

Column & Boom

PEMA EHD 9 x 5

Instruction manual

Original

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1. INTRODUCTION



Read and understand the INSTRUCTION MANUAL before installing or operating!

- Observe the following safety precautions in addition to the standard regulations that apply to the work place.
- Operator has the ultimate responsibility for ensuring that anyone who works with or near the equipment observes all the relevant safety precautions.
- All work must be carried out by trained personnel who is familiar with the operation of the equipment.
- Incorrect operation of the equipment may lead to a hazardous situation which can result in injury to the operator and damage to the equipment.
- Anyone who uses the equipment must be familiar with
 - its operation
 - the location of the emergency stop
 - its function
 - relevant safety precautions.
- Before starting the operation
 - make sure that no unauthorized person is stationed within the working area
 - appropriate fire extinguishing equipment is clearly marked and close at hand.
- The work place must
 - be suitable for the purpose
 - be free from draughts.
- Protect yourself and others!
- In case of malfunction call immediately for expert assistance!
- **Keep this manual for future reference.**

1.1. Contact information

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2. SAFETY

2.1. General information

PEMA Extra Heavy Duty column & boom is welding manipulator for demanding welding automation purposes. It is a versatile and cost-effective solution for different kind of welding processes from single to multi wire SAW welding as well as to TIG and MIG/MAG welding. Machine can be equipped also with different narrow gap applications and for example with a strip cladding head.

Column & boom welds both longitudinal and circumferential seams. For more accurate welding result column & boom has a seam tracking solution that keeps the welding system informed about the length of the stick-out. Welding operations are automated as well as movements of the column & boom. Welding is also possible with boom movement and as an option, with movement on rails.

In case there is a need to re-position, turn or move the work piece during a welding process, this can be done with PEMA roller beds and positioners which are easy to integrate to PEMA column & boom. As an option there is also a possibility to rotate the column & boom. With these kind of combinations, automated welding of work pieces can be carried out reliably and to highest standards of productivity and welding quality.

Column & boom is equipped with a control system which combines welding parameter control, welding data storage, remote control and other advanced welding functions into the column & boom control interface. The touch panel user interface location can be selected to fulfill the requirements of each application.

Column & boom is also equipped with an EN-certified seat, which enables easy access to control the welding process and ensures safe and ergonomic working position for the operator.

Machine is intended for industrial and indoor use only.

In case you intend to use the equipment for any other purpose, please confirm the suitability from the manufacturer or his representative.

Any modification made to the construction of the machine can yield to a hazard and will terminate the warranty.

2.2. Safety instructions







MOVING MACHINE – Crushing hazard!

- Secure the working area before operating the machine!
- Obey preventive maintenance instructions!
- DO NOT stay under the work piece!
- DO NOT use ladders unless in case of emergency.
- Ensure operator's safety if the machine is platform operated.
- While moving the horizontal boom, take care that it doesn't hit any person.
- While moving the horizontal boom, take care that it doesn't hit the work piece or any other objects nearby.
- In case of collision stop operation immediately. Be aware because impact may cause the tower to collapse.







ARC WELDING AND CUTTING - Can be injurious!

- Take precautions when welding.
- Ask for your employer's safety practices which should be based on manufacturer's hazard data.
- Make sure the welding ground cable is connected securely.
- Read the safety instructions supplied with the welding equipment.
- DO NOT lubricate or service the welding equipment during the use.

**WARNING**

ELECTRIC SHOCK - Can kill!

- Install and earth the welding unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the work piece.
- Ensure your working stance is safe.
- Disconnect main power before service or maintenance.

**WARNING**

NOISE - Excessive noise can damage hearing

- When noise level emissions reach 80 dB (A) or above it can damage hearing.
- Protect your ears. Use earmuffs or other hearing protection devices.
- Warn bystanders of the risk.

**WARNING**

HOT WORK PIECE – Can burn

- The work piece can be hot after welding or cutting.
- Use personal safety equipment.



FUMES AND GASES – can be dangerous to health

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to keep fumes and gases from you breathing zone and the general area.



ARC RAYS - Can injure eyes and burn skin

- Protect your eyes and body. Use the correct welding screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.



WELDING SPARKS – Fire hazard

- Ensure there is no inflammable material nearby.
- Ensure there is fire extinguishing equipment clearly marked and close at hand.




WARNING




FALLING OBJECT – Impact hazard!

- Attach the wire reel properly and safely.
- Obey preventive maintenance instructions!
- DO NOT stay under the work piece!
- Keep the operator's seat clean from idle objects.




WARNING




LASER RADIATION - Can injure eyes

- DO NOT have direct viewing of the beam.
- Ensure there are no reflections from mirror-like surfaces.
- Protect your eyes from laser radiation.
- Protect bystanders from laser radiation
- Class 2 device




WARNING




WORKING WITH OPERATOR'S SEAT – Falling and crushing hazard!

- DO NOT use ladders unless in case of emergency.
- Fasten seatbelt.
- Maximum load of seat is 115 kg.
- DO NOT operate from platform while seat is in use unless in case of emergency.
- Ensure operator's safety if the machine is platform operated.



INCORRECT USE OF THE MACHINE - Crushing or impact hazard!

- DO NOT use the machine as a crane!
- DO NOT exceed the maximum weight limit allowed for coil stand (see sticker on the boom).
- Incorrect use of the equipment may lead to a hazardous situation which can result in injury to the operator and damage to the equipment.



IN CASE OF AN EMERGENCY – Stop the machine with emergency stop button!

- Emergency stop buttons are used in case of an emergency.
- Do not use emergency stop buttons for normal stopping of the machine.
- Ensure safe working conditions before starting operation after emergency stop!

2.3. Safety related functions

In case of an emergency the operation of the machine is stopped with emergency stop button. The reason for emergency must be solved before continuing operation.

Please see further instructions in chapter Safety functions.

3. TECHNICAL INFORMATION

3.1. Machine structure

Pema Column & Boom Extra Heavy Duty welding station consists of the following main parts:

1. Rail car mounted base
2. Power source
3. Wire reel
4. Welding head
5. Cross slide
6. Flux handling
7. Control panels OP1 and RC 1
8. Main cabinet / Control panel MC1
9. Operator's seat

Location of the main parts is shown in figure [1](#)

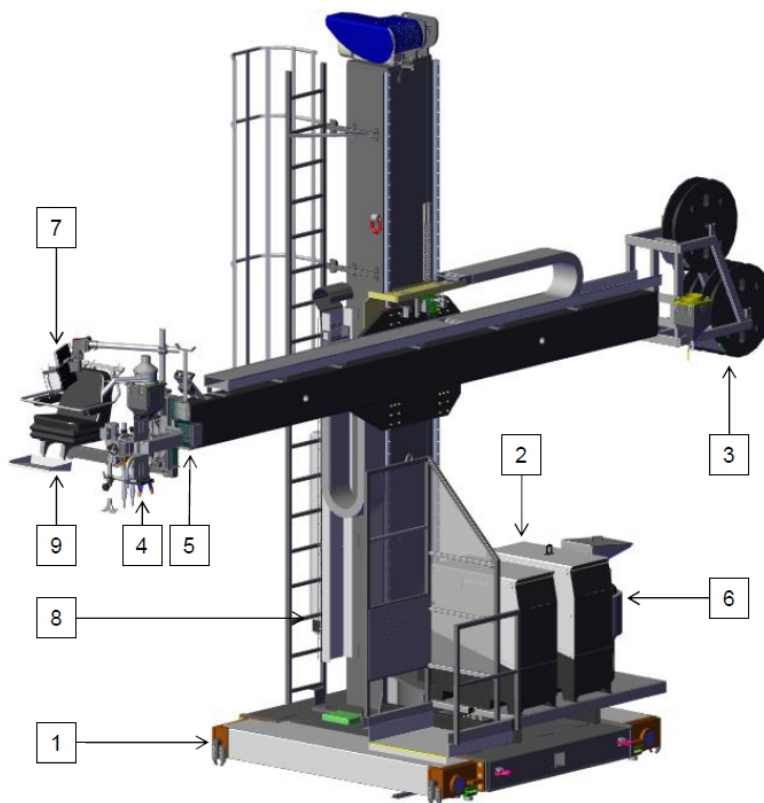


Figure 1 Main parts

3.2. Technical Data

3.2.1. Mechanical characteristics

Vertical reach [A]	1 500 - 10 500 mm
Horizontal reach [B]	1 250 - 6 250 mm
Lifting speed	200 - 2 500 mm/min
Speed of welding carriages	200 - 2 500 mm/min
Column rotation	360 deg
Column rotation speed	Motorized 360 degrees / 2 min
Total height [C]	11 613 mm
Weight	~15 200 kg
Radius of the danger area	r=7 750 mm
Rail width [D]	2 500 mm

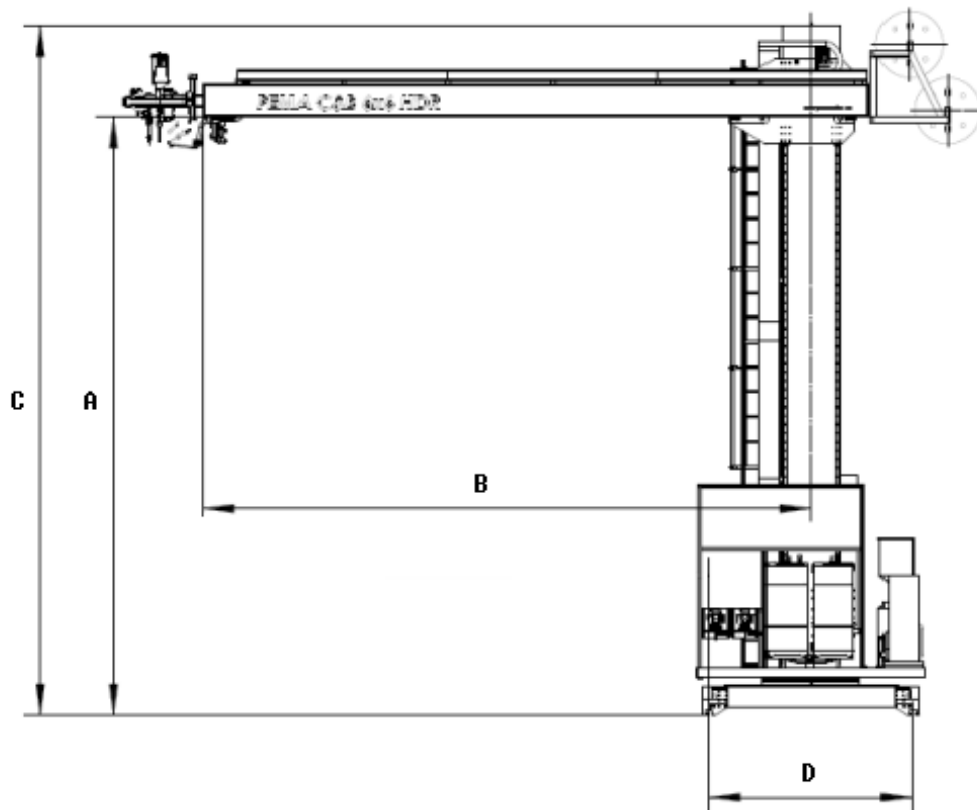


Figure 2 Measurements of the column & boom

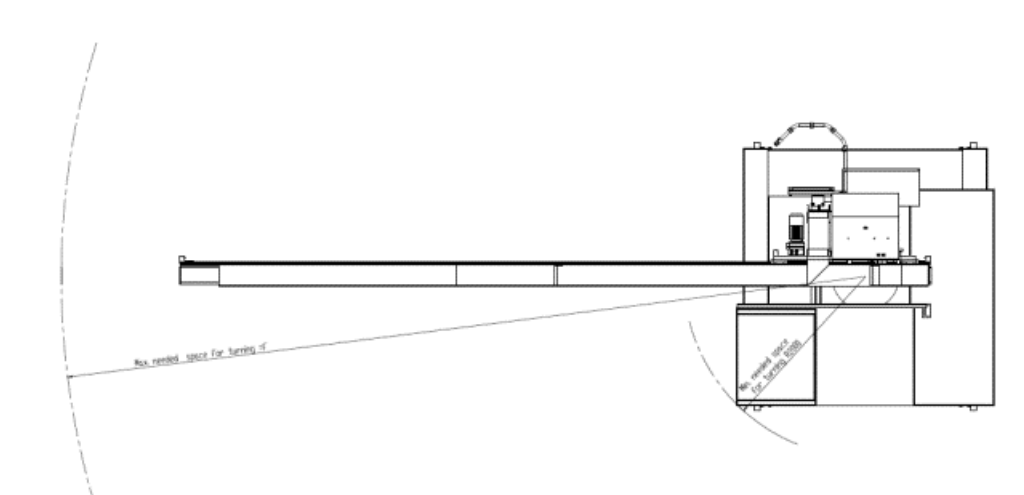


Figure 3 Radius of the danger area

3.2.2. Electrical characteristics

Main supply voltage	400 VAC / 50 Hz 3ph + N + PE
Power consumption	17 kVA
Required fuse size	32 A
IP protection class	IP 54

3.2.3. Noise level

A-weighted sound power level	85 dB
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3.2.4. Machine plate

Machine plate is attached to the side of the frame of the machine.

 Pemamek Oy Ltd. FIN-32200 Loimaa Finland www.pemamek.com	Type:		   701110-1
	Ser.No:		
	Art.No:		
	Man.Year:		
	Weight:		
	ph	Hz	
		V	
		A	
	kVA		

The machine plate contains the following important information:

Type:	Type of the machine
Ser. No:	Serial number of the machine
Art. No:	Article number of the machine
Man. Year:	Manufacturing year of the machine
Weight:	Weight of the machine
ph	Mains supply number of phases
Hz	Mains supply frequency
V	Mains supply voltage
A	Mains supply fuse size
kVA	Power consumption of the Machine




NOTICE




Read and Understand the INSTRUCTION MANUAL before installing or operating

- The weight in the machine plate does not include accessories!
- Always mention the type, serial number and manufacturing year of the machine when ordering spare parts.

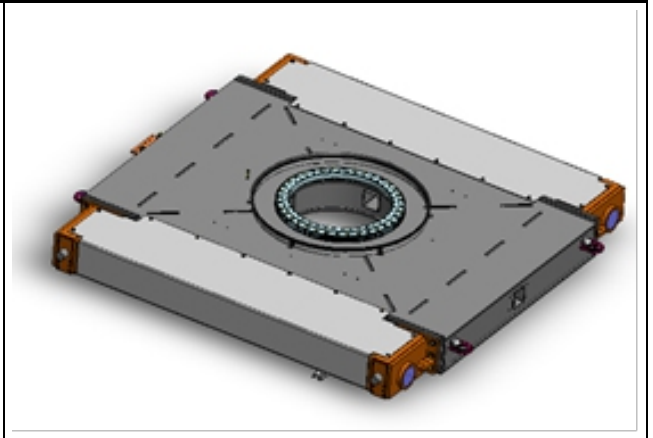
3.3. Modules and options

3.3.1. Modules

3.3.1.1. Base

Rail car mounted base

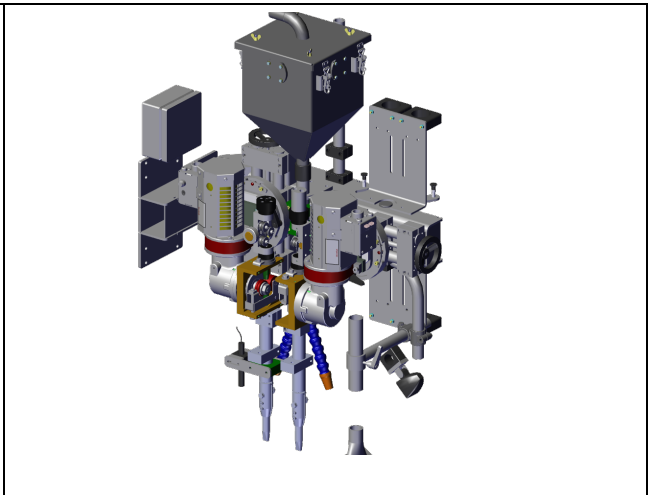
- Carrier for easy transfer of the welding machine
- Capable for rail movement welding with optional side support rollers



3.3.1.2. Welding head

Tandem Twin SAW

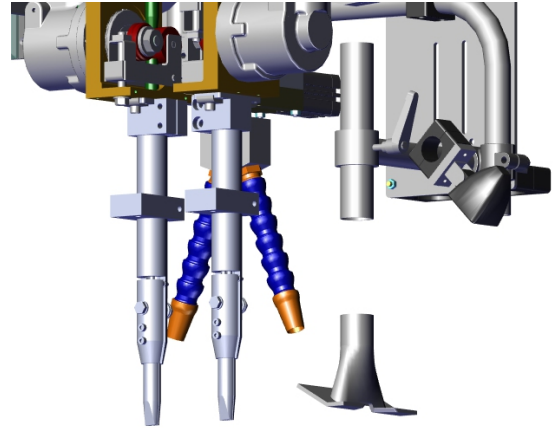
- Multi-arc Twin SAW welding head with automated functions for increased arc-on ratio as well as the welding output during arc-on.
- Flux hopper with remote controlled drop valve.



3.3.1.3. Welding torch

SAW Twin torch assembly

- Torch with jaw type contact nozzle
- Kit for twin wire feeding including twin nozzle, twin wire rollers to wire feeder and wire straightener for twin wire



3.3.1.4. Power source

Digital Power Source

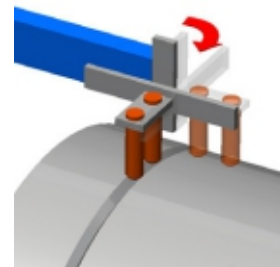
- For efficient automatic welding both single or multi -arc applications, with wire feeder and digital wire feeding control



3.3.1.5. Welding head mounting

Turnable 90° welding head mounting

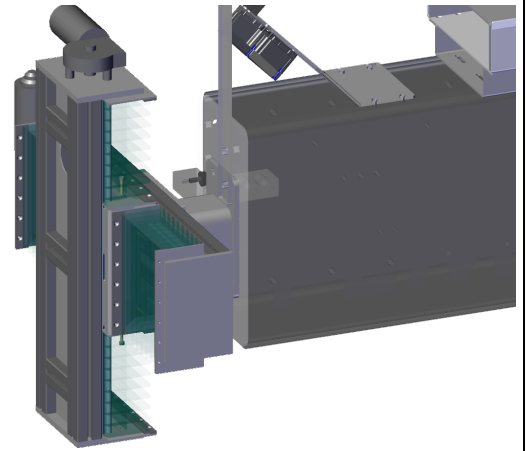
- Turnable welding head for both longitudinal and circumferential welding.



3.3.1.6. Cross slides

Motorized cross slide

- Motorized cross slides from 100 mm up to 1000 mm stroke both in vertical and/or in horizontal direction.
- Covered with self-extinguishing PU bellows that have good resistance to small weld spatters or hot material.
- Direct current motor with feedback control



3.3.1.7. User interface

PEMA WeldControl 100

- Industrial-quality full-color touch screen
- Can be connected to a factory network
- Management of all welding parameters and storing of production data
- Seam tracking control
- Language support
- Windows CE



3.3.1.8. Flux handling

Pressured air operated flux handling

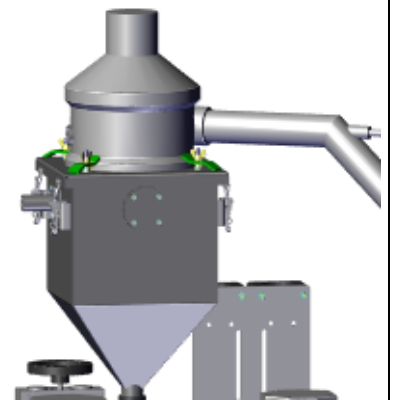
Heated 75 l flux tank to supply new flux from platform to welding head

- Low level sensor to alarm operator when flux is low
- Filling container with cover top of tank
- Automatic valves for remote control of flux supply
- Thermostat 0-120°C

Filter unit to collect dust from flux and leave used air out

Air operated flux recovery unit with ejector and flux hopper

- Hopper size 10l
- Automatic valve for remote control off flux drop
- Airflow 250l/min (6bar)
- Max suction height 0,8m
- Includes all needed nozzles and hoses for flux supply and recovery

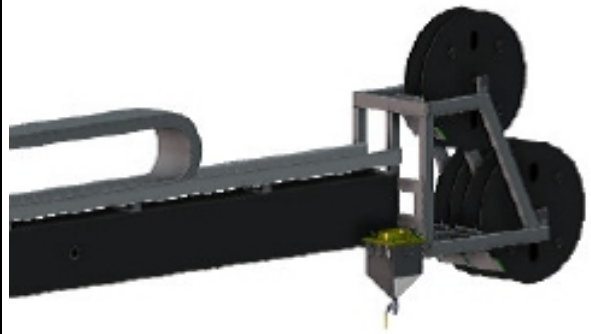


3.3.2. Options

3.3.2.1. Wire reel

Wire reels mounted on end of the boom

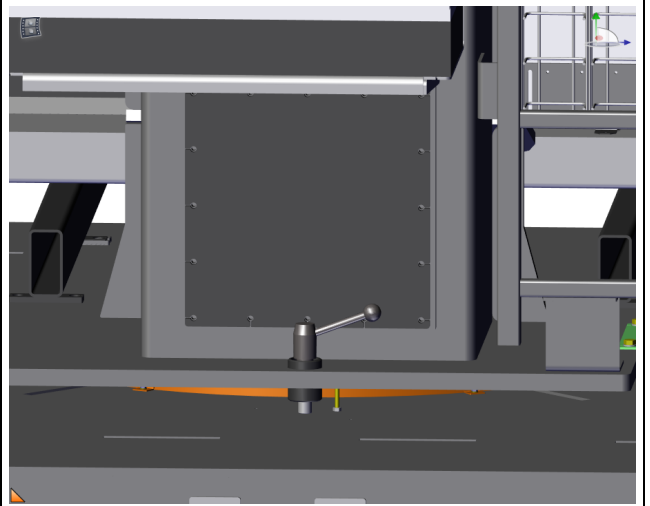
- Fast to lift down and open when adding new wire
- Rotating brake
- HD Liners from end of boom to welding head



3.3.2.2. Locking for rotation

Lever locking for rotation

- Hand lever locking to stop the rotation of the column & boom.



