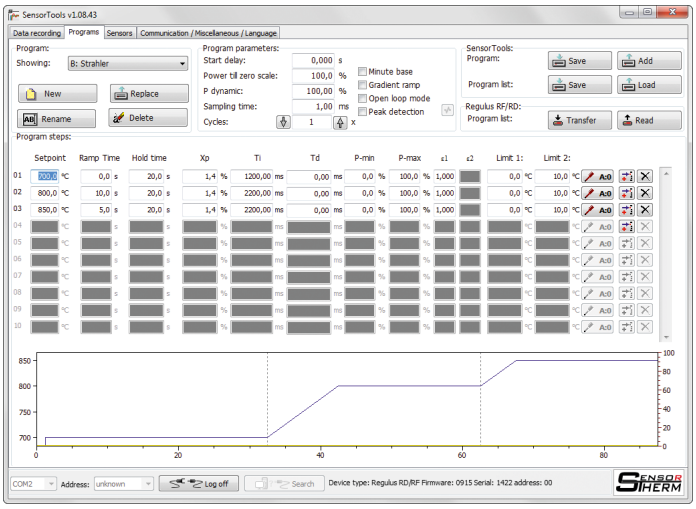
PC Software

The software *SensorTools* provides the user with a clean interface for configuration and programming of the control task. All entries can be written directly into the Regulus which allows a program execution without PC.

- **Controller configuration**
- **Creating and saving programs**
- **Recording and storing of controlling and temperature processes for documentation purposes**
- **Presentation and interpretation of stored events**
- **AutoTune function for automatic detection of P and I values**



Measurement and control curves



Programming window

Simple Programming of the Regulus

The versatile Regulus PID program controller can “stand alone” or operate with a PC connection as needed.

PC Connected: Operation with PC allows direct visual control of a running process. All control processes can be optimized and data can be stored in a separate files and retained for process and quality assessment.

Stand Alone: Especially useful for control processes in the field, initializing a program can be accomplished directly using the touch pads, or via an external control signal through one of the digital inputs.

Versatile Connectivity

7 user selectable digital outputs and 6 digital inputs provide the integration in almost every temperature monitoring and control process and enable an easy connection to existing controls.
Particular emphasis was placed on ease of use and simple integration into industrial processes.

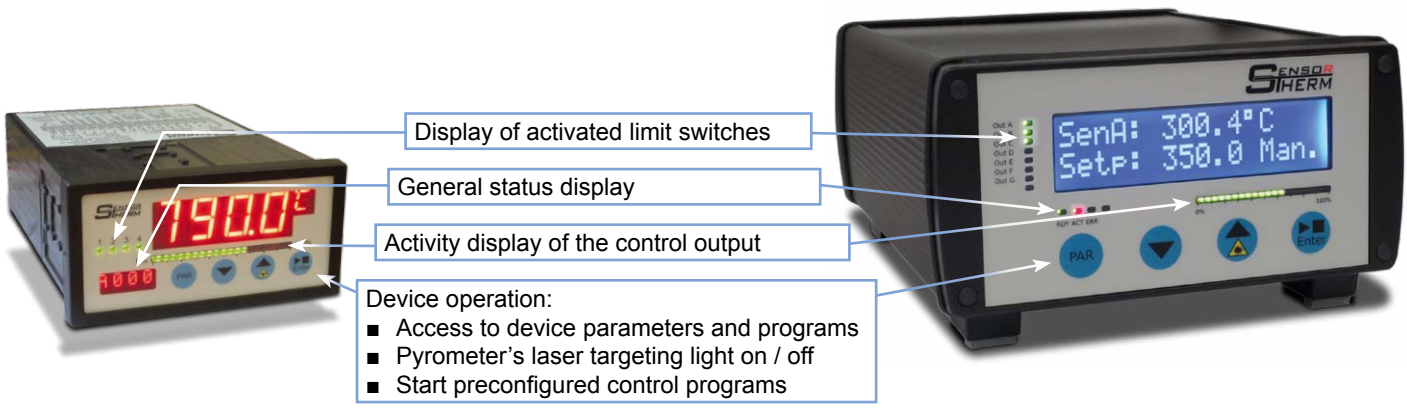
Assign possibilities of digital inputs:
Start / stop controlling (trigger)
Controller start (switch)
Emergency stop (switch)
Program step relaying (trigger)
Error reset

Assign possibilities of digital outputs:
State information: Controller ready
State information: Controller active
State information: Error
Generator control: on / off
Setpoint limit monitoring
Temperature limit switch

