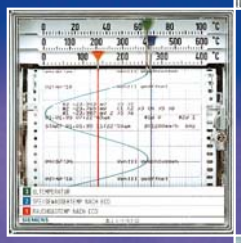

Catalog MP 20 • 2003

process AUTOMATION

SIEMENS

SIREC
Recorders and Accessories

Related Catalogs

Field Instruments for Process Automation FI 01

Order No.:
E86060-K6201-A101-A3-7600

SIREC
Process Recorders and Accessories MP 20

Order No.:
E86060-K6020-A101-A2-7600

SIWAREX
Weighing Systems WT 01

Order No.:
E86060-K6401-A101-A1-7600

OXYMAT 6
Gas Analyzers
for Determination of Oxygen Catalog Extract PA 10

Order No. (PDF):
E86060-K3510-B101-A3-7600

ULTRAMAT 6
NDIR Gas Analyzers, Single-channel or Dual-channel Versions Catalog Extract PA 10
Order No. (PDF):
E86060-K3510-B131-A3-7600

ULTRAMAT 23
NDIR Gas Analysers, one to three IR Channels plus Oxygen Catalog Extract PA 10
Order No.:
E86060-K3510-B151-A4-7600

Process Analytics
Component for Sample Preparation PA 11

Order No.:
E86060-D3511-A100-A5-7400

Field and Panel Instruments
for Process Automation

Order No.:
E86060-D6201-A100-A2-7400

Liquid Analytics PA 20

Order No.:
E86060-K3520-A101-A1-7600

SIPOS Electric Actuators
Electric Rotary, Linear and Part-turn Actuators MP 35

Order No.:
E20185-P920-A900-X-7600

SIMATIC NET
Industrial Communication and Field Devices IK PI

Order No.:
E86060-K6710-A101-B3-7600

SITRAIN™ Information and Training ITC
Automation and Drives
Order No.:
E86060-K6850-A101-B3
(German)

SITRAINonCD ITC
Course Information System for Automation and Drives

Order No.:
E86060-D6850-A100-B8-7400

Automation and Drives CA 01
The Entire Product Range on CD-ROM

Order No.:
E86060-D4001-A110-B8-7600

A&D Mall

Internet:
www.siemens.de/automation/mall

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All other product or system names are (registered) trademarks of their respective owners and must be treated accordingly.

According to the German law on units in measuring technology, data in inches only apply to devices for export.

SIREC Recorders and Accessories

Catalog MP 20 · 2003

Supersedes:
Catalog MP 20 · 2001

The products listed in this catalog are also included in the CD-ROM catalog CA 01
Order No.:
E86060-D4001-A110-B8-7600

Please contact your local Siemens representative.

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The products and systems listed in this catalog are manufactured under application of a certified quality management system in accordance with DIN EN ISO 9001 (Certificate registration No. 19656-04). The certificate is recognized in all EQ Net countries.

SIEMENS

Introduction 1

Line and multipoint recorders SIREC 2

Hybrid recorders VARIOGRAPH 3

Spare parts, Accessories, Consumable Material for Older Design Recorders 4

Appendix 5

Welcome to Automation and Drives

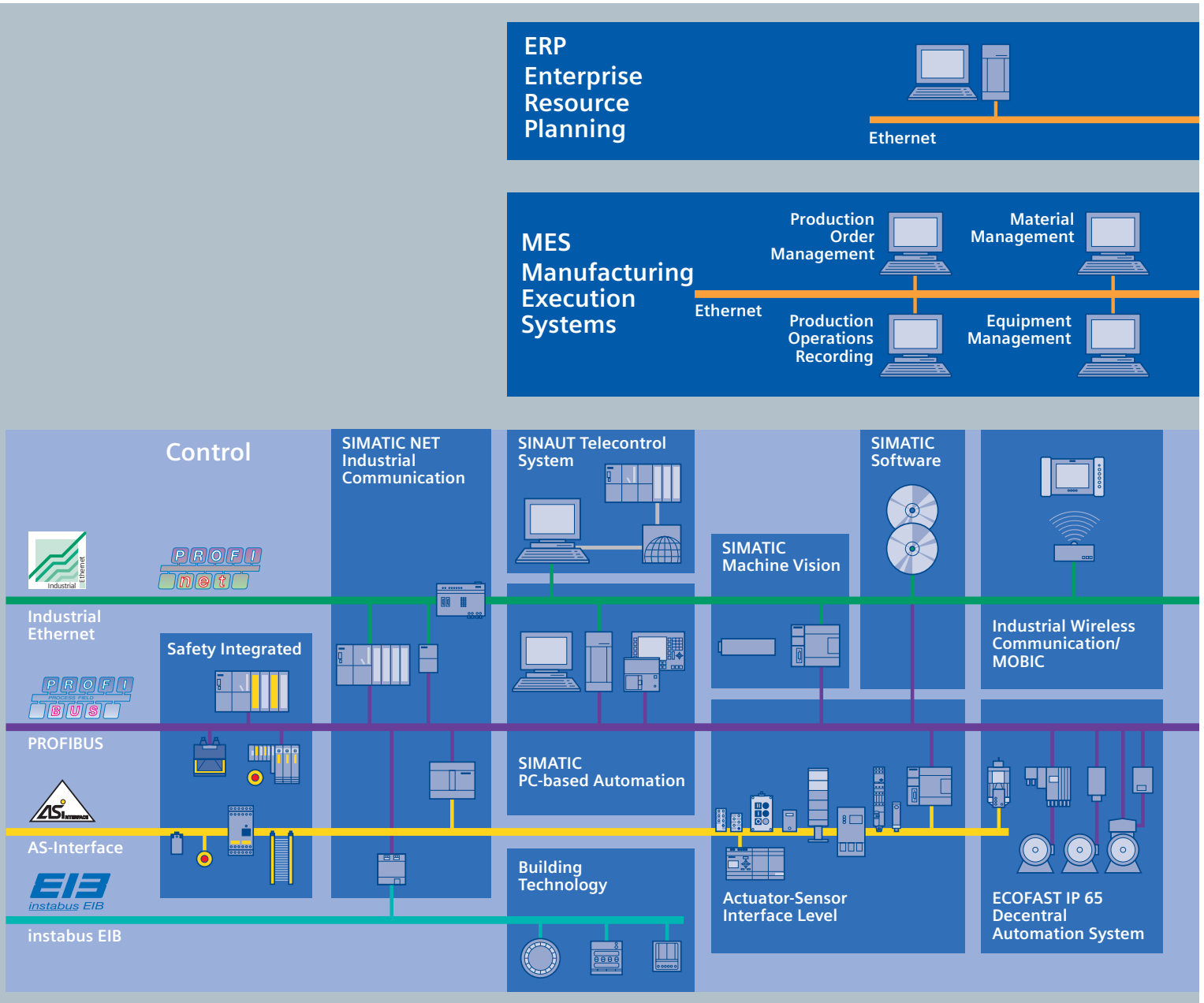
We would like to cordially welcome you to Automation and Drives and our comprehensive range of products, systems, solutions and services for production and process automation and building technology worldwide.

With integrated automation blocks, powerful engineering tools and innovative concepts such as Totally Integrated Automation and Totally Integrated Power, we deliver solution platforms based on standards that offer you a considerable savings potential.

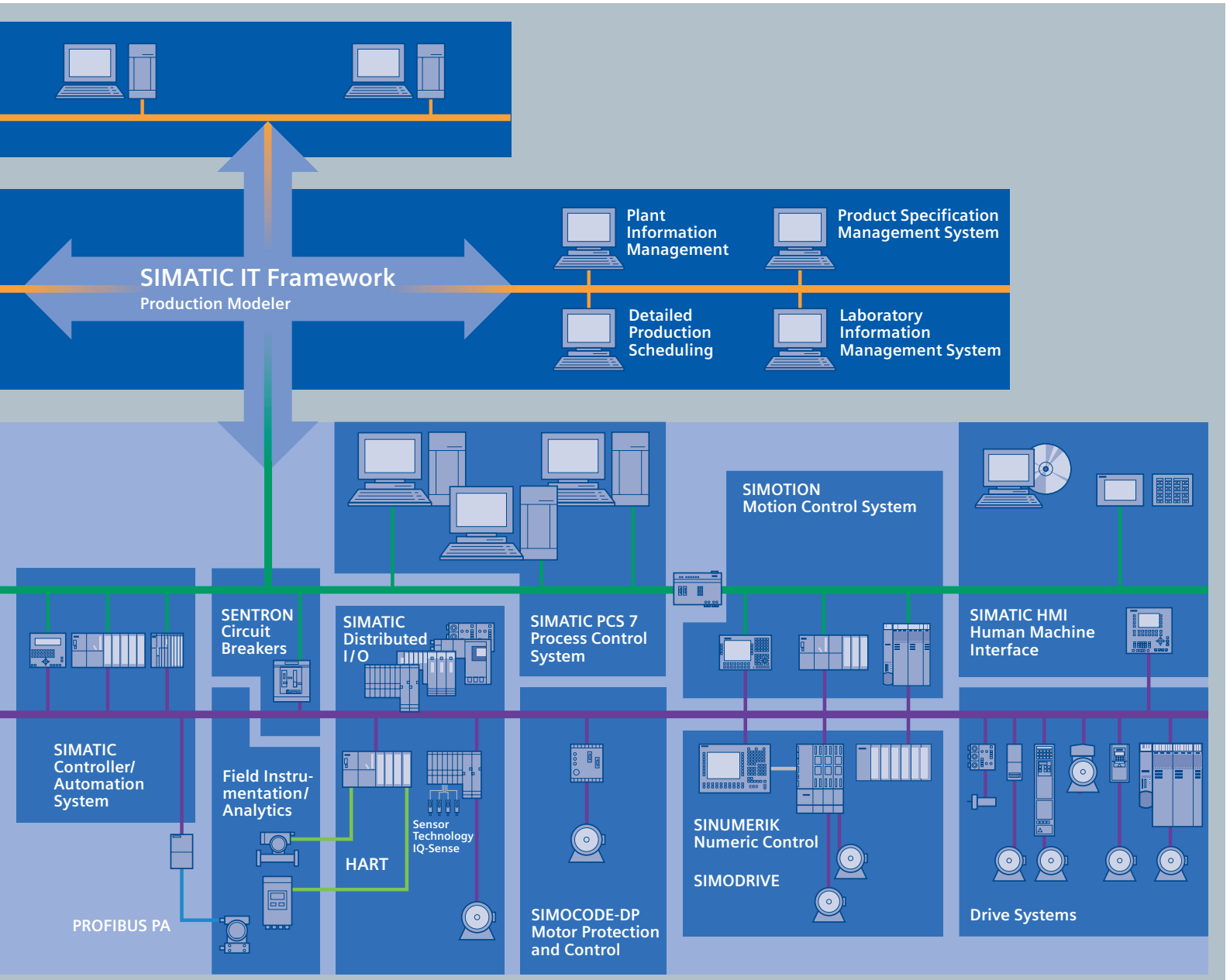
Discover the world of our technology now. If you need more detailed information, please contact one of your regional Siemens partners.
They will be glad to assist you.

Totally Integrated Automation – innovations for more productivity

With the launch of Totally Integrated Automation in 1996, we were the first ones on the market to consistently implement the trend from equipment to an integrated automation solution, and have continuously perfected the system ever since.
Whether your industry is process- and production-oriented or a hybrid, Totally Integrated Automation is a unique common solution platform that covers all the sectors.
Totally Integrated Automation is an integrated platform for the



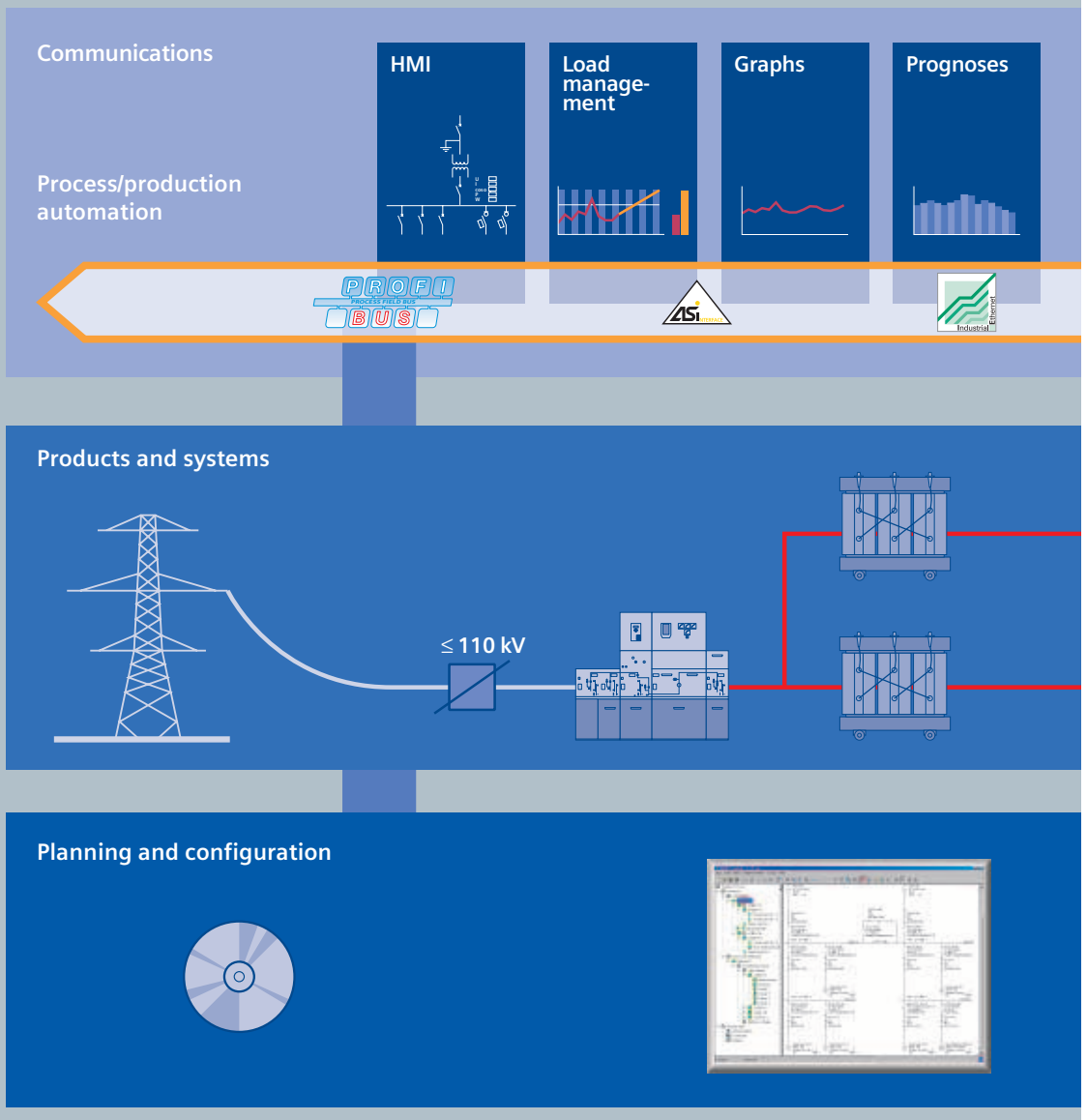
entire production line - from receiving to technical processing and production areas to shipping. Thanks to the system-oriented engineering environment, integrated, open communications as well as intelligent diagnostics options, your plant now benefits in every phase of the life cycle.
In fact, to this day we are the only company worldwide that can offer a control system based on an integrated platform for both the production and process industry.

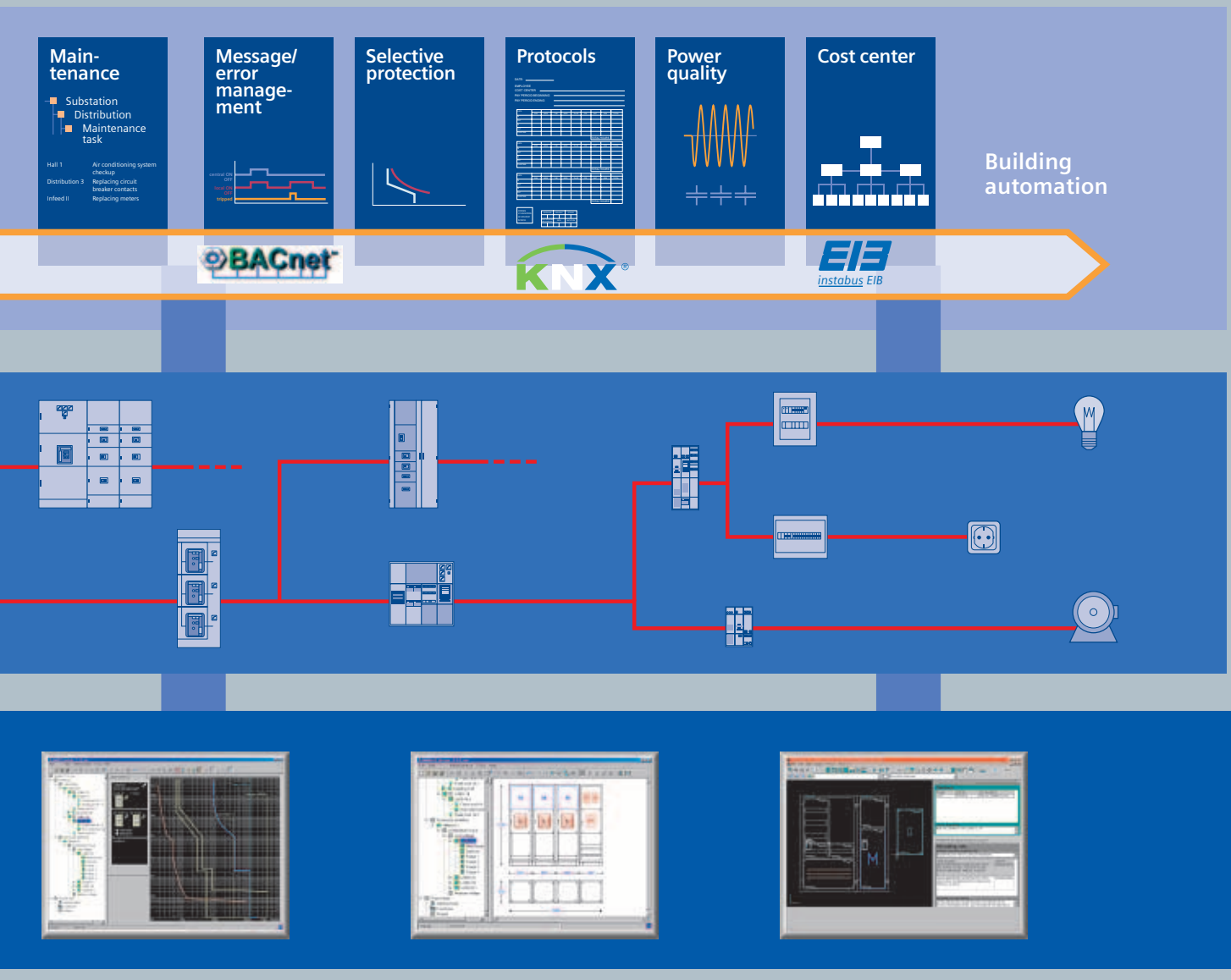


Totally Integrated Power – energy distribution and management from one source

Totally Integrated Power™ by Siemens offers integrated solutions for energy distribution in functional and industrial buildings covering everything from medium-high voltage to power outlets.

Totally Integrated Power™ is based on integration in planning and configuration as well as coordinated products and systems. In addition, it features communications and software modules for connecting power distribution systems to industrial automation and building automation, thereby offering a substantial savings potential.




Main-
tenance
Substation
Distribution
Maintenance
task
Message/
error
manage-
ment
Selective
protection
Protocols
Power
quality
Cost center
Building
automation
BACnet
KNX
instabus EIB

Process recorder - Reliable, field-tested and accurate.

No matter how special your measuring tasks may be, SIREC has the right chart recorder for you: sensibly graduated in performance and including everything from simple low-cost units to high-performance units and everything in between.

Continuous-line recorder, dotted-line recorder, or a hybrid, it's your choice.
SIREC continuous-line recorders are the best choice for quickly-changing measured variables such as current, voltage or pressure.
SIREC dotted-line recorders are the recorders of choice for measuring of slowly-changing variables such as temperature, pH value or level. These recorders are of a user-friendly design, with backlit display and wide reading angle.
The hybrid recorder is faster than dotted-line recorders or plotters. It can do virtually anything, which a continuous-line recorder can do, but has a larger number of channels, making it the most economical solution for the output of large amounts of text and tables.

SIMATIC PDM Software

SIMATIC PDM (Process Device Manager) is a consistent, manufacturer-independent software tool for the operation, configuration, parameterization, maintenance and diagnosis of intelligent field and control room instruments based on the worldwide leading EDD standard. It can be used independent of a specific automation system via PC or programming device or as an integral part of the SIMATIC PCS 7 process automation system.

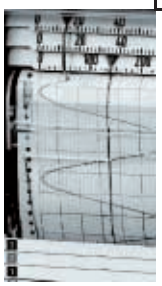
The following core functions of SIMATIC PDM enable you to keep all instruments and automation processes under control:
- Set up and modification of parameter
- Comparison
- Plausibility checks
- Data management
- Commissioning functions

The SIREC L/LA/P/PA/PU and Variograph recorders are integrated in SIMATIC PDM. Therefore only a software to the parameter setting of all paper process recorders is required.
The known interconnecting cables are used for communication to the PC or programming device.

Technical data and order data for SIMATIC PDM is found within the FI01 catalog, chapter 8.

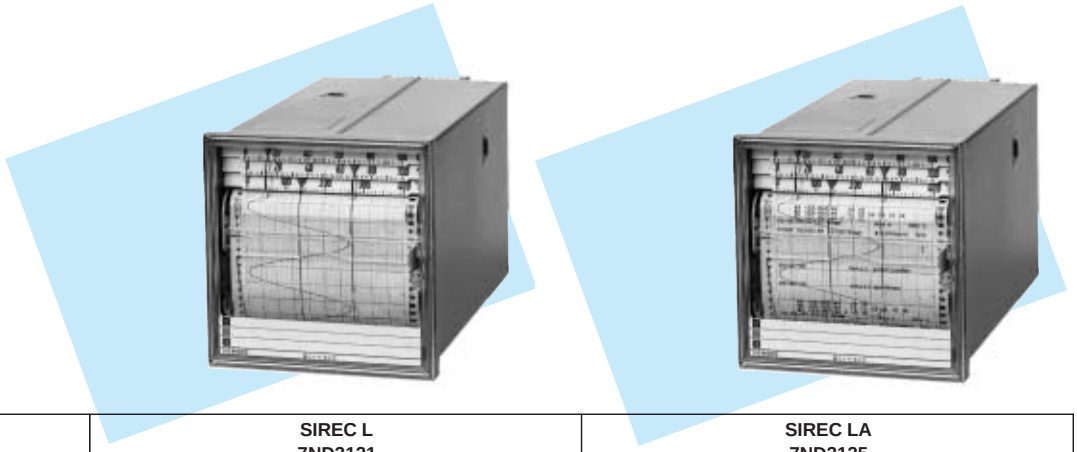
Line and multipoint recorders SIREC

2



2/2	**Summary of line recorders**
2/2	**Summary of multipoint recorders**
2/4	**Technical explanations**
2/6	**Ordering information**
2/7 2/7	**SIREC L/LA** Line recorder 144 x 144
2/17 2/17	**SIREC P/PA** Multipoint recorder 144 x 144
2/24 2/24	**SIREC PU** Multipoint recorder 144 x 144
	SIMATIC PDM software for parameterizing of SIREC L/LA/P/PA/PU see catalog FI 01

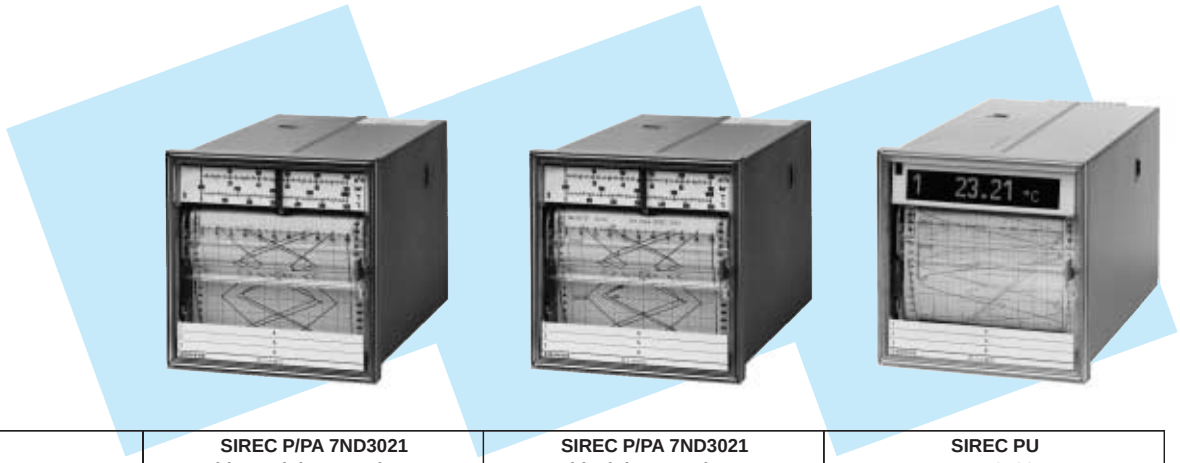
Summary of line recorders



2

	SIREC L 7ND3121 Page 2/7	SIREC LA 7ND3125 Page 2/7
Format Class	144 x 144 0.5	
Microprocessor-based Analog inputs	■ 1, 2 or 3	
Digital inputs/outputs Measured variable	4/6 U/I DC, temperature (thermocouple, resistance thermometer), resistance (2- or 3-wire)	
Measuring ranges Operating modes	Freely-adjustable Curves	Curves, tables, texts, symbols
Recording method Chart paper	Fiber pen Roll or fanfold pack	
Recording width Number of colors	100 mm 3	3 and black (for alphanumeric text)
Text printout Date and time printout	– –	■ ■
Alarms Alarm text	6, freely-programmable –	■
24 V DC output Zooming	■ ■	
PC connection (software) Interface	PC interface at front Digital input/output	
Power supply Mounting	AC 24 V, 115 or 230 V, DC 24 V Sheet-steel panel, desk upright panel or cabinet, panel with 72 x 72 grid	
Installation without interspacing	■	

Summary of multipoint recorders



	SIREC P/PA 7ND3021 Without alphanumeric text Page 2/17	SIREC P/PA 7ND3021 With alphanumeric text Page 2/17	SIREC PU 7ND3523 Page 2/24
Format Class	144 x 144 0.5		
Microprocessor-based Analog inputs	■ 6		
Digital inputs/output Measured variables	4/6 U/I DC, temperature (thermocouple/resistance thermometer), resistance (2- or 3-wire)		4/6 U/I DC, temperature (thermocouple)
Measuring ranges Operating modes	Curves	Freely-programmable Curves, tables, texts	Display, curves, tables, texts
Recording method Chart paper	Fiber pen Roll or fanfold pack		
Recording width Number of colors	100 mm 6		
Text printout Scale printout	–	■ –	■ ■
Date and time printout Alarms	6, freely-programmable	■	2 per channel
Math. functions Alarm text	–	Per channel	■
Alarm linking Zooming	–	■	■
Zoning Remote operation	– –		■ ■
PC connection (software) Line recorder function	PC interface at front Dot-joining		
Interface Storage (short-term)	Digital input/output –		■
Power supply Operator prompting	AC 24 V, 115 or 230 V, DC 24 V ■		
Mounting Installation without interspacing	Sheet-steel panel, desk upright panel, cabinet, panel with 72 x 72 grid ■		

Technical explanations

The range of flush-mounted recorders comprises two line recorders and three multipoint recorders with a standardized format of 144 x 144 mm.

Fiber pens are used for recording. The recorders are characterized by a robust design and programmable parameters. The recording is largely independent of the position, and the recorders are easy to service.

Recording method

With the fiber pen recording, the reservoir and fiber tip are combined in one assembly. Violet, red, black, green, blue and brown pens are available for the multipoint recorders, and blue, red, green and black (for alphanumeric text) pens for the line recorders.

Design

Front door
  Plastic with catch or with
  catch and lock
Sheet-steel housing
  Color: RAL 7037, dust gray

Front dimensions to DIN 43 831. Dimensions and panel cutouts are specified with the respective recorders.

Error limits and interference suppression

The recorders comply with class 0.5 of the regulations for electrical measuring instruments. Any differences are listed in the Technical data.

The interference suppression St_U is specified in decibels. It is determined according to the following equation:

$$St_U = 20 \cdot \log_{10} \frac{U_{St}}{U_{Sig}} \text{ dB}$$

U_{St} Measured value of the interference signal
U_{Sig} Determined value of the wanted signal

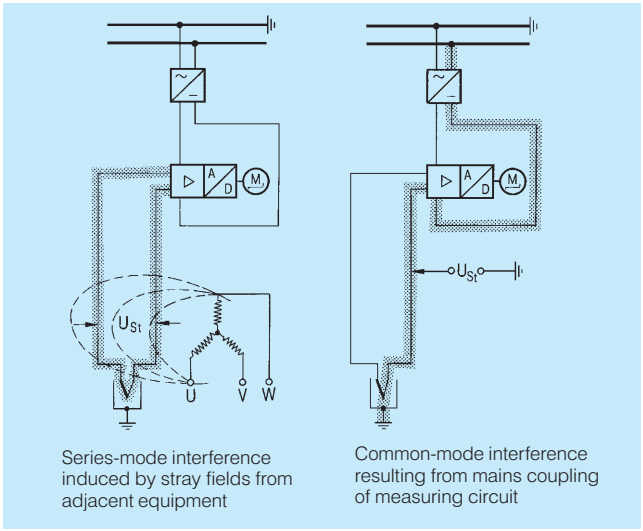


Fig. 2/1 Generation of interference signals

The worst condition is used in each case for the frequency and phase position of the interference. Since there are two manners in which the interference can affect the measuring circuit (common-mode or series-mode), two values in decibels are always required to completely specify the interference suppression.

The increasing energy density in modern plants means that it is advisable to suppress at least the induced series-mode interference at the point of occurrence (e.g. using commercially available contactors).

Limit monitoring

Limit monitoring functions output a binary signal when programmed limits are violated.

Up to 6 limits (opto isolator or relay outputs, freely-assignable) can be programmed.

Line recorders

The measured values are recorded as a continuous trace by fiber pens. Unsteady variables (e.g. pressure and flow) can be damped by a programmable filter (low-pass).

Multipoint recorders

The measured values for each channel are recorded as dots by a fiber pen (dotted line).

The individual measured values can be displayed as a continuous trace using a programmable dot-joining technique.

Input range

The input range is the electrical range of the instrument amplifier (measuring limits). The ranges are adapted using plug-in jumpers, and also by programming for certain ranges.

Example:
a): – 20 mA to + 20 mA for DC I as measured variable
b): – 100 mV to + 100 mV for TC, type J

The recording properties (measuring accuracy) of the instruments always refer to the input range.

Measuring range

Example:

a): For DC U/I as measured variable:
Measuring range = input range
e.g.: – 20 mA to + 20 mA

b): For direct connection of TC/RTD/R:
The measuring range is the range assigned to the input range (with linearization for TC and RTD).
e.g.: – 210 °C to + 1200 °C for TC, type J

Recording range

The recording range defines the part of the measuring range which is recorded over a width of 0 to 100 mm. The recording range is freely-programmable within the measuring range.

Example a) Measuring range: -20 to +20 mA
Recording range: +2 to +18 mA
b) Measuring range: 10 to 300 °C
Recording range: 20 to 180 °C

To permit easier operation, typical recording ranges are stored as "Fixed ranges".
Examples: 0/4 to 20 mA
0/2 to 10 V

Scale range

Easily-replaceable scales can be used to assign the scale range (graduation and dimension) to the recording range.

Standards

The recorders comply with the following standards:

- Housing: DIN 43 700, DIN 43 831
- Scales: DIN 43 790, 43 802
- Error limits: IEC 484 (DIN 43 782)
- Degree of protection: IEC 529 or EN 60 529
- Climate: IEC 68-2-1/2
- Mechanical stress: IEC 68-2-6
- Electric protection: IEC 1010-1 (EN 61 010-1, VDE 0411 Part 1)
- Electromagnetic compatibility: the protection objectives of the EMC guideline 89/336/EEC with respect to interference suppression to EN 50 081-1 and noise immunity to EN 50 082-2 of 03/95 are complied with.
- Interference suppression: VDE 0875 Part 11 (CISPR 11)
- Noise immunity: IEC 1000-4-...

Chart drive

A program-controlled stepping motor is responsible for the time-synchronous chart drive. The drive controls a sprocket wheel, and the sprockets engage in the perforations of the chart paper and thus transport the latter.

The chart paper is tightened in the longitudinal direction by a take-up spool driven by the drive via a slip coupling.

Time marking

For recorders without a text output, program-controlled time markers are recorded on the right edge of the chart every hour. The set chart speed can then be determined when evaluating the recording.

For recorders with a text output, the time is printed out at the left edge of the recording by means of the real-time scale clock.

Chart paper

Chart paper for line and multipoint recorders.

The absorptive capacity of the ink paper is optimally matched to fiber pens and recording heads. The paper has a very smooth surface so that the frictional resistance of the fiber pens is low.

Types of chart paper

Roll: low-price recording with greatest possible visible trace length.
Fanfold: fast access possible even to recordings made a long time earlier. Easy finding of specific positions by flipping through like in a book.

Chart paper graduations

(see Fig. 2/2 for example)

■ Range graduation
The recording width is divided linearly by longitudinal lines. Every fifth line is thicker than those in between.

Please contact us if you require chart paper with a non-linear range graduation or with printed text at regular intervals – e.g. range numbers, dimensions and measuring point names.

Blank chart paper can also be used for the SIREC LA and P/PA.

■ Time graduation
The line and multipoint recorders are supplied with chart paper with a time graduation, but without the printing of hours.

Blank chart paper can also be used for the SIREC LA and P/PA.

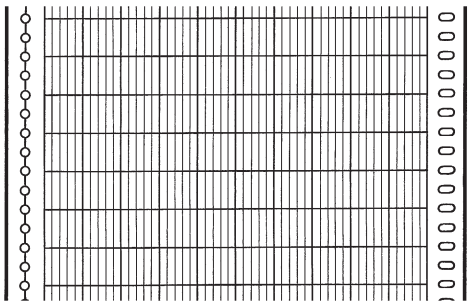


Fig. 2/2 Chart paper 120 mm wide, recording width 100 mm, 50 linear divisions (scale approx. 1:2)

Parameterization software

The SIMATIC PDM software permits you to use your PC for convenient dialog with the line and multipoint recorders.

Ordering information

Standard models are listed in the Ordering data. The technical data contain additional data for further designs, e.g. applications and power supply.

If designs are required for which no information is included in the technical data, please inquire whether the desired model is technically possible.

When ordering, please state:

- Order No.
- Order code, if applicable, according to table or as plain text (supplement Order No. with "-Z" in this case)
- Any plain text required for inscription of measuring point label or information on the recording ranges and scale graduations.

Recorders can also be delivered with measuring ranges other than those offered. However, the input ranges of these recorders must lie within the technical limits of the associated recorder.

