User Manual
ERS® Controller SP92Y2

AirCool®*plus* System

User Manual • Controller SP92Y2 • Edition 09/2006, Version 1.0

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ERS Trademarks:

ERS®

AirCool®

AirCool®*plus*

WaferTherm®

SuperCool®

HotCool®

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List of abbreviations

"	Inch = Zoll = 25.4 mm
°C	Celsius degree
ERS	Name of Manufacturer
GmbH	Gesellschaft mit beschränkter Haftung
g	Gram
HE	Höheneinheit, 1 HE = 1.75"
Hz	Frequency
IEEE	Institute of Electrical and Electronics Engineers
kg	Kilogram = 1000 g
l/min	Liter per minute
lb	Pound = 453.6 g
LED	Light Emitting Diode
mg	Milligram = 1/1,000 g
mg/m³	Milligram per square meter
min	Minute (Time)
mm	Millimeter = 1/1,000 meter
MPa	Mega-Pascal
PC	Personnel Computer
psi	Pound per square inch
RTD	Resistance Temperature Detector
RS232	Recommended Standard 232
s	Second (Time)
VA	Volt Ampere
VAC	Volt Alternating Current

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Definition of Terms

Mains	Electrical primary connection
OEM	Original Equipment Manufacturer
PMA	Parts Manufacturer Approval

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1 Usage and Data

1.1 Copyright

1.2 Use of this User Manual

1.2.1 Purpose

This User Manual contains the information required for the proper use of the Controller SP92Y2. The User Manual is delivered with the ERS® AirCool®*plus* System and is an essential part of the product. It must be kept in an accessible, visible place next to the AirCool®*plus* System.

Product Life Phases
The User Manual describes all the product life phases of the Controller SP92Y2. It consists of the following system conditions and applications that come after manufacturing: transport, installation, commissioning, operation, maintenance, service, storage and finally disposal. Each related chapter can be found easily with the table of contents in this User Manual.

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1.2.2 User Qualifications

This User Manual applies exclusively to technically qualified personnel, who have been trained by ERS® or ERS® autorized representative or have completed an instruction course for the Controller SP92Y2. This instruction course must have been carried out with the authorization of ERS®. Only technically qualified personnel are capable of interpreting correctly the safety regulations contained in this User Manual, and applying them in practice in a concrete situation.

Personnel who have not been trained by ERS® or who have not received ERS® authorized training on the Controller SP92Y2 are not considered as authorized working personnel. Unauthorized personnel are not permitted to carry out any kind of work on the Controller SP92Y2. ERS® declines all liability for any claims for damages which occur when stipulations are disregarded.

1.2.3 Safety

Be sure to read Chapter “Safety” in the AirCool®*plus* System Manual prior to performing any work with or on the Controller SP92Y2! It contains important information that is significant for your own personal safety. This chapter must have been read and understood by all persons who perform any kind of work on or with the Controller SP92Y2 during any stage of its serviceable life.

1.3 Intended Use

The Controller SP92Y2 is designed for controlling the components of the ERS® AirCool®*plus* System.

Any application exceeding the bounds of these specifications is considered improper use, and can lead to serious personal injury or material damage. ERS® will not be held responsible for any damages resulting in such a case.

Further requirements of proper use are that you:

- Read and adhere to this User Manual.
- Adhere to the technical data. See Chapter 1.9 Installation Data, 16.
- Complete the maintenance work on schedule. See Chapter 6 Maintenance and Service, 37.

Improper Use and Non-Adherence to Regulations
Other uses of the Controller SP92Y2 are permissible only with written permission from ERS® electronic GmbH (ERS®). Any application not adhering to the above specifications is considered improper use. ERS® will not be held responsible for any personal injury or material damage resulting from improper use.

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1.4 Residual Dangers

The Controller SP92Y2 employs state of the art technology and was built in accordance with the recognized safety regulations. It has been subjected to comprehensive safety test and approval processes. However, it is not possible to completely rule out any danger involved in the use of the system. There are dangers involved

- for the life and well-being of the user
- for the Controller SP92Y2 and other materials of the end user

as well as detrimental effects on the efficient working on and with the Controller SP92Y2.

For this reason it is necessary that all activities involving the Controller SP92Y2 are carried out by trained personnel in accordance with the guidelines in this User Manual. The technical data must be adhered to.

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1.5 Scope of Delivery

The delivery consists of the following components:

Qty	Component		Part No.	Packed
1	Controller SP92Y2		ERS	☐
1	Cable controller to Chiller 03		ACK004	☐
1	Cable controller to Chuck		ACK007T	☐

Tab. 1-1 *Scope of delivery*

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1.6 Type Label

A type label (Fig. 1-1, 🗎 14) is attached to the Controller SP92Y2. It identifies the component and provides information about customer-specific adaptations, if such exist. When communicating with ERS®, you should always supply all the details on the type label. With this information, the ERS® customer service can provide you with the support you need in the shortest possible time.

The type label is located at the rear side of the Controller SP92Y2.

Fig. 1-1 *Type label*

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1.7 Dimensions and Weights

1.7.1 Dimensions and Weights of the Controller SP92Y2

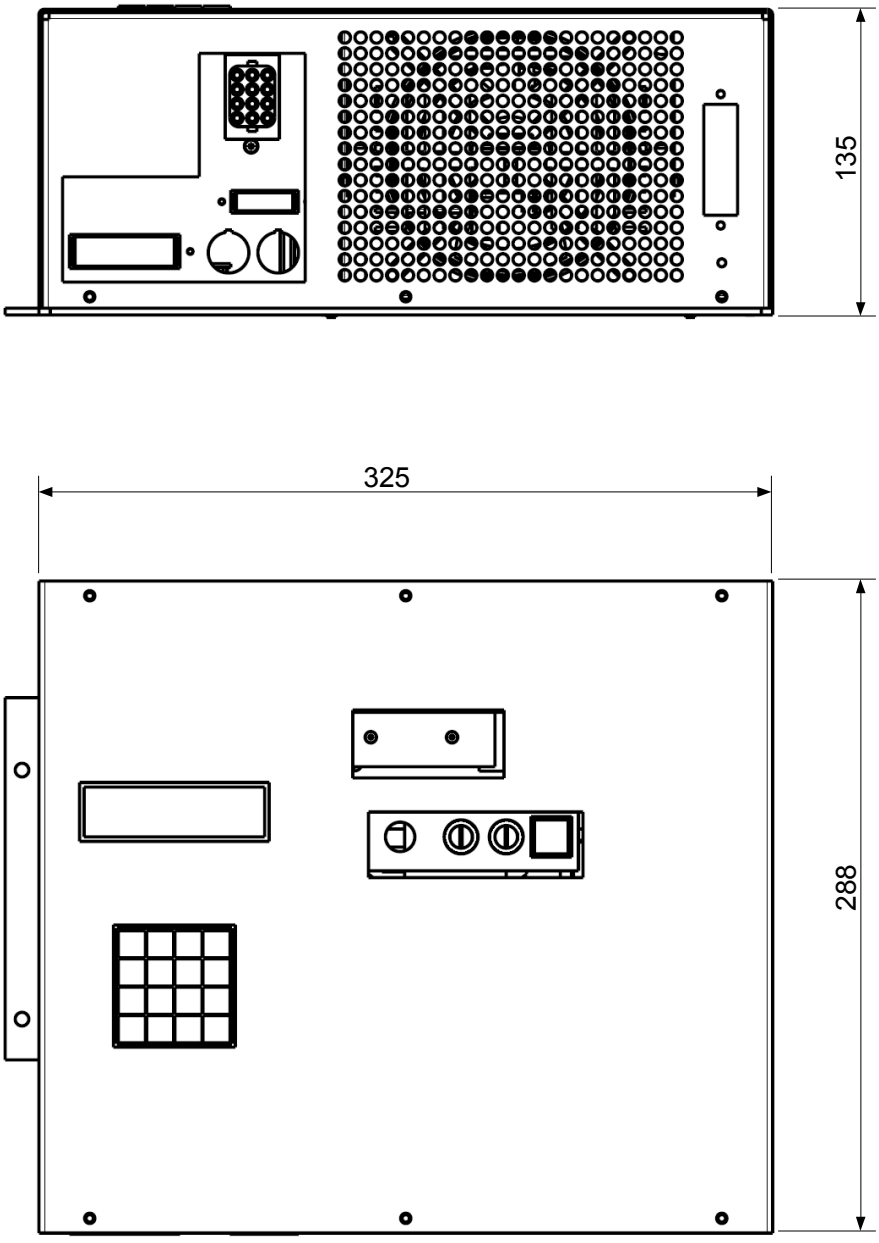

Fig. 1-2 *Dimensions of the Controller SP92Y2 (in mm)*

Width	Height	Depth	Weight
325 mm 12.8"	135 mm 5.3"	288 mm 11.3"	15,5 kg 34.2 lb

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1.8 Performance Data

Smallest temperature preselection step	± 0.1°C
Chuck temperature display resolution	0.01°C
Control method	DC / PID
Display type	LCD

Tab. 1-2 *Performance data: Controller SP92Y2*

1.9 Installation Data

1.9.1 Ambient Conditions

The Controller SP92Y2 requires the following environmental conditions during operation:

Temperature	+18°C through +28°C
Relative air humidity	20% through 60%

Tab. 1-3 *Ambient conditions*

1.9.2 Electrical Data

Power supply	100 / 110 / 208 / 230 VAC
Frequency	50 / 60Hz
Power consumption	450 VA

Tab. 1-4 *Electrical data: Controller SP92Y2*

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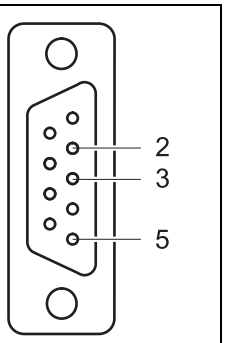
1.10 Interfaces

1.10.1 RS232

Name		XR2
Location		Rear of the Controller SP92Y2
Connection		D-Sub, 9 pin
Pin assignment		• Pin 2: sent data • Pin 3: received data • Pin 5: ground
Standard setup:		
	Bits/sec.	9600
	Parity	N
	Bits per symbol	8
	Stop bit	1
	Protocol mode	on



Tab. 1-5 *Interface RS232*

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2 Safety

2.1 Compulsory Reading Material!

Read this chapter prior to performing any work with or on the Controller SP92Y2! It contains important information that is significant for your own personal safety. This chapter must have been read and understood by all persons who perform any kind of work with or on the Controller SP92Y2 during any stage of its serviceable life.

