GOSSEN METRAWATT

# LINAX 4000M
Continuous-line recorder

Applications

The configurable continuous-line recorder LINAX 4000M serves to record slowly changing measured quantities. DC current, DC voltage, thermocouples as well as resistance thermometers (Pt 100) can be connected directly.
Alphanumeric texts can be printed out on the recording chart.
The recorder is meant for installation in panels.
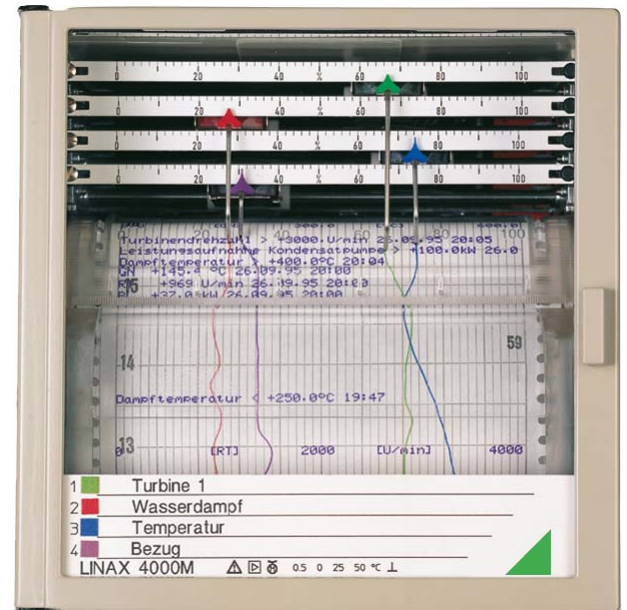
Essential features

- 1 to 4 line channels

- 1 to 3 line channels and one printer channel
  for data recording and text printout

- Format 144 mm x 144 mm, mounting depth 250 mm

- Combined recording table
  for roll chart (32 m) or fanfold chart (16 m)

- RS-485 interface

- Measuring channels electrically isolated

- 2 limits per measuring channel

Description

The LINAX 4000M is a microprocessor-controlled, continuous-line recorder. It is supplied in two different versions:
– 1 to 4 line channels
– 1 to 3 line channels and one printer channel

The recorder is connected to transducers and/or directly to sensors such as thermocouples or resistance thermometers.

Matching of the recorder to the task is made via the internal keyboard or via the serial interface.

Additional functions such as text printout and event markers increase the information content of the process quantities for which a protocol can be established. Alarm message and remote control make the LINAX 4000M a unit for versatile use.

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Applied rules and standards

A) International standards

IEC 484	Potentiometric recorders
IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use Part 1: General requirements
IEC 664	Overvoltage category, degree of pollution
IEC 68-2-6	Mechanical stress (vibrations)
IEC 68-2-27	Mechanical stress (shock)
EN 60529	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)
EN 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
IEC 721-3-3	Climatic environmental conditions
IEC 742	Isolating transformers and safety isolating transformers – requirements

B) German standards

DIN 43802	Scales
DIN 16234	Recording paper
DIN 43831	Cases
DIN 43834	Device fasteners
DIN VDE 0551-1	Transformers and safety transformers
DIN VDE 0100-410	Protection against shock currents
DIN VDE 0106-101	Basis requirements for protective separation

Symbols and their meaning

Symbol	Meaning
X1n / X1	Lower range limit nom. range / lower range limit
X2n / X2	Upper range limit nom. range / upper range limit
X2n – X1n / X2 – X1	Range span nom. range / range span

Technical data

Analog inputs

Standard version

DC current	0...20 mA; Ri = 50 Ω 4...20 mA; Ri = 50 Ω ± 20 mA; Ri = 50 Ω
DC voltage	± 10 V; Ri = 1 MΩ