Example for ordering:

Required recorder:

SIREC L line recorder 7ND3121
Format 144 x 144
For installation in sheet-steel panel
Power supply AC 50 Hz, 220 to 240 V

3 channels

Channel 1:	Recording range DC 0 to 1 V, scale 0 to 100 %, direct connection
Channel 2:	0 to 300 °C Sensor: Pt 100 resistance thermometer, connection via transmitter, output (recording range) DC 0 to 20 mA, temperature-linear
Channel 3:	Recording range DC 4 to 20 mA, scale 30 to 80 bar

6 electronic alarm outputs

Measuring point label inscribed "Water pump" (channel 1), "Inlet temperature" (channel 2), "Boiler pressure" (channel 3)

The Ordering data for this recorder must then be as follows (according to pages 2/13 and 2/15):

Order No.:	7ND3121-1CA21-3NA9-Z
Order codes:	R1Y + Y05 + Y01 + Y02
Plain text:	Scale graduation: Channel 1: 0 to 100 % Channel 2: 0 to 300 °C Channel 3: 30 to 80 bar Measuring point inscription: Channel 1: Water pump Channel 2: Inlet temperature Channel 3: Boiler pressure

Note:

The following designations are used in this section for the signal modules/measured variables:

DC U/I:	DC voltage/direct current
RTD:	Resistance temperature detector (resistance thermometer)
TC:	Thermocouple
R:	Resistance

Line recorder 144 x 144

Microprocessor-based line recorder 144 x 144 Single-channel, dual-channel or three-channel recorder, class 0.5 With fiber pen recording Input variables DC U/I/TC/RTD/R

SIREC L (7ND3121) Without text output

SIREC LA (7ND3125) With text output

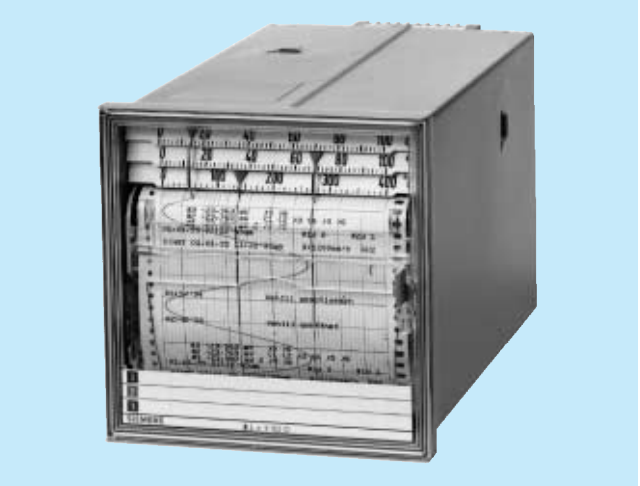


Fig. 2/3 SIREC LA

Features

General:

SIREC L/LA

- Operating modes:
  Measure, display (three scales), record
- Pen lift with pauses in operation, also in event of power failure
- Pens easily replaceable from the front
- Limit monitoring:
  Alarm identification and output with limit violations, freely-adjustable and freely-assignable to the channels
- Time marking
- Input/output module: 4 inputs, 6 outputs electrically isolated; electronic outputs or relays
- Floating DC 24 V output for supply of input/output module or transmitter
- CE symbol, NAMUR and KTA requirements complied with; permits use under all conditions
- Housing front with degree of protection IP 54
- Installation without interspacing possible
- Mounting depth including connections 260 mm

In addition with SIREC LA

- Real-time calendar/clock
- Summer time/winter time switchover
- Output of error messages, instrument text

Measure:

SIREC L/LA

- 1, 2, 3 analog channels and 2 digital channels
- Channel isolation: semiconductor relays, floating
- Measuring cycle 150/240 ms or 180/300 ms according to measuring ranges
- Measured variables (free selection possible):
  - Direct current, DC voltage
  - Temperature via thermocouple or resistance thermometer
  - Resistance transmitter (two-wire or three-wire system)
  - 2 digital channels (only with SIREC LA)
- Measuring ranges freely selectable with the range limits
- High measuring accuracy

Display:

- One scale plate and pointer for measured values for each channel, easy readability
- LED status display (NAMUR)

Record:

SIREC L/LA

- Recording with fiber pens, max. 3 colors
- Adjustable chart speed
- Curve display
- Zooming (scale expansion)
- Event marking
- Chart paper: roll or fanfold
- Formamide-free ink, large reservoir

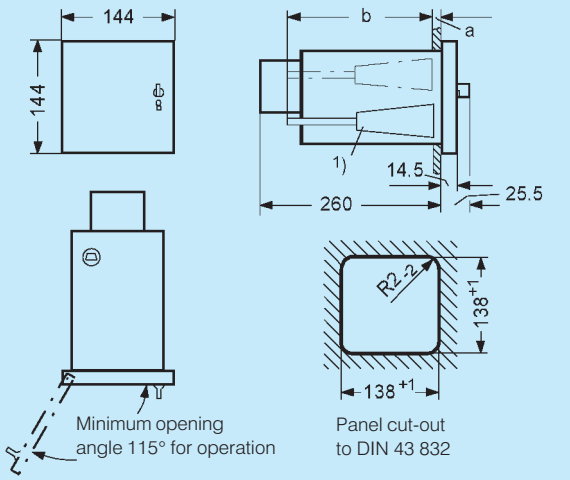
In addition with SIREC LA

- Alphanumeric output with additional fiber pen
- Chart paper: also grid-free chart, grid is generated (in 8 steps)
- Alphanumeric output:
  date, time, start/stop line, channel code, alarms, 6 event texts (with 16 characters each), measured-value table and parameter printout
- Limit lines assignable for every alarm

Adjustment/operation:

- All adjustments and operations using levers at front and via the PC interface (SIMATIC PDM software)
- Settings are saved by the non-volatile memory (EEPROM)

Line recorder 144 x 144



Distance between centers of adjacent instruments: ≥ 144 mm

Installation in	a	b
Sheet-steel panel or sheet-steel desk upright panel	2 to 42	230
Panel or desk upright panel with basic grid 72 x 72	39 to 81	195.5

1) The clamps can also be fitted at the top and bottom.

Fig. 2/4 Dimensions

Technical data

Note: Only values with tolerances or limits are guaranteed data. Values without tolerances are informative data. The defined error limits apply following a warming-up time of 30 minutes.

Measuring functions

General data		
Number of channels	analog	1, 2 or 3
	digital (only with LA)	2 (see digital input/output)
Channel isolation		Electrically isolated via semiconductors
Voltage endurance		See Table "Interference rejection" (page 2/10), protect. with varistors from protective earth conductor
Permissible potential		Max. DC 24 V compared to PE conductor; only measuring circuits with safe isolation from power supply are permissible
Input overload		Max. 10 % of full-scale value
Overload		Max. 24 V continuously in DC U range, max. 40 mA continuously in DC I range
A/D conversion		Dual-slope converter
Resolution		14 1/2 bits
Common-mode rejection		90 dB at 50 Hz
Series-mode rejection		60 dB at 50 Hz
Reference conditions		
Ambient temperature		23 ± 2 °C
Relative humidity		55 ± 10 %
Source resistance		≤ 1 kΩ
Potential difference		≤ 1 V
Adjustment interval		≤ 24 months; an additional error of 0.01 %/year must be expected with a longer interval
Measured value calibration		Class 0.5 to DIN 43 782 or IEC 484
Damping		1st order low-pass, 0, 1, 3, 10, 30, 100 s or automatic adaptation to chart speed

Measuring range/ linearization range 2)	Resolution Normal cycle 1)	Maximum electric measuring error 3) $F_{el} = F_{offset} + F_{rel} + F_{temp} + F_{terminal}$ (typ. 1/3 of max. measuring error)			
		F_{offset}	F_{rel}	F_{temp}	F_{term}
−40 to +40 mV	4 µV	16 µV	0.05	0.02 + 0 mV	–
−100 to +100 mV	10 µV	30 µV	0.05	0.02 + 0 mV	–
−400 to +400 mV	40 µV	120 µV	0.05	0.02 + 0 mV	–
−1000 to +1000 mV	100 µV	300 µV	0.05	0.02 + 0 mV	–
−1 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
0 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
+0.2 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
−10 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
0 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
+2 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
−20 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
0 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
+4 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
J (Fe/CuNi) −100 to +1200 °C/ −210 to +1200 °C	0.2 °C	0.6 °C	0.06	0.02 + 0 °C	0.8 °C
K (NiCr/Ni) −100 to +1370 °C/ −270 to +1370 °C	0.3 °C	0.8 °C	0.06	0.02 + 0 °C	0.8 °C
R (Pt13Rh/Pt) +100 to +1760 °C/ −50 to +1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
T (Cu/CuNi) −100 to +400 °C/ −270 to +400 °C	0.2 °C	0.6 °C	0.07	0.02 + 0 °C	0.8 °C
S (Pt10Rh/Pt) +100 to +1760 °C/ −50 to +1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
N (NiCrSi/NiSi) −100 to +1300 °C/ −200 to +1300 °C	0.4 °C	1 °C	0.05	0.02 + 0 °C	0.8 °C
E (NiCr/CuNi) −100 to +1000 °C/ −270 to +1000 °C	0.15 °C	0.5 °C	0.06	0.02 + 0 °C	0.8 °C
B (Pt30Rh/Pt6Rh) +600 to +1820 °C/ +100 to +1820 °C	0.6 °C	2 °C	0	0.01 + 0.2 °C	0.4 °C
L (FeCu/Ni) −100 to +900 °C/ −200 to +900 °C	0.2 °C	0.6 °C	0.06	0.02 + 0 °C	0.8 °C
U (Cu/CuNi) −100 to +560 °C/ −200 to +560 °C	0.2 °C	0.6 °C	0.07	0.02 + 0 °C	0.8 °C
0 to 300 Ω	0.03 Ω	0.2 Ω	0.07	0.02 + 0.02 Ω	–
0 to 1000 Ω	0.1 Ω	0.5 Ω	0.07	0.02 + 0.04 Ω	–
Pt 100 −200 to +800 °C/ −200 to +800 °C	0.08 °C	0.5 °C	0.05	0.02+0.05 °C	–
Ni 100 −60 to +180 °C/ −60 to +180 °C	0.05 °C	0.25 °C	0.07	0.02+0.025°C	–

Note:
A special calibration from a service place is recommended for a large stretching of the measuring ranges.

1) The specified values apply to the normal measuring cycle, they must be doubled for the fast cycle; the offset error F_{offset} becomes approx. 30 % larger.
2) Linearization range = measuring range with thermocouples with slightly increased error at start-of-scale including overload range.
3) Measuring error F_{offset} (zero error) = absolute value specified in table
F_{rel} (increasing error) = percentage specified in table multiplied by the value of the read measured value (% · |MV|)
F_{temp} (temperature error at an increased ambient temperature) = percentage specified in table multiplied by the value of the absolute measured value (% · |MV|) plus a constant specified as an absolute value, total multiplied by the value of the temperature difference between the reference value 23 ± 2 °C and the ambient temperature.
$F_{terminal}$ (error of terminal temperature measurement) = absolute value specified in table for additional error with direct connection of thermocouples.

Line recorder 144 x 144

Input resistance	10 MΩ in the TC/DC U range at ≤ 100 mV; 100 kΩ in the DC U range at 1 and 10 V; 50 Ω in the DC I range
Measuring mode	
Measuring cycle, adjustable	
– DC U/I	240 ms/150 ms
– DC U/I/TC/RTD/R	300 ms/180 ms
Measuring duration	40 ms (50 Hz), 33 1/3 ms (60 Hz)
Type of connection for resistance measurements	Two-wire or three-wire system
Signal connection (see Fig. 2/5)	2 or 3 screw terminals/channel
Terminal range	0.13 to 2.5 mm^2 solid conductor 0.13 to 1.5 mm^2 stranded conductor with sleeves; Terminal designations to DIN 45 140
Operation, displays	
Display	Scale and pointer for measured values, green LED for display of recorder readiness, red LED for display of programming and test status
Operation	2 levers for function settings, 2 levers for service (mechanical release)
PC interface	For all settings and measured-value scanning
Connection	2-pin plug at front, connection to PC via special cable (accessory)
Real-time clock (SIREC LA)	
Format	Year, month, day, hour, minute, second; 12/24-hour representation, summer/winter time switchover
Deviation	Max. $1 \cdot 10^{-5}$
Backup	Via capacitor in event of power failure (approx. 5 min) or via battery (approx. 36 months)
Recording	
Chart drive	Step motor
Chart speeds A, B	1 – 1.25 – 2.5 – 5 – 10 – 20 – 60 – 120 – 300 – 600 – 1200 mm/h
Analog recording system	
Recording system	Replaceable fiber pens
Pen spacing	1.5 mm (in chart direction)
Colors	Red, green, blue
Recording length	Approx. 1800 m
Service period	Approx. 6 months
Storage life	Approx. 24 months in closed packing, approx. 1 month in recorder with climate to DIN IEC 654-1
Pen assembly drive	Program-controlled step motor
Resolution	0.108 mm
Carriage speed	Max. 40 mm/s
Recording width	100 mm
Recording system error	$F_{mech} \leq 0.35$ %
Text recording system (SIREC LA)	
Recording system (can only be used up to 120 mm/h)	Replaceable fiber pen
Character height	Approx. 2.4 mm or 2.8 mm with descenders
Characters/line	51
Character set	ASCII standard with upper-case and lower-case letters, Greek alphabet, special characters, binary signals, limit lines etc.
Grid (for grid-free chart paper)	Adjustable in 8 steps
Color	Black
Recording length	Approx. 100 000 characters
Service period	Approx. 6 months
Storage life	Approx. 24 months in closed packing, app. 1 month in recorder with climate to DIN IEC 654-1
Pen assembly drive	Program-controlled step motor
Speed	Approx. 0.4 characters/s
Limit monitoring	6 alarms, free assignment of channels MIN or MAX can be set
Alarm output	Recording of a symbol in event of upward or downward violation of a limit
Limit hysteresis	2 % of recording range
Digital input/output	
Digital inputs	4, electrically isolated via opto isolators, passive
Switching level	Low: –3 to +5 V, High: +8 to +30 V
Signal duration	≥ 0.5 s
Input resistance	≥ 5 kΩ
Functions	2 digital channels, measuring mode "Normal/Fast" each with "On/Off", chart speeds A/B, chart feed 10 to 100 mm, time marker, interlocking With SIREC LA: clock synchronization, summer time/winter time, input interlocking, event text, measured-value tables With SIREC L: event marking on all channels (peak approx. 3 mm)
Digital outputs	6
Electronic version	Electrically isolated via opto isolators, semiconductor switches, short-circuit-proof, open collector, P-switching
Output current	Max. 150 mA
Switching level	High ext. voltage ≥ – 2 V
Ext. power supply	DC 18 to 30 V
Relay version	Electrically isolated via relays, floating switchover contacts
Switching voltage/current	50 V, 1 A (external voltage)
Switching capacity	30 W or 60 VA
Contact life	1 x 10^8 mechanical 3 x 10^6 at max. load
Permissible potential	50 V
Connections	Subminiature plug, 25-pin, lockable
Power supply	
AC power supply	
Mains voltage	AC 230/115 V +15 to –20 % AC 24 V +15 to –20 %
Frequency range	47 to 64 Hz
Power consumption	20 VA (with options) at rated voltage
DC power supply	
Rated voltage	DC 24 V +20 to –15 %
Power consumption	15 W (with options) at rated voltage
DC 24 V output	DC 24 V ±15 %, 75 mA, short-circuit-proof Capacitive load ≤ 33 µF
Ambient conditions	
Climate	To IEC 68/2-1/2/ DIN EN 60 068-2-1/2
Temperature of use	0 to 50 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temp. max. 10 K/h

2

Line recorder 144 x 144

Storage temperature range	–25 to +70 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temperature max. 20 K/h
Mechanical	
Vibrations during operation	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 200 Hz; 10 m/s^2 acceleration
Vibrations during storage and transport	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 500 Hz; 10 m/s^2 acceleration
Drop test for packed unit	To DIN EN 60 068-2-32, height < 0.8 m
Shock test during operation	To IEC 68-2-27/ DIN EN 60 068-2-27 Half-sine: 150 m/s^2 (15 g), 11 ms
Resistance to earthquakes during operation	Parameters to KWU AVS DD 7080.9; 5 to 35 Hz; max. 10 mm deflection, max. 15 m/s^2 acceleration

Electromagnetic compatibility

Emitted interference

The targets of the EMC guideline 89/336/EEC with respect to radio interference suppression to EN 50 081-1 and interference rejection to EN 50 082-2, as well as NAMUR recommendation NE 21 are observed.

Radio interference Power supply	Limit class B, measured according to VDE 0875 Part 11 (CISPR 11)

Interference rejection

Device-under-test	Influencing variable	Basic standard	Instrument	
			Test condition	Res [2]
Instrument	RF field AM	IEC 1000-4-3	10 V/m [1]	A
	RF field PM	IEC 1000-4-3	10 V/m	A
	Mag. field	IEC 1000-4-8	[3]	–
	Discharge	IEC 1000-4-2	6/8 kV	A
Process, measuring and control lines	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5I	1/2 kV [4]	B
DC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [4]	A
	Interruption	IEC SC77BWG3	20 ms/100 %	A
	In-rush current	–	≤ 15 I_{rated}	–
AC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [4]	A
	Interruption	IEC SC77BWG3	20 ms/100 %	A
	In-rush current	IEC 1000-3-3	≤ 15 I_{rated}	–
	Overshoots	IEC 1000-3-2	Class D	–
Earth connection	RF conducted interference	IEC 1000-4-6	10 V	A

Mounting position	To DIN 16 257
Operation with roll	Vertical –30 to +15°
Operation with fanfold	Vertical –15 to +15°
Degree of protection	To IEC 529 or EN 60 529
Front with door	IP 54
Terminals, interfaces, plug connectors	IP 20

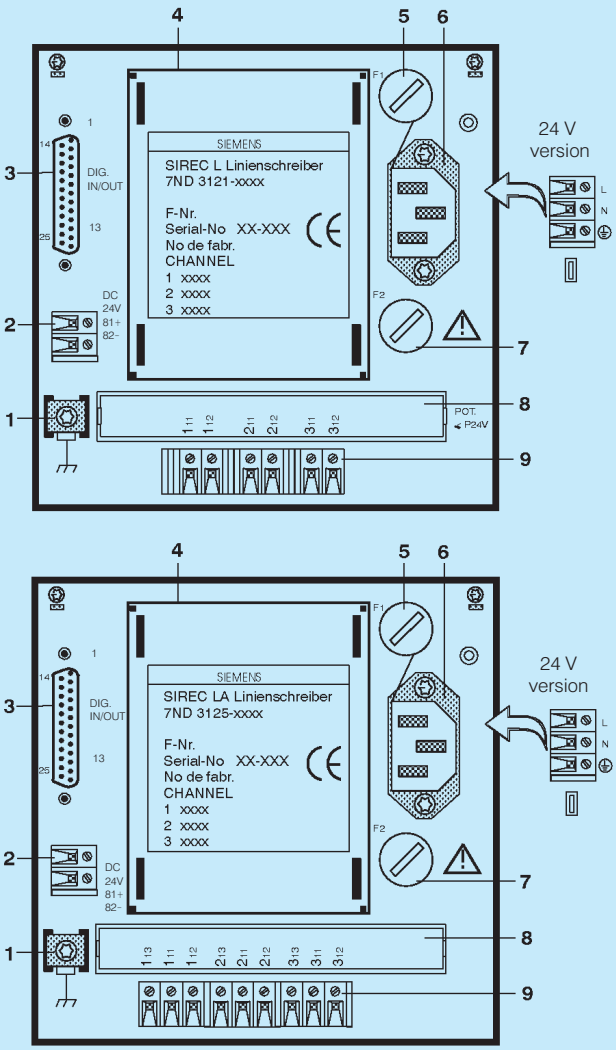
Electric safety

According to low-voltage guideline 73/23/EEC to EN 61010-1, overvoltage category II, degree of contamination 2 (IEC 1010-1, VDE 0411 Part 1)

Dimensions, mounting	
Dimensions	Front dimensions 144 x 144 to DIN 43 700 and DIN 43 831 (see Fig. 2/4)
Mounting	
Panel mounting	To DIN 43 834-A-340
Desk and cabinet mounting	To DIN 43 834-A-330
Front door	Plastic, spring-loaded latch
Weight	Approx. 4 kg

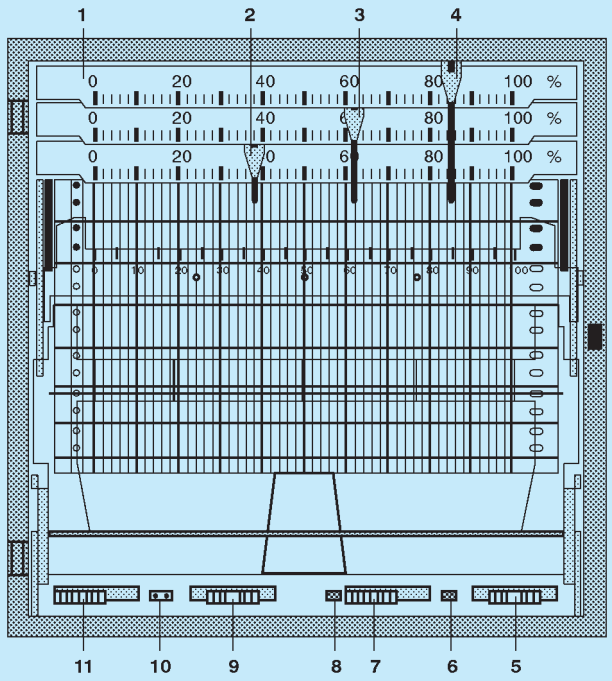
[1]) 3 V/m in the ranges 87 to 108, 174 to 230 and 470 to 790 MHz
[2]) Response A = class accuracy retained during effect
Response B = interference possible during effect
– = not relevant
[3]) Not relevant because of measuring and recording procedure used
[4]) 1 kV symmetric, 2 kV asymmetric

Line recorder 144 x 144



1 Ground connection
2 DC 24 V output
3 Digital input/output
4 Transformer with rating plate
5 Fuse F1
6 Power supply connection
7 Fuse F2
8 Window for measuring-point allocations with channel inscription for measuring ranges
9 Connection for analog channels

Fig. 2/5 Rear view of SIREC L (top) and LA (bottom)



1 Scale, channel 3
2 Pen, channel 1
3 Pen, channel 2
4 Pen, channel 3
5 Lever 3
6 LED, red
7 Lever 2
8 LED, green
9 Lever 1
10 PC interface
11 Service lever

Fig. 2/6 Front view of SIREC L/LA

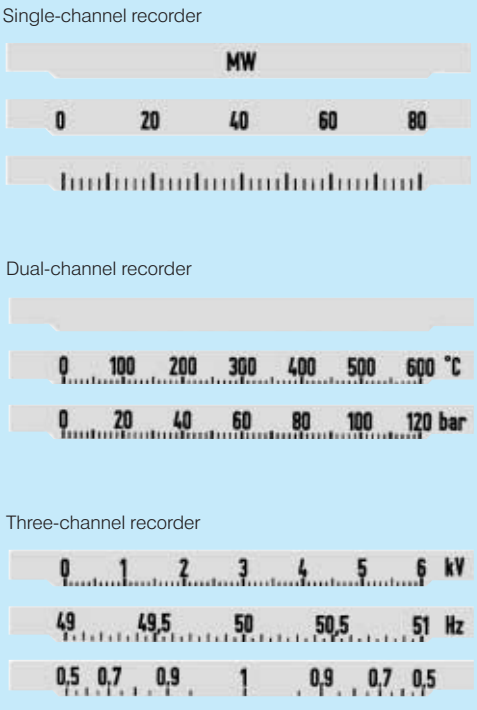


Fig. 2/7 Scale versions

Line recorder 144 x 144

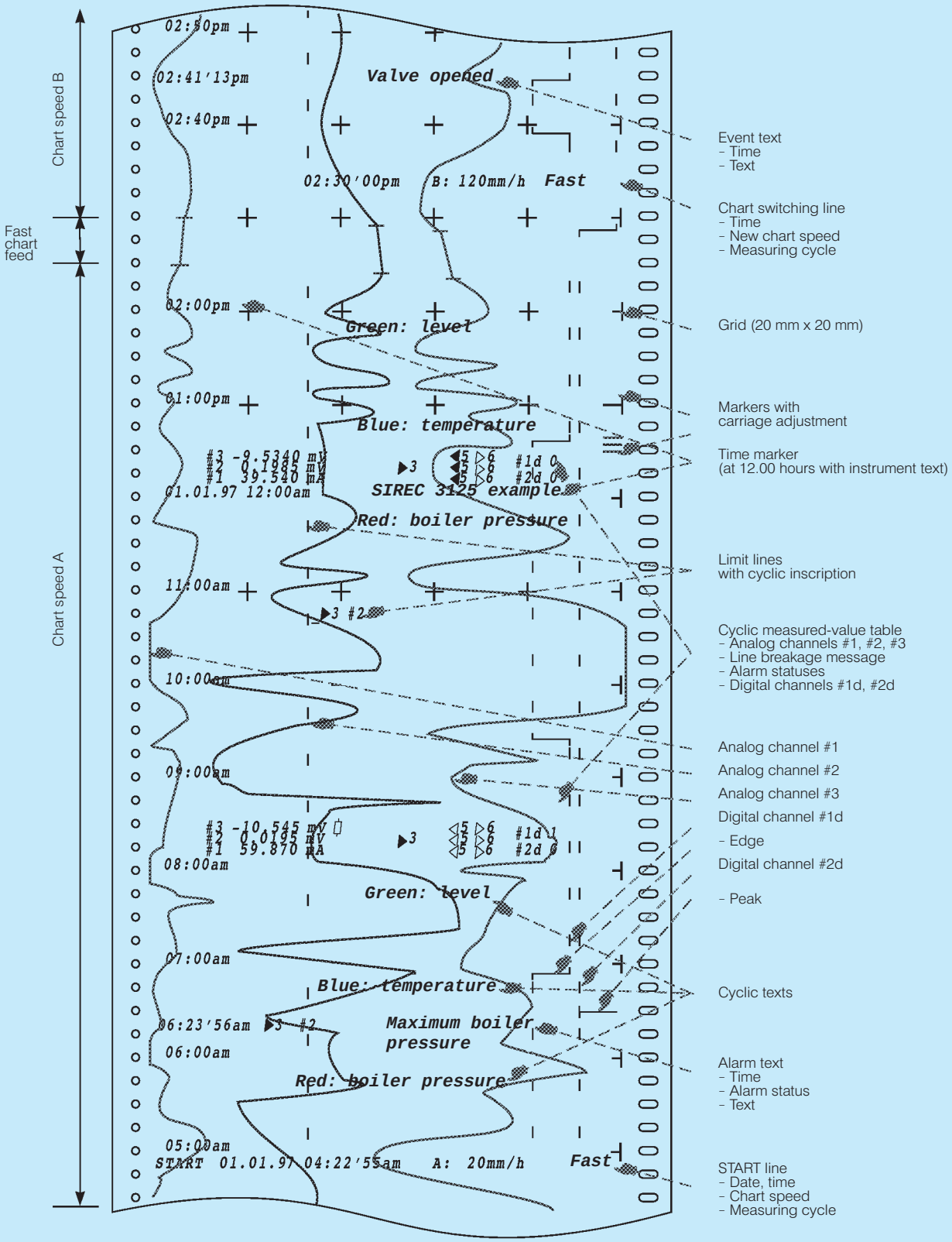


Fig. 2/8 Example of graphic recording with SIREC LA (80 % of original size)

Line recorder 144 x 144

Ordering data			Order No.	Order code	Price
Recorders available ex stock **SIREC L** Front dimensions 144 mm x 144 mm For installation in sheet-steel panel, cabinet or desk upright panel With recording unit for rolls or fanfold paper					
Single-channel line recorder [1] Dual-channel line recorder [1] Three-channel line recorder [1]			**7ND3121- 1 A A 1 1 - 1 N A 1** **7ND3121- 1 B A 1 1 - 1 N A 1** **7ND3121- 1 C A 1 1 - 1 N A 1**		
SIREC L Single-, dual- or three-channel line recorder [1], front dimensions 144 mm x 144 mm For installation in sheet-steel panel, cabinet or desk upright panel With recording unit for rolls or fanfold paper			**7ND3121-** ■ ■ ■ ■ ■ ■ **-** ■ **N A** ■ ■ ■ ■		
Power supply	AC 47 to 64 Hz AC 47 to 64 Hz AC 47 to 64 Hz DC 24 V	220 to 240 V 110 to 127 V 24 V	**1** **2** **3** **4**		
Number of channels	1, trace red 2, traces red and blue 3, traces red, blue and green		**A** **B** **C**		
Measured variables	DC U/I DC U/I/TC/RTD/R DC U/I, with DC 24 V output DC U/I/TC/RTD/R, with DC 24 V output		**A** **B** **C** **D**		
Digital input/output	Without With digital input, electronic output With digital input, relay output		**1** **2** **3**		
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B176 In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D101		**1** **3**		
Recorder setting	All channels set to 4 to 20 mA, scale(s) 0 to 100 % According to Order code [2] (see page 2/15)		**1** **3**		
Measuring-point label	Unlabelled Labelled (max. 29 digits/channel); specify desired inscription in plain text:		**1** **9**	**-Z** **. . .** **R1Y**	

Further designs on request.

Accessories, consumable material and conversion parts on page 2/15 ff

Scope of delivery

SIREC L line recorder 7ND3121 as ordered, 1 roll of chart paper, 1 accessories bag (1 to 3 fiber pen assemblies as ordered, 2 fuses), 1 appliance plug (with AC 230 or 115 V version), 2 clamps, 1 plug connector (with digital input/output), 1 measuring-point label, 1 ruler per scale, unpacking instructions, installation instructions, instructions "Operation – a concise overview", instructions "Parameterization – a concise overview". When using several SIREC L recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

[1] Basic setting when delivered:
The program interlock in the test menu is set such that all inputs are possible using the levers on the front of the instrument. The levers can be disabled at any time to permit customer-specific parameterization. The measured-value damping is set to "0 s" for all channels. The noise suppression is set for AC 50 Hz (switchable to AC 60 Hz).

[2] An order code is required for each channel (sequence: channel 1, 2, 3).
Example: Three-channel line recorder for mounting in cabinet, power supply AC 230 V, recording range DC 0 to 10 V for each channel, without digital input/output, all scales 0 to 5 t, measuring-point label inscribed.
Order as follows:
7ND3121-1CA11-3NA9-Z
R1Y + Y06 + Y06 + Y06
Each scale 0 to 5 t
In addition, plain text for inscription of measuring-point label (max. 29 digits/channel)

Line recorder 144 x 144

Ordering data			Order No.	Order code	Price
Recorders available ex stock **SIREC LA** with text output [3]) Front dimensions 144 mm x 144 mm With recording unit for rolls or fanfold paper Three-channel line recorder [1])			**7ND3125- 1 C B 1 1 - 1 N A 1**		
SIREC LA with text output Single-, dual- or three-channel line recorder [1]), front dimensions 144 mm x 144 mm For installation in sheet-steel panel, cabinet or desk upright panel With recording unit for rolls or fanfold paper			**7ND3125-** ■ ■ ■ ■ ■ ■ **-** ■ **N A** ■ ■ ■ ■		
Power supply	AC 47 to 64 Hz AC 47 to 64 Hz AC 47 to 64 Hz DC 24 V	220 to 240 V 110 to 127 V 24 V	**1** **2** **3** **4**		
Number of channels	1, trace red 2, traces red and blue 3, traces red, blue and green		**A** **B** **C**		
Measured variables	DC U/I/TC/RTD/R DC U/I/TC/RTD/R, with DC 24 V output		**B** **D**		
Digital input/output	Without With digital input, electronic output With digital input, relay output		**1** **2** **3**		
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B176 In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D101		**1** **3**		
Recorder setting	All channels set to 4 to 20 mA, scale(s) 0 to 100 % According to Order code [2]) (see page 2/15)		**1** **4**		
Measuring-point label	Unlabelled Labelled (max. 29 digits/channel); specify desired inscription in plain text:		**1** **9**	**-Z** **. . .** **R1Y**	

Further designs on request.

Accessories, consumable material and conversion parts on page 2/15 ff

Scope of delivery

SIREC LA line recorder 7ND3125 as ordered, 1 roll of chart paper, 1 accessories bag (1 to 3 fiber pen assemblies as ordered, 1 fiber pen assembly for alphanumeric output, 2 fuses), 1 appliance plug (with AC 230 or 115 V version), 2 clamps, 1 plug connector (with digital input/output), 1 measuring-point label, 1 ruler per scale, unpacking instructions, installation instructions, instructions "Operation – a concise overview", instructions "Parameterization – a concise overview", 1 battery (fitted).
When using several SIREC LA recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

[1]) Basic setting when delivered:
The program interlock in the test menu is set such that all inputs are possible using the levers on the front of the instrument. The levers can be disabled at any time to permit customer-specific parameterization.
The measured-value damping is set to "0 s" for all channels.
The noise suppression is set for AC 50 Hz (switchable to AC 60 Hz).

[2]) An order code is required for each channel (sequence: channel 1, 2, 3).
Example: Three-channel line recorder for mounting in cabinet, power supply AC 230 V, recording range DC 0 to 10 V for each channel, without digital input/output, all scales 0 to 5 t, measuring-point label inscribed
Order as follows:
7ND3125-1CB11-4NA9-Z
R1Y + Y06 + Y06 + Y06
Each scale 0 to 5 t
In addition, plain text for inscription of measuring-point label (max. 29 digits/channel)

[3]) Text output only recommended up to 120 mm paper feed.

Line recorder 144 x 144

Order codes

Recording range / Scales [4]	Measured variables: DC I (mA) 0 to 20	4 to 20	0 to 1	0 to 10	DC U (V) 0 to 1	0 to 10	0,2 to 1	2 to 10	Direct connection of sensor: Type of TC [3] J	L	T	U	K	N	E	S	B	R	RTD Pt 100 [2]	Ni 100 [2]	Acc. to plain text [1]	Price
According to plain text	**Y01**	**Y02**	**Y03**	**Y04**	**Y05**	**Y06**	**Y07**	**Y08**	**Y10**	**Y11**	**Y12**	**Y13**	**Y14**	**Y15**	**Y16**	**Y17**	**Y21**	**Y22**	**Y18**	**Y19**	**Y20**	

Ordering data

		Order No.	Price
Accessories			
Manual [5]	German	**C79000-G7300-C188**	
	English	**C79000-G7376-C188**	
	French	**C79000-G7377-C188**	
	Spanish	**C79000-G7378-C188**	
	Italian	**C79000-G7372-C188**	
Installation Instructions [5]		**C79000-M7364-C193**	
Instructions "Operation – a concise overview"			
	German	**C79000-M7300-C192**	
	English	**C79000-M7376-C192**	
	French	**C79000-M7377-C192**	
	Spanish	**C79000-M7378-C192**	
	Italian	**C79000-M7372-C192**	
Instructions "Parameterization – a concise overview"			
	German	**C79000-M7300-C191**	
	English	**C79000-M7376-C191**	
	French	**C79000-M7377-C191**	
	Spanish	**C79000-M7378-C191**	
	Italian	**C79000-M7372-C191**	
Transport housing			
– For AC 230 V version		**7ND9500-8AA3**	
– For DC 24 V version		**7ND9500-8AA4**	
SIMATIC PDM software from V5.2 onwards for parameterization of SIREC L and SIREC LA line recorders, with documentation (as help file)		**See catalog FI 01**	
Adapter cable for PC interface, with adapter (25 to 9)		**C79453-A3070-B104**	
Consumable material			
Chart paper 120 mm wide Recording width 100 mm 50 linear graduations			
• Roll, approx. 31 m long, approx. 0.15 kg			
Hours imprint			
For 10 mm/h		**C72452-A94-B208**	
20 mm/h		**C72452-A94-B209**	
60 mm/h		**C72452-A94-B210**	
120 mm/h		**C72452-A94-B211**	
Without		**C72452-A94-B212**	
Price per roll	20		
when ordering	60		
	100		
• Fanfold, approx. 16 m long, approx. 0.1 kg			
Hours imprint			
For 10 mm/h		**C72452-A94-B262**	
20 mm/h		**C72452-A94-B263**	
60 mm/h		**C72452-A94-B264**	
120 mm/h		**C72452-A94-B265**	
Without		**C72452-A94-B266**	
Price per pack	20		
when ordering	60		
	100		

		Order No.	Price
Chart paper 120 mm wide Recording width 100 mm Without graduations			
• Roll, approx. 31 m long, approx. 0.15 kg		**7ND9000-8EE**	
Price per roll	20		
when ordering	100		
• Fanfold, approx. 16 m long, approx. 0.1 kg		**7ND9000-1AE**	
Price per pack	20		
when ordering	100		
Fiber pen assembly			
Installation at top (channel 3)			
Green		**7ND9001-8AG**	
Installation in center (channel 2)			
Blue		**7ND9001-8AD**	
Red		**7ND9001-8AE**	
Installation at bottom (channel 1)			
Red		**7ND9001-8AA**	
Blue		**7ND9001-8AB**	
For alphanumeric output			
Black		**7ND9001-8DH**	
Lithium battery, 3 V (for the clock module)		**W79084-L1002-B1**	

Available ex stock

[1] Observe range limits in the technical data.

[2] Set to three-wire system.

[3] To DIN IEC 584
Type J: Fe/CuNi
Type K: NiCr/Ni
Type T: Cu/CuNi
Type S: Pt 10 % Rh/Pt
To DIN IEC 584
Type N: NiCrSi/NiSi
Type E: NiCr/CuNi
Type B: Pt30Rh/Pt6Rh
Type R: Pt13Rh/Pt
To DIN 43710
Type L: Fe-CuNi
Type U: Cu-CuNi

[4] Specify in addition: Order code(s) for the required recording range(s) including plain text(s) for the scale(s)

[5] Also available by downloading from the Internet (see page 5/10 bottom).

