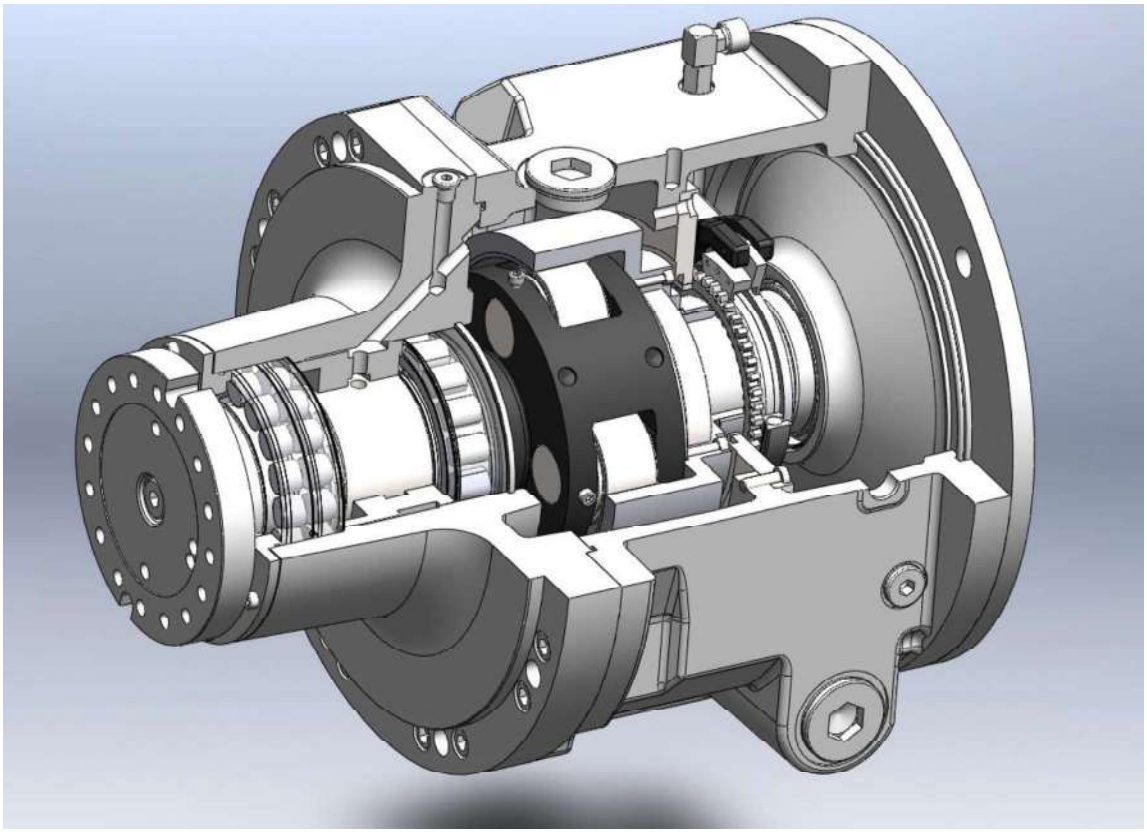
German Tech Precision Manufacturing Co., Ltd

Installation and Operation Instructions（manual）

For two-speed gearbox

2G800 / 2G801 / 2G802



Preface

1 Important Notes

Please observe the safety note in this manual!

	SERIOUS DANGER Can cause injury to personal and/or damage to property.
	DANGER Can cause slight or small injury.
	HAZARDS Can be harmful for the drive and environment
	Points and useful information.

Caution and safety note

All users of GTP are responsible for their own work safety.

(All personnel in charge of assembly and operation have to be familiar and comply with all safety instruction, to avoid the injury to personal and/or damage to gearbox.)

(All personnel in change of assembly and electricity have to be trained by GTP and make sure the proper operation of gearbox.)

(At any time the instruction need to be observed, for ensuring the correct operation and claim right within warranty period. Therefore, please read this instruction very carefully before commissioning!)

GTP cannot provide warranty, if any:

➢ Incorrect, improper use;

➢ Damage caused by using non-genuine parts or non-approved oil, or repair done by customer;

➢ Insufficient oil;

➢ Damage caused by accident or improper transportation;

➢ Out of scope of application;

➢ Defect or damage caused by motor (including belt), break off of the power transmission or defective of lubrication.

This instruction includes very important information about repair. Please keep it close to the gearbox.

In any case improper operation will make the warranty invalid even no description in this instruction!

Waste disposal, please observe current regulations.
Uncollected cast, gears, shafts and bearings will be treated as scrap.
Waste oil collection need to be treated according to local environment protection regulations.

2 Safety Notes

2.1 General introduction

During operation or after operation, surface of gearbox can generate high temperature.

Only qualified personnel can carry out the works as follows:

About transportation, storage, installation, connection, operation, maintenance and service, please read carefully below information and documents:

- ➢ Installation instruction
- ➢ Warning and notes on the gearbox
- ➢ Regulation and requirements for special system
- ➢ Safety regulation in the region and country

Personnel will be injured seriously due to below reasons:

- ➢ Use improperly or wrong installation or operation;
- ➢ Without authorization, disassemble the necessary protection cover or housing.

2.2 Application

The gearbox is designed for industry system, mainly for machine tool drives.

Please find technical data and information on the nameplate

It is very necessary to observe all the instruction!

2.3 Delivery

The shipment must be inspected for completeness and transport damages immediately after the delivery.
If damage is found, this must be communicated immediately to the transport company and confirmed by this company(may postpone the installation）.

Please use proper and safe equipment to transport the gearbox.

2.4 Storage and start-up

Gearbox is designed with channel lubrication system. No oil inside the gearbox during transportation.

Store the gearbox long time or store in an improper environment (high humidity, sea freight,) can make the gearbox inside and outside rusty.

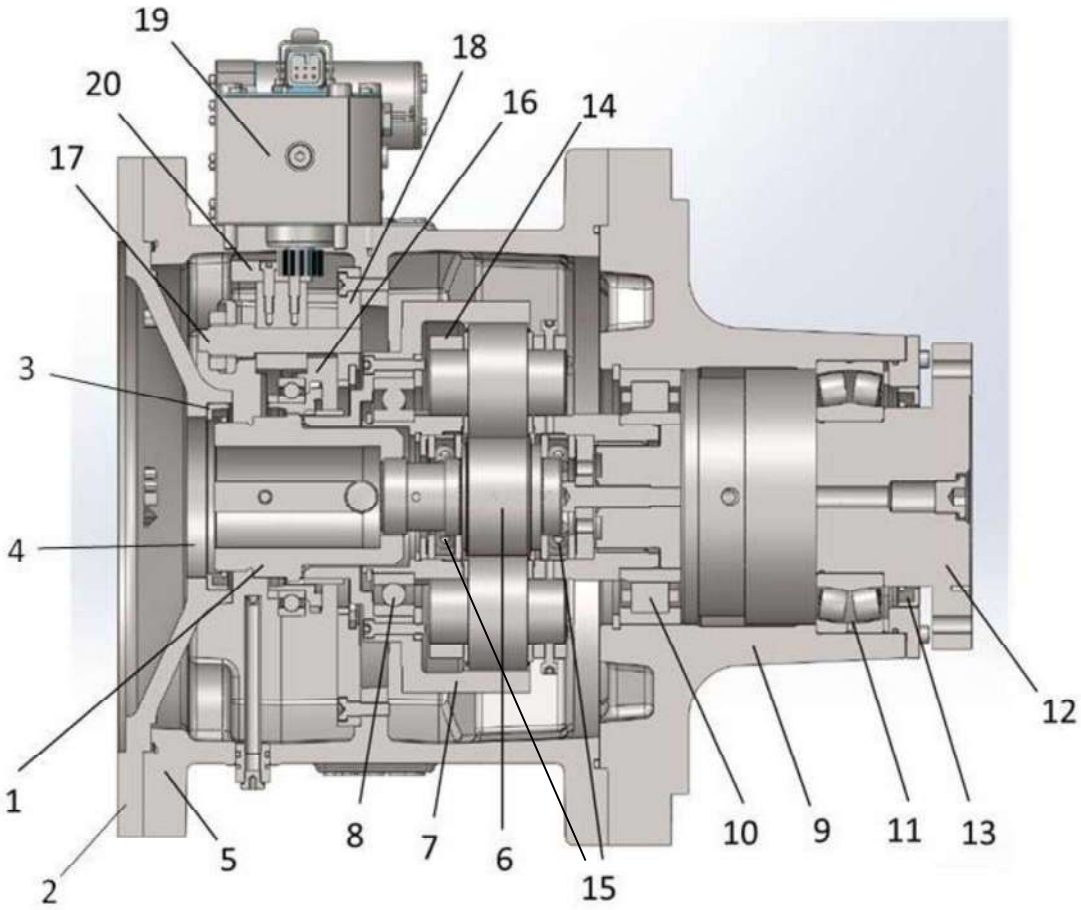
The gearbox is also useable for other systems which need torque increasing and/or speed reducing.

With different installation positions the gearbox can be used in Vertical Lathe and Horizontal B5, Vertical Machining center V1 or V3.

Before powering up the gearbox, make sure oil channels are connected properly to avoid any damage due to wrong connection.

3 Gearbox structure

Connecting parts	Input	Output	Shifting system
1.hub	6.sun gear	9.bearing housing	16.sliding sleeve
2.adpater plate	7.ring gear	10.11output bearing	17.shift fork
3.hub seal	8.ring gear bearing	12.output shaft	18.brake disc
4.hub bearing		13.radial shaft seal	19.shift unit
Housing		14.planet carrier	20.shift rack
5.Gearbox housing		15.sun gear bearing	

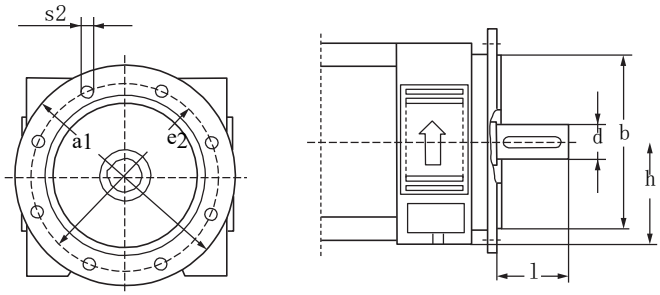


3.1 Technical data

Type	2G800	2G801	2G802
Nominal power	Max.84kw		
Nominal speed	1000rpm		
Nominal input torque	Max.800Nm		
Nominal input speedi≠1	5000rpm		
Nominal output speed i = 1.00 i = 4.00	 800Nm 3200Nm		
Weight	About180kg		
Motor dimension			
h	180	200	225
d	60	200	75
l	140±0.2	140±0.2	140±0.2
b	300	350	450
e2	350	400	500
a1	400	450	550
s2	4x18.5	8x18.5	8x18.5

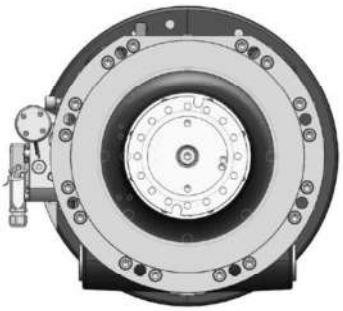
Caution:

Control braking time to ensure the brake torque should be less than the moments of inertia of gearbox.



