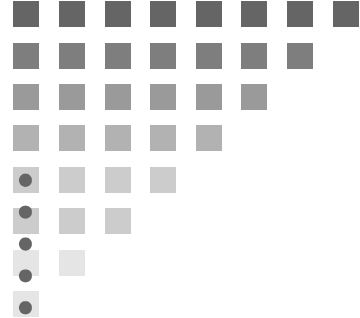


Hallmark Refining Corporation
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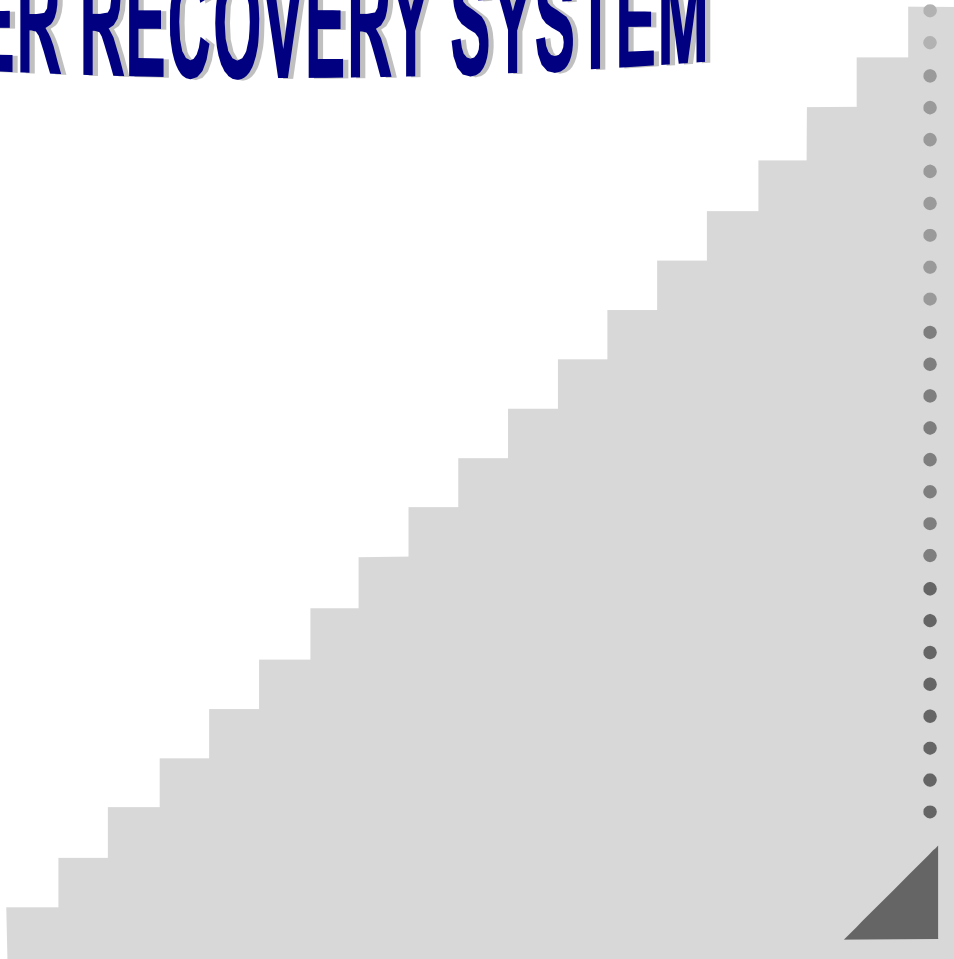


OPERATION AND INSTRUCTION MANUAL

BX2004

SILVER RECOVERY SYSTEM

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STATEMENT OF WARRANTY AND LIABILITY

All equipment manufactured by Hallmark Refining Corporation is guaranteed against defects in material and workmanship for a period of six months from the date of shipment from the factory. Any claimed defects must be reported, and the materials and/or equipment must be returned, freight prepaid, to HRC within the guarantee period. HRC's liability for defects in material and workmanship shall be limited to replacing or repairing (at its option) such defective materials or equipment at no cost to the original purchaser. Any damage or loss occurring during shipment is not covered by the terms of this warranty. Any shipping damage is the responsibility of the carrier(s) and should be reported to the carrier(s) immediately.

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There are no other warranties expressed or implied, except at stated above. This warranty becomes null and void if any devices or accessories other than those distributed or officially recommended by HRC are installed, attached or used in conjunction with this equipment.

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1. BATCH TIMER CONTROL UNIT

1.1 SPECIFICATIONS

Input Voltage:	90V to 130V or 180V to 260V switch selectable
Input Frequency:	60 Hz
Output current, per outlet:	15A

1.2 INTRODUCTION

This unit consists of a microprocessor controller, 3 level switch inputs, 3 relay outputs for pumps and a power supply, and a front panel for control and display.

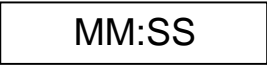
The unit contains a non-erasable memory to store the current state in case of power failure. The current state is saved at every step of the processing, and during the de-silvering process. The batch time is saved every 6 minutes. After a power failure, the controller will resume in the same state.