2.2 Safety-Related Responsibilities

The responsibilities for the safety of the Controller SP92Y2 are assigned as follows:

- ERS® is responsible for the safety of the Controller SP92Y2.
- The end user is responsible for safety in the vicinity of the Controller SP92Y2.
- The end user is responsible for the adherence to the general safety guidelines in all work carried out on and with the Controller SP92Y2.

Areas of Responsibility for ERS®

Controller SP92Y2	Areas of responsibility
Electrical supply	From the interface between the electrical supply and the Controller SP92Y2
Grounding	From the interface between the ground connection cable and the Controller SP92Y2

End User's Areas of Responsibility

Surrounding area of the Controller SP92Y2	Areas of responsibility
Electrical supply	Connecting cables to the connections of the Controller SP92Y2 in accordance with Chapter 1.9.2 Electrical Data, 🗎 16
Grounding	To the connector of the Controller SP92Y2
Personnel	Ensuring that information is passed on when operating, maintenance or service personnel are substituted or changed. Providing training courses.

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2.3 General Safety Guidelines for the End User

2.3.1 Personnel

All personnel who work with the Controller SP92Y2 must have the required technical qualifications and have received appropriate instruction and training. They must be informed about all conceivable dangers and risks which exist in conjunction with this system.

Unauthorized persons are not allowed access to Controller SP92Y2.

2.3.2 Operation

The Controller SP92Y2 must not be used for purposes other than those stipulated. See Chapter 1.3 Intended Use, 🗎 11. All work instructions and operational procedures which could impair personnel safety or cause damage to the AirCool® System are strictly prohibited. In addition, branch-specific and local regulations concerning prevention of accidents must always be followed.

2.3.3 Installation

Power Supply
The end user provides the connections for the supply of electricity to the Controller SP92Y2 with the required performance and quality levels. See Chapter 4 Installation, 🗎 23 and any supplementary information in the technical specifications.

Supply Lines
Electrical supply cables must be kept separate from one another and must be routed to the Controller SP92Y2 under protection from mechanical stress. They must be routed in such a way that the safety and reliability of the Controller SP92Y2 is not affected negatively.

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2.3.4 Maintenance and Service

The end user is obliged to only operate the Controller SP92Y2 in a technically faultless condition. All maintenance and service work must be carried out in accordance with Chapter 6 Maintenance and Service, 🗎 37.

2.3.4.1 Spare Parts

⚠WARNING

Non-original spare parts.

The use of non-approved parts can lead to malfunctions. This can lead to serious or fatal injuries or considerable material damage.

When carrying out maintenance and service work, use original OEM or PMA spare parts only.

Adaptations
Consult ERS® before modifying the system. Unauthorized adaptations and alterations which affect the safety of the Controller SP92Y2 are not permitted and void warranty.

2.3.5 Disposal

The end user must adhere to the pertinent regulations when disposing of the Controller SP92Y2. End users must hand over the system to either a licensed private or public disposal company or he must recycle the unit himself or dispose of it in accordance with the pertinent regulations. See Chapter 8.3 Disposal, 🗎 52.

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2.4 Residual Dangers

Fig. 2-1 *Residual dangers at the Controller SP92Y2*

Danger of lethal electrical shock at live parts connected to the mains

Personnel working with the Controller, must take note of the following safety guidelines.

	**⚠DANGER**
	Mains voltage. The Controller contains live voltage which are connected to the mains. Touching these parts can cause a lethal electrical shock. The system must be turned off and in a voltage-free state before you carry out any work at the Controller. Ground the equipment and secure the Controller against switching on inadvertently. Ensure that all covers are installed and nobody is remaining in the danger areas before you switch the Controller on again.

NOTE!
Only personnel with electrotechnical training are permitted to carry out work on the electrical equipment.

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3 Description

Fig. 3-1 *Controller Controller SP92Y2*

The Controller SP92Y2 continuously monitors the Chuck surface temperature using a precise platinum RTD sensor which is connected to a microprocessor controlled close loop temperature management system. It is operated via an top panel with a LED display. The Controller SP92Y2 is designed by minimum space requirement for installation in a prober. All control and service elements arranged on the top panel.

For a remote operation via PC or prober software, a RS232C interface are available in Controller SP92Y2.

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4 Installation

4.1 Personnel Qualifications

The standard of professional knowledge and experience which is usual for transport company personnel is an adequate qualification if the system is packaged and transported in accordance with the instructions given by a specially trained and authorized person. Only personnel with electrotechnical training are permitted to install the system.

4.2 Transport

The Controller SP92Y2 may only be transported in its original packaging units. The commissioned transport company must be specialized in the transport of delicate commodities.

⚠CAUTION

Damage to the system.

Improper handling during transportation can damage the system.

Measures:
- Pay attention to the packing symbols during transport.
- Always transport the system in its upright position and avoid shocks.

4.3 System Location Requirements

Environmental Conditions
At the Controller SP92Y2 site, the environmental conditions stipulated in Chapter 1.9.1 Ambient Conditions, 🗎 16 must be guaranteed.

Operating Media
The Controller SP92Y2 must be supplied with the required operating media during operation. See Chapter 1.9 Installation Data, 🗎 16. The supply lines must be routed in keeping with the local safety regulations.

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Space Requirements
Refer to Chapter 1.7 Dimensions and Weights, 15 for the dimensions of the Controller SP92Y2.

The safety clearance for the evacuation plan must be in accordance with the local safety regulations. Safety covers, etc., must be installed in such a way that the Controller SP92Y2 remains accessible for maintenance and service work.

4.4 Unpacking

4.4.1 General

NOTE!
Transport malpractices can damage the system. ERS® delivers the Controller SP92Y2 in a crate. Pay attention to the transport symbols and keep the crate upright!

1 Check the delivery papers to make sure the goods delivered match the specified equipment

2 Observe the transport symbols, Tilt watch and shock sensor on the packing units

3 Move the crate to the installation site

4 Remove the packing material and unpack the system carefully.

NOTE!
Keep the special packaging materials for later use. You will need them to transport and store the system. See Chapter 8.2 Storage, 51.

5 Examine the system for signs of transport damage

6 Make sure the system is complete. See Chapter 1.5 Scope of Delivery, 13.

7 Lodge any complaints immediately

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4.5 Connecting the Controller SP92Y2

All connectors on Controller SP92Y2 arranged on the front side of controller.

This chapter describes the following connections of the Controller SP92Y2:

- Voltage selection, see Chapter 4.5.1, 26
- Connecting the Controller to the Ground, see Chapter 4.5.2, 28

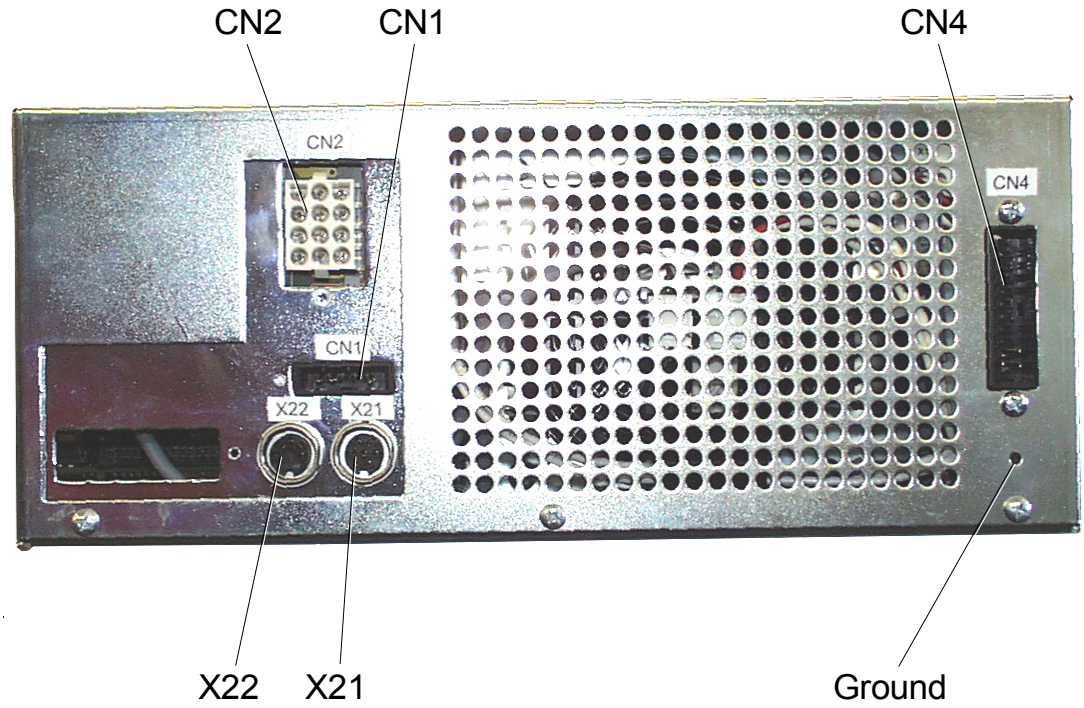

Fig. 4-1 *Front side of the Controller SP92Y2*

CN1 Mains connection
CN2 Chuck connection
CN4 RS232 interface
X21 Chiller connection
X22 not used

For the connection of other instruments to the Controller SP92Y2 refer to Fig. 4-1, 25 and the appropriate instrument manual.

