ISO Registered Company

MODELS 8311HP AND 8311LP
BACK PRESSURE / RELIEF REGULATORS

SECTION I

I. DESCRIPTION AND SCOPE

The Model 8311 is a high capacity back pressure / relief regulator with double seat design used to control upstream (inlet or P_1) pressure. Sizes are 1-1/2" (DN40), 2" (DN50), 2-1/2" (DN65), 3" (DN80) and 4" (DN100). With proper trim utilization, the unit is suitable for liquid, gaseous, or steam service. Refer to Technical Bulletin 8311-TB for design conditions and selection recommendations.

⚠ CAUTION

This is not a safety device and must not be substituted for a code approved pressure safety relief valve or rupture disc.

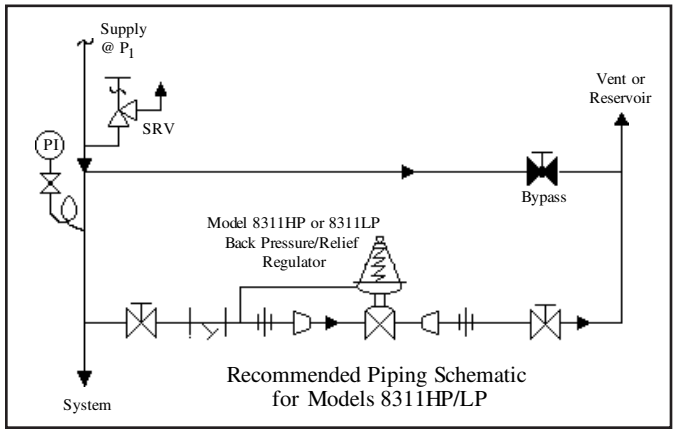
SECTION II

II. INSTALLATION

1. An inlet block valve should always be installed.
2. If service application is continuous such that shut down is not readily accomplished, it is recommended that an inlet block valve, outlet block valve, and a manual bypass valve be installed.
3. Pipe unions are recommended for NPT screwed installations to allow removal from piping.
4. An inlet pressure gauge should be located approximately ten pipe diameters upstream, and within sight.
5. All installations should include a upstream relief device if the inlet pressure could exceed the pressure rating of any upstream equipment or the maximum inlet pressure rating of the unit.
6. Clean the piping of all foreign material including chips, welding scale, oil, grease and dirt before installing the regulator. Strainers are recommended.

⚠ WARNING

The maximum inlet pressure is equal to 1.3 times the larger number of the stated range spring on the nameplate, and is the recommended "upper operative limit" for the sensing diaphragm. Higher pressures could damage the diaphragm. (Field hydrostatic tests frequently destroy diaphragms. DO NOT HYDROSTATIC TEST THRU AN INSTALLED UNIT; ISOLATE FROM TEST.)



Recommended Piping Schematic for Models 8311HP/LP

⚠ CAUTION

Installation of adequate overpressure protection is recommended to protect the regulator from overpressure and all downstream equipment from damage in the event of regulator failure.

7. In placing thread sealant on pipe ends prior to engagement, ensure that excess material is removed and not allowed to enter the regulator upon start-up.
8. Flow Direction: Install so the flow direction matches the arrow on the body. Install an external sensing line (1/2" O.D. tubing minimum) from the 3/8" NPT connection to a point upstream, preferably at gauge location. If regulator pipe line is expanding to a larger pipe line, always connect sensing line to the larger pipe line.
9. For best performance, install in well drained horizontal pipe, properly trapped, if a steam service application.

10. Basic Regulator - (Refer to Figure 1): Regulator may be rotated around the pipe axis 360°. Recommended position is with spring chamber vertical upwards. Orient such that the spring chamber vent hole does not collect rainwater or debris.

11. Regulators are not to be direct buried underground.

12. For insulated piping systems, recommendation is to not insulate regulator.

SECTION III

III. PRINCIPLE OF OPERATION

1. Movement occurs as pressure variations register on the diaphragm. The registering pressure is the inlet P_1, or upstream pressure. The range spring opposes diaphragm movement. As inlet pressure drops, the range spring pushes the diaphragm down, closing the ports; as inlet pressure increases, the diaphragm pushes up and the ports open.

