Web Tension Controller
OWC300 Serie

Technical Manual

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1 About This Document

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer
The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without prior announcement.

1.1 Explanation of symbols

The following symbols with corresponding warnings or explanatory text are used in the documentation. Read and follow the warnings.

Symbols that warn of personal injury:

⚠ DANGER

Danger of death and Serious risk of injury
Note this warning. Hazard with high risk of death or serious injury.

⚠ WARNING

Serious risk of injury
Note this warning. Hazard with high risk of death or serious injury.

⚠ CAUTION

Serious risk of injury
Note this warning. Hazard with high risk of death or serious injury.

Symbols that warn of damage to property or equipment:

NOTE

Damage to the devices or environment
Note this warning. Risk of damage to the environment and equipment.

Symbols indicating further information or tips:

Tip or pointer
This symbol indicates information that contributes to better understanding

1.2 About Safety

The system has been designed according to the state of the art and fulfils the latest safety standards.

When using the system, risks may occur that could threaten your life or health or lead to material damage. In order to avoid these risks, all instructions in this manual concerning safety and all relevant documentation of the entire system must be observed.

1.3 Intended Use

The system is only determined for web tension control.

The system is installed in a machine or assembled together to form a machine with another machine in compliance with the Machinery Directive 2006/42/EC. All machines of the entire system must comply with the guidelines of the Machinery Directive after being installed in the system.

The system and all of its components are only intended for use in industrial environments.

The system may only be put into operation if the following guidelines are also complied with:

- The product must **only** be installed or operated in a nonexplosive atmosphere.
- The product and all components must only be used in a perfect technical condition.
- All technical safety equipment must be in a perfect technical condition.
- The product must only be operated using the components that belong to the system. An exception is such, third party components that have been supplied by OWECON or have been explicitly approved for being operated with the system.
- Any part found to be working incorrectly must be replaced using original spare parts immediately.
- All work on or with the product must only be carried out by instructed and qualified personnel.
- These instructions and all safety information must be observed.
- The operating conditions and performance limits specified in the technical specifications must be observed

1.4 Non-intended Use

Every use is non-intended, that is not described in the chapter Intended Use or does not comply with the guidelines specified there, See Intended use.

1.4.1 Non-intended Infringement of Guidelines

- Infringement of operating, maintaining or installation instructions
- Unsuitable, incorrect or unauthorized use of the product
- Operating the product in an environment not intended for its use
- Operating the product in breach of the legal safety guidelines relevant at the location of use
- Neglecting the warning and safety instructions in the relevant documents for the product
- Operating the product under faulty safety and protective conditions

1.4.2 Non-intended Operation

- Operation by unauthorized or insufficiently qualified personnel
- By-passing, disassembling, switching off or manipulation of safety equipment
- Incorrect or negligent handling by the customer
- Any intervention, modification or conversions on the product without the express approval of OWECON.
- The use of unsuitable operating materials or spare parts
- Operation of the product near to sources of interference, e.g. electro-magnetic fields (high voltage lines) or sources of heat
- Operation of the product under the influence of chemical, electro-chemical or electrical factors

1.5 Safety Instructions

Every user must read and follow the safety instructions in these instructions before working with or on the system.

The following contains general safety instructions that always must be observed. Special safety information that must be observed for certain work will be specified at the start of the respective chapter of these instructions

1.5.1 General Safety Instructions

⚠ DANGER

Danger of death when operated in potentially explosive areas!

- The system must **not** be installed or operated in potentially explosive areas

⚠ DANGER

Danger of death caused by moving machine parts!

- Parts of your body could be crushed, cut, drawn in or hit.
- Never reach in-between the area containing moving rolls, shafts, brakes or machine parts.
- Do not wear any necklaces, scarves or similar near to moving rolls / parts of the machine.
- Never stay in the pivot / traversing area of moving machine parts or reach into the section.
- Before setting up / operating the system, ensure that no other person is in the working area of the moving machine parts.

⚠ DANGER

Danger of death from electric shock!

Life threatening injuries caused by incomplete switching off or residual current.
With defective insulators or live parts, switch off the power supply immediately and have the repairs carried out by a qualified electrician.
Switch the system off completely, switch free of voltage and wait 10 minutes before carrying out any maintenance, repair, cleaning or assembly work.
Secure the system against being switched back on.

⚠ WARNING

Risk of cutting on sharp edges of the material web!

Severe cutting injuries from the edges of the running material web.
Never touch the edges of running material webs.

⚠ WARNING

Danger of falling and damage to assets caused by stepping/climbing onto components!

Stepping/climbing onto components (e.g. Rolls, Rollers or Load Cells) can lead to life-threatening falling accidents and to the destruction of the components.

- Never climb or step onto components.

NOTE

Damage to electronic parts due to ESD (electrostatic discharge)!

Destruction / loss in performance of electronic components by making contact with electrostatically charged persons / objects.

- Open the system components only at a workplace suitable for ESD (according to DIN EN 61340-5-1).
- If there is no ESD-suitable workplace, ESD protective measures must be implemented (according to DIN EN 61340-5-1), so that electrostatic charges are discharged in a controlled manner.
- When returning electronic components, adhere to DIN EN 100015 ("Protection of electrostatically sensitive components").

NOTE

Damage to the touchscreen due to faulty operation!

Use of sharp, strong or coarse objects (e.g. pens, gloves) may damage the surface of the touchscreen.

- Touch the touchscreen only using bare fingers or a special pen (touch-pen).

2 OWC300 series Tension Controllers

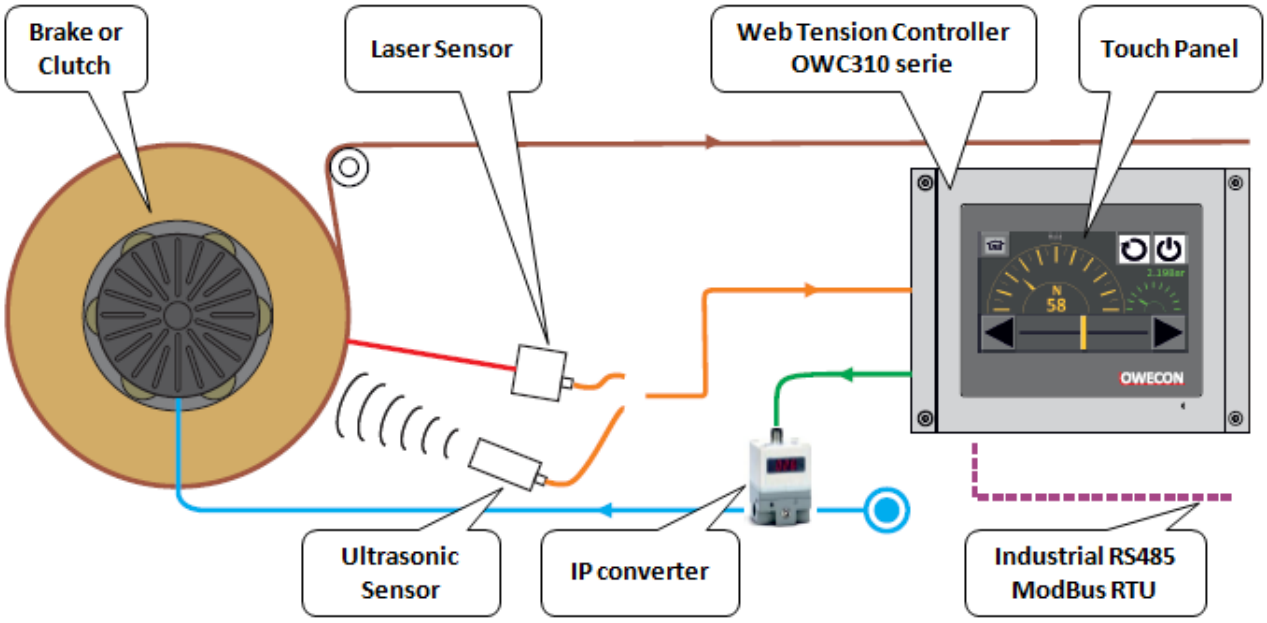
2.1 OWC 310 General description Open Loop tension controller

OWC310 is an Open loop Diameter based tension controller for use in various web unwind applications, it features optimum ease in installation, setup and use.
In the basic applications, the Web tension is based on the measurement or calculation of the roll diameter. The torque of the brake, clutch or motor is in a linear relationship with the diameter of the roll. It is scaled with the selected web tension setpoint. In an unwind application, as the roll of material becomes smaller, the torque output will decrease. In a rewind application, as the roll becomes larger, the torque output will increase. The accuracy of the web tension will depend on the linearity of the brake and the precision of the diameter measurement or calculation.
The controller also has the capability to perform **controlled fast stops** based on roll size.
Optionally automatic brake sizing (also known as **range expanding)** to improve linearity and the working range of the brake.

2.1.1 Diameter measurement method

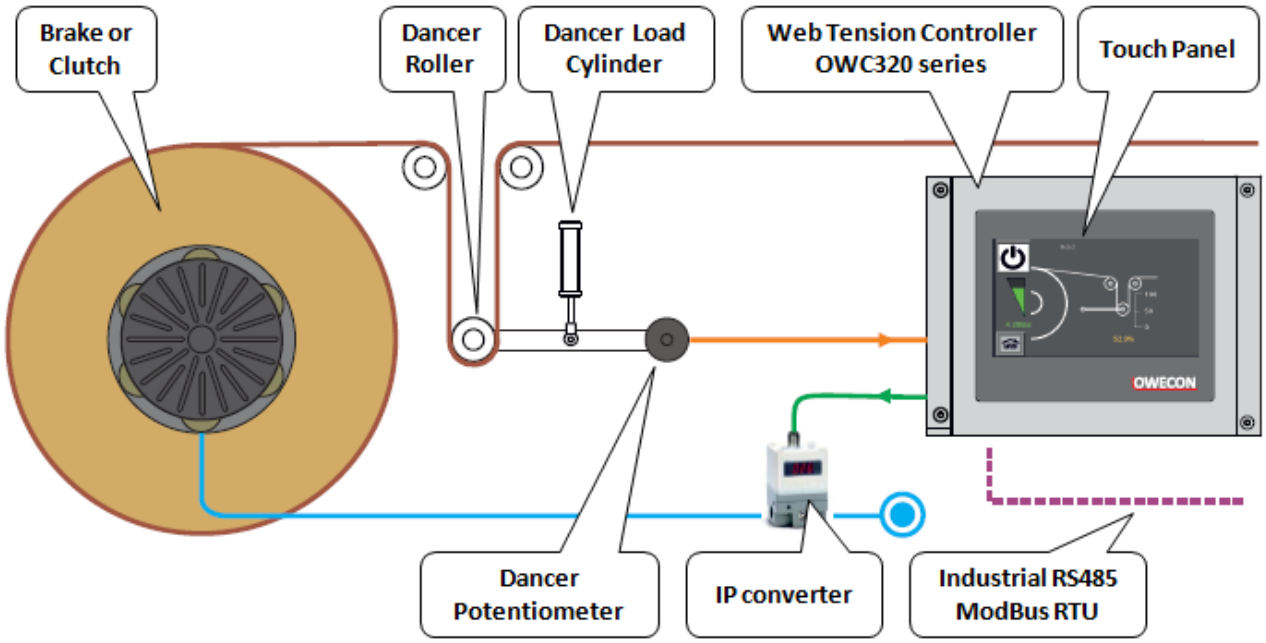
The diameter measurement is based on an analog distance measurement that is converted directly into diameter by the controller.

Note: to obtain a correct distance measurement. The placement of the Laser or Ultrasonic Sensor must be positioned <u>perpendicular to the roll surface</u>.



2.2 General description OWC 320 Dancer tension controller

OWC320 is a closed loop dancer controller for use in various web unwind applications, it features optimum ease in installation, setup and use.
In the basic applications, The Controller regulates the torque of the unwind to balance the dancer in the middle position. The web tension is the load of the dancer in the web, applied via an low friction air cylinder the air pressure is normally set via an air regulator or an IP Converter. In an unwind application, as the roll of material becomes smaller, the torque output will decrease. In a rewind application, as the roll becomes larger, the torque output will increase. The accuracy of the web tension will depend on the actual dancer design and the friction of the load cylinder.
The controller also has the capability to perform **controlled fast stops** based on roll size.
Optionally automatic brake sizing (also known as **range expanding)** to increase the working range of the brake.



Dancer Roll function

I/P converter function

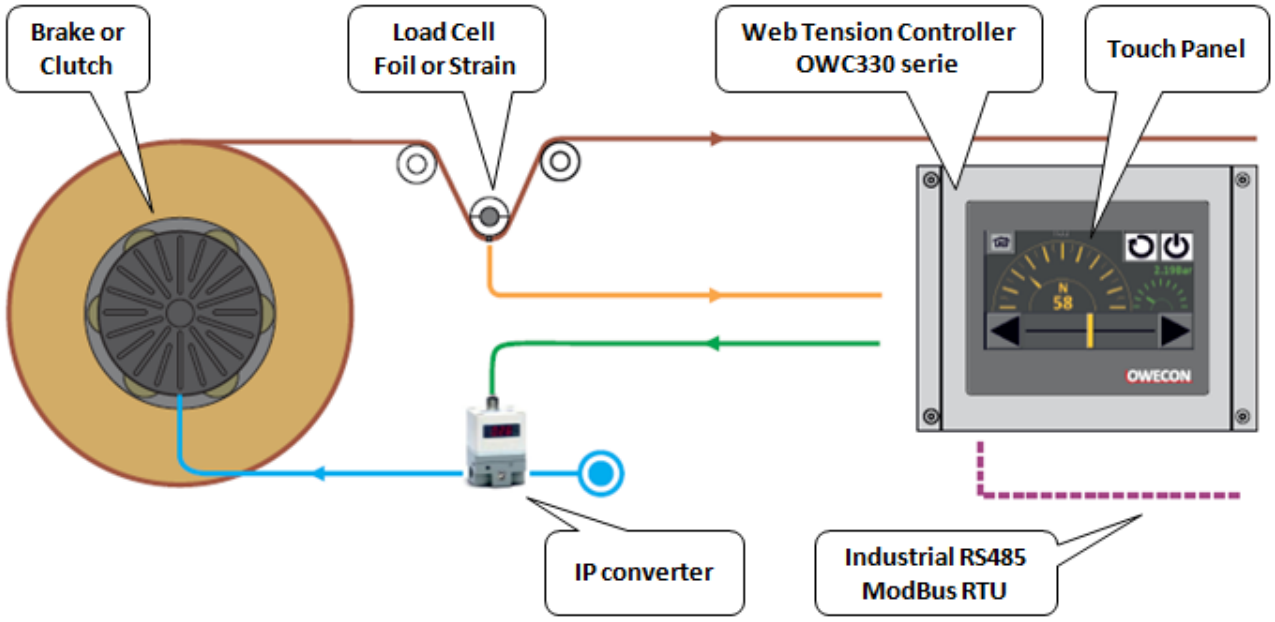
The I/P converter converts the regulator output from the OWC320 controller into a proportional 0 to 6 Bar to control a pneumatic brake/clutch.

Brake

Pneumatic brakes are controlled by the air pressure from the I/P converter or pneumatic interface box / Range Expander circuit.

2.3 General description OWC 330 Load Cell tension controller

OWC330 is a closed loop tension controller for use in various web unwind applications, it features optimum ease in installation, setup and use.
In the basic applications, measurement of the web tension is done by load cells. The signal is computed by the controller and forwarded via an interface to the actuating component, in most cases a pneumatic brake
A change (+ or -) in expected tension calculated by the controller results in a reactive signal (– or +) on the output - controlling the actuating component, and so the web Tension.



Working principle of the closed loop tension control method using the Owecon OWC330 controller, Load cell configuration

Terms and definitions:

Load cell function

Two load cells – or tension sensors – are used. The load cell signals are added together by an amplifier to indicate a total web tension expression. Each load cell has 2 strain gauges in series, 2 load cells form a resistor full bridge, which is supplied with 5 VDC

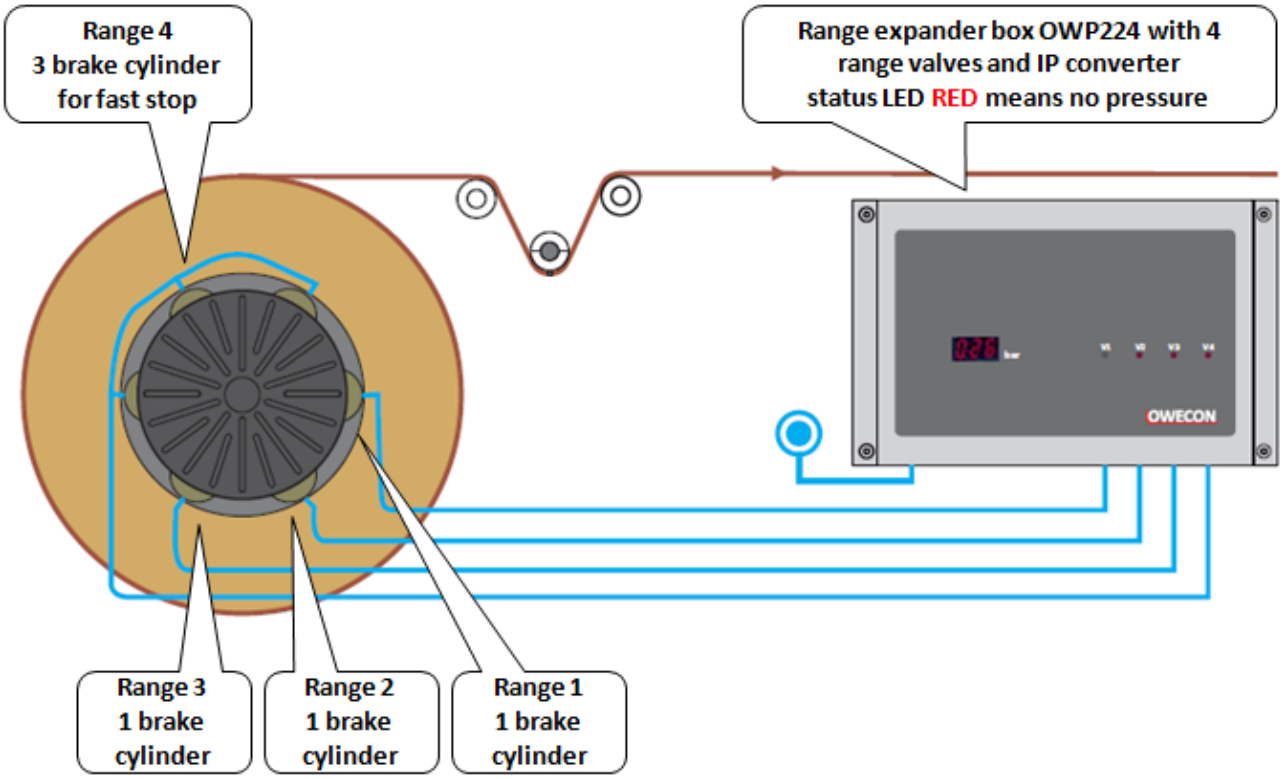
I/P converter function

The I/P converter converts the regulator output from the OWC330 controller into a proportional 0 to 6 Bar to control a pneumatic brake/clutch.

Brake

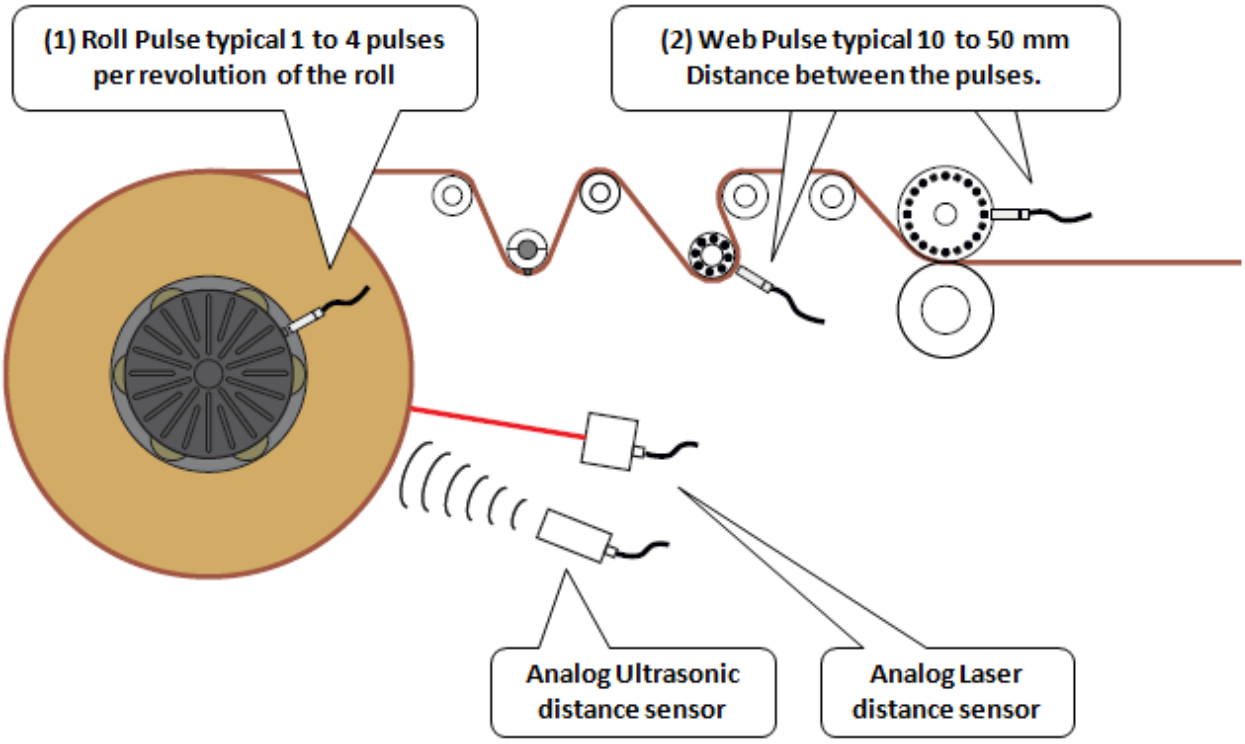
Pneumatic brakes are controlled by the air pressure from the I/P converter or pneumatic interface box / Range Expander circuit.

2.4 Range Expander *optional*



Pneumatic interface box containing both the I/P converter and a set of magnetic valves, enabling the OWC330 controller to switch the number of brake-modules used, as a function of the load on the brake, emergency stop etc.
The Range Expander enables the use of a larger brake, with extra torque resources, even when smaller torques / fine regulation is needed.

2.5 Diameter signal



To optimize a system, a diameter signal is recommended. An expression for the actual roll diameter can be calculated from 2 proximity switches, counting pulses from the unwind roll/brake and an idler roller (at web speed). **The sensor is ideally mounted on any roller that represents line speed and does not slip relative to the web. Choose rollers such as positive grip idlers, driven shafts / nips.**

Alternatively, the diameter is read by an analogue sensor, ultrasonic or laser.

3 General operation

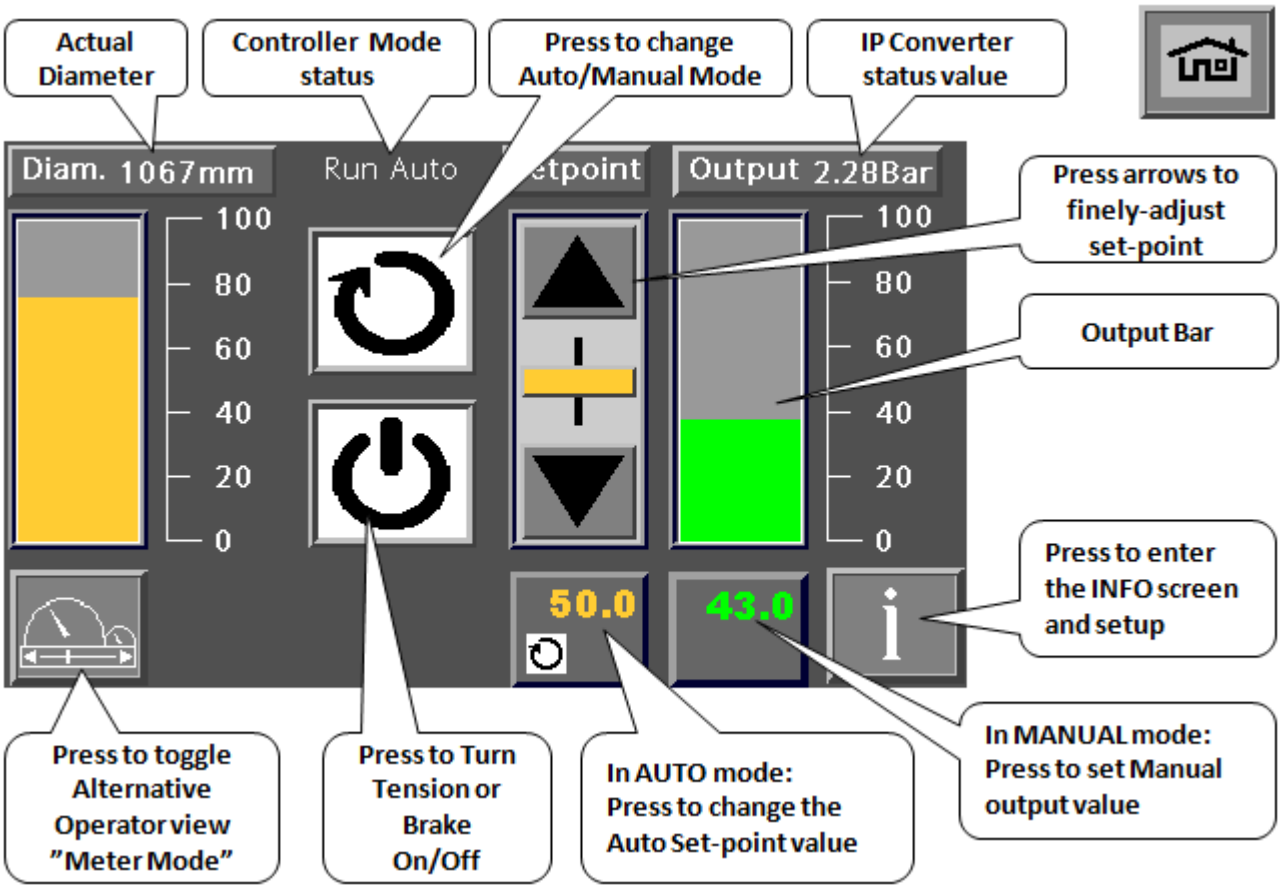
3.1 OWC310 Operator Screen 1

NOTE

Damage to the touchscreen due to faulty operation!

Use of sharp, strong or coarse objects (e.g. pens, gloves) may damage the surface of the touchscreen.

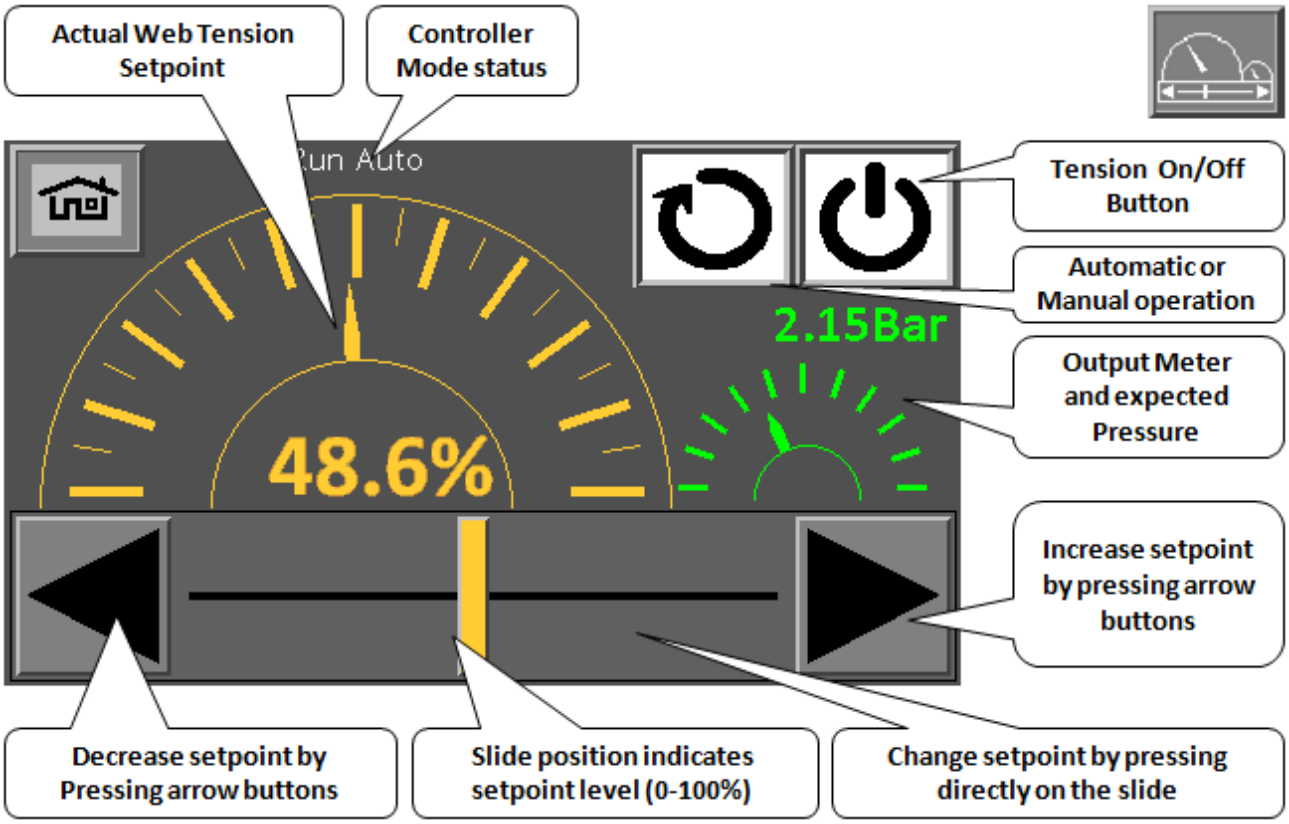
- Touch the touchscreen only using bare fingers or a special input pen (touchpen).



Controller Status Mode:

- Hold
- Run Auto
- Run Man
- Tension Off
- Stop
- Manual
- Splice (optional)

3.2 OWC310 Operator Screen 2 ”Meter Mode”



Press the OFF key  to change status to ON: 
This function is used to hold/release the roll.

Pressing the MANUAL key  changes the working mode to AUTO 
In AUTO MODE, the output will be controlled automatically according to Auto Setpoint and the Actual Diameter. The system works in calculated Open loop mode.

In MANUAL MODE , the output value stays constant, the system works in an open loop mode and requires adjustment from the operator.
Setpoints can be changed by pressing the numeric value or using the ”up/down” arrows.

