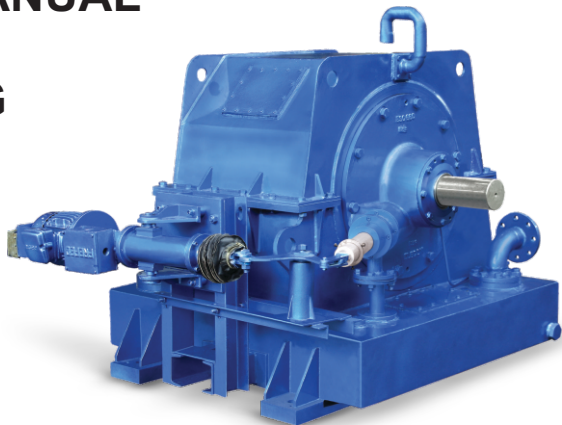


# INSTALLATION & MAINTENANCE MANUAL FOR SCOOP COUPLING



**Client Name** :  
**Project / Site** :  
**W.O. No.** :  
**Coupling Size** :  
**Coupling Sr. No.** :  
**Motor Power** :  
**Application** :

<b>Drawing / Document</b>	<b>(#) Drawing No. / Document Ref.</b>
G.A. Drawing of Scoop Coupling	
P & I Diagram	
Logic Diagram	
Torque-Speed Curve	
Technical Data Sheet	

**(#)** – Please refer the latest issue / revision for Drawing No. / Document Ref.

**N.B.** : These instructions are intended primarily for staff carrying out installation and maintenance of the coupling unit.

It is imperative therefore to provide each mechanic with a copy.

Further copies can be supplied on request.

Should any questions remain outstanding after consultation of this brochure, please contact us immediately and one of our specialists will provide you with further information.

## **(01) WORKING PRINCIPLE**

There are mainly two parts called Impeller and Runner, both have a large number of straight radial vanes. The motor drives the impeller. The runner is connected to the driven machine. In running condition, the working circuit of the scoop coupling is filled with the oil and the impeller acts as a centrifugal pump, creating oil flow radially outward, which crosses the gap to the runner, which acts as a turbine. The oil flow given up power as it return to the impeller again and thus the cycle is repeated.

As the fluid flow from impeller to runner is an essential feature of this power transmission, there is slip between these two parts. Due to the slip, there is heating of oil, which requires external cooling system for oil. The oil pump continuously supplies oil to the coupling.

The output speed of coupling can be changed by varying the slip, which depends upon the oil quantity maintained in the working circuit by changing the position of the scoop tube.

If the scoop tube is moved into the rotating ring of oil, it progressively removes the oil from the chamber and working circuit and discharges it into the sump. Inversely, moving the scoop tube from the oil ring allows retaining more oil in the working circuit.

## **(02) SPEED REGULATION**

The scoop tube position can be changed from 0% to 100% to regulate the output speed of the coupling. In 0% position, the scoop tube is at FULL IN position and does not allow oil level to build up in the coupling. At this position of scoop tube, there is maximum slip and minimum torque transmission. In 100% position, the scoop tube is at FULL OUT position at which maximum oil is in

the working circuit. This gives maximum torque transmission at minimum slip. For intermediate position of the scoop tube, intermediate value of slip and torque transmission is obtained.

For centrifugal machines the torque demand of machine reduced by square of speed of machine and power reduced by cube of speed of machine. The speed variation is obtained by varying the scoop tube position.

The torque v/s slip characteristic curve of scoop coupling is shown in Fig. No.-(A) The torque v/s speed characteristic of driven machine is plotted on this curve for constant torque machine and centrifugal machine. This curve shows how the speed variation is obtained by varying scoop tube position in ELECON scoop coupling.

### **(03) OIL CIRCUIT**

Fig. No.-(B) shows the basic oil circuit diagram.

The oil pump delivers oil from the sump (oil tank) to the oil cooler through oil filter. From oil cooler oil goes into working circuit of the Scoop Coupling. A small lube line is taken out from the main oil line that provides oil to bearing.

After transmitting power, the scoop tube collects oil from working circuit and delivers back to the oil tank. Also, some splashed oil in the coupling is returned to the oil tank.

The pressure switch, temperature switch, pressure gauge and temperature gauge are provided to monitor the pressure and temperature of oil.

The pressure switch and temperature switch give an electrical trip signal to the control panel in case

of oil flow failure and temperature rise respectively.