1.3 OPERATION:

The following is the sequence of operations for this unit:

1. Prior to starting a batch, the holding tank must contain enough solution to fill the de-silvering batch tank before processing. If level switch LL-1 is open, this indicates that there is not enough solution to fill the de-silvering batch tank. In this case the display on the front panel display will indicate "BULK TANK EMPTY". If level switch LL-1 is closed, the next step will proceed.
2. Pump P1 is started to fill the de-silvering batch tank. The front panel display will indicate "FILLING BATCH TANK". The de-silvering batch tank will continue to fill until the tank is full as indicated by level switch LL-2 closing.
3. Pump P2 and the power supply is turned on to process the batch. The processing time is setable and the procedure for setting is covered below. The front panel display will indicate "PROCESSING BATCH"
4. After the batch time is completed, the unit enters a delay state where all pumps are off. The delay time is setable and procedure for setting is covered below. The front panel display will indicate "HOLDING BATCH" and "MM:SS REMAINING" indicating the time remaining.
5. Pump P3 is started to empty the batch tank. The front panel display will indicate "EMPTYING BATCH". P3 is turned off and state 1 (the condition prior to starting a batch) is reentered when switch LL-3 opens indicating an empty batch tank.

DISPLAY SCREEN



At every step of the processing, the number of batches processed will also be indicated on the front panel display.

1.4 FRONT PANEL

On the right side of the front panel there is an alpha-numeric display for indicating the state of the controller. To the left side are the push-buttons and a switch to control the unit.

1.4.1 AUTO/MAN/OFF:

Combination power switch and mode selector. In auto mode the batch will start processing as soon as the bulk tank has sufficient solution to start processing. In manual mode, the controller will not start filling the de-silvering batch tank until the "START" switch is pressed. In both modes the controller will resume the state it was in before the power switch was turned off.

1.4.2 START:

Push-button to start the batch (manual mode only). If the controller is in manual mode it will wait before filling the batch until this button is pressed. During this time (if the bulk holding tank has sufficient solution for a batch) the front panel display will indicate "PRESS START TO START BATCH". In auto mode, the start button has no function and is ignored by the controller.

1.4.3 ADD TIME and SUBTRACT TIME:

used in conjunction with SET BATCH TIME and SET DELAY TIME. See description below.

1.4.4 SET BATCH TIME:

This button is used to set the batch time. Pressing this button will change the display to indicate "SETTING BATCH TIME HH:MM" where HH is the number of hours and MM is the number of minutes in the batch. The hours position will be flashing, and the ADD TIME and SUBTRACT TIME buttons can be used to increase or decrease the batch time. Pressing the SET BATCH TIME button again will change the minutes position to flashing and the number of minutes can be set using the ADD TIME SUBTRACT TIME buttons. Pressing the SET BATCH TIME button once more will save the batch time into the permanent memory of the controller. The maximum time the unit can be set for is 20 hours and the minimum time is one hour. If the batch is currently in process the end time of the current batch will be changed so that it's time will be the same as the time programmed.

1.4.5 SET DELAY TIME:

This button is used to set the delay time. Pressing this button will change the display to indicate "SETTING DELAY TIME MM:SS" where MM is the number of minutes and SS is the number of seconds of delay time. The minutes position will be flashing, and the ADD TIME and SUBTRACT TIME buttons can be used to increase or decrease the delay time. Pressing the SET BATCH TIME button again will change the seconds position to flashing and the number of seconds can be set using the ADD TIME and SUBTRACT TIME buttons. Pressing the SET BATCH TIME button once more will save the delay time into the permanent memory of the controller. The maximum time the unit can be set for is 59 minutes and minimum time is 1 minute.

1.4.6 RESET BATCH COUNTER:

Pressing this button will reset the counter to zero.

1.4.7 LL1, LL2, & LL3

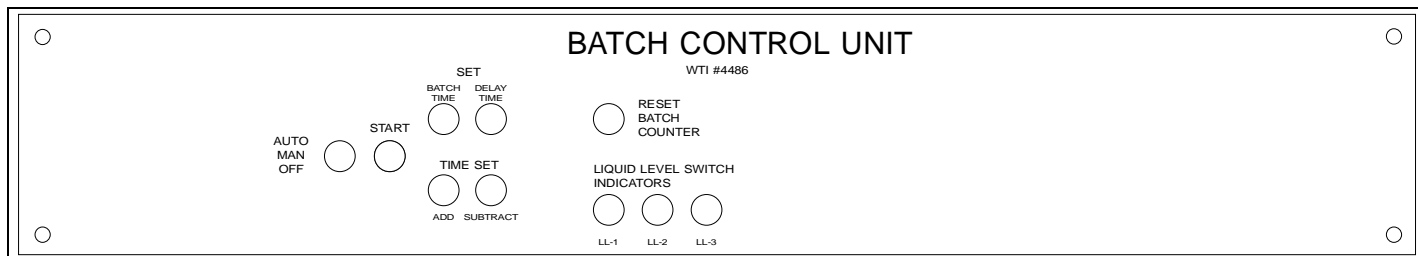
The three indicators are provided to help with diagnostic testing. The three indicators will light up when the level switch is closed.

1.5 SETUP AND OPERATION

The unit has IEC standard connectors for power input and pump connections. Each pump connection has a separate fuse. Maximum fuse size is not to exceed 15A. The level switch connections are to a terminal strip. To test the connections, the unit can be placed in manual mode and the level switch operation can be observed on the front panel indicators.

When shipped, the unit is set for 7 hours batch time and 15 minutes delay time. If desired this can be changed as outlined above before the unit is placed in operation. A suggested starting current setting per cathode would be 60 Amps.

The unit may be placed in operation by pressing the START button or by switching to AUTO mode if unattended operation is desired.



