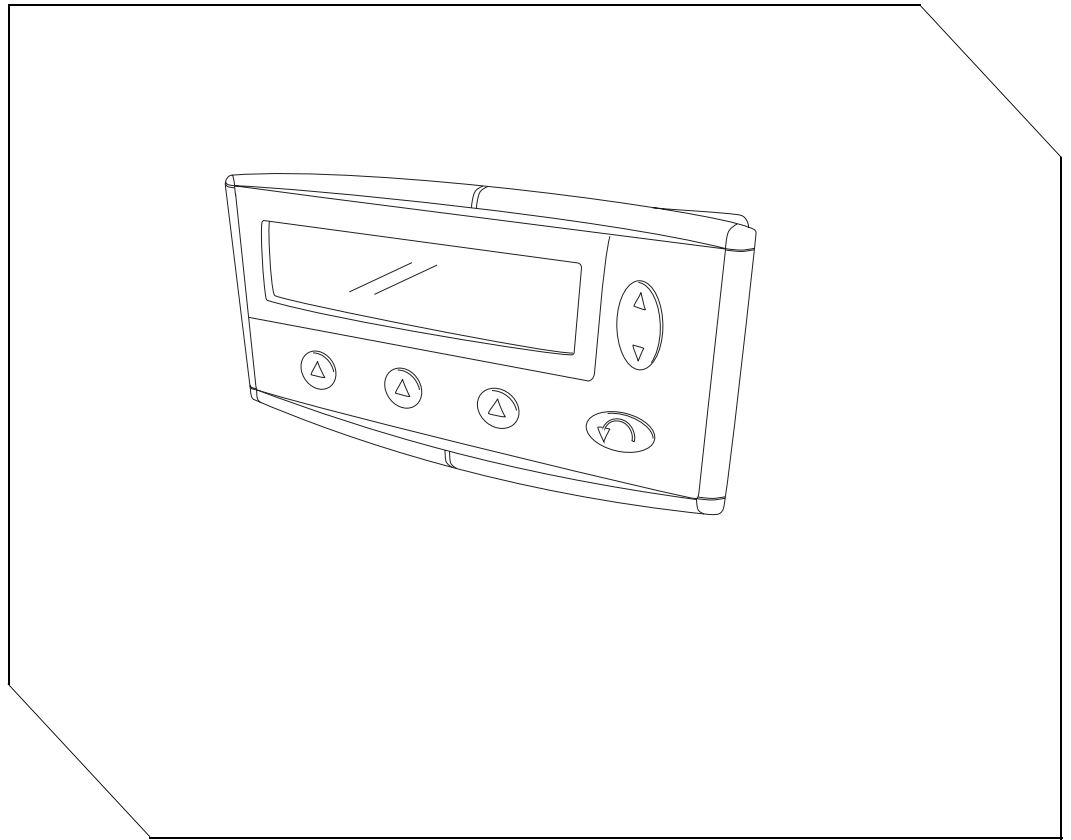




# Instruction book IQAN-MDM

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# 1 Introduction

These instructions are to be used as a reference tool for the vehicle manufacturer's design, production, and service personnel.

The user of these instructions should have basic knowledge in the handling of electronic equipment.

## Safety symbols

Sections regarding safety, marked with a symbol in the left margin, must be read and understood by everyone using the system, carrying out service work or making changes to hardware and software.

The different safety levels used in this manual are defined below.



### **WARNING**

Sections marked with a warning symbol in the left margin, indicate that a hazardous situation exists. If precautions are not taken, this could result in death, serious injury or major property damage.



### **CAUTION**

Sections marked with a caution symbol in the left margin, indicate that a potentially hazardous situation exists. If precautions are not taken, this could result in minor injury or property damage.



### **NOTICE**

Sections marked with a notice symbol in the left margin, indicate there is important information about the product. Ignoring this could result in damage to the product.

Contact the manufacturer if there is anything you are not sure about or if you have any questions regarding the product and its handling or maintenance.

The term "manufacturer" refers to Parker Hannifin Corporation.

## 2 Precautions

### General safety regulations

Work on the hydraulics control electronics may only be carried out by trained personnel who are well-acquainted with the control system, the machine and its safety regulations.



