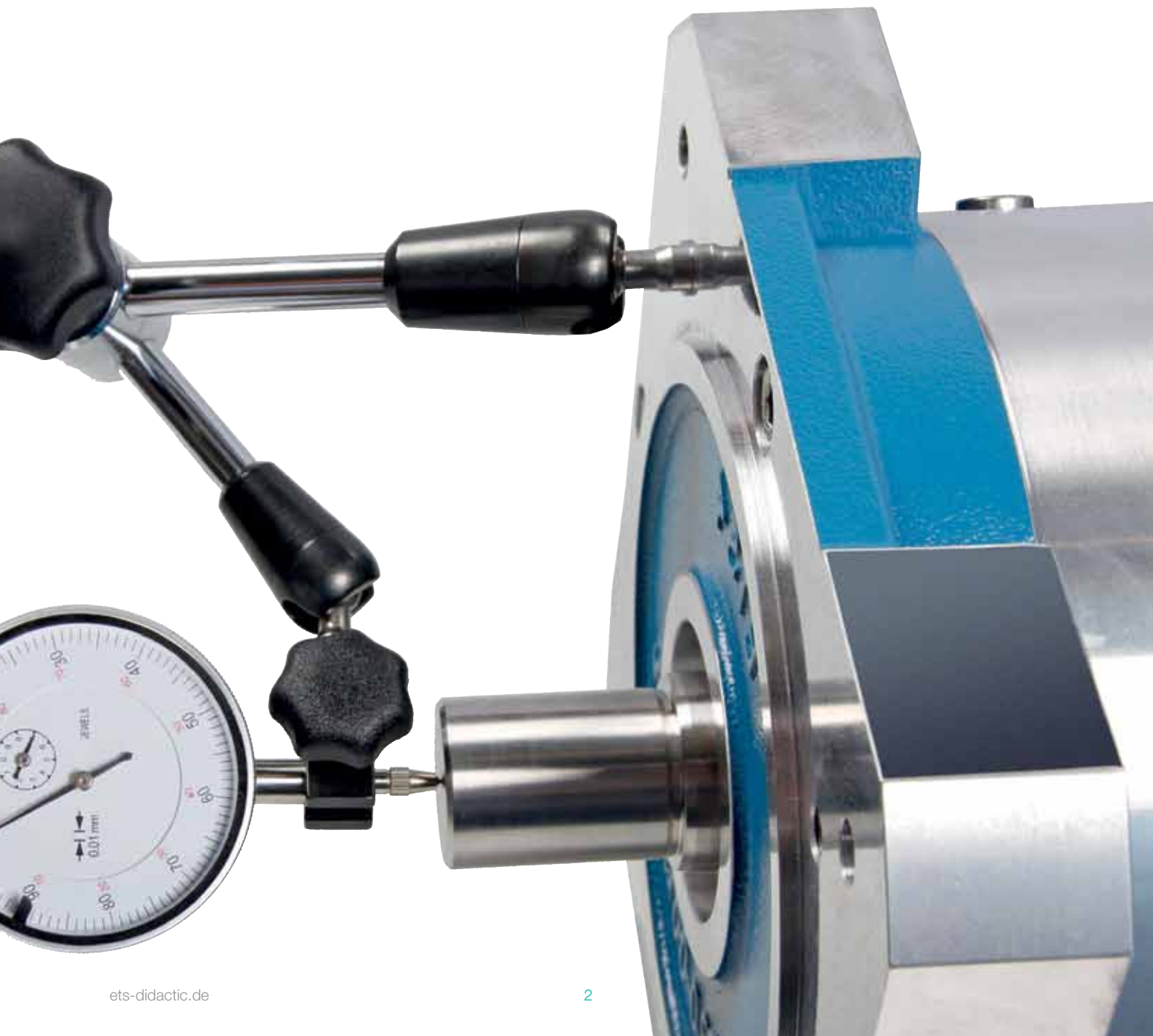




INDUSTRY 4.0 / MECHANICAL

Qualification for Future Manufacturing Processes



CONTENT

Gear and Bearing Technology

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PEOPLE AND TECHNOLOGY – A PERFECT MATCH

Technology to inspire you: understanding – comprehending – applying

ETS DIDACTIC is your partner for in-house and institutional education and training in the professional fields of electrical engineering and metal technology.

Topics such as Industry 4.0, electrical engineering, power electronics, pneumatics, drive technology, automation technology, sensor technology, bus systems, mechatronics, transmission technology and the complete scope of building systems engineering including renewable energies are presented as a training system. With the help of well thought-out learning-oriented hardware and accompanying courseware, the specialist skills are quickly learned, grasped by hands and lead to didactic learning success in a goal-oriented manner.

The service spectrum of ETS DIDACTIC ranges from the provision of didactic hardware, courseware and software to the planning and equipping of the complete training rooms. ETS meets all requirements with practice-oriented workshops on the complete spectrum of technical professions for lecturers, trainers and instructors in a specially built modern training center or online.

Vocational schools, training centres of the ICC, Chamber of Crafts or the industry, polytechnics and universities are among the long-standing customers of ETS DIDACTIC.



Welcome to ETS DIDACTIC

ETS DIDACTIC is the pioneer and market leader in the development, manufacture and sales of electrical, automation and mechatronic workstations for training and instruction.

ETS DIDACTIC counts among the leading international manufacturers in the market environment. Located in Kinding, in the beautiful natural reserve of Altmühltal – high-quality products and solutions are developed and manufactured for you.

In the training centre in Kinding, the focus is on the practical application of the systems and fast learning of new technologies by the customers.

The knowledge, experience and the above-average personal involvement of the motivated employees of ETS DIDACTIC are vital factors for the company's efficiency.



Sven Urban
Managing Director



Udo Urban
Managing Director
(Founder)



MADE IN GERMANY

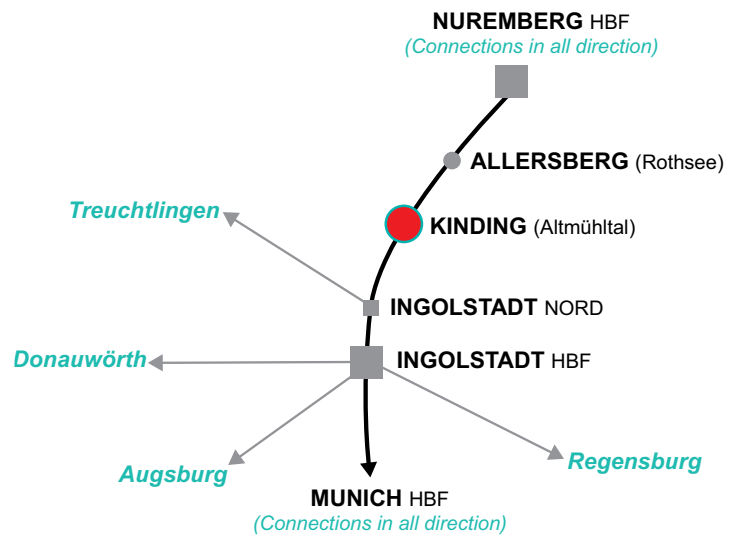
Visit ETS in the Valley of River Altmühl

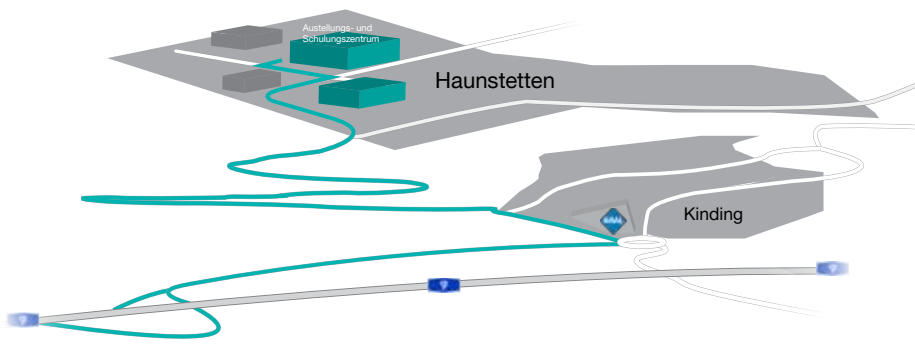
Welcome to Germany - Bavaria

The Altmühltal Nature Park is one of the largest in Germany and offers a thousand ideas for families, history fans, cultural discoverers and nature lovers.

You can travel to our workshop in Kinding-Haunstetten by train. The regional train station Kinding/Altmühltal is located directly on the ICE route between Nuremberg and Munich. The regional express trains of Deutsche Bahn stop every two hours. The journey from Kinding to Ingolstadt takes 17 minutes, to Munich 1 hour 15 minutes and to Nuremberg only 27 minutes.

Local cab companies are available to take you from Kinding to Haunstetten. We will be happy to assist you with the organization.

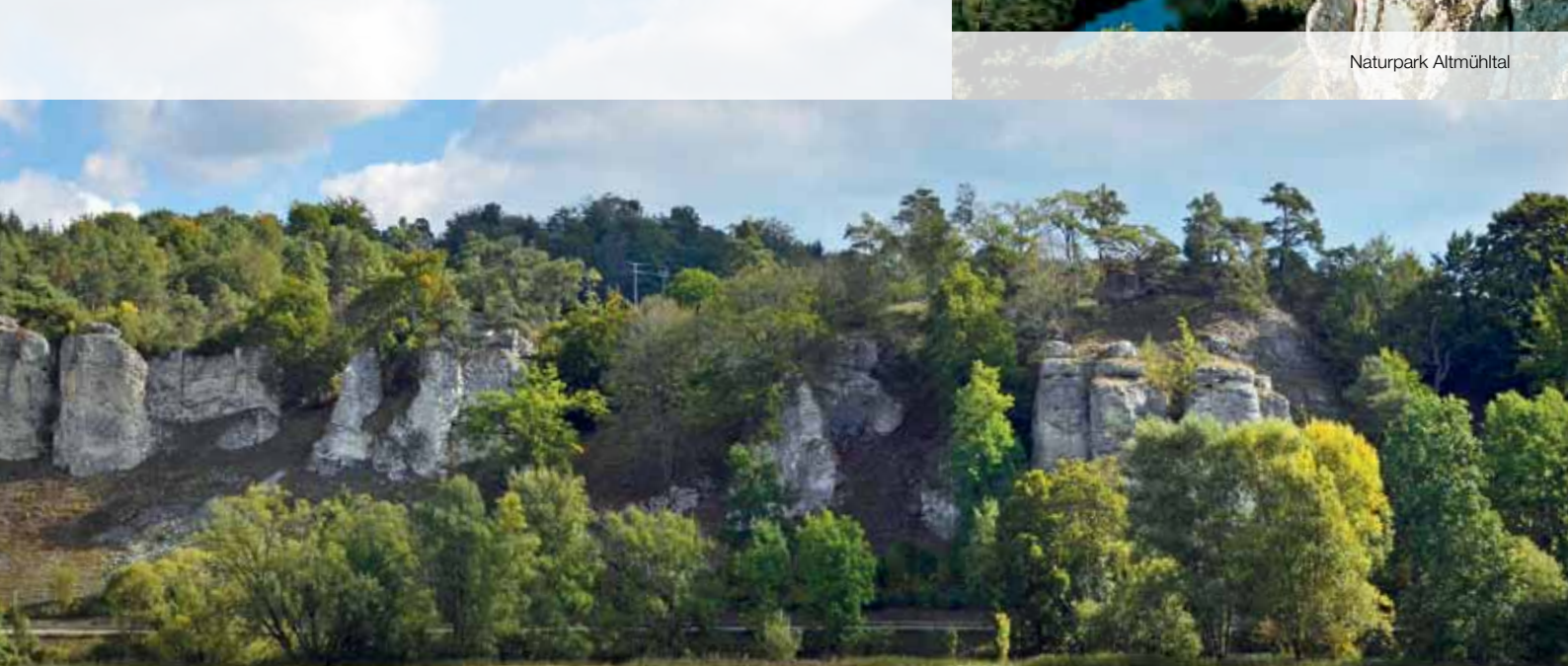




Kloster Weltenburg



Naturpark Altmühltal



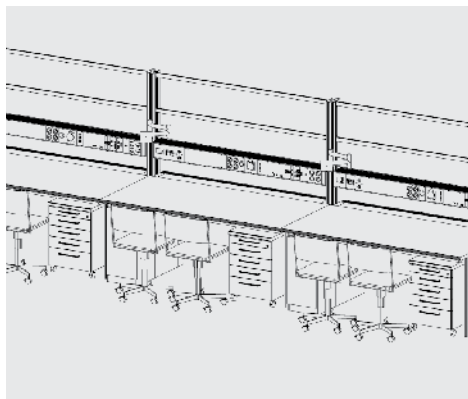
APPROACH AND ROOM CONCEPT

To plan a custom-made room concept with you, we proceed in the following steps:

- › A good room concept is based on professional advice. The technical consultants of ETS DIDACTIC are pleased to support you in the local planning phase. Benefit from their technical expertise and experience.
- › Planning a room concept is more than selecting the furniture. Each room concept is adapted to and developed for the local requirements of the customer.
- › Taking into account the learning contents an equipment list can be set up. As soon as the extent is defined, the storage equipment is optimised and designed.