The manually operated by-pass valve may be used to adjust the oil flow in the working circuit with care that its position is not disturbed once set. This valve allows either oil to flow into the working circuit or totally bypasses back to the oil tank.

#### **(04) COUPLING CONSTRUCTION**

The various parts of ELECON Scoop Coupling are mentioned in the PART LIST and shown in Fig. No.-© & (D). The basic assembly of Scoop Coupling includes mainly impeller, runner, primary casing, secondary casing, oil retaining ring, impeller side housing, scoop tube housing, input shaft, output shaft, shell, scoop tube, various bearings, seals, breather plug, fasteners, etc.

The scoop tube is linked with the electric actuator mounted on the scoop coupling through base frame.

The FLS which includes set of oil pump & motor, filter, oil cooler, switches, gauges, pipes, etc. is provided separately for oil cooling system.

For backup safety, the fusible plug is provided in the Scoop Coupling that blows off the oil from working circuit in case the oil temperature increased up 140 0C. The oil is drained into oil tank.

#### **4.1 Input & Output Couplings**

The suitable sizes of gear couplings are mounted on input and output shaft of Scoop Coupling for connection with driving and driven equipments.

## **4.2 Scoop Tube**

The position of scoop tube must be such that the opening of the scoop tube is facing the direction of rotation of oil. If it is so then only oil will be collected by the scoop tube otherwise, it will not collect oil resulting into abnormal performance of the Scoop Coupling.

## **4.3 Actuator for Scoop Tube**

The electric actuator is linked with the scoop tube for IN and OUT movement of the scoop tube. If required, this actuator can be operated by hand lever.

The electric limit switches may be used at suitable position of scoop tube depending on control scheme and load of the equipment.

## **4.4 Set of Oil Pump and Motor**

A set of oil pump and motor is provided to deliver oil into the working circuit through oil filter and oil cooler.

## **4.5 Oil Filter**

The suitable oil filter is provided in main oil flow line.

## **4.6 Oil Cooler**

The suitable size of oil cooler (either water cooled or air cooled) is provided in main oil flow line.

#### **4.7 Safety Devices**

As a requirement of minimum safety devices, the pressure switch and temperature switch are provided in oil flow circuit which will give an electrical trip signal to the control panel in case of oil flow failure and temperature rise respectively. Additional safety / sensing instruments are provided, if ordered and mutually agreed.

#### **4.8 Control Panel**

If ordered, the suitable control panel is provided. This is mounted separately and electrically linked with various instruments and safety devices.

### **(05) INSTALLATION**

#### **5.1 Mounting of Scoop Coupling**

The suitable concrete / steel foundation to be prepared for mounting of scoop coupling. The foundation bolts should be suitable to the mounting holes provided in the scoop coupling. The scoop coupling should be tightened securely on foundation bolts.

#### **5.2 Alignment**

There must be proper alignment between motor, scoop coupling and driven machine during installation and running. The thermal expansion of each equipment should be considered during alignment.

### **5.3 Arrangement of Oil Cooler and Piping**

Oil cooler should be mounted as per the G.A. Drawing approved by client. The piping should be designed properly to avoid air locks. Site fabricated oil pipes must be cleaned internally and should be rescaled. Proper Joints, bends & holdings and supporting of pipes must be ensured so those are free from stresses.

### **5.4 Position of Scoop Tube**

The opening of scoop tube must face the oil rotation.

If the DOR of runner shaft is clockwise (see from output side of scoop coupling) then marked position TOP (T) must be vertically upward.

If the DOR of runner shaft is anticlockwise (see from output side of scoop coupling) then marked position TOP (T) must be vertically downward.

### **5.5 Lubrication**

Lubrication of various parts is recommended during installation as well as periodically. The gear couplings (if provided) must be greased regularly.

### **5.6 Guards**

Guards must be provided on input & output couplings of scoop coupling.



## **(06) COMMISSIONING**

Following schedule to be followed for commissioning of the scoop coupling.

- (a) Operation sequence and checkpoints.
- (b) Check proper installation of scoop coupling, tightening of foundation bolts and alignment.

### **6.1 Oil Filling**

During normal operating conditions, the oil used (usually mineral oil) should meet the following requirements. The oil used should be antioxidant and antifoaming.

