

# SELECTRONICS, INC.

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## DANCER CONTROL DRIVE

Model DCD-2

The DCD-2 is designed to provide drive power to a yarn winder AC torque motor. The motor's torque is very accurately controlled by the position of a dancer compensator arm to keep constant or controlled tension on the yarn throughout the package build. Conventional drives for this application suffer from a number of drawbacks that have been eliminated by the DCD-2 such as: failure of the drive or expensive and trouble-prone transducers or position sensors, dancer arm hunting, the need for re-adjustment when tension or yarn speed is changed, linkages, dash-pots, etc.

The DCD-2 is the best dancer controlled drive available because it was designed to be dependable and hassle-free.

### FEATURES:

- **Non-contact** dancer arm sensing...no transducers, linkages, or damping to wear out or require adjustment
- Perfect dancer arm **dynamics**...no hunting
- Will drive **any** AC torque motor up to 1/3 HP
- May be powered from **170-250 VAC**, three-phase
- Extremely quick and **easy installation** / conversion

## DANCER CONTROL DRIVE

by

# SELECTRONICS

Innovative Solutions Through Electronic Technology



### Model DCD-2

**AC Motor Drive for Tension-Controlled  
Yarn & Tape Winding Applications**

- No adjustment necessary after installation
- Easy adjustment of Preset or "thread-up" torque by ten-turn potentiometer on compensator panel
- **"Auto Preset"** option available for adjustment-free, automatic "thread-up speed" setting
- **Over-current limiting** prevents overload damage to drive even if motor is stalled indefinitely
- Latest **high-tech design** makes circuitry fully automatic, self-adjusting, and trouble-free
- Proprietary arm position sensing technology and patented **"RSC"** circuitry were developed by Selectronics exclusively for the yarn industry!
- **One minute** "swap out" of the entire controller should servicing be necessary
- **Two-year warranty**

## DANCER CONTROL DRIVE

### DCD-2 Installation and Operation

The DCD-2 provides controlled power to an AC torque motor to drive the take-up winder at the correct regulated speed and torque to maintain the tension compensator (dancer) arm at a constant position.

There are two operation modes available in a single unit: the **"preset start"** and the **"demand start"**.

### **PRESET START**

This mode is for string-up-on-the-fly applications. When the dancer arm is all the way down against the stop the yarn-break limit switch is activated disabling the DCD-2's voltage output so the motor is stopped. When the dancer arm is raised slightly or put on the "step" the switch is closed enabling power to the motor. (An optional "non-step" start feature is available for push-button start.) In this "arm-lower-than-normal" position the power is ramped up quickly to the maximum motor torque limit as set by the 10-turn MAX TORQUE potentiometer on the winder panel (or the optional auto-preset module). This is usually set so easy and smooth string up may be accomplished without over-tensioning the yarn.

When the winder is threaded the spindle pulls the yarn slightly faster than the feed rate. This quickly takes up slack and pulls the dancer arm upward. The DCD-2 responds to this by reducing the motor torque so the spindle slows to the exact speed necessary to maintain the dancer arm at its desired running position. Due to the spring or air tension on the dancer arm this maintains constant tension on the yarn throughout the

winding process to assure uniform package build. (Tension “profiling” is available as an option. **Contact Selectronics at 704-694-3441.**)

## **DEMAND START**

This mode is for string-up-while-stopped applications. When the arm is all the way down the yarn and the spindle are stopped. The yarn is manually wrapped onto the empty take-up tube until the dancer arm is pulled up to the top. Now, the run circuit is closed and the yarn delivery to the winder is started. As the yarn motion causes the dancer arm to drop the spindle accelerates to the correct rate to keep the arm at its desired winding position. Due to the spring or air tension on the dancer arm this maintains constant tension on the yarn throughout the winding process to assure uniform package build. (Tension “profiling” is available as an option. **Contact Selectronics at 704-694-3441.**)

## **INSTALLATION**

The DCD-2 enclosure is mounted on the compensator panel with the provided bracket so its end is centered directly over the center axis of the magnet holder which is affixed to the dancer arm shaft bellcrank. The DCD-2 responds to the angle of the magnet with respect to the centerline of the enclosure. The magnet holder is secured to the dancer shaft with a setscrew so the RED TIP end of the magnet points directly away from, and is perpendicular to, the end of the enclosure when the dancer arm is in its desired “winding” position. This is usually “arm-level” but may be slightly higher or lower than level if the application requires. An air-gap the thickness of an index card should exist between the magnet and the DCD-2 enclosure so that it is as close as possible but not touching. The exact width of the air-gap

is not critical.

