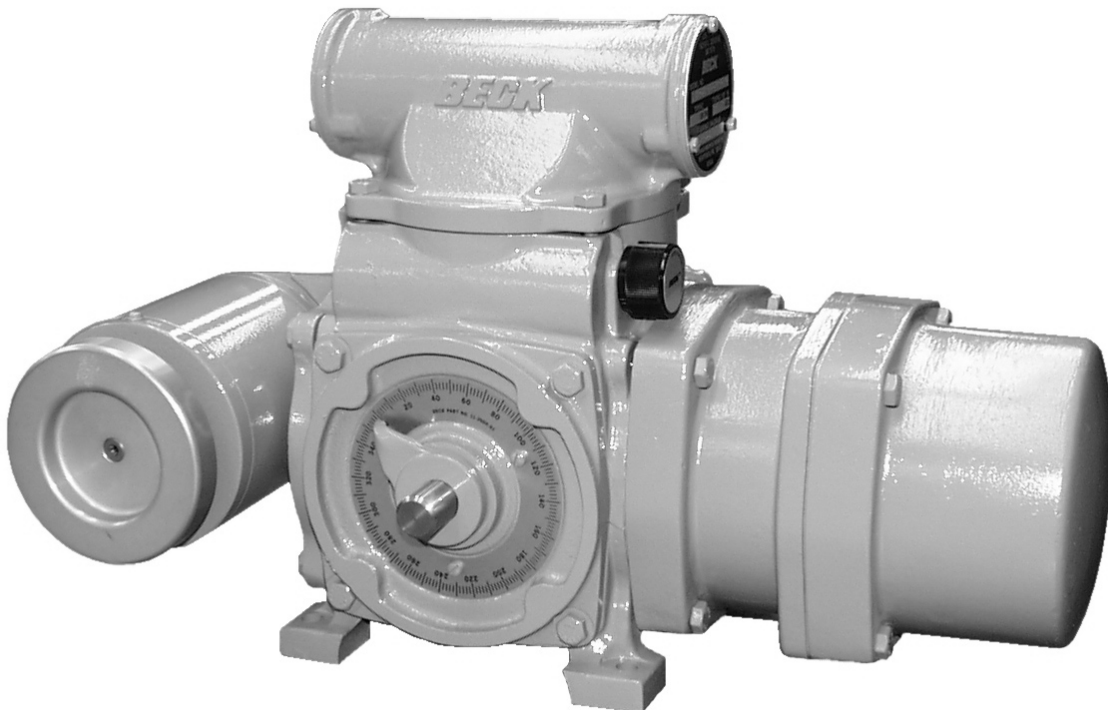


80-1100-11
Rev. 01

**BECK ELECTRONIC
CONTROL DRIVES
MODELS 25-102
and 25-105**

INSTRUCTION MANUAL



BECK[®]

CONTENTS

INTRODUCTION

This manual contains information that will make the installation, operation and maintenance of your Beck Group 25 Electronic Control Drive simple, efficient and trouble-free. Please read and understand the appropriate sections in this manual before attempting to install, operate or perform maintenance on your drive.

WARNING

Installation and service instructions are for use by qualified personnel only. To avoid injury and electric shock, do not perform any servicing other than that contained in this manual.

STORAGE INFORMATION

The drive should be stored in its shipping carton in a clean, dry area. If it is necessary to store the drive outdoors for a long period of time, it should be removed from its shipping carton and stored above ground. A waterproof cover should be securely fastened over it. Do not stack drives on top of one another. Stored drives should be periodically checked to make sure no condensation has formed in the control compartments. Damage due to moisture while in storage is not covered by warranty.

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PRODUCT DESCRIPTION

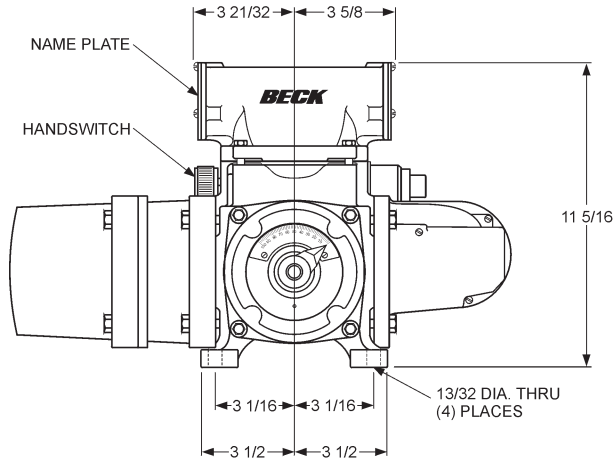
GENERAL SPECIFICATIONS

Input Power	120 V ac single-phase, 60 Hz Allowable Tolerance: +10%, -15%											
Max. Current and Power	.5 A 55 W											
Operating Conditions	-40° to 180° F (-40° to 85° C) 0 to 99% relative humidity											
Direct AC Control	120 V ac control from either an automatic controller, or manually operated switches. For use in 2-position, multi-position or continuously modulating applications over the full range of travel.											
Feedback Signal Options, with Contactless Position Sensor (CPS-2)	<table border="0"> <tr> <td><u>Current</u></td> <td><u>Voltage</u></td> </tr> <tr> <td>1–5 mA</td> <td>0–5 V dc</td> </tr> <tr> <td>4–20 mA</td> <td>1–5 V dc</td> </tr> <tr> <td>10–50 mA</td> <td>0–10 V dc</td> </tr> <tr> <td></td> <td>0–16 V dc</td> </tr> </table>	<u>Current</u>	<u>Voltage</u>	1–5 mA	0–5 V dc	4–20 mA	1–5 V dc	10–50 mA	0–10 V dc		0–16 V dc	<p>The CPS provides a continuous feedback signal proportional to the position of the drive's output shaft. It is used for remote position indication.</p> <p>The position sensing function of the CPS-2 is provided by a ferrite magnetic sensing assembly consisting of two parts; a stator mounted on the CPS-2 circuit board and a rotor mounted on the control shaft. The electronic circuit translates the signal from the ferrite magnetic sensor into an analog position feedback signal designed to interface with electronic control systems and indicating instruments.</p>
<u>Current</u>	<u>Voltage</u>											
1–5 mA	0–5 V dc											
4–20 mA	1–5 V dc											
10–50 mA	0–10 V dc											
	0–16 V dc											
Output Stability	0.25% of span from 102 to 132 V ac ±0.03% of span / °C for 0–50° C, ±0.05% of span / °C for -40–85° C											
Linearity	±1% of span, max. independent error											
Hysteresis	0.25% of span at any point											
Limit Switches	Two SPDT, one for CW and one for CCW limit of travel. Typical switch setting is for 100° of travel.											
Auxiliary Switches	Two 6 A, 120 V ac switches provided. Switches are labeled S1 and S2, and are cam-operated and field-adjustable.											
Handswitch	Permits local electrical operation, independent of controller signal. Standard on all units.											
Handwheel	Provides manual operation without electrical power.											
Motor	120 V ac, single-phase, no-burnout, non-coasting motor has instant magnetic braking that requires no contacts or moving parts. The motor can remain stalled for approximately 4 days (cumulative) without degradation of associated gearing.											
Gear Train	High-efficiency, precision-cut, heat-treated alloy steel and ductile iron spur gears.											
Mechanical Stops	Prevent over-travel during automatic or manual operation.											
Enclosure	Precision-machined aluminum alloy castings, painted with corrosion-resistant polyurethane paint, provide rugged, dust-tight and weatherproof enclosure.											