3.2 Installation position

Horizontal B5



Horizontal B5 rotate 90°

Shift unit on top side, gearbox turned 90°above axial (view to output end)

Vertical

Vertical V1

Vertical V3

CAUTION

The breather outlet must always be at the top, regardless of the installation position.

3.3 Main dimensions and models

GTP two-speed gearbox 2G800/2G801/2G802 is useable as below models:

Input:
Motor is installed onto the gearbox by a flange.

Three sizes of motor: center height（AH）：(180mm / 200mm / 225 mm)。
Closed version (adapter plate delivered with shaft seal, bearing and drive hub, if necessary adapter plate bearing can be taken away).

Output:

Standard design (belt output), design of bearing can allow high radial force.

Shaft output version

Shift unit can be mounted on right / top side of the gearbox.

3.4 Backlash

GTP two-speed gearbox 2G800 / 2G801/ 2G802 backlashes:

20 arcmin (measured on the output shaft, ambient temperature 20℃ before starting the gearbox).

3.5 Lubrication

For the first starting of the gearbox, the correct level of the lubricating oil should be at the middle of the oil sight glass in accordance with the requirements of the operating manual.

The pump, oil tank and heat exchanger components must be arranged below the gearbox oil level.
Connecting an oil return with a proper angle assures smooth oil return.

3.5.1 Recirculating lubrication

Continuous operation, or intermittent operation in the same gear for a long time running or high speed and short standby time must use this kind of lubrication mode.

For 2G800/2G801/2G802, the vertical V1 and the inverted V3 must be used with recirculating lubrication, and the arrangement of recirculating lubrication will be different according to the requirements of its operating temperature.

Some applications operate at low temperature require a suitable oil cooling system.

The application is various according to the different models of gearboxs.

In order to reach the best cooling performance of the gearbox and avoid affect the lubrication, different oil ports and connection modes must be used according to the different installation positions and operation ways.

3.5.2 **V1 / B5** Recirculating lubrication

Take out the oil plug and connect the oil inlet pipe.

The volume of lubricating oil is in total 3 liters / minute.

Remove one of the sight glass and connect the oil outlet pipe, the screw size (M42x1.5).

To maintain oil smooth run and avoid hot oil stay inside of the gearbox (pipe diameter at least 20mm).

3.5.3 Recirculating lubrication with heat exchanger

The recirculating lubrication system with heat exchanger can ensure further reduction of the oil temperature.

The quantity of the oil tank should be at least 10 times of requested circulating oil volume or 20 liters

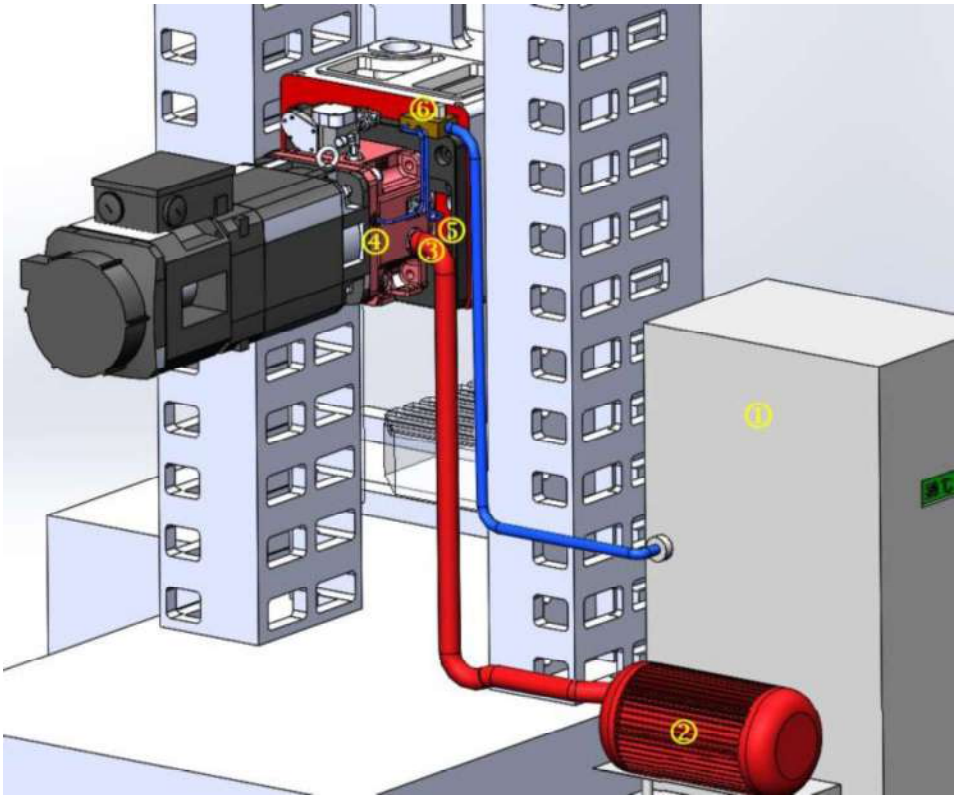
GTP recommends to install an oil level sensor in the auxiliary tank and avoid damage to the gearbox due to lack of oil.

Install a filter(60 μ m) and a safety valve at oil inlet pipeline.

The oil return pipe should be located lower than the gearbox oil outlet, in order to prevent the oil level rise in the gearbox.

Oil circuit configuration diagram

1. Oil chiller
2. Pump
3. Oil out let E
4. Oil inlet M
5. Oil inlet K
6. Flow meter and pressure gauge



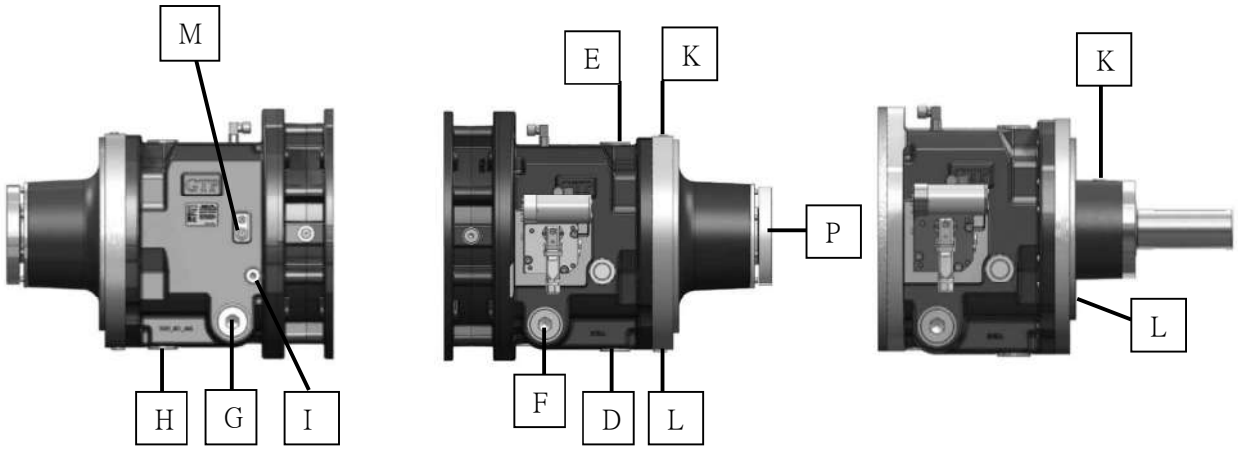
During gearbox operation, sub tank oil level decreases due to foaming of the lubricating oil in the gearbox.

When the gear box oil flows back to the sub tank and there is latex-like liquid, due to the mixing of oil and air.

3.5.4 Lubricant

	Description	Application	Remarks
Gear box oil	HLP46 to ISO VG46	Recirculating lubrication	Also for recirculating without lubrication heat exchanger
	HLP32 to ISO VG32	Recirculating lubrication with heat exchanger	
	HLP22 to ISO VG22	Recirculating lubrication with heat exchanger	

3.5.5 Ports and connections for initial fill/oil change

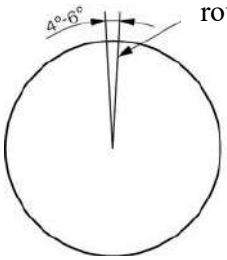


Installation position	Inlet ports	Max. pressure	Outlet ports
B5	**M** 0.5 l/min **K** 2.5 l/min	3 bar	G and F or D
V 1	**M** 0.5 l/min **K** 2.5 l/min	3 bar	D and E or L
V 3	**M** 0.5 l/min **K** 2.5 l/min	3 bar	H and I
	M 0.5 l/min **P** 2.5 l/min	3 bar	G and F

3.6 Gearbox shifting

Pin 2 and pin3 will be affected by 24 V voltage and rotating direction is defined by the applied polarity.

During the shafting, make sure the spindle motor shaft oscillating ±5°/s.



rotary direction change

Speed [rpm]	Time [sec]	Angle [°/sec]
0. 25	3. 33	5
0. 50	1. 67	5
1. 00	0. 83	5
2. 00	0. 42	5
3. 00	0. 28	5
4. 00	0. 21	5
5. 00	0. 17	5

In general :

n_{Mot} = 5°/s =5° ×60/min = 300°/min = 300/360 rpm = 0.83 rpm

After the limit switch obtains signals from S1 (pin 4) and S2 (pin 6), it indicates that the gear shift has been completed and the motor power will be cut off.

