

## Remote Radio Control

### M880 Radio Control for Hydraulic Cranes

#### Application

Radio Remote Controls are fast becoming the control method of choice for the vast majority of hydraulic crane manufacturers and operators. The use of a remote control system allows the operator to move around the workspace and therefore find the safest and most convenient position from which to carry out the operation resulting in improved productivity in addition to greater operator safety.



#### M880 Advantages

**Compact transmitters** – All M880 transmitters are compact and lightweight making life more comfortable for the operator and allowing greater freedom of movement.

**Extreme Environments** – Transmitters & Receivers are constructed from high impact resistant materials and are suitable for operating temperatures from -25 up to +70 deg C.

**Automatic Frequency change** – New 'AFA' technology effectively kills off the problem of interference as the M880 system continuously searches for, and logs on to the 'cleanest' channel within the operating frequency band.

**Contactless optical joysticks** – Designed & manufactured in house, our joysticks guarantee precise handling throughout the life of the radio system, available in both stepless and stepped format.

**Certified Safety** – The STOP circuit on all M880 units (with exception of ARES 2C) complies with the highest European & International standards (ISO13849-1 PLe / SIL3 / Cat 4)

#### Transmitters for Hydraulic Cranes

##### M880 KRON M4

The M880 KRON M4 is the latest addition to our range of joystick style transmitters, designed to provide a competitive solution for 4 function cranes the KRON M4 features four single axis proportional joysticks in addition to standard start & E-Stop buttons. KRON M4 is available in 3 versions – basic, standard & plus. Details of each are shown in the transmitter selection section on the following pages.



##### M880 ZEUS2

The M880 ZEUS2 M offers great flexibility with sufficient space on the transmitter panel to allow for as many as 8 additional auxiliary commands in addition to six single axis proportional joysticks and start and E-Stop buttons. ZEUS2 can also be configured with two double axis joysticks (ZEUS2 B2) for operators who prefer this layout to the traditional single axis layout

##### M880 THOR2

The M880 THOR2 is our largest and most flexible transmitter for hydraulic cranes, the THOR2 model has space for up to eight single axis proportional joysticks and up to ten additional auxiliary commands in addition to standard start and E-Stop buttons. THOR2 is also available with 3 or 4 double axis joysticks for operators who prefer that configuration.



Other standard features on all of our joystick transmitters include LED's to report on status of radio link & battery condition, these LED's are also used to transmit error codes for fault diagnosis enabling us to help get you working again quickly in the unlikely event of a system failure. Please see below for specific information on which transmitter is best suited to your application.

## Radio Remote Control for 4 Function Cranes

SIMBAL offer 7 different models for the control of 4 function hydraulic cranes depending on your requirement, the smallest & most cost effective solution is the KRON M4 transmitter which is available in 3 formats – Basic, Standard & Plus. If you need more flexibility then the ZEUS2 is a larger unit with space for additional auxiliary commands and is available with either single or double axis joysticks in Standard & Plus formats.



**KRON M4**



**ZEUS2 M4**



**ZEUS2 B2**

<b>Basic</b>	Rabbit / Snail (available on KRON M4 only)
<b>Standard</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off
<b>Plus</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off, Lights On/Off, Load Indication 90/100% by LED

## Radio Remote Control for 5 Function Cranes

SIMBAL offer 4 different models for the control of 5 function hydraulic cranes depending on your requirement, the smallest & most cost effective solution is the KRON M4 transmitter with an auxiliary command for selection of the 5th function which is available in either Standard or Plus format. If you prefer 5 individual joysticks or need more space for additional auxiliary commands then the ZEUS2 M5 is a larger unit also available in standard or plus formats.



**KRON M4**



**ZEUS2 M5**

<b>Standard</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off
<b>Plus</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off, Lights On/Off, Load Indication 90/100% by LED

## Radio Remote Control for 6 Function Cranes

SIMBAL offer 6 different models for the control of 6 function hydraulic cranes depending on your requirement, the smallest & most cost effective solution is the ZEUS2 M6 transmitter which is available in either Standard or Plus format. If you need more flexibility then the THOR2 is a larger unit with space for additional auxiliary commands and is available with either single or double axis joysticks in Standard & Plus formats.