2. A complete diaphragm failure will cause the regulator to fail closed.

SECTION IV

IV. START-UP

1. Start with the block valves closed. A bypass valve may be used to maintain inlet pressure in the upstream system without changing the following steps.

2. Relax the range spring by turning the adjusting screw counter clockwise (CCW) (viewed from above) a minimum of three (3) full revolutions. This reduces the inlet (upstream) pressure setpoint.

3. If it is a "hot" piping system, and equipped with a bypass valve, slowly open the bypass valve to preheat the system piping and to allow slow expansion of the piping. Ensure proper steam trap operation, if installed. Closely monitor inlet (upstream) pressure via gauge to ensure not over-pressurizing. ***NOTE:*** *If no bypass valve is installed, extra caution should be used in starting up a cold system; i.e. do everything slowly.*

4. Crack open the inlet (upstream) block valve.

5. Slowly open the outlet (downstream) block valve observing the inlet (upstream) pressure gauge. Determine if the regulator is flowing. If not, slowly rotate the regulator adjusting screw counter clockwise (CCW) (viewed from above) until flow begins.

6. Continue to slowly open the outlet (downstream) block valve until fully open.

7. Observing the inlet (upstream) pressure gauge, rotate the adjusting screw clockwise (CW) slowly until the inlet pressure begins to rise. Rotate CW until the desired setpoint is reached.

8. Continue to slowly open the inlet (upstream) block valve. If the inlet (upstream) pressure exceeds the desired setpoint pressure, rotate the adjusting screw CCW until the pressure decreases.

9. When flow is established steady enough that both the outlet and inlet block valves are fully open, begin to slowly close the bypass valve, if installed.

10. Develop system flow to a level near its expected normal rate, and reset the regulator setpoint by turning the adjusting screw CW (viewed from above) to increase inlet pressure, or CCW to reduce inlet pressure.

11. Reduce system flow to a minimum level and observe setpoint. Inlet pressure will rise from the setpoint of Step 10. The maximum rise in outlet pressure on decreasing flow should not exceed the stated upper limit of the range spring by greater than 10%; i.e. 10-40 psig (.69-2.76 Barg) range spring, at low flow the outlet pressure should not exceed 44 psig (3 Barg). If it does, consult factory.

SECTION V

V. SHUTDOWN

1. On systems with a bypass valve, and where system pressure is to be maintained as the regulator is shut down, slowly open the bypass valve while closing the inlet (upstream) block valve. Fully close the inlet (upstream) block valve. (When on bypass, the system pressure must be constantly observed and manually regulated.) Close the outlet (downstream) block valve.

⚠ CAUTION

Do not walk away and leave a bypassed regulator unattended!

2. If the regulator and system are to both be shutdown, slowly close the inlet (upstream) block valve. Close the outlet (downstream) valve only if regulator removal is required.

SECTION VI

VI. MAINTENANCE

⚠ WARNING

SYSTEM UNDER PRESSURE. Prior to performing any maintenance, isolate the regulator from the system and relieve all pressure. Failure to do so could result in personal injury.

A. General:

1. Maintenance procedures hereinafter are based upon removal of the regulator unit from the pipeline where installed.

2. Owner should refer to owner's procedures for removal, handling, cleaning and disposal of non-reuseable parts, i.e. gaskets, etc.

3. Refer to Figure 1 for standard regulator (***NOTE:*** "*LP" variation has larger diaphragm area than "HP" variation). Refer to Figures 2 and 3 for option blow-ups.*

B. Diaphragm Replacement:

1. Using an overhead hoist, lift regulator onto a flat surface work bench.

⚠ WARNING

SPRING UNDER COMPRESSION. Prior to removing flange bolts, relieve spring compression by backing out the adjusting screw. Failure to do so may result in flying parts that could cause personal injury.

2. Relax range spring (28) by turning adjusting screw (or T-bar) (32) CCW (viewed from above) until removed from spring chamber (13). Count and record the number of revolutions in the box below:

Number of revolutions required to relax range spring:_____

3. Draw or embed a match mark between diaphragm case (14) and spring chamber casting (13) along flanged area.

4. Remove all flange nuts (30) and bolts (29).

5. Remove spring chamber (13), spring button (27), and range spring (28).

6. Draw second match mark on diaphragm case (14) flange in alignment with a match mark on the threaded end of the plug and stem assembly (12) to indicate "free vertical movement" position of the plug and stem assembly (12).