#### WARNING

Mounting, modification, repair and maintenance must be carried out in accordance with the manufacturer's regulations. The manufacturer has no responsibility for any accidents caused by incorrectly mounted or incorrectly maintained equipment. The manufacturer does not assume any responsibility for the system being incorrectly applied, or the system being programmed in a manner that jeopardizes safety.



#### WARNING

Damaged product may not be used. If the control system shows error functions or if electronic modules, cabling or connectors are damaged, the system shall not be used.



#### WARNING

Electronic control systems in an inappropriate installation and in combination with strong electromagnetic interference fields can, in extreme cases, cause an unintentional change of speed of the output function.



#### NOTICE

As much as possible of the welding work on the chassis should be done before the installation of the system. If welding has to be done afterwards, the electrical connections on the system must be disconnected from other equipment. The negative cable must always be disconnected from the battery before disconnecting the positive cable. The ground wire of the welder shall be positioned as close as possible to the place of the welding. The cables on the welding unit shall never be placed near the electrical wires of the control system.

### Construction regulations



#### CAUTION

The vehicle must be equipped with an emergency stop which disconnects the supply voltage to the control system's electrical units. The emergency stop must be easily accessible to the operator. The machine must be built if possible, so that the supply voltage to the control system's electrical units is disconnected when the operator leaves the operator's station.

### Safety during installation



#### CAUTION

Incorrectly positioned or mounted cabling can be influenced by radio signals which can interfere with the functions of the system.

### Safety during start-up



#### WARNING

The machine's engine must not be started before the control system is mounted and its electrical functions have been verified.

Ensure that no one is in front, behind or nearby the machine when first starting up the machine.

Follow the instructions for function control in the Start-up section.

### Safety during maintenance and fault diagnosis



#### CAUTION

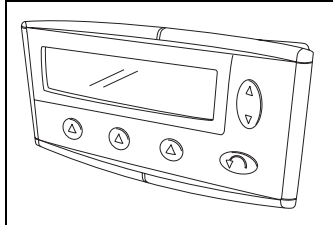
Ensure that the following requirements are fulfilled before any work is carried out on the hydraulics control electronics.

- The machine cannot start moving.
- Functions are positioned safely.
- The machine is turned off.
- The hydraulic system is relieved from any pressure.
- Supply voltage to the control electronics is disconnected.

## 3 Product description

### IQAN-MDM

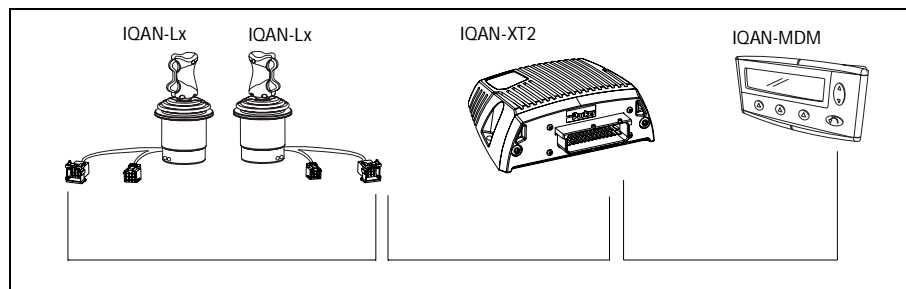
The IQAN-MDM is the main unit of the control system. The IQAN-MDM contains the system's application software and most decisions are made here. The communication on the CAN bus is initiated from IQAN-MDM.



The IQAN-MDM module.

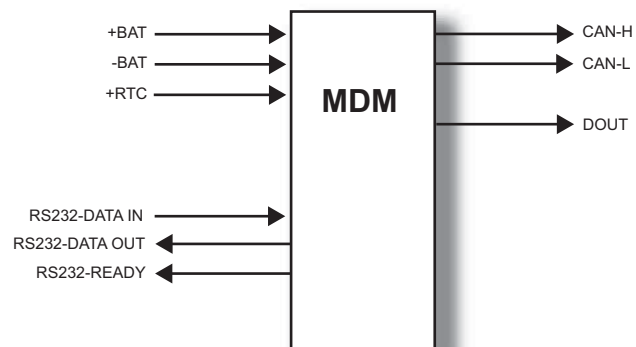
The master module, MDM, is the central unit in the system. The master module contains a display where alarm texts, parameters and settings are presented. All communication with the other modules takes place from the MDM via the CAN-bus.