3.3.2.3. Seam tracking

Electro-mechanical seam tracking

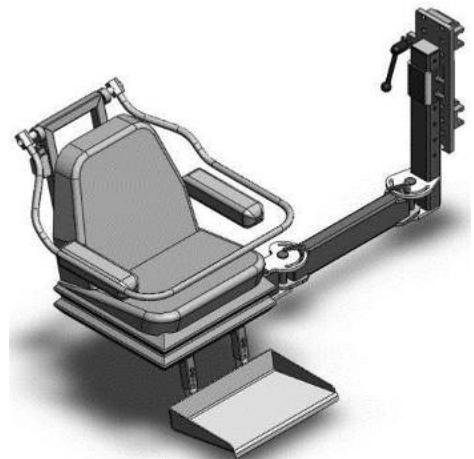
- Mechanical finger sensor equipped with manual cross-slides for easy adjustment of sensor.
- Control interface for Column & Boom motorized slides for fully controlled seam tracking.



3.3.2.4. Operator's seat

Operator's seat

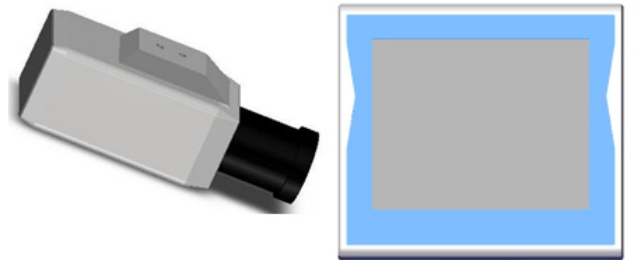
- EN-type certificated
- Adjustable fixings
- Ladders in column for emergency exit
- Operator panel and controller fixed in front of operator seat



3.3.2.5. Camera and display

Camera and display

- Welding process can be followed from operator's platform via camera and monitor system.



4. INSTALLATION AND COMMISSIONING

4.1. Handling and storing

The machine parts are packed on a basis, suitable for lifting by crane and/or forklift. Use only the designated lifting loops to lift up the machine.

Unload the machine from the packing and check the outer condition. Do not store the machine outside or in damp places.

4.2. Installation

Installation of the machine is only allowed under the supervision of PEMA or its authorized representative. Installation must be carried out according to installation instructions in Pema layout and foundation drawings.

5. OPERATING INSTRUCTIONS



Read and Understand the INSTRUCTION MANUAL before installing or operating

- Observe the following safety precautions in addition to the standard regulations that apply to the work place
- Operator has the ultimate responsibility for ensuring that anyone who works with or near the equipment observes all the relevant safety precautions.
- Only trained persons are allowed to operate the machine.
- Before operation:
 - Secure working area
 - Ensure proper fastening of work piece
 - Ensure the connection of welding ground cables.
 - Check the program parameters.
 - Check the condition and location of welding torch.
- Never leave machine unattended when operating!
- Protect yourself and others!



IN CASE OF AN EMERGENCY – Stop machine with emergency stop button!

- Emergency stop buttons are used in case of an emergency.
- Do not use emergency stop buttons for normal stopping of machine.
- Ensure safe working conditions before starting operation after emergency stop!

5.1. Safety functions

In case of an emergency the operation of the machine is stopped with emergency stop button. The reason for emergency must be solved before continuing operation.

5.1.1. Emergency stop function

The location of an emergency stop button is on the control panel in the door of the main control cabinet MC1. Other emergency stop button is located above the control panel RC1.

When any of these buttons is activated the emergency stop is performed. Emergency stop opens the main contactors of the machine yielding to powerless state of all motors. Emergency stop also switches off the welding equipment.

Note! The control voltage (24VDC) remains after emergency stop!

Note! The power of the flux heating system remains after emergency stop!

5.1.2. Proceeding after emergency stop; release and reset

Before resetting the emergency stop actuated emergency stop buttons must be released. Releasing and resetting the machine is done as follows:

- Release the emergency stop button by turning it clockwise.
- Reset the machine with the reset button situated in the control panel MC1 in the door of the main control cabinet. Reset is possible when the blue light of the reset button is on.

5.1.3. Controlling the boom in case of emergency

Normally, while machine is operated by operator up in the seat, it is not allowed to operate the column & boom simultaneously from floor level. However, if the emergency stop button has been pushed the column can be controlled with the control panel MC1 down on the platform. Controlling the boom from platform is done as follows:

- Turn the key to position 'Local'. In picture the location of the key switch is indicated with letter A.
- Turn button Boom Up / Down position down and drive the boom to its lower position. In picture the location of the Boom Up / Down is indicated with letters D.

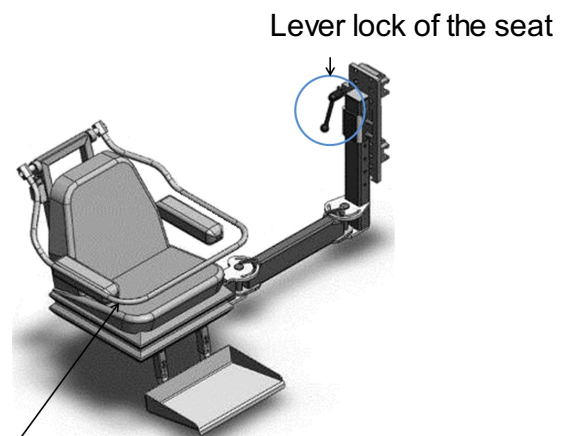
If the column is operated from the floor level, it's essential to ensure, that the operator isn't in danger while the boom is moving.

5.1.4. Emergency escape from the operator's seat

In case of emergency operator can exit the boom without using contry control panel RC1.

- Release the lever lock of the seat.
- Pull the seat next to the column.
- Use the ladders to get down.

Notice! Do not use ladders to get up or down unless in a case of emergency.



Safety frame

5.1.5. Activation of the safety device and controlling the boom afterwards

The safety device activates if the boom collides with work piece, or if the lifting equipment, chains or the chain fastening have been damaged or loosened for some other reasons. Activation of the safety device prevents the machine to run. Check the reason of the activation and do all the repairs needed.

The boom can be lift back to the chain support from floor level using the bypass button situated in the control panel in the door of the main control cabinet MC1. Controlling the boom after activation of safety device is done as follows:

- Ensure that the operator has left the seat and that there is not anyone under the boom.
- Turn the key (A) switch of the control mode position 'Local'.
- Press the bypass button (B) and keep it down, and now press also reset emergency stop button (C) above the bypass button.
- After resetting the emergency stop keep the bypass button still pressed down until the lifting mechanism of boom begins to work. This takes about 15 seconds.
- Let the boom rise a few seconds and check if the emergency stop is reset without using bypass button.
- Drive the boom down with button (D) and lock the operator's seat back on its place.
- Check the condition of safety device and repair all possible damages.

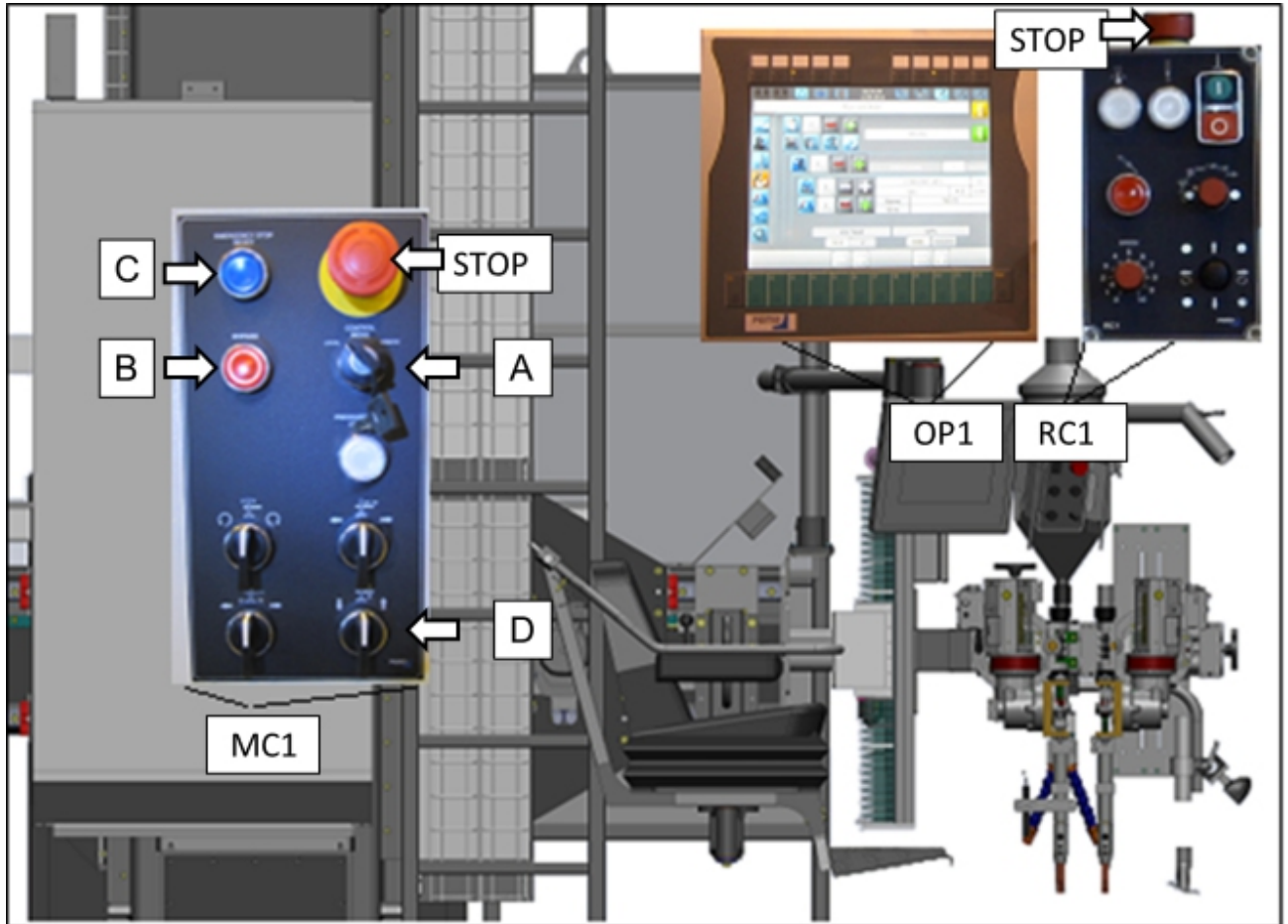


Figure 4 Control panels and emergency stop buttons

5.2. Control functions

Column & boom is equipped with different types of control panels to operate the machine and the welding process as well as the flux system.

On the floor level there is a control panel with the emergency stop button and the reset button. It is situated below main switch on the door of the main cabinet MC1. Control panel RC1 is used to control main movements of the machine and motorized cross slide. There is another emergency push button on top of the control panel RC1. Operator's panel OP1 is used to control and adjust welding process as well as movements and functions of the machine and auxiliary devices.



Control panel in MC1



Control panel RC1



Operator's panel OP1

5.2.1. Main switch and control panel in MC1

Main switch and the control panel in MC1 are located on the door of the main cabinet. In this control panel you can find an emergency push button as well as reset button to reset the machine after an emergency stop. There is also signal light serving information about function of the flux pressure tank.

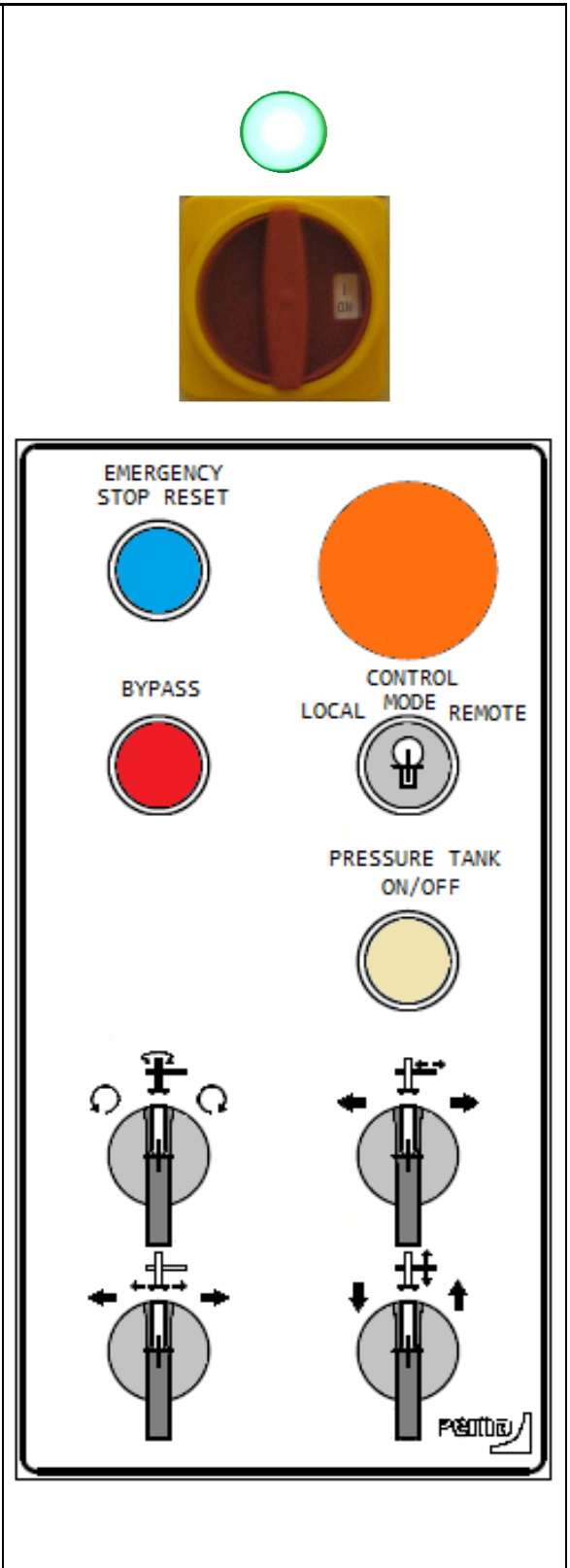
Control panel in MC1 is also used to operate the main movements of the column & boom manually, if there is a need to control the movements from the platform.

Using this control panel is forbidden, if machine is operated by the operator working up at the boom's end unless in case of emergency.

Notice! There are two keys, one for the operator and one to keep within site management for emergency situations.

Main switch and control panel in MC1 has the following functions:

1. Main switch
 - On; turn clockwise (green signal light is lit, reset light is lit in few minutes after start)
 - Off; turn counterclockwise (green signal light turns off)
2. Emergency stop push button
 - Press to activate
 - Emergency stop button is released by turning it clockwise
3. Emergency stop reset button
 - Reset is possible when blue light is lit.
 - After the machine is started, reset light is lit.
 - > Press reset
 - > If light does not turn off, check the emergency stop push buttons
4. Key switch for selecting the control location
 - Local selected: Control panel in MC1 is active.
 - Remote selected: Control panel RC1 next to operator's seat is active.
 - Two keys: Operator's key and spare key for emergency situations
 - While machine is driven from operator's seat, control panel in MC1 is not allowed to use unless emergency stop is active.
5. Bypass button
 - Controlling the boom in case of emergency
6. Flux pressure tank enable/disable (SAW)
 - Signal light is lit when pressure tank is enabled.
 - When pressure is switched on, the flux suction valve is also activated for 1 min, in order to create a counter pressure to the flux hopper. This procedure prevents possible clogs to the hopper system.
7. Manual movements of the boom and the tower



5.2.2. Control panel RC1

Control panel RC1 is used to control the machine movements and the welding process.

1. Automatic welding Start / Stop

- Signal light is lit when the automatic working cycle is on
- Stop: Press Stop (signal light turns off)
- Pause: Press Stop once (signal light blinks)
- WeldControl fault codes are reset by pressing Stop button continuously for 3 seconds (light flashes rapidly indicating when reset is complete)

2. Emergency stop push button

- Activate: press
- Release: turn clockwise

3. Flux suction and Flux drop

4. Selection switch for manual movement

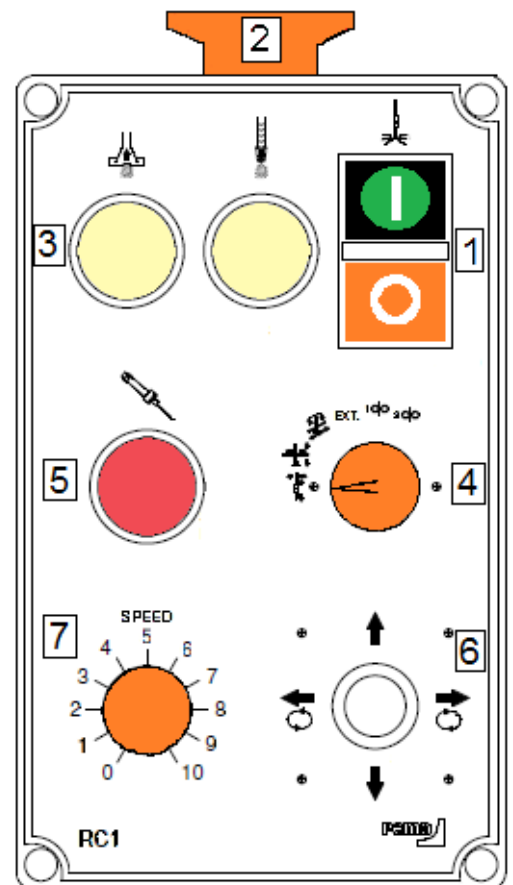
- a. Manual movement up/down/left/right for torches
- b. Manual boom movements up/down/forward/backward
- c. Column turning movement
- d. External device movements (roller bed / positioner)
- e. Manual wire feeding for torch / torches

5. Seam tracking sensor activation

- Light is flashing when seam is lost.
- Light stays continuously on when sensor is ready and tracking.

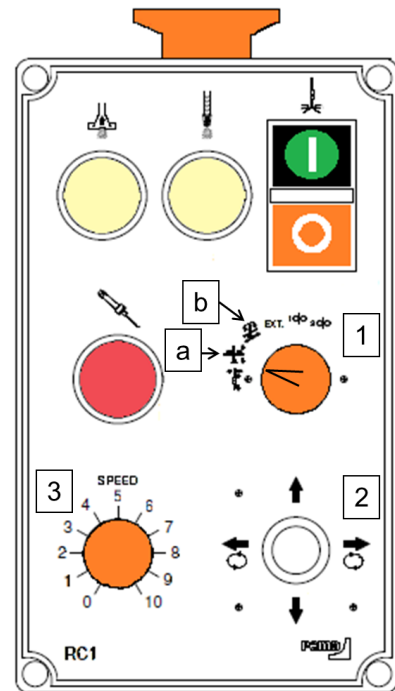
6. Joystick for selected movement

7. Manual speed control potentiometer for selected movement



5.2.2.1. Driving the boom with RC1

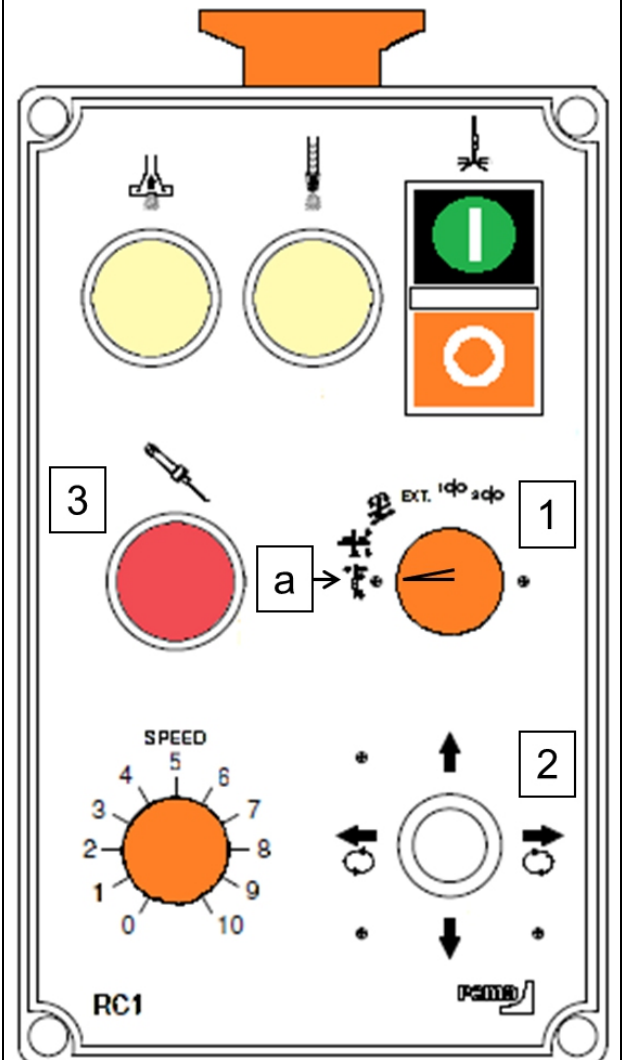
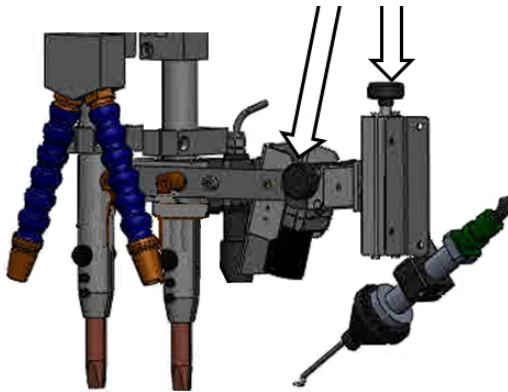
- Set the **selector (1)** position **Manual boom movements (a)**.
- Use **joystick (2)** to drive the boom up / down / forward / backward
- Set the **selector (1)** position **Manual boom rotation (b)**, and then use **joystick (2)** to turn the boom to the correct welding position.
- Speed of the movement is controlled with **speed potentiometer (3)**



5.2.2.2. Positioning the seam tracking equipment before start

Position the torch into the joint so, that the working area of the cross slide covers the full height and width of the joint from start to finish.

- Set the **selector switch (1)** to the **Manual torch (a)**.
- Use the **joystick (2)** to lower the tracking system down.
- Positioning is ready when the **indicator lamp of the tracking system (3)** stops blinking and the red light stays on.
- The tracking system finds for the zero setting and positions the contact tip on the right floating point.
- If necessary, adjust the position using the manual adjustment of cross slide.



