Instruction book
IQAN-MDM

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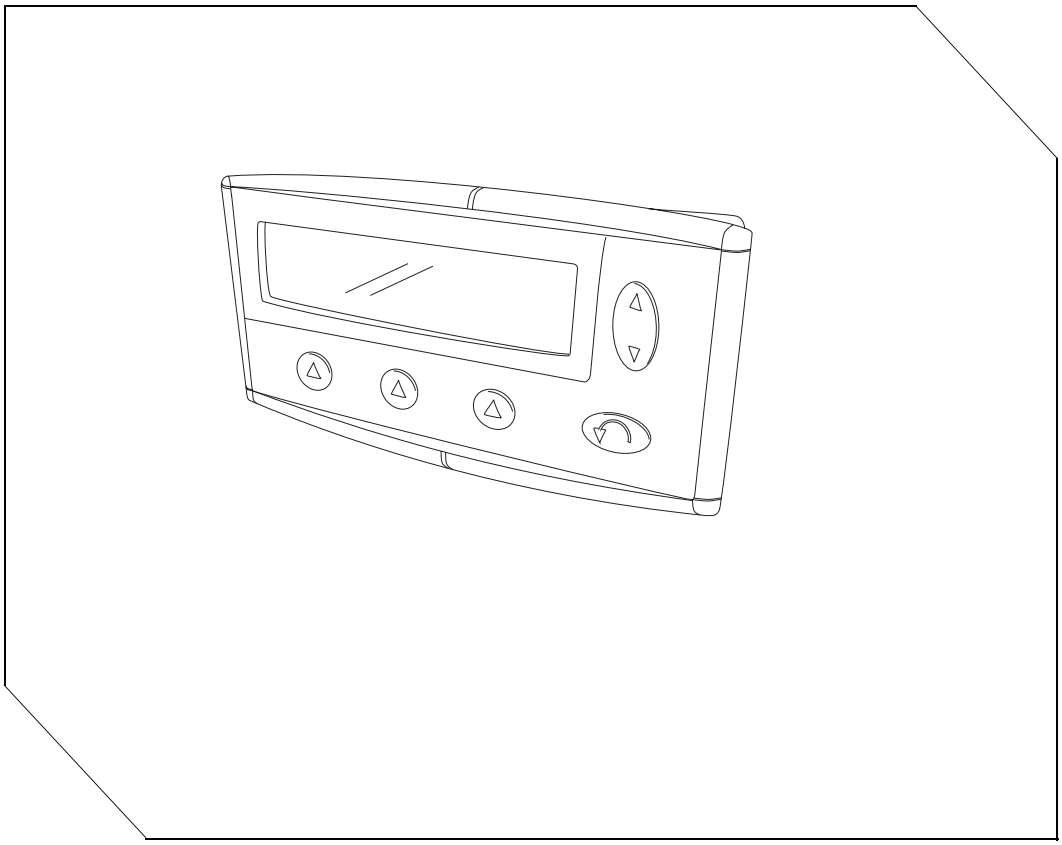
February 1, 2008



1 Introduction 3
Safety symbols 3
2 Precautions 4
General safety regulations 4
Construction regulations 4
Safety during installation 4
Safety during start-up 5
Safety during maintenance and fault diagnosis 5
3 Product description 6
IQAN-MDM 6
System overview 6
I/O overview 6
CAN related functions 7
Communication 7
Features 8
4 Safety 9
General 9
Polarity reversal 9
CAN-bus interruption 9
Input/output Protection 9
Memory test 9
System Diagnostics 10
5 Mounting 11
Mounting the unit 11
6 Installation 13
Connector C1 13
Supply Voltage 14
Emergency stop 14
Connecting of Supply Voltage 14
IQAN-MDM addressing/terminating 15
Addressing 15
Terminating 15
7 Start-up 16
Start-up procedures 16
Starting the control system 16
Prepare for system start 16
Start the system 17
Appendix A 18
IQAN-MDM Technical Overview 18
Absolute maximum ratings 18
Environmental ratings 18
Recommended operating conditions 19
System 19
I/O 19
Appendix B 20
Error codes, messages and actions 20
Appendix C 21
Dimensioning of the IQAN-MDM module 21

