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Servo Press Programming Video Transcript

0:05 I'm Paul Johnson with Dexter Precision. We make electric servo presses that can be used for a variety of manufacturing and testing processes. In this video I'm going to show how to program a servo press. Programs are created right at the machine. No additional software is necessary. Let's get started.

0:24 From the main menu press control panel. Arrow down to program editor and press enter. All inputs to the program are entered through the program editor menu or one of its sub menus. There are three sections; setup, program step, and monitor.

0:41 The setup section is for the machine setup. It includes tool, fixture, and chart information. The program step is for the four program steps; approach, detect, press, and return. The monitor section covers process evaluators and the data recorder. Evaluators are used to verify that the process data is within specifications. The data recorder can record position, force, and time as the press operates.

1:10 You can see that program name is highlighted in blue and there's a flashing message to press enter for keypad. Press enter, then use the arrow keys and the enter key to enter the program name. You can press backspace to remove a letter. Press back when done. This returns to the program editor. I'm going to name this program 'Test'.

1:40 Press down arrow to highlight tool. Tool refers to the press tool that's used in the press's ram. The tool section allows you to enter a tool number. A tool number is optional. It is used to define the tool used for the program. This can be helpful if you have a number of programs that use different tools. If you want to define a tool then enter a number from one to one hundred. I'm going to enter twenty-four. Press down arrow to highlight fixture.

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2:08 This refers to the press fixture that is installed on the press's base. Just like tool, a fixture number is optional and used to define the fixture for the program. I'm going to enter seventeen. Now press down arrow for chart.

2:25 The servo press plots force and position on its display as it runs. It needs to know the minimum and maximum values for the force and position axes. Use the arrows and number keys to enter the values. I'll enter zero Newtons for force minimum, fifteen hundred Newtons for force maximum, zero millimeters for position minimum, and seventy millimeters for position maximum.

2:49 During this video the units are displayed as Newtons and millimeters. The units are set in the system menu. If you want to pounds and inches you can change the units there. Now that the chart data is entered, press back and return to the program editor.

3:04 Press down arrow to highlight program step one approach and then press enter. Program home will be highlighted. This is the position of the ram where the program will start. This is usually a position that gives just enough room to remove the last part and install the next one.

3:23 From here you can press enable hand-wheel. This will enable you to move the ram by simultaneously pressing one of the start buttons and rotating the hand-wheel. You can select a fast or a slow hand-wheel speed.

3:37 Notice that as I turn the hand-wheel the ram moves and the position shown on the screen changes. You can also see that the force on the ram changes when I push on it.

3:49 I want to set the program home to thirty-five millimeters. This is thirty-five millimeters from the servo press's home position. There are two ways to enter the program home position. Either enter it with the keypad or move the ram using the hand-wheel and then press enter current position. I'm going to use the hand-wheel method. Now press down arrow to highlight approach speed.

4:15 This is the speed the ram will travel as it moves from the program home position to the detect start position which is defined in the next section. I'm going to enter twenty-five millimeters per second.

4:28 Next press down arrow to highlight approach force max. As the ram approaches the part the machine monitors the load cell. I'm going to enter

ten Newtons. If the force on the ram exceeds ten Newtons during the approach step the controller will stop and retract the ram. This could happen if the part is installed in the fixture incorrectly, if it is out of specification, or if there's something between the tool and the part.

4:55 In the upper left corner there's a checkbox for disable. Checking this box will disable the approach step of the program and the press would skip directly to the next step which in this case is detect. This feature is used in programs with multiple press operations such as one where you press to a force, dwell for some time and then press to a position. This video will just cover a single operation program so I won't disable the approach step here.

5:25 Now I'll go back to the program editor and down arrow to step two, detect. Detect refers to detecting the part. The press detects the part by sensing the force on the ram. When the force on the ram meets the detect force, the part is detected. The first variable is detect start. This is the ram position where the machine will begin sensing the part. I'm going to begin at fifty millimeters.

5:53 Next is detect speed. This is the speed the ram will travel while detecting the part. It's important to move the ram slowly when detecting the part. Moving too quickly will cause the tool to strike the part which will apply a rapidly increasing force that could damage the part or the press itself. I'm going to use one millimeter per second.

6:14 Next is detect force. When the force reaches this level the machine concludes that it has detected the part. I'm going to set that to five Newtons.

6:24 Then there's detect end. This is the ram position that ends the detection window. If the ram reaches this position and the force has not reached the detect force, the machine will stop and return to program home. I'll set detect end to fifty-one point five millimeters.

6:43 Since I set detect start to fifty millimeters this gives a one point five millimeter part detection window. Finally there's a checkbox for stop after detect. Selecting this will make the ram come to a complete stop after detecting the part. This feature is sometimes used for multiple step press programs. In this program there's no reason to stop so I'll leave it unchecked.