5.2.3. Welding control with touch screen OP1

Column & boom is equipped with a control system which combines welding parameter control, welding data storage, remote control and other advanced welding functions into the column & boom control interface. Control of the interface is done with a touch panel called Operator's panel OP1.

In this section it is told the main principles of how the touch screen works, programming functions are described in the following sections.



Figure 5 Operator's panel OP1

1. Soft keys of touch panel. These soft keys are used as keypad to activate functions given on toolbar on the top or the bottom of the screen.
2. Touch screen. This screen is used as display to follow welding process and welding parameters as well as use it as a keypad to change welding parameters and control other functions. This is done by touching the number fields on the display. That will open the keyboard on the screen, and the parameters can be fed to the fields of the screen.

Further instructions about programming with operator's panel are given in section Operation and programming functions.

5.2.4. Flux system control

Flux system has its own main switch. This makes it possible to keep the flux warm while other devices are switched off.

There are signal lights serving information about the functioning of flux pressure tank within the control panels MC1 and RC1. If pressure tank is enabled, signal light in control panel in MC1 is on. Functioning of flux suction and flux drop is indicated with signal lights in control panel RC1. Flux system is operated with buttons in operator's panel OP1.



Pressurizing the pressure tank on / off.



Flux dropping manually on / off (same function than with remote control RC1 button).



Flux vacuuming manually on / off (same function than with remote control RC1 button).

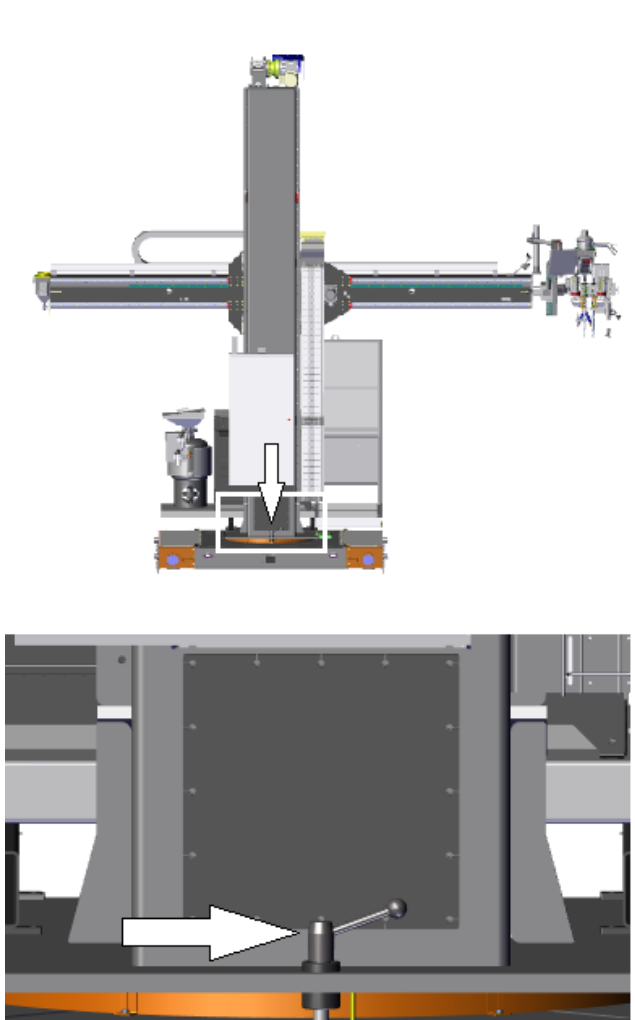
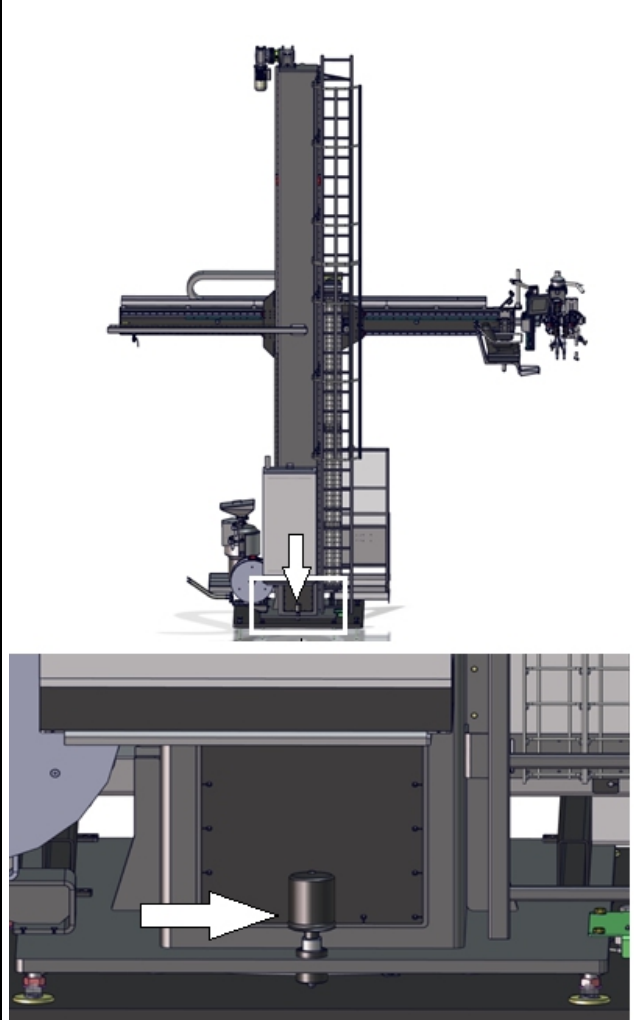
When flux pressure is switched on, the suction valve is also activated for 1 min, in order to create a counter pressure to the flux hopper. This procedure prevents possible clogs to the hopper system.

The pressure tank is providing welding head with flux. The recovery system will take the excess flux to the hopper where it is mixed with new flux from the tank. When the tank is empty the hopper acts as an intermediate storage allowing the operator to fill the tank without stopping the welding process.

Adjustments of the tank heater are done with tank's own thermostat (see section Flux heating adjustment).

5.3. Rotation lock

Boom can be rotated horizontally. This movement needs to be locked during the welding.

Lever lock	Pneumatic lock
Rotation is locked with a lever lock. Lock the machine before welding. Open the lock before rotating the machine. 	Rotation is controlled with a pneumatic cylinder. Pneumatic cylinder locks the machine automatically while welding. Locking is automatically controlled with pneumatic cylinder when rotation movement is started. 

5.4. Joint tracking operating instructions

5.4.1. Joint tracking

The joint tracking equipment can be set for various methods of joint tracking. It can be set for joint tracking with edge guidance, or for joint tracking with slot guidance. Adjustment is carried out on the control unit and the sensor.

5.4.2. Joint tracking with edge guidance

Select either  or  on the control unit depending on whether you want left or right edge guidance. On the sensor the two stop screws should be fully tightened. See the diagram below. The search fingers are now spring-loaded to the side to allow edge guidance. Joint tracking with edge guidance is used when welding fillet welds and similar joints. For more information see table [1](#)

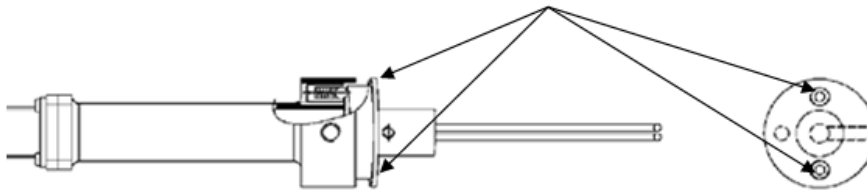


Figure 6 Stop screws fully tightened

5.4.3. Joint tracking with slot guidance

Select either  or  depending on whether you want control over height and transverse position, or just height. The stop screws on the sensor must be unscrewed: at least two turns or as far as they will go, see the diagram below. This releases the transverse spring--pressure on the search fingers and permits slot guidance. If the stop screws are not unscrewed there is a risk that the search fingers will "climb" out of the joint in shallow V or U joints. For more information about choice of setting refer to the joint table [1](#)

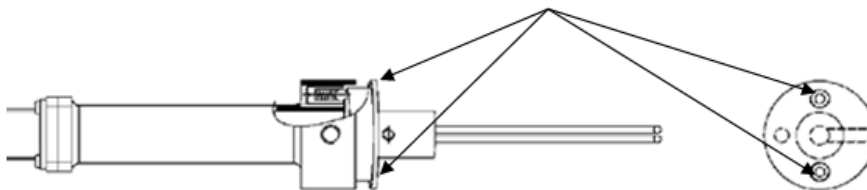


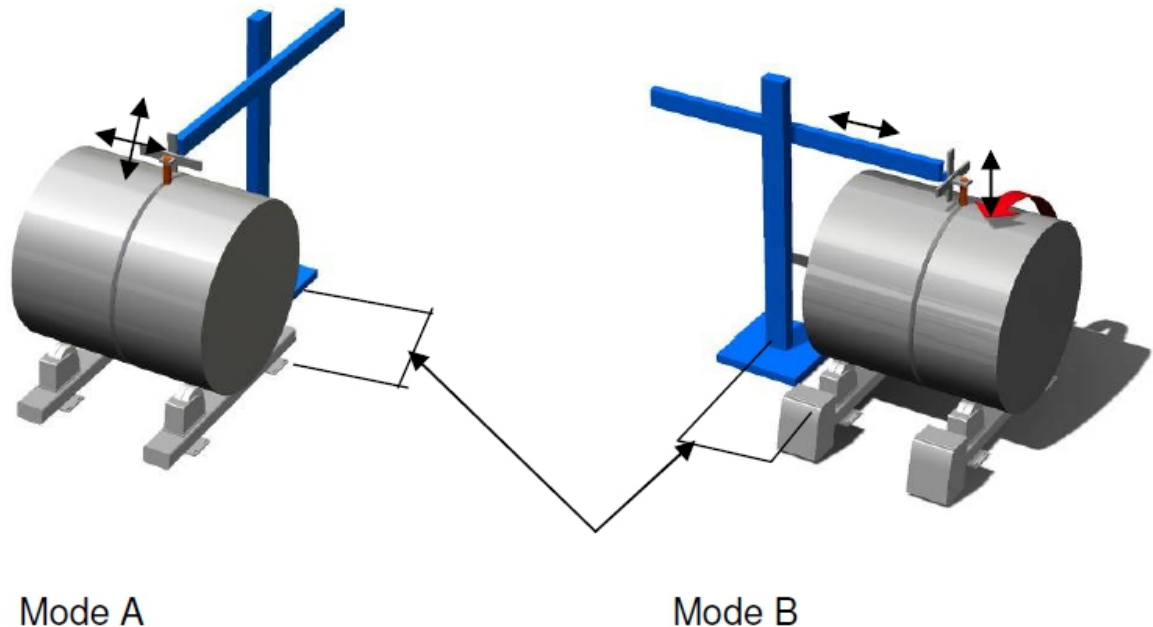
Figure 7 Stop screws unscrewed 2 turns

	Joint type	Setting, control unit
Double flange butt joint		
I-weld (A=guide)		
V -weld		
1/2 V - weld		
1/2 V - weld		
U - weld		
Double U - weld		
J - weld		
Double J - weld		
X - weld		
Asymmetrical X - weld		
K - weld		
K - weld		
Fillet weld		

Table 1 Examples of various types of joints and the tracking finger setting against the guiding edge

5.5. Selection of operation mode

5.5.1. Roller bed mode



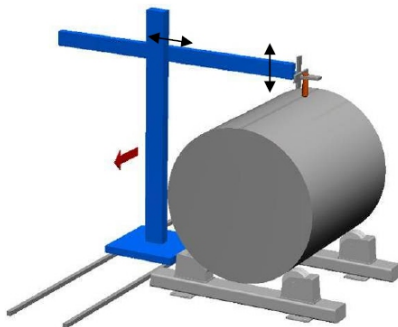
- Connection cable is needed for the synchronization of column & boom and roller bed (or positioner).
- The rotation movement of the roller bed is selected as the welding movement from the display of the C&B (Settings page).
- On roller bed or positioner remote control display should appear text EC on analog connection or BUS on bus connection (devicenet or ethercat).
- Now the welding and the roller bed are centrally started by using the START/STOP-button.
- A and B mode are different from each other for the horizontal slide of the seam tracking. With mode A the horizontal movement of the seam tracking is a short DC-motorized slide. With mode B the horizontal movement of the seam tracking is boom's horizontal movement.
- Manual speed can be set with the potentiometer from the remote control of the column & boom. Welding speed can be set from the display of the C&B.
- Rotational direction of the roller bed can be changed from the display of the C&B.
- Roller bed can also be rotated manually by remote control of C&B using the joystick left/right and choosing wire 1 or wire 2.

5.5.2. Linear mode



- If the connection cable is not in use the ETB-plugs (External terminating block) have to be connected to the cable plugs for ensure the integrity of emergency stop circuit.
- The linear movement of the column and boom is selected as the welding movement from the display of the C&B.
- The welding direction of the column & boom can be changed by from the display of the C&B. In this case, the horizontal working direction of the seam tracking will also change

5.5.3. Rail car welding



- If the connection cable is not in use, then the ETB-plugs have to be connected to the cable plugs for ensure the integrity of emergency stop circuit.
- The linear movement of the column and boom along the rails is selected as the welding movement from the display of the C&B.
- The welding direction of the column & boom can be changed from the display of the C&B. In this case the horizontal working direction of the seam tracking need to be changed too. The correct setting of the horizontal axis direction depends on the welding direction and horizontal angle of the welding head.

5.6. Adjustments

5.6.1. Flux heating adjustment

Flux system has its own main switch. This makes it possible to keep the flux warm while other devices are switched off.

Flux heating control panel is used to adjust heat of the flux tank. Heating keeps the moisture out from the flux pressure tank while it is in use. When flux system is not in use, empty all flux from the tank and hoses. If flux gets too damp, it is necessary to replace the moist flux with dry.

Panel is situated on insulation / heater element coating the flux pressure tank.



Figure 8 Flux heating control

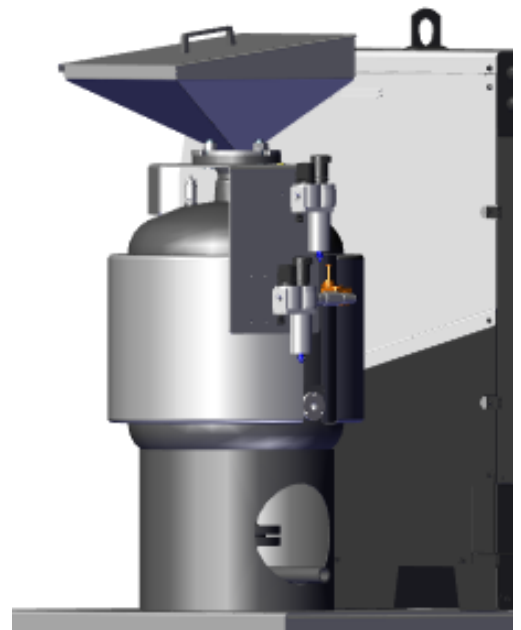
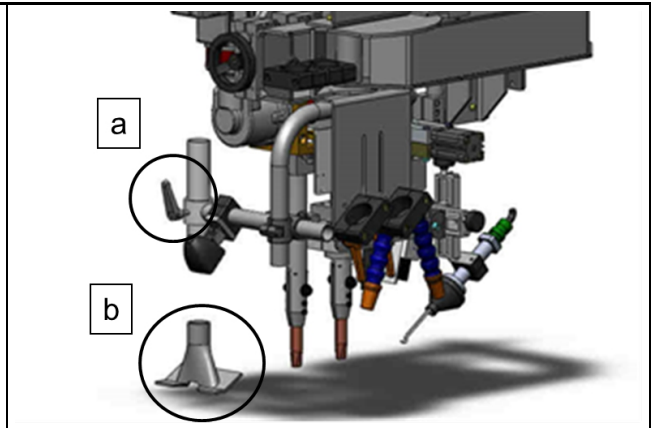


Figure 9 Flux pressure tank

5.6.2. Suction nozzle positioning

When starting or finishing welding work piece, suction hose of the flux system might need to be positioned.

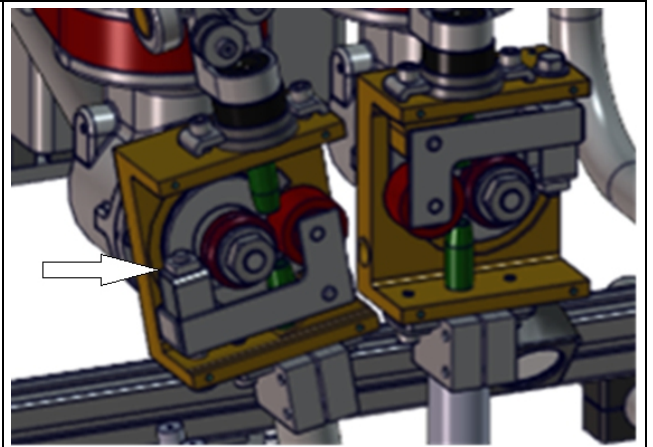
- Unlock the suction hose by turning the lever lock (a).
- Lower down or lift the suction nozzle (b).
- Lock the hose with the lever lock.



5.6.3. Adjusting wire feeder

When wire size is changed, the wire feeder has to be adjusted. Adjustment screw is located in welding head next to feed roller.

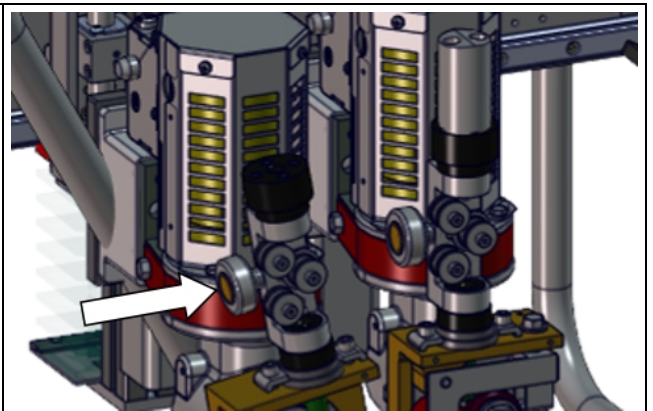
1. Tighten the wire feeder with correct spring load depending from wire size.
2. In case of twin wire check that both wires run with same speed and curled wire roll leaves teathed marks for both wires.



5.6.4. Adjusting wire straightener

Wire is kept straight with wire straightener. Wire straightener is located on welding head above wire feeder.

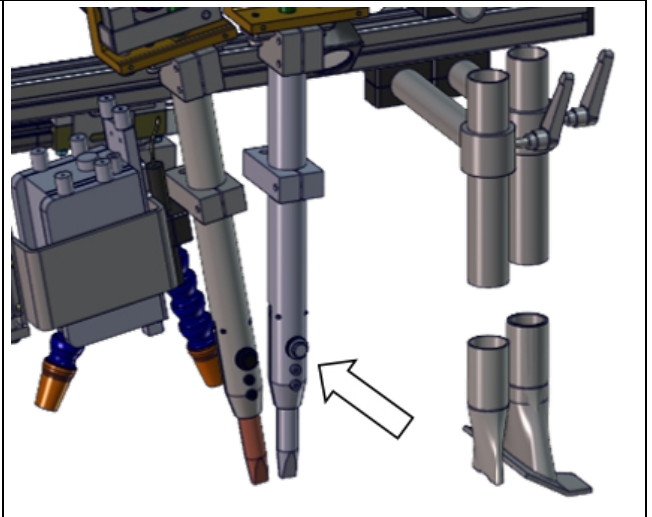
1. Move the straightener roll with the adjusting wheel.



5.6.5. Adjusting contact jaw nozzle

When wire size is changed, contact jaw nozzle has to be adjusted. Adjustment screw is located on connector tube in welding head.

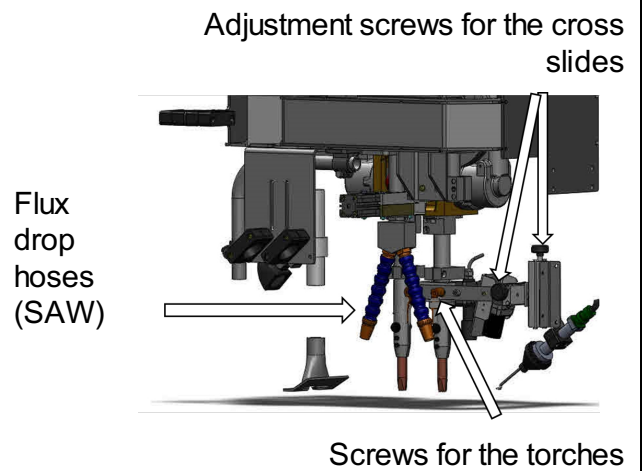
1. Adjust correct spring load to contact nozzle by fully tightening screw and then opening one round.
2. Check that there is washer under the upper bolt and jaw is contacting to wire only from the end of the nozzle.



5.6.6. Adjustments of the welding head

The equipment of the welding head might need other manual adjustment than mentioned before when welding work piece first time.

- Manual cross slides to adjust electro-mechanical seam tracking system (if included).
- Screws for adjusting torch angle if the torches are not in same line with tracking finger.
- Flux drop hoses are adjusted with hands.



5.7. Operator's seat

The column & boom as well as welding process can be operated from the operator's seat located at the boom's end.

