



SENSORICS - FUNDAMENTALS

Sensorics in CPS-i40® Applications



INDUSTRY 4.0

Qualify for the Future with CPS-i40®
connectedFACTORY



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Made
in
Germany

PEOPLE AND TECHNOLOGY – ONE UNIT TO SUCCESS

Welcome to ETS DIDACTIC



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

Subjects like pneumatics, Electropneumatics, drive technology, power electronics, automation engineering, sensor systems, bus systems, instrumentation, gear technology and the complete scope of building systems engineering including renewable energies can all be counted among the strengths of the company.

The spectrum of services offered by ETS DIDACTIC ranges from the planning and outfitting of complete training facilities to the provision of learning and teaching materials. Apart from the after-sales service, the offering of services is rounded off by practical workshops specially tailored for trainers and instructors.

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.



Udo Urban
Managing Director
ETS DIDACTIC GMBH

Technology that Fascinates: Understanding – Comprehending – Applying

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 Altmuehltal – high-quality products and solutions are developed and manufactured for you.

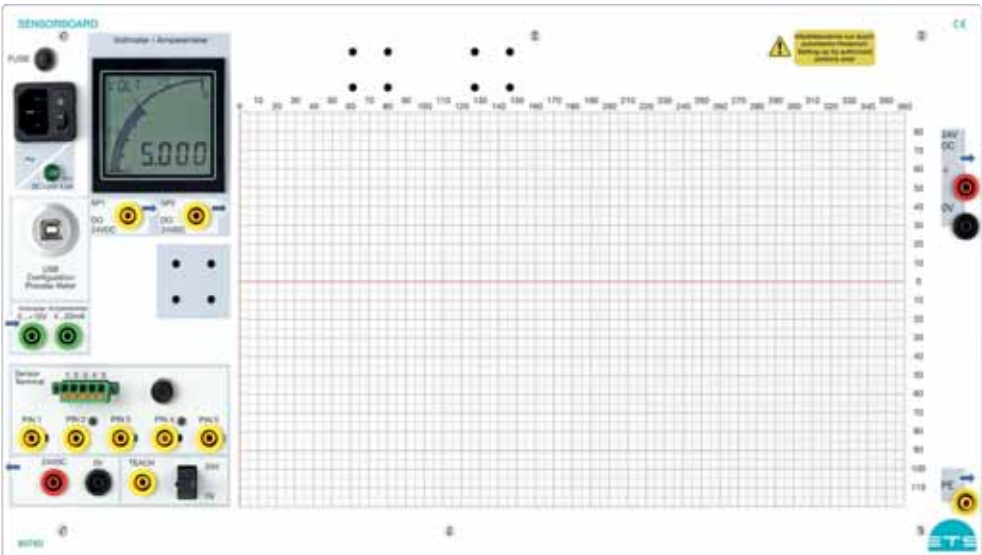
In the training centre in Kinding, the focus is on the practical application of the systems and fast learning of new technologies by the customers.

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



SENSORICS - FUNDAMENTALS

Universal Sensor Board



1

Learning objectives

- › Functionality of sensors
- › Determining sensors required for desired measurements
- › Mounting of sensors with subsequent function check
- › Designing electric and logical circuits
- › Establishing test criteria for function checks
- › Diagnosis and analysis of faults

Sensor Board

- › Experimenting Board for performing measurement tasks with various sensors, with front panel overlays for a great variety of different experiments.
- › Large working area with writable color millimeter grid for precise positioning of material samples



Voltmeter
0 V ... 10 V



Amperemeter
4 mA ... 20 mA

Meter display variable
for sensors with 0...10 V or 4...20 mA

Integrated function units

- › Power supply 24V/4.5A with fuse
- › Meter 0...10 V/4...20 mA, accuracy 0,1%, input via 4mm safety sockets; with USB port for configuration
- › Sensor terminal for connecting sensors, with 5-pin terminal block, 5-pin M12 socket, 5 safety sockets (4mm)
- › Switch for teaching the sensors, 0 V / 24 V
- › 2 signal LEDs status display of the sensors
- › 2 switching outputs (SP1/SP2) DO 24 V DC
- › 3 plug-in spaces for sensors and actuators

Design

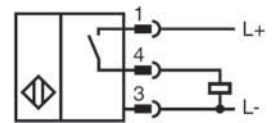
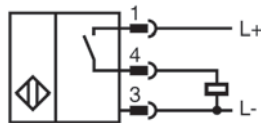
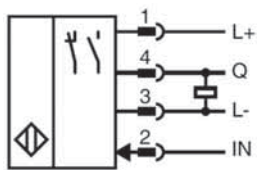
- › Board with photorealistic four-color front panel design, A4 format.
A special coating makes the panel surface scratch-proof.
- › Didactic standard labelling with operating instructions and connection possibilities facilitate commissioning by the user.
- › w x h x d: 133 x 297 x 90 mm

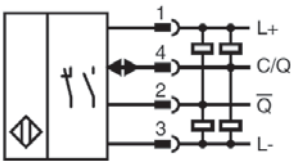
No.	Designation	Order No.
1	Sensor Board	80760



SENSORICS – BASIC

Sensor Assortment



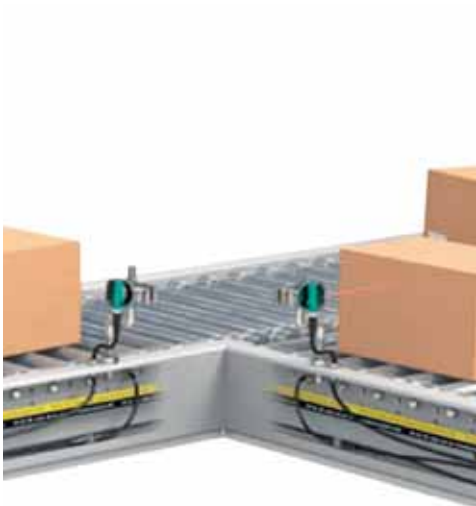


Sensor assortment – Basic
Set of sensors with digital output,
consisting of:

- › 1 optical sensor
- › 1 inductive sensor
- › 1 capacitive sensor
- › 1 retro-reflective sensor

on pluggable carriers for precise positioning and
quick building and rebuilding of measurement cir-
cuits on the Sensor Board

- › 1 reflector for retro-reflective sensor



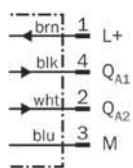
No.	Designation	Order No.
	Sensor Assortment – Basic	80762
1	1 optical sensor	
2	1 inductive sensor	
3	1 capacitive sensor	
4	1 retro-reflective sensor	
5	1 reflector for retro-reflective sensor	

SENSORICS – ADVANCED

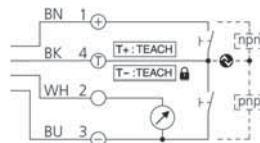
Sensor Assortment



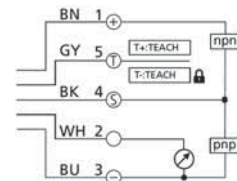
1



2



3



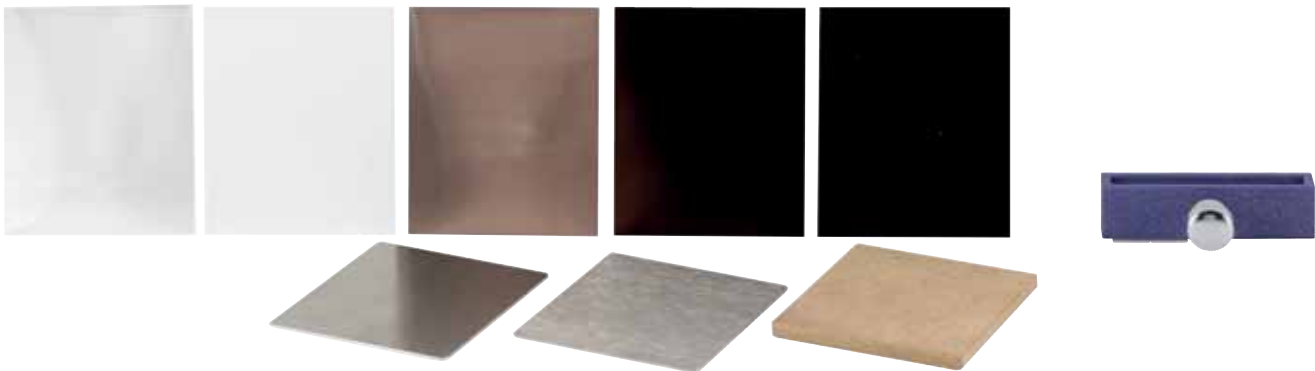
Sensor assortment – Advanced
consisting of:

- › 1 optical sensor
- › 1 inductive sensor
- › 1 ultrasonic sensor

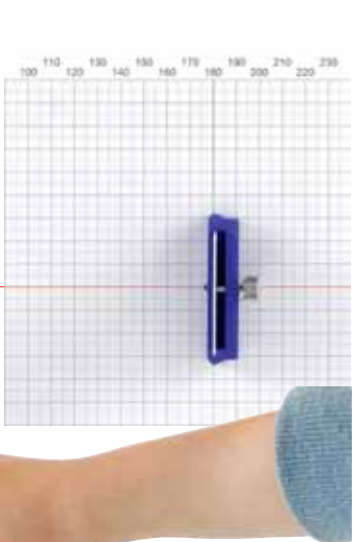
on pluggable carriers for precise positioning and quick building and rebuilding of measurement circuits on the Sensor Board



Set of Material Samples (Targets) including Holder



4



Exact positioning of the target
due to holder's position nibs

Set of material samples
of different materials:

- 3 x plastic transparent (clear; bright or dark toned)
for simulating various environmental conditions,
e.g. dirt
- 2 x plastic unicolour (white; black)
- 2 x metal (stainless steel; aluminium)
- 1 x wood

including holder with magnetic foot



The holder is equipped with a magnetic foot,
thus kept in any desired position

The position nibs of the holder ensure
exact determination of positions and distances

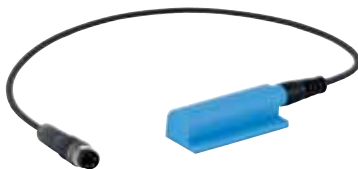
No.	Designation	Order No.
	Sensor assortment – Advanced	80763
1	1 optical sensor	
2	1 inductive sensor	
3	1 ultrasonic sensor	
4	Set of material samples with magnetic holder	80765

