SENSORICS - FUNDAMENTALS

Sensorics in CPS-i40® Applications

INDUSTRY 4.0

Qualify for the Future with CPS-i40®
connectedFACTORY

CONTENTS

Sensorics - Fundamentals – connectedFACTORY

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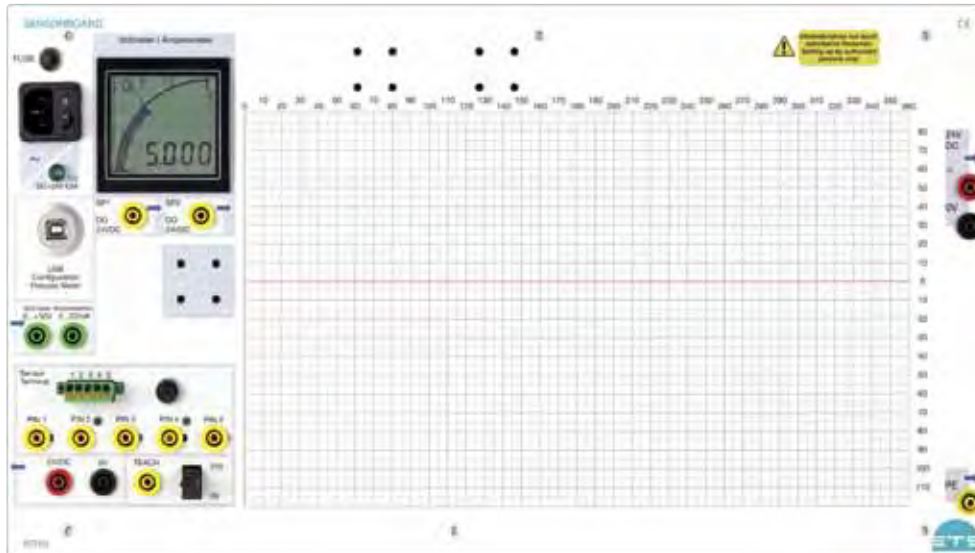
In the training centre in Kinding, the focus is on the practical application of the systems and fast learning of new technologies by the customers.

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 anlysis of faults

Sensor Board
〉 Experimimenting Board for performing measurement tasks with vari-
  ous sensors, with front panel overlays for a great variety of different
  experiments.
〉 Large working area with wiritable color milimeter grid for precise po-
  sitioning 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
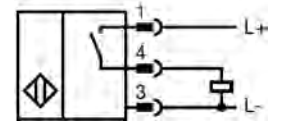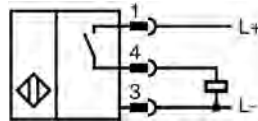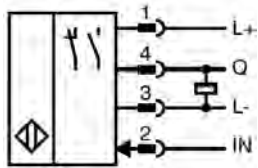〉 Board with photorealistic four-color front panel design, A4 format.
  A special coating makes the manel surface scratch-proof.
〉 Didactic standard labelling with operating instructions and
  connection possibilities facilitate commissioning by the user.
〉 w x h x d: 133 x 297 x 90 mm

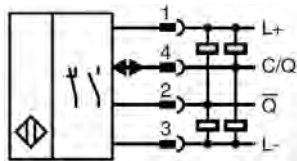| No.	Designation	Order No.
1	Sensor Board	80760

SENSORBOARD

USB
Configuration
Process Meter

Voltmeter / Amperemeter

5.0

PIN 4

PIN 5

SP2

FUSE

SENSORICS – BASIC

Sensor Assortment

1

2

3

4

5

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

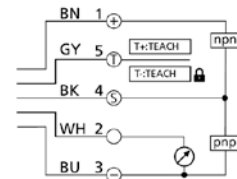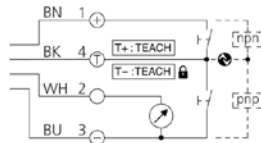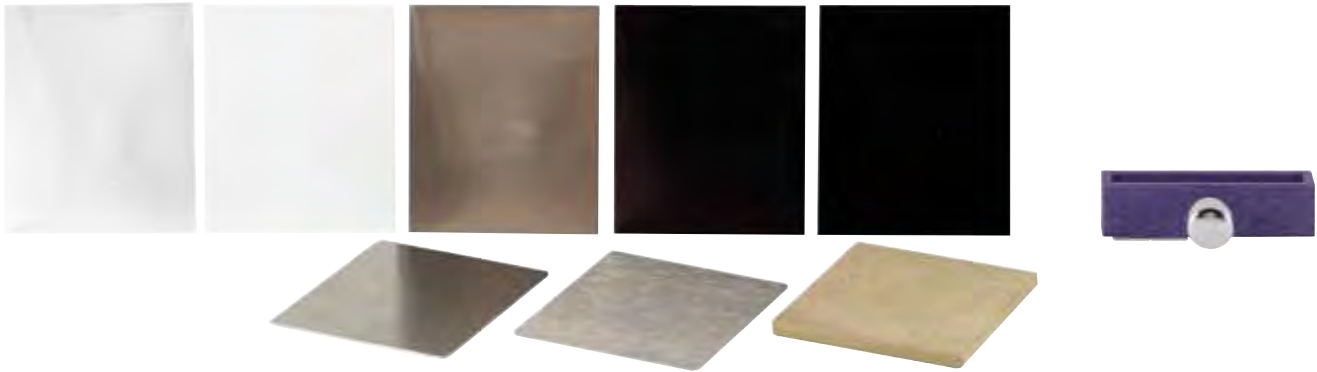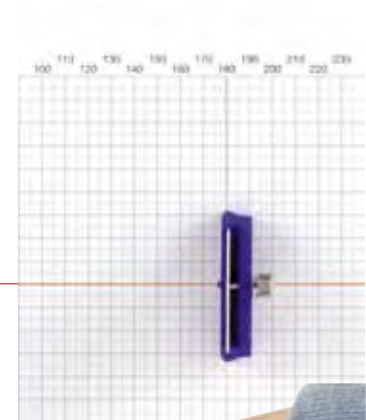# Set of Material Samples (Targets) including Holder

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
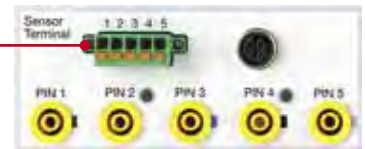
Sensor Assortment

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 circuits 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

