

Service Instructions

Syntron®
Vibrating Feeder
Model:
HV-10 High Velocity

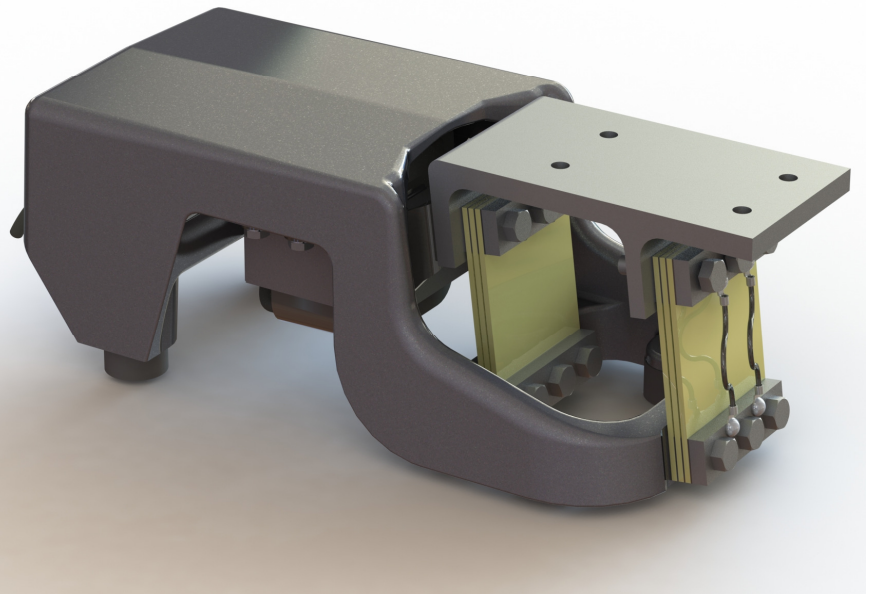


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Safety Instructions

The purpose of safety symbols is to attract your attention to possible danger. Safety symbols, and their explanations, deserve careful attention and understanding. The safety warnings do not by themselves eliminate any danger. The instructions or warnings they give are not substitutes for proper safety procedures.

SYMBOL

MEANING



Safety Alert Symbol: Indicates **DANGER, WARNING, or CAUTION.** Attention is required in order to avoid serious personal injury. This symbol may also be used in conjunction with other symbols or pictographs.

NOTE:

Notes advise you of information or instructions vital to the operation or maintenance of the equipment.

IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS BEFORE OPERATING

- Upon receipt, unpack and inspect the unit for damage that may have occurred during shipment. If damage is found, contact the shipping carrier and Syntron Material Handling immediately.
- Read instructions carefully. Be familiar with the controls and proper use of the unit.
- Do not operate the unit when tired, ill, or under the influence of alcohol, drugs or medication.

Product safety labels must remain highly visible on the equipment. Establish a regular schedule to check visibility. If you need to replace safety labels, contact Syntron Material Handling, LLC for an additional supply free of charge.

The instructions and data herein are vital to the proper installation and operation of this equipment. In order to avoid delays due to faulty installation or operation, please see that these instructions are read by the persons who will install, operate and maintain this equipment.

NOTE: Supporting information, such as drawings, may be attached to the manual. The information contained therein takes precedence over corresponding information printed in this manual.

INTRODUCTION

The Syntron® HV-10 Vibrating Feeder is a highly versatile vibrating feeder specifically designed to provide high speed and smooth feeding to milling or color sorting processes, but is also ideal for other bulk feeding applications where high stroke or fast feed rate is required. Versatility is the key that makes the HV-10 feeder capable of handling products formally considered difficult to feed.

THEORY OF OPERATION

The HV-10 is an electromagnetic feeder that consists of a trough and trough mounting bracket coupled to an electromagnetic drive by means of fiberglass leaf springs. The leaf springs are clamped to the base housing at the bottom, and to the trough mounting bracket at the top by hex head cap screws.

The drive incorporates an electromagnet which is located in the center of the unit. An armature assembly, also included as part of the drive unit, is located opposite the magnet and is connected directly to the trough mounting bracket which is attached to the trough assembly.

The HV-10 Feeder produces a vibrating stroke on the surface of the feeder trough. The stroke is created when the electromagnet pulls the trough assembly sharply down and back and then releases it to spring up and forward. When repeated at high speeds (3600 vpm @ 60 Hz or 3000 vpm @ 50 Hz), this action produces a definite vibratory movement on the trough surface.

