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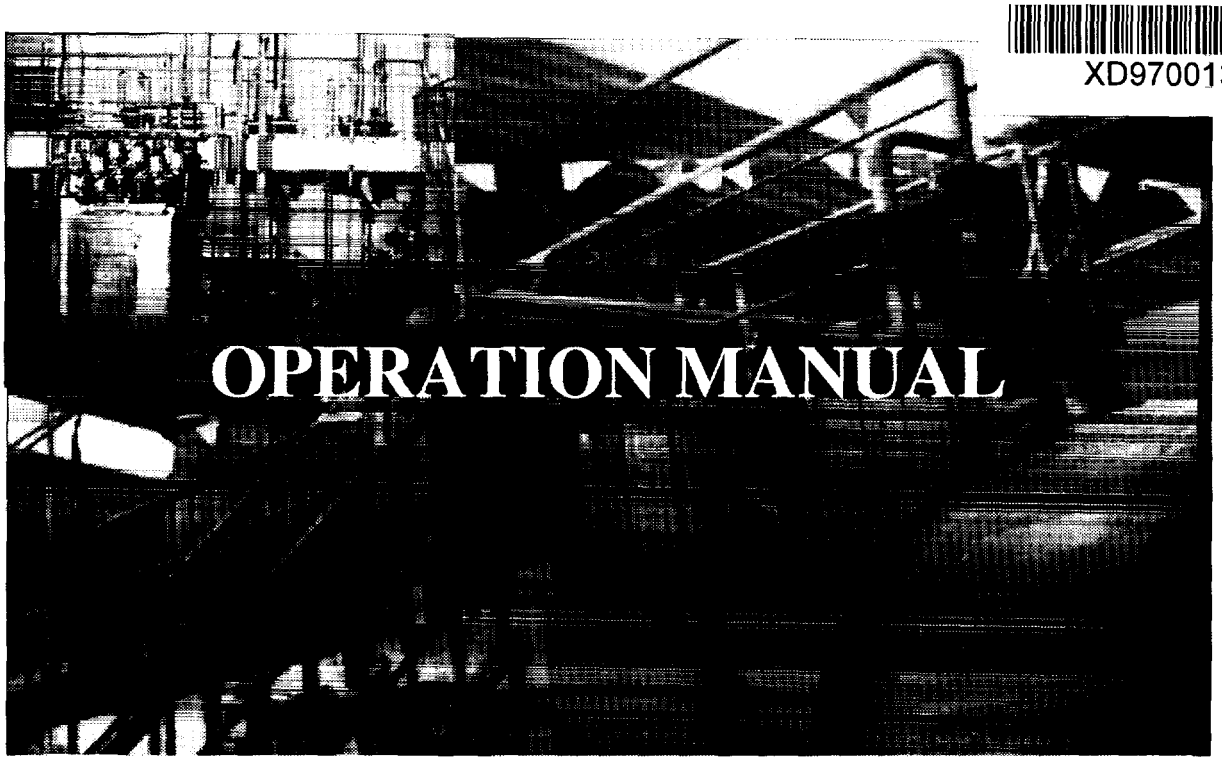
IMPLEMENTATION OF ENVIRONMENTALLY CLEANER TECHNOLOGIES

(UNIDO PROJECT : US/IND/90/244/2)

AMMONIA FREE AND CLEANER WET TANNING OPERATIONS



OPERATION MANUAL

A PROJECT ASSIGNED BY

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

IMPLEMENTED BY

CENTRAL LEATHER RESEARCH INSTITUTE
(Council of Scientific & Industrial Research)
ADYAR, MADRAS - 600 020, INDIA

FEBRUARY, 1996

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CONTENTS

ANNEXURES

1.0 INTRODUCTION

The various components of the cleaner wet tanning system installed at M/s. Tejoomals Tannery, Pernambut are:

- Ammonia Free (Carbon-di-Oxide) deliming
- High exhaust chrome tannage
- Use of High performance systems in wet finishing
- Simple process control system (for unit operations from deliming to dyeing)

1.1 AMMONIA FREE DELIMING

Ammonium salts are ideally suited for the technological requirements of deliming as they act as buffers and readily react with lime. However, use of ammonium salts adversely affect the effluent characteristics and create an unpleasant working condition. Conventional ammonium deliming contributes nearly 75-80% of ammonia in the effluent. Use of organic acids for deliming is often associated with the problem of drawn grain (or) acid shock resulting in poor grain qualities and are yield. Carbon-di-oxide does not pose these problems when used for deliming as it has an ability to act as buffer in the float. It has high affinity for lime and is comparatively inexpensive to use.

The other advantages associated with carbon-di-oxide deliming are:

* Reduction of nitrogenous discharges in the effluent
* Reduction of BOD & COD to an extent of 50%
* Reduction in ammonia odour
* Easy handling and automation ability

The work instructions for carbon-di-oxide deliming is given in case study (COW SOFTIE) in chapter 3.

1.2 HIGH EXHAUST CHROME TANNAGE

Nearly 85% of finished leathers in India are processed by using chrome tanning system. Normally, basic chromium sulfate with following characteristics is used for tanning.

Cr_2O_3	-	25%
Basicity	-	33.1/3%
pH of 10% Solution	-	3.0-3.5

In practice, 8-10% of basic chromium salt is normally used for effective tanning. Any chrome tanning salt used for tanning would have a fraction which consists of components which possess affinity i.e. the ability to bind to the hide/skin without any modification/use of external aids. Generally in a typical chrome tanning system employed in commercial tanneries, the fraction having ready affinity to hide/skin may constitute 50-65% of the total chrome used. The remaining component of chromium for reasons of lack of either affinity or high liability exhibits poor exhaustion behaviour. Under general conditions employed for tanning, the normal chrome tanning salt used has poor exhaustability with as much as 35-50% of chromium left out on the tanning bath level. This can be done by modifying the affinity of the chrome tanning salt and / or introducing more reactive sites for the chromium to reach.

Use of a polyamide chrome exhaust aid (commercial product) at 1.0% (on pelt weight) level has been found to enhance the chromium uptake by 15-20% leading to substantial pollution reduction and material saving.

Working instructions for high exhaust chrome tannage is given in case study in Chapter -3.

1.3 USE OF HIGH PERFORMANCE SYNTAN IN WET FINISHING

The problem associated with chromium is much more in rechroming as the exhaustion rates of chrome is only 50-55%. It has been suggested to use a high performance mineral (chromium-aluminum) based syntan in the place of chrome on partial/complete replacement basis depending on the properties required for the final product. These syntans are capable of effectively fixing 90% of aluminium & chromium present in them irreversibly, unlike conventional basic chromium sulfate. For upper leathers, chrome has been replaced to an extent of 75% by high performance syntans. In the case of softy leathers, 100% replacement of chrome has been suggested.

Working instructions for use of high performance syntan is given in case study in Chapter-3.

1.4 SIMPLE PROCESS CONTROL SYSTEM

The unit installed and implemented at M/s. Tejoomals is capable for controlling various unit operations in leather processing through specific modules. The operations controlled by the system are:

- Deliming (carbon-di-oxide) & Bating
- Pickling
- Tanning
- Rechroming
- Neutralization
- Retanning, Dyeing & Fat liquoring

The sub-components of the system are

- Water (Hot or Cold) addition to drum or for chemical preparation
- Chemical preparations & dosings
- pH control of process liquor using float recycle system
- Data logging

All these operations are executed with the help of different modules.

The functioning of the above modules are explained in Chapter-2.

2. FUNCTIONING OF MODULAR COMPONENTS

2.0 MAIN MENU & SUB COMPONENTS

The various modules are controlled by the programmes installed in the Mini-computer. The main menu of the computer is shown in Figure -1.

The submenus, as shown in Figure 1 are

-Set Configurations
-Call modules
-Hard Copies
-Process information
-Miscellaneous

Each of the sub menu is explianed in the following pages.

2.1 SET CONFIGURATIONS

Set configurations deal with instrumentation details governed by configuration of Analog channels, Digital channels and bulk storage tank allotments as shown in Figure 2.

The anlog and digital channels are meant only for installation purposes and are not requried for process personnel. Only storage tank allotment, indicating allocations made for various bulk chemicals provides necessary information for process as shown in Figure -3.

2.2 CALL MODULES

The various sub-modules are shown in Figure-4.

2.2.1 WATER ADDITION MODULE (WAM)

Purpose: To pump water from sump to the drum.

Work Instructions:

1. Switch on the compressor to activate the pneumatic valves.
2. Ensure sufficient water level in the sump.
3. Ensure opening of main water supply valve.
4. Access the main menu and select <call modules>
5. Select <water modules> in sub menu.
6. Enter appropriate data in the sub menu as shwon in figure 5.

The data required are

-Destination Drum no.
-Batch No.
-Quantity (in lits) of water required
-Cold (c) of Hot (H) water

7. On entering the data the water addition commences with pressing of <ESC> in key board.

8. After addition of required quanity of water in to the drum the valve will close & pumpng will also be stopped automatically.

2.2.2 HOT WATER ADDITION MODULE

Purpose: To pump hot water from sump to the drum.

Work Instructions:

1. Switch on the compressor to activate the pneumatic valves.
2. Ensure sufficient water level in hot water sump
3. Ensure opening of main water supply valve.
4. Access main menu and select <call modules>
5. Select <hot water additions> in sub-menu.
6. Enter appropriate data in the sub menu as shown in figure-6.

The data required are;

-Drum No.
-Batch No.
-Operation name.
-Quantity of water required
-Required water Temperature (in degree)
-On entering the data the water addition commences with pressing of <ESC> in key board.
- After addition of required quanity of water in to the drum the valve will close & pumpng will also be stopped automatically.

2.2.3 CHEMICAL ADDITION

Purpose: to add chemical solutions in to the drum

Work instructions:

1. Switch on the compressor to activate the valves
2. Ensure availablity of required chemical in the auxiliary tank
3. Ensure proper functioning of float recyle system
4. Ensure whether pH probe has been calibrated
5. Access main menu and select <call modules>
6. Select <chemical additions in to the drum> from sub menu.
7. Enter approproate data in the sub menu as shown in Figure-7.

The data required are

-Destination drum no.
-Batch no.
-Name of operation
-Source auxiliary tank no.
-Mode of addition

-(C) denotes opening of valve for certain period at regular time interval

-O denoted one time addition

-initial pH value
-final pH value
-Addition time (in secs) required for valve opening
-Addition interval in minutes
-Drumming time in minutes.

8. On entering the required data the chemical addition stops as soon as the final pH is reached or drumming time is completed, which ever is earlier.

2.2.4. CHEMICAL PREPARATOION MODULE (CPM)

Purpose: To prepare various chemical solutions, drawing from bulk storage tanks and pumping to auxiliarly tanks using product mixture utility.

Work Instructions

1. Switch on compressor to activate pneumatic valves.
2. Ensure required quantityt of chemical in bulk storage tanks
3. Ensure necessary wzter level in the sumps.
4. Access main menu and select <call module>
5. Select <product mixture utility> in sub menu
6. Enter appropriate date in the sub menu shown in figure-8

The data required are:

-Destination tank no.
-Stirring time after chemical preparation in secs.
-Solution no./name
-Total number of chemicals used for the solution preparation
-Source of chemcial
-From Bulk storage tank 1-5 or water/Hot water/Manually added chemical
-Name of the chemicals
-Quantity of each chemical

7. On entering the required data, chemical solutions are prepared and pumped to respective tanks automatically after pressing <Esc> of key board.

2.2.5. DRUM OPERATIONS

Purpose: To carryout drumming for a particlulr period of time

Work Instruction

1. Select auto mode for drumming by switching or the selector fixed to the drum starter.
2. Access the main menu and select <call module>
3. Select <Drum operations> in the sub menu
4. Fill in appropriate data in sub menu as shwon in figure-9.

Data required are:

-Drum number and

-Drumming time in minutes

5. On completion of the duration, the drum stops automatically.

2.2.6 AUXILARY & INTERMEDIATE TANK WASH UTILITY

Purpose: To clean the tanks by provindng water circulation.

Work Instruction

1. Access main menu and select < call modules>
2. Select <Auxilary & Intermdediate tank wash utility) in sub menu.
3. Press 1 or 2 for commencing or stopping water circulation as shown in figure 10.

2.2.7 MANUALLY ADDED CHEMICAL DATA ENTRY

Purpose: To record the additions of chemical made manually.

Work Instruction

1. Access main menu and select <call modules>
2. Select <Manually added chemicals data entry> in sub menu
3. Fill in appropraite data as shwon in figure 11.

2.2.8 MODIFICATION OF PROCESS PARAMETERS

Purpose: To modify porocess parameters like drumming time and chemical concentraion/ number of chemicals required after commencement of operation.

Work Insturmction;

1. Select <call modules> from amin menu.
2. Select <Modify parametes> from sub menu
3. Indicate your choice as shwon in figure 12
4. Repeat the instructions in 2.2.5 if choice is 1 or 2.2.4 if choice is 2.

2.2.9. STOP OPERATIONS

Purpose: to stop the operations going on in the drum or product mixture utility

Work Instruction

1. Select <call modules> from main menu.
2. Select <Stop operations> from sub menu
3. Indicate the choice as shwon in figure 13.

2.3.0 HARD COPIES

This module is used for retreieivng information pertaining to batch operations, product mixture utility, receipts etc in the form of print outs.

2.4.0 PROCESS INFORMATION

This module provides on line information about various process details like pH profiles, water additons, product mixture utility etc., in the form of display an screens as shown inf Figure 14 to 18.

2.5.0 SYSTEM SHUT DOWN

The system can be shut down by accessing the main menu and selecting <Misc/Shut down> submenu. On indicating the choice as shwon in figure 19, the system can be shut down.

ANNEXURES

TANMATE				
Set Config.	Call Modules	Hard Copies	Process Info	Misc/Shut Down

Fig : 1

Set Config .	Call Modules	Hard Copies	Process Info	Misc/Shut Down
Config.Analog Channels				
Config. Digital Channels				
Define St.Tank Chemicals				

Fig : 2

TANMATE				
Set Config.	Call Modules	Hard Copies	Process Info	Misc/Shut Down
Config. Analog Channels	Allot Storage Tanke Chemicals			
Define St. Ta				
Config. Digi				
	Storage Tank No.	Chemical Name		
	1	FATLIQUOR1		
	2	FATLIQUOR2		
	3	SOD-BI-CARB		
	4	SUL.ACID		
	5	FOR.ACID		
	Press 'ESC' to quit			

Fig : 3

TANMATE				
Set Config.	Call Modules	Hard Copies	Process Info	Misc/Shut Down

- Water Additions
- Hot Water Additions
- Chemical Additions
- Product Mixture Utility
- Drum Operations
- Aux/Int Tank Wash Utility
- Rec. Manually Added Chems
- Modify Parameters
- Stop Operations

Fig : 4

WATER addition into a drum

Drum No. Batch No. :

:

Operation :

Quantity (in Lts) : (C) old or (H) ot : C

(Press ESC to quit)

Fig : 5

HOTWATER addition into a drum

Drum No. : Batch No. :

Operation Name : Quantity (in Lts) :

Req. Water Temp (in

Deg. C) :

(Press ESC to quit)

Fig : 6

TANMATE

CHEMICAL addition into a drum

Drum No. : B. No. : Operation :

A.Tank No. :

Mode of addition [(c) on/(o)ne];

Init. pH Value : * Final pH Value :

Addition time (in Secs) : Addition Int. (in Mts) :

Drumming Time (in Mts) :

Fig : 7

(Product Mixture Data Entry Window)

Dest Tank No : Stirring Time : Secs

Solution No : Solution_name :

No. of Chemicals :

No.	Chemical Source (1-5 or W/H/M)	Chemical Name	Quantity (in Kgs)
1			.
2			.
3			.
4			.
5			.