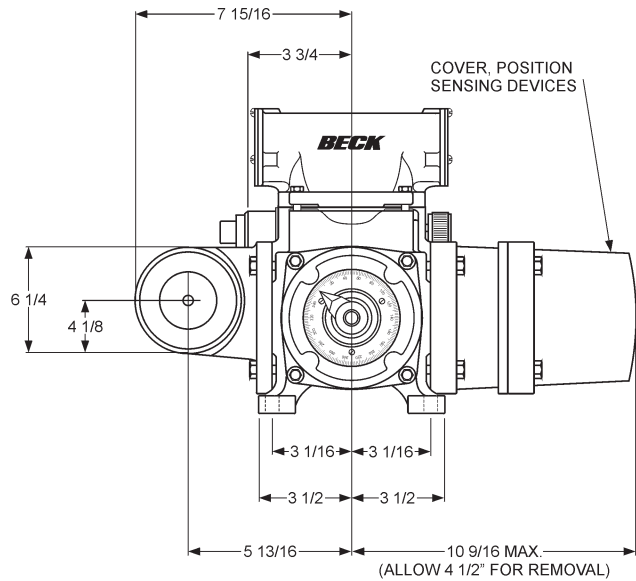
PRODUCT DESCRIPTION

MODEL 25-102

ALL DIMENSIONS ARE IN INCHES;
METRIC DIMENSIONS AVAILABLE
UPON REQUEST

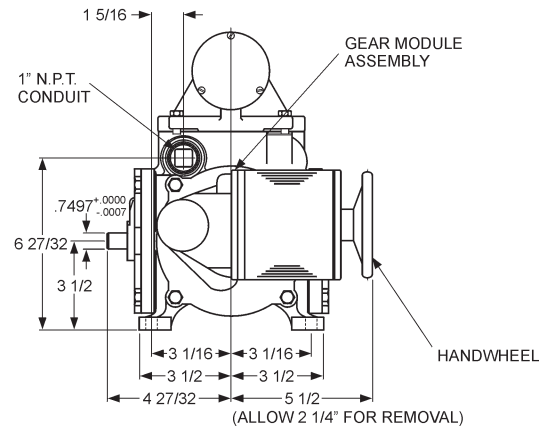


OPPOSITE MOTOR SIDE

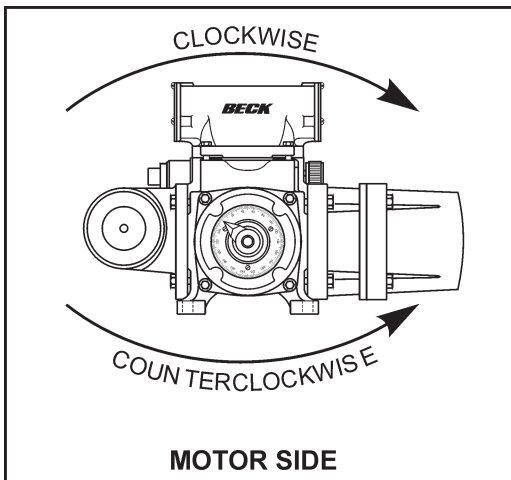


MOTOR SIDE

BECK DRIVE MODEL	TORQUE (lb-ft)	TIMING (sec)	APPROX. WT. (lbs)
25-102	40	25	34



CONDUIT SIDE



MOTOR SIDE

DIRECTION OF TRAVEL

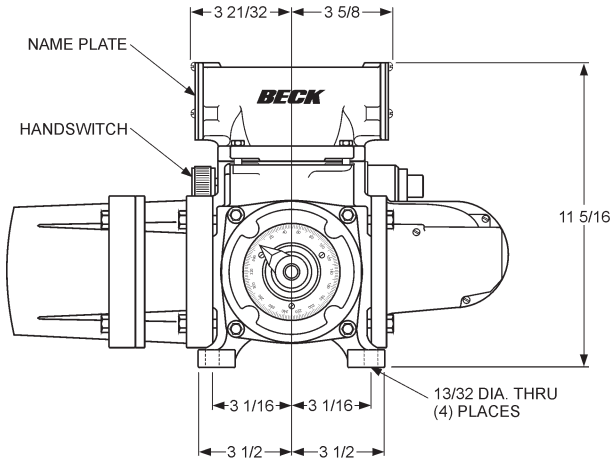
Direction of travel is determined when looking at the end of the output shaft on the motor side.

Recommended Bolt Torques

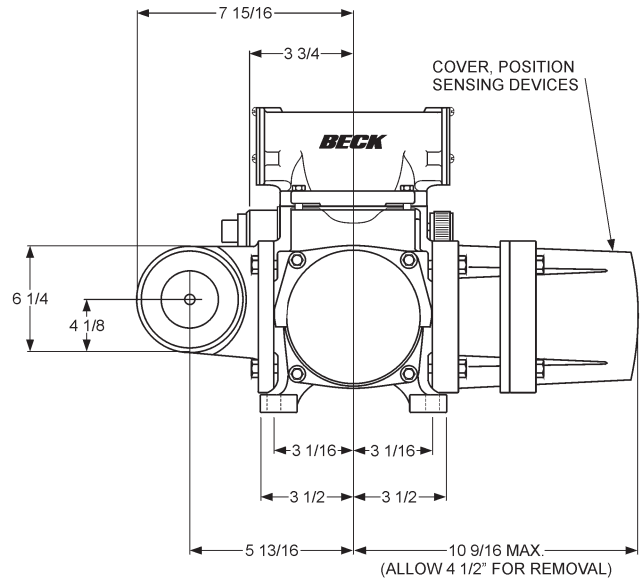
	SIZE (in)	TORQUE (lb-ft)
Cover Bolts	5/16-18	10
Gear Module Bolts	5/16-18	10
Body Bolts	5/16-18	10
Control End Cover Bolts	5/16-18	10

