



Data Sheet

611.D.101.05

Analog Meters with Stepper Motor with 240°, 300°, or 360° Dial

LSSM3-072
LSSM3-096
LSSM3-144
LSSM3-060
LSSM3-080
LSSM3-100
LSSM3-130
LRSM3-072
LRSM3-096
LRSM3-144
LRSM3-060
LRSM3-080
LRSM3-100
LRSM3-130



WEIGEL

Application

The **LSSM3** stepper motor meter with 240° scale angle (optionally up to 300°) and the **LRSM3** stepper motor meter with 360° scale angle are equipped with analog scales.

The indicators are extremely rugged and ideal for use in tough industrial ambient conditions, like e.g., in ships and rail vehicles.

The meters are available in all established meter sizes in square housings (**LSSM3/LRSM3 072/096/144**) as well as in round housings (**LSSM3/LRSM3 060/080/100/130**).

An externally adjustable **LED dial and optionally pointer illumination** homogeneously illumines the scale.

Optional features like setpoint switches, min-max-indication, or an additional alarm LED are available in addition to the standard versions.

Operating Principle

Microprocessor-controlled high resolution stepper motor with integrated fine gear and pivoted shaft for rugged conditions.

The motor motion is controlled by software using digital filters, so that there is an optimal combination of moving measurement adoption with high resolution, but without a fluttering pointer. When there is a measuring signal with harmonics the pointer cannot follow, the meter shows the arithmetic mean value of the signal.

When power is disconnected, after the minimum power-on time and the minimum temperature, the pointer is moved to the zero position thereby using an internal energy storage.

Inputs, (outputs), and power supply are galvanically isolated from each other.

Mechanical Data

case details	square (■ 072/096/144) or round (● 060/080/100/130) housing suitable to be mounted in control panels, machine tool consoles or mosaic panels, stackable			
material of case	glassfibre inforced UV resistant plastics			
front window	anti-glare float glass			
colour of bezel	black			
position of use	any			
panel fixing	fixing screw with fishtail connection and turning handle (no tool required)			
mounting	stackable next to each other			
panel thickness	≤ 20 mm			
mounting depth (incl. connector plug)	approx. 80 mm			
terminals	pluggable screw terminal barrier strip with screw fixing			
wire cross section	max. 2.5 mm ²			
dimensions (in mm)	■ 072	■ 096	■ 144	
bezel	□ 72	□ 96	□ 144	
case	□ 66	□ 90	□ 137	
panel cutout	□68 ^{+0.7}	□92 ^{+0.8}	□138 ⁺¹	
weight approx.	0.17 kg	0.25 kg	0.51 kg	
dimensions (in mm)	● 060	● 080	● 100	● 130
bezel	Ø 66	Ø 86	Ø 106	Ø 136
case	Ø 60	Ø 80	Ø 100	Ø 130
panel cutout	Ø61 ^{+0.5}	Ø81 ^{+0.5}	Ø101 ^{+0.5}	Ø131 ^{+0.5}
weight approx.	0.145 kg	0.185 kg	0.245 kg	0.375 kg

◆ Options on request

General Technical Data

isolating voltage	1000 V DC between all electrical inputs and outputs
fire prevention class	V0
enclosure code	IP 66 case, IP 67 case front IP 30 terminals

Measuring Ranges

measuring unit	DC voltage, DC current, temperature, or frequency
DC voltage ◆	internal resistance approx.
0 ... 10 V	29 kΩ
2 ... 10 V	29 kΩ
0 ... 6 V	16 kΩ
-10 ... 0 +10 V	26 kΩ
DC current ◆	internal resistance
0 ... 20 mA	121 Ω
4 ... 20 mA	121 Ω
2x 4 ... 20 mA	121 Ω each
-20 ... 0 +20 mA	59 Ω
Temperature Pt100	
0 ... 100 °C	
0 ... 120 °C	
0 ... 150 °C	
0 ... 200 °C	
0 ... 250 °C	
0 ... 300 °C	
0 ... 400 °C	
0 ... 500 °C	
0 ... 600 °C	
-30 ... 120 °C	
Frequency	0.2 Hz ... 140 kHz, arbitrary wave form
AC voltage	200 mV _{pp} ... 400 V _{pp}
positive frequency signals	Low level = 4 V High level = 6.5 V; max. 200 V _p
internal resistance R _i	> 220kΩ for all signals
possible sensor types	
active sensors	with NPN or PNP open collector output or with push-pull output stage;
passive sensors	inductive-magnetically;
speed generators	with AC voltage outputs

