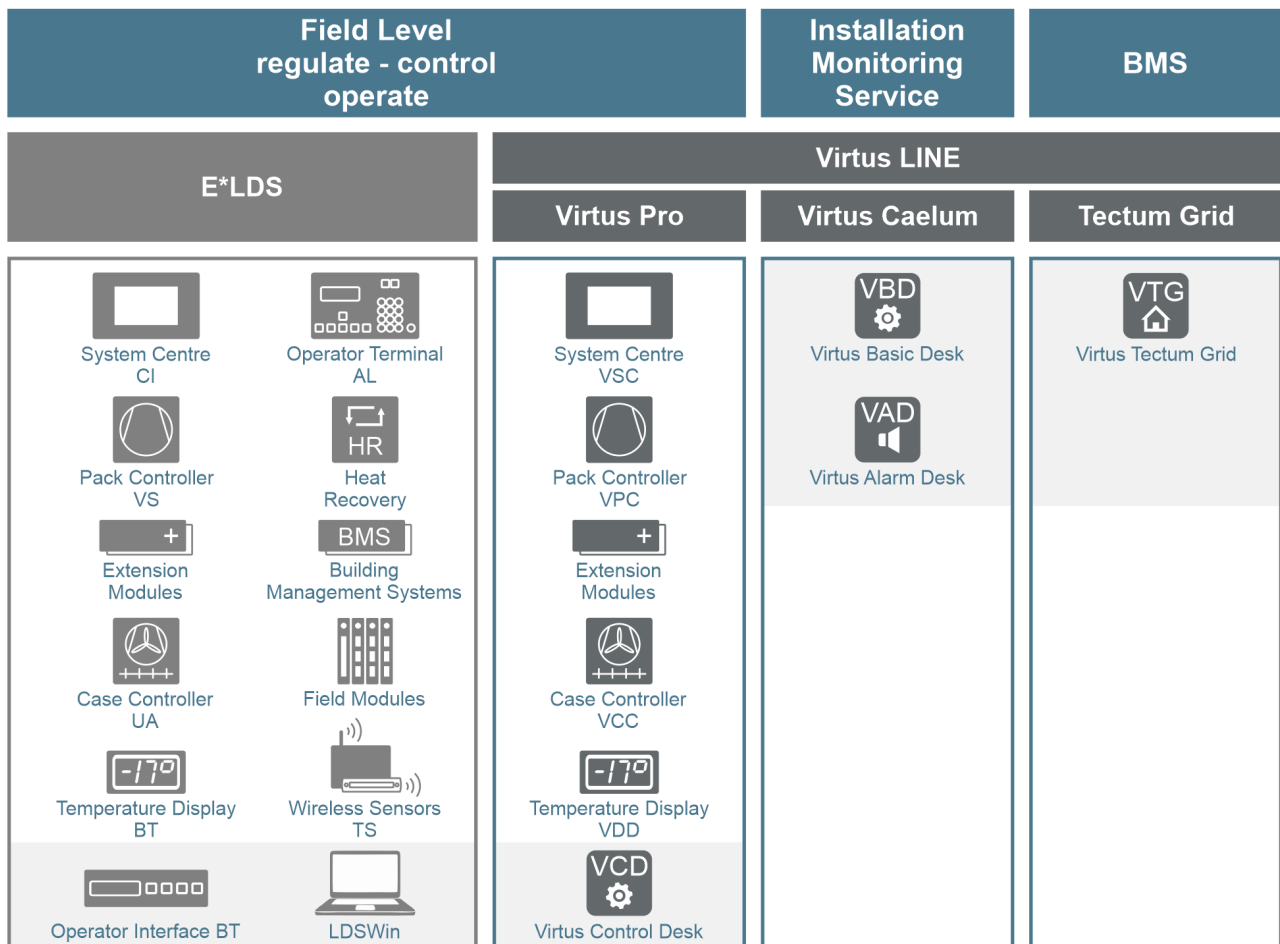


Operating instruction

E*LDS Safety Instructions and Basics

Overview of E*LDS components, CAN bus and Modbus

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www.eckelmann.de/elds

You reach all relevant documents for this component directly using the QR code:

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https://edp.eckelmann.de/edp/lds/_0sErd44C8T

Information on safety and connection instructions are described in detail in chapter "Industrial safety notes".

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1 Conventions

1.1 Warning Signs and Symbols Employed

Explanation of the warning signs, symbols and text formatting used in this operating and service manual:

- **DANGER**

 **DANGER**

Instructions with this symbol and/or the signal word **DANGER** warn the user of situations that will cause severe injury or death if the specified instructions are not observed! *

- **WARNING**

 **WARNING**

Instructions with this symbol and/or the signal word **WARNING** warn the user of situations that may cause severe injury or death if the specified instructions are not observed! *

- **CAUTION**

 **CAUTION**

Instructions with this symbol and/or the signal word **CAUTION** warn the user of situations that may cause moderate or minor injury if the specified instructions are not observed! *

* If any of these symbols **DANGER/WARNING/CAUTION** is recognized, the user **must** refer to the operating manual in order to understand the type of potential **HAZARD** and the required actions for avoiding the **HAZARD**. Carefully observe all health and safety instructions and use particular caution in these situations. **Failure to observe the DANGER/WARNING/CAUTION symbols will cause injury (in the worst case, severe injury or death) and/or damage to property!**

- **ATTENTION**

 **ATTENTION**

Instructions with this symbol and/or the signal word **ATTENTION** warn the user of situations that may cause damage to property if the specified instructions are not observed! The **ATTENTION** symbol highlights guidelines and regulations, instructions and proper working procedures that must be particularly observed in order to prevent damage to and destruction of components or malfunctioning. **Failure to observe the ATTENTION symbol will cause damage to property!**

- **NOTICE**

 **NOTICE**

Instructions with this symbol and/or the signal word **NOTICE** provide tips and useful additional information.

- **ELECTRIC SHOCK**



Risk of fatal electric shock!

This symbol warns of danger from **dangerous voltage** with possible consequences such as severe injury and death. If this symbol is seen, the user **must** refer to the operating manual in order to understand the type of potential **HAZARD** and the required actions for avoiding the **HAZARD**. Carefully observe all health and safety instructions and use particular caution in these situations. **Failure to observe the WARNING symbol will cause injury (in the worst case, severe injury or death) and/or damage to property!**

- **ESD - Electrostatic-sensitive components and control components**



Risk of destruction of the control component / controller!

Electronic components and control components (e.g. circuit boards) are sensitive to electrostatic charges. Circuit boards may only be replaced when the **power supply is disconnected**. Always hold circuit boards by the edges. The guidelines for the handling of electrostatic-sensitive components and control components **must** be observed at all times. **Failure to observe the ESD symbol will cause damage to property!**

- **DISPOSAL**




Potential negative impact on people and the environment due to non-environmentally friendly disposal.

The strike-through dustbin symbol indicates the duty to dispose of items properly. Do not dispose of this product with other domestic waste, see chapter Disposal. Please inform yourself about the local regulations for the separate disposal of electrical and electronic products. The correct disposal of your old equipment protects people and the environment from possible negative impact. **Failure to observe the DISPOSAL symbol will cause damage to people and the environment!**

1.2 Explanation of 'Safety Instructions and Hazard Warnings'

Safety instructions or hazard warnings are composed of four elements:

1. The symbol  with text (e.g. for DANGER),
2. a concise description of the hazard and
3. a description of the possible consequences.
4. Where applicable, a catalogue with measures for avoiding the hazard.

For example:




DANGER

Warning of dangerous electrical voltage! Risk of fatal electric shock!

Beware of external voltage at the digital inputs and outputs (relay/SSR)! Connections/plug connectors of the device may only be plugged in, removed and/or wired when **no voltage is present**.

A **general instruction** consists of two elements:

1. The symbol  with text (including NOTICE, if applicable) and
2. the text of the instruction:

For example:



NOTICE

The current operating manual is available online from the E°EDP (Eckelmann ° Electronic Documentation Platform) at www.eckelmann.de/elds.

2 Safety instructions

This operating manual is part of the device. It **must** be kept in the vicinity of the controller as well as for future use so that it can be consulted when required. The operating manual must be available to the operating and maintenance personnel at all times in order to avoid operating errors. The safety regulations, instructions and information **must be strictly observed and complied with**. During repairs on the entire E*LDS system, the accident prevention regulations and general safety regulations must be strictly complied with. Important information (safety instructions and hazard warnings) are indicated by appropriate symbols, see chapter Conventions. Follow these instructions in order to prevent accidents and danger to life and limb, as well as damage to the E*LDS system!

Always observe the following information:



DANGER

Warning of dangerous electrical voltage! Danger of electric shock!

