



Digital Dosing Disc Additive Feeders

Single, Duo and Trio With A250 Controller

Part Number: 882.01749.00

Bulletin Number: BF3-600.5

Effective: 12/17/10



Write Down Your Serial Numbers Here For Future Reference:

_____	_____
_____	_____
_____	_____

We are committed to a continuing program of product improvement.
Specifications, appearance, and dimensions described in this manual are subject to change without notice.

DCN No. _____

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Shipping Info

Unpacking and Inspection

You should inspect your granulator for possible shipping damage.

Thoroughly check the equipment for any damage that might have occurred in transit, such as broken or loose wiring and components, loose hardware and mounting screws, etc.

In the Event of Shipping Damage

According to the contract terms and conditions of the Carrier, the responsibility of the Shipper ends at the time and place of shipment.

Notify the transportation company's local agent if you discover damage.

Hold the damaged goods and packing material for the examining agent's inspection. **Do not return any goods before the transportation company's inspection and authorization.**

File a claim with the transportation company. Substantiate the claim by referring to the agent's report. A certified copy of our invoice is available upon request. The original Bill of Lading is attached to our original invoice. If the shipment was prepaid, write us for a receipted transportation bill.

Advise customer service regarding your wish for assistance and to obtain an RMA (return material authorization) number.

If the Shipment is Not Complete

Check the packing list as back-ordered items are noted on the packing list. You should have:

- Granulator
- Bill of lading
- Packing list
- Operating and Installation packet
- Electrical schematic and panel layout drawings
- Component instruction manuals

Re-inspect the container and packing material to see if you missed any smaller items during unpacking.

If the Shipment is Not Correct

If the shipment is not what you ordered, **please contact the parts and service department at: 262-641-8610.** Have the order number and item number available.

Hold the items until you receive shipping instructions.

Returns

Do not return any damaged or incorrect items until you receive shipping instructions from the shipping department.

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Chapter 1: Safety

1-1 How to Use This Manual

Use this manual as a guide and reference for installing, operating, and maintaining your equipment. The purpose is to assist you in applying efficient, proven techniques that enhance equipment productivity.

This manual covers only corrective maintenance. No other maintenance should be undertaken without first contacting a service engineer.

The Functional Description section outlines models covered, standard features, and safety features. Additional sections within the manual provide instructions for installation, pre-operational procedures, operation, preventive maintenance, and corrective maintenance.

The Installation chapter includes required data for receiving, unpacking, inspecting, and setup of the equipment. We can also provide the assistance of a factory-trained technician to help train your operator(s) for a nominal charge. This section includes instructions, checks, and adjustments that should be followed before commencing with operation. These instructions are intended to supplement standard shop procedures performed at shift, daily, and weekly intervals.

The Operation chapter includes a description of electrical and mechanical controls, in addition to information for operating the equipment safely and efficiently.

The Maintenance chapter is intended to serve as a source of detailed assembly and disassembly instructions for those areas of the equipment requiring service. Preventive maintenance sections are included to ensure that your granulator provides excellent, long term service.

The Troubleshooting chapter serves as a guide for identification of most common problems. Potential problems are listed, along with possible causes and related solutions.

The Appendix contains technical specifications, drawings, schematics, parts lists, and available options. A spare parts list with part numbers specific to your machine is provided with your shipping paperwork package. Refer to this section for a listing of spare parts for purchase. Have your serial number and model number ready when ordering.

Safety Symbols Used in this Manual

The following safety alert symbols are used to alert you to potential personal injury hazards. Obey all safety messages that follow these symbols to avoid possible injury or death.

DANGER! *DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.*

WARNING! *WARNING indicates a potentially hazardous situation or practice that, if not avoided, could result in death or serious injury.*

Caution! *CAUTION indicates a potentially hazardous situation or practice that, if not avoided, may result in minor or moderate injury or property damage.*

1-2 General Safety Regulations

These regulations should be read, understood and periodically reviewed by all personnel involved in any way with this machine.

Never operate or remove any machine components that are secured by wrench-type fasteners unless the motor is electrically locked out and the disc is motionless.

Never operate the machine unless the dosing module is in place and all guards and covers are in place and secure.

Prior to clearing a jam or performing any maintenance, the motor should be turned off and electrically locked out. Be sure that the disc has stopped. Hands must not be inserted into the machine to clear the jam.

Never extend fingers through safety guards.

Be sure that the v-belts are properly aligned and that tension is at its maximum.

Extreme care should be taken to see that all bolts are properly tightened at all times.

This machine is designed for the feeding of free-flowing granular materials. Do not feed any other materials into the machine without consulting with one of our Application Engineers.

1-3 Responsibility

These machines are constructed for maximum operator safety when used under standard operating conditions and when recommended instructions are followed in the maintenance and operation of the machine.

All personnel engaged in the use of the machine should become familiar with its operation as described in this manual.

Proper operation of the machine promotes safety for the operator and all workers in its vicinity.

Becoming familiar with materials, inspection, speed limitations, screens, and guard maintenance and total user responsibility will assist you in learning potential areas in need of observation for danger.

Each individual must take responsibility for observing the prescribed safety rules as outlined. All caution, warning and danger signs must be observed and obeyed. All actual or potential danger areas must be reported to your immediate supervisor.

1-4 Warnings and Precautions

Our equipment is designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes. This may include, but is not limited to OSHA, NEC, CSA, SPI, NEPA or CE and any other local, national and international regulations. To avoid possible personal injury or equipment damage when installing, operating, or maintaining this equipment, use good judgment and follow these safe practices:

- ☑ Read and follow these operation and installation instructions when installing, operating, and maintaining this equipment. If these instructions become damaged or unreadable, additional copies are available from the manufacturer.
- ☑ Follow all **SAFETY CODES**.
- ☑ Keep fingers away from rotating discs, slide gates, augers, clean-outs, and calibration hatches. Automatic operation may start unexpectedly, **A PINCH HAZARD CAPABLE OF CAUSING BODILY INJURY EXISTS ANY TIME THE POWER IS ON.**
- ☑ Wear **SAFETY GLASSES** and **WORK GLOVES**.
- ☑ Work only with approved tools and devices.
- ☑ Disconnect and/or lock out power and compressed air before servicing or maintaining the equipment.
- ☑ Use care when **LOADING, UNLOADING, RIGGING, or MOVING** this equipment.
- ☑ Operate this equipment within design specifications.
- ☑ **OPEN, TAG, and LOCK ALL DISCONNECTS** before working on equipment. You should remove the fuses and carry them with you.
- ☑ **NEVER PUT FINGERS OR TOOLS IN HOPPER, AUGER OR SLIDE GATE AREA.**
- ☑ Make sure the equipment and components are properly **GROUND**ED before you switch on power.
- ☑ Do not restore power until you remove all tools, test equipment, etc., and the equipment and related components are fully reassembled.
- ☑ Only **PROPERLY TRAINED** personnel familiar with the information in this manual should work on this equipment.

We have long recognized the importance of safety and have designed and manufactured our equipment with operator safety as a prime consideration. We expect you, as a user, to abide by the foregoing recommendations in order to make operator safety a reality.

Chapter 2: Functional Description

2-1 Introduction

This manual is to be used with the Digital Dosing Disc additive feeder. The feeder precisely meters and controls the addition of color concentrates, master batches, additives, regrind, and other materials to plastic processing systems. The Digital Dosing feeder can meter pellets, micro pellets, prill, powder and granular material of various sizes, *when equipped with the appropriate dosing module*. It can be used on extruders, and blow molding and injection molding machines. Single or Dual Station feeders are the most popular, but three and four component models are also available. See Figures 1 and 2. This manual covers the installation and operation of all of these feeders.

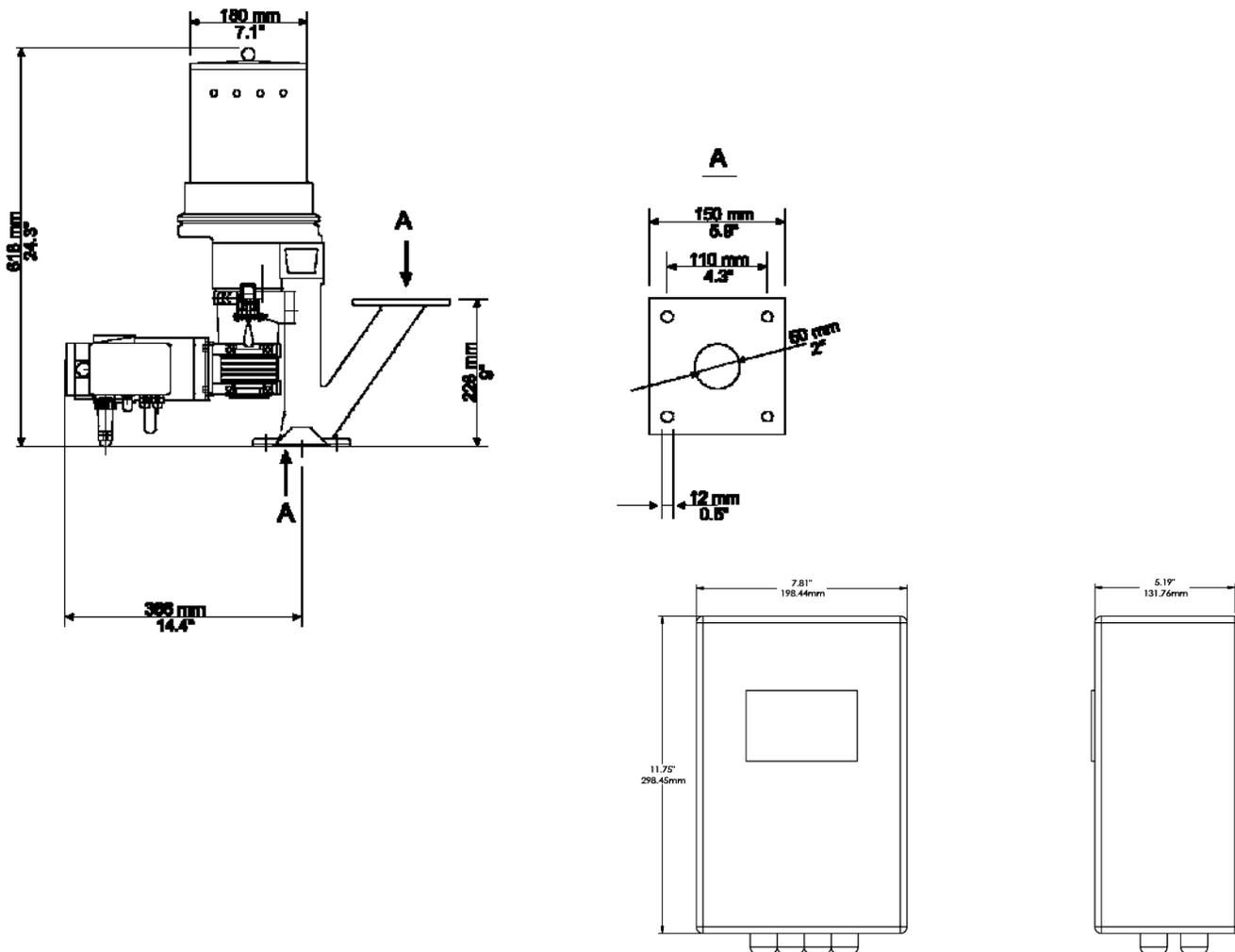


Figure 1. Single Station Digital Dosing Feeder and A250 Controller

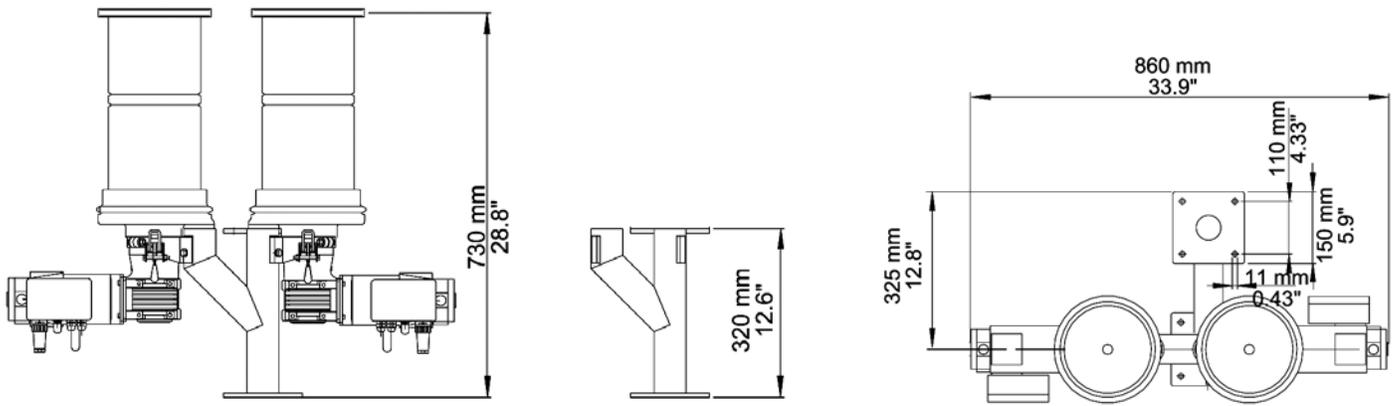


Figure 2. “Duo” Dual Station Digital Dosing Feeder

2-1 A250 Controller

The Digital Dosing additive feeder consists of a controller(s), dosing motor(s), and dosing module(s).

The controller is used to:

Configure the feeder to the desired process.

Calibrate the feeder.

Run, monitor, and stop the dosing (feeding) process.

Enter, recall, and run recipes.

Troubleshoot problems via touch screen.

A touch screen is used to enter, modify, and display data.

The control system is switched “On” (position “1”) with the “On/Off” switch.

2-2 Quick Start-Up Guide

(See Chapter four for complete description)

This “Quick Start” section is intended to help you start your Digital Dosing feeder quickly and easily. Please refer to the enclosed O & I manual for additional information.

Unpacking:

1. Inspect package for damage and notify carrier immediately – **DO NOT ACCEPT EQUIPMENT IF PACKAGING IS DAMAGED!**
2. File a claim with the shipping company immediately if damage is evident.
3. Unpack box, making sure all parts indicated on packing list are included.
4. Check all parts and equipment for any damage sustained during shipment.
5. If any damage is noted, contact manufacturer for replacement or service.
6. Make sure the following are present before proceeding:
 - Power: 110 or 220 volt, single phase, 50 or 60 hertz (verify voltage on S/N tag)
 - Proper mounting flange adapter, and mounting hardware, for the feed throat
 - Dry (ZERO VOLTAGE) contact that closes during screw recovery of IMM
 - Gram scale to measure weight of additive material for calibration.

Mounting:

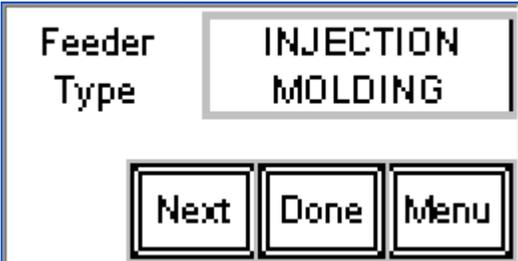
1. Mount the feeder, including the dosing hopper, on the feed throat (may need an adapter).
Be sure to use appropriate fasteners to secure the feeder in place.
2. Connect the motor drive connector (“Amp” connector-black) to the motor.
3. Connect the communication cable (DB-9 plug-silver) to the DB-9 connector on the motor junction box.
4. Plug power cord into appropriate outlet.
5. **INJECTION MOLDING:** Connect the “cycle/run” cable (2-conductor - gray) to a dry (ZERO VOLTAGE) contact that closes during the recovery cycle of the machine. (The connection in the controller should be on terminal block #10 and PLC input X5.

6. **EXTRUSION – “Simple”**: Connect the input cable (2-conductor cable-gray) to a dry contact (**zero voltage**) signal that indicates the extruder screw is turning. (The connection in the controller should be on terminal block #10 and PLC input X5.. A jumper wire can also be installed on the same terminals (instead of a dry contact.) if the feeder is to be started and stopped through the feeder controller, and not with the extruder screw.

7. **EXTRUSION – “Follower”**: Connect the input cable (2-conductor cable-gray) to a 0-10 VDC, 0-20 mA, or 4-20 mA signal from the extruder that indicates the screw speed (rpm) of the extruder. (The connection inside the controller should be on terminals blocks 51 and 54.

Feeder Configuration - Injection Molding:

Touch the ACS logo on the main menu screen to access the configuration menu. See section # for details.



Feeder Type Selection. Select injection molding (default value).



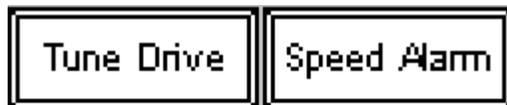
Maximum Motor speed. Enter nominal motor speed.

ENCODER PULSES 12345



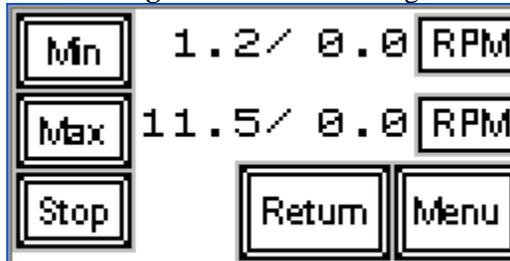
Encoder pulses per disk revolution. See table.

Manufacturer	Motor Color	RPM	Encoder Pulses
Bodine	Black & silver	3	8400
Bodine	Black & silver	8.4	8400
Bodine	Black & silver	11.5	5700
Bodine	Black & silver	38	1800

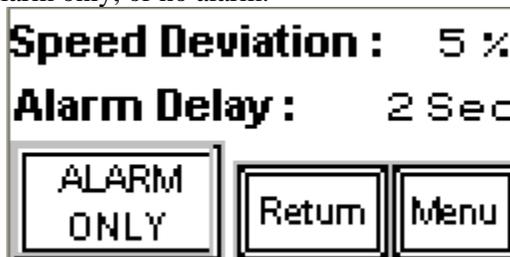


Motor and alarm utility selection

Drive tuning. Perform drive tuning. See section # for details.



Speed Alarm setup. Select alarm option – Alarm & stop, alarm only, or no alarm.



Default Measure

DEFAULT ADDITIVE MEASURE		GR	
Prev	Next	Done	Menu

GR or OZ. Select the measure commonly used at your facility.

DEFAULT SHOT SIZE MEASURE		GR	
Prev	Next	Done	Menu

Injection Press (GR/KG/OZ/LB) Select the measure commonly used at your facility.

Sensors

ADDITIVE MATERIAL SENSOR	NO SENSOR		
Prev	Next	Done	Menu

Additive sensor. Select the no sensor, alarm only, or alarm & stop.

VIRGIN MATERIAL SENSOR	NO SENSOR		
Prev	Next	Done	Menu

Virgin material sensor. Select the no sensor, alarm only, or alarm & stop.

Recipe Setup - Injection Molding:

Turn power switch to “ON” position.

Injection molding.

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 1) Additive %
- 2) Shot Size
- 3) Screw Recovery Time.
- 4) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the shot size is 200 grams and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Shot Size screen.

Shot Size



The shot size specifies the total capacity of the mold in use on the press. The value can be entered in grams, kilograms, ounces, or pounds. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen.

Screw Recovery Time.



The screw recovery time is the estimated screw recovery time, and is used as the initial value for validating the recipe. Actual screw recovery times as measured by the presence of the screw recovery signal, are used to fine-tune the feed rate during operation. The estimated time **must** be at least ½ of the actual recovery time. If less than ½, the feeder will interpret the recovery signal as a purge cycle.

