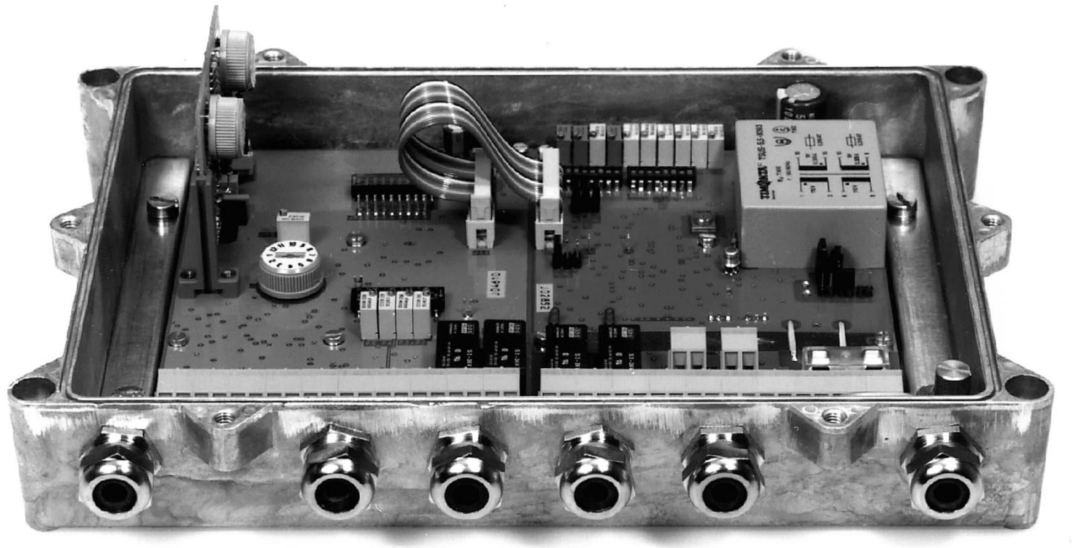
INSTRUCTION MANUAL

LOAD MONITORING UNIT
LMU 116 VERSIONS 02X AND 02XC

P/N 633.018 E

(MALMU116-02/E)



REVISION RECORD SHEET

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PREFACE

Purpose and Scope of This Manual

This manual has all the necessary information regarding the installation, configuration, calibration and connection of the LMU 116 load monitoring unit for strain gauge transducers.

Who Should Use This Manual ?

This manual is for users who want to install the load monitoring unit on lifting, weighing or other equipment, to program it, calibrate it, connect it to the strain gauge and to a display and alarm system and to use it to measure loads.

The user should have suitable technical training in mechanics and electronics (certificate of professional ability or equivalent) so as to allow him to install and use this load monitoring unit.

Manual Organization

This section gives an overview of the structure of the manual and the information contained within it. Some information has been deliberately repeated in different sections of the document to minimize cross-referencing and to facilitate understanding through reiteration.

The chapters of this manual are presented in a logical order. You should read those that are most relevant to you and then keep the manual at hand for future reference.

The structure of the manual is as follows :

Chapter 1 : **Safety** - Contains important information for your personal safety and the correct installation of the load monitoring unit.

THIS CHAPTER SHOULD BE READ BEFORE STARTING INSTALLATION, CONFIGURATION, CALIBRATION AND CONNECTION OF THE LOAD MONITORING UNIT.

Chapter 2 : **Introduction** - Contains the technical data sheet for the load monitoring unit. This data sheet describes the monitor and gives its technical characteristics.

Chapter 3 : **Configuration and Calibration** - Description of the programming and calibration procedures for optimum functioning of the load monitoring unit.

Chapter 4 : **Assembly and Connection** - Specifications for the assembly and connection of the load monitoring unit to a strain gauge and a display and alarm system.

Chapter 5 : **Applications** - Examples of applications for the load monitoring unit.

Appendix A : **Mechanical Layout** - Drawing of the LMU 116 load monitoring unit.

Appendix B : **Configuration and Calibration Form** - Contains a blank form which can be copied and filled in during the configuration and calibration of the load monitoring unit.

Appendix C : **CE Conformity declaration** - Document certifying that the LMU 116 load monitoring unit conform to the EN-50081-2 and EN-50082-2 standards.

Product Defect Report - Allows the user to indicate problems observed on a module/system, thus enabling our After-Sales Service department to repair the unit as quickly as possible.

Documentation Evaluation Form - Allows the user to provide us with valuable feedback on our documentation.

Related Publications

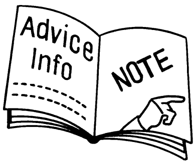
For additional information relating to the use of the LMU 116 load monitoring unit, the operator is referred to the following document :

- LB 210 & LB 230 Instruction manual P/N 632.005

1 SAFETY

1.1 Symbols Used in This Manual

The following symbols and type styles may be used in this manual to highlight certain parts of the text :

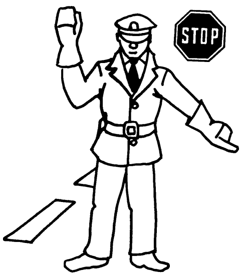


*The **NOTE** symbol.* ☞

This is intended to draw the operator’s attention to complementary information or advice relating to the subject being treated.
It introduces information enabling the correct and optimal functioning of the product to be obtained.

The CAUTION safety symbol. 

This is used to draw the operator’s attention to information, directives, procedures, etc. which, if ignored, may result in damage being caused to the material being used.
The associated text describes the necessary precautions to take and the consequences that may arise if the precautions are ignored.



THE WARNING SAFETY SYMBOL. 

THIS INTRODUCES DIRECTIVES, PROCEDURES, PRECAUTIONARY MEASURES, ETC. WHICH MUST BE EXECUTED OR FOLLOWED WITH UTMOST CARE AND ATTENTION, OTHERWISE THE PERSONAL SAFETY OF THE OPERATOR OR THIRD PARTIES MAY BE PUT AT RISK.
THE READER MUST ABSOLUTELY TAKE NOTE OF THE ACCOMPANYING TEXT, AND ACT UPON IT, BEFORE PROCEEDING FURTHER.

1.2 Important Remarks on Safety

WARNING

THIS EQUIPMENT MUST ALWAYS BE EARTHED.

ALWAYS DISCONNECT THE MAINS SUPPLY BEFORE UNDERTAKING ANY WORK ON THE SYSTEM.

THE OPERATOR OR THIRD PARTIES MAY BE SERIOUSLY OR FATALLY INJURED BY ELECTROCUTION IF THESE DIRECTIVES ARE INGNORED.

CAUTION

This instruction manual should be read carefully and the safety instructions observed before installing, calibration or using the material described herein.

CAUTION

The micro-switch configurations for the versions 011 and 02x are different. Please follow the instruction given in chapter 3 carefully. This is especially true when a LMU 116 Version 011 has to be replaced by a LMU 116 Version 02x.

1.2.1 Location of Safety Symbols in This Manual

The operator should also take note of the safety-related information found elsewhere in this manual :

This symbol is found on the following pages :
1-2 ; 3-1; 3-2; 3-10; 4-6

This symbol is found on the following page :
1-2

1.3 Additional Remarks on Safety

☞ *For the correct and safe use of this instrument, it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to safety precautions specified in this manual. Specific warning and caution statements, where they apply, will be found throughout the manual. These are highlighted by the corresponding warning and caution symbols (described above).*

The safety procedures should be communicated to all personnel who are liable to operate the equipment described in this manual.

No modifications, transformations or repairs should be made to the equipment without having first obtained the written permission of Vibro-Meter. Failure to observe this will invalidate the warranty.

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2 INTRODUCTION

This chapter contains the technical data sheet of the LMU 116 load monitoring unit. This gives a description of the LMU and its technical characteristics.

Data sheet	**P/N**
- LMU 116 load monitoring unit for strain gauge transducer	238-014

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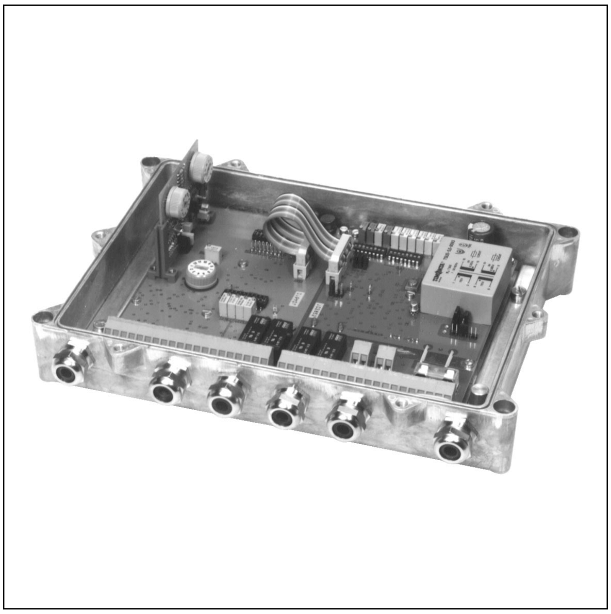
LMU 116

vibro-meter certified by BVQI ISO 9001

Load Monitoring Unit for Strain Gauge Transducer



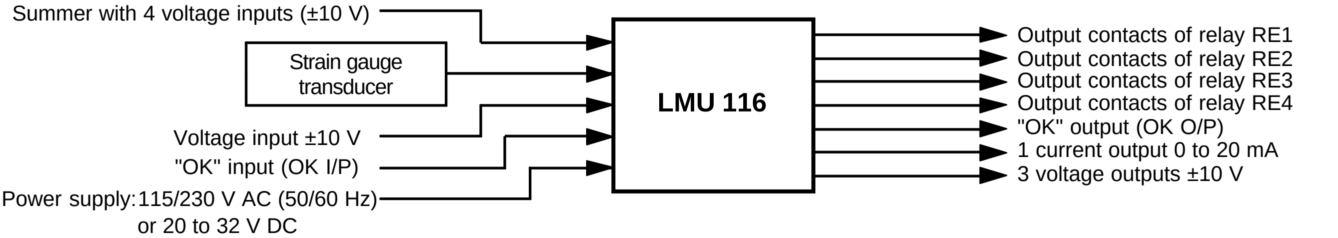
FEATURES

- **For use with full-bridge strain gauge transducers (sensitivity 0.5 to 2 mV/V)**
- **Voltage input for different charge summation**
- **Summer with 4 inputs**
- **Taring circuitry**
- **4 level detectors with relay output contacts, 2 of them with programmable memory**
- **One 0 to 20 mA DC current output**
- **Three ±10 V voltage outputs**
- **"OK" to monitor correct operation (detect signal line failure or short circuits)**
- **Compatible to CE standards**
- **IP 66 aluminium housing**

DESCRIPTION

The LMU load monitoring unit is specially designed for strain gauge transducer applications. It is flexible and fully configurable thanks to DIP-switches and jumpers, which allow the unit to be easily installed (no solder connections required).
The LMU contains 1 full-bridge strain gauge transducer input, 1 voltage input, 4 level detectors (output contacts, 2 of them with programmable memory), 1 current output, 3 voltage outputs and 2 "OK" self-test signals for monitoring the correct operation while running several LMU units simultaneously. The level detectors and the outputs can be dedicated to the specific applications. A built-in self-test 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 (resp. current) changes to >10 V DC (>20 mA).
The LMU is fully compatible with European Community reglementation (CE).
Its IP 66 aluminium housing allows the system to be used in harsh environments.
Using SMD (surface mounted device) technology, the LMU allows the price/performance ratio for strain gauge transducer monitoring.

System configuration :



INPUT CHARACTERISTICS

Power supply
- Voltage : 115 VAC/230 VAC (50 ÷ 60 Hz) or 20 to 32 V DC, jumper selectable
- Maximum current : 70 mA for 230 V AC, fuse rating = 80 mAT
  150 mA for 115 V AC, fuse rating = 160 mAT
  250 mA for 20 V DC, fuse rating = 400 mAT

Bridge signal
- Supply voltage : 10 V DC
- Max. possible current : 150 mA DC
- Sensitivity : 0.5 to 2 mV/V
- Max. dynamic component of bridge signal : ±30 mV DC
- Max. common mode voltage on input : ±10 V

Voltage input for summation of another load
- Input impedance : 200 kΩ
- Max. input signal (dynamic) : ±10 V

Input for self-test feature (OK I/P)
- Type : active if short circuited

OUTPUT CHARACTERISTICS

Relay outputs
- Number : 2 (RE 1; RE 2)
- Normal state : Normally energized
- Max. current per contact : 5 A continuous / break 20 A make
- Max. voltage per contact : AC : 250 V_{rms}
  DC : 350 V DC
- Max. break power : 100 W or 1000 VA
- Insulation voltage : Contact-contact : 750 V_{rms}
  contact-coil : 1,5 kV_{rms}
- Lifetime : > 2 x 10^8 switchings
- Contact resistance : < 20 mΩ

Current output
- 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_{max} = 20 mA
- Output impedance : > 50 kΩ

Voltage output
- Max. value : ±10 V ≡ FSD
- Max. load : ≥10 kΩ (ε ≤1%) [≥2 kΩ (ε ≤5%)] [1)]
- Output impedance : 100 Ω (in series)

Output for self-test feature (OK O/P)
- Type : open collector (short circuit-proof)

TRANSFER CHARACTERISTICS

Voltage transfer ranges ($\Delta U_{I/P}$ / $\Delta U_{O/P}$)

Range	1	2	3
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 : Using DIP-switches
- Zero adjustment for measuring chain :
  - 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 transfer function : ≤ 200 ppm/°C
- Temperature drift of 0 : ≤ 200 ppm of FSD/°C for range 0.5 mV/V ≡ ≤1 µV/°C

Current transfer range
- Sensitivity range with multi-turn potentiometer : ± 20% of FSD on $U_{O/P}$
- Nominal current range : 0 to 20 mA DC
- Max. current range : 0 to 25 mA DC
- Zero adjustment range : ± 5mA DC for $I_{O/P}$ ≥ 5 mA DC

Selectable low-pass filter
- Filter type : Butterworth
- Filter order : 2nd
- -3dB cut-off frequency : Selectable using DIP-switches to 0.3 Hz; 1 Hz; 3 Hz; 10 Hz
- Transfer function between summer input / voltage output : 1

Level detectors
- Number of detectors : 2 (REL1; REL2)
- Level adjustment range : -10 to +10 V DC using multi-turn potentiometer (measured on voltage output)
- Hysteresis : 0 or ~ 5% (selectable using DIP-switches)
- Detection indication : < or > (selectable using DIP-switches)

Switching delay
- Number of circuits : 2
- Delay adjustment range : 0 to 5 sec. using multi-turn potentiometer

Application selection

Selection	Det. REL1	Det. REL2	$U_{O/P}$, $I_{O/P}$
1	A	A	A
2	A + B	A	A + B
3	A	A + B	A
4	A + B	A + B	A + B
5	B	B	B
6	A + B	B	A + B

A : Bridge signal
B : Voltage input

ENVIRONMENTAL SPECIFICATIONS

Operating temperature : -40 to +80 °C

Storage temperature : -45 to +85 °C

Humidity : IP 66

Vibration and shock : According to IEC 68.2

EMC : According to EN-50081-2 (Generic Emission Standard) and EN-50082-2 (Generic Immunity Standard)

MECHANICAL SPECIFICATIONS

Housing
- Material : Aluminium
- Dimensions : 287 x 218 x 90 mm
- Weight : ~3 kg

Stuffing glands
- Type and number : 6 x PG 11
- Material : Nickel-plated brass

Terminal strip
- Type : MK8 (screw at 45° and connection at 45°)
- Max. ∅ of connecting wire : AWG 26 ... 16 Cross-section : 0,5 ... 1,5 mm^2

Note :

1) **In order to guarantee a precise calibration, the customer is asked to indicate the impedances of the connected unit together with the order.** If this value is unknown, an impedance of 1 MΩ will be used for calibration. The resulting deviation will be in the order of ≤ 5% with an impedance of ≥ 2 kΩ or ≤ 1% with ≥ 10kΩ.

Specifications of the monitoring module :

SUMMER

Number of inputs : 4 (UA, UB, UC and UD)

Input voltage : ±10 V

Output voltage : UE1 = (UA + UB ± UC ± UD) X factor X adjustable between 0.25 and 10

LEVEL DETECTOR

Number of detectors : 2 (REL3; REL4)

Level adjustment range : -10 à +10 V DC using multi-turn potentiometer (measured on voltage output)

Hysteresis : 0 or ~5% (selectable using DIP-switches)

Detection indication : < or > (selectable using DIP-switches)

SWITCHING DELAY

Number of circuits : 2

Delay adjustment range : 0 to 5 s, using multi-turn potentiometer

RELAY OUTPUT MEMORIZATION (LATCH)

Control : using DIP-switches

Reset signal : RESET REL3, RESET REL4

TARING CIRCUIT

Principle : Volatile digital 12-bit memory * (reset at switching on of the unit), the stored digital value is subtracted from the D/A converted input signal
* Current interruptions lasting for less than ≤ 30 ms don't cause the loss of the stored tare value