### System overview



A typical MDM system

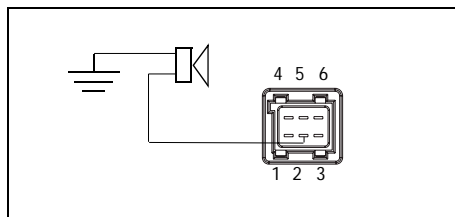
### I/O overview



### Inputs/Outputs

There is an alarm output DOUT on IQAN-MDM that is activated when there is an error message for the system, such as a short-circuit and input or output interruption. By connecting the alarm output to a warning lamp or acoustic signal, the driver is alerted that an error message has been given.

Connect the alarm (acoustic signal) between pin 2 and ground (the battery's negative pole). See the illustration below. An active output gives battery voltage (9-32 Vdc). The maximum load is 120 mA.



Connection of alarm output.

### CAN related functions

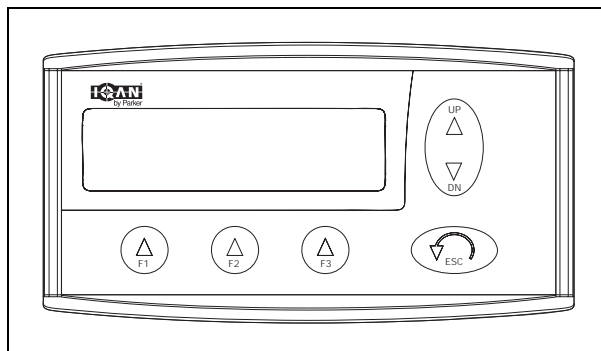
The IQAN-MDM uses a CAN-bus (CAN = Controller Area Network) to communicate with IQAN expansion modules and other systems.

### Communication

The IQAN-MDM has one RS232 port for communication with a PC, PDA and modems.

### Features

The front of IQAN-MDM consists of a control panel with a display and six buttons.



The front of the MDM.

- Back-lit graphic LCD display 32x202 pixels.
- F1 thru F3 buttons. The function for these buttons is dynamic, i.e the function of the buttons changes. The current function is stated on the display above the respective button.
- Two arrow keys Up/Dn - are to be used to increase/decrease value, or to go up/down a step in menus.
- 'Esc' or BACK button. Cancel a selection or setting without saving the value and return to the previous menu.

Please refer to the IQANdevelop software manual and IQAN-MDM menu system instruction book, HY17-8363/UK for programming information.

## 4 Safety

### General

In order to fulfill high safety demands, the IQAN-MDM uses a real-time operating system for fault tolerant embedded systems. The IQAN-MDM has an internal watchdog function. If the watchdog detects any software errors, necessary precautions will be activated.

### Polarity reversal

The IQAN-MDM is protected against power supply polarity reversal, provided an external fuse, max 3 A (Fast) is being used. Polarity reversal can damage the unit if the fuse is not used.

### CAN-bus interruption

The IQAN-MDM has special safety functions if the CAN-bus is interrupted. Each module checks for any interruptions in the CAN-bus communication. If an error occurs the master will present a related message on the display.

### Input/output Protection

All inputs on the IQAN-MDM are designed to withstand the maximum specified supply voltage. The outputs are protected against short circuit. Furthermore, an error on one in-/output will not influence other in-/outputs.

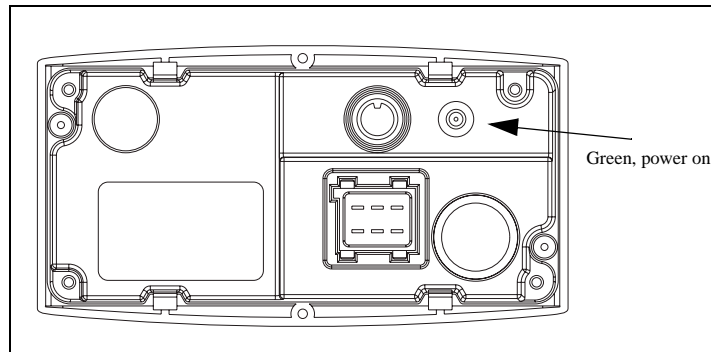
### Memory test

The MDM module will execute a self-test during operation to verify the software. The test includes a CAN-bus verification, processor and memory verification and an internal signal verification. If any software error is detected, appropriate precautions will be activated.