Limit switch control current : 0.1 – 0.5 A
Chang over control current : 5 A.

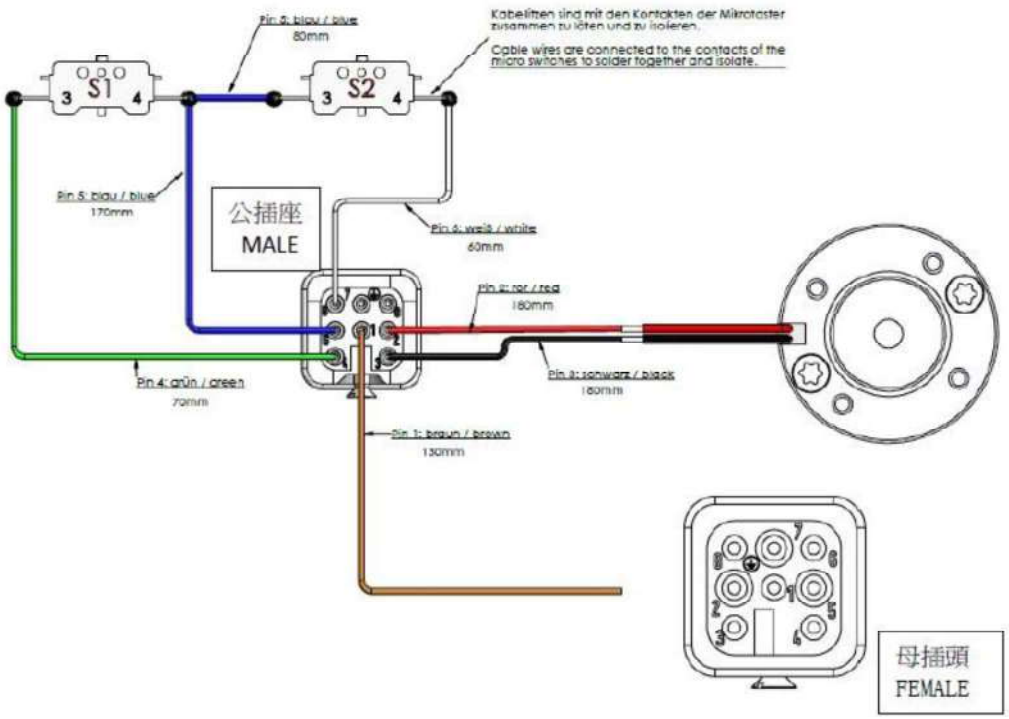
If the limit switches detect that a gear is no longer securely engaged, emergency shut-off must be initiated through the control system. Electromagnetic fields can falsify the limit position monitoring currents. This can be prevented by rerouting or shielding the circuit.

Diagram for shift unit with two positions:

1st gear ==>e.g. 4:1

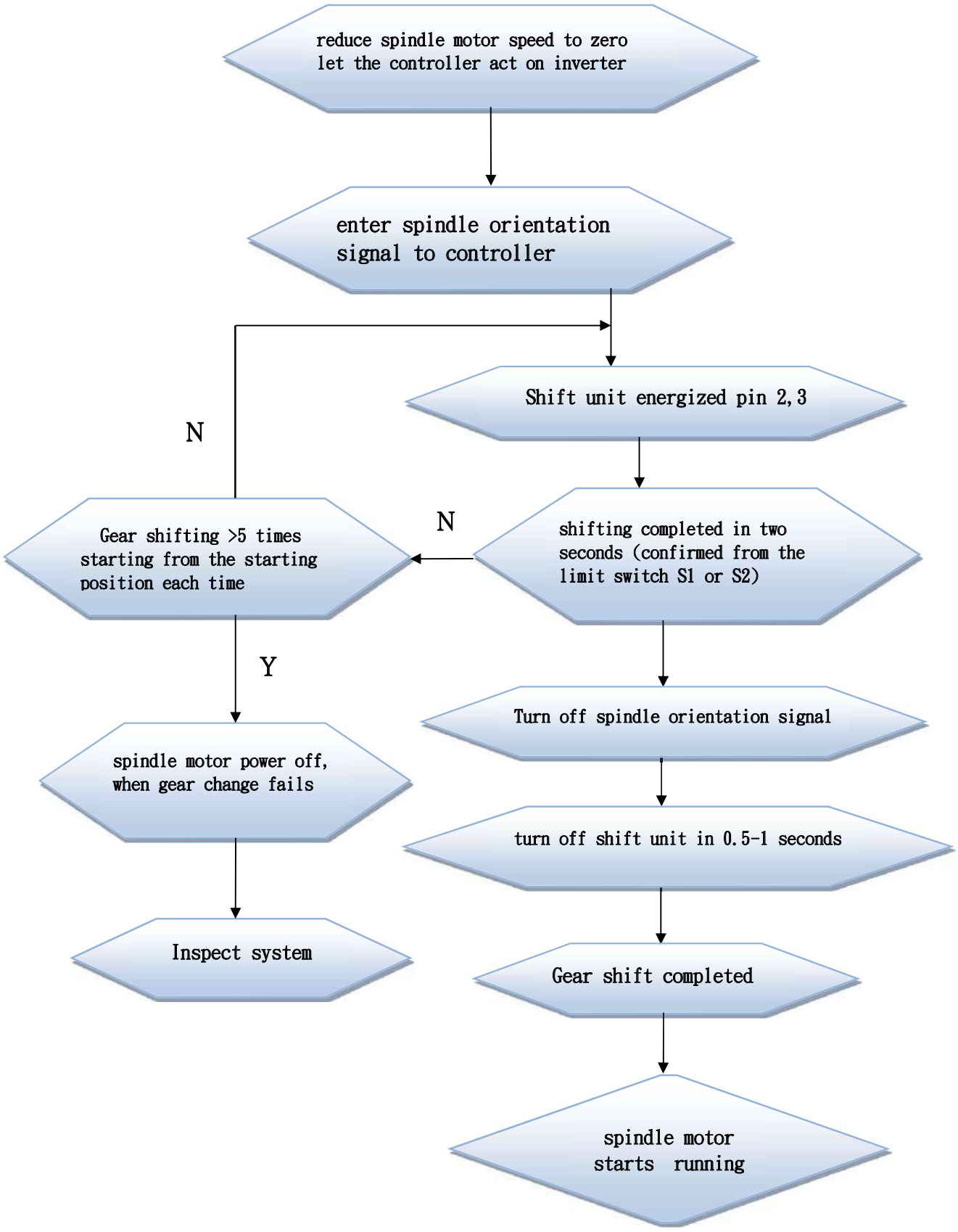
2nd gear ==> 1:1

3rd gear ==> neutral position, idling (option)



Gearbox shift unit driven by 24V DC motor

3.7 Shift logic



3.8 Neutral shift logic

Gear shift program must be detected. If necessary, using a timer to receive the gear signal (S1/S2), and the gear shift program must be eliminated after 2 seconds. Do not operate spindle motor before receive the gear signal.

S2 (standard) or S3 (neutral) drawing
S1: for example 4:1
S2: 1:1
S3: neutral (option)

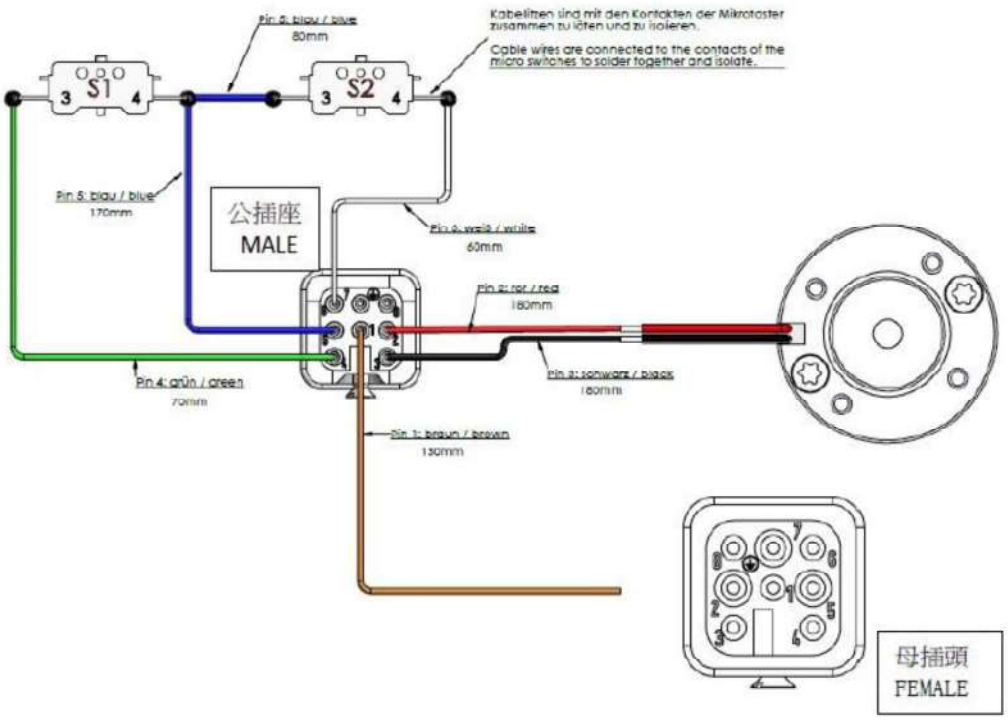
Electric shifting is driven by a (24V DC) motor through the shifting mechanism on the gear box. The limit position is monitored by the limit switch on the shift unit, and the timing is monitored by the control unit.

When shifting from 1st to 2nd gear, the motor must be energized and vice versa, the direction of rotation is by reversing the polarity to change.

