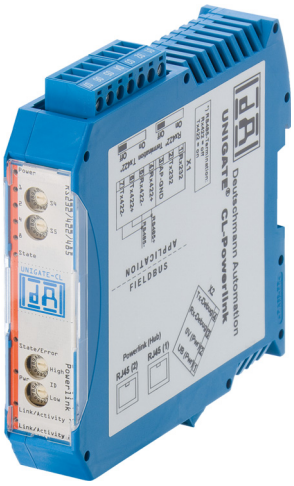
Deutschmann

your ticket to all buses

Instruction Manual
Universal Fieldbus-Gateway
UNIGATE® CL - Powerlink



Deutschmann Automation GmbH & Co. KG
www.deutschmann.com | wiki.deutschmann.de

Manual Art.-No.: V3653E

Disclaimer of liability

We have checked the contents of the document for conformity with the hardware and software described. Nevertheless, we are unable to preclude the possibility of deviations so that we are unable to assume warranty for full compliance. The information given in the publication is, however, reviewed regularly. Necessary amendments are incorporated in the following editions. We would be pleased to receive any improvement proposals which you may have.

1 Information on CE marking of the module

1.1 EU Directive EMC

The following applies to the module described in this User Manual:

Products which bear the CE mark comply with the requirements of EU Directive „Electromagnetic Compatibility“ and the harmonized European Standards (EN) listed therein.
The EU Declarations of Conformity are available at the following location for perusal by the responsible authorities in accordance with the EU Directive, Article 10:

Deutschmann Automation GmbH & Co. KG, Carl-Zeiss-Straße 8, 65520 Bad Camberg, Germany.

1.2 Scope of application

The modules are designed for use in the industrial sector and comply with the following requirements.

Scope of application	Requirement applicable to	
	Emitted interference	Interference immunity
Industry	EN 55011, cl. A (2007)	EN 61000-6-2 (2005)

1.3 Note installation guidelines

The module complies with the requirements if you

1. comply with the installation guidelines described in the User Manual when installing and operating the module.
2. also follow the rules below on installation of the equipment and on working on switch cabinets.

1.4 Installation of the unit

Modules must be installed in electrical equipment rooms/areas or in enclosed housings (e.g. switch boxes made of metal or plastic). Moreover, you must earth the unit and the switch box (metal box) or at least the top-hat rail (plastic box) onto which the module has been snapped.

1.5 Working on switch cabinets

In order to protect the modules against static electrical discharge, the personnel must discharge themselves electrostatically before opening switch cabinets or switch boxes.

2 Information for the machine manufacturers

2.1 Introduction

The UNIGATE® module does not constitute a machine as defined by the EU "Machinery“ Directive. Consequently, the module does not have a Declaration of Conformity in relation to the EU Machinery Directive.

2.2 EU Machinery Directive

The EU Machinery Directive stipulates the requirements applicable to a machine. The term "machine" is taken to mean a totality of connected parts or fixtures (see also EN 292-1, Paragraph 3.1)
The module is a part of the electrical equipment of the machine and must thus be included by the machine manufacturer in the Declaration of Conformity process.

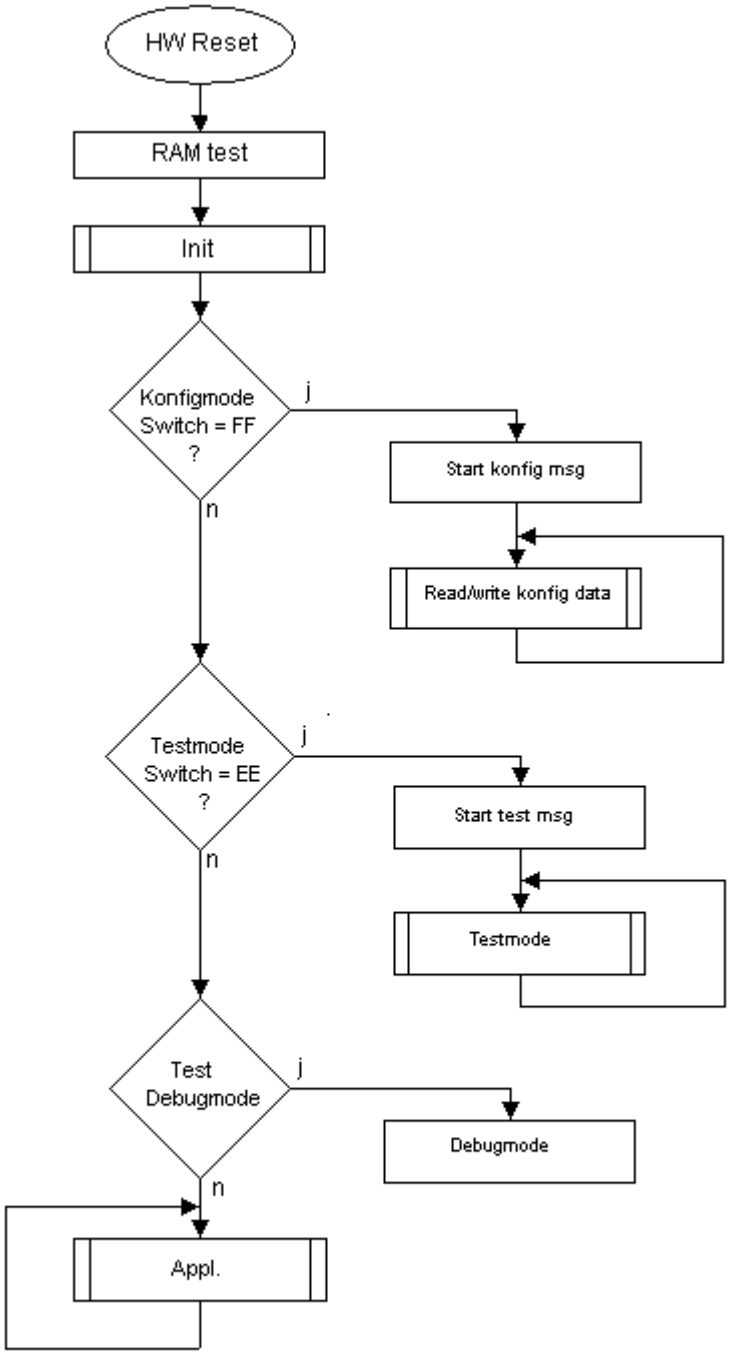
3 Introduction

The UNIGATE® CL-Powerlink module serves to adapt a serial port to Powerlink CN (Controller Nodes). The terminal unit's protocol is converted in the UNIGATE® via a Script.

