SMART II

GRAVIMETRIC CONTROL FOR

BeltColor & GraviColor

USER MANUAL

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Note: the screw body and some mechanical drawings in this manual are a product of Plastore Inc. USA (www.plastore.com).

Table of Contents

1. General Description

The Sysmetric Smart control unit operates and controls single channel gravimetric dosing units of the BeltColor and GraviColor type. The Smart control unit provides a user interface enabling setting required production outputs and tracking system work performance and system data.

Smart Control Unit

The BeltColor is a gravimetric belt conveyor based doser whereby the material is fed by a belt. The GraviColor is a gravimetric screw based doser whereby the material is fed by a screw.

GraviColor Gravimetric Dosing System

BeltColor Gravimetric Dosing System

Both units are gravimetric dosing systems designed to handle additives, both granulated material and micro pellets with outputs of up to 50Kg/Hour.
The systems consist of three main parts:

- Feeding unit: Belt conveyor or screw
- Weighing unit for automatic output calibration
- Venturi conveyer for loading material

The Smart controller supports three different modes of operation:

- Injection – for injection molding machines. Additive is fed according to plastification/injection cycles of the injection molding machine.
- Continuous– for extrusion. Additive is fed continuously at a given Kg/Hour.
- Analog – for extrusion. The output is defined by Kg/Hour or by percentage of the extruder's output and controlled by analog input (0-10Volt).

1.1. Features

- Servo / Modeling technique for accurate and stable system control
- Color touch screen
- Multi-language simple interface
- Galvanic isolation on all inputs and outputs (analog and digital) for electrical protection
- Isolated 10/100Mps Ethernet network connection for TCP/IP and Modbus communication
- Integrated machine data acquisition
- Remote PC control compatibility with ***Vision MES*** software extrusion and injection modules
- Rigid mechanical structure
- Automatic material parameter tuning
- Easy material emptying and system cleaning
- 0.1g weighing resolution
- Loss-in-weight measurement technique
- Stepper motor operated (1600 steps per revolution)
- Dynamic range:
    - For BeltColor: 1:1500
    - For GraviColor: 1:600 (screw speed 0.3-225rpm)
- Typical flow rate:
    - BeltColor: 0.033-50kg/hour for granulated material, 0.010-15kg/hour for micro pellets
    - GraviColor: 0.05-30kg/hour

Note: When using BeltColor with micro pellets and/or extremely low outputs it is recommended to use an alternative material-guide. Contact Sysmetric for more details.

1.2. About This Manual

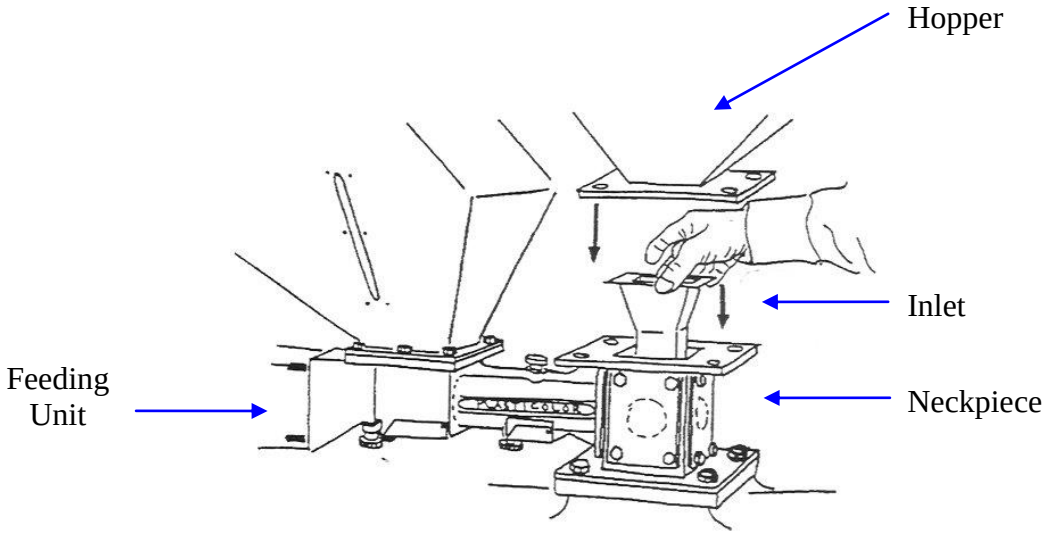
This manual describes the installation and operation of the Smart controller for both the BeltColor and GraviColor units. Most of the chapters are relevant to both units. When the information is pertinent to one of the units only, the appropriate unit - BeltColor or GraviColor, is specified. It also describes the correct and safe installation and operation of the BeltColor and GraviColor units. Please read this manual entirely before first time operation.

2. Installation

2.1. Feeding Unit Installation

1. Remove the material hopper from the injection/extrusion machine.
2. Install the neckpiece on the injection/extrusion machine.
3. Place the inlet inside the neckpiece.
4. Reposition the material hopper on top of the neckpiece.
5. Connect the feeding unit to the neckpiece. Note that the unit can be connected to the neckpiece in one of four directions. Pick the direction that provides the best accessibility to the operation switches and the drain/teach ports.
6. Fasten the flexible hose of the venturi conveyer to the material inlet at the top of the feeding unit. Connect the compressed air pipe to the air outlet on the side of the feeding unit.
7. Connect compressed air supply to the air inlet on the side of the feeding unit.

Note: Supply the feeding units with compressed dry air 6-8Bar.



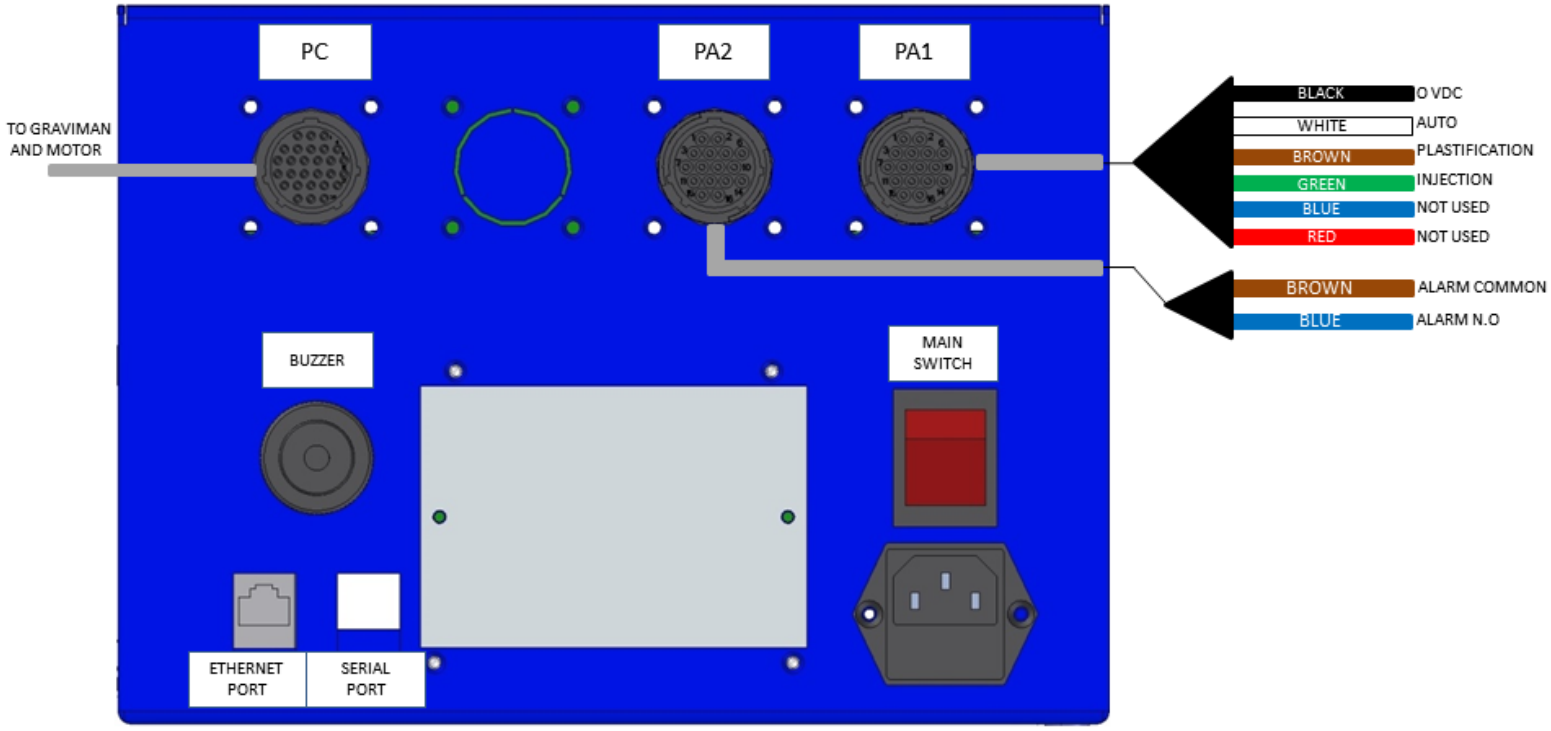
Feeding unit installation

2.2. Control Unit Installation

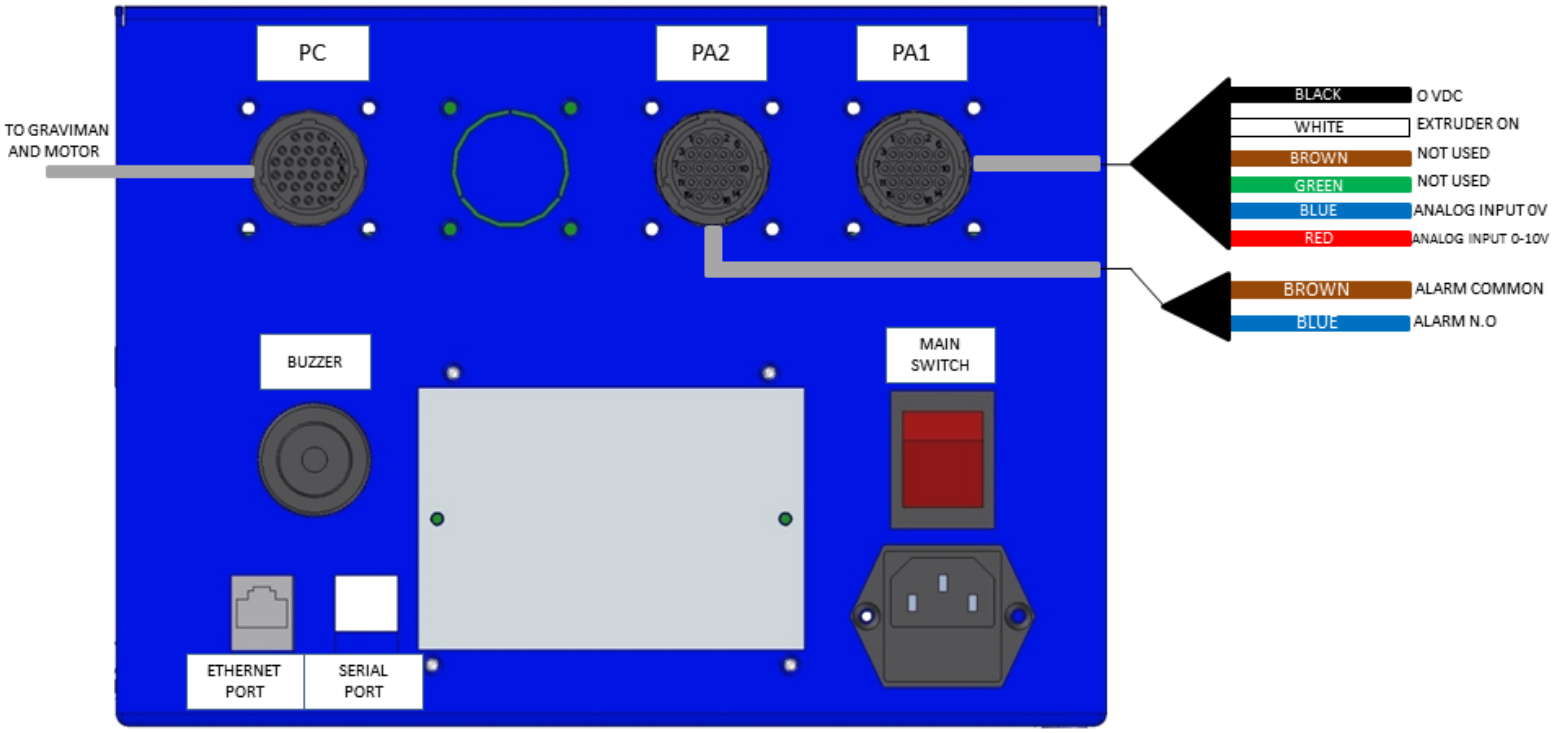
1. Install the control cabinet near the feeding unit. Take into consideration accessibility to the controller's display when positioning the cabinet.
2. Connect the power cable to the power supply. (Single phase 110-240Volt, 50/60Hz, 1A).
3. Wire the control cable PA1 of the unit (6 wires shielded cable):
   For injection molding machines:
   - Automatic mode signal – dry contact (Normally Open) between the white wire and the black wire. This signal should indicate if the injection molding machine is working in manual mode or automatic mode. If this signal is not supplied connect the white wire to the black wire permanently to set the feeding unit to automatic mode regularly.
   - Plastification signal – dry contact (Normally Open) between the brown wire and the black wire. This signal should indicate when the injection molding machine is filling material. This signal should be on throughout the plastification cycle of the injection molding machine.
   - Injection signal – dry contact (Normally Open) between the green wire and the black wire. This signal should indicate when the injection molding machine is doing the injection cycle. This signal should be on throughout the injection cycle of the injection molding machine. The injection signal is optional and is used to feed additive during injection cycles. See chapter 4.14.1 for more details.

   For extrusion machines:
   - Extruder On signal – dry contact (Normally Open) between the white wire and the black wire. This signal should indicate when the extruder is working. If this signal is not supplied connect the white wire to the black wire permanently.
   - Analog input – the analog signal is between the red and the blue wires. Blue wire is 0V and red is 0-10V.
4. Alarm – if required connect the alarm cable PA2 (two wires cable) to an external alarm system. The alarm cable is connected to a dry contact (normally open) that closes on system alarm.
5. Plug the PC cable between the graviman and the control cabinet. The plug and the socket are marked PC.
6. Turn on the power supply switch at the back of the control unit.

Caution!
Electrical maintenance should be carried out by authorized personnel only!



Power supply and typical control wiring for injection molding machines

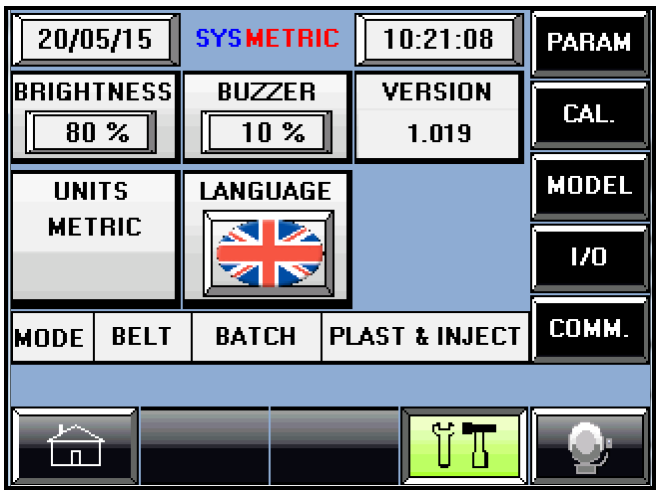


Power supply and typical control wiring for extrusion machines

3. Unit Configuration

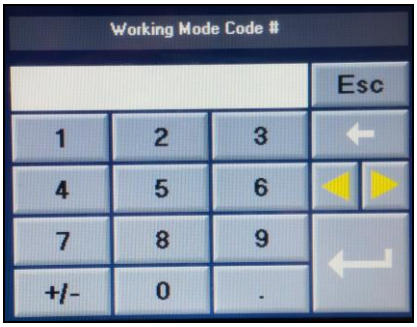
The SMART controller can work with different feeding units and supports different modes of operation. During first time operation the SMART should be configured to the specific feeding unit and to the required operation mode.

During the first power up of a new unit the controller will automatically start up on the language selection screen followed by the configuration screen. These screens can be accessed at a later date via the service screen.
To change the configuration, language or working mode, after first time operation press the service button  to access the service screen:



Service Screen

In the service screen press the flag button to access the language selection screen.
In order to change the working mode press the *MODE* label. You will be required to enter the access code 1397.



Access Code Screen

Enter the code: 1397 to enter the Work Mode Configuration Screen.

