

# LMU Series

## Load Monitoring Units

### FEATURES

- For use with full-bridge strain gauge transducers (sensitivity 0.5 to 4 mV/V)
- Voltage input for load summation or for individual use (without sensor)
- 2 to 4 level detectors with relay output contacts
- 0–20 mA or 4–20 mA DC current output
- $\pm 10$  V voltage output(s)
- Provides continuous detection of signal line failure and short circuits («OK» signals)
- Includes integrated test equipment (B.I.T.E.) with continuous power supply monitoring
- Compatible to CE Standards
- IP 65 aluminum housing

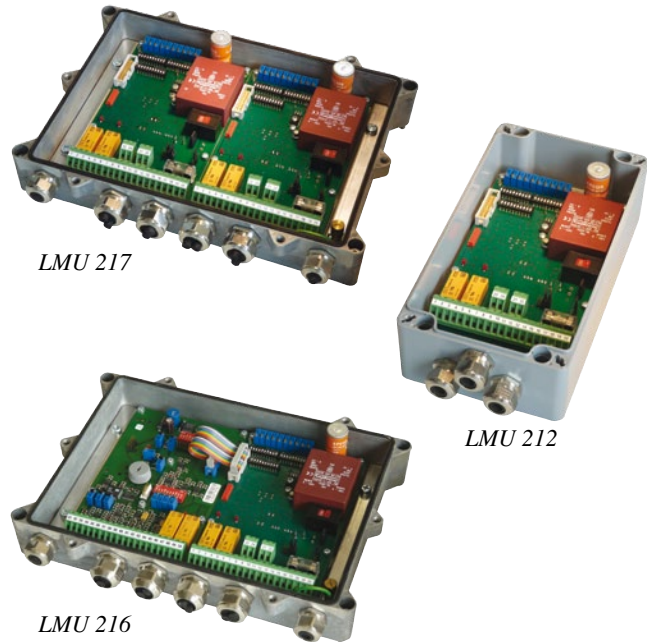
#### Features of LMU 216 only:

- 4 level detectors with output contacts, 2 of them with programmable memory
- Summer with 4 inputs
- Tare function
- Optional balancing and comparator sub-module

### DESCRIPTION

The Magtrol Load Monitoring Unit is specially designed for strain gauge transducer applications. Specifically developed for use with Magtrol load measuring pins and load-force-weight sensors, the LMU Series provides excitation current and amplifies the output signal of full-bridge strain gauges.

Load Monitoring Units are flexible and fully configurable due to DIP-switches and jumpers which allow the unit to be easily installed—no solder connections are required. The level detectors and the outputs can be dedicated either to the



full-bridge input, to the voltage input, or to the sum of both (see “Application Selection” at the top of page 3). A built-in auto-diagnostic system detects any short circuits or signal line failures, **thus allowing the system to be used in applications where safety is important**. If a problem is detected, both relays are deactivated and the output voltage (respective current) changes to  $>10$  VDC and  $>20$  mA.

The LMU is fully compatible with European Community (CE) standards. Its IP 65 aluminum housing allows the system to be used in harsh environments. Using SMD (surface mounted device) technology, the LMU allows the maximum performance/price ratio for strain gauge transducer monitoring.

### MODEL COMPARISON

	<b>LMU 212</b>	<b>LMU 217</b>	<b>LMU 216</b>
Description	1 transducer input	2 transducer inputs (2 $\times$ LMU 212)	1 transducer input
Voltage Output	1 $\times$ 0–10 V	2 $\times$ 0–10 V	3 $\times$ 0–10 V
Current Output	1 $\times$ 0–20 mA or 4–20 mA	2 $\times$ 0–20 mA or 4–20 mA	1 $\times$ 0–20 mA or 4–20 mA
Relays	2	4	4
Summation	2 signals	3 signals	4 signals

INPUT CHARACTERISTICS		
<b>Power Supply</b>		
Voltage	<ul style="list-style-type: none"> <li>• 115–230 VAC and 20–32 VDC jumper selectable</li> <li>• 48 VAC fixed</li> </ul>	
Maximum Current	Current	Fuse rating
	70 mA for 230 VAC	80 mA
	150 mA for 115 VAC	160 mA
	250 mA for 20 VDC	400 mA
350 mA for 48 VAC	400 mA	
<b>Bridge signal</b>		
Supply Voltage	10 VDC	
Max. Possible Current	140 mA DC	
Sensitivity	0.5 to 4 mV/V	
Max. Dynamic Component of Bridge Signal	±45 mVDC	
Max. Common Mode Voltage on Input	±10 V	
<b>Voltage Input for Summation of Another Load</b>		
Input Impedance	70 kΩ	
Max. Input Signal (dynamic)	±10 V	
Signal Division by 2	DIP-switch selectable	
Use Without Transducer	Jumper selectable	
<b>Input for Auto-diagnostic Feature (OK I/P)</b>		
Type	Active if short circuited	
<b>OUTPUT CHARACTERISTICS</b>		
<b>Relay Outputs</b>		
Number of Relays	LMU 212: 2 LMU 217: 4 (2 per input) LMU 216: 4	
Relay Behavior	Normally energized	
Max. Current per Contact	5 A continuous / break 20 A on startup	
Max. Voltage per Contact	AC : 250 V <sub>eff</sub> DC : 350 VDC	
Contact Rating	100 W or 1000 VA	
Insulation Voltage	Contact-contact: 750 V <sub>eff</sub> Contact-coil: 1.5 kV <sub>eff</sub>	
Lifetime	> 2 × 10 <sup>8</sup> switchings	
Contact Resistance	< 20 mΩ	
<b>Current Output</b>		
Output Type	Current generator	
Nominal Current Range	0 to 20 mA DC	
Max. Current Range	0 to 25 mA DC	
Max. Load	< 500 Ω for I <sub>max</sub> = 20 mA	
Output Impedance	> 50 kΩ	
<b>Voltage Output</b>		
Max. Dynamics	±10 V ≡ EM	
Max. Load	≥10 kΩ (ε≤0.5%) [≥1 kΩ (ε≤5%)] *	
Output Impedance	50 Ω (in series)	
<b>Output for Auto-diagnostic Feature (OK O/P)</b>		
Type	Open collector	