The module CL-Powerlink essentially consists of the following hardware components:

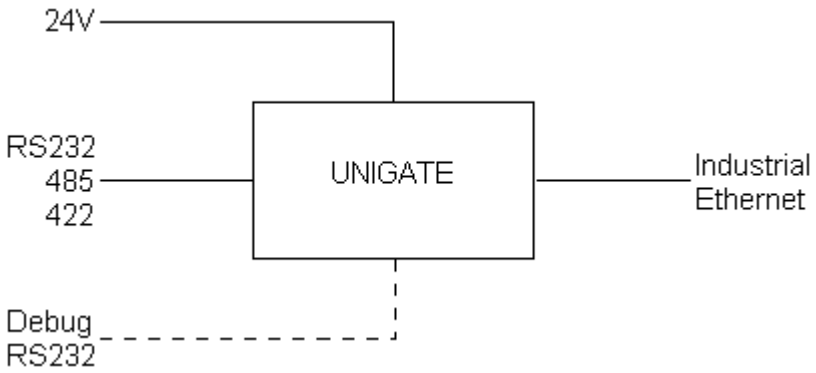
- Electrically isolated Powerlink-interface
- 32-bit processor
- RAM and FLASH
- Optionally electrically isolated on the RS-side
- Serial interface (RS232, RS485 and RS422) to the device connected externally

3.1 UNIGATE® CL software flow-chart



3.2 UNIGATE® application diagram

The following graph shows a typical connection scheme.



4 Operation modes of the Gateway

4.1 Configuration mode (config mode)

The configuration mode serves to configure the Gateway. The following adjustments are possible in this mode.

- Loading a Script (e. g. by means of the software WINGATE with "`Write Script`" under "File")
- Updating the firmware (e. g by means of the software "FDT" through the Ethernet (Powerlink)-interface)
- Configuration of the Gateway (by means of the software WINGATE)

The Gateway will be starting in this mode in case both switches S4 as well as S5 are set on position "F" when switching on the Gateway. Right after switching on the Gateway in the configuration mode it will be sending its starting message, that looks analog with the following message:
"RS-PL-CL (232/422/485) V0.1 [28] (c)dA Switch=0x00FF Script(16k)="Leer"
Author="Deutschmann Automation GmbH" Version="1.0" Date=21.08.2001 SN=47110001“.
In the configuration mode the Gateway always operates with the settings 9600 Bauds, no Parity, 8 Databits and 1 Stopbit, the RS-State LED will always be flashing red, the "Error No/Select ID" LEDs are of no account for the user. All software revisions contain the configuration mode.

4.2 Test mode

Setting of the test mode
The test mode is set by bringing the switches S4 and S5 in position "E". All other switches will not be taken into consideration for the setting of the test mode. Now the Gateway has to be restarted with these settings (by a short disconnection from the power supply).
In the test mode the Gateway always operates with the settings 9600 baud, no parity, 8 databits and 1 stopbit.
The test mode may be helpful to integrate the Gateway in the relevant environment, for instance to test the parameters of the RS-interfaces.

Mode of operation of the test mode
After the restart in the test mode the Gateway will be sending the values 0-15 in hexadecimal representation ("0".."F") in ASCII-coding on the serial side every second. Simultaneously the same values are issued binary on the fieldbus-interface.
In this mode the State-LED on the RS-side will be flashing red, the "Error No/Select ID" LEDs will be displaying the value in a binary way, that is issued that moment. Additionally each character that is received at one of the interfaces will also be output at the same interface as a local echo. On the fieldbus-side only the first byte will be used for the local echo, that means on receiving as well as on transmitting only the first byte of the bus data is looked at, the other bus data do not change compared to the last data.

4.3 Data exchange mode

The Gateway has to be in the data exchange mode, so that a data exchange between the RS-side of the Gateway and the fieldbus is possible. As long as the Gateway is not in the configuration mode or the test mode, the data exchange mode is active. In the data exchange mode the Gateway will execute the downloaded Script with the parameters, that have been preset through WINGATE.

5 RS-interface

5.1 RS-interfaces at the UNIGATE® CL

The UNIGATE® CL - Powerlink has the interfaces RS232, RS422 and RS485 available. The hardware always features a DEBUG-interface, see chapter 7.

5.2 Buffer sizes at the UNIGATE® CL

UNIGATE® CL features at the serial side a buffer with the size of 1024 bytes for input data and output data each.
The FIFO of the application interface (RS-interface) can be changed in any Gateway form Script revision 26 on, that is capable for Script. For it please check in the Protocol Developer under "Device Control" - "Hardware".

5.3 Framing Check

The length of the stop bit received by the Gateway is checked through the function "Framing Check". Here the stop bit generated by the Gateway is always long enough, so that connected participants can evaluate the stop bit.

Please be aware that the function "Framing Check" becomes effective only in case of 8 data bit and the setting "No parity".

An error is detected and indicated by the Error LEDs in case the stop bit does not show the length 1 bit during the activated check.

The possible setting for this parameter can be controlled by the Script (see online help from Protocol Developer). The presetting for the "Stop Bit Framing Check" is "enabled".

6 SSI-interface

The UNIGATE® also supports the connection of applications or products, that communicate via SSI.

6.1 Initiation of the SSI-interface

The required Script (`example_SSI`), the firmware- (Cust0023) and Protocol Developer-extension (`Cust_ssi.xml`) are available free of charge from our website at www.deutschmann.de, as well as the softwaretool Protocol Developer and the configuration software WINGATE.

- In the Protocol Developer (see chapter 7, The Debug-interface) the ConfigFile "`Cust_ssi.xml`" has to be added. At Options → Settings → ConfigFiles.
- Load the Script "`example_SSI.dss`" into the Protocol Developer.
- The encoder type and the clock frequency has to be defined in the Script itself under "`Set number of bits`" and "`Set type and clock stretch value`" (default = 12-Bit-Single-Turn-Gray, max. clock stretch):

```
// Set number of bits
//   1..16 = Single Turn
//  17..32 = Multi Turn
moveconst (bNumBits, 12);      // i.e. 12 bit single turn
// MT SSI 4096 x 4096 = 16777216 = 0b100000000000000000000000 => 24 bit

//-------------------------------------------------------------------------------
// Set type and clock stretch value
//  Type (low nibble):
//    0 = Reserved
//    1 = output value as is (i.e. binary encoder)
//    2 = convert Gray encoded output value to binary (i.e. Gray encoder)
//   >2 = Reserved
//
//  Clock stretch value (high nibble):
//  Please note that the given frequency values are only a rough estimate. The
//  exact frequency varies depending on the devices underlying architecture.
//    0 = No Stretch --> ~300 kHz
//    1 = ~185 kHz
//    2 = ~150 kHz
//    3 = ~125 kHz
//    4 = ~110 kHz
//    5 = ~100 kHz
//    6 = ~ 88 kHz
//    7 = ~ 80 kHz
//    8 = ~ 72 kHz
//    9 = ~ 67 kHz
//    A = ~ 62 kHz
//    B = ~ 58 kHz
//    C = ~ 54 kHz
//    D = ~ 50 kHz
//    E = ~ 48 kHz
//    F = ~ 45 kHz
//moveconst ( wTyp, 0x02); // i.e. Gray encoder, no clock stretch (High-Nibble=0)
```

moveconst (wTyp, 0xF2); // i.e. Gray encoder, max clock stretch (High-Nibble=F)

- Load the Script into the device. Open WINGATE and activate the device in the configuation mode (see chapter 4.1, Configuration mode (config mode)) - an actuation message appears, that looks in line with the following (example CL-PB):
  Special Firmware (23) not loaded
  RS-PBV1-CL (232/422/485) V7.31[30] (c)dA Switch=0x02FF Script(8k)="SSI"
  Author="Deutschmann Automation" Version="V 1.0" Date=20.03.2008 SN=47110002 ID=2
  Konfigmode...
  The note "Special Firmware (23) not loaded" means that the firmware-extension is not yet loaded. The extension is loaded through Extras -> Firmware Script Extension. Select the file "`Cust0023 (Cmd 23 + 24 for SSI).hex`" and choose "`write extension`".
- Re-start the device → now only the device's actual actuation message appears and not the note any more.
- Bring the device into the data exchange mode (see chapter 4.3, Data exchange mode) → DONE!