CYLINDRICAL SENSORS

Sensor Assortment



1



2



3



4



Use your own sensors
Connection via terminals possible



Sensor assortment Cylindrical sensors
with various connection principles

- › 1 reed contact (2-wire)
- › 1 reed contact (3-wire)
- › 1 position sensor
- › 1 pneumatic cylinder with mounting grooves, on pluggable carrier

No.	Designation	Order No.
	Sensor assortment Cylindrical sensors	80769
1	1 pneumatic cylinder with mounting grooves	
2	1 position sensor	
3	1 reed contact (2-wire)	
4	1 reed contact (3-wire)	

TEMPERATURE SENSOR

Sensor Assortment PT100



1



2



Sensor Assortment PT100
consisting of:
1 PT100 with evaluation unit 0-10 V
1 fan


on pluggable carriers for precise positioning and
quick building and rebuilding of measurement cir-
cuits on the Sensor Board



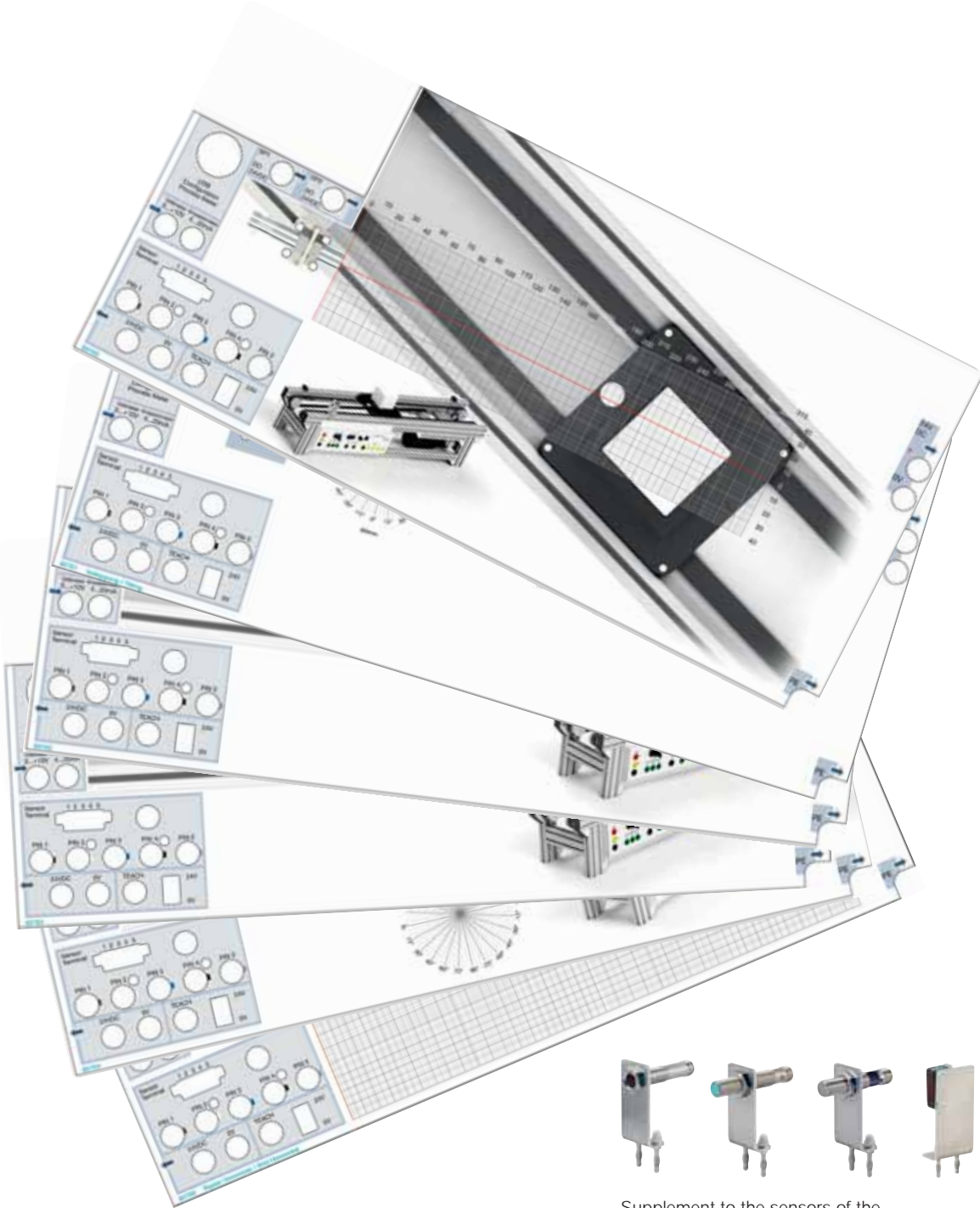
No.	Designation	Order No.
	Sensor Assortment PT100	80775
1	1 PT100 with evaluation unit 0-10 V	
2	1 fan	

SENSOR ASSORTMENT – BASIC

Set of Front Panel Overlays – Basic



The digital learning assistant for sensoric applications



1



Supplement to the sensors of the
Sensor assortment – Basic

2

No.	Designation	Order No.
1	Applications set Sensorics – Basic, 6 pcs.	80766
2	Sensor assortment – Basic	80762