2. REPLACEMENT PARTS LIST

Ref. #	Part #	Part Description	Quantity
1	107-010	Tubing Reinforced 1"	6
2	18645A23	Lid Handles S/S	5
3	250-001	Door Hinge S/S	2
4	250-006	Drive Assembly Hinge 6" x 3" 316 S/S	4
5	251-002	Drive Assembly Rubber Feet	8
6	504-007	Globe Valve ¾"	2
7	506-007	Duo Bloc Valve ¾"	4
8	506-010	Duo Bloc Valve 1"	3
9	507-010	Diaphragm Check Valve 1"	1
10	540-210	Filter Chamber ¾"	2
11	540-212	75 Micron Filter	2
12	541-010	Flowmeter 1-10 GPM	2
13	600-001	Junction Box	2
14	742-001	Flexible conduit ¾" Polytuff	20
15	742-002	Conduit Connector Straight Hubble	10
16	742-003	Conduit Connector Elbow Hubble	3
17	77005	Anode Mounting Bolts 316 S/S	64
18	78013	Anode Mounting Washers 316 S/S	64
19	900-002	Anode Clip 316 S/S	2
20	900-003	Anode Ring 316 S/S	2
21	903-016	Drive Motor Bodine 1/15 HP 170 RPM	4
22	903-411	Plexiglas Drive Cover	4
23	903-414	Drive Assembly Brush	4
24	903-416	Drive Motor Shaft with Commutator ¾"	4
25	903-406	Carbon Anode ½" x 18" x 4"	32
26	903-417	Drive Assembly Brush Holder	4
27	903-422	Drive Support	8
28	903-423	Cathode 9" x 14" (¾" Shaft)	4
29	903-424	Cathode 9" x 11" (¾" Shaft)	4
30	903-428	Drive Assembly End Piece	8
31	903-447	Drive Assembly Flange Bearing ¾"	8
32	903-516	Drive Assembly Rubber Coupler	4
33	903-618	Cathode Coupler ¾"	4
34	MD-55TC	MD-55RT 220V Mag Drive Pump	2
35	MD-70TC	MD-70RT 220V Mag Drive Pump	2