Calibration weight.



Calibration weight is determined from the following tables, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be ¼ to 5 times this initial value.

“DD” Pellet Discs

Disc	Calibration Number	No. of Pockets	Disc Thickness
DD 30-030672	1.75	72	3 mm
DD 30-051040	5.00	40	5mm
DD 30-051725	8.00	25	
DD 30-051818	15.00	18	

“DT” Pellet & Regrind Discs

Disc Thickness	Disc	Calibration Number	No. of Pockets
10 mm	DT 30-1018 20	32.00	20
	DT 30-1020 25 (“Sure-shot” - 20 oval holes)	38.00	20 Oval
20mm	DT 30-2030 12	100.00	12
	DT 30-2040 10	175.00	10

“DP” Powder Discs

Disc	Calibration Number	Disc Thickness
DP 30-0509 40	17.00	5mm
DP 30-2509 40	8.00	2.5mm

Additive Sample weighing.

Weighing samples of additive provides for more precise control of feed rate. Up to 5 samples can be weighed. All weights entered are averaged to arrive at a value to be used during operation. The weighing process may be skipped altogether, in which case the calibration weight is used for calculations of feed rate. See the section **Weight Calibration** at the end of this section.

Feeder Configuration – Simple extrusion:

Touch the ACS logo on the main menu screen to access the configuration menu. See section # for details.



Feeder Type Selection. Select simple extrusion.

Motor

Max RPM **11.5**

Prev Next Done Menu

Maximum Motor speed. Enter motor RPM.

ENCODER
PULSES **12345**

Prev Next Done Menu

Encoder pulses per disk revolution. See table.

Manufacturer	Motor Color	RPM	Encoder Pulses
Bodine	Black & silver	3	8400
Bodine	Black & silver	8.4	8400
Bodine	Black & silver	11.5	5700
Bodine	Black & silver	38	1800

Tune Drive Speed Alarm

Prev Next Done Menu

Motor and alarm utility selection

Drive tuning. Perform drive tuning. See section # for details.

Min	1.2 / 0.0	RPM
Max	11.5 / 0.0	RPM
Stop	Return	Menu

Speed Alarm setup. Select alarm option – Alarm & stop, alarm only, or no alarm.

Speed Deviation :	5 %	
Alarm Delay :	2 Sec	
ALARM ONLY	Return	Menu

Default Measure

DEFAULT ADDITIVE MEASURE		GR	
Prev	Next	Done	Menu

GR or OZ Select the measure commonly used at your facility.

DEFAULT THROUGH-PUT MEASURE		GR	
Prev	Next	Done	Menu

Extrusion Press (GR/KG/OZ/LB) Select the measure commonly used at your facility.

Sensors

ADDITIVE MATERIAL SENSOR	NO SENSOR		
Prev	Next	Done	Menu

Additive sensor. Select the no sensor, alarm only, or alarm & stop.



Virgin material sensor. Select the no sensor, alarm only, or alarm & stop.

Recipe Setup for Simple Extrusion:

1. Turn power switch to “ON” position.

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 1) Additive %
- 2) Throughput
- 3) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the throughput is 200 grams per minute and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Throughput screen.

Throughput.



Press throughput specifies the total weight of material through the extruder per minute. The value can be entered in grams, kilograms, ounces, or pounds per minute. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. It is important that this value be adjusted whenever the extruder speed changes.

Calibration weight.



Calibration weight is determined from the following tables, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be ¼ to 2.5 times this initial value.

“DD” Pellet Discs

Disc	Calibration Number	No. of Pockets	Disc Thickness
DD 30-030672	1.75	72	3 mm
DD 30-051040	5.00	40	5mm
DD 30-051725	8.00	25	
DD 30-051818	15.00	18	

“DT” Pellet & Regrind Discs

Disc Thickness	Disc	Calibration Number	No. of Pockets
10 mm	DT 30-1018 20	32.00	20
	DT 30-1020 25 (“Sure-shot” - 20 oval holes)	38.00	20 Oval
20mm	DT 30-2030 12	100.00	12
	DT 30-2040 10	175.00	10

“DP” Powder Discs

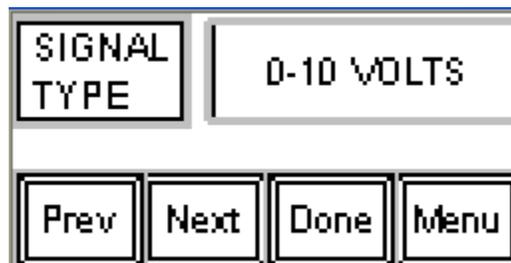
Disc	Calibration Number	Disc Thickness
DP 30-0509 40	17.00	5mm
DP 30-2509 40	8.00	2.5mm

Feeder Configuration – Extrusion follower:

Touch the ACS logo on the main menu screen to access the configuration menu. See section # for details.



Feeder Type Selection. Select extrusion follower.



Select press signal type, 0-10V, 0-20mA, or 4-20mA.

MIN	0.5	RPM	
SIGNAL	1.2	V	
123.4			
Prev	Next	Done	Menu

Enter/Read Minimum press signal. See section # for details.

MAX	11.5	RPM	
SIGNAL	9.8	V	
654.3			
Prev	Next	Done	Menu

Enter/Read Maximum press signal. See section # for details.

Motor

Max RPM	11.5		
Prev	Next	Done	Menu

Maximum Motor speed Enter motor speed.

ENCODER PULSES	12345		
Prev	Next	Done	Menu

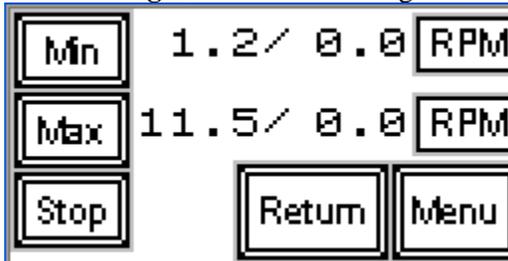
Encoder pulses per disk revolution. See table.

Manufacturer	Motor Color	RPM	Encoder Pulses
Bodine	Black & silver	3	8400
Bodine	Black & silver	8.4	8400
Bodine	Black & silver	11.5	5700
Bodine	Black & silver	38	1800

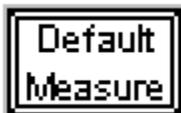
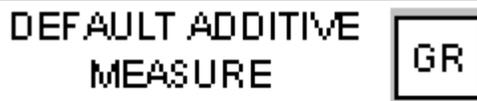
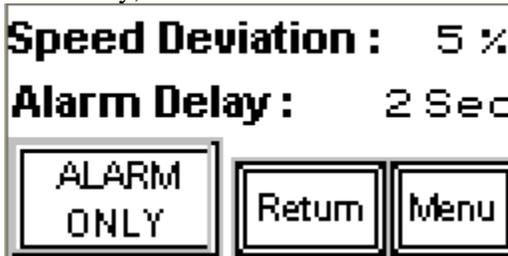


Motor and alarm utility selection

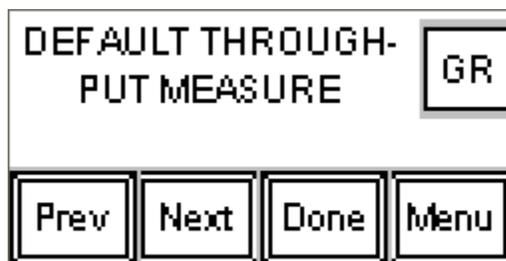
Drive tuning Perform drive tuning. See section # for details.



Speed Alarm setup. Select alarm option – Alarm & stop, alarm only, or no alarm.



GR or OZ Select the measure commonly used at your facility.



Extrusion Press (GR/KG/OZ/LB) Select the measure commonly used at your facility.

Sensors



Additive sensor. Select the no sensor, alarm only, or alarm & stop.



Virgin material sensor. Select the no sensor, alarm only, or alarm & stop.

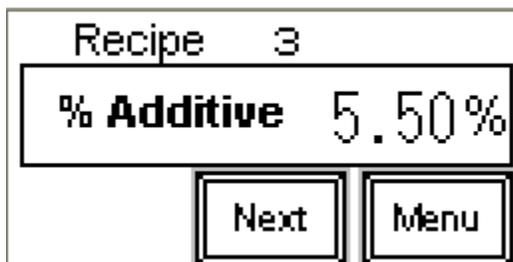
Recipe Setup for Simple Extrusion:

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 1) Additive %
- 2) Throughput
- 3) Throughput RPM
- 4) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the throughput is 200 grams per minute and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Throughput screen.

Throughput.



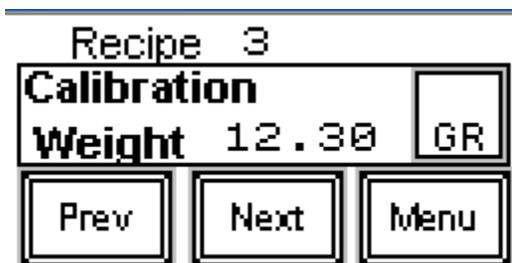
Press throughput specifies the total weight of material through the extruder per minute. The value can be entered in grams, kilograms, ounces, or pounds per minute. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. This value is the throughput corresponding to a specific extruder RPM, which will be entered on the following screen. Given these reference values, the correct feed rate can be determined for any extruder speed. Note that the minimum and maximum press speeds and signal levels must be entered correctly in Setup.

Throughput Speed.



The press speed corresponding to the throughput value entered on the previous screen. Given these reference values, the correct feed rate can be determined for any extruder speed. Note that the minimum and maximum press speeds and signal levels must be entered correctly in Setup.

Calibration weight.



Calibration weight is determined from the following tables, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value

initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be ¼ to 2.5 times this initial value.

“DD” Pellet Discs

Disc	Calibration Number	No. of Pockets	Disc Thickness
DD 30-030672	1.75	72	3 mm
DD 30-051040	5.00	40	5mm
DD 30-051725	8.00	25	
DD 30-051818	15.00	18	

“DT” Pellet & Regrind Discs

Disc Thickness	Disc	Calibration Number	No. of Pockets
10 mm	DT 30-101820	32.00	20
	DT 30-102025 (“Sure-shot” - 20 oval holes)	38.00	20 Oval
20mm	DT 30-203012	100.00	12
	DT 30-204010	175.00	10

“DP” Powder Discs

Disc	Calibration Number	Disc Thickness
DP 30-050940	17.00	5mm
DP 30-250940	8.00	2.5mm

Additive Sample weighing.

Weighing samples of additive provides for more precise control of feed rate. Up to 5 samples can be weighed. All weights entered are averaged to arrive at a value to be used during operation. The weighing process may be skipped altogether, in which case the calibration weight is used for calculations of feed rate.

Weight Calibration.

The final step of recipe setup is weight calibration. This procedure is common to all types of presses supported. After entering the calibration weight, pressing the “Next” button displays the following screen:

PRESS 'NEXT' TO WEIGH
ADDITIVE SAMPLES. PRESS
'MENU' TO SKIP.



Press the “Menu” button to skip the weighing procedure and use the calibration weight for feed rate calculations. Note that using the calibration weight is not as accurate as weighing samples. Pressing the “Next” button displays screen #1.

Screen 1.

TARE SAMPLE TRAY, THEN
PLACE IN CALIBRATION
BOX. PRESS 'NEXT'.



Initial preparation for weighing samples. The access cover to the calibration chamber should be removed / opened. The container used to catch and hold the samples should be tared (place the container on the scale and zero the scale). The container should then be placed in the calibration chamber. Press “Next” when these steps have been completed. The motor will begin to run as Screen 2 will be displayed.

Screen 2.

PRIMING DISK WITH
ADDITIVE. PLEASE WAIT.
PRESS 'MENU' TO CANCEL.



The disc will make one complete revolution, insuring all pockets are filled with additive material prior to actual weighing. Motor speed is 25%.

Screen 3.

DISCARD SAMPLE,
REPLACE TRAY IN CALI-
BRATION BOX. PRESS NEXT



When the motor stops, screen 3 is displayed. Discard sample and replace container in calibration box. Press “Next” starts the motor and displays Screen 4.

Screen 4.

LOADING NEXT WEIGHT
SAMPLE. PLEASE WAIT.
PRESS 'MENU' TO CANCEL.



The disc will make one complete revolution, dispensing additive into the tray. Motor speed is 25%. When the motor stops, Screen 5 is displayed.

Screen 5.

WEIGH SAMPLE, EMPTY &
REPLACE TRAY IN CALI-
BRATION BOX. PRESS NEXT



Weigh the sample, making note of the weight for entry on the next screen. Discard sample & replace tray in calibration box. Press "Next" to display Screen 6.

Screen 6.

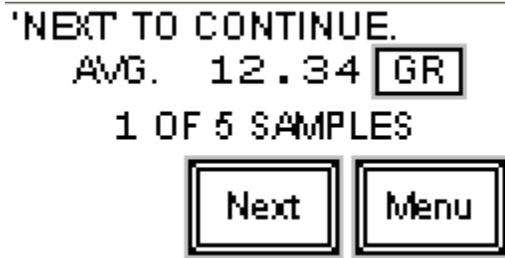
ENTER SAMPLE WEIGHT.

12.34 GR



Enter the sample weight obtained from the previous cycle of the feeder. The unit of measure will be the same as used for the calibration weight. Pressing the Enter symbol on the screen keypad displays Screen 7.

Screen 7.



The screen displays the running average of sample weights, as well as the number of samples taken. Pressing “Next” will repeat the process at Screen 4 if less than 5 samples have been taken, otherwise Screen 8 will be displayed.

Screen 8.



The tray should be removed from the calibration chamber. The access cover should be replaced / closed. Weight Calibration is complete. Note that at any time in the process, the “Menu” button may be pressed to abort the weight calibration process. Any sample weights, if any, are used to calculate the average weight. If no sample weights are entered, the calibration weight is used for calculations. Using less than 5 samples may affect feeder accuracy.

Chapter 3: Installation and Operation

3-1 Installation

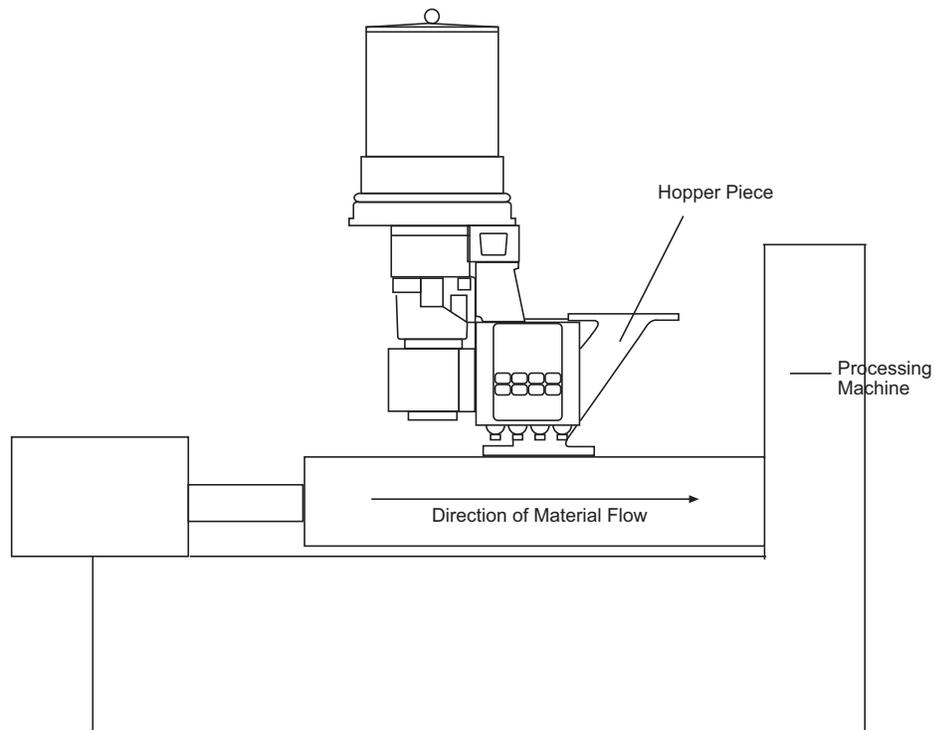


Figure 4. Digital Dosing Feeder Assembly

1. The Digital Dosing additive feeder is not affected by machine vibration, so the best performance is achieved by mounting the feeder directly on the feed throat of the molding machine or extruder (see Figure 4). The inlet into the process machine must be greater than 2" diameter, or an adapter may be necessary. If an adapter is required, it must be designed so that there are no edges where material can hang up - it must be smooth to promote consistent material flow.

2. The following applications require a larger feed stand (optional 3” or 4”) to prevent material bridging:
 - Machines with a total throughput over 200 lbs./hr.
 - Machines running regrind larger than 5/16” screen size
 - Processes with a high percentage of regrind (>30%)
 - Non-free flowing virgin material, i.e. powder
 - Consult factory for any special requirements.
3. Optimum mounting of the Digital Dosing feeder is shown in Figure 4, with the additive being dosed in the first few flights of the feed screw.
4. The controller should be remote mounted for operator convenience. **The control unit must not be exposed to temperatures above 45° C (115° F), or excessive moisture.**
5. Electrical connection to process machine:

Injection Molding: Connect the “cycle/run” cable (thin, gray two-conductor cable) to a set of dry (NO VOLTAGE) contacts that CLOSE for the duration of the screw recovery. (See Figure 5.)

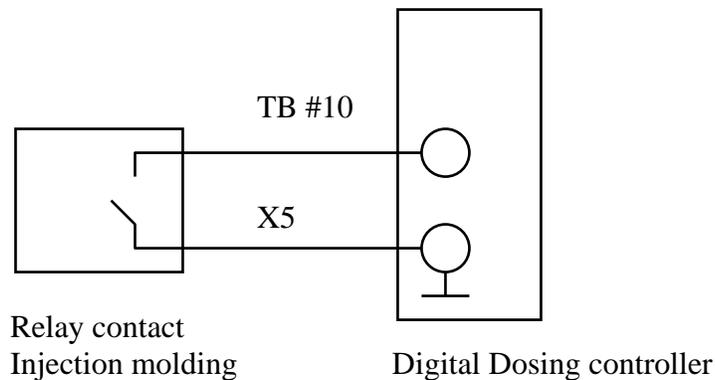
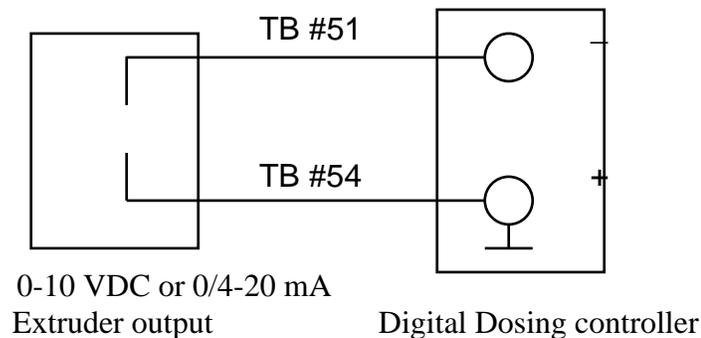


Figure 5. Electrical Interface Connection Diagram – Injection Molding or Extrusion - Constant

Extrusion - Constant: Wire the “cycle/run” cable (two- conductor gray cable) to a set of dry (NO VOLTAGE) contacts that CLOSE when the screw rotates. (See Figure 5.) The connection inside the controller should be on terminal block #10 and PLC input X5.

