Service Manual

SIGMA AIR CONTROL *plus*

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KAESER KOMPRESSOREN GmbH

1 General

SIGMA AIR CONTROL *plus* is a visualisation and data archiving system. It runs on the SIGMA AIR MANAGER and saves the data on a PC card hard disc. With the help of a PC or laptop it is possible to visualise the current and archived data of the compressed air system. Using a browser, the data can be can be stored as a text file and then processed using other systems such as Microsoft Excel, for example.

System pressure, free air delivery, specific power requirement, compressor status, duty cycle, power consumption and air system costs over a long time period can be graphically represented. This gives an overall view of the behaviour of the compressed air supply system.

The analyses can be copied into documents and documented using standard mechanisms in the browser. It is also possible to print out directly.

The capability of SIGMA AIR CONTROL *plus* to store data over the long term allows efficient compressed air audits to be carried out. If required, trained personnel from KAESER can analyse the data for the purpose of optimising the compressed air system.

1.1 Technical Specification

- 5 gigabyte PC card hard disc

- The hard disc should be replaced after four years

- Data is stored for at least 12 months

- Recording interval of 10 seconds

- Data archived on the hard disc every seven minutes

- Data width: 164 values
  (336 binary values in 21 data words with 16 bits and 143 analog values)

1.2 Interfaces

There are three ways of interfacing SIGMA AIR MANAGER to a PC with an Internet browser:
- directly via the Ethernet
- with a PC card modem via an analog phone connection
- directly via RS232 and a null modem cable to the RS232 interface of a PC

1.3 System Requirements

A unicode compatible operating system is needed to use SIGMA AIR CONTROL *plus.* Microsoft Windows 2000 is recommended. A prerequisite of the Web browser is that it must support the UTF 8 character code and the Java™ plug-in interface from Sun. Furthermore, to carry out the Applets it is necessary to download and install the Java™ plug-in 1.4.0_02 from the Sun Company. The Java™ plug-in can be downloaded free of charge from the Sun Website at "http://java.sun.com/j2se/1.3/jre/". It is only necessary to download once for each browser.
Microsoft Internet Explorer V 6.0 is recommended as the browser as it supports the above-mentioned requirements.

Note:

The full functional capability of SIGMA AIR CONTROL *plus* is guaranteed for the Microsoft Windows 2000 operating system, Microsoft Internet Explorer V6.0 and Java plug-in 1.4.0_02. Although special emphasis was placed on independent browser and operating system use during development of SIGMA AIR CONTROL *plus*, some functions may be impaired when it is used with systems other than those mentioned above.

1.4 Points of Special Interest

Note:

It is imperative that the following important points are carefully considered during operation of SIGMA AIR CONTROL *plus*:

- **System Requirements**
  The full functional capability of SIGMA AIR CONTROL *plus* is guaranteed for the Microsoft Windows 2000 operating system, Microsoft Internet Explorer V6.0 and Java plug-in 1.4.0_02. Although special emphasis was placed on independent browser and operating system use during development of SIGMA AIR CONTROL *plus*, some functions may be impaired when it is used with systems other than those mentioned above.

  The use of Internet Explorer version 5.5 is not recommended. If a permanent link between the Browser and SIGMA AIR MANAGER is established, access to SIGMA AIR MANAGER could be interrupted. Access is only possible by switching the power supply to SIGMA AIR MANAGER off and on again and then calling up SIGMA AIR MANAGER from the Browser.

- **Switching off the power supply**

  Deactivate SIGMA AIR CONTROL *plus* before switching off the power supply to SIGMA AIR MANAGER.
  Data are temporarily stored in SIGMA AIR MANAGER and archived on the hard disc every seven minutes. If the power supply is switched of directly up to seven minutes of current data could be lost before being archived.

- **Putting back the clock**

  If the clock (date or time) on SIGMA AIR MANAGER is put back, archived data will be lost. By putting back the clock from 17:30 to 17:00, for example, ➔ data between 17:00 and 17:30 will be overwritten by new data. This also happens with when the clock is automatically put back from summertime to wintertime, for example.

  The clock time on SIGMA AIR MANAGER must be checked and corrected, if necessary, before activating SIGMA AIR CONTROL *plus* for the first time.

- **Calculation of performance, free air delivery and costs**
  The values for performance, free air delivery and costs are calculated in SIGMA AIR MANAGER or SIGMA AIR CONTROL *plus* from previously entered values and from the operating periods of the compressor packages. These values are measured values. Deviations from measured values are unavoidable.

- **Calculation of costs**

  A valid scale of charges must be entered in the "Settings" page before activating SIGMA AIR CONTROL *plus* for the first time. If not, costs cannot be calculated. Charges entered later are only effective from the time of entry.

- **Data security and the hard disc**

  The hard disc used to archive the data has a typical operational life of four years. To avoid loss of data, replace the hard disc after four years of operation.

  The storage capacity of the hard disc is sufficient for at least 12 months. If this capacity is exceeded, the oldest data are overwritten. If the data are required for a period longer than 12 months, copy the contents of the hard disc onto a PC or a server, or replace the "full" hard disc with a new one.

  There is a certain risk of data loss on the hard disc. This risk can be minimised by copying the contents of the hard disc onto a PC or server at regular intervals, e.g. weekly or monthly.

- **Simultaneous use of SIGMA AIR CONTROL *plus***

  SIGMA AIR MANAGER allows SIGMA AIR CONTROL *plus* to be accessed by up to three browsers at the same time. If more than three browsers try to access, considerable delays can occur and, under certain circumstances, some queries remain unanswered.

  If several browsers are accessing and one browser initiates a change of language or units, this change also affects the other browsers. However, only the data that are cyclically updated are changed on the pages displayed on the other browsers at the time of changeover. Because of this, a mixture of old and new content can occur on the displays of the other browsers. If this happens, exit the pages and call them up anew.

- **Delay periods**

  Delay of minutes can occur when calling up pages for the first time. Repeated page call-ups typically appear within a maximum of 30 seconds.

  Calling up data from the archive, especially in the "three months" and "12 months" area can result in delays of minutes because of the very high volume of data. One year has 3,153,600 data records.

- **Changing language and units**

  If several browsers are accessing and one browser initiates a change of language or units, this change also affects the other browsers. However, only the data that are cyclically updated are changed on the pages displayed on the other browsers at the time of changeover. Because of this, a mixture of old and new content can occur on the displays of the other browsers. If this happens, exit the pages and call them up anew.

- **Free air delivery of all compressor packages**

  The total air delivery of all the compressor packages in the compressed air installation (sum of the FAD's entered in SIGMA AIR MANAGER for all compressors) may not exceed a maximum of 467 m³/min (17.551 cfm).

- **Nominal compressor data**

  The values for performance, free air delivery and costs are calculated in SIGMA AIR MANAGER or SIGMA AIR CONTROL *plus* from previously entered values and from the operating periods of the compressor packages. The parameters for FAD, power consumption, unloaded power consumption and, if necessary, FC characteristic entered for each compressor in SIGMA AIR MANAGER are used as the basis for calculation.

  Changes to these parameters after initial start-up of SIGMA AIR CONTROL *plus* are only effective after the time of entry. The time of entry of such changes is not stored and cannot be easily confirmed afterwards.

  The parameters for FAD, power consumption, unloaded power consumption and, if necessary, FC characteristic entered for each compressor in SIGMA AIR MANAGER must be checked and corrected, if necessary, before activating SIGMA AIR CONTROL *plus* for the first time.

2 Initial Start-Up

2.1 Retrofitting SIGMA AIR CONTROL plus

If SIGMA AIR CONTROL *plus* is retrofitted to an existing SIGMA AIR MANAGER, carry out the following:

- Update the KAESER software for SIGMA AIR MANAGER
  See "Annex A, Update for SIGMA AIR MANAGER" for update procedure.

- If need be, update the SIGMA AIR MANAGER operating system
  See "Annex A, Update for SIGMA AIR MANAGER" for update procedure.

- To install the SIGMA AIR CONTROL *plus* hard disc in SIGMA AIR MANAGER
  See "Annex A, Update for SIGMA AIR MANAGER" for update procedure.

2.2 Initial Start-Up of SIGMA AIR CONTROL plus

2.2.1 Settings for SIGMA AIR MANAGER

Before initially starting up SIGMA AIR CONTROL *plus* check the following settings and correct, if necessary:

- **Time**
  Check clock time and correct, if necessary [Main menu -> F1 -> F1 -> F1 -> F1].

- **Compressor package data**
  The parameters entered (FAD, power consumption, off-load power consumption, FC characteristic, etc, are to be checked for every compressor package and corrected, if necessary [main menu -> F1 -> F3 -> F1]. For details see

2.2.2 Initial start-up of the browser PC

Depending on the type of link, start up SIGMA AIR CONTROL *plus* as described in "Technical Description, SIGMA AIR CONTROL initial start-up". Anomalous to this description the system requirements in chapter 1.3, "System Requirements" are valid.

The technical description for initial start-up of SIGMA AIR CONTROL is part of the SIGMA AIR MANAGER documentation.

2.2.3 Entering the tariff charges

To ensure that costs are correctly recorded and archived right from the start, the tariffs for electricity costs should be entered before activating SIGMA AIR CONTROL *plus*. See "3.3 Settings" for further details.

2.2.4 Activation of SIGMA AIR CONTROL plus

Enter the register code and activate SIGMA AIR CONTROL *plus* on SIGMA AIR MANAGER in the SIGMA AIR CONTROL *plus* menu option [main menu -> F1 -> F1 -> F5 -> F2]. Data recording is starts with the activation.

3 Operation

3.1 Home Page

The home page is displayed when SIGMA AIR CONTROL *plus* is accessed.

Links to other pages are found in the grey navigation bar on the left. The KAESER logo is the link to the KAESER service support page.

The current date and time are shown on the top right. The data are read out of the PC clock.

Language selection is located below the time. A list of languages is shown by clicking on the small black arrow. To select, click on the required language. Country-specific units of pressure, FAD and temperature are automatically selected with the language.

An illustration of a compressed air system is shown in the centre.

SIGMA AIR MANAGER's identification data are shown below the illustration.
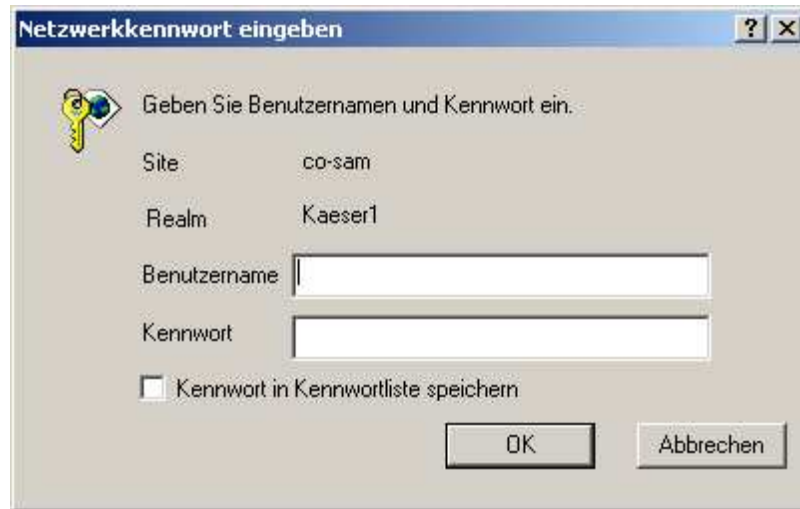- Model (SAM8/8)
- KAESER material number (7.7702.0)
- SIEMENS serial number (00300203)

The home page is reached by clicking on the "Home" button.

The export data function is reached by clicking on the "Data" button.

3.2 *Entering a Password*

If a link in the navigation bar is clicked, an input window requesting a user name and password appears.

