



# WST Studio

## for PHC400F

#### **Additional information**

This catalogue shows the product in the standard configurations.  
Please contact our Sales Dpt. for more detailed information or special requests.

#### **WARNING!**

All specifications of this catalogue refer to the standard product at this date.  
Walvoil, oriented to a continuous improvement, reserves the right to discontinue, modify or revise the specifications, without notice.

**WALVOIL IS NOT RESPONSIBLE FOR ANY DAMAGE CAUSED BY AN  
INCORRECT USE OF THE PRODUCT.**

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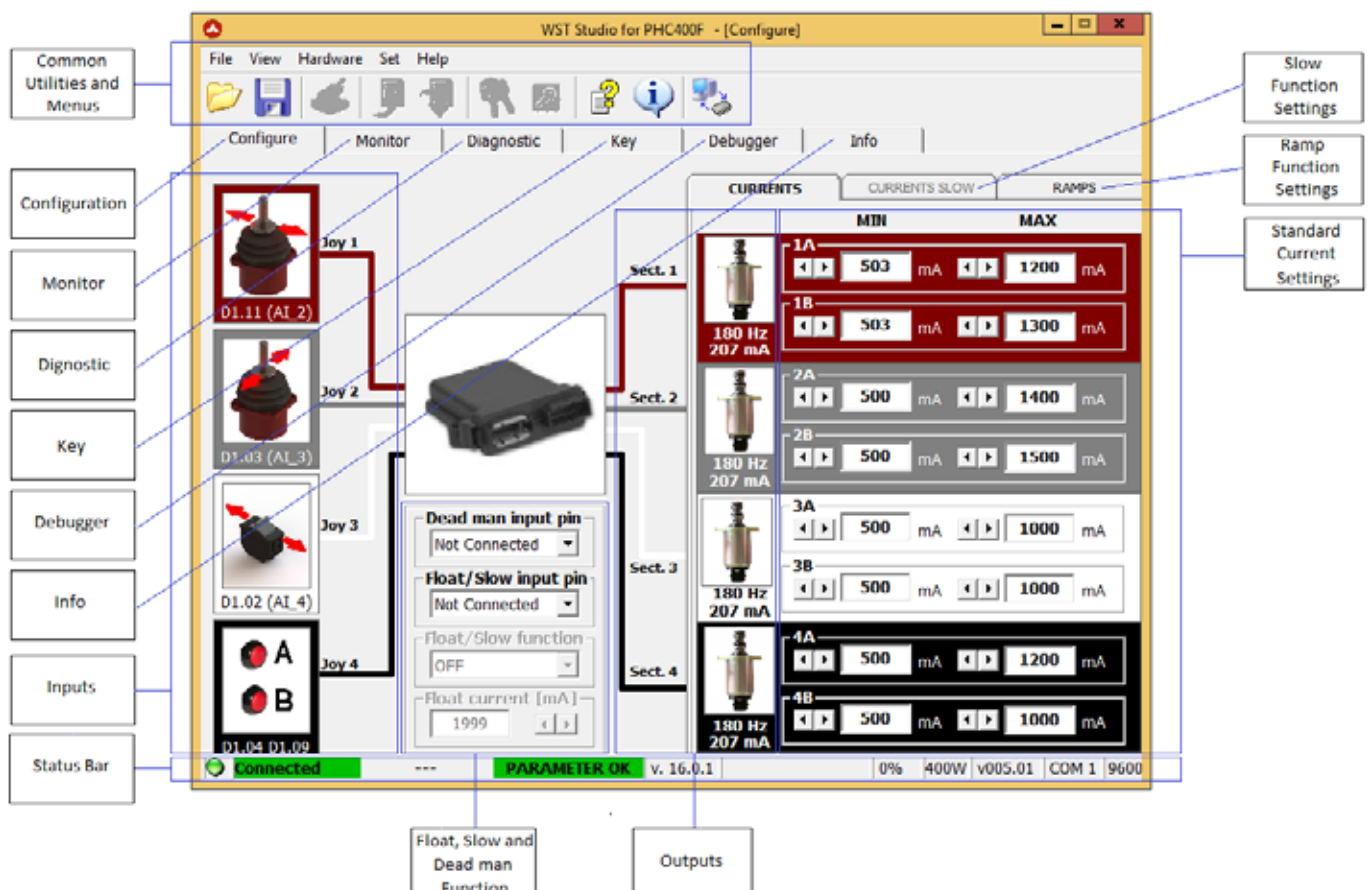
## 1. Product Overview

The WST Studio is simple software tool to let the operator dialog with the CED400W control unit via RS232. The operator can optimize the control unit performances, adapting them to the PHC application.

Through the WST Studio, 4 basic operations are possible on the control unit

- I/O interface configuration
  - o Inputs
  - o Outputs
- Working Parameters optimization
  - o Standard function
  - o Slow function
  - o Float function
  - o Ramp function
- I/O signals monitoring
  - o Monitor
- In-field system diagnostic
  - o Diagnostic

The WST Studio main window is the following:



## 2. WST software installation

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The WST Studio is a software for personal computer PC.

### 2.1 PC requirements

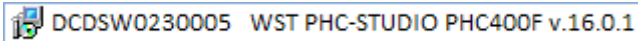
The WST software runs on windows based PCs, with the following main characteristics

- Windows XP, 7 and 8,
- Recommended Pentium Processor 166 MHz or higher ,
- 32 MB RAM, or higher,
- 20 MB of hard disk free space.
- RS232 communication port or USB / RS232 adapter.
- Specific wiring harness and hardware (see chapter 11, Appendix)

### 2.2 How to install

In case in the application is needed the USB / RS232 adapter, install this Driver first.

After that, run the '*DCDSW0230005 WST PHC-STUDIO PHC400F v.16.0.1.exe*' file and follow the installation instructions.

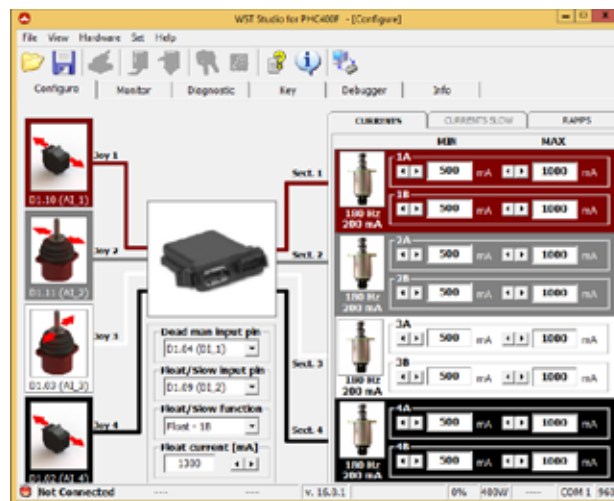


## 3. Run the WST Studio

Once the WST Studio has been installed, double click on the WST icon on the desktop (or from PC's Start menu), to run it. At first, the Start window (Splash Screen) will be loaded,



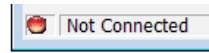
then the 'Configure' window will be loaded with default values



Right now, the WST Studio is running in OFF-LINE mode, no connection has been established to any control unit.

3.1 OFF-LINE mode

In OFF-LINE mode, there is no active connection between the WST Studio and the control unit. The indication 'Not Connected', shown on the bottom left side of the status bar, confirms it.



3.1.1 Connection

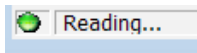
Click on the Connect button to establish an active connection between the WST Studio and the control unit.



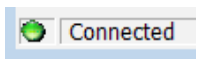
Notice that

- The control unit has to be powered through its power supply pins. It can not be powered through the PC connection.

While attempting the connection, an indication 'Reading...' is shown on the bottom left side of the status bar. This indicate that the WST Studio is uploading information from the control unit.



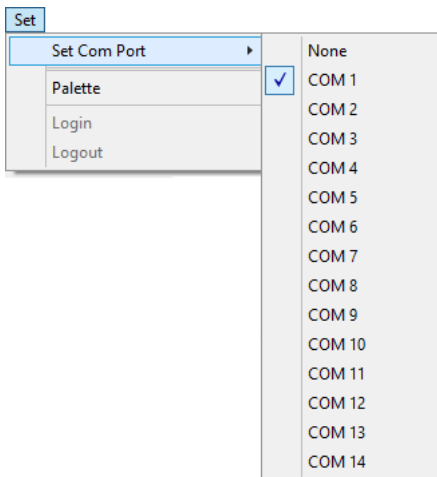
As soon as the loading is completed (the progress bar reaches the 100%), the indication 'Connected' is shown. The control unit Working Parameters are now loaded on the PC and are displayed on the WST Studio 'Configure' window.



Once the connection has been established, the WST Studio is in ON-LINE mode.

3.1.2 COM port selection

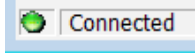
The WST Studio will attempt the connection to the control unit through the COM1 communication port of PC. If the COM1 port is not available (check in Windows Device Manager), a different COM port can be selected through the WST Studio. From the WST Studio toolbar, through the Set/Set Com Port path menu, select a new COM port.