1

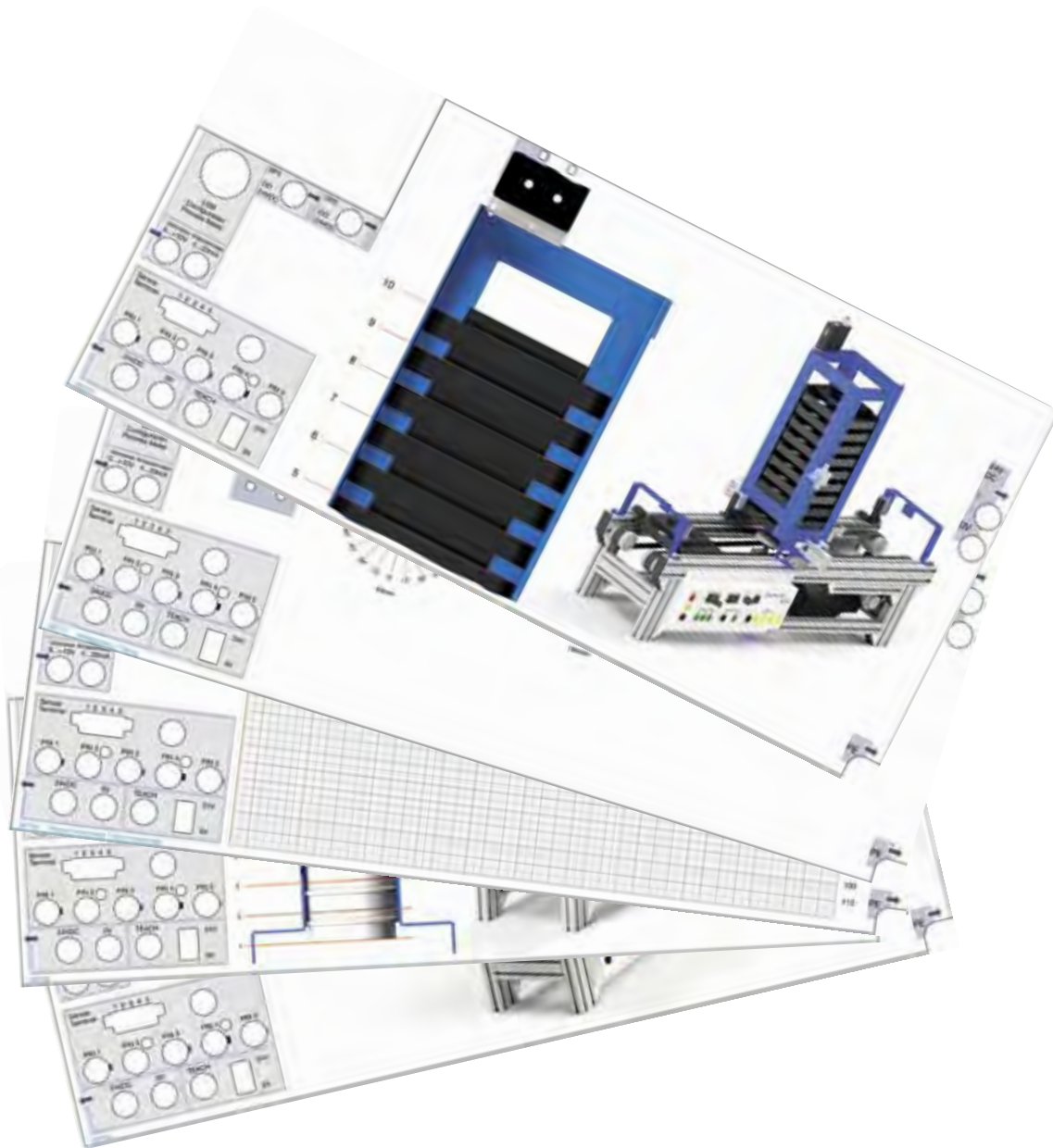Supplement to the sensors of the
Sensor assortment – **Basic**

2

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

DC CONTROL UNIT

ETS

RESET

SPEED CTRL. INT.

EXT INT

MOTOR CTRL. INT.

LEFT RIGHT

SENSORS

1 2 3 4

POWER

+24V

PE

MOTOR CTRL. EXT. IN

LEFT RIGHT MAL.

SPEED CTRL. EXT. IN

0V 0...10V

ETS

SENSOR ASSORTMENT – ADVANCED

Set of Front Panel Overlays – Advanced

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

Activated switching range or analog area (lit LED)

