

# Operating Manual

## Parallel Indexer XP/TP



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## Symbols are as followes



Note / Caution



Warning / Caution  
Electrical Voltage



Danger – do not touch



Danger – general prohibition

# 1. Safety instructions

## 1.1. General

Please carefully read these safety and operating instructions prior to installing and starting this parallel indexer. Please also read all warning labels on the equipment and ensure the labels are not damaged or removed. The installation, start-up and maintenance may only be conducted by qualified professionals. In the context of the safety instructions, qualified personnel are those familiar with the set-up, installation, start-up, operation and maintenance of parallel indexers, with respective qualifications. The safe operation of this equipment depends on proper application. Keep these safety and operating instructions in an accessible location and pass them on to anybody who has any type of access to this equipment. Non-compliance with instructions contained in this manual could endanger users and systems, and could lead to damages to the equipment, or even severe injuries or death.



The parallel indexer may only be used once the entire system in which it is integrated, as well as the control and safety system comply with machine guidelines of the respective national norms for the installation and operating location.



Rotating parts pose a crushing hazard. Keep a safe distance to moving parts!



Always obey appropriate precautions, as well as other generally recognized safety and occupational health regulations. Improper modifications and the use of spare parts and accessories not recommended by the manufacturer could lead to bodily injury or property damage.



Disconnect from power and prevent from self-restarting prior to any work on the parallel indexer and its attachments!

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CE certification per these directives:

- EU machinery directive 98/37/EC
- EU low voltage directive 93/68/EEC
- EC EMC directive 89/336/EEG

## 1.2. Applicability of this documentation

This operator's manual applies to XP and TP series parallel indexers of the following sizes: XP030, XP040, XP050, XP065, XP080, XP105, XP130, XP165, XP200, XP250 und TP040, TP063, TP080, TP100, TP125, TP160

## 1.3. Intended Application

The parallel indexer rating is based on tables and calculations illustrated during our project „parallel indexer XP/TP“ and should be performed by technical sales personnel of TAKTOMAT GmbH



The parallel indexers described here are intended for application in standard manufacturing plants. They may not be used in machines and equipment whose failure could directly endanger human lives or cause high losses.



They may not be used in explosive environments. Do not use parallel indexers for applications resulting in safety concerns! Please contact TAKTOMAT GmbH prior to use in such environments.



## 1.4. Assembly

Parallel indexers must be assembled per the instructions contained in the documentation. They may be installed in any position.

Please verify the completeness and accuracy of the shipment prior to assembly.

The shipment includes

- Parallel indexer
- Documentation
- Parallel indexer data sheet
- Operators manual Worm gear (Optional)
- Operators manual Motor (Optional)
- Operators manual TAKTOMAT Universal Controls TIC (only if controls included)

Please verify the correctness of your drive per the nameplate (see fig. 1).

## 1.5. Transportation and storage

In general, Parallel indexer should be stored and installed in a dry, clean environment.

Only use conveyors and lifting tools rated for the respective weight.

The weight is listed in the adjoining table.

## Shipping weight without drive

Parallel indexer model	Weight [kg]
XP030	0,7
XP040	2
XP050	2,5
XP065	8
XP080	16
XP105	32
XP130	45
XP165	120
XP200	220
XP250	350
TP040	2
TP063	8
TP080	22
TP100	25
TP125	45

## 1.6. Nameplate

The following information can be found on the nameplate:

Manufacturer  
Model / Overall size  
Number of stops – switching angle  
Order number

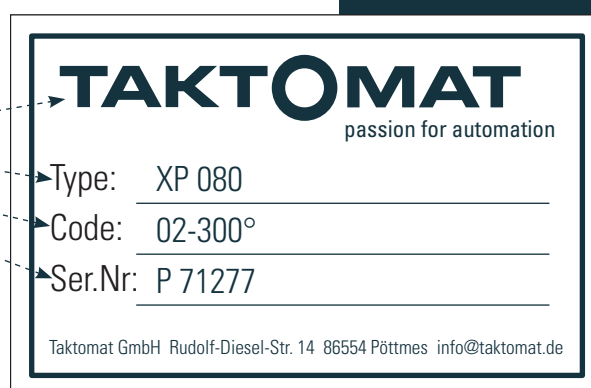


figure 1

## 1.7. Electrical Connection

(Only applicable if the drive is included)



Work on the electrical installation may only be performed by trained professionals. Please obey all technical and national regulations and norms during installation.