## 3.2 ON-LINE mode

The information about the system configuration (for example the joysticks type), and the working parameters (for example minimum and maximum currents, ramp times, etc. ) are now available and visible in the WST Studio 'Configure' window.



## 3.3 Load Default Valve Settings

When the WST Studio is opened the general default value are loaded in the 'Configure' window. This values are general and not related with any specific valves.

The default settings values specific for the WALVOIL valves are stored in the following folder:  
`\Wst for PHC400W - PHC 3.0\res\txt\Valve Default Settings`

The default valve settings are .DEF files and contain the settings for each specific valve.



*Example of some default valve settings files.*

### Notice that

- It is suggested to load the default valve settings provided by WALVOIL for the specific valve used before to start the field calibration.

## 4. System configuration

### 4.1 Control unit functionality

The control unit logical functionality is predefined and not user modifiable.

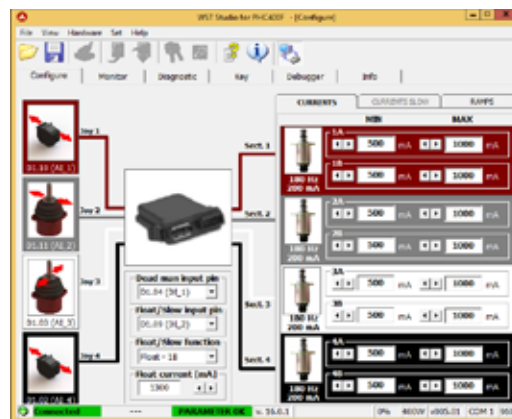
Only some predefined customization options are available to implement a simple personalization.

The control unit is able to control up to 4 functions/sections on an hydraulic valve system.

Each one of these function/section (Sect.1A, Sect. 1B, Sect.2A, ...) controls a pair of coils with a current proportional to the input signal (Joy1, Joy2, ...).

These 4 input-to-output connections are highlighted with 4 different colors,

- function/section 1 : brown as standard.
- function/section 2 : gray as standard.
- function/section 3 : white as standard
- function/section 4 : black as standard



It is possible to customize the color of the different sections from the WST Studio toolbar, through the *Set/Palette* path menu.

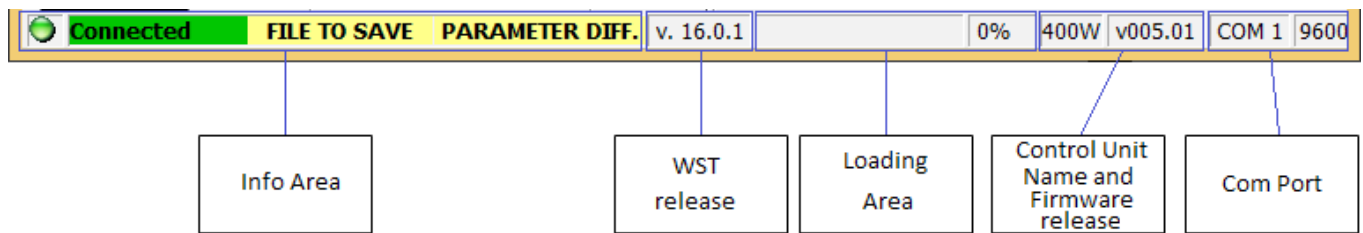
It is also possible configure the following functions:

- Dead man logic.
- Spool Float function.
- Slow function.
- Ramp function.

In the next chapters all this functions are described in detail.

## 4.2 Status bar

In the lower part of the WST windows there is the status bar with several information about the system.



### 4.2.1 Info area

In the info area there are 3 different information:

- Connection status:
  - o **Not connected**: when the system is in OFF-LINE mode.
  - o **Reading...**: when the system is attempting the connection.
  - o **Connected**: when the system is in ON-LINE mode.
- Configuration file status:
  - o **---**: when the parameters of the WST Studio windows are saved in the configuration file.
  - o **File to save**: when one or more parameters of the WST windows are different respect the parameters stored in the configuration file. Read operation from control unit will overwrite the parameter in the windows.
- Parameter status:
  - o **Parameter OK**: when the parameters of the WST Studio windows are aligned with the parameters stored in the memory of the control unit.
  - o **Parameter diff.**: when one or more parameters of the WST windows are different respect the parameters stored in the memory of the control unit

### 4.2.2 WST Studio release

In this area is reported the WST Studio software release.

### 4.2.3 Loading area

In this area is reported the progress of the current operation.

### 4.2.4 Control unit name and firmware release

In this area is reported the control unit name and the release of the firmware loaded.

### 4.2.5 Communication port info

In this area is reported the communication port selected and the baud rate.

## 4.3 Inputs definition

### 4.3.1 Predefined input

Two proportional input types signals are defined as standard

- type F
  - o 0.5÷4.5V, 2.5V neutral.
  - o the input signal is not variable with the system power supply voltage Vbb.
  - o the input signal is expressed in Volt.
- type P
  - o 25÷75%Vbb, 50%Vbb neutral
  - o the input signal is variable with the system power supply voltage Vbb.
  - o the input signal is expressed as a percentage of Vbb, it is ratiometric value.

One ON/OFF input type signal is defined as standard

- type DIGITAL CMD
  - o 0V OFF.
  - o Vbb ON.

Several WALVOIL components available with these characteristics are:

- type F
  - o ARW proportional roller
  - o AJW proportional joystick
- type P
  - o MDN proportional joystick
  - o PTM proportional potentiometer

### 4.3.2 Default input

By default, all the input signals are configured to be type F, 0.5÷4.5V, 2.5V neutral.

This means that their characteristics are

- Analog Type: joystick.
- Analog Reference: 5V (regulated).
- Analog Range: 10-90% (50% neutral).

Notice that

- The signal 0.5÷4.5V, 2.5V neutral, referred to 5V, means 10-90%, 50% neutral.

## 4.3.3 Change input type

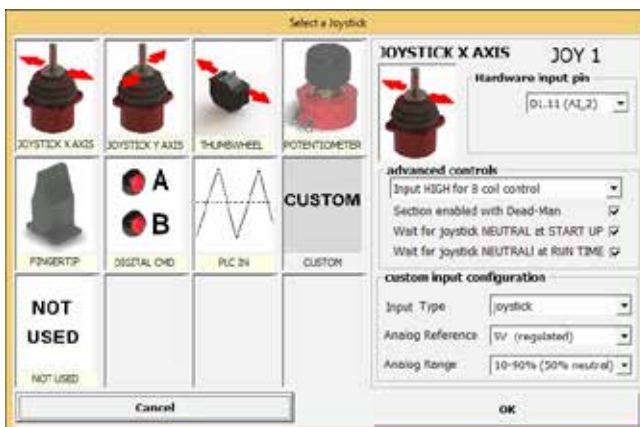
- In the WST Studio 'Configure' window, click on the joystick picture to configure it.



Ex. Function/section 1, input type selection picture

The 'Select a Joystick' form is shown with standard WALVOIL components:

- o type F, 0.5÷4.5V, 2.5V neutral: pictures from 1 to 3.
- o type P, 25÷75%Vbb, 50% neutral: pictures from 4 to 5,
- o type DIGITAL CMD, 0-Vbb: picture 6.
- o type PLC IN, 0-5V ECU input: picture 7.
- o type CUSTOM: picture 8.
- o type NOT USED: picture 9



'Select a Joystick' form

- Select one of the components for the desired type, clicking on its picture.  
On the top right of the page, the picture of the selected component is updated



Ex. Component 3, type F selection

- On the bottom right of the page, the 'custom input configuration' field is updated and the main characteristics for the signal are shown.

**custom input configuration**

Input Type

Analog Reference

Analog Range

*Ex. type F, characteristics*

- Select the Hardware input pin associated to the joystick.  
See chapter 11, Appendix, for the detailed pinout table.

**Hardware input pin**

*Ex. Analog Input 1, connector D1, pin 10*

- Click on the 'OK' button to confirm the selection on the WST Studio

**OK**

- Click on the 'Cancel' button to exit without modification

**Cancel**

- In the 'Configure' window the picture and the information are updated according with the selection made.



Notice that

- The input notation has the following meaning:
  - On the left side the connector pin number.
  - On the right side the type of input; AI, analog input and DI, digital input.
- For example, D1.04 (DI\_1) means: connector D1, pin 04 corresponding to Digital Input 1.

## 4.3.4 Custom input

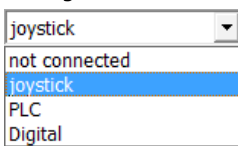
It is also possible to define a custom type for the input signal.

- Select the Custom component, clicking on the CUSTOM picture.



The custom signal has to be described with a combination of the following choices.

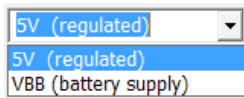
- Define the Input Type
  - o not connected           no input signal is connected.
  - o joystick                 neutral position at 50%.
  - o PLC                     0 to 95% with neutral position at lowest percentage value  
This input drive only 1 side of the function/section.
  - o Digital                 neutral with button not pressed



- Define the Analog Reference

It is the full-range value for the input signal:

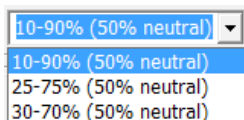
- o 5V (regulated)           for F types.
- o Vbb (battery supply)   for P types and DIGITAL CMD.



