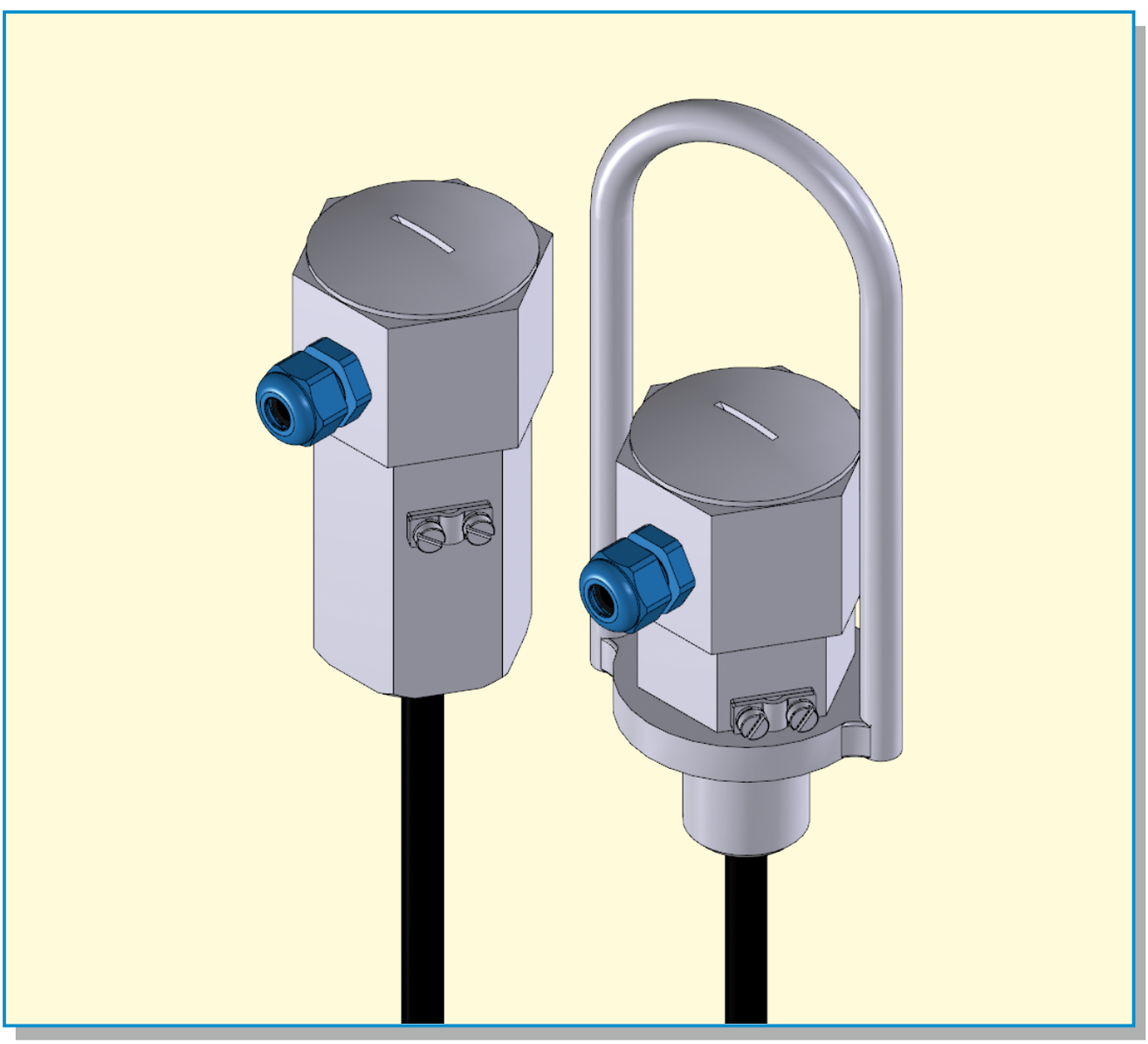
GRAIN-WATCH SYSTEM

Installationsmanual
Grain Watch Sensor Cables
GWSL1100/2100, GWML3100



C184A_Instman GWSL1100_2100_GWML3100 Eng20111124.cdr

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Table of contents

C184A_Instman GWSL1100_2100_GWML3100 Eng20111124.cdr

GWSL1100/2100, GWML3100 Grain Watch Sensor Cables

1. General description

The Grain Watch Temperature Monitoring System is a set of components used to monitor and supervise the temperature in grain storage facilities. The temperature is an instant indicator for all biological activity in the stored grain. Increased temperature reveals biological decomposition, mold, insect hatching and pests. Temperature measurement is done with temperature sensor cables and components that connect the sensor cables into a network with a single point of access. The temperatures can either be sampled manually with hand held portable instruments or be constantly supervised and logged with a stationary computer.

The environment, which some of the components of the Grain Watch Temperature Monitoring System are designed to operate in, can be classified as a hazardous area due to the presence of combustible dust. Electrical and mechanical equipment operating in this area has to be explosion and fire protected and separated from equipment in the non-hazardous area in order to be safe. The explosion and fire protection of the Grain Watch Temperature Monitoring System is realized using “Intrinsic safety” - “iD” and “dust ignition protection by enclosure” - “tD”.

The temperature sensor cables GWSL1100/2100 and the humidity sensor cable GWML3100 are the sensors in the Grain Watch Temperature Monitoring System which can contain up to 48 temperature sensors or 26 humidity sensors. The sensor cable has sensors evenly mounted, inside a protective, steel reinforced conduit cable, at intervals of 2-3 meters over the entire length of the cable. It is designed to be suspended in the ceiling of the silo, hanging down into the stored grain and thereby being able to measure the temperature of the grain throughout the entire height of the silo.