Line recorder 144 x 144

Ordering data (continued)	Order No.	Price
Conversion parts		
Digital input/output		
Electronic outputs	**7ND9400-8BF**	
Relay outputs	**7ND9400-8BE**	
DC 24 V output	**7ND9400-8BG**	
Recording unit		
For rolls or fanfold paper	**C72301-A20-A17**	
Take-up spool with rubber tongues	**C72301-A20-B110**	
Housing door with lock		
Normal	**C79165-A3029-B28**	
Low-reflection	**C79165-A3029-B30**	
Mounting set 72 x 72 for installation in panel or desk upright panel with basic grid dimensions 72 x 72	**C79453-A3011-D101**	
Measuring-point label		
Without inscription	**C79165-A3029-B367**	
With inscription (max. 29 digits per channel), specify in plain text: **Desired text: . . . . . .**	**C79165-A3029-B368-Z Y01**	
Ruler		
Without scale	**7ND9262**	
With one scale, Order code Y . . (see page 2/15)	**7ND9272-Z Y . .**	
Dummy pen required for channel not equipped with a pen assembly	**C79453-A3049-B522**	
Scales (see Fig. 2/7)		
• Without graduations (start and end are marked)	**7ND9300-8RA**	
• 1 scale for single-channel recorder (1 scale each for graduations, measured variable and dimension)	**7ND9300-8RB**	
• 1 scale for dual- and three-channel recorders (one scale is required for each channel)	**7ND9300-8RC**	

Multipoint recorder 144 x 144

Microprocessor-based multipoint recorder 144 x 144
Six-channel recorder, class 0.5
With fiber pen recording
Input variables DC U/I/TC/RTD/R
With or without text output

Fig. 2/9 SIREC P/PA (with alphanumeric text output)

Features

General:

- Operating modes:
  Measure, display, record
- Pen lift with pauses in operation and also in event of power failure
- Pens easily replaceable from the front
- Limit monitoring:
  Alarm identification and output with limit violations, freely-adjustable for every channel
- Time marking
- Input/output module: 4 inputs, 6 outputs electrically isolated; electronic outputs or relays
- Floating DC 24 V output for supply of input/output module or transmitter
- CE symbol, NAMUR and KTA requirements complied with; permits use under all conditions
- Housing front with degree of protection IP 54
- Installation without interspacing possible
- Mounting depth including connections 260 mm

In addition for recorders with alphanumeric text output

- Real-time calendar/clock
- Summer time/winter time switchover
- Output of error messages, instrument text

Measure:

- 6 analog channels and 2 digital channels
- Channel isolation: semiconductor relays, floating
- Measuring cycle 640/400 ms
- Measured variables (free selection possible):
  - Direct current, DC voltage
  - Temperature via thermocouple or resistance thermometer
  - Resistance transmitter (two-wire or three-wire system)
  - 2 digital channels
- Measuring ranges freely selectable with the range limits
- High measuring accuracy

Display:

- One scale plate (with max. 4 scales) and one pointer for measured values, easy readability
- LED status display (NAMUR)

Record:

- Recording with fiber recording head, 6 colors
- Freely-programmable recording ranges
- Adjustable chart speed
- Curve display (dotted line or dot-joining selectable)
- Zooming (scale expansion)
- Event marking
- Chart paper: roll or fanfold
- Formamide-free ink, large reservoir

In addition for recorders with alphanumeric text output

- Chart paper: also grid-free chart, grid is generated (in 8 steps)
- Alphanumeric output:
  date, time, start/stop line, channel code, alarms, 6 event texts (with 16 characters each), measured-value table and parameter printout

Adjustment/operation:

- All adjustments and operations using levers at front and via the PC interface (SIMATIC PDM software)
- Settings are saved by the non-volatile memory (EEPROM)

Technical data

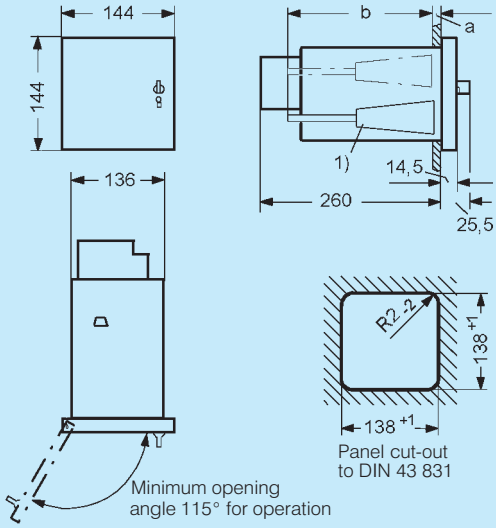
Note: Only values with tolerances or limits are guaranteed data. Values without tolerances are informative data. The defined error limits apply following a warming-up time of 30 minutes.

Measuring functions

General data

Number of channels	analog	6
	digital	2 (see digital input/output)
Channel isolation		Electrically isolated via semiconductors
Voltage endurance		See Table "Interference rejection" (page 2/20), protected with varistors from protective earth conductor

Multipoint recorder 144 x 144



Distance between centers
of 2 adjacent instruments or one above the other: ≥ 144 mm

Installation in	a	b
Sheet-steel panel or sheet-steel desk upright panel	2 to 42	230
Panel or desk upright panel with basic grid dimension 72 x 72	39 to 81	195.5

[1]) The clamps can also be fitted at the top and bottom.

Fig. 2/10 Dimensions

Permissible potential	Max. DC 24 V compared to PE conductor; only measuring circuits with safe isolation from power supply are permissible
Input overload	Max. 10 % of full-scale value
Overload	Max. 24 V continuously in DC U range, max. 40 mA continuously in DC I range
A/D conversion	Dual-slope converter
Resolution	14 1/2 bits
Common-mode rejection	90 dB at 50 Hz
Series-mode rejection	60 dB at 50 Hz
Reference conditions	
Ambient temperature	23 ± 2 °C
Relative humidity	55 ± 10 %
Source resistance	≤ 1 kΩ
Potential difference	≤ 1 V
Adjustment interval	≤ 24 months; an additional error of 0.01 %/year must be expected with a longer interval
Measured value calibration	Class 0.5 to DIN 43 782 or IEC 484
Damping	1st order low-pass, 0, 1, 3, 10, 30, 100 s or automatic adaptation to chart speed

Measuring range/ linearization range [3])	Resolution Normal cycle [1])	Maximum electric measuring error [2]) $F_{el} = F_{offset} + F_{rel} + F_{temp} + F_{terminal}$ (typ. 1/3 of max. measuring error)			
		F_{offset}	F_{rel}	F_{temp}	F_{term}
−40 to +40 mV	4 µV	16 µV	0.05	0.02 + 0 mV	–
−100 to +100 mV	10 µV	30 µV	0.05	0.02 + 0 mV	–
−400 to +400 mV	40 µV	120 µV	0.05	0.02 + 0 mV	–
−1000 to +1000 mV	100 µV	300 µA	0.05	0.02 + 0 mV	–
−1 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
0 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
+0.2 to +1 V	0.1 mV	0.3 mV	0.05	0.02 + 0 mV	–
−10 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
0 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
+2 to +10 V	1 mV	3 mV	0.05	0.02 + 0 mV	–
−20 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
0 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
+4 to +20 mA	2 µA	6 µA	0.05	0.02 + 0 mA	–
J (Fe/CuNi) −100 to +1200 °C/ −210 to +1200 °C	0.2 °C	0.6 °C	0.06	0.02 + 0 °C	0.8 °C
K (NiCr/Ni) −100 to +1370 °C/ −270 to +1370 °C	0.3 °C	0.8 °C	0.06	0.02 + 0 °C	0.8 °C
R (Pt13Rh/Pt) +100 to +1760 °C/ −50 to +1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
T (Cu/CuNi) −100 to +400 °C/ −270 to +400 °C	0.2 °C	0.6 °C	0.07	0.02 + 0 °C	0.8 °C
S (Pt10Rh/Pt) +100 to +1760 °C/ −50 to +1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
N (NiCrSi/NiSi) −100 to +1300 °C/ −200 to +1300 °C	0.4 °C	1 °C	0.05	0.02 + 0 °C	0.8 °C
E (NiCr/CuNi) −100 to +1000 °C/ −270 to +1000 °C	0.15 °C	0.5 °C	0.06	0.02 + 0 °C	0.8 °C
B (Pt30Rh/Pt6Rh) +600 to +1820 °C/ +100 to +1820 °C	0.6 °C	2 °C	0	0.01 + 0.2 °C	0.4 °C
L (FeCu/Ni) −100 to +900 °C/ −200 to +900 °C	0.2 °C	0.6 °C	0.06	0.02 + 0 °C	0.8 °C
U (Cu/CuNi) −100 to +560 °C/ −200 to +560 °C	0.2 °C	0.6 °C	0.07	0.02 + 0 °C	0.8 °C
0 to 300 Ω	0.03 Ω	0.2 Ω	0.07	0.02 + 0.02 Ω	–
0 to 1000 Ω	0.1 Ω	0.5 Ω	0.07	0.02 + 0.04 Ω	–
Pt 100 −200 to +800 °C/ −200 to +800 °C	0.08 °C	0.5 °C	0.05	0.02+0.05 °C	–
Ni 100 −60 to +180 °C/ −60 to +180 °C	0.05 °C	0.25 °C	0.07	0.02+0.025°C	–

Note:
A special calibration from a service place is recommended for a large stretching of the measuring ranges.

[1]) The specified values apply to the normal measuring cycle, they must be doubled for the fast cycle; the offset error F_{offset} becomes approx. 30 % larger.

[2]) Measuring error
F_{offset} (zero error) = absolute value specified in table
F_{rel} (increasing error) = percentage specified in table multiplied by the value of the read measured value (% · |MV|)
F_{temp} (temperature error at an increased ambient temperature) = percentage specified in table multiplied by the value of the absolute measured value (% · |MV|) plus a constant specified as an absolute value, total multiplied by the value of the temperature difference between the reference value 23 ± 2 °C and the ambient temperature.
$F_{terminal}$ (error of terminal temperature measurement) = absolute value specified in table for additional error with direct connection of thermocouples.

[3]) Linearization range = measuring range with thermocouples with slightly increased error at start-of-scale including overload range.

Multipoint recorder 144 x 144

Input resistance	10 MΩ in the TC/DC U range at ≤ 100 mV; 100 kΩ in the DC U range at 1 and 10 V; 50 Ω in the DC I range
Measuring mode	
Measuring cycle, adjustable	Normal 640 ms, fast 400 ms
Measuring duration	40 ms (50 Hz), 33 1/3 ms (60 Hz)
Type of connection for resistance measurements	Two-wire or three-wire system
Signal connection (see Fig. 2/11)	2 or 3 screw terminals per channel
Terminal range	0.13 to 2.5 mm^2 solid conductor 0.13 to 1.5 mm^2 stranded conductor with sleeves Terminal designations to DIN 45 140
Operation, displays	
Display	1 scale and 1 pointer for measured values, green LED for display of recorder readiness, red LED for display of programming and test status
Operation	2 levers for function settings, 2 levers for service (mechanical release)
PC interface	For all settings and measured-value scanning
Connection	2-pin plug at front, connection to PC via special cable (accessory)
Real-time clock (with alphanumeric text output)	
Format	Year, month, day, hour, minute, second; 12/24-hour representation, summer/winter time switchover
Deviation	Max. $1 \cdot 10^{-5}$
Backup	Via capacitor in event of power failure (approx. 5 min) or via battery (approx. 36 months)
Recording	
Operating modes	
Graphic recording	Dots or joined dots, programmable, time per dot programmable: 3, 6, 12, 24, 48 s or automatically adapted to selected chart speed
Alphanumeric printout (only recorders with alphanumeric text output)	Channel No., alarm symbols, date and time, measured-value table, 6 event texts (with 16 characters each), text with up to 20 characters; during pauses in operation: printout of measuring parameters
Recording range	"Value left" and "Value right" freely programmable
Recording system	
Pen assembly	Replaceable fiber pens
Colors	Violet, red, black, green, blue, brown
Recording length	Approx. 1800 m/color
Service period	Approx. 6 months
Storage life	Approx. 24 months in closed packing Approx. 1 month in recorder with climate to DIN IEC 654-1

Pen assembly drive	Program-controlled step motor
Resolution	0.125 mm
Carriage speed	Max. 125 mm/s
Recording system error	$F_{mech} \leq 0.3$ %
Chart drive	Program-controlled step motor class 0.005 DIN 43 782
Step length	0.02 mm
Chart speeds A and B (v1/v2) programmable	0 - 1 - 1.25 - 2.5 - 5 mm/h 10 - 20 - 60 - 120 mm/h (v1/v2 selectable via binary signal)
Chart paper	
Chart width	120 mm
Recording width	100 mm
Alphanumeric recording	
Character height	Approx. 2.2 mm
Characters/line	53
Character set	ASCII standard with upper-case and lower-case letters, Greek alphabet and special characters in 6 colors
Measured-value damping	
Filter	1st order low-pass
Time constant	0, 1, 3, 10, 30, 100 s per channel Adjustable or automatic adaptation to chart speed
Limit monitoring	6 alarms, free assignment of channels MIN or MAX can be set
Alarm output	Recording of a symbol in event of upward or downward violation of a limit
Limit hysteresis	2 % of recording range
Digital input/output	
Digital inputs	4, electrically isolated via opto isolators, passive
Switching level	Low: -3 to +5 V, High: +8 to +30 V
Signal duration	≥ 0.5 s
Input resistance	≥ 5 kΩ
Functions	2 digital channels, measuring mode "Normal/Fast" each with "On/Off", chart speeds A/B, chart feed 10 to 100 mm, clock synchronization, summer time/winter time, input interlocking, event text, measured-value tables
Digital outputs	6
Electronic version	Electrically isolated via opto isolators, semiconductor switches, short-circuit-proof, open collector, P-switching
Output current	Max. 150 mA
Switching level	High ext. voltage ≥ - 2 V
Ext. power supply	DC 18 to 30 V
Relay version	Electrically isolated via relays, floating switchover contacts
Switching voltage/current	50 V, 1 A (external voltage)
Switching capacity	30 W or 60 VA
Contact life	1 x 10^8 mechanical 3 x 10^6 at max. load
Permissible potential	50 V
Connections	Subminiature plug, 25-pin, lockable

Multipoint recorder 144 x 144

Power supply	
AC power supply	
Mains voltage	AC 230/115 V +15 to -20 % AC 24 V +15 to -20 %
Frequency range	47 to 64 Hz
Power consumption	20 VA (with options) at rated voltage
DC power supply	
Rated voltage	DC 24 V +20 to -15 %
Power consumption	15 W (with options) at rated voltage
DC 24 V output	DC 24 V ± 15 %, 75 mA, short-circuit-proof Capacitive load ≤ 33 µF
Ambient conditions	
Climate	To IEC 68/2-1/2/ DIN EN 60 068-2-1/2
Temperature of use	0 to 50 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temp. max. 10 K/h
Storage temperature range	-25 to +70 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temperature max. 20 K/h
Mechanical	
Vibrations during operation	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 200 Hz; 10 m/s^2 acceleration
Vibrations during storage and transport	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 500 Hz; 10 m/s^2 acceleration
Drop test for packed unit	To DIN EN 60 068-2-32, height < 0.8 m
Shock test during operation	To IEC 68-2-27/ DIN EN 60 068-2-27 Half-sine: 150 m/s^2 (15 g), 11 ms
Resistance to earthquakes during operation	Parameters to KWU AVS DD 7080.9; 5 to 35 Hz; max. 10 mm deflection, max. 15 m/s^2 acceleration
Mounting position	To DIN 16 257
Operation with roll	Vertical -30 to +15°
Operation with fanfold	Vertical -15 to +15°
Degree of protection	To IEC 529 or EN 60 529
Front with door	IP 54
Terminals, interfaces, plug connectors	IP 20

Electric safety
According to low-voltage guideline 73/23/EEC to EN 61010-1, overvoltage category II, degree of contamination 2 (IEC 1010-1, VDE 0411 Part 1)

Protection class	I

Electromagnetic compatibility
Emitted interference
The targets of the EMC guideline 89/336/EEC with respect to radio interference suppression to EN 50 081-1 and interference rejection to EN 50 082-2, as well as NAMUR recommendation NE 21 are observed.

Radio interference	
Power supply	Limit class B, measured according to VDE 0875 Part 11 (CISPR 11)

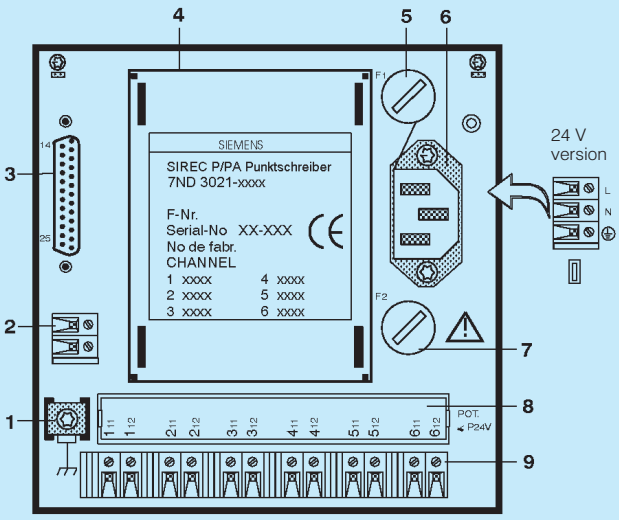
Interference rejection

Device-under-test	Influencing variable	Basic standard	Instrument	
			Test condition	Res [2]
Instrument	RF field AM	IEC 1000-4-3	10 V/m [1]	A
	RF field PM	IEC 1000-4-3	10 V/m	A
	Mag. field	IEC 1000-4-8	[3]	-
	Discharge	IEC 1000-4-2	6/8 kV	A
Process, measuring and control lines	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5I	1/2 kV [4]	B
DC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [4]	A
	Interruption	IEC SC77BWG3	20 ms/100 % ≤ 15 I_{rated}	A
	In-rush current	-		-
AC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [4]	A
	Interruption	IEC SC77BWG3	20 ms/100 % ≤ 15 I_{rated}	A
	In-rush current	IEC 1000-3-3		-
	Overshoots	IEC 1000-3-2	Class D	-
Earth connection	RF conducted interference	IEC 1000-4-6	10 V	A

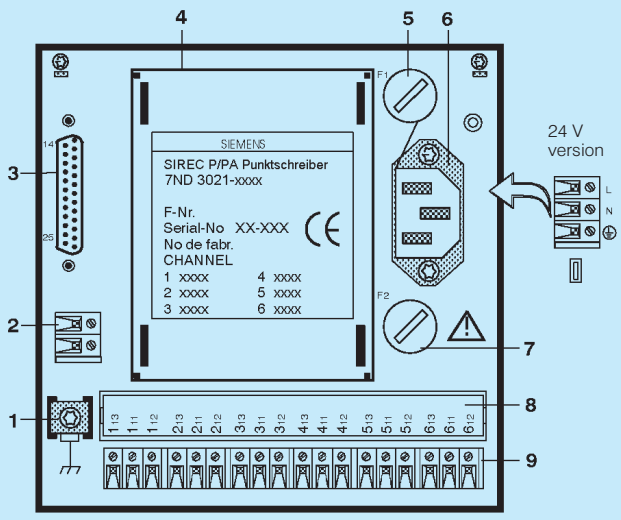
Dimensions, mounting	
Dimensions	Front dimensions 144 x 144 to DIN 43 700 and DIN 43 831 (see Fig. 2/10)
Mounting	
Panel mounting	To DIN 43 834-A-340
Desk and cabinet mounting	To DIN 43 834-A-330
Front door	Plastic, spring-loaded latch
Weight	Approx. 4 kg

[1]) 3 V/m in the ranges 87 to 108, 174 to 230 and 470 to 790 MHz
[2]) Response A = class accuracy retained during effect
Response B = interference possible during effect
- = not relevant
[3]) Not relevant because of measuring and recording procedure used
[4]) 1 kV symmetric, 2 kV asymmetric

Multipoint recorder 144 x 144



Version for DC U/I



Version for DC U/I/TC/RTD/R

"CHANNEL": inscription according to measuring ranges.

1 Ground connection
2 DC 24 V output
3 Digital input/output
4 Transformer with rating plate
5 Fuse F1
6 Power supply connection
7 Fuse F2
8 Window for measuring-point allocations with channel inscription for measuring ranges
9 Connection for analog channels

Fig. 2/11 Connection diagrams

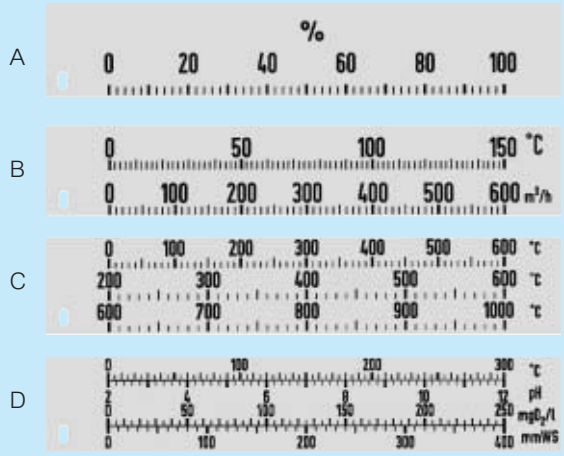


Fig. 2/12 Scale versions

Multipoint recorder 144 x 144

Ordering data			Order No.	Order code	Price
SIREC P/PA Six-channel multipoint recorder [1], front dimensions 144 mm x 144 mm, with recording unit for rolls or fanfold paper			7ND3021- ■■■■■■ - ■■■■ ■■■		
Power supply	AC 47 to 64 Hz AC 47 to 64 Hz AC 47 to 64 Hz DC 24 V	220 to 240 V 110 to 127 V 24 V	1 2 3 4		
Alphanumeric text	With Without		A B		
Measured variables	DC U/I DC U/I/TC/RTD/R DC U/I, with DC 24 V output DC U/I/TC/RTD/R, with DC 24 V output		A B C D		
Digital input/output	Without With digital input, electronic output With digital input, relay output		1 2 3		
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B176 In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D101		1 3		
Instrument settings	Recording range 4 to 20 mA According to plain text	Scale(s) (max. 4) [3] 0 to 100 % (for all channels) According to plain text	1 4 [2]	-Z	. . .
Housing door in protection IP 54	Without lock With lock	Standard door Door with low-reflection glass Standard door Door with low-reflection glass	N A P A R A S A		
Measuring-point label	Unlabelled Labelled (max. 29 digits/channel); specify desired inscription in plain text:		1 9	R1Y	

Further designs on request.

Available ex stock

Accessories, consumable material and conversion parts on page 2/23

Scope of delivery

SIREC P/PA multipoint recorder as ordered, 1 ruler per scale, 1 measuring-point label, 2 blank labels (for inscription of signal input), 2 clamps or 1 set of mounting parts, 2 instrument fuses, appliance plug, 1 roll of chart paper, 1 pen, 1 battery (fitted in 7ND3021-.A...-....), installation instructions, instructions "Operation – a concise overview", instructions "Parameterization – a concise overview", 2 keys for housing door with lock, 1 plug connector for recorder with digital input/output and for recorder with alphanumeric text, 6 shorting jumpers.

When using several SIREC P/PA recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

[1] Basic setting on delivery:
- The program interlock in the test menu is set such that only chart speed A (set to 20 mm/h) can be changed using the lever (enabling of lever is possible at any time).
- Dot joining for the graphic display of measured values.
- Color selected for output text: violet
- Channels with "Channel-specific parameters" are set to Measure ON and Recording ON. Channels without "Channel-specific parameters" are set to Measure OFF
- Noise suppression set for AC 50 Hz (switchable to AC 60 Hz).

[2] Plain text is required for each channel (sequence: channel 1 to 6) for the recording range and scale (max. 4 different scales are possible for the 6 channels).

Example: SIREC P/PA multipoint recorder, power supply AC 220 to 240 V, with text output, measured variables: DC U/I/TC/RTD, with digital input/output via opto isolator, for installation in panel, standard door without lock, measuring-point label inscribed.

Channel	Recording range	Scale	Label inscription
1	4 to 20 mA	0 to 10 bar, linear	Blower 1
2	0 to 20 mA	0 to 10 bar, linear	Blower 2
3	2 to 10 V	0 to 400 °C, linear	Furnace 1
4	Thermocouple J	400 to 800 °C, linear	Furnace 2
5	Thermocouple K	400 to 800 °C, linear	Furnace 3
6	Pt 100 (3-wire system)	0 to 200 °C, linear	Stack

Order as follows:
7ND3021-1AB21-4NA9-Z
R1Y + Y02 + Y01 + Y08 + Y10 + Y14 + Y18
Plus all data from the table of the example.

[3] All scales with the dimension °C are temperature-linear. Voltage- or resistance-linear temperature scales (only for older non-linearizing temperature transmitters) are available according to data in plain text.

Multipoint recorder 144 x 144

Order codes

Recording range / Scales [4]	Measured variables: DC I (mA) 0 to 20	4 to 20	0 to 1	0 to 10	DC U (V) 0 to 1	0 to 10	0,2 to 1	2 to 10	Direct connection of sensor: Type of TC [3] J	L	T	U	K	N	E	S	B	R	RTD Pt 100 [2]	Ni 100 [2]	Acc. to plain text [1]	Price
According to plain text	**Y01**	**Y02**	**Y03**	**Y04**	**Y05**	**Y06**	**Y07**	**Y08**	**Y10**	**Y11**	**Y12**	**Y13**	**Y14**	**Y15**	**Y16**	**Y17**	**Y21**	**Y22**	**Y18**	**Y19**	**Y20**	

Ordering data

		Order No.	Price
Accessories			
Manual [8]	German	**C79000-G7300-C188**	
	English	**C79000-G7376-C188**	
	French	**C79000-G7377-C188**	
	Spanish	**C79000-G7378-C188**	
	Italian	**C79000-G7372-C188**	
Installation Instructions [8]		**C79000-M7364-C193**	
Instructions "Operation – a concise overview"			
	German	**C79000-M7300-C192**	
	English	**C79000-M7376-C192**	
	French	**C79000-M7377-C192**	
	Spanish	**C79000-M7378-C192**	
	Italian	**C79000-M7372-C192**	
Instructions "Parameterization – a concise overview"			
	German	**C79000-M7300-C191**	
	English	**C79000-M7376-C191**	
	French	**C79000-M7377-C191**	
	Spanish	**C79000-M7378-C191**	
	Italian	**C79000-M7372-C191**	
Transport housing			
– For AC 230 V version		**7ND9500-8AA3**	
– For DC 24 V version		**7ND9500-8AA4**	
SIMATIC PDM software from V5.2 onwards for parameterization of SIREC P and SIREC PA multipoint recorders, with documentation (as help file)		**See catalog FI 01**	
Adapter cable for PC interface, with adapter (25 to 9)		**C79453-A3070-B104**	
Consumable material			
Chart paper 120 mm wide Recording width 100 mm 50 linear graduations			
• Roll,approx. 31 m long, approx. 0.15 kg			
Hours imprint			
For 10 mm/h		**C72452-A94-B208**	
20 mm/h		**C72452-A94-B209**	
60 mm/h		**C72452-A94-B210**	
120 mm/h		**C72452-A94-B211**	
Without		**C72452-A94-B212**	
Price per roll	20		
when ordering	60		
	100		
• Fanfold, approx. 16 m long, approx. 0.1 kg			
Hours imprint			
For 10 mm/h		**C72452-A94-B262**	
20 mm/h		**C72452-A94-B263**	
60 mm/h		**C72452-A94-B264**	
120 mm/h		**C72452-A94-B265**	
Without		**C72452-A94-B266**	
Price per pack	20		
when ordering	60		
	100		

	Order No.	Price
Consumable material (continued)		
Recording head (6 colors) violet, red, black, green, blue and brown	**7ND9001-8FB**	
Lithium battery, 3 V (for the clock module)	**W79084-L1002-B1**	
Conversion parts		
Digital input/output		
Electronic outputs	**7ND9400-8BF**	
Relay outputs	**7ND9400-8BE**	
DC 24 V output	**7ND9400-8BG**	
Recording unit		
For rolls or fanfold paper	**C72301-A20-A17**	
Take-up spool with rubber tongues	**C72301-A20-B110**	
Measuring-point label		
Without inscription	**C79165-A3029-B12**	
With inscription (max. 27 digits per channel), specify in plain text: **Desired text: . . .**	**C79165-A3029-B12-Z Y01**	

Scales

Type and arrangement of scales (Fig. 2/12)	Number of scales	Order No.
–	None [7]	**7ND9300-8QA**
A	One	**7ND9300-8QB** [5] [6]
B	Two	**7ND9300-8QC** [5] [6]
C	Three	**7ND9300-8QD** [5] [6]
D	Four	**7ND9300-8QE** [5] [6]

	Order No.
Ruler	
Without scale	**7ND9262**
With one scale	**7ND9272** [6]

Available ex stock

[1] Observe range limits in the technical data.

[2] Set to three-wire system.

[3] To DIN IEC 584
Type J: Fe/CuNi
Type K: NiCr/Ni
Type T: Cu/CuNi
Type S: Pt 10 % Rh/Pt
Type N: NiCrSi/NiSi
Type E: NiCr/CuNi
Type B: Pt30Rh/Pt6Rh
Type R: Pt13Rh/Pt
To DIN 43710
Type L: Fe-CuNi
Type U: Cu-CuNi

[4] Specify in addition: Order code(s) for the required recording range(s) including plain text(s) for the scale(s)

[5] A scale plate with one, two, three or four scales is required per recorder (Fig. 2/12: A, B, C or D); scale sequence from 1 at bottom to 4 at top according to sequence of Order codes 1 to 4.

[6] Specify in addition: Order code(s) for the required recording range(s) including plain text(s) for the scale(s) (see example for ordering on page 2/22).

[7] Start and end are marked.

[8] Also available by downloading from the Internet (see page 5/10 bottom).

SIREC PU

Multipoint recorder 144 x 144

7ND3523
Microprocessor-based multipoint recorder with display
Six-channel recorder, class 0.5
With fiber pen recording
Input variables DC U/I/TC

Features

General:

- Operating modes:
  - Measure
  - Display (as number and bar)
  - Record
- Limit monitoring:
  Alarm identification and output with limit violations, freely-adjustable for every channel
- Alarm linking
- Mathematical functions (cannot be retrofitted)
  - Fundamental operations
  - Statistical functions
  - Integration
  - Counter input
- Real-time calendar/clock
- Summer time/winter time switchover
- Output of error messages
- Input/output module: 4 inputs, 6 outputs via electronic outputs or relays
- Floating DC 24 V output for supply of input/output module or transmitter
- Housing front with degree of protection IP 54
- Installation without interspacing possible
- Mounting depth including connections 260 mm
- CE symbol, NAMUR/KTA requirements complied with

Measure:

- 6 analog channels and 2 digital channels
- Measuring cycle 0.3/0.5 s, depends on number of channels
- Measured variables (free selection possible):
  - Direct current, DC voltage
  - Temperature via thermocouples
- Channel isolation: semiconductor relays, floating
- Measured-value memory, thus no losses when replacing chart or during output of table (mixed mode)

Display:

- Display with background illumination, high contrast, large reading angle, background selectable as bright/black, brightness and contrast adjustable
- Display output of two measured values: numeric, analog bar display, mixed, including dimension, limit signals, alarm signals

Record:

- Recording with fiber recording head, max. 6 colors
- Curve display and printout as table
- Dot-joining technique
- Alphanumeric output: date, time, start/stop line, channel code, message text, alarms, event text, scale printout and measured-value table

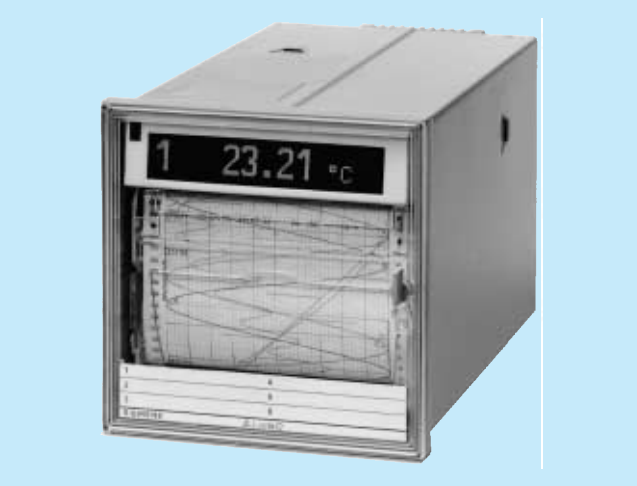
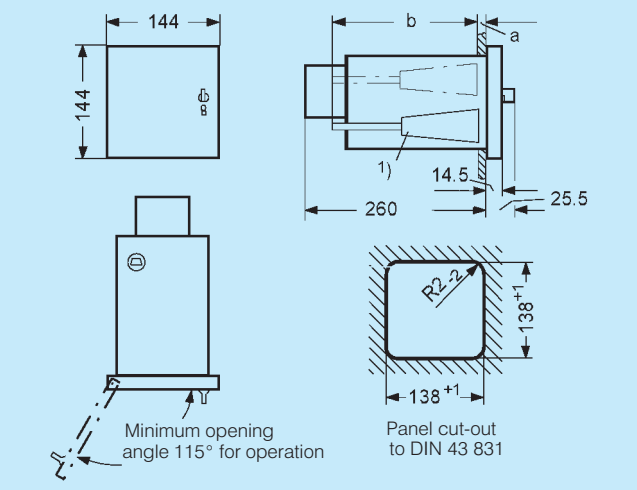


Fig. 2/13 SIREC PU

- Zooming and zoning (scale expansion and strip displays)
- Chart paper: roll or fanfold, also grid-free chart (grid is generated)

Adjustment/operation:

- Adjustments and operation using levers at front, the PC interface (SIMATIC PDM software) or the infrared remote control unit (is always required).
- Settings are saved by the non-volatile memory (EEPROM)



Distance between centers of adjacent instruments: ≥ 144 mm

Installation in	a	b
Sheet-steel panel or sheet-steel desk upright panel	2 to 42	230
Panel or desk upright pan. with basic grid dim. 72 x 72	39 to 81	195.5

[1]) The clamps can also be fitted at the top and bottom.

Fig. 2/14 Dimensions

Multipoint recorder 144 x 144

Technical data

Note: Only values with tolerances or limits are guaranteed data. Values without tolerances are informative data. The defined error limits apply following a warming-up time of 30 minutes.

Measuring functions	
Number of channels	6
Electric measuring ranges	Adjustable
Thermocouples	In °C or K
Functions $y = f(x)$	6 freely-programmable assignments between the input variable (x) (signal range) and the output variable (y) (measuring range), e.g. linearization with a maximum of 50 turning points each Dimension: 5 characters/dimension, freely-selectable/function Logic operations e.g. for control purposes
Channel isolation	Electrically isolated via semiconductor relays
Voltage endurance	Protected with varistors from PE conductor

Measuring range/ linearization range [1]	Resolution	Maximum electric measuring error [2] $F_{el} = F_{offset} + F_{rel} + F_{temp} + F_{terminal}$ (typ. 1/5 of max. measuring error)			
		F_{offset}	F_{rel}	F_{temp}	F_{term}
-10 to +60 mV	4 µV	15 µV	0.02	0.015 + 0 mV	-
-0.1 to +1 V	60 µV	0.2 mV	0.02	0.015 + 0 mV	-
-1 to +10 V	0.6 mV	2 mV	0.02	0.015 + 0 mV	-
-4 to +20 mA	1.2 µA	5 µA	0.03	0.015 + 0 mA	-
J (Fe/CuNi) -100 to +1000 °C/ -210 to +1000 °C	0.1 °C	0.4 °C	0.04	0.015 + 0 °C	0.8 °C
K (NiCr/Ni) -100 to +1370 °C/ -270 to +1370 °C	0.1 °C	0.4 °C	0.04	0.015 + 0 °C	0.8 °C
R (Pt13Rh/Pt) 100 to +1760 °C/ -50 to +1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
T (Cu/CuNi) -100 to +400 °C/ -270 to +400 °C	0.2 °C	0.6 °C	0.04	0.015 + 0 °C	0.8 °C
S (Pt10Rh/Pt) 100 to 1760 °C/ -50 to 1760 °C	0.5 °C	1.8 °C	0	0.01 + 0.2 °C	0.6 °C
N (NiCrSi/NiSi) -100 to +1300 °C/ -200 to +1300 °C	0.2 °C	0.8 °C	0.04	0.015 + 0 °C	0.8 °C
E (NiCr/CuNi) -100 to +800 °C/ -270 to +800 °C	0.1 °C	0.4 °C	0.04	0.015 + 0 °C	0.8 °C
B (Pt30Rh/Pt6Rh) 600 to 1820 °C/ 100 to 1820 °C	0.6 °C	2 °C	0	0.01 + 0.2 °C	0.4 °C
L (FeCu/Ni) -100 to +900 °C/ -200 to +900 °C	0.1 °C	0.4 °C	0.04	0.015 + 0 °C	0.8 °C
U (Cu/CuNi) -100 to +560 °C/ -200 to +560 °C	0.2 °C	0.6 °C	0.04	0.015 + 0 °C	0.8 °C

Note:
A special calibration from a service place is recommended for a large stretching of the measuring ranges.

[1] Linearization range = measuring range with thermocouples with slightly increased error at start-of-scale including overload range.

[2] Measuring error
F_{offset} (zero error) = absolute value specified in table
F_{rel} (increasing error) = percentage specified in table multiplied by the value of the read measured value (% · |MV|)
F_{temp} (temperature error at an increased ambient temperature) = percentage specified in table multiplied by the value of the absolute measured value (% · |MV|) plus a constant specified as an absolute value, total multiplied by the value of the temperature difference between the reference value 23 ± 2 °C and the ambient temperature.
$F_{terminal}$ (error of terminal temp. measurement = absolute value specified in table for additional error with direct connection of thermocouples.

