sartorius
mechatronics

Instrument Manual

Ethernet Transmitter Series PR 5220

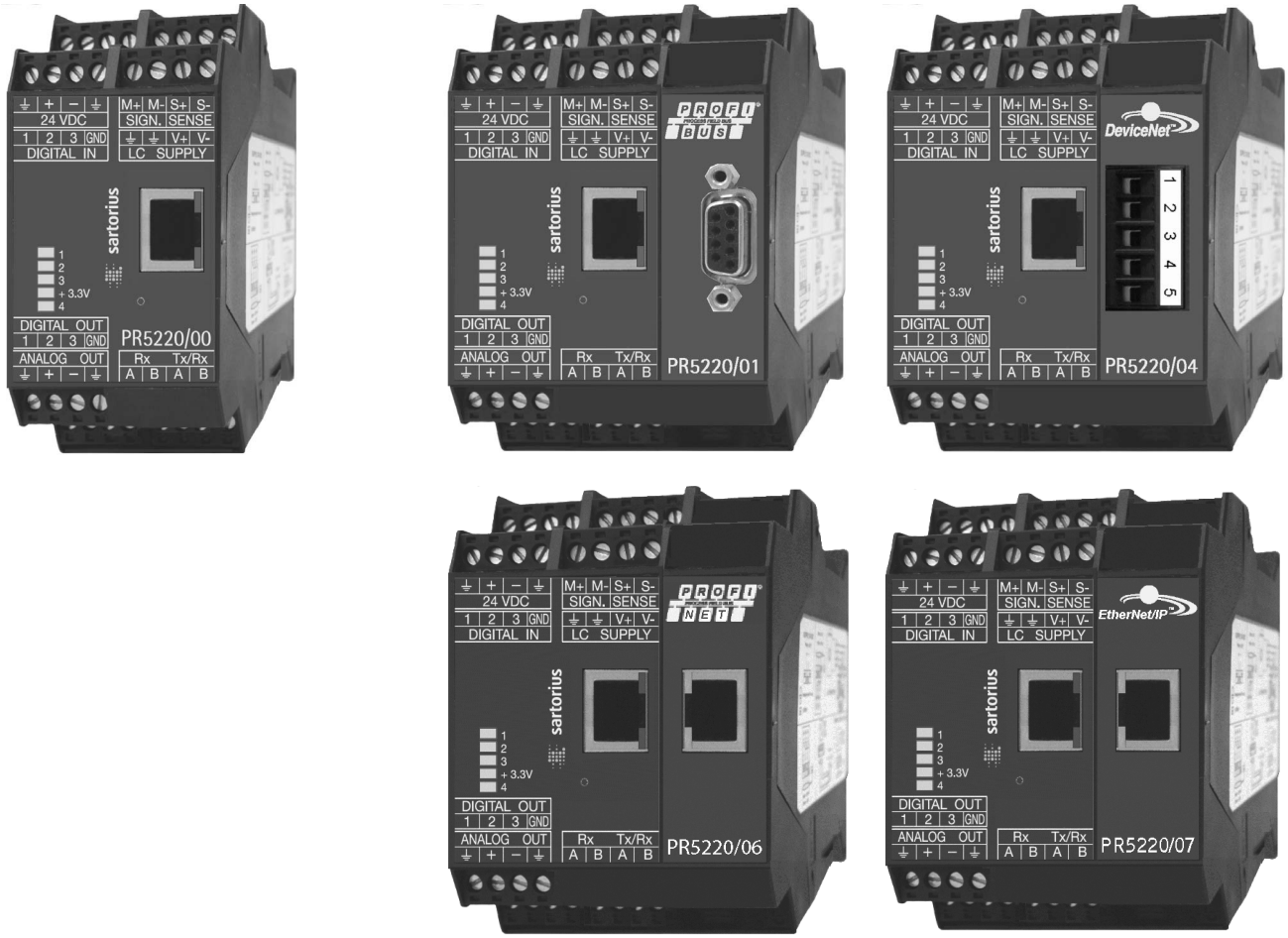
PR 5220/00 Ethernet Transmitter

PR 5220/01 Ethernet Transmitter with ProfiBus

PR 5220/04 Ethernet Transmitter with DeviceNet

PR 5220/06 Ethernet Transmitter with ProfiNet I/O

PR 5220/07 Ethernet Transmitter with EtherNet-IP



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Please note

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Table of Contents

1 Safety Information

1.1 General Information

The instrument was in perfect condition with regard to safety features when it left the factory. To maintain this condition and to ensure safe operation, the operator must follow the instructions and observe the warnings in this manual.

1.2 Intended Use

The instrument is intended for use as an indicator for weighing functions. Product operation, commissioning and maintenance must be performed by trained and qualified personnel who are aware of and able to deal with the related hazards and take suitable measures for self-protection.

The instrument reflects the state of the art. The manufacturer does not accept any liability for damage caused by other system components or due to incorrect use of the product.

1.3 Initial Inspection

Check the content of the consignment for completeness and inspect it visually for signs of damage that may have occurred during transport. If there are grounds for rejection of the goods, a claim must be filed with the carrier immediately and the Sartorius sales or service organization must be notified.

1.4 Before Commissioning

Visual inspection:

Before commissioning and after and storage or transport, inspect the instrument visually for signs of mechanical damage.

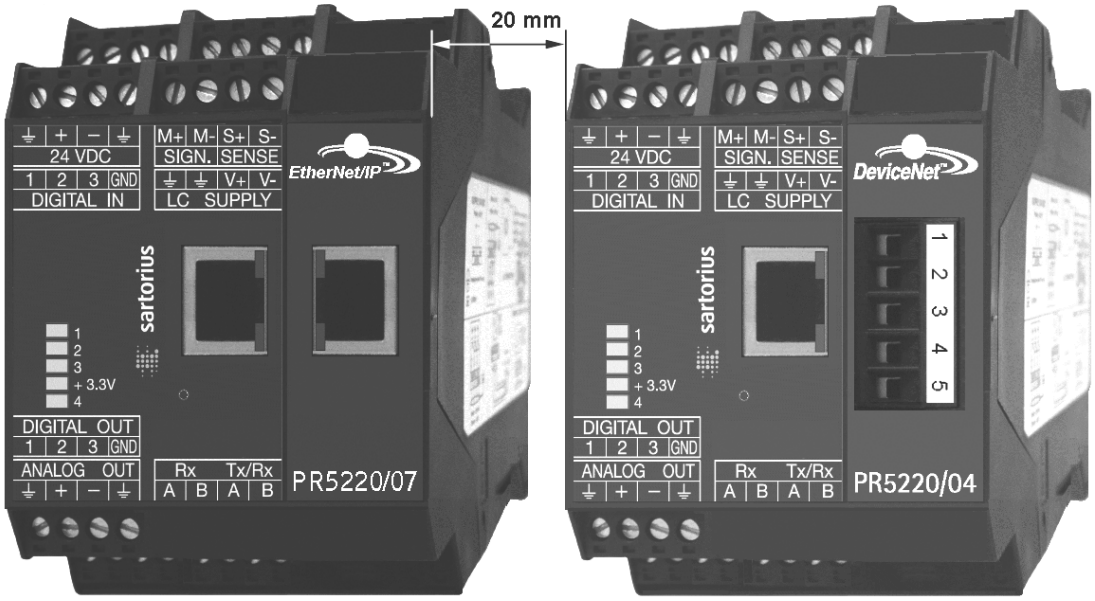
1.4.1 Installation

The instrument is designed for mounting on standard rails (35 mm, acc. to DIN 46277).

Caution!

Excessive heat may reduce the instrument lifetime!

When mounting on the rail, make sure that the distance from other instruments left and right of the module is at least 20 mm.



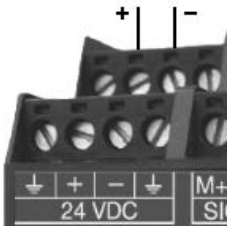
1.4.2 Electrostatically Sensitive Components

This instrument contains electrostatically sensitive components. For this reason, an equipotential bonding conductor must be connected when working on the open instrument (antistatic protection).

1.4.3 Protective Earth

Connection to protective earth must be performed via the mounting rail.

1.4.4 Supply Voltage Connection



The supply voltage is 24V DC +10% / -15%.

Max. power consumption of

- PR 5220/00: 6.5 W
- PR 5220/01: 8.5 W
- PR 5220/04: 8.5 W
- PR 5220/06: 8.5 W
- PR 5220/07: 8.5 W

For connection to 230/115 V AC, an external power supply (e.g. Sartorius PR 1624/00 or Phoenix Mini Power) is required.

1.4.5 Failure and Excessive Stress

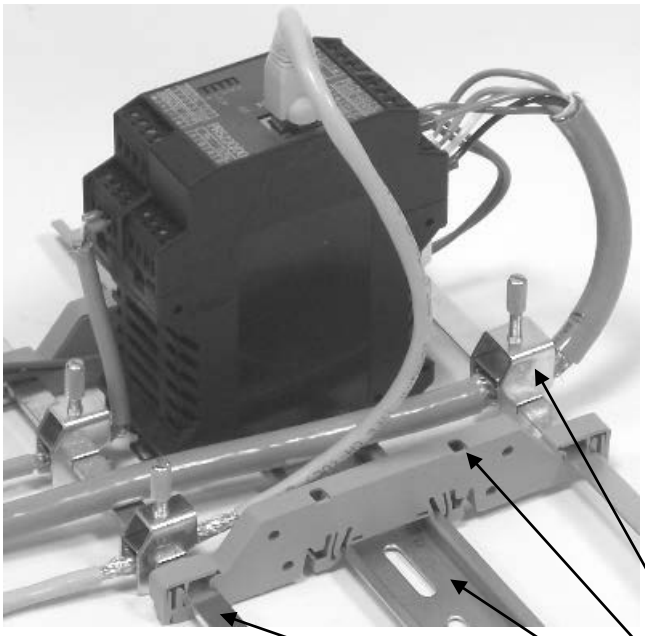
If there is any reason to assume that safe operation of the instrument is no longer ensured, shut it down and make sure it cannot be used. Safe operation is no longer ensured if any of the following is true:

- The instrument is physically damaged
- The instrument does not function
- The instrument has been subjected to stresses beyond the tolerance limits (e.g., during storage or transport).

1.4.6 Fuse

This instrument does not have a replaceable fuse. The load cell supply voltage is protected against short circuit. In case of failure of the load cell supply voltage, disconnect the instrument from the supply voltage, determine the cause and take remedial measures. Subsequently, the supply voltage can be switched on again.

1.4.7 EMC-Compliant Installation



- Use only screened data cables.
- Connect screens on both ends with ground.
- Keep unscreened cable ends short.
- Connect screen rail to cabinet / housing with low impedance.
- Use metal or metallized connector housings.
- Establish equipotential bonding between instruments / system modules (Mandatory for Ex-applications).
- Use standard reference potential.
- Connect mounting rail to protective earth.
- Install measure and data cables separately from power cables.

2 Ethernet Transmitter Series

2.1 The Transmitter Versions

Three PR 5220 series transmitter versions are available; subsequent extension of the version is not possible. The version is determined unambiguously by the type number. The front foils are adapted to the version.

PR 5220/00

PR 5220/01

PR 5220/04

PR 5220/06

PR 5220/07

2.1.1 PR 5220/00 Version

This version has digital inputs and outputs as well as an analog output and a LAN adaptor for configuration and operation of the instrument. Connecting e.g. a remote indicator is possible via the serial output.

2.1.2 PR 5220/01 ProfibBus

In addition to PR 5220/00, the instrument is provided with a ProfiBus port.

2.1.3 PR 5220/04 DeviceNet

In addition to PR 5220/00, the instrument is provided with a DeviceNet port.

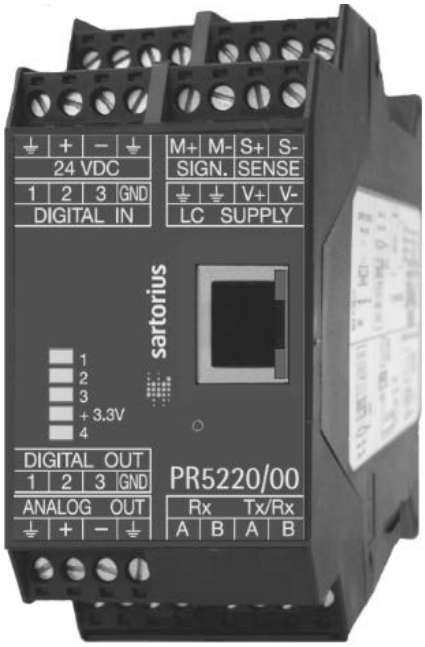
2.1.4 PR 5220/06 ProfiNet I/O

In addition to PR 5220/00, the instrument is provided with a ProfiNet I/O port.

2.1.5 PR 5220/07 EtherNet-IP

In addition to PR 5220/00, the instrument is provided with a EtherNet-IP port.

2.2 Overview of the Instrument



- Accuracy 10,000 e @ 6 samples/sec
- Internal resolution: 7.5 million counts
- Linearity: < 0.002%
- Sampling rate: 6 ... 100/sec selectable
- Digital filter with selectable characteristic
- Electrically isolated interfaces
- 3 programmable pairs of limit values
- 24 VDC supply voltage connection
- Connection using plug-in terminal blocks
- Socket for LAN adaptor
- The instrument is provided for snap-on mounting on a standard rail.
- 5 status LEDs für supply voltage, communication, error detection

Calibration and configuration of the instrument are menu guided using a PC.

- Calibration with weight, using the mV/V method or with load cell data ("smart calibration")
- 0/4 ... 20 mA analog output, configurable for gross/net weight
- Analog value via fieldbus
- 3 digital input channels, electrically isolated
- 3 digital output channels, electrically isolated

Communication protocols

For the internal RS-485:

- Remote display protocol
- SMA protocol
- xBPI protocol

For the internal LAN:

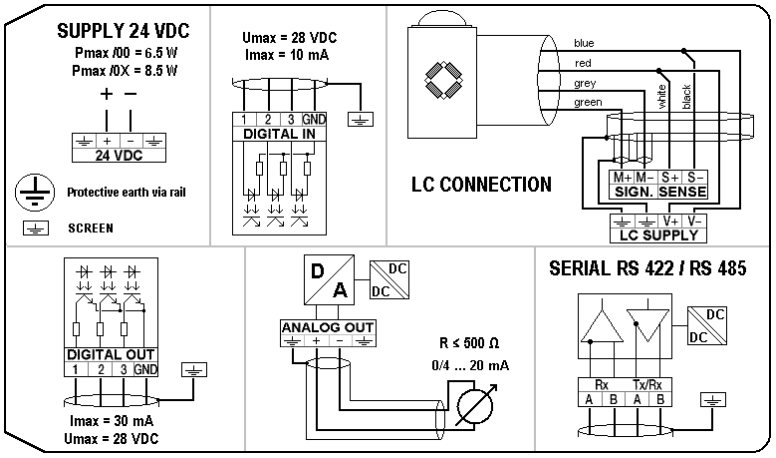
- ModBus-TCP
- Ethernet-TCP/IP
- OPC

Fieldbus slave:

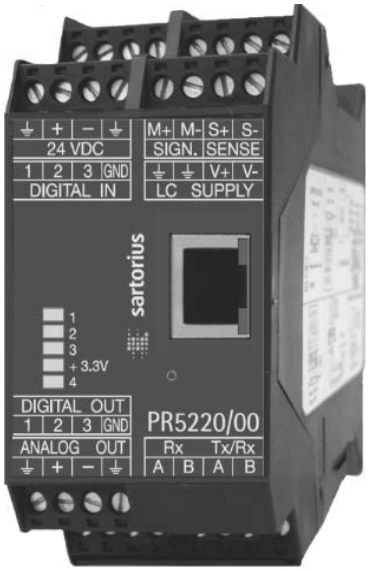
- PR 5220/01 ProfiBus-DP
- PR 5220/04 DeviceNet
- PR 5220/06 ProfiNet I/O
- PR 5220/07 EtherNet-IP

2.3 Label on the Housing

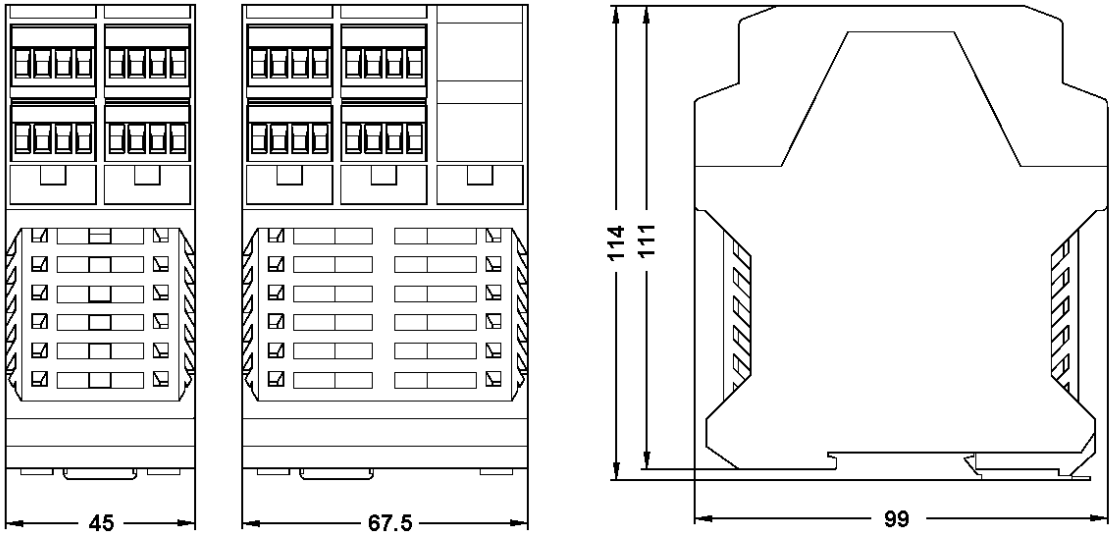
A label with the wiring diagram is located on one side of the instrument:



2.4 Housing Dimensions



PR 5220/00 **PR 5220/01, -/04, -/06, -/07**

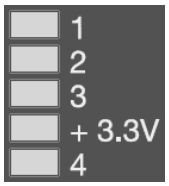


2.5 Display and Controls

2.5.1 Status LEDs

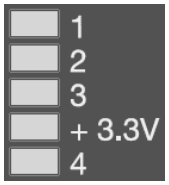
The instrument has 5 green LEDs for display of the operating or error status.

2.5.1.1 Power Supply, Bus Connection

	Power on	Bus	Bus connection not provided
			
	lit		
		lit *	blinks 1 Hz

* The LED for the bus activity (PR 5220/01 a. PR 5220/04) is lit as soon as there is a connection. It continues being lit, also when there is no communication, or when the physical connection is cut.

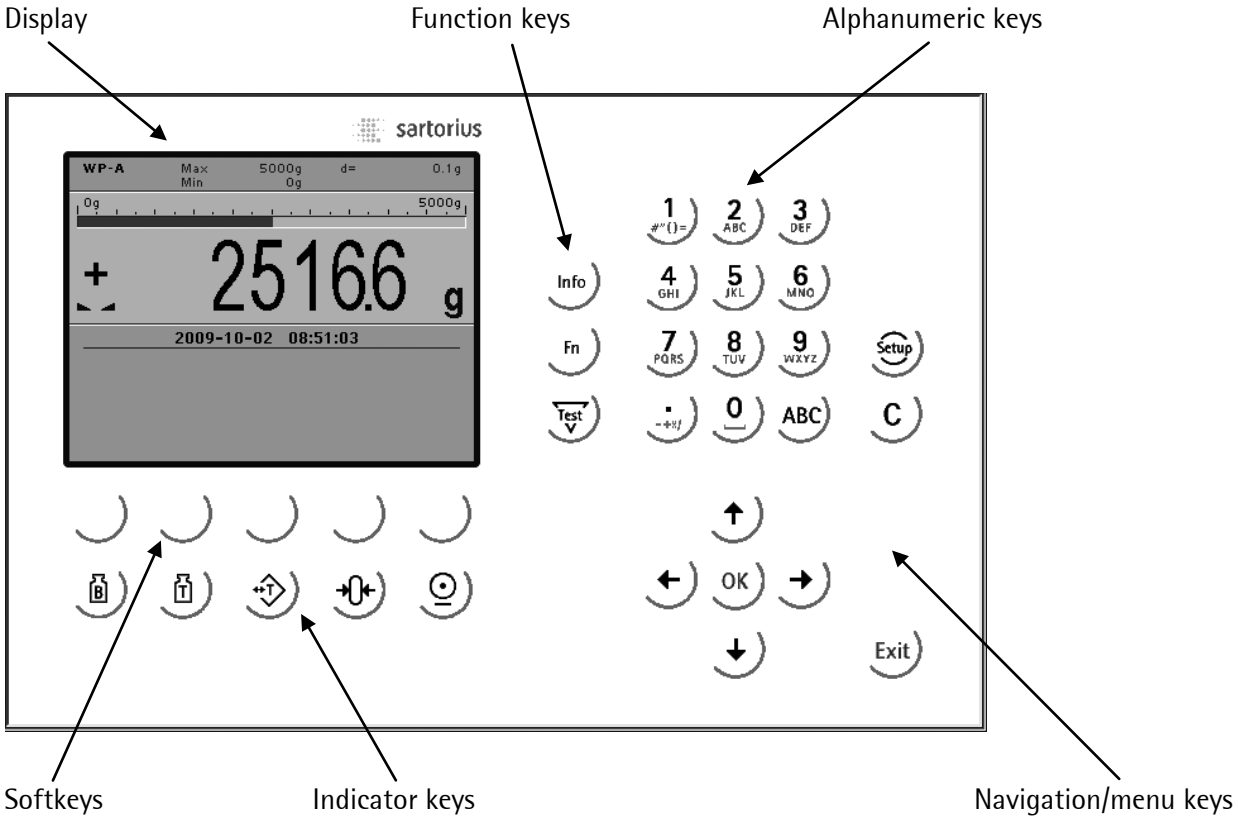
2.5.1.2 Weight Status Indicator

	Standstill	Center zero	Below zero or above max. capacity
	lit		
		lit	
			lit

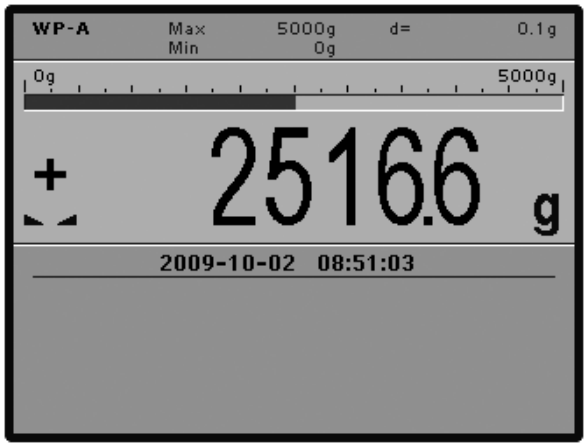
Note: The weight error status sees in Chapter 13.2.

2.5.2 Operation Using the VNC Program

2.5.2.1 Operator Interface



The display shows weight values of up to 7 digits with decimal point and plus or minus sign.



Available mass units are mg, g, kg, t, lb or oz.

lb and oz units are not permitted for use in legal metrology in the EU and EEC.

The weight readout shows the current weight on a bar graph that indicates proportion of the maximum capacity (Max), with 0 on the left and 100 % on the right.

2.5.2.2 Status Symbols

The following status symbols can be shown:

Symbol	Description
B	Gross weight (Brutto)
G	Gross weight in NTEP or NSC mode
N	Net weight (Net = gross – Tare)
T, **PT**	Tare weight, fixtare
TST	The display shows the test value without mass unit
+	Positive value
–	Negative value
→0←	The weight value is within ±¼ d of zero
◣ ◢	The weight value is stable.
⚠	Value not permissible in legal metrology (e.g., 10-fold resolution).
R1	Range 1
R2	Range 2
R3	Range 3

2.5.2.3 Keys

The following tables show the basic meanings of symbols on the operator interface.

Indicator key	Description
	Display gross weight
	Display tare weight
	Taring; the current gross weight is stored in the tare memory, provided that: - weight value is stable. - instrument is not in error status (function dependent on configuration).
	Sets gross weight to zero, provided that (function dependent on configuration): - weight value is stable. - weight is within zero setting range
	Start printing.

Navigation key	Description
	Cursor moves to the right. Selection
	Cursor moves to the left. Selection
	Scroll up in the menu.
	Scroll down in the menu.

Menu key	Description
	Softkey: select function
	Backspace/delete
	Exit from current menu; continue operation on next higher level.
	Enter/confirm

Function key	Description
Info	Information on version number, fitted hardware,10-fold resolution
Fn	Without function
Test	Test
Setup	Open the setup menu
ABC	Toggle to alphabetic input mode. During configuration, you can switch between the mass units by pressing this key.

2.5.2.4 Operation Using Softkeys

The functions of the five softkeys below the graphic display are indicated in the bottommost text line of the display. Softkey functions shown in gray are not available on the active menu level, or not with the active access privileges.

When operating steps involving softkeys are described in this manual, the softkey labels are shown in square brackets, rather than in graphics of the softkeys.

Setup	**Config**	**Calib**	**Param**	

2.5.2.5 Selection Using the Navigation Keys

Press ↓ to scroll down, or ↑ to scroll up in a menu.

Press OK to select a menu item. To select the desired setting for the selected menu item, press ←/→.

Press Exit to exit the menu and continue the operation on the next higher level.

An arrow ▸ in front of a menu item indicates that there are menu sublevels. The menu item selected by pressing ↓/↑ is shown inversely.

Info
▸ Show version
▸ Show status
▸ Show HW-slots

Press OK to select an item.

If the list of menu items is long, a vertical bar graph on the left (black and gray) shows which part of the list is displayed.

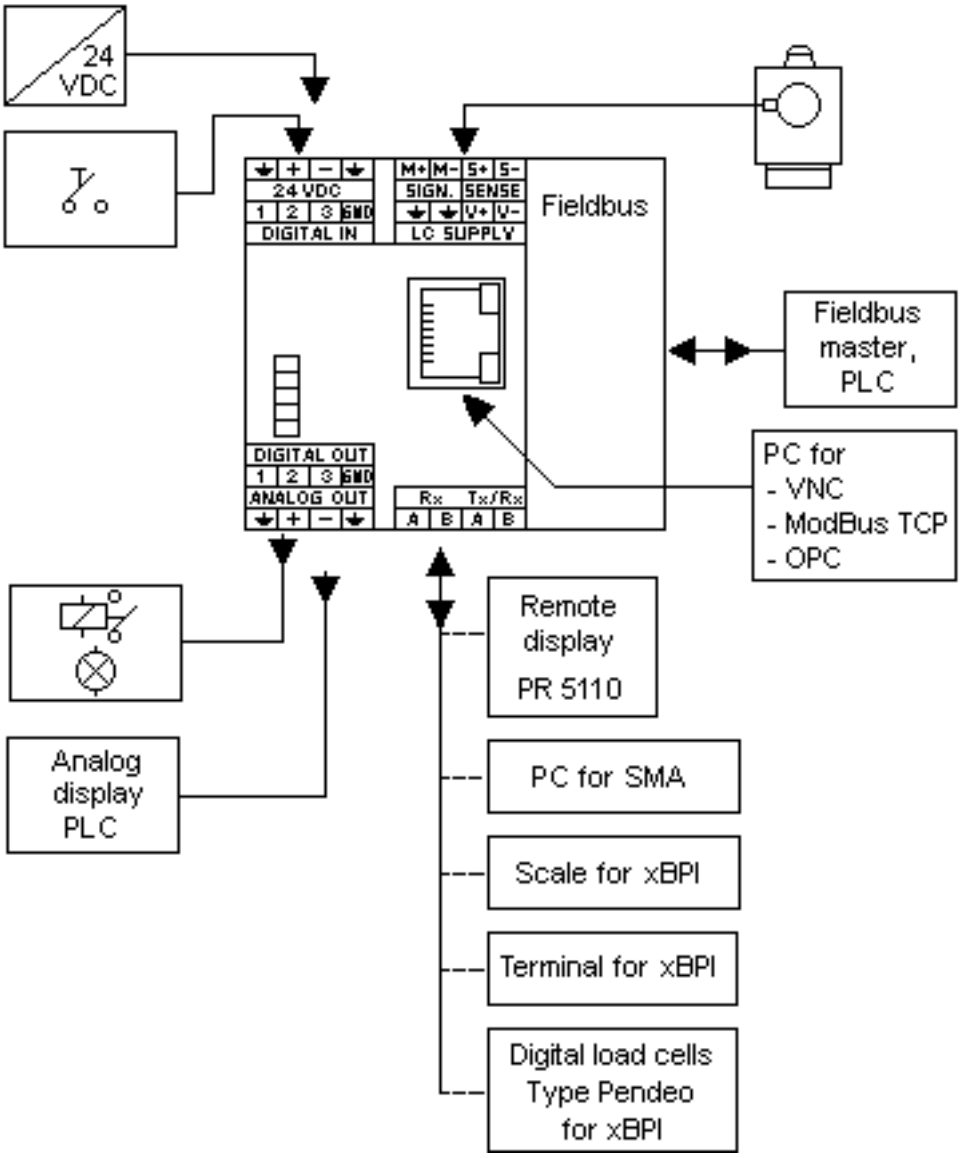
Weighingpoint/WP A/**Calibration**		
Measuretime	⇵	320 ms
Digital filter		off
Test mode		absolute
W & M		none
Standstill time		0.50 s
Standstill range		1.00 d

Availability of additional settings options selectable with ←/→ is indicated by preceding double arrows ⇵.

Weighingpoint/WP A/**Calibration**		
Measuretime	⇵	640 ms

Press ←/→ to select the measuring time.

2.6 Overview of Connections



3 Installing the Instrument

- Before starting work, please read Chapter 1 and follow all instructions.

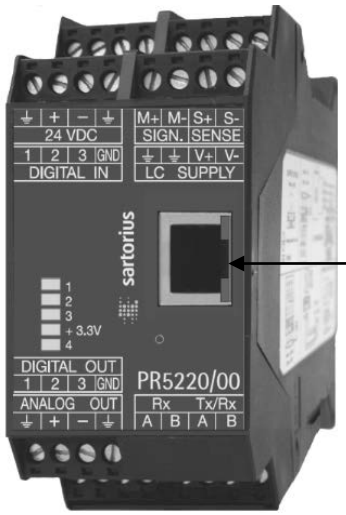
Further procedures:

- Check the consignment: unpack the components specific to the application.
- Safety check: inspect all components for damage.
- Make sure the on-site installation is correct and complete including cables, e.g. power cable fuse protection, load cells, cable junction box, data cable, console/cabinet, etc.
- Follow the instructions for installation of the unit relating to application, safety, ventilation, sealing and environmental influences.
- Connect the cable from cable junction box or platform/load cell.
- If applicable: connect other data cables, network cables, etc.
- Connect the instrument to the supply voltage.
- Check the installation.

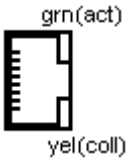
3.1 Connections

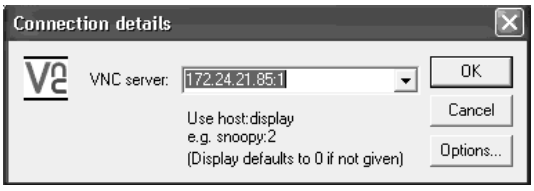
3.1.1 Network Port

The network port is built in as standard equipment. The port contains powerful TCP/IP connection circuitry with transfer rates of 10 or 100 Mbit/sec. The LEDs on the connector (RJ-45) indicate whether the port is functioning.



Transfer rate	10 Mbit/sec, 100 Mbit/sec, full/half duplex, auto-detection
Connection method	Point to point
Cable	CAT 5 patch cable, shielded twisted pair
Cable impedance	150 Ω
Electrical isolation	yes
Connection	RJ-45 socket on top of housing



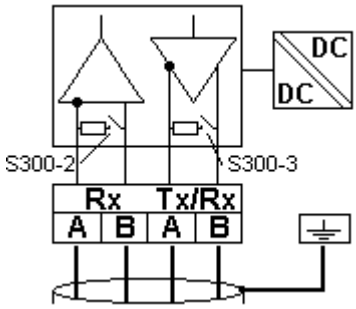


Remote operation of the instrument from the notebook/PC is possible; install VNC program version 3.3.7* on the notebook/PC. For setting the network address, see Chapter 4.3.3.

* Sartorius guarantees the functionality only if this version is used!

3.1.2 RS-485 Interface

The interface is intended for connecting a remote display, a PC for data transmission using the SMA protocol or scale/terminal/digital load cells, type Pendeo for data transmission using the xBPI protocol.



Connection method	4-pin plug-in terminal block
Number of channels/type	1 RS-485, full/half duplex
Transfer rate (Bits/s)	300, 600, 1200, 2400, 4800, <9600>, 19200
Bits/stop bits	<8/1> or 7/1
Parity	<even>, <odd>, <none>
Signals	RxA (R-), RxB (R+), TxA, TxB
Electrical isolation	yes
Cable length	max. 1000 m
Cable type	Shielded twisted pair (e.g. LifYCY 2x2x0.20)

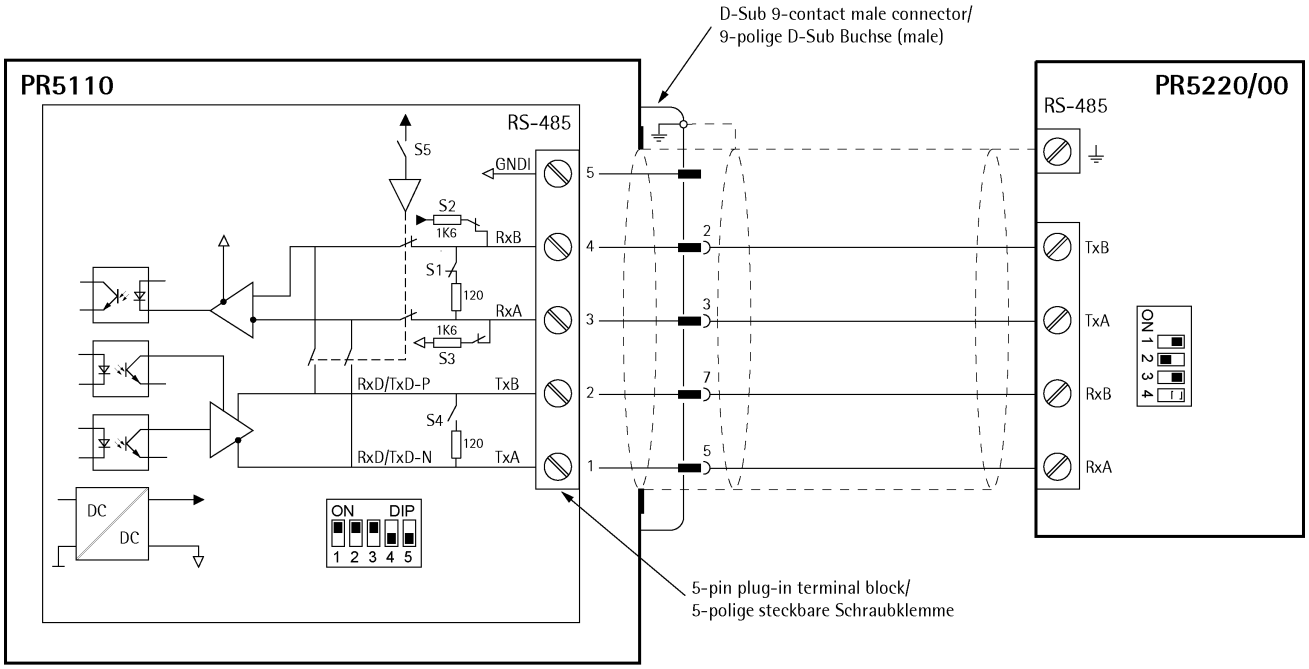
<...> = default settings (factory settings)

3.1.2.1 Connecting of a PR 5110 Remote Display

Four-wire transmission, point to point, full duplex (simultaneous sending and receiving possible) with PR 5110 remote display.

Note: When replacing PR 1627/PR 1628 with PR 5110, note that the pin assignment must be attended, see Chapter 16.1.

Description see instrument manual PR 5110.



Switch settings

ON: S1, S2, S3

OFF: S4, S5

Switch settings

ON: S2

OFF: S1, S3,

S4 is not relevant!

