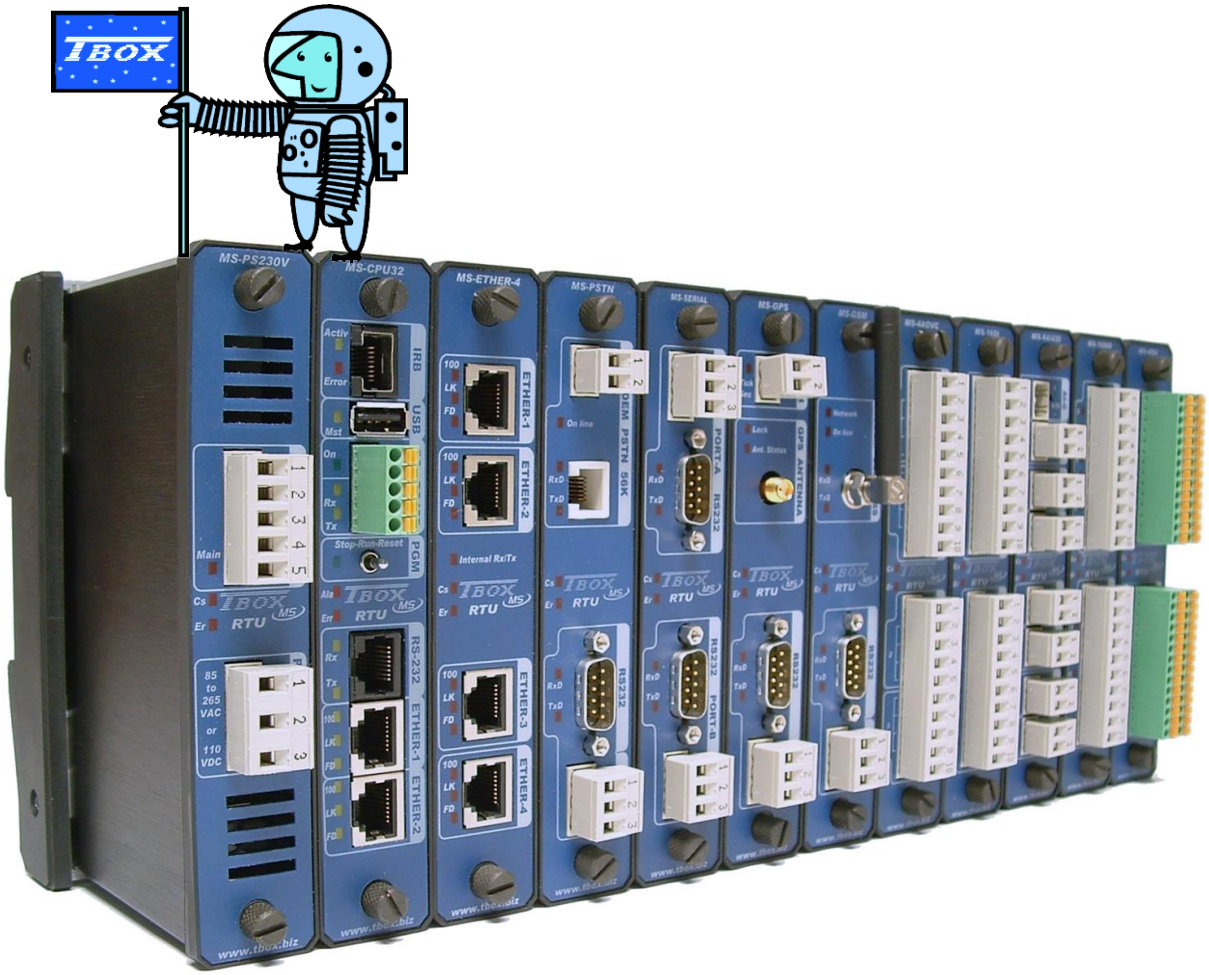
servelec technologies

TBox MS



TBox-MS
Technical Specifications & Cabling

Version 2.28

Read the instruction manual carefully before using the equipment and comply with the instructions that it contains to avoid mistakes and to prevent any personal injury

Warning! Hot surfaces
Depending on ambient temperature and card consumption, housing of the card may be hot. Take care when manipulating the cards.

Use the equipment only in non-tropical conditions.
Do not use the equipment in a wet environment.

This symbol is imposed by China on any electronic equipment not designed to operate up to an altitude of at least 5000m. The symbol cannot be changed with the actual maximum altitude (for example 4000m).
Please refer to the actual maximum altitude indicated on the label or in the manual.

Certifications

CE FCC CSA for US and Canada C-Tick A-Tick Telepermit

Disclaimer

Every effort has been made to ensure the accuracy of the information in this guide. However, Servelec-Technologies assumes no responsibility for the accuracy of the information. Product information is subject to change without notice.
In case of problem, please contact support.tbox@servelec-technologies.com

Edition: September 18, 2018
Author: Jean Burton

Important Safety Instructions

Read and understand all instructions. Save these instructions.

- Read the instruction manual carefully before using the equipment and comply with the instructions that it contains to avoid mistakes and to prevent any personal injury or damage to property.
- **Warning!** It is mandatory that this equipment is earthed by the rack. Connect the crimp terminal ring to the earth with a stranded wire between 1.5 and 2.5 mm² inclusively. The cable must be crimped consistent with rules of good practice. Connecting only the earth on the power connector is not permitted.
- Installation must be carried out by suitable, competent personnel, according to the steps and stated specifications described in this manual.
- Use only the approved color-coded wires for connecting to mains. The green/yellow colored wire can be only used as earth wire.
- This equipment has been designed for use only by qualified and instructed personnel in an industrial environment. This equipment must be operated in a restricted access location according to IEC60950.
- It is a Safety Class I equipment (according to IEC classification) if powered by the MS-PS230V or MS-PS-AC30W or a safety Class III equipment otherwise. In this case the equipment must be powered by a Safety Extra Low Voltage (SELV).
- If voltage under 60Vdcare used they must be Safety Extra Low Voltage (SELV).
- This Equipment has been designed to be also compatible with an IT power distribution system.
- This equipment has been designed to meet IEC60950-1 requirements (safety of information technology equipment)
- This equipment has been designed for indoor use in a Pollution Degree 2 environment (dry non-conductive pollution).
- The card must be fastened to the rack using a screw driver, with a recommended minimum torque of 0.5 Nm.
- **Caution** – Never power the card when not fixed on the rack. Switch off and disconnect power before removing the card from the rack.
- Connection from the equipment to mains must be protected by a circuit breaker of 16 A on both line and neutral except for TT or TN power networks with earthed Neutral unequivocally identified where only the Line need to be protected.
- **Caution** – To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.
- Do not use your TBox in a wet environment.
- Using this instrument in a way not specified by these instructions can impair the equipment safety. Do not operate the instrument outside its rated supply voltage and environmental ranges.
- Do not open power supply unit. There are no user serviceable parts inside.
- Do not connect or disconnect any connector when powered.
- Protect your TBox from environmental hazards such as dirt, dust, food, liquids, excessive temperature, and sunlight overexposure. The protection Rating of TBox is IP30.
- Keep your TBox away from direct or excessive moisture or rain and extremely hot or cold temperatures to ensure that the TBox is used within the specified operating range.
- Make sure that only fuses with the required rated current and of the specified type are used for replacement.
- End assembler must take appropriate precautions if the equipment is mounted on a wall to ensure the equipment is safely mounted in order to prevent the risk of detachment.
- End assembler must take appropriate precautions in order to prevent risks of electrical shocks if plugs to be connected to MS-RELAY, MS-8DI-120V or MS-8DI-240VAC are erroneously plugged to connector of another kind of card (like MS-8AI-420).
- **Caution** – Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the local regulations.
- **Caution** – Depending on Ambient temperature and card consumption, housing of the card may be hot. Take care when manipulating the cards.