Resolution : 1/4096 of the selected range

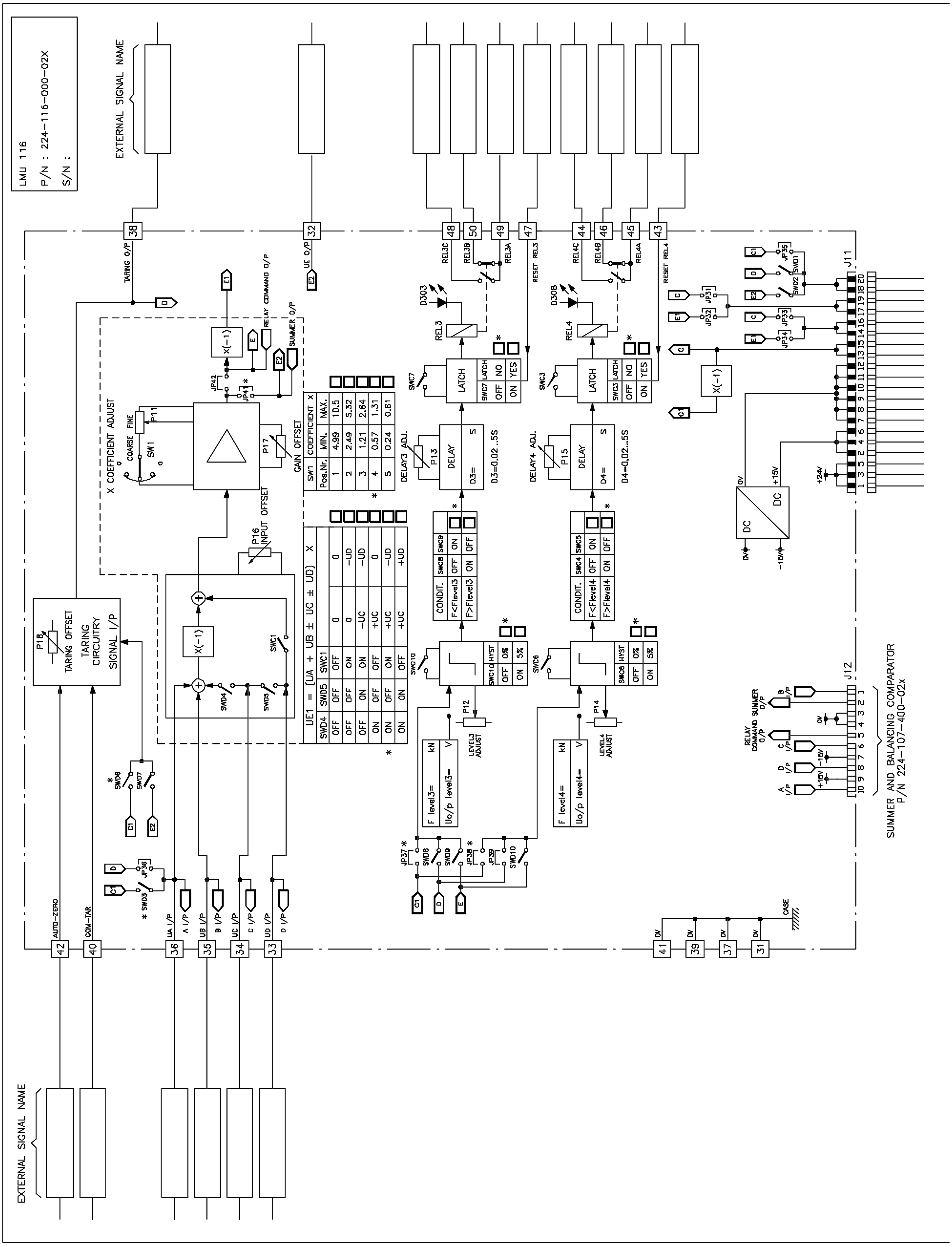
Storing time : < 2 s

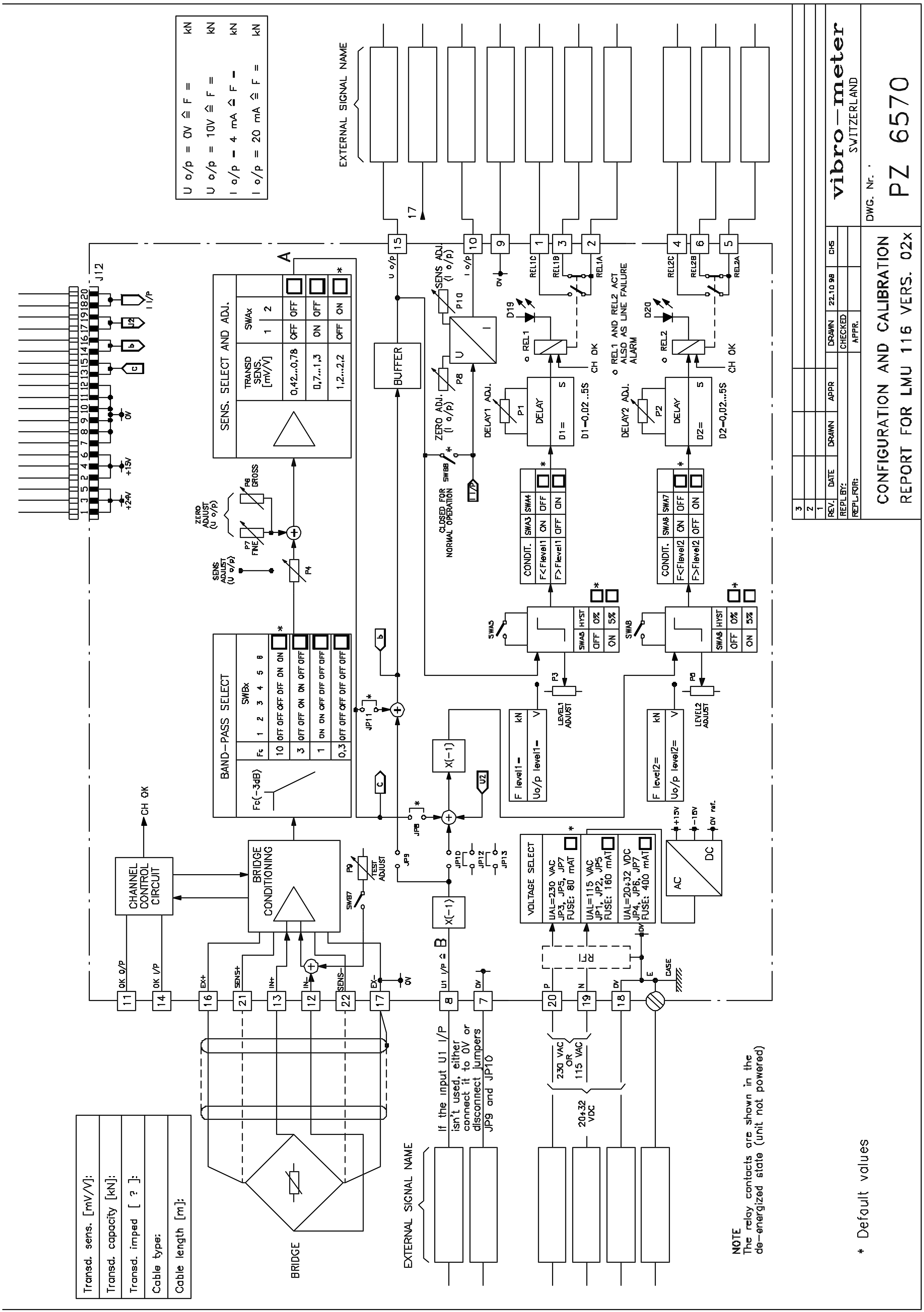
Output impedance : < 200 Ω

Acceptable load resistance : ≥ 20 kΩ

LMU 116 configuration :

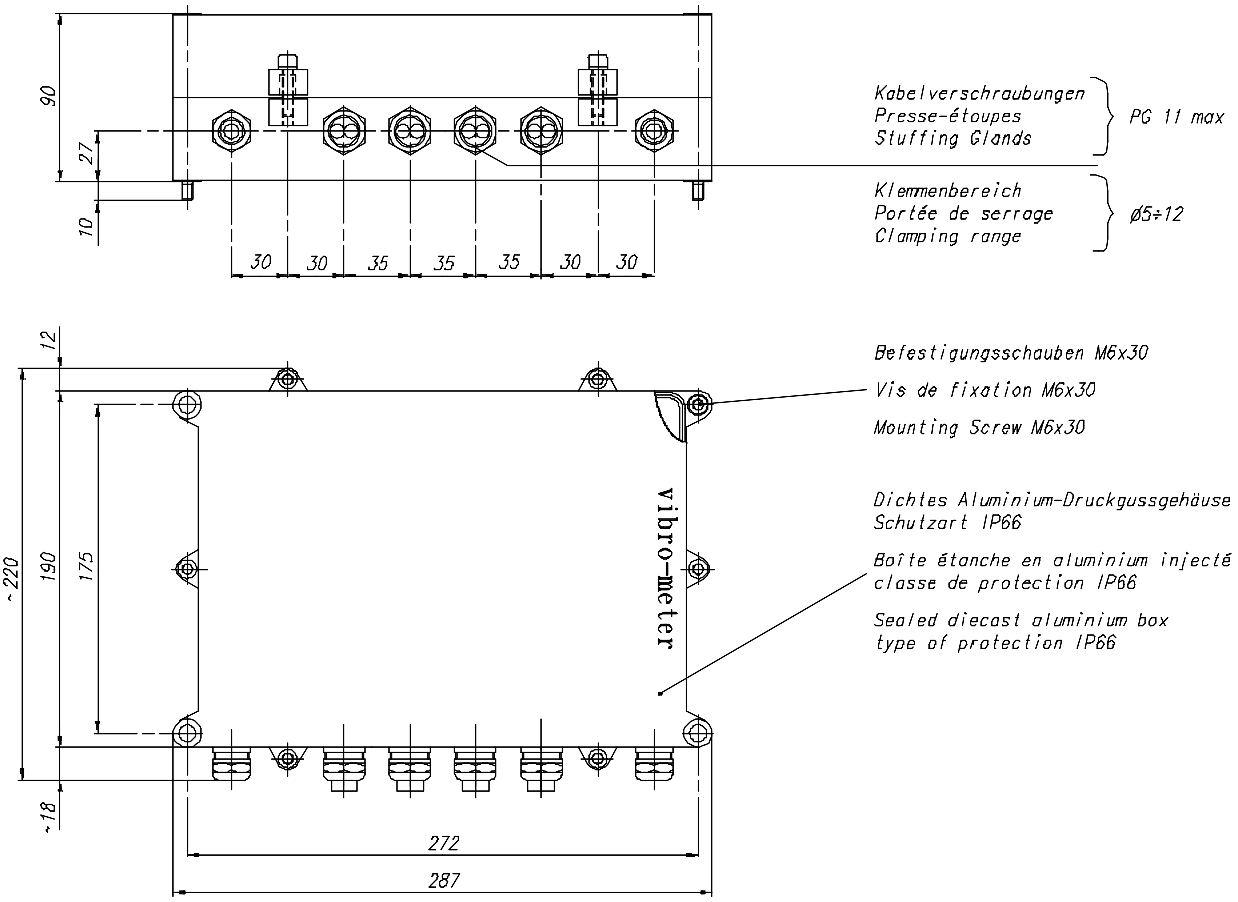
The LMU 116 load monitoring unit offers unlimited configuration possibilities. It is impossible to list them all in this data sheet. Please contact Vibro-Meter or one of its subsidiaries or representatives to discuss your specific applications.


LMU 116
P/N : 224-116-000-02X
S/N :
EXTERNAL SIGNAL NAME
X COEFFICIENT ADJUST
GAIN OFFSET
INPUT OFFSET
TARING OFFSET
TARING CIRCUITRY
SIGNAL I/P
SW1 | COEFFICIENT X
Pos.Nr. | MIN. | MAX.
1 | 4.99 | 10.5
2 | 2.49 | 5.32
3 | 1.21 | 2.64
4 | 0.57 | 1.31
5 | 0.24 | 0.61
UE1 = (UA + UB ± UC ± UD) X
SWD4 | SWD5 | SWC1
OFF | OFF | OFF | 0 | 0
OFF | OFF | ON | 0 | 0
OFF | ON | OFF | 0 | -UD
OFF | ON | ON | -UC | -UD
ON | OFF | OFF | +UC | 0
ON | OFF | ON | +UC | -UD
ON | ON | OFF | +UC | +UD
DELAY3 ADJ.
DELAY4 ADJ.
D3=0,02..5S
D4=0,02..5S
LATCH
DELAY
LEVEL3 ADJUST
LEVEL4 ADJUST
F level3= kN
Uo/p level3= V
F level4= kN
Uo/p level4= V
CONDIT.
F<Flevel3
F>Flevel3
F<Flevel4
F>Flevel4
RESET REL3
RESET REL4
TARING O/P
UE O/P
RELAY COMMAND O/P
SUMMER O/P
AUTO-ZERO
COM-TAR
CASE
SUMMER AND BALANCING COMPARATOR
P/N 224-107-400-02x



U o/p = 0V ≙ F = kN
U o/p = 10V ≙ F = kN
I o/p = 4 mA ≙ F = kN
I o/p = 20 mA ≙ F = kN
EXTERNAL SIGNAL NAME
SENS. SELECT AND ADJ.
BAND-PASS SELECT
BUFFER
BRIDGE CONDITIONING
CHANNEL CONTROL CIRCUIT
CH OK
VOLTAGE SELECT
UAL=230 VAC JP3, JP5, JP7 FUSE: 80 mAT
UAL=115 VAC JP1, JP2, JP5 FUSE: 160 mAT
UAL=20÷32 VDC JP4, JP6, JP7 FUSE: 400 mAT
AC
DC
DELAY
CONDIT.
F<Flevel1
F>Flevel1
F<Flevel2
F>Flevel2
LEVEL1 ADJUST
LEVEL2 ADJUST
DELAY1 ADJ.
DELAY2 ADJ.
D1=0,02...5S
D2=0,02...5S
REL1 AND REL2 ACT ALSO AS LINE FAILURE ALARM
ZERO ADJ. (I o/p)
SENS ADJ. (I o/p)
CLOSED FOR NORMAL OPERATION
TEST ADJUST
BRIDGE
Transd. sens. [mV/V]:
Transd. capacity [kN]:
Transd. imped [?]:
Cable type:
Cable length [m]:
If the input U1 I/P isn't used, either connect it to 0V or disconnect Jumpers JP9 and JP10
230 VAC OR 115 VAC
20÷32 VDC
NOTE
The relay contacts are shown in the de-energized state (unit not powered)
* Default values
vibro-meter
SWITZERLAND
DWG. Nr.
PZ 6570
CONFIGURATION AND CALIBRATION REPORT FOR LMU 116 VERS. 02x

Dimensions :



Ordering information :

- Designation : **LMU 116 load monitoring unit**
- Ordering number : **224-116-000-021**, standard module with no set-up and no calibration.

224-116-000-061, standard module with no set-up and no calibration, including the summer and balancing comparator sub-module.

224-116-000-021C, set-up and calibrated according to the configuration and calibration report PY 6494 (to be filled in according to the application).

224-116-000-061C, set-up and calibrated according to the configuration and calibration report PY 6494 (to be filled in according to the application), including the summer and balancing comparator sub-module.

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

vibro-meter

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Subsidiaries in :

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- France
- Great Britain
- Scandinavia
- USA
- Canada
- Singapore

3 CONFIGURATION AND CALIBRATION

☞ *The asterisk (*) used in this chapter corresponds to the standard configuration of the LMU 116 Version 02X (basic, uncalibrated module). The calibration is carried out starting from this standard configuration. However, the user is free to calibrate the load monitoring unit according to his specific application.*

CAUTION

⚠ **The micro-switch configurations for the versions 011 and 02x are different. Please follow the instruction given in chapter 3 carefully. This is especially true when a LMU 116 Version 011 has to be replaced by a LMU 116 Version 02x.**

3.1 Configuration of the Load Monitoring Unit

3.1.1 Adaptation of the Monitor to the Supply Voltage

Before connecting the LMU 116 load monitoring unit, select its operating voltage, choose the supply fuse rating and position the jumpers JP1 to JP7 as described in this paragraph.

The monitor can be seriously damaged, if not destroyed, if this advice is not followed.

The information given in Figures 3-1 and 3-2 allows the user to select the operating voltage of the load monitoring unit, to choose the supply fuse and to assign the supply terminals.

☞ *Record the designation of the external signals connected to the supply terminals on the configuration and calibration form (see Appendix B).*

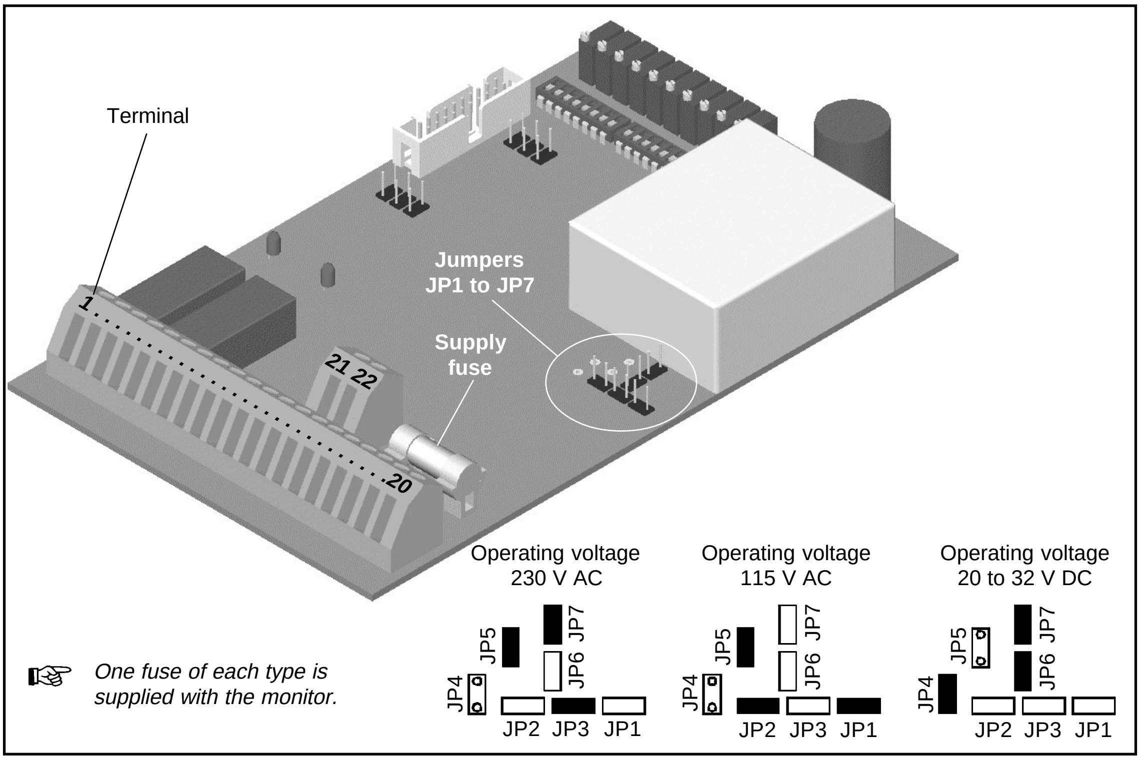


Fig. 3-1 : Monitor board with location of the selection elements.

	Operating voltage	Supply terminals			Fuse	Jumpers
		0 V (18)	P (20)	N (19)		
*	230 V AC	- - -	Phase	Neutral	80 mAT	JP3, JP5, JP7
	115 V AC	- - -	Phase	Neutral	160 mAT	JP1, JP2, JP5
	20 to 32 V DC	0 V	20 to 32 V	- - -	400 mAT	JP4, JP6, JP7

Fig. 3-2 : Table for adaptation of the monitor to the operating voltage.

3.1.2 Selection of the Type of Wiring to the Strain Gauge

The choice of the type of wiring depends on the length of the cable between the LMU 116 and the strain gauge transducer, on the impedance of the transducer and the linear resistance of the cable.

If the linear resistance of the cable is $\leq$0,1 Ω/m, the impedance of the transformer is $\geq$200 Ω and the length of the cable is $\leq$100 m, the wiring of type 1 can be selected (see Figure 3-3).

It is possible to modify the cable or its length after calibration, but wiring of type 2 must be selected (see Figure 3-3). In this way the LMU 116 does not require any new calibration.

If the length of cable is >200m, type 2 is recommended (see Figure 3-3).

☞ *Record the length of cable (transducer - LMU 116) and its type on the configuration and calibration form (see Appendix B).*

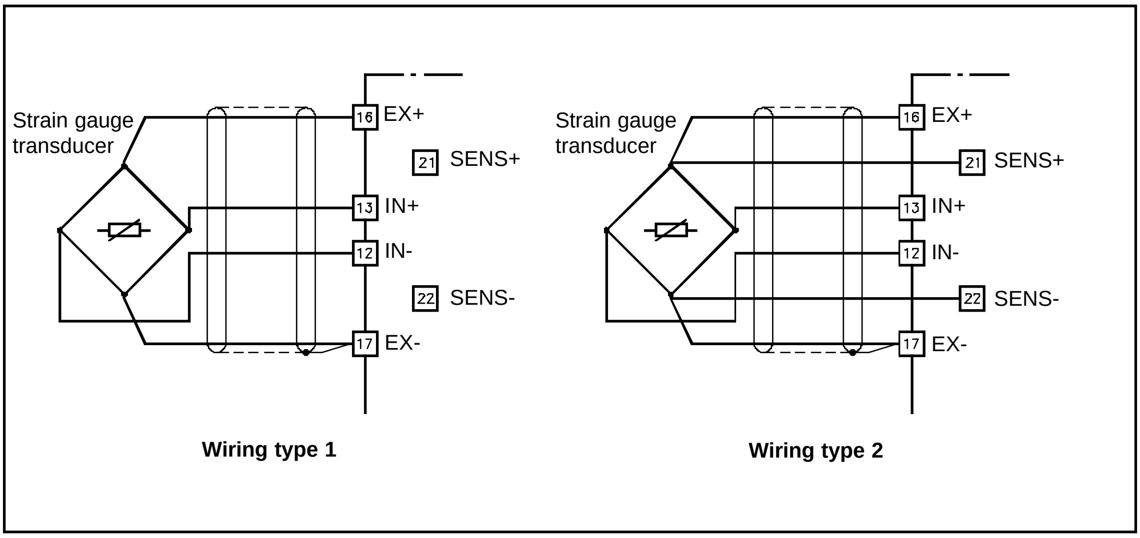


Fig. 3-3 : Wiring types.

3.1.3 Designation of the Voltage and Current Inputs/Outputs

Record the designation of the external signals connected to $U_{I/P}$, $U_{O/P}$, $I_{O/P}$, $UA_{I/P}$, $UB_{I/P}$, $UC_{I/P}$ and $UD_{I/P}$.

3.1.4 Configuration of the Detection Chains

a) Detection chain for relay 1 (REL1)

The table in Figure 3-4 allows the user to select the direction of detection and the hysteresis value. Figure 3-5 shows the user where the SWA micro-switches are on the load monitoring unit board.

☞ *Record the value of F_{level1} and the configuration of the micro-switches SWA3, SWA4 and SWA5 on the configuration and calibration form (see Appendix B).*

	Condition	Configuration			Effect
		SWA3	SWA4	SWA5	
*	REL1 de-energized for $F < F_{level1}$ (Monitoring at underload)	ON	OFF	- - -	Detection for $U_{O/P} < U_{level1}$
	REL1 de-energized for $F > F_{level1}$ (Monitoring at overload)	OFF	ON	- - -	Detection for $U_{O/P} > U_{level1}$
*	Hysteresis = 0	- - -	- - -	OFF	Hysteresis = 0 mV measured on $U_{O/P}$
	Hysteresis ≈ 5% (FSD)	- - -	- - -	ON	Hysteresis ≈ 500 mV measured on $U_{O/P}$

Fig. 3-4 : Configuration of the micro-switches SWA3, SWA4 and SWA5.

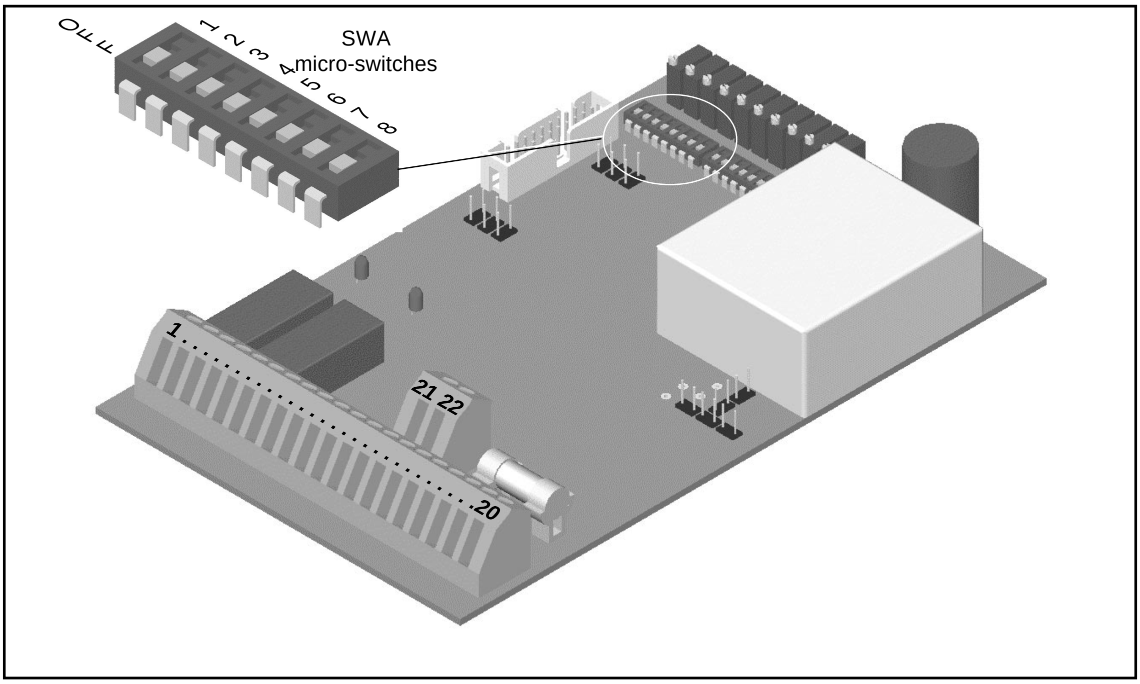


Fig. 3-5 : Location fo the SWA micro-switches on the load monitoring board.