**ZEUS2 M6**



**THOR2 M6**



**THOR2 B3**

<b>Standard</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off
<b>Plus</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off, Lights On/Off, Load Indication 90/100% by LED

## Remote Radio Control

### M880 Radio Control for Hydraulic Cranes

#### Radio Remote Control for 7/8 Function Cranes

SIMBAL offer 3 different models for the control of 7 & 8 function hydraulic cranes depending on your requirement, the smallest & most cost effective solution is the ZEUS2 M6+2 transmitter fitted with a selector switch to enable the 7th & 8th functions. ZEUS2 M6+2s is available in either Standard or Plus format. If you need more flexibility then the THOR2 M8 is a larger unit with 8 single axis joysticks and space for additional auxiliary commands.



ZEUS2 M6+2



THOR2 M8

<b>Standard</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off
<b>Plus</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off, Lights On/Off, Load Indication 90/100% by LED

#### Radio Remote Control for 9/10 Function Cranes

SIMBAL offer just one model for the control of 9 & 10 function hydraulic cranes the THOR2 M9 is a large unit with 9 single axis joysticks and space for additional auxiliary commands. For 10 function cranes a selector switch is incorporated to change the function of the 9th joystick.



THOR2 M9

<b>Standard</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off
<b>Plus</b>	DSC IN-SLOW, Rabbit / Snail, RPM +/-, Motor On/Off, Lights On/Off, Load Indication 90/100% by LED

# Remote Radio Control

## M880 Radio Control for Hydraulic Cranes

### M880 KRON / ZEUS2 / THOR2 - Standard Features



#### Rechargeable NiMh Batteries

Extractable, rechargeable NiMh batteries for extra long operating duration up to 22 hours continuous use between charges.



#### Status LED's

Coloured LED's report the status of the radio link, battery charge level and error diagnostics



#### PIN Code

Access PIN code can be programmed in to the transmitter to restrict use to authorised personnel



#### Legends

Standard arrow legends or fully customised legends with symbols or text



#### Emergency STOP

Mushroom Head E-Stop button featuring functional safety level PLe/SIL3/Cat4



#### Carrying Strap

Waist belts or shoulder straps are available for all joystick transmitters

### M880 KRON / ZEUS2 / THOR2 - Options



#### Auxilliary commands

All KRON, ZEUS2, THOR2 & G4 joystick transmitters have space available to accommodate additional commands in the form of rotary switches, toggle switches, key switch, pushbutton or potentiometers. The number of commands which can be fitted depends on the transmitter type selected.



#### Load indication LED's

A standard requirement for many crane applications, particularly tower cranes, load indication LED's are a popular option, normally set to indicate 90% & 100% load status.



#### Add Box display

The add box display is available with all ZEUS2 & THOR2 transmitters and can be used to house additional commands or as a display screen to show load & status data received through a digital feedback link from the radio receiver.



# Remote Radio Control

## M880 Radio Control for Hydraulic Cranes

### M880 KRON / ZEUS2 / THOR2 – Options (continued)



#### I-READY Infra Red Start up

An infra-red directional START operation, requires line of site between transmitter and receiver to start the system increasing safety by reducing the possibility of accidental operation.



#### MTRS Multi machine control

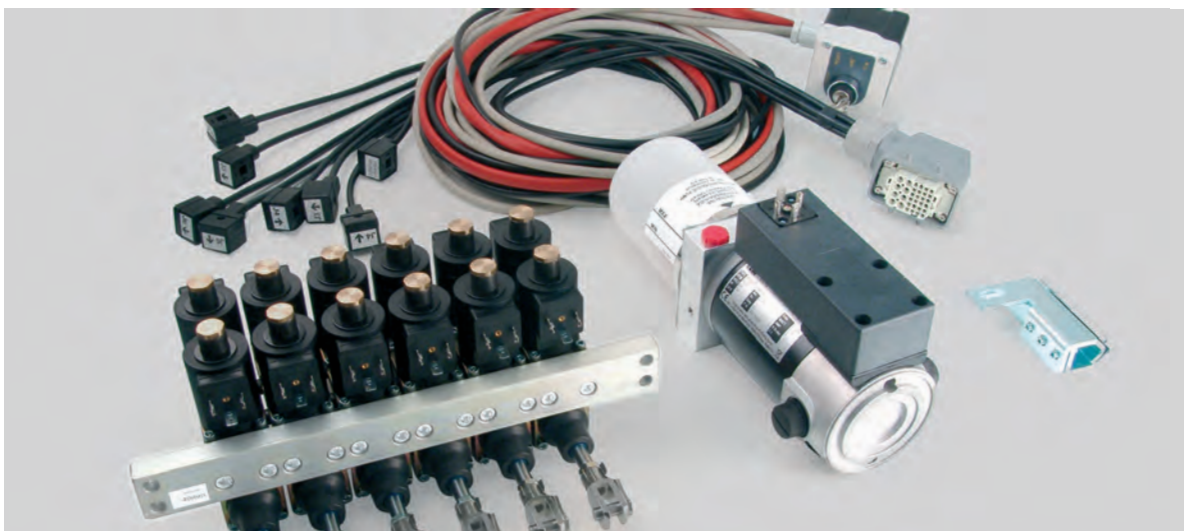
Communication between multiple transmitters and receivers allows classic tandem operations such as catch & release and pitch & catch plus many other configurations. Can be combined with our fixed radio to provide crane to crane or machine to machine communication.



