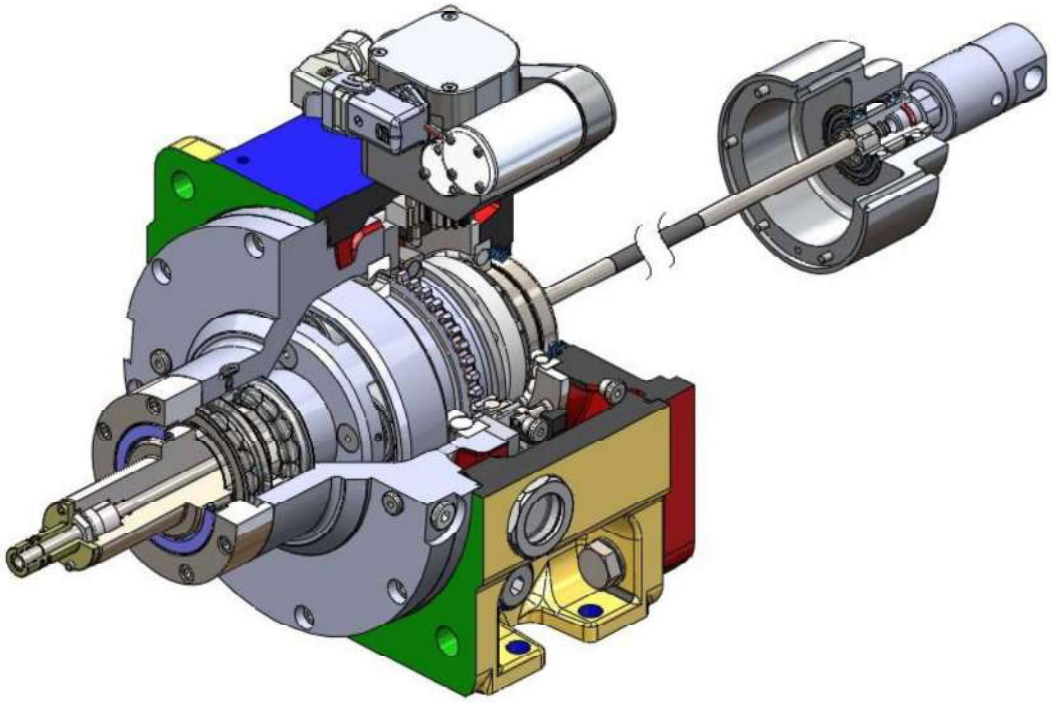
German Tech Precision Manufacturing Co., Ltd

Installation and Operation Instructions（manual）

For two-speed gearbox

2G CTS 120/250/300



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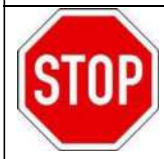
1 Important Notes

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 delivery;

➢ 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 can 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.