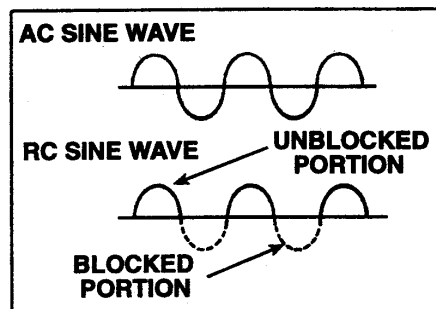


FIGURE 1: Rectified Sine Wave

Figure 1 illustrates a typical AC sine wave and a typical RC wave (the type of pulsating current which is required to operate the feeder). The magnet is energized only by a portion of the sine wave shown as the solid line of the RC sine wave. The broken line represents the portion of the sine wave which is blocked by the electric controller. The blocked portion does not reach the feeder magnet, and during this time the feeder is de-energized.

When the magnet is energized, it attracts the armature, which pulls the trough and trough mounting bracket down and back towards the magnet, flexing and storing energy in the spring system.

Each power half-cycle is followed by a half-cycle of blocked current flow. During this half-cycle, the magnet is de-energized. With the magnet de-energized, the magnetic pull between the magnet and the armature is released, allowing the spring system to spring back to and slightly through its normal position. This acceleration causes the trough assembly to move up and forward, pushing the material being fed.

NOTE: The feed rate is controlled by the intensity of the magnetic pull, which is varied by the control.

The unit must be mechanically adjusted to prevent the armature from striking against the face of the magnet. The space between the armature and magnet is called the “air gap”. The size of the air gap is critical to good feeder operation. (Refer to Air Gap Adjustment instructions for further information).

UNPACKING / LONG-TERM STORAGE

Upon receipt, carefully unpack the equipment. Check all of the equipment for protective shipping brackets, tape, etc. All packing bands, paper, etc., must be removed prior to operation. Give the equipment a thorough visual inspection to reveal any damage that may have occurred during shipment. If damage is found, contact Syntron Material Handling and the shipping carrier immediately.

When storing the control, store it in the original shipping carton and plug all openings in the control box to prevent dirt, rodents and insects from entering. Syntron Material Handling advises placing a corrosion preventive inside the control box during storage. Cover the control and place it in an area that is protected from extreme heat. Do not drop the control. The force of the impact may damage the components.

If the feeder is placed into storage prior to installation, the unit should be stored inside a controlled environment in its original shipping carton.

INSTALLATION



CAUTION: Do not lift the unit by the trough. Handling by the trough could cause damage to the feeder.

NOTE: The HV-10 can weigh up to 60 pounds when supplied with a trough. Therefore, when installing the feeder, consideration must be given to the area of support that will carry the full weight of the unit under loaded conditions.



CAUTION: The feeder must not come in contact with any rigid object or adjacent surface that could hamper its vibrating action.

The control assembly (supplied separately) should be installed as close to the feeder as possible. Installation on a wall in a clean, dry location, free of excessive vibration is recommended.



WARNING: The electrical power supply connection to the Syntron Material Handling-supplied control or feeder must be made through a customer-supplied safety disconnect switch. This switch must be mounted next to the control.

If possible, install the control in a location where it will receive adequate ventilation. This will ensure prolonged component life.



CAUTION: The electrical power supply cable to the control and the feeder must be sufficient to carry the current and voltage indicated on the equipment nameplate(s).



DANGER: Be certain the equipment is properly grounded before operating the unit.

If the feeder includes a trough (provided by Syntron Material Handling), then the feeder has been factory tuned for your specific application. If the HV-10 was supplied without a trough, please follow the trough mounting and tuning guidelines in the following sections.

OPERATION



WARNING: Unauthorized modification of the feeder or the use of unauthorized replacement parts may damage the feeder and void the warranty.

Syntron Material Handling will not assume responsibility for poor feeder performance as a result of any unauthorized alterations to the equipment. Consult Syntron Material Handling prior to any modifications.

With the feeder and control properly installed and all wiring complete, the equipment is ready for operation.



WARNING: Except during maintenance or repairs, the control must be kept closed and secured.

Before starting the equipment, rotate the control knob to its minimum setting. Turn the switch to its ON position, and the feeder will begin operating at a low feed rate. Slowly increase the feeder output (by adjusting the control) to the maximum setting. Check the method of feeder support, making sure it is substantial and that the feeder is not touching any rigid objects or adjacent structures.