Universal version

DC current	0...20 mA; Ri = 50 Ω 4...20 mA; Ri = 50 Ω ± 20 mA; Ri = 50 Ω
DC voltage	± 20 V; Ri = 1 MΩ ± 75 mV; Ri ≥ 2 MΩ
Thermocouples, Ri ≥ 2 MΩ	Type T 0 ... +400 °C Type J 0 ... +1200 °C

Thermocouples, Ri ≥ 2 MΩ	Type L 0 ... +900 °C Type K 0 ... +1372 °C Type E 0 ... +1000 °C Type S 0 ... +1769 °C Type R 0 ... +1769 °C Type B 100 ... +1820 °C Cold junction compensation internally or externally parameterizeable
Resistance thermometer Pt 100	−50 ... +500 °C; −50 ... 150 °C
With 2-wire connection With 3-wire connection	Lead resistance 10 Ω max. Lead resistance 40 Ω max.

Lower range limit can be parameterized from X1n ... X1n + 0,8(X2n – X1n) and **range span** can be parameterized from 0,2(X2n – X1n) ... (X2n – X1n).

Deadband	0.25 % of range span
Setting time	2 s
Attenuation of the meas. value	with low-pass filter of 1st order;
Time constant	0 ... 60 s/meas. chann., can be parameterized
Root-extra. function	can be parameterized with DC current and DC voltage measuring ranges

Reference conditions

Ambient temperature	25 °C ± 1 K
Relative humidity	45 ... 75 %
Auxiliary voltage	Hn ± 2 %, nominal frequency ± 2 %
Mounting position	Front upright ± 2°
Warm-up time	30 min

Accuracy

Deviation for line channels acc. to IEC 483	Class 0.5 referred to range span
With displacement of lower range limit and/or upper range limit additionally	$\pm\,(0.1\ \% \times \frac{X2n - X1n}{X2 - X1} - 0.1)$
Data recording with printer system according to IEC 484	Class 1 referred to range span
With internal cold junction compensation	± 4 K, additionally

Variations

Temperature	0.2 %/10 K, additionally 0.1 %/10 K with connect. to thermocouple
Humidity	Note influence on recording paper according to DIN 16234
Auxiliary voltage Hn	0.1 % at 24 V AC/DC ± 20 % 0.1 % at 24 V AC +10 % / −15 % 0.1 % at 115 V AC +10 % / −15 % 0.1 % at 230 V AC +10 % / −15 %
AC interference voltages (see perm. interference voltages)	0.5 % of range span
Magnetic field of external origin 0.5 mT	0.5 % of range span

Mechanical stress according to DIN IEC 68-2-6/27
Transport   Impact: 30 g/18 ms
            Vibration: 2 g/5 ... 150 Hz
in function   Vibration:
            0.5 g/± 0,04 mm/
            5...150 Hz/3 × 2 cycles
	During and after the effect ± 0.5 % of range span

Real-time clock

Function maintained in the case of power failure: 5 days (cond.)

Options (code GA001)

Binary inputs

Number	4 (speed 2, speed off, DI 1, DI 2)
Auxiliary voltage	DC 20 ... 24 ...30 V
Input current	6 mA
H signal	20 ... 30 V
L signal	0 ... 1.3 V

Relay outputs

Four potential-free relay contacts (connected with each other on one side), contact load 30 V / 100 mA.

External speed change

It can be switched between speed 1 and 2 (terminals 901-922); the chart speed can be switched off (terminals 901-912).

Event markers

Only for version with printer channel
Two markers possible
Recording at approx. 2 % and 5 % of the recording width

Standby function

The standby function is activated via a freely selectable binary input.

Paper end signal

With speeds of ≥120 mm/h, 2 hours before the paper ends. With speeds smaller than < 120 mm/h, at least 8 hours before the paper ends.
Signalling is effected via a freely correlatable relay contact. Output: potential-free contact. When changing the recording paper the length of the chart roll must be entered into the recorder.

Limit monitoring

Two limits per channel for absolute monitoring.
The four internal relays can freely be correlated with the limits. Hysteresis 2 % of range span.