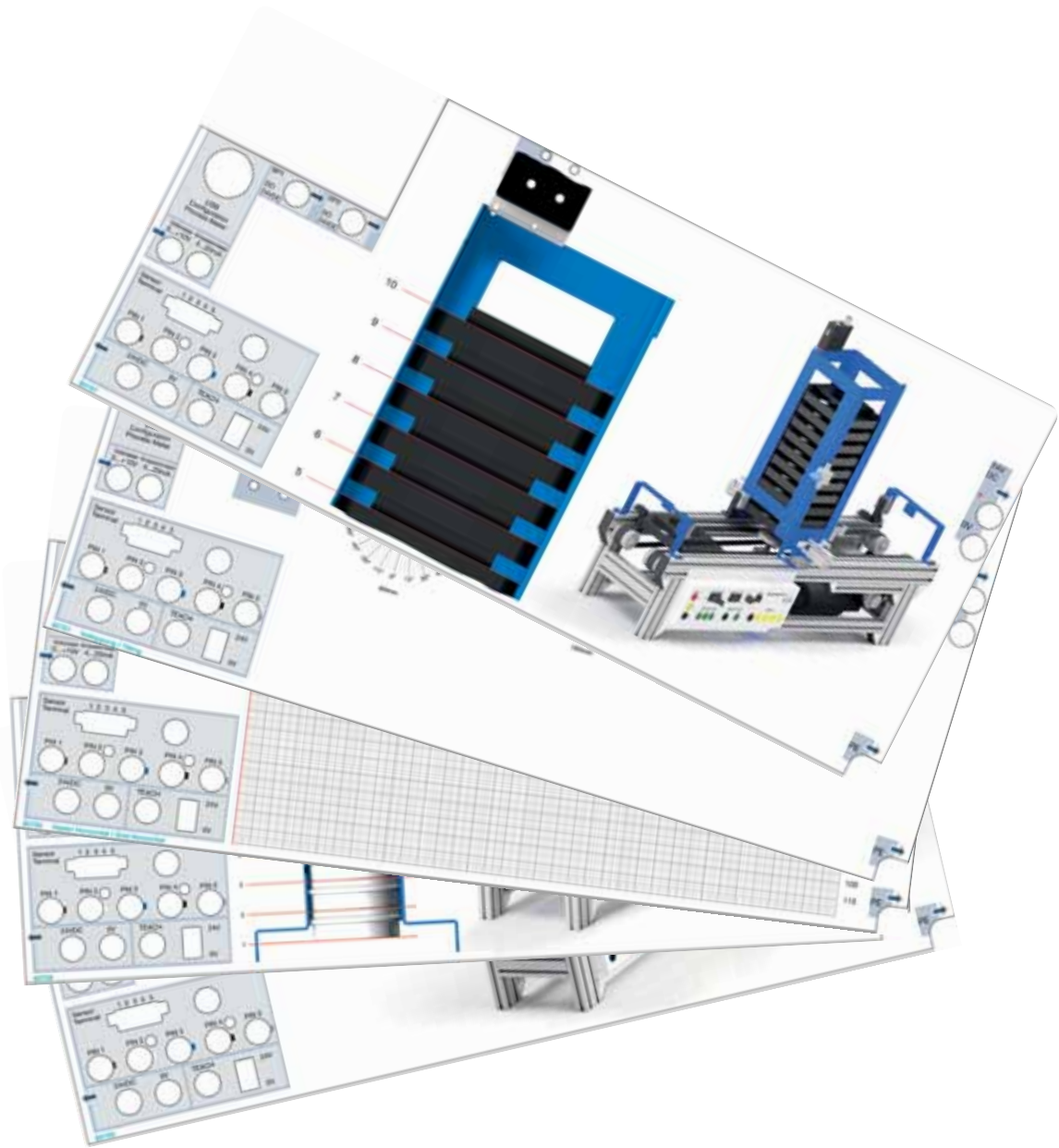


SENSOR ASSORTMENT – ADVANCED

Set of Front Panel Overlays – Advanced



The digital
learning assistant
for sensoric applications



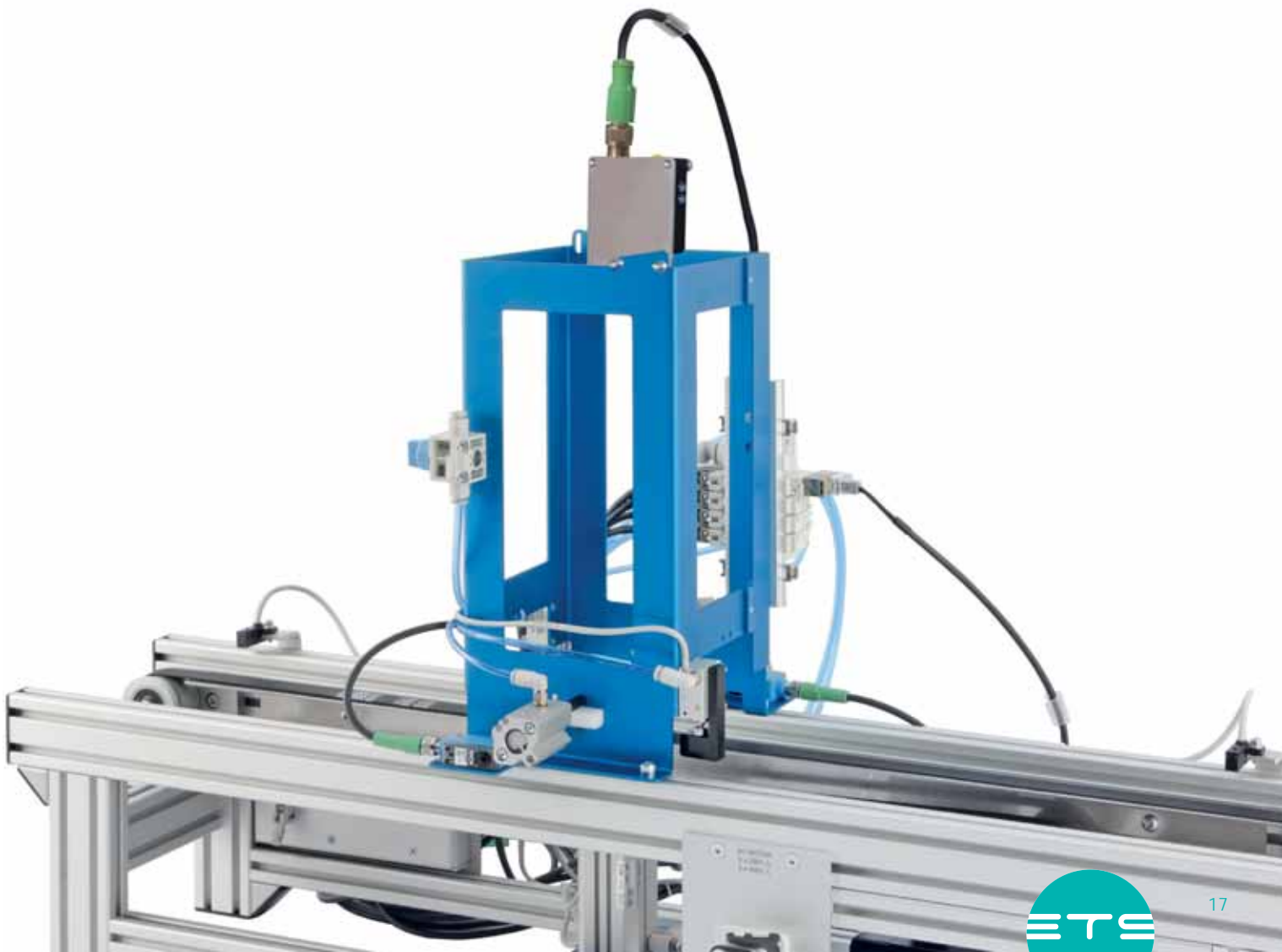
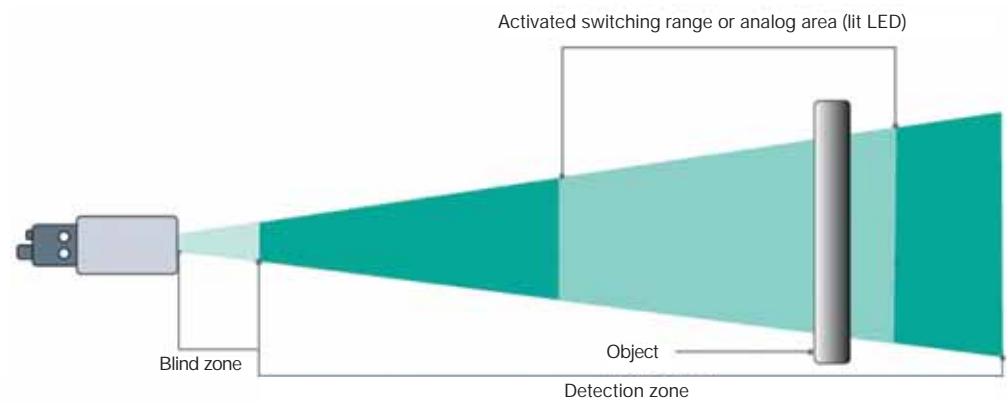
3



Supplement to the sensors of the
Sensor assortment – Advanced

4

No.	Designation	Order No.
3	Applications set Sensorics – Advanced, 5 pcs.	80777
4	Sensor assortment – Advanced	80763



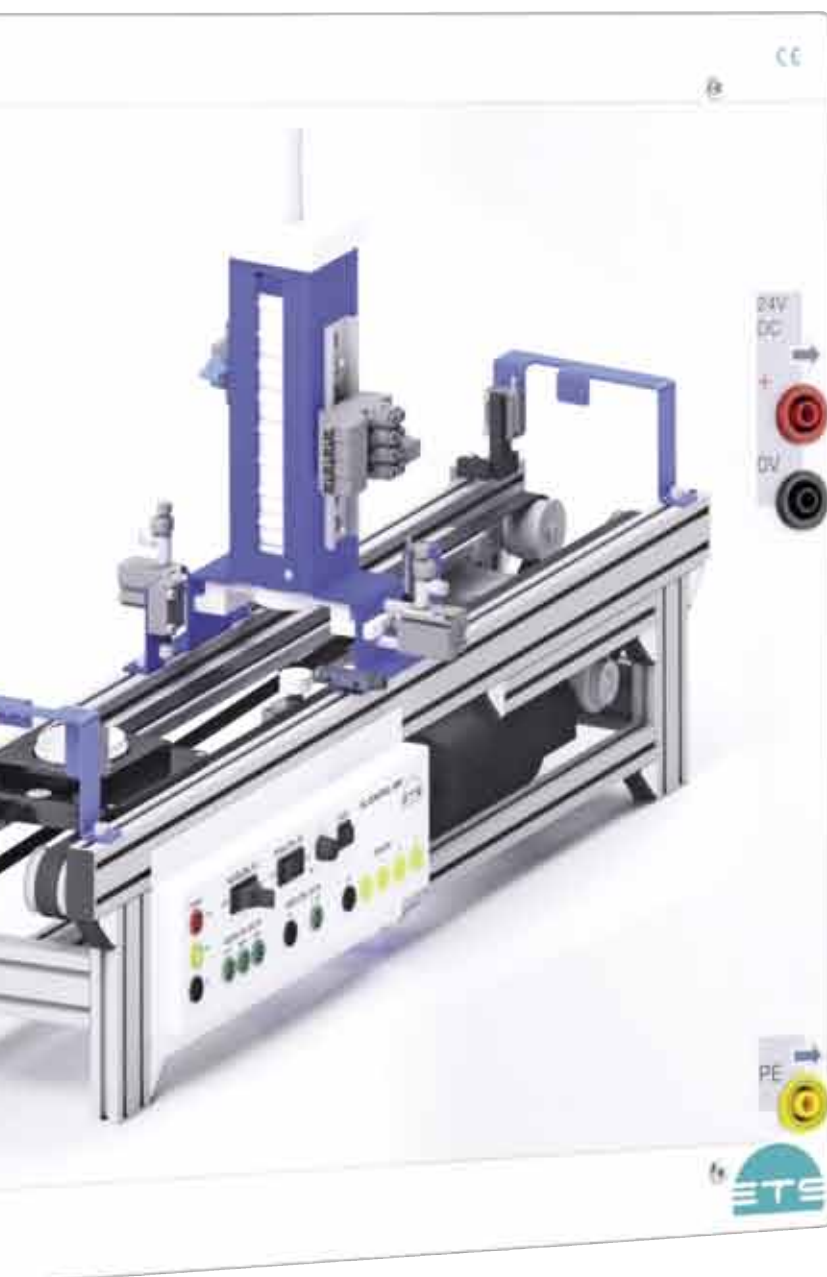
FILL LEVEL CONTROL

with Various Sensors



Applications

- › Analog
- › Digital
- › IO-Link



Test setup with analog sensor

80760 Sensor Board

with front panel overlay "Simulation of the mechatronic system's box base store" from

80777 Applications set – Advanced

and ultrasonic sensor with analog output from

80763 Sensor Assortment – Advanced



The digital
learning assistant
for sensoric applications

Based on augmented reality, tec2SKILL® offers the students the possibility to work out helpful information.

Functionality in accordance with real industrial applications, data sheets and start-up instructions make the learning situation perfect.

Designation	Order No.
Sensor Board	80760
Applications set – Advanced, 5 pcs.	80777
Sensor assortment – Advanced	80763

THE FUTURE IS GEARED TOWARD IO-LINK

Factory Automation with IO-LINK



IO-Link

Standard

IO-Link is standardized in the international, vendor-independent standard IEC61131-9. Many well-known manufacturers adhere to the standardized communication interface and support IO-Link in the market.



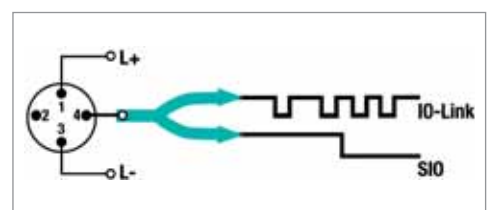
Communication

IO Link supports seamless communication down to the sensor level. Thus, the sensor intelligence can be exploited to the full opening new ways in automation technique.