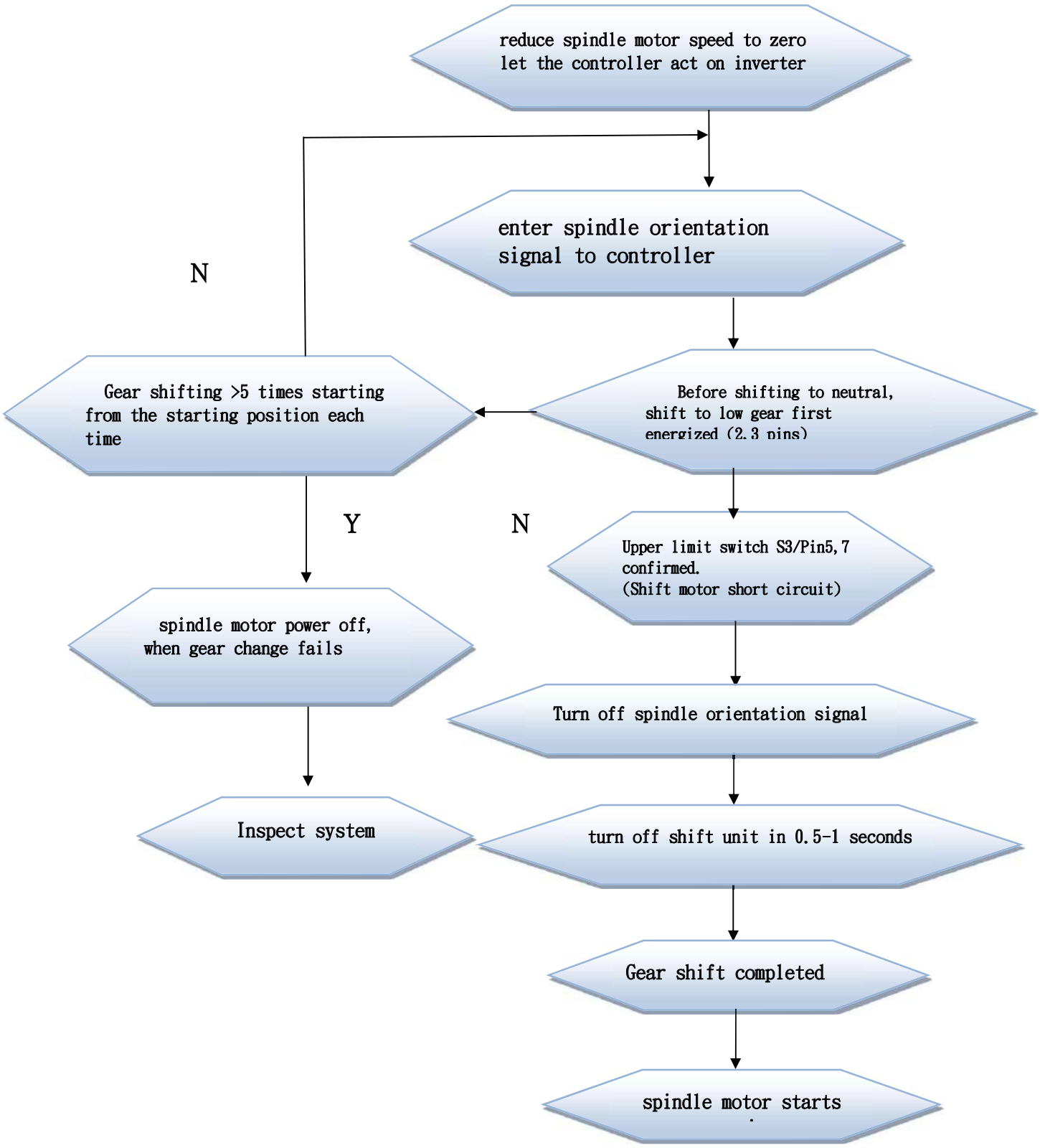
Neutral can only be shifted from 1st gear

When changing to neutral, you need todetermine which gear is. If it is in 1st gear, you can change to neutral directly. If it is in 2nd gear, you must switch to 1st gear and then change to neutral.

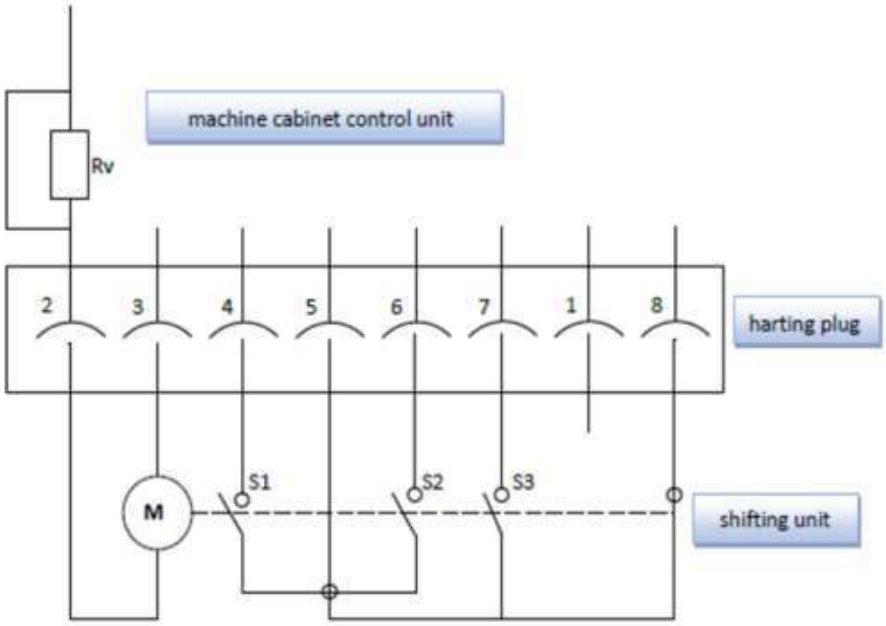
When limit switch S3 receives the signal, it will turns off motor power immediately.



Neutral shift logic



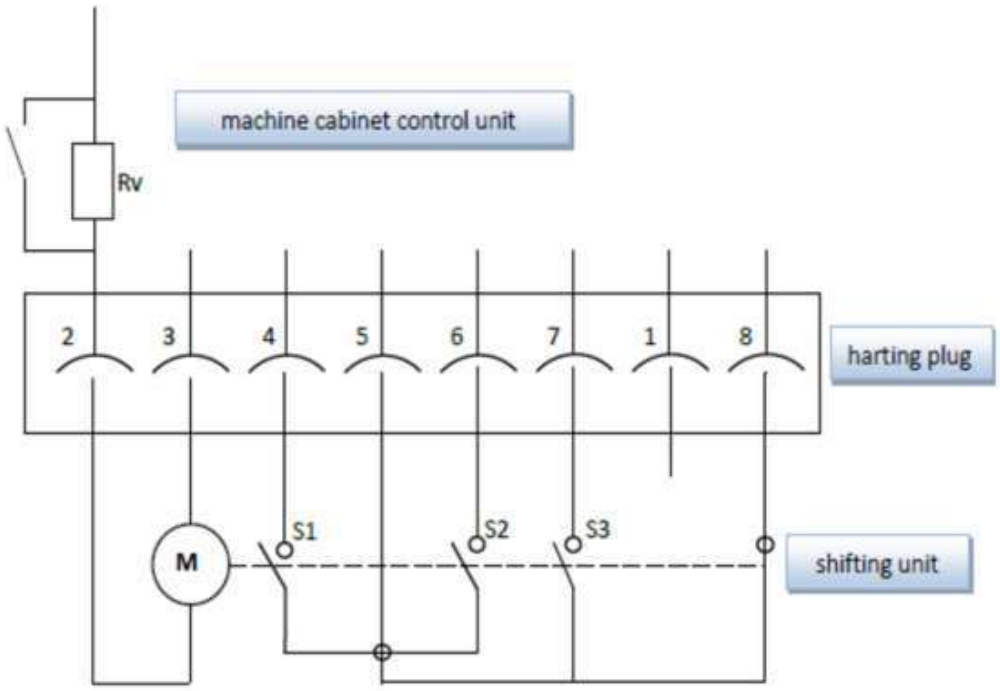
1-1 High low gear circuit diagram



wiring diagram for switch over gear 1>2

or gear 2>1

1-2 Diagram for neutral position gear change



wiring diagram for switch over gear 1> N-position or

gear2> gear1 > N-position

Before change to neutral, make sure the gear in high or low gear. Install a starting protection resistor on the circuit of the shift motor.
Reduce the motor speed through a protective resistor.
After receive the neutral signal, stop the motor protective resistor. When resistor select, wire diameter and length need to be considered to ensure that the circuit voltage is 7~8V to avoid rotating too fast and exceeding the S3 limit switch. When gear change, the resistor must be stopped and keep voltage at 24V. Install an adjustable resistor (the resistance value 50 ohms/20-25 watts)

4 Installation and operation

4.1 Safety start

Please observe all the regulations about safety and accident prevention in the country or region. Only qualified personnel can carry out the installation and starting up.

Improper operation or use can cause serious injury or property loss.

GTP will not be responsible for the results due to wrong operation.

4.2 Before start

Please check the gearbox carefully and make sure no technical defect before installation.

Gearbox can be installed only under below conditions:

- ➢ Technical data on the purchasing order matchable with the nameplate;
- ➢ No damage on the gearbox;
- ➢ Can rotate the gearbox shaft by hand;
- ➢ Clean oil pipe, enough oil quantity and oil pressure;
- ➢ All the electrical wires no damage.

4.3 Before operation

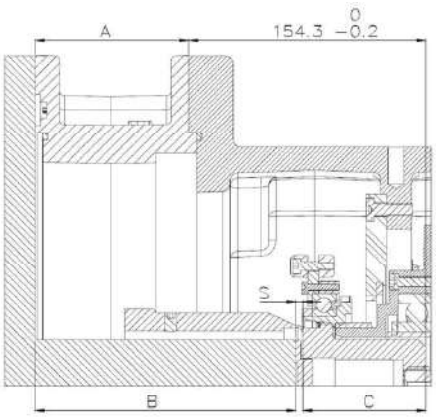
Must clean the antirust agent, dust or another contaminant (use standard agent). Keep the agent away from seal lip, it can damage the material!

4.4 Input

4.4.1 Adaptation and assembling motor/gearbox

Different connection parts are used depending on the motor size

To ensure faultless function, the input hub must be mounted on the right position, therefore compliance with reference dimension “D” is necessary.



