

Installation and Operation Instructions

**Variable Speed Couplings
Type YOTcp**

Guangdong Zhongxing Power Transmission Co., Ltd.

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1. Preface

This manual will help you to use our couplings in a safe, proper and economical way.

This manual shall always be read and used by every person before working on the coupling, it shall be available on the machine site for easy reference.

The YOTcp coupling is designed on the basis of the advanced theory & technology in field of power transmission of Voith, Germany, referenced with the ideal cavity and manufactured according to the requirement of GB 5837-86 < The Types and basic parameters of Hydrodynamic Couplings> in standardization, seriezation and universaztion.

The YOTcp coupling is designed to transmit power at rated values and under definite conditions. Incorrect use including incorrect installation or filling, use for other purpose or excessive power or speed etc., will cause damages to the coupling and other machines and may even endanger the safety of operating personnel. The manufacturer is not liable for any responsibility on all loss out of incorrect handling of the couplings.

This manual has been issued with utmost care. However, in case you need any further information, please contact

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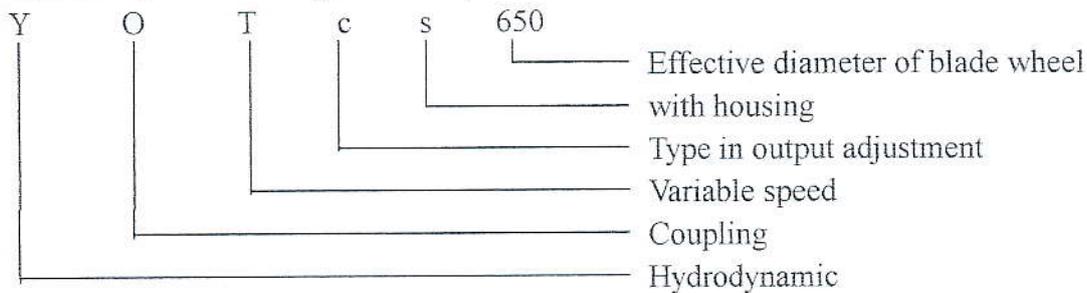
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2. Constructions

2.1 Code meanings:

For example: meanings of YOTcp650



2.2 Construction features:

YOTcp couplings mainly consists of housing, running parts, oil supply components, oil drainage components, scoop operating device and instruments. It can be in operation after adding the auxiliary parts (such as cooler, speed inspection device, etc.).

(1) Housing

The rotation components of YOTcp coupling is supported by a rectangle welding housing, which has enough capacity for fluid and connects the cooler in outlet. Oil is pumped directly from the housing, entered inlet & working cavity after cooling. Oil will be drained to the housing after aspirated by scoop tube.

(2) Running part

Input side: input shaft, back shell, pump wheel, shell and bearing sleeve of pump wheel.

Output side: turbine wheel and output shaft.

The input shaft and output shaft of YOTcp couplings are supported by roller bearing. After connection, the input shaft, pump wheel, back shell and back shell cover are supported by housing and scoop tube housing. The output shaft is supported by a bearing bush and scoop tube housing. The pump wheel and turbo wheel are aluminum castings with high strength. For special case, such as large power & high speed, they should be steel castings. The running parts support on the housing. During the operation, the temperature will increase to 50°C~80°C, thus the flexible coupling must be used for the connection of YOTcp coupling, motor and working machine.

(3) Oil supply components

I. Mail oil pump

The main oil pump is the trochoid rotor pump, which the rotor is made up of iron-base alloy. It is put in the pump case, driven by the gear of input shaft. As the power transmitted and filling volume is different, the structure of oil supply device is different in different size.

II. Oil inlet and outlet

There are inlet & outlet flange on the housing, which connects the in & out pipes of cooler.

III Oil level, temperature & pressure

The level gauge is put on the housing. The pressure gauge, thermometer are put at outlet. And there is a thermometer at inlet.

(4) Oil draining components

Mainly consists of scoop tube, oil returning pipes.

(5) Scoop tube control assembly

The speed regulation of coupling is realized via the moving of scoop tube to change the filling volume of working cavity. The assembly which can control the moving of scoop tube is electric actuator, which can realize remote and automatic control.