The table in Figure 3-6 allows the user to choose the state of the contacts depending on the state of relay REL1.

☞ *Record the designation of the external signals connected to REL1A, REL1B and REL1C on the configuration and calibration form (see Appendix B).*

State of relay REL1	Contact REL1A - REL1C	Contact REL1A - REL1B
REL1 energized	Closed	Open
REL1 de-energized	Open	Closed

Fig. 3-6 : State of contacts as a function of the state of relay REL1.

☞ *The REL1 relay also operates as line check relay and is de-energized in case of short-circuit or line failure.*

b) Detection chain for relay 2 (REL2)

The table in Figure 3-7 allows the user to select the direction of detection and the hysteresis value. Figure 3-5 shows the user where the SWA micro-switches are on the load monitoring unit board.

☞ *Record the value of F_{level2} and the configuration of the micro-switches SWA6, SWA7 and SWA8 on the configuration and calibration form (see Appendix B).*

	Condition	Configuration			Effect
		SWA6	SWA7	SWA8	
*	REL2 de-energized for $F < F_{level2}$ (Monitoring at underload)	ON	OFF	- - -	Detection for $U_{O/P} < U_{level2}$
	REL2 de-energized for $F > F_{level2}$ (Monitoring at overload)	OFF	ON	- - -	Detection for $U_{O/P} > U_{level2}$
*	Hysteresis = 0	- - -	- - -	OFF	Hysteresis = 0 mV measured on $U_{O/P}$
	Hysteresis ≈ 5% (FSD)	- - -	- - -	ON	Hysteresis ≈ 500 mV measured on $U_{O/P}$

Fig. 3-7 : Configuration of micro-switches SWA6, SWA7 and SWA8.

The table in Figure 3-8 allows the user to select the state of the contacts depending on the state of relay REL2.

☞ *Record the designation of the external signals connected to REL2A, REL2B and REL2C on the configuration and calibration form (see Appendix B).*

State of relay REL2	Contact REL2A - REL2C	Contact REL2A - REL2B
REL2 energized	Closed	Open
REL2 de-energized	Open	Closed

Fig. 3-8 : State of contacts as a function of the state of relay REL2.

☞ *The REL2 relay also operates as line check relay and is de-energized in case of short-circuit of line failure.*

c) Detection chain for relay 3 (REL3)

The table in Figure 3-9 allows the user to select the direction of the detection as well as the hysteresis value and whether latching is used. Figure 3-10 informs the user of the positions of the SWC micro-switches on the load monitoring unit circuit board.

☞ *Record the value of F_{level3} and the configuration of the micro-switches SWC7, SWC8, SWC9 and SWC10 (see Appendix B).*

	Condition	Configuration				Effect
		SWC7	SWC8	SWC9	SWC10	
*	REL3 de-energized for $F < F_{level3}$ (Monitoring at underload)	- - -	OFF	ON	- - -	Detection for $U_{O/P} < U_{level3}$
	REL3 de-energized for $F > F_{level3}$ (Monitoring at overload)	- - -	ON	OFF	- - -	Detection for $U_{O/P} > U_{level3}$
*	Hysteresis = 0	- - -	- - -	- - -	OFF	Hysteresis = 0 mV measured on $U_{O/P}$
	Hysteresis ≈ 5% (FSD)	- - -	- - -	- - -	ON	Hysteresis ≈ 500 mV measured on $U_{O/P}$
*	Unlatched	OFF	- - -	- - -	- - -	The relay changes state after the alarm has disappeared
	Latched (LATCH function)	ON	- - -	- - -	- - -	Relay stays in the altered state after the alarm has disappeared

Fig. 3-9 : Configuration of the micro-switches SWC7, SWC8, SWC9 and SWC10.

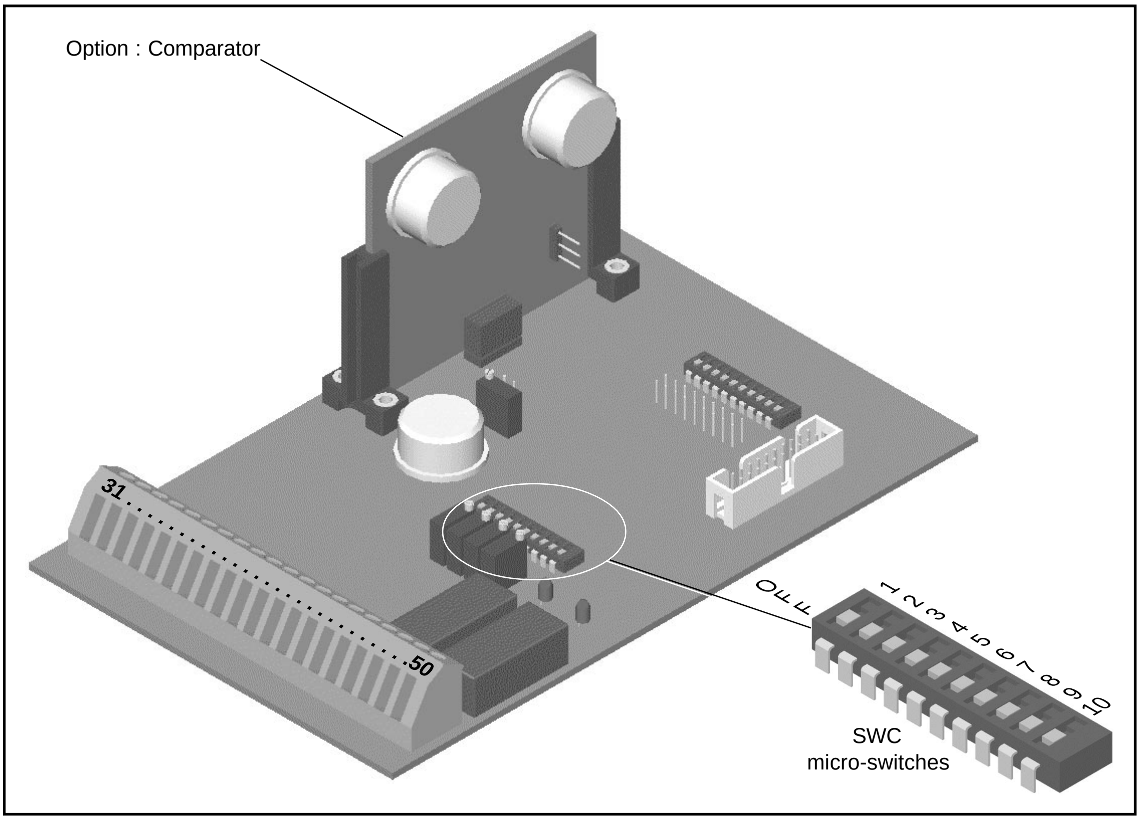


Fig. 3-10 : Location of the SWC micro-switches on the load monitoring board.

The table in Figure 3-11 allows the user to choose the state of the contacts depending on the state of relay REL3.

☞ *Record the designation of the external signals connected to REL3A, REL3B and REL3C on the configuration and calibration form (see Appendix B).*

State of relay REL3	Contact REL3A - REL3C	Contact REL3A - REL3B
REL3 energized	Closed	Open
REL3 de-energized	Open	Closed

Fig. 3-11 : State of contacts as a function of the state of relay REL3.

d) Detection chain for relay 4 (REL4)

The table in Figure 3-12 allows the user to select the direction of the detection as well as the hysteresis value and whether latching is used. Figure 3-10 informs the user of the positions of the SWC micro-switches on the load monitoring unit circuit board.

☞ *Record the value of F_{level4} and the configuration of the micro-switches SWC3, SWC4, SWC5 and SWC6 (see Appendix B).*

	Condition	Configuration				Effect
		SWC3	SWC4	SWC5	SWC6	
	REL4 de-energized for $F < F_{level4}$ (Monitoring at underload)	- - -	OFF	ON	- - -	Detection for $U_{O/P} < U_{level4}$
*	REL4 de-energized for $F > F_{level4}$ (Monitoring at overload)	- - -	ON	OFF	- - -	Detection for $U_{O/P} > U_{level4}$
	Hysteresis = 0	- - -	- - -	- - -	OFF	Hysteresis = 0 mV measured on $U_{O/P}$
*	Hysteresis ≈ 5% (EM)	- - -	- - -	- - -	ON	Hysteresis ≈ 500 mV measured on $U_{O/P}$
	Unlatched	OFF	- - -	- - -	- - -	The relay changes state after the alarm has disappeared
*	Latched (LATCH function)	ON	- - -	- - -	- - -	Relay stays in the altered state after the alarm has disappeared

Fig. 3-12 : Configuration of the micro-switches SWC3, SWC4, SWC5 and SWC6.

The table in Figure 3-13 allows the user to choose the state of the contacts depending on the state of relay REL4.

☞ *Record the designation of the external signals connected to REL4A, REL4B and REL4C on the configuration and calibration form (see Appendix B).*

State of relay REL4	Contact REL4A - REL4C	Contact REL4A - REL4B
REL4 energized	Closed	Open
REL4 de-energized	Open	Closed

Fig. 3-13 : State of contacts as a function of the state of relay REL4.

e) Adjusting the switching delay

The switching delay corresponds to the time passing between the moment when the detection level is reached at the voltage output of the LMU ($U_{O/P}$) and the moment when the relay is de-energized (see Figure 3-14). On the other hand, the switching delay on tripping of the relay in relation to the voltage output of the LMU ($U_{O/P}$) is instantaneous.

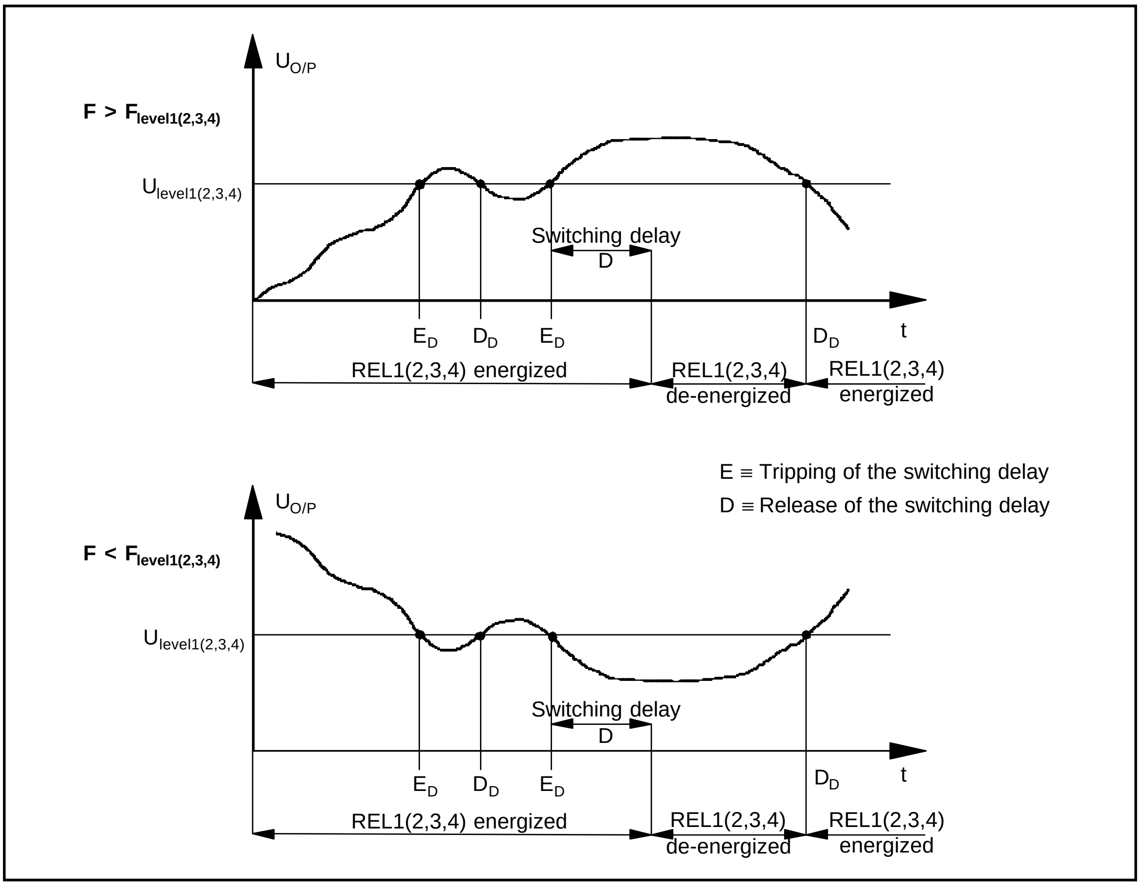


Fig. 3-14 : Examples of switching delays for the load monitoring unit.

To set the switching delay to be applied to the REL1 relay, adjust potentiometer P1. To set the switching delay to be applied to relay REL2, REL3 and REL4, adjust potentiometer P2, P13 and P15. Figure 3-15 shows the user where the potentiometers are located on the load monitoring unit board.

The method of adjustment is as follows :

D1 = Switching delay on REL1

To determine the switching delay value, calculate the number of turns to be applied to the potentiometers :

$$N1 = \frac{D1 - 0.02}{0.164}$$ with N1 = number of turns to be applied to potentiometer P1

D1 = switching delay required for relay REL1 in seconds
$D1_{min}$ = 0.02 sec.
$D1_{max}$ = 5 sec.

Apply the calculated number of turns (N) by counting them starting at 0 (the potentiometer at its limit stop in the anti-clockwise sense) and by turning the potentiometer clockwise.

☞ *To reach the limit stop, make more than 30 turns anti-clockwise.*

☞ *Record the switching delay values of D1, D2, D3 and D4 on the configuration and calibration form (see Appendix B).*

⚠ **Potentiometers not mentioned on Figure 3-15 should not be adjusted as this has been done at the factory. After the setting these potentiometers have been sealed with wax. Failure to respect this provision will result in the revocation of the warranty.**

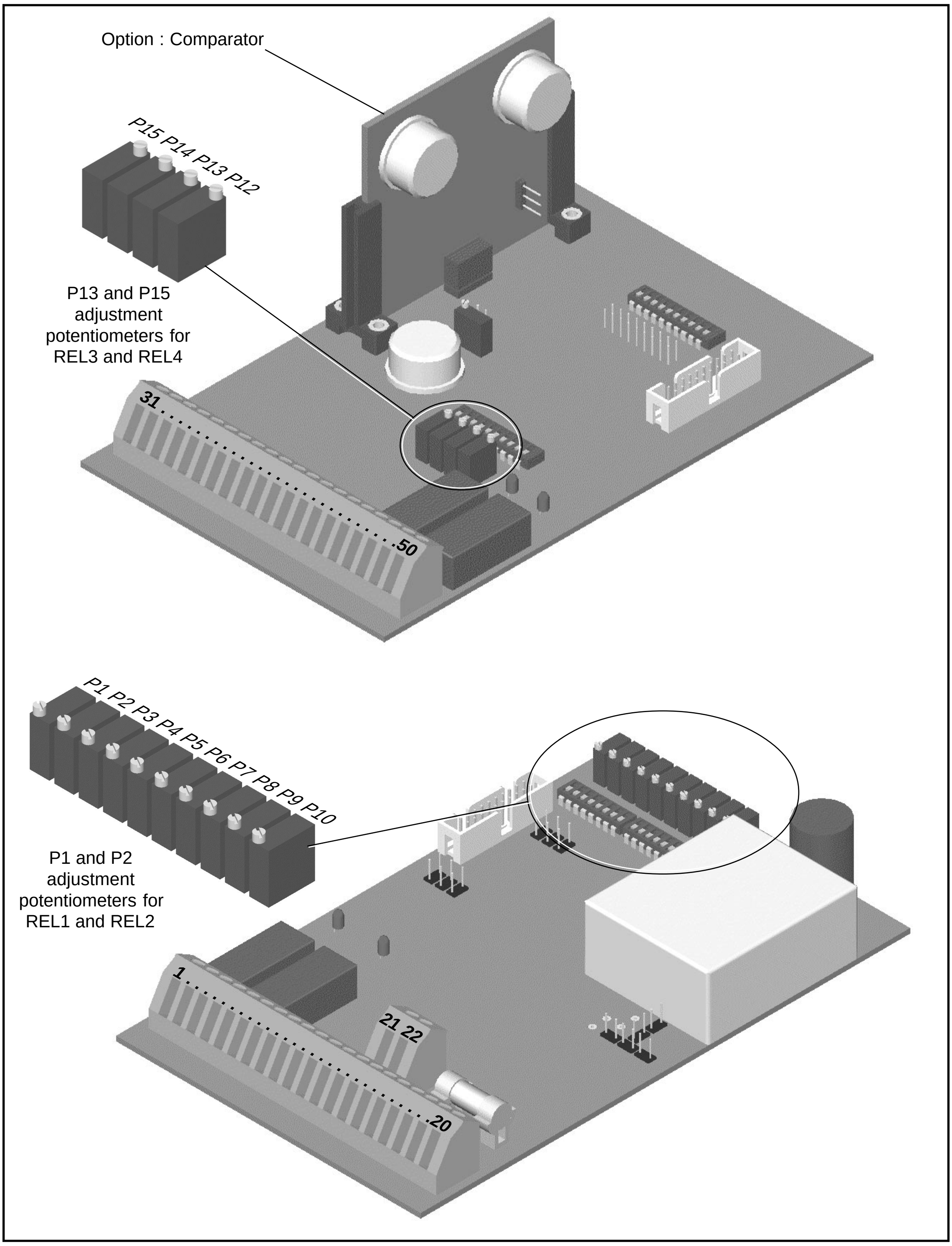


Fig. 3-15 : Location of potentiometers on the load monitoring board.

3.1.5 Selection of the Pass Band

The table in Figure 3-16 allows the user to select the frequency band of the output signal. Figure 3-17 informs the user of the position of the SWB micro-switches on the load monitoring unit board.

☞ *Record the cut-off frequency f_c and the configuration of the micro-switches SWB1, SWB2, SWB3, SWB4, SWB5 and SWB6 on the configuration and calibration form (see Appendix B).*

☞ *The SWB7 micro-switch is only used during the calibration phase of the LMU load monitoring unit (see Section 3.2).*
The SWB8 micro-switch must be found in the closed position.

	Frequency band fc	SWB1	SWB2	SWB3	SWB4	SWB5	SWB6	SWB7	SWB8
*	DC to 10 Hz	OFF	OFF	OFF	OFF	ON	ON	OFF	ON
	DC to 3 Hz	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
	DC to 1 Hz	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
	DC to 0,3 Hz	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

Fig. 3-16 : Configuration of micro-switches SWB1 to SWB8 for the selection of the frequency band f_c.

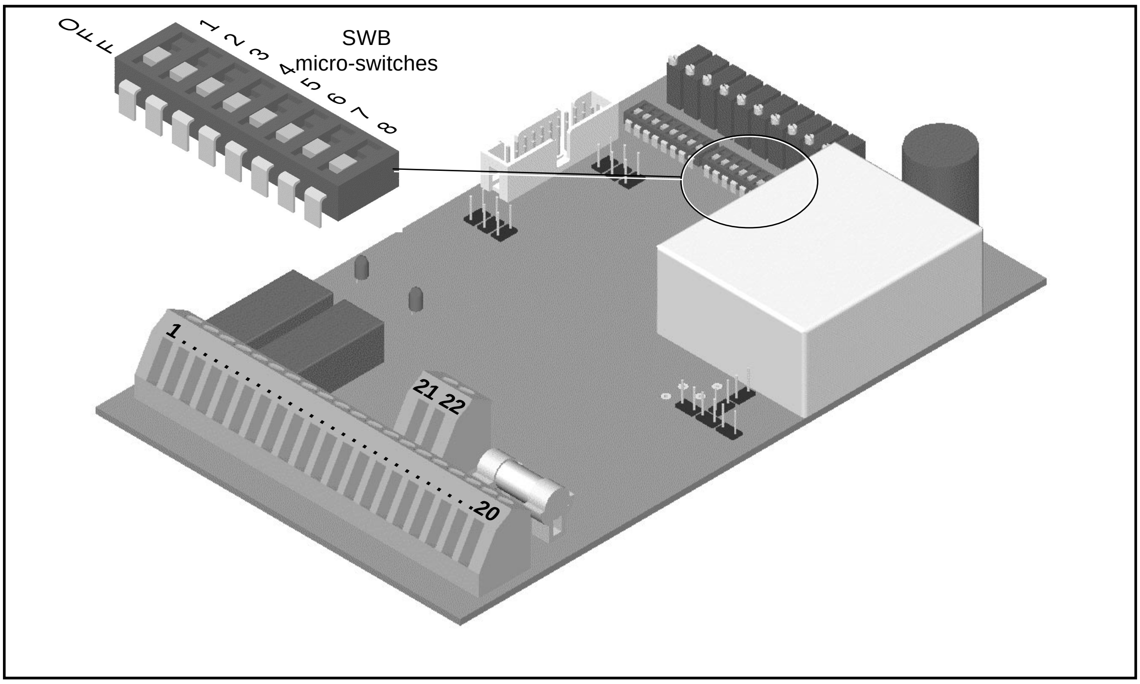


Fig. 3-17 : Location of the SWB micro-switches on the load monitoring board.