7. Securing the "flats" on the threaded end of the plug and stem assembly (12) with adjustable wrench, remove pressure plate nut (24) by rotating CCW (viewed from above).

NOTE: *Do not rotate the plug and stem assembly (12). The plug (12.1) and seat rings (10 & 11) have been mechanically lapped at the factory per ANSI Class II seat leakage and assembled to provide optimum "free vertical movement".*

8. Pry loose pressure plate (22) from diaphragm(s) (20) and remove both. Inspect to ensure no deformation due to over-pressurization. If deformed, replace. ***NOTE:*** *1. Not removing the pusher plate (17) or rotating the plug and stem assembly (12) will provide performance equal to original factory performance when diaphragm(s) (20) is replaced with a like diaphragm(s) (20). Refer to Section VI.C, steps 12 and 13 for correct diaphragm setting if pusher plate (17) or stem lock nut (19) is removed, or plug and stem assembly (12) is rotated.*
2. Refer to quantity of diaphragm(s) (20) incorporated in the bill of materials listing. Depending on outlet pressure level, multiple metal diaphragms may be "stacked".

9. Remove diaphragm gasket (21) and pusher plate gasket (18). Clean gasket sealing surfaces thoroughly.

10. Install new diaphragm gasket (21) on diaphragm case (14) flange and new pusher plate gasket (18) on pusher plate, if required. ***NOTE:*** *No gaskets utilized with a composition (soft) diaphragm.*

11. Position new diaphragm(s) (20) over threaded end of plug and stem assembly (12).

12. Ensuring that the curved outer rim side of the pressure plate (22) rests against the diaphragm(s) (20) directly, place the pressure plate (22) over threaded end of the plug and stem assembly (12).

13. Reposition pressure plate nut (24) on threaded end of plug and stem assembly (12) and tighten to 75-80 ft/lbs. (108-115 N-M) for metal or 30-35 ft/lbs. (40-47 N-M) for composition diaphragm. Maintain alignment of match marks on the plug and stem assembly (12) with second match mark on the diaphragm case (14) flange. ***NOTE:*** *Use two flange bolts (29) to keep multiple diaphragms (20) bolt holes properly aligned while tightening the pressure plate nut (24).* DO NOT USE FINGERS TO HOLD DIAPHRAGMS (20) DURING TIGHTENING OF NUT (24).

14. Set range spring (28) on retainer hub of pressure plate (22).

15. Place multi-purpose, high temperature grease into depression of spring button (27) where adjusting screw (or T-bar) (32) bears. Set spring button (27) onto range spring (28); ensure spring button (27) is laying flat.

16. Aligning the match marks, place spring chamber (13) over the above stacked parts. Install all bolts (29) and nuts (30) by hand tightening. Mechanically

tighten bolting (29) (30) in a crossing pattern that allows spring chamber (13) to be pulled down evenly. Recommended torques are as follows: ***NOTE:*** *Never replace bolting (29) (30) with just any bolting, if lost. Bolt heads and nuts are marked with specification identification markings. Use only proper grades as replacements.*

Model	Diaphragm Material	Torque	Bolt Size
8311HP	ALL	45 ft-lbs (61 N-M)	5/8" Ø
8311LP	ALL	45 ft-lbs (61 N-M)	1/2" Ø

17. Reinstall adjusting screw (or T-bar) (32) with lock nut (or lever) (33). Rotate number of revolutions recorded in Step 2. above.

18. Pressurize inlet portion of valve. Soap solution test around bolting (29)(30), diaphragm case (14), and spring chamber (13) flanges for leakage. Ensure that an inlet pressure is maintained during this leak test of at least mid-range spring level; i.e. 10-40 psig (.69-2.76 Barg) range spring, 25 psig (1.72 Barg) test pressure minimum.

C. Trim Inspection:

1. To inspect the internal trim parts, refer to Section VI.A. and B.1 through 9 for diaphragm replacement and proceed as follows.

