
 <p>Bayer MaterialScience Bayer Technology Services</p>	<h1 style="text-align: center;">MDI-TRAIN CAOJING</h1> 	<p><b>Date :</b> 2005-12-12</p> <p><b>Rev.:</b> 01</p> <p><b>Page</b> 1 of 10</p>
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# General Information for PAT

## CAO MDIX

Document Name:



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Contact:

Name: Dr. T. Sauter Bayer Technology Services	Phone: +49-2151-88-7598 E-mail: thomas.sauter@bayertechnology.com	Fax: +49-2151-88-969-7598
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## 1 General

The information given in this chapter shall be understood as reference for all MDI-train projects.

This chapter describes the scope of the contractor in general, the general installation and execution concept as well as the detailed design guidelines that shall be followed for engineering and construction.

All design guidelines described in this chapter shall be followed as long as no other project specific information is given in chapters 13.2 and 13.7.



## 2 Scope of Contractor

The scope of the contractor is to supply the process analyzers on the bases of this FEL package.

The scope of the contractor includes but is not limited to:

- detail engineering of analyzers system hardware
- engineering of software for automation of the analyzer systems
- procurement
- fabrication and delivery of analyzer containers/cabinets with analyzer systems
- fabrication and delivery of field analyzer systems
- on site field installation
- commissioning support
- start up support
- specification of spare parts for start up and the first year of operation with vendor, order and price information
- specification of consumables and calibration fluids with vendor, order and price information

For detailed scope with list and specification of analyzer, description of analyzer containers etc. please refer to chapters 13.2 and 13.7.

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### 3 Overall Installation and Execution Concept

In this project there is a number of process analyzers.

The more complex analyzers (e.g. photometers, spectrometers, chromatographs, TOC analyzers etc.) are installed in analyzer containers or in smaller analyzer cabinets. Less complex analyzers e.g. conductivity, pH and single point ambient air monitoring analyzers are typically installed directly in the field.

The analyzer containers shall be fabricated off site and shall be delivered to the construction site as complete functional units, ready to be integrated into the production unit. Each container shall be equipped with a “chemical and electrical plug” that means clearly defined interfaces for process connections (sample supply and returns), power and signals as well as utilities (instrument air, nitrogen, cooling water etc.). This concept minimizes the time for integration of the container into the production unit.



Prior to shipment to the construction site the containers shall be tested intensively during a factory acceptance test (FAT). This FAT includes a complete functional test of all systems components (analyzers, sample preparation systems, electrical signals, alarm and safety systems etc.). This concept helps to avoid surprises on the construction site and to minimize the time for commissioning and start up.

The more complex analyzer systems inside the analyzer container consist of the analyzer itself and a sample supply and sample preparation system typically with pressure regulators, filters, gas coolers, valves etc..

These analyzer systems are equipped with automatic self test routines which include periodic zero and span tests with calibration fluids. The automation also includes the sample supply and sample preparation systems as well as e.g. multiple stream switching. In addition to the measurement signal the analyzer systems send status signals to the control room such as analyzer system failure, maintenance request and self test/maintenance ongoing (i. e. measurement signal currently not valid).

Besides the analyzers itself also the status of the various components of the sample supply and sample preparation systems are monitored by additional transmitters (flow, pressure, temperature) for the purpose of an overall system status and to support of preventive maintenance and trouble shooting.

The automation of the analyzer systems is realized by Emerson DELTAV system components that are located within the analyzer container and that are part of the overall DELTAV process control system of the production unit.

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The analyzer systems are panel mounted in a modular way and the electrical signals of each module are collected by Siemens ET200 SC components and then transferred to the DELTAV system inside the analyzer containers via PROFIBUS DP. The signals are transmitted into the control room via fibre optical link.

In addition to the measurement and status signals additional signals are exchanged between the analyzer systems and the control room that include e.g. calibration check enable/disable or multiple sample stream switching select options.

The signals from the analyzer system (especially the measurement values) shall be tied in via the DELTA V system into the PI data historian system.



## 4 Detailed Design Guidelines

The following describes the design guidelines in detail that shall be followed for engineering and construction of the process analytical part. Many of the design requirements are given in ANNEX 1 which includes pictures and documents from previous project to make the requirements clear in more detail.

It is the intension that the current projects shall be realized with at least the same level of quality than the previous projects. The pictures shall help to support this.

ANNEX 1 includes details of the:

- design and layout of the analyzer containers
- design and layout of smaller analyzer walk in cabinets
- power supply concept for analyzer containers / cabinets
- container safety systems
- calibration gas cabinets
- design criteria for analyzer systems
- automation concept for analyzer systems
- analyzer safety concepts
- automation concept with Emerson DELTAV with architecture and hardware requirements
- information about the automation and visualization in the DELTAV system (with screen shots)
- signal handling between the analyzers in the container and the control room
- typicals for field installations of pH and conductivity measurements
- installation of Near Infrared Systems with spectrometers and inline optical cells

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## 4.1 Analyzer Containers

Please refer to **ANNEX 1** for a description of the design requirements.

### Analyzer Cabinets

Walk-in analyzer cabinets are used instead of a big containers if only a few analyzers are to be installed. They are typically used for stand alone TOC analyzers in the field.

There is no DELTAV system used for these cabinets.

## 4.2 Analyzer Container Safety System

Each analyzer container is equipped with a safety system. Please refer to **ANNEX 1** for details.

## 4.3 Analyzer Container/Cabinet Power Requirements

Due to the aspects of both analyzer system availability as well as safety (handling of toxic or explosive fluids) a power supply concept shall be followed that is described in **ANNEX 1**.

## 4.4 Design of analyzer systems

It is the nature of process analyzers that each individual analyzer system has to be designed to the individual measurement task to fulfill its task. A major focus during the design of the systems shall be:

- the availability of the systems
- the confidence level of the measurement values
- safety aspects (some sample are highly toxic)
- maintenance aspects



Please refer to **ANNEX 1** for the detailed design requirements that shall be followed during the design of the analyzer systems.

### Special Note:

The design of the analyzer systems from the sample take off point at the process valve back to the process (sample return) shall fulfill the requirements of the process piping specification.

## 4.5 Field Analyzers

Analyzers that are installed directly in the field e.g. pH or conductivity analyzers shall use Foundation Field Bus for signal transmission if available.

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As in the case of the analyzer containers the concept of a high level of off site prefabrication shall also be followed in the case the field analyzers.

Conductivity, pH and ORP analyzers shall be mounted on a stand rack ready to be installed in the production unit (design spec see ANNEX 1) . Together with the stand rack each system shall be delivered with a spool piece with pH / conductivity probe adapter for direct integration into the process pipe.

## 4.6 Analyzers in Safety Critical Loops

Analyzers in safety critical loops (whether they are installed in the field or within an analyzer container) must use 4-20 mA signal outputs and hard wiring directly to the unit safety system. Safety critical analyzers that are installed within an analyzer container are in addition connected to the containers DELTAV system for visualization.

## 4.7 Components and Materials for Construction

Besides the analyzers itself which are specified in chapter 13.7 there is a number of components that are necessary for sample supply, sample preparation and supply with utilities and for the construction of the analyzer containers and cabinets. ANNEX 2 describes which vendor/ models are to be used for the individual components.



All bulk material (for mounting) shall be stainless steel

All components for toxic gas service such as filters, valves, pressure regulators etc. have to be completely metallically sealed and the number of connections has to be kept at a minimum. All tubing has to be seamless stainless steel tubing and double ferrul swagelok fittings shall be used.

Generally: during the detailed design phase prior to purchasing and construction all system components have to be approved by Bayer for each the individual analyzer systems.

## 4.8 Automation of Analyzers in Analyzer Containers

Due to the fact that the DELTAV system within the analyzer containers is an integral part of the overall DELTAV system of the production unit the same hardware components (controllers, switches etc.) have to be used which are specified for the PCT part (see chap. 11.8 of FEL „Specifications for Process Control Systems (DCS, ESD)“).

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### 4.8.1 DELTAV System Hardware

Please refer to **ANNEX 1** for information about DELTA V and related system components that shall be used in the analyzer containers.

### 4.8.2 DELTAV System Software

The software shall be realized according to the rules and guidelines of the PCT part. Especially Emerson PBL shall be used.

The software for the analyzer containers has to be very specifically adapted to each individual analyzer and sample preparation system to fulfill the intended goal of the automation concept.

The variety of analyzers and sample preparation systems will therefore result in a larger number of different software modules. The function sequences shall be able to react to certain conditions within the analyzer or sample preparation system or to other conditions or signals (e.g. from the control room) that shall bring the analyzer system in a defined status or in a defined mode of operation. Examples are automatic switch to purge fluid if sample not available, stand by mode, automatic sample filter blow back at low flow alarm, calibration check enable/disable from control room, manual calibration check start from control room, selection of a defined mode of sample stream switching out of various options etc..

**ANNEX 1** in chapter 13.4 shows an example of a P&ID drawing of an individual analyzer system that shall give a general impression about the design of an analyzer system with analyzer and sample supply and sample preparation system components.

The description of the software is part of the scope of the analyzer specialist of the contractor and requires a detailed knowledge about the functionality of each analyzer system.

The software shall be programmed into the DELTA V system by Emerson. This is due to the fact that Emerson shall keep the overall responsibility for the merge of the analyzer part of software and hardware with the PCT part.



During the development of the software description by the contractor BAYER-BTS PAT will review the status of the description on a regular bases.

### 4.8.3 DELTA V Visualization

There are basically four (4) levels of information that shall be displayed:

- overview display of analyzer container with basic status information of all systems
- P&ID display for each analyzer system with access to analyzer system operation
- detailed status display for each analyzer system with status information about sample system components
- display with overall DELTA V system status information



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Please refer to **ANNEX 1** for more details and screen shots of the above mentioned displays from a previous project.

#### 4.8.4 Test of DELTA V System with Software

A test of the complete DELTA V system including the software shall be performed during the factory acceptance test (FAT) of the analyzer containers with the actual analyzer systems. During this test it shall be demonstrated in detail that the complete system of DELTA V and analyzer systems is working properly. Any problems that should be detected during this test shall be corrected before delivery of the container to the construction site.

#### 4.8.5 Merge of Analyzer Container with DELTA V system of production unit

It shall be guaranteed and it is an essential part of the overall concept that after delivery to the construction site the analyzer container can be merged with the DELTA V part of the production unit smoothly and without problems. Therefore it is important during the software description and programming phase to work according to the guidelines for the DELTA V system, especially e.g. naming conventions shall be followed strictly. Please refer to the PCT part of this FEL package for details.

#### 4.8.6 Signal Interface Module with Siemens ET 200 SC

The signal interface module collects all data to and from an analyzer system and is connected to the DELTA V system inside the analyzer container via PROFIBUS DP.

Please refer to **ANNEX 2** for information about the Siemens ET 200 SC components that shall be used. **ANNEX 1** includes a picture of such a module from a previous project.



#### 4.8.7 Signals between Analyzer Systems and Control Room

As mentioned above there are signals between the analyzer systems and the control room in addition to the measurement value and overall status signal. Please refer to **ANNEX 1** for details and specification of these signals.

### 4.9 Energies for Analyzer Operation

The following energies are available on site for the operation of the analyzers:

- instrument air: 5.0 - 8.0 bar (absolute)
- plant air: 5.5 - 7.0 bar (absolute)
- plant nitrogen: 6.5 - 7.0 bar (absolute)
- electrical power: 400 / 230 VAC, 50 Hz

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## 5 Sub-orders

Contractor shall issue to BAYER one unpriced copy of sub-orders in English, specific to this contract, as soon as they are issued. Such copies shall be complete with all attachments, drawings and specifications applicable. Copies shall be identified by adding the above mentioned references.

Contractor shall ensure that sub-orders make reference to all appropriate standards and specifications and that sub-suppliers are in possession of those.