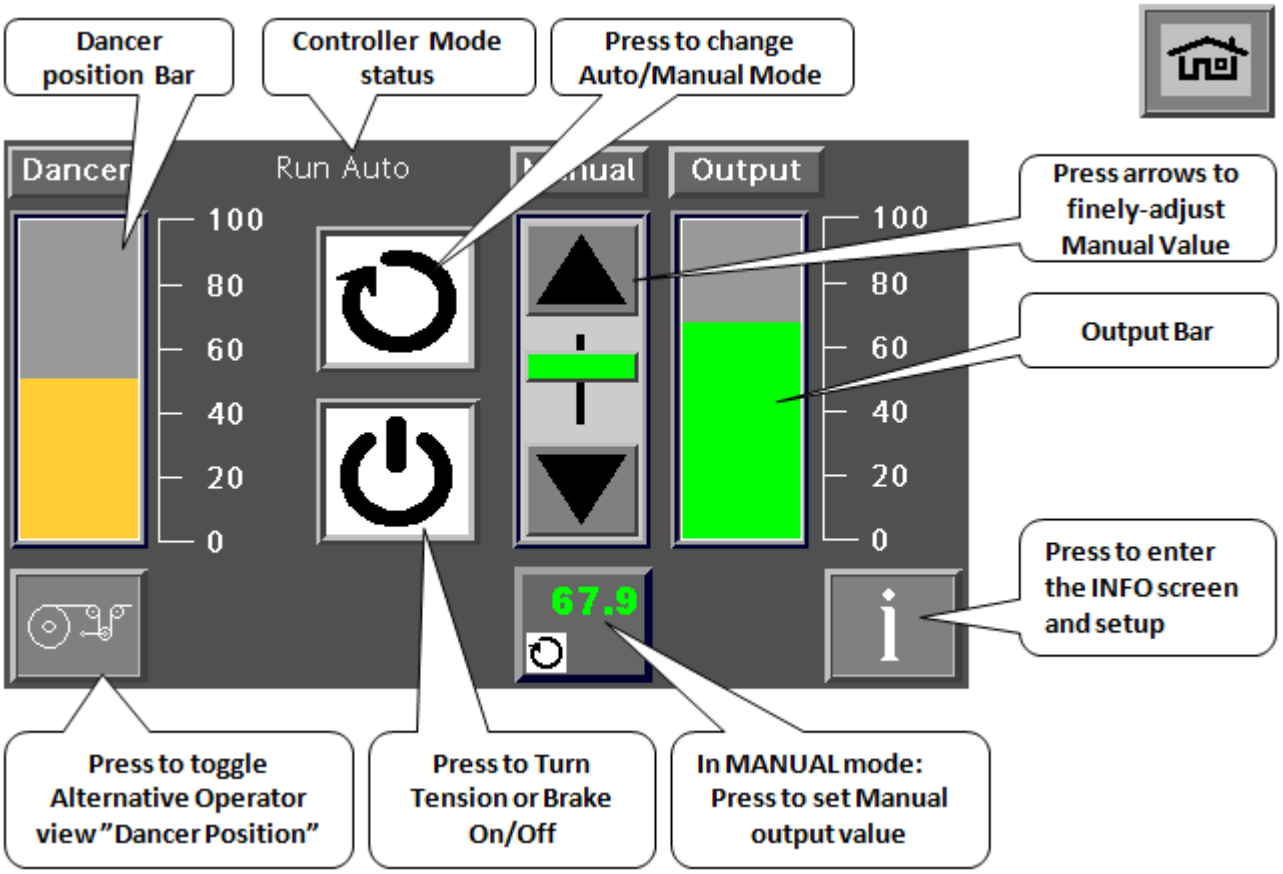
3.3 OWC320 Operator Screen 1

NOTE

Damage to the touchscreen due to faulty operation!

Use of sharp, strong or coarse objects (e.g. pens, gloves) may damage the surface of the touchscreen.

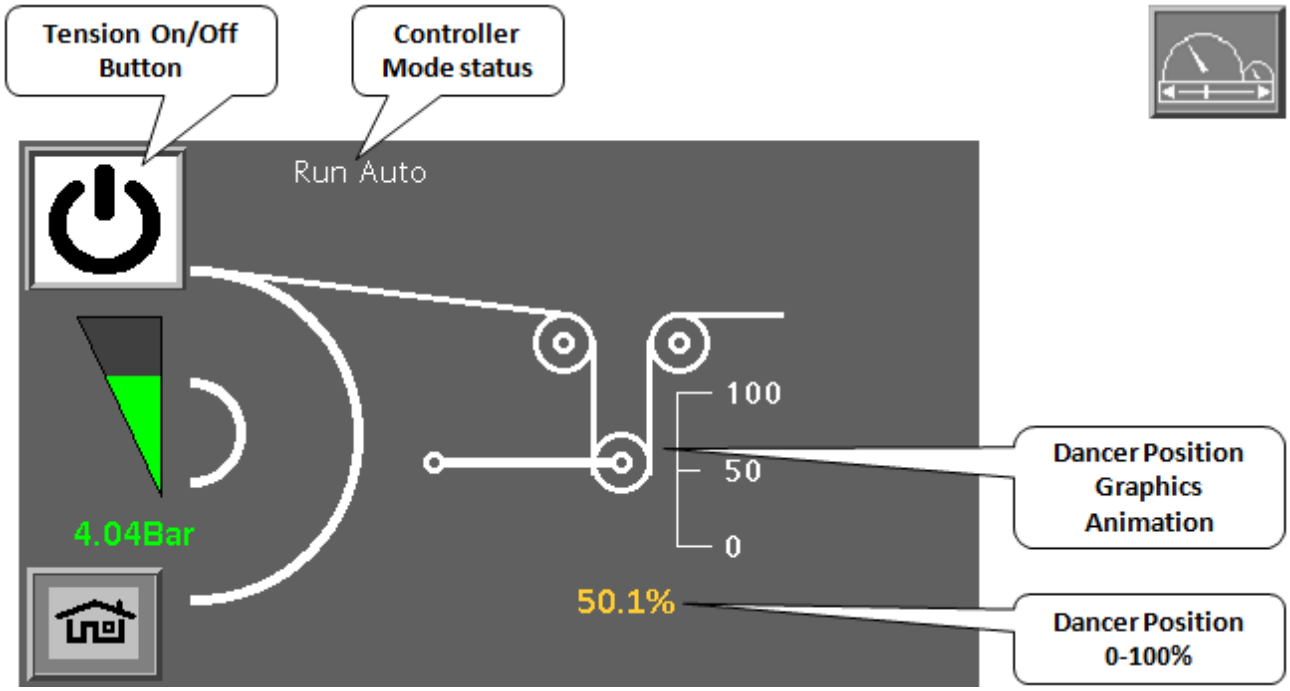
- Touch the touchscreen only using bare fingers or a special input pen (touch-pen).



Controller Status Mode:

- Hold
- Run Auto
- Run Man
- Tension Off
- Stop
- Manual
- Splice (optional)

3.4 OWC320 Operator Screen 2 ”Meter Mode”



Press the OFF key  to change status to ON: 
This function is used to hold/release the roll.

Pressing the MANUAL key  changes the working mode to AUTO 
In AUTO MODE, the output will be controlled automatically, according to Auto Setpoint and the present input from the senor. The system works in closed loop mode.

In MANUEL MODE, the output value stays constant, the system works in an open loop mode and requires adjustment from the operator.
Setpoints can be changed by pressing the numeric value or using the” up/down” arrows.

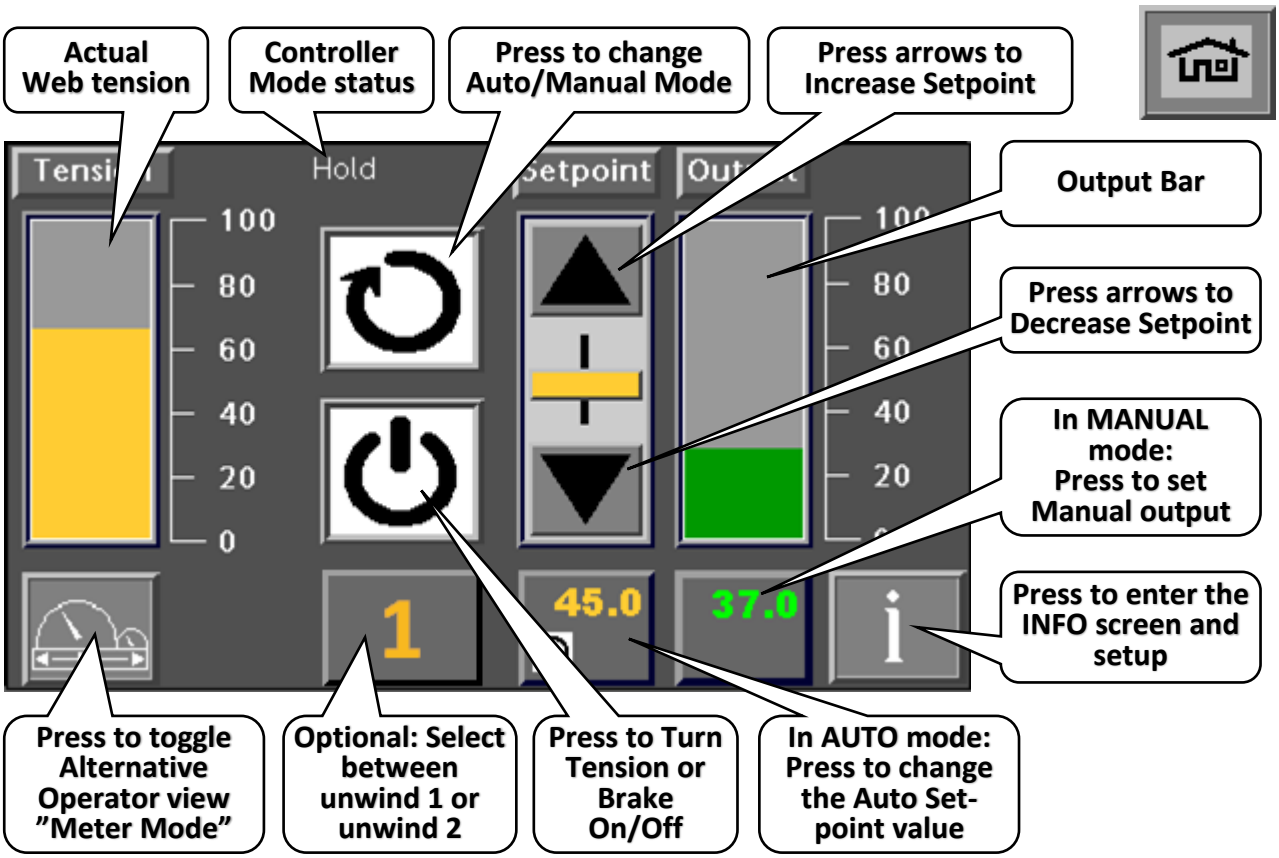
3.5 OWC330 Operator Screen 1

NOTE

Damage to the touchscreen due to faulty operation!

Use of sharp, strong or coarse objects (e.g. pens, gloves) may damage the surface of the touchscreen.

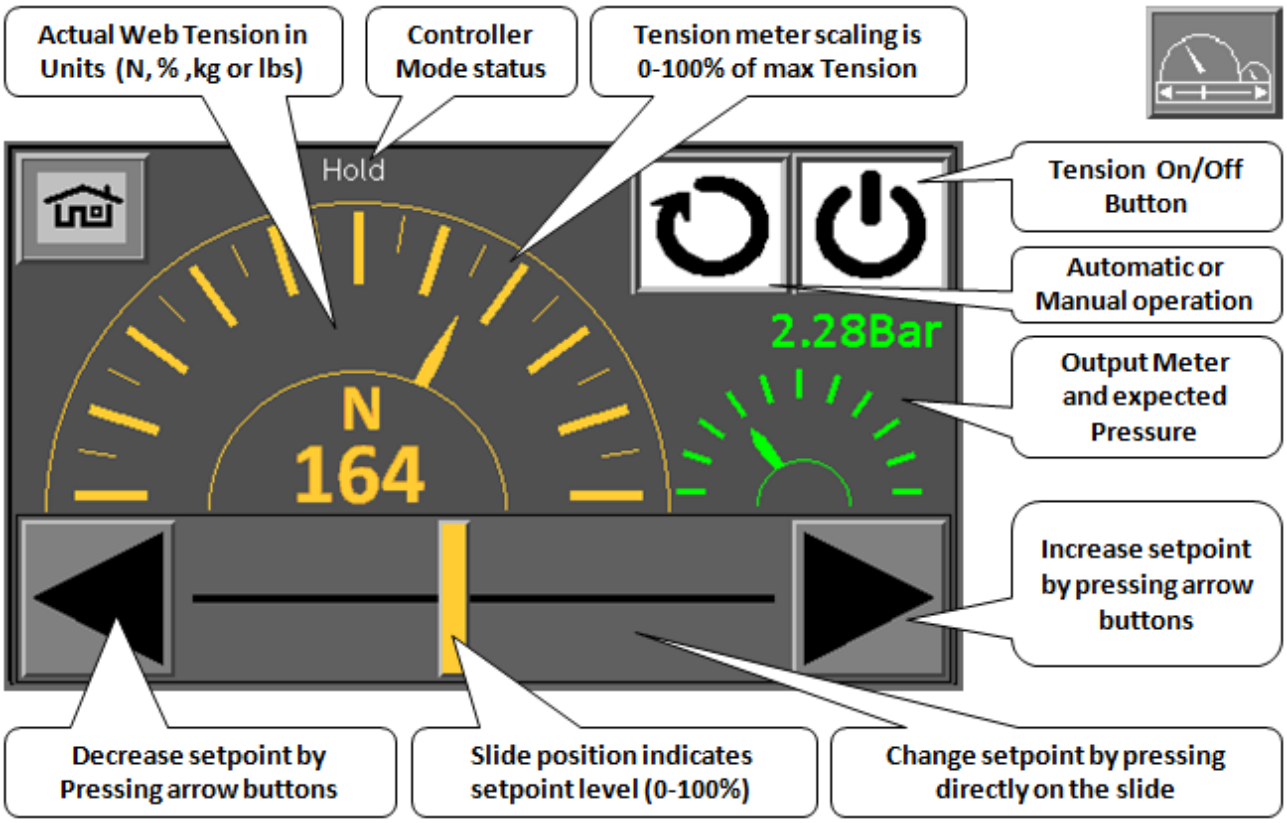
- Touch the touchscreen only using bare fingers or a special input pen (touch-pen).



Controller Status Mode:

- Hold
- Run Auto
- Run Man
- Tension Off
- Stop
- Manual
- Splice (optional)

3.6 OWC330 Operator Screen 2 ”Meter Mode”



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In AUTO MODE, the output will be controlled automatically, according to Auto Setpoint and the present input from the senor. The system works in closed loop mode.

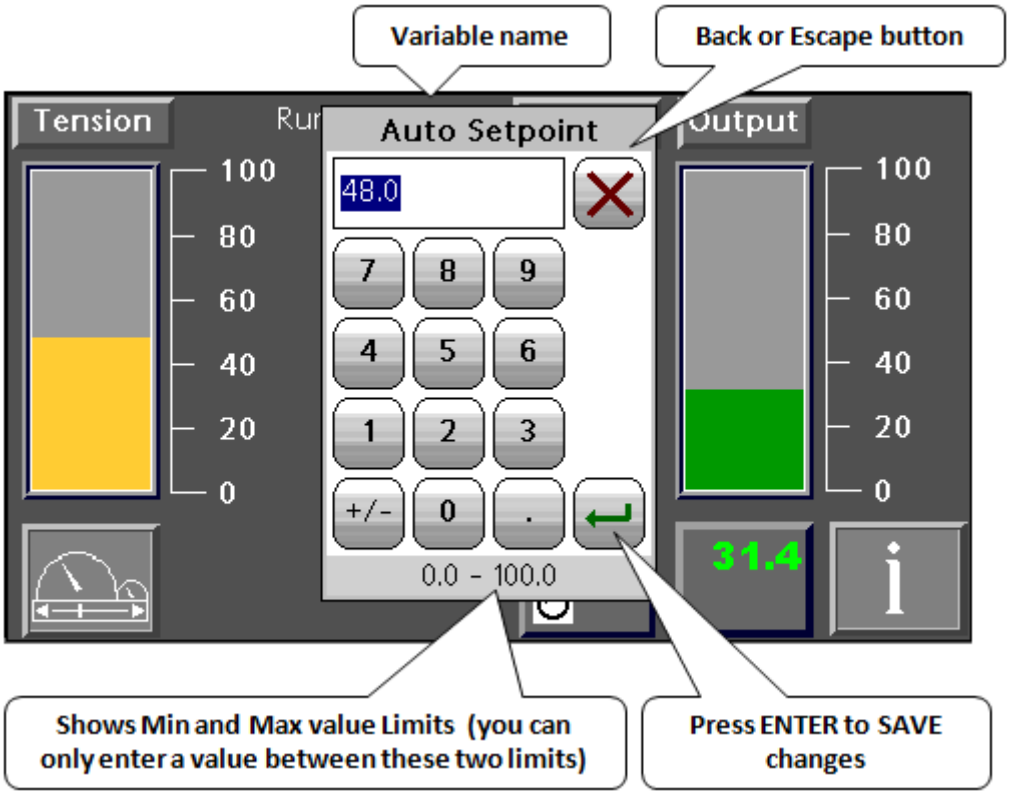
In MANUEL MODE, the output value stays constant, the system works in an open loop mode and requires adjustment from the operator.
Setpoints can be changed by pressing the numeric value or using the ”up/down” arrows.

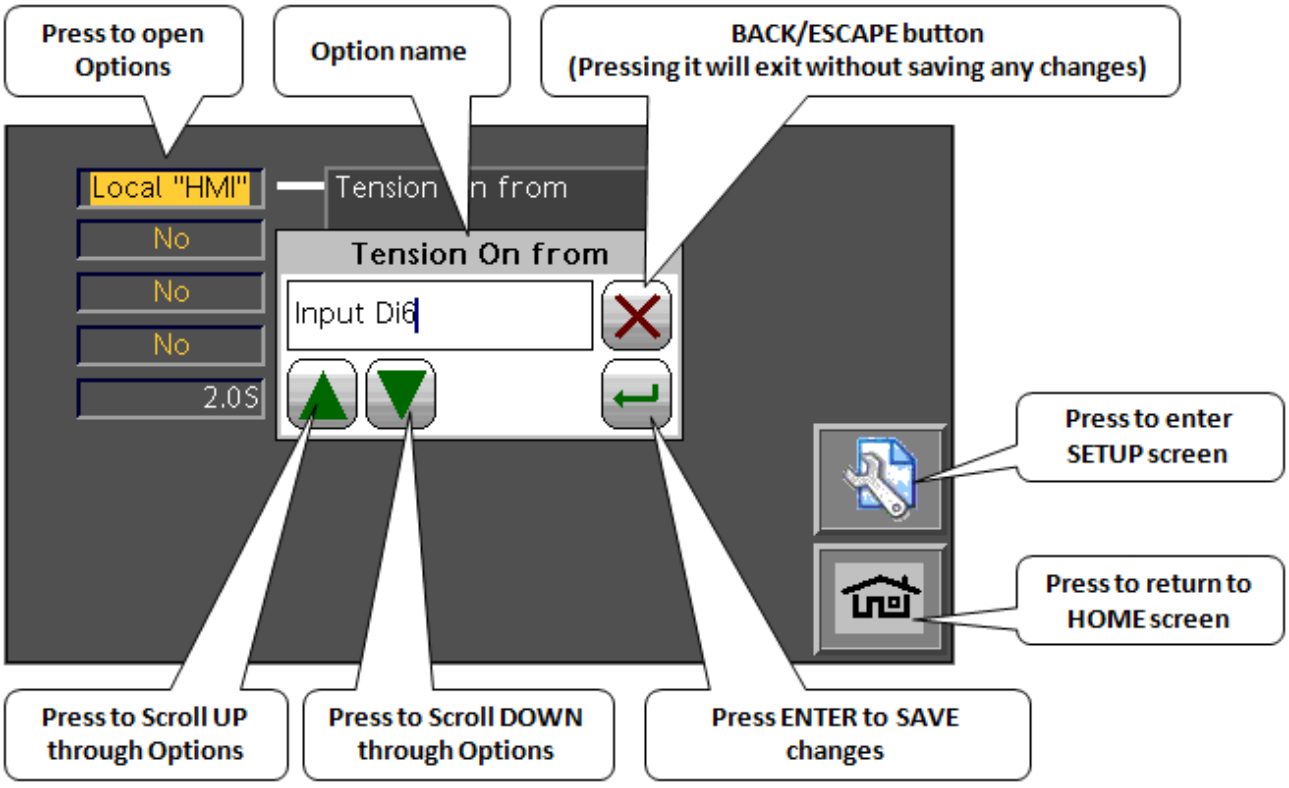
3.7 The Pop-Up Keyboards

By pressing on a numeric value-button, the Pop-Up Keyboard is shown.

Symbols indicating further information or tips:

The Pop-Up Keyboard is a multi-input tool, to use for all data value entries.
Simply touch a data block in the program for entry - and the keyboard pops up. Enter by touching the keys w. finger or pen.





4 Installation

4.1 Safety Instructions

⚠ WARNING

Danger of death and material damage caused by incorrect assembly!

- Have the installation carried out only by educated and qualified personnel

⚠ DANGER

Danger of death caused by the machine starting up!

Parts of your body could be crushed, cut, drawn in or hit.

- Switch off the machine completely and secure it against it being switched back on.

NOTICE

Damage to the system from drilling dust and loose parts!

Drilling dust, splitter and loose parts may damage the machine.

- Before carrying out drilling or installation work, cover the affected area of the machine with film or paper.

4.1.1 Before starting with the installation work

- Read the safety instructions in the operating instructions of the machine in which the components are to be installed.
- Observe the complete safety concept of the machine.
- Cordon-off the work area in order to prevent access by unauthorized persons (e.g. by setting up barriers).

4.1.2 During installation work

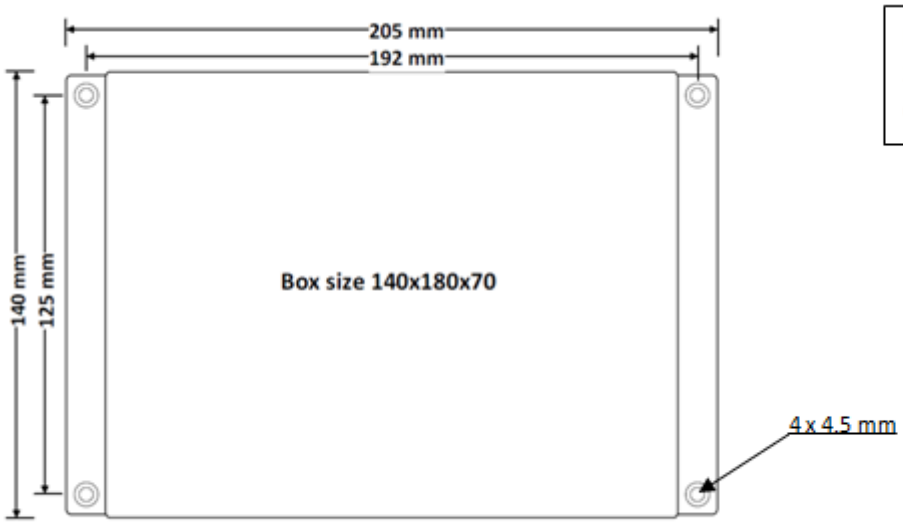
- Observe all safety instructions and hazard warnings on the components and the machine.
- Do not deactivate or remove any protection and safety equipment belonging to the machine. If the protection and safety equipment has to be removed for the installation of the components, these must be re-installed immediately after completing the installation work.
- Escape routes and access to safety equipment must not be blocked by the installation of the components.
- Make sure that no parts (e.g. screws, washers, tools) can fall into the machine. Cover the affected area of the machine with film or paper. Parts falling down may damage the machine.
- Do not climb onto or walk the components or unsuitable parts of the machine.

4.1.3 After completing the installation work

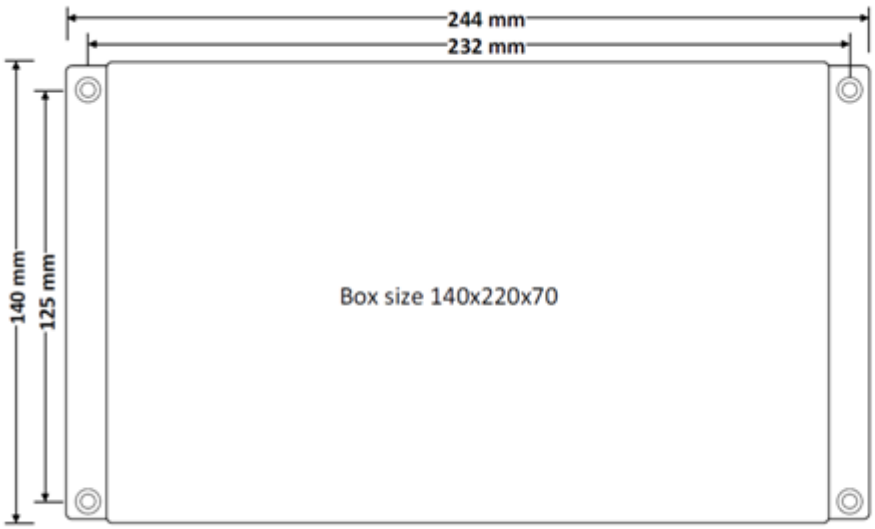
- Install all safety equipment and protective covers that had to be removed for the installation work.
- Check that the bolts are screwed tight.
- Remove all tools and auxiliary aids used from the machine.

4.2 Mechanical Installation

4.2.1 Mechanical dimensions of Boxes for ”Plug and Play” Controllers OWC300

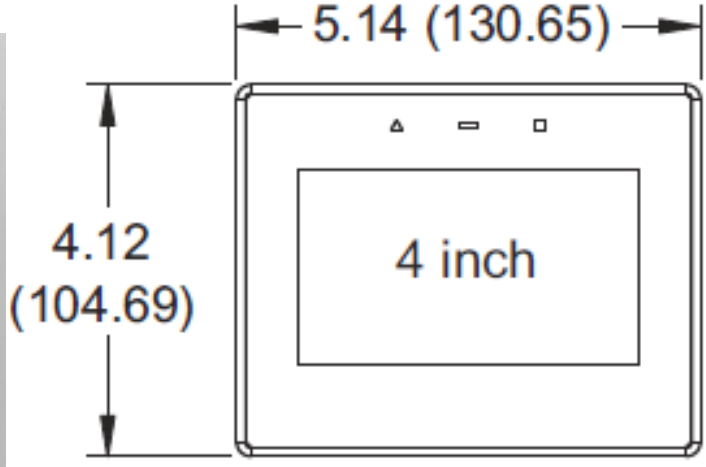


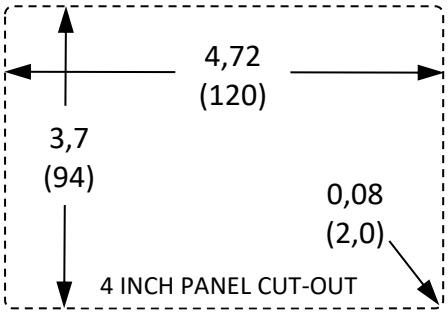
Box mount
24VDC supply version
OWC310, 320, 330

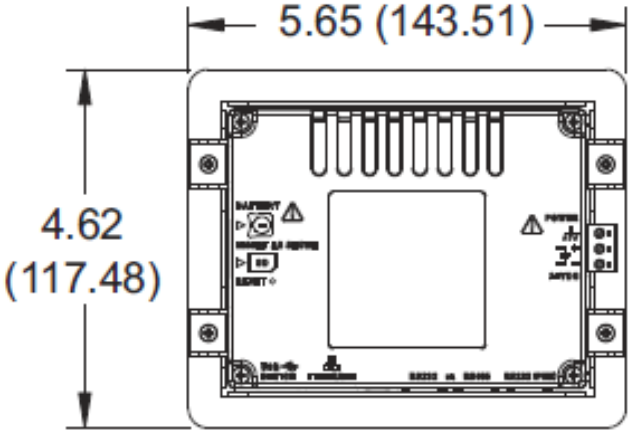


Box mount
110 / 240VAC Version
OWC310, 320, 330

4.2.2 Mechanical dimensions for HMI and Front-mount Controllers



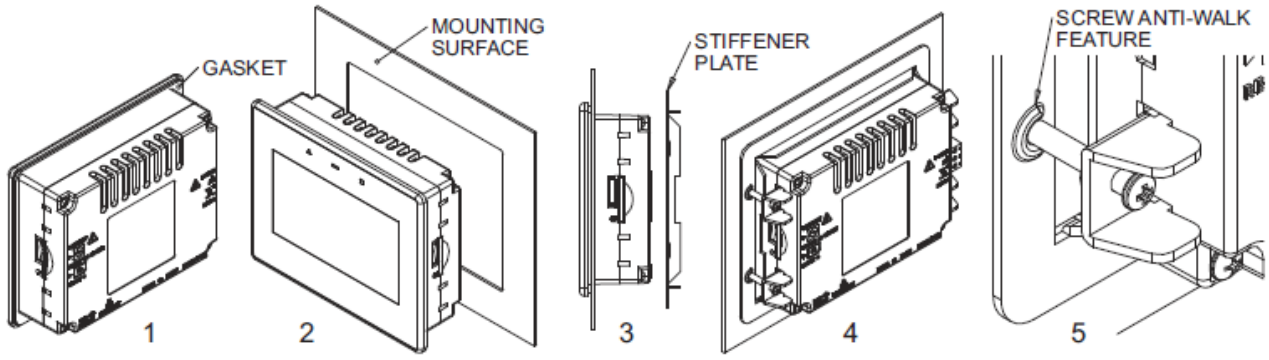




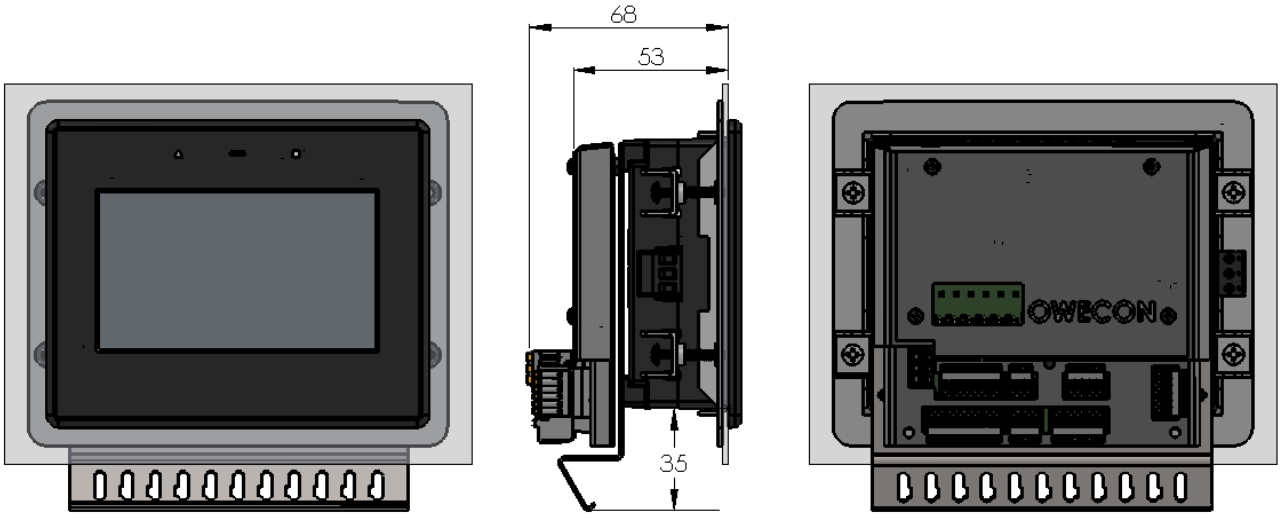
Follow these steps to install the unit.

1. Make sure the bezel gasket is properly in place.
2. Place the unit into the front of the panel cutout.
3. Install stiffener plate over unit on the inside of the panel. This ensures the mounting surface is stiff enough for a proper seal. The plate is required to meet IP66.
4. Insert clamps into the slots provided on the side of the HMI.
5. Make sure the clamp's screw sits in the "U" shaped feature located on the stiffener plate. This will prevent the screw from "walking". Tighten the clamping screws in an even pattern until the unit is secured in the panel. To seal to IP66 specifications, all supplied mounting clamps must be used and be torqued to 4.0 lbf-in (0.45 Nm).