(Press ESC to Quit)

Fig : 8

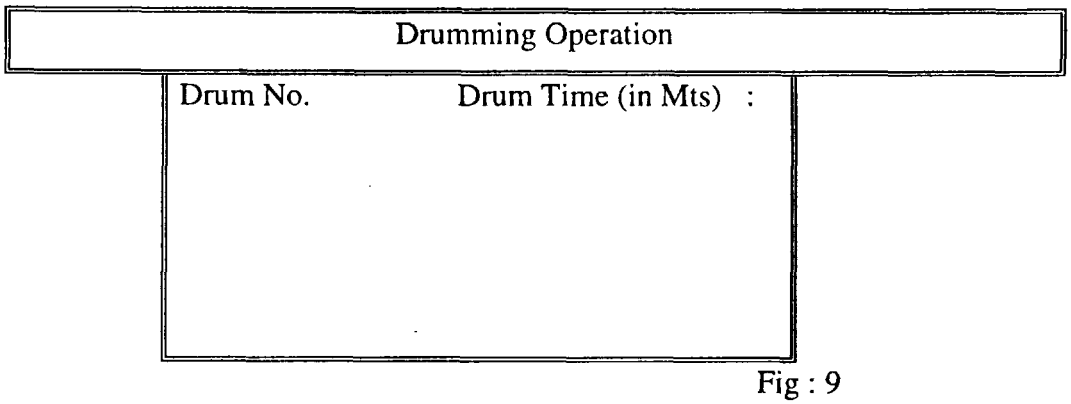


Fig : 9

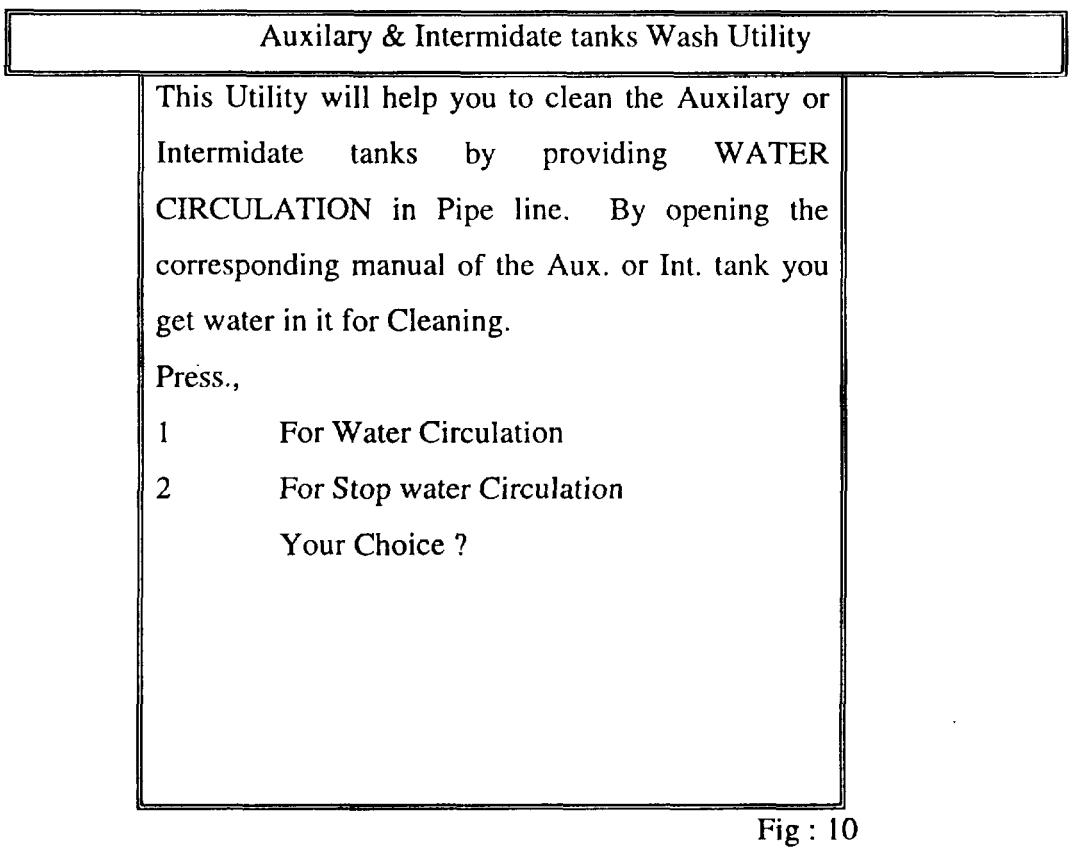


Fig : 10

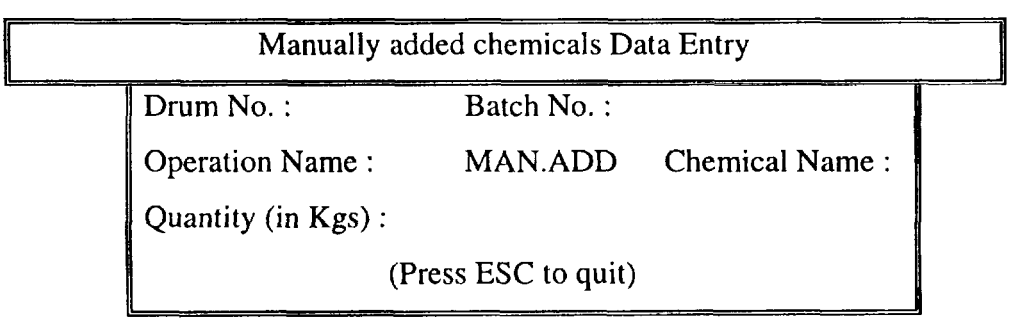


Fig : 11

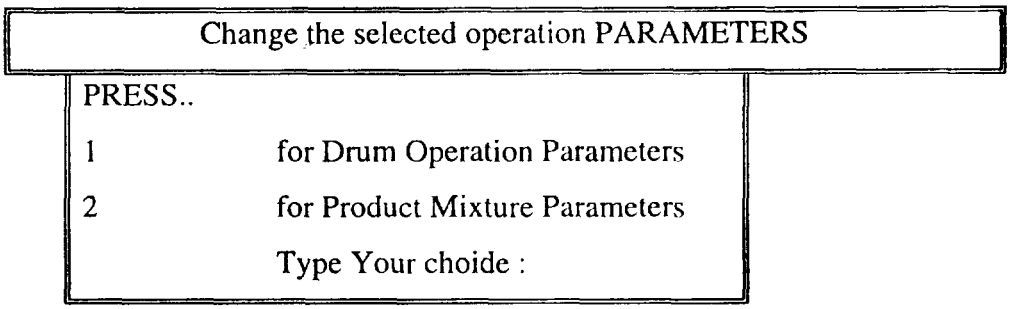

Change the selected operation PARAMETERS
PRESS..
1 for Drum Operation Parameters
2 for Product Mixture Parameters
Type Your choide :

Fig : 12

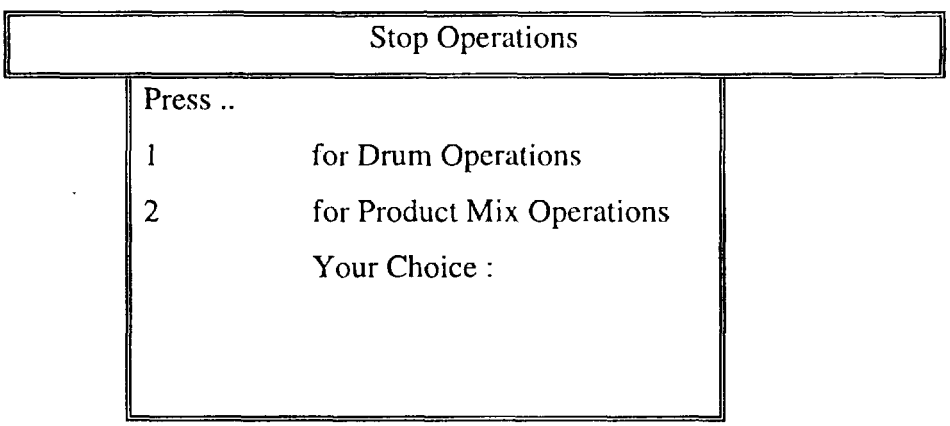
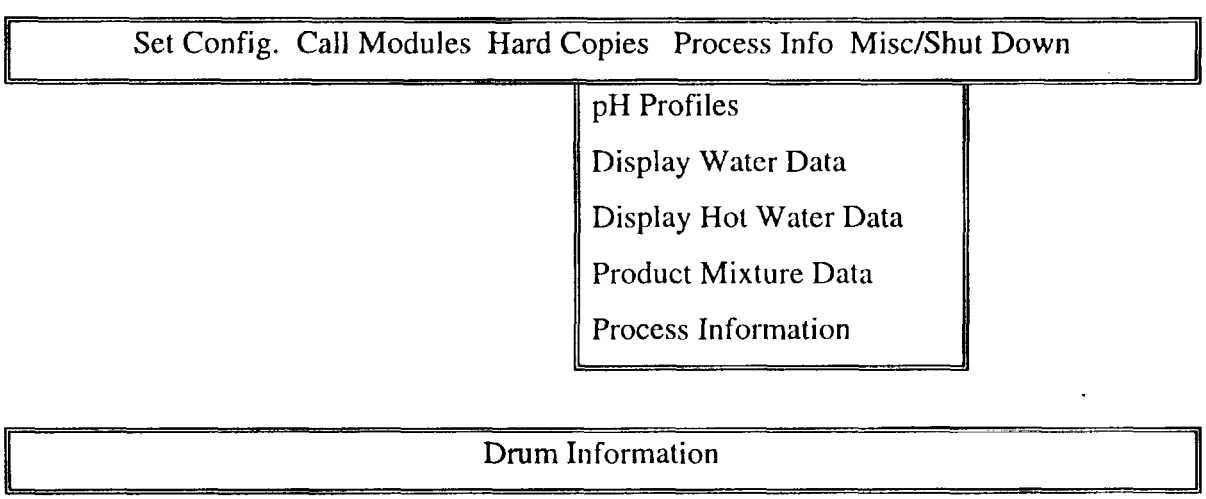

Stop Operations
Press ..
1 for Drum Operations
2 for Product Mix Operations
Your Choice :

Fig : 13


Set Config. Call Modules Hard Copies Process Info Misc/Shut Down
pH Profiles
Display Water Data
Display Hot Water Data
Product Mixture Data
Process Information
Drum Information

	Drum # 1	Drum # 2	Drum # 3	Drum # 4
Operaion :	None	None	None	None
Batch No :				
Curr. pH :	0.0	0.0	0.0	0.0
Prod. Mix:				
H.W. & W				
Wat.Temp.:	28.7 Deg.C		Free Core : 0000008436	

Prod_Mix : OFF Hot_water: OFF Water_add : OFF Tue Feb 06 14:41:32 1996 CEERI

Fig : 14

TANMATE

Product Mixture Display Window

Solution Name :

No. of Chemicals : Sol. No : Aux. Tank No:

Current St.: Idle

Weights		Time	
Total Weight (Kgs) :		Stirr .Set Time	Stirr.Cur.Time
Partial Weight (Kgs) :		S.Temp:60.0 C	C.Temp:

Product Weights Display

Serial No.	Chemical Name	Quantity Set	(in Kgs) Act	Tank No.	Remarks
1					
2					
3					
4					
5					

Prod_Mix : OFF Hot_water : OFF Water-add :OFF Tue Feb 06 14:59:18 1996 CEERI

Fig : 17

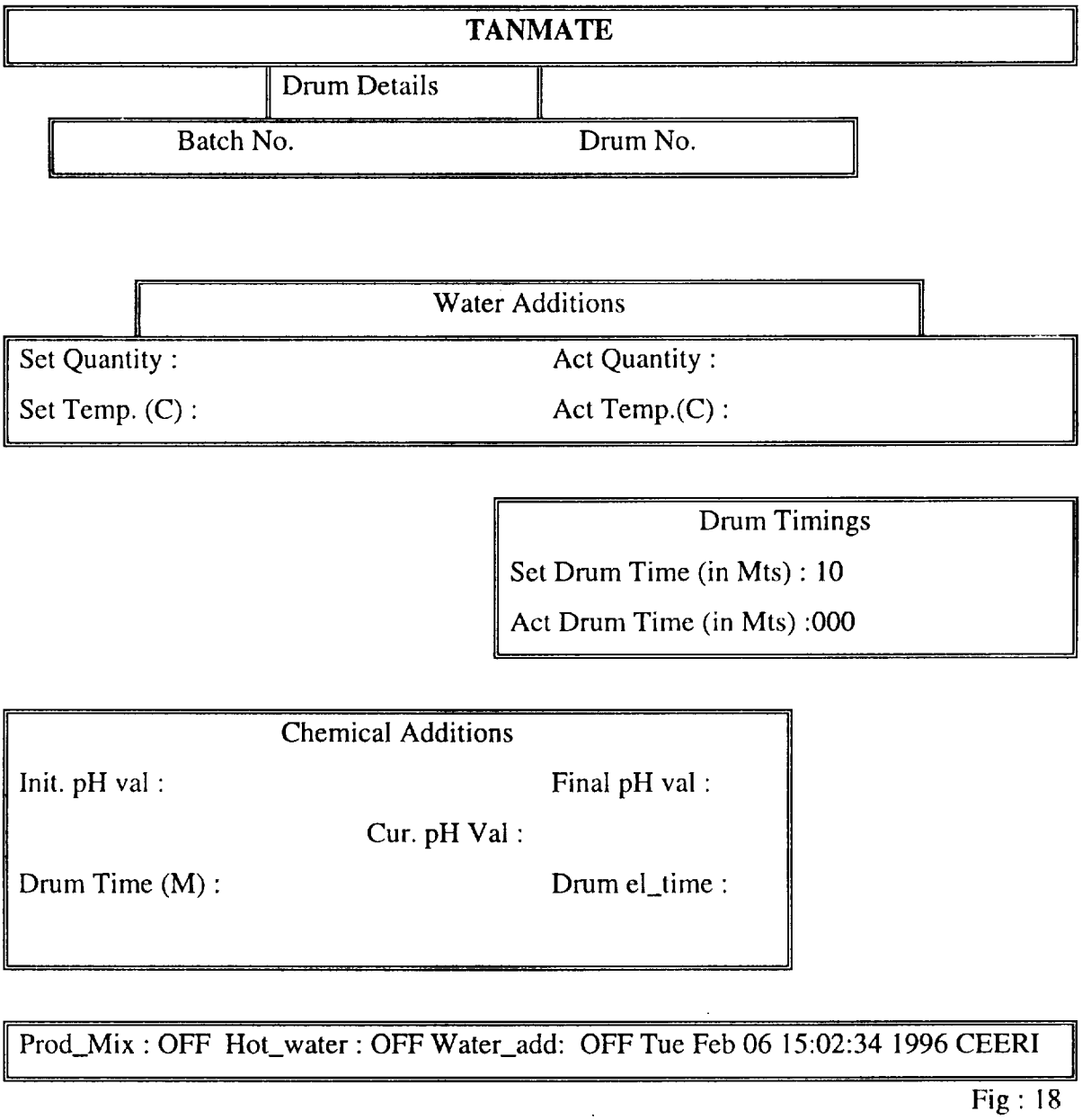

TANMATE
Drum Details
Batch No.
Drum No.
Water Additions
Set Quantity :
Act Quantity :
Set Temp. (C) :
Act Temp.(C) :
Drum Timings
Set Drum Time (in Mts) : 10
Act Drum Time (in Mts) :000
Chemical Additions
Init. pH val :
Final pH val :
Cur. pH Val :
Drum Time (M) :
Drum el_time :
Prod_Mix : OFF Hot_water : OFF Water_add: OFF Tue Feb 06 15:02:34 1996 CEERI