Density at 15 0C.	: 0.873 to 0.879
Engler viscosity at 50 0C.	: 2.9 to 3
Flash point	: 210 0C.
Aniline point	: 105 to 108
Pour point	: -30 0C.
Viscosity index	: $\leq$ 105

Recommended Oil Grades (viscosities as per ISO 3448) :

- Servo System HLP-46 of Indian Oil Company
- OR Castrol Hyspin VG-46 of Castrol
- OR Bharat Hydrol-46 of Bharat Petroleum
- OR HP Enklo HLP-46 of Hindustan Petroleum

Fill oil in the bottom oil tank of scoop coupling.

Fill oil by opening one of the plugs provided on top of the oil tank.

Do not fill oil from breather plug provided on scoop coupling.

Oil level should be checked by the dipstick or level gauge if provided.  
The oil tank should not be over-filled.

**CAUTION:** Great care should be taken to ensure that a mixture of oil is never used. Absolute cleanliness of all containers used for handling the oil is essential. Oil must be free from dirt & moisture.

## **6.2 Electrical Equipment**

Connect various motor, equipments and instruments to the panel through proper cables. Check and confirm satisfactory operation of these electrical part and panel functioning. Check all motors for direction of rotation, smooth operation and power consumption.

## **6.3 Oil Cooler**

Ensure proper mounting of oil cooler and connection of oil line & water line (in case of water-cooled oil cooler). Check for desired water flow through the water-cooled oil cooler. In case of air-cooled oil cooler, check the direction of fan motor and its operation. Ensure that it is mounted securely on its base.

## **6.4 Oil Filter**

Ensure that the oil filter must be clean and it is not clogged due to any reason at the time of commissioning.

## **(07) OPERATING INSTRUCTION**

### **7.1 Starting of Scoop Coupling**

After all checks during commissioning stage, keep drive motor and machine ready for operation. Start the motor of oil pump, keep the scoop tube at FULL IN position and check all instruments & equipments are working satisfactorily. Start the main motor and ensure that there is not any abnormal noise and vibrations. Now, pull out the scoop tube either by the control circuit or by hand lever up to FULL OUT position.

Check again various parameters and ensure smooth running of scoop coupling. If everything is found OK, then continue the running of scoop coupling. For subsequent starting and running, the scoop tube must be at its respective position.

## **7.2 Oil Level**

The oil level in the oil tank of scoop coupling should be checked periodically. If possible, this check should be made with the set shut down and preferable when the oil is cold. If required, oil of the correct grade should be added in the oil tank to bring the oil level to the 'MAXIMUM STATIC' position.

## **7.3 Working Oil Temperature**

The most favorable characteristics for the scoop coupling are obtained when the temperature of oil leaving the scoop coupling to the cooler is within the temperature limits specified in the approved drawing. The temperature switch should be set for the trip value mentioned in the approved drawing. Finally, it depends upon the application / load condition.

## **7.4 Interlocks**

The main drive motor should be interlocked with the following.

**(a) Oil temperature :** If oil temperature is higher than the pre-set value then the main motor cannot be started. Also during running condition, If oil temperature exceeds the pre-set value then the main motor will be tripped.

**(b) Oil flow :** If oil flow is not established then the main motor can not be started. Also during running condition, if oil flow fails then the main motor will be tripped.

**(c) Scoop tube initialization (optional) :** If this interlocking is done then the scoop tube will travel automatically from FULL OUT position to FULL IN position on each starting. The main motor can be started only when the scoop tube is at FULL IN position.

### **(08) LONG STAND-STILL PERIOD**

If the plant is shutdown for long period, protect the coupling against moisture, water and dust. Preserve the unpainted surfaces against corrosion.

The oil pump should be run for few minutes once a week to wet the inner parts. If possible, run the coupling for short period once a month.

### **(09) PERIODIC CHECKS**

#### **After long stand-still period :**

Check all instruments, equipments and operations as per point (06) & (07).

#### **After first 250 working hours :**

Check alignment of coupling and re-tighten various foundation bolts. Check current drawn by

various motors for oil pump, actuator and air-cooled oil cooler. Clean oil filter.

**After every 600 working hours :**

Do greasing of input and output gear couplings. Check oil level in the oil tank. Check normal working of the electrical actuator. Check alignment of coupling. Clean oil filter.

**Subsequently after every 5000 working hours or once in a year :**

(For dusty / humid atmospheres this frequency should be 2500 hours)

- Check oil for any impurity and sludge.
- Clean oil filter.
- Check alignment of coupling with drive motor and machine.
- Check all couplings and rubber parts of various drives.
- Check flanged pipe connection, oil leakages, vibration in pipes etc.
- Check all instruments and equipments.
- Clean oil cooler, if necessary as per manufacturer's instruction.

