Operating Instructions of the Booth control with a

GF1 Touch Panel

CAUTION!
Do not put the coating system into operation before the safety instructions in this handbook have been studied thoroughly!

Identification:	Pages:	Date:
Operating Instructions-GF1.doc	**38**	**18.12.2001**

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1 Safety rules for Electrostatic powder coating

1. This equipment can be dangerous when it is not operated according to the recommendations in these Operating Instructions.

2. The equipment must also be operated according to the local regulations where it is set up.

3. The Operating Instructions for running the powder recovery equipment, the reciprocator, and all other attached plant must be carefully observed.

4. All electrically conductive parts, which are within a distance of 5 m of the coating position, and especially the workpieces must be grounded.

5. The floor of the coating area must be electrically conductive (normal concrete is generally conductive).

6. The operating personnel must wear electrically conductive footwear (e. g. Leather soles).

7. A good metallic connection between the gun control unit, the coating booth, and the conveyor or the workpiece hooks is a prerequisite

8. The power cables, and powder supply hoses to the gun must be laid out so that they are well protected from mechanical damage.

9. The powder coating equipment must only be switched on after the booth is in operation. If the booth stops, the powder coating equipment must also switch off.

10. The grounding of all conductive parts is to be checked at least once a week.

11. The ground leakage resistance of the contact point for each workpiece can be maximum 1 MOhm. The construction of the workpieces, and workpiece hangers must ensure that the workpieces remain grounded. NOTE: Because workpieces are grounded through metal hooks, it is important that these hooks are cleaned regularly, in order to inhibit the formation of an insulating coating of melted powder.

12. When cleaning the gun, and changing the nozzles the control unit must be ***switched off.***

2 General operation

2.1 Automatic equipment with PLC and Operator Panel

The Touch Panel is a monitor through which all the data, and control commands for the automatic coating equipment are directly input with „fingertips“. The process control and process display simplifies operation. The symbols, and activity messages give overview, and check function.

- The operator is guided clearly through the processes.
- Symbols are on available for all corresponding operating modes
- Data can be called up or changed.
- Greater flexibility, simple adaptation to the new values.
- Activity messages appear on the Touch Panel, which are helpful to the operator, e.g. when looking for errors.
- Also legible in poor lighting conditions.
- IP 65 type protection.
- Available in different languages.
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The Touch Panel is special suited for operation with a PLC control on automatic powder coating equipment.

The Touch Panel communication and operating unit, as a rule, is built into the door of the PLC control cabinet. All Masks, Touch logic, and communications are stored directly in the Touch Panel. The PLC control deals only with actual control functions.

The Touch Panel is a communications terminal based on an graphic display screen. Process control, and process display give the operator an overview and control over the whole coating procedure.

2.2 The various Touch Fields

What is a Touch field?
The built-in Touch Logic (Touch recognition) based on an Infrared matrix, which is built in front of the Monitor. The Touch field is represented as a surface (button, key etc.) on the Monitor.

The visible Touch fields are recognizable by their graphic representation. If the display screen is touched inside this area, the boarder, the graphics or the colour of the key changes. Illumination means that the Touch field has been touched. If this function is to be activated, the **finger** must be moved away from the display screen **vertically.** If the finger is moved away at an angle, then the function is not activated. A function on the Touch Panel will be activated first when the finger is **"vertically"** removed**"** from the screen and not before. The Touch field must have a certain minimum size, so that flies and dirt cannot release the function.

There are also 'invisible' key fields, these are first made visible by touching and can lie somewhere over a graphic representation.

The Operating key
For Control on the Touch Panel there are various types of Touch fields present. The most common Touch fields are the operating keys. They are represented as a 3-D frame and change by touching the 3-D representation.

When they are released they are no longer visible. So that the function is activates, the **finger** must be moved away **vertically** from the display screen.

Changing the Theoretical value
When a value is to be input or changed, this takes place through a Theoretical value Input field:

1. The desired value is selected by pressing → the frame illuminates → the Key mask appears on the Touch Panel.

2. The desired value is input with the Key (only values within a given range. False inputs will not be accepted). The Keypad can be exited with "ESC", without the pre-selected value being changed. The input range is displayed in the upper area of the Keypad.

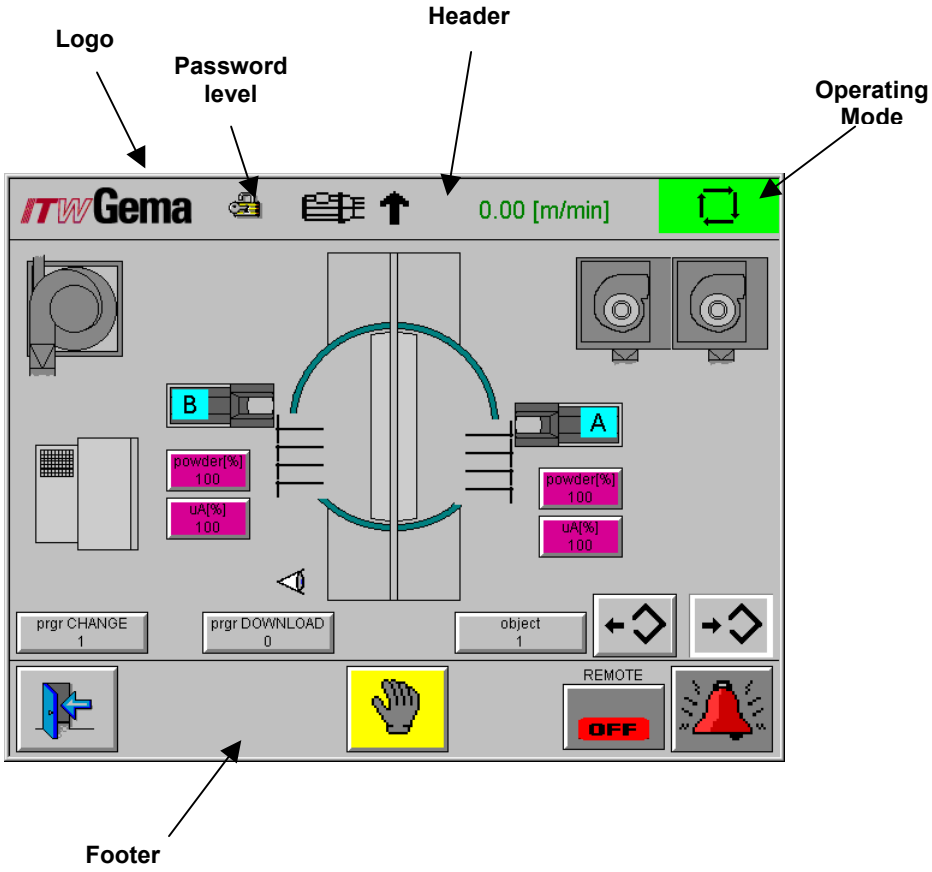
3. The input value must still be acknowledged with "RET". The Keypad then disappears and the new value appears in the display field.

2.3 Symbols

The partitioning of the display
To help the user all program masks are standardized as far as possible. The upper portion of the display is separated from rest of the display by a line and is called the Header. This header always has the ITW Gema Logo on the left-hand side. A symbol is displayed on the right-hand side in which a mask of the program in which the plant is at that moment. The momentary operating mode can be recognized through this. Each program mask is represented by a precise symbol. The actual release level is always represented by a symbol in the header.

Display specific texts and parameter values are represented in the middle field of the program mask. The display of the powder coating equipment is shown in manual, automatic, and cleaning modes in this display portion.

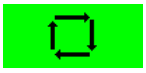
The current operating keys to change to another program mask are displayed in the lower portion of the display screen. The previous program mask can always be returned to with the left-hand key. The remaining operating keys switch to the next corresponding program mask.



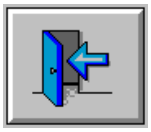
3 Description of Masks

3.1 Operating mode masks

The operation mode masks generally have the following layout:



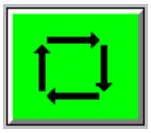
Above right
The display of the actual operating mode (The Automatic mode is shown here).



Below left
The *Exit* key always returns to the last Mask

Below right
The Message key show a separate mask for mode messages. See also Operation messages, Alarm messages. If one or more messages are present, this is indicated with the Bell symbol.

