XVision

Text-Display-PLC XSystem

Device Description

XVC-100

MOELLER

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Proper use

The device must only be used for the applications specified in the device description and only in conjunction with the components recommended by Moeller GmbH.

Warning

Trouble-free and safe operation of the product can only be ensured if the measures relating to proper transport, storage, assembly, installation and careful operation are strictly observed.

The device must not be switched on when it is covered with condensation. When changing its location from cold to warm allow the device to acclimatise to the new conditions before commissioning.

No warranty claims will be recognised for faults arising from the improper handling of the device.

The device should not be used for the implementation of any safety functions relating to the protection of personnel and machinery.

No liability is accepted for claims for damages arising from a failure or functional defect in the device.

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Safety instructions for the user

This device description contains the information required for the proper use of the products described therein. Sections 1 to 11 address technically qualified personnel and Section 12 onwards addresses personnel not requiring any technical knowledge.

Qualified personnel in the sense of the safety instructions given in this device description or on the project itself are persons who:

as engineering personnel are either familiar with the safety concepts of automation,

or as operating personnel, are instructed in the use of automation components and are familiar with the contents of this device description relating to the operation of the device,

or as commissioning or service personnel are suitably trained for the repair of automation devices and are authorised to commission circuits and device/systems in accordance with standard safety engineering principles.

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1 Explanation of symbols

Danger warnings

The following information is for your personal safety and the prevention of damage to the device described or connected devices.

Safety instructions and warnings for the prevention of danger to the life and health of users or service personnel, and for the prevention of damage are highlighted in this document by the following pictograms. “Warning” and “Information” pictograms are shown in this document.

Warnings indicate the following:

Death, serious injury or substantial material damage may occur if the related safety measures are not implemented.

The individual “Warning” pictograms have the following meaning:

Caution! General!
An instruction to be observed in order to ensure protection against hazards and the safe operation of the device. The specified procedure should be observed.

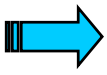
Caution! Electric shock!
Persons may be exposed to dangerous voltages that occur in electrical systems. There is a danger of electric shock if a live part is touched.

Caution! Observe ESD measures!
Electrostatic discharge may destroy electronic components.

Information pictograms indicate the following:

Important information about the product or the relevant section of the document, requiring the particular attention of the reader.

The “Information” pictogram has the following meaning:



Indicates important and instructional information.

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2 INTRODUCTION

Advantages of the XVC-100 devices

- 8x20 or 4x10 CHARACTER TEXT DISPLAY WITH VARIABLE FONT
- MEMBRANE KEYBOARD WITH 28 KEYS AND 3 LEDs
- INTEGRATED INPUTS/OUTPUTS
- CANopen STANDARD FIELDBUS INTERFACE
- EXCHANGEABLE COMPACTFLASH™
- PROGRAMMABLE TO IEC61131 (IL, LD, FBD, SFC, ST, CFC)
- IP65 FRONT

The XVC-100 series text display PLC combines in one device a text display operator panel with a powerful compact PLC. This future-oriented device concept creates wide range of automation and networking options.

A compact and fully-fledged PLC with digital and analog inputs and outputs is provided behind the membrane keyboard with the 8x20 character display. Remote peripheral devices can be connected via the integrated CAN bus. All plugs are accessible from the rear.

The PLC is programmed in compliance with the IEC61131 industrial standard, thus making the XVC-100 text display PLC into a universal device for automation tasks. A user-friendly PLC function library is provided for designing the visualization functions simply and effectively.

The integration of third-party systems (I/Os, drives etc.) via standard fieldbus interfaces (CANopen) and their integration in the overall system offers access to a wide range of process optimised peripheral components.

Application range

The XVC-100 series text display PLC is designed for controlling, operating and monitoring machines and plants. The rugged and compact design allows the implementation of applications that were previously impossible due to the prohibitive space and cost requirements involved.

The high degree of protection (front IP65) and the omission of any moving parts (hard disks, fans) makes the devices ideal for robust use in rugged industrial environments directly at the machine.

The devices can be installed in control panels or control desks without any problem.

This device description is a reference for the technical data, installation, terminals, commissioning, operation, and maintenance of all XVC-100 versions. The illustrations in this document are for the XVC-100 device version (➔ Section 3), unless otherwise stated. The designation and function of the connections and signals are the same for all versions.

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3 DEVICE VERSIONS

The term XVC-100 stands for the following versions.

XVC-100 Device types				
Type designation	Display	Fieldbus	Resolution	Power supply
XVC-101-C192K-K82	LCD mono	CAN	8X20 or 4X10 characters can be selected via the software	24 VDC

The following front plate versions are available:

Front plate type		Standard front with Moeller membrane seal

3.1 SPECIFICATIONS

XVC-101-C192K-K82	Order No.: **264113** 8 x 20/4 x 10 characters, 28 keys / 3 LEDs, retentive data 8KB Interface: 1 x CAN, 1 x RS232 I/O: 10 x DI 24VDC, 8 x DO 24VDC 0.5A, 8 x DIO selectable, 2 x AI 0-10V/10-bit, 2 x AO +/-10V/12-bit Without CompactFlash™

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3.2 ACCESSORIES

CompactFlash™	**XT-MEM-CF8M** Order No.: **264182** CompactFlash 8MB **XT-MEM-CF16M1** Order No.: **256213** CompactFlash 16MB
Battery	**XT-CPU-BAT2** Order No.: **264115** Battery Spare battery (Type ➔ Section11)
Programming cable	**XT-SUB-D-SUB-D** Order No.: **264114** Programming cabel Programming cable RS232 Null modem (serial connection)

3.3 DESIGNING

XSoft-Professional (on CD)	XSoftProfessional Consisting of: - XSoft -> IEC61131 software - Documentation in PDF format

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4 FEATURES

Feature			Comment
Display	LCD text	Resolution	8 x 20 or 4 x 10 characters can be selected via the software
	Line height	mm	4 or 8
	Type	Mono	
Keys	Total	Number	28
	Function keys	Number	8
PLC	Languages	IEC61131	IL, LD, FBD, SFC, ST, CFC
	PLC program	KByte	Configurable: Default: 384 (program + data max. 440)
	PLC data	KByte	Configurable: Default: 56 (program + data max. 440)
	Retentive data	KByte	Max. 8
	Multi-tasking	No	
	Debug options	Yes	Online change, breakpoint, trace, flow control
	Cycle time/1000 instructions	ms	Normally 1 ms (Bit, Byte, Word, DWord Operations)
	Digital Inputs of which	Number	10 x 24VDC
	Counter inputs	Number	Configurable: Max. 2 x Up/Down Max. 50 kHz
	Interrupt inputs	Number	Configurable: Max. 2
	Encoder inputs	Number	Configurable: 1 max. 50 kHz
	Digital outputs	Number	8 x 24VDC 0.5A
	Digital inputs/outputs	Number	8 x 24VDC 0.5A, individually configurable
	Analog inputs	Number	2 x 0-10V/10-bit
	Analog outputs	Number	2 x +/-10V/12-bit
	Real-time clock	Yes	Battery-backed
Visualization	User memory for visualization	KByte	Max. 60 KByte text, parameters and recipes
	Fonts	Number	1 x large/small characters, variable, fixed[1]
	Variable font	Number	1 x large/small can be loaded
	Online languages	Number	Normally 5
	Character languages	Yes	In preparation
	Text lines	Number	Max. 2200 at 20 characters each
	Operator function	Yes	Alphanumeric setpoint entry
	Signalling function	Yes	Display of process values, message texts, time/date
	Recipes	Yes	Predefined parameters or loadable from CompactFlash™, configurable in PLC
	Password	Yes	Configurable in PLC
	Alarm	Yes	Configurable in PLC
Communication	COM1 (RS232)	kBit/s	Max. 57.6
	CAN (CANopen)	kBit/s	CAN master, Max. 1000 Default: 125
	Remote maintenance	Yes	Serial, with external modem
Exchangeable memory	CompactFlash™	MByte	8 or 16MB
	Software update via CompactFlash™	Yes	PLC project, visualization texts automatically on Power On; firmware update via System menu

The number of designable screen pages, messages, languages etc. is restricted by the memory available for visualization. The memory required per screen page greatly depends on the application concerned, and is mainly determined by the number and length of the texts shown. (60 KByte can store max. 55 pictures * 8 lines * 20 characters * 5 languages)

[1] Standard font see Appendix

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The display is controlled in the background and takes up max. 7 % of the CPU capacity. A complete screen change takes approx. 150 ms.