TRANSFER CHARACTERISTICS			
<b>Voltage Transfer Ranges (<math>\Delta U_{I/P}</math> / <math>\Delta U_{O/P}</math>)</b>			
<b>Range</b>	<b>1</b>	<b>2</b>	<b>3</b>
Bridge Sensitivity [mV/V]	0.42 to 0.78 (0.6)	0.7 to 1.3 (1)	1.2 to 2.2 (1.7)
Voltage Transfer (gain)	2380 to 1280 (1670)	1428 to 769 (1000)	833 to 455 (588)
Adjustment Range	±30%	±30%	±30%
Range Selection	Selectable using DIP-switches		
Signal Division by 2	DIP-switch selectable (the available sensitivities then moves from 0.84 to 4.4 mV/V according to the selected range)		
Measuring Chain Zero Adjustment	Coarse adjustment using multi-turn potentiometer: equivalent to ±10 V/output for range 3 Fine adjustment using multi-turn potentiometer: 5% of the coarse adjustment		
Temperature drift of the transfer function	≤ 200 ppm/°C		
Temperature drift of the measuring chain zero value	≤ 200 ppm of FSD/°C for 0.5 mV/V at the input ≡ ≤1 μV/°C		
<b>Current transfer range</b>			
Sensitivity Range with Multi-turn Potentiometer	± 20% of FSD on U <sub>O/P</sub>		
Nominal Current Range	0 to 20 mA DC		
Max. Current Range	0 to 25 mA DC		
Zero Adjustment Range	± 5 mA DC for I <sub>O/P</sub> ≥ 5 mA DC		
<b>Selectable low-pass filter</b>			
Filter Type	Butterworth		
Filter Order	2		
-3 dB Cut-off Frequency	Selectable using DIP-switches (0.3 Hz, 1 Hz, 3 Hz, 10 Hz, 100 Hz)		
<b>Level detectors</b>			
Number of Detectors	LMU 212: 2 LMU 217: 4 (2 per input) LMU 216: 4		
Level Adjustment Range	-10 to +10 VDC using multi-turn potentiometer (measured on voltage output)		
Hysteresis	<0.5% or ≈ 5% (DIP-switch selectable)		
Detection Indication	< or > (DIP-switch selectable)		
<b>Switching Delay</b>			
Number of Circuits	2		
Delay Adjustment Range	0.01 to 4.25 seconds (DIP-switch selectable)		

\* NOTE: To guarantee precise calibration, the impedance of the connected unit must be indicated at time of order. If this value is unknown, an impedance of 1 MΩ will be used for calibration. The resulting deviation will be ≤5% with an impedance of ≥2 kΩ or ≤1% with ≥10 kΩ.

TRANSFER CHARACTERISTICS (cont.)			
<b>Application selection</b>			
<i>Output specific application:</i>			
<b>REL1 det.</b>	<b>REL2 det.</b>	<b>U<sub>O/P</sub></b>	<b>I<sub>O/P</sub></b>
A, B or A+B	A, B or A+B	A, B or A+B	A, B or A+B
<i>A = bride signal; B = voltage input</i>			
MECHANICAL CHARACTERISTICS			
<b>Housing</b>			
Material	Aluminum		
<b>Stuffing glands</b>			
Type and number	LMU 212:	3 × PG 11	
	LMU 216 and 217:	6 × PG 11	
Material	Nickel-plated brass		
<b>Terminal strip</b>			
Type	MK8 (screw and connection at 45°)		
Max. Area of Connecting Wire	AWG 20 to 16 Cross section: 0.5 to 1.5 mm <sup>2</sup> (0.00077 to 0.0023 in <sup>2</sup> )		