## Annex 1

# Detailed Design Guidelines for PAT

**Design guidelines for:**

- analyzer containers
- analyzer cabinets
- field instruments

**Guidelines for field installation**



# Design Guidelines for Analyzer Containers



container shall be equipped with:

- HVAC system (water cooled)
- lighting (explosion proof with emergency lighting)
- safety and alarm system

specification of container structural design  
see **ANNEX 3**

container shall be galvanized steel  
color: RAL 9006 silver-grey

container shall have a floor drain and  
shall be placed on a concret pad

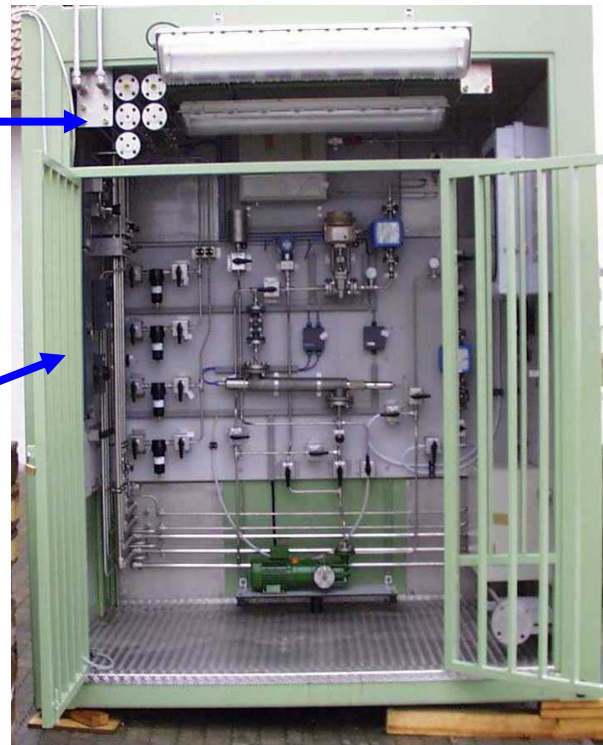


interfaces for power & signals and sample supply / return and utilities

chemical  
plug



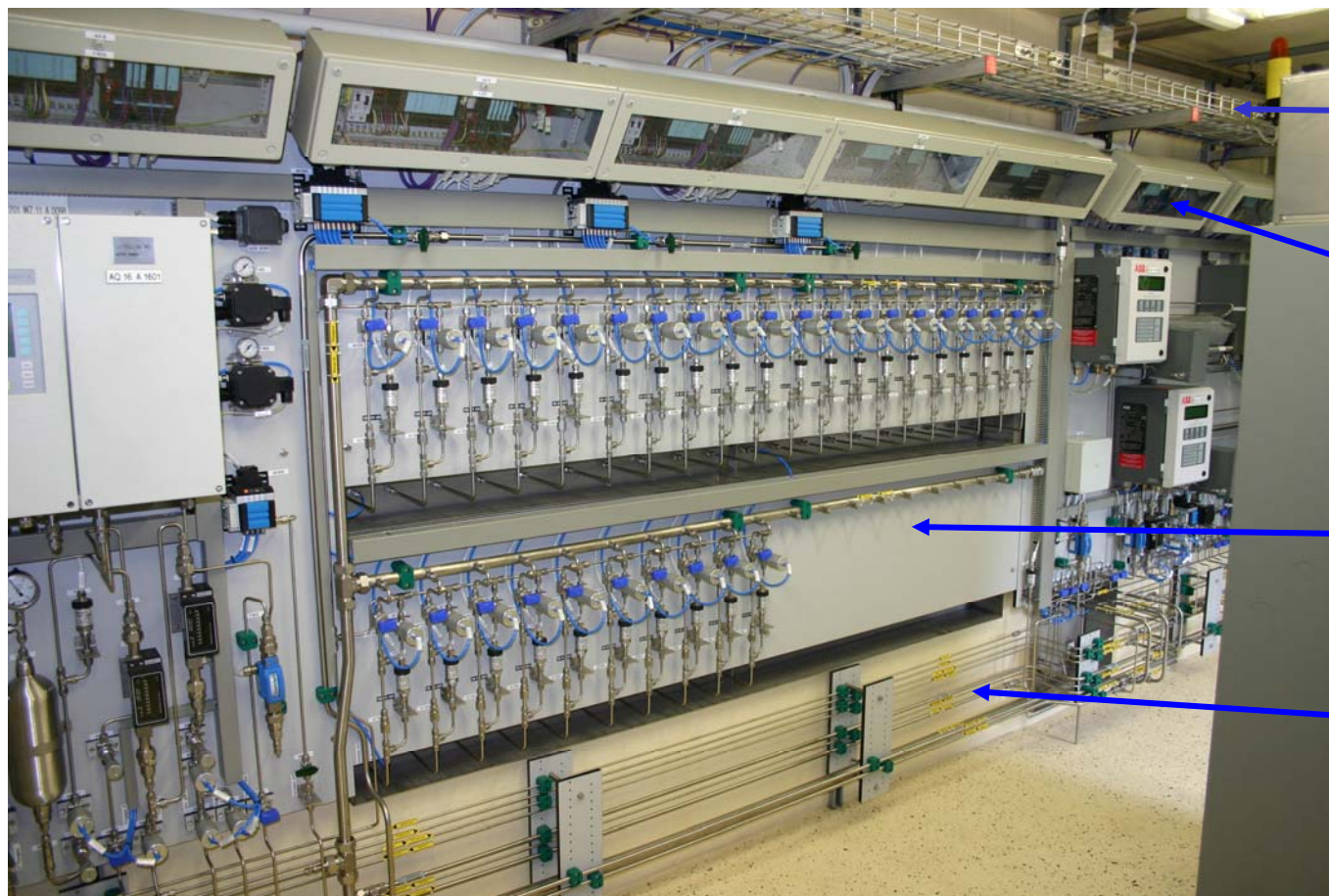
electrical  
plug



container interface area

container shall be equipped with well defined and clearly tagged interfaces at the outside of the container for fast integration into the production unit





two separated cable trays for:  
- electrical power  
- signals  
trays and supports shall be stainless steel

signal interface module box with Siemens ET 200

analyzer systems shall be panel mounted

headers for utilities, sample supply&return

electrical area classification inside container shall be general purpose



signal interface box  
with Siemens ET 200  
(see also detailed picture)

All system components  
on the analyzer  
panels shall be mounted  
for easy accessibility  
and maintenance and  
easy replacability.  
All components (valves,  
filters etc.) shall carry  
a tag that is identical  
to the tag on the corres-  
ponding P&ID drawings.

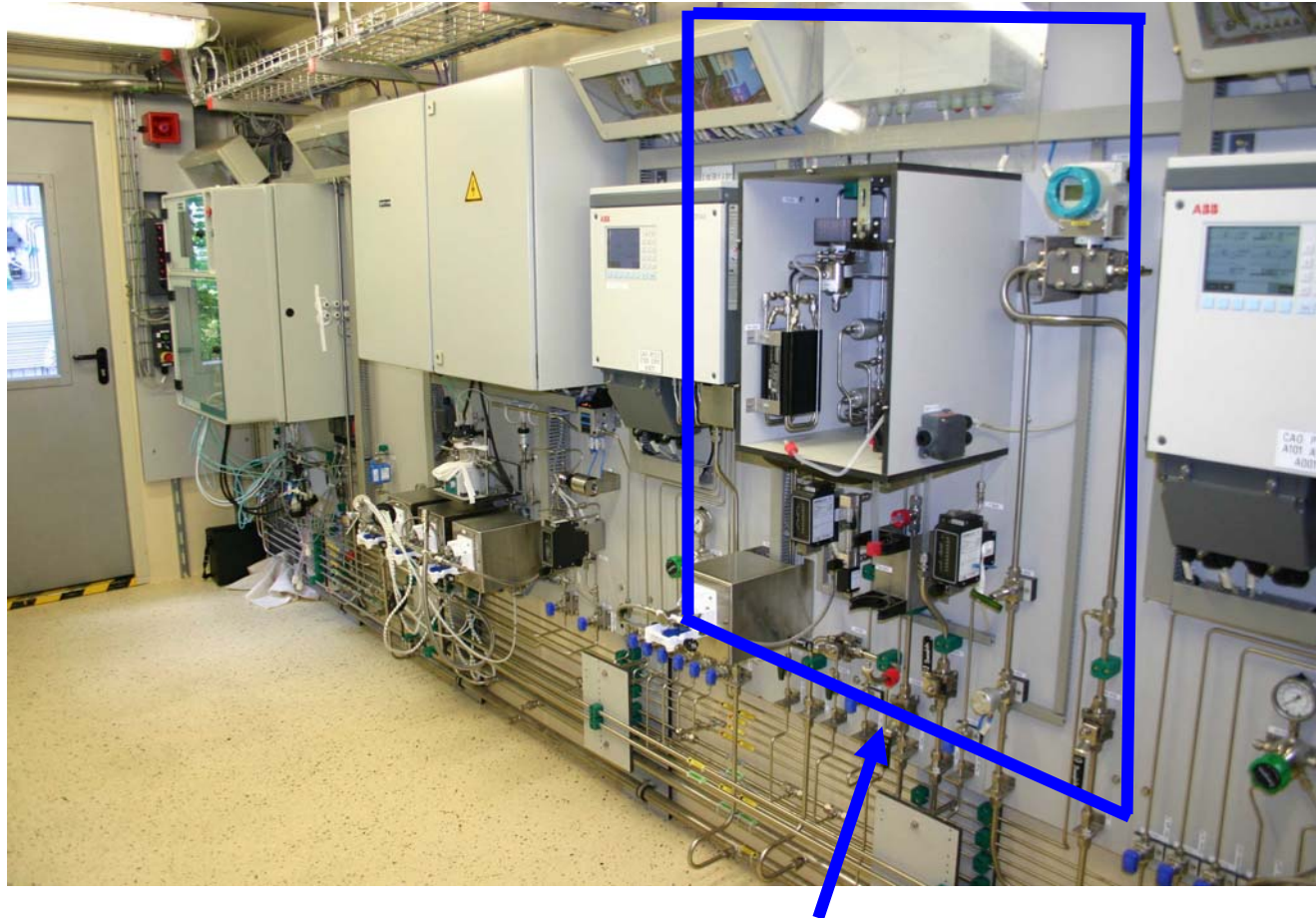
The overall installation  
shall be of high quality  
with a clear and nice  
appearance.



dual cabinet  
with  
DELTA V  
controllers  
&  
power  
distribution

Each analyzer system (analyzer, sample preparation system, signal I/O box) shall be designed and mounted as an individual functional modul, such that they can be replaced individually , no cross mounting of tubing etc. between different modules allowed !





each individual analyzer systems  
is mounted on a panel as a modul  
material of panel: TRESPA

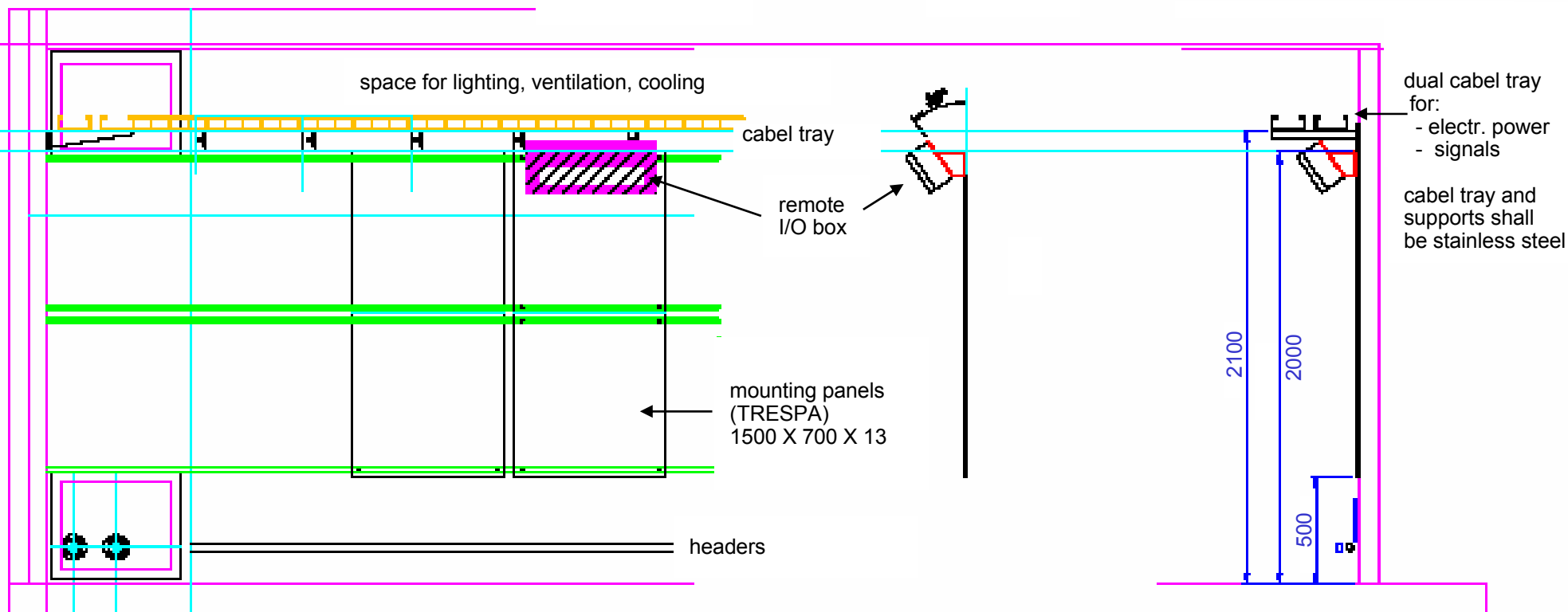
panel size:  
hight 1500 mm  
thickness: 13 mm

color: light gray

Each analyzer system shall be designed and mounted as a panel mounted modul

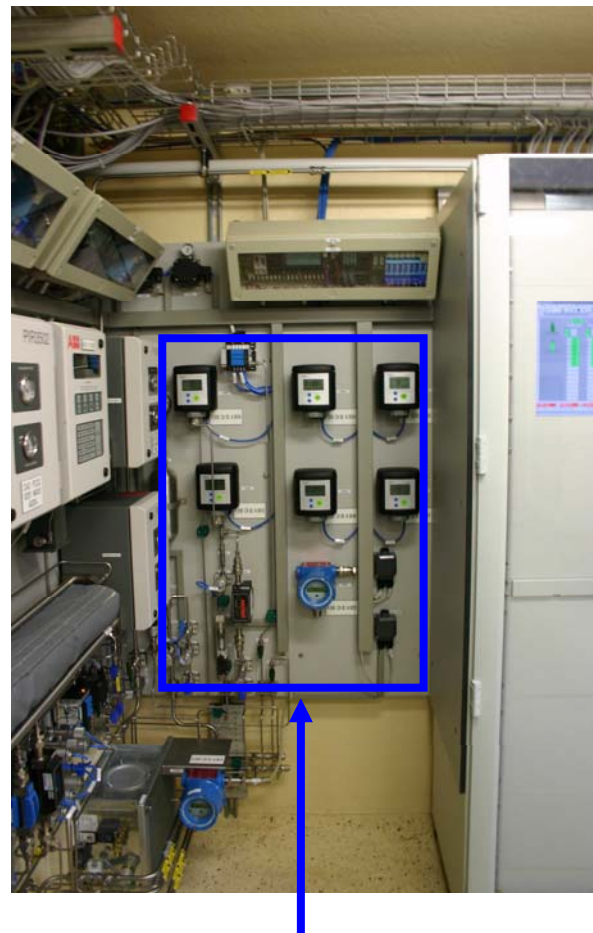


(dimensions in mm)





analyzer container shall have two alarm modules  
(one inside and one outside of container)  
for toxic and explosive atmosphere warning,  
HVAC and ventilation status (details see next page)



monitors for toxic and explosive gases shall be mounted on a panel



A strobe light and a buzzer shall be installed in the interior of the container (in addition to the interior alarm panel)

