

## 2.4 Questions for acquiring information

The quality of the information obtained about a fault situation directly correlates with the quality of the questions asked. The following general principles for formulating questions can help significantly.

- ▶ Ask questions as simply, clearly and briefly as possible, i.e. do not formulate questions in an abstract or artificial manner
- ▶ Ask questions in colloquial language as far as possible
- ▶ Avoid placing excessive demands on respondents
- ▶ Only ever ask one question at a time
- ▶ Do not use suggestive questions, i.e. do not influence the respondent by the way you ask the question
- ▶ Establish a point of reference for asking the questions, i.e. explain in which context the question should be considered
- ▶ Do not use terms with evaluating intentions
- ▶ Consider suggested answers carefully

Taking these principles into consideration, questions such as "What have you done this time?" and "You also consider that..." are not suitable for obtaining qualified information from respondents.

The type of question is also fundamentally important. A distinction is made here between:

- ▶ Open questions
- ▶ Closed questions

Open questions do not result in yes/no answers or purely factual answers, but are an invitation to go into more detail about

	Maintenance/section: Basic principles	<b>Metal working</b>
	<b>Systematic fault handling</b>	
	<b>Questions for acquiring information</b>	

### Exercise 3

#### Task/assignment:

Exercise structure: Team activity (TA)

Once you have developed a check list for precisely and comprehensively describing the fault, you should devise a learning situation that incorporates your existing knowledge and experience relating to fault handling and test your check list.

Fault reporting and fault determination should be practised through role play.

The team task includes:

- ▶ Theoretical construction of an operational fault and its effects
- ▶ Preparing a fault message with a non-technical description of the perceptions
- ▶ Selecting a team member for reporting faults
- ▶ Selecting a team member for determining faults by using the improved check list from exercise 2
- ▶ Observing and evaluating the interactions (throughout the conversation) during other team members' role plays
- ▶ Evaluating the role play and extending the check list, if necessary
- ▶ Entering the fault messages reported during the role play into the "Flow diagram" form
- ▶ Analysing the fault message using a flow diagram to establish the probable fault cause (individual activity)
- ▶ Presenting and discussing the results within the team
- ▶ Discussing the results with the trainer

	Maintenance/section: Basic principles	<b>Metal working</b>
	<b>Systematic fault handling</b>	
	<b>Task/assignment</b>	Exercise 3

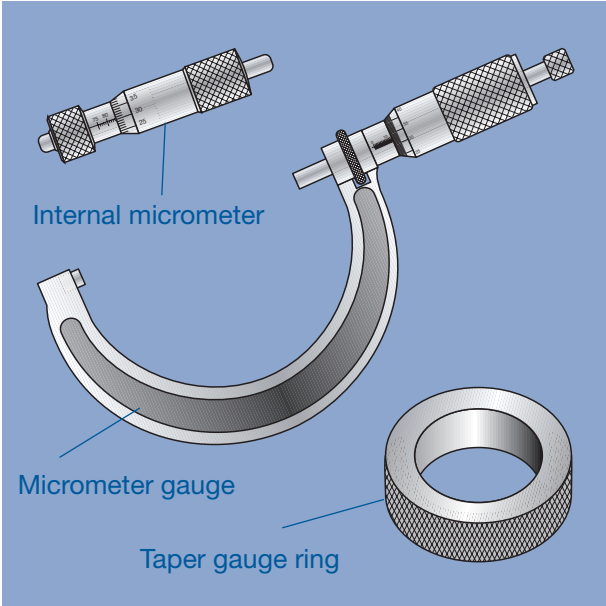
Before roller bearings are wound, the shape accuracy of the receiving components (shaft extension, housing) must be checked. Bearing seat tolerances not being adhered to, irregular shaft extensions or housing bores, and slanted contact surfaces affect the proper running of the roller bearing and may result in early failure; if necessary, servicing measures should be carried out or introduced.

The shaft diameter and the housing bore are measured using a micrometer gauge and an internal micrometer. These measures are usually taken at several points.

The tapered seat surfaces of shaft tapers and the inner ring bore must match to ensure that the ring is firmly seated on the shaft. The roller bearing ring taper is standardised; with most bearing series, it is 1:12, with some wide bearings, it is 1:30.

The taper gauge ring is a simple testing instrument for small bearing seat points. Through spotting, it can be determined whether it is supported along the entire bearing seat width of the shaft extension.