**After every 8000 working hours or two years:**

Oil must be changed after every 8000 working hours of the coupling.

**After 20000 working hours or five years: (whichever is earlier)**

Coupling should be serviced. All rubber parts should be changed. Check all bearings and change complete set of bearings, if required.

**(10) PRESERVATION OF COUPLING**

(a) Store the coupling in a covered warehouse and it should not be

exposed to rain water, dripping water, dust and sun light.

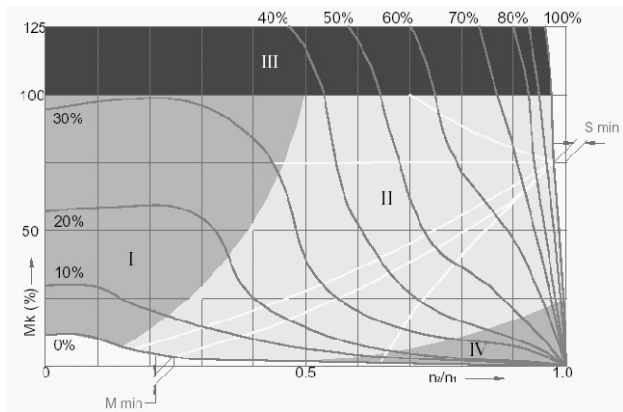
(b) The coupling should be covered with plastic sheet.

(c) All unpainted surfaces, bolts and working surfaces must be protected with proper coating and covered in plastic films.

(d) All electrical items and panels must be fully wrapped in plastic film. The cables, wires etc. should be protected from rodents, rats, etc.

(e) The oil must be stored in sealed airtight containers / drum. Moisture & dust should not be entered in the container / drum. Safety against fire hazard must be ensured.

## CHARACTERISTIC CURVE OF SCOOP COUPLING



### Operating Ranges :

- I & IV : Starting Range
- II : Control Range
- III : Overload Range

### Parameters :

- Scoop tube position in % of the full scoop tube stroke.
- $M_{min}$  : Minimum torque required for minimum speed adjustment.
- $S_{min}$  : Minimum slip required for torque transmission.
- $M_k$  : Coupling torque in % of the normal torque.
- $n_1$  : Input speed.
- $n_2$  : Output speed.

**Fig. No. : (A)**

## OIL CIRCUIT DIAGRAM

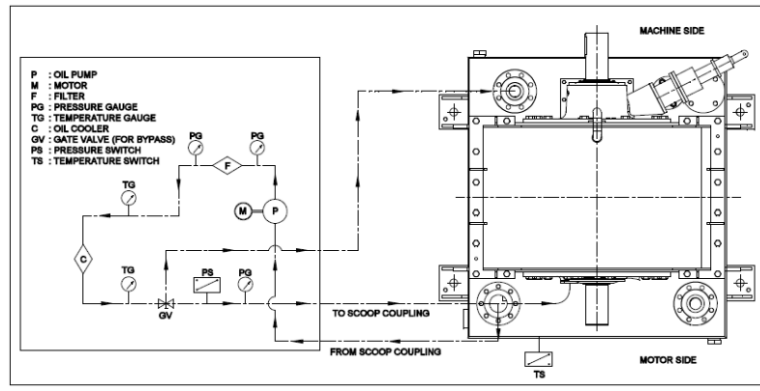
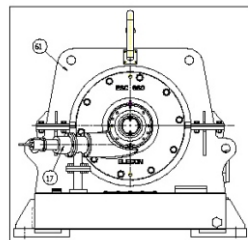
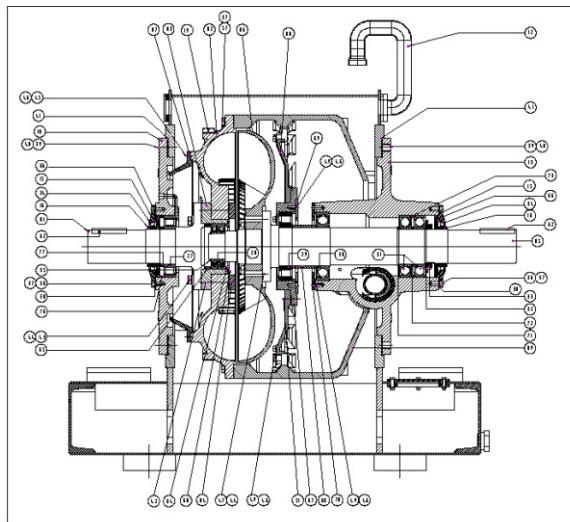