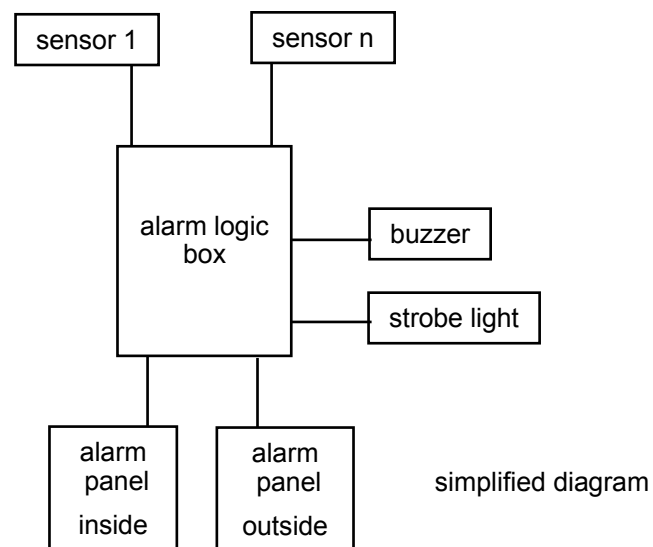
### alarm logic:

- any alarm condition activates the red individual alarm light (blinking) at the two alarm panels and activates the strobe light and the buzzer
- acknowledging the alarm with the buzzer reset button resets the buzzer, the strobe light stays active and the individual red alarm light at the alarm panel changes from blinking to permanent on
- if after alarm acknowledgement all alarm conditions have disappeared the strobe light and the red individual alarm lights are deactivated

Each of the two alarm panels shall indicate the following conditions:

- high level concentration alarm for all toxic and corrosive components in ambient air (defined in scope list)
- alarm for explosive components (LEL)
- low oxygen concentration alarm in ambient air
- failure of ventilation
- failure of HVAC system
- failure of at least one of the ambient air sensors
- warning that function check (FC) is activated on at least one of the ambient air sensors (i.e. at least one sensor cannot alarm in the moment)

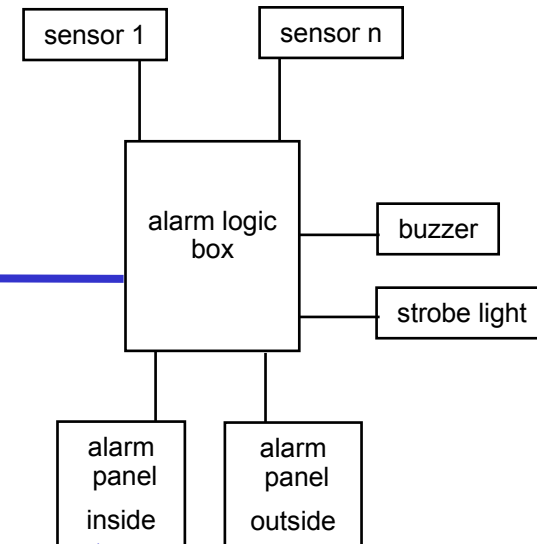
The alarm panels shall be equipped with a lamp test button and a buzzer reset button







alarm logic box



simplified diagram





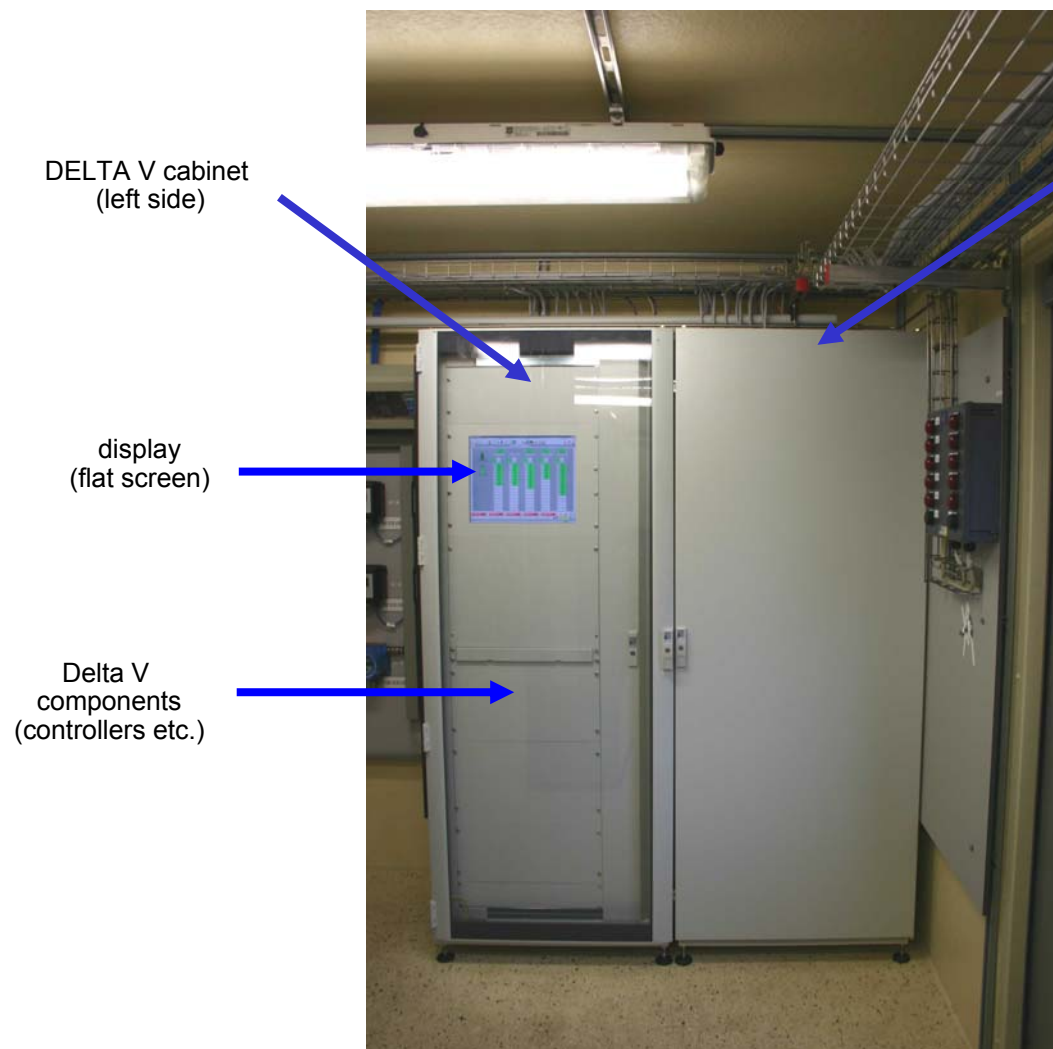
## Power supply for analyzer rooms with power shut off safety concept

Consumers	ID	No LEL-, no COCI2-Monitoring inside analyzer room	LEL-, but no COCI2-Monitoring inside analyzer room	No LEL-, but COCI2-Monitoring inside analyzer room	LEL- and COCI2-Monitoring inside analyzer room
<b>Analyzers</b>	<b>1</b>	400V/AC 3-phase UPS	400V/AC 3-phase UPS (switched off by LEL-Alarm)	400V/AC 3-phase UPS	400V/AC UPS 3-phase (switched off by LEL-Alarm)
<b>Alarm system</b>	<b>2</b>		230 V/AC UPS		230 V/AC UPS
<b>Heat tracing &amp; HVAC</b>	<b>3</b>	400V/AC 3-phase regular power	400V/AC 3-phase regular power (switched off by LEL-Alarm)	400V/AC 3-phase regular power	400V/AC 3-phase regular power (switched off by LEL-Alarm)
<b>Lighting</b>	<b>4</b>		230 V/AC regular power		230 V/AC regular power
<b>Ventilation</b>	<b>5</b>		Connected to [3]	400V/AC 3-phase regular power (switched off by COCI2 alarm)	400V/AC 3-phase regular power (switched off by COCI2 alarm)

24 VDC shall be generated from 400V/AC UPS within analyzer room



The DELTA V components and the power distribution components shall be installed in a dual cabinet (metal)



power distribution cabinet (right side)

The following power supply concept shall be followed:

- UPS power for analyzers and 24 VDC generation
- regular power for heaters, pumps, lighting, HVAC
- separate fuses for each user (analyzers, pumps, heat tracing)
- separate RCD for heat tracing
- power input: 400 VAC, 3 phase, 50 Hz

(picture of open cabinets see next page)



DELTA V cabinet (left side)



power distribution cabinet (right side)







### The following design concepts shall be followed for analyzer systems:

- sample flow to analyzer measured upstream of analyzer by analogue flow meter with valve and flow controller (by Delta V)
- pressure measurements downstream of analyzer for pressure compensation
- purge gas (nitrogen) for analyzers and sample preparation boxes with flow measurement and low flow alarm
- calibration media with double block valves
- back flow of sample into utilities has to be safely avoided !
- separate headers for each utility and function:
  - example: separate header for nitrogen zero gas and nitrogen purge gas for sample preparation boxes
- sensors for monitoring of functionality of all sample system components (e.g. temp. measurement downstream sample cooler, pressure measurement downstream sample filter, temp. indicator within heated sample preparation box)



**The more complexe analyzer systems shall be equipped with:**

Automatic self test routines:

These tests shall include:

- periodic zero and span verification (no automatic adjustment, manually only)
- periodic check for valve tightness

The following status signals:

- Failure
- Function Control
- Maintenance Request

Automatic sample flow control:

This shall be realized by analogue sample flow meter with flow controller via DELTA V

The automation shall be realized by Emerson DELTA V system



**The following safety concept shall be followed for toxic and highly corrosive samples:**

- automatic shut off of sample supply and return outside analyzer container on toxic or corrosive gas alarm
- sample flow limitation outside analyzer container
- sample filters outside analyzer container
- injector pumps if possible
- purge connections for analyzer system decontamination
- for toxic samples:  
all analyzer sample boxes shall be purged and held at under pressure (approx. - 10 mbar) with monitoring of purge flow with tox sensor for potential leakage within sample system
- for containers with phosgene samples:
  - automatic shut off of container air inlet fans at phosgene alarm
  - container shall have a possibility for a temporary connection to the unit decomposition system for decontamination purposes (manually operated)
- alarming in control room



**The following concept shall be followed for samples that could lead to an explosive atmosphere inside the container:**

- automatic main power shut off to analyzer container at LEL alarm level
- sample flow limitation outside analyzer container
- sample filters outside analyzer container
- alarming in control room



**The following concept shall be followed if heat tracing is necessary to avoid sample condensation:**

Continuous heat tracing without interruptions is required to avoid cold spots.