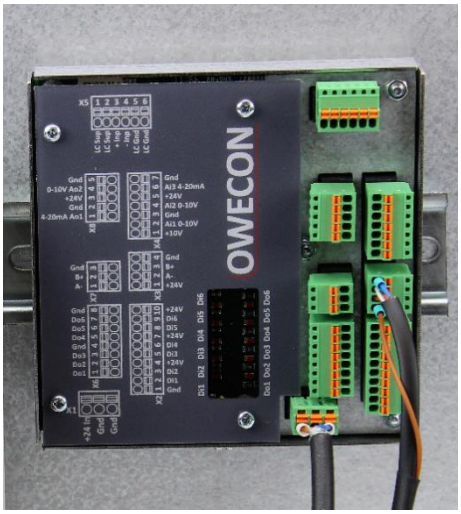
   CAUTION: DO NOT OVERTIGHTEN THE CLAMPS.



Mechanical dimensions for Front mount Controllers OWC300F



4.2.3 Mechanical dimensions for DIN-mount Controllers OWC300D



5 Electrical Installation

5.1 Warning and Safety

⚠ DANGER

Danger of death from electric shock!

Life threatening injuries caused by incomplete switching off or residual current.

- Switch the machine off completely, switch free of voltage and wait 10 minutes before carrying out the electrical connection.
- Check that the unit is voltage-free.
- Secure the machine against being switched back on.

⚠ WARNING

Mortal danger and property damage caused by incorrect electric connections / insufficient PE connection!

Life-threatening electric shock and destruction of system components caused by short-circuits.

- Have electrical connections carried out by qualified electricians only.
- Carry out PE connections for all live system components professionally.

⚠ WARNING

Severe injuries and damage to assets caused by incorrect cable routing.

Poorly routed cables can cause tripping, spills and consecutive accidents.

- Always route cables strain-relieved and well anchored.
- Ensure that no tripping or catching points are generated.
- Do not bend/kink cables; observe the minimum bending radius.

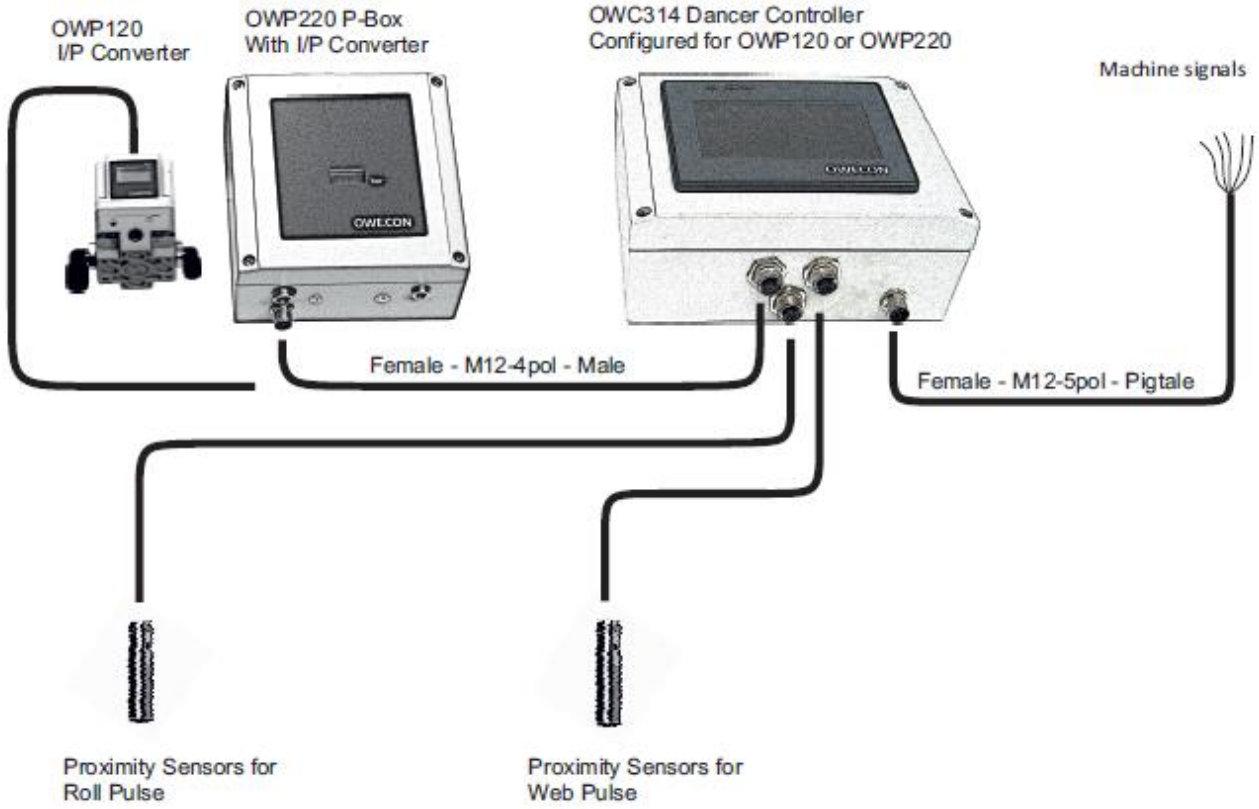
NOTICE

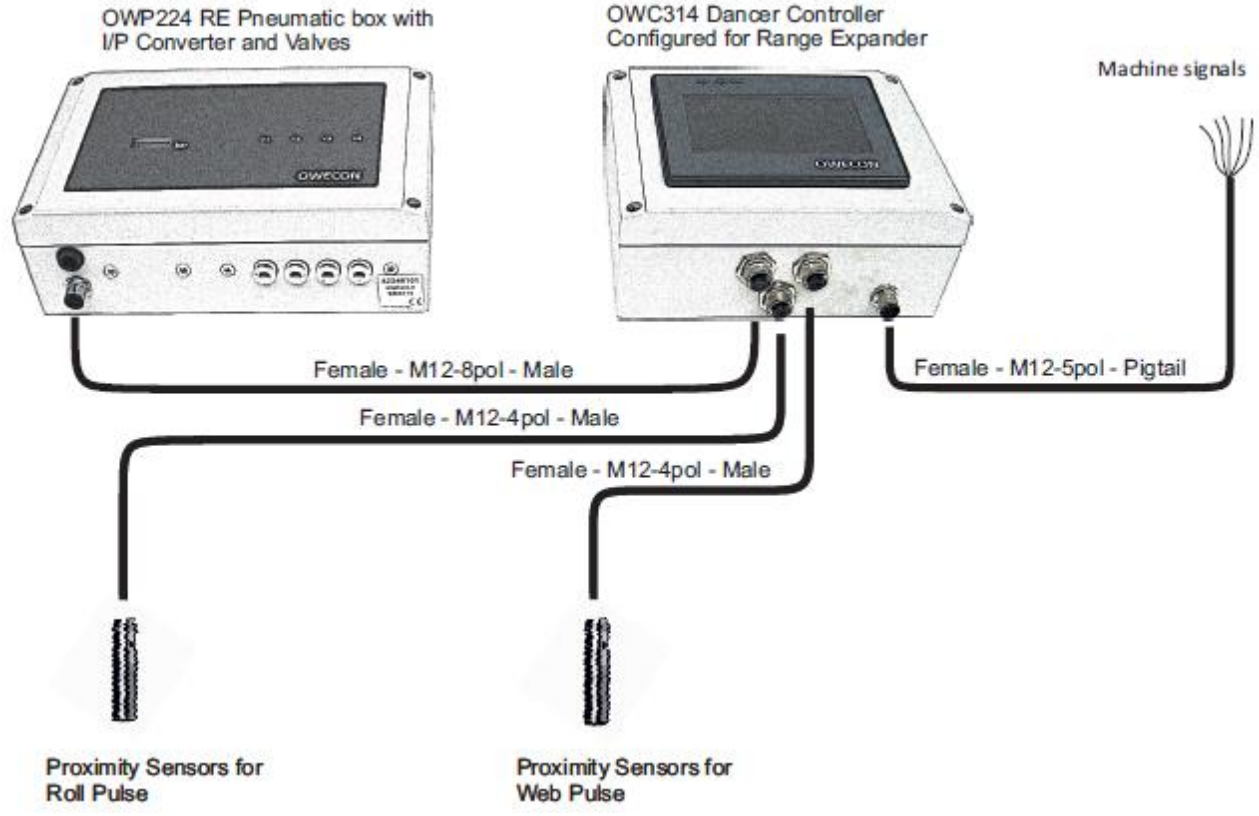
Damage to components caused by connecting to the wrong mains voltage, incorrect terminal connection or from incorrect polarity.

- Before connecting, observe the connecting diagram and cable diagram
- Before connecting, make sure that the Supply voltage corresponds with the details specified for the components.
- Select the correct terminals and polarity when connecting the power supply.

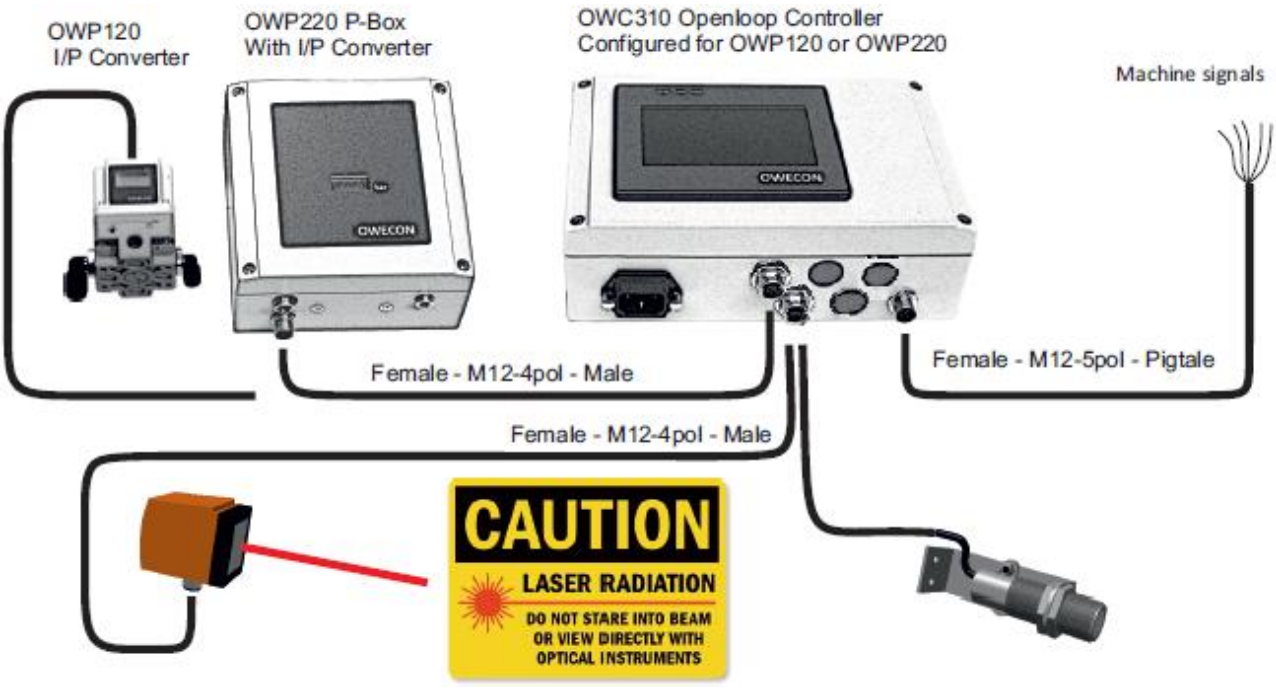
5.2 OWC300 series Cable Diagrams

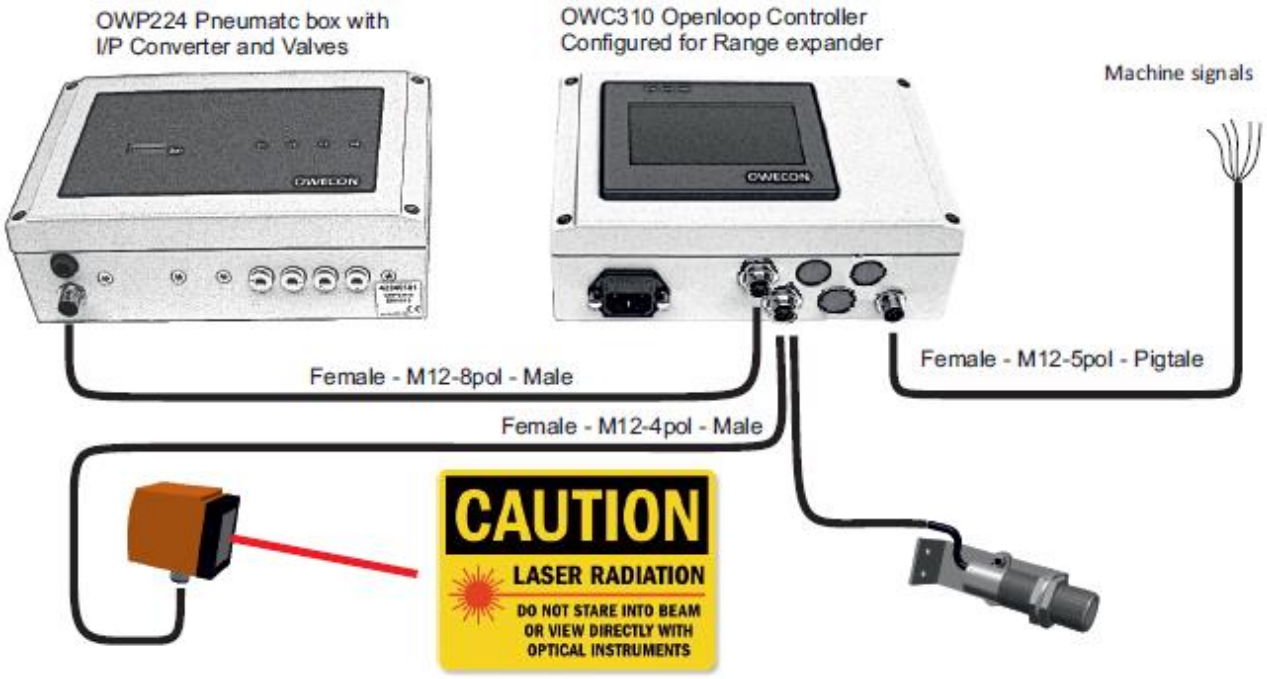
5.2.1 OWC310 Puls Diameter Application Cabling





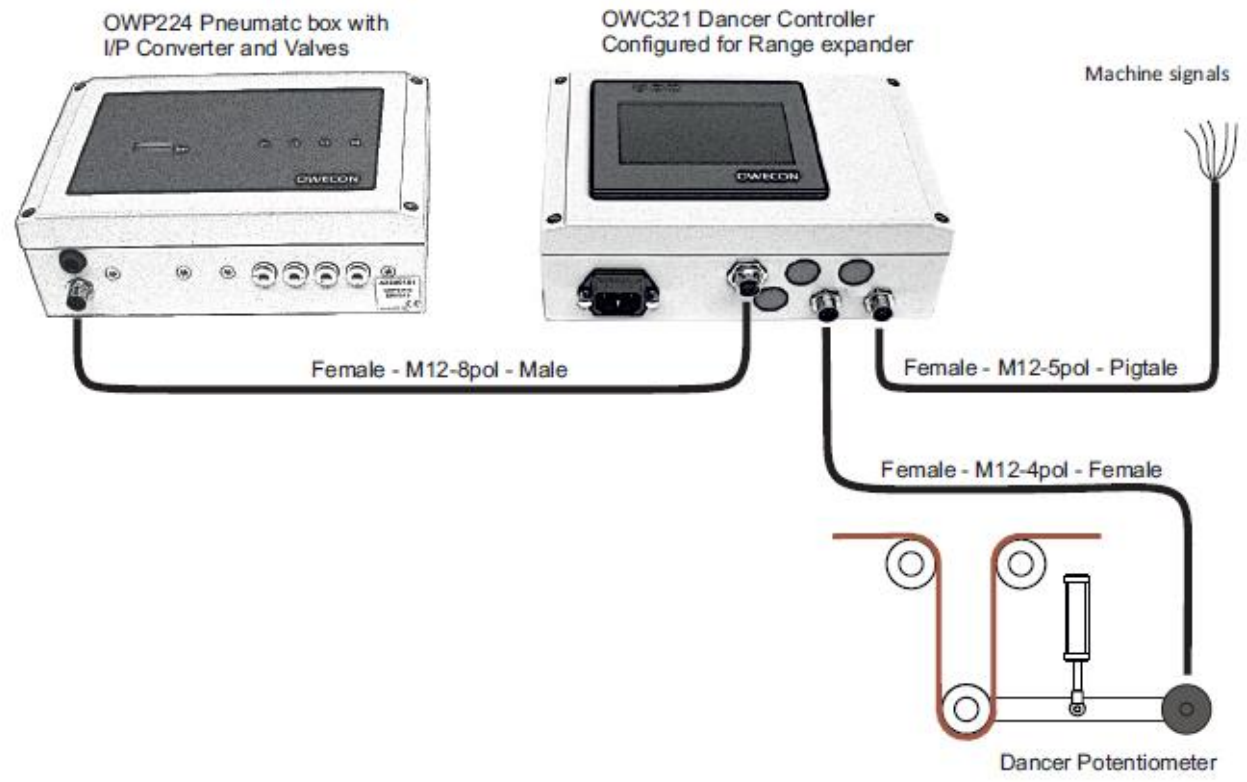
5.2.2 Analog Diameter Application Cabling

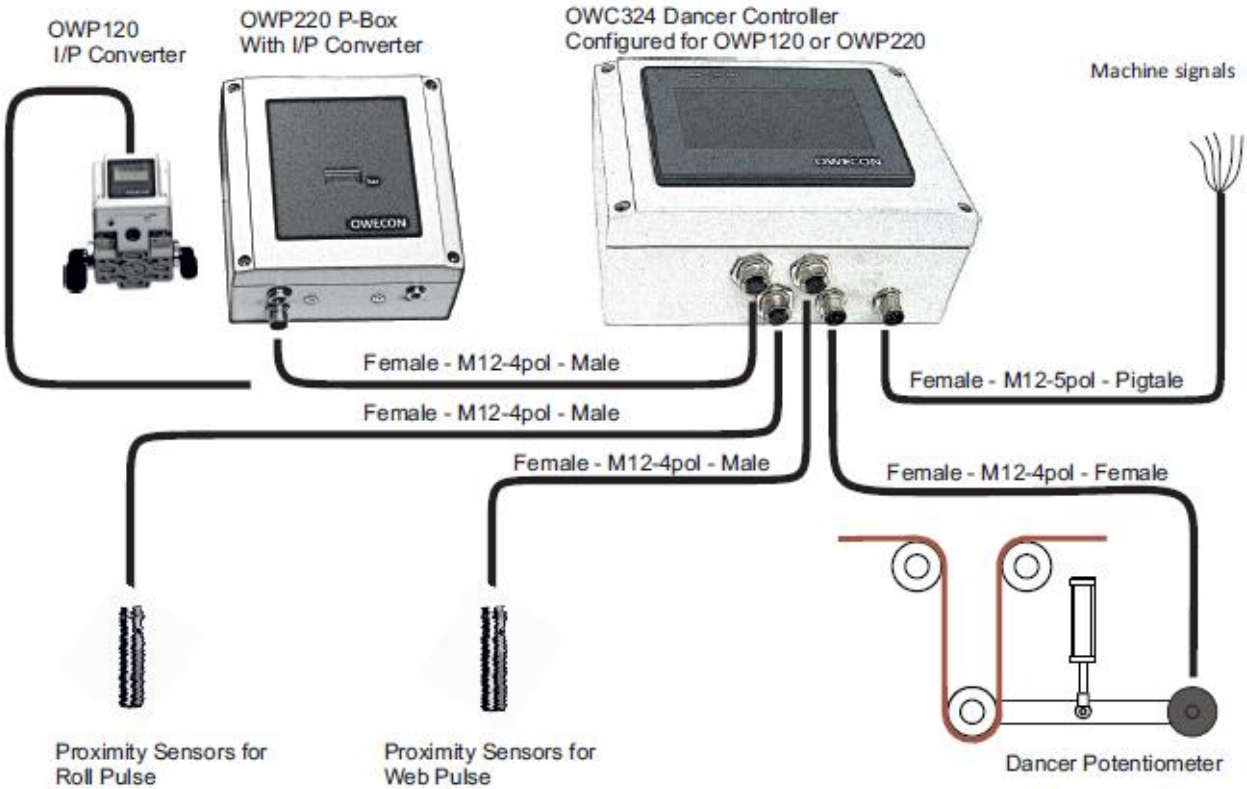




5.2.3 OWC320 Cable Diagram

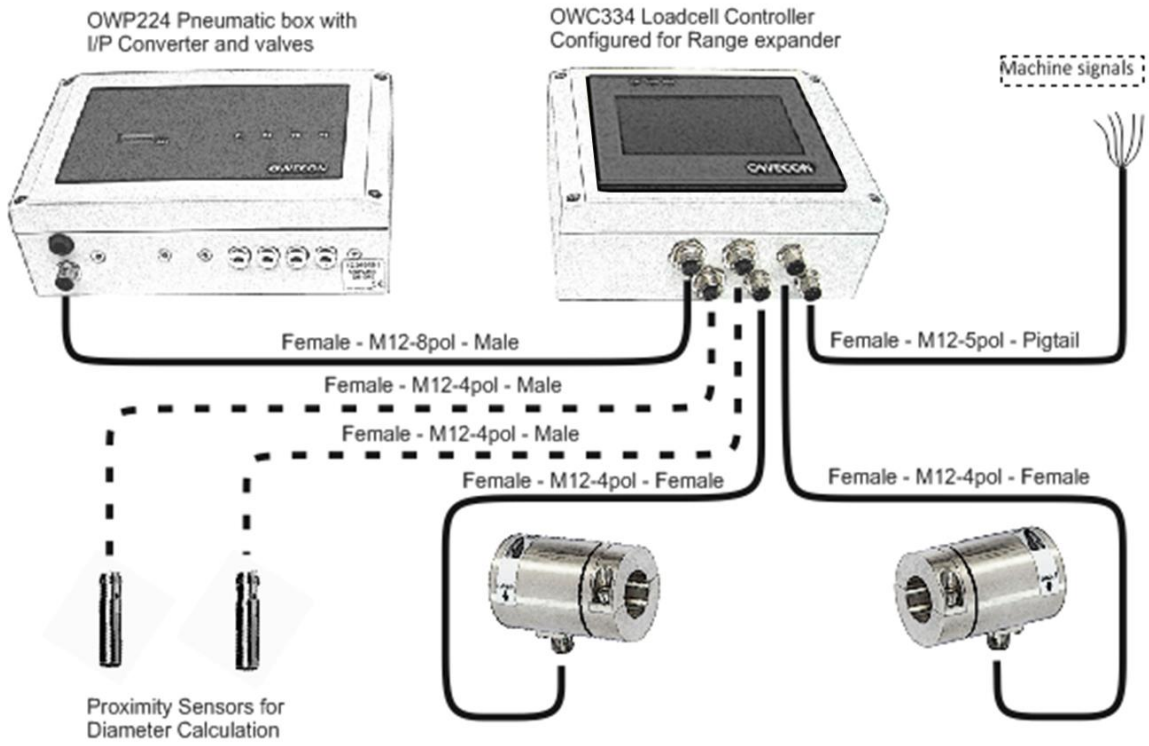
Connector to the controller whit the prepared cables as shown.

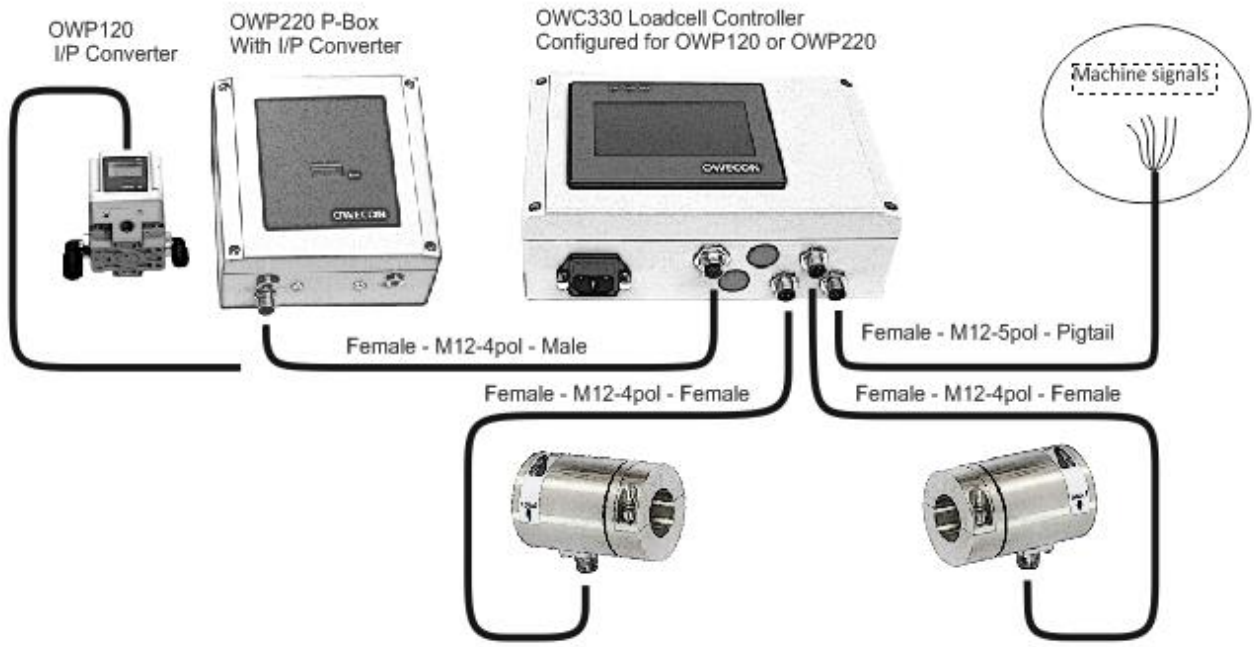




5.2.4 OWC330 Cable Diagram

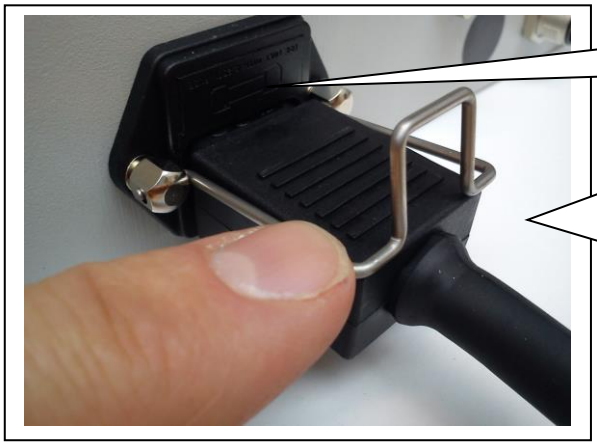
Connector to the controller whit the prepared cables as shown.





- Maintain a minimum distance of at least 25 mm between the cables and moving parts of the machine.
- Route the cables so that they do not rub or become crushed, cut or caught.
- Tighten up the securing screws in the plug connections.
- Route signal cables separately from supply cables as signal cables are sensitive to interference.

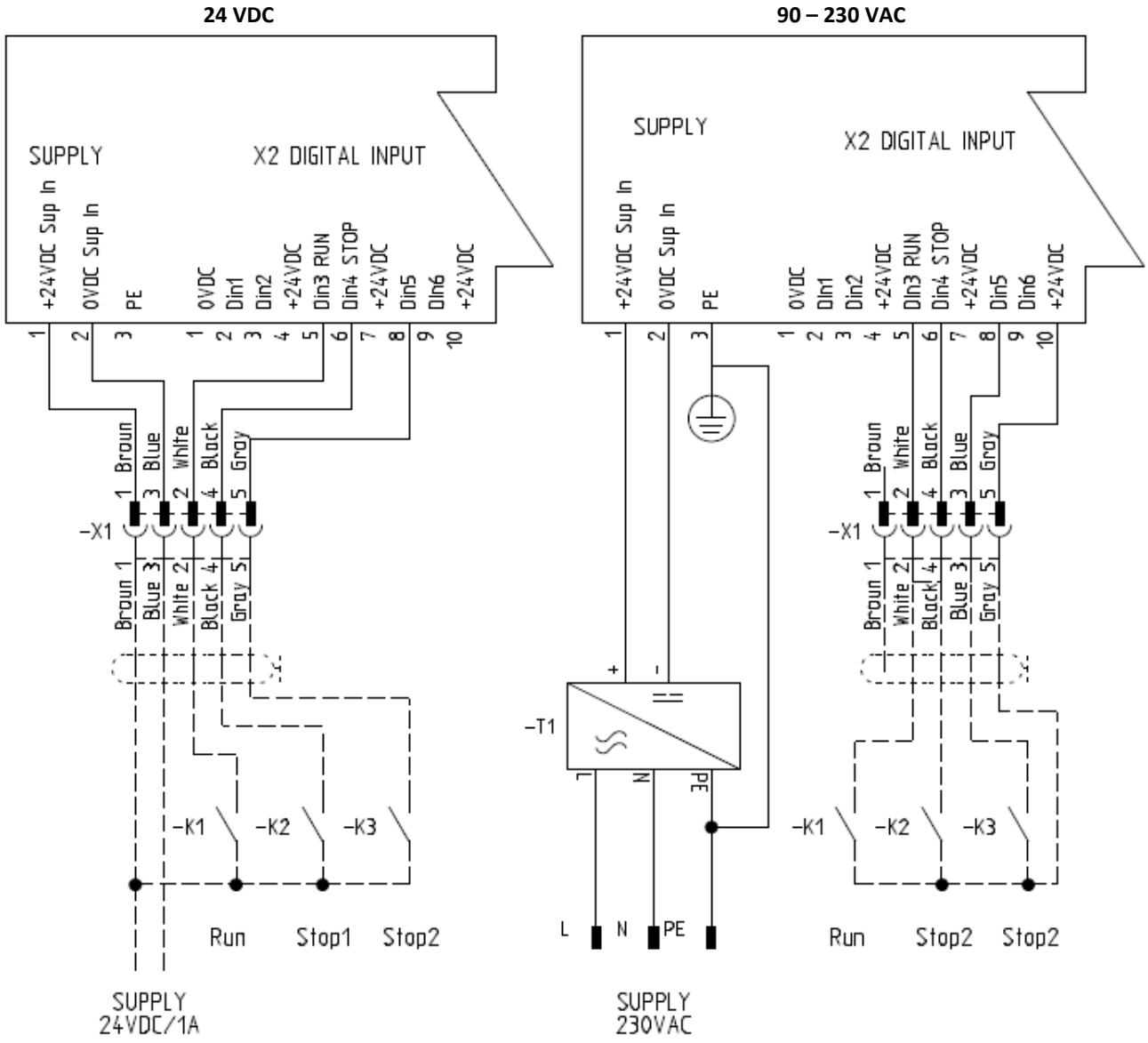
5.2.5 Power Connector 90-230V



An 1A fuse is integrated in the cabinet power connector.

