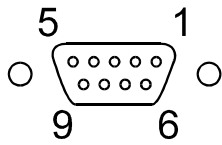



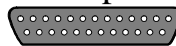


Serial interface (K)



This interface is a 9-pole connector:

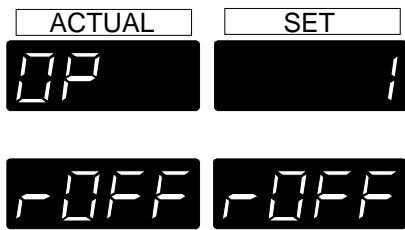
- Pin 2 RxD Receive Data
- Pin 3 TxD Transmit Data
- Pin 5 Gnd
- Pin 7 RTS Request to send
- Pin 8 CTS Clear to send

Interface correspondence:

Circulator	Computer	Circulator	Computer
			
9-pole	25-pole	9-pole	9-pole
Pin 2 RxD	⇔ Pin 2 TxD	Pin 2 RxD	⇔ Pin 3 TxD
Pin 3 TxD	⇔ Pin 3 RxD	Pin 3 TxD	⇔ Pin 2 RxD
Pin 5 GND	⇔ Pin 7 GND	Pin 5 GND	⇔ Pin 5 GND
Pin 7 RTS	⇔ Pin 5 CTS	Pin 7 RTS	⇔ Pin 8 CTS
Pin 8 CTS	⇔ Pin 4 RTS	Pin 8 CTS	⇔ Pin 7 RTS

1. Remote control

1.1. Communication with a PC or data system



For remote control, under the menu item **OP** (Operating mode) set the parameter to 1.

The message "rOFF" appears on the display. In general, the computer (master) sends commands to the recirculating cooler (slave). The recirculating cooler sends data (including error messages) only when the computer asks for it.

A transfer sequence consists of:

- command
- space (\Leftrightarrow ; Hex: 20)
- parameter (the character separating decimals in a group is the period)
- end of file (\downarrow ; Hex: 0D)

The commands are divided into **in** or **out** commands.

in commands: asking for parameters to be displayed

out commands: setting parameters



The **out** commands are valid only in remote control mode.

Examples:

- Command to set the setpoint to 5.5 °C:
out_sp_00 \Leftrightarrow 5.5 \downarrow
- Command to ask for the setpoint:
in_sp_00 \downarrow
- Response from the recirculating cooler:
5.5 \downarrow

1.1.1. List of commands

Command	Parameter	Response of recirculating cooler
version	no	Number of the software version
status	no	Status message (see below)
out_mode_05	0	Stop the recirculating cooler = rOFF
out_mode_05	1	Start the recirculating cooler
in_mode_05	no	Ask for the actual condition (Start/Stop)
out_sp_00	xx.x	Set working temperature value
in_sp_00	no	Ask for working temperature value
in_sp_01	no	Ask for high temperature value
in_sp_02	no	Ask for low temperature value
out_sp_03	xxx	Set control ratio for feed/return flow temperature
in_sp_03	no	Ask for actual control ratio
in_pv_00	no	Ask for actual feed temperature
in_pv_01	no	Ask for actual temperature reported by the external sensor
in_pv_02	no	Ask for actual heater capacity
in_pv_03	no	Ask for actual return temperature
in_pv_04	no	Ask for actual safety temperature

1.1.2. Status messages

Message	Description
00 MANUAL STOP	Recirculating cooler in condition "OFF" (LOCAL)
01 MANUAL START	Recirculating cooler in keypad control mode (LOCAL)
02 REMOTE STOP	Recirculating cooler in condition "rOFF" (RS 232)
03 REMOTE START	Recirculating cooler in remote control mode (RS 232)

1.1.3. Error messages

Message	Description
-01 WORKING PROCESSOR ALARM	Internal error
-02 EXCESS TEMPERATURE ALARM	High temperature alarm
-03 LOW TEMPERATURE ALARM	Low temperature alarm
-04 SENSOR DIFFERENCE ALARM	Sensor difference alarm $ \vartheta_{\text{Safety sensor}} - \vartheta_{\text{Feed}} > 25\text{ }^{\circ}\text{C}$
-05 LOW LEVEL ALARM	Low liquid level alarm
-06 PROCESSOR COMMUNICATION ERROR	Internal error
-07 I2C-BUS WRITE ERROR	Internal error
-08 I2C-BUS READ ERROR	Internal error
-09 I2C-BUS READ/WRITE ERROR	Internal error
-10 COMMAND NOT ALLOWED IN CURRENT OPERATING MODE	Invalid command in this operating mode
-12 VALUE TOO SMALL	Value too small
-13 VALUE TOO LARGE	Value too large
-14 INVALID COMMAND	Invalid command
-15 WARNING: STAND-BY PLUG IS MISSING	External stand-by plug missing (see page Error! Bookmark not defined.)
-16 WARNING: VALUE EXCEEDS TEMPERATURE LIMITS	Value lies outside the permissible range for the safety temperature limits. But value is stored anyway.
-17 PUMP ERROR	Pump disconnection
-18 COMPRESSOR ERROR	Compressor disconnection
-19 HEATER TRIAC SHORTED	Heater disconnection