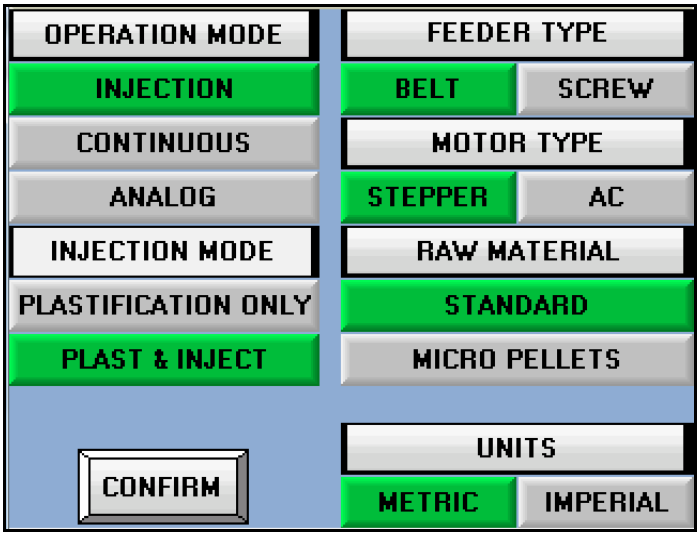
3.1. Language

In order to select a language press the corresponding button.

Language Selection Screen

3.2. Configuration Screen

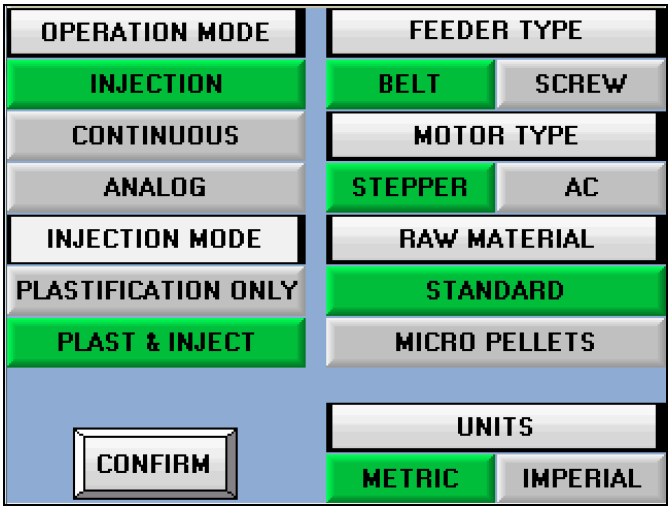
The configuration screens enable the user to select the operation mode, feeder type, motor type, material type and more.



Configuration Screen

3.2.1. Operation Mode

Press the corresponding button to select the system's operation mode:



Configuration Screen

INJECTION – for injection molding machine

CONTINUOUS – for continuous extrusion

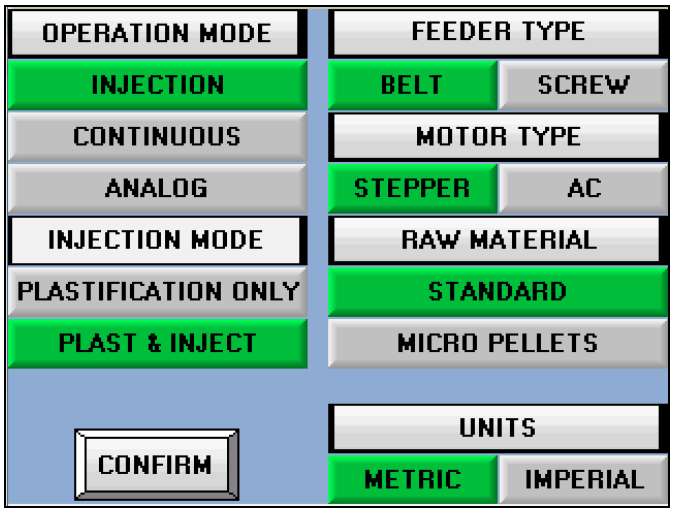
ANALOG – for continuous extrusion with output controlled by analog voltage (0-10 Volt)

3.2.1.1. Injection Mode

Select injection mode for injection molding machines. In the injection mode there are two sub operation modes "Plastification only" and "Plastification & Injection". Select the required mode:

PLASTIFICATION ONLY - feeding additive only during plastification (common mode).

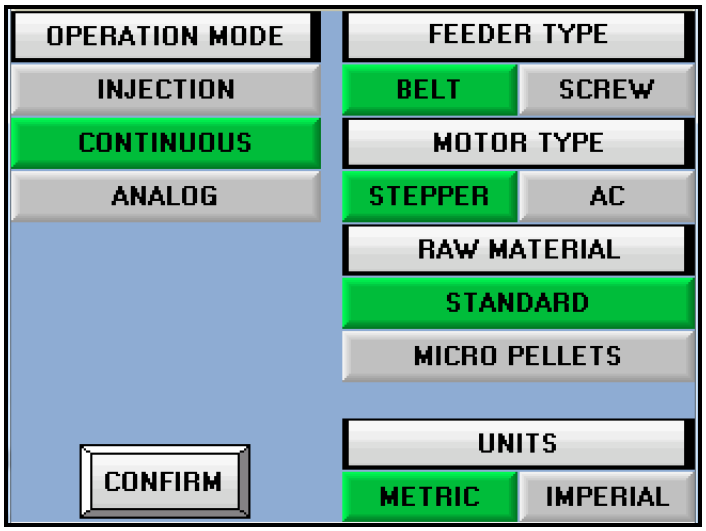
PLAST & INJECT – feeding additive during plastification & injection.



Configuration Screen

3.2.1.2. Continuous Mode

Select continuous mode for continuous extrusion:



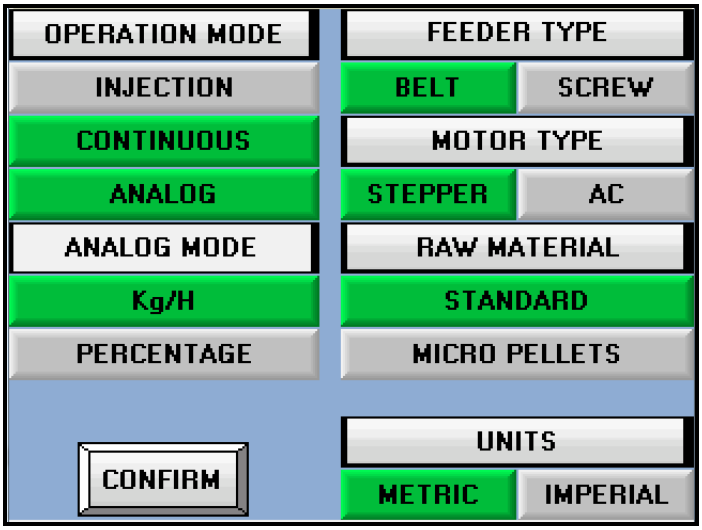
Configuration Screen

3.2.1.3. Analog Mode

Select analog mode for extrusion applications where the unit capacity is controlled with an external analog reference signal. In the analog mode there are two sub operation modes "Kg/H" and "percentage". Select the required mode:

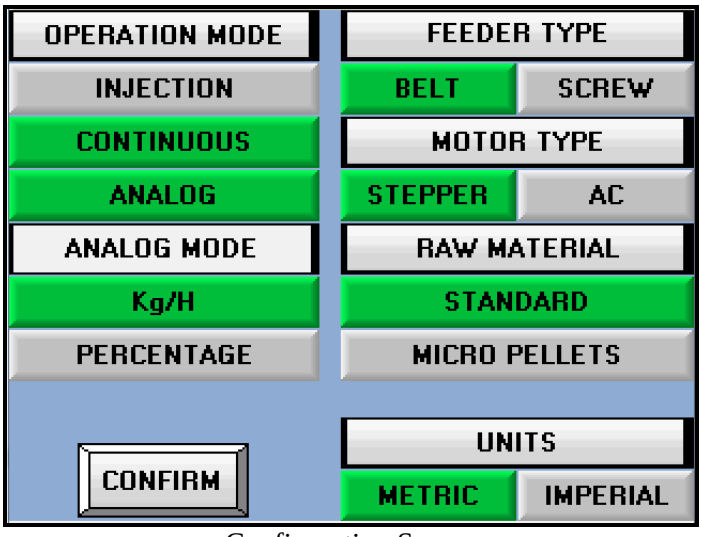
Kg/H – The analog input defines the set capacity in Kg/h or lb/h.

PERCENTAGE – The analog input defines the extruder capacity (the unit's capacity is set as a percentage of the extruder's capacity).



Configuration Screen

3.2.2. Feeder Type



Configuration Screen

Press the corresponding button to select the system's feeder type:
BELT – for BeltColor
SCREW – for GraviColor

3.2.3. Motor Type

Press the corresponding button to select the system's motor type:
STEPPER – for step motor
AC – for AC motor

3.2.4. Raw Material

Press the corresponding button to select the system's feeder type:
STANDARD – for standard raw material
MICRO PELLETS – for micro pellets

3.2.5. Units

Press the corresponding button to select the system's feeder type:
METRIC– for metric units
IMPERIAL – for imperial units

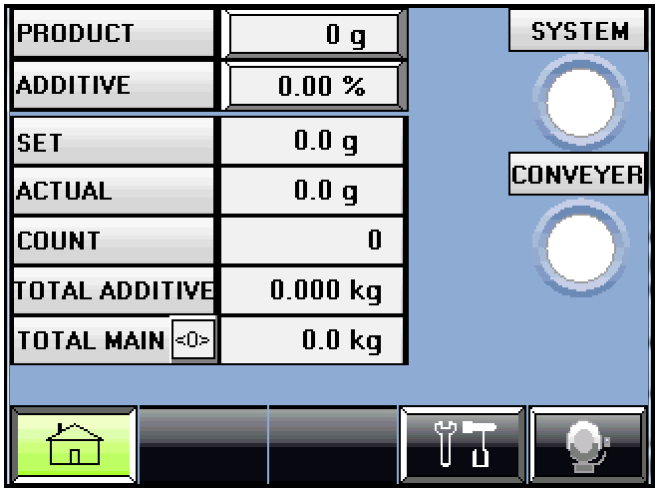
4. Operation Screens

4.1. Injection Mode

For operating in injection mode the user has to set the product weight and the additive percentage. The SMART, using those parameters, will add the additive according to plastifications/injections cycles of the injection molding machine.
The SMART controller has two sub-modes of operation for injection molding machines. (See chapter 3 for changing operation mode):

- Feeding additive only during plastification cycles of the injection molding machine. This is the common mode and it is applicable with all injection molding machines.
- Feeding additive during plastification cycles and during injection cycles of the injection molding machine. This mode is applicable with relatively large injection molding machines, where a significant amount of the main material enters the extruder during the injection cycle, and can spread the additive more uniformly. In this case the user has to set the percentage of additive to be fed during injection cycles.

4.1.1. Injection – Main Screen

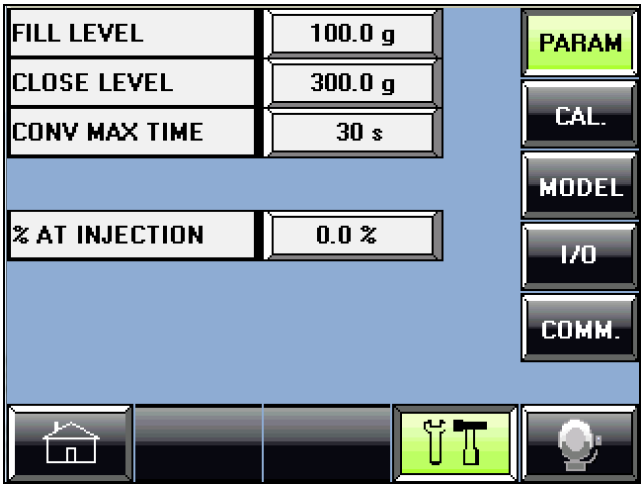


Main Screen

PRODUCT - Enter the Product weight.
ADDITIVE - Enter the percentage of additive to the Product.
SET - The set additive weight per cycle
ACT – The actual additive weight per cycle
COUNT – Product counter
TOTAL ADDITIVE – Total weight of additive
TOTAL MAIN – Total weight of main material
<0> - Press to reset the "*totals*" counters. Resetting the totals requires the access code (1234).

4.1.2. Injection – Percentage at Injection

When working in plastification & injection mode the percentage at injection parameter must be defined. This parameter is in the parameter screen in the service menu. See chapter 11.1 on how to access the parameter screen.



Service Screen

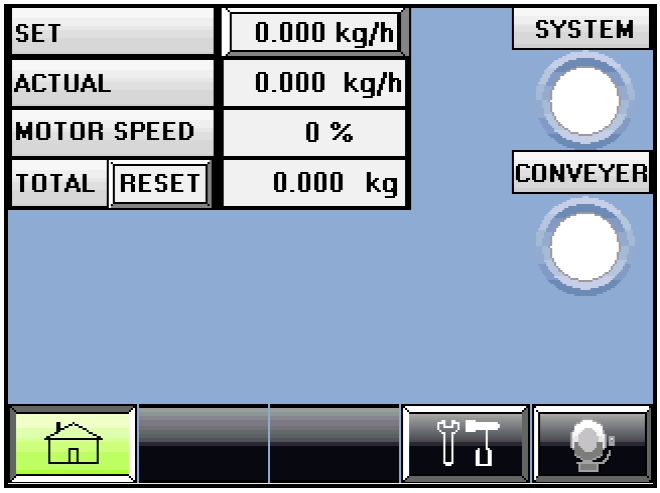
% AT INJECTION – percentage of additive to be fed during injection cycles of the injection molding machine.

Additive fed during injection cycles is part of the total percentage of additive. Setting percentage of additive at injection does not change the overall amount of additive that is fed to the injection molding machine.

4.2. Continuous Mode

When operating the BeltColor and GraviColor in continuous mode the additive is fed continuously at a set output of Kg/Hour that is defined by the user.

4.2.1. Continuous – Main Screen



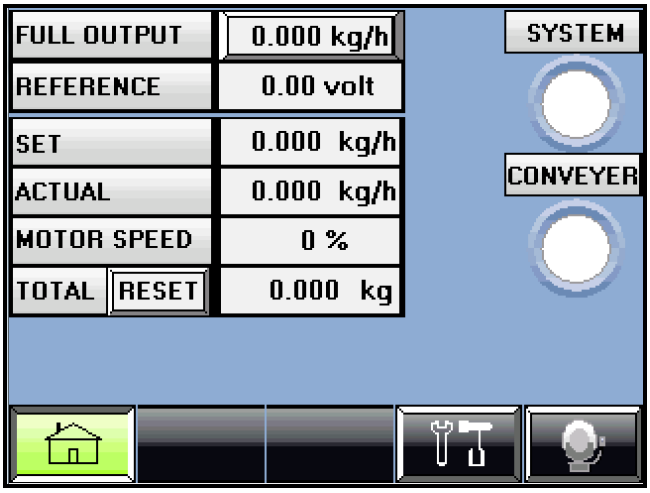
Main Screen

SET – Defined output.
ACTUAL – Actual system's output
MOTOR SPEED – Feeder's motor speed in percentage
TOTAL – Total weight of additive
RESET – Press to reset the "*Totals"* counter. Resetting the totals requires the access code (1234).

4.3. Analog Mode – Kg/H

When operating the BeltColor and GraviColor in this mode the user defines the maximum output by Kg/Hour and the SMART adjusts the output relatively to the voltage at the analog input (0-10Volt).

4.3.1. Analog Kg/h – Main Screen



Main Screen

FULL OUTPUT – The full capacity of the feeder when the extruder is at full speed.
REFERENCE – The voltage at the analog input.
SET – Defined output by the analog input at 0-10Volt. Calculated from the *Full Output*.
ACTUAL – Actual material capacity.
MOTOR SPEED – Feeder's motor speed in percentage.
TOTAL – Total weight of additive.
RESET – Press to reset the "*Totals"* counter. Resetting the totals requires the access code (1234).

4.4. Analog Mode – Percentage

When operating the BeltColor and GraviColor in this mode the user defines the output as a percentage of the extruder's capacity. The unit receives the extruder's capacity by a reference voltage at the analog input (0-10Volt).

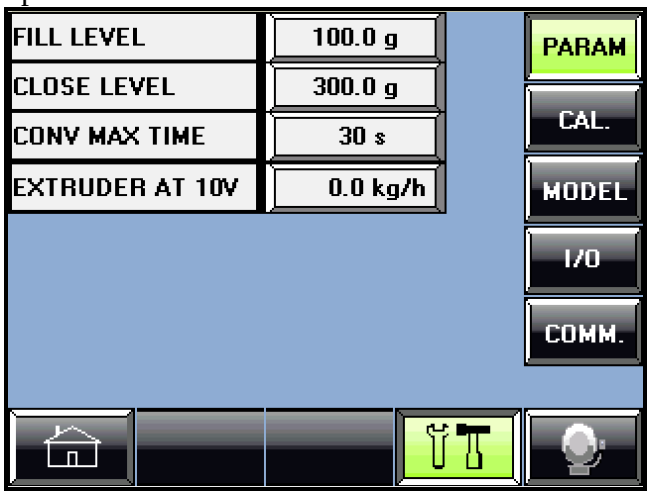
4.4.1. Analog Percentage – Main Screen

Main Screen

EXTRUDER – Current extruder capacity (according to the analog input 0-10Volt)
REFERENCE – The voltage at the analog input.
SET – Defined feeder output by percentage of the extruder capacity.
ACTUAL – Actual feeder output in percentage.
OUTPUT – Actual feeder output in kg/h.
MOTOR SPEED – Feeder's motor speed in percentage
TOTAL – Total weight of additive
RESET – Press to reset the "*Totals"* counter. Resetting the totals requires the access code (1234).