Blind zone

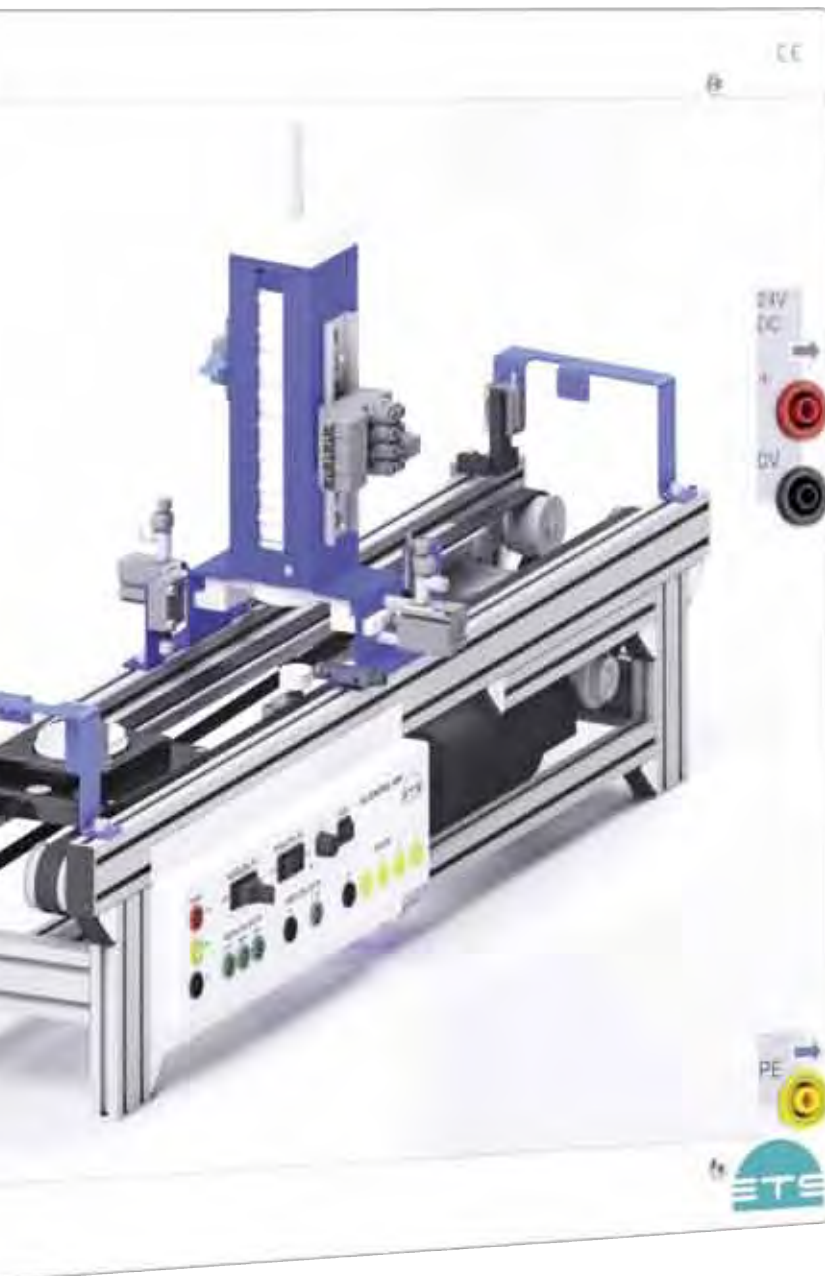Object

Detection zone
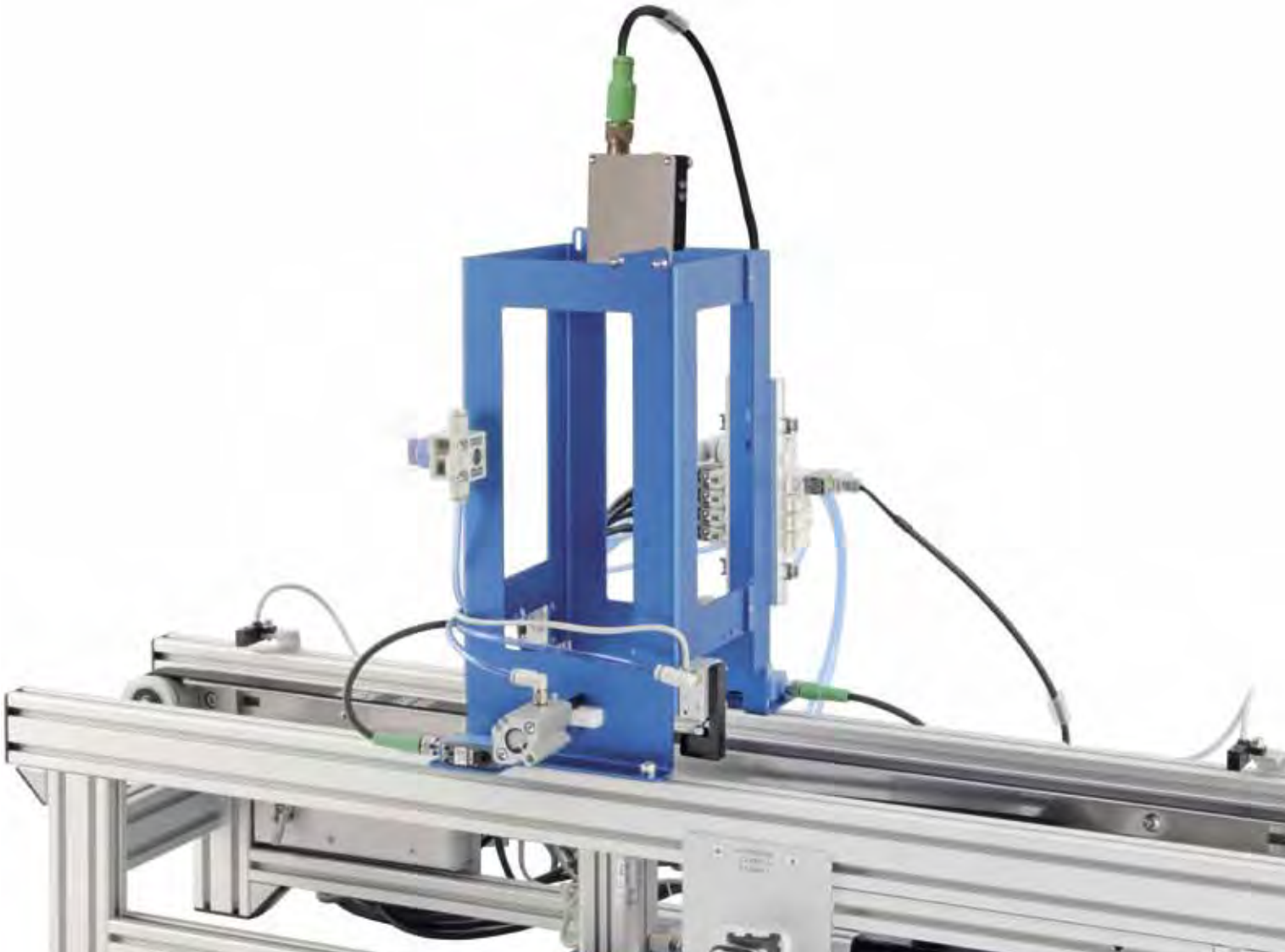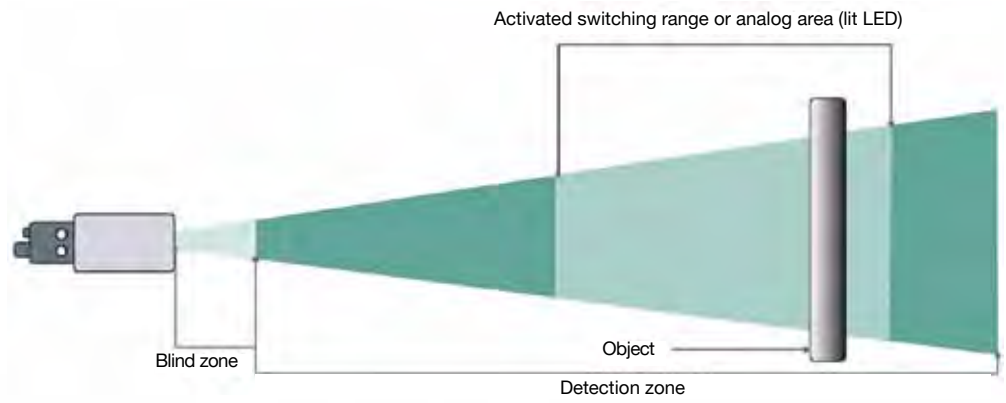
FILL LEVEL CONTROL

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

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 manufaturers 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.
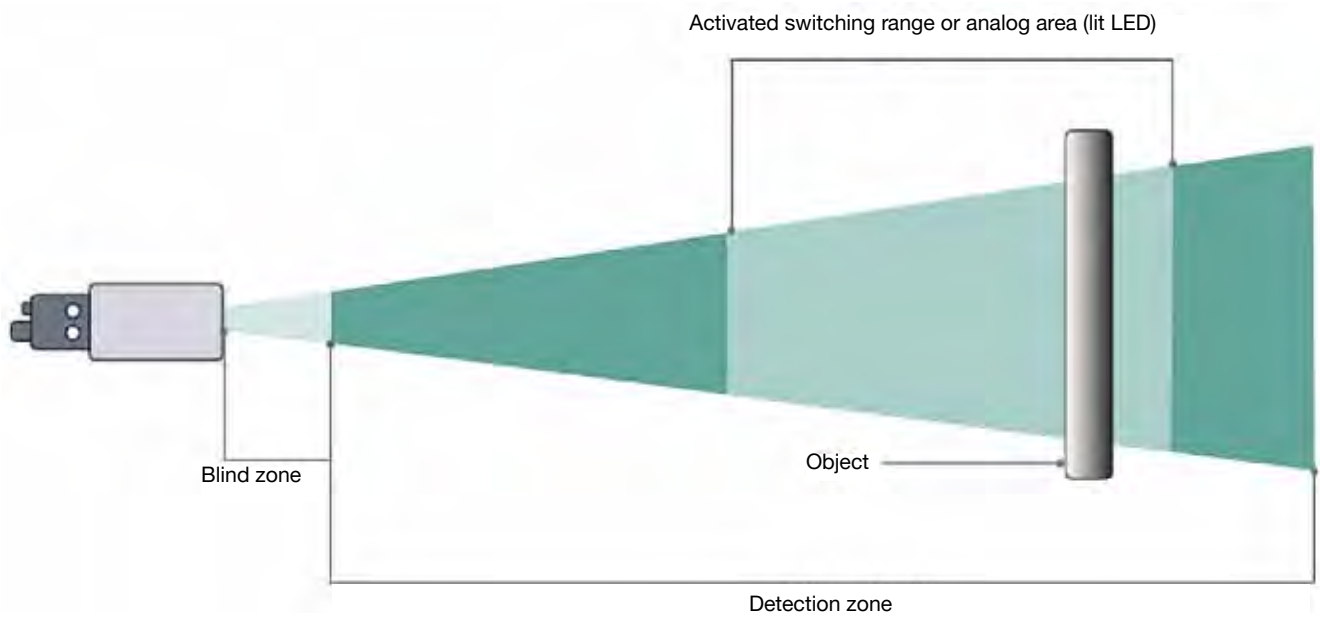
Diagnosis