Extrusion - Proportional: Wire the “cycle/run” cable to the extruder signal output that is proportional to the extruder speed. The signal can be 0-10 VDC or 0-20 mA or 4-20 mA. *Jumpers J1 and J2 should be installed for 0-20mA or 4-20mA, and removed for 0-10VDC.*

- NOTES:**
1. Signal voltage from the extruder must to be isolated. Consult factory for other signal requirements. External signal converter may be required.
 2. “Zero” input corresponds to zero screw speed and no additive dosing. “Maximum” input corresponds to maximum screw speed.



**Figure 6. Analog Extruder Input Connection Diagram –
Extrusion - Proportional**

3-2 Initial Operation

The control system is factory-programmed. However, specific values need to be verified prior to operation (basic parameter settings). The input values will be saved and still be available if the feeder is switched off, or a power failure occurs. Please refer to Appendix B for these values.

Extrusion operations require a “span factor” to be entered into the basic settings. These are also explained in Appendix B.

Prior to putting your new Digital Dosing feeder on-line:

Configure the feeder control for motor speed, encoder pulses, sensors, and alarm options.

Tune the drive.

Enter a recipe.

Calibrate the additive weight for best accuracy.

NOTE: Recipe parameters are different for Injection Molding, Extrusion – Constant, and Extrusion - Proportional operation. See each individual section for details.

Once the feeder is on-line, recipes can be saved for later recall (up to 50 standard).

3-3 Recipes

Recipe Menu



The Recipe menu allows selection, editing, and deletion of recipes. The current recipe is displayed in the upper left corner. A different recipe can be selected by pressing the recipe value. Selecting a new recipe will automatically change the screen to the 1st recipe entry/editing screen.

Pressing the Edit Recipe button will display the 1st recipe entry/edit screen. See following section.

Pressing the New Recipe button will display the New Recipe menu.



Pressing the Edit Recipe button will display the 1st recipe entry/edit screen. See following section. Select a new recipe by pressing the recipe # value. Press the “Next Avail” button to use the next available empty / unused recipe number.

Pressing the Delete Recipe button will display a confirmation screen as follows:



Press the Delete Recipe button to clear all values from the current recipe. Pressing the Keep Recipe button will retain the values and return to the Recipe Menu screen.

Enter / Edit Recipes.

Injection molding.

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 5) Additive %
- 6) Shot Size
- 7) Screw Recovery Time.
- 8) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



The screenshot shows a monochrome LCD display. At the top, it reads "Recipe 3". Below that, a large box contains the text "% Additive 5.50%". At the bottom of the screen, there are two rectangular buttons labeled "Next" and "Menu".

The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the shot size is 200 grams and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Shot Size screen.

Shot Size



The screenshot shows a monochrome LCD display. At the top, it reads "Recipe 3". Below that, a large box contains the text "Shot Size 123.4 GR". At the bottom of the screen, there are three rectangular buttons labeled "Prev", "Next", and "Menu".

The shot size specifies the total capacity of the mold in use on the press. The value can be entered in grams, kilograms, ounces, or pounds. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen.

Screw Recovery Time.



The screw recovery time is the estimated screw recovery time, and is used as the initial value for validating the recipe. Actual screw recovery times as measured by the presence of the screw recovery signal, are used to fine-tune the feed rate during operation. The estimated time **must** be at least $\frac{1}{2}$ of the actual recovery time. If less than $\frac{1}{2}$, the feeder will interpret the recovery signal as a purge cycle.

Calibration weight.



Calibration weight is determined from chart 5.1, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be $\frac{1}{4}$ to 5 times this initial value.

Additive Sample weighing.

Weighing samples of additive provides for more precise control of feed rate. Up to 5 samples can be weighed. All weights entered are averaged to arrive at a value to be used during operation. The weighing process may be skipped altogether, in which case the calibration weight is used for calculations of feed rate. See the section **Weight Calibration** at the end of this section.

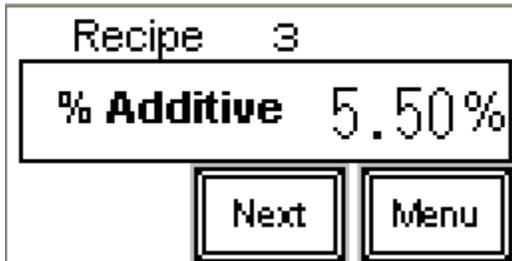
Simple Extrusion Recipe.

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 4) Additive %
- 5) Throughput
- 6) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



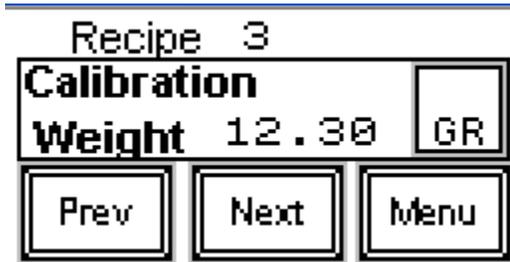
The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the throughput is 200 grams per minute and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Throughput screen.

Throughput.



Press throughput specifies the total weight of material through the extruder per minute. The value can be entered in grams, kilograms, ounces, or pounds per minute. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. It is important that this value be adjusted whenever the extruder speed changes.

Calibration weight.



Calibration weight is determined from chart 5.1, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be $\frac{1}{4}$ to 2.5 times this initial value.

Additive Sample weighing.

Weighing samples of additive provides for more precise control of feed rate. Up to 5 samples can be weighed. All weights entered are averaged to arrive at a value to be used during operation. The weighing process may be skipped altogether, in which case the calibration weight is used for calculations of feed rate. See the section **Weight Calibration** at the end of this section.

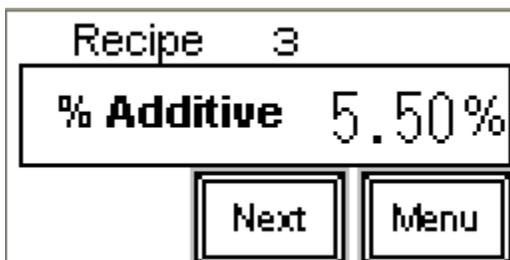
Extrusion Follower Recipe.

In order to calculate the correct motor speed required to feed the desired amount of additive, the following data must be entered:

- 1) Additive %
- 5) Throughput
- 6) Throughput RPM
- 7) Calibration weight.

In addition, for the greatest accuracy, samples of the additive should be weighed and entered.

Additive %



The % additive specifies the proportion of additive to virgin material as a percentage of throughput. For example, if the throughput is 200 grams per minute and 8.5 grams of additive are required, the additive percentage would be 4.25. After the additive value has been entered, press the “Next” button to navigate to the Throughput screen.

Throughput.



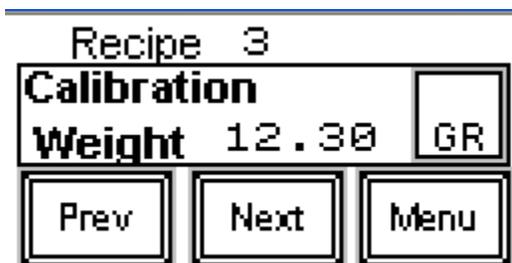
Press throughput specifies the total weight of material through the extruder per minute. The value can be entered in grams, kilograms, ounces, or pounds per minute. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. This value is the throughput corresponding to a specific extruder RPM, which will be entered on the following screen. Given these reference values, the correct feed rate can be determined for any extruder speed. Note that the minimum and maximum press speeds and signal levels must be entered correctly in Setup.

Throughput Speed.



The press speed corresponding to the throughput value entered on the previous screen. Given these reference values, the correct feed rate can be determined for any extruder speed. Note that the minimum and maximum press speeds and signal levels must be entered correctly in Setup.

Calibration weight.



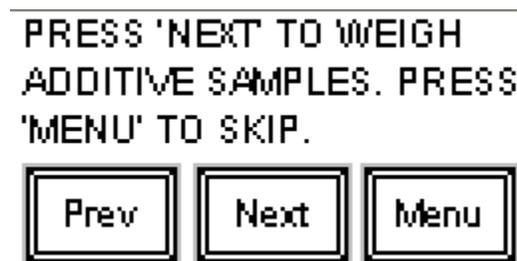
Calibration weight is determined from chart 5.1, and is dependant on the disc installed in the feeder. This weight is the amount of standard density material dispensed by the feeder during one revolution of the disc. This weight is used as the initial value for recipe validation and feed rate calculation. If samples are not weighed as described in the next section, this value is used during operation. The weight can be entered in ounces or grams. The unit of measure is changed by pressing the units button at the middle right of the screen. Changing the unit of measure will NOT change the value displayed on the screen. The value initially displayed is the weight which would result in a motor speed of 25%. The valid range of values would then be ¼ to 2.5 times this initial value.

Additive Sample weighing.

Weighing samples of additive provides for more precise control of feed rate. Up to 5 samples can be weighed. All weights entered are averaged to arrive at a value to be used during operation. The weighing process may be skipped altogether, in which case the calibration weight is used for calculations of feed rate.

3-4 Calibration

The final step of recipe setup is weight calibration. This procedure is common to all types of presses supported. After entering the calibration weight, pressing the “Next” button displays the following screen:



Press the “Menu” button to skip the weighing procedure and use the calibration weight for feed rate calculations. Note that using the calibration weight is not as accurate as weighing samples. Pressing the “Next” button displays screen #1.

Screen 1.



Initial preparation for weighing samples. The access cover to the calibration chamber should be removed / opened. The container used to catch and hold the samples should be tared (place the container on the scale and zero the scale). The container should then be placed in the calibration chamber. Press “Next” when these steps have been completed. The motor will begin to run as Screen 2 will be displayed.

Screen 2.

PRIMING DISK WITH
ADDITIVE. PLEASE WAIT.
PRESS 'MENU' TO CANCEL.



The disc will make one complete revolution, insuring all pockets are filled with additive material prior to actual weighing. Motor speed is 25%.

Screen 3.

DISCARD SAMPLE,
REPLACE TRAY IN CALI-
BRATION BOX. PRESS NEXT



When the motor stops, screen 3 is displayed. Discard sample and replace container in calibration box. Press "Next" starts the motor and displays Screen 4.

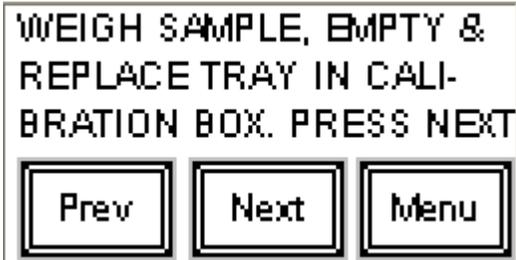
Screen 4.

LOADING NEXT WEIGHT
SAMPLE. PLEASE WAIT.
PRESS 'MENU' TO CANCEL.



The disc will make one complete revolution, dispensing additive into the tray. Motor speed is 25%. When the motor stops, Screen 5 is displayed.

Screen 5.



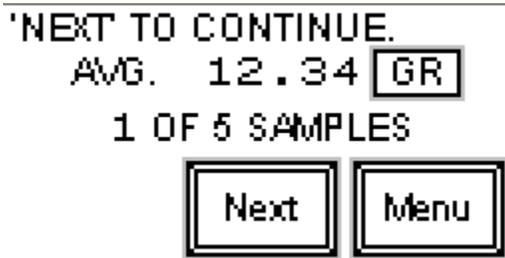
Weigh the sample, making note of the weight for entry on the next screen. Discard sample & replace tray in calibration box. Press “Next” to display Screen 6.

Screen 6.



Enter the sample weight obtained from the previous cycle of the feeder. The unit of measure will be the same as used for the calibration weight. Pressing the Enter symbol on the screen keypad displays Screen 7.

Screen 7.



The screen displays the running average of sample weights, as well as the number of samples taken. Pressing “Next” will repeat the process at Screen 4 if less than 5 samples have been taken, otherwise Screen 8 will be displayed.

Screen 8.

REMOVE TRAY, REPLACE
SAMPLING COVER.
PRESS 'NEXT'.



The tray should be removed from the calibration chamber. The access cover should be replaced / closed. Weight Calibration is complete. Note that at any time in the process, the “Menu” button may be pressed to abort the weight calibration process. Any sample weights, if any, are used to calculate the average weight. If no sample weights are entered, the calibration weight is used for calculations. Using less than 5 samples may affect feeder accuracy.

3-5 Status screens

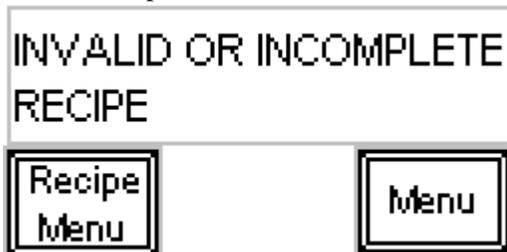
Status Screens

The status screens reflect the state of the feeder during operation. The status screens are accessed by pressing the “Status” button on the main menu.

Prerequisites.

Before the status screens can be displayed, the current recipe must be valid & complete. If the current recipe is not valid, an advisory screen is displayed :

Invalid Recipe:



Common Elements



Buttons



Press the Start button to begin feeding operation using the current recipe.



Press the Stop button to end feeding operation.



Press the Next button to display the next Status screen. There are 3 status screens available while the A250 is running:

Totalizer screen

Throughput screen

Motor Speed screen

When the A250 is stopped, a 4th screen is available – The Manual Run / Jog screen.



Press the Menu button to display the Main Menu screen.

Speed Status Indicator

If the speed alarm only option is selected in the configuration section, the following indicators are enabled.

OVERSPEED

Displays when the feeder speed exceeds the calculated speed by greater than that specified on the speed alarm setup screen. The screen will change to a steady orange color.

UNDERSPEED

Displayed when the feeder speed is less than that specified on the speed alarm setup screen. The screen will change to a steady orange color.

NO PULSES

Displayed when no encoder pulses are detected from the drive motor. The screen will change to a steady orange color.

ABOVE MAX

Displayed when the calculated motor speed is greater than the rated motor speed. The screen will change to orange and flash in this condition.

BELOW MIN

Displayed when the calculated motor speed is less than 5% of the rated motor speed. The screen will change to orange and flash in this condition.

Disc Motor Indicator



Displayed when the drive motor is running.

Press Signal Indicator



Displayed when press signal is detected:

Injection – Screw recovery signal.

Simple Extrusion – Press Run signal.

Extrusion Follower – Analog speed signal.

Totalizer Screen



Displays total additive dosed since:

- A. Recipe change. Modifying the current recipe will not reset the total.
- Or
- B. Totalizer reset.

The total is displayed in KG if recipe additive is measured in grams or kilograms. The total is displayed in LB if the recipe additive is measured in ounces or pounds.



Pressing the reset button resets the total display to zero.

Throughput Screen



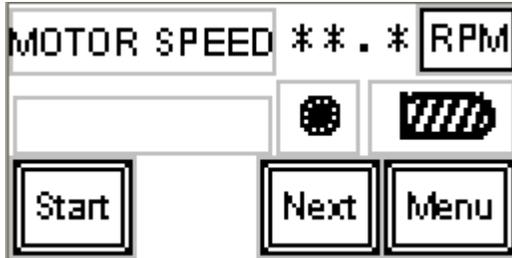
Displays the calculated throughput.

Injection Press. Throughput is based on recipe data and measured average screw recovery time. A running average of the 5 most recent screw recovery times is used.

Simple extrusion. Throughput is based on recipe data.

Extrusion Follower. Throughput is based on recipe data and the current press speed signal.

Motor Speed Screen



Displays the current motor speed when running, and the calculated speed when stopped.

Screw Recovery Times Screen (Injection only)



Displays the 5 most recent screw recovery times (latest on top), as well as the simple average and weighted average.

Manual Run / Jog Screen



This screen is only available when the A250 control is stopped. This screen provides the means to purge / clear additive, prime additive, etc..

2.9 RPM

The speed at which the motor will run, jog, or purge. Adjust using the Accel and Decel buttons.



Pressing and holding either of these buttons will adjust the motor run speed by approximately 1% of max speed every 1/2 second. The minimum speed is 5%, while the maximum speed is 100%. The default speed is 50%.



Pressing and holding the Jog button will run the motor at the indicated speed for as long as the button is held.

10 SECS

The length of time the motor will run when the Run Motor button is pressed. Adjustable from 0 to 999 seconds. The default is 0 seconds.



Pressing the Run Motor button causes the motor to run for the indicated time.



While the motor is running, it can be stopped by pressing the Stop Motor button.



Pressing the Purge button will cause the feeder to run at the indicated rate for the duration of the next screw recovery signal. The purge mode will be cancelled at the end of the screw recovery signal or as noted below.



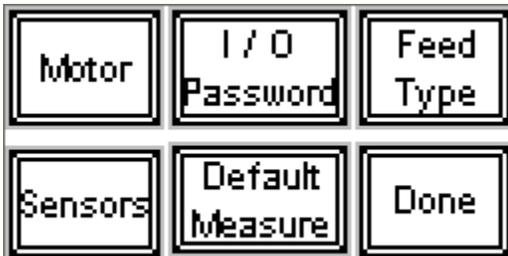
Pressing the Purge button when purge mode is active will cancel purge mode.

Configuration.

Navigation.

The top level of System setup navigation is the System Setup Menu:

System Setup Menu



The configuration screens are grouped by similar function. Each of the buttons on the System Setup Menu screen will navigate to the 1st screen of each group. From each configuration screen, any of the following screens can be reached:

- A) The Main Menu, using the Menu button.
- B) The System Setup Menu, using the Done button.
- C) The next Configuration screen, using the Next button.
- D) The previous Configuration screen, using the Prev button.

System Setup Navigation Buttons.



Navigates to the previous screen in the setup “chain”. See Table 4.1.



Navigates to the next screen in the setup “chain”. See Table 4.1.



Navigates to the Setup Menu screen.



Navigates to the Main Menu screen.



From the Drive Tuning screen, returns to the Max RPM screen.
From the Speed Alarm screen, returns to the Encoder Pulses screen.