WARNING: During normal operation, the feeder should perform with a smooth even stroke. If a loud “striking” noise occurs, immediately turn off the feeder. Striking can result in serious damage to the unit.

Striking is the result of contact between the magnet and armature. Refer to the Air Gap Adjustment instructions for corrective action.

With the feeder operating satisfactorily, load the trough with the material to be conveyed and adjust the control knob to the desired output. Turn the knob clockwise to increase the feed rate and counterclockwise to decrease the feed rate. The material will flow along the trough surface in a smooth controlled rate of feed toward the discharge.

MAINTENANCE



WARNING: Before performing any maintenance work, the electrical power supply must be disconnected at the safety disconnect switch.

Some materials, due to their nature, adhere to the trough surface. These deposits increase the dead weight of the feeder trough and, if permitted to build up excessively, will alter the natural frequency (tuning) of the feeder. Material build-up on the trough should be removed as a daily practice. Look for material build-up on the trough, particularly around and under the hopper openings.

A clean, dry compressed air supply is recommended for general cleaning of this unit.



CAUTION: Never oil the spring assembly. This destroys the clamping effect of the spring clamping bolts.

In the event repairs are necessary, take immediate action to avoid possible injury to personnel and damage to the feeder parts from faulty operation. When ordering replacement parts, include all information given on the nameplate.



CAUTION: Any signs of excessive heat or burned-out components is an indication of trouble. At first notice of an overheating condition, immediately investigate and correct the cause. Feeder coils should never exceed 200° F (93° C).

Periodically verify that all safety labels are visible and legible; if not, contact Syntron Material Handling for replacement.

TROUBLESHOOTING

PROBLEM	CAUSE	CORRECTION
Feeder operates too slowly	Line voltage below designated rating	Increase line voltage as designated on the nameplate
	Unit contacting a rigid object or surface	Maintain a ½ inch (12 mm) clearance surface all around
	Build-up of material	Clean trough surfaces
	Spring action may be hampered	Clean spring assemblies
	Defective leaf springs	Replace
Unit operates above 200° F	Excessive air gap	Adjust air gap closer
Feeder operates too fast	Line voltage above designated rating	Reduce line voltage to that designated on the nameplate
	Worn or cracked trough	Replace
Unit hums, but will not vibrate	Unit receiving full AC power and not RC (rectified current)	Check wiring and controller.
Unit fails to operate	No power to control	Check for broken or grounded lines
	Defective switch or fuse	Replace
	Defective diode or rectifier	Replace
	Feeder coil burned out	Replace coil
	Short circuit in wiring	Repair
	Open winding on potentiometer	Replace

NOTE: Replace parts only with those supplied or recommended by Syntron Material Handling

LEAF SPRING REPLACEMENT

Due to normal wear and tear under operating conditions, the leaf springs will eventually need to be replaced. The replacement leaf springs must be of the same size and thickness as the springs that were removed. Syntron Material Handling recommends replacing all of the leaf springs at one time, rather than just the one that failed.

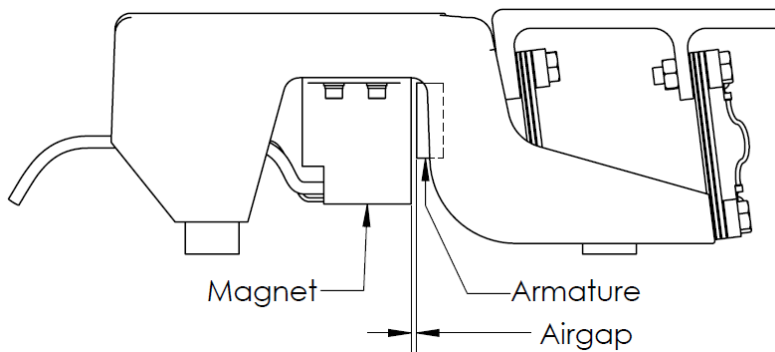


WARNING: Before performing any maintenance work, the electrical power supply must be disconnected at the safety disconnect switch.

Before replacing the springs, disconnect the feeder from the power supply. Make note of the location and arrangement of each spring, spacer and clamp. Remove the bolts that secure the leaf springs to the base unit, then remove the remaining cap crews that secure the leaf springs to the trough mounting bracket. Install the new springs in the reverse order, starting with the last spring removed. Replace cap screws and torque per the Torque Specifications.