On delivery the following entries have been made:

Level	Username	Password
1	Kaeser1	11

If the password for the password for the corresponding level in SIGMA AIR MANAGER is to be changed, restart SIGMA AIR MANAGER once to validate the password changes for SIGMA AIR CONTROL plus as well. Restart by switching the power supply to SIGMA AIR MANAGER off and then on again. Keep to the upper and lower case when entering username and password.

3.3 Page Settings

By clicking on "Settings" the following is displayed:

The units for pressure, temperature and FAD can be individually selected by clicking the field to the left of the corresponding unit. The selected unit is identified by a point in the field and display of the unit in square brackets in the title.

Note:
Tariff settings that have not yet been accepted are lost if the units of pressure, temperature or FAD are changed.

To ensure that electricity costs are shown correctly in the table a maximum of four decimal places must be entered. If values are larger, adapt the currency to suit, for example, K€ for the factor 1000€.

The electricity charges (tariffs) can be entered in the lower part of the page.
Always enter an accepted symbol for the currency, e.g. € for euro. Enter the charges for low tariff and high tariff under "Currency/Kilowatt-hours" in the corresponding fields.
Enter the time (hours and minutes) of the start and finish of the high tariff in the corresponding fields for every day of the week. Make the entry in 24-hour format 00:00 to 24:00.
After checking of all tariff parameters, they can be accepted by clicking on the "Accept tariff" button. If the page is left without clicking this button, the previously entered parameters remain valid.
If there is only one tariff for the whole week, fill out only the "Currency" and "High tariff (HT)" firlds. Enter "00:00" in all the "HT start" fields and "24:00" in the "HT end" fields.

On delivery the following entries have been made:

Currency	Low tariff (LT)	High tariff (HT)	HT start	HT end
...	0	0	00:00	24:00

Note:

- **There is no automatic conversion if the currency is changed**

- **After changing the currency (e.g. € → $) and corresponding adaptation of the tariff, it is no longer possible to determine the costs incurred before the change was made.**

Proceed as follows if the currency has to be changed during recording.

➢ Note the current currency and tariffs
➢ Enter the new currency and tariffs and note them separately.
➢ Activate the new settings by clicking the "Accept tariff" button.

The time of the currency change is saved in SIGMA AIR MANAGER and displayed on all pages of SIGMA AIR CONTROL *plus* that are concerned with costs (point in time).
The evaluation of costs from the point in time at which the currency conversion took place is correct. Evaluation of costs before the point in time at which the currency conversion took place has no practical use.
Evaluations ot to the time of the currency change are possible to a certain degree if the previous currency is known. The currency quoted in the evaluation can then be mentally replaced by the previous currency.

3.4 System Status Page

By clicking on "System settings" the following is displayed:
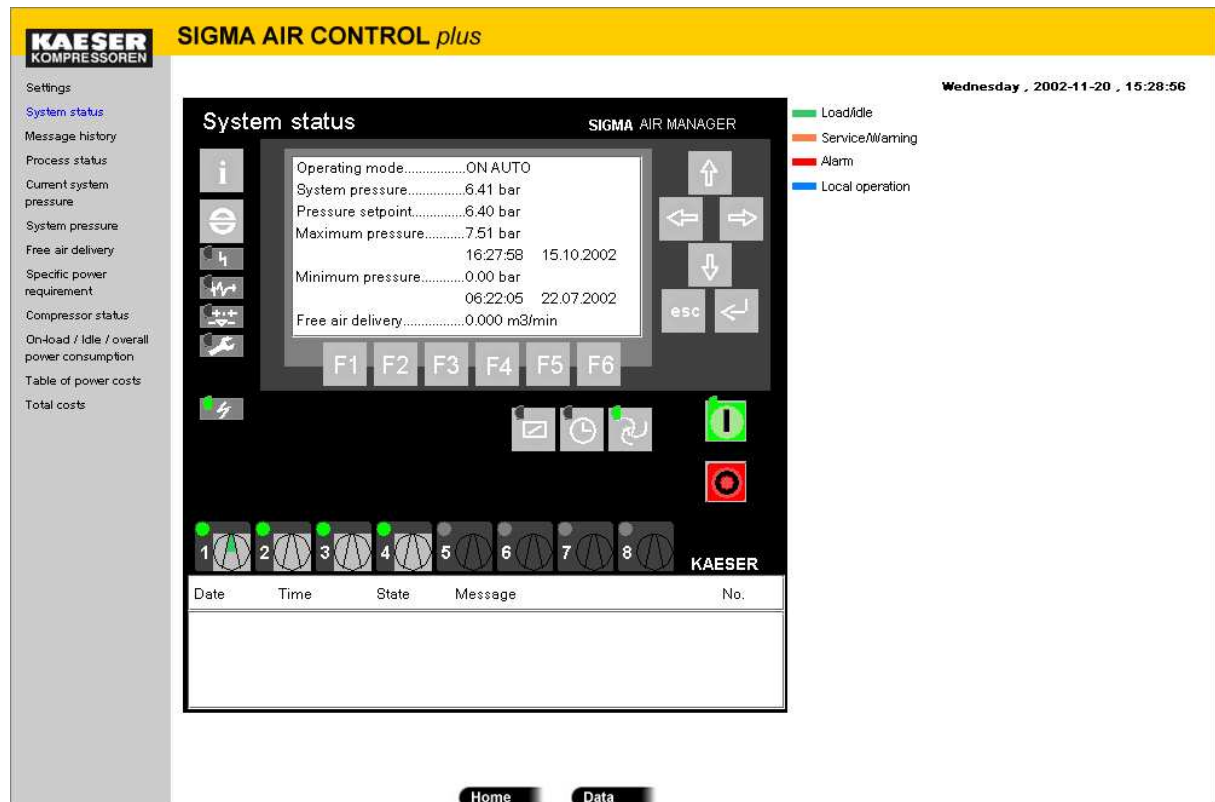
This page is used purely for display purposes; data cannot be entered and there are no operating functions. The information shown is actualised automatically every 20 seconds.

The operating display of SIGMA AIR MANAGER is shown in upper part of the page.
The states of the LEDs correspond to those on SIGMA AIR MANAGER. When the cursor moves across a symbol, a short descriptive text is displayed.
The most important system data are shown in the display.
More information on the displayed data is found in the "SIGMA AIR CONTROL" service manual.

SIGMA AIR CONTROL *plus*

The status of compressor packages is shown in the black SIGMA AIR MANAGER control panel. The number shown is the compressor package number. The following displays are possible:

Symbol	Meaning
	OFF
	Idling (unloaded)
	On load
	OFF/service/warning
	Bus alarm
	Alarm
	Idle/service/warning
	On load/service/warning
	Idle/local mode
	Load/local mode

Current active messages are displayed in the lower part of the page. The date, time, status, text and number of each message are shown. Alarms are written in red; all other messages are orange. See page 3.5, Event Memory for more details.

3.5 Event Memory Page

By clicking on "Event memory" the following is displayed:

The message history (event memory) from SIGMA AIR MANAGER is displayed on this page. The date, time, status, type and number of each message are shown. Alarms are written in red; all other messages are orange. Current messages are above.

Date and time show when the indicated message status occurred. The following states are possible:

C or CGQ	Message coming
G	Message going
Q	Message acknowledged

The following message types are possible

(A)	Alarm
(S)	Service
(W)	Warning
(H)	Note:

3.6 System Data Page

By clicking on "System data" the following is displayed:

Note:
The system data option is intended for the use of KAESER service personnel and for KAESER distributors participating in KAESER Teleservice. An explanation of the data displayed is to be found in a separate documentation.

Current systems data in raw format are shown are shown on several pages. These pages are always displayed in English. The data are actualised every 30 seconds.

One page shows the data from SIGMA AIR MANAGER, further pages show the data from the internal SIGMA CONTROL in the compressor packages linked to SIGMA AIR MANAGER.
By clicking on the blue numbers after the word "Compressor", a link is made to the data of the corresponding compressor package. Click on the blue "SIGMA AIR MANAGER" link to return to the data in SIGMA AIR MANAGER.
Each page consists of several blocks, which are accessed through the blue links in the upper part of the page. Return from the corresponding block to the beginning of the page by clicking the small blue arrow to the left of the page. The hidden part of the page is read by moving the slider on the right-hand edge.

3.7 Current System Pressure page

By clicking on "Current system pressure" the following is displayed:
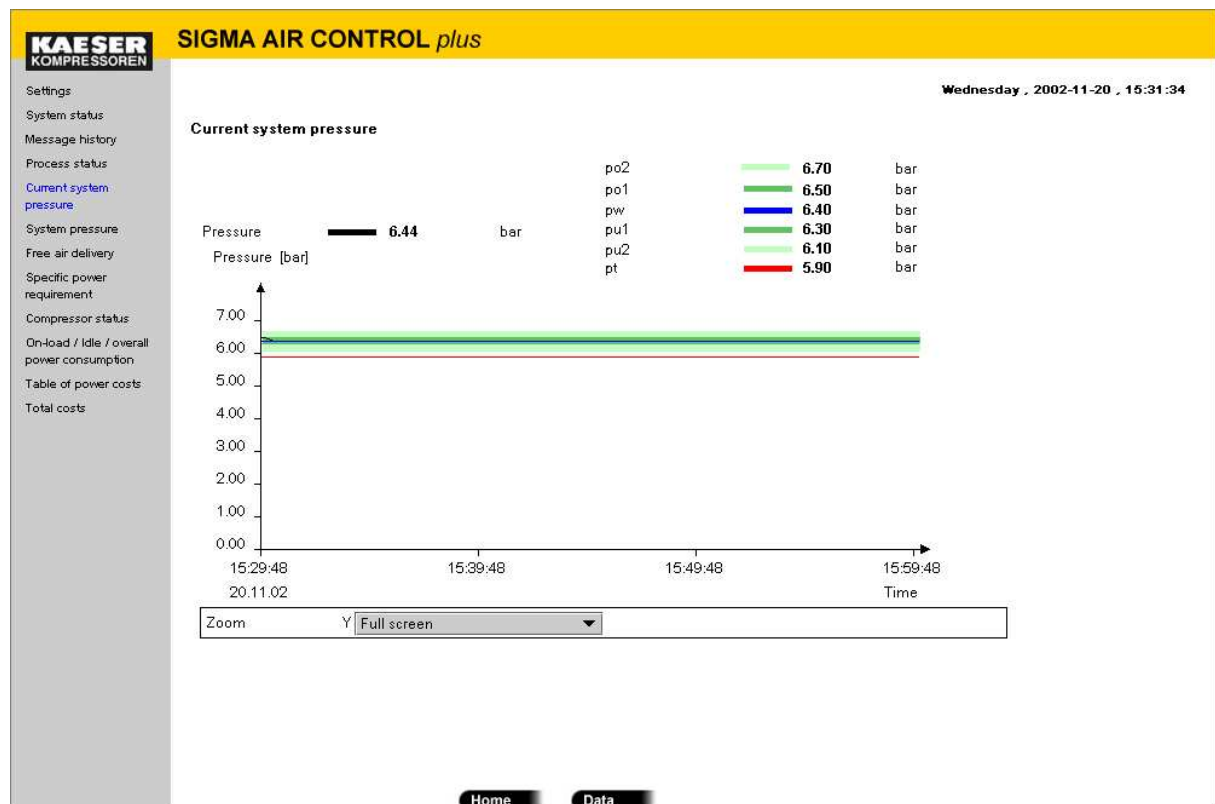
The current system pressure is shown in the left-upper part of the page (Pressure ---- 6.41 bar. The current pressure control settings are located at the top right. The settings are displayed in the units for the selected language (in this case bar).

The graph in the centre shows the profile of system pressure over time. The pressure ranges (bands) for pressure control, pressure setpoint and minimum pressure pt are shown in colour. The colour allocation is shown at the top right. The current time (date and time) of **SIGMA AIR MANAGER** is shown on the time axis.

The pressure **always** starts from the left of the graph. The curve moves further to the right every 10 seconds when the value is actualised. When the curve reaches the right-hand edge of the graph after approximately 30 minutes, the graph is shifted to the left by about one third and the process continues. If the page is left and then accessed again, the graph starts again from the left.

