

Technical documentation
Last changed on: 21.10.2020

iCSmini 2

Controller box with embedded Linux server for use with iseg Hardware equipped with CAN or RS-232 interfaces

- Ethernet and WiFi connectivity
- Embedded Linux-Server with iCS control system
- 1x CAN D-SUB9, 1x RS-232 D-SUB9, 3x USB-A connectors
- Controls wide range of iseg Power Supplies, Crates, Modules, Devices (see compatibility list)
- small form factor
- rack and top-hat rail (EN 60715) mount kits available
- Preconfigured services: EPICS, SNMP, HTTP, Websocket
- Webbrowser based control and configuration system
- Easy configuration and firmware updates of connected hardware



Document history

Version	Date	Major changes
2.4	21.10.2020	improved documentation
2.3	22.07.2020	ICS2.5 review iCSmini2 manual
2.2	06.07.2020	ICS2.5 update, Rack Mount Kit, dimensions draw
2.1	05.02.2020	ICS Server, new image
2.0	25.11.2019	safety information, glossary, improved documentation
1.2	07.04.2017	ICS2.1 update
1.1	29.03.2016	Compliance information WiFi
1.0	29.02.2016	Initial release

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The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.

Safety

This section contains important security information for the installation and operation of the device. Failure to follow safety instructions and warnings can result in serious injury or death and property damage.

Safety and operating instructions must be read carefully before starting any operation.

We decline all responsibility for damages and injuries caused which may arise from improper use of our equipment.

Depiction of the safety instructions

DANGER!	
 DANGER!	<p>“Danger!” indicates a severe injury hazard. The non-observance of safety instructions marked as “Danger!” will lead to possible injury or death.</p>
WARNING!	
 WARNING!	<p>“Warning!” indicates an injury hazard. The non-observance of safety instructions marked as “Warning!” could lead to possible injury or death.</p>
CAUTION!	
 CAUTION!	<p>Advices marked as “Caution!” describe actions to avoid possible damages to property.</p>
INFORMATION	
 INFORMATION	<p>Advices marked as “Information” give important information.</p>



Read the manual.



Attention high voltage!



Important information.

Intended Use

The device may only be operated within the limits specified in the data sheet. The permissible ambient conditions (temperature, humidity) must be observed. The device is designed exclusively for the generation of high voltage as specified in the data sheet. Any other use not specified by the manufacturer is not intended. The manufacturer is not liable for any damage resulting from improper use.

Qualification of personnel

A qualified person is someone who is able to assess the work assigned to him, recognize possible dangers and take suitable safety measures on the basis of his technical training, his knowledge and experience as well as his knowledge of the relevant regulations.

General safety instructions

- Observe the valid regulations for accident prevention and environmental protection.
- Observe the safety regulations of the country in which the product is used.
- Observe the technical data and environmental conditions specified in the product documentation.
- You may only put the product into operation after it has been established that the high-voltage device complies with the country-specific regulations, safety regulations and standards of the application.
- The high-voltage power supply unit may only be installed by qualified personnel.

Important safety instructions

DANGER!



DANGER!

This device generates high voltages or is part of or attached to high voltage supplying systems. High voltages are dangerous and may be fatal.

USE CAUTION WHILE WORKING WITH THIS EQUIPMENT.
BE AWARE OF ELECTRICAL HAZARDS.

Always follow at the minimum these provisions:

- High voltages must always be grounded
- Do not touch wiring or connectors without securing
- Never remove covers or equipment
- Always observe humidity conditions
- Service must be done by qualified personnel only

WARNING!



WARNING!

To avoid injury of users it is not allowed to open the unit. There are no parts which can be maintained by users inside of the unit. Opening the unit will void the warranty.

WARNING!



WARNING!

Do not operate the unit in wet or damp conditions.

WARNING!



WARNING!

Do not operate the unit in an explosive atmosphere.

WARNING!



WARNING!

Do not operate the unit if you suspect the unit or the connected equipment to be damaged.

WARNING!



WARNING!

The protective conductor connection must be ensured by an appropriate mains cable. Before connecting to the local power supply, check whether the nominal voltage of the devices corresponds to the mains voltage.

CAUTION!



Caution!

When installing the units, make sure that an air flow through the corresponding air inlet and outlet openings is possible.

CAUTION!



Caution!

When controlling, with software, the high voltage systems, make sure that nobody is near the high voltage or can be injured.

CAUTION!



CAUTION!

CHECK COMPLIANCE FIRST

Before using this device or connecting supplementary WiFi hardware please make sure that it complies to your local and governmental requirements, laws and other terms or provisions. iseq accepts no liability for any case of unauthorized use of the provided hardware. See page 9 under Compatibility for more information.

INFORMATION



INFORMATION

Please check the compatibility with the devices used.

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1. General description

The iseg iCSmini2 is an intelligent external controller box with an embedded Linux-Server system and preinstalled iseg Communication Server (iCS). The iCS comes with a large set of preconfigured services as EPICS, Web-Control, SNMP, Websocket, OPC/UA¹, isegHAL and HTTP-API. The iCS also delivers two main web based user applications. iCS**control** provides a quick and smart control interface of the connected hardware by using web-browser without software installation. iCS**config** is used for hardware and service configuration and firmware upgrades. Both can also be used on mobile devices like tablets or smartphones.

For native application control several software solutions are available:

- iseg SNMP Control
- iseg**Control** (Linux, Windows, Mac)
- isegHalRemote-Library

2. Package contents

Hardware	included	optional
iCSmini2	iCSmini2 control box Plug-in power supply Cable D-Sub 9 female-male Gender changer CAN RJ45-D-sub 9 Adapter	USB surveillance cam 19" rack mount kit see 10 Accesories

3. Compatibility

Crate	Slots	Required controller firmware	Notes
ECH 224	4 MMS		
ECH 238	8 MMS	ECH238_213 ECH238_313	
ECH 124	4 MMC	MICC_425	
ECH 128	8 MMC	MICC_425	
ECH 12A	10 MMC	MICC_425	
ECH 14A	10 MMC / 9 MMC + 1 MMS-3U	MICC_425	

Table 1: Compatibility list

1 Expected available middle of 2021

The iCSmini2 controller box series is compatible to the following MMS and NIM HV-modules:

Module	Firmware	Required firmware release	Serial number
EBS 8/16 channel, Bipolar	E08B0 1.xx	1.11 (or higher)	77xxx0/1 (6 digits)
EBS 12/16/24 channel, Bipolar	E12B0_211	2.11 (or higher)	77xxxxx (7 digits)
EDS 16/32 channel, Distributor	E16D0 4.xx	4.43 (or higher)	71xxx0/1 (6 digits)
EDS 16/32 channel, Distributor	E16D1 4.xx	4.43 (or higher)	71xxx0/1 (6 digits)
EDS 16/32/48 channel, Distributor	E24D1 5.xx	5.52 (or higher)	715xx0 (6 digits)/1
EDS 16/32/48 channel, Distributor	E24D1 6.xx	6.12 (or higher)	71xxxxx (7 digits)
EHS 4/6/16 channel, Common Ground	E08C0 2.xx	2.42 (or higher)	73xxx0/1 (6 digits)
EHS 8/16 channel, Common Floating Ground, High Precision	E08C2 1.xx	1.25 (or higher)	78xxx0/1 (6 digits)
EHS 2/4/8/16 channel, Common Floating Ground, Standard or High Precision	E08C2 4.xx	4.51 (or higher)	73xxxxx and 78xxxxx (7 digits)
EHS 4/8/16 channel, Floating Ground	E08F0 2.xx	2.52 (or higher)	74xxx0/1 (6 digits)
EHS 4/8/16 channel, Floating Ground, High Precision	E08F2 4.xx	4.34 (or higher)	72xxx0/1 (6 digits)
EHS 2/4/8/16 channel, Floating Ground, Standard or High Precision	E08F2 6.xx	6.51 (or higher)	74xxxxx and 72xxxxx (7 digits)
EHS 8/16 channel, STACK, Floating Ground	E08F7 1.xx	1.00 (or higher)	810xxxx (7 digits)
EHS 8/16 channel, STACK, Floating Ground, Standard or High Precision	E08F7 2.xx	2.26 (or higher)	815xxxx (7 digits)
EHS 16/32 channel, Common Ground, Low Cost	E16C1 1.xx	1.23 (or higher)	79xxx0/1 (6 digits)
EHS 16/32 channel, Common Ground, Low Cost	E16C1 2.xx	2.13 (or higher)	79xxxxx (7 digits)
EHS 24/48 channel, Common Ground, Low Cost, FLEX	E24C1_1.xx	1.11 (or higher)	79xxxxx (7 digits)
ESS 1 channel, Bipolar	ESS01C 1.xx	1.20 (or higher)	77xxxxx (7 digits)
NHS	N06C2 2.xx	2.20 (or higher)	80xxxxx (7 digits)
NHR	N04C2 1.xx	1.56 (or higher)	23xxxxx (7 digits)

Table 2: compatible list

The iCSmini2 controller box series is compatible to the following standalone AC/DC HV-Supplies:

HV supply series	Required Firmware	Notes
HPS 1,5 – 10 kW	H101C1_225 (or higher)	CAN, RS232 or USB
HPS compact	H201C0_3.05 (or higher)	CAN, RS232 or USB
HPS 300-800 W	H101C0_541 (or higher)	CAN, RS232 or USB
FPS	FLM5D1_203 (or higher)	CAN only
SHR		USB

4. Technical data

Supply	
POWER in	24V DC / 1A
Control elements	
Display LED	Power, Serial, CAN, WiFi
Buttons	Reset, Diag
Connectivity	
System connector	96pin backplane
USB 2.0	1x USB-A
USB 3.0	2x USB-A
Ethernet (10/100/1000 MBit)	1x RJ-45
CAN	1x D-SUB-9 male
RS-232 serial interface	1x D-SUB-9 male
Wireless interface	<p>Intel Dual Band Wireless-AC7260 Standard 802.11n, 2,4 GHz, Ch. 1-11</p> <p>Compliance notes see intel specifications Link see chapter 11 Appendix</p>
	
Server hardware	
CPU	NXP/Freescale iMX6 Quad-Core 996 MHz
RAM	1 GB DDR3 onboard
Flash Memory	4 GB onboard
CMOS Battery	Supported battery types: CR1216, BR1220, CL1225
Operating system	
iCS2	Manufacturer specific Linux distribution
Services	iCSservice (Websocket, HTTP), SNMP, EPICS, HALservice
Native control software	iseqControl (Win 7/8/10 – 32/64bit, Linux, OS X 10.9 and higher)
Web browser based control / config software	iCSconfig / iCScontrol: All platforms: Mozilla Firefox (version > 41), Google Chrome (version > 45), iOS (Safari): version > 7
Environmental conditions	
Operating temperature range	10 – 40 °C
Storage temperature range	-20 – 85 °C
Humidity	30 – 70 % (non condensating)
Compliance	
	RoHS, CE, UL-94, Conflict Mineral, REACH

Table 3: Technical data

5. Connecting and operation

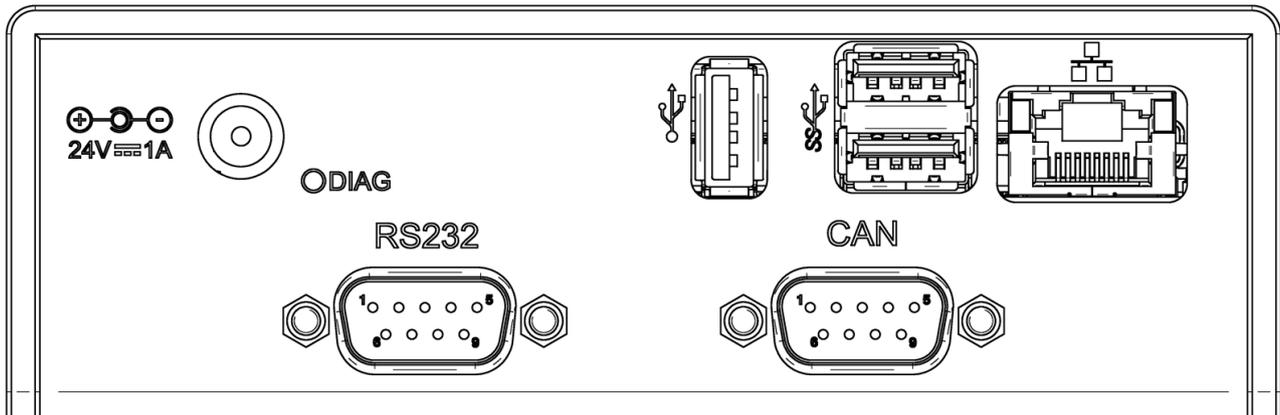


Figure 1: back side

The iCSmini2 can be connected to any compatible hardware by CAN or serial interface, please refer compatibility list (see 3 Compatibility).

Please make sure to get the right configuration of CAN – addresses, Bit-rates of CAN-Bus or RS-232 interface.

CAUTION!



CAUTION!

Before plugging the power supply of iCSmini2 in or out, please make sure, all voltages are ramped down, connected crates or AC/DC supplies are switched off.

Connection and Termination

The CAN connector of the iCSmini2 is internally terminated by a 120 Ohm resistor. Any connected device or more device must be also terminated by 120 Ohm resistor at the last bus subscriber.

6. Front panel

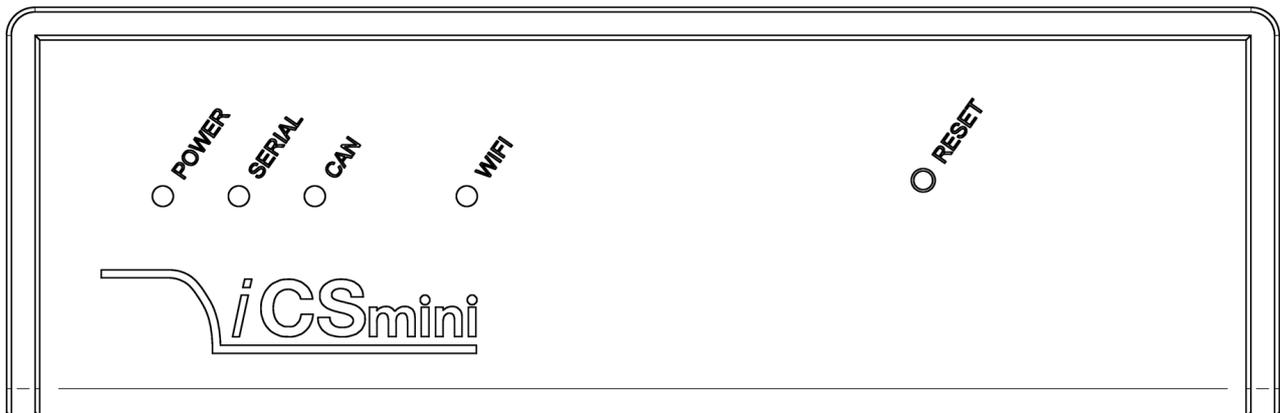


Figure 2: front side

LEDs and Reset pushbutton

Element	Function
LED POWER	Off: iCSmini2 off – no DC power Green: iCSmini2 powered on
LED SERIAL	Off: no serial connection Orange: serial connection enabled, but not established to any device Green: serial connection enabled and a device is connected Green flashing: serial connection enabled and a device is connected, data is submitted
LED CAN	Off: no serial connection Orange: CAN connection enabled, but not established to any device Green: CAN connection enabled and a device is connected Green flashing: CAN connection enabled and a device is connected, data are submitted
LED WIFI	Off: WiFi disabled Green: WiFi enabled

7. WiFi

The iCSmini2 is equipped with an internal WiFi access point. This feature can be enabled or disabled by software configuration.

The operation mode is indicated by the LED WIFI on the front panel.

For more information refer to the iCS section. See “iCS2 – iseg Communication Server” on the next pages.