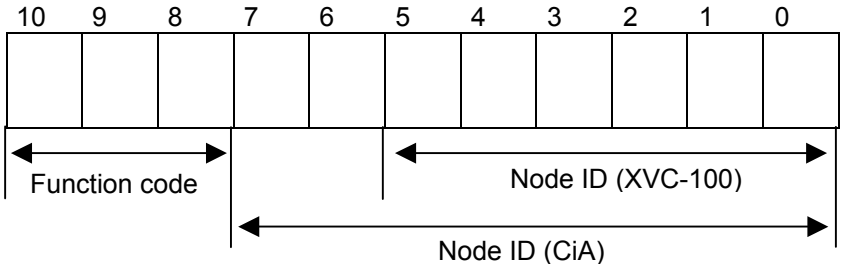
CompactFlash™ memory media are NOT suitable for cyclical data logging due to the limited number of write cycles (normally 100,000).

4.1 UTILISATION OF THE CAN IDENTIFIER (CANOPEN)

The utilisation of the CAN identifier is in compliance with the CANopen Standard with the following deviations:

1. Selectable CAN node numbers (Node ID) are 1 to 31
2. The following additional CAN node numbers (node IDs) are reserved for networking the devices:
   - Own node number + 32
   - Own node number + 64
   - Own node number + 96

Utilisation of the CAN node numbers (Node ID):



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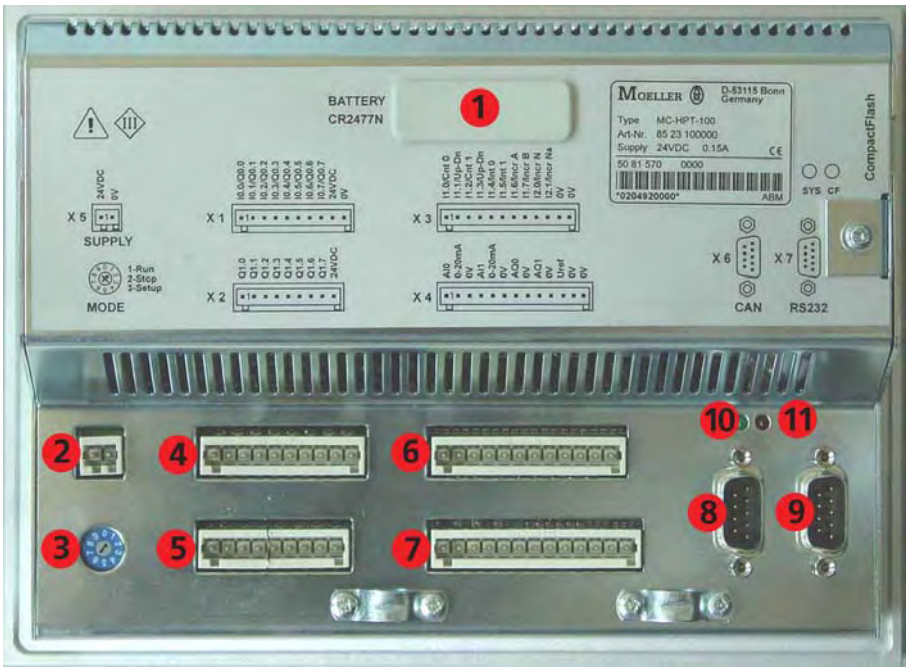
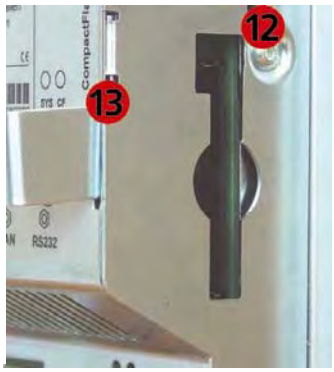
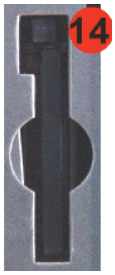
5 COMMISSIONING

5.1 OVERVIEW OF CONNECTIONS







No.	Element	Description
1	Battery for retentive PLC data and real-time clock	➔ Section 5.2
2	Connector X 5 (power supply)	➔ Section 5.3
3	Operating mode switch	➔ Section 6.4
4	Connector X 1 (Digital Input / Output)	➔ Section 5.6
5	Connector X 2 (Digital Output)	➔ Section 5.7
6	Connector X 3 (Digital Input)	➔ Section 5.8
7	Connector X 4 (Analog Input / Output)	➔ Section 5.9
8	Connector X 6 (CAN Communication Interface)	➔ Section 5.10
9	Connector X 7 (RS232 Programming Interface)	➔ Section 5.5
10	*SYS* control LED	➔ Section 5.12
11	*CompactFlash*™ control LED	➔ Section 5.12
12-14	CompactFlash™ with protective cover and ejector	➔ Section 5.11

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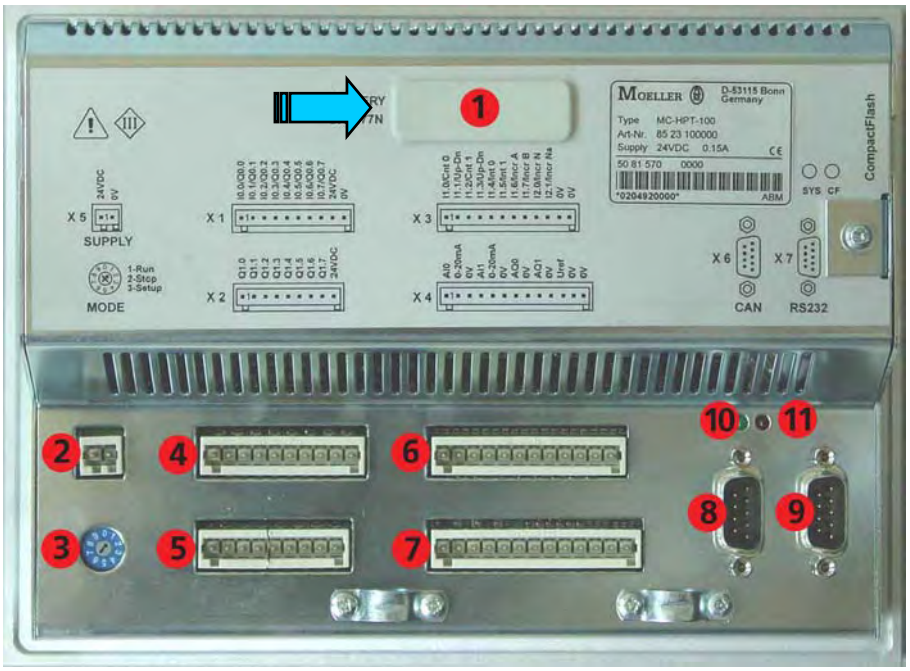
5.2 INSERTING THE BATTERY

The battery supplied (Ord. no. 264115) is used for backing up the real-time clock and the retentive PLC data. The battery is already inserted when delivered. It can be replaced in the following way:

1. Connect the device to power supply at least 10 minutes
2. Unplug the power supply (the retentive data will be stored at least 2 minutes)
3. Carefully remove the battery cover
4. Insert battery
5. Refit battery cover



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5.3 Connecting the power supply

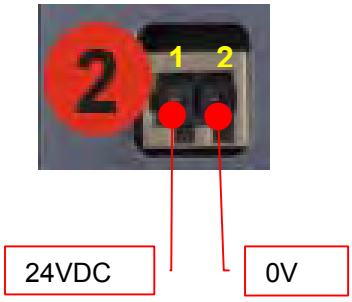
The XVC-100 device belongs to protection class 3. The system power supply must be provided with a 24VDC **SELV** voltage (➔ Section 11). The power supply is not isolated. The 0V connection is directly connected to the housing potential. The current supply is protected with a fuse (2A slow) (➔ Section 11). A reverse polarity protective device is used to protect the device in the event of reversed poles. Operation, however, is only possible if the connection was made correctly.
Connections for the XVC-100 must comply with specific, local regulations.