Fig : 18

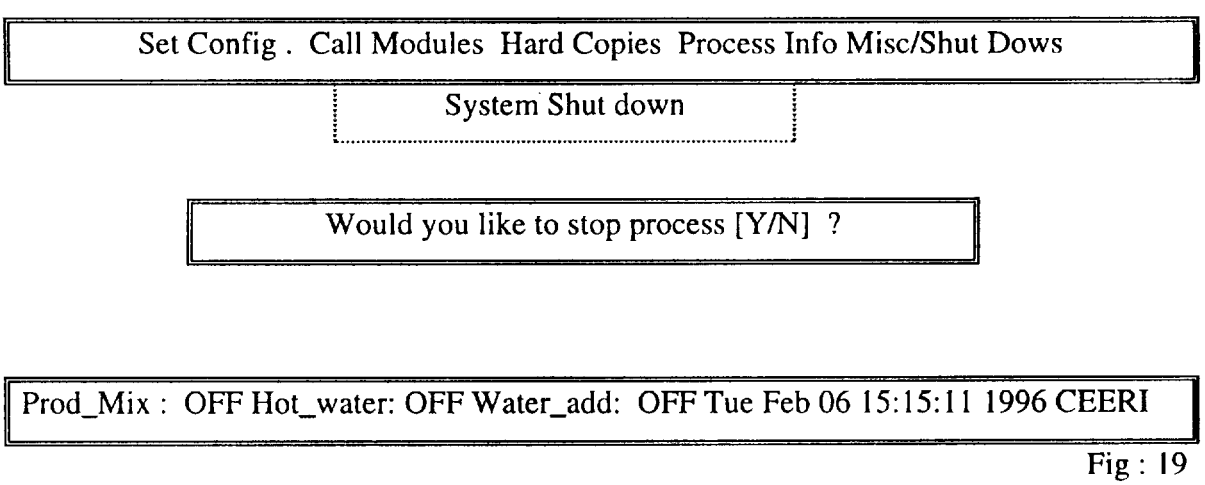

Set Config . Call Modules Hard Copies Process Info Misc/Shut Dows
System Shut down
Would you like to stop process [Y/N] ?
Prod_Mix : OFF Hot_water: OFF Water_add: OFF Tue Feb 06 15:15:11 1996 CEERI

Fig : 19

3. CASE STUDY

RAW MATERIAL : FLESHED COW SIDES

OPERATIONS CONTROLLED.

Delimimg & Bating

Pickling

Tanning

Rechroming

Neutralisation

Retanning, Dyeing & Fat liquoring

TANK ALLOCATIONS.

BULK STORAGE TANKS.

BT_1 - For Alkali

BT_2 - For Fatliquor composition I

BT_3 - For Fatliquor composition II

BT_4 - For Sulfuric acid.

BT_5 - For Formic acid.

* All the Bulk storage tanks are provided with pumps to facilitate loading, unloading and for recalculation to prevent settling.

* Alkali is stared as 5% solution in the Bulk storage tank.

* All other Chemicals are stared in undiluted form.

CHEMICAL PREPARATION & STORAGE TANKS.

T1 - For Sulfuric acid

T2, T6 - For Alkali solution.

T3, T5 - For Formic acid.

T4, T7 - For Fatliquor, Dye etc.

* T_1 is attached to Drum D2 exclusively
* T_2 is attached to Drum D2 & D3
* T_3 & T4 are attached to Drum D3 exclusively.
* T_5, T6, T7 are attached to Drum D4 exclusively.

3.1.0 CARBON-DI-OXIDE DELIMING & BATING

3.1.1. WASHING

3.1.1.1. Weigh the fleshed sides.

3.1.1.2. Load the sides in Drum & close the door

3.1.1.3. Add 150% Water (All percentages based on weight of hides noted in 3.1.1.1) to the Drum through Water Addition Module (WAM) (Refer WAM in 2.2.1 in chapter 2)

3.1.1.4. Drum the sides for 15 minutes.

3.1.1.5. Drain the liquor completely by opening the drum door.

3.1.2. DELIMING & BATING

3.1.2.1. Weigh the carbon-di-oxide cylinders

3.1.2.2. Switch-on the gas heater.

3.1.2.3. Add 150% Water to the drum through WAM. (Refer WAM in 2.2.1 in chapter 2)

3.1.2.4. Start drumming after closing the door.

3.1.2.5. Open CO_2 cylinder & inject the gas in to the drum through the rubber tube (the tip of the tube should be immersed in water) at a flow rate of 100 litters per minute (lpm)

3.1.2.6. After 15 minutes, add 1% Bate and reduce the CO_2 flow rate to 60 lpm.

3.1.2.7. Continue drumming for 120-180 minutes, until comple deliming is achieved.

3.1.2.8. After ensuring completion of deliming, by checking cross section with phenolphthalein (should not develop pink colour if deliming is complete), Drain the bath,

3.1.2.9. Unload the sides a from the drums by opening the door.

3.1.3. DRUM SCUDDING

3.1.3.1. Load the sides in the drum.

3.1.3.2. Add 0.2% Wetting agent & close the door.

3.1.3.3. Drum for 20 minutes.

3.1.3.4. Add 150% Water to the drum through WAM. (Refer WAM in 2.2.1 in chapter)

3.1.3.5. Continue drumming for another 20 minutes.

3.1.3.6. Drain the bath

3.1.3.7. Unload the sides by opening the door.

3.2.0. PICKLING

3. 2.1. ADD 12% water to the Load cell through Chemical Preparation Module (CPM) (Refer CPM in 2.2.4. in chapter 2)

3.2.2. Draw 1.2% Sulfuric acid from bulk storage to the load cell through CPM (Refer CPM in 2.2.4).

3.2.3. Stirr the solution in load cell for 2 minutes.

3.2.4. Pump the acid solution to chemical storage tank T1 through CPM. (Refer CPM in 2.2.4.).

3.2.5. Load the sides in the drum.

3.2.6. Add 8% Salt to the drum.

3.3.7. Close the door.

3.2.8. Add 80% Water to the drum through WAM. (Refer WAM in 2.2.1. in chapter 2).

3.2.9. Start the drum & run for 15 minutes.

3.2.10. Start acid addition from Tank T1 to the drum through Chemical Addition Module (CAM) (Refer CAM in 2.2.3. in chapter 2). The valve should open for 6-9 seconds every minute.

3.2.11. Continue acid addition & drumming until an equilibrium pH of 2.8-3.0 is achieved.

3.2.12. Leave the pelts in the pickle bath overnight.

3.2.13. Nextday, Run the drum for 30 minutes to achieve equilibrium pH. Of 2.8-3.0.

3.2.14. Drain 50% of the float.

3.3.0 CHROME TANNING

3.3.1. Add 4% Basic chromium Sulfate to the drum & close the door.

3.3.2. Run the drum for 30 minutes.

3.3.3. Add 1% Chrome exhaust aid.

3.3.4. Run the drum for another 30 minutes.

3.3.5. Add second instalment of 4% Basic Chromium Sulfate to the drum.

3.3.6. Run the drum for 60 minutes.

3.3.7. Draw 2% of Formate-Bicarb solution from the bulk storage tank to the load cell through CPM & make the alkali solution as 10% (w/v) solution. (Refer CPM in 2.2.4.)

3.3.8. Pump the solution to Tank T_2 through CPM. (Refer CPM in 2.2.4.).

3.3.9. Add the alkali solution from Tank T2 to the drum through CAM (Refer CAM in 2.2.3. in chapter 2) until the pH reached an equilibrium valve of 3.8-4.0. The valve should open for 6-9 seconds every minute.

3.3.10. Open the drum door.

3.3.11. Check the leather cross-section pH. It should be 3.8-40. If less, continue alkali addition until the required pH of 3.8-4.0 is attained.

3.3.12. Open the door & discharge the effluent.

3.3.13. Un load the sides & pile them.

3.4.0 RECHROMING

RAW MATERIAL : WET BLUE COW SIDES - split & shaved to required thickness.

3.4.1. Weigh the sides (All percentages refered here in after are based on this weight).

3.4.2. Draw 2% alkali solution (Formate:Bicarb : 1:1) from the bulk storage tank to the load cell using CPM. (Refer CPM in 2.2.4).

3.4.3. Mix with Water to make it 10% solution and stirr for 2 minutes using CPM. (Refer 2.2.4).

3.4.4. Pump the solution to T_2 or T_6 (T_2 for Drum D_3 & T_6 for Drum D_4) using CPM.

3.4.5. Load the Wet blue sides in to the drum.

3.4.6. Add 150% Water in to the drum through WAM. (Refer WAM in 2.2.1. in chapter 2)

3.4.7. Add 5% High performance syntan to the drum.

3.4.8. Close the drum door & run the drum for 60 minutes.

3.4.9. Start alkali addition to the drum through CAM, (Refer CAM in 2.2.3 in chapter 2) continuously by opening the valve for a period of 60 minutes until an equilibrium pH of 4.0-4.2 is attained.

3.4.10 Drain the bath by opening the door.

3.5. 0. NEUTRALIZATION

Raw material : Rechromed cow sides.

3. 5.1. Alkali preparation.

3.5.1.1. DRAW 2% alkali solution (Formate: Bicerb: : 1:1) from the bulk storage tank to the load cell, using CPM. (Refer CPM in 2.2.4.)

3.5.1.2. Add water to make it 10% solution & stirr for 2 minutes using CPM. (Refer CPM in 2.2.4.)

3.5.1.3. Pump the solution to T_2 or T_6 (T_2 for Drum D_3 & T_6 for Drum D_4)

3.5.2. Washing

3.5.2.1. Add 200% Water to the drum, through WAM (Refer 2.2.1 in chapter 2).

3.5.2.2. Close the door.

3.5.2.3. Run the drum for 15 minutes.

3.5.2.4. Open the door & drain the bath.

3.5.3. Neutralisation.

3.5.3.1. Add 200% water to the drum, through WAM (Refer 2.2.1 in chapter 2).

3.5.3.2. Close the door & start the drum.

3.5.3.3. Start Chemical addition and continue addition by adding alkali continuously with a valve opening time of 6-9 secs every minute. The addition of alkali should continue until pH of 5.0-5.2 is reached.

3.5.3.4. Drain the bath by opening the door.

3.5.4. Washing

3.5.4.1. Add 200% Water to the drum, through WAM (Refer 2.2.1 in chapter).

3.5.4.2. Close the door & run the drum for 15 mounts.

3.5.4.3. Drain the bath by opening the door.

3. 6.0 RETANNING, DYEING & FATLIQNORING

3.6.1. Draw 4% Fatliquor composition I from the bulk storage tank to the load cell through CPM.

3.6.2. Add 12%.Hot water 60°c (From Hot water sump) to this composition through CPM. (Refer CPM in 2.2.4).

3.6.3. Stirr well the solution in the load cell for 2 minutes, using CPM. (Refer 2.2.4).

3.6.4. Pump the fatliquor solution to Tank T_4 or T_7 (T_4 for Drum D_3 and T_7 for Drum D_4) using CPM.(Refer 2.2.4)

3.6.5. Add 150% Hot Water (60°c) to the drum through (Hot water Addition module (Refer 2.2.2 in chapter 2)

3.6.6. Close the door.

3.6.7. Add Fat liquor composition I from T_4 or T_7 to the drum using CAM. (Refer CAM in 2.2.3 in chapter 2)

3.6.8. Run the drum for 30 minutes. While the drum is running prepare the dye solution.

3.6.9. Prepare dye solution in the load cell by dissolving x% of dye (depending on the colour) in 3x% of Hot water using CPM. (Refer 2.2.4)

3.6.10 Pump the dye solution from the load cell to the tank T_4 or T_7 using CPM.

3.6.11. Add the dye solution in to the drum using CAM, (Refer CAM in 2.2.3)continuously in oner a period of 30 minutes.

3.6.12. Stop the drum.

3.6.13. Open the door & add 4% Retanning syntan & 4%. Vegetable tarnning extract.

3.6.14. Close the door and run for 45 minutes.

3.6.15. While the drum is running prepare fatliquor solution II as below.

3.6.16. Draw 6% Fatliquor composition-II from Bulk storage tank to the load cell through CPM. (Refer 2.2.4)

3.6.17. Add 18% Hot water (at 60_oc) to the fatliquor composition through CPM. (Refer 2.2.4)

3.6.18. Stirr well the solution in load cell for 2 minutes using CPM. (Refer 2.2.4)

3.6.19. Pump this solution to the tank T_4 or T_7 through CPM. (Refer 2.2.4)

3.6.20. Add this fatliquor solution from tank T_4 or T_7 to the drum through CAM. (Refer 2.2.3 chapter 2)

3.6.21. Run the drum for a period of 30 minutes.

3.6.22. While the drum is running, prepare Formic acid solution as given below.

3.6.23. Draw x/2% (x is the percentage of dye used) Formic acid from Bulk storage tank to the load cell through CPM. (Refer 2.2.4)

3.6.24. Add Water, 10 times the qnantity of Formic acid to the load cell through CPM. (Refer 2.2.4)

3.6.25. Stirr well the solution in the load cell for 2 minutes through CPM. (Refer 2.2.4).

3.6.26. Pump the formic acid solution to the tank T_3 or T_5 (T_3 for Drum 3 and T_5 for Drum 4)

3.6.27. Add Formic acid solution to the drum continuously over a period of 30 minutes by opening the valve for 6 seconds every one minute, through CAM. (Refer 2.2.3 in chapter 2)

3.6.28. Check exhaustion. If complete, drain the bath. If not add some more formic acid by repeating steps 6.23 to 6.28.

3.6.29. Rinse the leathers & pile them.

PRECAUTIONS / SIMPLE CHECKS

* Caliberate the electrodes with buffer solutions (pH 4, 7 & 9) daily.
* Check for blockage in recycle system daily
* Ensure whether storage tanks are in empty condition before any addition is made.
* Monitor closely the chemical addition system.
* Ensure availability water always in the sump.