A selection bar is located below the graph for toggling between full screen and part screen. Click on the small arrow to the right of the bar to select "Full screen" or "Part screen". In "Full screen" the pressure axis starts with zero and in "Part screen" the graph is displayed such that the pressure profile is maximised.

Tip:
System pressure can be visually monitored over a long period in parallel with other pages by opening up two windows in the browser with one displaying the system pressure page permanently.

Note:
If the browser receives no new data within the 10-second actualising period the "0" is entered for this period. Two downward vertical lines appear in the graph as shown on the left in the graph above. The cause could be delays in the communication path or in SIGMA AIR MANAGER. The problem could be caused, for example, by the parallel use of SIGMA AIR CONTROL *plus* with more than three browsers.

3.8 System Pressure Page

By clicking on "System Pressure" the following is displayed:
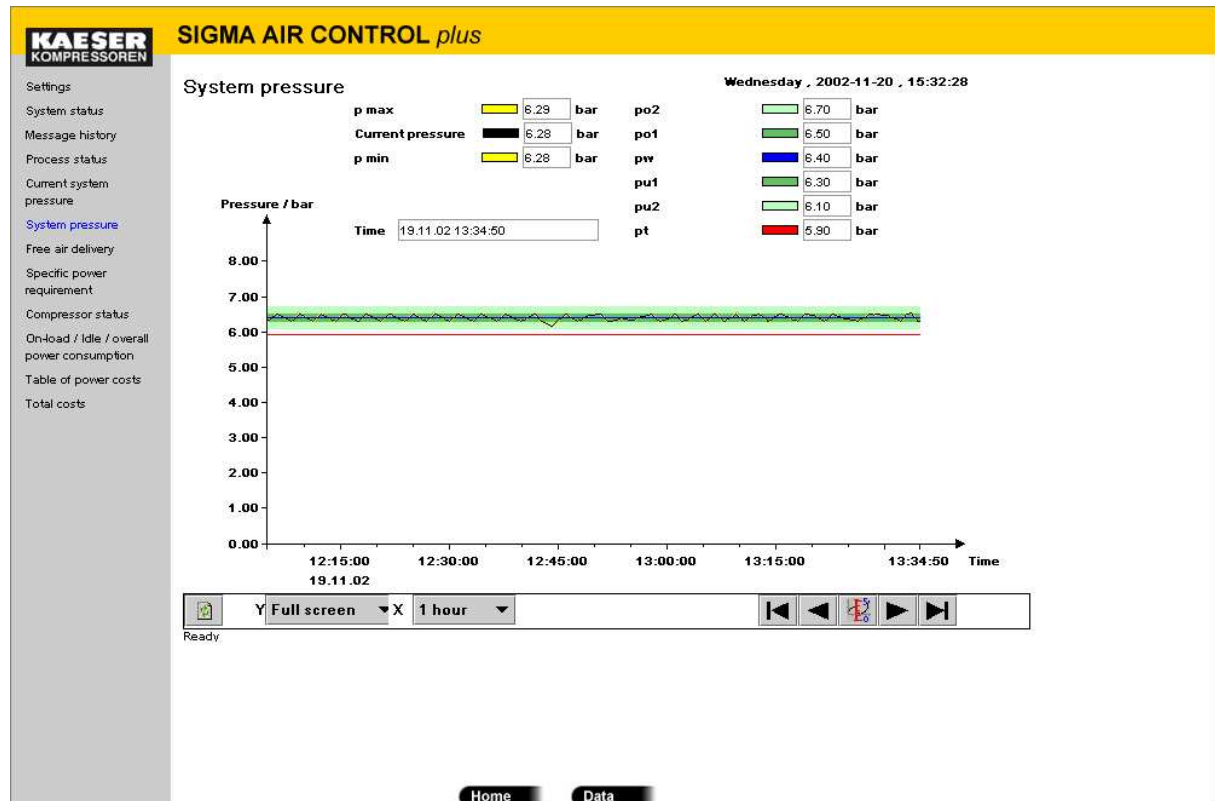
The system pressure from the data store for the selected period is displayed on this page. When called up, the graph **always** shows the pressure profile from the time of access for one hour backwards in time (right aligned). The graph is not automatically actualised. The settings are displayed in the units for the selected language (in this case bar).

The system pressure page is divided into three sections:
- Text display of the latest values in the selected period or, if the time scale is active, the values for the period on the time axis selected by the scale.
- Graphical representation of system pressure
- Navigation elements and input fields for selection of a new representation

Text display section
The system pressure for the selected time is shown in the upper left of the page (Current pressure ---- 6.35 bar.
In the "1 hour" time period, pmax (in this case --- 6.36 bar) and pmin (in this case --- 6.36 bar) are displayed above and below the current pressure. The values reflect the maximal and minimal pressure occurring within the period defined by the current pressure (mean pressure value).
The selected period is displayed just beneath the current pressure (in this case 11.11.02 10:54:50).
The current pressure control settings for the selected period are located at the top right.

Graphic representation:
The graph in the centre shows the profile of system pressure over time. The pressure ranges (bands) for pressure control, pressure setpoint with minimal and maximal pressure and the minimum pressure pt are shown in colour. The colour allocation is shown at the top right. The current time (date and time) from **SIGMA AIR MANAGER** for the selected period is shown on the time axis.

Navigation elements:
A selection and display bar with the following functions is located below the graph:

- Display status (far left)

The "Refresh page" symbol indicating completed page build-up is located here. The page is refreshed when the symbol is clicked. When the page is refreshed, the word "Ready" is displayed.
A rotating wheel is displayed here during page renewal. The build-up sequence is displayed below the wheel.

- **Full screen / Zoom** (next to display status)

The display can be toggled between full screen and zoom. Click on the small arrow to the right of the bar to select "Full screen" or "Part screen". In "Full screen" the pressure axis starts with zero and in "Part screen" the graph is displayed such that the pressure profile is maximised.


- **Time period selection** (to the right of "Full screen/Zoom)

The required period can be selected here. Click on the small arrow to the right of the bar to select the period. The following periods can be selected:

Period
1 hour
8 Hours
3 days
3 weeks
3 months
1 year

The complete period is always displayed, plus a few values.

- **Navigation buttons** (to the right)

|◀	Select the first data record (oldest)
◀	Select the previous data record (around 1/3)
	Toggle scale on/off
▶	Select the next data record (around 1/3)
▶|	Select the last data record (latest)

A defined group of values in the graph can be selected with the horizontally sliding bar The values are displayed in the text section at the top of the page. The scale can be moved with both the mouse and the arrow keys. To move the scale, click the point next to the scale to which it is intended to shift the scale.

Note:
- When selecting a longer period, e.g. from 1 hour to 3 months, the new data will be presented from the old starting point onwards (left aligned). If the selection is made from the last (latest) right-aligned displayed data record then it is possible that only a few data can be seen at the left-hand edge. In order to obtain a full display of data load the last (latest) data record by clicking the **>!** button.
- When selecting a shorter period, e.g. from 3 months to 1 hour, the new data will be presented from the old starting point onwards (left aligned).
- The build-up of the graph can take some minutes if a long period (3 months, 1 year) is selected. During this time the graph builds up bit-by-bit.
- If the clock was put back during the displayed period, then the corresponding point in time is indicated by a vertical brown bar with a clock symbol at the top.

3.9 Free Air Delivery Page

By clicking on "Free air delivery" the following is displayed:
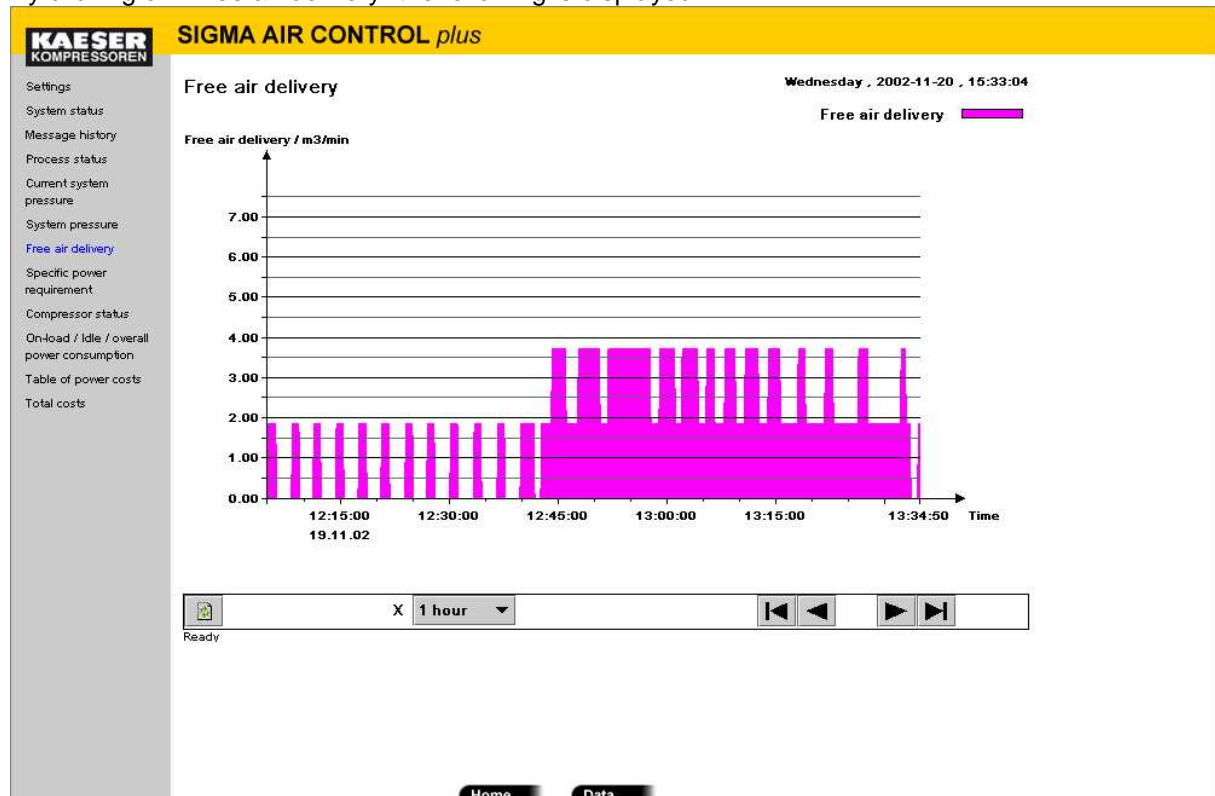
The computed FAD of all compressor packages in the air system linked to SIGMA AIR MANAGER for the selected period are displayed. For more details on the computation of the FAD see the SIGMA AIR MANAGER service manual.
When called up, the graph **always** shows the FAD profile from the time of access for one hour backwards in time (right aligned). The graph is not automatically actualised. The settings are displayed in the units for the selected language (in this case m³/min).

The free air delivery page is divided into two sections:
- Graphic representation of the free air delivery
- Navigation elements and input fields for selection of a new representation

Graphic representation:
The graph in the centre shows the profile of FAD over time. The current time (date and time) from **SIGMA AIR MANAGER** for the selected period is shown on the time axis.
The FAD axis scale is dependent on the maximum value of the represented FAD and its unit of measure. Horizontal lines are shown to ease orientation in the graph

Navigation elements:
A selection and display bar with the following functions is located below the graph:

- Display status (far left)
The "Refresh page" symbol indicating completed page build-up is located here. The page is refreshed when the symbol is clicked. When the page is refreshed, the word "Ready" is displayed.
A rotating wheel is displayed here during page renewal. The build-up sequence is displayed below the wheel.

- Period selection (centre)

The required period can be selected here. Click on the small arrow to the right of the bar to select the period. The following periods can be selected:

Period
1 hour
8 Hours
3 days
3 weeks
3 months
1 year

The complete period is always displayed, plus a few values.