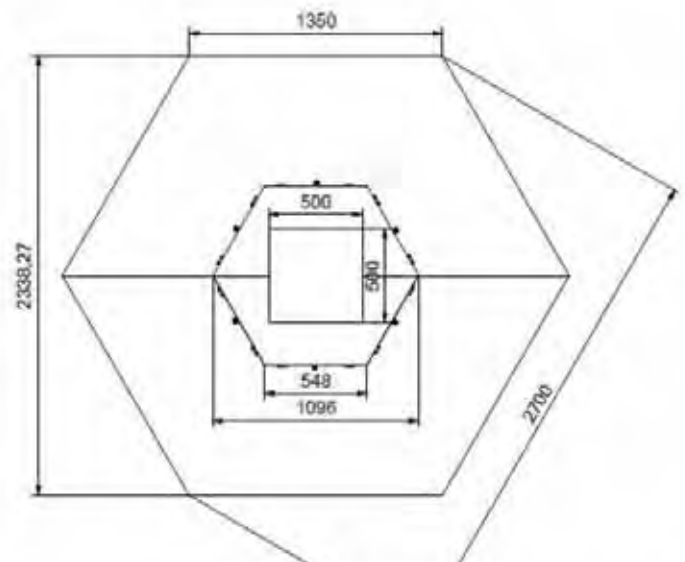
Analysis

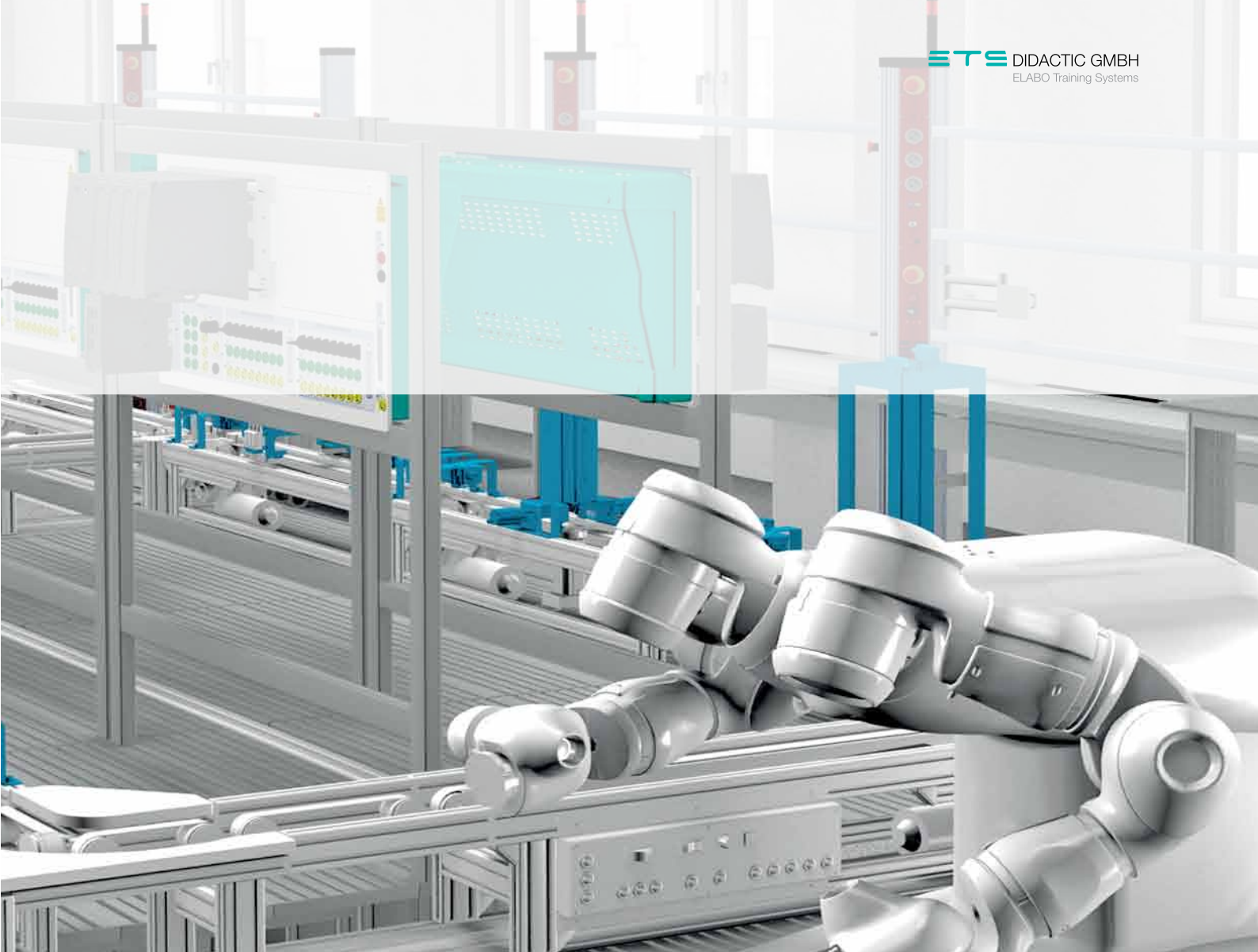


Conception



Consulation / Planning





Design / Construction



Workshops

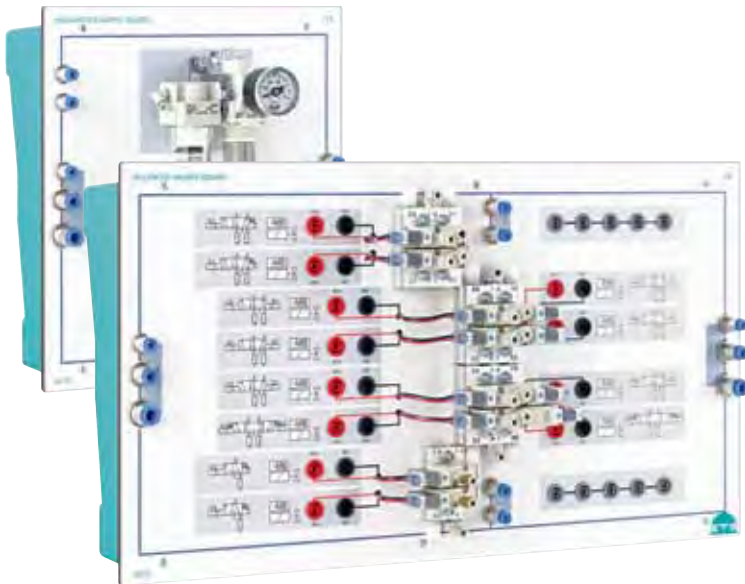


Application



PEOPLE AND TECHNOLOGY – A PERFECT MATCH

Didactic and Technology Result in the ETS-Concept



Compact Boards

- › Their didactical concept makes our training systems in A4 format outstanding.
- › The photorealistic design of their front panels with graphics, pictures, connection details or warning messages assist and guide the experiments - cognitive didactics. Due to the graphics, users comprehend and remember the technologies more easily.
- › The systems can be mounted in an A4 frame or placed directly on a table.

Experimental Boxes

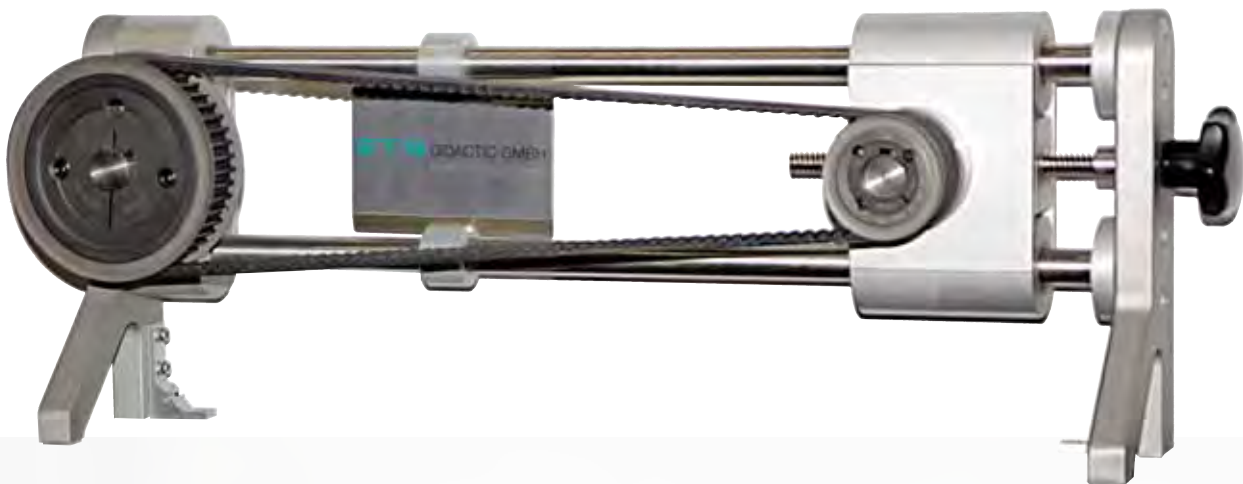
- › Construct your own experiments. Beside the wiring, the arrangement of the components is focused. With the experimental boxes it's possible to practice basic circuits as well as complex installations
- › Always close to practice, fast and safe!
- › Wide range of industrial components.



Training model

Example – Belt drive

- › Mechanical assembly and disassembly of belts on training model
- › Alignment of belts on the training model
- › Alignment of belts
- › Measurement of belt tension
- › Translation, work, energy, performance
- › Production and commissioning of technical systems
- › Maintenance of technical systems
- › Drive technology
- › Service life and thermal load



WORKSHOPS WITH ETS

Always up to Date – Training at the Highest Level



) Train the Trainer – workshops for teachers, trainers and lecturers in the field of electrical engineering, mechatronics and metal technology.

) Learn more about the management and the application of various technologies with the support of the ETS trainers. Find out more about the didactic concept and learn to teach the material quickly and safe.

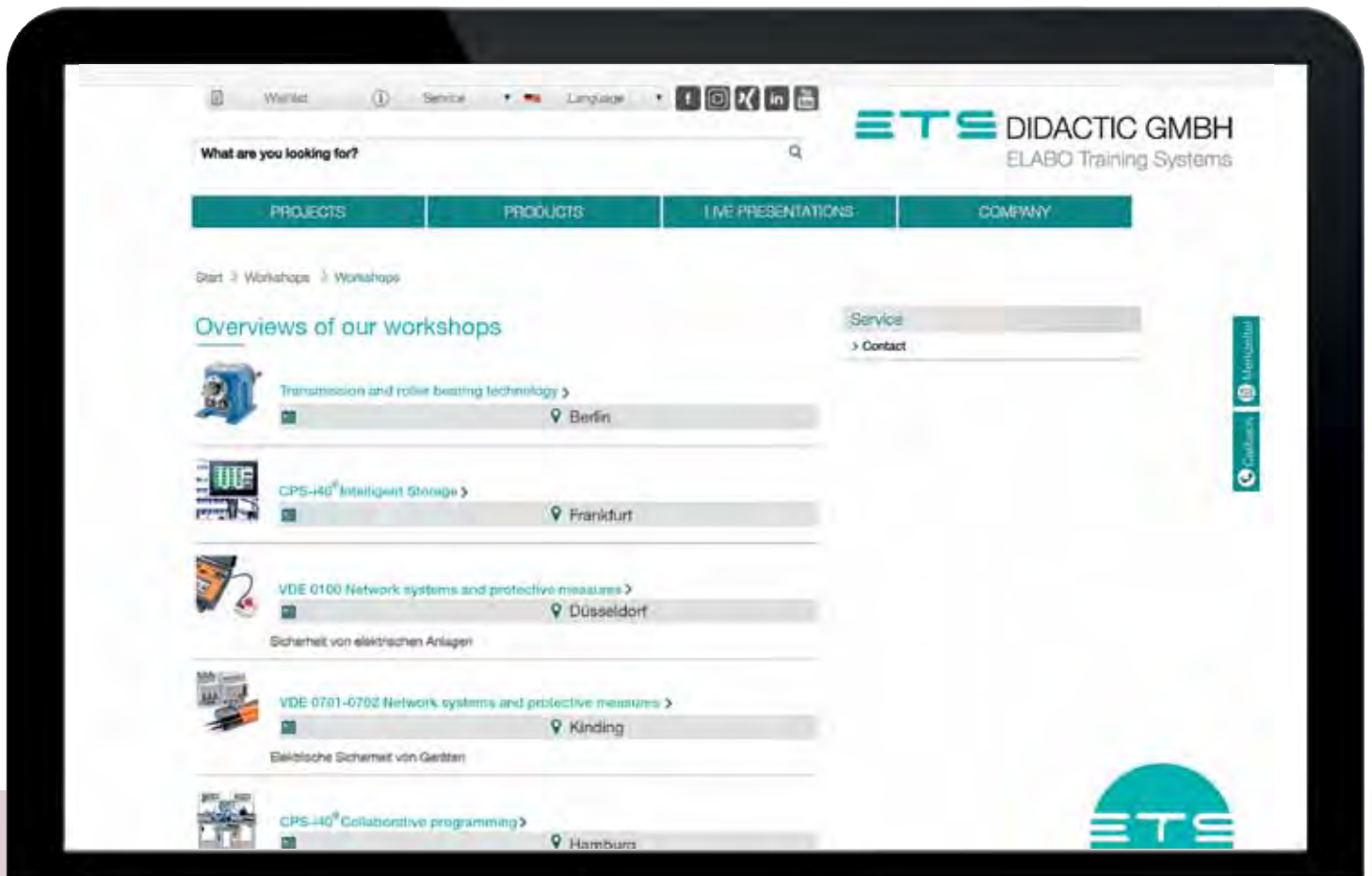
) ETS offers a perfect seminar for all groups of products and topics of technical education. Scan the QR code to subscribe in a workshop:



<https://ets-didactic.de/hp584/Workshops.htm>



Fast and Safe into New Technologies



THE ETS TRAINING CONCEPT

Innovative Hardware / Perfect Courseware

Structure of the Manuals

- › Ringbinder principle
- › Dividers
- › Incorporation of personal documents

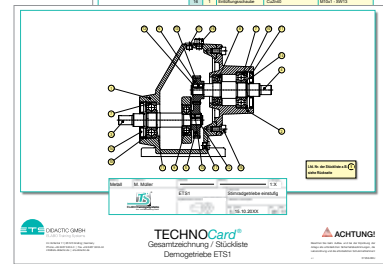


compact

TECHNOCards®

- › Depiction of the parameters in function groups
- › Start-up instructions
- › Safety functions
- › Individual learning help

Einzelliste Demogetriebe ETS1			
Nr.	Bezeichnung	Zusammengeh. Material	Abbildung
1	Motor	IM100-200	
2	Ölwanne	ÖW100-200	
3	Wälzlager	WAG100-200	
4	Wellenschutzhülse	WSH100-200	
5	Wellenschutzhülse	WSH100-200	
6	Wellenschutzhülse	WSH100-200	
7	Wellenschutzhülse	WSH100-200	
8	Wellenschutzhülse	WSH100-200	
9	Wellenschutzhülse	WSH100-200	
10	Wellenschutzhülse	WSH100-200	
11	Wellenschutzhülse	WSH100-200	
12	Wellenschutzhülse	WSH100-200	
13	Wellenschutzhülse	WSH100-200	
14	Wellenschutzhülse	WSH100-200	
15	Wellenschutzhülse	WSH100-200	
16	Wellenschutzhülse	WSH100-200	
17	Wellenschutzhülse	WSH100-200	
18	Wellenschutzhülse	WSH100-200	
19	Wellenschutzhülse	WSH100-200	
20	Wellenschutzhülse	WSH100-200	



close to practice

Instructor's Edition / Student Edition

- › 100 % function guarantee
- › High print quality
- › Digital and on paper
- › Original photographs with practical references
- › Detailed work instructions



motivating

Simulations Software

- › Accompanying the courseware
- › Function simulation
- › Combination of theory and practice



multimedia

Front panel overlays

- › Contents reduced to main focus of the experiment
- › Clear layout
- › Basic function
- › Various languages



efficient

Furniture

- › Technically matched conception
- › Excellent functionality
- › Ergonomics at the workplace
- › Outstanding design



ergonomics

... the System for Gear and Bearing Technology



- › Didactically prepared gear kit
- › Changed fits – assembly and disassembly without pressing tools in and out
- › No use of lubricants (oil, greases)
- › Corrosion resistant components
- › Didactically prepared courseware
- › Ergonomic workstations





GEAR UNIT TECHNOLOGY

Helical gear unit ETS1, single-stage

Training package 81.3-5

Helical gear unit ETS6, 2/3-stage

Training package 81.3-2

Bevel gear unit ETS7

Training package 81.3-4

Planetary gear unit ETS4

Training package 81.3-6

Worm gear unit ETS5

Training package 81.3-7



HELICAL GEAR UNIT ETS1, SINGLE-STAGE

Mechanical Components for Hands-on Training



The learning application tec2SKILL® Mechanical is a digital assistant for the didactic support for all gears for tablet, smartphone and now also for „Smart Glasses“.



1

Learning Objectives

Helical gear unit ETS1

- › Assess assembly drawings, layout plans, and parts lists
- › Select suitable test equipment and create test reports
- › Create assembly plan for proper assembly and disassembly
- › Develop test criteria for functional tests
- › Plan maintenance including environmentally-friendly disposal of material and operating fluids
- › Analyze faults and determine components to be replaced
- › Assemble technical subsystems with subsequent function check
- › Convert existing systems according to customer request
- › Select tools and resources by means of function plans and design drawings
- › Analyze, plan, and organize workflows (assembly, disassembly and preventive maintenance measures)

No.	Designation	Order no.
1	Helical gear unit ETS1, single-stage, in system case	57345
2	Tool set for gear units, in system case	57306
3	Caster for gear unit system case	57307
N/I	Rubber mat 800mm x 500mm	57308

Storage and Accessories



Overview

- › Educational gear self-assembly kit
- › Modified fits—assembly and disassembly possible without press-in or injection tools
- › No use of lubricants (oil, grease)—clean workplace
- › Corrosion-resistant components: all components are either made from stainless materials (e.g., stainless steel bearings) or surface-treated (painted / powder-coated housing)

Storage system

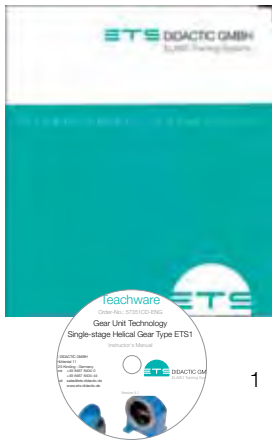
- › Individual parts are clearly arranged in high-quality foam inserts
- › Missing parts can be detected immediately
- › Stored in a space-saving plastic case and covered from dust
- › Roller unit (optional) for easy and quick transportation

Self-assembly kit

The gear self-assembly kit for the single-stage spur gear has a modified fit system so no special tools such as presses or pullers are required for assembly. Using mechanical drawings or detailed assembly instructions, learners can assemble the gear independently and perform a function test using the hand wheel. This allows trainees to experience the functionality of a single-stage spur gear and to better understand its mechanical sequences.

HELICAL GEAR UNIT ETS1, SINGLE-STAGE

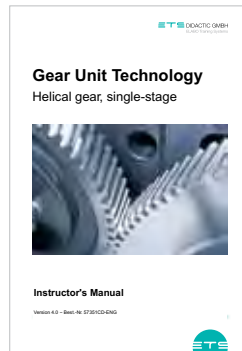
Courseware



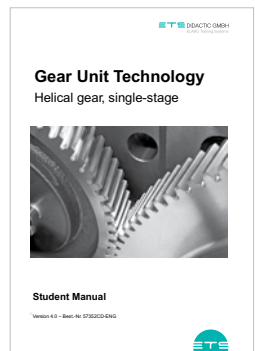
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2

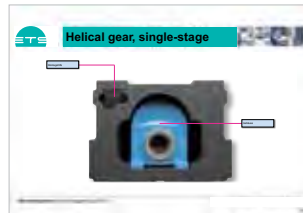
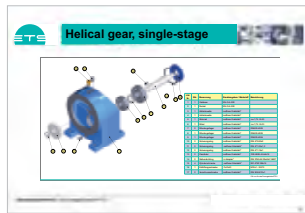


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4

Printed and digital!



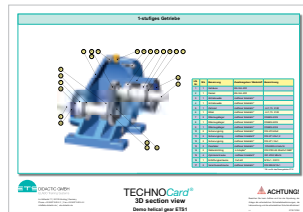
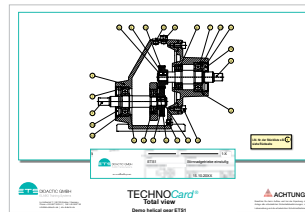
5

Manual

Helical gear unit ETS1

Practical, detailed manual using the ETS1 single-stage helical gear unit to explain gear theory as well as maintenance and quality assurance.

- › Technical communication
- › Transmission
- › Gear wheels and toothed gearing
- › Assembly and disassembly
- › Servicing and maintenance
- › Quality assurance



6

Set of TECHNOCards®

Helical gear unit ETS1

consisting of:
57355-ENG

Helical gear unit ETS1:

Tools and small parts

57356-ENG

Helical gear unit ETS1:

Housing and gear parts

57357-ENG

Helical gear unit ETS1:

Exploded view

57358-ENG

Helical gear unit ETS1: Total view

57359-ENG

Helical gear unit ETS1:

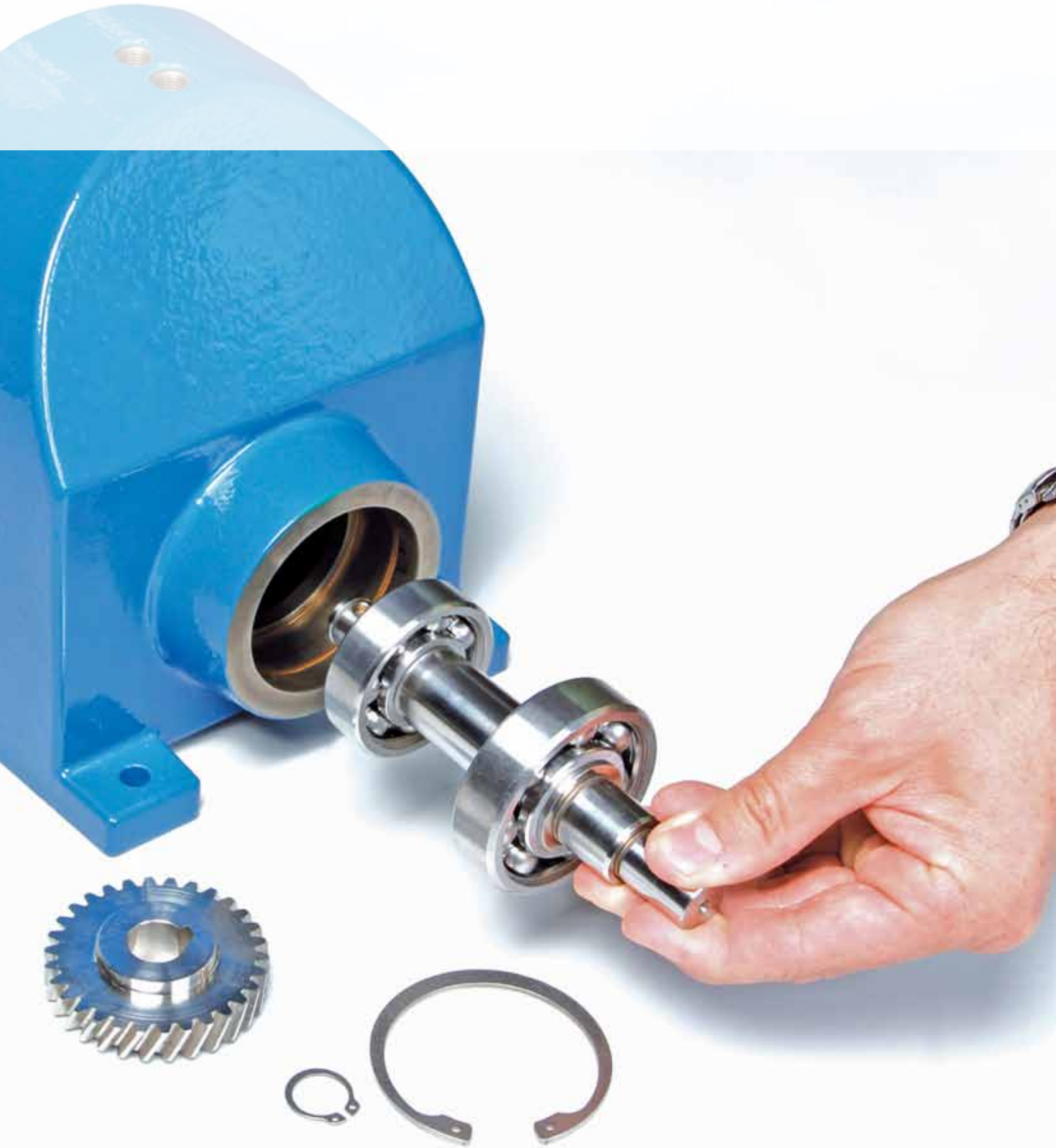
Output/input shaft

57360-ENG

Helical gear unit ETS1:

Exploded drawing

No.	Designation	Order no.
1	Set of ETS ring binders	91903-ENG
2	Assembly and disassembly instruction ETS1	57350CD-ENG
3	Instructor's Manual ETS1, incl. CD-ROM	57351CD-ENG
4	Student Manual ETS1, incl. CDROM	57352CD-ENG
5	Set of colour transparencies, incl. CD-ROM	57353CD-ENG
6	Set of TECHNOCards® "Helical gear unit ETS1"	57354-ENG
N/I	Video clips "Helical gear, single-stage" on CD	57347CD
N/I	CAD data for helical gear unit ETS1	57348CD



HELICAL GEAR UNIT ETS1 WITH tec2SKILL®

Augmented Reality

What is tec2SKILL®

The learning application tec2SKILL® Mechanics is a digital assistant providing didactic support for the use of Helical gear ETS1.



PROCESS ANIMATION

Helical Carrier Assembly



How can I get the tec2SKILL® APP?

Search the relevant App-Store for "tec2SKILL"
Or use the QR codes on the right.
Scan the QR codes and install the demo application.



Scan with App



Assembly Instructions Helical Gear Type ETS1 1-stage ETS DIDACTIC GMBH
ELABO Training Systems

3.5 Assembly Component Group Drive shaft

Ser. No	Description	Qty.
1	Housing	1
5	Gear wheel	1
10	Locking snap ring DIN 472-62x2	1
12	Locking snap ring DIN 471-16x1	1
	Mounted Shaft	

17

Planetary carrier assembly

No.	Designation	Order No.
1	Augmented documentation Helical gear unit for tec2SKILL®	57397-ENG

ADDITIVE MANUFACTURING 3D PRINTING ETS1

Courseware | Construction

Learning objectives

- › Introduction to the "Additive Manufacturing"
- › Calculation of different transmission ratios
- › Creation of CAD data
- › Working with CAD System
- › Preparing CAD data for additive manufacturing
- › Working with a slicer software
- › Convert CAD data for additive manufacturing into G-Code



1

Printed and digital!