2. Before Use

2.1 Important safety precautions

The GWSL1100/2100 is intended for operation in the presence of combustible dust. This manual describes important points of caution regarding installation, connection and basic maintenance procedures. Please read this manual carefully before installing and operating the product.

❑ Verify that the operating atmosphere of the GWSL1100/2100 and GWML3100 is consistent with the appropriate hazardous locations certifications.

❑ Verify that the environmental temperature is within the specifications of the GWSL1100/2100 and GWML3100.

❑ Make sure all local legislative requirements regarding electrical installation, authorization, Ex and possibly other requirements comply with the specifications of the Grain Watch Temperature Monitoring System.

❑ Make sure only qualified personnel perform the installation.

3. Safety certification and features

3.1 Certification label information

The certification information is shown on a label placed on the top housing of the sensor cable.

GWSL1100-XX Serial No: YYYYWWNNN
IECEx TUN 10.0013X Ex ia IIIC T85°C
CE 0044 TÜV 10 ATEX 386498X Ex II 1D Ex ia IIIC T85°C
-20°C ≤ Ta ≤ +50°C U:5V I:3mA P:15mW
U_i:8V I_i:300mA P_i:500mW C_i:90nF L_i:0H L_i/R_i:30µH/Ω
AB Liros Electronic, Box 9124, S-200 39 Malmö, SWEDEN

GWSL2100-XX Serial No: YYYYWWNNN
IECEx TUN 10.0013X Ex ia IIIC T85°C
CE 0044 TÜV 10 ATEX 386498X Ex II 1D EX ia IIIC T85°C
-20°C ≤ Ta ≤ +50°C U:5V I:3mA P:15mW
U_i:8V I_i:300mA P_i:500mW C_i:90nF L_i:0H L_i/R_i:30µH/Ω
AB Liros Electronic, Box 9124, S-200 39 Malmö, SWEDEN

GWML3100-XX Serial No: YYYYWWNNN
IECEx TUN 10.0013X Ex ia IIIC T85°C
CE 0044 TÜV 10 ATEX 386498X Ex II 1D Ex ia IIIC T85°C
-20°C ≤ Ta ≤ +50°C U:5V I:5mA P:25mW
U_i:8V I_i:300mA P_i:500mW C_i:3,0µF L_i:0H L_i/R_i:30µH/Ω
AB Liros Electronic, Box 9124, S-200 39 Malmö, SWEDEN

In addition to the Ex certification information, it shows the product model number, variant number, serial number, year of manufacture, intrinsic safety parameters, operating parameters and LIROS Electronic name and location.