In the lowest line: Keys for changing the operating modes.



Automatic operating mode

Manual operating mode

Cleaning operating mode

Service operating mode

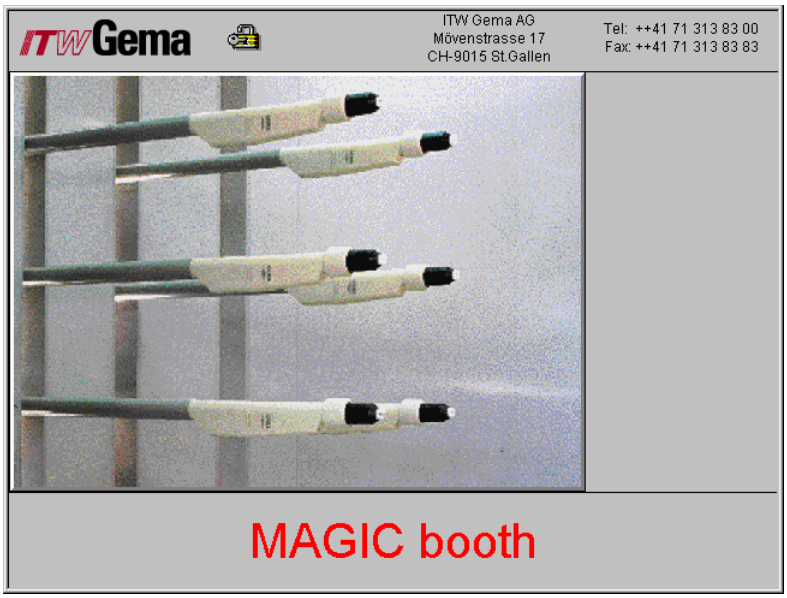
The following plant segments are displayed in grey when they are switched off, and green when they are switched on:

- the fan
- the Cyclone
- all axes
- all guns
- the chain conveyor

3.2 System Start

After the Powder Coating Equipment is switched on with the Main switch, the Control unit (PLC) and the Touch Panel start. After an internal test of the Touch Panel the *START* Mask (below) appears.

START Mask 1

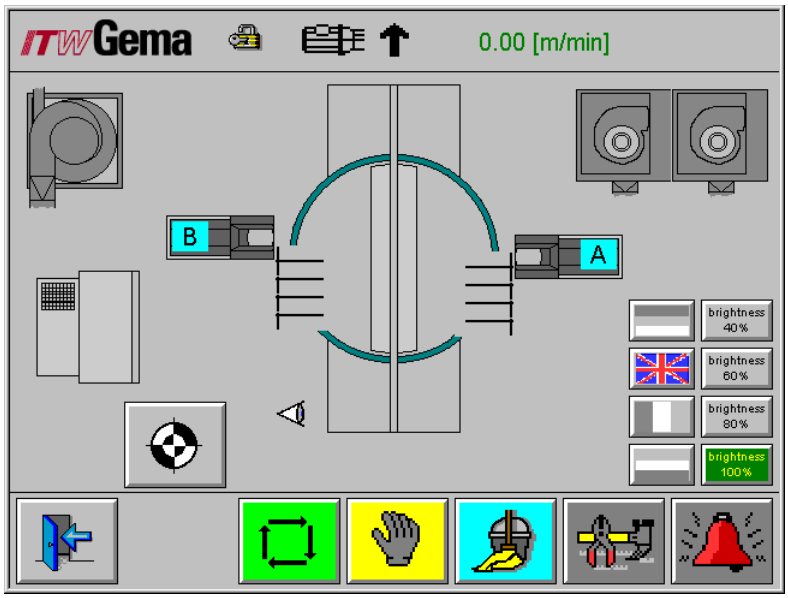


The main menu is called up by touching the gun picture (Start key).
The *System* mask appears when the ITW Gema address is touched. (When the Password level 0 is activated. Description in Password levels.)

3.3 Main Menu

Changing to the Main menu switches the whole plant on, that means, the reciprocator, and guns are supplied with power.

MAIN MENU Mask 2



The following functions are possible in the Main menu:

- Project language switching: German, English, French, and a fourth language as an option is possible (Customer chose).
- Brightness selection: 40%, 60%, 80%, 100%

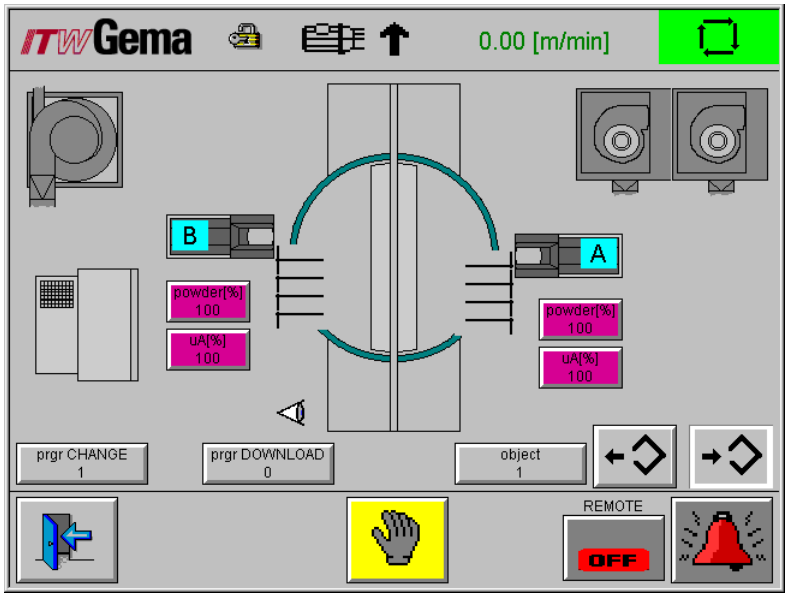
Operating mode selection: Manual , Automatic, Cleaning, Service, Alarm

- Reference travel (Initialization) of the reciprocator by pressing this key. Before changing to the Automatic mode, the plant should be initialized, otherwise the plant cannot be started in Automatic mode, and a fault message appears. Reference travel of the reciprocator can also released in Manual mode directly on every individual PRC 3.

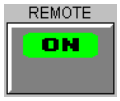
3.4 Automatic

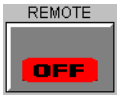
The plant is switched into the Automatic mode by pressing the Automatic key. The axes remain at rest. The plant waits for the next workpiece that enters the Object recognition and then works through the set program.

AUTOMATIC MODE Mask 7

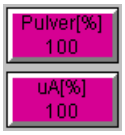


- If the Remote function (Remote control) is switched to ON, the OptiTronic equipment (Gun control equipment) is controlled from the PLC, when OFF the values can be changed manually on the OptiTronic equipment.





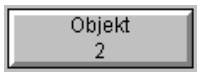
- These keys are used for the daily corrections. The powder output and the current can be changed in the range 0%-200%, that is, 0%-200% of the given programmed powder volume is transported without influencing the total air volume. It can only be corrected when Remote is set to ON and the program Download is not set to the number 0



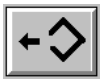
- **Attention**: If a programmed output is already very large and is multiplied by a daily correction which is greater than 100, it can happen that the output is limited by the gun control unit. When this is the case with individual guns only, a non-linear increase of the output is achieved with the increase of the daily correction.

- Program change: This selection is only possible when the number 0 is selected in the program Download. Another program can be selected by using this key. A maximum of 254 Program (1-254) are possible. The parameters are set on the OptiTronic equipment.

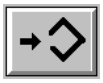
- A maximum of 50 different objects can be selected with this key. The following data is stored per object number: Program number and data for the guns, program number for the horizontal axis and a program number for the vertical axis per reciprocator. These are loaded in the equipment only after they are actualized with the key Upload. Special feature: If the program Download = 0 is selected, the program numbers from Program Change are active. The number 1-254 appears on the OptiTronic equipment.



- Upload: The data from the PLC are actualized on the display and the data are loaded on the corresponding equipment. Necessary for Change of object.



- Download: The data are written on the PLC from the display and stored under the set object number. This, however, is only possible in Password level 0 or 1.