ENVIRONMENTAL CHARACTERISTICS	
Operating Temperature	-40° C to +80° C
Storage Temperature	-45° C to +85° C
Protection Class	IP 65
Vibration and Shock	According to IEC 68.2
EMC	According to EN 61326-1 and EN 61326-2-3
SAFETY CHARACTERISTICS	
<b>B.I.T.E. test signal (Built In Test Equipment)</b>	
Signal type	Load simulation on request (calibrated during the installation)
Control	Logic signal, active low, CMOS/TTL compatible
<b>Reliability</b>	
MTBF	> 1,500,000 hours

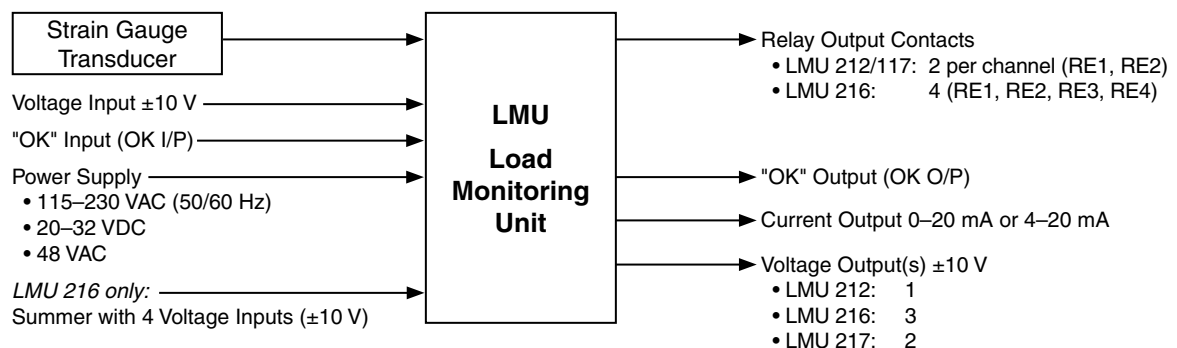
## ADDITIONAL LMU 216 FUNCTIONS

SUMMER	
Number of Inputs	4 (UA, UB, UC and UD)
Input Voltage	±10 V
Output Voltage	UE1 = (UA + UB ± UC ± UD)X X adjustable between 0.25 and 10
LATCHING	
Control	Using DIP-switches
Reset Signal	RESET REL3, RESET REL4

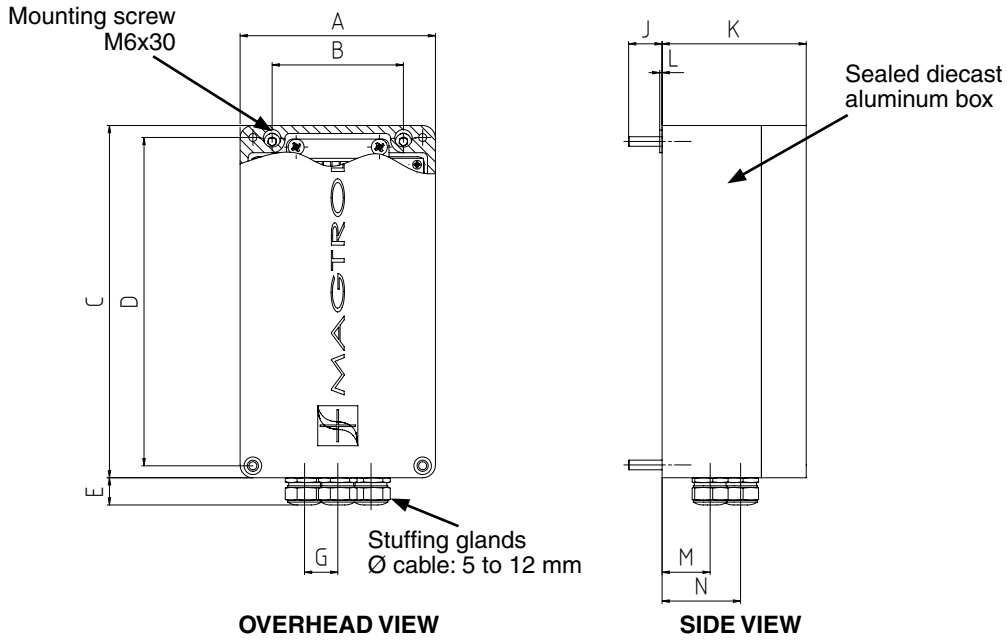
CALIBRATION CIRCUIT	
Principle	Volatile* digital memory at 12 bits (memory reset at startup), the stored digital value is subtracted from the input signal after D/A conversion  * Current interruptions lasting for less than 30 ms do not lead to the loss of the stored calibration value
Resolution	1/4096 of the selected range
Storing Time	< 2 s
Output Impedence	< 200 Ω
Acceptable Load Resistance	≤ 20 kΩ

## BASIC CONFIGURATION

The LMU Load Monitoring Unit offers unlimited configuration possibilities. It is impossible to list them all in this data sheet. Please contact Magtrol or one of its subsidiaries or sales agents to discuss your specific applications.