2. Secure the "flats" on the threaded end of the plug and stem assembly (12) with adjustable wrench and remove pusher plate (17), stem lock nut (19) by rotating CCW (viewed from above). ***NOTE:*** *Do not rotate the plug and stem assembly (12).*

3. Draw or embed a match mark between body (1) and bonnet (2).

4. Loosen and remove bonnet flange stud nuts (8) CCW (viewed from top) and remove bonnet (2). Inspect the upper guide bushing (4) for excessive wear. Replace, if worn. **NOTE:** DO NOT REMOVE BOTTOM FLANGE (3). The bottom flange (3) acts as a guide to align the plug and stem assembly (12) into the seat rings (10 and 11).

5. Firmly grasp end of plug and stem assembly (12) by hand and pull out of the body (1) cavity.

6. Inspect the seating surfaces of the plug (12.1) for nicks or excessive wear.

7. Using a flashlight or other light source, examine the interior of body (1) cavity. Also, inspect the seating surfaces of both the upper and lower seat rings (10 and 11) for excessive wear. If either the plug (12.1) or the seat rings (10 and 11) are worn and in need of replacement, contact the factory for authorization to return unit for repair. ***NOTE:*** *Overhaul and replacement of trim parts is not easily accomplished by non-factory trained personnel.*

8. Examine the lower guide bushing (4) for wear; determine if debris has gathered in lower guide bushing (4) zone. Clean, if necessary. If unable to clean then remove per Step 16. below.

9. Remove upper body gasket (6) and clean sealing surface thoroughly.

10. Install plug and stem assembly (12) into body (1) and place new body gasket (6) onto body (1).

11. Align match mark and replace bonnet (2) on body (1) and reinstall bonnet flange stud nuts (8). Mechanically tighten nuts (8) in alternating crossing pattern that allows bonnet (2) to be pulled up evenly. Recommended torques are as follows:

Regulator Size	Torque	Bolt Size
1-1/2" - 2"	50 ft/lbs (68 N-M)	1/2" Ø
3" - 4"	50 ft/lbs (68 N-M)	5/8"Ø

12. Fully thread stem lock nut (19) and pusher plate (17) on end of plug and stem assembly (12). Refer to Figure 1 for correct orientation of the pusher plate (17).

13. Calibrate diaphragm (20) setting and correct plug and stem assembly (12) travel as follows:

    a) Hand press plug and stem assembly (12) tight into the seats (10 and 11).
    b) Adjust the pusher plate (17) so that the gasket surface face of the pusher plate (17) is flush with the top of the diaphragm case (14) flange.
    c) Draw the stem lock nut (19) up tight against the pusher plate (17) by holding "flats" milled on pusher plate (17).

14. Grasp threaded end of plug and stem assembly (12) by hand and ensure that the assembly moves freely by lifting the plug and stem assembly (12) in and out of the seats (10 and 11), making sure it does not "stick". If it does not move freely, rotate plug and stem assembly (12) CW until new position is found which allows optimum "free vertical movement" in and out of seats.

15. Proceed with diaphragm (20) assembly instructions in accordance with Section IV.B., steps 10 through 18. ***NOTE:*** *Do not rotate plug and stem assembly (12) from optimum "free vertical movement" position during final assembly.*

16. If necessary, remove bottom flange (3) bolting (7) (8). Clean cavity. Examine lower guide bushing for wear. Replace bottom bonnet if lower guide bushing is worn or damaged.

17. Replace bottom flange (3) on body (1) and re-install bolting(7)(8). Mechanically tighten nuts (8) in alternating crossing pattern that allows bottom flange (3) to be brought up evenly. Refer to Step 11. for recommended torques.

SECTION VII

VII. TROUBLE SHOOTING GUIDE

1. Erratic operation; chattering.

Possible Causes	Remedies
A. Oversized regulator; inadequate rangeability.	A1. Check actual flow conditions, resize regulator for minimum and maximum flow. A2. Decrease regulator pressure drop; decrease inlet pressure by placing a throttling orifice in inlet piping union. A3. Install next step higher range spring. Contact factory. A4. Before replacing regulator, contact factory.
B. Worn plug/stem assembly; inadequate guiding.	B1. Contact factory.