- Define the Analog Range

It is the variation range for the input signal, compared to its maximum value.

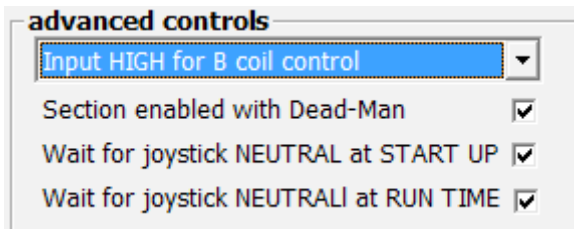
- o 10-90% (50% neutral)           typical for F types.
- o 25-75% (50% neutral)           typical for P types.
- o 30-70% (50% neutral)



## 4.3.5 Advanced controls

Some advanced controls are available to properly manage the input signals in the application.

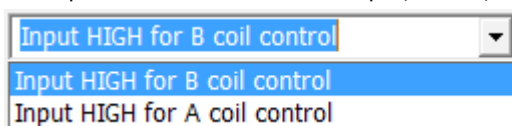
- to customize the logic functionality of the control unit.
- for each of the input signals independently.



These advanced controls are

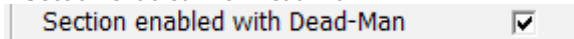
- Input HIGH for A or B coil control

It is possible to decide which output, A or B, has to be actuated with input signal HIGH values.



The option 'Input HIGH for B coil control' is selected by default.

- Section enabled with Dead-Man



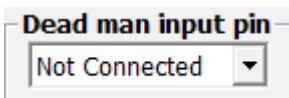
If this option is selected,

- o the input signals can be used to energize the coils only if the Dead-Man switch is active.
- o it acts as a function/section ENABLE.

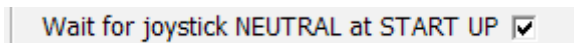
This option affects only the specific function/section.

The option is selected by default.

If in the 'Configure' window the Dead man input is not connected, in all the 4 functions/sections this option is ignored and the system work like option not selected.



- Wait for joystick NEUTRAL at START UP

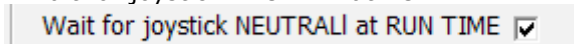


If this option is selected, at START UP, in order to enable the output, the corresponding input signal must be in neutral.

This option is independent respect the Section enabled *with Dead-Man* option.

The option is selected by default.

- Wait for joystick NEUTRAL at RUN TIME



If this option is selected, during RUN TIME, if dead man is released while input signal is out of neutral, in order to reactivate the output is requested to return the corresponding input signal in neutral.

This option is ignored if the *Section enabled with Dead-Man* option is not selected.

The option is selected by default



## 4.4 Dead man input

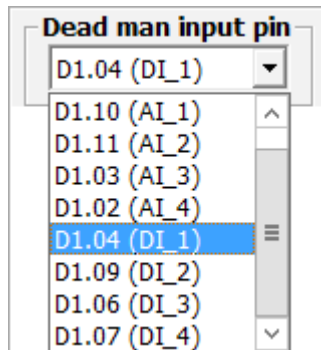
The Dead man feature is a safety feature to energize the coils only if the Dead-Man switch is active (and maintained active).

To enable this function it is necessary to select the input from the specific list.

The possible values are:

- Not connected: no Dead man feature selected.
- Analog inputs: to select one of the analog inputs for the switch.
- Digital inputs: to select one of the digital inputs for the switch.

See chapter 11, Appendix, for the detailed pinout table.



### Notice that

- For the Dead man input is possible to select both Digital and Analog input.
- The input notation has the following meaning:
  - o On the left side the connector pin number.
  - o On the right side the type of input; AI, analog input and DI, digital input.
- For example, D1.04 (DI\_1) means: connector D1, pin 04 corresponding to Digital Input 1.

## 4.5 Output definition

### 4.5.1 Dither frequency

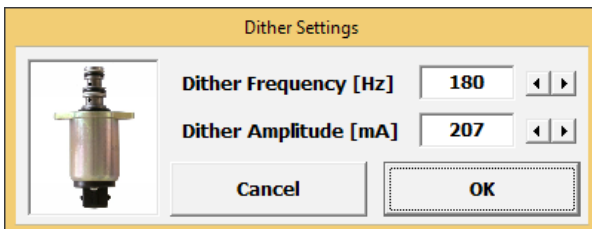
Depending on the valve model to be controlled, the control unit output dither frequency has to be set properly. This is useful to reduce the valve hydraulic hysteresis.

- Click on one of the coil pictures to enter the Dither Settings windows.



Ex. Function/section 1, Dither frequency selection picture

The following 'Dither Settings' window will appear.



*Dither Settings form*

In this windows it is possible to change:

- o 'Dither frequency [Hz]' from 50 to 300Hz.
- o 'Dither amplitude [mA]' from 0 to 500 mA.

The new selection will be shown into 'Configure' page

#### Notice that

- This selection will be the same for all the outputs of the control unit.
- The suggested Dither Settings for the specific WALVOIL valves are loaded with the default valve setting file

## 4.6 Working Parameters

The Working Parameters let the operator fine-tune the control unit standard functionality inside the application. Modify these parameters to improve and/or optimize the sensibility of the control.

### 4.6.1 Standard function

#### 4.6.1.1 Control law

Per each function/section, the Standard function works as follows:

- Logic:
  - o for input value greater than neutral, the current is driven through the output B (or A).
  - o for input value equal than neutral, no current is driven through the outputs, A or B.
  - o for input value lower than neutral, the current is driven through the output A (or B).
- Regulation:
  - o as soon as the input value is out of neutral the minimum current is driven.
  - o when the input value reaches the full range value the maximum current is driven.
  - o for the intermediate values of the input, the output current value is obtained through a linear interpolation between minimum and maximum currents.

#### 4.6.1.2 Minimum current

The Minimum current is the lowest current that the control unit drives through the specified output. This controls the minimum oil flow on the valve output.



*Ex. Output 1A MIN current settings*

A new value can be set

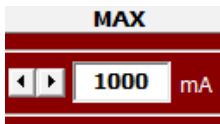
- typing the desired value directly into the corresponding text box.
- acting on the horizontal scroll bar (1mA steps).

About the value

- it is expressed in mA.
- the lowest value allowed is 100mA.
- the Minimum current has to be lower than the Maximum current.

#### 4.6.1.3 Maximum current

The Maximum current is the highest current that the control unit drives through the specified output. This controls the maximum oil flow on the valve output.



*Ex. Output 1A MAX current settings*

A new value can be set

- typing the desired value directly into the corresponding text box.
- acting on the horizontal scroll bar (1mA steps).

About the value

- it is expressed in mA.
- the highest value allowed is 2.000mA.
- the Maximum current has to be higher than the Minimum current.

#### Notice that

- Modifying the Working Parameters, the logical functionality is not modified.
- The suggested minimum and maximum current for the specific WALVOIL valves are loaded with the relative default valve setting file

## 4.6.2 Float function

### 4.6.2.1 Control law

The Float function works as follows:

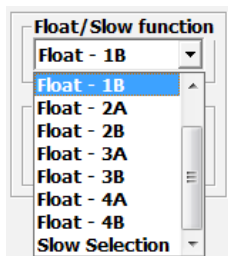
- Logic:
  - o the control is engaged turning ON the associated input. The output is still engaged also after the input release (Float is a memory function).
  - o the control is disengaged turning ON again the associated input.
- Regulation:
  - o while the Float control is engaged, the Float current is driven through the selected Float output

### 4.6.2.2 Enable

The Float function has to be enabled selecting the output of the control unit involved in the control.

Click on the box and select the desired output.

By default, the Float function is enabled on output 1B.



*Ex. Default Float function selection*

#### Notice that

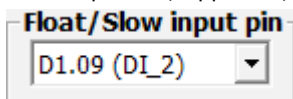
- This function is not affected by the Dead Man switch state.
- Due to the Float input is the same as per the Slow input, if the Float function is enabled the Slow function cannot be enabled.
- Float function can be disabled selecting OFF in the box: it is recommended to turn-OFF the Float function if in the system there are no spools with Float position

### 4.6.2.3 Input pin selection

For the Float function the input pin for the activation / deactivation command has to be selected.

Click on the box and select the desired input.

See chapter 11, Appendix, for the detailed pinout table.



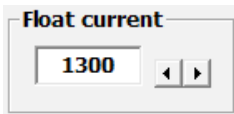
*Ex. Digital Input 2, connector D1, pin 09.*

#### Notice that

- For the Float input it is possible to select both Digital and Analog inputs.
- The input notation has the following meaning:
  - o On the left side the connector pin number.
  - o On the right side the type of input; AI, analog input and DI, digital input.
- For example, D1.04 (DI\_1) means: connector D1, pin 04 corresponding to Digital Input 1.