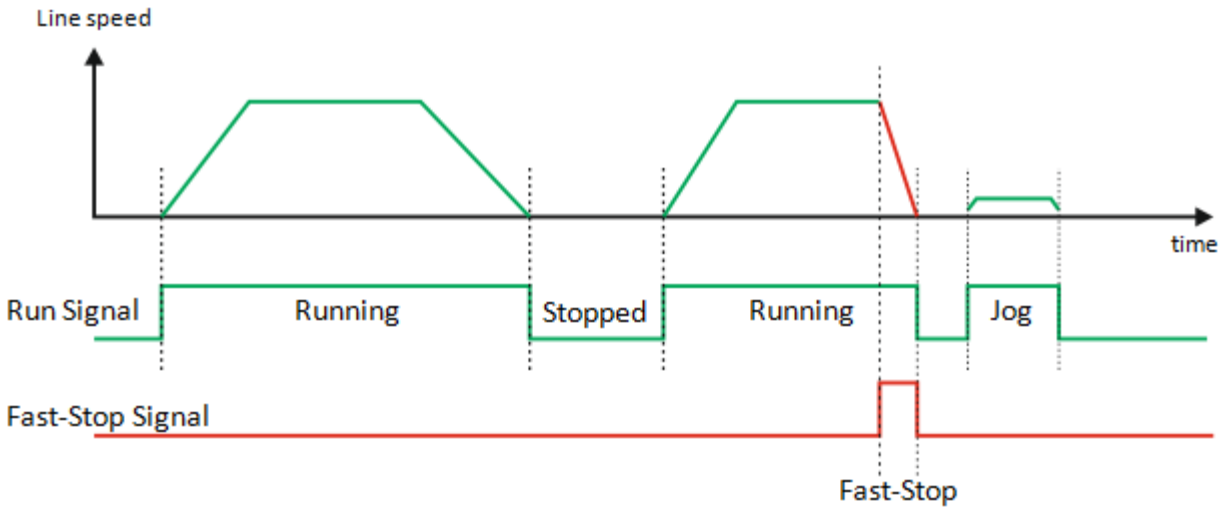
After connecting the loadcells and I/P converter:
Connect the 90-230 VAC supply via the supplied power cable connector to the OWC300 controller box. Secure the power plug using the integrated safety spring

5.3 Machine Signals diagram



Digital inputs are active with a High 24VDC signal for PLC connections use PNP output and common ground 0VDC. Di 3-6 can be inverted under the Digital input menu under setup

5.3.1 Machine Signals Description



The **run** signal serves the following purposes:

1. At start of the machine, the controller goes into run mode Auto and regulates the brake torque to obtain correct tension
2. At machine still stand the controller goes in to hold mode, the brake torque stays at a constant level to insure an optimal web tension at restart of the machine.

NOTICE

The importance of integrate the machine functions with the Tension Controller

- The run signal shall ideally always be activated when the web is moving, also when turning or inching the machine. The Run Signal applies on Digital input 3
- The **Stop** signals should be applied if the tension drops during stopping of the machine. When the stop signal is applied the brake torque will increase directly to compensate for the inertia of the running roll during deceleration of the machine.

Using the diameter calculation or measurement features, the controller calculates the mass of the roll allowing controlled fast stop of the machine with control of the web tension.

5.4 Wiring Diagrams

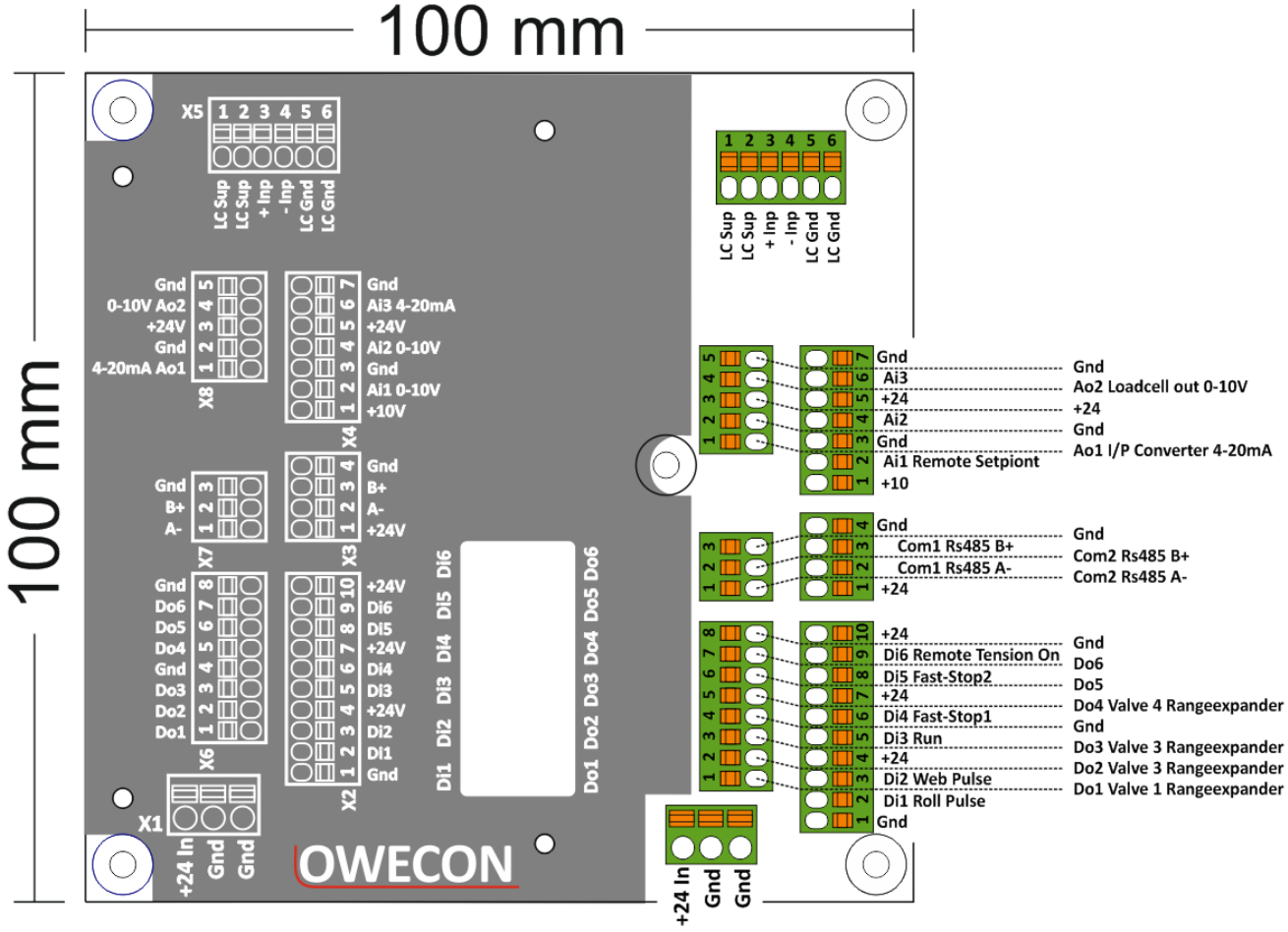
5.4.1 EMC cable shield earthing

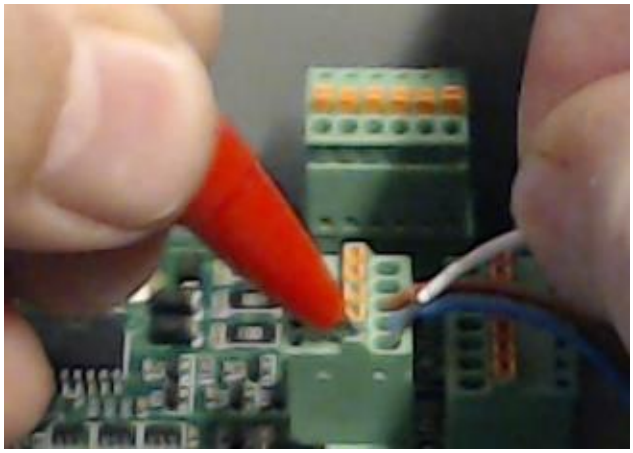
For process measurement a high level of protection against noise is required.
The area where the cable shield is connected to the enclosure earth is a critical point.
It is very important that the connection has a low resistance.

- Earthing of the signal cable shields is very important.
- Route signal cables separately from supply, motor and other power cables.
- Route the cables so that they do not rub or become crushed, cut or caught.
- Use proper Shield clamps and earthing components.

Examples of shield methods

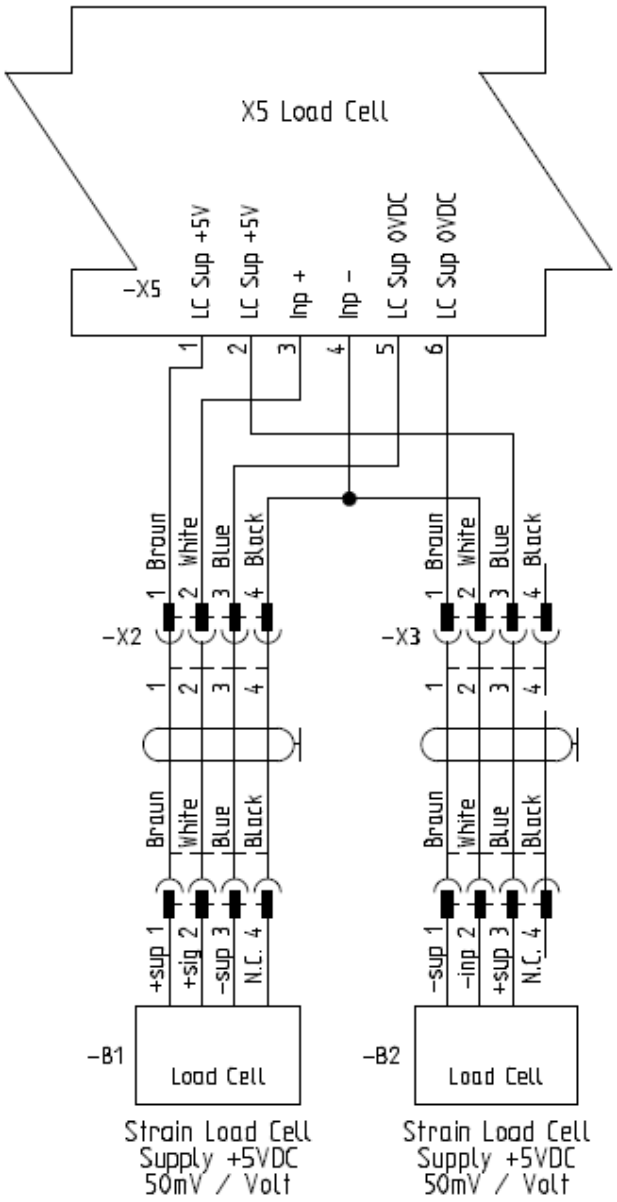
5.5 PCB Controller terminals



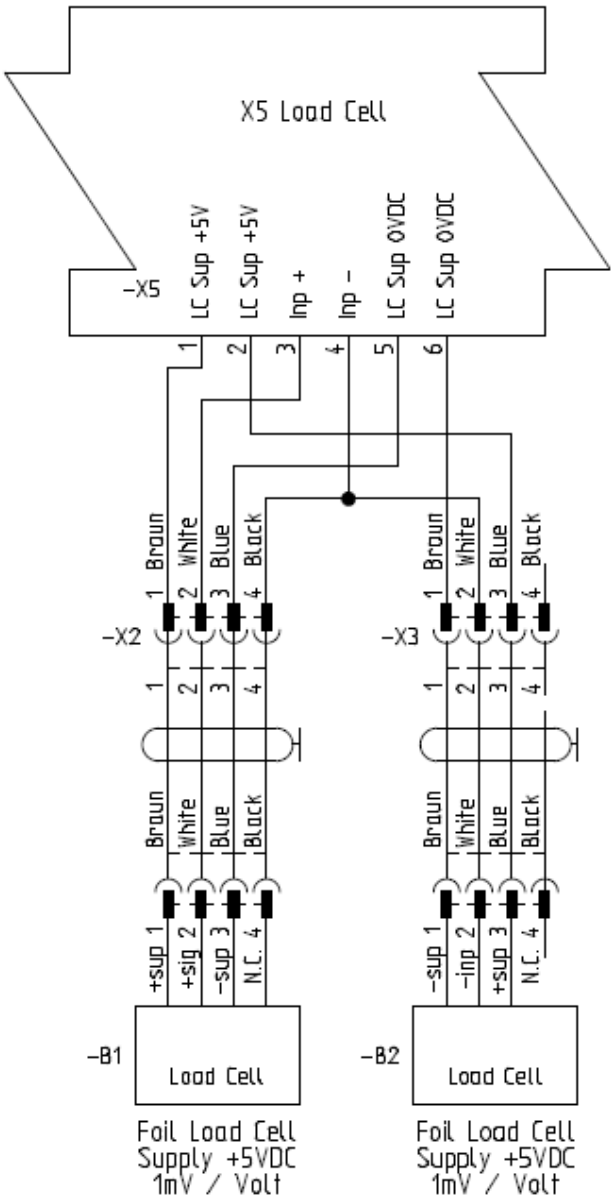


5.6 Load cell diagram

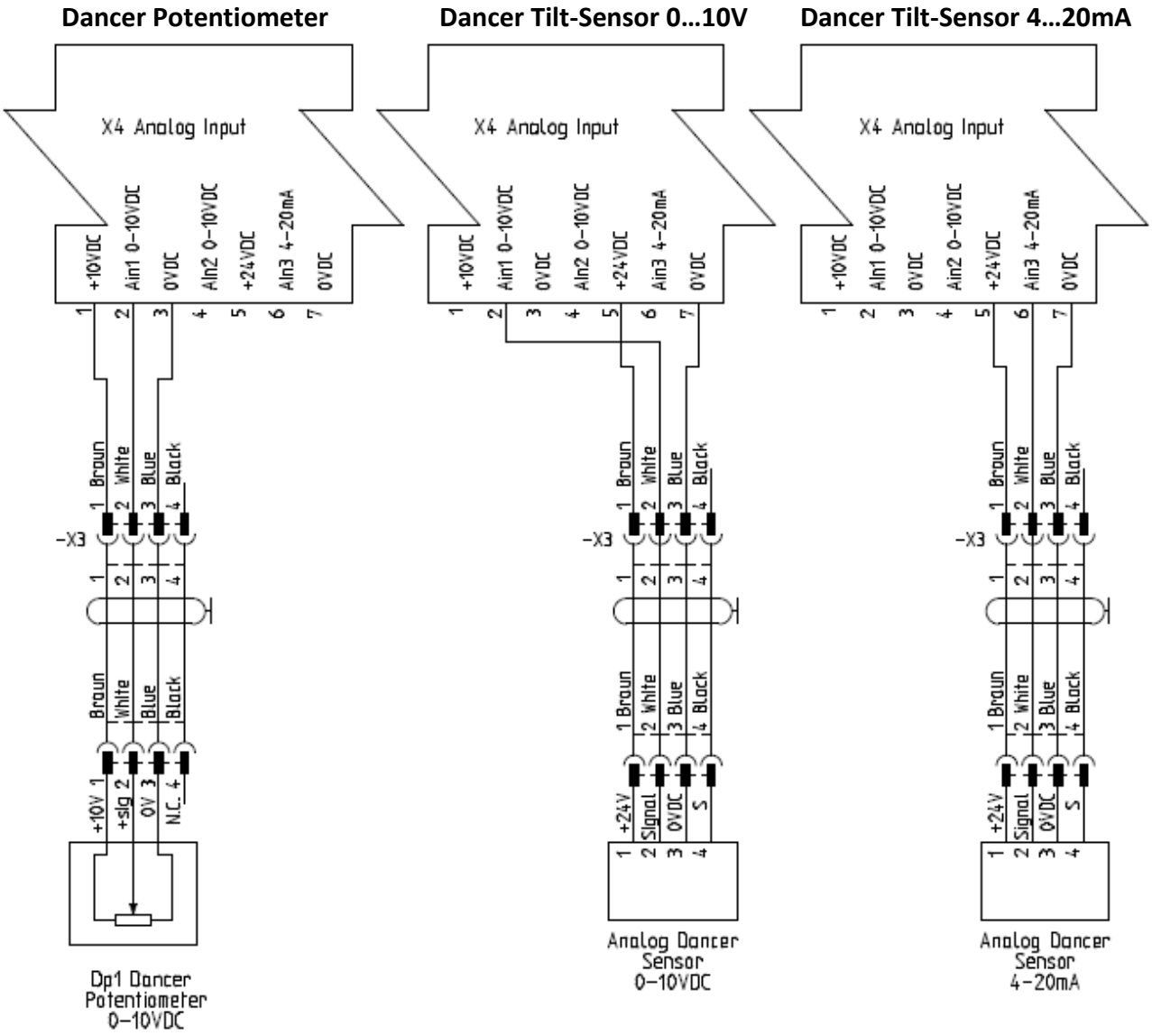
Strain Load cell



Foil Load cell

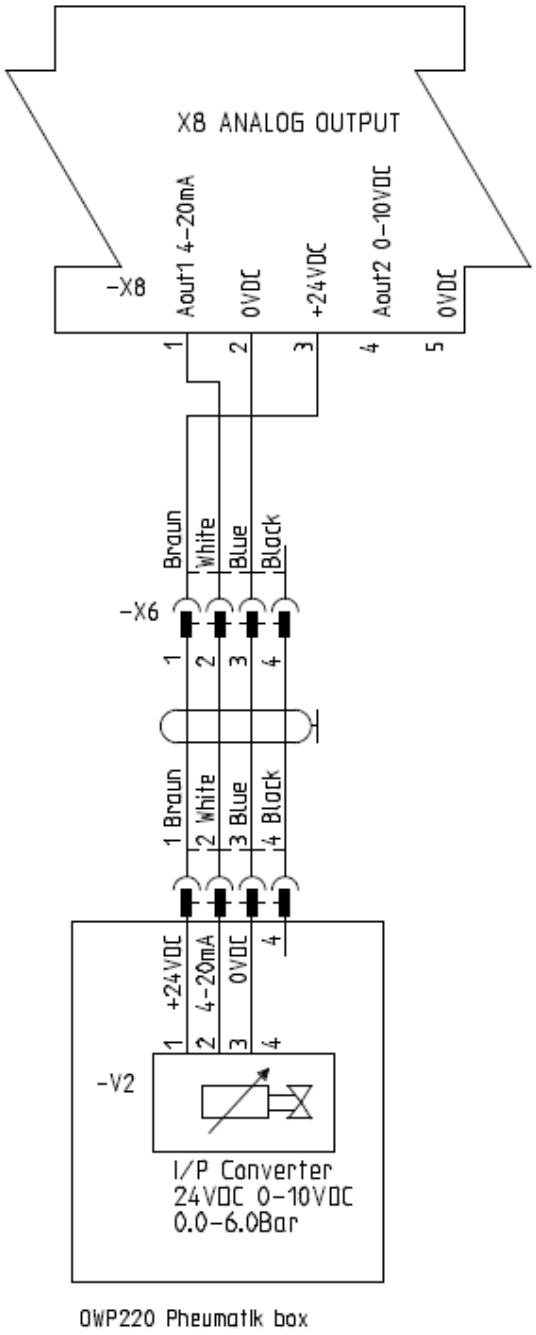


5.7 Dancer Sensor diagram

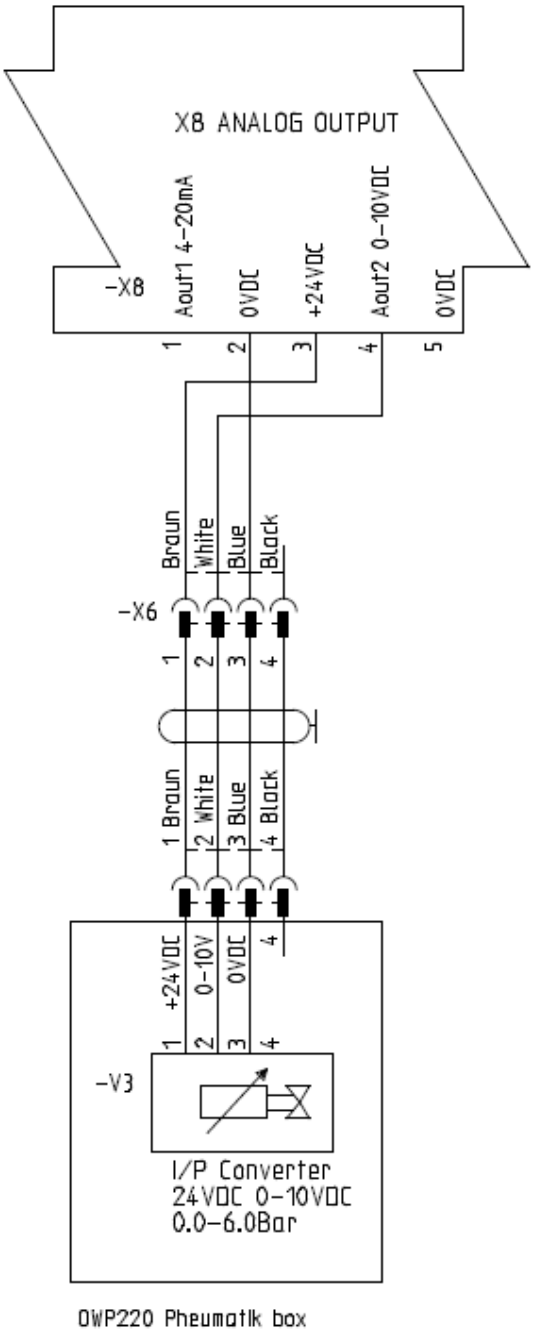


5.8 IP Converter diagram

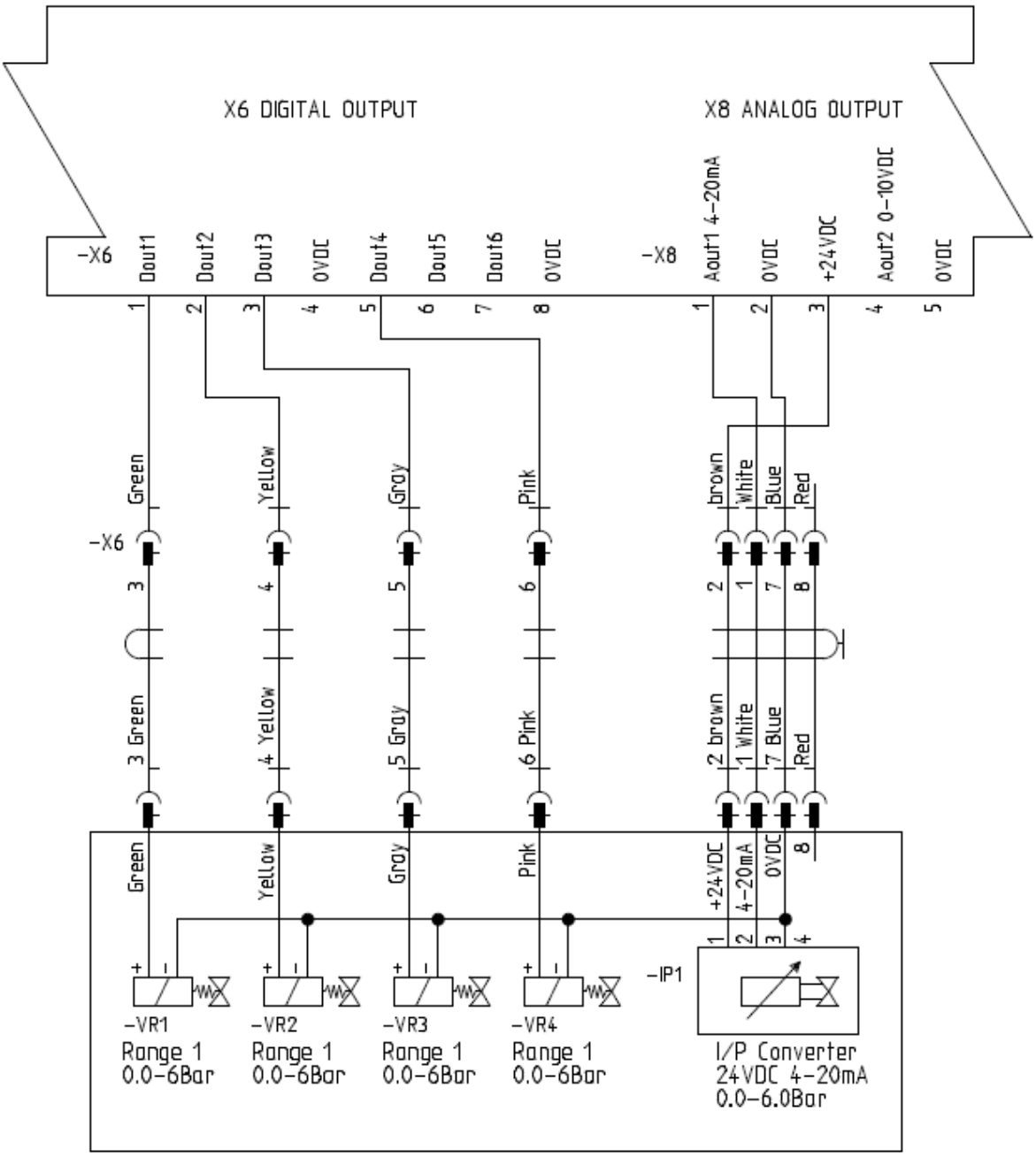
4-20mA Connection



0-10VDC Connection

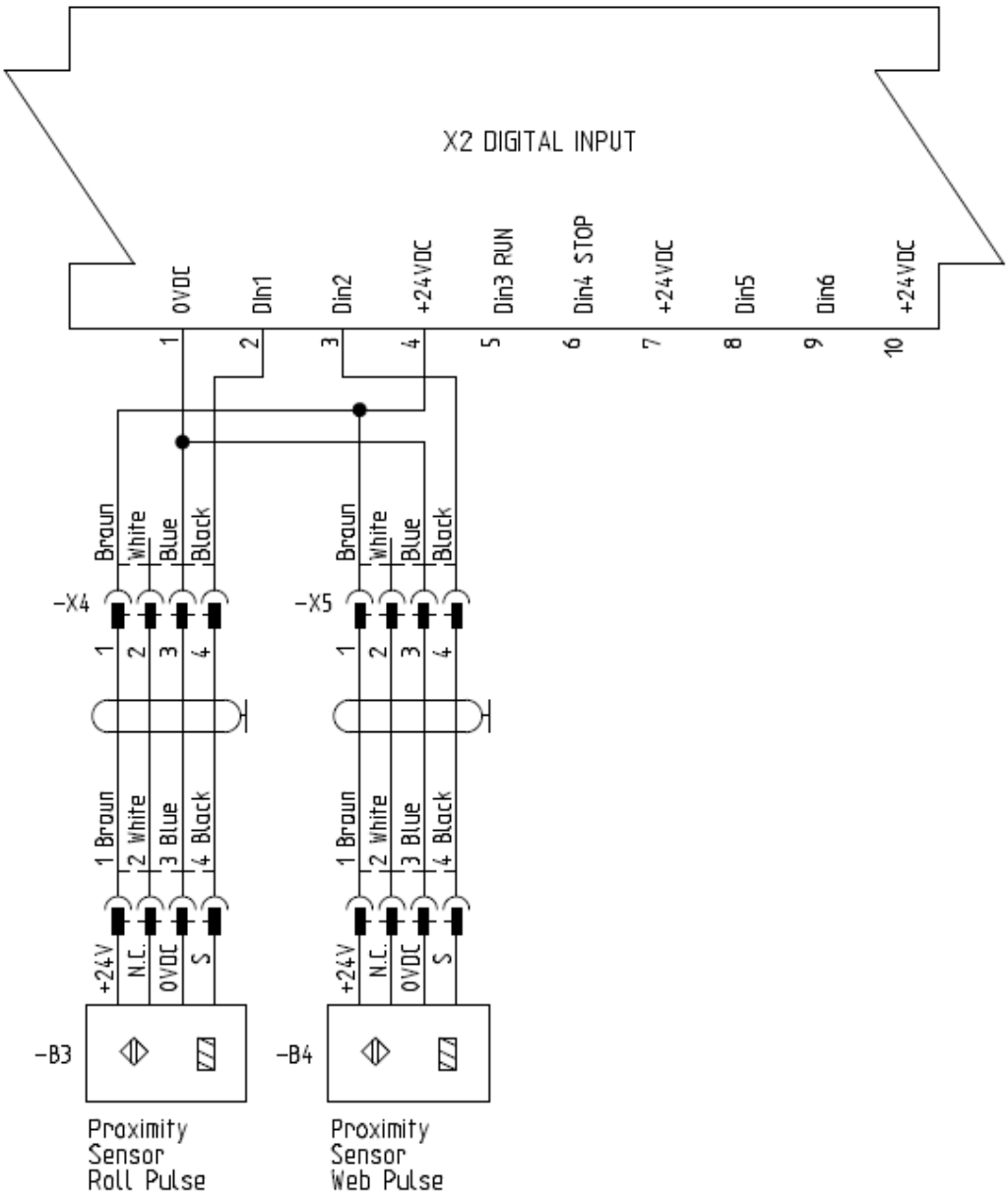


5.9 Range expander diagram

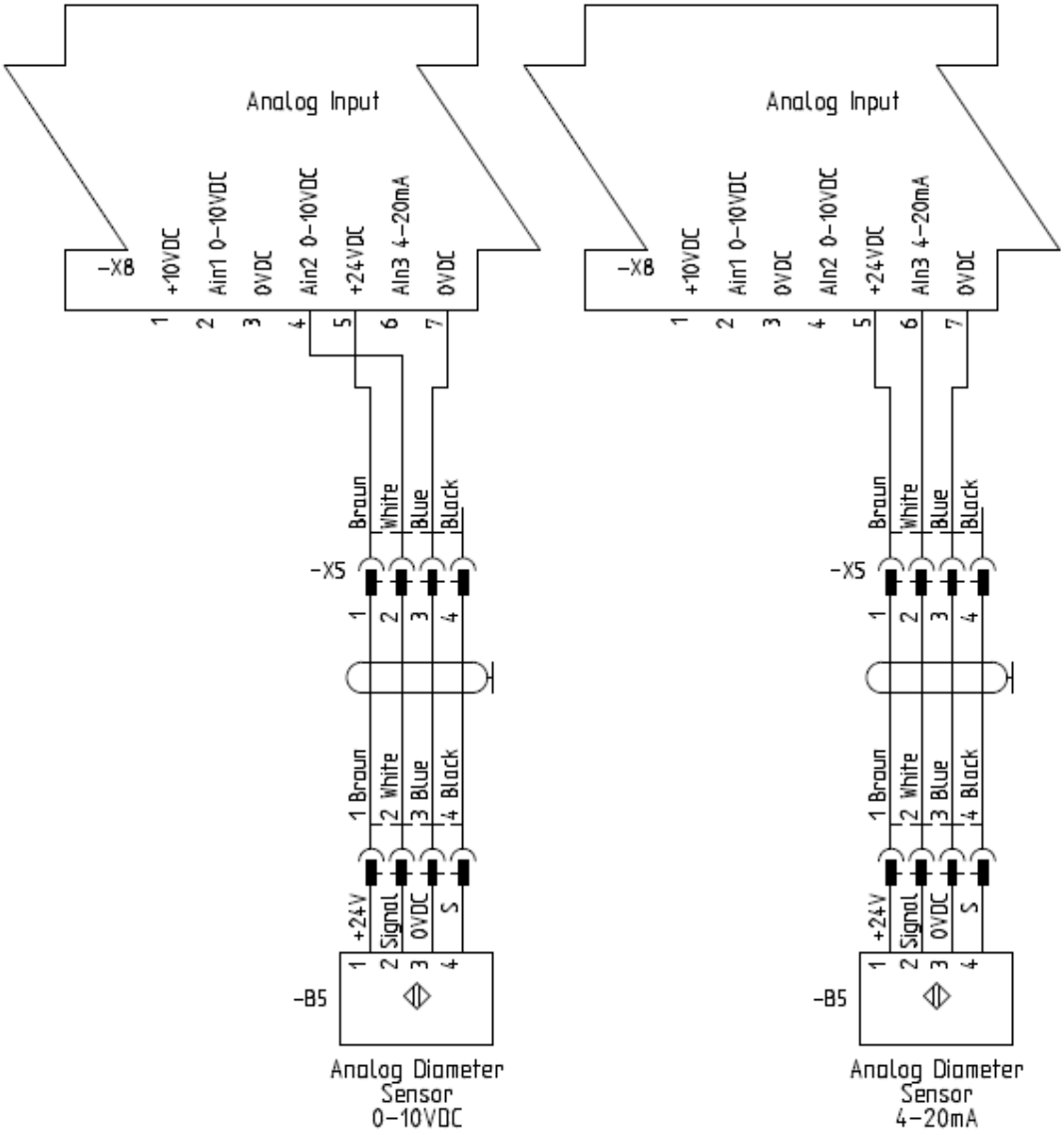


OWP224 Pneumatik box with Range valves and IP Converter

5.10 **Proximity sensor Puls diameter**



5.11 **Analog Diameter Sensor**



6 Setup feature of the controller

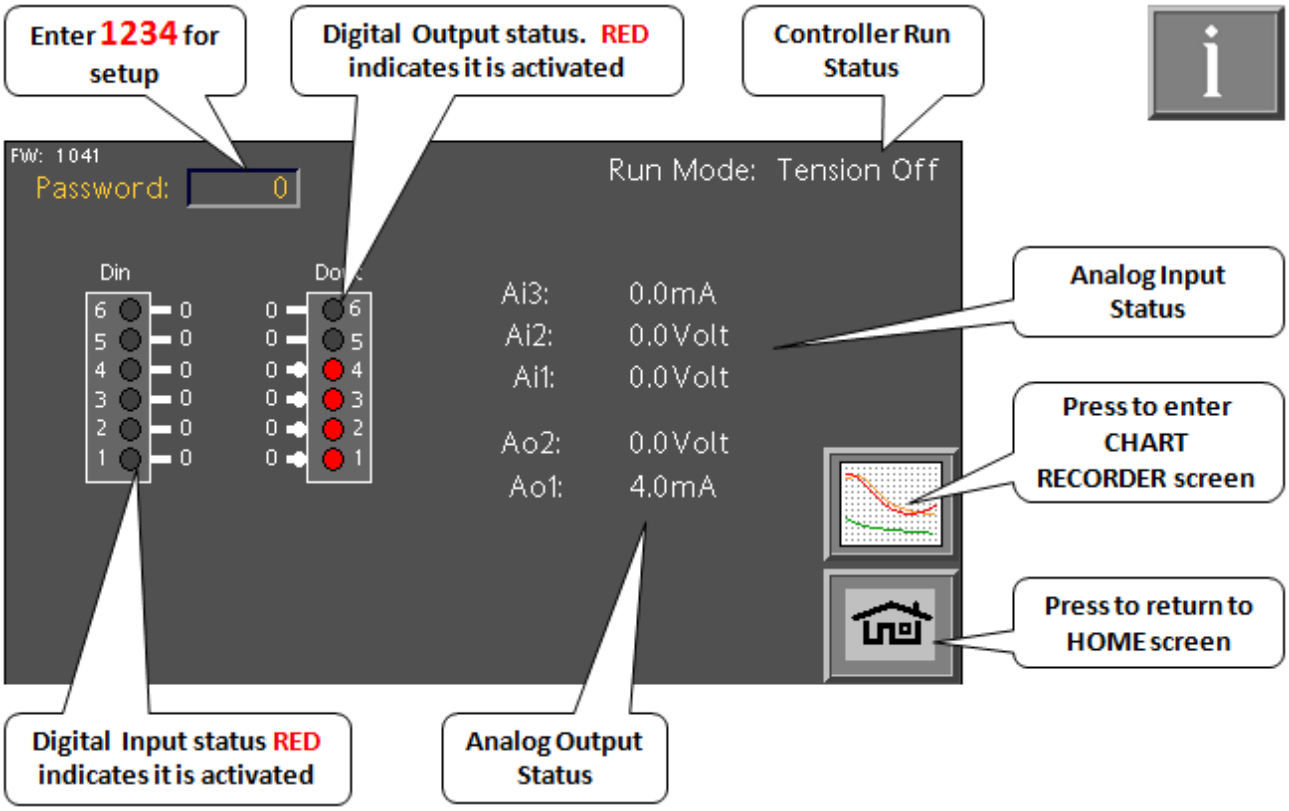
NOTE

Damage to the touchscreen due to faulty operation!