Configuration PR 5110

Setup - oP 10 - LInE - r5485

Setup - oP 12 - toKEn - oFF

Setup - oP 13 - SEndModE - SEnd

Configuration PR 5220/00

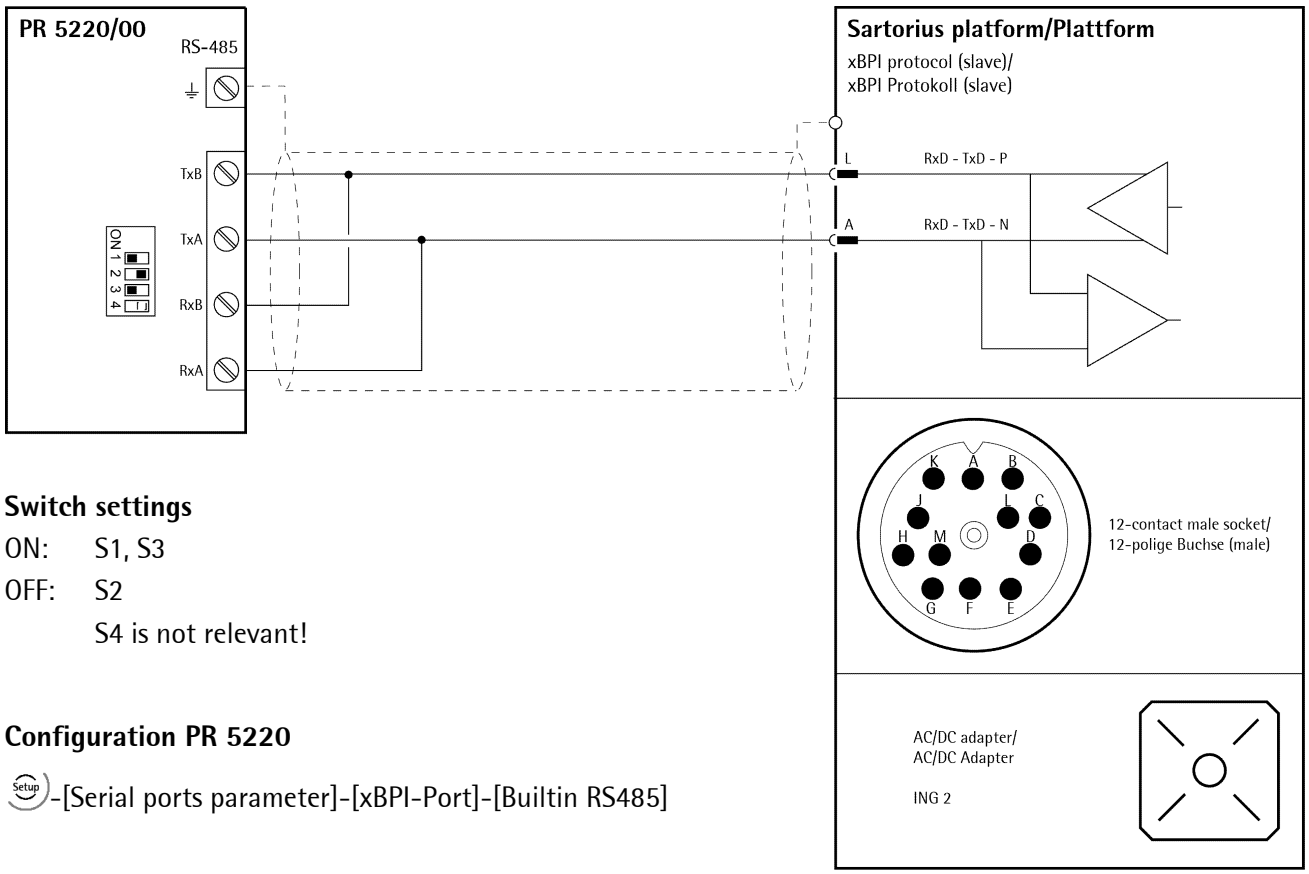
Setup - [Serial ports parameter]-[Remote display]-[Builtin RS485]

[Param]: [Mode]-[single transmitter]

The following operations are possible from the connected remote display:

- Switch over to another weighing point
- Indicate current value type
- Set tare
- Reset tare
- Set zero
- Start Print

3.1.2.2 Connection of a xBPI Platform



Switch settings

ON: S1, S3

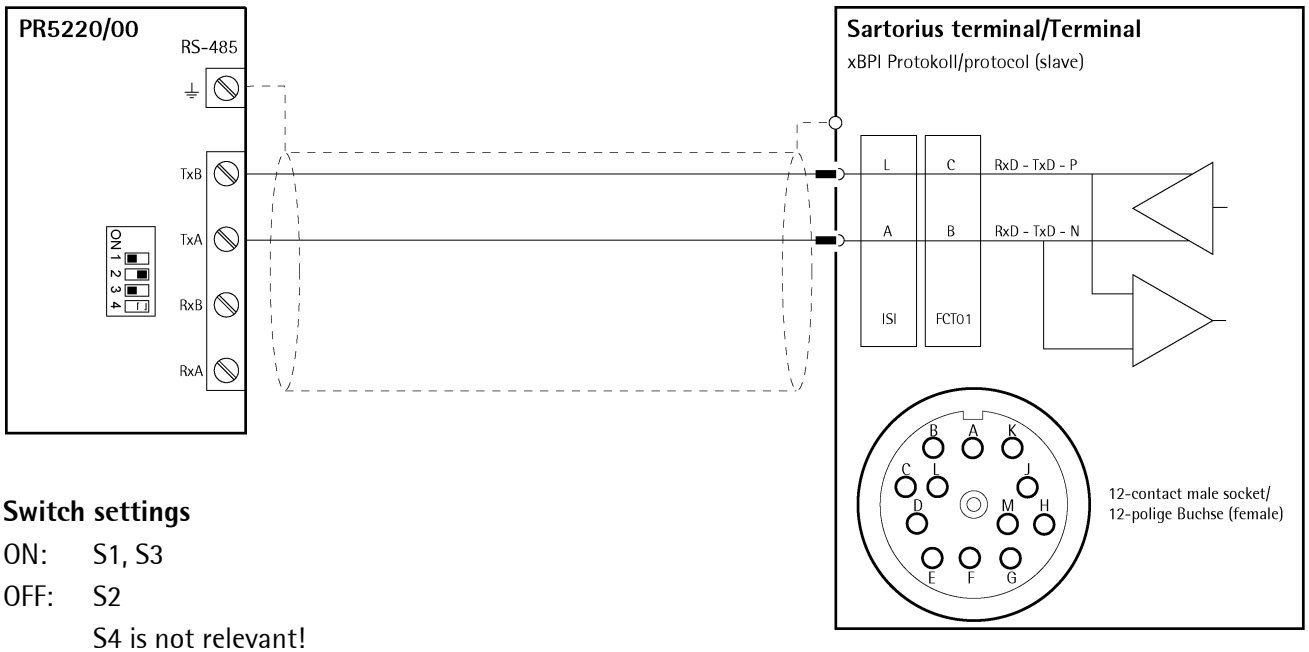
OFF: S2

S4 is not relevant!

Configuration PR 5220

Setup-[Serial ports parameter]-[xBPI-Port]-[Builtin RS485]

3.1.2.3 Connection of a xBPI terminal



Switch settings

ON: S1, S3

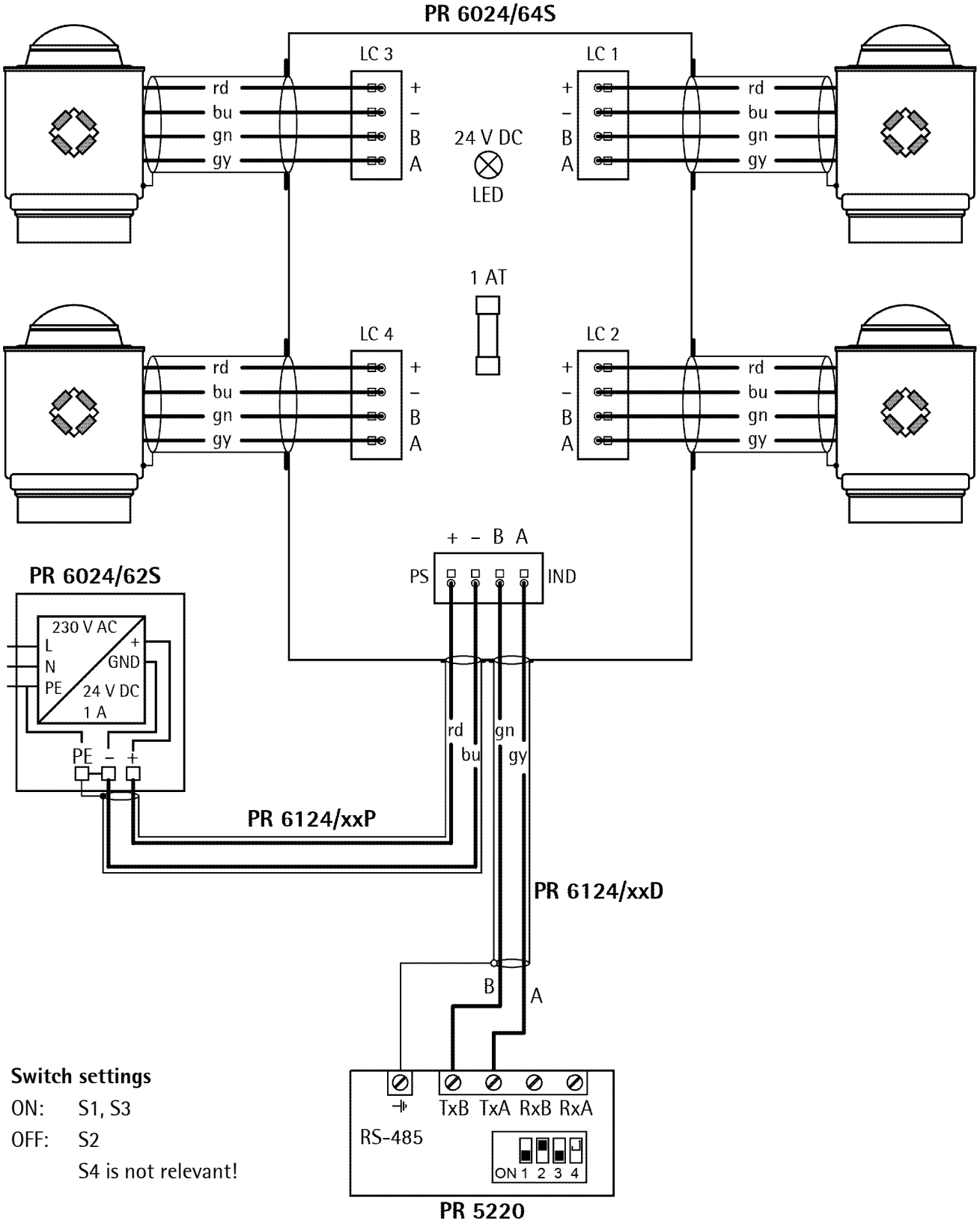
OFF: S2

S4 is not relevant!

Configuration PR 5220

Setup-[Serial ports parameter]-[xBPI-Port]-[Builtin RS485]

3.1.2.4 Connecting 4 Digital Load Cells Type ‚Pendeo®'



Switch settings

ON: S1, S3

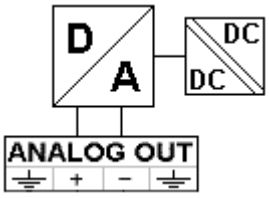
OFF: S2

S4 is not relevant!

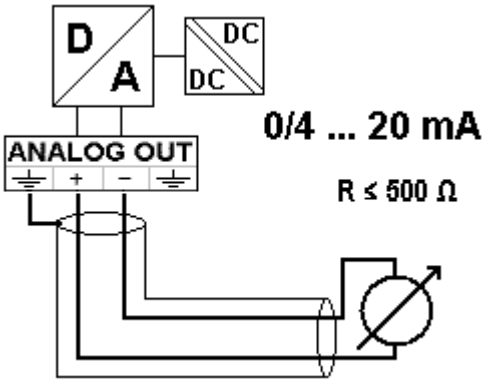
Configuration PR 5220

Setup-[Serial ports parameter]-[xBPI-Port]-[Builtin RS485]

3.1.3 Analog Output



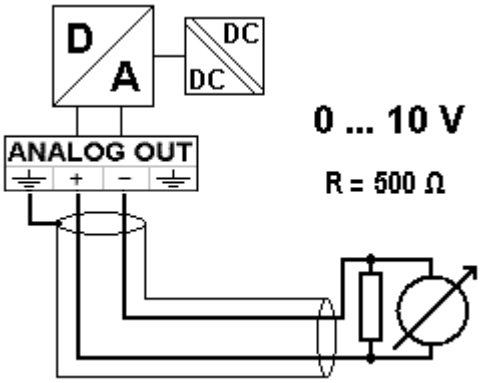
Connection method	4-pin plug-in terminal block
Number of outputs	1 current output, output voltage via external resistor
Output	Gross, net weight or via ProfiBus
Range	0/4 ... 20mA, configurable
Resolution	e.g. 0 - 20 mA in max. 40,000 counts
Linearity error	@ 0 - 20mA: <0,05 % @ 4 - 20 mA: <0,025 %
Temperature effect	<100 ppm/K
Load	0 ... max. 500 Ω
Protected against short circuit	yes
Electrical isolation	yes
Cable length (shielded)	150 m (current output)



0/4...20mA

Analog signal,
current output

The current is supplied directly via the terminals.



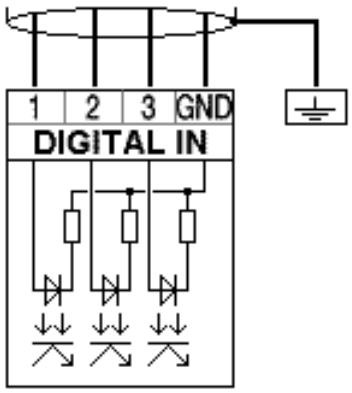
0...10V

Analog signal,
voltage output

The voltage level corresponds to the voltage drop across the 500 Ω (10 ppm/K) resistor.

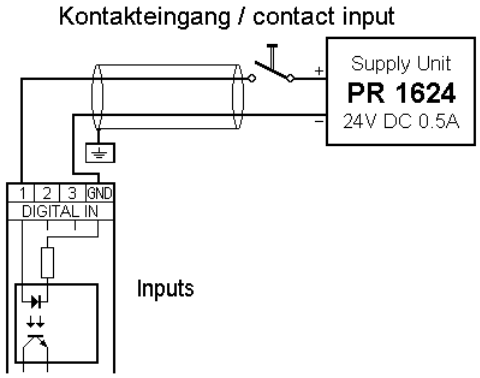
3.1.4 Optocoupler Inputs

The 3 optocoupler inputs have one common potential (GND) for the input group that is separated from the common potential of the output group.



Connection method	4-pin plug-in terminal block
Cable	Shielded, max. 50 m
Number of outputs	3
Input signal	External supply required 10...28 V DC for 'high' level 0...5 V DC for 'low' level
Input voltage	Max. 28 V DC
Input current	<11 mA @ 24 V DC <5 mA @ 12 V DC
Electrical isolation	Yes; a common minus potential for the group of 3 inputs

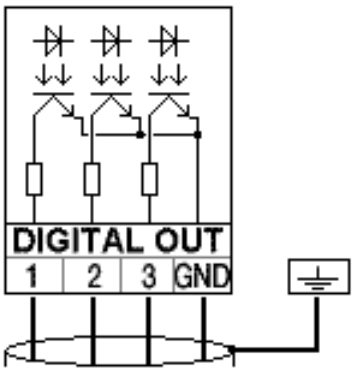
Example: contact input connection



When a voltage ≥10 V DC is applied to the terminals (in the example:1-GND), input 1 is active (true).

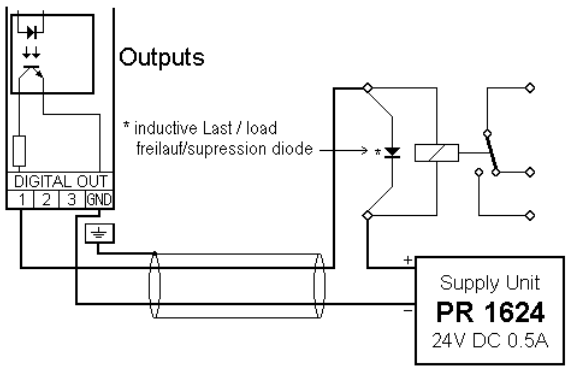
3.1.5 Optocoupler Outputs

The 3 optocoupler outputs have one common potential (GND) for the output group that is separated from the common potential of the input group.



Connection method	4-pin plug-in terminal block
Cable	Shielded, max. 50 m
Number of outputs	3
Output signal	External supply required
Output current	Max. 30 mA
Output voltage	Max. switching voltage: 28 VDC
Electrical isolation	Yes; a common minus potential for the group of 3 outputs

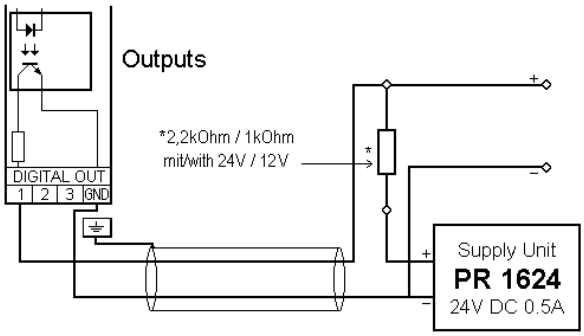
Example: relay control connection



Stromausgang / Current output

When output 1 is active (true), the relay switches. For protection of the output circuit, relays with free-wheel diode must be provided.

Example: voltage output connection



Spannungsausgang / Voltage output

When output 1 is active (true), the output voltage changes from 24/12 V DC into <3 V DC.
A load resistance of 2.2/1 kΩ must be provided.

3.1.6 Load Cell Connection

The cable colors shown in this chapter are applicable to the Sartorius PR 62XX series load cells.
Before connecting other types, carefully follow the information related to the assignment of load cell/platform cable colors.

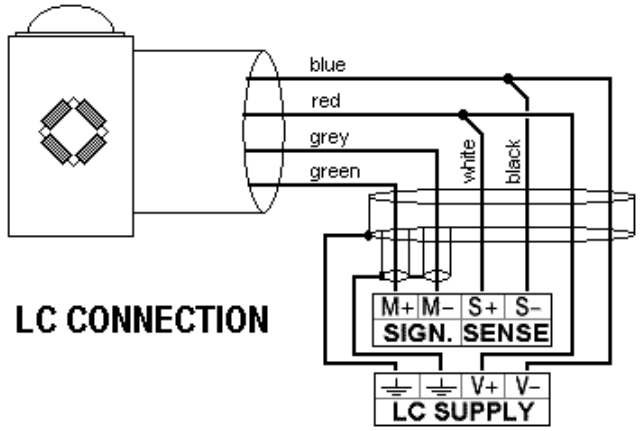
- The distance between the measuring cables and the power cables should be at least 1 m.
- The measuring cables should be laid in separate cable conduits or steel pipes connected to earth potential.
- Power cables should be crossed at right angles.

Load cell supply circuit

The load cell supply voltage is fixed to 12 V DC and protected against short circuit.
Load resistance of load cells ≥75 Ω, e.g. 8 load cells of 650 Ω each.

3.1.6.1 Connection Using 6-Wire Technology

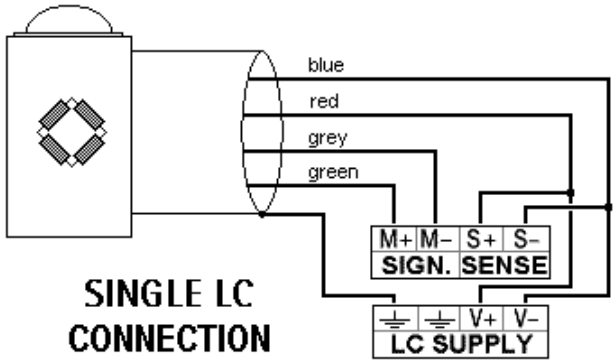
See also label on the housing outside (Chapter 2.3) and manual of the junction box.



Terminal	Description
SIGN. M+	+ signal/LC output
SIGN. M-	- signal/LC output
SENSE S+	+ sense
SENSE S-	- sense
LC SUPPLY V+	+ supply/excitation
LC SUPPLY V-	- supply/excitation

3.1.6.2 Connection of a Load Cell in 4-Wire Technology

Note that links between SENSE S+ and LC SUPPLY V+ and between SENSE S- and LC SUPPLY V- directly at the transmitter must be provided.



Terminal	Description
SIGN. M+	+ signal/LC output
SIGN. M-	- signal/LC output
SENSE S+	+ sense
SENSE S-	- sense
LC SUPPLY V+	+ supply/excitation
LC SUPPLY V-	- supply/excitation

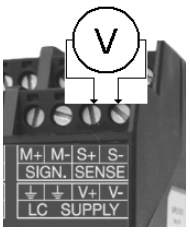
3.1.6.3 Connecting PR 6221 Load Cells

See installation manual PR 6221 and PR 6021/08, -/68.

Testing the Measuring Circuit

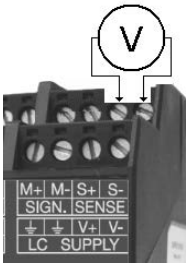
A simple test with the load cells connected can be carried out with a multimeter (not with external supply or intrinsically safe load cell interface):

Supply voltage



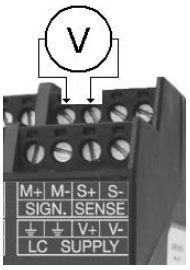
12 V ±0,8 V
(symmetrical to housing GND)

Sense voltage



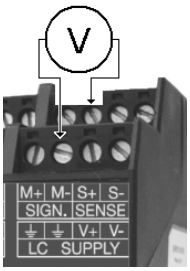
12 V ±0,8 V
(symmetrical to housing GND)

Measuring voltage



0 - 12 mV @ WZ mit 1,0 mV/V
0 - 24 mV @ WZ mit 2,0 mV/V

Measuring voltage

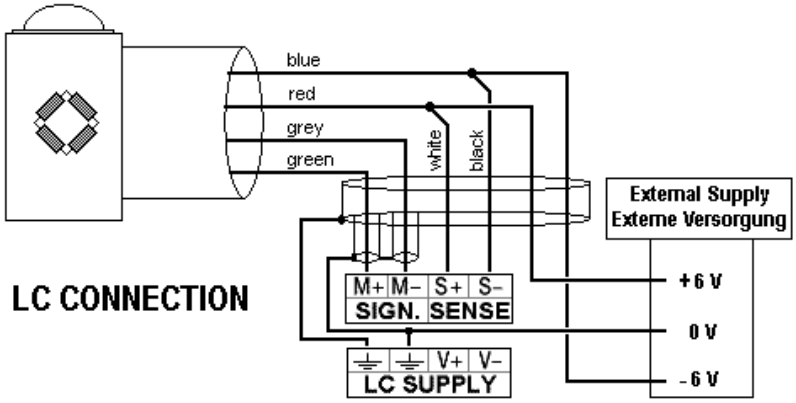


0 V ±0,5 V

3.1.6.4 External Load Cell Supply

The internal load cell supply voltage of PR 5220 (V+, V-) is not connected.

The common line of the symmetrical external supply must be connected to the same terminal of PR 5220 as the shield of the load cell/extension cable.

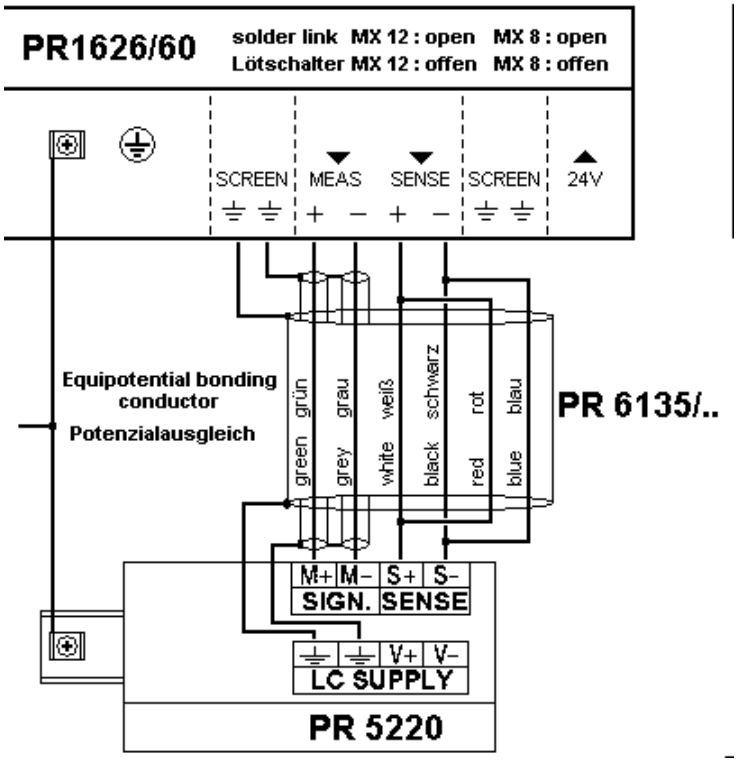


Specification of external supply: ±6 V DC +5 %, -30 %; max ripple. 50 mVpp; max. asymmetry ±3 %.

An external supply voltage smaller than 8 V DC (±4 V DC) must be set under Setup-[Weighingpoint]-[WP A]-[Calibration]-[Param]-[External supply].

3.1.6.5 Connection via Intrinsically Safe Interface PR 1626/60

Connect the instrument to PR 1626/60 as described below. For additional connections, refer to the PR 1626/60 instrument manual. The internal load cell supply voltage of PR 5220 (V+, V-) is not connected.

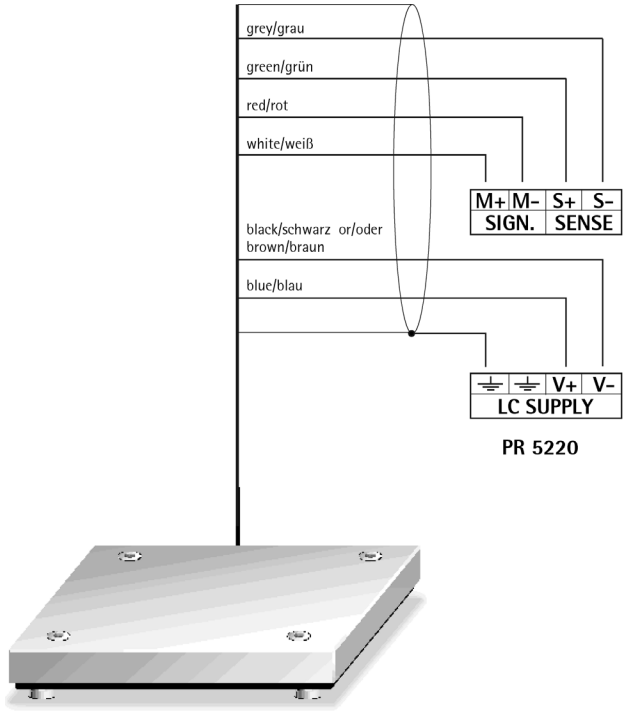


Note:

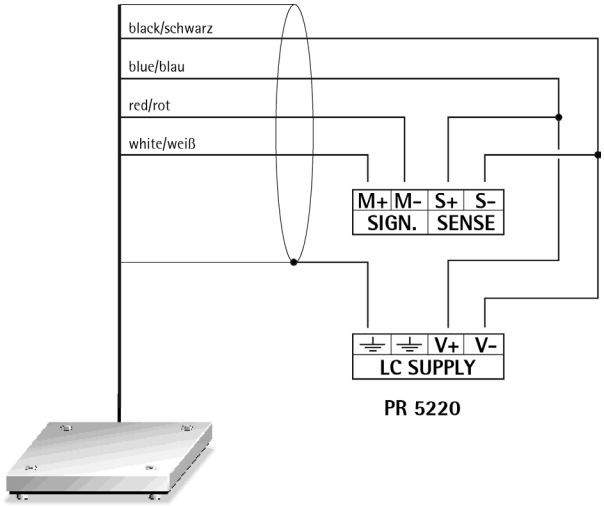
If MX8 is closed in PR 1626/60, [below 8 V DC] must be set under Setup-[Weighingpoint]-[WP A]-[Calibration]-[Param]- [External supply].

3.1.7 Connecting Analog Platforms (CAP...)

One Combics analog platform (CAP... series) can be connected to the instrument.
The following example shows a platform with 6-wire connection and another one with 4-wire connection.



Platform with 6-wire connection



Platform with 4-wire connection

Platforms with 4-wire connection require following links:

- between +V and +S
- between –V and –S

Caution!

The cable colors shown above are valid for a CAPP4 500 x 400 and a CAPP1 320 x 420, as an example.

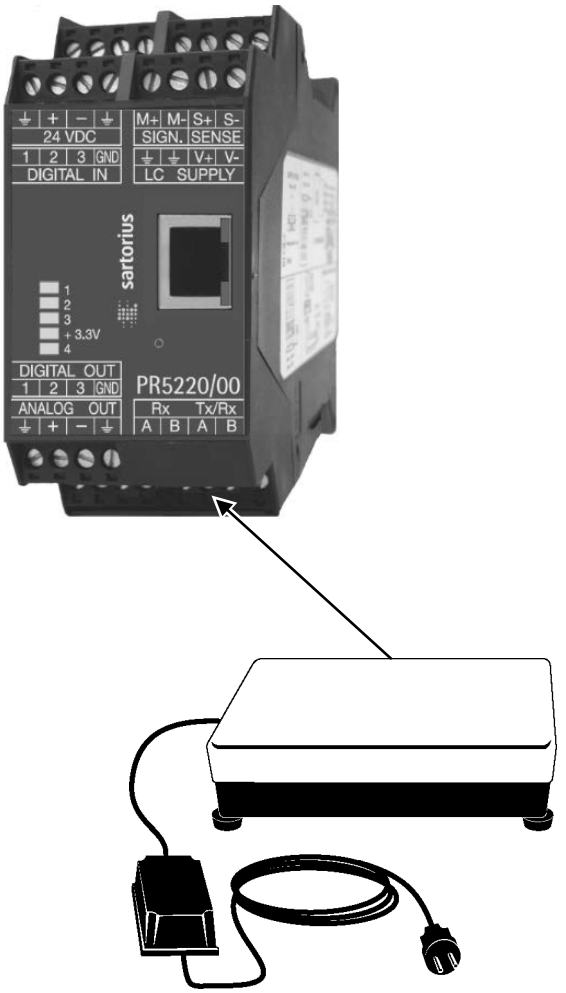
The assignments of cable colors are given in the platform operating manual.

Pin allocation Combics 1...3-instruments	Pin allocation PR 5220	
BR_POS	V+	LC SUPPLY
SENSE_POS	S+	SENSE
OUT_POS	M+	SIGN.
OUT_NEG	M-	SIGN.
SENSE_NEG	S-	SENSE
BR_NEG	V-	LC SUPPLY

Connect the cable screens with the ground terminal of the instrument. If the measuring leads (+M, -M) are screened individually, these screens must also be connected to the ground terminal (see also Chapter 1.4.7).

3.1.8 Connecting xBPI Platforms (IS...)

One xBPI platform (IS... series) can be connected to the instrument.



Connection to a RS-485 interface, see Chapter 3.1.2.2.

3.1.9 Connection of Digital Load Cells

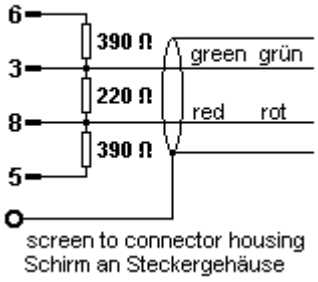
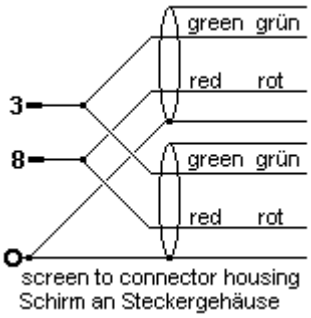
Digital load cells can be connected to the device via xBPI port and RS-485 interface.
Connection to an RS-485 interface, see Chapter 3.1.2.4.

3.1.10 ProfiBus Interface (PR 5220/01 only)

Communication protocols and syntax comply with the ProfiBus-DP standard to IEC 61158 with transfer rates up to 12 Mbit/s.

Transfer rate	9.6 kbit/s to 12 Mbit/s, baud rate auto-detection
Protocol	PR OFIBUS-DP-V0 slave to EN 50 170 (DIN 19245), mono or multi-master systems are supported. Master and slave devices, max. 126 nodes possible. Watchdog timer
Configuration	GSD file (‚SART5220.gsd' stored on the CD in directory 'Fieldbus')
Cable	Special ProfiBus color: violet Shielded twisted pair cable
Cable impedance	150 Ω
Certificates	ProfiBus test center Comdec in Germany and PNO (ProfiBus User Organization). Suitable for industrial applications to CE, UL and cUL
Electrical isolation	Optocoupler in lines A and B (RS-485)
Cable length	Max. distances 200 m can be extended with 1.5 Mbit/s by means of additional repeater

Connection to the ProfiBus is using the 9-contact plug-in socket on the front panel.

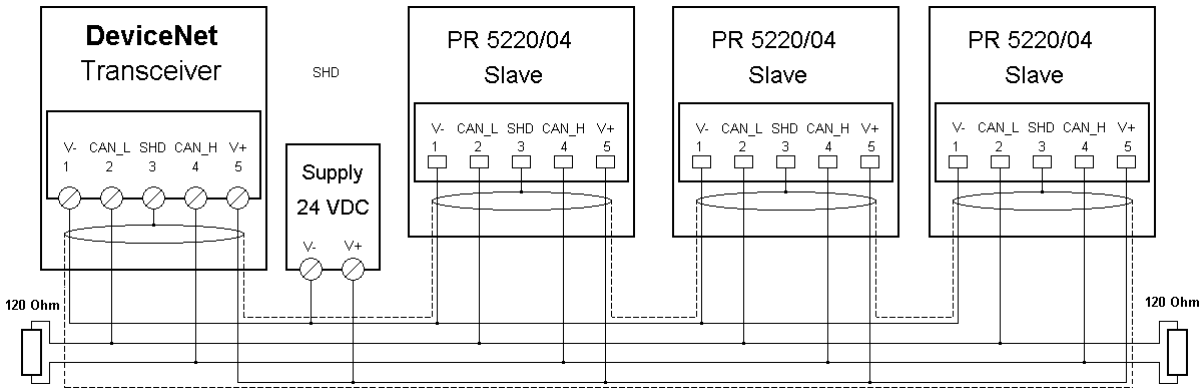
The transmitter is the only or last slave on the bus	The transmitter is not the only or last slave on the bus	PIN	Signal
 	 	3 4 5 6 8	RxD/TxD-P CNTR-P DGND VP RxD/TxD-P

3.1.11 DeviceNet Interface (PR 5220/04 only)

It is a complete DeviceNet adapter (SLAVE) with CAN controller and transfer rates of up to 500 kbit/s.

Connection	5-contact screw terminal block (plug-in)
Transfer rate	125, 250 and 500 kbit/s
Topology	Parallel bus
Protocol	DeviceNet master/slave Polling method (polled I/O) CRC error detection to IEC 62026 (EN50325) Max. 64 station nodes Max. data width 512 bytes input & output
Configuration	EDS file (‚sag_5220.eds' stored on the CD in directory 'Fieldbus') MAC-ID (1...62)
Certificates/ conformity	Compatible with DeviceNet specification Vol 1: 2.0, Vol 2: 2.0 ODVA certificate in accordance with conformity test software version A-12 Suitable for industrial applications to CE, UL and cUL
Cable	DeviceNet, color: petrol-green 2x 2 shielded twisted pair
Cable impedance	150 Ω
Bus termination	120 Ω at the cable ends
Bus load	30 mA @ 24 V DC
Electrical isolation	Yes, optocoupler and DC/DC converter

Connecting diagram for a master with three slaves



3.1.12 ProfiNet I/O Interface (PR 5220/06 only)

It is a complete ProfiNet I/O interface (SLAVE). It contains a powerful UDP/IP connecting circuitry with transfer rates of 10 and 100 Mbits/s.

Connection	RJ-45 connecting socket
Transfer rate	10 Mbit/sec and 100 Mbit/sec Autodetection (10/100, HalfDX/FullDX)
Connection mode	Network
Protocol	ProfiNet I/O
Configuration	XML file (‚GSDML-xxx-Sartorius-PR5220-xxx.xml' stored on the CD in directory 'Fieldbus')
Certificate	ProfiBus Nutzerorganisation e.V. for HMS Industrial Networks AB Certificate no.: Z10006 Report: PN005-1, 12.02.2007
Cable	Twisted pairs, screened, e.g. patch cable CAT5 Autolink (straight oder crossover
Cable impedance	150 Ω
Potential isolation	Yes

Note: Recommendation for e.g. Siemens S7

Fieldbus slave setting:

Use DHCP [on] as default and activate the master as a DHCP server (✓ [assign IP Adr via IO controller]).

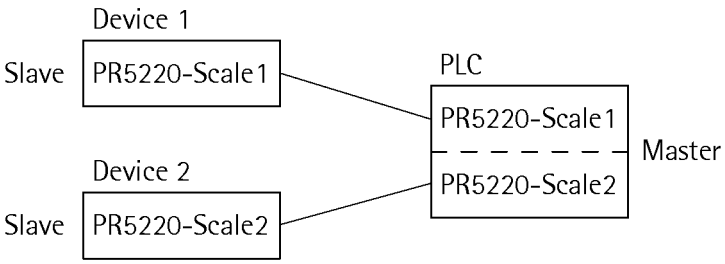
Slave – master device names

A unique device name must be assigned out of the master. This name is given highest priority when establishing the communication.

When changing instruments/servicing, please note:

Apart from the IP address, the device name must correspond to the one of the replacement device. Explicit assignment out of the master is required.

Example:



3.1.13 EtherNet-IP Interface (PR 5220/07 only)

It is a complete EtherNet-IP adapter (SLAVE). It contains a powerful TCP/IP and EtherNet-IP connecting circuitry with transfer rates of 10 and 100 Mbits/s.