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7:06 Now go back to program editor and down arrow for step three, press. Number of press operations is highlighted. As I mentioned this program will have one press operation. This is the default so I can down arrow to press type. I want constant speed press to position so I'll select that and press enter.

7:28 The soft menu key edit press operation one appears, press the key. Here I enter the press speed. This is the speed the ram will travel as it presses. I want this to be twenty millimeters per second.

7:43 Next is press force max. If press force max is reached the machine will stop and reverse the ram. It's possible that an out of specification part would require more force than expected to reach a position such as when pressing a pin into a hole where the hole is too small or the pin is too big. I'll set it to fifteen hundred Newtons.

8:05 Next there's press position max. Since the press operation type is press to position, this is the ram position where the machine is going to stop pressing. I'm going to press to sixty-eight millimeters.

8:18 Now there's dwell time. There may be a reason to hold the press in position for some period of time. You may want to trigger an ultraviolet light to cure an adhesive or send a signal to another machine. I don't need to dwell so I'll leave it at zero and go back to the program editor.

8:34 Now we're at step four, return.

8:38 The first variable is decompress speed. At this point in the program the press's ram is loaded up against the part. That loading combined with the elasticity of the part and the machine can mean that there's some built up energy in the system. It can be helpful to back the ram off the part slowly thereby releasing that energy smoothly. Decompress speed is the speed the ram will travel while decompressing. This works in combination with decompress distance which is the distance the ram travels while decompressing.

9:10 Since I'm working with a spring, the part isn't very stiff, so there's no need to decompress slowly. I'll leave both variables as zero and the program will skip the decompression step.

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9:21 Next is return speed. This is the speed the ram travels while returning to program home. I'll set it to one hundred millimeters per second and return to the program editor.

9:33 Next is the monitor section where we have evaluate and record. The valuate section covers analyzers, tests, and windows that can be used to evaluate the process data. First there's enable. This is an option to enable and disable all evaluators. It is sometimes helpful to disable them such as when developing a program. In this case I'm going to enable them.

9:57 I want to add a test so I'll arrow over to test one and press enter. I want to nable this test. For test type I want force at end. This is going to look at the force at the end of the press operation and compare it to the minimum and maximum we'll set below. We want to control what the press does if force at end is out of limits. Select stop and return to program home.

10:23 For force minimum enter thirteen hundred Newtons and for force maximum enter fifteen hundred Newtons. If the force at the end of the press operation is not within these limits the machine will display operation failed. Now press back and add a window.

10:41 Arrow over to window one. Select enable. I want a force in position window. The press supports multiple operation pressing. Because of this we need to relate the test window to one of the operations. Since this is a single operation program select press operation one. I want the window to start at the ram position of fifty millimeters and end at fifty-one millimeters and the force at the start of the window to be between zero and eight Newtons and the force at the end of the window to be between zero and forty Newtons.

11:20 Now as the ram travels between fifty and fifty-one millimeters the controller will interpolate the minimum and maximum force limits at the ram's current position. If the force is not within those limits the operation will stop, the ram will go to program home, and the machine will display operation failed.

11:39 Let's go back and add another window. Select window two, force in position, press operation one, on failure stop and return, start position fifty-six millimeters, stop position sixty-six millimeters, start force minimum three hundred and seventy Newtons, start force maximum four hundred and twenty Newtons, end force minimum twelve

hundred Newtons, end force maximum twelve hundred and fifty Newtons.

12:12 As in the last window, the controller will take the ram's position, interpolate the allowable force, and stop the operation if the force falls outside of the window. Now back to the program editor.

12:24 Select record. The recorder can acquire position, force, and time data as the press operates. It can save this data in a comma separated value file. The file can be downloaded through the machines USB or Ethernet connection. I'll enable the recorder and set it to save data always. This will save all the data every time this program runs. Usually this should be set to save data only on failure so that the data is there only when something goes wrong. But I'm going to use this data for another video.

12:55 Set the sample rate to one thousand samples per second. This is quite fast and will cause the data file to be large. It might make sense to sample at only fifty or one hundred samples per second. This would reduce the size of the data file.

13:08 We need to set the trigger that starts the recorder, select program start. The recorder will begin acquiring data when the start buttons are pressed or when the machine receives a start signal. Set end to program end. The machine will record data until it has finished the program.

13:26 Now that the program is entered, it needs to be saved. Press the save program menu button. You can select the folder where you want to save the program.

13:36 Folders are created through the USB connection using a separate computer. The servo press appears like a flash drive. Just use your computer's file explorer to create a new folder. Press the save program key and return to the program editor and then go back to the main menu.

13:58 Now we've created the program that is used for our spring test video which you can watch to see how it works.

14:05 Thanks for watching. For more information check us out at dexterprecision.com

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