Our parallel indexers are typically driven by three-phase brake motors. Only connect the motor and brake to voltages listed on the nameplate. The motor must be protected from overcharges with motor overload switches or other suitable protective devices.

## 2. Configuration and Functionality

Taktomat Parallel indexers are precision drives which transform a uniform drive movement into stepped or swinging movements. The use of mathematically defined and standardized curve laws (VDI 2143 Sheet 1) guarantees a jolt and shock free movement. The structural design of Taktomat Parallel indexers produces a positive drive position free of play. An additional interlocking of the drive shaft or of the flanged construction is not required. It could lead to mechanical over-determination and therefore a long-term destruction of the indexing table.

The flux either occurs from a three-phase brake motor via a Worm gear, or from a chain or belt pulley onto the drive shaft of the parallel indexer. That is tightly connected with pulley set and turns the roll star with the drive shaft.

Suitably sized shaft seals seal the parallel indexer to the inside and outside.

Output shaft and cam follower carrier

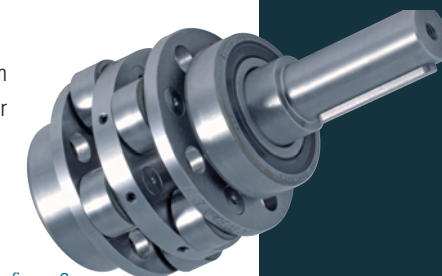


figure 2

Drive shaft and set of switch cams

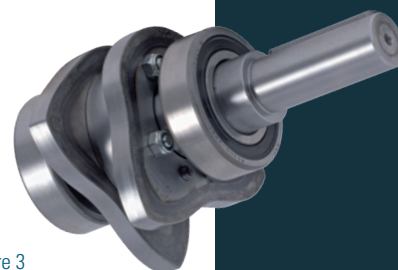


figure 3

Drives in switching mode

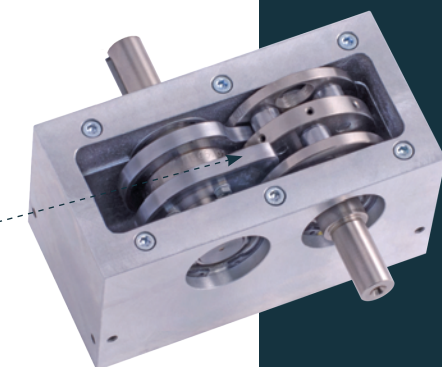


figure 4

Drives in dwell

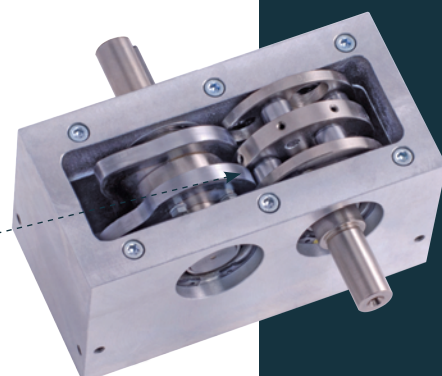


figure 5



## 3. Operating Modes

### 3.1. Normal Mode

We consider normal mode the single direction pulsing of the output shaft from one dwell position to the next. The output shaft rotates opposite direction of the drive shaft.

#### 3.1.1. Intermittent duty

The drive shaft stops in dwell. The cycle time is fixed. The dwell time is variable.

For this operating mode, the parallel indexer is usually equipped with its own drive.

#### 3.1.2. Continuous operation

The drive shaft is continuously rotating. The Output shaft continuously pulsates into one direction. This operating mode is oftentimes used in fast running systems with short operating times. The parallel indexer is mechanically synchronized with the remainder of the system through the free drive shaft. The ratio between dwell and cycle time can be adjusted in cam production within limits, using the TAKTOMAT.

#### 3.1.3. Continuous Reverse (pendulum mode)

The parallel indexer drive is reversed in each dwell phase. In this operating mode, the output shaft continuously pulsates between two positions. In output shaft rotation angles below  $90^\circ$ , the switch cam set can be designed so the pendulum service can occur without the drive changing directions.

### 3.2. Inching mode

In inching mode, the output shaft is moved between two dwell positions in small steps. The switch cam can not gently accelerate or slow down the built-up load. This poses a stress situation for the hardware, as the accelerations occurring in inching mode exceed those of normal operation in multiples. Without suitable controls to enable a gentle, drive-friendly start and deceleration of the load outside the dwell phase, inching mode may not be used. For this purpose, use our universal controller TIC.