The formula to calculate thickness of shims

$$S=D+A-B-C$$

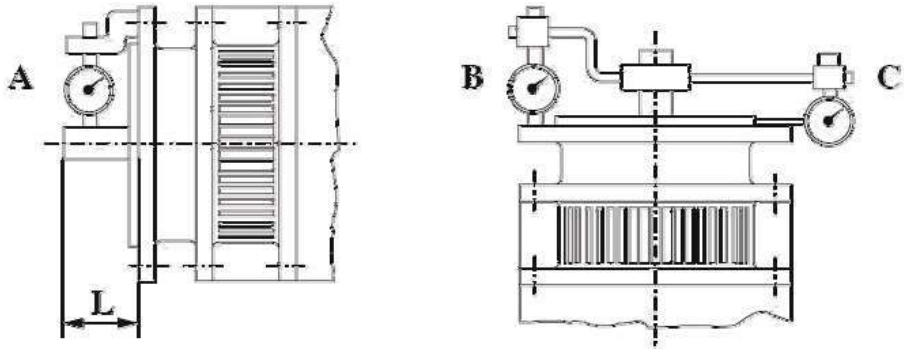
S = Thickness of shims

D = 154.1~154.3 mm

A = Thickness of adapter

B = Length of motor shaft

C = Thickness between Hub inner bottom to outside end



Measurement of motor tolerance

Gearbox type	Tolerance			
2G800/801/802	**A**	**B**	**C**	**L**
	0.030	0.063	0,063	±0,200
Tolerances *A,B,C* according to *DIN 42955R* Please note that the tolerance of the shaft length "L" is restricted in relation to the DIN standard!				

Motor tolerance

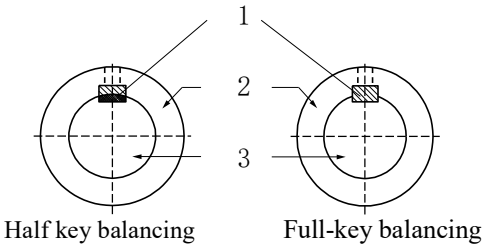
The tolerance for motor shaft length "L" must be conformed to the specification to ensure the normal operation of gearbox.

In case of oversize shaft, It must be machined to the correct tolerance.

For undersize shaft, take shims to compensate it.

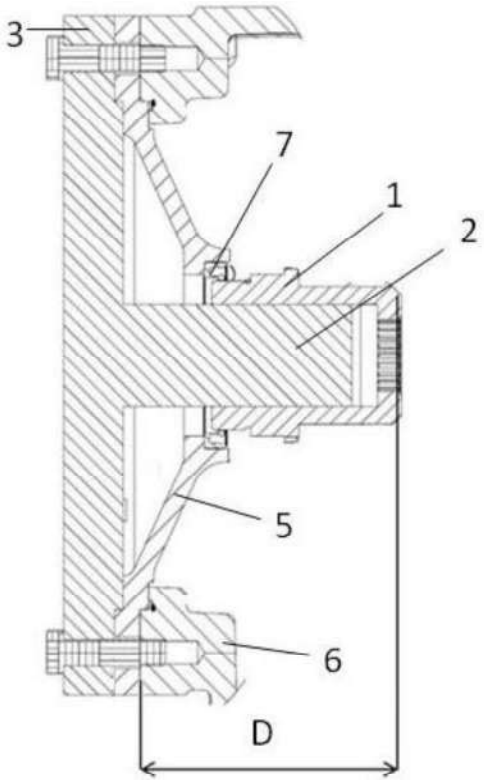
4.4.1.1 Balancing There are two balancing types for the motor and gearbox: Semi-key and full-key (DIN ISO 8821).

The hub is balanced without key. It must be ensured that the motor is balanced with full key. This is based on the original key.



Motor shaft diameter	Fitted key	Fitted key length
60 mm	A18x11	125 mm
65 mm	A18x11	125 mm
75 mm	A20x12	125mm
80 mm	A22x14	140mm

4.4.1.2 Closed design with shaft seal



2G800 standard version is closed, because different motor types have different center heights, therefore, using different adapter plate(5) with seal(7) is necessary.

The reference dimension "D" is important for gearbox operating.
For motor shaft length 140mm D value is 154.0~154.3mm

Hub (1) and adapter plate (5) are not fixed with gearbox while delivery.
Before installation, please clean the fitting surface of motor flange(3), hub(1), adapter plate(5) and gearbox.
Refer to the page 22 to check the "A", "B" and "C" values, then apply grease to the motor shaft lightly.
Adapter plate(5) with seal(7) is pre-installed to the motor shaft, fix it by bolts, then install gearbox.

Apply grease to seal (7) and hub (1) completely before installation, check and make sure the seal(7) and its lip are in the correct position during installing processing.

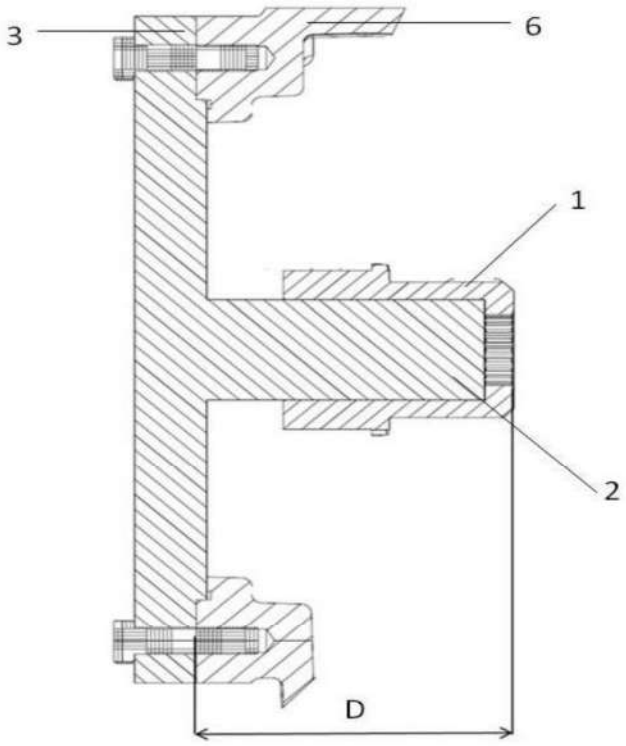
After cleaning, heat the hub (1) opening side to about 120° C, then insert it to motor shaft until it cannot moved anymore.

The motor shaft will be damaged if the hub heating is not successful.

Recheck reference dimension “D” (as shown in Page 21). Tighten the threaded pin (9) and secure it to prevent it from turning
Depending on the used specification, an O-ring or sealing compound is used to tighten the gearbox agains the adapter plate and the adapter plate against the motor flange. Using the O-ring, it has to be coated with grease before being inserted into the seal groove.

Check the right position. Using sealing compound, observe manufacurers instrucions.
Check the position of the gearbox shifting mechanism.
The sliding sleeve must be in gear position S1（i ≠ 1）.
Take up the gearbox and place it onto the adapter plate.
Carefully bring the sun-hub-connection together when doing this.
This can be made easier by turning to the left and right at the gearbox output.
Gearbox housing, adapter plate and motor are bolted together using four or eight bolts, quality 8.8 or higher.

4.4.1.3 Open design



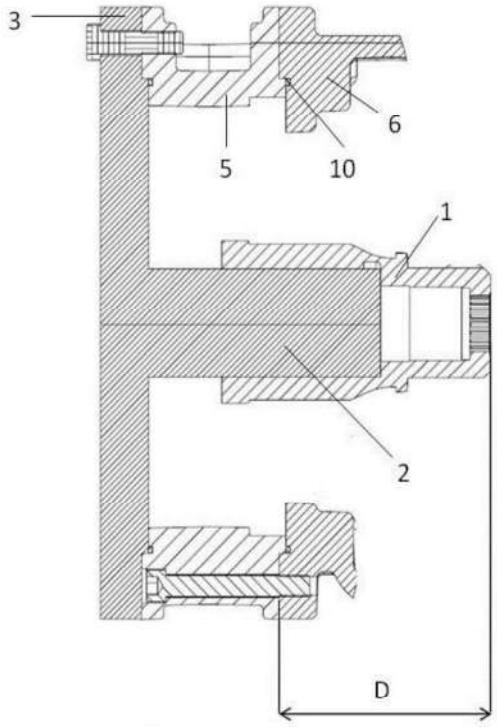
Open design is gearbox without adapter plate, but motor shaft (2) to prevent gearbox oil ingress.
For delivery, gearbox and hub(1) are separate, Clean the fitting surfaces of the motor (3) and hub. Check the motor shaft (2) for axial and radial run out as described in section 4.4.1. Also lightly grease the motor shaft.

After cleaning the fitting surfaces, heat the drive hub to approx. 120 °C from the opening and slide it onto the motor shaft until it reaches the stop.

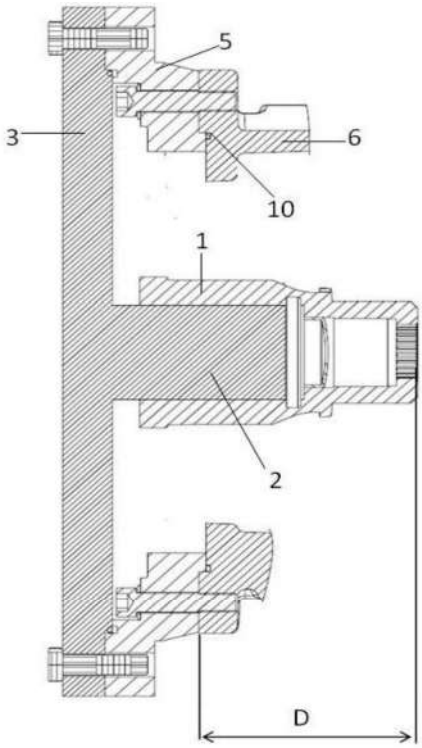
- **When assembling, it must be possible to easily slide the hub onto the motor shaft until it reaches the stop.**

4.4.1.4 Open design-with adapter plate

2G800 2G801with adapter plate



2G802 with adapter plate



Adapter plate can match variant connecting dimensions, but the motor shaft must attach a seal.

For delivery, adapter plate (5) and hub (1) are separate, Clean the fitting surfaces of the motor (3) and hub. Check the motor shaft (2) for axial and radial run out as described in section 4.4.1. Also lightly grease the motor shaft.

After cleaning the fitting surfaces, heat the drive hub to approx. 120 ˚C from the opening and slide it onto the motor shaft until it reaches the stop.
Check “D” dimension after assembly, if necessary please change the shims.

4.4.2 Pulley drive input

Flange input is a special version and connected with pulley drive to the motor shaft. The pulley must be in the center of the outer diameter of the input flange, bolts tightening according to specified torque for friction engagement and fixing.
According to VDI Directive 2060, pulley drive should be balanced in quality 6.3 to ensure lower vibration operating.