3.1.6 Selection of the Sensitivity Range

The table in Figure 3-18 allows the user to select the sensitivity range within which the strain gauge transducer lies. Figure 3-5 informs the user of the position of the SWA micro-switches on the load monitoring unit board.

☞ *Record the selected sensitivity range and the configuration of the micro-switches SWA1 and SWA2 on the configuration and calibration form (see Appendix B).*

	Strain gauge sensitivity [mV/V]	SWA1	SWA2
	0,42 to 0,78	OFF	OFF
	0,7 to 1,3	ON	OFF
*	1,2 to 2,2	OFF	ON

Fig. 3-18 : Configuration of micro-switches SWA1 and SWA2
for the selection of the strain gauge sensitivity.

3.1.7 Combination of Signals on the Summing Circuit

The table in Figure 3-19 allows the user to define the signals to be added or subtracted. Figures 3-10 and 3-20 inform the user of the positions of the SWC and SWD micro-switches on the load monitoring unit circuit board.

☞ *Record the configuration of the SWD4-5 and SWC1 micro-switches on the configuration and calibration form (see Appendix B).*

	UE1 = (UA + UB ± UC ± UD) X				
	SWD4	SWD5	SWC1		
	OFF	OFF	OFF	0	0
	OFF	OFF	ON	0	-UD
	OFF	ON	ON	-UC	-UD
	ON	OFF	OFF	+UC	0
*	ON	OFF	ON	+UC	-UD
	ON	ON	OFF	+UC	+UD

Fig. 3-19 : Configuration of SWD4-5 and SWC1
micro-switches for the signal combination on the summing circuit.

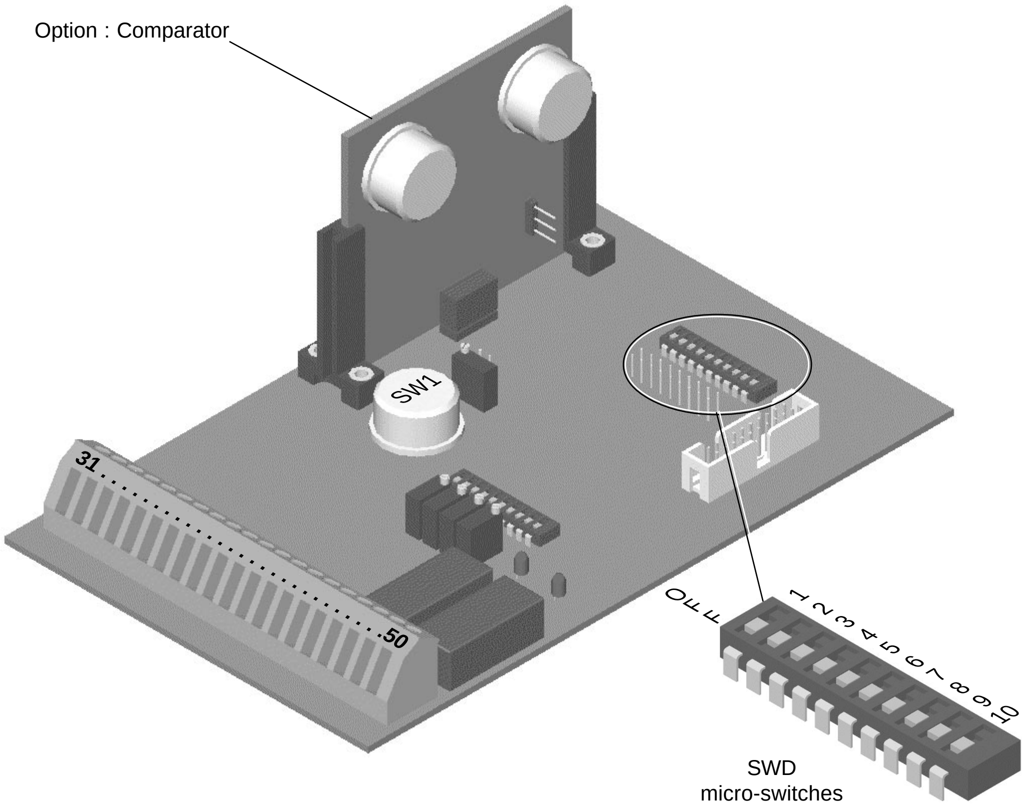


Fig. 3-20 : Location of the SWD micro-switches and the SW1 selector on the load monitoring board.

3.1.8 Selecting the X-Coefficient Range

The table in Figure 3-21 allows the user to define the range of the X-coefficient which will be used in the formula given in Figure 3-19. Figure 3-20 informs the user of the position of selector SW1 on the load monitoring unit circuit board.

☞ *Record the configuration of selector SW1 on the configuration and calibration form (see Appendix B).*

	SW1	X-Coefficient	
	Position	**Min.**	**Max.**
	1	4.99	10.5
	2	2.49	5.32
	3	1.21	2.64
*	4	0.57	1.31
	5	0.24	0.61

Fig. 3-21 : Configuration of selector SW1 for selection of the X-coefficient range.

3.2 Calibration of the Load Monitoring Unit

3.2.1 Zero Adjustment on the Voltage Output

The following conditions are required to adjust the zero on the voltage output :

- the load applied to the strain gauge transducer F = 0,
- the micro-switch SWB7 = OFF.

Connect a numerical millivoltmeter between terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit.

Adjust P6 then P7 (see Figure 3-15 for their location, circuit of the lower part) to 0 V ±10 mV on the millivoltmeter.

3.2.2 Zero Adjustment on the Current Output

The following conditions are required to adjust the zero on the current output :

- the load applied to the strain gauge transducer F = 0,
- The micro-switch SWB7 = OFF.

Connect a numerical milliammeter between terminals 10 ($I_{O/P}$) and 9 (0 V) of the load monitoring unit.

Adjust P8 (see Figure 3-15 for the location, circuit of the lower part) to the initial value ±50 µA (e.g. 4 mA ±50 µA) on the milliammeter.

3.2.3 Sensitivity Adjustment on the Voltage Output

To adjust the sensitivity on the voltage output ($U_{O/P}$), carry out the following operations :

Apply a known load ($F_{known} > 0,5F_N$) to the strain gauge transducer.

With :	F_N	≡	nominal strain gauge transducer load
	F_N	≡	$U_{O/P\ nominal}$ = 10 V DC
	$U_{O/P\ known}$	≡	F_{known}

To determine the rating of the voltage output, carry out the following calculation :

$$U_{O/P\ known} = \frac{10V \cdot F_{known}}{F_N}$$

Connect a digital millivoltmeter between terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit.

Adjust P4 (see Figure 3-15 for the location, circuit of the lower part) to $U_{O/P\ known}$ with an accuracy of ±10 mV.

3.2.4 Sensitivity Adjustment on the Current Output

To adjust the sensitivity on the current output ($I_{O/P}$) , the load applied to the strain gauge transducer F_{known} must be maintained and the sensitivity on the voltage output ($U_{O/P}$) must be adjusted first.

To determine the rating of the current output make the following calculation :

$$I_{O/P\ known} = \frac{16mA \cdot F_{known}}{F_N} + \text{initial value (e.g. 4 mA)}$$

Connect a milliammeter between the terminals 10 ($I_{O/P}$) and 9 (0 V) of the load monitoring unit.

Adjust P10 (see Figure 3-10 for the location, circuit of the lower part) to $I_{O/P\ known}$ with an accuracy of ±50 µA.

3.2.5 Adjustment of the U_{level1} and U_{level2} Detection Thresholds

The following conditions are required to adjust the detection thresholds :

- the load applied to the strain gauge transducer F = 0,
- the micro-switch SWB7 = ON (injected test signal),
- $U_{O/P}$ must be connected to $U_{O/Plevel2}$ by connecting the JP8 jumper.

Calculate the threshold voltages in relation to the voltage output $U_{O/P}$:

$$U_{O/P\ level1} = \frac{10V \cdot F_{level1}}{F_N}$$

$$U_{O/P\ level2} = \frac{10V \cdot F_{level2}}{F_N}$$

- **Adjustment of detection threshold U_{level1}**

  Connect a millivoltmeter between the terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit. Adjust P9 (refer to Figure 3-15 for its location, circuit of the lower part) to obtain $U_{O/P\ level1}$ with an accuracy of ±20 mV. Turn P3 until the illuminated diode of relay REL1 lights up (see Figure 3-22). Then turn P3 slowly until the diode of REL1 goes out (the detection level has been reached).

☞ *Record the rating of $U_{O/P\ level1}$ and that of F_{level1} on the configuration and calibration form (see Appendix B).*

- **Adjustment of detection threshold U_{level2}**

Connect a millivoltmeter between the terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit. Adjust P9 (refer to Figure 3-15 for its location, circuit of the lower part) to obtain $U_{O/P\ level2}$ with an accuracy of ±20 mV. Turn P5 until the illuminated diode of relay REL2 lights up (see Figure 3-22). Then turn P5 slowly until the diode of REL2 goes out (the detection level has been reached).

☞ *Record the rating of $U_{O/P\ level2}$ and that of F_{level2} on the configuration and calibration form (see Appendix B).*

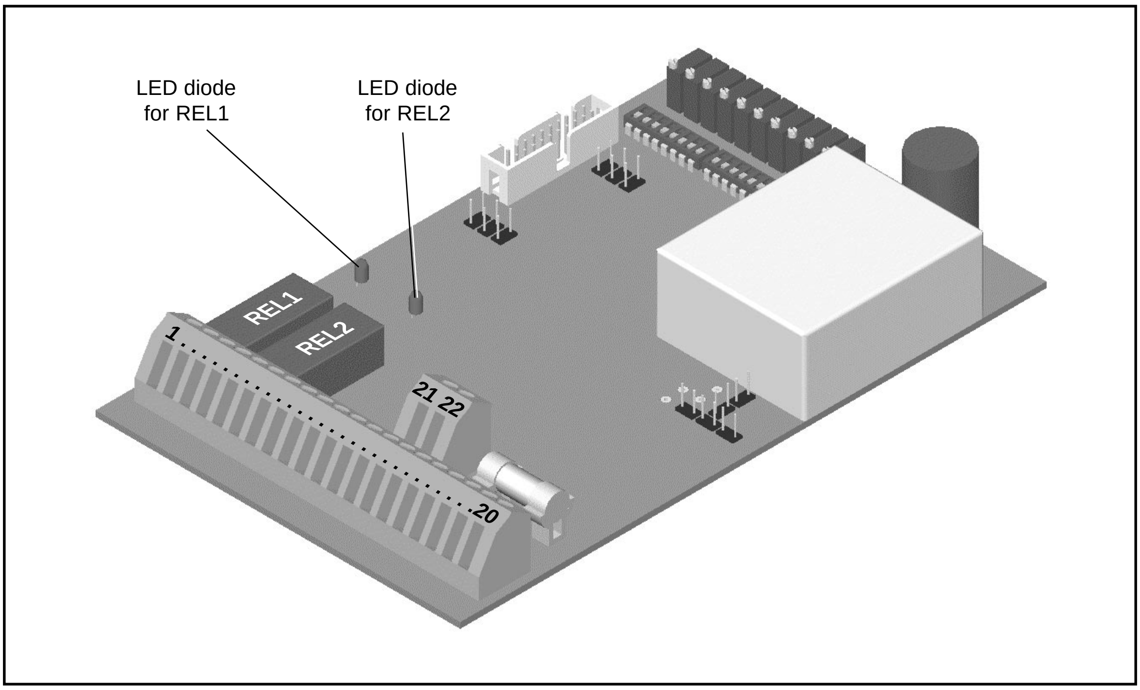


Fig. 3-22 : Loacation of the diodes of relays REL1 and REL2.

Remember to set micro-switch SWB7 to the OFF position once the U_{level1} and U_{level2} detection thresholds have been adjusted.

3.2.6 Adjustment of the U_{level3} and U_{level4} Detection Thresholds

The following conditions are required to adjust the detection thresholds :

- the load applied to the strain gauge transducer F = 0,
- the micro-switch SWB7 = ON (injected test signal),
- $U_{O/P}$ must be connected to $U_{O/Plevel3}$ and $U_{O/Plevel4}$ by checking the signal passes through C1 and by connecting the JP37 and JP38 jumpers (see wiring diagram on Figure 4-2).

Calculate the threshold voltages in relation to the voltage output $U_{O/P}$:

$$U_{O/P\ level3} = \frac{10V \cdot F_{level3}}{F_N}$$

$$U_{O/P\ level4} = \frac{10V \cdot F_{level4}}{F_N}$$

- **Adjustment of detection threshold U_{level3}**

  Connect a millivoltmeter between the terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit. Adjust P9 (refer to Figure 3-15 for its location, circuit of the lower part) to obtain $U_{O/P\ level3}$ with an accuracy of ±20 mV. Turn P12 until the illuminated diode of relay REL3 lights up (see Figure 3-23). Then turn P12 slowly until the diode of REL3 goes out (the detection level has been reached).

☞ *Record the rating of $U_{O/P\ level3}$ and that of F_{level3} on the configuration and calibration form (see Appendix B).*

- **Adjustment of detection threshold U_{level4}**

  Connect a millivoltmeter between the terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit. Adjust P9 (refer to Figure 3-15 for its location, circuit of the lower part) to obtain $U_{O/P\ level4}$ with an accuracy of ±20 mV. Turn P14 until the illuminated diode of relay REL4 lights up (see Figure 3-23). Then turn P14 slowly until the diode of REL4 goes out (the detection level has been reached).

☞ *Record the rating of $U_{O/P\ level4}$ and that of F_{level4} on the configuration and calibration form (see Appendix B).*

Remember to set micro-switch SWB7 to the OFF position once the U_{level3} and U_{level4} detection thresholds have been adjusted.

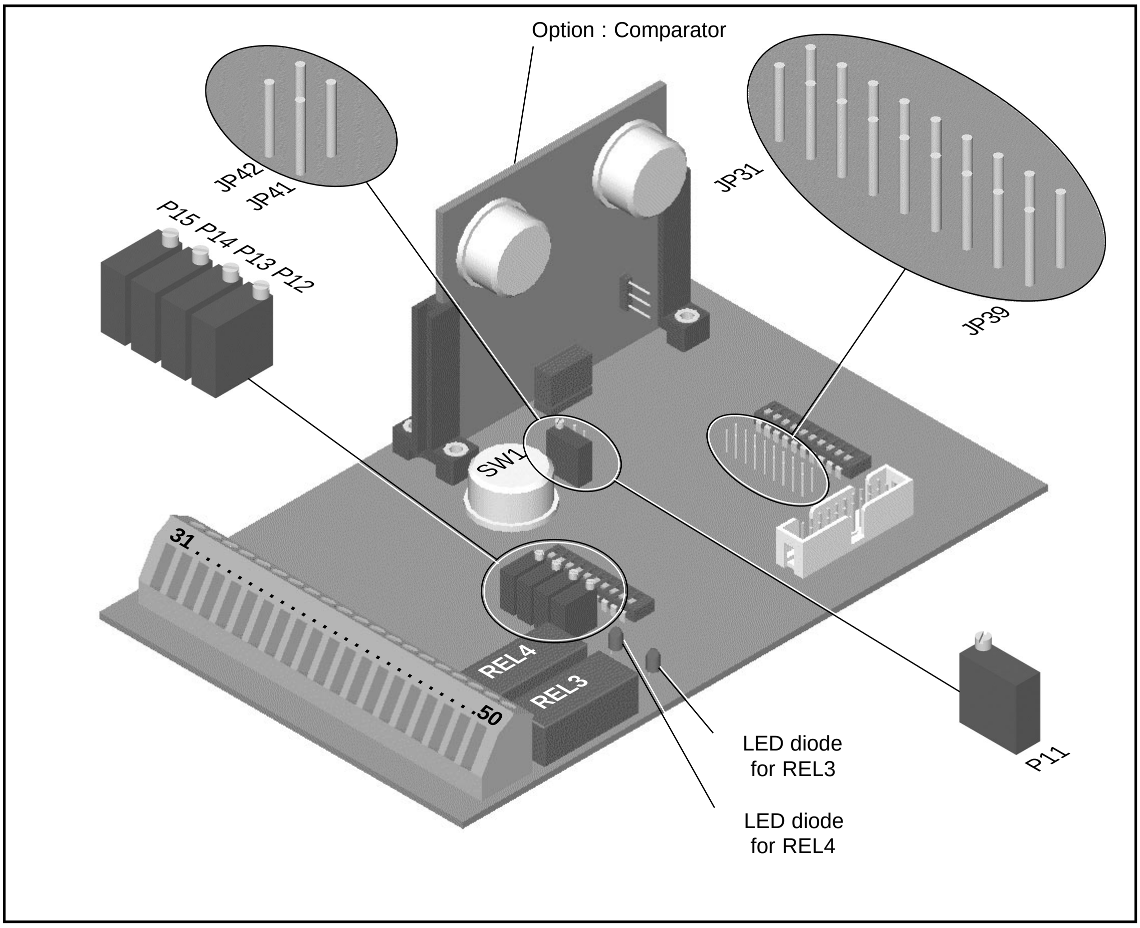


Fig. 3-23 : Location of the adjustment elements.

3.2.7 Adjustment of the X-Coefficient (Summing Circuit)

The following conditions are required in order to adjust the X-coefficient :

- The test signal (SWB7 = ON) must be applied to C1. Terminal 36 ($UA_{I/P}$) must not be connected,
- All other inputs must be put to zero,
- Connect jumper JP42 and remove jumper JP41 (their location is shown in Figure 3-23)

Connect a millivoltmeter between terminals 15 ($U_{O/P}$) and 9 (0 V) of the load monitoring unit. Adjust P9 (refer to Figure 3-15 for its location on the lower part of the circuit board) to obtain $U_{O/P}$ = 1 V. The millivoltmeter can then be connected between the terminals 32 ($U_{E\ O/P}$) and 9 (0 V). After having correctly positioned selector SW1, P11 can be adjusted with an accuracy of ±20 mV so as to get an output voltage $U_{E\ O/P}$ equal to the input voltage multiplied by the coefficient X.

Example : The user wants a coefficient of 0.5
Set selector SW1 to position 5

☞ *Record the value of the x-coefficient on the configuration and calibration form (see Appendix B).*

3.3 Configuration of the taring circuitry

The LMU 116 is fitted with a taring circuitry. This circuitry allows one to force a measured signal to zero by means of external instructions (AUTO-ZERO terminal 42 and COM-TAR terminal 40). This new value, called NET is available on the output TARING O/P (terminal 38).

The output TARING O/P follows the rule NET = GROSS - TARE.

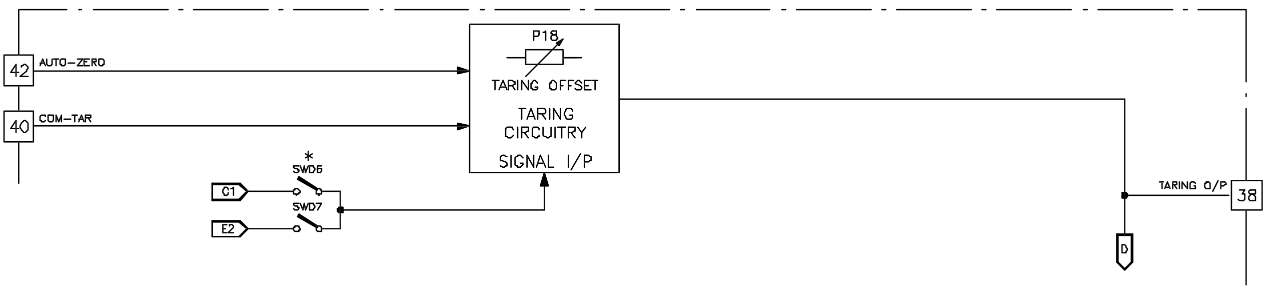
3.3.1 AUTO-TARE

To add a tare to a measured signal : connect input COM-TAR (terminal 40) to 0 V (terminal 41) for a minimum time of 1 second.

3.3.2 RESET-TARE

To remove the tare of the measured signal : connect AUTO-ZERO (terminal 42) to 0 V (terminal 41) for a minimum time of 1 second.

3.3.3 Selection of the TARE signal



Taring circuitry input signal (gross weight)	SWD 6	SWD 7	JP41 (see appendix B)
Amplified transducer (C1) signal	ON	OFF	- - -
Output signal of the summer (E2)	OFF	ON	ON
Optional submodule output signal (SUMMER O/P P/N 224-107-400-02x)	OFF	ON	OFF
Taring system out of order	OFF	OFF	- - -

Fig. 3-24 : Taring circuitry

The micro-switches SWD 6 and 7 (see fig. 3-20 indicating their location on the printed circuit board), as well as the jumper JP41 (see fig. 3-23 indicating its location on the printed circuit board) allows one to select the taring circuitry input value. This value corresponds to the TARE signal, which will be subtracted to obtain the NET signal NET (TARING O/P, terminal 38).