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

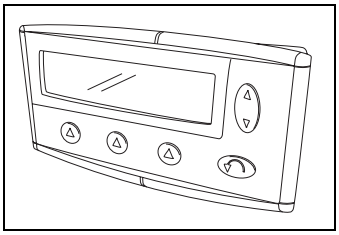
Ensure that the following requirements are fulfilled before any work is carried out on the hydraulics control electronics.

- 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

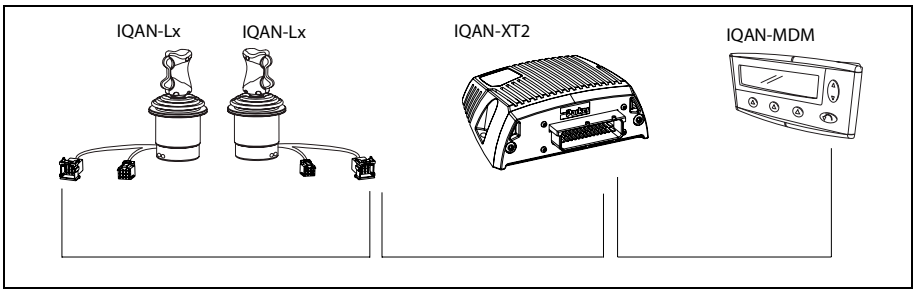
The IQAN-MDM is the main unit of an IQANdevelop platform control system. The IQAN-MDM contains the system's application software and most decisions are made here. The communication on the CAN bus is initiated from IQAN-MDM.



The IQAN-MDM module.

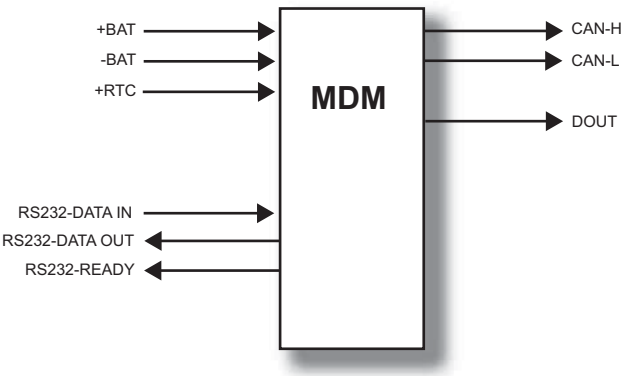
The master module, MDM, is the central unit in the system. The master module contains a display where alarm texts, parameters and settings are presented. All communication with the other modules takes place from the MDM via the CAN-bus.

System overview



A typical MDM system

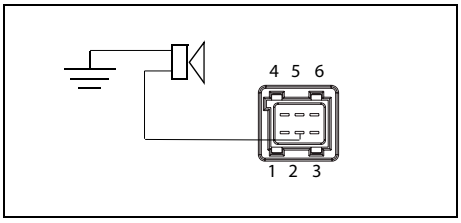
I/O overview



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 (11-32 Vdc). The maximum load is 1,2 A.



Connection of alarm output.

WARNING

Risk of back-ending

The IQAN-MDM output, DOUT has the potential risk to supply power to the unit backwards (back-ending). This is possible if:

- DOUT becomes connected to a voltage higher than 6.5V and
- the connection is able to supply enough current.

Please take appropriate measures to prevent short circuited wires, etc.