4.4.2. Analog Percentage – Extruder Capacity at 10V

When working in analog percentage mode the extruder at 10V parameter must be defined. This parameter is in the parameter screen in the service menu. See chapter 11.1 on how to access the parameter screen.



Service Screen

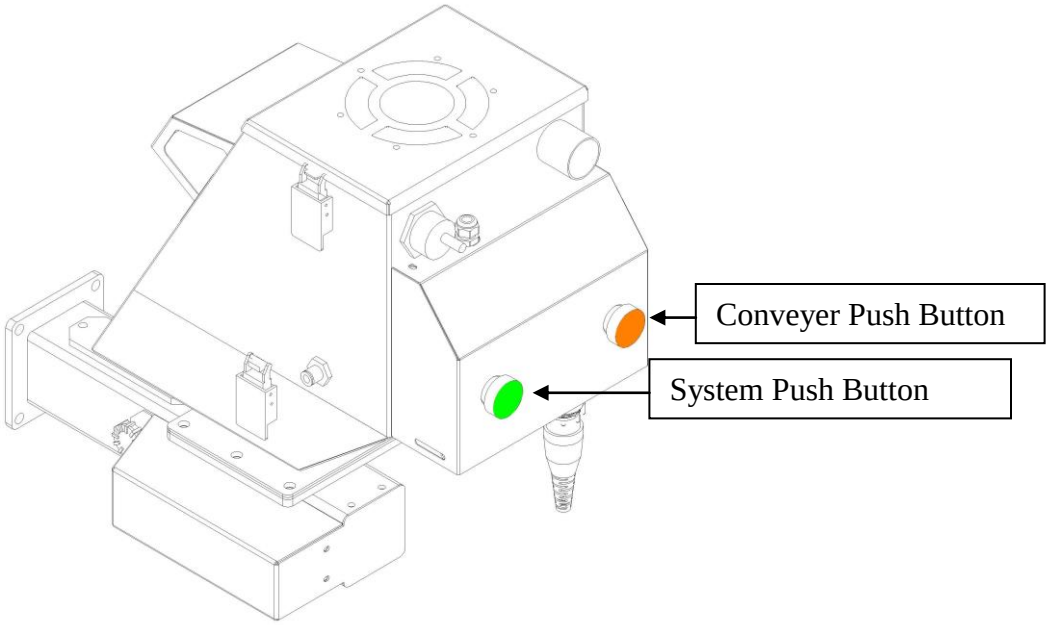
EXTRUDER AT 10V – set the full capacity of the extruder when the analog reference signal is 10V.

5. BeltColor Operation

5.1. Starting the BeltColor

1. Press the conveyer push button (orange push button) to activate the conveyer. The orange lamp on the push button will light up and the unit will load material into the conveyer hopper.
2. Press the system push button (green push button). The green lamp on the push button will start flashing alternately and the system will start a teach cycle. In this teach cycle the SMART learns the material parameters needed for correct operation of the BeltColor. The teach cycle lasts about 45 seconds and when finished the system push button lamp (green lamp) will stop flashing (or flash steadily if the system is in automatic mode / extruder on).
3. Using the SMART screens enter the required parameters for the BeltColor operation:
    - For injection mode – product weight and additive percentage
    - For continuous mode – set output of kg/hour
    - For analog mode kg/hour – set output at 10Volt
    - For analog mode percentage – extruder capacity at 10Volt and additive percentage
4. The BeltColor will start feeding material according to the operation mode:
    - At injection mode – according to Injection/Plastification signals.
    - At continuous mode – according to Extruder On signal.
    - At analog mode – according to Extruder On signal and the voltage at the analog input.

    During operation the green lamp will flash steadily to indicate normal operation.
5. If an alarm is activated during operation the system push button lamp (green lamp) will flash rapidly. If the alarm is related to the conveyer the conveyer push button lamp (orange lamp) will flash rapidly as well. In addition to these signals an alarm message will appear on the screen specifying the type of alarm and the unit buzzer turns on.



5.2. Emptying Material in the BeltColor

1. Press the system push button to stop the BeltColor.
2. Press the conveyer push button to stop material loading.
3. Place a bucket under the drain port of the BeltColor.
4. Press and hold the system push button to start the drain function. Hold the button until the BeltColor is empty.
5. Clean residual material using compressed air. Remove the conveyer hopper lid and clean the hopper. Turn the hopper aside and clean the weighing chamber. Pull out the belt conveyor and clean residual material.
6. Re-insert the belt conveyor and close the hopper.

6. GraviColor Operation

6.1. Screw Selection

Selecting the appropriate screw for the feeding unit is carried out according to the outputs required from the GraviColor. If the GraviColor is working in continuous mode (on extrusion machines) select a screw that will fit the expected outputs. If the GraviColor is working in injection mode (on injection molding machines) compute the continuous output in order to select an appropriate screw.

6.1.1. Output at Injection Mode

In order to select an appropriate screw for the feeding unit of the GraviColor when working in injection mode, compute the continuous output of the screw according to the following formula:

$$Output = Product \; x \; \frac{Additive}{Fill \;\; Time} \; x \; \frac{36}{1000}$$

- Output in Kg/Hour
- Product weight in grams
- Additive by percentage
- Fill Time in seconds

6.2. Screw Types

The following table details the available screws for the GraviColor and their typical outputs:

Suitable for PC2000

Screw Type	**6/12 white**	**8/15 Silver**	**10/17 Orange**	**13/20 Purple**	**15/22 Gold**	**17/25 Red**
Output Kg/Hour	0.1-1.4	0.2-3.8	0.3-8	0.5-15	0.9-22	1-28

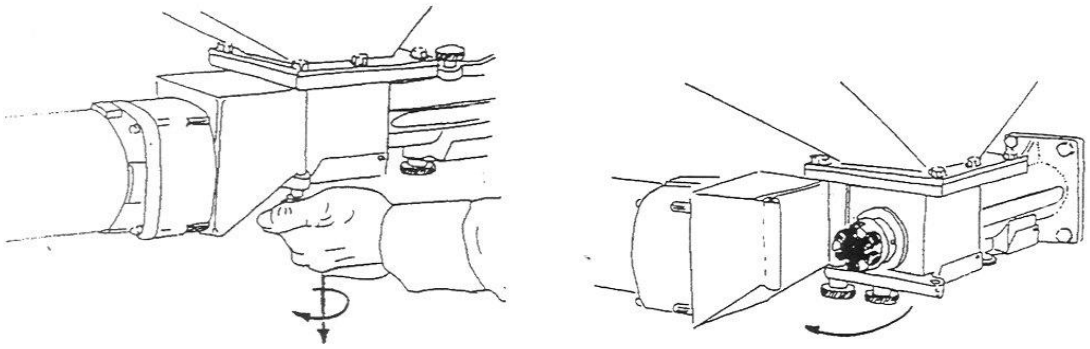
Suitable for PC3000

Screw Type	**6/12 White**	**8/15 Yellow**	**10/17 Orange**	**13/20 Brown**	**15/22 Gold**	**17/25 Red**	**25/34 Green**	**40 Black**
Output Kg/Hour	0.1-1.4	0.2-4.5	0.3-8	0.5-15	0.9-23	0.9-29	3.6-96	12.7-365

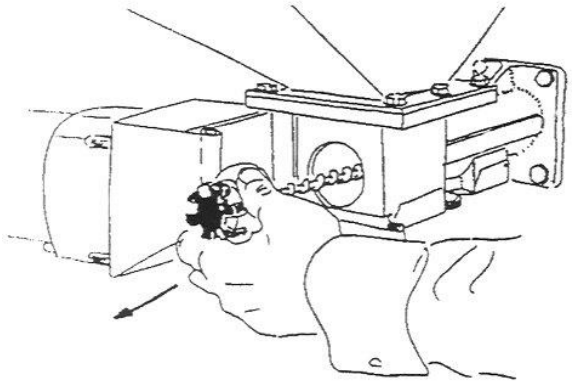
Note: the screw output depends on the material's characteristics (shape, size, volume etc.) so the actual output might differ from the data in the above table.

6.3. Screw Installation

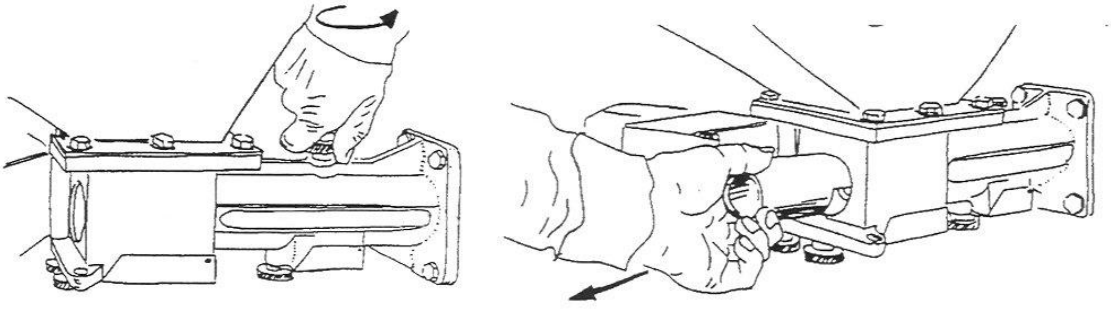
1. Empty all material from the GraviColor by opening the drain port and the test port at the bottom of the GraviColor.
2. Loosen and remove one of the motor hinge bolts and swing the motor aside.



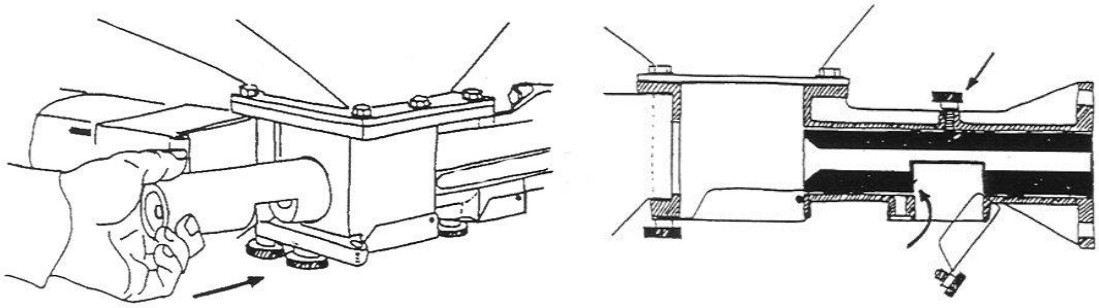
3. Pull the feeder screw out of the body housing.



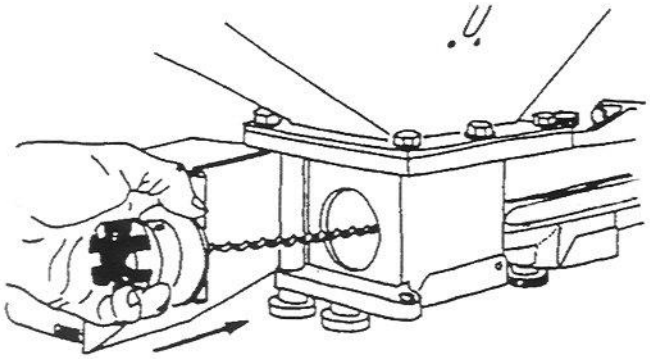
4. Loosen the locating knob on top of the feeder and pull the sleeve out of the housing.



5. Insert the new sleeve and tighten back the locating knob. Make sure that the cutout in the sleeve is facing downwards and aligned with the test port.

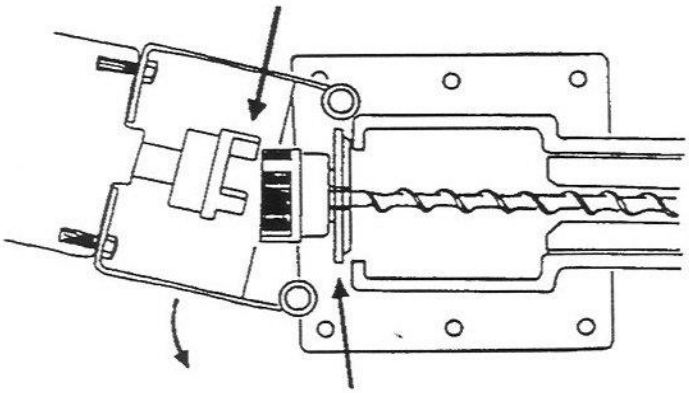


6. Insert the new feeder screw.

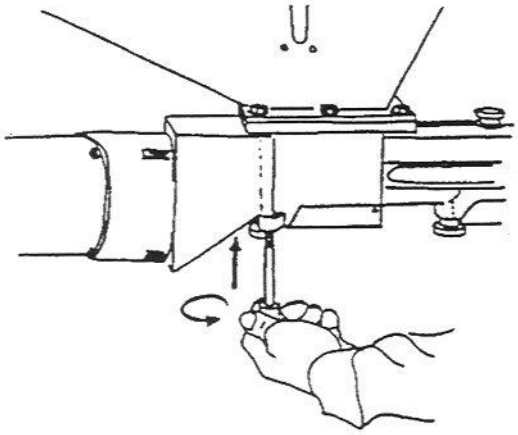


Note: never mix-up screw and sleeve combinations. They are color-coded for easy identification.

7. Turn motor shaft so that one of the coupling cogs points toward the motor hinge knob. Slide the feeder screw with the flex-coupling and housing seal out toward the motor coupling. Verify that the motor cogs fit into the flex-coupling and slowly swing the motor back into position.

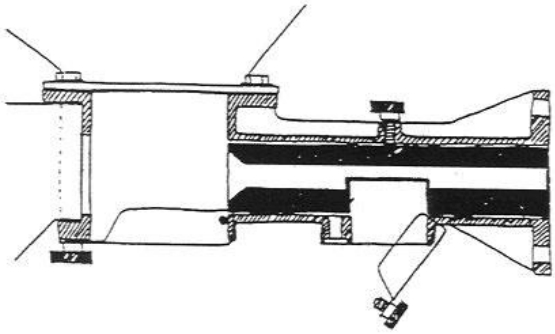


8. Re-insert and tighten the motor hinge knob.



6.4. Starting the GraviColor

1. Press the conveyer push button (orange push button) to activate the conveyer. The orange lamp on the push button will light up and the unit will load material into the conveyer hopper.
2. Open the test port at the bottom of the GraviColor and place a bucket underneath.



Test port

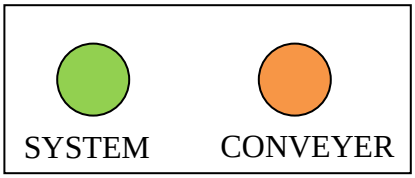
3. Press and hold the system push button (green push button) for two seconds to activate the teach cycle. The green lamp will start flashing alternately and the system will run the teach cycle to learn the material parameters needed for correct operation of the GraviColor. During the teach cycle material will flow out through the test port to the bucket. The teach cycle lasts about 1-2 minutes and when it ends the system push button lamp (green lamp) will stop flashing.

Note: the teach cycle can last up to 5 minutes depended on the material's characteristics and screw type. The teach cycle can be stopped by pressing again the system push button (green push button).

4. Using the SMART screens to enter the required parameters for the GraviColor operation:
    - For injection mode – product weight and additive percentage.
    - For continuous mode – set output of Kg/Hour.
    - For analog mode Kg/Hour – set output at 10Volt.
    - For analog mode percentage – extrusion machine output at 10Volt and additive percentage.
5. Press the system push button (green switch). The GraviColor will start feeding material depended on the operation mode:
    - At injection mode – according to Injection/Plastification signals.
    - At continuous mode – according to Extruder On signal.
    - At analog mode – according to Extruder On signal and the voltage at the analog input.

    During operation the green lamp will flash steadily to indicate normal operation.

6. If an alarm is activated during operation the system push button lamp (green lamp) will flash rapidly. If the alarm is related to the conveyer the conveyer push button lamp (orange lamp) will flash rapidly as well. In addition to these signals an alarm message will appear on the screen specifying the type of alarm and the unit buzzer turns on.



Operation Push Buttons

6.5. Emptying Material in the GraviColor

1. Stop the GraviColor – press the system push button to stop the unit and press the conveyer push button to stop conveying.
2. Place a bucket beneath the GraviColor and open the drain port and the test port. The material from inside the feeder and the weighing bucket will drop down.
3. If there is material in the conveyer hopper, press and hold the conveyer push button in order to open the slide gate between the hopper and the weighing chamber so that the material can drain from the hopper through the weighing bucket.
4. Open one of the motor hinge bolts and turn the motor aside. Remove the screw and the sleeve.
5. Clean any residual material using compressed air. Remove the conveyer hopper lid and clean the hopper. Turn the hopper aside and clean the weighing chamber.
6. Close back the hopper. Reinsert the sleeve and the screw. Close the motor and tighten the hinge bolt.