Environmental Considerations

Battery Disposal

! CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Do not dispose of the battery along with household waste. Contact your local waste disposal agency for the address of the nearest battery deposit site.

Your TBox uses a lithium coin cell battery. The lithium coin cell battery is a long-life battery, and it is very possible that you will never need to replace it. However, should you need to replace it, see chapter related to the MS-CPUxx for instructions.

General Precautions in Cabling

- To avoid **electrostatic discharge**, drain off electrostatic charges by touching a known earth immediately before handling TBox, touching front plate button, connectors or cables.
- Ethernet cabling must be with **Shielded SFTP** cable to guarantee **class B immunity**.
- Ethernet cable of ***TBox MS32*** must be equipped with a **ferrite** to guarantee **class B immunity**.
- Cabling of Inputs/Outputs, RS232 connections, GSM antennas cannot **exceed 30 m.**, neither leave the building without surge protection.
  Cabling to mains, DC power, PSTN modem and RS485 can exceed 30 m.
- In case of DC power to a distribution network, it is mandatory to use a **surge protection** (except when using MS-PS230V or MS-PS-AC30W in DC mode).

Certifications

SAFETY	**CSA**	**CAN/CSA C22.2** N° 60950-1-07 **ANSI/UL 60950-1**:2005 (2nd edition)
	CEBEC	**IEC 60950-1**:2005 (2nd Edition) and **EN 60950-1**:2006
EMC		**EN 61326-1**: 2006
		EN 61000-6-2:2016 — **EN 61000-6-4**:2016
		EN 55011:2009+Amd1:2010 — **EN 55022:**2006
		EN 61000-3-2:2006 — **EN 61000-3-3:**1995+Amd1:2001 + Amd2:2010
		EN 61000-4-2:2009 — **EN 61000-4-3:**2006+IS1:2009
		EN 61000-4-4:2012 — **EN61000-4-5:**2006
		EN 61000-4-6:2009 — **EN 61000-4-8:**2010
		EN 61000-4-11:2004
		EN 301 489-1 V1.6.1 (2005) — **EN 301 489-7 V1.3.1** (2005)
FCC		**CFR47:** 2005 (Part15 Sub Part B) **EN55011**: 1998 +A1, A2
CE		Low Voltage directive: 2006/95/EC Electromagnetic Compatibility Directive: 2004/108/EEC
C-TICK		**ACMA N3413**
A-TICK		**AS/ACIF S002**:2005
Telepermit		**PTC 211/09/043**

Table of Contents

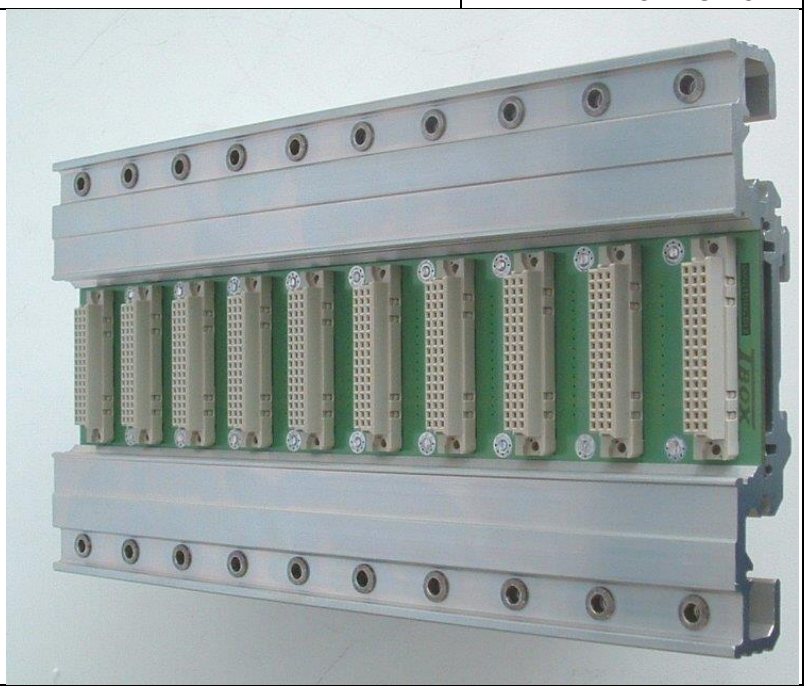
1. Racks

References:
MS-RACK3
MS-RACK5
MS-RACK10
MS-RACK15
MS-RACK20

Racks used as base for the Cards.

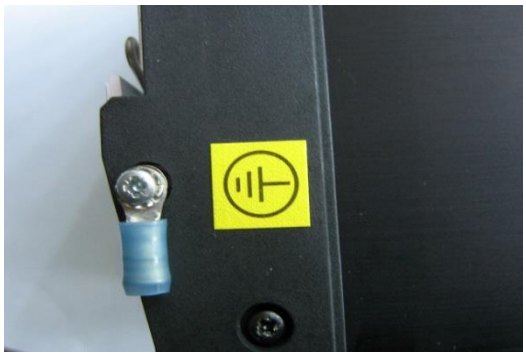
Exist in 5 versions:

- Rack **3** slots
- Rack **5** slots
- Rack **10** slots
- Rack **15** slots
- Rack **20** slots



1.1. "Safety Earth Ground" Connection

Each Rack is equipped with a "Safety Earth Ground" blue ring tongue PIDG. It is marked with the famous upside-down Christmas tree in a circle.



You have to crimp this ring tongue to a cable and screw this ring to the rack as indicated. On the other side, you must connect the cable to the ground.
The cable must be with a cross-section of **2.5mm²** (≈AWG 13), colored **green/yellow** (ratio ±70% / 30%).
Be sure all connections and joints are reliably made and that Safety Earth Ground connections have no other function that connection to ground.

1. Be aware that **RS485 of TBox is not isolated**. If connecting several devices together, be sure they use **the same ground connection**; otherwise, you have to use **ACC-RS485** (contact your local TBox distributor)
2. If the environment is very **noisy**, like for instance with the presence of a **frequency variator**, be sure :
   - the connection to earth stake is **as short as possible**
   - to **separate the connection of TBox to ground** from other devices
   - not **to mix AC cabling** with low voltage DC cabling

TECHNICAL SPECIFICATIONS

General	
Speed	Maximum: 1 Mbytes / second
PCB	6 layers
Component	NO component. Bus Passive
Fixing	DIN rail
Dimensions: Rack 3	
Without card, including earth connection	Height x Length x Depth: 150 x 105 x 30 mm
Weight	360 g.
Dimensions: Rack 5	
Without card, including earth connection	Height x Length x Depth: 150 x 166 x 30 mm
Weight	600 g.
Dimensions: Rack 10	
Without card, including earth connection	Height x Length x Depth: 150 x 310 x 30 mm
Weight	1200 g.
Dimensions: Rack 15	
Without card, including earth connection	Height x Length x Depth: 150 x 460 x 30 mm
Weight	1800 g.
Dimensions: Rack 20	
Without card, including earth connection	Height x Length x Depth: 150 x 600 x 30 mm
Weight	2400 g.