3. ASSEMBLY DRAWINGS

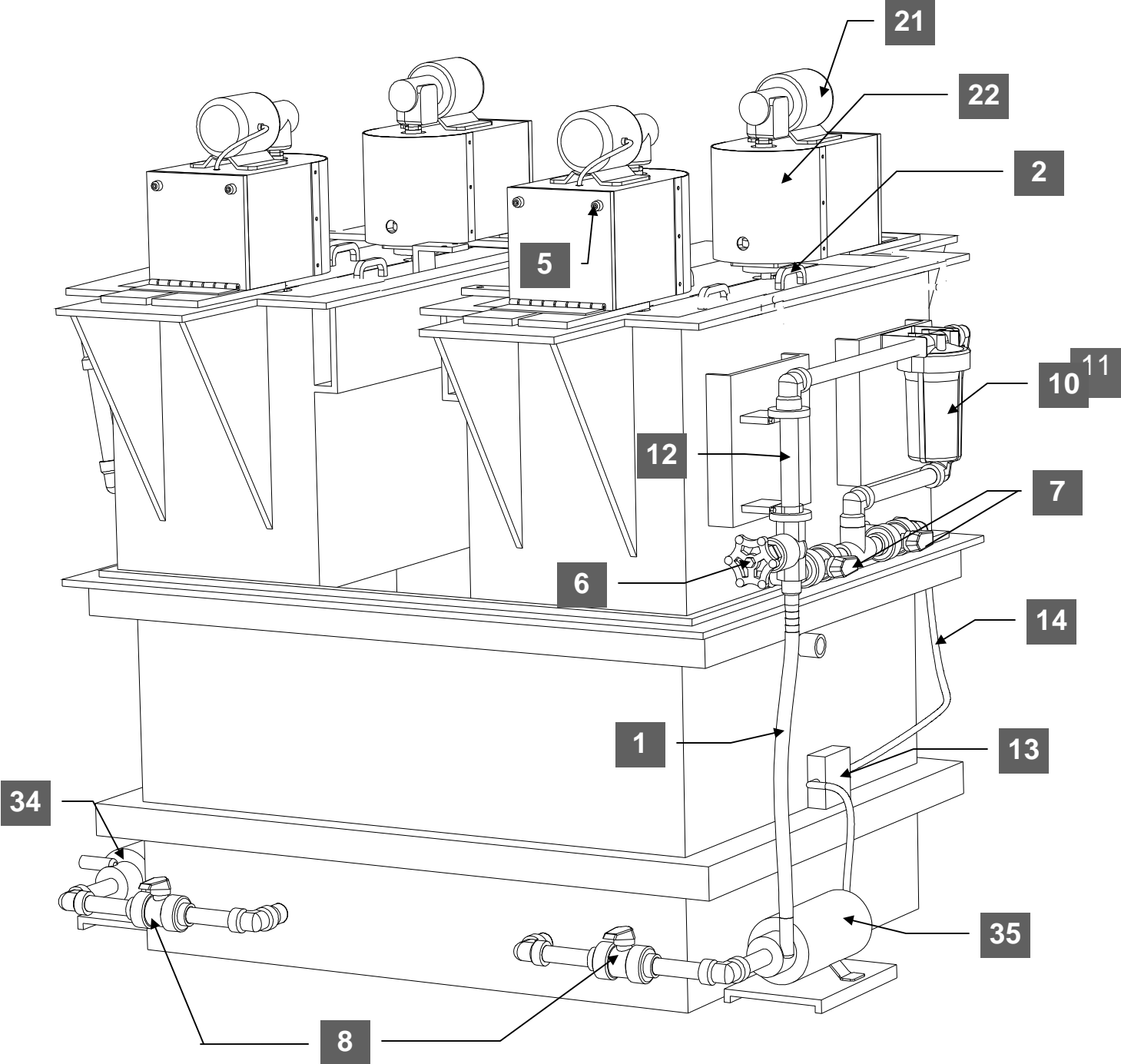


Figure 3-1: Complete Assembly

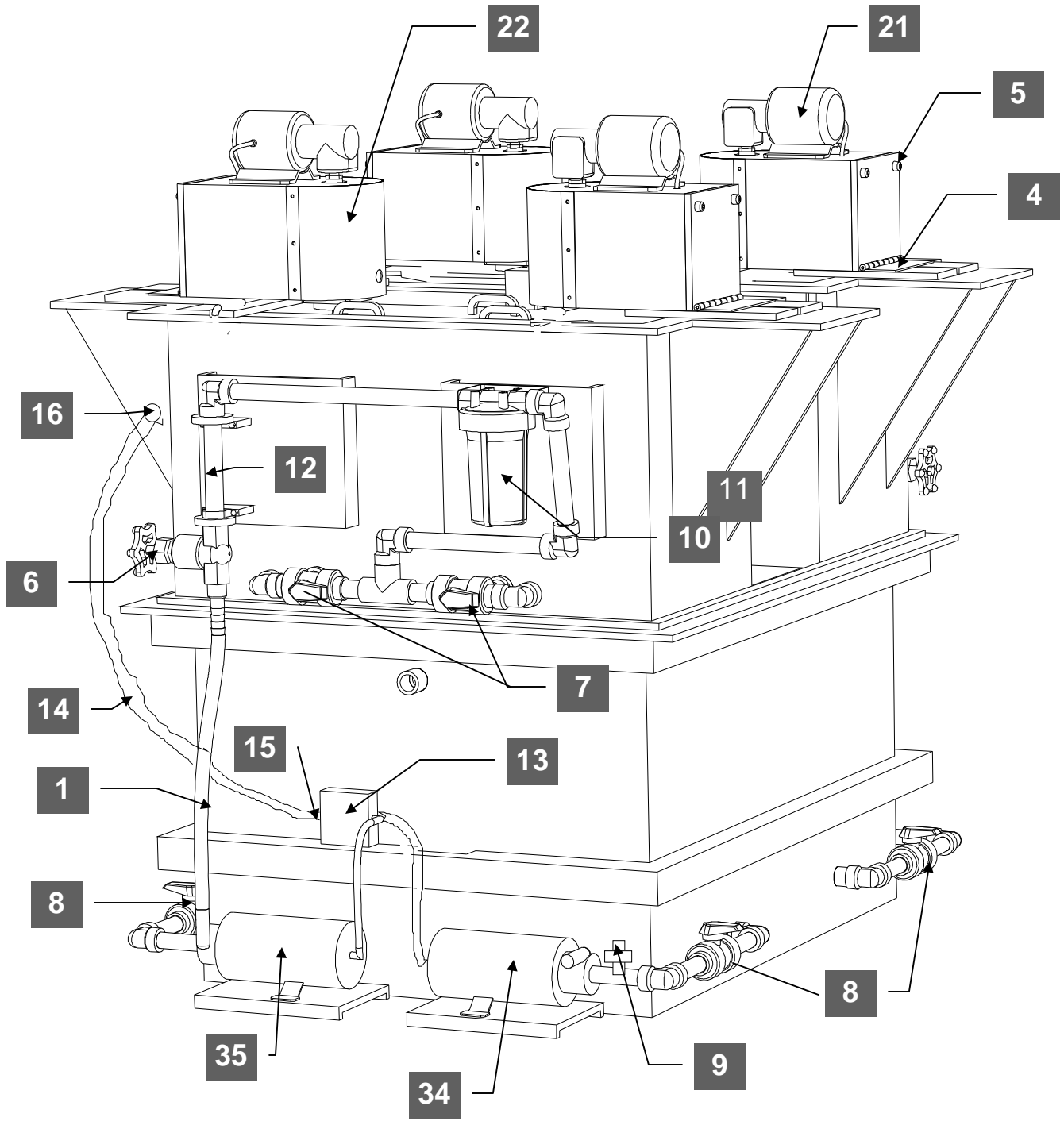