- **Navigation buttons** (to the right)

|K| Select the first data record (oldest)

|◄| Select the previous data record (around 1/3)

|►| Select the next data record (around 1/3)

|►| Select the last data record (latest)

Note:
- When selecting a longer period, e.g. from 1 hour to 3 months, the new data will be presented from the old starting point onwards (left aligned). If the selection is made from the last (latest) right-aligned displayed data record then it is possible that only a few data can be seen at the left-hand edge. In order to obtain a full display of data load the last (latest) data record by clicking the **>!** button.
- When selecting a shorter period, e.g. from 3 months to 1 hour, the new data will be presented from the old starting point onwards (left aligned).
- The build-up of the graph can take some minutes if a long period (3 months, 1 year) is selected. During this time the graph builds up bit-by-bit.
- If the clock was put back during the displayed period, then the corresponding point in time is indicated by a vertical brown bar with a clock symbol at the top.

3.10 Specific Power Requirement Page

By clicking on "Specific power requirement" the following is displayed:
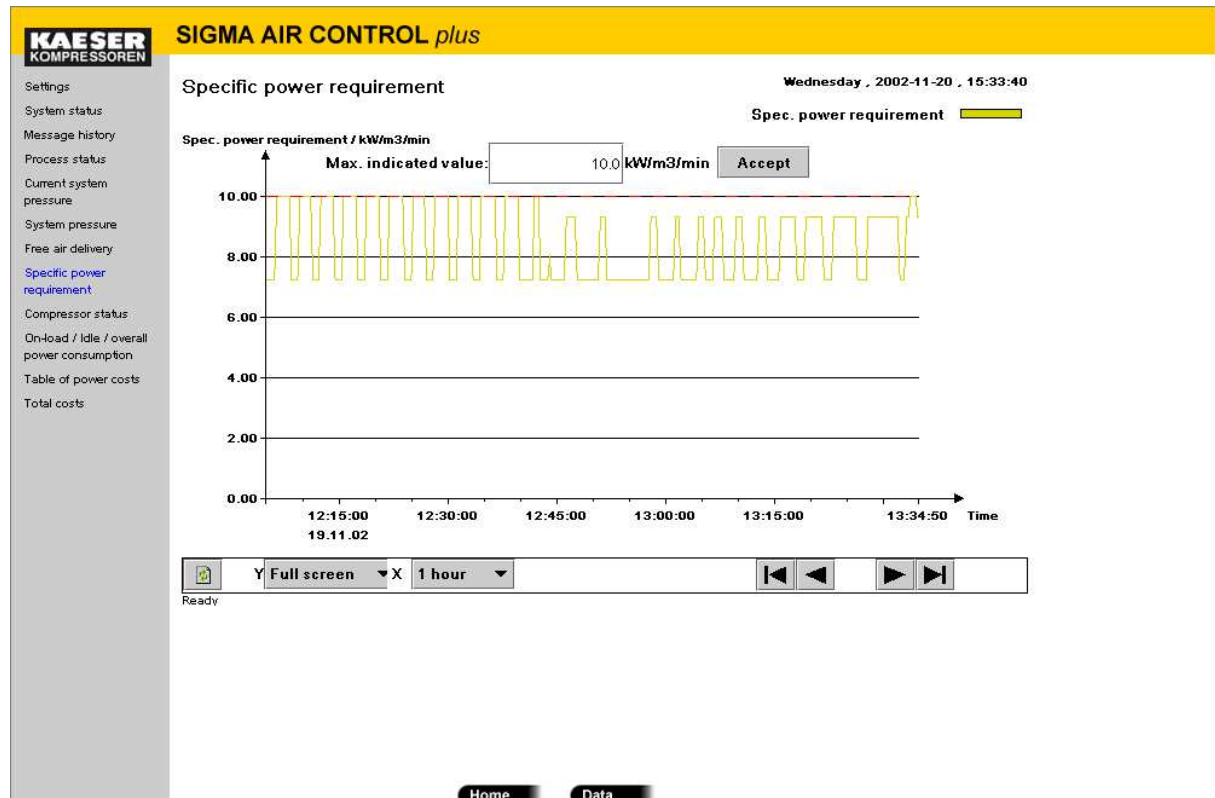
The computed specific power requirement of all compressor packages in the air system linked to SIGMA AIR MANAGER for the selected period are displayed. For more information on the computation of FAD and power consumption see SIGMA AIR MANAGER service manual; for more information on specific power requirement see the end of this section.

When called up, the graph **always** shows the specific power profile from the time of access for one hour backwards in time (right aligned). The graph is not automatically actualised. The settings are displayed in relation to the units for the selected language (in this case m³/min).

The specific power requirement page is divided into three sections:
- Entry of maximum values
- Graphic representation of the specific power requirement
- Navigation elements and input fields for selection of a new representation

Entry of maximum value:
The maximum value can be entered in the upper section of the page. The graph is refreshed when the "Accept" button is clicked. For more information on selection of maximum value see the note at the end of this section.

Graphic representation:
The graph in the centre shows the profile of specific power requirement over time. The current time (date and time) from **SIGMA AIR MANAGER** for the selected period is shown on the time axis. The scale of the "Specific power requirement" axis is related to the maximum value entered and to its unit of measurement. Horizontal lines are shown to ease orientation in the graph

Navigation elements:
A selection and display bar with the following functions is located below the graph:

- Display status (far left)

The "Refresh page" symbol indicating completed page build-up is located here. The page is refreshed when the symbol is clicked. When the page is refreshed, the word "Ready" is displayed.
A rotating wheel is displayed here during page renewal. The build-up sequence is displayed below the wheel.

- **Full screen / Zoom** (next to display status)

The display can be toggled between full screen and zoom by clicking on the small arrow to the right of the bar to select "Full screen" or "Zoom". In "Full screen" the specific power requirement axis starts at zero and in "Zoom" the graph is displayed such that the profile is maximised.

- **Period selection** (centre)

The required period can be selected here. Click on the small arrow to the right of the bar to select the period. The following periods can be selected:

Period
1 hour
8 Hours
3 days
3 weeks
3 months
1 year

The complete period is always displayed, plus a few values.

- **Navigation buttons** (to the right)

|	
Select the first data record (oldest)	
Select the previous data record (around 1/3)	
Select the next data record (around 1/3)	
Select the last data record (latest)	

Note:

- **Computation of the specific power requirement**
  The specific power requirement of all compressor packages in the air system linked to SIGMA AIR MANAGER is computed as follows:

  Sum of full load power consumption and off load power consumption of all online compressors
  Free air delivery of all online compressors

- **Range**
  If power is consumed, but no air is delivered, then the specific power requirement is infinite. This only happens if all compressor packages are running off load (idle) and none are on load. If no compressor packages are running, the specific power requirement is zero.
  Because of these two specific characteristics, representation of specific power requirement is somewhat problematical. Normally, the specific power requirement lies between 6 and 10KW/m3/min.

- When selecting a longer period, e.g. from 1 hour to 3 months, the new data will be presented from the old starting point onwards (left aligned). If the selection is made from the last (latest) right-aligned displayed data record then it is possible that only a few data can be seen at the left-hand edge. In order to obtain a full display of data load the last (latest) data record by clicking the **>!** button.

- When selecting a shorter period, e.g. from 3 months to 1 hour, the new data will be presented from the old starting point onwards (left aligned).

- The build-up of the graph can take some minutes if a long period (3 months, 1 year) is selected. During this time the graph builds up bit-by-bit.

- If the clock was put back during the displayed period, then the corresponding point in time is indicated by a vertical brown bar with a clock symbol at the top.

3.11 Compressor Status Page

By clicking on "Compressor status" the following is displayed:
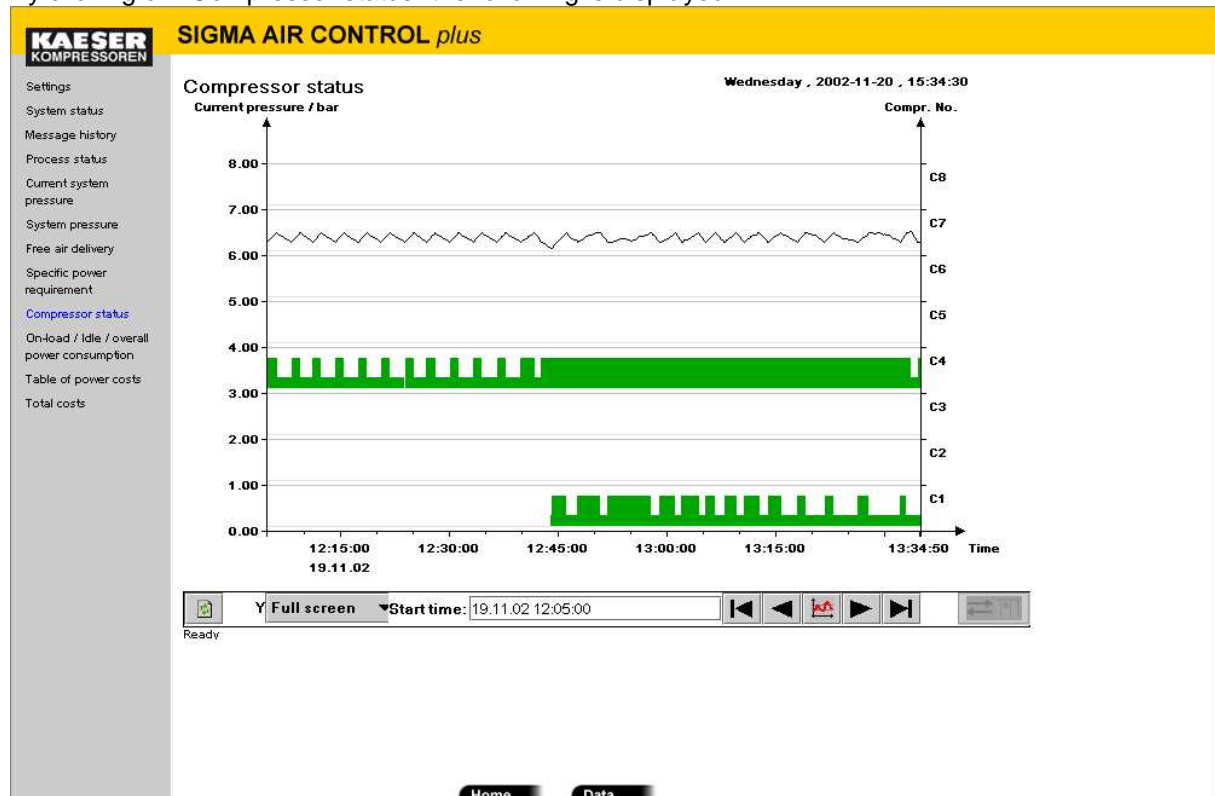
The states of the individual compressor packages and system pressure from the data store for the selected period are displayed on this page. When called up, the graph **always** shows data from the time of access for one hour backwards in time (right aligned). The graph is not automatically actualised. The settings are displayed in the units for the selected language (in this case bar).

The compressor status page is divided into two sections:
- Graphical representation of system pressure
- Navigation elements and input fields for selection of a new representation

Graphic representation:
The graph in the centre shows the states of the individual compressor packages and the profile of system pressure over time. The current time (date and time) from **SIGMA AIR MANAGER** for the selected period is shown on the time axis. The period displayed, which is always 1½ hours, cannot be changed.
The number of the corresponding compressor package is shown on the right-hand "Compr. No." axis. Variable drive compressor packages are identified by the "SFC" suffix below the compressor number.

The following compressor states are possible:

Ready for operation or nonexistent

On load, green; online to SIGMA AIR MANAGER, blue; local mode

Off load, green; online to SIGMA AIR MANAGER, blue; local mode

Red; **alarm** or orange; **service/warning** (alarm has priority)

Navigation elements:
A selection and display bar with the following functions is located below the graph:

- Display status (far left)

The "Refresh page" symbol indicating completed page build-up is located here. The page is refreshed when the symbol is clicked. When the page is refreshed, the word "Ready" is displayed.
A rotating wheel is displayed here during page renewal. The build-up sequence is displayed below the wheel.