3.3.4 Connection diagram of the taring control circuitry

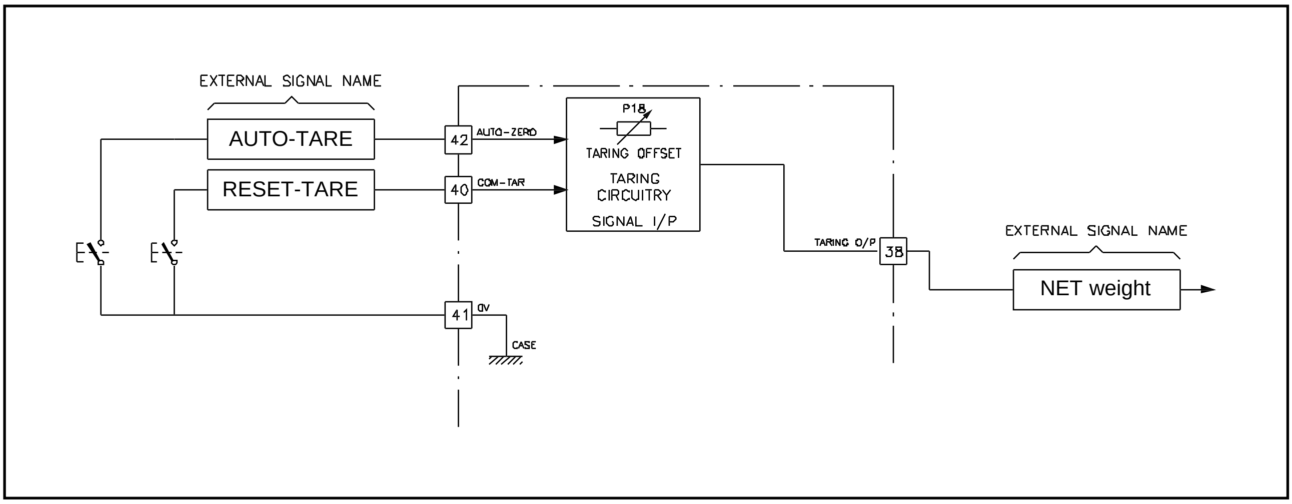


Fig. 3-25 : Taring control circuitry

The diagram on figure 3-25 shows the external connections which are necessary to use the taring circuitry.

Two push-buttons can be installed close to the weight display. The first button will be used to remove the tare (Reset), the second to add the tare.

The NET output is available on terminal 38.

Thus, to carry out a taring press the tare button for 1 s (or until the weight display indicates 0). To remove a tare press the reset button for 1 s (or until the weight display indicates the gross weight).

3.4 Customized Configuration

After having carried out the procedures described in Sections 3.1 and 3.2, it is possible to configure the load measuring unit according to the user's requirements. Mark the signal path on the configuration and calibration protocol PZ 6548 (see Appendix B) and adjust the jumpers and micro-switches according to the application required by the user (see Chapter 5).

4 ASSEMBLY AND CONNECTION

4.1 General

So that the means used to carry out the assembly and connection of the load monitoring unit LMU 116 are suitable and so that the signals recorded do not suffer any disruption caused by incorrect procedures, follow and apply the procedures indicated in this chapter.

☞ *The procedures contained in this chapter do not cover every assembly and connection option. However, they allow the user to gain inspiration from specific applications. If in doubt, the user should contact Vibro-Meter so that a solution which does not disrupt the measurements can be found.*
Also the user should respect the general instructions of the machine manufacturers and the standards and specifications on the subject of safety and special construction.

4.2 Assembly of the Load Monitoring Unit

☞ *Make sure that the temperature in the area where the load monitoring unit is to be located is between -40°C and +80°C.*

- Choose an assembly location free of vibrations (e.g. instrument support base)
- Mark the position of 4 tapping points on the assembly surface (see Figure 4-1).
- Drill and tap the four M6 holes. The taps should be ~15 mm.
- Remove the cover of the load monitoring unit housing by unscrewing its six screws (see Figure 4-1).
- Position the housing on the assembly surface and tighten up the four M6 x 30 fixing screws. Adopt a torque suitable for the type of screw used.
- If the configuration and calibration of the monitor have not been done, do them using the procedures described in Chapter 3.
- Make the electrical connections in accordance with the specifications given in Section 4.3.
- Put the cover back on the load monitoring unit housing and tighten up its six screws.

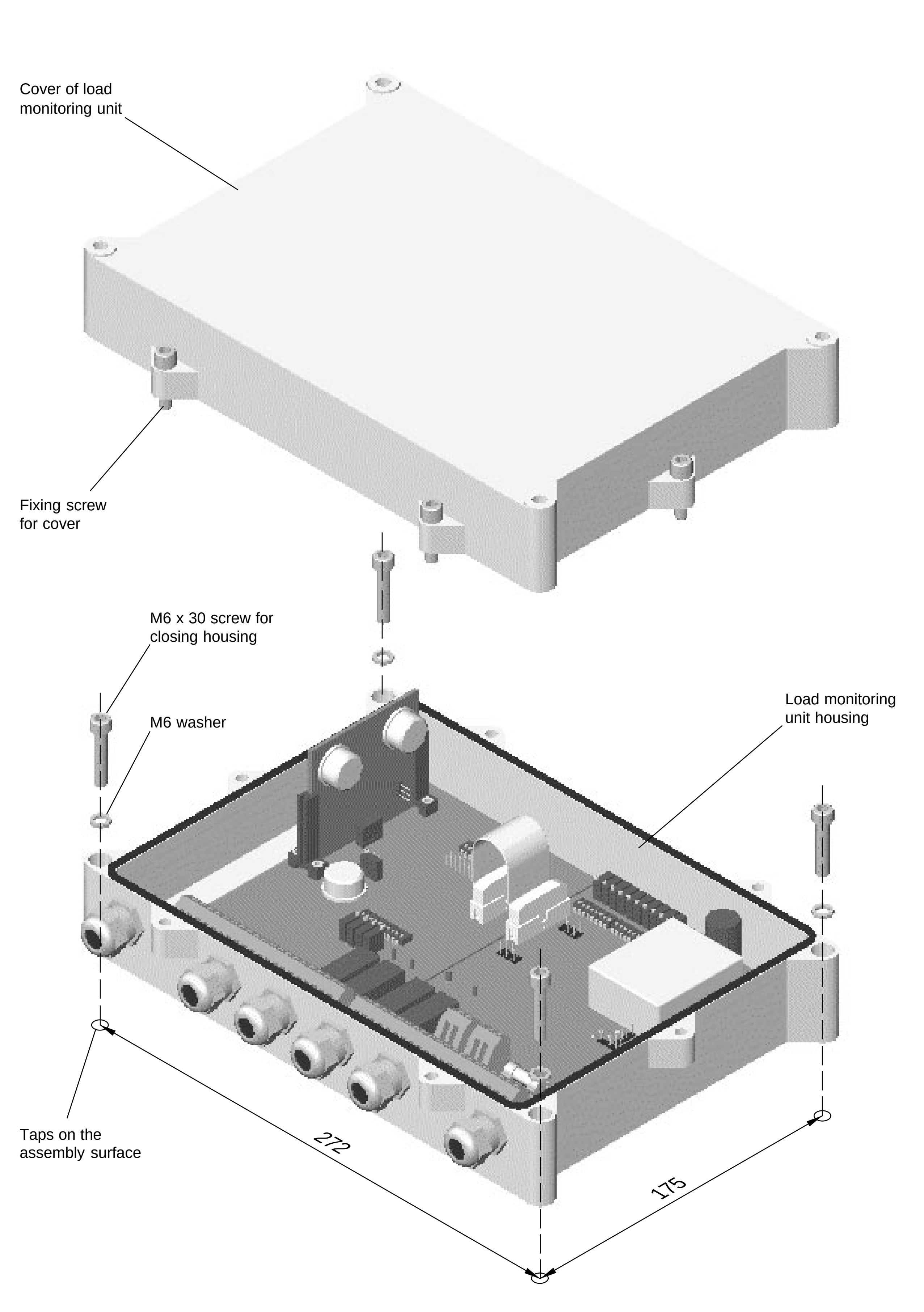
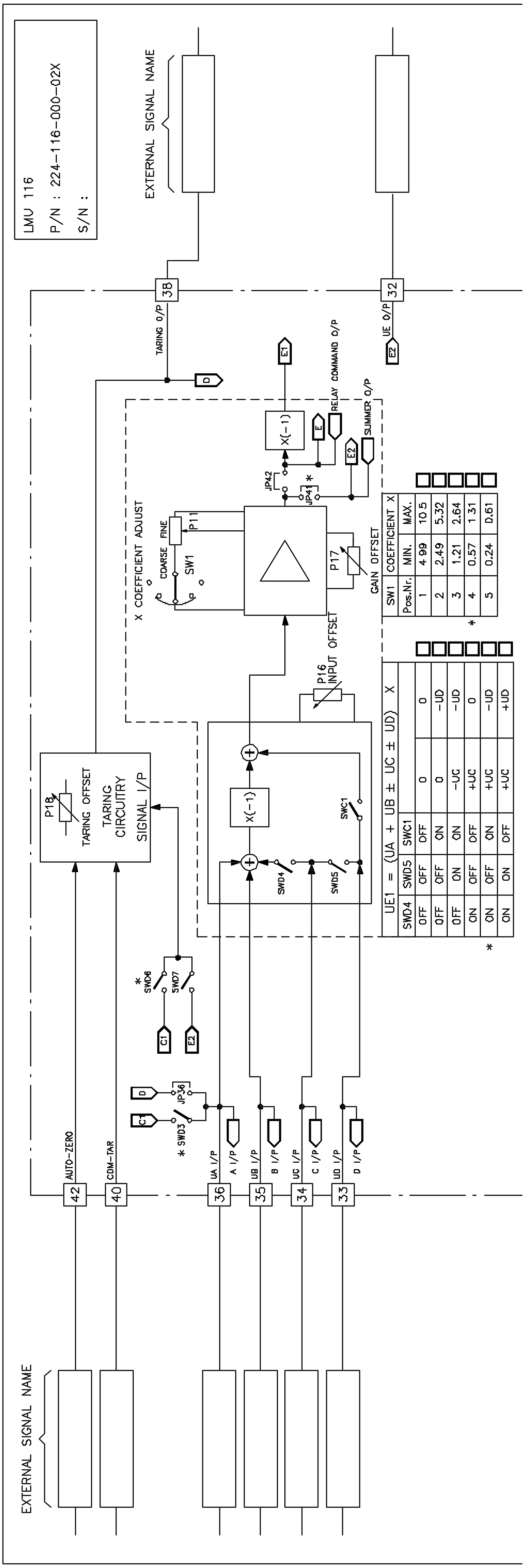


Fig. 4-1 : Installation of the LMU 116 load monitoring unit.

4.3 Connection of the Load Monitoring Unit



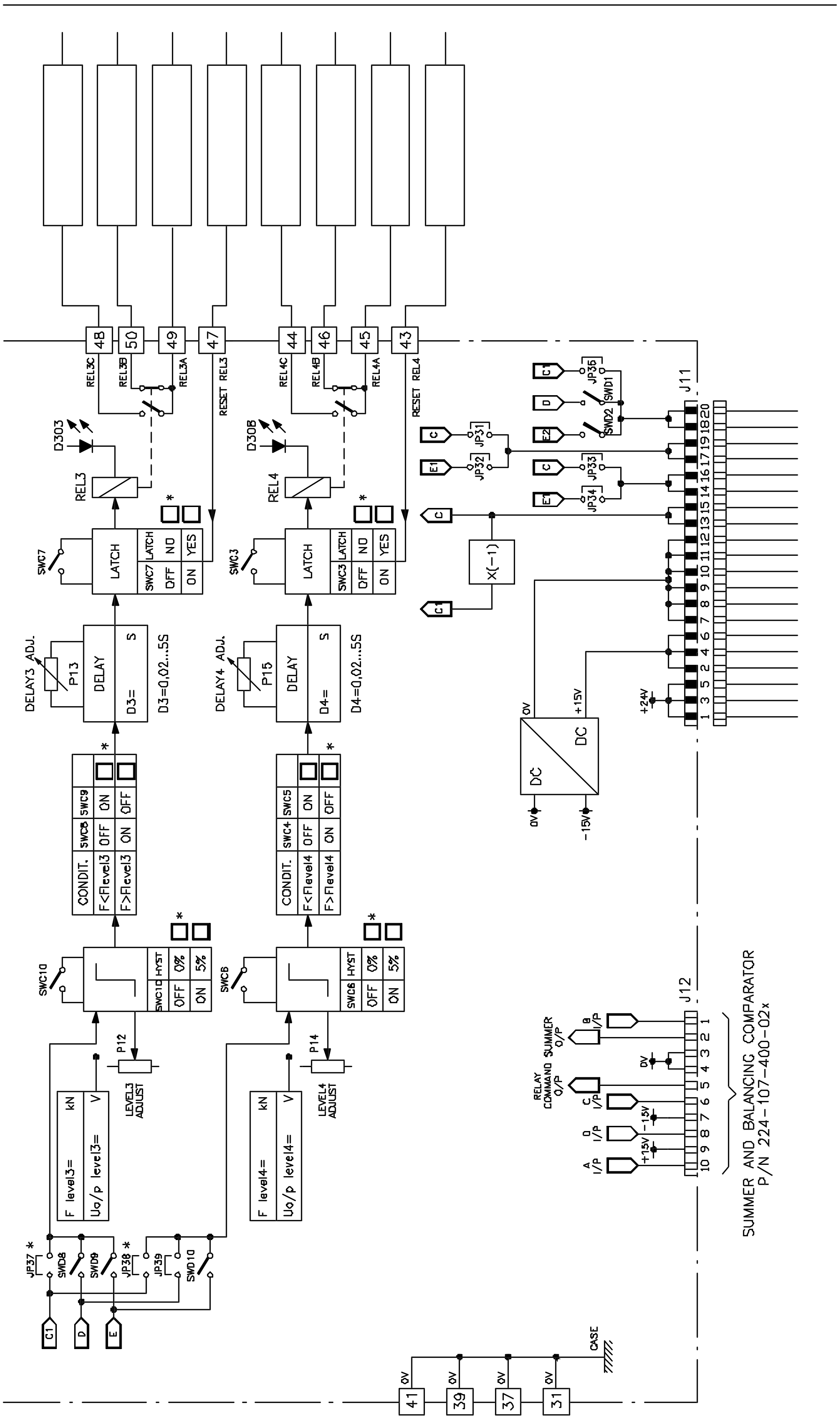
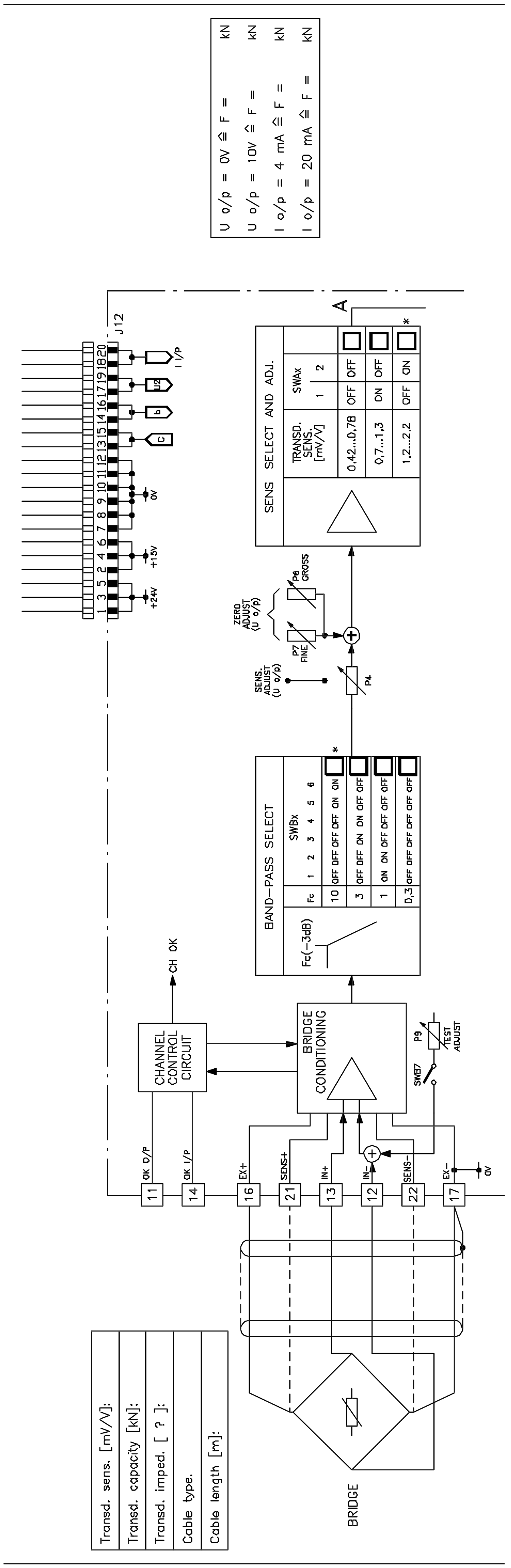


Fig. 4-2 : General wiring diagram (part 1of 2).


U o/p = 0V ≙ F = kN
U o/p = 10V ≙ F = kN
I o/p = 4 mA ≙ F = kN
I o/p = 20 mA ≙ F = kN
J12
I/P
0V
+15V
+24V
SENS SELECT AND ADJ.
TRANSD. SENS. [mV/V]
SWAx
0,42...0,78
0,7...1,3
1,2...2,2
A
ZERO ADJUST (U o/p)
P6 GROSS
P7 FINE
SENS. ADJUST (U o/p)
P4
BAND-PASS SELECT
Fc(-3dB)
SWBx
CH OK
CHANNEL CONTROL CIRCUIT
BRIDGE CONDITIONING
P9
TEST ADJUST
SWB7
OK O/P
OK I/P
EX+
SENS+
IN+
IN-
SENS-
EX-
BRIDGE
Transd. sens. [mV/V]:
Transd. capacity [kN]:
Transd. imped. [?]:
Cable type.
Cable length [m]:

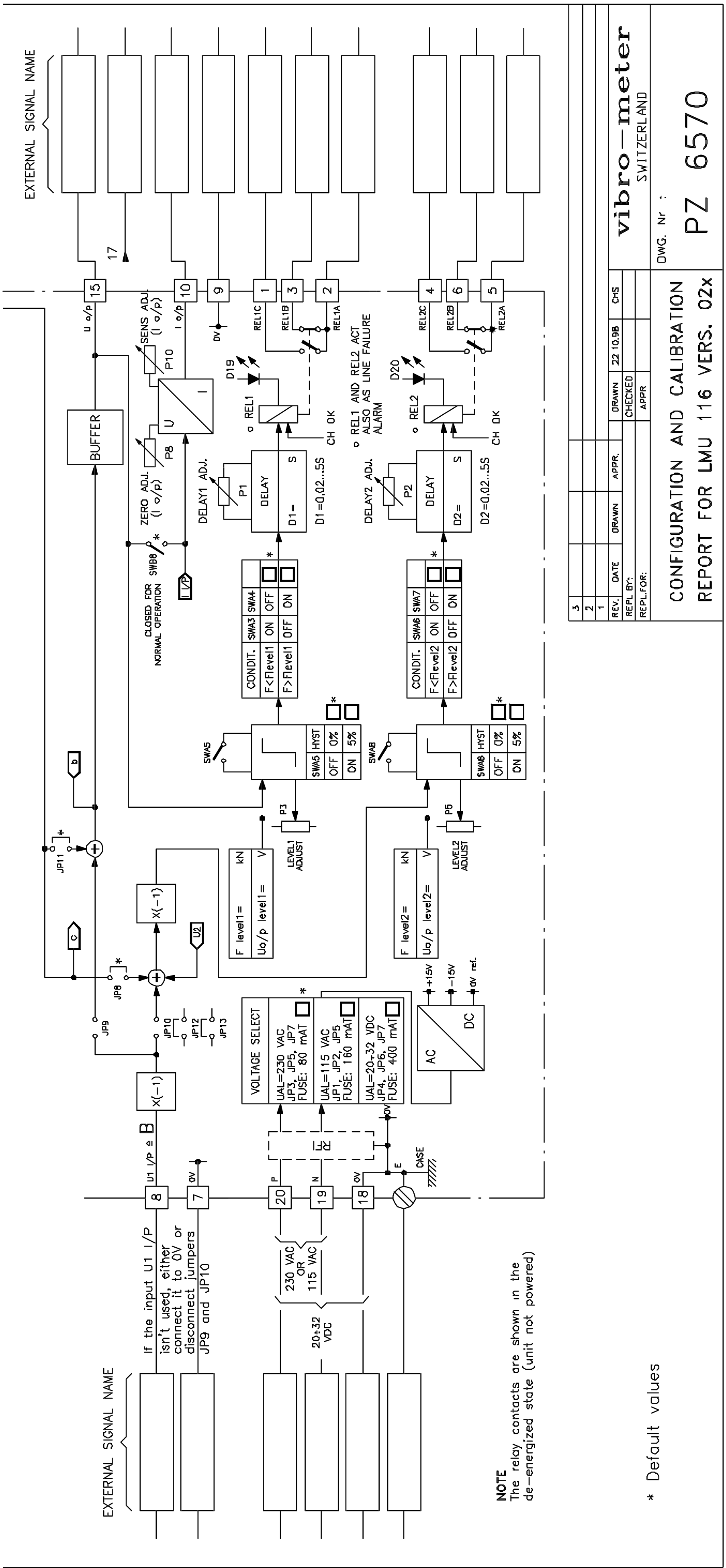


Fig. 4-2 : General wiring diagram (part 2 of 2).