## System Diagnostics

One LED is mounted on the reverse side of the MDM. This LED indicates supply voltage with a steady green light. If this LED is out, the supply voltage is missing.



The location of the LED indicator.

Diagnostic messages for the IQAN-MDM or for the system in which it is the master unit are shown on the front LCD display.

## 5 Mounting

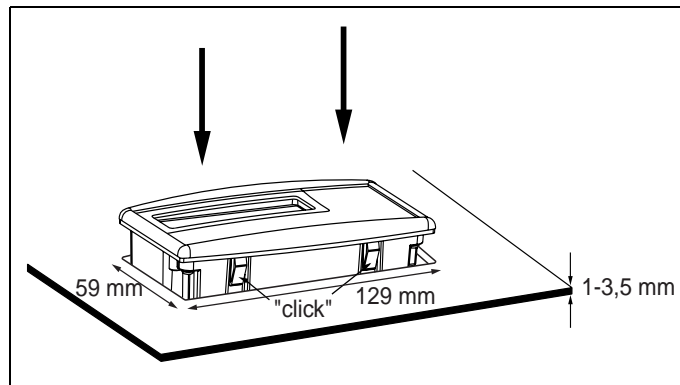
### Mounting the unit



#### NOTICE

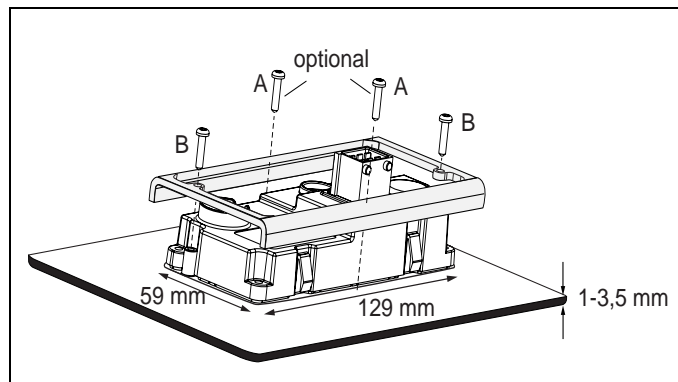
The IQAN-MDM unit should be mounted according to the following instructions. The IQAN-MDM can be mounted in two different ways:

- inserted into a panel with snap-on holders
- with screws from the reverse side.



Mounting with snap-on attachment in panel

- The thickness of the material must be between 1.0 to 3.5 mm.
- The size of the opening in the panel: 130 x 60 mm. Corner radius: 5 mm.



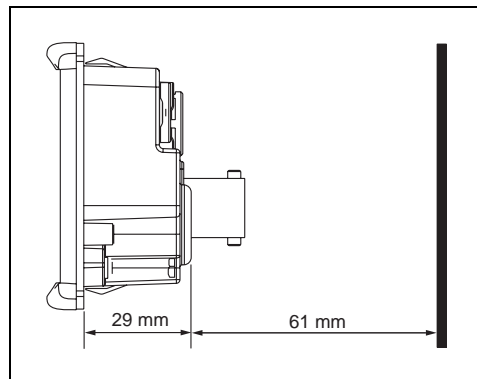
Mounting with screws from the reverse side

The unit can be mounted with 2 or 4 screws.

Type of screw: PT3.

Select the screw length so that the engagement length in the unit is:

- 4-6 mm for screw A.
- 6-10 mm for screw B (used with optional bracket).



Distance for connector removal.



#### Notice

The IQAN-MDM shall be positioned in the machine as per the following instructions:

- The unit is designed for outdoor use. Position the unit and make sure that it is not exposed to mechanical damage or high pressure water.
- The terminal for PC connection on the reverse side of the unit should be accessible.
- Position the unit so there is no risk that the cabling can be folded, crushed, worn or damaged in any other way.
- Position the unit so that it is not exposed to external heat, e.g. from the engine or heater.
- The best readability will be achieved by positioning the front face of the unit directly towards the operator.
- The readability deteriorates if the unit vibrates. Position the unit in a stable foundation.