### 3.3. Emergency-Stop

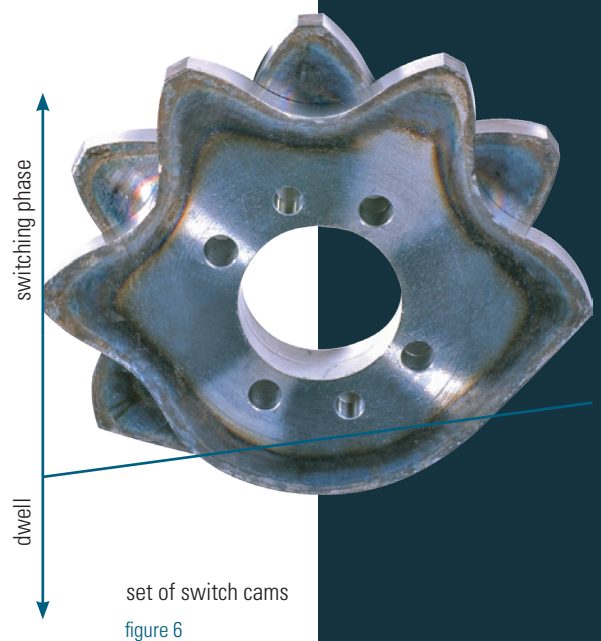
Emergency-Stop is comparable with stoppages in inching mode. Here too, the stopping and restarting of the accumulated load occurs outside the dwell phase. Frequent non-stop situations are to be avoided, or configured in a manner not hazardous to the mechanics through use of the universal control TIC.

## 4. Cycle times

A complete parallel indexer cycle is the advancing of the output shaft from one dwell position to the next. The cycle time consists of cycle time and rest period. The cycle time corresponds with the stepping angle of the switching curve, and the rest period with the angle without a switching curve radius change.

Example: XP105-04-270

This is a parallel indexer with a 105mm axle base, a stopping number of 4 ( $4 \times 90^\circ$  output shaft rotation), a cam switching angle of  $270^\circ$  and a dwell angle of  $90^\circ$ . At an input speed of 60 rpm, the output shaft would complete 60 pulses per minute. The cycle time of the output shaft herein is 0,75s. The dwell period is 0,25s.



## 5. Speeds

The maximum speed of the parallel indexer, or the shortest cycle time of the output shaft, conforms to the built-up load (mass moment of inertia), or the required torque. The correlation is clearly illustrated in the load tables of the catalogue „Parallel indexer series XP and TP“.

Example Load Table XP105

Angle at Output [°]	No of Stops n	Switch Angle [°] $\alpha$	Acceleration Method MS	Output Torque $M_{AB}$ [Nm]			Moment of Inertia J [kgm²]			Index Time $t_s$ [s]		
				n=50	n=100	n=200	n=50	n=100	n=200	n=50	n=100	n=200
360°	1	330	MS30	359	290	227	6,9	1,4	0,3	1,10	0,55	0,28
		300	MS50	350	278	210	7,0	1,4	0,3	1,00	0,50	0,25
180°	2	270	MS0	449	370	302	14,5	3,0	0,6	0,90	0,45	0,23
		210	MS30	372	283	213	8,4	1,6	0,3	0,70	0,35	0,18
		150	MS50	310	228	165	2,5	0,5	0,1	0,50	0,25	0,13
120°	3	270	MS0	554	460	375	31,0	6,4	1,3	0,90	0,45	0,23
		210	MS30	520	436	360	15,2	3,2	0,7	0,70	0,35	0,18
		150	MS30	415	330	240	6,2	1,2	0,2	0,50	0,25	0,13
		120	MS30	390	285	210	3,7	0,7	0,1	0,40	0,20	0,10
90°	4	270	MS0	540	455	360	40,3	8,5	1,7	0,90	0,45	0,23
		210	MS0	501	413	325	22,6	4,7	0,9	0,70	0,35	0,18
		150	MS30	480	390	294	9,5	1,9	0,4	0,50	0,25	0,13
		90	MS30	440	346	263	3,1	0,6	0,1	0,30	0,15	0,08
72°	5	270	MS0	540	455	360	50,4	10,6	2,1	0,90	0,45	0,23
		210	MS0	501	413	325	28,3	5,8	1,1	0,70	0,35	0,18
		150	MS30	480	390	294	11,9	2,4	0,5	0,50	0,25	0,13
		90	MS30	440	346	263	3,9	0,8	0,1	0,30	0,15	0,08
60°	61)	270	MS0	615	537	442	17,2	3,8	0,8	0,45	0,23	0,11
		240	MS0	576	483	390	12,7	2,7	0,5	0,40	0,20	0,10
		180	MS30	445	368	280	4,8	1,0	0,2	0,30	0,15	0,08
		120	MS30	395	320	239	1,9	0,4	0,1	0,20	0,10	0,05
45°	81)	270	MS0	615	537	442	23,0	5,0	1,0	0,45	0,23	0,11
		240	MS0	576	483	390	17,0	3,6	0,7	0,40	0,20	0,10
		180	MS30	445	368	280	6,4	1,3	0,3	0,30	0,15	0,08
		120	MS30	395	320	239	2,5	0,5	0,1	0,20	0,10	0,05
36°	101)	270	MS0	615	537	442	28,7	6,3	1,3	0,45	0,23	0,11
		240	MS0	576	483	390	21,2	4,5	0,9	0,40	0,20	0,10
		180	MS30	445	368	280	8,0	1,6	0,3	0,30	0,15	0,08
		120	MS30	395	320	239	3,1	0,6	0,1	0,20	0,10	0,05
30°	122)	240	MS0	360	290	230	4,0	0,8	0,2	0,20	0,10	0,05