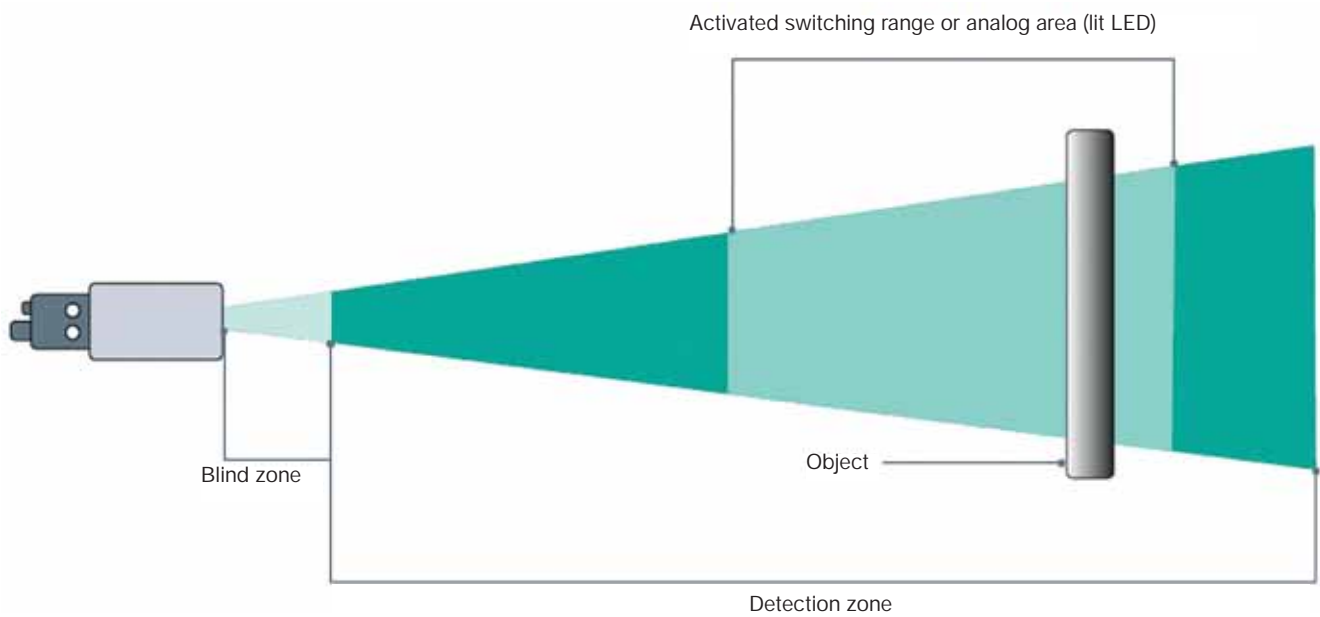
Diagnosis

Comfortable, consistent device diagnosis right down to the field level. Intelligent parameter management.



DETECTION ZONE

Switching Range / Analog Output



Object distances are shown as analog value (4...20 mA, 0...10 V)
or directly submitted to a control system (PLC) as digital value, e.g. via IO-Link.

SMART SENSORICS WITH IO-LINK

IO-Link Board



1

- IO-Link Board
for supplement and functional enhancement of the Sensor Board
- › Experimenting Board for additional measurement experiments with various IO-Link capable sensors
 - › Integrated data logger functionality

- Function units
- › 1 5-pin M12 connector for sensors (output)
 - › 1 5-pin M12 connector for sensors (input)
 - › 3 signal LEDs for indicating operating mode
 - › USB port for reading saved data

- Design
- › Experimenting Board in A4 format with fotorealistic, four-colour front panel design.
A special coating makes the panel surface scratch-proof.
 - › Didactic standard labelling with operating instructions and connection possibilities facilitate commissioning by the user.
 - › L x B x H: 133 x 297 x 90 mm

No.	Designation	Order No.
1	IO-Link Board	80761



Parameterize, configure and monitor connected sensors on the basis of smart terminal equipment.

You will also get the product data of the sensors and further useful information regarding maintenance and service operations.

SMART SENSORICS – PROFESSIONAL

Sensor Assortment IO-LINK / CPS-i40®



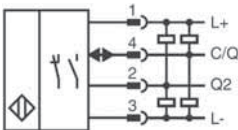
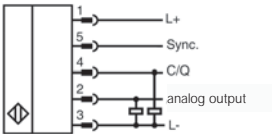
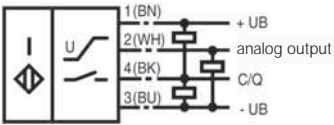
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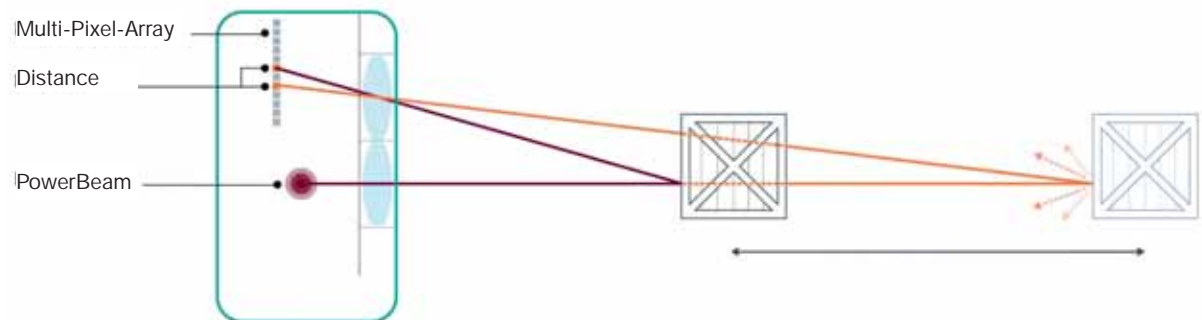
Sensor assortment
IO-LINK Professional CPS-i40®

- › 1 inductive sensor
- › 1 ultrasonic sensor
- › 1 optical sensor

on pluggable carriers for precise positioning and quick building and rebuilding of measurement circuits on the Sensor Board

- › 1 Reference sample for inductive sensor

No.	Designation	Order No.
	Sensor assortment Sensorics IO-LINK Professional CPS-i40®	80764
1	1 inductive sensor	
2	1 ultrasonic sensor	
3	1 optical sensor	
4	1 Reference sample	



COURSEWARE

Manuals and TECHNOCards®

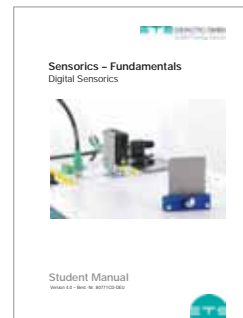


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Printed and digital



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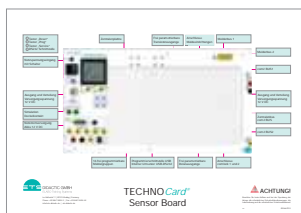


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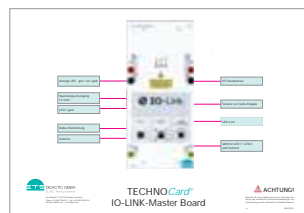
Contents

- › Introduction
- › Planning and implementing a sensor arrangement for passing metals
- › Planning and implementing a sensor arrangement for passing plastics
- › Sensor assortment for distinguishing between plastic and metal parts
- › Sensor assortment for sorting metal parts according to size
- › Tools and equipment list

TECHNOCard®



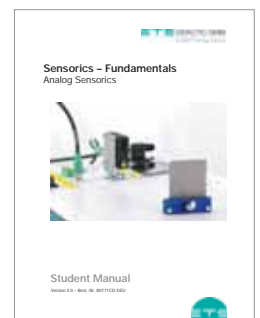
7



8



4



5



9



10

No.	Designation	Order No.
1	Set of ETS ring binders with dividers	91903-ENG
2	Digital Sensorics – Fundamentals – Instructor's Manual	80770CD-ENG
3	Digital Sensorics – Fundamentals – Student Manual	80771CD-ENG
4	Analog Sensorics – Fundamentals – Instructor's Manual	80793CD-ENG
5	Analog Sensorics – Fundamentals – Student Manual	80794CD-ENG
6	Sensorics - Fundamentals – Presentation Aids	80772CD-ENG
7	TECHNOCard® – Sensor Board	80767-ENG
8	TECHNOCard® – IO-Link Board	80768-ENG
9	IIoT – Industrial Internet of Things – Instructor's Manual	71072CD-ENG
10	IIoT – Industrial Internet of Things – Student Manual	71073CD-ENG

Asseccories / Storage



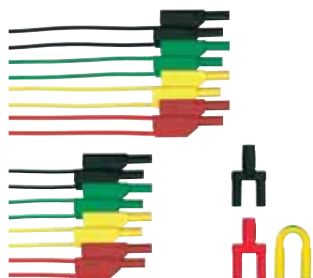
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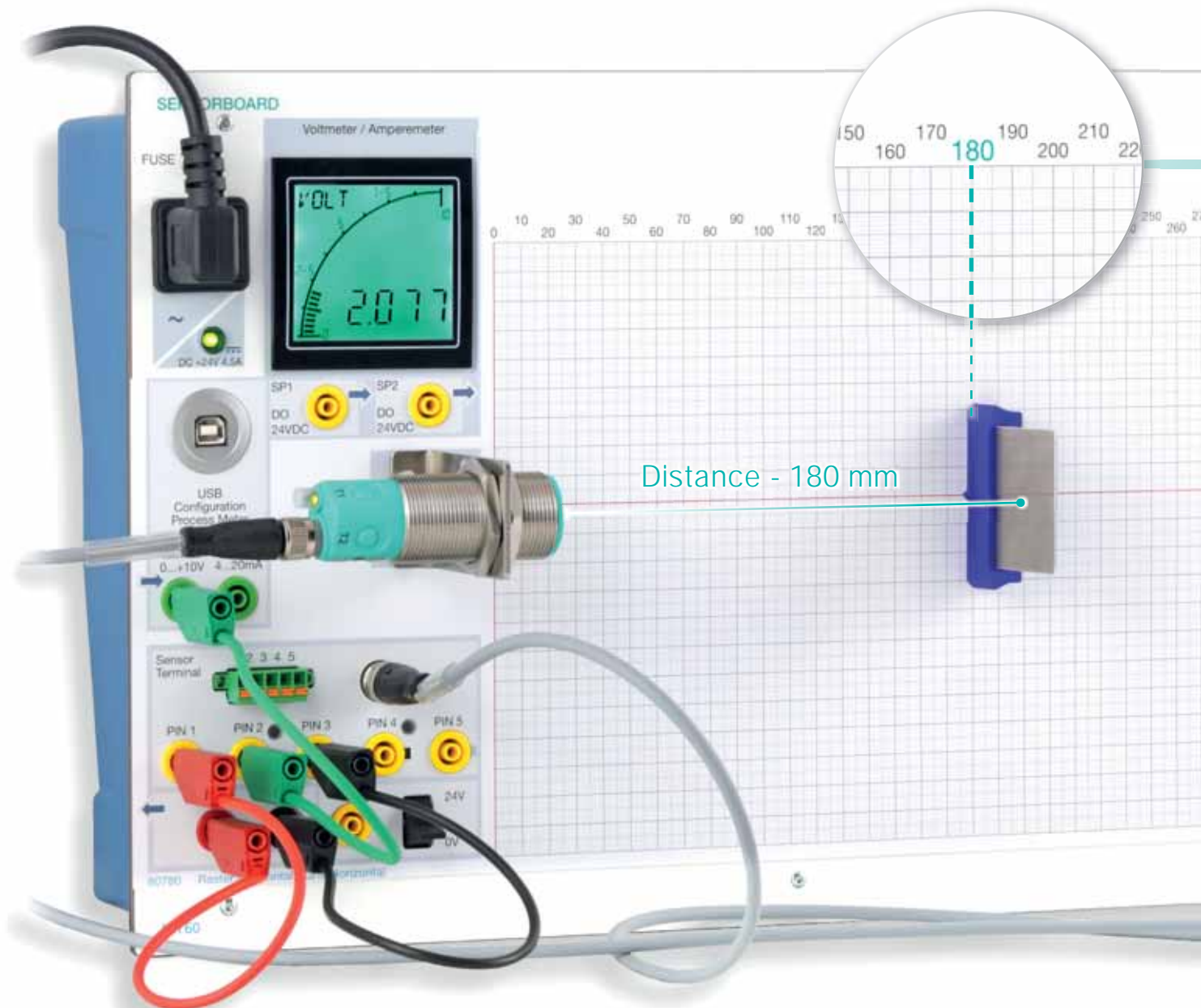