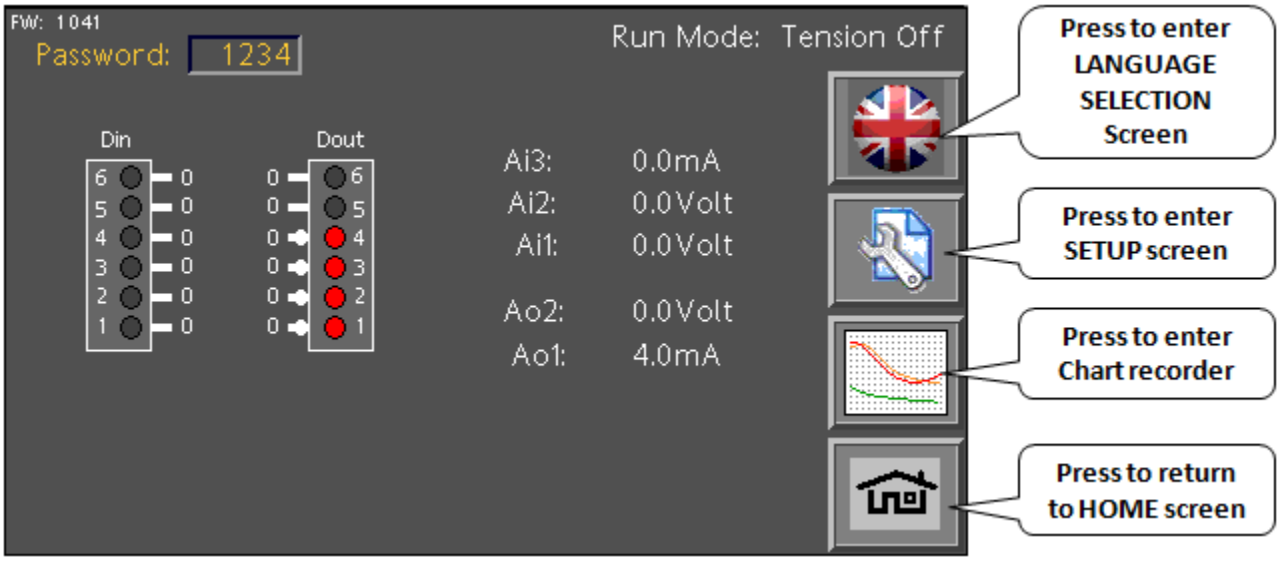
Use of sharp, strong or coarse objects (e.g. pens, gloves) may damage the surface of the touchscreen.

- Touch the touchscreen only using bare fingers or a special pen (touchpen).

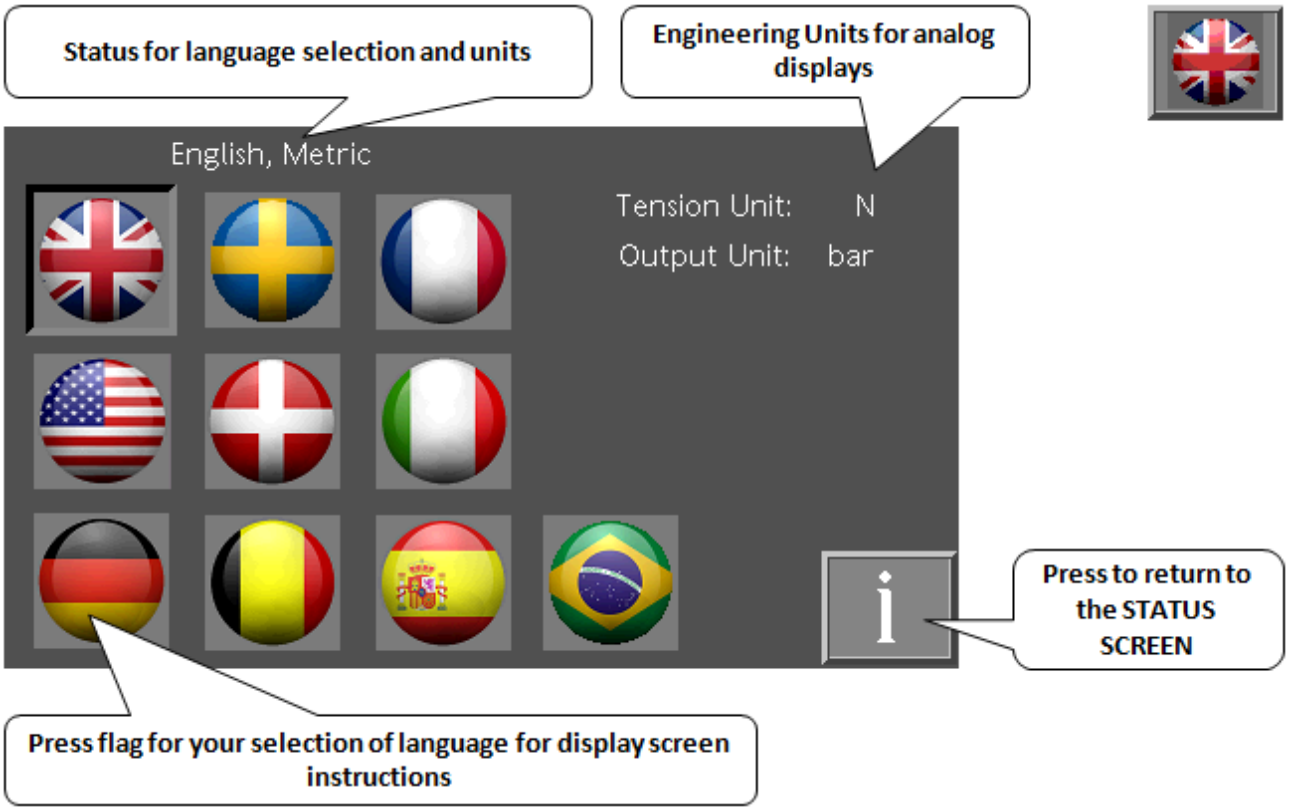
Press the STATUS Button  on the Operator screen to go to the Status Screen



6.1 Status Screen



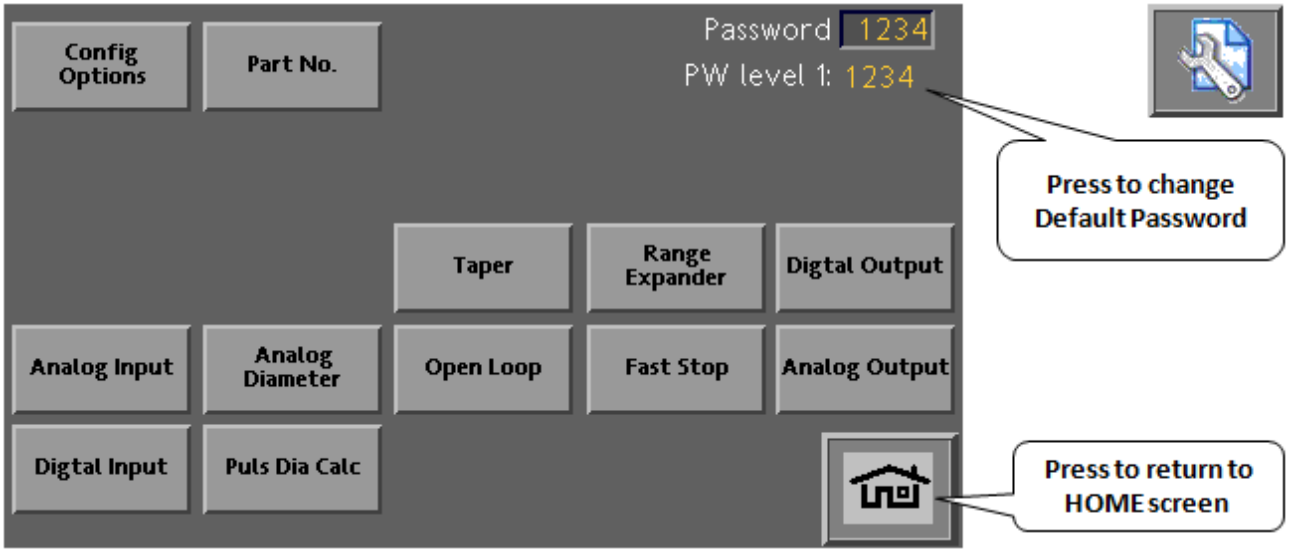
6.2 Language Screen



6.3 Setup Screen

From the Status screen: press  to get to the general Setup screen:

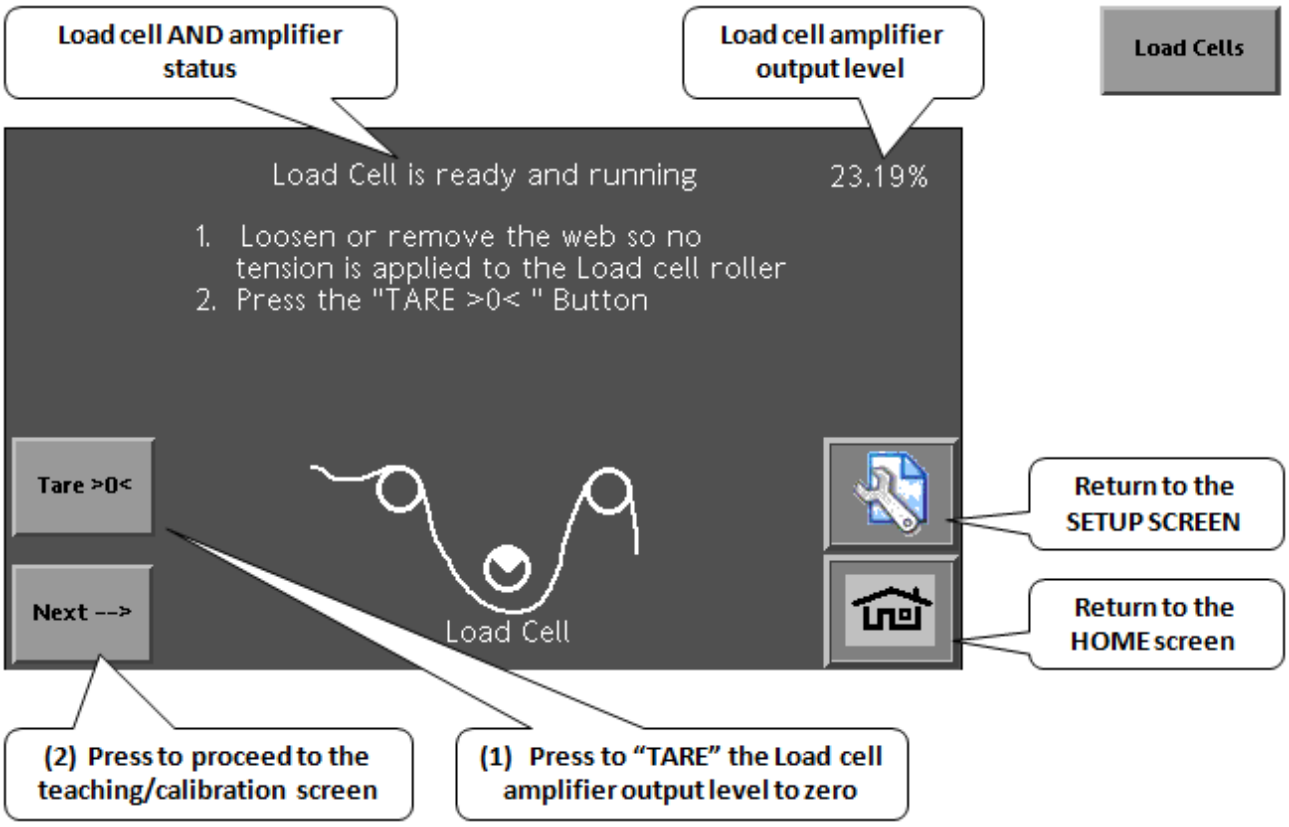
From here, you can, via the buttons, access the individual function blocks Settings and values.
The number of available blocks on the screen will depend of the configuration part number



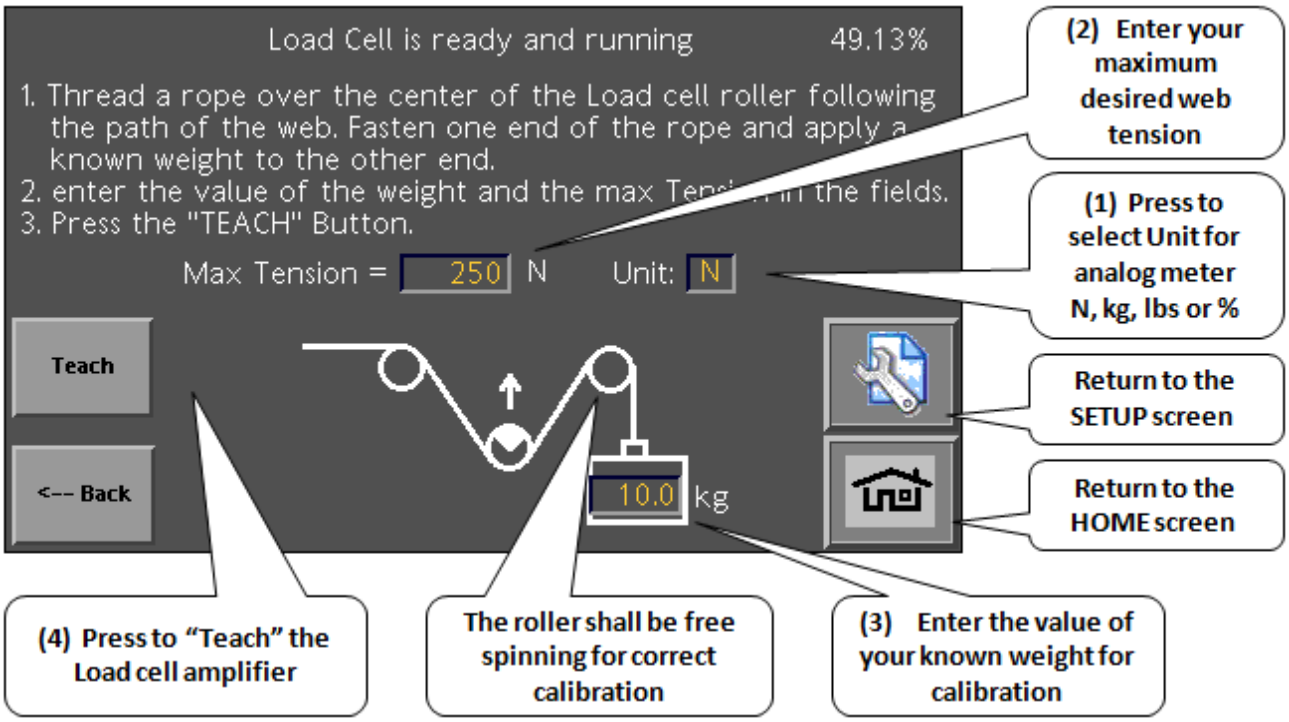
6.4 Load Cells Calibration

6.4.1 "TARE" Load Cells

The Screen instructions will be in the selected language

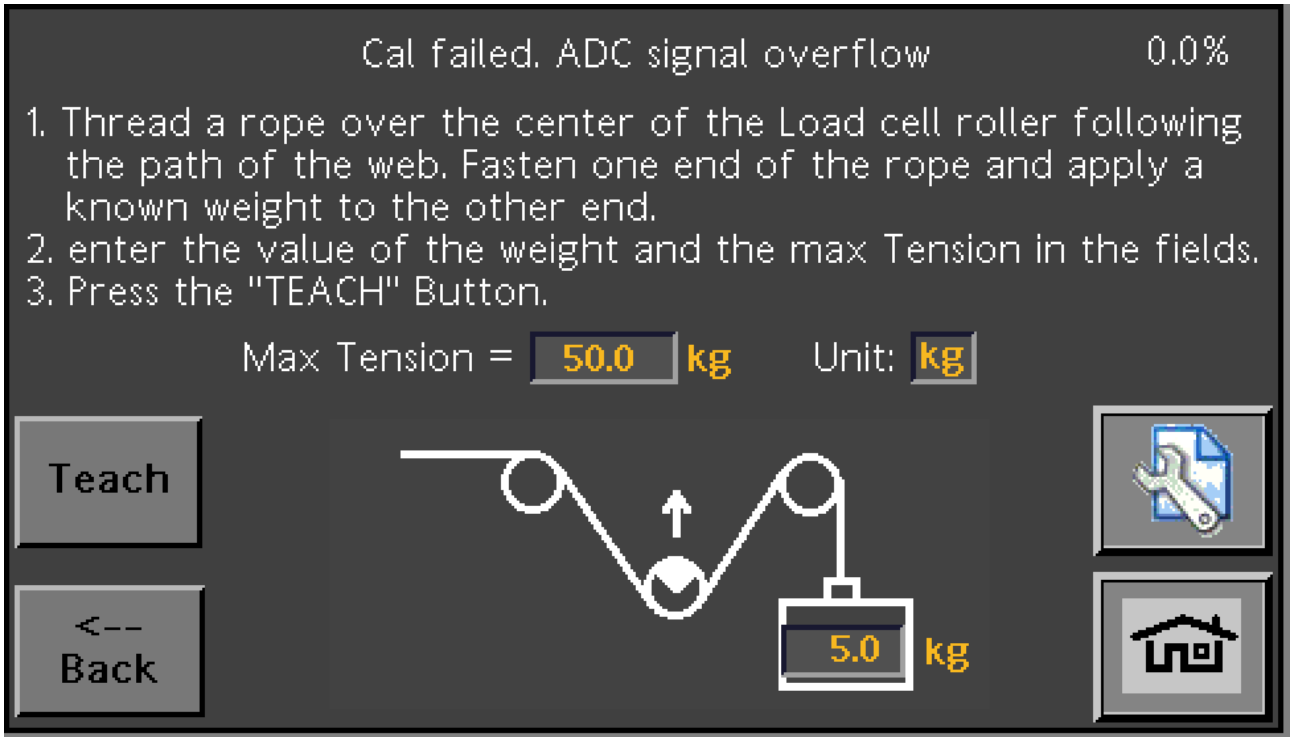


6.4.2 "TEACH" Load Cells



6.4.3 Load Cell Calibration error

"Cal failed. ADC signal overflow" Means that the output from the load cells is too high for the controller to calibrate correctly



The solution is to:

1. Reduce the **Max Tension** value for the application and try to **Teach** again.
2. Reduce the wrap angle of the web over the load cell roller and try to **Teach** again.
3. Change the Load cells to the next higher load rating.

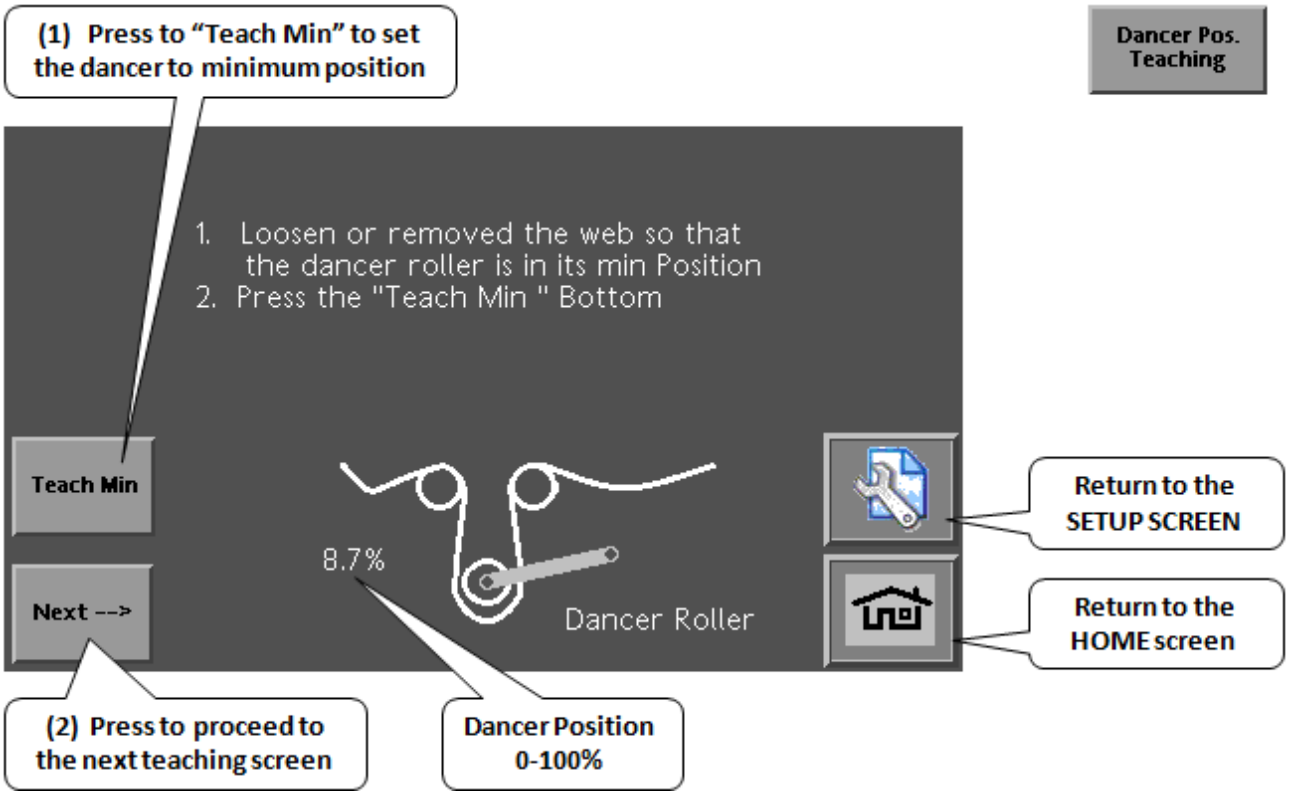
To evaluate if the load cell size is correct you can use this table

Max Tension [Kg]	Wrap angle	Angle Force factor	total resultant force [kg]	Min Load cell Size [N]
50	**180**	**2.00**	**100**	**1000**
50	**150**	**1.93**	**97**	**966**
50	**120**	**1.73**	**87**	**866**
50	**90**	**1.41**	**71**	**707**
50	**60**	**1.00**	**50**	**500**
50	**30**	**0.52**	**26**	**259**