8. iCS2 – iseg Communication Server 2.5

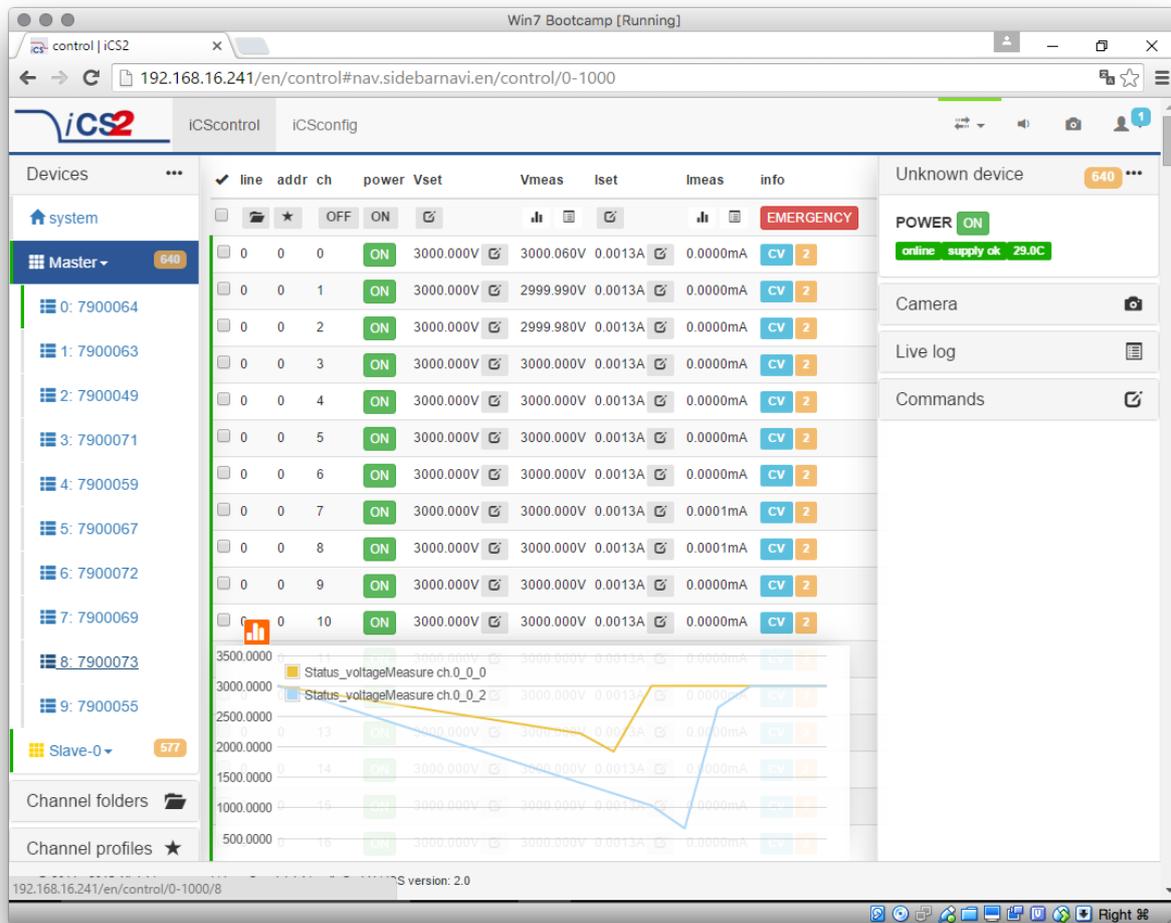


Figure 3: iseg Communication Server

8.1. System description

The iseg Communication Server iCS is a software solution to control iseg high voltage hardware from multiple devices over wired or wireless network. iCS is a manufacturer specific Linux OS, which runs on iseg hardware, like iCSmini2, CC24 crate controller series or SHR Desktop High Voltage Power Supply.

The iCS front end is based on browser technology to keep installation and maintenance effort low, to enable a quick start for configuration independently from the user's software platform, even on mobile devices.

iCS is equipped with an integrated role and user management, and delivers important software services right out of the box, like EPICS IOC, OPC server, SNMP interface, HTTP, SOAP and webservice to give a quick access to iseg hardware.

iCS also delivers configuration utilities and straight forwarded tools for firmware upgrading process.

The installed iCS2 libraries and services licenses files are located on the system under:

`/usr/share/common-licenses/[library or service module]`

iCS software components	Description	Port / Protocol
iCSconfig	Configuration section for iCS software services, restorable hardware configurations, and firmware updates, documentation access and more...	TCP 80 / HTTP
iCScontrol	Multi-user browser based device control, surveillance cam support	TCP 80 / HTTP
iCSservice	Internal websocket based server, JSON objects, with clients Push (websocket) or pull (HTTP polling) technology	TCP 8080 / Websocket TCP 8081 / HTTP API
isegHALservice	iseg hardware abstraction layer service, simple hardware access	TCP 1454 / isegHAL Socket
EPICS IOC	EPICS Input / Output controller, autoconfiguring to hardware setup, customizable by file upload#	EPICS Base R3.15.7 TCP/UDP 5064, 5065
OPC/UA	OPC / UA server	
SNMP	Simple Network Management Protocol	UDP 161

Table 4

8.2. Software architecture



¹⁾ not part of isegControl2

Figure 4: Software architecture

8.2.1. How to connect via WiFi

- 1) Make sure to have the WiFi adapter onboard or external installed, all modules are plugged in and CAN connections (if used) are attached. Start the crate or device.
- 2) Use your mobile device or computer to search for existing WiFi networks and select „iseq-iCS_XXXX“ (XXXX is the iCS serial number).
Enter the factory default WiFi password (**password**).
- 3) Open a recommended web-browser like Google Chrome and enter the factory default IP address (**192.168.1.1**)
- 4) Enter the factory default username (**admin**) and password (**password**)

INFORMATION



INFORMATION

WiFi support can be turned off in iCSconfig → WiFi. The default WiFi password can be changed there also.

8.2.2. How to connect via Ethernet

For Ethernet connections with the use of factory defaults, it is necessary to know the IP address of the iCS server first.

By default the iCS is configured to obtain the IP automatically by DHCP. To discover the IP address of the iCS, a small software application iCSfinder can be used. It scans the local network for running iCS services. More details are in the INFORMATION box below.

iCS also provides UPnP messages, which can be discovered, e.g. in Windows using „Network“ environment. For Linux and MAC, Zeroconf/Bonjour can be used to find the iCS.

INFORMATION



INFORMATION

To discover iCS installations on the local network, a small utility **iCSfinder** can be used.

It can be downloaded here: <https://iseq-hv.com/download/?dir=SOFTWARE/iCS/iCSfinder/>

Note: If you wish to set a fixed address without preconnecting via DHCP, please use a (temporarily) WiFi connection to setup OR follow the instructions of (re)setting the ethernet settings (see chapter Ethernet configuration)

Hint: If you experience problems using iCSfinder, please try using free software tools like “IP SCANNER” / MAC or “ADVANCED IP SCANNER” (Windows)

- 1) Make sure to have the network cable, all modules plugged in and all CAN connections if used attached. Start the crate.
- 2) Open a recommended web-browser and enter the current IP address (see preparations before).
- 3) Enter the factory default username (**admin**) and password (**password**).

8.2.3. iCSconfig: manage hardware, service and preferences

iCS has a comprehensive set of configurable properties. All of them are stored in an XML file, to keep configuration flexible. This enables the possibility to have multiple configuration setups stored and restored using the import / export utility.

iCS config sections	
iCScontrol Setup	Manage preferences of iCS web control application
Hardware	Manage connected hardware, set configurations, auto configure, start firmware updates
Ethernet	Manage Ethernet port settings of the iCS
Wifi	Manage wireless access point of the iCS
Users	Create / edit / delete iCS users
Roles	Create / edit / delete iCS roles
Access Control Lists	Grant / deny rights on user / group / channel / item base
iCSservice	Configure iCSservice API / HTTP API
HAL/HALservice	Configure HAL logging and HALservice credentials
EPICS	Configure the embedded EPICS Input/Output controller (IOC)
OPC	Configure the embedded OPC/UA server
SNMP	Configure the embedded SNMP server
Updates	Download updates (System, Product database, firmware) from internet
Custom Scripts	Configure the custom Python3 scripts
Import / Export	Save and restore complete iCS configuration to backup hardware setup

Table 5

8.3. Hardware

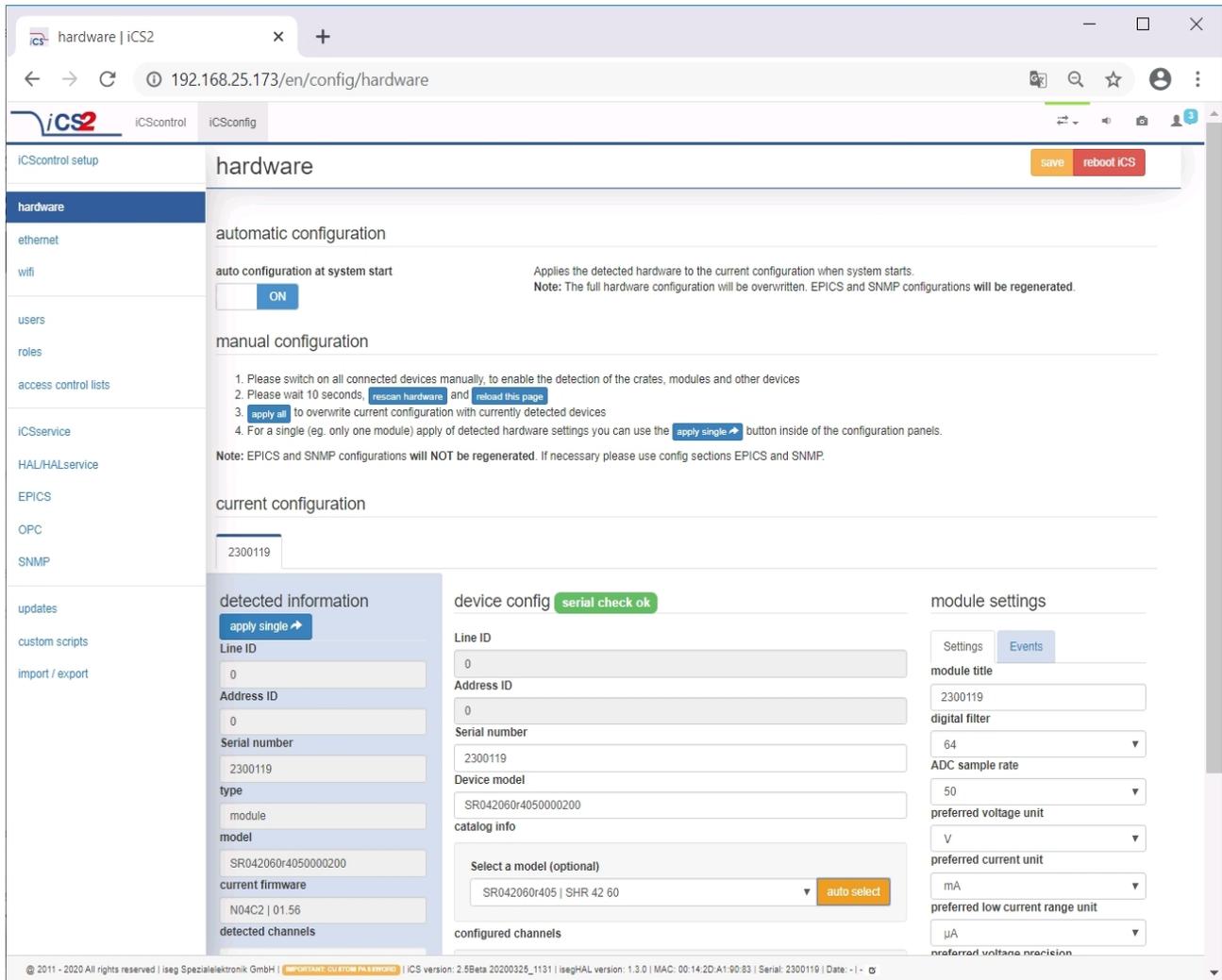


Figure 5: Hardware

In the hardware section, all iCS connected devices like connected crates, controllers and modules are listed and configurable. Each device is represented by a tab, modules and controllers are nested into their responding crates. The CAN lines of the crates are presented with a yellow or green upper tab border (corresponding to yellow or green CAN line), master crates and modules in legacy crates with a blue upper tab border.