#### Diagnostic Tool

Allows cable connection from transmitter to receiver overriding radio for situations where radio transmission is not allowed. Data can be viewed and saved on a PC in editable format. Available in 2 versions, cable connection only and wireless connection

### PWM Actuator Kit APT400



The PWM Actuator kit APT400 can be combined with any KRON, ZEUS2 or THOR2 radio control system to provide a remote control solution for almost any hydraulic crane on the market today which is currently equipped with manual cross rod controls. The system can be installed easily with no welding to the transmission rods and without effecting the integrity of the original system.

The electro hydraulic system of the APT400 works independently from the crane hydraulics thanks to a dedicated electro hydraulic control unit. This prevents potential failures caused by sharing the oil from the crane circuit which is often contaminated by years of heavy and intensive use.

This dedicated power pack only operates when crane manoeuvres are activated thus ensuring low operating temperatures and avoidance of wear & tear. Calibration of the actuators is carried out by the radio control unit once installation is complete allowing the speed and acceleration factors to be set according to the requirements of the operator.

#### The complete kit consists of

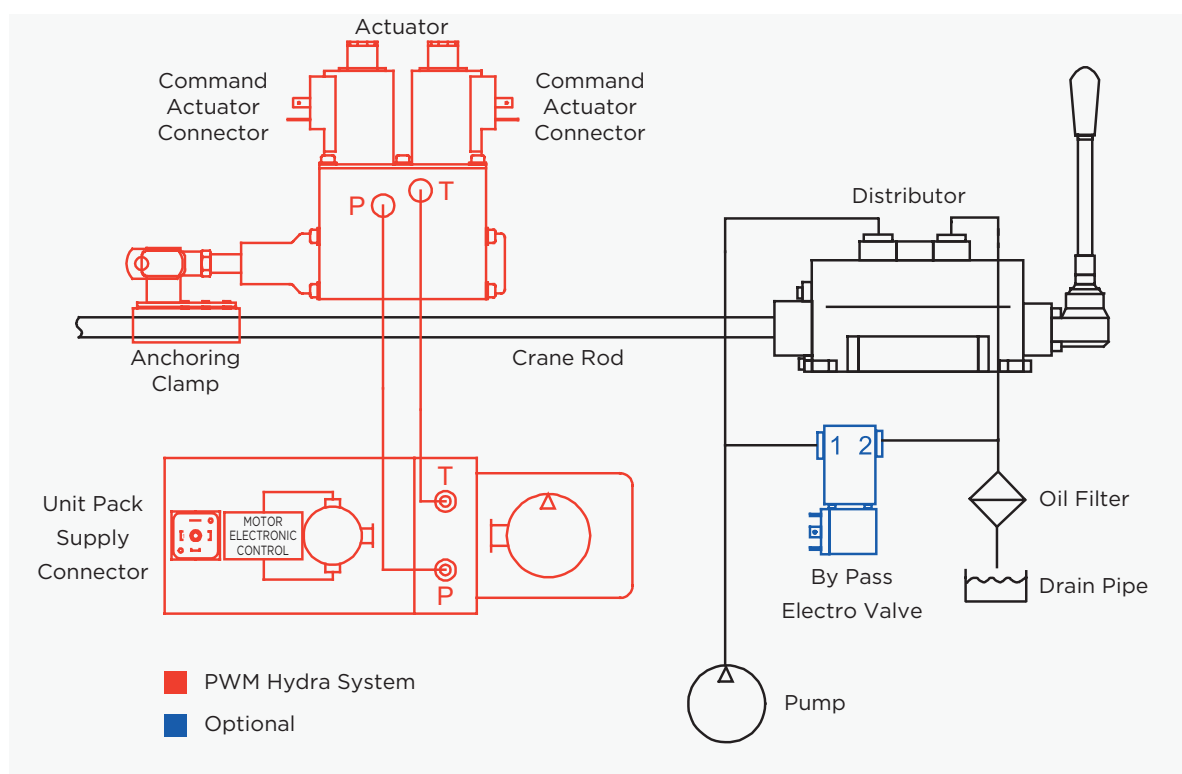
- Electro Hydraulic power pack
- Actuator kit
- Rod clamps
- Wiring kit
- By pass valve