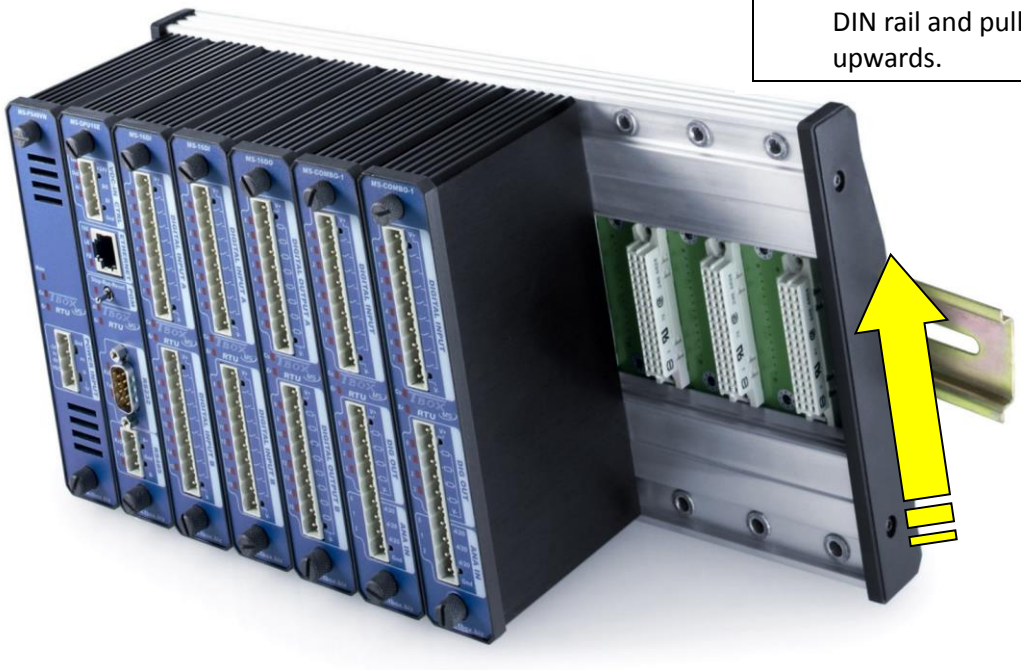
Temperature	
Storage	-40°C to 85°C
Working (ambient)	**Industrial temperature:** -40°C to 70°C

2. Installation of the Rack

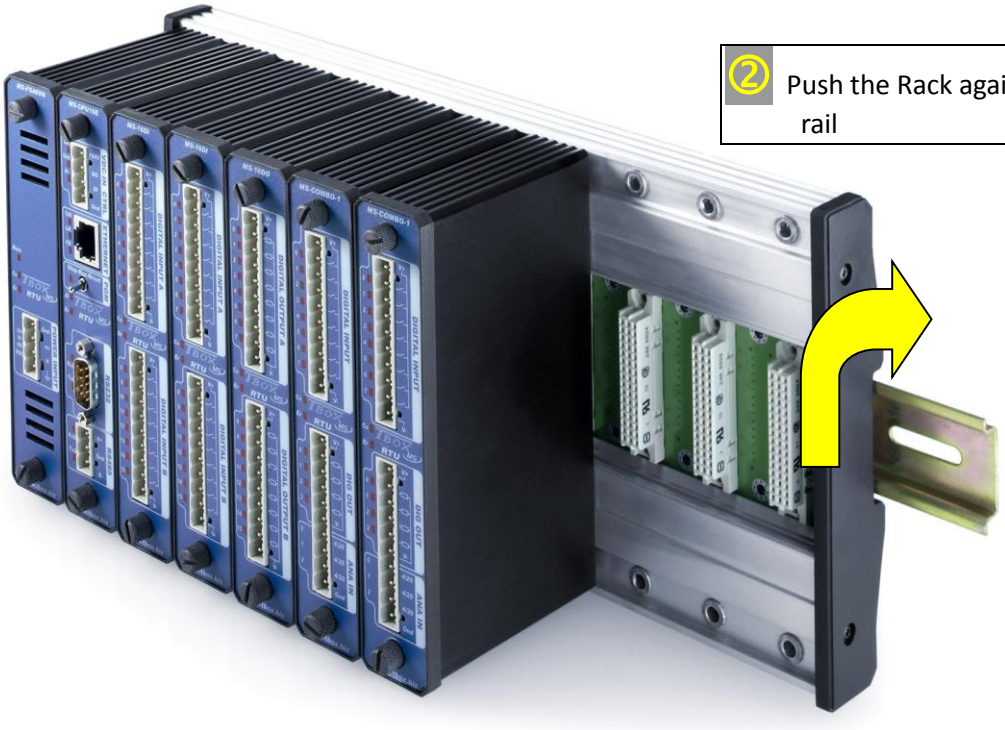
2.1. Installation of the Rack on a DIN rail

The back side of the rack is equipped with **springs** for DIN rail fixing.

① Place the springs of the Rack under the bottom side of the DIN rail and pull the Rack upwards.



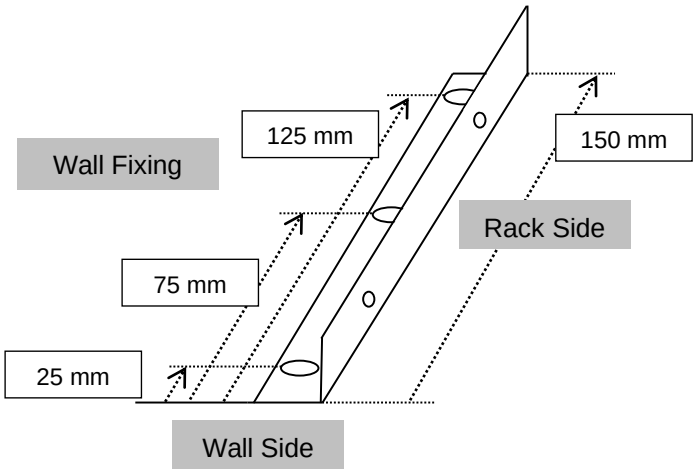
② Push the Rack against the DIN rail

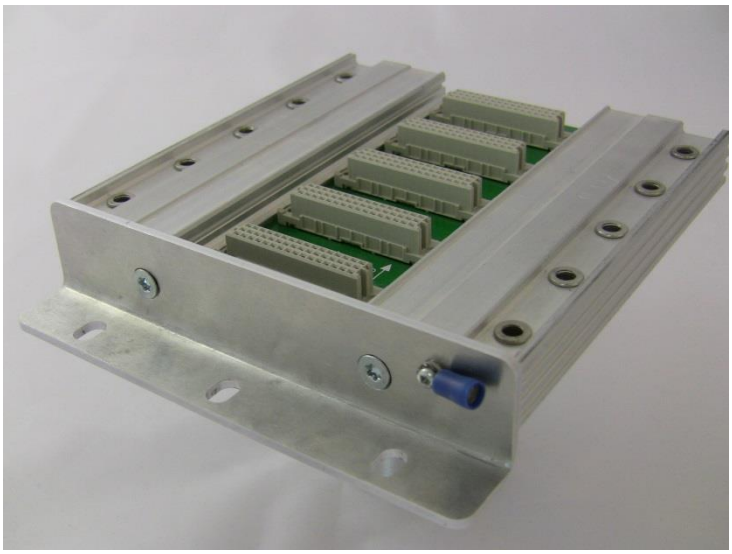


2.2. Installation on the Rack on a wall

Square with three wall fixings.