The configuration is stored independently from the current hardware setup or connected states. This gives the opportunity to detect misconfigurations and recent hardware setups can easily be restored.

The feature **auto configuration at system start** supports automatically take over of the detected to the configured hardware, generation of EPICS and SNMP configuration. Auto configuration will be executed one time after iCS system start when master crate backplane is on or when iCS is running on a iCSmini.

To apply the complete detected hardware state into the configuration use the **apply all** button **after triggering a rescan using the rescan hardware button**.

To apply the detected config of just one device (controller or module) use the **apply single** button under each single tab. The devices information is stored with the information of "module/device config" column. Here the line and address ID are shown and a serial number can be entered (or applied by using auto configuration / apply). If the model of the hardware device could be detected automatically, a model is selected in the dropdown list, otherwise it should be selected manually. Here a **FIND** buttons checks the list and helps prefiltering the list.

HARDWARE TYPES	
Device	Standalone High Voltage Power Supply
Crate	Case / Bin for a modular HV-supply (module), which supplies power and provides slots for the modules
Controller	Special controller card used in a crate to control, monitors and manages nested modules and crate functions, like switch ON/OFF of crate power supply, monitor temperatures, fans, UPS and more
Module	Modular High Voltage Power Supply, plugged in a slot of a crate, supplied by a CRATE, communication and management by CRATE CONTROLLER, no own POWER ON feature

Table 6: Hardware Types

Information in the row „module settings /device settings“ are module / device specific settings and are stored into the XML configuration file. These settings will get lost when using **auto configuration at system start**, **apply all** or **apply single** functionality.

8.3.1. Ethernet configuration

The ethernet settings of the iCS server hardware (CC2x Crate Controller, iCSmini) can be changed under the **ethernet** tab. By turning DHCP Client to enabled the iCS will try to obtain an IP address from the local networks DHCP server. Otherwise the IP can be set fixed. Therefore DHCP client must be disabled and IPv4 settings can be entered manually.

ETHERNET FACTORY DEFAULTS	
IP	DHCP
GATEWAY	empty
NAMESERVER	empty
DNS	empty
TIMESERVER	empty

Table 7: Ethernet Defaults

The ethernet settings will be stored automatically to the USB flash memory, directory iseg-iCS as file ip-config.txt whenever an USB flash memory is plugged in. This allows retrieving the current IP configuration from an iCS system.

8.3.2. (Re)set / ethernet configuration

You can reset the ethernet configuration and also set to fixed IP adress e.g. cause of problems with DHCP IP relay using the following procedure:

- 1) Shut down all modules/devices and turn off the iCS System by unplugging mains.
- 2) Create an empty file called "RESET_NET.txt" on a USB flash memory drive (FAT32 format)
- 3) Now edit the file. It should contain the following entries, separated by new lines.
- 4) Plug USB flash memory drive into the USB slot at the front panel of the device (CC24, iCSmini2, SHR)
- 5) Plug in mains
- 6) Please wait about 20 seconds until iCS has started completely
- 7) Optional: Plug off the USB flash memory drive and check on a computer if the file created on step 2 was renamed to RESET_NET.txt.done. If it was not renamed, then something went wrong.

CONTENT OF RESET_NET.txt			
LINE	PARAMETER	EXAMPLE	DEFAULT-VALUE
0	IP address / DHCP	192.168.0.10	DHCP
1	NET MASK	255.255.255.0	255.255.255.0
2	GATEWAY	192.168.0.1	192.168.0.1
3	NAMESERVER	192.168.0.1	192.168.0.1

Table 8

INFORMATION	
 INFORMATION	Use quality USB flash memory drives, otherwise the drive might not be detected by the iCS. Also make shure, the flash memory has no file system problems.

8.3.3. WiFi configuration

The WiFi configuration sets the wireless network properties provided by the iCS hardware access point (optional). Generally the WiFi function can be disabled using the WiFi support switch. The IP address of the WiFi is fixed, so once connected with a iCS WiFi the IP address always stays the same.

WIFI FACTORY DEFAULTS	
IP (fixed)	192.168.1.1
SSID	iseq-iCS2_[HARDWARE SERIAL-NUMBER]
Channel	5
Password	password

Table 9

8.4. Users / roles configuration

Users of iCScontrol can be added, edited and removed in the users section. Users can be assigned roles, such like admin, user etc. One or more users can be selected by editing a role.

USER DEFAULTS	
User	admin
Password	password
Role	admin

8.4.1. Access Control Lists (ACL)

With the access control list rights to grant or forbid control on special objects for principals (roles or users) is managed. This gives a powerful tool for very detailed rights mechanism.

INFORMATION	
	<p>Note: Users, roles and ACL are only applied for user authentication for applications and services, which are based on iCSservice. These are iCScontrol, iCSconfig, isegControl, and HTTP API.</p> <p>iseqHAL based services should implement their own security mechanisms.</p>
INFORMATION	

8.4.2. SSH access

The ICS2 Linux host system can be fully accessed as root user using an encrypted SSH shell access over port 22.

This enables user to install own services or freely configure e.g. EPICS plugins etc. The setup of a custom password will be described in the next chapter (Re)set SSH access.

INFORMATION	
	<p>The local file system is divided into a system and a user data partition. To make changes on the read-only mounted system part use the following command: mount-rw / and mount-ro / switches the root file system back to read-only.</p>
INFORMATION	

8.4.3. (Re)set SSH access

INFORMATION



INFORMATION

To protect your iCS system we strongly advice to change the standard factory password into a new user defined one. Keep this password secret!

For security reasons this is only possible with direct hardware access using the following procedure:

- 1) Create a file RESET_SSH.txt with your new root Passwort as content in the first line and save it to an USB flash memory drive (FAT32 format). Note: if the file is empty, the iCS root password will be reset to factory default.
- 2) Plug the USB flash into iCS hardware and reboot iCS.
- 3) The iCS changes the password during the boot process. In case of success the file will be renamed into RESET_SSH.txt.done.

8.4.4. iCS Factory Reset Invocation

In case the user has forgotten his password or simply wants to get back to factory default configuration, it is possible to invoke a factory reset. For factory reset an USB flash drive (USB stick) with a FAT32/FAT16 partition is needed.

CAUTION!