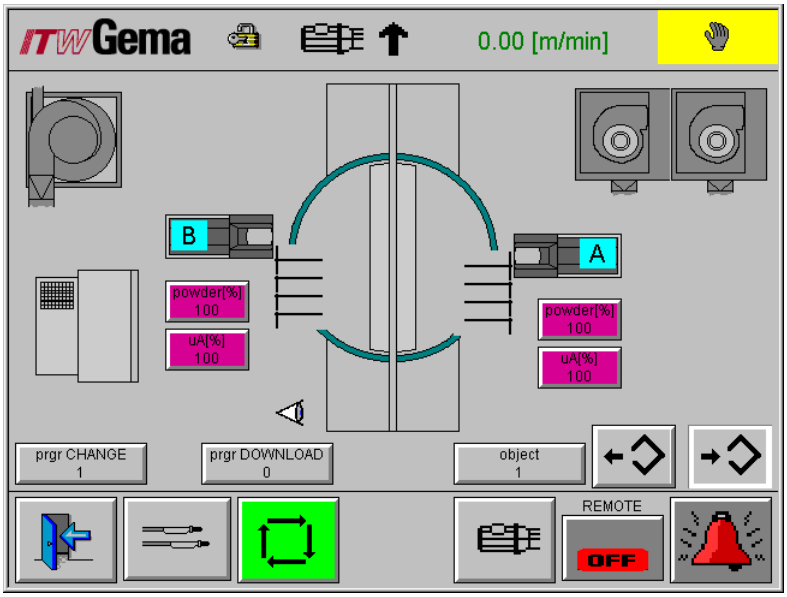
- A further display is entered by selecting the guns: Automatic mode Guns is described below further. *See Chapter 3.6.1 Gun selection*
- A further display is entered by selecting Reciprocator: Reciprocator Automatic is described below further. *See Chapter 3.6.2 Reciprocator Automatic*

- OptiTronic Parameter: Another mask is called up here and the parameters can be changed. The parameters for the Programs 1-254 are managed by the PLC. If the Program 0 is loaded, no parameters from the PLC are loaded into the equipment. The number 255 appears on the OptiTronic equipment *See Chapter 3.6.4 Gun Value*

3.5 Manual Mode

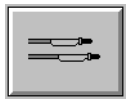
Switches the plant into the Manual Operating mode. The booth runs up as in the Automatic mode. The rest of the plant (axes and guns) is released, so that the operator can operate the plant himself. The operating panel switches to the Manual mode mask.

MANUAL MODE Mask 5



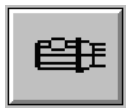
The same plant segments are displayed as in the Automatic mode.
Additional functions as opposed to the Automatic mode are:

- Guns On/Off: The guns can be switched on and off. If the guns are switched on, only those guns are switched on which are pre-selected. This is decided according to the customer request:

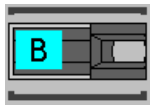


- - Variant 1: The guns can be switched on and off at any time, also when the chain conveyor is stopped (this is used mostly for test purposes here).
- - Variant 2: The guns can be switched on, coating is only done when the chain conveyor is running.

- Chain conveyor On/Off: The conveyor can be bridged (simulated), by the continuous pressing of this key.



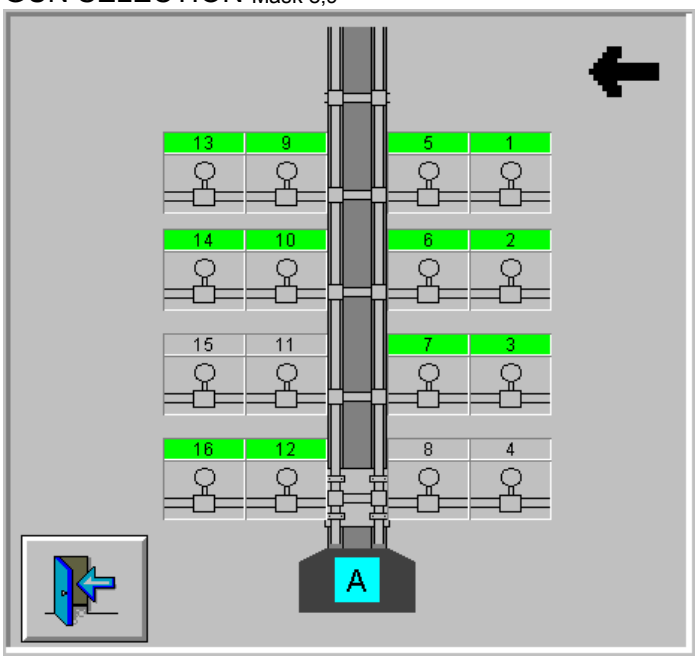
- A further display is opened by selecting the reciprocator: Reciprocator Manual mode is described below further. *See Chapter 3.6.3 Reciprocator Manual Mode*



3.6 Automatic and Manual Modes

3.6.1 Gun selection

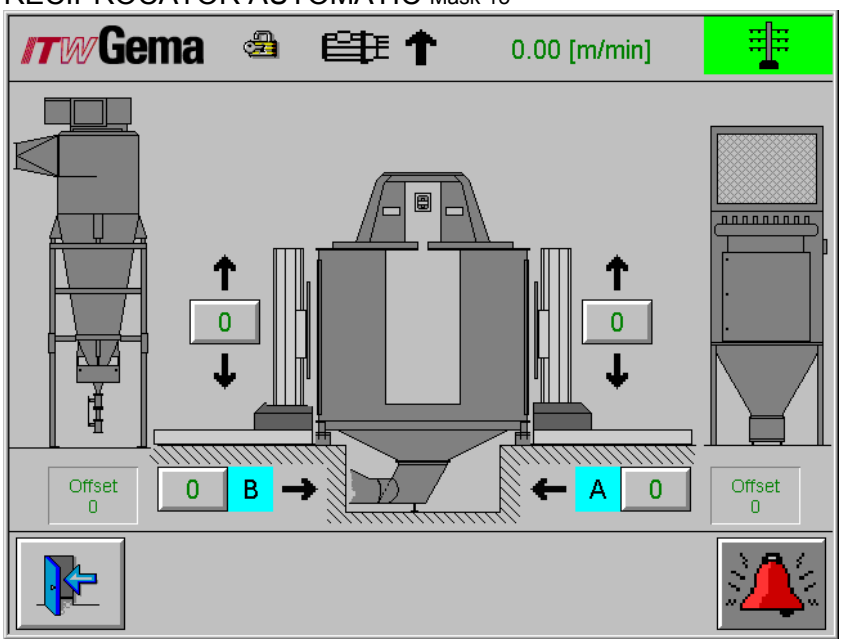
GUN SELECTION Mask 8,9



Gun pre-selection: The corresponding gun can be switched on and off by touching the gun symbols. This is possible in Manual, and Automatic mode. The actual condition of the gun is accepted when the gun values are saved to memory.

3.6.2 Reciprocator Automatic

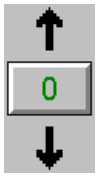
RECIPROCATOR AUTOMATIC Mask 15



- X Axis: A maximum of 30 different program numbers can be set for the axes here. The parameters for the corresponding programs must be input directly in the Position regulator. If a 0 is present, then the axes are controlled through the Light grid, otherwise they travel to the corresponding position of the axes number.

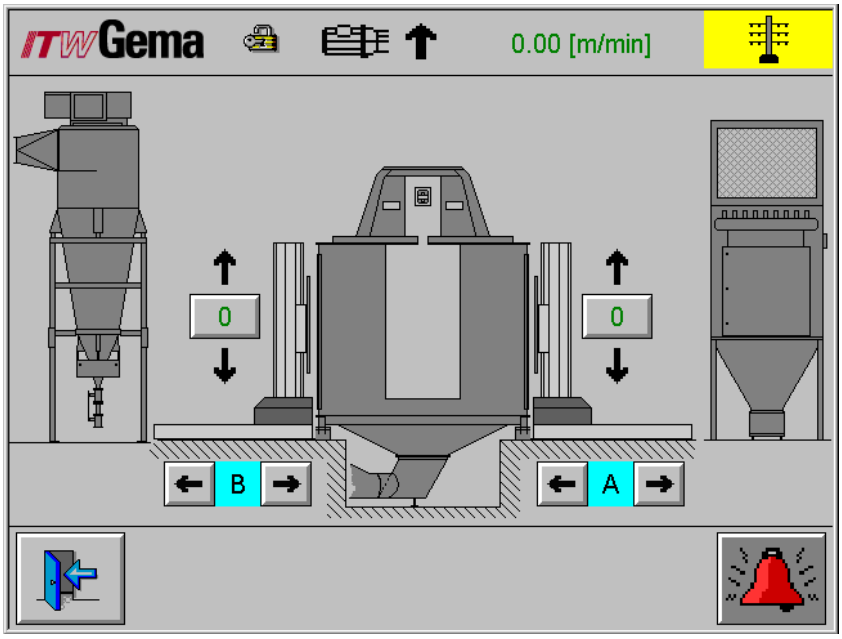
- X Axis Offset: The position can be moved in the range +/- 30 in Automatic mode.