The connection must be made as follows:

- The cross-section of the power supply cable must be at least 0.75 mm² and a maximum of 2.5 mm².
- A flexible lead or wire can be used for the connection.
- The current consumption (➔ Section 11 must be taken into account when implementing the power supply. The functional earth is not compulsory for operation. The GND connection is directly connected to the housing potential

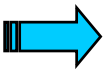
The plug connector for the connection is supplied with the unit.

Connector assignment:



X 5 - Supply		
2-pole, WAGO multi-connector system MINI, RM 3.5 mm, 734-132		
Counterpart: WAGO 734-102		
Pin No.	Assignment	Function
1	24VDC	+24V power supply
2	0V	0V power supply

In the event of reverse polarity and if an additional 0 V connection is implemented, e.g. GND connection of an analog output, the fault current is fed via this 0V connection. The XVC-100 or the external components may be destroyed if the housing is not connected tightly to the 0V potential!



The XVC-100 text display PLC has a two-stage undervoltage monitoring system. If level 1 is undershot, the backlight is switched off. If level 2 is undershot, the PLC is switched off.

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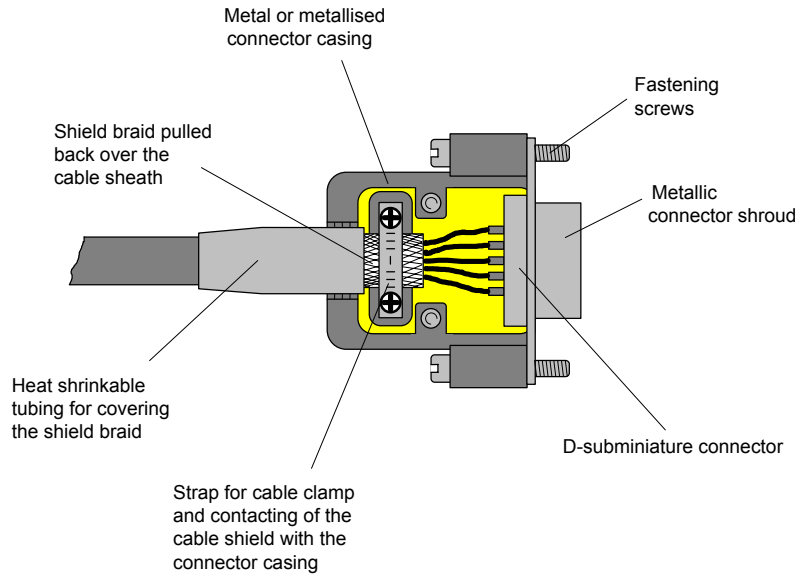
5.4 PREPARING THE SHIELD CONNECTIONS

The preparation of the data and signal cables is an important factor for the electromagnetic compatibility (EMC) of the XVC-100, both in terms of interference immunity and emission.

The **RS232** interface and **CAN** interface are connected via D-Subminiature plug connectors in accordance with DIN 41652. Only use metal or metallized connector casings with a cable clamp for strain relief fastened or clamped on the connector. The clamping of the cable shield ensures an optimum contact area and a low impedance connection with the connector casing of the XVC-100 text display PLC.

The following procedure is recommended for making the low-impedance connection for the cable shield:

1. Strip the cable.
2. Shorten the exposed shield braid by approx. 3 cm.
3. Turn back the braid over the cable sheath.
4. Use a heat shrinkable tubing or rubber grommet to cover the exposed cable sheath with the folded back shield braid so that 5 to 8 mm of exposed cable shield is left at the sheath end and is cleanly covered at the back.
5. Fit the connector
6. The cable is then fastened at the exposed shield braid and the cable sheath below it directly underneath the cable clamp strap of the connector casing.



Connection work should be carried out with special care in order to ensure trouble-free operation.
The EMC values stated in the technical data can only be guaranteed if the cables are prepared according to the stated specifications.

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5.5 CONNECTING THE PROGRAMMING INTERFACE – X7

The programming is carried out via the standard RS232 interface (COM1). The connection to the programming PC is made using a null modem cable. The cables are also available as an accessory (➔ Section 3.2).
This interface is **not** isolated. The GND connection is implemented directly on the housing potential (➔ Section 11).

Cables connected to the programming interface must be laid separately from the low-voltage cables.

Connector assignment

Connector X 7 - RS232 programming interface		
Sub-D 9 Pole male		
Pin No.	Assignment	Function
1	DCD	Data Carry Detect
2	RXD	Receive data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Ready for Operation
7	RTS	Send Request
8	CTS	Send Enable
9	RI	Ring Indicator
Case	Case	Cable shield

A detailed description of the project download is provided in the "XSoft" system description or in the appropriate software documentation.

Wiring of the null modem cable

	female			female		
	9pole	25pole		25pole	9pole	
DCD	1	8	———	20	4	DTR
RXD	2	3	———	2	3	TD
TXD	3	2	———	3	2	RD
DTR	4	20	———	8/6	1/6	DCD/DSR
GND	5	7	———	7	5	GND
DSR	6	6	———	20	4	DTR
RTS	7	4	———	5	8	CTS
CTS	8	5	———	4	7	RTS
RI	9				9	

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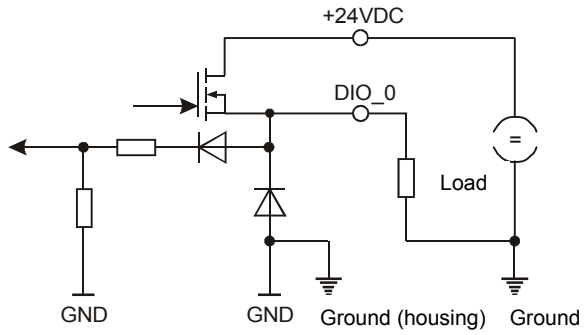
5.6 Connection of the digital input / output - Connector X 1

Connector Assignment for X 1

Connector X 1 - digital input / output		
10-pole, WAGO multi-connector system MINI, RM 3.5 mm, 734-140		
Counterpart: WAGO 734-110		
Pin No.	Assignment	Function
1	I0.0/Q0.0	Digital input/output 0
2	I0.1/Q0.1	Digital input/output 1
3	I0.2/Q0.2	Digital input/output 2
4	I0.3/Q0.3	Digital input/output 3
5	I0.4/Q0.4	Digital input/output 4
6	I0.5/Q0.5	Digital input/output 5
7	I0.6/Q0.6	Digital input/output 6
8	I0.7/Q0.7	Digital input/output 7
9	24VDC	+24VDC supply for DIG_I/O0-7
10	0V	Signal Ground (ground potential)

X 1 input / output level

24 VDC sensors and actuators can be connected to the digital inputs/outputs. The inputs/outputs are configured in the user PLC program. All inputs/outputs are outputs in their default configuration.



The input is designed for 24VDC. (➔ Section11).
The load current for each digital output is 0.5A

The digital inputs/outputs are not isolated.

All outputs are switched off if one of the outputs has an overload! The overload is indicated and can be read in the PLC user program.

All inputs/outputs are outputs in their default configuration.
The outputs can be used for switching inductive loads. An external free-wheeling circuit must be implemented for large inductances. (➔ Section 11).

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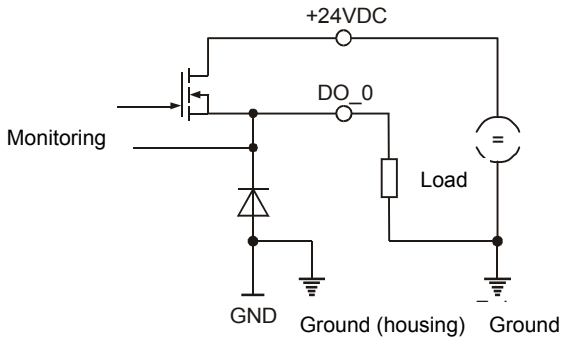
5.7 Connection of the digital output - Connector X 2

Connector Assignment for X 2

Connector X 2 - digital output		
9-pole, WAGO multi-connector system MINI, RM 3.5 mm, 734-139		
Counterpart: WAGO 734-109		
Pin No.	Assignment	Function
1	Q1.0	Digital output 0
2	Q1.1	Digital output 1
3	Q1.2	Digital output 2
4	Q1.3	Digital output 3
5	Q1.4	Digital output 4
6	Q1.5	Digital output 5
7	Q1.6	Digital output 6
8	Q1.7	Digital output 7
9	24VDC	+24VDC supply for DIG_OUT0-7

X 2 output level

Eight digital outputs are provided for 24VDC actuators. The power supply is fed via a separate pin and is common for all outputs. Each output is protected against short-circuits and reverse polarity. In the event of a fault, this is detected by the output driver.