- **Full screen / Zoom** (next to display status)

The display can be toggled between full screen and zoom. Click on the small arrow to the right of the bar to select "Full screen" or "Part screen". In "Full screen" the pressure axis starts with zero and in "Part screen" the graph is displayed such that the pressure profile is maximised.

- **Start time selection** (centre)

The start time of the graph is selected here. Enter date and time and press the <Enter> key; the graph now displays the data for 1½ hours from the time entered (left-aligned) Enter date and time in the prescribed format or by just overwriting the numbers already in the field.

- **Navigation buttons** (to the right)

◄◄	Select the first data record (oldest)
◄	Select the previous data record (around 1/3)
⩗	Toggle system pressure profile on/off
►	Select the next data record (around 1/3)
►►	Select the last data record (latest)

⇄▣	*SIGMA AIR MANAGER 16/8 only:* changeover between compressor pages. This allows the display of either compressor packages 1-8 or 9-16.

Note:

- If the clock was put back during the displayed period, then the corresponding point in time is indicated by a vertical brown bar with a clock symbol at the top.

3.12 On load/Off load Overall Power Consumption

By clicking on "On load/off load power consumption" the following is displayed:
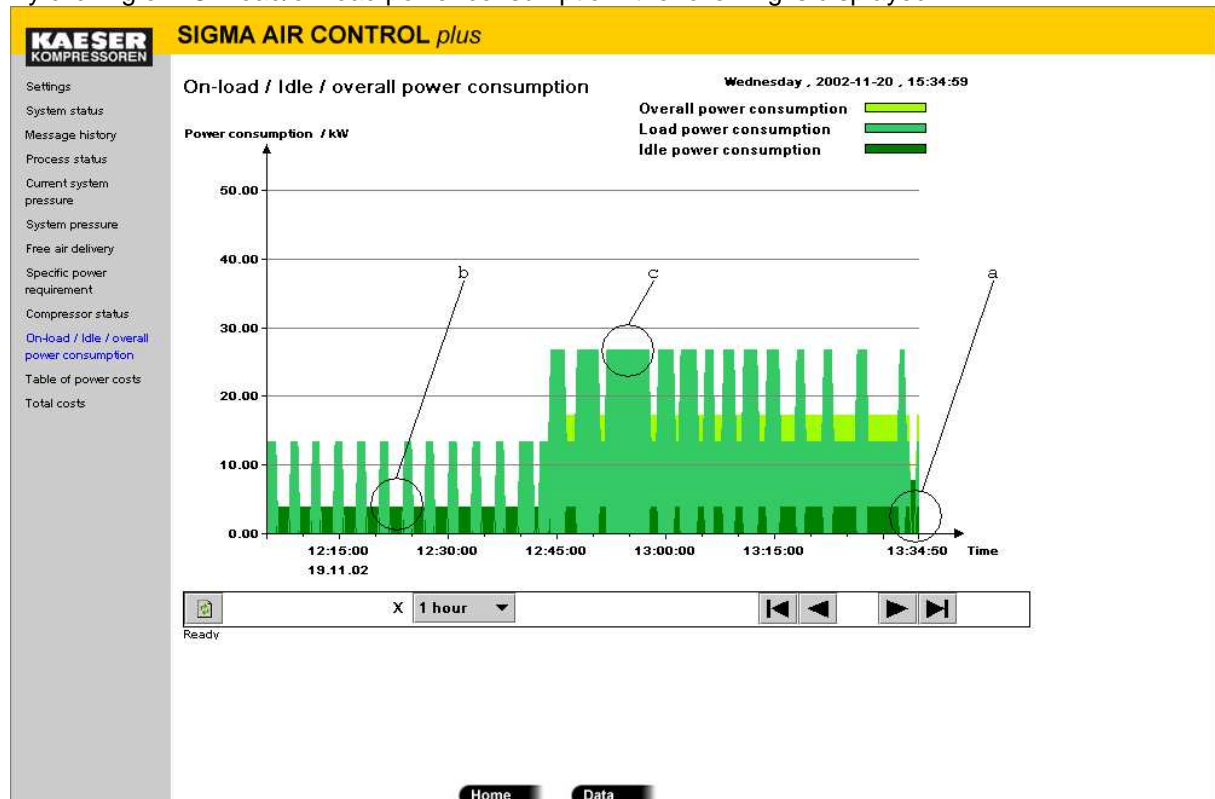
The computed overall power consumption of all compressor packages in the air system linked to SIGMA AIR MANAGER for the selected period are displayed. For more details on the computation of the overall power consumption see the SIGMA AIR MANAGER service manual.
When called up, the graph **always** shows the power consumption profile from the time of access for one hour backwards in time (right aligned). The graph is not automatically actualised. The power consumption is always shown in kilowatts (kW).

The load/offload overall power consumption page is divided into two sections:
- Graphic representation of the power consumption
- Navigation elements and input fields for selection of a new representation

Graphic representation:
The graph in the centre shows the profile of on load power consumption, off load power consumption and overall power consumption over time. The current time (date and time) from **SIGMA AIR MANAGER** for the selected period is shown on the time axis.
The scale of the power consumption axis is dependent on the maximum value of the represented power consumptions and their unit of measure. Horizontal lines are shown to ease orientation in the graph
The off load power consumption is always shown at the front of the graph, the on load power consumption behind and the overall power consumption behind both. Every power consumption peak starts at 0 kW. If only on load power is required, i.e. none of the compressor packages are running off load (idling), then the overall power consumption is covered completely by the on load power consumption (**c** in illustration above). If only on off load power is required, i.e. none of the compressor packages are running on load, then the overall power consumption is covered completely by the off load power consumption (**b** in illustration above).
If the on load power falls to zero or rises from zero, this is indicated by a line down to zero in the foreground. This line can be seen through the off load power consumption (**a** in illustration above).

Overall power consumption = on load power consumption + off load power consumption

Navigation elements:
A selection and display bar with the following functions is located below the graph:

- Display status (far left)

The "Refresh page" symbol indicating completed page build-up is located here. The page is refreshed when the symbol is clicked. When the page is refreshed, the word "Ready" is displayed.
A rotating wheel is displayed here during page renewal. The build-up sequence is displayed below the wheel.

- **Period selection** (centre)

The required period can be selected here. Click on the small arrow to the right of the bar to select the period. The following periods can be selected:

Period
1 hour
8 Hours
3 days
3 weeks
3 months
1 year

The complete period is always displayed, plus a few values.

- **Navigation buttons** (to the right)

Select the first data record (oldest)
Select the previous data record (around 1/3)

Select the next data record (around 1/3)
Select the last data record (latest)

Note:
- When selecting a longer period, e.g. from 1 hour to 3 months, the new data will be presented from the old starting point onwards (left aligned). If the selection is made from the last (latest) right-aligned displayed data record then it is possible that only a few data can be seen at the left-hand edge. In order to obtain a full display of data load the last (latest) data record by clicking the **>!** button.
- When selecting a shorter period, e.g. from 3 months to 1 hour, the new data will be presented from the old starting point onwards (left aligned).
- The build-up of the graph can take some minutes if a long period (3 months, 1 year) is selected. During this time the graph builds up bit-by-bit.
- If the clock was put back during the displayed period, then the corresponding point in time is indicated by a vertical brown bar with a clock symbol at the top.

3.13 Power Costs Page

By clicking on "Table of power costs" the following is displayed:

The **computed** power costs of all compressor packages in the air system linked to SIGMA AIR MANAGER for the selected period are displayed. For more details on the computation of the power costs, see the SIGMA AIR MANAGER service manual.

When accessed, the table **always** shows the power costs of the current day. The table is not automatically actualised. The display of power consumption is always given in kilowatts (kW); the display of load in hours (h), the display of load in percent (%) and the display of work done in kilowatt hours (kWh). The free air delivery is displayed in the units for the selected language (in this case m³/min). The costs are always given in the selected currency (in this case €).

The power costs page is divided into five fields:

1. The entry of the required period
2. Field for special events occurring during this period
3. Field for nominal compressor data
4. Field showing the computed running hours, FADs, work done and costs
5. Display status

1. Field for the entry of the required period (box to the top left)

The period of computation of the required data is entered here. The evaluation starts at 00:00 of the day entered in the "Date from" field and ends at 24:00 of the day entered in the "Date to" field. If the day entered in the "Date to" field is the current day or a day in the future, the display of data ends at the last data record stored on the current day.

If a date is entered in a date field that is outside the range of stored data or does not exist then the date fields are coloured yellow and no evaluation takes place.
The costs are computed for a minimum of one day and a maximum of one year.
The computation is started by clicking the "Update display" button or by pressing the <Enter> key when in an active date field.

2. Field for special events occurring during this period (box at the top right)

The top field shows when the display of data starts (in this case 10.10.01 at 00:00:10 hours). Computations before this point in time are not possible.

The date and time of currency changes and clock backdates during the selected period are shown in the field below. For example:

Uhrzeitrückstellung: 27.10.02 02:00:00
Währungsänderung: 05.11.02 15:07:40

Putting back the clock (in the example 27.10.2002 at 02:00:00 hours

If the clock (date or time) on SIGMA AIR MANAGER is put back, archived data will be lost. By putting back the clock from 17:30 to 17:00, for example, ➔ data between 17:00 and 17:30 will be overwritten by new data. This also happens with when the clock is automatically put back from summertime to wintertime.

For normal evaluations covering a period of a week, month, quarter or a year putting the clock back by one hour has no significant effect (0,59%; 0,14%; 0,05%; 0,01%).

Currency change (in the example 05.11.02 at 15:07:40 hours)

The unit of currency is changed at the time of the currency change.

There is no point in carrying out evaluations for a period covering a change of currency.
The evaluation of costs from the time at which the currency conversion took place give correct results.
Evaluations ot to the time of the currency change are possible to a certain degree if the previous currency is known. The currency quoted in the evaluation can then be mentally replaced by the previous currency.

3. Columns showing the nominal data of the compressor packages (table: on load power consumption, off load power consumption and FAD)

The nominal data for the compressor packages are entered here:

Column	Displayed value	Unit
On load power consumption	Power consumption of the compressor package under full load	Kilowatts
Off load power consumption	Power consumption of the compressor package off load	Kilowatts
FAD [m³/min]	Free air delivery of the compressor package	here [m³/min]

The values are set to "0" if the compressor does not exist.

4. Columns showing the computed running times, FADs, work done and costs (table: on load, duty cycle, FAD and table below)

The values computed from the stored data for the period of evaluation are displayed:

Column	Displayed value	Unit
On load [h]	On load running time of the compressor packages during the evaluation period	Hours
Running time [h]	Running time of the compressor packages during the evaluation period	Hours
Duty cycle [%]	On load [h] / Running time [h] * 100	Percent
FAD [m³/min]	Total amount of free air delivered by the compressor package for the period of evaluation	Cubic metres
On load [kWh]	Total amount of electrical energy consumed under load by the compressor package for the period of evaluation (work done)	Kilowatt hours
Off load [kWh]	Total amount of electrical energy consumed off load by the compressor package for the period of evaluation (work done)	Kilowatt hours
Total [kWh]	Total amount of electrical energy consumed by the compressor package for the period of evaluation (work done)	Kilowatt hours
On load [€]	Power costs under load for the compressor package for the period of evaluation	Here €
Off load [€]	Power costs off load for the compressor package for the period of evaluation	Here €
Total [€]	Total power costs for the compressor package for the period of evaluation	Here €

The "Sum" totals are the sum of the values for all compressors in each case. The duty cycle sum is the total of all compressor values divided by 100.

Note:

- **All values shown are either parameters entered in SIGMA AIR MANAGER or values computed from entered parameters and running periods.**

- Computation of the values for longer periods of evaluation (three months, six months or one year) can take several minutes.

- There is no point in carrying out evaluations for a period covering a change of currency. see above for further details.