7. Status Lamps

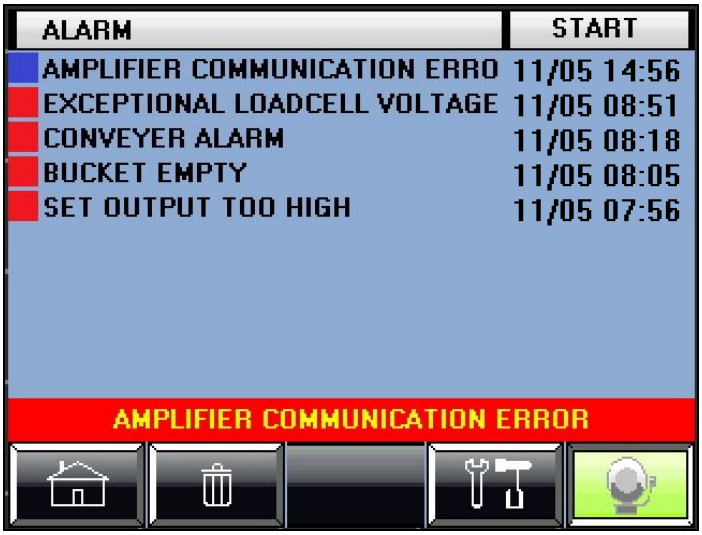
The lamps on the operating push buttons of the BeltColor and GraviColor indicate the system status. The following table describes the different indications:

Push Button	Lamp Status	Indication
System (green)	off	system is off
	on	system is on
	flashing steadily	automatic mode / extruder on
	flashing alternately	system is in teach cycle
	flashing rapidly	system alarm
Conveyer (orange)	off	conveyor is off
	on	conveyor is on
	flashing rapidly	conveyor alarm

8. Alarms

The SMART is self-supervised and will report any error occurring in material handling. If an error occurs the SMART will display it in the "Red alarm line" at the bottom of the screen and will log and show it in the alarms logger screen.

8.1. Alarms Logger Screen



Alarm Logger Screen

The system creates an alarm logger. Press the ALARM button  on the display to switch to the alarm log screen.
The alarm logger shows the following details:

- The alarm that was activated.
- The time at which the alarm was activated.
- The status of the alarm – red if the alarm is still active or blue if the alarm was stopped.

Inactive alarms can be cleared by pressing the  delete button.

8.2. Alarms List

8.2.1. Exceptional Load-cell Voltage

Indicates that the voltage from the load-cell is too high or too low. Check the load-cell voltage at the calibration screen and:

- Check electrical wiring.
- Clean the weighing bucket and the weighing chamber and make sure there are no objects interfering with the load-cell or the weighing bucket and that they move freely up and down.
- Check the weighing amplifier and the load-cell. See chapter 11.2.

8.2.2. Bucket Empty

Indicates that there is less than 10 grams material in the weighing bucket:

- Check that the conveyer is activated and that material flows freely during conveying.
- Check air supply and pressure.
- Check the slide gate between the hopper and the weighing bucket.
- If this alarm is activated when the bucket is full with material check the weighing amplifier and the weighing load-cell and perform weighing calibration. See chapter 11.2.

8.2.3. Conveyer Alarm

Indicates that the system failed to fill the conveyor hopper (the material level proximity switch does not detect material):

- Check that material flows freely during conveying.
- Check air supply and pressure.
- If this alarm is activated when the hopper is full with material verify intactness of the material level proximity switch. See chapter 11.2.2.

8.2.4. Set Output Too High (BeltColor only)

Indicates that the required output exceeds the system's capability:

- Set a lower value for the system output

8.2.5. Set Output Too Low (BeltColor only)

Indicates that the required output exceeds the system's capability:

- Set a higher value for the system output

8.2.6. Larger Screw Needed (GraviColor only)

Indicates that the required output exceeds the system's capability:

- Use a larger screw.

8.2.7. Smaller Screw Needed (GraviColor only)

Indicates that the required output exceeds the system's capability:

- Use a smaller screw.

8.2.8. DM/DS Limit

Indicates that the DM/DS reached the maximum or the minimum limit.

- Make sure that material flows freely through the system's feeder.
- If it is possible – start teach cycle. See chapter 3.5 / 4.4

If necessary, change the limits as needed.

8.2.9. No Flow Alarm

Indicates that material is not flowing through the system:

- Search for material blockage in the system

8.2.10. Teach Failed

Indicates that the teach cycle has failed.

- Check material supply
- Check that material flows freely in the system
- Empty and reactivate the unit to start a new teach cycle

8.2.11. Batch Oversize

The set parameters (product weight and additive percentage) require a batch of material larger than the unit can handle.

- Increase the amount of material in the weighing bucket by increasing the fill level or decreasing the close level of the bucket. See chapter 11.1.1.1. If you increase the fill level, make sure not to exceed the bucket capacity and if you decrease the close level, make sure not to leave the bucket without material. In any case, it is recommended to increase the fill level if possible rather than decreasing the close level.

8.2.12. Fan Alarm (BeltColor only)

Indicates that the cooling fan of the motor is not running.

- Open the motor cover and check if the fan is running.
- Check if the fan is covered by dust.
- Replace the fan.

8.2.13. PLC Battery Low

Indicates that the backup battery of the controller is weak.

- Replace the backup battery of the PLC.

8.2.14. Exceptional Plastification Time

Indicates that the last plastification time was exceptional with respect to the average plastification time:

- Check plastification time of the injection molding machine
- Check system electric wiring

8.2.15. Exceptional Injection Time

Indicates that the last injection time was exceptional with respect to the average injection time:

- Check injection time of the injection molding machine
- Check system electric wiring

9. Troubleshooting

In some cases the unit may encounter errors that do not have an alarm. The following paragraphs describe possible cases and the solutions.

9.1. Material Level Proximity Switch Error

If the unit does not load material to the hopper when the Conveyer switch is turned on, or if it does not stop loading material when the hopper is full, check the material level proximity switch. The proximity switch sensitivity may need adjusting or the switch may be damaged.

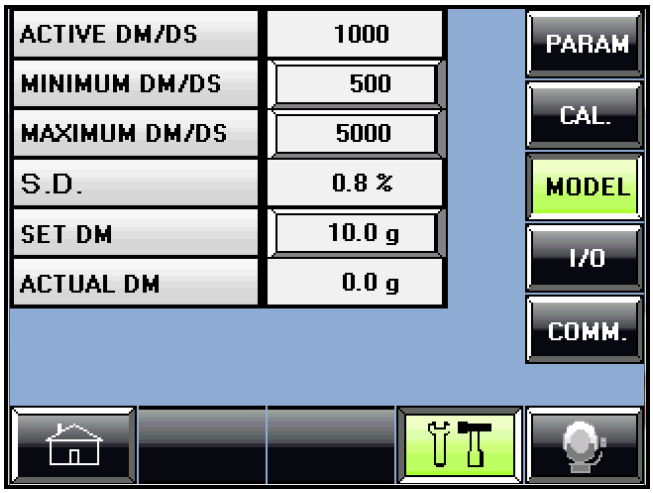
The proximity switch can be easily checked by turning off the Conveyer switch and touching the proximity switch briefly with your hand. This should cause the Conveyer switch orange lamp to blink twice. If the lamp does not blink then the sensor is damaged and should be replaced. If the lamp blinks, check the sensitivity as explained in the maintenance chapter.

The Proximity switch can also be checked using the Monitor screen. The PROX signal in the Monitor screen shows the status of the input coming from the proximity switch. The PROX signal value should be "0" when there is no material in the hopper and it should be "1" when it is covered with material.

9.2. Volumetric Test

The volumetric test can be performed when it is suspected that the control unit produces fluctuating capacity. The volumetric test disables the gravimetric control and forces the feeding unit to run at a constant speed. This forces the unit to feed constant capacity as in volumetric systems. If the capacity stabilizes when the unit is forced to volumetric production check the weighing system as explained in the maintenance chapter. If the capacity continues fluctuating when the unit is forced to volumetric production then it is caused by some external problem. Possible causes of fluctuating capacity are: raw material is not uniform and homogenous, raw material does not flow freely to the extruder, material does not flow freely in the unit, etc.

In order to force the unit to volumetric production go to the Model screen and set the DM/DS Maximum and Minimum to be equal to the Active.



Model Screen

Note: remember to change back the DM/DS limits. The unit does not alarm for DM/DS Limit if the limits and active values are equal.

9.3. Unit Runs Material Once and Hangs

When the unit is set to work in *Plastification and Injection Mode* on an injection molding machine it feeds part of the material during the plastification cycle and part of the material during the injection cycle of the injection molding machine. In order to ensure correct operation the unit expects to receive one plastification cycle followed by one injection cycle followed by one plastification cycle and so on. If the unit receives two consecutive plastification cycles it ignores the second one and waits for the injection cycle and vice versa.

If the unit runs material once and hangs, check if it set to *Plastification and Injection Mode* and if so check the electrical wiring and verify that it is receiving both signals: the plastification and the injection. If the injection signal cannot be supplied change the operation mode to *Plastification Only*.

9.4. Actual Batch Size Error

If the set and the actual batch size are not equal during operation on an injection molding machine verify that the unit is in automatic mode. If the unit is in manual mode it feeds material according to the length of the plastification cycle and according to the batch parameters. This will cause the actual batch size to differ from the set size.

10. Communication

The SMART supports serial and Ethernet communication which can be used to set and read all working parameters using a remote PC. See chapter 11.1.5 regarding communication configuration.

10.1. Data addresses

10.1.1. Injection Mode

Function	PLC Address	Type	Action	Value	Modbus Address
Additive	ML101	32 Bit	Write	00.0-99.9%	5303
Product	ML108	32 Bit	Write	00000-99999gram	5317
Set New Output	MB62	1 Bit	Write	1	0063
Reset Totals	MB63	1 Bit	Write	1	0064
Alarm Code	ML100	32 Bit	Read	00-17	5301
Additive	ML101	32 Bit	Write	00.0-99.9%	5303
Set	ML102	32 Bit	Read	000.0-999.9gram	5305
Act	ML103	32 Bit	Read	000.0-999.9gram	5307
Total	ML105	32 Bit	Read	000.000-999.999Kg	5311
Additive	ML106	32 Bit	Read	000.000-999.999Kg	5313
Count	ML107	32 Bit	Read	0000000000-9999999999	5315
Product	ML108	32 Bit	Read	00000-99999gram	5317
System Status	MB64	1 Bit	Read	0-1	0065
Conveyor Status	MB65	1 Bit	Read	0-1	0066

10.1.2. Continuous Mode - Capacity

Function	PLC Address	Type	Action	Value	Modbus Address
Set	ML101	32 Bit	Write	00.000-99.999Kg/Hour	5303
Set New Output	MB62	1 Bit	Write	1	0063
Reset Totals	MB63	1 Bit	Write	1	0064
Alarm Code	ML100	32 Bit	Read	00-17	5301
Set	ML101	32 Bit	Read	00.000-99.999Kg/Hour	5303
Actual	ML102	32 Bit	Read	00.000-99.999Kg/Hour	5305
Speed	ML103	32 Bit	Read	000-100%	5307
Total	ML105	32 Bit	Read	000.000-999.999Kg	5311
System Status	MB64	1 Bit	Read	0-1	0065
Conveyor Status	MB65	1 Bit	Read	0-1	0066

10.1.3. Analog Mode – Kg/hour (Capacity)

Function	PLC Address	Type	Action	Value	Modbus Address
Output at 10 V	ML107	32 Bit	Write	00.000-99.999Kg/Hour	5315
Set New Output	MB62	1 Bit	Write	1	0063
Reset Totals	MB63	1 Bit	Write	1	0064
Alarm Code	ML100	32 Bit	Read	00-17	5301
Set	ML101	32 Bit	Read	00.000-99.999Kg/Hour	5303
Actual	ML102	32 Bit	Read	00.000-99.999Kg/Hour	5305
Speed	ML103	32 Bit	Read	000-100%	5307
Total	ML105	32 Bit	Read	000.000-999.999Kg	5311
Input Voltage	ML106	32 Bit	Read	00.00-10.00Volt	5313
Output at 10 V	ML107	32 Bit	Read	00.000-99.999Kg/Hour	5315
System Status	MB64	1 Bit	Read	0-1	0065
Conveyor Status	MB65	1 Bit	Read	0-1	0066

10.1.4. Analog Mode – Percentage

Function	PLC Address	Type	Action	Value	Modbus Address
Set	ML101	32 Bit	Write	00.000-50.000%	5303
Machine Output at 10V	ML108	32 Bit	Write	000.0-999.9Kg/Hour	5317
Set New Output	MB62	1 Bit	Write	1	0063
Reset Totals	MB63	1 Bit	Write	1	0064
Alarm Code	ML100	32 Bit	Read	00-17	5301
Set	ML101	32 Bit	Read	00.000-50.000%	5303
Actual	ML102	32 Bit	Read	00.000-50.000%	5305
Speed	ML103	32 Bit	Read	000-100%	5307
Total	ML105	32 Bit	Read	000.000-999.999Kg	5311
Input Voltage	ML106	32 Bit	Read	00.00-10.00Volt	5313
Machine Output	ML107	32 Bit	Read	000.0-999.9Kg/Hour	5315
Machine Output at 10V	ML108	32 Bit	Read	000.0-999.9Kg/Hour	5317
System Status	MB64	1 Bit	Read	0-1	0065
Conveyor Status	MB65	1 Bit	Read	0-1	0066

- After writing a new output, set “Set New Output” bit to 1 (MB62). The SMART will update the new values and will clear the bit back to 0.
- In order to reset the totals set “Reset Totals” bit to 1 (MB63). The SMART will reset the totals and will clear the bit back to 0.

10.2. Alarm Bits

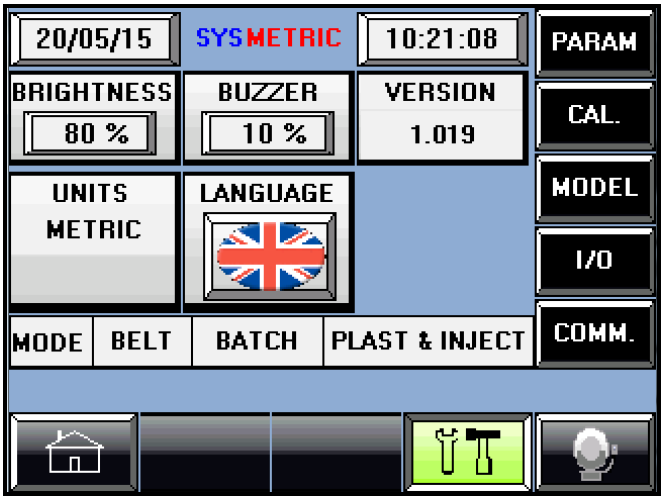
The SMART alarms are indicated by two methods: a code which indicates the current active alarms and bits which indicates the status of each alarm. Both, the code and the status bits, can be used to indicate alarms in the remote control unit.
The following table details the code of each alarm as read in ML100 and the status bits.

Alarm	Code	PLC Address	Type	Action	Modbus Address
No alarm	0				
Exceptional load-cell voltage	1	MB100	1 Bit	Read	0101
Conveyor alarm	2	MB105	1 Bit	Read	0106
Bucket empty	3	MB110	1 Bit	Read	0111
Set output too high	4	MB115	1 Bit	Read	0116
Set output too low	5	MB120	1 Bit	Read	0121
No flow	6	MB125	1 Bit	Read	0126
Exceptional injection time	7	MB130	1 Bit	Read	0131
Exceptional plastification time	8	MB135	1 Bit	Read	0136
PLC battery low	9	MB140	1 Bit	Read	0141
Teach failed	10	MB145	1 Bit	Read	0146
Motor fan is not running	11	MB150	1 Bit	Read	0151
DM/DS limit	12	MB155	1 Bit	Read	0156
Batch oversize	17	MB160	1 Bit	Read	0161
Amplifier communication error	19	MB165	1 Bit	Read	

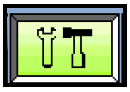
11. Service and Maintenance

11.1. Service Screens

11.1.1. Service Menu



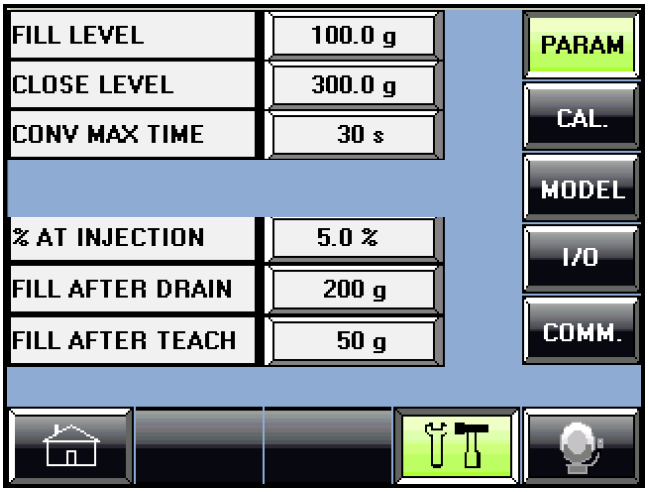
Service Screen

Press the service button  to access the service menu screen. The service menu enables access to the weighing calibration and operation parameters of the BeltColor and GraviColor. Take extreme care when using the service screens. Setting incompatible values can reduce system performance.