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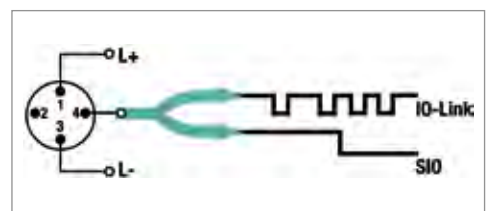
DETECTION ZONE

Switching Range / Analog Output

Activated switching range or analog area (lit LED)

Blind zone

Object

Detection zone

IO-Link

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

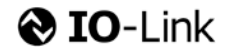| No.	Designation	Order No.
1	IO-Link Board	80761

❭ 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
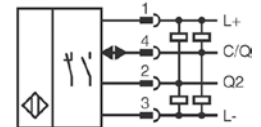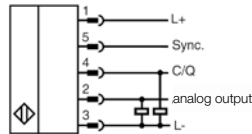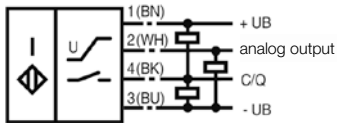
## Sensor Assortment IO-LINK / CPS-i40®

⊘ IO-Link

1

2

3

4

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	

Multi-Pixel-Array

Distance

PowerBeam
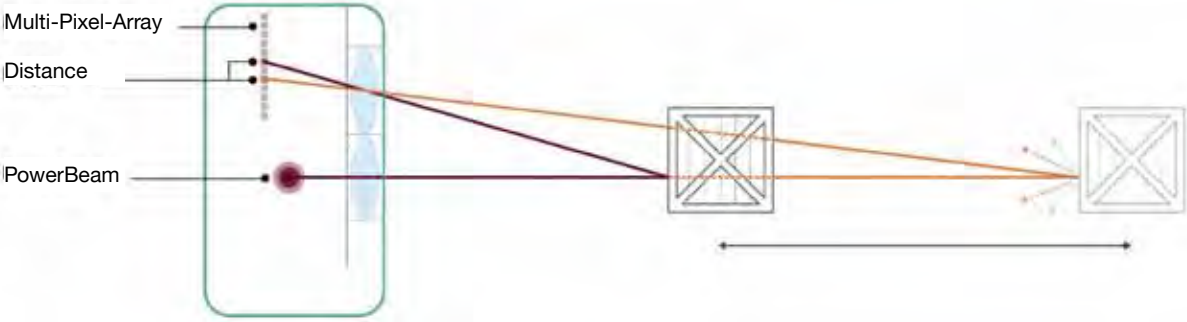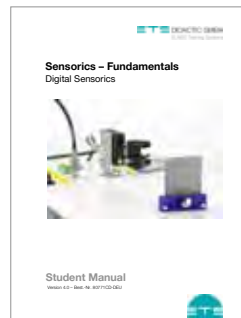
COURSEWARE

Manuals and TECHNOCards®

1

Printed and digital

2

3

6

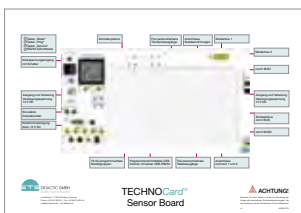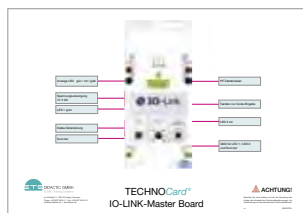### Contents

〉 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

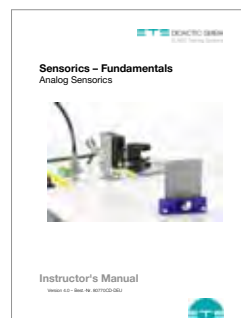〉 Sensor assortment for sorting metal parts according to size