The load current for each digital output is 0.5A (➔ Section 11)

The digital outputs are not isolated.

It must be ensured that there is a good connection between the reference potential (GND) for the digital outputs and the GND of the XVC-100.

All 8 outputs are switched off if one of the outputs has an overload! The overload is indicated and can be read in the PLC user program.

The outputs can be used for switching inductive loads. An external free-wheeling circuit must be implemented for large inductances. (➔ Section11).

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5.8 Connection of the digital input - Connector X 3

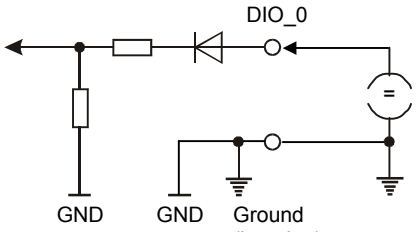
Connector Assignment for X 3

Connector X 3 - digital input		
12-pole, WAGO multi-connector system MINI, RM 3.5 mm, 734-142		
Counterpart: WAGO 734-112		
Pin No.	Assignment	Function
1	I1.0/Cnt 0	Digital input 0 / Counter0 input
2	I1.1/Up-Dn	Digital input 1 / Counter0 Up/Down
3	I1.2/Cnt 1	Digital input 2 / Counter1 input
4	I1.3/Up-Dn	Digital input 3 / Counter1 Up/Down
5	I1.4/Int 0	Digital input 4 / Interrupt0 input
6	I1.5/Int 1	Digital input 5 / Interrupt1 input
7	I1.6/Incr A	Digital input 6 / Incr. Ch A
8	I1.7/Incr B	Digital input 7 / Incr. Ch B
9	I2.0/Incr N	Digital input 8 / Incr. zero mark
10	I2.1/Incr Na	Digital input 9 / Incr. zero mark active
11	0V	Signal Ground (ground potential)
12	0V	Signal Ground (ground potential)

X 3 input level

Function:Digital Inputs

Ten digital inputs are provided. These inputs enable 24 volt digital sensors, counters and incremental encoders to be connected.



The input is designed for 24VDC. (➔ Section 11).

The digital inputs are not isolated, the input voltage refers to ground (GND).

The debouncing of inputs is implemented via the software. This function must be activated if required. (see also Description of the function block libraries for XVC-100)

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Function: Counter Inputs

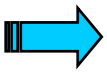
Two counter inputs are provided. These allow counter functions with a maximum input frequency of 50 kHz each. The switch thresholds are the same as the signal values of the digital inputs (➔ Section11).

Function:Interrupt Inputs

Two Interrupt inputs are provided. The switch thresholds are the same as the signal values of the digital inputs (➔ Section 11).

Function:Incremental Encoder Inputs

An incremental encoder input is provided. The switch thresholds are the same as the signal values of the digital inputs (➔ Section 11).



The connected incremental encoder must be provided with a push-pull interface!

Counters and incremental encoder inputs must be shielded.

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5.9 CONNECTION OF THE ANALOG INPUT / OUTPUT - CONNECTOR X 4

Connector Assignment for X 4

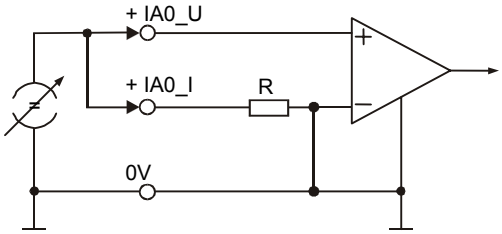
Connector X 4 - analog input / output		
13-pole, WAGO multi-connector system MINI, RM 3.5 mm, 734-143		
Counterpart: WAGO 734-113		
Pin No.	Assignment	Function
1	AI0	Analog voltage input 0
2	0-20mA	Analog current resistor 0
3	0V	Signal GND
4	AI1	Analog voltage input 1
5	0-20mA	Analog current resistor 0
6	0V	Signal GND
7	AQ0	Analog voltage output 0
8	0V	Signal GND
9	AQ1	Analog voltage output 0
10	0V	Signal GND
11	Uref	4.096VDC reference output (1mA)
12	0V	Signal Ground (ground potential)
13	0V	Signal Ground (ground potential)

1 13

X 4 input / output level

Function: Analog Input

The analog inputs can be used for measuring and processing voltages and currents. The evaluation of the analog value is processed via the same terminal pin – the voltage input is changed to a current input by connecting a parallel resistor. The diagram below shows the structure of the analog input.



Voltage Input: The input range is 0 to +10VDC
The input resistance is 1MΩ

Current Input: The input range is 0 to +20mA
The current measuring resistance *R* is 500Ω

The A/D converter has a 10-bit resolution (LSB = 9.766mV)

The analog inputs are not isolated.
The connections must be shielded. The shield connections must be grounded on the housing.
Mean analog input values are automatically determined from the 8 most recent measured values. (arithmetic mean)

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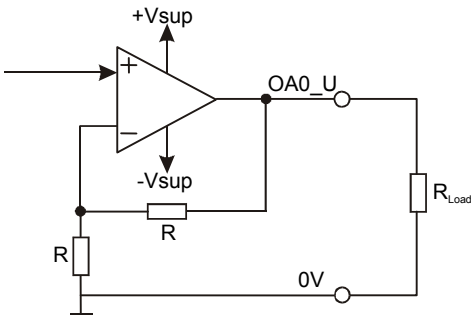
The analog inputs are single ended and do not allow differential measurements.

If a potentiometer is used as a reference value potentiometer, the voltage must be well decoupled and the GND well connected.

Function: Analog Output
The analog outputs are used to control peripheral devices with analog inputs. The output circuit is as follows:



The output range is -10VDC to +10VDC

The load current for each analog output is 1mA

The D/A converter has a 12-bit resolution (LSB = 4.883 mV)

The analog outputs are not isolated.

After the Reset the analog outputs are undefined! They are normally initialised to 0V by the boot software within 105 ms.

The analog outputs are single ended and do not allow differential output voltages.

The 12-bit resolution applies to the entire output voltage range (20VDC). If only a range of 0 to 5VDC is used for example, the resolution is reduced to 10-bit.

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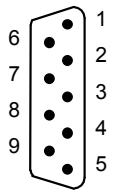
5.10 Connection of the CAN interface - Connector X 6

The communication interface is defined in accordance with the CiA CAN Specification V2.0 part B. The fully-integrated CAN unit supports the sending and receiving of frames with an 11-bit Identifier. The type of configuration selected depends on the software protocol. The baud rate can be selected in a wide range, and only the standard CiA baud rates are implemented. The XVC-100 is the master on the CAN bus.

CAN connector X 6			
Sub-D 9 Pole male			
Connector 	Pin No.	Assignment	Function
	1	-	
	2	CAN LOW	Negative data signal
	3	GND	Signal Ground (ground potential)
	4	-	
	5	-	
	6	GND	Signal Ground (ground potential)
	7	CAN HIGH	Positive data signal
	8	-	
	9	-	
	Case	Case	Cable shield

The CAN interface is <u>not</u> isolated.

The terminating resistor must be implemented externally, e.g. in the connector, and is not part of the device.

The CAN connector is not provided with a supply for third-party devices.