Beware of external voltage at the digital inputs and outputs (relay/SSR)! Connections/plug connectors of the device may only be plugged in, removed and/or wired when **no voltage is present**.

- Work on the electrical system may only be performed by **authorised, skilled personnel** (according to the definition of skilled persons in DIN/VDE 0105 and IEC364) while observing the applicable
 - VDE regulations
 - Local safety regulations
 - Intended Use
 - Five safety rules according to DGUV Regulation 3
 - ESD measures
 - Operating manuals
- For safety reasons, the equipment must not be used for any applications other than described in the operating manual and only for the intended use.
- **Before** using the device, check whether it is suitable for your application with regard to its limit values.
- The equipment **must** be installed in an electrically shielded area within the switch cabinet.
- Before connecting the device, it **must** be checked whether the power supply is suitable for the device.
- Coded connectors **must** be used, as there is a possibility of plugging in non-coded connectors in such a way that there is a danger to life and limb!
- Specified ambient conditions (e.g. humidity and temperature limits, see chapter Technical Data) **must** be observed and complied with at all times to prevent malfunction.
- **Before** switching on the device, check the correct wiring of the connections.
- The device must **never be operated without** its housing. If the intended use requires opening the housing, the control unit **must** be disconnected from the power supply before opening the housing.
- Note the maximum load of the relay contacts, see chapter Technical Data.
- Note that all supply lines from and to the device, particularly those of the CAN bus and Modbus, must be shielded or installed sufficiently far away from live cables. This prevents faulty measurements and protects the device against electrical interference via the analogue inputs. Connection in parallel of RC elements is recommended for applications with critical environment.
- Contact the supplier in the case of any malfunction.

ATTENTION


Warning of damage to goods!

In our experience, the transmission of fault messages is not yet functional during the putting into service (no internet connection, no telephone line installed, etc.). It is strongly recommended in such cases to monitor the controller via the CAN bus using a system centre, a store computer or an operator terminal and to enable the transmission of fault messages, for example using a GSM modem via a mobile telephone system. In standalone operation, or as an alternative to monitoring via system centre / store computer / operator terminal, an available alarm contact on the controller must be used to enable the transmission of fault messages via a telephone network.

For more information, refer to [E*LDS basics](#), [safety instructions](#), [CAN bus & Modbus](#).

2.1 Disclaimer in the event of non-compliance

These operating instructions contain information on the commissioning, function, operation and maintenance of the controls and of the associated components.

 **Observance** of these operating instructions is a prerequisite for safe and trouble-free operation.

2.2 Personnel requirements, requirements on staff

Special technical knowledge is required for planning, programming, installation, putting into service and maintenance work. This work may **only** be performed by skilled, specially trained personnel. The installation, putting into service and maintenance personnel must have training that authorises them to perform interventions in the system and the automation system. The planning and programming personnel must be familiar with the safety concepts of automation technology. Working on electrical systems **requires special technical knowledge**. Work on electrical systems may only be performed **by instructed electrically skilled persons** or under the guidance or supervision of such persons. The applicable regulations (e.g. DIN EN 60204, EN 50178, DGUV Regulation 3, DIN-VDE 0100/0113) must be observed. The operating personnel must be instructed in how to handle the system / machine and the controller and must be familiar with the operating instructions.

2.3 Intended Use

The E*LDS system is exclusively designed for its intended use: All the controllers of the E*LDS system are designed for use in commercial and industrial refrigeration facilities in accordance with the functional parameters and environmental conditions described in the instruction manuals.

Read the safety instructions and the instructions for installation and putting into service, operation and maintenance. THEN start the commissioning and/or operation of the machine / system.

The safety and functionality of the machine / system are only guaranteed for this intended application. Never use the machine / system, its components, control components or parts for any other purpose. The system must not be put into operation until conformity with the applicable EU Directives has been established for the entire system.

2.4 BGV A3 - Five safety rules

The following rules must be strictly observed!

1. Disconnect: The entire system to be worked on must be disconnected from the power supply at all poles.

DANGER

Warning of dangerous electrical voltage! Warning of dangerous electrical voltage! Danger of electric shock!

Beware of a possible external power supply! **BEFORE** connecting and disconnecting it must be checked that **no voltage is present** at the controller! Connections/plug connectors of the device may only be plugged in, removed and/or wired when **no voltage is present**.

2. Secure against reconnection: Attach information signs to the disconnected operating equipment stating:

- What has been disconnected.
- Reason for the disconnection.
- Name of the person who made the disconnection.
- Reconnection must be prevented using a suitable lock (e.g. padlock).

3. Prove dead (authorised skilled personnel only):

- Check voltmeter just before use.
- Prove dead on all poles at the disconnection point.
- Prove dead on all poles at the work area.

4. Ground and short-circuit: All electrical parts at the work area **must be grounded and then short-circuited**.

5. Cover or block off adjacent live parts: If there is live equipment adjacent to the work area, it must be covered using appropriate materials (e.g. insulation blankets / plates).

2.5 Electrostatic sensitive devices (ESDs)

All electrostatic-sensitive components and control components (referred to as "ESD" below) are labelled with the warning sign shown. Electrostatic charges arise from friction of insulating materials (e.g. floor covering, items of clothing made of synthetic fibres etc.). Even small charges can result in damage to or destruction of components. Such damage is not always immediately noticeable; in some cases, it does not lead to failure until after a certain operating time.

ATTENTION



Risk of destruction of the control component / controller! Electronic components and control components (e.g. circuit boards) are sensitive to electrostatic charges. Therefore, the guidelines for handling electrostatic-sensitive components and control components must be strictly observed.

2.5.1 ESD - Rules for handling and working

Transport and store ESDs only in the protective packaging provided.

Avoid materials that may produce electrostatic discharge, for example

- Plastic containers and table tops
- Synthetic fibre clothing
- Plastic-soled shoes
- Plastic file covers
- Styrofoam packaging
- Computer monitors, etc.

Preferably wear the following:

- Cotton work clothes
- ESD shoes with conductive soles or leather soles

Use the following:

- Conductive flooring
- ESD workstations equipped with suitable tools (grounded soldering guns, antistatic wrist straps, etc.)
- Conductive ESD bags, conductive plastic containers, IC tubes or cartons lined with conductive foam
- Containers and worktops made of wood, metal or conductive plastics or paper bags

2.6 Abbreviations used

- DGUV Regulation 3 - Accident Prevention Regulation for Electrical Systems and Equipment (previously: BGV A3 - Employer's Liability Association Regulation for Occupational Health and Safety)
- DIN Deutsches Institut für Normung e.V. (German Standardisation Institute)
- E°EDP/EDP Electronic Documentation Platform of Eckelmann AG
- ESD Electrostatic-Sensitive Device
- ESD Electro-static discharge (Electro Sensitive Devices)
- IEC International Electric Committee
- VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V. (German Association for Electrical, Electronic and Information Technologies)