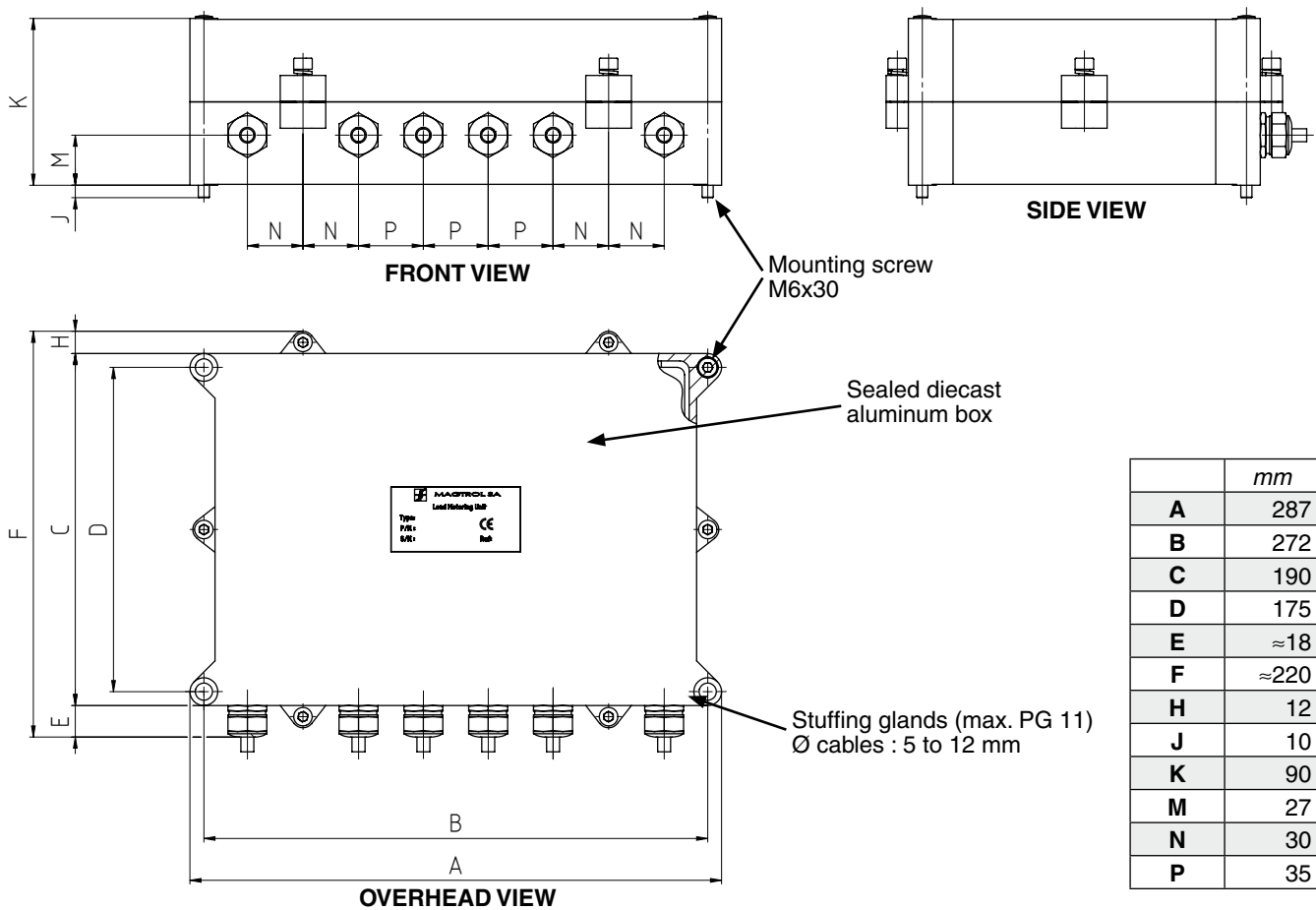


**LMU 212**

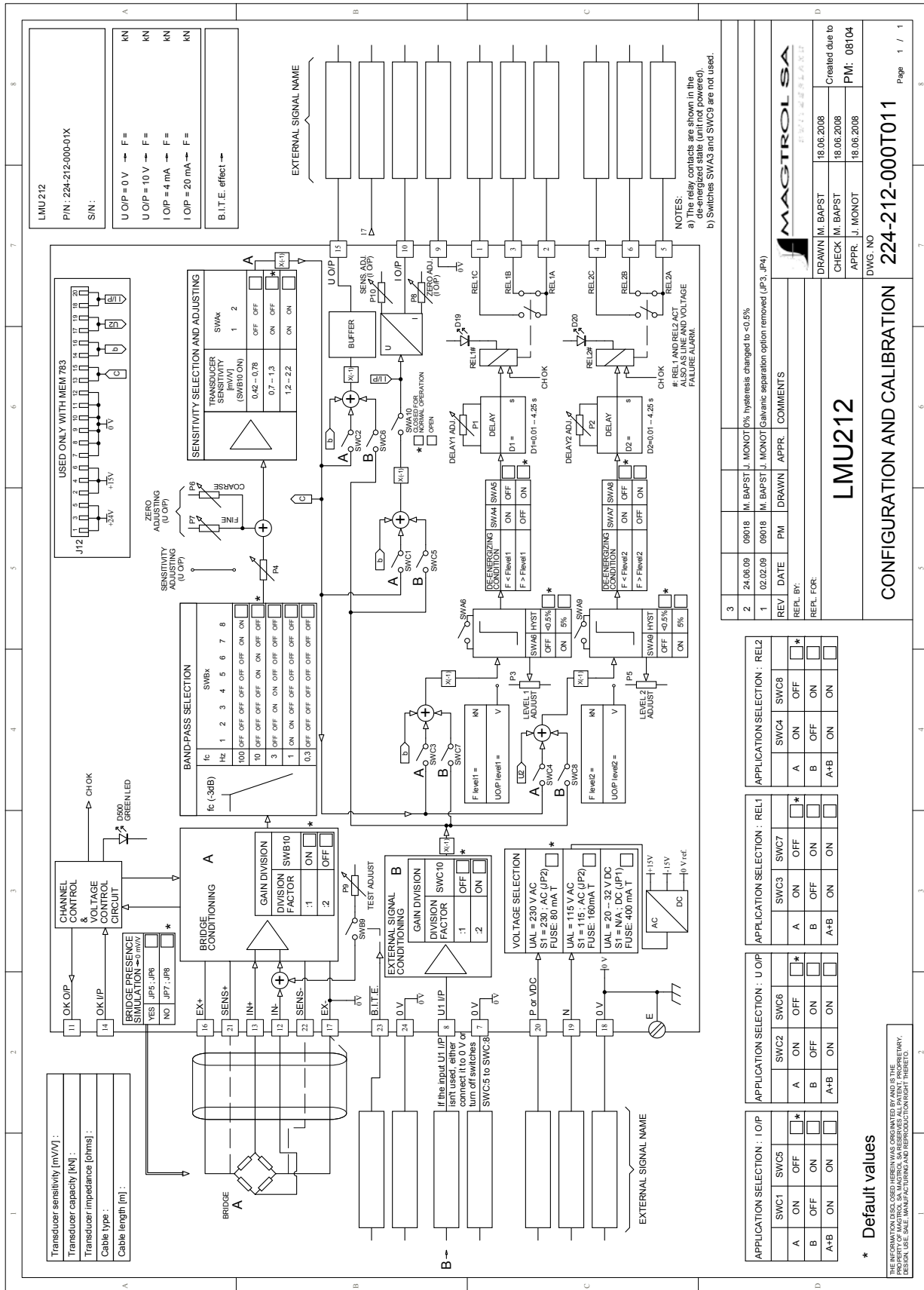