MODEL 25-105

ALL DIMENSIONS ARE IN INCHES;
METRIC DIMENSIONS AVAILABLE
UPON REQUEST

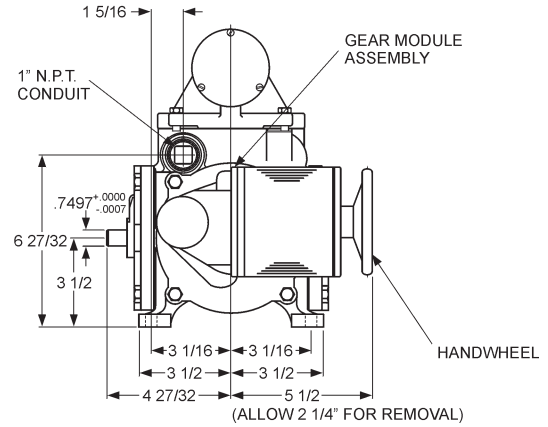


OPPOSITE MOTOR SIDE

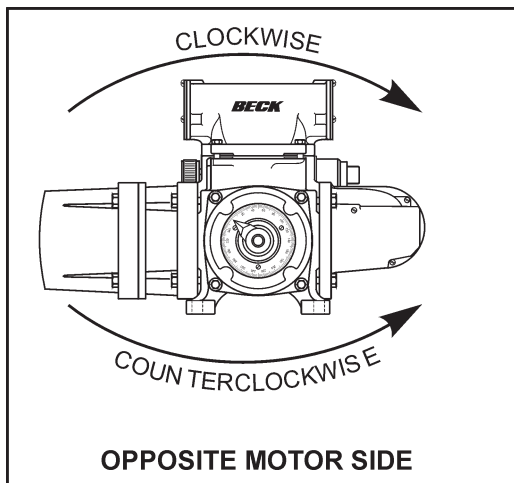


MOTOR SIDE

BECK DRIVE MODEL	TORQUE (lb-ft)	TIMING (sec)	APPROX. WT. (lbs)
25-105	40	30	35



CONDUIT SIDE



DIRECTION OF TRAVEL

Direction of travel is determined when looking at the end of the output shaft opposite that of the motor side.

Recommended Bolt Torques

	SIZE (in)	TORQUE (lb-ft)
Cover Bolts	5/16-18	10
Gear Module Bolts	5/16-18	10
Body Bolts	5/16-18	10
Control End Cover Bolts	5/16-18	10

INSTALLATION

INSTALLATION—MECHANICAL

Beck drives may be mounted in any orientation. Refer to the outline dimension drawings on pages 4 and 5 for physical dimensions and required clearances.

When installing a Beck drive, ensure that it is bolted securely to a flat mounting surface that will not yield to the stresses created from operating the drive. A rigid, vibration-free surface will generally prolong the life of the drive's components.

INSTALLATION—ELECTRICAL

NOTE: All Beck drives are shipped from the factory ready for installation; no electrical adjustments are required before placing them in operation. Each drive is set up and calibrated to the customer's specifications that were written into the equipment order.

One N.P.T. conduit connection is provided for power and signal wiring to the drive. A wiring diagram is shipped with each drive and is fastened to the inside of the terminal block cover. Refer to this wiring diagram for proper AC power and signal connections. If the wiring diagram is not available, you may obtain another copy from Beck by providing the serial number of your drive.

To prevent moisture from entering the drive, a sealant must be used on the threaded conduit connection. The conduit should be routed from below the drive so that condensation and other contaminants entering the conduit cannot enter the drive.

For maximum safety, the Beck drive body should be grounded. Use the grounding terminal in the wiring compartment of the drive.

TYPICAL WIRING CONNECTIONS

Input Power

Standard input power is 120 V ac. The 120 V ac line connects to terminal 8, and the neutral line connects to terminal 2.

Direct AC Control Input Signal

Terminal 10 is the connection for the forward direction signal line. Terminal 9 is the connection for the reverse direction signal line.

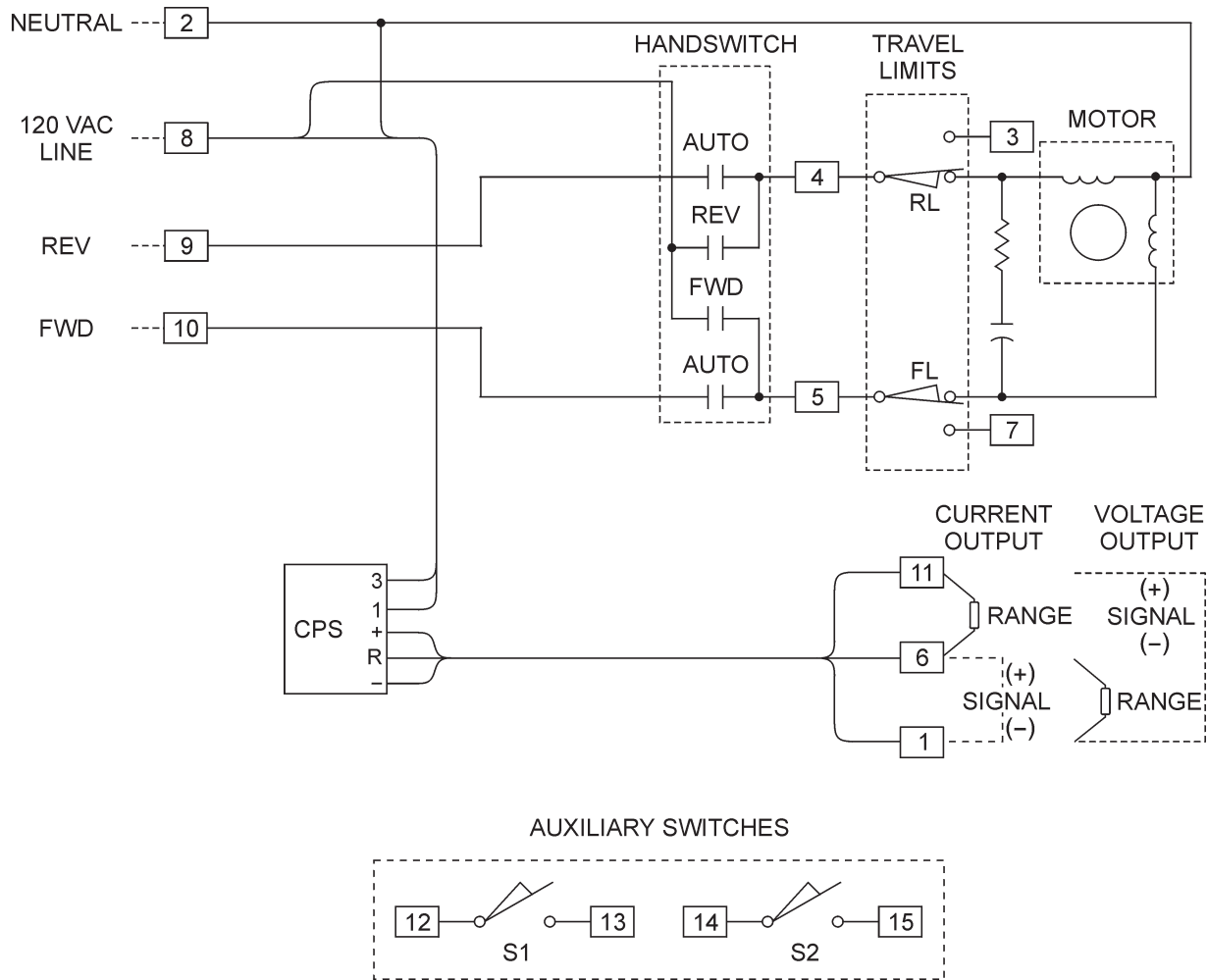
Position Feedback Signal (CPS-2)