The manufactured year is identified by the serial number in the form YYYY WWNNN, where YYYY is the year, WW is the week number and NNN is the batch serial number. Serial No. 2011 05010 means that the unit is no. 10 of the batch manufactured in week 5, year 2011.

The certification label may not be removed.

3.2 Safety approvals

IECEx Type Examination Certificate: TUN 10.0013X

ATEX EC-Type Examination Certificate: TÜV 10 ATEX 386498X

- EN 60079-0:2009 / IEC 60079-0:2007, Explosive atmospheres – Part 0: Equipment – General requirements.

- EN 61241-11:2006 / IEC 61241-11:2005, Electrical apparatus for use in the presence of combustible dust – Part 11: Protection by intrinsic safety “iD”.

The GWSL1100/2100 and the GWML3100 are designed to meet the following ex protection methods:

IECEx marking: Ex ia IIIC T85°C

ATEX marking: Ex II 1D Ex ia IIIC T85°C

With the following nominal and safety data for GWSL1100/2100:

-20°C ≤ Ta ≤ +50°C U:5V I:3mA P:15mW

Ui:8.0V Ii:300mA Pi:500mW Ci:90nF Li:0H Li/Ri:30µH/Ω

And the following nominal and safety data for GWML3100:

-20°C ≤ Ta ≤ +50°C U:5V I:5mA P:25mW

Ui:8.0V Ii:300mA Pi:500mW Ci:3,0µF Li:0H Li/Ri:30µH/Ω

- It is an intrinsically safe component that can be installed in hazardous locations with atmosphere containing combustible dust classified as Zone 20, 21 and 22. It has to be connected to an associated

apparatus compatible with the intrinsic safety parameters: Ui:8.0V, Ii:300mA and Pi:500mW. It adds 90nF (GWSL1100/2100) or 3.0µF (GWML3100) and 0H to the total capacitance and inductance of the intrinsically safe circuit. It has an Li/Ri ratio of 30µH/Ω

❑ The surface of the enclosure can reach a maximum temperature of 85°C when operated in an ambient temperature between -20°C to +50°C. This has not been determined with a dust layer test or dust immersion test.

❑ Nominal values for U, I and P are 5V, 3mA and 15mW (GWSL1100/2100) or 5mA and 25mW (GWML3100).

The GWSL1100/2100 and GWML3100 are also tested to meet the Council Directive 2004/108/EC Electromagnetic Compatibility (EMC) by applying the following standards:

❑ EN/IEC 61000-6-2:2001, Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity for Industrial Environments.

❑ EN/IEC 61000-6-3:2001, Electromagnetic Compatibility (EMC) – Part 6-3: Generic Standards – Emission standard for residential, commercial and light-industrial environments.

3.3 Variants

The XX after the model number in the labels above identifies the variant for the sensor cable. The difference between the variants is that the top housing is made for different types of suspension methods in the silo.

The sensor cables can be mounted with one of the following methods.

Suspension in loop: The sensor cable is hanged inside the top of the silo in a loop mounted on the sensor cable housing.

Floor well mount: The sensor cable is mounted through a floor well in the top of the silo. This is used for concrete silos.

Pipe mount: The sensor cable is mounted through a pipe on top of the silo. This is used for steel bin silos.

Pipe mount with loop: This is the same as the pipe mounted sensor cable with a loop mounted on the sensor cable top housing. The sensor cable can then either be suspended in the loop or mounted through a pipe.

Short floor well mount: The sensor cable is mounted through a floor well in the top of the silo. This is mainly used for concrete silos where there already are floor wells with limited space.

3.3.1 Variants for GWSL1100

GWSL1100-01	Floor well mount
GWSL1100-02	Pipe mount
GWSL1100-03	Short floor well mount

The GWSL1100-01 can be fitted with an external suspension loop which enables it to be hanged inside the silo.