- Strip the conductors of the integral cable (coming from the strain gauge transducer), the supply cable and the transmission cable (relay, voltage and current outputs), if this has not already been done.

- Remove the cover of the load monitoring unit housing by unscrewing its six screws (see Figure 4-1).

- Pass the cables into the stuffing glands located on the load monitoring unit housing, proceding as follows (see Figure 4-4) :

  - Unscrew element (1) anti-clockwise. Element (5) should not be removed from the housing.
  - Takes out joints (2) and (3) from element (1) (elements (2) and (3) allow the stuffing gland to be adapted to different diameters of cable). Element (2) can be removed from element (3) by simply pushing outwards.
  - Pass the cable across elements (1), (2) (if used), (3), (4) and (5).
  - Reassemble the elements of the stuffing gland and, before placing element (1), coat joint (3) with silicone grease as shown in Figure 4-4. Tighten element (1) in such a way that joint , (2) and/or (3) protrudes, so as to provide the degree of watertightness required.
  - Ensure also that the cable is well gripped by the stuffing gland.

Do not damage the joints with cutting objects.
Check that no foreign bodies have slid between the elements of the stuffing gland.
Degrease the surface of the cable which will come into contact with the joint.

The seal of the stuffing gland cannot be guaranteed if these instructions are notfollowed.

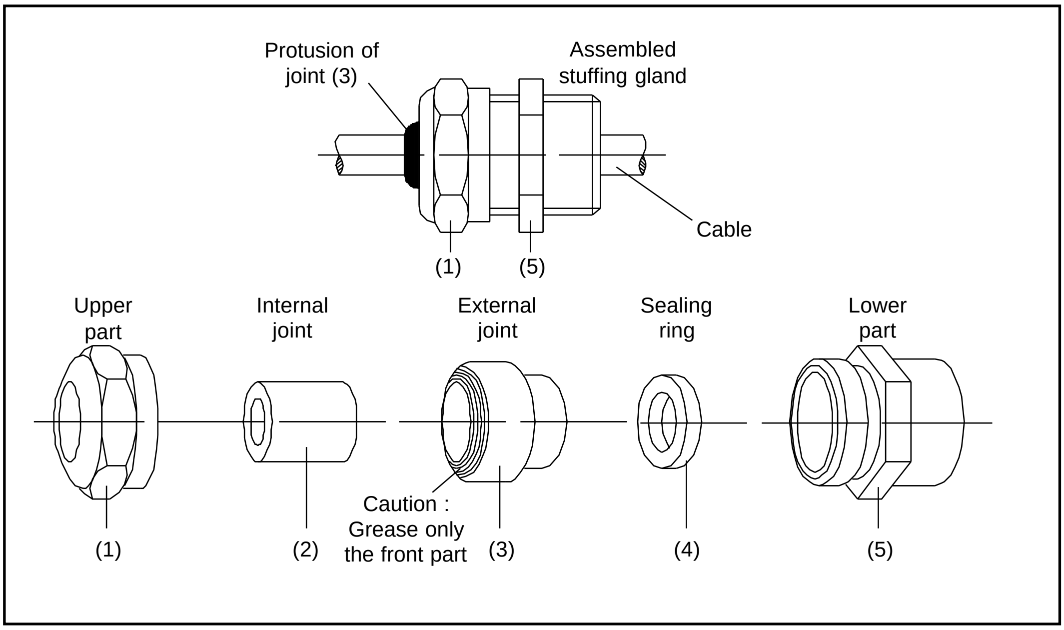


Fig. 4-4 : Stuffing gland (overall view and exploded view).

- Connect the conductors of the various cables to the load monitoring unit terminals (see Figures 4-2 and 4-3).

- Put the cover back on the load monitoring unit and tighten up its six screws.

5 APPLICATIONS

This chapter describes two practical applications which illustrate the configuration procedure for a LMU 116 load monitoring unit. These examples show just two applications out of many other possibilities using load monitoring units.

5.1 Simple Weighing System with Adjustable Tare

This weighing system (see Figure 5-1) uses only one LMU 116 load monitoring unit. According to the proposed configurations shown in Figures 5-2 and 5-4, the following functions and signals are made available by the LMU 116 unit :

- Input signal : Signal generated by a load measuring pin, connected to the BRIDGE input
- Output signals : Gross load (voltage)
  Net load (current and voltage)
- Relay outputs : “Gross load” threshold reached (REL1)
  “Overload” threshold reached (REL2)
  First and second “Net load” thresholds reached (REL3, REL4)

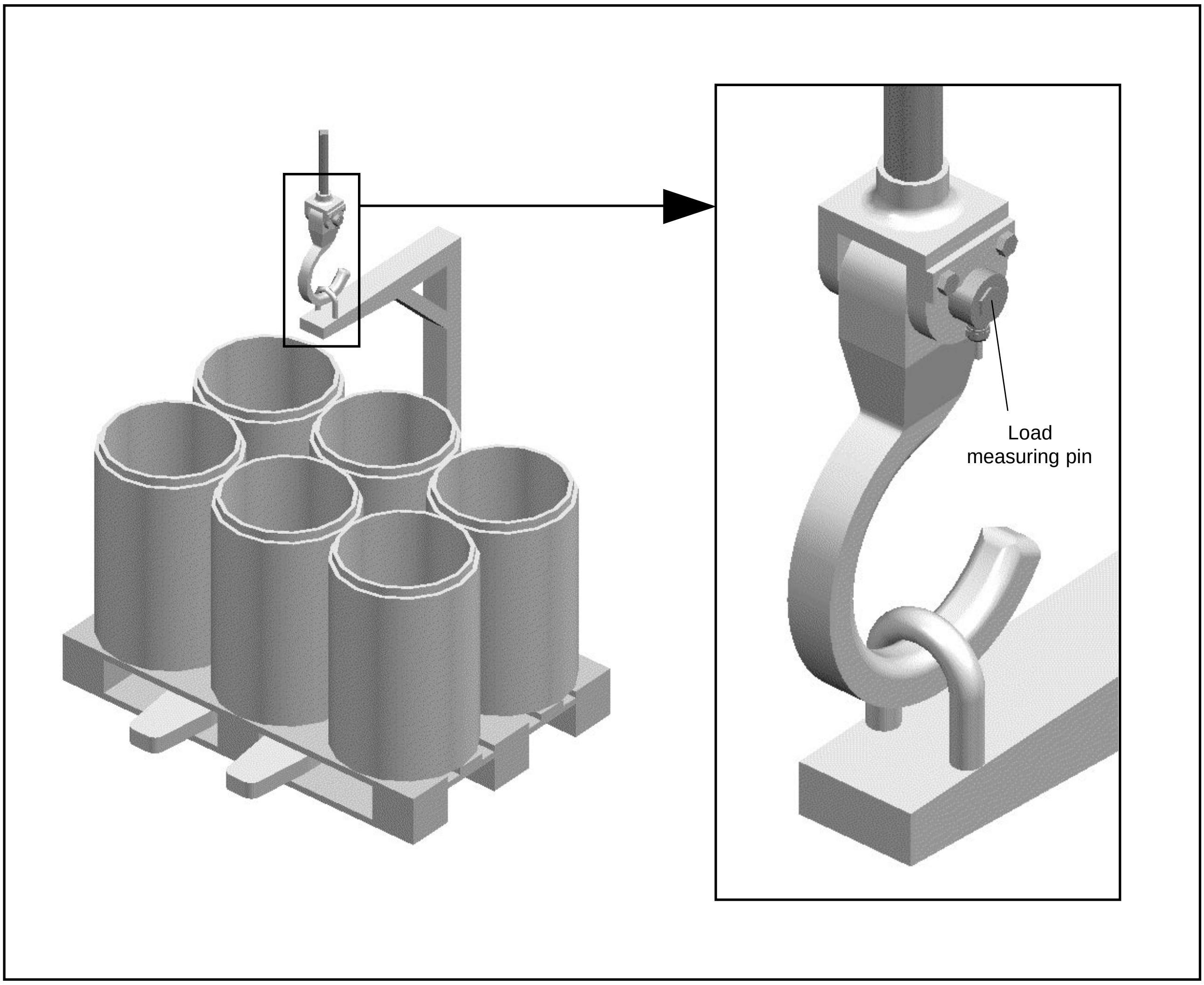


Fig. 5-1 : Example of a simple weighing system used with lifting devices.

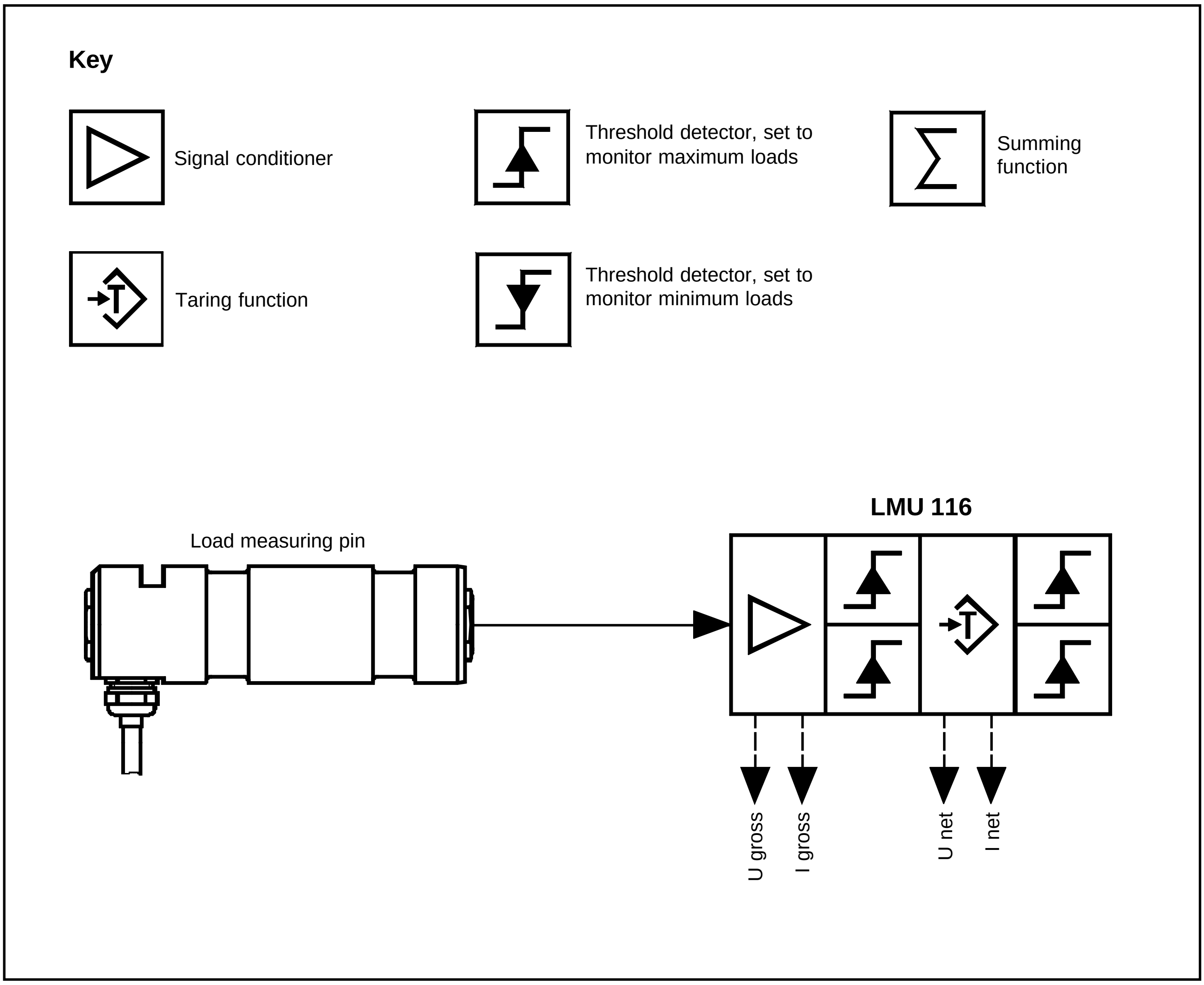


Fig. 5-2 : Symbolic representation of a simple weighing system.

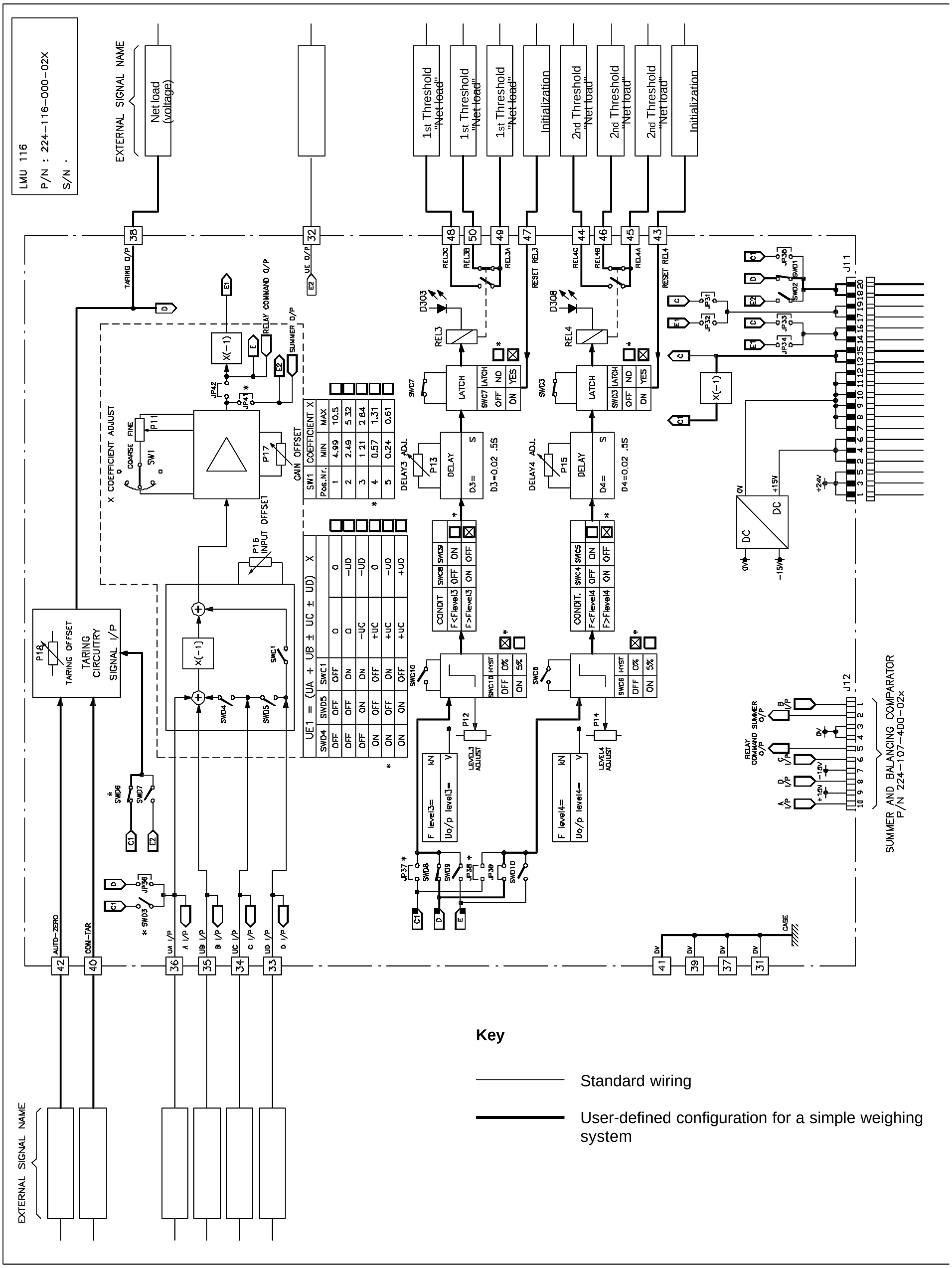


Fig. 5-3 : Load monitoring unit configured for a simple weighing system (Part 1 of 2).

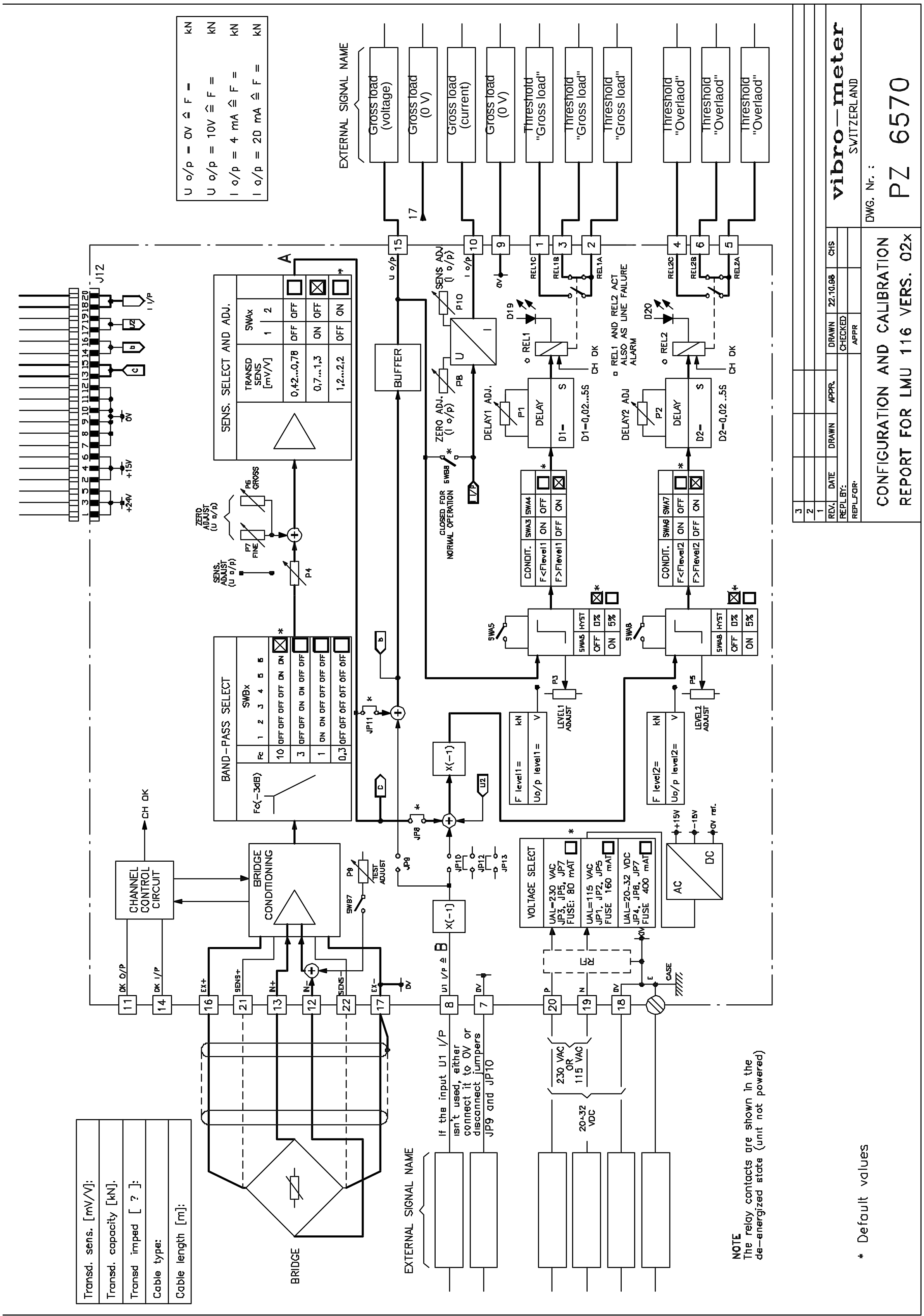


Fig. 5-4 : Load monitoring unit configured for a simple weighing system (Part 2 of 2).