Table 4.1
Injection Press

Screen #	Title/Function	Prev Screen	Next Screen
60	Press Type	N/A	Max Motor Speed
61	Max Motor Speed	Press Type	Encoder Pulses Tune & Speed alarm
62	Encoder Pulses Tune & Speed alarm	Max Motor Speed	Default Add. Measure
76	Default Add. Measure	Encoder Pulses Tune & Speed alarm	Default Shot Measure
63	Default Shot Measure	Default Add. Measure	Additive Sensor
64	Measure	Default Shot Measure	Virgin Sensor
6A	Additive Sensor	Measure	Passwords
6B	Virgin Sensor	Additive Sensor	Digital I/O Monitor
6C	Passwords	Virgin Sensor	Analog I/O Monitor
6D	Digital I/O Monitor	Passwords	Setup Menu
6E	Analog I/O Monitor	Digital I/O Monitor	

Simple Extrusion Press

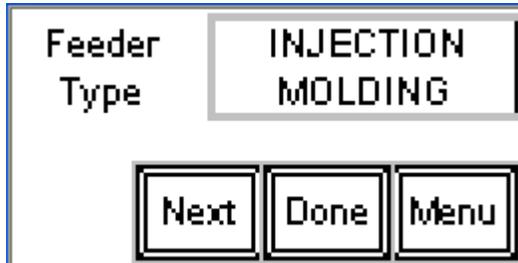
Screen #	Title/Function	Prev Screen	Next Screen
60	Press Type	N/A	Max Motor Speed
61	Max Motor Speed	Press Type	Encoder Pulses Tune & Speed alarm
62	Encoder Pulses Tune & Speed alarm	Max Motor Speed	Default Add. Measure
76	Default Add. Measure	Encoder Pulses Tune & Speed alarm	Default Shot Measure
63	Default Thruput Meas.	Default Add. Measure	Additive Sensor
65	Measure	Default Thruput Meas.	Virgin Sensor
6A	Additive Sensor	Measure	Passwords
6B	Virgin Sensor	Additive Sensor	Digital I/O Monitor
6C	Passwords	Virgin Sensor	Analog I/O Monitor
6D	Digital I/O Monitor	Passwords	Setup Menu
6E	Analog I/O Monitor	Digital I/O Monitor	

Extrusion Follower Press

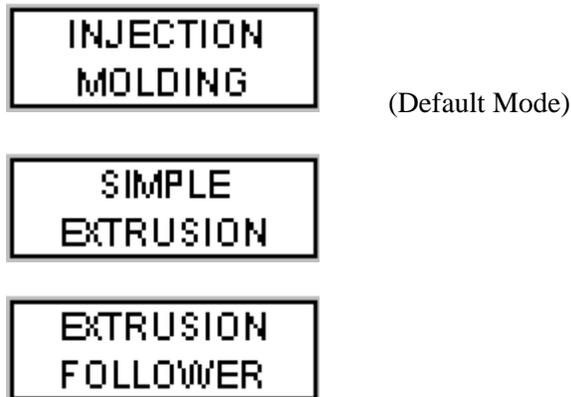
Screen #	Title/Function	Prev Screen	Next Screen
60	Press Type	N/A	Max Motor Speed

61	Max Motor Speed	Press Type	Encoder Pulses Tune & Speed alarm
62	Encoder Pulses Tune & Speed alarm	Max Motor Speed	Default Add. Measure
76	Default Add. Measure	Encoder Pulses Tune & Speed alarm	Default Shot Measure
63	Default Thruput Meas.	Default Add. Measure	Additive Sensor
65	Additive Sensor	Default Thruput Meas.	Virgin Sensor
6A	Virgin Sensor	Additive Sensor	Press Signal Type
6B	Press Signal Type	Virgin Sensor	Min Signal set
66	Min Signal set	Press Signal Type	Max Signal set
67	Max Signal set	Min Signal set	Passwords
68	Passwords	Max Signal set	Digital I/O Monitor
6C	Digital I/O Monitor	Passwords	Analog I/O Monitor
6D	Analog I/O Monitor	Digital I/O Monitor	Setup Menu
6E			

Feeder Type.



Feeder type is selected by pressing the button in the upper-right corner. The button text changes with each press of the button in the following order:



An injection molding press provides a contact closure during the “Screw Recovery Cycle”, or that period when the press is loading material prior to injection into the mold cavity.

The 2 types of extrusion presses are dependant on the input signal provided to the A250 additive feeder. Simple extrusion provides a contact closure to input 5 of the PLC, and it is assumed that the press is always run at the speed entered for the active recipe. Extrusion follower provides an analog signal to channel 0 of the analog module which changes in relation to the speed (throughput) of the press.

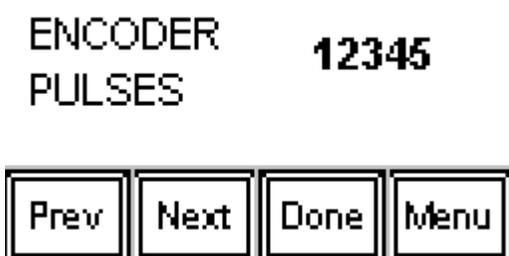
Maximum Motor Speed.



The maximum motor RPM is the maximum rated speed for the motor being used with the A250 control. The default nominal value is 11.5 RPM. This value should be changed to reflect the actual motor RPM based on motor type and tuning results (See **Drive Tuning** following this section). Initially, this value should be set to the nameplate RPM for the motor/gearbox being used, before proceeding to Drive Tuning.

- 1) Turn the Accel & Decel pots fully counter-clockwise.
- 2) Press the “Min” button.
- 3) Check rotation direction. Disk should turn (**counterclockwise**).
- 4) Swap A+ & A- leads **With Power Off** to change rotation direction.
- 5) Press “Max” button.
- 6) Adjust max pot to adjust max speed to match target value.
- 7) Press “Min” button.
- 8) Adjust min pot to adjust min speed to match target value.
- 9) Repeat steps 5-8 until readings stabilize.
- 10) If maximum speed value cannot be obtained, change max RPM on the **Maximum Motor Speed** screen to match the closest value obtained on this screen.

Encoder Pulses.



The encoder pulses are determined by the number of encoder steps per motor revolution (usually 30) multiplied by the gearbox ratio. In the case of the standard motor, the ratio is 190:1, so $30 \times 190 = 5700$. To change the value, press the value on the screen to activate the keyboard. Key in the correct value and press the  key.

Manufacturer	Motor Color	RPM	Encoder Pulses

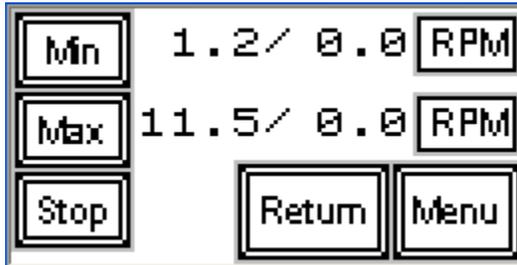
Bodine	Black & silver	3	8400
Bodine	Black & silver	8.4	8400
Bodine	Black & silver	11.5	5700
Bodine	Black & silver	38	1800



Motor and alarm utility selection

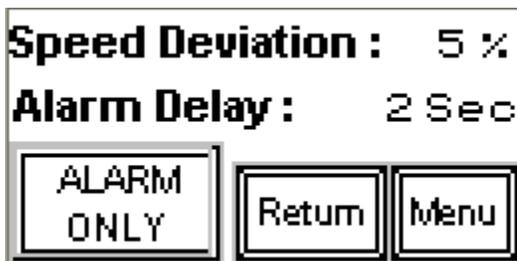
The **Speed Alarm** settings screen can be activated by pressing the “Speed Alarm” button. The **Drive Tuning** screen can be activated by pressing the “Tune Drive” button. See the following sections for these screens.

Drive Tuning.



The drive tuning screen is provided as an aid to tuning the drive to match the motor and load of the A250 feeder. Pressing the “Min” button will send the minimum drive signal to the controller. Pressing the “Max” button will send the maximum drive signal to the controller. Pressing the “Stop” button (or leaving this screen) will terminate any signal sent to the controller. The numbers on the left are the target min/max values. The numbers on the right are the actual speed values. A small screwdriver, preferably non-metallic, is needed to tune the drive. Tune the drive as follows:

Speed Alarm



The reaction to deviations from the commanded speed are controlled via this screen. Speed deviation specifies the window within which the motor speed must be for normal operation. The Alarm Delay specifies the minimum time the speed must be outside this window before generating an alarm. For example, if the default values are used and the commanded speed is 5 RPM, the controller will alarm if the speed is less than 4.75 RPM or more than 5.25 RPM for at least 2 seconds. The specific response to the alarm condition can be selected by pressing the button in the lower left corner as follows:



Take no action. See Status screens for indicator.



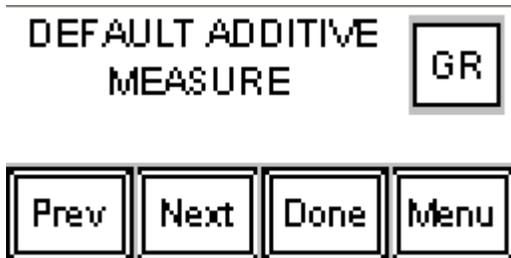
Activate alarm screen & alarm output on PLC.



Activate alarm screen & alarm outputs, and stop the feeder.

See **Status Screens** section for speed alarm screen details.

Default Additive Measure.



This screen sets the default measure for additive weight in recipes. While the measure can be changed in any recipe, this screen allows selection of the most commonly used unit of measure. Press the upper right corner to select:



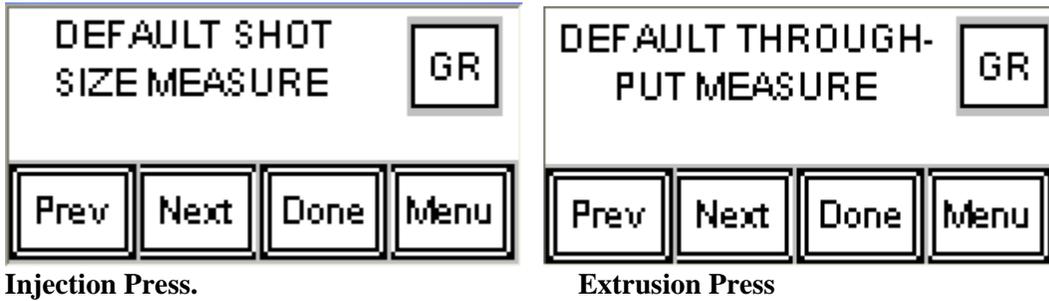
Grams

Or



Ounces

Default Shot Size / Throughput Measure.



This screen sets the default measure for overall weight in recipes. While the measure can be changed in any recipe, this screen allows selection of the most commonly used unit of measure. Press the upper right corner to select:

- GR Grams
- KG Kilograms
- OZ Ounces
- LB Pounds

Additive / Virgin Material Sensor.



These screens select whether an additive (or virgin) material sensor is present and if so, what action to take when the sensor detects no material. Press the button in the upper right corner to sequence through the following options:



No sensor is present. (Default)

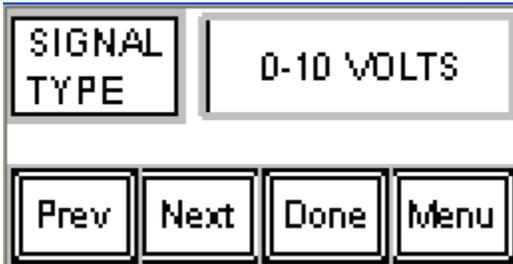


Sensor is present. Display alarm screen & activate alarm output, but keep feeder running.



Sensor is present. Display alarm screen & activate alarm output, and stop feeder operation.

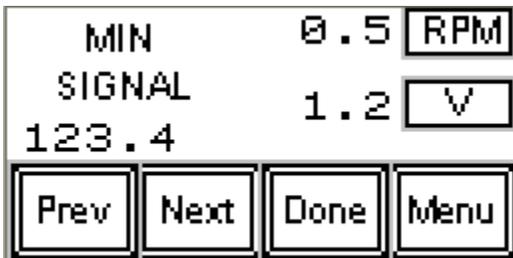
Press Signal Type. (Extrusion Follower only)



This screen selects the type of analog signal provided by the press to communicate the press speed. Press the button in the upper right corner to select from the following:

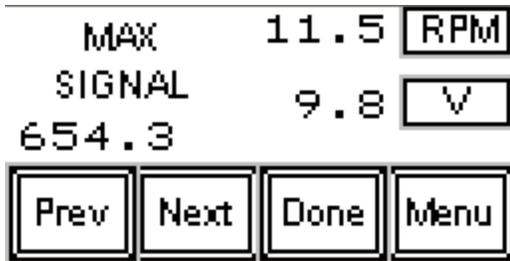
- 0-10 VOLTS 0 to 10 volts DC. (Default)
- 0-20 mA 0 to 20 mA (milliamps) DC.
- 4-20 mA 0 to 20 mA (milliamps) DC.

Minimum Press Signal. (Extrusion Follower only)



This screen configures the minimum speed of the press and the analog signal associated with that speed. Press the top number to enter the minimum speed, using the screen keyboard, in RPM for the press. The voltage associated with that speed can either be entered manually by pressing the value and entering the value on the keyboard, or by pressing the number at the lower left to read the voltage level currently being sent by the press. The unit of measure, A or V, is determined by the selection made on the **Press Signal Type** screen.

Maximum Press Signal. (Extrusion Follower only)



This screen configures the maximum speed of the press and the analog signal associated with that speed. Press the top number to enter the maximum speed, using the screen keyboard, in RPM for the press. The voltage associated with that speed can either be entered manually by pressing the value and entering the value on the keyboard, or by pressing the number at the lower left to read the voltage level currently being sent by the press. The unit of measure, A or V, is determined by the selection made on the **Press Signal Type** screen.

Note: The Minimum & maximum press signal values are used to calculate the relationship between input signal and extruder speed. Operation at speeds below the minimum and above the maximum are possible, subject to input signal limits. See appendix # for examples.

Passwords Screen.



The passwords screen allow the entry of Operator & Setup passwords. By default, these are set to 0, which disables the password requirement. Setting the password to a non-zero value activates password protection. To set / change the Operator password, press the value next to “Operator” and enter the new password using the screen keyboard. To change the password duration, press the duration value & enter the new duration using the screen keyboard. The Setup password and duration are entered in the same way. Refer to Table 4.2 for password requirements based on which passwords are enabled.

Table 4.2
Password requirements.

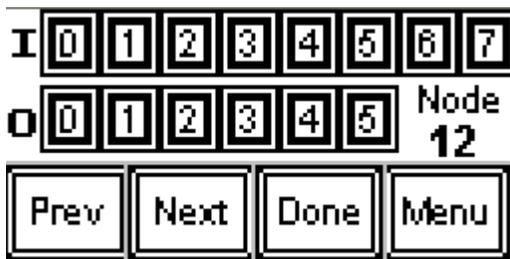
	No Passwords Set	Operator Only Active	Setup Only Active	Operator and. Setup Active
Recipe Functions	X	O	X	O
System Start/Stop	X	O	X	O
Manual Jog/Run	X	O	X	O
System Setup	X	O	S	S

X - None

O - Operator

S - Setup

Digital I/O Monitor.



This screen monitors the PLC inputs and outputs. When an input or output is on, the indicator is displayed white on black - . When an input or output is off, the indicator is displayed as black on white - .

If using the Modbus communications option, the node (station) number is set here. Valid node numbers are 0-32.

Analog / Encoder Monitor.



This screen monitors the analog input & output, as well as the raw encoder value input. Additionally, the encoder can be connected to an alternate PLC input to help troubleshoot encoder problems. To change the encoder input, disconnect power & move the encoder signal wire from input 0 to any of inputs 1, 2, or 3. Restore power, navigate back to this screen, and change the “ENC CH” # to match the PLC input chosen.

When the “Jog Mtr” button is pressed, the motor will run at 25% speed for as long as the button is pressed. The top line will display the raw encoder value. The “MTR OUT” value will be 500 for KB or Bodine drives, or 1000 for Dart drives. The “PRESS” value will be 0-4000, depending on the press signal, if no press signal is connected, the value will be at or near zero.

3-6 Optional Features

Optional equipment for the Digital Dosing Additive Feeder includes:

Loaders

Several versions of automatic loaders are available to keep the additive (or virgin material) supply hoppers full – consult with your sales contact for the unit that best fits your needs.

Hoppers

Several versions of hoppers are available and can be used in different applications - consult with your sales contact for the unit that best fits your needs.

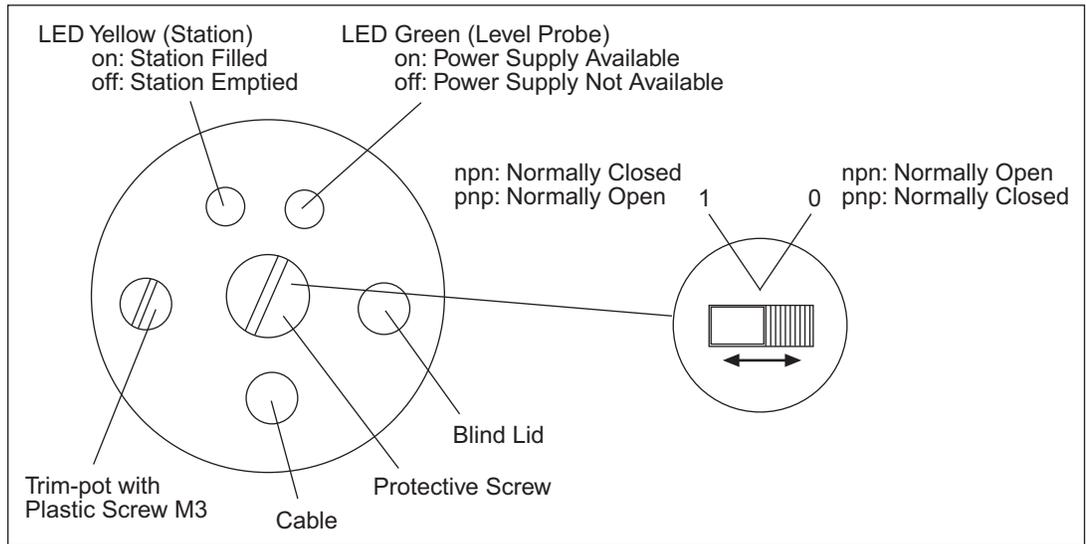
Alarms

Several alarm options are available for the Digital Dosing feeder. Options include both audible horns and flashing lights. An optional no voltage alarm relay can be connected to the user’s central alarm system.

Level switches (probes)

To adjust the level switches:

1. Turn the controller ON.
2. Fill the dosing station until the level sensor is one-third covered.
3. Remove the plastic screw (M3) on the back of the level sensor (see Figure 7).



Level Probe

Figure 7. Level Sensor Adjustment Screw

4. Turn the trim-pot until the yellow control lamp just switches off.

NOTE: *Turning the trim-pot to the left decreases the switching sensitivity, and turning it to the right increases the sensitivity.*

5. Fill the dosing station until the level probe is two-thirds covered. The yellow control lamp should now switch on again. If not, repeat Step 4.
6. Reinstall the plastic screw (M3).

NOTE: *The sliding switch under the cover must be set on "0".*

Communication Protocol Interfaces

The Digital Dosing feeder can be controlled remotely through ODBUS RTU protocol. Contact the Sales Department at 810.720.7300 for more information.

OPTIONAL Additive Hoppers

Various styles of additive hoppers and options are also available for the Digital Dosing feeder. Contact the Sales Department at 810.720.7300 for more information.



ALUMINUM SUPPLY HOPPER



892.01717.00 - ALUMINUM HOPPER ASSEMBLY, DD/DP
 892.01718.00 - ALUMINUM HOPPER ASSEMBLY, DT
 IF THE STANDARD BOLT PATTERN IS USED, (SEE FIG. 1) THEN AN ADDITIONAL COVER IS NOT REQUIRED.
 IF THE HOPPER ASSEMBLY IS ORDERED FOR A DP UNIT (POWDER DOZER) THEN 2 (2) PINS ARE REQUIRED FOR PROPER ALIGNMENT. (CT14027)



AD67133 - BLANK COVER



AD64740 - MOUNTS AN EL-1 LOADER



AD64741 - MOUNTS AN EL-3 OR EL-7 LOADER



892.01740.00 - MOUNTS TWO LOADERS LESS SIGHTGLASS



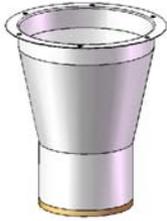
892.01749.00 - MOUNTS TWO AND SIGHTGLASS AND SIGHTGLASS RECEIVER WITH SIGHTGLASS



AD77180K - ADAPTS TO 190mm FLANGE



AD77180K - ADAPTS TO 230mm FLANGE



892.00140.00 - ALUMINUM HOPPER ONLY, USED TO REPLACE ACRYLIC HOPPER

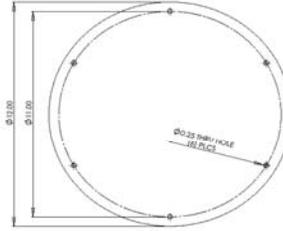


FIG. 1

STAINLESS STEEL SUPPLY HOPPERS

208mm FLANGE (8.19" DIA.)
 ALL STAINLESS STEEL SUPPLY HOPPERS INCLUDE FINGER GUARD AND RING CLAMP.