2



3

Content

- › Project 1
Additive Manufacturing
- › Project 2
Rapid Prototyping
- › Project 3
Rapid Tooling



4

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Additive Manufacturing 3D-Printing ETS1 - Instructor's Manual	57450CD-ENG
3	Additive Manufacturing 3D-Printing ETS1 - Student Manual	57451CD-ENG
4	Additive Manufacturing ETS1 CAD Data	57452CD



Competence

Better to know
than just to guess



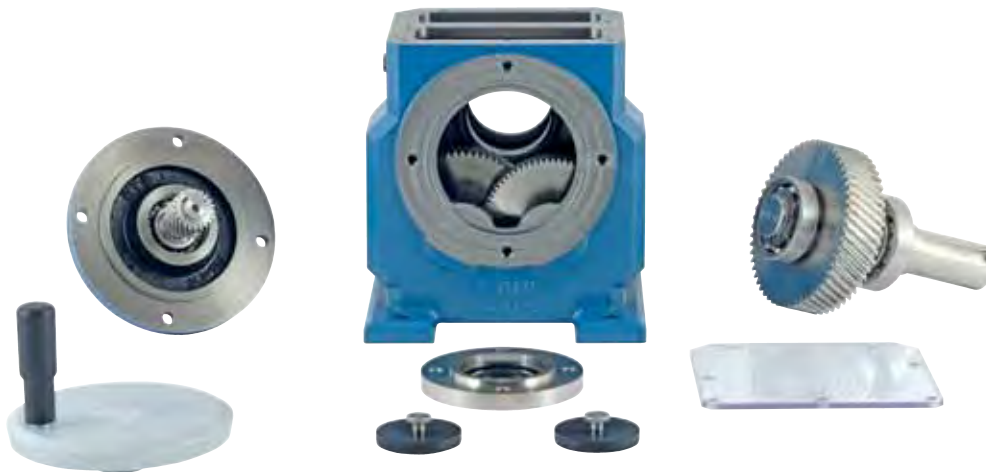
tec2SKILL®

Employ Augmented Reality to interlink theory, practice and implementation and make technology tangible



HELICAL GEAR UNIT ETS6, 2/3-STAGE

Mechanical components for hands-on training



The learning application tec2SKILL® Mechanical is a digital assistant for the didactic support for all gears for tablet, smartphone and now also for „Smart Glasses“.

1



Learning Objectives

Helical gear unit ETS6

- › Assess assembly drawings, layout plans, and parts lists
- › Select suitable test equipment and create test reports
- › Create assembly plan for proper assembly and disassembly
- › Develop test criteria for functional tests
- › Plan maintenance including environmentally-friendly disposal of material and operating fluids
- › Analyze faults and determine components to be replaced
- › Assemble technical subsystems with subsequent function check
- › Convert existing systems according to customer request
- › Select tools and resources by means of function plans and design drawings
- › Analyze, plan, and organize workflows (assembly, disassembly and preventive maintenance measures)

No.	Designation	Order No.
1	Helical gear unit ETS6, 2/3-stage, in system case	57303
2	Tool set for gear units, in system case	57306
3	Caster for gear unit system case	57307
N/I	Rubber mat 800mm x 500mm	57308

Storage and Accessories



Overview

- › Educational gear self-assembly kit
- › Modified fits—assembly and disassembly possible without press-in or injection tools
- › No use of lubricants (oil, grease)—clean workplace
- › Corrosion-resistant components: all components are either made from stainless materials (e.g., stainless steel bearings) or surface-treated (painted / powder-coated housing)

Storage system

- › Individual parts are clearly arranged in high-quality foam inserts
- › Missing parts can be detected immediately
- › Stored in a space-saving plastic case and covered from dust
- › Roller unit (optional) for easy and quick transportation

Self-assembly kit

The gear self-assembly kit for the double-/triple-stage spur gear has a modified fit system so no special tools such as presses or pullers are required for assembly. Using mechanical drawings or detailed assembly instructions, learners can assemble the gear independently and perform a function test using the hand wheel. This allows trainees to experience the functionality of a multi-stage spur gear and to better understand its mechanical sequences.

HELICAL GEAR UNIT ETS6, 2/3-STAGE

Courseware



1

Printed and digital!



2



3



4

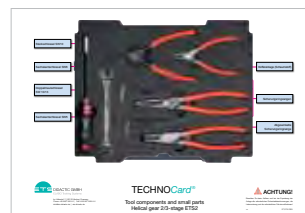
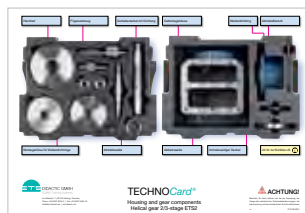


5

Manual

Helical gear unit ETS6
Practical, detailed manual using the dual-/triple-stage helical gear to explain gear theory.

- › Gear wheels and toothed gearing
- › Geometry of gear wheels
- › Gear unit construction
- › Drive engineering
- › Assembly and disassembly
- › Servicing and maintenance



6

Set of TECHNOCards®

- Helical gear unit ETS6 consisting of:
- 57388-ENG Gear Components and Small Parts ETS6
 - 57389-ENG Housing and Gear Components
 - 57390-ENG 3-stage ETS6 – 3D Sectional View
 - 57391-ENG 3-stage ETS6 – Exploded View
 - 57393-ENG Tool Components - Gear Technology
 - 57394-ENG 2-stage ETS6 – 3D Sectional View
 - 57395-ENG 2-stage ETS6 – Exploded View

No.	Designation	Order No.
1	Set of ETS ring binders	91903-ENG
2	Assembly and disassembly instruction ETS6	57341CD-ENG
3	Instructor's Manual ETS6, incl. CD-ROM	57342CD-ENG
4	Student Manual ETS6, incl. CD-ROM	57343CD-ENG
5	Presentation Aids, incl. CD-ROM	57344CD-ENG
6	TECHNOCards® Set	57396-ENG
N/I	CAD-Daten 2/3-stage Helical Gear ETS6	57349CD
N/I	Video clips "Helical gear unit, 2/3-stage" on CD	57323CD
N/I	Augmented documentation ETS6 tec2SKILL®	57361-ENG



HELICAL GEAR UNIT ETS6 WITH tec2SKILL®

Augmented Reality

What is tec2SKILL®

The learning application tec2SKILL® Mechanics is a digital assistant providing didactic support for the use of Helical gear ETS6.



Assembly Instructions Helical Gear ETS6 Assembly – 2-stage



3.3 Assembly group: Driven shaft



Part No.	Designation	Number
3	Flange, output side	1
10	Gear wheel 6	
11	Driven shaft	
13		
18		
19		
22		
23		
25		
33		

Technician ID	Task	AR Clause (description)	Components	Assembly	Tools
	Assembly group: Driven shaft				

Part No.	Designation	Number
3	Flange, output side	1
10	Gear wheel 6	
11	Driven shaft	

tec2SKILL®

ETS DIDACTIC GMBH
ELABO Training Systems

PROCESS ANIMATION

Helical Carrier Assembly



How can I get the tec2SKILL® APP?

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Or use the QR codes on the right.

Scan the QR codes and install the demo application.



Scan with
App



Assembly Instructions Helical Gear ETS6 Assembly – 2-stage



3.3 Assembly group: Driven shaft



Part No.	Designation	Number
3	Flange, output side	1
10	Gear wheel 6	1
11	Driven shaft	1
13	Spacer tube „big“	1
18	Grooved ball bearing DIN 625-6206	1
19	Grooved ball bearing DIN 625-6207	1
22	Shaft seal ring DIN 3760-AS-40x62x7-NBR	1
28	Feather key DIN 6885-A10x8x32	1
29	Cylinder screws ISO 4762-M8x16-8.8	4
33	Locking snap ring DIN 471-30x1.5	1
38	Shim rings DIN 988-30x42x0.1 or 0.3	if required
Z3	Mounting sleeve „big“	1

12

Planetary carrier assembly

No.	Designation	Order No
1	Augmented documentation Helicar gear unit with tec2SKILL®	57363-DEU

ADDITIVE MANUFACTURING 3D PRINTING ETS6

Courseware | Construction

Learning objectives

- › Introduction to the "Additive Manufacturing"
- › Calculation of different transmission ratios
- › Creation of CAD data
- › Working with CAD System
- › Preparing CAD data for additive manufacturing
- › Working with a slicer software
- › Convert CAD data for additive manufacturing into G-Code



1

Printed and digital!



2



3

Content

- › Project 1
Additive Manufacturing
- › Project 2
Rapid Prototyping
- › Project 3
Rapid Tooling



4

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Additive Manufacturing 3D-Printing ETS6 - Instructor's Manual	57453CD-ENG
3	Additive Manufacturing 3D-Printing ETS6 - Student Manual	57454CD-ENG
4	Additive Manufacturing ETS6 CAD Data	57455CD



Competence

Better to know
than just to guess



tec2SKILL®

Employ Augmented Reality to interlink theory, practice and implementation and make technology tangible



BEVEL GEAR UNIT ETS7

Mechanical Components for Hands-on Training

Bevel Gear with upstream spur gear stage



1



The learning application tec2SKILL® Mechanical is a digital assistant for the didactic support for all gears for tablet, smartphone and now also for „Smart Glasses“.



Learning Objectives

Bevel gear unit ETS3

- › Assess assembly drawings, layout plans, and parts lists
- › Select suitable test equipment and create test reports
- › Create assembly plan for proper assembly and disassembly
- › Develop test criteria for functional tests
- › Plan maintenance including environmentally-friendly disposal of material and operating fluids
- › Analyze faults and determine components to be replaced
- › Assemble technical subsystems with subsequent function check
- › Quality assurance, incl. theory of the Gaussian (normal) distribution and the Pareto distribution and design drawings
- › Select tools and resources by means of function plans and design drawings
- › Analyze, plan, and organize workflows (assembly, disassembly and preventive maintenance measures)



4

No.	Designation	Order No.
1	Bevel gear unit ETS7 with upstream spur gear stage, in system case	57420
2	Tool set for gear units, in system case	57306
3	Caster for gear unit system case	57307
4	Assembly Instructions	57424CD-ENG
N/I	Rubber mat 800mm x 500mm	57308

Storage and Accessories



Overview

- › Educational gear self-assembly kit
- › Modified fits—assembly and disassembly possible without press-in or injection tools
- › No use of lubricants (oil, grease)—clean workplace
- › Corrosion-resistant components: all components are either made from stainless materials (e.g., stainless steel bearings) or surface-treated (painted / powder-coated housing)

Storage system

- › Individual parts are clearly arranged in high-quality foam inserts
- › Missing parts can be detected immediately
- › Stored in a space-saving plastic case and covered from dust
- › Roller unit (optional) for easy and quick transportation

Self-assembly kit

The gear self-assembly kit for the bevel gear has a modified fit system so no special tools such as presses or pullers are required for assembly. Using mechanical drawings or detailed assembly instructions, learners can assemble the gear independently and perform a function test using the hand wheel. This allows trainees to experience the functionality of a bevel gear and to better understand its mechanical sequences.

BEVEL GEAR UNIT ETS7

Courseware



1

Printed and digital!

Manual

Bevel gear unit ETS3

Practical, detailed manual using the ETS3 bevel gear unit to explain gear theory as well as maintenance and quality assurance.

- › Gear wheels and toothed gearing
- › Gear wheel geometry
- › Toothed gearing construction
- › Drive technology
- › Assembly and disassembly
- › Quality assurance
- › Servicing and maintenance

With Chapter

Quality assurance

- The quality concept
- Quality testing
- Quality management
- Statistical evaluation
- Standard deviation
- The Pareto method



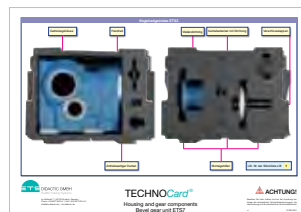
2



5



3



Set of TECHNOCards®

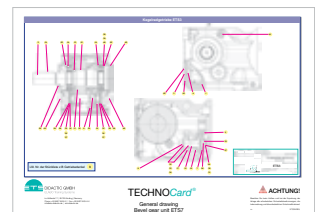
Bevel gear unit ETS3

consisting of:

- 57335-ENG Bevel Gear Unit ETS3: Tools and small parts
- 57336-ENG Bevel Gear Unit ETS3: Housing and gear parts
- 57337-ENG Bevel Gear Unit ETS3: 3D section view
- 57338-ENG



