

# Manual extension

## Crate ECH 228 to

## Crate ECH 238 and option UPS

### with CAN-Control

The crates ECH 238 are supplied with a controller for remote and monitoring control via CAN-bus.

#### Option UPS:

together with an UPS and a battery back up, short term power failure (<10s) can be bridged and in case of longer AC power failure a defined shut down procedure for the HV modules is guaranteed.

#### Installation

After unpacking the crate has to be installed under the described condition.

For crates with UPS option the 16A fuse which is included has to put into the fuse holder on the rear side.

Afterwards the battery is activated.

With AC line ON the crate is in Stand-by mode.

<b>Technical Data version 1.</b>	
CAN bus speed	20, 50, 100, 125 and 250 kbit/s
Analogue functions	ADC with 10-Bit resolution, control of supplies voltages and temperature of this crate.
Digital functions	ON – and OFF switch of internal supply voltages via CAN-Bus in Stand-by mode
Power-ON/OFF	Power cable connected and AC line is ON, now the crate is in Stand-by mode. In Stand-by mode the internal DC supply voltages can be switched ON and OFF with help of a push button, even if no CAN-control is present.
With option UPS	In case of AC power failure the internal voltages are saved by the acc. battery. If the power is failing more than 10 sec. a signal will be provided , which is going to start a defined shut down procedure. (HLH- impulses on each module-slot, Pin b13). The bridge time for the battery is 1 min at least.

#### CAN-Interface

The CAN-control is completely configurable via software. The Structures is following to CAN-Open (CAL-based Draft Standard 301 / release 3.0).

After Power\_ON-Reset the controller is running into CAN-Status “Initialisation“. During this state Write access is possible to all EEPROM-cells via the sub identifier. If control is already configured (e.g. from factory), control is running into CAN-status “Pre-operational“.

Only in these both states it is possible to work with services Network-Management (NMT) and Distribution - Management (DBT).

CAN-Status "Pre-operational" is necessary for the further description.

In order to allow the control of the crate via CAN-Bus, with global command „START“ the CAN-Status „Pre-operational“ will be switched into CAN-Status "Operational":

Services	ID (with RTR =0)	DLC	DATA_1
<b>Network - Management (NMT)</b>			
START / STOP / RESET  global  broadcast message to all ECH CAN nodes	0	1	Bit 0 = 1 ⇒ Start Bit 1 = 1 ⇒ Stop Bit 2 = 1 ⇒ Reset CAN-interf. Bit 3 = 1 ⇒ Reset Controller

Now control can work via two identifier (see ID - Distribution):

### 1. Control (EMCY-ID)

The internal supply voltages will be controlled cyclically ( $V_{Meas}$  ca all 100 ms). The voltage control is factory fixed with  $\Delta V = \pm 5\%$  given through tolerance values  $V_{Treshold}$  in an EEPROM. If the thresholds of voltage and/or temperature will be exceeding then the controller is sending a message with EMCY-ID to the Bus (send only).

Controls of EMCY-ID's are working only after the controller has been set into Operational mode with NMT-Start.

ID	RTR	DLC	Voltage	DATA_2	DATA_3	DATA_4	DATA_5
EMCY-ID	0	5	0 0 0 0 0 x x x	12-bit unsigned ADC-word: $V_{Meas}$	12-bit unsigned ADC-word: $V_{Threshold}$	xxx: 000 + 24 V = $V_{Nominal 0}$ 001 + 5 V = $V_{Nominal 1}$ 010 24V <sub>Battery</sub> = $V_{Nominal 2}$	
$V_{Meas}$ resp. $V_{Threshold} = V_{Nominal} \times \text{ADC-word} / 2048$							

ID	RTR	DLC	Temperature	DATA_2	DATA_3	DATA_4	DATA_5
EMCY-ID	0	5	0 0 0 0 0 x x x	0	$T_{Meas}$ [°C]	0	$T_{Threshold}$ [°C]
xxx:			011 temperature sensor 1 (24V-DC PS) 100 temperature sensor 2 (Back plane) 101 temperature sensor 3 110 temperature sensor 4 (3 and 4: reserved)				