Fig. No. : (B)

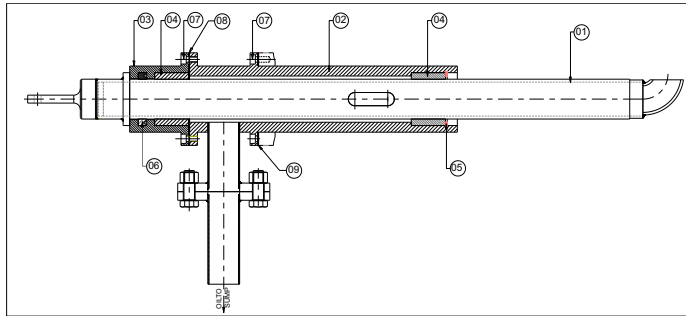


## PART DETAILS OF SCOOP COUPLING



**Fig. No. : (C)**

## SCOOP TUBE ASSEMBLY



**Fig. No. : (D)**

**PART LIST**

<b>PART NO.</b>	<b>PART DESCRIPTION</b>
01	Impeller Shaft
02	Impeller
03	Impeller Bush
04	Nut Plate
05	Runner Shaft
06	Runner
07	Oil retaining ring
08	Casing – Secondary
09	Casing – Primary
10	Housing – Impeller Side
12	Breather Plug
13	Scoop Tube Housing
15	Oil Seal Sleeve
16	Shaft Sleeve
17	Scoop Tube Assembly
17-01	Scoop Tube
17-02	Bush (for scoop tube assembly)
17-03	Support Bush (for scoop tube assembly)
17-04	Guide Bush (for scoop tube assembly)
17-05	U-seal (for scoop tube assembly)
17-06	Internal Circlip (for scoop tube assembly)
17-07	Bolts / Screws (for joining part no. 17-02 & 17-03 and 17-02 & 13)
17-08	Gasket (between part no. 17-02 & 17-03)
17-09	Gasket (between part no. 17-02 & 13)
19	Fusible Plug
27	Cylindrical Roller Bearing (NU)
28	Angular Contact Double Row Ball Bearing

**PART LIST**

<b>PART NO.</b>	<b>PART DESCRIPTION</b>
29	Cylindrical Roller Bearing (NU)
30	Deep Groove Single Row Ball Bearing
31	Angular Contact Single Row Ball Bearing
32	Lock Washer
33	Lock nut
34	Oil seal
35	External Circlip
36	Bolts / Screws (for joining part no. 10 & 15 and 13 & 15)
37	Spring Washers
38	Gasket (between part no. 10 & 15 and 13 & 15)
39	Bolts / Screws (for joining part no. 10 & 61 and 13 & 61)
40	Spring Washers
41	Gasket (between part no. 10 & 61 and 13 & 61)
42	Bolts / Screws (for joining part no. 02 & 03 & 04)
43	Bolts / Screws (for joining part no. 01 & 03)
44	Spring Washers
45	Bolts / Screws (for joining part no. 07 & 02)
46	Spring Washers
47	Bolts / Screws (for joining part no. 06 & 05)
49	Bolts / Screws (for joining part no. 08 & 09)
51	Bolts / Screws (for joining part no. 08 & 67 )
57	Bolts / Screws (for joining part no. 02 & 09 )
60	Bolts / Screws (for joining part no. 64 & 03)
61	Housing Assembly
62	Key
64	Abutment Plate – Imp. Side
65	Abutment Sleeve – Imp. Side
66	Labyrinth sealing plate

**PART LIST**

<b>PART NO.</b>	<b>PART DESCRIPTION</b>
67	Bearing Housing – Runner Side
68	Abutment Sleeve – Runner Side
69	Abutment Plate – Runner Side
70	Abutment Plate – Scoop Housing
71	Abutment Sleeve – Scoop Housing
72	Abutment Sleeve – Scoop Housing
73	Abutment Ring – Scoop Housing
76	Abutment Spacer – Housing Imp. Side
77	Abutment Spacer – Shaft – Imp. Side

For any service requirement, please contact our office with complete name plate details

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