4

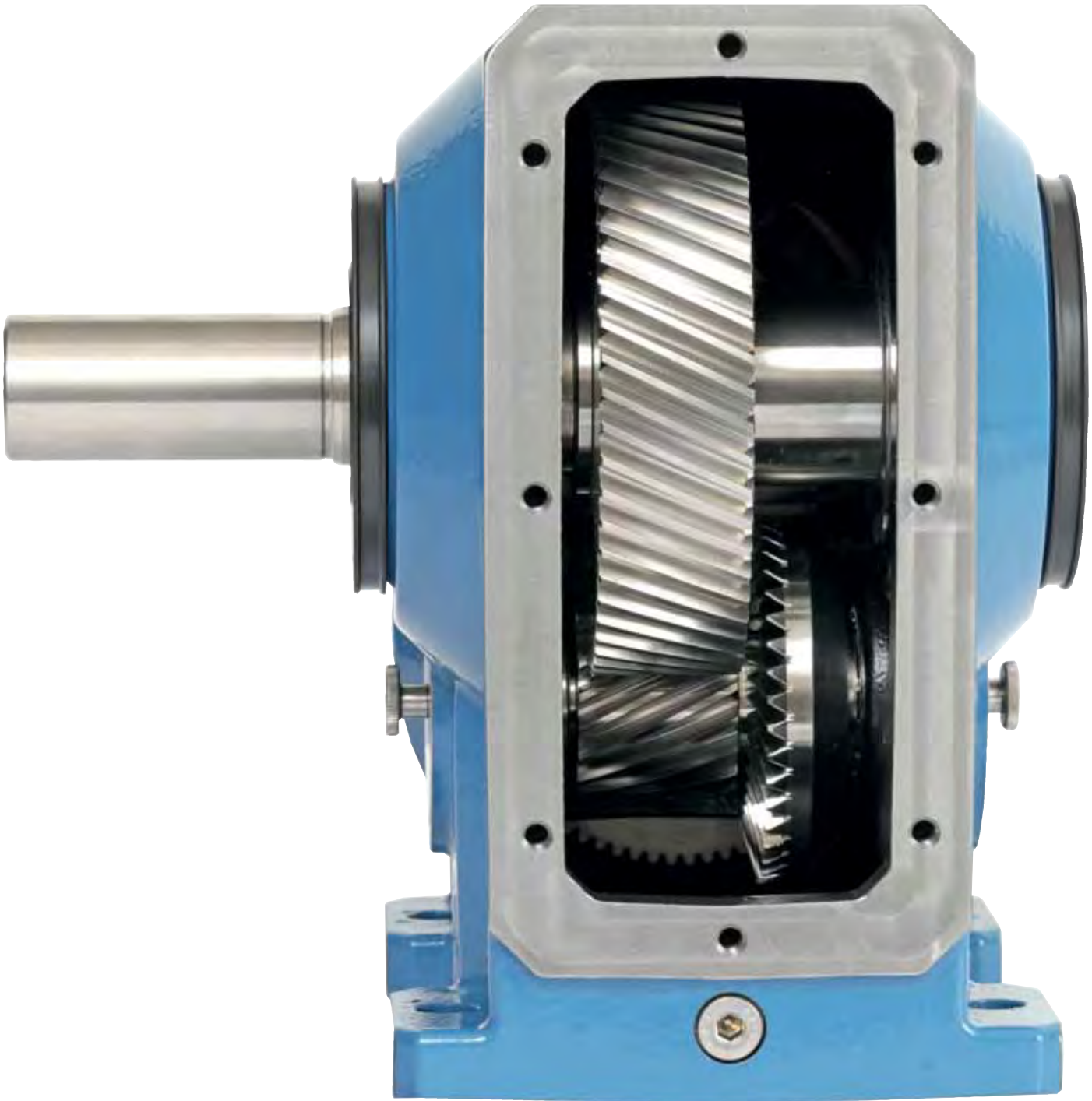


6

Bevel Gear Unit ETS3:

- Total view 57339-ENG
- Bevel Gear Unit ETS3: Output shaft (student version) 57340-ENG
- Bevel Gear Unit ETS3: Output shaft (instructor's version)

No.	Designation	Order No.
1	Set of ETS ring binders	91903-ENG
2	Assembly and disassembly instruction ETS7	57424CD-ENG
3	Instructor's Manual ETS7, incl. CD-ROM	57425CD-ENG
4	Student Manual ETS7, incl. CD-ROM	57426CD-ENG
5	Presentation ETS7 incl. CD	57427CD-ENG
6	Set of TECHNOCards® "Bevel gear unit ETS7"	57334-ENG
n. ill.	Video clips "Bevel gear unit" on CD	57335CD



BEVEL GEAR UNIT ETS7 WITH tec2SKILL®

Augmented Reality

What is tec2SKILL®

The learning application tec2SKILL® Mechanics is a digital assistant providing didactic support for the use of Bevel gear ETS7.



PROCESS ANIMATION

Bevel Carrier Assembly



How can I get the tec2SKILL® APP?

Search the relevant App-Store for "tec2SKILL"
Or use the QR codes on the right.
Scan the QR codes and install the demo application.



Scan with
App



ETS DIDACTIC GMBH
ELABO Training Systems

Assembly Instructions Bevel Gear Unit ETS 7 Assembly

3.7 Assembly of driven shaft

Part No.	Designation	Quantity
9a	Gear wheel 6	1
10	Driven shaft	1
11	Spacer	1
15	Grooved ball bearing DIN 625-6207	2
21	Feather key DIN 6885-A10x8x32	1
29	Locking snap ring DIN 472-72x2.5	1

28

Planetary carrier assembly

No.	Designation	Order No.
1	Augmented documentation Bevel gear unit tec2SKILL®	57431-ENG

Competence

Better to know
than just to guess



tec2SKILL®

Employ Augmented Reality to interlink theory, practice and implementation and make technology tangible



PLANETARY GEAR UNIT ETS4

Mechanical Components for Hands-on Training



The learning application tec2SKILL® Mechanical is a digital assistant for the didactic support for all gears for tablet, smartphone and now also for „Smart Glasses“.



1

Learning Objectives

Planetary gear unit ETS4

- › Assess assembly drawings, layout plans, and parts lists
- › Select suitable test equipment and create test reports
- › Create assembly plan for proper assembly and disassembly
- › Develop test criteria for functional tests
- › Plan maintenance including environmentally-friendly disposal of material and operating fluids
- › Analyze faults and determine components to be replaced
- › Assemble technical subsystems with subsequent function check
- › Convert existing systems according to customer request
- › Select tools and resources by means of function plans and design drawings
- › Analyze, plan, and organize workflows (assembly, disassembly and preventive maintenance measures)

Self-assembly kit

The gear self-assembly kit for the planetary gear has a modified fit system so no special tools such as presses or pullers are required for assembly. Using mechanical drawings or detailed assembly instructions, learners can assemble the gear independently and perform a function test using the hand wheel. This allows trainees to experience the functionality of a planetary gear and to better understand its mechanical sequences.

No.	Designation	Order No.
1	Planetary gear unit ETS4, in system case	57365
2	Tool set for gear units, in system case	57306
3	Caster for gear unit system case	57307
4	Dial gauge in suitcase	90299
N/I	Rubber mat 800mm x 500mm	57308

Storage and Accessories



Overview

- › Educational gear self-assembly kit
- › Modified fits—assembly and disassembly possible without press-in or injection tools
- › No use of lubricants (oil, grease)—clean workplace
- › Corrosion-resistant components: all components are either made from stainless materials (e.g., stainless steel bearings) or surface-treated (painted / powder-coated housing)

Storage system

- › Individual parts are clearly arranged in high-quality foam inserts
- › Missing parts can be detected immediately
- › Stored in a space-saving plastic case and covered from dust
- › Roller unit (optional) for easy and quick transportation

Dial gauge case

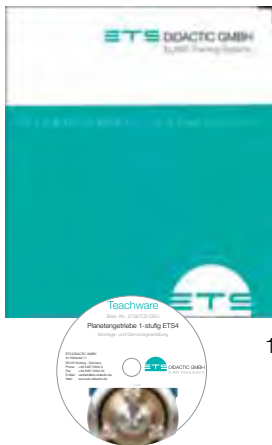
- for measuring and adjusting the axial play, consisting of:
- › Tripod with dovetail dial-gauge holder
 - › Magnetic base
 - › Lever gauge
 - › Dial gauge
 - › Open-ended wrench

4

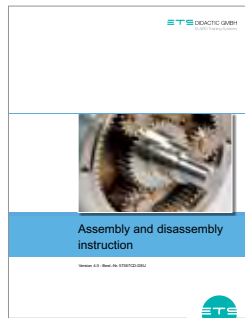


PLANETARY GEAR UNIT ETS4

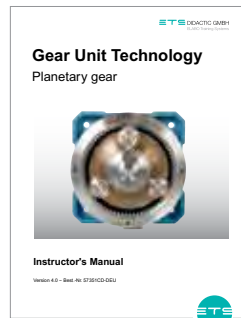
Courseware



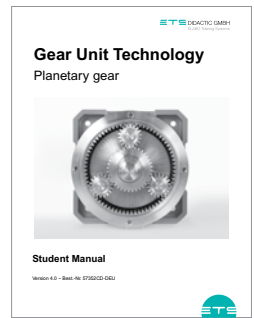
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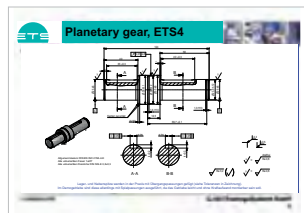
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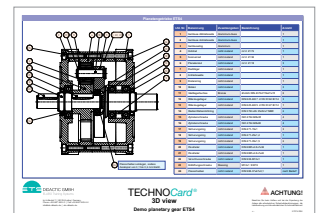
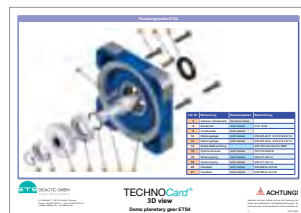
3



4



5



6

Manual

Planetary gear unit ETS4

Practical, detailed manual using the ETS4 planetary gear to explain gear theory.

- › Technical communication
- › Transmission
- › Gearwheels and toothed gearing
- › Assembly and disassembly
- › Servicing and maintenance

Set of TECHNOCards®

Planetary gear unit ETS4

consisting of:

57374-ENG

Planetary gear ETS4: Cross-sectional drawing and component list

57375-ENG

Planetary gear unit ETS4:

Cross-sectional drawing and component list

57376-ENG

Planetary gear unit ETS4:

Dimensioned drawing of input shaft

57377-ENG

Planetary gear unit ETS4:

Exploded drawing of gear carrier

57378-ENG

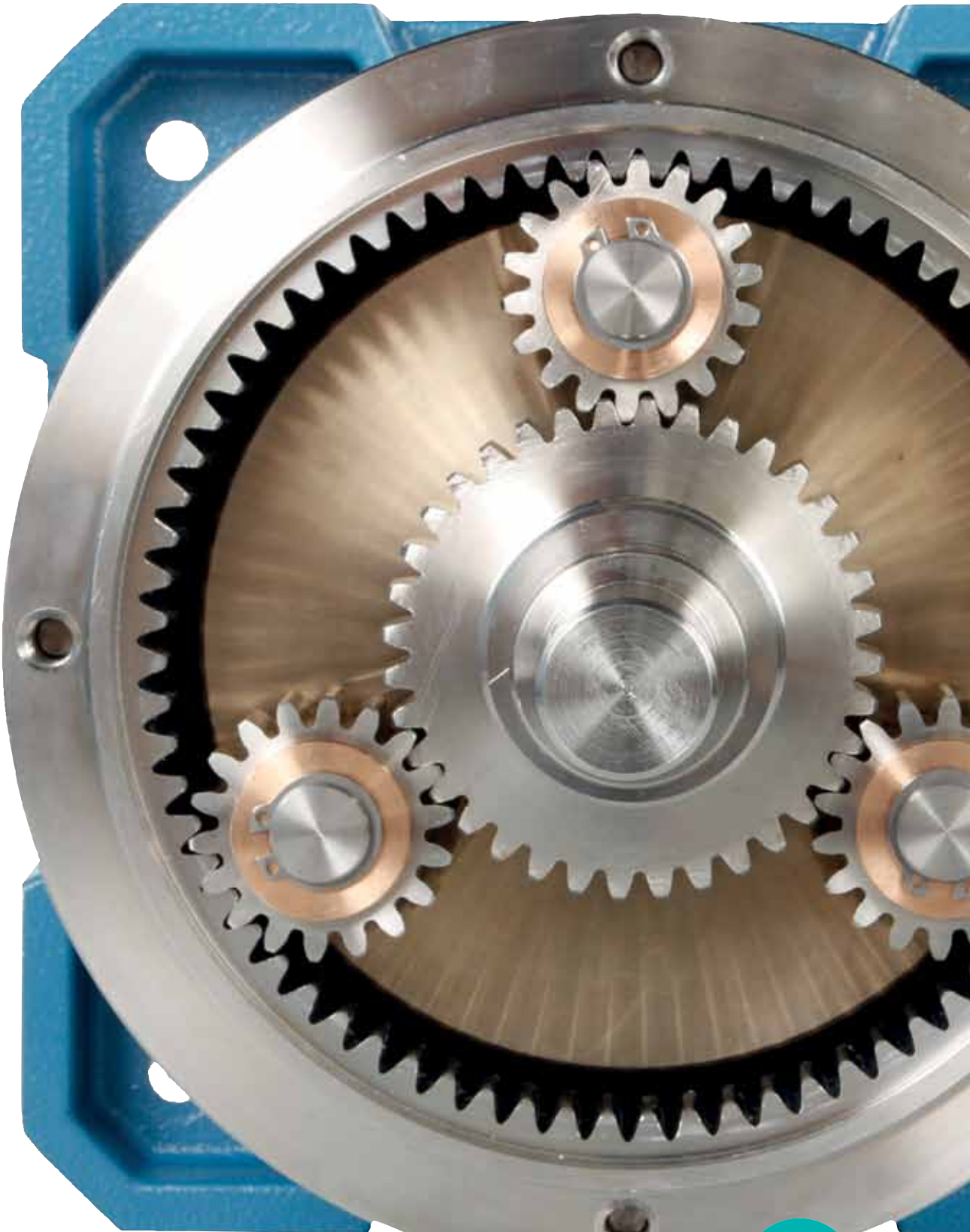
Planetary gear unit ETS4: Exploded drawing of output shaft

57379-ENG

Planetary gear unit ETS4: Dimensioned drawing of gear carrier

57379-ENG

No.	Designation	Order No.
1	Set of ETS ring binders	91903-ENG
2	Assembly and disassembly instruction ETS4	57367CD-ENG
3	ETS4 Instructor Section Manual	57368CD-ENG
4	ETS4 Practical Experiments Manual	57369CD-ENG
5	Set of colour transparencies ETS4	57370CD-ENG
6	Set of TechnoCards® ETS4	57373-ENG
N/I	Video clips "Planetary gear ETS4" on CD	57371CD
N/I	CAD data for planetary gear unit ETS4	57372CD



PLANETARY GEAR UNIT ETS4 WITH tec2SKILL®

Augmented Reality

What is tec2SKILL®

The learning application tec2SKILL® Mechanics is a digital assistant providing didactic support for the use of Planetary gear ETS4.