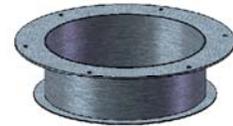
892.01982.00 - 4.4L SUPPLY HOPPER, DD/DP DP UNIT REQUIRES 2 ROLL PINS(CT144027)
 892.01981.00 - 4.4L SUPPLY HOPPER, DT



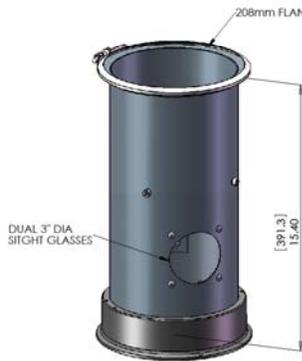
CT29264 - ADAPTER HOPPER ASSY 190D-208D (RING CLAMP INCLUDED)



CT29120K - ADAPTER HOPPER ASSY 208D-253D (RING CLAMP INCLUDED)



A0569641K - ADAPTER HOPPER ASSY 253D-SRC LOADER



892.01982.00 - 8.8L SUPPLY HOPPER, DD/DP DP UNIT REQUIRES 2 ROLL PINS(CT144027)
 892.01981.00 - 8.8L SUPPLY HOPPER, DT

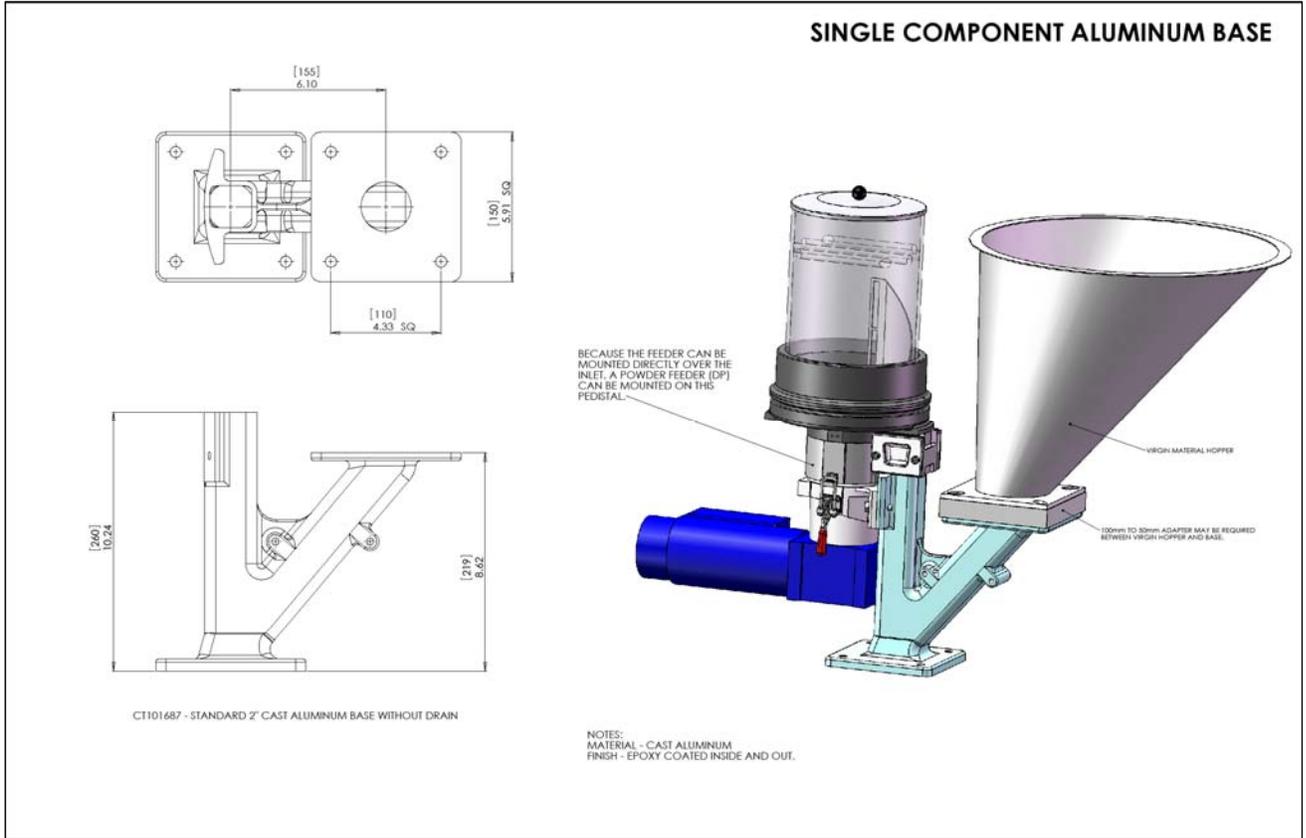


CT102004 - 4.4L SUPPLY HOPPER, DD/DP DP UNIT REQUIRES 2 ROLL PINS(CT144027)
 CT102112 - 4.4L SUPPLY HOPPER, DT

STAINLESS STEEL HOPPERS ARE MOST OFTEN USED TO MOUNT A LOADER AUTOMATICALLY KEEPING THE SUPPLY HOPPER FULL OPPOSED TO A MANUAL FILL OPTION.
 SIGHTGLASSES ARE THE EASIEST WAY TO CHECK FOR PROPER PERFORMANCE

Virgin Material Supply Hoppers

Various virgin material supply hopper options are available if your existing hopper will not work properly with the Digital Dosing feeder. Contact the Sales Department at 810.720.7300 for more information.



Chapter 4: Maintenance

4-1 Preventative Maintenance Intervals

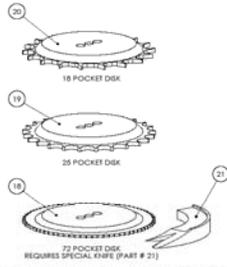
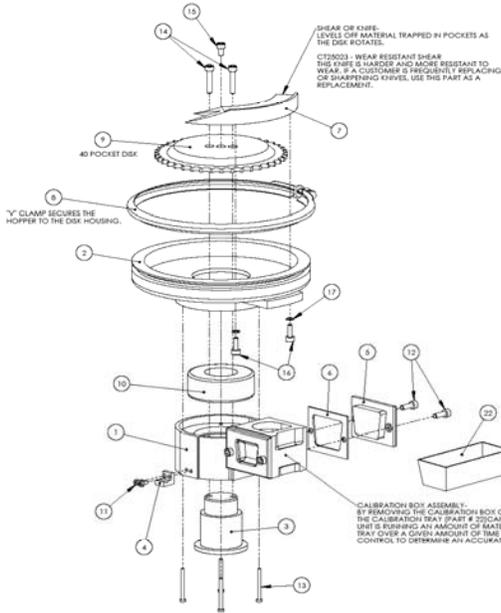
Daily:	Check warning signs on equipment for good legibility and completeness.
Weekly:	Check function of the “On/Off” Switch. Check shear plate and mounting hardware in “DD” dosing station.
Every 3 months:	Check wiper and mounting hardware in “DT” dosing station.
Every 6 months:	Check that all electrical and mechanical connections are tight. Check adjustment of the level probes (optional).
Annually:	Check dosing disc in dosing station DD and DT.
Each time after material Is changed:	Clean the dosing station. Check shear plate or wiper. Check dosing disc.

CAUTION: Always disconnect power and remove the dosing module from the motor assembly before taking the dosing module apart.

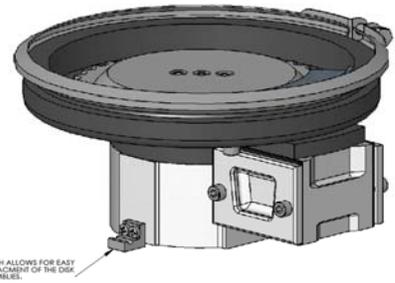
Injury could result if fingers are pinched between the rotating disc.

"DD" Dosing Module - Pellets

DD DISK AND HOUSING FOR DOSING PELLET ADDITIVES



DISKS ARE INTERCHANGABLE INCLUDING THE 72 POCKET DISK AND ACCOMPANYING KNIFE.
FREQUENT DISK CHANGES ARE REQUIRED, IT IS CONSIDERABLY EASIER TO HAVE A SEPARATE DISK AND HOUSING ASSEMBLY (WITH HOPPER).

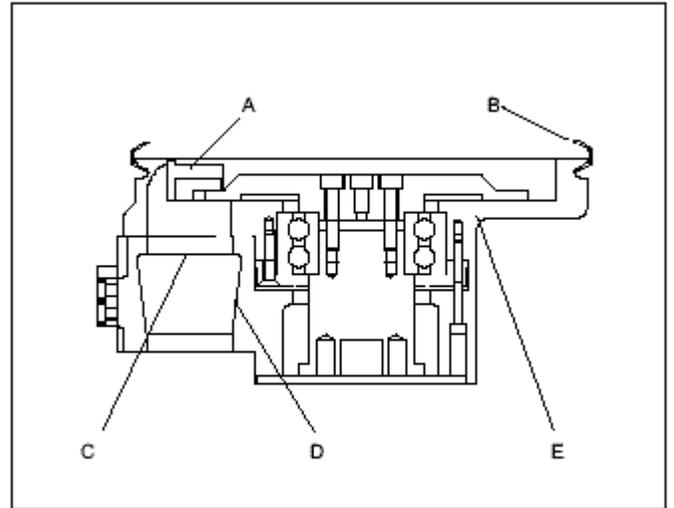


ITEM PART NO.	DESCRIPTION
1	CT18431 CALIBRATION BOX CSD C878 RN
2	CT113007 DISK HSG DD30 MACH & HARDPOINT
3	CT113008 SHEAR CALIBRATION BOX CSD
4	CT186113 HOOK FOR DETACH CLAMP
5	CT18444 COVER CALIBRATION BOX CSD/CSD
6	CT18481 SHEAR COVER CAL BOX CSD/CSD
7	CT21392 SHEAR CSD 1.0 C878
8	CT2228 Y CLAMP DD30 DISG/INTERMEDIATE
9	CT21710 DISC DD30 40 POCKET
10	CT2228 Y CLAMP DD30 DISG/INTERMEDIATE
11	CT10009 1.14 SCREW PAN PHILLIPS M4X12
12	CT10003 172 SCREW SOCKET M4X14
13	CT10003 145 SCREW SOCKET M4X10
14	CT10003 177 SCREW SOCKET M4X30
15	CT2228 Y CLAMP DD30 DISG/INTERMEDIATE
16	CT10003 154 SCREW SOCKET M4X14
17	CT10004 106 WASHER LOCK M6
18	CT10565 DISC DD30 18 POCKET
19	CT21711 DISC DD30 25 POCKET
20	CT2228 Y CLAMP DD30 DISG/INTERMEDIATE
21	CT100075 SHEAR DD 72 POCKET
22	CT18484 TRAY CAL BOX

4-2 Removing the Shear Plate (“DD dosing Module)

Removing the shear

1. Turn “Off” off the “On/Off” switch.
2. Disconnect the power supply.
3. Open the toggle latches on the dosing motor.
4. Remove the dosing unit from the dosing motor.
5. Empty the dosing station.
6. Open the profile clamp (B) on the dosing hopper.
7. Remove the dosing hopper from the dosing feeder.
8. Loosen the two screws (C) on the underside of the dosing unit housing (E).
9. Remove the shear (A).



Dosing unit (side view)

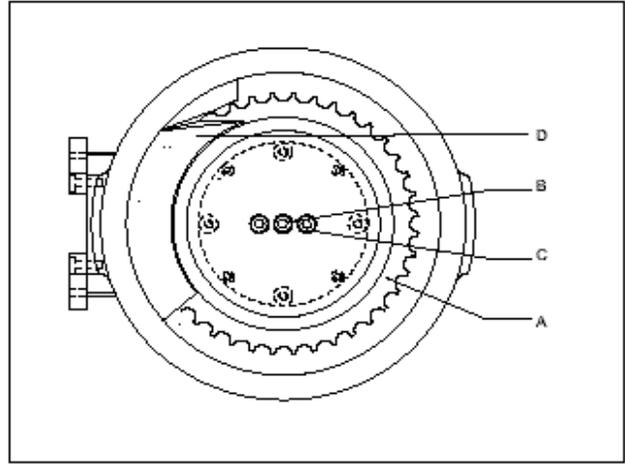
Installing the shear

1. Place the new shear in the dosing unit housing, and ensure that it is positioned correctly.
2. Bolt the shear in place with the two (2) hexagon M5 x 16 socket screws and lock washers.
3. Turn the dosing disc to verify smooth rotation. Replace shear if it is dragging on disc when disc is rotated.
4. Position the dosing hopper on the dosing module, and install the profile clamp (B).
5. Tighten the M10 hex head screw on the profile clamp.
6. Position the dosing unit on the dosing motor, aligning the guide pins.
7. Close the toggle latches, fastening the dosing module to the motor assembly.

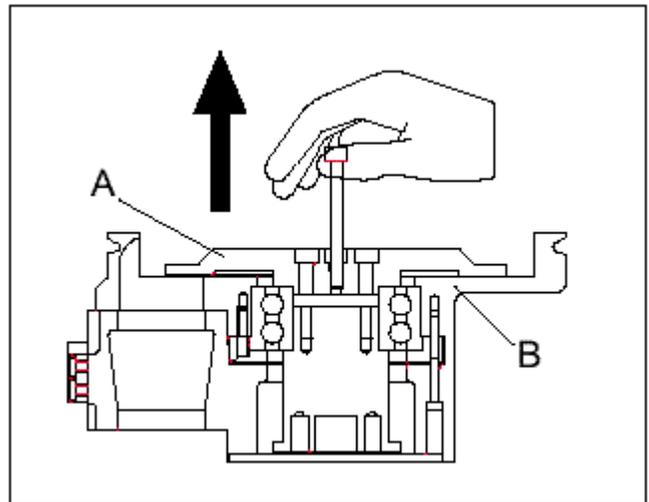
4-3 Removing the “DD” Disc and Cleaning the Dosing Module

Dismantling the Dosing Module

1. Switch the control unit “Off” with the “On/Off” switch.
2. Disconnect the power supply.
3. Open the toggle latches on the dosing motor.
4. Remove the dosing unit from the dosing motor.
5. Empty the dosing module.
6. Open the profile clamp on the dosing hopper.
7. Remove the dosing hopper from the dosing module.
8. Dismantle the dosing module and remove the shear (D) as described above in 5.2.
9. Loosen and remove the two M6 x 30 socket screws (C) on top of the dosing disc (A).
10. Remove the center M6 x 12 socket screw (B) and replace with an M6 x 30 or 60 screw.
11. Lift the dosing disc (A) from the dosing unit housing (B) by tightening this screw.
12. Clean the shear plate with a cotton cloth.
13. Clean the dosing hopper and the dosing disc in soapy water.
14. The dosing unit housing may also be cleaned with a soft cloth, keeping liquids out of the bearings.



Dosing unit (top view)



Dosing unit (side view)

Installing the Dosing Module

1. Remove the screw (M6 x 30 or 60) from the center hole.
2. Place the dosing disc in the dosing unit housing.
3. Screw the dosing disc in place with two (2) M6 x 30 socket screws, ensuring they are tight.
4. Re-install the center M6 x 12 socket screw to prevent pellets from getting stuck in the hole.
5. Install the shear, verifying that the fasteners are tight.
6. Turn the dosing disc to verify smooth rotation. If the disc drags on the shear, the shear may have to be loosened and re-positioned, or replaced.
7. Position the hopper on the dosing module.
8. Tighten the profile clamp.
9. Position the dosing unit on the dosing motor, aligning the guide pins.
10. Close the toggle latches, fastening the dosing module to the motor assembly.

Installing Different Types of Dosing Discs

Dosing discs of the same type, and thickness (except 72 pocket), may be exchanged for each other. If dosing discs with a different compartment number or thickness are installed, the new calibration number needs to be entered into the controller!

1. Enter the (preliminary) calibration value of the newly installed dosing disc
2. Repeat the “calibration” procedure to determine the final calibration value.

See Appendix D: Spare Parts List on page 61 for disc part numbers.

“DT” Dosing Module - Pellets and Some Regrind

DT DISK AND HOUSING

FOR DOSING MICRO-PELLETS AND GRANULAR ADDITIVES

ALL DT HOPPERS INCLUDE THESE PARTS. AS THE DISK TURNS THE WIPER LEVELS OFF THE MATERIAL IN THE POCKET MAKING IT MORE ACCURATE.

SCREWS THAT SECURE THE WIPER ARE MADE OF PLASTIC. IF ONE WHERE TO FALL INTO THE MATERIAL, THEY WILL NOT DO ANY DAMAGE.

DISCHARGE

30 POCKET DISK, 10mm DEEP

30 POCKET DISK, SURE SHOT, 10mm DEEP

13 POCKET DISK, 20mm DEEP

10 POCKET DISK, 20mm DEEP

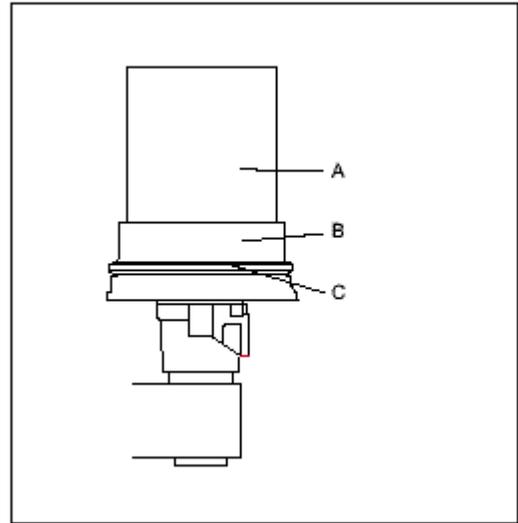
20mm DISKS REQUIRE LONGER MOUNTING SCREWS AND DEEPER HOUSING

CALIBRATION TUBE:
AFTER SPRINGING THE HOUSING AROUND SO THAT THE DISCHARGED MATERIAL FALLS INTO THE CALIBRATION TUBE AN AMOUNT OF MATERIAL WILL FALL INTO A CONTAINER OVER A GIVEN AMOUNT OF TIME. ALLOWING THE CONTROL TO DETERMINE AN ACCURATE THROUGHPUT.