CAN related functions

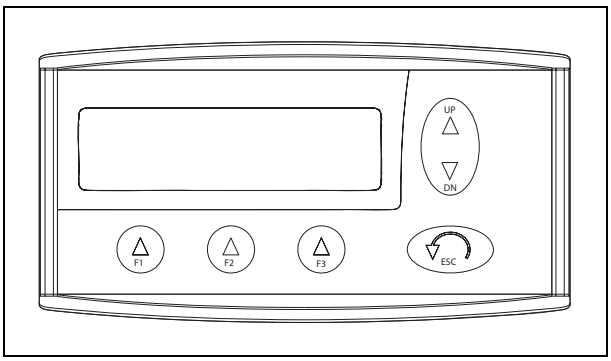
The IQAN-MDM uses ICP (ICP = IQAN CAN Protocol) to communicate via a CAN-bus (CAN = Controller Area Network) with IQAN expansion modules and other systems.

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 IQAN-MDM.

- 2.8" FSTN (FSTN = Fast response, Super-Twist Nematic) black and white LCD display, 202x32 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.

Polarity reversal

The IQAN-MDM is protected against power supply polarity reversal.

NOTICE

Units manufactured before February 1, 2008 require that an external fuse, max 3 A (Fast) is used. Polarity reversal can damage older units 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

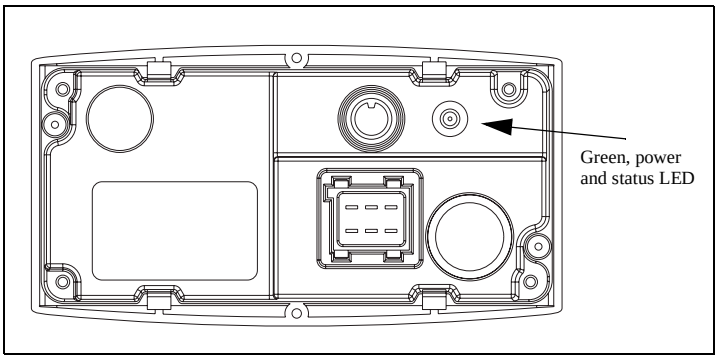
All I/O on the IQAN-MDM are designed to withstand the maximum specified supply voltage. The outputs are protected against short circuit. Furthermore, an error on one input/output will not influence other input/outputs.

Memory test

The IQAN-MDM module will execute a self-test during operation to verify the software. The test includes 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 IQAN-MDM. This LED indicates supply voltage and normal operation with a blinking green light. If this LED is out, the supply voltage is missing. If the blinking stops, the IQAN-MDM is in a fault condition.



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.

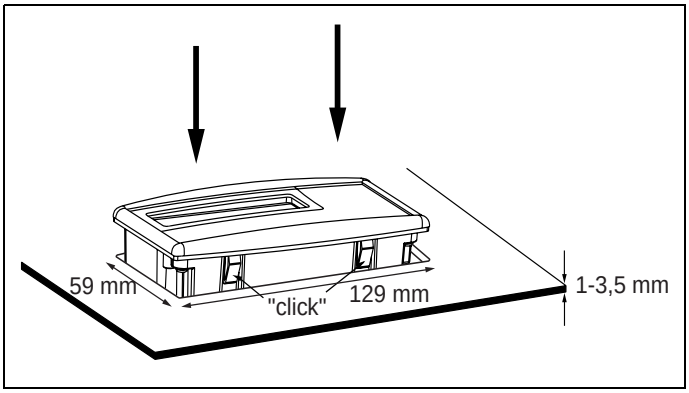
5 Mounting

Mounting the unit

NOTICE

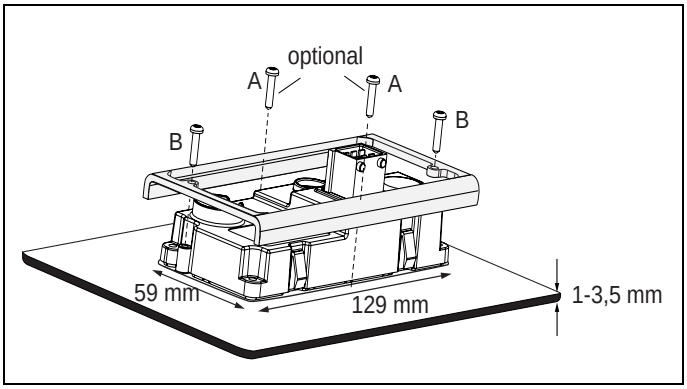
The IQAN-MDM unit should be mounted according to the following instructions.
The IQAN-MDM can be mounted in two different ways:

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



Mounting with snap-on attachment in panel

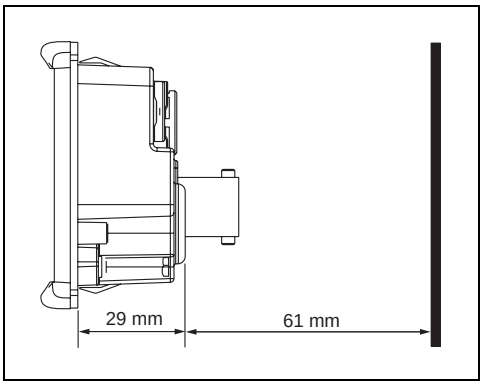
- The thickness of the material must be between 1.0 to 3.5 mm.
- The size of the opening in the panel: 130 x 60 mm. Corner radius: 5 mm.



Mounting with screws from the reverse side

The unit can be mounted with 2 or 4 screws.
Type of screw: PT3 (3 mm dia.), high helix, self-threading for thermoplastics.
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 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 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.

The IQAN-MDM is designed with protection against penetration by dust and water.

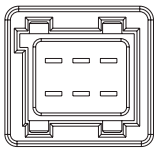
- To fullfill environmental specifications the unit has to be flush-mounted with sealed protection for the backside of the unit (connector side) from water jets.
- The mating connector must always be connected in position C1 and the rubber cap must be installed to protect connector C2.
- For all unused wire positions in connector C1, a sealing plug must be used.

6 Installation

Connector C1

Connector kit	**PARKER 5031022**
Housing	AMP no. 1-963212-1
Pin type	AMP no. 929940-1
Scat	AMP no. 828904-1
Cable	0.75-1 mm^2
IQAN tool kit[a]	Parker 5031061

a.Further information about the IQAN tool 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.

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.