6.2 Hardware-wiring

The clock wires of the SSI-interface are placed onto the Tx-wires of the RS422-interface and the data wires onto the Rx-wires at the UNIGATE® CL.

X1 (3pin + 4pin screw-plug-connector):

Pin no.	Name	Function at SSI
1	Rx 232	n. c.
2	Tx 232	n. c.
3	AP-GND	n. c.
4	Rx 422+	SSI DAT+
5	Rx 422-	SSI DAT-
6	Tx 422+	SSI CLK+
7	Tx 422-	SSI CLK-

7 The Debug-interface

7.1 Overview of the Debug-interface

The UNIGATE® CL features a Debug-interface, that allows a step-by-step processing of a Script. Normally this interface is only required for the development of a Script.

7.2 Starting in the Debug-mode

When applying power to the UNIGATE® (power up) the firmware will output the binary character 0 (0x00) after a self-test was carried out on this interface. If the UNIGATE® receives an acknowledgement via this interface within 500 ms, it is in the Debug-mode. The acknowledgement is the ASCII-character O (0x4F).
With the start in the Debug-mode the further execution of Script commands will be put to a stop.

7.3 Communication parameter for the Debug-interface

The Debug-interface is always operating with 9600 baud, no parity, 8 data bit, 1 stop bit. It is not possible to change this parameter in the Protocol Developer. Please consider the fact that these settings have to be in accordance with those of the PC-COM-interface and that the flow control (protocol) has to be set on „none“ there.

7.4 Possibilities with the Debug-interface

Usually the Protocol Developer is connected to the Debug-interface. With it a step-by-step processing of a Script, monitoring jumps and decisions and looking at memory areas is possible. Moreover breakpoints can be set. It basically possesses all characteristics a software-development tool is typically supposed to have. However, it is also possible to carry out a Scrip-update via this interface.
From Script version [27] on you can also output data with the Script command "`SerialOutputToDebugInterface`". Please also pay attention to the remark in the manual ’Protocol Developer’.

7.5 Commands of the Debug-interface

The commands for the use of the Debug-interface are described in the instruction manual Protocol Developer.

8 Mode of operation of the system

8.1 General explanation

Communication can be split into seven layers, Layer 1 to Layer 7, in accordance with the ISO/OSI model.
The Deutschmann Automation Gateways convert Layers 1 and 2 of the customized bus system (RS485 / RS232 / RS422) to the corresponding Fieldbus system. Layers 3 and 4 are being covered by the UDP/IP- and TCP/IP-protocol. The Layers 5 and 6 are empty. Layer 7 is converted in accordance with Ethernet Powerlink V2.0 specification. This access is described in chapter 8.3.

8.2 Interfaces

The Gateway features the RS232-, RS422- and RS485-interfaces.

8.3 Data exchange

All data is transferred by the Gateway in dependence of the downloaded Script.

Example Script:

```
// Reservieren eines Speicherbereichs für die Objekttabelle
   var a_ObjectTableBuffer    : buffer[32];

// 2 Objekte * 16 = 32 ; Anzahl Obj * 16 = reservierter Speicherbereich
   InitObjectTable ( 2 , a_ObjectTableBuffer[0] ) ;

// erzeugen der Variablen für die einzelnen Obj
   var a_Variable_2000 : buffer[6] ;
   var a_Variable_2001 : buffer[6] ;

// erzeugen eines Obj
//      CreateObject(index      ,object_type,subindex,data_type,flags,
MPtr_Buffer ) ;
     CreateObject(0x2001,   0x7          ,     0       ,    0x6       ,
0x08,a_Variable_2001[0]);
     CreateObject(0x2000,   0x7          ,     0       ,    0x6       ,
0x08,a_Variable_2000[0]);
   // Anzahl der Objekte:
    // Die maximale Anzahl der Objekte ergibt sich aus der maximal zur
Verfügung
   // stehenden größe des zu reservierenden Speicherbereichs.
    // Der gesammte Speicherbereich für Scriptvariablen ist 8k (Stand
Sept.2007).

// bei Bedarf kann ein Obj auf eine PDO gemappet werden
  //              Tx=0,  Idx   SubIdx  Ofset  BitLen
  //              Rx=1,  Idx   SubIdx  Ofset  BitLen
  SetTxRxPDOMapping ( 0, 0x2001 , 0x0 , 0x0 , 0x8 ) ;  //  hier TxPDO
  SetTxRxPDOMapping ( 1, 0x2000 , 0x0 , 0x0 , 0x8 ) ;  //  hier RxPDO
   // Die maximale Anzahl von gemappten Objekten ist auf 255 für TxPDO
   // und 255 für RxPDO begrenzt
```

```
  // setzen eines Obj. mit einem Default-Wert
  moveconst (a_Variable_2001[0], "01234");
  moveconst (a_Variable_2000[0], "56789");  // "

//...

BusStart;
Wait ( Bus_Active ) ;

//...
:main;

// zum Lesen der zyclischen RxPDO kann fogendes Kommando im Script
benutzt werden
 ReadBus ( aBusIn[0] , wBusInLen ) ;  // Lese RxPDO

// folgende Befehle werden auch unterstützt:
// Get ( AvailableBusData , wBusInLen ) ;
// WaitBusDataChanged ( w_Timeout , w_NumberChar ) ;

// Die RxPDO wird von diesem CN (Slave) nur empfangen wenn der MN
(Master)
// diesen CN in seiner Liste im Obj 0x1F81 aufgenommen hat und der MN
// ein PReq (Poll Request) schickt.

// Die TxPDO schickt das UNIGATE dann automatisch als PRes (Poll
Response)
// zum MN, bzw. als Broadcast auf den Bus.


// ...
// Lese SDO
// Wird eine SDO an diesen CN geschickt, wird diese im Asynchronen Teil
des
// Datenzyclus empfangen und in das entsprechende Objektverzeichnis
geschrieben.
// Das Objektverzeichnis enthält immer den letzten empfangen Wert,
// es kann jederzeit von anderen Teilnehmern ausgelesen werden.
// Gleichzeitig wird jedes Obj in eine Queue geschrieben und zwischen-
gespeichert
// Diese Queue kann mit folgendem Kommando ausgelesen werden,
// sind keine neuen SDO´s eingegangen liefert das Kommando den Return-
code 0x03
// zurück
// Die Queue kann 255 SDO´s empfangen, wobei die jeweilige Datengröße
// auf 255 Byte begrenzt ist
 ReadNewEPLObjectData ( w_Index , b_Subindex , a_Data[0] , b_DataLen ) ;
 Get ( ErrorCode , bRetCode ) ;
 if bRetCode equal b3 then :Loop1;

//...
// Schreibe SDO
```

```
// Der Inhalt eines Obj kann mit folgendem Kommando aktualisiert werden
// Besteht gleichzeitig auch für das Obj mit dieser Variablen
// (hier "a_Variable_2001") ein PDO mapping wird der Wert auch in die
// TxPDO gemappet (kopiert)
  WriteObject ( a_Variable_2001[0] , a_ReceiveData[0] , b1 ) ;

jump :main;

//...
// Keine Unterstützung von Kreuzverkehr
// Kreuzverkehr: direktes senden und empfangen von einem bestimmten
Teilnehmer


//-----------------------------------------------------------------------
----------
// Mit folgenden Scriptbefehlen können Obj. vordefiniert werden:

// Manufact Device Type Obj. 0x1000
// Set ( DeviceType , 0x1234 ) ;
// SetByVar ( DeviceType , ltemp ) ;
   Get ( DeviceType , ltemp ) ;   // default: 12
```

```
   //  _______ _________________________ _________________________
   // | Byte: |   MSB    |            |   LSB    |           |
   // |_______|__________________________|_________________________|
   // |       |Additional Information|Device Profile Number|
   // |_______|__________________________|_________________________|

    // DeviceType is composed of a 16-bit field which describes the
device
   // profile that is used and a second 16-bit field which gives addi-
tional
   // information about optional functionality of the device.
   // The Additional Information parameter is device profile specific.
   // Its specification does not fall within the scope of this document,
   // it is defined in the appropriate device profile.
   // The value 0000h indicates a device that does not follow a standar-
dised
   // device profile.
   // For multiple device modules the Additional Information parameter
contains
   // FFFFh and the device profile number referenced by object 1000h is
the
   // device profile of the first device in the Object Dictionary.
   // All other devices of a multiple device module identify their pro-
files
   // at objects

//-----------------------------

// Manufact Dev Name Obj. 0x1008
   var variable:buffer[15];
    moveconst ( variable[0], "UNIGATE Ethernet Powerlink CL"#0x00); //
Max-Len=32
   SetByVar ( DeviceName , variable[0] ) ;
   // default CL: "RS-EP-CL"
   // default IC: "IC-EP-SC"

//-----------------------------
// Identity Object 0x1018
// Sub Idx 1 Vendor Id
// Set ( VendorID, 0x9876);
// SetByVar ( VendorID, wtemp);
   Get ( VendorID , wtemp ) ;  // default: 0x0000019D = "dA"
    // Laut EPSG kann eine vorhandene CANopen Vendor Id für Ethernet
Powerlink
   // übernommen werden

// Sub Idx 2 Product Code
// Set ( ProductCode , 0x2468 ) ;  // default: 0x00
// SetByVar ( ProductCode , wtemp ) ;
   Get ( ProductCode , wtemp ) ;
    // Der Herstellerspezifische Produktcode identifiziert eine spezi-
elle Geräte
```

```
   // Version

// Sub Idx 3 Revision number
// Set ( DeviceRevision , 0x1357 ) ;
// SetByVar ( DeviceRevision , wtemp ) ;
   Get ( DeviceRevision , wtemp ) ;
   // Beim Auslesen dieses Obj wird der Wert in einen Longwert geändert
   // aus 0x4121 => 0x00410021

// Sub Idx 4 Serial number
   Get ( SerialNumber , ltemp ) ;  // Read only (see label on housing)
//---------------------------------
```