Connection	RJ-45 connecting socket
Transfer rate	10 Mbit/sec and 100 Mbit/sec Autodetection (10/100, HalfDX/FullDX)
Network	**Connection mode**
Protocol	EtherNet-IP
Configuration	EDS file (‚sag_5220_ethernetip.eds' stored on the CD in directory 'Fieldbus')
Certificates/ conformity	ODVA für HMS Industrial Networks AB Product code: 99 Product name: Anybus-CC EtherNet/IP SOC file name: ABCC_EIP_205_2.stc 17.04.2009
Cable	Twisted pairs, screened, e.g. patch cable CAT5 Autolink (straight oder crossover)
Cable impedance	150 Ω
Electrical isolation	Yes

4 Commissioning

The meaning of indicator LEDs is described in Chapter 2.5.

4.1 Data Backup/Power Failure

The calibration data and parameters as well as all configuration and interface data are stored in a non-volatile (EAROM) memory. Unauthorized data changing can be prevented by an access code. Additional write protection is provided for calibration data and parameters (CAL switch, see Chapter 4.1.1).

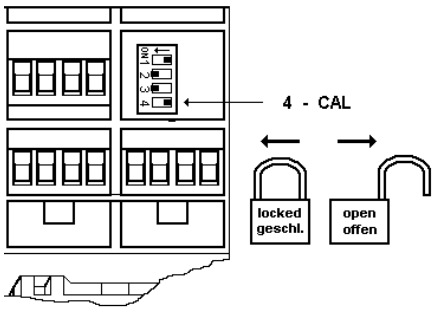
In case of power failure, all entered data and parameters remain unchanged.

4.1.1 CAL Switch

The CAL switch protects the calibration data and parameters against unauthorized access.

When the CAL switch is in 'open' position, the calibration data and parameters can be changed using the PC program or via the ProfiBus connection.

With the CAL switch in the 'closed' position, the calibration data (e.g. dead load, Span) and Parameters (e.g. measure time, zero tracking etc.) cannot be changed.



The CAL switch is located under a cover that can be opened by means of a knife.

For 'legal-for-trade' applications, set the CAL switch (4) to the left position (ON) and seal the cover.

To view the position of the CAL switch, select Info-[Show status]:

Info/**Status**	
Free system RAM	**4128 of 15184 kb**
Cal-Switch	**opened**

[opened] = opened; no write protection

[closed] = closed; write protection is active

4.1.2 Factory Settings

Calibration data <default>	Calibration data <default>
Full scale (Max) <3000> <Kg>	Measure time (M) <320>ms
Scale interval <1>	Measuring rate <160>ms
Dead load <0.000000>mV/V	Standstill time <1>M
Span <1.000000>mV/V	Standstill range <1.00>d
	Tare timeout <8>M
Calibration parameters <default>	<Absolute> test mode
Overload (range above Max) <9>d	Zero-setting range <50.00>d
* W & M mode <off>	Zero-tracking range <0.25>d
Filter <off>	Zero-tracking step <0.25>d
Frequency <1.56 Hz>	Zerotrack repeat <0>M

* Parameter W&M must be set to 'on' or 'off' prior to input of the calibration data, see Chapter 4.4.13.1.

.

4.2 Switching on the Instrument

The instrument can be put into operation and calibrated using a notebook/PC with the VNC program (on the CD packed with the instrument) and an Internet Browser.

4.3 Configuration and Calibration

There are following possibilities:

- with VNC viewer (on the enclosed CD-ROM), see Chapter 4.3.4
- with an Internet Browser (‚Microsoft InternetExplorer' or ‚Mozilla Firefox Webbrowser'), see Chapter 4.3.5. The prerequisite is an installed and activated Java (Sun) 'applet'.

4.3.1 Connecting the Device to the Network and Finding out the IP address

The DHCP server is active in the network

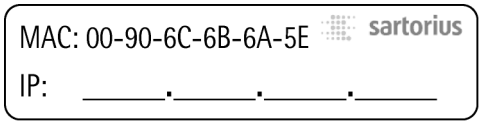
An IP address is assigned to the device automatically.

The DHCP server is not active in the network

If the device is connected to a notebook/PC via a point-to-point connection, an IP address is negotiated via function 'AutoIP'. **This can take up to 2 minutes!**

IndikatorBowser

The IP address can be found out using the 'IndicatorBrowser' (supplied on CD-ROM) and via the 'host name' of the device (see also Chapter 4.3.3). The 'host name' is composed of the device name and the last 3 bytes of the MAC ID. A label with the complete MAC ID is fitted inside the door of the instrument.



Hostname: PR5220-6B6A5E

UPnP view with Microsoft Windows XP

The IP address can be found out also using the 'Microsoft InternetExplorer' under 'Network', if the 'UPnP' view is switched on (default: off).

Procedure:

1. Click 'Start' -> 'Control Panel' -> 'System'.

The display shows:

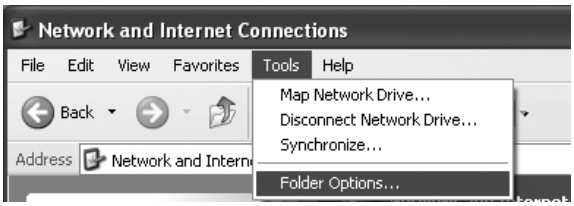
Note:

At least 'Service Pack 2' or higher must be installed.

2. Click ‚OK'.

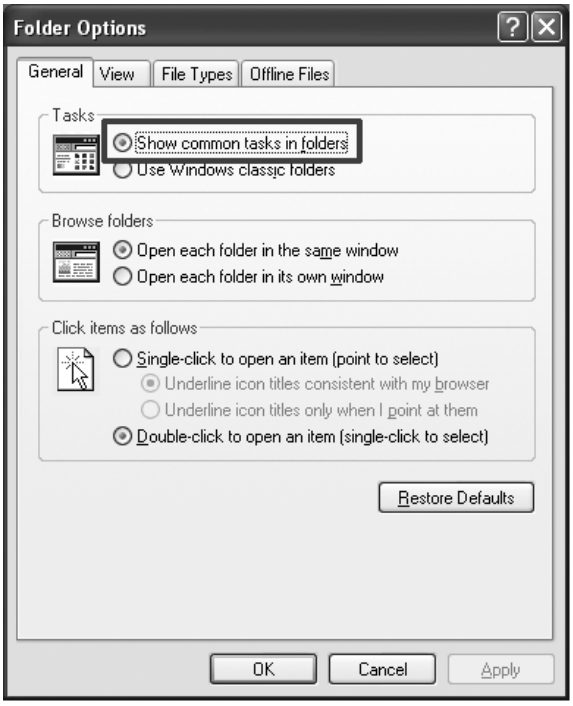
3. Double-click the icon for the network environment on the 'desktop'.

The display shows:



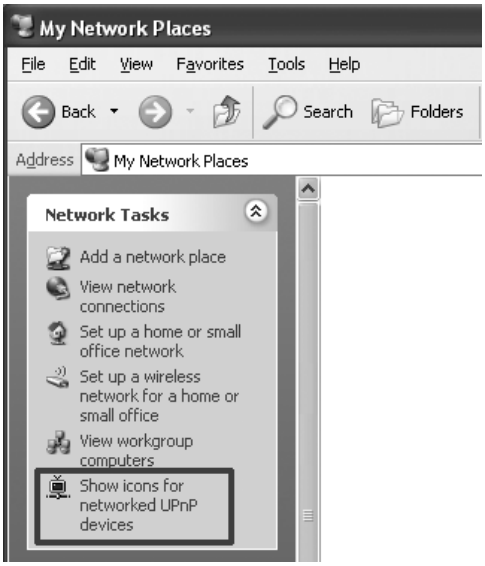
4. Click menu item 'Tools' -> 'Folder Options...'.

The display shows:



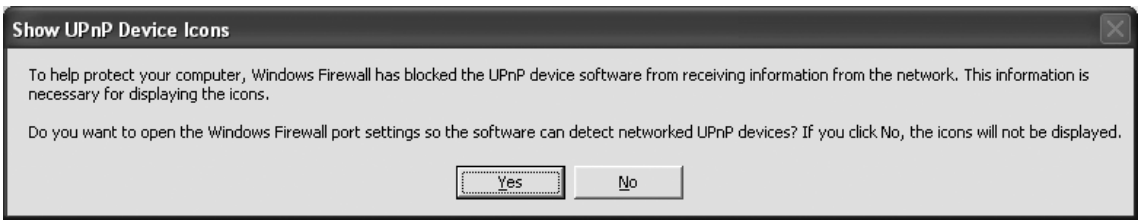
5. Click item 'Show common tasks in folders'.

6. Click ‚OK'.

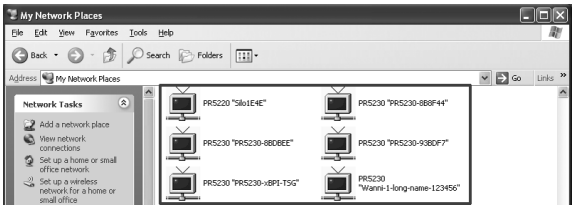


7. Click item 'Show icons for networked UPnP devices' in window 'Network Tasks' under 'My Network Places'.

The display shows:



8. Click ‚Yes'.



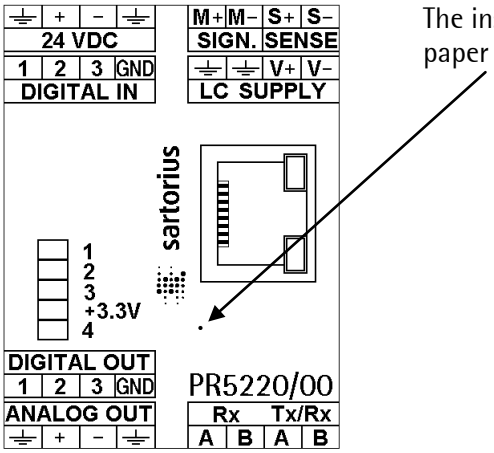
The icons for the devices are displayed.

9. Click the relevant icon with the right mouse key and select menu item 'Properties'.
10. Read the IP address.

UPnP view with Microsoft Windows 7

The device icons are displayed automatically under 'Network'.

4.3.2 Resetting the Instrument/Activating Network'DHCP'



The instrument can be reset using a pin with a diameter of 1.0 mm (e.g. paper clip).

The instrument is re-started by a short-time actuating of the reset switch (function like switch-off/-on).

Pressing the reset switch during a long time (wait until the 3 upper LEDs are lit simultaneously) resets the network settings to default/factory settings.

That means:

- 'DHCP' is activated.
- ‚Host name' is initialized e.g. PR 5220-**6B6A5E** (instrument type -**MAC-ID**).

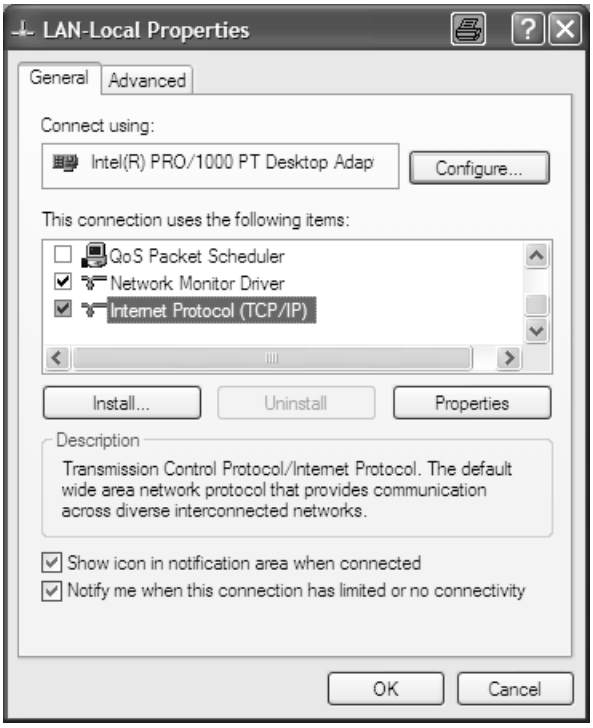
  Example of MAC ID: 00-90-6C-**6B-6A-5E**

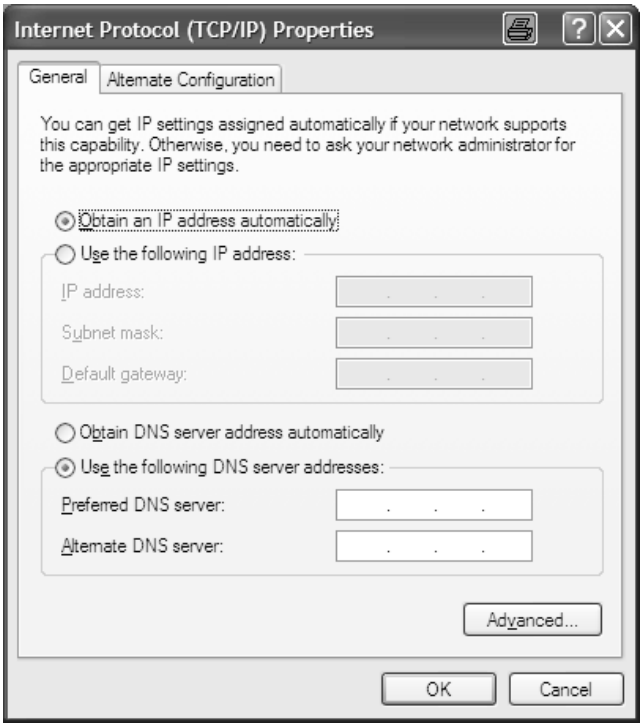
This ensures that a valid address for identification of the instrument in the network can be assigned to the instrument, see Chapter 4.7.4.

Note: The last 3 bytes of the MAC ID are displayed. A label with the complete MAC ID is fitted to the outside of the device.

An device set to 'on' DHCP (default/factory setting) and connected to an IT network (company network) with a DHCP server does not require further actions except for a **2...3-minute waiting time**. Subsequently, a network connection is established automatically (device <-> workstation/PC).

Temporarily connected PCs must have the following network adaptor properties (DHCP/DNS automatic):





PR 5220 can be operated only, if a notebook/PC is connected!

For commissioning, the first network contact is possible only by finding the IP address/subnet mask under DHCP 'on' (factory setting) automatically.

4.3.2.1 MAC ID

The MAC ID or (6-digit) hardware address, e.g. 00-90-6C-**6B-6A-5E** is a unique number for identification of any network adaptors.

A label with the complete MAC ID is fitted outside the instrument.

MAC: 00-90-6C-6B-6A-5E sartorius

IP: _____._____._____._____

Due to the last 3 bytes, the initialized host name is always unique.

4.3.2.2 DHCP

Normally, DHCP servers are provided only in IT-supported company networks and not on locally (directly) connected notebooks/PCs or notebooks.

Nevertheless, 'DHCP' must be activated on the notebooks/PC. The 'DHCP' devices find each other because they fall into a so-called auto-IP address in the range 169.254.0.1...169.254.255.254 with the associated auto-subnet mask 255.255.0.0 after a cyclical automatic 'DHCP' server search run due to time overflow (2...3 minutes).

Caution!

When connecting the IT/DHCP network cable temporarily from the PC to a device, the DHCP server is lost and the PC returns to the auto-IP address within approx. 2 minutes.

Reason: The DHCP server/client relationship is checked cyclically in 2...3-minute intervals.

Example

If the search time is exceeded (due to the result 'no server found'), the PR 5220 is provided with an IP address (e.g. 169.254.0.123) automatically. The same applies to the notebook/PC (e.g. 169.254.0.54). These IP addresses are different on both sides:

- equal regarding the first 3 octets of the IP address (e.g. network ID 169.254.)
- different in the last 2 octets of the IP address (e.g. host ID 0.123.)

4.3.2.3 Host Name (device name)

With DHCP applications, this must be a unique name.

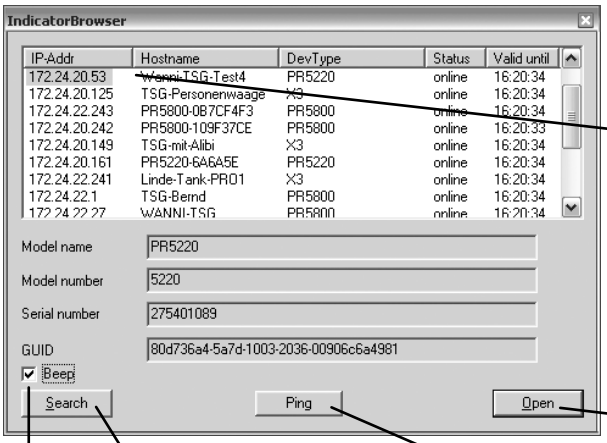
If own names are defined (host name is editable)

- the same host name must not exist twice within the network ID.
  Correct is e.g. host name device 1: PR 5220 scale1, device 2: PR 5220 scale2
  Always correct is the 'default' with PR 5220-8BB499, whereby the last 3 bytes of the MAC-ID are unique.
- there is a limitation to 2...24 characters.
  Permitted are
  - letters A...Z, a...z
  - digits 0...9, which must not be the first or last character
  - character "-", which must not be the first or last character

4.3.3 Searching the Instrument in the Network Using 'IndicatorBrowser'

The address can be determined using the 'IndicatorBrowser' program (on the enclosed CD-ROM).

Install and start the 'IndicatorBrowser'.



The 'IndicatorBrowser' searches within the current network ID, e.g. 169.254. and 172.24., on all available network adaptors in the PC (several possible/recommended, e.g. LAN global/LAN local)

Result:
List of all connected devices with status:
search??? – online - byebye – lost???

Click the button to open the 'standard' Internet Browser, e.g. Microsoft InternetExplorer, directly with the marked IP address.

Click the button to localize the associated device.
Short-term visual response of the device:
Regular running light in LED 1, 2, 3.

Click the button
to re-start the network search run.
Waiting 2...3 minutes is essential!

Acoustic signal for each device that was found 'online'.

If the browser window remains empty after a minimum waiting time, or if the expected device is not listed, the network ID of the local notebook/PC must be checked and changed, if necessary!

Note: Only certain Sartorius devices are supported by the 'IndicatorBrowser'!

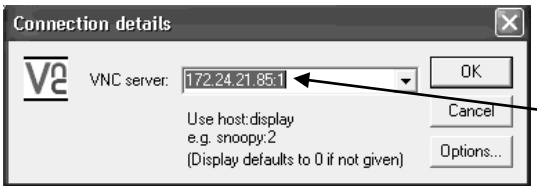
4.3.4 Operation Using the VNC Program

VNC (on the enclosed CD-ROM) stands for 'virtual network computing' and is a program for remote operation of computers.

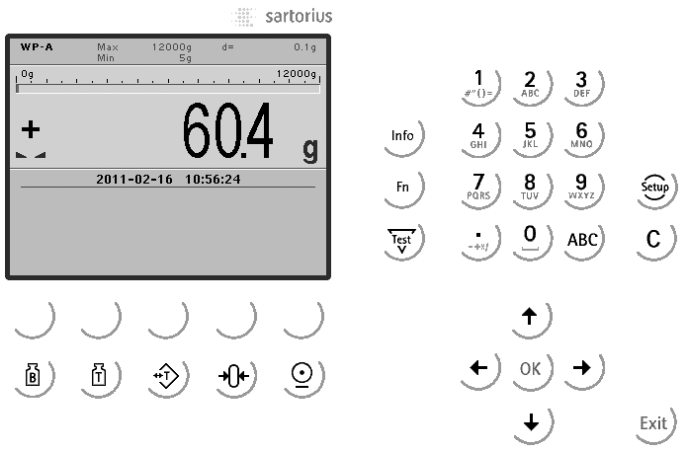
The program distinguishes between the VNC server and VNC client (viewer). The server program is part of the instrument software. The client program (viewer) must be executed on the notebook/PC to be used for operating the instrument.

Caution!

The VNC version provided on CD must be used.
More recent VNC versions (freeware) from the Internet are not supported by the device!



For direct operation using the VNC program, the IP address (extended by :1) must be specified when you run the program, e.g. 172.24.21.85:1.



The address range of the controlling notebook/PC can be limited in the instrument; see Chapter 4.7.4.

The operator interface of the VNC program appears:

Note:

Instead of the VNC viewer, the web browser, e.g. Microsoft InternetExplorer, ‚Mozilla Firefox Webbrowser' etc., can be used directly.

The disadvantage is that an additional 'Java' installation is required.

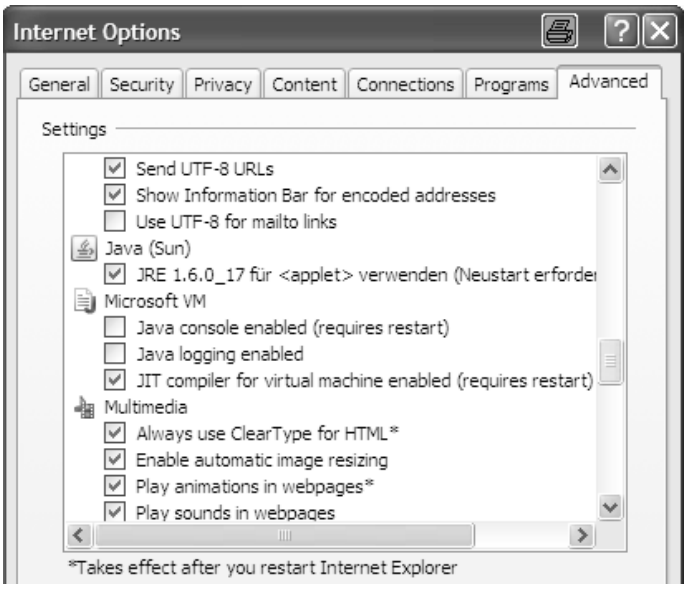
In addition to VNC, this includes:

- easy operation for back-up/restore
- easy operation for analysis
- easy operation for data of the entire device configuration, see page 47.

4.3.5 Operation Using Internet Browser

Example: Microsoft InternetExplorer under Windows XP

With Internet Explorer, check if the required Java (Sun) 'applet' is installed and activated.



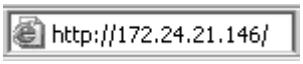
- Start the Internet Explorer
- Click [Tools] – [Internet Options...].
- Click the [Advanced] tab.
- [Java (Sun)]: Check whether entries are provided.
- If so, check ☑ with [IRE 1.6.xxx ...] (not activated by default).
- If no entries are provided, load 'Java (Sun) applet' as freeware from the Internet and install it.

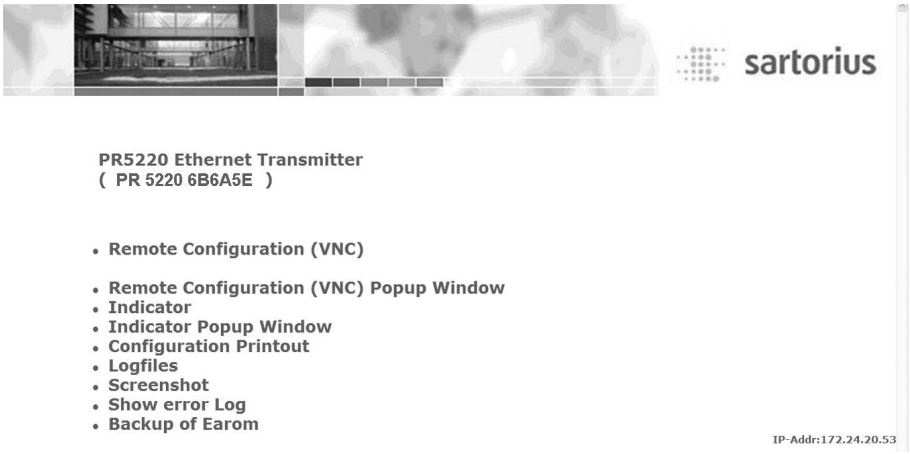
Note: In earlier Windows installations, Java was provided as standard, but not activated.

Example: Microsoft InternetExplorer under Windows 7

With InternetExplorer, check if the required Java (Sun) 'applet' is installed.
If it is not installed, the link for a 'Java' download is suggested automatically.

With the Internet browser, the [IP address] must be filled in.

Example: 



The menu appears on the monitor. The line in brackets below the header corresponds to the device name specified in [Hostname].

[Remote Configuration (VNC)], [Remote Configuration (VNC) Pop up Window]

For instrument operation using the VNC program without additional installation of VNC, see page 46.

[Indicator], [Indicator Pop up Window]

The weight value is displayed with the unit and status symbols.

[Configuration Printout]

Displaying and saving the configuration data as a text file, see Chapter 9.

[Logfiles]

Displaying the log files, see Chapter 4.11.

[Screenshot]

Device display for saving the display

[Show error Log]

Displaying and saving the error logs, see Chapter 13.5.

[Backup of Earom]

Saving and restoring the configuration and calibration data, see Chapter 4.12.

4.3.6 INFO Function

When you press (info), the program releases and status messages are displayed. The (info) key also has other functions; see Chapters 4.4.1.1 and 4.4.9.

Info
▸ Show version
▸ Show status
▸ Show HW-slots

When you select [Show version], the installed program releases and the board number are displayed:

Info/Version		
Firmware	**Rel. 02.00.00.00000**	Firmware release and creation date
	2010-11-11 11:11	
PR5220-Application	**Rel. 01.20.06**	Application release and creation date
	2010-11-11 11:11	
Bios	**Rel 02.00.00.00000**	BIOS release and creation date
	2010-11-11 11:11	
Boardnumber	**275401089**	Main board identification number (different from the device serial number)

When you select [Show status], instrument status information is displayed:

Info/Status		
Free system RAM	**6328 of 15212 kb**	
Cal-Switch	**closed**	('opened' if CAL switch is open)

When you select [Show HW-slots], the installed plug-in cards are displayed:

Info/HW-Slots		
Builtin	**RS 485**	Standard serial interface
Builtin	**analog out**	Standard interface, analog outputs
Builtin	**digital i/o**	Standard interface, digital I/Os

4.3.7 Setup Function (VNC)

Press (Setup) to configure the main operating parameters. The instrument configuration depends on the application and the plug-in cards installed.

Calibration is in a simple dialogue. Compliance with the relevant (verification) standards must be checked by the person commissioning the instrument or the verification officer. To protect the calibration data from overwriting, close the CAL switch on the back panel of the instrument. On legal-for trade instruments, the CAL switch must be sealed in the closed (write-protected) position; see Chapter 4.1.1.

4.3.8 Setup Menu

- Serial ports parameter	
- Remote display	<none>, Builtin RS485
- Param	Assigned to, Protocol, Baudrate., Bits, Parity, Stopbits, Mode
- SMA	not used <none>, Builtin RS485
- Param	Assigned to, Protocol, Baudrate., Bits, Parity, Stopbits,
- xBPI-Port	<none>, Builtin RS485
- Param	Assigned to, Baudrate, Bits, Parity, Stopbits
- Operating parameter	
- AccessCode	Access code for changes
- SetTareKey	Tare&reset tare, tare&tare again, disabled
- SetZeroKey	Only when not tared, reset tare on zeroset , disabled.
- Fieldbus parameter	Only for PR 5220/01, ../04, ../06 und ../07, see Chapter 4.7.3
- Network parameter	Hardware address (read only), Hostname (instrument name), Use DHCP, IP address (read only), Subnet mask (read only), Standard gateway (read only), Remote access, VNC-Client (access restriction)
- Weighingpoint	<Internal A>, xBPI-Scale
- Calib	‚Internal A' selected: New, Modify, Param, see Chapter 4.3.8.1
- Setup	‚xBPI-Scale' selected: Calibration, Configuration, Select, Show device info, see Chapter 4.3.8.2
- Config	‚xBPI-Scale' selected: Type, W&M, Tare timeout, Serial number, SBN Address, see Chapter 4.3.8.2
- Param	‚xBPI-Scale' selected: Assigned to, Baudrate, Bits, Parity, Stopbits, see Chapter 4.3.8.2
-Limit parameter	
- Limit 1/2/3 on/off	Limit 1/2/3 'on'/ 'off', Action, Condition; see Chapter 4.8
-Digital I/O parameter	
- Output 1/2/3	Configuring outputs; see Chapter 4.9.1
- Limit 1/2/3 on/off	Inputs, Action, Condition; see Chapter 4.9.2
- Analog output parameter	
- Analog mode	Analog output parameter: Gross D08, Net if tared D09, Selected D11, Transparent D30, no output, see Chapter 4.10
- Analog range	0…20 mA, <4…20 mA>
- Output on error	Output on error: 0 mA = set to 0 mA, <4 mA> = set to 4 mA, mA = set to 20 mA, hold = last output value remains unchanged
- Output if <0	Output if <0: set 0 mA = 0 mA, set <4 mA> = 4 mA, set 20 mA = 20 mA, linear = goes below 4 mA down to the limit (with 4…20 mA)
- Output if >Max	set 0 mA = 0 mA, set 4 mA = 4 mA, set <20> mA = 20 mA, linear = goes above 20 mA up to the limit
- Weight at 0/4 mA	Weight value for 0/4 mA output
- Weight at 20 mA	Weight value for 20 mA output

4.3.8.1 Weighingpoint ‚Internal A'

- Calibration	Calibration of weighing electronics
- New	
Reset Span and deadload	Contin, Cancel
- Max	0.00001 ...<3000>... 999999 <kg>, t, lb, g
- Scale interval	<1>, 2, 5, 10, 20, 50
- Deadload at	<0.000000 mV/V> or [by load]
- Max at	<1.000000 mV/V> or [by load]
by load	0.00001 ... 999999 <kg>, t, lb, g
- Calibrated at	(Display only)
- Sensitivity (µV/d)	(Display only)
- Test	Determine test value
Exit calibration	Save or cancel changes
- Modify	Only for minor modifications/ setting new dead load, otherwise [New
see New	
- Param	
- Measuretime	5 ms, 10, 20, 40, 80, 160, <320>, 640, 960, 1280, 1600ms
- Digital filter	<off>, Bessel, aperiod., butterw., tscheby.
- External supply	<8 -12 VDC>, below 8 VDC
- * Fcut	Cut-off frequency, only unless filter 'off', 0.1 - 80.0 Hz
- Test mode	<Absolute>, relative
- W & M	<none>, OIML, NSC, NTEP
- Standstill time	0.01 s…<0.50 s> ... 2.0 s (range is dependent on response time)
- Standstill range	0.00 d ... <1.00 d> ... 10.00 d
- Tare timeout	0.1 s ... <2.5 s> ... 25 s, timeout due to instability
- Zeroset range	0.00 d ... <1.00 d> ... 10.00 d
- Zeroset range	0.00 d ... <1.00 d> ... 10.00 d
- Zerotrack step	0.00 d ... <1.00 d> ... 10.00 d
- Zerotrack time	<0.0 s> ... 25 s
- Overload	0 d ... <9 d> ... 999900 d
- Min	0 d ... <50 d> ... 999900 d, minimum weight
- Range mode	<Single range>, multiple range, multi-interval
- * Range limit 1	In weight, unit same as Max, transition from small to medium scale interval, *only for multiple range or multi-interval
- * Range limit 2	In weight, unit same as Max, transition from medium to high scale interval, *only for multiple range or multi-interval
- View(when - View(when CAL switch closed)	
- Max	(Display only)
- Scale interval	(Display only)
- Deadload at	(Display only)
- Max at	(Display only)
- Calibrated at	(Display only)
- Sensitivity (µV/d)	(Display only)
- Param	Items as for Param. (display only)

4.3.8.2 Weighingpoint ‚xBPI-Scale'

- Setup	
- Calibration	
- Deadload	
- Set	Accept, ResError = reset error, Abort
- Delete	Accept, ResError = reset error, Abort
- SPAN	
- Adjust with user weight	Adjust with user-defined weight
- Adjust with auto weight	Adjust with automatic weight detection
- Adjust with default weight	Adjust with default weight
- Adjust with intern weight	Adjust with internal weight
- Linearity	
- Default	Accept, ResError = reset error, Abort
- User	Accept = OK, ResError = reset error, Abort = Abbruch
- Configuration	
- Weighing parameters	
- Ambient conditions	Very stable, stable, unstable, very unstable
- Application filter	Final readout, Filling mode, low filtering, w/o filtering = without filtering
- Stability range	0,25 digit, 0,5 digit, 1 digit, 2 digit, 4 digit, 8 digit
- Stability symb. delay	no delay, short delay, average delay, long delay
- Tare parameter	at any time, not until stable
- Auto zero function	auto zero on, auto zero off
- Adjustment function	ext.adj.w.fact.wt., ext.adj.w.user.wt.., ext.adj.w.pres.wt., internal adjust, ext.lin.w.fact.wt., ext.lin.w.user.wt., confirm preload, delete preload, adjust disabled
- Confirming adjust.	manual, automatically
- Zero range	1% of max load, 2% of max load, 5% of max load, 10% of max load
- Power-On zero range	2% of max load, 5% of max loadt, 10% of max load, 20% of max load
- Power-On tare/zero	active, inactive, only for zeroing
- Measure rate	normal output, fast output
- Calibration check	calibration prompt, off
- External adjustment	accessible, blocked
- Application settings	
- Application Tare	accessible, blocked
- Number of units	1 weight unit, 2 weight units, 3 weight units
- Weight unit 1	Gramm [g], Kilogram [kg], Carat [ct], Pound [lb], Unze [oz], Troy unze [ozt],
- Weight unit 2	Tael Hongkong [tlh], Tael Singapur [tls], Tael Taiwan [tlt], Grain [GN],
- Weight unit 3	Pennyweight [dwt], Milligramm [mg], Parts/pound [/lb], Tael china [tlc], Momme [mom], Karat [k], Tola [tol], Baht [bat], Mesghal [m], Tonne [t]
- Display accuracy 1	all digits, reduced when moved, one level lower, two level lower, three level
- Display accuracy 2	lower, 1%, 0.5%, 0.2%, 0.1%, 0.05%, 0.02%, 0.01%, Multi-interval,
- Display accuracy 3	increased by 10

- Interface settings	
- Communication type	SBI protocol, xBPI protocol
- Baudrate for SBI	150 baud, 300 baud, 600 baud, 1200 baud, 2400 baud, 4800 baud, 9600 baud, 19200 baud
- Parity for SBI	Mark, Space, Odd, Even
- Stopbits	1 stopbit, 2 stopbits
- Handshake	Software handshake, CTS with 2 chr.pau = CTS with 2 characters, CTS with 1 chr.pau = CTS with 1 character
- Data output interval	with each display, after 2 updates, after 5 updates,after 10 update, after 20 updates, after 50 updates, after 100 updates
- Parameter change	can be changed, cannot be changed
- Select specification group	
- Specif. group 1 …6	Select specification group of the scale (see operating manual of the relevant scale)
- Show device info	
- Set user	User name of the connected device
- Set SBN	Address for xBPI at an interface must be <0 >, because there is no bus operation.
- Config	
- Type	xBPI-Scale
- W&M	<none>, OIML, NSC, NTEP
- Tare timeout	0.1 s ... <2.0 s> ... 25 s,
- Serial number	<0>, if >0, the serial number is checked (with verified scale)
- SBN Address	<0 > no bus operation.
- Param	
- Assigned to	xBPI-Port 1
- Baudrate	Transmission rate: <9600>, 19200, 38400
- Bits	8
- Parity	odd
- Stopbits	<1>, 2

4.3.8.3 Weighingpoint , Pendeo Load Cells'

- Search	Search load cells - Search for a new network and reset the load cell data to the factory settings. - Or replace a single faulty load cell with the existing data.
- View	Serial number and current weigh of connected load cells are displayed.
- Info	Data of selected load cell are displayed.
- Assign	Load cells (serial number) are assigned to the mounting place.
- Calib	Calibration xBPI load cells
- New	
Corner correction will be reset	Yes, No
- Number of vessel feet	Enter number of vessel feet
- Local gravity	Enter local gravity (Default: Hamburg 9,81379 m/s^2)
- Max	Max. capacity: 0.000010 ...<3000>... 9999998 <kg>, t, lb, g, mg, oz
- Sccale interval	<1>, 2, 5, 10, 20, 50
- Dead load	Empty scale
- CAL weight	Calibration weight: 0.000010 ... 9999998 <kg>, t, lb, g, mg, oz
- Corner correction	O.k., when realized
- Modify	For minor modifications/ subsequent dead load setting only, otherwise, use [New].
siehe ‚New'	
- Param	
- Ambient conditions	Very stable, stable, unstable, very unstable
- W & M	<none>, OIML, NSC, NTEP
- Standstill time	0.01 s…<0.50 s> ... 2.0 s (The range depends on the measurement time.)
- Standstill range	0.00 d ... <1.00 d> ... 10.00 d (The range depends on the measurement time.)
- Tare timeout	0.1 s ... <2.5 s> ... 25 s, timeout when there is no standstill
- Zeroset range	0.00 d ... <50.00 d> ... 10000.00 d
- Zerotrack range	0.00 d ... <0.25 d> ... 10000.00 d
- Zerotrack step	0.00 d ... <0.25 d> ... 10.00 d
- Zerotrack time	<0.0 s> ... 25 s
- Overload	0 d ... <9 d> ... 999900 d
- Min	0 d ... <50 d> ... 999900 d, min. weight
- Range mode	<Single range>, Multiple range, Multi-interval
- Range limit 1	0…max. weight, transition from small to medium scale interval; only when multiple range or multi-interval has been selected.
- Range limit 2	0…max. weight, transition from medium to large scale interval; only when multiple range or multi-interval has been selected.