PROCESS ANIMATION

Planetary Carrier Assembly



How can I get the tec2SKILL® APP?

Search the relevant App-Store for "tec2SKILL"
Or use the QR codes on the right.
Scan the QR codes and install the demo application.



Scan with App



Assembly Instructions Planetary Gear Type ETS4 Single-stage

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ELABO Training Systems

3.2 Planetary carrier assembly

Part No.	Designation	Quantity
6	Planet gear	3
7	Wheel carrier	1
9	Spacer ring	1
10	Bolt	3
11	Plain bearing bush	6
12	Grooved ball bearing DIN 625-6007	2
17	Locking snap ring DIN 471 – 15 x 1	3
19	Locking snap ring DIN 471 – 35 x 1.5	1
M3	Mounting aid „angular“	1

8

Planetary carrier assembly

No.	Designation	Order No.
1	Augmented documentation Planetary gear for tec2SKILL®	57361-ENG

Competence

Better to know
than just to guess



tec2SKILL®

Employ Augmented Reality to interlink theory, practice and implementation and make technology tangible



WORM GEAR UNIT ETS5

Mechanical Components for Hands-on Training



The learning application tec2SKILL® Mechanical is a digital assistant for the didactic support for all gears for tablet, smartphone and now also for „Smart Glasses“.



1

Learning objectives

Worm gear unit ETS5

- › Assess assembly drawings, layout plans, and parts lists
- › Select suitable test equipment and create test reports
- › Create assembly plan for proper assembly and disassembly
- › Develop test criteria for functional tests
- › Plan maintenance including environmentally-friendly disposal of material and operating fluids
- › Analyze faults and determine components to be replaced
- › Assemble technical subsystems with subsequent function check
- › Modification of existing installations according to customers' specifications
- › Select tools and resources by means of function plans and design drawings
- › Analyze, plan, and organize workflows (assembly, disassembly and preventive maintenance measures)
- › Contact pattern check

Overview

- › Self-assembly kit considering didactic aspects
- › Modified fits – assembly and disassembly possible without press-in or injection tools
- › No use of lubricants (oil, grease) – clean workplace
- › Corrosion-resistant components: all components are either made from stainless materials (e.g., stainless steel bearings) or surface-treated (painted / powder-coated housing)

No.	Designation	Order No.
1	Worm gear unit ETS5, in system case	57302
2	Caster for gear unit system case	57307
N/I	Rubber mat 800 mm x 500 mm	57308

Storage and Accessories



1



2



Self-assembly kit

The gear self-assembly kit for the worm gear has a modified fit system so no special tools such as presses or pullers are required for assembly. Using mechanical drawings or detailed assembly instructions, learners can assemble the gear independently and perform a function test using the hand wheel. This allows trainees to experience the functionality of a worm gear and to better understand its mechanical sequences.

Storage system

- › Individual parts are clearly arranged in high-quality foam inserts
- › Missing parts can be detected immediately
- › Stored in a space-saving plastic case and covered from dust
- › Caster unit (optional) for easy and quick transportation

WORM GEAR UNIT ETS5

Courseware



1



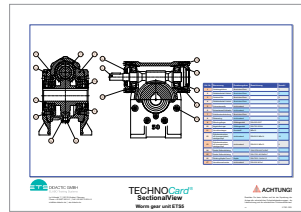
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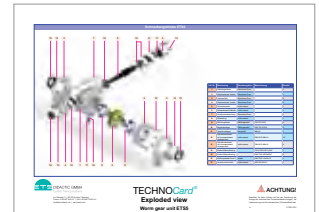
3



4



6



7

Manual

Worm gear unit ETS5

Practical, detailed manual using the ETS5 planetary gear to explain gear theory.

- › Technical communication
- › Transmission
- › Gearwheels and toothed gearing
- › Assembly and disassembly
- › Servicing and maintenance

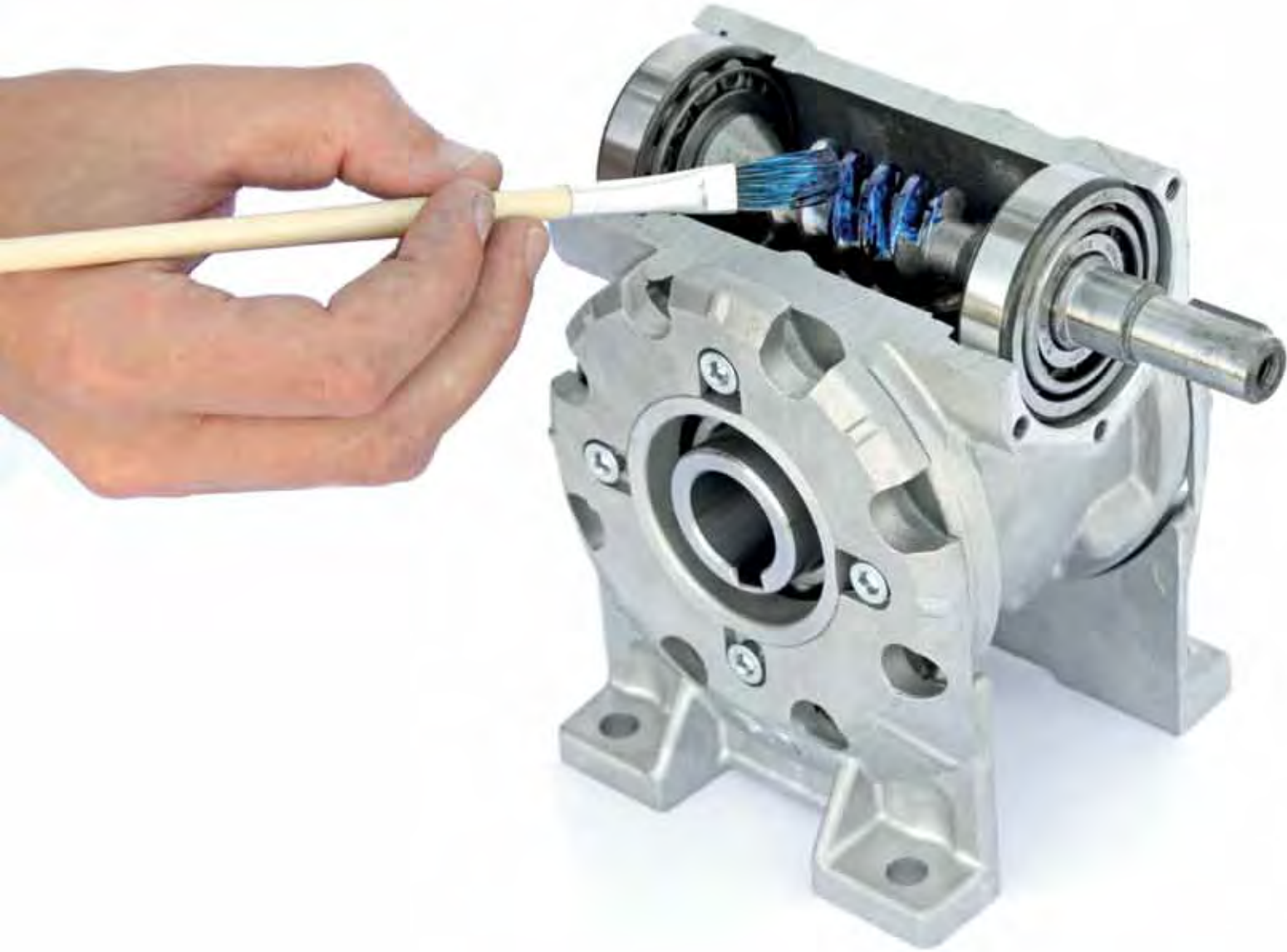
TECHNOCards®

Worm gear ETS5

57381-ENG
Sectional View
Worm gear ETS5

57382-ENG
Exploded view
Worm gear ETS5

No.	Designation	Order No.
1	Set of ETS ring binders	91903-ENG
3	Assembly Instructions Worm gear ETS5	57383CD-ENG
4	Worm gear – Instructor's Manual	57328CD-ENG
5	Worm gear – Student Manual	57329CD-ENG
6	TechnoCards® Worm Gear ETS5 Sectional View	57381-ENG
7	TechnoCards® Worm Gear ETS5 Exploded View	57382-ENG

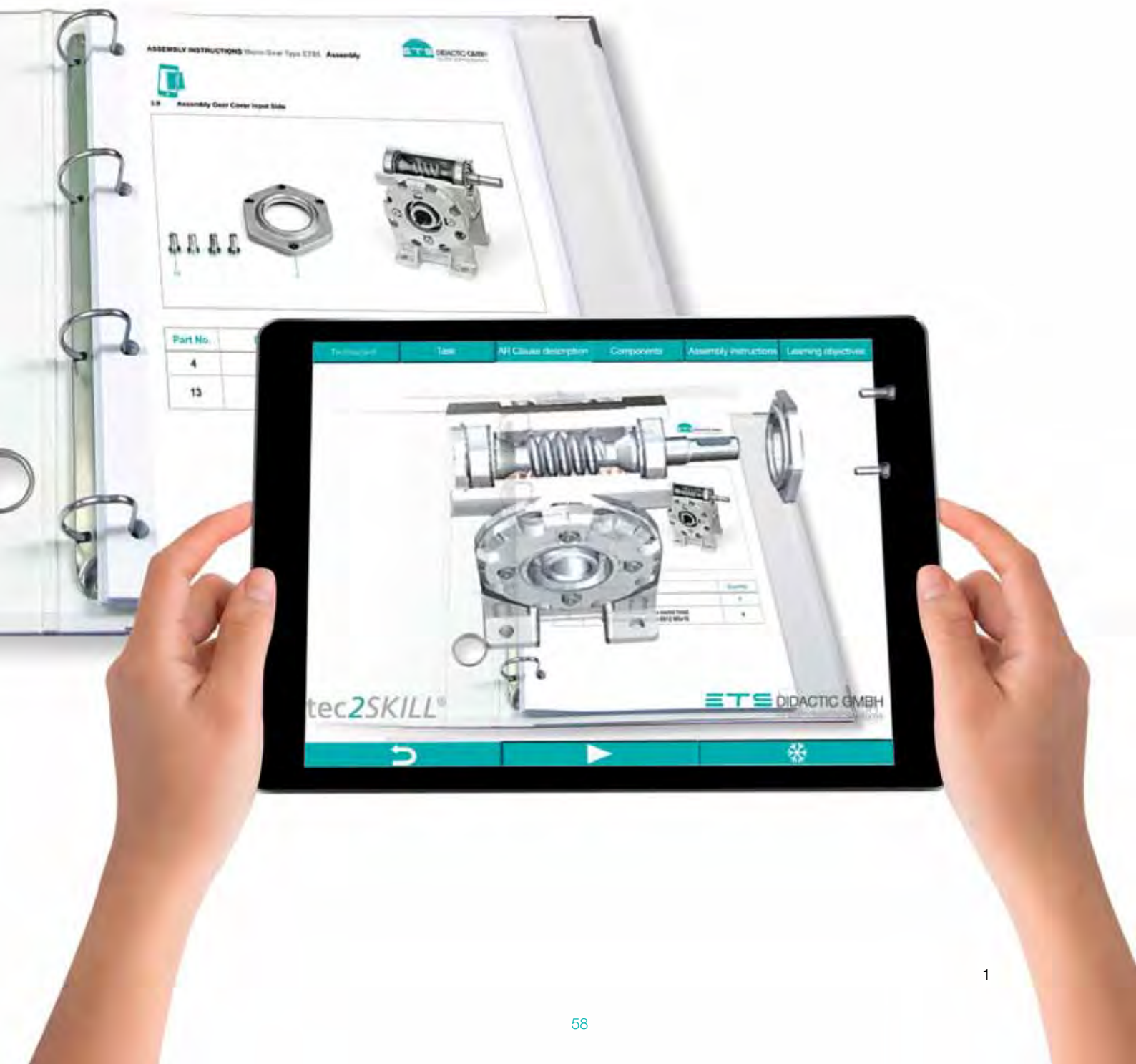


WORM GEAR UNIT ETS5 WITH tec2SKILL®

Augmented Reality

What is tec2SKILL®

The learning application tec2SKILL® Mechanics is a digital assistant providing didactic support for the use of worm gear unit ETS5.



PROCESS ANIMATION

Gear Cover Assembly - Input Side



How can I get the tec2SKILL® APP?

Search the relevant App-Store for "tec2SKILL"

Or use the QR codes on the right.


Scan the QR codes and install the demo application.