## 4.6.2.4 Float current

The Float current is the current driven through the Float output as soon as the Float control is engaged.



A new value can be set

- typing the desired value directly into the corresponding text box.
- acting on the horizontal scroll bar (1mA steps).

About the value

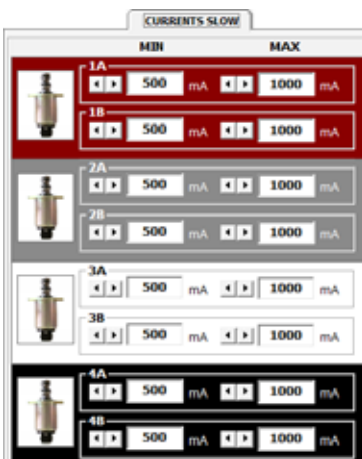
- it is expressed in mA.
- the highest value allowed is 2.000mA.

Notice that

- The suggested minimum and maximum current for the specific WALVOIL valves are loaded with the default valve setting file.

## 4.6.3 Slow function

The Slow function is a second set of current calibration parameters that are used in that application when the Slow input is ON.



### 4.6.3.1 Control law

Per each function/section of the control unit, 4 Working Parameters are available:

- Minimum currents, A and B outputs,
- Maximum currents, A and B outputs.

The Slow function works as follows:

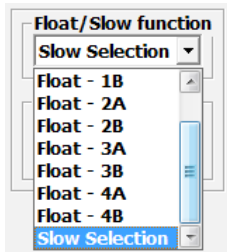
- Logic:
  - o the control is engaged turning ON the associated input.
  - o the control is executed maintaining ON the associated input.
  - o the control is disengaged turning OFF the associated input.
- Regulation:
  - o while the Slow control is engaged, in each function/section the currents driven through the outputs are defined using the Slow function Working Parameters, instead the Standard function Parameters.
  - o as soon as the input value is out of neutral the minimum current is driven.
  - o when the input value reaches the full range value the maximum current is driven.
  - o for the intermediate values of the input, the output current value is obtained through a linear interpolation between minimum and maximum currents.

## 4.6.3.2 Enable

The Slow function has to be enabled.

Click on the box and select Slow Selection.

By default, the Slow function is not enabled.



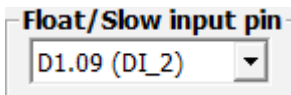
Ex. Slow function enable

## 4.6.3.3 Input pin selection

The input pin associated to Slow function has to be selected.

Click on the box and select the desired input.

See chapter 11, Appendix, for the detailed pinout table.



Ex. Digital Input 2, connector D1, pin 09.

### Notice that

- It is possible to select both Digital and Analog input.
- The input notation has the following meaning:
  - On the left side the connector pin number.
  - On the right side the type of input; AI, analog input and DI, digital input.
- For example, D1.04 (DI\_1) means: connector D1, pin 04 corresponding to Digital Input 1

## 4.6.3.4 Minimum current

The Minimum current is the lowest current that the control unit drives through the specified output.

This controls the minimum oil flow on the valve output



Ex. Output 1A MIN current settings

A new value can be set

- typing the desired value directly into the corresponding text box.
- acting on the horizontal scroll bar (1mA steps).

About the value

- it is expressed in mA.
- the lowest value allowed is 100mA.
- the Minimum current has to be lower than the Maximum current.

## 4.6.3.5 Maximum current

The Maximum current is the highest current that the control unit drives through the specified output. This controls the maximum oil flow on the valve output.



Ex. Output 1A MAX current settings

A new value can be set

- typing the desired value directly into the corresponding text box.
- acting on the horizontal scroll bar (1mA steps).

About the value

- it is expressed in mA.
- the highest value allowed is 2.000mA.
- the Maximum current has to be higher than the Minimum current.

### Notice that

- By default
  - o The Slow function Minimum current is equal than the Standard function Minimum current. As soon as the input signal is out of neutral, the minimum oil flow is output from the valve.
  - o The Slow function Maximum current is lower than to the Standard function Maximum current. The maximum oil flow output from the valve is reduced.
- When enabled, the Slow function is active on all the control unit outputs.
- Due to the Slow input is the same as per the Float input, if the Slow function is enabled the Float function cannot be enabled.
- Slow function can be disabled selecting OFF in the box.
- The suggested minimum and maximum current for the specific WALVOIL valves are loaded with the default valve setting file.

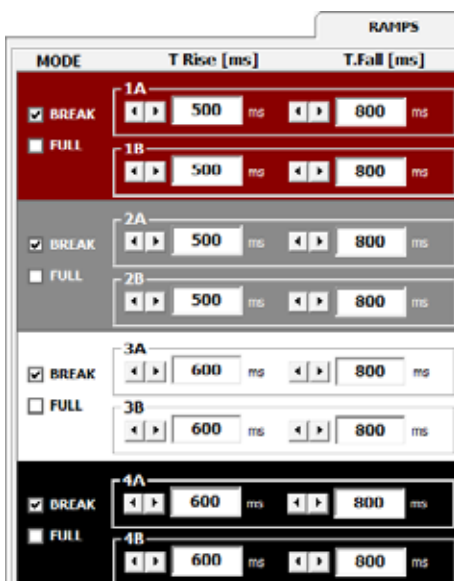
## 4.6.4 Ramp function

These are the Working Parameters that the operator can modify

- to smooth the system dynamic.
- to force the response time delay on the control.

Useful for

- rotor or motor control.
- cranes applications.



## 4.6.4.1 Control law

Per each function/section of the control unit, 5 ramp Working Parameters are available

- acceleration ramp times, for A and B outputs.
- deceleration ramp times, for A and B outputs.
- mode control.

The Ramp function works as follows:

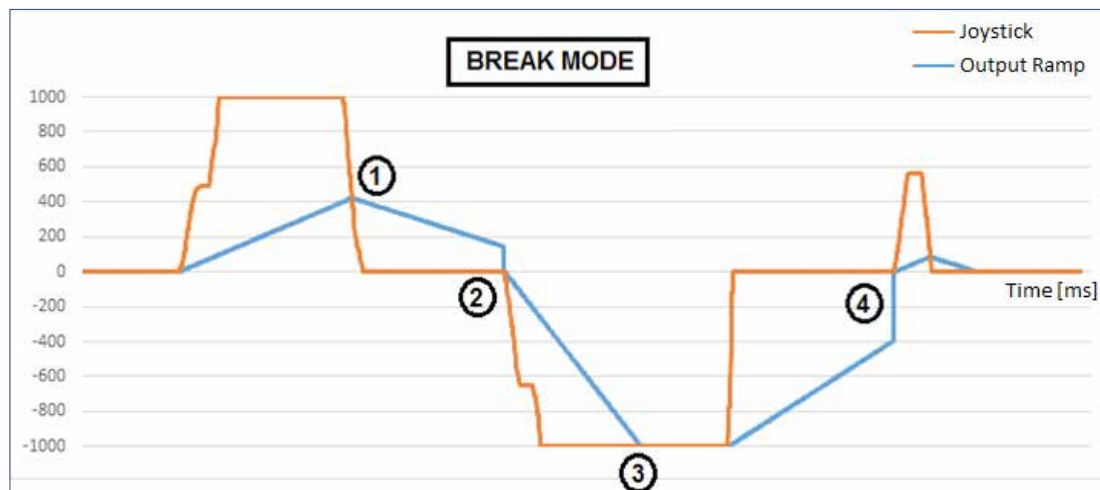
- the control is always enabled.
- it is appreciable only if the acceleration and/or deceleration ramp times are not null.
- it is possible to define how to switch current between A and B outputs during the actuation of the ramp control with 2 modalities; Break and Full.

### o BREAK (default)

Let's suppose some current is driven through the output A.

As soon as it is requested to drive current from B output, the output A is turned off, the output B is immediately turned on and driven.

This happens even if any deceleration ramp time is set on the output A, and not expired.  
(vice-versa while driving the output B).

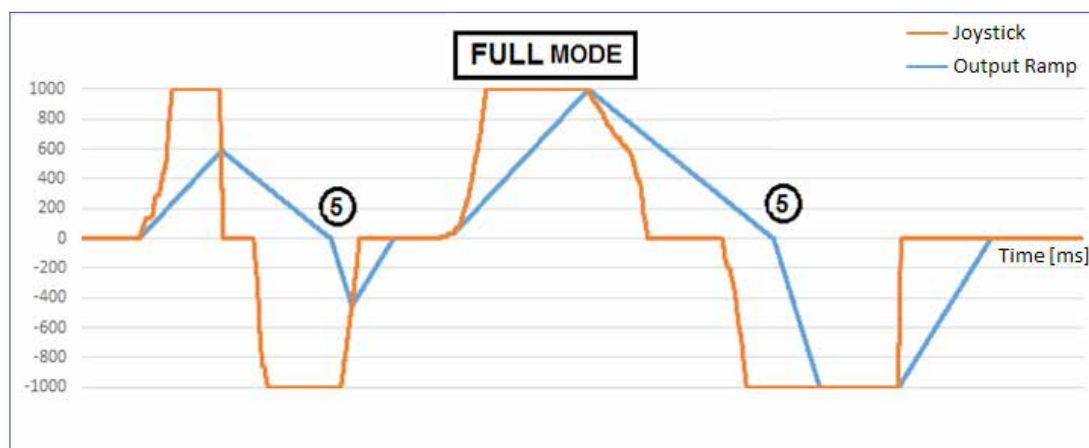


### o FULL

Let's suppose some current is driven through the output A.