The shortest cycle time possible in an existing engine torque ensures a lifetime of no less than 30,000 hours of pure cyclic operation. For a parallel indexer with 0,5s cycle time, calculate 120 pulses per operating minute (independent of the dwell period specified by the application).

If you are able to select a longer cycle time than listed in the cycle time table, you will drastically prolong the lifetime of the parallel indexer. Doubling the cycle time prolongs the lifetime by a factor of 200 to 500!

The speed can be adjusted in fixed steps or infinitely.

## 6. Parallel indexer controls

In General: A parallel indexers cycle consists of index and dwell period. During the indexing period, the output shaft rotates from one dwell position to the next. During the dwell phase, the output shaft locks into one of the desired positions. Assembly processes running externally will be dwellarting upon reaching the dwell phase. The parallel indexer drive may only be shut down during the dwell phase, as the built-up mass moved by the parallel indexer was decelerated to null here. Stopping during the stepping phase is equivalent to Emergency-Stop mode and poses a stress factor for the drive.

The dwell phase of the parallel indexer is signalled by a positioning cam mounted at the drive. Continuously verify in your controls the cam switch also came to a stop within the sensor area and does not leave without a starting signal.

The length of the positioning cam corresponds with the length of the dwell phase, minus 2.5° safety zone on both sides of the dwell.



If this area is passed due to e.g. long process times of the controls, the output flange has moved to far, which could lead to crashes.



Defective motor contactors (clotted mechanical or burnt-through electronic contacts) prevent the drive motor from turning off. This could lead to severe bodily injury or property damage. Immediately activate Emergency-Stop mode!

### 6.1. Adjusting the position cam

Turn the input shaft until the key points exactly toward the output shaft. (See image 7). Turn the positioning cam precisely with its centre to the centre of the position sensor.