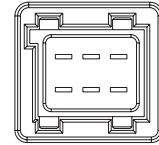
#### NOTICE

The IQAN-MDM unit must not be placed in any marine related or similar continuously damp environment without external protection.

## 6 Installation

### Connector C1

Connector kit	<b>PARKER 5031022</b>
Housing	AMP no. 1-963212-1
Pin type	AMP no. 929940-1
Cable	0.75-1 mm <sup>2</sup>
IQANtool kit <sup>a</sup>	Parker 5031061



a. Further information about the IQANtool kit, see datasheet IQAN accessories

#### Connector pin assignments

Logical Symbol	Pin No.	Function description
CAN-L	1	CAN Low
DOUT	2	Digital Alarm Output
-BAT	3	Connected to negative pole on the battery
CAN-H	4	CAN High
+RTC	5	Real Time Clock
+BAT	6	Connected to positive pole on the battery. Min 9 V, max 32V

## Supply Voltage

Before any installation of the IQAN system can take place, make sure the ignition lock is turned off and the battery is disconnected.

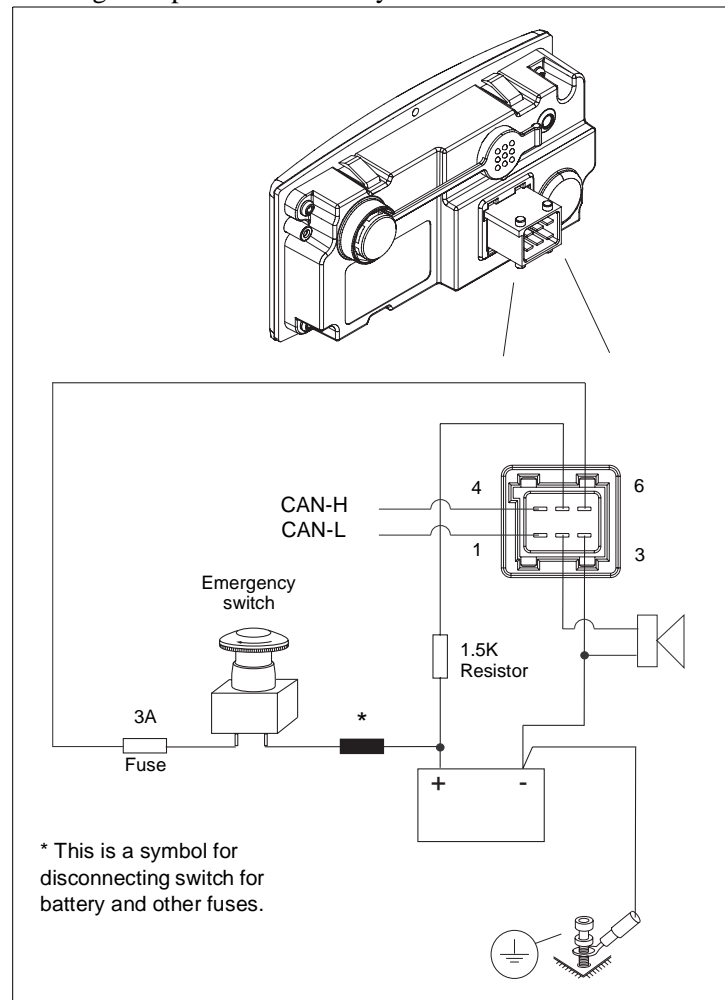
### Emergency stop

Make sure an *Emergency Stop* disconnecting the power supply, is easily accessible at any time. The figure below shows how to connect the emergency stop.

### Connecting of Supply Voltage

The supply voltage, should be within the operating interval, see Appendix A, on page 17.

Connect the supply voltage to +BAT pin 6 through the vehicle power disconnecting switch and a fuse. The fuse shall be 3A fast (F). Supply voltage for +RTC pin 5 is connected straight from the battery through a 1.5K ohm resistor. The resistor should be as close to the battery as possible for safety. Ground connection -BAT is made from pin 3 to negative pole on the battery.



Connecting the emergency stop and voltage supply.