Display

Scale
   One graduation per measuring system
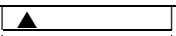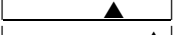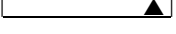   Scale face 5 mm wide
   Character size 2 mm

Control and display table (only for parameterizing)
   Display
   5-digit 7-segment display
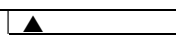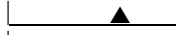   Size of characters 4 x 7 mm
   Operation via 3 keys
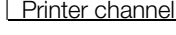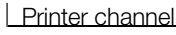
Recording

Arrangement of measuring systems and color correlation

Version without printer channel

		1	2	3	4	No. of line channels
▲	green			×	×	
▲	red		×	×	×	
▲	blue	×	×	×	×	
▲	violet				×	

Version with printer channel

			2			No. of channels
▲	green					
▲	red					
▲	blue		×			1st channel
Printer channel	violet		×			2nd channel

			3			No. of channels
▲	green					
▲	red		×			2nd channel
▲	blue		×			1st channel
Printer channel	violet		×			3rd channel

			4	No. of channels
▲	green		×	3rd channel
▲	red		×	2nd channel
▲	blue		×	1st channel
Printer channel	violet		×	4th channel

1. Line recording
   Fiber recording pen with inkwell of approximately 1.4 ml, line length approximately 1300 m, distance between the tips of the fiber recording pens 2 mm.

2. Printing
   A printer system for printing of texts can be installed in place of the lower measuring system. Distance between blue fiber pen and print head 6 mm.

   In addition to the text printout, a measured value can be recorded with the printer system.
   Recording of the measured value is made in the form of a dotted line with equidistant dot spacing.
   Color supply of the print head approx. 1.5×10^6 dots.

Text printout for:

1. Eight text lines of 16 characters each.
   Each text line is supplemented with time printout. Resolution cyclic, in parameterizable intervals or event-depending by internal limits or external stimulation (binary inputs).

2. Printout of chart speed, date and time.
   Initiation with recorder ON and with a change in chart speed.

3. Printout of time and date.
   Cyclic initiation, in parameterizable time intervals or event-depending by external stimulation.

4. Printout of actual measured values
   Cyclic initiation, in parameterizable time intervals or event-depending by internal/external stimulation.

5. Printout of double lines correlated with the individual measuring points.
   First line: Scaling line with channel designation and printout of the unit.
   Second line: Text specific to the measuring point, max. 32 characters.

6. Listing of all active parameters
   Manual initiation in parameterizing mode.

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Text printout/recording

Maximum possible chart speed with print channel instead of fibre-tip pen	240 mm/h
Size of characters	approx. 1.5 × 2 mm
Chart speed	2 chart speeds can be parameterized in mm/h: 0/2,5/5/10/20/60/120/240/300/ 600/1200 can be changed-over and disconnected externally (24 V DC/6 mA)
Recording chart	32 m roll chart or 16 m fanfold chart
Visible chart length	60 mm
Recording width	100 mm (chart width 120 mm, DIN 16230)
Chart intake (with roll chart)	Via automatic paper take-up device (daily tear-off or take-up of the 32 m possible)

Auxiliary voltage

24 V AC/DC ± 20 % or
24/115/230 V AC +10 %/–15 %
Frequency range 47.5 ... 63 Hz
Power consumption with max. fitting approx. 20 W/27 VA

RS-485 interface (optionally RS-232 with adapter)

a) For parameterizing
b) Linking to host systems for bidirectional data transmission. Data protocol with reference to the PROFIBUS standard.

Climatic suitability

Ambient temperature	0 ... 25 ... 50 °C
Transport and storage temperature	–40 ... +70 °C
Relative humidity	≤ 75 % annual average max. RH ≤ 85 % in function
Climatic class	3K3 acc. to IEC 721-3-3

Electrical safety

Test according to DIN EN 61010-1 (classification VDE 0411) or IEC 61010-1
Measuring category III at the power input and degree of pollution 2 according to VDE 0110, parts 1 and 2
Test voltage
   3.75 kV measuring channels to energy supply
   2.20 kV protective conductor to energy supply

Functional extra low voltage with protective separation (PELV)

Between power input – measuring channels, control leads, interface cables acc. to VDE 0100 part 410 and VDE 0106 part 101.