ITEM/PART NO.	QTY	DESCRIPTION
1	1	DT DISK HOUSING DT30 10MM
2	1	DT30 10MM
3	2	HOOK FOR DETACH CLAMP
4	1	BEARING M10 20P
5	1	DT30 10MM
6	1	DT30 10MM
7	1	DT30 10MM
8	1	DT30 10MM
9	1	DT30 10MM
10	1	DT30 10MM
11	1	DT30 10MM
12	1	DT30 10MM
13	1	DT30 10MM
14	1	DT30 10MM
15	1	DT30 10MM
16	1	DT30 10MM
17	1	DT30 10MM
18	1	DT30 10MM
19	1	DT30 10MM
20	1	DT30 10MM
21	1	DT30 10MM
22	1	DT30 10MM
23	1	DT30 10MM
24	1	DT30 10MM

4-4 Removing/Replacing the Wiper in the “DT” Dosing Station

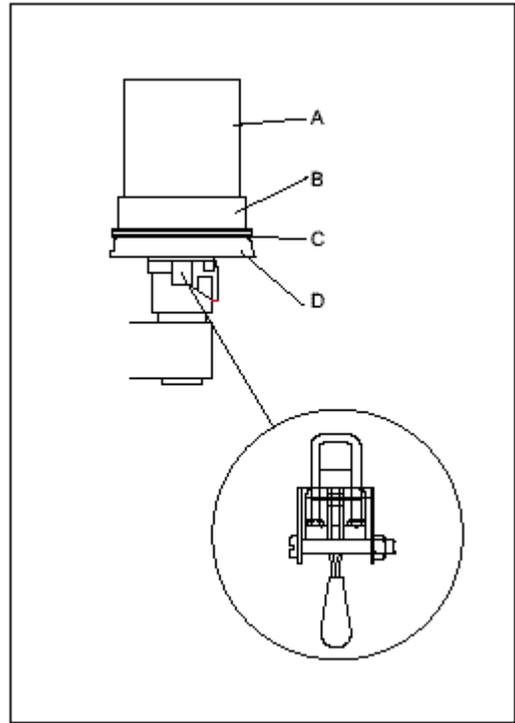
1. Switch the control unit “Off” with the “On/Off” switch.
2. Disconnect the power supply.
3. Empty the dosing station.
4. Open the toggle latches on the dosing motor.
5. Remove the dosing unit from the dosing motor.
6. Open the profile clamp (C) of the dosing container.
7. Remove the profile clamp (C).
8. Remove the dosing module (A and B).
9. Loosen the 3 plastic screws on the wiper.
10. Remove the wiper and holding plate.
11. Install the new wiper along with the holding plate.
12. Tighten down the 3 plastic screws. Make sure that the wiper is fitted parallel to the dosing plate (**Use only *plastic* screws to avoid damage to the extruder or molding machine screw should the mounting screws ever come loose.**)
13. Install the dosing hopper on the dosing housing, ensuring the guide pin is in place, and locate the “shelf” above the module discharge hole.
14. Install and tighten the profile clamp.



DT 30

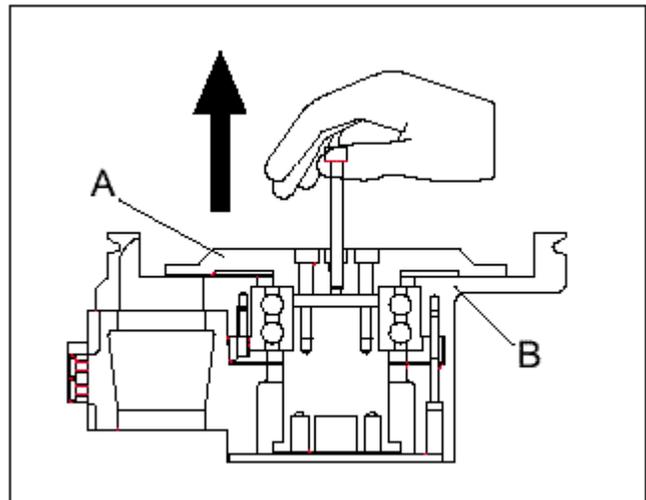
4-5 Removing the “DT” Disc and cleaning the dosing station

1. Switch the control unit “Off” with the “On/Off” switch.
2. Disconnect the power supply.
3. Open the toggle latches.
2. Remove the dosing hopper (D) from the motor.
3. Empty the dosing station.
4. Open the profile clamp (C).
6. Remove the profile clamp (C).
7. Remove the dosing hopper assembly (A and B).
6. Remove the two M6 x 30 socket screws (B) on top of the dosing disc (A).
7. Lift the dosing disc (A) from the dosing unit housing.



Toggle-type fastener

8. Clean the components with a cotton cloth.
9. Clean the dosing hopper (A and B) in soapy water.
10. Dry all parts thoroughly.
11. Install the dosing hopper on the dosing module (locating the guide pin).
12. Install the profile clamp and tighten the screw.
13. Mount the dosing housing onto the dosing motor.
14. Close the toggle latches, securing the dosing module to the motor assembly.



Dosing unit (side view)

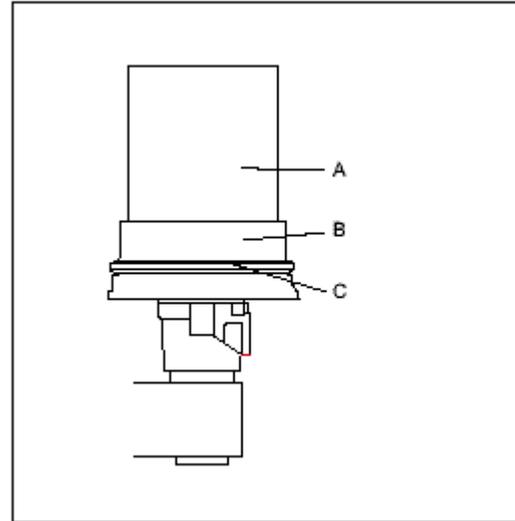
“DP” Powder Dosing Module

DP DISK AND HOUSING
FOR DOSING POWDER ADDITIVES

ITEM	PART NO.	QTY	UOM	DESCRIPTION
1	822.00549.00	1	EA	DISK ASSEMBLY RIGHT TOL/DP30
2	CT44113	2	EA	HOOK FOR DETACH CLAMP
3	CT99113	2	EA	RETAINING RING 8010 2516
4	CT99114	2	EA	RETAINING RING 8022 2
5	CT44295	1	EA	DISC METERING DP30-5 NYLON
6	CT44109	1	EA	HUB L LIP DISC KCI
7	822.00570.00	1	EA	TRAVELER RIGHT TOL 3MM DP30
8	CT99101	2	EA	BEARING 626 2RS DAX1716
9	CT99100	2	EA	BEARING 6000 2RS 1012x18
10	822.00071.00	1	EA	DISC EJECT RIGHT TOL/DP30/5MM
11	CT90079	1	EA	BUSHING DISC EJECTION DP30-5
12	CT14620	1	EA	IMPER BLADE DP30-5
13	CT14625	1	EA	AGITATOR DP30 W/SHAL
14	CT99320	1	EA	SEAL V22A DP30/DP30
15	CT14440	1	EA	SCREWING DRIVE DP30 (R)
16	CT10009.116	4	EA	SCREW PAN PHILIPS M4X12
17	CT10003.174	4	EA	SCREW SOCKET M4X20
18	CT10010.132	4	EA	SCREW SOCKET FLAT M4X16
19	CT18430	1	EA	CALIBRATION BOX DTND/DP30 R2H
20	CT99327	1	EA	RETAINING RING 8012
21	CT44841	2	EA	GASKET COVER CAL BOX COU/COO
22	CT18448	2	EA	COVER CALIBRATION BOX COU/COO
23	CT10003.172	4	EA	SCREW SOCKET M4X14
24	CT10003.140	4	EA	SCREW SOCKET M4X10
25	CT99441	1	EA	IMPER BLADE DP30-2.5
26	CT99013	1	EA	DISC METERING DP30-2.5 NYLON
27	CT99014	1	EA	DISC EJECT RIGHT TOL/DP30/5MM
28	CT99015	1	EA	BUSHING DISC EJECTION DP30-5
29	822.00570.00	1	EA	TRAVELER RIGHT TOL 3MM DP30
30	CT14655	1	EA	DRIVE CALIBRATION BOX COU
31	CT44296	1	EA	DP30 STANDARD AGITATOR

4-6 Removing/Replacing the “DT” Disc & Cleaning the Dosing Station

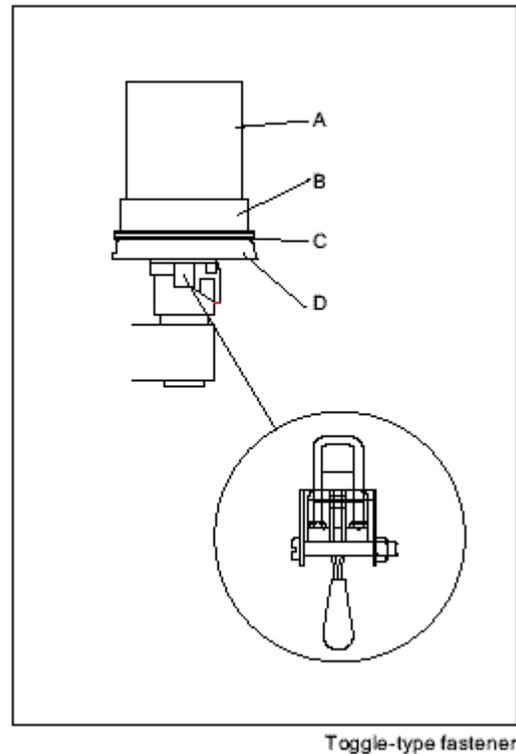
1. Switch the control unit “Off” with the “On/Off” switch.
2. Disconnect the power supply.
3. Empty the dosing station.
4. Open the toggle latches on the dosing motor.
5. Remove the dosing unit from the dosing motor.
6. Open the profile clamp (C) of the dosing container.
7. Remove the profile clamp (C).
8. Remove the dosing module (A and B).
9. Hold disc and rotate the wiper
10. counterclockwise (looking at the disc from the top).
11. Remove the wiper and “traverse” (holding plate).
12. Install the new wiper along with the “traverse” (holding plate).
13. Rotate the wiper clockwise, while the metering disc in place.
14. Install the dosing hopper on the dosing housing, ensuring the guide pin is in place,
15. and locate the “shelf” above the module discharge hole.
16. Install and tighten the profile clamp



DT 30

4-7 Removing the “DP” Disc and Cleaning the Dosing Station

1. Turn the control unit “Off”.
2. Disconnect the power supply.
3. Open the toggle latches.
4. Remove the dosing hopper (D).
5. Empty the dosing station.
6. Remove the profile clamp (C).
7. Remove the dosing hopper assembly (A and B).
8. Remove the wiper and traverse as described above.
9. Remove the four screws from the metering disc and lift the disc from the dosing unit housing.
10. Clean the components with a cotton cloth.
11. Clean the dosing hopper (A and B) in soapy water.
12. Dry all parts thoroughly.
13. Install the dosing hopper on the dosing module (locating the guide pin).
14. Install the profile clamp and tighten the screw.
15. Mount the dosing housing onto the dosing motor.
16. Close the toggle latches, securing the dosing module to the motor assembly.



4-8 Exchangeable Dosing Modules

Dosing discs of the same type, i.e. “DD” may be exchanged for each other. (The 72 pocket also requires a different shear plate.) If dosing discs with a different compartment number are installed, the new calibration number needs to be entered into the controller!

2. Enter the ***preliminary*** calibration value of *the new* dosing disc or module.
3. Repeat the “Calibration” procedure to determine the final calibration value.

DD Discs

Disc	Calibration Number	Number of pockets
DD 30-030672	1.75	72
DD 30-051040	5.00	40
DD 30-051725	8.00	25
DD 30-051818	15.00	18

DT Discs

Disc	Calibration Number	Number of Pockets
DT 30-101820	32.00	20
DT 30-102025 “Sure-shot”	38.00	20 “Oval”
DT 30-203012	100.00	12
DT 30-204010	175.00	10

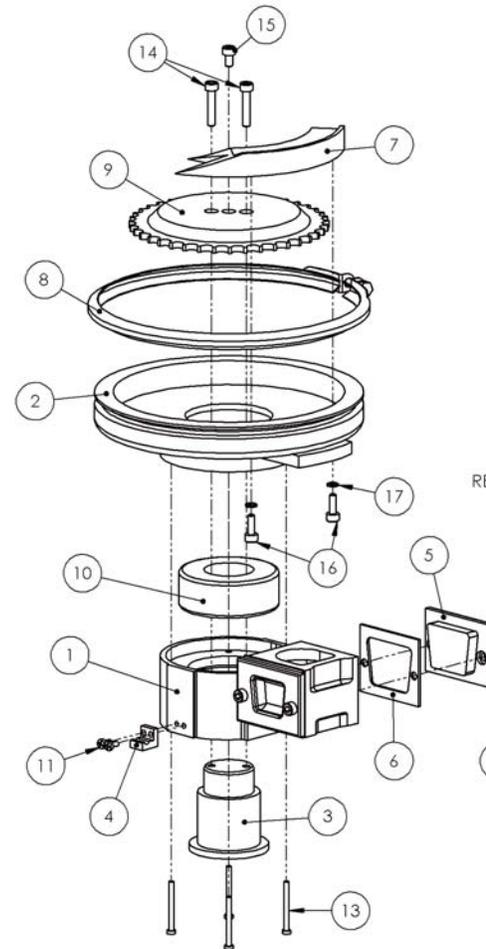
DP Discs

Disc	Calibration Number	Number of Pockets	Disc Thickness
DP 30-050940	17.00	40	0.5 mm
DP 30-250940	8.00	40	2.5 mm

4-9 Spare Parts

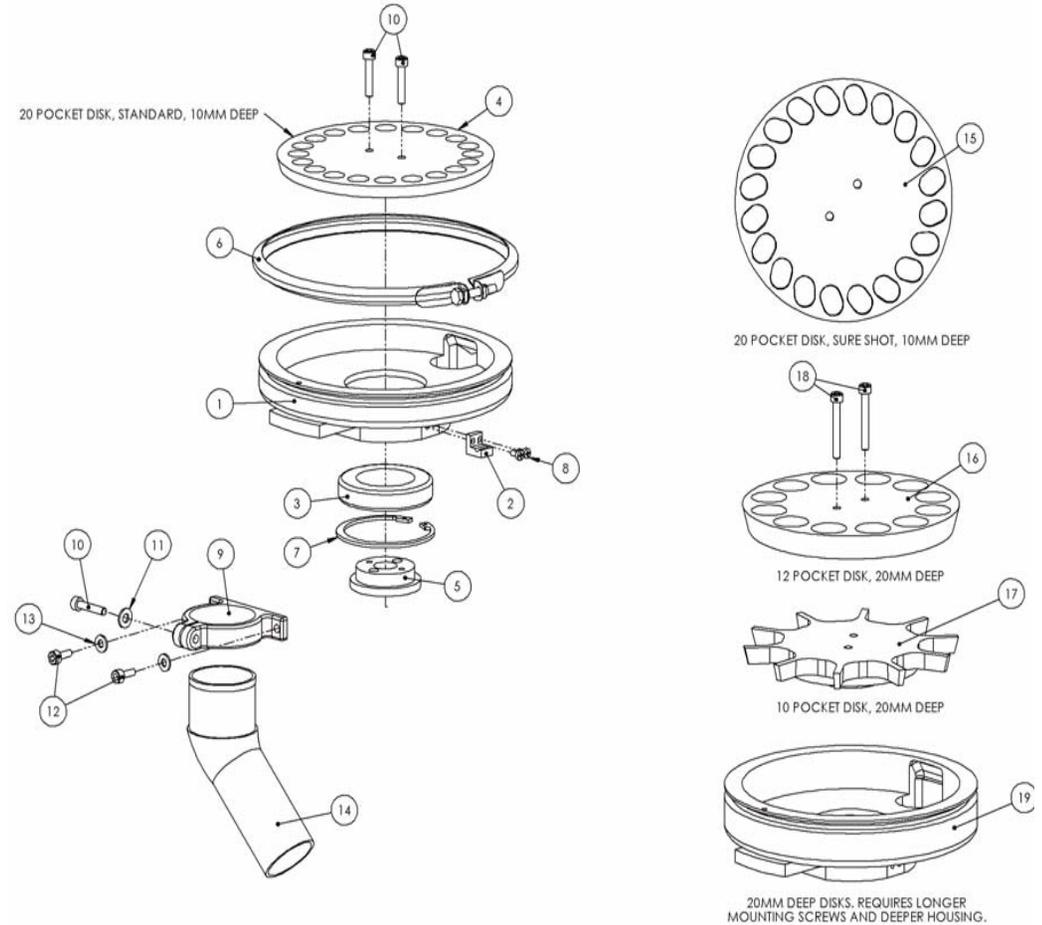
DD Dosing Units

ITEM	PART NO	QTY	U/M DESCRIPTION
1	CT18431	1 EA	CALIBRATION BOX CDD CB/SB FIN
2	CT13007	1 EA	DISC HSG DD30 MACH & HARDCOAT
3	CT13008	1 EA	DRIVE CALIBRATION BOX CDD
4	CT66113	2 EA	HOOK FOR DESTACO CLAMP
5	CT18444	2 EA	COVER CALIBRATION BOX CDK/CDD
6	CT66861	2 EA	GASKET COVER CAL BOX CDK/CDD
7	CT21392	1 EA	SHEAR CDD 1.0 CBQ/SB
8	CT92228	1 EA	V-CLAMP DT30 DISC/INTERMEDIATE
9	CT21710	1 EA	DISC DD30, 40 POCKET
10	CT100029.116	1 EA	BEARING DOUBLE ROW CDDd40; D80; B30.2
11	CT100023.172	4 EA	SCREW PAN PHILLIPS M4X12
12	CT100023.145	4 EA	SCREW SOCKET M6X16
13	CT10023.145	4 EA	SCREW SOCKET M4X40
14	CT100023.177	2 EA	SCREW SOCKET M6X30
15	CT88057	1 EA	SCREW, M6X10
16	CT100023.154	2 EA	SCREW SOCKET M5X16
17	CT100036.105	2 EA	WASHER LOCK M5
18	CT100562	1 EA	DISC DD30, 72 POCKET
19	CT21711	1 EA	DISC DD30, 25 POCKET
20	CT123057	1 EA	DISC DD30, 18POCKET
21	CT100875	1 EA	SHEAR DD, 72 POCKET, 3MM
22	CT66864	1 EA	TRAY CAL BOX
23	CT21392	1 EA	ALL OTHER DISCS, 5MM