The components can be purchased as a kit or as separate components (see page 7) and a typical connection drawing is shown on the next page.

# Remote Radio Control

## M880 Radio Control for Hydraulic Cranes

### Typical Connection Diagram for 4 Function Monoblock



### Rechargeable NiMh Batteries

Driving Signal	PWM at 80Hz
Coil Resistance	5.5 Ohm
Absorption at 27 Vdc	170 ÷ 620 mA
Absorption at 13.5 Vdc	300 ÷ 1250 mA
Operating Temperature	-20° c ÷ +70° c (-4° f ÷ 158° f)
Max Stroke	26mm (±13mm from centre)
Max Stroke (optinoal)	40mm (±20mm from centre)
Thrust Force and Traction at 12 bar	600N
Optimal Operating Pressure	15 ÷ 20 bar
Max Operating Pressure	30 bar
Hydraulic Circuit Connection	1/4" Gas
Dimensions (L.W.H)	210 x 38 x 138mm
Weight (single mode)	1500 g
Standard Distance between Centres	38, 42, 44, 46, 48, 50 mm *
Number of Standard Functions	4 ÷ 8 *

### Electro Hydraulic Central Unit

Supply Voltage	12 o 24 Vdc +20% -10%
Operating Pressure	18 bar 27 Vdc - 16 bar 13.5 Vdc
Dimensions (L.W.H)	330 x 130 160 mm
Weight (dry)	5200 g

### Counter Pressure Valve with Filter

Operating Temperature	-20° c ÷ +70° c (-4° f ÷ 158° f)
Flow Rate	70l/min
Dimensions (L.W.H)	84 x 50 132 mm
Weight (dry)	110 g

\* in case of monoblock: 4F and 40 mm distance between centres

# Remote Radio Control

## M880 Radio Control for Hydraulic Cranes

### Components / Options for Actuator Kit APT400



#### The Complete Electrical Wiring

The electrical wiring of the receiver / actuator / control unit system.



#### The Clamps for the Transmission Rods

The clamps to be fixed to the transmission rods of the crane avoid welding whatsoever and render the system independent.



#### Fittings and Hydraulic Piping

Fittings and connecting pipes to the control unit.

### Other Accessories for The Actuator APT400 (optional)



#### Stroke Extension Kit

The standard actuator is  $\pm 13$ mm from the centre and fits most part of the hydraulic distributors present in the market. A kit that can extend the piston's stroke up to  $\pm 20$ mm is available.



#### Adapter Kit

It is possible to connect the actuators APT 400 directly to the proportional manual distributors Walvoil SD6-SD8, Galtech and Parker, thanks to the dedicated flanging kit. This configuration involves the removal of the transmission bars.



#### The By-Pass Valve

This valve is required to make the crane comply with CE regulations. In case you are lacking it, it is available in our catalogue.

# Remote Radio Control

## M880 Radio Control for Hydraulic Cranes



### Tilt Sensor

The Tilt Sensor device is a micro switch within the transmitter which is able to recognise emergency situations caused by dropping or seriously tilting the transmitter, the function of the Tilt Sensor can be customised according to customer requirements and the level of safety required. It can be set to perform a number of actions from the activation of a simple buzzer up to total cut out of the radio transmission.



### Serial Cable

All of our joystick style transmitters can be equipped with a socket for serial cable connection to the receiver. The direct cable connection from transmitter to receiver overrides the radio transmission thus overcoming any issues of signal noise and allowing use in those areas where radiofrequency transmission is not permitted.