2. Leakage through the spring chamber vent hole.

Possible Causes	Remedies
A. Normal-life diaphragm failure.	A1. Replace diaphragm.
B. Abnormal short-life diaphragm failure.	B1. Can be caused by excessive chattering. See No.1 to remedy chatter. B2. can be caused by corrosive action. Consider alternate diaphragm material. B3. For composition diaphragms, ensure not subjecting to over-temperature conditions. B4. Upstream (inlet pressure buildup occurring that overstresses diaphragms. Relocate regulator or protect with safety relief valve.

3. Upstream pressure too high.

Possible Causes	Remedies
A. Regulator undersized	A1. Confirm by opening bypass valves together with regulator. A2. Check actual flow conditions, resize regulator; if regulator has inadequate capacity, replace with larger unit.
B. Incorrect range spring (screwing out CCW of adjusting screw does not allow bringing pressure to a stable and proper level).	B. Replace range spring with proper lower range. Contact factory.
C. Too much build.	C1. Review build expected. C2. Contact factory.
D. Restricted diaphragm movement.	D. Ensure no moisture in spring chamber at temperatures below freeze point. Ensure no dust or debris entering vent opening. If rainwater or debris can enter, re-orient spring chamber.

4. Sluggish operation.

Possible Causes	Remedies
A. Plugged spring chamber vent.	A. Clean vent opening.
B. Fluid too viscous.	B. Heat fluid. Contact factory.

SECTION VIII

VIII. ORDERING INFORMATION
NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material ("BOM"), a parts list that was provided when unit was originally shipped. (Serial Number typically 6 digits). Product Code typical format as follows: (last digit is alpha character that reflects revision level for the product).

□□□-□□□7-□□□□□□□□□

NEW REPLACEMENT UNIT:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. With this information they can provide a quotation for a new unit including a complete description, price and availability.

⚠ CAUTION

Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accommodate the recommended part(s) changes.

PARTS "KIT" for FIELD REPAIR:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the "BOM" sheet that was provided when unit was originally shipped.

NOTE: *Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".*

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

A Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

Item No.	Description
1	Body
2	Bonnet
3	Bottom Flange
4	Guide Bushing
5	Stem Bushing
6	Body Gasket
7	Body Stud
8	Body Stud Nut
10	Upper Seat Ring
11	Lower Seat Ring
12	Valve Plug Assembly
	12.1 Plug
	12.2 Stem
	12.3 Pin (Groove)
13	Spring Chamber
14	Diaphragm Case
15	O-ring
16	Bonnet Nut
17	Pusher Plate
18	Pusher Plate Gasket
19	Stem Lock Nut
20	Diaphragm
21	Diaphragm Gasket
22	Pressure Plate
24	Pressure Plate Nut
25	Diaphragm Ring
27	Spring Button
28	Range Spring
29	Flange Bolt
30	Flange Nut
31	Nameplate
32	Adjusting Screw (or Handwheel Assembly)
33	Adjusting Screw Lock nut (or Lever)
34	Seal Washer
35	Closing Cap
36	Closing Cap Gasket
43	Pipe Plug
	NOT SHOWN
54	Drive Screw
55	Flow Arrow