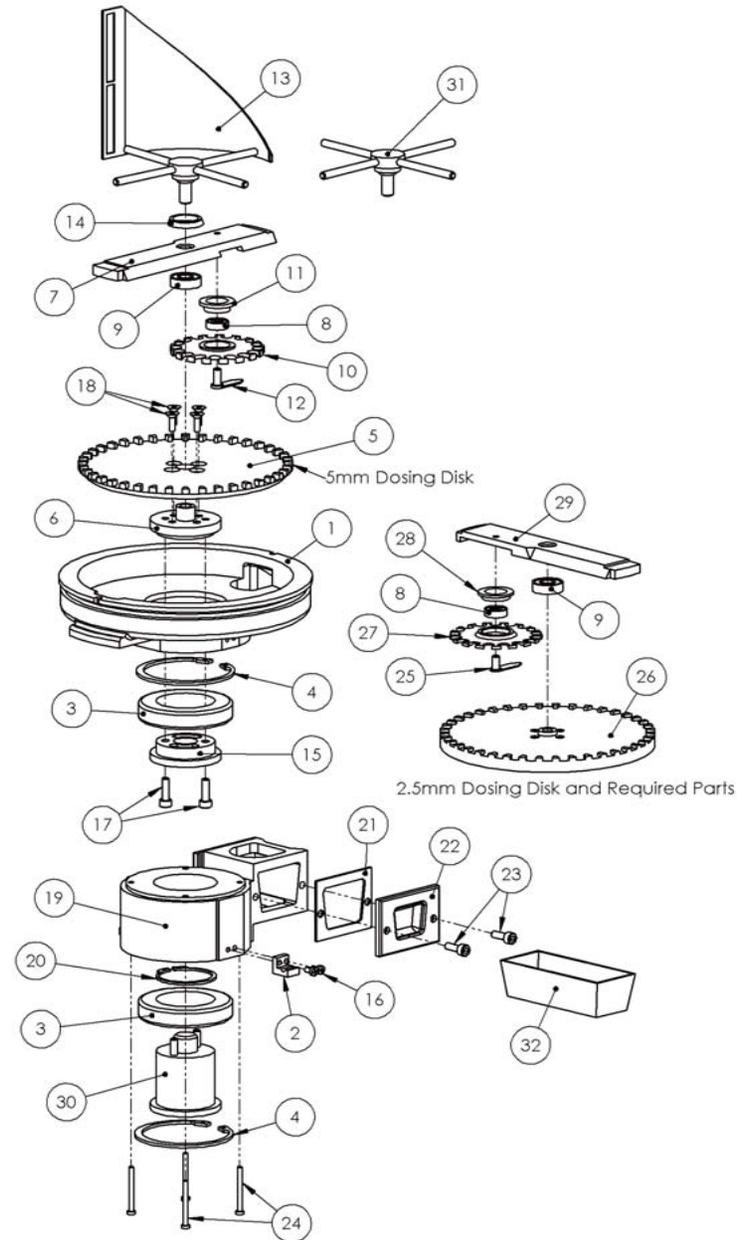
DT Dosing Units

ITEM	PART NO	QTY	U/M DESCRIPTION
1	CT66122	1 EA	DISC HOUSING DT30 10MM
2	CT66113	2 EA	HOOK FOR DESTACO CLAMP
3	CT99113	1 EA	BEARING 6010 2RSR
4	CT23056	1 EA	DISC DT30, 20 POCKET
5	CT04294	1 EA	COUPLING DRIVE CBQ/SB
6	CT92228	1 EA	V-CLAMP DT30 DISC/INTERMEDIATE
7	CT99144	1 EA	RETAINING RING 80X2.5
8	CT100029.116	4 EA	SCREW PAN PHILLIPS M4X12
9	CT11863	1 EA	MOUNT CALIBRATE TUBE CDK/CB/SB
10	CT100031.147	3 EA	SCREW HEX M6X35
11	CT100034.147	1 EA	WASHER FLAT M6
12	CT100023.154	2 EA	SCREW SOCKET M5X16
13	CT100034.105	2 EA	WASHER FLAT M5
14	CT11864	1 EA	CALIBRATION TUBE CDK/CB/SB
15	CT66707	1 EA	DISC DT30, 20 POCKET, SURE SHOT
16	CT23060	1 EA	DISC DT30 12 POCKET 20MM DEEP
17	CT18405	1 EA	DISC DT30 10 POCKET, 20MM DEEP
18	CT100031.149	2 EA	SCREW HEX M6X35
19	CT66121	1 EA	DISC HOUSING DT30 20MM



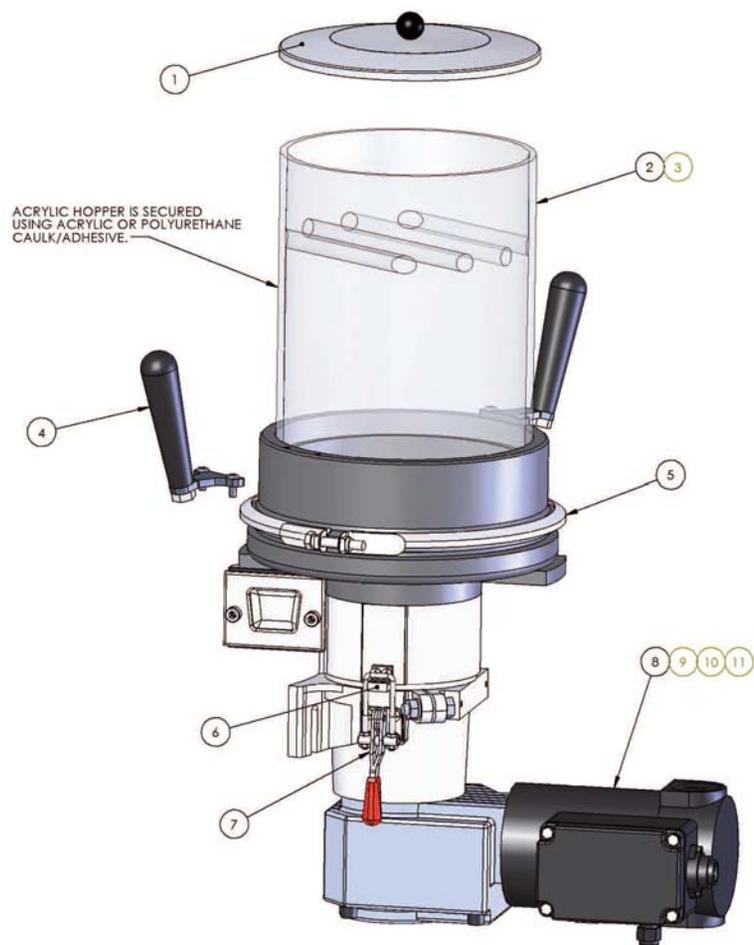
DP Dosing Units

ITEM	PART NO	QTY	U/M DESCRIPTION
1	882.00569.00	1 EA	DISK, HSG, TIGHT TOL, DP30
2	CT66113	2 EA	HOOK FOR DESTACO CLAMP
3	CT99113	2 EA	BEARING 6010 2RSR
4	CT99114	2 EA	RETAINING RING 80X2.5
5	CT66298	1 EA	DISC METERING DP30-5 NYLON
6	CT66109	1 EA	HUB K1DP DISK KCT
7	882.00570.00	1 EA	TRAVERST, TIGHT TOL 5MM, DP30
8	CT99101	2 EA	BEARING 626 2RS D6X19X6
9	CT99102	2 EA	BEARING 6000 2RS 10X26X8
10	882.000571.00	1 EA	DISK, EJECT, TIGHT TOL, DP30, 5MM
11	CT00879	1 EA	BUSHING DISC EJECTION DP30-5
12	CT66290	1 EA	WIPER BLADE DP30-5
13	CT66295	1 EA	AGITATOR DP30 W/SAIL
14	CT99325	1 EA	SEAL V22A DP30/DP50
15	CT66460	1 EA	COUPLING DRIVE DP30 (E)
16	CT1000029.11	4 EA	SCREW PAN PHILLIPS M4X12
17	CT100023.174	2 EA	SCREW SOCKET M6X20
18	CT100139.132	4 EA	SCREW SOCKET FLAT M6X16
19	CT184.30	1 EA	CALIBRATION BOX DT30/DP30 FIN
20	CT99327	1 EA	RETAINING RING 50X2
21	CT66861	2 EA	GASKET COVER CAL BOX CDK/CDD
22	CT18444	2 EA	COVER CALIBRATION BOX CDK/CDD
23	CT100023.172	4 EA	SCREW SOCKET M6X16
24	CT100023.145	4 EA	SCREW SOCKET M4X40
25	CT00641	1 EA	WIPER BLADE DP30-2.5
26	CT25013	1 EA	DISC METERING DP30-2.5 NYLON
27	CT25014	1 EA	DISK, EJECT, TIGHT TOL, 5MM DP30
28	CT25015	1 EA	BUSHING DISC EJECTION DP30-5
29	882.00593.00	1 EA	TRAVERSE, TIGHT TOL, 5MM, DP30
30	CT66853	1 EA	DRIVE CALIBRATION BOX CDK
31	CT66296	1 EA	DP30, STANDARD AGITATOR
32	CT66864	1 EA	TRAY CAL BOX



DD/DT/DP
Additional Spare Parts

ITEM	PART NO	QTY	U/M DESCRIPTION
1	892.01046.00	1 EA	COVER WITH KNOB, SS FOR ACRYLIC HOPPER
2	832.00040.00	1 EA	ACRYLIC HOPPER, 4.4 LITER, ACRYLIC ONLY
3	832.00041.00	1 EA	ACRYLIC HOPPER, 8.8 LITER, ACRYLIC ONLY
4	892.01490.00	1 EA	KIT, HANDLE, DD/DT/DP, SUPPLY HOPPER
5	CT92228	1 EA	V-CLAMP DD/DT/TP, HOPPER TO DISK HOUSING
6	CT66113	1 EA	HOOK FOR TOGGLE CLAMP
7	CT99063	1 EA	TOGGLE LATCH
8	CT34299	1 EA	DOSING MOTOR ASSEMBLY, 38 RPM
9	CT102241	1 EA	DOSING MOTOR ASSEMBLY, 11.5 RPM
10	CT34300	1 EA	DOSING MOTOR ASSEMBLY, 8.4 RPM
11	892.02095.00	1 EA	DOSING MOTOR ASSEMBLY, 3 RPM



Appendix A Basic Parameter Settings

A-2 Recipe Formulas

The following formulas can be used to determine if a recipe is appropriate or possible.

Injection Molding

For injection molding applications, compute the dosing disc speed and total number of disc revolutions using the following formulas. Recipe limitations are listed in the table following the equations.

Recipe Limitations for Injection Molding

Motor Speed (rpm)	Maximum	
	Max Speed (rpm)	Min Speed (rpm)
3	3	0.15
8.4	8.4	0.4
11.5	11.5	0.6
38	38	1.9

Extrusion - Simple

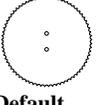
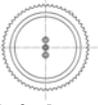
For extrusion applications, compute the dosing disc speed using the following formula. Recipe limitations are listed in the table following the recipe.

$$\text{Disc RPM} = \frac{(\text{Additive} - \%) \times (\text{Total Extruder Throughput} - \text{lb} / \text{hr})}{13.22 \times (\text{Disc Calibration Weight} - \text{g})}$$

Recipe Limitations Extrusion

Motor Speed (rpm)	Maximum	
	Max Speed (rpm)	Min Speed (rpm)
3	3	0.15
8.4	8.4	0.4
11.5	11.5	0.6
38	38	1.9

Appendix B Disc Sizing Guides

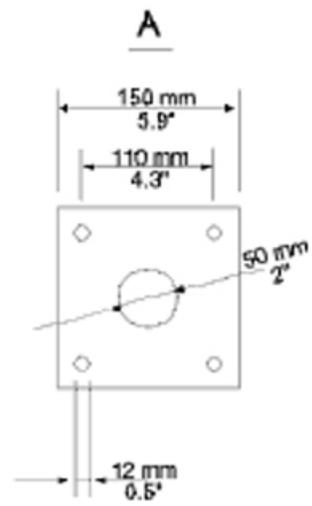
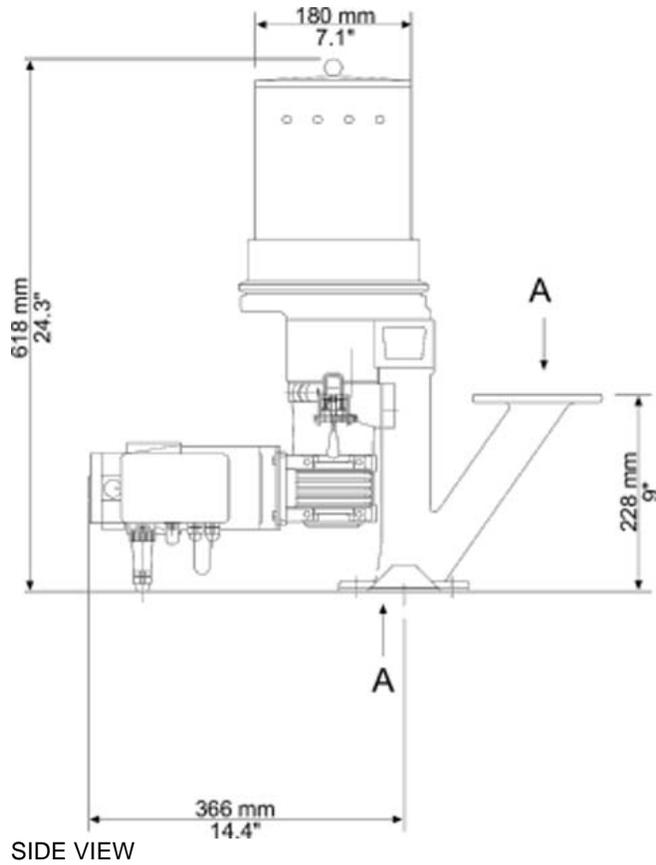
Disc	Disc Nomenclature	Min/Max Disc RPM	Amount of Material Dispensed every Disc Revolution*		Minimum Throughput - Continuous Running*		Maximum Throughput - Continuous Running*	
			35 lbs./ft ³	44 lbs./ft ³	35 lbs./ft ³	44 lbs./ft ³	35 lbs./ft ³	44 lbs./ft ³
 DD30-030672 Default calibration # 1.50 g/rev	P030672 3 mm thick 5.7 mm diameter 72 pockets CT100562	0.2 RPM 3 RPM	1.53 g/rev 0.02 g/hole	1.95 g/rev 0.027 g/hole	0.04 lbs/hr 0.02 kg/hr	0.04 lbs/hr 0.02 kg/hr	0.61 lbs/hr 0.28 kg/hr	0.77 lbs/hr 0.35 kg/hr
		0.2 RPM 8.4 RPM			0.04 lb/hr 0.02 kg/hr	0.04 lb/hr 0.02 kg/hr	1.69 lbs/hr 0.77 kg/hr	2.17 lbs/hr 0.98 kg/hr
		0.5 RPM 11.5 RPM			0.10 lb/hr 0.045 kg/hr	0.12 lb/hr 0.05 kg/hr	2.32 lbs/hr 1.05 kg/hr	2.89 lbs/hr 1.31 kg/hr
		1.0 RPM 38 RPM See Note 4			0.19 lb/hr 0.09 kg/hr	0.26 lb/hr 0.12 kg/hr	7.66 lbs/hr 3.47 kg/hr	9.63 lbs/hr 4.37 kg/hr
 DD30-050660 Default Calibration # 1.30 g/rev	P050660 5 mm thick 5.7 mm diameter 60 pockets 822.00738.00	0.2 RPM 3 RPM	1.35 g/rev 0.02 g/hole	1.70 g/rev 0.028 g/hole	0.04 lbs/hr 0.02 kg/hr	0.06 lbs/hr 0.03 kg/hr	0.42 lbs/hr 0.19 kg/hr	0.54 lbs/hr 0.24 kg/hr
		0.2 RPM 8.4 RPM			0.05 lb/hr 0.02 kg/hr	0.07 lb/hr 0.03 kg/hr	1.1 lbs/hr 0.50 kg/hr	1.37 lbs/hr 0.62 kg/hr
		0.5 RPM 11.5 RPM			0.09 lb/hr 0.04 kg/hr	0.10 lb/hr 0.05 kg/hr	1.46 lbs/hr 0.66 kg/hr	1.83 lbs/hr 0.83 kg/hr
		1.0 RPM 38 RPM See Note 4			0.17 lb/hr 0.08 kg/hr	0.22 lb/hr 0.10 kg/hr	6.48 lbs/hr 2.94 kg/hr	8.54 lbs/hr 3.87 kg/hr
 DD30-051040 Default calibration # 4.00 g/rev	051040 5 mm thick 10 mm dia. 40 pockets CT21710	0.2 RPM 3 RPM	4.24 g/rev 0.11 g/hole	5.39 g/rev 0.13 g/hole	0.11 lb/hr 0.05 kg/hr	0.15 lb/hr 0.07 kg/hr	1.68 lbs/hr 0.76 kg/hr	2.14 lbs/hr 0.97 kg/hr
		0.2 RPM 8.4 RPM			0.11 lb/hr 0.05 kg/hr	0.15 lb/hr 0.07 kg/hr	4.71 lbs/hr 2.12 kg/hr	5.99 lbs/hr 2.72 kg/hr
		0.5 RPM 11.5 RPM			0.27 lb/hr 0.12 kg/hr	0.35 lb/hr 0.15 kg/hr	6.33 lbs/hr 2.87 kg/hr	8.00 lbs/hr 3.62 kg/hr
		1.0 RPM 38 RPM See Note 4			0.55 lb/hr 0.25 kg/hr	0.70 lb/hr 0.32 kg/hr	21.19 lbs/hr 9.61 kg/hr	27.08 lbs/hr 12.28 kg/hr
					Consult factory - 40 pocket disc and 35.5 rpm motor for small pellets and coarse powder <i>only</i>			
 4-10 DD3 0-051725 Default calibration # 7.30 g/rev	051725 5 mm thick 17 mm dia. 25 pockets CT21711	0.2 RPM 3 RPM	7.37 g/rev 0.30 g/hole	9.38 g/rev 0.38 g/hole	0.20 lb/hr 0.09 kg/hr	0.24 lb/hr 0.11 kg/hr	2.92 lbs/hr 1.32 kg/hr	3.70 lbs/hr 1.68 kg/hr
		0.2 RPM 8.4 RPM			0.20 lb/hr 0.09 kg/hr	0.24 lb/hr 0.11 kg/hr	8.18 lbs/hr 3.71 kg/hr	10.37 lbs/hr 4.70 kg/hr
		0.5 RPM 11.5 RPM			0.48 lb/hr 0.22 kg/hr	0.61 lb/hr 0.27 kg/hr	11.0 lbs/hr 4.99 kg/hr	14.0 lbs/hr 6.36 kg/hr
		1.0 RPM 38 RPM See Note 4			1.00 lb/hr 0.44 kg/hr	1.25 lbs/hr 0.57 kg/hr	37.04 lbs/hr 16.80 kg/hr	47.10 lbs/hr 21.36 kg/hr
 4-11 DD3 0-051818 Default calibration # 13.50 g/rev	051818 5 mm thick 18 mm dia. 18 pockets CT23057	0.2 RPM 3 RPM	13.42 g/rev 0.75 g/hole	17.08 g/rev 0.95 g/hole	0.35 lb/hr 0.16 kg/hr	0.44 lb/hr 0.20 kg/hr	5.34 lbs/hr 2.42 kg/hr	6.80 lbs/hr 3.08 kg/hr
		0.2 RPM 8.4 RPM			0.35 lb/hr 0.16 kg/hr	0.44 lb/hr 0.20 kg/hr	14.96 lbs/hr 6.79 kg/hr	19.03 lbs/hr 8.63 kg/hr
		0.5 RPM 11.5 RPM			0.85 lb/hr 0.39 kg/hr	1.12 lbs/hr 0.51 kg/hr	19.60 lbs/hr 8.89 kg/hr	25.63 lbs/hr 11.62 kg/hr
		1.0 RPM 38 RPM See Note 4			1.76 lbs/hr 0.80 kg/hr	2.20 lbs/hr 1.00 kg/hr	67.44 lbs/hr 30.59 kg/hr	85.90 lbs/hr 38.95 kg/hr

- Note 1:** This guide is to be used for *general* disc selection for Digital Dosing unit applications. All rates shown are based on continuous throughput of free-flowing materials. Consult factory for regrind, powder and all hard-to-flow materials.
- Note 2:** Minimum recovery time is one (1) second, and maximum rate is 9.5 disc revolutions in one screw recovery cycle (injection mode). Use correct disc for molding applications to ensure proper dispensing of material during the recovery cycle.
- Note 3:** Feeder should not run continuously below 15% of maximum speed – use lower RPM motor or disc with smaller pockets.
- Note 4:** 35.5 and 38 rpm motors can only be used with *soft* pellets – may not have enough torque to cut hard pellets, i.e. PC, PET, nylon, etc., especially when the shear gets dull.