Electromagnetic compatibility

The protection goals of the EMC directive 2014/30/EU as to radio interference suppression and as to immunity to interference according to EN 61326-1 are complied with.

Default parameter setting

If individual parameter setting is not specified when ordering a recorder, the LINAX 4000M is delivered with the following default parameter setting:

All measuring channels with 0...20 mA measuring range
Chart speed 1: 20 mm/h
Chart speed 2: 120 mm/h
Chart speed 3: Off
Limits are set to end positions (0 and 20 mA).
Attenuation of measured value, zoom, printer and limit functions are inactive. No password entered.
This default parameter setting can be re-initialized independent of the actually set parameters

Scope of delivery

1 copy of operating instructions
2 fasteners
1 chart roll or fanfold pack, inserted in the unit
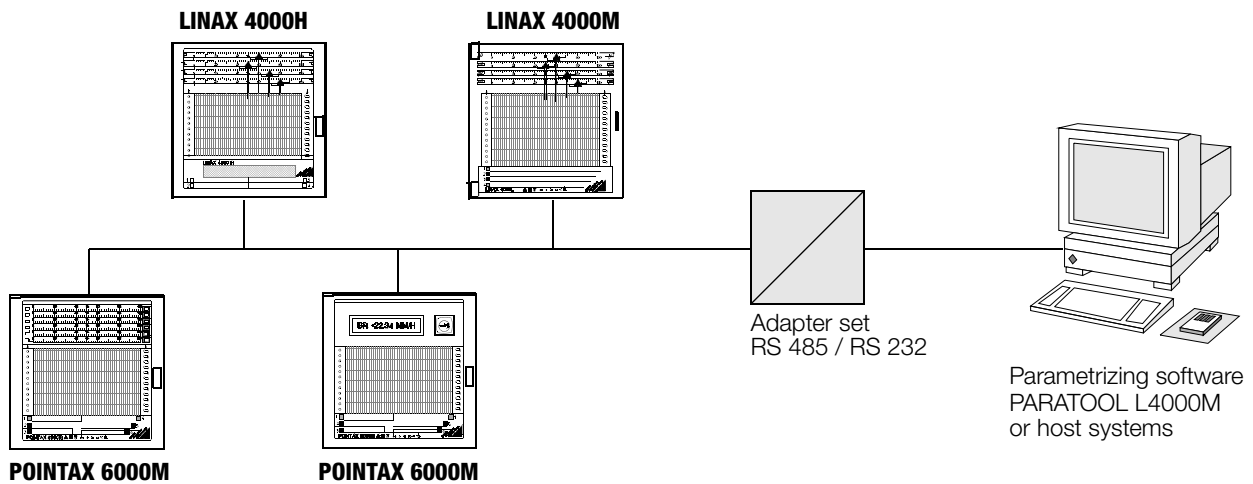1 fiber recording pen per measuring channel
1 print inset (for recorder version with printer channel)

Additionally, depending upon the order:
Centering angle bracket for installation in mechanical grids; reading ruler(s)

Example of interlinking

LINAX 4000H   LINAX 4000M
POINTAX 6000M   POINTAX 6000M
Adapter set RS 485 / RS 232
Parametrizing software PARATOOL L4000M or host systems

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Connection, case and installation

Electrical connections
Protection type IP 20
Screw and plug terminals for signal inputs, control inputs
and limit relay outputs.
Max. wire cross section 2 x 1 mm^2
Screw terminals for line connection
Max. wire cross section 4 mm^2
RS-485 interface via 9-pin SUB-D plug
Case
Molded material for installation in panels or mechanical grids
(see dimensional drawing for dimensions)
Protection type of case (including front)
IP 54 according to EN 60529
Color of case
Silica-gray according to RAL 7032
Front door
Molded material (RAL 7032) with mineral glas or plastics
Fastening of case
With 2 fasteners (optionally for installation in panel or mechanical grid), centering angle brackets are required for installation in
mechanical grids, see BA No. 605
Position of use
Lateral [–30° ... 0 ... +30°], inclined to the rear 20°,
to the front 20°

Mounting distance
Horizontal or vertical 0 mm, it must be possible to open
the door of the case through 100°
Weight 3.2 kg, approx.