3 Overview of the E*LDS system

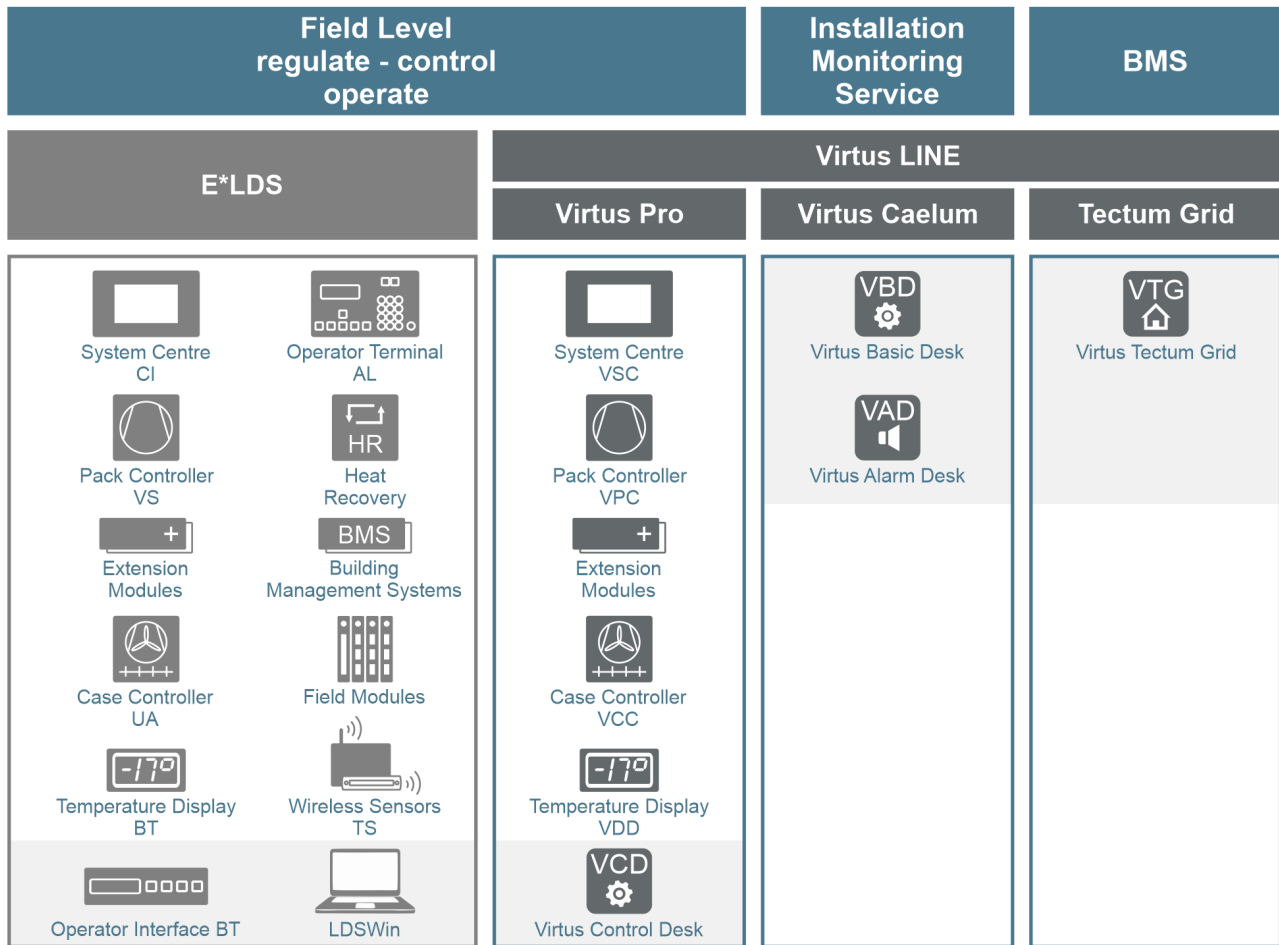
The E*LDS system

Electronic information systems optimise efficient operational processes in all technical application areas and provide reliability.

The E*LDS system (**L**ong **D**istance **S**ervice) is such an electronic information system that is used particularly in the sensitive perishables and deep-freeze areas of supermarkets and warehouses and communicates with the E*LDS components over a long distance via CAN bus. It is characterised by very high efficiency and reliability, as refrigerated and frozen food display cases, storage rooms and associated refrigeration systems are controlled, monitored and ensured according to ambient conditions in a system-integrated manner.

The following diagram shows the structure of the E*LDS system and the Virtus LINE:

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Characteristics

The E*LDS system ensures an optimum cold supply of the refrigerated goods due to constantly synchronised data with continuous setpoint/actual value comparison of the refrigeration points and the refrigeration pack. The operating behaviour of all connected cold generators and consumers is subject to a complete check, whereby any irregularities can be detected and remedied at an early stage. The energy consumption of the entire installation is minimised thanks to an integrated energy management system.

Current information about our E*LDS products can be found at www.eckelmann.de/produkte-loesungen/kaeltetechnik.

i This document contains important information about the commissioning and functionality of the CAN bus and Modbus as well as instructions and tips for connecting the associated E*LDS components. It is a reference work for operating and service personnel and is designed to ensure the safe handling of the E*LDS system and E*LDS components. In order to avoid operating errors, the operating and service manuals must be available to operating and service personnel **at all times**.

3.1 Short description of E*LDS components

Using **Virtus Caelum** or the dongle-protected **LDSWin PC software**, current temperatures, operating states and the store layout can be clearly displayed on a **service PC**. In addition, all data from refrigeration points and refrigeration pack systems are automatically archived (EU archiving) for any period of time, and daily temperature lists (HACCP - Hazard Analysis and Critical Control Points) are automatically created and printed. For example, several refrigeration pack systems of various supermarkets can be supported and monitored from a remote service centre using a **central computer** with Internet connection. All E*LDS components can be operated centrally or decentrally with up to nine **AL 300 operator terminals** on-site in the store. The operator terminal has an alarm memory with acknowledgement function and floating contacts for the PRIO1 and PRIO2 alarm priorities so that an alarm device can be controlled hierarchically.

In addition, a **CI 4x00/CI 5x00/ or Virtus 5 series system centre** is usually integrated in the E*LDS system. However, the system centre also stores and archives all operating data of the E*LDS components. A **Service PC** can also be connected to the system centre for support, parametrisation, configuration and monitoring of the store.

For remote service, the system centre can be integrated into a network or equipped with a modem and is connected to the E*LDS components via the CAN bus. Furthermore, up to four DDC modules (Digital Direct Control) from the **building management system (BMS)** can be integrated. The actual and target values of the connected refrigeration points and refrigeration pack systems are recorded and archived by the system centre and, if required, made available for remote data transmission.

The control of the refrigeration pack systems is performed by the universally deployable **VS 3010 pack controller**, which ensures energy-optimised operation. The VS 3010 allows the connection of four compressor stages and four condenser stages as well as 2 external speed controllers. The E*LDS System can be connected to a maximum of 9 pack controllers. Furthermore, the VS 3010 can be expanded to up to twelve compressor and condenser stages using two **SIOX extension modules**. For the realisation of special regulation tasks and requirements, the **VS 3010 BS** (for booster/satellite operation), the **VS 3015 CT and VPC 5000** (for transcritical CO₂ systems) and the **FS 3010** (for water chiller units) can be integrated into the system. With the **VS 300**, the E*LDS system has a compact pack controller available that can also take over challenging standalone refrigeration pack tasks.

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A wide range of applications for normal and low temperature cooling can be covered with the **UA 400 series of case controllers** for DIN rail mounting. The special controller functions have been specifically developed to meet their specific refrigeration requirements. A maximum of 99 case controllers can be integrated into the E*LDS system. One **BT 300 x** operator interface on each case can be connected to the individual case controllers of the UA 400 series for convenient operation and checking of setpoint and actual values of the refrigerated cases / cold rooms and for temperature display. It is also possible to connect up to four **BT 30 temperature displays** to each case controller of the UA 400 series in order to provide the refrigerated case elements with a clear on-site temperature display. Up to four **VDD 500 temperature displays** can be connected to the **UA 4xx E refrigeration controller**.



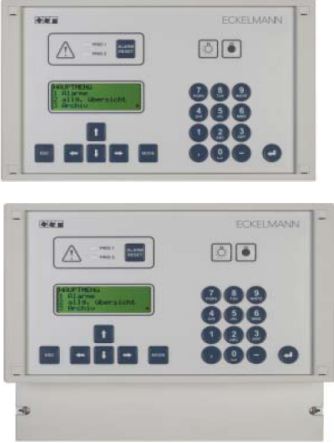

Furthermore, up to 50 **UA 30 series compact case controllers** can be integrated into the E*LDS system via Modbus: these can be directly connected to a CI 4x00-/CI 5x00-/ and Virtus 5 series system centre. Using the **LDS1 Gateway**, up to 48 case controllers of the LDS-1 system can be integrated into the E*LDS system.

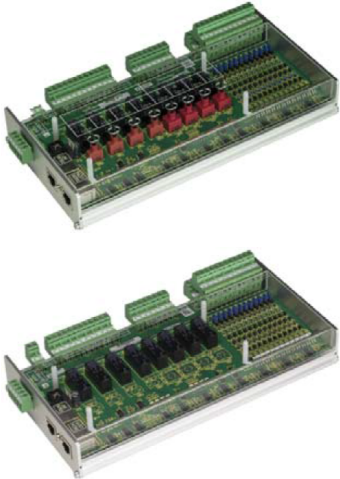




The **TS 30 W / XW radio sensors** are available for recording and monitoring of any temperatures in cases, cold rooms or outdoor and room temperatures. They are integrated in the E*LDS system using the **Receiver Module WR 300**. Up to four receiver modules with up to 100 wireless sensors each can be integrated in the system.




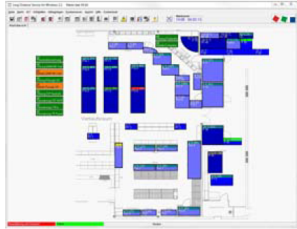


In addition to the refrigeration technology components, the system has been extended with the addition of the **Compact GLT x010** for freely programmable solutions for integrated building control technology.

3.2 Presentation of E*LDS components

Detailed information about the individual E*LDS components and accessory parts can be found in their operating manuals or data sheets that are available for you online in E°EDP (*Eckelmann ° Electronic Documentation Platform*) at <https://edp.eckelmann.de/edp/lids/start>.