3.3.1 Variants for GWSL2100

GWSL2100-01	Suspension loop
GWSL2100-02	Floor well mount
GWSL2100-03	Pipe mount
GWSL2100-04	Pipe mount with loop
GWSL2100-05	Short floor well mount

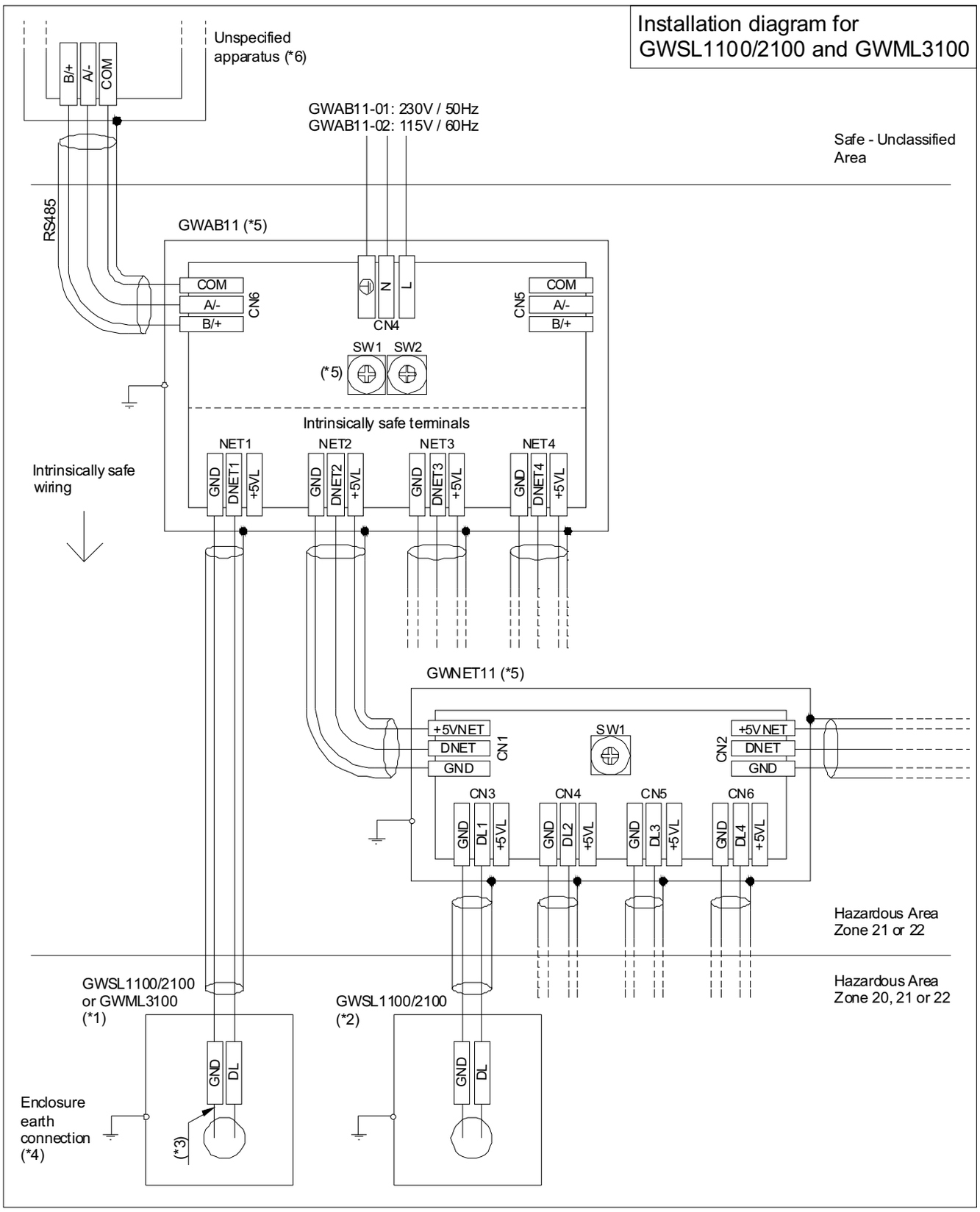
3.3.1 Variants for GWML3100

GWML3100-02	Floor well mount
GWML3100-03	Pipe mount
GWML3100-04	Pipe mount with loop
GWML3100-05	Short floor well mount
GWML3100-06	Suspension loop

The GWML3100-06 has a sensor mounted in a filter in the top housing in order to be able to measure the moisture conditions in the head space above the grain in the silo.