〉 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

1

2

3
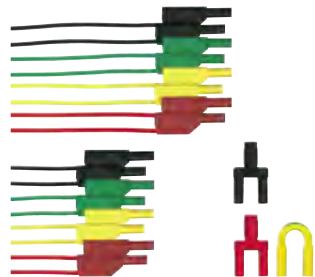
4

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

Distance - 180 mm
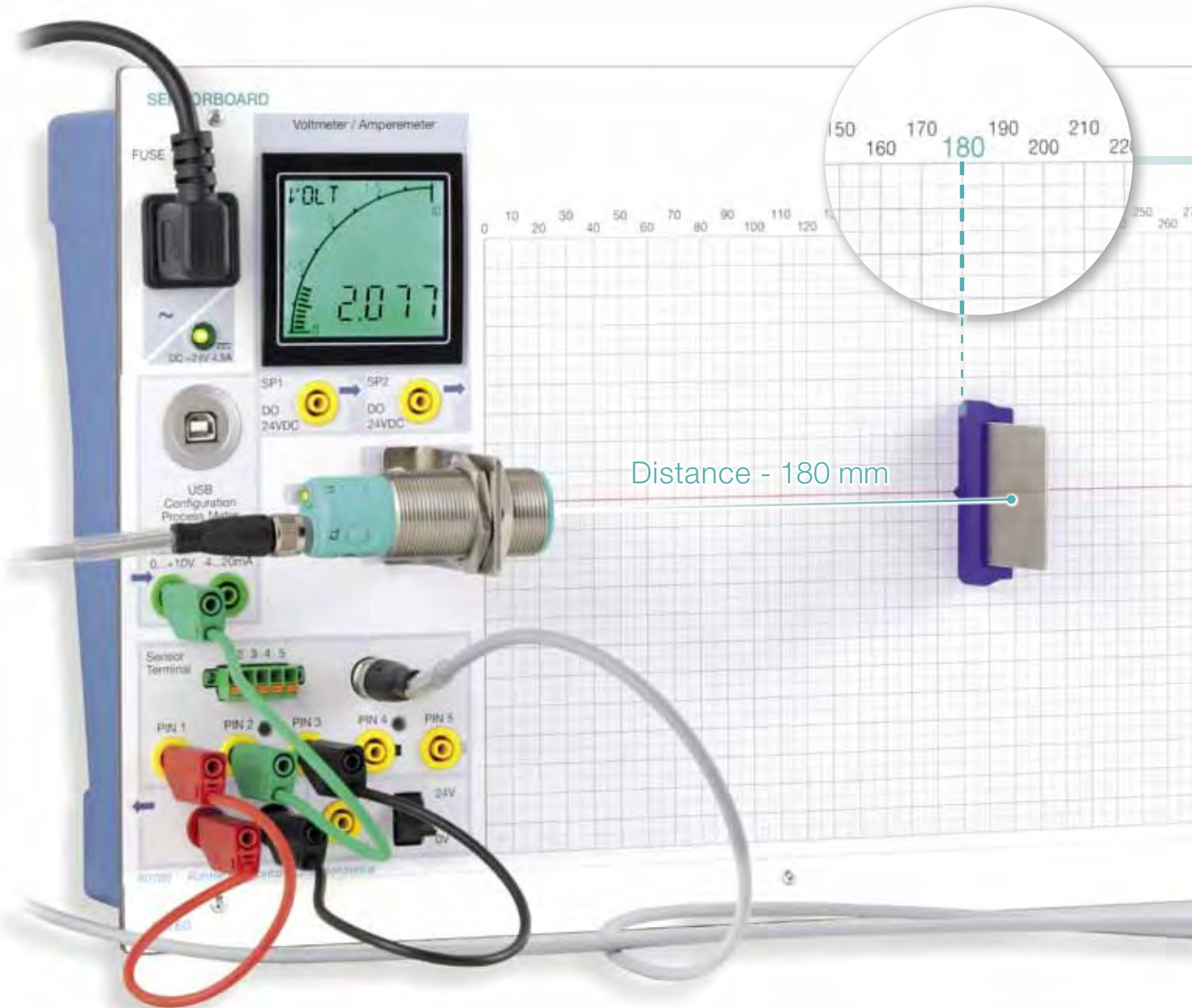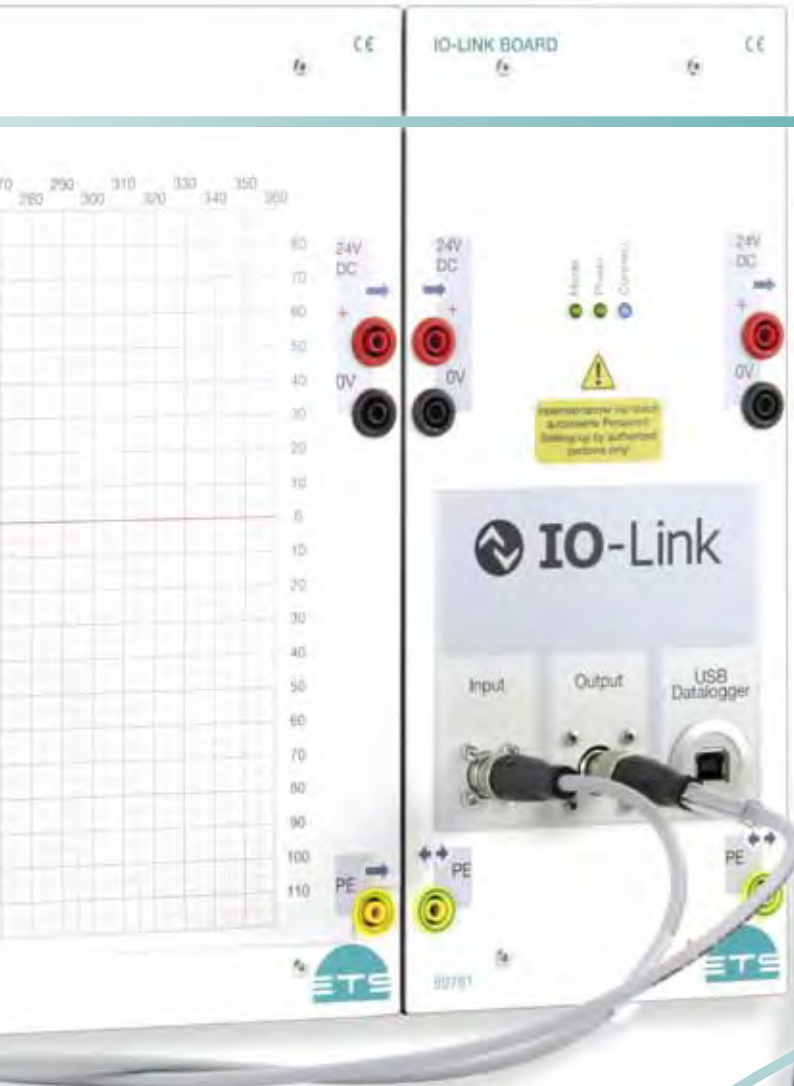
Exact reading
in real time on the tablet

IO-LINK BOARD

⊗ IO-Link

Input   Output   USB
Datalogger

Timeline

⊗ IO-Link
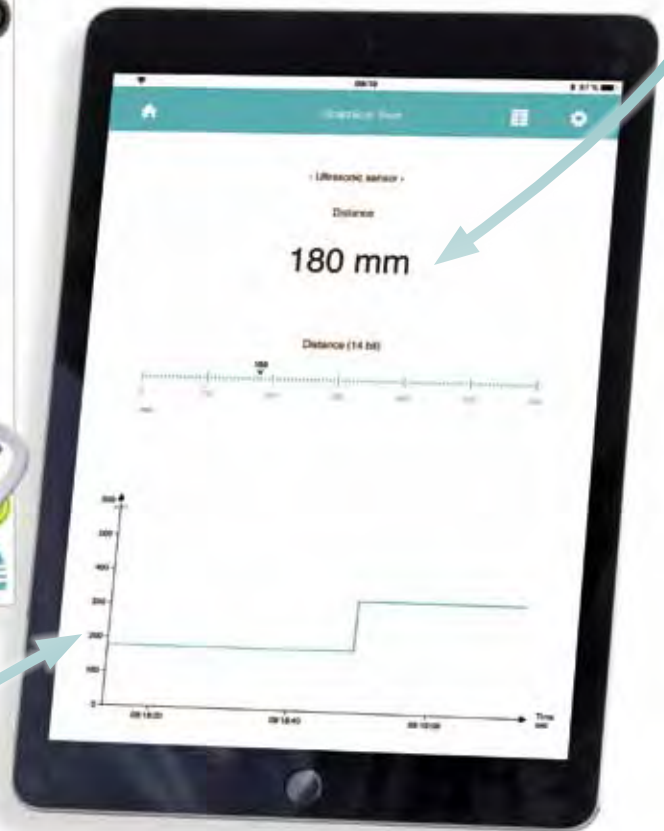
IIOT - GATEWAY – INDUSTRIAL INTERNET OF THINGS