This shall be realized by:

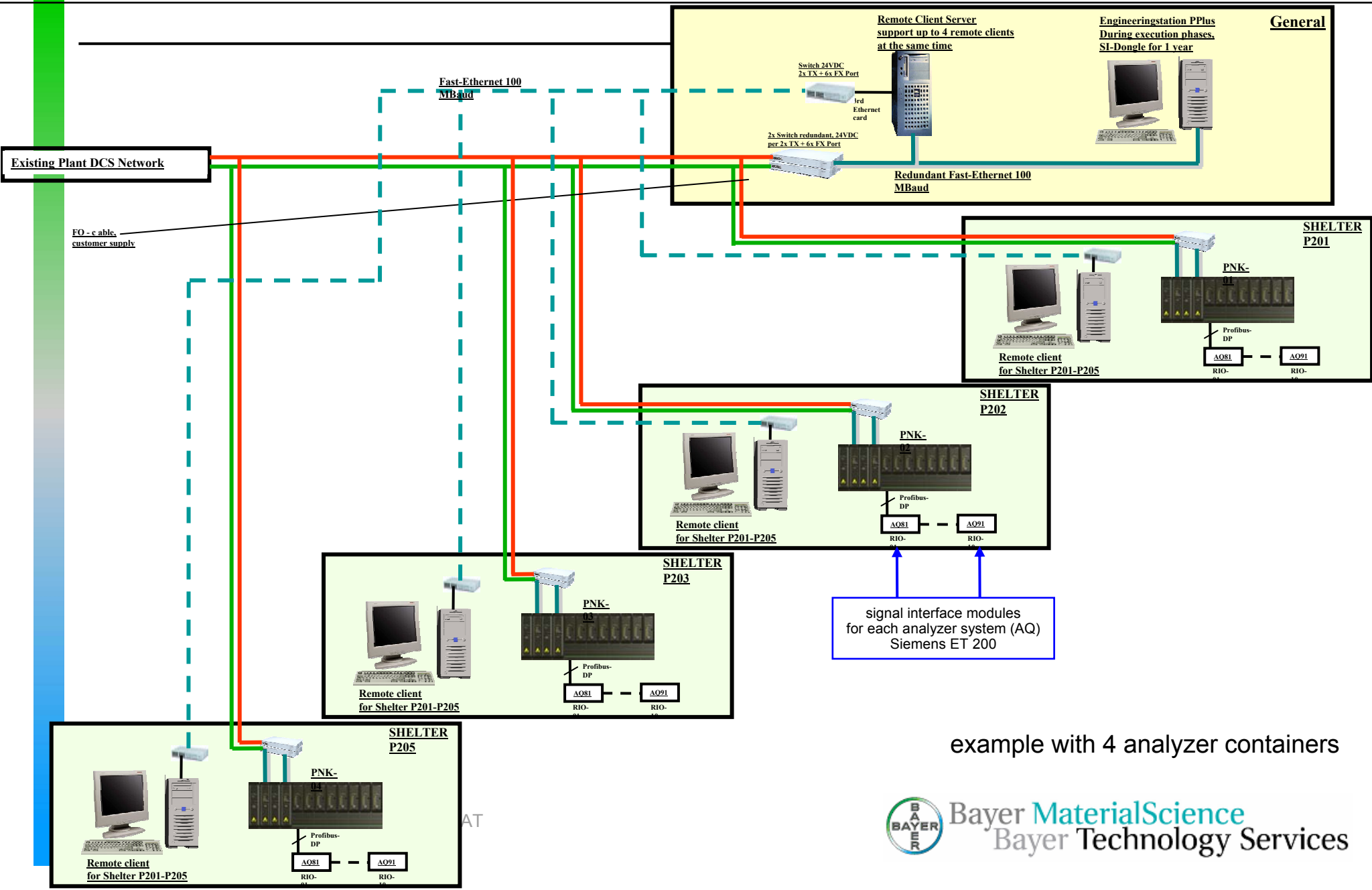
- installation of parts (valves, filters, ...) inside an electrically heated box with local temperature indicator and with temperature measurement (with signal to Delta V)
- outside the box: electrically heat traced tubing bundles
- temperature has to be at least 10 °C above condensation temperature of sample



- Each functional component of all analyzer systems (except probes) shall carry two name plates:
  - one with the tag number indicated in the P&IDs
  - one with a text describing the function of the components

The name plates shall be according to the following rules:

- engraved phenolic tag
  - white background with black letters
  - letter type ARIAL, letter size 4 mm (hight)
- 
- all piping and tubing shall carry a name plate with indication of flow direction. The name plates shall be according to BAYER WN 1203 and DIN 2403
- 
- all interfaces (electrical and mechanical) shall be clearly and permanantly tagged
- 
- all cables and wires have to be labeled on both terminations





For each DELTA V controller the following components shall be installed

Qty.	Part Number	Redundant controller and redundant sytem power supply, IO-components
2,00	VE3005	MD Controller
1,00	VE31RED	Controller Redundancy
2,00	VE5008	24/12 Vdc System Power Supply
2,00	VE3051C0	2-Wide Power/Controller Carrier
1,00	VE4014	Profibus DP I/O Interface with Termination Block
1,00	VE4050S2K1C0	8-Wide I/O Interface Carrier with Carrier Shield Bar
7,00	VE6101	Carrier Blank Cap





The following components shall be installed in the analyzer container.

The list shows the configuration for a container with a single controller.

Provider: Emerson

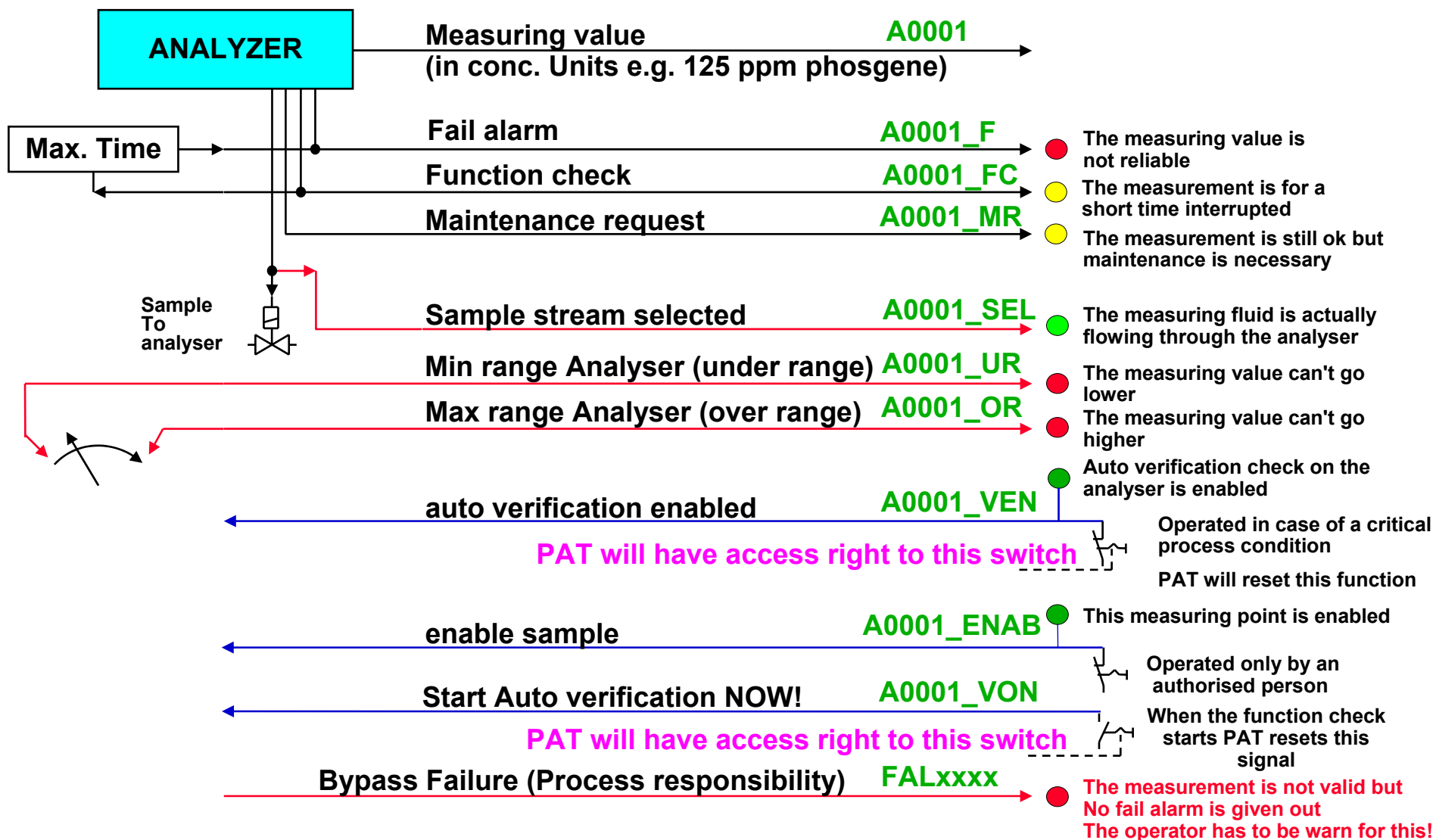
Qty.	Part Number	Fast Ethernet Network 100 MBaud redundant, Switch with 2x 24VDC power supply
3,00	RS2-3TX/2FX	Industrial Ethernet Switch for Twisted Pair and Multimode Fiber Optic, 2x 24VDC power supply -3 Ports 10/100BASE-TX, RJ45 -2 Ports 100BASE-FX, Multimode, SC
1,00	VE2508M99L01	Optiplex GX280 Desktop PC; Win XP Professional; Pentium-4 2.8 GHz (min) CPU; No Monitor; Ext Speakers; 40G (min) Drive; 1 GB RAM; 32X (min) DVD-CDRW Drive; Redundant Control Network Ports; 3rd Ethernet Port Remark: Monitor customer supply

Additional: 19" TFT monitor and 19" keyboard in drawer underneath monitor



Signal interface module based on SIEMENS ET 200 SC components:

This module is collecting all data to and from an analyzer system and is connected to the DELTA V system inside the analyzer container via PROFIBUS DP





info level 1: overview of all containers per production unit with status signals for each analyzer system / module

Example shows four analyzer containers (P201, P202, P203, P205) that belong to one production unit

AQ XX = analyzer system

indicators for  
analyzer system  
status:

FC = Function Check  
F = Failure  
MR = Maintenance Request

**DeltaV Operate (Run)**  
Module: AQ21\_VTIMER Main: KU\_OVV Username: ADMINISTRATOR 1:40:35 PM

**PC\_SHANGHAI OVERVIEW**

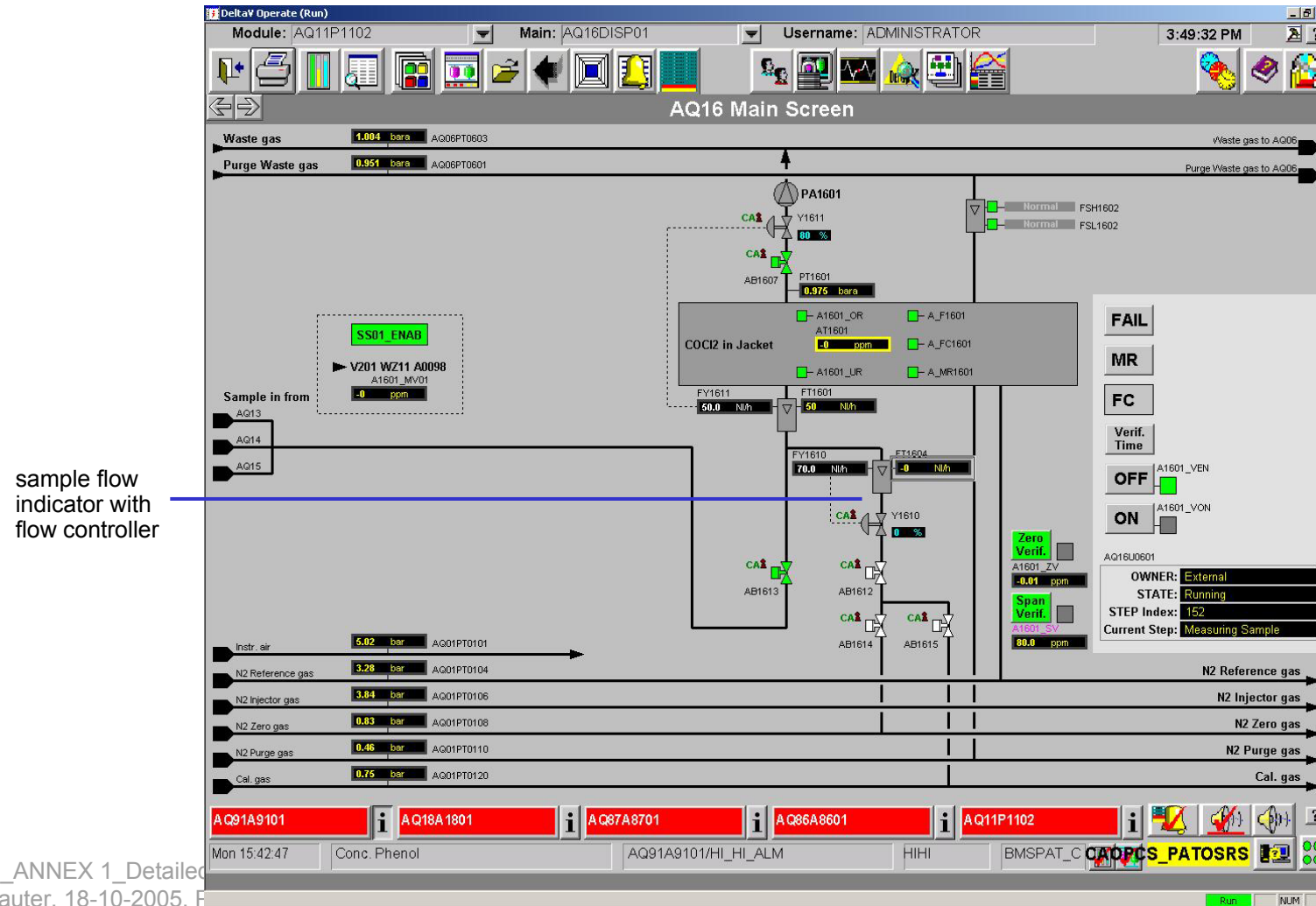
P201	P202	P203	P205
AQ01 [Green] F MR	AQ31 [Green] F MR	AQ51 [Blue] F MR	AQ81 [Orange] F MR
AQ06 [Green] FC F MR	AQ32 [Green] F MR	AQ52 [Blue] F MR	AQ83 [Orange] F MR
AQ09 [Green] F MR	AQ34 [Green] FC F MR	AQ54 [Blue] FC F MR	AQ84 [Orange] FC F MR
AQ11 [Green] FC F MR	AQ35 [Green] FC F MR	AQ55 [Blue] F MR	AQ85 [Orange] FC F MR
AQ12 [Green] FC F MR	AQ36 [Green] FC F MR	AQ56 [Blue] FC F MR	AQ86 [Orange] FC F MR
AQ13 [Green] F MR	AQ37 [Green] FC F MR		AQ87 [Orange] FC F MR
AQ14 [Green] F MR	AQ38 [Green] FC F MR		AQ88 [Orange] FC F MR
AQ15 [Green] F MR	AQ39 [Green] FC F MR		AQ89 [Orange] FC F MR
AQ16 [Green] FC F MR			AQ90 [Orange] FC F MR
AQ17 [Green] FC F MR			AQ91 [Orange] FC F MR
AQ18 [Green] FC F MR			
AQ19 [Green] FC F MR			
AQ20 [Green] FC F MR			
AQ21 [Green] FC F MR			