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4.5.1 Voltage selection

NOTE!
Adhere to the stipulations for the electric supply in Chapter 1.9.2 Electrical Data, 16 when making electro-installations.

The ERS® Controller SP92Y2 is prepared for use at different input voltages.

Select setting at transformer	for use at rated mains voltage of	Allowed tolerance of voltage
230V	220V; 230V	200V through 242V
208V	200V; 208V; 210V	187V though 220V
120V	115V; 120V	110V though 130V
110V	110V	100V though 120V
100V	100V	90V though 110V

Tab. 4-1 *Voltage selection*

NOTE!
For electrical connections, take note of the relevant local/state and national codes and connect only in a safe and authorized manner.

⚠DANGER

Mains voltage.

The Controller contains live voltage which are connected to the mains. Touching these parts can cause a lethal electrical shock.

Measures:
- The Controller must be turned off and in a voltage-free state before you carry out any work in the danger areas.
- Ensure that nobody is remaining in the danger areas before you switch the system on again.

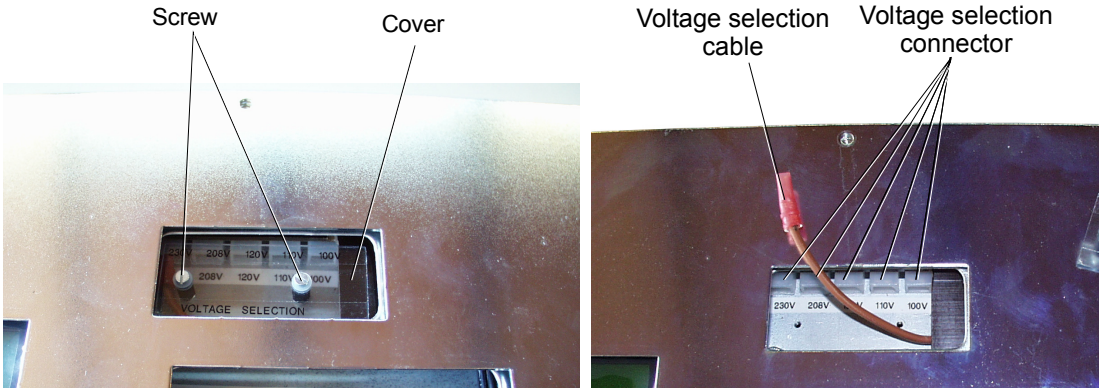

Fig. 4-2 *Voltage selection*

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- Open cover by unscrew of two captive screws (see Fig. 4-2, 🗎 26)
- Connect the voltage selection cable to voltage selection connector according to mains voltage (see Tab. 4-1, 🗎 26)

NOTE!
The standard voltage setting (state at delivery) is 230V.

⚠CAUTION

Damage the Controller SP92Y2.

Use with wrong voltage setting or wrong type of fuse can damage the system.

Measures:
- Make voltage selection according mains voltage.
- Use correct fuse according mains voltage.

- Change fuse according to mains voltage. Only use the fuses listed in Tab. 4-2, 🗎 27

Mains voltage	Fuse F1	Fuse F2	Fuse F3
100V - 120V	1.0 AT (time - lag)	4.0 AT (time - lag)	6.3 AT (time - lag)
200V - 230V	0.5 AT (time - lag)	2.0 AT (time - lag)	6.3 AT (time - lag)

Tab. 4-2 *Fuse selection*

The Controller SP92Y2 is equipped with three fuses. These fuses are easy to access at the top side of the Controller (see Tab. 4-3, 🗎 27).

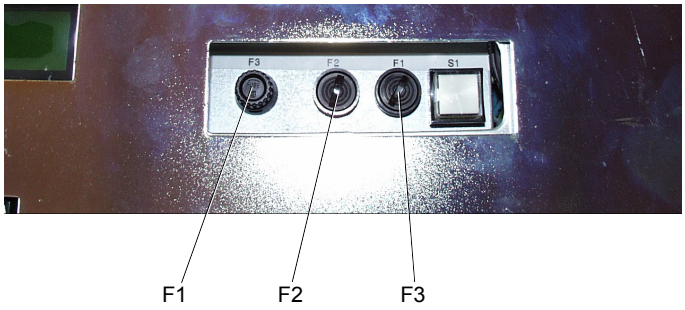

Fig. 4-3 *Location of the fuses at the Controller SP92Y2.*

The fuses can be changed by means of a screwdriver.

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4.5.2 Connecting the Controller to the Ground

The Controller Ground connection (Fig. 4-1, 🗎 25) must be connect to a Ground line.

Operate the Controller SP92Y2 in conjunction with a Chiller, the Controller Ground connection (Fig. 4-1, 🗎 25) must connected in line with the Chiller Ground connection.

If the Controller SP92Y2 mounted in the Rack of ERS® Chiller or mounted in another grounded metal rack, the ground connection of controller is not required.

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5 Operation

5.1 Operating Elements of the Controller SP92Y2

The operating elements of the Controller SP92Y2 are located on the front panel when Controller is turn on. (Fig. 5-1, 29).

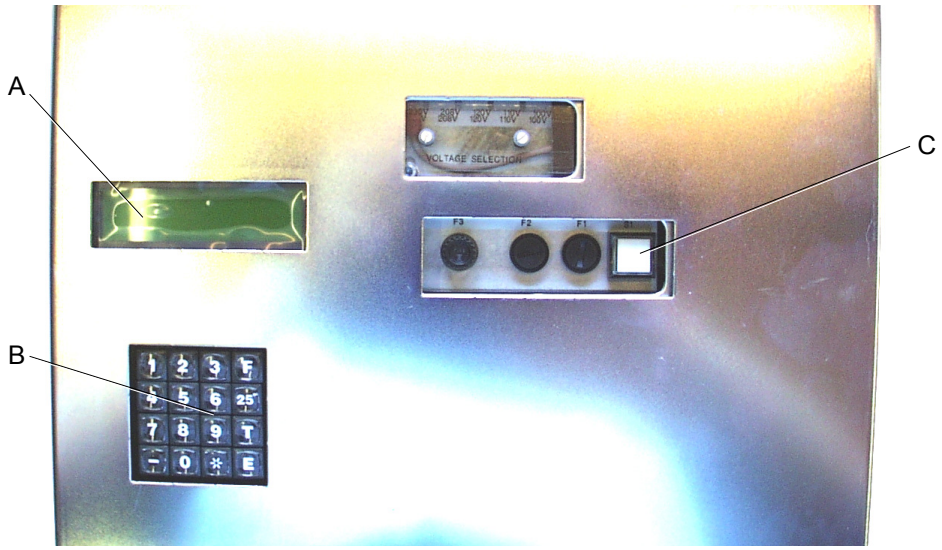

Fig. 5-1 *Control panel of the Controller SP92Y2*

A Display
B Keyboard
C ON/OFF Power Switch

Operating Elements

Item	Display	Function
A	Display	Show the actual chuck surface temperature and the set temperature or controller messages. See
B	Keypad	Enter set temperature values. See Chapter “Key functions”
C	ON/OFF power switch	switch the Controller SP92Y2 ON or OFF. See Chapter 5.2.1 Main Power Switch, 30

Tab. 5-1 *Operating elements*

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Key functions

Key	Key name	Function
0 ... 9	Numeric key	0 through 9: to enter set temperature values
-	Minus key	Set temperature input to negative values
*	Escape key	Stop input und restart preset temperature. Chapter 5.2.2.2 Escape Key “∗“, 🗎 31
F	Function key “F”	Start special purposes
25	Preset +25°C key	Activates the preset +25°C as set temperature. Chapter 5.2.2.4 25°C Key, 🗎 31
T	Function key “T”	To enter a set temperature value. See Chapter 5.2.2.3 Temperature recall Key “T”, 🗎 31.
E	Enter key	To enter a set temperature value. See Chapter 5.2.2.1 Enter Key”E”, 🗎 31.

Tab. 5-2 *Key functions*

5.2 Control Panel Functions

5.2.1 Main Power Switch

After this switch is turned ON, the controller performs a self test lasting approximately 1 second. While the self test is in progress “ERS AIRCOOL plus” appears in the first display line. The software version number is shown in the in the second line of the display.

Example:

ERS AirCool plus
Vx.x startup ...

Afterwards the display appears blank for a period of 1 second. Then the measured temperature “Temp and the set temperature “Set” are shown.

At startup the Controller SP92Y2 is set to a temperature of 25°C.