ANNEXURE - I

INSTRUCTION OPERATING MANUAL
FOR
DIGITAL pH CONTROLLER

(TYPE : DPH - 510)

Distributors Name & Address :

Manufactured by : GLOBAL ELECTRONICS,

3 - 5 - 331, NARAYANGUDA,

HYDERABAD - 500 029.

SPECIFICATIONS

1.	Readout	:	3 1/2 digit bright 7 segmentLED 12.7mm high.
2.	Range	:	0 - 14 pH or 0 to +/- 1999mV.
3.	Resolution	:	0.01 pH or 1mV.
4.	Accuracy	:	0.01pH or 1mV +/- 1 digit.
5.	Reproducibility	:	0.01pH or 1mV +/- 1 digit.
6.	Stability	:	Better than 0.02pH or 1mV per 15'C change in ambient temperature or +/- 20% change in supply voltage.
7.	Temperature Compensation	:	Automatic -50 50 + 150'C, using PT100 RTD.
8.	Input impedance	:	10^{13} Ohms.
9.	Input bias current	:	1 pA @ 25'C.
10.	Standardisation	:	+/- 120m V(+/-2 pH Units).
11.	Slope Control	:	80 to 105%.
12.	Control	:	2 set points Hi and Lo digitally set with independent 230V, 3A relay contacts. Audio Visual alarm on limit violation.
13.	Ambient	:	0 to 55'C,0-90% RH non-condensing.
16.	Power	:	230V +/- 10%, 50Hz.
17.	Electrode housing	:	To suit application in Dip/Flow through housing of S.S. 304/316 or Polypropylene
18.	Dimensions	:	Instrument : 72 x 144 x 300mm (D). Transmitter : 170 x 170 x 60mm.
19.	Options	:	1) ON-LINE electrode wash jet with controller. 2) Electrode dry annunciation. 3) Digital LCD display on Transmitter. 4) Recorder output 10mV/pH or 4-20mA 5) 24V DC Operation 6) Flame Proof Housing.

20. Electrode : Combined or Glass & Reference pair Gel or Electrolyte filled to suit application
Metal electrode for ORP measurement.

pH or ORP Indication must be specified at the time of ordering. Specifications subject to change without notice

The DPH 510 system comprises

(a) pH electrode housing
(b) pH electrode
(c) thermocompensator
(d) pH transmitter
(e) Indicating controller

Installation and commissioning of the DPH 510 comprises the following steps :

(1) Conditioning the pH electrode
(2) Assembly of electrode housing
(3) Connecting pH electrode and temperature sensor to traansmitter
(4) Connecting transmitter to controller
(5) Electrode calibration
(6) Setting of limits and control wiring

CONDITIONING pH ELECTRODE

(A) Combination pH electrodes

Single rod combination pH electrodes are normally supplied with the electrode bulb covered with a cap containing storage solution, keeping the electrode in ready to use condition.

(1) Remove the pH electrode from the packing box.

(2) Remove the storage cap from the base of the electrode. PRESERVE THIS CAP FOR FUTURE USE.

(3) Shake the glass electrode like a clinical thermometer to remove all air bubbles from the bulb.

(4) Rinse the electrode in distilled water.

(5) Remove the reference electrode from packing box.

(6) Remove the storage cap from the base of the reference electrode. PRESERVE THIS CAP FOR FUTURE USE.

(7) Rinse the reference electrode like a chemical thermometer to remove all air bubbles from the bulb.

(8) Remove the electrolyte filling port rubber cap and lop up with reference electrolyte.

IMPORTANT : NEVER TOUCH THE ELECTRODE BULB WITH HAND.
DO NOT WIPE THE ELECTRODE BULB.

ELECTRODE MAINTENANCE :

The pH electrode is the heart of the system and proper care in maintenance of the electrode will go a long way in ensuring correct readings and longer life.

(1) Insert the electrode as frequently as is possible for scratches, salt crystal buildup or membrane/junction coating. This inspection should be done at least once a week and more frequently if possible.

(2) Rinse off any salt deposits with distilled water and remove any membrane deposits by rinsing. If rinsing with distilled water does not remove deposits from the membrane follow the CLEANING PROCEDURE outlined below.

(3) Drain the reference electrode chamber, flush with fresh filling solutions and refill. This does not apply to gel filled electrodes.

(4) In case of gel filled electrodes it is very important that the electrode is never allowed to remain dry. Permitting the electrode to remain dry will definitely damage the electrode.

ELECTRODE CLEANING :

GENERAL : Rinse the pH electrode well in distilled water and soak in 0.1N HCl for 30 minutes.

REMOVAL OF MEMBRANE DEPOSITS

INORGANIC : Soak the electrode in 0.1M Tetrasodium EDTa solution for 15 minutes.

PROTEIN : Soak in 1% Pepsin in 0.1M Hcl for 15 minutes.

GREASE & OIL : Rinse with mild detergent or Methanol followed by good rinsing with distilled water.

After any treatment with EDTA, Pepsin/HCl or Methanol it is recommended to replace the reference electrolyte with fresh electrolyte.

ELECTRODE CALIBRATION :

Connect the indicator to 230 V 50Hz power supply ensuring that a good earth is definitely provided. A GOOD EARTHING IS VERY IMPORTANT. Rinse the pH electrodes and temperature sensor in distilled buffer. Adjust the STANDARDISE control on the transmitter to get 7.00 display.

Rinse the electrode assembly in distilled water, dab with tissue paper and dip in 4.01 buffer. Adjust the SLOPE control on the transmitter to get 4.01 on display.

Instal the electrode housing in place, connecting the KCl electrolyte reservoir if present.

NOW THE ELECTRODE IS CALIBRATED AND READY FOR USE. FOR SYSTEMS PROVIDED WITH OPTION 510-01 ON-SITE LCD DISPLAY NO ADDITIONAL CALIBRATION IS REQUIRED.

SETTING OF CONTROL LIMITS

Two set points Hi and Lo are provided to give relay outputs for Alarm or ON-OFF control.

Setting of High limit : On the left side of the front panel is a push button switch marked Hi with a potentiometer just above the switch. Push the switch in to see the High limit setting. This setting is changed by keeping the switch pressed and turning the potentiometer.

Setting of Low limit : On the left side of the front panel is a push button switch marked Lo with a potentiometer just below the switch. Push the switch in to see the Low limit setting. This setting is changed by keeping the switch pressed and turning the potentiometer.

CONNECTING ELECTRODE AND THERMOCOMPENSATOR TO TRANSMITTER

(1) Pass the electrode and thermocompensator cables through the transmitter cable gland and connect to the transmitter as per attached connection diagram.

(2) Connect the transmitter to the indicating controller using 4 core shield cable (at least 7/.2 guage).

(3) Connect power supply 230 V 50 Hz to the instrument Ensure that the power supply has a good ground.

ASSEMBLY OF ELECTRODE HOUSING

(A) Flow through electrode housing

(1) Remove the top cover of the electrode housing by unsrewing the holder ring.

(2) Wet the pH electrode body, unscrew the gland nut on the housing and gently insert the pH electrode with slight twisting action till the electrode has gone in by about 75 mm.

Tighten the gland nut with hand.

(3) If separate glass and reference electrodes are used, remove the blanking piece from the second hole and insert the reference electrode just like the glass electode.

(4) Screw the thermocompensator into the housing using some teflon tape to seal.

(5)_If an external electrolyte reservoir is used, connect the electrolyte tubing to the reference electrode side arm.

(6) Pass the cables and the rubber tube through the opening on the top cover. Press the cover firmly on the O ring and tighten the holder ring.

(7) Now screw in the 1" Tee along with adapter to the housing top cover.

(8) Pass the cables through the side of the Tee through the cable gland.

(9) Fix the electrolyte reservoir base on the top of the Tee. Connect the rubber tube to the nipple of the reservoir and fix the reservoir by tightening the clamp ring.

B. IMMERSION TYPE HOUSINGS.

(1) Remove the top cover of the electrode housing by unsrewing the holder ring.

(2) Wet the pH electrode body, unscrew the gland nut on the housing and gently insert the pH electrode with slight twisting action till the electrode has gone in by about 75mm. Tighten the gland nut with hand.

(3) If separate glass and reference electrodes are used, remove the blanking piece from the second hole and insert the reference electrode just like the glass electode.

(4) Screw the thermocompensator into the housing using some teflon tape to seal.

(5) If an external electrolyte reservoir is used, connect the electrolyte tubing to the reference electrode side arm.

(6) Now screw in the extension pipe into the housing cover, screw in the mounting flange at the other end of the extension pipe.

(7) Pass the cables and the rubber tube through the opening on the top cover and through the extension pipe. Press the cover firmly on the 0 ring and tighten the holder ring.

(8) Screw in the 1" Tee along with adapter to the extension pipe above the mounting flange.

(9) Pass the cables through the side of the Tee through the cable gland.

(10) Fix the electrolyte reservoir base on the top of the Tee.
Connect the rubber tube to the nipple of the reservoir and fix the reservoir by tightening the clamp ring.

IMPORTANT POINTS TO BE OBSERVED FOR TROUBLE FREE OPERATIONS :

1) Before placing the valve in the pipe line, clean the line through out of all dirt, Welding chips, Scale, Oil, Grease foreign material.
2) If valve connections are smaller than the size of pipe, swaged nipples or reducing fitting should be used rather than bushings.
3) The compressed air should be clean and free from oil, water and dirt; please use lubricated air.
4) The valves may be mounted in any position, but advisable to be mounted vertically.

ANNEXURE - II

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR `AVCON' MAKE PNEUMATIC ACTUATED BALL VALVES

INSTALLATION

`AVCON' Pneumatic Actuated Ball Valves are heavy duty versatile and can be mounted in any direction, vertical or horizontal. Gaskets recommended are to be 1/8" more in diameter than valves flange diameter, so that placement and fixing is easier. They are for use on the pipe lines carrying liquids, air, gases and slurries. Normally dinkers are to be avoided.

MAINTENANCE

No maintenance is required except periodic inspection to ensure smooth operation. However changing seals and gland packing is recommended at least once in a year to avoid leakage. The actuators are provided with an inbuilt lubrication. For maintenance, refer to the maintenance manual enclosed.

REPLACEMENT OF SEAT AND SEALS :

1. Disconnect pneumatic supply line of actuator.
2. Unscrew the actuator from mounting and remove it from the bracket.
3. Remove the coupling and unscrew the bracket from the valve body.
4. Unscrew the nuts from the body studs, loosen the gland nut and remove from valve bonnet.
5. Remove the seat from body of the valve.

   A. Incase of three piece design, you can remove both side seats without removing the Ball.

B. In case of 2 piece or single piece construction, you have to push the Ball (sphere) from the body

and then only the other side seal can be replaced.

6. Remove the gland packings.
7. Replace seat and gland packings. (Ensure they are factory supplied to avoid damage and leakage problems).
8. Replace the Ball (sphere) into body.
9. Connect stem from the bonnet in proper slot provided on the Ball.
10. Replace gland packing.
11. Fix the gland nut.
12. Fix the end pieces, tighten the nuts over studs.
13. Fix the mounting bracket.
14. Adjust the Ball to original position by wrench on the stem.
15. Replace adopter coupling.
16. Replace the actuator properly, correct it to adopter. Tighter the mounting bolts.
17. Correct the airline.

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR 3300 PNEUMATIC ACTUATOR
DOUBLE ACTING AND SPRING RETURN

PRIMA
SERIES
3300

INTRODUCTION :

PRIMA Series 3300 Actuators are compact Pneumatic Actuators, based on rack and pinion principle, using two opposite playing pistons, operating around a centrally located driving shaft which rotates through 90° (approximately). The pistons are located on S.S.guide rods running on synthetic bearings in the end covers and are operated by internal air distribution system through the hollow guide rod bore. Refer to diagram fig. No. 1 &2.

It is necessary for all maintenance personnel, to aqquaint themselves throughly with the information and recommendation described in this manual before handling the actuator and the accessories. Please refer to the safety instructions in the last section.

GENERAL :

Please refer to the relevant literature of actuators for technical data. Before attempting the installation, study carefully the specifications of requirement of valves to determine, whether actuator to be used in Double Acting or Single Acting design; also fail to close the valve or fail to open the valve.

All standard actuators operate satisfactorily with the air-line pressure upto 8.2 kg/cm^2 . The actuators are sized with regards to the torque requirement to open or close the valve at a particular line pressure. Care must be taken to provide specified operating pressure.

ROTATION :

The actuators turn normally through a full 90 ° angular rotation with overrun of Zero to 11/2 ° at each end of the stroke.

OPERATING TEMPERATURE :

-10° C to +80° C, Whenever the actuators are used below zero degree temperature, operating media should and must be free from moisture. Lubricated or unlubricated compressed air is a most usual operating media. The air provided for operation should be filtered and moisture removed, filtration is necessary, especially for old pipe line or during pre-commissioning to prevent the particles entering the actuator and control valve. Any media other than air should be clean, free from injurious elements detrimenal to Aluminium constructional material. Better refer to PRIMA for clarifications.

A suitable direction control valve should be installed for the operation of the actuator. The Direction control valve should be installed as close to the actuator as possible, for optimum response time, More care should be taken to the factors like velocity, weight, etc. so that actuator rotation does not induce detrimenal pressure surge to the actuator parts or valve in the main pipeline. While away from actuator, due consideration should be given to the pressure drop offered by the interconnecting pipeline.

TYPES :

Actuators are available in Suffix `D' - Double Acting. Air ports are located on the end-covers of the actuators. Introduction of air to the right hand port rotates the actuator driving pinion in anticlockwise direction, while exhausting air from the left hand port. Introduction of air to the left hand port rotates the actuator driving pinion in clockwise directior. While exhausting air from opposite port.

Suffix `S' - Spring Return (Single Acting). Introduction of air is only done through right hand port. Air pressure rotates the actuator driving pinion through anticlockwise direction. If air supply is cut-off and exhausted, the actuator rotates clockwise with the help of returning springs, thereby moving the valve or auxiliary equipment to fail safe position. The exhaust ports are fitted with breather silencer; in case of corrosive and dirty environment the exhaust port must be piped to the natural atmosphere.