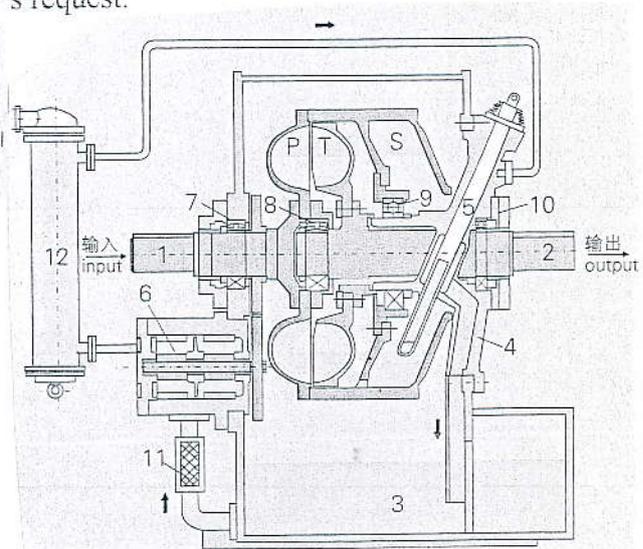
(6) Instrument

Mainly consists of two electric thermometers to measure the temperature of inlet & outlet, and a electric pressure gauge to measure the oil pressure at outlet. The RTD and pressure transformer can be used according to user's request.

(7) Speed measuring pick-up

To measure the speed of output shaft. The output shaft or output connecting coupling should be fixed with a gear wheel with 60 gears and the modulus bigger than 2.5mm. The speed measuring pick-up is supplied according to user's request.

P. Pump wheel	T. Turbo wheel	S. Scoop chamber
1. Input shaft	2. Output shaft	3. Housing
4. Scoop case	5. Scoop tube	6. Oil pump
7. Input bearing	8. Inset bearing	9. Bearing of pump wheel
10. Output bearing	11. Filter	12. Cooler



3. Operation Principle

3.1 The principle of power transmission

When machine starts, the oil is forced out from the bottom of the housing by the gear pump of input shaft, arrives the scoop tube through cooler and enters the working cavity through the oil inlet of pump wheel.

When the couplings is running, the fluid extravagates from the working cavity via the hole on edge pump wheel and enters the cavity of scoop tube. There is an adjustable scoop tube in the housing of pump wheel and enters the cavity of scoop tube. As the nozzle of scoop tube is put inside of the scoop tube room, the flex of scoop tube is controlled by the electric actuator placed outside, and the thickness of the oil ring inside scoop

tube cavity depends on the radial position of scoop tube nozzle, thus the filling volume of working cavity and output speed is fixed. The oil is brought out from the cavity of scoop tube when the scoop tube enters the rotating oil ring, thus the thickness of oil ring is reduced and the fluid inside working cavity is out and flows to the bottom of housing, which supports the circulation. Contrarily, when the scoop tube draws back, the thickness of oil ring increases and more fluid inside the working cavity. Thus, the adjustment is made between two-limit position "full" and "empty" with the outside controlling device – scoop tube, and the stepless regulating of output shaft is achieved. Please pay attention that the nozzle of scoop tube must move towards the rotating direction of working fluid.

3.2 The principle of speed variation

The oil can be cycled when the pressure difference exists between pump wheel and turbo wheel. Thus the speed difference (slip) is needed, i.e. the power transmission needs slip. The coupling is sized so that full power can be transmitted at 2~3% slip. The output speed can be steplessly varied by changing the slip which is achieved by increasing or decreasing the amount of oil in the working chamber between pump wheel and turbo wheel, i.e. by positioning the scoop tube to match the required output speed.

4. Function and Application

YOTcp coupling is a hydrodynamic component, which can adjust the output speed. It is placed between the engine machine and working machine, realizing the power transmission. It can make the engine startup without load. It can make the working machine realize stepless variation and change the output power under the condition that the input speed keeps unchanged. Its regulating scope: for centrifugal machine (such as fan, pump): 1~1:5 ; for constant torque machine: 1~1:3. YOTcp coupling is compact in structure and convenient in installation & adjustment, which has its own oil supply system. The flex of scoop tube can be adjusted by the electric actuator with automatic & remote control. The coupling can be used as soon as a suitable cooler and relative pipes is equipped.

4.1 Advantages:

- ◆ Increase the startup ability of squirrel-motor, and accelerate the driven machine at its maximum torque; can be equipped with high-voltage motor.
- ◆ Overload protection; prevent the motor from damage by overspeed and protect the motor from overload of working machine.
- ◆ Enable the motor to start at no load, shorten the startup time and reduce the average current during startup.
- ◆ Synchronize multi-motor drive.
- ◆ Dampen shocks and vibrations, prolong the service life of machine.
- ◆ No special maintenance is needed for long time, no friction to transmit torque, longer working life.
- ◆ Stepless regulating can be realized; good energy saving at about 20%~40%; low investment with less electric equipment.
- ◆ Allow remote and automatic control.