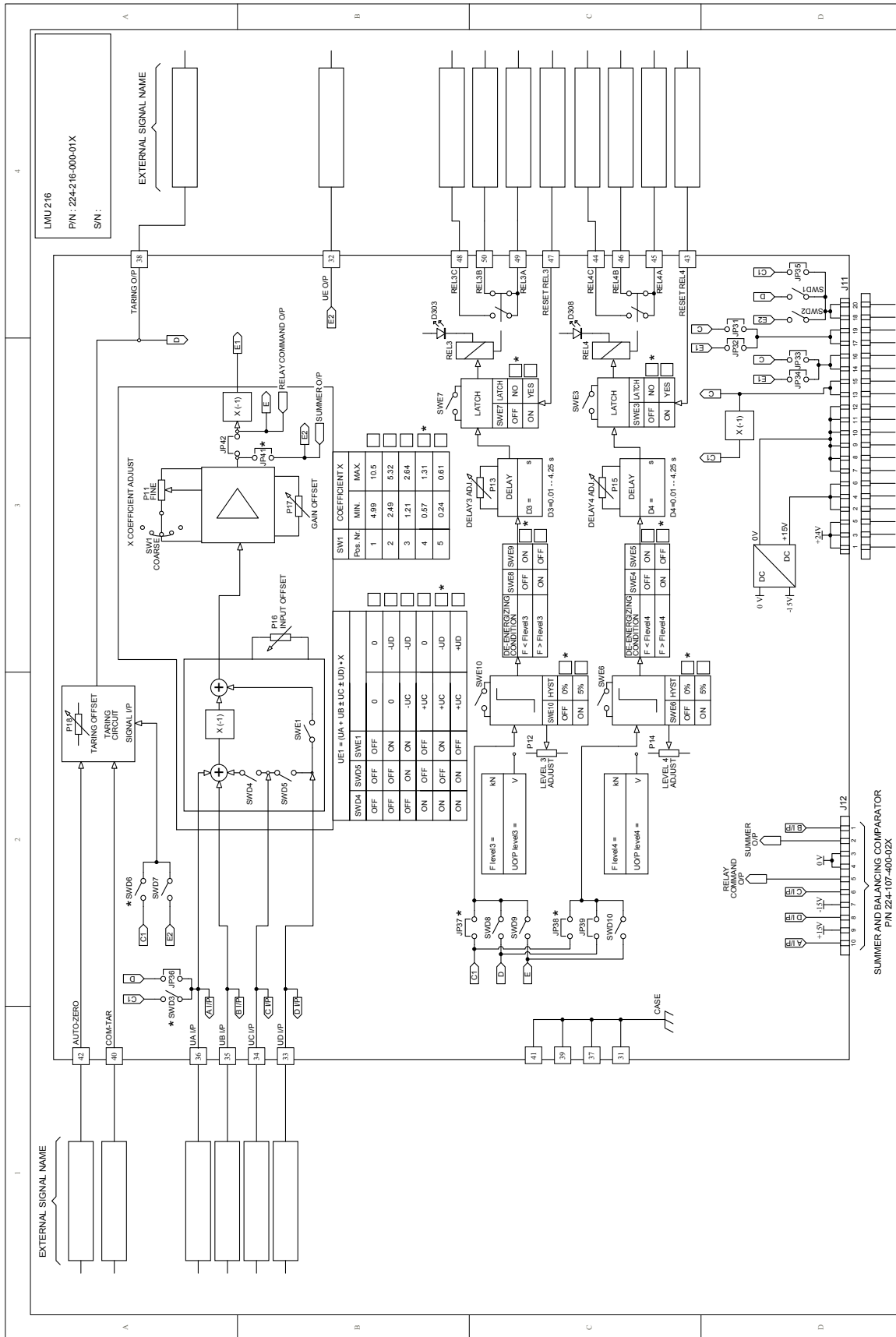
	mm
A	122
B	82
C	220
D	204
E	≈16
G	20.75
J	13.4
K	90
L	≈1.5
M	28
N	47