Scaling

dial	flat dial, white
scale characteristics	linear
scale division and figuring ◆	coarse-fine according to DIN 43802
dial illumination ◆	dimnable LED illumination by keys on meter rear side, 30...100% in 100 steps
scale	
LSSM3 ...	0 ... 240° ◆ by pointer
LRSM3 ...	0 ... 360° by rotating dial without stop
zero position LRSM3...	zero transition at 180° ◆ return position at 180° ◆
motor torque	statically: 4 mNm dynamically: 1,2 mNm
operation	2 rear side buttons or potentiometer for setting basic brightness, (pointer brightness, and special functions ◆)
zero adjustment	when powering on by moving to mechanical zero (LSSM3 ...) or via laser sensing (LRSM3 ...)
initialization time	approx. 5 s after power-on of auxiliary supply
minimum power-on	2 min, for permanently storing a changed basic brightness; 3 min, for moving the pointer from any position to zero position



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Auxiliary Supply

auxiliary voltage 24 V DC (18 ... 36V) ⚡
 power demand max. 2 W
 Input, (output ⚡), and power supply are galvanically isolated from each other.

Accuracy at Reference Conditions

accuracy class better than 0.5 according to DIN EN 60 051 - 1
 sampling resolution 10 bits
 stepping motor resolution 12 motor steps per degree
 resolution 2880 indication steps for 240° (**LSSM3 ...**)
 4320 indication steps for 360° (**LRSM3 ...**)
 gear backlash typical 0.3°
 gear backlash correction by software

reference conditions

ambient temperature 23°C
 input rated measuring value
 others DIN EN 60 051 - 1

influences

ambient temperature 23°C ± 2K

Environmental

EMC all guidelines from "Germanischer Lloyd" and "Bahn Norm" (railway standard)
climatic suitability according to IEC60068-2-1/2
 operating temperature -20°C ... +70°C (**LSSM3 ...**)
 -25°C ... +70°C (**LRSM3 ...**)
 -40°C ... +70°C without pointer zero positioning on power fail
 storage temperature -40°C ... +70°C
 relative humidity ≤ 95% at 55°C according to IEC60068-2-30
vibration and shock
 vibration resistance up to 4g
 shock resistance 5g for 30ms and 10g for 18ms

Rules and Standards

DIN EN 50 121-3 Railway applications – Electromagnetic compatibility –
 -1 Part 3-1: Rolling stock – Train and complete vehicle
 -2 Part 3-2: Rolling stock – Apparatus
 DIN EN 50 155 Railway applications – Electronic equipment used on rolling stock
 DIN EN 61 373 Railway applications – Rolling stock equipment – Shock and vibration tests
 DIN EN 61 010-1 Safety requirements for electrical measuring, control and laboratory equipment
 Part 1: General requirements
 IEC 60068-2 Environmental testing – Tests –
 -1 Part 2-1: Test A: Cold
 -2 Part 2-2: Test B: Dry heat
 -6 Part 2-6: Test Fc: Vibrations
 -30 Part 2-30: Test Db: Damp heat, cyclic (12 h + 12 h cycle)

⚡ Options on request

IEC 61000-4 Electromagnetic compatibility (EMC) – Testing and measurement techniques –
 -2 Part 4-2: Test of immunity against discharge of static electricity
 -3 Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test
 -4 Part 4-4: Test of immunity against fast transient electric disturbances/Burst
 -5 Part 4-5: Surge immunity test
 -6 Part 4-6: Test of immunity against conducted disturbances, induced by high frequency fields
 CISPR 16 Requirements for devices and facilities as well as definition of measurement procedures for high frequency disturbances (radio disturbances) and immunity –
 -1 Part 1-1: Measuring devices
 -2 Part 1-2: Additional/auxiliary facilities – conducted disturbances
 Fire protection class V0