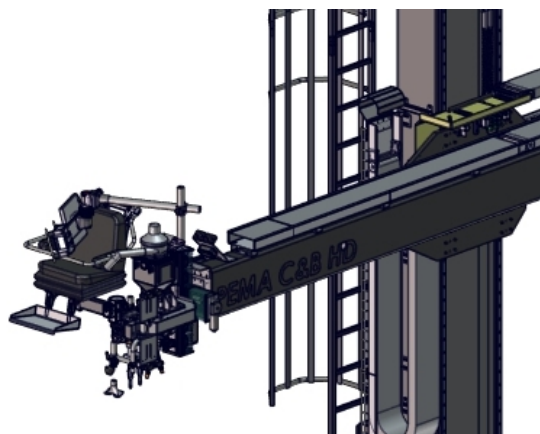
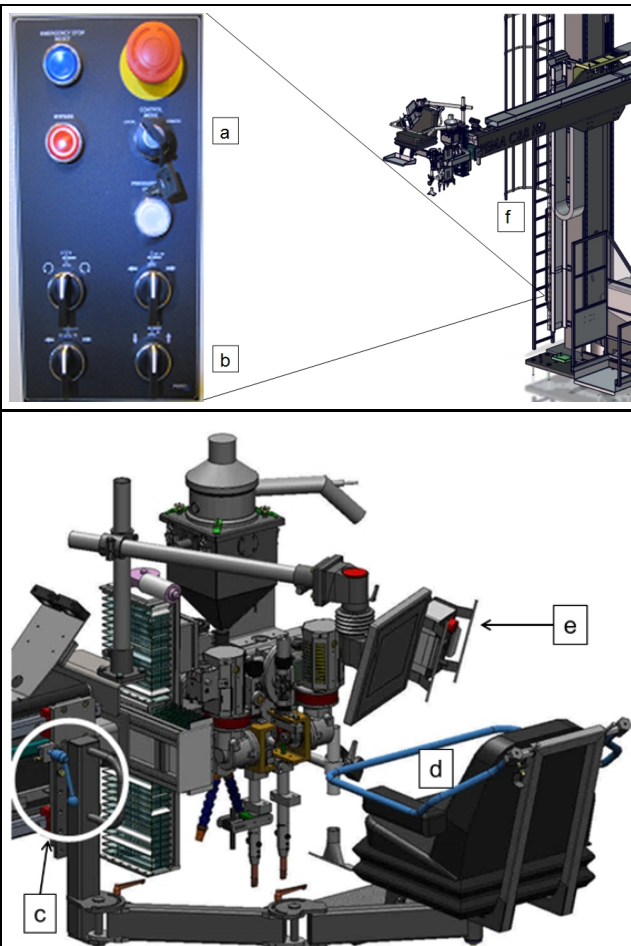


Figure 10 Operator's seat

5.7.1. Using the seat with the panel MC1

1. - Turn key **(a)** to **Local** in MC1 control panel.
- Turn button Boom up /down **(b)** position down and drive the horizontal boom to its lower position
2. - Release a lever lock of the seat **(c)**.
- Adjust the seat to the right distance from the welding head
- Lock the lever lock of the seat.
3. Turn the key **(a)** **Remote** (machine is now controlled from the remote control next to the seat).
4. - Have a seat.
- Lower down the safety frame and lock the seat belt **(d)**.
5. Use control panel RC1 **(e)** to control the boom movements.

Notice! Using ladders **(f)** to get up for the operator's seat is not allowed unless in case of emergency.



5.7.2. Controlling the boom in case of emergency

Normally, while machine is operated by operator up in the seat, it is not allowed to operate the column & boom simultaneously from floor level. However, if the emergency stop button has been pushed the column can be controlled with the control panel MC1 down on the platform. Controlling the boom from platform is done as follows:

- Turn the key to position 'Local'.
- Turn button Boom Up / Down position down and drive the boom to its lower position.

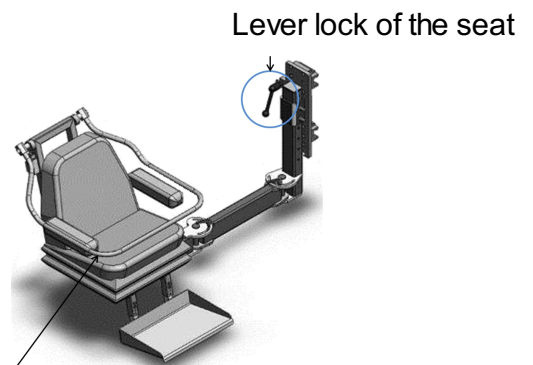
If the column is operated from the floor level, it's essential to ensure, that the operator isn't in danger while the boom is moving.

5.7.3. Emergency escape from the operator's seat

In case of emergency operator can exit the boom without using control panel RC1.

- Release the lever lock of the seat.
- Pull the seat next to the column.
- Use the ladders to get down.

Notice! Do not use ladders to get up or down unless in a case of emergency.



Safety frame



WORKING WITH OPERATOR'S SEAT – Falling hazard!

- DO NOT use ladders unless in case of emergency.
- Fasten seatbelt.
- Maximum load of seat is 115 kg.
- DO NOT operate from platform while seat is in use unless in case of emergency.
- Ensure operator's safety if the column & boom is platform operated.

6. OPERATION AND PROGRAMMING FUNCTIONS

6.1. OP1 Touch panel's main structure in WeldControl 100



Figure 11 OP1 touch panel structure

The main structure of the OP1 touch panel can be seen in figure 11. Touch panel pages includes seven sections with the following functions.

- A. Text field for displaying the active error / alarm
- B. The navigation bar is used to navigate between pages
- C. Memory functions to control welding parameters
- D. Operational functions for controlling and adjusting welding process
- E. Seam tracking functions for choosing automatic seam tracking
- F. Manual functions for manual control of external devices
- G. Welding functions for manual control of welding devices
- H. Time and date

6.2. OP1 upper push buttons in WeldControl 100

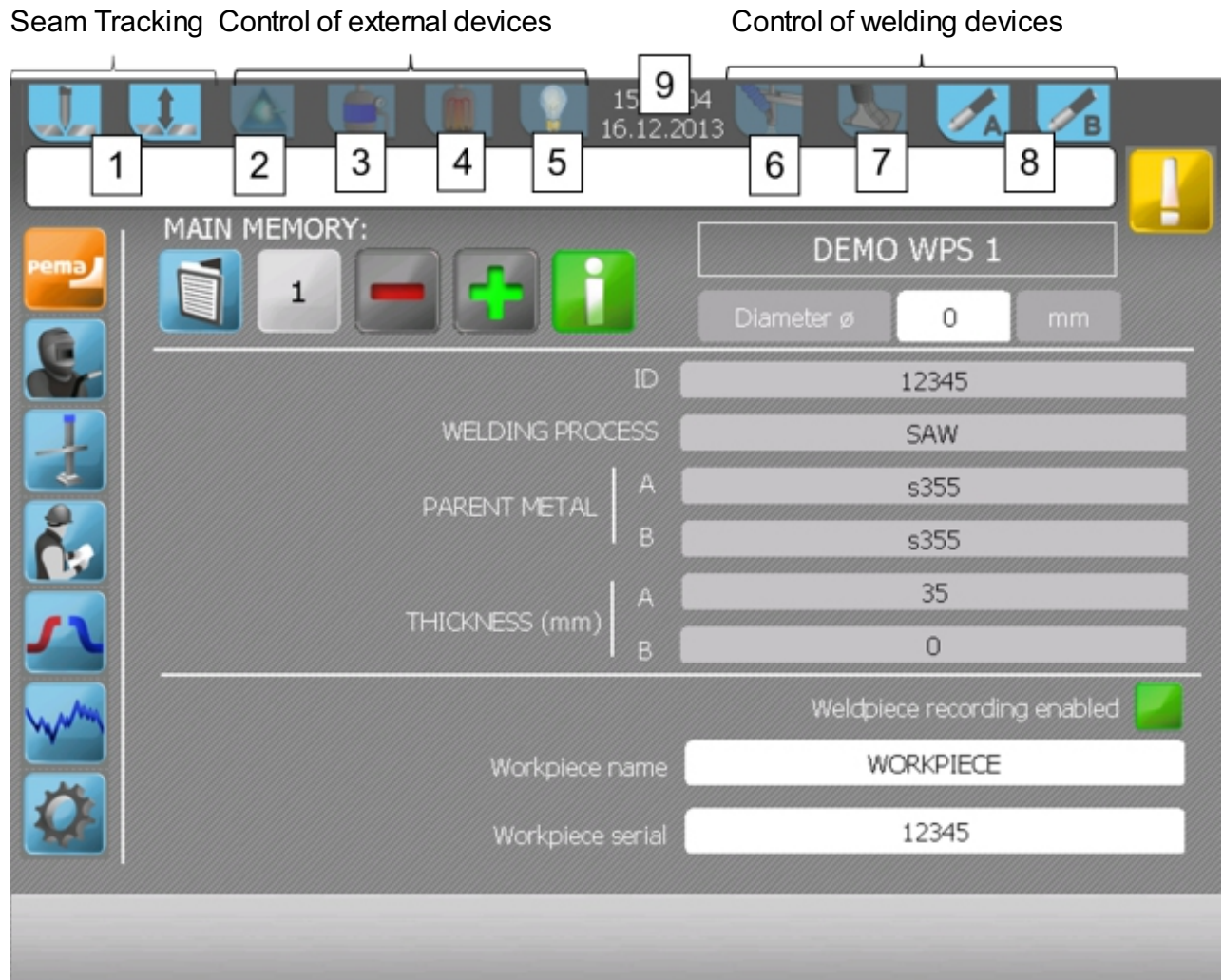
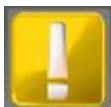


Figure 12 Upper push buttons

1. Seam tracking on/off. When seam tracking is chosen the seam tracking direction button appears and the sensing directions can be chosen.
2. Laser pointer manually on/off
3. The pressure tank on/off
4. Flux tank heating on/off
5. Working lights on/off
6. Flux dropping manually on/off
7. Flux vacuuming manually on/off
8. Torch selection (A lead).
9. Time and date information

6.2.1. Alarm page



An active alarm is seen on the text field on the top of each page. After the error is solved, an alarm reported by WeldControl 100 is reset by pressing Stop button in control panel RC1 for 3 seconds. Alarm history and a list of all present alarms with message and time of alarm is opened by pressing the exclamation mark next to the text field.

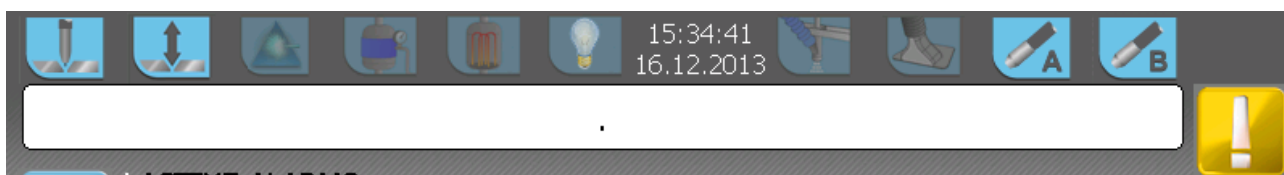


Figure 13 Text field for displaying the active error

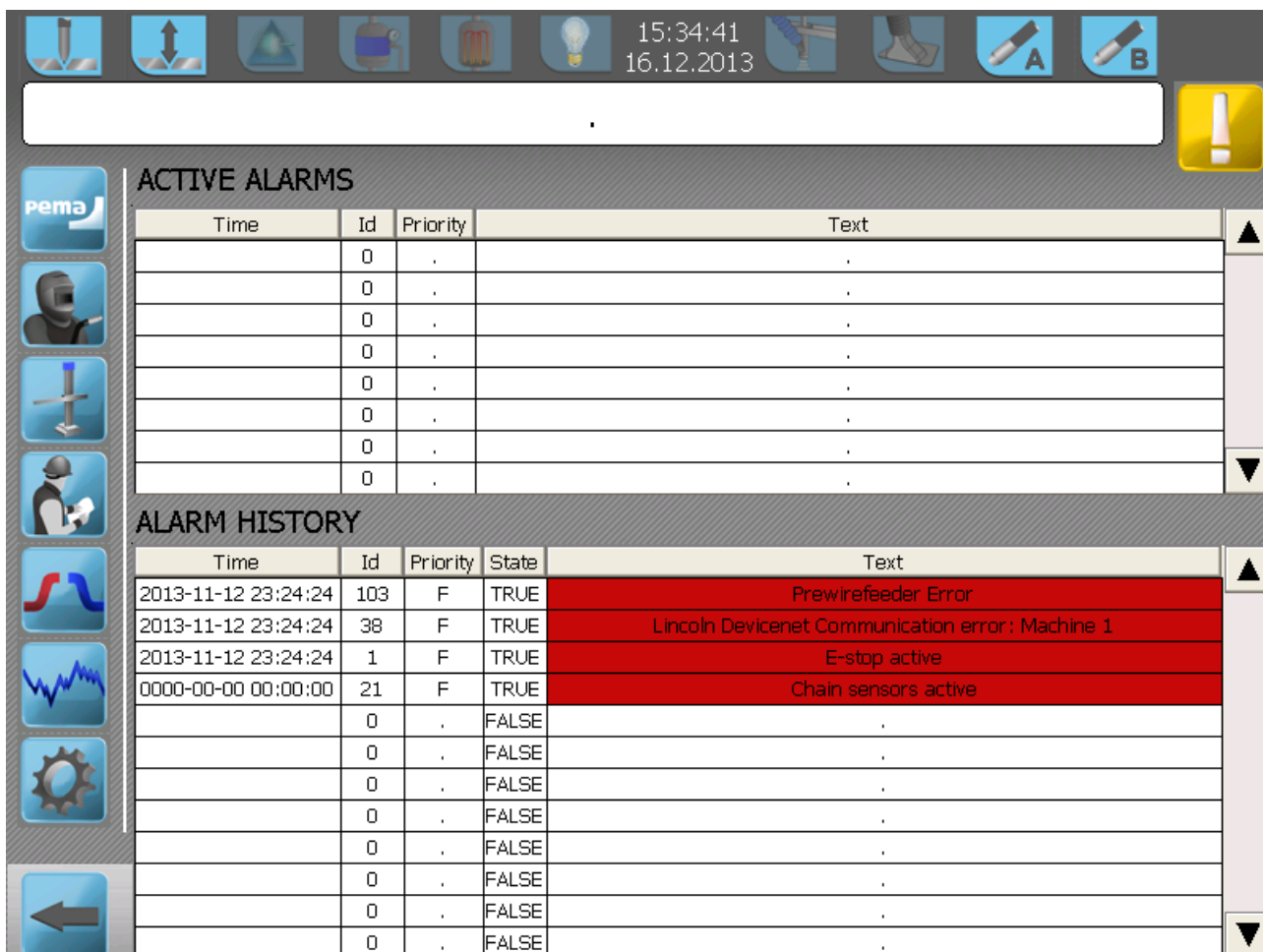


Figure 14 Alarm page

Alarms have three different stages shown with different colors.

Stage 1 colour white

- Information from operations or components

Stage 2 colour yellow

- Warning from operations or components, need to be fixed soon

Stage 3 colour red

- Failure from operations or components. They prevent normal use of machine. Need to be fixed immediately.

6.2.1.1. Resetting alarm codes with RC1

If WeldControl present alarms demand resetting this is done by pressing Stop button in control panel RC1 for 3 seconds.

6.3. Begin welding: Navigation bar, memory and operational functions



Start welding process by choosing main page (1a) and then the memory slot (2), where the work piece specific parameters are saved. If work piece is new, work piece information can be saved to production data enabling it with button weldpiece recording enabled (6). (For more information about begin procedures see also Control panel RC1.) In this chapter it is told more specifically, what is included in navigation bar, in memory functions field and on operational functions field. The locations of these functions are displayed in figure 15 The symbol of Main page is a square with text PEMA in it. While requested page is displayed, the color of the symbol turns orange.

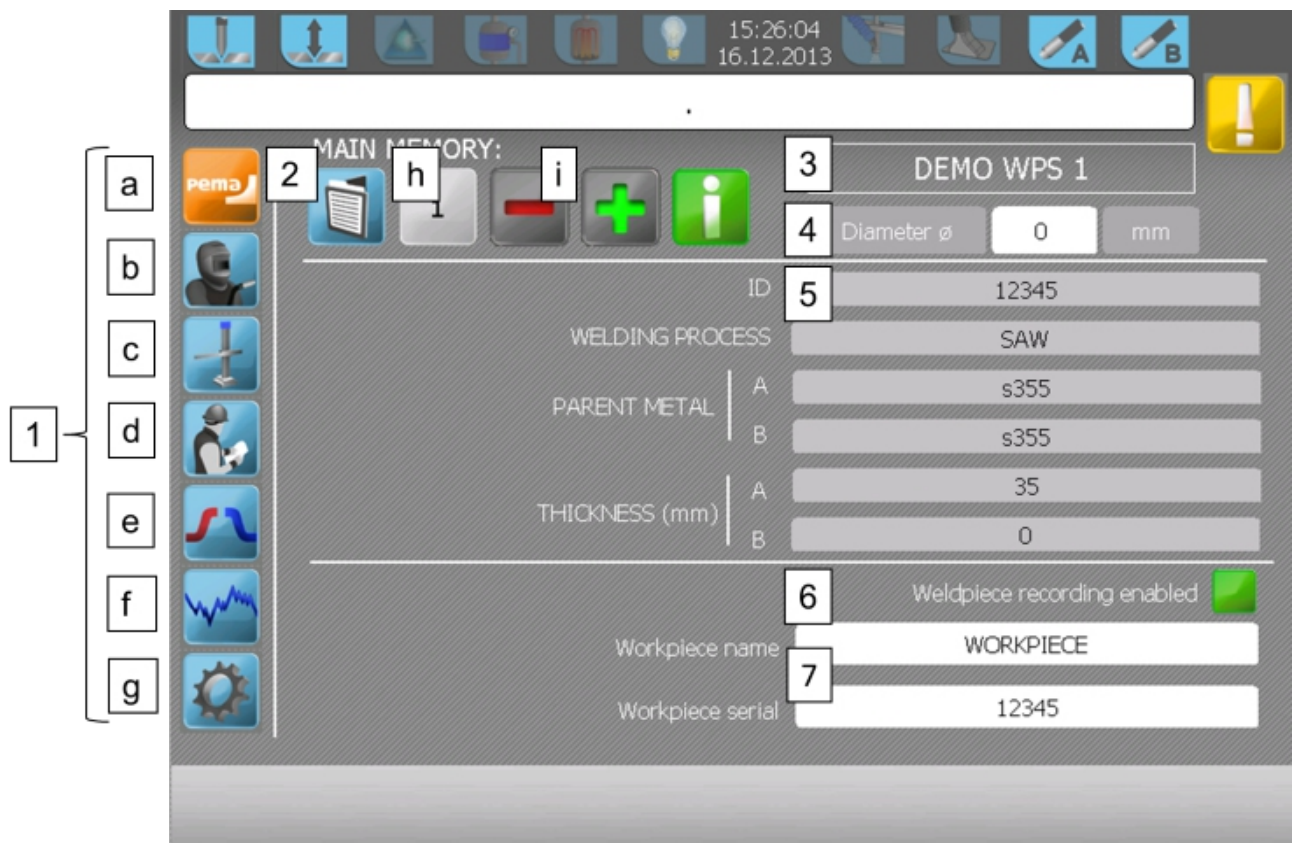


Figure 15 Main screen in OP1

1. Navigation bar includes shortcut buttons with symbols to navigate through different pages
 - a. Main page
 - b. Welding information page for the operator
 - c. Selection of operation mode
 - d. WPS editor
 - e. Editing welding start and stop memories
 - f. Graphic monitoring of the welding values during welding
 - g. Service pages

2. Memory functions are used to find parameters needed for welding
 - Opens AC/DC memory slot page, where saved welding parameters are displayed with name and comments. By pushing the memory slot, it is able to switch to different programs. AC/DC Memory slot page is displayed in figure [16](#)
 - h. Memory slot selection with number
 - i. Memory slot selection by browsing + / -
(Welding parameters can be configured with WPS-editor)
3. Comments about memory
4. Diameter of work piece
5. Information about welding process
6. Save work piece information to production data
7. Work piece information

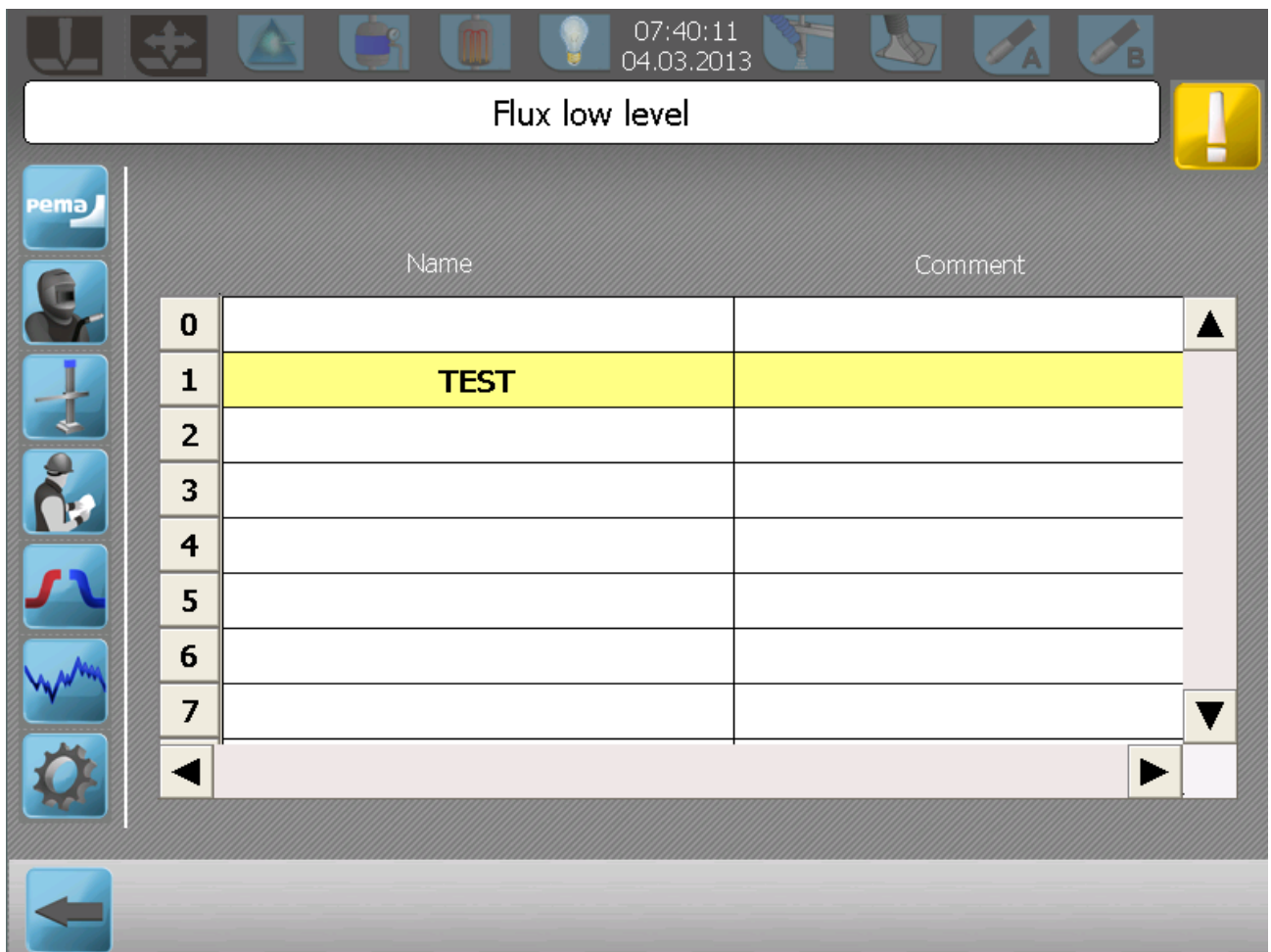


Figure 16 AC/DC Memory slot page

6.4. Welding information page and adjustment of parameters



This page is used for fine tuning and monitoring actual welding values as well as preset parameters during welding. If there is need to adjust parameters it can be done while on this page. In this section it is told more specifically, how you can monitor welding parameters in Welding information page. Welding information page is found by pushing this symbol on navigation bar. Picture of welding information page is shown in figure [17](#).