The Group 25 drive is equipped with a Contactless Position Sensor (CPS) to generate an output shaft position feedback signal. The CPS can deliver a variety of industry standard feedback signals as shown in Table 1, page 7.

Depending on the desired feedback signal, connections are made at terminals 11 and 1 or at terminals 6 and 1. A ranging resistor may also be required for your application. Refer to the wiring diagram shipped with your drive or Figure 1 and Table 1 shown on the following page.

START-UP INSTRUCTIONS

After the drive is mounted and its wiring connections are made, it is ready to be tested for proper operation. Turn on the power supply. Operate the drive with the Handswitch and run it through its full travel in both directions. Observe that the driven device travels through its desired range. When travel of the driven device is satisfactory, the unit is ready for operation.



TYPICAL WIRING DIAGRAM

Figure 1

**TABLE 1:
CPS-2 SIGNAL OUTPUT TERMINAL CONNECTIONS AND LOADING**

SIGNAL RANGE (Model 20-3400-03)	OUTPUT TERMINALS (+) (-)	RANGING RESISTOR		RESISTOR CONNECTIONS	MAXIMUM EXTERNAL LOAD
		VALUE	BECK PART NO.		
<u>Current Output</u>					
1-5 mA	6 - 1	Open			2 K Ω
4-20 mA	6 - 1	332 Ω	13-2511-06	11 - 6	500 Ω
10-50 mA	6 - 1	110 Ω	13-2510-25	11 - 6	200 Ω
<u>Voltage Output</u>					
0-5 V dc	11 - 1	249 Ω	13-2511-08	6 - 1	16 mA
1-5 V dc	11 - 1	Jumper		6 - 1	16 mA
0-10 V dc	11 - 1	1.50 K Ω	13-2512-02	6 - 1	16 mA
0-16 V dc	11 - 1	3.01 K Ω	13-2513-26	6 - 1	16 mA

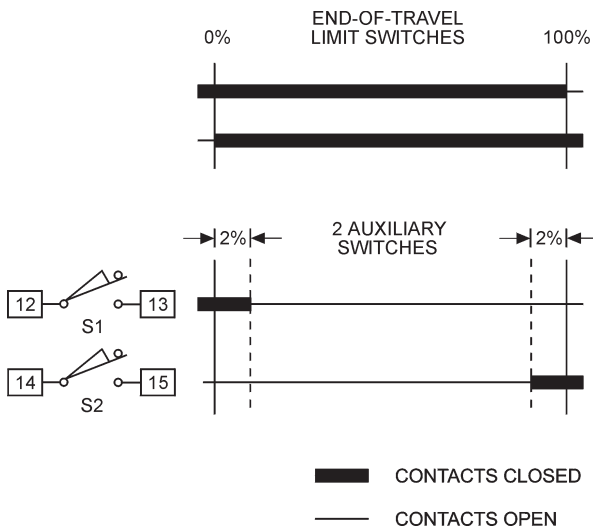
CALIBRATION SWITCHES

Under normal operating conditions there is no need to recalibrate the control drive. However, if the application requirements change or are different than specified on the equipment order, the drive should be recalibrated according to the procedures in this section.

SWITCH ADJUSTMENTS

All control drives are shipped with end-of-travel limit switches factory-adjusted for 100° of travel unless otherwise specified at time of order. Limit switches must be set inside the range of the built-in mechanical stops to prevent stalling of the motor. Limit switches can be reset to limit travel of the output shaft to any angle down to a minimum of 60°. Auxiliary switches are adjusted as shown in Figure 2, below, unless otherwise specified at time of order.

NOTE: On Beck drives, the travel limit switches are located inside the control end cover and are marked “FL” and “RL”. To adjust the travel limit switches, it is necessary to remove the control end cover.



STANDARD SWITCH SETTINGS

Figure 2

All switches are SPDT and are rated at 6 A, 120 V ac. Switches are operated by cams that are clamped onto the control shaft. Setting a switch involves loosening the cam, moving the drive output shaft to the desired position, and positioning the cam so that it just operates the switch at that point. In the following procedure, the use of a continuity meter is recommended to determine when the switch opens or closes. If such a meter is not available, it is possible to hear the switch click as the contacts open and close.

CAUTION

Do not attach the meter or attempt to move the switch cams until the drive disconnected from the line voltage and auxiliary switches are disconnected from external power sources.