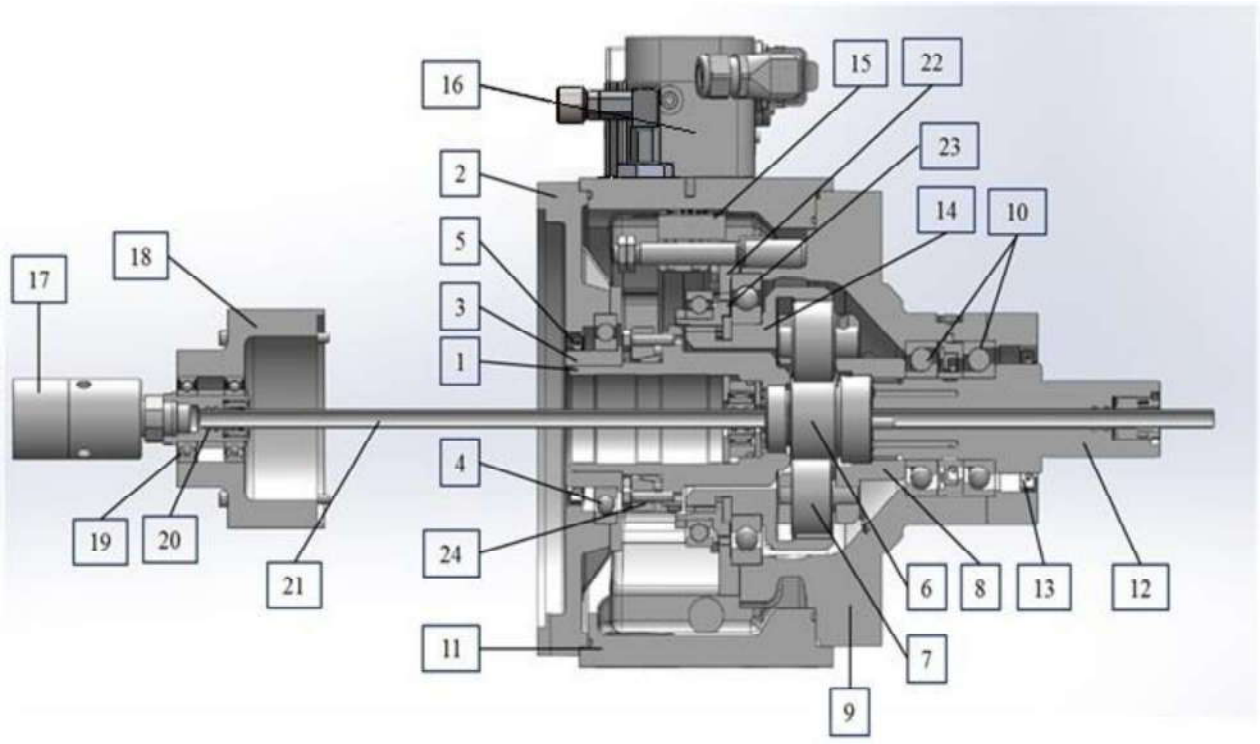
With different installation positions the gearbox can be used in Vertical

Lathe and Horizontal B5, Vertical Machining center V1 or V3.

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

3 Gearbox Structure

Connecting part	**Input**	**Shifting system**	**Rotary union**
1.hub	6.sun gear	15.rack	17.rotary union
2.adpater plate	14.ring gear	16.shift unit	18.bearing seat
3.bushing	**Output**	22.brake disc	19.bearing
4.hub bearing	7.planetary gear	23.sliding sleeve	20.bearing bushing
5.hub seal	8. planet carrier		21.coolant pipe
24.shrink disc	9. bearing housing		
Housing	10.output bearing		
11.gearboxb housing	12.output shaft		
	13.output seal		

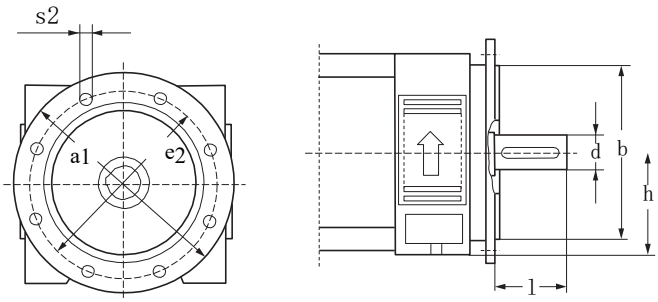


3.1 Technical data

Type	2G CTS120	2G CTS250	2G CTS300
Nominal torque	Max.19kw	Max.39kw	Max.47kw
Nominal speed	1500rpm	1500rpm	1500rpm
Nominal input speed	Max.120Nm	Max.250Nm	Max.300Nm
Max.input speedi≠1	8000rpm	6300rpm	6300rpm
Max. input speed i=1	12000rpm	10000rpm	10000rpm
Max.output torque i = 1.00 i = 4.00 i = 4.91 i = 5.5	 120Nm 480Nm 589Nm	 250Nm 1000Nm 1375Nm	 300Nm 1200Nm 1375Nm
Weight	About 45kg	About 71kg	About 95kg
Motor dimension			
h	100	132	160
d	32/38	42/48	55/60
l	80-0.1	110-0.2	110-0.2
b	180	250	300
e2	215	300	350
a1	-	-	-
s2	14	18	18

Caution:

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



3.2 Installation positions

Horizontal B5 (fig 1)