E*LDS components	
<p>System centre Virtus 5 series VCS 5410 / VCS 5510 Successors for CI 3x00 / CI 4x00 / CI 5x00</p>	
<p>System centre CI 4x00 / CI 5x00 Successors for CI 3x00</p>	
<p>Operator Terminal AL 300</p>	
<p>Pack controllers</p> <ul style="list-style-type: none"> • VS 3010 • VS 3010 BS (booster / satellite) • VS 3010 CT (CO₂, transcritical) • VS 3015 CT (CO₂, transcritical) • FS 3010 (brine systems) • VS 3010 WP (heat pumps) • GLT x010 (building control) 	

E*LDS components	
<p>SIOX extension modules Serial IO extension with / without switch for</p> <ul style="list-style-type: none"> • CI 3x00 / CI 4x00 / CI 5x00 Virtus 5 series • GLT x010 VS 3010, VS 3010 BS, VS 3010 CT, VS 3015 CT, WRG 3010 x FS 3010, VS 3010 WP 	
<p>Compact pack controller VS 300</p>	
<p>UA 400 series Case Controllers Successors for UA 300 series</p> <ul style="list-style-type: none"> • UA 400: Universal controller (TEV) • UA 410 D: Discount controller (TEV) • UA 4xx E: Electronic Expansion Valves (EEV) • UA 410 L: Temperature recording controller (logger) 	
<p>Compact case controllers UA 30 series</p>	
<p>Operator interfaces for UA 400 series / UA 213 S BT 300 x</p>	

E*LDS components	
Temperature Display <ul style="list-style-type: none"> • VDD 500 • BT 30 • RJ45 splitter for up to 4 BT 30 	
Receiver Module WR 300	
Radio sensors TS 30 W / TS 30 XW	
Web application Virtus Caelum	
PC software LDSWin	
Gateway LDS1 Gateway for integration of up to 48 case controllers of the old system	
Accessories <ul style="list-style-type: none"> • CAN bus repeater • RS232 to RS485 converter for Modbus (only required for CI 3000) 	

4 CAN bus in the E*LDS system

All E*LDS components (CAN bus nodes) in the system are connected to each other via the CAN bus in a line structure (see chapter [Cable lengths in the CAN bus and repeaters](#)). Thereby, a unique CAN bus address **must** be assigned to each node; this address may **only be allocated once** within the CAN bus.

E*LDS components	CAN bus addresses in the CAN bus segment	Max. number of E*LDS components
Case controllers UA 300 / UA 400 series / UA 213 S	1 .. 99	99
Pack controllers VS 300 / VS 3010 / VS 3010 BS / VS 3010 CT / VS 3010 WP / FS 3010 / VS 3010 C VS 3015 C / VS 3015 CT / VPC 5000 / WRG 3010 x / GLT 3010 / GLT 5010	101 .. 109	9
System centre CI 4x00 / CI 5x00 / Virtus 5 series	111 127	1 system centre 1 integrated LAN gateway
CI 3000 / CI 3100 Store Computer	111	1
AL 300 operator terminal	112 .. 116 117 .. 120	9 or max. 5, if 4 receiver modules are present in the system.
Receiver Module WR 300 / WR 400 for Wireless Sensors TS 30 W / TS 30 XW	117 .. 120	4 (only possible if no AL 300 operator terminal uses these CAN bus addresses)
LDSWin PC via CI 3000 COM port	121	1
DDC modules of the BCS (building control system)	122..125	4 max. 4 if there are no Modbus TCP master gateways installed in the system
CAN bus to PC adapter for connection of a PC / laptop to the PC software LDSWin	126	1
LAN Gateway * (Version 1.1c and higher) for connection of a PC / laptop to the PC software LDSWin	126 or 127	1
Combi Gateway * - LAN Gateway - XML Gateway - Modbus TCP Master 1..4 Gateway	126 or 127 110 122..125	1 1 max. 4, if no DDC modules are installed in the system

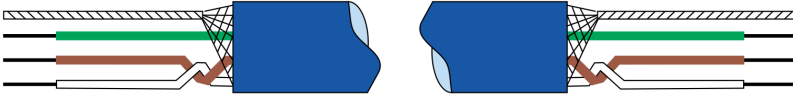
* The Combi Gateway has been specially developed for E*LDS systems where a CI 3000 or CI 3100 Store Computer is available, but is not intended for use in E*LDS systems with a CI 4x00 System Centre! Operation in parallel of a Combi Gateway with a CAN bus to PC adapter or a LAN Gateway (old version) is not possible as these components use the same CAN bus addresses!

ATTENTION

The instructions in the following chapters must be strictly observed for the installation of the CAN bus cable and for assurance of the operational reliability.

4.1 CAN bus cable type

The **cable type LIYCY 2x2x0.75 mm² (twisted pair wires) with 120 ohm characteristic impedance** must strictly be used for the CAN bus.



As the CAN bus components are sometimes connected to each other over long distances within a CAN bus segment, interference and transmission errors are avoided due to the line architecture.

ATTENTION

Incorrect shielding results in electromagnetic interference fields. It must be strictly ensured during installation that the cables with shielding are correctly connected. The CAN bus cable for each CAN bus segment must not exceed a cable length of **max. 500 m**. For detailed information see document [CAN bus in the application](#).

4.2 Cable lengths in CAN bus and repeater

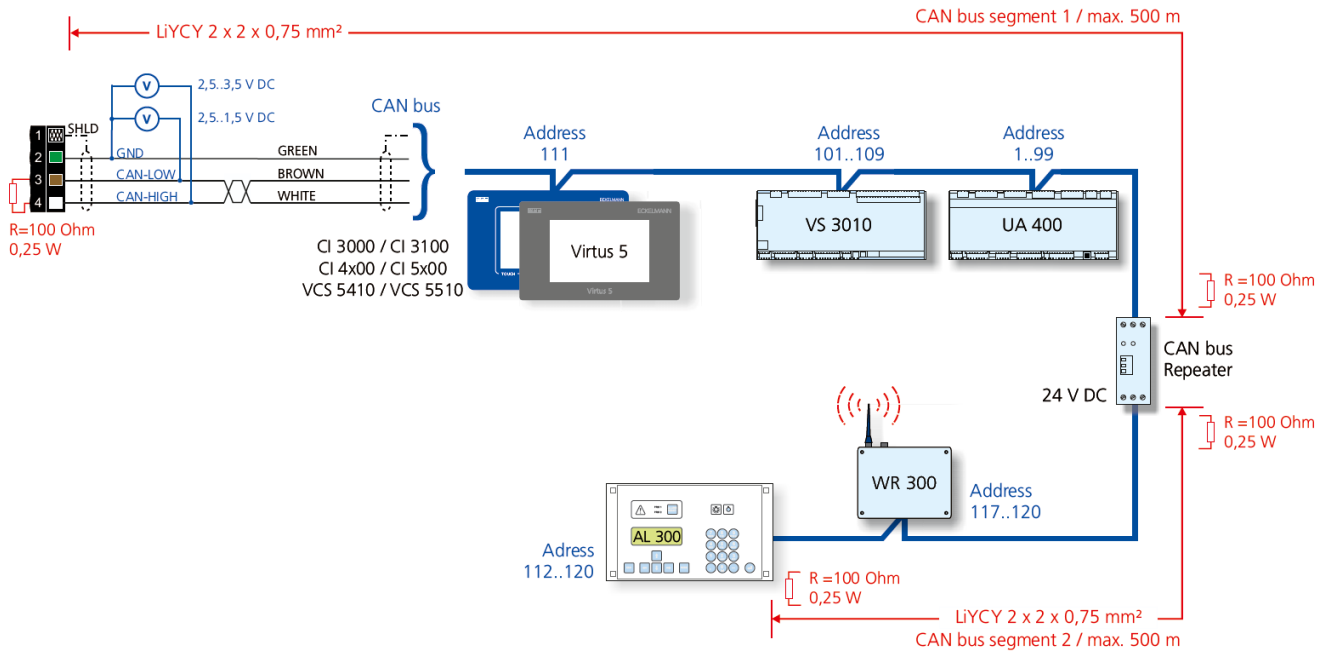
The CAN bus cable is installed in a line structure.

ATTENTION

- The CAN bus cable for **each CAN bus segment** must not exceed a cable length of **max. 500 m**.
- Using a CAN bus repeater increases the length by another 500 m through the second CAN bus segment.
- Branch lines on the CAN bus are not permitted!
- For detailed information, see [CAN bus in the application](#).