Setting Travel Limit Switches FL and RL

This procedure should be used if the factory end-of-travel switch settings must be changed in the field. It is advisable to operate the drive fully in each direction, using the electric Handswitch, to check switch settings before changing them. Follow these instructions if the switches require adjustment:

1. Remove the control end cover and cover extensions, if applicable, and terminal block cover (1/2" bolt heads).
2. Use the electric Handswitch to drive the control shaft so that the FL switch cam screw is accessible. Using a 7/64" hex wrench, loosen the screw so that the cam is just snug on the shaft.
3. Move the output shaft to the desired forward limit.
4. Turn the Handswitch to the STOP position.
5. Disconnect the power from the drive.
6. Connect the continuity meter across terminals 2 and 5. Rotate the cam until the meter shows no continuity (when the switch contacts open, the switch emits an audible click).
7. Tighten the cam locking screw to 5 lb-in torque.
8. Disconnect the meter and reconnect drive power.
9. Rotate the drive's output shaft in the reverse direction away from the forward travel limit. Note the direction of rotation of the lobe of the cam. The correct cam lobe motion is away from the switch lever with the switch lever on the lower part of the cam. If this is not correct, return to step 2 and reset the cam to the proper orientation.

10. Rotate the output shaft again to the desired forward travel limit. If the stopping point is reached, the switch is properly set.
11. Repeat instructions for setting RL travel limit switch except that direction of rotation is opposite of that used for FL switch setting. Connect continuity meter across terminals 2 and 4.
12. Replace covers and tighten cover bolts to 10 lb-ft torque.

Setting Auxiliary Switches

Standard switch settings for drives with 2 auxiliary switches are shown in Figure 2 on page 8. The operating point of all auxiliary switches is defined as a percentage of output shaft travel. One hundred percent is defined as the forward limit of output shaft travel. The heavy line on Figure 2 indicates a closed circuit. The following instructions should be used when changing the operating point of auxiliary switches:

NOTE: In the following procedure, it is assumed that switch settings are to be adjusted so that contacts are open when the desired position is achieved. If the settings are to be adjusted to close, it may be necessary to reverse the operating mode of the switch by reversing the leads on the switch itself. Be sure to disconnect power from the switch terminals first.

1. Remove the control end cover and the terminal block cover (1/2" bolt heads).
2. Use the electric Handswitch to drive the shaft so that the switch cam is accessible. Using a 7/64" hex wrench, loosen the screw so that the cam is just snug on the shaft.
3. Move the output shaft to the desired position.
4. Turn the Handswitch to the STOP position.
5. Disconnect power from the drive and switch terminals.
6. Connect the continuity meter across the appropriate terminals. See Figure 2 on page 8 or the drive wiring diagram. Rotate the cam to operate the switch.
7. Tighten the cam locking screw to 5 lb-in torque.
8. Disconnect the meter and reconnect power.
9. Move the drive's output shaft in the desired direction so that the cam lobe moves away from the switch lever. If not correct, return to step 2 and reset the cam to the proper orientation.
10. Replace covers and tighten cover bolts to 10 lb-ft torque.

CALIBRATION *DIRECTION CHANGE*

CHANGING DIRECTION OF TRAVEL

CAUTION

Be sure the drive is disconnected from the line voltage and that both auxiliary switches are disconnected from external power sources beginning the direction change procedure.

To change the direction of travel, use the following procedures:

1. Remove the terminal compartment cover, control end cover, and the extension, if applicable (1/2" bolt heads).
2. Interchange the yellow and black wires on the common terminals of the FL and RL travel limit switches.
3. Identify the feedback terminals from the wiring diagram supplied with your drive.
4. For CURRENT feedback applications: Record the color and location of the feedback signal wires for reconnection later. Remove the two feedback wires. Connect the mA meter in series with a 200 ohm load resistor.
For VOLTAGE feedback applications: Connect a voltmeter across the feedback terminals, do not remove the feedback signal wires.
5. Reconnect drive power.
6. Drive the output shaft until the CPS-2 output is 50% of the range (e.g. for 4–20 mA signal range, set output to 12 mA).
7. Set Handswitch to STOP position.
8. Using a 7/64" hex wrench, loosen the CPS-2 rotor clamp.
9. Rotate the CPS-2 180° and set the output back to the mid-range (e.g. 12 mA).
10. Tighten the rotor clamp.
11. Run the drive to the 0% and 100% limits using the Handswitch. Record the CPS-2 output at these limits.
12. Subtract the outputs recorded at the two limits and compare with the desired output signal span (e.g. 16 mA for a 4–20 mA signal range). The difference between the measured span and the desired span is the span error.
13. With the drive at the 100% limit, turn the span potentiometer to adjust the CPS-2 output signal by 1/2 of the span error calculated in step 12. Turning the span potentiometer CW increases the span equally at both ends. Turning the span potentiometer CCW decreases the span equally at both ends. See Figure 3 on page 12 for the location of the span potentiometer.
14. Loosen the CPS-2 rotor clamp and rotate to achieve the desired value of maximum output signal (e.g. 20 mA for a 4–20 mA signal range). Rotation of the CPS-2 rotor moves the entire signal span up or down.
15. Tighten the CPS-2 rotor clamp to 5 lb-in torque. Maintain a 0.031" clearance between the rotor clamp and stator.
16. Run the drive to the 0% and 100% limits and check the output signal for desired span. If not correct, repeat this procedure from step 11.
17. Remove the meter and resistor, and reconnect the feedback wiring.
18. Replace covers and tighten cover bolts to 10 lb-ft torque.

CALIBRATION FEEDBACK SIGNAL

FEEDBACK SIGNAL CALIBRATION

Feedback signal calibration is necessary if the feedback signal does not correspond to the drive's output shaft position. The feedback signal calibration can be checked using the following procedure.

All drives are shipped with the feedback calibrated for 100° travel of the output shaft unless otherwise specified at the time of order.

NOTE: The travel limit switches must be properly adjusted before the feedback signal is calibrated.

Check Calibration

The following procedure should be followed to check the CPS-2 calibration:

Tools required;

mA/V dc Multimeter

1/4" Screwdriver

1/2" Combination Wrench

200 ohm Resistor

1. Put electric Handswitch in STOP position.
2. Remove the terminal block cover and the control end cover (1/2" bolt heads).
3. Identify the feedback terminals from the wiring diagram supplied with your drive.
4. For CURRENT feedback applications: Record the color and location of the feedback signal wires for reconnection later. Remove the two feedback wires. Connect the mA meter in series with a 200 ohm load resistor.
For VOLTAGE feedback applications: Connect a voltmeter across the feedback terminals, do not remove the feedback signal wires.
5. Drive the output shaft through its full range and check the feedback signal.