8.4 Possible data lengths

The table below shows the maximum transferable data:

Message	Amount of messages	Message length
Rx PDO	1	Maximum 1514 bytes
Tx PDO	1	Maximum 1514 bytes
SDO	Maximum 256 pcs.	Maximum variable length per SDO = 256 bytes

8.5 Startup phase

The Master sets up a TCP/IP- or a UDP/IP-connection to the Gateway during the startup phase. Only after a correct termination of the startup phase the data exchange with external devices will take place.

9 Generating a Script

9.1 What is a Script?

A Script is a sequence of commands, that are executed in that exact order. Because of the fact that also mechanisms are given that control the program flow in the Script it is also possible to assemble more complex processes from these simple commands.

The Script is memory-oriented. It means that all variables always refer to one memory area. While developing a Script you do not have to take care of the memory management though. The Protocol Developer takes on this responsibility for you.

9.2 Memory efficiency of the programs

A Script command can carry out e. g. a complex checksum like a CRC-16 calculation via data. For the coding of this command only 9 byte are required as memory space (for the command itself). This is only possible when these complex commands are contained in a library.
A further advantage of this library is, that the underlying functions have been in practical use for a couple of years and therefore can be described as 'void of errors'. As these commands are also present in the native code for the controller, at this point also the runtime performance of the Script is favorable.

9.3 What can you do with a Script device?

Our Script devices are in the position to process a lot of commands. In this case a command is always a small firmly outlined task. All commands can be put into classes or groups. A group of commands deals with the communication in general. This group's commands enable the Gateway to send and receive data on the serial side as well as on the bus-side.

9.4 Independence of buses

Basically the Scripts do not depend on the bus, they are supposed to operate on. It means that a Script which was developed on a PROFIBUS Gateway can also be operated on an Interbus without changes, since the functioning of these buses is very similar. In order to also process this Script on an Ethernet Gateway, perhaps further adjustments have to be made in the Script, so that the Script can be executed reasonably.
There are no fixed rules how which Scripts have to operate properly. When writing a Script you should take into account on which target hardware the Script is to be executed, so the necessary settings for the respective buses can be made.

9.5 Further settings at the Gateway

Most devices require no further adjustments, except for those made in the Script itself. However, there are also exceptions to it. These settings are made by means of the software WINGATE. If you know our UNIGATE®-series, you are already familiar with the proceeding with it. An example is the adjustment of the IP-address and the net-mask of an Ethernet-Gateway. These values have to be known as fixed values and are not available for the runtime. Another reason for the configuration of the values in WINGATE is the following: After an update of the Script these values
remain untouched, i. e. the settings that were made once are still available after a change of the Script.
Only this way it is also possible that the same Script operates on different Ethernet-Gateways, that feature different IP-addresses.

9.6 The use of the Protocol Developer

The software tool Protocol Developer can be downloaded from our website http://www.deutschmann.com
It is a tool for an easy generation of a Script for our Script Gateways. Its operation is exactly aimed at this use. After starting the program the Script that was loaded the last time is loaded again, provided that it is not the first start.

Typical for Windows Script commands can be added by means of the mouse or the keyboard. As far as defined and required for the corresponding command, the dialog to the corresponding command is displayed, and after entering the values the right text is automatically added to the Script. The insertion of new commands by the Protocol Developer is carried out in a way that existing commands will not be overwritten. Generally a new command is inserted in front of the one where the cursor is positioned. Of course the commands can also be written by means of the keyboard or already written commands can also be modified.

10 FTP-Server

This UNIGATE® features an integrated FTP-Server, that can be accessed with the file system.
The FTP-Server is password protected and can be addressed via the user name "deutschmann“ and the password “deutschmann“.
The following files that are located there on this file system MUST NOT be deleted or changed in no case since they are mandatory for the system:

- project.hex
- ftp_accounts.txt
- script.sys

The remaining files belong to the WEB-Server. Further information can be found in the corresponding chapter "WEB-Server".

10.1 Script-update via FTP

The dcs-file generated by the Protocol Developer has to be stored as "`script.dcs`" by the FTP on the Gateway (subdirectory "flash"). When the Gateway starts up, it identifies, converts and integrates this file into the file "`script.sys`", where the Script is usually filed and then deletes the file "`script.dcs`".