ADJUSTING THE AIR GAP

The air gap is the space that exists between the faces of the armature and magnet. Proper adjustment of this space is extremely important for good feeder operation.



If the air gap is adjusted so the armature and magnet are too close, the faces of these items will make contact during feeder operation. This is called “striking”.



CAUTION: When operating normally, the feeder should perform with a smooth, even stroke. If a loud “striking” noise occurs, immediately turn the feeder off. Striking can seriously damage the unit!

If the air gap is adjusted so the armature and magnet are too far apart, the feeder current may increase to a dangerous level. A high current condition could result in magnet burn-out, failure of control components, or a reduced rate of material feed.

If the unit is sold by Syntron Material Handling complete with a trough, then the air gap is properly set at the factory and readjustment should rarely be required. However, if high voltage is applied to the feeder, or if the air gap has been altered due to improper handling, or if the unit was supplied without a trough, an adjustment may be required.

The air gap adjustment is a very delicate procedure and may require some time and several attempts to properly obtain the desired setting. The correct air gap spacing will be obtained when the armature and magnet faces are as close as possible without “striking” when the maximum power is applied to the feeder.

To set the air gap, loosen the (4) screws securing the magnet assembly, and slide the magnet as required. Use a set of long feeler gauges to get an even gap across the pole faces. The air gap is typically between 0.130 inches (3.3 mm) and 0.140 inches (3.5 mm).

After each adjustment of the air gap, secure the magnet in place by tightening the socket head cap screws (#14).

The feeder operates with a trough stroke of between 0.110 inches (2.8 mm) and 0.120 inches (3.0mm). The feeder stroke can be determined by checking the stroke gauges located on the trough assembly. See the instructions for measuring the stroke in the stroke gauge section below.

STROKE GAUGE

The feeder stroke is the distance the trough travels in one complete cycle of vibration. This is measured from the forward upward limit to the downward backward limit of the vibrating stroke.

The stroke can be measured by applying the stroke sticker (part no 300700) to the feeder trough. Be certain the graduated lines on the gauge are parallel with the line of vibration. The line of vibration will be different, depending on the weight or length of the trough being used in each application. Place a stroke sticker at the inlet and discharge areas of the trough, making sure that the stickers are parallel to the line of vibration, to obtain a true reading.