Fig 1

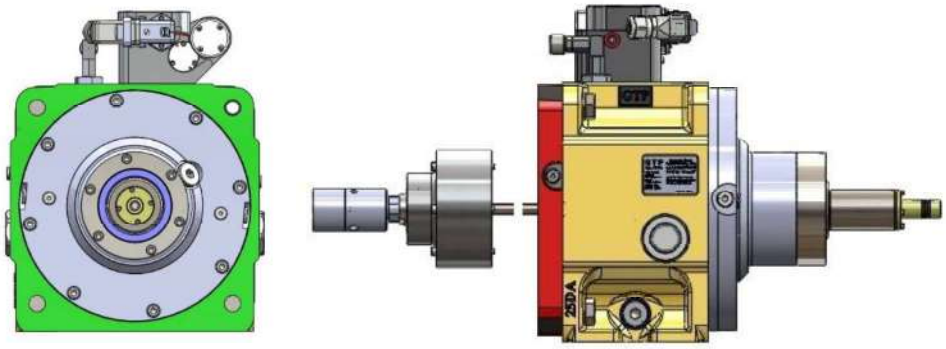
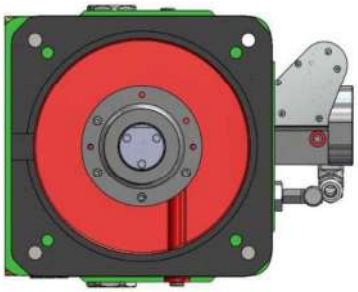
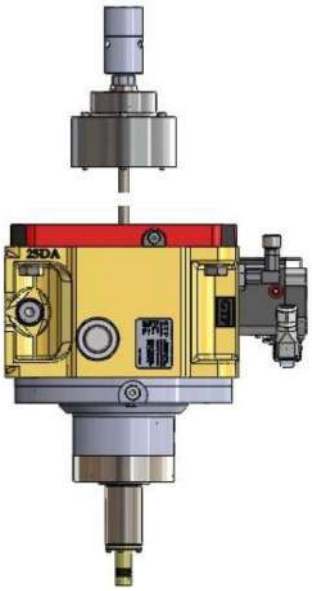


Fig 2 Horizontal B5 rotate 90°

Fig 3 Vertical V1

Shift unit on right side, gearbox turned 90°around axial (view to input end)





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 2G CTS120/250/300 is useable as below models:

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

Three sizes of motor: center height（AH）：(100mm, 132mm and 160 mm).

Output:

Inline CTS output version

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

3.4 Backlash

GTP 2G CTS 120/250/300 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.

NOTE:
In case of oil sight glass is not visible when gearbox is installed on special angle, please take a tube with scale to replace oil sight glass.

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, installation positions as well.

For 2G CTS, it is necessary to use 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 2.5 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 that install an oil level sensor in the auxiliary tank to avoid damage to the gearbox due to lack of oil.

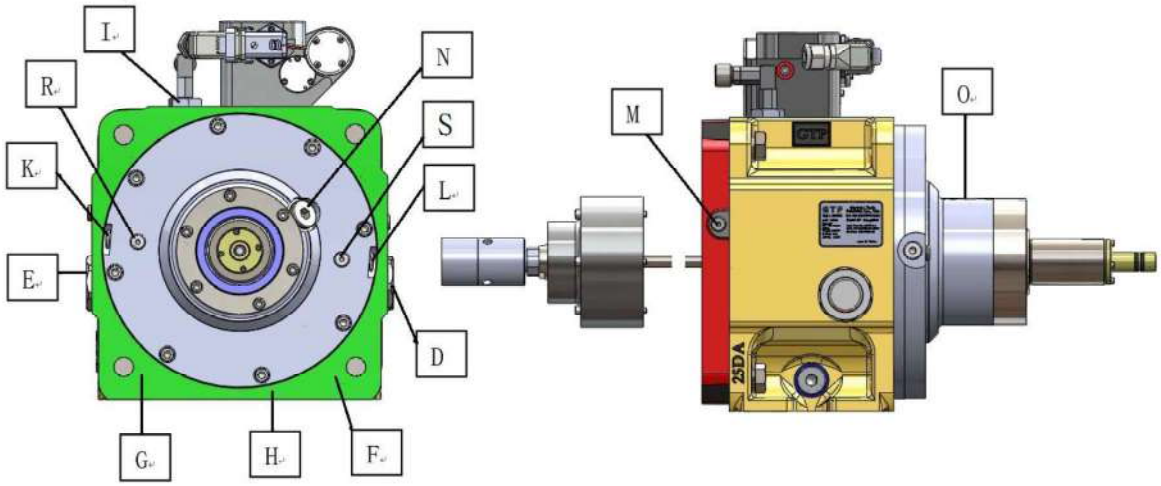
Install a filter(60μm) and a safety valve at oil inlet pipeline.