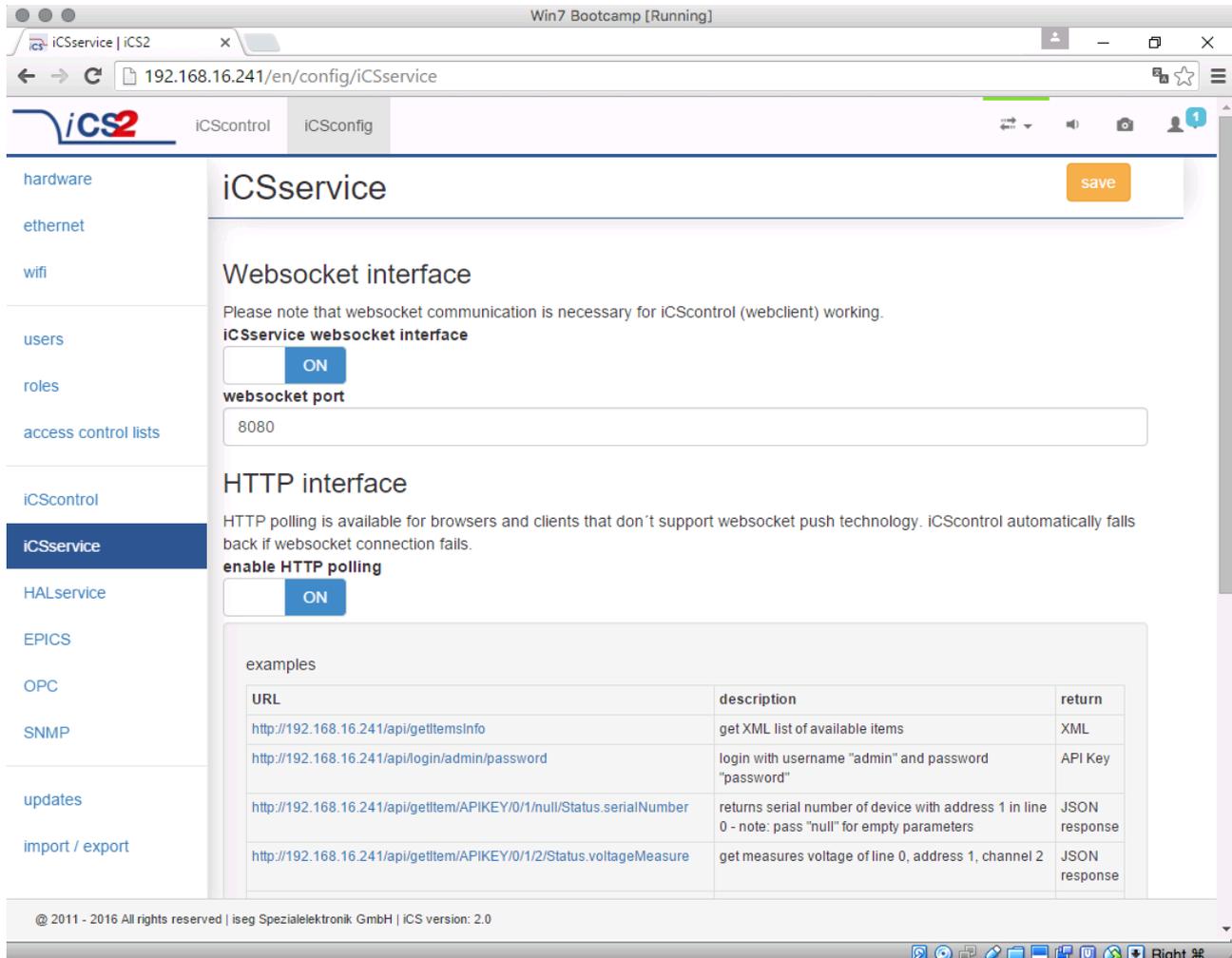
CAUTION!

After factory reset all hardware configurations will get lost!

8.4.5. Instructions:

- 1) Shut down all modules / devices and turn off the iCS System by unplugging mains.
- 2) On the USB flash drive create an empty file called "RESET_ICCS.txt"
- 3) Plug the USB flash memory drive into the USB slot at the front panel of the Crate-Controller
- 4) Plug in mains
- 5) Please wait about 20 seconds until iCS has started completely
- 6) In case of success the file will be renamed to RESET_ICCS.txt.done.

8.5. iCSservice configuration



Websocket interface

Please note that websocket communication is necessary for iCScontrol (webclient) working.

iCSservice websocket interface

ON

websocket port

8080

HTTP interface

HTTP polling is available for browsers and clients that don't support websocket push technology. iCScontrol automatically falls back if websocket connection fails.

enable HTTP polling

ON

examples

URL	description	return
http://192.168.16.241/api/getItemsInfo	get XML list of available items	XML
http://192.168.16.241/api/login/admin/password	login with username "admin" and password "password"	API Key
http://192.168.16.241/api/getItem/APIKEY/0/1/null/Status.serialNumber	returns serial number of device with address 1 in line 0 - note: pass "null" for empty parameters	JSON response
http://192.168.16.241/api/getItem/APIKEY/0/1/2/Status.voltageMeasure	get measures voltage of line 0, address 1, channel 2	JSON response

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Figure 6: iCSservice configuration

The iCSservice running on iCS hardware provides two interfaces, a websocket interface with push technology and a HTTP polling interface, which is fallback for browsers and clients, that do not support websocket technology. Both of them can be disabled, whereas at least one of them is necessary for the correct operation of iCScontrol.

iCSservice DEFAULTS	
Websocket Port	8080
HTTP port	8081
HTTP URL BASE	<IP-of-iCS>:8081/api/

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The documentation of iCSservice API, step by step connection guide to use Websocket / HTTP interface and an example Javascript is available on iCS directly (iCSconfig / iCSservice) or online on:
<https://iseg-hv.com/download/?dir=SOFTWARE/iCS/doc/iCSservice/>

INFORMATION

8.5.1. HTTP interface

This interface gives quick access to iCSservice by simple HTTP queries.

iCSservice HTTP functions		
URL, Parameters with leading \$, params not mandatory [\$param]	Response	Description
http://<IP-of-ICS>:8081/api/login/\$username/\$password	API Key	Returns API Key to be identified for session
http://<IP-of-ICS>:8081/api/logout/\$session-ID	TRUE / FALSE	
http://<IP-of-ICS>:8081/api/getItem/\$apikey/\$line/\$address/\$channel/\$item	JSON Object	Returns state of a specific item of a hardware path \$line, \$address, \$channel and \$item can be set by wildcard '*'
http://<IP-of-ICS>:8081/api/setItem/\$apikey/\$line/\$address/\$channel/\$item/\$value/[\$unit]	TRUE / FALSE	Sets state of a specific item of a hardware path \$line, \$address, \$channel can be set by wildcard '*'
http://<IP-of-ICS>:8081/api/getUpdate/\$apikey/	JSON Object	returns all changes collected by iCSservice since last getUpdate call for this client session
Notes: Use "*" as wildcard, e.g. to set or get items on multiple channels at once. Use "null" as empty set identifier, e.g. to obtain module specific objects without channel declaration.		

Table 10

EXAMPLES	
http://192.168.1.1:8081/api/getItem/123456-321/0/1/0/Status.voltageMeasure	Returns voltage value, unit and timestamp of channel 0 of module with address 1 of line 0
http://192.168.1.1:8081/api/setItem/123456-321/0/1/*/Control.voltageSet/1/kV	Set set voltages of all channels of module 1 in line 0 to 1,000 Volt
http://192.168.1.1:8081/api/setItem/123456-321/0/null/null/Control.power/1	Switch controller of line 0 (master) on

Table 11: Examples

8.5.2. EPICS

For the use of iseg hardware with Experimental Physics and Industrial Control System (EPICS), the iCS comes with a preinstalled integrated Input-Output-Controller (IOC). This service can be enabled or disabled using the switch **enable EPICS input / output controller**. To keep things straight forward, the iCS can generate IOC configuration files (.db and .sub) using the current hardware configuration. Both files can be downloaded to the local computer, edited manually, e.g. with a text editor and uploaded again. This gives a quick start to run an IOC out of the box. To get an overview on all available process variables (PV), which are generated at the start of IOC, the PV list can be downloaded using the respective button. The IOC script combines a process variable definition file (.db) with a substitution file (.sub), which contains hardware setup information and placeholders to create all accessible process variables at runtime.

File	Description	Sample content (extraction)
iseg_epics.db	Database file with definitions of PV	<pre>##### # ### Crate item values ### # ##### record(mbbiDirect, "ISEG:\${CONTROLLER_SN}:\${CAN_LINE}:\${ DEVICE_ID};StatusLow") { field(DESC, "Lower 16 bit of module status register") field(DTYP, "isegHAL") field(INP, "@\${CAN_LINE}.\${DEVICE_ID}.Status can0") field(NOBT, "16") field(SHFT, "0") field(TSE, "-2") } ...</pre>
iseg_epics.sub	Substitution file contains a pattern that will be substituted by the following lines for each corresponding channel	<pre>{CONTROLLER_SN,CAN_LINE,DEVICE_ID,MODULE_ID,CHANNEL_ID} {5230003,0,1000,0,0,"AUTO"} {5230003,0,1000,0,1,"AUTO"} {5230003,0,1000,0,2,"AUTO"} ...</pre>
iseg_epics.pv	Text file with list of process variables generated	<pre>ISEG:5230003:0:0:0:CurrentMeasure ISEG:5230003:0:0:0:CurrentNominal ISEG:5230003:0:0:0:VoltageMeasure ISEG:5230003:0:0:0:VoltageNominal ...</pre>

Table 12

For more detailed information on EPICS, please visit: <https://epics.anl.gov/>, for sample libraries and test scripts, please contact support@iseg-hv.de.

INFORMATION	
 <p>INFORMATION</p>	<p>The documentation of iseg EPICS IOC and a sample scripts are available on iCS directly (iCSconfig / EPICS) or online on: https://iseg-hv.com/download/?dir=SOFTWARE/iCS/doc/isegIOC/</p>

8.5.3. HALservice

The isegHALservice provides a secure sockets encrypted end-to-endpoint access to the iseg hardware layer running on iCS hardware. The isegHALservice API is similar to isegHAL API, with some specific extension. Please refer Appendix “isegHAL” for details. For an easy start a simple example program isegHalTerminal demonstrates the remote access. There are virtual instruments (VIs) which are based on the library **isegHAL-remote** in order to control iseg hardware via LabVIEW ².

INFORMATION



INFORMATION

The documentation of iseg HAL (service) is available on iCS directly (iCSconfig / HALservice) or online on:
<https://iseg-hv.com/download/SOFTWARE/iCS/doc/isegHAL/index.html>

8.5.4. SNMP

For backward compatibility of the iCS2 to SNMP controlled systems like WIENER MPOD, iCS2 is able to communicate using the SNMP service.