A detailed description of the wiring is provided in the "XSoft" system description

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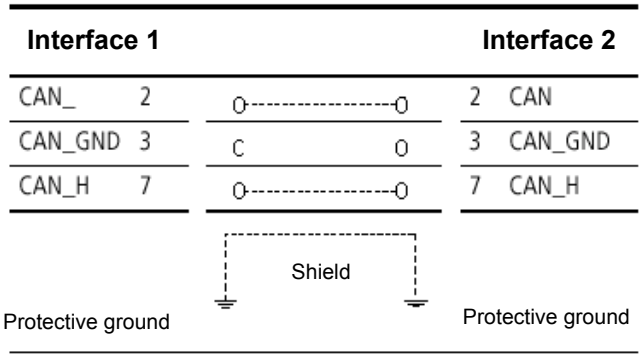
Wiring instructions

The stations on the bus system are connected via fieldbus lines complying with ISO 11898. The cables must accordingly have the following electrical characteristics:

Parameter	Abbreviation	Unit	Value min.	Value nom.	Value max.	Note
Impedance	Z	Ω	108	120	132	Measured between two signal lines
Specific resistance		mΩ/m		70		For the receiver module, the differential voltage on the bus cable depends on cable resistance between it and the sender
Cable delay		ns/m		5		The mininum delay between to points on the bus is 0. The maximum delay is determined by the bit timing and the delays of the sender and receiver circuits

The figure shows the minimum wiring with shielding between two bus stations with the Sub-D connector as an example. A bus terminating resistor (120 Ohm between Pin 2 and Pin 7 of the Sub-D connector) must be connected at the beginning and the end of each CAN bus. Do not swap around the two signal wires!



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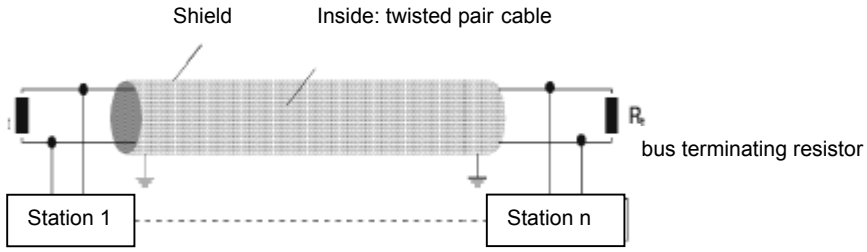

Pin 3 and 6 (CAN_GND) are both connected internally with the CAN Ground. Pins 4, 5 and 8 must *not* be connected! The CAN bus driver is fed internally.

Baud rate and cable lengths

Baud rate	Max. length
20kBit/sec	2500m
25kBit/sec	2000m
50kBit/sec	1000m
100kBit/sec	650m
125kBit/sec	500m
250kBit/sec	250m
500kBit/sec	100m
800kBit/sec	20m
1000kBit/sec	6m

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5.11 Inserting the CompactFlash™

The XVC-100 series devices can use a CompactFlash™ for optional data storage (e.g. recipes). The runtime system and the application are stored on the Flash inside the device.

To do this undo the cover of the CompactFlash™ Interface and fit a suitable CompactFlash™ from the original accessories. The cover must be refitted and fastened.

CompactFlash control LED (red)

The CompactFlash™ must only be inserted / removed when the red LED is not lit! This may otherwise lead to loss of data.

Apart from the above restriction, the CompactFlash™ can be inserted or removed when the power supply has been switched on.

Correct functioning can only be ensured by using CompactFlash™ cards obtained from the original accessories.

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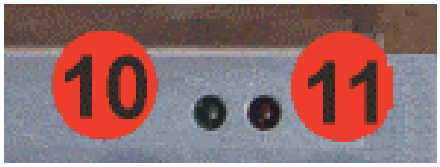
5.12 Function and control LEDs

Control LED on rear

The red *CompactFlash*™ LED indicates that the XVC-100 text display PLC is accessing the CompactFlash™. The CompactFlash™ **cannot** be inserted / removed as long as this LED is lit.

The green *SYS* control LED has the following function:

- Flashes at approx. 1 Hz → System menu active



SYS control LED (green) *CompactFlash* control LED (red)

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5.13 MEMBRANE KEYBOARD

The membrane keyboard has 28 keys, of which 8 are function keys. The keys are evaluated in the PLC user program by means of appropriate function blocks. (see also Description of the function block libraries for XVC-100)

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6 Operation

6.1 Startup behaviour

After power on, the XVC-100 carries out a system test. The PLC does not switch to Run or Stop until no hardware errors have been found. The system test includes the following:

- LED test (all LEDs are activated momentarily on power on)
- Memory test
- User program test

The results of the tests are indicated by the Stop, Run and SF LEDs. Additional information is shown in the display. The SF LED lights up in the event of a fault.

The PLC status depends on the position of the operating mode switch (➔ Section 6.4)

Start messages:

```
100000000100
31
```

1st Line: Hardware and software version: are shown in the first line in the following format

HRVxxxxESSSS

H	...Hardware type	1 = XVC-100
R	…RAM size	0 = 512 KB
V	...Hardware version	0 = XVC-100
x	...reserved (0)	
E	…Error status	0 ...o.k.
		Bit 1 1 = Operating system missing
		Bit 2 1 = I/O driver missing
		Bit 3 1 = PLC runtime system missing

SSSS ...Software version of the runtime system: 0100 = Version 1.00

2nd Line: CAN node number (can be set in the System menu ➔ Section 6.7 or in the user program)

6.2 Shutdown behaviour

The power supply unit can bridge a voltage dip of <= 10ms at 24V. With longer voltage dips (when the power supply falls below 18 V), the internal 5V supply remains stable for at least 100ms. This is enough time for all the information required for the restart to be saved.

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6.3 PLC OPERATING STATES

Power on

Power on status is indicated by a flashing Stop LED: In Power on status, there is no user program in the PLC.

Stop

The Stop operating status has the following features:

- A user program is stored on the PLC.
- The user program is not running

The Stop status is selected:

- After the power supply has been switched on when the operating mode switch has been switched to Stop position.
- Via the programming software in the PC
- After a cycle time violation (this causes the PLC to restart in Stop mode)

Run

In RUN status, the user program is processed cyclically.
The RUN operating status is selected:

- After the power supply has been switched on when the operating mode switch has been switched to Run position.
- Via the programming software in the PC

System Fault SF

The SF LED indicates a system fault. The following system faults can occur (➔ Section 9):

- Hardware fault
- System fault in firmware

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6.4 CHANGING OPERATING MODE

With XVC-100 devices, the operating mode switch or the programming software are used to change the operating mode.

Operating mode switch (OMS):

The operating mode switch on the rear of the device is assigned the following modes: (➔ Section 6.3)

Operating mode switch	
Rotary switch with ten positions	
Position	Function
0	reserved
1	Function 0 (PLC-RUN)
2	Function 1 (PLC-STOP)
3	Function 2 (SETUP)
4	reserved
5	reserved
6	reserved
7	reserved
8	Reserved for Service function
9	Reserved for Service function

Programming software:

Reset

Apart from with retentive tag variables (RETAIN), this command resets all tag variables to the value with which they were initialised. Tag variables not explicitly assigned an initialisation value are set to the standard initial values (integral numbers for example to 0). XSoft outputs a safety prompt before all tag variables are overwritten. This also happens when there is a power failure or when the PLC is switched off and on again (warm start).
Use the command 'Online', 'Start' to restart the PLC and resume program processing.

Reset Cold

This command resets all tag variables to their initialised values regardless of whether they are RETAIN tag variables or not. A Reset Cold can also be carried out by switching the operating mode switch from Stop to Setup four times (at least 100ms/position).

Reset Original

This command resets all tag variables including retentive ones (RETAIN) to the value with which they were initialised, and deletes the user program on the PLC. The PLC is reset to its basic setting.

The XVC-100 does not support persistent tag variables.