Double Acting actuator can be provided with 4-way, 2-position Solenoid Valve. While Spring Return type can be provided with 3-way, 2-position Solenoid Valve. Minimum air pressure requirement for Solenoid Operated Actuator is 2.8 kg/cm^2 . Many a times process requirement calls for manual operation of actuator. Double Acting and Spring Return Actuator - 3304 and 3305 models can be provided with direct operation lever. Model 3306 and above can be provided with geared actuation system. The safety should be provided to refrain the operation of actuator manually when pneumatic operation is to be provided. The arrangement must be made to shut off and exhaust the airline pressure before attempting manual operation.

ACCESSORIES :

The actuators are available with accessories such as manual operators, solenoid valves, air operated limit switches, proximity switches, filter regulators, lubricator set, valve positioners, etc.

MAINTENANCE :

Before attempting any maintenance, isolate actuator pneumatically and electrically. It is recommended that only genuine replacement parts be used.

Lubrication - All actuators are supplied sufficiently greased for their normal working life. If required, air can be lubricated with Castoral Hysping, Shell Tell-us or equivalent lubricants. Designed for ambient temperature range upto 50° C.

REPAIR KITS :

It is adviseable to introduce routine maintenance schedule. For this purpose repair kit is necessary. Keep sufficient quantity of repair kits in stock. Also the spares required for accessories may be carried in stock. In case of Spring Return actuator, springs may be needed to be changed after prolonged duty. Springs should be replaced in complete set. All spares are promptly delivered from PRIMA Factory.

TOOLS :

For Double Acting Actuators, no special tools are required. For Spring Return Actuators, model no.3306-S and above, a special long assembly bolts may be required, to relieve the spring tension.

SYMPTONS	POSSIBLE FAULT	CHECK	RECTIFICATION
	Air is escaping through exhaust port of the valve	Ensure the seals are intact	Change the seals or soft rubber parts of the valve.
Operational failure of actuator where fitted with solenoid control valve.	Damaged coils	Introduce power supply and check for clicking sound	If clicking sound is absent replace coil. Clean parts specially plunger seats before assembly.
	Defective and jammed valve	Ensure valve body or spool is driven to one corner and do not return to other side by changing the circuit.	Open the valve. Check for damaged or swollen rings and seats. Replace soft seated parts with maintenance spares supplied by the manufacturer.
Limit switches	No electrical	For the soundness of	Tighten loose screws

failure of to operate	indication. Electrical or mechanical failure of circuit.	the limit switches Check limit switches operating cams for displacement. Perform electrical test independent of actuator operations	provided on the cams replace faulty limit switches.

DIS-ASSEMBLY : (Refer fig.no.3)

Disconnect all electrical and mechanical connections or ancilliary equipment which are likely to prevent full access. Then remove actuator from the equipment.

To Disassemble Double Acting Actuator

a) Remove cap screw fitted at the end.

b) Rotate the driving pinion in the anti-clockwise direction, till 'O ring fitted on the end cap emerges from the body.

c) Mark end caps and body before removal to ensure correct assembly. Remove end caps.

d) Continue to rotate further driving pinion in anticlockwise direction till piston reaches end of travel.

e) Remove pistons from body by pulling the protuding guide rods.

f) Remove circlip and washer from top of the driving pinion.

g) Push driving pinion clear of body out through base of actuator body.

h) To release guide rods from piston, unscrew set into the side of each piston and withdraw it from the rack side of the piston.

FAULT FINDING CHART :

SYMPTONS	POSSIBLE FAULT	CHECK	RECTIFICATION
	Double Acting/ Spring Return		
	Lower air supply pressure	Air line and joints for leakage or blockage.	Remove leakage or blockage from pipeline
	Incorrect Assembly	As per the assembly instructions	Re-assemble correctly
No movement of driving pinion.	Hardened grease between the driving pinion and piston rack.	By visual examination	Clean with paraffin, dry off, regrease and reassemble.
	Spring Return		
	Spring Return units. Displaced or broken spring	Spring for displacement or failure	Replace all the springs if one out of them is buckled, damaged or failed. Inspect body bore for scratches, if found no scoring, replace piston seals, `O rings, etc. As necessary.

Excessive back-lash	Worn out piston rack due to prolong use or excessive load	Movement of driving pinion by spanner fitted across the flated extension.	Replace piston assemblies, remove excessive load
	Spring Return		
Noisy Operations			
Failure to open or close valve at 15% less than specified working pressure.	Displaced or broken spring	Spring for displacement or failure	Replace all the spring if one piece is buckled, damaged or failed. Check body bore for scratches. If found with no scoring change piston 'O' seals if necessary.

Foring Return Unit - (Refer fig. No.4)

Upto and including Actuator model 3305-S, cap screw provided on the Spring Return Type Actuators are normally sufficient in length to completely release spring compression. The model 3306-S and above, use special long bolts for relieving spring compression - Refer fig. No.5.

a) Remove end cap screw diagonally, if not done the spring will lock the end cap, preventing complete removal of parts.
b) In case where there are less than 12-springs in each end cap, carefully note the position of spring in the end cap to ensure actuator is reassembled correctly.
c) If above procedure has been correctly followed, complete disassembly of all sizes of spring return actuator is identical to Double Acting Actuators.

REPAIR KIT containing soft seals should be carried in stock and all seals should be replaced while re-assembling. To replace `O rings on driving pinion shaft, remove damaged `O rings from the body and examine the pinion shaft.

Parts for Body :

a) If body bore is undamaged, remove old `O rings replace with new ones, assemble the actuator as per the instructions of reassembly.
b) If body bore is damaged, remove actuator and replace with new one.
c) To replace piston `O ring, replace large `O ring if necessary. Examine smaller guide `O ring. If necessary remove the guide rods from the piston following the instruction of preceding paragraph.

RE-ASSEMBLY :

Double Acting Actuators (without springs) coded as `D'. Refer to Fig. No. 6 and 7. Also for nomenclature, please refer to figure no.3 - exploded view and part list.

Note : Where greasing is specified use SPHEEROL-BW or equivalent.

a) A one pair of piston and guide rod assembly comprises -
   2 pistons (identical)
   1 guide rod with double hole
   1 guide rod with dimple
   2 set screws

b) Inspect all bearings and `O ring grooves are clean and smooth.

c) Fit one bearing and two small `O rings to each piston. Bearing grooves are wider and shallower than those for the `O rings.

d) Inspect the guide rod for scoring or other damages, replace if necessary.

e) Select a guide rod with through hole and after greasing, slide the end nearest to the through hole from the rack side of the piston. This will prevent the free hole damaging the `O ring.

f) Align the piston boss set screw hole and guide rod hole. Tighten the set screws and lock with Araldite or equivalent.

g) Repeat (e) and (f) with other piston and the dimpled guide rod.

h) Ensure that driving pinion bore in the body tube are undamaged; now insert new `O seals in the top and bottom driving pinion bores in the bodt

i) Lightly grease the `O seals and driving pinion. Insert the latter through the large bore of the tube.

j) Let the driving pinion come out through the smaller bore. Replace the hard rubber washer between the body and driving pinion circlip, then snap the circlip, then snap the circlip into its grooves.

k) Change the two main piston `O rings and lightly grease.

l) Grease the rack and body bore.

m) Slide the piston rod assemblies in through each end of the body, so that the rack teeth engage correctly with the driving pinion.

---

n) Rotate driving pinion clockwise so that the piston comes together. In this position the driving pinion gear flats should be at right angle to the body axis (Refer fig. 7).

o) Select one end of the rube and one end cover. Inspect all `O rings and bearing grooves are cleaned. Fit `O rings and bearings.

p) It is very important that end covers are replaced in the correct way or loss of power will result (See Fault Finding Chart).

q) Slide the end covers squarely into their relative end of the body.

(We have provided a location pin to avoid misalignment. Observe the correct end cap is installed at right end).

Spring Return Actuators are coded as `S'.

---

a) Follow above procedure upto step no.`p' observed in Double acting actuator.

b) Grease heavily one end of each spring and locate each spring into spring pockets in actuator and cap. If the actuator has less than 12-springs in each end cap, replace spring exactly as they were while disassemblying.

c) Carefully slide end covers squarely into their relative end of body assembly. All the springs MUST locate into their relative guide on the piston.

d) Tighten end cover portion diagonally, evenly and in small stages.

e) To fully locate springs, apply an increasing air supply to the actuator in steps upto 80 psi.

FOR OPTIONAL ASSEMBLES :

Please refer to the separate instruction manual.

RETESTING :

Double acting actuator-air-leaks on assembly. The maximum permissible air leakage rate across the actuator port is plain water is 5 bubbles per second. All actuators are tested to this specification before despatch. The air leakage in excess of this may not effect the performance, but may be unacceptable for other reasons like air is expensive.

CHECK AIR-LEAK :

a) With only one airline attach to the inlet port, check the leak rate at the opposite port when 8.2 bar (120 psi) pressure is applied.

b) Reverse the air connection and check for leakage in the opposite direction.

c) Check for leakage at the top and bottom of driving pinion by brushing a soap solution on the joint areas with 8.2 bar (120 psi) air pressure applied to the right hand port of the actuator.

d) Check there is no leakage between the end cover and body by brushing a soap solution on the joint areas with 8.2 bar pressure applied to the left hand port of the actuator.

e) Before replacing actuator on the valve, check that the full 90 ° movement takes place, using air pressure of 0.65 bar (10 psi) through right hand port pressurised.

f) Ensure that the end covers have been replaced in correct way up and ensure that actuator rotates anticlockwise (when viewed from the top).

SPRING RETURN ACTUATOR-AIR-LEAK CHECK

Air leakage should be checked as per Double Acting Actuator, the only exception to the procedure is that, inspection need only be done in one direction with airline connected to the right hand port.

b) Inspect leakage through driving pinion as carried out in Double Acting Actuator.

c) Inspection for leakage through body end cover joint is not necessary for spring return actuator.

d) Inspection should also be made when full 90 ° movement takes place, using air pressure of 5.5 bar (apprx. 80 psi) to ensure correct spring setting for 24-springs set only.

VALVE POSITION INDICATOR

All Actuators supplied without attachment incorporated to the driving pinion extension are supplied with indicator. These are supplied fitted directly on the actuator. The same contains one plastic indicator, one socket screw. This indicator is provided for indicating driving pinion position with respect to the indicated air ports. Care should be taken while assemblying and disassemblying for any purpose that indicator is assembled and aligned with correct position. It is potentially dangerous if indicator is showing wrong position. Indicators are nor designed to act as manual over ride handle or levers. The indicator fitted on the existing series 3300 Actuators can be used to indicate the relative valve flow condition.

SAFETY INSTRUCTIONS :

a) In all cases care must be taken to ensure the correct use of the actuator within the parameters of actuator specifications. Apply adequate safety factor and with due consideration to the potential hazards to health and safety of the individual application. Once actuator has been properly installed, precaution should be taken to ensure unauthorised interference does not degrade the safety margin

b) Care should be taken that correct piping, adequate quality of pipe fitting, electrical wiring is used. Electrical parts should be properly connected and adequate earthing is carried out. Isolate electric and pneumatic connections before attempting any maintenance or readjustments.

c) Due consideration should be given to the fail safe aspect of Spring Return Actuators, when used with solenoid operated valves. Proper consideration should be given to a situation when accidental failure of air or electrical power occurs.

d) The bolts fitted through end covers are only adequate for carrying out sealing aspect between the body and end cover. These bolts should not be used for anchoring any additional fitting. The end covers are not suitable for carrying a weight of any additional attachment are used a separate mounting arrangement should be made. Whenever the actuators is lifted from the body of the valve or fitting of the valve, this should be ensured that actuator is lifted vertically and steadily. Projection of actuator or attachment should not be used for alinging purpose.

e) Should it be necessary to remove the actuator from the installation, note relative position of all driving and driven members and ensure that same relationship on reassembly.

f) In case you have any doubt regarding the installation or whatsoever nature, contact PRIMA Sales.

These instructions are likely to change without notice, for the purpose of improvement of specifications and designs.

ITEM NO.	DESCRIPTION	MATERIAL	QTY./ UNIT	SPECIFICATION
1.	ACTUATOR BODY	HE-30 TF	1-No	EXTRUDED
2.	`O' RING (BIG BORE)*	VITON	1-No	
3.	`O RING (SMALL BORE)*	VITON	1-No	
4.	PINION	EN-24	1-No.	
5.	PINION FLANGE	EN-24	1-No	
6.	CIRCLIP (PINION FLANGE)	EN-45	1-No	
7.	RETAINING RING	EN-45	1-No	
8.	CUSHIONING RING	NITRILE	1-No	MOULDED
9.	WASHER	S.S.304	1-No	
10.	CIRCLIP	EN-45	1-No	
11.	PISTON	LM-6	2-Nos	DIE CASTED
12.	`O RING (PISTON)*	VITON	2-Nos	
13.	CONNECTING ROD (WITH DIMPLE)	SS 304	1-No	HARD CHROME PLATED
14.	CONNECTED ROD (WITH THRO' HOLE)	SS-304	1-No	HARD CHROME PLATED
15.	LOCKING SCREW	IS-2269	2-Nos	
16.	`O RING (PISTON & ENDCOVER)	VITON	8-Nos	
17.	SPRINGS*	SPRING STEEL	24-Nos	

18.	TEFLON GUIDE RING (PISTON & ENDCOVER)	TEFLON	6-Nos	
19.	`O RING (END COVER)	NITRILE	2-Nos	
20.	END COVER (BLIND)	LM-25	1-No	DIE CASTED
21.	END COVER (INLET)	LM-25	1-No	DIE CASTED
22.	ALLEN SCREWS	IS-2269	8-Nos	
23.	NAME PLATE	ALUMINIUM	1-No	
24.	HELICOIL INSERTS	SS 304	8-Nos	
25.	INDICATOR	PLASTIC	1-No	
26.	`OPEN' `CLOSE' LABEL	METTALLIC	2-Nos.	

* Changeable spare parts.

INSTALLATION & MAINTENANCE INSTRUCTIONS 6616D/6619D
6622D 6612D

DESCRIPTION : Type 6612/6622/6616/6619d series valves are Screwed and soft seated, Angle pattern, Pneumatic Operated Valves. In order to avoid stocking of several materials and to produce commercially viable but high quality product at moderate price, AVCON has used a technic of Stainless steel investment casting for bodies, bonnets and Aluminium die casting for actuator. The sizing of actuator have been based on available pilot air pressure in most of the industries. All valves are working satisfactorily with pilot air pressure between 2.5 to 6 bar when fluid pressure supplied to the Main valve is 10 bar. Valves can be used in either way, i.e. Flow to close the plug or Flow to open the plug. For maximum pressure differential, refer to product literature.

Valves are suitably applicable on air, water,oil, chemicals, acidic as well as alkaline fluid, fruit, steam and (with little modification for vacuum). Pilot fluid can be either air duty or lubricated or inert gas.

Bonnets are packed with Teflon Vee Ring packs, spring loaded, self compensating to adjust by itself, to compensate for wear. Prior to seal, Graphile wiper ring is provided which wipes fluid struck to stem, prior to passing through gland packing. Gland packing is non-pressurised type.