Even if it's requested to drive current from B output, the output B is turned on and driven, only after the service of the output A is completed, and any deceleration ramp time on A output is expired.

(vice-versa while driving the output B).





## 4.6.4.2 Rise time

This is the time delay to increase the current on the output, from its minimum value to its maximum value. Following an immediate request of maximum current, the output current will increase linearly in this time.



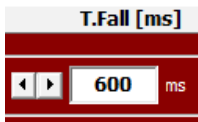
*Ex. Ramp function, output 1A, 500ms rise time*

About the value

- it is expressed in ms.
- the highest value allowed is 10.000ms.
- the lowest value allowed is 0ms.
- 0ms time means no ramp.

## 4.6.4.3 Fall time

This is the time delay to decrease the current on the output, from its maximum value to its minimum value. Following an immediate request of minimum current, the output current will decrease linearly in this time.



*Ex. Ramp function, output 1A, 600ms fall time*

About the value

- it is expressed in ms.
- the highest value allowed is 10.000ms.
- the lowest value allowed is 0ms.
- 0ms time means no ramp.

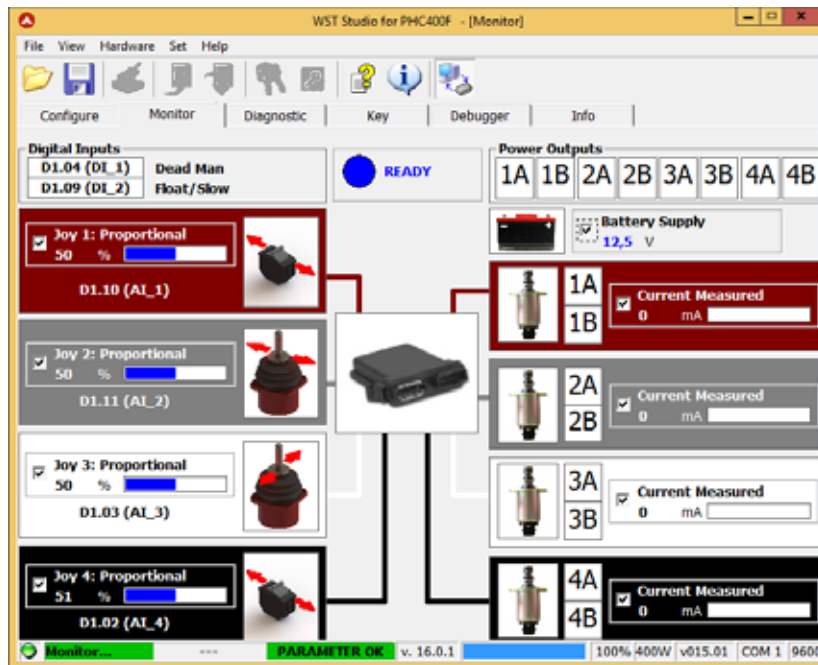
Notice that

- Ramp times lower than 20ms are not visible in the system behavior.

## 5. Monitor

In the 'Monitor' window are visible

- the values of the input and output signals managed by the control unit,
- the status of the control unit.



These values are not user modifiable, they are the real time value of the signals of the control unit.

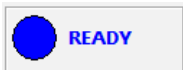
### Notice that

- These values give only a first indication about what is happening in the system. To get the real system signals values, it is necessary that the operator uses a multimeter, an oscilloscope, or a dedicated measurement instrument.
- It is possible to stop the refresh for most of these values unchecking the correspondent checkbox. This would speed-up the refresh for the other values. When the refresh is stopped, the last value refreshed is shown.

### 5.1 Status

The status of the control unit can be:

- READY to work



While the control unit is in this status, the outputs are turned-on. Current is driven to coils, depending on the input signals values.

- NOT READY to work



There are 2 possibilities

- o the dead-man switch is not pressed, and the system is not enabled to work.
- o an error event is occurred and detected by the control unit (see Diagnostic chapter for details).

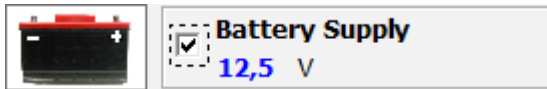
While the control unit is in this status, all the outputs are turned-off.

No current is driven to the coils, independently of the input signals values.

The Status refresh is always enabled, no check box is available to stop it.

## 5.2 Battery Supply

It is visible the Battery Supply voltage that powers the control unit.

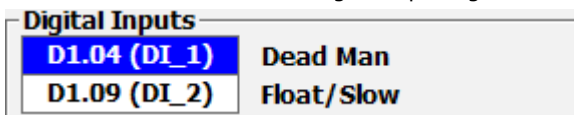


The value is expressed in V.

The refresh is enabled by default.

## 5.3 Digital Inputs

It is visible the status of the Digital Input signals connected to the control unit.



Ex. Digital Input 1 is turned-ON

The status (value) of the Digital Inputs is indicated by the corresponding label

- White label = Digital Input is turned-OFF,
- Blue label = Digital Input is turned-ON.

In the standard control unit PHC software their meaning is

- DI\_1 = dead-man switch input status,
- DI\_2 = FLOAT/SLOW inputs status,

All labels do not affect the standard control unit software.

The Digital Inputs refresh is always enabled, no check box is available to stop it.

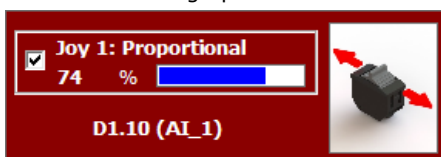
## 5.4 Proportional Inputs

The Proportional Input signals for each function/section of the control unit are visible; this is the command signal used by the control unit to define the output current to be driven through the output ports, A or B.

Its refresh is enabled by default.

For each Proportional signals, 2 indications are visible

- percentage % value, referred to the maximum value of the input range.
- horizontal bargraph.



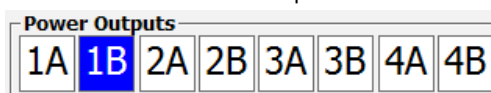
Ex. Function/section 1 input, 74%.

## 5.5 Digital Outputs

The Power Output signals show which control unit outputs are turned-ON.

The status (value) of the Power Output is indicated by the corresponding label

- o White label= Power Output is turned-OFF,
- o Blue label= Power Output is turned-ON.



Ex. Function/section 1 output, 1B is turned-ON

The Power Outputs refresh is always enabled, no check box is available to stop it.

## 5.6 Proportional Outputs

It is visible the current driven through the control unit outputs.

For each function/section 4 indications are visible

- current value expressed in mA.
- which output is driven, A or B.
- horizontal label, blue lighted depending by the mA value, referred to the minimum-maximum current range set for the driven output.



*Ex. Function/section 1 outputs, 864mA are driven through 1B output*

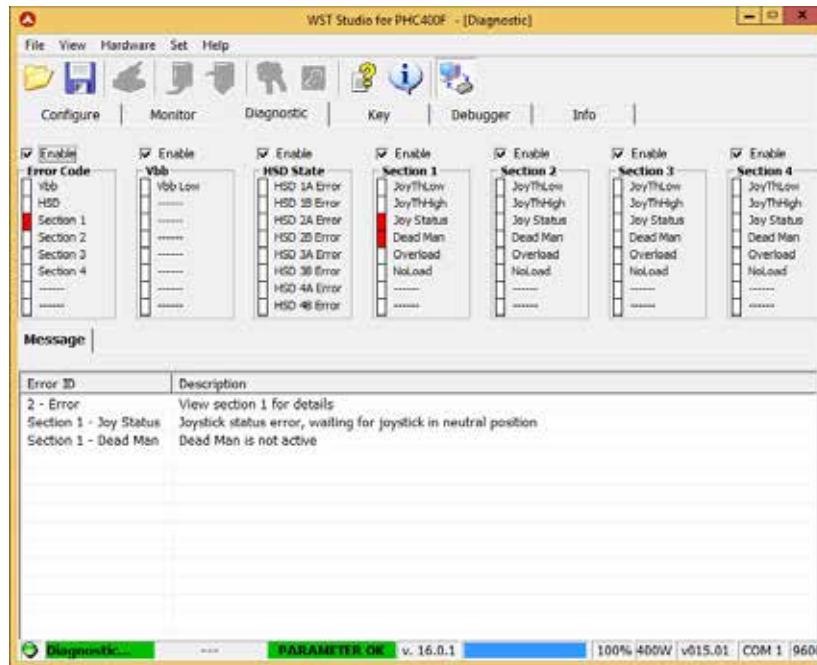
The refresh is enabled by default.