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5.2.2 Digit-Keyboard

5.2.2.1 Enter Key”E”

While in “Enter” mode (indicated by “Enter” in the second display line), the keys “0” through “9” are used to enter a new set temperature value. By pressing the “-” key you can toggle the values sign.

5.2.2.2 Escape Key “*“

The Escape-button “∗“ can be used to end the temperature input without changing the preselected “Set”-temperature.

5.2.2.3 Temperature recall Key “T”

The button “T” is used to recall the stored set temperature (see Chapter 5.2.2.1 Enter Key”E”, 31), after having passed a complete entering process. For example, if you pressed the “25°C” button, which automatically sets the chuck temperature to 25°C, you can switch back to your former set temperature. This set temperature value is stored in the controll unit memory even if the power is turned off.

5.2.2.4 25°C Key

This key activates a fixed set temperature of 25°C. There is no influence on the value saved as the set temperature, wich is activated by the “T” button.

5.2.3 Setting a Temperature Value

- In order to enter a new set temperature press the “E” button
- On the display you will see the lastest set temperature. Now enter the new set temperature with the digit keys.
- Press the button “T” to finish the procedure. The new parameter is now saved as set temperature. The control unit starts immediately to change the chuck temperature (see the “Temp” line of the display),

or

- Press the enter “E” button again. The new parameter is saved as preset which can be activated later on by pressing the “T” button.

The temperature input process can be stopped at any time by pressing the Esc-button “∗“. It will not affect the preselected temperature entered before.

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5.2.4 Setting Display Language

With this procedure you can change the language of the controllers display messages. (Described display messages assume the factory setting of English language).

- Press the “F” key once. The display shows “Special Function” in the bottom line.
- Press “0” to enter the country-code selection. Now the display show “Countrycode 1-3” in the second line.
- Press “1”; “2” or “3” according to the desired language (see Tab. 5-3, 32). The display switches back to normal mode with all messages in the selected language.

You can leave this procedure wihin the first two steps by pressing the “F” key once again wihtout changing the language setup.

Key	Language
1	English (factory setting)
2	German
3	Japanese

Tab. 5-3 Language selection

5.2.5 Setting Standby Mode

The AirCool®*plus* System can be switched to a so called “Standby Mode” for special puposes. While in Stanby Mode the unit will not keep track of the set temperature, because in this mode of operation all heating current and cooling function will be cut off. The Controller SP92Y2 will still monitor the chuck temperature but it will not try to correct any deviation. When the Standby Mode is released the controller will immediately start to track the set temperature again.

Selecting Standby mode via keyboard:

- Press special function key “F” once, line 2 of display show “Special Function”
- Press key “2” once, line 2 of display show “Standby Mode 0/1”
- Press “0” or “1” respectively if you want to switch Standby Mode off or on, line 2 of display show the set temperature if Standby Mode is off, or the string “Standby Mode” if Standby Mode is active.

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5.2.6 LCD-Display functions

The following information is presented on the display:
The first line shows the measured chuck temperature “Temp:”.
In the second line the preset chuck temperature is displayed “Set:”. The last right hand character of the second line shows a symbol for the internal state of the controller.
These symbols have the means:

↑	The control unit heats the chuck
↓	The control unit cools the chuck
=	The chuck has reached its “Set” temperature

If the software of the Controller SP92Y2 recognizes an error, then the display will show an error code (see Chapter 7 Troubleshooting, 🗎 45) in the second display line. Please contact a service technician if any error message appears.

5.3 Normal Start of Operation

Before starting the system have a look at the operating instruction, of this user manual to get familiar with the essential control panel and display elements. The following list shows a typical startup and quick functional check for a AirCool®*plus* -40°C through +160°C System.

Press ON/OFF power switch (see Fig. 5-1, 🗎 29 Item “C”). The display of Controller SP92Y2 will show a startup message (see Chapter 5.2.1 Main Power Switch, 🗎 30) for approximately two seconds. The startup message is replaced by the chuck temperature and the set temperature. Set temperature of 25.0°C is indicated and the system will adjust the chuck temperature towards this value.

If the actual chuck temperature is higher then 26.5°C the system will startup the cooling compressor of Chiller 03 system to speed up temperature adjustment. This depends on the actual differnce between setpoint and chuck temperature.

Set a preset temperature of 0°C (see Chapter 5.2.3 Setting a Temperature Value, 🗎 31). At least now the system will startup the cooling compressor. Watch the chuck temperature for 0°C. After a few minutes the system must have reached 0°C and stabilized.

Now set +25°C. The system must heat up and stabilize at 25°C.

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5.4 Remote Control via RS232

The serial interface RS232 may be operated with or without a special transmission protocol.

5.4.1 Communicating without Transmission Protocol

If no transmission protocol is selected, command strings are transmitted as ASCII characters. The Controller SP92Y2 will send «ok» if the command is accepted or «?» if the command is not accepted.

5.4.2 Communicating with Transmission Protocol

For safer communication, the Controller SP92Y2 uses a transmission protocol with start- and stop-flags and a checksum byte.

General Format of a Message
Messages are composed of control characters and commands. A message has the following format:

STX Message ETX LRC

Significance of the Control Characters

Mnemonic	ASCII Value	Significance
STX	02 Hex	Start-flag
ETX	03 Hex	Stop-flag
LRC		Check sum byte, calculated as the XOR function over STX Message ETX
ENQ	05 Hex	Enquiry
ACK	06 Hex	Acknowledged
NAK	15 Hex	Not acknowledged
CAN	18 Hex	Command unknown

Handshake Procedure
The protocol's handshake consists of the following procedure:

Request:

→ ENQ	Sending a request from host to Controller
← ACK	Receiving an acknowledgement from the Controller if it is ready
← NAK	Inform not acknowledged by the Controller if an error in transmission occurs

After receiving the acknowledgement ACK the transmission of data starts, i.e. STX Message ETX LRC is sent.

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Message:

← ACK	Sending an acknowledgement from the Controller to the host if the message was accepted
← NAK	Message not acknowledged by the Controller if an error in transmission occurs
← CAN	Received command is unknown

5.4.3 Sending Commands via RS232

In Tab. 5-4, 🗎 35 the commands which can be used for sending messages to the Controller SP92Y2 via the RS232 interface are listed. The following abbreviations are used in the table:

v Sign of value

x Value in units of 1/10°C
The number of x's indicates the number of decimals

y Number

NOTE!
All commands must be written in capital letters otherwise the Controller will not accept the command and will therefore answer with «CAN» when the protocol mode is on, or with «?» if no protocol is selected.

Command	Significance
SL0y	Keyboard lock • y = 0: release keyboard lock • y = 1: set keyboard lock (release with «Local» key possible)
SOy	Set operating mode (see Chapter 5.2.5 Setting Standby Mode, 🗎 32) • y = 0: switch unit off (not supported in Controller SP92Y2 software) • y = 1: set normal mode of operation • y = 2: set Standby Mode
SR+xx-xx	Set deviation range for status display «=» and RI-Request answer «0» • +xx: max. positive deviation in 1/10°C • -yy: max. negative deviation in 1/10°C Example: SR+12-08 sets the range from set temperature +1.2°C to set temperature -0.8°C
STvxxxx	Set new set temperature with 1/10°C resolution Example: ST+0305 sets +30.5°C as new set temperature

Tab. 5-4 *Send commands for communication via the RS232 interface*

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5.4.4 Requesting Commands via RS232

In Tab. 5-5, 36 the responce messages from the Controller SP92Y2 via the RS232 interface are listed. The following abbreviations are used in the table:

v Sign of value

x Value in units of 1/10°C
The number of x's indicates the number of decimals

y Number

Command	Significance	Response
RC	Request actual Chuck temperature with 1/10 °C resolution	Cvxxxx Example: C+0634 means that the Chuck temperature is +63.4°C
RE	Request error status	E0yy Example: E003 means that Error 03 has occurred. See Chapter 7 Troubleshooting, 45.
RI	Request status of Chuck	In • n = 0: set temperature reached and controlling • n = 1: heating up Chuck • n = 2: cooling down Chuck • n = 8: error
RL0	Request status of keyboard lock	L0y • y = 0: keyboard unlocked • y = 1: keyboard locked (release with Local key possible) • y = 2: keyboard locked (release only via «SL00» command possible)
RO	Request operation mode	Oy • y = 0: unit is off (not supported in Controller SP92Y2 software) • y = 1: normal operation • y = 4: save mode
RR	Request deviation range	R+xx-yy • +xx: max. positive deviation in units of 1/10°C • -yy: max. negative deviation in units of 1/10°C Example: R+05-08 means that the deviation ranges from set temperature +0.5°C to set temperature -0.8°C
RT	Request set temperature with 1/10 °C resolution	Tvxxxx Example: T-0105 means that the set temperature is -10.5°C

Tab. 5-5 Request commands for communication via the RS232 interface

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6 Maintenance and Service

6.1 Introduction

This chapter provides an overview of all the measures necessary for proper maintenance and servicing of the Controller SP92Y2.

The system can be operated with a minimum of difficulty when the measures for preventive maintenance and the specified working conditions and regulations are adhered to.

6.1.1 Safety Information

NOTE!
Before carrying out maintenance and service work on the Controller SP92Y2, the appointed personnel must have read and fully understood Chapter 2 Safety, 🗎 18.

In particular, the safety instructions contained in Chapter 2.4 Residual Dangers, 🗎 21 must be strictly adhered to.

6.1.2 Personnel Qualifications

Carrying out maintenance and service work applies only to personnel who have the required technical qualifications and have received appropriate instruction and training.