Note: entering any of the Service screens for the first time, requires an access code. The default code is 1234.

11.1.1. Parameters

Press the PARAM button to access the parameters screen. The parameters screen contains operation parameters of the weighing bucket and the material conveyer. In addition it contains the automatic fill parameters when the feeder type is screw (GraviColor).



Parameters Screen

Note: In specific operation modes the parameters screen will have additional parameters: Percentage at injection when working in injection mode and extruder capacity at 10V when working in analog mode. See the corresponding operation chapter 3.2.1.

11.1.1.1. Weighing Bucket Parameters

The parameters of the weighing bucket determine the thresholds of filling the bucket with material. When the weight of material in the weighing bucket goes below the fill level the system starts filling the bucket. When the weight in the bucket goes above the close level the filling is stopped. The values of the weighing bucket parameters can be adjusted but this should only be carried out during exceptional conditions. Setting incompatible values can reduce system performance.

FILL LEVEL – start filling threshold. Recommended value - 100g.
CLOSE LEVEL – stop filling threshold. Recommended value - 300g.

Note: when working with materials of low density, where the volume of the weighing bucket cannot hold 300g, the maximum threshold should be set to 250g or less if needed.

11.1.1.2. Conveyer Parameters

The conveyer maximum time determines the threshold for the conveyer alarm. If the conveyer fails to fill the hopper after that threshold it will trigger an alarm.

CONV MAX TIME – Set the conveying maximum time for the ventury loader.

Note: the conveyer will keep trying to load material alternately even after the alarm is set.

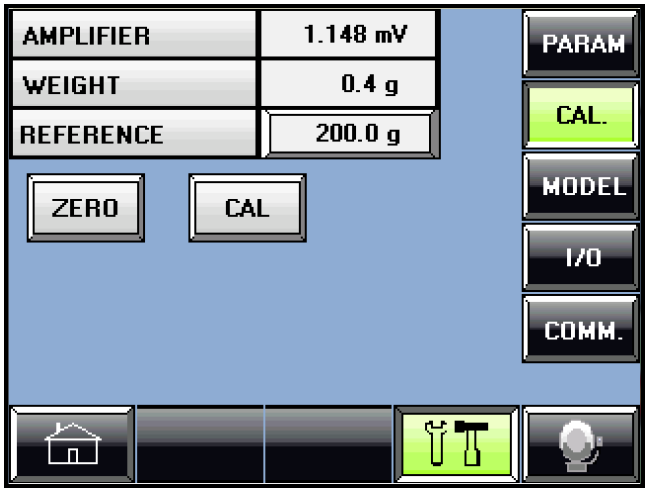
11.1.1.3. Automatic fill (GraviColor only)

The automatic filling parameters allow taking the volume of the screw housing into consideration to ensure that it is filled after draining the unit or after the teach cycle so that raw material is ready for feeding at the start of production.

FILL AFTER DRAIN – define the amount of material to be filled after draining (when production starts without carrying out the teach cycle).
FILL AFTER TEACH – define the amount of material to be filled after the teach cycle is completed.

11.1.2. Weighing Calibration

Press the CAL button on the service screen to access the calibration screen.



Calibration Screen

Weighing calibration is performed in order to calibrate and ensure that the system reports the correct weight of material in the weighing bucket. Weighing calibration is performed during manufacturing, yet it is advisable to perform calibration before the first operation of the system. Recalibration should be carried out in the following cases:

- If any inaccuracy in the BeltColor or GraviColor's output is noticed.
- If the SMART controller has been replaced.
- If the weighing amplifier has been replaced.
- If the weighing load-cell has been replaced.
- If the system has been initialized.
- If the NO CAL message is flashing on the main screen.

AMPLIFIER – Load cell voltage
WEIGHT – Current weight in the weighing bucket
REFERENCE – Reference weight used for the calibration.
ZERO – Press to remove tare weight.
CAL – Press to calibrate.

Weighing calibration is performed by the following steps:

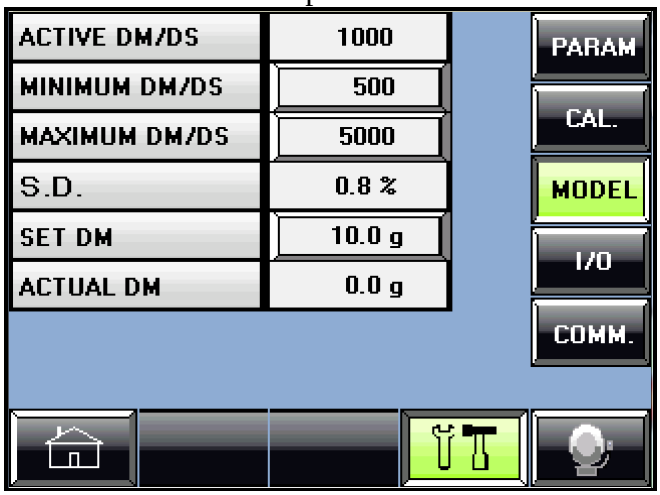
1. Stop the system – turn system OFF and conveyer OFF.

2. Empty material from the system.
3. Turn the conveyor hopper aside to gain access to the weighing bucket.
4. Make sure that the weighing bucket is empty.
5. Press "Zero" to remove tare weight. Verify that "Weight" shows 0.
6. Enter the "Reference" value according to the reference weight used for the calibration.
7. Put the reference weight in the weighing bucket, wait 10 seconds for the "Weight" value to stabilize and press "Cal". Verify the "Weight" shows the value of the reference weight.
8. Remove the reference weight from the weighing bucket and then put it back again. Verify that the "Weight" goes down to 0 and back to the reference value accordingly. If necessary, repeat steps 5-8.

Note: a valid reference weight is 100-500g. Calibration is disabled when the system is ON. The "Zero" and "Cal" buttons are accordingly disabled.
For further information on service and maintenance of the weighing system see chapter 11.2.

11.1.3. Model

The model screen contains the flow model parameters.



Model Screen

Flow Parameters

ACTIVE DM/DS – average feeder throughput (mass per motor step).

MINIMUM DM/DS – lower limit for the flow parameter.

MAXIMUM DM/DS – upper limit for the flow parameter.

S.D. – standard deviation of the active DM/DS.

SET DM – DM/DS sample rate.

ACTUAL DM – actual sample rate.

The maximum and minimum values of the flow parameter can be adjusted but this should only be carried out during exceptional conditions. Setting incompatible values can reduce system performance.
Set DM can be adjusted as follows:

- Increase value to increase stability and accuracy. This will also result in a slower sample rate and will increase the time taken to adjust correct output.
- Decrease value to shorten the time taken to adjust correct output. This may decrease stability and accuracy.

11.1.4. I/O Monitor

I/O Monitor Screen

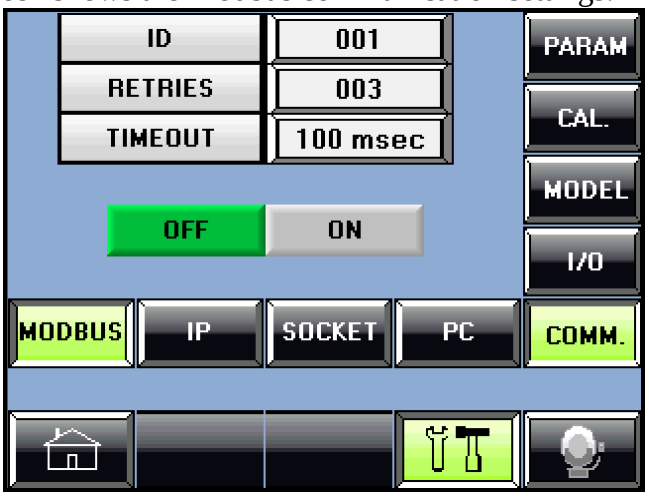
The I/O monitor screen shows the actual values of the inputs and outputs of the controller. This screen can be used to identify the source of operation errors.

11.1.5. Communications Screens

Pressing the COMM button opens the communication sub menu which enables selecting various service screens for adjusting different communication settings.

11.1.5.1. Modbus Screen

This sub service screen shows the Modbus communication settings.

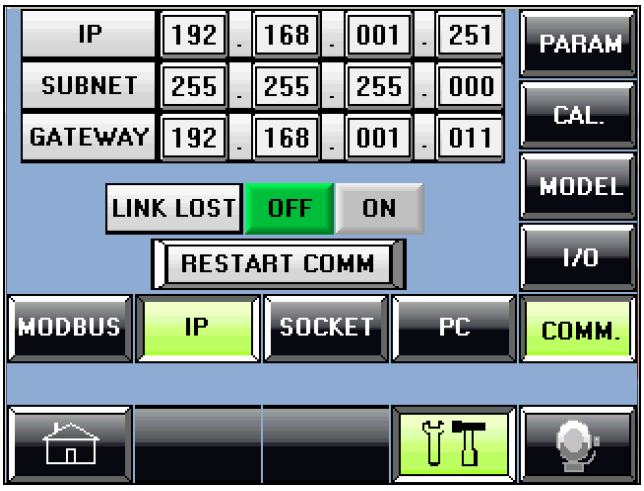


Communication/Modbus Screen

- *ID* – set the ID for the device for Modbus communications.
- *RETRIES* – the number of retries the device will try to connect.
- *TIMEOUT* – the Modbus communication timeout.
- *OFF/ON* – Enable/disable Modbus communication.

11.1.5.2. IP Screen

This sub service screen shows the Ethernet IP communications for port #3 of the device.



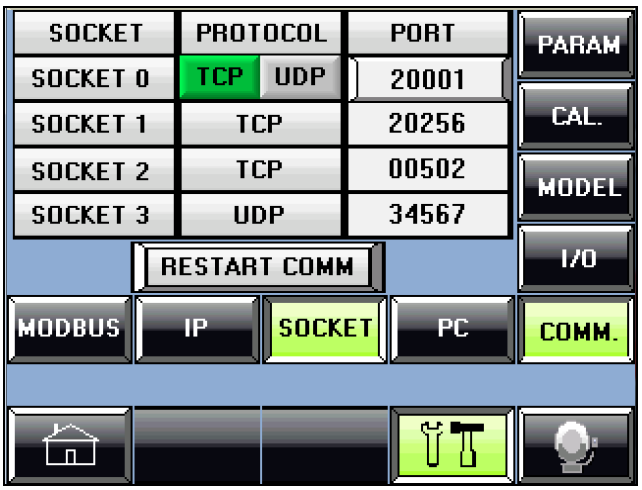
Communication/IP Screen

- *IP* – set the IP address.
- *SUBNET* – set the subnet mask.
- *GATEWAY* – set the default gateway.
- *LINK LOST OFF/ON* – Enable/disable TCP Link Lost function. This function improves handling TCP communication restoration after disconnections. Note: This feature may interfere with UDP communication and should be disabled when using UDP communication.

After changing any of the parameters press RESET PORT for the change to take effect.

11.1.5.3. Socket Screen

This sub service screen shows the communication protocols and port numbers of all of the device sockets.

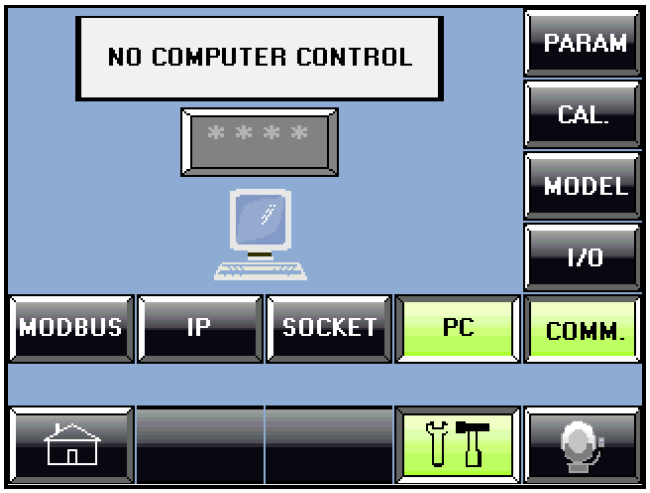


Communication/Socket Screen

Use the socket screen to change socket #0 protocol (TCP or UDP) and the port number. Socket 1,2 and 3 are pre-defined and cannot be changed.
After changing any of the parameters press RESET PORT for the change to take effect.

11.1.5.4. PC Screen

This sub service screen enables disabling computer control temporarily.



Communication/PC Screen

When the controller is connected to a computer with data acquisition or remote control software the production parameters can be controlled via the computer. In this case it is also possible to block the controller in order to prevent changing parameters locally. In such a case the computer icon will appear in the production screens to indicate that the controller is under remote control.
The PC screen enables temporarily releasing the remote control. This can be done by entering the computer release code 1234. The parameters are automatically blocked again after the controller has been idle for ten minutes.

11.2. Weighing System

The BeltColor and GraviColor weighing system consists of three elements:

- Load cell
- Amplifier
- Calibration in the controller

The weighing system is tested and calibrated during production and should be checked again after installation and if any weighing error occurs. The following is a list of possible weighing errors and the action to be taken:

1. Exceptional load cell voltage – if the system reports this error check the electrical wiring between the load cell and the amplifier and test the load cell as described in chapter 11.2.1.
2. Amplifier communication error – if the system reports this error check the power supply to the amplifier and the wiring from the amplifier to the controller.
3. Weighing error – if an incorrect capacity is suspected check the weighing calibration. See chapter 11.1.2.

11.2.1. Load Cell Test

The load cell test is performed in order to ensure the accuracy of the system and that the correct weight is reported from the weighing bucket. The load-cell test has three checks:

1. Hysterasis check (repeatability) – ensures that friction is not affecting the load-cell and the weighing bucket.
2. Calibration check – ensures correct ratio between the load-cell voltage output and the weight reported by the system.
3. Linearity check – ensure the linearity of the load-cell.

Load-cell test procedure:

1. Stop the system – turn system switch to *OFF*.
2. Empty all material from the system.
3. Open the conveyor hopper and turn it aside to gain access to the weighing chamber.
4. Clean the weighing chamber. Verify no residual material between the chamber walls and the load-cell and weighing bucket.
5. Switch the controller display to the weighing calibration screen. Press *SERVICE* in the main menu and *CAL* in the service menu.
6. At this stage, when the weighing bucket is empty, the load cell voltage should be approximately 1.5 mV (0 – 3mV). If not, verify again that no residual material presses the weighing bucket or the load-cell. If the load cell has been damaged then the voltage may differ. Although any value between ± 10 mV can also be acceptable it is recommended to replace the load cell. If the load cell cannot be replaced it is necessary to make sure that the following checks are carried out in order to ensure correct weight measurements.
7. Wait for about 10 seconds and press *Zero* to remove tare weight. The value *WEIGHT* will show 0.

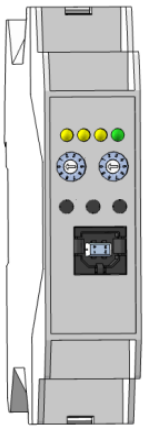
8. Hysterasis check (repeatability) – gently press the weighing bucket and release. The *WEIGHT* in the calibration screen should rise and drop back to zero (allow ±2g tolerance). Gently pull the weighing bucket. The *WEIGHT* should drop below zero and rise back to zero (allow ±2g tolerance).
9. Calibration check – press *Zero* to clear any residual offset from the previous check. Place a reference weight in the weighing bucket and verify that the *REF* value corresponds with the reference weight. The *WEIGHT* value should match the reference weight (allow ±2g tolerance). If not, perform weighing calibration as detailed in 11.1.1.
10. Linearity check – put a weight that is different from the reference weight in the weighing bucket and verify correct *WEIGHT* value. It is recommended to repeat this procedure with several different weights to check all of the working range.
11. Remove the weight and close the conveyor hopper.

Note: use weights of 100-500g only and make sure that the load cell output does not exceed the amplifier limits of ± 19 mV.

11.2.2. Load Cell Amplifier

The load cell amplifier does not require calibration. It directly reports the load cell output to the controller via communication. If the amplifier is suspected to be faulty check the following:

1. Check the power supply to the unit. Make sure that the green status led is lit.
2. Make sure that the ID number is 0.
3. Check the load cell and the communication wiring (see electrical drawing).
4. If the red led is lit press the SET button to clear the alarm.



If the above does not solve the problem and the amplifier reports incorrect load cell output it is advisable to replace it.

11.2.3. Material Level Proximity Switch

The material level proximity switch (capacitive switch – Normally Closed) located in the conveyor hopper indicates the presence of material in the hopper.
When the proximity switch does not detect material the conveyor is activated to load material to the hopper. Once the proximity switch detects material the conveying is stopped.