### Notice that

- The current value (mA) is measured by the control unit.
- The control unit implements a compensation on the current value on the output, against:
  - o Battery Voltage fluctuations.
  - o Coil resistance variations.

## 6. Diagnostic

In the 'Diagnostic' window the indications about the system status are available. These indications are useful to understand why the system is NOT READY to work. (See Monitor chapter, too).



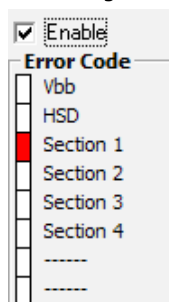
The failure events detected and managed by the control unit are relative to the following software blocks

- Error Code.
- Vbb (Battery Supply voltage value).
- High Side Driver State (HSD, output ports hardware).
- Section 1.
- Section 2.
- Section 3.
- Section 4.

See details below.

### 6.1 Error Code

This is a global view of the software blocks that are failing.



*The refresh is enabled by default.*

For the Error Code, the failure events that can occur are

- o Vbb: see details below.
- o HSD (High Side Driver): see details below.
- o Section 1: see details below.
- o Section 2: see details below.
- o Section 3: see details below.
- o Section 4: see details below.

6.2 Vbb (Battery Supply voltage value)

- o Vbb Low: the value is lower than 8V.

☒ Enable

**Vbb**

<input type="checkbox"/>	Vbb Low
<input type="checkbox"/>	-----
<input type="checkbox"/>	-----
<input type="checkbox"/>	-----
<input type="checkbox"/>	-----
<input type="checkbox"/>	-----
<input type="checkbox"/>	-----

The refresh is enabled by default.

6.3 HSD State (output ports hardware)

- o HSD 1A Err: error on output port 1A,
- o HSD 1B Err: error on output port 1B,
- o HSD 2A Err: error on output port 2A,
- o ...

☒ Enable

**HSD State**

<input type="checkbox"/>	HSD 1A Error
<input type="checkbox"/>	HSD 1B Error
<input type="checkbox"/>	HSD 2A Error
<input type="checkbox"/>	HSD 2B Error
<input type="checkbox"/>	HSD 3A Error
<input type="checkbox"/>	HSD 3B Error
<input type="checkbox"/>	HSD 4A Error
<input type="checkbox"/>	HSD 4B Error

The refresh is enabled by default.

## 6.4 Section

For each function/section the state of the output is shown

- o JoyThLow: input signal disconnected or shorted to ground.
- o JoyThHigh: input signal shorted to its maximum value.
- o Joy Status: the Joystick value is not in neutral even if any of the Joystick failure events detection is expired. The Status failure event detection depends on the Advanced Controls setting (see Advanced Controls).
- o Dead Man: the dead-man switch input signal is enabled but not active.
- o Overload: while driving current through the output port a too high current is measured. It is possible that the coil is shorted to ground.
- o NoLoad: no current measured through the output port. It is possible that the coil is not connected.

<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable
<b>Section 1</b>	<b>Section 2</b>	<b>Section 3</b>	<b>Section 4</b>
<input type="checkbox"/> JoyThLow	<input type="checkbox"/> JoyThLow	<input type="checkbox"/> JoyThLow	<input type="checkbox"/> JoyThLow
<input type="checkbox"/> JoyThHigh	<input type="checkbox"/> JoyThHigh	<input type="checkbox"/> JoyThHigh	<input type="checkbox"/> JoyThHigh
<input checked="" type="checkbox"/> Joy Status	<input type="checkbox"/> Joy Status	<input type="checkbox"/> Joy Status	<input type="checkbox"/> Joy Status
<input checked="" type="checkbox"/> Dead Man	<input type="checkbox"/> Dead Man	<input type="checkbox"/> Dead Man	<input type="checkbox"/> Dead Man
<input type="checkbox"/> Overload	<input type="checkbox"/> Overload	<input type="checkbox"/> Overload	<input type="checkbox"/> Overload
<input type="checkbox"/> NoLoad	<input type="checkbox"/> NoLoad	<input type="checkbox"/> NoLoad	<input type="checkbox"/> NoLoad
<input type="checkbox"/> -----	<input type="checkbox"/> -----	<input type="checkbox"/> -----	<input type="checkbox"/> -----
<input type="checkbox"/> -----	<input type="checkbox"/> -----	<input type="checkbox"/> -----	<input type="checkbox"/> -----

*The refresh is enabled by default*

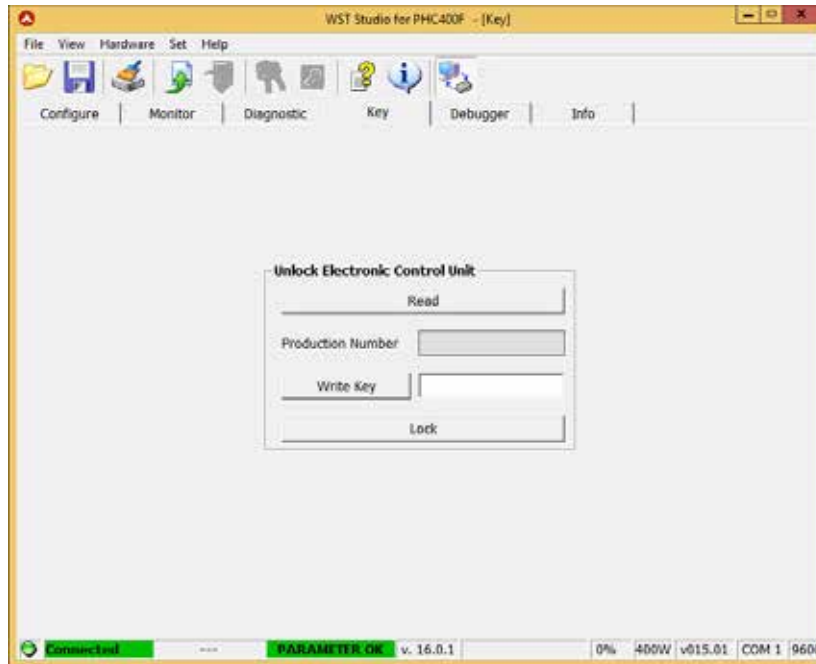
### Notice that

- It is possible to stop the refresh of these software blocks unchecking the correspondent checkbox. This would speed-up the refresh for the status of the other software blocks. When the refresh is stopped, the failure event label is turned to White.
- Depending on the status of the failure event, the corresponding label is:
  - o White label = the failure event is not active,
  - o Red label = the failure event is active.
- These are all the faulty conditions that the control unit is able to detect.
- For each function/section, once a faulty condition is detected by any software block:
  - o the faulty condition is propagated to the next software blocks.
  - o the control unit enters into the ERROR mode condition or status.
  - o the outputs are turned-OFF (for that function/section).

## 7. Key

In the 'Key' window it is possible to:

- Read Production Number.
- Write Key to unlock control unit for PHC Studio developer.
- Write Key to lock control unit to prevent modification by end users.



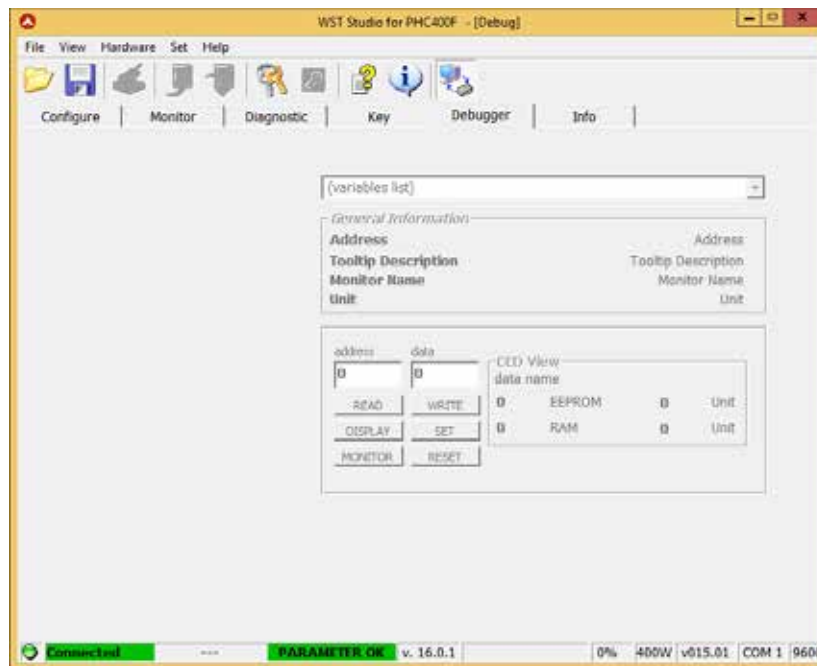
### Notice that

- When a control unit is locked the connection with PHC Studio is not allowed. In order to modify the application firmware with PHC Studio is necessary to unlock the control unit.
- To unlock the control unit it is necessary to read its 'Production number' and send it to WALVOIL customer service with a Key order.
- WALVOIL will send back the unlock key for the specific control unit.
- Copy the unlock key into text box and press command 'Write Key' to unlock the control unit; after that the application firmware modification with PHC Studio are allowed.