### Diagnostic Tool

This tool allows you to connect the transmitter or receiver to a PC to undergo status diagnostics. The data can be viewed by means of an easy and intuitive graphical interface, and can be saved to your PC in editable format.

*There are two versions of the tool :*

**Standard** - The transmitter can be connected to the tool only via cable

**Plus** - In addition to cable connection, the device can be connected in wireless mode allowing diagnostics to be carried out without removing the receiver from the crane

### Double Battery

This feature is available only on the THOR2 transmitter and consists of a twin battery compartment. Once the first battery reaches the 'low power' state the transmitter automatically switches to the second battery. This switch over takes place without interruption to the power supply making it the ideal solution for applications where the radio system has to operate continuously for long periods.



# Remote Radio Control

## M880 Joystick Radio Control

### Technical Data

#### M880 Transmitting Units

	ARES2	KRON	ZEUS2	THOR2	G4
Dimensions	143x143x80mm	180x107x160mm	205x150x150mm	295x180x160mm	520x430x225mm
Dimensions with display			205x150x150mm	295x180x160mm	
Weight (inc. battery)	667g	880g	1450g	2300g	4000g
Operating Range	100m				
Max number of On/Off commands	32	56	56	56	96
No of Service & Safety commands	3 (Start / Klaxon / Stop)				
Casing Material	Charged Nylon UL94 HB				
Supply Voltage	3.6 Vdc				
Absorption	95 "mA"				160 "mA"
Max supply power	0.35 W				0.30 W
Battery	NiMh	NiMh 3.6v Li-ion 2.2A/h accumulator			
Battery Life @ 20 deg C in cont. use		22 hours			13 hours
Warning notice for low battery	15 mins				
Stop command safety category	(ISO 13849-1 2006.6.2.7 architecture) Pie / SIL3 / Category 4				
Operating Frequency 1	ISM band 433.050 - 434.790 MHz, 69 channels (max power 1mW e.r.p)				
Operating Frequency 2	ISM band 433.050 - 434.790 MHz, 30 channels (max power 10mW e.r.p)				
Operating Frequency 3	2.4 GHz 16ch				
Alphanumeric LCD display (Optional)				4 rows (20 char)	
Graphic Display (optional)				128 x 64 pixel	
Buzzer	Yes				
Operating Temperature	-25 to +70 deg C				
Storage Temperature	-40 to +85 deg C				
Power Supply	Single NiMh battery (option for double battery on THOR2 only)				
Radio Transmission	Double Transmission (Single on MTRS systems)				
LEDs	Link TX, Link RX. Error code				
Degree of Protection	IP65				

#### M880 Battery Chargers

	CB3622	CB3722
Supply Voltage (DC)	11-30Vdc	
Absorption	400mA max	300mA max
Battery Type	NiMh 3.6V	Li-ion 3.7V
Charging Current	900mA	640mA
Max Charging Time	2 hrs 45 mins	
Recommended Charging Temp	0- +35 deg C	
Dimesions	120x80x30mm	130x70x25mm
Weight	250g	110g
Degree of Protection	IP20	

#### Compliance to Standard

IEC/EN 60950-1	EN 301 489-1	EN 301 489-1
EN 50371	EN 301 489-3	EN 301 489-3
EN 60204-32	EN 300 220-1	EN 300 220-1
EN 60529 1991+A1	EN 300 220-2	EN 300 220-2
ISO 13849-1	1999/5/CE (Directive R&TTE)	1999/5/CE (Directive R&TTE)
EN 13557/A2	2006/42/CE (Directive R&TTE)	2006/42/CE (Directive R&TTE)
EN 61000-6-2	RED Directive (2014/53/EU)	RED Directive (2014/53/EU)

# Remote Radio Control

## M880 Radio Receivers

### Receiver M880 S

The **Receiver S**, thanks to its minimum size (127 x 70 147mm), can be installed in small spaces.