Permissible potential	Max. DC 24 V compared to PE conductor; only measuring circuits with safe isolation from power supply are permissible
Detection of line breakage	60 mV range and TC, source resistance ≤ 2 kΩ
Input resistance	≥ 100 kΩ in DC U range 10 MΩ in TC range 50 Ω in DC I range
Overload capacity	Max. 10 % of respective electric start-of-scale or full-scale value
Overload	Max. 24 V continuously (in DC U/TC range) Max. 40 mA continuously (in DC I range)
A/D conversion	One common dual-slope converter
Measuring cycle	0.3 s with ≤ 3 channels, 0.5 s with ≥ 4 channels
Measuring duration	20 ms with 50 Hz mains freq. 16 2/3 ms with 60 Hz mains freq.
Resolution	14 1/2 bits
Commom-mode rejection	≥ 90 dB for rated frequency
Series-mode rejection	≥ 60 dB for rated frequency
Reference conditions	
Ambient temperature	23 ± 2 °C
Relative humidity	55 ± 10 %
Source resistance	≤ 1 kΩ
Potential difference	≤ 1 V
Adjustment interval	≤ 12 months; an additional error of 0.01 %/year must be expected with a longer interval
Measured value calibration	Class 0.5 to DIN 43 782 or IEC 484
Damping	1st order low-pass, adjustable 0 to 120 s
Signal connection	2 screw terminals per channel
Terminal range	0.13 to 2.5 mm² solid conductor 0.13 to 1.5 mm² stranded conductor with sleeves Terminal designations to DIN 45 140
Mathematical functions	Addition, subtraction, multiplication, division, square-root, exponent, polynomial, Napierian log, common log, absolute value, minimum, maximum, mean value, equation editor, summation, F-value (sterilization), Digital counter inputs 2 Hz
Operation, displays	
Display	LCD with background illumination
Display modes	
Alphanumeric	Measured values, messages, settings
Bars	Measured values
Characters/line	16 or 11 (see Fig. 2/19)
Character height	6.5 or 13 mm (see Fig. 2/19)
Operation	4 levers for basic functions and servicing on recorder Infrared remote control unit for all setting data, menu-based PC interface on front, for all setting data and measured values
Real-time clock	
Format	Year, month, day, hour, minute, second; 12/24-hour representation, Summer/winter time switchover

2

Multipoint recorder 144 x 144

Error	Max. $1 \cdot 10^{-5}$
Backup	Via capacitor in event of power failure (approx. 5 min) or via battery (approx. 36 months)
Recording	
Recording method	Discontinuous with intermediate storage of measured value, compensation of pen offset
Chart drive	Step motor
Chart speed (2 speeds preselectable and switchable via control input)	1 - 1.25 - 2 - 2.5 - 5 - 10 - 15 -20 - 30 - 40 - 50 - 60 - 100 - 120 - 150 - 180 - 200 - 300 - 600 - 1200 mm/h
Recording system	
Pen assembly	Replaceable fiber pens
Colors	Violet, red, black, green, blue, brown
Recording length	Approx. 1800 m
Service period	Approx. 6 months
Storage life	Approx. 24 months in closed packing, approx. 1 month in recorder with climate to DIN IEC 654-1
Pen assembly drive	Program-controlled step motor
Resolution	0.125 mm
Carriage speed	Max. 125 mm/s
Recording system error	$F_{mech} \leq 0.3$ %
Recording width	100 mm
Alphanumeric recording	
Character height	Approx. 2.2 mm
Characters/line	53
Character set	ASCII standard with upper-case and lower-case letters, Greek alphabet and special characters in 6 colors
Limit monitoring	2 alarms per channel, free assignment of channels MIN or MAX adjustable
Alarm signalling	Recording of a symbol in event of upward or downward violation of a limit
Limit hysteresis	2 % of recording range
Digital input/output	
Digital inputs	4, electrically isolated via opto isolators, passive
Switching level	Low $\leq$ 0.3 V, High +8 V to +30 V
Input resistance	$\geq$ 5 kΩ
Digital outputs	6
Electronic version	Electrically isolated via opto isolators, semiconductor switches, short-circuit-proof, P-switching
Output current	Max. 150 mA
Switching level	High ext. voltage $\geq$ - 2 V
Ext. power supply	DC 18 to 30 V
Relay version	Electrically isolated via relays, floating switchover contacts
Switching voltage/current	50 V, 1 A (external voltage)
Switching capacity	30 W or 60 VA
Contact life	1 x 10^8 mechanical 3 x 10^6 at max. load
Permissible potential	50 V
Connections	Subminiature plug, 25-pin, lockable

Power supply	
AC power supply	
Mains voltage	AC 230/115 V +15 % to -20 % AC 24 V +15 % to -20 %
Frequency range	47 to 64 Hz
Power consumption	30 VA (with options) at rated voltage
DC power supply	
Rated voltage	DC 24 V +20 % to -15 %
Power consumption	18 W (with options) at rated voltage
DC 24 V output	DC 24 V ± 15 %, 75 mA, short-circuit-proof Capacitive load $\leq$ 33 µF
Ambient conditions	
Climate	To IEC 68-2-1/2/ DIN EN 60 068-2-1/2
Temperature of use	0 to 50 °C (max. 75 % rel. humidity, no condensation), change in temperature max. 10 K/h
Storage temperature range	-25 to +70 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temperature max. 20 K/h
Mechanical	
Vibrations during operation	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 200 Hz; 10 m/s^2 acceleration
Vibrations during storage and transport	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 500 Hz; 10 m/s^2 acceleration
Drop test for packed unit	To DIN EN 60 068-2-32, height < 0.8 m
Shock test during operation	To IEC 68-2-27/ DIN EN 60 068-2-27 Half-sine: 150 m/s^2 (15 g), 11 ms
Resistance to earthquakes during operation	Parameters to KWU AVS DD 7080.9; 5 to 35 Hz; max. 10 mm deflection, max. 15 m/s^2 acceleration
Mounting position	To DIN 16 257
Operation with roll	Vertical -30° to +15°
Operation with fanfold	Vertical -15° to +15°
Degree of protection	To IEC 529 or EN 60 529
Front with door	IP 54
Terminals, interfaces, plug connectors	IP 20

Electric safety
According to low-voltage guideline 73/23/EEC to EN 61010-1, overvoltage category II, degree of contamination 2 (IEC 1010-1, VDE 0411 Part 1)

Protection class	I

Multipoint recorder 144 x 144

Electromagnetic compatibility

Emitted interference

The targets of the EMC guideline 89/336/EEC with respect to radio interference suppression to EN 50 081-1 and interference rejection to EN 50 082-2, as well as NAMUR recommendation NE 21 are observed.

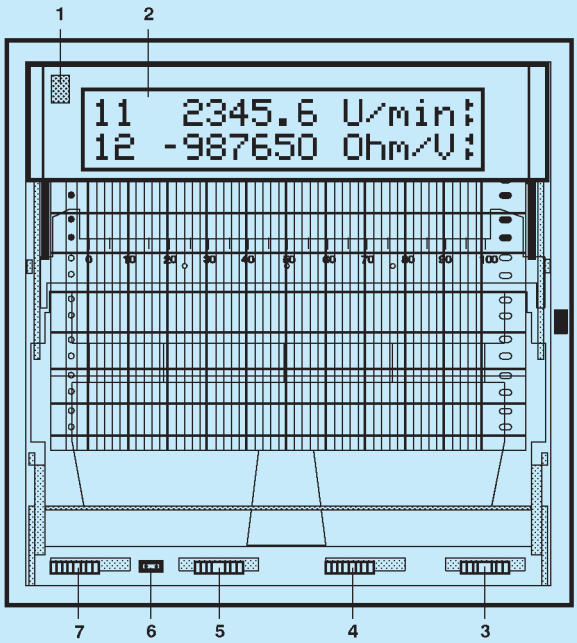
Radio interference Power supply	Limit class B, measured according to VDE 0875 Part 11 (CISPR 11)

Device-under-test	Influencing variable	Basic standard	Instrument	
			Test condition	Res [2]
Instrument	RF field AM	IEC 1000-4-3	10 V/m [1]	A
	RF field PM	IEC 1000-4-3	10 V/m	A
	Mag. field	IEC 1000-4-8	[3]	–
	Discharge	IEC 1000-4-2	6/8 kV	A
Process, measuring and control lines	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	1/2 kV	A
	Surge	IEC 1000-4-5I	1/2 kV [4]	B

[1] 3 V/m in the ranges 87 to 108, 174 to 230 and 470 to 790 MHz
[2] Response A = class accuracy retained during effect
Response B = interference possible during effect
– = not relevant
[3] Not relevant because of measuring and recording procedure used
[4] 1 kV symmetric, 2 kV asymmetric

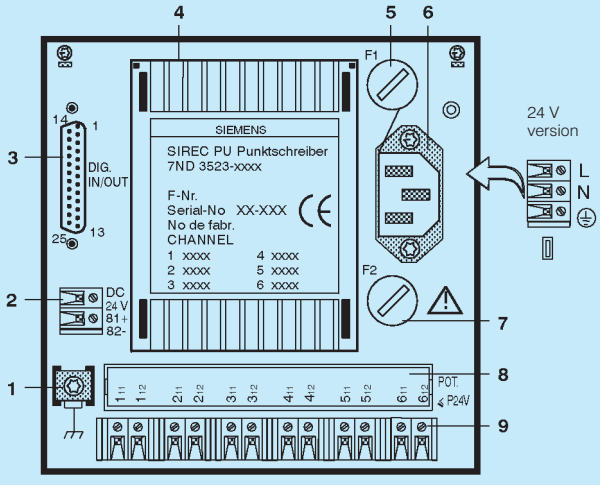
Device-under-test	Influencing variable	Basic standard	Instrument	
			Test condition	Res [2]
DC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [1]	A
	Interruption	IEC SC77BWG3	20 ms/100 %	A
	In-rush current	–	≤ 15 I_{rated}	–
AC power inputs	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/2 kV [1]	A
	Interruption	IEC SC77BWG3	20 ms/100 %	A
	In-rush current	IEC 1000-3-3	≤ 15 I_{rated}	–
	Overshoots	IEC 1000-3-2	Class D	–
Earth connection	RF conducted interference	IEC 1000-4-6	10 V	A

Dimensions, mounting	
Dimensions	Front dimensions 144 x 144 to DIN 43 700 and DIN 43 831 (see Fig. 2/15)
Mounting	
Panel mounting	To DIN 43 834-A-340
Desk and cabinet mounting	To DIN 43 834-A-330
Front door	Plastic with spring-loaded latch
Weight	Approx. 4.3 kg



1 Infrared receiver
2 Display
3 Lever 3
4 Lever 2
5 Lever 1
6 PC interface
7 Service lever

Fig. 2/15 Front view



1 Ground connection
2 DC 24 V output
3 Digital input/output
4 Transformer with rating plate
5 Fuse F1
6 Power supply connection
7 Fuse F2
8 Window for measuring-point allocations with channel inscription for measuring ranges
9 Connection for analog channels

Fig. 2/16 Rear view

Multipoint recorder 144 x 144

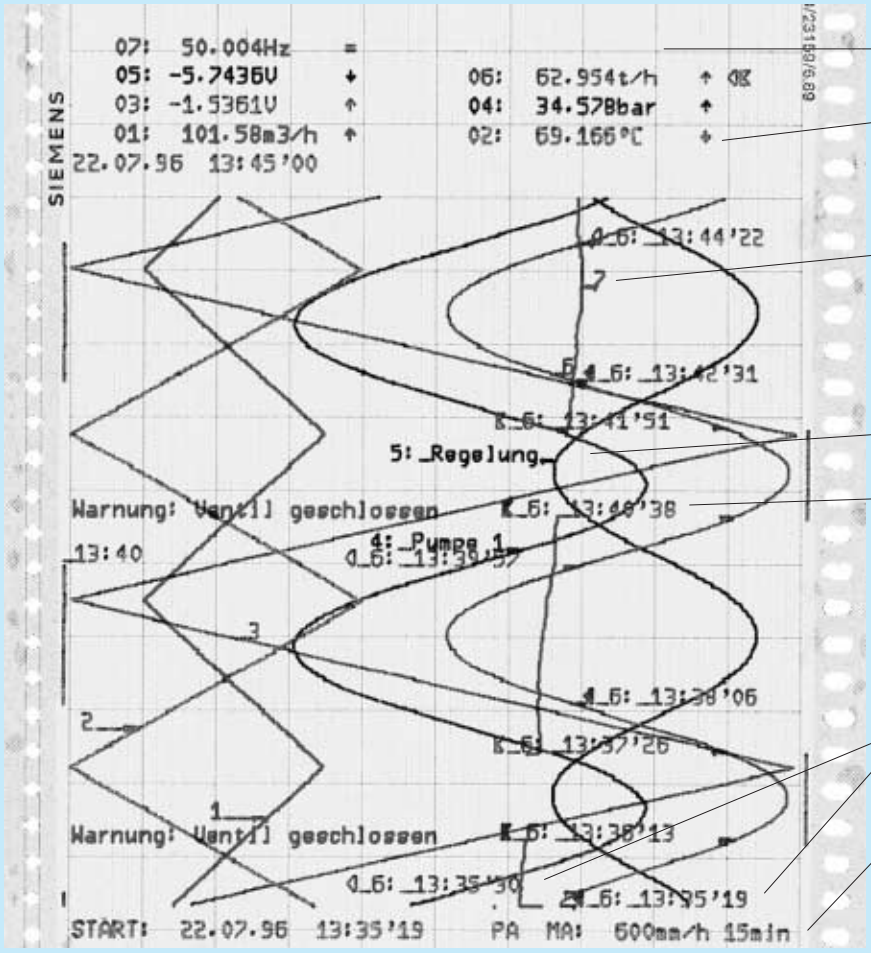
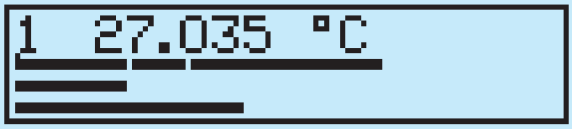


Fig. 2/17 Example of graphic recording (80 % of original size)

Measured-value display "Numeric (1)"

Measured-value display "Numeric/analog (1)"

Measured-value display "Numeric (2)"



Measured-value display "Numeric/analog (3)"

Fig. 2/18 Display examples

Multipoint recorder 144 x 144

Ordering data			Order No.	Order code	Price
Recorders available ex stock **SIREC PU** with display Six-channel multipoint recorder, front dimensions 144 mm x 144 mm For installation in sheet-steel panel, cabinet or desk upright panel With recording unit for rolls or fanfold paper			**7ND3523- 1 A B 1 1 - 1 N A 1**		
SIREC PU with display Six-channel multipoint recorder, front dimensions 144 mm x 144 mm For installation in sheet-steel panel, cabinet or desk upright panel With recording unit for rolls or fanfold paper			**7ND3523-** ■■■■■■ **- ■ N A ■** ■■■		
Power supply	AC 47 to 64 Hz AC 47 to 64 Hz AC 47 to 64 Hz DC 24 V	220 to 240 V 110 to 127 V 24 V	**1** **2** **3** **4**		
Number of channels	6 6, with mathematical functions [1]		**A** **B**		
Measured variables	DC U/I/TC DC U/I/TC, with DC 24 V output		**B** **D**		
Digital input/output	Without With digital input, electronic output With digital input, relay output		**1** **2** **3**		
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B176 In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D101		**1** **3**		
Recorder setting	All 6 channels set to 4 to 20 mA Specify for all 6 channels in plain text . . . . . . (including built-in battery for clock module)		**1** **4**	**-Z**	**Y01**
Measuring-point label	Unlabelled Labelled (max. 29 digits/channel); specify desired inscription in plain text:		**1** **9**		**R1Y**

Further designs on request.

Note:
Operation always requires a remote control unit 7ND9190-8AA.

Accessories, consumable material and conversion parts on page 2/30

Scope of delivery

SIREC PU multipoint recorder 7ND3523 as ordered, 1 roll of chart paper, 1 accessories bag (1 recording head, 2 fuses), 1 appliance plug (with AC 230 or 115 V version), 2 clamps, 1 plug connector (with digital input/output), 1 measuring-point label, unpacking instructions, installation instructions, instructions "Operation – a concise overview", instructions "Parameterization – a concise overview", 1 battery (fitted).
When using several SIREC PU recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

[1]) SIPROM R-PU required for parameterization.

Multipoint recorder 144 x 144

Ordering data	Order No.	Price
Accessories		
Manual (as file: Instruction Manual for recorder and PC interface) [1]		
German	C79000-G7300-C195	
English	C79000-G7376-C195	
French	C79000-G7377-C195	
Spanish	C79000-G7378-C195	
Italian	C79000-G7372-C195	
Installation Instructions, in 5 languages	C79000-M7364-C200	
Instructions "Operation – a concise overview"		
German	C79000-M7300-C199	
English	C79000-M7376-C199	
French	C79000-M7377-C199	
Spanish	C79000-M7378-C199	
Italian	C79000-M7372-C199	
"Parameterization – a concise overview"		
German	C79000-M7300-C198	
English	C79000-M7376-C198	
French	C79000-M7377-C198	
Spanish	C79000-M7378-C198	
Italian	C79000-M7372-C198	
Transport housing		
– For AC 230 V version	7ND9500-8AA3	
– For DC 24 V version	7ND9500-8AA4	
SIMATIC PDM software from V5.2 onwards for parameterization of SIREC PU multipoint recorders, with documentation (as help file)	See catalog FI 01	
Adapter cable for PC interface, with adapter (25 to 9)	C79453-A3070-B104	
Infrared remote control unit with 4 alkaline batteries each 1.5 V	7ND9190-8AA	
Consumable material		
Chart paper 120 mm wide Recording width 100 mm 50 linear graduations		
• Roll, approx. 31 m long, approx. 0.15 kg		
Hours imprint		
For 10 mm/h	C72452-A94-B208	
20 mm/h	C72452-A94-B209	
60 mm/h	C72452-A94-B210	
120 mm/h	C72452-A94-B211	
Without	C72452-A94-B212	
Price per roll when ordering 20		
60		
100		
• Fanfold, approx. 16 m long, approx. 0.1 kg		
Hours imprint		
For 10 mm/h	C72452-A94-B262	
20 mm/h	C72452-A94-B263	
60 mm/h	C72452-A94-B264	
120 mm/h	C72452-A94-B265	
Without	C72452-A94-B266	
Price per pack when ordering 20		
60		
100		

	Order No.	Price
Chart paper 120 mm wide Recording width 100 mm Without graduations		
• Roll, approx. 31 m long, approx. 0.15 kg	7ND9000-8EE	
Price per roll when ordering 20		
100		
• Fanfold, approx. 16 m long, approx. 0.1 kg	7ND9000-1AE	
Price per pack when ordering 20		
100		
Recording head (6 colors) violet, red, black, green, blue and brown	7ND9001-8FB	
Lithium battery, 3 V (for the clock module)	W79084-L1002-B1	
Conversion parts		
Digital input/output		
Electronic outputs	7ND9400-8BF	
Relay outputs	7ND9400-8BE	
DC 24 V output	7ND9400-8BG	
Recording unit		
For fanfold paper	C72301-A20-A6	
For rolls or fanfold paper	C72301-A20-A7	
Take-up spool with rubber tongues	C72301-A20-B110	
Housing door with lock		
Normal	C79165-A3029-B28	
Low-reflection	C79165-A3029-B30	
Mounting set 72 x 72 for installation in panel or desk upright panel with basic grid dimensions 72 x 72	C79453-A3011-D101	
Measuring-point label		
Without inscription	C79165-A3029-B382	
With inscription (max. 29 digits per channel), specify in plain text: **Desired text: . . . . . .**	C79165-A3029-B383-Z Y01	

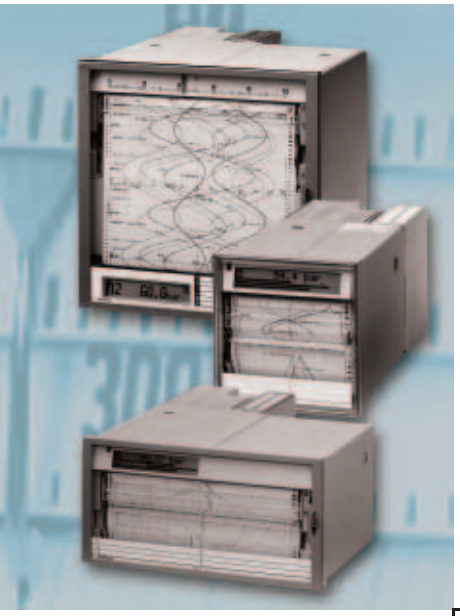
Fig. 2/19 Infrared remote control unit

Available ex stock

[1] Also available by downloading from the Internet (see page 5/10 bottom).

Hybrid recorders
VARIOGRAPH

3



3/2	**Summary**
3/3	**Technical explanations**
3/6	**Ordering information**
3/7	**VARIOGRAPH 7ND3521, 7ND3590, 7ND3560**
3/7	Universal hybrid recorders 144 x 144, 288 x 144 and 288 x 288
3/16	Ordering data 144 x 144
3/17	Ordering data 288 x 144
3/18	Ordering data 288 x 288
3/19	Accessories
3/19	Consumable material
3/19	Replacement parts
3/19	Conversion parts
	SIMATIC PDM software for parameterizing of VARIOGRAPH see catalog FI 01

Summary

3

	VARIOGRAPH 7ND3560 Page 3/7	VARIOGRAPH 7ND3590 Page 3/7	VARIOGRAPH 7ND3521 Page 3/7
Format	288 x 288	288 x 144	144 x 144
Class		0.5	
Microprocessor-based		■	
Analog inputs		3, 6 or 12	
Digital inputs/outputs		6/8	
Inputs		Plug-in modules	
Measured variable Current		DC	
Voltage		DC	
Temperature		Thermocouple	
		Resistance thermometer	
Resistance		■ (2- or 3-wire)	
Measuring ranges		Freely-programmable	
Operating modes		Display, curves, tables	
Recording method		Fiber pen	
Chart paper	Roll	Roll	Roll or fanfold pack
Recording width	210 mm	210 mm	100 mm
Number of colors		6	
Text printout		■	
Scale printout		■	
Date and time printout		■	
Alarms		2 per channel, freely-programmable	
Math. functions		■	
Alarm text		Per channel	
Alarm linking		■	
Zooming		■	
Zoning		■	
Remote operation		■	
Remote control		–	
PC connection		■	
Line recorder function		Dot-joining	
Pen offset		Compensated	
Interface		Serial	
Storage (measured values)		Short-term	
Power supply		AC 24 or 110 to 240 V DC 24 or 110 to 230 V	
Operator prompting		De/En/Fr	
Mounting		Sheet-steel panel, desk upright panel, cabinet	
		Panel with 72 x 72 grid	
Installation without interspacing		■	

The range of flush-mounted recorders – 3 standardized formats – comprises 3 hybrid recorders which can record texts and the date and time in addition to printing curves and tables of measured values.

Fiber pens are used for recording. All recorders are characterized by a robust design and programmable parameters. The recording is largely independent of the position, and the recorders are easy to service.

Recording method

With the fiber pen recording, the reservoir and fiber tip are combined in one assembly. Violet, red, black, green, blue and brown pens are available for the VARIOGRAPH hybrid recorders.

VARIOGRAPH recording method

The VARIOGRAPH recorders operate according to a discontinuous recording method.

The values are measured using a short scanning cycle, stored in intermediate memory, and output channel-by-channel within one recording cycle with a max. recording length of 5 mm.

If
- highly oscillating signals with a large amplitude (approx. $^2/_3$ of the chart width) and/or
- long character strings such as texts and measured-value tables

have to be output over a longer period, the maximum possible output speed of the recording system is insufficient.

To prevent the loss of measured values with such types of signal – which are not typical for process engineering applications – the maximum chart speed should not be set. It is additionally recommendable to omit simultaneous use of all properties of the recorders in such cases, especially the output of texts and tables.

Design

Sheet-steel housing, ergo gray (RAL 7032) or dust gray (RAL 7037)

7ND3521:
Plastic front door with matt border, with spring-loaded latch or with spring-loaded latch and lock.

7ND3590, 7ND3560:
Front door with lock and glass pane, front frame dust gray (RAL 7037).

Frame width:
7.5 mm/12 mm (housing format 288 x 144)
9 mm/15 mm (housing format 288 x 288)

Front dimensions to DIN 43831.
Dimensions and panel cut-outs are specified with the respective recorders.

Technical explanations

Error limits and interference suppression

The recorders comply with class 0.5 of the regulations for electrical measuring instruments. Any differences are listed in the Technical data.

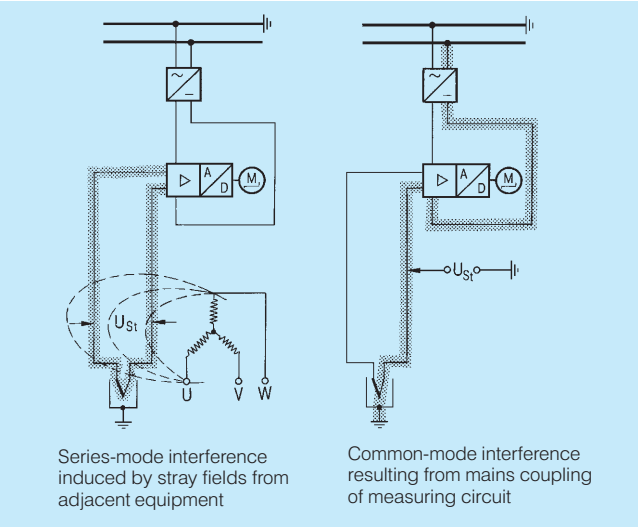
The interference suppression St_U is specified in decibels. It is determined according to the following equation:

$$St_U = 20 \cdot \log_{10} \frac{U_{St}}{U_{Sig}} \quad dB$$

U_{St} Measured value of the interference signal
U_{Sig} Determined value of the wanted signal

The worst condition is used in each case for the frequency and phase position of the interference. Since there are two manners in which the interference can affect the measuring circuit (common-mode or series-mode), two values in decibels are always required to completely specify the interference suppression.

The increasing energy density in modern plants means that it is advisable to suppress at least the induced series-mode interference at the point of occurrence (e.g. using commercially available contactors).



Series-mode interference induced by stray fields from adjacent equipment

Common-mode interference resulting from mains coupling of measuring circuit

Fig. 3/1 Generation of interference signals

Limit monitoring

The limit monitoring functions of the hybrid recorders output a binary signal when programmed limits are violated. Two limits (opto isolator outputs) can be programmed for each channel.

Technical explanations

Features

The VARIOGRAPH hybrid recorder has up to 12 channels for analog signals and/or 6 channels for digital signals (via serial interface and/or digital input/output). In addition, one of the channels 1 to 7 can be programmed to measure the mains frequency, and another to measure the terminal temperature. The minimum scanning cycle for all channels is 120 ms, and the maximum 3 s.

The recorder can be used as a multipoint or line recorder. Its fiber pen assembly records the measured values from up to 12 channels graphically and/or alphanumerically in 6 freely-selectable colors. The recorder can monitor the maximum and/or minimum values of measured variables in static or dynamic mode, and mark these on the chart by symbols with the channel No. and also with text or the time if required. Chart rolls are used, or also fanfold packs with the 7ND3521.

Further features of the VARIOGRAPH hybrid recorder:

- Permanent recording, or recording on event
- 2 different programs
- Menu-based programming with IR remote control unit
- Communication in 3 languages
- Display with selectable measured-value representation
- Measured-value buffer to cover the time required to replace the chart or pen assembly.

Input range

The input range is the electrical range of the instrument amplifier (measuring limits). The ranges are adapted by programming or by using plug-in jumpers.

Example:
a): – 20 to + 20 mA for DC I as measured variable
b): – 10 to + 60 mV for TC as measured variable
c): – 20 to + 20 mA with function (for other physical variables)

The recording properties (measuring accuracy) of the instruments always refer to the input range.

Measuring range

Example:

a): For DC U/I as measured variable:
Measuring range = input range
e.g.: – 20 mA to + 20 mA

b): For direct connection of TC/RTD/R:
The measuring range is the range assigned to the input range with dimension (and linearization for TC and RTD).
e.g.: – 100 °C to + 900 °C for TC, type J

c): For any dimensions/other physical variables:
The measuring range is defined by programming a "Function".
e.g.: 4 mA to 20 mA corresponds to 0 to 250 t/h, thus:
measuring range = 0 to 250 t/h.

Recording and display range "Analog"

The recording and display range "Analog" defines the part of the measuring range which can be recorded and graphically displayed on the chart or as a bargraph.

This range is freely-programmable within the measuring range by input of "Left value" and "Right value".

Example:

a) 5 mA to 15 mA for DC I as measured variable,
measuring range – 20 mA to + 20 mA

b): 100 °C to 700 °C for TC, type J,
measuring range – 100 °C to + 900 °C

c): 50 t/h to 200 t/h via "Function",
measuring range 0 t/h to 250 t/h

Recording and display range "Digital"

The recording and display range "Digital" defines the range which can be displayed or printed as a digital value.

This range is identical to the measuring range. Thus the digital recording and display range may be larger than the analog recording and display range.

Example:

a): – 20 mA to + 20 mA for DC I as measured variable

b): – 100 °C to 900 °C for TC, type J

c): 0 t/h to 250 t/h via "Function"

Standards

The recorders comply with the following standards:

- Housing: DIN 43 700, DIN 43 831
- Error limits: IEC 484 (DIN 43 782)
- Degree of protection: IEC 529 or EN 60 529
- Climate: IEC 68-2-1/2
- Mechanical stress: IEC 68-2-6
- Electric protection: IEC 1010-1 (EN 61 010-1, VDE 0411 Part 1)
- Electromagnetic compatibility: the protection objectives of the EMC guideline 89/336/EEC with respect to interference suppression to EN 50 081-1 and noise immunity to EN 50 082-2 of 03/95 are complied with.
- Interference suppression: VDE 0875 Part 11 (CISPR 11)
- Noise immunity: IEC 1000-4-...

Chart drive

A program-controlled stepping motor is responsible for the time-synchronous chart drive.

In the VARIOGRAPH hybrid recorder, the drive controls a sprocket wheel, and the sprockets engage in the perforations of the chart paper and thus transport the latter.
The chart paper is tightened in the longitudinal direction by a take-up spool driven by the drive via a slip coupling.

Event marking system

The event marking system records an event (e.g. the switching on or off of a pump) by recording a binary variable (square-wave recording).

Chart paper

Chart paper for VARIOGRAPH hybrid recorders

The absorptive capacity of the ink paper is optimally matched to fiber pens. The paper has a very smooth surface so that the frictional resistance of the fiber pens is low.

Types of chart paper

Roll: low-price recording with greatest possible visible trace length.
Fanfold: (only for 7ND3521): fast access possible even to recordings made a long time earlier. Easy finding of specific positions by flipping through like in a book.

Chart paper graduations
(see Figs. 3/2 to 3/3 for examples)

■ Range graduation
The recording width is divided linearly by longitudinal lines. Every fifth line is thicker than those in between.

Please contact us if you require chart paper with a non-linear range graduation or with printed text at regular intervals – e.g. range numbers, dimensions and measuring point names.

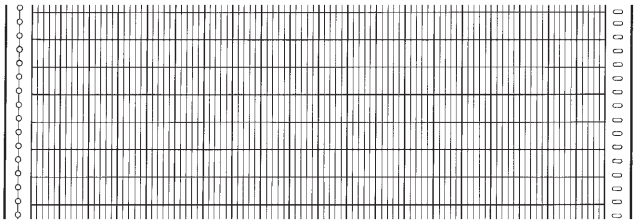


Fig. 3/2 Chart paper 230 mm wide, recording width 210 mm, 100 linear divisions (scale approx. 1:3)

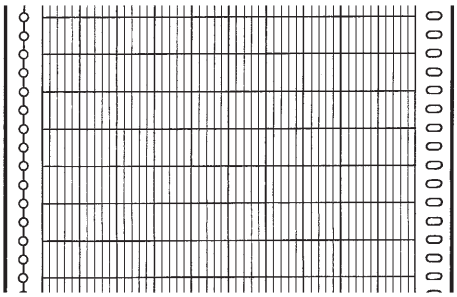


Fig. 3/3 Chart paper 120 mm wide, recording width 100 mm, 50 linear divisions (scale approx. 1:2)

Parameterization software

The SIMATIC PDM software permits you to use your PC for convenient dialog with the hybrid recorders.

Possible configurations

Various configurations are possible when operating the hybrid recorders via a PC:

Point-to-point operation

This is possible with the VARIOGRAPH by using the SIPROM R-VARIOGRAPH software and a null modem cable.

Bus operation

No standard solutions for bus operation exist for the VARIOGRAPH. Customer-specific solutions can be configured.

Ordering information

Ordering information

Standard models are listed in the Ordering data. The technical data contain additional data for further designs, e.g. applications and power supply.

If designs are required for which no information is included in the technical data, please inquire whether the desired model is technically possible.

When ordering, please state:
- Order No.
- Order code, if applicable
- Any plain text required (e.g. inscription of measuring point label, information on the measuring ranges).