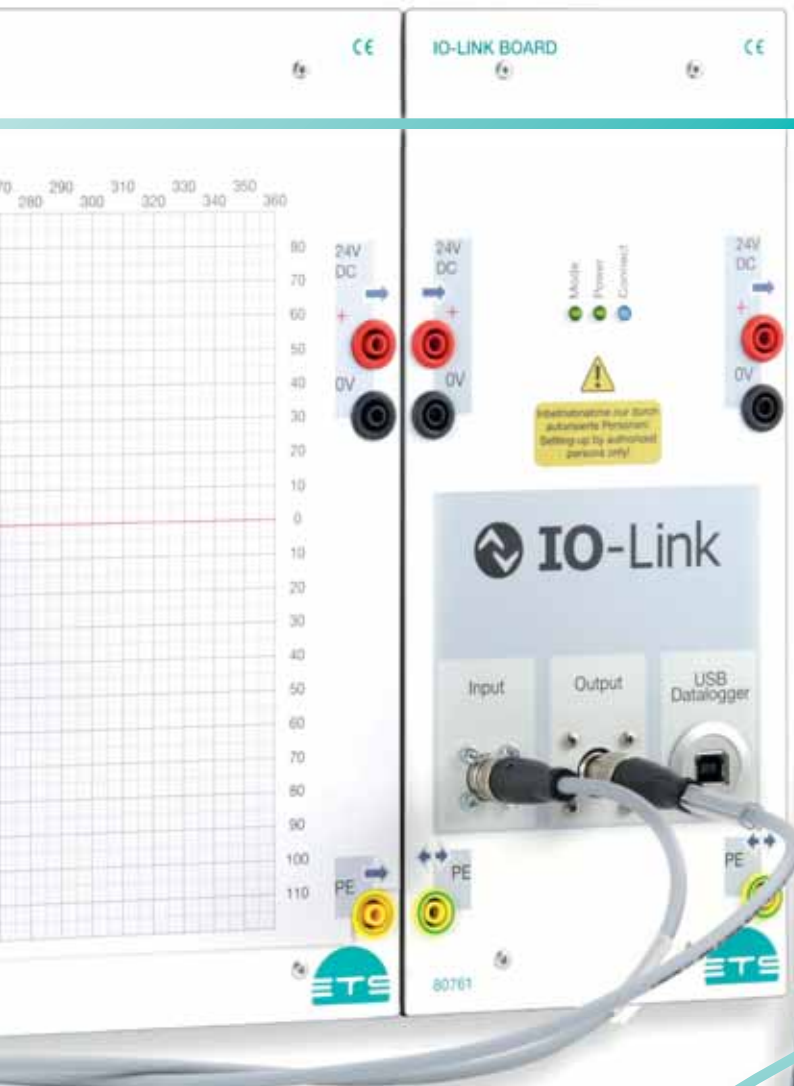
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5

No.	Designation	Order No.
1	Set of universal sensor holders for adjustment exercises	80776
2	Set of sensor cables	80773
3	USB programming connection line, A-B, 3 m	80544
4	Set of safety connections – 4mm, 15 parts	90035
5	Component case Sensorics, with foam inlays	80774





Exact reading
in real time on the tablet



Timeline

IO-Link

SMART SENSORICS WITH IO-LINK

IO-Link Master Board



1

IO-Link Master Board

Supplement and functional enhancement to Sensor Board

- › Experimenting board for performing additional measurement exercises with various IO-link capable sensors
- › For Windows® compatible PCs
- › Multi-vendor environment as far as IODDs are made available

Function units

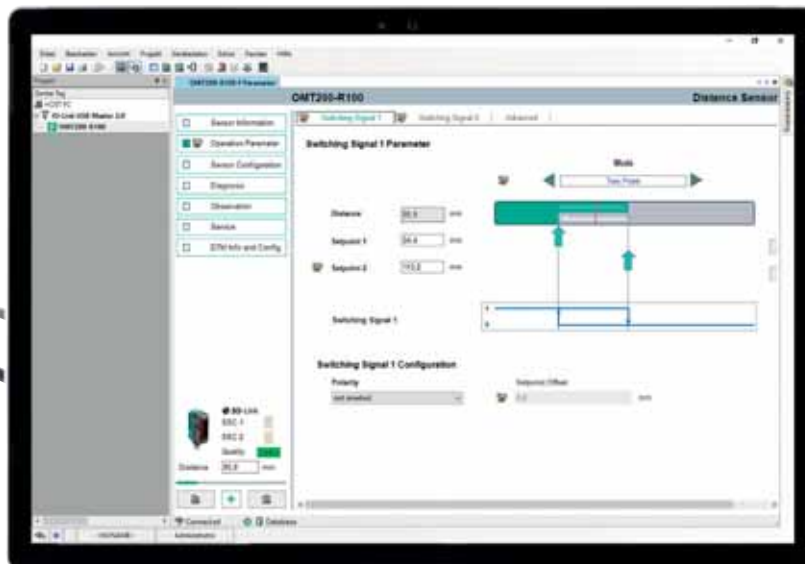
- › 1 5-pin M12 connector (input)
- › USB port for connecting Windows® compatible PCs



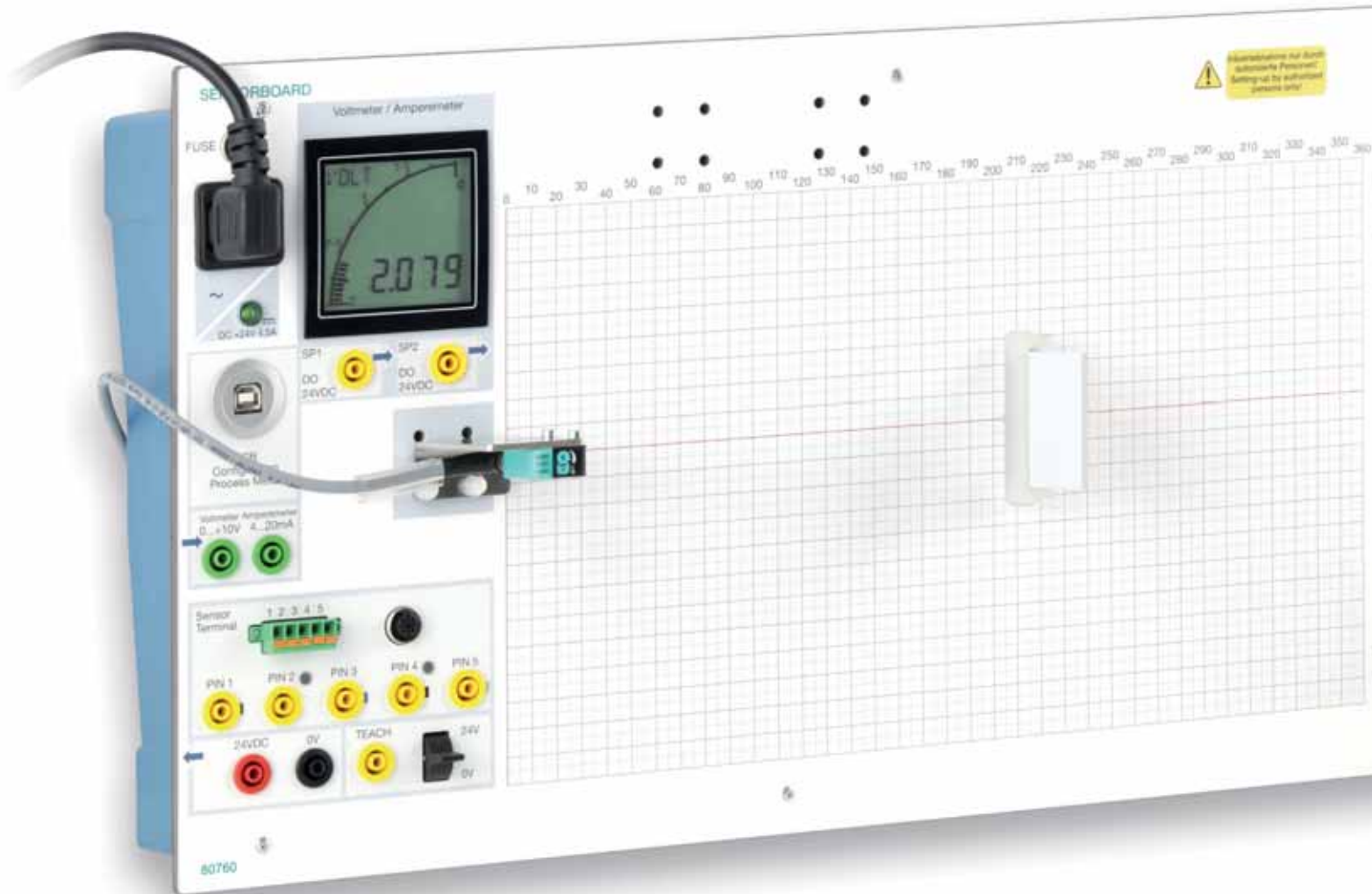
Design

- › Board with photorealistic four-color front panel design, A4 format. A special coating makes the panel surface scratch-proof.
- › Didactic standard labelling with operating instructions and connection possibilities facilitate commissioning by the user.
- › w x h x d: 133 x 297 x 90 mm

No.	Designation	Order No.
1	IO-Link Master Board	80790



- › Parameterize, configure and monitor connected sensors on the basis of smart terminal equipment.
- › You will also get the product data of the sensors and further useful information regarding maintenance and service operations.
- › Universal configuration board for sensors of manufacturers providing IODDs



Test setup with an IO-link capable light sensor

80760 Sensor Board
with light sensor included in
80764 Sensor assortment Sensorics IO-LINK Profes-
sional / CPS-i40 with 80790 IO-Link Master Board



+ Object distances are shown as analog value (4...20 mA, 0...10 V) or directly submitted to a control system (PLC) as digital value, e.g. via IO-Link.