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Start

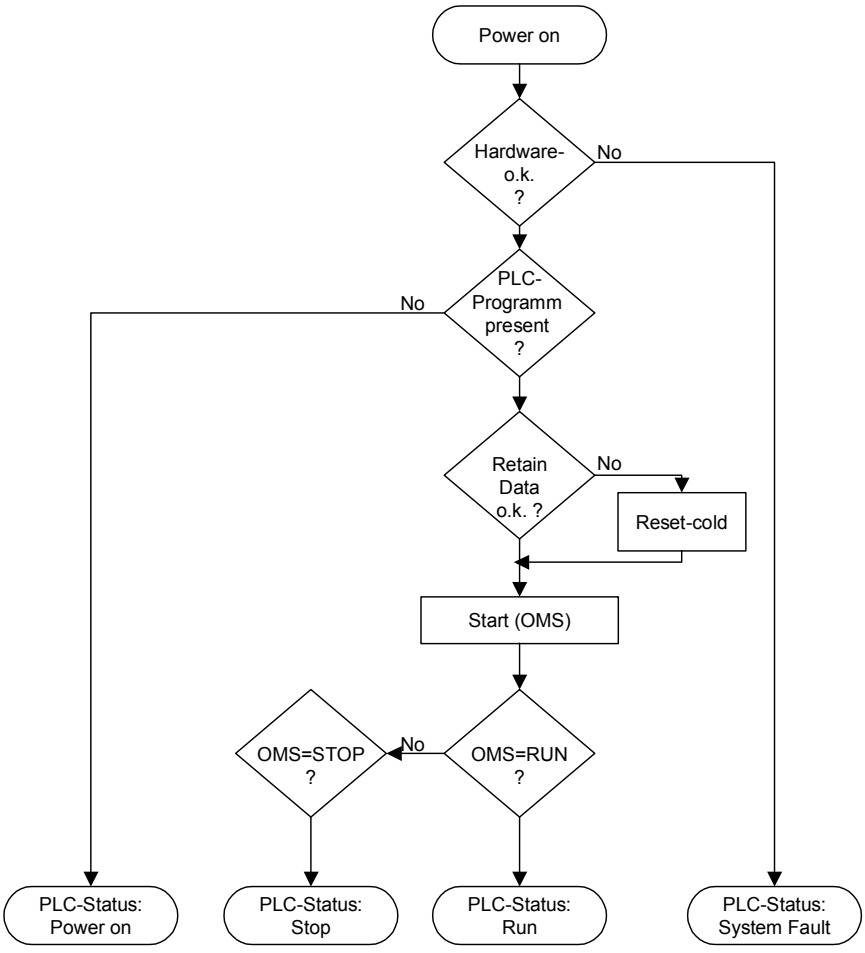
The command starts the running of the user program in the PLC. The command can be executed directly after the commands ‘Online’, ‘Load’ or after the user program was stopped in the PC via the commands ‘Online’, ‘Stop’, or if the user program is at a break point, or after the commands 'Online', 'Single Cycle'.

A detailed description of the online functions is also provided the XSoft manual.

6.5 STARTUP BEHAVIOUR/STARTUP

After the power supply is switched on, the user program is loaded from the internal flash memory into the RAM, and the PLC is started.

Procedure:



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6.6 PROGRAM TRANSFER

If the user program was compiled error-free on the programming device (PC), it can be loaded into the working memory of the XVC-100 and then started.

PC → PLC:

During a program transfer from the PC to the PLC, the program in the PLC is compared with the program in the PC. If they are not the same, a prompt will ask whether the program is to be overwritten. If this prompt is confirmed, the PLC switches to Stop status and the new program is loaded into the working memory. The position of the operating mode switch is not important for this (for program transfer see also XSoft manual). The user program is stored in the internal flash memory by generating a boot project.

PC → PLC and CompactFlash™:

A program transfer from the PC to the CompactFlash™ in the PLC is in preparation. (see notes on Firmware)

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6.7 SYSTEM SETTINGS

XVC-100 devices allow the following system settings via the System menu:

- Setting of the CAN parameters Node number from 1 to 31 (Default: 31, ➔ Section4.1) and baud rate (Default: 125kBit/s)
- Setting of the serial interface (Default: 57,6 KByte 8, n, 1)
- Contrast setting
- Firmware update

The System menu can be called in the following way:

- The System menu is called automatically when there are hardware faults or when system software components (e.g. runtime system) are missing
- With the device switched off set the operating mode switch to Position 3 (Setup). Then switch on the device.

Main menu

The System menu will show the following screen once it has been started:

```
00000000  BSW  XX.YY

▲▼    -> Contrast +/-
F1    -> CAN Setup
F2    -> RS232 Setup
F3    -> SW update
ENTER-> Save/Restart
```

00000000 ➔ Hardware Type (➔ Section 6.1)
BSW XX.YY ➔ Boot software version

- You can use the "▲▼" (Up /Down arrows) keys to set the contrast.
- Press the ENTER key to save the settings (contrast, CAN, RS232) in the flash memory. The saved settings are accepted by the runtime system during startup. To start the runtime system, set the operating mode switch to Position 1 (RUN) or 2 (STOP) and press the ENTER key.
- Fault messages are displayed instead of BSW XX.YY (➔ Section 9)

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CAN settings

Press the F1 key to enter the CAN Setup menu for accessing the CAN settings. When a setting is changed, the CAN bus will be reconfigured straightaway according to the new setting. The settings can only be saved from the main menu.

```
00000000  BSW  XX.YY
->CAN Id  :    31 <-
  Baud rate: 125K


▲▼   -> Choose
◀▶   -> Modify
ENTER-> Back
```

- Use the "▲▼" keys to move between CAN Id and CAN Baud rate.
- Use the "◀▶" keys to change the selected setting.
- Use ENTER to exit the CAN Settings menu without saving

RS232 settings

Pressing the F2 key calls up the RS232 Setup menu for accessing the RS232 settings. When a setting is changed, the serial interface will be reconfigured straightaway according to the new setting. The settings can only be saved from the main menu.

```
00000000  BSW  XX.YY
->Baud rate:  57.6K<-




◀▶   -> Modify
ENTER-> Back
```

- Use the "◀▶" keys to change the Baud rate
- Press ENTER to exit the RS232 Settings menu without saving

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Firmware update

This System menu enables you to make firmware updates via CAN, RS232 and CompactFlash™. In order to carry out updates via CAN or RS232, you need the GatewayMonitor program (see also the "XSoft" system description).

Updates via CompactFlash™ can be carried out directly. To do this press key F3. This will open the following display:

```
00000000  BSW  XX.YY

Please insert CF....



ESC-> Abort
```

- Pressing the ESC key aborts the operation

The CompactFlash™ for a firmware update can be created using the SetupTargetFirmware.exe program from the XSoft CD.
Then insert the CompactFlash™. The existing software is checked and the software versions displayed:

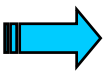
```
00000000  BSW  XX.YY

Replace  SW  xx.xx
By       SW  yy.yy


ESC  -> Abort
ENTER-> YES, replace
```

- Pressing the ESC key aborts the operation
- Pressing the ENTER key starts the update.

The CompactFlash™ must be removed once the update has been completed. The device is then restarted.



This operation must be repeated if the firmware update is not carried out completely (e.g. power failure).
The saved PLC project is retained during a firmware update.

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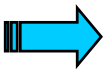
7 MOUNTING INSTRUCTIONS

7.1 GENERAL MOUNTING INSTRUCTIONS

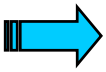
All XVC-100 Series devices are mounted from the front, i.e. in a control panel. The devices are fastened from the rear with the fixing clamps supplied.

All XVC-100 Series devices can be operated at an ambient temperature of up to 60°C (➔ Section 11). The ambient temperature stated applies to the area in the direct vicinity of the lower connectors if the device is mounted vertically with unimpeded air convection and a maximum operating height of 2000m above sea level.
The device can be mounted in an enclosure if the permissible ambient temperature is observed. Provide a wall clearance of at least 50 mm on all sides of the housing, so that sufficient air circulation is ensured. A minimum clearance of 75 mm from active elements such as load current supply, transformers etc. must be ensured.
Avoid the exposure of the membrane keyboard and display to direct sunlight. The radiation from the sun (UV component) reduces the lifespan of the LCD display.



The following must be ensured in order to prevent the device from overheating during operation:

- **The cooling slots must always be free in order to ensure the proper cooling of the system.**
- **Avoid the exposure of the front and the display to direct sunlight.**
- **The mounting angle must not exceed ± 35° from the vertical**



Mounting in compliance with degree of protection IP65 requires the use of the conter frame .

Ensure that the seal is fitted correctly on the front panel.