From Sensor into the Cloud

1

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

Cloud
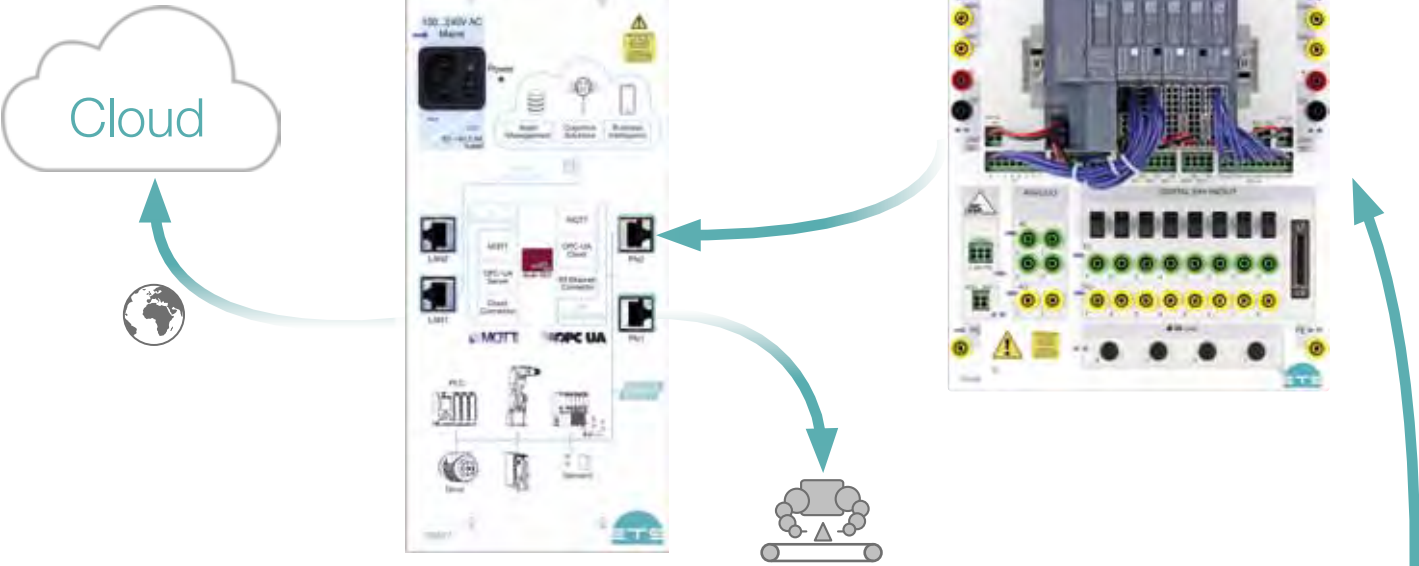
Optional: IO-Link Board

IO-Link
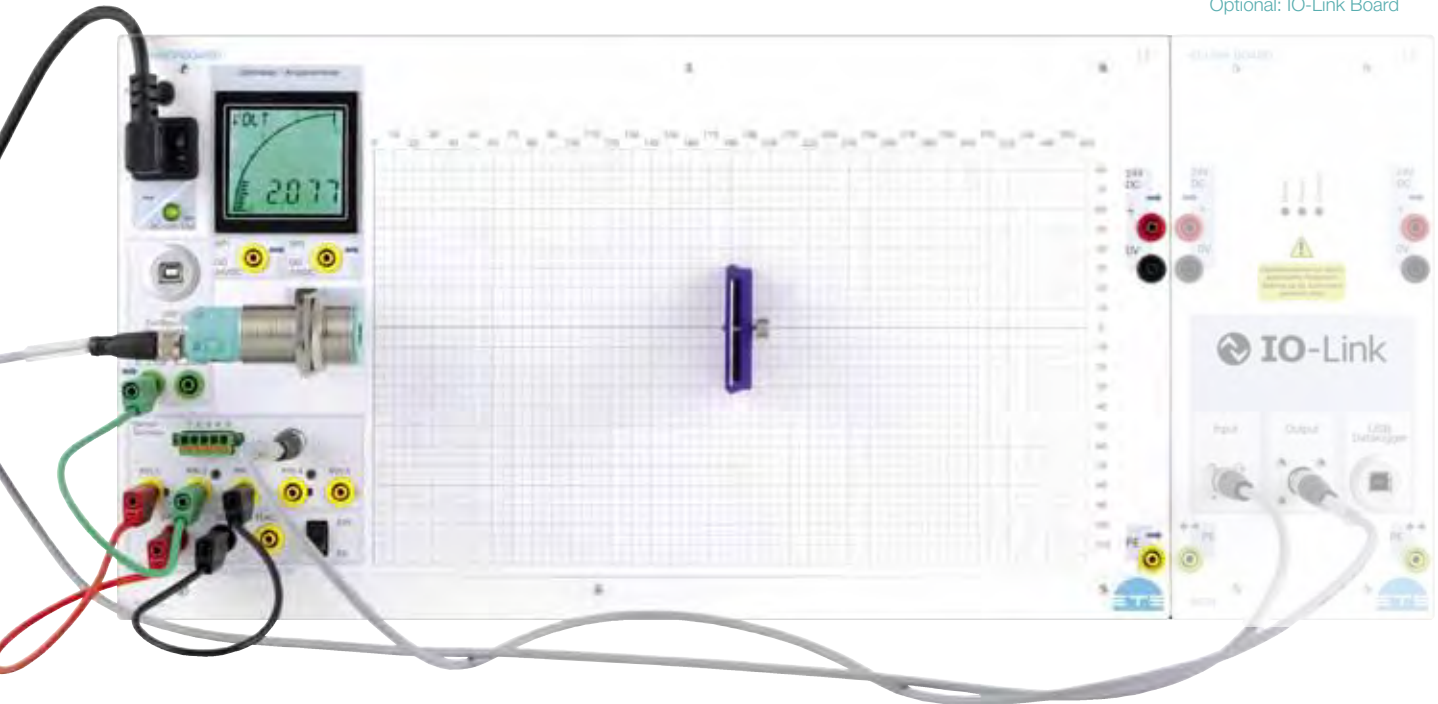
COMMUNICATION VIA MQTT / Node-RED