10.2 System configuration update via FTP

A WINGATE gwc-file has to be stored on the Gateway as "SYSTEM.GWC" via FTP. When the Gateway is startet, it identifies this file, transfers the new configuration and then deletes the file "SYSTEM.GWC".

11 WEB-Server

This Gateway also contains a WEB-Server by default. In the initial state there is a welcome page on the Flashdisk, that presents the device's system parameters.
The WEB-pages can be changed by the customer as desired and via FTP they can be written on the Flashdisk.
The "*Server-Side-Include*"-functionality is made available in order to be able to generate dynamic WEB-pages that display process data on the WEB-page or pass on data from the WEB-page to the process, which means that placeholders are used for the process data on the HTML-page.

Data exchange through Server-Side-Include (SSI)

In case the UNIGATE® detects the variable's placeholder, that is described by a variable's name (see below), it places the corresponding String at the variable's place. The other way round Strings, that are passed on via „POST" by the HTML-page with the corresponding variable name, are copied in to the corresponding Script buffer.
The Syntax looks as follows:

```
<?--#exec cmd_argument='xxxxx'-->
```

For xxxxx the following expressions are possible:

```
- DisplayFWVersion
- DisplayBLVersion
- DisplaySerial
- DisplayMacID
- DisplayStationName
- DisplayStationType
- DisplayVendorID
- DisplayDeviceID
- DisplayIP
- DisplaySubnet
- DisplayGateway
```

These expressions are self-explanatory and they reflect the corresponding values that have been preset by the Firmware.

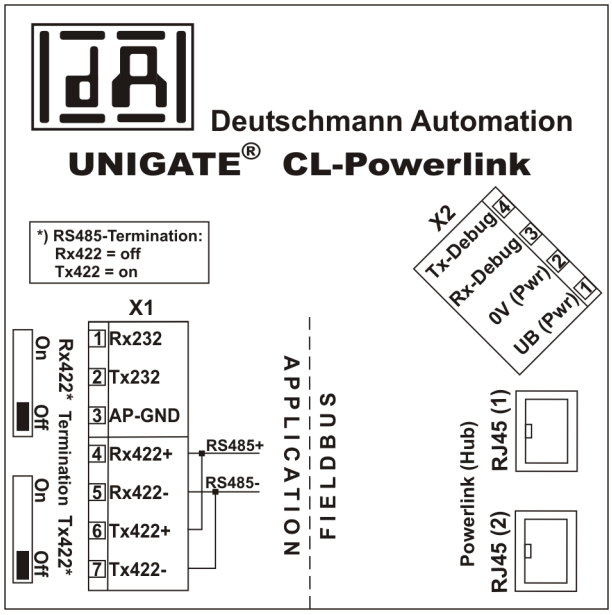
The following expression is required for the exchange of any process data between the Script in the Gateway and the WEB-page:

```
- DisplayScriptVar,Variablenname
```

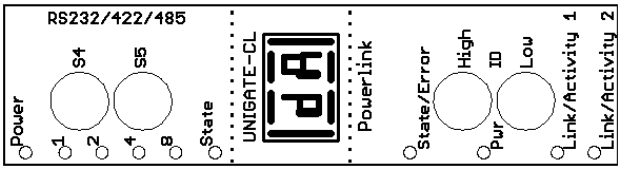
A good exmple for the interaction between Gateway-Script and HTML-page ca be taken from the Example-HTML-page `"ssi.html"` and Example-Script "`example_Set_HTML_String.dss`", that can both be found in the download area on our homepage at www.deutschmann.com.

12 Hardware ports, switches and LEDs

12.1 Device labeling



Picture 1: Terminal labeling and termination



Picture 2: Front panel: Rotary switches and LEDs

12.2 Connectors

12.2.1 Connector to the external device (RS-interface)

The serial interface is available at the plug accessible on the upper side of the device.
Pin assignment X1 (3-pole and 4-pole screw-type plug connector)

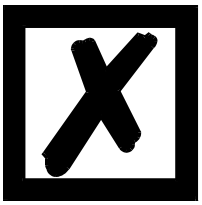
Pin No.	Name	Function
1	Rx 232	Receive signal
2	Tx 232	Transmit signal
3	AP-GND	Application Ground
4	Rx 422+ (485+)	Receive signal
5	Rx 422- (485-)	Receive signal
6	Tx 422+ (485+)	Transmit signal
7	Tx 422- (485-)	Transmit signal

For the operation at a 485-interface the two pins labeled "485-" have to be connected together.
Also the two pins "485+".

12.2.2 Connector supply voltage and DEBUG-interface

Pin assignment X2 (4-pole screw-plug connector, on the bottom side, at the back)

Pin No.	Name	Function
1	UB (Pwr)	10..33 V supply voltage / DC
2	0 V (Pwr)	0 V supply voltage / DC
3	Rx-Debug	Receive signal Debug
4	Tx-Debug	Transmit signal Debug



Attention:
At isolated devices (option GT) Ground for the DEBUG-Interface must be connected with pin 3 (AP-GND) of the RS-interface!
At devices that are not isolated also the 0V (Pwr)-signal can be used as reference.

12.2.3 Powerlink-connector

The plugs (labeled: Powerlink (Hub)) for the connection to the Ethernet Powerlink net are located on the bottom side of the device.

Pin assignment RJ45 (1) und RJ45 (2)

Pin No.	Name	Function
1	TD+	Transmission line +
2	TD-	Transmission line -
3	RD+	Receive line +
4		
5		
6	RD-	Receive line -
7		
8		

12.2.4 Power supply

The device must be powered with 10-33 VDC, The voltage supply is made through the 4-pole screw-plug connector at the device's bottom side.
Please note that the devices of the series UNIGATE should not be operated with AC voltage.

12.3 LEDs

The Gateway UNIGATE® CL - Powerlink features 10 LEDs with the following significance:

LED Pwr	green	Supply voltage Powerlink
LED Link / Activity 1	green	Ethernet-link pulses found / network data traffic
LED Link / Activity 2	green	Ethernet-link pulses found / network data traffic
LED State / Error	red/green	Interface-state Powerlink
LED Power	green	Supply voltage serial interface
LED State	red/green	User-defined / general Gateway error
LEDs 1 / 2 / 4 / 8 (Error No. / Select ID)	green	User-defined / general Gateway error

12.3.1 LED "Pwr"

This LED is connected directly to the Powerlink supply voltage.

12.3.2 LED "Link / Activity 1"

This LED is directly controlled by the Powerlink processor and shines when the Gateway is located at the RJ45 (1) at a working net (link pulses are received) and flickers during network data traffic (Activity).

12.3.3 LED "Link / Activity 2"

This LED is directly controlled by the Powerlink processor and shines when the Gateway is located at the RJ45 (2) at a working net (link pulses are received) and flickers during network data traffic (Activity).