Figure 17 Welding information page

1. Actual welding values: wire feed, current and voltage.
2. Production data parameters.
3. Welding parameters specified in WPS.
4. Welding speed specified in WPS.

5. Changing of the parameters step by step with the soft keys below the touch screen, which are indicated with number 5 in figure [17](#)

Notice that correct password is needed so that user can store parameters of WPS and welding start/stop to memory locations.

6.5. Selection of operation mode



In this section it is told how you can select different operation modes and external devices suit for your purposes to accomplish the welding process. Page Selecting of operation mode page is found by pushing this symbol on navigation bar. Page displaying selection of operation mode can be seen in figure [18](#)

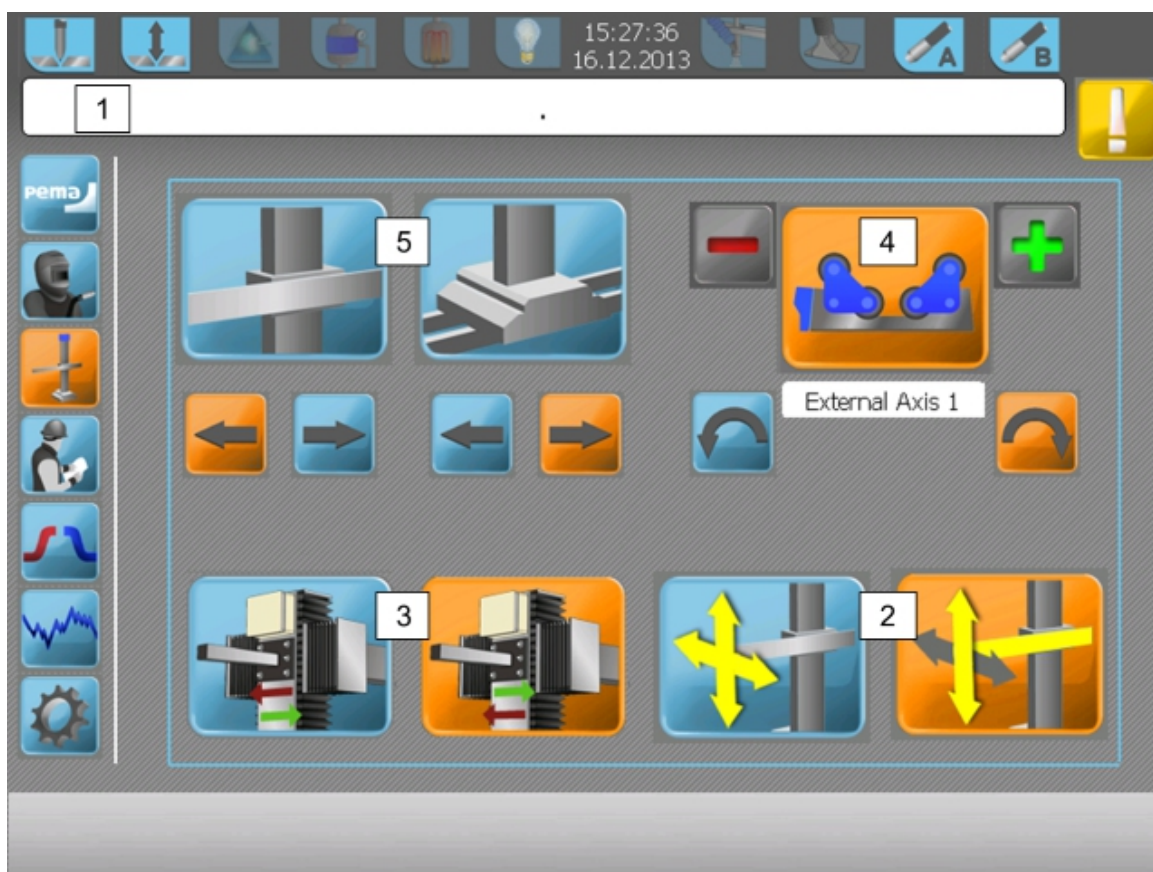
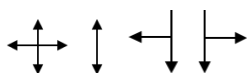


Figure 18 Selection of operation mode

1. Selection of seam tracking mode on / off.

- After the seam tracking is selected the button for operating seam tracking direction appears and the sensing directions can be chosen.

- "Every direction" – mode
- "Only the vertical direction" – mode
- "Vertically and the search to the left" – mode
- "Vertically and the search to the right" – mode



(Further instruction of joint tracking operations is given in the chapter Joint tracking operating instructions.)

2. Selection of the horizontal axis of the seam tracking.

- Horizontal boom can be used as a horizontal axis, when the welding head has to be turned 90°
- The short cross slide can be used as a horizontal axis, when the welding head is in direct relation to the horizontal boom.

3. Reverse of the horizontal axis

- The movement direction of the horizontal axis has to be correct in relation to the seam tracking sensor. E.g. if the sensor is pushed to the left, then the horizontal axis should also move to the left.
- The correct setting of the horizontal axis direction depends on the welding direction and horizontal angle of the welding head.

4. Selection of the welding movement

- Welding movement can be roller bed or positioner Analog (service page selection) or External axis 1 or 2 (Devicenet/Ethercat bus connections)
- Rotation direction choose buttons for external axis

5. Selection of welding direction

- There can be pull or push type of welding with boom movement. This is largely depending on the fact how the welding head can be rotated.

6.6. Setting up and adjusting welding parameters using WPS editor



WPS editor is used for setting up welding parameters as well as adjusting the parameters given before. WPS editor is found by pushing this symbol on navigation bar. In these following sections it is told, how you start using WPS editor or how you can modify WPS welding parameters set before.

6.6.1. Starting to use WPS editor with login function

When entering the WPS editor first time after machine has put on operation, the system requests a password on a pop-up window. At the same time appears "Login required to use current screen", text in the alarm text field as seen in figure 19

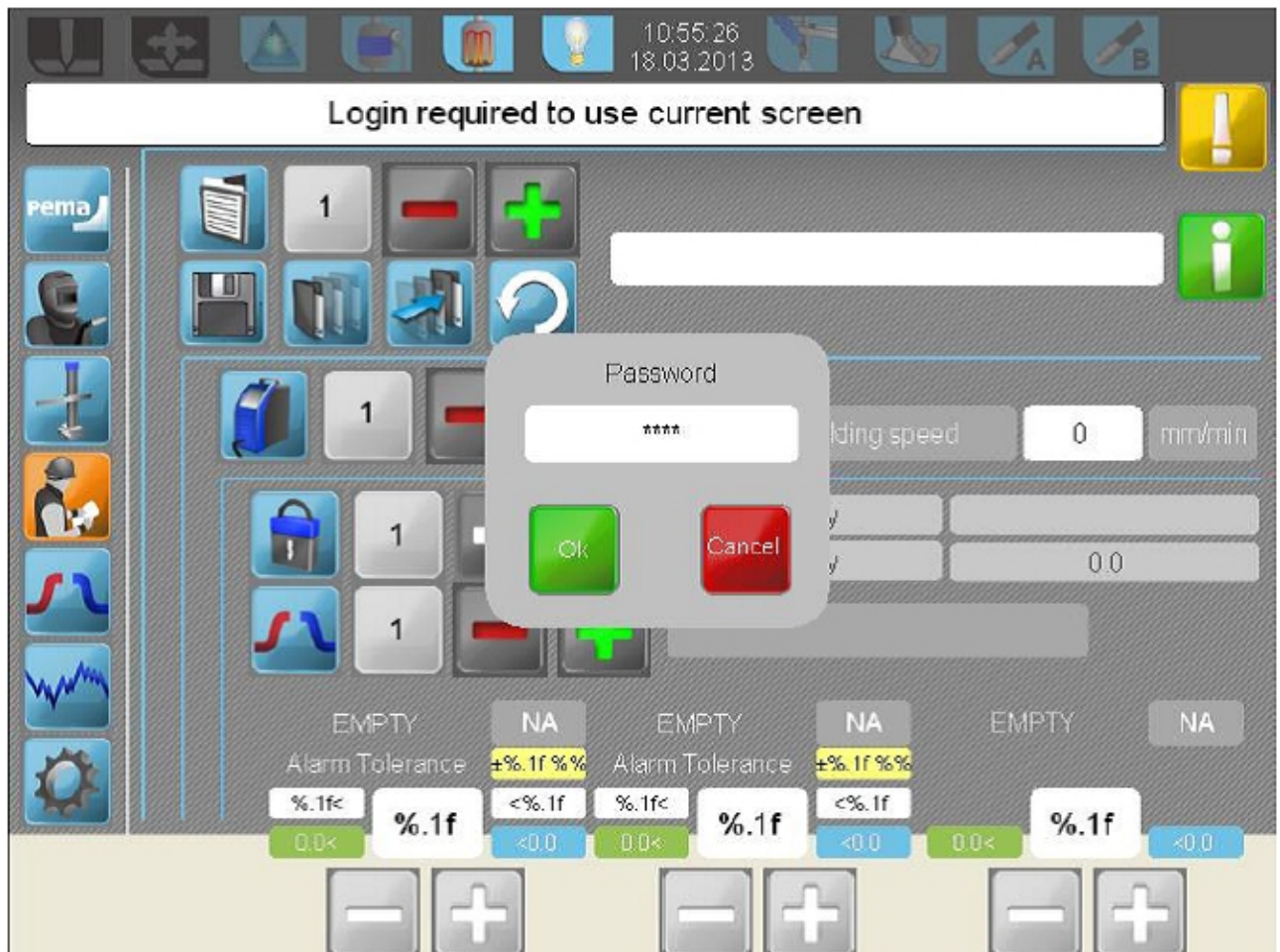


Figure 19 Entering WPS editor with password

Press the **** field on the screen and there appears a keypad in the window. Insert the password pushing buttons on the touch screen. After this press OK button in the keypad and check out the pop-up window pressing OK. If the inserted password is wrong, system informs "Incorrect password". Correct password allows entering the WPS editor pages.

The password inquiry can be turned off in the service pages.

Notice that correct password is needed so that user can store parameters of WPS and welding start/stop to memory locations.

6.6.1.1. Memory and saving functions

Memory functions are used to search for welding parameters stored before and to save new or updated parameters to WPS as well as updating the given information to the power supply. Memory functions are shown in figure 20

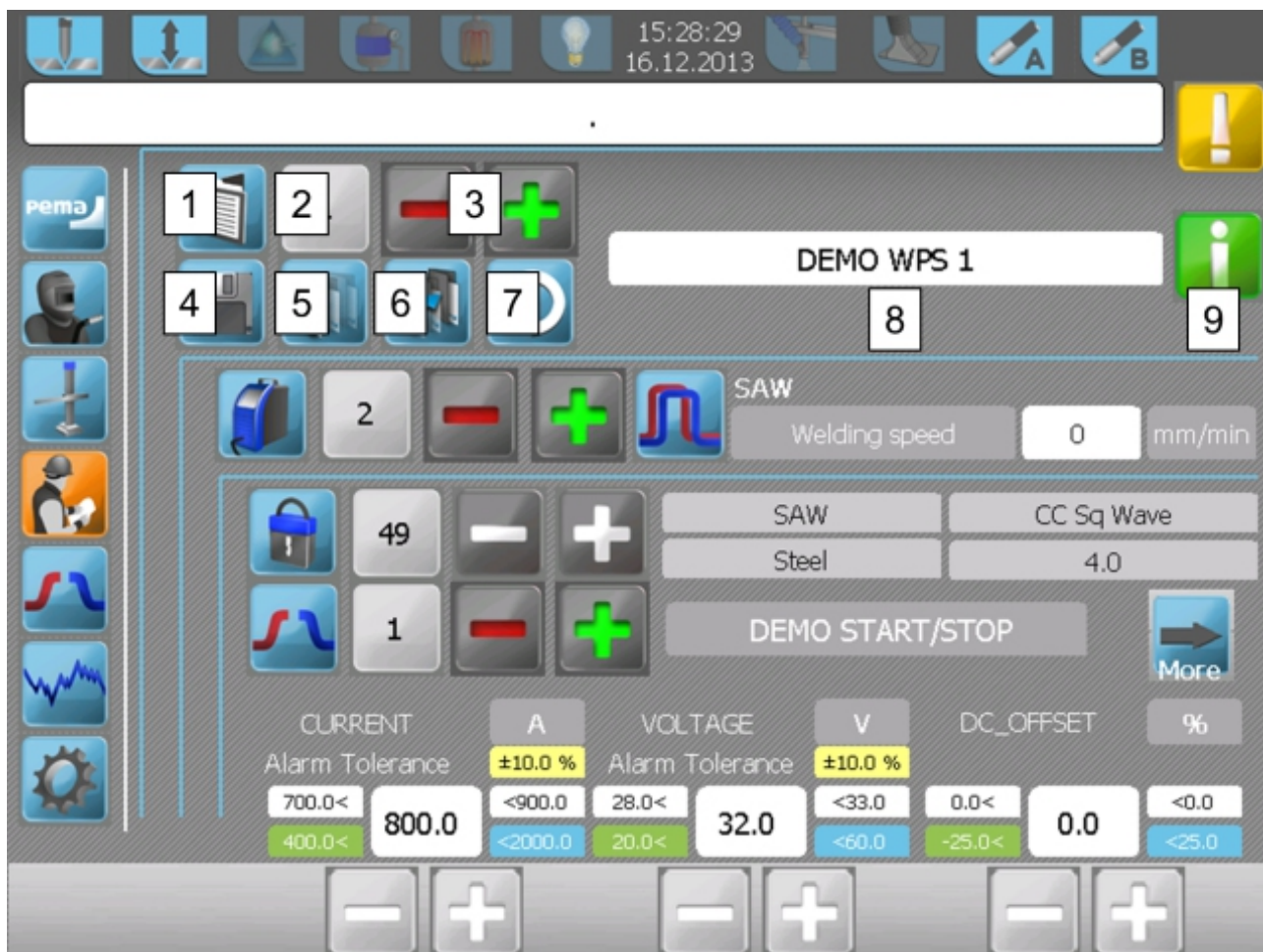


Figure 20 Memory functions

1. Content of stored data
 - Opens AC/DC memory slot page, where saved welding parameters are displayed with name and comments. By pushing the memory slot, operator is able to switch to different programs. AC/DC Memory slot page is displayed in figure 21
2. Memory slot selection with number
3. Memory slot selection by browsing + / -
4. Save
 - a. When parameters are changed, a blinking question mark appears on the top of the save button, reminding to save the altered parameters.
5. Upload
6. Download
7. Refresh

8. Comments concerning WPS
9. Entering WPS details page

	Name	Comment
0		
1	TEST	
2		
3		
4		
5		
6		
7		

Figure 21 AC/DC Memory slot page

6.6.1.1.1. Editing WPS parameters

To edit parameters select the memory slot that need to be altered by using memory function buttons introduced in previous chapter.

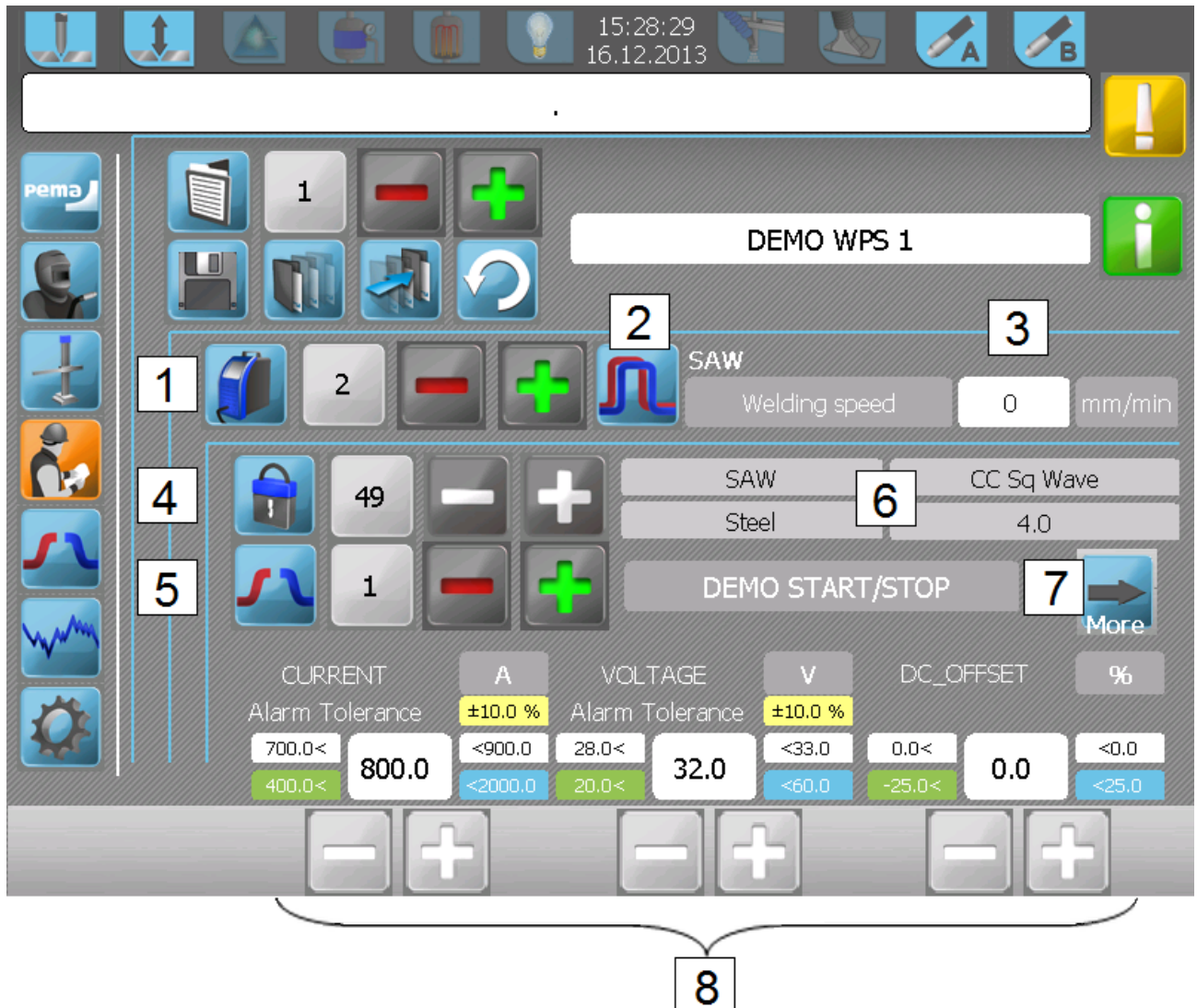


Figure 22 Editing parameters

1. Power supply selection (Depends on the number of torches and welding mode)
2. Torch phase and square-wave voltage (balance,frequency) settings
3. Welding speed

4. Welding mode selection with numbers or +/- -button. It's recommended to start the input of the WPS-values with selection of the needed mode. Up to date tables for welding mode selection is available online
https://www.powerwavesoftware.com/powerwave_powerfeed.asp .
5. Transition to the start/stop parameter page. You can choose saved start/stop parameter with + and -. (CV and CC values change automatically in terms of chosen welding mode.)
6. Memory slot comment for mode: name of the process, welding procedure, wire material and size. Mode content is determined after the Lincoln power supply (and its firmware-version) that is used.
7. Access to additional parameters page
8. Adjusting welding parameters step by step by using soft keys F7-F12 below the screen.

If there are more than three parameters with welding mode, additional parameters for selected WPS are set on page setting additional parameters.