Reference: **ACC-WALLKIT**





The kit is composed of 2 squares and 4 screws. The squares are fixed at the sides of the rack.
The black plastic sides must first be removed as well as the GND screw. The latter must be screwed to the square after fixing.

2.3. Installation of the Rack in a 19" cabinet

The Rack 15 slots can be mounted directly in the 19'' cabinet.

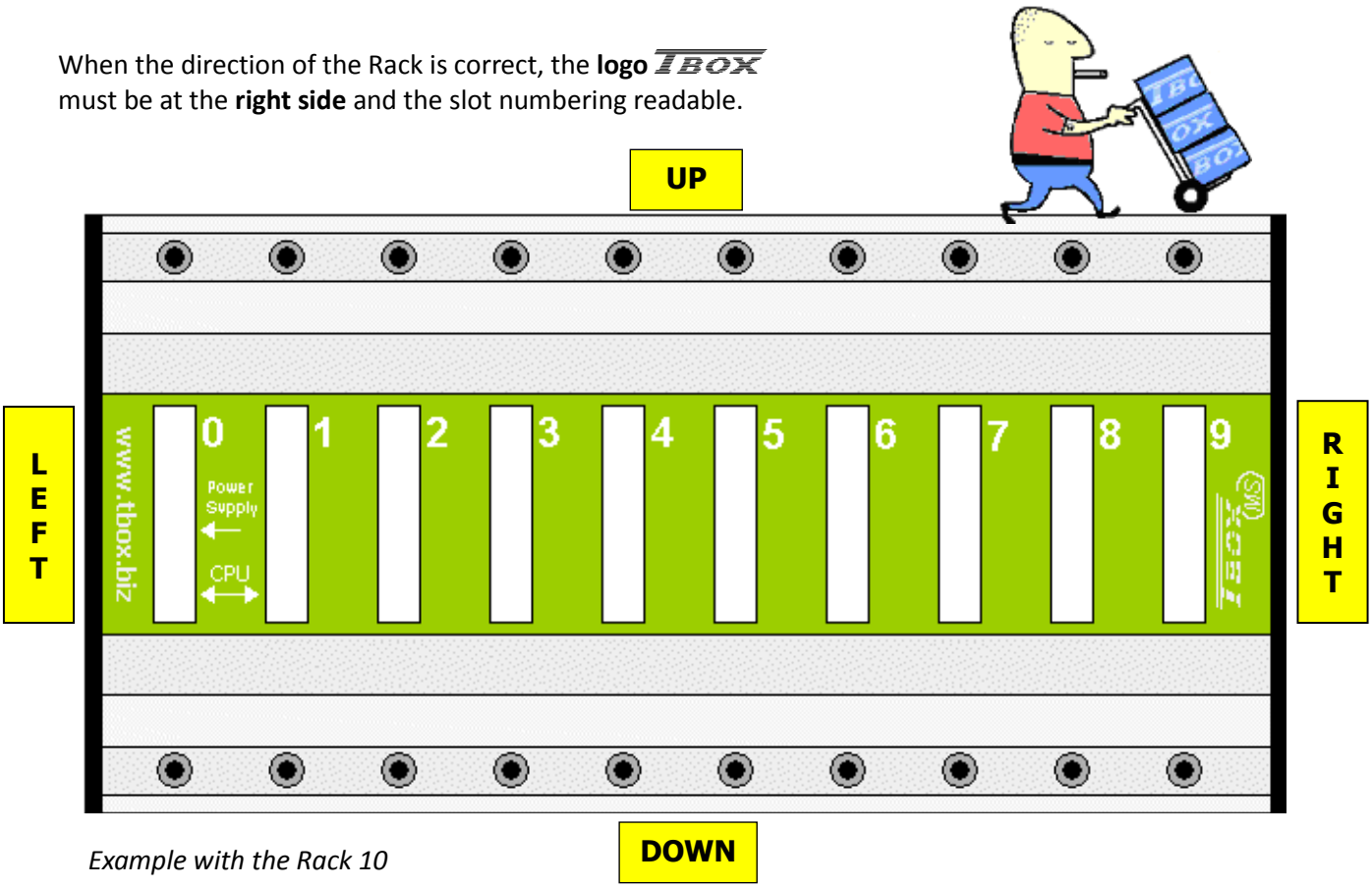
The height of the Rack is 150 mm and adapted for a 4U cabinet (177.8 mm).
You have then enough room for cabling the Cards.

19" cabinet rack with special sides.Reference: **MS-RACK15-R**

3. Insertion of Cards in the Rack

The Rack has a side **UP** side and a side **DOWN** side.

When the direction of the Rack is correct, the **logo** TBOX must be at the **right side** and the slot numbering readable.



Example with the Rack 10

Each slot has a **unique index number**, starting at '0' from the left side.