- Z Axis: A maximum of 20 different program numbers can be set for the axes here. The parameters for the corresponding programs must be input directly in the Position regulator. The axes are at rest when 0 is present, otherwise the set program runs, but only when the Light grid recognizes an object.



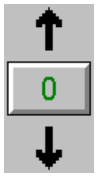
3.6.3 Reciprocator Manual Mode

RECIPROCATOR MANUAL MODE Mask 14



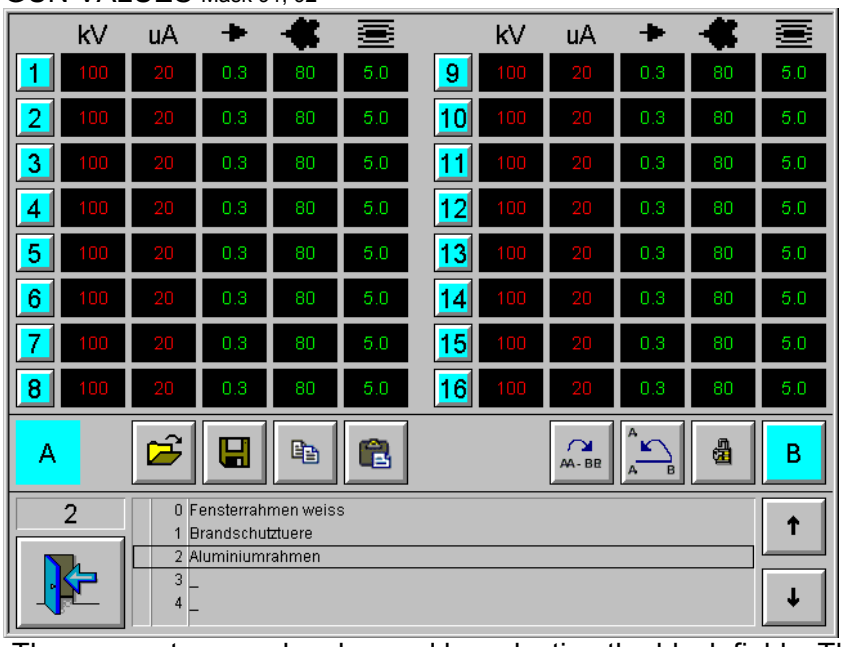
- X Axes: The reciprocator can be moved completely in or out in the X direction with these keys.

- Z Axes: A maximum of 20 different program numbers can be set for the axes here. The parameters for the corresponding programs must be input directly in the Position regulator. The axes are at rest when 0 is present, otherwise the set program runs, as soon as a program number is input.



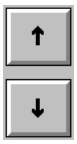
3.6.4 Gun Values

GUN VALUES Mask 91, 92



The parameters can be changed by selecting the black fields. They are, however, only actualized when stored to memory, and downloaded.

- The corresponding gun program can be selected with this key. The values are not yet the actual values. The example „Aluminium frames“ with the program number 2 can be seen here.



- The selected gun program is opened with this key. Which program is open can be seen above the Exit key.

- The edited values can be stored to memory

- Copys the actual program

- Inserts the copied program

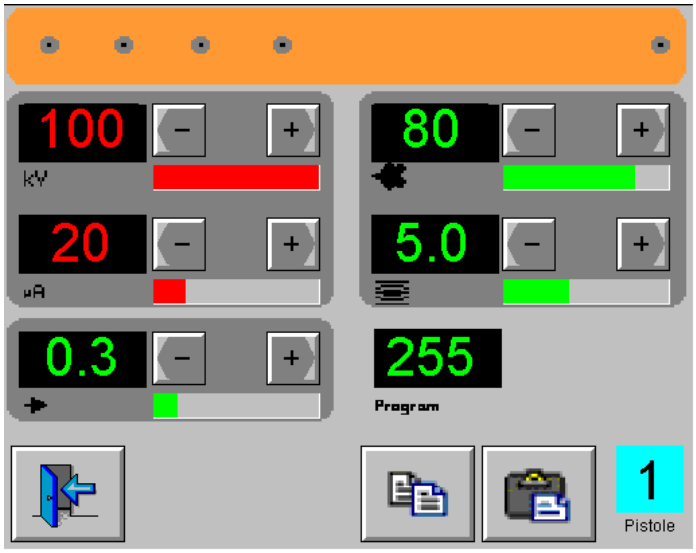
- Edits the program texts

- Loads default values. This key can only be selected with Password level 0 or 1

- The OptiTronic operation is called up with this key.
  See Chapter 3.6.5 OptiTronic Operation

3.6.5 OptiTronic Operation

OPTITRONIC OPERATION Mask 101-132

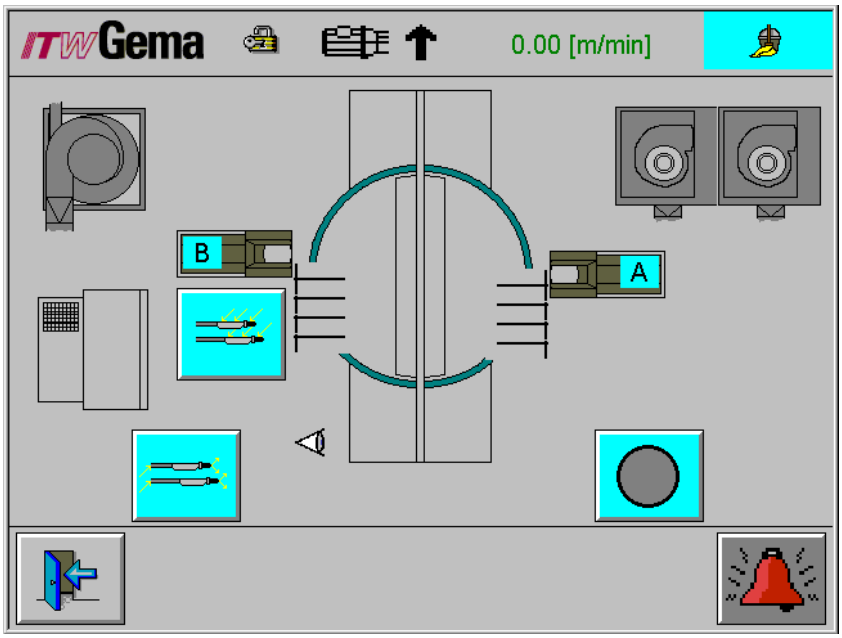


The data can be changed On-line by calling up this mask. On closing the mask the values are transferred into the other mask Gun Values. *See Chapter 3.6.4 Gun Values*

- Copys the actual gun data. 
- Inserts the copied gun data. 

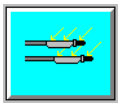
3.7 Cleaning

CLEANING MODE Mask 4

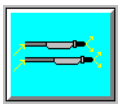


The request for fresh powder is switched off during the cleaning operation. (The powder hopper is supplied with sufficient recovered powder because of the return of the backed-up powder from the booth).

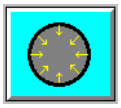
- Clean Guns externally: All guns are moved completely into the booth (PRC Program number 63), then each Station travels out of the booth for individual automatic cleaning of the gun tubes during this blowing off (PRC Program number 60).



- Clean Guns internally: All axes travel into the booth to the cleaning position (PRC Program number 62), then the release is given to start the internal cleaning of the guns from the Powder Centre control.