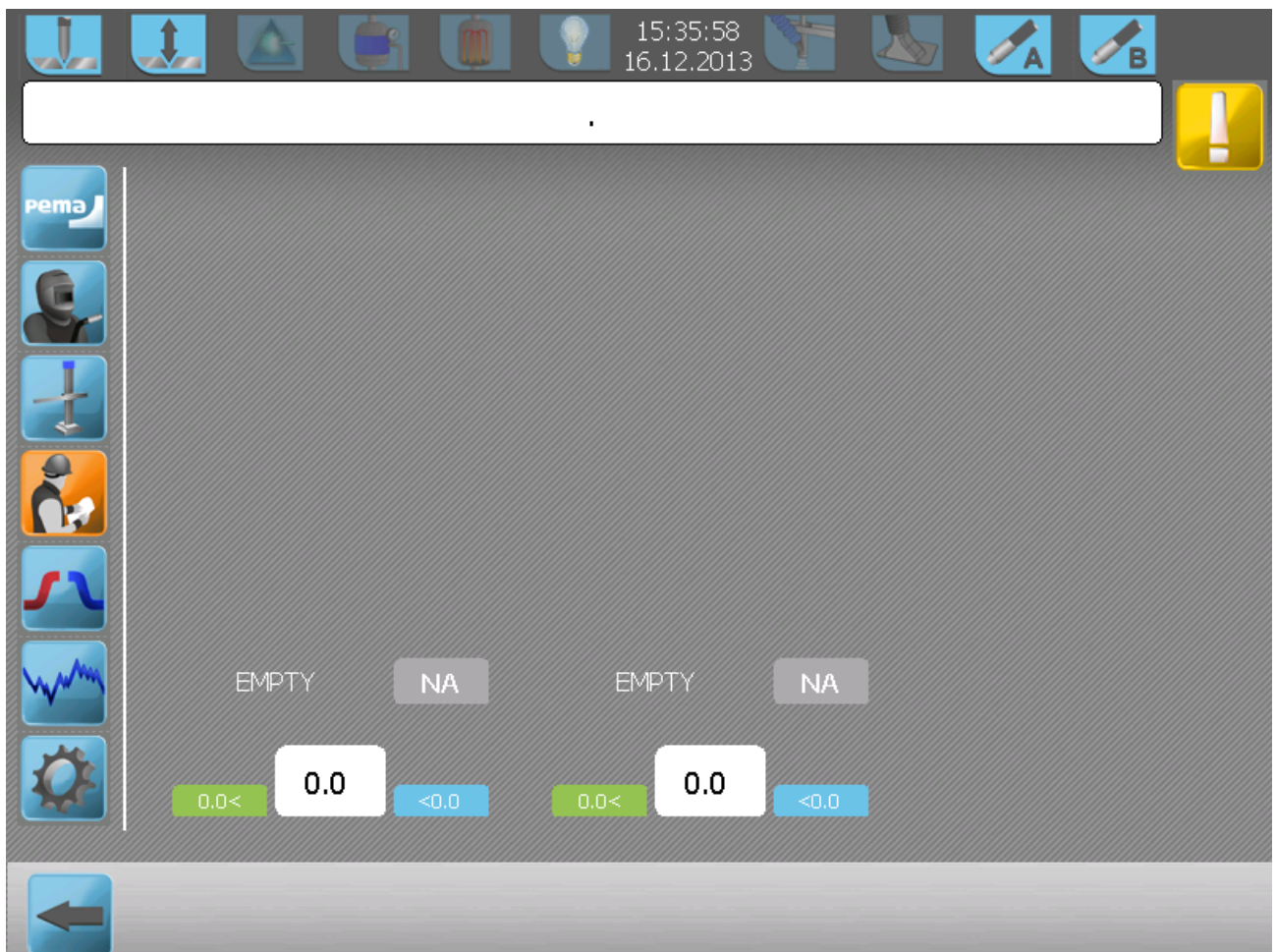


Figure 23 Set additional parameters

6.6.1.1.2. WPS details pages



In WPS details pages can be stored specific details of welding process settings, work piece material, it's prefabrication, consumables and torch configuration. In order to get WPS info pages push green i-button in Memory functions field (presented number 9 in figure 20). Page WPS details is displayed in figure 24

The screenshot shows the WPS details page with a top navigation bar containing icons for different functions. The main area is divided into two columns: PARENT METAL and WELDING PROCESS. The PARENT METAL section includes fields for ID, PARENT METAL (A and B), THICKNESS (mm) (A and B), OUTSIDE DIAMETER (mm), CONSUMABLES (FLUX TOP and ROOT), and WIRE BRAND NAME. The WELDING PROCESS section includes fields for WELDING PROCESS, WELDING POSITION, GROOVE PREPARATION, GROOVE CLEANING, JIG ON THE WORK PIECE, TACKING, BACKING, BACK GOUGING, PRE HEAT TREATMENT, PREHEAT TEMP, INTERPASS TEMP, POST HEAT TREATMENT, TORCH CONFIGURATION (A, B, C), WIRE DISTANCES (mm), TILT ANGLE, TRAVEL ANGLE, and STICK OUT (mm). A save button (floppy disk icon) is located at the bottom left, and a warning icon (yellow exclamation mark) is at the top right.

PARENT METAL		WELDING PROCESS	
ID	12345	WELDING PROCESS	SAW
PARENT METAL A	s355	WELDING POSITION	PA
PARENT METAL B	s355	GROOVE PREPARATION	milling
THICKNESS (mm) A	35	GROOVE CLEANING	-
THICKNESS (mm) B	0	JIG ON THE WORK PIECE	
OUTSIDE DIAMETER (mm)	6000	TACKING	mag
CONSUMABLES		BACKING	mag
FLUX TOP	LE P-860	BACK GOUGING	-
FLUX ROOT		PRE HEAT TREATMENT	-
WIRE BRAND NAME		PREHEAT TEMP	0
TORCH A	LE L-61	INTERPASS TEMP	0
TORCH B	LE L-61	POST HEAT TREATMENT	-
TORCH C		TORCH CONFIGURATION	
		WIRE DISTANCES (mm)	A B C
			0 30 0
		TILT ANGLE	0 0 0
		TRAVEL ANGLE	0 30 0
		STICK OUT (mm)	35 35 0

Figure 24 WPS details page

Added data is stored to the selected memory location when the save button is pressed on the down corner of the screen next to navigation bar.



When parameters have been changed, a question mark starts to blink on the top of the save button, reminding to save the altered parameters.

6.7. Editing welding start and stop memories



Welding start and stop parameters are stored on their own memory places. This makes it possible to use same parameter sets in multiple WPSs. There you can see the symbol for editing welding start and stop memories on navigation bar. Editing welding start and stop memories page is displayed in figure 25

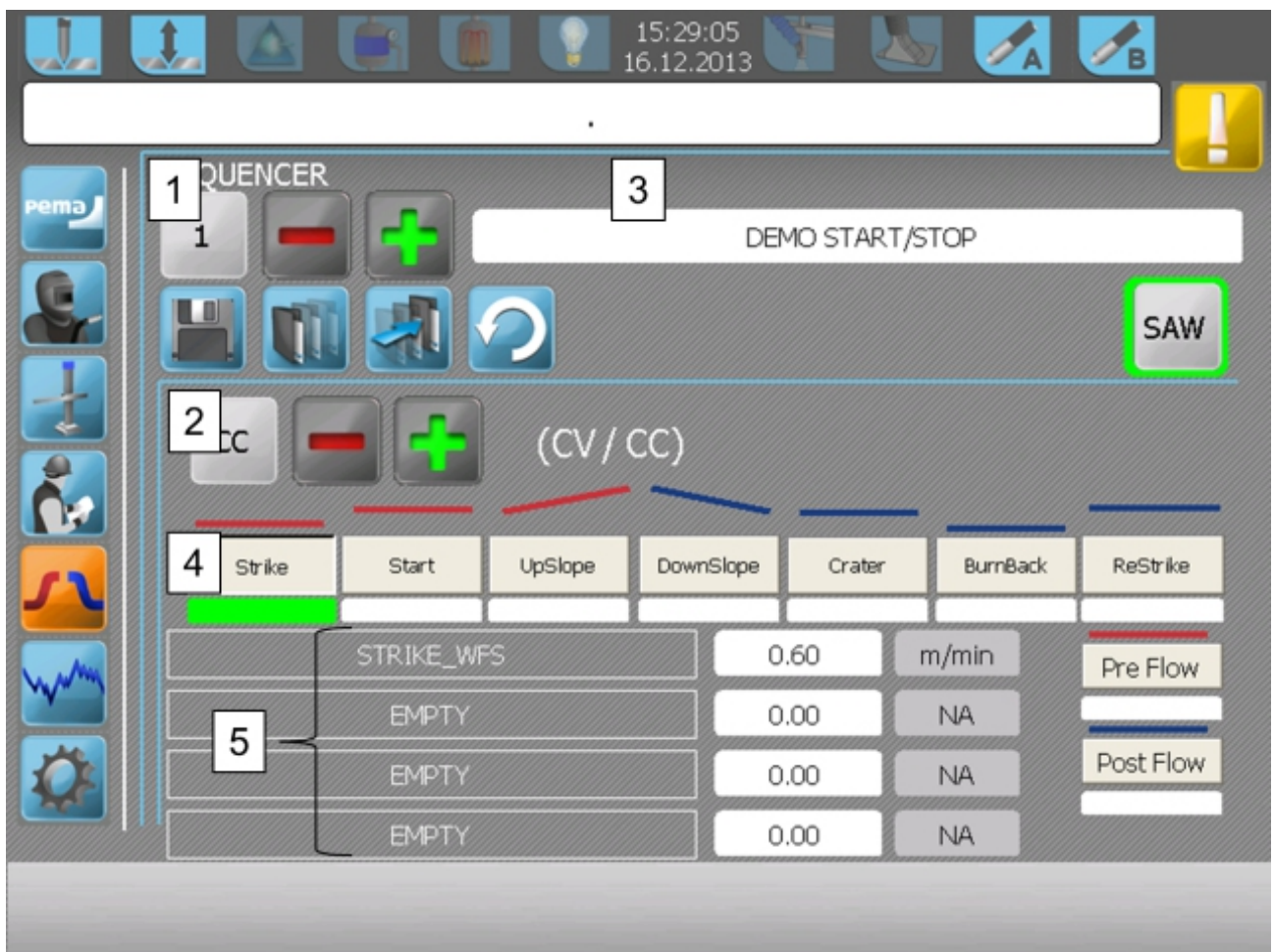


Figure 25 Editing welding start and stop memories

1. Welding start and stop memory slot selection with numbers or +/- button
-Save, upload, download and refresh buttons below

2. Selection of constant voltage or current. Every memory slot of starting parameters contains the values of "constant voltage"-mode and "constant current"-mode (CV = constant voltage, CC = constant current). More information about choosing constant voltage or current see manufacturer's manual.
 - The constant welding mode defines which start parameters are used
 - "Constant voltage" -mode defines the wire speed
 - "Constant current" -mode defines the current
3. Memory slot comment
4. Welding process has defined to different sequences so that the welding process can be controlled more effectively. Select the sequence step which parameters you want to set.
5. Parameters of the selected sequence step. The parameter names depend on step. The wanted length of every sequence is definable. More information about parameters see manufacturer's manual.

6.8. Graphic monitoring of the welding values



Welding values can be monitored graphically in real time on page Graphic monitoring of the welding values. Monitoring page is found by pushing this symbol on navigation bar.

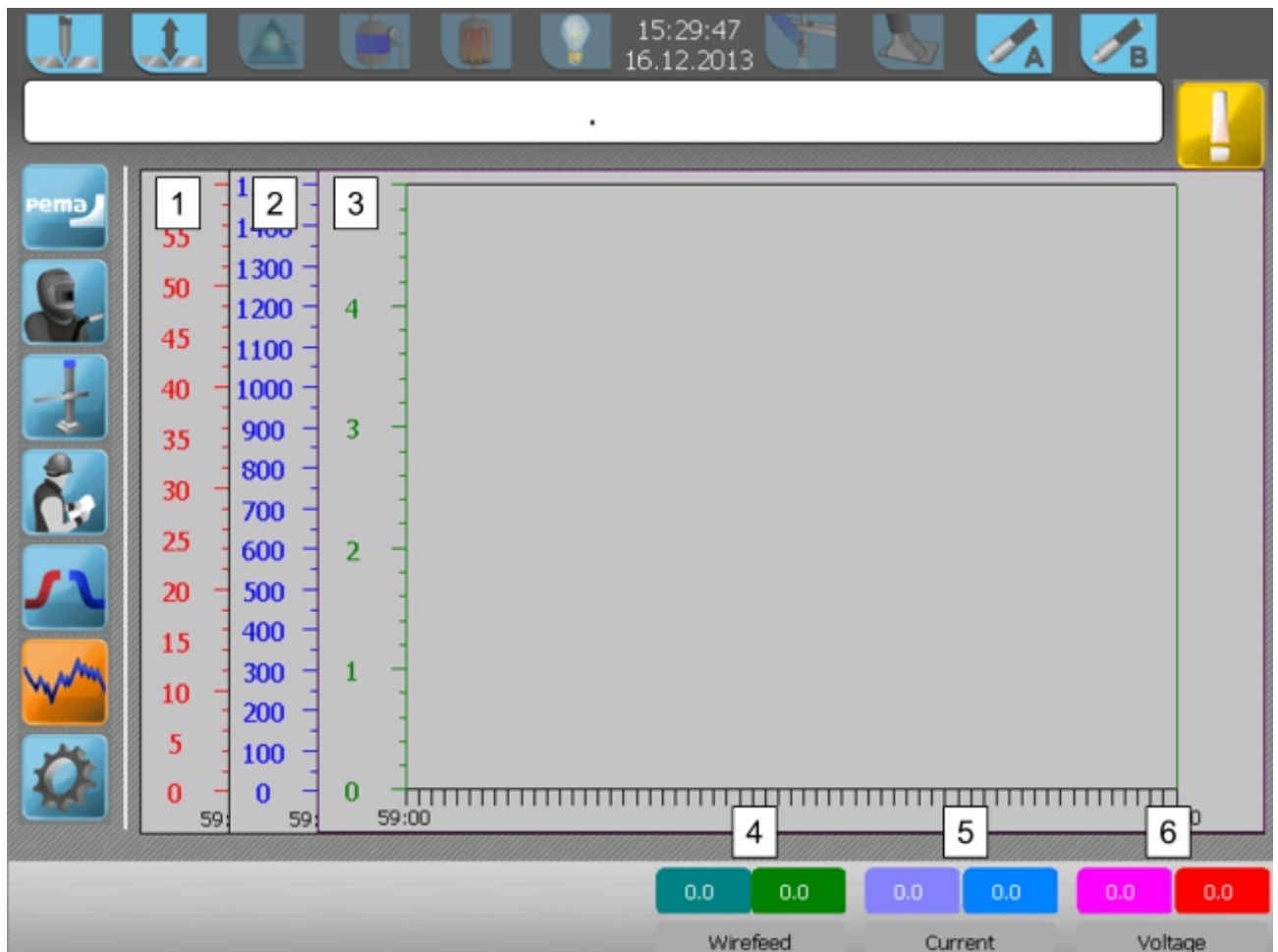


Figure 26 Welding values in real time graphical monitoring display

1. Voltage scale V.
2. Current scale A.
3. Wire feed scale mm/min
4. Wire feed actual values of the torch 1 (light green)
5. Current actual parameters of the torch 1
6. Voltage actual parameters of the torch 1

6.9. Torch phase and square-wave voltage (balance,frequency) settings



To minimize the effects of magnetism in multiple arc systems maintaining phase relationship between the arcs (time offset between the arcs) is important. Every arc phase is set according to the leading arc. For shifting the phase and square-wave voltage (balance,frequency) menu for torches choose this symbol while being in WPS editor page. Symbol is marked with number 2 in the figure 22 Page Torch phase and square-wave voltage settings for torches is shown in the figure 27

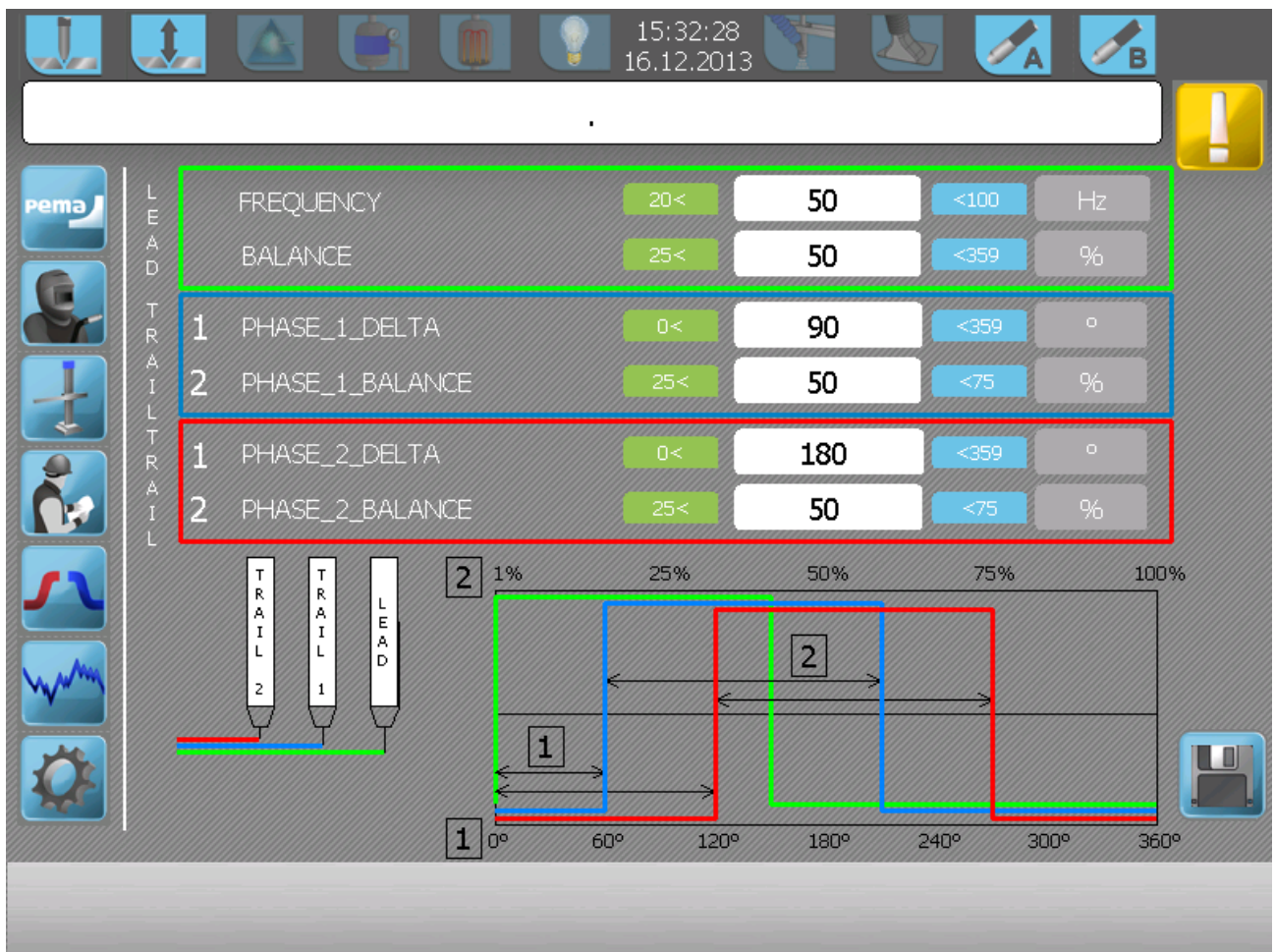


Figure 27 Phase shift and balance menu for torches

The phase is given to the Powerwave-power supply of the torch 1 that guides the other torches.

To accomplish the phase difference the Lincoln Powerwave-equipment has to be set to Lead-Trail –mode with dip-switches and they also has to be connected to each other with synchronization cables.

More information about configuration you can find from Lincoln manual on chapter Phase adjustment for multiple arc systems and System connection included in this manual.

Notice! The phase relationship has a particular importance with AC-welding. Configuration is not need to be changed or removed with DC-welding mode.

1. The phase shift of the other torch **with degrees** in relation *to the first torch*.
2. *The positive part of square-wave voltage* **with percentage** of the whole period.

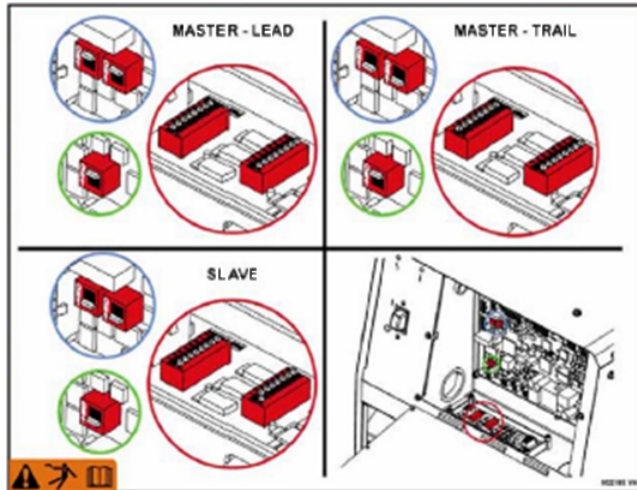


Figure 28 Dip switch settings

7. MAINTENANCE AND SERVICE INSTRUCTIONS

7.1. Introduction



Read and understand the INSTRUCTION MANUAL before maintaining or servicing the machine!

- Observe the following safety precautions before servicing or maintaining the equipment.
- Read manufacturer's service instructions before servicing electric motors.
- Tripped thermal relay or circuit breaker indicate interference, failure or overload.
- In order to prevent any further damages eliminate the source of the failure before restarting the machine or before changing any parts.
- Warranty does not cover damages caused by faulty, improper unauthorized service, use, storage or handling, overloading or carelessness of equipment.
- DO NOT service the machine, while it is used.
- For the optimum and safe welding result keep all the welding equipment clean.



ELECTRIC SHOCK - Can kill

- Only authorized electrician may service electrical devices.
- Follow the service instructions and safety instructions.
- Disconnect main power supply before removing any protecting cover.
- Disconnect main power before service or maintenance.
- Relieve feeding fuses before service or maintenance.