- ◆ High transmit efficiency, at rated working condition $\geq 97\%$.

4.2 Applications:

- ◆ Pumps: boiler feed pump, circulation pump, cooling and condensation pump, crude oil pump, pipeline pump, ash pump, piston pump, etc.
- ◆ Fans: dedust fans in the field of metallurgy industry, ventilation fan, induce draft fan, forced draft fan, blower, compressors and fans used in steel plant, power plant and cement plant.
- ◆ Belt conveyor, crusher, centrifugal machine and rotating dryer, etc.

5. Working fluid

Couplings must be filled with 6# hydraulic oil or #32 machine oil before operation. Mixing oil is not allowed. The container for filling must be clean enough. The specified filling quantity is just approximate, which does not include the filling of cooler.

Remove the cap of filling plug on the oil housing and fill the filtered oil (40 μ m filtered precision) to "Maximum level", then start the machine for short time operation. The scoop tube should be adjusted to the 0% position. The oil is cycled by the supply pump via pipes and cooler. The oil level should be reached "Maximum level" after the machine is stopped. Be ware not to fill too much. Otherwise, the running parts will overheat because of too high oil level or the oil pump will be damaged because of too low oil level.

The oil level should be regularly checked during operation. It is not allowed to higher than "Maximum level" or lower than "Minimum level" at any case.

Physical performance of oils

No.	Performance	6# Hydraulic oil	#32 Machice oil
1	Density (20°C) KN/M ³	0.872	0.901
2	Viscosity m ² /s(50°C)	22~26 × 10 ⁻⁶	22~23 × 10 ⁻⁶
3	Viscosity ratio (V50/V100 not larger than)	4.2	
4	Viscosity index		>90
5	Flash point °C (not lower than)	180	180
6	Freezing point (not higher than)	-25	-15
7	Water	no	no
8	Acid value after oxidation(mmKOH/g)		0.02
9	Anti-foam(mm)	55/0(120°C)	10/0(80°C)
10	Color	Transparent, yellow	Transparent