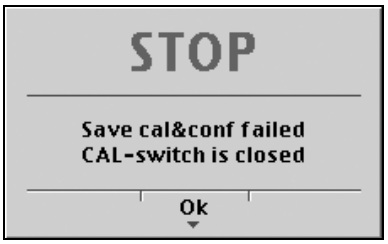
- Calib (when CAL-switch is closed)
  - Number of vessel feet (display only)
  - Local gravity (display only)
  - Max (display only)
  - Sccale interval (display only)
  - Dead load (display only)
  - CAL weight (display only)
  - Corner correction (display only)

4.4 Calibration Weighing Point ‚Internal A'

Calibration using weights, mV/V or load cell data can be done using the VNC program. During calibration, the instrument must be set to gross weight display (reset tare, if necessary).

For a 'legal-for-trade' application, set the mode under Setup-[Weighingpoint]-[Calib]- [Param] to [W&M] before starting calibration; see Chapter 4.4.13.1. Select [New] to go to the maximum capacity [Max] (see chapter 4.4.3), select the scale interval and determine the dead load. Now calibrate the maximum capacity by applying a calibration weight, in mV/V or with load cell data. After determining the test value, the menu can be closed as described in Chapter 4.4.12, in order to save the new settings. Calibration data can be protected by the CAL switch (see Chapter 4.1.1), which must be sealed in the closed (write-protected) position for 'legal-for-trade' applications.

4.4.1 Displaying Calibration Data



When the CAL switch is closed, the following message is displayed; only data display possible with [Param]:

With [View], the calibration data can be displayed, but not changed.

Weighingpoint/WP A/**View Calibration**			
Max	3000 d	3000 kg	Number of scale intervals and max. capacity
Scale interval	3000 d	1 kg	Scale interval
Deadload at	0.00 kg	0.000000 mV/V	Dead load in weight and mV/V
Max at	3000.00 kg	1.000000 mV/V	Weight and mV/V for maximum capacity
Calibrated at	3000.00 kg	1.000000 mV/V	Test load* and corresponding mV/V
Sensitivity	833.33 cnt/d	4.000000 µV/d	Number of internal counts and voltage per scale interval
Param			

The calibration data and parameters (press [Param]) are displayed in the format entered/determined during calibration.

* After input with mV/V, the maximum capacity and the mV/V value entered are displayed.

4.4.1.1 Increased Resolution (10-Fold)

In the Setup-[Weighingpoint]-[Calib] menu, the weight is displayed with 10-fold resolution (also with the CAL switch closed) when you press the key Info, and marked as an invalid weight with ⚠ above the weight unit. After 5 s, the display returns to normal resolution.

You can press the key ↓ to return to normal display immediately.

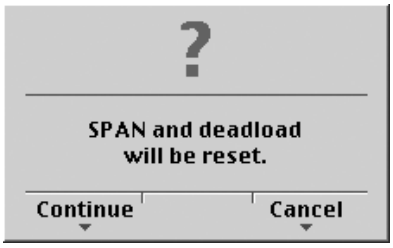
4.4.2 Selecting the Calibration Mode

You can choose between [New] and [Modify] with the softkeys:

New	Modify	Param		

4.4.2.1 New Calibration

Open the menu via Setup-[Weighingpoint]-[Calib]. When you press [New], the data is set to default first and calibration is started.



You are prompted to confirm:
Press [Continue] for the default settings, or [Cancel] to cancel the selection.

Default settings with [New]:

Weighingpoint/WP A/**Calibration**			
Max	**3000 d**	**3000 kg**	
Scale interval	3000 d	1 kg	
Deadload at		0.000000	mV/V
Max at		1.000000	mV/V
Not calibrated			
Sensitivity	833.33 mV/d	4.000000	µV/d
			CalcTest

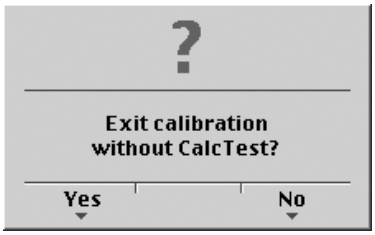
4.4.2.2 Changing the Calibration

Note: [Modify] may be used only for minor changes (e.g. changing the dead load, adapting mV/V values for dead load and/or Max); otherwise, always use [New].

Open the menu via Setup-[Weighingpoint]-[Calib] -[Modify].

Weighingpoint/WP A/**Calibration**			
Max	**3000 d**	**3000 kg**	
Scale interval	**3000 d**	**1 kg**	
Deadload at	**1.07 kg**	**0.000358**	mV/V
Max at	3000.00 kg	1.000000	mV/V
Calibrated at	3000.00 kg	1.000000	mV/V
Sensitivity	833.33	4.000000	
by load	**by mV/V**		**Test**

For setting a new value for Dead load, press ↓/↑ to select [Deadload] and either enter a new mV/V value with [by mV/V] or discharge the scale/hopper and press [by load].



When closing the menu with Exit you are prompted whether the menu should be closed without calculation of the test value:

Reply [Yes] to close the menu.

4.4.3 Determining the Maximum Capacity (Max)

The maximum capacity (Max) determines the maximum weight without dead load of the weight to be measured and the displayed number of digits behind the decimal point. Normally, Max is less than the load cell capacity (nominal capacity x number of load cells).

Permissible values are:

[Max] from 0.00010 to 999999, with ABC in kg, t, g or lb

Max must be an integer multiple of the scale interval. It may have up to 6 digits and is entered as a numeric value with or without decimal point.

Note: If the liniarization is active (see Chapter 4.4.10):
After selection of the line ‚Max at' the following tip is displayed:

Can not be changed here while linearization is active

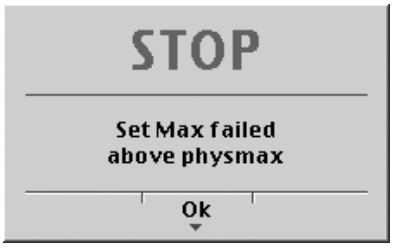
Weighingpoint/WP A/**Calibration**		
Max at	**3000 d**	**3000 kg**

The weight unit can be changed from kg into t, g or lb by pressing ABC.

After pressing OK or ↓ confirmation of the change is displayed with:

Setting Max

Possible Error messages

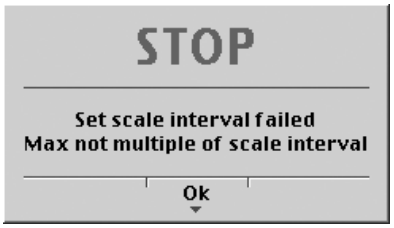


This message displays, if the maximum capacity is too high (the calculated input voltage for the specified maximum capacity exceeds 36 mV).

Subsequent changing of the maximum capacity is possible; if you decrease the capacity, a message is displayed if the new maximum capacity is lower than the test load ([Calibrated at]).

This message displays, if the selected resolution is to low, e.g. 5 kg.

The selected resolution is so high that less than 0.8 internal counts per scale interval (d) or 0.5 µV/e for legal-for-trade acc. to OIML/NSC are available.



This message displays, if the maximum capacity is not an integer multiple of the scale interval.

After you press [OK], the input value for the maximum capacity is canceled.

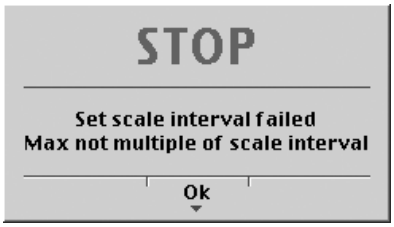
4.4.4 Determining the Scale Interval

Weighingpoint/WP A/Calibration			
Max	3000 d		3000 kg
Scale interval	3000 d	⇵	1kg

The scale interval 1, 2, 5 10, 20 or 50 can be set by pressing ←/→.

The weight unit is taken from [Max] and cannot be changed here.
The number of digits behind the decimal point must be determined already when entering [Max] as well.
After OK or ↓ confirmation of the change is displayed with:

Set Scale interval



The maximum capacity is not an integer multiple of the scale interval.

4.4.5 Determining the Dead Load

Note: If the liniarization is active (see Chapter 4.4.10):
After selection of the line ‚Dead load at' the following tip is displayed:

Can not be changed here while linearization is active

Weighingpoint/WP A/**Calibration**			
Max	**3000 d**	**3000 kg**	
Scale interval	**3000 d**	**1 kg**	
Deadload at	**0.00 kg**	**0.000000**	mV/V
Max at	**3000.00 kg**	**1.000000**	mV/V
Not calibrated			
Sensitivity	833.33	4.000000	µV/d
by load	**by mV/V**		**CalcTest**

To use the empty scale/hopper as dead load (normal case):

- discharge the scale/hopper
- press [by load]

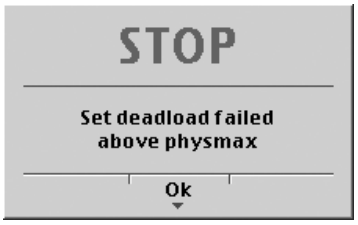
After OK or ↓ confirmation of the change is displayed:

Set deadload

If the mV/V value of the dead load was calculated, or if it is known from the previous calibration, the value can be overwritten by pressing [by mV/V].

Weighingpoint/WP A/**Calibration**			
Max	**3000 d**	**3000 kg**	
Scale interval	**3000 d**	**1 kg**	
Deadload at	**0.00 kg**	**0.000000**	mV/V
Max at	**3000.00 kg**	**1.000000**	mV/V
Calibrated at	3000.00 kg	1.000000	mV/V
Sensitivity	833.33	4.000000	µV/d
by load	**by mV/V**		**CalcTest**

Possible error messages

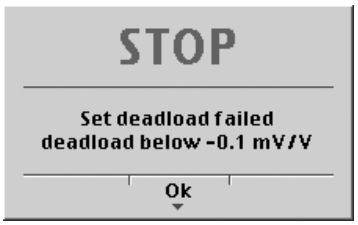


The dead load entered in mV/V plus maximum capacity in mV/V is higher than 3 mV/V (= 36 mV).

This message displays, if the scale is not stable.

Remedial action

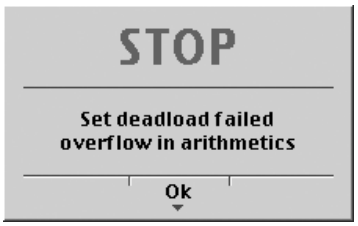
- Check the mechanical function of the scale.
- Adapt the filter setting; reduce the resolution, if necessary.
- Adapt the stability conditions.



This message displays, if the Measurement signal is negative when determining the dead load with [by load].

Cause

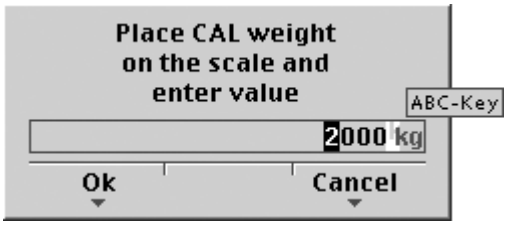
Load cells connected with wrong polarity or defective.



This message displays, if dead load entered in mV/V is higher than 5 mV/V.

4.4.6 Calibration with Weight (by Load)

Select [by load] for calibration using weight.



The weight value for the calibration weight must be entered in separate window.

After applying the weight, enter the weight value and confirm with OK. The weight unit for the calibration weight (press ABC to change) may differ from the unit in the instrument; conversion is automatic.
Afterward, the following message is displayed:

Setting SPAN by load

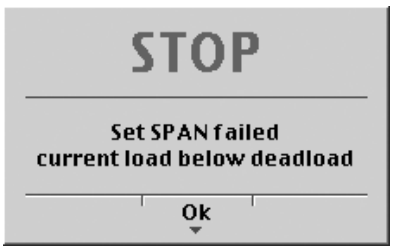
Weight value, weight unit and measuring signal in mV/V corresponding to this value are displayed in the [Calibrated at] line.

Weighingpoint /WP A/**Calibration**			
Max	3000 d	3000 kg	
Scale interval	3000 d	1 kg	
Deadload at	165.11 kg	0.057920	mV/V
Max at	3000.00 kg	1.052369	mV/V
Calibrated at	2000 kg	0.701579	mV/V
Sensitivity	876.97 cnt/d	4.209600	µV/d
by load / by mV/V / by data / Linear. / CalcTest			

This message displays, if the scale is not stable.

Remedial action

- Check the mechanical function of the scale.
- Adapt the filter setting; reduce the resolution, if necessary.
- Adapt the stability conditions.



This message displays, if the weight on the scale is less than the dead load after input of the weight value.

The next step is calculation of the test value with [CalcTest] (see Chapter 4.4.11), and calibration is completed with Exit (see Chapter 4.4.12).

4.4.7 Calibration with mV/V Value [by mV/V]

The scale can be calibrated without weights. During input of the load cell mV/V value, the acceleration of gravity at the place of installation can be taken into account. The STAR load cell data is based on the acceleration of gravity effective at Hamburg, Germany: 9.81379 m/s².

4.4.7.1 SPAN

Span indicates the equivalent input voltage in mV/V related to the maximum capacity (Max) of the scale. It is calculated as follows:

$$\text{SPAN [mV/V]} = \frac{\text{maximum capacity * load cell sensitivity Cn [mV/V]}}{\text{load cell capacity (nominal load * number of load cells)}}$$

Load cell sensitivity C_n = rated output C_n (see technical data of the load cell)

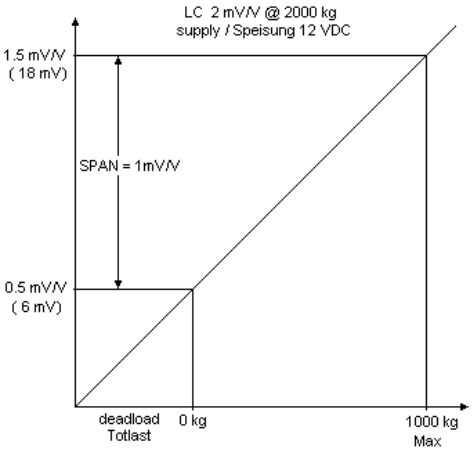
4.4.7.2 Dead Load

The input voltage in mV/V equivalent to the dead load can be calculated by using the dead load rather than the maximum capacity in the formula specified above.

Normally, calculation of the dead load (scale without load/empty hopper) is not necessary. Subsequent dead load correction (as described in Chapter 4.4.9) can be used for later re-determination of the dead load, when the scale/hopper is empty.

Example

- Load cell(s) with rated output of 2 mV/V
- at nominal load of 2,000 kg,
- dead load 500 kg
- load cell supply voltage 12 V DC



The calibration dialog provides an overview of all settings:

Weighingpoint/WP A/**Calibration**		
Max	**1000 d**	**1000 kg**
Scale interval	**1000 d**	**1 kg**
Deadload at	**500.00 kg**	**0.500000** mV/V
Max at	**1000.00 kg**	**1.000000** mV/V
Calibrated at	1000.00 kg	1.000000 mV/V
Sensitivity	2500.00 cnt/d	12.000000 µV/d

After selecting [mV/V], the values for the Max and for the dead load (if necessary) can be entered.

The next step is calculation of the test value with [CalcTest] (see Chapter 4.4.11).

The calibration is completed by pressing Exit (see Chapter 4.4.12).

4.4.8 Calibration with Load Cell Data ("Smart Calibration")

If the scale to be calibrated is not legal for trade, it can be calibrated without weights. The easiest method is the one using load cell data without calculation [by data].

Weighingpoint/WP A/**Calibration**		
Max	3000 d	3000 kg
Scale interval	3000 d	1 kg
Deadload at	3.00 kg	0.001000 mV/V
Max at	3000.00 kg	0.000000 mV/V
Not calibrated		
Sensitivity	833.33 cnt/d	4.000000 µV/d
by load | by mV/V | by data | Linear. | CalcTest		

Start by pressing [by data].

Weighingpoint/WP A/Calibration/**Load cell configuration**	
Number of load cells	4
Nominal load	3000 kg
Gravity	9.81379 m/s²
Hysteresis error	not specified
Certified data	all LC same
LC sensitivity	1.000000 mV/V
Enter | Calc	

Weighingpoint/WP A/Calibration/**Load cell configuration**	
LC resistance	600.000 Ω
Enter | Calc	

[Number of load cells]

Number of load cells connected in parallel (1, 2...<4>...9, 10)

[Nominal load]

Max. capacity E_{max} of a load cell (not the overall nominal weight of the scale).

[Gravity]

Acceleration of gravity at the place of installation; default is the value for Hamburg, Germany, 9.81379 m/s².

[Hysteresis error]

When switching from [Not specified] to [Specified], values for [Correction A/B] must be filled in. The data is given on the load cell certificate.

[Certified data], [LC sensitivity], [LC resistance]

With [all LC same], only 1 value for the sensitivity [LC sensitivity] and the output resistance [LC resistance] must be filled in. With [each LC specific], individual values for each load cell are requested.

[Calc]

The mV/V value is calculated and after confirmation with [OK], the calculated mV/V value is stored in the calibration data.

4.4.9 Subsequent Dead Load Correction

If the hopper/platform weight changes by an amount that is higher than the zero-setting range; e.g., due to dead load reduction, dead load increase or mechanical changes, the functions for automatic zero tracking and manual zero setting no longer work. To view the range which is already utilized by zero tracking or zero setting, select [Calibration] and press Info; this also activates 10-fold increased resolution of the weight value. Press Info again to return to the previous state:

Current zero setting: 0.123 kg

If the entire zero-setting range is already utilized, you can still correct the dead load (CAL switch must be open) without affecting other calibration data/parameters.

To do this, select Setup-[Weighingpoint]-[Calib]-[Modify] and determine the dead load with [Dead load at]-[by load] (see Chapter 4.4.5).

Note: If the liniarization is active (see Chapter 4.4.10):
After selection of the line ‚Dead load at' the following tip is displayed:

Can not be changed here while linearization is active

4.4.10 Linearization

After selecting Setup-[Weighingpoint]-[Calib]-[New]/[Modify] and after completing calibration, select the linearization menu with softkey [Linear.]:

by load	by mV/V	by data	Linear.	CalcTest

When you press [Linear], the menu shown below appears:

Weighingpoint/WP A/Calibration/**Linearization**				
Max at	3000.00 kg		1.000000 mV/V	
Add			**by mV/V**	**by load**

To add a new linearization point, press [Add], fill in the weight value, apply the weight and press [by load]. Then fill in the corresponding value in mV/V for the weight. After pressing [mV/V], the value can be entered directly.

Up to 3 linearization points can be determined.

A linearization point can be added with [Add], removed with [Delete] and changed with [Change].

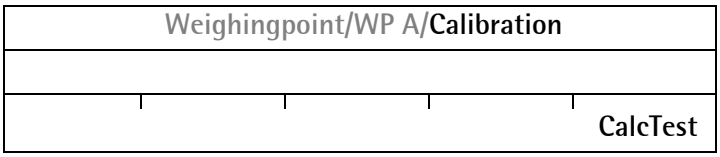
Weighingpoint/WP A/Calibration/**Linearization**				
1. Lin. point	750 kg		0.250010 mV/V	
2. Lin. point	1500 kg		0.500020 mV/V	
3. Lin. point	2250 kg		0.750040 mV/V	
Max at	3000.00 kg		1.000000 mV/V	
Add	**Change**	**Delete**	**by mV/V**	**by load**

A linearization point can be selected with ↓/↑, changed with [Change] and deleted with [Delete].

4.4.11 Test Value Determination/Display

Press [Test] to activate test value calculation. The maximum capacity (Max) is displayed with the designation **TST** without a weight unit.

The value determined during calibration after starting the test [CalcTest] is shown.



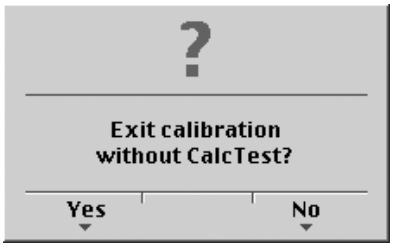
Depending on the settings under Setup-[Weighingpoint]-[Calib]-[Param]-[Test mode], either

- the maximum capacity with [Absolute], or
- the deviation from the test value with [Relative]

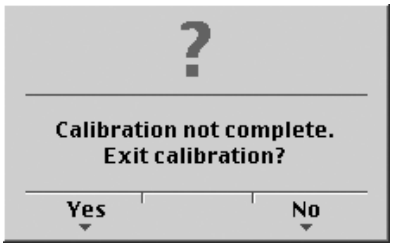
is shown when you press Test to view the test data.

4.4.12 Finishing/Saving the Calibration

Finish the calibration with Exit.

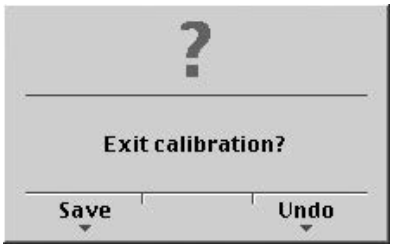


You are prompted to confirm whether calibration should be closed without determining the test value.



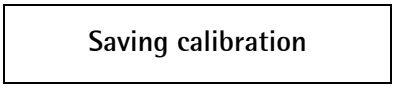
If not all data was determined when calibrating with [New] (e.g. dead load not set/entered), this message is shown:

Press [Yes] to confirm and then press Exit again; another prompt is displayed:

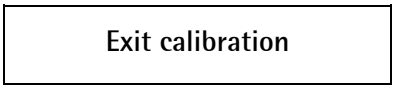


Press [Save] to save changes in calibration data. If you press [Undo], changes are not saved and the display returns to the selection menu for the weighing points.

The confirmation is displayed as follows:



After quitting the menu, the following message is displayed:



After finishing the calibration, set the CAL switch to the closed position; see also Chapter 4.1.1.

4.4.13 Parameter Input

Open the menu via Setup-[Weighingpoint]-[Calib]-[Param].

Weighingpoint/WP A/**Calibration**		
Measuretime	⇵	**160 ms**
Digital filter		**bessel**
External supply		**8 - 12 VDC**
Fcut		**3.00 Hz**
Test mode		**absolute**
W & M		**none**
Standstill time		**0.50 s**
Standstill range		**1.00 d**

This line is shown only if the filter is on.

[Measuretime]

Select the measuring time; possible values: 5, 10, 20, 40, 80, 160, 320, 640, 960, 1280, 1600 ms.
In 'legal-for-trade' mode select ≤1 s.

[Digital filter]

The digital filter can be switched on only with the measuring time set to ≤160 ms.
Select the filter characteristic [off], [bessel], [aperiod.], [butterw.], [tscheby.].

[Fcut]

Enter the cut-off frequency for the filter (0.1...80 Hz); the setting is dependent on the measuring time.

[External supply]

With external load cell supply (e.g. 7.5 V DC via 1626/60 with MX8 = closed), [below 8 VDC] can be selected to adapt the sense voltage monitoring to the lower supply voltage.

[Test mode]

With [Absolute], the test value is calculated when the test is called. With [relative], the deviation from the initially stored test value is displayed; see Chapter 4.4.11.

[W & M]

Setting for 'legal-for-trade' mode; select [none], [OIML], [NTEP] (for USA) or [NSC] (for Australia), see Chapter 4.4.13.1.

[Standstill time]

Settings [Standstill range] and [Standstill time] are required for determining the mechanical stability of the scale. Input in seconds; permissible range 0.01 bis 2 sec. (max. measuring time x 32). If 0 is set, stability is not checked. The stability time must not be less than the measuring time and not greater than 32 times the measuring time.

[Standstill range]

The scale is stable as long as any changes in the weight value are within this range; permissible range: 0.01d to 10.00d. In 'legal-for-trade' mode select ≤1 d.

Weighingpoint/WP A/Calibration		
Tare timeout	2.5	s
Zeroset range	50.00	d
Zerotrack range	0.25	d
Zerotrack step	0.25	d
Zerotrack time	0.0	s
Overload	9	d

[Tare timeout]

Enter a timeout value between 0.1 and 25 s for a taring/zero set command that cannot be executed (e.g., if scale mechanically unstable, filter settings faulty, resolution too high, stability condition too narrow).

[Zeroset range]

Determine a ±range around the zero point determined by the dead load during calibration; within this range:

- the displayed gross weight can be set to zero by pressing the zero-setting key (or by a corresponding external command), and
- automatic zero tracking is active.
  Available range: 0.00 d to 10000.00d

In 'legal-for-trade' mode a value ≤ 2 % of Max. must be entered. Example: 60 d for 3000e, class III.

[Zerotrack range]

Range within which automatic zero tracking compensates deviations; 0.25 to 10000.00d.
In 'legal-for-trade' mode a value of 0.25 d has to be entered.

[Zerotrack step]

Step for automatic tracking; 0.25 to 10d. In 'legal-for-trade' mode a value of 0.25 d has to be entered.

[Zerotrack time]

Enter a time interval for automatic zero tracking within 0.0 (tracking switched off) and 25 s.
In 'legal-for-trade' mode a value of 0.25 d has to be entered.

[Overload]

Weighing range above the maximum capacity (Max), without error message. Available range: 0 to 9999900 d.
In 'legal-for-trade' mode max. 9 d=e has to be entered.

Weighingpoint/WP A/Calibration		
Minimum weight	50	d
Range mode	Single range	

[Minimum weight]

Minimum weight at which a print command can still be executed. Range is 0 to 9999900 d.

In 'legal-for-trade' mode min. 20 d has to be entered.

[Range mode]

For scale range selection, see Chapter 4.4.13.2.

4.4.13.1 Legal-for-Trade Operation

Under Setup-[Weighingpoint]-[Calib]-[Param]-[W&M] you can choose between:
[none] and a legal-for-trade mode [OIML], [NTEP] or [NSC].

	[none]	[OIML]	[NTEP]	[NSC]
Gross weight display	B	B	G	G
Min. meas. signal	0.125 mV/V at 30000 d	0.125 mV/V at 3000 e	0.125 mV/V at 3000 e	0.125 mV/V at 3000 e
	0.25 mV/V at 60000 d	0.25 mV/V at 6000 e	0.25 mV/V at 6000 e	0.25 mV/V at 6000 e
		0.42 mV/V at 10000 e	0.42 mV/V at 10000 e	0.42 mV/V at 10000 e

If legal-for-trade operation is selected, the parameters (zero tracking etc.) must be set accordingly; they are not checked. The relevant CAL switch (see Chapter 4.1.1) must be sealed in the closed position.

4.4.13.2 Multiple Range Scale/Multi-Interval Scale

Range selection is controlled by three parameters under Setup-[Weighingpoint]-[Calib]-[Param].

Weighingpoint/WP A/**Calibration**			
Range mode	↕	**Multiple range**	Select [Multiple range] or [Multi-interval]
Range limit 1		**1000 kg**	Switch point from range 1 to 2
Range limit 2		**2000 kg**	Switch point from range 2 to 3

Multiple Range Scale (Class III or one range scale Class I and II with variable interval)

With [Range mode] = [Multiple range], the scale has up to 3 ranges with different resolutions.
The corresponding ranges are indicated above the mass unit as follows:

R1, R2 or R3

The switch points [Range limit 1] and [Range limit 2] are the range limits. As soon as the gross weight exceeds range 1, the next higher range with the next higher interval becomes valid (1->2->5->10->20->50->100->200). When reducing the weight, the interval of the previous range is kept. When the gross weight is ≤0,25 d of range 1 and the scale is stable and not tared, the scale returns to range 1 with the corresponding interval.

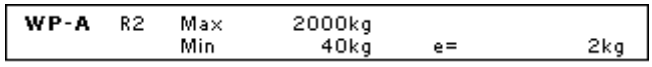
Multi-Interval Scale (Class III or one range scale Class I and II with variable interval)

With [Range mode] = [Multi-interval], the scale has up to three ranges with different resolution. Each range has the corresponding interval. Unlike [Multiple range], switching the interval is also triggered by weight reduction; i.e., when the weight drops below the range limits.

During calibration, the multiple range/multi-interval function is always switched off.

Display VNC

The weight display header includes the current range (R1, R2, and R3), Max, Min and d (or e with legal-for-trade instruments) (Example: multiple range scale in range 2):



4.5 Calibrating an xBPI Scale

Legal-for-trade application of PR 5220 with an xBPI scale is not possible.

4.5.1 xBPI Set-up for Serial Port

Determination and setting of the interface to which the scale/platform is connected must be done in menu Setup-[Serial ports parameter]-[xBPI-Port].

Setup/**Serial ports**		
Remote display		**-none-**
SMA		**-none-**
xBPI-Port	⇵	**Builtin RS485**
Param		

Select the interface for the xBPI scale with ←/→.

Press [Param].

The menu appears.

Setup/Serial ports/**Slot1 RS485**		
Assigned to		**xBPI-Port**
Baudrate	⇵	**9600 bd**
Bits		8
Parity		odd
Stopbits		**1**

Select with ↓/↑ and set the following parameters with ←/→.

1, 2

4.5.2 xBPI Scale Function

Weighingpoint		
Weighingpoint A	⇵	**xBPI-Scale**
Setup	**Config**	**Param**

Select [xBPI-Scale] with ←/→ and OK.

Select [Config].

The menu appears.

Weighingpoint/**WP A**		
Type		**xBPI-Scale**
W&M	⇵	**none**
Tare timeout		**1.0 s**
Serial number		**0**
SBN Address		**0**

Select the W&M mode with ←/→.

Leave with Exit.

[Tare timeout]

Waiting time for the execution of a zero set or taring command. If the xBPI-scale has not executed the command in the specified time, the action will be aborted.

[Serial number]

Serial number of the connected xBPI scale/weighing module. The number is required for checking with legal for trade application. With serial number 0, checking is omitted.

[SBN Address]

With an address unequal to 0, bus operation active, possible addresses: 1 - 31, i.e. max. 31 xBPI scales can be operated at an RS 485 bus line. The SBN Address is shown in the display.

Example: Address 31 at WP-A.

WP-A.31	Max	5000kg	d=	0.1kg
	Min	2kg		

4.5.3 xBPI Platform Configuration

Weighingpoint		
Weighingpoint A	⇵	**xBPI-Scale**
Setup	**Config**	**Param**

Select [xBPI-Scale] with ←/→ and OK.

Select [Setup].

Read the parameters from the xBPI scale with [Setup].

Weighingpoint/**xBPI-Scale Setup**	
Reading parameters	
model	☑
metrologie	☑
device info	☑
settings	☑

Ticks indicate the progress.

An error message displays, unless communication with the xBPI scale is possible!

Weighingpoint/**xBPI-Scale Setup**
▸ Calibration
▸ Configuration
▸ Select group of specification
▸ Show device info

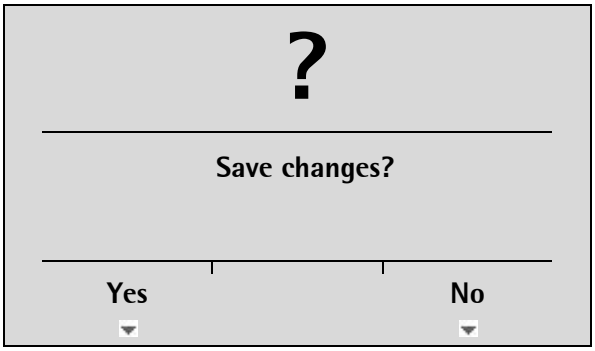
Open with OK.

Selection of specification group (see operating instructions of the scale):

Weighingpoint/**xBPI-Scale Setup**	
Specification group 1	○
Specification group 2	○
Specification group 3	◉
Specification group 4	○
Specification group 5	○
Specification group 6	○

Select with ↓/↑ and OK.

Leave with Exit.



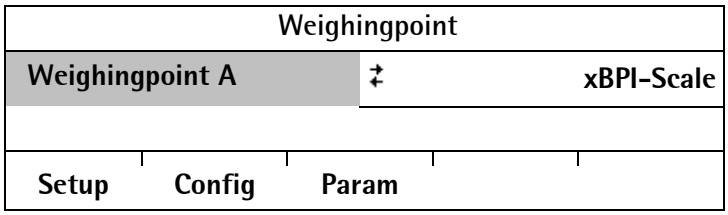
Save the data with [Yes].

Press [NO] for exit from the menu without data change.

Weighingpoint/**xBPI-Scale Setup**	
Saving changes parameters	
download values	☑
write nonvolatile	☑
reconfig system	☑

Ticks indicate the progress.

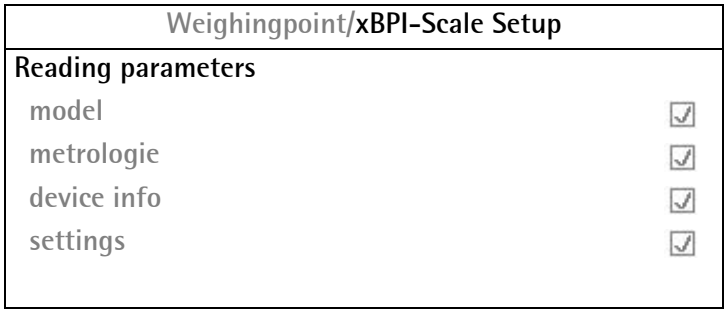
4.5.4 xBPI Scale Parameter



Select [xBPI-Scale] with ←/→ and OK.

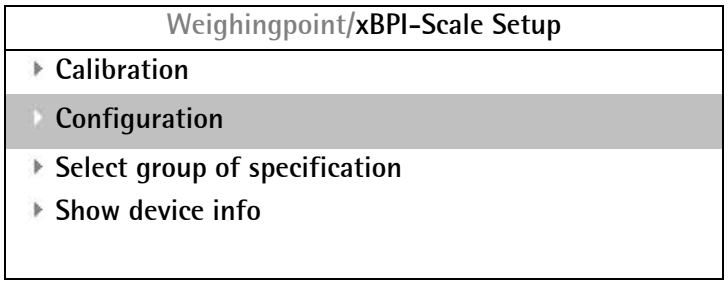
Select [Setup].

Read the parameters from the xBPI scale with [Setup].

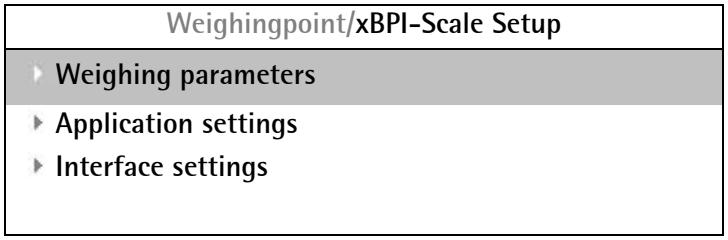


Ticks indicate the progress.

An error message displays, unless communication with the xBPI scale is possible!

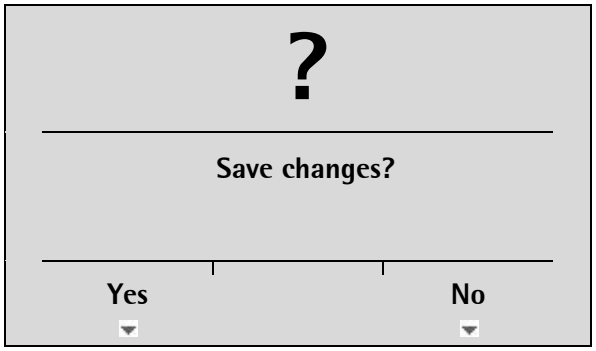


Open with OK.



Open with OK.

For further procedure, see Chapter 4.5.5.



Save the data with [Yes].

Press [NO] for exit from the menu without data change.

4.5.5 xBPI Parameter Tables

The parameters which must be entered in Setup-[Weighingpoint]-[xBPI-xBPI-Scale]-[Setup]-[Configuration]-[Weighing parameters]/[Application settings]/[Interface settings] are listed in the following tables.

Weighingpoint/**xBPI-Scale Setup**		
Ambient conditions	⇕	**Very stable cond.**
Application/Filter		**standard mode**
Stability range		**8 digit**
Stability symb. delay		**no delay**
Tare parameter		**at any time**
Auto zero function		**Auto Zero off**

Select the parameter with ↓/↑ and
Make the setting with ←/→.

Leave with Exit.