Figure 3-2: Complete Assembly Side View

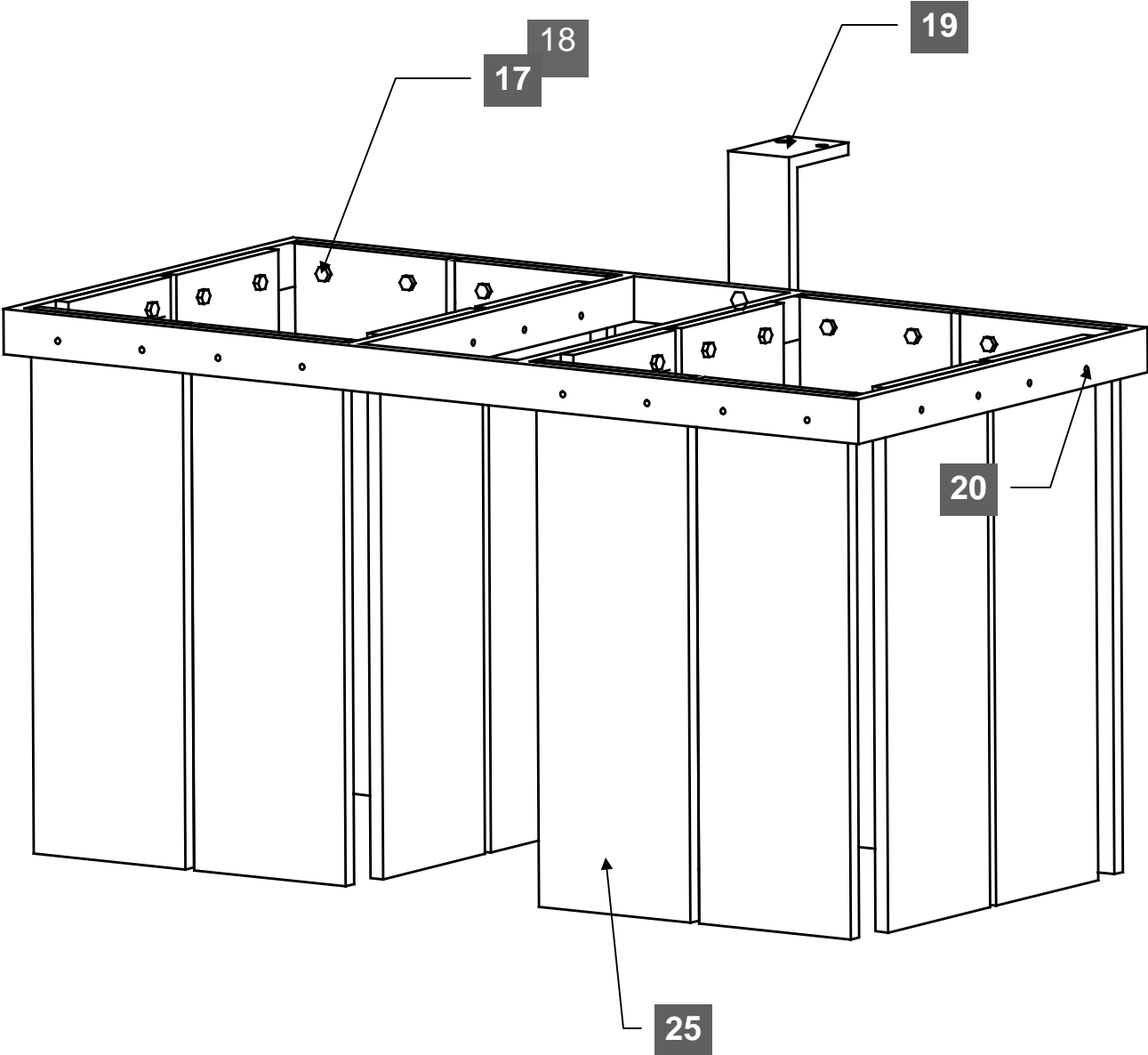


Figure 3-3: Anode Ring Assembly