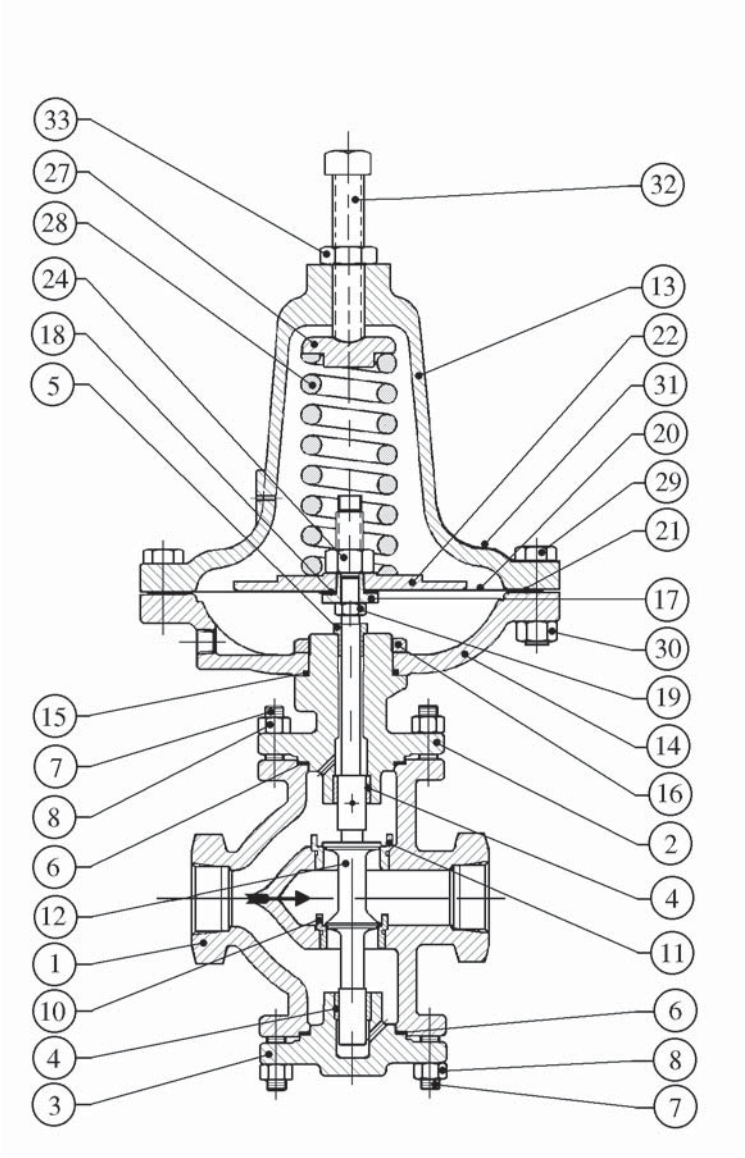


Figure 1: Standard Model 8311HP/LP
(**NOTE:** Variation "LP" has a larger diaphragm area than the "HP".)

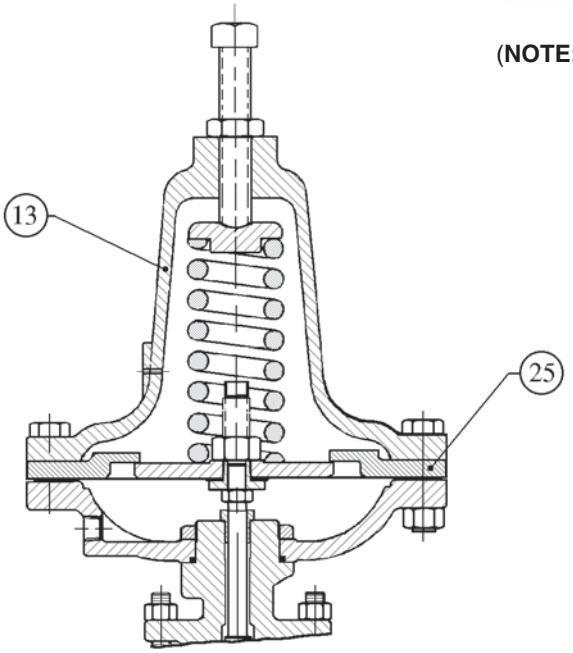


Figure 2: Model 8311HP only – Option-80, High Pressure Spring Chamber Construction

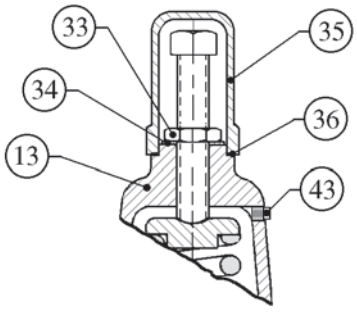


Figure 3: Model 8311HP/LP, Option-1 Closing Cap

Cashco, Inc.
P.O. Box 6
Ellsworth, KS 67439-0006
PH (785) 472-4461
Fax. # (785) 472-3539
www.cashco.com
email: sales@cashco.com
Printed in U.S.A. IOM-8311HP/LP

Cashco GmbH
Handwerkerstrasse 15
15366 Hoppegarten, Germany
PH +49 3342 30968 0
Fax. No. +49 3342 30968 29
www.cashco.com
email: germany@cashco.com

Cashco do Brasil, Ltda.
Al.Venus, 340
Indaiatuba - Sao Paulo, Brazil
PH +55 11 99677 7177
Fax. No.
www.cashco.com
email: brazil@cashco.com