Technical Data

Measured value display	RF: 4 digit red 7 segment LED display, 13 mm height of digits RD: LCD dot matrix, white text on blue background, height of digits: 4.84 x 9.66 mm
Program and status display	RF: 4-digit alphanumeric LED display RD: LCD dot matrix, white text on blue background, height of digits: 4.84 x 9.66 mm
Control output display	20 digit green LED bar display
Temperature unit	Switchable °C / °F
Sampling time	100 µs to 25 ms (in 10 µs selectable)
Number of programs	26
Program steps:	Overall 990 free assignable, up to 255 for each program
Program step duration	100 ms to 108 min in 100 ms steps adjustable, max. 45.5 days
Program period	max. 255 x 45.5 days
Proportional band Xp	0.0 to 1000%
Integral time constant Ti	0 to max. 27 minutes (1638 s), adjustable in increments of 0.1 ms to 25 ms
Differential time constant Td	0 to max. 27 minutes (1638 s), adjustable in increments of 0.1 ms to 25 ms
Control output limit	P_{min} to P_{max} adjustable from 0.0 to 100% in 0.1% steps
Dynamic control output limit P_{dyn}	0.0 to 100% in 0.1% steps
AutoTune function:	To determine the PI parameters
Digital interface to pyrometer	RS232 (4.8–230 kbit/s) and bus-compatible RS485, half duplex, (4.8–921 kbit/s)
Analog input for pyrometer:	4-20 mA, resolution 16 Bit
(Option) Thermocouple input type K	NiCr-Ni, temperature range 0-1300°C resolution 0.1°C
(Option) Thermocouple input type S	Pt10Rh-Pt, temperature range 0-1750°C, resolution 0.1°C
Analog control output	0/4–20 mA switchable to 0-10 V, 0-5 V, resolution each 16 Bit, accuracy <0.1%, PWM output
Analog actual value output	0/4–20 mA switchable to 0-10 V, 0-5 V, resolution each 16 Bit, accuracy <0.1%
Digital inputs	6 digital inputs (input resistance >10 kOhm)
Digital outputs	7 digital switching outputs (24 V / 100 mA)
Relays outputs (only RD)	4 limit relays: 230 V, 6 A (switching time: relays pull in time t ≤ 9 ms relays dropout time t ≤ 5 ms
Digital interface to PC	USB (only RD) / RS232 / RS485
Program parameters	Setpoint value, ramp time, hold time, propotional band, integral time constant, differential time constant , minimum control output power, maximum control output, control output power, pyrometer emissivity, setpoint limits for digital outputs, sensor selection for temperature measurement, start delay, control output power limitation, sensor sampling time, program cycles, gradient ramp in degree per second, open loop mode for control processes without pyrometer, language (d + e), pyrometer parameters.
Power supply	24 V DC (18 V - 32 V)
Current consumption	200 mA (24 V) without external wiring
Terminals	Screw terminals, nominal cross-section 1.5 mm
Isolation	Digital interface and analog output are galvanically isolated to each other and to the power supply, thermocouple input galvanically isolated.
Operation temperature	0 to 60°C
Storage temperature	-20 to 70°C
Housing	RF: Panel mounting housing DIN IEC 61554 RD: Aluminum
Weight	RF: 320 g; RD: 1700 g
Protection	RF: Front IP40 (IP65 with optional cover), RD: Front IP65
CE mark	According to EU directives about electromagnetic immunity