The following cable lengths are possible:

- Variant 1: Bus length up to **500 m**
- Variant 2: Bus length up to **1000 m** - with one CAN bus repeater (see graphic)
- Variant 3: Bus length up to **1500 m** - with two CAN bus repeaters



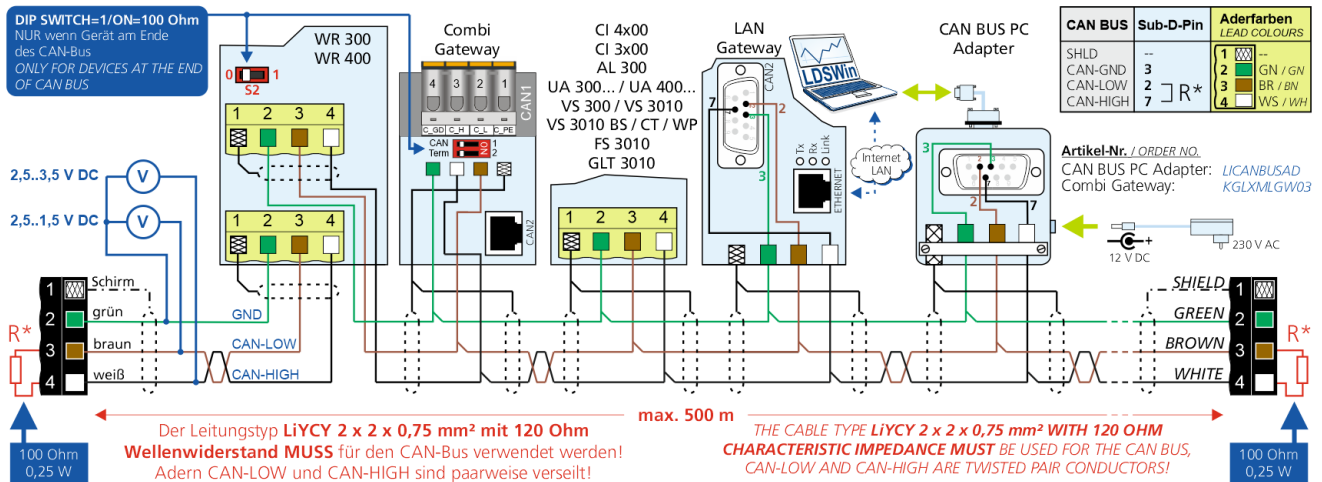
Short description of CAN bus repeater

A CAN bus repeater transmits and amplifies CAN bus signals. CAN bus repeaters are used for the physical coupling of two or more CAN bus segments in the bus system. Furthermore, due to the galvanic isolation of the CAN bus repeater, CAN bus segments, e.g. between two buildings, can be electrically decoupled. Mounting must be performed at a suitable location in the system or in the switch cabinet.

ATTENTION

A **maximum of 2 CAN bus repeaters** can be used in an E*LDS system! Detailed information (e.g. cable connections and terminal assignments of the CAN bus) and further **application examples** can be found in the operating manual of the [CAN bus repeater](#).

4.3 Cable routing and connection to the CAN bus

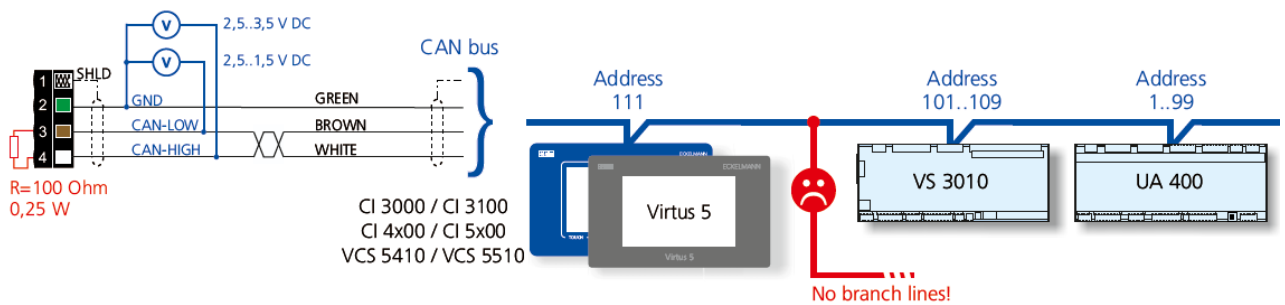


ATTENTION

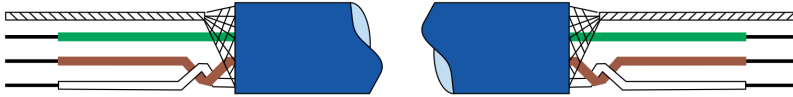
The CAN bus cable for each CAN bus segment must not exceed a cable length of **max. 500 m**. For detailed information, see [CAN bus in the application](#).

The following points must be observed for the cable routing of the CAN bus:

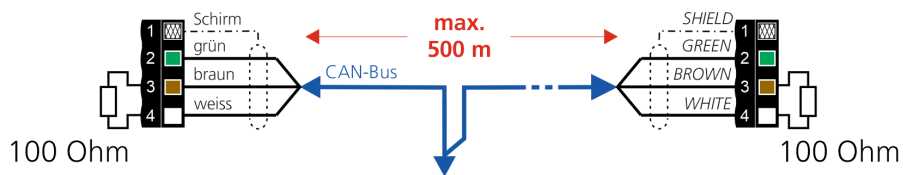
- The CAN bus cable **must not** be routed in the immediate proximity of high voltage and high frequency cables.
- A CAN bus repeater can be used for the galvanic isolation of two different voltages (e.g. between two buildings); see operating manual of the [CAN bus repeater](#).
- The E*LDS nodes on the CAN bus can be connected in any order.
Note: The objective should be to achieve a cable length as **short** as possible.
- A unique CAN bus address **must** be assigned to each node; this address may **only be allocated once** within the CAN bus.
- All CAN bus components **must** be connected to each other in a line structure; see chapter [Cable lengths for CAN bus](#):
- Branch lines on the CAN bus are **not** permitted:



- CAN-LOW (brown) and CAN-HIGH (white) **must** be connected to a **twisted pair of wires** (LIYCY 2x2x0.75 mm² with 120 ohm characteristic impedance).



- **The start and end** of a CAN bus segment **must** each be connected to a **terminating resistor** $R'=100\text{ ohm}$ (0.25 W):



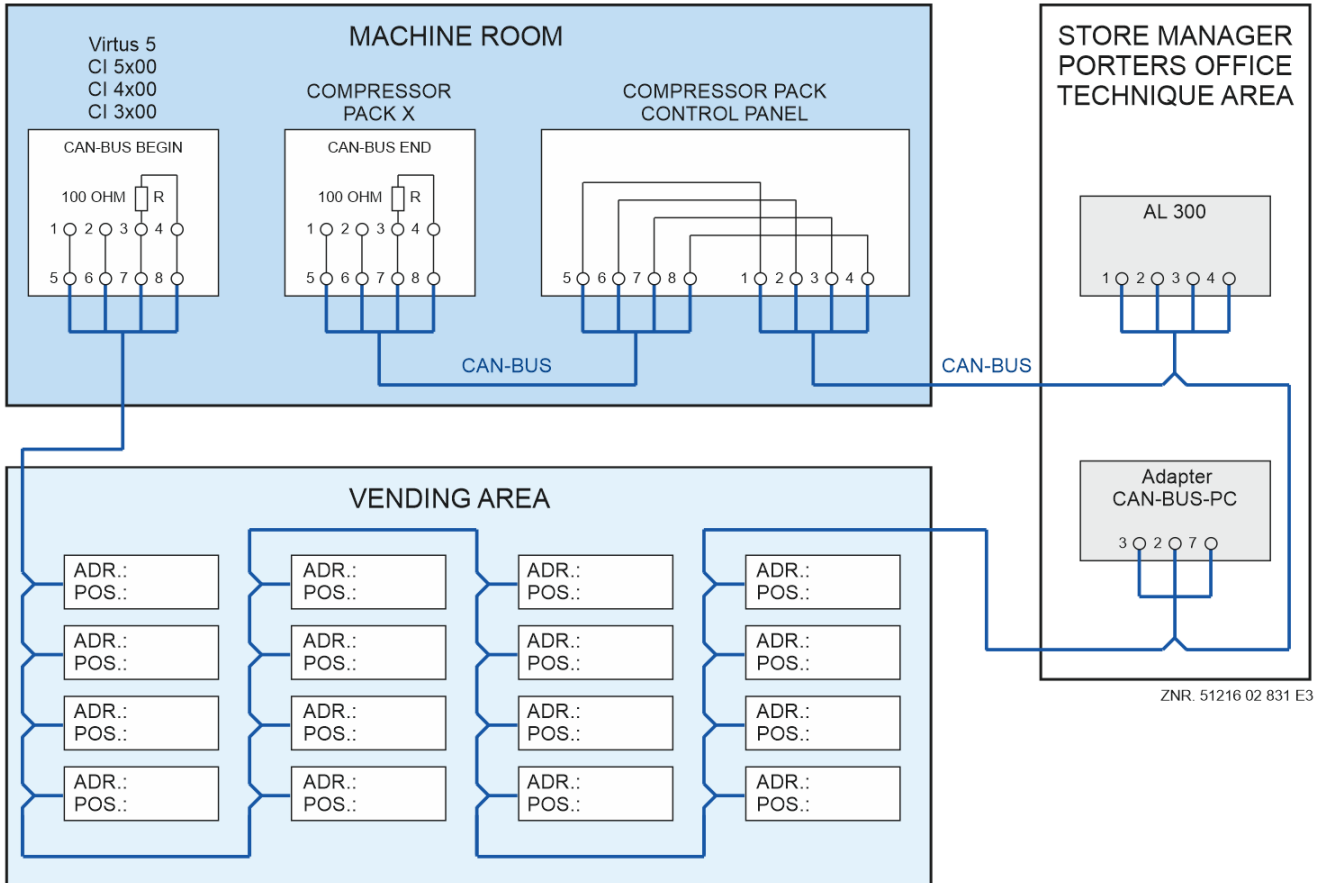
Practical tip: The terminating resistor is usually mounted in the rack switch cabinet at the terminal block of the first node (e.g. at the beginning on the system centre / store computer). The second terminating resistor must be installed at the terminal block of the last node (e.g. at the end at the operator terminal). For detailed information, see [CAN bus in the application](#).