WARNING




LASER RADIATION - Can injure eyes

- Disable laser before any maintenance on the sensor head or welding torch.
- DO NOT have direct viewing of the beam.
- Ensure there are no reflections from mirror-like surfaces.
- Protect your eyes from laser radiation.
- Protect bystanders from laser radiation.
- Class 2 device

7.2. Service-, checking- and cleaning procedures

Check daily

Checking area	Checking point	Description	Functions
General	Working area	Working area must be suitable for work	Visual checking
	Whole machine	Abnormal vibration, noise and heating	Visual checking (make immediately all the needed repairs)
		General condition of machine	Visual checking
Mechanical	Cover and safety equipment	Must be in their places and in proper condition	Visual checking (make immediately all the needed repairs / changes)
Electrical	Remote control and control panel	Cables must be unbroken	Visual checking (change when needed)
	Safety equipment	Emergency stop button has to be unbroken	Check the function

Check every month

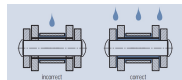
Checking area	Checking point	Description	Functions
Pneumatical	Pressure tank	Pressure tank has to be clean	Clean pressure tank with pressured air
	Pressure tank water collector	Check amount of water in the collector	Drain water from the collector

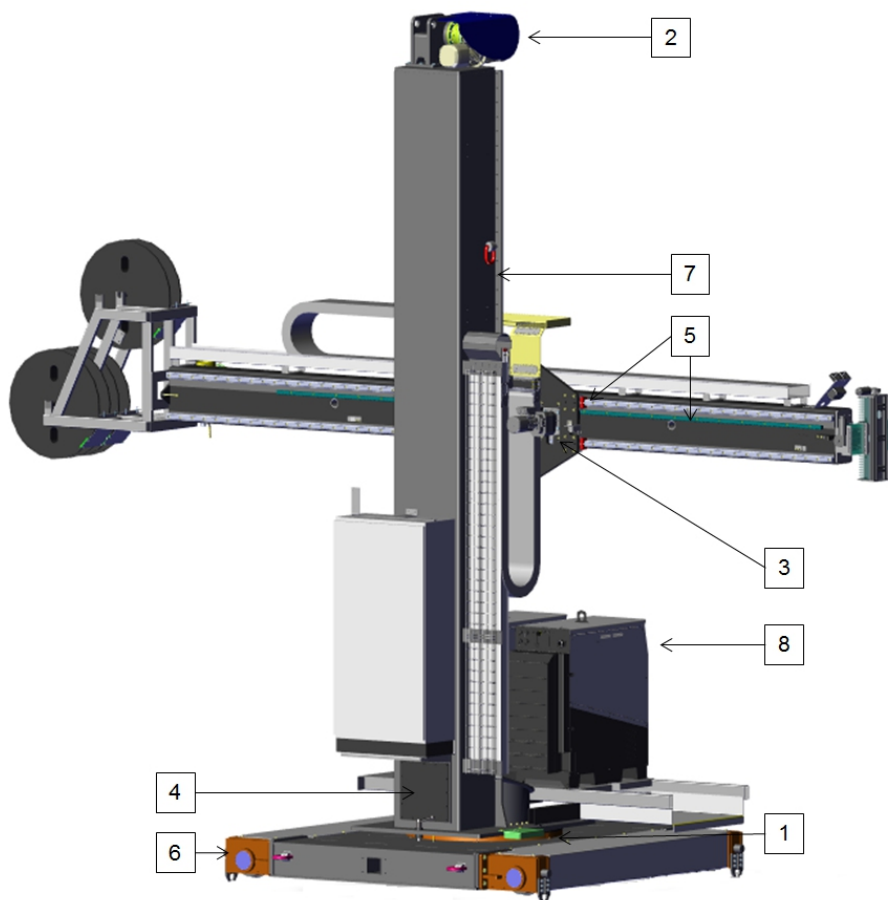
Check every six months

Checking area	Checking point	Description	Functions
Mechanical	Fastening bolts	Fastening bolts have to be tight	Tight all fastening bolts
	Rotation machinery	Gearing has to be greased and clean	Clean, grease and check the condition of machinery
		Lubricant has to be distributed evenly	Use rotation function to guarantee the proper lubrication.
		Checking of the gear oil	Add oil or change it according to lubrication instructions
	Transmission mechanism	Chains have to be lubricated and clean	Take off the chain covers. Clean, lubricate and check the condition of the chains
		Checking of the gear oil	Add oil or change it according to lubrication instructions
		Tightness of the chains	Do the tightening when needed
	Safety equipment	Safety device and safety switches	Check that safety device and safety switches will be activated if the chain will be loosen
		Teeth of safety device	Check the condition

Checking area	Checking point	Description	Functions
Electrical	Electric cabin	Electric cabin has to be clean	Vacuum the cabin
	Connections	Screw and plug contacts have to be tight and in good condition	Tight and check all connections
	Remote control and control panel	General function	Check all the functions and repair when needed
	Cables and sensors	Cables and sensors must be unbroken	Visual checking (broken cables and sensors must be changed immediately)
	Components	Check relays, contactors and fuses	Visual checking (check tips and change when needed)

7.3. Lubrication instructions

Nr	Lubrication object	Lubricant	Period*
1	Gearings	Omega 73 Waterproof open gear grease	500 hours
	Bearings for the ball bearing turning ring	Vaseline NLGI 2 based on Litium-soap	500 hours Att! Make also the tightening of the turning ring's screws!
2	Worm gear W110 (lifting mechanism)	Lubricated for life. If needed: Synthetic oil Shell Tivela Oil SC, viscosity 320 cSt or similar	Check the oil level periodically. Restore proper quantity if necessary. Oil change 25000 hours
	Planetary gear PL303L1 (lifting mechanism)	Gear oil ISO VG 320-460 320-460 cSt / 40° C	First: 500 hours Others: 4000 hours (Check carefully the level of the oil after filling)
3	Gear motor C313F (carriage)	Lubricated for life. If needed: Synthetic oil Shell Tivela Oil SC, viscosity 320 cSt or similar	Check the oil level periodically. Restore proper quantity if necessary. Oil change 25000 hours
4	Gear motor VF44 / W86 (rotation mechanism; if included)	Lubricated for life Gear oil ISO VG 320-460 320-460 cSt / 40° C	Check the oil level periodically. Restore proper quantity if necessary. Oil change 25000 hours
5	Linear guides (nipples)	Grease, HIWIN G05 or similar	500 hours
	Rack bar	Clean rack bar with pressured air	Once a month
6	Gear motor F313H40 (rail car; if included)	Lubricated for life Gear oil ISO VG 320-460 320-460 cSt / 40° C	Check the oil level periodically. Restore proper quantity if necessary. Oil change 25000 hours
7	Chains	Fluid mineral oil or liquid grease Oil ISO VG100 (SAE 30) Checking/Tightening	500 hours 
8	Welding equipment, air dryer (if included)	See the own manuals	



1. Gearings
Bearings for the ball bearing turning ring
2. Worm gear W110 (lifting mechanism)
Planetary gear PL303L1 (lifting mechanism)
3. Gear motor C313F (carriage)
4. Gear motor VF44 / W86 (rotation mechanism; if included)
5. Linear guides
Rack bar
6. Gear motor F313H40 (rail car; if included)
7. Chains
8. Welding equipment

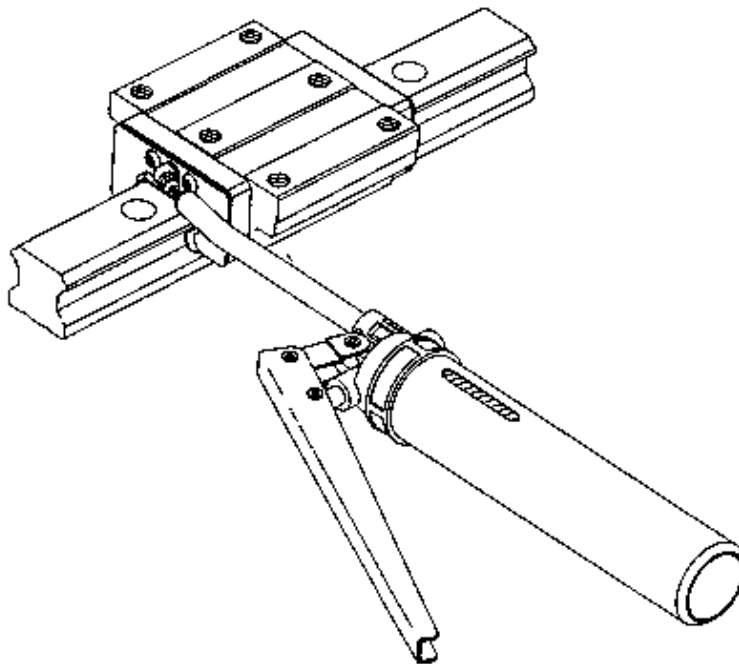
* The re-lubrication period will depend on the operating conditions of the machine: speed, load, number of working cycles per day etc. The adjacent table gives recommended values (operating temperatures not exceeding +70° C). At higher temperatures the re-lubrication intervals should be shorter.

**The precise values vary depending on the number of stages and gear ratio. When filling, it is essential to check the oil level plug since it indicates the precise oil capacity.

7.3.1. Lubricating the linear motion guides

Lubricate linear motion guides with a grease gun.

Lubrication must be done carefully, avoid pressing too much grease at time. Too much grease damages bearing protections.



NOTICE



**Read and understand the INSTRUCTION
MANUAL before maintaining or servicing the
machine!**

- Obey preventive maintenance instructions!
- Keep all the welding equipment clean to gain for the optimum welding result!

7.3.2. Service and lubrication for linear bearings and tracks

Linear tracks and bearings have a critical part in machine functioning. Linear tracks are exposed to humidity, dust and particles and for this reason maintenance plays a big part. With proper maintenance the life span is years, but if maintenance is neglected life span may fall into few months.

Maintenance includes two parts:

1. Daily checking
2. Periodic maintenance

1. Daily checking should be carried out before every shift to make sure general appearance of the machine is good; tracks are clean and have a slight coating of crease on those.

Visual inspection is enough. In case track looks dirty, wet from water or not lubricated, periodic maintenance should be carried out.

2. Periodic maintenance should be done by trained maintenance personnel.

Maintenance period depends on machine working environment. Remember to carry out maintenance even the machine is not actively used.

Standard period; No manual grinding in the shop. Low humidity. Filtered air inlet in the shop.

- Track cleaning once a month
- Linear bearing lubrication once in every three months

Compressed period; Manual grinding in the shop, open shop> dust from outside air, High humidity

- Track cleaning twice a month
- Linear bearing lubrication once a month

Instructions for periodic maintenance

1. Cleaning of the track is the first and very important task. Clean the track by cleaning spray and rag. If beginning of corrosion can be seen, use anti rust spray for example CRC Quickleen. If this doesn't help, contact Pema service for assistance. Don't try to remove rust mechanically by grinding or sand paper.
2. Lubricate the linear bearings by crease gun. Use only high quality grease. Cheapest one is not usually the best. It is highly recommended to use manufacturer's own grease. Avoid pumping too much grease in the bearing. Over filling can do harm to the bearing.
3. After creasing drive the carriage from end to end of the movement area few times. This spreads the grease inside the bearing and on track as well.
4. Good way to protect the track from humidity is to end up the maintenance by wiping the track with oily rag. Thin oil layer (eg CRC Multilube) will give good protection against humidity.

7.3.3. Table for gear oil selection

ISO VG		MINERAL OIL			SYNTHETIC OIL			
		460	320	220	460	320	220	150
Amb. temp. [°C]		10° ÷ 45°	0° ÷ 35°	-5° ÷ 25°	10° ÷ 60°	0° ÷ 50°	-5° ÷ 35°	-10° ÷ 25°
MANUFACTURER	ARAL	Degol BG 460	Degol BG 320	Degol BG 220	Degol GS 460	Degol GS 320	Degol GS 220	
	BP	Energol GRXP 460	Energol GRXP 320	Enerol GRXP 220	Enersyn HTX 460	Enersyn EPX 320	Enersyn EPX 220	Enersyn MTX 150
	ESSO	Spartan EP 460	Spartan EP 320	Spartan EP 220				
	AGIP	Blasia 460	Blasia OIL 320	Blasia OIL 220		AGIP Telium VSF 320		AGIP Telium VSF 150
	KLÜBER	Lamora 460	Lamora 320	Lamora 220	Syntheso D460 EP	Syntheso D320 EP	Syntheso D220 EP	Syntheso D150 EP
	MOBIL	Mobilgear 634	Mobilgear 632	Mobilgear 630	Glygoyle 80		Glygoyle 30	
					SHC 634	SHC 632	SHC 630	SHC 629
	SHELL	Omala OIL 460	Omala OIL 320	Omala OIL 220	Tivela OIL SD	Tivela OIL SC	Tivela OIL WB	Tivela OIL SA
	TEXACO	Meropa 460	Meropa 320	Meropa 220	Synlube CLP 460	Synlube CLP 320	Synlube CLP 220	
	CASTROL	Alpha SP 460	Alpha SP 320	Alpha SP 220	Alpha Synt 460	Alpha Synt 460	Alpha Synt 220	Alpha Synt 150

7.4. Service pages and alarm history in control panel OP1



In this pages it is told, how works the service pages within control panel OP1. The service page is found by pushing this symbol on navigation bar.

7.4.1. Service pages



Figure 29 Service pages

1. Start delay times for powder dropping, welding movement, wire1 feed and wire 2 feed starts in milli seconds.

2. Wire inching speed
3. Analog axis, maximum rotation speed and chosen positioned or rollerbed.
4. Password is shown here, if password is typed correctly starting this service page. (For Login instructions see the next chapter.)
5. Joint tracking with laser on / off and zeroing function
6. Stop delay time for wire 2
7. Weld speed inc. (How many mm the weld speed changes by one push of the button)
8. Ethernet IP-Address set to the panel (Information for programmers and experts)
9. Clock and date in h, min, s day, month, year
10. Backup Manager page (store, upload and delete backups)
11. Language change
12. Forward to advanced service pages

7.4.1.1. Login in to the service pages

When opening the service page first time, password field indicated with number 1 seen in figure [30](#) pop ups on the center of the display screen. Password is provided by service@pemamek.com only for maintenance and repair uses for skilled service personnel.



Figure 30 Login to the service pages

In order to prevent unauthorized use of the machine default password should be changed. Password can now be changed in field indicated with number 2 in figure [31](#) and asking can be enabled or disabled if the password is typed correctly.



Figure 31 Changing the password

7.4.1.2. Backup Manager

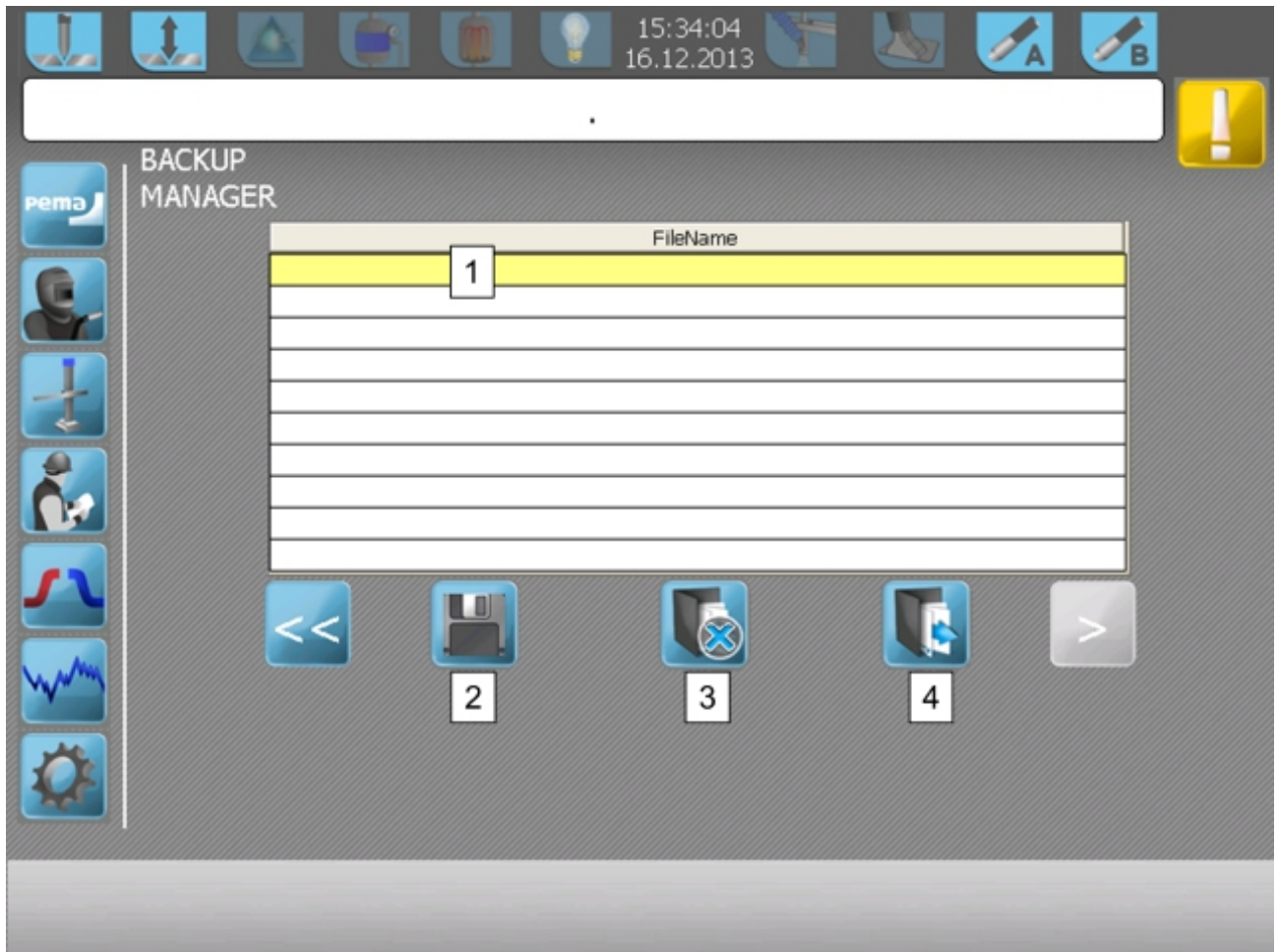


Figure 32 Backup Manager

1. Displays all the generated backups with date and time label.
2. Press the disk to make a new backup on the present settings on the machine.
3. Delete the chosen backup from the list.
4. Upload the saved backup which is chosen from the list.

7.4.1.3. Advanced service

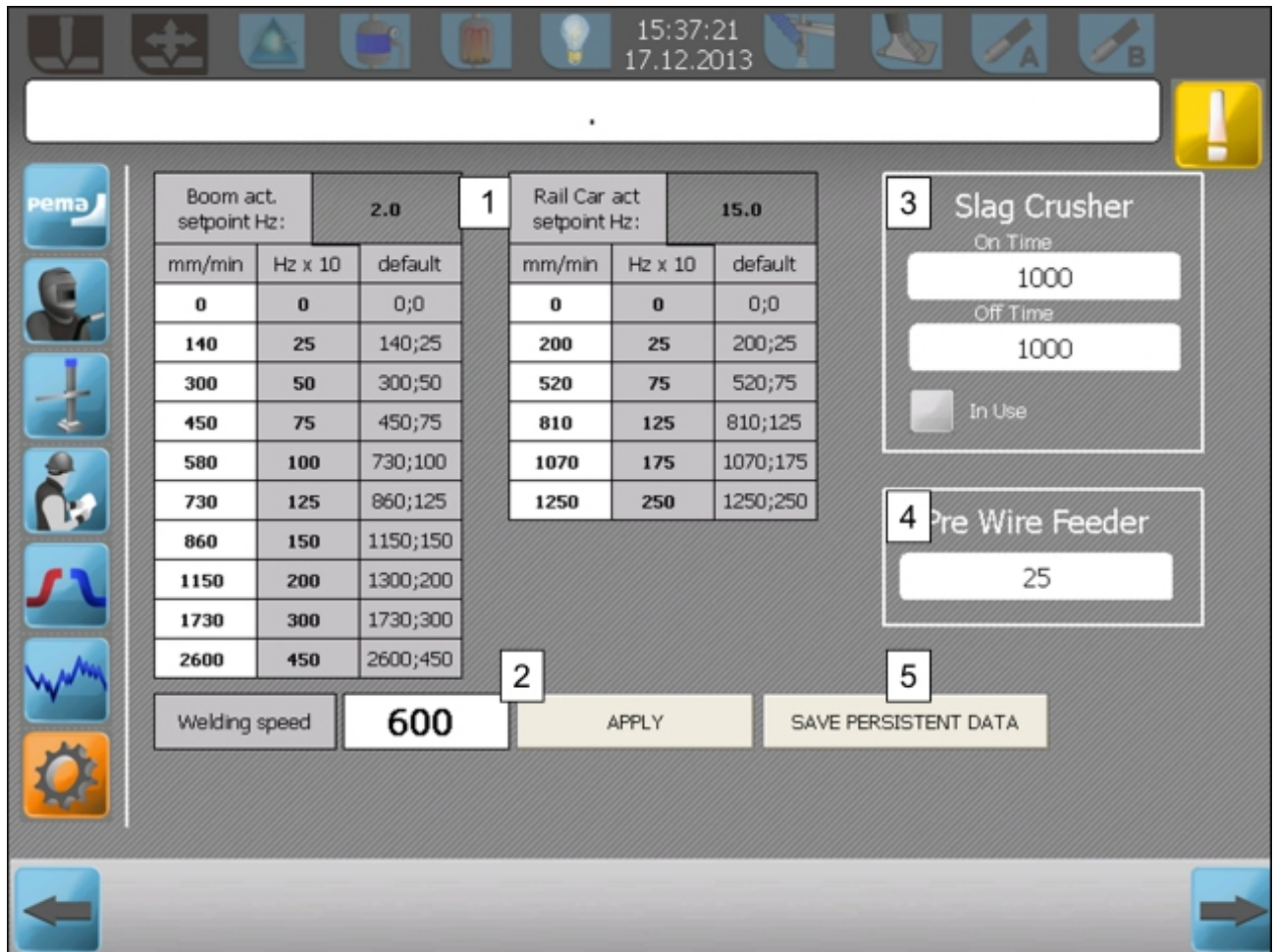


Figure 33 Advanced service

1. To achieve the most accurate travelling speed the program uses these tables on the automatic welding mode. Speeds are written to inverter controlled regulators which uses these set values to generate the correct travelling speed of the welding head. Both boom and rail car movements use similar tables. If either boom or railcar gear ratios are changed these values need to be measured and set to the tables.
2. Welding speed which is shown on the display screen can be calibrated here.
3. Slag crusher on / off and time after welding (optional accessory)
4. Speed of auxiliary feeding unit
5. Save persistent data

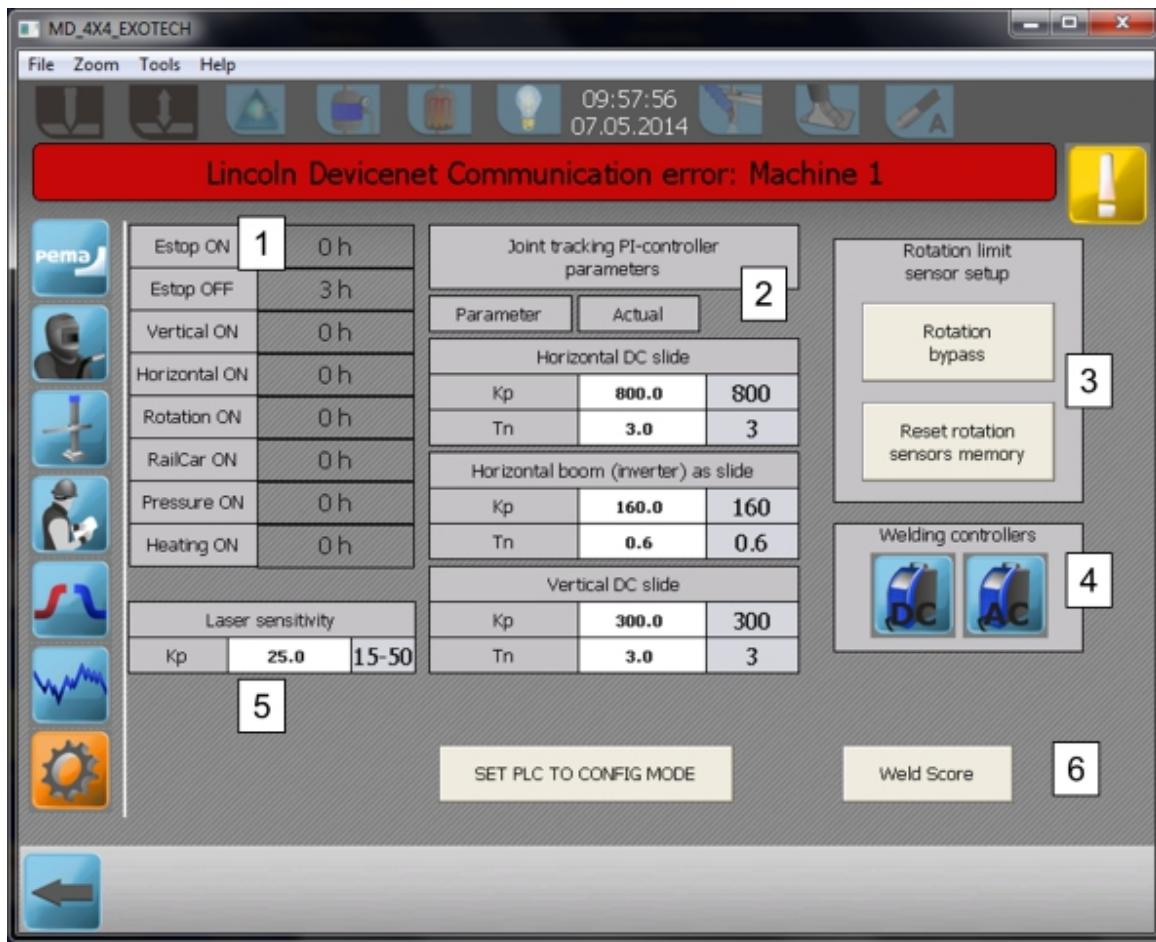


Figure 34 Advanced service 2

1. Different times are calculated and shown here on hours. Timers are started when the tower is switched on. Same data is been collected to the production data pages.
2. Joint tracking PI-controllers parameters can be changed by setting the values to the value fields. Both parameters and actual values are shown.
3. Rotation limit sensors can be bypassed and the rotation sensor memory can be reset with these buttons.
4. Welding controllers can be selected either DC or AC to be shown on welding parameters in real time graphical monitoring display page.
5. Set laser sensor's sensitivity (min. value 15 - max. value 50).
The vertical slide reacts changes on the surface of the welding seam depending from the value of the sensitivity.
- > Movement of the welding torch is smoother, while value is low.
Higher values = vertical slide movements are faster and more precise.
Lower values = vertical slide movements are slower and more imprecise.
6. WeldScore, Lincoln program for monitoring weld quality

7.4.2. Production data pages

All Pema Weldcontrol 100 includes production data surveillance, which can be used for production monitoring. Below is description how to access these pages and what is included on them.