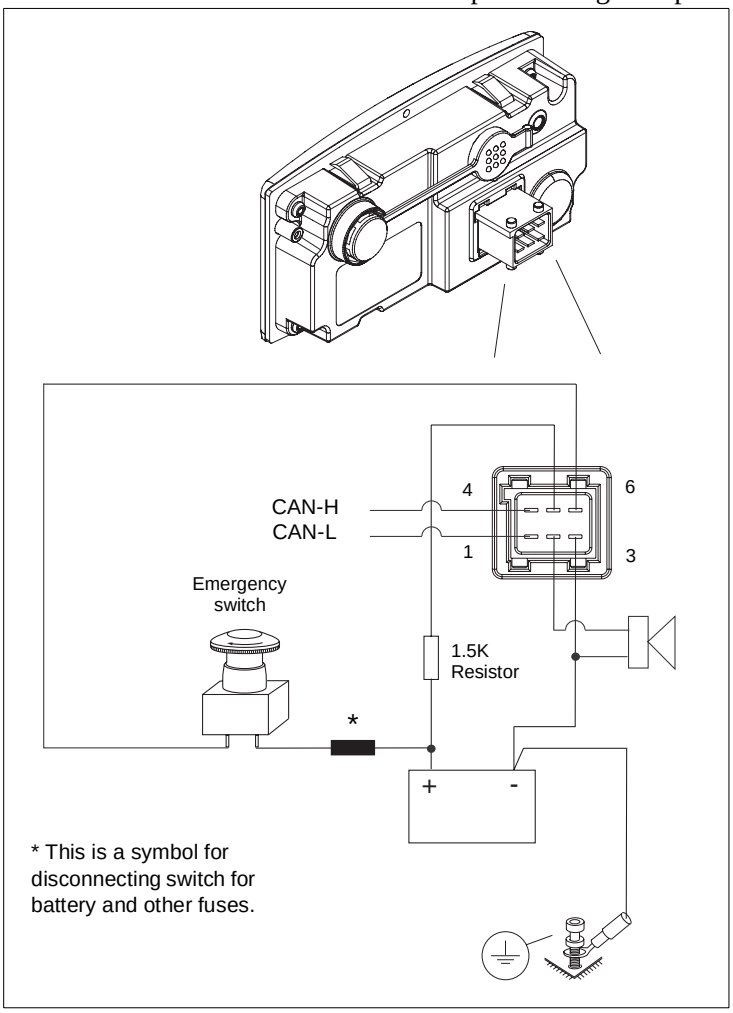
Emergency stop

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 18.

Connect the supply voltage to +BAT pin 6 through the vehicle power disconnecting switch. 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.

NOTICE

The IQAN-MDM units manufactured before 02/01/2008 require a 3 A fast acting fuse on pin 6 for reverse polarity protection.

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[a]

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Operating ambient temperature, T_{AOP}	– 30		+70	°C	No external load, no backlight
Storage ambient temperature, T_{AST}	– 40		+85	°C	
Voltage supply, V_{BAT}	6.5		36	V	Reverse polarity protected
Voltage on any pin with respect to -BAT			36	V	

a. The “Absolute Maximum Ratings” table lists the maximum limits to which the device can be subjected without damage. This doesn´t imply that the device will function at these extreme conditions, only that, when these conditions are removed and the device operates within the “Recommended Operating Conditions”, it will still be functional and its useful life hasn’t been shortened.

Environmental ratings

Parameter	Remark
EMI	
ISO 14982:1998, Radiated emission	Bb: 30/75/400/3000MHz: 64/54/65/65 dBìV/m Nb: 30/75/400/3000MHz: 54/44/55/55 dBìV/m
EN 55025:2003, Conducted emission	0.15-108 MHz, class 1
ISO 11452-2:1995, Radiated Susceptilbility	20-3000 MHz, 100V/m
ISO 11452-4:2001, Conducted Susceptibility	1-200 MHz, 150mA
ISO 7637-2:2004, Conducted transient susceptibility on power	1,2a,2b,3a,3b,4,5a
ISO 7637-3:1995, Conducted transient susceptibility on signal	level 4, ±80V
ESD	
ISO 10605:2001, ESD	25KV, air, front side of unit 15 KV, air, back side of unit 8 KV contact 8 KV handling
Mechanical environment	
IEC 60068-2-64:1993 Fh, Random vibration	0.1 g^2/Hz, 15- 250 Hz, 30 hours 0.04 g^2/Hz, 15-2000hz, 10h
IEC 60068-2-29:1987 Eb, Bump	40g, 6 ms,1000 in each direction
Climate environment	
IEC 60529:2001, Enclosure protection	10 l/min, 5 minutes
IEC 60068-2-30:1985 Db, Damp heat cyclic	55°C, 6 cycles
IEC 60068-2-78:2001, Damp heat, steady state	40°C, 93% RH, 21 days
IEC 60068-2-14:1984 Nb, Change of temperature	-30°C to 70°C, 100 cycles
Chemical environment	
IEC 60068-2-52:1996 Kb, salt, mist	3 days

Recommended operating conditions[a]

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Module diagnostic temperature[b], T_{MD}	– 30		+80	°C	All operating conditions. Update time on LCD wil be reduced below -10°C.l
Voltage supply, V_{BAT}	11		32	V	

a. Recommended operating conditions are given for maximum and minimum conditions where normal performance is still available from the device. Once the normal operating conditions are exceeded, the performance of the device may suffer.

b. The module diagnostic temperature (TMD) refers to the internal module temperature and is measured by an embedded temperature sensor. The TMD temperature is read though the module diagnostic interface with a IQAN diagnostic tool. The TMD temperature must be verified in the intended application for all operating conditions and the TMD temperature must not exceed limits specified under ROC (recommended Operating Conditions).