- **Practical tip:** Use of the terminal set with terminating resistor for CAN bus (article no. KGLCANTERM):



4.4 Installation of the CAN bus cable

It is recommended to document the installation of the CAN bus cable in the store as this measure provides quicker discovery of, e.g. wiring errors during the installation, putting into service or service call. The following diagram shows an example of the arrangement of the CAN bus nodes in the E*LDS system and the cable routing of the CAN bus to the CI 4x00, CI 5x00, Virtus 5 series System Centre or to a CI 3x00 Store Computer.



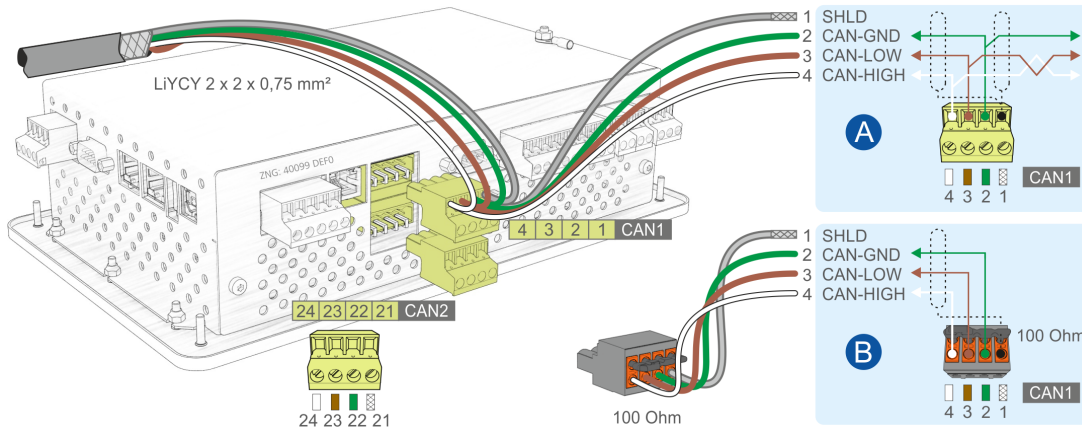
Practical tip: Ideally, the CAN bus addresses and position numbers of the individual nodes should be recorded in the same order as the installation of the cable. For detailed information, see [CAN bus in the application](#).

4.5 Possible CAN- bus errors - Remedy and examples

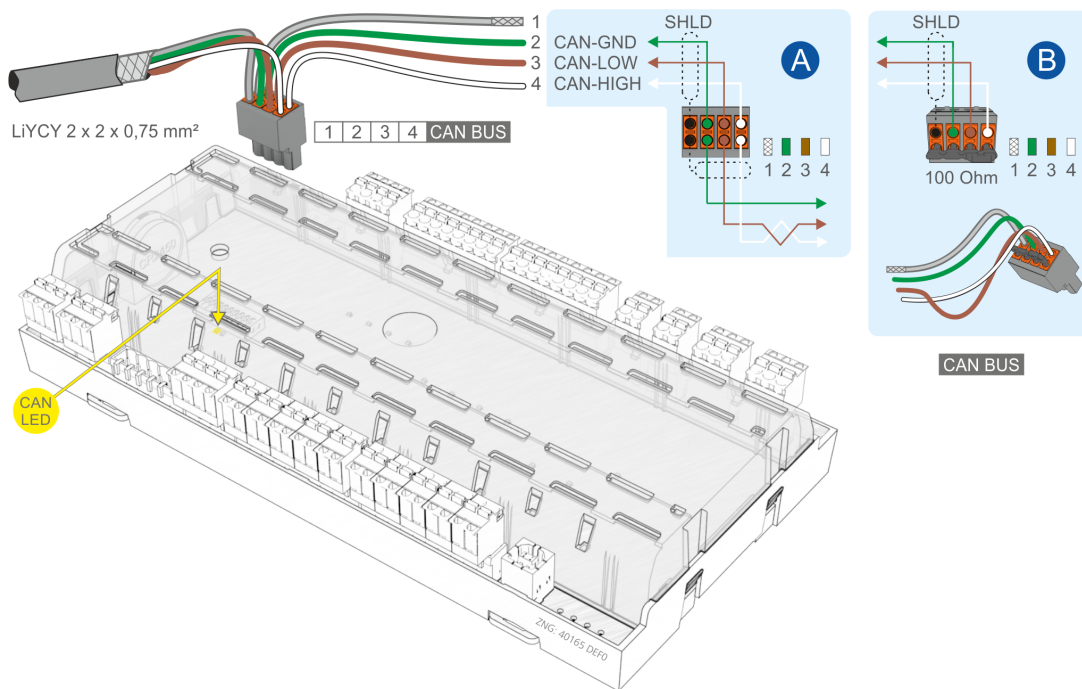
Error	Possible causes	Remedy / Check
E*LDS components are not detected within the CAN bus segment.	<ul style="list-style-type: none"> CAN bus wired incorrectly at the male connector. 	<ul style="list-style-type: none"> Connect the CAN bus wires correctly at the connector: 1=Shield / 2=Ground (green) / 3=CAN-LOW (brown) / 4=CAN-HIGH (white). The brown (CAN-LOW) and white (CAN-HIGH) wires must be twisted in pairs!
	<ul style="list-style-type: none"> CAN bus address selector switch of the E*LDS component is set to zero. CAN bus address has been allocated more than once. 	<ul style="list-style-type: none"> Select CAN bus address on E*LDS component. Uniquely assign the CAN bus address on the relevant component (may only be used once), see chapter CAN bus in the E*LDS system.
	<ul style="list-style-type: none"> The cable is not properly terminated with 100 ohm at both ends. 	<ul style="list-style-type: none"> Terminate cable with 100 ohm resistor; see chapter Cable routing and CAN bus connection.
	<ul style="list-style-type: none"> CAN bus traffic is severely disrupted. 	<ul style="list-style-type: none"> Use CAN bus repeater; see chapter Cable lengths in the CAN bus and repeaters
	<ul style="list-style-type: none"> CAN bus cable is too long. 	<ul style="list-style-type: none"> Use CAN bus repeater; see chapter Cable lengths in the CAN bus and repeaters or change bus installation, observe line structure. No branch lines, no star structure; see chapter Cable routing and CAN bus connection.
	<ul style="list-style-type: none"> CAN bus cable is damaged (short circuit / cable break). 	<ul style="list-style-type: none"> Check CAN bus cables and cable type (LIYCY 2x2x0.75 mm² with 120 ohm characteristic impedance; replace if necessary).
<p>Error messages:</p> <ul style="list-style-type: none"> CAN bus overflow CAN bus MSGLOST (= Message lost) CAN bus fault CAN bus failure 	<ul style="list-style-type: none"> Communication fault on the CAN bus Short-circuit between CAN-L (brown) and CAN-H (white) 	<p>Check:</p> <ul style="list-style-type: none"> Wiring of the CAN bus CAN bus length (max. 500 m) CAN-GND must be available everywhere Colour scheme complied with: 1=Shield / 2=Ground (green) / 3=CAN-LOW (brown) / 4=CAN-HIGH (white). The brown (CAN-LOW) and white (CAN-HIGH) wires must be twisted in pairs. Correct cable type: LIYCY 2x2x0.75 mm² with 120 ohm characteristic impedance
Individual lines function, however in the case of interconnection of several lines, the CAN bus breaks down or faults occur on the CAN bus.	The individual lines are in fact defective, but communication is possible. The faults accumulate during the interconnection so that the bus breaks down.	Use CAN bus repeater ; see chapter Cable lengths in the CAN bus and repeater For details, see operating manual of the CAN bus repeater .