ID	RTR	DLC	AC line power failure signal	DATA_2	DATA_3	DATA_4	DATA_5
EMCY-ID	0	5	0 0 0 0 0 x x x	0	0	7	7c
xxx:			111 AC line power failure				

**2. Subidentifizier (Sub-ID)**

E-command	ID	R	D	r	Command								DATA_n	Remarks
		T	L	/										
		R	C	w										
Multiplex-command	Sub-ID	0	x	x	0	x	x	x	x	x	x			multiplexed DAC/ADC – work on channels of selected module (Sub-ID)
ADC	Sub-ID	0	1	1	0	1	0	0	x	x	x			Read Access, (call from host)
	Sub-ID	0	3	1	0	1	0	0	x	x	x	2 Byte ADC-word	$V_{Meas} = V_{Nominal} \times \text{ADC-word} / 2048$ xxx: 000 + 24 V = $V_{Nominal 0}$ 001 + 5 V = $V_{Nominal 1}$ 010 24V <sub>Battery</sub> = $V_{Nominal 2}$	
	Sub-ID	0	4	1	0	1	0	0	x	x	x	2 Byte ADC-value + 1 Byte fan status	ADC-value = Temperature [°C] Byte fan status = 0: stage 1, 1: stage 2, full cooling xxx: 011 temperature sensor 1 (Back plane) 100 temperature sensor 2 (24V-DC Power supply) 101 temperature sensor 3 110 temperature sensor 4 (3 and 4: not installed)	
	Sub-ID	0	3	1	0	1	0	0	1	1	1	1. Byte AC line power status 2. Byte crate power status	Status AC line power 1: AC line power OK 0: AC line power wrong Capture status if voltages were out of range. Bit b7=1 temperature to high Bit b5=1 +24V to high Bit b4=1 +24V to low Bit b3=1 +5V to high Bit b2=1 +5V to low Bit b1=1 24V battery voltage to high Bit b0=1 24V battery voltage to low	
	Sub-ID	0	3	0	0	1	0	0	1	1	1	1. Byte AC line power status 2. Byte crate power status	In order to reset the AC power line status it have to be set bit 0 to one in DATA_1. In order to reset the corresponding bit of the crate status it have to be set in the DATA_2.	

Module-command	Sub-ID	0	x	x	1	x	x	x	x	x	x		Use module functions of selected module (Sub-ID)																				
EEPROM	Sub-ID	0	2	1	1	0	0	0	0	0	0	EEPROM-address	Read / Write access, ( call from host)																				
/Tolerances	Sub-ID	0	3	1	1	0	0	0	0	0	0	Data_1: EEPROM-address	Byte oriented reading of tolerances from EEPROM-address:																				
												V	Higher ADC-threshold		Lower ADC-threshold																		
													<table border="1"> <tr> <td></td> <td>High</td> <td>low</td> <td>high</td> <td>low</td> </tr> <tr> <td>+ 24 V</td> <td>0x3d</td> <td>0x3e</td> <td>0x3f</td> <td>0x40</td> </tr> <tr> <td>+ 5 V</td> <td>0x41</td> <td>0x42</td> <td>0x43</td> <td>0x44</td> </tr> <tr> <td>24V<sub>Battery</sub></td> <td>0x45</td> <td>0x46</td> <td>0x47</td> <td>0x48</td> </tr> </table>		High	low	high	low	+ 24 V	0x3d	0x3e	0x3f	0x40	+ 5 V	0x41	0x42	0x43	0x44	24V <sub>Battery</sub>	0x45	0x46	0x47	0x48
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24V <sub>Battery</sub>	0x45	0x46	0x47	0x48																													
	Sub-ID	0	3	0	1	0	0	0	0	0	0	Data_1: EEPROM-address Data_2: tolerance high/low	-byte oriented writing of tolerances on above EEPROM-address, tolerance = word ADC-threshold -tolerance = (calculated set-ADC-value) * (1 ± ΔV)																				





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## **Maintenance**

The crate and the included battery are free from any support. If the crate is not in use for more than half a year it has to be connected to mains and switched ON for at least 8 hours, so that the batteries will be charged to full capacity again. After 5 years time the batteries have to be replaced by new ones.