To access these pages you need a computer with web browser. Most recommended browsers are Internet Explorer >8.0 or Firefox > 7.0. Set your network configuration to static IP address 192.168.151.200 and subnet mask 255.255.255.0.

Attach your laptop to electrical cabinets white Sonicwall units ethernet port (slots to choose from are 1 to 4).



Figure 35 The electric cabinet

Open up your computers web browser and type `//192.168.151.2/index.htm` to the address bar. After this the production data pages should appear as seen in next picture.

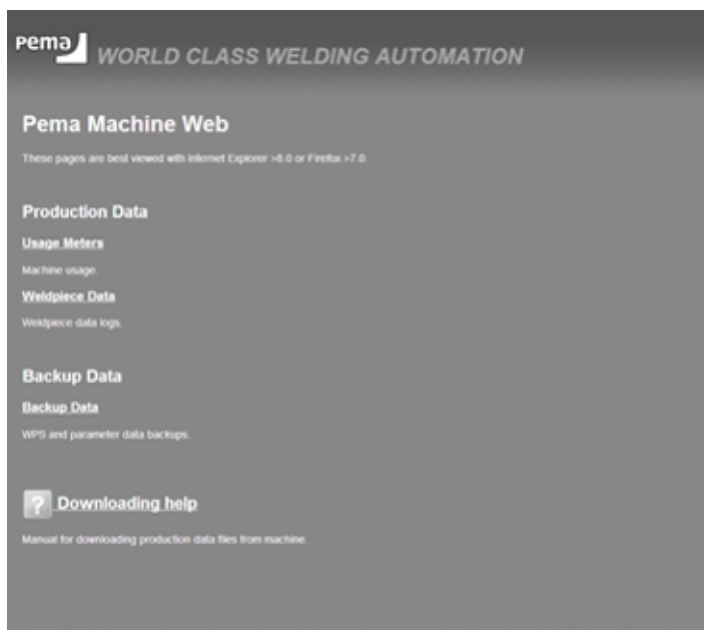


Figure 36 Production data pages

By pressing usage meters opens the page showing the welded meters, uptimes, and daily machine history. At the end of this page is print mode where you can change the graphics background color to white and more easily to see on black/white prints.

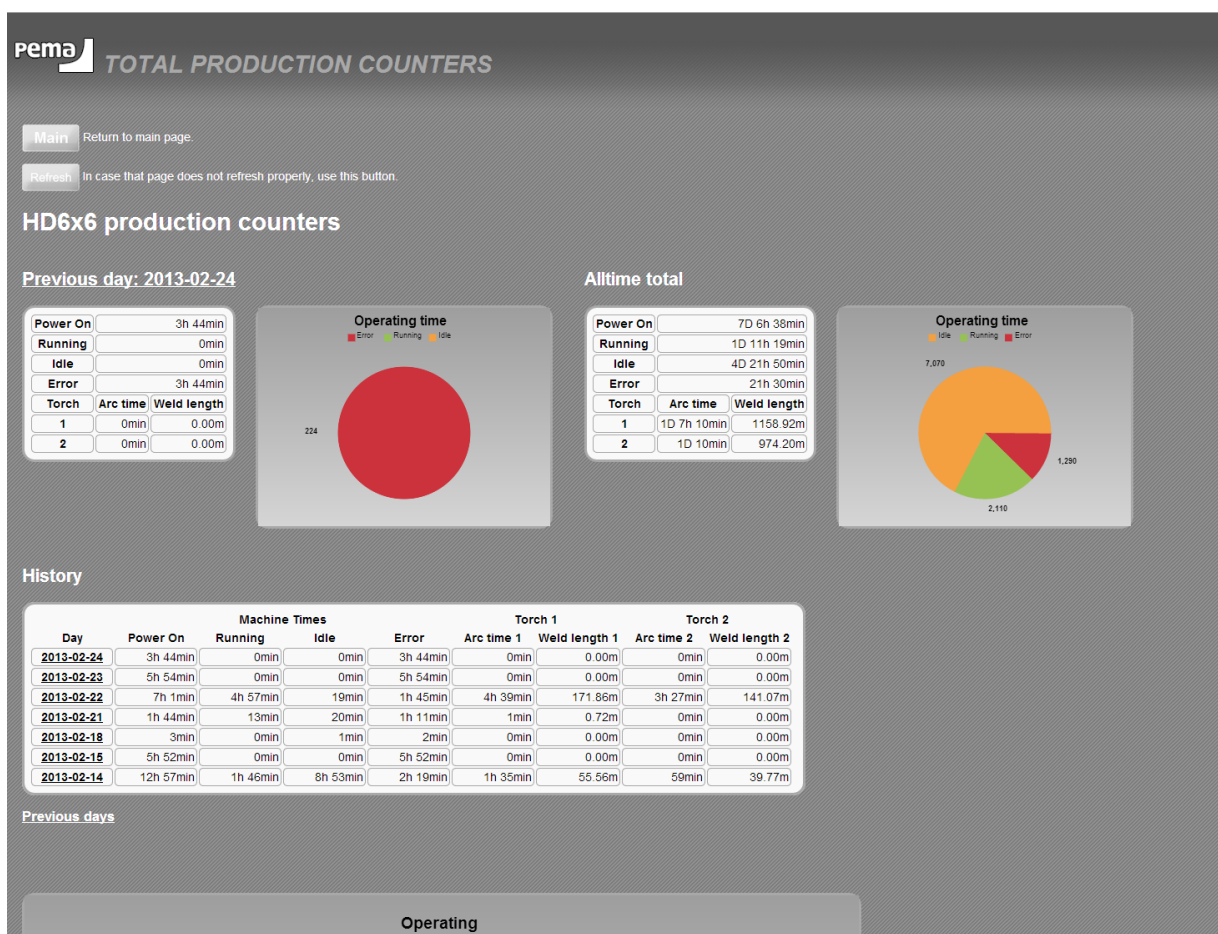


Figure 37 Usage meters

By pressing Weldpiece data opens the page seen in 38 showing the list of weldpiece weldings. To store the weldpiece data to these pages, you need to enable it from the Weldcontrol 100 main page.

By selecting the wanted file the page is opened, where all values are easily seen.

WELDPIECE RECORD

test - 1
2012-12-10 11:01:26
(Best printed on Landscape)

Time	2012-12-10 11:01:26	Duration	1min 10s
WPS no	2	Speed	600mm/min
WPS name	Inst 1	Length	750mm
Procedure	CC DC+		
Setpoints	CURRENT 500.0	VOLTAGE 31.0	EMPTY 0.0
Measurement	Current 502.7 A	Voltage 30.8 V	WFS 1.0 mm/min
Monitoring	Tolerance 10.0%	Out Of Range Lo 0.0s	Out Of Range Hi 1.2s
CURRENT	10.0%	0.0s	0.0s
VOLTAGE	10.0%	0.3s	0.0s
Heat Input	14.1	Peak Lo	31.9
Deposition Rate	5.7 kg/h	Peak Hi	31.9

Procedure	CC Square Wave		
Setpoints	CURRENT 500.0	VOLTAGE 30.0	DC OFFSET 0.0
Measurement	Current 499.1 A	Voltage 29.8 V	WFS 1.7 mm/min
Monitoring	Tolerance 10.0%	Out Of Range Lo 0.0s	Out Of Range Hi 0.0s
CURRENT	10.0%	0.0s	0.0s
VOLTAGE	10.0%	0.0s	0.0s
Heat Input	27.8	Peak Lo	32.0
Deposition Rate	3.6 kg/h	Peak Hi	32.0

Time	2012-12-10 11:09:56	Duration	1min 57s
WPS no	2	Speed	420mm/min
WPS name	Inst 1	Length	821mm
Procedure	CC DC+		
Setpoints	CURRENT 500.0	VOLTAGE 26.0	EMPTY 0.0
Measurement	Current 519.8 A	Voltage 25.5 V	WFS 0.7 mm/min
Monitoring	Tolerance 10.0%	Out Of Range Lo 0.0s	Out Of Range Hi 0.0s
CURRENT	10.0%	0.0s	0.0s
VOLTAGE	10.0%	0.0s	0.0s
Heat Input	362.6	Peak Lo	396.0
Deposition Rate	4.4 kg/h	Peak Hi	396.0

Figure 38 Weldpiece data

By pressing Backup data opens the page showing the machines stored backup files. Selecting the wanted file opens the download link where the files can be downloaded to own computer from where to example to similar other Pema column and boom.

File *.wps contains welding values, modes and weldings speeds.

File *.seq contains start / stop parameters and torches phase shift values.

HD6x6 - /receipt_data/

[\[To Parent Directory\]](#)

1/30/2013	12:00 AM	161600	2013-01-30 17.30.05.wps
1/30/2013	12:00 AM	9780	2013-01-30 17.30.05.seq

Figure 39 Backup data

7.4.3. Alarm code list

	Alarm message	Description
1	E-stop active	Emergency stop button pressed or open contact on the emergency stop circuit.
2	Safe PLC FB error	Beckhoff TwinSafe fieldbus error
3	Safe PLC COM error	Beckhoff TwinSafe communication error
4	Safe PLC OUT error	Beckhoff TwinSafe output error
5	Frequency converter Modbus initialization fault. Vertical boom movement	Inverter in initialization mode. Reset is needed to modbus. Check error code on inverter display.
6	Frequency converter Modbus initialization fault. Horizontal boom movement	Inverter in initialization mode. Reset is needed to modbus. Check error code on inverter display.
7	Frequency converter Modbus initialization fault. Rotational boom movement	Inverter in initialization mode. Reset is needed to modbus. Check error code on inverter display.
8	Frequency converter Modbus initialization fault. RailCar movement	Inverter in initialization mode. Reset is needed to modbus. Check error code on inverter display.
9	Welding speed is greater than max speed of external device.	
10	Thermal relay trip of the vertical movement	Overheat. Reduce ambient temperature or reduce motor current.
11	Brake resistor thermal contact	Overheat. Reduce ambient temperature or reduce motor current.
12	E-stop contactor jammed	Change E-stop contactor
13	Flux low level	Insert more flux to the system. Check flux sensor and connection for damages
14	Remote operator panel selected	Remote operator panel selected
15	Cross slide horizontal, fault	Check cables for damages.
16	Cross slide vertical, fault	Check cables for damages.
17	GMD joint tracking horizontal fault. Sensor signal 0V is not allowed for long period	Check cables for damages.
18	GMD joint tracking vertical fault. Sensor signal 0V is not allowed for long period	Check cables for damages.

19	Oscillator reference poin driving fault. Check gear	Check gear for damages.
20	Vertical limit switch active	Column in end position
21	Chain sensors active	Chain locks activated
22	Rotation limit switch active	Rotation in end position
23	Horizontal limit switch active	Boom in end position
24	Rail car limit switch active	Railcar in end position
25	Modbus communication fault. Vertical boom movement	Communication fault on the inverter or modbus cable. Check error code on inverter display.
26	Modbus communication fault. Horizontal boom movement	Communication fault on the inverter or modbus cable. Check error code on inverter display.
27	Modbus communication fault. Rotational boom movement	Communication fault on the inverter or modbus cable. Check error code on inverter display.
28	Modbus communication fault. RailCar movement	Communication fault on the inverter or modbus cable. Check error code on inverter display.
29	Lincoln Parameter sending	Welding parameters are sent to welding machine. Wait that sending is ready.
30	Lincoln Arc Error: Machine 1	Arc has shutdown during welding. Check that values you are using are for stable welding (and wire is moving).
31	Lincoln Gas Fault: Machine 1	There is gas flow problem. Check gas pressure and cabling.
32	Lincoln Estop Circuit Open: Machine 1, Channel 1	Emergency stop active. Check the cables and connectors for damages.
33	Lincoln Estop Circuit Open: Machine 1, Channel 2	Emergency stop active. Check the cables and connectors for damages.
34	Lincoln Inverter Fault: Machine 1	There is error in powersource. Check error code from powersource and refer Lincoln user manual.
35	Lincoln Wire Stick Fault: Machine 1	Wire is connected to work piece after welding. Cut the wire and make sure it's not connected to work piece and ack the alarm.
36	Lincoln Inverter Fault2: Machine 1	There is error in powersource. Check error code from powersource and refer Lincoln Power Wawe Manager.
37	Lincoln Limit Error: Machine 1	Welding values are outside weldmode limit. Please check limits and correct welding values. Remember sequencer values.

38	Lincoln Devicenet Communication error: Machine 1	There is communication problem with powersource check bus cabling and powersource error codes.
39	Lincoln Devicenet Attribute list write error: Machine 1	There is communication problem with powersource. Check welding values used.
40	WireFeeder 1 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
41	WireFeeder 2 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
42	WireFeeder 3 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
43	WireFeeder 4 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
44	WireFeeder 5 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
45	WireFeeder 6 Fault	Error in wire feeder. Make sure that wire runs freely. Wire feeder motor or motor cable failure. Check unit for damages.
46	Workpiece report writing error	
47	Workpiece report file too long, disable recording if not needed	
48	Login required to use current screen	
49		
50	Lincoln Arc Error: Machine 2	Arc has shutdown during welding. Check that values you are using are for stable welding (and wire is moving).
51	Lincoln Gas Fault: Machine 2	There is gas flow problem. Check gas pressure and cabling.
52	Lincoln Estop Circuit Open: Machine 2, Channel 1	Emergency stop active. Check the cables and connectors for damages.

53	Lincoln Estop Circuit Open: Machine 2, Channel 2	Emergency stop active. Check the cables and connectors for damages.
54	Lincoln Inverter Fault: Machine 2	There is error in powersource. Check error code from powersource and refer Lincoln user manual.
55	Lincoln Wire Stick Fault: Machine 2	Wire is connected to work piece after welding. Cut the wire and make sure it's not connected to work piece and ack the alarm.
56	Lincoln Inverter Fault2: Machine 2	There is error in powersource. Check error code from powersource and refer Lincoln Power Wawe Manager.
57	Lincoln Limit Error: Machine 2	Welding values are outside weldmode limit. Please check limits and correct welding values. Remember sequencer values.
58	Lincoln Devicenet Communication error: Machine 2	There is communication problem with powersource check bus cabling and powersource error codes.
59	Lincoln Devicenet Attribute list write error: Machine 2	There is communication problem with powersource. Check welding values used.
60	Lincoln Arc Error: Machine 3	Arc has shutdown during welding. Check that values you are using are for stable welding (and wire is moving).
61	Lincoln Gas Fault: Machine 3	There is gas flow problem. Check gas pressure and cabling.
62	Lincoln Estop Circuit Open: Machine 3, Channel 1	Emergency stop active. Check the cables and connectors for damages
63	Lincoln Estop Circuit Open: Machine 3, Channel 2	Emergency stop active. Check the cables and connectors for damages
64	Lincoln Inverter Fault: Machine 3	There is error in powersource. Check error code from powersource and refer Lincoln user manual.
65	Lincoln Wire Stick Fault: Machine 3	Wire is connected to work piece after welding. Cut the wire and make sure it's not connected to work piece and ack the alarm.
66	Lincoln Inverter Fault2: Machine 3	There is error in powersource. Check error code from powersource and refer Lincoln Power Wawe Manager.
67	Lincoln Limit Error: Machine 3	Welding values are outside weldmode limit. Please check limits and correct welding values. Remember sequencer values.

68	Lincoln Devicenet Communication error: Machine 3	There is communication problem with powersource check bus cabling and powersource error codes.
69	Lincoln Devicenet Attribute list write error: Machine 3	There is communication problem with powersource. Check welding values used.
70	Voltage/Current Out Of Set Tolerance Range: Machine 1	Welding alarm tolerance set value reached on WeldControl WPS page
71	Voltage/Current Out Of Set Tolerance Range: Machine 2	Welding alarm tolerance set value reached on WeldControl WPS page
72	Voltage/Current Out Of Set Tolerance Range: Machine 3	Welding alarm tolerance set value reached on WeldControl WPS page
73	Vertical movement components service time	Service and lubrication time for the component. See machine manual for section maintenance and lubrication.
74	Horizontal movement components service time	Service and lubrication time for the component. See machine manual for section maintenance and lubrication.
75	Rotation movement components service time	Service and lubrication time for the component. See machine manual for section maintenance and lubrication.
76	Rail car movement components service time	Service and lubrication time for the component. See machine manual for section maintenance and lubrication.
77	Inverter Fault. Vertical boom movement	Fault on the inverter or a break down of the unit. Check error code on inverter display. Check motor cable and connectors.
78	Inverter Warning. Vertical boom movement	Set current or distance limit achieved. Check error code on inverter display.
79	Inverter Write Error. Vertical boom movement	Write error on the inverter. Unable to write the drive. Check parameters from the drive and communication module for faults.
80	Inverter Communication Error. Vertical boom movement	Communication fault on the inverter. Check error code on inverter display
81	Absolut Encoder Fault. Vertical boom movement	Absolute encoder on vertical boom failure. Check encoder, cable and connectors for damages.
82	Inverter Fault. Horizontal boom movement	Fault on the inverter or a break down of the unit. Check error code on inverter display. Check motor cable and connectors.
83	Inverter Warning. Horizontal boom movement	Set current or distance limit achieved. Check error code on inverter display.

84	Inverter Write Error. Horizontal boom movement	Write error on the inverter. Unable to write the drive. Check parameters from the drive and communication module for faults.
85	Inverter Communication Error. Horizontal boom movement	Communication fault on the inverter. Check error code on inverter display.
86	Absolut Encoder Fault. Horizontal boom movement	Absolute encoder on horizontal boom failure. Check encoder, cable and connectors for damages.
87	Inverter Fault. Rotational boom movement	Fault on the inverter or a break down of the unit. Check error code on inverter display. Check motor cable and connectors.
88	Inverter Warning. Rotational boom movement	Set current or distance limit achieved. Check error code on inverter display.
89	Inverter Write Error. Rotational boom movement	Write error on the inverter. Unable to write the drive. Check parameters from the drive and communication module for faults.
90	Inverter Communication Error. Rotational boom movement	Communication fault on the inverter. Check error code on inverter display.
91	Absolut Encoder Fault. Rotational boom movement	Absolut encoder on rotation boom failure. Check encoder, cable and connectors for damages.
92	Inverter Fault. Railcar movement	Fault on the inverter or a break down of the unit. Check error code on inverter display. Check motor cable and connectors.
93	Inverter Warning. Railcar movement	Set current or distance limit achieved. Check error code on inverter display.
94	Inverter Write Error. Railcar movement	Write error on the inverter. Unable to write the drive. Check parameters from the drive and communication module for faults
95	Inverter Communication Error. Railcar movement	Communication fault on the inverter. Check error code on inverter display.
96	Absolut Encoder Fault. Railcar movement	Absolute encoder on railcar failure. Check encoder, cable and connectors for damages.
97	Wire feeder 1 DC motor fault	Wire feeder motor or motor cable failure. Check unit for damages.
98	Wire feeder 2 DC motor fault	Wire feeder motor or motor cable failure. Check unit for damages.
99	Wire feeder 3 DC motor fault	Wire feeder motor or motor cable failure. Check unit for damages.
100	Wire feeder 4 DC motor fault	Wire feeder motor or motor cable failure. Check unit for damages.

101	Wire feeder 5 DC motor fault	Wire feeder motor or motor cable failure. Check unit for damages.
102	External axis communication error	Communication between external axis device is lost. Check the communication cable for damages. Check condition of the communication modules.
103	Prewirefeeder Error	Communication fault on the inverter. Check error code on inverter display.
104	External axis creep limit active	
105	External axis fault	Check communication cables and external axis alarms.