Example for ordering:

Required recorder:

VARIOGRAPH 7ND3590 hybrid recorder
Format 288 x 144
For installation in panel with basic grid 72 x 72
Power supply DC 24 V

6 channels
6 freely-adjustable/programmable measuring ranges (according to signal modules fitted)
Channels 1 to 3: fitted with signal module DC U/I
Channels 4 to 6: fitted with signal module DC U/I

Electronic alarm output

Door with low-reflection glass

Measuring point label inscribed "Transformer station south" (channel 1), "Main substation 1" (channel 2), "Total current" (channel 3), "Total power output" (channel 4), "Speed turbine 1" (channel 5), "Imported power" (channel 6)

The Ordering data for this recorder must then be as follows (according to page 3/17):

Order No.:	7ND3590-2BB13-1DG9
Order code:	R1Y
Plain text:	Measuring point inscription:
	Channel 1: Transformer station south
	Channel 2: Main substation 1
	Channel 3: Total current
	Channel 4: Total power output
	Channel 5: Speed turbine 1
	Channel 6: Imported power

Note:

The following designations are used in this section for the signal modules/measured variables:

DC U/I:	DC voltage/direct current
AC U/I:	AC voltage/alternating current
RTD:	Resistance temperature detector (resistance thermometer)
TC:	Thermocouple
R:	Resistance

Universal hybrid recorder VARIOGRAPH

7ND3521 (144 x 144)
7ND3590 (288 x 144)
7ND3560 (288 x 288)

12 channels for analog measured variables

Common features

- 3, 6 or 12 channels for analog variables; up to 6 additional channels via interface (max. total of 12 channels, however), without pen offset
- Microprocessor-based
- Recording with fiber recording head, max. 6 colors
- Short scanning cycle with intermediate data memory
- Recording cycle independent of measured value, use as line recorder or multipoint recorder
- Storage of 2 user programs, protected by 4-digit code number
- Operating modes:
  - Displays (numeric and/or analog as bargraph)
  - Curves
  - Tables
- No data loss for curves with tables (mixed operation)
- Measured variables (measurement via plug-in signal modules):
  - Direct current, DC voltage
  - Temperature (connection to thermocouples and resistance thermometers)
  - Resistance (2-wire or 3-wire systems)
- Freely-programmable measuring ranges and alarms
- Zooming
- Zoning
- Programmable alarm identification and output for each channel with limit violation
- Logic operations on alarms
- Text and scale printouts
- Real-time calender clock, internal or external synchronization, e.g. by a master clock
- Date/time printout, channel identification and message text
- Operator prompting in German and English; French or Russian as option
- Operation and programming with infrared remote control unit and parameterization software (SIMATIC PDM)
- Coupling to interface-based automation systems via serial interfaces
- Recording paper: roll, or fanfold (only 7ND3521)
- Suitable for installation without interspacing
- Housing front: degree of protection IP 54

Fig. 3/4 VARIOGRAPH 7ND3521, format 144 x 144

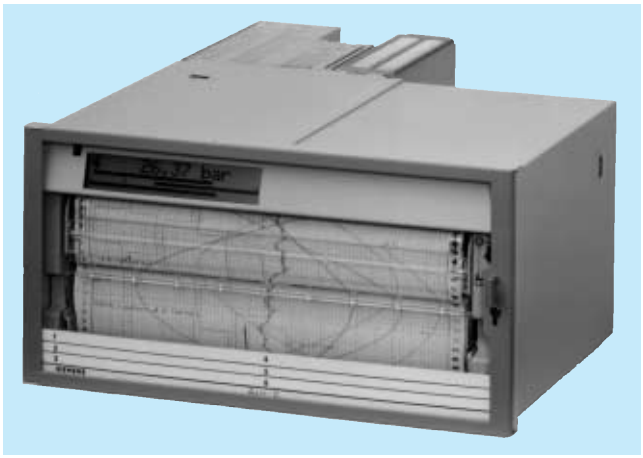


Fig. 3/5 VARIOGRAPH 7ND3590, format 288 x 144

Fig. 3/6 VARIOGRAPH 7ND3560, format 288 x 288

VARIOGRAPH 7ND3521, 7ND3590, 7ND3560

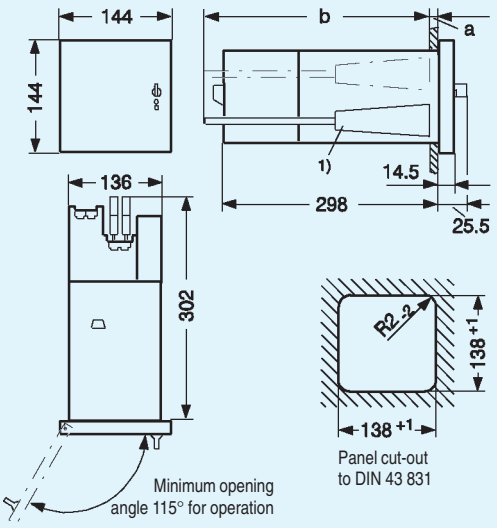
Universal hybrid recorders
144 x 144, 288 x 144 and 288 x 288

Technical data, basic device

Measurements	
Measuring procedure	Analog-to-digital conversion according to dual-slope procedure
Channels	
– Analog inputs	3, 6 or 12, connection via signal modules (channels 1 to 12)
– Digital inputs	6, connection via auxiliary modules "Serial interface" and/or "Digital input/output" (only for binary variables) (channels 7 to 12)
Scales	
– Printed in diagram	
Number	1 per channel, programmable
Generation	Automatic
Additional inscriptions	Channel number and dimension
– Mechanical on recorder (7ND3560 only)	Max. 4 divisions
Functions $y = f(x)$	6 freely-programmable assignments between the input variable *(x)* (signal range) and the output variable *(y)* (measuring range), e.g. linearization with max. 50 turning points each Dimension: 5 characters per dimension, freely-selectable per function, logic operations e.g. for control purposes
Measuring ranges	Adjustable/programmable for each range within the measuring limits of the signal modules
Programs	2 programs can be stored, selectable manually (internal/external) or via "Condition"
Available signal modules	
– 3-channel	7ND9400-8AA (DC U/I)
– 6-channel	7ND9400-8AF (DC U/I/TC/RTD/R) 7ND9400-8AJ (DC U/I/TC)
Available auxiliary modules	Serial interface 7ND9400-8BH Digital input/output 7ND9400-8BB
Error limits	Class 0.5, DIN 43 782
Basic device	0.3 % of recording width (100 mm)
Signal module 7ND9400-8AA	0.2 % with expansion factor of max. 4
Signal module 7ND9400-8AF	0.2 % with expansion factor of max. 5
Signal module 7ND9400-8AJ	0.2 % with expansion factor of max. 5 (spec. errors see pages 3/11 to 3/13)
Measured-value damping	Separate for each channel
Filter	1st order low-pass
Time constant	0 to 120 s, programmable in unit steps
Recording	
Recording range	"Left value" and "Right value" freely programmable
Data display	
– Graphic recording, curves	Line or multipoint recorder, freely-selectable color assignments, inscription with channel number and text or measured value
– Numeric recording, text	Data set with symbols, 1 device text, max. 16 characters, 12 channel texts, max. 16 characters each, 12 event texts, max. 53 characters each, freely-selectable color assignment
– Mixed recording	Alternate graphic and numeric recording
Recording procedure	Discontinuous with intermediate storage of data, pen offset compensated
Recording system	
– Pen assembly	Replaceable, with flexible fiber pen capillaries
– Colors	Violet, red, black, green, blue, brown
– Recording length	Approx. 1800 m
– Service life	Approx. 6 months
– Storage life	24 months in closed packing 1 month in device with climate to DIN IEC 654-1
– Character set	ASCII standard with upper-case and lower-case letters, Greek alphabet and special characters, selectable in 6 colors
– Length of text line	53 characters
– Character height	2.16 mm (standard)
Pen assembly drive	Program-controlled step motor
Carriage drive	Program-controlled step motor
Step length 7ND3521	0.125 mm = 0.125 %
7ND3560/90	0.125 mm = 0.06 %
Carriage speed	Max. 125 mm/s
Recording width 7ND3521	Max. 100 mm (selectable per channel)
7ND3560/90	Max. 210 mm (selectable per channel)
Chart drive	Program-controlled step motor, class 0.005 to DIN 43 782
Step length	0.06 mm to 0.6 mm programmable
Fast forward	1 mm/s to 30 mm/s
Chart speeds	0 (off) 1 – 1.25 – 2 – 2.5 – 5 mm/h 10 – 15 – 20 – 30 – 40 mm/h 50 – 60 – 100 – 120 – 150 mm/h 180 – 200 – 240 – 300 mm/h
7ND3521	600 – 1200 [1] mm/h
7ND3560/90	600 [1] – 1200 [1] mm/h
Printing interval for data table	∞ (off), 15 – 30 min 1 – 2 – 3 – 4 – 6 – 12 – 24 h
Chart paper	
Roll 7ND3521	31 m long, 120 mm wide
7ND3560/90	31 m long, 230 mm wide
Fanfold 7ND3521	16 m long, 120 mm wide
Visible chart length	
Roll 7ND3521/90	70 to 80 mm
7ND3560	200 mm
Fanfold 7ND3521	30 to 80 mm
Recording condition	Continuous recording or recording with "Condition", e.g. via alarms or their boolean operations
Display	
Display unit	Liquid crystal (DSTN)
Dot matrix	16 x 100
Characters	5 x 7 or 7 x 13 dots ASCII standard with upper-case and lower-case letters, Greek alphabet and special characters
Character height	6.85 mm or 12.85 mm
Data display	Number and dimension, 5 digits each
Bar display	0 to 100 %, resolution 1 %
Operation/programming	Via infrared remote control unit, menu-based, output of menu line on display of recorder, PC parameterization software
STATUS menu	Display and printout of device configuraiton, time, start table, code No., dialog address, device text
MODE menu	Chart speed, printing interval and display mode can be set in MODE A and MODE B, selectable manually (internal/external) or via "Condition"
PROGRAM menu	Parameters and recording conditions can be set in PROGRAM A and PROGRAM B, selectable manually (internal/external) or via "Condition"

[1] Not to be recommended for the output of highly oscillating signals with a large amplitude and/or the output of longer strings (such as texts and tables of data) over a longer period because of the possibility of data losses.

TEST menu	Calling of test functions
Operator prompting	German, English, French (Russian on request)
Limit monitoring	
Number of alarms	2 alarms per channel, programmable
Alarm output	Recording of a symbol and the channel number, optionally with text or time
– Static	On violation of upper or lower limit
– Dynamic (gradient)	On defined change in signal speed
Alarm output	Via auxiliary module "Digital input/ output" (page 3/13)
Limit hysteresis	0.01 to 5 % of measuring range, programmable in 9 steps
Logic operations on alarms	AND, OR, EXOR, negation
Data memory	Recording buffer for a chart length of approx. 55 mm to cover the time for replacing chart paper or pen assembly
Real-time calender clock	
Format	Year, month, day, hour, minute, second; 24-hour or 12-hour representation programmable
Program	Up to year 2048
Accuracy	Max. error 1 x 10^{-5} at 25 °C
Back-up on power failure	With 3-V lithium battery
External synchronization	Programmable by master clock via SYNC input or via power supply network
Control inputs	Passive, electrically isolated via opto isolator: START/STOP, CONTR. IN and SYNC. (Fig. 3/10)
Input resistance	≥ 5 kΩ
Low level	≤ 5 V, min. -3 V
High level	≥ 8 V, max. 30 V
General data	
Format 7ND3521	144 x 144 } DIN 43 700 and
7ND3560	288 x 288 } DIN 43 831
7ND3590	288 x 144 }
Mounting facilities	Sheet-steel panel, panel or desk upright panel with basic grid dimensions 72 x 72, cabinet or sheet-steel desk upright panel
Mounting	
Panel mounting	To DIN 43 834-A-340
Desk and cabinet mounting	To DIN 43 834-A-230
Mounting position	To DIN 16 257
Operation with roll	Vertical - 30 ° to + 15 °
Operation with fanfold	Vertical - 15 ° to + 15 °
Climatic ambient conditions	To IEC 68-2-1/2/ DIN EN 60 068-2-1/2
Temperature of use	0 to 50 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temperature max. 10 K/h
Storage temperature range	-25 to +70 °C (max. 75 % rel. humidity at 25 °C, no condensation), change in temperature max. 20 K/h
Mechanical ambient conditions	
Vibrations during operation	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 200 Hz; 10 m/s^2 acceleration
Vibrations during storage and transport	To DIN IEC 68-2-6 5 to 9 Hz; 3.5 mm deflection 9 to 500 Hz; 10 m/s^2 acceleration
Drop test for packed unit	To DIN EN 60 068-2-32, height < 0.8 m
Shock test during operation	To DIN IEC 68 Part 2-27 15 g, 11 ms
Resistance to earthquakes during operation	Vibrations in the three axes X, Y, Z to DIN IEC 68 Part 2-6
Frequency range 5 ... 35 ... 5 Hz	2 g, 1 octave/min., max. ± 10 mm amplitude
Frequency range 10 ... 58 Hz, 58 ... 500 Hz	2 g, 5 cycles, 1 h
Protection class	I to IEC 348/DIN VDE 0411 Part 1
Degree of protection	EN 60 529 (IEC 529)
Terminals	IP 20
Housing, rear	IP 20
Housing door	IP 54
Test voltages	IEC 348/DIN VDE 0411 Part 1
Mains/housing	DC 2.1 kV
Control input/housing	AC 0.5 kV
Radio interference suppression	To DIN VDE 0871, limit class A
Power supply	
– AC/DC power pack 230 V	AC 50 to 60 Hz (- 5 to + 5 %) 110 to 240 V (- 15 to + 10 %), approx. 36 VA; DC 110 to 230 V (± 10 %), 18 W
– AC/DC power pack 24 V	AC 50 to 60 Hz (- 5 to + 5 %) 24 V (- 15 to + 10 %), approx. 36 VA; DC 24 V (18 to 33 V), approx. 18 W
Type of connections	Screw terminals
– Terminal range	
For solid conductors	0.13 to 2,5 mm^2
For stranded conductors	0.13 to 1.5 mm^2 (conductor sleeves)



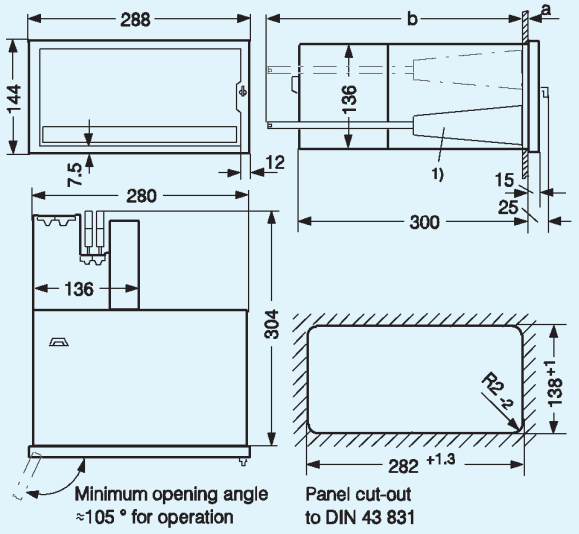
Distance between centers of 2 adjacent instruments or one above the other: ≥ 144 mm

Installation in	a	b
Sheet-steel panel or cabinet or sheet-steel desk upright panel	2 to 42	340
Panel with basic grid dimensions 72 x 72 or desk upright panel with basic grid dim. 72 x 72	39 to 81	305.5

Fig. 3/7 Universal hybrid recorder VARIOGRAPH 144 x 144, dimensions

[1]) The clamps can also be fitted at the top and bottom.

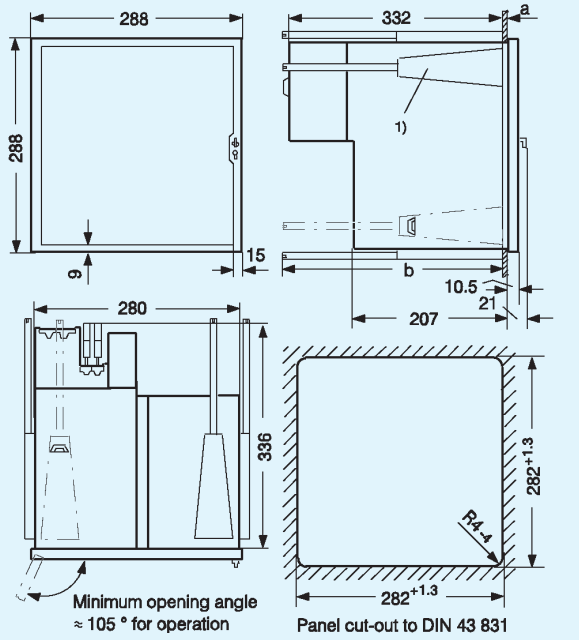
Universal hybrid recorders
144 x 144, 288 x 144 and 288 x 288



Distance between centers of 2 adjacent instruments: ≥ 288 mm
Distance between centers of 2 instruments one above the other: ≥ 144 mm

Installation in	a	b
Sheet-steel panel or cabinet or sheet-steel desk upright panel	2 to 42	340
Panel with basic grid dimensions 72 x 72 or desk upright panel with basic grid dim. 72 x 72	39 to 81	305.5

Fig. 3/8 Universal hybrid recorder VARIOGRAPH 288 x 144, dimensions



Distance between centers of 2 adjacent instruments or one above the other: ≥ 288 mm

Installation in	a	b
Sheet-steel panel or cabinet or sheet-steel desk upright panel	2 to 42	340
Panel with basic grid dimensions 72 x 72 or desk upright panel with basic grid dim. 72 x 72	39 to 81	305.5

Fig. 3/9 Universal hybrid recorder VARIOGRAPH 288 x 288, dimensions

Front door	7ND3521	Plastic; with matt border, with spring-loaded latch or with spring-loaded latch and lock
Front frame	7ND3560/90	Gray; front door with lock and glass pane
Weight	7ND3521	Approx. 4 kg
	7ND3560	Approx. 8.5 kg
	7ND3590	Approx. 6 kg

Electromagnetic compatibility

Emitted interference

The targets of the EMC guideline 89/336/EEC with respect to radio interference suppression to EN 50 081-1 and interference rejection to EN 50 082-2 of 03/95 are observed.

Radio interference	Measured according to VDE 0875 Part 11 (CISPR 11)
Power supply AC 110 to 240 V	Limit class B for shielded control cables

Interference rejection

Device-under-test	Influencing variable	Basic standard	Instrument	
			Test condition	Res [3]
Instrument	RF field AM	IEC 1000-4-3	10 V/m [2]	A
	RF field PM	IEC 1000-4-3	10 V/m	A
	Discharge	IEC 1000-4-2	6/8 kV	A
Process, measuring and control lines	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
AC/DC 24 V power supply	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/1 kV [4]	B
	Interruption	IEC SC77BWG3	20 ms/100 %	A
AC 110 to 240 V power supply	RF conducted interference	IEC 1000-4-6	10 V	A
	Burst	IEC 1000-4-4	2 kV	A
	Surge	IEC 1000-4-5	1/1 kV [5]	B
	Interruption	IEC SC77BWG3	20 ms/100 %	A
Earth connection	RF conducted interference	IEC 1000-4-6	10 V	A

1) The clamps can be fitted on all sides.
2) 3 V/m in the ranges 87 to 108, 174 to 230 and 470 to 790 MHz.
3) A = additional error during effect of interference referred to span of signal modules when using shielded signal and control cables (screen connected to PE conductor at both ends):
   - 7ND9400-8AA max. 0.2 %
   - 7ND9400-8AF max. 0.2 %, but 0.5 % in range -10 to +60 mV and in the TC ranges
   - 7ND9400-8AJ max. 0.2 %, but 0.5 % in the range -10 bis +60 mV and in the TC ranges

   When using non-shielded cables, the above error may be up to 3 % in the sensitive signal and TC ranges (thermocouples), and 0.5 % in the other ranges.
   B = interference possible during effect
4) 1 kV symmetric, 1 kV asymmetric
5) 1 kV symmetric, 2 kV asymmetric

Technical data, signal modules

Signal module DC U/I, 7ND9400-8AA

Number of channels	3, electrically isolated
Measured variables	Electrical variables (DC U/I)

Measuring range (adjustable)	Resolution Graphic min.	Numeric	Error [1] Absolute	Relative % of meas. value
DC voltage				
– 1 to + 1 V	100 µV	100 µV	0.75 mV	0.025
–10 to + 10 V	1 mV	1 mV	7.5 mV	0.025
Direct current				
– 10 to + 10 mA	1 µA	1 µA	7.5 µA	0.025
– 20 to + 20 mA	2 µA	2 µA	15 µA	0.025

Recording ranges	Programmable
Input resistance	
DC voltage	50 kΩ/V
Direct current	50 Ω (± 10 mA range) 25 Ω (± 20 mA range)
Potential	Max. permissible 24 V against protective earth conductor: only circuits with safe electrical isolation from the power supply are permissible
Measuring cycle with 1 or 2 signal modules in the VARIOGRAPH	
With 50-Hz mains frequency	120 ms
With 60-Hz mains frequency	100 ms
With DC power supply	120 or 100 ms, selectable [2]
Measuring duration with 1 or 2 signal modules in the VARIOGRAPH	
With 50-Hz mains frequency	20 ms
With 60-Hz mains frequency	16.6 ms
With DC power supply	20 or 16.6 ms, selectable [2]
Resolution and errors	According to table above
Additional temperature error	
Typical	30 ppm of span per K
Maximum	300 ppm of span per K
Continuous overload capacity	
Voltage input	Max. 30 V
Current input	Max. 80 mA
Surge overload capacity (5 s)	
Voltage input	Max. 30 V
Current input	Max. 100 mA
Analog-to-digital conversion	1 dual-slope converter/channel, resolution $14^1/_2$ bits
Series-mode rejection	≥ 60 dB for mains frequency
Common-mode rejecton	≥ 90 dB for mains frequency
Signal connection	Screw terminals
Terminal range	
For solid conductors	0.13 to 2.5 mm²
For stranded conductors	0.13 to 1.5 mm² (conductor sleeves)
Test voltages	IEC 348/DIN VDE 0411 Part 1
Signal input/housing	AC 500 V
Signal input/signal input	AC 500 V
Weight	Approx. 150 g

Signal module DC U/I/TC/RTD/R, 7ND9400-8AF

Number of channels	6, electrically isolated via relays
Measured variables	
• Electrical variables (DC U/I/R)	
Measuring ranges	Adjustable/programmable according to following table
Recording ranges	Programmable
Input resistance with:	
DC voltage measurements	10 MΩ
Direct current measurements	2.5 Ω
Current source for resistance measurements	Approx. 1 mA, built-in
Permissible line resistance with resistance measurements	
– 3-wire system	$R_L \leq R_E - R_M$, max. 100 Ω
– 2-wire system	$R_L \leq 0.5\ (R_E - R_M)$ R_E 600 Ω full-scale value R_L Line resistance per conductor R_M Measuring resistance for full-scale value of recorder
Detection of line breakage with DC voltage measurements	Present
• Temperature via thermocouple (TC)	
Measuring ranges	Adjustable/programmable according to following table
Dimension	°C or K, selectable
Recording ranges	Programmable
Reference temperature	
Internal	Via measurement of terminal temperature, additional error ≤ 0.6 K
External	Via reference channel or – 50 to + 150 °C, programmable, 223 to 423 K, programmable
Potential	Max. permissible 24 V against PE conductor; only circuits with safe electrical isolation from the power supply are permissible
Input resistance	10 MΩ
Detection of line breakage	Present
• Temperature via resistance thermometer (RTD)	
Measuring ranges	Adjustable/programmable according to following table
Dimension	°C or K, selectable
Recording ranges	Programmable
Potential	Max. 24 V
Input resistance	10 MΩ
Current source	Approx. 1 mA, built-in
Permissible line resistance	
3-wire system	$R_L \leq R_E - R_M$, max. 100 Ω
2-wire system	$R_L \leq 0.5\ (R_E - R_M)$ R_E 600 Ω full-scale value R_L Line resistance per conductor R_M Measuring resistance for full-scale value of recorder
Measuring cycle	3 s
Measuring duration	
With 50-Hz mains frequency	20 ms
With 60-Hz mains frequency	16.6 ms
With DC power supply	20 or 16.6 ms, selectable depending on frequency of adjacent AC network
Resolution and errors	According to following table
Additional temperature error	
Typical	15 ppm of span per K
Maximum	150 ppm of span per K
Continuous overload capacity	
Voltage input; current input	Max. 24 V; max. 225 mA
Surge overload capacity (5 s)	
Voltage input	Max. 24 V
Current input	Max. 300 mA
Analog-to-digital conversion	1 common dual-slope converter, resolution $13^1/_2$ bits

[1] Reference conditions: ambient temperature 23 °C ± 2 °C, relative humidity 55 % ± 10 %.
[2] Depending on frequency of adjacent AC network.

Universal hybrid recorders
144 x 144, 288 x 144 and 288 x 288

Series-mode rejection	≥ 60 dB for mains frequency
Common-mode rejection	≥ 90 dB for mains frequency
Signal connection	Screw terminals
Terminal range	
For solid conductors	0.13 to 2.5 mm²
For stranded conductors	0.13 to 1.5 mm² (conductor sleeves)
Test voltages	IEC 348/DIN VDE 0411 Part 1
Signal input/housing	AC 500 V
Signal input/signal input	DC 500 V
Weight	Approx. 440 g

Measuring range	Resolution Graphic min.	Resolution Numeric	Error [1] Absolute	Error [1] Relative % of meas. value
DC voltage				
– 10 to + 60 mV	6 µV	6 µV	20 µV	0.02
–100 to + 600 mV	60 µV	60 µV	130 µV	0.02
Direct current				
– 4 to + 20 mA	3 µA	3 µA	10 µA	0.03
– 40 to + 200 mA	30 µA	30 µA	100 µA	0.03
Resistance				
0 to 600 Ω	60 mΩ	0.1 Ω	0.2 Ω	0.04
Thermocouple to DIN IEC 584				
Type J Fe/Cu Ni				
–100 to + 1000 °C	0.2 °C	0.2 °C	0.3 °C	0.04
173 to 1273 K	0.2 K	0.2 K	0.3 K	0.04
Type K Ni Cr/Ni				
0 to 1200 °C	0.2 °C	0.2 °C	0.5 °C	0.04
273 to 1473 K	0.2 K	0.2 K	0.5 K	0.04
Type T Cu/Cu Ni				
0 to 400 °C	0.2 °C	0.2 °C	0.3 °C	0.04
273 to 673 K	0.2 K	0.2 K	0.3 K	0.03
Type S Pt 10% Rh/Pt				
0 to 1600 °C	0.6 °C	0.6 °C	1.5 °C	0.05
273 to 1873 K	0.6 K	0.6 K	1.5 K	0.05
Type R Pt 13% Rh/Pt				
0 to 1600 °C	0.6 °C	0.6 °C	1.5 °C	0.05
273 to 1873 K	0.6 K	0.6 K	1.5 K	0.05
Thermocouple to DIN 43 710				
Type L Fe-Cu Ni				
–100 to + 900 °C	0.2 °C	0.2 °C	0.3 °C	0.04
173 to 1173 K	0.2 K	0.2 K	0.3 K	0.04
Type U Cu-CuNi				
0 to 400 °C	0.2 °C	0.2 °C	0.3 °C	0.04
273 to 673 K	0.2 K	0.2 K	0.3 K	0.03
Resistance thermometer				
Pt 100 to DIN IEC 751				
–200 to +850 °C	0.2 °C	0.2 °C	0.4 °C	0.05
73 to 1123 K	0.2 K	0.2 K	0.4 K	0.04
Pt 200 according to manufacturer's data				
–200 to + 250 °C	0.1 °C	0.1 °C	0.2 °C	0.05
73 to 523 K	0.1 K	0.1 K	0.2 K	0.02
Ni 100 to DIN 43 760				
– 60 to + 240 °C	0.1 °C	0.1 °C	0.2 °C	0.05
213 to 513 K	0.1 K	0.1 K	0.2 K	0.03

Signal module DC U/I/TC, 7ND9400-8AJ

Number of channels	6, electrically isolated via semiconductor relays (reverse resistance > 2 GΩ at 100 V DC, breakdown voltage > 200 V DC)
Measured variables	
• Electrical variables (DC U/I)	
Measuring ranges	Adjustable/programmable according to following table
Recording ranges	Programmable
Input resistance with:	
DC voltage measurements	10 MΩ
Direct current measurements	2.5 Ω
• Temperature via thermocouple (TC)	
Measuring ranges	Adjustable/programmable according to following table
Dimension	°C or K, selectable
Recording ranges	Programmable
Reference temperature	
Internal	Via measurement of terminal temperature, additional error ≤ 0.6 K
External	Via reference channel or – 50 to + 150 °C, programmable, 223 to 423 K, programmable
Input resistance	10 MΩ
Detection of line breakage	40 to 500 kΩ, dependent on input signal Source resistance ≤ 2 kΩ
Potential	Max. permissible 24 V against PE conductor: only circuits with safe electrical isolation from the power supply are permissible
Measuring cycle	1.5 s with 1 to 12 channels
Measuring duration	
With 50-Hz mains frequency	20 ms
With 60-Hz mains frequency	16.6 ms
With DC power supply	20 or 16.6 ms, selectable depending on frequency of adjacent AC network
Resolution and errors	According to following table
Additional temperature error	
Typical	15 ppm of span per K
Maximum	150 ppm of span per K
Continuous overload capacity	
Voltage input, temperature	Max. 24 V
Current input	Max. 250 mA
Overload capacity	Max 5 % of full-scale value
Analog-to-digital conversion	1 common dual-slope converter, resolution $13^1/_2$ bits
Series-mode rejection	≥ 60 dB for mains frequency
Common-mode rejection	≥ 90 dB for mains frequency
Signal connection	Screw terminals
Terminal range	
For solid conductors	0.13 to 2.5 mm²
For stranded conductors	0.13 to 1.5 mm² (conductor sleeves)
Test voltages	According to DIN IEC 1010-1; the test specifications must be observed when retesting
Signal input/housing	DC 500 V
Weight	Approx. 200 g

[1] Reference conditions: ambient temperature 23 °C ± 2 °C, relative humidity 55 % ± 10 %.

Measuring range	Resolution Graphic min.	Numeric	Error [1] Absolute	Relative % of meas. value
DC voltage				
– 10 to + 60 mV	6 µV	6 µV	20 µV	0.02
– 0.1 to + 1 V	100 µV	100 µV	250 µV	0.02
Direct current				
– 4 to + 20 mA	3 µA	3 µA	10 µA	0.03
Thermocouple to DIN IEC 584				
Type J Fe/Cu Ni				
–100 to +1000 °C	0.2 °C	0.2 °C	0.4 °C	0.04
173 to 1273 K	0.2 K	0.2 K	0.4 K	0.04
Type K Ni Cr/Ni				
0 to 1200 °C	0.2 °C	0.2 °C	0.5 °C	0.04
273 to 1473 K	0.2 K	0.2 K	0.5 K	0.04
Type T Cu/Cu Ni				
0 to 400 °C	0.2 °C	0.2 °C	0.5 °C	–0.04
273 to 673 K	0.2 K	0.2 K	0.5 K	–0.03
Type S Pt 10% Rh/Pt				
0 to 1600 °C	0.6 °C	0.6 °C	3 °C	–0.05
273 to 1873 K	0.6 K	0.6 K	3 K	–0.05
Type R Pt 13% Rh/Pt				
0 to 1600 °C	0.6 °C	0.6 °C	3 °C	–0.05
273 to 1873 K	0.6 K	0.6 K	3 K	–0.05
Thermocouple to DIN 43 710				
Type L Fe-Cu Ni				
–100 to + 900 °C	0.2 °C	0.2 °C	0.4 °C	0.04
173 to 1173 K	0.2 K	0.2 K	0.4 K	0.04
Type U Cu–CuNi				
0 to 400 °C	0.2 °C	0.2 °C	0.5 °C	–0.04
273 to 673 K	0.2 K	0.2 K	0.5 K	–0.03

Auxiliary module: "Serial interface" 7ND9400-8BH

Interfaces	20-mA current loop (TTY), RS-232, RS-485, electrically isolated from basic electronics
Procedures	Xon/Xoff ETX-ACK/NAK
Transmission rates	110/150/300/600/1200/2400/4800/9600/19200 bits/s
Data formats	Decimal ASCII Real Hex ASCII Real BCD ASCII
Operating modes	Manual/remote operation, Listen Only, Talk Only
External power supply	DC 18 to 30 V
Current consumption	Max. 125 mA
Connection	Subminiature socket, 25-contact
Weight	Approx. 90 g

Auxiliary module: "Digital input/output" 7ND9400-8BB

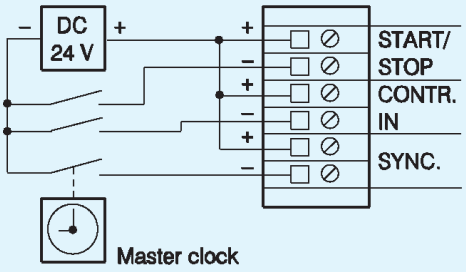
Inputs	6 passive inputs, electrically isolated from basic electronics via opto isolator
Input resistance	≥ 5 kΩ
Low level	≤ 5 V, min. – 3 V
High level	≥ 8 V, max. 30 V
Polarity reversal protection	Up to 40 V
Outputs	8 outputs, electrically isolated from basic electronics via opto isolator
Technology	Semiconductor drivers, short-circuit-proof and overload-proof
Output current	Max. 150 mA
Low level	≤ 0.3 V
High level	≥ U_V – 2 V U_V : power supply
External power supply	DC 18 to 30 V
Current consumption	
Typical	60 mA (all outputs inactive)
Maximum	1260 mA (all outputs active)
Test voltages	IEC 348/DIN VDE 0411 Part 1
Input/output/housing	AC 500 V
Connection	Subminiature plug, 25-pin
Weight	Approx. 80 g

Infrared remote control unit 7ND9190-8AA

Transmission mode	Pulse-modulated infrared signal (biphase coding)
Range	Approx. 5 m, depending on state of battery
Radiation angle	Approx. 30°
Number of keys	30
Functions	See Fig. 3/17
Temperature of use	0 to 50 °C
Storage temperature range	– 25 to + 70 °C
Permissible relative humidity	Max. 75 %, no condensation
Climatic class	2 to VDI/VDE 3540, but KWF DIN 40 040
Degree of protection	IP 40 EN 60 529
Battery	4 alkaline batteries Micro type 4003, IEC LR 6
– Voltage	4 x 1.5 V
– Service life	
With low usage	Approx. 1 year
With high usage	Approx. 100 hours
Dimensions (W x H x D)	57 mm x 23 mm x 135 mm
Weight	Approx. 110 g (including battery)

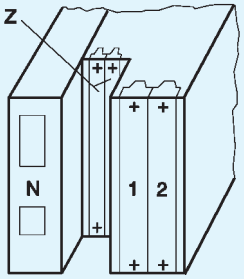
[1]) Reference conditions: ambient temperature 23 °C ± 2 °C, relative humidity 55 % ± 10 %.
$F = F_{abs} + F_{rel} \cdot$ IMWI (with DC voltage and direct current)
$F = F_{abs}$ [°C] + $F_{rel} \cdot$ I MW [°C] I or $F = F_{abs}$ [K] + $F_{rel} \cdot$ I MW [K] · 273 K I (with thermocouples)

Universal hybrid recorders
144 x 144, 288 x 144 and 288 x 288



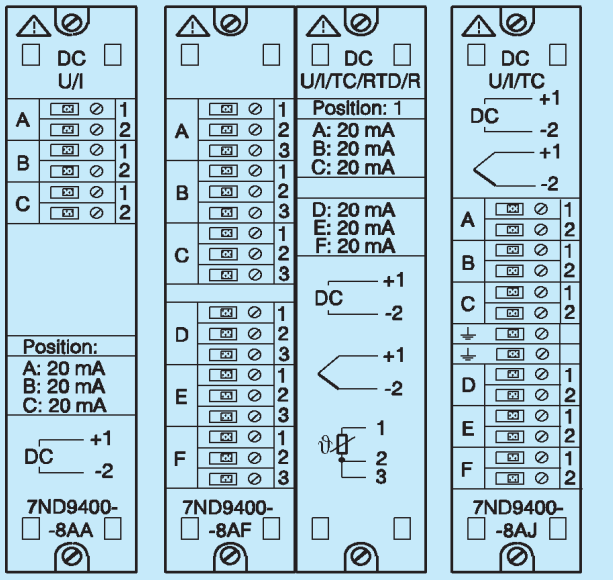
START/STOP Beginning/end of measurement
CONTR. IN Mode/program switchover/recording conditions
SYNC. External synchronization of calender clock by a master clock or by a VARIOGRAPH as the control unit

Fig. 3/10 VARIOGRAPH 7ND35.., connection of control signal lines



N Power pack
Z Auxiliary module slots
1 Signal module slot 1 (position 1)
2 Signal module slot 2 (position 2 with two 3-channel signal modules or two 6-channel signal modules 7ND9400-8AJ)

Fig. 3/11 VARIOGRAPH 7ND.., rear view



DC U/I
Signal module, 3-channel

Signal connections
Signal module in slot 1 (Fig. 3/11), position 1, A to C: channels 1 to 3
Signal module in slot 2 (Fig. 3/11), position 2, A to C: channels 4 to 6

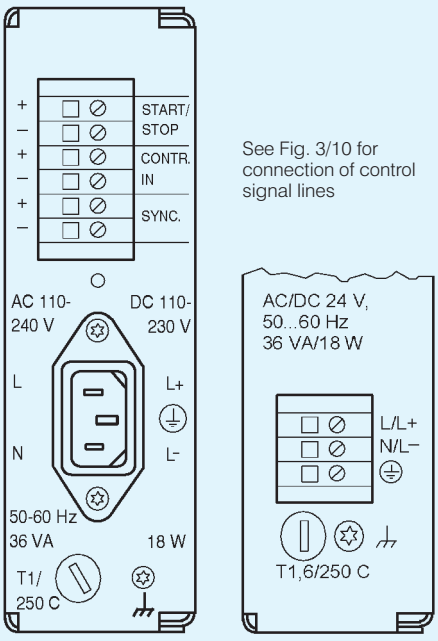
DC U/I/TC/RTD/R
Signal module, 6-channel

Signal connections
Signal modules in slots 1 and 2 (Fig. 3/11), position 1, A to F: channels 1 to 6

DC U/I/TC
Signal module, 6-channel

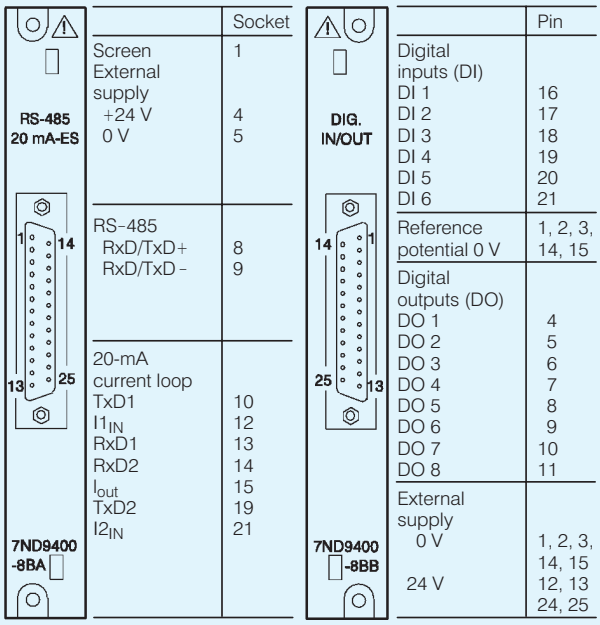
Signal connections
Signal modules in slot 1 or 2 (Fig. 3/11), position 1, A to F: channels 1 to 6, position 2, A to F: channels 7 to 12

Fig. 3/13 VARIOGRAPH 7ND35.., connection diagrams for the signal modules (setting on delivery: all channels in basic setting 20 mA)



UC power pack 230 V **UC power pack 24 V**

Fig. 3/12 VARIOGRAPH 7ND35.., connection for power pack



	Socket
Screen	1
External supply	
+24 V	4
0 V	5
RS-485	
RxD/TxD+	8
RxD/TxD-	9
20-mA current loop	
TxD1	10
$I1_{IN}$	12
RxD1	13
RxD2	14
I_{out}	15
TxD2	19
$I2_{IN}$	21

	Pin
Digital inputs (DI)	
DI 1	16
DI 2	17
DI 3	18
DI 4	19
DI 5	20
DI 6	21
Reference potential 0 V	1, 2, 3, 14, 15
Digital outputs (DO)	
DO 1	4
DO 2	5
DO 3	6
DO 4	7
DO 5	8
DO 6	9
DO 7	10
DO 8	11
External supply	
0 V	1, 2, 3, 14, 15
24 V	12, 13 24, 25

Serial interface with subminiature socket

Digital input/output with subminiature plug

Fig. 3/14 VARIOGRAPH 7ND35.., connection for the auxiliary modules

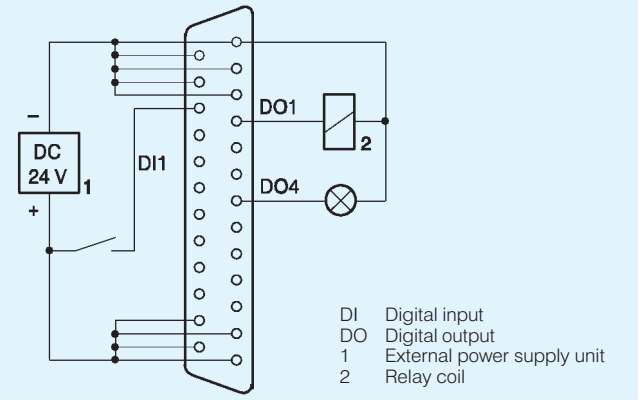
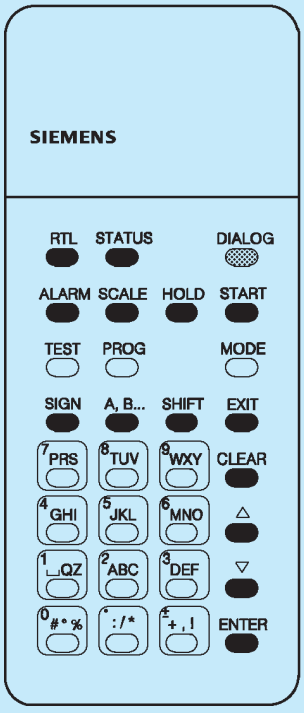


Fig. 3/15 Digital input/0utput, connection example

Fig. 3/16 Infrared remote control unit 7ND9190-8AA



RTL	Return to local (manual operation)
STATUS	Call device status (ON/OFF)
DIALOG	Start dialog
ALARM	Display alarm 1 and/or alarm 2 of current channel
SCALE	Display left value or right value of current channel
HOLD	Fixed/cyclic data display
START	Measure (ON/OFF)
TEST	Test functions (ON/OFF)
PROG	Program input (ON/OFF)
MODE	Set operating mode (ON/OFF)
SIGN	Input of special characters using coding table (ON/OFF)
A, B ...	Text input via additional assignments of decimal keypad (ON/OFF)
SHIFT	Select upper-case/lower-case letters (non-numeric input)
EXIT	Leave operator prompting menus
CLEAR	Clear input (numeric input)
	Clear character (non-numeric input)
△	Increment key (menu)
	Shift cursor to right (non-numeric input)
▽	Decrement key (menu)
	Shift cursor to left (non-numeric input)
Decimal keypad	For numeric and non-numeric inputs (letters and special characters)
ENTER	Release numeric input

Fig. 3/17 Infrared remote control unit 7ND9190-8AA

VARIOGRAPH 7ND3521

Universal hybrid recorder 144 x 144

Ordering data

Order No. | Order code | Price

VARIOGRAPH
Universal hybrid recorder, front dimensions 144 x 144
With recording unit for rolls or fanfold paper

					Order code
Power supply	AC 50 to 60 Hz 110 to 240 V, DC 110 to 230 V				1
	AC 50 to 60 Hz 24 V, DC 24 V				2
Signal modules (analog inputs)	Measured variables/limits	Channels 1 to 3	Channels 4 to 6	Meas. cycle	
Without sig. mod.	–	Not fitted [2]		–	AA
Signal module, 3-channel DC U/I [1]	DC voltage / ± 10 V Direct current / ± 20 mA	Fitted	Not fitted [2]	120 ms	BA
			Fitted		BB
Signal module, 6-channel DC U/I/TC/RTD/R [1]	DC voltage /–100 mV, +600 mV Direct current/–40 mA, +200 mA Resistance / 0 Ω, 600 Ω Temperature via thermocouple or resistance thermometer	Fitted		3 s	GA
Signal module, 6-channel DC U/I/TC [1]	DC voltage /–10 mV, +1 V Direct current/– 4 mA, + 20 mA Temperature via thermocouple	1 to 6 Fitted Fitted	7 to 12 Not fitted Fitted	1.5 s	HA HH
Auxiliary modules (digital inputs and outputs)	Without auxiliary modules [2]				11
	With serial interface				12
	With digital input/output				13
	With serial interface and digital input/output				14
Housing door in protection IP 54 [3]	Without lock	Standard door			1N
		Low-reflection door			1P
	With lock	Standard door			1R
		Low-reflection door			1S
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B177				A
	In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D100				G
Measuring-point label	Unlabelled				1
	Labelled (max. 29 digits per channel) Specify desired inscription in plain text:				9
					R1Y
					.....