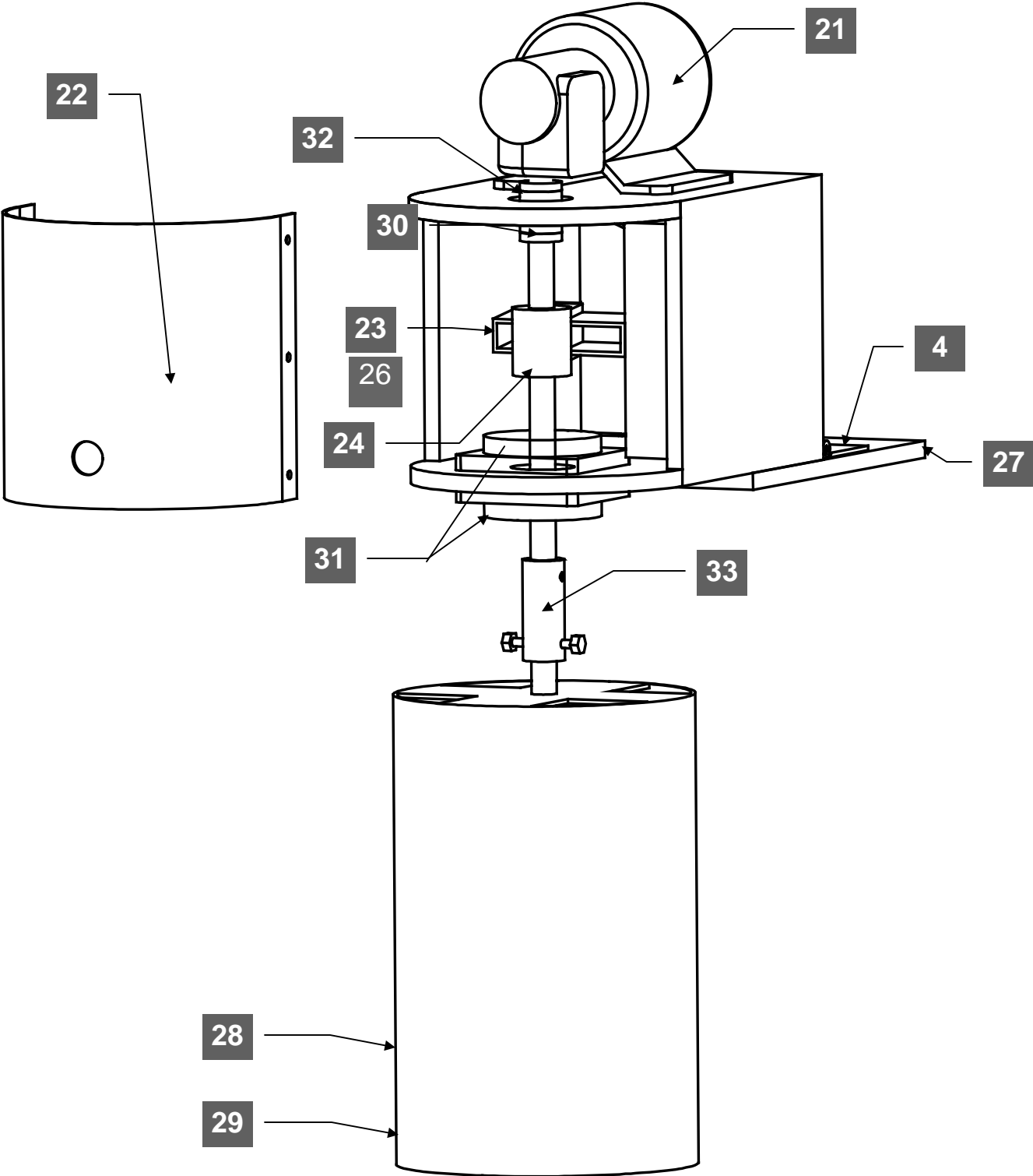


Figure 3-4: Drive Assembly

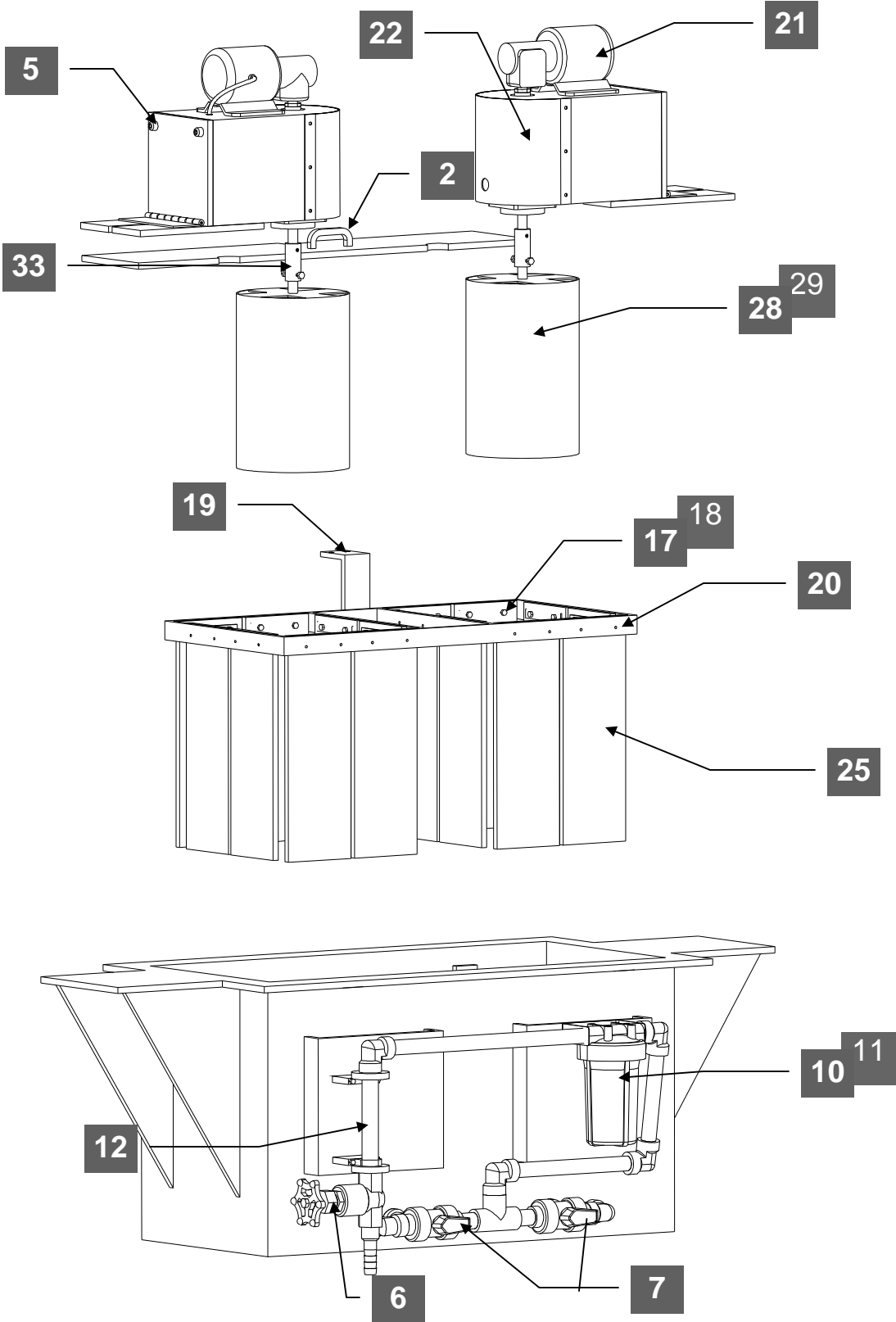