Wiring examples

- System centre Virtus 5 (also applicable for CI 3x00, CI 4x00, CI 5x00)
For details, see operating manual at https://edp.eckelmann.de/edp/lds/_wOgjj7LxnO:



- Case controller UA 400 E / UA 410 E (also applicable for UA 400 / UA 410 D / UA 410 L, UA 413 S)
For details, see operating manual at https://edp.eckelmann.de/edp/lds/_s1nNBB45xE:



i All CAN bus supply lines must be shielded (cable type: **LiYCY 2x2x0.75 mm²**). As a general rule, care should be taken to ensure that signal cables and cables carrying mains voltage are routed in separate cable channels.

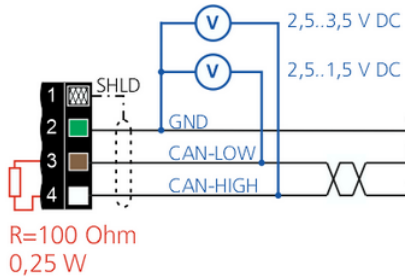
Wiring Variant A: Device is a node in a CAN bus segment with other nodes before and after this, **no terminating resistor** required.

Wiring Variant B: Device is at the start / end of a CAN bus segment, **terminating resistor** required.

Practical tip: Use of the terminal set for CAN bus termination;
see https://edp.eckelmann.de/edp/lds/_SPcLA4PMbf.

Check of the voltage level on the CAN bus during operation:

- Between CAN-GND (terminal 2, green) and CAN-Low (terminal 3, brown): **1.5 V .. 2.5 V**
- Between CAN-GND (terminal 2, green) and CAN-High (terminal 4, white): **2.5 V .. 3.5 V**



Practical tip: During the routing and installation of the CAN bus, the CAN bus should always be checked again for any possible short-circuit using a multimeter between the terminals 1, 2, 3 and 4 (on the terminal block) – this check will save time for troubleshooting!

5 Modbus in the E*LDS system

All Modbus components in the system are connected to each other via the Modbus in a line structure (see chapter [Cable routing for Modbus](#)). Thereby, a unique Modbus address **must** be assigned to each node; this address may **only be allocated once** within the Modbus.

E*LDS components	Modbus addresses	Max. number of Modbus components
Case controller (e.g. UA 30 / Dixell and LDS1 gateways)	1 .. 50	50

The Modbus components (e.g. UA 30, Dixell and LDS1 gateways) are integrated via the system centre or the store computer:

- **System centre CI 4100 or higher, CI 5x00, Virtus 5 or store computer CI 3100**

The connection is made directly via their COM3 port.

i Configuration of the COM3 port is not necessary as the compact controller is automatically detected and integrated in the E*LDS system after the connection by the system centre CI 4100 or higher, CI 5x00, Virtus 5 or by the CI 3100 Store Computer.

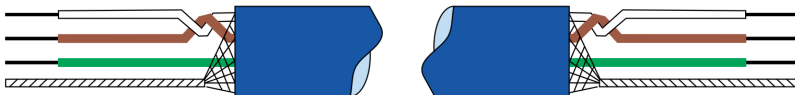
- **CI 3000 Store Computer**

The connection is made via the COM2 port whereby an [RS232 to RS485 converter](#) is required.

i In order for the compact controller to be detected in the E*LDS system, the COM2 port must be configured in menu 6-1-9, see Operating Manual [CI 3000](#).

5.1 Modbus cable type

The **cable type J-Y(ST)Y 2x2x0.8 mm² (cores twisted in pairs)** must strictly be used for the Modbus.

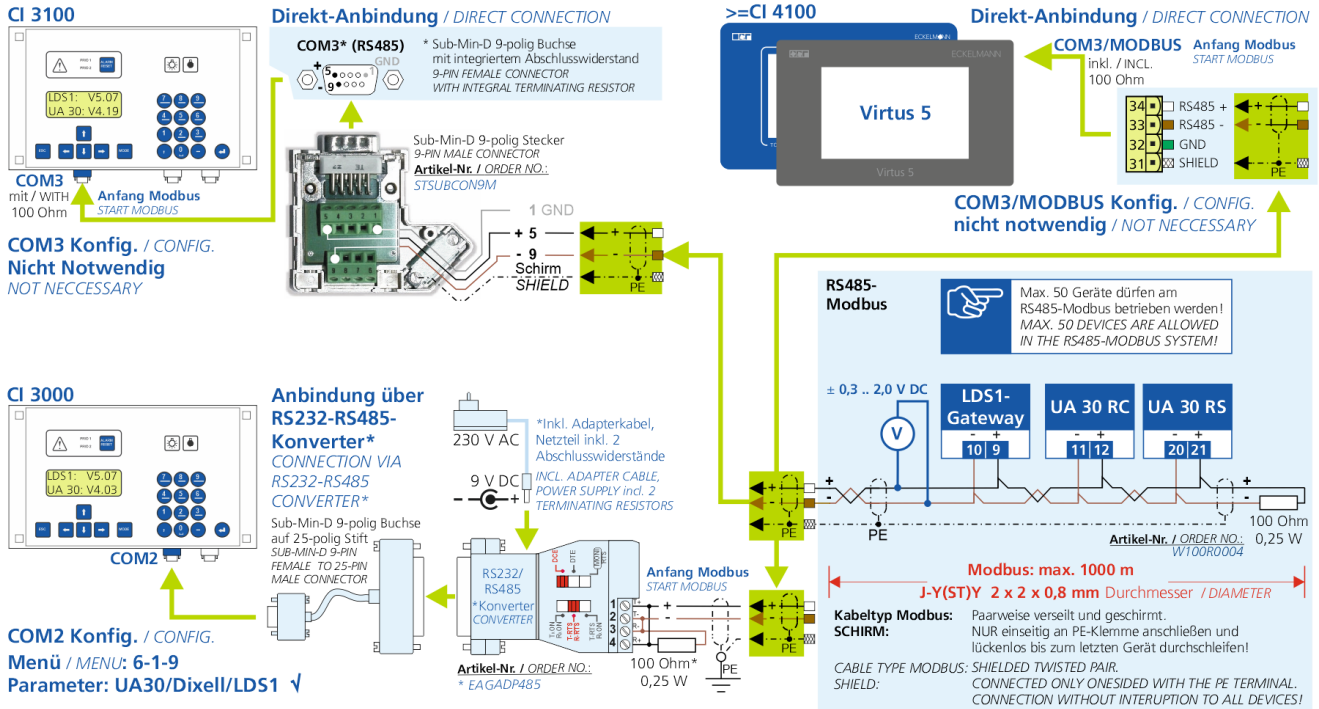


As the Modbus components are sometimes connected to each other over long distances within a Modbus segment, interference and transmission errors are avoided due to the line architecture.

i **ATTENTION**

Incorrect shielding results in electromagnetic interference fields. It must be strictly ensured during wiring that the cables with shielding are correctly connected.

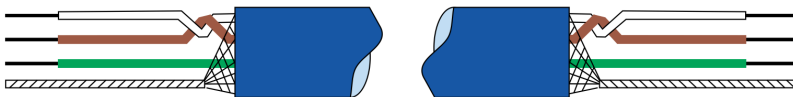
5.2 Cable routing and Modbus connection



ATTENTION
 The Modbus cable must not exceed the cable length of **max. 1000 m**.