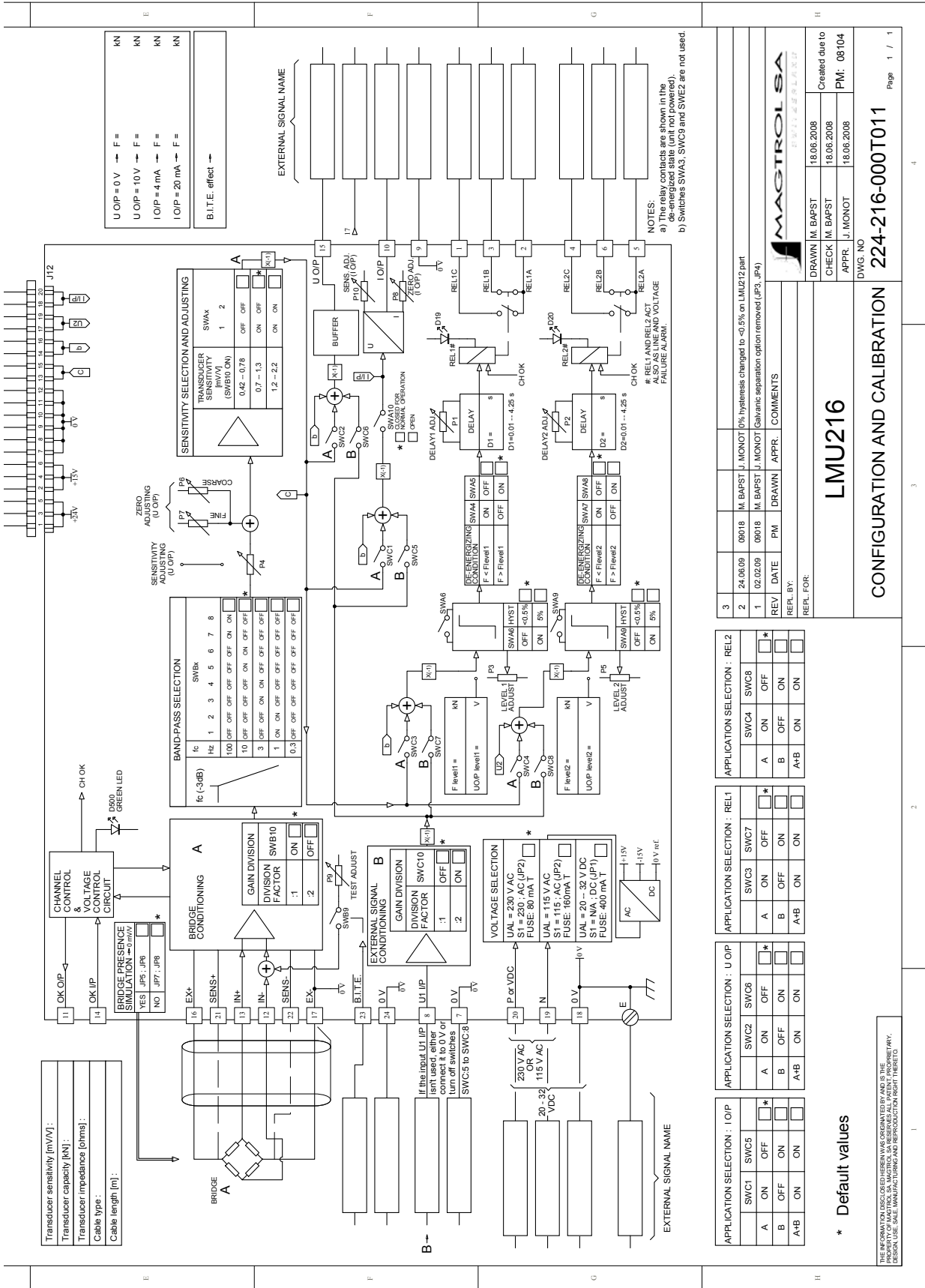
**LMU 216 AND LMU 217**

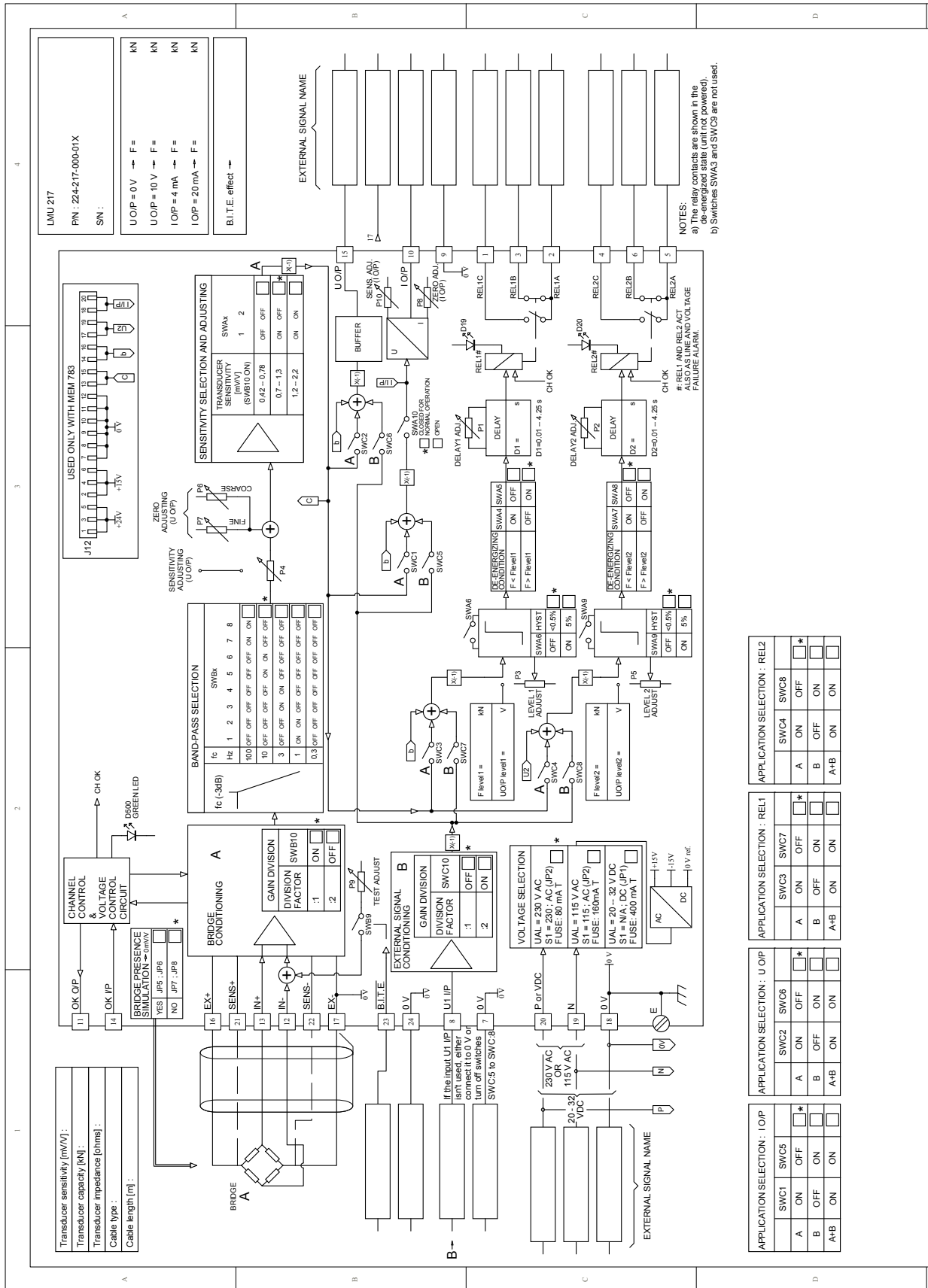


	mm
A	287
B	272
C	190
D	175
E	≈18
F	≈220
H	12
J	10
K	90
M	27
N	30
P	35

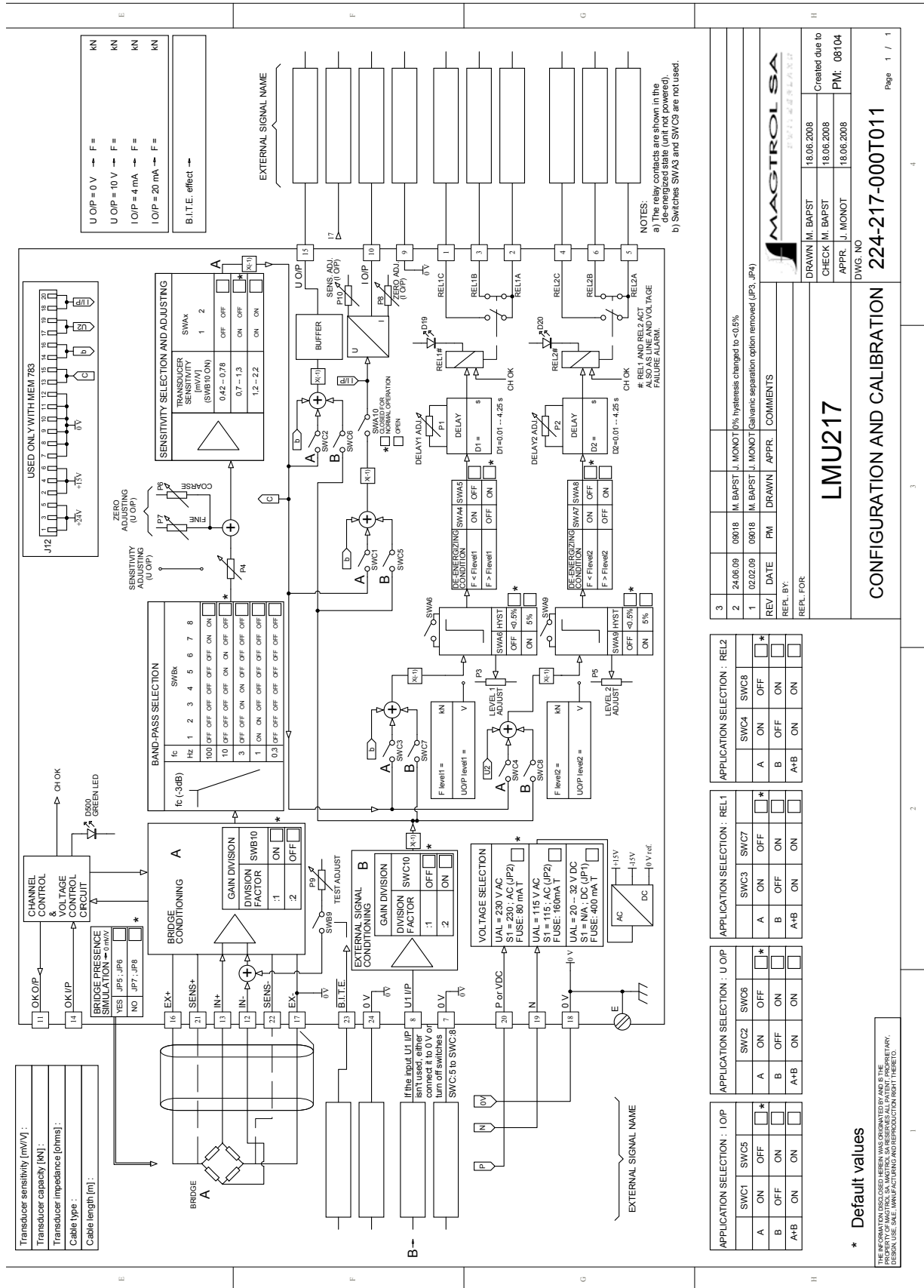












\* Default values

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REV.	DATE	PM	DRAWN	APPR.	COMMENTS
1	02.02.09	PM	J. MONOT	J. MONOT	Galvanic separation option removed (IP3, IP4)
2	24.06.09	PM	J. MONOT	J. MONOT	0% hysteresis changed to <0.5%
3					

REFL. BY: \_\_\_\_\_  
REFL. FOR: \_\_\_\_\_

DRAWN	M. BAPST	18.06.2008	Created due to
CHECK	M. BAPST	18.06.2008	PM: 08104
APPR.	J. MONOT	18.06.2008	

DWG. NO: **224-217-000T011**

**LMU217**

**CONFIGURATION AND CALIBRATION**

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**ORDERING INFORMATION**

LOAD MONITORING UNIT		P/N 224 -	□□□	-000-	□□□	□□□
<b>Model</b>						
• LMU 212 (1 input)	_____	212				
• LMU 216 (1 input)	_____	216				
• LMU 217 (2 inputs)	_____	217				
<b>Supply</b>						
• 115–230 VAC (50/60 Hz) or 20–32 VDC	_____	0				
• 48 VAC (50/60 Hz)	_____	4				
<b>Balancing comparator option (only for LMU 216)</b>						
LMU 216:						
• No	_____	11				
• Yes	_____	61				
LMU 212:						
• No (not available)	_____	11				
LMU 217:						
• No (not available)	_____	11				
<b>Configured and calibrated?</b>						
• No (standard)	_____	(blank)				
• Yes (according to application and Magtrol Configuration and Calibration Protocol)	_____	C				

*Due to the continual development of our products, we reserve the right to modify specifications without forewarning.*



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