Options

Measuring range

special measuring range on request

Scaling

pointer deflection 0 ... 240° up to 300° as specified (**LSSM3 ...**)
 scale division 0 ... 100%,
 and figuring linear, full-scale values acc. to standardized series (1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 and their decimal multiples e.g. 150 m³/h) or deviating from standard; special calibration from customer's non-linear graph or chart

black dial; scale division according to DIN, white pointer and figuring
 additional lettering on request e.g. "generator"
 additional figuring on request
 coloured marks red, green or blue for important scale values
 coloured sector red, green or blue within scale division
 calibration, scale splay, "non-linear scale", off-set zero position with up to 11 calibration points freely distributable over the scale, linear between the calibration points; additionally zero position in centre of scale, or on arbitrary position of scale
 zero position **LRSM3...** zero transition not at 180°
 return position not at 180°

logo on the dial none or on request

pointer illumination in different colours, dimmable in 100 steps

alarm LED colour to be specified

auxiliary voltage other voltage on request

illumination for common 24V PWM dimmer

control input (positive or negative control) or via 0 ... 24V DC voltage; Ri 17 kΩ, PWM frequency: 70 Hz

binary connection can be used either as input or as output:

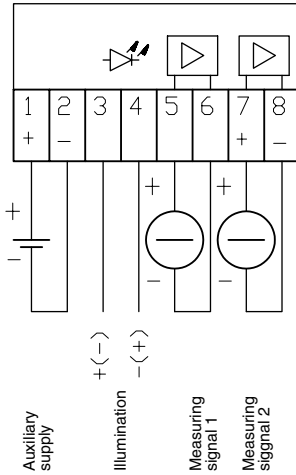
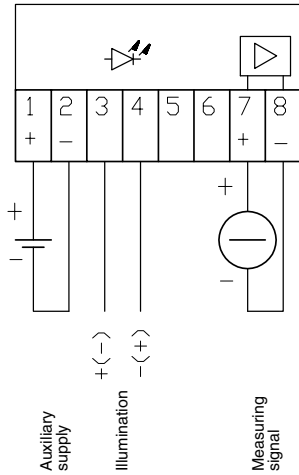
– switching input Low=0V, High=12V/24V, for PT100/PT1000 sensor signals used for 3 or 4 wire connection

– switching output for setpoint either
 • current limited solidstate relay max. 100 mA, max. 60 V DC or
 • magnetic contact relay max. 500 mA, max. 60 V DC

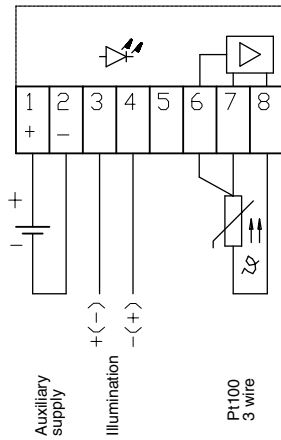
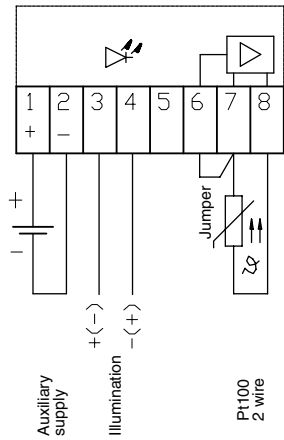
marine application with approbation by Germanischer Lloyd or with approbation by Wheelmark