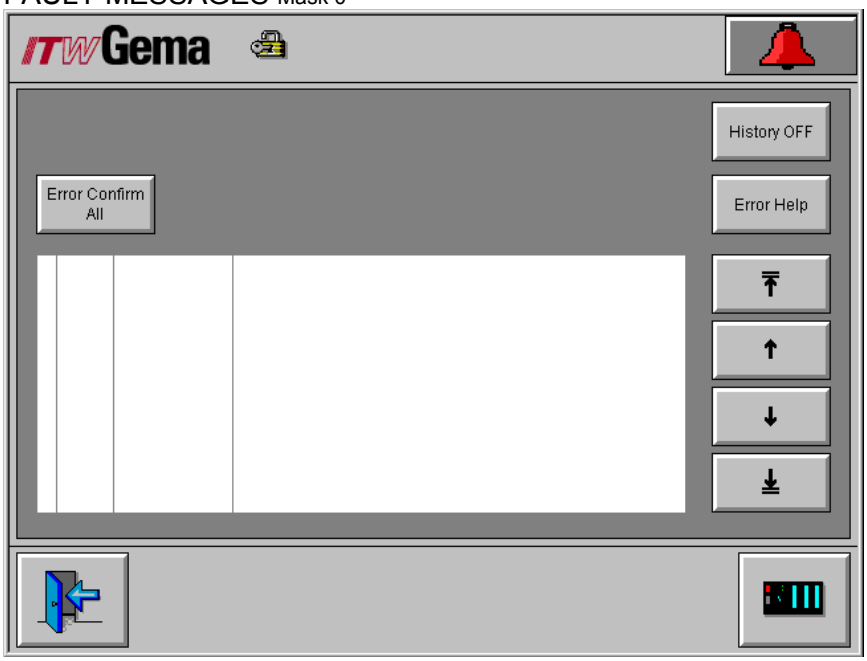
- Ring rinsing on is only for Cylinder booths: Ring rinsing is switched on and off with this key. When the Ring rinsing is switched on neither external cleaning of the guns nor blowing through of the powder tubes can be started.



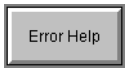
3.8 Fault Messages

Faults can occur during operation. Faults are displayed directly in this mask.

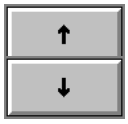
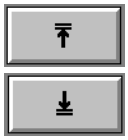
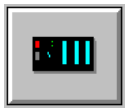
FAULT MESSAGES Mask 0



- Acknowledges the Alarm horn. 
- Acknowledges all fault messages that appear. 

- Help text for the selected fault message. 

- Switches On/Off Fault message buffer. All previously appearing messages are stored here. The last 4096 messages are displayed with time and date. 

- The next or previous message text page is entered with these keys. 
- The start or the end of the message text page are entered with these keys. 
- The PLC Inputs and Outputs entered with this key.
  See Chapter 4.3 PLC Test 

Following fault messages can occur:

- Motor protection NOK: A fuse or a motor protection switch has blown. It is recommended to call an electrician to eliminate the cause of the fault.
- Fire protection NOK: Emergency Stop or Fire protection actuated (See Fire protection documentation)
- Switch cabinet temperature NOK: The thermostat in the Switch cabinet reports over-temperature. It is recommended to call an electrician to eliminate the cause of the fault.
- Grounding control NOK (See Fire protection documentation)
- Booth doors are not open: The booth doors should be open in the coating operation. One of the door end switches reports not open.
- Fan Over-pressure: Too much air is sucked from the Booth.
- Fan Under-pressure: Too little air is sucked from the Booth.
- PLC Battery EMPTY: This message is created when the battery of the PLC is empty. As long as the Mains power is present (Mains switch on) the program in the PLC remains in the memory. As soon as the plant is switched off the program is lost. The complete program must be reloaded with a programming device or it is read in with an EPROM (if present).
  ATTENTION: Data, formulae and parameters can deviate from the plant and must be input again.
- Control distance overstepped: The set control distance is overstepped, which means, the Light grid is permanently covered and no longer switches.
- PRC 3 Axis not ready: Axis does not react or is not initialized (Reference point travelled).
- Conveyor stopped, Danger of collision: Doors are not open and the Light grid has detected an object.
- Booth doors are still open: The doors should be closed in the Cleaning mode
- PRC 3 Axis not at the Reference point**.** Axes are not initialized.

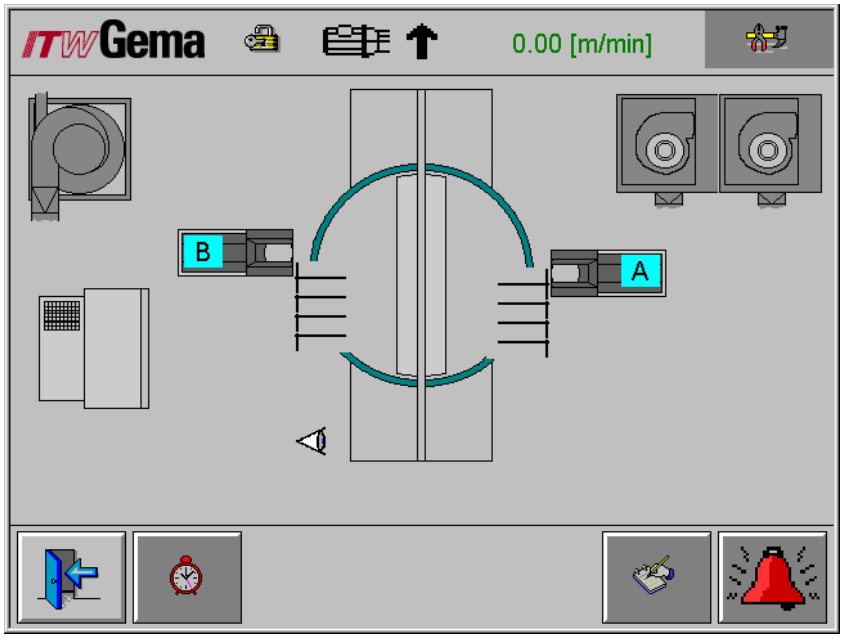
EMERGENCY STOP:

- At an Emergency Stop the whole plant (except the Operator panel and PLC) is switched off. A serious fault has occurred and further coating is not possible.

3.9 Service

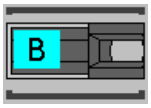
Some functions can be used in the Service mask which are foreseen for maintenance work and Start-Up. All monitoring is switched off in these operating modes.

SERVICE MODE Mask 6



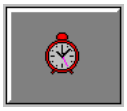
The booth is switched off, and the conveyor is released.

- Axes test: If this Operating mode is selected, only the power to the axes is switched on



- Gun test: The high-voltage of the guns can be measured with this function. All the guns are switched on, the air supply to the guns is, however, switched off. Now the ITW Gema Service engineer can measure the High-voltage value of the guns.

- Operating time: A mask is opened in which the different measured operating times are displayed. *See Chapter 3.9.1 Operating Time*

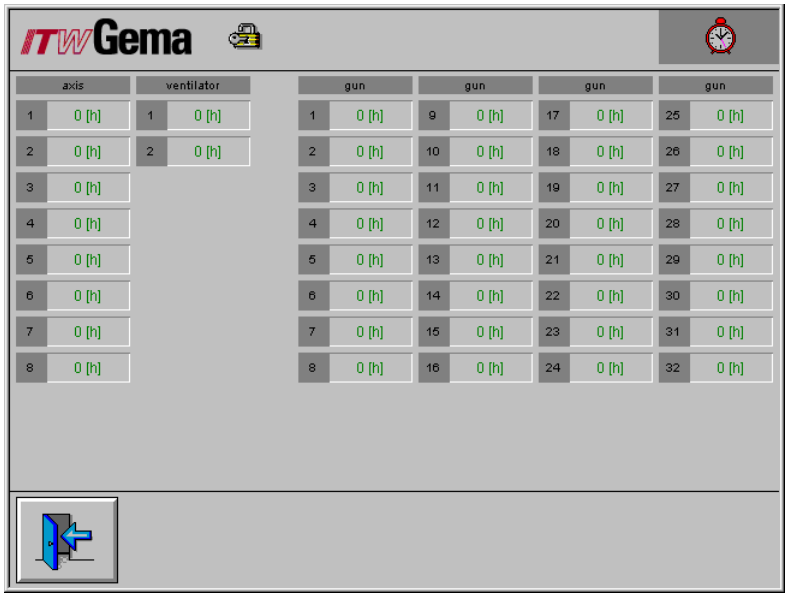


- The Set-up mask is called up. *See Chapter 3.9.2 Set-Up*

- Calibrates the Incremental pulse generator of the chain conveyor. *See Chapter 3.9.8 Test Incremental Pulse Generator Conveyor*