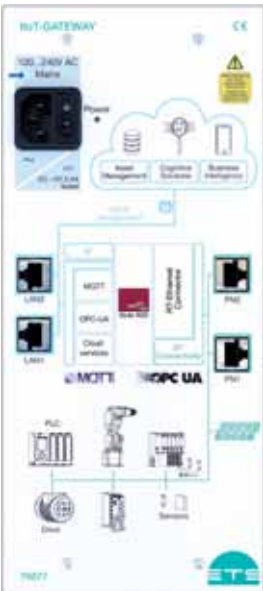
+ Multi-vendor environment as far as IODDs are made available.

+ Short set-up times, e.g. when exchanging the sensor. The configuration of the old sensor can simply be transferred to the new sensor – minimized downtimes

+ Bidirectional communication

IIOT - GATEWAY – INDUSTRIAL INTERNET OF THINGS

From Sensor into the Cloud

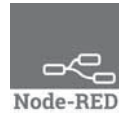


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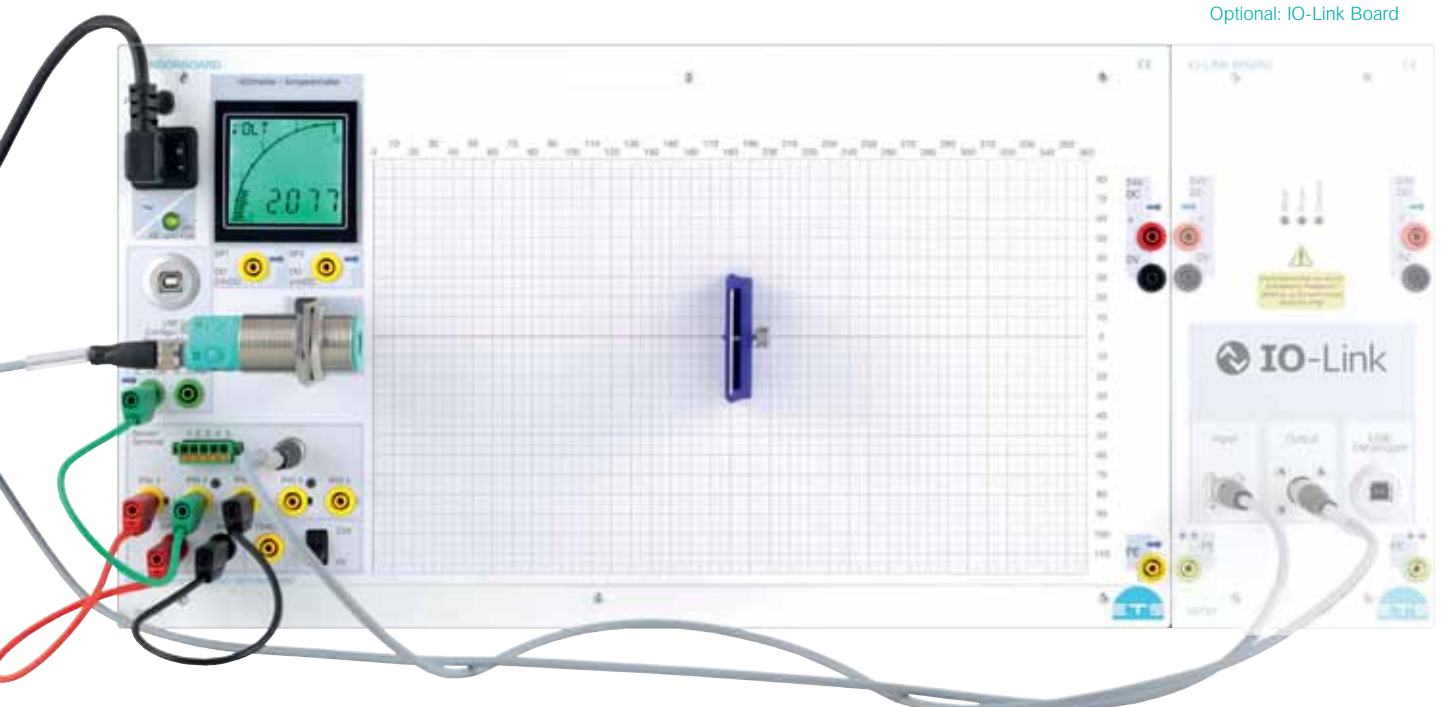
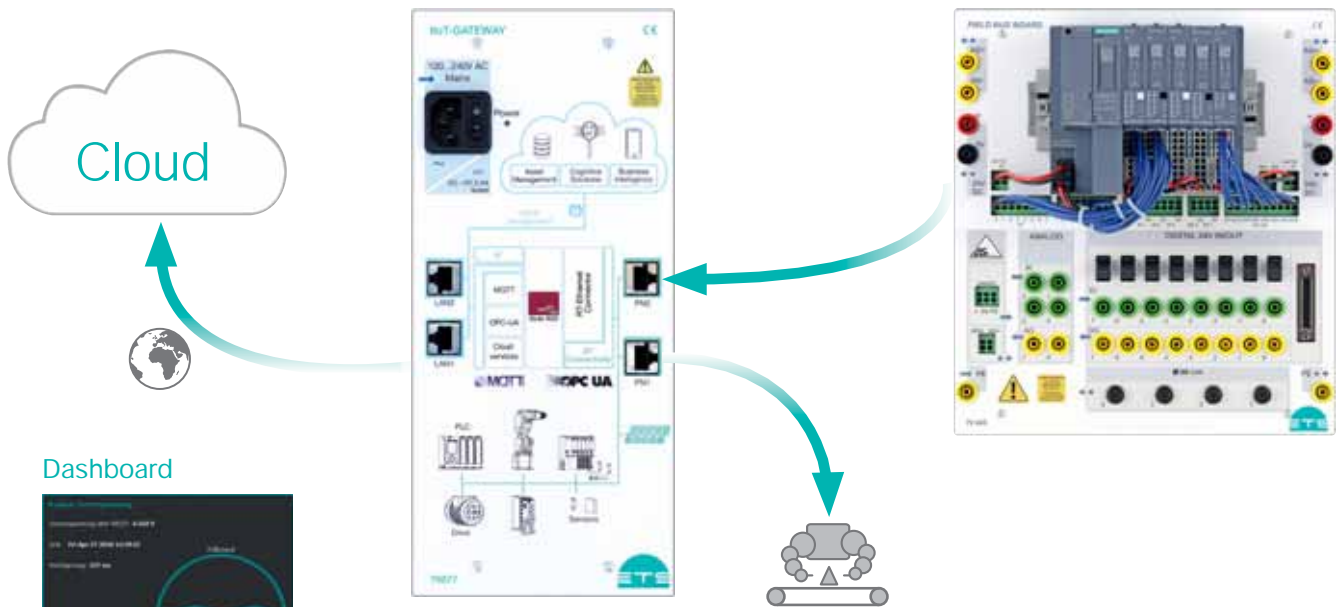


Learning objectives

- › From Operating Technology (OT) into Information Technology (IT)
- › Commissioning of a PROFINET installation with TIA-Portal
- › Commissioning of IOT
- › Integration of IOT into the process
- › Getting to know Node-RED-Editors
- › Fundamental exercises with Node-RED
- › Sending records from the control unit to a MQTT broker
- › Display machine data on the mobile phone



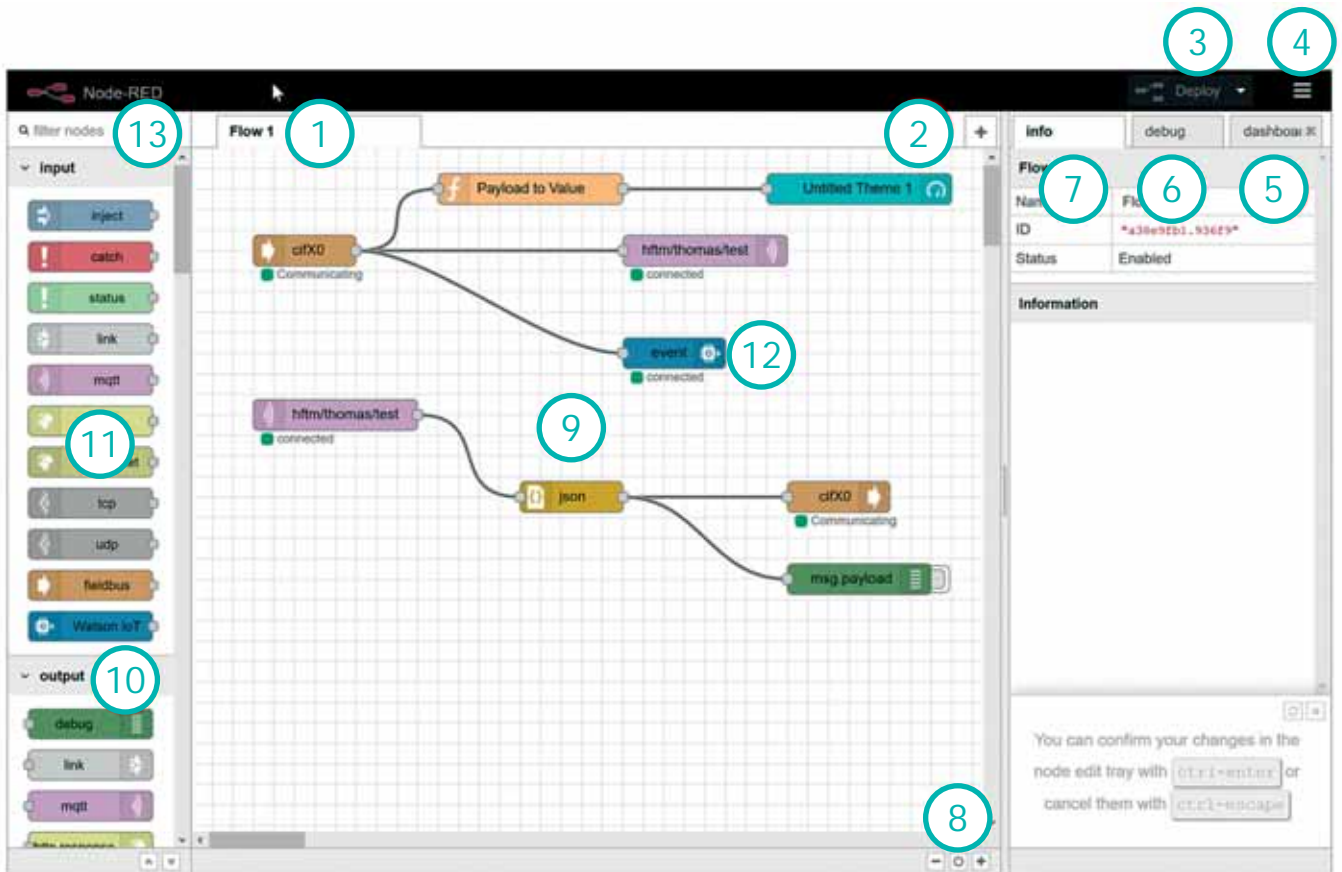
No.	Designation	Order No.
1	IIoT-Gateway Board	70077