Figure 3-5: Top Cell Exploded View

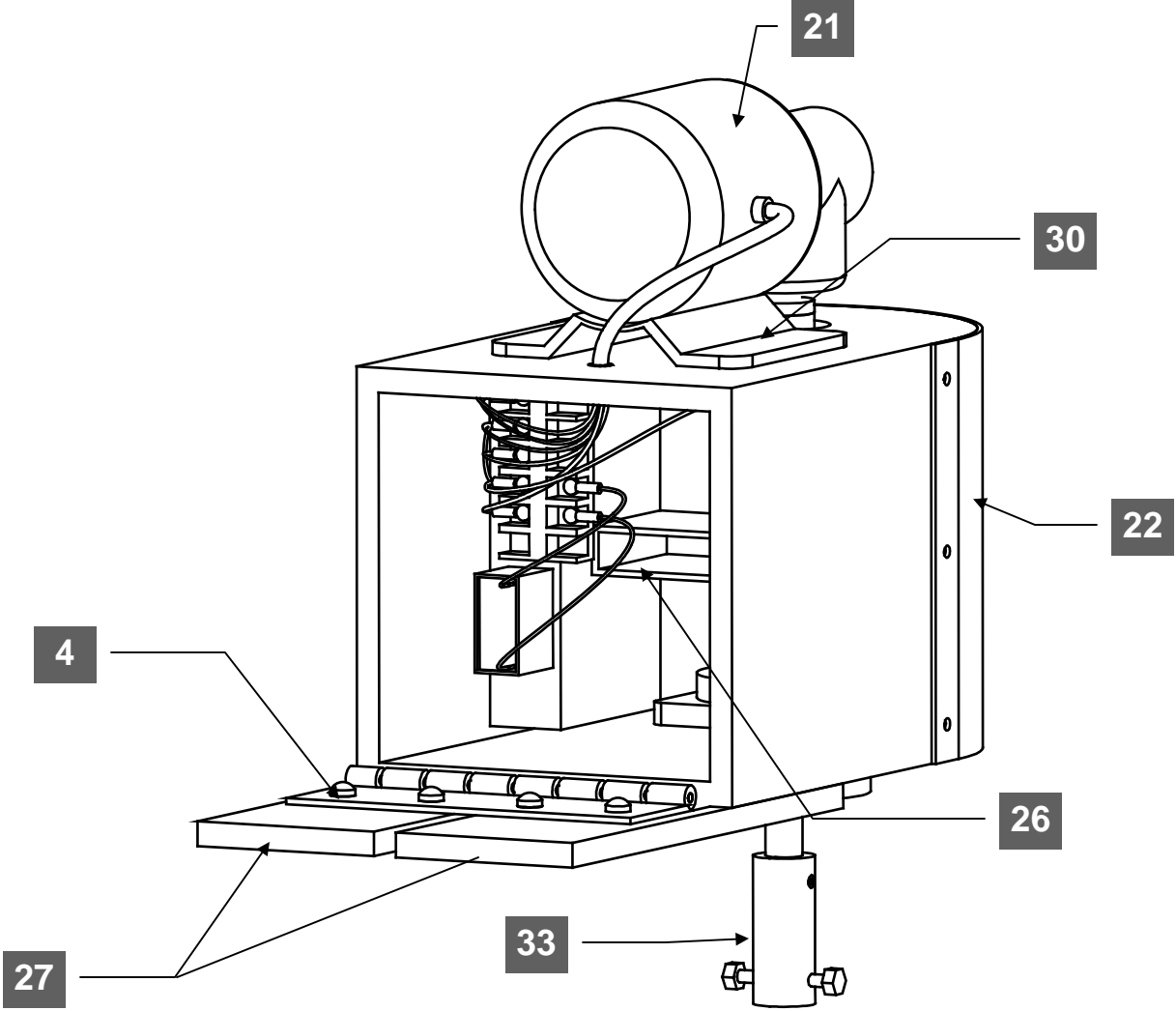


Figure 3-6: Drive Assembly Detail