Scan with App



ASSEMBLY INSTRUCTIONS Worm Gear Type ETS5 Assembly



3.8 Assembly Gear Cover Input Side



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ELABO Training Systems

Part No.	Designation	Quantity
4	Gear cover input side	1
13	Cylinder screws with hex socket head, with low profile head Din 6912 M5x16	4

24

Gear cover assembly - input side

No.	Designation	Order No.
1	Augmented documentation Worm gear for tec2SKILL®	57362-ENG



BEARING TECHNOLOGY

Training package TP 81.2-1

Anti-friction bearing assembly

Inner ring hammer assembly

Outer ring hammer assembly

Shaft press-in assembly—housing

Hydraulic mounting on a tapered shaft seat

Mechanical mounting on a tapered shaft seat

Angular contact ball bearing

Thermal assembly of ball bearing on shaft



BALL BEARING ASSEMBLY

Training Systems for Assembly and Disassembly of Ball Bearings



Learning objectives

- › Mechanical assembly and disassembly of anti-friction bearings
- › Hydraulic assembly and disassembly of anti-friction bearings
- › Conditions of rotation
- › Creating assembly plans for expert assembly and disassembly
- › Developing test criteria for functional checks
- › Assembling technical sub-systems followed by functional check

The innovation –

Separating dummy and workpiece intake

- › Mobile, lightweight, and compact dummy fitting
- › Can be used in any type of vice
- › Depending on assembly situation, only the relevant dummy is installed
- › Easy design of activity-focused learning circles
- › Perfectly suited also for larger groups,
- › Teams split into sub-teams at the stations
- › Encourages independent activity
- › Helps the teacher / trainer



Hammer Mounting through Inner Ring



2



1

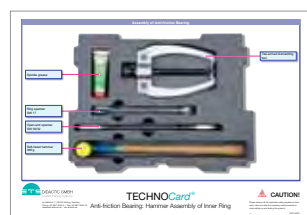


Learning objectives

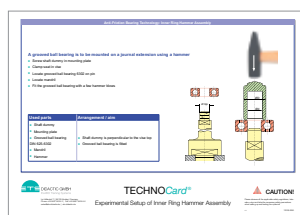
Hammer mounting through inner ring

- › Assembling a grooved ball bearing on a shaft extension
- › Handling industrial assembly tools
- › Observing conditions of rotation
- › Disassembling using a two-armed puller

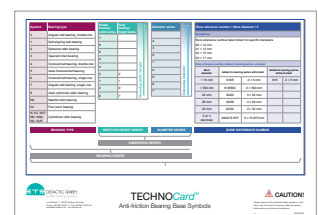
TECHNOCards®



3



4



5

Hammer mounting through inner ring

Mechanical assembly and disassembly of grooved ball bearings across the inner ring, consisting of:

- › Shaft extension
- › Grooved ball bearing
DIN 625-6302

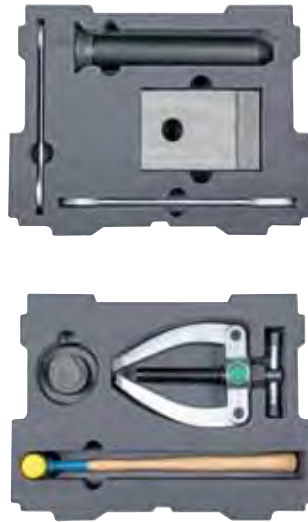
- › Striking sleeve with removable strike ring
- › Soft-head hammer
- › Two-arm, self-aligning puller
- › Disassembly aid
- › Open-ended wrench
- › Combination wrench
- › Support plate

No.	Designation	Order No.
1	Hammer mounting through inner ring	12010
2	Caster for gear unit system case	57307
3	TECHNOCard® – Hammer assembly of inner ring	12021-ENG
4	TECHNOCard® – Experimental setup of inner ring hammer assembly	12026-ENG
5	TECHNOCard® – Anti-friction bearing base symbol	12029-ENG
n. ill.	Rubber mat, 800mm × 500mm	57308

Hammer Mounting through Outer Ring



2



1



Learning objectives

Hammer mounting through outer ring

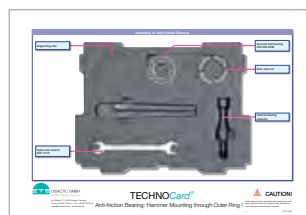
- › Assembling a grooved ball bearing in a housing
- › Assembly using an industrial tool
- › Observing conditions of rotation
- › Disassembly using internal extractors and support brace

Hammer mounting through outer ring

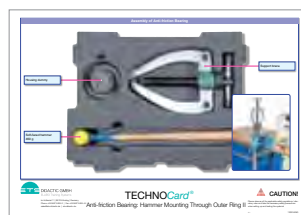
Training system in a plastic case. Mechanical assembly and disassembly of grooved ball bearings across the outer ring, consisting of:

- › Housing dummy
- › Bore hole nut
- › Grooved ball bearing DIN 625-6206

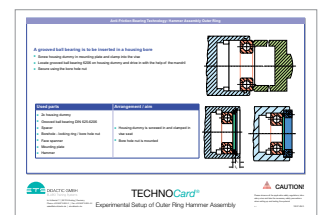
TECHNOCards®



3



4



5

- › Striking sleeve with removable strike ring
- › Soft-head hammer 460g
- › Face pin wrench size 5
- › Internal bearing extractor
- › Support brace compatible with internal extractor 30–39
- › Open-ended wrench SW 30/32
- › Open-ended wrench SW 14/15
- › Open-ended wrench SW 20/22
- › Support plate

No.	Designation	Order No.
1	Hammer mounting through outer ring	12011
2	Caster for gear unit system case	57307
3	TECHNOCard® – Hammer mounting through outer ring I	12022-ENG
4	TECHNOCard® – Hammer mounting through outer ring II	12023-ENG
5	TECHNOCard® – Experimental setup of outer ring hammer assembly	12027-ENG
N/I	TECHNOCard® – Anti-friction bearing base symbol	12029-ENG
N/I	Rubber mat 800 mm x 500 mm	57308

Press Fit of Shaft in Housing



Learning objectives

Press fit of shaft in housing

- › Assembling a simple shaft on bearings in a housing
- › Assembling grooved ball bearings using a press
- › Sealing the assembly using a rotary shaft seal

Press fit of shaft in housing

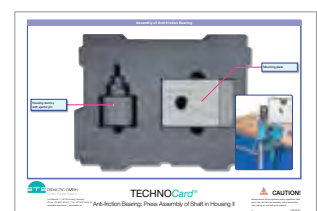
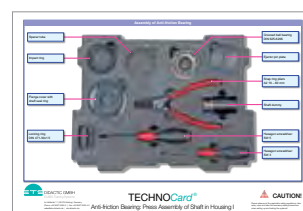
Training system for mechanical assembly and disassembly of a shaft on bearings in the housing; inside a plastic case, consisting of:

- › Shaft extension
- › Housing dummy

- › Spacer ring
- › Flange cover
- › Ejector pin plate
- › Spacer
- › Bearing DIN 625-6206
- › Locking ring
- › Rotary shaft seal
- › Circlip pliers
- › Strike ring
- › Allen key
- › Two-arm puller
- › Open-ended wrench
- › Combination wrench
- › Support plate

No.	Designation	Order No.
1	Press fit of shaft in housing	12012
2	Caster for gear unit system case	57307
3	TECHNOCard® – Press assembly of shaft in housing I	12024-ENG
4	TECHNOCard® – Press assembly of shaft in housing II	12025-ENG
5	Arbor press	10009
N/I	TECHNOCard® – Experimental setup of shaft in housing press assembly	12028-ENG
N/I	TECHNOCard® – Anti-friction bearing base symbol	12029-ENG
N/I	Rubber mat, 800 mm x 500 mm	57308

TECHNOCards®



3

4

Roller Bearing - Hydraulic Mounting on a Tapered Shaft Seat



2



1



Learning objectives

Roller bearing - hydraulic mounting on a tapered shaft seat

- › Assembling a self-aligning roller bearing with tapered bore hole on tapered shaft using hydraulic nut
- › Choosing suitable measuring equipment
- › Checking that bearing fits correctly
- › Disassembling using hydraulic—using oil to free the tapered press fit

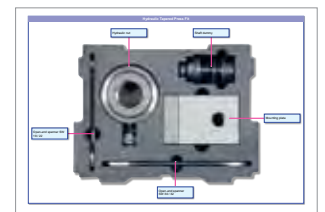
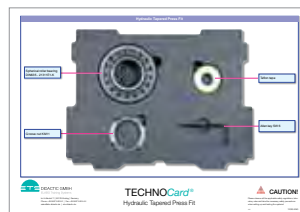
Anti-friction bearing assembly

Hydraulic mounting on a tapered shaft seat

Training system for hydraulic assembly and disassembly of a self-aligning roller bearing with tapered bore hole in a plastic case, consisting of:

- › Support plate
- › Tapered shaft dummy, 1:12
- › Self-aligning roller bearing DIN 635-2 21311
- › Hydraulic nut
- › 1x groove nut KM11
- › Allen key
- › Open-ended wrench
- › 12m Teflon tape

TECHNOCard®



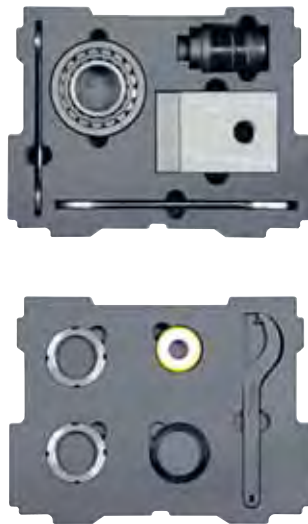
3

No.	Designation	Order No.
1	Roller bearing – mechanical mounting on tapered shaft seat	12014
2	Caster for gear unit system case	57307
3	TECHNOCard® – Hydraulic tapered press fit	12030-ENG
N/I	Oil injector	12015
N/I	Hydraulic hand pump, 2-speed operation, 700bar	12016
N/I	Rubber mat 800mm × 500mm	57308
N/I	Dial gauge in case	90299

Roller Bearing - Mechanical Mounting on a Tapered Shaft Seat



2



1



Learning objectives

Roller bearing - mechanical mounting on a tapered shaft seat

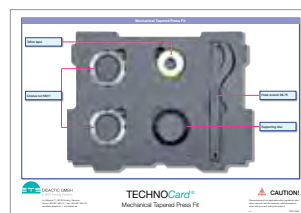
- › Assembling a self-aligning roller bearing with tapered bore hole on tapered shaft using groove nut
- › Choosing suitable measuring equipment
- › Check that bearing fits correc.
- › Disassembling using hydraulic—using oil to free the tapered press fit

Roller bearing - mechanical mounting on a tapered shaft seat

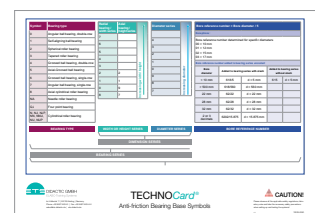
Training system inside a plastic case: Mechanical assembly of a self-aligning roller bearing onto a tapered shaft fit and hydraulic disassembly, including

- › Self-aligning roller bearing DIN 635-2 21311
- › Support plate
- › Tapered shaft dummy
- › 2x groove nut
- › Hook wrench
- › Supporting disc
- › Open-ended wrench
- › Teflon tape