6.1.3 Use of Spare Parts and Aid Materials

Spare Parts
System parts affected by wear or defects may only be replaced by original ERS® spare parts.

Aid Materials
The term aid materials covers all usage and cleaning materials required for the maintenance and service of the Controller SP92Y2. Essentially, they are the cleaning and operating materials used.

Cleaning materials used:

- Dust-free, lint-free cloth
- Methanol, Ethanol, Isopropanol

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6.2 Tag-out Procedure

Maintenance and service work can be extremely dangerous if the serviced components are not shut down, de-energized and locked out properly. Contact with live parts, the release of stored energy, or the unexpected start-up of the serviced component can cause serious injury to personnel and also damage the equipment.

These hazards can be avoided through the strict use of the lockout/tagout procedure. In short, this means that you have to shut down, de-energize and tag out the component before servicing it. In Chapter 6.2.1 Applying Tag-out Devices, 38, this procedure will be described in detail.

6.2.1 Applying Tag-out Devices

Before beginning any maintenance or service work, the following steps must be performed in the given order:

Shut down

1 Prepare the Controller for shutdown (if necessary). Also make sure that the shutdown of the Controller will not affect running processes.

2 Shut off the Controller. See Chapter 5.1 Operating Elements of the Controller SP92Y2, 29.

3 Disconnect the Controller from the mains

4 Disconnect the mains cable from controller.

Tag-out

5 Post a prominent tag onto Controller. See Fig. 6-1, 39. This tag is a warning to others that the Controller must not be put back into operation until the tag have been removed by the authorized person. Tags must be written in a language that can be understood by all personnel. They must contain the following information:
- A warning text or prohibitive sign
- Name and phone number of the person in charge
- Date and time when the component has been locked out

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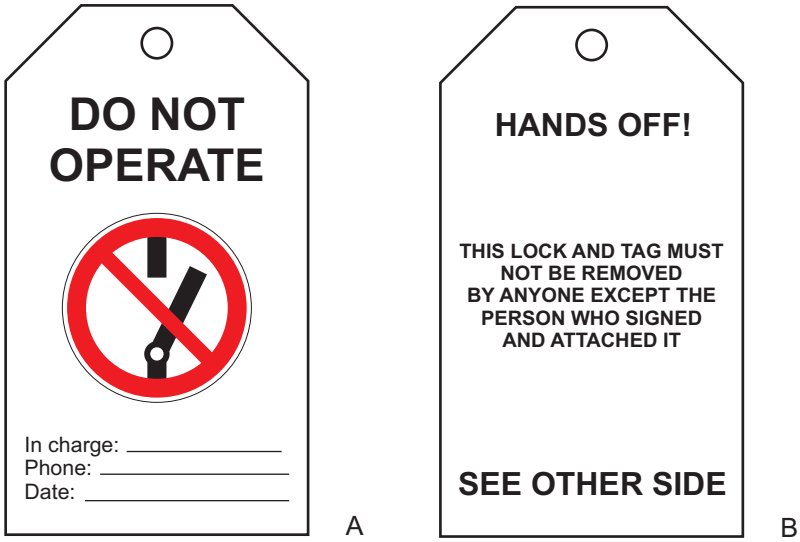

Fig. 6-1 *Front and back of a lockout tag (example)*

A Front *B Back*

Verify

6 Verify the isolated and de-energized state of the Controller

6.2.2 Removing Tag-out Devices

	⚠DANGER
	Tag-outs. Personnel who work on de-energized components may be seriously injured or killed if someone removes tag-out devices and re-energizes the component without their knowledge. Respect lock-out and tag-out devices! Locks and tags must not be removed by anyone except the person who attached them.

Before removing tag-out devices, the following steps must be performed:

1 Inspect the Controller to ensure that it is operationally intact and that nonessential items are removed from the area

2 Make sure that everyone is positioned safely and away from the component

3 Connect the power cord to controller and remove the tag

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4 Make sure that all employees who work with the Controller SP92Y2 know that the system will be energized

5 Energize the Controller by switch on controller.

6.3 Maintenance

6.3.1 Maintenance Schedule

The required maintenance work at the Controller SP72-T2 and Controller SP72-T2S must be carried out at regular intervals. In addition, you should always listen for unusual noises and pay immediate attention to any malfunction that occurs in the system during the interim period between official system inspection procedures.

Maintenance Verification
ERS® recommends that a record of all maintenance work performed on the Controller SP72-T2 and Controller SP72-T2S be kept in a logbook. This is particularly important if various different personnel are responsible for maintenance work on one system. A logbook allows the end user to keep a reliable check on the type and date of performed maintenance work.

Component	Action	Interval	Instructions
Controller SP92Y2	Basic Cleaning	Weekly	Chapter 6.3.2, 🗎 40
	Check fuses	Process-specific	Chapter 6.3.3, 🗎 41

6.3.2 Basic Cleaning

NOTE!
Before cleaning the Controller shut off the power supply.

Wipe dirt off the Controller SP92Y2 surface with a dust-free, lint-free cloth.

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6.3.3 Changing Fuses

DANGER

Mains voltage.

The controller contains live voltage which are connected to the mains. Touching these parts can cause a lethal electrical shock.

The controller must be disconnected from the mains. Secure the Controller to make sure that it can not be switched on again inadvertently before you change the fuses.

The Controller SP92Y2 is equipped with three fuses. These fuses are easy to access at the top side of the Controller. See Fig. 6-2, 41.

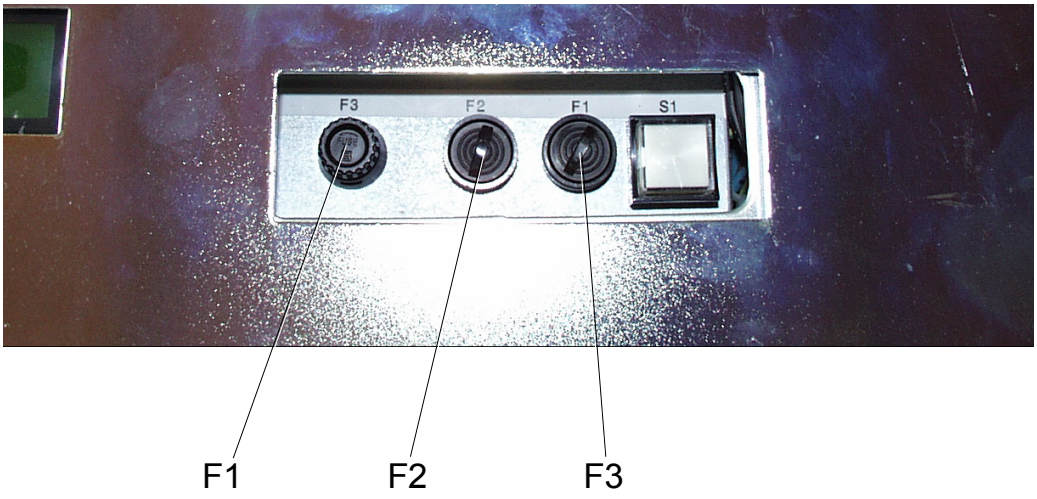

Fig. 6-2 *Location of the fuses at the Controller SP92Y2 topside*

The fuses can be changed by means of a screwdriver. Only use the fuses listed in Tab. 6-1, 41.

Mains voltage	Fuse F1	Fuse F2	Fuse F3
100V - 120V	1.0 AT (time - lag)	4.0 AT (time - lag)	6.3 AT (time - lag)
200V - 230V	0.5 AT (time - lag)	2.0 AT (time - lag)	6.3 AT (time - lag)

Tab. 6-1 *Fuses to be used*

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6.3.4 Prepare Controller SP92Y2 for maintenance

DANGER

Mains voltage.

The controller contains live parts which are connected to the mains. Touching these parts can cause a lethal electrical shock.

The controller must be disconnected from the mains. Secure the Controller to make sure that it can not be switched on again inadvertently before you change the power transistors.

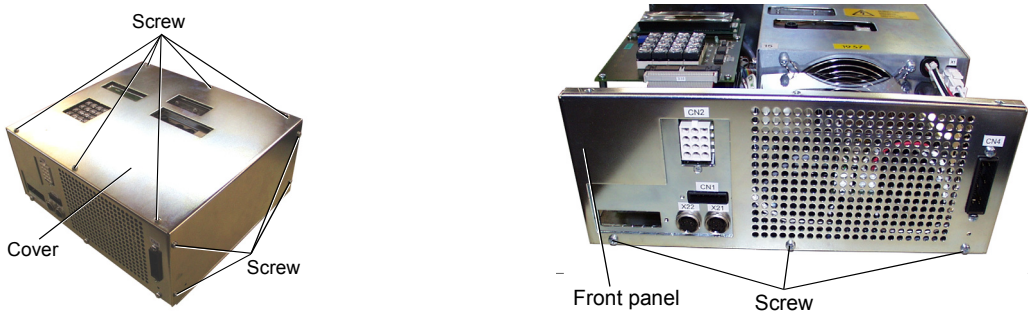

Fig. 6-3 *Cover of Controller SP92Y2*

- Unscrew six screws from top and eight screws from the left and right side of cover.
- Remove screws and cover.
- Untighten three screws on the front panel and fold the front panel forward.
- After maintenance install cover and screw in and tight all screws.