7ND3521- ■■■■■■ - ■■■■

Further designs on request.
Accessories, spare parts, consumable material and conversion parts on page 3/19.

Available ex stock

Note:
Operation always requires a remote control unit 7ND9190-8AA.

[1]) Basic setting on delivery: all channels 20 mA.
[2]) Can be upgraded (see page 3/19).
[3]) Also available in IP 51 for KWU control panels.

Scope of delivery:
VARIOGRAPH 7ND3521, fitted as ordered
1 roll of chart paper
1 accessories bag (pen assembly, lithium battery and 2 fuses)
2 clamps or 1 set of mounting parts
With auxiliary modules: 1 or 2 connectors
Instructions "Parameterization – a concise overview"

When using several VARIOGRAPH recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

Universal hybrid recorder 288 x 144

Ordering data

Order No. | Order code | Price

VARIOGRAPH
Universal hybrid recorder, front dimensions 288 x 144
With recording unit for rolls

7ND3590- ■■■ - ■■■■■■■■

					Order code
Power supply	AC 50 to 60 Hz 110 to 240 V, DC 110 to 230 V				1
	AC 50 to 60 Hz 24 V, DC 24 V				2
Signal modules (analog inputs)	Measured variables/limits	Channels 1 to 3	Channels 4 to 6	Meas. cycle	
Without sig. mod.	–	Not fitted [2]		–	AA
Signal module, 3-channel DC U/I	DC voltage / ± 10 V Direct current / ± 20 mA [1]	Fitted	Not fitted [2]	120 ms	BA
			Fitted		BB
Signal module, 6-channel DC U/I/TC/RTD/R [1]	DC voltage /–100 mV, +600 mV Direct current/–40 mA, +200 mA Resistance / 0 Ω, 600 Ω Temperature via thermocouple or resistance thermometer	Fitted		3 s	GA
Signal module, 6-channel DC U/I/TC [1]	DC voltage /–10 mV, +1 V Direct current/– 4 mA, + 20 mA Temperature via thermocouple	1 bis 6 Fitted Fitted	7 bis 12 Not fitted Fitted	1.5 s	HA HH
Auxiliary modules (digital inputs and outputs)	Without auxiliary modules [2] With serial interface With digital input/output With serial interface and digital input/output				11 12 13 14
Housing door	With lock Standard door Door with low-reflection glass				1C 1D
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B177				A
	In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D100				G
Measuring-point label	Unlabelled				1
	Labelled (max. 29 digits per channel) Specify desired inscription in plain text:				9 R1Y .....

Further designs on request.
Accessories, spare parts, consumable material and conversion parts on page 3/19.

Note:
Operation always requires a remote control unit 7ND9190-8AA.

[1] Basic setting on delivery: all channels 20 mA.
[2] Can be upgraded (see page 3/19).

Scope of delivery:
VARIOGRAPH 7ND3590, fitted as ordered
1 roll of chart paper
1 accessories bag (pen assembly, lithium battery and 2 fuses)
2 clamps or 1 set of mounting parts
With auxiliary modules: 1 or 2 connectors
Instructions "Parameterization – a concise overview"

When using several VARIOGRAPH recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

Universal hybrid recorder 288 x 288

Ordering data

Order No. 7ND3560- ■■■■■■ - ■■■■■■■■■

Order code ..... Price

VARIOGRAPH
Universal hybrid recorder, front dimensions 288 x 288
With recording unit for rolls

					Order code
Power supply	AC 50 to 60 Hz 110 to 240 V, DC 110 to 230 V				1
	AC 50 to 60 Hz 24 V, DC 24 V				2
Signal modules (analog inputs)	Measured variables/limits	Channels 1 to 3	Channels 4 to 6	Meas. cycle	
Without sig. mod.	–	Not fitted [2]		–	AA
Signal module, 3-channel DC U/I	DC voltage / ± 10 V Direct current / ± 20 mA [1]	Fitted	Not fitted [2]	120 ms	BA
			Fitted		BB
Signal module, 6-channel DC U/I/TC/RTD/R [1]	DC voltage /–100 mV, +600 mV Direct current/–40 mA, +200 mA Resistance / 0 Ω, 600 Ω Temperature via thermocouple or resistance thermometer	Fitted		3 s	GA
Signal module, 6-channel DC U/I/TC [1]	DC voltage /–10 mV, +1 V Direct current/– 4 mA, + 20 mA Temperature via thermocouple	1 bis 6 Fitted Fitted	7 bis 12 Not fitted Fitted	1.5 s	HA HH
Scale (mechanical on device)	Scale graduation (max. 4 graduations possible)				
	0 to 100 % (for all channels)				1
	As specified in plain text				2
Auxiliary modules (digital inputs and outputs)	Without auxiliary modules [2]				1
	With serial interface				2
	With digital input/output				3
	With serial interface and digital input/output				4
Housing door	With lock				1C
	Standard door				1D
Installation	In sheet-steel panel, cabinet or sheet-steel desk upright panel, with 2 clamps C72165-A405-B177				A
	In panel or desk upright panel with basic grid dimension 72 x 72, with one set of mounting parts C79453-A3011-D100				G
Measuring-point label	Unlabelled				1
	Labelled (max. 29 digits per channel) Specify desired inscription in plain text:				9 R1Y

-Z Y01

Further designs on request (e.g. front dimensions 360 x 288 or black front frame)
Accessories, spare parts, consumable material and conversion parts on page 3/19.

Note:
Operation always requires a remote control unit 7ND9190-8AA.

[1]) Basic setting on delivery: all channels 20 mA.
[2]) Can be upgraded (see page 3/19).

Scope of delivery:
VARIOGRAPH 7ND3560, fitted as ordered
1 roll of chart paper
1 accessories bag (pen assembly, lithium battery and 2 fuses)
4 clamps or 1 set of mounting parts
With auxiliary modules: 1 or 2 connectors
Instructions "Parameterization – a concise overview"

When using several VARIOGRAPH recorders it is sometimes only necessary to have one Manual. This is therefore not included in the delivery and must be ordered separately.

Ordering data	Order No.	Price
Accessories		
Infrared remote control unit [4] with four 1.5-V alkaline batteries	**7ND9190-8AA**	
Manual [4] [7] including brief instructions and spare parts list		
– For 7ND3521 and 7ND3590		
German	**C79000-G7300-C79**	
English	**C79000-G7376-C79**	
French	**C79000-G7377-C79**	
– For 7ND3560		
German	**C79000-G7300-C185**	
English	**C79000-G7376-C185**	
French	**C79000-G7377-C185**	
Instructions "Parameterization – a concise overview"		
German	**C79000-M7300-C94**	
English	**C79000-M7376-C94**	
French	**C79000-M7377-C94**	
Transport housing for VARIOGRAPH 7ND3521		
– For AC 230 V version	**7ND9500-8AB1**	
– For DC 24 V version	**7ND9500-8AB2**	
for VARIOGRAPH 7ND3590		
– For AC 230 V version	**7ND9500-8AC1**	
– For DC 24 V version	**7ND9500-8AC2**	
SIMATIC PDM software from V5.2 onwards (serial interface required) for parameterization of VARIOGRAPH 7ND3521, 7ND3590, 7ND3560 hybrid recorders; with documentation (as help file)	**See catalog FI 01**	
Consumable material		
Pen assembly (6 colors), violet, red, black, green, blue and brown	**7ND9001-8FB**	
Chart paper 120 mm wide, roll, for 7ND3521 (approx. 31 m long, recording width 100 mm, 50 linear graduations, weight approx. 0.15 kg)		
Hours imprint	**C72452-A94-B208**	
For 10 mm/h	**C72452-A94-B209**	
20 mm/h	**C72452-A94-B210**	
60 mm/h	**C72452-A94-B211**	
120 mm/h	**C72452-A94-B212**	
Without		
Price per roll when ordering		
20		
60		
100		
Chart paper 230 mm wide, roll, for 7ND3560 or 7ND3590 (approx. 31 m long, recording width 210 mm, 100 linear graduations, without hours imprint, weight approx. 0.35 kg)	**C72452-A98-B172**	
Price per roll when ordering		
20		
60		
100		
Chart papier 120 mm wide, fanfold, for 7ND3521 (approx. 16 m long, recording width 100 mm, 50 linear graduations, weight approx. 0.15 kg)		
Hours imprint	**C72452-A94-B262**	
For 10 mm/h	**C72452-A94-B263**	
20 mm/h	**C72452-A94-B264**	
60 mm/h	**C72452-A94-B265**	
120 mm/h	**C72452-A94-B266**	
Without		
Price per pack when ordering		
20		
60		
100		

	Order No.	Price
Replacement parts		
Take-up spool for		
7ND3521	**C72301-A20-B110**	
7ND3560	**C79453-A3068-B9**	
7ND3590	**C79301-A3000-B4**	
Recording unit for fanfold paper für 7ND3521	**C72301-A20-A6**	
Recording unit for rolls für 7ND3590	**C79301-A3000-A2**	
Recording unit for rolls or fanfold paper for 7ND3521	**C72301-A20-A7**	
Lithium battery, 3 V	**W79084-L1004-B1**	
Conversion parts		
Signal module, 3-channel (2 modules possible per recorder). The defined values are measuring limits		
DC U/I (DC voltage ± 10 V, direct current ± 20 mA) [1] [6]	**7ND9400-8AA**	
Signal module, 6-channel DC U/I/TC/RTD/R (1 module possible per recorder) DC voltage –100 mV, + 600 mV Direct current – 40 mA, + 200 mA Resistance 0 Ω, 600 Ω Temperature via thermocouple or resistance thermometer [1]	**7ND9400-8AF**	
DC U/I/TC (2 modules possible per recorder, cannot be combined with 3-channel modules) DC voltage –10 mV, +1 V Direct current – 4 mA, + 20 mA Temperature via thermocouple [1]	**7ND9400-8AJ** [3]	
Serial interface 20-mA current loop, RS-232, RS-485 with enclosed zero modem cable	**7ND9400-8BH** [3] [5]	
Digital input/output with 6 inputs and 8 outputs	**7ND9400-8BB**	
Measuring-point label without inscription		
For 7ND3521	**C79165-A3029-B10**	
For 7ND3560	**C79453-A3066-B119**	
For 7ND3590	**C79165-A3029-B82**	
Measuring-point label with inscription		
For 7ND3521	**C79165-A3029-B10-Z**	
For 7ND3560	**C79453-A3066-B119-Z**	
For 7ND3590	**C79165-A3029-B82-Z**	
Order code Specify in plain text: **Desired text: . . .** [2]	**Y01**	

Available ex stock

[1] Basic setting on delivery: all channels 20 mA.
[2] Max. 29 characters per channel.
[3] Can be used with firmware version 08 of recorder and later (can be called in STATUS menu). Firmware upgrading not possible.
[4] When using several VARIOGRAPH hybrid recorders it is sometimes only necessary to have one remote control unit and one Manual. These are therefore not included in the delivery and must be ordered separately.
[5] For use in recorders with firmware ≥ 07 to ≤ 08 on request.
[6] See chapter 4 for further 3-channel signal modules.
[7] Also available by downloading from the Internet (see page 5/10 bottom).

Spare Parts, Accessories, Consumable Material for Older Design Recorders

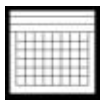
4

4/2 **Summary**
4/2 Accessories for multipoint and line recorders SIREC 2010
4/2 Accessories for hybrid recorders VARIOGRAPH
4/2 Accessories for hybrid recorders PIEZOGRAPH
4/3 Accessories for servo recorders KOMPENSOGRAPH
4/5 Accessories for galvanometer recorders GALVANOGRAPH

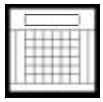
4/6 **Ordering data**
4/6 Ink paper
4/7 Pens and replacement parts
4/8 Conversion parts for multipoint and line recorders
4/10 Ink paper for hybrid, multipoint and line recorders
4/11 Thermal papers for line recorders
4/12 Pen assemblies for hybrid, multipoint and line recorders
4/14 Other consumable material for multipoint and line recorders
4/15 Conversion parts for multipoint and line recorders
4/19 Ink paper for KOMPENSOGRAPH and GALVANOGRAPH
4/20 Pen assemblies for multipoint recorders
4/20 Ink
4/21 Further consumable material and conversion parts for servo multipoint recorders
4/23 Further consumable material and conversion parts
4/24 Measuring ranges for signal plug-ins, scales, rulers and memory chips (EPROM)

Summary

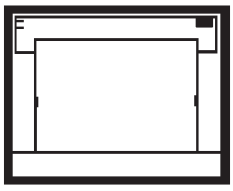
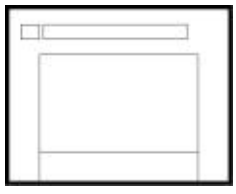
Accessories for SIREC 2010 multipoint and line recorders

	Size 144 x 144 Multipoint recorder Recorder code 7ND3020 Chart width 120 mm Recording width 100 mm	 Size 144 x 144 Line recorder Recorder code 7ND3120 Chart width 120 mm Recording width 100 mm
Ink paper	Page 4/6	
Recording head	Page 4/7	
Fiber pen assemblies		Page 4/7
Take-up spool	Page 4/7	
Recording unit	Page 4/7	
Lithium battery	Page 4/7	
Scales	Page 4/8	
Ruler	Page 4/8	
Measuring point labels	Page 4/9	

Accessories for VARIOGRAPH hybrid recorders

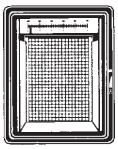
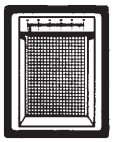
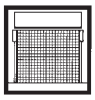
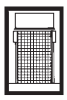
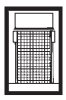
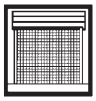
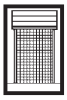
	 Size 144 x 144 Hybrid recorder Recorder code 7ND3520 Chart width 120 mm Recording width 100 mm
Ink paper	Page 4/6
Recording head	Page 4/7
Take-up spool	Page 4/7
Recording unit	Page 4/7
Lithium battery	Page 4/7
Signal module, 3-channel	Page 4/9
Signal module, 6-channel	Page 4/9
Measuring point labels	Page 4/9

Accessories for PIEZOGRAPH hybrid recorders

	 Size 360 x 288 Hybrid recorder Recorder code 7ND2480 Chart width 270 mm Recording width 250 mm	 Size 360 x 288 PIEZOGRAPH 2/3 hybrid recorder Recorder code 7ND2482 Chart width 270 mm Recording width 250 mm
Ink paper	Page 4/10	Page 4/6
Ink reservoir	Page 4/12	Page 4/7
Cleaning set	Page 4/12	Page 4/7
Ink drip assembly		Page 4/7
Take-up spool	Page 4/21	Page 4/7
Lithium battery		Page 4/7
Channel plug-in	Page 4/21	
Signal plug-in	Page 4/21	
Shunt	Page 4/21	
Limit monitor	Page 4/21	Page 4/9
Interfaces		Page 4/9
Memory modules	Page 4/21	
Memory unit		Page 4/21

Summary

Accessories for KOMPENSOGRAPH servo recorders

	 Size 392 x 474 Multipoint and line recorders Recorder code K42, K77 Chart width 270 mm Recording width 250 mm				 Size 398 x 480 Multipoint and line recorders Recorder code K155 Chart width 270 mm Recording width 250 mm			
Ink rollers for multipoint recorders	Page 4/20							
Ink and recording capillaries for line recorders	Page 4/20							
								
Size	288 x 288	192 x 288	192 x 288	192 x 240	288 x 288	288 x 240	192 x 288	192 x 240
	Multipoint and line recorders		Line recorders		Line recorders		Multipoint and line recorders	
Recorder code	M2, M73810, 7ND1160, M73812, 7ND1060	M4, K164, M73814, M73816, 7ND1040, 7ND1140	M73916, M73760, 7ND1141, 7ND1142	M73632, M73634	7ND2160 7ND2161 7ND2162 7ND2163	7ND2150 7ND2151 7ND2152 7ND2153	7ND2042 7ND2043 7ND2140 7ND2141 7ND2142 7ND2143	7ND2032 7ND2033 7ND2130 7ND2131 7ND2132 7ND2133
Chart width Recording width	230 mm 210 mm	140 mm 120 mm	140 mm 120 mm	140 mm 120 mm	230 mm 210 mm	230 mm 210 mm	140 mm 120 mm	140 mm 120 mm
Ink paper	Page 4/19 C72452-A98-...	Page 4/19 C72452-A96-B9						
Ink roller drums for multipoint recorders	Page 4/20 C70301-A531-...				Page 4/12 (printing head)			
Ink for line recorders	Page 4/20							
Pens for line recorders	Page 4/21							
Fiber pen assemblies					Page 4/13			
Thermal styluses					Page 4/13			
Wipers: For potentiometers For limit contacts	Page 4/23 C70301-A531-B285 C70301-A531-B290		Page 4/23					
Scale cable	Page 4/22 C70301-A532-B42	Page 4/23			Page 4/14			
Ink hose			Page 4/23					
Take-up spool		Pages 4/23			Page 4/14			
Signal plug-in	Page 4/23 7ND9111-Z				Page 4/17			
Amplifier, inverter	Page 4/23							
Shunt for current measurement	Page 4/21 7ND9132-8AA						Page 4/17	
Resistor R_{CU}	Page 4/23 C74005-A212-A1			Page 4/23 C74005-A212-A1				
Scale plate	Pages 4/22 and 4/23				Page 4/16			
Ruler	Page 4/22 7ND9260, 7ND9270-Z				Page 4/16			
Meas. point label	Page 4/22				Page 4/18			
Mounting set for limit contacts					Page 4/18			
Mounting set for marking system					Page 4/18			
Blowball			Page 4/23					

KOMPENSOGRAPH 144 x 144, 96 x 144 and 72 x 144: Page 4/4

4

KOMPENSOGRAPH

Summary

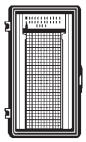
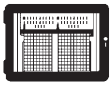
Size	144 x 144	144 x 144	144 x 144	144 x 144	144 x 144	96 x 144	96 x 144	72 x 144
	Multipoint recorder		Line recorder			Multipoint rec.	Line recorder	
Recorder code	M73910	M73911 7ND2020 7ND2021	K203	M73950 7ND1123 7ND2121 7ND2123	M742 M936 7ND1122 M73938 7ND1120 M73940 7ND1121	M73948 7ND1010	M73949 7ND1110	M73950 7ND1100 7ND2100 7ND2101
Chart width Recording width	120 mm 100 mm	120 mm 100 mm	110 mm 100 mm	110 mm 100 mm	120 mm 100 mm	120 mm 100 mm	120 mm 100 mm	110 mm 100 mm
Ink paper	Page 4/19	Page 4/10 C72452-A94-B8 to B12	Page 4/10 [1]		Page 4/10 C72452-A94-B8 to B12			Page 4/19 and Page 4/10 [1]
Printing head and ink pad carrier for multipoint recorders	Page 4/20	Page 4/12 C72453-A320--B117 u. -B221				Page 4/20		
Ink for line recorders			Page 4/20 and Page 4/12 [1]					Page 4/12 [1]
Fiber pens			Page 4/13 [1]				Page 4/21	P. 4/13 [1]
Wiper for potentiometer		Page 4/22						
Scale cable			Page 4/14 [1]					P. 4/14 [1]
Measuring point selector	Page 4/14, C74315-A66-A4							
Take-up spool		Page 4/22	Page 4/14 [1]					P. 4/14 [1]
Signal plug-in								
Shunt for current measurement		Page 4/23 7ND9132-8AA						
Resistor R_{CU}	Page 4/23, C74005-A212-A1							
Scale plate			Page 4/16 [1]					P. 4/16 [1]
Ruler	Page 4/16: 7ND9262, 7ND9272-Z		Page 4/16: 7ND9262, 7ND9272-Z		Page 4/16: 7ND9262, 7ND9272-Z			Page 4/16 7ND9272-Z

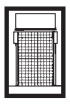
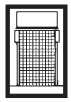
Size	144 x 144	144 x 144	144 x 144	144 x 144
	Multipoint recorder	Line recorder		
Recorder code	7ND2022 7ND2023	7ND2125	7ND2124	7ND2122
Chart width Recording width	120 mm 100 mm	120 mm 100 mm	120 mm 100 mm	120 mm 100 mm
Ink paper	Pages 4/10 and 11		Page 4/10	
Thermal paper		Page 4/11		
Printing head	Page 4/12			
Fiber pen		Page 4/13		
Thermal stylus		Page 4/13		
Scale cable	Page 4/14	Page 4/14		
Meas. point selector	Page 4/14			
Take-up spool	Page 4/14	Page 4/14		
Signal plug-in	Page 4/17 [2]	Page 4/17		
Shunt for current measurement	Page 4/17			
Scale plate	Page 4/16			
Ruler	Page 4/16			
Thermal manifold		Page 4/17		
Measuring point label	Page 4/18			

[1]) Only for 7ND21.. [2]) Only for 7ND2023.

Summary

Accessories for GALVANOGRAPH galvanometer recorders

							
Size	21 K	12 K	12 L, NUMO	SPV	288 x 240 288 x 288	192 x 240 192 x 288	192 x 240 192 x 288
	Line recorder	Line recorder	Line recorder	Multipoint recorder	Line recorder	Multipoint recorder	Line recorder
Recorder code	T22, T25	T20, T24, T26, T27	T3, T4, T21	F10 to F13	T7, T28, T35	F20 to F31 F32 to F43	T9, T23, T29
Chart width Recording width	230 mm 210 mm	140 mm 120 mm	140 mm 120 mm	140 mm 120 mm	230 mm 210 mm	140 mm 120 mm	140 mm 120 mm
Ink paper	Page 4/19						
Ribbons for multipoint recorders				Page 4/20		Page 4/20	
Ink pens. Recording capillaries and recording electrodes for line recorders	Page 4/20				Page 4/20		Page 4/20

										
Size	288 x 288	288 x 240	192 x 288	192 x 240	192 x 288	192 x 240	144 x 144		144 x 144	144 x 144	96 x 96
	Line recorder		Multipoint recorder		Line recorder		Line recorder		Line rec.	Multipoint recorder	
Recorder code	T43, M02194, 7ND1360	T42, M02190, 7ND1350	M734, 7ND1240, M73260 to M73266	M734, 7ND1230, M73250 to M73256	T38, M02192, 7ND1340	T40, M02188, 7ND1330	T8, T39	M02186	7ND2320 7ND2321 7ND2322 7ND2323 7ND2324	7ND1220	7ND2270 7ND2271
Chart width Recording width	230 mm 210 mm		140 mm 120 mm		140 mm 120 mm		110 mm 100 mm	110 mm 100 mm	120 mm 100 mm	120 mm 100 mm	70 mm 60 mm
Ink paper	Page 4/19						Page 4/19		Page 4/10 [5]	Page 4/10 C72452--A94-B8 to -B12 + -B262 to -B266 Page 4/11	Page 4/10
Thermal paper									Page 4/11 [3]		
Ribbons for multipoint recorders			Page 4/20							Page 4/20	Page 4/12
Ink for line recorders	Page 4/20				Page 4/20				Page 4/12		
Thermal stylus									Page 4/13 [2]		
Take-up spool									Page 4/14		
Scale plate									Page 4/16		
Ruler											Page 4/16
Signal plug-in									Page 4/17 [4]		
Oil damping insert									Page 4/18 [1]		
Measuring point label									Page 4/18		

[1]) Only for 7ND2320, 7ND2321 and 7ND2324. [2]) Not for 7ND2323 and 7ND2324. [3]) Not for 7ND2323 and 7ND2324. [4]) Only for 7ND2320 and 7ND2321.
[5]) Only for 7ND2320 and 7ND2324.

Ink paper

Ordering data	Record-ing width	Divisions (linear)	Hours print	For recorder / Order No.	144 x 144			360 x 288	Price per roll/fanfold pack for following quantity			
					7ND3020	7ND3120	7ND3520	7ND2482	10	20	60	100
Chart roll												
Ink paper												
120 mm wide												
Approx. 31 m long Approx. weight 0.15 kg	100 mm	50	For 10 mm/h	**C72452-A94-B208**	–	♦	–	–	–			
			20 mm/h	**C72452-A94-B209**	–	♦	–	–				
			60 mm/h	**C72452-A94-B210**	–	♦	–	–				
			120 mm/h	**C72452-A94-B211**	–	♦	–	–				
			Without	**C72452-A94-B212**	♦	♦	♦	–				
270 mm wide												
Brillant	250 mm	Without	Without	**7ND2482-8UA**	–	–	–	♦		–	–	–
Standard				**7ND2482-8UC**	–	–	–	♦		–	–	–
Approx. 33 m long Approx. weight 0.55 kg												
Fanfold chart												
Ink paper												
120 mm wide												
Approx. 16 m long Approx. weight 0.1 kg	100 mm	50	For 10 mm/h	**C72452-A94-B262**	–	♦	–	–	–			
			20 mm/h	**C72452-A94-B263**	–	♦	–	–				
			60 mm/h	**C72452-A94-B264**	–	♦	–	–				
			120 mm/h	**C72452-A94-B265**	–	♦	–	–				
			Without	**C72452-A94-B266**	♦	♦	♦	–				
270 mm wide												
Fanfold "Standard" Approx. 33 m long Approx. weight 0.55 kg	250 mm	Without	Without	**7ND2482-8UD**	–	–	–	♦		–	–	–

Available ex stock.

Minimum ordering quantity 20 rolls/fanfold packs, or 10 rolls/fanfold packs for 7ND2482.
Price for larger quantities than those listed on request.
Other range divisions, additional text and numbers on request.

Fig. 4/1 Recording head with 6 fiber pens for SIREC 2010 multipoint recorder 7ND3020 and VARIOGRAPH hybrid recorder 7ND3520

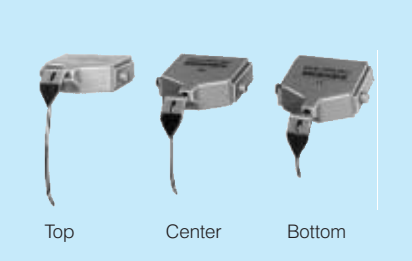


Fig. 4/2 Fiber pen assemblies for SIREC 2010 line recorder 7ND3120

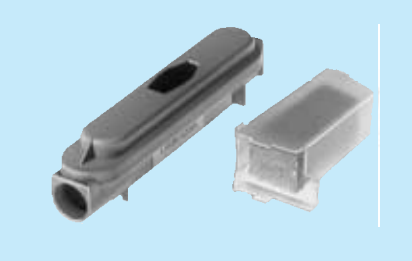


Fig. 4/3 Disposable ink reservoir for PIEZOGRAPH 7ND2482 with ink drip assembly

Ordering data			For recorder / Order No.	144 x 144 7ND3020	144 x 144 7ND3120	144 x 144 7ND3520	360 x 288 7ND2482	Price
Pen assemblies								
Recording head (6 colors) Violet, red, black, green, blue and brown			**7ND9001-8FB**	♦	–	♦	–	
Fiber pen assembly Recording width 100 mm per channel								
Channel assignment			Location / Color					
		3 gn	Top / Green	**7ND9001-8AG**	–	♦	–	–
	2 bl (rd)	2 bl (rd)	Center / Blue	**7ND9001-8AD**	–	♦	–	–
			Center / Red	**7ND9001-8AE**	–	♦	–	–
1 rd (bl)	1 rd (bl)	1 rd (bl)	Bottom / Red	**7ND9001-8AA**	–	♦	–	–
			Bottom / Blue	**7ND9001-8AB**	–	♦	–	–
Disposable ink reservoir, contents 7 cm³ (max. storage period 18 months) [1] Minimum ordering quantity: 4 reservoirs (any combination of colors)			Magenta	**7ND2482-8TA**	–	–	–	♦
			Cyan	**7ND2482-8TB**	–	–	–	♦
			Yellow	**7ND2482-8TC**	–	–	–	♦
			Black	**7ND2482-8TD**	–	–	–	♦
Disposable ink reservoir set, content 7 cm³, magenta, cyan, yellow and 2 x black				**7ND2482-8TE**	–	–	–	♦
Cleaning set for the piezo recording head				**7ND2482-8VD**	–	–	–	♦
Ink drip assembly Minimum ordering quantity 5 assemblies				**7ND2482-8WB**	–	–	–	♦
Replacement parts								
Take-up spool	With rubber tongues (Fig. 4/4)			**C72301-A20-B110**	♦	♦	♦	–
	With clamping sleeve (Fig. 4/5)			**C79453-A3033-B203**	–	–	–	♦
Recording unit	For fanfold paper			**C72301-A20-A6**	–	–	♦	–
	For chart roll or fanfold			**C72301-A20-A7**	–	–	♦	–
	For fanfold paper			**C72301-A20-A16**	♦	♦	–	–
	For chart roll or fanfold			**C72301-A20-A17**	♦	♦	–	–
Lithium battery	3 V			**W79084-L1004-B1**	–	–	♦	–
	3 V			**W79084-L1002-B1**	♦	–	–	–
	3.4 V			**W79084-U1001-B2**	–	–	–	♦

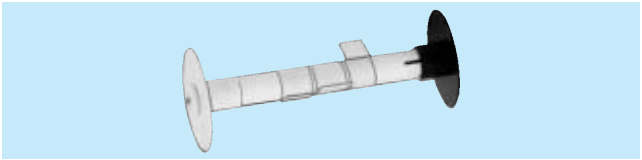


Fig. 4/4 Take-up spool with rubber tongues

Fig. 4/5 Take-up spool with clamping sleeve

[1]) Replacement of reservoir when in use: after max. 6 months.

Conversion parts for multipoint and line recorders

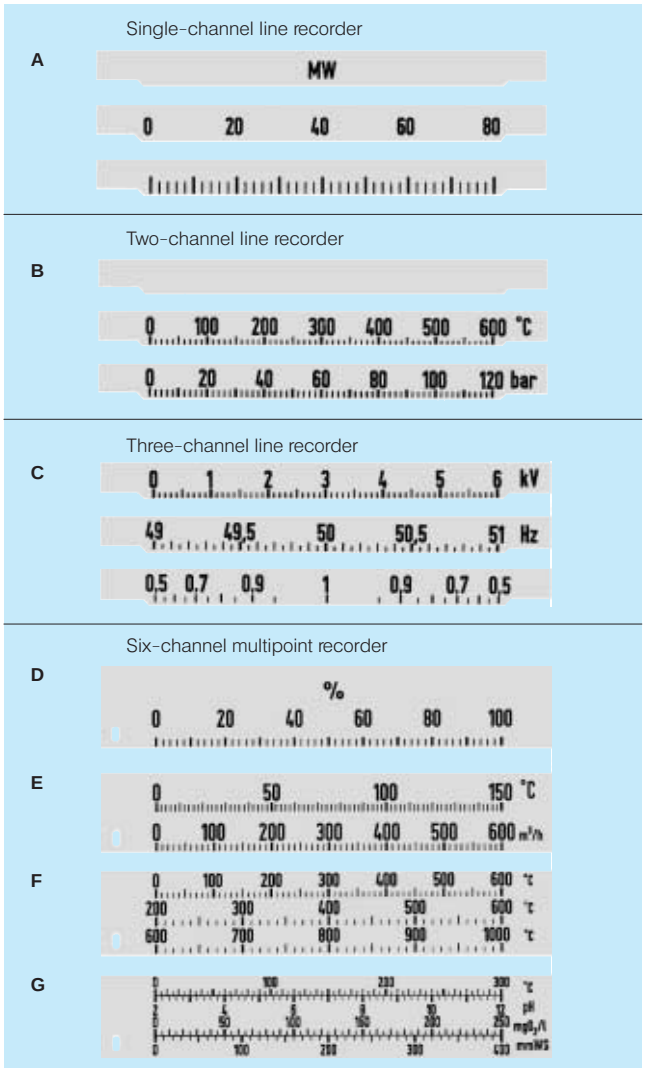


Fig. 4/6 Scale versions for line and multipoint recorders

Ordering data		For recorder / Order No.	144 x 144 7ND3020	144 x 144 7ND3120	Price
Scales					
Design and arrangement of scale plates	Number of scales				
–	Without [4]	**7ND9300-8RA** **7ND9300-8QA** [1]	– ♦	♦ –	
A	One [2]	**7ND9300-8RB-Z**	–	♦	
B or C [3]	One	**7ND9300-8RC-Z**	–	♦	
D	One	**7ND9300-8QB-Z** [1]	♦	–	
E	Two	**7ND9300-8QC-Z** [1]	♦	–	
F	Three	**7ND9300-8QD-Z** [1]	♦	–	
G	Four	**7ND9300-8QE-Z** [1]	♦	–	
Ruler Without scale With one scale		 **7ND9262** **7ND9272-Z**	 ♦ ♦	 ♦ ♦	
Specify in addition for the Order Nos. identified by "-Z": Recording range(s) and scale(s) according to plain text		...			

[1]) A scale plate printed with two, three or four scales is required for each multipoint recorder (Fig. 4/6: D, E, F or G); sequence of scale plates from 1 at bottom to 4 at top according to sequence of Order codes 1 to 4.
[2]) One scale plate each for scale, measured variable and unit.
[3]) One scale plate required for each channel.
[4]) Start and end are marked.