Dimensional drawing (dimensions in mm)

Panel cutout
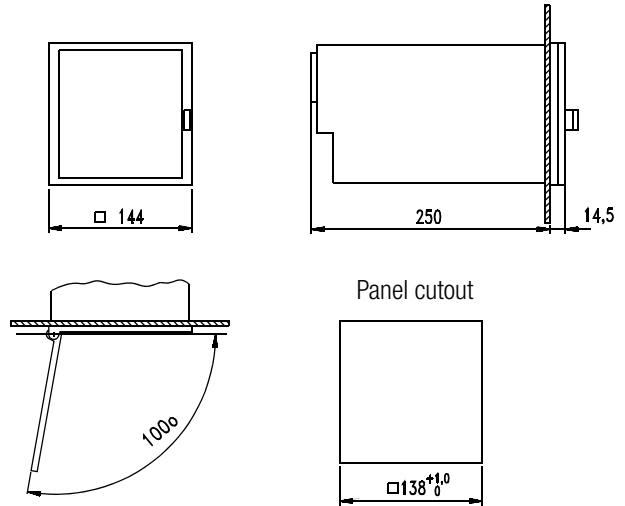
Wiring diagrams
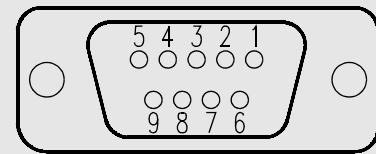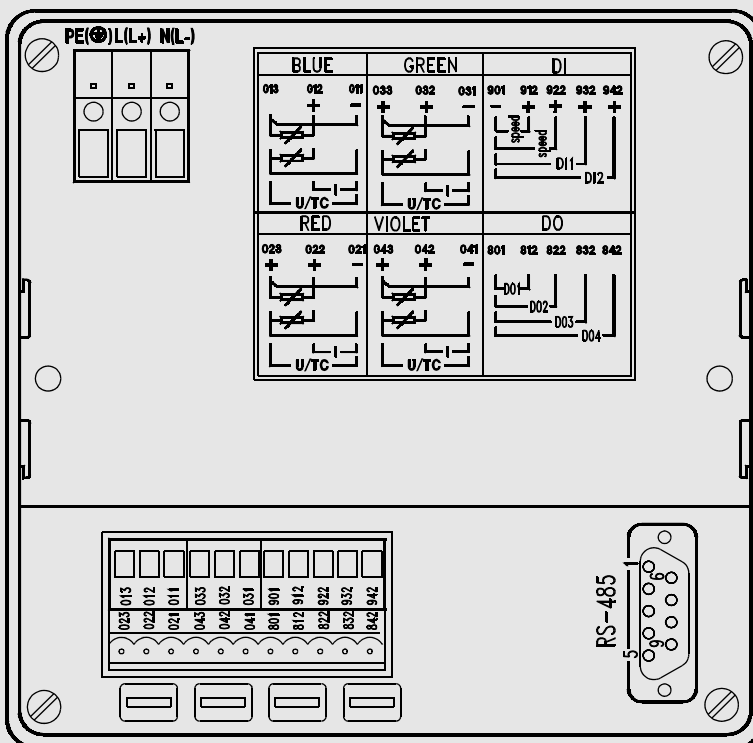
RS 485 interface
Pin 1:   Shield
Pin 3:   RXD (+)
Pin 5:   Gnd (reference potential)
Pin 6:   +5 V
Pin 8:   RXD (-)

For bus operation:
The + 5 V voltage on pin 6 is required when
the LINAX 4000M is used as bus termination
device.