**Status Bar:**  
Mon 13:13:18 Pressure Phosgene inlet AQ11P1102/LO\_LO\_ALM LOLO BMSPAT\_C CADPCS\_PATOSRS



info level 2: simplified P&ID for each analyzer system (AQ XX)

display shows status of analyzer and sample supply and preparation components and gives access to analyzer system operation







info level 3: detailed status display for each analyzer system (AQ XX)

Display with detailed status of each analyzer system component with status memory for maintenance and trouble shooting support

DeltaV Operate (Run)

Module: AQ21\_VTIMER Main: AQ11DISP02 Username: ADMINISTRATOR 1:52:54 PM

AQ11 Fail Screen

**FAIL** **Reset Fail**

No.	Text	Loop	Func.	This cycle	Last cycle	No.	Text	Loop	Func.	This cycle	Last cycle
1	High Flow Measuring Gas	FT1101	AHH			17	Max - deviation Span Point	A1101_S	ALL		
2	Low Flow Measuring Gas	FT1101	ALL			18	Analyzer Fail	A_F1101	-		
3	Low Flow Analyzer purge gas	FSL1102	-			19	Max + deviation Zero Point	A1102_Z	ALL		
4	-	-	-			20	Max - deviation Zero Point	A1102_Z	AHH		
5	-	-	-			21	Max + deviation Span Point	A1102_S	ALL		
6	-	-	-			22	Max - deviation Span Point	A1102_S	AHH		
7	Low Flow Clock Out purge gas	FSL1103	-			23	Analyzer Fail	A_F1102	-		
8	High Temp. Cabinet 1	TT1101	AHH			24	-	-	-		
9	Low Temp. Cabinet 1	TT1101	ALL			25	-	-	-		
10	-	-	-			26	-	-	-		
11	-	-	-			27	-	-	-		
12	High Pressure Analyzer	PT1101	AHH			28	-	-	-		
13	Low Pressure Analyzer	PT1101	ALL			29	-	-	-		
14	Max + deviation Zero Point	A1101_Z	AHH			30	PROFIBUS Failure	-	-		
15	Max - deviation Zero Point	A1101_Z	ALL			31	-	-	-		
16	Max + deviation Span Point	A1101_S	AHH			32	Time FC too long	-	-		

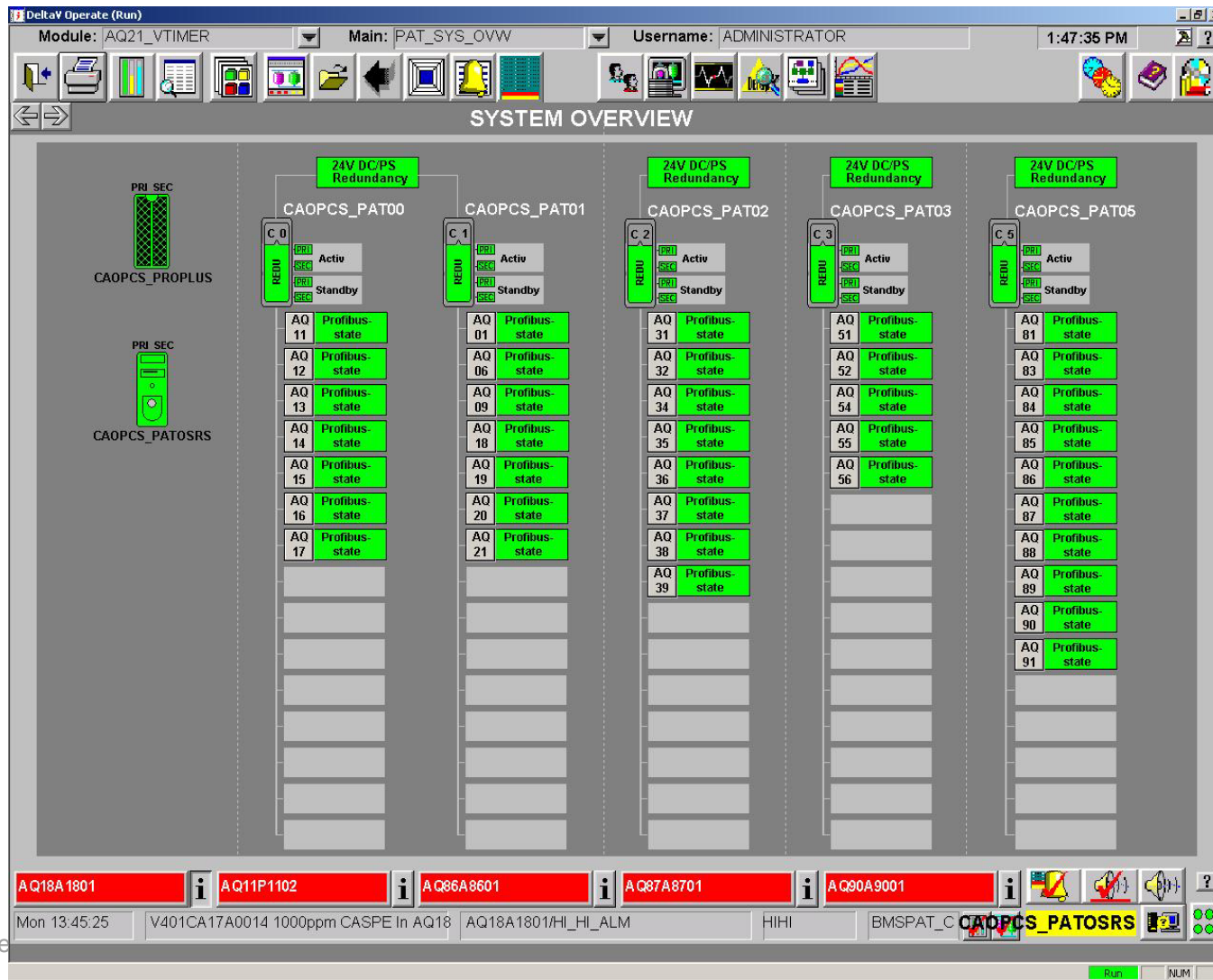
AQ85A8501 AQ18A1801 AQ11P1102 AQ86A8601 AQ87A8701

Mon 13:52:53 Conc. O2 AQ85A8501/Hi\_HI\_ALM HIHI BMSPAT\_C CADPCS\_PATOSRS





Display with overall DELTA V system status





Due to the fact that the automation of the analyzer systems shall be realized by Emerson DELTA V and in this respect is an integral part of the overall DELTA V system of the production unit the software shall be described according to the conventions and rules that are used for the PCT part !  
Particularly PBL according to the train standard shall be used for software generation.

It also shall be ensured that there is a separation between the analyzer containers and the production process such that visualization is possible for all users but control is only possible in the two areas by authorized personnel. This shall be realized by using different system areas for both the production process and the analyzer containers.



**Each analyzer container shall be equipped with the following additional infrastructure:**

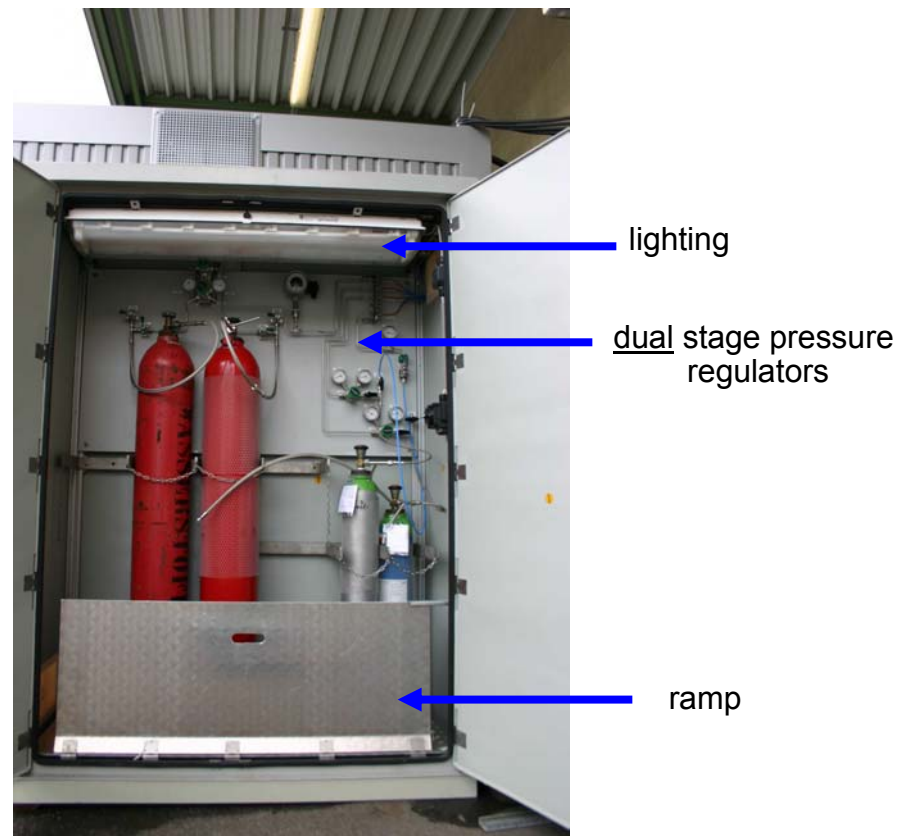
- smoke detector (not within PAT scope, will be installed on site by PCT group)
- loud speaker , alarm lights connected to the unit alarm system
- fire extinguisher (outside container)
- emergency shower (near container)
- eye wash bottle inside container



The cabinets for calibration gases shall be supplied according to the following design guidelines:



fiber glass cabinet for  
calibration gas cylinders



- back up for each gas cylinder
- automatic switch over to back up  
in case of users with higher consumption



# Design Guidelines for Analyzer Cabinets



walk in cabinet (with HVAC system and lighting)  
(color for Caojing: RAL 9006 silver-grey)

(max. wind load to be considered during design, see  
environmental conditions !)