When properly adjusted, the feedback signal should be maximum with the drive's output shaft in the full forward position. At 50% travel the signal should be mid-span. At full reverse the signal should be minimum. If not correct, proceed with the calibration procedure.

NOTE: Tolerance on factory calibration is ±0.5% of span.

Calibration Procedure

Adjustment of the CPS-2 is necessary if the signal range requires an increase or decrease in value relative to the drive's output shaft rotation. Calibrate by turning the Span Potentiometer CW to increase the gain of the CPS-2. This has the effect of increasing the output at the high end and lowering the output at the low end equally.

Signal span is determined by the value of the ranging resistor connected to the output terminals.

CAUTION

Do not adjust the zero potentiometer to shift the span.

To adjust the span, turn the Span Potentiometer on the CPS-2 circuit board. The Span Potentiometer adjusts the CPS-2 so that the drive output shaft rotation from 80° to 100° produces the specified output signal range.

For output shaft rotation between 60° and 79°, it may be necessary to remove resistor R8 (100 K ohm) to change the range of the span adjustment. An R8 value of 100 K ohms produces shaft output range of 80° to 100°; R8 = 249 K ohms produces shaft output range of 70° to 79°; and removing R8 produces shaft output range of 60° to 69°. See Figure 3, page 12.

Tools required for calibration:

mA/V dc Multimeter

3/32" Screwdriver

7/64" Hex Wrench

1/4" Screwdriver

1/2" Combination Wrench

1/32" Thickness Feeler Gauge

200 ohm Resistor

1. Put electric Handswitch in STOP position.
2. Remove the terminal block cover and the control end cover (1/2" bolt heads).
3. Identify the feedback terminals from the wiring diagram supplied with your drive.
4. For CURRENT feedback applications: Record the color and location of the feedback signal wires for reconnection later. Remove the two feedback wires. Connect the mA meter in series with a 200 ohm load resistor.
For VOLTAGE feedback applications: Connect a voltmeter across the feedback terminals, *do not* remove the feedback signal wires.
5. Run the drive to the 0% and 100% limits using the Handswitch. Record the CPS-2 output at these limits.

Continued

CALIBRATION FEEDBACK SIGNAL

CALIBRATION PROCEDURE, CONT'D

6. Subtract the outputs recorded at the two limits and compare with the desired output signal span (e.g. 16 mA for a 4–20 mA signal range). The difference between the measured span and the desired span is the span error.
7. With the drive at the 100% limit, turn the span potentiometer to adjust the CPS-2 output signal by 1/2 of the span error calculated in step 6. Turning the span potentiometer CW increases the span equally at both ends. Turning the span potentiometer CCW decreases the span equally at both ends. See Figure 3 below for the location of the span potentiometer.
8. Loosen the CPS-2 rotor clamp and rotate to achieve the desired value of maximum output signal (e.g. 20 mA for a 4–20 mA signal range). Rotation of the CPS-2 rotor moves the entire signal span up or down.
9. Tighten the CPS-2 rotor clamp to 5 lb-in torque. Maintain a 0.031" clearance between the rotor clamp and stator.
10. Run the drive to the 0% and 100% limits and check the output signal for desired span. If not correct, repeat the procedure from step 6.
11. Remove the meter and resistor, then reconnect the feedback wiring.
12. Replace covers and tighten the cover bolts to 10 lb-ft torque.

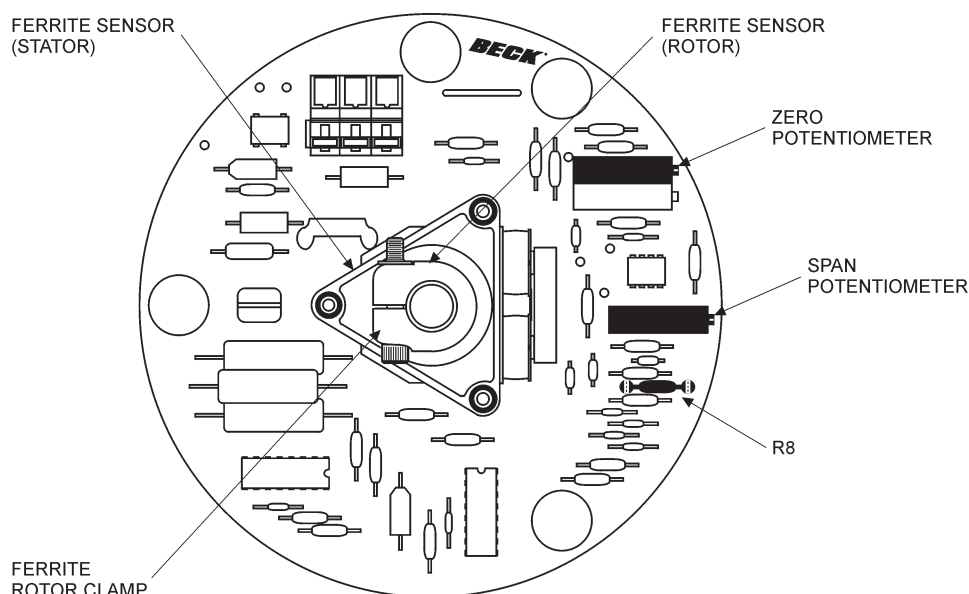
Adjusting the Zero Potentiometer

The Zero Potentiometer is provided to change from a suppressed zero to a zero-based range (e.g., from 1–5 V dc to 0–16 V dc). The zero is adjustable from -5% to +30% of span.

NOTE: Do not adjust the Zero Potentiometer to shift calibration. Adjust the rotor position only to shift calibration.

The following example is given to illustrate how the zero is adjusted to effect a range change from 1–5 V dc to 0–16 V dc:

1. Install the 1–5 V dc unit as a 1–5 V dc range. Do not make any adjustments other than setting the rotor position.
2. Remove jumper from terminals 6 to 1 and replace with a 3.01 K ohm resistor (see Table 1, page 7). This shifts the range to 4–20 V dc.
3. Using a voltmeter at the appropriate output terminals, adjust the Zero Potentiometer with the drive at the 0% position so that output reads 0 V dc. This changes the range to 0–16 V dc.



CPS-2 POSITION SENSOR (REAR VIEW) FOR MODEL 20-3400-03

Figure 3

MAINTENANCE ROUTINE

Beck drives require only minimal routine maintenance. Periodic lubrication of the gearing is recommended to extend gear life. Periodic visual inspections are recommended to verify that the connection to the final control element is intact and operating normally. If vibration is present, check the electrical terminal connections and other hardware for tightness.