The first step in the conversion from a Leeson drive to the Selectronics DCD-2 is to remove the old transducer and its bracket, the bellcrank tensioning and the transducer linkage. Disconnect the yarn-break switch wires and remove the old potentiometer and its harness. Now remove the end cap and pins from the bellcrank. Slide the provided magnet collar assembly over the end of the bellcrank but do not tighten yet.

The universal hole pattern in the provided mounting bracket matches existing holes in all Leeson compensator panels, so no drilling is necessary. Size #10 screws and washers may be used to attach DCD-2 bracket to the panel. The size of the holes in the bracket and panel will allow some latitude in the positioning of the enclosure. Install the provided Torque Potentiometer in the compensator panel hole where the old one was. Connect its harness wires to the yarn-break switch (circuit should close when arm is lifted).

## **ALIGNMENT**

Temporarily position the magnet collar so it is almost touching the bottom of the DCD-2 enclosure and the red tip of the magnet is pointing away from the bracket. Tighten the Allen setscrew just snug not tight. Remove the four corner screws from the cover of the DCD-2 and take out the circuit assembly. A sticker on the inside bottom of the enclosure covers the alignment sight-hole. Move this sticker aside and, with the bracket-to-panel screws loose, position the enclosure so the locator dot on the center of the magnet collar aligns with the center of the sight-hole. Tighten the mounting screws.

Now, fix the compensator arm in the desired winding position. Loosen the magnet collar setscrew. Place a standard index or business card between the magnet collar and the bottom of the enclosure as a thickness gauge. Position the magnet collar just touching the card and with the red tip of the magnet pointing away from the mounting bracket and perpendicular to the end of the enclosure. Tighten the setscrew securely. Confirm that the locator dot is still in the center of the sight-hole. Replace the sticker over the hole to keep out debris. Re-install the circuit assembly.

The magnet collar position determines the normal winding position of the compensator arm. If the arm's winding position is not as desired when put into operation the magnet collar may be re-positioned as necessary to correct the arm position. There is no electrical adjustment of the arm position which assures that any DCD-2 circuit assembly will run in the same arm position in a given panel. If servicing is necessary then just remove the circuit assembly only which will not disturb the alignment and will allow quick substitution without the need for re-adjustment.

**NOTE:**

The DCD-2's operation does not behave like a potentiometer. That is, the arm position does not determine the actual torque of the motor. Instead, arm position determines torque "trend". Arm-lower-than-winding-position gives torque trend upward. Arm-higher-than-winding-position gives torque trend downward. Normal winding position gives no trend, regardless of present torque. Rapid arm movement gives rapid torque change. In this way the DCD-2 maintains the arm position no matter what the yarn speed.

## ELECTRICAL CONNECTIONS

The DCD-2 will accept any supply input from 170-250 VAC and deliver to the motor whatever voltage is necessary to keep the compensator arm in the desired winding position, as long as what is required is not greater than the supply input. The DCD-2 will pass through to the motor from 0 to 100% of the available input power.

**The DCD-2 contains three internal 5 AMP fuses for motor and circuit protection.**

The standard power/motor connector used on the DCD-2 is the Vernitron 7-pin "E" plug which matches the plug used on the Leesona 37X and the Type-R drives. Contact Selectronics for other connector preferences.