3.1. The Power supply

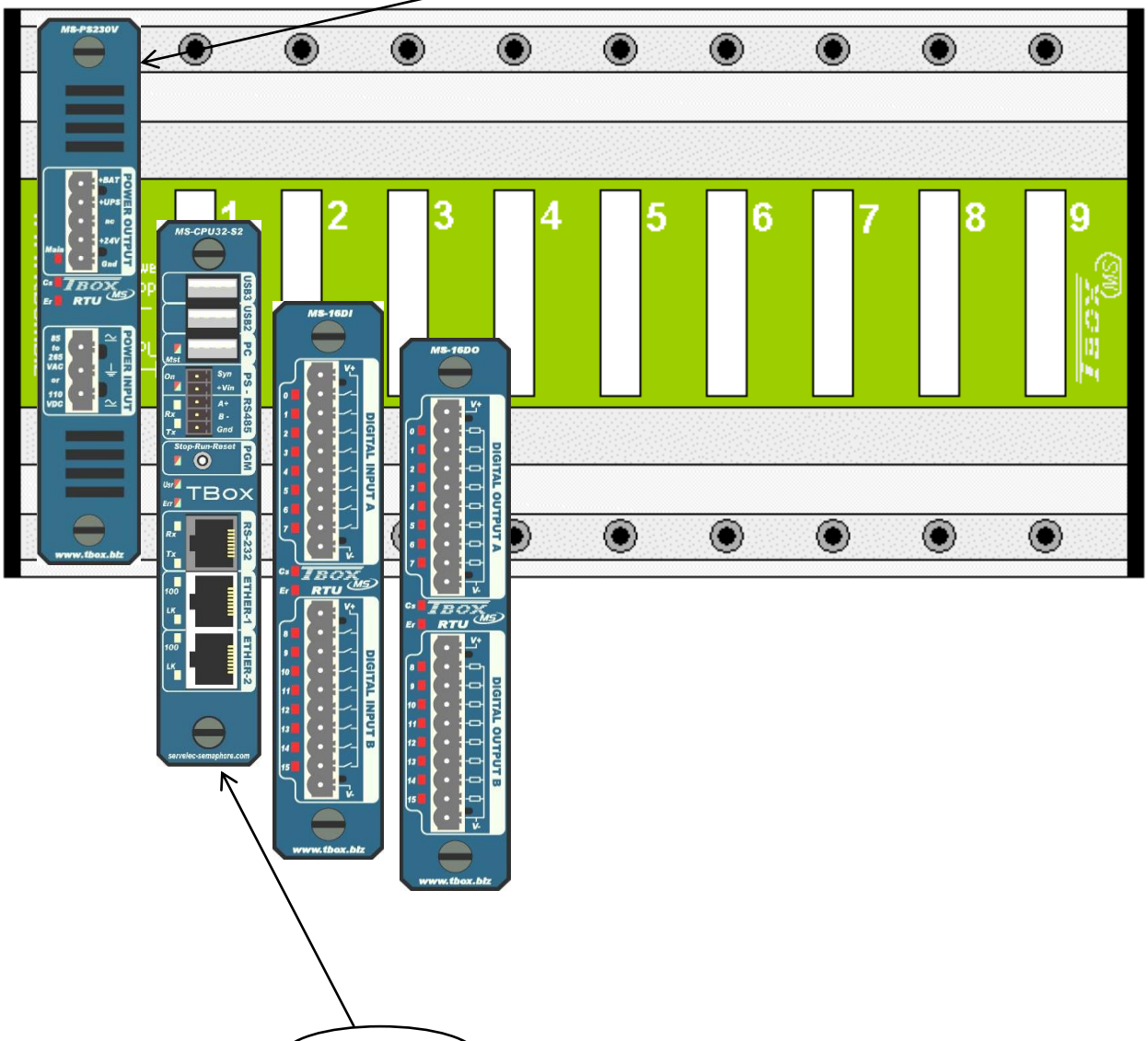
There are 2 possibilities of powering ***TBox MS***. **You have to choose one or the other**:

- With a Power supply Card (AC or DC)
  This power supply supports **3 A** on the Bus, allows connecting a **backup battery** and provides an **external 24 VDC**.
  This is required when driving many Cards or if a backup battery is **mandatory to maintain the *TBox MS* running** even when the main power has broken down.

- With the CPU Card
  The CPU includes a small power supply which supports 1.5 A to 2.5 A on the BUS, depending on the model.
  It does not include a battery charger and is not isolated.
  This is sufficient for non-critical applications that do not require Telecontrol, for instance handling few I/O cards, when only little power is required.
  Check the consumption of the cards with the table at the end of the manual.

3.2. Placing the Power Supply Card

When using a **power supply card**, it is always placed at the **first position** in the Rack. This is not mandatory but important for thermal reasons.



The **CPU** is placed in the **second position**.

The communication cards and/or the I/O cards are placed in any following slots.

Next to 'Power Supply' and 'CPU' cards, you can leave **slots empty**

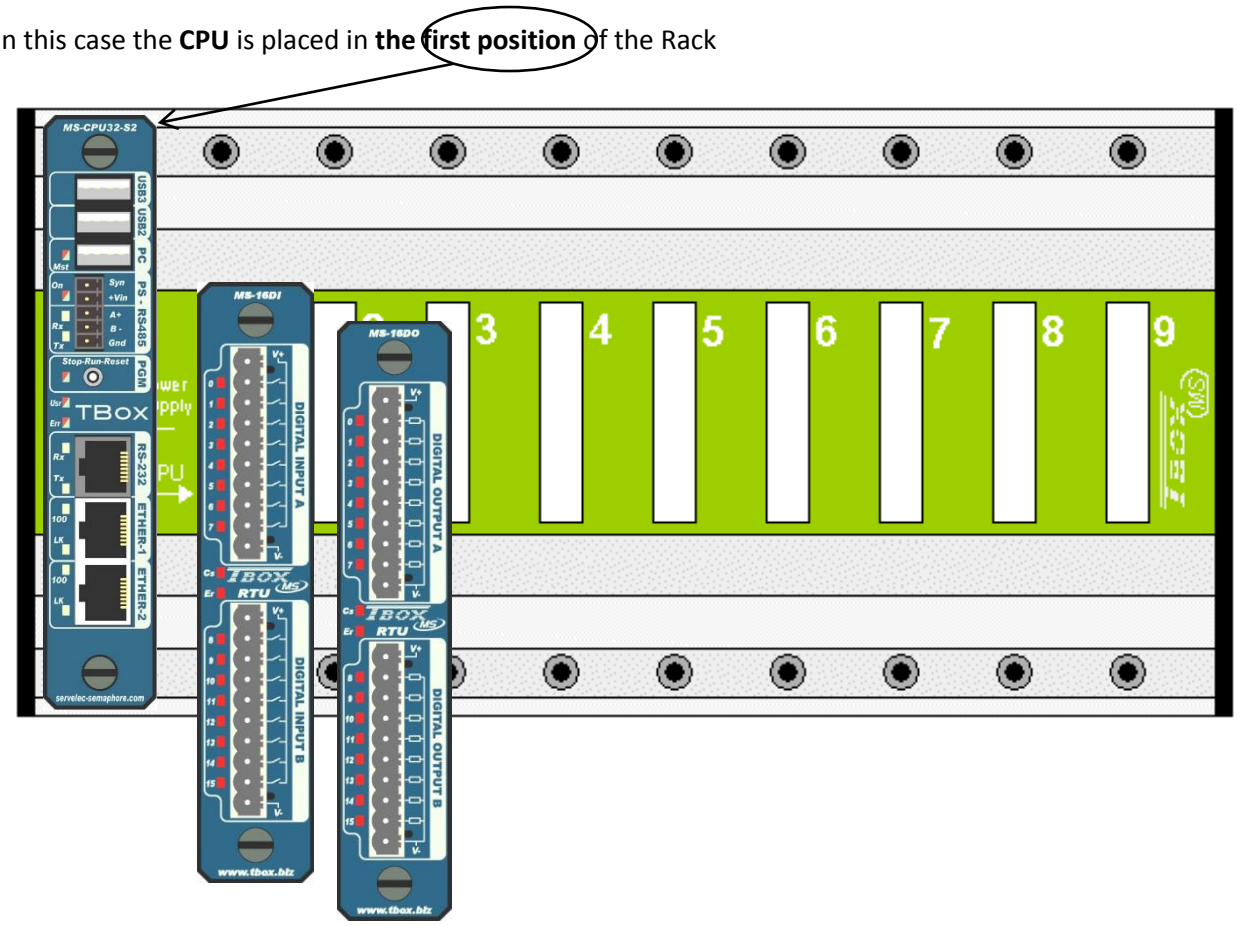
3.2.1. Redundant Power Supplies

1. When using **two redundant CPU**, you **must** place them into **slot 0 and slot 1.**
2. When using **two redundant power supplies**, you can place them where you want, but preferably on the extreme right, for thermal reason

3.3. Working without Power Supply Card

If a power supply card is not required, the one in the CPU can be used.