The service can be enabled or disabled using the switch **enable SNMP interface**.

Using the current iCS2 hardware configuration a SNMP configuration can be automatically generated. To create a new SNMP configuration, which is compatible to WIENER Configuration file (.mib) please use button “generate configuration” under the SNMP tab in iCSconfig.

For user specific changes of configuration, the .mib (vendor specific definition of datapoints) and .sub (substitution information with list of hardware channels) files can be downloaded, locally modified and uploaded again.

Please note: local modifications will be overwritten every time the “generate configuration” function will be used.

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The documentation of iseg SNMPservice and sample scripts are available on iCS directly (iCSconfig / SNMP) or online on: https://iseg-hv.com/download/SOFTWARE/SNMPguide/SNMP_Programmers-Guide_en.pdf

8.5.5. Updates

The following types of updates can be managed with iCS:

Type	Description
base	product database with information about iseg hardware specifications
system	update image of the iCS server operating system (CC, iCSmini)
firmware	firmware update files for iseg devices (like HV modules, crate controllers etc.)

All update files can be downloaded from iseg web repository using the **CHECK ONLINE FOR UPDATES** or using the update **UPLOAD** function to send a file from the local computer to the iCS server.

Once an update file is available on the iCS, it can be installed using **INSTALL** or removed by using **DELETE** Buttons. After using install, follow the instructions shown on the screen.

Firmware files can be unzipped using **EXTRACT**. After extraction the available firmware files are shown in a list. By clicking **INSTALL** the iCS tries to apply the selected firmware to all connected devices, that are qualified for (matching item code, online, lower firmware version installed).

To update specific hardware devices please extract the firmware package first and then navigate in the **hardware section** to the corresponding device and use firmware update functionality individually.

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INFORMATION

Using the **Check online for updates** feature the iCS directly connects to iseg online software repository.

All update files can also be downloaded directly on <http://download.iseg-hv.com/?dir=SOFTWARE/iCS>

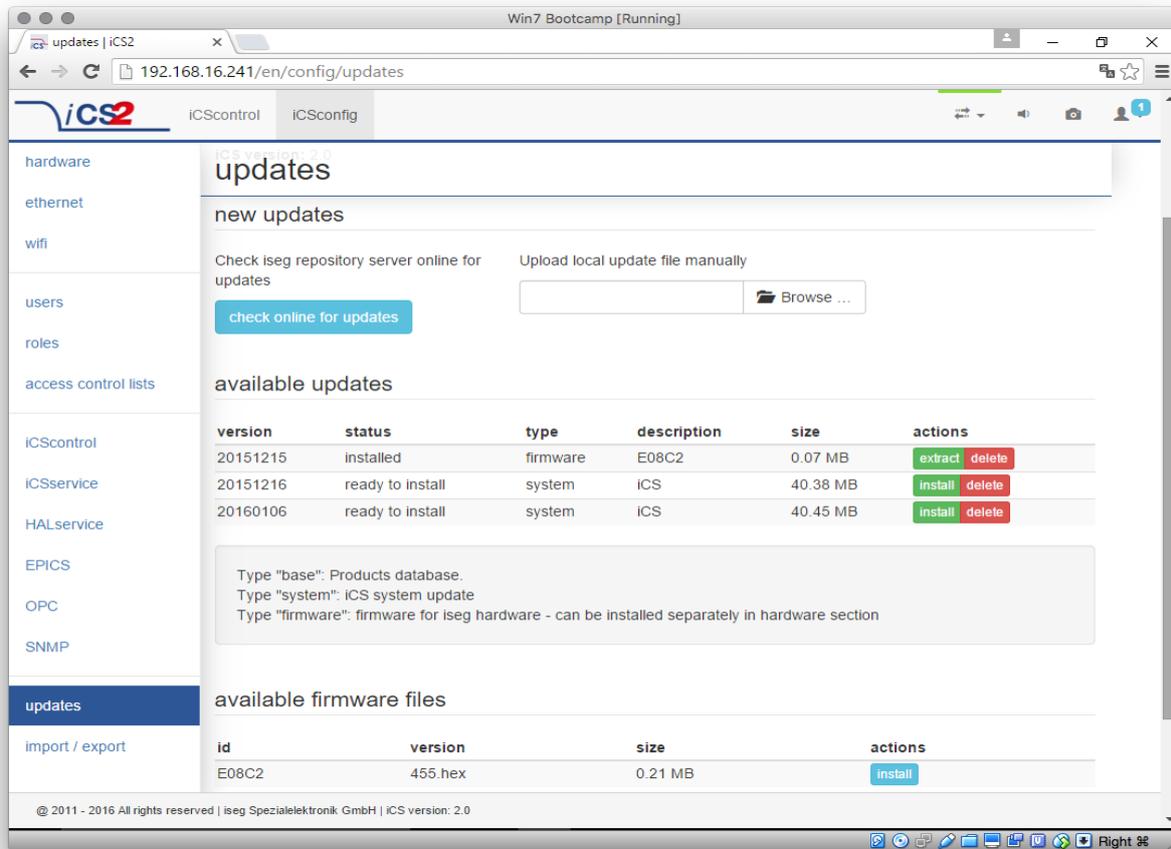


Figure 7: Updates

8.5.6. Custom scripts

The custom script folder provides an access to the script setup. A list of installed scripts will be displayed here.