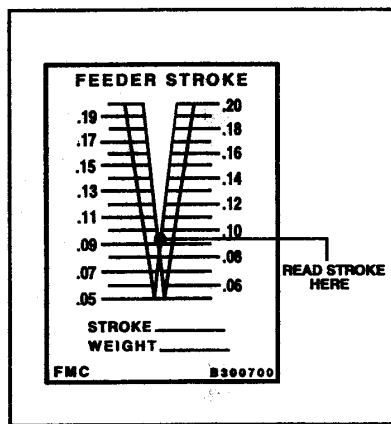


FIGURE 3: Reading the Stroke Gauge

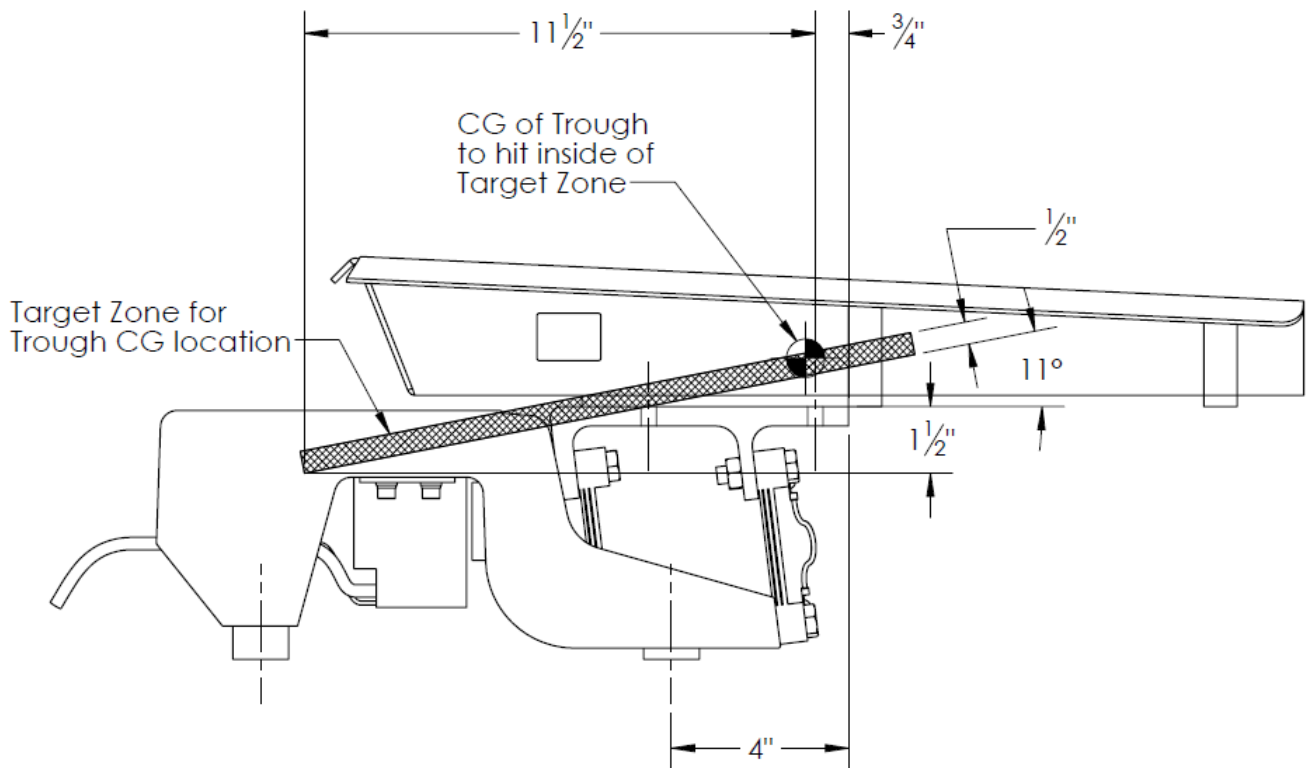
When reading a stroke sticker, the graduated lines should appear solid black. If the lines are fuzzy and gray, the graduated lines of the gauge are not parallel to the line of the drive. Adjust the location of the stroke sticker parallel to the drive line. Under vibration, a black inverted “V” will appear. The feeder stroke can be read at the apex of this black “V”.

CHECKING FEEDER CURRENT

When using a digital in-line or clamp-on meter to read the current of the feeder, the meter reading must always be multiplied by a value of 1.7 due to the wave characteristics of the feeder when operating. When using an analog "iron vane" meter, the current is as indicated. All current readings must be taken at the control.

TROUGH MOUNTING

The diagram below shows the correct location for the trough CG (Center of Gravity). The CG will need to be located within the target zone to ensure product flow.



If the trough CG is located much higher than shown in the diagram, then the product flow at the inlet may be slowed. If the trough CG is located below the target zone, then the product flow will be slowed as it exits the discharge.

TUNING PROCEDURE

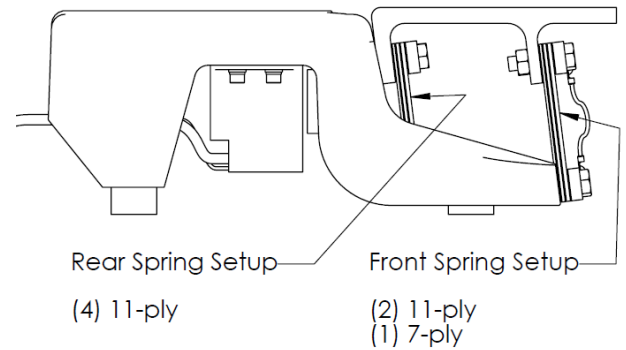
<u>Step Number</u>	<u>Step Description</u>
1	Refer to the Air Gap Adjustment instructions for directions on setting the air gap. Be sure to check the gap on both sides of the armature. This will ensure the armature face is parallel to the magnet face.
2	Assemble the trough to the unit using a quantity of springs that will achieve a system natural frequency of 3550 VPM for 60 Hz incoming power, and 2950 VPM for 50 Hz incoming power. See spring arrangements tables. The system natural frequency is most easily determined with a variable frequency control. Always determine the system natural frequency at the maximum stroke. If using a variable frequency control, go to step 4.
3	If using a Syntron® Rectified Control such as the PowerPulse™ Control, set the potentiometer to its maximum setting. This ensures the unit is receiving full power.
4	Check the stroke once the feeder drive and trough unit is assembled. Refer to the Stroke Gauge section of this manual.
5	If the stroke is not at or near 0.110 inches (2.8 mm), use a variable frequency control to check the relationship of the operating frequency to resonate frequency. If a variable frequency control is not available, clamp a small [approximately 1/3 lb. (15 kg.) or less] C-clamp to the trough. If the trough stroke gets smaller, the unit is on the correct side of resonance. If the stroke gets larger, the unit is on the wrong side of resonance. Remove the leaf springs one by one until the unit is on the proper side of resonance.
6	Once on the correct side of resonance, adjust the stroke. Add springs to increase stroke; subtract springs to decrease stroke. Always begin by adding or removing the thinnest spring possible. NOTE: Re-torque the spring bolts after each iteration. Refer to Torque Specifications, Page 14
7	Repeat spring adjustments until the trough stroke is between 0.110 inches (2.8 mm) and 0.120 inches (3.0 mm).
8	If a variable frequency control is available, check the system natural frequency. It must 3550 VPM for 60 Hz incoming power, and 2950 VPM for 50 Hz, as stated in step 2 above.