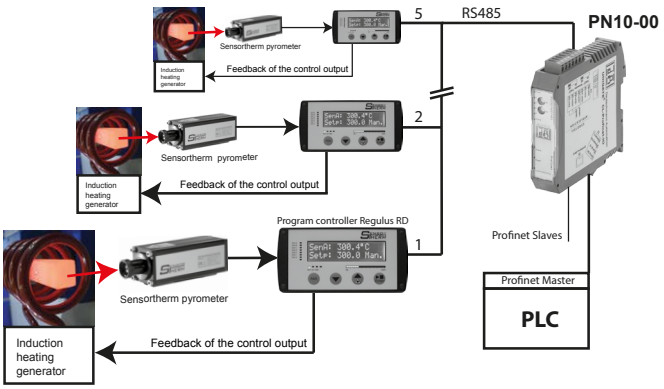
Operation



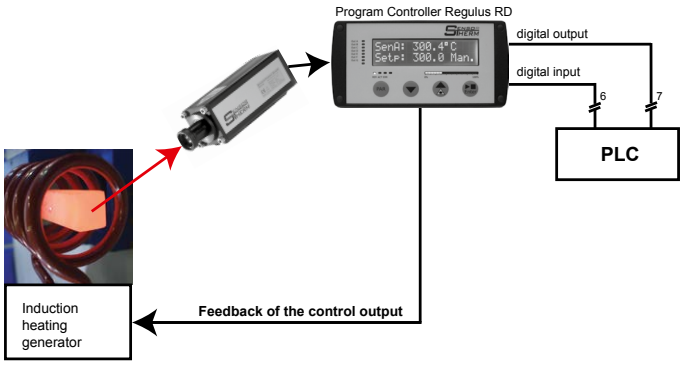
Controller Connections

The signal transmission of the measured temperature from the pyrometer to the controller can be 4-20 mA analog, or digitally via RS232 or RS485. A 0-10 V or 0-20 mA signal power specification to the generator is selectable. The temperature sensor, controller and generator form a closed circuit that requires only a start / stop signal.

The protocol converter PN10-00 allows Profinet connection of up to five Regulus controllers to a higher-level control. All necessary parameters are accessible and programs stored in the controller can be selected and started via the Profinet master.

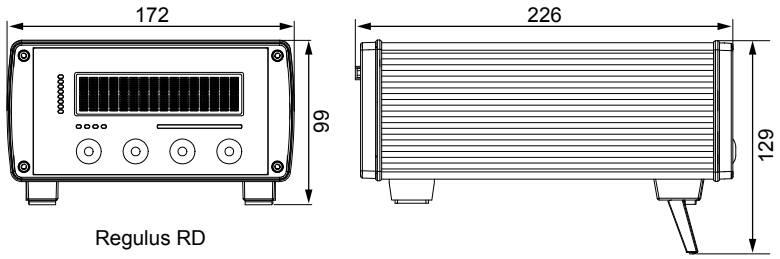


The Regulus is connected to the master controller via digital inputs and outputs. It receives the start and stop signals at the 24 V and forwards status messages and temperature thresholds to the PLC via its 7 digital outputs.

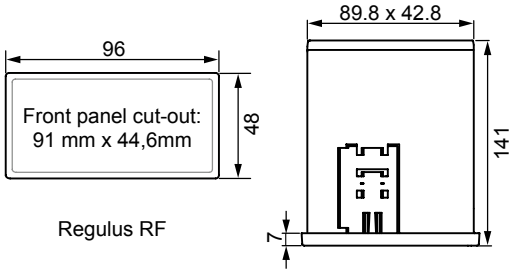


Dimensions

All dimensions in mm



Regulus RD



Regulus RF

Reference Numbers

RF00-00	Regulus RF
RFK0-00	Regulus RF with additional thermocouple input type K
RFS0-00	Regulus RF with additional thermocouple input type S
RD00-00	Regulus RD with connectors for 2 pyrometers
RDK0-00	Regulus RD with additional thermo couple connector type K, standard miniature connector
RDKK-00	Regulus RD with 2 additional thermo couple connectors type K, standard miniature connector
RDS0-00	Regulus RD with additional thermo couple connector type S, standard miniature connector
RDSS-00	Regulus RD with 2 additional thermo couple connectors type S, standard miniature connector
RDKS-00	Regulus RD with 2 additional thermo couple connectors type K+S, standard miniature connector

Scope of delivery:
RD: 4 plug connectors for sensors / e. connections, inputs/outputs and 2 for relays contacts, USB cable, Software *SensorTools*
RF: program controller with clamps for case mounting, 2 multiple plug connectors f, software *SensorTools*

Recommended accessories:

Pyrometer	Digital Sensortherm pyrometer type Metis or Sirius.
AR11 / AR43 / AR10	RD pyrometer connection cable (with plug connector to Sensortherm pyrometer, length in 5 m steps) with connector: right-angle / straight / right-angle with laser targeting light button
AL11 / AL43 / AL10	Pyrometer connection cable (with open wire ends, length in 5 m steps) with connector: right-angle / straight / right-angle with laser targeting light button
PN10-00	Profinet converter

Sensortherm reserves the right to make changes in scope of technical progress or further developments.

Sensortherm-Datasheet_Regulus_RF_RD (Okt. 05, 2015)

Sensortherm GmbH
Infrared Temperature Measurement and Control
Hauptstr. 123 • D-65843 Sulzbach/Ts.
Phone.: +49 6196 64065-80 • Fax: -89
www.sensortherm.com • info@sensortherm.de