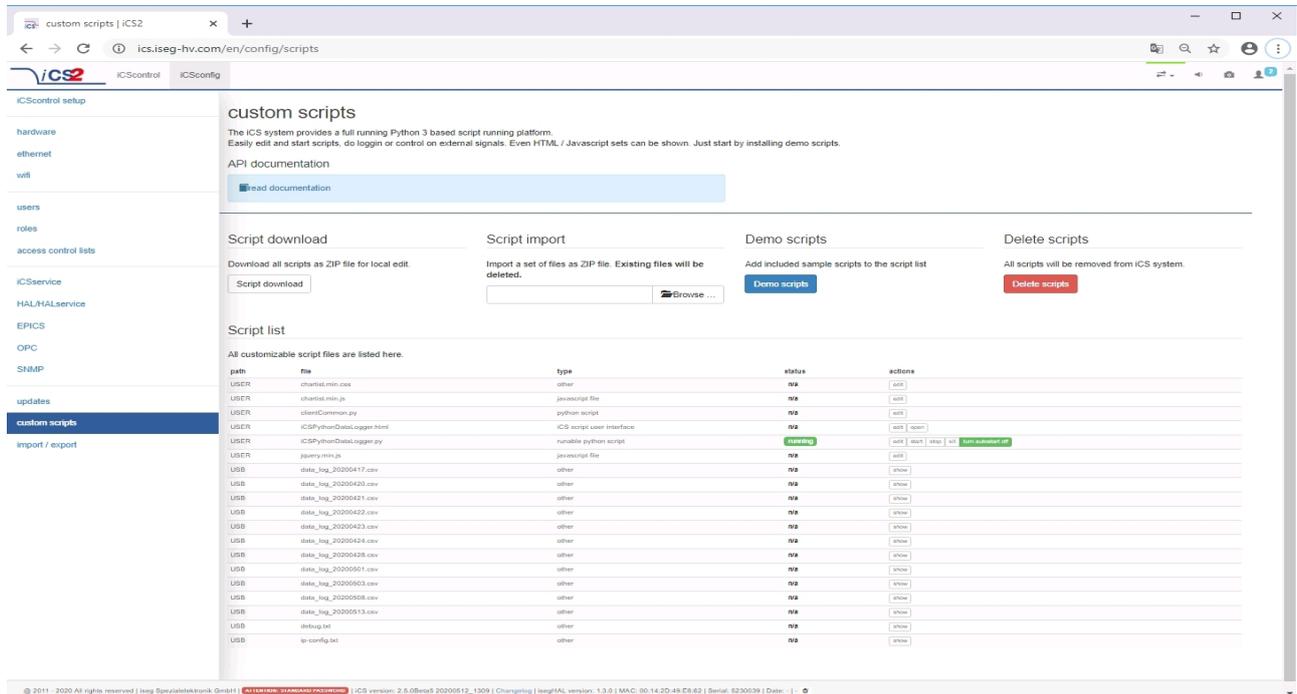


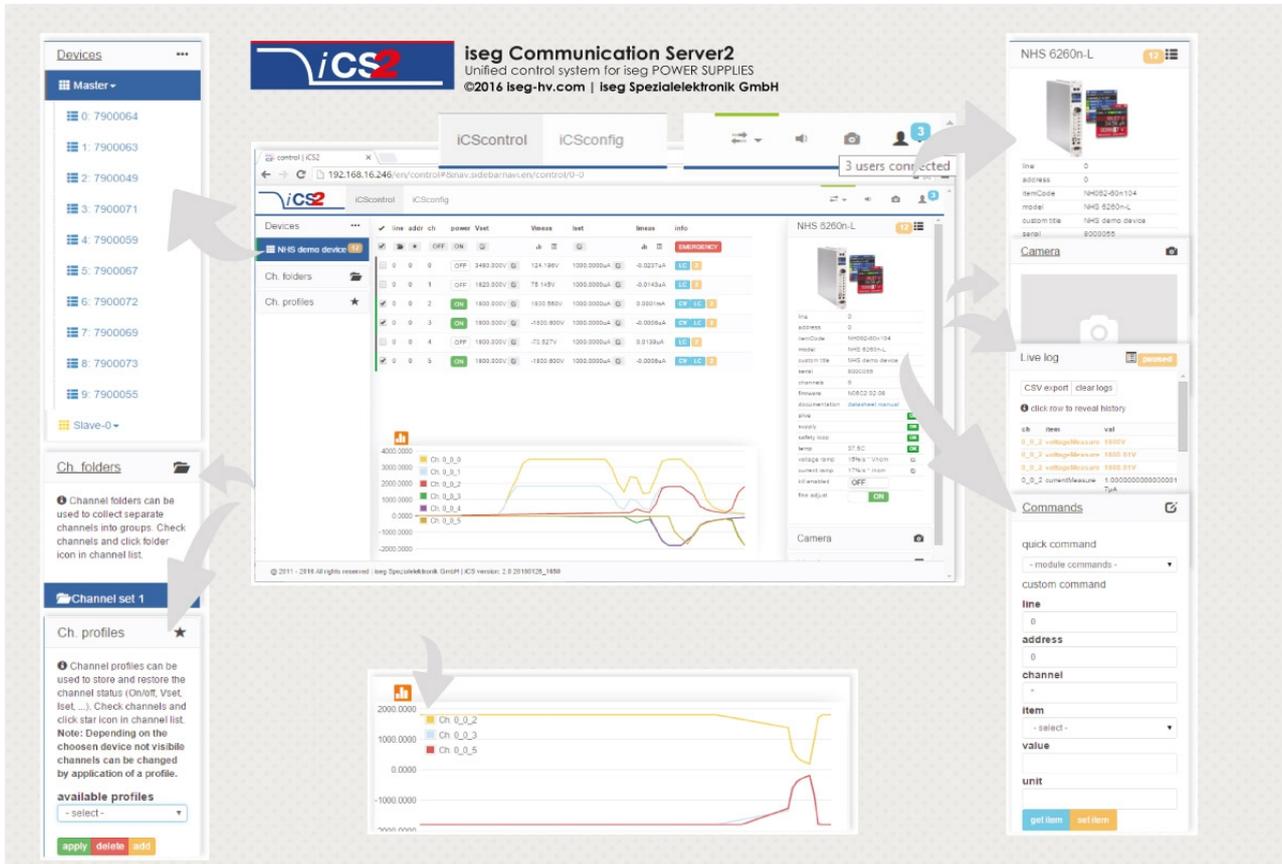
Figure 8: Custom scripts setup

Custom scripts	
Script download	Load a copy of all installed files from iseg hardware <code>/mnt/user/data/scripts</code> as ZIP file to your local download directory
Script import	Import a ZIP file to iseg hardware and extract it to <code>/mnt/user/data/scripts</code> . Existing files will be overwritten.
Demo scripts	Add included sample scripts to <code>/mnt/user/data/scripts</code> on ICS hardware
Delete scripts	All scripts will be removed from iCS system
Edit	An editor window open the selected file to make changes or input additionally contents.
Open	Open ICSPythonDataLogger.html for graphical output of logging data.
Start	Start script execute a python3 process with the scrip
Stop	Send a stop command to the script in order to finish the execution.
Kill	Kill the script execution process
Turn on autostart on	Configure an autostart process for a script when the iCS system will be started.

Table 13: Custom script

8.6. iCScontrol software overview

The user interface of iCScontrol software is divided into three parts. The left bar contains the **Devices**, **Ch folders** channel folders and **Ch profiles** channel profiles. The center bar contains control elements, device and channel process variables with the possibility to output a graphical line plott. The right bar contains a device section, **Camera** access to an optional USB webcam, **Live log** for data logging and a field to input single **Commands** from a list.



The screenshot displays the iCScontrol software interface for an iCS2 server. The interface is divided into three main sections:

- Left Panel:** Contains navigation menus for 'Devices' (listing various device IDs), 'Ch. folders', 'Channel set 1', and 'Ch. profiles'.
- Center Panel:** The main control area, featuring a table of device and channel parameters (line, addr, ch, power, Vset, Wset, Iset, Ires, info), a large line graph showing multiple channel outputs (Ch_0_0_2, Ch_0_0_3, Ch_0_0_5), and a 'Camera' section with a live video feed.
- Right Panel:** Contains a 'Live log' section with a 'CSV export' button and a 'Commands' section with input fields for 'quick command', 'custom command', 'line', 'address', 'channel', 'item', 'value', and 'unit'.

At the top of the center panel, the text reads: 'iseg Communication Server2 Unified control system for iseg POWER SUPPLIES ©2016 iseg-hv.com | iseg Spezialelektronik GmbH'. The browser address bar shows '192.168.16.245/en/control/0/nav/andbar/nav/en/control/0/0'.

Figure 9: iCScontrol

8.6.1. Left bar: Hardware Explorer

The left column shows the configured hardware.

If connected with iseg CAN line management (starting with CC23) slaves are shown in yellow or green background, corresponding to the CAN line they are connected to. Every device has a colored left border showing the running state.

Crate/Device running states	
gray	all channels of the module are off
yellow	one channel of one of the nested channels is ramping to the desired voltage
red	the crate / device (or one of the nested modules/channels) has one or more errors (refer to the error/event badges)
green	the crate / device (and all of the nested modules) are in a good condition, at least one channel of a nested module is running high voltage

Module running states	
gray	not present, not connected or switched off
yellow	one channel of the module is ramping to the desired voltage
red	the module has one or more errors (refer to the error/event badges)
green	the device/module is in a good condition, at least one channel is running high voltage

Channel running states	
blurred / faded out	Module is not detected (probably switched off)
gray	not present (configured module to current module mismatch), or switched off
yellow	channel is ramping to the desired set voltage
red	channel has at least one error (please inspect error counter badge)
green	channel is in good condition and switched on

8.6.2. Left bar: Channel folders

Channel folders are shown in the section “channel folders” below the hardware section in the left application bar. Channel folders can be created and extended by selecting a set of channels and clicking the folders icon on top of the channel list.

Existing folders can be selected or removed in the folders section of the left bar.

8.6.3. Left bar: Channel profiles

Channel profiles store information about set values, on/off states, and Kill properties of channels. They can be created by selecting the channels that should be restored in the channel list and clicking the star-icon. Existing profiles can be selected, applied and removed in the channel profiles section of the left bar. A new option with the custom given title appears in the select box. By selecting a channel profile and clicking the APPLY button the stored state of the channel will be adjusted.

8.6.4. Center bar: Channel list

Once a device or channel folder has been selected, the channel list will update and show only the corresponding channels, with

- The topological location (line, address, channel),
- The running state,
- Set and measured values,
- Channel infos, events and errors (displayed as clickable badges)

The list header has an **ACTION ROW**, where all channels can be selected with one click for more actions.

Each action in this row is located in top of its respective column.

Some examples:

- To create a new channel folder of specific channels, select these channels and click the folder-icon.
- To store the current setup of the specific channels (running state, set-values, kill enable etc.), select them and click on the star-icon. To enable or disable all selected channels, click the ON / OFF icons.
- Change the set voltages of all selected channels, click the edit-icon which is located in the V_{set} column.
- To display a graph of measured voltages of all selected channels, click on the graph-icon located in the V_{meas} column.
- To show a live log of measured voltages of all selected channels, click on the logtable icon located in the V_{meas} column.

8.6.5. Right bar: Device information

The device section gives information on the currently selected hardware device of the hardware explorer. Depending on the device type, hardware status information are given (temperature, error, safety loop states), the device can be enabled / disabled. Device specific parameters can be set (ramps, kill parameters ...). To get a quick help, hardware documentation can be downloaded directly.

8.6.6. Right bar: Camera

The camera tab shows the captured image of the configured camera. It can be directly connected with the iCS hardware or an IP-Cam URL, configured in hardware / iCScontrol section.

8.6.7. Right bar: Live log

The live log collects information of the current session. The log data is only available until a reload of the iCScontrol webpage occurs. The live log can be filtered to specific channels or value types, by selecting channels and clicking the corresponding log icon in the action row on top of the channel list. The log list shows the last value of an item. By clicking on it, previous log items are displayed.

All session log data can be exported as **CSV** file for ongoing work with spreadsheet applications, eg. Microsoft® Excel.

8.6.8. Right bar: Commands

Commands can be send directly to connected devices. Quick commands are mass operations that can be sent to more devices at one time. The commands tab prefills the input fields according to the selected hardware device (in hardware explorer).