12.3.4 LED "State / Error"

STATUS LED	State
LED off	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE / NMT_MS_NOT_ACTIVE
LED flickering	NMT_CS_BASIC_ETHERNET
LED single flash	NMT_CS_PRE_OPERATIONAL_1 / NMT_MS_PRE_OPERATIONAL_1
LED double flash	NMT_CS_PRE_OPERATIONAL_2 / NMT_MS_PRE_OPERATIONAL_2
LED triple flash	NMT_CS_READY_TO_OPERATE / NMT_MS_READY_TO_OPERATE
LED on	NMT_CS_OPERATIONAL / NMT_MS_OPERATIONAL
LED blinking	NMT_CS_STOPPED

12.3.5 LED "Power"

This LED is connected directly to the (optionally also electrically isolated) supply voltage of the serial interface (RS232/422/485).

12.3.6 LED "State"

Lights green	Controllable via Script
Flashes green	Controllable via Script
Flashes green/red	Controllable via Script
Lights red	General Gateway error (see LEDs Error No.), controllable via Script
Flashes red	UNIGATE is in the configuration / test mode, controllable via Script

12.3.7 LEDs (Error No. / Select ID)

If these 4 LEDs flash and LED “State“ simultaneously lights red, the error number is displayed in binary notation (conversion table, see Annex) in accordance with the table in chapter "Error handling". Additionally these LEDs are controllable via Script:

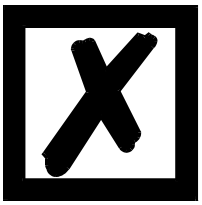
12.4 Switches

The Gateway features 6 switches with the following functions:

Termination Rx 422	switchable Rx 422-terminating resistor for the serial interface
Termination Tx 422	switchable Tx 422- or RS485-terminating resistor for the serial interface
Rotary coding switch S4	ID High for serial interface i. e. configmode
Rotary coding switch S5	ID Low for serial interface i. e. configmode
Rotary coding switch High	Powerlink Node ID (High byte)
Rotary coding switch Low	Powerlink Node ID (Low byte)

12.4.1 Termination Rx 422 + Tx 422 (serial interface)

If the Gateway is operated as the physically first or last device in an RS485-bus or as 422, there must be a bus termination at this Gateway. In order to do this the termination switch is set to position ON. The resistor (150 Ω) integrated in the Gateway is activated. In all other cases, the switch remains in position OFF.
Please refer to the general RS485 literature for further information on the subject of bus terminations.
If the integrated resistor is used, please allow for the fact that this also activates a pull-down resistor (390 Ω) to ground and a pull-up resistor (390 Ω) to VCC.



At RS48 only the Tx 422-switch must be set to ON.
The Rx 422-switch has to be on OFF.

12.4.2 Rotary coding switches S4 + S5 (serial interface)

These two switches can be read out through the Script command "`Get (RS_Switch, Destination)`" and the value can be used for further functions. This value is read in when the Gateway is switched on or always after a Script command has been executed. The switch positions "EE" (testmode) and "FF" (config mode) are reserved.

Note: The switch position "DD" (ie, S4 and S5 in position "D") is reserved for internal purposes.

12.4.3 Rotary coding switch High and Low (Powerlink Node ID)

The last byte of the Powerlink IP-address is set hexadecimal with these two switches.
This value is read in only once when the Gateway is activated.The value can also be read-out or analyzed through the Script command "`Get (FieldbusID, LongTemp)`".
-> 192.168.100.xy [Powerlink Node ID]
x = ID High
y = ID Low
Node ID from 1...239 possible (01...EF)

Example:
Rotary coding switch High = 6 and Low = 9. With it the Node ID is 69 hexadecimal = 105 decimal. This results in the Powerlink IP-address 192.168.100.105.

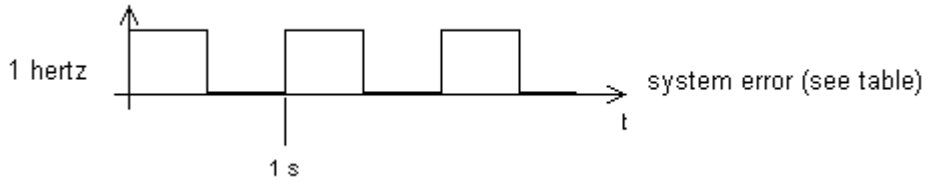
12.5 The Debug cable for UNIGATE® CL

As accessory a pre-configured Debug cable is available. The Debug cable connects the Gateway to Debug and RS.

13 Error handling

13.1 Error handling at UNIGATE® CL

If the Gateway detects an error, the error is signalled by the “State“ LED lighting red and, simultaneously, the error number being indicated by means of LEDs “Error No.“ (flashing frequency 1 hertz) as shown in the table below. A distinction can be made between two error categories:
Serious errors (1-5): In this case, the Gateway must be switched off and switched back on again. If the error occurs again, the Gateway must be exchanged and returned for repair.
Warnings (6-15): These warnings are displayed for one minute simply for information purposes and are then automatically reset. If such warnings occur frequently, please inform After-Sales Service.

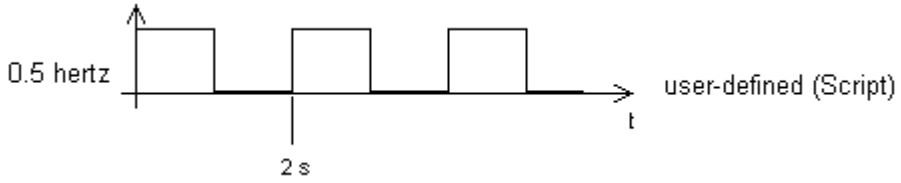


In the configuration mode these displays are not valid and only meant for internal use.

LED8	LED4	LED2	LED1	Error no. resp. ID	Error description
0	0	0	0	0	Reserved
0	0	0	1	1	Hardware fault
0	0	1	0	2	EEROM error
0	0	1	1	3	Internal memory error
0	1	0	0	4	Fieldbus hardware error
0	1	0	1	5	Script error
0	1	1	0	6	Reserved
0	1	1	1	7	RS-transmit buffer overflow
1	0	0	0	8	RS-receive buffer overflow
1	0	0	1	9	Controllable via Script
1	0	1	0	10	General fieldbus error
1	0	1	1	11	Parity-or frame-check-error
1	1	0	0	12	Reserved
1	1	0	1	13	Fieldbus configuration error
1	1	1	0	14	Fieldbus data buffer overflow
1	1	1	1	15	Reserved

Table 1: Error handling at UNIGATE® CL

For user-defined errors the flash frequency is 0.5 hertz. The error is displayed as long as defined by "Set Warning Time".



14 Installation guidelines

14.1 Installation of the module

The module with the dimensions 23 x 115 x 111 mm (W x D x H) has been developed for switch cabinet use (IP 20) and can thus be mounted only on a standard mounting channel (deep DIN-rail to EN 50022).

14.1.1 Mounting

- Engage the module from the top in the top-hat rail and swivel it down so that the module engages in position.
- Other modules may be rowed up to the left and right of the module.
- There must be at least 5 cm clearance for heat dissipation above and below the module.
- The standard mounting channel must be connected to the equipotential bonding strip of the switch cabinet. The connection wire must feature a cross-section of at least 10 mm².

14.1.2 Removal

- First disconnect the power supply and signal lines.
- Then push the module up and swivel it out of the top-hat rail.

Vertical installation
The standard mounting channel may also be mounted vertically so that the module is mounted turned through 90°.