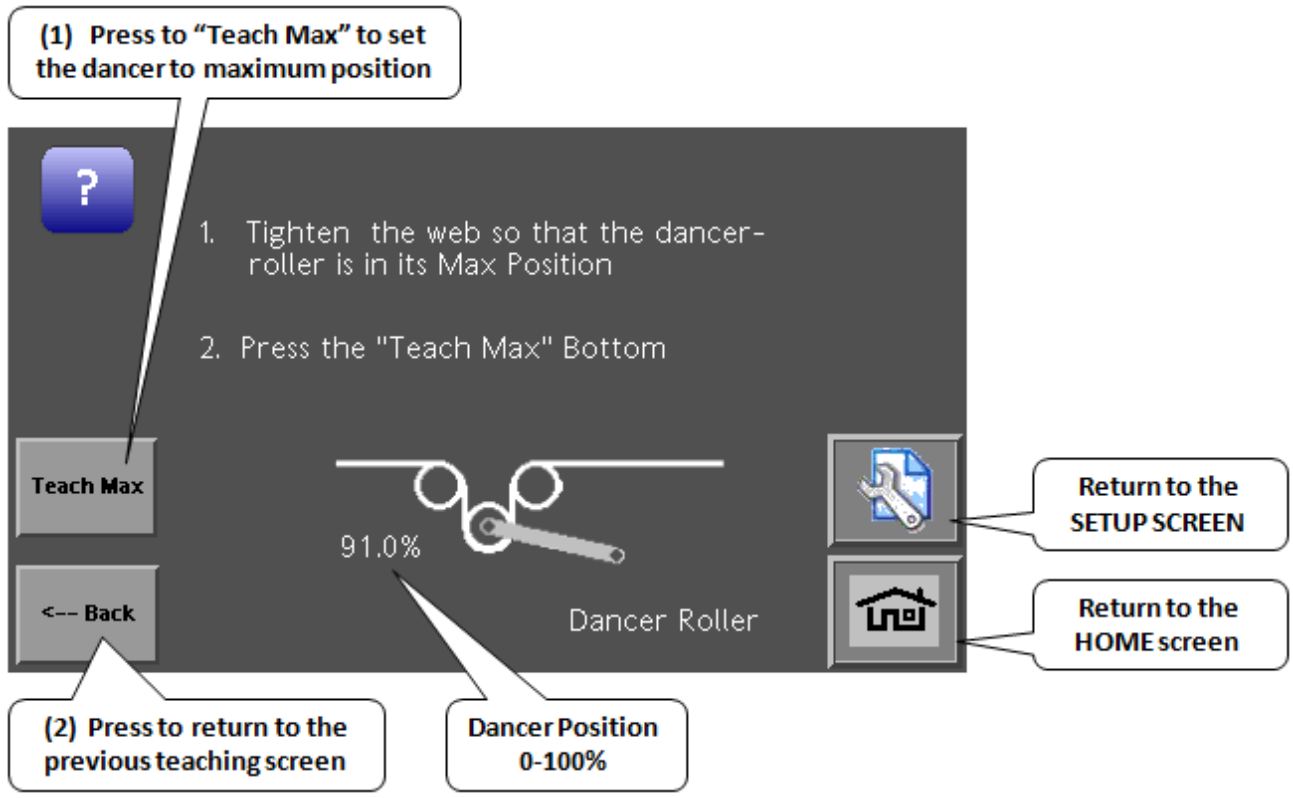
6.5 Dancer Position Calibration

6.5.1 "Teach Min" Dancer Position

The Screen instructions will be in the selected language

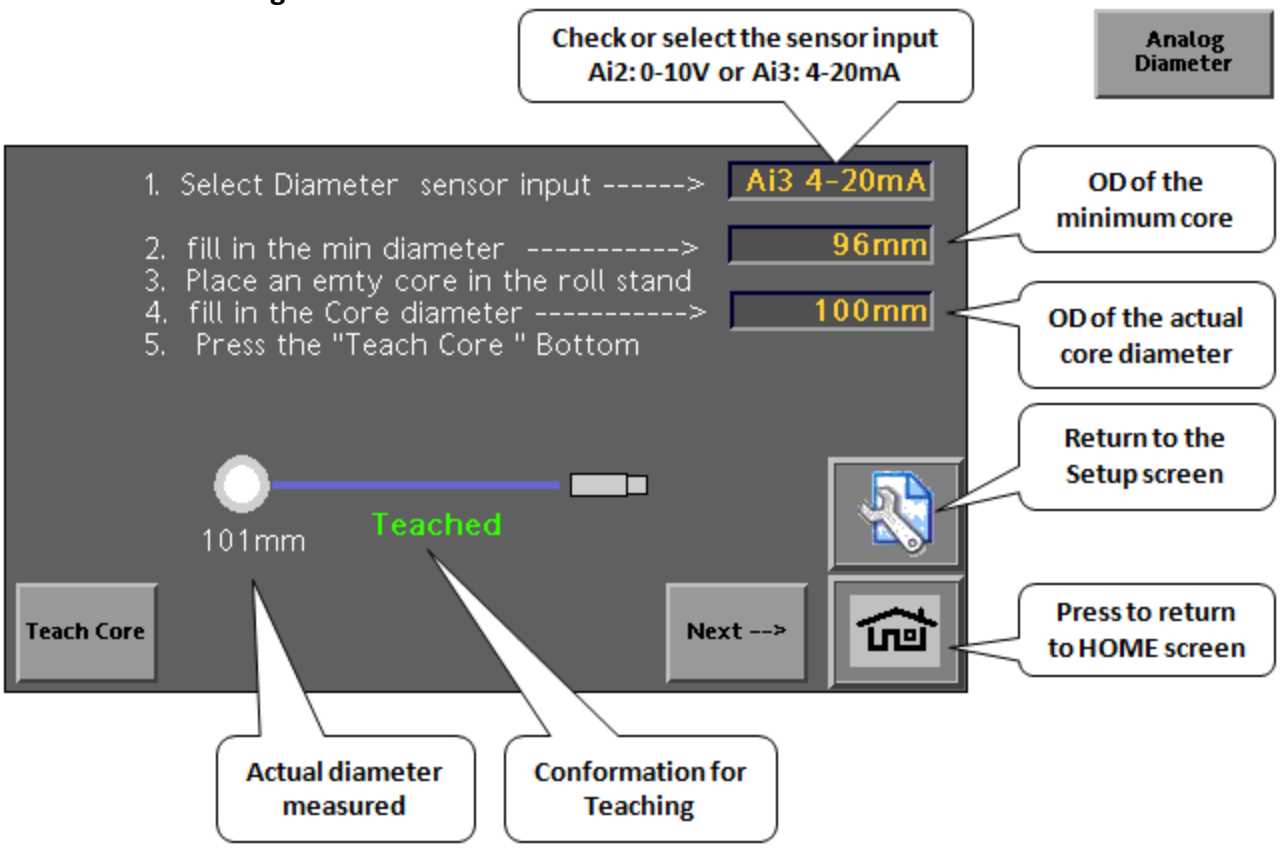


6.5.2 "Teach Max" Dancer Position

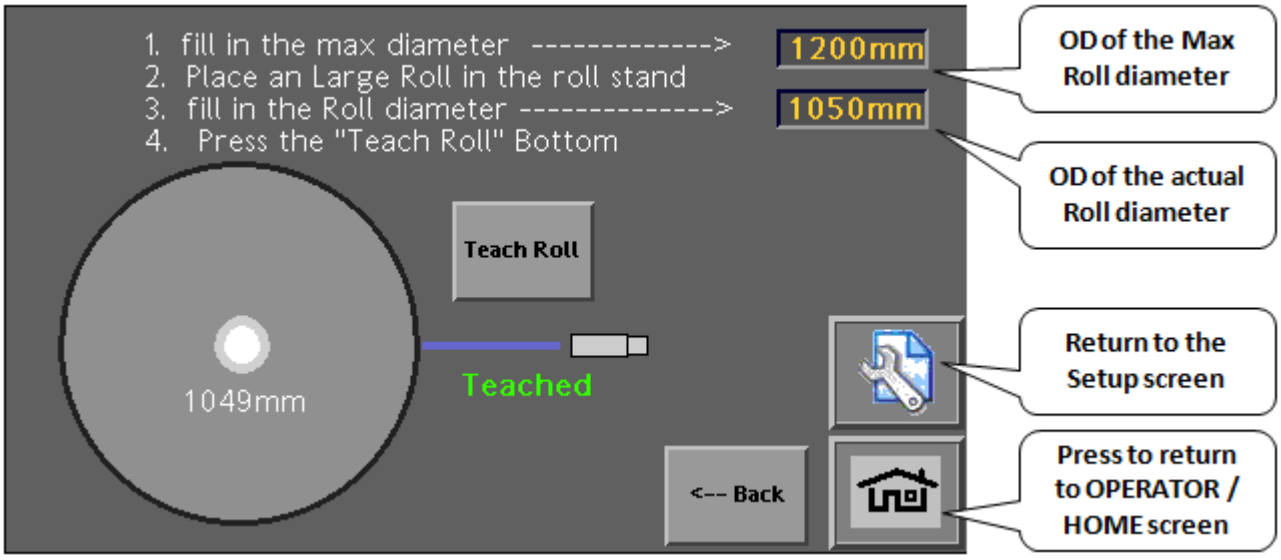


6.6 Analog Diameter measurement

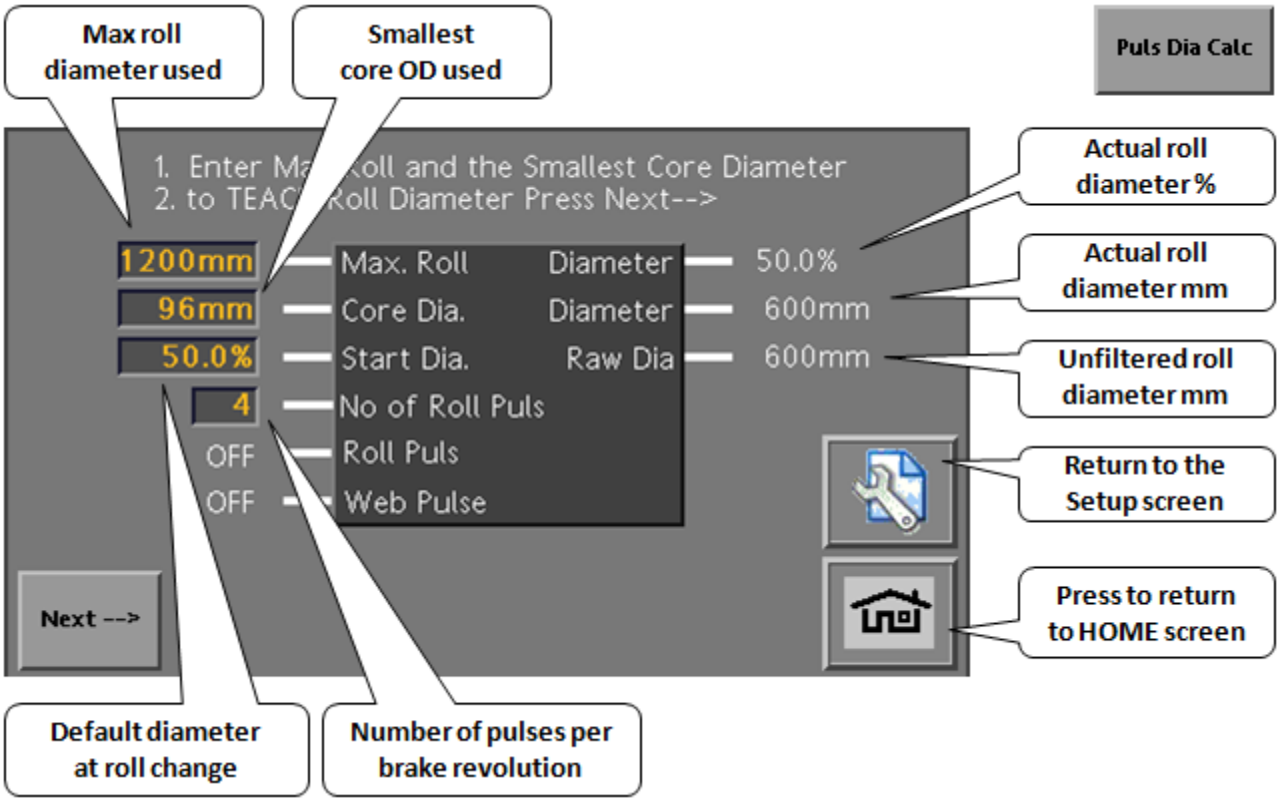
6.6.1 Core Teaching



6.6.2 Roll Teaching

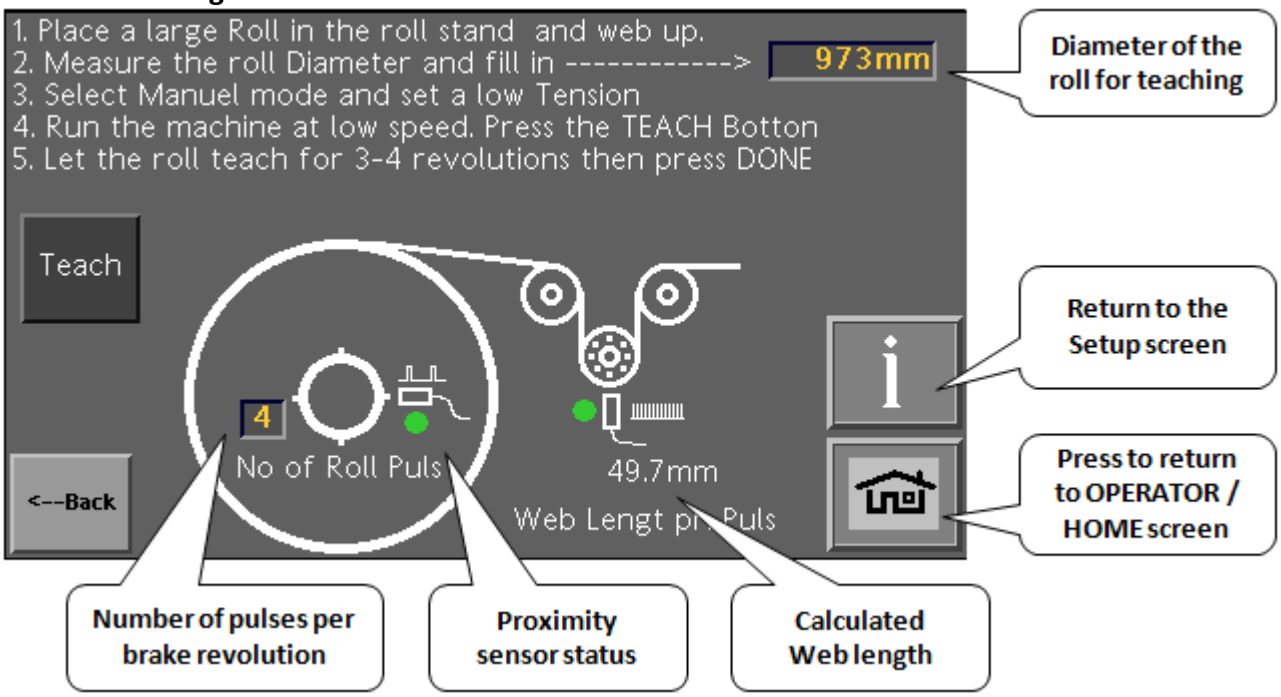


6.7 Pulse Diameter calculation



Parameter	Description	Value
Max. Roll	Entry field for max. roll diameter	0 – 3000 mm
Core Dia.	Entry field for core diameter	0 – 500 mm
Start Dia.	Start diameter for new roll	0.0 – 100.0 %
No of Roll Puls	Entry field for number of roll pulses of proximity switches	1 – 4

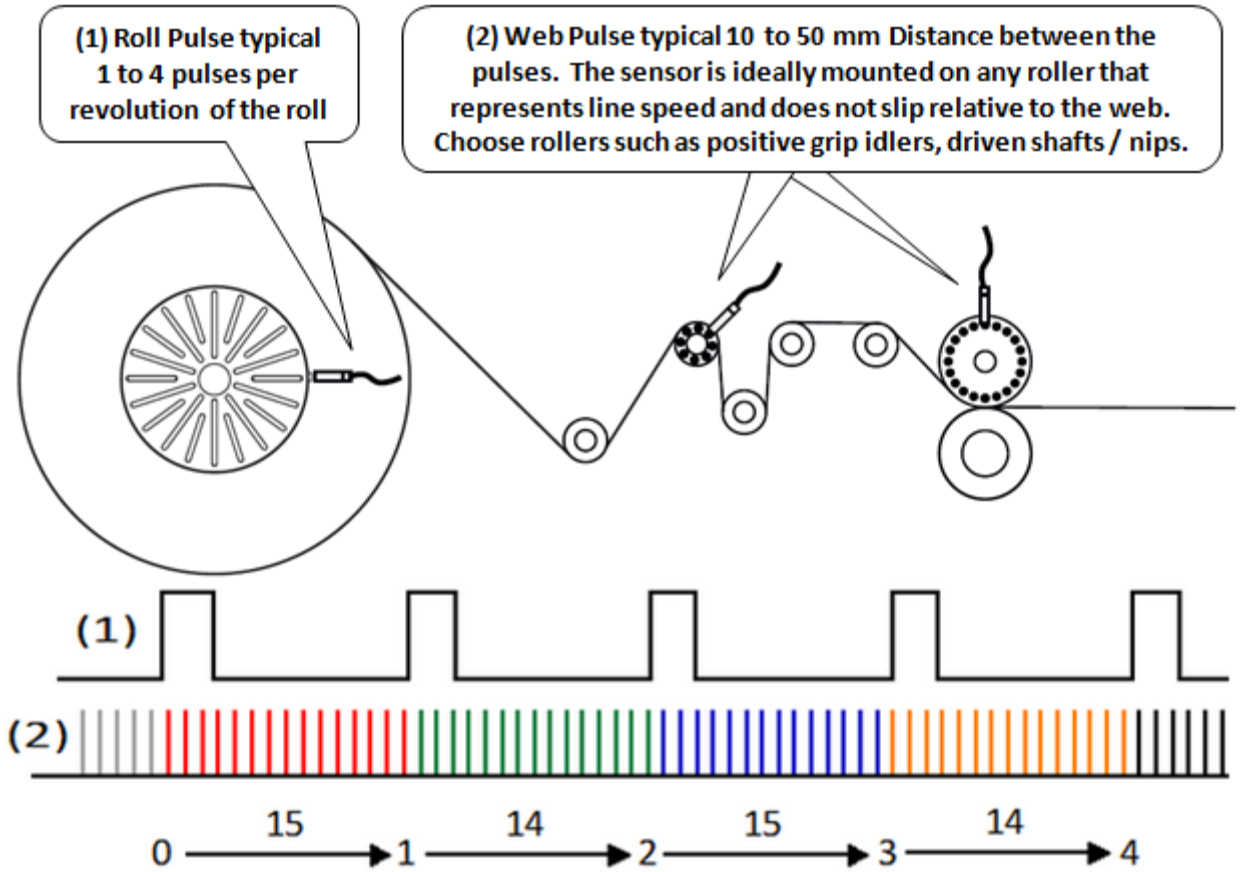
6.7.1 Teaching



6.7.2 Diameter calculation Description

Impulse-Diameter calculation through 2 proximity switches

The roll diameter is determined by 2 proximity switches, one of which captures the roll revolutions and the other the length of material passing through (material length impulse).



(1) The proximity switch captures 1 to 4 impulses per roll revolution.
(2) The proximity switch captures the length of material passing through per impulse.

The recommended length of material should be between 3 and 100 mm per impulse.

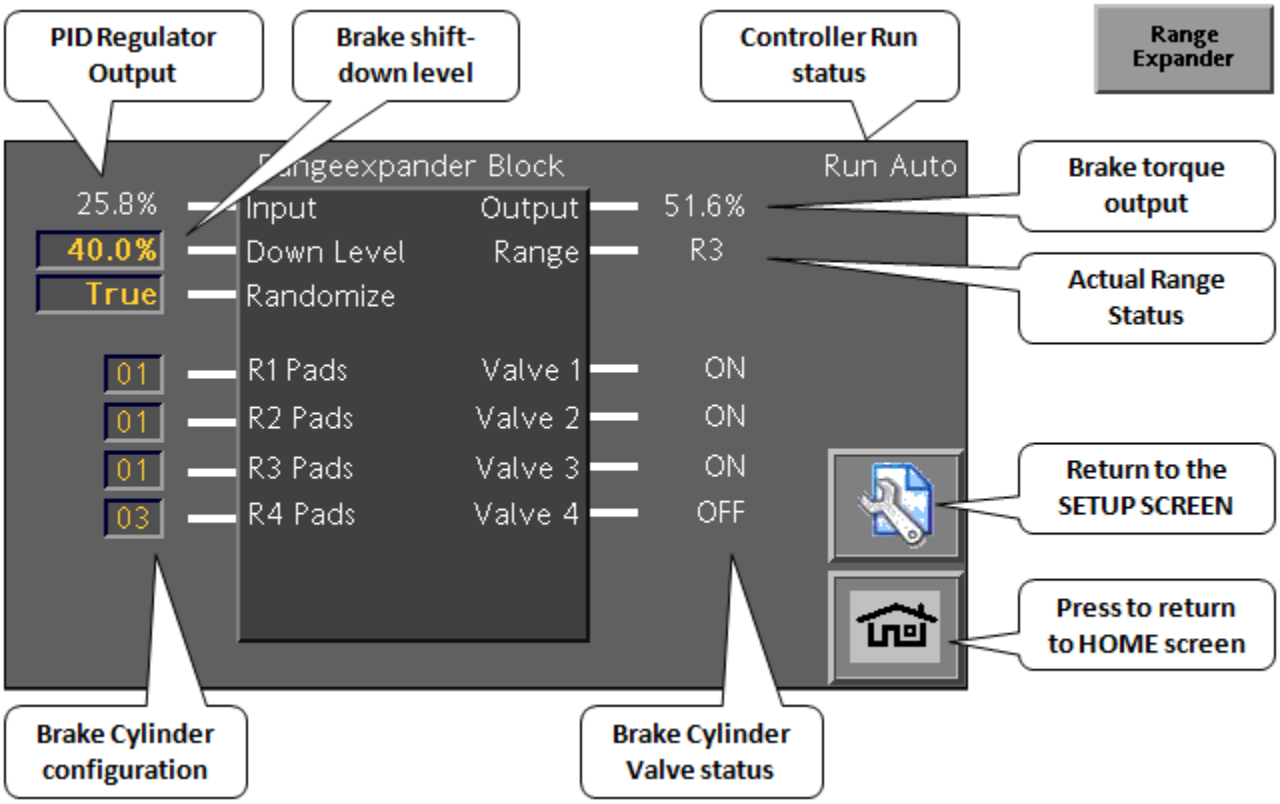
The diameter of the new roll is calculated as soon as the controller has received 2 impulses of the new roll.

Inductive sensor requirement depending on line speed

Housing	Range	Switching frequency	Design	Connection	Temperature range	Approval
M12 / L = 65 mm	3 mm	2000 Hz	M12	DC PNP (200mA)	-25...70 °C	cULus (CCC)
M12 / L = 65 mm	3 mm	4000 Hz	M12	DC PNP (200mA)	-25...70 °C	cULus (CCC)

Note: For machines faster than 600 meters/min (1800rpm), you must use a 4000 Hz sensor

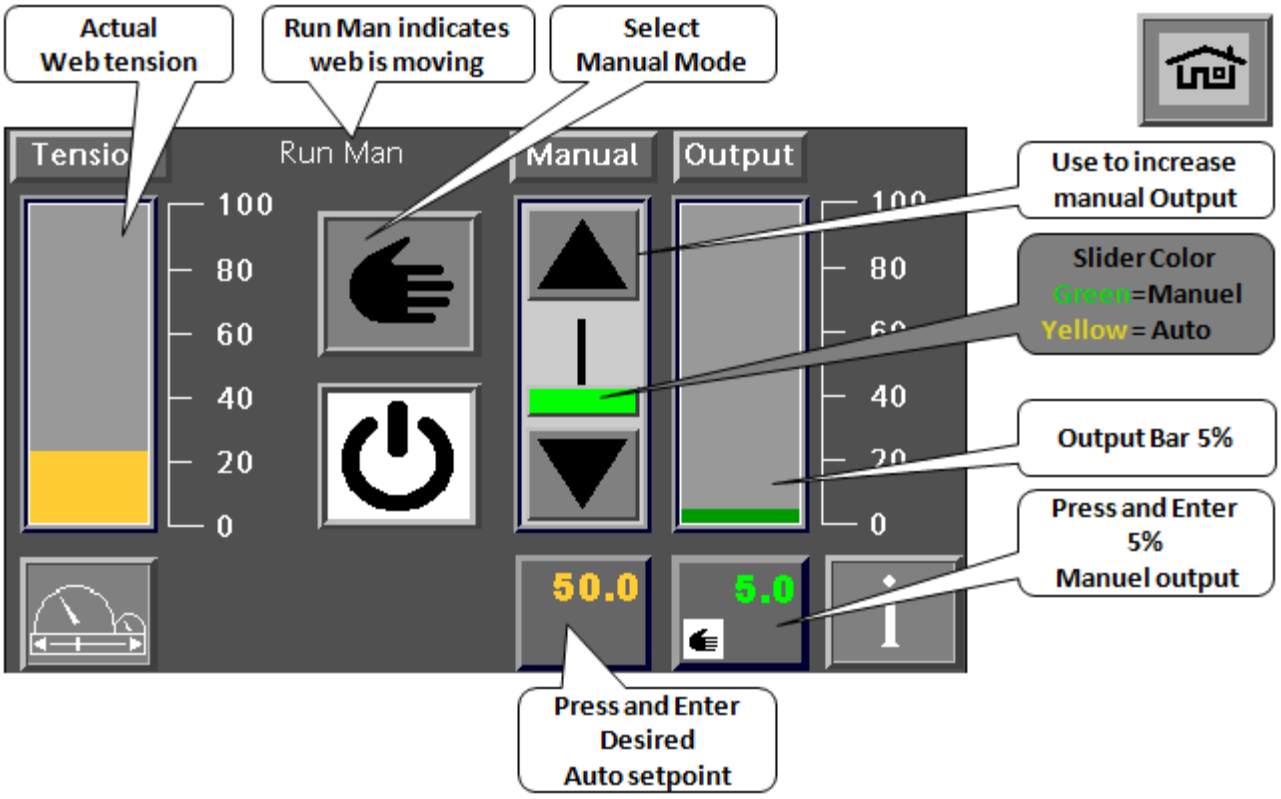
6.8 Range Expander



Parameter	Description	Value
Output	Output from Range Expander	0 – 100%
RE State	Actual Range status	R1 - R6
Valve 1-6	Actual valve status 1-6	False - True
Input	Input from PID controller	0 – 100%
Down Level	Threshold value for the new output	0 – 100% Default: 30%
Randomize	Function for even wear of friction pads	False – True Default: True
Pads R1 – R6	Number of friction pads per area (R1 – R6)	0 – 12 (Default: 1)

Note. The number of ranges is defined via the part number configuration

6.10 **Tuning**



6.10.1 Small Roll:

1. Start with a Small roll in the machine. On the HOME screen, chose manual mode *the controller mode is **Manual*** and a 5% manual setting.
2. Run the machine at slow speed, observe that the controller mode changes to **Run Man** if the controller mode is still **Manual,** the controller is not receiving a run signal *Check wiring to the machine and make sure that the relay used for the machine Start/Stop signal is closing and opening when pressed or switched. If the switch is working but is inverted, then you will need to invert the start/stop signal (DI3) in the controller.*
3. While running the machine, adjust the Manual setpoint sliders to desired web tension
4. Enter the Auto setpoint to the desired web tension and change from  to 
5. Observe that the controller is regulating to the correct web tension. In MOST applications, *the default PI parameters in the controller will NOT need changed.*
6. Run the machine up to production speed and run the roll to the end and observe that the web tension is stable and constant within a few %. If the Tension is increasing towards the end of the roll, some additional tuning is required.

Note: the PI parameter that has the most effect on small rolls is **Min Gain**. Lower gain means it will be less responsive. Higher gain means it will be more responsive.

SEE ADDITIONAL PI TUNING SECTION FOR ASSISTANCE.

6.10.2 Large Roll:

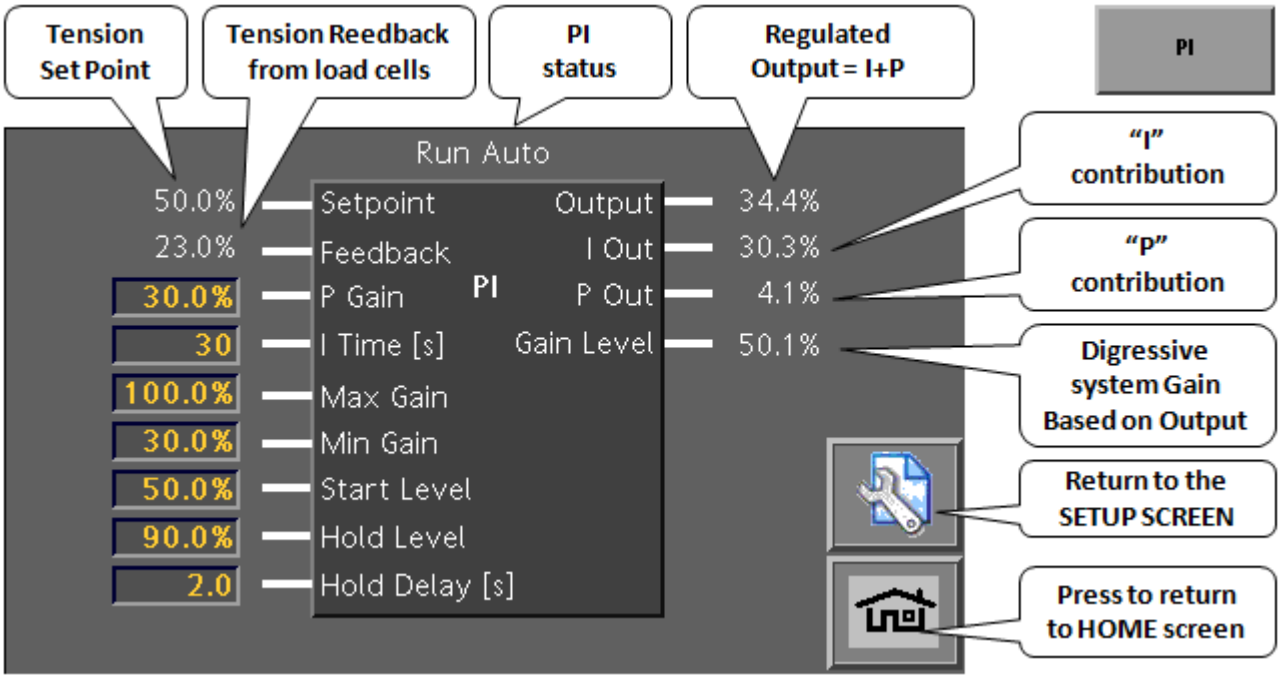
1. Keep the controller in Auto Mode  and change the roll to a large roll. Re-start the machine and turn the machine speed up and down and observe that the web tension and output is stable. *If the tension is jumping or erratic, it can be due to bad roll shape. To check to see if the roll quality is causing a problem with tension control, switch the controller from Auto*  *to Manual*  *and compare the tension variation in the 2 modes. If the tension is still erratic or jumpy, and the control output is stable (which in manual mode, the output is fixed) then the roll shape is probably causing a problem OR there is some other mechanical problem. These can sometimes be "Tuned Out" by turning the Max Gain down. Otherwise* some PI parameter tuning is required.
2. Perform Fast and auto stop of the Machine. If the web tension drops (i.e. becomes slack or drops to the floor) then consider setting up the Fast stop functions. SEE FAST STOP TUNING SECTION FOR ADDITIONAL ASSISTANCE.

Note: the PI parameter that has the most effect on large rolls is **Max Gain**. Lower gain means it will be less responsive. Higher gain means it will be more responsive.

SEE ADDITIONAL PI TUNING SECTION FOR ASSISTANCE

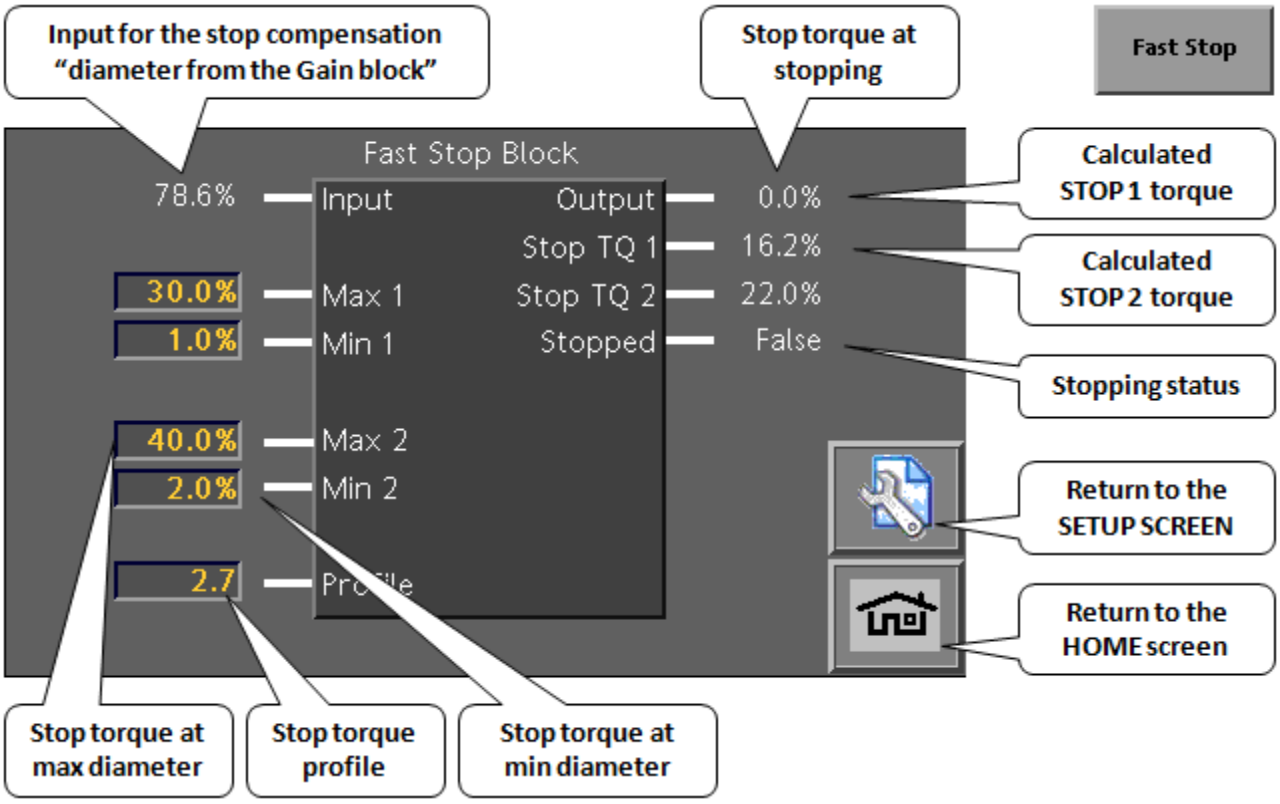
6.10.3 PI

The control algorithm uses a specially designed DYNAMIC GAIN FUNCTION that automatically takes roll size into consideration. The gain level automatically decreases or increases with roll size. The PI Regulator algorithm is specially designed for handling web tension in machines with booth small and large rolls due to the digressive internal gain control.