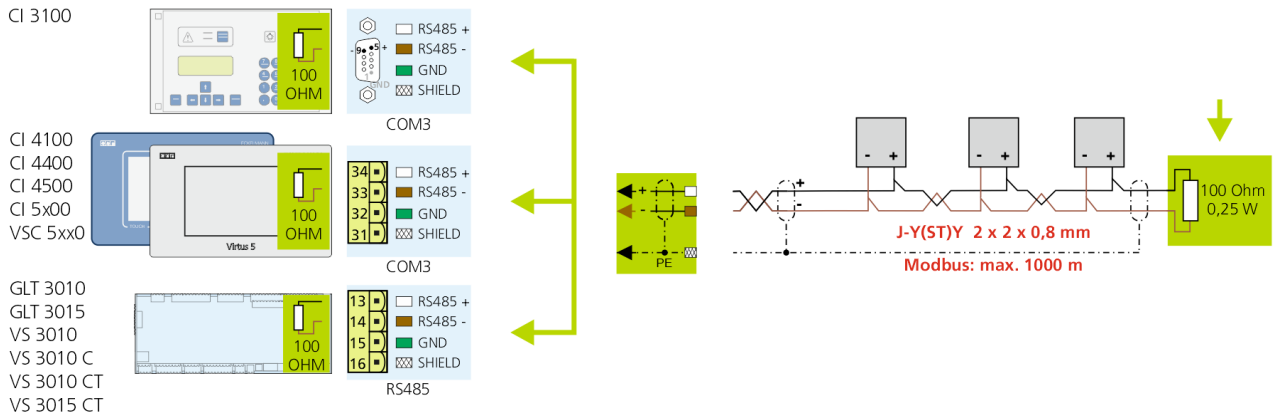
The following points must be observed for the cable routing and connection of the Modbus:

- The Modbus cable **must not** be routed in the immediate proximity of high voltage and high frequency cables.
- The Modbus nodes can be connected in any order. The objective should be to achieve a cable length as **short** as possible.
- All Modbus nodes **must** be connected to each other in a line structure.
- Branch lines up to a maximum of 40 m in total are permitted on the Modbus.
- A unique Modbus address **must** be assigned to each Modbus node; this address may **only be allocated once** within the Modbus.
- The recommended wire colours are SHIELD, GND (if required) = green, - RS485 = brown, + RS485 = white
- + RS485 = white and - RS485 = brown **must be connected to a twisted pair of wires (J-Y(ST)Y 2x2x0.8 mm2)**.



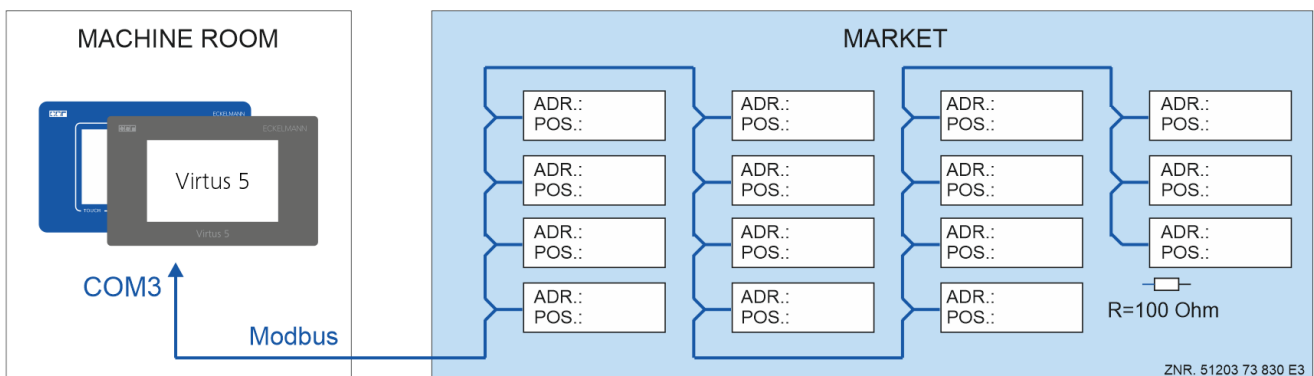
- **The start and end** of the Modbus cable **must** each be connected to a **terminating resistor** **R = 100 ohm (0.5 W)**. The terminating resistor is usually installed in the switch cabinet on the terminal block of the first Modbus node (e.g. RS232 to RS484 converter).

Note: The mounting of a terminating resistor at the start of the Modbus is **not permitted** for the following components as this is already integrated in these devices! However, the second terminating resistor **must** be installed on the terminal block of the **last** Modbus node (e.g. UA 30 / Dixell / LDS1 gateways); see graphic:



5.3 Installation of the Modbus cable

It is recommended to document the installation of the Modbus cable in the store as this measure provides quicker discovery of, e.g. wiring errors during the installation, putting into service or service call. The following diagram shows an example of the arrangement of the Modbus nodes in the E*LDS system and the cable routing of the Modbus to the CI 4x00, CI 5x00, Virtus 5 series System Centre or to a CI 3x00 Store Computer.



Practical tip: Ideally, the Modbus addresses and position numbers of the individual nodes should be recorded in the same order as the installation of the cable.

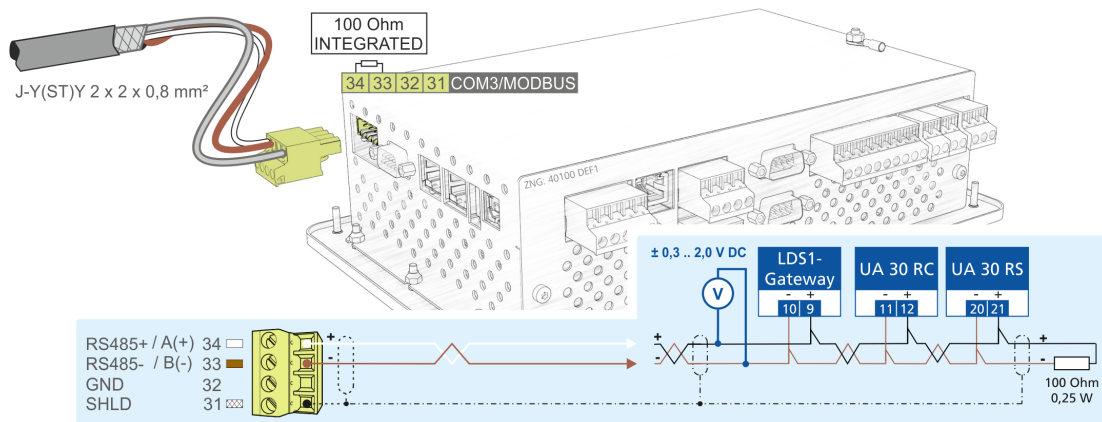
5.4 Possible Modbus errors - Remedy and examples

Error	Possible causes	Remedy
Components are not detected within the Modbus segment.	<ul style="list-style-type: none"> Modbus wired incorrectly at the male connector. 	<ul style="list-style-type: none"> Connect the Modbus wires correctly at the connector, pay attention to polarity: SHIELD, GND (if required) = green, -RS485 = brown, +RS485 = white; see chapter Cable routing and Modbus connection.
	<ul style="list-style-type: none"> Modbus address of the component is set to zero. Modbus address has been allocated more than once (e.g. address 1). 	<ul style="list-style-type: none"> Uniquely assign the Modbus address on the relevant component; see chapter Modbus in the E*LDS system
	<ul style="list-style-type: none"> The cable is not properly terminated with 100 ohm at both ends. 	<ul style="list-style-type: none"> Terminate cable with 100 ohm resistor; see chapter Cable routing and Modbus connection.
	<ul style="list-style-type: none"> Modbus cable is too long. 	<ul style="list-style-type: none"> Only cable lengths up to 1000 m are permitted; see chapter Cable routing and Modbus connection.
	<ul style="list-style-type: none"> Modbus cable is damaged (short circuit / cable break). 	<ul style="list-style-type: none"> Check Modbus cables and cable type (J-Y(ST)Y 2x2x0.8 mm²); replace if necessary.
Individual lines function, however in the case of interconnection of several lines, the Modbus breaks down or faults occur on the Modbus.	The individual lines are in fact defective, but communication is possible. The faults accumulate during the interconnection so that the bus breaks down.	<p>Check:</p> <ul style="list-style-type: none"> Check cable; replace if necessary Check cable length Connect the Modbus correctly to the terminals, pay attention to polarity: SHIELD, GND (if required) = green, -RS485 = brown, +RS485 = white; see chapter Cable routing and Modbus connection.

Wiring examples

- System centre Virtus 5, UA 30 x Compact Controller and LDS1 Gateway

For details, see operating manual at https://edp.eckelmann.de/edp/lids/_wOgjj7LxnO:



Practical tip: During the routing and installation of the Modbus, the Modbus should always be checked again for any possible short-circuit using a multimeter between the terminals SHIELD, GND if required) = green, .RS485 = brown, +RS485= white (on the terminal block) – this check will save time for troubleshooting!

6 Supply lines from and to the controls

i ATTENTION

All supply lines from and to the controls (with the exception of the 230 V power supply and 230 V signal lines) must be **shielded** (cable type: LiYCY)!

This particularly applies for the **analogue inputs and outputs** (e.g. sensor supply cables) as well as the **CAN bus** and **Modbus** cabling.

- These must also be installed with sufficiently **large distance** from live cables.
- As a general rule, care should be taken to ensure that sensor supply cables and cables carrying mains voltage are routed in **separate cable channels**.

Example VS 3015 CT