# Description of the NIR system

(supplied by BAYER-BTS)

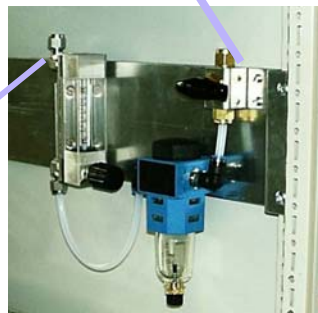
- spectrometer
- inline optical cells
- installation concept



LCD-screen

keyboard  
19" computer

instrument air  
~5 l/h for  
spectrometer



screen, computer and  
keyboard are parts of the  
measuring system, 230V,  
4 A

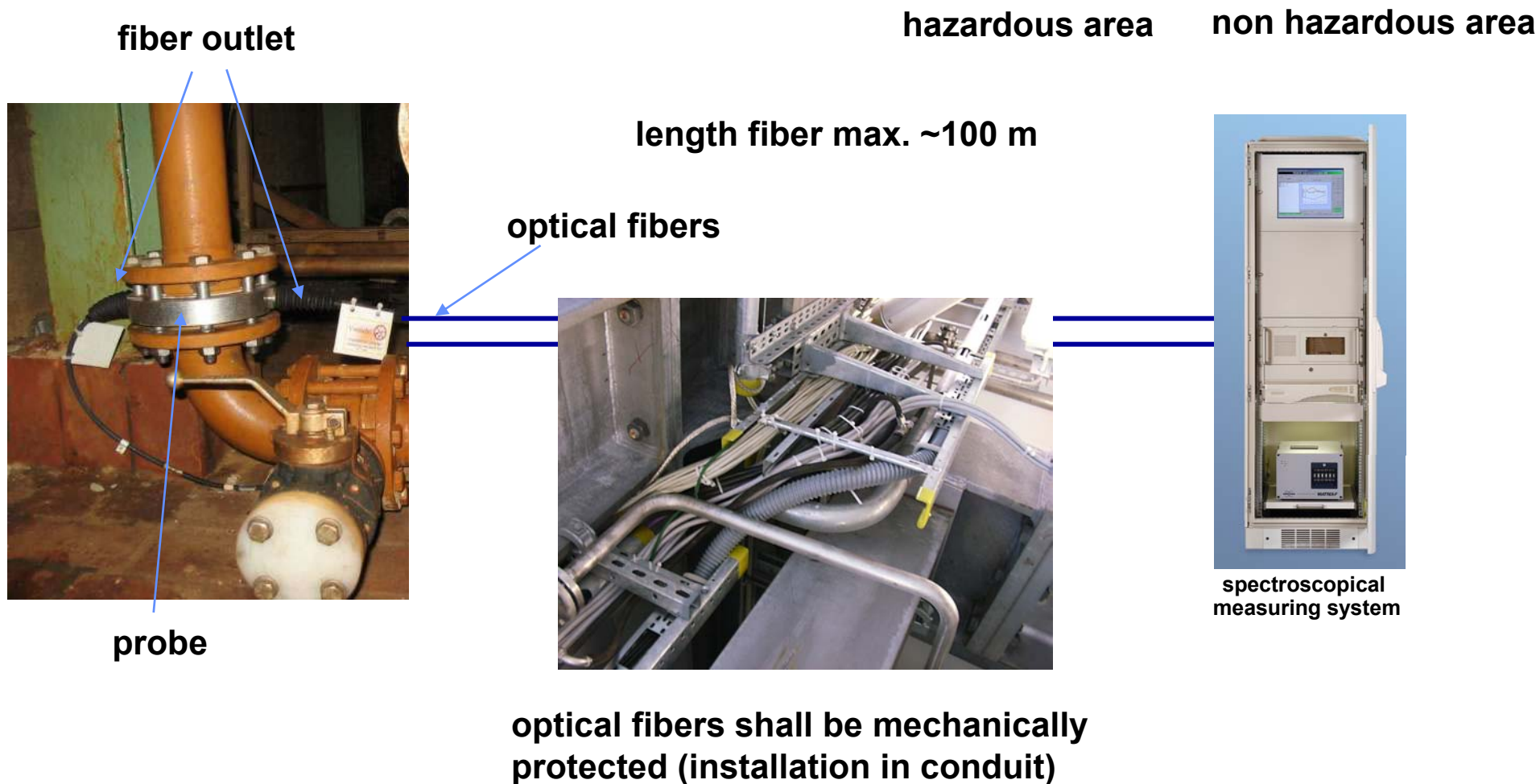
output optional: 4-20mA,  
Profibus DP, Modbus,  
Ethernet, ... , interface  
board is part of the  
measuring system

spectrometer





optical flow through cell for direct installation into process pipes





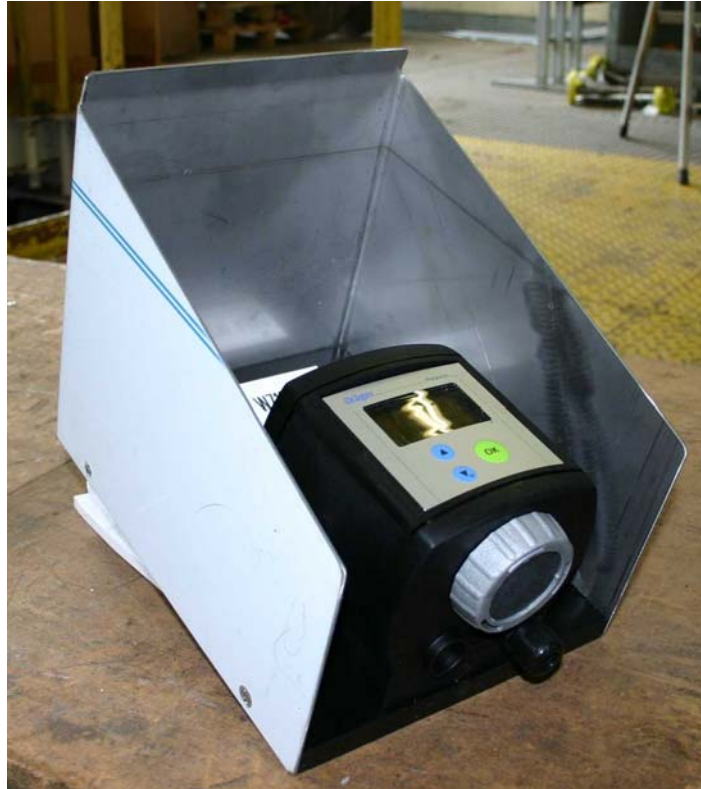
The fibre cables for this project are significantly more fragile than the data cables and the cables are also significantly more expensive. Accordingly, the manufacturer has issued the following installation safeguards and instructions:

- The NIR fiber cable has a quartzglass core of 0.66 mm (0.026") which makes it much more fragile than fibres used for communications.
- A broken fibre cannot be spliced or repaired in any way; it would require complete replacement of the cable.
- When installing the fibers in longer conduits the maximum pulling tension needs to be considered (risk of breakage of fiber).
- The maximum pulling tension is 6.7 lb or 30 N.
- The cable reel must be rotated as the cable is taken off so as not to impart any torsional (twisting) force on the cable.
- The minimum allowable bending radius, before, during and after installation, is 16 inches or 400 mm

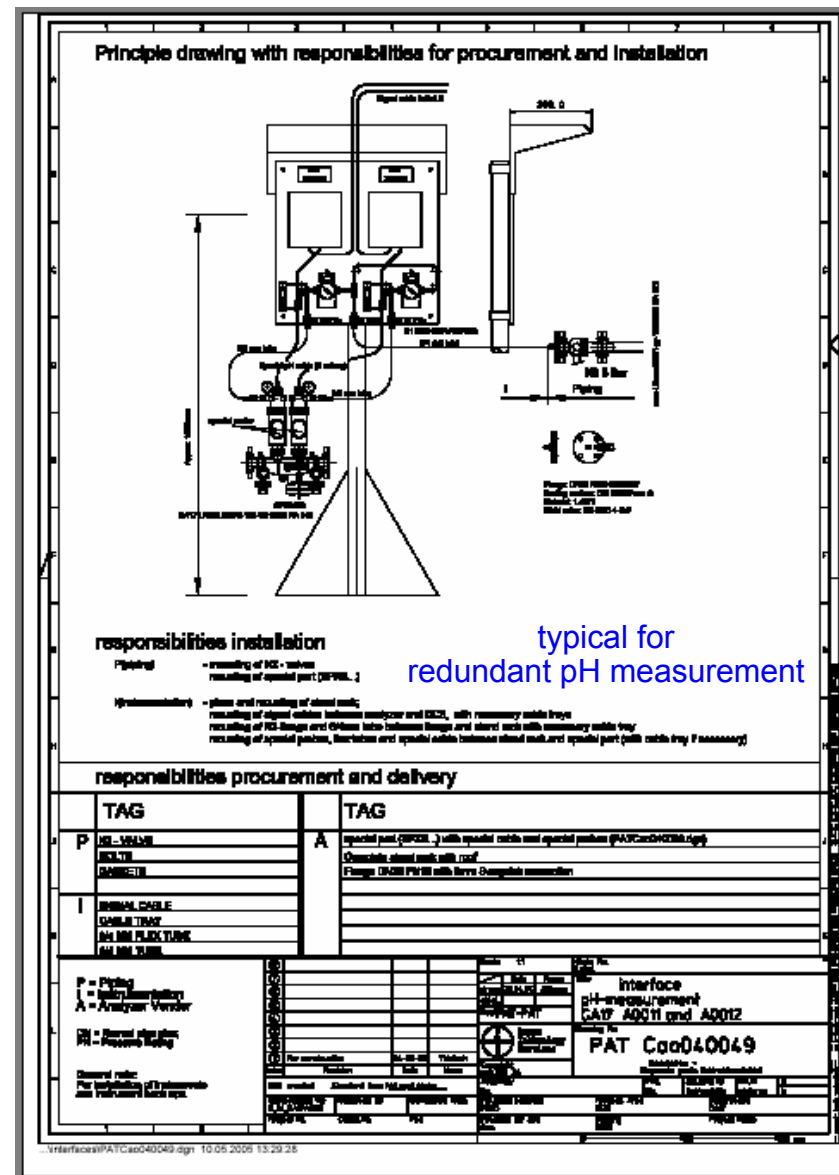
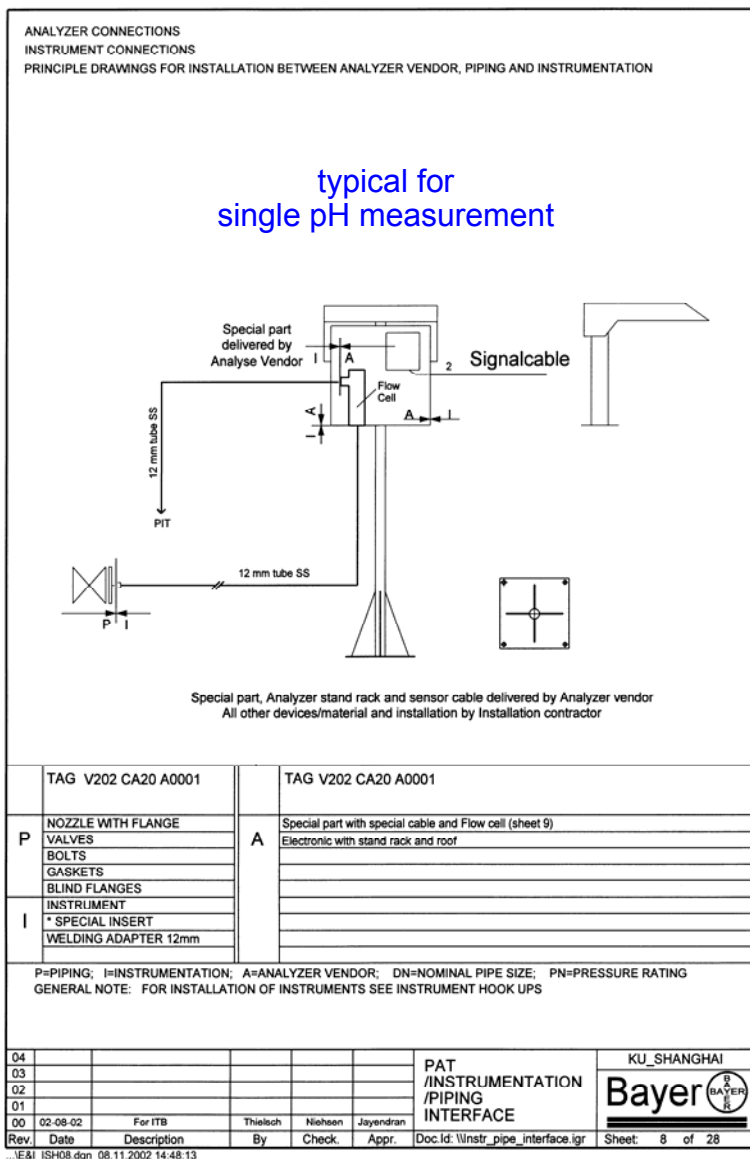


# Guidelines for Field Installations





gas sensor shall be mounted on panel  
with small protection roof for field installation