## 8. Debugger

This features are available only for WALVOIL operators.



## 9. Info

In the 'Info' window it is possible to write general information about the project:

- Author name.
- Date.
- Revision.
- Company name.
- Additional comments.



## 10. Common utilities

Some common utilities are available in the WST Studio toolbar.

### 10.1 Connect button

The Connect button establishes the RS232 connection between the WST Studio and the control unit. Once the connection is established the following buttons are enabled.



### 10.2 Open button

The Open button transfers data from a text file to the WST Studio.

All the Working Parameters will be uploaded from the file.

To load this Working Parameters in the control unit a Write operation is requested (see Write button).



### 10.3 Save button

The Save button transfers data from the WST Studio to a text file.

All the Working Parameters will be saved in the file.



### 10.4 Read button

The Read button transfers all the Working Parameters from the control unit to the WST Studio 'Configure' window



### 10.5 Write button

The Write button transfers all the Working Parameters from the WST Studio 'Configure' window to the control unit.



### 10.6 Reset button

A Reset button is available to restore in the control unit the factory default Working Parameters.

The following operations have to be executed in sequence to make the reset command be effective.



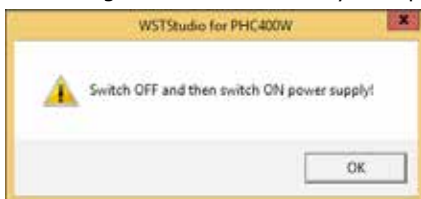
- Click on the RESET button



The reset action is engaged and the control unit is informed that it has to restore its defaults Working Parameters.

Take care that the reset operation will be executed only at the next control unit power-on.

A message will inform that a system power supply reset is requested



- Reset the system power supply:
  - o turn-OFF the system power supply,
  - o turn-ON the system power supply.
- Once the reset action is engaged the connection between the WST Studio and the CONTROL UNIT is lost.
- A new connection is then requested to continue the dialogue between the WST and the CONTROL UNIT. Click on the Connect button

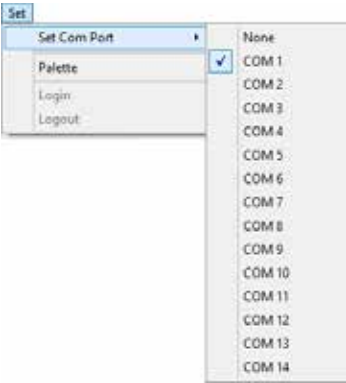


After the new connection has been realized, if a power supply reset has not been attempted, a message box will inform the operator that the RESET request is still active, but can not be served.



10.7 Set Com Port menu

For the RS232 interface, it is possible to select the personal computer communication port.  
From the WST Studio toolbar, enter into the submenu Set/Set Com Port, and select the desired communication port.  
The default communication port is COM 1.

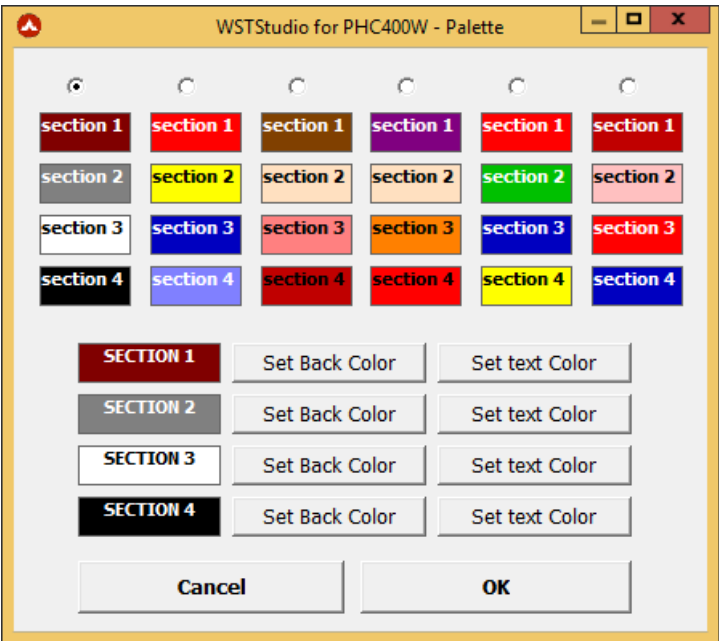
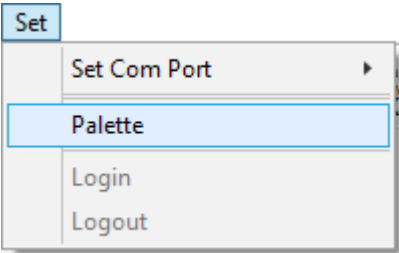


An indication about the communication port in use is visible on the right side of the status bar of the WST frame.



10.8 Set Palette

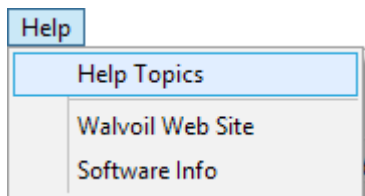
In WST Studio it is possible to select the color scheme of the windows.  
From the WST Studio toolbar, enter into the submenu *Set/Palette*, and select the desired color scheme.



## 10.9 Help



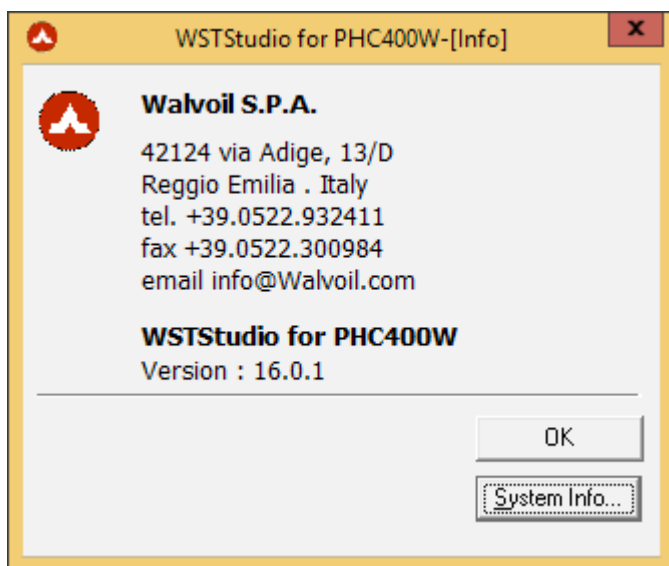
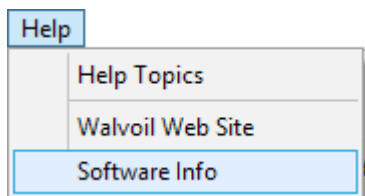
To open the Help document press the specific button or from the WST toolbar enter into the submenu *Help/Help Topics*.



## 10.10 Software Info



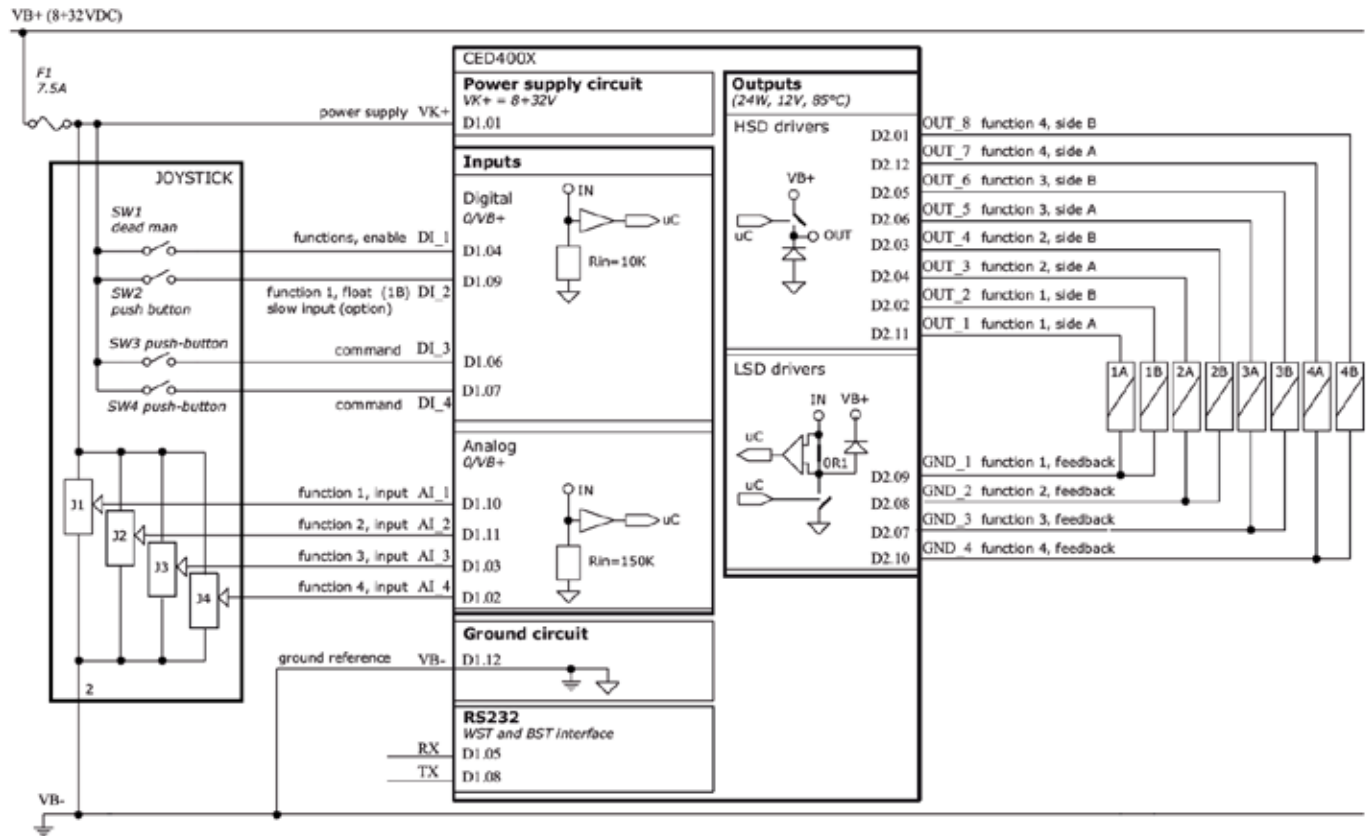
To open the software info windows push the specific button or from the WST Studio toolbar enter into the submenu *Help/Software Info*.