LUBRICATION

Periodic lubrication is not required on Beck control drives. It is recommended that the drive occasionally be run through its full travel to ensure an even distribution of gear lubrication—particularly if the drive normally operates in a narrow range. For drives operating near their rated torque, the gear train should be inspected during major shutdowns or outages and lubricated as necessary.

CAUTION

Before removing the motor and gear housing assembly, block the final control element to prevent the gear train from moving.

To inspect the gears: Remove the motor, then the gear housing assembly. Examine the gear teeth for signs of excessive wear, scoring, or other damage. If evidence of such damage is present, the drive should be returned to Beck for a detailed examination and necessary repairs.

If the drive gears appear to be in good condition, coat the gear teeth with a heavy layer of Fiske Lupriplate GR-132 or equivalent. An Extreme Pressure grease, GR-132 contains polymer additives and has an effective temperature range between -40° F and +350° F.

Reassemble the drive.

MAINTENANCE COMPONENT REPLACEMENT

This section covers replacement of many components of the Group 25 drive. Note that some components are not field repairable.

If it should ever be necessary to replace the output gear, shaft, or output shaft bearings, a major overhaul is required and the drive should be returned to the factory.

Gaskets

During routine service, inspect the terminal compartment cover, control end cover, motor, and gear housing assembly gaskets for wear or damage. In order to protect internal components, worn or damaged gaskets and O-rings should be replaced.

To remove damaged gaskets, scrape the gasket material and adhesive from the body housing and cover. Cement the new gasket to the drive body using a gasket cement such as 3M #847 Rubber and Gasket Adhesive, or equivalent. Note that the gear housing gasket is adhered on both sides and the motor gasket is not adhered, but greased on both sides.

Seals

Worn or damaged output shaft, control end shaft, and motor shaft seals should be replaced to prevent damage to internal bearings and drive train parts.

To remove the shaft seal, push the blade of a small screwdriver along the shaft and under the seal lip.

CAUTION

The seal is approximately 1/4" wide. Do not force the screwdriver blade beyond the width of the seal or damage to the shaft bearing may result.

Pry the seal up and force it out of the housing. Clean the shaft and housing, then press in the replacement seal with the closed side facing outward.

Bearings

There are no field-replaceable bearings in the Group 25 drive.

Motor

The Beck control motor is not field repairable. Disassembly of the motor will result in a loss of torque that can only be restored by returning the motor to the factory for remagnetizing.

CAUTION

Before removing the motor assembly, block the final control element to prevent the gear train from moving.

To remove the motor, first disconnect the motor wires in the terminal compartment of the control drive. The wiring is under the terminal board. Identify the black, red and green motor wires extending from the black, three-wire sleeve. Remove the black wire from the terminal post. Record the wire colors at the two butt joints. Cut the red and green motor wires near their respective butt joints. Remove the three 10-32 socket head cap screws that secure the motor. Carefully slide the motor down and out of the drive body.

To install the motor, insert the three-wire sleeve through the wire hole in the gear module and into the terminal compartment. Carefully slide the motor into the gear module; rotating the motor shaft if necessary to engage the pinion with the first combination gear. Install motor mounting screws and torque to 6 lb-ft. Reconnect the motor wires.

Motor Resistor and Capacitor

The motor resistor and capacitor are located in the terminal compartment cover. To replace a resistor or capacitor, remove the terminal cover. Remove the existing part and transfer the wires one at a time to the replacement part. Inspect the terminal cover gasket and replace if necessary. Replace the terminal cover.

Limit and Auxiliary Switches

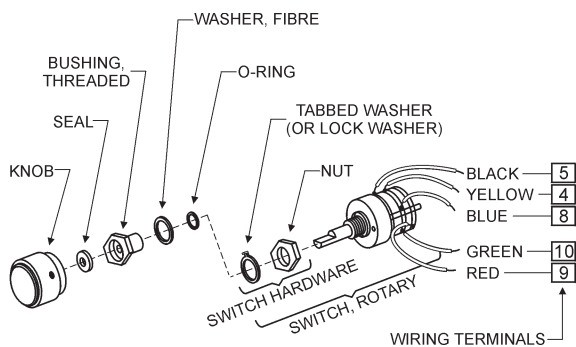
Complete switch assemblies may be replaced. It is not possible to replace individual switches. To replace switch assemblies, remove the control end cover (1/2" bolt heads) and extension, if applicable. Remove the screws holding the switch assembly to the plate and slide it out to the side. Note the configuration of the assembly—right-hand or left-hand. Right-hand assemblies have screws in the "R" holes and left-hand assemblies have screws in the "L" holes. See Table 2 on page 16 for switch part numbers.

Transfer the wires one at a time to the replacement assembly using the push-on lugs provided. Install the replacement assembly and note that it rotates around one screw to permit an adjustment of the cam-to-switch lever spacing and the switch operating point. To properly set the switch, use a .030" shim between the cam and switch lever and loosely position the switch assembly so that the

switch is just actuated. The switch lever should be on the low or minimum radius portion of the cam when setting the switches. DO NOT overstress the switch lever. Tighten both screws to 20 lb-in torque and remove the shim. When properly adjusted, the switch lever should remain in contact with the cam throughout the control drive travel.

Handswitch

To replace the Handswitch, remove the terminal cover, then remove the terminal board. Clip the five wires from the old Handswitch. Remove the knob and the nut under the knob to remove the switch. Install the new Handswitch as shown in Figure 4, below. Splice the wires color for color. Replace the terminal board. Torque the screws to 3 lb-ft. Replace the terminal cover. Torque the bolts to 10 lb-ft. The standard Handswitch part number is 20-3300-07.



HANDSWITCH PARTS

Figure 4

CPS-2

Field repair of the CPS-2 assembly is not recommended. The factory maintains a stock of replacement assemblies available for immediate shipment. If it is necessary to replace the CPS-2, replace both the rotor and stator/circuit board assembly. When returning the CPS-2 to the factory for service, include the rotor and stator/circuit board assembly. Do not separate the stator or circuit boards from their mounting plates. It is recommended that the rotor be held inside the stator with rubber bands and the hex studs be reattached to the mounting plate for protection during shipment.