## **IQAN-MDM addressing/terminating**

### **Addressing**

IQAN-MDM shall not be addressed because there is only one in every system.

### **Terminating**

Termination shall not be done as it is built-in to the IQAN-MDM.

## 7 Start-up

### Start-up procedures

This chapter contains instructions for action to be taken in connection with the initial start.



#### **WARNING**

Risk of injury!

If the control system is not fitted properly, the machine could move uncontrollably. The machine's engine shall not be started before the control system is completely fitted and its signals are verified.

### Starting the control system

#### **Start the control system as follows:**

- Prior to start, all modules and cables are to be fitted correctly.
- Check fuses, i.e. make sure that the supply voltage to the modules is equipped with the correct fuse.
- Make sure that connections for supply voltage and return lines are correct in the cable's conductor joint.
- Make sure the emergency stop works.  
The emergency stop should disconnect the supply voltage to all modules.

Alternatively, the emergency stop may also shut off the diesel engine or a dump valve, and with that depressurize the hydraulic system.

### Prepare for system start



#### **WARNING**

Make sure no one is in dangerous proximity to the vehicle to avoid injuries when it starts.

#### **Prepare for the initial system start as follows:**

- The engine for the hydraulic system's pump shall be in off position.
- Make sure that all connectors are properly connected.
- Turn on the control system.
- Make sure that voltage is being supplied to all modules, the green diode shall be illuminated on all modules. Also make sure that master is in contact with all modules by reading the master's display. Error messages are displayed if the master is not in contact with one or more of the modules.
- Make sure the emergency stop is functioning properly.

## **Start the system**

### **Start the system as follows:**

- Start the engine for the hydraulic system's pump, assuming that the above mentioned inspections have been carried out and shown correct values.
- Calibrate and adjust input and output signals according to the instructions related to the master menu system and check each and every output function carefully.
- In addition to these measures, the machine shall also meet the machine directives for the country in question.



## Appendix A

### IQAN-MDM Technical Overview

#### Absolute maximum ratings

$T_A = +25\text{ °C}$  (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Operating ambient temperature, $T_A$	-30		+80	°C	
Storage temperature	-30		+100		
Voltage supply, $V_{BAT}$	6		36	V	
Load current, DO <sub>UT</sub>				A	internally limited

#### Environmental rating

$T_A = +25\text{ °C}$  (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
EMI ISO 11452-2:1995, radiated susceptibility ISO 11452-4:2001, conducted susceptibility EN 55022:1994, conducted emission EN55022:1994, radiated emission			100 150	V/m mA	20-1000 MHz 1-200 MHz class B, 0.15-30 MHz class B, 30-1000 MHz
ESD IEC/EN 61000-4-2:1995 air and contact discharge			25	kV	
CAN-bus length <sup>a</sup>			100	m	
Mechanical environment IEC 68-2-64 Fh (random) IEC 68-2-27 Es (shock,) IEC 68-2-29 Eb (bump)			0.1 40 40	g <sup>2</sup> /Hz g g	10 - 250 Hz 11 ms 6 ms
Climate environment IEC 68-2-18 Rb1.2 (water) IEC 68-2-30 Db (var1: damp, cyclic) IEC 68-2-3 Ca (damp, heat steady state) IEC 68-2-2 Bb (heat) IEC 68-2-1 Ab (cold) IEC 68-2-14 Nb (change of temperature)			3 72 240 72 16 10 x 6	min hour hour hour hour hour	10 l/min <sup>b</sup> 25-55°C, 95% RH 44°C, 93% RH 70°C -30°C -30 - 70°C
Chemical environment IEC 68-2-52 Kb (salt, mist, cyclic)			72	hour	

- a. Maximum length between any two modules, unshielded twisted pair cable.
- b. Unit mounted in dashboard when subject to water.

### Operation

-30 °C < T<sub>A</sub> < +70 ° C (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Ambient temperature, T <sub>A</sub>	- 30		+70	°C	
Ambient temperature, T <sub>A</sub>	-30		+0	°C	Reduced LCD update
Voltage supply, V <sub>BAT</sub>	9		34	V	
Current supply V <sub>BAT</sub> =14V V <sub>BAT</sub> =28V		180 100		mA mA	outputs = off

### I/O

-30 °C < T<sub>A</sub> < +70 °C (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
<b>DOUT (Digital output)</b>					
Load current			1.2	A	
Voltage drop V <sub>BAT</sub> - V <sub>DOUT</sub> load I <sub>L</sub> = 1.2A		0.7		V	
Short Circuit current limit		2.5		A	

## Appendix B

### Error codes, messages and actions

If one of the following error is detected, a message will be presented on the display.