The shield is attached to a plug connector on
the recorder case.

Signal inputs

Limit contacts

Speed circuitry (terminals 901, 912, 922)
Binary inputs =
depending upon parameter setting
for event markers - initiation of text printout
(terminals 901, 932, 942)

Order code

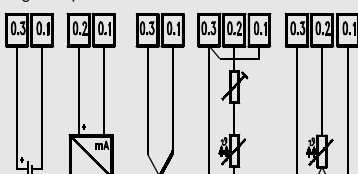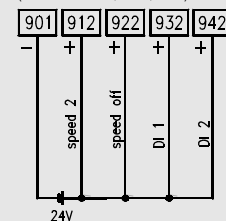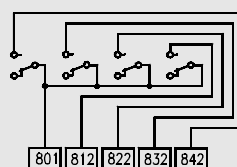| Description			Article number			
Continuous-line recorder LINAX 4000M in standard version with DC measuring ranges for all channels			**A4001**			
Front dimensions 144 × 144mm						
Continuous-line recorder LINAX 4000M with universal card (DC an process inputs) and basic parameter setting according to data sheet, measuring range 0 ... 20 mA				**A4002**		
Front dimensions 144 × 144mm						
Continuous-line recorder LINAX 4000M with universal card (DC an process inputs) and parameter setting as per request					**A4003**	
Front dimensions 144 × 144mm						
	1 line channel		AA001			
	2 line channels		AA002			
	3 line channels		AA003			
	4 line channels		AA004			
	1 line channel plus print channel		AA005			
	2 line channels plus print channel		AA006			
	3 line channels plus print channel		AA007			
	1 line channel			AA001	AA001	
	2 line channels			AA002	AA002	
	3 line channels			AA003	AA003	
	4 line channels			AA004	AA004	
	1 line channel plus print channel			AA005	AA005	
	2 line channels plus print channel			AA006	AA006	
	3 line channels plus print channel			AA007	AA007	
Parameter setting						
Parameter setting with standard settings according to data sheet (for article no. A4001)	see page 5		BA000			
Parameter setting as per request within listed limits (for article no. A4001) Meas. range (all channels identical) Binary inputs and limits, text lines, time and date, scaling line, ...	only with GA001 only with AA005,AA006,AA007		BA900			

Order code (cont'd)