Measuring tools and test equipment



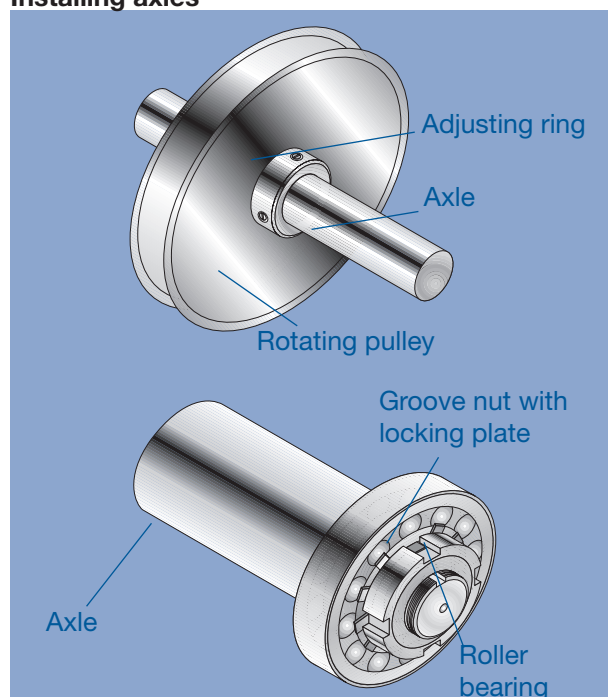
### 3.1.4 Installing roller bearings

Roller bearings are installed in different ways due to different designs and sizes. In doing so, a distinction is drawn between mechanical, hydraulic and thermal procedures.

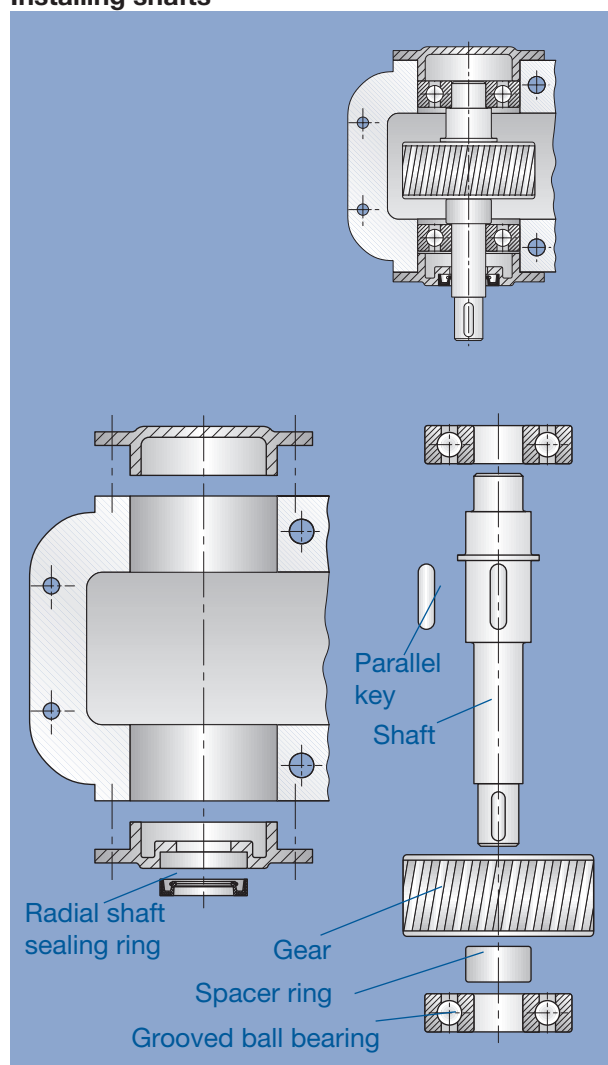
When installing bearings that cannot be disassembled, the assembly forces must always be exerted on the tightly fitted ring. If the forces are exerted on the loosely fitted ring, the track and rolling element may be damaged.

	Maintenance/section: Basic principles	Metal working
	Machine elements	
	Bearings/installing roller bearings	

### Installing axles



### Installing shafts



### 3.2.2 Installing axles and shafts

Axles or shafts are components that are always intended for incorporating additional machine elements, such as roller bearings, gears or pulley wheels. As a consequence, these machine elements must be pre-assembled before being installed in a final assembly. For example, when assembling a rotating pulley on an axle, adjusting rings and pulley wheels should be fitted first. The work sequence depends on the design of the pulley bracket. For example, when assembling a roller bearing on a shaft, additional machine elements are required to ensure that the roller bearing's axial position is maintained. This includes groove nuts, spacer rings or adjusting rings.

When fitting gears or V-belt pulleys on shafts, further machine elements are required to transfer the rotary motion. Studs or parallel keys between the shaft and the above-mentioned machine elements create a positive connection.

In the event of significant assembly works, assembly drawings provide a quick overview of the sequence in which machine elements should be fitted. They also indicate the role of the fitted assembly within the overall assembly or system.

### 3.2.3 Removing axles and shafts

In principle, axles and shafts are removed in reverse order to the installation. When doing so, remember that some machine elements may be very tightly seated as a result of operating under thermal, mechanical or corrosive influences. The required removal forces can be reduced significantly by using penetrating oil and rust remover. Ensure that these components are not damaged during removal, particularly if individual components are to be reused.

	Maintenance/section: Basic principles	Metal working
	<b>Machine elements</b>	
	<b>Axles and shafts/installation and removal</b>	