In this case the **CPU** is placed in **the first position** of the Rack



Next to the 'CPU' card, you can leave **slots empty**

If you intend to use a 'Power Supply' card latter and don't want to re-arrange all the cards, you can also leave the **first slot empty (slot '0')**

The communication ports and/or the I/O cards are placed in any following slot.

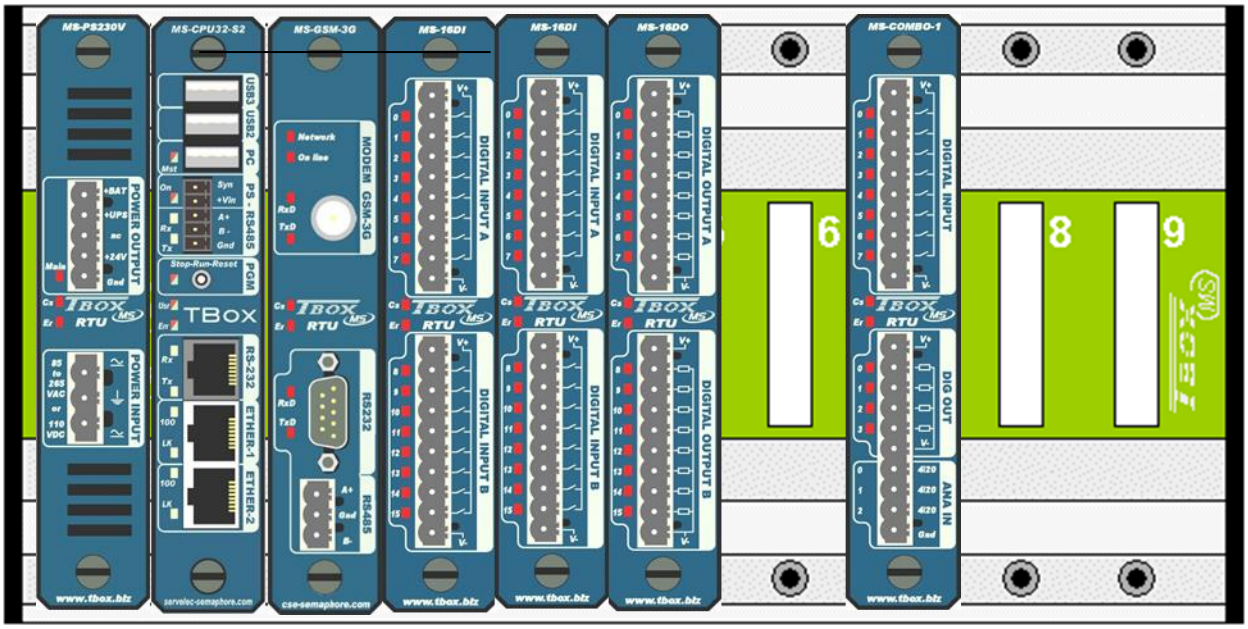
3.3.1. Redundant CPUs

1. When using **two redundant CPU**, you **must** place them into **slot 0 and slot 1.**
2. When using **two redundant power supplies**, you can place them where you want, but preferably on the extreme right, for thermal reason.

3.4. Hardware vs. Software Address of Cards

In ***TWinSoft Programming Guide***, we see how to use the software *TWinSoft*, the tool for programming ***TBox MS***.

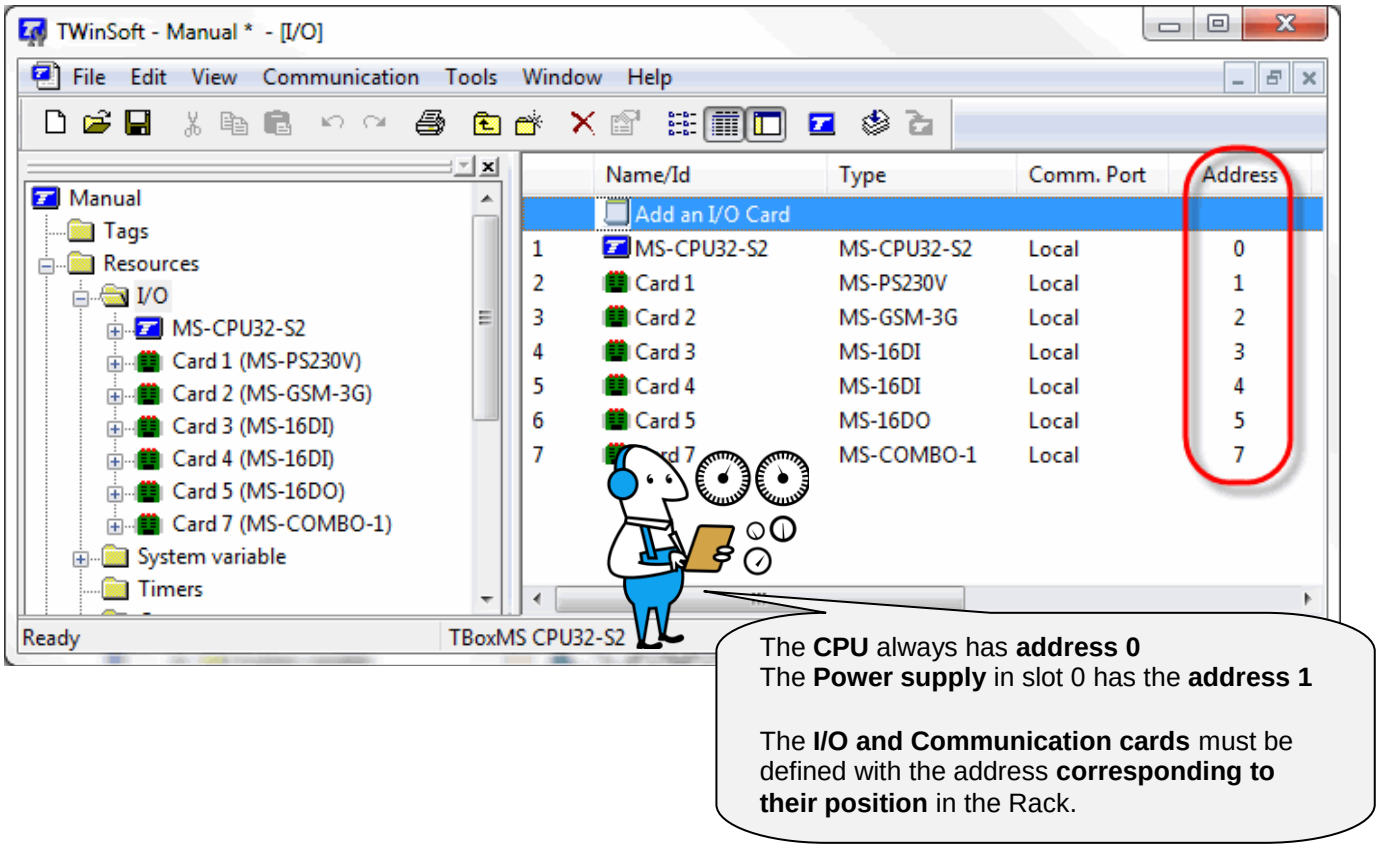
But as we mention slot index of the Rack, **it is important to relate it to the corresponding software address** declared in TWinSoft.