5. Display status (bottom left below the table)

"Ready" is displayed here when the table has filled up completely.
The sequence of actions is displayed during build-up of the screen.

3.14 Total Costs Page

By clicking on "Total costs" the following is displayed:

The total costs of the compressed air system (**computed** power costs of all compressor packages in the system that are connected to SIGMA AIR MANAGER together with other costs that can be entered) are computed for the selected period from the data in the data store. For more information on the evaluation of the on load and off load power consumption costs see chapter 3.13.

When accessed, the page **always** shows the total power costs of the current day. The page is not automatically actualised. The costs are always given in the selected currency (in this case €).

The total costs page is divided into five fields:

1. The entry of the required period
2. Field for special events occurring during this period
3. Display of on load and off load costs
4. Field for entry of additional fixed costs and evaluation of overall costs
5. Graphic representation:

1. Field for the entry of the required period (box at the top left)

The period of computation of the required data is entered here. The evaluation starts at 00:00 of the day entered in the "Date from" field and ends at 24:00 of the day entered in the "Date to" field. If the day entered in the "Date to" field is the current day or a day in the future, the display of data ends at the last data record stored on the current day.
If a date is entered in a date field that is outside the range of stored data or does not exist then the date fields are coloured yellow and no evaluation takes place.
The costs are computed for a minimum of one day and a maximum of one year.
The computation is started by clicking the "Update display" button or by pressing the <Enter> key when in an active date field.

2. Field for special events occurring during this period (box at the right centre)

The top field of the two shows the time at which the display of data starts (in this case 11.10.01 at 00:00:10 hours). Computations before this point in time are not possible.

The date and time of currency changes and clock backdates during the selected period are shown in the field below. For example:

Uhrzeitrückstellung: 27.10.02 02:00:00
Währungsänderung: 05.11.02 15:07:40

Putting back the clock (in the example 27.10.2002 at 02:00:00 hours)

If the clock (date or time) on SIGMA AIR MANAGER is put back, archived data will be lost. By putting back the clock from 17:30 to 17:00, for example, ➔ data between 17:00 and 17:30 will be overwritten by new data. This also happens with when the clock is automatically put back from summertime to wintertime.

For normal evaluations covering a period of a week, month, quarter or a year putting the clock back by one hour has no significant effect (0,59%; 0,14%; 0,05%; 0,01%).

Currency change (in the example 05.11.02 at 15:07:40 hours)

The unit of currency is changed at the time of the currency change.

There is no point in carrying out evaluations for a period covering a change of currency.
The evaluation of costs from the time at which the currency conversion took place give correct results. Evaluations up to the time of the currency change are possible to a certain degree if the previous currency is known. The currency quoted in the evaluation can then be mentally replaced by the previous currency.

3. Display of on load and off load costs (top left)

The on load costs (power costs of all compressor packages running on load during the period of evaluation) and the off load costs (power costs of all compressor packages running off load during the period of evaluation) are shown here.

4. Field for entry of additional fixed costs and evaluation of overall costs (outer left)
General costs for servicing, material, downtime and other costs can be entered here. The values entered are then stored in SIGMA AIR MANAGER. The entered costs are added together in the "Sum" field below the entry field. The data entered are accepted by clicking on the "Accept" button and the page is actualised.
The on load and off load costs are repeated at the bottom left. These costs are added to the general costs and shown as the "Total sum".

5. Graphic representation (centre right)

The overall costs of the compressed air system are represented by a pie graph. The individual cost components are shown in various colours and additionally identified by the numbers 1 to 6. The costs of the individual components and their percentage related to the total costs are shown below the graph.
If the pie graph is clicked with the right mouse button, an arrowed cross appears. The graph can now be rotated with the mouse. This function is switched off by clicking again with the right mouse button.
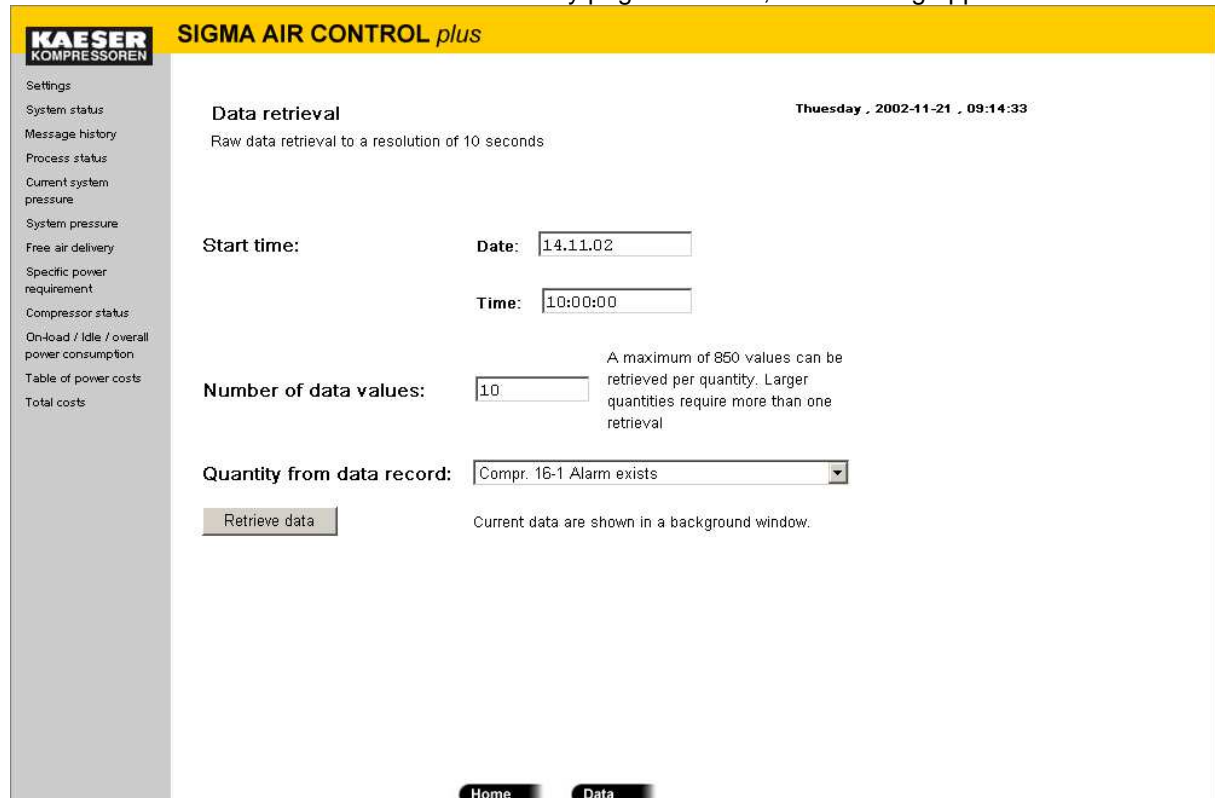
Note:

- **All values shown are either parameters entered in SIGMA AIR MANAGER or values computed from entered parameters and running periods.**

- Computation of the values for longer periods of evaluation (three months, six months or one year) can take several minutes.

- There is no point in carrying out evaluations for a period covering a change of currency. see above for further details.

3.15 *Data Retrieval Page*

If the "Data" button at the bottom centre of every page is clicked, the following appears:

KAESER
KOMPRESSOREN

SIGMA AIR CONTROL *plus*

Settings
System status
Message history
Process status
Current system pressure
System pressure
Free air delivery
Specific power requirement
Compressor status
On-load / Idle / overall power consumption
Table of power costs
Total costs

Data retrieval   **Thuesday , 2002-11-21 , 09:14:33**
Raw data retrieval to a resolution of 10 seconds

Start time: **Date:** 14.11.02

                         Time: 10:00:00

                                        A maximum of 850 values can be
                                        retrieved per quantity. Larger
Number of data values: 10   quantities require more than one
                                        retrieval

Quantity from data record: Compr. 16-1 Alarm exists

Retrieve data   Current data are shown in a background window.

Home   Data

This page is used to retrieve stored data as a text file. SIGMA AIR CONTROL *plus* saves a complete data record every 10 seconds on its hard disc. A data record consists of 164 values (336 binary values in 21 data words with 16 bits and 143 analog values)

Parts of the stored data can be retrieved as a tab-separated text file (.txt). The file then consists of "Quantity" columns and "Time stamp" lines.
The following can be selected:
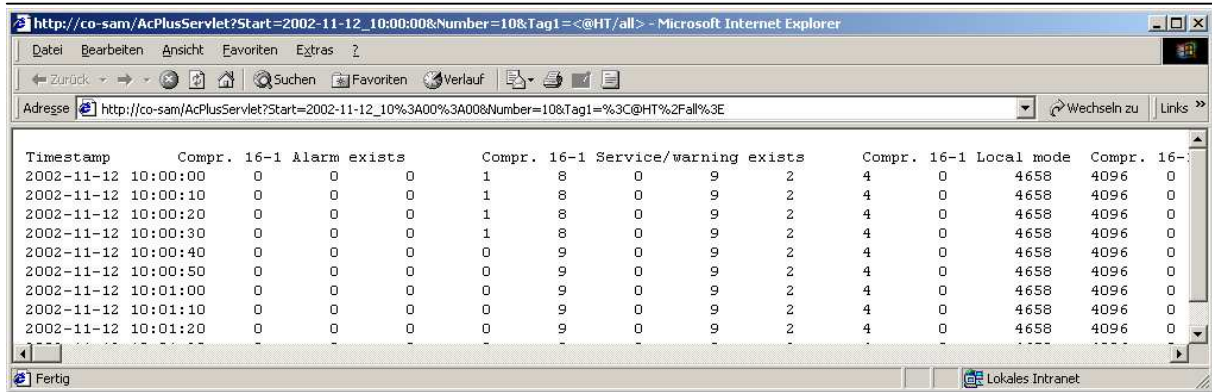
Start time: enter the date and time (in this case 12.11.2002, 10:00:00 hours) from which data is to be retrieved.

Number of data values: enter the number of data records to be retrieved (10 in this case) A maximum of 850 data records can be retrieved per query. This corresponds to 2 ½ hours (850 x 10s).

Quantities from the data record: enter the quantity that is to be retrieved, e.g. system pressure, (in this case all) Individual or all quantities can be selected. "All" is right at the end of the selection list.

The data are retrieved from the hard disc and entered in a separate browser window by clicking the "Retrieve data" button. If data retrieval is repeated, the browser window remains in the background and is filled with fresh data. This then looks like the window below, for example:

KAESER
COMPRESSORS

Every line corresponds to a data record. Every data record is given a time stamp in ISO 8601 format with date and time and the quantities to the right. Tabs separate the individual columns. The column headings are always in English. Because of the length of the column header texts, an optical relationship of the columns to the headings is not guaranteed in the illustration above. The data are filed in raw data format, see annex C for more details.

The text file displayed can be saved as a text file on the browser PC with "File" -> "Save as". Select the ".txt" file extension.
The file is thus available for further processing, e.g. with Excel.

3.16 Archiving Pages

Pages can be archived as follows:

3.16.1 Copying onto the clipboard

The current browser window can be copied onto the clipboard with the key combinations <Alt> <Print> or <Alt Gr> <Print> It can then be inserted into other documents e.g. Word, Excel, Paint, … with the key combination <Ctrl> <V>. In this way, it is possible to document evaluations of the compressed air system.

3.16.2 Printouts

The current browser window can be printed by clicking with the right mouse key on the window or below the navigation bar in windows containing graphics. Select "Print" in the drop-down menu to print out the page.
Depending on the type of printer, settings can be made before the printout. If the printout is cut off on the right side, select landscape in the print settings.

3.17 KAESER Service Support Page

When the KAESER logo at the top left is clicked, the following page appears:

The KAESER Service Support contact addresses can be retrieved and displayed on this page. It is possible to enter individual contact information on local KAESER subsidiaries and contact persons.
All the data entered in this page are saved in SIGMA AIR MANAGER and are available the next time it is called up.