Tighten the belts with specified tensioning force to avoid overload on bearing. The belt stress must be equally between the bearings.

4.5 Output

GTP two-speed gearbox 2G800/2G801/2G802 has two kinds of output versions.

4.5.1 Pulley output (standard / long output)

Pulley must be fixed at the center of flange (tolerance g6) outer diameter, fixing bolts tighten according to tightening torque.

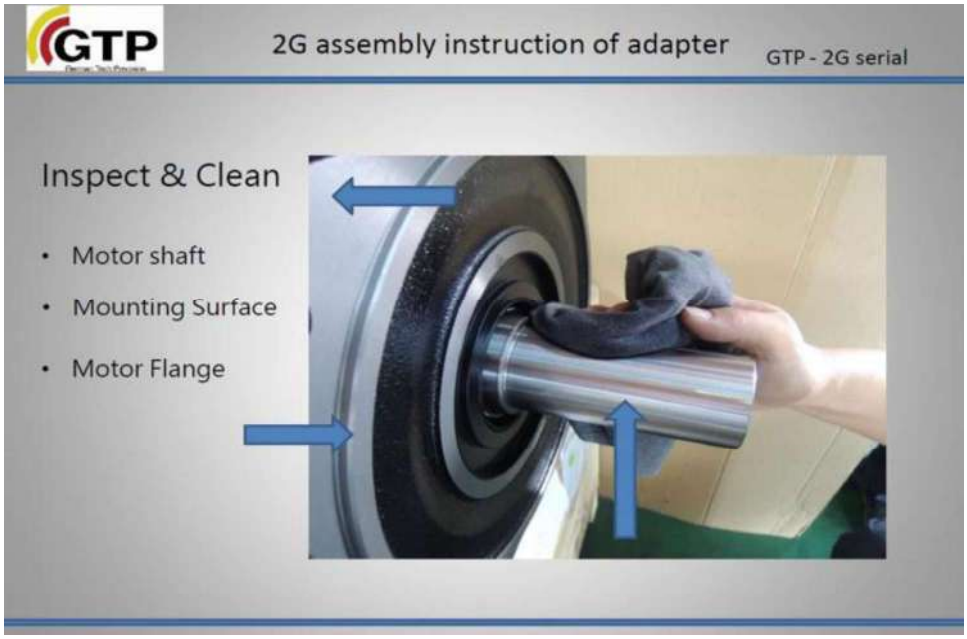
Balanced level is 6.3 to ensure low vibration running

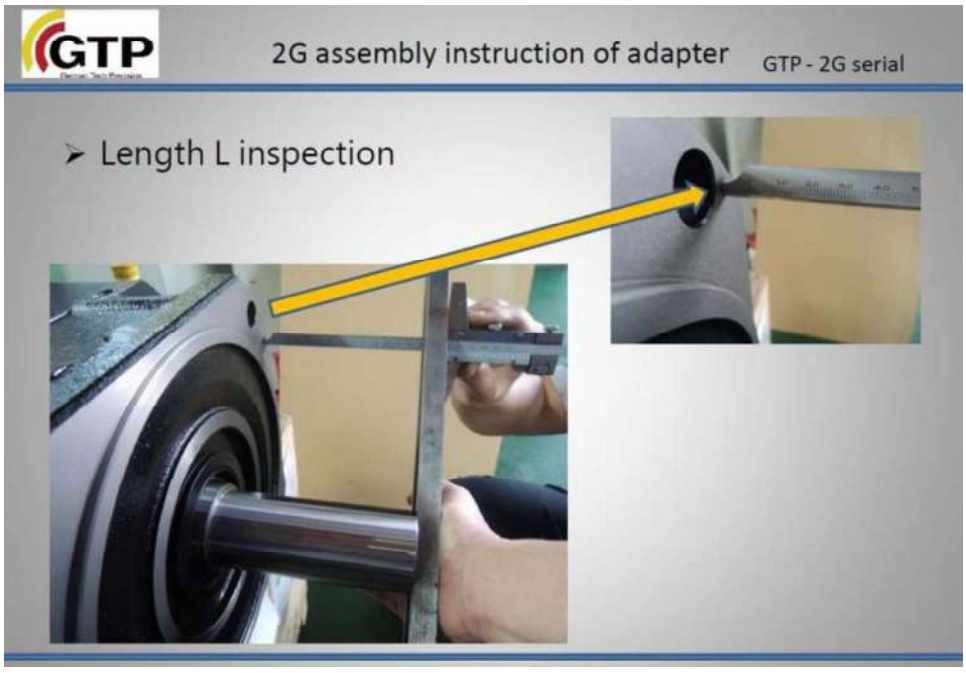
When strain the belt, please be aware of the maximum tension to avoid bearing overload. Belt stress must be evenly between the two bearings of output shaft.

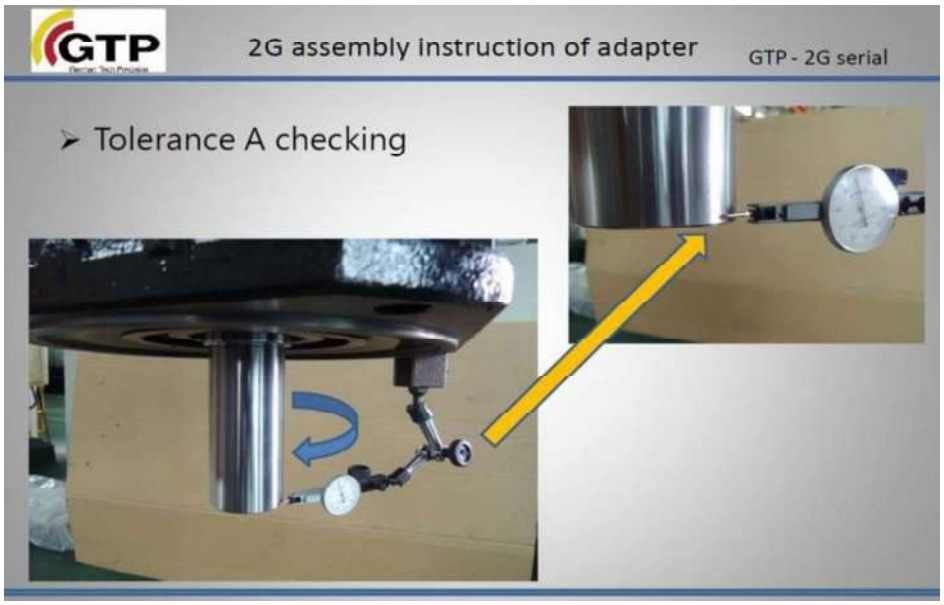
4.5.2 Direct shaft output (gear output)

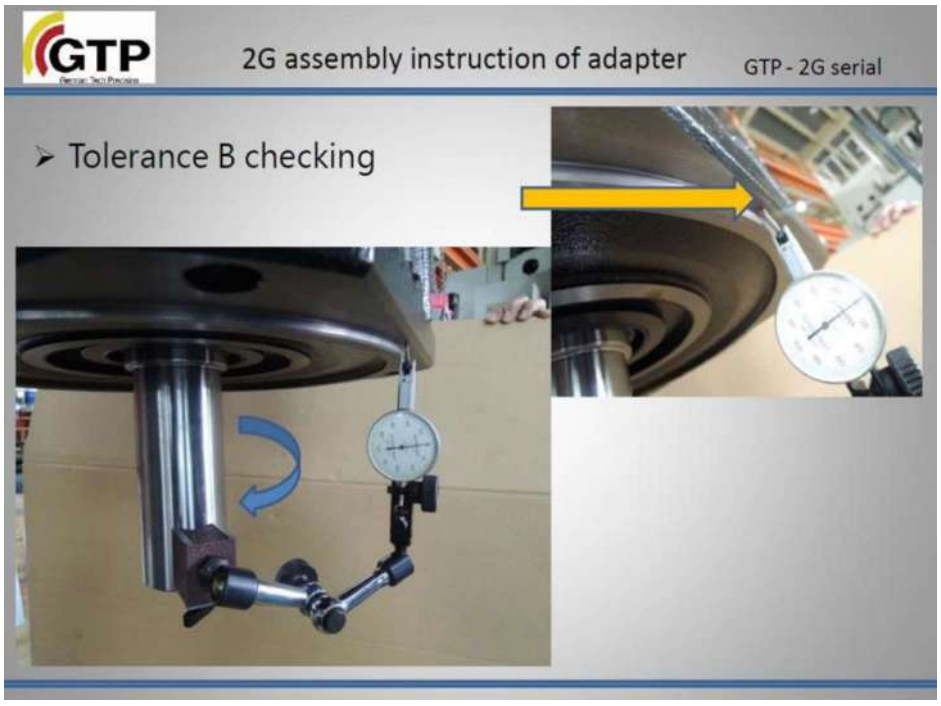
Please pay attention on balancing method while useing direct shaft output, Gearbox output shaft is full-key balancing when it is delivered.