6.3.5 Changing the power transistors (PT)

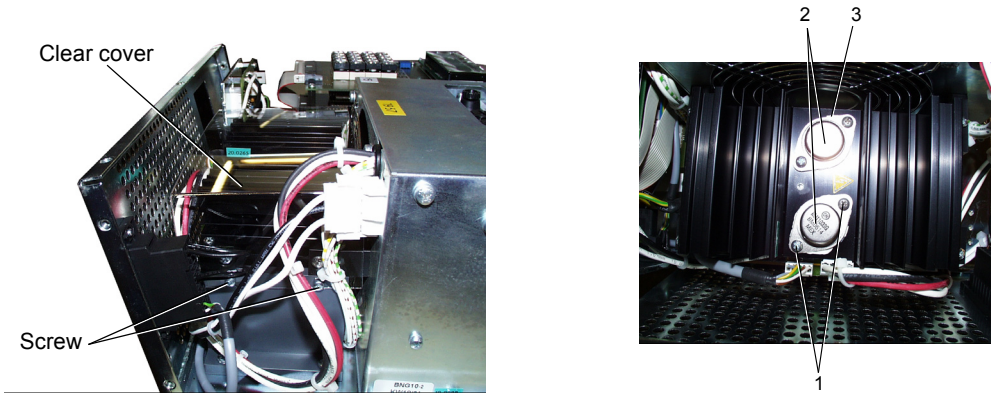

Fig. 6-4 *Power Transistor (PT)*

Pos.	Qty.	Description	Item Number
1	4	Screw	ERS-654268
2	2	Transistor	ERS-220061
3	0NB	Head sink compound	ERS-DC340

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Tab. 6-2 *Parts list: Power transistor*

- Remove clear cover from power amplifier. Untighten the screws left and right side when required.
- Unscrew and remove transistor screws (1).
- Remove both transistors (2) from sockets.
- Replace both transistors (2) with new parts of the same type. Use heat sink compound.
- Screw in and tight transistor screws (1).
- Install clear cover.

6.3.6 Changing the power amplifier (NB4)

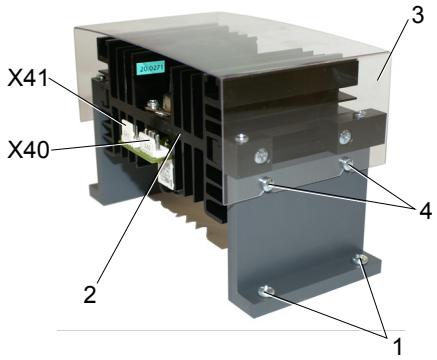

Fig. 6-5 *Power amplifier (NB4)*

Pos.	Qty.	Description	Item Number
1	4	Screw	ERS-654291
2	1	Power amplifier	ERS-1000042
3	1	. Clear Cover (Part of Pos. 2)	ERS-40700-006
4	1	. Screw (Part of Pos. 2)	ERS-654267

Tab. 6-3 *Parts list: Power amplifier*

- Remove clear cover from power amplifier. Untighten the screws left and right side when required.
- Disconnect the connectors X40 and X41.
- Unscrew and remove four screws (1).
- Remove defective power amplifier and install a new power amplifier (2).
- Screw in and tight four screws (1).
- Connect the connectors X40 and X41.
- Install clear cover.

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7 Troubleshooting

7.1 Possible problems at first time of operation

The problems decribed below may occur when first starting up. Normally they are caused for example by plugs that are not connected properly. In such cases a malfunction of a system's component is not involved.

Symptom	Cause
After switching on the prober the Controller SP92Y2 does not operate	• the power switch of the Controller SP92Y2 is not on. • the prober software is not booted yet, so that the prober has not yet turned on the controller power. • in the Setup of the prober software correct chuck-type is not selected. • the fuse F1 is broken, because of wrong voltage setting, or wrong type of fuse.
There is no communication from the prober to the Controller SP92Y2	• the interface cable to the Controller SP92Y2 is not correctly connected at socket CN4. • in the Setup of the prober software correct chuck-type is not selected.
Although it is set to a lower temperature, the chuck is not cooling or cooling very slowly. (the controller does not display an error message)	• the air tubes are creased or squeezed. • Chiller 03 fuse broken or voltage wrong.

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7.2 Error message at start up

Symptom	Cause
Chiller 03 does not work	• the connection between Controller SP92Y2 connector X21 and the Chiller 03 connector XC12 is interrupted. • Chiller 03 circuit breakers broken.
No reasonable chuck temperature indicated and after a short delay the error message “Pt100 cable def.” appears.	• the connection between Controller SP92Y2 connector XF1 and the Chuck is interrupted.
Error message “chuck cable def.” appears a short time after switching on at the Controller SP92Y2 display	• the connection between Controller SP92Y2 connector XF1 and the Chuck heating device is interrupted. • the fuse F2 and/or F3 is broken.
Error message “thermosens. fail” flashing in Controller SP92Y2 display	• the connection between Controller SP92Y2 connector XF1 and the Chuck is interrupted.

7.3 Error Messages and Recovery

If an error message is displayed an dead end error has occurred. To reset the error condition cycle power switch off the Controller SP92Y2.

If you cannot solve the problem by means of the descriptions in the following table, contact ERS® electronic GmbH to get further assistance.

Error message	Problem	Possible causes and recovery
E002, E003	The analog/digital-circuit, controlling the Chuck temperature recognizes an overflow. The Controller SP92Y2 will shut off the chuck power supply.	The cable connection (CN2 or X21) from the Controller to the Chuck is interrupted. One of the wire connections to the Chuck is broken or grounded. Check the Chuck cables. See Fig. 7-3, 🗎 50.
E006	The Chuck temperature has passed the maximum temperature limit by more than 2°C. The Controller switches off the Chuck supply (Dead end error).	Switch the Controller OFF, then ON again after cooling down to the set temperature.

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Error message	Problem	Possible causes and recovery
E008	The sensor monitoring the cooling unit temperature can not be read by the software.	Check cooling unit for loose connectors or damaged wiring. Check CN2
E040	A/D-Converter defect.	Change A/D-Converter. Call ERS® electronic GmbH for support.
E061	The protective circuit has detected too much current to the Chuck heater. The Controller will shut off the Chuck power supply. (Dead end error)	Switch the Controller OFF, then ON again after two minutes. If the error appears again replace both transistors (PT) of the power amplifier (NB4). See Fig. 6-4, 🗎 42. Check fuse F2 and F3.
E062	While the heating process, the control unit discovers that there is no voltage along the chuck wiring.	Check fuse F2 and F3. Replace power amplifier (NB4). See Fig. 6-5, 🗎 43.
E063	The control unit measures no heating current, although there is voltage to the chuck.	Check the wiring to the Chuck for unplugged or broken lines.
E064	Overtemperature switch of power amplifiere NB4 has cut off chuck power supply.	Check the air flow through Controller SP92Y2 for obstacles. Check if the air flow through the fan is blocked.
E074	Overtemperature switch of transformer TR1has cut off chuck power supply.	Check the air flow through Controller SP92Y2 for obstacles. Check if the air flow through the fan is blocked.
E099	EEPROM check sum error or EEPROM defect.	Change EEPROM. (Correct software version required). Call ERS® electronic GmbH for support.

Tab. 7-1 *Error messages and recovery*

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7.4 Location of Controller Components