[Weighingpoint A-xBPI-scale]-[Setup]-[Configuration]-[Weighing parameters]

- Ambient conditions
  - Very stable cond.
  - Stable conditions
  - Unstable cond.
  - Very unstable cond
- Application/Filter
  - standard mode
  - manual filling
  - automatic dosing
  - checkweighing
- Stability range
  - 0,25 digit
  - 0,5 digit
  - 1 digit
  - 2 digit
  - 4 digit
  - 8 digit
- Stability symb.delay
  - no delay
  - short delay
  - long delay
  - extrem long delay
- Tare parameter
  - at any time
  - not until stable
- Auto zero function
  - Auto Zero on
  - Auto Zero off
- Adjustment function
  - ext.adj.w.fact.wt.
  - ext.adj.w.user.wt.
  - ext.adj.w.pres.wt.
  - internal adjust
  - ext.lin.w.fact.wt.
  - ext.lin.w.pres.wt.
  - Confirm preload
  - Delete preload
  - adjust disabled
- Confirming adjust.
  - automatically
  - manual
- Zero range
  - 1% of max load
  - 2% of max load
  - 5% of max load
  - 10% of max load
- Power-On zero range
  - factory settings
  - 2% of max load
  - 5% of max load
  - 10% of max load
  - 20% of max load
- Power-On tare/zero
  - activ
  - inactiv
  - only for zeroing
- Measure rate
  - normal output
  - fast output
- Calibration check
  - Off
  - Calibration prompt
- External adjustment
  - Accessible
  - Blocked
- Maximum capacity
  - reduced by preload
  - constant

[Weighingpoint A-xBPI-scale]-[Setup]-[Configuration]-[Application settings]

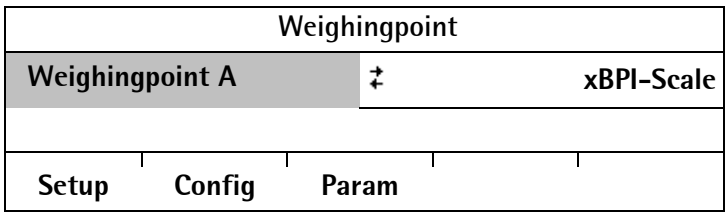
- Application Tare
  - Accessible
  - Blocked
- Number of units
  - 1 weight unit
  - 2 weight units
  - 3 weight units
- Weight unit 1
  - gramm g
  - kilogram kg
  - Carat ct
  - Pound lb
  - Unze oz
  - Troy unze ozt
  - Tael Hongkong tlh
  - Tael Singapur tls
  - Tael Taiwan tlt
  - grain GN
  - pennyweight dwt
  - milligramm mg
  - Parts/pound /lb
  - Tael china tlc
  - Momme mom
  - Karat k
  - Tola tol
  - Baht bat
  - Mesghal m
  - Tonne t
- Display accuracy 1
  - all digits
  - reduced when moved
  - one level lower
  - two levels lower
  - three levels lower
  - 1%
  - 0.5%
  - 0.2%
  - 0.1%
  - 0.05%
  - 0.02%
  - 0.01%
  - Multiinterval
  - increased by 10
- Weight unit 2
  - gramm g
  - kilogram kg
  - Carat ct
  - Pound lb
  - Unze oz
  - Troy unze ozt
  - Tael Hongkong tlh
  - Tael Singapur tls
  - Tael Taiwan tlt
  - grain GN
  - pennyweight dwt
  - milligramm mg
  - Parts/pound /lb
  - Tael china tlc
  - Momme mom
  - Karat k
  - Tola tol
  - Baht bat
  - Mesghal m
  - Tonne t
- Display accuracy 2
  - all digits
  - reduced when moved
  - one level lower
  - two levels lower
  - three levels lower
  - 1%
  - 0.5%
  - 0.2%
  - 0.1%
  - 0.05%
  - 0.02%
  - 0.01%
  - Multiinterval
  - increased by 10
- Weight unit 3
  - gramm g
  - kilogram kg
  - Carat ct
  - Pound lb
  - Unze oz
  - Troy unze ozt
  - Tael Hongkong tlh
  - Tael Singapur tls
  - Tael Taiwan tlt
  - grain GN
  - pennyweight dwt
  - milligramm mg
  - Parts/pound /lb
  - Tael china tlc
  - Momme mom
  - Karat k
  - Tola tol
  - Baht bat
  - Mesghal m
  - Tonne t
- Display accuracy 3
  - all digits
  - reduced when moved
  - one level lower
  - two levels lower
  - three levels lower
  - 1%
  - 0.5%
  - 0.2%
  - 0.1%
  - 0.05%
  - 0.02%
  - 0.01%
  - Multiinterval
  - increased by 10

[Weighingpoint A-xBPI-scale]-[Setup]-[Configuration]-[Interface settings]

- Communication type
  - SBI protocol
  - xBPI protocol
- Baudrate for SBI
  - 150 baud
  - 300 baud
  - 600 baud
  - 1200 baud
  - 2400 baud
  - 4800 baud
  - 9600 baud
  - 19200 baud
- Parity for SBI
  - Mark
  - Space
  - Odd
  - Even
- Stop bits
  - 1 stop bit
  - 2 stop bits
- Handshake
  - software handshake
  - CTS with 2 chr.pau
  - CTS with 1 chr.pau
- Data output print
  - on requ always
  - on requ when stab
  - on requ with store
  - auto
  - auto when stable
- Auto print
  - start/stop by ESCP
  - not stoppable
- Output format
  - without ID 16 byte
  - with ID 22 byte
- Data output interval
  - with each display
  - after 2 updates
  - after 5 updates
  - after 10 updates
  - after 20 updates
  - after 50 updates
  - after 100 updates
- Parameter change
  - can be changed
  - cannot be changed

4.5.6 xBPI Setting Dead Load

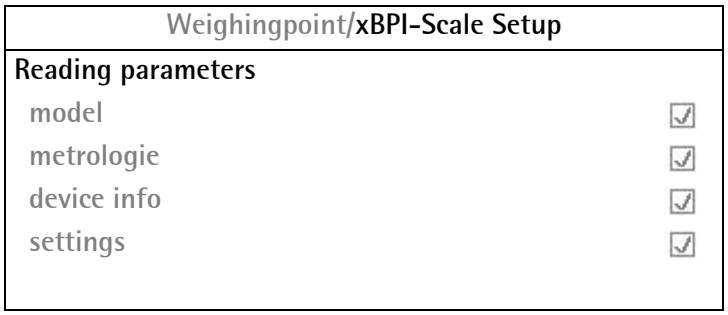
Note: Both terms 'dead load' and 'preload' are used by Sartorius.



Select [xBPI-Scale] with ←/→ and OK.

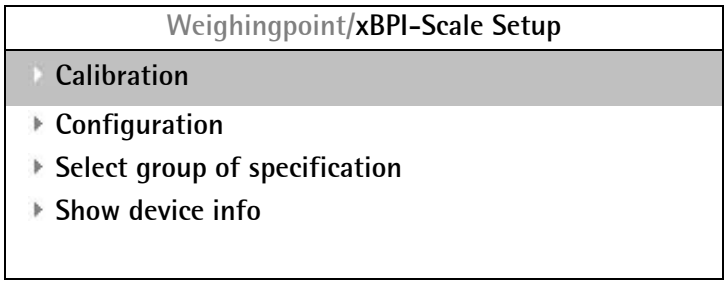
Select [Setup].

Read the parameters from the xBPI scale with [Setup].

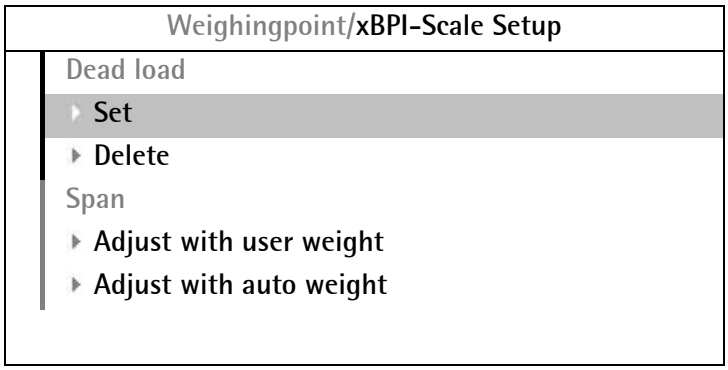


Ticks indicate the progress.

An error message displays, unless communication with the xBPI scale is possible!



Open with OK.



Set dead load.

Delete dead load.

Leave with Exit.

For setting the dead load, remove the weight from the scale and select [Set]. After sending the command, 0 is indicated on the gross weight display.

Alternatively, the stored dead load can be deleted:

Remove the weight from the scale and select [Delete]. The stored dead load is deleted. The instantaneous dead load is shown on the weight display.

4.5.7 xBPI Calibration with the User Weight

Prerequisites:

- The xBPI protocol has been selected (see Chapter 4.5.1).
- The weighing point ‚xBPI-scale' has been selected (see Chapter 4.5.4).
- The platform configuration has been executed (see Chapter 4.5.3).
- The setting in the following menu has been done: [Weighingpoint A-xBPI-Scale]-[Setup]: [Configuration]-[Confirming adjust.]: [manual] (see Chapter 4.5.5).
- The communication between instrument and platform is active.

Weighingpoint/**xBPI-Scale Setup**	
▸ **Calibration**	Open with OK.
▸ **Configuration**	
▸ **Select group of specification**	
▸ **Show device info**	

Weighingpoint/**xBPI-Scale Setup**	
Dead load	
▸ **Set**	
▸ **Delete**	
Span	
▸ **Adjust with user weight**	Select with ↓/↑ and enter with OK.
▸ **Adjust with auto weight**	

Enter user weight	The previously stored user weight is displayed.
2000 g	The weight can be changed.

Following window appears:

Weighingpoint/**xBPI-Scale Setup**		
Calibration status	**Load to small**	Calibration progress without weight.
Cal-Target	**-2000 g**	
--	**0.01 g**	

The following window is displayed after applying the weight:

Weighingpoint/**xBPI-Scale Setup**		
Calibration status	**Difference display**	
Cal-Delta	**-0.3 g**	
--	**1999.75 g**	The weight is displayed in high-resolution (10x).
Accept ResError Abort		Select [Accept].

The data are saved and the instrument generates a corresponding message:

Weighingpoint/xBPI-Scale Setup	
Calibration status	complete
Net=Grs	2000 g
--	2000.01 g

The weight is displayed in high-resolution (10x).

Accept ResError Abort

Leave with Exit.

4.5.8 xBPI Calibration with Automatic Weight Detection

Prerequisites:

- The xBPI protocol has been selected (see Chapter 4.5.1).
- The weighing point ‚xBPI-scale' has been selected (see Chapter 4.5.4).
- The platform configuration has been executed (see Chapter 4.5.3).
- The setting in the following menu has been done: [Weighingpoint A-xBPI-Scale]-[Setup]: [Configuration]-[Confirming adjust.]: [manual] (see Chapter 4.5.5).
- The communication between instrument and platform is active.

Weighingpoint/xBPI-Scale Setup

- Calibration
- Configuration
- Select group of specification
- Show device info

Open with OK.

Weighingpoint/xBPI-Scale Setup

- Dead load
  - Set
  - Delete
- Span
  - Adjust with user weight
  - Adjust with auto weight

Select with ↓/↑ and enter with OK.

Following window appears:

Weighingpoint/xBPI-Scale Setup		
Calibration status	Load to small	Calibration progress without weight.
Cal-Target	-10000.0 g	The weight is displayed in high-resolution (10x).
--	-0.02 g	

In this example, a weight of 5000 g is put onto the scale.
The following window is displayed after applying the weight:

Weighingpoint/xBPI-Scale Setup		
Calibration status	Difference display	
Cal-Delta	0.1 g	
--	5000.06 g	The weight is displayed in high-resolution (10x).
Accept ResError Abort		Select [Accept].

The data are saved and the instrument generates a corresponding message:

Weighingpoint/xBPI-Scale Setup		
Calibration status	complete	
Net=Grs	5000.0 g	
--	5000.01 g	The weight is displayed in high-resolution (10x).
Accept ResError Abort		Leave with Exit.

4.5.9 xBPI Calibration with Default Weight

Prerequisites:

- The xBPI protocol has been selected (see Chapter 4.5.1).
- The weighing point ‚xBPI-scale' has been selected (see Chapter 4.5.4).
- The platform configuration has been executed (see Chapter 4.5.3).
- The setting in the following menu has been done: [Weighingpoint A-xBPI-Scale]-[Setup]: [Configuration]-[Confirming adjust.]: [manual] (see Chapter 4.5.5).
- The communication between instrument and platform is active.

Weighingpoint/xBPI-Scale Setup	
▸ Calibration	Open with OK.
▸ Configuration	
▸ Select group of specification	
▸ Show device info	

Weighingpoint/xBPI-Scale Setup	
▸ Adjust with default weight	Select with ↓/↑ and enter with OK.
▸ Adjust with intern weight	
Linearity	
▸ Default	
▸ User	

Following window appears:

Weighingpoint/xBPI-Scale Setup	
Calibration status	Load to small
Cal-Target	-5000.0 g
--	0.00 g

The following window is displayed after applying the weight:

Weighingpoint/xBPI-Scale Setup		
Calibration status	Difference display	Calibration progress without weight.
Cal-Delta	-0.0 g	
--	4999.98 g	The weight is displayed in high-resolution (10x).
Accept ResError Abort		Select [Accept].

The data are saved and the instrument generates a corresponding message:

Weighingpoint/xBPI-Scale Setup		
Calibration status	complete	
Net=Grs	5000.0 g	
--	5000.00 g	The weight is displayed in high-resolution (10x).
Accept ResError Abort		Leave with Exit.

4.5.10 xBPI Calibration with Built-in Weight

Prerequisites:

- The xBPI protocol has been selected (see Chapter 4.5.1).
- The weighing point ‚xBPI-scale' has been selected (see Chapter 4.5.4).
- The platform configuration has been executed (see Chapter 4.5.3).
- The setting in the following menu has been done: [Weighingpoint A-xBPI-Scale]-[Setup]: [Configuration]-[Confirming adjust.]: [manual] (see Chapter 4.5.5).
- The communication between instrument and platform is active.

Weighingpoint/**xBPI-Scale Setup**
▸ **Calibration**
▸ **Configuration**
▸ **Select group of specification**
▸ **Show device info**

Open with OK.

Weighingpoint/**xBPI-Scale Setup**
▸ **Adjust with default weight**
▸ **Adjust with intern weight**
Linearity
▸ **Default**
▸ **User**

Select with ↓/↑ and enter with OK.

The procedure is shown e.g. with the following message:

Weighingpoint/**xBPI-Scale Setup**	
Calibration status	**Motor in motion**
Accept	ResError Abort

The calibration progress is displayed.

Weighingpoint/**xBPI-Scale Setup**	
Calibration status	**Difference display**
Cal-Delta	**0.0 g**
--	**1212.73 g**
Accept	ResError Abort

Select [Accept].

The data are saved and the instrument generates a corresponding message:

Weighingpoint/**xBPI-Scale Setup**	
Calibration status	**complete**
Net=Grs	**-0.0 g**
--	**-0.06 g**
Accept	ResError Abort

Leave with Exit.

4.6 Calibrating Digital Load Cells Type 'Pendeo®'

4.6.1 General Information

The digital load cells have been calibrated at the factory based on the acceleration of gravity Hamburg, Germany: 9.81379 m/s². The calibration data in the load cells are invariable. The calibration data for the gravity acceleration at the place of installation can be adapted only in the instrument and protected against overwriting (see Chapter 4.1.1). With applications for use in legal metrology, the legal requirements and the conditions given on the test/approval certificate must be taken into account when selecting the settings.

For connecting digital load cells (xBPI load cells) a Firmware from 2.10 onwards is required.

4.6.2 Viewing the Interfaces

The existing interfaces can be viewed under Info-[Show HW-slots]:

Info/HW-Slots			
	Builtin	RS485	Built-in interface
	Builtin	analog out	
	Builtin	digital I/O	
Slot 4	PR5220/01	Profibus-DP	Built-in interface

4.6.3 Selecting and Setting up the Interface

Select Setup-[Serial ports parameter]-[xBPI-Port] to choose a serial interface.

Setup/Serial ports		
Remote display		-none-
SMA		-none-
xBPI-Port	⇵	Builtin RS485
Param		

Press ←/→ to select RS-485.

Press [Param].

The menu appears.

Setup/Serial ports/Slot2 RS485		
Assigned to		xBPI-Port
Protocol		xBPI
Baudrate	⇵	19200 bd
Bits		8
Parity		odd
Stopbits		1

Press ←/→ to select the value ‚19200 bd'.

Press ←/→ to select the value ‚1'.

4.6.4 Selecting the Load Cell Type

Setup
Serial ports parameter
Date & Time
Operating parameter
Printing parameter
Fieldbus parameter
Network parameter
Weighingpoint
Limit parameter
Digital I/O parameter
Analog output parameter

Press ↓/↑ and OK to select [Weighingpoint].

Weighingpoint		
Weighingpoint A	⇵	**Pendeo Load Cells**
Setup	Config	Param	**Assign**

Press ←/→ and OK to select [Pendeo Load Cells]

4.6.5 Adjustment Sequence

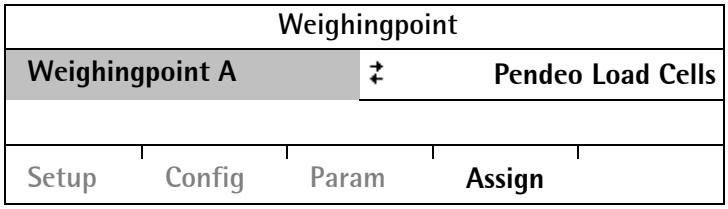
During calibration, no data is changed in the digital load cells. The calibration data and parameters are saved in the instrument. The unique serial numbers of the connected load cells are monitored.

For the adjustment is the following order specified:

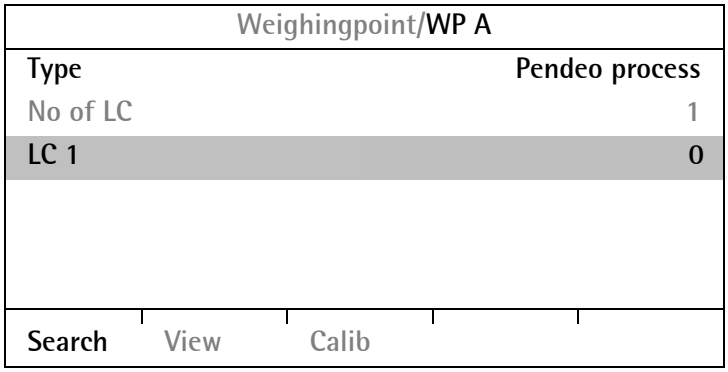
- Search for load cells, see Chapter 4.6.6.
- Assign load cells, see Chapter 4.6.7.
- Calibrate 'New': Max with weight unit, scale interval, dead load, calibration weight, see Chapter 4.6.8.

Note: For further information about calibrating weighing points, see Chapter 4.4.

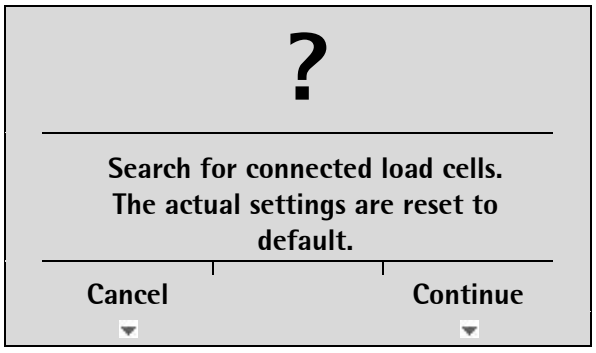
4.6.6 Search for Load Cells



Press [Assign].



Press [Search].



Press [Cancel] to accept and display the existing values.

Press [Continue] to start a new search process.

Weighingpoint/WP A	
Type	Pendeo process
No of LC	4
LC 1	101
LC 2	103
LC 3	104
LC 4	102

Search | View | Calib

Load Cell Information

Load cell type

Number of load cells

Load cell serial number

Press [View].

Weighingpoint/WP A/View		
LC 1	101	1.958 t
LC 2	103	2.118 t
LC 3	104	1.610 t
LC 4	102	1.828 t

Info | Assign

Load cell load

Press ↓/↑ to select the desired load cell.

Press [Info] to display the load cell data.

Press Exit to return.

If necessary press [Assign] to assign the load cells; see Chapter 4.6.7.

4.6.7 Assigning Load Cells

The load cells (serial number) can be assigned to the place of installation in this menu. This is important for correcting the dead load (distribution to the individual load cells), for corner correction and in the event of load cell replacement.

Note: The assignment from the installation should be documented in the case of load cells being replaced.

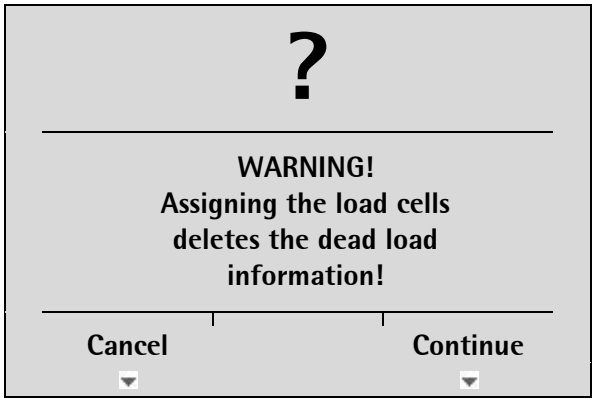
Access the menu as follows: Setup-[Weighingpoint]-[Assign]-[View].

Weighingpoint/WP A/View		
LC 1	101	1.958 t
LC 2	103	2.118 t
LC 3	104	1.610 t
LC 4	102	1.828 t
Info	Assign	

Load cell load

Make sure to unload the scale.

Press [Assign].



Press [Continue] to reset the dead load information.

Press [Cancel] for no assigning start.

The load cells are assigned by placing minimum weights (50 kg) on the scale.

Weighingpoint/WP A/View			
LC 1	101	1.958 t	1
LC 2	103	2.118 t	
LC 3	104	1.610 t	
LC 4	102	1.828 t	
Info	Accept		

Attach calibration weight to area of weighing construction to be assigned to load cell No 1.

As soon as the device detects the weight change, the corresponding line is selected.

Confirm the assigning of the 1st load cell with OK.

The future LC no. appears at the far right of the line.

Remove the weight.

Repeat these steps for load cells 2–4.

Press the [Accept] soft key.

Press Exit to return.

Weighingpoint/**WP A**	
Type	**Pendeo process**
No of LC	4
LC 1	101
LC 2	103
LC 3	104
LC 4	102
Search **View** **Calib**	

Press the [View] soft key.

The new assignment will be displayed.

Check the corner load (dead load); see Chapter 4.6.9.2.

Press Exit to return.

4.6.8 Calibrating Load Cells

Note: [Modify] may be used only for minor changes (e.g. changing the dead load); otherwise, always use [New].

Weighingpoint/**WP A**	
Type	**Pendeo process**
No of LC	**4**
LC 1	101
LC 2	103
LC 3	104
LC 4	102
Search **View** **Calib**	

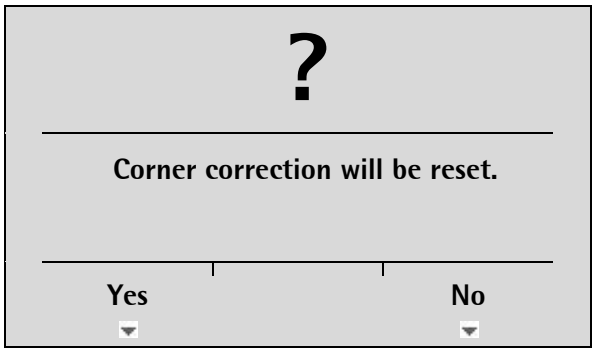
Press [Calib].

Weighingpoint/WP A/**Calibration**		
Number of vessel feet		4
Local gravity		9.81379 m/s^2
Max	10000 d	200.000 t
Scale interval	1 d	0.020 t
Dead load		
CAL weight		
New **Modify** **Param**		

Max: the sum of the max. load cell capacity is preset (4x 50 t = 200 t).

Press [New].

When you press [New], the data is set to default first and calibration is started.



Press [No] for no corner correction reset.

Press [Yes] to reset the corner correction and calibrating continues.

Weighingpoint/WP A/**Calibration**			Parameter input:
Number of vessel feet		**4**	Number of vessel feet (in the case, 4).
Local gravity		**9.81379 m/s²**	Local gravity
Max	**10000 d**	**200.000 t**	Max. weight
Scale interval	**1 d**	**0.020 t**	Scale interval
Dead load			Dead load: empty scale
CAL weight			Calibrating weight
Corner correction			Corner correction

[Number of vessel feet]

Enter number of vessel feet.

[Local gravity]

Enter local gravity (in this case: Hamburg 9.81379 m/s^2); see e.g. http://www.ptb.de/cartoweb3/SISproject.php.

[Max]

The load cell capacity is suggested as Max (E_{max} * number of load cells).

The maximum capacity (Max) determines the maximum measured weight without dead load. Normally, the selected Max must be smaller than the load cell capacity (nominal load * number of load cells) – dead load, in order to prevent overloading the load cells.

Adapt the value for Max. When entering Max, the required number of digits behind the decimal point must be taken into account. Press ABC to switch units.

[Scale interval]

Select the scale interval (1, 2, 5, 10, 20 or 50). The number of intervals is calculated and fed back automatically.

[Dead load]

Empty weight as dead load

To use the empty scale/hopper as dead load (normal case):

- Discharge the scale/vessel.
- Press [by load].

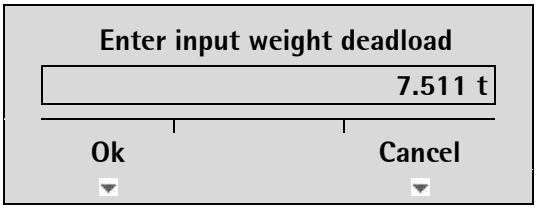
The device must now display 0.000.

Weighingpoint/WP A/Calibration		
Number of vessel feet		4
Local gravity		9.81379 m/s^2
Max	10000 d	200.000 t
Scale interval	1 d	0.020 t
Dead load		
CAL weight		
by load	by value	

Known weight value as dead load

To use the known weight value as dead load:

- Press [by value].
  An input window appears:

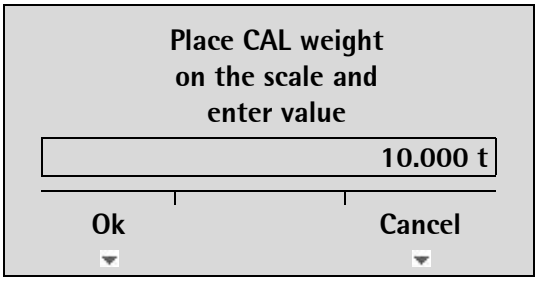


- Enter the known weight value and press [Ok].

The device must now display 0.000.

[CAL weight]

Press OK and an input window appears.



Center the calibration weight on the scale and enter the weight value. Press the [OK] soft key.
Remove the calibration weight.

[Corner correction]

Carry out a corner correction if necessary, see Chapter 4.6.9.

Increased Resolution (10-fold)

During calibration press Info to display the weight with 10-fold resolution. The resolution is reset after approx. 5 seconds. Press ↓ if you want to switch to normal resolution immediately.

4.6.9 Corner Correction

4.6.9.1 General Information

An asymmetric scale construction doesn't need a corner correction. But the corner correction may be necessary at a symmetric scale construction.

4.6.9.2 Checking Corner Load (Dead Load)

After assignment and calibration, the load cell positions have been defined clearly.

4.6.9.3 Software Corner Correction

If the corners are loaded in succession, the same value should be displayed on the device at all times. An excessive deviation almost always means that the scale is tilted or indicates load cell force shunts.

If the signal deviations cannot be resolved by carefully leveling the scale, the software must be calibrated.

Weighingpoint/WP A/**Calibration**			
Number of vessel feet			4
Local gravity			9.81379 m/s²
Max	10000 d		200.000 t
Scale interval	1 d		0.020 t
Dead load			7.511 t
CAL weight			10.000 t
New	**Modify**	**Param**	

Press [Modify] and OK.

Weighingpoint/WP A/Calibration/**Corner correction**		
LC 1	**-0.008 t**	☐
LC 2	**-0.008 t**	☐
LC 3	**0.007 t**	☐
LC 4	0.008 t	☑
Calc		

Set the calibration weight on an area of weighing construction.

The position (in this case, LC 4) is selected.

After confirmation (indicated by ☑), put the weight onto the next position. The sequence is unimportant. The cursor indicates the next load cell/weight position.

When all load cells have been loaded once, you can press [Calc] to complete the corner correction.

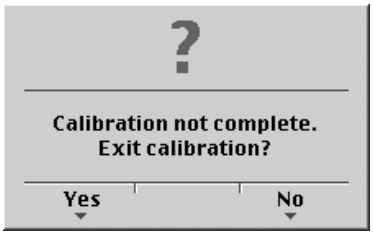
The total weight remains unchanged. Only the effect of the individual load cells is corrected.

When corner correction is completed, the marking [ok] is shown.

Press Exit to return.

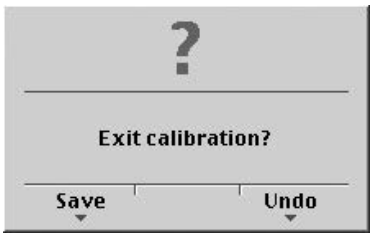
4.6.10 Finishing/Saving the Calibration

Press Exit to complete the calibration.



Unless all data were determined during calibration using [New] (e.g. dead load not set / entered), the following prompt is shown:

After replying [Yes] to confirm and pressing Exit, another prompt is displayed:



Press [Save] to save changes in calibration data. If you press [Undo], changes are not saved and the display returns to the selection menu for the weighing points.

The Confirmation is displayed with:

Saving calibration

After quitting the menu, the following message is displayed:

Exit calibration

After finishing the calibration, set the CAL switch to the closed position; see also Chapter 4.1.1.

4.6.11 Parameter Input

Weighingpoint/WP A/**Calibration**		
Ambient conditions	⇵	**Very stable cond.**
W & M		**none**
Standstill time		**0.50 s**
Standstill range		**1.00 d**
Tare timeout		**2.5 s**
Zeroset range		**50.00 d**

[Ambient conditions]

This parameter is used to define the ambient conditions of the scale.

Possible values: very stable condition, Stable condition, Unstable condition, Very unstable condition

[W & M]

Setting for operation in Legal-for-Trade mode.

Select [none], [OIML], [NTEP] (für USA) or [NSC] (for Australia), see Chapter 4.4.13.1.

[Standstill time]

The parameters [Standstill time] and [Standstill range] can be used to define the stability of the scale (stable balance).

The [Standstill time] parameter is entered in seconds. The permitted range is 0.00...2 s.

The time can be entered from 0.00 to 2.00 seconds, but makes up at least one measurement time.

[Standstill range]

As long as the weight fluctuations remain within this range, the device is determined to be stable.

The [Standstill range] parameter is entered in "d." The permitted range is 0.01...10.00 d.

For use in Legal-for-Trade mode, ≤1 d must be selected.

[Tare timeout]

Timeout for a tare/zeroset command that cannot be executed (e.g., due to mechanical instability of the scale, incorrect filter setting, resolution too high, standstill condition too strict).

This parameter is given in seconds. The permitted range is 0.0...<2.5>...25 s.

At 0.0 s taring is only carried out when the scale is already stable.

[Zeroset range]

Determine a ±range around the zero point determined by the dead load during calibration; within this range

- the displayed gross weight can be set to zero by pressing the zero-setting key (or by a corresponding external command), and
- automatic zero tracking is active.

Setting range: 0.00...10000.00 d

For use in Legal-for-Trade mode a value ≤2% of Max must be entered. Example: 60 d for 3000 e, class III.

Weighingpoint/WP A/Calibration		
Zerotrack range	0.25	d
Zerotrack step	0.25	d
Zerotrack time	1.0	s
Overload	9	d
Min	20	d
Range mode	Single range	

[Zerotrack range]

Range within which the automatic zerotrack is balanced.
Setting range: 0.25...10000.00 d
For use in Legal-for-Trade mode a value of 0.25 d must be entered.

[Zerotrack step]

If a weight change exceeds the adjusted value, automatic tracking does not function any more.
Setting range for automatic tracking increments: 0.25... 10 d
For use in Legal-for-Trade mode a value of 0.25 d must be entered.

[Zerotrack time]

Time interval for automatic zero tracking.
Setting range: 0.0...25 s
At 0.0 s the tracking is switched off. For use in Legal-for-Trade mode a value of 1 s must be entered.

[Overload]

Weighing range above the maximum capacity (Max) without error message.
Setting range: 0...999900 d. For use in Legal-for-Trade mode a value of max. 9 d = e must be set.

[Min]

Minimum weight at which a print command can be triggered.
Setting range: 0...999900 d. For use in Legal-for-Trade mode a value of at least 20 d must be set.

[Range mode]

For scale range selection, see Chapter 4.4.13.2.

4.6.12 Subsequent Dead Load Correction

If the vessel weight changes by an amount that is higher than the zero-setting range, e.g. due to dead load reduction, dead load increase or mechanical changes, the functions for automatic zero tracking and manual zero setting no longer work. To view the range which is currently being utilized for zero tracking or zero setting, press Info. This also activates 10-fold increased resolution of the weight value. Press Info again to return to the previous state:

Current zero set: 0.00001 t

If the full zero-setting range is already being utilized, you can still correct the dead load (CAL switch must be open) without affecting other calibration data/parameters.

Weighingpoint/WP A/**Calibration**		
Number of vessel feet		**4**
Local gravity		**9.81379 m/s²**
Max	**10000 d**	**200.000 t**
Scale interval	**1 d**	**0.020 t**
Dead load		**7.512 t**
CAL weight		**10 t**
Corner correction		**ok**

Select [Dead load] and see page 90.

Check the corner load, see Chapter 4.6.9.2.

Carry out a corner correction if necessary, see Chapter 4.6.9.3.

4.7 Configuring General Parameters

The configuration of parameters which are not related to the weighing electronics is divided into several sections (see Chapter 4.3.8).

4.7.1 Serial Interfaces [Serial ports parameter]

To configure the serial interfaces, select Setup-[Serial ports parameter].

Setup	
Serial ports parameter	
Operating parameter	

Select [Serial ports parameter] with ↓/↑ and OK

Setup/Serial ports		
Remote display	⇵	Builtin RS485
SMA		none
Param	Config	

Remote display protocol [Remote display]

Select the serial interface to which the remote display is connected and then select [Param] to define the [Baudrate] and the remote display type [Mode] connected.

Setup/Serial ports/Builtin RS485			
Assigned to		Remote display	
Protocol		Remote display	
Baudrate	⇵	9600 bd	Select [Baud rate] with ↓/↑
Bits		7	and set the baud rate with ←/→.
Parity		even	
Stopbits		1	
Mode		multiple transmitters	Several remote displays are connected.
Device ID		A	Address of the instrument
Next Device ID		B	Next address of the instrument

You can only set the baud rate to 300, 600, 1200, 2400, 4800 or 9600. The other parameters (displayed in light-gray) cannot be changed.

If only 1 instrument is connected to a remote display (normal case), [Mode] must be set to [single transmitter].

If more than 1 instrument is connected to 1 remote display, [Mode] must be set to [multiple transmitters].

At [Device Id] the own instrument address (A, B, C ...) has to be entered, at [Next Device Id] the address of the subsequent instrument has to be entered

Press Exit to return to the menu ‚Serial ports'.

SMA Protocol

Select an RS-485 interface under Setup-[Serial ports parameter].

Setup/Serial ports		
Remote display		none
SMA	⇵	Builtin RS485
Param		

Click [Param].

Only the baud rate is adjustable; the other parameters are fixed.

Setup/Serial ports/Builtin RS485		
Assigned to		SMA
Baudrate	⇵	9600 bd
Bits		8
Parity		none
Stopbits		1

Press ↓/↑ to select [Baudrate] and set the baud rate with ←/→.

The SMA protocol is described in Chapter 4.8.

xBPI-Protokoll

To configure the serial interfaces, press Setup-[Serial ports parameter]-[xBPI-Port] to select a RS-485 interface.

Setup/Serial ports		
Remote display		-none-
SMA		-none-
xBPI-Port	⇵	Builtin RS485
Param		

Click [Param].

Only the baud rate and the stop bits are adjustable; the other parameters are fixed.

Setup/Serial ports/Builtin RS485		
Assigned to		xBPI-Port
Baudrate	⇵	9600 bd
Bits		8
Parity		odd
Stopbits		1

Press ↓/↑ to select [Baudrate] and set the baud rate with ←/→.

1, 2

4.7.2 Operating Parameters

Define the basic operating parameters under Setup-[Operating parameter].

Setup/Operating parameter	
AccessCode	0
SetTareKey	tare & reset tare
SetZeroKey	only when not tared

[AccessCode]

The access code can be used to protect the [Setup] from unauthorized operation. Enter a number with up to 6 digits. As long as you are in this menu, the value can be overwritten as required. When [AccessCode] is set to 0, no access code ist prompted.

[SetTareKey]

The SetTare function can be configured (VNC operation / Internet browser).

[tare & reset tare]: the scale is tared if it was not tared previously; otherwise, tare is reset.

[tare & tare again]: when you press the [Tare] key, the current value is stored in the tare memory and a net weight of 0 is displayed.

[disabled]: The tare key has no function.

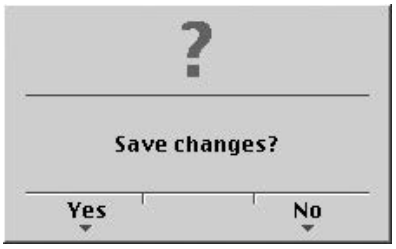
[SetZeroKey]

The SetZero function (VNC operation / Internet browser) can be limited to gross mode with [only when not tared] or switch the scale to gross mode automatically with [reset tare on zeroset]. If the zero-setting key with these settings has no effect, the configured zero-setting range (around the zero-point set with the dead load) is already utilized due to a previous zero-setting operation and/or automatic zero setting.

[disabled]: The key has no function.

Closing the menu

To close the menu, press Exit. The following message is displayed:



Press [Yes] to save the data.

Press [No] to close the menu without changing data.

4.7.3 Fieldbus Parameters

Setup
▸ Serial ports parameter
▸ Operating parameter
▸ Fieldbus parameter

Press ↓/↑ and OK to select [Fieldbus parameter]

This menu item can only be selected if the instrument is a PR 5220/01, a PR 5220/04, PR 5220/06 or PR 5220/07 version.

The instrument version automatically determines the corresponding protocol:

- [Profibus-DP] for PR 5220/01
- [DeviceNet] for PR 5220/04
- [ProfiNet I/O] for PR 5220/06
- [EtherNet-IP] for PR 5220/07

Dependent on the interface type, additional parameters are required:

[Profibus-DP]

Setup/Fieldbus parameter	
Protocol	Profibus-DP
Profibus-DP Address	1

Enter address.