ACTUATORS : Actuator is Piston Cylinder Type, fitted with powerful return spring. The actuators are normally reversible, i.e. valves which are normally closed can be reversed to act as normally open, by changing spring position from top to bottom. Ofcourse, pilot air connection is also required to be changed. However, it is adviseable to order out valves from factory, either in normally closed or normally open conditions. Actuators are provided with mechanical position indicator fixed underneath the

transparent soft cap. The cap protects indicator from dust and other environmental pollutants.

LUBRICATION : For normal working of the valve at very low reprtition, actuator does not need any lubrication, as the same is lubricated with special grease. If the valve is to be used on rapid cycling process, then the actuator is required to be lubricated by good quality mocrofag lubrication system.

MOUNTING POSITION : Valve can be fitted in Universal position, vertically, horizontally, Inverted.

FITTING OF END CONNECTIONS : Valves are provided either with BSP/NPT end connections. Please check up name plates. Good quality threaded, clean pipe should be used for pipeline assembly, hold pipe in the vice. Screw the valve end on to the pipe. Use pipe wrench, never use ACTUATOR AS A LEVER. Use Trflon tape or Loctite no.577, as pipe sealant. Before fixing up pipe, the pipeline should be thoroughly cleaned and blown to avoid metallic swarf coming into the valve.

INSTALLATION : Install pilot air or gas pipeline through 3-way Solenoid Valve or Mechanical Valve (one inlet, one outlet and one exhaust). Use pressure, from 3 to 6 bar, for efficient opening.

SERVICING : For any reason valve is required to be disassembled, the same should be done inaccordance with exploded view shown herewith. Spare parts are provided in Kit form. It is better to replace the entire spare kit at the time of servicing. This saves further down time.

CLEANING : Clean internals of the valve with solvent like kerosene, carbon tetra chloride, followed by hot water and cold water wash. Air should be blown after hot or cold water wash. Actuator should be dismantled and cleaned with CTC or kerosene. Normally upto 1 Million cycle, part no.18 will not require replacement. This seal will get damaged if AIR PRESSURE EXCEED ABOVE 6 BAR. Whenever actuator is being opened, air must be released. It is better for safety reason to remove air connections. Main valve body is assembled condition can be sterlized by passing steam if fitted with teflonseat.

TROUBLE SHOOTING :

	SYMPTOMS	LOOK FOR	REMEDY
1A	Valve does not open	High line pressure	Line pressure should be less then 10 bar.
B		Low pilot air pressure	Increase pilot air pressure between 3 to 6 bar.
2A	Main valve leaks	Worn out seat	Change seating.
B		Entrapment of some particle between soft seat and metal seat.	Clean the valve, if there is a dent mark on soft seat, change soft seat.
C		Loose or broken spring.	Change spring
3	Valve gives pipeline hammer	Excessive pressure	Change direction of valve. Flow to open seat helps in reducing pipeline hammer.(additional spring needed).

4.	Fluid coming through vent hole.	Damage or worn out spindle packing	Change spindle packing with genulne AVCON spare parts.
5.	Pilot air pressure coming through vant hole.	Damaged part seal part	Change seal.

NOTE : Periodic Inspection of the valve is recommended. Use of strainer on the fluidline with 0.01 mm hole is recommended. Use of Non-Return Valve helps to stop back pressure being built from outlet side. Care should be taken while using chemical fluids. The fluid should be non-injurious to body, bonnet, spindle and seat material. Excessive thick fluid or slurry which can dry inside the valve is dangerous. Perhaps, the complete valve is required to be thrown because of blocking. It is always advisable to take advantages of slanted port position of the valve, to keep valve clean. Wehnever using thick fluids like furnace oil, wax, etc.heating of flowing media and recirculation pressure will definitely delp in keeping valve in working order. Use genuine spare parts supplied by AVCON. Using spurious parts reduces safety of the equipment.

INSTALLATION & MAINTENANCE INSTRUCTIONS **FOR THREE WAY, DIRECT ACTING/INTERNALLY PILOT OPERATED SOLENOID VALVES. TYPE 9350/52, 9353,9351/52, NORMALLY CLOSED/NORMALLY OPEN/UNIVERSAL TYPE .**	avcon INSTRUCTIONS MANUAL 9350/52,9353,9351/52

DESCRIPTION : Type 9350 Valves are 3-way, 2-position, Direct Acting Solenoid Valves available in normally closed construction. These are standard valves provided with General Purpose Enclosure.

9350/FLP OR P5-II valves are fitted with Explosion/Flameproof enclosures as per Is 2148 for use in area Group I, IIA & B. The enclosure also comply with IS 4013 of 1967 as dust tight enclosure, Is 2147 of 1962 for Protection Class upto Ip-67.

Type 9353 - is similar to basic type 9350 Valve. but is available in universal construction.

Type 9352 - is simialr to the basic type 9350 Valve, except the valve is available in Normally Open construction.

Type 9351A5 - is a pilot operated, normally closed, quick exhausting type valve.

Type 9352A5 - is normally Open, quick exhausting type valve.

Type 9351A6 to A9 - are normally inlet closed, 3-way, 2-position valves connecting outlet port closing exchaust. On energisation, the inlet is closed and outlet is connected to exchaust.

Type 9352A6 to A9, are normally inlet open type - pressure is allowed to pass to the outlet port closing exhaust. On energisation, the inlet is closed and outlet is connected to exhaust.

ALL THE ABOVE VALVES ARE SIMILAR TO THE BASIC VALVE TYPE 9350 AND ARE FITTED WITH GENERAL PURPOSE ENCLOSURE. WHEN SUFFIX FLP P5 or P5 II IS ADDED TO THE VALVE CATALOGUE NO.INDICATES, FITTED ENCLOSURE IS OF FLAMEPROOF TYPE.

Manual Operator : (Optional feature) - Valve with suffix MO is provided with Manual operator which allows manual operation during the power interruption or circuit check up.. Valve types 9350/52 & 53 are provided with Manual operator at the bottom. Push the operator button upward and twist clock-wise to lock valve in position. Whenever the operator is to be released, twist the button anti-clock-wise and let it return to the original position. Valve Types 9351A5 to A9 and 9352A5 to A9 are provided with screw driver operated manual override pins. Just to operate the valve, twist the operator pin with a screw driver clock-wise; the valve can lock in this position. To bring the pin in its own position of flow depending upon normally closed or normally open type valve supplied.

Minimum Operating Pressure :3-way Valves type 9350/52 & 53 do not require minimum operating pressure differential. However, the valve types 9351A5 to A9 and 9352A5 to A9 require minimum operating pressure differential for satisfactory opening and closing, please check the name plate details. The valve operation depends on the back pressure experienced from the outlet side. DO NOT TRY TO OPERATE THE

VALVE WITHOUT INSTALLING PNEUMATIC CYLINDER OR DIAPHRAGM ACTUATOR TO THE OUTLET SIDE OF THE VALVE. Ignoring this instruction, valve may not change the position of the flow. Similarly, when using large ported valve do not connect small size pipeline in the inlet side. This may cause throttling-pulsating operation or mal-functioning of the valve. Do not try to obstruct exhaust port by installing small size exhaust muffler or introducing small ported aperture, may result in unsatisfacotry working of the valve. When using exhaust silencer or muffler ensure the total free surface area is twice the area of port size. Do not obstruct pilot exhaust port. While installing valve exhaust ports by installing proper silencer or protective nipple. AVCON Solenoid Valves are practically hum free and are ineffected by vibrations. They can be mounted in any position, but preferably solenoid upright. Valves function satisfactorily on clean dry or lubricated air. Valves are designed for use on maximum ambient temperature of 50° C.

INSTALLATION : Check name plate details for correct catalogue no pressure, temperature, flowing media, voltage. Ensure correct minimum operating pressure differential which necessary to function the valve satisfactorily.

MOUNTING : Mounting bracket can be fixed with the help of tappings in the body cover bolts. AVCON provides specially made, plated, side mounting brackets, on special orders.

PIPING : Connect the valve in the pipeline in accordance with the block diagrams printed overleaf. Normally closed and normally open construction are factory set and cannot be changed in the field. However for advise, you may refer to AVCON. If necessary apply pipe sealing compound sparingly to the male fittings only. Excessive use of piping compound or if applied to the valve female threads, may enter the valve and cause operational difficulties.

Avoid piping strain on the valve by providing proper support and alignment of piping. When tightening the pipe do not use the valve body and solenoid portion as a lever, as this may cause damage to the precision made tube assembly. Blow the pipe with air or water before attempting installation of the Solenoid Valve on line.

Minute partices, dust and other foreign matters occasionally carried along by the fluid, as a rule, remain stuck near the valve disc and prevent the valve from closing properly. Also they are likely to become jammed between the stationery core and movable core (Plunger) and thus cause humming when the coil is energised. If the movable core (Plunger) becomes jammed; due to foreign matter inside the valve, or damaged core tube - the coil will become over heated and may cause burn out. While attempting new installation small particles in the pipe, gasket seal compound, rust, med, scale may spoil the working of valve. This is strongly recommended that new piping system should be thoroughly cleaned and then valve be installed. Also installation of the filter at the inlet side is strongly recommended, to protect the valve parts and seating surface against failure.

COILS : With 9350 catalogue valves, normally class `B' insulation bobbin wound or class `F' insuLated polyamide moulded coils are provided. Coils are available for all standard A.C. or D.C> voltage supply. Interchanging of coils for A.C. to D.C. is not recommended. Standard catalogue valves are supplied with coils designed for continuous duty service. When the solenoid is energised for long period, the solenoid becomes hot to the extent, which cannot be touched lightly by bare hand. This is the safe operating temperture. Any excessive heating will be indicated by smoke and odour of burning of coil insulation.

Wiring : Wiring must comply with local and IS specification. The Solenoid enclosure is provided with (1/2") BS Conduit female threads. While installing condult pipe or cable gland remove the coil enclosure from the valve and re-install after fixing conduit or cable gland. Do not attempt to fix the conduit or cable gland while the enclosure is right on the

valve body. Failure to observe the instructions, may result damage to valve core tube assembly, effecting working of valve seriously.

IMPORTANT : Alternating current (AC) and Direct current (DC) Solenoids, are built individually. To convert from one to another it is necessary to change the complete Solenoid assembly including the base and core.

OPERATING FLUID : During final inspection, before leaving the factory, AVCON Solenoid Valves are checked thoroughly at pressures exceeding to those given in the catalogue. Naturally, it is inadvisable to operate the valve repeatedly at excessive pressure. This may result in faulty operations, leakage, erratic working, blocking of pilot mechanism and shortening the life of valve components, etc. Ensure correct supply of minimum and maximum pressure to the valve.

IMPORTANT : Use the valve only for the fluid as specified in the name plate. Change in fluid may result valve stop working. To control speed of operation. Flow control valve may be installed between the valve and cylinder or diaphragm. While installing Flow control valve, observe direction of free flow and restricted flow. Ensure valve has minimum operating pressure differential as given in the name plate.

MAINTENANCE : Before attempting valve maintenance, isolate electric power and cut off line pressure to the valve. Perhaps, it is necessary to remove the valve from pipeline for repair.

CLEANING : Periodic cleaning of Solenoid Valve is desireable. The time between cleaning will vary depending on media and servide conditions. In general, if the voltage to the coil is correct, sluggish valve operation ot excessive leakage will indicate that cleaning is required. Dismantle the valve parts, one by one, using proper spanners or whenches. Use Kerosene or Carbon Tetra Chloride for cleaning the diaphragm, core tube, etc. Before assembly, wipe all the parts dry. Install the parts in the reverse order of

dismantling. Turn the line pressure and electrical power. First try to check up the valve operation through manual override, if provided with.

TROUBLE SHOOTING : 1. Faulty Control Circuit; Check the electrical system by energising the solenoid. The click signifles the solenoid is operating; absence of click indicates loss of power supply or interruption. Check for the loose or blown-off fuses, open circuited or grounded coil, broken lead wire or splice connection.

2. Brunt out coil; Check for open circuited coil, replace coil if necessary.

3. Low voltage; Check voltage across the coil lead. Voltage must be atleast 90% of name plate rating. Similarly over voltage may cause damage to the coil.

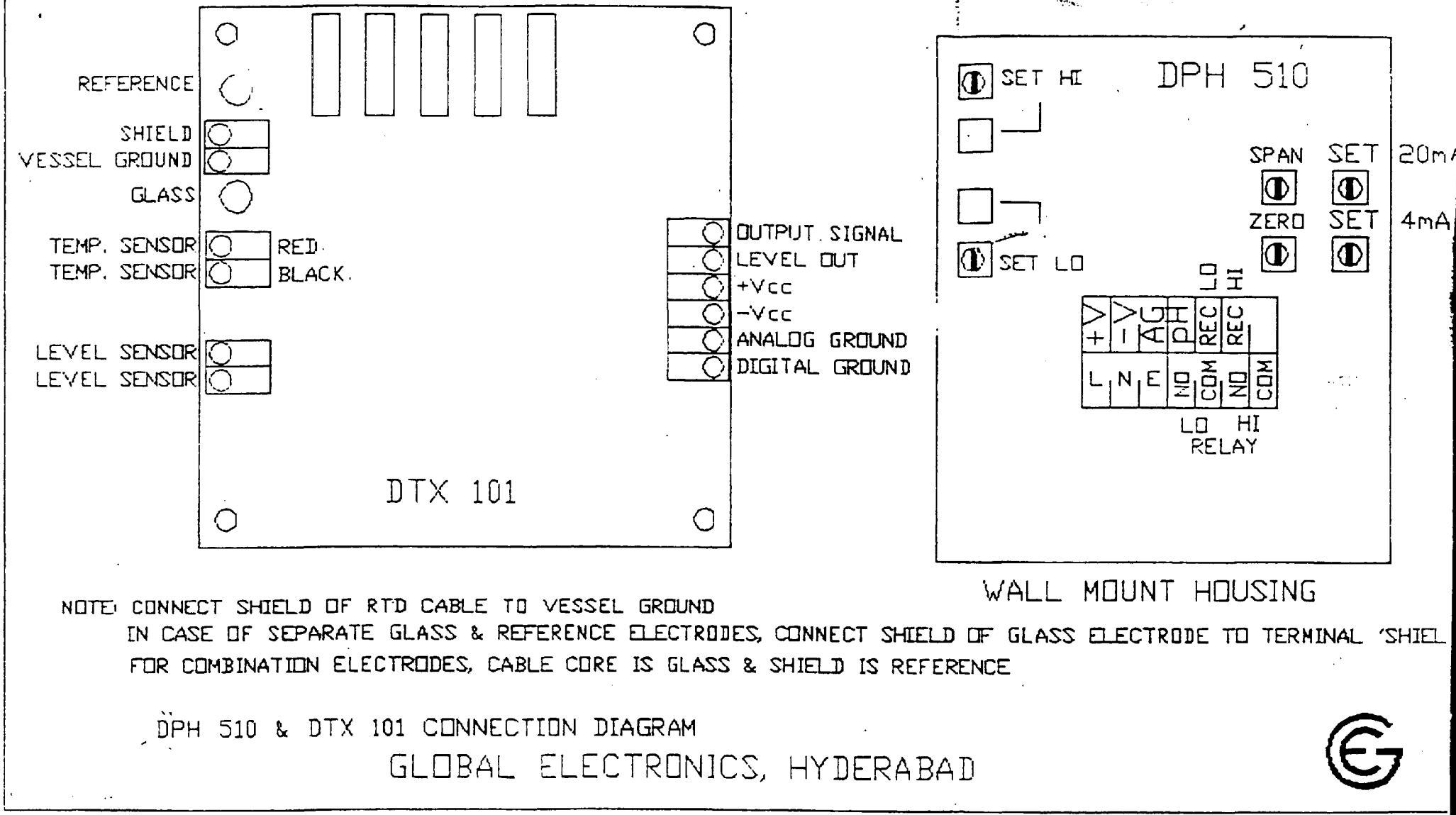
4. Correct Pressure : Check fluid pressure, pressure to valve must be within the range specified on name plate. Check for minimum pressure.