6. Technical parameters

规格型号 Size	输入 转速 Input speed r.p.m	传递功 率范围 Power transmitted kw	额定 转差率 Slip s%	无级调 速范围 Range of speed regulating	安装尺寸 Mounting dimension (mm)																	重量 (净重) Weight kg			
					A	B	C	K	E	F	L	P	Q	M	N	h ₁	h ₂	h	H	L ₁	D		G	S	4- ϕ
YOTcp360	1500	15-40	1.5-3	离心式机械: 1-1/3; 恒扭矩机械: 1-1/5;	712	912	750	89	680	625	830	150	150	100	40	250	220	560	940	120	60	64	18	ϕ 27	525
	3000	110-320			712	912	750	89	680	625	830	150	150	100	40	250	220	560	940	120	60	64	18	ϕ 27	525
YOTcp400	1500	30-70	1.5-3		712	912	750	89	680	625	830	150	150	100	40	250	220	560	940	120	60	64	18	ϕ 27	680
	3000	220-540			712	912	750	89	680	625	830	150	150	100	40	250	220	560	940	120	60	64	18	ϕ 27	680
YOTcp450	1500	55-120	1.5-3		1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	960
	3000	390-970			1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	960
YOTcp500	1500	90-205	1.5-3		1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	1180
	3000	670-1640			1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	1250
YOTcp530	3000	900-2150	1.5-3		1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	1350
YOTcp560	1000	55-110	1.5-3		1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	1400
	1500	155-360			1020	1185	1110	40	865	940	1020	110	230	120	40	285	75	635	1285	145	75	79.5	20	ϕ 27	1400
YOTcp650	1000	95-225	1.5-3		1000	1550	1035	152.5	1450	800	1200	175	230	120	45	315	195	750	1385	150	100	106	28	ϕ 35	1550
	1500	290-760			1000	1550	1035	152.5	1450	800	1200	175	230	120	45	315	195	750	1385	150	100	106	28	ϕ 35	1550
YOTcp750	750	80-195	1.5-3		1000	1550	1035	152.5	1450	800	1200	175	230	120	45	315	195	750	1385	150	100	106	28	ϕ 35	1750
	1000	185-460			1000	1550	1035	152.5	1450	800	1200	175	230	120	45	315	195	750	1385	150	100	106	28	ϕ 35	1750
	1500	510-1555			1000	1550	1035	152.5	1450	800	1200	175	230	120	45	315	195	750	1385	150	100	106	28	ϕ 35	1750
YOTcp800	750	100-265	1.5-3		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2500
	1000	250-635			1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2500
	1500	790-2150			1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2500
YOTcp875	750	155-420	1.5-3		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2750
	1000	390-995		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2750	
	1500	1240-3360		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	2750	
YOTcp910	600	115-280	1.5-3	1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	3150	
	750	235-530		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	3150	
	1000	500-1250		1150	1600	1050	220	1500	950	1400	185	190	120	45	375	250	850	1550	210	130	137	32	ϕ 35	3150	
YOTcp1000	600	170-420	1.5-3	1150	1750	1250	220	1650	950	1500	190	235	135	45	375	180	900	1650	250	150	158	36	ϕ 35	4150	
	750	330-820		1150	1750	1250	220	1650	950	1500	190	235	135	45	375	180	900	1650	250	150	158	36	ϕ 35	4150	
	1000	750-1950		1150	1750	1250	220	1650	950	1500	190	235	135	45	375	180	900	1650	250	150	158	36	ϕ 35	4750	
YOTcp1050	600	175-535	1.5-3	1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5150	
	750	360-1045		1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5150	
	1000	815-2480		1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5150	
YOTcp1150	600	355-845	1.5-3	1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5500	
	750	670-1650		1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5500	
	1000	1590-3905		1500	1850	1300	235	1750	1300	1750	340	225	120	50	320	200	1150	1950	250	150	158	36	ϕ 35	5500	
YOTcp1250	500	400-740	1.5-3	2050	2150	1650	135	1600	1980	2250	570	325	200	70	310	175	1170	2150	300	160	169	40	ϕ 40	7550	
	600	500-1280		2050	2150	1650	135	1600	1980	2250	570	325	200	70	310	175	1170	2150	300	160	169	40	ϕ 40	7550	
YOTcp1320	500	525-975	1.5-3	2050	2150	1650	135	1600	1980	2250	570	325	200	70	310	175	1170	2150	300	160	169	40	ϕ 40	7850	
	600	690-1700		2050	2150	1650	135	1600	1980	2250	570	325	200	70	310	175	1170	2150	300	160	169	40	ϕ 40	7850	
YOTcp1400	500	650-1250	1.5-3	2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	8850	
	600	900-2150		2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	8850	
	750	2000-4350		2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	8850	
YOTcp1550	500	1150-2050	1.5-3	2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	9500	
	600	1500-3650		2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	9500	
	750	3350-7150		2500	2350	1700	200	1750	2000	2500	555	1550	200	70	385	200	1350	2350	320	200	210	45	ϕ 45	9500	