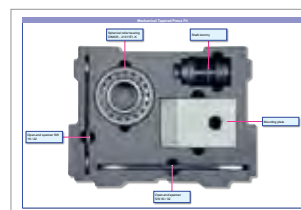
TECHNOCards®



3

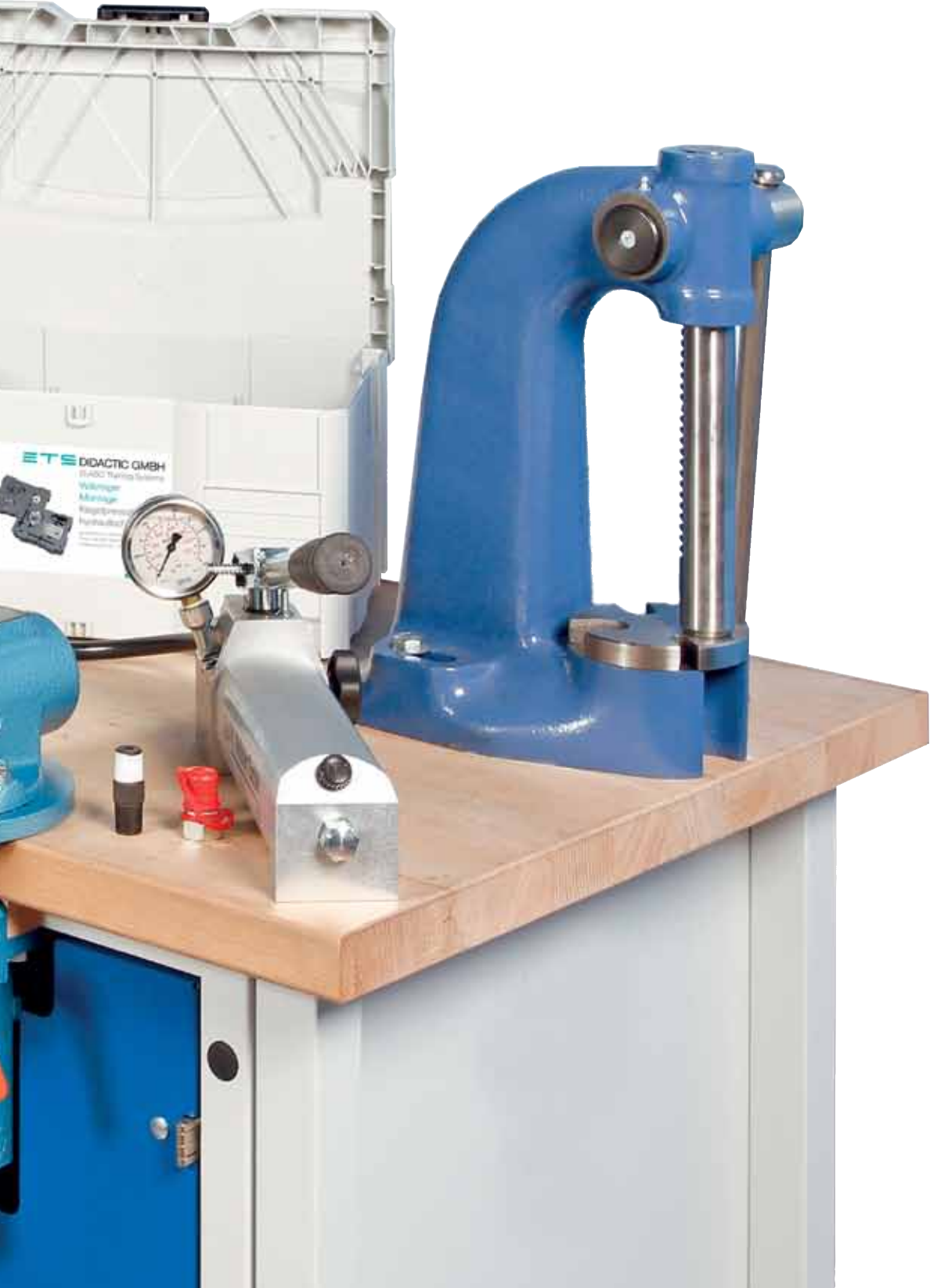


4

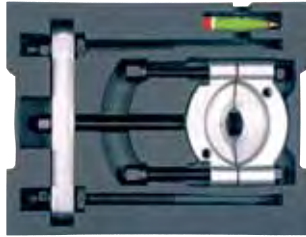


No.	Designation	Order No.
1	Roller bearing – mechanical mounting on tapered shaft seat	12013
2	Caster for gear unit system case	57307
3	TECHNOCard® – Mechanical tapered press fit	12031-ENG
4	TECHNOCard® – Anti-friction bearing base symbol	12029-ENG
N/I	Oil injector	12015
N/I	Hydraulic hand pump, 2-speed operation, 700bar	12016
N/I	Rubber mat 800 mm x 500 mm	57308





Anti-friction Bearing Assembly— Angular Contact Ball Bearing



1



2

No.	Designation	Order No.
1	Angular contact ball bearing	12017
2	Caster for gear unit system case	57307
N/1	Rubber mat 800mm × 500mm	57308



Anti-friction Bearing Assembly—Thermal Assembly of Ball Bearing on Shaft



2

1



Learning Objectives

Ball bearing assembly

Thermal assembly on shaft

› Mounting a self-aligning ball bearing on a shaft by heating of the bearing

› Heating of bearings (max. temperature, handling of heating devices)

› Dismounting with standard industrial tools

Ball bearing assembly

Thermal assembly on shaft

› Self-aligning ball bearing DIN 630 - 2210

› Mounting plate

› Shaft journal

› Hold-down flange

› Dismounting aid

› Allen key size 5

› Double-ended open jaw spanner, size 19/22

› Double-ended open jaw spanner, size 30/32

› 3-arm extractor

No.	Designation	Order No.
1	Thermal assembly of ball bearing on shaft	12018
2	Caster for gear unit system case	57307
3	Induction heating device	12019
N/I	Rubber mat 800mm x 500mm	57308

Induction Heating Device



1

Induction heating device for heating of bearings

- } Temperature and time control
- } Fast and efficient heating of bearings
- } Device is portable
- } Safe operation
- } Automatic demagnetization
- } Constant, controlled heating
- } Max. bearing weight: 10kg Ferrous metal parts heatable up to 180°C

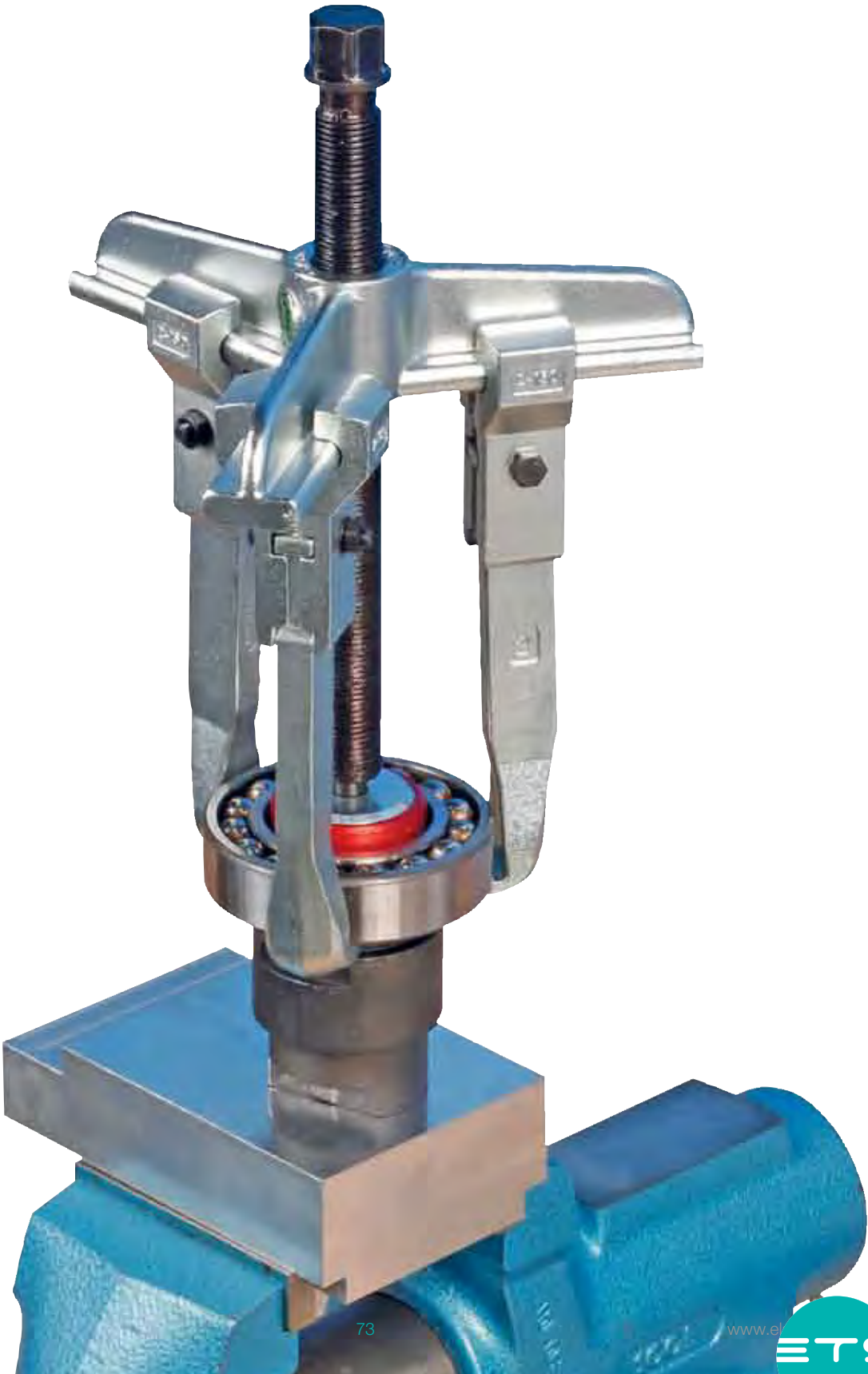
Technical data

- } Voltage: 230V
- } Current: 10A
- } Clear width / clear height: 34 cm x 25 cm x 6.4 cm
- } Weight: 3.5 kg

Scope of delivery

- } Heating unit
- } Carrying bag

No.	Designation	Order No.
1	Induction heating device	12019



ACCESSORIES

Optional

57348

Spare part set for single-stage helical gear unit ETS1

57327

Set of spare parts for bevel gear unit ETS3

57366

Set of spare parts for planetary gear unit ETS4

57304

Spare part set for 2/3-stage helical gear unit ETS6

57326

Set of spare parts for bevel gear unit ETS3

57308

Rubber mat, 800mm x 500mm



12016

Hydraulic hand pump, 2-speed operation, 700 bar



10009

Arbor press

YOUR INQUIRY

Fax

ETS DIDACTIC GMBH

Im Hüttental 11

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- a quotation for

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Qty.	Description	Order no.
Helical gear unit, single-stage (ETS1)		
	Helical gear unit ETS1, single-stage, in system case	57345
	Tool set for gear units, in system case	57306
	Set of ETS ring binders	91903-ENG
	Assembly and disassembly instruction ETS1	57350CD-ENG
	Instructor's Manual ETS1, incl. CD-ROM	57351CD-ENG
	Manual Practical Experiments ETS1, incl. CD-ROM	57352CD-ENG
	ETS1 slide set incl. CD	57353CD-ENG
	Set of colour transparencies, incl. CD	57354-ENG
	Video clips "Helical gear, single-stage" on CD	57347CD
	CAD data for helical gear unit ETS1	57348CD
Helical gear unit, 2/3-stage (ETS6)		
	Helical gear unit ETS6, 2/3-stage, in system case	57303
	Tool set for gear units, in system case	57306
	Set of ETS ring binders	91903-ENG
	Assembly and disassembly instruction ETS6	57341CD-ENG
	Instructor's Manual ETS6, incl. CD-ROM	57342CD-ENG
	Student Manual ETS6, incl. CD-ROM	57343CD-ENG
	Presentation Aids, incl. CD-ROM	57344CD-ENG
	Set TechnoCards® ETS6	57396-ENG
	CAD Data "Helical gear, 2/3-stage" on CD	57349CD
	Video clips "Helical gear, 2/3-stage" on CD	57392CD
	Augmented documentation Helical gear for tec2SKILL®	57361-ENG
Bevel gear (ETS7)		
	Bevel gear unit ETS7, in system case	57420
	Tool set for gear units, in system case	57306
	Set of ETS ring binders	91903-ENG
	Assembly and disassembly instruction ETS7	57330CD-ENG
	Instructor's Manual ETS7, incl. CD-ROM	57331CD-ENG
	Manual Practical Experiments ETS7, incl. CD-ROM	57425CD-ENG
	Presentation, incl. CD	57333CD-ENG
	Set TechnoCards® ETS7	57334-ENG
	Video clips "Bevel gear ETS7"	57335CD
Planetary gear (ETS4)		
	Planetary gear unit ETS4, in system case	57365
	Tool set for gear units, in system case	57306
	Set of ETS ring binders	91903-ENG
	Gauges suitcase	90299
	Assembly and disassembly instruction ETS4	57367CD-ENG
	Instructor's Manual ETS4, incl. CD-ROM	57368CD-ENG
	Manual Practical Experiments ETS4, incl. CD-ROM	57369CD-ENG
	Set of colour transparencies ETS4, incl. CD	57370CD-ENG
	Set TechnoCards® ETS4	57373-ENG
	Video clips "Planetary gear ETS4"	57371CD
	CAD data for planetary gear ETS4	57372CD
	Augmented documentation Planetary gear for tec2SKILL®	57361-ENG

Qty.	Description	Order no.
Worm gear (ETS5)		
	Worm gear unit ETS5, in system case	57302
	Set of ETS ring binders	91903-ENG
	Assembly instructions Worm gear unit ETS5	57383CD-ENG
	Instructor's Manual Worm gear unit ETS5	57328CD-ENG
	Instructor's Manual Worm gear unit ETS5	57329CD-ENG
	TechnoCards® Sectional View ETS5	57381-ENG
	TechnoCards® Exploded View ETS5	57382-ENG
	Augmented documentation Worm gear for tec2SKILL®	57362-ENG
Roller Bearing Technology		
Hammer mounting through outer ring		
	Hammer mounting through outer ring	12011
	TECHNOCard® – Hammer mounting through outer ring I	12022-ENG
	TECHNOCard® – Hammer mounting through outer ring II	12023-ENG
	TECHNOCard® – Outer ring hammer assemb.	12027-ENG
Press fit of shaft in housing		
	Press fit of shaft in housing	12012
	TECHNOCard® – Shaft press-in assembly – Housing I	12024-ENG
	TECHNOCard® – Shaft press-in assembly – Housing II	12025-ENG
	TECHNOCard® – Press-in assembly test assembly	57328-ENG
Anti-friction bearing assembly		
	Anti-friction bearing assembly	12014
	TECHNOCard® – Hydraulic tapered press fit	12030-ENG
Roller bearing - Mechanical mounting		
	Roller bearing - Mechanical mounting	12013
	TECHNOCard® – Mechanical tapered press fit	12031-ENG
Anti-friction bearing ass. - Angular contact ball bearing		
	Angular contact ball bearing	12017
Anti-friction bearing ass. - Thermal assembly on shaft		
	Thermal assembly of ball bearing on shaft	12019
Accessories (optional)		
	Caster for gear unit system case	57307
	TECHNOCard® Anti-friction bearing base symbol	12029-ENG
	Rubber mat, 800 mm x 500 mm	57308
	Spare part set for single-stage helical gear unit ETS1	57348
	Spare part set for 2/3-stage helical gear unit ETS6	57304
	Set of spare parts for bevel gear unit ETS3	57327
	Set of spare parts for bevel gear unit ETS3	57326
	Set of spare parts for planetary gear unit ETS4	57366
	Oil injector	12015
	Hydraulic hand pump, 2-speed operation, 700 bar	12016
	Arbor press	10009
	Induction heating device	12019



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Export Assistant



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