5. Excessive leakage : Dismantle the valve and clean all parts. Replace the parts that are worn out or damaged. Use complete spare part kit for the best results. Tighten all the parts to 4.5 kg cm. Torque wrench.

6. Jammed Plunger : If the plunger is found jammed look for the throughness of tube assembly. If the tube assembly is found damaged while working or installation, complete tube assembly may be replaced.

7. Hundting or pulsating valve operation. Check inlet pipe connection, ensure full opening of the hand operated valve and sufficient quantity of flow and pressure, inorder to operate the valve satisfactorily. It is incorrect to use small size pipeline on large ported valve.

8. When using normally open valve, ensure bleed pipe for tightness. Loose orleaky bleed pipe may result in non-function of the valve.



NOTE: CONNECT SHIELD OF RTD CABLE TO VESSEL GROUND
IN CASE OF SEPARATE GLASS & REFERENCE ELECTRODES, CONNECT SHIELD OF GLASS ELECTRODE TO TERMINAL 'SHIEL
FOR COMBINATION ELECTRODES, CABLE CORE IS GLASS & SHIELD IS REFERENCE

DPH 510 & DTX 101 CONNECTION DIAGRAM

GLOBAL ELECTRONICS, HYDERABAD

Double Acting Actuator

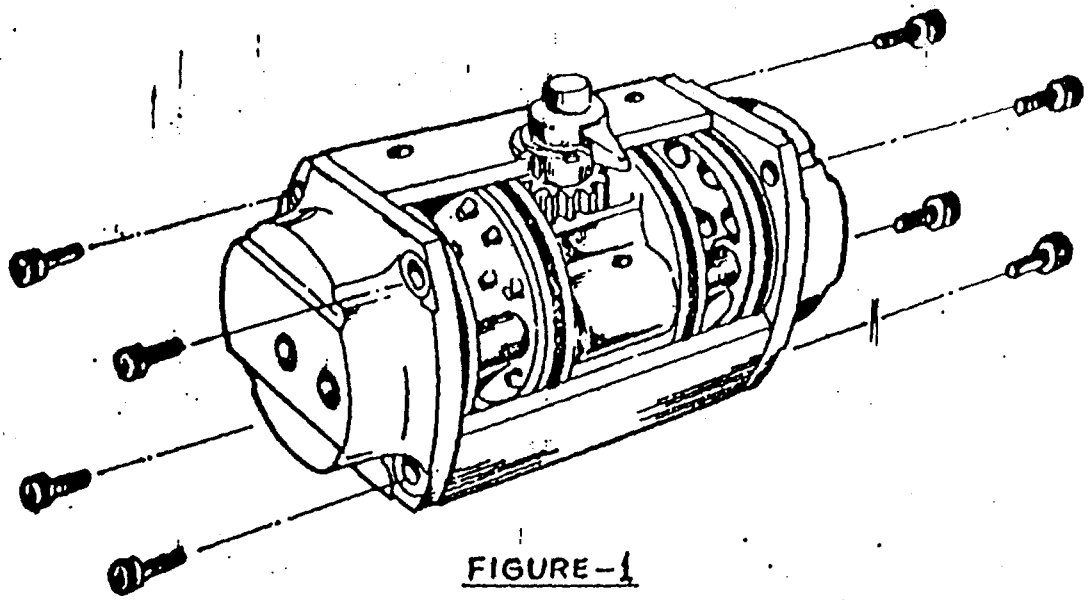


FIGURE-1

Spring Return Actuator

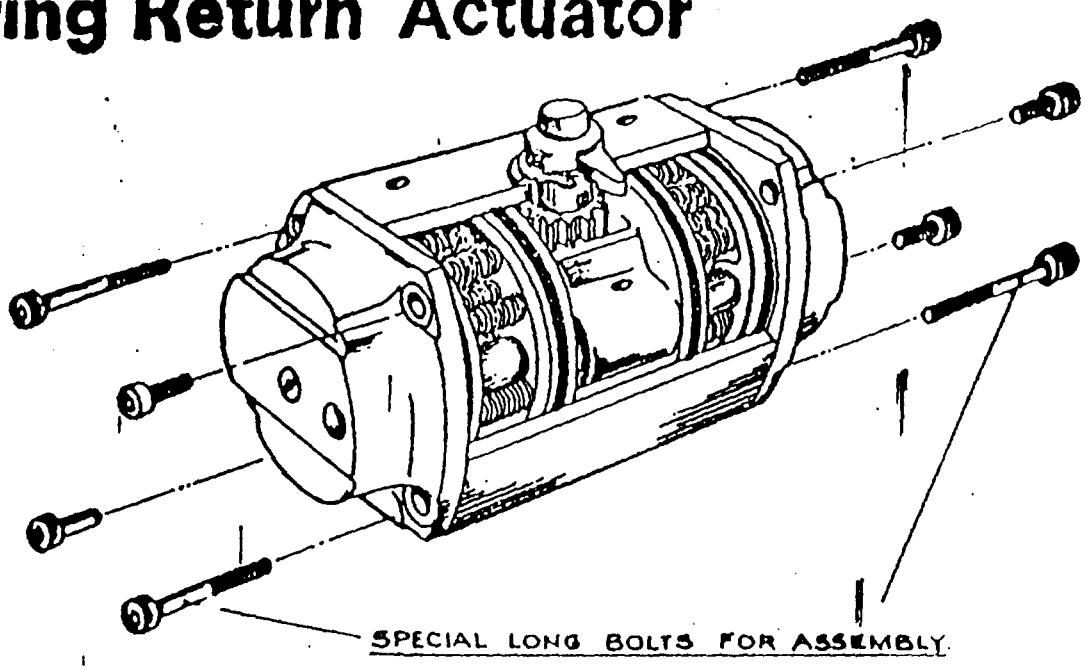


FIGURE - 2

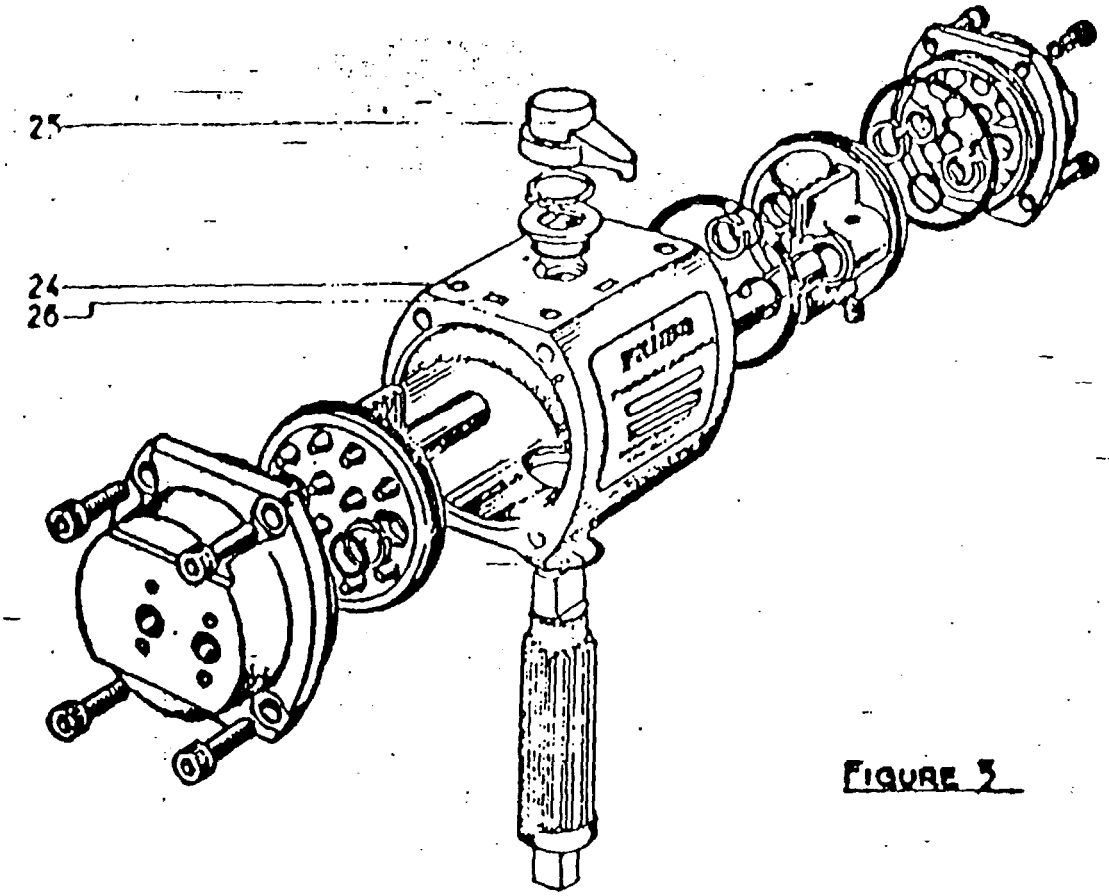


FIGURE 3

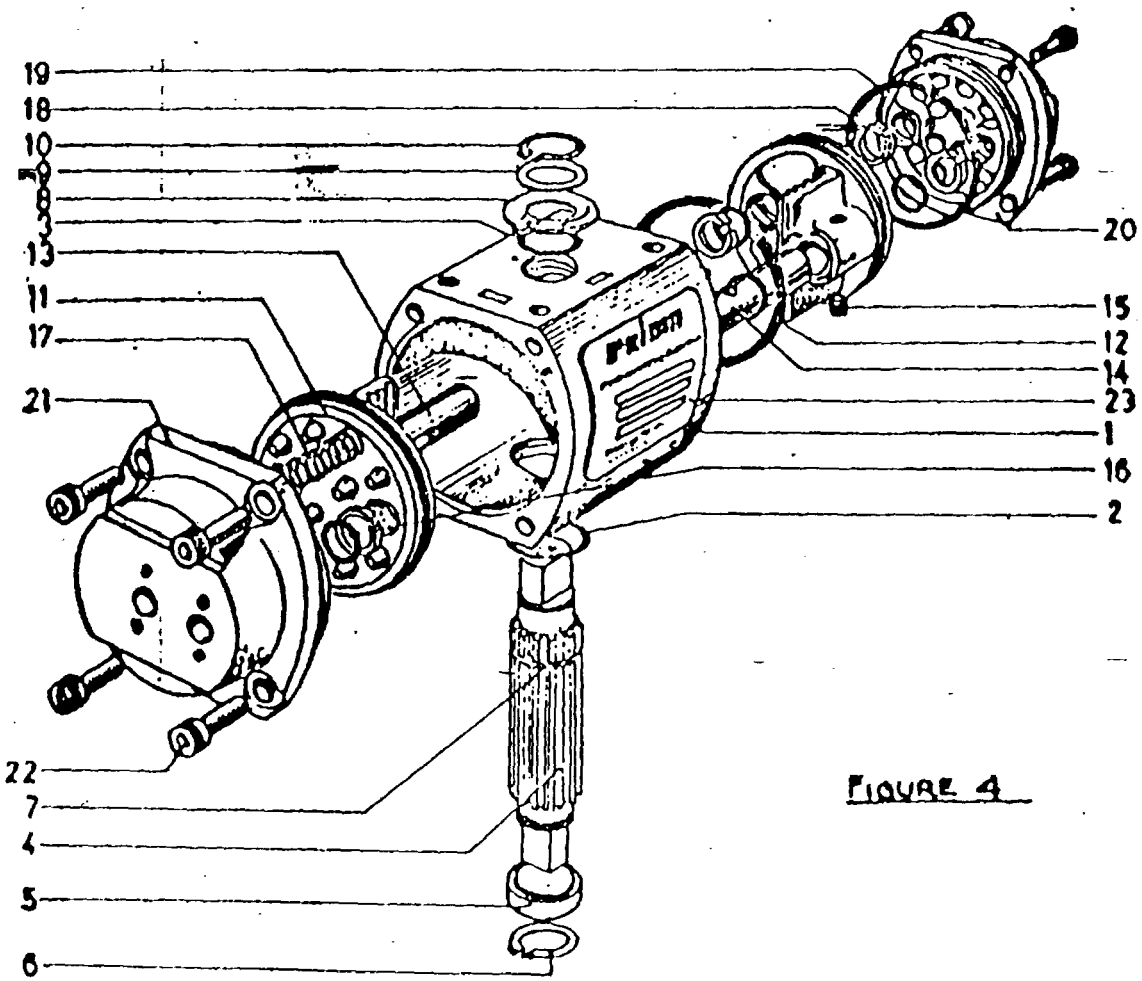
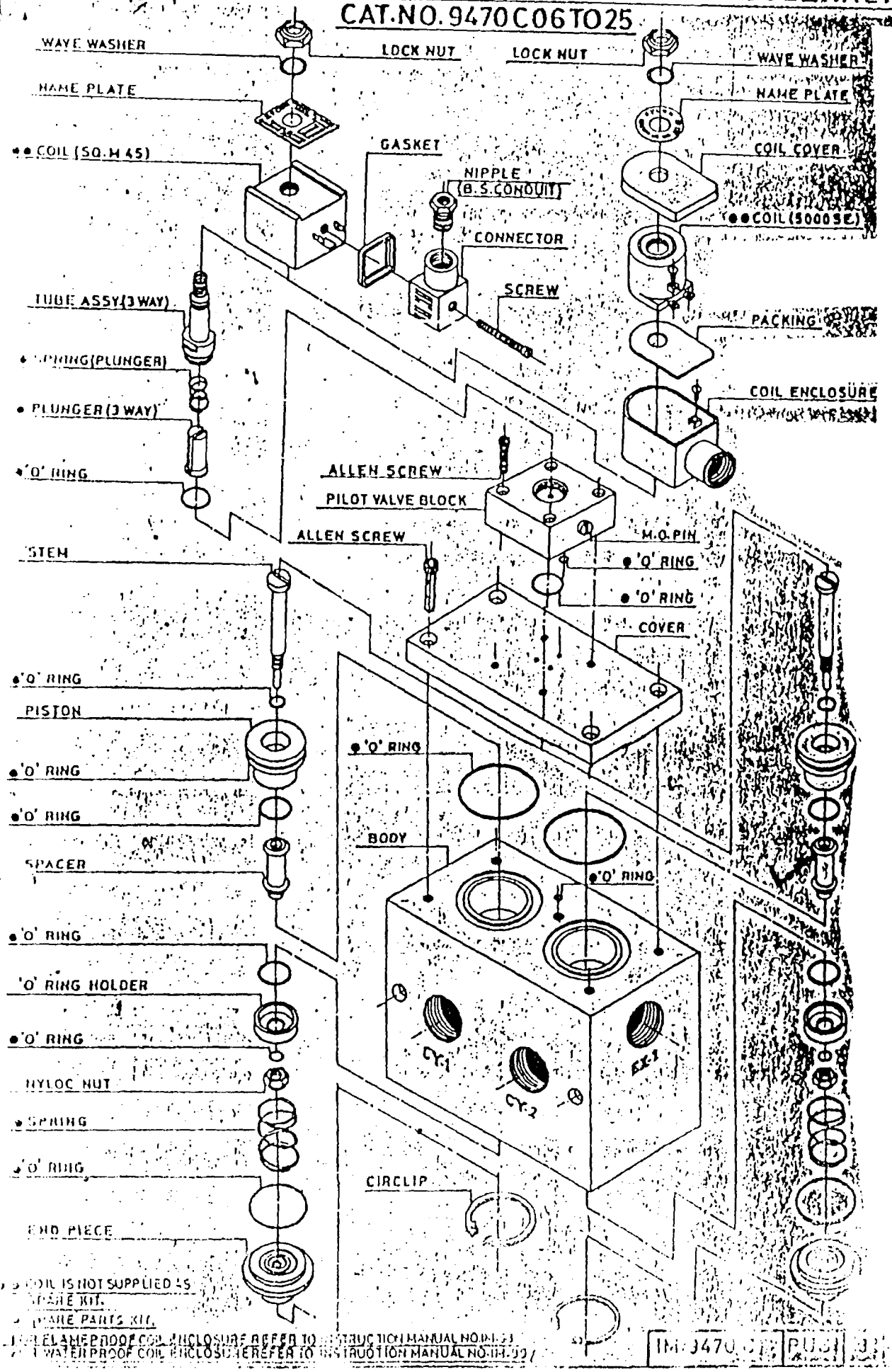