Conversion parts

Ordering data		For recorder / Order No.	144 x 144 7ND3020	144 x 144 7ND3120	144 x 144 7ND3520	144 x 144 7ND3521	288 x 144 7ND3590	288 x 288 7ND3560	360 x 288 7ND2482	Price
Signal module, three-channel (2 modules required per recorder)										
DC U/I	Measuring limits									
DC voltage	± 10 V	**7ND9400-8AA**	–	–	♦	–	–	–	–	
Direct current	± 20 mA [3]									
DC voltage	± 30 V	**7ND9400-8AB** [1] [11]	–	–	–	♦	♦	♦	–	
Direct current	± 50 mA [4]									
DC U/TC		**7ND9400-8AC** [1] [11]	–	–	–	♦	♦	♦	–	
DC voltage	–10 mV, + 60 mV									
Temperature via thermocouple										
Signal module, six-channel	**DC U/I/TC/RTD/R**									
• Not intrinsically-safe [3]		**7ND9400-8AF** [1]	–	–	♦	–	–	–	–	
Measuring point label without inscription										
For SIREC 2010 line recorder		**C79165-A3029-B11**	–	♦	–	–	–	–	–	
For SIREC 2010 multipoint recorder		**C79165-A3029-B12**	♦	–	–	–	–	–	–	
For VARIOGRAPH hybrid recorder		**C79165-A3029-B10**	–	–	♦	–	–	–	–	
Measuring point label with inscription										
For SIREC 2010 line recorder		**C79165-A3029-B11-Z**	–	♦	–	–	–	–	–	
For SIREC 2010 multipoint recorder		**C79165-A3029-B12-Z**	♦	–	–	–	–	–	–	
For VARIOGRAPH hybrid recorder		**C79165-A3029-B10-Z**	–	–	♦	–	–	–	–	
Order code Specify in plain text: **Desired text: . . .** [7]		**Y01**	♦	♦	♦	–	–	–	–	
Limit monitor 2 alarm outputs per channel, selectable as maximum or minimum limits	**32 outputs**	**7ND2482-8PA**	–	–	–	–	–	–	♦	
	64 outputs	**7ND2482-8PB**	–	–	–	–	–	–	♦	
Interface, basic		**7ND2482-8NY** [8]	–	–	–	–	–	–	♦	
basic		**7ND2482-8NX** [9]	–	–	–	–	–	–	♦	
Always required 1 x, in addition:										
Interface, IEC or/and		**7ND2482-8NC**	–	–	–	–	–	–	♦	
Interface, serial		**7ND2482-8NB**	–	–	–	–	–	–	♦	

Available ex stock.

[1]) Can be used with firmware version 04 and later of VARIOGRAPH hybrid recorder. Uprating of firmware on request.
The firmware version can be called in the STATUS menu of the recorder.
[2]) Can be used with firmware version 06 and later of VARIOGRAPH hybrid recorder. Uprating of firmware on request.
The firmware version can be called in the STATUS menu of the recorder.
[3]) Basic setting on delivery: all channels 20 mA.
[4]) Basic setting on delivery: all channels 50 mA.
[5]) With resistance measurement in potentiometer circuit: max. 180 Ω can be set.
[6]) Basic setting on delivery: all channels 100 V.
[7]) Max. number of places for inscription: see Ordering data of associated recorder.
[8]) Can be used up to firmware version < 10 of PIEZOGRAPH hybrid recorder.
[9]) Can be used with firmware version ≥ 10/10/10 of PIEZOGRAPH hybrid recorder.
[10]) With intrinsically-safe: –4 mA, +20 mA.
[11]) Only available as spare part. Without CE-symbol.

Ink paper for hybrid, multipoint and line recorders

Chart rolls

Ordering data Ink paper	Record-ing width	Divisions (linear)	Hours print	For recorder Order No.	96 x 96 7ND2270, 7ND2271	72 x 144 7ND2100, 7ND2101	144 x 144 7ND2022, 7ND2023	7ND2122	7ND2121, 7ND2123	7ND2124	7ND2125	7ND2320 (M73152)	7ND2324	360 x 288 7ND2480	Price per roll for following quantity 10	20	60	100
110 mm wide																		
Approx. 16 m long Approx. weight 0.07 kg	100 mm	50	For 20 mm/h 60 mm/h Without	**C72452-A92-B62** **C72452-A92-B63** **C72452-A92-B61**	– – –	♦ ♦ ♦	– – –	– – –	♦ ♦ ♦	– – –	– – –	– – –	– – –	– – –				
120 mm wide																		
Approx. 16 m long Approx. weight 0.1 kg	100 mm	50	For 10 mm/h 20 mm/h 60 mm/h 120 mm/h Without	**C72452-A94-B8** **C72452-A94-B9** **C72452-A94-B10** **C72452-A94-B11** **C72452-A94-B12**	– – – – –	– – – – –	♦ ♦ ♦ ♦ ♦	♦ ♦ ♦ ♦ ♦	– – – – –	♦ ♦ ♦ ♦ ♦	♦ ♦ ♦ ♦ ♦	♦ ♦ ♦ ♦ ♦	♦ ♦ ♦ ♦ ♦	– – – – –				
Approx. 31 m long Approx. weight 0.15 kg	100 m	50	For 10 mm/h 20 mm/h 60 mm/h 120 mm/h Without	**C72452-A94-B208** **C72452-A94-B209** **C72452-A94-B210** **C72452-A94-B211** **C72452-A94-B212**	– – – – –	– – – – –	♦ ♦ ♦ ♦ ♦	– – – – –	– – – – –	– – – – –	♦ ♦ ♦ ♦ ♦	– – – – –	– – – – –	– – – – –				
270 mm wide																		
Approx. 33 m long Approx. weight 0.55 kg	250 mm	Without	Without	**C72452–A110–B1**	–	–	–	–	–	–	–	–	–	♦		–	–	–

Minimum ordering quantity 20 rolls, or 10 rolls for 7ND2480. Price for larger quantities than those listed on request.
Other range divisions, additional text and numbers on request.

Ink paper for multipoint and line recorders

Fanfold paper

Ordering data Ink paper	Record-ing width	Divisions (linear)	Hours print	For recorder Order No.	144 x 144 7ND2022 7ND2023 7ND2125	Price per fanfold pack for following quantity 20	 60	 100
120 mm wide								
Approx. 16 m long Approx. weight 0.1 kg	100 mm	50	For 10 mm/h 20 mm/h 60 mm/h 120 mm/h Without	**C72452-A94-B262** **C72452-A94-B263** **C72452-A94-B264** **C72452-A94-B265** **C72452-A94-B266**	♦ ♦ ♦ ♦ ♦			

Thermal paper for line recorders

Chart rolls

Ordering data Thermal paper	Record-ing width	Divisions (linear)	Hours print	For recorder Order No.	144 x 144 7ND2125	 7ND2320/21 (M73152)	 7ND2322 (M73172)	Price per roll for following quantity 20	 60	 100
120 mm wide										
Approx. 16 m long Approx. weight 0.1 kg	100 mm	50	For 20 mm/h Without	**C72452-A94-B159** **C72452-A94-B162**	♦ ♦	♦ ♦	– –			
		12	Without	**C72452-A94-B181**	–	–	♦			

Price for larger quantities than those listed on request. Other range divisions, additional text and numbers on request.

Available ex stock

Pen assemblies for hybrid, multipoint and line recorders

Fig. 4/7 Ribbon for multipoint recorder

Fig. 4/8 Printing head with six fiber pens

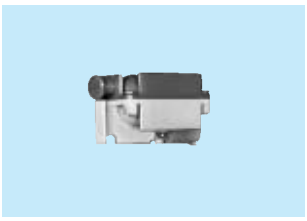


Fig. 4/9 Ink reservoir for hybrid recorder

Fig. 4/10 Ink, 50 cm^3 bottle

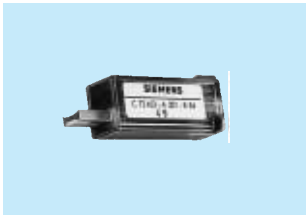


Fig. 4/11 Disposable ink reservoir 4 cm^3

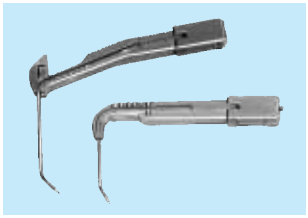


Fig. 4/12 Upper and lower channel pens

Ordering data			For recorder / Order No.	72 x 144 7ND2100 7ND2101	96 x 96 7ND2270 7ND2271	144 x 144 7ND2022 7ND2023	144 x 144 7ND2121/23	144 x 144 7ND2320 (M73152)	144 x 144 7ND2324	192 x 240 7ND2032 7ND2033	192 x 288 7ND2042 7ND2043	360 x 288 7ND2480	Price
Ribbons													
For single-channel recorders	6, blue		**7ND9018-8AA**	–	♦	–	–	–	–	–	–	–	
For two-channel recorders	3, blue and red (2 colors each)		**7ND9018-8AB**	–	♦	–	–	–	–	–	–	–	
For six-channel recorders	3, black, red, green, blue, brown and violet (6 colors each)		**7ND9018-8AC**	–	♦	–	–	–	–	–	–	–	
Printing head (6 colors) DIN 16 235-A-h-6 violet, red, black, green, blue and brown			**C72453-A320-B117**	–	–	♦	–	–	–	♦	♦	–	
Ink reservoir set (stock life max. **18 months**), consisting of ink reservoirs in magenta, cyan, yellow and black as well as a tampon with holder (replacement of reservoir in recorder: max. 6 mon.)			**C79453-A3031-D50**	–	–	–	–	–	–	–	–	♦	
Cleaning set for piezo recording head, not for "A ink", comprising 1 bottle of cleaning liquid (40 cm^3) and 1 brush			**C79453-A3031-D33**	–	–	–	–	–	–	–	–	♦	
Cleaning set as above, but for recording heads identified "A ink"			**7ND2482-8VD**	–	–	–	–	–	–	–	–	♦	
Ink	Bottle 50 cm^3	Blue	**C72452-Z725-C30**	♦	–	–	♦	–	–	–	–	–	
		Red	**C72452-Z725-C32**	♦	–	–	♦	–	–	–	–	–	
		Green	**C72452-Z725-C31**	♦	–	–	♦	–	–	–	–	–	
		Blue [1]	**C72452-Z725-C28**	–	–	–	–	♦	–	–	–	–	
		Red [1]	**C72452-Z725-C27**	–	–	–	–	♦	–	–	–	–	
		Grn. [1]	**C72452-Z725-C29**	–	–	–	–	♦	–	–	–	–	
	Bottle 500 cm^3	Blue [1]	**7ND9050-0GB**	–	–	–	–	♦	–	–	–	–	
		Red [1]	**7ND9050-0PC**	–	–	–	–	♦	–	–	–	–	
		Grn. [1]	**7ND9050-0QD**	–	–	–	–	♦	–	–	–	–	
	Disposable ink reservoir [2] 4 cm^3	Red	**C72453-A321-B83**	–	–	–	–	♦	♦	–	–	–	
		Blue	**C72453-A321-B84**	–	–	–	–	♦	♦	–	–	–	
	2 ink bags [1]	Red	**C72453-Z725-H1**	–	–	–	–	♦	–	–	–	–	
		Blue	**C72453-Z725-H2**	–	–	–	–	♦	–	–	–	–	

[1]) Before ordering, check whether the recorder 7ND2320 has an ink bag, refillable reservoir or disposable reservoir.
[2]) Applies to recorder 7ND2320 only from serial No. M 10-785 onwards.

Pen assemblies for line recorders

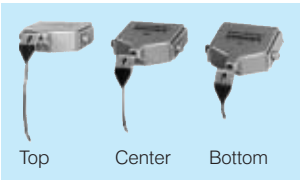


Fig. 4/13
Fiber pens 7ND9001-8AG, -8AD/AE, -8AA/AB and thermal styluses 7ND9001-8CA

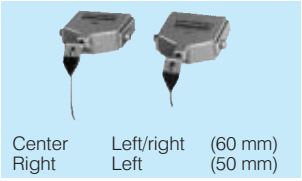


Fig. 4/14
Fiber pens 7ND9001-8AK, -8AA and thermal styluses 7ND9001-8CA

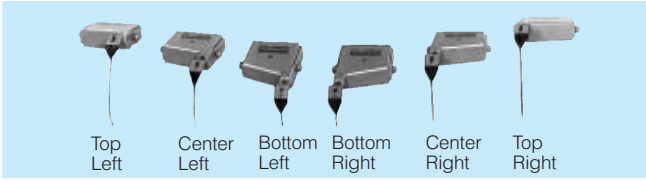


Fig. 4/15 Fiber pens 7ND9001-8AU, -8AN, -8AR, -8BA

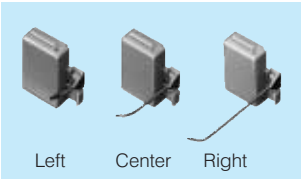


Fig. 4/16 Fiber pens 7ND9001-8BL/BK, -8BP/BN, -8BR

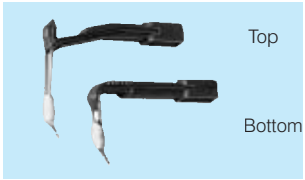


Fig. 4/17 Thermal styluses C72453-A321-B162, -B160

Ordering data			For recorder	72x144	144 x 144						192 x 240				288 x 240				Price
											7ND2130 7ND2131	7ND2132 7ND2133			7ND2150 7ND2151	7ND2152 7ND2153			
											192 x 288				288 x 288				
Fiber pen assembly for recording on ink paper											7ND2140 7ND2141	7ND2142 7ND2143			7ND2160 7ND2161	7ND2162 7ND2163			
				7ND2100/01	7ND2121	7ND2122	7ND2123	7ND2124	7ND2125	7ND2320/21/22	Recording width in mm, per channel								
Channel assignment			Order No.	100	100	100	100	100	100	100	120	50	120	50	210	100	60	210	100	60	
1 bl (rd), 2 rd (bl), 3 gn			Left	Blue	**7ND9001-8BL**	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
				Red	**7ND9001-8BK**	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
			Center	Red	**7ND9001-8BP**	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
				Blue	**7ND9001-8BN**	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
			Right	Green	**7ND9001-8BR**	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
		3 gn	Top	Green	**7ND9001-8AG**	–	–	♦	–	♦	♦	–	♦	–	♦	–	–	♦	–	–		
	2 bl (rd)	2 bl (rd)	Center	Blue	**7ND9001-8AD**	–	–	♦	–	♦	♦	–	♦	–	♦	–	–	♦	–	–		
				Red	**7ND9001-8AE**	–	–	♦	–	♦	♦	–	♦	–	♦	–	–	♦	–	–		
1 rd (bl)	1 rd (bl)	1 rd (bl)	Bottom	Red	**7ND9001-8AA**	–	–	♦	–	♦	♦	–	♦	–	♦	–	–	♦	–	–		
				Blue	**7ND9001-8AB**	–	–	♦	–	♦	♦	–	♦	–	♦	–	–	♦	–	–		
	2 bl 4 bl	2 bl 5 bl	Cent. left	Blue	**7ND9001-8AU**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
			right	Blue	**7ND9001-8BA**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
1 rd 2 rd	1 rd 3 rd	1 rd 4 rd	Bot. left	Red	**7ND9001-8AN**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
			right	Red	**7ND9001-8AR**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
1 rd 2 rd			Left	Red	**7ND9001-8AA**	–	–	–	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–
			Right	Red	**7ND9001-8AK**	–	–	–	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–
1 rd 2 rd 3 rd			Left/right	Red	**7ND9001-8AA**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
			Center	Red	**7ND9001-8AK**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–
Thermal stylus for recording on thermal paper																					
Channel assignment			Location	Indicat. color																	
1 rd	1 rd	1 rd	Bottom	Red	**7ND9001-8CA**	–	–	–	–	–	♦	–	♦	–	–	–	♦	–	–	–	–	–	
1 rd 2 rd			Left	Red	**7ND9001-8CA**	–	–	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–
			Right	Red	**7ND9001-8CD**	–	–	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–
1 rd 2 rd 3 rd			Left/right	Red	**7ND9001-8CA**	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	–	
2 bl 1 rd			Top	Blue	**C72453-A321-B162**	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	
			Bottom	Red	**-A321-B160**	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	

Other consumable material for multipoint and line recorders

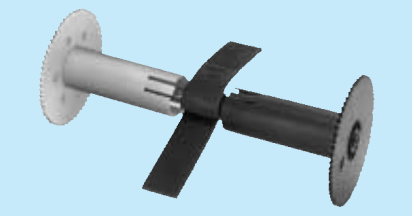


Fig. 4/18 Take-up spool with rubber tongues; for automatic chart take-up

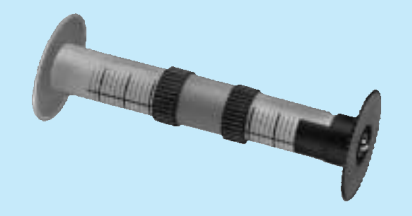


Fig. 4/19 Take-up spool with rubber rings; for automatic chart take-up

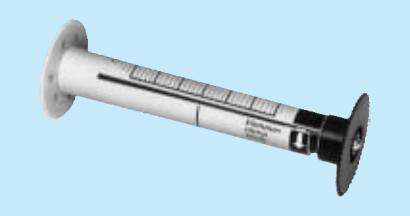


Fig. 4/20 Take-up spool with clamping sleeve

Ordering data	For recorder / Order No.	72 x 144	144 x 144							192 x 240				192 x 288				288 x 240		288 x 288		Price
		7ND2100, 7ND2101	7ND2022	7ND2023	7ND2121, 7ND2123	7ND2122, 7ND2124	7ND2125	7ND2320 (M73152)	7ND2321, 7ND2322, 7ND2323	7ND2324	7ND2032	7ND2033	7ND2130, 7ND2131	7ND2132, 7ND2133	7ND2042	7ND2043	7ND2140, 7ND2141	7ND2142, 7ND2143	7ND2150, 7ND2151	7ND2152, 7ND2153	7ND2160, 7ND2161	7ND2162, 7ND2163	
Take-up spool with rubber tongues	**C72301-A20-B110**	–	♦	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72301-A20-B71	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	♦	♦	♦	♦	–	–	–	–	
	C72301-A20-B72	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	
Take-up spool with rubber rings	**C72301-A20-B53**	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Take-up spool with clamping sleeve	**C72301-A20-B13**	–	–	–	–	–	–	♦	♦	♦	–	–	–	–	–	–	–	–	–	–	–	–	
Mandrel (part pushed onto take-up spool)	**C72301-A22-B8**	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Scale cable																							
For channel 1 (white identification)	**C72453-A340-B6**	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
For channel 2 (gray identification)	**C72453-A340-B7**	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
For channel 3 (black identification)	**C72453-A340-B8**	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
For fiber pen recording	**C79453-A3011-B39**	–	–	–	–	♦	♦	–	–	–	–	–	♦	♦	–	–	♦	♦	♦	♦	♦	♦	
For thermal stylus recording	**C79453-A3025-D83**	–	–	–	–	–	♦	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	–	
	C79453-A3027-C72	–	♦	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C79453-A3027-C75	–	–	–	–	–	–	–	–	–	♦	♦	–	–	♦	♦	–	–	–	–	–	–	
Servo unit	**C72246-A144-A14** [3]	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72246-A144-A6	–	–	–	–	♦	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72246-A144-A8	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	–	
	C72246-A144-A18	–	–	–	–	–	–	–	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	
Servo unit, without motor	**C72246-A144-A7**	–	♦	–	–	–	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	–	
	C72246-A144-A13	–	–	♦	–	–	–	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	
Recording unit for chart roll	**C72301-A22-A1**	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72301-A22-A2	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72301-A20-A8	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	C72301-A20-A4	–	–	–	–	–	–	♦	♦	♦	–	–	–	–	–	–	–	–	–	–	–	–	
	C72301-A20-A10	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	–	–	–	–	–	–	–	–	
	C72301-A20-A12	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	–	–	–	–	
	C72301-A20-A11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	–	–	
	C72301-A20-A13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	
Recording unit For fanfold paper	**C72301-A20-A6**	–	♦	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
For roll or fanfold paper	**C72301-A20-A7**	–	♦	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Measuring point selector, plug-in Single-pole	**C74315-A66-A4**	–	♦	–	–	–	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	–	
Two-pole	**W79050-U1201-U106**	–	–	♦	–	–	–	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	
Ink reservoir, refillable	**C72453-A315-B20** [1]	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Ink hose for measuring system	**C72246-A138-C73**	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Holder for ink reservoir	**C72453-A315-C24** [1]	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
	C72453-A315-B86 [2]	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Plug for ink reservoir Channel 1	**C72453-A315-B33**	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Channel 2	**C72453-A315-B35**	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Tube	**C72246-A138-C94**	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Blowball	**C79453-A3028-B1**	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Lubricating oil Etsyntha Silber Bottle 1 cm³	**C72453-A320-B22**	♦	♦	♦	♦	–	–	–	–	–		–				–			–	–	–	–	
Flushing liquid Bottle 5 cm³	**C72453-A315-B23** [1]	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	
Tank 4 cm³	**C72453-A321-B88** [2]	–	–	–	–	–	–	♦	–	♦		–				–			–	–	–	–	

[1]) Only applies to rec. 7ND2320 up to ser. No. M10-784. [2]) Only applies to rec. 7ND2320 from ser. No. M10-785 onwards. [3]) Not for 7ND2100 and 7ND2121.

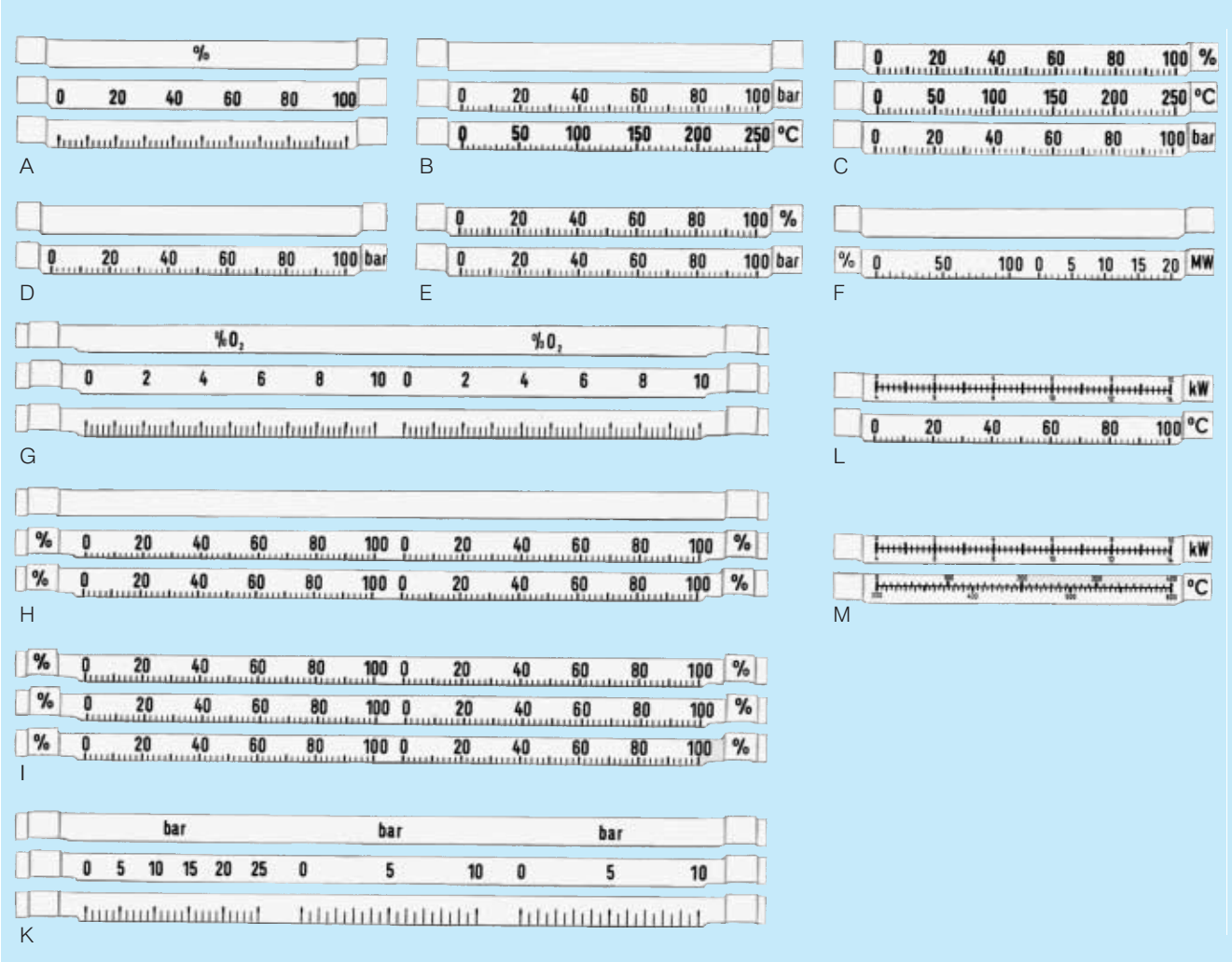


Fig. 4/21 Scale versions for flush-mounting recorders; design and arrangement of the scale plates (strips)

Conversion parts for multipoint and line recorders

Ordering data		Order No.	96 x 96	72 x 144	144 x 144					192 x 240		192 x 288		288 x 240			288 x 288			Price
		For recorder	7ND2270,7ND2271	7ND2100, 7ND2101	7ND2022, 7ND2023	7ND2122	7ND2121, 7ND2123	7ND2124, 7ND2125	7ND2320, 7ND2324	7ND2032, 7ND2033	7ND2130 to 7ND2133	7ND2042, 7ND2043	7ND2140 to 7ND2143	7ND2150	7ND2151, 7ND2153	7ND2152	7ND2160	7ND2161, 7ND2163	7ND2162	
Scale plate	Without scale	**7ND9300-8HA**	–	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	
	With one scale	**7ND9300-8HB-Z**	–	♦	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	
Design and arrangement of scale plates (strips) Fig. 4/21	Number of scales																			
–	Without	**7ND9300-8FA** [1] **7ND9300-8PA** [1] **7ND9300-8NA**	– – –	– – –	♦ – –	♦ – –	– – –	♦ – –	♦ – –	– ♦ –	– ♦ –	– ♦ –	– ♦ –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
A	One [2]	**7ND9300-8FH-Z** **7ND9300-8PH-Z** **7ND9300-8NH-Z**	– – –	– – –	– – –	♦ – –	– – –	♦ – –	– – –	– – –	– ♦ –	– – –	– ♦ –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
B or C	One	**7ND9300-8FB-Z** **7ND9300-8PB-Z** [1] **7ND9300-8NB-Z**	– – –	– – –	– – –	♦ – –	– – –	♦ – –	– – –	– ♦ –	– ♦ –	– ♦ –	– ♦ –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
D or E	One	**7ND9300-8FB-Z** [1]	–	–	♦	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	
G	Two adjacent [2]	**7ND9300-8PJ-Z** **7ND9300-8NJ-Z**	– –	– –	– –	– –	– –	– –	– –	– –	♦ –	– –	♦ –	– ♦	– ♦	– ♦	– ♦	– ♦	– ♦	
F	Two adjacent	**7ND9300-8FL-Z**	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	
H or I	Two adjacent	**7ND9300-8NL-Z**	–	–	–	–	–	–	–	–	–	–	–	♦	–	♦	♦	–	♦	
K	Three adjacent [2]	**7ND9300-8NK-Z**	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	♦	♦	
L or M	Two above each other	**7ND9300-8FC-Z** [1] **7ND9300-8PC-Z** [1]	– –	– –	♦ –	– –	– –	– –	– –	– ♦	– –	– ♦	– –	– –	– –	– –	– –	– –	– –	
Specify in addition for the Order Nos. identified by "-Z": Order code(s) for the desired **measuring range(s)** (pages 4/24 to 4/27)		...	–	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	
Ruler without scale		**7ND9262** **7ND9261** **7ND9260**	– – –	♦ – –	♦ – –	♦ – –	♦ – –	♦ – –	♦ – –	– ♦ –	– ♦ –	– ♦ –	– ♦ –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
Ruler with one scale		**7ND9281-8AB-Z** **7ND9272-Z** **7ND9271-Z** **7ND9270-Z**	♦ – – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– ♦ – –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
With two adjacent scales, recording width per channel	45 mm 50 mm 100 mm	**7ND9281-8AD-Z** **7ND9281-8AC-Z** **7ND9281-8AF-Z**	– – –	– – –	– – –	– – –	– – –	– – –	♦ – –	– ♦ –	– ♦ –	– ♦ –	– ♦ –	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	– – ♦	
With three adjacent scales, recording width per channel	60 mm	**7ND9281-8AE-Z**	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦	♦	♦	
Specify in addition for the Order Nos. identified by "-Z": Order code(s) for the desired **measuring range(s)** (pages 4/24 to 4/27)		...	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	

[1]) Two scale plates (for one or two scales each) are required for multipoint recorders (Fig. 22; D, E, L, M).
[2]) One scale plate (strip) each for scale, measured variable and unit.

Conversion parts for multipoint and line recorders

Ordering data	For recorder / Order No.	144 x 144					192 x 240				192 x 288				288 x 240		288 x 288		Price
		7ND2022	7ND2023	7ND2122	7ND2124, 7ND2125	7ND2320, 7ND2321 (M73152)	7ND2032	7ND2033	7ND2130	7ND2131, 7ND2133	7ND2042	7ND2043	7ND2140	7ND2141, 7ND2143	7ND2150	7ND2151, 7ND2153	7ND2160	7ND2161, 7ND2163	
Amplifier for signal ranges 0 to 20 mA, 4 to 20 mA	**C79453-A3011-B51**	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Signal plug-in (see example for ordering)																			Price group: pages 4/24 to 4/27
For current, voltage, thermoelectric voltage, resistance, power and frequency measurements	**7ND9118-8L-Z** [1]	–	♦	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	
	7ND9118-8K-Z	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	
	7ND9121-Z	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	
	7ND9118-8J-Z	–	–	–	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	
For current measurements	**7ND9118-8G-Z**	–	–	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	–	
For voltage measurements 500 mV ≤ Δ*U* ≤ 40 V	**7ND9118-8H-Z**	–	–	–	–	–	–	–	♦	–	–	–	♦	–	♦	–	♦	–	
Specify in addition for the Order Nos. identified by "-Z": Order code for the desired **measuring range** (pages 4/24 to 4/27)	**. . .**	–	♦	–	♦	♦	–	♦	♦	♦	–	♦	♦	♦	♦	♦	♦	♦	
Measuring point selector, plug-in Single-pole	**C74315-A66-A4**	♦	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	–	
Two-pole	**W79050-U1201-U106**	–	♦	–	–	–	–	♦	–	–	–	♦	–	–	–	–	–	–	
Shunt, R_e = 25 Ω ± 0.1 % A shunt is required for each measuring point if a signal plug-in is used for current measurements.	**7ND9132-8AB**	♦	♦	–	–	–	♦	♦	–	–	♦	♦	–	–	–	–	–	–	

Example for ordering

Required:

Signal plug-in for voltage measurements;
for KOMPENSOGRAPH 7ND2131;
signal range 0 to 500 mV,
measuring range 0 to 100 % linear

Order No.	7ND9118-8J-Z
Order code (page 4/26)	H10
Complete Order No.:	**7ND9118-8J-Z H10**

[1] Only one shunt (25 Ω) is required per measuring point with signal ranges for current measurements (0/4 to 20 mA).

Conversion parts for multipoint and line recorders

Ordering data	For recorder / Order No.	72 x 144	144 x 144						192 x 240			192 x 288			192 x 240		288 x 288		Price
		7ND2100, 7ND2101	7ND2022, 7ND2023	7ND2122	7ND2121, 7ND2123	7ND2124, 7ND2125	7ND2320/21 (M73152)	7ND2323	7ND2324	7ND2032, 7ND2033	7ND2130, 7ND2131	7ND2132, 7ND2133	7ND2042, 7ND2043	7ND2140, 7ND2141	7ND2142, 7ND2143	7ND2150, 7ND2151	7ND2152, 7ND2153	7ND2160, 7ND2161	7ND2162, 7ND2163	
Measuring point label without inscription For single-channel to three-channel recorders	**C72453-A340-C123**	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	C72453-A340-C124	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	C72165-A405-B43-Z	–	–	♦	–	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–
	C79165-A3010-B127-Z	–	–	–	–	–	–	–	–	–	♦	♦	–	♦	♦	–	–	–	–
For single-channel to six-channel recorders	**C79165-A3010-B129-Z**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦
For six-channel recorders	**C72165-A405-C299**	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	C72165-A405-C320	–	–	–	–	–	–	–	–	♦	–	–	♦	–	–	–	–	–	–
For twelve-channel recorders	**C72165-A405-C310**	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–
Specify in addition for the Order Nos. identified by "-Z": Order code: Plain text: **Number of channels: ...** **Recording width per channel: ... mm**	**Y02**	–	–	♦	–	♦	♦	–	♦	–	♦	♦	–	♦	♦	♦	♦	♦	♦
Measuring point label with inscription																			
For six-channel recorders	**C72165-A405-C299-Z**	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	C72165-A405-C320-Z	–	–	–	–	–	–	–	–	♦	–	–	♦	–	–	–	–	–	–
For twelve-channel recorders	**C72165-A405-C310-Z**	–	–	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–
Order code: Specify in plain text: **Desired text: ...**	**Y01**	–	♦	–	–	–	–	♦	–	♦	–	–	♦	–	–	–	–	–	–
For single-channel to three-channel recorders	**C72165-A405-B43-Z**	–	–	♦	–	♦	♦	–	♦	–	–	–	–	–	–	–	–	–	–
	C72165-A3010-B127-Z	–	–	–	–	–	–	–	–	–	♦	♦	–	♦	♦	–	–	–	–
For single-channel to six-channel recorders	**C72165-A3010-B129-Z**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦
Order code: Specify in plain text: **Desired text: ...** **Number of channels: ...** **Recording width per channel: ... mm**	**Y01** **Y03**	–	–	♦	–	♦	♦	–	♦	–	♦	♦	–	♦	♦	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	♦	♦	♦	♦
Mounting set for two electronic limit contacts Selectable as minimum or maximum contact	**C79453-A3011-D67**	–	–	–	–	♦	–	–	–	–	–	–	–	–	–	–	–	–	–
	C79453-A3025-D69	–	–	–	–	–	–	–	–	–	♦	♦	–	♦	♦	♦	♦	♦	♦
Oil damping insert 6 s	**C72246-A138-B60**	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–	–	–	–
15 s	**C72246-A138-B61**	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–	–	–	–
30 s	**C72246-A138-B62**	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–	–	–	–
60 s	**C72246-A138-B63**	–	–	–	–	–	♦	–	♦	–	–	–	–	–	–	–	–	–	–
Mounting set for electronic marking system For 1 channel [1]) For up to 3 channels [2])	**C79453-A3025-D70**	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–	♦	–	♦	–
	C79453-A3025-D157	–	–	–	–	–	–	–	–	–	–	♦	–	–	♦	–	♦	–	♦	

Fig. 4/22 Oil damping insert for GALVANOGRAPH line recorders 7ND2320, 7ND2321 and 7ND2324

[1]) One marking system can be used per channel.
[2]) One marking system can be used per channel, only for 7ND21.2.

Ink paper for KOMPENSOGRAPH and GALVANOGRAPH

Ordering data		Order No.	Price per roll for following quantity		
For recorder	Designation		20	60	100
Servo multipoint recorder: KOMPENSOGRAPH 288 x 288	**Ink paper 230 mm wide** Length Approx. 24 m Weight Approx. 0.25 kg **Recording width 210 mm** 100 linear divisions Hours print for 20 mm/h Without hours print 105 linear divisions Hours print for 20 mm/h	 **C72452-A98-B9** **C72452-A98-B12** **C72452-A98-B15**			
Galvanometer line recorders: 288 x 240, 288 x 288 GALVANOGRAPH 7ND1350 (M02190) 7ND1360 (M02194) T7, T22, T25, T28, T35, T42, T43	**Ink paper 230 mm wide** Length Approx. 24 m Weight Approx. 0.25 kg **Recording width 2 x 100 m** 50 linear divisions each Hours print for 20 mm/h **Recording width 3 x 60 mm** 20 linear divisions each Hours print for 20 mm/h	 **C72452-A98-B22** **C72452-A98-B32**			
Galvanometer line recorders: 192 x 240, 192 x 288 GALVANOGRAPH 7ND1330 (M02188) 7ND1340 (M02192) T3, T4, T9, T20, T21, T23, T24, T26, T27, T29, T38, T40 Galvanometer multipoint recorders: 192 x 240, 192 x 288 F10 to F13 F20 to F43 M734 Multipoint and line recorders: KOMPENSOGRAPH 192 x 240, 192 x 288 M4, K164 M73632, M73634, M73760, M73814, M73816, M73916 7ND1040, 7ND1140 to 7ND1142	**Ink paper 140 mm wide** Length Approx. 24 m Weight Approx. 0.15 kg **Recording width 120 mm** 50 linear divisions Hours print for 20 mm/h	 **C72452-A96-B9**			
Multipoint recorders: KOMPENSOGRAPH 144 x 144 M73910	**Ink paper 120 mm wide** Length Approx. 16 m Weight Approx. 0.1 kg **Recording width 100 mm** 50 linear divisions Hours print for 20 mm/h	 **C72452-A94-B109**			
Line recorders: KOMPENSOGRAPH 144 x 144 K203 GALVANOGRAPH 144 x 144 T8, T39 and M02186	**Ink paper 110 mm wide** Length Approx. 16 m Weight Approx. 0.08 kg **Recording width 100 mm** 50 linear divisions Hours print for 10 mm/h 20 mm/h Without hours print	 **C72452-A92-B8** **C72452-A92-B9** **C72452-A92-B12**			

Minimum ordering quantity 20 rolls.
Price for larger quantities than those listed on request.
Other range divisions, additional text and numbers on request.