<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b>Fittings and Connectors</b>			
All Fittings and Connectors from Company Swagelok	SS316 / 1.4401		
<b>Valves</b>			
<b>Instrument air</b>			
Valve plug (manual, instrument air) 6mm	Valve - SS316 / 1.4401 - 6mm	SS-6P4T-MM	Swagelok
Valve plug (manual, instrument air) 12mm	Valve - SS316 / 1.4401 - 12mm	SS-12P6T-MM	Swagelok
<b>Regulation</b>			
Valve Bellow Regulation (manual) 6mm	Valve - SS316 / 1.4401 - 6mm	SS-6BMG-MM	Swagelok
Valve Bellow Regulation (manual) 12mm	Valve - SS316L - 12mm	SS-12BK-MM	Swagelok
Valve Regulation (manual adjustable) 12mm	Valve Regulation - 12 mm	SS-1RS-12MM	Swagelok
Valve Regulation (manual adjustable) 6mm	Valve Regulation - 6 mm	SS-1RS-6MM	Swagelok
<b>Process medium</b>			
Valve Diaphragm (manual, low pressure) 6mm	Valve DP	6LVV-DPS6M	Swagelok
Valve Diaphragm (NC, high pressure) 6mm	Valve DP	6LVV-DPHS6M-C	Swagelok
Valve Diaphragm (NC, low pressure) 6mm	Valve DP	6LVV-DPS6M-C	Swagelok
Valve Bellow (NC, low pressure) 12 mm	Valve Bellow BK	SS-12BK-MM-1C	Swagelok
Valve Bellow (manual, low pressure) 12 mm	Valve Bellow BK	SS-12BK-MM	Swagelok
Valve Diaphragm (manual, high pressure) 6mm	Valve DL DS	SS-DLS6MM	Swagelok
Valve Diaphragm (NC, high pressure) 6mm, NC	Valve DP	6LVV-DPHS6M-C	Swagelok
<b>Tox auxiliary medium</b>			
Valve Ball (manual, high flow) 6mm	Valve Ball 60	SS-62TS6MM	Swagelok
Valve Ball (manual, high flow) 12mm	Valve Ball 60	SS-63TS12MM	Swagelok
Valve Ball (manual; 6mm)	Valve Ball 40 (43-Series)	SS-43S6MM	Swagelok
Valve Ball (manual;12mm)	Valve Ball 40 (45-Series)	SS-45S12MM	Swagelok
Valve Ball Pneumatic 3 way 12mm single valve dual acting	valve 83	SS-83XKS12MM-53D	Swagelok
Valve Ball Pneumatic 3 way 12mm double valve dual acting	valve 83	SS-83XKS12MM-53DDM	Swagelok
Valve Ball oval handle extension 100mm, RED Handle;12mm for "high temp	Valve Ball 60 (C1000)	SS-63TS12MM-EK4-rd	Swagelok
<b>Check Valves</b>			
Valve Check & Relief (manual adjustable, low pressure) 6mm	Valve - SS316 / 1.4401 - 6mm	SS-6CA-MM-3	Swagelok
Valve Check (0,02 bar) 12mm	Valve - SS316L - 12mm	SS-12C-MM-1/3	Swagelok
Check Valve 12mm (85 PSI = 5,9 bar Opening Pressure)	Valve - SS316 / 1.4401 - 12mm (5,9 bar Opening Pres	SS-CHS12MM-85	Swagelok
Check Valve 12mm (25 PSI = 1,7 bar Opening Pressure)	Valve - SS316 / 1.4401 - 12mm (1,7 bar Opening Pres	SS-CHS12MM-25	Swagelok
Check Valve 12mm (1 PSI = 0,06 Bar Opening Pressure)	Check Valve - C8-serie - 12mm (0,07 Bar Opening Pre	SS-12C-MM-1	Swagelok
Check Valve 6mm (1 PSI = 0,06 Bar Opening Pressure)	Check Valve - C4-serie - 6mm (0,07 Bar Opening Pres	SS-6C-MM-1	Swagelok
<b>Corrosive Medium</b>			
Valve Diaphragm (manual, low pressure) G1/4" - (6mm), DN04, PVDF	Valve - PVDF - 6mm	5B 0100.00 - 051200f1	EM - Technik GmbH
Valve Diaphragm (NC, low pressure) G1/4" , DN05, PVDF	Valve - PVDF - 6mm	5P 0111.00 - 041200f1	EM - Technik GmbH
Valve Diaphragm (manual, low pressure) G1/4" - (12mm), DN04, PVDF	Valve - PVDF - 12mm	5B 0100.00 - 051200f1	EM - Technik GmbH



<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b>Water</b>			
Valve Ball (manual; DA 20; PVC)	Valve-ball type 546; PVC-U ;DA 20; EPDM 6112099	GF 161 546 062 DA 20 K-MUF	ThyssenKrupp Schulte
<b>Filters</b>			
<b>Auxiliary mmedium</b>			
Filter 25u Balston 45S6 1/2"NPT	balston PK4-3	45S6	Parker Hannifin GmbH (Balston)
Filter 5u Balston 45S6; In/Out 1/2"NPT ; Drain 1/8"NPT	balston PK4-3	45S6	Parker Hannifin GmbH (Balston)
<b>Process</b>			
Filter (2µm, all welded, in-line)	Filter	SS-6FW-MM-2	Swagelok
Filter 25u Balston 45S6 1/2"NPT	balston PK4-3	45S6	Parker Hannifin GmbH (Balston)
Filter 5u Balston 95S6; Ports: 3 x 1/4" NPT	balston PK2-8(B)	95S6-1/4	Parker Hannifin GmbH (Balston)
Aerosolfilter CLF-5/W	CLF-5/W	03F3005	M&C
Filter 5u Balston 45S6; In/Out 1/2"NPT ; Drain 1/8"NPT	balston PK4-3	45S6	Parker Hannifin GmbH (Balston)
Filter 5u Balston 45S6; In/Out 1/2"NPT ; Drain 1/8"NPT	balston PK4-3	45S6	Parker Hannifin GmbH (Balston)
Filter PVDF/Glas with GL25-Outlet, F-element PTFE 20µm	FP-20T-D	02F1200	M&C
Filter body for measurement COCl2 in ambient air, with filter, with two G1/2" female	Filter with two G1/2" Female connection	-	Bayer Industrie Services
Filter PVDF/Glas with GL25-Outlet, F-element PTFE 20µm	FP-20T-D	02F1200	M&C
Sintered metal filter (Ambient air monitoring system for COCl2)	SIKA R2AX Material 1.4404 (25mm x 3mm)	according Quotation AX-050701-2 (01.07.2005)	GKN Sinter Metals Filters GmbH
<b>Sun -Control</b>			
Filter for H2O (oneway) 6 mm tube PP, PTFE	water filter (sun control) PP, PTFE	WT205 R	Sun - Control
Filter for H2O (Bypass) 1/4" NPT 1.4401	water filter (sun control) 1.4401	WT2087 e	Sun - Control
Filter for H2O (Bypass) 1/4" NPT PVDF	water filter (sun control) PVDF	WT2048 N	Sun - Control
Filter for AEROSOL 6/4 tube connections PVDF/Glas	SUN SF20.13	SUN SF20.13	Sun - Control
HCL Absorber	SUN ABS 20.03	SUN ABS 20.03	Sun - Control
<b>Flame arrestors</b>			
Flame arrestor; SS 1/4" NPT female	1.4305 - 1/4" NPT Female	RF85-10 ES (for 80°C)	Witt
Flame arrestor; 1.4571 G1/4" female, (12mm tube)	PROTEGO DR/ES-10-IIC	A.-Nr. 207 110 1 22 0002/0103/086117	Protego
<b>Solenoid and control valves</b>			
Valve terminal CPV 10-VI (8 x MV 3/2)	10P-10-4A-MP-R-A-4C+ZURA	18 200	Festo
Valve terminal CPV10-VI (16 x MV 3/2)	10P-10-8A-MP-R-A-8C+ZURA	18 200	Festo
One-way flow control valve (for CPV10)	GRLZ-M5-QS-6-D	19 31 55	Festo
Solenoid valve 5/2 monostable for CPV10	CPV10-M1H-5LS-M7	16 14 14	Festo
valve pneumatic Festo 1 x PV 3/2	VL/0-3-1/4-EX	53 60 29	Festo
valve pneumatic Festo 1 x PV 5/2	VL-5-1/4-EX	53 60 33	Festo



<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b><u>Pressure Reducer</u></b>			
<b>High flow</b>			
Pressure Reducer SS316 single stage 1 LP PG 150-... bar-g high flow (... mm conn)	Pressure Regulator (High Flow Cv: 0,2)	KPR1H1C5GA10A00-WS ... MM	Swagelok
<b>High tightly for sensitive cal. Gas (all-metal, welded con.)</b>			
Pressure Reducer station Calibration gas	Pressure Reduce Station	ASSEMBLY-KPR-DL-FM-N2-WS... MM-STATION	Swagelok
<b>Normal quality for cal. Gas</b>			
Pressure Reducer station Calibration gas	Pressure Reduce Station	ASSEMBLY-KPR-43T-TH-N2-STATION	Swagelok
<b>For H2</b>			
Double reducing station for hydrogen	Pressure Reduce Station change over system; SS316	KCM1LBC3GA1022	Swagelok
Extention for Pressure Reducer station 100% H2, (C1705)	Pressure Reduce Station	ASSEMBLY-KIT-DL-FM-H2DIN477	Swagelok
<b>Reducer with Filter</b>			
Filter regulator MS4-LFR	MS4-LFR-1/4-D5-C-R-M-WB	52 64 89	Festo
Filter regulator MS4-LFR (with flex tube connectors)	MS4-LFR-1/4-D5-C-R-M-WB	52 64 89	Festo
<b><u>Flowmeters</u></b>			
Flowmeter DK800 (with Needle valve 1mm) min ... - ... l/h N2 25 °C ...bar	Flowmeter DK800	offer 237372 Rev 3 pos.: 10 - VG34	Krohne
Flowmeter H250 (without Needle valve) ...-...l/h water 25°C 1 bar	H250/RR/M9	offer 237372 Rev 3 pos.: 50 - VG34	Krohne
Flowmeter DK34 (without Needle valve) ...-...l/h N2 25 C ...bar 18mm tube (without	Flowmeter DK34	offer 237372 Rev 3 pos.: 80 - VG47	Krohne
Flowmeter DK32 (with Needle valve, no switches) ...-...l/h N2 25 C... bar 1/4" NPT	Flowmeter DK32		Krohne
Flowmeter DK37 (with Needle valve) (4-20mA) ...-...L/h N2 25 C ...bar 1/4"NPT	Flowmeter DK37	offer 237372 Rev 3 pos.: 160 - VG48	Krohne
Flowmeter Sitrans 20-200 l/h H2O 1/4 NPT	Sitran P DS III	7MF4433-1EA02-1BB7-Z+A02+B11+Y01+Y15+Y21	Siemens
Flowmeter IDM, 0-6000 l/h water	Promag 53H DN15 1/2" PFA / 20x2-PVC; Output: FF	53H15-SB2B1AC1ABAK (Quot. 712080967/30.09.2004)	Endress+Hauser
<b><u>Pressure transducers</u></b>			
Pressure transducer abs. (... - .... bar ....) 6mm tube adapter	Pressure transducer - SS316 - 6mm	PTI-S-A.....-12AS	Swagelok
<b><u>Pressure Gauges and switches</u></b>			
<b>63mm diameter</b>			
Pressure Gauge 63mm SS316 ..... bar-g	Pressure Gauge - SS316 / 1.4401 - 6mm	PGI-63B-BG.....-LASX	Swagelok
<b>100mm diameter</b>			
Pressure Gauge 100mm SS316 ..... bar-g Namur Min (813.1)	Pressure Gauge - SS316 / 1.4401 - 12mm	PGI-100B-BG.....-LATX-831.1	Swagelok
<b>Switch</b>			
Pressure switch 0-10bar	SDE5-D10-O-Q6E-P-K 3X	52 90 27	Festo
Pressure switch, adjustable, G1/4"	PEV-1/4-B	10 773	Festo.