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

3.5.4 Lubricant

	Description	Application	Remarks
Gearbox oil	HLP32 to ISO VG32	Recirculating lubrication with heat exchanger	
	HLP22 to ISO VG22		

3.5.5 Oil ports and pipes connections for circulation lubrication



The principle factor in determining the oil supply volume is always the volume that flows out of the oil return.

If lubricating system is not able to use K, R/L as oil inlets, the C.L.S. cannot be used, and also max. speed is not reachable.

Installation position	Inlet ports	Max. pressure	Outlet ports
V1/B5	**K or R**(1.5 dm^3/min) **M** (approx. 1.0 dm^3/min)	2.5 bar	D or E
B5 rotate 90°	**K or R** (1.5 dm^3/min) **M** (1.0 dm^3/min)	2.5 bar	H

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° and 1-5 times per second.

Angle**[°/sec]**	Speed**[rpm]**	Time**[sec]**
5	1.00	0.83
	2.00	0.42
	3.00	0.28
	4.00	0.21
	5.00	0.17

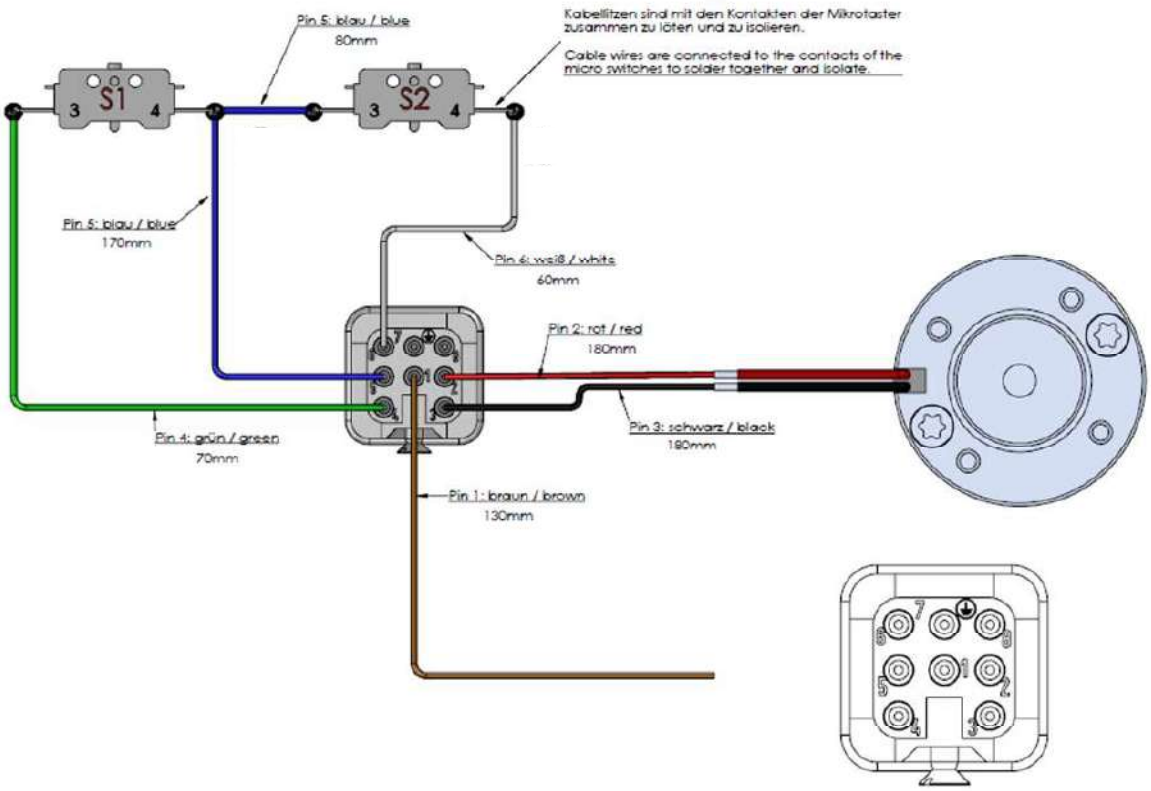
Limit switch control current : 0.1 – 0.5 A
Chang over control current : 5 A.