Calibrating the sensitivity of the proximity switch is carried out by turning the small screw on the back of the proximity switch, according to the following steps:

1. Stop the system – press the system and conveyor pushbutton to off.
2. Empty material from the conveyor hopper.
3. Open the operation panel to gain access to the back of the proximity switch.
4. If the status LED on the back of the proximity switch is lit skip to step 6.
5. Turn the sensitivity screw clockwise until the status LED lights.
6. Turn the sensitivity screw counterclockwise slowly until the status LED goes off. Continue turning the screw counterclockwise another half a turn.
7. Check the operation of the proximity switch. Fill the conveyor hopper with material to cover the proximity switch and verify that the status LED lights.
8. Close the operation panel and the conveyor hopper.

Note: the calibration described here refers to proximity switches whose status LED lights when material is detected.

Appendix A – Control Cabinet Electrical Wiring

Plug PA1

Pin	Function	I/O	Wire Color	Cable Type
1	Common 0VDC		Black	6x6005 Shielded
2	Extruder On / Automatic Mode	I9	White	
3	Plastification	I10	Brown	
4	Injection	I11	Green	
5	0VDC			
6	24VDC			
7	Analog Input 0V	ACM	Blue	
8	Analog Input 0-10V	AIN1	Red	
9				
10				
11				
12				
13				
14				
15				
16				

Plug PA2

Pin	Function	I/O	Wire Color	Cable Type
1	Alarm Relay Normally-Open R11-2	O16	Brown	2x0.75
2	Alarm Relay Normally-Close R11-3			
3	Alarm Relay Common R11-1		Blue	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

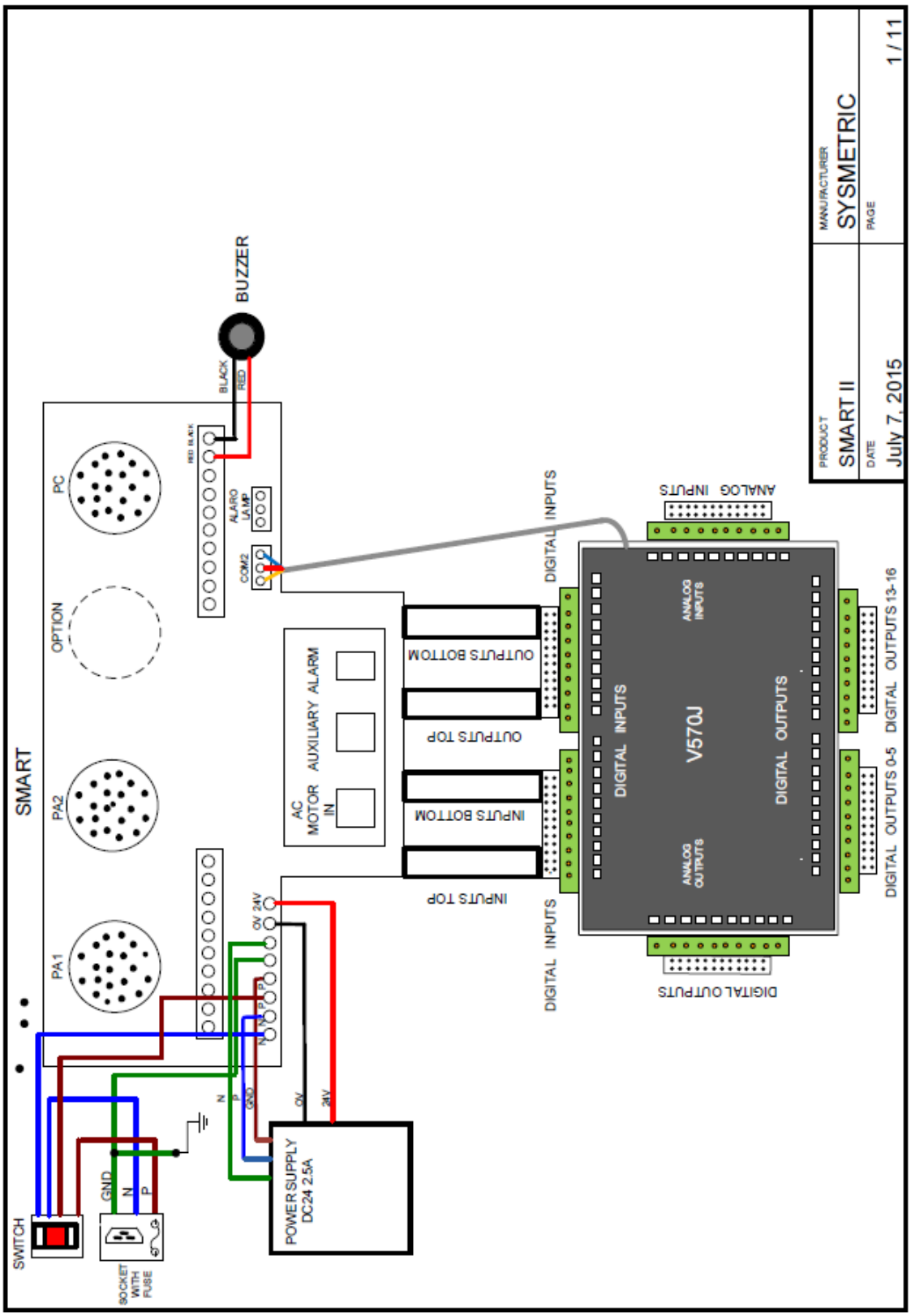
Plug PB

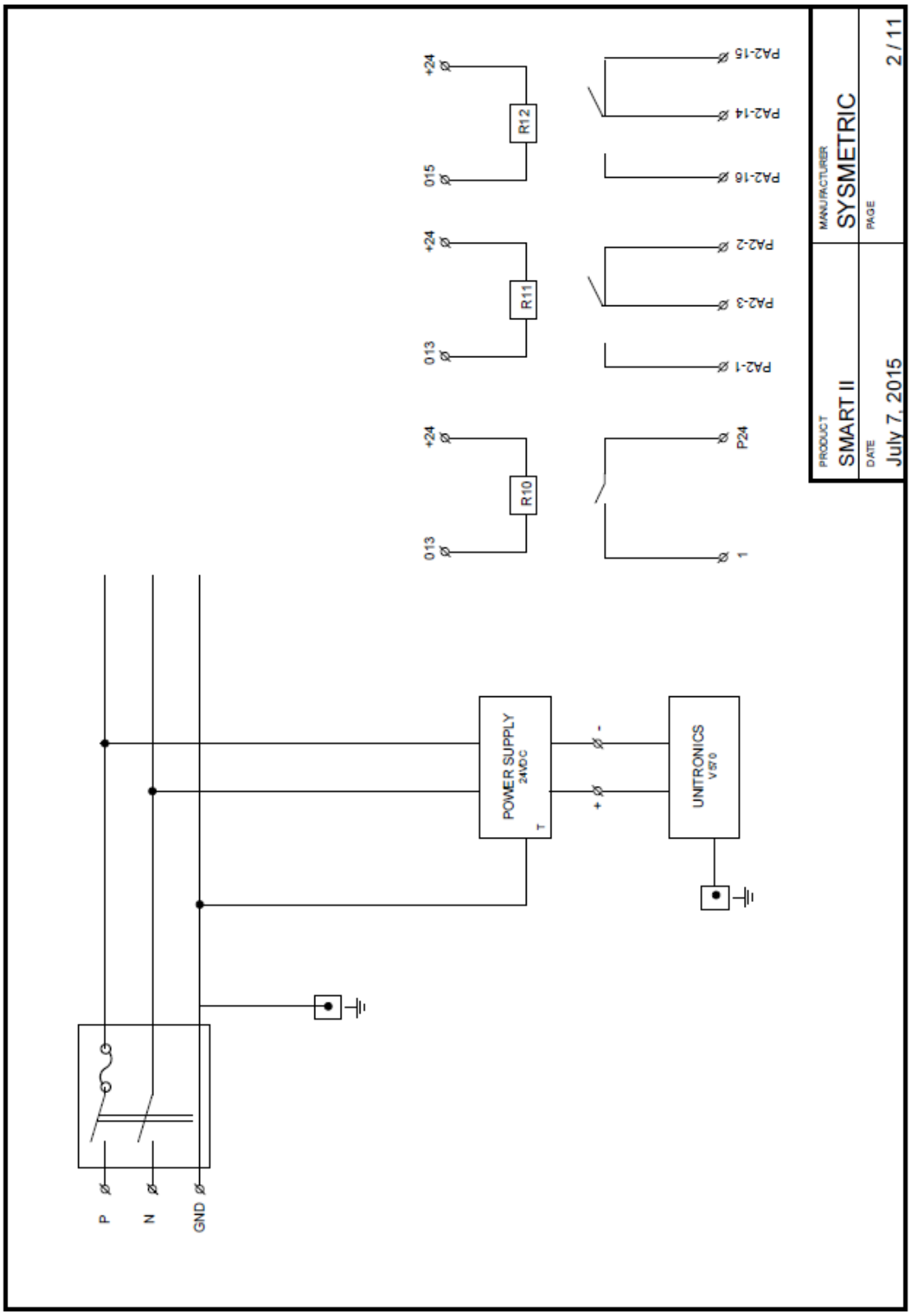
Pin	Function	I/O	Wire Color	Cable Type
1	0VDC		Black	10x6005
2	24VDC		Red	
3	Motor Enable	O13	White	
4	Motor Alarm	I5	Brown	
5			Green	
6	Common 24VDC		Yellow	
7	Motor Direction	O1	Gray	
8	Motor Step	O0	Orange	
9	Analog Speed 0V	ACOM	Blue	
10	Analog Speed 0-10V	AOUT0	Purple	
11				
12				
13				
14				

Plug PC

Pin	Function	I/O	Pair #
1	0VDC		1-1
2	0VDC		2-1
3	0VDC		3-1
4	24VDC		1-2
5	24VDC		2-2
6	24VDC		3-2
7	Motor Step	O0	4-1
8	Motor Direction	O1	4-2
9	Motor Alarm	I5	5-1
10	System Switch – On	I1	5-2
11	System Switch – Drain	I2	6-1
12	Conveyor Switch – On	I3	6-2
13	Conveyor Switch – Hopper Drain	I7	7-1
14	Level Proximity Switch	I4	7-2
15	System Switch Lamp	O2	8-1
16	Conveyor Switch Lamp	O3	8-2
17	Slide Gate Valve	O4	9-1
18	Conveyor Valve	O5	9-2
19	Flap Reed Switch	I8	10-1
20	Motor Enable	O13	10-2
21	Analog Speed 0V	ACOM	11-1
22	Analog Speed 0-10V	AOUT0	11-2
23	LC Amplifier +	AIN0	12-1
24	LC Amplifier -	ACM	12-2
25	LC Shield		13-1
26	Amplifier DGND (-12VDC)		13-2
27	Amplifier TX (ANGND)		14-1
28	Amplifier RX (+12VDC)		14-2

Appendix B – Electrical Drawings




+24
R12
015
+24
R11
013
+24
R10
013
PA2-15
PA2-14
PA2-16
PA2-2
PA2-3
PA2-1
P24
1
POWER SUPPLY
24VDC
T
UNITRONICS
V570
P
N
GND
MANUFACTURER
SYSMETRIC
PAGE
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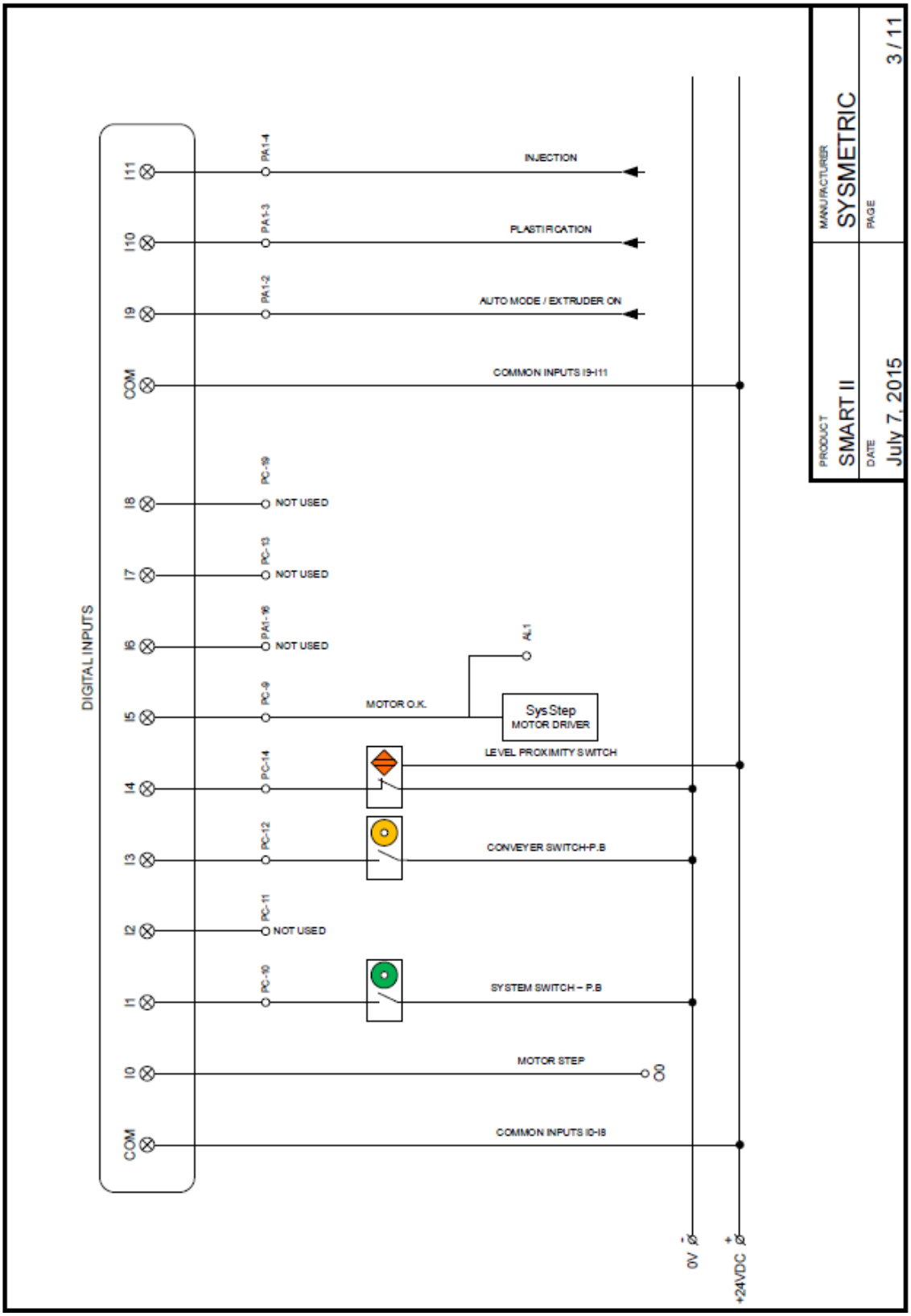
PRODUCT
SMART II
DATE
July 7, 2015