[DeviceNet]

Setup/Fieldbus parameter	
Protocol	DeviceNet
DeviceNet baudrate	500k
DeviceNet MAC-ID	1

Press ←/→ to select 500, 250 or 125 k.
address 1 ... 62.

[ProfiNet I/O]

Setup/Fieldbus parameter		
Fieldbus protocol		ProfiNet I/O
Use DHCP	⇵	off
IP address		192.168.1.1
Subnet mask		255.255.255.0

Select ←/→ on/off.
Enter IP address.
Enter Subnet mask.

[EtherNet/IP]

Setup/**Fieldbus parameter**		
Fieldbus protocol	**EtherNet/IP**	
Use DHCP	**off**	Select ←/→ on/off.
IP address	**192.168.1.1**	Enter IP address.
Subnet mask	**255.255.255.0**	Enter Subnet mask.

Closing the menu

To close the menu, press Exit. The following message is displayed:

Press [Yes] to save the data.

Press [No] to close the menu without changing data.

4.7.4 Network Parameters

You can configure settings for the network connections (built-in LAN adaptor).

Define the network parameters under Setup-[Network parameter].

Setup/**Operating parameter**		
HW address	00:90:6C:6A:6B:5E	Fixed address determined by the instrument.
Hostname	**PR 5220-6A6B5E**	The device name can be defined* by the user.
Use DHCP	☑	The address is assigned by the server.
IP address	172.24.21.82	The address is assigned by the server.
Subnetmask	255.255.240.0	Mask for the permissible IP address range
Standardgateway	172.24.16.1	IP number for the gateway
Remote access		
VNC-Client	**255.255.255.255**	Permitted client for instrument operation

[Hostname]

Caution!

The host name must be unique in the network!

* The device name [Hostname] is subject to the following restrictions:

- Minimum number of characters: 2, maximum number of characters: 24
- The first character must be a letter. Spaces are not permitted.
- **0-9**, **A-Z** (upper and lower case letters are not distinguished) are permitted.
- **-** or **.** may be included, but neither at the end nor in succession.

[Use DHCP]

If the checkbox has been marked, the server defines the IP address automatically.

[VNC-Client]

You can configure access permissions for the address:

VNC-Client	0.0.0.0.	Access over VNC not permitted
VNC-Client	172.24.21.101	Access only from client machine with this address
VNC-Client	172.24.21.255	Access from any client with address within range 172.24.21.1 - ..254
VNC-Client	255.255.255.255	Access from client with any address

Note: When setting [IP address], [Subnet mask] and [Standard gateway], please consult with your network administrator.

4.8 Configuring Limit Values

Each limit value consists of a switch-on and a switch-off point for definition of a hysteresis. The three pairs of values must be entered according to the same principle. The limit values always refer to the gross weight.

The limit values of an xBPI weighing point are scale-specific.

- The scale must be active when entering the limit values.
- The scale and the unit must not be changed after configuration.
- The following settings are required:
  [Weighingpoint/xBPI-Scale]-[Setup]-[Configuration]-[Application settings]-
  [Number of units]: [1 Weight]

Define the limit values under Setup-[Limit parameter].

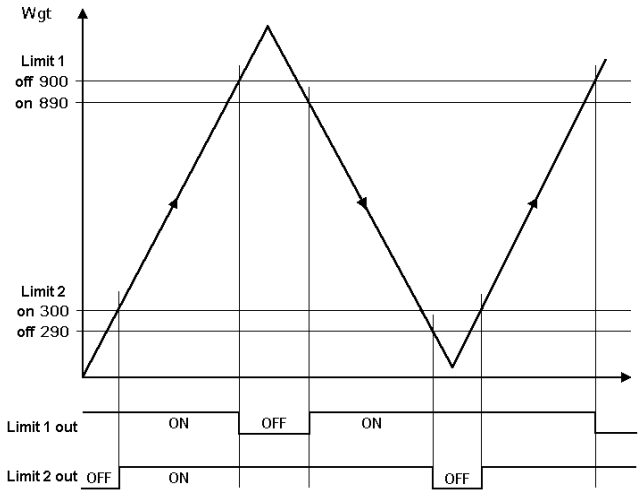
Press ↓/↑ to select the specific items.

Press ←/→ to select the respective parameter.

Setup/**Limit parameter**		
Limit 1 on		**890 kg**
	Action	**-no action-**
Limit 1 off		**900 kg**
	Action	**-no action-**
Limit 2 on		**300 kg**
	Action	**-no action-**
Limit 2 off		**290 kg**
	Action	**-no action-**

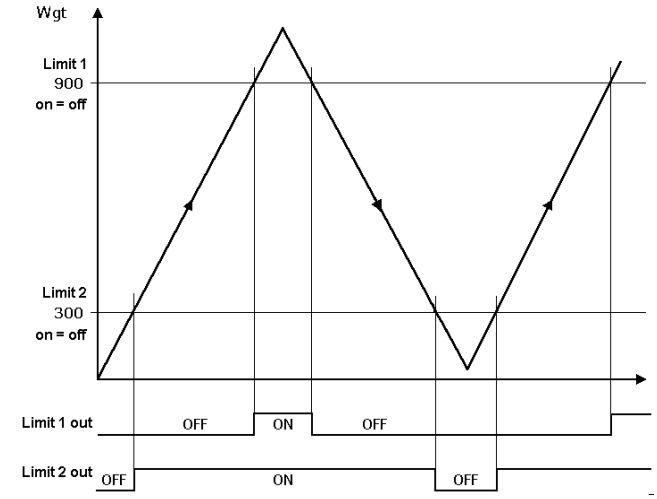
Determine the limit values.

Example:



The output signal (Limit 1 out) of limit 1 switches OFF above a weight of 900 kg. The output signal (Limit 2 out) of limit 2 switches OFF below a weight of 290 kg. Both limit values have a hysteresis of 10 kg.

In the event of a power failure, the two outputs go to OFF, thus indicating underfill and overfill at the same time.



If the limits (Limit 1 and Limit 2) for 'On' and 'Off' are equal (on = off), output 1 (Limit 1 out) switches ON, when the weight (Wgt) exceeds the value and output 2 (Limit 2 out) switches OFF, when the weight drops below the value.

1. Determining an action

Determine the action for the rising edge of the reference signal under [Limit 1 on] from the following list (here: Marker 1 is set when 900 kg are exceeded).

Accordingly, an action for [Limit 1 off] can be determined.

Setup/**Limit parameter**		
Limit 1 on		**900 kg**
Action	**set marker 1**	**X64=1**
Condition	**no condition**	**-----**

Function	SPM Bit	
-no action-	-----	no function
set marker 1	X64=1	Set marker 1
set marker 2	X65=1	Set marker 2
set marker 3	X66=1	Set marker 3
clr marker 1	X64=0	Clear marker 1
clr marker 2	X65=0	Clear marker 2
clr marker 3	X66=0	Clear marker 3

Note: The limit values can be assigned to the outputs directly in the I/O parameters.

2. Determining a condition

Additionally, a condition [Condition] can be assigned to the marker.

Selection list for conditions [condition]

Condition	SPM bit	Description
no condition	-----	No condition
actual diginp1	X00=0	Digital input 1: not active
actual diginp2	X01=0	Digital input 2: not active
actual diginp3	X02=0	Digital input 3: not active
actual limit 1	X16=0	Limit signal 1: not active
actual limit 2	X17=0	Limit signal 2: not active
actual limit 3	X18=0	Limit signal 3: not active
ADC error	X32=0	General error in the weighing point: not active (no error)
above Max	X33=0	Weight above Max: not active
overload	X34=0	Weight above Max plus the 'overload' value: not active
below zero	X35=0	Weight not below zero
center zero	X36=0	Weight not within ¼ d of zero
inside ZSR	X37=0	Weight not within zero-setting range
standstill	X38=0	No mechanical stability of the scale
out	X39=0	Weight not below zero or above Max
command error	X48=0	For internal use only.
command busy	X49=0	For internal use only.
power fail	X50=0	Set after power-on (=power failure): not active
test active	X56=0	Analog test was not started.
cal active	X57=0	For internal use only.
tare active	X58=0	Instrument is not tared.
marker bit 1	X64=0	Marker bit 1 not set, after power-on the markers are set to '0'.
marker bit 2	X65=0	Marker bit 2 not set, after power-on the markers are set to '0'.
marker bit 3	X66=0	Marker bit 3 not set, after power-on the markers are set to '0'.

Condition	SPM bit	Description
actual diginp1	X00=1	Digital input 1: active
actual diginp2	X01=1	Digital input 2: active
actual diginp3	X02=1	Digital input 3: active
actual limit 1	X16=1	Limit signal 1: active
actual limit 2	X17=1	Limit signal 2: active
actual limit 3	X18=1	Limit signal 3: active
ADC error	X32=1	General error in the weighing point
above Max	X33=1	Weight above Max
overload	X34=1	Weight above Max plus the 'overload' value
below zero	X35=1	Weight below zero
center zero	X36=1	Weight within ¼ d of zero
inside ZSR	X37=1	Weight within zero-setting range
standstill	X38=1	Mechanical stability of the scale
out	X39=1	Weight below zero or above Max
command error	X48=1	For internal use only.
command busy	X49=1	For internal use only.
power fail	X50=1	Set after power-on (=power failure)
test active	X56=1	Analog test was started.
cal active	X57=1	For internal use only.
tare active	X58=1	Instrument is tared.
marker bit 1	X64=1	Marker bit 1 set, after power-on the markers are set to '0'.
marker bit 2	X65=1	Marker bit 2 set, after power-on the markers are set to '0'.
marker bit 3	X66=1	Marker bit 3 set, after power-on the markers are set to '0'.

4.9 Digital Outputs and Inputs

4.9.1 Configuring Digital Outputs

Configure the required function for [Output 1] to [Output 3] by selecting a signal from the list. The output goes to the corresponding state, see Example.

Press Setup and select [Digital I/O parameter] to open the configuration menu.

Setup/Digital I/O parameter		
Output 1	**below zero**	**X35=1**
Output 2	**above Max**	**X33=0**
Output 3	**center zero**	**X36=1**
Input 1 on	**-no action-**	

[Output 1] is true (active), when the weight value drops below zero (X35=1).

[Output 2] remains (active), as long as the weight is not above Max (X33=0).

[Output 3] is true (active), when the weight is zero ±¼ d (X36=1).

Selection list for output functions

Function	SPM bit	Description
actual diginp1	X00=0	Digital input 1: not active
actual diginp2	X01=0	Digital input 2: not active
actual diginp3	X02=0	Digital input 3: not active
actual limit 1	X16=0	Limit signal 1: not active
actual limit 2	X17=0	Limit signal 2: not active
actual limit 3	X18=0	Limit signal 3: not active
ADC error	X32=0	General error in the weighing point: not active (no error)
above Max	X33=0	Weight above Max: not active
overload	X34=0	Weight above Max plus the 'overload' value: not active
below zero	X35=0	Weight not below zero
center zero	X36=0	Weight not within ¼ d of zero
inside ZSR	X37=0	Weight not within zero-setting range
standstill	X38=0	No mechanical stability of the scale
out	X39=0	Weight not below zero or above Max
command error	X48=0	For internal use only.
command busy	X49=0	For internal use only.
power fail	X50=0	Set after power-on (=power failure): not active
test active	X56=0	Analog test was not started.
cal active	X57=0	For internal use only.
tare active	X58=0	Instrument is not tared.
marker bit 1	X64=0	Marker bit 1 not set, after power-on the markers are set to '0'.
marker bit 2	X65=0	Marker bit 2 not set, after power-on the markers are set to '0'.
marker bit 3	X66=0	Marker bit 3 not set, after power-on the markers are set to '0'.

Function	SPM bit	Description
actual diginp1	X00=1	Digital input 1: active
actual diginp2	X01=1	Digital input 2: active
actual diginp3	X02=1	Digital input 3: active
actual limit 1	X16=1	Limit signal 1: active
actual limit 2	X17=1	Limit signal 2: active
actual limit 3	X18=1	Limit signal 3: active
ADC error	X32=1	General error in the weighing point
above Max	X33=1	Weight above Max
overload	X34=1	Weight above Max plus the 'overload' value
below zero	X35=1	Weight below zero
center zero	X36=1	Weight within ¼ d of zero
inside ZSR	X37=1	Weight within zero-setting range
standstill	X38=1	Mechanical stability of the scale
out	X39=1	Weight below zero or above Max
command error	X48=1	For internal use only.
command busy	X49=1	For internal use only.
power fail	X50=1	Set after power-on (=power failure)
test active	X56=1	Analog test was started.
cal active	X57=1	For internal use only.
tare active	X58=1	Instrument is tared.
marker bit 1	X64=1	Marker bit 1 set, after power-on the markers are set to '0'.
marker bit 2	X65=1	Marker bit 2 set, after power-on the markers are set to '0'.
marker bit 3	X66=1	Marker bit 3 set, after power-on the markers are set to '0'.

Example: ‚overload'	X34=1	Function and output are active (e. g.: if 'overload' is reached, a lamp is lit).
	X34=0	Function and output are not active (e. g.: if 'overload' is reached, a lamp is lit).

4.9.2 Configuring Digital Inputs

An action both for signal change from 0 to 1 (on) and from 1 to 0 (off) can be determined for each of the three inputs. Digital inputs can be linked with conditions that must be met before an action can be started.

Press Setup and select [Digital I/O parameter] to open the configuration menu.

Setup/Digital I/O parameter		
Output 1	marker bit 1	X64=1
Output 2	marker bit 2	X65=1
Output 3	marker bit 3	X66=1
Input 1 on	⇵ set tare	X113=1
Condition	no condition	-----
Input 1 off	-no action-	
Input 2 on	-no action-	
Input 2 off	-no action-	
Input 3 on	-no action-	
Input 3 off	-no action-	
BCD out		Gross

1. Determining an action

Determine the action for the rising edge of input 1 under [Input 1 on] from the following list (here: When the input signal changes from 0 to 1, a tare command is generated).

Accordingly, an action for the falling edge can be determined.

Selection list for actions of the inputs [Input 1/2/3 on/off]

Function	SPM bit	Description
-no action-	-----	No function
set marker 1	X64=1	Set marker 1
set marker 2	X65=1	Set marker 2
set marker 3	X66=1	Set marker 3
select net	X72=1	Select net
set zero	X112=1	Set zero
set tare	X113=1	Set tare
reset tare	X114=1	Reset tare
set test	X115=1	Activate the analog test
reset test	X116=1	Finish the analog test
reset PWF	X117=1	Reset power fail
set fixtare	X118=1	Set fixtare (use the value in address D31 as a tare value)
get fixtare	X119=1	Save gross value as fixtare in address D31
set print	X120=1	Activate a print order
clr marker 1	X64=0	Clear marker 1
clr marker 2	X65=0	Clear marker 2
clr marker 3	X66=0	Clear marker 3
select gross	X72=0	Save the gross weight in address D11

2. Determining a condition

The selected action of each digital input can be combined with a condition that must be met for signal change from 0 to 1 (on) or for signal change from 1 to 0 (off). Select the condition from the list; see page 104. No condition is defined when selecting [no condition]; the action is executed directly.

Example: Taring via the digital input only if the gross weight exceeds the limit value.

Press Setup and select [Digital I/O parameter] to open the configuration menu.

Setup/**Digital I/O parameter**		
Output 1	**marker bit 1**	**X64=1**
Output 2	**marker bit 2**	**X65=1**
Output 3	**marker bit 3**	**X66=1**
Input 1 on	**set tare**	**X113=1**
Condition	**tare active**	**X58=0**
Input 1 off	**-no action-**	
Input 2 on	**-no action-**	
Input 2 off	**-no action-**	
Input 3 on	**-no action-**	
Input 3 off	**-no action-**	
BCD out		**Gross**

In this example: If input 1 changes from 0 to 1 [input 1 on], a taring signal is triggered only if the condition under [Condition] is met (limit 1 out = active).

4.10 Analog Output

Determine the analog output under Setup-[Analog output parameter].

Setup
Serial ports parameter
Operating parameter
Fieldbus parameter
Network parameter
Weighingpoint
Limit parameter
Digital i/o parameter
Analog output parameter

Press ↓/↑ and OK to select [Analog output parameter]

Setup/Analog output parameter		
Analog mode	⇵	no output
Analog range		0 ... 20 mA
Output on error		0 mA
Output if < 0		0 mA
Output if > Max		20 mA
Weight at 0/4 mA		0 kg
Weight at 20 mA		3000 kg

[Analog mode]	[no output]	The analog output is not used
	[Gross D08]	Output of the gross weight
	[Net D09]	Output of the net weight
	[Select D11]	Output of the value on the display
	[Transparent D30]	Output of the value in D30
[Analog range]	[0...20 mA]	Output of 0... 20 mA
	[4...20 mA]	Output of 4... 20 mA
[Output on error]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[hold]	The last output value is held
[Output if < 0]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[linear]	The output drops below 4 mA up to the limitation (at 4 .. 20 mA)
[Output if > Max]	[0 mA]	Set the output to 0 mA
	[4 mA]	Set the output to 4 mA
	[20 mA]	Set the output to 20 mA
	[linear]	The output exceeds 20 mA up to the limitation
[Weight at 0/4 mA]		Weight value for 0/4 mA output
[Weight at 20 mA]		Weight value for 20 mA output

Press Exit to return to the previous menu.

4.10.1 Adapting the Analog Output

The output current can be adapted in small ranges. This is required, if small deviations from the nominal value occur in a connected PLC.

Open the menu with Info [Show HW-slots]:

Info/**HW-Slots**	
Builtin	**RS485**
Builtin	**analog out**
Builtin	**digital i/o**

Select [analog i/o].

Info/**HW-Slots**	
Builtin	**analog out**
In use by PLC task	1
Analog output	4.004 mA
counts	10934 cnt

Stop PLC	**Stop I/O**	**Adjust**	**Reset**	

Press [Adjust].

Adapt analog output ?

Safety prompt: Reply [Yes] to start adapting.

Info/HW-Slots/**Adjust Analog Output**	
Output	4.000 mA
Measured	**4.004 mA**

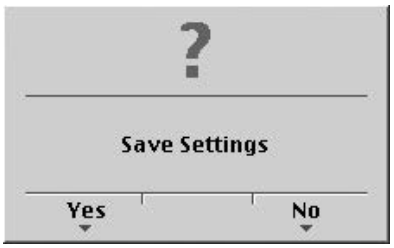
Enter e.g. the value for 4 mA measured by the connected PLC under [Measured].

After pressing OK, the 2nd value (20 mA) is displayed:

Info/HW-Slots/**Adjust Analog Output**	
Output	**20.000 mA**
Measured	**20.010 mA**

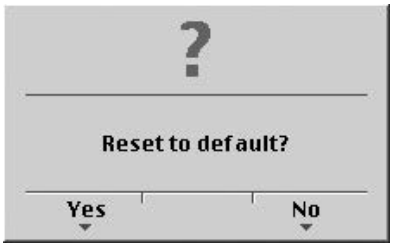
Enter e.g. the value for 20 mA measured by the connected PLC under [Measured].

After pressing OK, this message is displayed:



Press [Yes] to validate the changes.
Press [No] to keep the previous values.

If you want to return to the factory settings (4 mA and 20 mA):
Press [Reset]: A safety prompt is displayed:



Press [Yes] for reset to the factory settings.
Press [No] if you want to keep the entered values unchanged.

4.11 Logfiles

These files contain all actions from processes of the device.
After selecting menu item 'Logfiles', several log files are listed.

DIR of /var/log/

```
1997 18.02.2011 10:46:21 logd.2        text/plain
 10013 18.02.2011 08:05:58 logd.1        text/plain
 10056 15.02.2011 19:57:52 logd.0        text/plain
  3686 15.02.2011 18:24:43 messages      text/plain
```

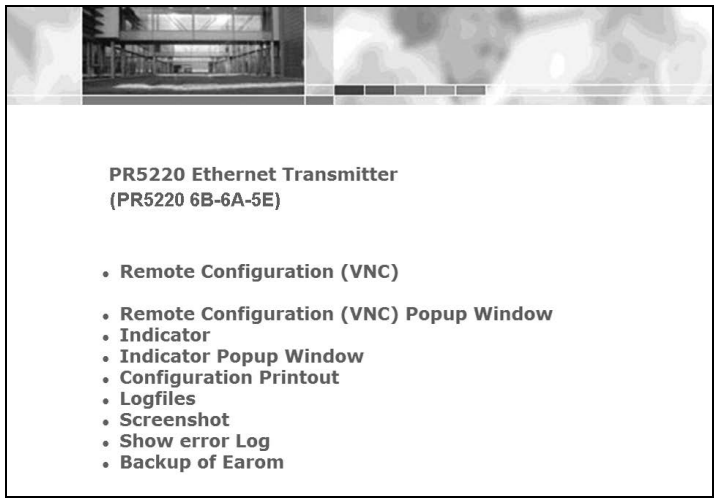
The files contain the log lines that can be evaluated, if necessary.

4.12 Saving Configuration Data [Backup of EAROM]

The configuration and calibration data of the EAROM can be saved for back-up on the PC and downloaded, if necessary.

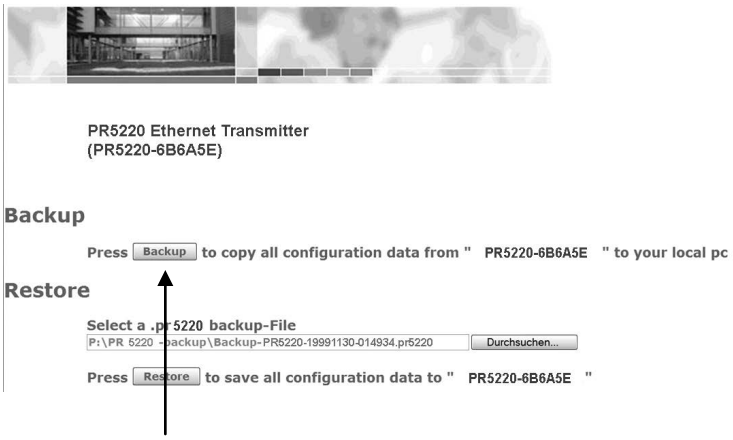
4.12.1 Saving Configuration and Calibration Data

Procedure:



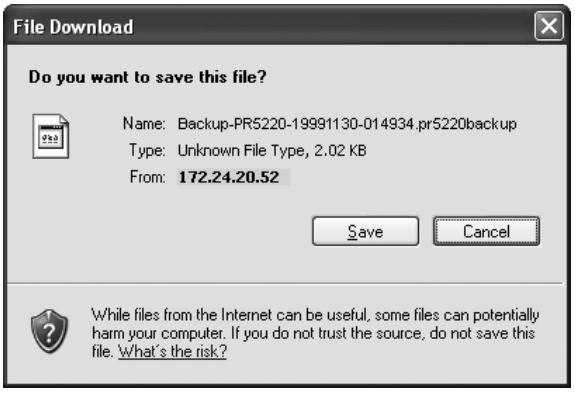
1. Click on ‚Backup of Earom' to open the menu 'Backup-/Restore'.

Following window appears:



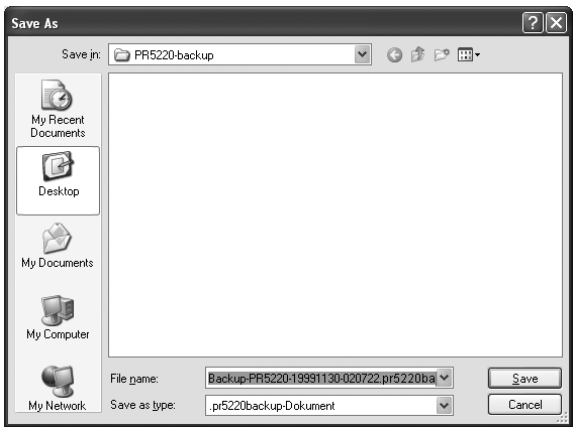
2. Click on ‚Backup'.

Following window appears:



3. Click on 'Save'.

Following window appears:



4. Create and open the required directory e.g. on the notebook.
5. Click button 'Save' to save the file in the relevant directory.

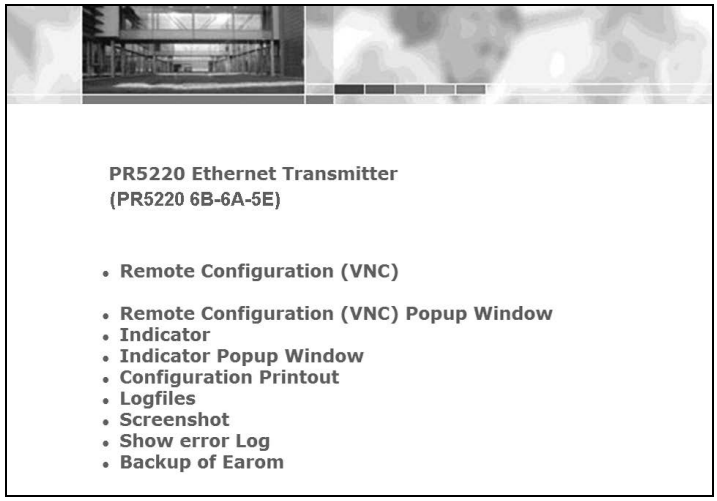
4.12.2 Loading Configuration and Calibration Data into the Device

Caution!

All data which can be adjusted in the setup menu are overwritten!

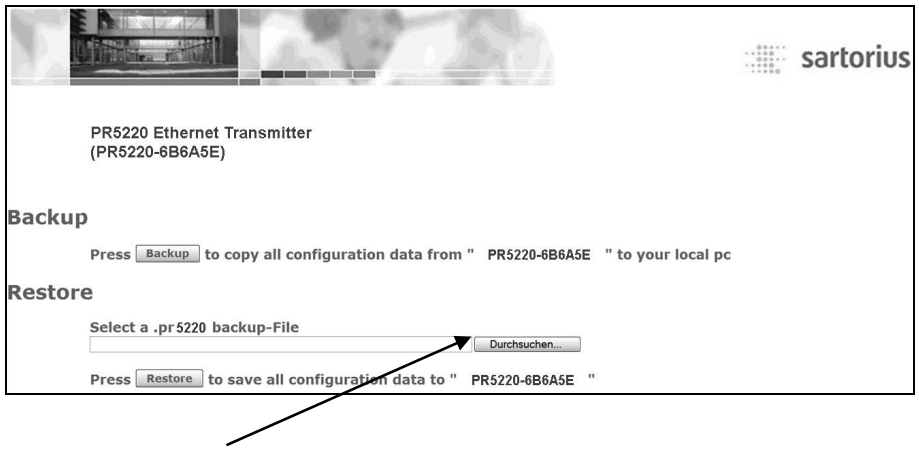
If the file is loaded into several devices, changing the network settings and the host name is indispensable!

Procedure:



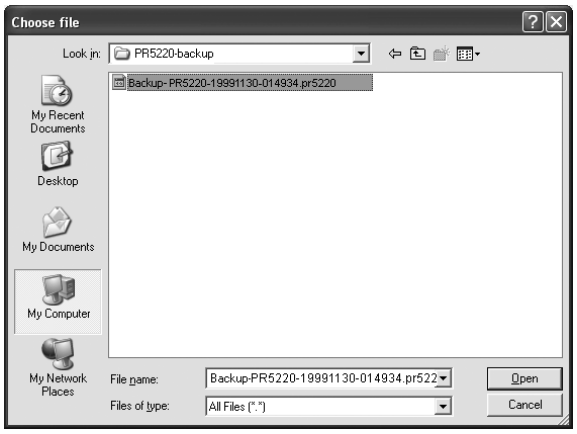
1. Click on ‚Backup of Earom' to open the menu 'Backup-/Restore'.

Following window appears:



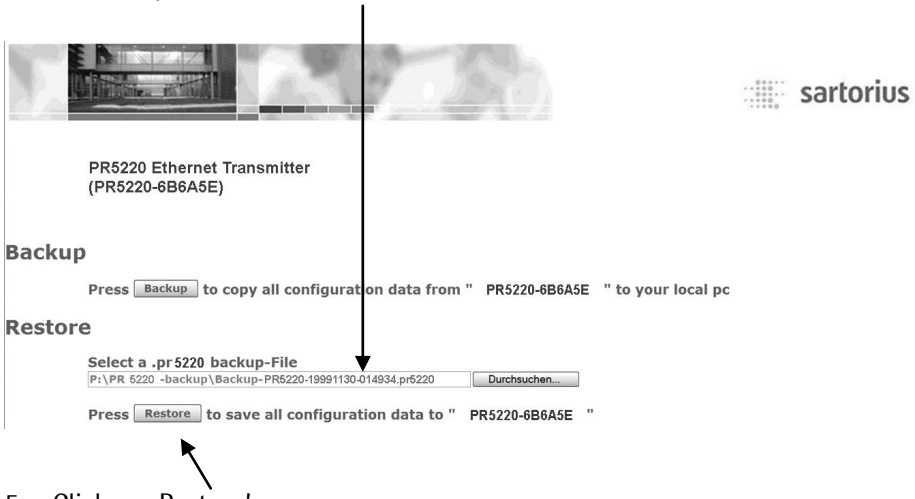
2. Click on ‚Durchsuchen' (depending on Internet browser).

Following window appears:



3. Click the file that must be loaded.
4. Click on 'Open'.

The file is displayed in the window.



5. Click on ‚Restore'.

The selected file is loaded into the device.

5 J-Bus/ModBus Protocol

5.1 General Description

The J-Bus/ModBus protocol implemented in the instrument permits fast, simple and reliable communication between a PC or a PLC and up to 127 instruments.

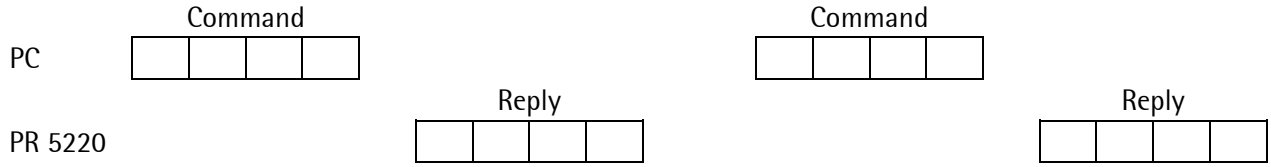
PR 5220 fully supports

- ModBus-TCP (via network interface), see Chapter 5.2
- ModBus-UDP (via network interface), see Chapter 5.2

including functions 1, 2, 3, 4, 5, 6, 8 (sub-function 0), 15 and 16.

J-Bus is a French 'clone' of the ModBus. There is a small difference: J-Bus addresses count from 0 (instead of 1) to hex FFFF (instead of dec. 9999). Some ModBus masters automatically subtract 1 before sending a message, and some ModBus slaves subtract 1 to get the requested address. Thus it may happen that access to an address shifted by 1 is made; this is the only point which must be taken into account. In everyday practice, no other problems when connecting J-Bus and ModBus instruments should appear.

Binary data from and to the SPM of PR 5220 are transmitted using this protocol. Any data exchange includes two telegrams: a command from the PC to PR 5220 and a reply from PR 5220 to the PC.



Note: A telegram sent to Slave 0 is executed by all ModBus users, but not replied by anyone!

2-byte values (16-bit values/word) have the Motorola notation. Consequence: MSB - LSB

If the received command is correct but cannot be executed nevertheless (e.g. due to a faulty address or faulty data), reply is with an error telegram.

5.2 ModBus-TCP/-UDP

Connection is via the network interface.

The telegram consists of six blocks:

$Trans_{16}$	$Proto_{16}$	$Size_{16}$	$Addr_8$	$Func_8$	<data>

Legend

$Trans_{16}$	Sequential transaction number. The number is reflected by the instrument in such a way that the reply can be assigned to the enquiry.
$Proto_{16}$	Reserved for future extension, here always 0.
$Size_{16}$	Number of subsequent bytes
$Addr_8$	Normally, the device address is not used with ModBus-TCP/-UDP. It is used if ModBus-TCP/-UDP is connected behind a ModBus RTU gateway. With ModBus-TCP/-UDP, PR 5220 ignores this parameter.
$Func_8$	Function code (see Chapter 5.3)
<data>	Further data (see Chapter 5.3)

The telegrams can be exchanged using TCP or UDP via Port 502. Normally, this is a fixed setting in the ModBus-TCP master.

With UDP, the typical response time is 4 ms and max. 8 ms. With high network traffic, failed telegram transmissions must be expected. Suitable measures must be taken in the ModBus-TCP master to force a repeated transmission in the event of telegram loss.

With TCP, the typical response time is approx. 10 ms. With high network traffic, transmission can be delayed (max. 120 seconds in extremely disturbed networks, or with long transmission distances as encountered e.g. with the Internet). Normally, however, no telegrams are lost.

Comparison

ModBus-TCP	**ModBus-UDP**
Reliable transmission: As long as the line is not interrupted, no telegram is lost.	Unreliable transmission: With high network traffic or transmission over long distances, telegram loss must be expected.
Low speed: With transmission problems, transmission can be delayed considerably.	High speed: The reply is transmitted quickly, or not at all.
Suitable for: - Parameter transmission - Result logging - Non-time-critical process control	Suitable for: - Transmission of dynamic values - Visualization - Time-critical process control (requiring timeout handling)

5.3 Functions

Function 1 or 2: Reading n Bits

Command	Device address	Function number	Address of 1st bit	Number of bits
	1 byte	1 byte	2 bytes	2 bytes
Range	1...127	1, 2	0, 8 , 16...	8, 16, 24...

The bit address must always be the 1st bit of a byte. The number of bits to be read may not be smaller than 8 and must be a multiple of 8.

Reply	Device address	Function number	Number of read bytes	Value of 1st byte	Value of 2nd byte	..	Value of last byte
	1 byte	1 byte	1 byte	1 byte	1 byte		1 byte
				8. ...1. bit			last bit

If the address of a bit to be read is out of the permissible range (0...127), an error message is sent as a reply (the address plus the number of bits must not exceed 128).

Example of function 1 for reading the status bits of the scale (8 bits start at bit 32) with ModBus-TCP:

Command	47	11	0	0	0	6	0	1	0	32	0	8

Reply	47	11	0	0	0	4	0	1	1	X

The individual bytes are shown.

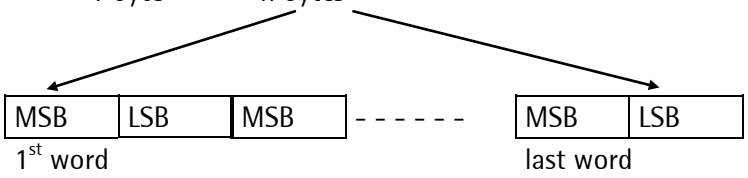
The read byte X is interpreted as follows:

Bit 0 = bit 32 of SPM = ADC error
Bit 1 = bit 33 of SPM = above Max (maximum capacity)
:
Bit 6 = bit 38 of SPM = weight is stable
Bit 7 = bit 39 of SPM = weight is below zero or above Max

Function 3 or 4: Reading n Successive Words

Command	Device address	Function number	Address of 1st word	Number of words
	1 byte	1 byte	2 bytes	2 bytes
Range	1...127	3, 4	0...63	1...64

Reply	Device address	Function number	Number of bytes	Value of the words
	1 byte	1 byte	1 byte	n bytes



If the address of one of the words to be read is out of the permissible range (0...63), an error message is sent as a reply (the address plus the number of bytes must not exceed 64).

Example of function 3 for reading a gross weight (D8 = W16) of 893 kg with ModBus-TCP:

Command	47	12	0	0	0	6	0	3	0	16	0	2

Reply	47	12	0	0	0	7	0	3	4	0	0	3	125

The individual bytes are shown.

Function 5: Writing a Bit

Command	Device address	Function number	Address of the bit	Value of the bit	Always 0
	1 byte	1 byte	2 bytes	1 byte	1 byte
Range	0...127	5	0...127	0 or 255	0

Reply	Device address	Function number	Address of the bit	Value of the bit	Always 0
	1 byte	1 byte	2 bytes	1 byte	1 byte

If the address of the bit is out of the permissible range (0...127), an error message is sent as a reply.

Example of function 5 for setting bit 113 (taring) with ModBus-TCP:

Command	47	13	0	0	0	6	0	5	0	113	255	0
Reply	47	13	0	0	0	6	0	5	0	113	255	

The individual bytes are shown.

Function 6: Writing a Word

Command	Device address	Function number	Word address	Value of the word
	1 byte	1 byte	2 bytes	2 bytes
Range	0...127	6	0...63	

Reply	Device address	Function number	Word address	Value of the word
	1 byte	1 byte	2 bytes	2 bytes

If the address is out of the permissible range (0...63), an error message is sent as a reply.

Function 8: Diagnosis

Command	Device address	Function number	Sub-function	Any value
	1 byte	1 byte	2 bytes	2 bytes
Range	1...127	8	0	

This function is intended for testing the communication.

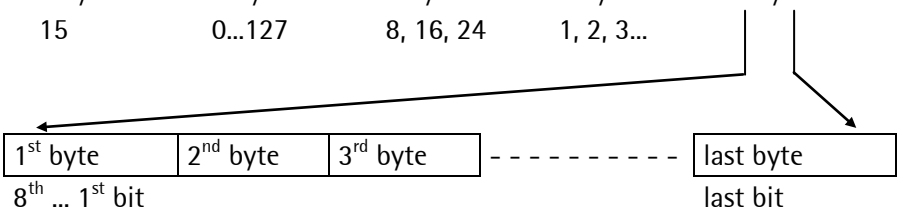
Only sub-function 0 is supported.