7. Outside dimension and layout with motor & working machine

Size	Input speed r.p.m	Mounting dimension (mm)														Weight kg
		A	B	C	K	E	F	L	h	H	L ₁	D	G	S	φ-P	
Y0Tcp360	1500	712	912	750	89	680	625	830	560	940	120	60	64	18	φ 27	525
	3000															
Y0Tcp400	1500	712	912	750	89	680	625	830	560	940	120	60	64	18	φ 27	680
	3000															
Y0Tcp450	1500	1020	1185	1110	40	865	940	1020	635	1285	145	75	79.5	20	φ 27	960
	3000															
Y0Tcp500	1500	1020	1185	1110	40	865	940	1020	635	1285	145	75	79.5	20	φ 27	1180
	3000															1250
Y0Tcp530	3000	1020	1185	1110	40	865	940	1020	635	1285	145	75	79.5	20	φ 27	1350
Y0Tcp560	1000	1020	1185	1110	40	865	940	1020	635	1285	145	75	79.5	20	φ 27	1400
	1500															
Y0Tcp580	3000	1160	1310	1150	30	920	1080	1230	810	1450	165	95	100	25	φ 27	1650
	3000															1850
Y0Tcp620	3000	1170	2160	1320	183	2060	1070	1485	900	1583	200	120	127	32	φ 35	2750
Y0Tcp650	1000	900	1210	975	113.5	1140	675	1130	700	1250	150	100	106	28	φ 35	1550
	1500															
Y0Tcp750	750	1000	1550	1035	152.5	1450	800	1200	750	1385	150	100	106	28	φ 35	1750
	1000															
	1500															
Y0Tcp800	750	1150	1600	1050	220	1500	950	1400	850	1550	210	130	137	32	φ 35	2500
	1000															
	1500															
Y0Tcp875	750	1150	1600	1050	220	1500	950	1400	850	1550	210	130	137	32	φ 35	2750
	1000															
	1500															
Y0Tcp910	600	1150	1600	1050	220	1500	950	1400	850	1550	210	130	137	32	φ 35	3150
	750															
	1000															
Y0Tcp1000	600	1150	1750	1250	220	1650	950	1500	900	1650	250	150	158	36	φ 35	4150
	750															
	1000															
Y0Tcp1050	600	1500	1850	1300	235	1750	1300	1750	1150	1950	250	150	158	36	φ 35	5150
	750															
	1000															
Y0Tcp1150	600	1500	1850	1300	235	1750	1300	1750	1150	1950	250	150	158	36	φ 35	5500
	750															
	1000															
Y0Tcp1250	500	2050	2150	1650	150	1600	1950	2250	1170	2150	300	160	169	40	φ 40	7550
	600															
	750															
Y0Tcp1320	500	2400	2250	1650	200	1700	2000	2400	1250	2250	300	180	190	45	φ 45	7900
	600															
	750															
Y0Tcp1400	500	2400	2250	1650	200	1700	2000	2400	1250	2250	300	180	190	45	φ 45	8250
	600															
	750															
Y0Tcp1550	500	2500	2350	1700	200	1750	2000	2500	1350	2350	320	200	210	45	φ 45	9500
	600															
	750															

8. Transportation, Installation & Commissioning

8.1 Transportation

The coupling is packed with a wooden box for transportation. The coupling must be lifted at holes on two sides when arriving the application site and checking its spare parts.

8.2 Mounting on foundation

It is recommended to add a foundation with steel frame for motor-coupling-working machine or motor-coupling on the concrete foundation for convenient installation. Concrete should be finished in two times after the level of steel frame is adjusted, so that the motor, coupling and working machine is in the same foundation.

8.3 Installation & adjustment

- 1) The flexible coupling is used for the connection between YOTcp coupling and motor, working machine, which the tolerance between the hole of flexible coupling and hub is H7/js6. The coaxial between outer diameter and inner hole is required not to exceed 0.05mm. The vertical requirement between the plane and shaft line of inner hole should not exceed 0.04mm. The micrometer gauge is used for adjustment during alignment.
- 2) The alignment of YOTcp coupling. Normally the working machine should be adjusted firstly, then the coupling is aligned to working machine. Finally the motor is aligned to the coupling.
- 3) The alignment of coupling is very important. If the alignment between these three machines, the flexible component inside flexible coupling will be damaged very quickly, resulting in the damage of bearings. Seriously, the hub will be bent or broken. Therefore, the following procedures should be followed for alignment:
 - a. To align the position of hubs & shafts roughly.
 - b. To align the hubs & shafts on horizontal plane, which should not exceed 0.06/1000.
 - c. To align the hubs & shafts on vertical plane. As the center height will rise with the increase of temperature when the motor, coupling and working machine is running, while their increase value is different, this factor should be considered and suitable value should be reserved during alignment. The detailed value can be determined by the increase ratio of motor, working machine and coupling.

The increase value (mm) of center height, which causes by the temperature increase of coupling, is referenced as following:

Type	360	400	450	500	560	580	650	750	875	910	1000	1150	1250 1320	1400	1550
Increase value	0.25		0.30			0.35	0.35		0.35		0.40		0.45		0.55

(mm)

Therefore, the center height can be a little lower than the fix value during alignment.

- d. Machines can be run after motor, coupling and working machine is aligned and trial running, finding that the temperature is increased to stable and the vibration, noise complies to the requirement. If the vibration and noise exceeds the normal range, machines should be sopped for checking and looked for reasons to align again for re-trial running. The vibration and noise of should be accorded to the standard JB/JQ19120-88 .