14.2 Wiring

14.2.1 Connection systems

The following connection systems must resp. may be used when wiring the module:
- Standard screw-type/plug connection (power supply + RS)
- 8-pin RJ45-plug-in connection (Powerlink-connection)

a) In the case of standard screw-type terminals, one lead can be clamped per connection point. It is best to then use a screwdriver with a blade width of 3.5 mm to firmly tighten the screw.

Permitted cross-sections of the line:
- Flexible line with wire-end ferrule: 1 x 0.25 ... 1.5 mm²
- Solid conductor: 1 x 0.25 ... 1.5 mm²
- Tightening torque: 0.5 ... 0.8 Nm

b) The plug-in connection terminal strip is a combination of standard screw-type terminal and plug connector. The plug connection section is coded and can thus not be plugged on the wrong way round.

14.2.1.1 Power supply

The device must be powered with 10..33 V DC.

- Connect the supply voltage to the 4-pole plug-in screw terminal in accordance with the labelling on the device.

14.2.1.2 Equipotential bonding connection

The connection to the potential equalization automatically takes place it is put on the DIN-rail.

14.2.2 Ethernet Powerlink communication interface

This interface is located on the module in the form of two 8-pin RJ45 sockets on the bottom side of the housing.

- Plug the Powerlink-connector onto one of the RJ45 sockets labeled "Powerlink ’(Hub)".

- Please make sure that the length of the line to the adjacent Ethernet participants does not fall below 0.6 m.

14.2.3 Line routing, shield and measures to combat interference voltage

This chapter deals with line routing in the case of bus, signal and power supply lines, with the aim of ensuring an EMC-compliant design of your system.

14.2.4 General information on line routing

- Inside and outside of cabinets
In order to achieve EMC-compliant routing of the lines, it is advisable to split the lines into the following line groups and to lay these groups separately.

⇒ Group A:
- shielded bus and data lines (e. g. for RS232C and printers etc.)
- shielded analogue lines
- unshielded lines for DC voltages ≥ 60 V
- unshielded lines for AC voltage ≥ 25 V
- coaxial lines for monitors

⇒ Group B:
- unshielded lines for DC voltages ≥ 60 V and ≥ 400 V
- unshielded lines for AC voltage ≥ 24 V and ≥ 400 V

⇒ Group C:
- unshielded lines for DC voltages > 400 V

The table below allows you to read off the conditions for laying the line groups on the basis of the combination of the individual groups.

	Group A	**Group B**	**Group C**
Group A	1	2	3
Group B	2	1	3
Group C	3	3	1

Table 3: Line laying instructions as a function of the combination of line groups

1) Lines may be laid in common bunches or cable ducts.
2) Lines must be laid in separate bunches or cable ducts (without minimum clearance).
3) Lines must be laid in separate bunches or cable ducts inside cabinets but on separate cable racks with at least 10 cm clearance outside of cabinets but inside buildings.

14.2.4.1 Shielding of lines

Shielding is intended to weaken (attenuate) magnetic, electrical or electromagnetic interference fields.
Interference currents on cable shields are discharged to earth via the shielding bus which is connected conductively to the chassis or housing. A low-impedance connection to the PE wire is particularly important in order to prevent these interference currents themselves becoming an interference source.

Wherever possible, use only lines with braided shield. The coverage density of the shield should exceed 80%. Avoid lines with foil shield since the foil can be damaged very easily as the result of tensile and compressive stress on attachment. The consequence is a reduction in the shielding effect.
In general, you should always connect the shields of cables at both ends. The only way of achieving good interference suppression in the higher frequency band is by connecting the shields at both ends.
The shield may also be connected at one end only in exceptional cases. However, this then achieves only an attenuation of the lower frequencies. Connecting the shield at one end may be more favorable if

- it is not possible to lay an equipotential bonding line
- analogue signals (a few mV resp. mA) are to be transmitted
- foil shields (static shields) are used.

In the case of data lines for serial couplings, always use metallic or metallized plugs and connectors. Attach the shield of the data line to the plug or connector housing.

If there are potential differences between the earthing points, a compensating current may flow via the shield connected at both ends. In this case, you should lay an additional equipotential bonding line.

Please note the following points when shielding:

- Use metal cable clips to secure the shield braiding. The clips must surround the shield over a large area and must have good contact.
- Downstream of the entry point of the line into the cabinet, connect the shield to a shielding bus. Continue the shield as far as the module, but do not connect it again at this point!

15 Technical data

15.1 Device data

The technical data of the module is given in the table below.

No.	Parameter	Data	Explanations
1	Location	Switch cabinet	DIN-rail mounting
2	Enclosure	IP20	Protection against foreign bodies and water to IEC 529 (DIN 40050)
4	Service life	10 years	
5	Housing size	23 x 115 x 111 mm (screw-plug-connector included) 23 x 115 x 100 mm (screw-plug connector not included)	W x D x H
6	Installation position	Any	
7	Weight	Approx. 130 g	
8	Operating temperature	-25ºC ... +85ºC	
9	Storage/transport temperature	-40 ºC ... +85 ºC	
10	Atmospheric pressure during operation during transport	 795 hPa ... 1080 hPa 660 hPa ... 1080 hPa	
11	Installation altitude	2000 m 4000 m	Unrestricted Restricted - Ambient temperature ≤ 40ºC
12	Relative humidity	Max. 80 %	No condensation, no corrosive atmosphere
14	External power supply	10..33 V DC	Standard power supply unit to DIN 19240
15	Current consumption at 24 VDC	Typ. 120 mA max 150 mA	
17	Reverse voltage protection	Yes	But does not function!
18	Short-circuit protection	Yes	
19	Overload protection	Poly-switch	Thermal fuse
20	Undervoltage detection (USP)	≤ 9 V DC	
21	Emergency power supply	≥ 5 ms	Device fully operable

Table: Technical data of the module

15.1.1 Interface data

The table below lists the technical data of the interfaces and ports on the device. The data has been taken from the corresponding Standards.

No.	Interface designation Physical interface	Powerlink Ethernet 100 BaseT	RS232-C RS232-C	RS485/RS422 RS485/RS422
1	Standard		DIN 66020	EIA Standard
2	Transmission mode	Symmetrical asynchronous serial full-duplex half-duplex → Difference signal	Asymmetrical asynchronous serial full-duplex → Level	Symmetrical asynchronous serial half-duplex full-duplex at RS422 → Difference signal
3	Transmission method	Multimaster CSMA/CD	Master / slave	Master / slave
4	Number of users : - Transmitters - Receivers	512 512	1 1	32 32
5	Cable length: - Maximum - Depending on baud rate	100 m	15 m no	1200 m <93.75 kBd→1200 m 312 kBd→500 m 625 kBd→250 m
6	Bus topology	Star / line	Point-to-point	Line
7	Data rate: - Maximum - Standard	100 Mbit/s 100 Mbit/s	120 kBit/s 2.4 k/B 4.8 k/B 9.6 kBit/s 19.2 kBit/s 38.4 kBit/s	625 kBaud 2.4 kBit/s 4.8 kBit/s 9.6 kBit/s 19.2 kBit/s 57.6 kB 312.5 kB 625 kB
8	Transmitter: - Load - Maximum voltage - Signal, unloaded - Signal, loaded	100 Ω	3 ... 7 kΩ ± 25 V ± 15 V ± 5 V	54 Ω - 7 V ... 12 V ± 5 V ± 1.5 V
9	Receiver: - Input resistance - Maximum input signal - Sensitivity	100 Ω	3 ... 7 Ω ± 15 V ± 3 V	12 Ω - 7 V ... 12 V ± 0.2 V
10	Transmit range (SPACE): - Voltage level - Logic level		 + 3 ... + 15 V 0	 - 0.2 ... + 0.2 V 0
11	Transmit pause (MARK): - Voltage level - Logic level		 - 3 ... –15 V 1	 + 1.5 ... +5 V 1

Table: Technical data of the interfaces at the module

16 Commissioning guide

16.1 Note

Only trained personnel following the safety regulations may commission the UNIGATE®.