3.9.1 Operating Time

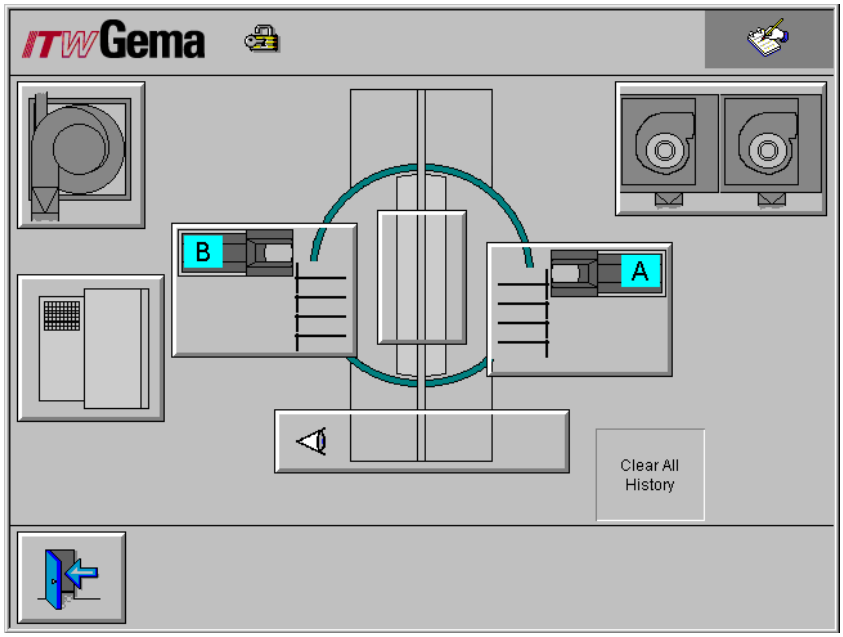
OPERATING TIME Mask 16



The operating times of all axes, guns, and fans are displayed when this mask is selected. Changing the operating times is possible with Level 0.

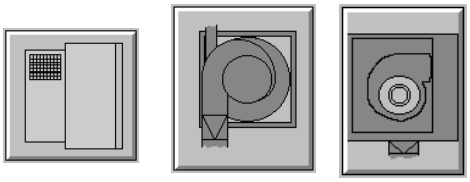
3.9.2 Set-Up

SET-UP Mask 20

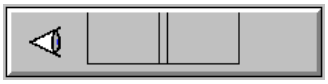


The parameters can be checked by each user. Changes are only possible with Password level 0 or 1.

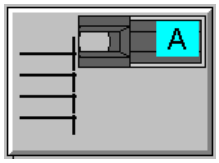
- Active Set-up General Data and Options.
  See Chapter 3.9.3 Data and 3.9.4 Set-Up Functions



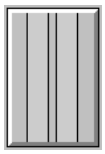
- Set-up Light grid. *See Chapter 3.9.5 Set-Up Light Gri*



- Set-up Axes / Guns. *See Chapter 3.9.6 Set-Up Axes / Guns*



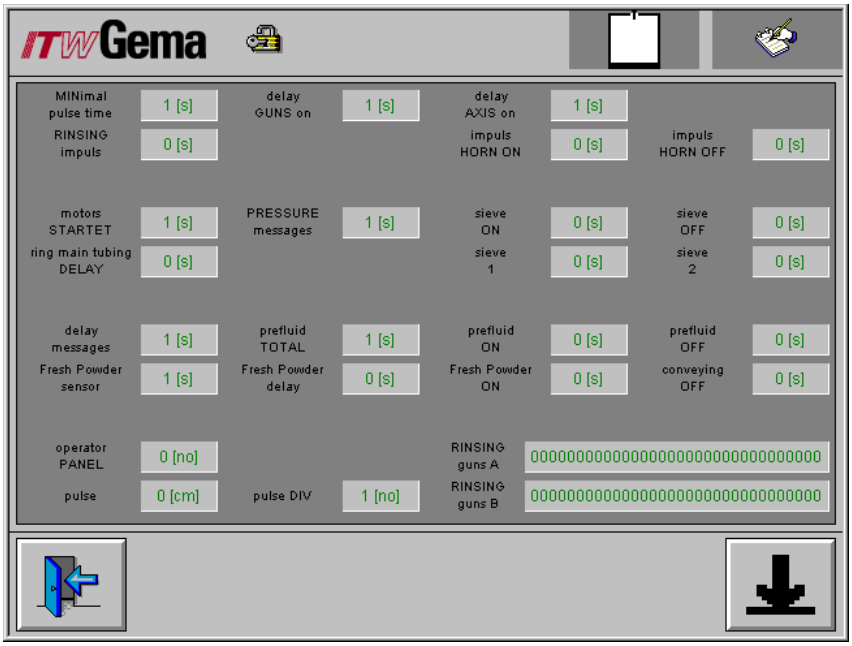
- Set-up Object. *See Chapter 3.9.7 Set-Up*



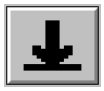
- The Fault message buffer (Alarm message buffer) is deleted. Only possible with Password level 0.

3.9.3 Set-Up General Data

SET-UP GENERAL DATA Mask 21

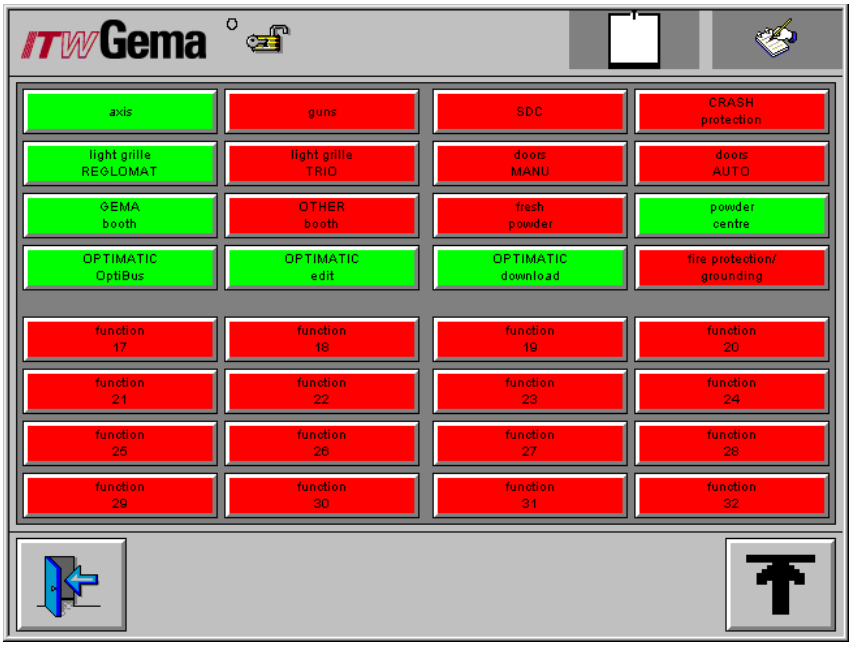


These parameters can only be changed with Password level 0 and 1. Changes may only be made by ITW Gema Service personnel.