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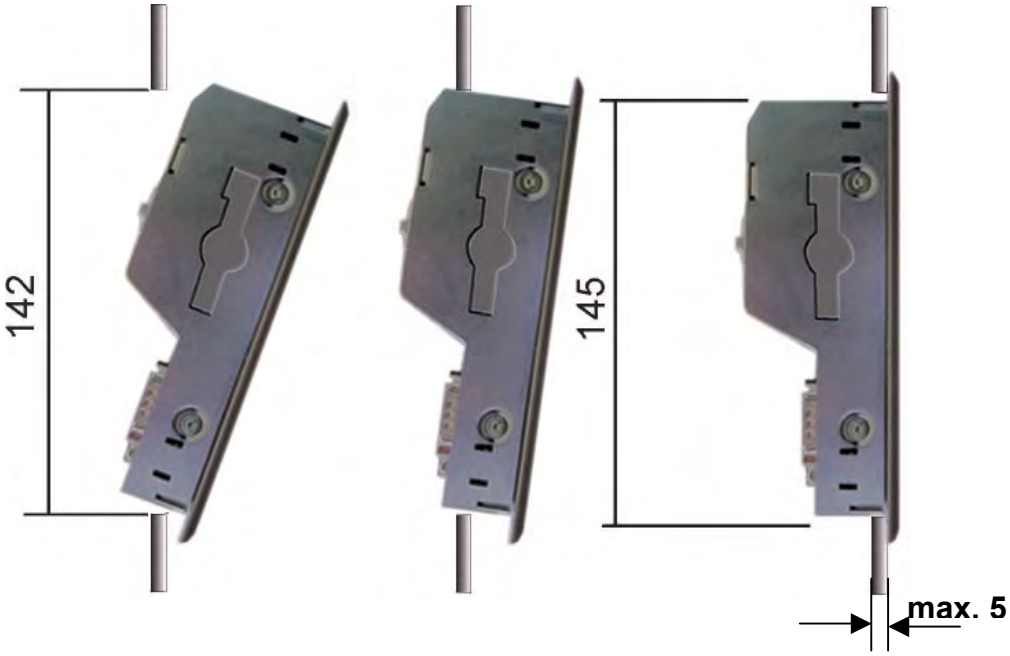
7.2 MOUNTING IN THE FRONT PANEL

1. Push the XVC-100 from the front into the cutout (➔ Section 7.3) of the front panel.
2. The front seal must be level and evenly positioned between the front plate and the front panel.
3. Secure the device with the 4 fixing clamps supplied and tighten evenly from the rear until the front plate is flush with the front panel.



Ensure that the seal is fitted correctly on the front panel.
Avoid tightening torques of greater than 0.3 Nm as this could otherwise damage the device.
The maximum thickness of the front panel should not exceed 5 mm.
The conter frame can be used for mounting in thin-walled front panels <= 2 mm.

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7.3 FRONT CUTOUT

The device requires a mounting cutout of WxH:
198 +0/-1 mm x 142 +0/-1 mm

The thickness of the front panel must not exceed 5 mm.

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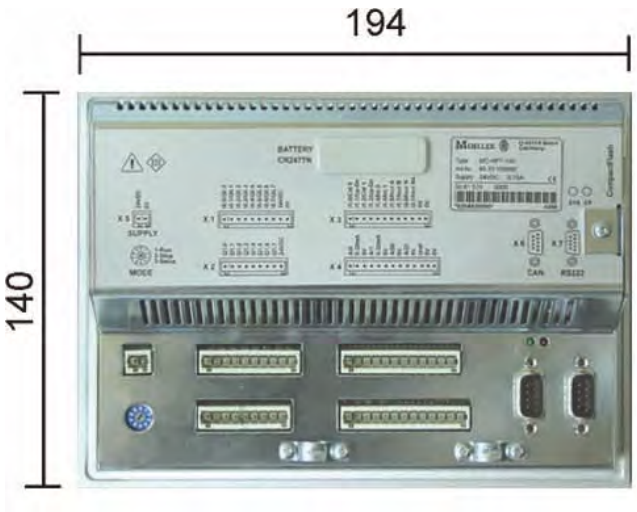
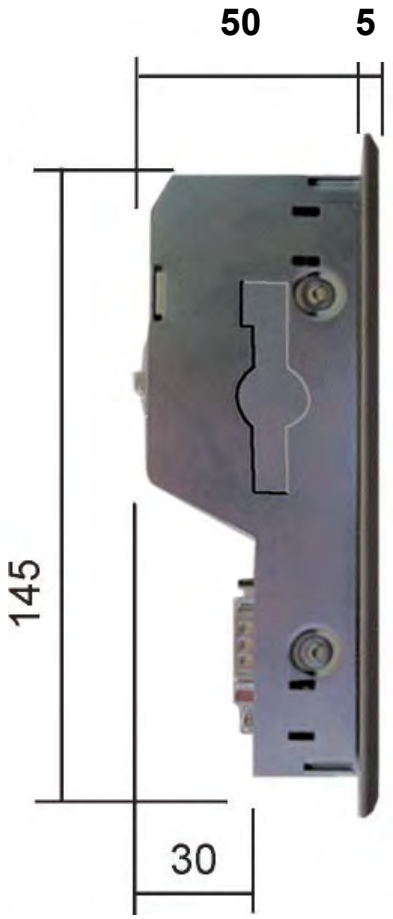
7.4 Mechanical dimensions





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8 DISPLAY, BACKLIGHT, CONTRAST

8.1 CONTRAST

The contrast voltage can be set in the System menu (➔ Section 6.7).

8.2 BACKLIGHT

The LED backlight is always active.

9 DIAGNOSTICS

The following diagnostics options are available:

Symptom		Possible cause and solution
SF LED lit	-	System faults: • Hardware fault messages are shown in the display instead of BSW XX.YY: NO RETAIN ➔ System-retentive data not present in flash RAM ERR ➔ Error during memory test FLASH ERR➔ Error during Flash test • Firmware system faults No display ➔ Display faulty FLASH WRITE ERR ➔ Flash faulty SYS-SW INIT ERR ➔ Firmware initialisation error ➔ Reload firmware SYS-SW OD ERR ➔ Error in the object dictionary structure ➔ Reload visualization texts/parameters/recipes with teX-Tool
Device does not start, screen dark or error message during startup	-	Check power supply/fuse faulty ➔ All LEDs are lit momentarily during device startup
Date/time incorrect		Insert or replace battery (➔ Section 5.2) The time can be set using teX-Tool.
Screen dark or light		Contrast set incorrectly. The contrast can be set in the System menu (➔ Section 6.7)
SYS LED		Flashes at approx. 1 Hz → System menu active

Refer to the XSoft engineering software documentation for other diagnostics options.

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10 MAINTENANCE AND REPAIR

Battery

The battery is used for backing up the real-time clock and the retentive PLC data. The battery should be changed every 3 years in order to prevent any data loss.

Procedure for changing the battery

1. Switch on the device for at least 10 minutes
2. Then switch off the device and change the battery quickly

   (the data is retained without a battery for approx. 2 minutes)

Repairs

Repairs to the XVC-100 should only be carried out by the manufacturer or by Moeller GmbH repair centers. In this case, please contact your local XSystem dealer or the Technical Support at Moeller GmbH. (manufacturer's address ➔ Section 13)
No liability is accepted for any modifications made to the device that are not described in this document.

Transport

Only the original packaging must be used for transporting the device.

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11 TECHNICAL DATA

Display	Technology	Passive matrix mono LC display (Mono STN-LCD yellow-green)
	Resolution	128 x 64 pixels
	Display area	71 mm x 39 mm
	Backlight	LED
Operation	Membrane keyboard	28 keys; 3 LEDs
Ambient conditions	Operating climate	0...60°C, 10...90% rel. air humidity, non-condensing
	Storage climate	-25...85°C, 10...90% rel. air humidity, non-condensing
	EMC interference immunity	EN 61000-6-2
	Emission	EN 50081-2
Degree of protection	Front	IP 65 (NEMA 12), to EN 60529 IP65 protection only with additional mounting kit! (➔ Section 7)
	Rear	IP 20
Weight		Approx. 0.9 kg
Dimensions	W x H x D	212 x 156 x 50 mm
	Cutout	198 x 142 mm (+0/-1mm)
System supply	Rated voltage	24 VDC SELV, safety extra low voltage
	Voltage range	24 VDC to DIN 19240 20.4...28.8 VDC effective, absolute value with ripple 18.5...30.2 VDC 35.0 VDC for a duration of < 100ms
	Voltage dips	100 ms max., at 20.4 VDC to 0 VDC, repetition rate 1 s
	Protection against reverse polarity	Yes (➔ Section 5.3)
	Fuse protection	Yes
	Potential isolation	No The 0V connection is directly connected to the housing potential (GND)
	Current consumption	Normally 160mA/24VDC
	Power consumption	Normally 4 W/24VDC
Battery backup	Battery type	3V / 950mAh Lithium, RENATA CR2477N
	Data retention	Normally 5 years
Real-time clock	Counters	Seconds, minutes, hour, day, month, year, decade
	Leap year change	Automatic
	DST change	Via the software
	Deviation at T_{amb}=25°C	Normally +/- 100ppm
Fuse	Inside the unit	2 A slow (not accessible from outside,➔ Section 5.3)
	Breaking capacity	Max. 30A
Programming interface	Type	RS 232, not potential-free (➔ Section 5.5)
	Connection	Sub-D pole male
Communication interface	Type	CAN, not potential-free (➔ Section 5.10)
	Connection	D-Subminiature 9-pole male