(JB/JQ 19120—88)

Check-up Item				Measurement unit	Excellent product	First-class product	Qualified product	
Performance	Rated slip S			%	To be determined	≤ 3		
	λB (not less than)			min^2/m		1.9×10^{-6}	1.7×10^6	
	Variation range(not less than)					1:1/5		Loading for fans
Normal Required	Result of sealing					no leakage		
	Reliability	Average working time without fault (not less than)				h	700	5000
Vibration (not larger than)		Speed r/min	3000	μm		20	75	
			1500			33	160	
			1000			42	235	
Safety	Noise (Not larger than)	Speed r/min	≤ 1500			84	90	
			≤ 3000	87		93		
			> 3000	89	95			

8.4 Mounting of cooler

The cooler should be mounted near the couplings. Its inlet & outlet flange should be lower than the Max. level of couplings. For tube-type cooler, its foundation should be 250mm lower than coupling's, in order to prevent the cooling oil back filled. The board-type cooler doesn't have this special requirement. The feet of cooler can be fixed with bolts.

8.5 Connections of oil & water pipes

The related oil and water pipes are connected with flanges by solder in accordance the actual requirement on the site. They must be cleaned. The oil pipes should be washed with hot oil after the rusts are moved out by acid. First they are connecting to the inlet & outlet flange of cooler, then they are connected to the inlet & outlet flanges of coupling after fully filling of oil. There should be a gauge for water pressure at the inlet of cooling water, so that the water pressure can be observed whether the pressure is enough or not. The normal water pressure is $P_{water} \geq 0.2\text{Mpa}$.

8.6 Electric installation

In accordance with the related requirement, cables of pressure gauge and thermometer should be linked to the related warning circuit, or linked to the control circuit of motor, working machine, so that the motor and working machine can stop operation when the pressure & temperature exceed. The alarm of pressure gauge is lower than 0.05Mpa or higher than 0.35Mpa, and the alarm of inlet temperature is higher than 70°C and the outlet is higher than 88°C.

The wires of electric actuator, operator and speed measuring pick-up should be connected according to the manual. Or the wires can be linked according to the requirement of auto-control, so that the auto-control can be realized.

9. Variable speed coupling Operation & Maintenance

9.1 Test running

- a) As the rotation direction has been determined during assembly, the motor & working machine must be checked to rotate at the same direction at the first time of start up.
- b) To check the flexibility and accuracy of electric actuator.
- c) The input & output shaft is not allowed to vibrate during rotation.
- d) Leakage is not allowed at any parts.
- e) To open the water valve of cooler, ensuring the water flow speed is higher than 0.8m/s.
- f) The scoop tube must be adjusted to 0% when the coupling is started or stopped.
- g) To check the oil level is in Max. level.
- h) The working temperature of coupling must be between 45°C~88°C. It is not allowed to exceed 88°C. The best working temperature is 70°C±5°C. To select cooler according to the above figure, so that the temperature of oil drained by scoop tube doesn't exceed 95°C on the max. thermal load. To observe the oil temperature until level off.
- i) In principle, the machine can be turned off at any scoop tube position. If turned off at 0%, the motor may turn to the speed of empty.
- j) Long rotation of coupling should be avoided after turn off.
- k) If the actual condition is different to the assumption, the dimension of inlet baffle or oil or orifice should be changed.

9.2 Measures to be taken at standstill periods or at stand by operation

- a). If the plant is shutdown for long period , protect the coupling against water ingress and moisture. Preserve bright parts accordingly.
- b) For protection against corrosion of inner parts run the variable speed couplings for a short time, at least 1 to 2 months, to wet the inner pars with oil. Do not run the coupling hot. Condensation water may occur.

9.3 Maintenance Intervals and Measures to be taken

- a) Measures which can be taken with the unit running

During commissioning:

Check display of all thermometers and pressure gauges during start-up and Normal operation in accordance with the oil circuit and measuring points scheme, record values for subsequent comparison.

After 100 operation hours

Record and compare the displays of all thermometers and pressure gauges.

After 500 operation hours

Measure, record and compare noise pattern and smooth running (vibration) under same operating conditions in each case. Irregular running may refer to bearing damage or misalignment. Find out and remove the cause.

- b) Measures which can only be taken when the unit is at operation

Weekly:

Check oil level. The oil level can not be too low. In case of too high oil level, check the operation oil for water content. Find out and remove the cause f water content. Separate or change the oil.

After 100 operating hours:

Clean lube oil filter.

Clean vent filter.

Check smooth running of the actuator, check the end stops grease the articulated joints and exposed parts.

Clean oil cooler, if necessary, following manufacturer's instructions.

Check piping and grease/oil-lubricated connecting couplings for leaks.