Connections for the DCD-2 leads are as follows:

**POWER/MOTOR HARNESS** (7 – conductor cable, large plug)

<u>WIRE COLOR</u>	<u>PIN #</u>	<u>FUNCTION</u>
WHITE	10	Phase A ---
BLACK	11	Phase B ---   170-277 VAC Supply
GREEN	12	Phase C ---
GREY	7	Phase A ---   AC motor
VIOLET	8	Phase B ---   (other leads
BLUE	9	Phase C ---   go together)
WHITE/BLACK	Index	Ground

## CONTROL HARNESS (4 – conductor cable, small plug)

Color	Pin #	FUNCTION
BROWN	1	Limit (STOP) Switch (open circuit
YELLOW	4	Limit (STOP) Switch disables run)
BROWN	1	MAX. TORQUE Potentiometer CW
ORANGE	3	MAX. TORQUE Potentiometer Wiper
RED	2	MAX. TORQUE Potentiometer CCW

Note that the power connections are the same as those used by the Leeson 37X drive but different than the ERC Type-R. When replacing Type-R drives two simple modifications must be added to the wiring inside the winder:

- 1- Connect an 18-gauge lead from the TS-1 terminal strip T1 to the back of the female socket SO-1 pin 12.
- 2- Remove the motor wires from the TS-1 terminal strip T1, T2 and T3 and connect them all together. Insulate the connection with tape or wire nut.

## OPERATION

When the arm is raised slightly from the lower stop position the DCD-2 starts and the MAX. TORQUE potentiometer is in control of the motor's torque. This potentiometer should be set so that the spindle speed makes the empty tube surface-speed more than the yarn speed by a few percent. (**clockwise = less torque**) This assures that when the yarn is started on the tube the arm will be raised. The motor slows quickly, the arm drops to normal winding position, and the DCD-2 starts regulating. If the MAX. TORQUE isn't set high enough the arm won't rise. This means no regulating will occur and the arm may drop and the motor will stop.

It is important to note that the MAX. TORQUE potentiometer adjusts motor torque maximum limit and not actually speed directly. It is this torque of the motor shaft working against the machine load and friction that results in the speed the spindle actually achieves. Thus, the spindle RPM for a given potentiometer setting may vary from time to time depending on machine wear, lubrication, etc. This is unavoidable since an AC motor's speed cannot be accurately controlled except by controlling the frequency of its power source or by tachometer closed-loop feedback. This is beyond the scope of the DCD-2 and unnecessary in this application. However, this option is available from Selectronics. It is possible to set the torque sufficient for string-up but after the package builds and the load increases the torque setting is no longer sufficient, the arm drops slowly until cut-off. The best way to set the MAX TORQUE potentiometer is to adjust for a comfortable string-up then periodically monitor the first package throughout its build and, if the arm starts to sag, increase torque (pot counter-clockwise) slightly until arm is back to normal winding position. No further adjustment will be necessary in the future unless the winder's drag increases significantly.

## WINDER SET-UP FOR OPTIMUM PERFORMANCE:

The gear ratio between the motor and the take-up spindle on a winder determines its performance under specific conditions. If the spindle is geared too low then it will be operating at a disadvantage near full package where maximum horsepower is needed. Insufficient spindle torque will result causing motor heating and unstable operation.

## NOTES

Ideally, the winder should be set-up so that the surface speed of the empty core, when the motor is running at its maximum, is 15-25% above the fastest speed that the yarn will ever be delivered to the spindle. (If this speed is not known then it can be determined by placing a surface-wheel tachometer against the package surface or roller bail while winding the product with the highest process speed.)

To determine if gearing is acceptable put an empty tube on the spindle, place the compensator arm at the fast (lower than normal) running position and start the winder. Place a surface-wheel-tachometer against the empty tube, turn the preset torque pot to maximum (fully counter-clockwise) and record the yards or meters-per-minute.

If this speed is much greater than 125% of the fastest process speed previously determined then a gearing decrease is warranted. If this speed is less than 115% then a gearing increase is necessary.

The Dancer Control Drive DCD-2 was designed specifically for the yarn winding industry. Many thousands are in use throughout the world since 1993. This product will give many years of reliable service under normal operating conditions.

Selectronics guarantee it free from defects in materials and workmanship for a period of two years from the date of purchase.

We welcome your questions and comments. We stand ready to assist you with special applications. And, we have a broad line of other products for the winding industry. Please let us know if we can help you in any way!

**a product of  
Selectronics, Inc.**

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