<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b>Temperature sensor</b>			
Resistance thermometer (PT100)	WIKA_TE6019	TR730-Y-14B-ZZ-ZT...150S5000Z-ZZ	Wika
Thermocouple Ni CrNi d = 6mm, l=150mm	WIKA_TE6540	TC730-Y-A21-ZZ-ZT60150S5000Z-ZZ	Wika
Digital Temperature Transmitter	WIKA_TE32.10	T32.10-002-GKS-Z (with BPO parameters)	Wika
Bimetal thermometer 0-60°C Typ 52/1/L=63mm	WIKA_Model 52	A52.050-1-C1C-BB-B063-VZ-Z	Wika
<b>Typical Remote IO components</b>			
Circuit-breaker 2A	5SX2102-7	5SX2102-7	Siemens AG A&D Köln
Switch / Proximity detector interface (2 in / 2 out), MTL5017	two channel, with line fault detection and phase reverse	MTL5017	MTL
Repeater power supply, MTL 5044	two channel, 4-20mA for 2-wire transmitters	MTL5044	MTL
AI Isolation and power supply amplifier 4-20mA Hart	MTL5042	MTL 5042	MTL
Power supply bus for MTL (8 Module), PB - 8T	Power supply cable for 8 MTL Modules	PB - 8T	MTL
DIN rail, steel, perforated, height 7,5mm width 35mm length 2m	NS 35/7,5 (1 unit = 2 meter) perforated	080 17 33	PHOENIX
CONNECTION TERMINAL UK10 GRIJS	UK 10 N	300 50 73	PHOENIX
CONNECTION TERMINAL UHK 4-FS/FS(12-2,8-0,8)	UHK 4-FS(8-2,8-0,8)	201 72 37	PHOENIX
RELAY 24VDC 2 X CHANGE OVER	EMG 17-REL/KSR-24/21-21-LC	294 03 91	PHOENIX
CONNECTION TERMINAL USLKG 10	USLKG10	442 011	PHOENIX
SOLID BRIDGE FB 10-10	FB 10-10	02 03 179	PHOENIX
CABINET 600X200X123mm	BG Bus system cabinet RAL 7032	1.559.210	RITTAL
PROFIBUS CONNECTOR SINEC L2-DP + PG	SIMATIC DP, connector plug for Profibus, 90 degree c	6ES7 972-0BB12-0XA0	Siemens
PROFIBUS BUSCABLE		6XV1830-0EH10	Siemens
EL. SUBMOD. 1 X AO, 4...20 MA		6ES7 124-1GA00-0AB0	Siemens
EL. SUBMOD. 2 AI, 4...20 MA	SIMATIC SC, Electronic module, 2 AI, 4...20mA. +/-20	6ES7 123-1GB00-0AB0	Siemens
TB16SC TERMINAL BLOCK	SIMATIC SC, Terminal block, TB16SC, for expansion	6ES7 120-0AH01-0AA0	Siemens
EL.BLOCK FOR ET 200L-SC, 16DI/16DO 24VDC	SIMATIC DP, Elektronik block, for ET 200L-SC, 16 DI/	6ES7 133-1BL11-0XB0	Siemens
TB32L TERMIN. BLOCK FOR ET 200L	SIMATIC DP, Terminal block, TB32L, 32 channels for	6ES7 193-1CL00-0XA0	Siemens
EKSTRA TERMINAL BLOCK FOR TB16SC	SIMATIC SC, Additive clamp, 16 channels	6ES7 120-2AH00-0AA0	Siemens
EL. SUBMOD. 2 AI, 4...20 MA	SIMATIC SC, Electronic module, 2 AI, 4...20mA. +/-20	6ES7 123-1GB00-0AB0	Siemens
<b>Electrical Heater</b>			
Electr. Heater (300W radiator) Ex		CP Varitherm DPA 300 T3 60	intertec Hess GmbH
Electr. Heater (200W radiator) Ex		CP Varitherm DPA 200 T3 40	intertec Hess GmbH
<b>Cooler</b>			
Compressor gas cooler, 1 stream, 230V/50Hz	ECM-1	02K7500X	M&C
Jet stream heat exchanger, 1 stream, 1.4571	ECM-1SS	93K0160	M&C
Liquid cooler with G1/2" female connetions	LTC cooler according offer no.: 411828 Pos.: 8 - 8.3	04K3000+04K9010+04K9020+04K9030;0-120°C NPT	M&C







<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b>Bundle Cables and attachments</b>			
Bundle Cable n x . . . mm - 1.4571 - (PVC, without isolation)	according Quotation : I-786 / 6464 (22.07.2005)	7049609	KM Europa Metal AG / Osnaline
Bundle Cable n x . . . mm - 1.4571 - (PVC cover, with isolation), electrical heated	according Quotation : I-786 / 6464 (22.07.2005)	7076023	KM Europa Metal AG / Osnaline
Tube ...mm - 1.4571 seamless (PVC jacket, without isolation)		according Quotation : I-786 / 6431	KM Europa Metal AG / Osnaline
Integrated connecting system JBS-100E with heating band feed through	according Quotation : I-786 / 6464 (22.07.2005)	7075970	KM Europa Metal AG / Osnaline
Termination E-150	according Quotation : I-786 / 6464 (22.07.2005)	7075971	KM Europa Metal AG / Osnaline
Shrink partion cap	ATK-6R-10/12 add. Part	according Quotation : I-786 / 5817d	KM Europa Metal AG / Osnaline
<b>Pumps</b>			
Air stream pump 6mm			Bayer Industrie Services
Air stream pump 12mm			Bayer Industrie Services
Sample pump, P2.4, 230V/50Hz, for heated boxes, EX-Proof	Head: 1.4571; Valves: 140°C P2.4 Atex	426 211 2299	Bühler
Sample pump, P2.3 SP, 230V/50Hz, Non-Ex, PTFE	Head: PTFE, 180° rotated; Valves: 80°C	425 6121 199	Bühler
Vacuum pump, 230V/50Hz, Non-Ex,	ME 4		Vacuubrand
<b>Electrical Switches</b>			
Company Stahl			
<b>Air generator</b>			
Zero Air Generator	76-803NA	HPZA-3500-220	Parker Hannifin GmbH (Balston)
Pure Air Generator (CO2 Adsorber)	CO2RP140	CO2RP140	Domnick Hunter
<b>Lighting</b>			
Ex emergency light with storage battery, Zone 2 T3,	6008/542-9617-6120 (Notlicht m. Zweist. 2 x 40W)	according Quotation SVW5V5008411029054A Pos 0003	Stahl
Ex lighting for Zone 1 T3	6000/542-9511-6250-C1135 (Leuchte m. Zweist. 2x36)	according Quotation SVW5V5008411029054A Pos 0002	Stahl
<b>Alarm system</b>			
Alarm-Panel for Container. EEx de IIC T6 for Zone 1 or 2 (6 Lamps red - 2 switches)	8146/5... (Steuerkasten komplex gem. Geräteliste)	according Quotation SVW5VE008412-029997A Pos 0002	Stahl
Switch for Alarmsystem Zone 2 T3	8040/1180.008-2+r abzb.0-022 (8040/Befehlsgerät ger	according Quotation SVW5V5008411029054A Pos 0009	Stahl
Switch panel for Alarmsystem Zone 2 T3	8040/1380.001+I/gn-022.008-2+r abzb.0-022.010-021	according Quotation SVW5V5008411029054A Pos 0008	Stahl
Box with Electronic for alarm system, for Zone 2 T3 (V4A 8125 / -917 - 2 EEx nR	94... (Baugruppen I.S.1 gem. Spezifikation)	according Quotation SVW5VE008412-029997A Pos 0003	Stahl
Alarm-Panel for Container. EEx de IIC T6 for Zone 1 or 2 (10 Lamps red - 2 switches)	8146/5... (Steuerkasten komplex gem. Geräteliste)	according Quotation SVW5VE008412-029997A Pos 0001	Stahl
Buzzer gas alarm, Zone 2 T3	8492/111 (Sonder IIC)	according Quotation SVW5V5008411029054A Pos 0010	Stahl
Lamp for gas alarm, Zone 2 T3	6161/2-61-621 Blitzleuchte 12V...48V DC	according Quotation SVW5V5008411029054A Pos 0011	Stahl



<u>Description</u>	<u>Type</u>	<u>Order No.</u>	<u>Vendor</u>
<b>Air condition</b>			
WATER COOLED WATER CHILLER FOR INDOOR INSTALLATION	CAS 51	KL 641 142	Clivet / Polenz
Cooling water controller	WVFX	ZU 630 200	Clivet / Polenz
Electric powered air heater	9 kW	SA 310 013	Clivet / Polenz
Main switch with interlock	QS1	QS1	Clivet / Polenz
Air filter for duct installation, DN 250	TFE25		1.490.044 Maico
Pipe ventilator, DN 250, AC, explosion proof	DZR25/ 2 B E EX		860.702 Maico
Temperature sensor for air temperature measurement in	DRH 25-6	DRH 25-6	Maico
Swing type check valve, 400 x 345	ARK 400x345	GIA 000 TRNE 0105	Trox
Termination fence, 318 x 252	No.43 318x252	FKA 000 TRNE 0101	Trox
Swing type check valve, DN 250	AVM 25		930.007 Maico

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## Annex 3 : Structural Design of Analyzer Containers

ALHO system container "Basic"

=====

Dimensions:

Width and lengths: project specific

Height: 2,84 m

Clear room height: 2.50 m

### **Statics:**

stackable design according to type tested static calculations

On request, you will receive type tested statical calculations and the respective foundation drawing, if we are awarded the contract. If necessary, supplement on type statical calculations.

Statistical calculations will be delivered in German and English.

### **Quality control:**

All materials used with the container have been submitted to quality control and found uncontaminated.

We are a licensed welding shop qualified according to DIN 18800 part 7

### **Frame construction:**

On the bottom with container angles, on top with jack ring plate

Room layout and layout of windows and doors according to the enclosed drawing No.

For more details, see the following description of work.

Self-supporting welded 5/6 mm steel frame structure, hot galvanized, zinc plating approx. 80-100 my  
Sendzimier galvanized U sections of the roof

### **Roof:**

D 3 – 225 mm roof frame – structure from top to bottom:  
Galvalum coated sectional sheet, with 2 gutters soldered to the face, formed as a trough roof.

- Storm water drainage through 4 downpipes protected in the container corners
- 40 mm insulation in the reinforcing creases of the sectional sheet
- 40 mm mineral wool



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- 100 mm DP/SP mineral wool
- roof load  $100 \text{ kg/m}^2$  ( $1000 \text{ N/m}^2$ )
- heat insulation value:  $u = 0.267 \text{ W/m}^2 \text{ K}$

### Interior lining:

Ceiling with 12 mm Duripanel plates,  
with latex coating in the installation room

Glass fibre-reinforced plastic ceiling with fibre glass lengths laid  
in 2 layers, beige, with transparent varnish sealing

### Floor:

B 4 – Circumferential C floor frame

Structure from bottom to top :

- False floor of galvanized flat plate,  
Plate to be screwed on the floor assembly.
- Floor cross girder I 120
- 120 mm mineral wool
- Floor load  $3500 \text{ N/m}^2$  on ground floor (without load in  
special cases)
- 300 my PE vapour barrier
- Heat insulation value:  $u = 0.301 \text{ W/m}^2 \text{ K}$

Installation areas: neither false floor plates nor insulation.

Water tight glued 18 mm plywood panels, AW 100

### Floor covering:

Glass fibre-reinforced plastic floor with fibre glass lengths laid in  
2 layers, with raised sides to form trough,  
beige, with spread slip resistant granulated material and  
transparent varnish sealing

In the open area:

2.5/4.0mm aluminium channelled plate

2.5/4.0mm aluminium channelled plate  
as baseboard per running metre

### Floor drains:

2

Plastic floor drain in the tool room

Drain: DN 25, with DN20 shut-off valve to be included in the  
shipment for later assembly.

Make: Nicoll ES or equivalent

To be sufficiently embedded in the plywood floor, so that no  
water can remain stagnant in the room.

The connection will be laid outside (outer edge of container).

Sufficient installation material to be included in the shipment

### Outer wall:

AW 1 – stationary outer wall,

Steel frame construction of galvanized U sections,

Structure, ectoentad:

- galvanized sectional sheet, varnished
- 60 mm mineral wool
- heat insulation value:  $u = 0,565 \text{ W/m}^2 \text{ K}$

### Interior lining:

Walls with 12 mm Duripanel plates,

In the installation room: sectional sheet interior lining

Varnishing similar to exterior finish



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### Wall openings

Openings in the inner wall according to drawing, sealed towards insulation, glass fibre-reinforced plastic drawn out beyond the edge of the cutouts, framed with stainless steel sections (WN 1.4571)

Dimensions: xxx/xxx mm (inside width) accord. to drawing

Wall openings with 4 or 6 8x20 mm stainless steel stay bolts

Wall openings in the outer wall accord. to drawing, sealed towards the insulation, glass fibre-reinforced plastic drawn out beyond the edge of the cutouts, framed with stainless steel sections (WN 1.4571)

Dimensions: xxx/xxx mm (inside width) accord. to drawing

Wall openings with 4 or 6 8x20 mm stainless steel stay bolts

Transfer panel according to drawing

Material thickness: 2.5 mm

Material: 1.4571

Bore holes: according to drawing

Manufacturer: Fa. ML Feinmechanik GmbH

### Exterior finish

Roof frame in RAL

Floor frame in RAL

Corner supports in RAL

Walls in RAL

All steel parts not galvanized will be additionally primed with a rust proofing agent

Glass fibre-reinforced plastic walls with fibre glass lengths laid in 2 layers, beige, with transparent varnish sealing

### Interior wall

IW 10 - 40 mm framed steel interior wall

- 40 mm mineral wool

### Interior lining

Walls with 12 mm Duripanel plates,

Interior lining in the installation room: sectional sheet,

Varnishing similar to exterior finish

Glass fibre reinforced plastic walls with fibre glass lengths laid in 2 layers, beige, with transparent varnish sealing

### External door:

1

Single-leaf steel door accord. to DIN 4102,

Smoke tight accord. to DIN 18095, dimensions: 112.5 x 212.5cm with:

- 42 mm door leaf, welded on three sides, galvanized

1 mm steel sheet with fireproofing insert, varnished

2 construction hinges with ball bearing

lowerable floor sealing (Rw P approx. 36 dB)

- Glass cutout approx. 550 x 950 mm

- Panic lock with bilateral door opener incl. profile cylinder

- Round lever handle set, black

- 2 mm galvanized steel frame, varnished

- Make: Teckentrup or equivalent

- Colour of door leaf and frame: in RAL .....



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- External doors:** 1 Dorma TS 92 overhead door closer, with slide bar with reinforced fastening from within.
- Sill in the floor area of the external door: 25 mm high, surfaced with glass fibre reinforced plastic and kick-strip with warning marking in black and yellow
- Wall openings:** 1 Wall openings in the outer wall accord. to drawing above installation passage or in the installation area
- Hilti rails:** MS21 Hilti rail system, backed with caulking strip, on the roof and all side walls in 100 cm spacing.  
Partitioning according to floor plan