Spring Arrangements Chart

The following tables are to be used as a reference to obtain the correct size/qty. of springs to properly tune the HV-10 feeder based on the trough weight. The tables below are to be used as a starting point for setup of the feeder. Additional tuning per the instructions on page 11 may be required.

The drive is supplied with a spring setup to handle a 10 lb. (4.5 kg) trough. The diagram to the lower right illustrates the factory setup for a 60HZ drive spring arrangement (North and South America). Additional spring arrangements for other trough weights are listed in the table.

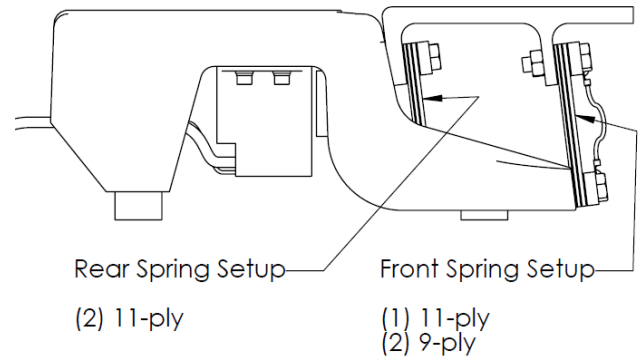
60HZ Operation (Natural Freq. 3550 VPM)										
Trough Weight		Rear Spring Arrangements				Front Spring Arrangements				
Lbs.	KG									
6.0	2.7	11	11	11		9	9	7		
6.4	2.9	11	11	11		11	7	7		
6.4	2.9	11	11	11		11	9			
6.5	2.9	11	11	11		9	9	9		
7.0	3.2	11	11	11		11	9	7		
7.3	3.3	11	11	11		11	11			
7.6	3.4	11	11	11		11	9	9		
8.0	3.6	11	11	11		11	11	7		
8.1	3.7	11	11	11	11	9	9	7		
8.4	3.8	11	11	11	11	11	7	7		
8.8	4.0	11	11	11	11	9	9	9		
9.2	4.2	11	11	11	11	11	9	7		
9.5	4.3	11	11	11	11	9	9	9	7	
9.6	4.4	11	11	11	11	11	11			
9.8	4.4	11	11	11	11	11	9	9		
10.2	4.6	11	11	11	11	11	11	7		
10.5	4.8	11	11	11	11	11	9	9	7	
10.9	4.9	11	11	11	11	11	11	7	7	
11.1	5.0	11	11	11	11	11	11	9		
11.6	5.3	11	11	11	11	11	11	9	7	
12.1	5.5	11	11	11	11	11	11	11		
12.4	5.6	11	11	11	11	11	11	9	9	
12.8	5.8	11	11	11	11	11	11	11	7	
13.2	6.0	11	11	11	11	11	11	9	9	7
13.9	6.3	11	11	11	11	11	11	11	9	
14.4	6.5	11	11	11	11	11	11	11	9	7
14.6	6.6	11	11	11	11	11	11	11	11	



← Standard Spring Arrangement

The table below is similar to the one on the previous page, except it is for units set up for 50HZ operation (Europe/Asia). The diagram to the lower right illustrates the stock 50HZ drive spring arrangement. Additional spring arrangements for other trough weights are listed in the table.