Check operating oil for impurities and condensation water, centrifuge and filter if necessary.

After 500 operating hours:

Clean lube oil filter. Clean vent filter and wet with oil. Check piping and connecting couplings for leaks.

After 1000 operating hours:

All checks and maintenance operation as after 100 operating hours.

After 6000 operating hours:

Analyze the oil filling for aging. Consult the oil supplier before taking remedial action.

Check and service the connecting coupling according to manufacturer's instructions.

Check alignment of the variable speed couplings with the drive motor and the driven machine.

Check the foundation to be secure.

Visual inspection (corrosion, general condition etc.) of the variable speed coupling.

Check whether the fusible plugs are filled with solder by opening the cover fitted laterally on the housing.

10. Servicing of variable speed coupling

In the event of a change in operating behavior, the variable speed coupling should be serviced. Before beginning the service, take all necessary precautions to ensure the unit cannot be accidentally started up. Ensure no dust is raised during servicing and no dirt can enter the open variable speed couplings.

Procedure:

- 1) Open lube oil filter, examine and clean. Dismantle and check condition of connecting couplings. Check radial run-out and alignment of input and output shaft. Dismantle actuator and scoop tube. Drain operating fluid and fill in a collecting tank. Unflange cooler piping from couplings. Ensure that no oil will enter the foundation or ground during any work (take suitable measure to collect the oil.)
- 2) Remove filling pump, filling pipe and oil injection pipe. Remove the complete runner with the scoop tube housing from the couplings housing. To achieve this tilt the coupling until it rests on its input side.
- 3) We recommend to match-mark all running parts, which have no balancing marks, prior to dismantling, in order to reassemble them in their original position. Dismantle the rotating parts and renew the anti-friction bearings. Clean and check the impellers (resonance check of blades).
- 4) Re-assemble running parts using new washer, seals and anti-friction bearing.
- 5) Clean the housing, removing oil sludge and old sealing compound. If necessary, clean the oil cooler following the manufacturer's instructions. The cooler must then be pressure-tested for leaks (do not exceed the max. test pressure).
- 6) Install the running parts, the filling pipe, the oil injection pipe. Coat all sealing surface with new sealing compound and secure the bolts and screws as originally.
- 7) Remount the variable speed couplings on the foundation, re-align and bolt up the connecting couplings halves. Flange the piping on the cooler. Fill the variable speed

couplings and cooler with operating fluid.

Mount scoop tube and actuator.

Grease the joints and bright parts.

8) Connect the unit electrically.

Carry out a trial run and check the monitoring instruments.

11. Trouble Shooting

No	Observations	Possible case	Remedial action
1	Coupling doesn't start after the input side has run up to speed	Scoop tube position at "0%". No oil delivered by oil pump. Start torque too high, driven machine blocked.	Scoop tube adjustment towards "100%". Check oil pump and its direction of rotation.
2	Coupling heats up excessively during start-up	Driven machine is jammed in the bearings or glands, other obstacles. Oil flow too low	Remove obstacles Check oil flow.
3	Coupling heats up excessively during operation	Lack of cooling water, cooling water too warm, cooler contaminated. Oil supply too low	Check cooling system, clean cooler. Check oil pump and pipes.
4	Max. output speed can not be reached	Scoop tube is not in max. position. Input power of driven machine too high	Check max. scoop tube stroke. Measure power consumption and compare with the data.
5	Coupling cannot be controlled	Scoop tube or control rods are jammed. Actuator defect	Remove obstacles Check actuator
6	Fluctuation of output speed during manual control of variable speed coupling	Momentary fluctuations in driven machine due to pressure or quantity fluctuation in the system. Oil temperature from cooler to coupling too low, with a poor deaeration of oil. Oil pump is perhaps aspirating air.	Check the system, ventilate or stabilize, if necessary Increase the temperature (45 to 50°) Check oil level of pump
7	Fluctuation of output speed at automatic control of variable Speed couplings	The time required by the controller is not collect functional relation to the controlled system.	Calibrate the controller to the controlled system (by damping, if necessary)
8	Uneven running of Coupling, vibration and mech. noise	Loose foundation bolts Bearing damaged in the coupling or in the connected units	Check foundation bolts of the complete unit, retighten, if necessary, check alignment Check bearings of the units, replace them, if necessary
9	Bearing temperature too high	Lube oil filter contaminated, bearing damaged	Clean fiktter, replace the bearing, see also item 8