Description			Article number			
X1n = nom. range of lower range limit						
X2n = nom. range of upper range limit						
Meas. ranges for article no. A4003						
Meas. range 1st channel:		**Lower range limit X1**	**Upper range limit X2**			
DC current	X1n	X2n				
	0 mA	20 mA	X1 = X1n = 0 mA	X2 = X2n = 20 mA		BA001
	4 mA	20 mA	X1 = X1n = 4 mA	X2 = X2n = 20 mA		BA002
	−20 mA	20 mA	X1 = X1n = −20 mA	X2 = X2n = 20 mA		BA003
			X1n ≤ X1 ≤ X1n+0,8(X2n−X1n)	X1+0,2(X2n−X1n) ≤ X2 ≤ X2n		BA913
DC voltage	X1n	X2n				
	−75 mV	+75 mV	X1 = X1n = −75 mV	X2 = X2n = 75 mV		BA005
	−20 V	+20 V	X1 = X1n = −20 V	X2 = X2n = 20 V		BA004
			X1n ≤ X1 ≤ X1n+0,8(X2n−X1n)	X1+0,2(X2n−X1n) ≤ X2 ≤ X2n		BA914
Resist. thermometer	X1n	X2n				
2-wire	−50 °C	+500 °C	−50 °C ≤ X1 ≤ 390 °C	X1+ 110 °C ≤ X2 ≤ 500 °C		BA901
2-wire	−50 °C	+150 °C	−50 °C ≤ X1 ≤ 110 °C	X1+ 40 °C ≤ X2 ≤ 150 °C		BA902
3-wire	−50 °C	+500 °C	−50 °C ≤ X1 ≤ 390 °C	X1+ 110 °C ≤ X2 ≤ 500 °C		BA903
3-wire	−50 °C	+150 °C	−50 °C ≤ X1 ≤ 110 °C	X1+ 40 °C ≤ X2 ≤ 150 °C		BA904
Thermocouple	X1n	X2n				
Type T	0 °C	400 °C	0 °C ≤ X1 ≤ 320 °C	X1 + 80 °C ≤ X2 ≤ 400 °C		BA905
Type J	0 °C	1200 °C	0 °C ≤ X1 ≤ 960 °C	X1 + 240 °C ≤ X2 ≤ 1200 °C		BA906
Type L	0 °C	900 °C	0 °C ≤ X1 ≤ 720 °C	X1 + 180 °C ≤ X2 ≤ 900 °C		BA907
Type K	0 °C	1372 °C	0 °C ≤ X1 ≤ 1097 °C	X1 + 275 °C ≤ X2 ≤ 1372 °C		BA908
Type E	0 °C	1000 °C	0 °C ≤ X1 ≤ 800 °C	X1 + 200 °C ≤ X2 ≤ 1000 °C		BA909
Type S	0 °C	1769 °C	0 °C ≤ X1 ≤ 1415 °C	X1 + 354 °C ≤ X2 ≤ 1769 °C		BA910
Type R	0 °C	1769 °C	0 °C ≤ X1 ≤ 1415 °C	X1 + 354 °C ≤ X2 ≤ 1769 °C		BA911
Type B	100 °C	1820 °C	100 °C ≤ X1 ≤ 1476 °C	X1 + 344 °C ≤ X2 ≤ 1820 °C		BA912
Scale 1st channel:		Same as measuring range				BB001
		Without graduation		BB002	BB002	BB002
		0 ... 100		BB003	BB003	BB003
		as per request		BB900	BB900	BB900
Reading ruler 1st channel:		Without reading ruler		BC000	BC000	BC000
		Same as scale		BC001	BC001	BC001
		0 ... 100		BC002	BC002	BC002
		as per request		BC900	BC900	BC900

Order code (cont'd)

Description				Article number	
Measuring range 2nd channel, only for 2-channel or multi-channel versions:					
Same as measuring range 1st channel, but features CA...				CAxxx	
Scale 2nd channel, only for 2-channel or multi-channel versions:					
Same as scale 1st channel, but features CB...			CBxxx	CBxxx	CBxxx
Reading ruler 2nd channel, only for 2-channel or multi-channel versions:					
Same as 1st channel, but features CC...			CCxxx	CCxxx	CCxxx
Measuring range 3rd channel, only for 3-channel or four-channel versions:					
Same as measuring range 1st channel, but features DA...				DAxxx	
Scale 3rd channel, only for 3-channel or four-channel versions:					
Same as scale 1st channel, but features DB...			DBxxx	DBxxx	DBxxx
Reading ruler 3rd channel, only for 3-channel or four-channel versions:					
Same as 1st channel, but features DC...			DCxxx	DCxxx	DCxxx
Measuring range 4th channel, only for four-channel versions:					
Same as measuring range 1st channel, but features EA...				EAxxx	
Scale 4th channel, only for four-channel versions:					
Same as scale 1st channel, but features EB...			EBxxx	EBxxx	EBxxx
Reading ruler 4th channel, only for four-channel versions:					
Same as 1st channel, but features EC...			ECxxx	ECxxx	ECxxxx
Options (binary input, limits)	see page 3	No	GA000	GA000	GA000
		Yes	GA001	GA001	GA001
Further parameters same as **parameter presettings**	see page 5				HA000
Further **parameters deviating** from the parameter presetting					HA900
Recording type	for roll (32 m)		KA001	KA001	KA001
	for fanfold pack (16 m)		KA002	KA002	KA002
Auxiliary voltage:	24 V ... 85 V AC/DC		LA001	LA001	LA001
	95 V ... 240 V AC/DC		LA002	LA002	LA002
Front door:	Plastic		MA001	MA001	MA001
	Metal		MA002	MA002	MA002
Label:	Blank, with GOSSEN METRAWATT logo		NA000	NA000	NA000
	Blank, without logo		NA001	NA001	NA001
	With inscr. as per request, 1 line/meas. point with max. 31 charact.		NA900	NA900	NA900
Test report	No		PA000	PA000	PA000
	With factory test certificate M according to DIN 55350-18-4.2.2 and reading test certificate B according to EN 10204-3.1B		PA001	PA001	PA001