50HZ Operation (Natural Freq. 2950 VPM)										
Trough Weight		Rear Spring Arrangements					Front Spring Arrangements			
Lbs.	KG									
6.0	2.7	11	11				9	7	7	
6.4	2.9	11	11				9	9		
7.0	3.2	11	11				11	7		
7.3	3.3	11	11				9	9	7	
7.7	3.5	11	11				11	7	7	
8.0	3.6	11	11				9	9	9	
8.6	3.9	11	11				11	9	7	
9.0	4.1	11	11				9	9	9	7
9.4	4.3	11	11				11	11		
9.8	4.4	11	11				11	9	9	
10.0	4.5	11	11				11	11	7	
10.5	4.8	11	11	11			9	9	7	
11.3	5.1	11	11	11			11	7	7	
11.5	5.2	11	11	11			9	9	9	
12.4	5.6	11	11	11			11	9	7	
12.8	5.8	11	11	11			9	9	9	7
13.0	5.9	11	11	11			11	11		
13.5	6.1	11	11	11			11	9	9	
14.0	6.4	11	11	11			11	11	7	
14.5	6.6	11	11	11			11	9	9	7



← Standard Spring Arrangement

OPERATING SPECIFICATIONS

Maximum Stroke

Trough Weight	Maximum Stroke
6 to 11 lbs. (2.7 - 5 kg)	.120" (3 mm)
11 to 13 lbs. (5 - 5.9 kg)	.100" (2.5 mm)
13 to 15 lbs. (5.9 -6.8 kg)	.080" (2 mm)

Natural Frequency (See spring setup tables)

Incoming Power	Natural Frequency
60 HZ Operation	3550 VPM (59.2 HZ)
50 HZ Operation	2950 VPM (49.2 HZ)