System

T_{AOP} = +25 °C (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
Start-up delay		350		ms	Power to activated output. No application
System cycle time	20		100	ms	
Sample rate local I/O	20		100	ms	System cycle time
Current supply $V_{BAT = 14V}$ $V_{BAT = 28V}$			 180 100	mA	output = off
Current supply RTC $V_{BAT = 14V}$ $V_{BAT = 28V}$			 2 5	mA	output = off
RTC power backup	7			days	

I/O

T_{AOP} = +25 °C (unless otherwise specified)

Parameter	Limit values			Unit	Remark
	min.	typ.	max.		
DOUT (Digital output)					
Load current			1.2	A	-30°C <T_{MD}< +80°C
Voltage drop VBAT - VDOUT load $I_{L = 1.2A}$		0.7		V	
Off state output current			10	µA	
Max inductive switch off energy load $I_{L = 1.0A}$			16	mJ	
Short Circuit current limit	1.4			A	-30°C <T_{MD}< +80°C

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 messages or situations pertaining to the IQAN-MDM itself, not including expansion units.

LOW/ HIGH SUPPLY VOLTAGE

Display message	Situation	Action MDM	Comment
Low supply voltage	+BAT < 8,5V	Error delay @ power on	Check voltage supply
High supply voltage	+BAT > 32.5V	-	Check voltage supply
Critical supply voltage	+BAT > 42V	-	Check voltage supply

CAN BUS ERRORS

Display message	Situation	Action MDM	Comment
Module offline	CAN-bus interrupt	All outputs shut off	Check CAN-bus
CAN-bus off	CAN-bus is off	All outputs shut off	Check CAN-bus Restart master

HIGH TEMPERATURE

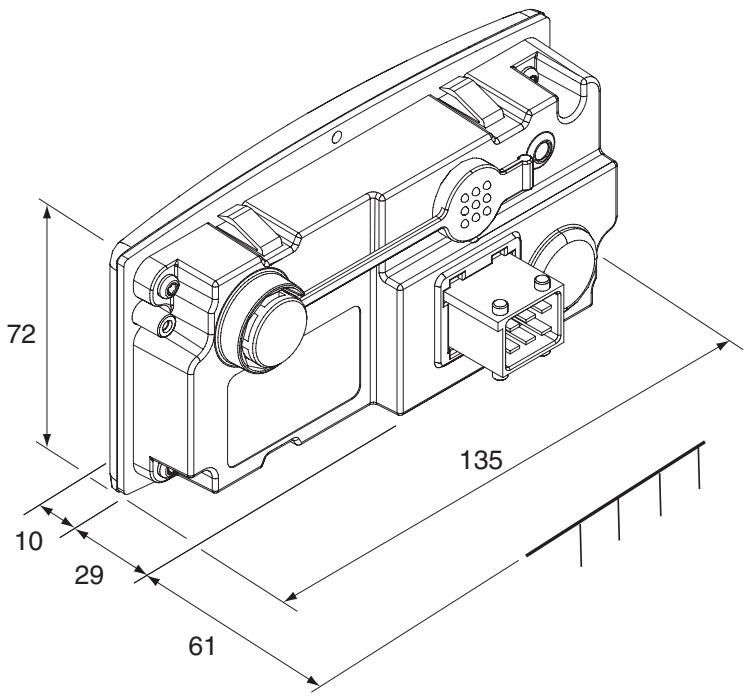
Display message	Situation	Action MDM	Comment
High temperature	Internal temperature > 80°C.	-	Check ambient temperature
Critical temperature	Internal temperature > 100°C.	-	Check ambient temperature

OTHER

Display message	Situation	Action MDM	Comment
Checksum error	Internal software failure	All outputs shut off	Contact supplier

Appendix C

Dimensioning of the IQAN-MDM module



units=mm

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