The received command is sent as a reply.

Reply	Device address	Function number	Sub-function	Value of the command
	1 byte	1 byte	2 bytes	2 bytes

Function 15: Writing n Successive Bits

Command	Device address	Function number	Address of the 1st bit	Number of bits	Number of bytes	Value of bits
	1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes
Range	0...127	15	0...127	8, 16, 24	1, 2, 3...	



The bit address must always be the 1st bit of a byte. The number of bits to be read must not be smaller than 8 and must be a multiple of 8. The address plus the number of bits must not exceed 128.

Reply	Device address	Function number	Address of the 1st bit	Number of bits
	1 byte	1 byte	2 bytes	2 bytes

Example of function 15 with ModBus-TCP:

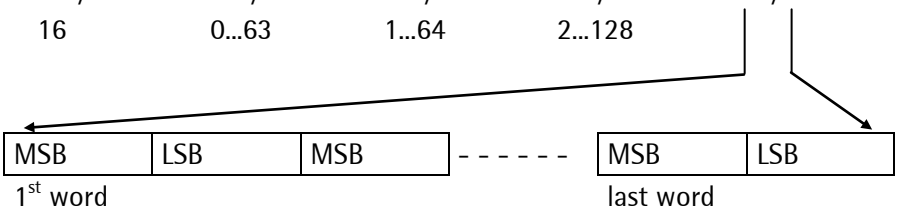
Command	47	14	0	0	0	8	0	15	0	64	0	8	1	3

Reply	47	14	0	0	0	6	0	15	0	64	0	8

The individual bytes are shown.

Function 16: Writing n Successive Words

Command	Device address	Function number	Address of 1st word	Number of words	Number of bytes	Value of words
	1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes
Range	0...127	16	0...63	1...64	2...128	



Reply	Device address	Function number	Address of 1st word	Number of words
	1 byte	1 byte	2 bytes	2 bytes

If the address is out of the permissible range (0...63), an error message is sent as a reply (the address plus the number of bytes must not exceed 64).

Example of function 16 for writing the limit_1 switch-on point using value 893 with ModBus-TCP:

Command	47	15	0	0	0	8	0	16	0	48	0	2	4	0	0	3	125

Reply	47	15	0	0	0	6	0	16	0	48	0	2

The individual bytes are shown.

5.4 Error Messages

If a command was transmitted correctly, but cannot be executed because e.g. the address is too high, an error message is sent as a reply to the command.

The error message has the following format:

Device address	Function number +128	Error number	CRC 16
1 byte	1 byte	1 byte	2 bytes

The 2nd byte contains the received function number; the most significant bit is set additionally.

Meaning of the error number:

1	The function number is unknown
2	The address is out of the permissible range
3	The data format is faulty (e.g. more data than specified in the number were written)

Example of an error message, which was generated by an invalid function number with ModBus-RTU.

Command	1	9	0	0	0	0	CRC	CRC

Reply	1	137	1	CRC	CRC

The individual bytes are shown.

5.5 Word Addresses

16	Gross weight, 1st byte (MSB)	Gross weight, 2nd byte
17	Gross weight, 3rd byte	Gross weight, 4th byte (LSB)

2	39	38	37	36	35	34	33	32	47	46	45	44	43	42	41	40
7	119	118	117	116	115	114	113	112	127	126	125	124	123	122	121	120

Address	Description
Read bits:	
32	ADC error
33	Above Max (full scale deflection)
34	Above Max + n d
35	Below zero (minus sign)
36	Zero within ¼ d
37	Within zero setting range
38	The weight is stable
39	The weight is below zero or above Max
Write bits:	
112	Set zero
1130	Set tare
114	Reset tare

For further bits, see Chapter 8.

6 SMA Protocol

6.1 General

The protocol of the 'Scale Manufacturers Association' (SMA) provides a simple access to the scale. It can be used for reading data, or for executing functions.

The RS-485 interface is used. Fixed interface settings are 8 bits, no parity and 1 stop bit.

The commands to the transmitter are printable ASCII characters starting with <LF> = 0A hex and ending with <CR> = 0D hex.

The instrument sends a reply on each received command after approx. 100 µs. With commands that wait for stability of the weight value, the reply can be delayed by the waiting time.

6.2 Description of Used Symbols

All characters used in this protocol are printable ASCII characters. Characters <CR> <LF> <SPACE> and <ESC> are excepted.

< >	The symbols < and > are used to put communication fields and non-printable ASCII characters into brackets. These symbols are never part of any communication message.
<LF>	A data set starts with a line feed character (line feed = 0A hex).
<CR>	A data set ends with the carriage return character (carriage return = 0D hex).
'_' <space>	The underscore or space character is used to mark an ASCII space character (20 hex).
<ESC>	The 'escape' character (1B hex) is used to cancel a command.
'!'	An ASCII exclamation mark (21 hex) is used for communication errors.
':'	An ASCII colon is used as a field delimiter.
'-'	ASCII minus sign (2D hex)
'?'	An ASCII question mark (3F hex) is used for unknown or non-supported commands.
'c'	Command character. All printable ASCII characters are permitted.
<s><r><n>	Scale status indicator characters; ASCII letters or spaces
<m><f>	For details, see page 130.
<r><e>	Scale diagnostics indicator characters; upper case ASCII letters or spaces.
<c><m>	For details, see page 131.
<xxxxxx.xxx>	Weight data including minus sign (right-adjusted) and a decimal point (if any). If necessary, leading spaces are introduced with a leading zero before the decimal point. The entire field is always 10 characters long. With some error states, the field is filled up with minus signs '-'.
	Examples: <_ _ _ _ _0.000>; <_ _ _ _11.120>; <_ _ _ _ -1.000>; <- - - - - - - - - ->
<yyyyyy>	Text field of printable ASCII characters; for transporting scale information. The field has max. 25 characters.
<uuu>	Abbreviation of the used unit. The field is always 3 characters long; it is left-adjusted and filled up with spaces.

6.3 SMA Command Set

The SMA command set is intended for requesting weight values and status information as well as for control of the scale. The commands start with <LF> and end with <CR>.

Format: <LF>c<CR>

Requesting a Weight

Requesting a Weight

Command:	<LF>W<CR>
Reply:	The scale immediately returns the weight and status: gross weight if not tared, net weight if tared.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Requesting the Weight with Stability

Command:	<LF>P<CR>
Reply:	The scale returns the weight and the status only, when the stability condition is met: Gross weight if not tared, net weight if tared.
	For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.4.13.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	After elapse of the waiting time without reaching stability, the following reply is sent:
	<LF><_><1><n><_><f><----------><___><CR>
	For details, see page 130.

Requesting Weight Continuously

This is a command which generates non-requested replies, because it does not function according to the strict pattern of command and reply. After the command, the scale repeats the reply continuously.

Command:	<LF>R<CR>
Reply:	The scale repeats the weight and status information continuously until another command is received.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Dependent on the used baud rate, the repetition rate of reply telegrams is roughly as follows:

19200 bd ⇨ 100ms

9600 bd ⇨ 110ms

4800 bd ⇨ 170ms

Requesting the High-Resolution Weight

Command:	<LF>R<CR>
Reply:	The scale immediately returns the high-resolution (10x) weight and status: Gross weight if not tared, net weight if tared.
	Note: The <n> gross/net status is shown in lower-case letters while the high-resolution weight is sent.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Requesting the High-Resolution Weight with Stability

Command:	<LF>Q<CR>
Reply:	The scale returns the weight and the status only, when the stability condition is met: Gross weight if not tared, net weight if tared.
	For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.4.13.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	After elapse of the waiting time without reaching stability, the following reply is sent:
	<LF><_><1><n><_><f><----------><___><CR>
	For details, see page 130.

Requesting the High-Resolution Weight Continuously

This is a command which generates non-requested replies, because it does not function according to the strict pattern of command and reply. After the command, the scale repeats the reply continuously.

Command:	<LF>S<CR>
Reply:	The scale repeats the weight and status information continuously until another command is received.
	<LF><s><r><n><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Dependent on the used baud rate, the repetition rate of reply telegrams is roughly as follows:

19200 bd ⇨ 100ms

9600 bd ⇨ 110ms

4800 bd ⇨ 170ms

Requesting the Tare Weight

Command:	<LF>M<CR>
Reply:	The scale returns the tare weight and signals the 'tared' status in the <n> status character.
	<LF><s><r><T><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Controlling the Scale

Request for Taring of the Scale

Command:	<LF>T<CR>
Reply:	The scale makes a taring attempt and signals the tared status in the <s> and <n> characters.
	For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.4.13.
	<LF><s><r><N><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Request for Taring with Fixtare Value

Command:	<LF>T<xxxxxx.xxx><CR>
Reply:	The scale makes a taring attempt using the fixtare value <xxxxxx.xxx> and signals the tared status in the <s> and <n> characters.
	<LF><s><r><N><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Request for Zero Setting of the Scale

Command:	<LF>Z<CR>
Reply:	The scale makes a zero setting attempt and signals the zero status in the <s> character.
	For this function, the stability condition must be met. The maximum waiting time for stability is set under [Tare timeout]; see Chapter 4.4.13.
	<LF><Z><r><n><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.
	Unless the scale is in the zero setting range, an error reply is generated.

Request for Tare Resetting

Command:	<LF>C<CR>
Reply:	The scale deletes the tare weight and signals the tare reset status in the <n> status character. The scale tare is reset.
	<LF><s><r><G><m><f><xxxxxx.xxx><uuu><CR>
	For details, see page 130.

Scale Diagnosis

Command:	<LF>D<CR>
Reply:	The scale starts the diagnosis and returns a diagnosis reply.
	<LF><r><e><c><m><CR>
	For details, see page 130.

Scale Data

Scale Data – First Line

Command:	<LF>A<CR>
Reply:	The scale sends the first line of its scale data.
	<LF><SMA>:<yyyyyy><CR>
	For details, see page 130.

Scale Data – Other Lines

Command:	<LF>B<CR>
Reply:	The scale sends additional lines of its scale data.
	<LF><MFG>:<yyyyyy><CR>
	For details, see page 130.

Scale Information

Scale Information - First Line

Command:	<LF>I<CR>
Reply:	The scale sends the first line of its scale information.
	<LF><SMA>:<yyyyyy><CR>
	For details, see page 130.

Scale Information – Other Lines

Command:	<LF>N<CR>
Reply:	The scale sends additional lines of its scale information.
	<LF><TYP>:<yyyyyy><CR>
	For details, see page 130.

Escape Command

Command:	<ESC>
Reply:	This is the only command which does not work according to the <LF>c<CR> protocol principle. It does not have a reply. The <ESC> character is detected at any time and cancels any current command.

6.4 SMA Reply Messages

In this section, the replies are described in detail. The data format of each reply has a fixed length. The communication error is the only exception from this pre-definable format. Thus the controlling computer can check each reply according to fixed rules, because each data field is in a fixed position.

Standard Reply

With most commands, the reply format is as described below:

Exceptions are the commands: 'D', 'A'/'B' and 'I'/'N'.

<LF> <s> <r> <n> <m> <f> <xxxxxx.xxx> <uuu> <CR>

Reply format and meaning:

<LF>		Start of reply message
<s>	Scale status	Definition / example
	'Z'	Zero within 1/4d <xxxxxx.xxx>= 0.000
	'O'	Above Max <xxxxxx.xxx>= +weight
	'U'	Below zero <xxxxxx.xxx>= - weight
	'E'	Zero setting error
	'T'	Taring error
	<space>	None of the above conditions
		Note: For 'E', 'I', 'T' error conditions
		<xxxxxx.xxx>= −−−−− (minus sign)
		and 'Z', 'O', 'U' are overwritten.
<r>	Range	('1', '2', '3', etc.) always '1' for single range scales
<n>	Gross/net	Status
	'G'	Gross weight
	'T'	Tare weight (as reply from 'M' command)
	'N'	Net weight
	'g'	High-resolution gross weight
	'n'	High-resolution net weight
<m>	Stability status	
	'M'	The scale is not stable
	<space>	The stability-of-scale condition is met
<f>	Reserved for future extensions	
<xxxxxx.xxx>	Weight value; the field has always 10 characters	
<uuu>	Unit of the weight value	
<CR>	End of the reply message	
Example:		
Command	Reply	
<LF>W<CR>	<LF> <_> <1> <G> <_> <_> <_ _ _ _ 5.025> <lb_> <CR>	
<LF>W<CR>	<LF> <_> <1> <N> <_> <_> <_ _ _ _ 100000> <lb_> <CR>	
<LF>H<CR>	<LF> <_> <1> <g> <_> <_> <_ _ _ _5.0025> <lb_> <CR>	
<LF>Z<CR>	<LF> <Z> <1> <G> <_> <_> <_ _ _ _ _0.000> <lb_> <CR>	
<LF>R<CR>	<LF> <_> <1> <G> <_> <_> <_ _ _ _ 7.025> <kg_> <CR>	
	<LF> <_> <1> <G> <M> <_> <_ _ _ _ 7.650> <kg_> <CR>	
	... repeat...	
	<LF> <_> <1> <G> <_> <_> <_ _ _ _ 7.650> <kg_> <CR>	
	The scale repeats the weight, until another command is received.	

Reply with Unknown Command

<LF> ? <CR>	A command from the controlling computer that is not implemented, or invalid, is replied with an ASCII '?'.

Reply in Case of Communication Error

<LF> ! <CR>	A command from the controlling computer that is unknown to the scale due to a communication error is replied with an ASCII '!'. This includes parity error or frame error (if any).

Reply with Diagnosis Command

When a diagnosis command is given, the scale makes a test and gives a status reply.

<LF> <r> <e> <c> <m> <CR>

Reply format and meaning:

<LF>	Start of diagnosis reply
<r>	'R' = RAM or ROM error, '_' = OK,
<e>	'E' = EEPR OM error, '_' = OK
<c>	'C' = calibration error, '_' = OK
<m>	Always: '_' = OK
<CR>	Start of the diagnosis reply

Example: without error status

Command	Reply
<LF>D<CR>	<LF> <_> <_> <_> <_> <CR>

Reply with 'A' and 'B' Command

Reply format with 'A' and 'B' commands (variable length):

<LF><xxx>:<yyyyyy><CR>

The reply format and meaning are:

<LF>	Start of reply from 'A'/'B' command
<xxx>	The field name is three characters long, left-adjusted and filled up with spaces on the right, if necessary.
	The following fields are sent:
	"SMA" level/revision
	(reply from 'A' command)
	"MFG" manufacturer marking
	(reply from the 1st 'B' command)
	"MOD" product / model identification
	(reply from the 2nd 'B' command)
	"REV" software version
	(reply from the 3rd 'B' command)
	"SN_" serial number
	(reply from the 4th 'B' command)
	"END": This is always the last inscription field
	(reply from the last 'B' command)
':'	Separator between field name and field content.
<yyyyyy>	The data field has up to 25 characters.
	The SMA field contains <level/revision>
	with the following meaning: level= (1, 2, etc.); revision= (1.0, 1.1, etc.)
<CR>	End of reply from 'A'/'B' command

Example:

Command	Reply
<LF> A <CR>	<LF>SMA:1/1.0 <CR>
<LF> B <CR>	<LF>MFG:Sartorius <CR>
<LF> B <CR>	<LF>MOD:PR 5220 <CR>
<LF> B <CR>	<LF>REV:01.01.9 <CR>
<LF> B <CR>	<LF>SN_:148388723 <CR>
<LF> B <CR>	<LF>END: <CR>

Note: If the controlling computer sends another 'B' command:

<LF> B <CR> <LF> ? <CR>

Scale Reply with 'I' and 'N' Commands

Reply format with and 'N' commands (variable length):

<LF><xxx>:<yyyyyy><CR>

Reply format and meaning:

<LF>	Start of reply from 'I'/'N' command	
<xxx>	The field name is three characters long, left-adjusted and filled up with spaces, if necessary.	
	The following fields are sent:	
	"SMA"	level/revision
		(reply from 'I' command)
	"TYP"	Scale type: 'S'= scale
		(reply from the 1st 'N' command)
	"CAP"	Max, unit, scale interval and decimal position, separated by ':'
		Meaning :
		yyyyyy= uuu:c..c:n:d
		uuu= unit
		n= scale interval (e.g. 1, 2, 5,10,20...) without decimal point
		d= decimal point position
		'0'= without, '1'= xxxx.x, '2'= xxx.xx, '3'= xx.xxx , ... etc.
		(reply from the 2nd 'N' command)
	"CMD"	Supported SMA commands
		(reply from the 3rd 'N' command)
	"END"	This is always the last inscription field
		(reply from the last 'N' command)
':'	Separator between field name and field content.	
<yyyyyy>	The data field has up to 25 characters.	
	The SMA field contains <level/revision>	
	Meaning: level= (1, 2, etc.); revision= (1.0, 1.1, etc.)	
<CR>	Start of reply from 'I'/'N' command	

Example: 6000kg x 1kg platform scale

Command	Reply
<LF> I <CR>	<LF>SMA:2/1.0 <CR>
<LF>N<CR>	<LF>TYP:S <CR>
<LF>N<CR>	<LF>CAP:kg_:6000:1:0 <CR>
<LF>N<CR>	<LF>CMD:HPTMCR <CR>
<LF>N<CR>	<LF>END: <CR>

Example: 5000g x 1g, 10000g x 2, 25000g x 5 multiple range / multi-interval

Command	Reply
<LF> I <CR>	<LF>SMA:2/1.0 <CR>
<LF>N<CR>	<LF>TYP:S <CR>
<LF>N<CR>	<LF>CAP:g_:5000:1:0 <CR>
	<LF>CAP:g_:10000:2:0 <CR>
	<LF>CAP:g_:25000:5:0 <CR>
<LF>N<CR>	<LF>CMD:HPTMCRQ <CR>
<LF>N<CR>	<LF>END: <CR>

6.5 Communication Error

When a communication error due to a parity error or a frame error (if used) was detected, the scale sends an ASCII '!' character. The only other error is the detection of an unknown or non-supported command. In this case, an ASCII '?' character is sent as a reply. Dependent on the error messages, the controlling computer must decide how to continue the scale operation.

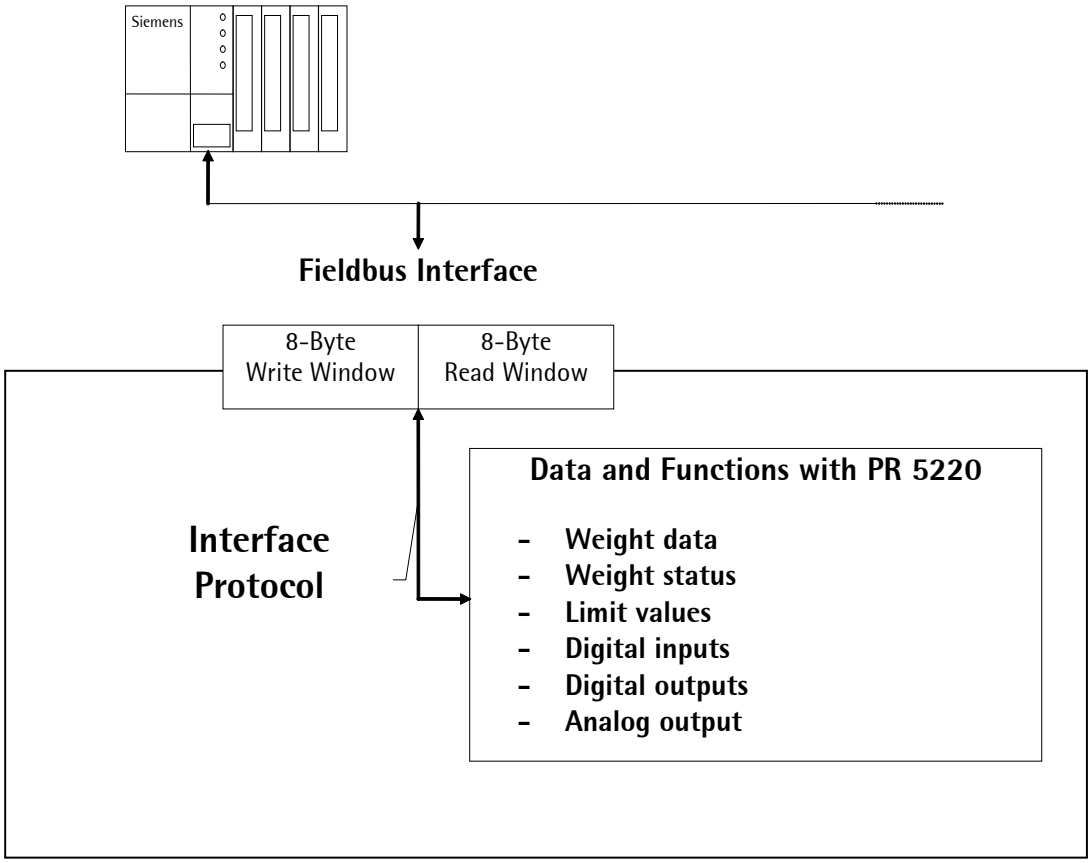
7 Fieldbus Interface

7.1 Fieldbus Interface Protocol

The interface works with an 8-byte write window and an 8-byte read window. The fieldbus exchanges its data cyclically with each slave. This means: In each cycle, 8 bytes are written and 8 bytes are read, also if the data content is unchanged.

The fieldbus protocol ensures the data transport between the fieldbus master and the 2 x 8-byte data windows.

The interface protocol runs under the fieldbus and manages the access to a multitude of different data.



Write Window (Input Area)

Data transmission from the master to the slave (PR 5220) is in this window.

The first four bytes are used only for writing a data value.

The register number is in byte 5.

Bytes 6 and 7 contain bits in direct access independent of the write data.

The command is executed after a 0-1 transition of the corresponding bit.

Byte 0	Write data: MSB
Byte 1	"
Byte 2	"
Byte 3	Write data: LSB
Byte 4	Read_Value _Select
Byte 5	Write_Value _Select
Byte 6	Direct control bits
Byte 7	Direct control bits

Read Window (Output Area)

Data transmission from the slave (PR 5220) to the master is in this window.

The first four bytes are used for reading a data value.

The register number of data is mirrored in byte 4 by the write window, when data is available.

Bytes 5, 6 and 7 contain status bits independent of the read data.

Byte 0	Read data: MSB
Byte 1	"
Byte 2	"
Byte 3	Read data: LSB
Byte 4	Read_Value _Selected
Byte 5	General system bits: - Write_Active - power_fail - analog error...
Byte 6	Status bits
Byte 7	Status bits

Reading and Writing Data

The number of data exceeds the size of the read/write window by far. For this reason, data is addressed with Write_Value_Select and Read_Value_Select. To do this, the first six bytes of the write window and the first five bytes of the read window are required. These can be used by the master to write data in PR 5220: e.g., a limit value is set to 100kg. The master can also read out weight values or other data from the PR 5220. For this purpose, the write and the read window are always required. Safe data exchange is ensured by a write and a read procedure.

For reading status bits, and for writing direct control bits, however, no procedure is required. The general system bits and the status bits are always provided and need not be requested. The direct control bits are also available continuously.

Procedure for reading data:

1. Writing the register number as Read_Value_Select in byte 4 of the **write window** (e.g. net weight).
2. Waiting, until the Read_Value_Selected in byte 4 of the **read window** is equal to the Read_Value_Select in byte 4 of the write window.
3. Now the value is available in bytes 0 to 3.

Procedure for writing data:

1. Waiting, until Write_Active = 0 in the **read window** (ready to receive new data).
2. Writing the value in bytes 0 to 3.
3. Writing the register number in byte 5 (Write_Value_Select).
4. Waiting, until Write_Active = 1 (acknowledges data reception)
5. Writing 0 in byte 5 (Write_Value_Select) -> Write_Active goes to 0.

7.2 Description of the I/O Area (Read / Write Window)

Input Area

Data transmission from the master to the PR 5220 (slave) is via the input area.
Weight or data requests are transmitted to the slave by the master.
The master has write access; the slave has read access.

Byte	Name								Description
0	Write_Value (MSB)								e.g. limit value
1	:::								"
2	:::								"
3	Write_Value (LSB)								"
4	Read_Value_Select								e.g. gross weight
5	Write_Value_Select								Write: Limit 1 On
6	free	Res M 3	Res M 2	Res M 1	free	Set M 3	Set M 2	Set M 1	Reset/set marker
7	Get FixTare	Set FixTare	Res Power	Res Test	Set Test	Res Tare	Set Tare	Set Zero	Control byte, response to 0->1 transition
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	

The control byte activates the corresponding action in the instrument with a set bit.
After execution of the operation, the bit should be reset.

Variable	Function
Write_Value	The weight value is transmitted as a binary 32-bit value with plus or minus sign. Data type: DINT
Read_Value_Select	For selecting the value sent by the instrument
Write_Value_Select	For selecting the function to be executed by the instrument
Res M 1…3	Reset marker 1...3.
Set M 1…3	Set marker 1...3.
GetFixTare	The gross weight is copied into the fixtare memory.
SetFixTare	Taring is performed using the value stored in the fixtare memory.
ResPower	The Power_Fail bit in the output area is deleted.
ResTest	The test operating mode is finished.
SetTest	The test operating mode is started. Now the test value can be read out by reading out the gross weight.
ResTare	Tare is reset.
SetTare	The scale is tared.
SetZero	The scale is set to zero.

Output Area

Data transmission from the PR 5220 to the master is via the output area.

The weight or data information requested by the master is transmitted to the master by PR 5220.

PR 5220 has write access, the master has read access.

Byte	Name								Description
0	Read_Value (MSB)								e.g. gross value
1	:::								"
2	:::								"
3	Read_Value (LSB)								"
4	Read_Value _Selected								e.g. gross
5	Write Active	Power Fail	Out 3	Out 2	Out 1	Limit 3	Limit 2	Limit 1	Status
6	Cmd Busy	Cmd Error	Inp.3	Inp.2	Inp.1	Tare Active	Cal Active	Test Active	Command status
7	Out	Stand-still	Inside ZSR	Center zero	Below Zero	Over-load	Above Max	Adc Error	Device status
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	

Variable	Function
Read_Value	The weight value is transmitted as a binary 32-bit value with plus or minus sign. Data type: DINT
Read_Value_Selected	Acknowledgement of the transmitted value.
Write_Active	The function selected with Write_Value_Select is executed once. This bit is deleted, when Write_Value_Select is set to 0.
Power_Fail	Is set when switching on the instrument. Is reset by ResPower with transition from 0→1.
Cmd_Busy	The instrument is busy executing a command (e.g. the instrument has received a taring command and waits for stability).
Cmd_Error	The instrument has interrupted the execution of a command (e.g. StandStill could not be reached within the defined standstill time). The error number can be read at Lasterror. It is set only, if an action is executed.
Tare_Active	The instrument was tared.
Cal_Active	The instrument is / was configured. When this bit is 1, the scale parameters (Expo/Unit/Step) must be read again. Set after power On and reset after reading the max. capacity.
Test_Active	The instrument executes the ADC test. The read weight value is not the gross value, but the test value.
Out	Above Max. capacity or below zero
Standstill	The instrument is stable.
InsideZSR	The weight value is within the zero setting range.
CenterZero	The weight value is within center zero (0 +/- 0.25 d)
BelowZero	The weight value is negative (gross< -0.25d)
Overload	The weight value has exceeded the Max. capacity, but is still within Max + permissible overload (gross <= max. capacity+overload)
AboveMax	The weight value has exceeded the Max. capacity, but is still within Max + permissible overload (gross <= max. capacity+overload)
AdcError	A/D conversion error. (Details are given in register 1, Read_Value_Select = 1)

Reading and Writing Register via Fieldbus

Reading Data: Read_Value, Read_Value_Select, Read_Value_Selected

When the master has to read from the instrument, the register number is transmitted in Read_Value_Select in the input area. The result is specified with Read_Value_Selected in the output area.

Action of the master	Response of PR 5220
Writing register no. in Read_Value_Select	
	Writing the selected register in Read_Value
	Copying Read_Value_Select into Read_Value_Selected
Waiting, until Read_Value_Selected = Read_Value_Select	
Reading Read_Value	

Writing Data: Write_Value, Write_Value_Select, Write_Active

When the master has to write into the instrument, the required action is transmitted into the input area with Write_Value_Select together with the data. Execution is indicated by bit Write_Active in the output area.

Action of the master	Response of PR 5220
Writing value in Write_Value	
Writing the register number in Write_Value_Select	
	Writing Write_Value in the selected register
	Setting bit Write_Active
Waiting, until Write_Active was set	
Writing 0 in Write_Value_Select	
	Resetting bit Write_Active

Setting Bit: Action_Select, Write_Active

Single bits can be set or reset directly with Write_Value_Select.

For setting, the bit number (80.. 127) is written in Write_Value_Select.

For resetting, the bit number + 128 (208..255) is written in Write_Value_Select.

Action of the master	Response of PR 5220
Writing the register number in Write_Value_Select	
	Writing Write_Value in the selected register
	Setting bit Write_Active
Waiting, until Write_Active was set	
Writing 0 in Write_Value_Select	
	Resetting bit Write_Active

Reading Bit

Single bits can be read only by reading a register. The procedure is described in Chapter 0.

Control Byte

Some instrument functions can be executed by setting bits in the input area directly.

Action of the master	Response of PR 5220
Setting bits in the control byte	
	The operation is handled
Resetting bits in the control byte	

Waiting for the Result of the Action

When an action taking a longer time was started, the end of execution can be waited for after starting (see page 138 and 139).

Action of the master	Response of PR 5220
Setting bits as in Chapters page 138 and 139.	
	Acknowledging the set bit as on page 138
	Setting the CmdBusy bit
	The operation is handled
	In the event of an error: Setting the CmdError bit and the LastError byte
	Resetting the CmdBusy bit
Waiting, until CmdBusy was reset	
Checking the CmdError bit	
When set, reading LastError (see page 138)	

This is applicable to taring, zero setting etc. over the fieldbus.

Example: Reading the Gross Weight

The master writes value 8 in Read_Value_Select (byte 4) of the input area.

Input area

Byte	Value								Description
0									
1									
2									
3									
4	**8**								Gross
5									
6									
7									

The master waits, until value 8 was reflected in Read_Value_Selected (byte 4) of the output area.

Output Area

Byte	Value								Description
0	**00**								Gross value
1	**00**								"
2	**4**								"
3	**D2**								"
4	**8**								Gross weight request was detected
5									Status
6								Test active	Command status
7		Stand-still	Inside ZSR	Center zero	Below zero	Over-load	Above Max	Adc error	Device status
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	

The gross value (hex:000004D2 <=> 1234) can be read from bytes 0...3. When the 'Overload', 'Test Active' or 'ADC error' bits are set, the read value is invalid.

Negative values are output in two's complement.

7.3 Special hints for DeviceNet and EtherNet-IP

With these field bus types, the sequence of the bytes (only applicable for words and individual bytes) is inverted.

With long words, this problem does not arise due to compensation by the firmware.

Sequence of bytes 0...3, e.g. with device type and software version, see table:

Standard sequence		Sequence for DeviceNet and EtherNet –IP	
Byte 0	TYPE MSB	Byte 0	SUBVERSION
Byte 1	TYPE LSB	Byte 1	MAINVERSION
Byte 2	MAINVERSION	Byte 2	TYPE LSB
Byte 3	SUBVERSION	Byte 3	TYPE MSB

Consequently, the sequence on the PLC side must be changed when using the DeviceNet and EtherNet –IP field bus types.

7.4 Fieldbus Register

Register 0: I/O Status Bits for Reading

Dynamic status, only reading is permitted

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0						Input 3	Input 2	Input 1
Byte 1						Output 3	Output 2	Output 1
Byte 2						Limit 3	Limit 2	Limit 1
Byte 3								

Register 1: Scale Status

Dynamic status, only reading is permitted

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	DIM	STND	INZSR	CZERO	BELOW0	OVL	>Max	ADCERR
Byte 1					E6	E1	E3	E7
Byte 2						PowerFail	ActionActive	CmdError
Byte 3						TareActive	CalActive	TestActive

Byte 0 corresponds to byte 7 in the output area; for weight error, see also the table in Chapter 13.1.

ADCERR	Error of analog conversion/ load cell circuit (OR function of the E1, E3, E7 bits)
>Max	Gross value is higher than Max (maximum capacity); the full scale deflection was exceeded.
OVL	Scale overload; Gross >Max + overload, `Error 2`
BELOW0	Gross weight is negative (<0-¼ d)
CZERO	Center of zero; weight within 0 ±¼ d
INZSR	The gross weight is within the zero setting range
STND	The scale is stable
DIM	The gross weight has exceeded the full scale deflection (0-¼ d > weight value >Max+overload), (OR function of bits BELOW0, OVL).
E7	The input signal is negative (inverse conversion), `Error 7`
E6	No sense voltage, or Sense voltage is low, `Error 6`
E3	The input signal is >36mV (no end of conversion), `Error 3`
E1	Arithmetic error (overflow), `Error 1`
E9	No Communication with xBPI scale, `Error 9`

CmdError	Error during execution (cmdError); e.g. the 'taring' operation is not handled, because the scale is not stable. The error is stored in LastError (register 4). The bit is reset with the ResetError bit (register 2).
ActionActive	The operation is handled; handling is busy
PowerFail	Power failure; is always set after power on. The PowerFail bit is reset with the ResetPWF bit (register 2) 'Reset power failure'.
TestActive	The analog test is busy
CalActive	The instrument is / was configured. When this bit is 1, the scale parameters (Expo/Unit/Step) must be read again. Set after power On and reset after reading the max. capacity.
TareActive	The instrument was tared.

Register 2: State of State-Controlled Action Bits

Only reading is permitted; the signal state is shown.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1								
Byte 2	87: GetFixTare	86: SetFixTare	85: ResetPWF	84: ResetTest	83: SetTest	82: ResetTare	81: SetTare	80: SetZero
Byte 3							89: ResetError	88: Print

Register 3: State of Edge-Controlled Action Bits

Only reading is permitted; it is always 0.

Register 4: Calibration Information, Error Byte

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	EXPO							
Byte 1	UNIT							
Byte 2	STEP							
Byte 3	LASTERROR							

EXPO	One byte for the position of the decimal point; content in decimal form 0 ... 255
	0 = 000000
	1 = 00000.0
	2 = 0000.00
	3 = 000.000
	4 = 00.0000
	5 = 0.00000
UNIT	One byte for the weight unit; content in decimal form: 0 ... 255
	2 = g, grams 3 = kg, kilograms
	4 = t, tons 5 = lb, pound
STEP	One byte for scale interval; content in decimal form: 0 ...255
	1 = scale interval '1', 2 = scale interval '2', 5 = scale interval '5'
	10 = scale interval '10', 20 = scale interval '20', 50 = scale interval '50'
LASTERROR	Last error byte; see also CmdError bit, number of 'last error':
	31 = no stability was reached (e.g. when taring)
	33 = negative weight value when taring and 'legal-for-trade' mode on
	47 = no zero setting; weight not within zero setting range
	107 = no stability with Getfixtare

Register 5: Device Type and Software Release

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	TYPE MSB							
Byte 1	TYPE LSB							
Byte 2	MAINVERSION							
Byte 3	SUBVERSION							

E.g. 5220 Rel 1.23 = 52200123_{hex}

Register 6: Board Number

Only reading is permitted.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Board number MSB							
Byte 1	""							
Byte 2	""							
Byte 3	Board number LSB							

E.g. 148388723 = $08D83B73_{hex}$

Register 7: (Reserved)

Register 8 ...15: Weight Data

Only reading is permitted.

The gross, net and tare weight are stored as DINT fixpoint.

The real data value is derived from DINT and EXPO as follows :

$$Value_{Real}=reading_{DINT}*10^{(-EXPO}$$

Register 8	Current gross value
Register 9	Current net value, if tared; otherwise gross
Register 10	Current tare value, if tared, otherwise 0
Register 11	Value on the front-panel display
Register 12	Reserved
Register 13	Reserved
Register 14	Max (FSD)
Register 15	Reserved (free)

Register 24 ... 29: Limit Values (Read/Write)

Register 24	Limit 1 on
Register 25	Limit 1 off
Register 26	Limit 2 on
Register 27	Limit 2 off
Register 28	Limit 3 on
Register 29	Limit 3 off

Register 30, 31: Fixed Values (Read/Write)

Register 30	Fixed value for analog output; value (num) 0... 20000 corresponds to 20 mA
Register 31	Fixed value for fixtare; see also SetFixTare, GetFixTare (see page 142)

Register 80 ... 89: State-Controlled Action Bits (Write)

For setting bits, see page 138.

Only setting and resetting of single bits is possible.

When changing a bit from 0 to 1, the corresponding action starts. After handling the command, the bit must be reset. Application: the master writes cyclically.

The bit is set as Write_Value_Select with the specified number (see page 138); the bit is reset at the specified number +128.

Register 80	SetZero	Set the gross weight to zero
Register 81	SetTare	Execute taring
Register 82	ResetTare	Reset tare
Register 83	SetTest	Start the ADC test
Register 84	ResetTest	Finish the ADC test
Register 85	ResetPwf	Reset the PowerFail bit (Register 1; the bit was set after power on)
Register 86	SetFixTare	Taring with weight in numerical address D31 'Fixtare'
Register 87	GetFixTare	The current gross weight is copied into numerical address D31.
Register 89	ResetError	The CmdError error bit is reset

Register 112 ... 121: Transition-Controlled Action Bits (Write)

For setting bits, see page 138.