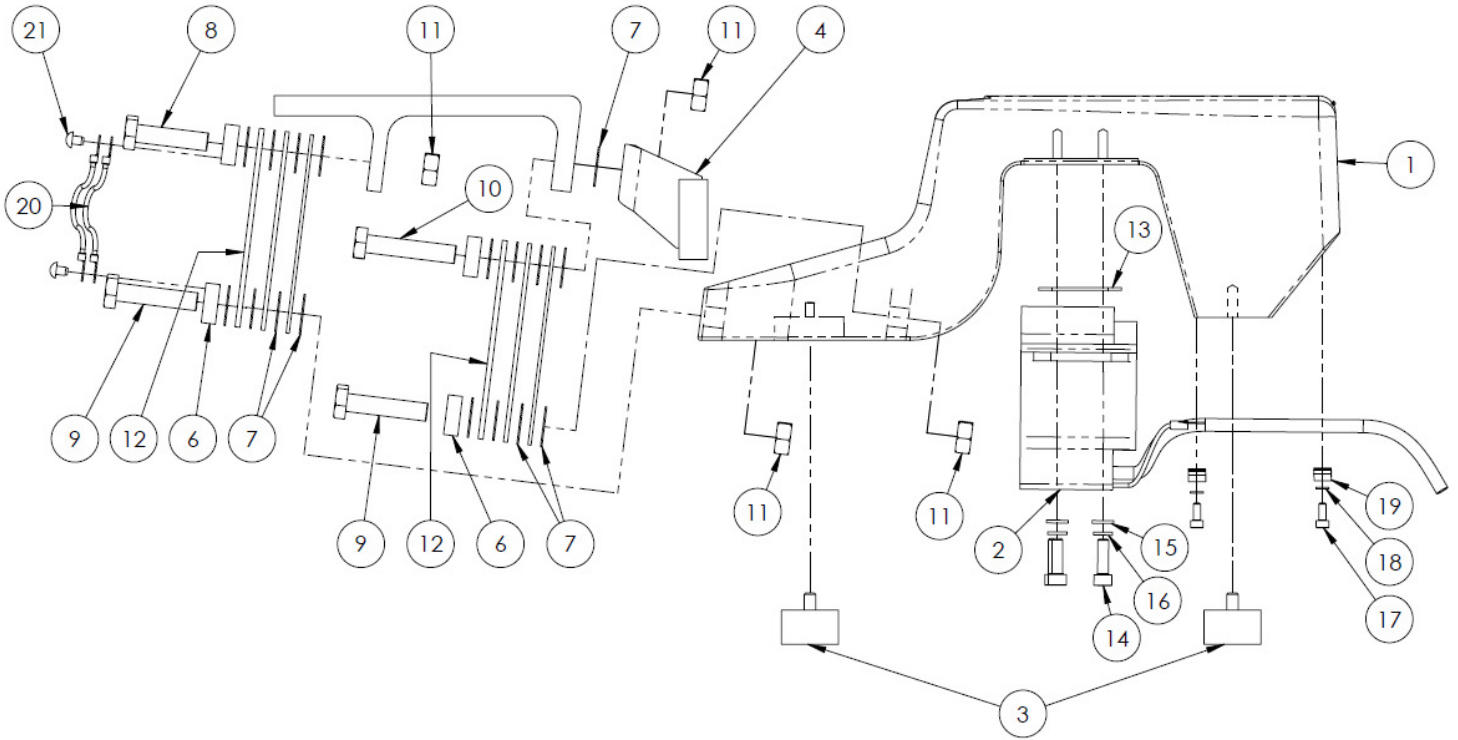
Maximum Current

Coil Voltage	Max. Current
115 Volt	2.8 Amps
208 Volt	1.5 Amps
220/230 Volt	1.4 Amps
380 Volt	0.85 Amps
460 Volt	0.70 Amps

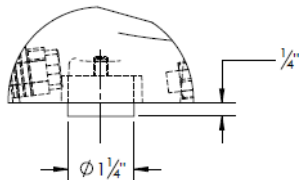
Torque Specifications

Fastener Size	Torque (IN-LBS)
M10	375
M6	80
M4	23

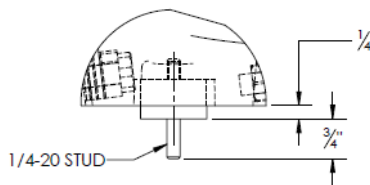
Parts List



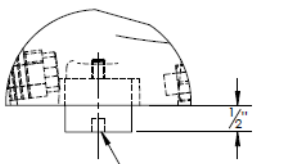
Isolator Feet Options (Item 3)



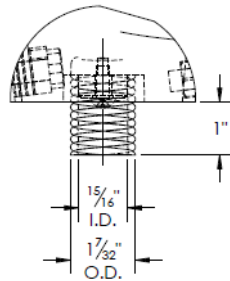
N - STANDARD RUBBER FOOT



M - 1/4-20 MALE THREAD



F - 1/4-20 FEMALE THREAD



C - COIL SPRING FEET

Item	Description	Quantity	Part Number
1	Base Casting	1	6510-092-001
2	Magnet/Cable Assembly	1	
	115 Volts, 60 HZ		6510-089-A16
	208 Volts, 60 HZ		6510-089-B26
	230 Volts, 60 HZ		6510-089-A26
	460 Volts, 60 HZ		6510-089-A46
	115 Volts, 50 HZ		6510-089-A15
	220 Volts, 50 HZ		6510-089-A25
	380 Volts, 50 HZ		6510-089-A35
3	Isolators	4	
	N - Standard Rubber Foot		0207X038
	M- Stud Foot (1/4-20 Male Thread)		0207X035
	F - Sandwich Foot (1/4-20 Female)		0207X039
	C - Coil Spring Isolator		232571-T
4	Armature Assembly	1	6510-090-A
5	Trough Mounting Bracket	1	6510-081-001
6	Clamp Bar	4	6510-084-001
7	Spring Spacer	As Required	6510-083-001
8	M10X40 8.8 ZP HHCS	3	H0302048
9	M10X45 8.8 ZP HHCS	6	H0302148
10	M10X50 8.8 ZP HHCS	3	H0302248
11	M10 Hex Nut 8	12	H0100896
12	Leaf Spring	See Tuning Chart	
	5-Ply (.050" Thick)		6510-082-005
	7-Ply (.070" Thick)		6510-082-007
	9-Ply (.090" Thick)		6510-082-009
	11-Ply (.110" Thick)		6510-082-011
13	MAGNET SPACER	2	6510-097-001
14	SOC. HD. CP. SCRW M6 X 20	4	H0405344
15	PLAIN WSHR DIN125A HSS, M6	4	H0103396
16	LOCKWASHER REG. SPR. M6	4	H0101796
17	SOC. HD. CP. SCRW M4 X 10	2	H0403344
18	LOCKWASHER REG. SPR. M4	2	H0101597
19	WIRING & TUBE CLAMPS MEDIUM DUTY	2	142X112
20	GROUND STRAP ASSY	2	6510-014-A
21	DRIVE SCREW, #10 X 1/4	4	H0457102

Important

Syntron Material Handling reserves the right to alter at any time, without notice and without liability or other obligations on its part, materials, equipment specifications, and models. Syntron Material Handling also reserves the right to discontinue the manufacture of models, parts, and components thereof.

Your satisfaction is very important to us. Please direct any comments, questions, or concerns to our Marketing Communications Department.

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