9. Dimensional drawing

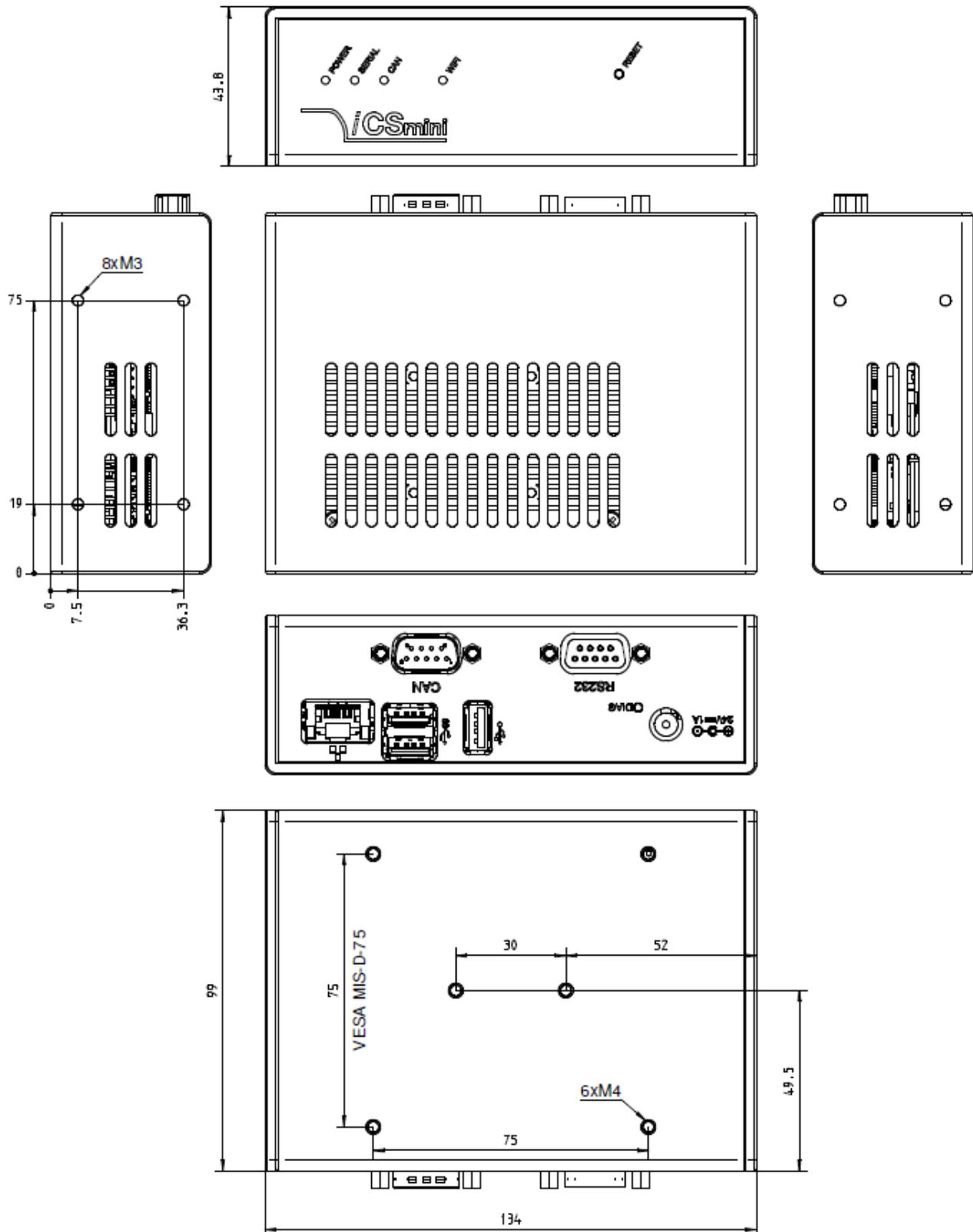


Figure 10: Dimension drawing



Figure 11: ICSmini with 19" rack mount kit - front side



Figure 12: ICSmini with 19" rack mount kit - back side

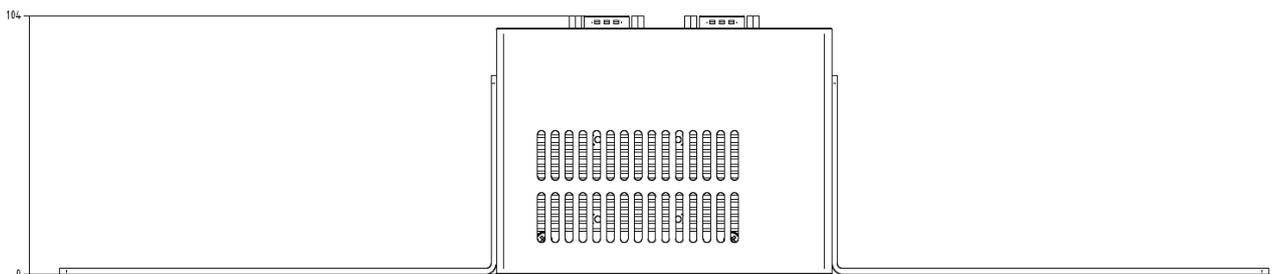
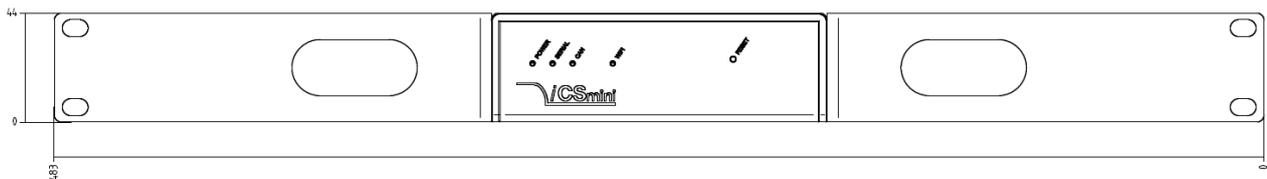


Figure 13: Dimension drawing

INFORMATION



INFORMATION

Use only M3x8 lens head screws to fix the rack mount kit.

10. Accessories

CAUTION!



CAUTION!

Only use genuine iseg parts like power cables, CAN cables and terminators for stable and safe operation.

ACCESSORY ITEM	ORDER ITEM CODE
Cable D-Sub 9 female-male	Z592341
CAN RJ45-D-sub 9 Adapter	Z583382
USB surveillance cam	Z520158
19" rack mount kit	Z516641
Plug-in power supply	Z520176
Gender changer (Socket / Socket)	Z592741

11. Appendix

For more information please use the following download links:

This document
https://iseq-hv.com/download/ACCESSORIES/iCSmini2/iseq_manual_iCSmini2_en.pdf
iseqControl2
https://iseq-hv.com/download/?dir=SOFTWARE/iseqControl2/
iCSservice
https://iseq-hv.com/download/?dir=SOFTWARE/iCS/doc/iCSservice/
iCSfinder
https://iseq-hv.com/download/?dir=SOFTWARE/iCS/iCSfinder/
iseq EPICS IOC and a sample
https://iseq-hv.com/download/?dir=SOFTWARE/iCS/doc/iseqIOC/
iseq HAL (service)
https://iseq-hv.com/download/SOFTWARE/iCS/doc/iseqHAL/index.html
Intel WLAN Specification
http://www.intel.eu/content/www/eu/en/wireless-products/dual-band-wireless-ac-7260-bluetooth-brief.html

12. Glossary

SHORTCUT	MEANING
V_{nom}	nominal output voltage
V_{out}	output voltage
V_{set}	set value of output voltage
V_{mon}	monitor voltage
V_{meas}	digital measured value of voltage
V_{p-p}	peak to peak ripple voltage
V_{in}	input / supply voltage
V_{type}	type of output voltage (AC, DC)
V_{ref}	internal reference voltage
V_{max}	limit (max.) value of output voltage
$\Delta V_{out} - [\Delta V_{in}]$	deviation of V_{out} dep. on variation of supply voltage
$\Delta V_{out} - [\Delta R_{load}]$	deviation of V_{out} dep. on variation of output load
V_{bounds}	Voltage bounds, a tolerance tube $V_{set} \pm V_{bounds}$ around V_{set} .
I_{nom}	nominal output current
I_{out}	output current
I_{set}	set value of output current
I_{mon}	monitor voltage of output current
I_{meas}	digital measured value of current
I_{trip}	current limit to shut down the output voltage
I_{in}	input / supply current
I_{max}	limit (max.) value of output current
I_{limit}	Current Limit.
I_{bounds}	Current bounds, a tolerance tube $I_{set} \pm I_{bounds}$ around I_{set} .
P_{nom}	nominal output power
P_{in}	input power
P_{in_nom}	nominal input power
T	temperature
T_{REF}	Reference temperature
ON	HV ON/OFF
/ON	HV OFF/ON
CH	channel(s)
HV	high voltage
LV	low voltage
GND	signal ground
INH	Inhibit
POL	Polarity
KILL	KillEnable

13. Warranty & service

This device is made with high care and quality assurance methods. The standard factory warranty is 36 months. Please contact the iseg sales department if you wish to extend the warranty.

CAUTION!



CAUTION!

Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: www.iseg-hv.com/en/support/rma

14. Disposal

INFORMATION



INFORMATION

All high-voltage equipment and integrated components are largely made of recyclable materials. Do not dispose the device with regular residual waste. Please use the recycling and disposal facilities for electrical and electronic equipment available in your country.

15. Manufacturer contact

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Bautzner Landstr. 23

01454 Radeberg / OT Rossendorf

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