To remove the CPS-2:

1. Run the control drive to its midpoint of travel using the Handswitch. (If the standard rotation of 100° has been reduced to 80°, the midpoint of travel is 40°.)
2. Disconnect 120 V ac power from the drive. Remove the terminal compartment and control end covers (1/2" bolt heads).
3. Record the wire colors on the terminal block of the CPS-2 then disconnect the wires. The terminals are spring-loaded. To remove a wire, press the tip of a 3/32" screwdriver into the slot at the top of the small, white lever. Push down on the lever to open the spring-loaded contact and release the wire.
4. Remove the wires from the transformer and pull through the wire hole in the CPS-2.
5. Loosen and remove the 3 hex studs that clamp the CPS-2 in place. Support the inboard hex stud with a wrench as the outboard stud is loosened.
6. Slide the CPS-2 stator assembly off of the three mounting bolts.
7. Note the position of the rotor clamp, then loosen the rotor clamp screw and remove the rotor from the shaft.

To install the new CPS-2:

1. Remove the rotor from the replacement CPS-2 assembly. Slide the rotor, clamp end first, onto the control shaft as close to the mounting plate as possible. Leave the clamp loose. Position the clamp in the same general location as the one removed previously.
2. Slide the new CPS-2 assembly over the studs and rotor. Replace the hex nuts, but do not tighten. Carefully slide the rotor back into the CPS-2 assembly. Twist the rotor while sliding to prevent damage to the assembly. Tighten the three hex nuts to 5 lb-ft.
3. Thread the wires through the wire hole in the CPS-2 and reconnect them to the terminal block.
4. Restore 120 V ac power to the drive and connect a meter to the output.
5. For CURRENT feedback applications: Record the color and location of the feedback signal wires for reconnection later. Remove the two feedback wires. Connect a mA meter in series with a 200 ohm load resistor.
For VOLTAGE feedback applications: Connect a voltmeter across the feedback terminals. DO NOT remove the signal feedback wires.
5. Insert a 0.031" feeler gauge between the rotor clamp and stator. Position the clamp 0.031" from the stator.
6. Rotate the rotor on the control shaft until the output on the mA or voltmeter reads mid-range of span (e.g., 12 mA for a 4–20 mA span, or 3 V dc for a 1–5 V dc span) then tighten the clamp to 5 lb-in torque.
7. Check the feedback signal calibration as described on page 11.

SPARE PARTS

RECOMMENDED SPARE PARTS

It is recommended that certain replacement parts be stocked for quick availability in the event that service of your Beck control drive is required. Recommended spare parts are listed in Table 2.

HOW TO ORDER SPARE PARTS

Select the needed parts from the spare parts list given below. Specify the drive's model/serial number shown on the nameplate to allow the factory to verify your parts selection. Parts may be ordered by mail, telephone or fax, with the confirming order sent to the factory.

**TABLE 2:
RECOMMENDED SPARE PARTS**

DESCRIPTION	PART NO.
Switch assembly	20-3200-03 RH 20-3200-04 LH
Gasket kit	20-3110-05
Control motor	See Table 3
Motor capacitor (located in the terminal compartment cover)	See Table 3
Motor resistor (located in the terminal compartment cover)	See Table 3
CPS-2	20-3400-03

**TABLE 3:
MOTORS, CAPACITORS AND RESISTORS**

USED ON MODEL NO.	MOTOR PART NO.	VOLTAGE	HERTZ	AMP.	CAPACITOR PART NO.	VALUE	RESISTOR PART NO.	VALUE
25-102	20-2702-11	120	60	.35	14-2840-18	5 μ f	12-1050-09	220 Ω
25-105	20-2702-13	120	60	.35	14-2840-18	5 μ f	12-1050-09	220 Ω

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WARRANTY STATEMENT

The Seller warrants that the equipment sold hereunder shall conform to Seller's standard specifications. The Seller warrants said equipment to be free from defects in materials and workmanship. This warranty applies to normal recommended use and service for one year from the date on which the equipment is shipped. The Seller's obligation under this warranty, and Buyer's exclusive remedy, will be the repair or replacement, without charge, at the Seller's factory, of any defective equipment covered by this warranty. In no event will the Seller's liability exceed the contract price for the goods claimed to be defective.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER OBLIGATIONS OR LIABILITIES OF THE SELLER INCLUDING INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES.

Buyer acknowledges its responsibility under OSHA, related laws and regulations and other safety laws, regulations, standards, practices or recommendations which are principally directed to the use of equipment in its operating environment. Buyer acknowledges that the conditions under which such equipment will be used, its use or combination with, or proximity to, other equipment, and other circumstances of the operation of such equipment are matters beyond Seller's control. BUYER HEREBY AGREES TO INDEMNIFY SELLER AGAINST ALL CLAIMS, DAMAGES, COSTS OR LIABILITIES (INCLUDING, BUT NOT LIMITED TO, ATTORNEYS' FEES AND OTHER LEGAL EXPENSES), WHETHER ON ACCOUNT OF NEGLIGENCE OR OTHERWISE, EXCEPT THOSE CLAIMS BASED SOLELY UPON THE NEGLIGENCE OF SELLER AND THOSE CLAIMS ASSERTED BY SELLER'S EMPLOYEES WHICH ARISE OUT OF OR RESULT FROM THE OPERATION OR USE OF THE EQUIPMENT BY SELLER'S EMPLOYEES.

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Beck Control Drives are covered by the following patents: 3,667,578; 4,690,168; and 6,563,412 with other patents pending.

NOTES

SERVICES

SITE SURVEYS

Beck Sales Engineers are available to discuss your process control requirements. Often a visit to your location is the best way to gain a thorough understanding of your needs, in order to meet them most accurately and completely.

Mounting hardware, torque requirements, linkage, control signal information, and optional equipment can be analyzed most effectively at the worksite. Beck's analysis at the jobsite can help ensure that specifications are accurate—particularly in the case of complex applications.

APPLICATION REVIEWS

By sharing your needs with a Beck Sales Engineer, you can take advantage of the best application advice for the type of control you need. This review will yield a better understanding of the versatility of Beck drives for your installations, as well as complete details on options and accessories to make the process as effective as possible.

SPECIFICATION WRITING

Beck provides specification writing assistance in order to help you specify and order the right drives for your applications. Beck Sales Engineers will work with you to make it easier for you to obtain the proper equipment and give you confidence that no details are overlooked.

HOW TO OBTAIN SERVICE

Factory repair of drives or subassemblies is available for both normal and emergency service. To assure prompt processing, contact the factory to receive a Returned Material Authorization (RMA) number. If a repair estimation is desired, please send the name and phone number of your contact for service authorization. It is helpful to include a description of the work desired with the shipment or, in the event of a problem, the malfunction being experienced.



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