Connections

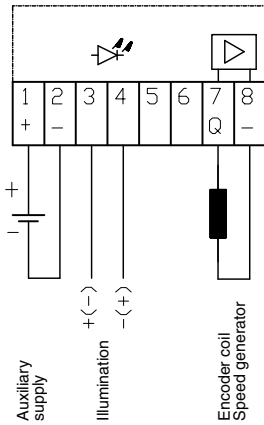
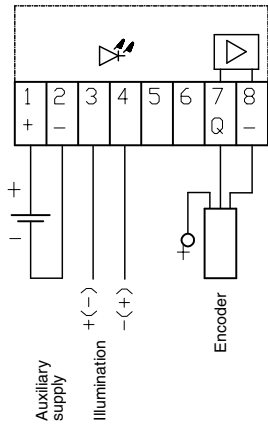
DC voltage, DC current



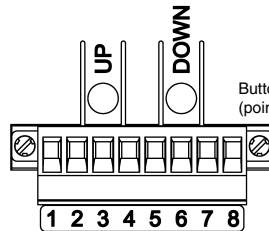
Temperature



Frequency

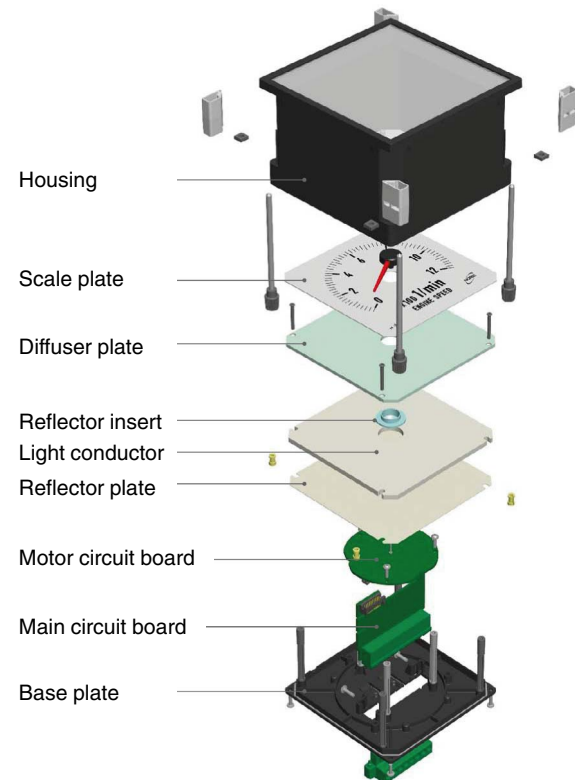


Terminals



Terminal	LSSM3/LRSM3 ...	DLSSM3 ...
1	Auxiliary voltage +	
2	Auxiliary voltage -	
3	Illumination (any polarity)	
4	Illumination (any polarity)	
5	Option +	Measuring signal 1 +
6	Option -	Measuring signal 1 -
7	Measuring signal +	Measuring signal 2 +
8	Measuring signal -	Measuring signal 2 -

Technical Design





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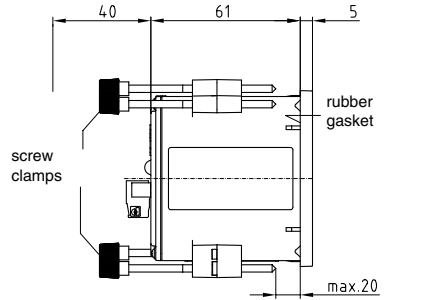
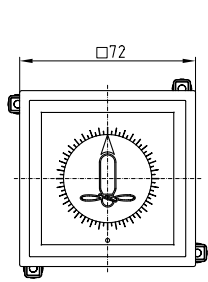
Dimensions

front view

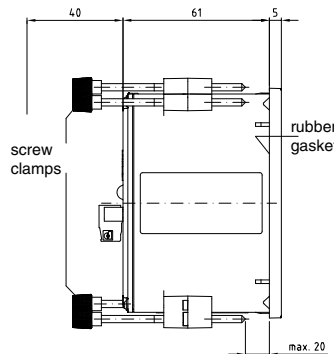
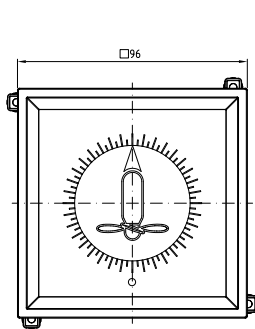
side view