DIGITAL INPUTS
I11
I10
I9
COM
I8
I7
I6
I5
I4
I3
I2
I1
I0
COM
PA1-4
PA1-3
PA1-2
PC-19
PC-13
PA1-16
PC-9
PC-14
PC-12
PC-11
PC-10
INJECTION
PLASTIFICATION
AUTO MODE / EXTRUDER ON
COMMON INPUTS I9-I11
NOT USED
NOT USED
NOT USED
AL1
MOTOR O.K.
Sys Step
MOTOR DRIVER
LEVEL PROXIMITY SWITCH
CONVEYER SWITCH-P.B
NOT USED
SYSTEM SWITCH – P.B
MOTOR STEP
COMMON INPUTS I0-I8
0V
+24VDC
MANUFACTURER
SYSMETRIC
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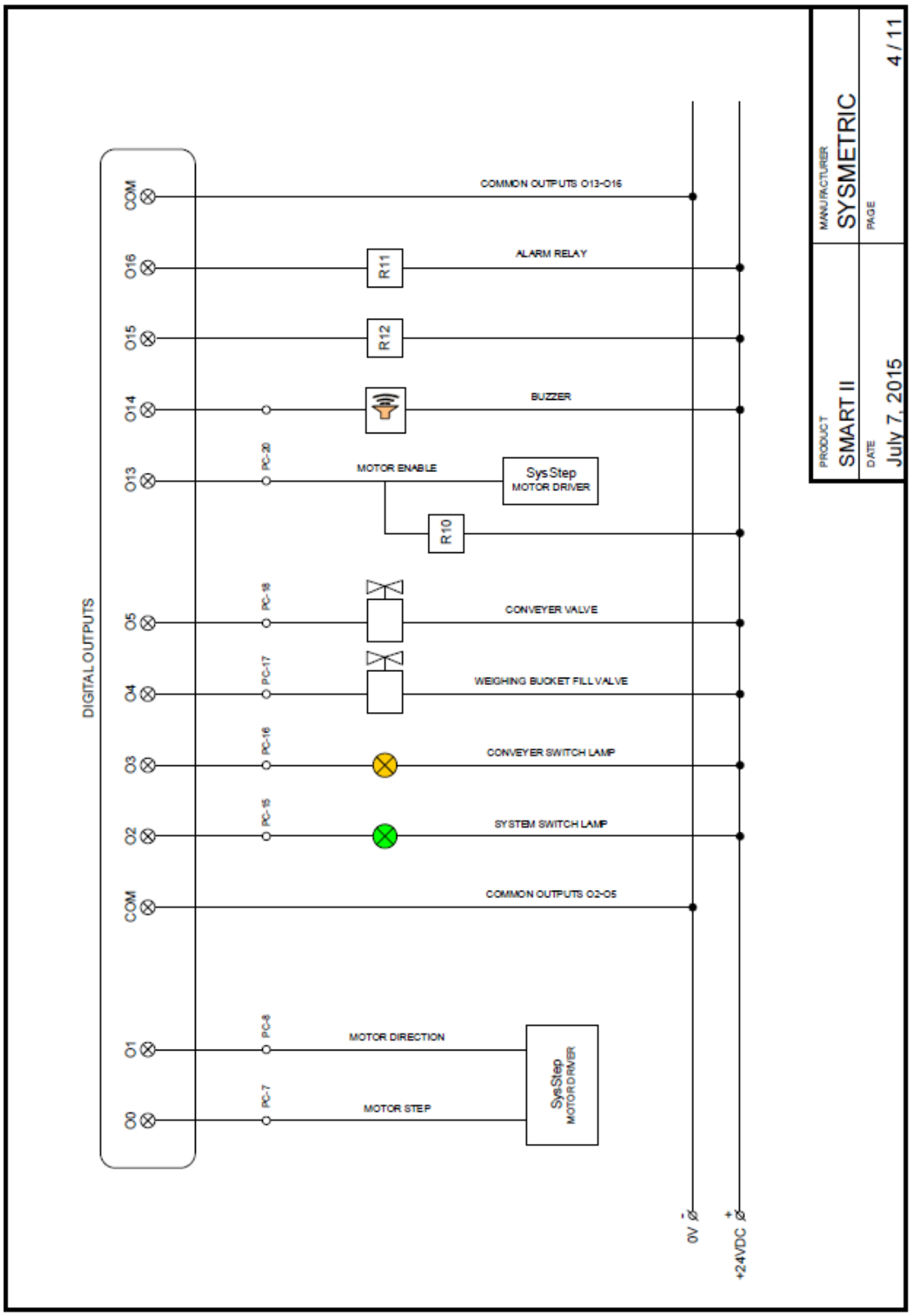
DIGITAL OUTPUTS
COM
O16
O15
O14
O13
O5
O4
O3
O2
COM
O1
O0
PC-20
PC-18
PC-17
PC-16
PC-15
PC-8
PC-7
COMMON OUTPUTS O13-O16
ALARM RELAY
R11
R12
BUZZER
MOTOR ENABLE
SysStep
MOTOR DRIVER
R10
CONVEYER VALVE
WEIGHING BUCKET FILL VALVE
CONVEYER SWITCH LAMP
SYSTEM SWITCH LAMP
COMMON OUTPUTS O2-O5
MOTOR DIRECTION
MOTOR STEP
SysStep
MOTOR DRIVER
0V -
+24VDC +
MANUFACTURER
SYSMETRIC
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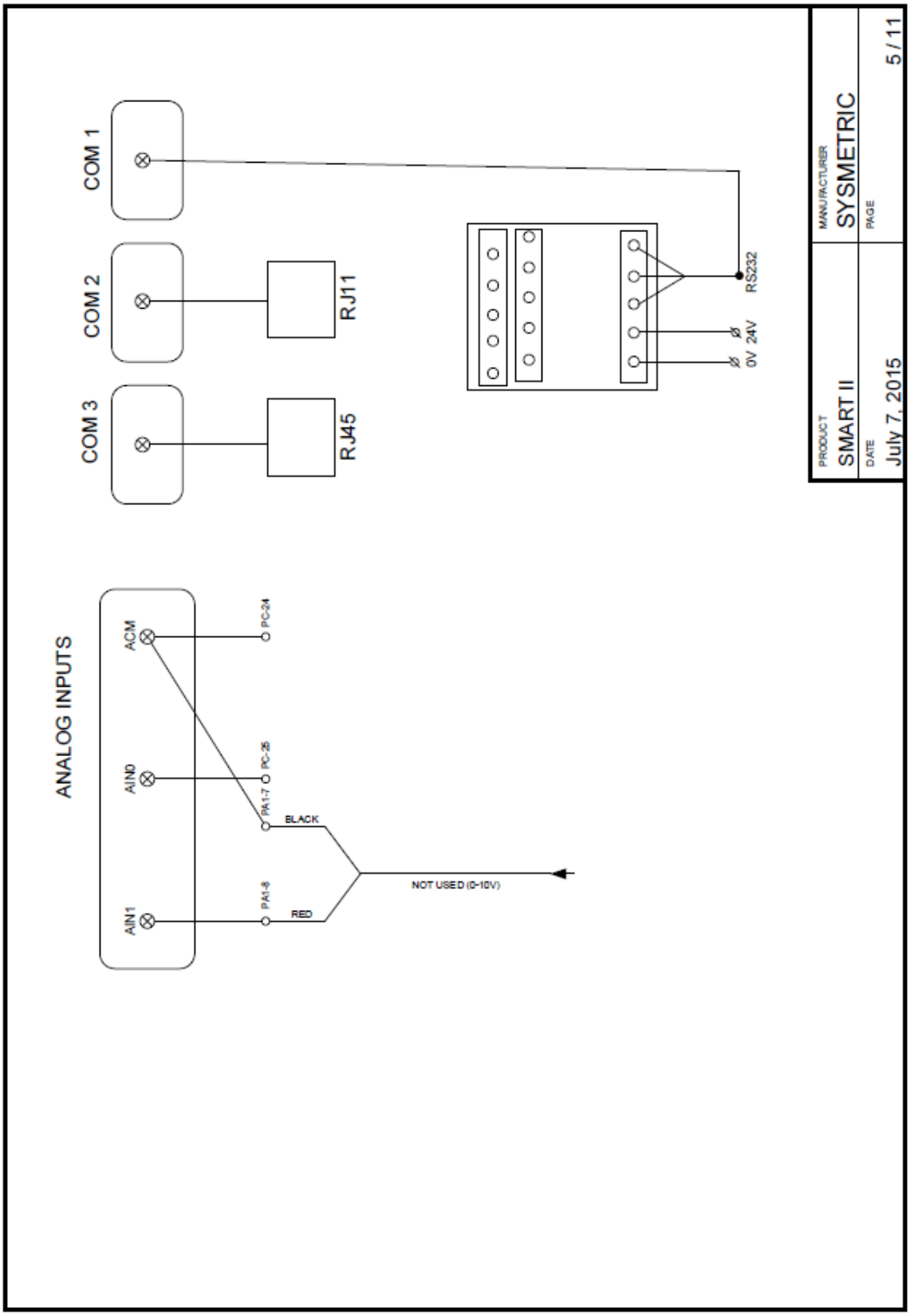
COM 1
COM 2
RJ11
COM 3
RJ45
RS232
24V
0V
ANALOG INPUTS
ACM
AIN2
AIN1
PC-24
PC-25
PA1-7
PA1-8
BLACK
RED
NOT USED (0-10V)
MANUFACTURER
SYSMETRIC
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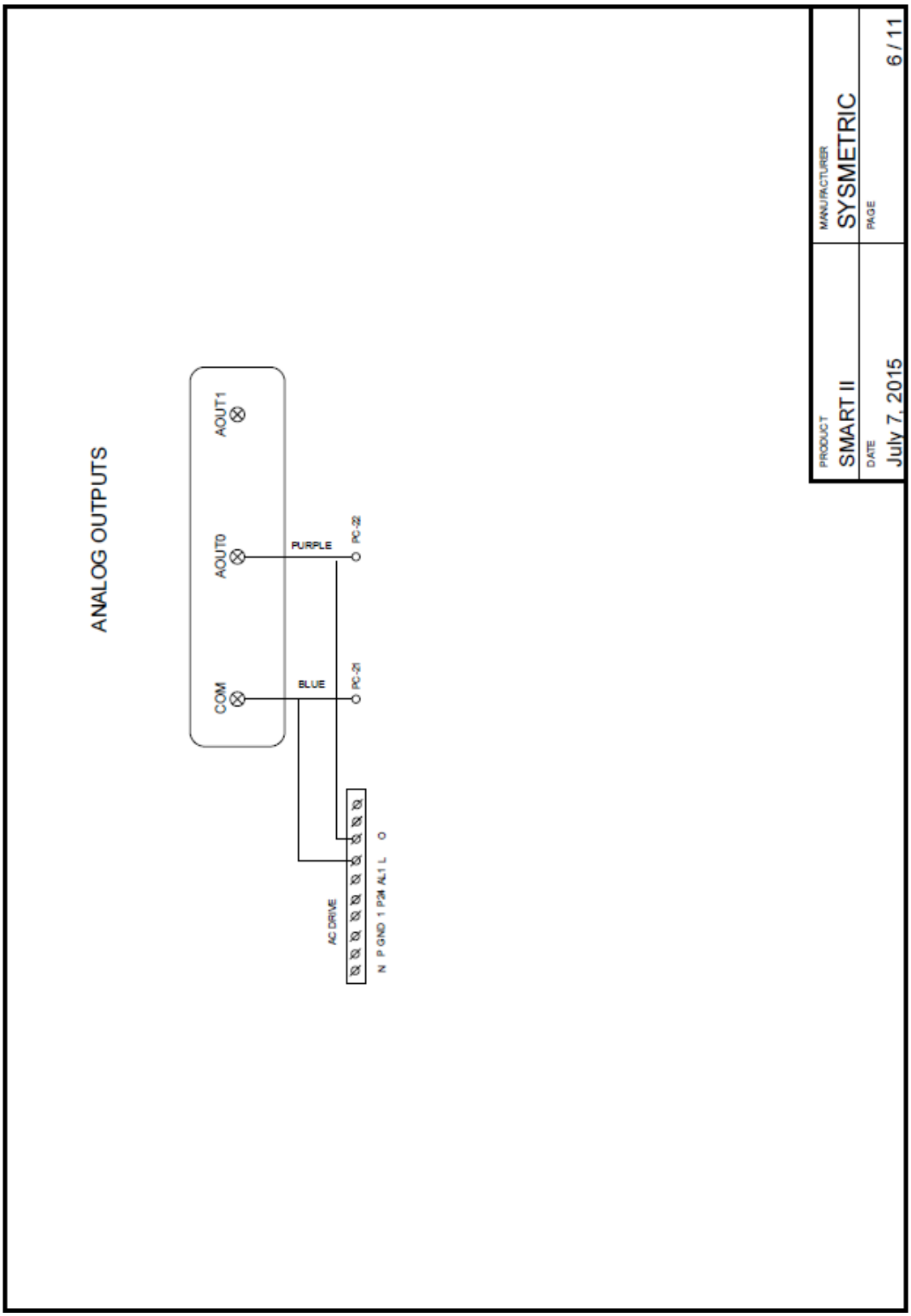
ANALOG OUTPUTS
AOUT1
AOUT0
COM
PURPLE
BLUE
PC-22
PC-21
AC DRIVE
N P GND 1 PM AL1 L O
PRODUCT
SMART II
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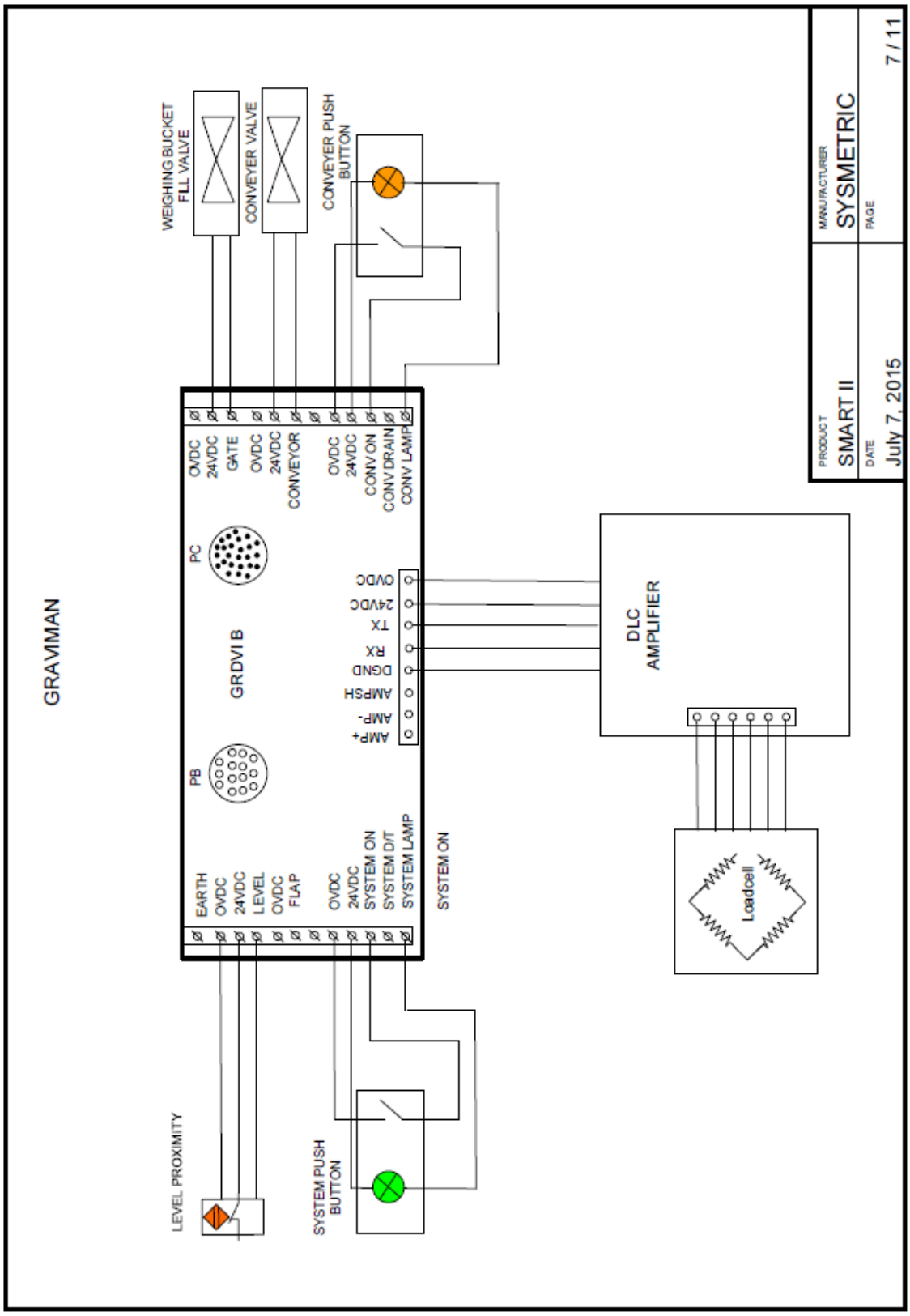
GRAVIMAN
WEIGHING BUCKET FILL VALVE
CONVEYER VALVE
CONVEYER PUSH BUTTON
0VDC
24VDC
GATE
0VDC
24VDC
CONVEYOR
0VDC
24VDC
CONV ON
CONV DRAIN
CONV LAMP
PC
GRDVI B
PB
0VDC
24VDC
TX
RX
DGND
AMPSH
AMP-
AMP+
DLC AMPLIFIER
Loadcell
EARTH
0VDC
24VDC
LEVEL
0VDC
FLAP
0VDC
24VDC
SYSTEM ON
SYSTEM D/T
SYSTEM LAMP
SYSTEM ON
LEVEL PROXIMITY
SYSTEM PUSH BUTTON
PRODUCT
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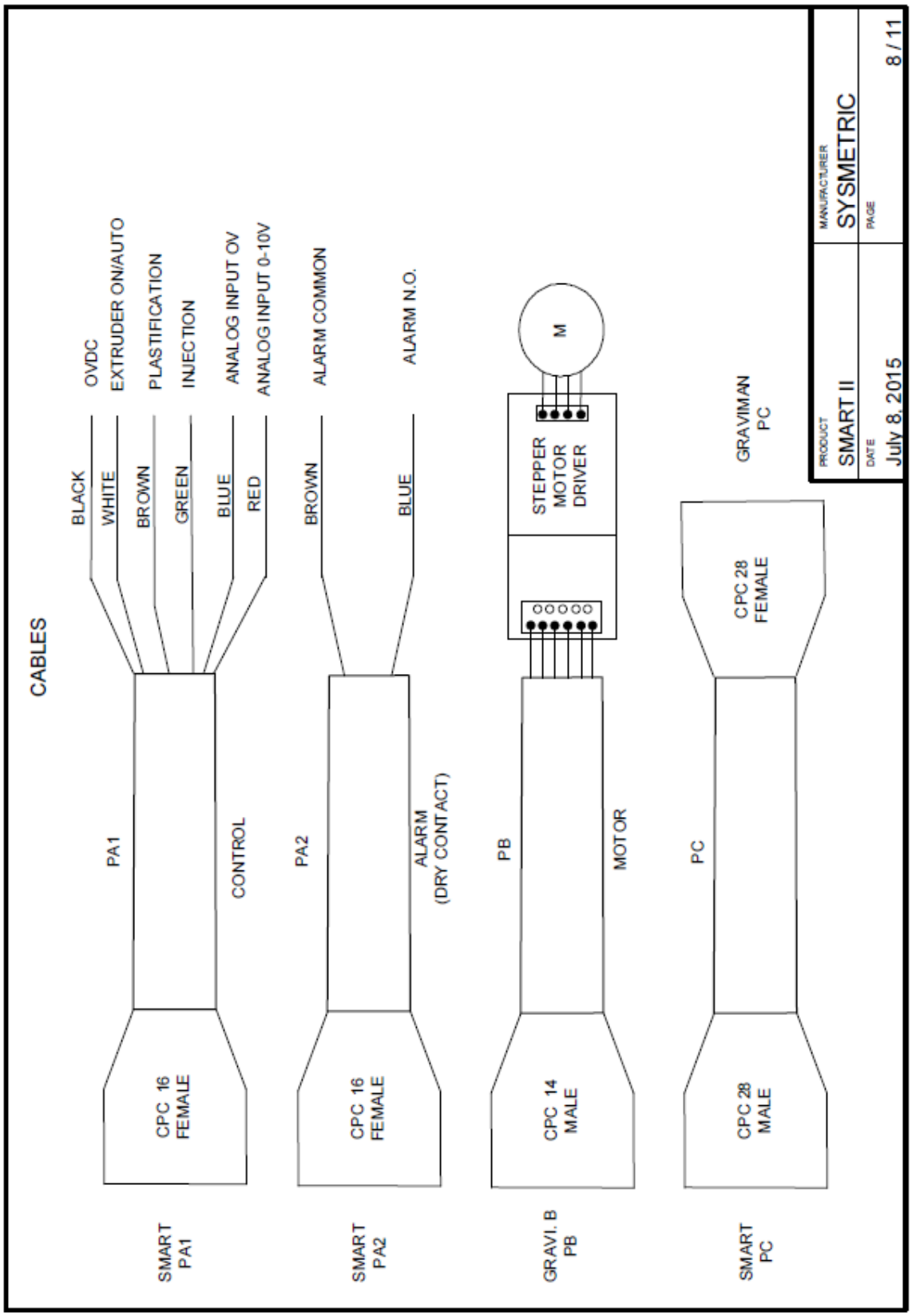
CABLES
BLACK
WHITE
BROWN
GREEN
BLUE
RED
0VDC
EXTRUDER ON/AUTO
PLASTIFICATION
INJECTION
ANALOG INPUT 0V
ANALOG INPUT 0-10V
PA1
CONTROL
CPC 16 FEMALE
SMART PA1
BROWN
BLUE
ALARM COMMON
ALARM N.O.
PA2
ALARM (DRY CONTACT)
CPC 16 FEMALE
SMART PA2
M
STEPPER MOTOR DRIVER
PB
MOTOR
CPC 14 MALE
GRAVI. B PB
GRAVIMAN PC