16.2 Components

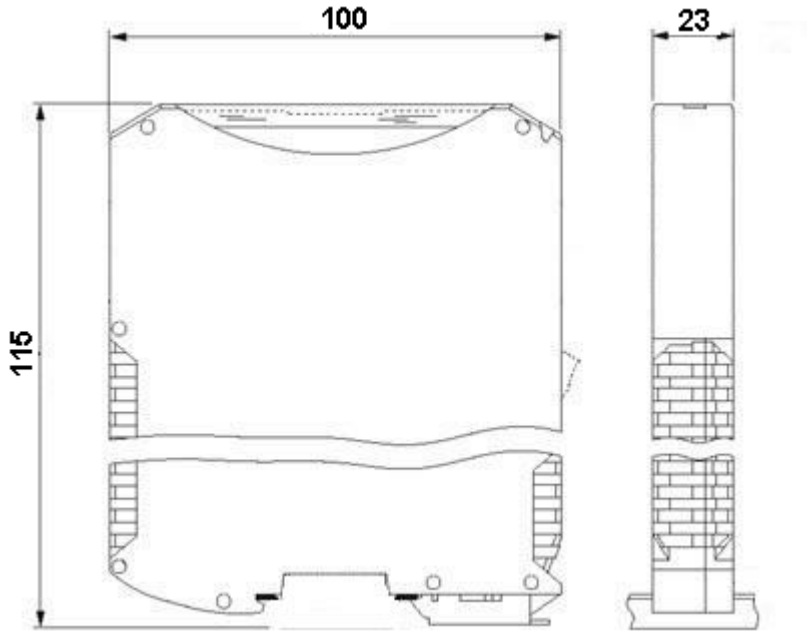
You will require the following components to commission the UNIGATE®:

- UNIGATE®
- Connection cable from gateway to the process
- Connector for Powerlink connection to the Gateway
- Ethernet cable (this cable is generally available on site!)
- 10..33 V DC power supply (DIN 19240)
- Type file or EDS file and user manual (a sample EDS file as well as the user manual can be ordered separately or downloaded free of charge from our homepage at www.deutschmann.de).

16.3 Installation

The UNIGATE® CL - PL module features protection type IP20 and is thus suitable for switch cabinet use. The device is designed for snapping onto a 35 mm DIN-rail.

16.4 Dimensional drawing UNIGATE® CL - Powerlink



16.5 Commissioning

It is essential that you perform the following steps during commissioning in order to ensure that the module operates correctly:

16.6 Powerlink connection

Connect the device to the Powerlink network at the interface labeled "Powerlink (Hub)".

16.7 Connection to the process device

Please also read the manual for the process device when commissioning the process device.

16.8 Shield connection

Earth the top-hat rail onto which the module has been snapped.

16.9 Connecting the supply voltage

Please connect 10..33 DC voltage to the terminals provided for this.

16.10 Project planning

Use any project planning tool for project planning.
If the required EDS file was not supplied with your project planning tool, a sample file can be found on the Internet (www.deutschmann.com).

17 Servicing

Should questions arise that are not covered in this manual you can find further information in our

- FAQ/Wiki area on our homepage www.deutschmann.com or directly in our Wiki on www.wiki.deutschmann.de

If your questions are still unanswered please contact us directly.

Please note down the following information before calling:
- Device designation
- Serial number (S/N)
- Article number
- Error number and error description

Your request will be recorded in the Support center and will be processed by our Support Team as quickly as possible (Usually in 1 working day, rarely more than 3 working days.).

The technical support hours:
Monday to Thursday from 8 am to midday and from 1 pm to 4 pm, Friday from 8 am to midday. (CET)

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Fax sales department	+49 6434 9433-40
Fax technical support	+49 6434 9433-44
E-mail technical support	support@deutschmann.de

17.1 Returning a device

If you return a device, we require as comprehensive a fault/error description as possible. We require the following information in particular:

- What error number was displayed?
- What is the supply voltage (±0.5 V) with Gateway connected?
- What were you last doing or what last happened on the device (programming, error on power-up,...)?

The more precise information a fault/error description you provide, the more exactly we will be able to pinpoint the possible causes.

17.2 Downloading PC software

You can download current information and software free of charge from our Internet server.
http://www.deutschmann.com

18 Annex

18.1 Explanations of the abbreviations

General

CL	=	Product group CL (Compact Line)
CM	=	Product group CM (CANopen Line)
CX	=	Product group CX
EL	=	Product group EL (Ethernet Line)
FC	=	Product group FC (Fast Connect)
GT	=	Galvanic separation RS-side
GY	=	Housing color gray
MB	=	Product group MB
RS	=	Product group RS
SC	=	Product group SC (Script)
232/485	=	Interface RS232 and RS485 switchable
232/422	=	Interface RS232 and RS422 switchable
DB	=	Additional RS232 DEBUG-interface
D9	=	Connection of the RS through 9-pin D-SUB instead of 5-pin screw-plug connector
PL	=	Board only without DIN-rail module and without housing cover
PD	=	Board only without DIN-rail module and with housing cover
AG	=	Gateway installed in a die-cast aluminum housing
EG	=	Gateway installed in a stainless steel housing
IC	=	Product group IC (IC-design DIL32)
IO8	=	Option I/O8
16	=	Script memory expanded to 16KB
5V	=	Operating voltage 5V
3,.3V	=	Operating voltage 3.3V

Fieldbus

ASI	=	AS-Interface (AS-i)
BI	=	BACnet/IP
BMS	=	BACnet MSTB
CO	=	CANopen
C4	=	CANopen V4
C4X	=	CANopen V4-version X (see comparison table UNIGATE® IC for the respective product)
DN	=	DeviceNet
EC	=	EtherCAT
EI	=	Ethernet/IP
FE	=	Ethernet 10/100 MBit
FEX	=	Ethernet 10/100 MBit-version X (see comparison table UNIGATE® IC for the respective product)
IB	=	Interbus
IBL	=	Interbus
LN62	=	LONWorks62
LN512	=	LONWorks512
ModTCP	=	ModbusTCP
MPI	=	Siemens MPI®
PL	=	Powerlink

PN = Profinet-IO
PBDP = ProfibusDP
PBDPL = ProfibusDP-version L (see comparison table UNIGATE® IC for the respective product)
PBDPX = ProfibusDP-version X (see comparison table UNIGATE® IC for the respective product)
PBDPV0 = ProfibusDPV0
PBDPV1 = ProfibusDPV1
RS = Serial RS232/485/422

18.2 Hexadecimal table

Hex	Decimal	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111