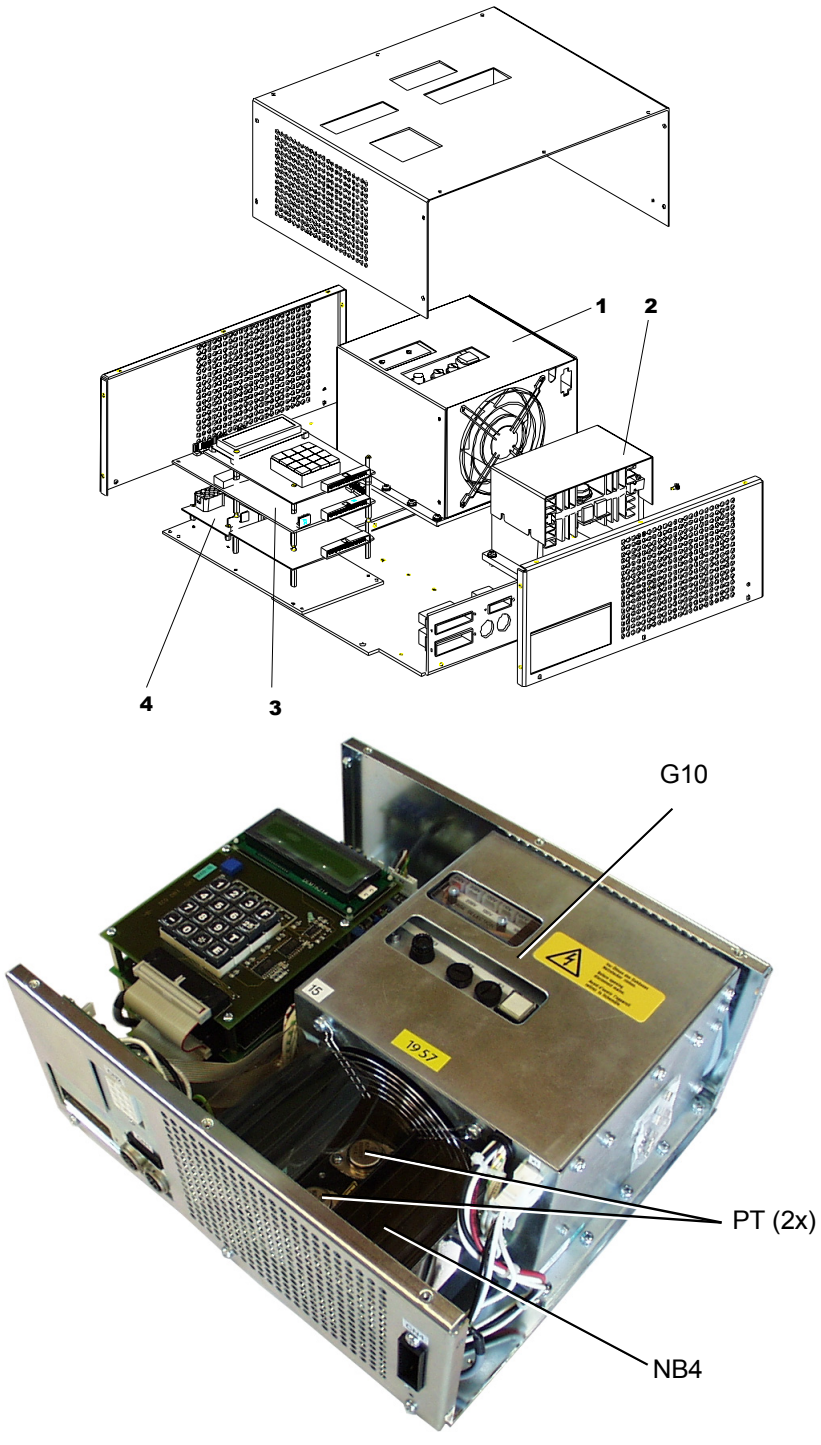

Fig. 7-1 *Location of the Controller components*

Pos.	Description	Part Number	Pos.	Description	Part Number
1	Power supply	G10	4	Connector assy	ASM21
2	Power amplifier	NB4	PT	Power transistor	
3	PCB assembly	ASM11			

Tab. 7-2 *Controller cpmponents*

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7.5 Wiring of Power Supply G10

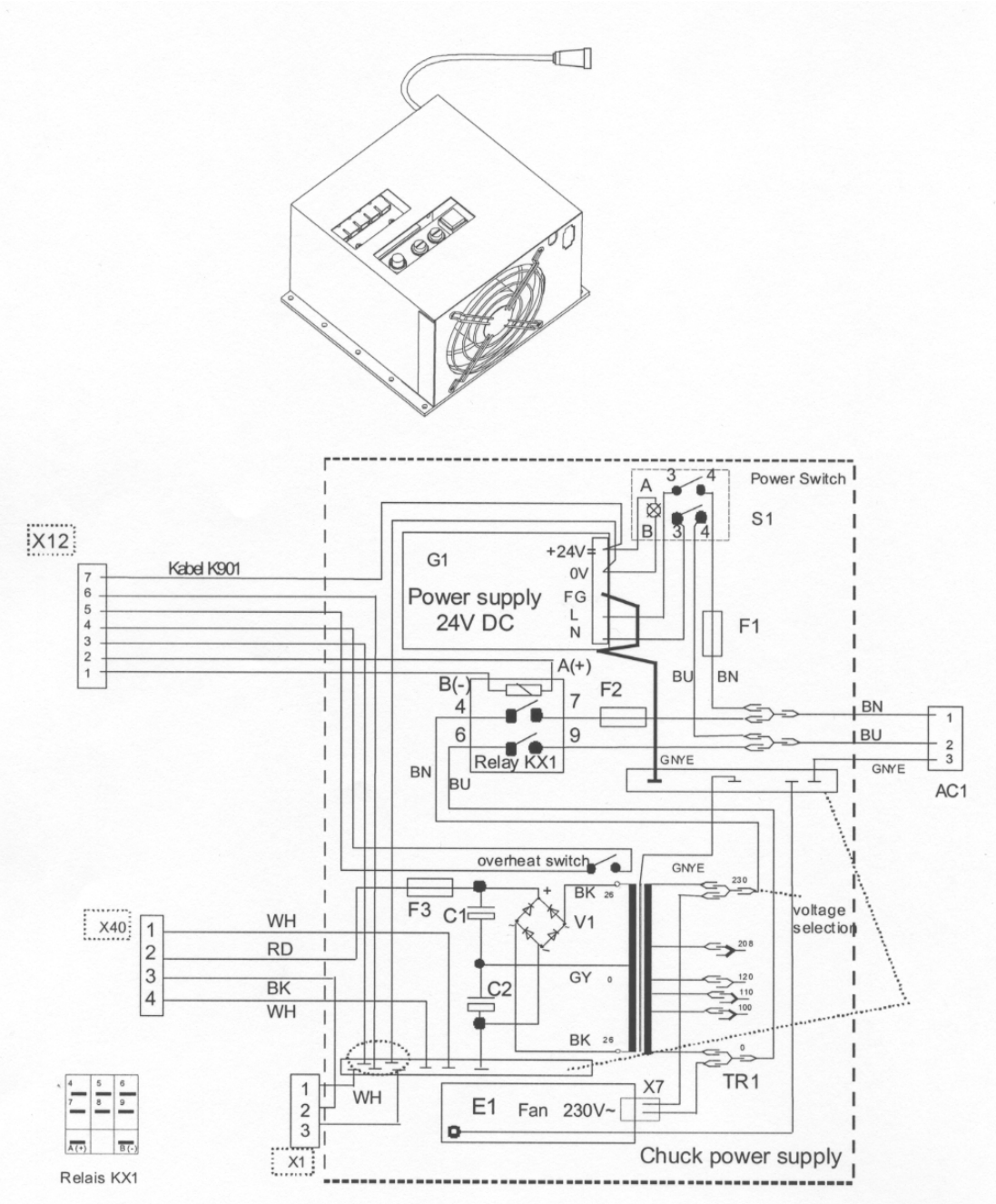

Fig. 7-2 *Wiring of power supplies*

7.6 Cable ACK007T Wiring

Fig. 7-3, 50 shows the wiring of the cable connecting the ERS® Chuck with port CN2at the front side of the Controller SP92Y2.

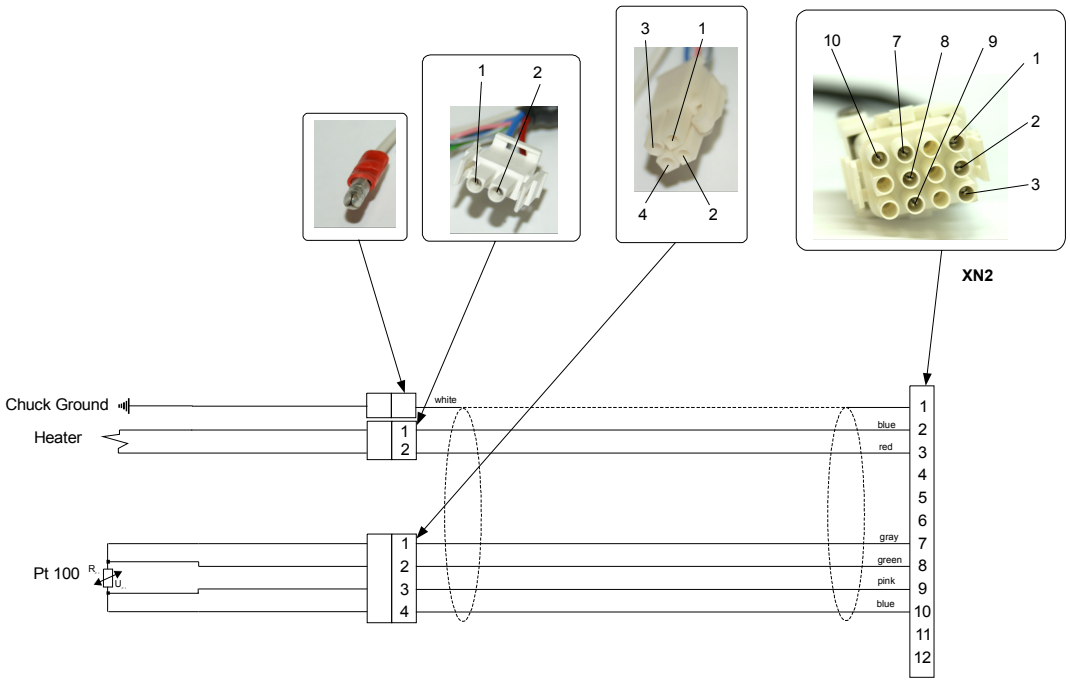

Fig. 7-3 *Cable ACK007T wiring*

Resistance check between pins of the XN2 socket:

From Pin	To Pin	Approximate resistance	Remarks
2	3	10 - 12 Ω	Resistance of heater
7	8	110 Ω	Resistance of the Pt100 temperature sensor at room temperature.
8	9	1.5 Ω	Resistance of connecting lines
9	10	110 Ω	Resistance of the Pt100 temperature sensor at room temperature.
7	10	1.5 Ω	Resistance of connecting lines

Tab. 7-3 *Resistance check*

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8 Storage, Disposal

8.1 Safety Regulations

Read Chapter 2 Safety, 18, before you dispose of the system or put it into storage. Adhere to the danger notes which appear in this chapter.