IIoT – connectedFACTORY / Node-RED EDITOR
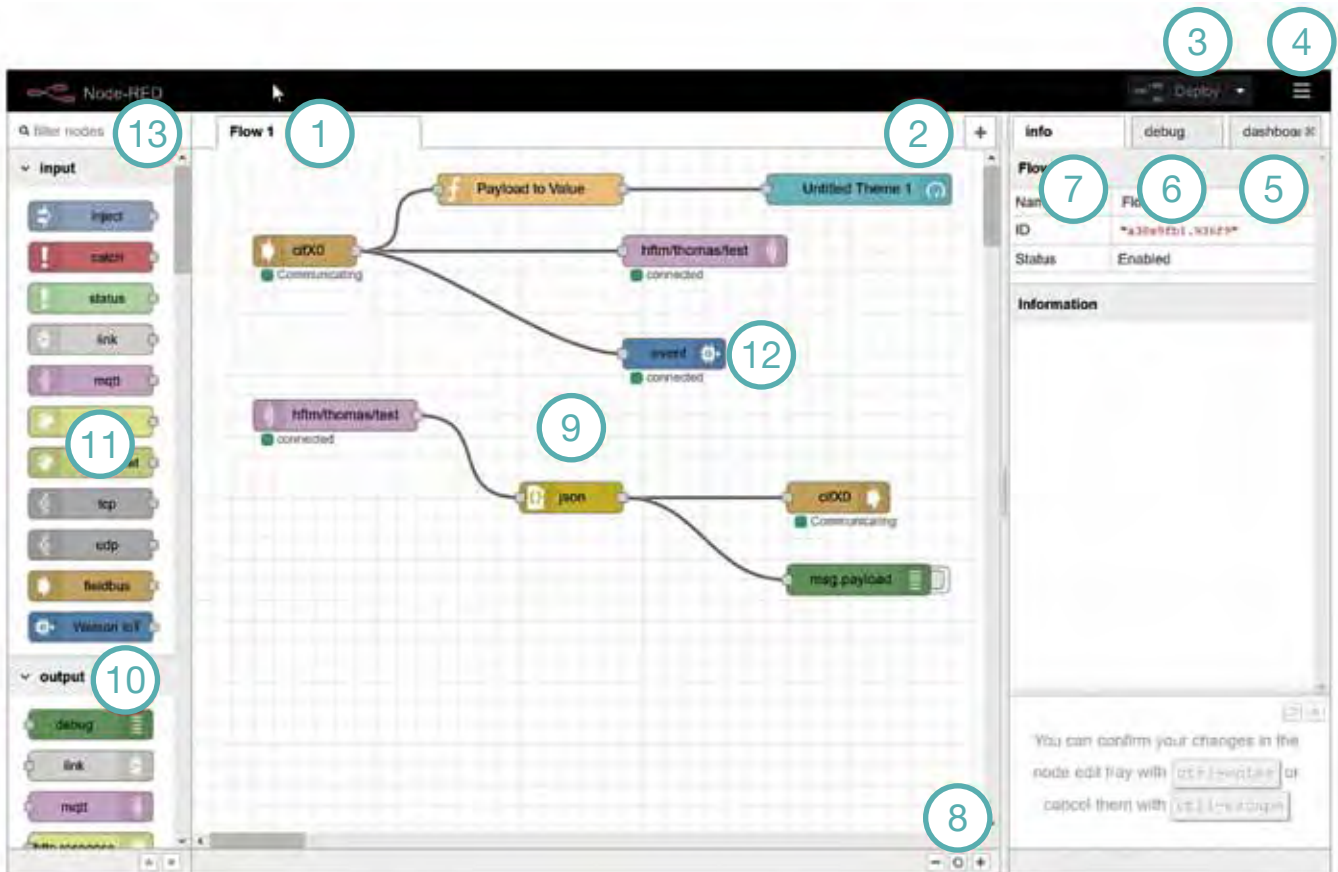
Node-Red EDITOR

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

LAN 1 Fixe IP
192.168.253.1

Cloud

Industrie 4.0
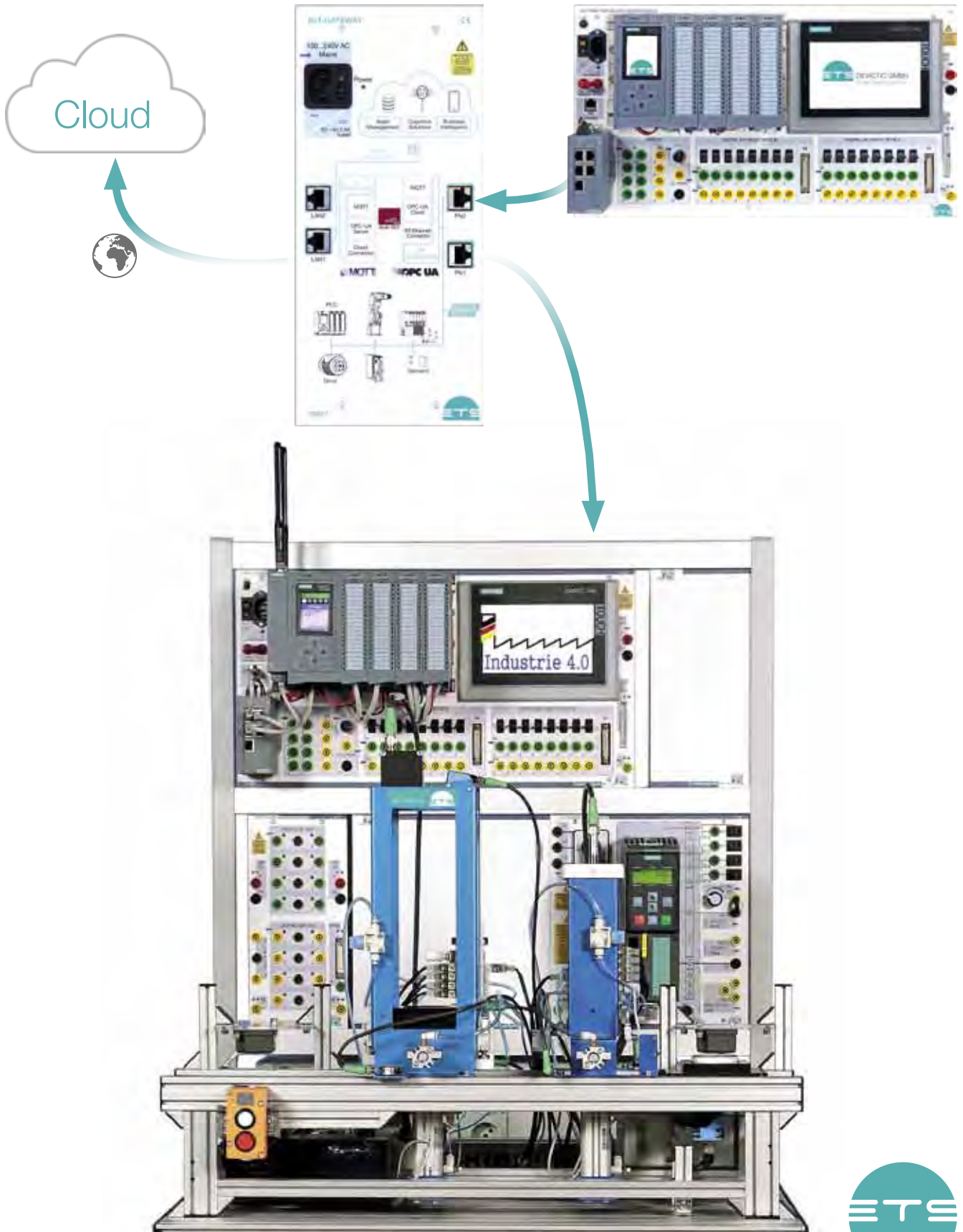
LEARNING FACTORY 4.0 CPS-i40® – connectedFACTORY