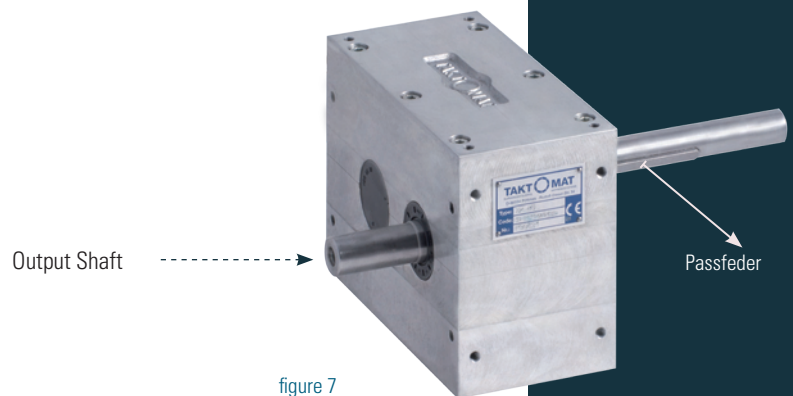


figure 7

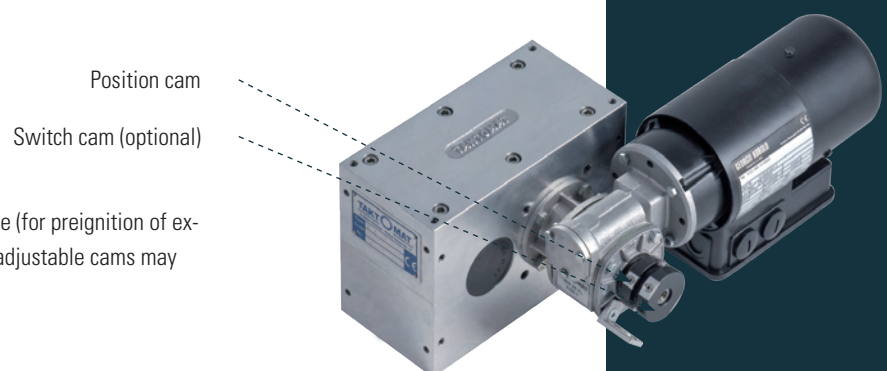


figure 8

To receive additional signals during switching phase (for preignition of external processes or the like, one or multiple freely adjustable cams may be mounted on the drive shaft.



## 7. Installation and Start-Up

Installation and start-up may only be performed by experienced professionals.



Read the operators manual. Please also obey the specifications contained in other documents included.



Work on the electrical system may only be performed by specialists experienced herein. Please obey all technical and national requirements and norms during installation.



Prior to any work on the parallel indexer and its attachments, disconnect the drive from voltage and secure from self-starting!

### 7.1. Installation

Ensure an even mounting surface.

Clean mounting surfaces and apply a film of oil.

Mount the parallel indexer in its mounting position on the mounting surface. Tighten mounting screws evenly.

Compare the supply voltage with the specifications on the rating plate.

Separately connect the motor and brake and run in separate conduits (observe EMC).

Connect per wiring diagram inside the terminal box.

Adjust motor protection switch to the rated current of the motor. Data per motor rating plate. (Not required with TIC)

Connect protective earthing conductor to the earthing screw of the motor.

### 7.2. Start-up



Do not reach into danger zone

Verify correct position of the position cam (see figure 6).

Remove all possible obstructions from the displacement.

Visually inspect the rotational direction and if necessary, reverse the motor poles.

Visually inspect the operation.

## 8. Maintenance

Maintenance includes inspection, servicing and repair. Repair work may only be conducted by experienced professionals.



Prior to any work on the parallel indexer and its attachments, disconnect the drive from voltage and secure from self-starting!

### 8.1. Service

By default, the parallel indexer and the worm gear on the drive are filled with a lifetime supply of oil for a normal environment and application ratio.

## 8.2. Fill Levels

Drive model	Capacity
XP030	22 g
XP040	0,15 l
XP050	0,2 l
XP065	0,4 l
XP080	0,75 l
XP105	1l
XP130	2,7 l
XP165	6,5 l
XP200	9,5 l
XP250	17,5 l

Drive model	Capacity
TP040	0,15 l
TP063	0,4 l
TP080	0,75 l
TP100	1,3 l
TP125	2 l
TP160	3,2 l

### verwendete Schmierstoffe

Öl Mobilgear XP460



Do not mix mineral lubricants with synthetic lubricants.

## 8.3. Inspection

The specified intervals must be adjusted to the actual conditions.



Disconnect the drive from voltage and secure from self-starting!

Visually inspect for damages **every 6** months. Remove dust deposits (particularly on the motor's ventilation grate) and inspect electrical lines for damage.

Inspect parallel indexer for play in the dwell positions **every 12** months

## 8.4. Repairs

In the event the parallel indexer or the drive is damaged, please first contact TAKTOMAT. Only repairs conducted through TAKTOMAT ensure the agreed characteristics. Unauthorized opening of the housing cancels the warranty.

## 8.5. Replace cam followers

The parallel indexer must be inspected for play. With play in one or more stations, the cam rollers must be replaced.

Turn the input Shaft (01) to the centre of the dwell. In the standard model, the key points toward the output shaft.

Loosen the 6 screws connecting two housing sections. \* (Also loosen the 2 locking screws of the excentric bushing.)

(open the upper four screws of the flange rings)

Separate the two housing sections. Mark the position of the output shaft to the cam position. This will make the later mounting easier.