FIGURE 4

ASSY. SEQUENCE OF 4/2 WAY PILOT OP. POPPET TYPE SOLENOID

CAT.NO. 9470C06TO25



COIL IS NOT SUPPLIED AS SPARE KIT.

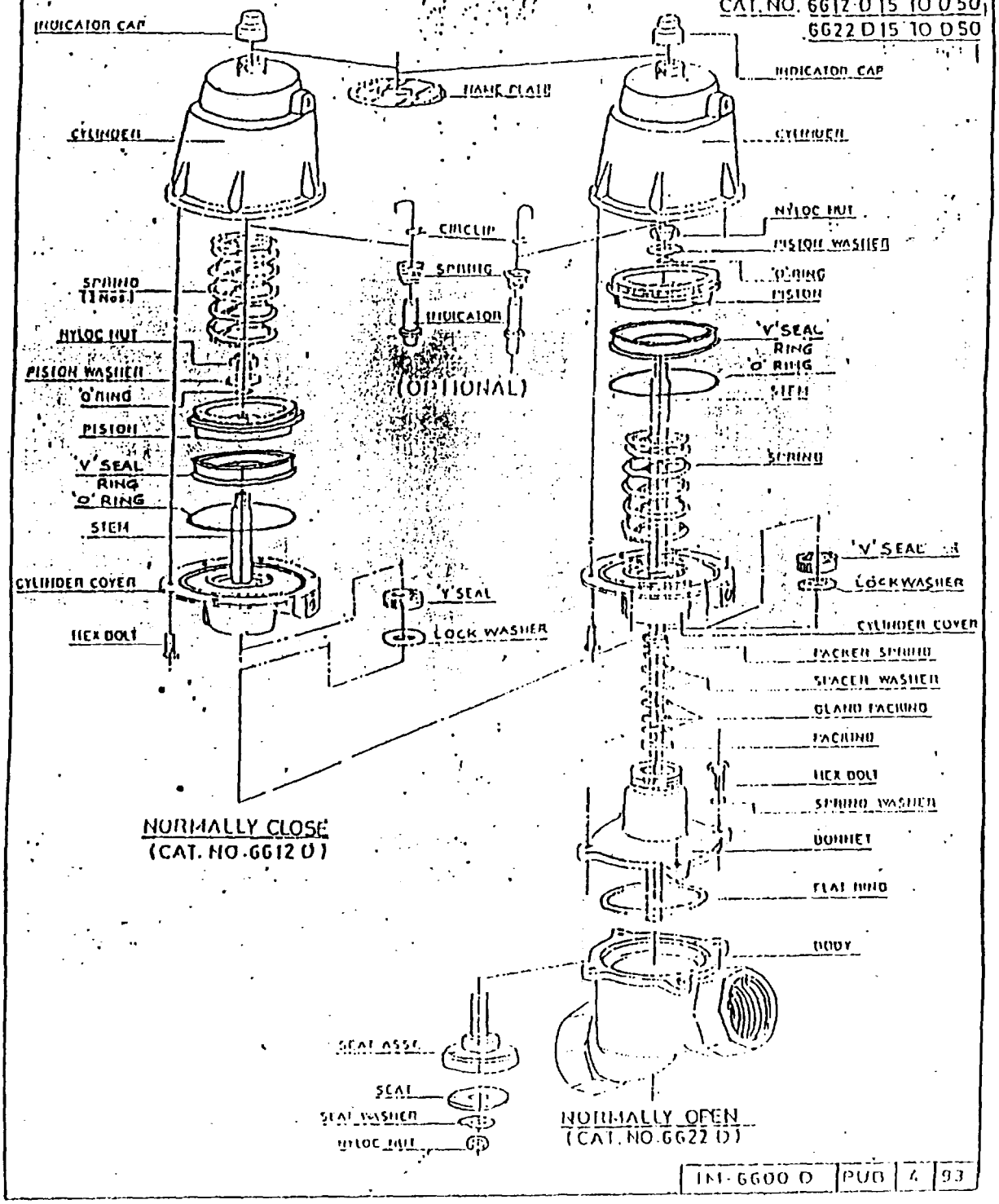
SPARE PARTS KIT.

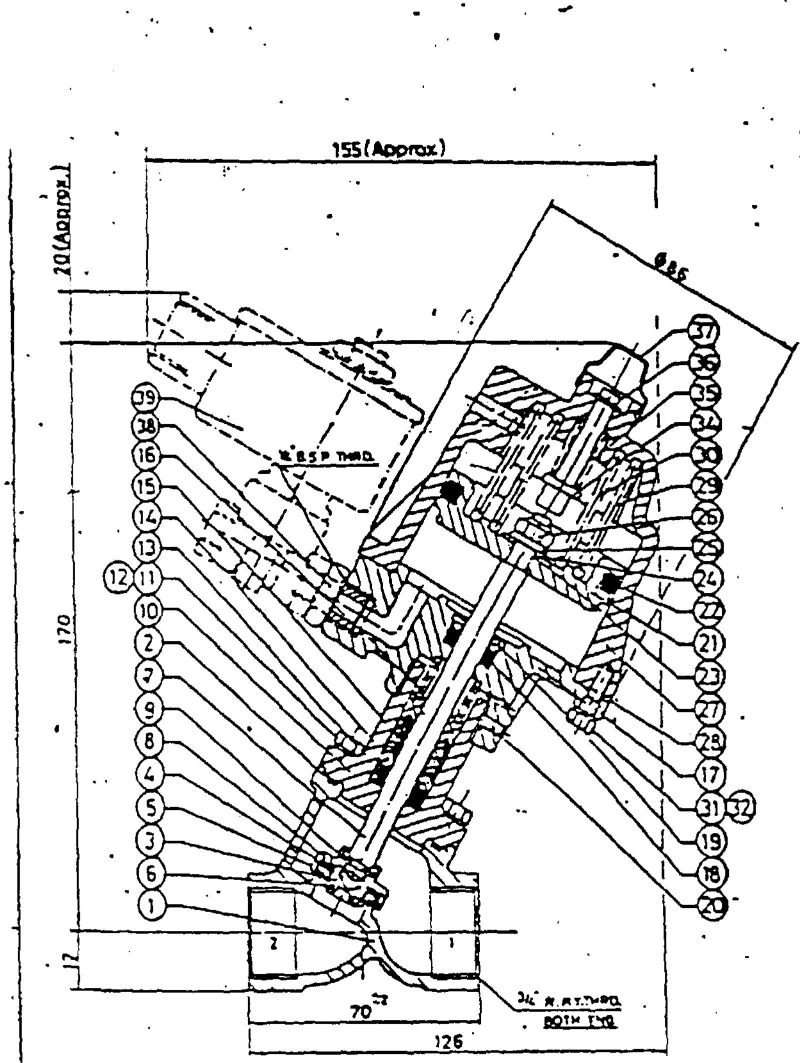
FLAMEPROOF COIL ENCLOSURE REFER TO INSTRUCTION MANUAL NO.IM-93

WATERPROOF COIL ENCLOSURE REFER TO INSTRUCTION MANUAL NO.IM-93

ASSY SEQUANCE OF 2 WAY SCREWED-END CYLINDER OPERATED VALVE

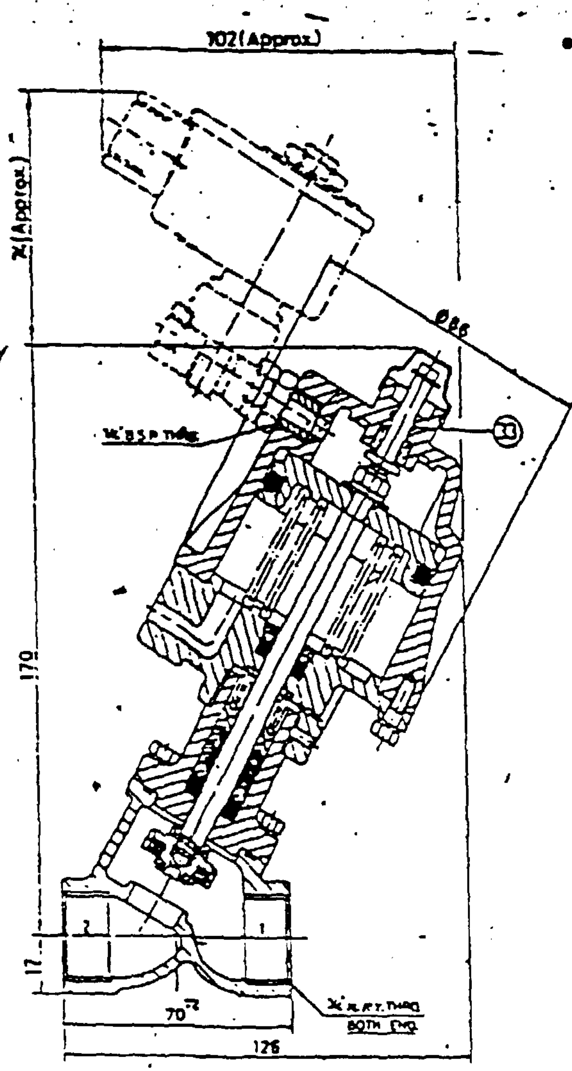
CAT. NO. 6612 D 15 10 D 50
6622 D 15 10 D 50





NORMALLY CLOSE

Cat. No. 6612 D 20/S4/S4/N.P.T.



NORMALLY OPEN

Cat. No. 6622 D 20/S4/S4/N.P.T.

PART	DESCRIPTION	MATERIAL	QTY
39	SOLENOID VALVE	3 WAY	1
38	NIPPLE	BRASS	1
37	CAP	POLYPROPYLENE	1
36	CIRCLIP	STEEL	1
35	SPRING	S.S. AISI. 304	1
34	INDICATOR	H.D. PLASTIC	1
33	'O' RING	NITRILE	1
32	HEX. BOLT	IS 1363	6
31	SPRING WASHER	IS 4072	6
30	SPRING	S.S. AISI. 304	1
29	SPRING	S.S. AISI. 304	1
28	'O' RING	NITRILE	1
27	CYLINDER	ALUMINIUM	1
26	NYLOC NUT	S.S. AISI. 304	1
25	ANTIVIBRATION WASHER	IS 2269	1
24	PISTON WASHER	S.S. AISI. 304	1
23	'O' RING	NITRILE	1
22	'O' RING	NITRILE	1
21	PISTON	ALUMINIUM	1
20	LOCK SCREW	IS 2269	1
19	'V' SEAL LOCK WASHER	S.S. AISI. 304	1
18	'V' SEAL	NITRILE	1
17	CYLINDER COVER	ALUMINIUM	1
16	SPRING	S.S. AISI. 304	1
15	GLAND PACKING	TEFLON	4
14	SPACER WASHER	S.S. AISI. 304	3
13	PACKING	GRAFOIL	1
12	HEX. BOLT	IS 1363	4
11	SPRING WASHER	IS 4072	4
10	BONNET	S.S. ASTM-A 351-90 GR CF8	1
9	STEM LOCK WASHER	S.S. AISI. 304	1
8	SPRING	S.S. AISI. 304	1
7	STEM	S.S. AISI. 410	1
6	SEAT LOCK WASHER	S.S. AISI. 304	1
5	SEAT	TEFLON	1
4	SEAT PACKING	EPDM	1
3	SEAT HOLDER	S.S. AISI. 304	1
2	FLAT RING	TEFLON	1
1	BODY	S.S. ASTM-A351-90 GR CF8	1

TITLE: 3/4" 2WAY SCREWED-END CYLINDER OPERATED VALVE

DRAWN: 10-10-92

SCALE: N.T.S.

DRG. NO. AVC-AJ-3868

CHR NO.

avcon CONTROLS PVT LTD.

●NOTE: ITEM NOS. 38 & 39 ARE OPTIONAL

EASUN ENGINEERING CO., LTD.,
BOMBAY MUTUAL BUILDING,
N. S. ROAD,
MADRAS 600 001.

avcon
CONTROLS PVT. LTD.
23-24, Nandu Industrial Estate, Mahakali Caves Road,
Andheri East, BOMBAY 400 093. INDIA
Phone : 579134 Gram : 'MOTORVALVE' Bombay-93
Telex : 011-4489 A/B AVCON

Fig.-3

Fig.-4

EASUN ENGINEERING CO., LTD.
BOMBAY IMPERIAL BUILDING,
N. S. G. ROSE ROAD,
MADRAS-600 001.

Note: On account of continuous development programme, AVCON reserves the right of change specifications, details, dimensions.

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