4. Installation

4.1 Installation diagram



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The installation diagram shows a typical installation using a GWAB11 as the intrinsically safe associated apparatus, i.e. the barrier and a GWNET11 to extend the number of sensor cable inputs in the GWAB11.

Notes:

*1: A sensor cable which can be any of the types GWSL1100/2100 or GWML3100.

*2: A sensor cable which can be of the types GWSL1100 or GWSL2100. The humidity sensor cable GWML3100 can not be connected to a GWNET11.

*3: GND and DL is marked only by the color of the wires. GND is white or gray. DL is white or gray with a red stripe.

*4: In order to prevent an ignition hazard caused by electrostatic build-up and subsequent propagating-brush-discharges, lightning or other electrical faults, the top housing of the sensor cable has to be grounded to earth. The surface of the protective conduit cable is electrically conductive in order to discharge electrostatic charges. It is essential that the sensor cable is connected to a local earthed ground potential with as short wires as possible.

*5: Components part of the Grain Watch Temperature Monitoring system. Note that it is only the sensor cables that can be placed in hazardous locations Zone 20. For installation information regarding the other components, see the individual installation manuals for the respective component.

*6: Apparatus that is unspecified except that it must not, under normal or abnormal conditions, be supplied from, nor contain, a source of voltage with respect to earth, in excess of 250V r.m.s. This is normally a host computer which communicates with the GWAB11s through the RS485 interface.

4.2 Components connected to the safe circuit

The sensor cables are intrinsically safe components that can be installed in atmosphere containing combustible dust. In order to not invalidate the safety, the sensor cables must be connected to an associated apparatus, i.e. a safety barrier. The entity parameters of the intrinsically safe components and the wiring connected to the intrinsically safe circuit have to match the parameters of the safety barrier in the associated apparatus, e.g. a GWAB11 or GWAB12. All the intrinsically safe components in the Grain Watch Temperature Monitoring System, including the sensor cables are designed to be compatible with the safety barrier in the GWAB11 and GWAB12. These parameters include Uo/Ui, Io/Ii, Po/Pi and Co/Ci.

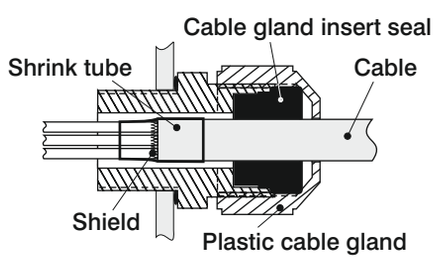
4.3 Wiring

Wiring has to be done in accordance with intrinsic safety standards. Wiring with non-intrinsically safe circuits must be separated from wiring with intrinsically safe circuits. Wires with separate intrinsically safe circuits must also be separated from each other, e.g. wiring from two separate GWABs. Separate conduits, cable trays etc. can be used to keep the wiring separate. Wiring to separate sensor cable inputs in one GWAB are part of the same intrinsically safe circuit and does not have to be separated. Wiring to all sensor cables connected to all GWNET11s for one GWAB is also part of the same intrinsically safe circuit.

Intrinsically safe wiring must be clearly identified, preferably by using a light blue color, as long as no other wiring is light blue. If light blue is used on non-intrinsically safe wiring, the intrinsically

safe wiring can be marked by other means, such as tagging. This must be visible after installation.

For improved EMC performances it is recommended that wiring of the safe circuit is done with a shielded cable. Since current flowing in earth loops in the hazardous area can invalidate the safety, the shields have to be connected in one end of the cable only. Cables connected to the sensor cables, through the plastic cable gland shall NOT have its shield terminated since it already is terminated in the other end in the GWNET or the GWAB. The shield for the connecting cable has to be insulated from the circuits and the metallic top housing in the GWSL1100/2100 and the GWML3100. The insulation must be done with shrink tube or equivalent and be done so that the shield is insulated inside the plastic cable gland. The insert seal in the cable gland shall only cover the cable itself and not the shrink tube. The insulation between the shield and the earthed top housing and the circuits inside the housing has to be capable of withstanding an r.m.s. a.c. test voltage of at least 500V.