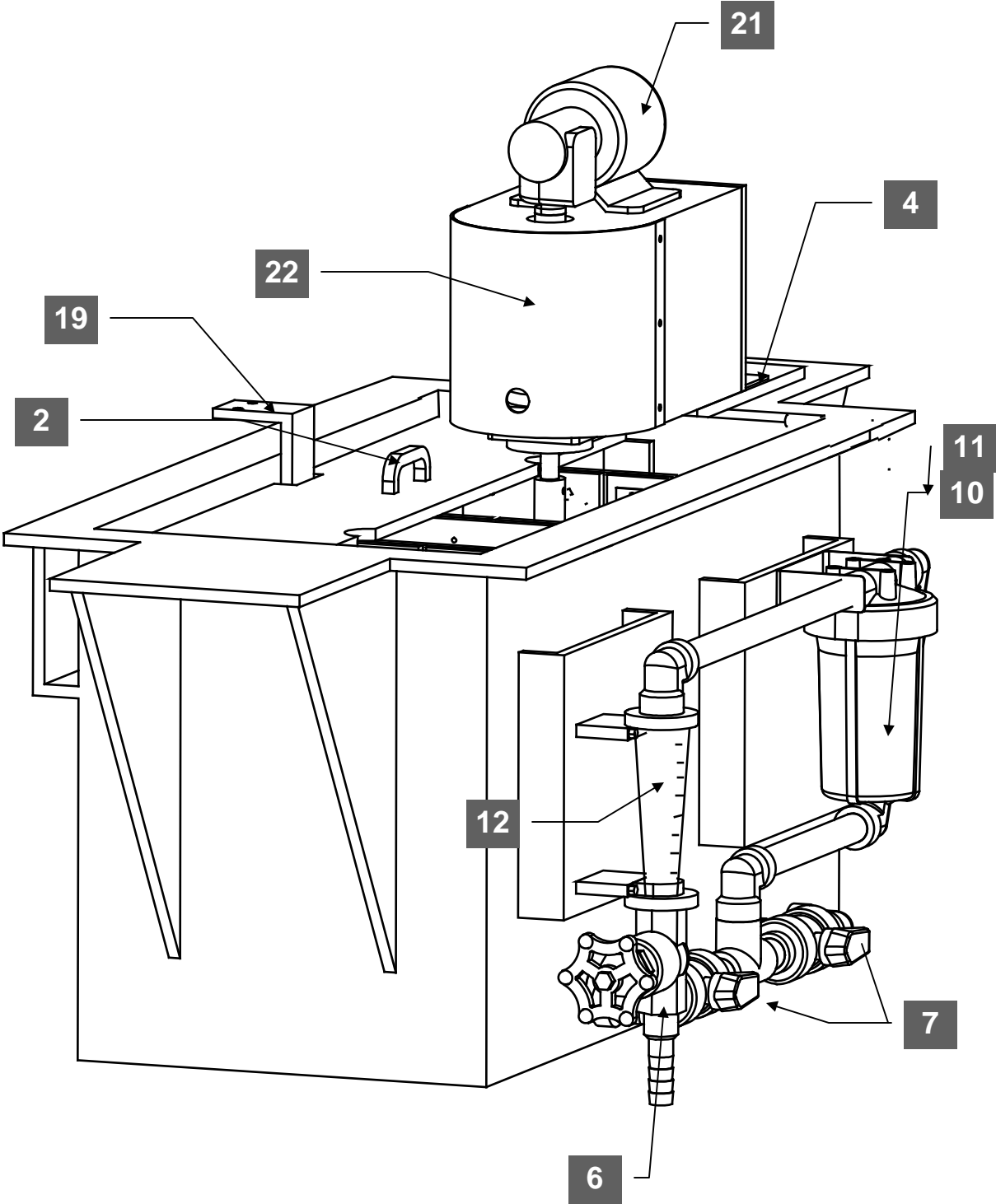


Figure 3-7: Top Cell Complete

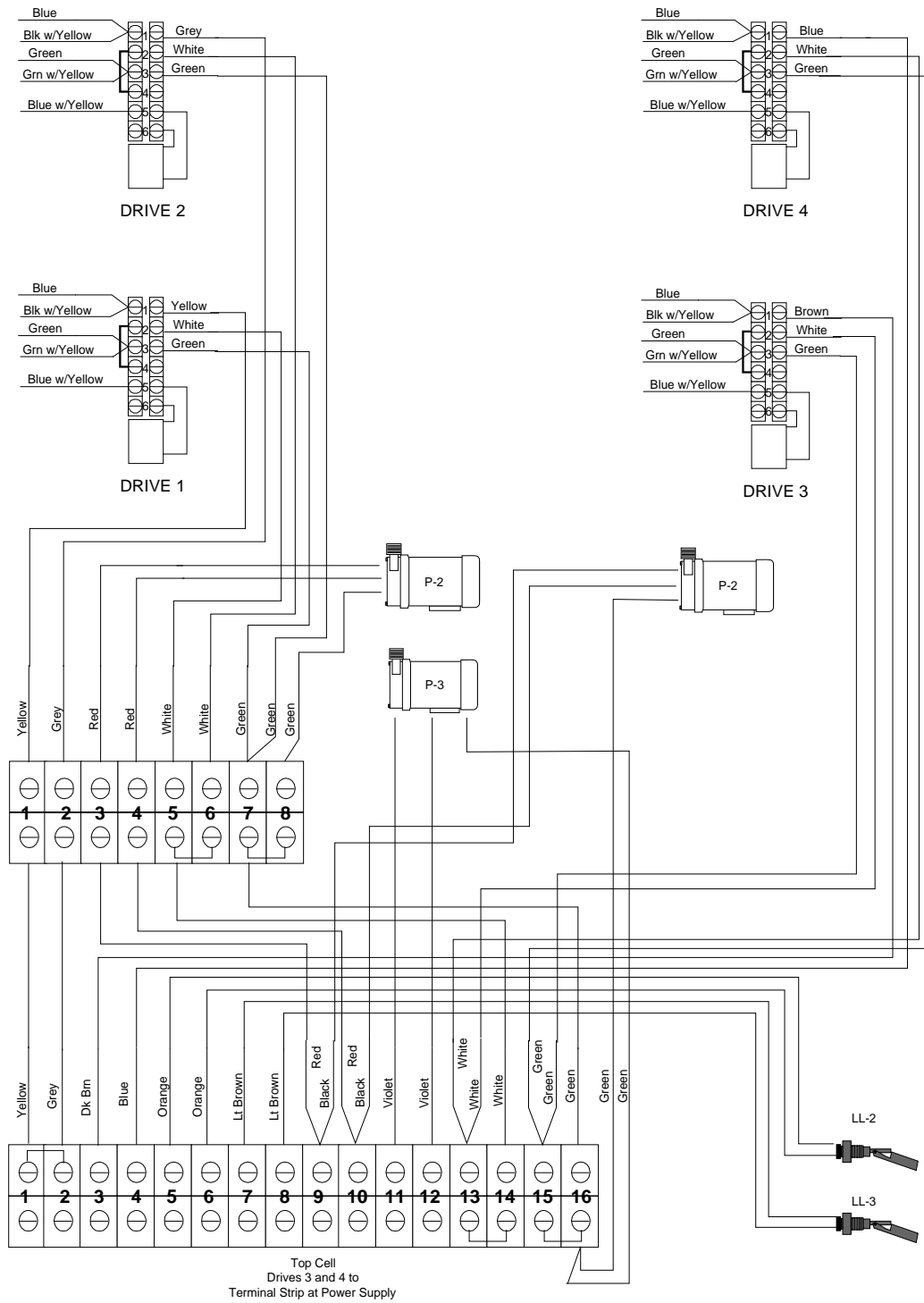


Figure 3-8: Wiring Diagram