- The Options display can be opened with this key 

3.9.4 Set-Up Functions

SET-UP FUNCTIONS Mask 26

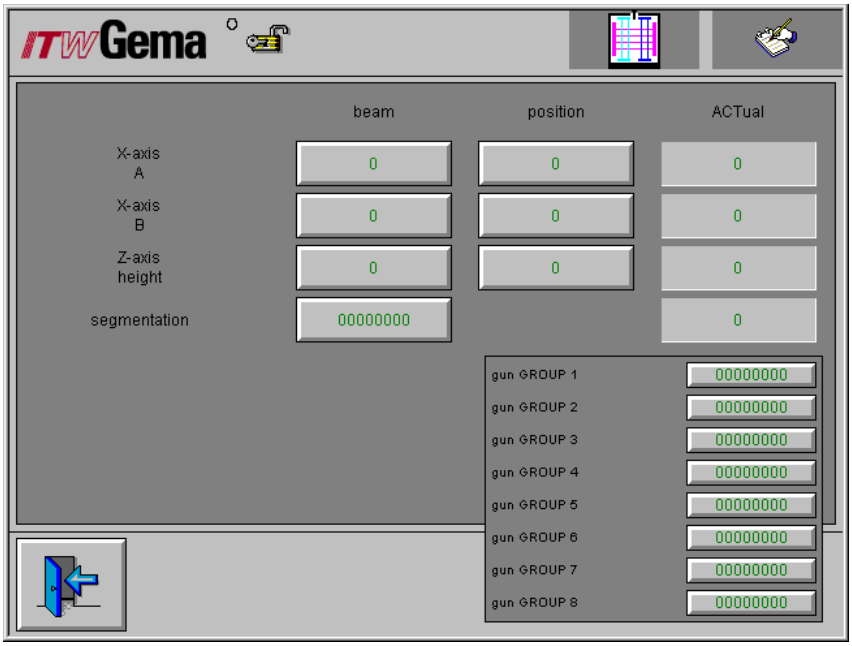


These parameters can only be changed with Password level 0 and 1. Changes may only be made by ITW Gema Service personnel.

Function: red = switched off
green = switched on

3.9.5 Set-Up Light Grid

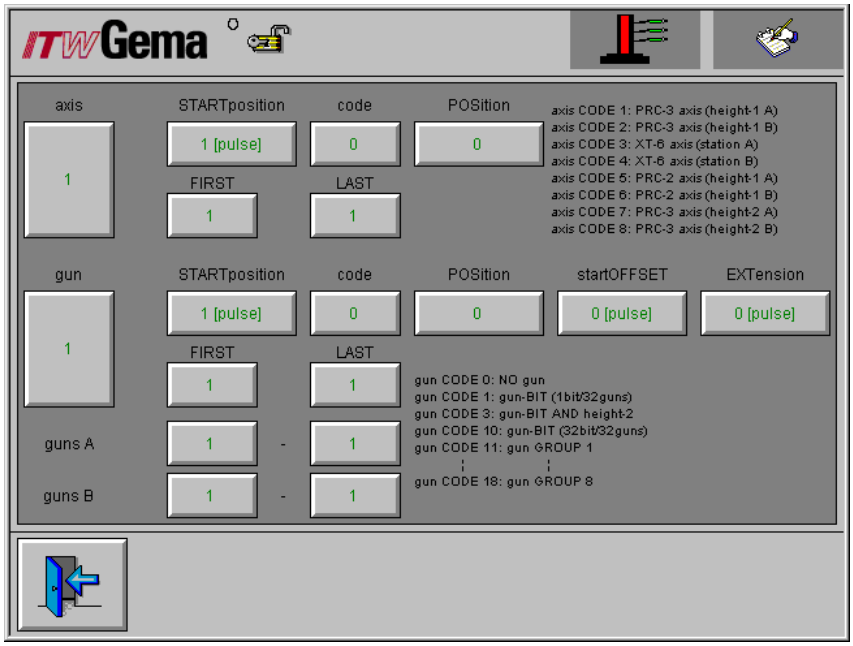
SET-UP LIGHT GRID Mask 27



These parameters can only be changed with Password level 0 and 1. Changes may only be made by ITW Gema Service personnel.

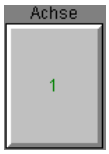
3.9.6 Set-Up Axes / Guns

SET-UP AXES / GUNS Mask 22

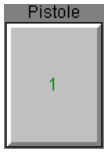


These parameters can only be changed with Password level 0 and 1. Changes may only be made by ITW Gema Service personnel.

- Press this key in order to see the parameters of the corresponding axis, and input the corresponding axis number, then the parameters of the axis will be displayed.

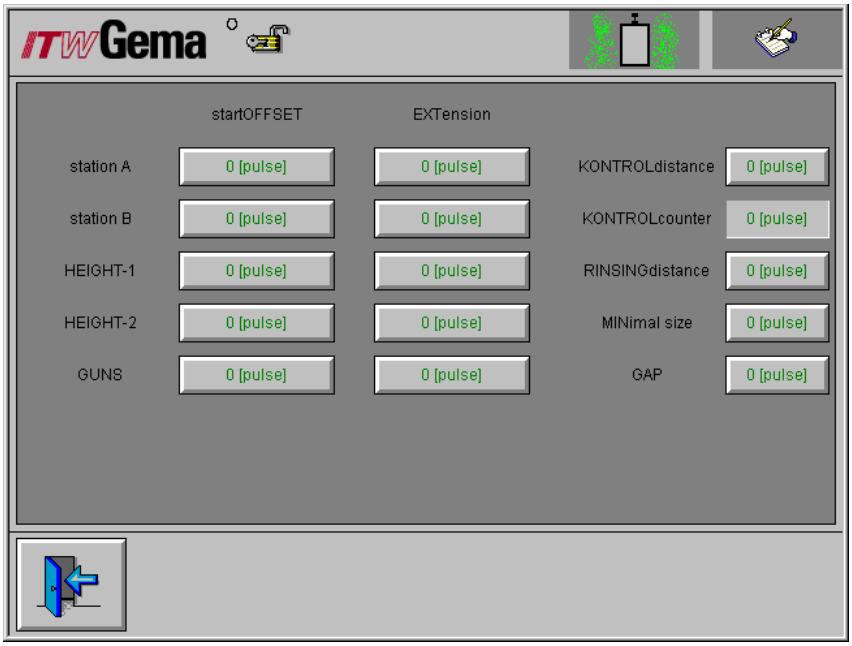


- Press this key in order to see the parameters of the corresponding gun, and input the corresponding gun number, then the parameters of the gun will be displayed.



3.9.7 Set-Up Object

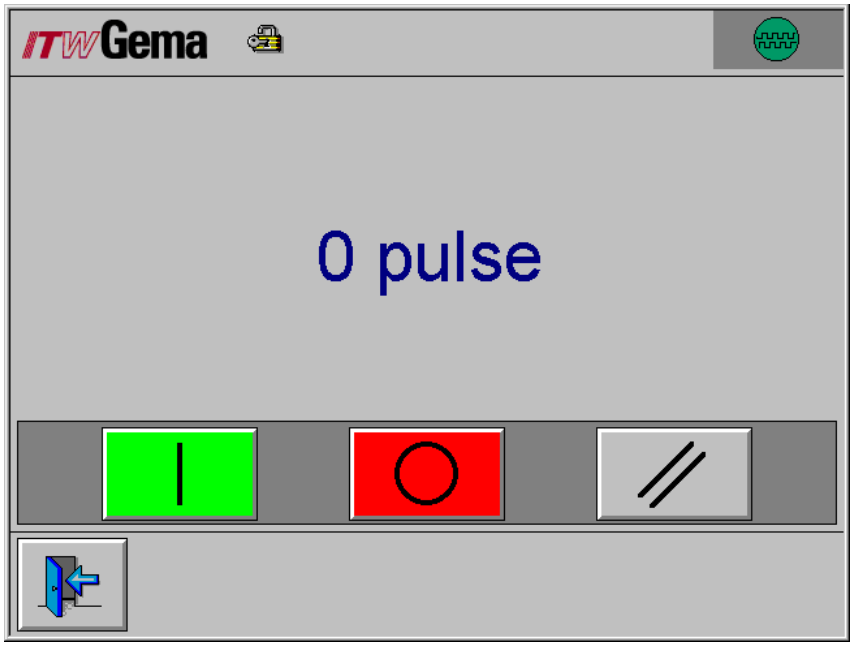
SET-UP OBJECT Mask 25

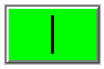


These parameters can only be changed with Password level 0 and 1. Changes may only be made by ITW Gema Service personnel.

3.9.8 Test Incremental Pulse Generator Conveyor

INCREMENTAL PULSE GENERATOR CONVEYOR Mask 13



- Start Chain conveyor 
- Stop Chain conveyor 
- Reset Incremental pulse generator display to 0. 