### Technical Data

	M880 S AC	M880 S DC Harting Connector PCB415	M880 S DC DEUSCH connector PCB410
<b>Supply voltage</b>	24Vac (50–60HZ) 11÷30 Vdc (24 – 240V optional)	11÷30 Vdc	11÷30 Vdc
<b>Safety control</b>	1 safety-enable relay, 2 Stop relays	1 safety-enable relay, 2 Stop relays	1 safety-enable relay, 2 Stop relays
<b>Max. no. of ON/OFF controls</b>	14 relays ISO 13849-1:2006 6.2.7 architecture (PLe Cat 4)	Up to 14 MOSFET ISO 13849-1:2006 6.2.7 architecture (PLe Cat 4)	8 MOSFET ISO 13849-1:2006 6.2.7 architecture (PLe Cat 4)
	<i>or</i>	<i>or</i>	<i>or</i>
<b>2 STOP relays</b>	ISO 13849-1:2006 6.2.6 architecture (PLC Cat 1) (excluding ARES2 C) (excluding WAVE2 C)	ISO 13849-1:2006 6.2.6 architecture (PLC Cat 1) (excluding ARES2 C) (excluding WAVE2 C)	ISO 13849-1:2006 6.2.6 architecture (PLC Cat 1) (excluding ARES2 C) (excluding WAVE2 C)
<b>Max. no. of analog controls</b>	N.D.	4	N.D.
<b>Service commands</b>	Start, Horn	Start, Horn	Start, Horn,
<b>Serial ports</b>	N.D.	CAN, RS232, RS485	CAN, RS232, RS485
<b>Analog commands</b>	N.D.	0÷20mA, 4÷20mA, 0Vdc – (Vdc–3) with N.D. Vccmax=28Vdc, 0 ÷ ±10Vdc PWM 0÷1,4A (F=40÷150Hz F=200÷600Hz; F=600÷1000Hz), 25%–50%–75% Vcc	

# Remote Radio Control

## M880 Radio Receivers

RECEIVING UNIT MODEL	M880 S AC	M880 S DC Harting Connector PCB415	M880 S DC DEUSCH connector PCB410
Operating temperature	-25°C ÷ +70°C	-25°C ÷ +70°C	-25°C ÷ +70°C
Storage temperature	-40°C ÷ +85°C	-40°C ÷ +85°C	-40°C ÷ +85°C
Size (L x P x A)	127 x 70 x 147 mm	127 x 70 x 147 mm	127 x 70 x 147 mm
Weight	630 g	630 g	630 g
Serial cable between TX and RX	YES *	YES	YES *
Integrated blinklight	YES	NO	NO
External antenna	YES **	YES **	NO
Protection class	IP 66	IP 66	IP 66

\* If DEUSCH no serial cable

\*\* If Harting or DEUSCH no external antenna

### Receiver M880 L

Thanks to its compact size and extreme versatility, the **M880 L receiver** is perfect for a wide range of on/off applications in AC and DC, as well as for standard proportional applications in DC, such as hydraulic cranes. It may be installed on the machine in an easy and non-invasive way.



### Technical Data

RECEIVING UNIT MODEL	M880 L AC	M880 L DC
Supply voltage	24÷240Vac (50-60Hz), 30VA, max 1.2A @24Vac	11÷30Vdc, max 2A @11Vdc
Safety controls	Safety-enable relay, 2 Stop relays	Safety-enable relay, 2 Stop relays
Max. no. of ON/OFF controls	20 relays or MOSFET	20 relays or MOSFET
Mx. no. of analog controls	8	8
Service commands	Start, Horn, Timed-relay	Start, Horn, Timed-relay
2 STOP relays	ISO 13849-1:2006 6.2.7 architecture (excluding ARES2 C) (excluding WAVE2 C)	ISO 13849-1:2006 6.2.7 architecture C) (excluding WAVE2 C)
Input port	CAN, Serial	CAN, Serial
Proportional commands	N.A.	0÷20mA, 4÷20mA, 0Vdc - (Vdc-3) with Vccmax=28Vdc, 0 ÷ 310Vdc PWM 0÷1.4A (F=40÷150Hz; F=200÷600Hz; F=600÷1000Hz), 25%-50%-75% Vcc
Proportional commands	CAN (ID 11-29 bit) CANOpen (ID 11-29 bit) RS232/RS485	CAN (ID 11-29 bit) CANOpen (ID 11-29 bit) RS232/RS485
Operating temperature	-25°C ÷ +70°C	-25°C ÷ +70°C
Storage temperature	-40°C ÷ +85°C	-40°C ÷ +85°C
Size (L x P x A)	145 x 65 x 230 mm	145 x 65 x 230 mm
Protection class	IP66	IP66

# Remote Radio Control

## M880 Radio Receivers

### Receiver M880 H

The **M880 H receiver** can be paired with transmitting units that require executing a significant number and variety of commands.