Optional: IO-Link Board

COMMUNICATION VIA MQTT / Node-RED

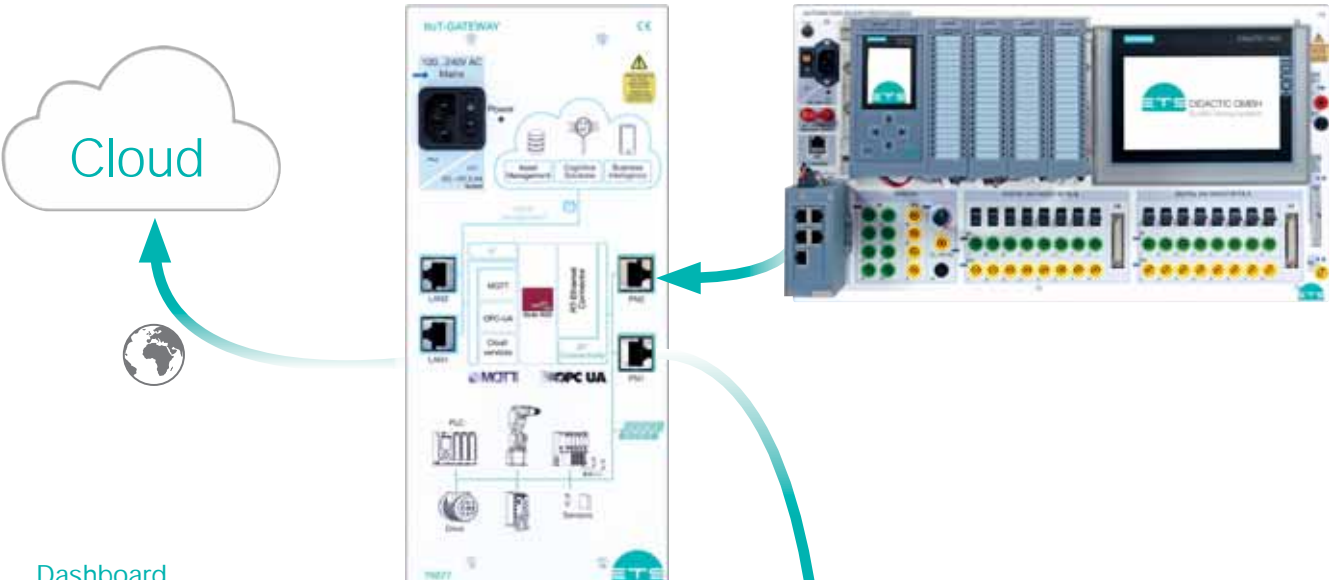
IIoT – connectedFACTORY / Node-RED EDITOR



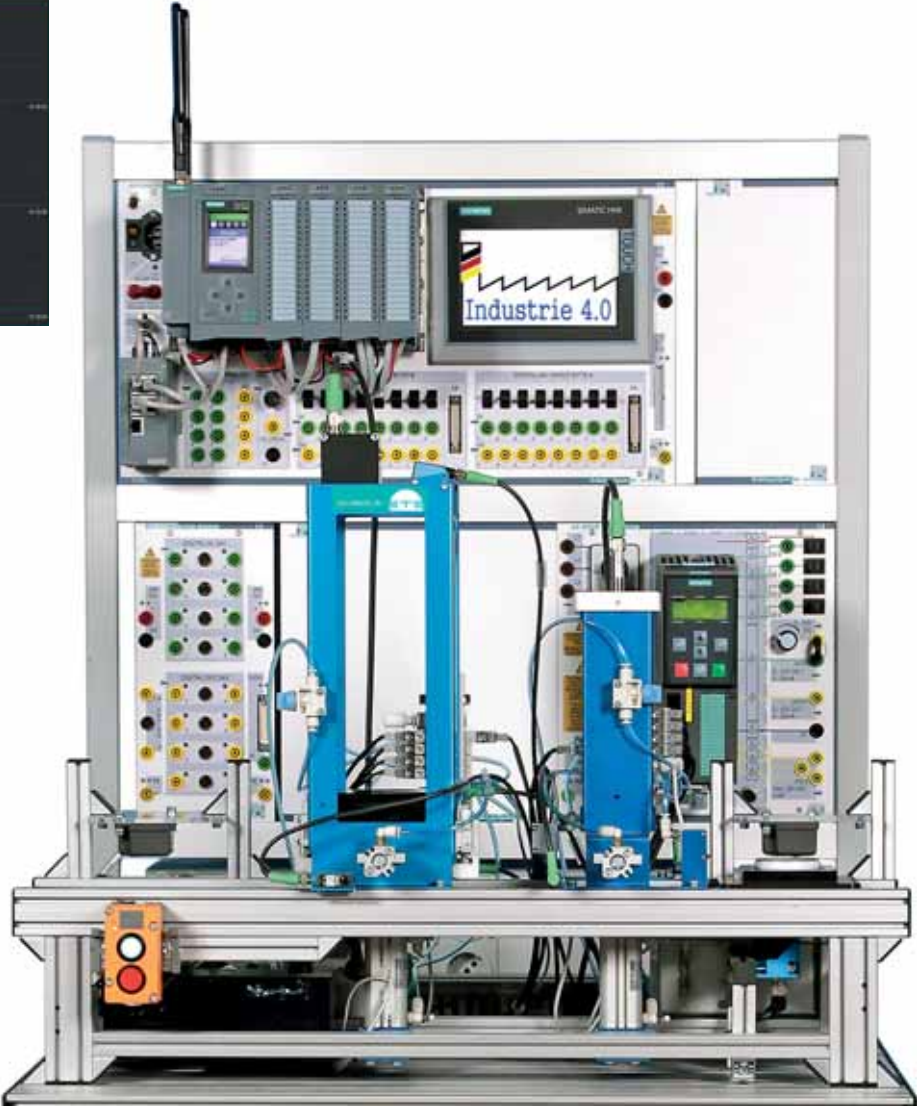
Node-Red EDITOR

- | No. | Description |
|-----|-------------------------------|
| 1 | Worksheet (flow) |
| 2 | Add flow |
| 3 | Deploy (put in flows & run) |
| 4 | Node-RED menu |
| 5 | Display of all configurations |
| 6 | Debug output (debug-nodes) |
| 7 | Information/Help |
| 8 | Zoom |
| 9 | Working area for nodes |
| 10 | Showing or hiding node list |
| 11 | Node list |
| 12 | Node |
| 13 | Node filter |