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

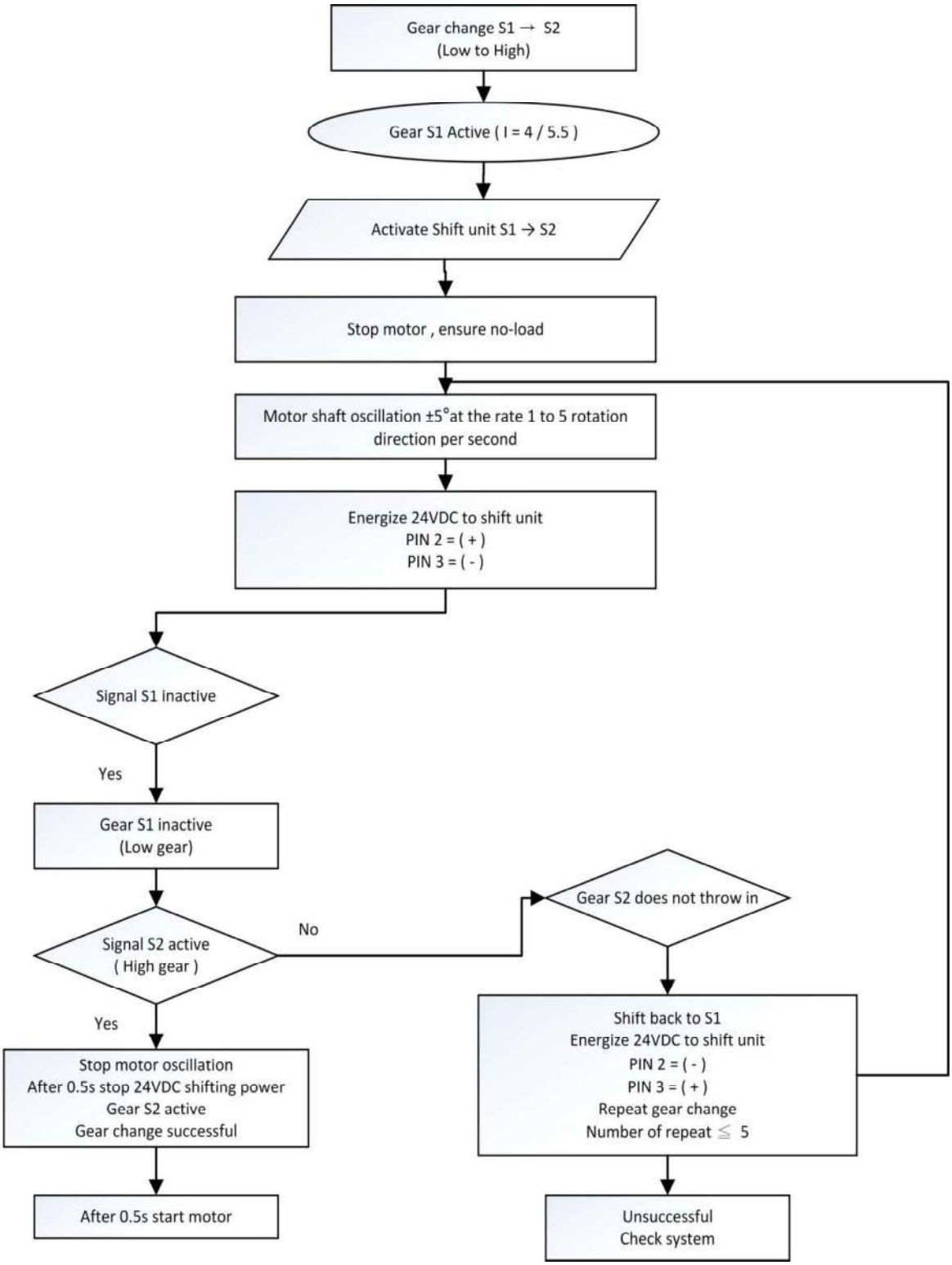
2nd gear ==> 1:1



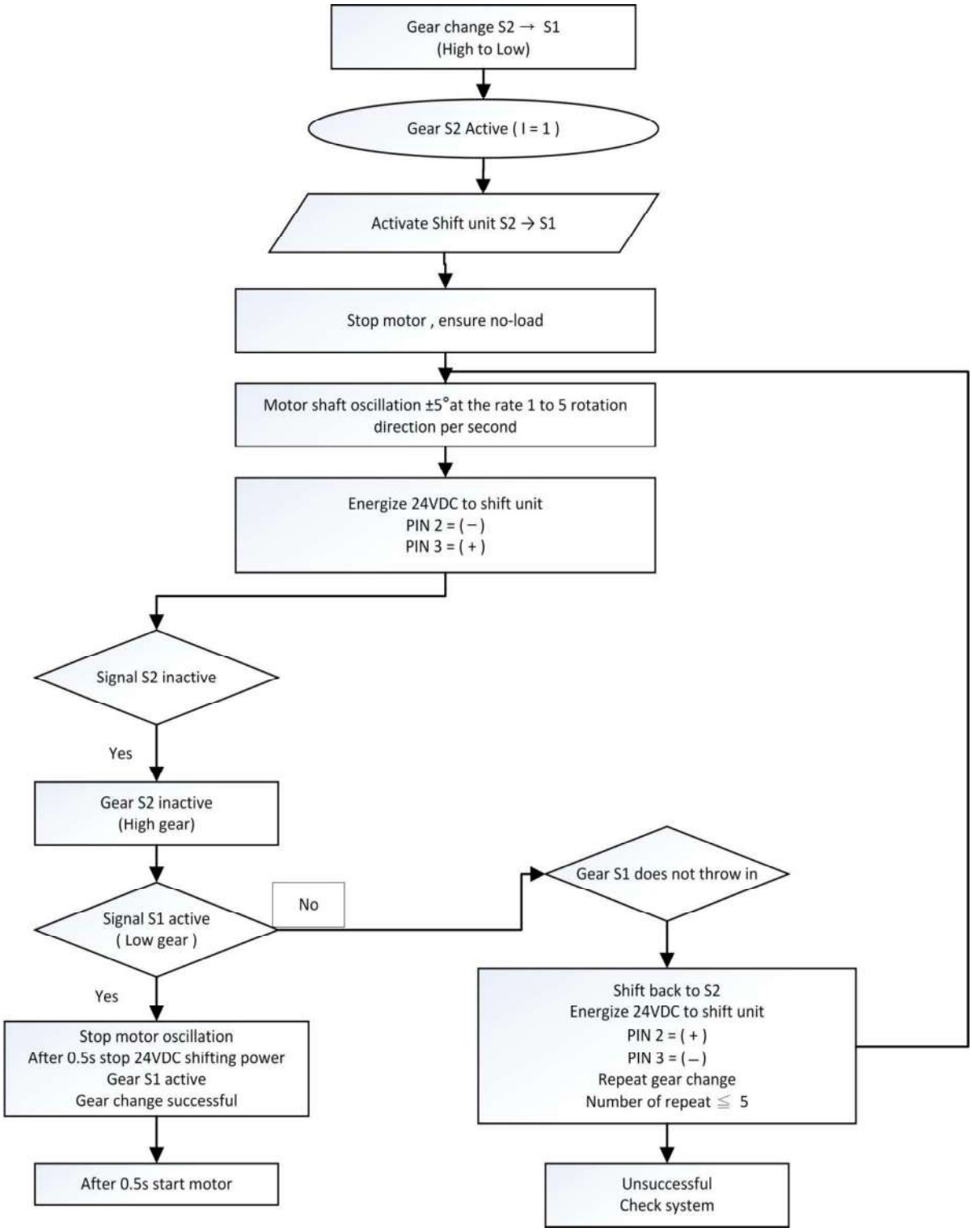
plug configuration Harting Han8U without Neutral position		
	cable color	2G120 / 2G121 / 2G250 / 2G300
Pin 1	brown	grounding housing
Pin 2	red	motor + ; + 24V DC ; min. 2.5A
Pin 3	black	motor - ; - 24V DC ; min. 2.5A
Pin 4	green	signal S1- Position
Pin 5	blue	power supply micro switch ; 24V DC ; max.1.5A
Pin 6	white	signal S2- Position
Pin 7	not used	not used
Pin 8	not used	not used