Qualify for the Future – already Today

IO-Link

OPC UA
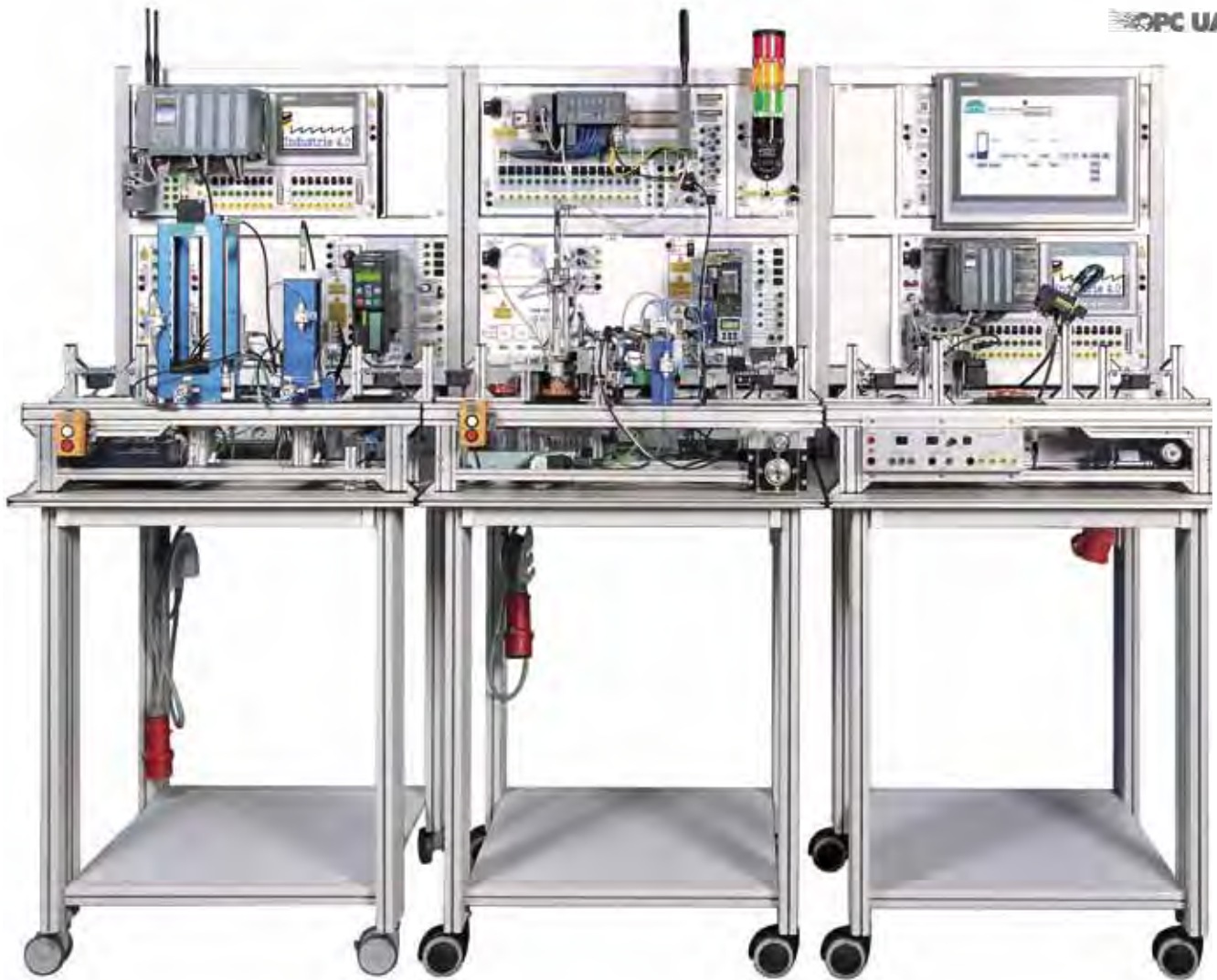
Industry 4.0 Compact System – Modular, Digital Learning Factory 4.0
The digital learning factory 4.0 or connectedFACTORY CPS-i40 has been developed for education and training in the field of automated and digital production.
The qualification of future specialists as well as advanced training of experienced 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. integratability 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
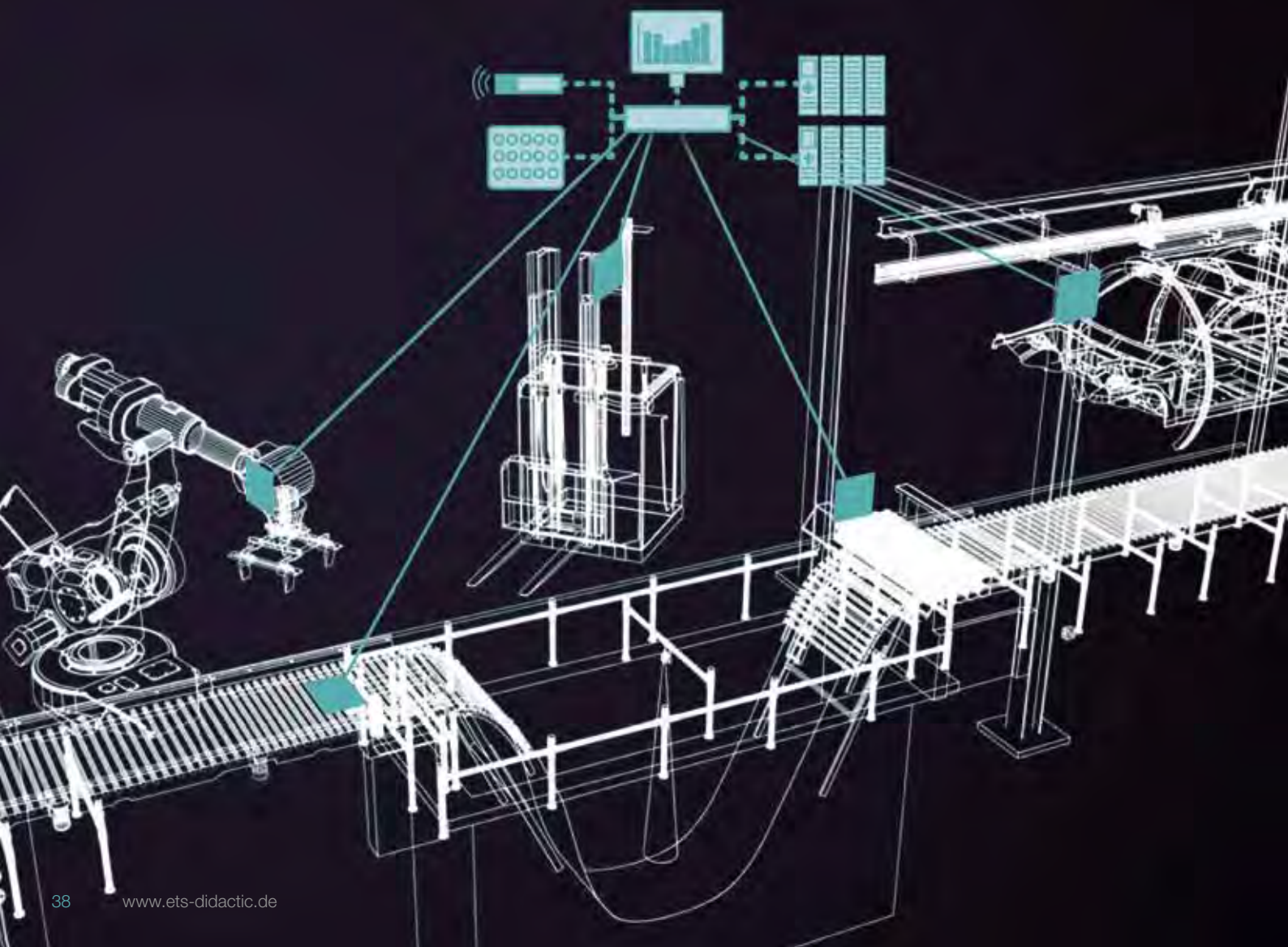
YOUR INQUIRY

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
	IO-Link Board	80761
	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 IoT-Gateway	71071-ENG

EXCELLENCE IN DETAIL.
BETTER ETS.

DIDACTIC GMBH
ELABO Training Systems