#### **WARNING**

An error message could indicate that a hazardous situation exists. If precautions are not taken, this could result in death, serious injury or major property damage.

The following sections will present what measures to take for different error situations put into appropriate context.

#### **LOW/ HIGH SUPPLY VOLTAGE**

Error code	Situation	Action MDM	Comment
Error 1	+BAT < 8,5V	-	Check voltage supply
Error 1	+BAT > 34V	-	Check voltage supply

#### **VREF ERROR**

Error code	Situation	Action MDM	Comment
Error 1	VREF < 4,9 V	-	Check voltage
Error 1	VREF > 5,1 V	-	Check voltage

#### **MODULE IS OFFLINE**

Error code	Situation	Action MDM	Comment
Error 3	CAN-bus interrupt	All outputs shut off	Check CAN-bus
Error 6	Software error	The module turns off	Contact supplier

#### **HIGH TEMPERATURE**

Error code	Situation	Action MDM	Comment
Error 2	Internal temperature > max temp	-	Check ambient temperature
Error 4	Internal temperature sensor error	-	Contact supplier

**PARAMETER ERROR**

<b>Error code</b>	<b>Situation</b>	<b>Action MDM</b>	<b>Comment</b>
Error 6	Parameter error	No calibration of signals	Contact supplier

**RTC+ NOT CONNECTED**

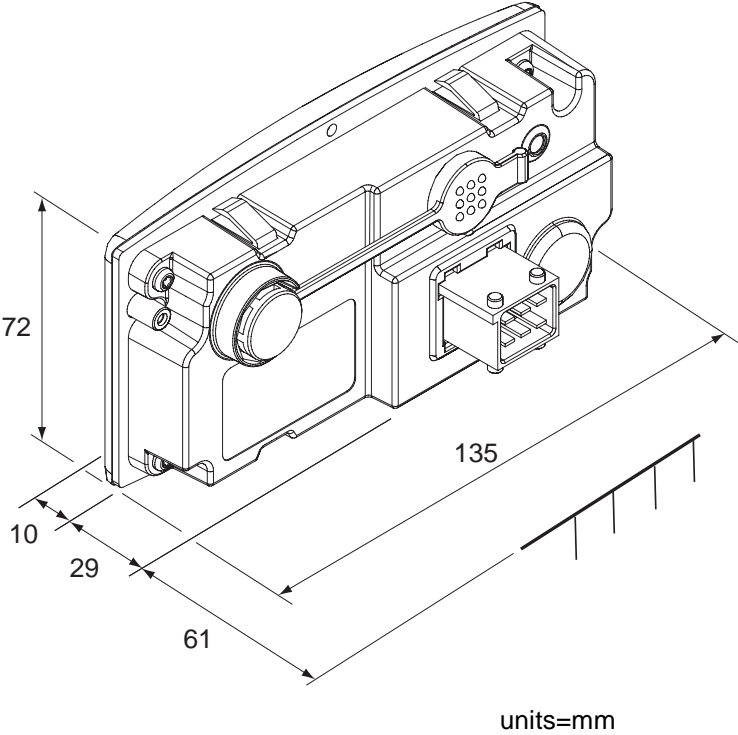
<b>Error code</b>	<b>Situation</b>	<b>Action MDM</b>	<b>Comment</b>
-	The power supply is not connected to the <i>real time clock</i> in the IQAN-MDM	-	Connect the power supply to RTC+, pin 5.

**OUTPUT HIGH**

<b>Error code</b>	<b>Situation</b>	<b>Action MDM</b>	<b>Comment</b>
Error 4	DOUT: Internal driver failure	Active output shuts off	Contact supplier

# Appendix C

## Dimensioning of the IQAN-MDM module



For the latest information visit our website [www.iqan.com](http://www.iqan.com)

Information in this instructionbook is subject to change without notice

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