(dimensions in mm)

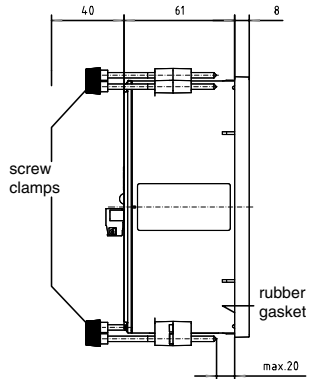
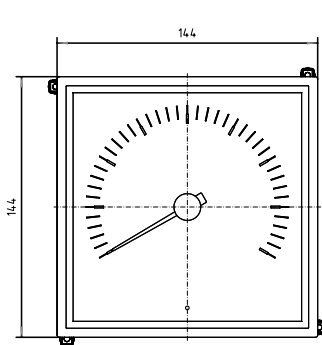
LSSM3/LRSM3 072



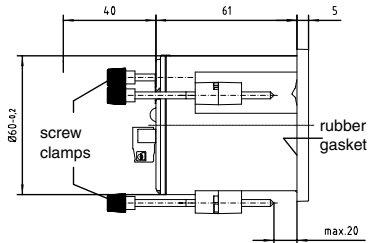
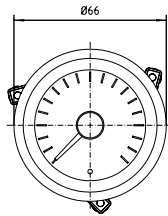
LSSM3/LRSM3 096



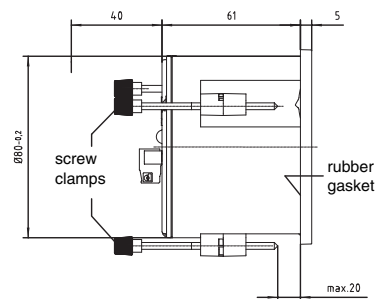
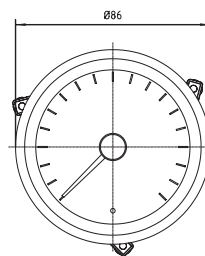
LSSM3/LRSM3 144



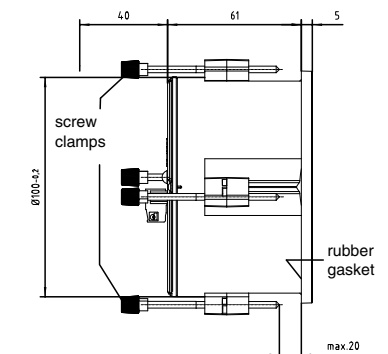
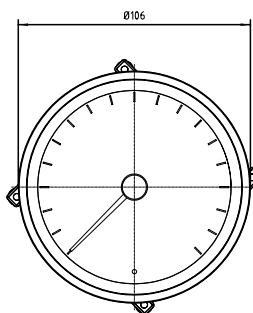
LSSM3/LRSM3 060



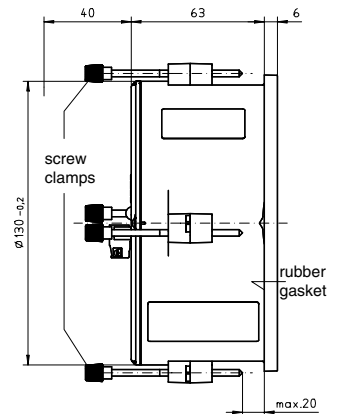
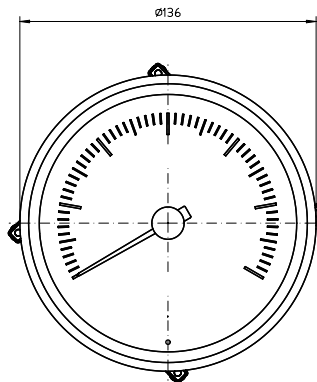
LSSM3/LRSM3 080