If this Operating mode is selected, only the power to the axes is switched on. If the conveyor is switched on with the Start key, all impulses from the conveyor are counted and displayed. When switching on the display is always deleted, when stopped it remains as it is. A measured distance on the conveyor is defined to calibrate the Incremental pulse generator. It is advantageous to take the distances of a number of hanger spaces in a range of between 5 m and 10 m. The required pulse length is set on the corresponding PRC 3 with Parameter 10 (PRC 3 AC) or Parameter 12 (PRC 3 DC). The counter is started with the conveyor running at the beginning of the measured distance and stopped again at the end of this distance. Parameter 8 (PRC 3 AC) or Parameter 10 (PRC 3 DC) are calculated according to the following formula:

$$\text{New parameter} = \frac{\text{(Old parameter)} * \text{(Counter reading after Stop)} * \text{Pulse length}}{\text{Measured distance}}$$

4 Configuration Level

4.1 Password levels

Password levels: The release level is displayed symbolically in the title line of each mask:

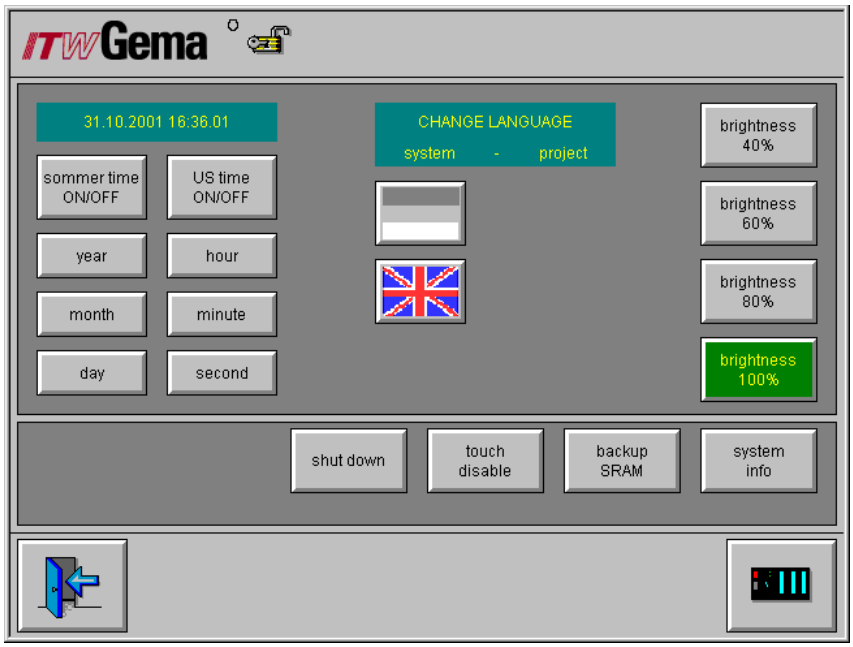
- Without password input: The plant can be fully operated and the System parameters can be viewed.

- The Password 0 can be input with the ITW Gema symbol. Password Level 0 (All System settings can be changed).

- The Password 1 can be input with the Padlock symbol. Password Level 1 (The System settings can be changed).

4.2 System

SYSTEM Mask 10

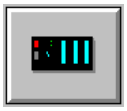


The following functions are possible here:

- Setting the internal clock
- Setting Summer time / Standard time
- Setting the date format
- Brightness: The background lighting of the panel can be set. If the background lighting is selected brighter than 40%, the panel switches all masks back to 40% automatically after 10 minutes without operation to protect the display screen. When the display screen is touched again, the illumination returns to the value previously set.

- System language switching:
  German or English can be selected as the System language.
- System Info: The System data of the panel can be called up.
  See Chapter 4.2.1 System Info

- PLC Test: Selecting the PLC key changes to the next display screen, where the Inputs and Outputs can be checked. *See Chapter 4.3 PLC Test*

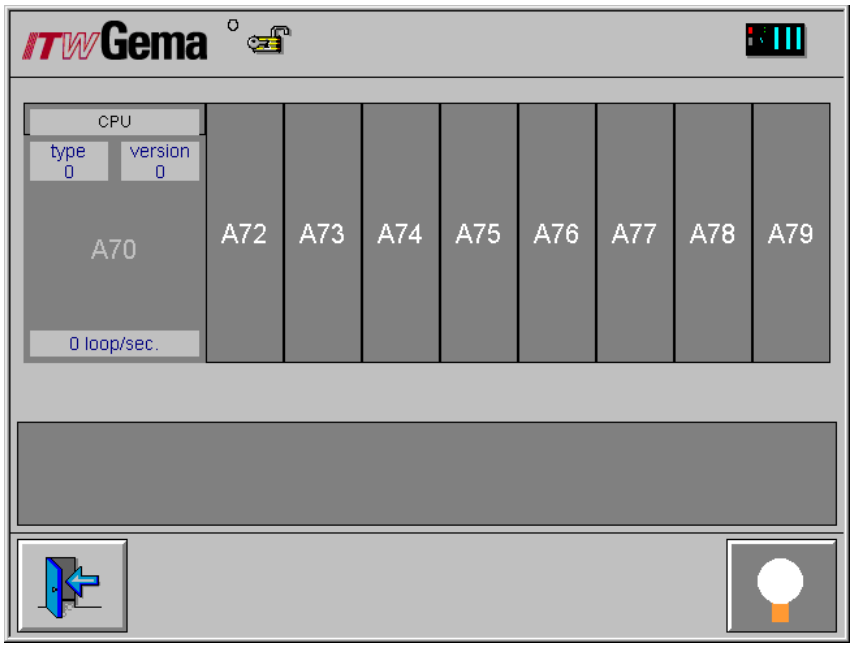


4.2.1 System Info

GRS-Version :	3.12.8	Disk Space :	13'849'403'392 Bytes
Project Name :	OPTI315.PRJ	Free Disk Space :	4'971'716'608 Bytes
Project Size :	1'805'187 Bytes	Unused RAM :	???
Project Date/Time :	17.09.01 10:24.05	Project Language:	0
System Language File :	GRS_LOG.GER	No Of Compilings :	780
Serial No. :	Windows	Galileo Compiler Version :	2.21
COM Board (Slot 0) :	Serial Communication 0.0		
PLC Name :	Serial Communication		

4.3 PLC Test

PLC TEST Mask 40

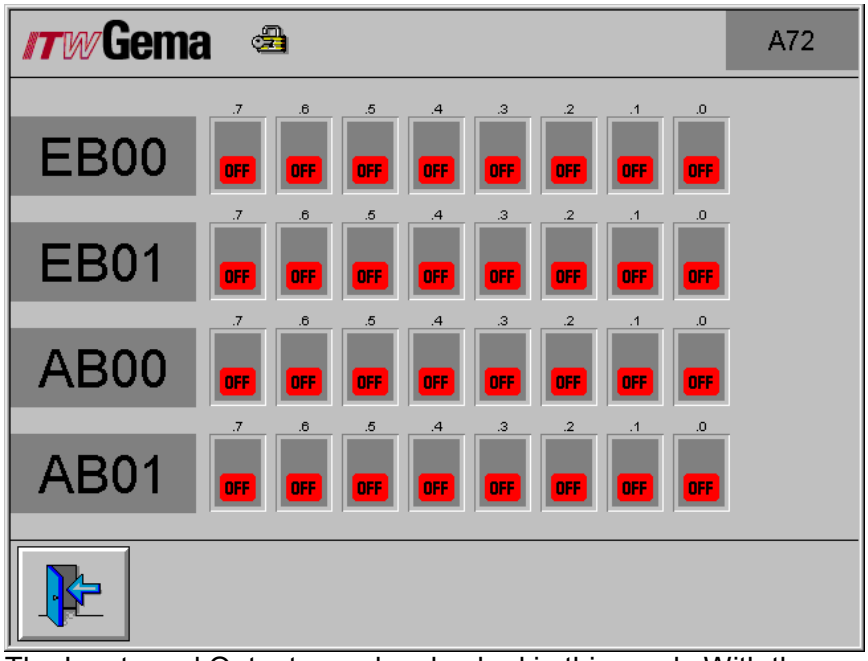


- Key for Lamp test 

- The Input/Output display is entered by pressing Fields A72-A79.
  See Chapter 4.3.1 Test

4.3.1 Test Inputs and Outputs

TEST INPUTS AND OUTPUTS Mask 42-



The Inputs and Outputs can be checked in this mask. With the appropriate authorization the Outputs can also be switched on.

Notes:

Documentation GF 1 Touch Panel

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