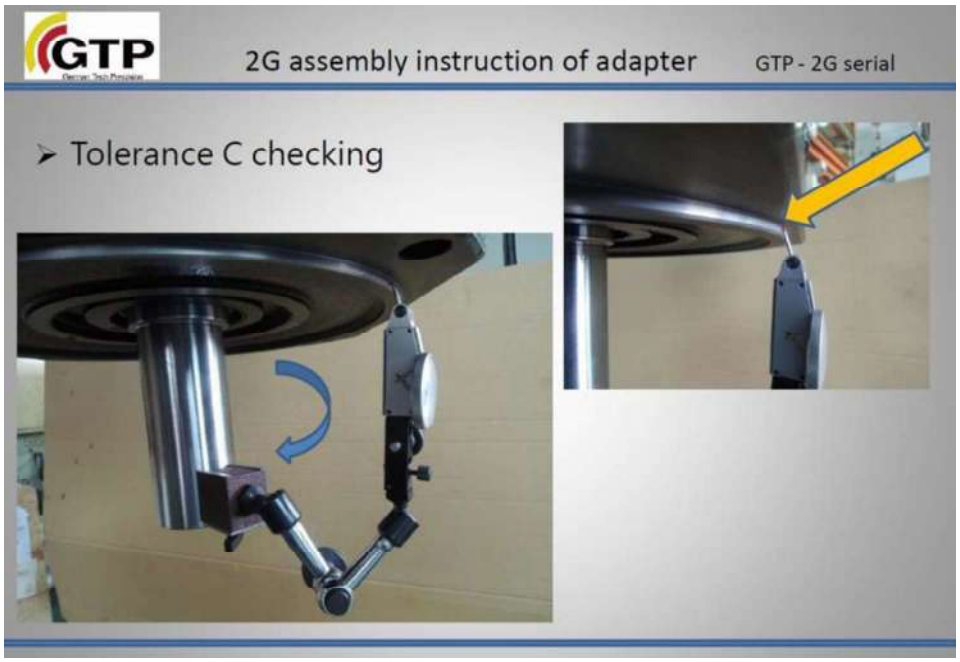
4.5.3 2G adapter plate installation

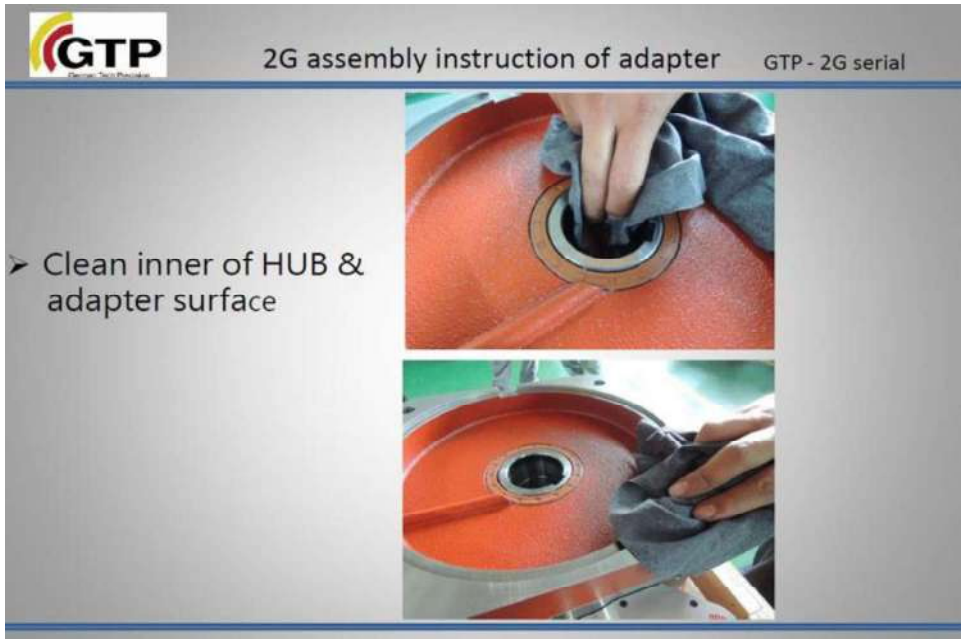





GTP
2G assembly instruction of adapter
GTP - 2G serial
➢ Tolerance A checking


GTP
2G assembly instruction of adapter
GTP - 2G serial
➢ Tolerance B checking


GTP
2G assembly instruction of adapter
GTP - 2G serial
Tolerance C checking


GTP
2G assembly instruction of adapter
GTP - 2G serial
Clean inner of HUB & adapter surface

2G assembly instruction of adapter

GTP - 2G serial

- Lubricate the motor shaft Surface with high performance grease for protection .

2G assembly instruction of adapter

GTP - 2G serial

- Inspect thread making sure that everything is dry & clean .

2G assembly instruction of adapter

GTP - 2G serial

- Heat HUB to 120℃
- The warm up process Can be done inside of HUB

Attention :
No direct to heat on the seal

2G assembly instruction of adapter

GTP - 2G serial

- HUB key way level at The motor key .

2G assembly instruction of adapter

GTP - 2G serial

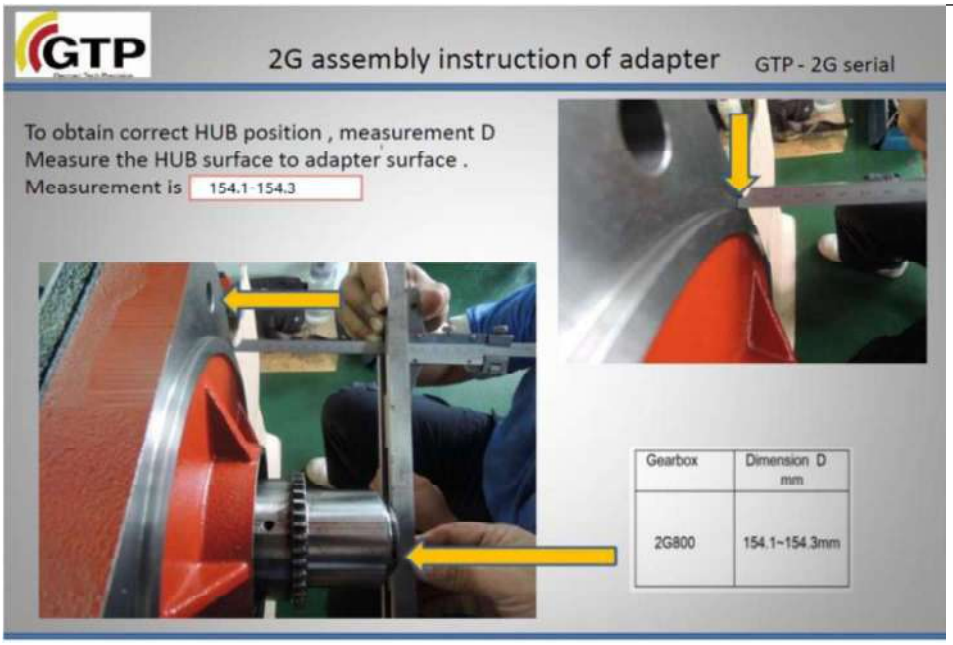
- To reach correct & position
  Tap gently with plastic hammer.

- No space between
  Adapter & motor plate .

2G assembly instruction of adapter

GTP - 2G serial

- When assembled , tighten screw
  Using Loctite 270 .
- Torque to 23Nm .



Check the position of the gearbox shift mechanism. The sliding sleeve must be in the 1st gear position ("low" gear ratio).

Low gear	High gear
	

4.6 Electrical connection, shifting

The gearbox is electrically connected using the supplied 8pole Harting connector (HAN 8 U).
Shift unit Technical data：
Power: 120W
Voltage: 24 V DC ± 10%
Current: 5 A
Required cable cross-sectional diameter: 1.5 mm².

The 24 V DC connection voltage and 5 A power consumption must be assured on the shift unit connector. Losses due to cable length and transition resistors must be taken into account.
We recommend using a separate power supply to assure the stability of power.

4.7 Installation

Installation position of GTP two-speed gearbox 2G800/801/802 is B5/V1/V3.

Shift unit can be located on the left side, right side or top of the gearbox.

The breather outlet must always be at the top, regardless of the installation position.

When install the motor onto the gearbox, support B side of the motor to reduce the vibration. When assembly make sure no blockage on the fan.
Oil is out of supply scope.

Before starting the gearbox, please assure enough oil quantity and oil pressure.

Input flange, output flange and output shaft rotate at a very high speed, must provide proper protection cover, otherwise there will be danger of injury!

4.8 Operation

Gearbox has to be checked about function. When check the function, need test the gearbox at both of the directions and ratios.
Shift unit also need to be tested.

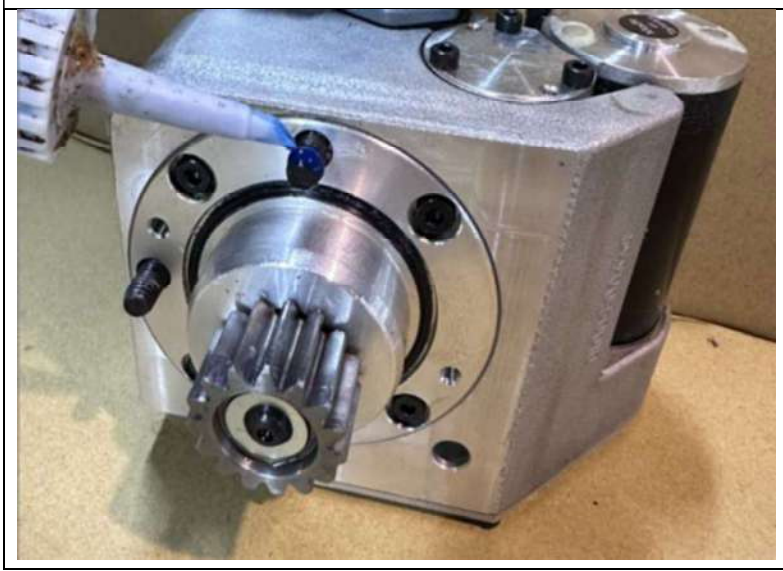
4.8.1 Shift unit installation

Do not energize shift unit before installation.

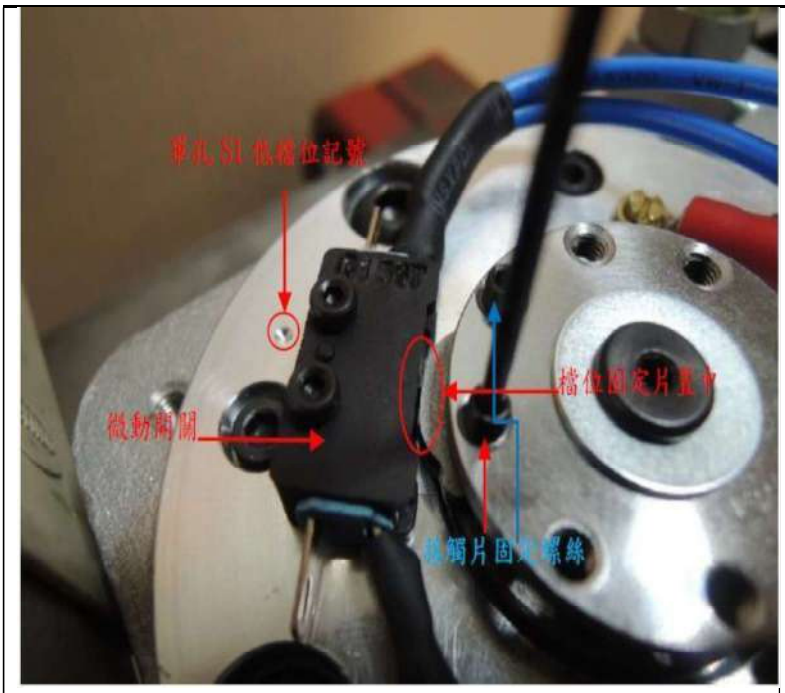
Before install or remove shift unit, make sure gear box in low gear.