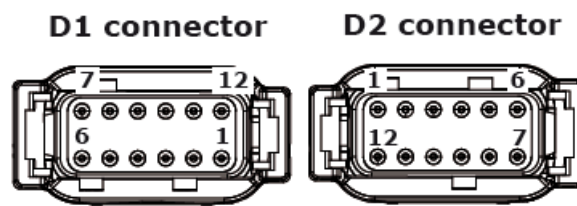
## 11. APPENDIX

### 11.1 System Diagram

Below the general System Diagram of the application.

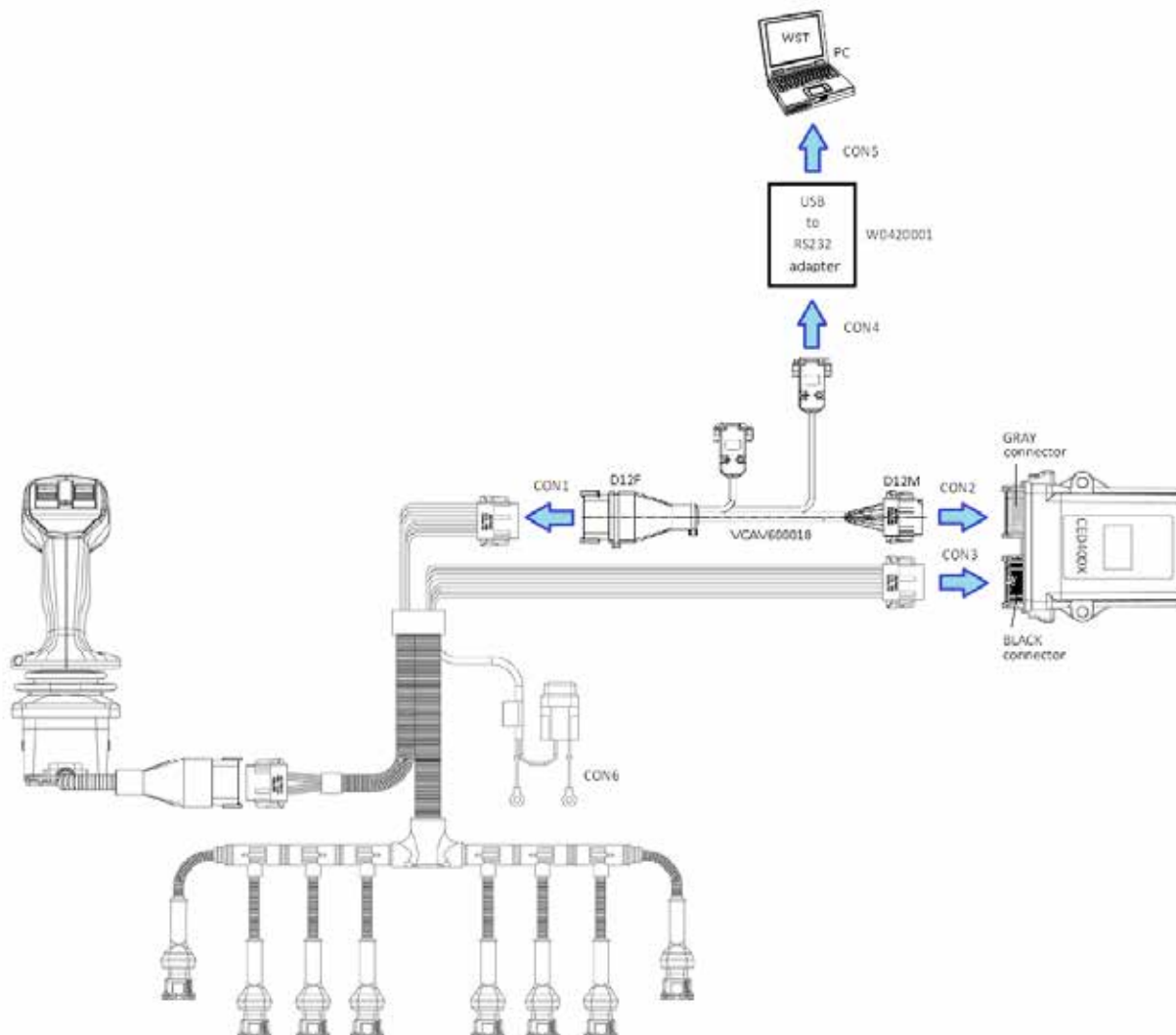


## 11.2 CED400W control unit Pin-out table



Connector PIN-OUT			
D1 connector		D2 connector	
Pin	function	Pin	function
1	VK+	1	OUT_8
2	AI_4	2	OUT_2
3	AI_3	3	OUT_4
4	DI_1	4	OUT_3
5	RX	5	OUT_6
6	DI_3	6	OUT_5
7	DI_4	7	GND_3
8	TX	8	GND_2
9	DI_2	9	GND_1
10	AI_1	10	GND_4
11	AI_2	11	OUT_1
12	VB-	12	OUT_7

## 11.3 WST Studio to CED400W control unit connection



### □ CON1 : joystick line connection

Connect VCAV600018 D12F connector to the system harness male mating connector.

### □ CON2 : control unit CED400W input line connection

Connect VCAV600018 D12M connector to the control unit female GRAY mating connector.

Due to the connectors polarizations no mismatch is possible.

### □ CON3 : control unit CED400W output line connection

Connect the coils to the control unit BLACK output connector.

This connection is not strictly necessary for the unit programming, it is useful to check if the new parameters set into the unit work as expected.

### □ CON4+CON5 : RS232 programming connection

Connect the VCAV600018 RS232 connector, DB9 male, to the computer PC.

Be sure that you are working with the RS232 connector, not with the CAN one.

It is possible that an USB to RS232 adapter is required to interface your PC to the system, through one of its USB ports.

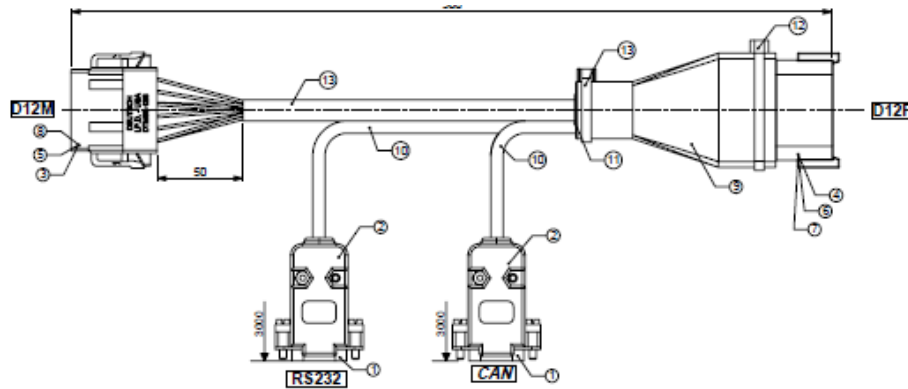
### □ CON6 : power supply connection

While programming the control unit the power supply has to be constantly provided (the unit is not supplied through the PC USB port).



## 11.4 CED400W programming cable

Use the programming cable part number VCAV600018 to program the Working Parameters in the CED400W control unit.



## 11.5 USB-RS232 adapter

Due to the fact that on the last generation PCs the RS232 port is no more available, an USB to RS232 adapter is requested do let the WST Studio dialog with the control unit.

The part number W0420001 is available from WALVOIL.

## Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## Notes

1<sup>st</sup> edition June 2016

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D1WWTE10E