LSSM3/LRSM3 100



LSSM3/LRSM3 130



Ordering Information

Type	analog meter with stepper motor indicator
LSSM3	with 240° scale angle (optionally up to 300°)
DLSSM3	double indicator with 240° scale angle (optionally up to 300°)
LRSM3	with 360° scale angle
Case	
072	square, 72 mm x 72 mm
096	square, 96 mm x 96 mm
144	square, 144 mm x 144 mm
060	round, Ø 60 mm ⁵⁾
080	round, Ø 80 mm ⁵⁾
100	round, Ø 100 mm ⁵⁾
130	round, Ø 130 mm ⁵⁾
Measuring range	
U1	DC voltage 0 ... 10 V
U2	DC voltage 2 ... 10 V
U3	DC voltage 0 ... 6 V
U4	DC voltage -10 ... 0 ... +10 V
I1	DC current 0 ... 20 mA
I2	DC current 4 ... 20 mA
I3	2x DC current 4 ... 20 mA (DLSSM3 only)
I4	DC current -20 ... 0 ... +20 mA
P1	for temperature Pt100 0 ... 120°C
P2	for temperature Pt100 0 ... 150°C
P3	for temperature Pt100 0 ... 200°C
P4	for temperature Pt100 0 ... 250°C
P5	for temperature Pt100 0 ... 300°C
P6	for temperature Pt100 0 ... 400°C
P7	for temperature Pt100 0 ... 500°C
P8	for temperature Pt100 0 ... 600°C
P11	for temperature Pt100 -30 ... 120°C
P12	for temperature Pt100 0 ... 100°C
F	frequency, square-wave signal 24V
FP	frequency, square-wave signal 24V PNP
FZ	frequency, square-wave signal 12V
FZP	frequency, square-wave signal 12V PNP
FG	frequency, speed generator >6V _{SS}
FS	frequency, coil >1 V _{SS}
FJ	frequency, coil >100 mV _{SS}
xx	special measuring range ²⁾
Pointer deflection	
0 ... 240° ¹⁾³⁾ or 0 ... 360° ¹⁾⁴⁾	
0 ... 240° up to 300° as specified ²⁾³⁾	
Dial	
white dial ¹⁾	
black dial; scale division according to DIN, white pointer and figuring	

Scale division and figuring according to measuring range ¹⁾ 0 ... 100% linear according to standard series ²⁾ linear deviating from standard ²⁾ calibration from equation ²⁾ additional lettering as specified ²⁾ additional figuring as specified ²⁾ coloured mark red, green, or blue ²⁾ coloured sector red, green, or blue ²⁾
Calibration, zero position linear, left or centre zero ¹⁾ with up to 11 calibration points ²⁾ linear between calibration points additional zero position in centre of scale additional zero position in any position of scale for LRSM3 zero transition at 180° ¹⁾ zero transition not at 180° ²⁾ return position at 180° ¹⁾ return position not at 180° ²⁾
Logo WEIGEL ¹⁾ none OEM logo ²⁾
Alarm LED none ¹⁾ with LED, colour as specified ²⁾
Illumination with dial illumination ¹⁾ with additional pointer illumination ²⁾
Illumination control input none ¹⁾ with 24 V PWM dimmer input with 0 ... 24 V input for potentiometer
Binary connection none ¹⁾ switching input 24 V setpoint output ²⁾ with solidstate relay setpoint output ²⁾ with magnetic relay
Marine application none ¹⁾ with approbation by Germanischer Lloyd with approbation by Wheelmark

¹⁾ Standard

²⁾ On request, please clearly add the desired specifications.

³⁾ LSSM3 ... only

⁴⁾ LRSM3 ... only

⁵⁾ LRSM3 ... on request

Ordering example

LSSM3 096 I2 <scale code from request>

analog meter with stepper motor indicator, 96 mm x 96 mm, 0 ... 240° measuring range 4 ... 20 mA, scale 0 ... 10 x100 rpm, WEIGEL logo, with additional red pointer illumination

– specifications subject to change without notice; date of issue 08/11 –

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