5.2 Multi-Transducer Weighing System for Container Loading Bridges

This weighing system (see Figure 5-5) uses an LMU 116, an LMU 117 and an LMU 112 load monitoring unit. According to the proposed configuration shown in Figures 5-6 and 5-8, the following functions and signals are available on the LMU 116 unit :

- Input signal : Signal originating from load measuring pin D, connected to the LMU 116 BRIDGE input
  Gross load D, from the LMU 116
  Gross loads A and B, from the LMU 117
  Gross load C, from the LMU 112

- Output signals : Net load sum (current and voltage)
  Gross load D (voltage)

- Relay outputs : Threshold "Gross load D" reached (REL1)
  Threshold "Σ Gross loads" reached (REL3)
  Threshold "Σ Unloaded cable" reached (REL4)
  Threshold "Σ Net loads" reached (REL2)

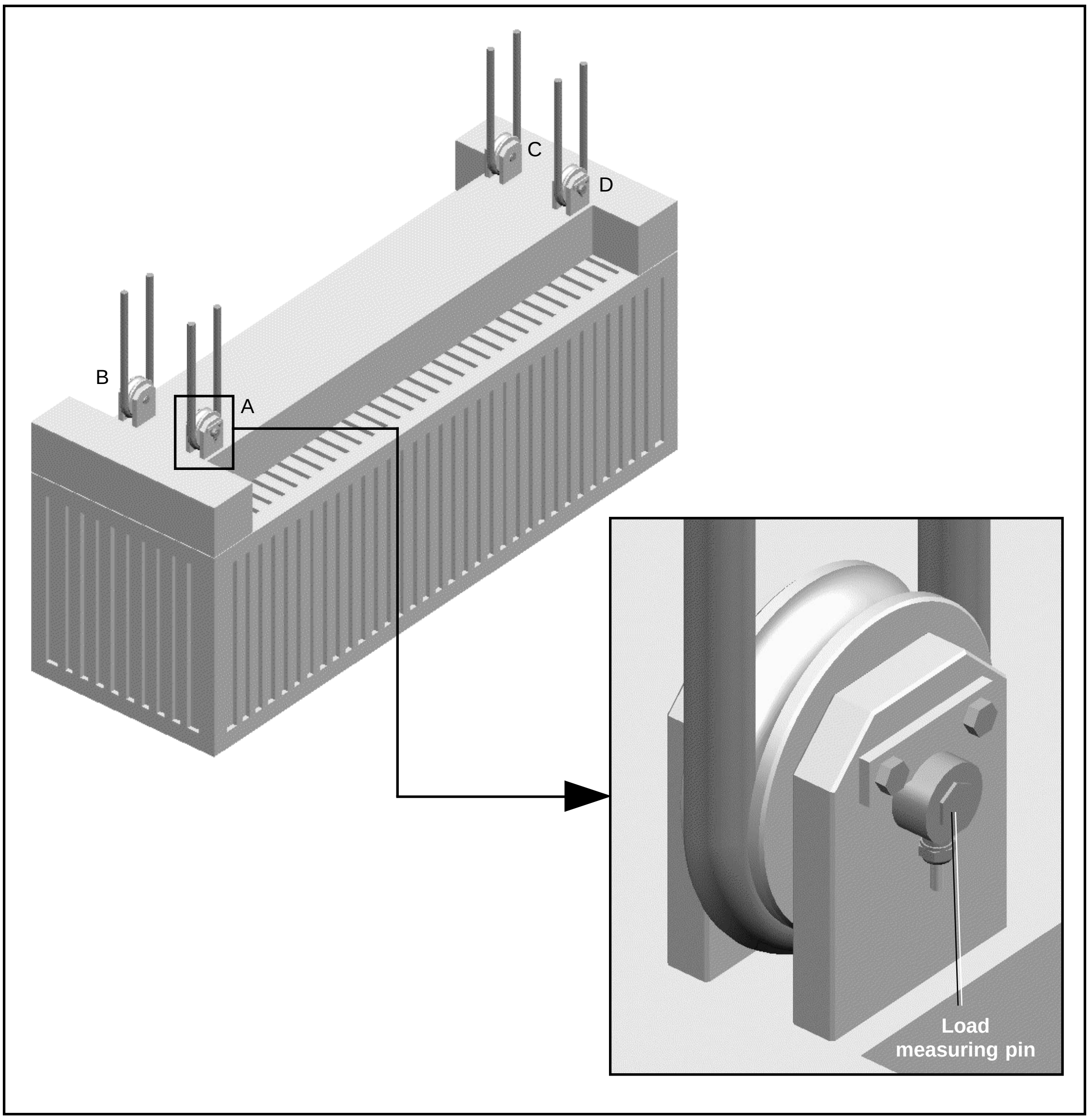


Fig. 5-5 : Example of multi-transducer weighing system for container loading bridges.

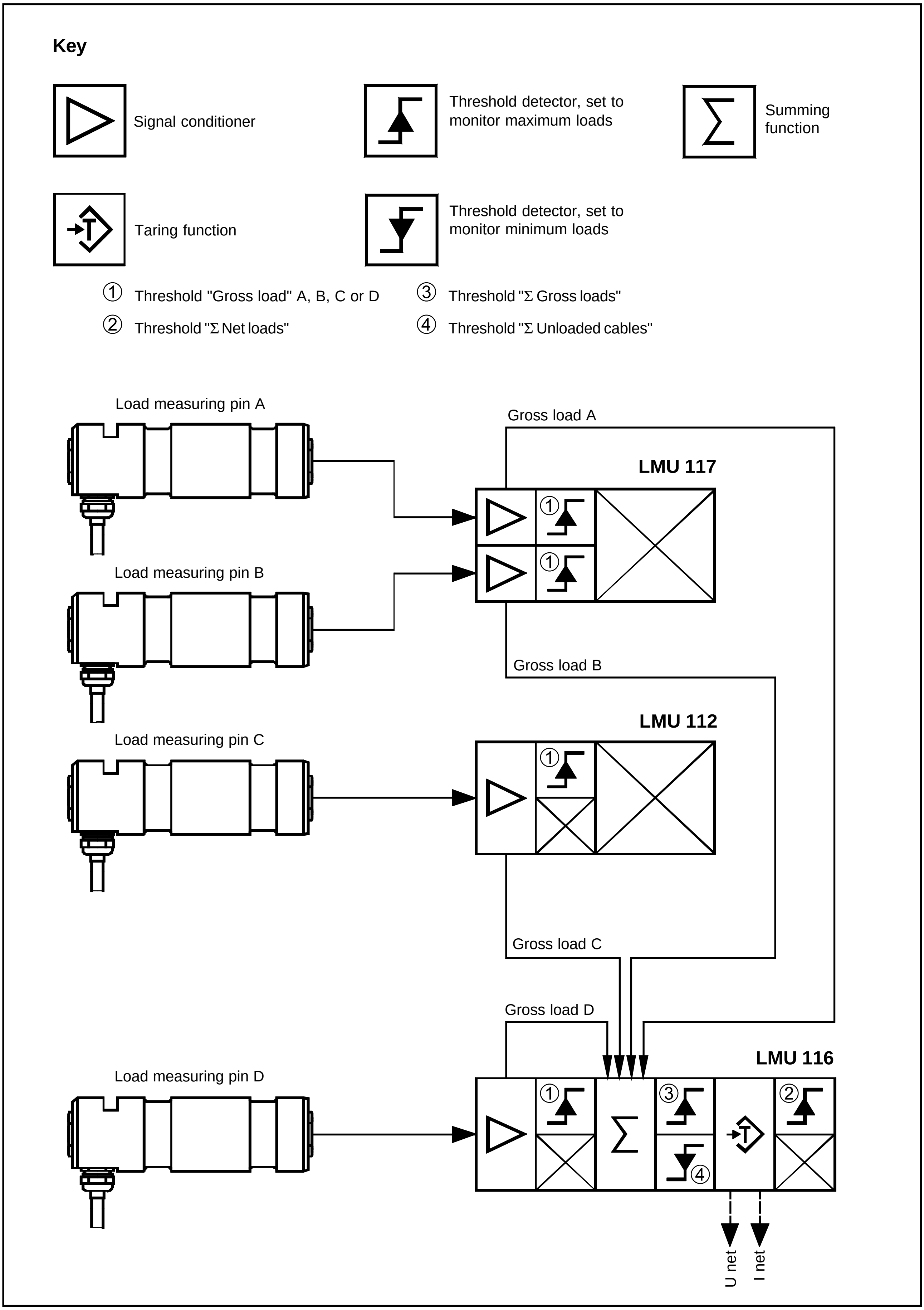


Fig. 5-6 : Symbolic representation of multi-transducer weighing system for container loading bridges.

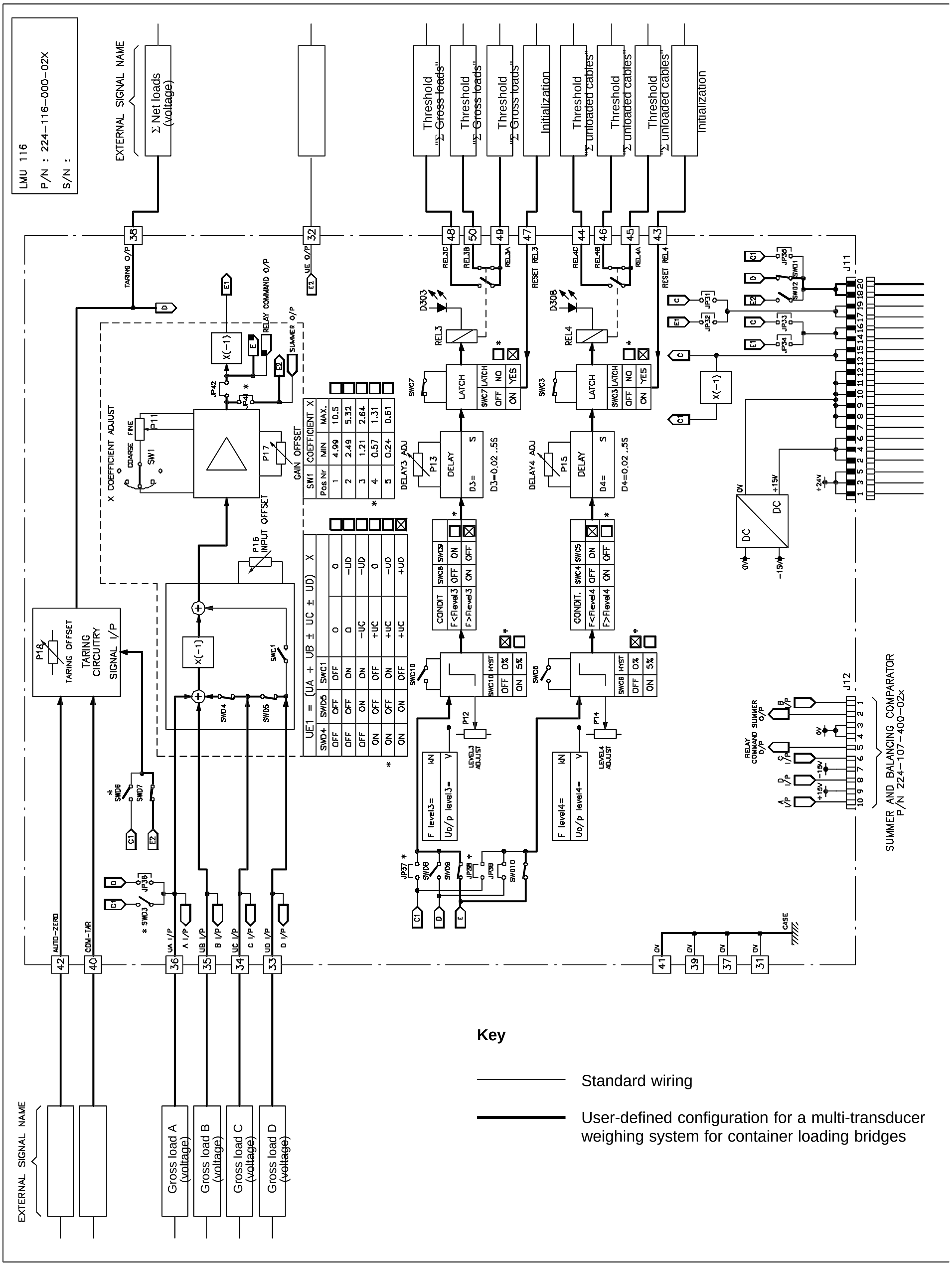


Fig. 5-7 : Load monitoring unit configured for a multi-transducer weighing system for container loading bridges (Part 1 of 2).

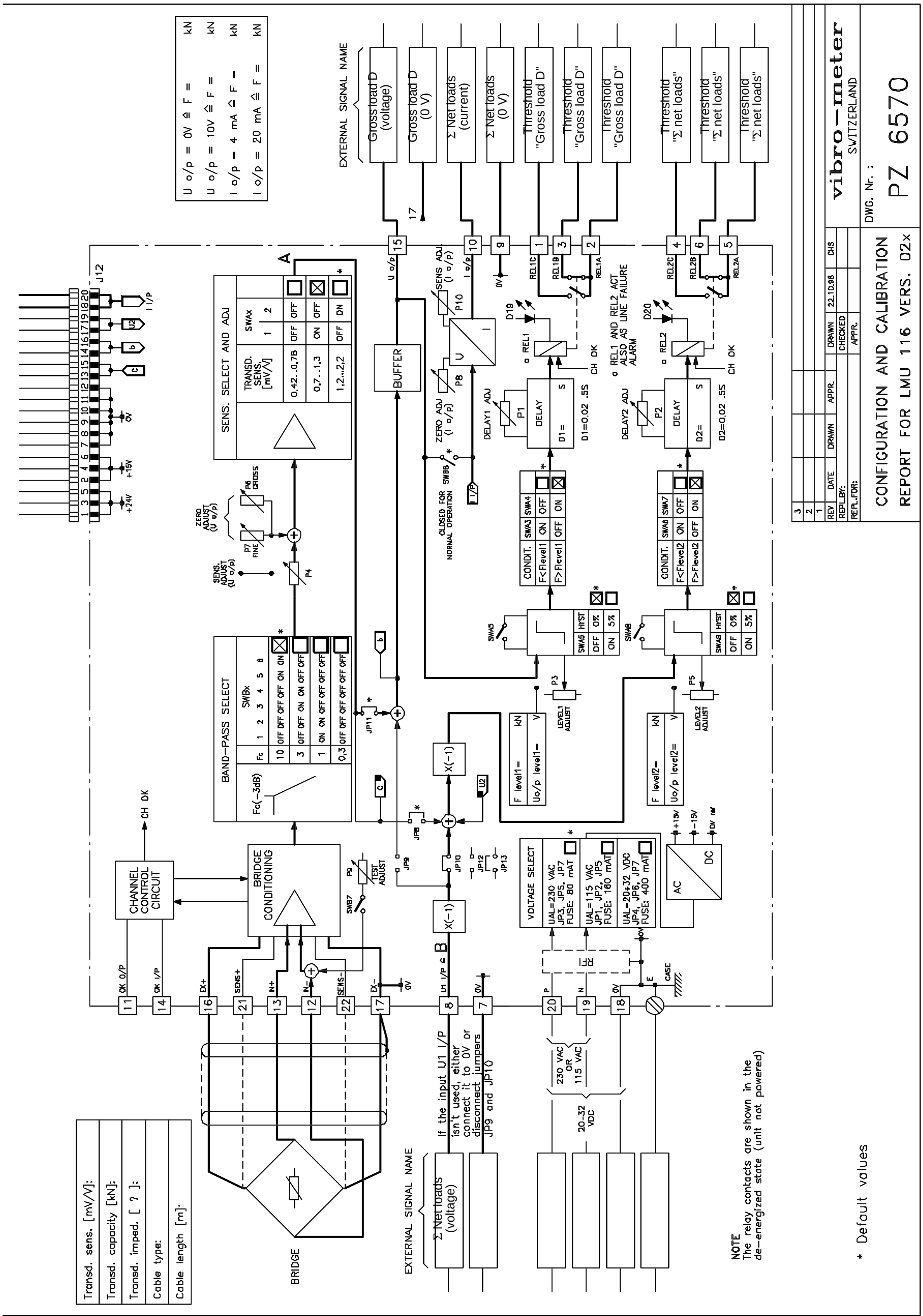


Fig. 5-8 : Load monitoring unit configured for a multi-transducer weighing system for container loading bridges (Part 2 of 2).

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A MECHANICAL DRAWING

Designation	Drawing No.
- LMU 116/117 Load Monitoring Unit	224-116-000 V 011

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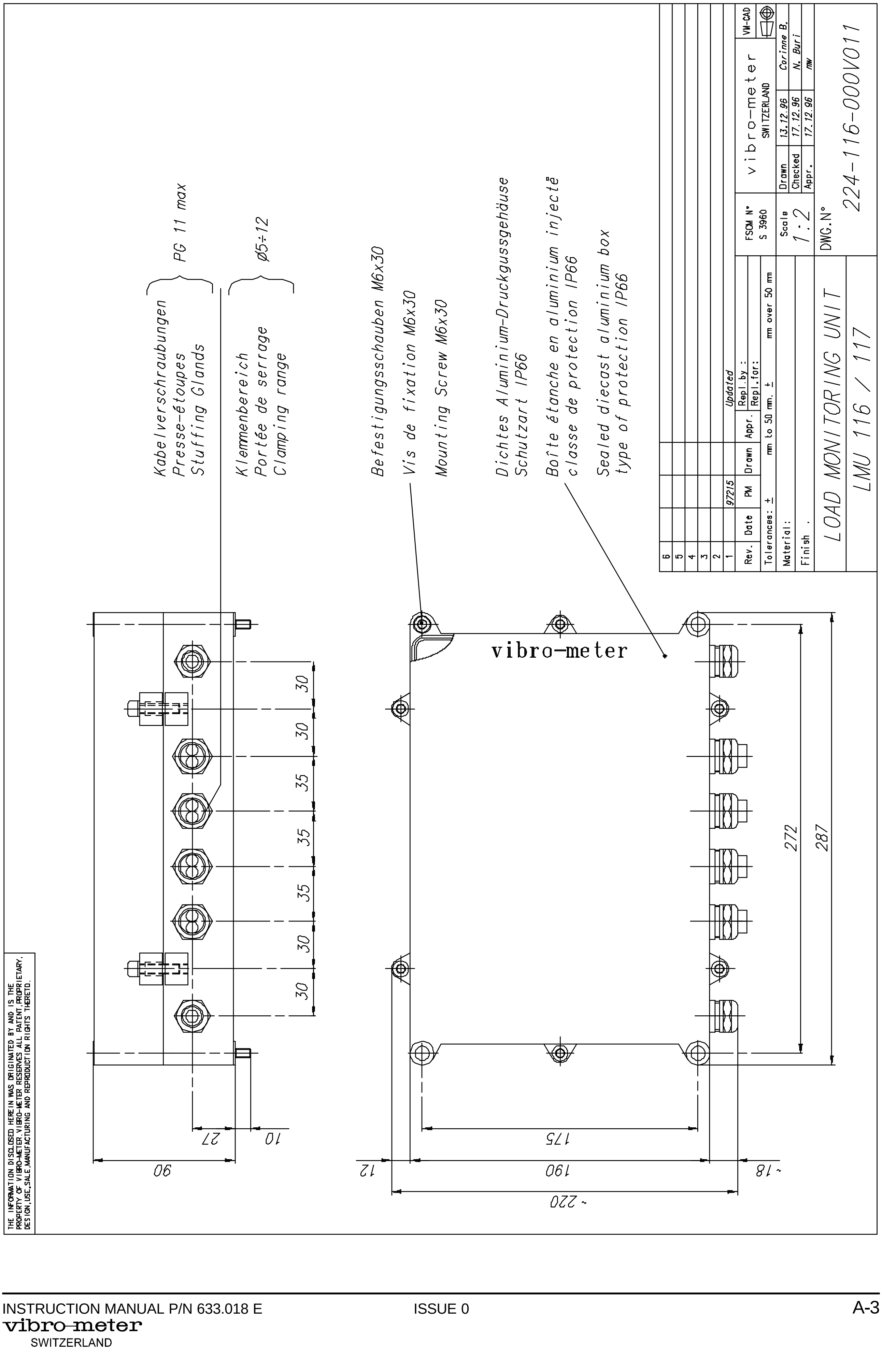
Kabelverschraubungen
Presse-étoupes
Stuffing Glands
PG 11 max
Klemmenbereich
Portée de serrage
Clamping range
Ø5÷12
Befestigungsschauben M6x30
Vis de fixation M6x30
Mounting Screw M6x30
Dichtes Aluminium-Druckgussgehäuse
Schutzart IP66
Boîte étanche en aluminium injecté
classe de protection IP66
Sealed diecast aluminium box
type of protection IP66
vibro-meter
LOAD MONITORING UNIT
LMU 116 / 117
224-116-000V011
vibro-meter SWITZERLAND
FSCM N° S 3960
Scale 1:2
Drawn 13.12.96 Corinne B.
Checked 17.12.96 N. Buri
Appr. 17.12.96 mw
DWG.N°
Tolerances: ± mm to 50 mm. ± mm over 50 mm
Material:
Finish .
Rev. Date PM Drawn Appr. Repl.by : Repl.for:
97215 Updated
30 30 35 35 35 30 30
272 287
27 10 90
175 190 12 ~18 ~220
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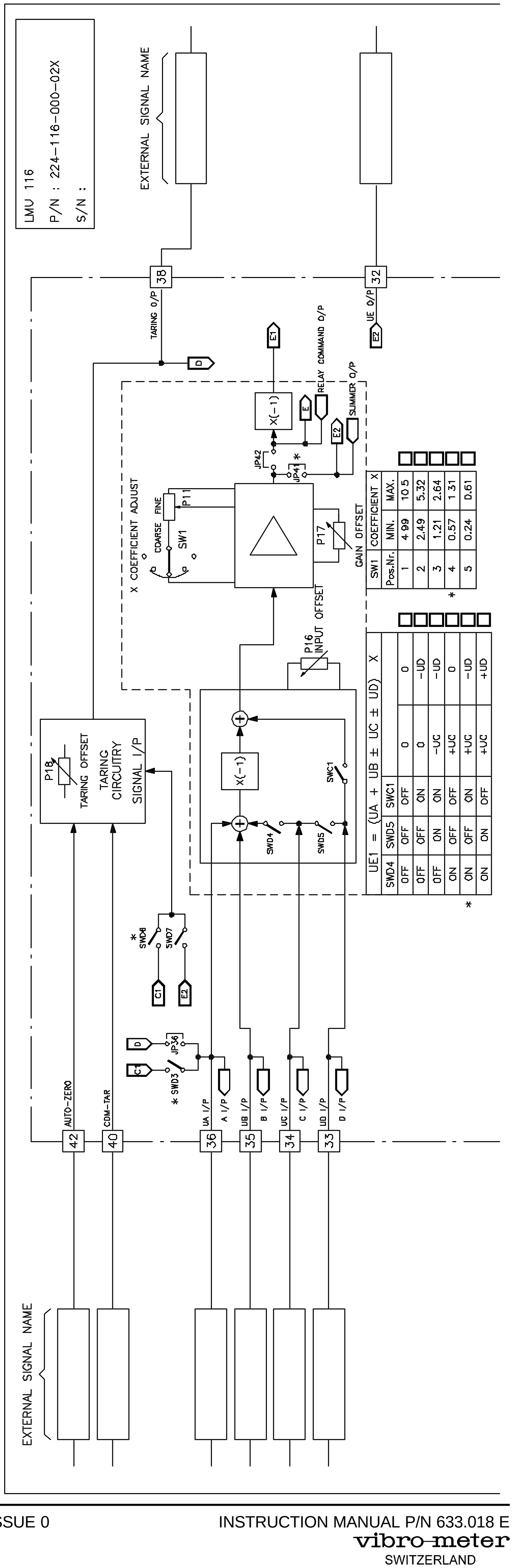
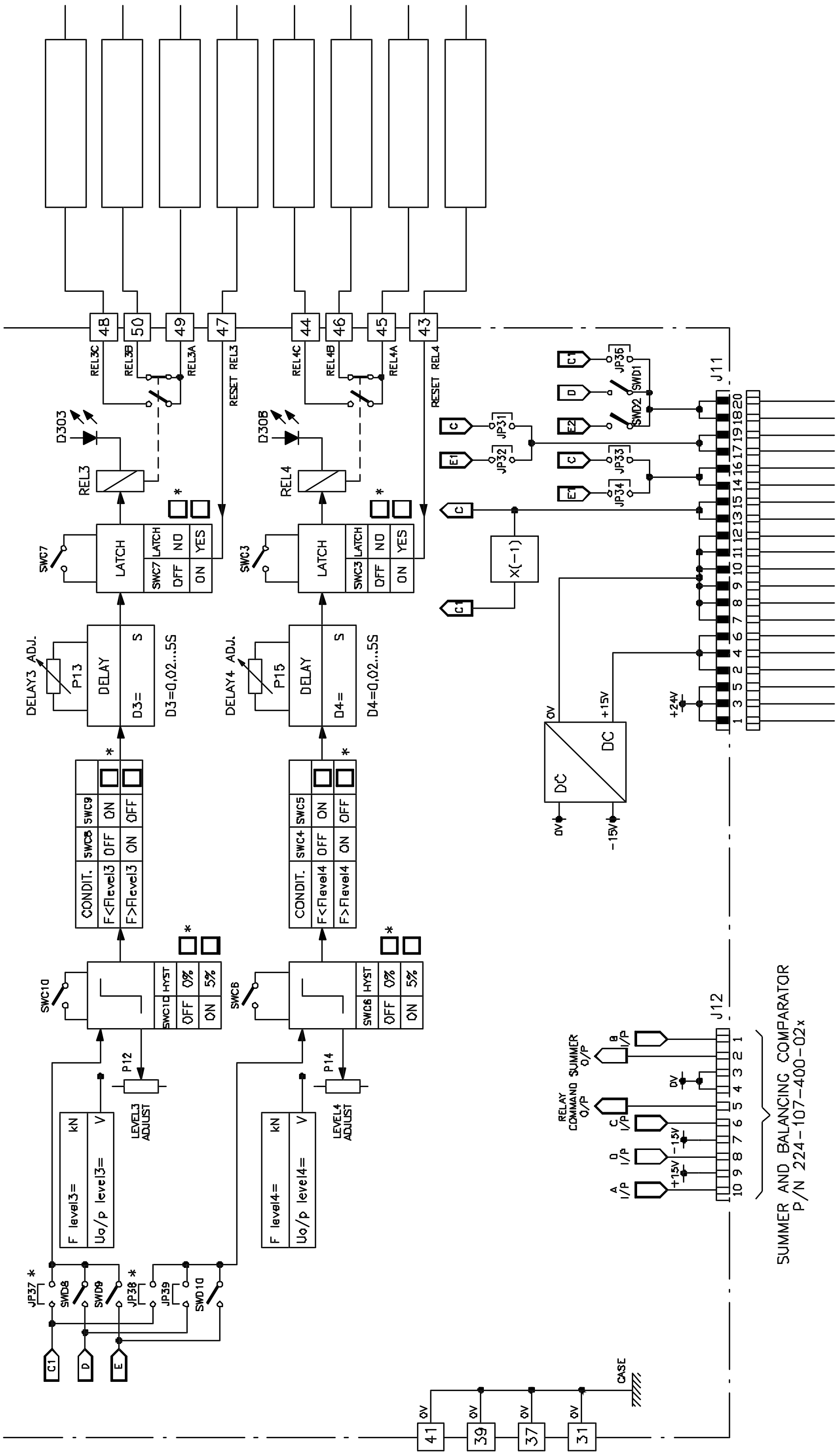
B CONFIGURATION AND CALIBRATION FORM