The service support page is divided into five fields:

1. **Contact information on KAESER headquarters in Germany** (top left)
2. **Contact information on the KAESER main subsidiary or representative in the countries corresponding to the selected language.**
3. **Contact information on the local KAESER subsidiary or representative** (centre left)
   Information can be entered in the fields provided. Clicking the "Accept subsidiary" button saves the data in SIGMA AIR MANAGER.
4. **Contact information on the local contact person** (centre right)
   Information can be entered in the fields provided. Clicking the "Accept contact person" button saves the data in SIGMA AIR MANAGER.
5. **General comments** (below)
   Information can be entered in the field provided. Clicking the "Accept comment" button saves the data in SIGMA AIR MANAGER.

Note:

- To allow any character to be entered in the browser the it must accept Unicode (UTF 8) characters. This applies, for example, to Explorer 6.0.
  The required character set or font can be viewed under "View" → "Coding" and then selected.
- If characters are entered when the browser is not set to unicode (UTF 8), special characters may be wrongly displayed if a browser calls up the page again with another setting than that of the browser used for entering them.
- The text entered is displayed as entered in every language. The characters are not adapted to the other language.

3.18 Putting back the Clock

When putting the clock back on SAM the following display appears, e.g.:
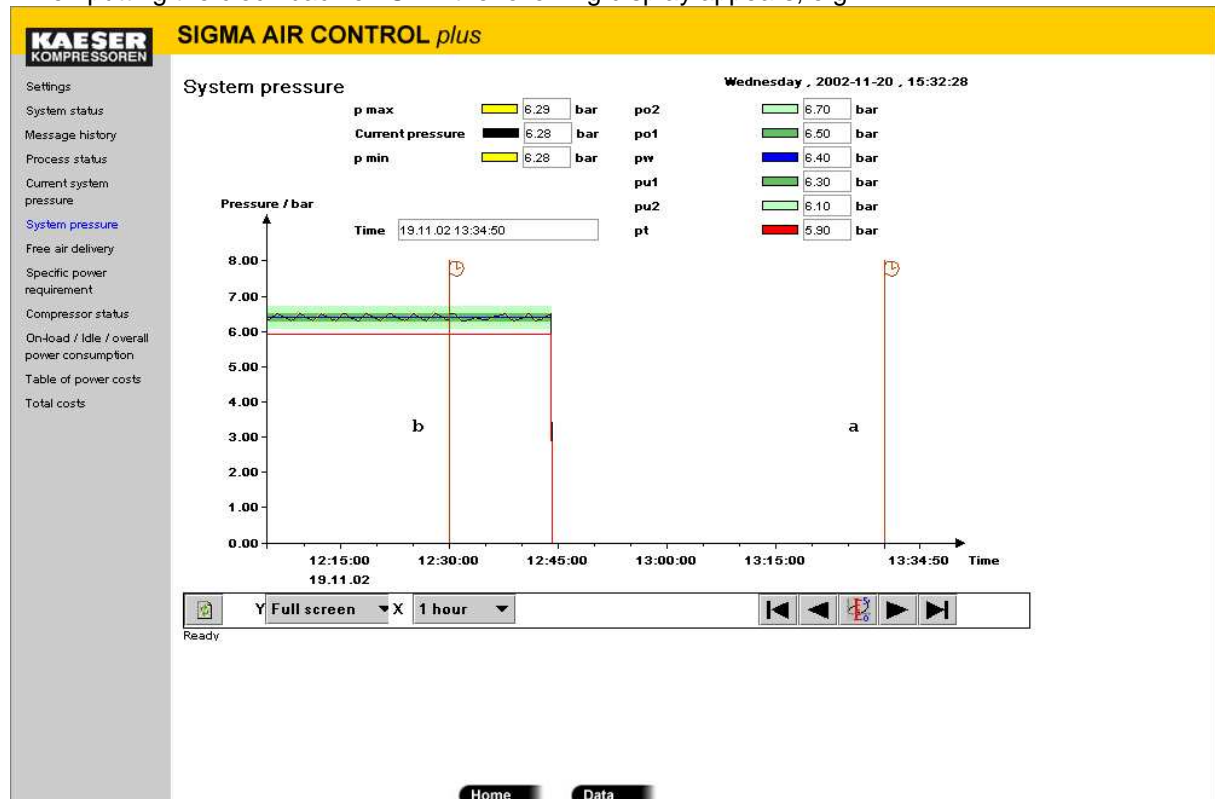
When putting the clock back on SAM the time stamp (a) for the new time is shown in the display (here, for example, system pressure. If the clock is put back again, a new time stamp (b) is entered in the diagram. The first time stamp is retained, but has no meaning any more.
The displayed data are deleted from the time of the valid time stamp (b) and the new data are entered in the diagram. Which means that data within the period overlapped by putting the clock back are lost.

Annex A Update for SIGMA AIR MANAGER

Attention:
- **Only qualified personnel may carry out the update to Sigma Air Manager.**
- **KAESER KOMPRESSOREN cannot accept any liability for damage caused by the update.**
- **Password level 7 (technician's level) is required to update software versions STEP5 v0.08 und v0.09 to a higher version.**

The SIGMA AIR MANAGER software comprises two parts:
   a) The operating system The current version is 1.01(109). This version is updated using a laptop, similar to SIGMA CONTROL.
   b) The Kaeser Software. The current version is 0.13. This is updated with a flashcard that must contain the corresponding update files.
As there will be no significant changes to the operating system, updates can be carried out in the future just using the flashcard.

Update procedure

1. Finding the corresponding update files
Various files are available to update SAM. Firstly, it must be ensured that the right files are on the flashcard and that the right operating system update matching the SAM model (4/4, 8/4, 8/8 und 16/8) and the SAM Kaeser software (0.08 to 0.11) is started. More details are given in Item 6.

Attention:
If the wrong update file is used the controller will be inoperable. SAM can only be reprogrammed in the KAESER factory in Coburg.

2. Changeover to manual mode
   Attention:
   ➢ **Change the 'Automatic restart' parameter to 'yes' to ensure that SAM stays in manual mode after power off/on [main menu -> F1 -> F4 -> F2].**
   ➢ **The air system must be ON (LED in the green ON key lit) if the air supply is to be available during the update.**

   ➢ Switch the air supply system to manual mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.
The 'Automatic' LED extinguishes, and 'ON MANUAL' appears at the top left of the display.
The compressors are under the control of their own internal controllers. The air system carries on running without the SIGMA AIR MANAGER.
Because of the cascaded pressure regulation settings on the compressors, system pressure will swing much further in manual mode than in automatic mode with SAM.

3. Recording parameter settings
   ➢ Always record the current parameter settings in SAM. The list at the back of the SAM service manual can be copied and used to record these settings.

4. Determining the SAM model
   ➢ Read off the SAM model at the top right of the SAM control panel.

---

5. **Determining the SAM software**
   ➢ Turn off the power supply to SAM and then turn it on again (using the cutout in SAM's control cabinet or the user's power switch.
   On the display appears, for example:

```
KAESER Sigma Air Manager
----------------------------
RMOS3 v3.21   SYSTEM v1.01(105)
STEP5 v0.09   HMI    v0.10
```

   ➢ Read off and record the operating system (SYSTEM) and Kaeser software (STEP5).

   When SAM has booted the large pressure reading appears.
   Alarms appearing on SAM after the boot-up can be ignored.

6. **Copying update files to the flashcard**
   The programs for the update that have been stored on your computer have the following directory:

Main directory V0.13
            Update_fro version_0.11
            Update_toversion_0.09
            Update_forversion_0.10

Each of these directories contains six subdirectories:

| /operating system | /Flashcard_SAM | /SAM16_8 | /SAM4_4 | /SAM8_4 |

/SAM8_8

   ➢ Open the directory 0.09, 0.10 or 0.11 complying with the Kaeser software (STEP5) version for your SAM.
   ➢ Copy the **contents** of the 'Flashcard_SAM' subdirectory onto the flashcard.
   ➢ Open the subdirectory for the SAM model in question and copy the contents **additionally** to the contents already on the flashcard.

The files written onto the flashcard are needed to update the Kaeser software. See Item 7.

The operating system will be updated with the Samsetup.exe software in the subdirectory 'Operating system' located in the directory for the applicable version of the Kaeser Software (STEP5). See Item 8.

Attention:
   - **No update is possible for software versions earlier than STEP5 v0.08.**
   - **In such cases, exchange the SAM controller for a later model.**
   - **Do not carry out an update on special software STEP5 v9.xx, for example v9.00. A special update is required for these versions. If required, this can be individually requested quoting the current version number.**

7. SAM Kaeser software update

- ➢ Switch off the power supply to the SAM.
- ➢ Plug the update flashcard in the PC slot in SAM as described below:
    - o Open the control cabinet
    - o If a modem is fitted, pull out the telephone plug
    - o Remove the blanking plate for the slot
    - o Plug the update flashcard into the slot nearest to the SAM control panel The side with the large red 16 and the small red arrow must be on the control panel side, and the large red arrow on the slot side
    - o Plug the flashcard carefully into the slot so that the black knob below the flashcard moves to the outside
    - o Close the control cabinet
- ➢ Switch on the power supply to the SAM.

The update is automatic and takes about five minutes.

The update is completed when `*** Update complete ***` appears on the display.

- ➢ When *** Update complete *** appears on the display switch off the control voltage.
- ➢ Remove the update flashcard as described below:
    - o Open the control cabinet
    - o Push out the update flashcard by pressing down on the black knob below the flashcard
    - o Pull out the flashcard
    - o Replace the blanking plate for the slot
    - o If a modem is fitted, plug in the telephone plug again
    - o Close the control cabinet
- ➢ Switch on the power supply to the SAM.

    The new software version appears on the display; e.g. STEP5 v0.12

8. SAM operating system update

Attention:

The operating system update takes approximately 10 minutes.
Make sure that reliable power supplies are available during the backup (i.e. laptop battery charged, etc.). For example, the laptop battery should be fully charged and the laptop or desktop computer should not be able to switch to power-save.
Should this happen despite precautions; carry out the update again.

- ➢ Link SAM and the laptop or desktop computer with a suitable null modem cable.
    - o Connect the null modem cable to the RS232 COM1 interface of the laptop/desktop computer
    - o Open the control cabinet
    - o Connect the null modem cable to the RS232 interface on SAM (0X2, middle one of the three existing SUB-D connectors)
    - o Close the control cabinet, as far as is possible
- ➢ On the laptop/desktop computer, copy the **Disk1** directory from the subdirectory Operating system located in the directory for the matching version of the Kaeser Software (STEP5) to **c:\temp** (see also Item 6).
- ➢ Open the file **SamSetup.exe** in the Disk1 directory (double-click the file).
- ➢ Confirm the note displayed with OK.
- ➢ Select the COM1 interface and confirm with OK.
- ➢ Confirm the request 'Following subdirectory ... Do you want to create it?' twice with 'yes', which saves two sub-directories in c:\temp.
- ➢ When the command 'Synchronisation COM1' from the set-up program appears, turn the power supply to SAM off and then on again to synchronise the interface.

The update is automatic and takes about five minutes.

The update is completed when SAM boots again. The large pressure reading appears on the display.

On the laptop/desktop computer the message 'Update completed successfully' appears.
  ➢ Exit the update program on the laptop/desktop computer with 'Exit'.
  ➢ Remove the link between the laptop/desktop computer and SAM (null modem cable).
  ➢ Close the SAM control cabinet.
  ➢ Turn the power supply to SAM off and on again.
    During the boot, the standard passwords for the current version are loaded.
    The new software version appears on the display; e.g. SYSTEM v1.01(109).