Pen assemblies for multipoint recorders, ink

Pen assemblies for multipoint recorders

Ordering data For recorders	Designation		Order No.	Price
KOMPENSOGRAPH 288 x 288 7ND1060 (M73812)	**Ink roller drum** For six-channel and twelve-channel recorders	Violet, red, black, brown, blue and green ink rollers, 1 each	**C70301-A531-B302**	
KOMPENSOGRAPH 144 x 144 M73910	**Ink pad carrier** Violet, red, black, green, blue and brown		**C74453-A172-B29**	
KOMPENSOGRAPH 96 x 144 M73948, 7ND1010	**Six-color printing head** Violet, red, black, green, blue and brown		**M73948-X-A1**	
GALVANOGRAPH 192 x 240, 192 x 288 M734 7ND1230 (M73250 to M73256) 7ND1240 (M73260 to M73266) F10 to F13, F20 to F43	**Ribbons** For single-channel recorders For two-channel recorders For three-channel recorders For six-channel recorders	 Violet, 6 off Violet and red, 3 each Violet, red and black, 2 each Violet, red, black, brown, blue and green, 1 each	 **C74301-A8-B53** **C74301-A8-B54** **C74301-A8-B55** **C74301-A8-B56**	
GALVANOGRAPH 144 x 144 7ND1220	**Ribbons** For single-channel recorders For six-channel recorders	 Violet, 6 off Violet, red, black, green, blue and brown, 3 each	 **7ND9058-0AB** **7ND9058-0DB**	

Ink

Ordering data For recorders	Designation			Order No.	Price
Line recorders: KOMPENSOGRAPH 192 x 288 M73760, M73916, 7ND1141 and 7ND1142 KOMPENSOGRAPH 192 x 240 M73632 and M73634 KOMPENSOGRAPH 144 x 144 K203, M742, M936, 7ND1120 to 7ND1122, M73938, M73940	**Recording ink**	Plastic bottle 8 cm^3	Violet Red Green	**C71452-A64-B1** **C71452-A64-B2** **C71452-A64-B3**	
Multipoint and line recorders: KOMPENSOGRAPH 288 x 288 M2 KOMPENSOGRAPH 288 x 288 7ND1060 (M73812) [1]) KOMPENSOGRAPH 192 x 288 M4, K164 Line recorders: KOMPENSOGRAPH 192 x 288 7ND1141 (M73916) 7ND1142 (M73760) KOMPENSOGRAPH 192 x 240 M73632 and M73634 KOMPENSOGRAPH 144 x 144 K203, M742, M936, M73938, M73940 and M73950, 7ND1120 to 7ND1123 KOMPENSOGRAPH 72 x 144 M73950, 7ND1100 GALVANOGRAPH 144 x 144 192 x 240, 192 x 288, 288 x 240, 288 x 288 7ND1330 (M02188), 7ND1340 (M02192), 7ND1350 (M02190), 7ND1360 (M02194) and M02186	**Recording ink**	Bottle 50 cm^3 Bottle 500 cm^3	Violet Red Green Violet Red Green	**C70429-A63-A8** **C70429-A63-A7** **C70429-A63-A9** **C70429-A959-A8** **C70429-A959-A7** **C70429-A959-A9**	

[1]) Only applies to marking system with recording capillary (older version).

Further consumable material and conversion parts for servo multipoint recorders

Pens, recording electrodes and fiber pen assemblies

Ordering data For recorders		Designation		Order No.	Price
Line recorders: GALVANOGRAPH 144 x 144, 192 x 240, 192 x 228, 288 x 240, 288 x 288 7ND1330 (M02188), 7ND1340 (M02192), 7ND1350 (M02190), 7ND1360 (M02194) and M02186		**Fiber pen**	Red Blue Violet Green Brown Black	**7ND9001-8DA** **7ND9001-8DB** **7ND9001-8DC** **7ND9001-8DS** **7ND9001-8DE** **7ND9001-8DF**	
		Holder for fiber pen		**7ND9001-8DG**	
Line recorders: KOMPENSOGRAPH 192 x 288, 288 x 288 M2, M4, M73810, M73814, 7ND1140 and 7ND1160		**Pen** for measuring system		**C70301-A531-B495**	
Line recorders: KOMPENSOGRAPH 192 x 288, 288 x 288 M2, M4, M73810, M73814, 7ND1140 and 7ND1160 Multipoint recorders: KOMPENSOGRAPH 192 x 288 M4, M73816 and 7ND1040		**Fiber pen assembly** for marking system (only version with fiber pen assembly)		**7ND9001-8FA**	
Line recorders: KOMPENSOGRAPH 96 x 144 M73949, 7ND1110		**Fiber pen assembly** 6 pens, violet 6 pens, red	 Channel 1 Channel 2	 **M73949-X-A1** **M73949-X-A2**	

Further consumable material and conversion parts for hybrid recorders

Ordering data For recorders	Designation	Order No.	Price
Hybrid recorders: PIEZOGRAPH 360 x 288 7ND2480	**Take-up spool**	**C79453-A3031-B57**	
	Channel plug-in for 8 channels	**C79453-A3031-B513**	
	Signal plug-in For current measurements [1]) For voltage measurements For voltage and thermoelectric voltage measurements 5 mV ≤ Δ *U* ≤ 200 mV For Pt 100 resistance thermometer measurements Specify in plain text in addition to Order No.: **Signal range: ...**	 **C79453-A3031-B535-Z** **C79453-A3031-B534-Z** **C79453-A3031-B537-Z** **C79453-A3031-B536-Z** **...**	
	Shunt, R_e = 25 Ω ± 0.1 % R_e = 10 Ω ± 0.1 %	**7ND9132-8AB** **7ND9132-8AA**	
	Limit monitor for 32 limits with 16 channels; 2 alarm outputs per channel, selectable as maximum or minimum alarms; for channels 1 to 16 or 17 to 32	**C79453-A3031-B346**	
	Memory chip (EPROM) Programmed for 1 scale 2 scales 3 scales 4 scales 5 scales 6 scales 7 scales 8 scales Order code(s) for the desired **measuring range(s):** (pages 4/24 to 4/27) Specify in plain text: **Serial No. of PIEZOGRAPH: . . .**	 **C79453-A3031-D311-Z** **C79453-A3031-D312-Z** **C79453-A3031-D313-Z** **C79453-A3031-D314-Z** **C79453-A3031-D315-Z** **C79453-A3031-D316-Z** **C79453-A3031-D317-Z** **C79453-A3031-D318-Z** **...**	
	Memory chip (EPROM), programmed for linearization of scales, with 1 linearization 2 linearizations 3 linearizations 4 linearizations Order code(s) for the desired **measuring range(s):** (pages 4/24 to 4/27) Specify in plain text: **Serial No. of PIEZOGRAPH: . . .** Associated **signal and range values** if necessary (table or function curve)	 **C79453-A3031-D321-Z** **C79453-A3031-D322-Z** **C79453-A3031-D323-Z** **C79453-A3031-D324-Z** **...**	
Hybrid recorders: PIEZOGRAPH 3 7ND2482	**Memory unit** for sheet-steel panel for panel with basicgrid 72 x 72	 **7ND2482-8AD** **7ND2482-8AN**	

[1]) A shunt is required for each current measuring point: $R_e = \frac{200\ \text{mV}}{\Delta I\ (\text{mA})}$

Further consumable material and conversion parts for servo multipoint recorders

For servo multipoint recorders

Order data For recorders	Designation		Order No.	Price
Multipoint recorders: KOMPENSOGRAPH 288 x 288 7ND1060 (M73812)	**Take-up spool** with rubber tongues		**C71452-A12-B44**	
	Scale cable		**C70301-A532-B42**	
	Scale plate	Without scale With one scale With two scales With three scales	**7ND9300-8AA** **7ND9300-8AB-Z** **7ND9300-8AC-Z** **7ND9300-8AD-Z**	
		With four scales With five scales With six scales	**7ND9300-8AE-Z** **7ND9300-8AF-Z** **7ND9300-8AG-Z**	
	Ruler without scale		**7ND9260**	
	Ruler with one scale		**7ND9270-Z**	
	Specify in addition for the Order Nos. identified by "-Z": Order code(s) (pages 4/24 to 4/27) for the desired **measuring range(s)**		**...**	
	Measuring point label without inscription For six-channel recorder For twelve-channel recorder		 **C74453-A66-C28** **C74553-A66-C30**	
	Measuring point label with inscription For six-channel recorder For twelve-channel recorder Order code: Specify in plain text: **Desired text: ...** (max. 23 positions per channel)		 **C74453-A66-C28-Z** **C74453-A66-C30-Z** **Y01**	
Multipoint recorders: KOMPENSOGRAPH 192 x 288 M4, M73816 and 7ND1040	**Take-up spool** with rubber tongues		**C71452-A12-B43**	
	Scale cable		**C70301-A531-B28**	
	Scale plate	Without scale With one scale With two scales With three scales	**7ND9300-8CA** **7ND9300-8CB-Z** **7ND9300-8CC-Z** **7ND9300-8CD-Z**	
		With four scales With five scales With six scales	**7ND9300-8CE-Z** **7ND9300-8CF-Z** **7ND9300-8CG-Z**	
	Specify in addition for the Order Nos. identified by "-Z": Order code(s) (pages 4/24 to 4/27) for the desired **measuring range(s)**		**...**	
	Measuring point label without inscription		**C74453-A66-C38**	
Multipoint recorders: KOMPENSOGRAPH 144 x 144 7ND2020 (M73911)	**Take-up spool** with clamping sleeve		**C72301-A20-B13**	
	Scale cable		**C72453-A320-B43**	
	Wiper	For upper potentiometer For lower potentiometer	**C74453-A56-B20** **C74453-A56-B21**	
Multipoint recorders: KOMPENSOGRAPH 144 x 144 7ND2021	**Take-up spool** with clamping sleeve		**C72301-A20-B13**	
	Scale cable		**C72453-A320-B206**	
	Signal plug-in	For current measurements [1] For voltage measurements For thermoelectric voltage measurements [2]	**C74250-A58-D26-Z** **C74250-A58-D27-Z** **C74250-A58-D30-Z**	
		For resistance measurements For resistance measurements, potentiometric	**C74250-A58-D28-Z** **C74250-A58-D29-Z**	
	Specify in addition for the Order Nos. identified by "-Z": Order code (pages 4/24 to 4/27) for the desired **measuring range**		**...**	

[1] A shunt is required per measuring point with signal ranges for current measurements.
[2] A cold junction correction resistor R_{Cu} is required per KOMPENSOGRAPH for temperature measurements with a directly connected thermocouple.

Further consumable material and conversion parts

For servo line recorders

Ordering data For recorders	Designation		Order No.	Price
Line recorders: KOMPENSOGRAPH 288 x 288 M2, M73810 and 7ND1160	**Ink hose** for measuring system		**C70301-A532-C60**	
	Ink reservoir, refillable		**C70429-A1532-A4**	
	Scale plate	Without scale	**7ND9300-8BA**	
		With one scale	**7ND9300-8BB-Z**	
		With two scales	**7ND9300-8BC-Z**	
		With three scales	**7ND9300-8BD-Z**	
		With four scales	**7ND9300-8BE-Z**	
		With five scales	**7ND9300-8BF-Z**	
		With six scales	**7ND9300-8BG-Z**	
	Specify in addition for the Order Nos. identified by "-Z": Order code(s) (pages 4/24 to 4/27) for the desired **measuring range(s)**		**...**	
	Measuring point label without inscription		**C74453-A66-C22**	
	Limit contact mounting set One minimum and one maximum contact		**C74453-A80-D30**	
	Marking system mounting set New design with fiber pen assembly		**C74453-A80-D121**	
Line recorders: KOMPENSOGRAPH 192 x 288 M4, K164, M73814 and 7ND1140	**Take-up spool** with rubber tongues		**C71452-A12-B43**	
	Scale cable		**C70301-A531-B28**	
	Ink hose for measuring system		**C70301-A351-C292**	
	Ink reservoir, refillable		**C70429-A1532-A4**	
	Scale plate	Without scale	**7ND9300-8DA**	
		With one scale	**7ND9300-8DB-Z**	
		With two scales	**7ND9300-8DC-Z**	
		With three scales	**7ND9300-8DD-Z**	
		With four scales	**7ND9300-8DE-Z**	
		With five scales	**7ND9300-8DF-Z**	
		With six scales	**7ND9300-8DG-Z**	
	Specify in addition for the Order Nos. identified by "-Z": Order code(s) (pages 4/24 to 4/27) for the desired **measuring range(s)**		**...**	
Line recorders: KOMPENSOGRAPH 192 x 288 7ND1141, M73916 7ND1142, M73760	**Take-up spool** with rubber tongues		**C71452-A12-B43**	
	Scale cable		**C72453-A56-B105**	
	Ink hose	Channel 1	**C74453-A88-C13**	
		Channel 2	**C74453-A88-C14**	
	Wiper	For upper potentiometer	**C74453-A56-B20**	
		For lower potentiometer	**C74453-A56-B21**	
	Blowball		**C79453-A3028-B1**	

For servo multipoint and line recorders

Ordering data For recorders	Designation		Order No.	Price
Multipoint and line recorders: KOMPENSOGRAPH 192 x 288, 288 x 288 7ND1040, 7ND1060, 7ND1140, 7ND1160, M73810 M73812 Year 1973 and later M73814 Serial No. C01-001 and later M73816	**Signal plug-in**	For direct current, DC voltage and resistance measurements	**7ND9111-Z** [1] [2]	
	Specify in addition to Order No.: Order code (pages 4/24 to 4/27) for the desired **measuring range**		**...**	
	Wiper For measuring and slave potentiometers, also for M2, M4 and K164 For limit contacts, not for K164		**C70301-A531-B285** **C70301-A531-B290**	
	Shunt, R_e = 10 Ω ± 0.1 %		**7ND9132-8AA**	
	Cold junction correction resistor R_{CU} for 20 °C		**C74005-A212-A1**	
	Measuring relay One relay is required per measuring point and per signal range (only with multi-range recorders), also for M2 and M4		**C70301-A532-C103**	

[1] A shunt is required per measuring point with signal ranges for current measurements.
[2] A cold junction correction resistor R_{Cu} is required per KOMPENSOGRAPH for temperature measurements with a directly connected thermocouple.

Measuring ranges for signal plug-ins, scales, rulers and memory chips (EPROM)

1) DIN IEC 584 on request.
2) Programmed with the 7ND2480.
3) Connection via transmitter (page 4/26).
4) Pt 10 % Rh/Pt.

Measuring range (scale) 2)	Order code for connection: Via transmitter 0 to 20 mA, voltage-linear; temperature-linear on request	Via thermostat 50 °C	Direct / With internal cold junction correction	7ND1040/1140 7ND1060/1160	7ND2021	7ND2022/32/42	7ND2023/33/43	7ND2100/01 7ND2122 7ND2121/23	7ND2124 7ND2125	7ND2130 7ND2140 7ND2150 7ND2160	7ND2131 7ND2141 7ND2151 7ND2161	7ND2132 7ND2142 7ND2152 7ND2162	7ND2270 7ND2271	7ND2320/21	7ND2324	7ND2480 3)
Sensor: **Fe-CuNi thermocouple** to DIN 43 710 1)				Price group												
0 to 250 °C	**A01**	**A02**	**A03**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 400 °C	**A04**	**A05**	**A06**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 600 °C	**A07**	**A08**	**A09**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 900 °C	**A10**	**A11**	**A12**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
300 to 600 °C	**A13**	**A14**	**A15**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
Sensor: **NiCr-Ni thermocouple** to DIN 43 710 1)				Price group												
0 to 250 °C	**A16**	**A17**	**A18**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 400 °C	**A19**	**A20**	**A21**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 600 °C	**A22**	**A23**	**A24**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 900 °C	**A25**	**A26**	**A27**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1000 °C	**A28**	**A29**	**A30**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1200 °C	**A31**	**A32**	**A33**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
600 to 900 °C	**A34**	**A35**	**A36**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
600 to 1000 °C	**A37**	**A38**	**A39**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
Sensor: **PtRh-Pt thermocouple** 4) to DIN 43 710/DIN IEC 584				Price group												
0 to 1000 °C	**A40**	**A41**	**A42**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1200 °C	**A43**	**A44**	**A45**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1400 °C	**A46**	**A47**	**A48**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1600 °C	**A49**	**A50**	**A51**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1
0 to 1600 °C	**A52**	**A53**	**A54**	1 1 1	1 1	1 – –	1 6 6	1 – –	4 7 7	1 – –	3 8 8	1 – –	1 1 1	2 9 9	1 – –	– 1 1

Measuring ranges for signal plug-ins, scales, rulers and memory chips (EPROM)

Measuring range (scale) [2]	Order code for connection: Via transmitter 0 to 20 mA, temperature-linear; resistance-linear on request	Order code for connection: Direct	7ND1040/7ND1140 7ND1060/7ND1160	7ND2021	7ND2022/7ND2032/7ND2042	7ND2023/7ND2033/7ND2043	7ND2100/7ND2101 7ND2122 7ND2121/23	7ND2124 7ND2125	7ND2130 7ND2140 7ND2150 7ND2160	7ND2131 7ND2141 7ND2151 7ND2161	7ND2132 7ND2142 7ND2152 7ND2162	7ND2270 [4] 7ND2271 [4]	7ND2320/7ND2321	7ND2324	7ND2480 [3]
Sensor: **Pt 100 resistance thermometer** to DIN IEC 751 Connection in two-wire system [1] or three-wire system; four-wire system on request			Price group												
- 30 to + 60 °C	**C72**	**A55**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 40 °C	**C73**	**A57**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 60 °C	**C74**	**A59**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 80 °C	**C75**	**A61**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 100 °C	**C76**	**A63**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 120 °C	**C77**	**A65**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 150 °C	**C78**	**A67**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 200 °C	**C79**	**A69**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 250 °C	**C80**	**A71**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 300 °C	**C81**	**A73**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 400 °C	**C82**	**A75**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 500 °C	**C83**	**A77**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
0 to 600 °C	**C84**	**A79**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
200 to 400 °C	**C85**	**A81**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
200 to 600 °C	**C86**	**A83**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1
400 to 600 °C	**C87**	**A85**	1 1	1 1	1 –	1 5	1 –	4 6	1 –	3 6	1 –	1 1	2 7	1 –	– 1

Price group [5]	Price
1	
2	
3	
4	
5	
6	
7	
8	
9	

1) A line symmetry resistor is required for each channel.
2) Programmed with the 7ND2480.
3) Connection via transmitter (page 4/26).
4) GALVANOGRAPH 7ND2270 and 7ND2271: connection to resistance thermometer only in three-wire system; two-wire system on request.
5) Price groups 2 to 9 and the respective prices only apply in conjunction with the signal plug-ins 7ND9118-8L-Z, 7ND9118-8K-Z, 7ND9118-8J-Z and 7ND9121-Z (page 4/17); otherwise price group 1 always applies.

Measuring ranges for signal plug-ins, scales, rulers and memory chips (EPROM)

Measuring range (scale) [1]	Order code for connect. Via shunt	Direct or via transmitter, adapter etc. [2]	7ND1040/7ND1140 7ND1060/7ND1160	7ND2021	7ND2022/7ND2032/7ND2042	7ND2023/7ND2033/7ND2043	7ND2100/7ND2101	7ND2122	7ND2121/7ND2123	7ND2124 7ND2125	7ND2130 7ND2140 7ND2150 7ND2160	7ND2131 7ND2141 7ND2151 7ND2161	7ND2132 7ND2142 7ND2152 7ND2162	7ND2270 7ND2271	7ND2320/7ND2321	7ND2324	7ND2480
Direct current			Price group														
Signal range																	
Specify measuring range in plain text																	
. . . A/ 60 mV	**J32**		1	1	–	6	–	–	–	7	–	8	–	1	8	–	–
. . . A/150 mV	**J33**		1	1	–	6	–	–	–	7	–	8	–	1	8	–	–
. . . A/300 mV	**J34**		1	1	–	6	–	–	–	7	–	8	–	1	5	–	–
Direct current, DC voltage or **any process variable** with direct current or DC voltage as the input signal			Price group														
Measuring range (scale)	Signal range																
0 to 100 % linear	0 to 1 mA		**H06**	1	1	1	1	–	1	–	4	1	3	–	1	5	–	–
	0 to 10 mA		**H08**	1	1	1	1	–	1	–	4	1	3	–	1	5	–	–
	0 to 20 mA		**H07**	1	1	1	1	1	1	1	4	1	3	1	1	2	1	–
	4 to 20 mA		**H09**	1	1	1	1	1	1	1	4	1	3	1	1	5	1	–
	0 to 500 mV		**H10**	1	1	1	1	–	–	–	4	1	3	–	1	5	–	–
	0 to 10 V		**H11**	–	1	1	1	1	1	1	4	1	3	–	1	5	–	–
	2 to 10 V		**H12**	–	1	1	1	1	1	1	4	1	3	–	1	5	–	–
Specify measuring range (scale) in plain text	0 to 1 mA		**Y20**	1	1	1	1	–	1	–	4	1	3	–	1	5	–	–
	0 to 10 mA		**Y23**	1	1	1	1	–	1	–	4	1	3	–	1	5	–	–
	0 to ±10 mA		**Y65**	1	1	–	–	–	–	–	4	1	3	–	1	2	–	1
	0 to 20 mA		**Y24**	1	1	1	1	1	1	1	4	1	3	1	1	2	1	1
	4 to 20 mA		**Y25**	1	1	1	1	1	1	1	4	1	3	1	1	5	1	1
	0 to 500 mV		**Y31**	1	1	1	1	–	–	–	4	1	3	–	1	5	–	1
	0 to 10 V		**Y58**	–	1	1	1	1	1	1	4	1	3	–	1	5	–	1
	2 to 10 V		**Y59**	–	1	1	1	1	1	1	4	1	3	–	1	5	–	1
	0 to 25 V		**Y84**	–	–	1	1	–	1	–	4	1	4	–	–	6	–	–
	Signal span (ranges other than those above)																
Specify measuring range (scale) and signal range in plain text	>1 to <20 mA		**Y61**	1	1	1	1	–	1	–	4	1	3	–	–	5	1	1
	>20 to <60 mA		**Y62**	1	1	1	1	–	1	–	4	1	3	–	–	2	1	1
	60 to <90 mA		**Y63**	–	–	1	1	–	–	–	4	1	3	–	–	–	1	1
	90 to 500 mA		**Y64**	–	–	–	–	–	–	–	4	–	3	–	–	–	1	1
	5 to <200 mV		**Y67**	1	1	–	6	–	–	–	7	–	8	–	–	8	1	1
	0.2 to <1 V		**Y68**	–	–	–	–	–	–	–	–	–	–	–	–	5	1	1
	1 to <40 V		**Y69**	–	–	1	1	–	1	–	4	1	4	–	–	5	1	1
	40 to <60 V		**Y70**	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–
	60 to <110 V		**Y71**	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–
	110 to <210 V		**Y72**	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–
	210 to 310 V		**Y73**	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–

Price group [3]	Price
1	
2	
3	
4	
5	
6	
7	
8	

[1] Programmed with the 7ND2480.
[2] With multipoint recorders, specify channel assignment in plain text for current and voltage signal ranges (full-scale value > 500 mV).
[3] Price groups 2 to 8 and the respective prices only apply in conjunction with the signal plug-ins 7ND9118-8L-Z, 7ND9118-8K-Z, 7ND9118-8J-Z and 7ND9121-Z (page 4/17); otherwise price group 1 always applies.

Measuring ranges for signal plug-ins, scales, rulers and memory chips (EPROM)

		Ord. code for connection					
		RMS value, sinusoidal curve, Direct	RMS value, any waveform	7ND2124 7ND2125	7ND2131, 7ND2133 7ND2141, 7ND2143 7ND2151, 7ND2153 7ND2161, 7ND2163	7ND2320, 7ND2321
Alternating current (50 Hz) or **any process variable** with alternating current (50 Hz) as input signal [1]				Price group		
	Signal range					
Specify measuring range (scale) and rated transformer data in plain text	0 to 1 A	**Y42**	**L01**	6 –	6 8	– 8
	0 to 5 A	**Y44**	**L11**	– –	6 8	– 8
AC voltage (50 Hz) or **any process variable** with AC voltage (50 Hz) as input signal [1]						
	Signal span					
Specify measuring range (scale) and rated transformer data in plain text	57.5 to < 100 V	**Y75**	**Y79**	6 –	6 9	6 9
	100 to < 200 V	**Y76**	**Y80**	6 –	6 9	6 9
	200 to < 300 V	**Y77**	**Y81**	– –	6 9	6 9
	300 to 500 V	**Y78**	**Y82**	– –	6 9	– 9
SPANNUNGSLUPE AC voltage (50 Hz) [1]						
	Rated voltage	Order code for direct connection				
Specify rated voltage and measuring range (scale; ± 5 to ± 20 % of rated voltage) in plain text	57.5 to 380 V	**Y83**		–	7	7
Measuring equipment for **frequency 50 Hz** [1]						
Specify measuring range (scale) and voltage value in plain text		**N25**		–	8	8
Measuring equipment for **power factor cos φ**						
Specify current and voltage values at 50 Hz [1] as well as scale in plain text		**P37**		–	10	10

	Transformer ratio	Ord. code for connection: Active power, Direct	Ord. code for connection: Reactive power	7ND2131, 7ND2133 7ND2141, 7ND2143 7ND2151, 7ND2153 7ND2161, 7ND2163	7ND2320, 7ND2321
Active or reactive power with single-phase current 50 Hz) [1]				Price group	
Specify measuring range (scale) and transformer ratio in plain text	… /1A, … / ..V	**Q01**	**Q17**	10	
	… /5 A, … / .. V	**Q09**	**Q25**		
Active or reactive power with three-wire three-phase current with balanced load 50 Hz) [1]					
Specify measuring range (scale) and transformer ratio in plain text	… /1A, … / ..V	**R01**	**R17**	10	
	… /5 A, … / .. V	**R09**	**R25**		
Active or reactive power with three-wire three-phase current with unbalanced load 50 Hz) [1]					
Specify measuring range (scale) and transformer ratio in plain text	… /1A, … / ..V	**R33**	**R49**	11	
	… /5 A, … / .. V	**R41**	**R57**		
Active or reactive power with four-wire three-phase current with unbalanced load 50 Hz) [1]					
Specify measuring range (scale) and transformer ratio in plain text	… /1A, … / ..V	**S01**	**S17**	12	
	… /5 A, … / .. V	**S09**	**S25**		

Price group [2]	Price
6	
7	
8	
9	
10	
11	
12	

[1] For 60 Hz on request.

[2] The price groups 6 to 12 and the respective prices only apply in conjunction with the signal plug-ins 7ND9118-8L-Z, 7ND9118-8K-Z, 7ND9118-8J-Z and 7ND9121-Z (page 4/17).

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Siemens contacts worldwide

At

www.siemens.com/automation/partner

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

- Technical Support,
- Spares/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partnerwith his/her respective expertise:

Need more Information?

Then fax us!
Under the fax no.
0 08 00-74 62 84 27
you will find further information.

5

Information and Ordering in the Internet and on CD-ROM

A&D in the WWW

A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

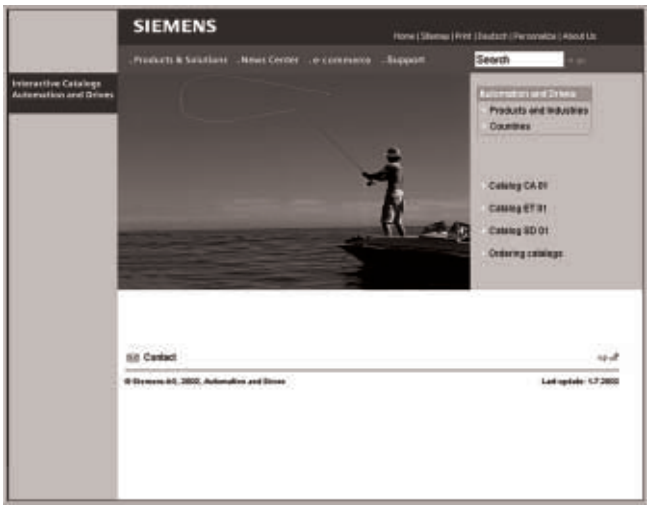
The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Interactive Catalogs



Detailed information together with convenient interactive functions:
The interactive catalogs CA 01 and SD 01 cover more than 80,000 products and thus provide a full summary of the Siemens Automation and Drives product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.
All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the interactive catalogs can be found in the Internet under

www.siemens.com/automation/ca01

or on CD-ROM:

- Automation & Drives CA 01,
  Order No.: E86060-D4001-A100-B8-7600
- Standard Drives SD 01,
  Order No.: E86060-D5201-A100-A3-7600

Easy Shopping with the A&D Mall

The A&D Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the A&D Mall on the Internet under:

www.siemens.com/automation/mall

Our Services for Every Phase of Your Project

In the face of harsh competition you need optimum conditions to keep ahead all the time:
A strong starting position. A sophisticated strategy and team for the necessary support - in every phase.
Service & Support from Siemens provides this support with a complete range of different services for automation and drives.

In every phase: from planning and startup to maintenance and upgrading.

Our specialists know when and where to act to keep the productivity and cost-effectiveness of your system running in top form.

Online Support

The comprehensive information system available round the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

www.siemens.com/automation/service&support

Technical Support

Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

Tel.: +49 (0)180 50 50 222
Fax: +49 (0)180 50 50 223

E-Mail:
adsupport@siemens.com

Technical Consulting

Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution.

Get in touch with the sales contact in your region for questions about these services.
Our Helpline
(tel.: +49 (0) 180 50 50 111)
will also put you through to the right contact or just visit our Internet site.

Configuration and Software Engineering

Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project.

Get in touch with the sales contact in your region for questions about these services.
Our Helpline
(tel.: +49 (0) 180 50 50 111)
will also put you through to the right contact or just visit our Internet site.

Service On Site

With Service On Site we offer services for startup and maintenance, essential for ensuring system availability.

In Germany
Tel.: 0180 50 50 444

For country-specific telephone numbers go to our Internet site at
www.siemens.com/automation/service&support

Repairs and Spare Parts

In the operating phase of a machine or automation system we provide a comprehensive repair and spare parts service ensuring the highest degree of operating safety and reliability.

In Germany
Tel.: 0180 50 50 448

For country-specific telephone numbers go to our Internet site at
www.siemens.com/automation/service&support

Optimization and Upgrading

To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading.

Get in touch with the sales contact in your region for questions about these services.
Our Helpline
(tel.: +49 (0) 180 50 50 111)
will also put you through to the right contact or just visit our Internet site.

Customer Support

Knowledge Base on CD-ROM

For locations without online connections to the Internet there are excerpts of the free part of the information sources available on CD-ROM (Service & Support Knowledge Base). This CD-ROM contains all the latest product information at the time of production (FAQs, Downloads, Tips and Tricks, Updates) as well as general information on Service and Technical Support.

The CD-ROM also includes a full-text search and our Knowledge Manager for targeted searches for solutions. The CD-ROM will be updated every 4 months.

Just the same as our online offer in the Internet, the Service & Support Knowledge Base on CD comes complete in 5 languages (German, English, French, Italian, Spanish).

You can order the **Service & Support Knowledge Base** CD from your Siemens contact.

Order no. **6ZB5310-0EP30-0BA2**

Orders via the Internet
(with Automation Value Card or credit card) at:

www.siemens.com/automation/service&support

in the Shop domain.

Automation Value Card

Small card - great support

The Automation Value Card is an integral component of the comprehensive service concept with which Siemens Automation and Drives will accompany you in each phase of your automation project.

It doesn't matter whether you want just specific services from our Technical Support or want to purchase high-quality Support Tools in our Online Shop, you can always pay with your Automation Value Card. No invoicing, transparent and safe. With your personal card number and associated PIN you can view the state of your account and all transactions at any time.

Services on card. This is how it's done.

Card number and PIN are on the back of the Automation Value Card. When delivered, the PIN is covered by a scratch field, guaranteeing that the full credit is on the card.

By entering the card number and PIN you have full access to the Service & Support services being offered. The charge for the services procured is debited from the credits on your Automation Value Card.

All the services offered are marked in currency-neutral credits, so you can use the Automation Value Card worldwide.

Automation Value Card order numbers	
Credits	Order no.
200	**6ES7 997-0BA00-0XA0**
500	**6ES7 997-0BB00-0XA0**
1000	**6ES7 997-0BC00-0XA0**
10000	**6ES7 997-0BG00-0XA0**

Detailed information on the services offered is available on our Internet site at:

www.siemens.com/automation/service&support

Service & Support à la Card: Examples

Technical Support	
„Priority“	Priority processing for urgent cases
„24 h“	Availability round the clock
„Extended“	Technical consulting for complex questions
Support Tools in the Support Shop	
„System Utilities“	Tools that can be used directly for configuration, analysis and testing
„Applications“	Complete topic solutions including ready-tested software
„Functions & Samples“	Adaptable blocks for accelerating your developments

Calibration service – Repair service – Spare parts

For the products in this catalog as well as products from this range which are no longer manufactured (no longer listed in this catalog) calibration service, repair service and spare parts are carried out by our central servicing department:

Siemens AG
Industrial Solutions and Services
I&S IS SC S RC DIT1
Siemensstr. 33
D-71254 Ditzingen

Tel.: +49 711 137-6093
Fax: +49 711 137-662

e-mail: herbert.bantele@siemens.com

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

- Engineering software
- Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

License types

Siemens Automation & Drives offers various types of software license:

- Floating license
- Single license
- Rental license
- Trial license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.

A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per device, per axis, per channel, etc.

One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific number of hours (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivered versions

Software is constantly being updated.
The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

ServicePack

ServicePacks are used to debug existing products.
ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

Detailed explanations concerning license conditions can be found in the “Terms and Conditions of Siemens AG” (see last page) or with the A&D Mall Online-Help System under

www.siemens.com/automation/mall

License key

Siemens Automation & Drives supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Certificate of License

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens.

A CoL is required for every type of use and must be kept in a safe place.

Conditions of sale and delivery

Terms and Conditions of sale and delivery
Export regulations

Terms and Conditions of Sale and Delivery

in the Federal Republic of Germany

By using this catalog you can acquire hardware and software products described therein from the Siemens AG subject to the following terms. Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside the Federal Republic of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity.

for customers based in the Federal Republic of Germany

The General Terms of Payment as well as the General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry shall apply.

For software products, the General License Conditions for Software Products for Automation and Drives for Customers with Seat or registered Office in Germany shall apply.

for customers with a seat or registered office outside the Federal Republic of Germany

The General Terms of Payment as well as the General Conditions for Supplies of Siemens, Automation and Drives for Customers with a Seat or registered Office outside of Germany shall apply.

For software products, the General License Conditions for Software Products for Automation and Drives for Customers with Seat or registered Office outside of Germany shall apply.

General

The prices are in € (Euro) ex works, exclusive packaging.
A surcharge of 25.- Euros is added to orders under 100.- Euros.

The sales tax (value added tax) is not included in the prices.
It shall be debited separately at the respective rate according to the applicable legal regulations.

In addition to the prices of products which include silver and/or copper, surcharges may be calculated if the respective limits of the notes are exceeded.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

The dimensions are in mm. Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

- 6ZB5310-0KR30-0BA0
  (for customers based in the Federal Republic of Germany)
- 6ZB5310-0KS53-0BA0
  (for customers based outside of theFederal Republic of Germany)

or download them from the Internet:
www.siemens.com/automation/mall
(A&D Mall Online-Help System)

Export regulations

The products listed in this catalog / price list may be subject to European / German and/or US export regulations.

Therefore, any export requiring a license is subject to approval by the competent authorities.

According to current provisions, the following export regulations must be observed with respect to the products featured in this catalog / price list:

AL	Number of the German Export List. Products marked other than "N" require an export license. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "AL not equal to N" are subject to a European or German export authorization when being exported out of the EU.
ECCN	Export Control Classification Number. Products marked other than "N" are subject to a reexport license to specific countries. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "ECCN not equal to N" are subject to a US re-export authorization.

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Subject to change without prior notice.

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Siemens AG
Automation and Drives
Process Instrumentation and Analytics
D-76181 Karlsruhe
Federal Republic of Germany

Order No.: E86060-K6020-A101-A3-7600
This catalog is also available as PDF file in the Internet.
Download is possible under: www.siemens.com/fielddevices
under Products & Solutions, →Process Recorders

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Catalogs of the Automation and Drives Group (A&D)

Further information can be obtained from our branch offices listed in the appendix of this catalog

Automation & Drives	*Catalog*
Interactive catalog on CD-ROM	
• Components for Automation & Drives	CA 01

Automation Systems for Machine Tools	
SINUMERIK & SIMODRIVE	NC 60
Cables, Connectors and System Components	NC Z

Drive Systems	
Variable-Speed Drives	
DC Motors	DA 12
DC Drives Preferred Series up to 500 kW	DA 12.1
DC Drives Preferred Series 215 kW to 1500 kW	DA 12.2
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	DA 22
SIMOVERT PM Modular Converter Systems	DA 45
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