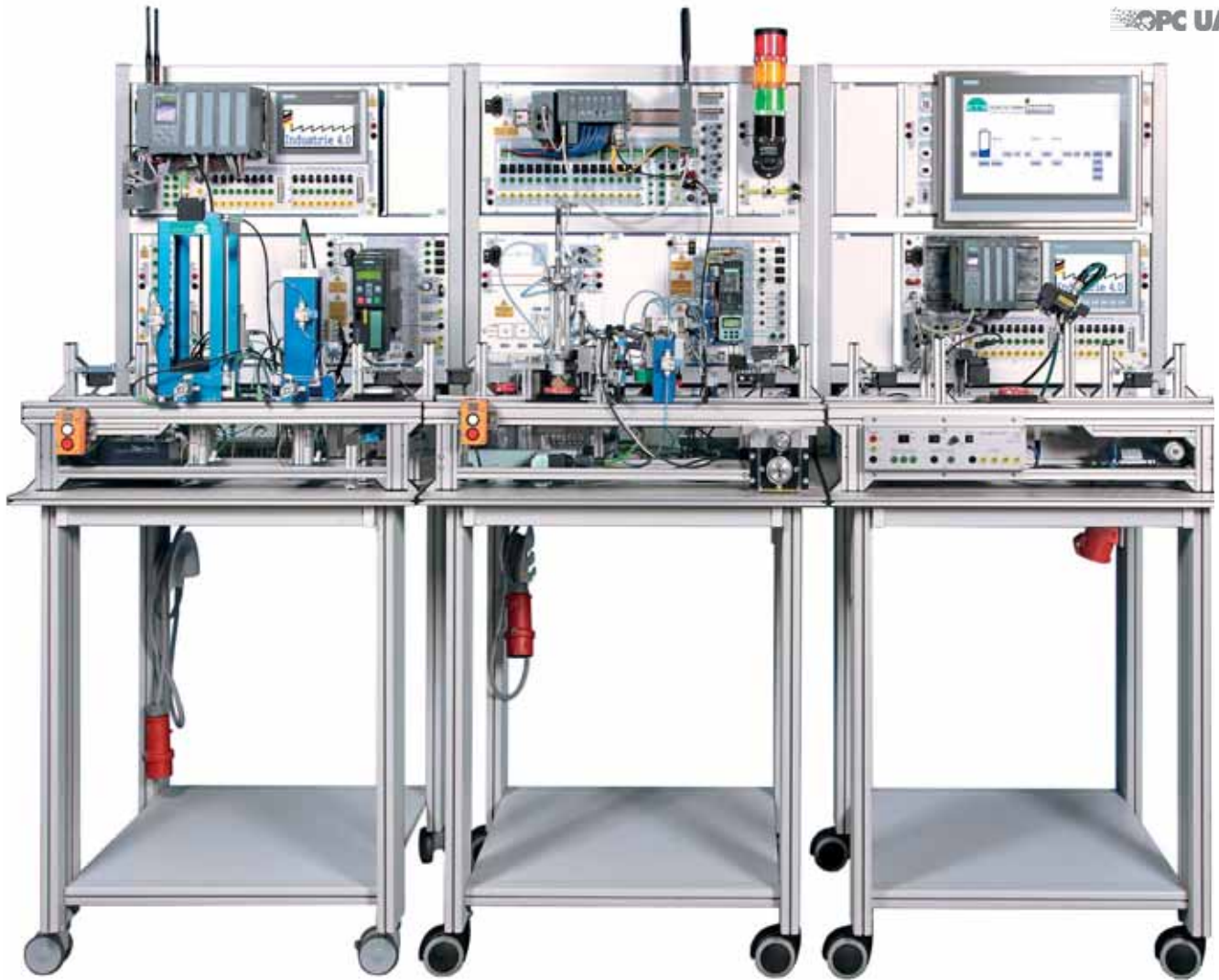


Dashboard



LEARNING FACTORY 4.0 CPS-i40® – connectedFACTORY

Qualify for the Future – already Today



Industry 4.0 Compact System – Modular, Digital Learning Factory 4.0
The digital learning factory 4.0 or connectedFACTORY CPS-i40 has been developed for education and training in the field of automated and digital production.

The qualification of future specialists as well as advanced training of experienced personnel for tomorrow's job market requirements have been and will be a focal point.

The training concept connectedFACTORY CPS-i40 is modular and consists of individual stations, i.e. CyberPhysicalSystems, which are ready for interconnecting, interlinking and extension by production segments for building up plants. The learning situations are freely scalable. Each individual station is independent and intelligent.

„Connectivity“ – i.e. integrability or communication with other systems and production facilities – is at the focus of attention.

All the production steps are recorded and logged. The collected data are ready for evaluation, processing and production optimization, as well as for subordinate software systems like MES or ERP.

Education and training can be targeted at the actual learning contents covering basic technical principles, e.g. PLC programming, sensor and drive technologies, as well as communication technologies via Profinet, OPC UA, MQTT or docker. Tailored to the target group and the teaching topics, the learning situation is adapted and prepared in coordination with the respective curricula.



From Big-Data to SMART-Data



WE ARE HAPPY TO HELP

Information and Consulting



We accompany you and are at your side with active advice.

Whether you need information, or some advice in advance of making an investment, or have questions regarding the daily use of the products:

Contact us – we would be happy to help:

ETS DIDACTIC GMBH
Service-Center
Im Hüttental 11
85125 Kinding | Germany

Phone +49 8467 8404-0
Fax +49 8467 8404-44

sales@ets-didactic.de
ets-didactic.de



Customer-oriented solutions

- › Presentation, product demonstrations and on-site consultancy
- › Support in the selection of educational systems according to the syllabus requirements
- › Matching of the training systems to customer requirements
- › Working out room concepts
- › Designing ergonomic workstations

Experience

- › Comprehensive range of innovative products
- › Systems and solutions from our own (in-house) production
- › Development and design, technical training systems
- › Quality right from the consultancy up to delivery and onward
- › Trainer seminars / In-house training
- › References world-wide
- › Industrial educational institutions
- › Vocational schools / Technical schools
- › Chambers of crafts
- › Technical colleges / Universities

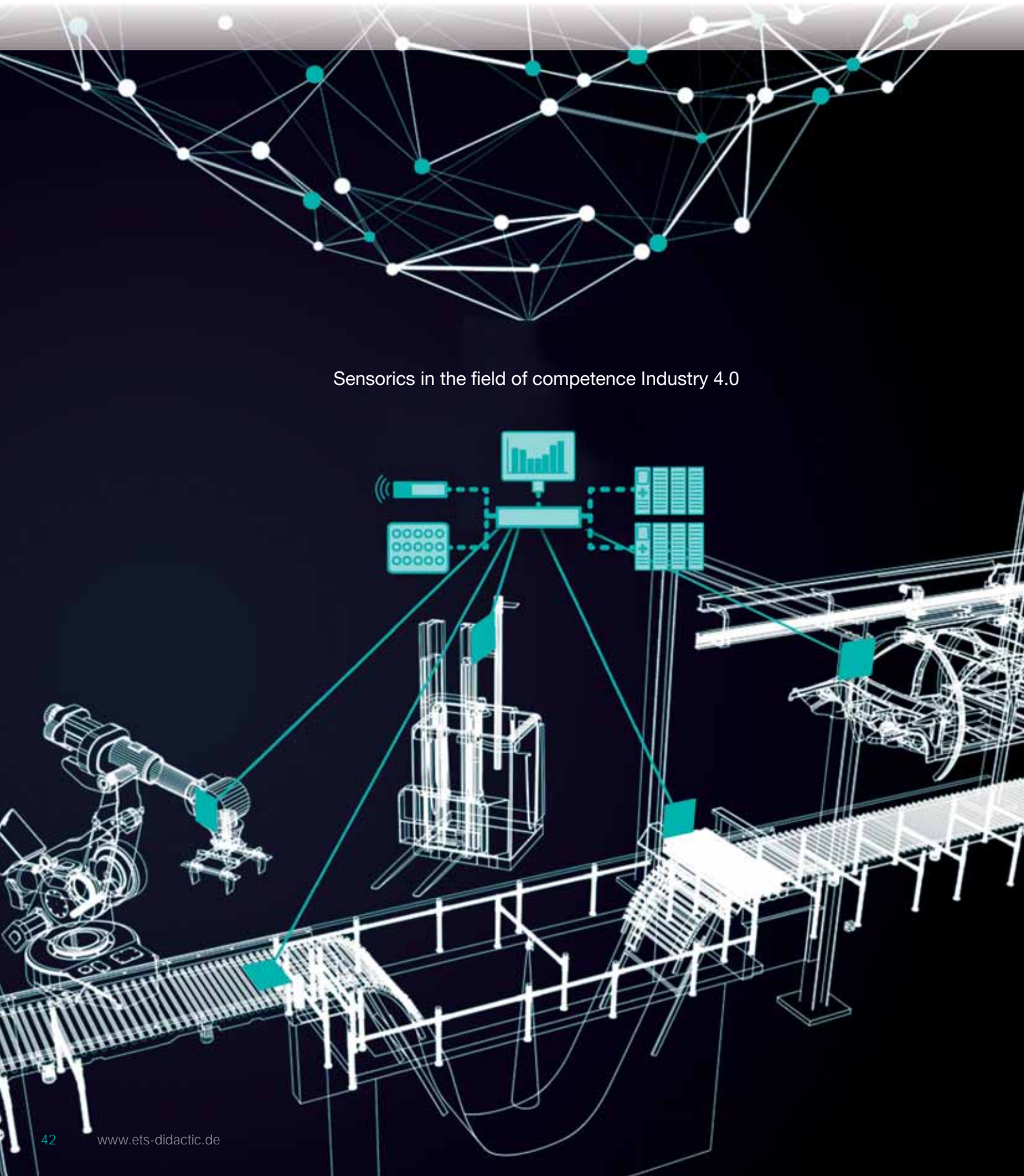
We support you

- › Installation and commissioning of the systems on-site
- › Technical support
- › Warranty and repairs
- › Instruction and training
- › Further education, training, seminars
- › Comprehensive product documentation
- › Courseware for instructors and trainees

INDUSTRY 4.0

Opening New Ways and Possibilities

Sensorics in the field of competence Industry 4.0



YOUR INQUIRY

ETS DIDACTIC GMBH

Im Hüttental 11
85125 Kinding / Germany
Tel.: +49 8467 8404-0
Fax: +49 8467 8404-44

Name, Function

Company / Institution / Government agency

Street, post box

Post code, place

Telephone

Telefax

E-Mail

We would like:

- ☐ to be contacted by telephone
- ☐ information on seminars
- ☐ on-site consultation
- ☐ quotation for ...

Number	Designation	Order No.
	Sensor Board	80760
	Sensor assortment – Basic	80762
	Sensor assortment – Advanced	80763
	Set of material samples with magnetic holder	80765
	Sensor assortment Cylindrical sensors	80769
	Sensor assortment PT100	80775
	Applications set Sensorics – Basic, 6 pcs.	80766
	Applications set Sensorics – Advanced, 5 pcs.	80777
	Augmented documentation Sensor Technology – tec2SKILL®	80760-ENG
	IO-Link Board	80761
	IO-Link Master Board	80790
	Sensor assortment – Sensorics IO-Link Professional CPS-i40®	80764
	Set of ETS ring binders with dividers	91903-ENG
	Sensorics - Fundamentals - Digital Sensorics – Instructor's Manual	80770CD-ENG
	Sensorics - Fundamentals - Digital Sensorics – Student Manual	80771CD-ENG
	Sensorics - Fundamentals – Presentation Aids	80772CD-ENG
	Sensorics - Fundamentals - Analog Sensorics – Instructor's Manual	80793CD-ENG
	Sensorics - Fundamentals - Analog Sensorics – Student Manual	80794CD-ENG
	TECHNOCard® – Sensor Board	80767-ENG
	TECHNOCard® – IO-Link Board	80768-ENG
	Set of sensor cables	80773
	Set of universal sensor holders for adjustment exercises	80776
	USB programming connection line, A-B, 3 m	80544
	Set of safety connections – 4mm, 15 parts	90035
	Component case Sensorics, with foam inlays	80774
	IIoT-Gateway Board	70077
	Set of ETS ring binders with dividers	91903-ENG
	IIoT – Industrial Internet of Things – Instructor's Manual	71072CD-ENG
	IIoT – Industrial Internet of Things – Student Manual	71073CD-ENG
	TECHNOCard® – Industrial IIoT-Gateway	71071-ENG

EXCELLENCE IN TRAINING

Subject to technical modifications and further developments June 2018



DIDACTIC GMBH
ELABO Training Systems

Im Hüttental 11 | 85125 Kinding | Germany
Phone +49 8467 8404-0 | Fax +49 8467 8404-44
sales@ets-didactic.de | ets-didactic.de

 Made
in
Germany