### Technical Data

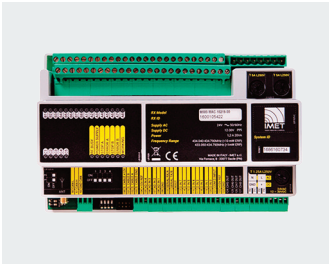
RECEIVING UNIT MODEL	M880 H AC	M880 H DC
Supply voltage	24Vac (50–60Hz), 68VA, max 2.8A 45÷240Vac (50–60Hz), 45VA, max 1,1A @45Vac	11÷30Vdc, max 4A @11Vdc, 44W
Safety control	Up to 6 safety-enable relays, 2 Stop relays	Up to 6 safety-enable relays, 2 Stop relays
Max. no. of ON/OFF controls	73 relays or MOSFET	73 relays or MOSFET
Max. no. of analog controls	32	32
Service commands	Start, Horn, Timed-relay	Start, Horn, Timed-relay
2 STOP relays	ISO 13849-1:2006 6.2.7 architecture (excluding ARES2 C) (excluding WAVE 2C)	ISO 13849-1:2006 6.2.7 architecture (excluding ARES2 C) (excluding WAVE 2C)
Input port	CAN, Serial	CAN, Serial
Proportional commands	N.A.	0÷20mA, 4÷20mA, 0Vdc - (Vdc-3) with Vccmax=28Vdc, 0 ÷ 310Vdc PWM 0÷1,4A (F=40÷150Hz; F=200÷600Hz; F=600÷1000Hz), 25%–50%–75% Vcc
Communication protocols	CAN (ID 11–29 bit) CANOpen (ID 11–29 bit) RS232/RS485	CAN (ID 11–29 bit) CANOpen (ID 11–29 bit) RS232/RS485
Operating temperature	–25°C ÷ +70°C	–25°C ÷ +70°C
Storage temperature	–40°C ÷ +85°C	–40°C ÷ +85°C
Size (L x P x A)	205 x 130 x 280 mm	205 x 130 x 280 mm
Protection class	IP66	IP66

# Remote Radio Control

## M880 Radio Receivers

### Receiver M880 M AC

Thanks to its compact size and extreme versatility, the **M880 L receiver** is perfect for a wide range of on/off applications in AC and DC, as well as for standard proportional applications in DC, such as hydraulic cranes. It may be installed on the machine in an easy and non-invasive way.



### Technical Data

RECEIVING UNIT MODEL	M880 M AC
Supply voltage	MAC:12-30 Vdc / 24 Vac (50-60 Hz)
Safety controls	2 STOP, 1 Safety-Enable
Max. no. of ON/OFF controls	24 relays (20 N.O: and 4 N.C. /N.O.)
Max. no. of analog controls	4
Service commands	Start, Lamp, (Between 24 relays)
2 STOP relays	ISO 13849-1:2006 6.2.7 architecture n(excluding ARES2 C) (excluding WAVE2 C)
Input port	CAN, Serial 232, 485
Proportional commands	0÷20mA, 4÷20mA, 0Vdc - (Vdc-3) with Vccmax=28Vdc, 0 ÷ 310Vdc 25%-50%-75% Vcc
Communication protocols	CAN (ID 11-29 bit) CANOpen (ID 11-29 bit) RS232/RS485
Operating temperature	-25°C ÷ +70°C
Storage temperature	-40°C ÷ +85°C
Size (L x P x A)	180 x 73 x 120 mm
Protection class	IP20

### ATEX Certified Receiving Unit

**Device of group II.** Device designed for environments in which explosive atmospheres may occur;  
**High protection level: category 2.** Intended for use in enviroments in which explosive atmospheres may occur due to gases, vapours, mists or ir and dust mixtures;  
**Protection system for potentially explosive gases and dusts.** The device remains powered and keeps operating in zones 1, 2 (G) e 21, 22 (D);  
**Explosion-proof housing;**  
**Temperature class 85°C;**  
 Fully protected against dust and powerful water jets (IP66);  
 Case equipped with a 1" IOS7/IRC and ¾" IOS7/IRC barrier for reinforced cables with specifications: ATEX Ex II2GD Exd II C IP 66;  
 Operating radius 70 m without obstacles.