Parameter	Description	Value
P Gain	**Pout= Pgain X (Setpoint-Feedback) x Gain Level** Adjust **Pgain** at small roll if oscillation occurs	0– 300% Default: 20 %
I Time	Integration time "Ramp time" of the regulator. If the time is too small, the output will not stabilize at large rolls; the symptom is called "waving" and is similar to oscillating but more slowly.	0 – 200 s Default: 15s
Max. Gain	This controls how fast the controller reacts at at large output. It has the most effect on **LARGE ROLLS**.	0– 300 % Default: 100%
Min. Gain	This controls how quickly the control reacts at small output. It has the best effect on **SMALL ROLLS**. If the controller is not reacting fast enough and tension is increasing as the roll gets smaller, Increase this value. If the controller is reacting too quickly and tension is oscillating as the roll becomes smaller, Decrease this value.	0– 100% Default: 30%
Start Level	Output=Start Level*Setpoint. This is the level that the controller will start with when you start a new roll and turn "Tension Off" to "Tension On"	0– 100% Default: 50%
Hold Level	This is the level that the controller will go to when the machine is stopped. It is a percentage of the most recent output when you stopped the machine	
Hold Delay	This is the amount of time, in seconds, that the controller will wait before it goes into HOLD mode. The timer is activated when the RUN signal is removed.	0-30sec Default: 2s

6.10.4 Fast Stops



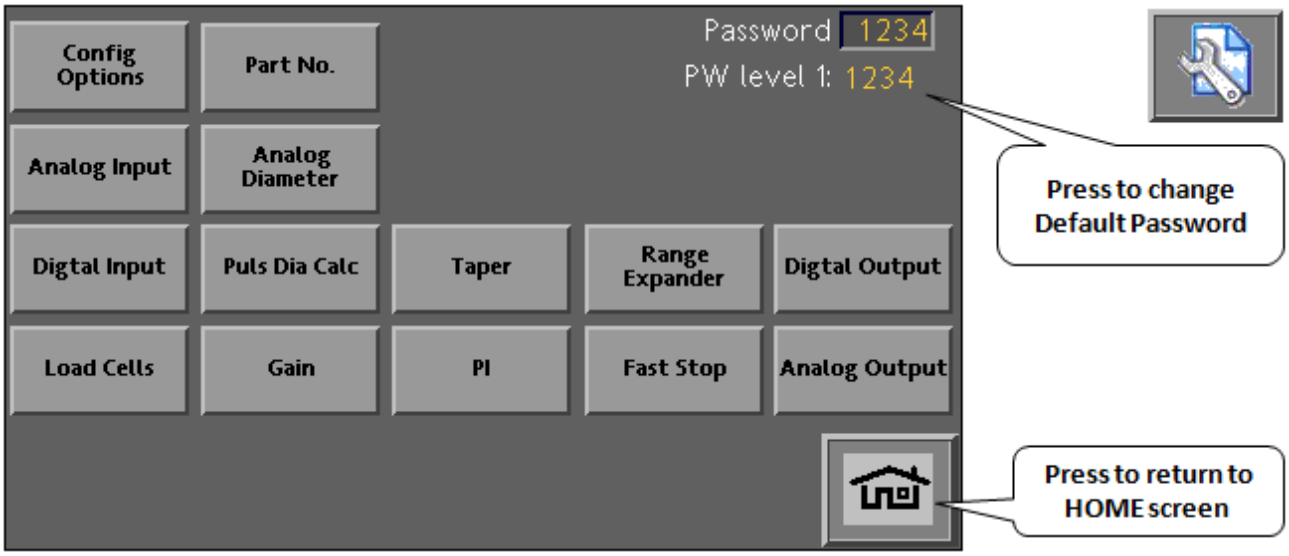
Parameter	Description	Value
Max. 1	Contribution at max. roll diameter for 'Stop 1 signal'	0.0 – 100.0 % Default: 40.0%
Min. 1	Contribution at min. roll diameter for 'Stop 1' signal'	0.0 – 100.0 % Default: 1.0%
Max. 2	Contribution at max. roll diameter for 'Stop 2' signal'	0.0 – 100.0 % Default: 80.0%
Min. 2	Contribution at min. roll diameter for 'Stop 2' signal'	0.0 – 100.0 % Default: 2.0%
Profile	Gain characteristic (max. To min. roll diameter)	– 3.0* Default: 2.7

* 1.0 = linear course of gain from max. to min. roll diameter
  3.0 = max. progression of gain (diameter ^{3} ≈ inertia)

7 Parameter Menu

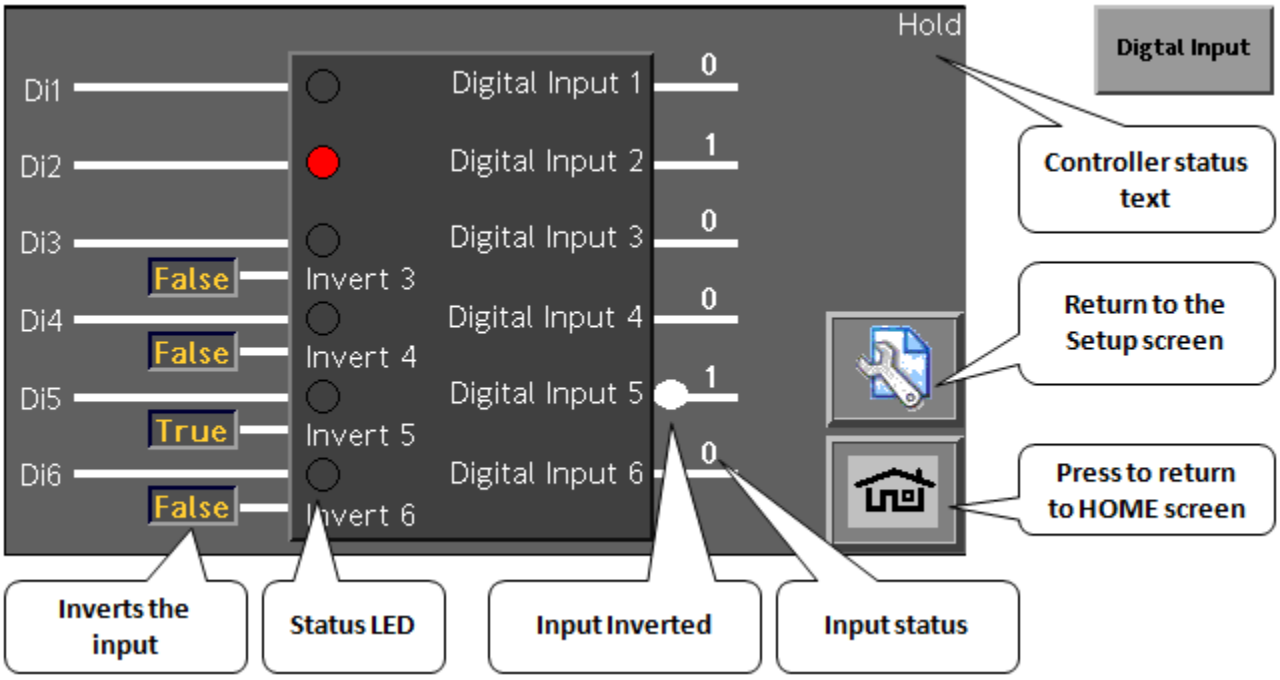
From the Status screen: press  to get to the general Setup screen:

7.1 Setup Screen

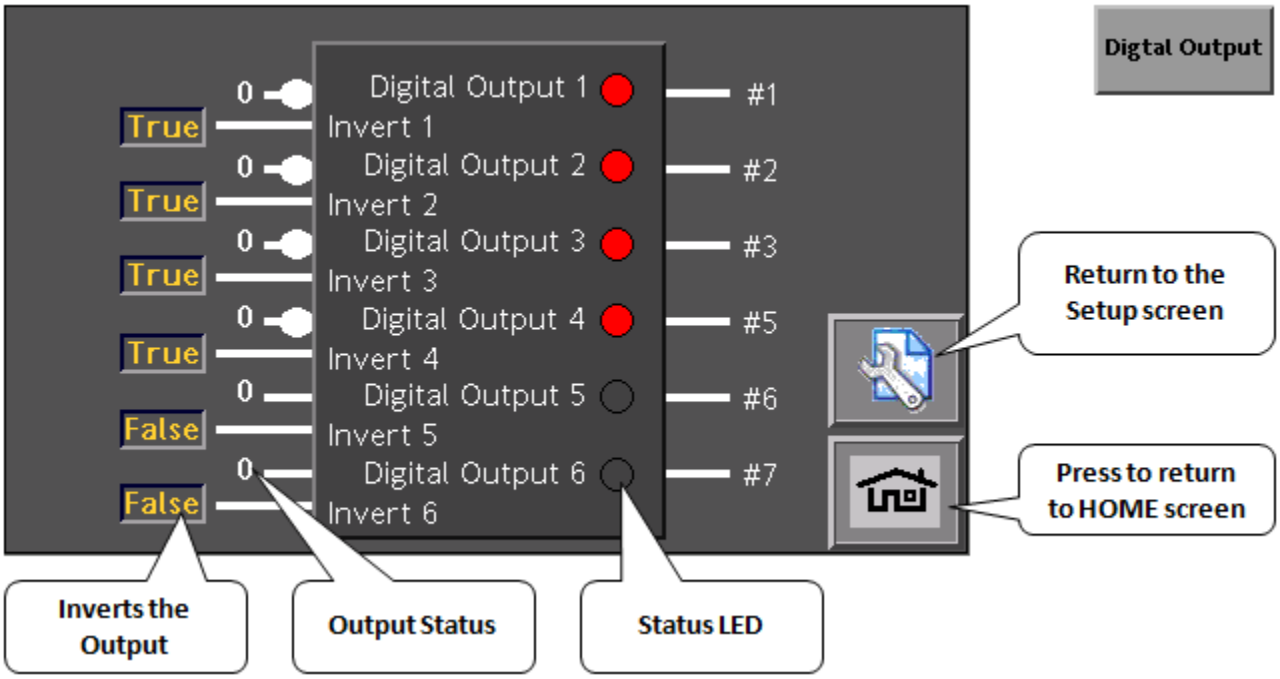


From here, you can, via the buttons, access the individual function blocks.
Note: The number of available blocks on the screen will depend of the controller configuration.

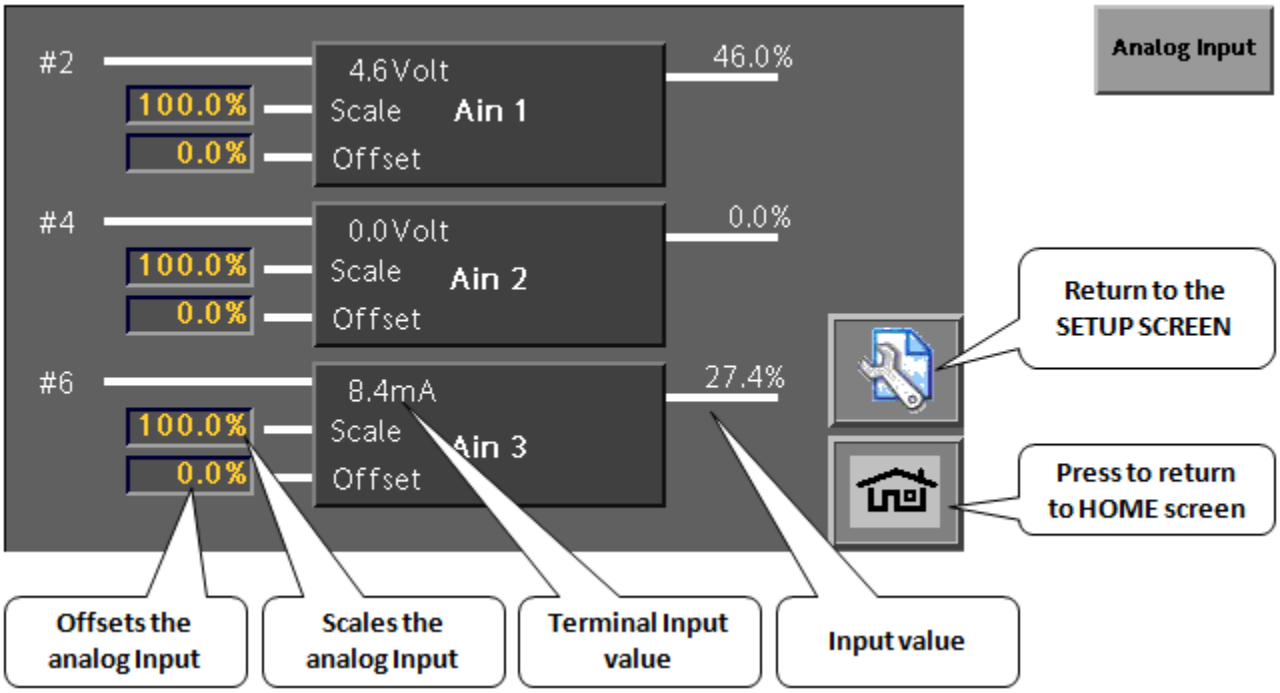
7.2 Digital Inputs



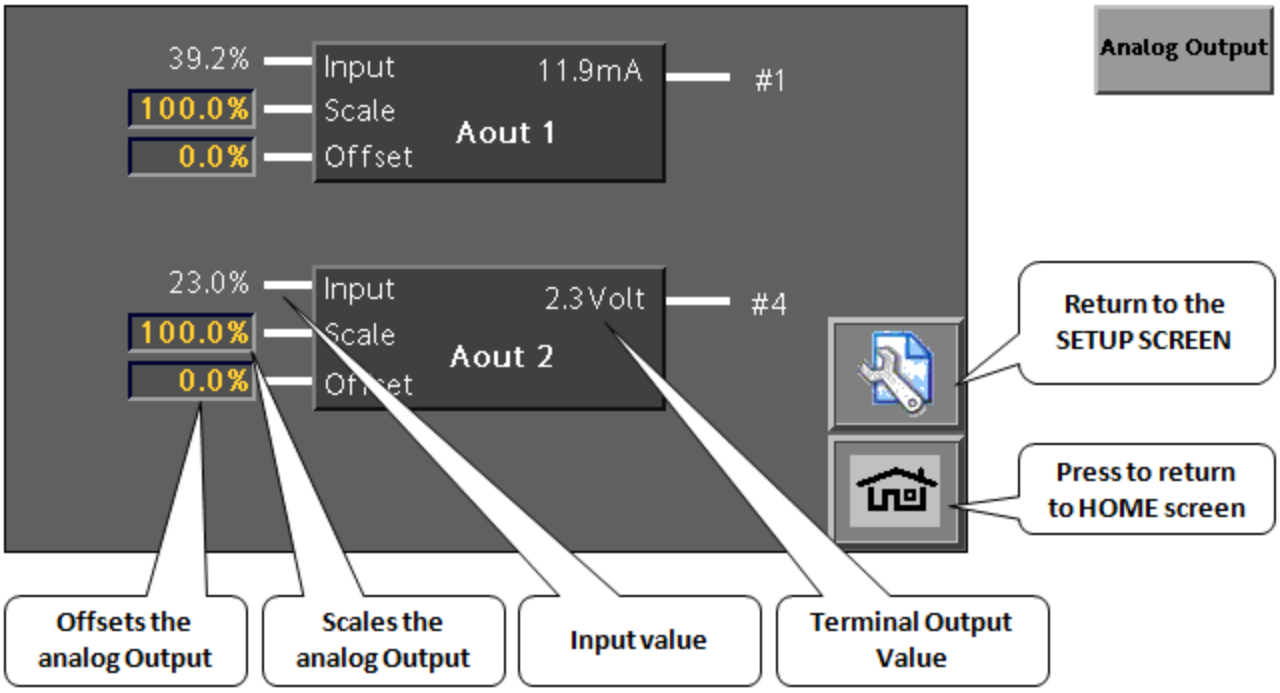
7.3 Digital Outputs



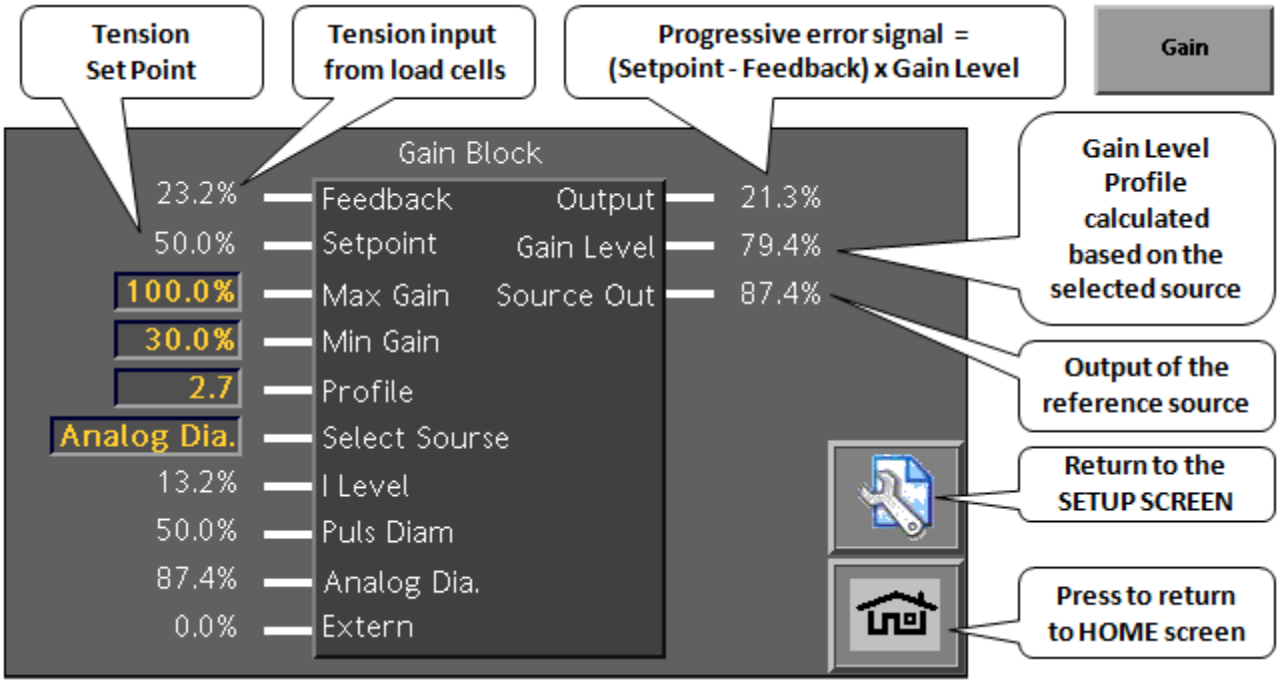
7.4 Analog Inputs



7.5 Analog outputs



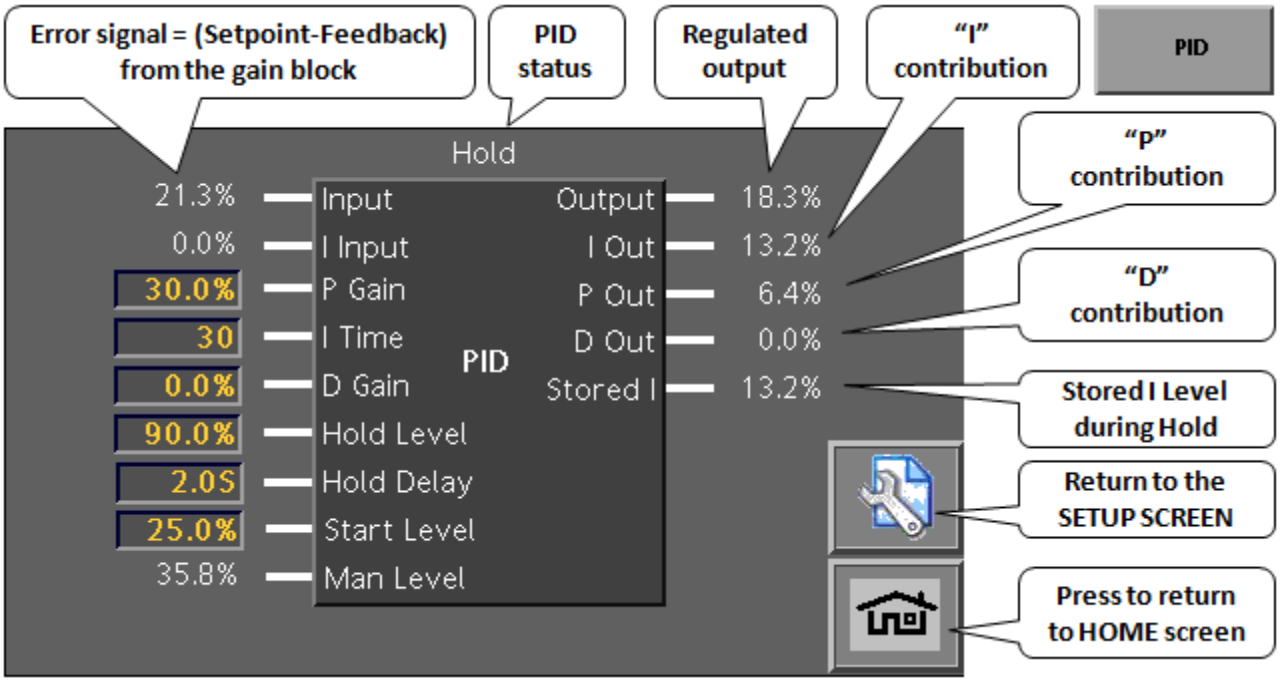
7.6 Gain setup screen



Parameter	Description	Value
Max. Gain	Gain value at max. roll diameter	– 300.0 % Default: 100.0 %
Min. Gain	Gain value at min. roll diameter	– 100.0 % Default: 30.0 %
Profile	Gain characteristic (max. To min. roll diameter)	– 3.0* Default: 1.0
Select Source	Select source of Error - Gain characteristic	1=I Level (Default) 2=Puls Dia. 3=Analog Dia. 4=Extern
I Level	Integrator level of PID controller	0.0 – 100.0 %
Puls Dia.	Calculated roll diameter through proximity switches	0.0 – 100.0 %
Analog Dia.	Measured roll diameter through Ultrasonic- / Laser-Sensor	0.0 – 100.0 %
Extern	Free input for an external source	0.0 – 100.0 %

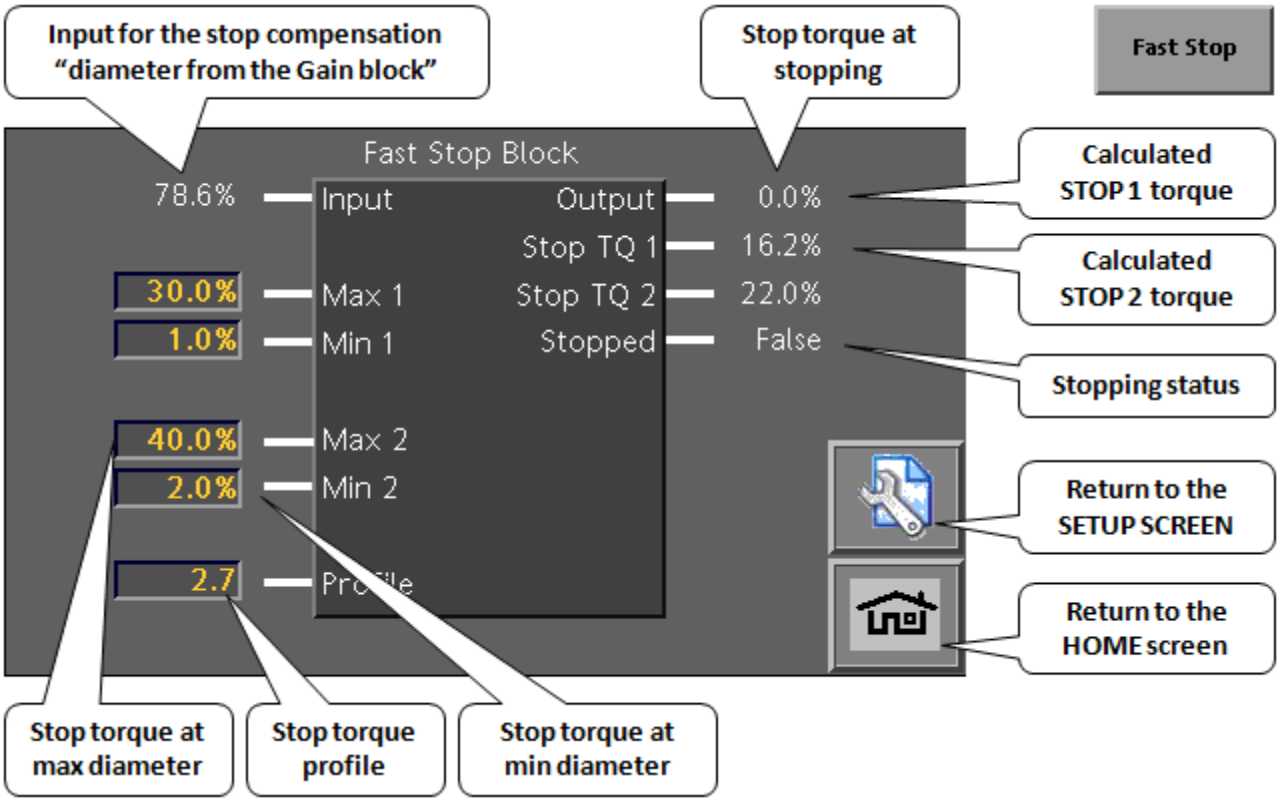
* 1.0 = linear course of gain from max. to min. roll diameter
  3.0 = max. progression of gain (diameter ^{3} ≈ inertia)

7.7 PID parameters setup



Parameter	Description	Value
P Gain	Gain value of P-share	0.0 – 300.0 % Default: 20 %
I Time	Re-adjustment time of I-share	0 – 200 s Default: 15 s
D Gain	Gain value of D-share	– 300.0 % Default: 0.0 %
Hold Level	Hold level of I-share (at machine standstill)	– 300.0 % Default: 90.0 %
Hold Delay		
Start Level	Start level of I-share (after roll change)	– 100.0 % Default: 25.0 %
Man Level	Manual adjustment of I-share (P + D not active)	0.0 – 100.0 %

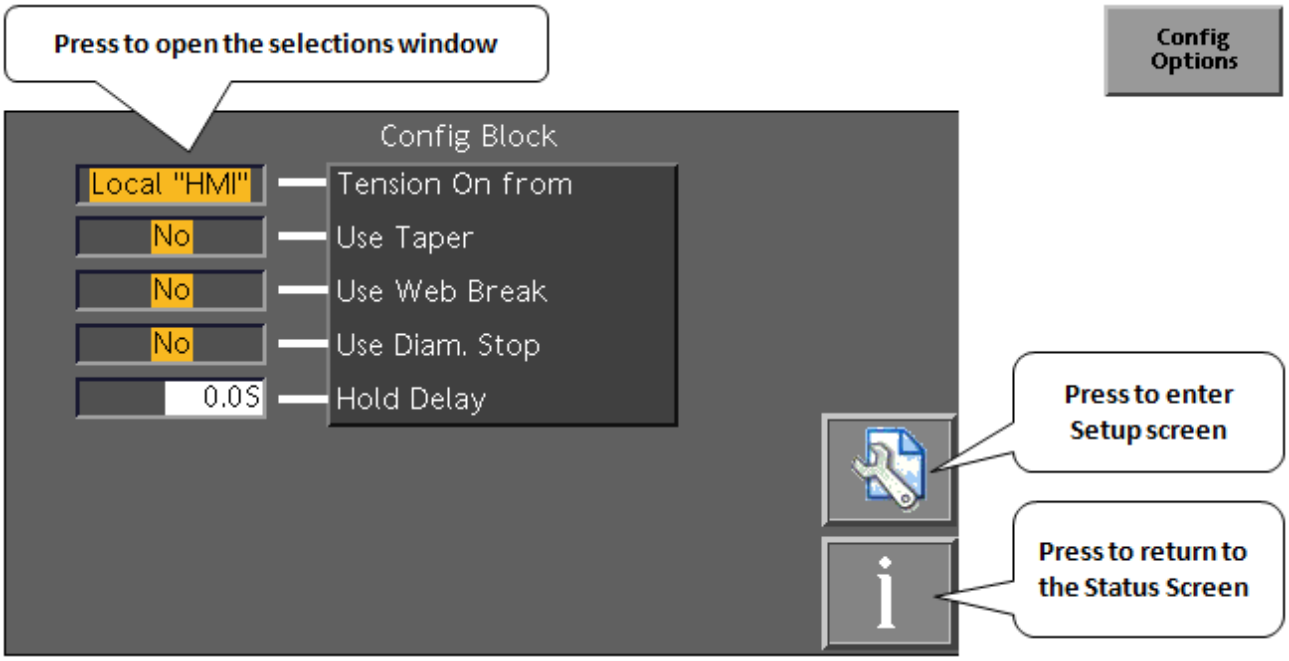
7.8 Fast Stops



Parameter	Description	Value
Max. 1	Contribution at max. roll diameter for 'Stop 1'	0.0 – 100.0 % Default: 40.0%
Min. 1	Contribution at min. roll diameter for 'Stop 1'	0.0 – 100.0 % Default: 1.0%
Stop 1	Activation of calculated contributory value for 'Stop 1'	False - True
Max. 2	Contribution at max. roll diameter for 'Stop 2'	0.0 – 100.0 % Default: 80.0%
Min. 2	Contribution at min. roll diameter for 'Stop 2'	0.0 – 100.0 % Default: 2.0%
Stop 2	Activation of calculated contributory value for 'Stop 2'	False - True
Profile	Gain characteristic (max. To min. roll diameter)	– 3.0* Default: 2.7

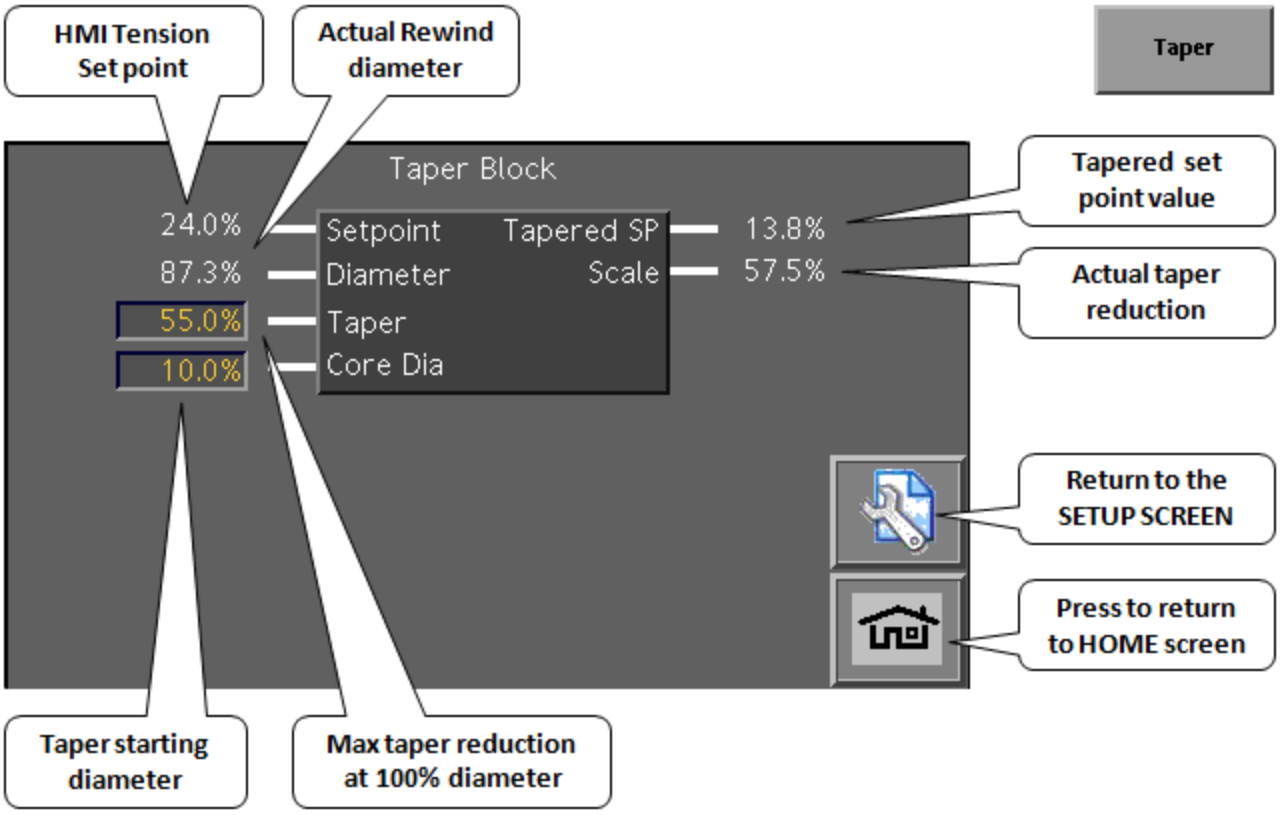
* 1.0 = linear course of gain from max. to min. roll diameter
  3.0 = max. progression of gain (diameter ^{3} ≈ inertia)