The shield, at any end of the cable, MUST NEVER, under any circumstance, be connected to GND or any other terminal in the sensor cables, the GWNET11 or the GWAB11/12.

For sensor cables that have the top housing located outside, e.g. pipe mounted variants, wiring should be done so that the incoming cable is connected from below in order to minimize risk of rain water flowing into the housing on a cable connected from above. In this case it is also important to make sure that the top blanking element, the lid, and the cable gland is fully engaged. For extreme conditions there is also a hood available that protects the top housing from the outside weather.

4.4 Setup

In order for the host system to be able to acquire the data from the sensor cables, each sensor cable has to be uniquely identified with an address in the sensor cable network. This is not done in the sensor cable itself; instead it is done with switches in the GWAB11/12 and the GWNET11. This has the advantage that sensor cables can be swapped or replaced without reconfiguration of the host software.

Part of the address for a sensor cable is determined by which input in the GWNET11 or the GWAB11/12 that the sensor cable is connected to which means that it is important to use the correct input and not change inputs once the system is configured and operating.

When Liros TMS PC software is used, it is always accompanied with a CD that contains the software pre configured and with a binder containing schematic diagrams and component overviews with information about how the switches in the GWAB11/12s and GWNET11s should be set and at what input in the GWAB11/12s or the GWNET11s the sensor cables should be connected to. For a successful installation these instructions must always be followed exactly. If the sensor cables are not connected according to the instructions in the binder or the switches are not set according to the instructions, the software will not work and the temperatures for a sensor cable may not show up at all or it may be displayed as temperatures for another sensor cable.

4.5 Checklist before applying power

Make sure to check that:

❑ The GWSL1100/2100 or GWML3100 and all components in the system operating in the hazardous area are connected to an appropriate earth connection.

❑ All sensor cables are connected to the correct inputs in the GWAB11/12 or GWNET11 in accordance with the connection diagrams.

❑ Wiring is done according to the connection diagrams and intrinsic safety standards.

❑ The shields for all cables in the hazardous locations are connected at one end only and that they are connected to the enclosure or sensor cable housing using the metal EMC cable glands.

❑ The top blanking element in the sensor cable is fully engaged and the cable glands are tightened accordingly, especially in sensor cables where the top housing is located outside the silo.

5. Maintenance and repair

5.1 Periodic maintenance

The unit should periodically be cleaned from excessive layers of dust.

Check integrity of earth grounding and electrical connections at periodical intervals.

5.2 Repair

The GWSL1100/2100 and the GWML3100 are not field repairable and contains no replaceable parts. Any attempt to modify or repair this unit will void the warranty and the safety certification. If repair is necessary, return the unit to the manufacturer.

C184A_Instman GWSL1100_2100_GWML3100 Eng20111124.cdr

6. GWNET11 Specifications

6.1 GWSL1100/2100 and GWML3100 Specifications

U - Nominal voltage	5V
I - Nominal current	GWSL1100/2100: 3mA GWML3100: 5mA
P - Nominal power	GWSL1100/2100: 15mW GWNL3100:25mW
Ui – Maximum voltage that can be applied to any terminal without invalidating safety	8.0V
Ii - Maximum current that can be applied to any terminal without invalidating safety	300mA
Pi - Maximum power that can be applied to any terminal without invalidating safety	500mW
Ci – Maximum unprotected internal capacitance	GWSL1100/2100: 90nF GWML3100: 3.0μF
Li/Ri – internal inductance to resistance ratio	30μH/Ω
Maximum surface temperature	85°C
Operating temperature	-20°C – +50°C
Certifications	IECEx: TUN 10.0013X ATEX: TÜV 10 ATEX 386498X
Marking	IECEx: Ex ia IIIC T85°C ATEX:  I 1D Ex ia IIIC T85°C

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