As soon as the bit was set, it is reset internally and the operation is handled; this is transition-controlled (for writing once).

The bit is set as Write_Value_Select with the specified number (see page 138).

Register 112	SetZero
Register 113	SetTare
Register 114	ResetTare
Register 115	SetTest
Register 116	ResetTest
Register 117	ResetPwf
Register 118	SetFixTare
Register 119	GetFixTare
Register 121	ResetError

8 Global SPM Variables

Definined ranges are assigned to firmware functions.

Weights are DINT formats in 'kg' or 'lb', depending on scale configuration.

For communication via OPC, the following variables are available:

Format	Address for read [R]/ write [W]	Funktion	Address
BOOL	R	Digital input 1	X0
BOOL	R	Digital input 2	X1
BOOL	R	Digital input 3	X2
BOOL	R	Digital output 1	X8
BOOL	R	Digital output 2	X9
BOOL	R	Digital output 3	X10
BOOL	R	Output limit 1	X16
BOOL	R	Output limit 2	X17
BOOL	R	Output limit 3	X18
BOOL	R	ADC error	X32
BOOL	R	Above Max (FSD)	X33
BOOL	R	Overload, above (Max + plus the range that is still permissible)	X34
BOOL	R	Below zero	X35
BOOL	R	Zero ±¼d	X36
BOOL	R	Within the zero setting range	X37
BOOL	R	The weight is stable	X38
BOOL	R	Below zero or above Max	X39
BOOL	R	Load cell measuring signal negative (error 7)	X40
BOOL	R	Load cell measuring signal >36 mV (error 3)	X41
BOOL	R	Internal arithmetic error; CAL data are perhaps faulty (error 1)	X42
BOOL	R	No or too low sense voltage (error 6)	X43
BOOL	R	No Communication with xBPI scale (error 9)	X44
BOOL	R	Command error	X48
BOOL	R	Command active	X49
BOOL	R	Power fail signal	X50
BOOL	R	Test mode active	X56
BOOL	R	Calibration active	X57
BOOL	R	Instrument is tared	X58
BOOL	R/W	Read/write marker bit 1	X64
BOOL	R/W	Read/write marker bit 2	X65
BOOL	R/W	Read/write marker bit 3	X66
BOOL	W	Switch D11 to net weight	X72

Format	Address for read [R]/ write [W]	Funktion	Address
BOOL	W	Set the instrument to zero	X112
BOOL	W	Set tare of the instrument	X113
BOOL	W	Reset the tare of the instrument	X114
BOOL	W	Start the ADC test	X115
BOOL	W	Finish the ADC test	X116
BOOL	W	Reset the power fail signal	X117
BOOL	W	Set the fixtare value as tare	X118
BOOL	W	Store the current gross weight in the fixtare memory (D31)	X119
BOOL	W	Reset error	X121
BOOL	W	Read actual date and time	X123
BOOL	W	Store (set) actual date and time	X124
BYTE	R	Indicator status	B4 (X32...X39)
BYTE	R	ADC status	B5 (X40...X44)
BYTE	R	Command status	B6 (X48...X50)
BYTE	R	Active status	B7 (X56...X58)
BYTE	R	Exponent (digits behind the decimal point)	B16
BYTE	R	Weight unit 2=gr, 3=kg, 4=t, 5=lb	B17
BYTE	R	Scale interval (multi-interval/multiple range: d1 or e1)	B18
USINT	R	Last error	B19
BYTE	R	High byte of product code (0x54)	B20
BYTE	R	Low byte of product code (0x10)	B21
BYTE	R	Major version number (**1**.0)	B22
BYTE	R	Minor version number (1.**0**)	B23
UDINT	R	Boardnumber	D6
DINT	R	Current gross weight	D8
DINT	R	Current net weight	D9
DINT	R	Current tare weight	D10
DINT	R	Current gross/net weight selected with X72	D11

Format	Address for read [R]/ write [W]	Funktion	Address
DINT	R	MAX weight (FSD)	D14
DINT	R	MIN weight	D15
DINT	W	Counter will be incremented on every PLC-cycle	D23
DINT	W	Weight limit 1 on	D24
DINT	W	Weight limit 1 off	D25
DINT	W	Weight limit 2 on	D26
DINT	W	Weight limit 2 off	D27
DINT	W	Weight limit 3 on	D28
DINT	W	Weight limit 3 off	D29
UDINT	W	Analog output for 'transparent' mode	D30
DINT	W	Write the value in the fixtare memory	D31
REAL	R	Current gross value (as float)	R264
REAL	R	Current net value (as float)	R265
REAL	R	Current tare value (as float)	R266
REAL	R	Gross/net selected by X72 (as float)	R267
REAL	R	Max value from scale (FSD) (as float)	R270
REAL	R	Min value from scale (as float)	R271
REAL	R/W	Limit 1 on value (as float)	R280
REAL	R/W	Limit 1 off value (as float)	R281
REAL	R/W	Limit 2 on value (as float)	R282
REAL	R/W	Limit 2 off value (as float)	R283
REAL	R/W	Limit 3 on value (as float)	R284
REAL	R/W	Limit 3 off value (as float)	R285
REAL	R/W	Preset for fix tare (as float)	R287
INT	R	Conversion counter	W14

Note: For communication via OPC the system variables (e. g.: ST_WGT_A) are described in the operating manual PR 1792 (Chapter 4 + 5).

9 Configuration Print-Out

The configuration data can be saved as follows:

- Click [File]-[Save as...].
- Select the corresponding directory in window [Save website], fill in the required file name and select the 'txt' file type.
- Click [Save].

```
Configuration of PR5220
=======================================
Firmware           : Rel 02.00.00.00000
                        2010-11-11 11:11
PR5220-Application :       Rel 02.00.00
                        2010-11-11 11:11
Bios               : Rel 02.00.00.00000
                        2010-11-11 11:11
Boardnumber        :          275401089


HW-Options
=======================================
Builtin                           RS485
Builtin                      analog out
Builtin                     digital i/o


Operating parameter
=======================================
Access code        :                  0
Set Tare Key       :           disabled
Set zero key       :           disabled


Limits
=======================================
Limit 1 on         :             110000
            Action :set marker 1  X64=1
         Condition :no condition  -----
Limit 1 off        :             115000
            Action :clr marker 1  X64=0
         Condition :no condition  -----
Limit 2 on         :                  0
            Action :set marker 2  X65=1
         Condition :no condition  -----
Limit 2 off        :                  0
            Action :clr marker 2  X65=0
         Condition :no condition  -----
Limit 3 on         :                  0
            Action :set marker 3  X66=1
         Condition :no condition  -----
Limit 3 off        :                  0
            Action :clr marker 3  X66=0
         Condition :no condition  -----
```

```
Digital I/O
=======================================
Output 1           :center zero   X36=1
Output 2           :standstill    X38=0
Output 3           :limit 1 out   X16=0
Input 1 on         :set zero     X112=1
         Condition :no condition  -----
Input 1 off        :       -no action-
Input 2 on         :set tare     X113=1
         Condition :no condition  -----
Input 2 off        :       -no action-
Input 3 on         :reset tare   X114=1
         Condition :no condition  -----
Input 3 off     :       -no action-


Analog out
=======================================
Analog mode        :Gross            D08
Analog range       :           4..20mA
Output on error    :                0mA
Output if < 0      :                0mA
Output if > Max    :                0mA
Weight at 0/4mA    :                  0
Weight at 20mA     :              12000


Serial assignment
=======================================
Remote display     :           - none -
SMA                :           - none -
xBPI-Port          :      Builtin RS485


Serial port Builtin RS485
=======================================
Protocol           :        no protocol
Baudrate           :            9600 bd
Bits               :                   8
Parity             :                 odd
Stopbits           :                   1


Network settings
=======================================
HW-address         :  00:90:6C:6A:49:81
Hostname           :      PR5220-6B6A5E
Use DHCP           :                 Yes
VNC-Client         :    255.255.255.255
```

```
Weighingpoint A    :       xBPI-Scale
====================================
Type               :       xBPI-Scale
W & M              :             none
Tare timeout       :            1.2 s
Serial number      :                0
SBN Address        :                s


xBPI device info
====================================
Model name         :   IS12CCE  -S0CE
Version            :         00-20-12
Serial no.         :         12809189
User id            :         tsg-1115
Manufacturer id    :        SARTORIUS
SBN                :                2


xBPI metrological data
====================================
Additional digits  :  1 unprec digits
Class              :          Class II
Fallback mode      :   multi-interval
Multirange mode    :   multi-interval
Decimal point      :            xxx.x
Unit               : gramm          g
Ranges             :         2 ranges
Range 1:        Max:         6200.0 g
                Min:            5.0 g
                  e:            1.0 g
                  d:            0.1 g
Range 2:        Max:        12000.0 g
                Min:            5.0 g
                  e:            1.0 g
                  d:            1.0 g
```

```
xBPI weighing parameters
====================================
Ambient conditions : Very stable cond.
Application filter :     Final readout
Stability range    :          8 digits
Stability symb.dela:          No delay
Tare parameter     :       at any time
Auto zero function :     Auto Zero off
Adjustment function:ext.adj.w.user wt.
Confirming adjust. :            manual
Zero range         :    2% of max load
Power-On zero range:    5% of max load
Power-On tare/zero :          inactive
Measure rate       :     normal output
Calibration check  :Calibration prompt
External Adjustment:        Accessible


xBPI application parameters
====================================
Application Tare   :           Blocked
Number of units    :     1 weight unit
Unit 1             :gramm           g
           Adaption:        All digits


xBPI interface parameters
====================================
Communication type :     xBPI protocol
Data output interva: with each display
Parameter change   :    can be changed
```

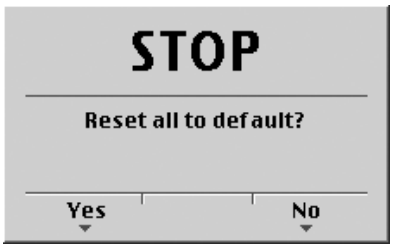
10 Extended Functions

10.1 Resetting the Instrument to the Factory Settings

Note: Reset to the factory settings is possible only, when the CAL switch is open.
The IP address and the Hostname remain unaffected.

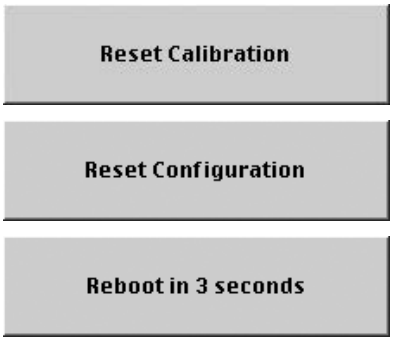
1. Click on Setup.
2. Click on C.

The following message is displayed:



Reply [Yes] for reset to the factory settings.
Reply [No], if you want to keep the entered values unchanged.

The following messages show the respective progress:



10.2 Updating a new Software with ‚FlashIt'

Note: Updating the software is only possible with fixed IP address!
Always flash/load the BIOS into the device first, and then the firmware&application.

Updating the Software in a Network/via Point-to-Point Connection with a Fixed IP Address

Prerequisites:
- Device and notebook/PC are connected to the network/each other.
- The automatic address assignment 'DHCP' is deactivated in the device and in the notebook/PC, see Chapter 16.2/16.3.
- The 'FlashIt!32' program (in a directory on the enclosed CD-ROM) is installed on the notebook/PC.
- The 'FlashIt!32' program is started.

Device presettings in the setup menu

Setup/**Network parameter**	
HW address	00:90:6C:6B:6A:5E
Hostname	**PR5230-6A6B5E**
Use DHCP	☐
IP Address	**172.24.20.101**
Subnetmask	**255.255.0.0**
Default gateway	**0.0.0.0**
Remote access	
VNC-Client	**255.255.255.255**

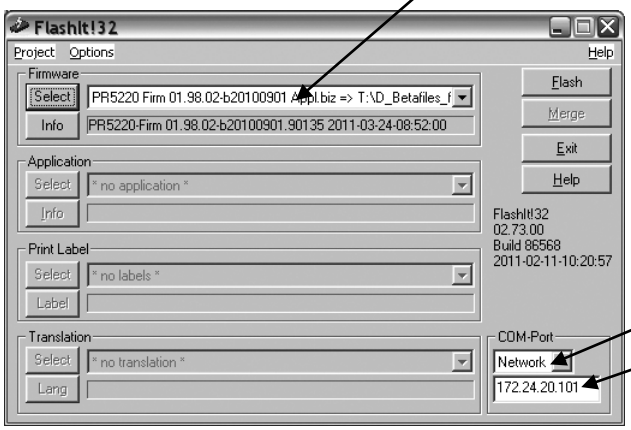
1. Select Setup-[Network parameter].
2. Deactivate ‚Use DHCP'.
3. Enter the corresponding IP address*.
4. Enter the corresponding subnet mask.
5. Leave with Exit.

* Using a point-to-point connection the notebook/PC has to be set to a fixed IP address too. This IP address must be in the same number range, which was configured by the Subnetmask.

Example:
PR 5220: IP address 172.24.22.1
Notebook/PC: IP address 172.24.22.2

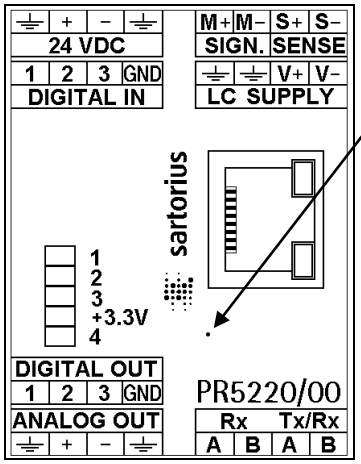
Device and notebook/PC have the Subnetmask 255.255.255.0.

6. Click the relevant file in the 'Explorer' with the mouse and drag it into window [Select] (or use 'Copy and paste').



7. Select [Network].
8. Fill in the device IP address.
9. Click [Flash] to start the procedure.

The first three LEDs blink in a pattern on the device for 30 seconds.



10. Press the reset key on the device a short time, within these 30 seconds using a pen tip or paper clip with a diameter of 1.0 mm.

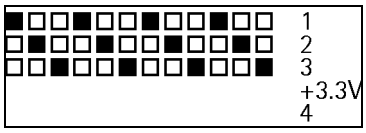
Note:

The flash procedure will not start if the reset key is not pressed within the 30-second time period.

During the flash procedure, LEDs 1–4 blink in a pattern.

The device is restarted after the software has loaded.

The next file can be loaded as described in steps 6–10.



Note:

If the device cannot start because the software has not loaded correctly, the first three LEDs blink in a pattern to prompt an update.

11 Repairs and Maintenance

Repairs are subject to inspection and must be carried out at Sartorius. In case of defect or malfunction, please contact your local Sartorius dealer or service center for repair. When returning the instrument for repair, please include a precise and complete description of the problem. Maintenance work may be carried out only by a trained technician with expert knowledge of the hazards involved and the required precautions.

11.1 Solder Work

Soldering work on the instrument is neither required nor permitted.

11.2 Cleaning

⚠ Disconnect the instrument from the supply voltage and remove connected data cables.

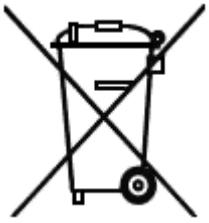
⚠ Prevent moisture from penetrating the instrument.

⚠ Do not use aggressive cleaning agents (solvents, etc.).

⚠ Do not wash down the equipment with water or dry it with compressed air; this is not permitted.

12 Disposal

The packaging is made from environmentally friendly materials, which are suitable for recycling. For more information, please see the T&Cs.
If the packaging is no longer needed, it can be disposed of by local waste disposal authorities.



Contact your local authorities regarding the disposal of the devices.

In Germany, Sartorius also offers a return service and legally compliant recycling of its equipment.

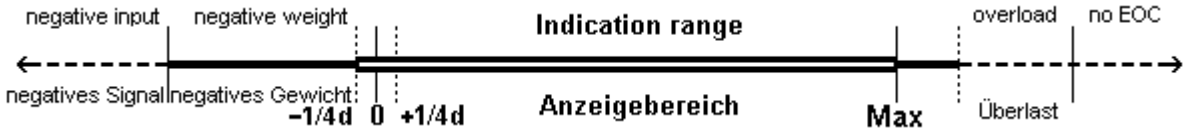
In other countries, please consult with the local authorities.

13 Error Messages

13.1 Measuring Circuit Error Messages

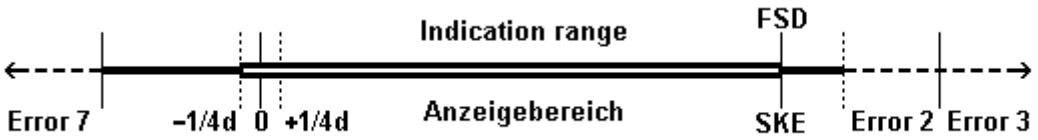
The weighing electronics can generate error messages, which are output on the weight display.

VNC Text	Error	Possible Cause
Arith err	Internal arithmetic overflow	- Faulty calibration values
Overload	Input voltage is higher than Max + (x d)	- To much weight on the scale
Ext. meas.device error	Internal weighing point: Input signal is higher than the permissible range of 36 mV.	- Defective load cell - Cable break
	xBPI scale: Cannot read weight values from scale.	- Cable break - Internal scale error
No sense voltage	No sense voltage	- Load cells not connected - Sense line or supply line is interrupted. - Wrong polarity or sense voltage is low.
Negative input	Negative input	- Wrong polarity of load cell signal. - Wrong polarity of supply voltage.



13.2 Weight Error Status

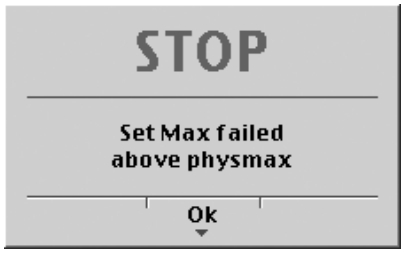
	Error 1 Arithmetic	Error 7 (negative)	Error 2 Overload	Error 3 (>36 mV)	Error 6 Sense monit.	Error 9 Communicat.
1	flashing 1Hz	flashing 1Hz			Altern. flash. 1Hz	Altern. flash. 1Hz
2	flashing 1Hz			flashing 1Hz	Altern. flash. 1Hz	
3	flashing 1Hz	flashing 1Hz	flashing 1Hz	flashing 1Hz	Altern. flash. 1Hz	Altern. flash. 1Hz
+ 3.3V						
4						



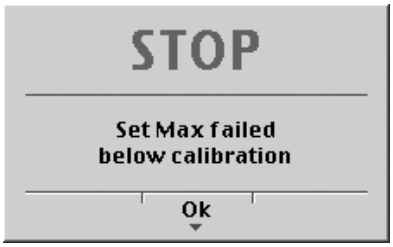
13.3 Error Messages with xBPI Scales

VNC Text	Cause
No values from scale	No Communication with xBPI scale.
No weight data	This message is shown, when the weighing point is switched over. Press OK to assign the new weighing point to the device.
Scale not ready	This message is shown - during the warm-up phase. - when the device is in the automatic taring mode. - if the device has been switched on with the scale loaded. Switch the device off and on again.
Wrong configuration	The number of load cells does not correspond to the load cell configuration settings.
Wrong serial number	'Serial number' does not correspond to the number set in the device.

13.4 Error messages of the Calibration



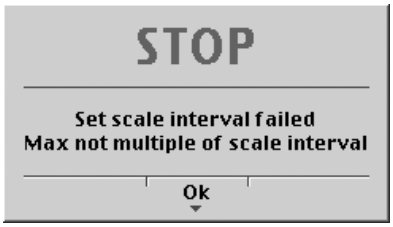
The maximum capacity is too high (the calculated input voltage for the specified maximum capacity exceeds 36 mV).



Subsequent changing of the maximum capacity is possible; if you decrease the capacity, a message is displayed if the new maximum capacity is lower than the test load ([Calibrated at]).

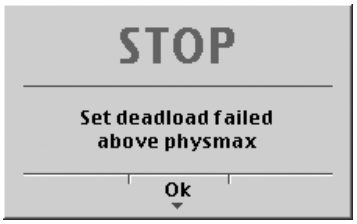
This message displays, if the selected resolution is to low, e.g. 5 kg.

The selected resolution is so high that less than 0.8 internal counts per scale interval (d) or 0.5 µV/e for legal-for-trade acc. to OIML/NSC are available.



The maximum capacity is not an integer multiple of the scale interval.

Weight units do not match, e.g. subsequent change of [Max] from kg to lb.

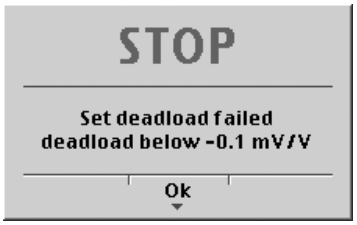


The dead load entered in mV/V plus maximum capacity in mV/V is higher than 3 mV/V (= 36 mV).

The scale is not stable.

Remedial action

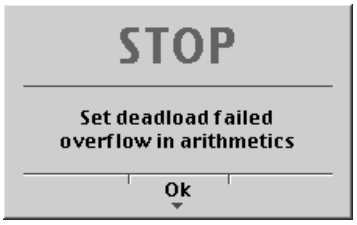
- Check the mechanical function of the scale.
- Adapt the filter setting; reduce the resolution.
- Adapt the stability conditions.



Measurement signal is negative (load cells connected with wrong polarity or defective) when determining the dead load with [by load].

Cause

Load cell connected with wrong polarity, or defective.

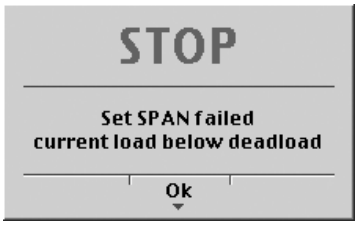


The dead load entered in mV/V is higher than 5 mV/V.

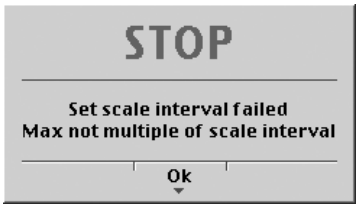
The scale is not stable.

Remedial action

- Check the mechanical function of the scale
- Adapt the filter setting; reduce the resolution.
- Adapt the stability conditions.



The weight on the scale is less than the dead load after input of the weight value.

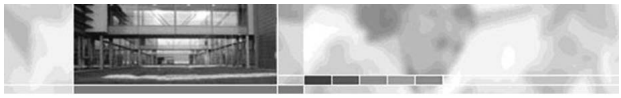


The maximum capacity is not an integer multiple of the scale interval.

13.5 Show Error Log

An error protocol can be displayed and saved under this menu item.

Procedure:



- Click on ‚Show error Log' to display the error log.

PR5220 Ethernet Transmitter
(PR5220 6B-6A-5E)

- Remote Configuration (VNC)
- Remote Configuration (VNC) Popup Window
- Indicator
- Indicator Popup Window
- Configuration Printout
- Logfiles
- Screenshot
- Show error Log
- Backup of Earom

Ser. No. Function Description

Record	Type	Message
289	RESET	RCM:Software Reset
290	RESET	RCM:Power-On Reset
291	RESET	RCM:Power-On Reset
292	RESET	RCM:Power-On Reset
293	RESET	RCM:Power-On Reset
294	RESET	RCM:Software Reset
295	RESET	RCM:Software Reset
296	RESET	RCM:Software Reset

The error protocol can be saved as follows:

- Click [File]-[Save as...].
- Select the corresponding directory in window [Save website], fill in the required file name and select the 'txt' file type.
- Click [Save].

14 Specifications

14.1 Instructions for Use of 'Free Software'

The firmware in the PR 5220 instrument contains free software that is licensed under

GNU General Public License (GPL) Version 2, June 1991, and

GNU Lesser General Public License (LGPL) Version 2.1, February 1999.

This software, developed by third parties, is protected by copyright and is supplied free of charge.

The license terms and conditions of Free Software Foundation, Inc in English are enclosed in the delivery of the instrument.

The source text written under the above conditions is contained on the CD-ROM delivered with the instrument.

14.2 General Data

The following characteristics are valid after a warm-up time of at least 60 minutes (reference temperature: 23°C).

14.2.1 Power Supply

Supply voltage		24 V DC	±20 %
Power consumption			
	standard	6 Watts	
	with fieldbus option	8 Watts	

14.3 Effect of Ambient Conditions

14.3.1 Environmental Conditions

Temperature range			
Reference temperature		23 °C	
Ambient temp. for operation	10,000 e	-10... +40 °C	
	'not legal for trade'	-10... +50 °C	
Power-on temperature		0... +50 °C	
Storage/transport		-40... +70 °C	
Humidity		<95 %, no condensation, (acc. to IEC 68-2)	
Protection type to DIN 40050		IP30	

14.3.2 Electromagnetic Compatibility (EMC)

All data in compliance with EN 61326 industrial area

Housing	Radio frequency electromagnetic fields (80...1000 MHz)	EN 61000-4-3	10 V/m
	Radio frequency electromagnetic fields (1.4...2.0 GHz)	EN 61000-4-3	3 V/m
	Radio frequency electromagnetic fields (2.0...2.7 GHz)	EN 61000-4-3	1 V/m
	Electrostatic discharge (ESD)	EN 61000-4-2	6/8 kV
Signal and	Fast transients (burst)	EN 61000-4-4	1 kV
control lines	Peak voltages (surge) 1.2/50 µs	EN 61000-4-5	1 kV
	Conducted disturbances by radio frequency (0.15...80 MHz)	EN 61000-4-6	10 V
Mains input	Fast transients (burst)	EN 61000-4-4	2 kV
	Peak voltages (surge) 1.2/50 µs	EN 61000-4-5	1/2 kV
	Conducted disturbances by radio frequency (0.15...80 MHz)	EN 61000-4-6	10 V

14.3.3 RF Interference Suppression

Electromagnetic emission	In acc. with EN 61326, limit value class A, industrial area

14.4 Weighing Electronics

The weighing electronics are suitable for connection of strain-gauge load cells.

14.4.1 Load Cells

Load cell type	Strain gauge, 6 or 4-wire connection possible	
Supply voltage	U= 12V DC	for I_{max}= 160 mA
		for up to 8 load cells of 650 Ω each or 4 load cells of 350 Ω each
Sense voltage monitoring	Sense voltage below +4VDC -- -4VDC is detected; can be switched off	
Max. load	≥75 Ω	
Cable length	Max. 500 m	

14.4.2 Principle

Principle	DC voltage, delta-sigma converter, ratiometric to the load cell supply voltage
Conversion/measurement time	5, 10, 20, 40, 80, 160, 320, 640, 960, 1200, 1600 ms
Digital filter	Selectable, active 4th order (low-pass), Characteristic: Bessel, aperiodic, Butterworth, Tschebyscheff
	Configurable cut-off frequency

14.4.3 Accuracy and Stability

Accuracy class	≤10000 e (Cl. III) acc. to OIML R76 / EN 45501
Min. measuring signal (OIML)	0.5µV/e, i.e. 3 mV for 6000 e, 5 mV for 10000 e
Linearity error:	<0.002 %
Zero stability error (TK_0)	<0.02 µV/K RTI <= 0.004%/10K at 1mV/V
Span stability error (TK_{Spn})	< ±2 ppm/K

14.4.4 Sensitivity

Sensitivity	0.5 µV/e @ 10000e (Cl. III) OIML R76,
Resolution	7.5 million counts at 3mV/V, not legal for trade
Input voltage (input signal + dead load)	0 ... max. 36 mV DC, symmetrical to 0
Dead load range	36 mV DC (max. input signal); input/ calibration via software

14.5 Mechanical Data

14.5.1 Construction

Polyamide housing for mounting rail, black, flammability class V0 (UL94).

14.5.2 Dimensions

Housing:	PR 5220/00	PR 5220/01, -/04, -/06, -/07
Width	45 mm	68 mm
Height	99 mm	99 mm
Depth	116 mm	116 mm

14.5.3 Weight

Net weight	PR 5220/00	PR 5220/01, -/04, -/06, -/07
	0.29 kg	0.35 kg

14.6 Use in Legal-for-Trade Mode

The Guide to Verification and further documents can be found on the Internet at
www.sartorius-mechatronics.com

14.6.1 Documentation for Verification on the Enclosed CD

The enclosed CD has a directory containing the following PDF documents (in preparation):

- EC Declaration of Conformity to Council Directive 90/384/EEC
- Plates and markings (sealing and labels)
- Test certificate for the instrument
- EC type approval

14.6.2 Additional Instructions

Information on the meaning of the CAL switch to be sealed can be found in Chapter 4.1.1 .

Make sure when configuring the instrument (see Chapter 4.4.13) that the settings are in compliance with the legal requirements as well as with the requirements of the EC Type Approval and the EC Test Certificate. Furthermore, the settings and functions described under Item 7 of the EC Test Certificate (Orders and Conditions) must be checked. The person performing installation is responsible for selecting the legally permitted settings. The settings must be checked.

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16 Appendix

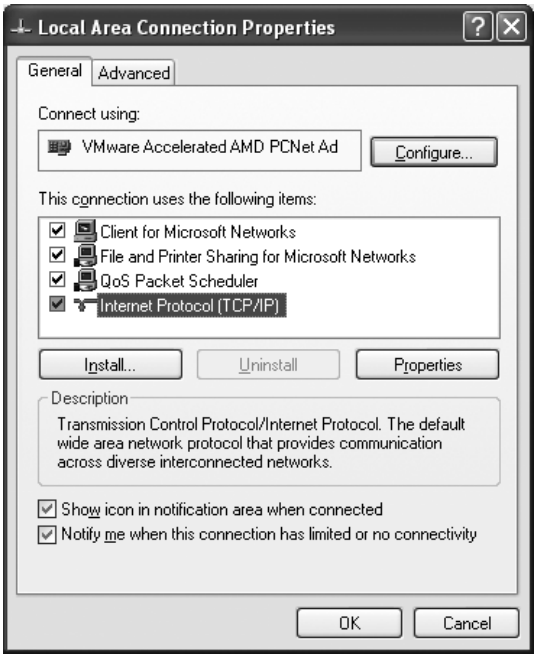
16.1 Pin Assignment for Interface RS-485

PR 5110: Pin assignment female		PR 1627/PR 1628 with interface card PR 1604: Pin assignment male	
GND	= 8	GND	= 3
RxB	= 2	RxB	= 8
RxA	= 3	RxA	= 9
TxB	= 7	TxB	= 4
TxA	= 5	TxA	= 5

16.2 Network Settings under Windows XP

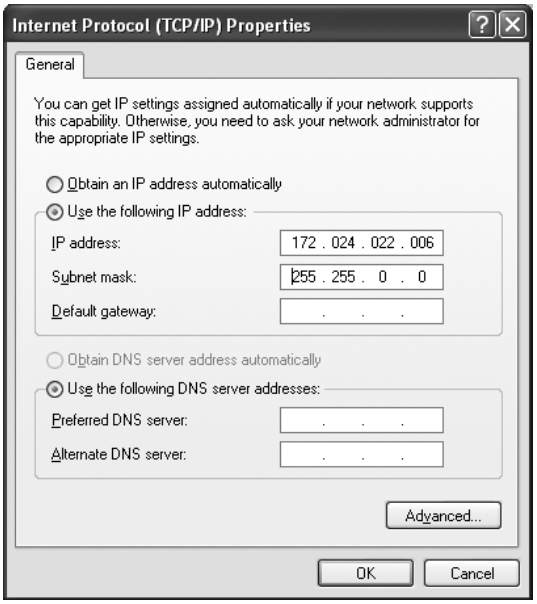
1. Double-click the icon for network connections on the desktop.
2. Click menu item [Network connections] under [Network tasks].
3. Click [LAN connection] using the right mouse key and select [Properties].

The following window appears:



4. Select 'Internet Protocol (TCP/IP)'.
5. Click [Properties].

The following window appears:

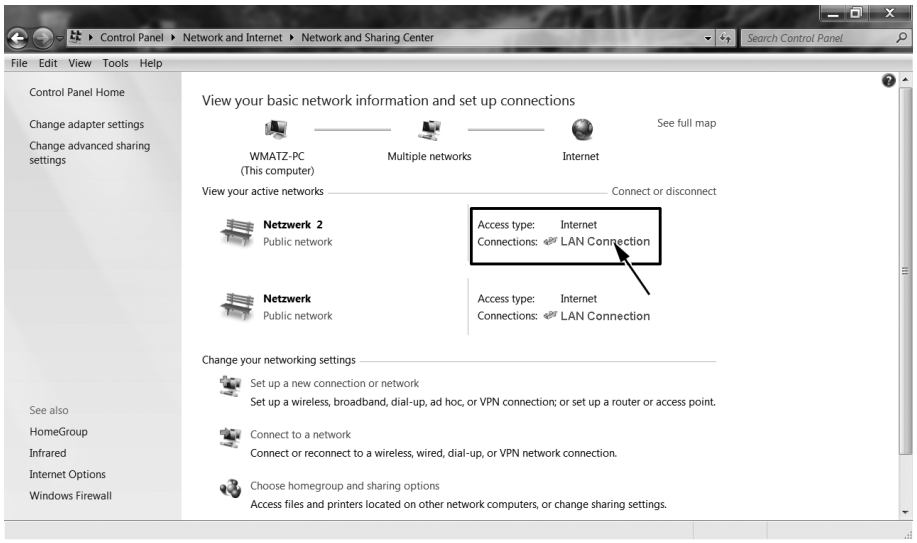


6. Get the IP address automatically (DHCP), select it, or enter the relevant IP address.
7. Enter the corresponding subnet mask.
8. Click [OK] to save the entries.

16.3 Network Settings under Windows 7

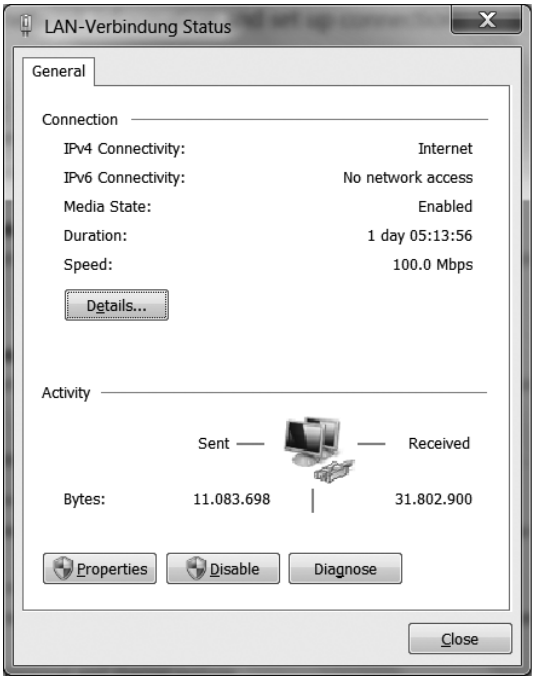
1. Select [Start]-[Control Panel]-[Network and Internet]-[Network and Sharing Center].

The following window appears:



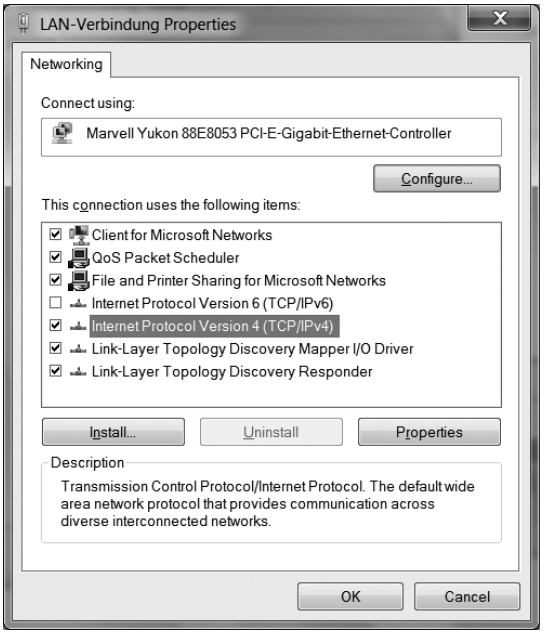
2. Select 'LAN connection'.

The following window appears:



3. Click [Properties].

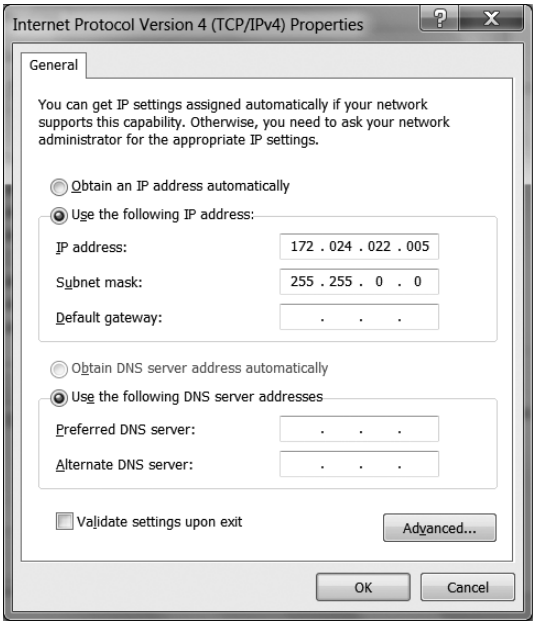
The following window appears:



4. Click 'Internet Protocol (TCP/IP)'.

5. Click [Properties].

The following window appears:



6. Get the IP address automatically (DHCP), select it, or enter the relevant IP address.
7. Enter the corresponding subnet mask.

8. Click [OK] to save the entries.

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