12. Spare Parts List

Size Qty Part	YOTcp360	YOTcp400	YOTcp450	YOTcp500	YOTcp530	YOTcp560	YOTcp580
O-ring	φ 75×3.55/1	φ 75×3.55/1	φ 210×3.55/1	φ 210×3.55/1	φ 210×3.55/1	φ 210×3.55/1	φ 155×3.55/1
	φ 180×3.55/1	φ 180×3.55/1	φ 190×3.55/1	φ 190×3.55/1	φ 190×3.55/1	φ 190×3.55/1	
	φ 260×3.55/1	φ 260×3.55/1	φ 78×3.55/1	φ 78×3.55/1	φ 78×3.55/1	φ 78×3.55/1	
	φ 65×3.55/1	φ 65×3.55/1	φ 135×3.55/1	φ 135×3.55/1	φ 135×3.55/1	φ 135×3.55/1	
Seal	PD38×55×12/1	PD38×55×12/1	PD42×62×12/1	PD42×62×12/1	PD42×62×12/1	PD42×62×12/1	
Bearing	32515E/1	32515E/1	32516E/1	32516E/1	32516E/1	32516E/1	E316E/1
	412 (D) 1	412 (D) 1	176314/1	176314/1	176314/1	176314/1	
	119/1	119/1	121/1	121/1	121/1	121/1	
	215/1	215/1	176216/1	176216/1	176216/1	176216/1	

Size Qty Part	YOTcp620	YOTcp650	YOTcp750	YOTcp800	YOTcp875	YOTcp910	YOTcp1000
O-ring	φ 135×3.55/1	φ 135×3.55/1	φ 135×3.55/1	φ 268×3.55/1	φ 268×3.55/1	φ 140×3.55/1	φ 210×3.55/1
	φ 130×3.55/1	φ 130×3.55/1	φ 130×3.55/1	φ 430×3.55/1	φ 430×3.55/1	φ 430×3.55/1	φ 190×3.55/1
	φ 110×3.55/1	φ 110×3.55/1	φ 110×3.55/1	φ 135×3.55/1	φ 135×3.55/1	φ 280×3.55/1	φ 78×3.55/1
	φ 50×3.55/1	φ 50×3.55/1	φ 50×3.55/1	φ 280×3.55/1	φ 280×3.55/1	φ 135×3.55/1	φ 135×3.55/1
Seal	PD60×80×12/1	PD60×80×12/1	PD60×80×12/1	PD50×80×12/2	PD50×80×12/2	PD75×95×12/2	PD70×90×12/2
Bearing		53122/1	53122/1	32228/1	32228/1	2228/1	32232/1
		53722/1	53722/1	3620/1	3620/1	176234/1	176328/1
		32136/1	32136/1	140/1	140/1	138/1	144/1
		32222/1	32222/1	3528/1	3528/1	228/1	334/1

Size Qty Part	YOTcp1050	YOTcp1150	YOTcp1250	YOTcp1320	YOTcp1400	YOTcp1550	
O-ring	φ 210×3.55/1	φ 210×3.55/1	φ 430×3.55/1	φ 450×3.55/1	φ 450×3.55/1	φ 470×3.55/1	
	φ 190×3.55/1	φ 190×3.55/1	φ 280×3.55/1	φ 300×3.55/1	φ 300×3.55/1	φ 320×3.55/1	
	φ 78×3.55/1	φ 78×3.55/1	φ 175×3.55/1	φ 195×3.55/1	φ 195×3.55/1	φ 215×3.55/1	
	φ 135×3.55/1	φ 135×3.55/1	φ 60×3.55/1	φ 85×3.55/1	φ 85×3.55/1	φ 100×3.55/1	
Seal	PD70×90×12/2	PD70×90×12/2	PD75×95×12/2	PD85×100×12/2	PD85×110×12/2	PD100×130×12/2	
Bearing	32232/1	32232/1	32234/1	32238/1	32238/1	32242/1	
	176238/1	176238/1	176234/1	176238/1	176238/1	176242/1	
	144/1	144/1	32152/1	32156/1	32156/1	32160/1	
	334/1	334/1	176234/1	176238/1	176238/1	176242/1	

13. Purchase of spare parts

On every coupling you will find its Serial Number Stamped on the Mark Plate. In case you need any spare part or service, please inform us the Type of coupling, its Serial Number and the Part Number and Part description. We would be pleased to submit a spares offer on request.