Remove the output shaft and remove the bearings. \*(Remove eccentric bushings)

Loosen the safety screws (08) on the bolts of the rollers. Disassemble bolts and rollers.

Replace damaged bolts and rollers.

Verify whether the receiving holes of the bolts are still round and true to size. If necessary, replace the complete output shaft.

Thoroughly clean the separation place on the housing and apply surface sealant.

Clean the surface between the two half housings and put some seal paste between.

\*(notes in parentheses apply to XP165, XP200 and XP250)



If necessary, replaces all cam rollers. Verify whether the receiving holes of the cam rollers in the drive flange are still round and true to size, otherwise replace the complete drive flange.

## 9. Spare parts and consumables

TAKTOMAT parallel indexers are virtually maintenance free. The cam followers roll on the tempered cam tracks free from wear, all ball bearings are overdimensional and run in an oil bath. For safety reasons, only spare parts of the same quality of the original parts may be used.

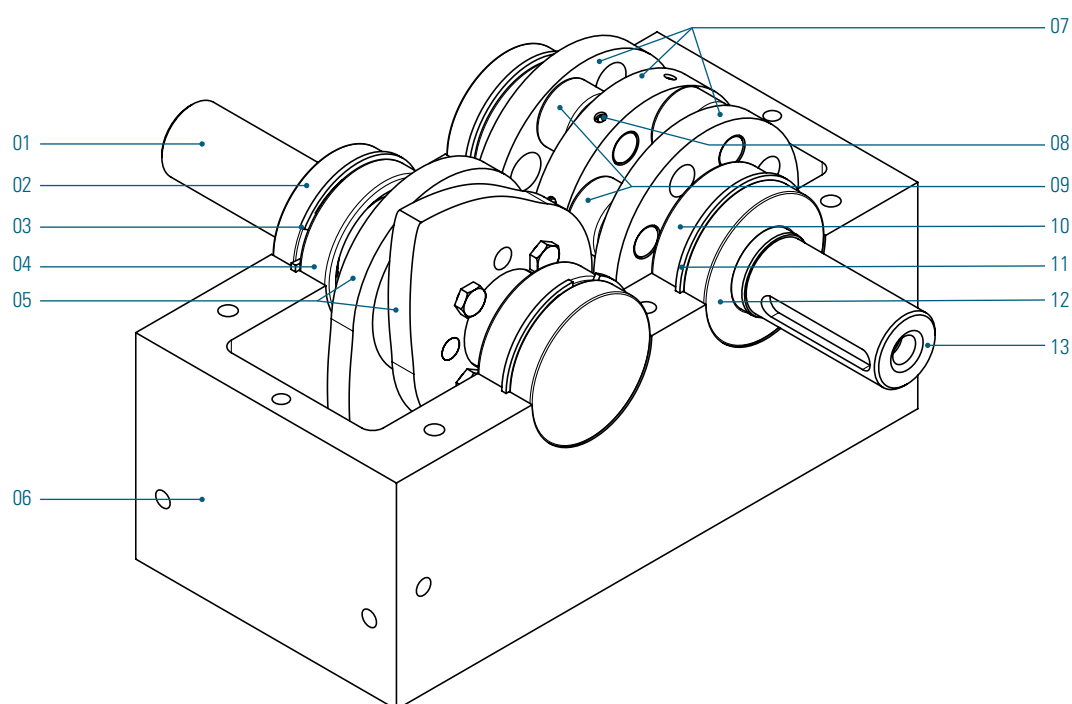
When ordering, please include the following data:

Model and order number for the parallel indexer, per nameplate

Description, per the following overview

Quantity

Consumables are marked with (x). Please order spare parts in sets. The number or quantity n\* of cam followers and the lubricant depend on the model and design of the parallel indexer.



### Spare parts and consumables

Number	Quantity	Description
01	1	Input shaft
02 (x)	1	Shaft seal
03 (x)	2	Locking ring
04 (x)	2	Bearing
05	2	Switch cam set
06	1	Housing
07	1	Cam follower carrier

Number	Quantity	Description
08	n*	Safety screws
09 (x)	n*	Rollers
10 (x)	1	Bearing
11 (x)	1	Locking ring
12 (x)	1	Shaft seal
13	1	Output shaft

## 10. Disposal



Lubricants (oils, greases) pollute the environment. Dispose of them per local environmental regulations.



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