3.7 Shift logic

S1→ S2 (Low gear to High gear)



S2→S1 (High gear to Low gear)


Gear change S2 → S1
(High to Low)
Gear S2 Active (I = 1)
Activate Shift unit S2 → S1
Stop motor , ensure no-load
Motor shaft oscillation ±5°at the rate 1 to 5 rotation direction per second
Energize 24VDC to shift unit
PIN 2 = (–)
PIN 3 = (+)
Signal S2 inactive
Yes
Gear S2 inactive
(High gear)
Signal S1 active
(Low gear)
No
Gear S1 does not throw in
Yes
Stop motor oscillation
After 0.5s stop 24VDC shifting power
Gear S1 active
Gear change successful
Shift back to S2
Energize 24VDC to shift unit
PIN 2 = (+)
PIN 3 = (–)
Repeat gear change
Number of repeat ≦ 5
After 0.5s start motor
Unsuccessful
Check system

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 other contaminant (use standard agent).
Keep the agent away from seal lip, it can damage the material!

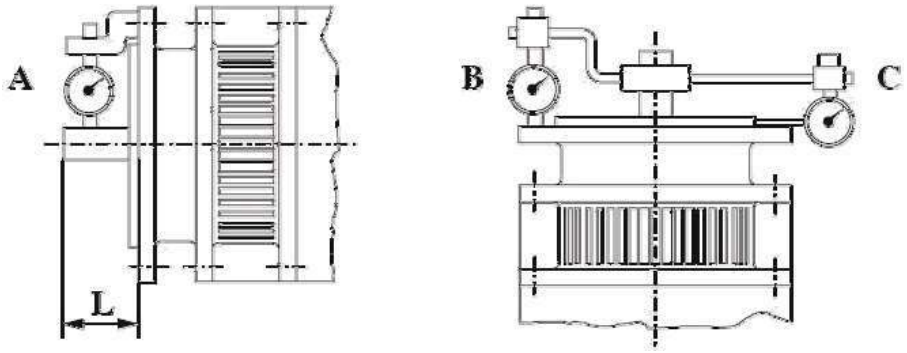
4.4 Input

According to specific requirements GTP can provide different input versions.

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
Gearbox 2G CTS120 D value :73.3~73.5.mm
Gearbox 2G CTS250/300 D value :124.8~125.0mm



Measurement of motor tolerance

Gearbox type	tolerance			
	A	**B**	**C**	**L**
2G CTS120	0.025	0.05	0,05	±0,1
2G CTS250 2G CTS300	0.025	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.

4.4.2 Gearbox installation

Please refer to the video.

4.5 Output

GTP 2G CTS gearbox - Optical output

Gearbox type	Diameter
2G CTS120	Φ38
2G CTS250	Φ42
2G CTS300	Φ42

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 GTP 2G CTS is B5/V1。

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.

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
Abnormal, regular noise	a) engaging/friction noise: bearing damage	a) contact GTP service.
	b) Knocking noise: drive mechanism is asymmetric.	b) contact GTP service.
	c) Rotating noise: wrong installation of output shaft.	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	a) rubber seal of the gear cover has a leakage	a) Tighten the screw between gear cover and gear, if still leakage please contact GTP service.
b) sealing	b) sealing defect	b) Contact GTP service.
	c)oil cannot return to oil cooler.	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.