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CompactFlash™ slot	CompactFlash™ Type 1		
	Technology		ATA Flash, 5V
Connector X 1	Type		Digital inputs/outputs
	Number of I/O		8
	Number of supply terminals		1
	Number of 0V terminals		1
	Supply voltage for outputs		Normally 24VDC (18.5VDC...30.2VDC)
	Max. output current per channel		0.5 A
	Inductive loads		Max. 150mJ
	Input voltage	Low High	-3...**4.5**VDC **14**...32.0VDC
	Input current	Low High	0..1mA 2..15mA
	Max. input voltage		40VDC
	Protection against reverse polarity		Yes
	Potential isolation		No
	Protected against short-circuit		Yes
	Supply monitoring		Yes
	Fault status		Common for all outputs
Connector X 2	Type		Digital outputs
	Number of I/O		8
	Number of supply terminals		1
	Supply voltage		Normally 24VDC (18.5VDC...30.2VDC)
	Max. output current per channel		0.5 A
	Inductive loads		Max. 150mJ
	Protection against reverse polarity		Yes
	Potential isolation		No
	Protected against short-circuit		Yes
	Supply monitoring		Yes
	Fault status		Common for all outputs
Connector X 3	Type		Digital inputs
Function: Digital Input	Number		10, all of which have a second function (➔ Section 5.8)
	Number of 0V terminals		1
	Input voltage	Low High	-3...**4.5**VDC **14**...32.0VDC
	Input current	Low High	0..1mA 2..15mA
	Max. input voltage		40VDC
	Protection against reverse polarity		Yes
	Potential isolation		No
Function Counter Input	Number		2
	Input voltage	Low High	-3...**4.5**VDC **14**...32.0VDC
	Input current	Low High	0..1mA 2..15mA
	Max. input voltage		40VDC
	Protection against reverse polarity		Yes

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	Potential isolation		No
	Max. counter frequency		50kHz
	Direction change		Yes
Function Interrupt Input	Number		2
	Input voltage	Low High	-3...**4.5**VDC **14**...32.0VDC
	Input current	Low High	0..1mA 2..15mA
	Max. input voltage		40VDC
	Protection against reverse polarity		Yes
	Potential isolation		No
Function Incremental encoder	Number		1
	Signals		A, B, zero mark, zero mark active
	Evaluation		2-fold, 4-fold
	Input voltage	Low High	-3...**4.5**VDC **14**...32.0VDC
	Input current	Low High	0..1mA 2..15mA
	Max. input voltage		40VDC
	Protection against reverse polarity		Yes
	Potential isolation		No
	Max. input frequency		50kHz
	Incremental encoder Output		Push-pull
Connector X 4	Type		Analog inputs and outputs
Function: Analog input	Number of inputs		2
	Terminals		3 per input (0V, voltage, current) 1 reference output
	Input voltage		0..10VDC
	Input resistance Voltage input		1MΩ
	Input current		0..20mA
	Input resistance Current input		500Ω
	Resolution		10-bit
	Reference output		4.096V ±0.2%
	Reference protected against short-circuit		Yes
	Potential isolation		No
Function Analog output	Number of outputs		2
	Terminals		2 per output (0V, voltage)
	Output voltage		-10VDC...+10VDC
	Output current		1mA (10kΩ load)
	Resolution		12-bit
	Protected against short-circuit		Yes
	Potential isolation		No

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12 DISPOSAL

XVC-100 devices that are no longer used must be disposed of properly or returned to the manufacturer for disposal. (manufacturer's address ➔ Section 13)

Special note:

- The device contains a lithium battery

Materials:

Housing:	Sheet steel, galvanized
Front:	Aluminium, anodised
Printed-circuit board:	1st quality
Membrane:	Polyester PETP

13 EC CONFORMITY

The **XVC-100** meets the requirements specified by the EU Council Directives for harmonizing the regulations of EU member states relating to electromagnetic compatibility (**89/336/EEC**) and electrical safety (Low-Voltage Directive **73/23/EEC**).
The generic standards below were used to assess the electromagnetic compatibility of the XVC-100:

EN 50081-2 (Emission)
EN 61000-6-2 (Immunity)

The following standard was used to assess the electrical safety of the XVC-100:

EN 60950-1

CE
2002

Manufacturer:	Moeller GmbH
Manufacturer address:	Hein-Moeller-Str. 7-11 D-53115 Bonn Germany

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14 REVISION HISTORY

Revision	Date / Initials	Modification : Remarks, News, Attention
1.0	05-02 / Fis	Initial Version for XVC-100

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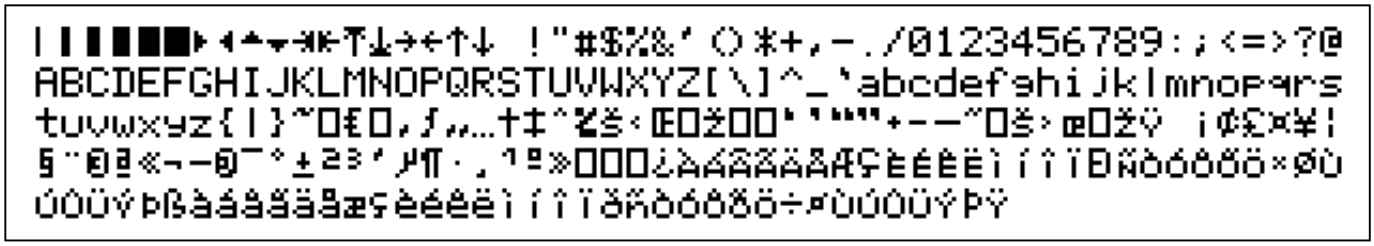
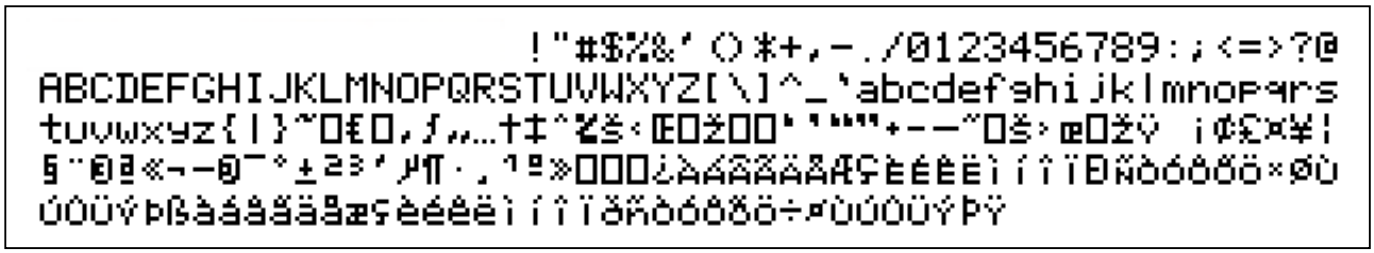
15 Appendix, Font

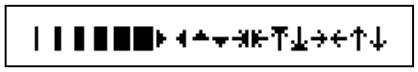
A standard font is installed in two sizes (8x6 and 16x12). The characters run from ASCII Code 0x0e to 0xff.



Characters from ASCII code 0x20 to 0xff comply with the Windows™ font and can therefore be entered directly via the keyboard, e.g. in XSoft or teX-Tool.



The characters from ASCII code 0x0e to 0x1f are special characters and cannot therefore be entered directly via the keyboard.



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16 ALPHABETICAL INDEX

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