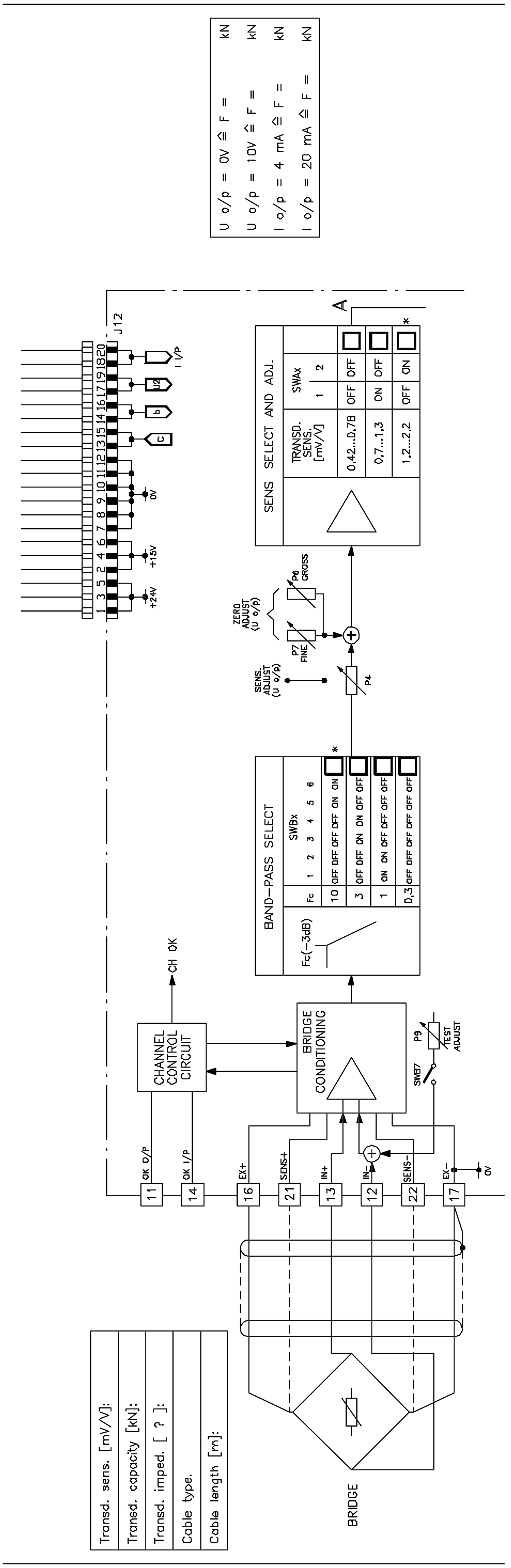
Configuration and calibration form PZ 6494 contained in this appendix must be duly completed by the user in accordance with the information given in Chapter 3 of this manual and placed inside the load monitor under the cover.

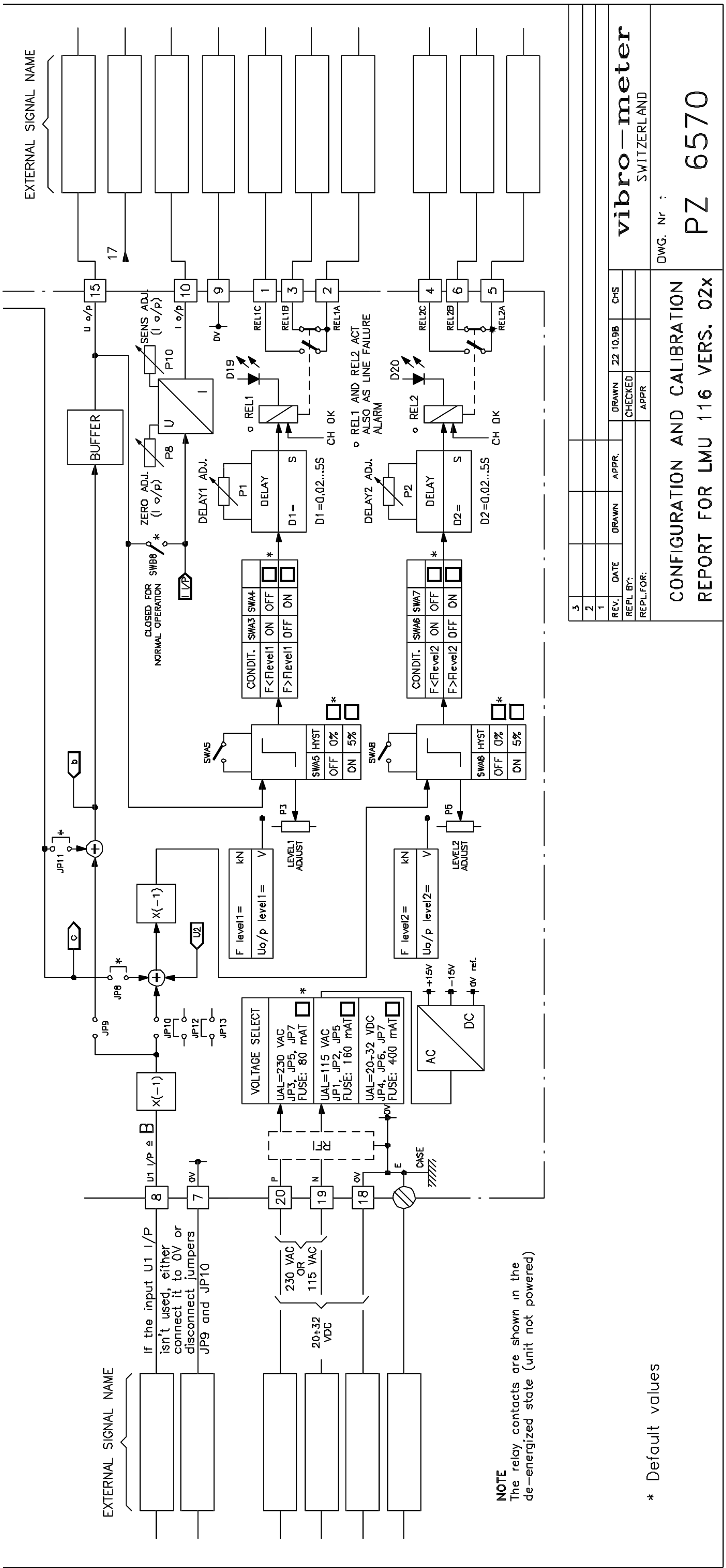
One copy of this must be returned to the address indicated below so that the after-sales service for the unit is assured on the best conditions :

Vibro-Meter SA
Instrumentation After-Sales Service
Route de Moncor 4
CH-1701 Fribourg


LMU 116
P/N : 224-116-000-02X
S/N :
EXTERNAL SIGNAL NAME
38
32
TARING O/P
UE O/P
E1
E2
D
RELAY COMMAND O/P
SUMMER O/P
X(-1)
E
JP42
JP41 *
X COEFFICIENT ADJUST
COARSE FINE
SW1
P11
P17
GAIN OFFSET
P16
INPUT OFFSET
SW1 Pos.Nr. | COEFFICIENT X MIN. | MAX.
1 | 4.99 | 10.5
2 | 2.49 | 5.32
3 | 1.21 | 2.64
4 | 0.57 | 1.31
5 | 0.24 | 0.61
UE1 = (UA + UB ± UC ± UD) X
SWD4 | SWD5 | SWC1 | ±UC | ±UD
OFF | OFF | OFF | 0 | 0
OFF | OFF | ON | 0 | -UD
OFF | ON | OFF | -UC | -UD
ON | OFF | OFF | +UC | 0
ON | OFF | ON | +UC | -UD
ON | ON | OFF | +UC | +UD
X(-1)
SWC1
SWD4
SWD5
P18
TARING OFFSET
TARING CIRCUITRY
SIGNAL I/P
SWD8 *
SWD7
C1
E2
D
C1
JP36
* SWD3
AUTO-ZERO
CDM-TAR
UA I/P
A I/P
UB I/P
B I/P
UC I/P
C I/P
UD I/P
D I/P
42
40
36
35
34
33
EXTERNAL SIGNAL NAME


48
50
49
47
44
46
45
43
REL3C
REL3B
REL3A
RESET REL3
REL4C
REL4B
REL4A
RESET REL4
D303
D308
REL3
REL4
LATCH
SWC7
SWC3
LATCH NO YES
OFF ON
DELAY
S
D3=
D3=0,02...5S
D4=
D4=0,02...5S
DELAY3 ADJ.
DELAY4 ADJ.
P13
P15
CONDIT.
F<Flevel3
F>Flevel3
F<Flevel4
F>Flevel4
SWC8
SWC9
SWC4
SWC5
SWC10
SWC6
HYST
0%
5%
P12
P14
LEVEL3 ADJUST
LEVEL4 ADJUST
F level3=
Uo/p level3=
F level4=
Uo/p level4=
kN
V
JP37
JP38
JP39
SWD8
SWD9
SWD10
C1
D
E
X(-1)
JP31
JP32
JP33
JP34
JP36
SWD1
SWD2
E2
E1
J11
DC
0V
+15V
-15V
+24V
J12
SUMMER O/P
RELAY COMMAND O/P
A I/P
B I/P
C I/P
D I/P
SUMMER AND BALANCING COMPARATOR
P/N 224-107-400-02x
CASE
41
39
37
31


U o/p = 0V ≙ F = kN
U o/p = 10V ≙ F = kN
I o/p = 4 mA ≙ F = kN
I o/p = 20 mA ≙ F = kN
J12
I/P
U2
b
c
0V
+15V
+24V
A
SENS SELECT AND ADJ.
TRANSD. SENS. [mV/V]
SWAx
1 2
0,42...0,78 OFF OFF
0,7...1,3 ON OFF
1,2...2,2 OFF ON
ZERO ADJUST (U o/p)
P6 GROSS
P7 FINE
SENS. ADJUST (U o/p)
P4
BAND-PASS SELECT
Fc(−3dB)
Fc
SWBx
1 2 3 4 5 6
10 OFF OFF OFF OFF ON ON
3 OFF OFF ON ON OFF OFF
1 ON ON OFF OFF OFF OFF
0,3 OFF OFF OFF OFF OFF OFF
CH OK
CHANNEL CONTROL CIRCUIT
BRIDGE CONDITIONING
P9
TEST ADJUST
SWB7
OK O/P
OK I/P
EX+
SENS+
IN+
IN−
SENS−
EX−
0V
11
14
16
21
13
12
22
17
BRIDGE
Transd. sens. [mV/V]:
Transd. capacity [kN]:
Transd. imped. [?]:
Cable type.
Cable length [m]:


EXTERNAL SIGNAL NAME
BUFFER
SENS ADJ. (I o/p)
ZERO ADJ. (I o/p)
DELAY1 ADJ.
DELAY2 ADJ.
REL1 AND REL2 ACT ALSO AS LINE FAILURE ALARM
CH OK
D1=0.02...5S
D2=0.02...5S
CLOSED FOR NORMAL OPERATION
LEVEL1 ADJUST
LEVEL2 ADJUST
VOLTAGE SELECT
UAL=230 VAC JP3, JP5, JP7 FUSE: 80 mAT
UAL=115 VAC JP1, JP2, JP5 FUSE: 160 mAT
UAL=20÷32 VDC JP4, JP6, JP7 FUSE: 400 mAT
AC
DC
230 VAC OR 115 VAC
20÷32 VDC
If the input U1 I/P isn't used, either connect it to 0V or disconnect jumpers JP9 and JP10
NOTE
The relay contacts are shown in the de-energized state (unit not powered)
* Default values
vibro-meter
SWITZERLAND
DWG. Nr :
PZ 6570
CONFIGURATION AND CALIBRATION REPORT FOR LMU 116 VERS. 02x

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C DECLARATION OF EC CONFORMITY

Designation	No.	Reference
Declaration of conformity	DEC No 202	QHB-001/K12

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Vibro-Meter Fribourg Switzerland	Formulaire-Q Déclaration de conformité CE	Formulaire No :	QFO-067F/a
		Réf. au document :	QHB-001/K12
		Date d'émission/Visa	95/11/28/W.K.

	Déclaration de conformité	DEC No 202	CE

Nous,

VIBRO-METER SA
Rte de Moncor 4
CH-1752 Villars-sur-Glâne (Suisse)

Déclarons, par la présente, que les produits :

Types de la famille

Moniteur de charge LMU

qui font l'objet de cette déclaration, remplissent les exigences définies par :

89/336/CEE Compatibilité électromagnétiques (CEM) / applicable pour les produits Vibro-Meter.
93/68/CEE Directives de marquage de 89/336/CEE (et suivantes)

Ces produits ont été développés et produits conformément aux directives internes QHB001 conforme à EN29001 / ISO 9001.

Pour l'évaluation de ces produits, les normes suivantes ont été prises en considération

EN 50081-2 Norme générique EMISSION partie 2 : environnement industriel
EN 50082-2 Norme générique IMMUNITE partie 2 : environnement industriel.

	Lieu et date de l'émission	Nom et signature
Représentants dûment autorisés de Vibro-Meter SA	Fribourg 22. 12. 95	P. Jeger
		W. Kurth

LMUF.doc/mj

Page 1 de 1

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PRODUCT DEFECT REPORT

If you should observe any problems with this Vibro-Meter product would you please contact your **Vibro-Meter agent**.
Please fill in this form (in English), giving as much specific information as possible on the problems observed. This will enable us to decide the quickest way to solve the problem.
NB : If more than one unit is defective, photocopy this sheet and fill in one copy for each unit.

☞ **THIS REPORT OR A COPY OF IT SHOULD ACCOMPANY THE DEFECTIVE UNIT AT ALL TIMES !**

NB : For plug-in modules this information can usually be found on the label stuck on its side.

Module type : ______________________

Part number (P/N) : ______________________

Serial number (S/N) : ______________________

Vibro-Meter order no. : ______________________

Date of purchase : ______________________

Site where used : ______________________

Problems observed : ______________________

____

____

____

____

____

____

(Please continue on back of sheet if necessary)

Is the problem :

☐ Always evident ?   ☐ Intermittent ?

☐ Temperature dependent ?   (☒ Mark as appropriate)

In case we need any further information, please provide us with the name of an employee with whom we can make contact :

Name : ______________________

Department : ______________________

Company : ______________________

Address : ______________________

____

____

Country : ______________ **Postal code :** ______________

Tel. : ______________ **Telex :** ______________

Fax : ______________

Signature : ______________ **Date :** ______________

Please cut out or copy and send to Vibro-Meter Sales agent

PRODUCT DEFECT REPORT
(cont.)

Please use this space for any additional information :

DOCUMENTATION EVALUATION FORM

Instruction Manual : LOAD MONITORING UNIT LMU 116 VERSIONS 02x AND 02xC **P/N :** 633.018 E

Vibro-Meter welcomes your evaluation of this intruction manual. Your comments and suggestions will help us to improve our documentation.

Please circle the following Yes or No :

• Is the document well organized ?	Yes	No
• Is the information technically accurate ?	Yes	No
• Would you like more technical detail ?	Yes	No
• Are the instructions clear and complete ?	Yes	No
• Are the descriptions easy to understand ?	Yes	No
• Are the examples and diagrams/photos helpful ?	Yes	No
• Are there enough examples and diagrams/photos ?	Yes	No
• Is the style/wording easy to read ?	Yes	No
• Are there any omissions ? (If so, please list below)	Yes	No

Comments : ____

____

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Name : ____

Title : ____

Company : ____

Address : ____

____

____

Country : ______________________ **Postal code :** ______________

Signature : ______________________ **Date :** ______________

Please cut out and mail to Vibro-Meter

Thank you for your cooperation

Tape here

Please do not staple

Tape here

Tape here

Tape here

Fold here

Attn : Technical Documentation Dept. (I / M)

Switzerland
CH-1701 Fribourg
Route de Moncor 4
Vibro-Meter SA

Place
stamp
here