7.9 Config Screen “optional functions”

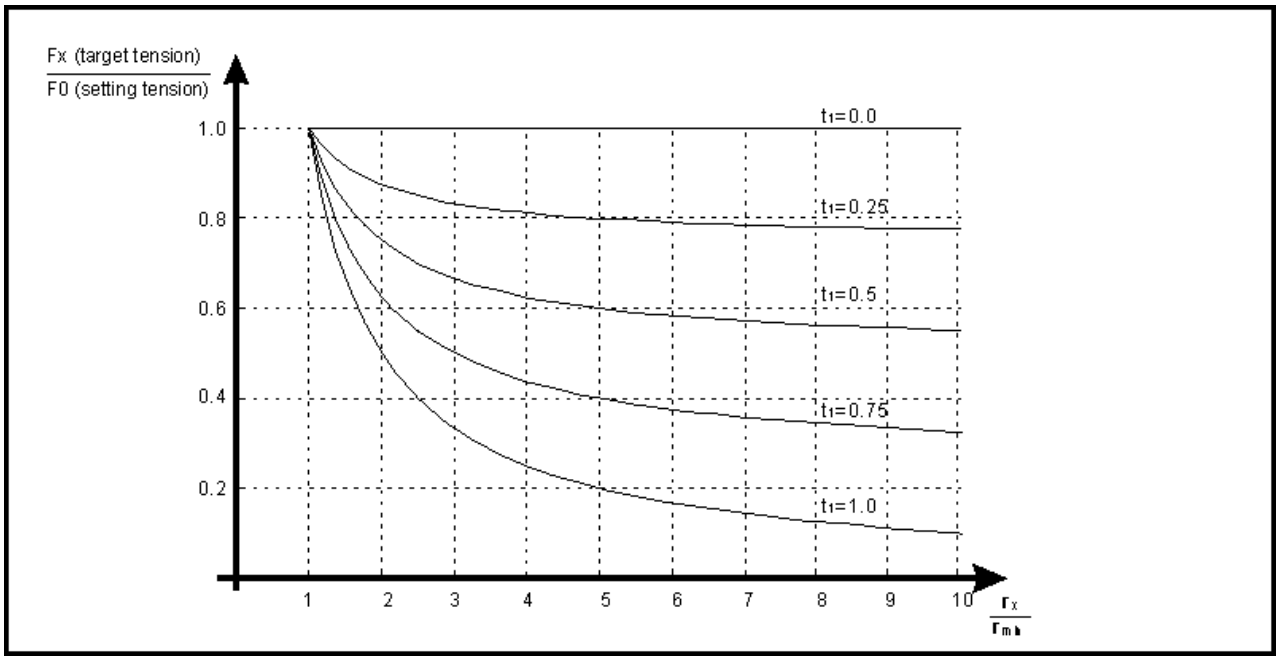


Tension On From: selection HMI or Digital input 6

7.10 **Taper tension Taper tension**



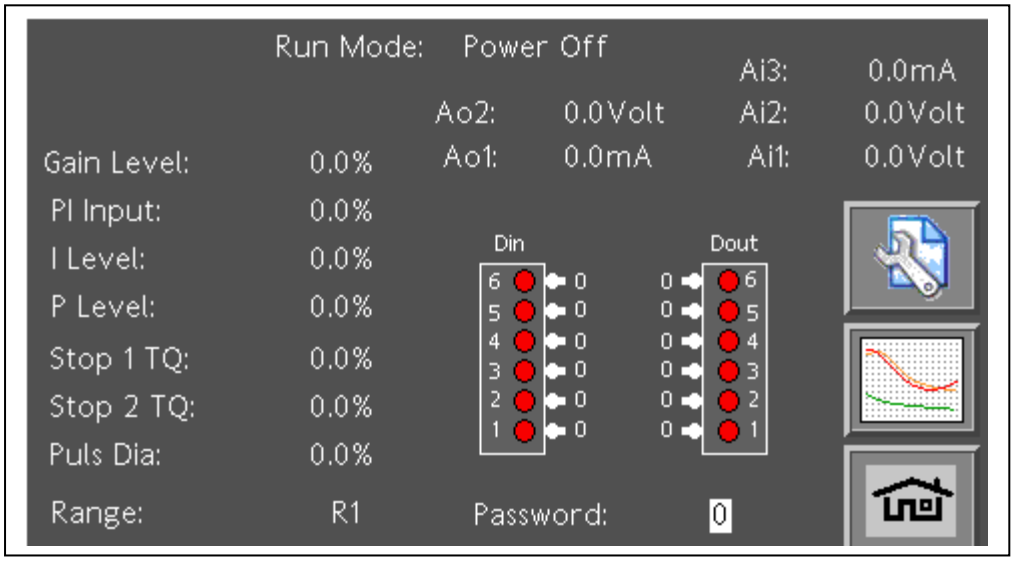
In winding systems, decreasing the tension while the winder radius increases is called taper tension control, this can make the inner of the winder tighten and the outer of the winder loosen, thus avoid slipping (telescoping rolls).



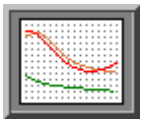
7.11 **Status Screen and Chart recorder**

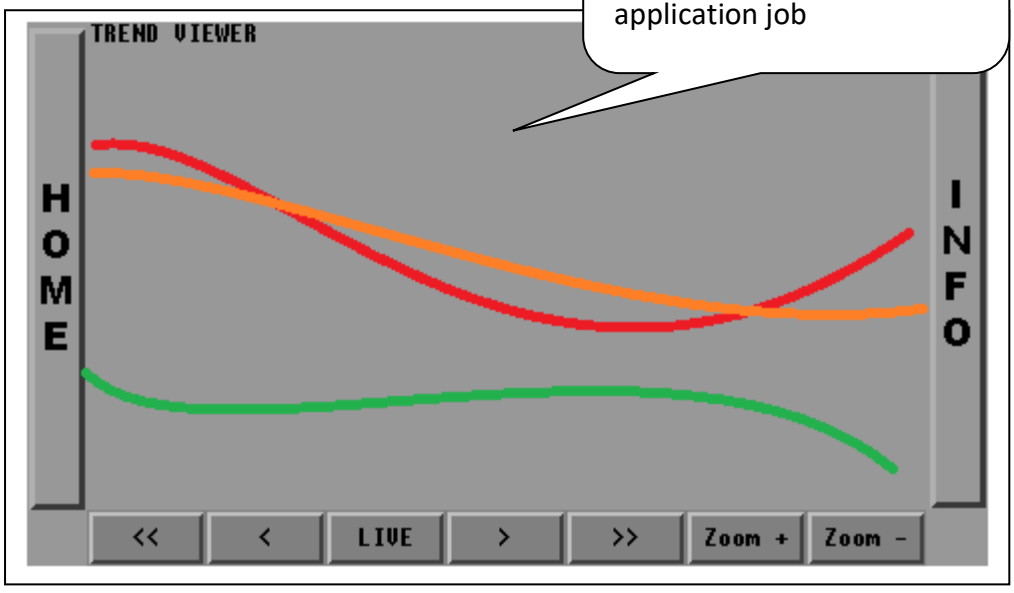
If the system experiences a power-down situation, the controller status i.e. setpoints and mode are stored. *At power on, the controller returns to the stored status.*

Use the Status page, press : 



Use the built in Chart Viewer for analysis of the present running application .

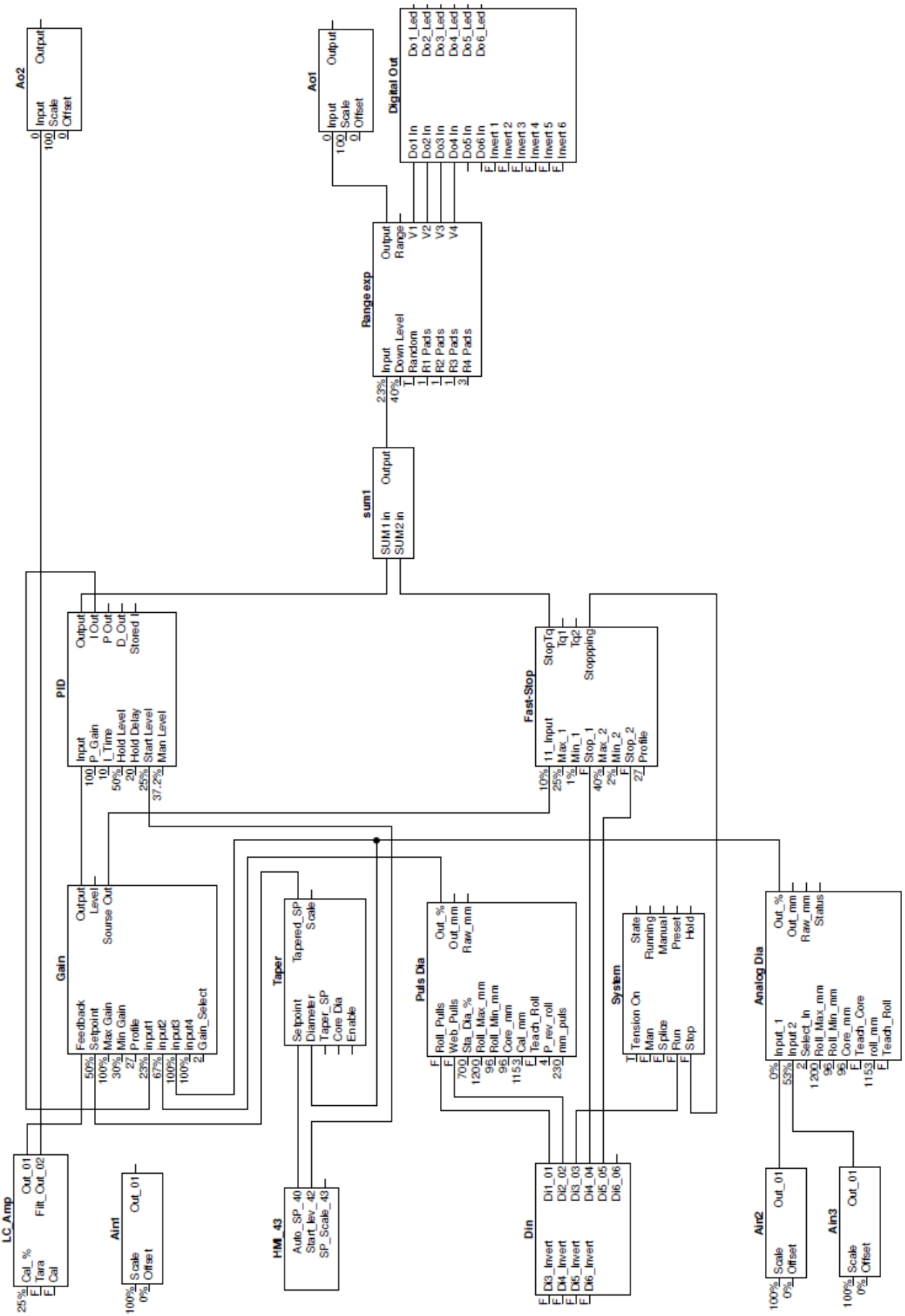
Press: 



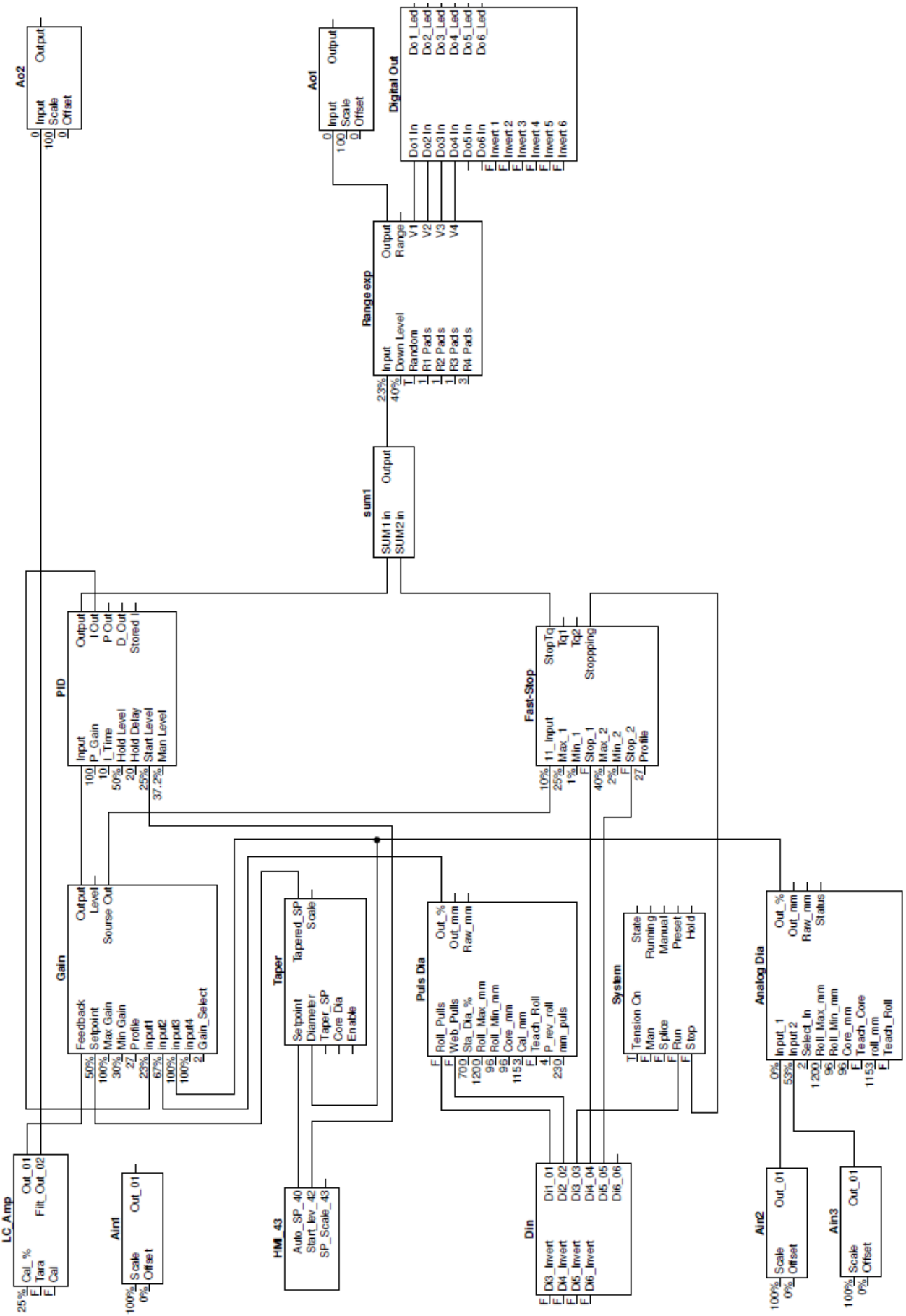
The Chart Viewer draws and saves a live picture of the signals of the present application job

8 Block diagram

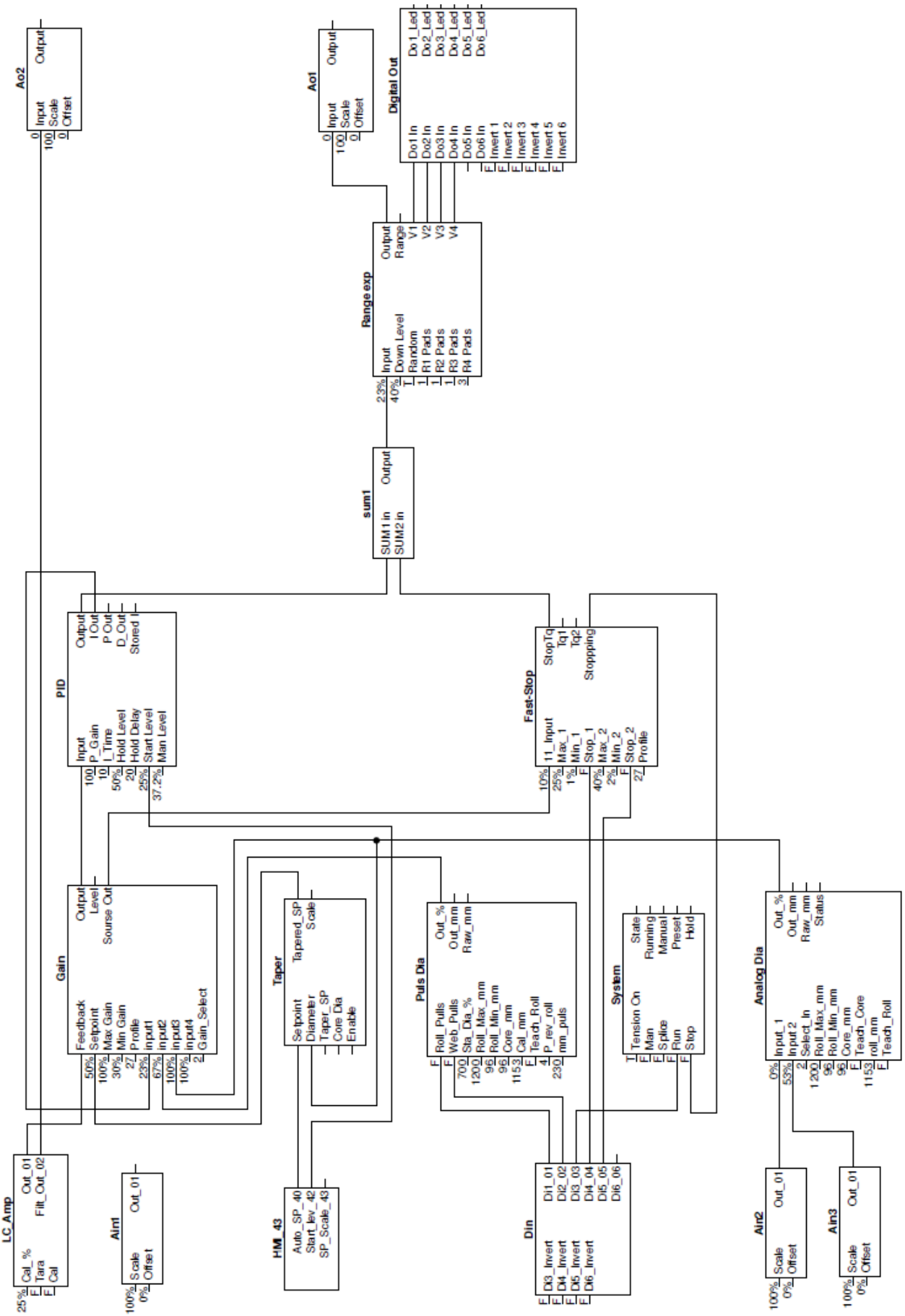
8.1 OWC310 Open Loop Unwind



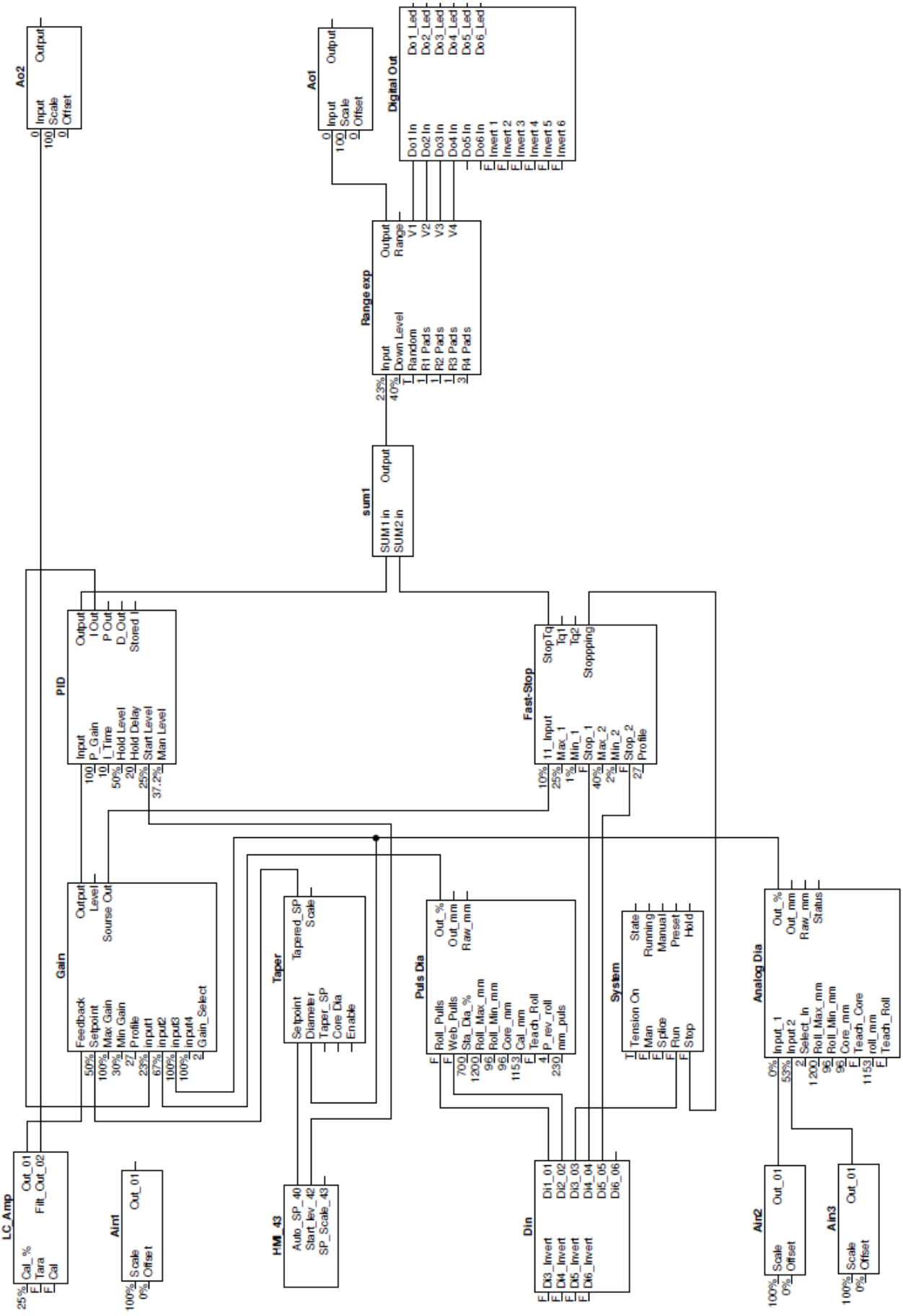
8.2 OWC320 Dancer controller Unwind



8.3 **OWC330 Load Cell controller Unwind**



8.4 **OWC330 Load Cell controller Rewind**



9 Communication

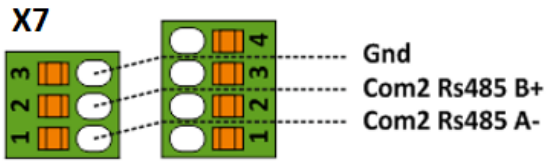
The OWC300 series amplifier supports Modbus Slave protocols RTU and optional TCP

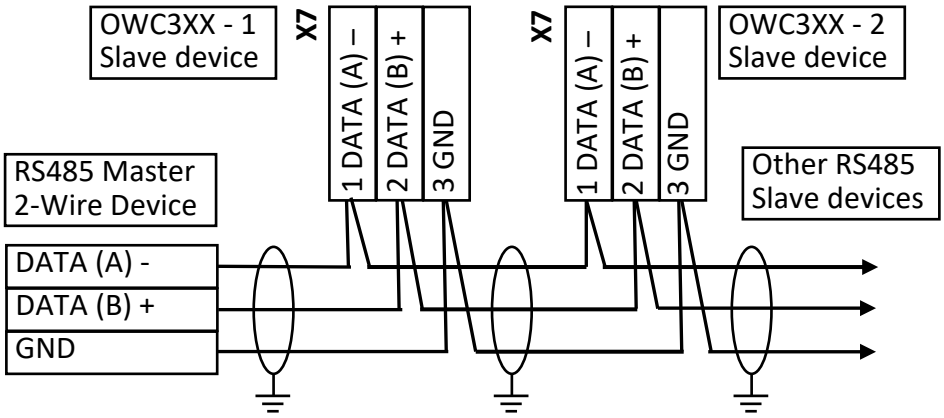
9.1 Modbus RTU RS485

Modbus is a serial communication protocol developed by Modicon published by Modicon® in 1979 for use with its programmable logic controllers (PLCs). In simple terms, it is a method used for transmitting information over serial lines between electronic devices. The device requesting the information is called the Modbus Master and the devices supplying information are Modbus Slaves. In a standard Modbus network, there is one Master and up to 247 Slaves, each with a unique Slave Address from 1 to 247

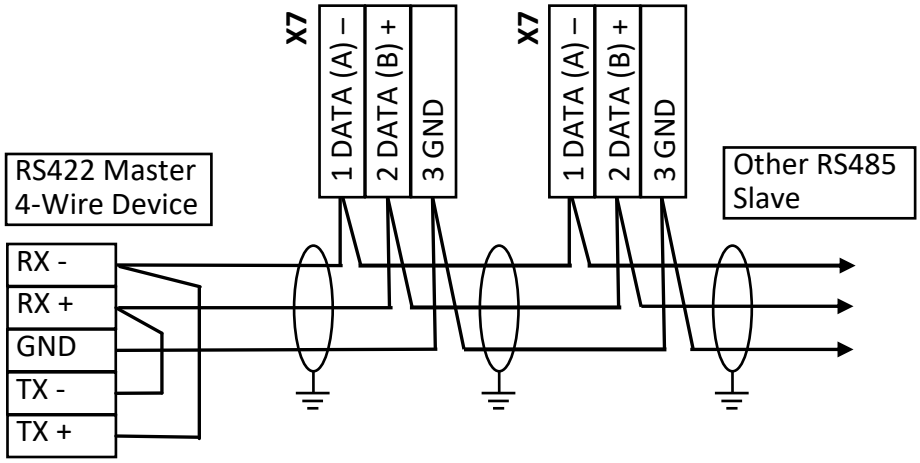
The Modbus RTU Master sends data on the two data lines while all Modbus RTU Slave devices listen. The Modbus RTU Slave recognizing itself as the destination of the message now becomes the sender and sends the response. The Modbus RTU Master becomes a listener after finishing transmission to get the response from the Modbus RTU Slave. Transmissions like this are known as Half Duplex communications.

9.1.1 Wiring diagram with 2-wire master





9.1.2 Wiring diagram with 4-wire master



9.2 Port setting terminal X7 on the PCB

Adress	Block	Description	Range	Default	PW Level
402301	ModBus	Modbus slave address	1-254	247	PW3
402302	ModBus	Modbus slave baudrate:	48 = 4800 bps 96 = 9600 bps 192 = 19200 bps 576 = 57600 bps 1152 = 115200 bps	576 = 57600	PW3
401803	ModBus	Modbus slave parity	0 = None 1 = Even 2 = Odd	1 = Even	PW3

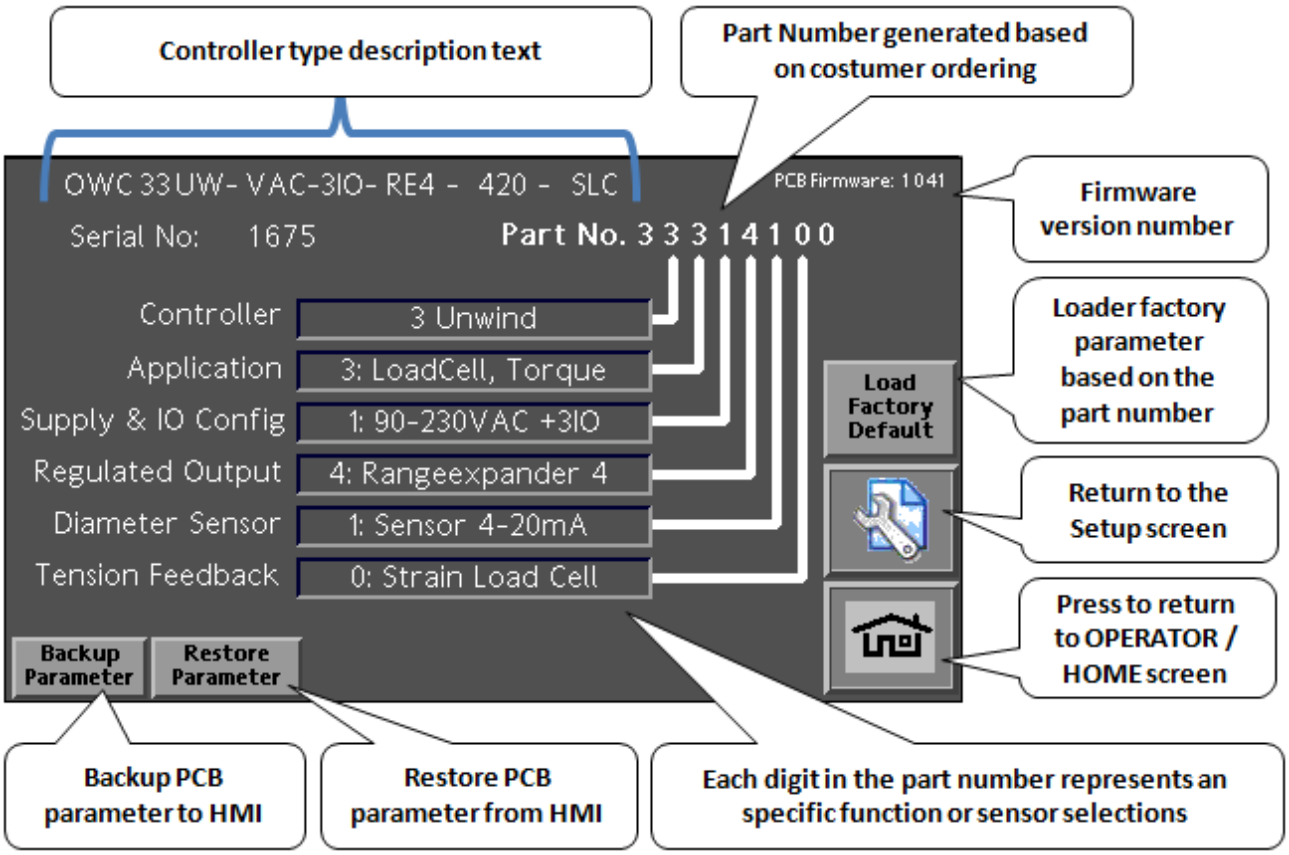
9.3 Holding parameters (Short List) No Password

Adress	Block	Description	Type	Range
404325	HMI	Auto Setpoint	Int16 R/W	0 to 10000 0 to 100.00%
401701	Loadcell	Calibrated output from Loadcells	Int16, Ro	-30000 to 30000 -300.00 to 300.00%
402701	PI	PI output	Int16, Ro	-30000 to 30000 -300.00 to 300.00%
402702	PI	I Level output	Int16, Ro	-30000 to 30000 -300.00 to 300.00%
402703	PI	P Level output	Int16, Ro	-30000 to 30000 -300.00 to 300.00%
402801	Sum1	Total regulated output	Int16, Ro	-30000 to 30000 -300.00 to 300.00%
403101	ADia	Diameter in %	Int16, Ro	0 to 10000 0 to 100.00%
403102	ADia	Diameter in mm	Int16, Ro	0 to 3000mm

10 Appendix

10.1 Part Number and ordering info

10.1.1 Part Number Screen



The controller configuration is based on the part number to insure optimal costumer configuration and spare parts handling

In case of a defective PCB or operator HMI the system is capable of re programming the components for further information contact costumer service

10.1.2 Part Number Selection plan