9. Carry out necessary settings

After booting the large pressure reading (e.g. 0265) appears on the display.
  ➢ Set language [Main menu -> F3 (?) -> select language with F1/F6 -> esc].
  ➢ *STEP5 v0.08 und 0.09 version update only:* In the 'Country-specific settings' menu [Main menu -> F1 -> F1 -> F1 -> F3] set the units for pressure, temperature, FAD and volume anew. Return to the main menu with the esc key.
    The large pressure reading is displayed again e.g. 7.63 bar.
  ➢ In the '6.4 Further inputs' menu [Main menu -> F1 -> F6 -> F4] scroll once through the functions with F6, i.e. press F6 four times. Return to the main menu with the esc key.
  ➢ Set, check and, if necessary, correct all parameter settings.
    o During updates from STEP 5 v 0.08 or v0.09 to the current version all the parameters are preset with the standard values. Customer-specific values must be entered again manually.
    o During updates from STEP 5 v 0.10 or higher to the current version, customer specific parameters are partly taken over. The following parameters, especially with regard to the assignment of inputs and outputs are to be entered manually.
        ▪ Conventional compressor linking [Main menu -> F1 -> F3 -> F1 -> F1] for all compressors that are conventionally linked through inputs and outputs
        ▪ External alarm/service/warning [Main menu -> F1 -> F6 -> F1] for all necessary messages
        ▪ Further input functions [Main menu -> F1 -> F6 -> F4] for all necessary functions
        ▪ Further output functions [Main menu -> F1 -> F6 -> F5] for all necessary functions
        ▪ SMS channel 1 [Main menu F1 -> F1 ->F5 -> F1 -> F1] set protocol to 'TAP', do the same for channel 2 [proceed with F1]

    o Pay particular attention to the following settings:
        ▪ Final pressure for pressure transducer [Main menu -> F1 -> F4 -> F1
        ▪ Pressure setpoint [main menu]
        ▪ Profibus interface [Main menu -> F1 -> F1 -> F3 -> F1]
          Do not activate until the data for the SIGMA CONTROL compressors is entered.
        ▪ Ethernet IP address [Main menu -> F1 -> F1 -> F3 -> F4]
        ▪ *Update of SAM4/4 or SAM8/4 from Version STEP5 v0.08 und 0.09 only:* conventional compressor link, full load output [Main menu -> F1 -> F3 -> F1 -> F1]. An 'n' next to the full load output address on the left of the display **must** be displayed for all compressors.
    Check all parameters again once the settings have been made.

10. Changeover to automatic mode

➢ Preselect all required compressors with the preselect keys.
➢ Switch the air supply system to automatic mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.

The 'Automatic' LED illuminates, and 'ON AUTO appears at the top left of the display.
The compressors are now switched from their internal pressure control back to operation under the control of SAM.

➢ Switch compressors with SIGMA CONTROL running with software versions up to 0.6x to remote mode on the Sigma Control panel.

o Reset any alarms on Sigma Control.
o Press the Remote key, the LED in the remote key should illuminate.

SAM now controls the compressors.

➢ Reset compressor alarms on SAM.

11. Documentation of the software update

Record the update in KAESER SAP in SAM/Equipment.

Annex B   SAC *plus* – Installing the Hard Disc

Attention:
- **Only qualified technicians are allowed to install or remove the hard disc.**
- **KAESER KOMPRESSOREN cannot accept any liability for damage caused by installing or removing the hard disc.**

Installation Procedure

1   Changeover to manual mode
   Attention:
   - ➢ **Change the 'Automatic restart' parameter to 'yes' to ensure that SAM stays in manual mode after power off/on [main menu -> F1 -> F4 -> F2].**
   - ➢ **The air system must be ON (LED in the green ON key lit) if the air supply is to be available during the installation or removal of the hard disc.**

   - ➢ Switch the air supply system to manual mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.
   The 'Automatic' LED extinguishes, and 'ON MANUAL' appears at the top left of the display.
   The compressors are under the control of their own internal controllers. The air system carries on running without the SIGMA AIR MANAGER.
   Because of the cascaded pressure regulation settings on the compressors, system pressure will swing much further in manual mode than in automatic mode with SAM.

2   Installing the hard disk
   - ➢ Switch off the power supply to the SAM.
   - ➢ Plug the hard disc in the PC slot in SAM as described below:
     - o   Open the control cabinet
     - o   If a modem is fitted, pull out the telephone plug
     - o   Remove the blanking plate for the slot
     - o   Plug the hard disc into the slot nearest to the SAM control panel The side where TOSHIBA 5.0GB is printed and the small black arrow with "Insert" must point to the slot.
     - o   Push the hard disc into the slot such that the black knob under the hard disc moves to the outside.
     - o   Replace the blanking plate in the slot
     - o   If a modem is fitted, plug in the telephone plug again
     - o   Close the control cabinet
   - ➢ Switch on the power supply to SAM.

3   Changeover to automatic mode
   - ➢ Preselect all required compressors with the preselect keys.
   - ➢ Switch the air supply system to automatic mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.
   The 'Automatic' LED illuminates, and 'ON AUTO appears at the top left of the display.
   The compressors are now switched from their internal pressure control back to operation under the control of SAM.
   - ➢ Switch compressors with SIGMA CONTROL running with software versions up to 0.6x to remote mode on the Sigma Control panel.
     - o   Reset any alarms on Sigma Control.
     - o   Press the Remote key, the LED in the remote key should illuminate.
   SAM now controls the compressors.
   - ➢ Reset compressor alarms on SAM.

Procedure for Removal

1. Changeover to manual mode
   Attention:
   - ➢ **Change the 'Automatic restart' parameter to 'yes' to ensure that SAM stays in manual mode after power off/on [main menu -> F1 -> F4 -> F2].**
   - ➢ **The air system must be ON (LED in the green ON key lit) if the air supply is to be available during installation or removal of the hard disc.**

   - ➢ Switch the air supply system to manual mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.
   The 'Automatic' LED extinguishes, and 'ON MANUAL' appears at the top left of the display.
   The compressors are under the control of their own internal controllers. The air system carries on running without the SIGMA AIR MANAGER.
   Because of the cascaded pressure regulation settings on the compressors, system pressure will swing much further in manual mode than in automatic mode with SAM.

2. Removing the hard disc
   - ➢ Switch off the power supply to the SAM.
   - ➢ Remove the hard disc as described below
       - o Open the control cabinet
       - o If a modem is fitted, pull out the telephone plug
       - o Remove the blanking plate for the slot
       - o Push out the hard disc by pressing the black knob under the hard disc
       - o Pull out the hard disc
       - o Replace the blanking plate in the slot
       - o If a modem is fitted, plug in the telephone plug again
       - o Close the control cabinet
   - ➢ Switch on the power supply to the SAM.

3. Changeover to automatic mode
   - ➢ Preselect all required compressors with the preselect keys.
   - ➢ Switch the air supply system to automatic mode with the Manual/Automatic Mode key on SIGMA AIR MANAGER.
   The 'Automatic' LED illuminates, and 'ON AUTO appears at the top left of the display.
   The compressors are now switched from their internal pressure control back to operation under the control of SAM.
   - ➢ Switch compressors with SIGMA CONTROL running with software versions up to 0.6x to remote mode on the Sigma Control panel.
       - o Reset any alarms on Sigma Control.
       - o Press the Remote key, the LED in the remote key should illuminate.
       SAM now controls the compressors.
   - ➢ Reset compressor alarms on SAM.

Annex C Retrievable Data

1	Compressor 16-1 Alarm active
2	Compressor 16-1 service/warning active
3	Compressor 16-1 local mode
4	Compressor 16-1 off load
5	Compressor 16-1 on load
6	Compressor 16-1 variable frequency drive
7	Compressor 16-1 group A
8	Compressor 16-1 group B
9	Compressor 16-1 group C
10	Compressor 16-1 group D
11	Group sequence priority 1/2/3/4
12	Group sequence priority 5/6/7/-
13	Maximum system pressure
14	Minimum system pressure
15	System pressure
16	Minimum pressure p low
17	Switching point po2(. .
18	Switching point po1(. .
19	Setpoint pressure
20	Switching point pu1
21	Switching point pu2
22	System FAD
23	System power consumption
24	System on load power consumption
25	Compressor 1 FAD
26	Compressor 2 FAD
27	Compressor 3 FAD
28	Compressor 4 FAD
29	Compressor 5 FAD
30	Compressor 6 FAD
31	Compressor 7 FAD
32	Compressor 8 FAD
33	Compressor 9 FAD
34	Compressor 10 FAD
35	Compressor 11 FAD
36	Compressor 12 FAD
37	Compressor 13 FAD
38	Compressor 14 FAD
39	Compressor 15 FAD
40	Compressor 16 FAD
41	Compressor 1 on load time
42	Compressor 2 on load time
43	Compressor 3 on load time
44	Compressor 4 on load time
45	Compressor 5 on load time
46	Compressor 6 on load time
47	Compressor 7 on load time
48	Compressor 8 on load time
49	Compressor 9 on load time
50	Compressor 10 on load time
51	Compressor 11 on load time
52	Compressor 12 on load time

53	Compressor 13 on load time
54	Compressor 14 on load time
55	Compressor 15 on load time
56	Compressor 16 on load time
57	Compressor 1 motor runtime
58	Compressor 2 motor runtime
59	Compressor 3 motor runtime
60	Compressor 4 motor runtime
61	Compressor 5 motor runtime
62	Compressor 6 motor runtime
63	Compressor 7 motor runtime
64	Compressor 8 motor runtime
65	Compressor 9 motor runtime
66	Compressor 10 motor runtime
67	Compressor 11 motor runtime
68	Compressor 12 motor runtime
69	Compressor 13 motor runtime
70	Compressor 14 motor runtime
71	Compressor 15 motor runtime
72	Compressor 16 motor runtime
73	Compressor 1 power consumption
74	Compressor 2 power consumption
75	Compressor 3 power consumption
76	Compressor 4 power consumption
77	Compressor 5 power consumption
78	Compressor 6 power consumption
79	Compressor 7 power consumption
80	Compressor 8 power consumption
81	Compressor 9 power consumption
82	Compressor 10 power consumption
83	Compressor 11 power consumption
84	Compressor 12 power consumption
85	Compressor 13 power consumption
86	Compressor 14 power consumption
87	Compressor 15 power consumption
88	Compressor 16 power consumption
89	Compressor 1 on load power consumption
90	Compressor 2 on load power consumption
91	Compressor 3 on load power consumption
92	Compressor 4 on load power consumption
93	Compressor 5 on load power consumption
94	Compressor 6 on load power consumption
95	Compressor 7 on load power consumption
96	Compressor 8 on load power consumption
97	Compressor 9 on load power consumption
98	Compressor 10 on load power consumption
99	Compressor 11 on load power consumption
100	Compressor 12 on load power consumption
101	Compressor 13 on load power consumption
102	Compressor 14 on load power consumption
103	Compressor 15 on load power consumption
104	Compressor 16 on load power consumption
105	Analog input AI0
106	Analog input AI17
107	Analog input AI16

108	Analog input AI17
109	Analog input PT0, PT100
110	Analog input PT1, PT100
111	Analog input PT8, PT100
112	Analog input PT9, PT100
113	AO0, allocation system pressure
114	AO8, spare
115	Compressor 1 total costs
116	Compressor 2 total costs
117	Compressor 3 total costs
118	Compressor 4 total costs
119	Compressor 5 total costs
120	Compressor 6 total costs
121	Compressor 7 total costs
122	Compressor 8 total costs
123	Compressor 9 total costs
124	Compressor 10 total costs
125	Compressor 11 total costs
126	Compressor 12 total costs
127	Compressor 13 total costs
128	Compressor 14 total costs
129	Compressor 15 total costs
130	Compressor 16 total costs
131	Compressor 1 on load costs
132	Compressor 2 on load costs
133	Compressor 3 on load costs
134	Compressor 4 on load costs
135	Compressor 5 on load costs
136	Compressor 6 on load costs
137	Compressor 7 on load costs
138	Compressor 8 on load costs
139	Compressor 9 on load costs
140	Compressor 10 on load costs
141	Compressor 11 on load costs
142	Compressor 12 on load costs
143	Compressor 13 on load costs
144	Compressor 14 on load costs
145	Compressor 15 on load costs
146	Compressor 16 on load costs