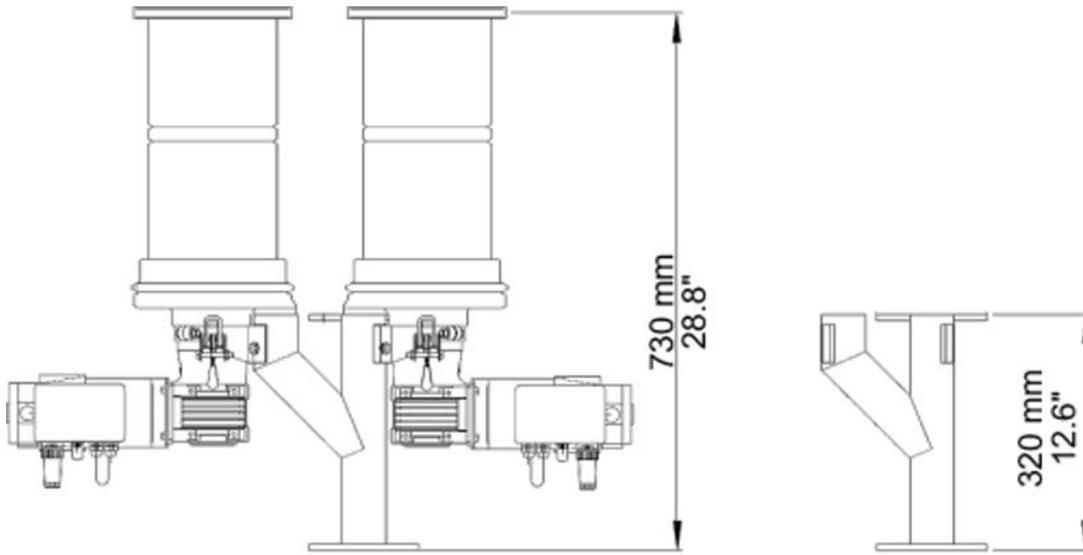
Disc	Disc Nomenclature	Min/Max Disc RPM	Amount of Material Dispensed every Disc Revolution*		Minimum Throughput - Continuous Running*		Maximum Throughput - Continuous Running*	
			35 lbs./ft ³	44 lbs./ft ³	35 lbs./ft ³	44 lbs./ft ³	35 lbs./ft ³	44 lbs./ft ³
 DT30 101820 Default calibration # 28.00 g/rev	101820 10 mm thick 18 mm dia. 20 holes CT23056	0.2 RPM 3 RPM	28.0 g/rev 1.4 g/hole	35.6 g/rev 1.7 g/hole	0.75 lb/hr 0.34 kg/hr	1.00 lb/hr 0.43 kg/hr	11.11 lbs/hr 5.04 kg/hr	14.1 lbs/hr 6.4 kg/hr
		0.2 RPM 8.4 RPM			0.75 lb/hr 0.34 kg/hr	1.00 lb/hr 0.43 kg/hr	31.11 lbs/hr 14.11 kg/hr	39.5 lbs/hr 17.9 kg/hr
		0.5 RPM 11.5 RPM			1.85 lbs/hr 0.84 kg/hr	2.31 lbs/hr 1.05 kg/hr	42.23 lbs/hr 19.15 kg/hr	52.7 lbs/hr 23.9 kg/hr
		1.0 RPM 38 RPM			3.7 lbs/hr 1.68 kg/hr	4.70 lbs/hr 2.14 kg/hr	140.76 lbs/hr 63.85 kg/hr	179.0 lbs/hr 81.2 kg/hr
DT30-102520 "Sure-shot" Default calibration # 33.00 g/rev	P102520 10 mm thick Oval Hole 18mm x 25mm 20 holes CT66707	0.2 RPM 3 RPM	33.6 g/rev 1.3 g/hole	42.7 g/rev 1.7 g/hole	0.87 lb/hr 0.40 kg/hr	1.12 lbs/hr 0.50 kg/hr	13.10 lbs/hr 5.94 kg/hr	16.6 lbs/hr 7.5 kg/hr
		0.2 RPM 8.4 RPM			0.87 lb/hr 0.40 kg/hr	1.12 lbs/hr 0.50 kg/hr	36.67 lbs/hr 16.63 kg/hr	46.6 lbs/hr 21.1 kg/hr
		0.5 RPM 11.5 RPM			2.18 lbs/hr 0.99 kg/hr	2.77 lbs/hr 1.26 kg/hr	49.77 lbs/hr 22.57 kg/hr	63.3 lbs/hr 28.7 kg/hr
		1.0 RPM 38 RPM			4.36 lbs/hr 1.98 kg/hr	5.55 lbs/hr 2.52 kg/hr	165.81 lbs/hr 75.21 kg/hr	211.1 lbs/hr 95.7 kg/hr
 DT30-203012 Default calibration # 95.00 g/rev	203012 20 mm thick 30 mm dia 12 holes CT23060	0.2 RPM 3 RPM	95.0 g/rev 7.9 g/hole	118.7 g/rev 9.8 g/hole	2.51 lbs/hr 1.14 kg/hr	3.13 lbs/hr 1.42 kg/hr	37.73 lbs/hr 17.11 kg/hr	47.1 lbs/hr 21.3 kg/hr
		0.2 RPM 8.4 RPM			2.51 lbs/hr 1.14 kg/hr	3.13 lbs/hr 1.42 kg/hr	105.66 lbs/hr 47.93 kg/hr	131.9 lbs/hr 59.8 kg/hr
		0.5 RPM 11.5 RPM			6.28 lbs/hr 2.85 kg/hr	7.80 lbs/hr 3.54 kg/hr	143.28 lbs/hr 65.00 kg/hr	178.0 lbs/hr 80.7 kg/hr
		1.0 RPM 38 RPM			12.50 lbs/hr 5.70 kg/hr	15.65 lbs/hr 7.10 kg/hr	477.99 lbs/hr 216.81 kg/hr	596.8 lbs/hr 270.7 kg/hr
 DT30-204010F Default calibration # 150.00 g/rev	204010F 20 mm thick 40 mm dia 10 pockets CT18405	0.2 RPM 3 RPM	151.1 g/rev 15.1 g/hole	188.7 g/rev 18.8 g/hole	4.00 lbs/hr 1.80 kg/hr	5.00 lbs/hr 2.25 kg/hr	60.00 lbs/hr 27.22 kg/hr	75.0 lbs/hr 34.0 kg/hr
		0.2 RPM 8.4 RPM			4.00 lbs/hr 1.80 kg/hr	5.00 lbs/hr 2.25 kg/hr	168.00 lbs/hr 76.20 kg/hr	210.0 lbs/hr 95.2 kg/hr
		0.5 RPM 11.5 RPM			10.00 lbs/hr 4.53 kg/hr	12.43 lbs/hr 5.64 kg/hr	227.74 lbs/hr 103.28 kg/hr	283.5 lbs/hr 129.0 kg/hr
		1.0 RPM 38 RPM			20.00 lbs/hr 9.00 kg/hr	25.00 lbs/hr 11.30 kg/hr	754.65 lbs/hr 342.30 kg/hr	948.3 lbs/hr 430.1 kg/hr
 DP30-250940 Default calibration # 7.80 g/rev	P250940 2.5 mm thick 9 mm diameter 40 pockets CT100864	0.2 RPM 3 RPM	7.8 g/rev 0.2 g/hole	9.7 g/rev 0.24 g/hole	0.20 lb/hr 0.093 kg/hr	0.26 lb/hr 0.115 kg/hr	3.07 lbs/hr 1.40 kg/hr	3.87 lbs/hr 1.76 kg/hr
		0.2 RPM 8.4 RPM			0.20 lb/hr 0.093 kg/hr	0.26 lb/hr 0.115 kg/hr	8.61 lbs/hr 3.91 kg/hr	10.83 lbs/hr 4.91 kg/hr
		0.5 RPM 11.5 RPM			0.46 lb/hr 0.21 kg/hr	0.60 lb/hr 0.27 kg/hr	10.79 lbs/hr 4.90 kg/hr	13.57 lbs/hr 6.15 kg/hr
		1.0 RPM 38 RPM			1.00 lb/hr 0.47 kg/hr	1.30 lbs/hr 0.58 kg/hr	39.28 lbs/hr 17.82 kg/hr	49.08 lbs/hr 22.26 kg/hr
 DP30-050940 Default calibration #15.00 g/rev	P050940 5 mm thick 9 mm diameter 40 pockets CT100863	0.2 RPM 3 RPM	15.6 g/rev 0.3 g/hole	19.5 g/rev 0.4 g/hole	0.41 lb/hr 0.187 kg/hr	0.51 lb/hr 0.23 kg/hr	6.19 lbs/hr 2.81 kg/hr	7.73 lbs/hr 3.51 kg/hr
		0.2 RPM 8.4 RPM			0.41 lb/hr 0.187 kg/hr	0.51 lb/hr 0.23 kg/hr	17.33 lbs/hr 7.86 kg/hr	21.66 lbs/hr 9.82 kg/hr
		0.5 RPM 11.5 RPM			1.00 lb/hr 0.45 kg/hr	0.12 lb/hr 0.57 kg/hr	22.62 lbs/hr 10.62 kg/hr	28.65 lbs/hr 13.80 kg/hr
		1.0 RPM 38 RPM			2.00 lbs/hr 0.94 kg/hr	2.60 lbs/hr 1.17 kg/hr	78.57 lbs/hr 35.64 kg/hr	98.16 lbs/hr 44.52 kg/hr

Appendix C Drawings

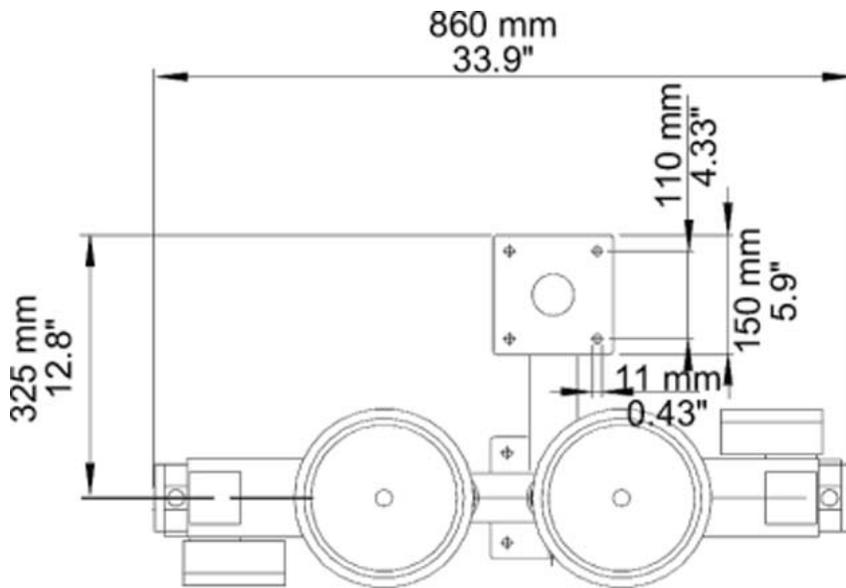
Single Station Digital Dosing Feeder



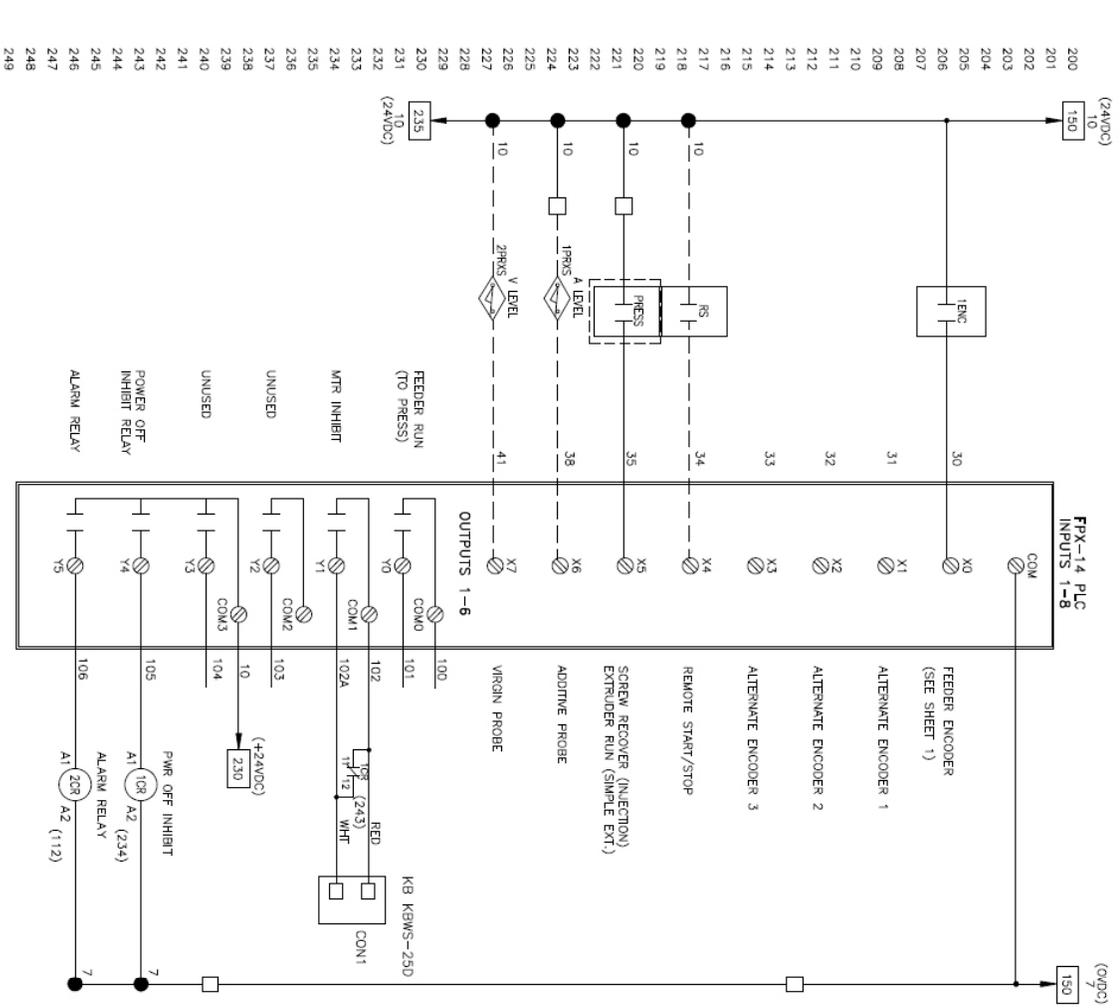
"Duo" Digital Dosing Feeder



SIDE VIEW

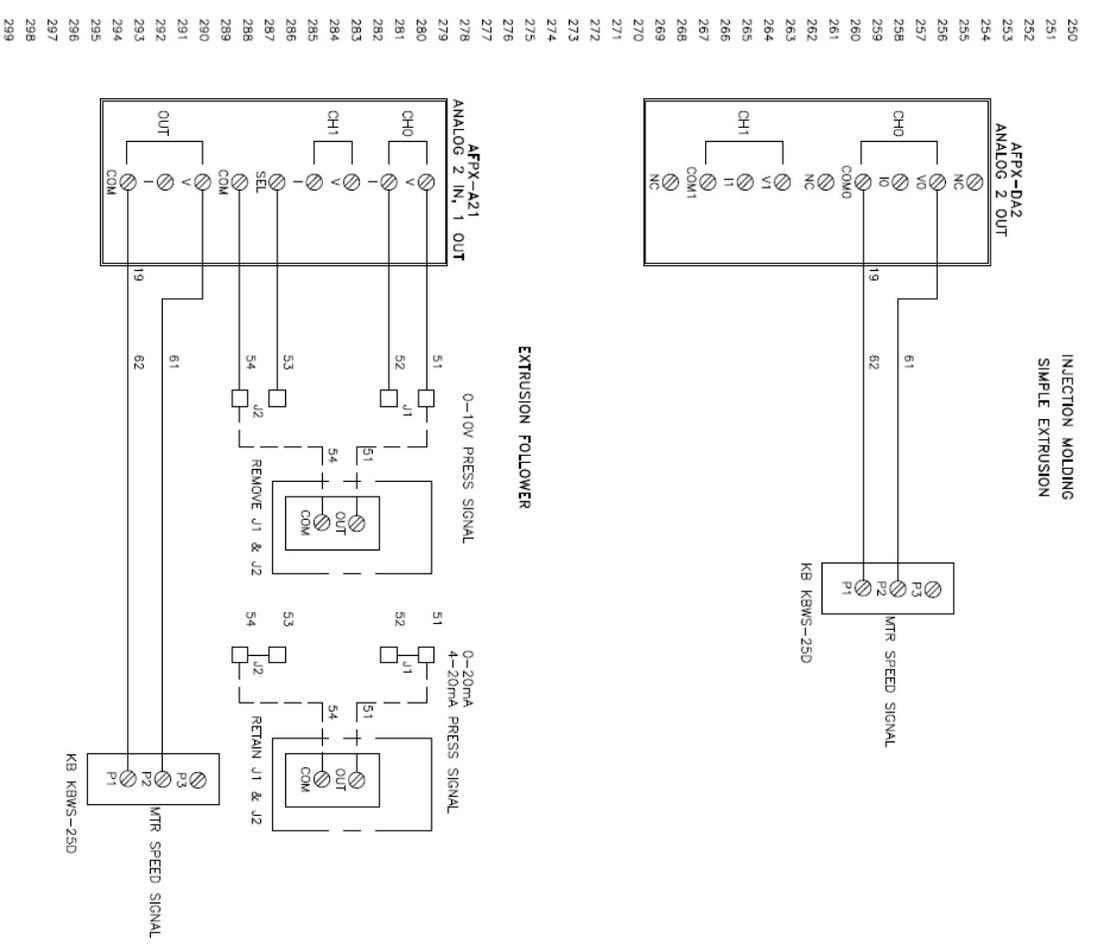


TOP VIEW



LEGEND:
 □ TERMINAL BLOCKS LOCATED OUTSIDE ENCLOSURE
 XXX SCHEMATIC LINE NUMBER REF. FIELD WIRING

OPTIONAL FEATURES



Appendix D Spare Parts List

Dosing Disc/Shear Order Numbers

Dosing disc	
72 chambers	CT100562
40 chambers	CT21710
25 chambers	CT21711
18 chambers	CT2057
Dosing disc, wear-resistant	
40 chambers	CT28214
25 chambers	CT27141
18 chambers	CT27142
Shear for DD style feeder	
18, 25 and 40 pocket disc	CT21392
72 pocket disc	CT100875

Replacement Motor Assembly Part Numbers

Gear Motor Assemblies		
Bauer	Bodine	
N/A	3 RPM	892.02095.00
6.4 RPM	8.4 RPM	CT34300
11.5 RPM	11.5 RPM	CT102241
35.5 RPM	38 RPM	CT34299

NOTE: Bauer (blue) and Bodine (black & silver) motors are mechanically interchangeable, with changes to controller parameters # 7 and # 8. (See page 20 & 21)

Appendix E Technical Assistance

Parts Department

Call toll-free 7am–5pm CST [800] 423-3183 or call [262] 641-8610, Fax [262] 641-8653
The ACS Customer Service Group will provide your company with genuine OEM quality parts manufactured to engineering design specifications, which will maximize your equipment's performance and efficiency. To assist in expediting your phone or fax order, please have the model and serial number of your unit when you contact us. A customer replacement parts list is included in this manual for your convenience. ACS welcomes inquiries on all your parts needs and is dedicated to providing excellent customer service.

Service Department

Call toll-free 8am–5pm CST [800] 423-3183 or call [262] 641-8610
Emergencies after 5pm CST, call [847] 439-5655
We have a qualified service department ready to help. Service contracts are available for most

Sales Department

Call [262] 641-8610 Monday–Friday, 8am–5pm CST
Our products are sold by a worldwide network of independent sales representatives. Contact our Sales Department for the name of the sales representative nearest you.

Contract Department

Call [262] 641-8610 Monday–Friday, 8am–5pm CST
Let us install your system. The Contract Department offers any or all of these services: project planning; system packages including drawings; equipment, labor, and construction materials; and union or non-union installations

Sterling, Inc.
2900 S. 160th Street
New Berlin, WI 53151

www.sterlco.com