1. O-ring installation
Apply Vaseline or grease , make sure the O-ring adhere inside.

Check O-ring in correct position.

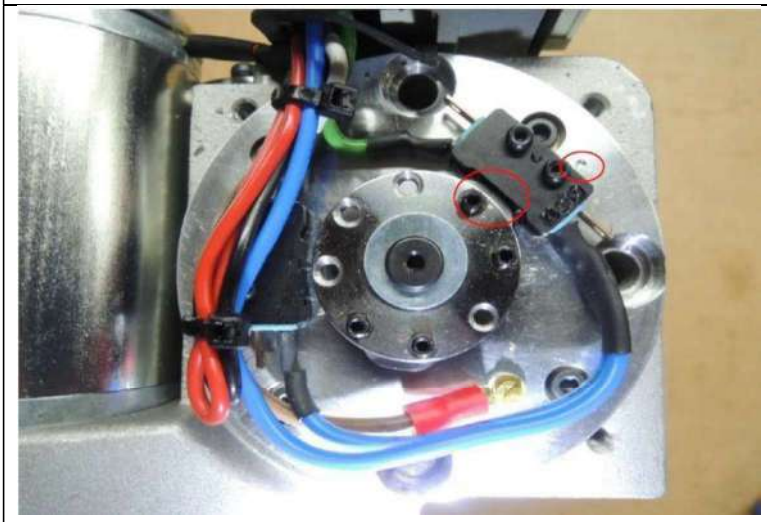


2. Lock 2pcs bolts without glue first, apply Loctite: 243 to last bolt and lock it.
Remove another 2 pcs bolts apply glue, and lock them.

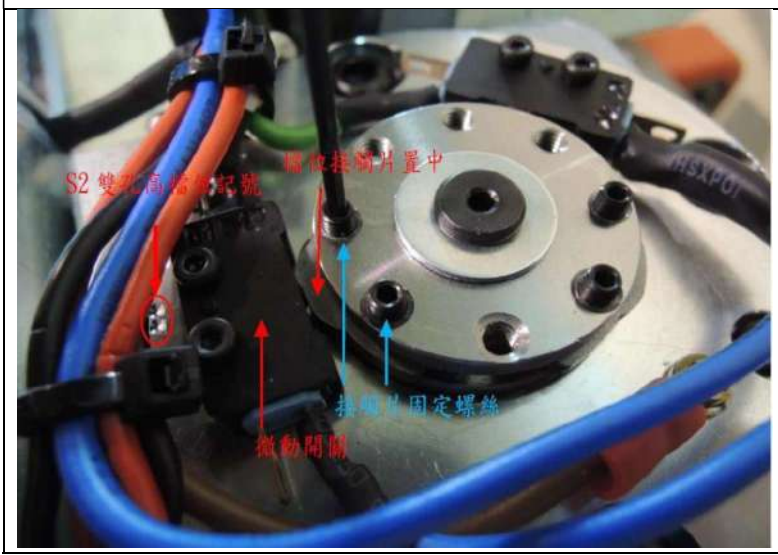


3. S1 Shift unit contact piece adjustment

Low gear S1 adjustment
Switch to low gear and insert contact piece into S1 low gear micro switch.
Adjust the contact position between the contact piece and the micro switch to the center.
Fix contact piece with bolts M3x6 and Loctite:243.

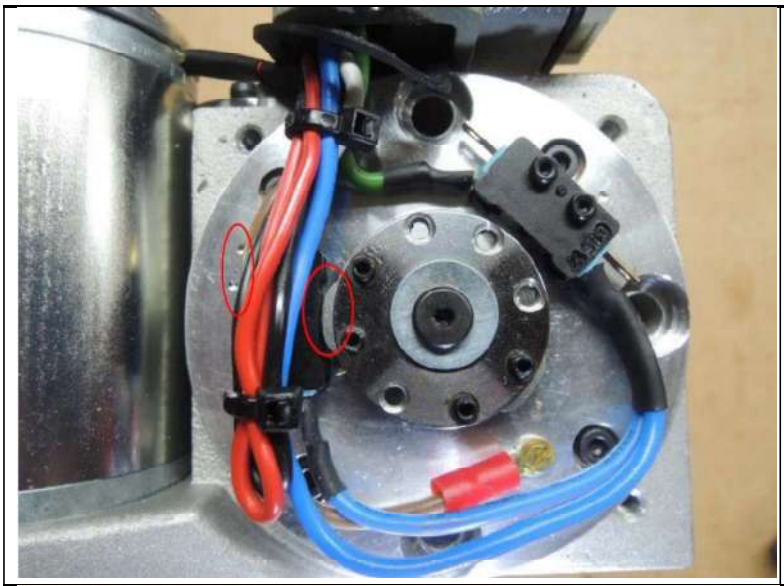
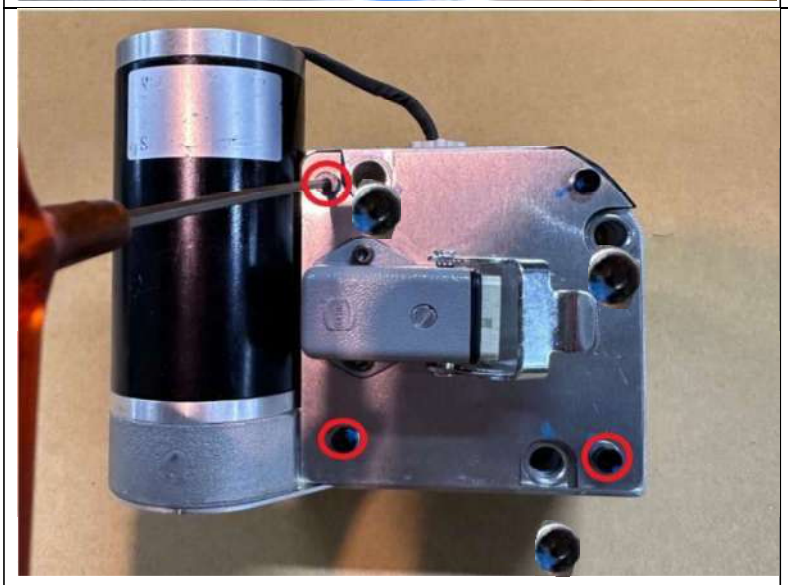


S1 Low gear adjustment complete



4. S2 Shift unit contact piece adjustment

Low gear S2 adjustment
Switch to high gear and insert contact piece into S2 high gear micro switch.
Adjust the contact position between the contact piece and the micro switch to the center.
Fix contact piece with bolts M3x6 and Loctite:243.

	S2 High gear adjustment complete
	5. Using PH T25 wrench to tighten 3 bolts.
	6. Using torque wrench to tighten bolts. torque :23Nm

5 Inspection and maintenance

Frequency	Content
Every day:	- check the oil channels and oil control system
Every week:	- check the oil level of gearbox - check the oil quantity(visually) - check the filter - check the leakage of the gearbox
After 2000 working hours or every six months	- change the oil - check the oil channel and control system

Intervals for check and maintenance must be kept.

It may cause damage on the bearing or gear if don't comply with above description about check and maintenance.

Check and maintenance can be only carried out when the gearbox cool down. Hot oil may cause injury.

6 Fault finding and Tips

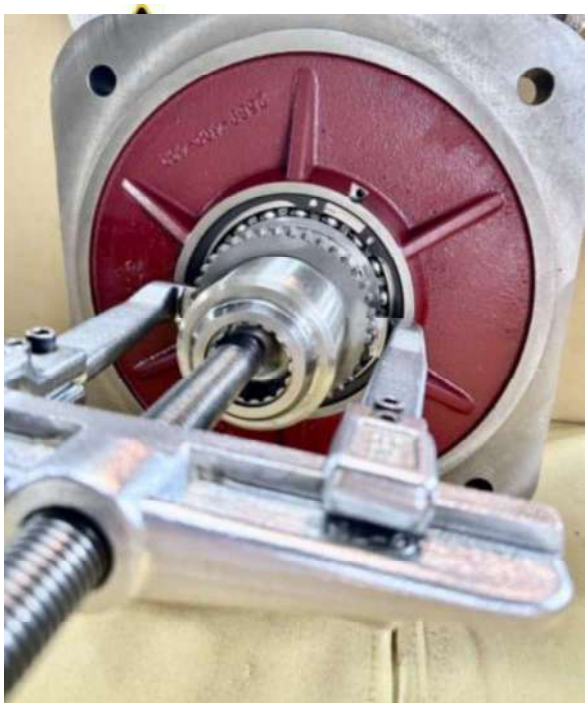
Fault	Cause of fault	Tips
Gearbox is loud, running noise	a) engaging/friction noise: bearing damage b) Knocking noise: drive mechanism is asymmetric. c) Rotating noise: wrong installation of output shaft.	a) contact GTP service. b) contact GTP service. c) Mount the output shaft onto the spindle correctly, careful about second damage.
Abnormal, irregular noise	Foreign object in the oil.	- Check the oil - stop the gearbox and contact GTP service.
Oil leakage at a) gear cover b) sealing	a) rubber seal of the gear cover has a leakage b) sealing defect c)oil cannot return to oil cooler.	a) Tighten the screw between gear cover and gear, if still leakage please contact GTP service. b) Contact GTP service. c) Check the oil quantity and remove the foreign object, if still leakage please contact GTP service.
Motor or input shaft rotate, output shaft cannot rotate.	a) Connection between shaft and hub is interrupted.	Return the gearbox to the manufacturer.

6.1 Gearbox – disassemble

- Stop the machine
- Stop the power supply
- Disconnect the electrical plug
- Drain the gearbox oil and disconnect the gearbox oil pipes
- Remove the bolts (11)
- Pull the gearbox (6) off the adapter plate (5) and hub (1)

Hub:

- Screw off the pin(9)
- Using the three am puller and remove aid(12) to pull off the hub until it is separated from motor shaft.



After disassembly renew the hub seal disc and o-ring
Before installing clean and coat the sealing edge with liquid seal.