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Order code (cont'd)

Description			Article number			
Operating instructions	German		RA000	RA000	RA000	
	No		RA001	RA001	RA001	
	English		RA002	RA002	RA002	
	French		RA003	RA003	RA003	
	Italian		RA004	RA004	RA004	

Accessories

Article numbers ending with a letter are complete and need not be commented.
Article numbers ending with a **numeral** must be commented with the **following features**.

Description			Ident-Nummer							
RS232/RS485 Converter	for top-hat rail mounting	A403B								
RS485 Cable	for connection recorder converter (2x 9pole SUB-D plug)		A420C							
RS232 Cable	for connection converter-PC (2x 9pole SUB-D plug)			GTZ3241000R0001						
Scale with heights 5.0 mm	Scale, graduation as per request			**A4130**						
Reading ruler, division as requested				**A4120**						
Label for measuring point										
	for LINAX 4000			**A4110**						
	With GOSSEN METRAWATT logo			AA000						
	Without GOSSEN METRAWATT logo			AA001						
	Channel green without inscription			BA001						
	Channel green with inscription			BA900						
	Channel red without inscription			BB001						
	Channel red with inscription			BB900						
	Channel blue without inscription			BC001						
	Channel blue with inscription			BC900						
	Channel violet without inscrption			BD001						
	Channel violet with inscrption			BD900						
Screw terminal with five connectors					**A404A**					
Screw terminal with three connectors						**A404B**				
4 each centering angle (wit installation in grid)							**A416A**			
Bus termination resistors								**A409A**		
Package of 2 × 390 Ohm and 1 × 150 Ohm										

Consumable items

Article numbers ending with a letter are complete and need not be commented.
Article numbers ending with a **numeral** must be commented with the **following features**.

Description			Article number								
Recording chart, chart width 120 mm, recording width 100 mm											
Chart roll 32 m, graduation 0 ... 100, minimum ordering quantity 25 rolls											
	Time graduation / speed	None	**A401A**								
		10 mm/h	**A401B**								
		20 mm/h	**A401C**								
		60 mm/h	**A401D**								
		120 mm/h	**A401E**								
		as per request	**A4070**								
			CA90								
Chart roll 32 m, with calibrated graduation, minimum ordering quantity 25 rolls				**A4071**							
	Calibrated graduation	as per request		AA900							
	Inscription	as per request		BA900							
	Time graduation / speed	as per request		CA900							
Fanfold pack 16 m, graduation 0 ... 100, minimum ordering quantity 25 packs											
	Time graduation / speed	ohne					**A401L**				
		20 mm/h					**A401N**				
		as per request					**A4075**				
							CA90				
Fanfold pack 16 m, with calibrated graduation, minimum ordering quantity 25 packs									**A4074**		
	Calibrated graduation	as per request							AA900		
	Inscription	as per request							BA900		
	Time graduation / speed	as per request							CA900		
Recording styli / printer styli											
Stylus green										**A406B**	
Stylus red										**A406A**	
Stylus blue										**A406C**	
Stylus violet										**A406D**	
Printer stylus violet										**A406E**	

LINAX 4000M
Continuous-line recorder

GOSSEN METRAWATT