CPC 28 FEMALE
PC
CPC 28 MALE
SMART PC
PRODUCT
SMART II
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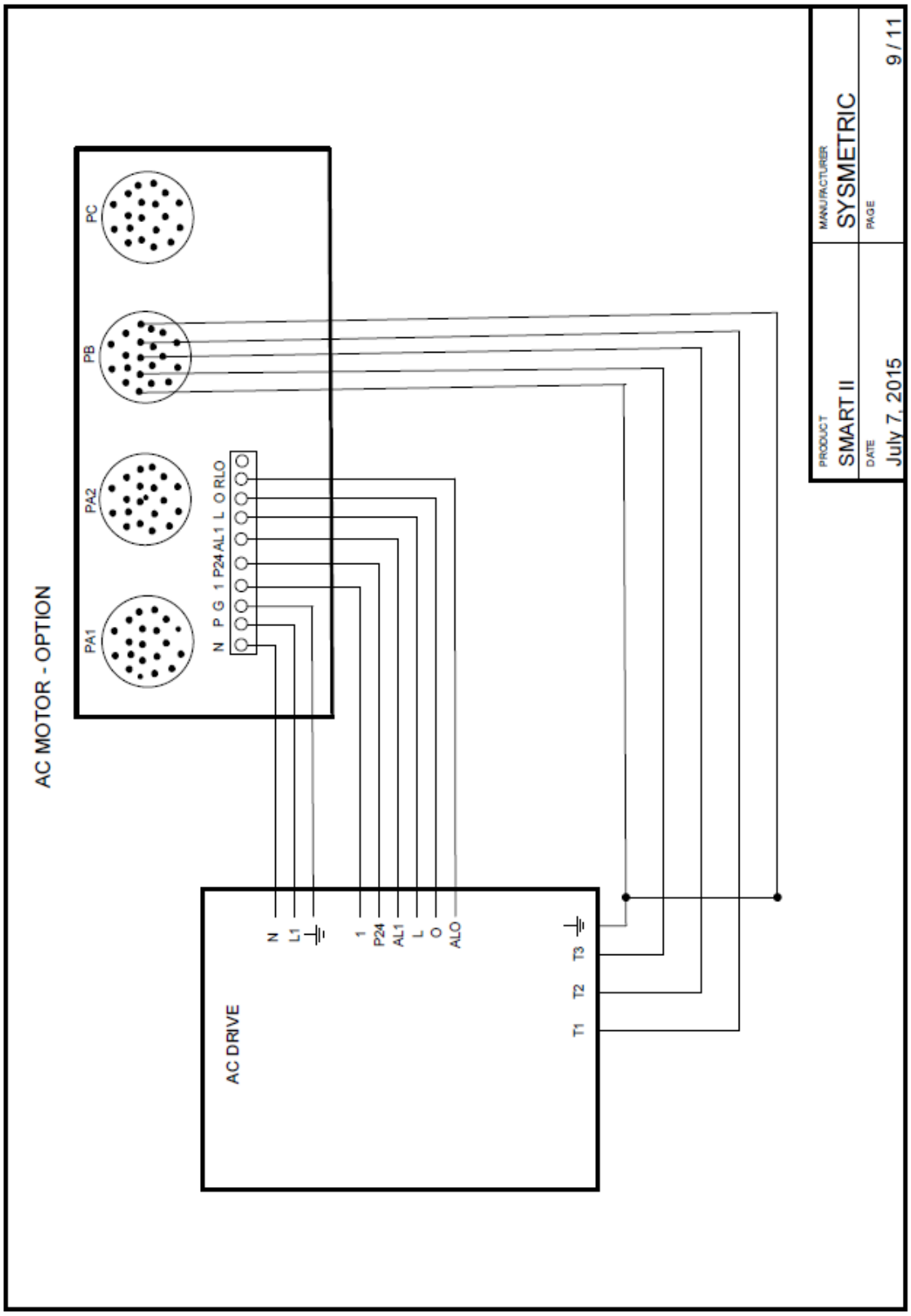
AC MOTOR - OPTION
PC
PB
PA2
PA1
N P G 1 P24 AL1 L O RLO
AC DRIVE
N L1
1 P24 AL1 L O ALO
T3 T2 T1
PRODUCT
SMART II
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SYSMETRIC
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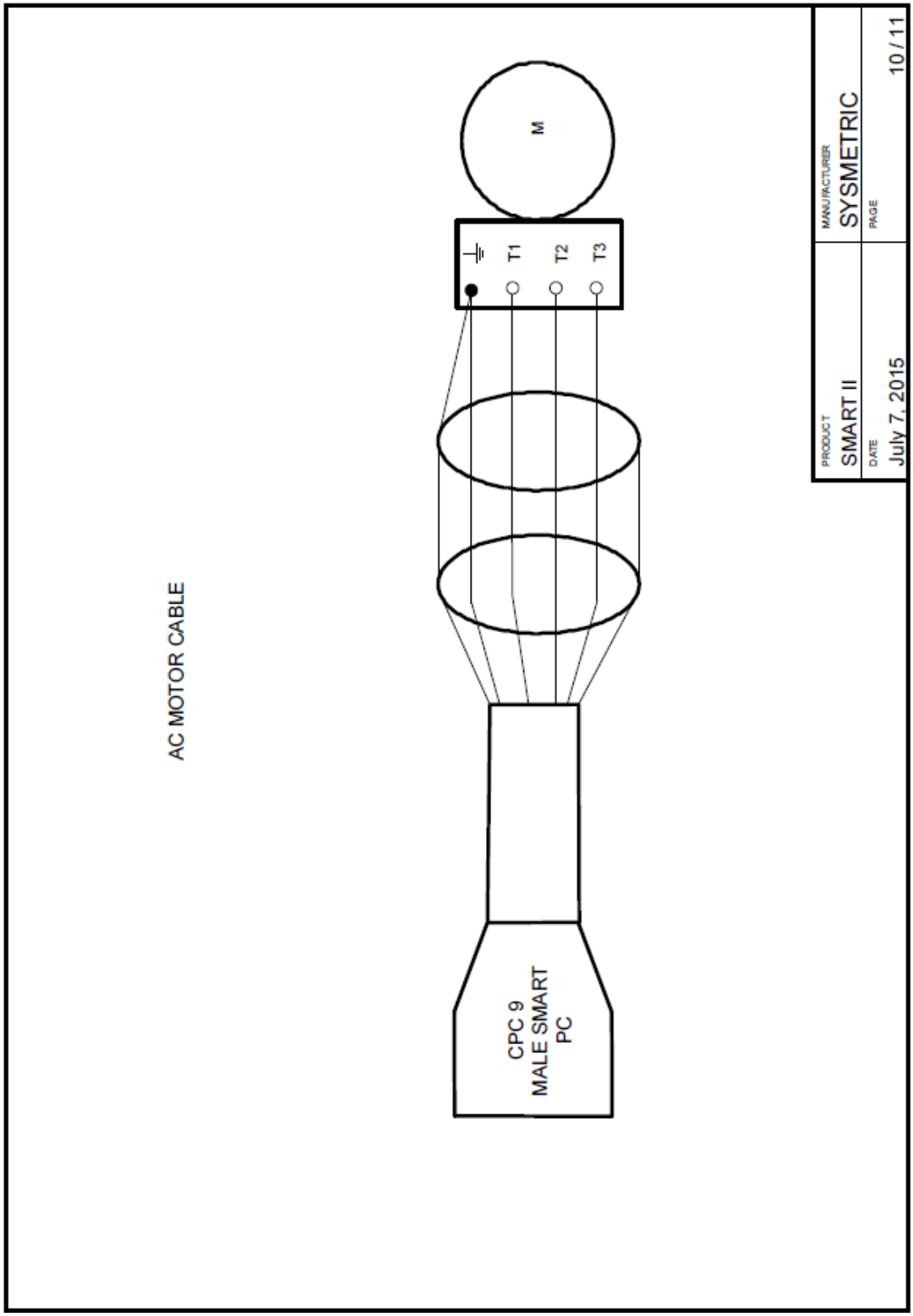
AC MOTOR CABLE
M
T1
T2
T3
CPC 9
MALE SMART
PC
MANUFACTURER
SYSMETRIC
PRODUCT
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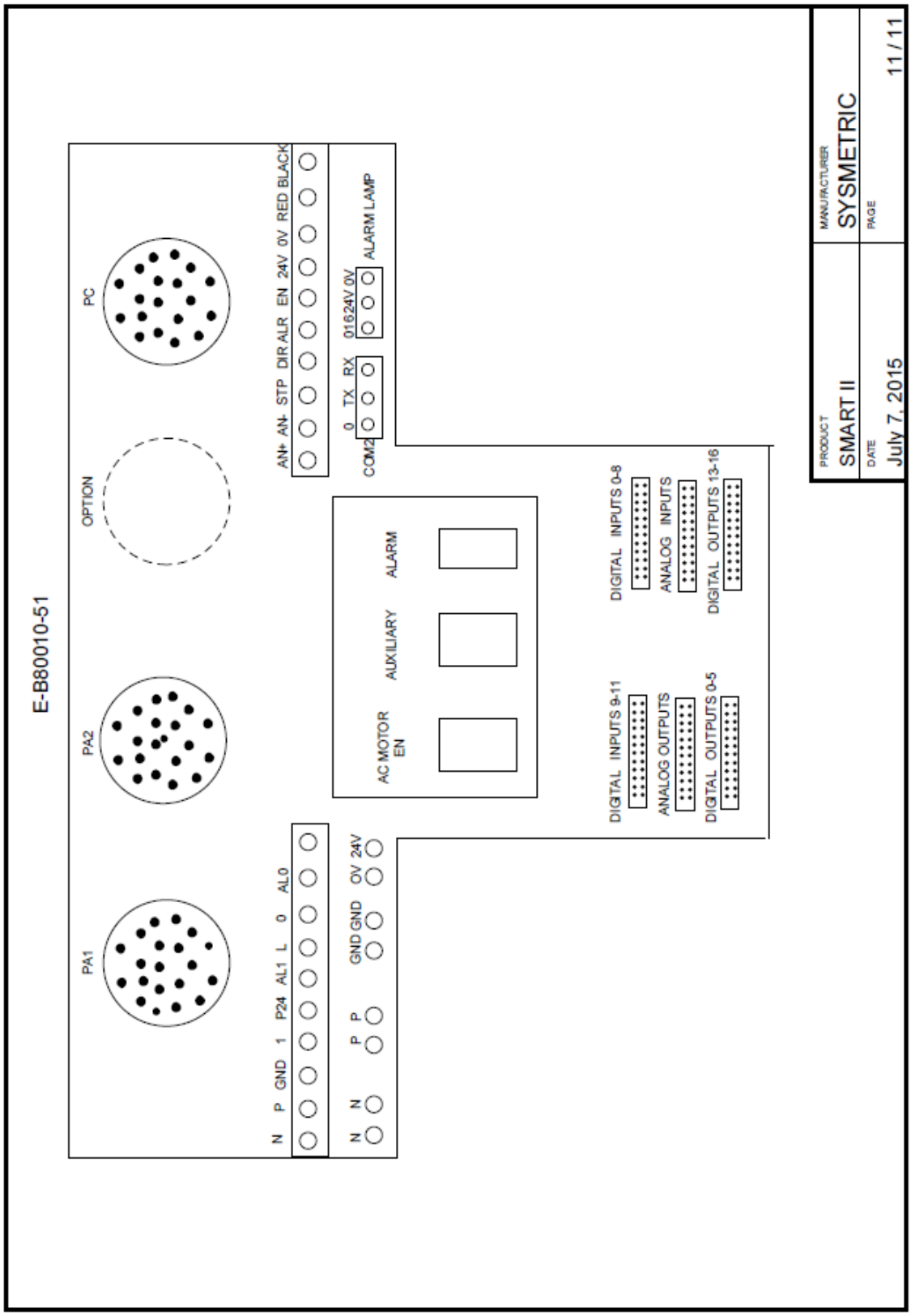
E-B80010-51
PA1
PA2
OPTION
PC
N P GND 1 P24 AL1 L 0 AL0
N N P P GND GND 0V 24V
AN+ AN- STP DIR ALR EN 24V 0V RED BLACK
0 TX RX 01624V 0V
COM2
ALARM LAMP
AC MOTOR EN
AUXILIARY
ALARM
DIGITAL INPUTS 0-8
ANALOG INPUTS
DIGITAL OUTPUTS 13-16
DIGITAL INPUTS 9-11
ANALOG OUTPUTS
DIGITAL OUTPUTS 0-5
PRODUCT
SMART II
MANUFACTURER
SYSMETRIC
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Appendix C – System Specification

Power supply

- High voltage model: 200-240Volt, 50/60Hz, 2Amp
- Low voltage model: 100-120Volt, 50/60Hz, 4Amp

Air Supply

- 6-8Bar dry air
- 8mm fast connector

Control

- Servo / Modeling technique for accurate and stable system control
- Color touchscreen
- Multi-language simple interface
- Galvanic isolation on all inputs and outputs (analog and digital)
- Isolated 10/100Mps Ethernet network connection
- Integrated machine data acquisition
- Remote PC control compatibility with ***Vision MES*** software

Weighing and Feeding Unit

- Rigid mechanical structure
- Automatic material parameter tuning
- Easy material emptying and system cleaning
- 0.1g weighing resolution
- Loss-in-weight measurement technique
- Stepper motor operated (1600 steps per revolution)
- Dynamic range:
    - For BeltColor: 1:1500 (belt conveyor resolution 0.02mm)
    - For GraviColor: 1:600 (screw speed 0.3-225rpm)
- Typical flow rate:
    - BeltColor: 0.033-50kg/hour for granulated material, 0.010-15kg/hour for micro pellets
    - GraviColor: 0.05-30kg/hour

Material Conveying

- Built-in venturi material conveyor
- 3 meter flexible hose