8.2 Storage

The Controller SP92Y2 may only be stored in its original packaging. You must note the packaging symbols and adhere to the following storage conditions:

Storage Conditions

Temperature	+5°C through 60 °C
Relative humidity	20 - 60% (non-condensing)

Tab. 8-1 *Storage conditions*

Required Space

Controller SP92Y2 (LxBxH)	Approx. 400 mm × 350 mm × 200 mm (15.75" × 13.78" × 7.87")

Tab. 8-2 *Required space for storage*

8.2.1 Deactivating the System

1. Switch off the Controller SP92Y2. See Chapter 5.1 Operating Elements of the Controller SP92Y2, 29.
2. Disconnect the Controller SP92Y2 from the mains supply.
3. Remove Controller SP92Y2 from System.
4. Cover the system with plastic foil to protect it from dust.

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8.3 Disposal

8.3.1 Personnel Qualifications

The end user can recycle or dispose of the system in accordance with the legal regulations. For the proper dismantling of the system and the sensible separation of materials, you require wide knowledge of mechanical work and in differentiating between waste materials.

NOTE!
ERS® electronic GmbH offers cost free recycling of the Controller SP92Y2.

For using this option send the Controller SP92Y2 carriage paid to:

ERS electronic GmbH
Stettiner Straße 3 + 5
D-88110 Germering.

All components must be stored in its original packaging and declared with an recycling order.

Additional Qualifications
If dangerous materials as defined by guideline 91/689/EWG are being disposed of, the persons carrying out the work require additional knowledge in the following areas:

- Risks and dangers
- Disposal regulations
- Accident prevention regulations
- First aid measures

8.3.2 Statutory Basis

Responsibilities
The end user is responsible for correct disposal of the Controller SP92Y2. End users can either hand over the system to a licensed private or public disposal company or they can recycle the unit themselves or dispose of it in accordance with the pertinent regulations.

NOTE!
If the end user hands over the Controller SP92Y2 to a disposal company then he/she must also forward a copy of this User Manual to the company in question. This User Manual contains important information which is required for system disposal.

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Obligation to Register
Companies that dispose of and recycle their own waste material must be officially licensed to do so and are subject to official supervision. They can, under certain circumstances, be exempted from the obligatory license, provided that they are in a position to meet the demands for protection of the environment. These companies are obliged to register. For further information, contact the departmental office competent for environmental protection.

Environmental Statutes
Waste material must be recycled or disposed of in a manner which does not present a health hazard. Use only procedures and methods which do not cause damage to the environment. In particular, make sure that

- Air, water and ground are not contaminated
- Flora and fauna are not endangered
- Irritation from noise and odors does not occur
- Environment and landscape are not adversely affected

Classification
Subsequent to dismantling the system, you must sort the individual system parts into their respective waste categories. Do this in accordance with the classifications contained in the current European Waste Catalog (EWC) or other similar statutes. The EWC catalog is valid for all waste material irrespective of intention; i.e. if the material is destined for disposal or recycling.

Administration of Waste Material
Adhere to the official handling and administration plans which outline the procedure for dealing with waste material. These plans comprise the following:

- Type, amount and origin of waste material
- General technical regulations
- Special arrangements for specific waste products
- Suitable regions for dumping grounds and other disposal installations

The plans also include the following information:

- Natural persons and legal entities who have authorization to deal with waste material
- The estimated costs for recycling and disposal
- Measures which can be implemented to rationalize collection, sorting and handling of waste material
- Identification labels for hazardous waste

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8.3.3 Disposal of Assemblies and Components

Metals and Alloys

- Aluminum (casing, cover plates, etc.)
- Copper (electric lines)
- Steel (profiles, mounting materials such as screws, etc.)
- Stainless steel

Glass

- Glass cover plates
- Glass plates in display instruments

Synthetic Material and Rubber

- Synthetic material (command elements, tubing, casing, etc.)
- Rubber (seals, silicon tubing)

Composite Material

- Electrical material (cables, components)
- Electronic material (printed circuit boards)

Packaging

- Wood (packing cases)
- Styrofoam (packing material)
- Plastic (foil)
- Iron (nails, etc.)

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9 Appendix

9.1 Temperature Conversion Table °C <-> °F

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
		-9	15.8	33	91.4	75	167.0	117	242.6	159	318.2
-50	-58.0	-8	17.6	34	93.2	76	168.8	118	244.4	160	320.0
-49	-56.2	-7	19.4	35	95.0	77	170.6	119	246.2	161	321.8
-48	-54.4	-6	21.2	36	96.8	78	172.4	120	248.0	162	323.6
-47	-52.6	-5	23.0	37	98.6	79	174.2	121	249.8	163	325.4
-46	-50.8	-4	24.8	38	100.4	80	176.0	122	251.6	164	327.2
-45	-49.0	-3	26.6	39	102.2	81	177.8	123	253.4	165	329.0
-44	-47.2	-2	28.4	40	104.0	82	179.6	124	255.2	166	330.8
-43	-45.4	-1	30.2	41	105.8	83	181.4	125	257.0	167	332.6
-42	-43.6	0	32.0	42	107.6	84	183.2	126	258.8	168	334.4
-41	-41.8	1	33.8	43	109.4	85	185.0	127	260.6	169	336.2
-40	-40.0	2	35.6	44	111.2	86	186.8	128	262.4	170	338.0
-39	-38.2	3	37.4	45	113.4	87	188.6	129	264.2	171	339.8
-38	-36.4	4	39.2	46	114.8	88	190.4	130	266.0	172	341.6
-37	-34.6	5	41.0	47	116.6	89	192.2	131	267.8	173	343.4
-36	-32.8	6	42.8	48	118.4	90	194.0	132	269.6	174	345.2
-35	-31.0	7	44.6	49	120.2	91	195.8	133	271.4	175	347.0
-34	-29.2	8	46.4	50	122.0	92	197.6	134	273.2	176	348.8
-33	-27.4	9	48.2	51	123.8	93	199.4	135	275.0	177	350.6
-32	-25.6	10	50.0	52	125.6	94	201.2	136	276.8	178	352.4
-31	-23.8	11	51.8	53	127.4	95	203.0	137	278.6	179	354.2
-30	-22.0	12	53.6	54	129.2	96	204.8	138	280.4	180	356.0
-29	-20.2	13	55.4	55	131.0	97	206.6	139	282.2	181	357.8
-28	-18.4	14	57.2	56	132.8	98	208.4	140	284.0	182	359.6
-27	-16.6	15	59.0	57	134.6	99	210.2	141	285.8	183	361.4

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°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-26	-14.8	16	60.8	58	136.4	100	212.0	142	287.6	184	363.2
-25	-13.0	17	62.6	59	138.2	101	213.8	143	289.4	185	365.0
-24	-11.2	18	64.4	60	140.0	102	215.6	144	291.2	186	366.8
-23	-9.4	19	66.2	61	141.8	103	217.4	145	293.0	187	368.6
-22	-7.6	20	68.0	62	143.6	104	219.2	146	294.8	188	370.4
-21	-5.8	21	69.8	63	145.4	105	221.0	147	296.6	189	372.2
-20	-4.0	22	71.6	64	147.2	106	222.8	148	298.4	190	374.0
-19	2.2	23	73.4	65	149.0	107	224.6	149	300.2	191	375.8
-18	-0.4	24	75.2	66	150.8	108	226.4	150	302.0	192	377.6
-17	1.4	25	77.0	67	152.6	109	228.2	151	303.8	193	379.4
-16	3.2	26	78.8	68	154.4	110	230.0	152	305.6	194	381.2
-15	5.0	27	80.6	69	156.2	111	231.8	153	307.4	195	383.0
-14	6.8	28	82.4	70	158.0	112	233.6	154	309.2	196	384.8
-13	8.6	29	84.2	71	159.8	113	235.4	155	311.0	197	386.6
-12	10.4	30	86.0	72	161.6	114	237.2	156	312.8	198	388.4
-11	12.2	31	87.8	73	163.4	115	239.0	157	314.6	199	390.2
-10	14.0	32	89.6	74	165.2	116	240.8	158	316.4	200	392.0

Tab. 9-1 *Temperature conversion table*

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9.2 Pressure Conversion Tables PSI <-> bar

9.2.1 Conversion PSI -> bar

PSI	bar		PSI	bar		PSI	bar		PSI	bar
5	0.34		65	4.48		125	8.61		185	12.75
10	0.69		70	4.82		130	8.96		190	13.09
15	1.03		75	5.17		135	9.30		195	13.44
20	1.38		80	5.51		140	9.65		200	13.78
25	1.72		85	5.86		145	9.99		205	14.12
30	2.07		90	6.20		150	10.34		210	14.47
35	2.41		95	6.55		155	10.68		215	14.81
40	2.76		100	6.89		160	11.02		220	15.16
45	3.10		105	7.23		165	11.37		225	15.50
50	3.45		110	7.58		170	11.71		230	15.85
55	3.79		115	7.92		175	12.06		235	16.19
60	4.13		120	8.27		180	12.40		240	16.54

Tab. 9-2 *Pressure conversion table PSI -> bar*

9.2.2 Conversion bar -> PSI

bar	PSI		bar	PSI		bar	PSI		bar	PSI
1	14.50		5	72.52		9	130.53		13	188.54
1.5	21.75		5.5	79.77		9.5	137.78		13.5	195.79
2	29.01		6	87.02		10	145.03		14	203.04
2.5	36.26		6.5	94.27		10.5	152.28		14.5	210.29
3	43.51		7	101.52		11	159.53		15	217.55
3.5	50.76		7.5	108.77		11.5	166.78		15.5	224.80
4	58.01		8	116.02		12	174.04		16	232.05
4.5	65.26		8.5	123.28		12.5	181.29			

Tab. 9-3 *Pressure conversion table bar -> PSI*

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