With the following set of Cards on a Rack 10:

Slot (hard)	Address (soft)	Card Description
0	1	Power Supply – 230 VAC
1	0	CPU 32-S2
2	2	Modem GSM-3G
3	3	16 Digital Input
4	4	16 Digital Input
5	5	16 Digital Output
6	-	empty
7	7	Combo-1 (combination Input/Output)
8	-	empty
9	-	empty

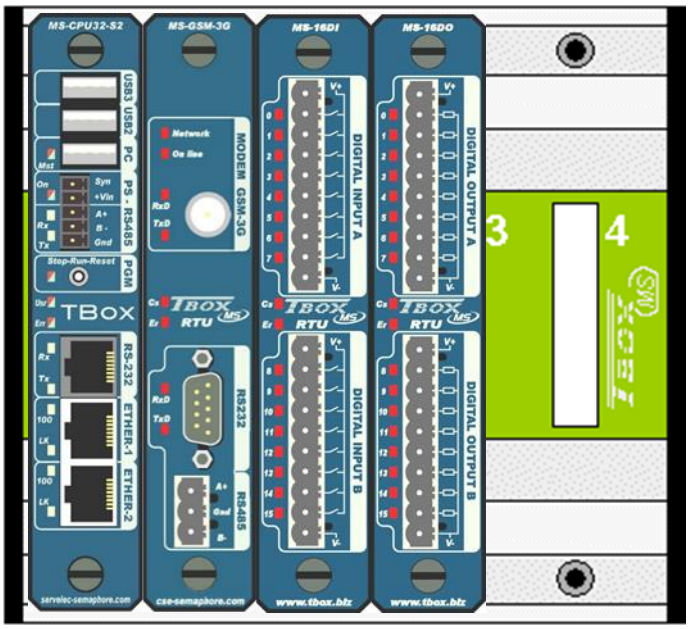
The corresponding TWinSoft configuration:



The **CPU** always has **address 0**
The **Power supply** in slot 0 has the **address 1**

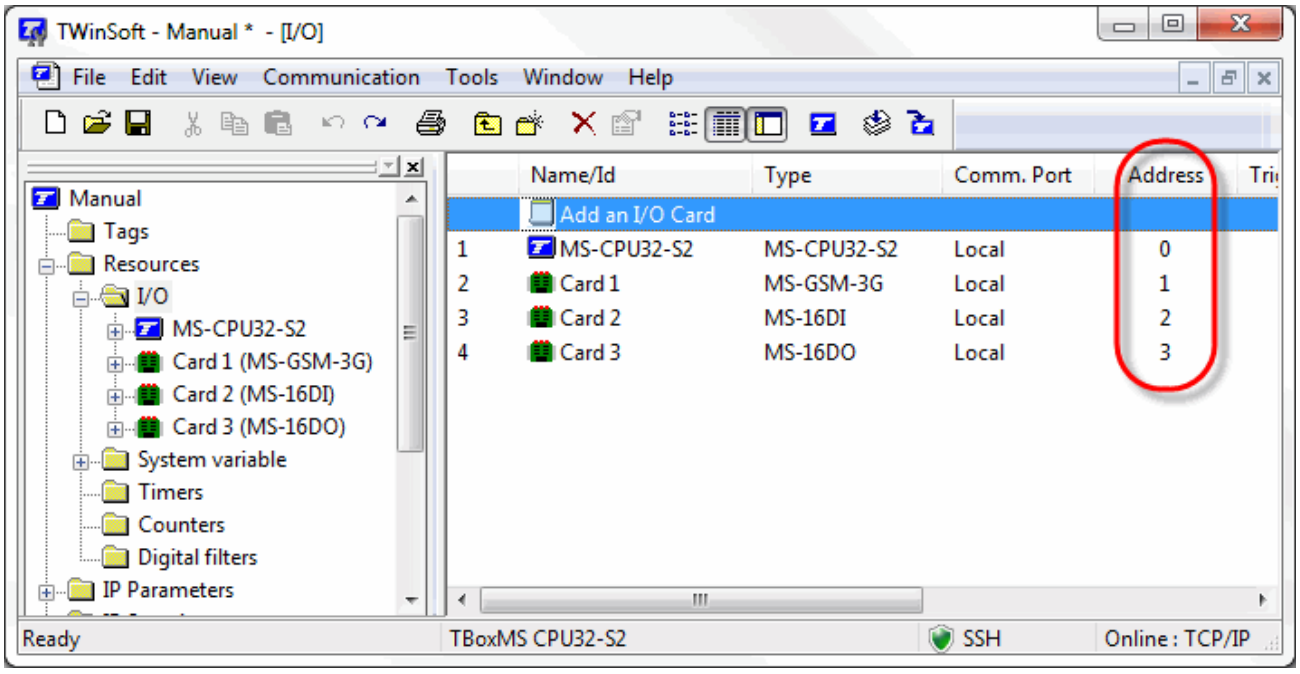
The **I/O and Communication cards** must be defined with the address **corresponding to their position** in the Rack.

With the following set of Cards on a Rack 5:



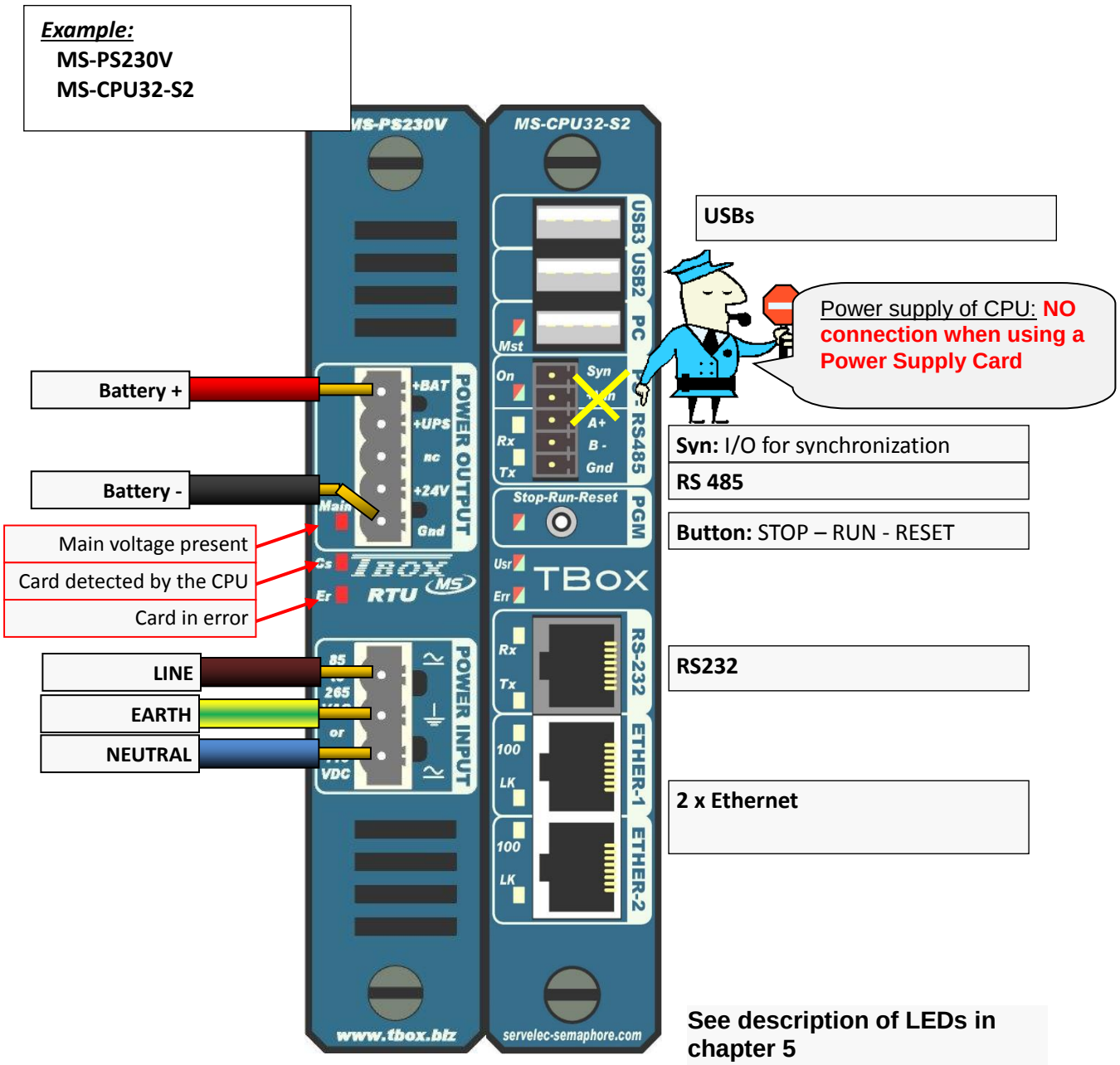
Slot (hard)	Address (soft)	Card Description
0	0	CPU-32-S2
1	1	Modem GSM-3G
2	2	16 Digital Input
3	3	16 Digital Output
4	-	empty

The corresponding TWinSoft configuration:



3.5. Powering

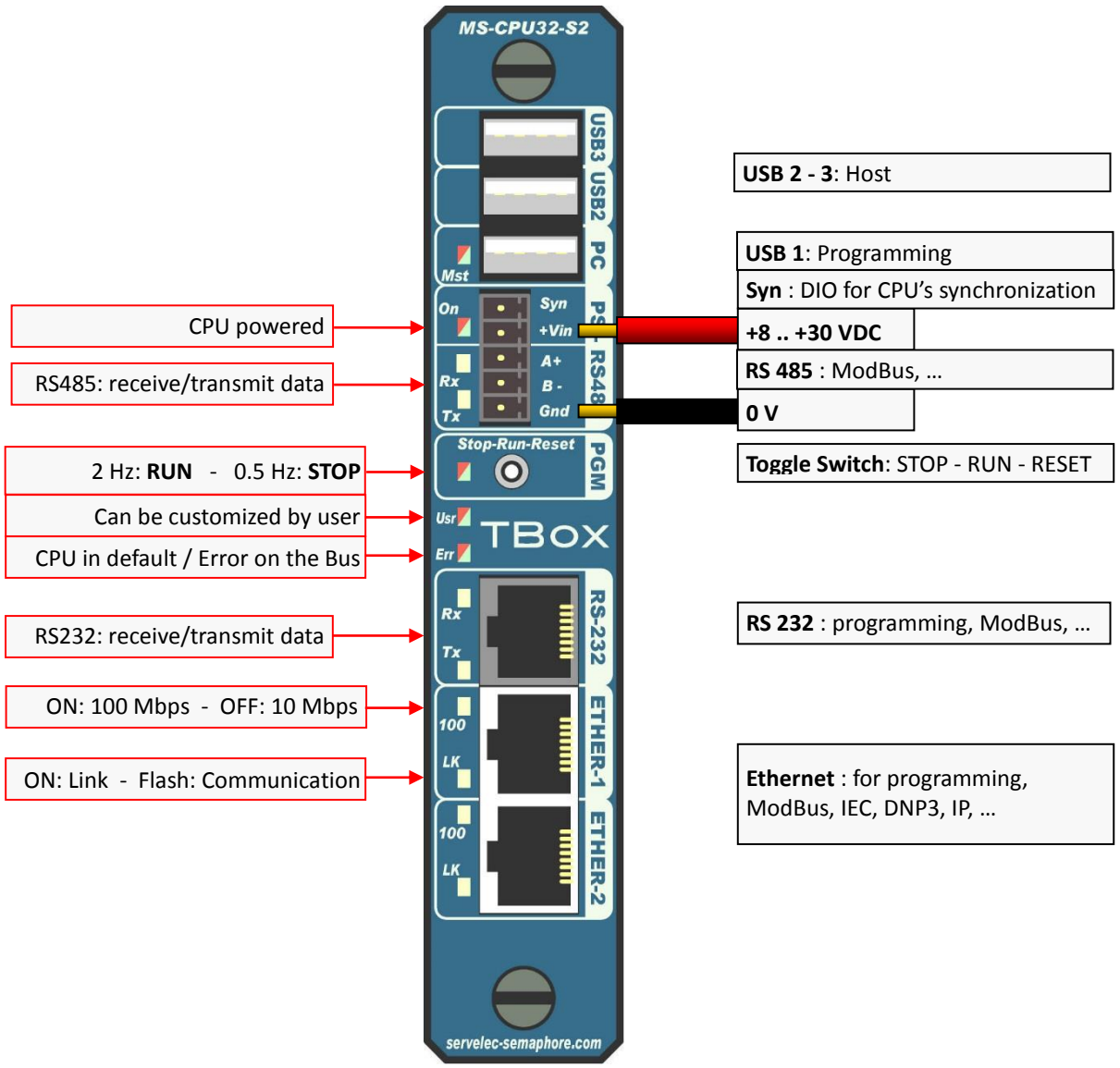
Working **with a power supply module**, example of cabling the power supply:



For **electrical safety** reasons, you may only manipulate connectors with **power switched OFF**.

Working **without power supply module**, cabling power to the CPU:

Example:
MS-CPU32-S2

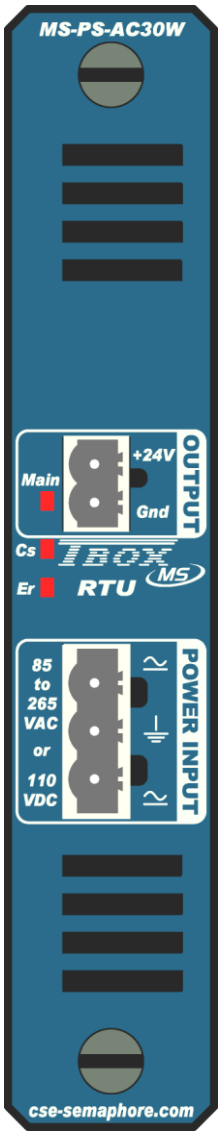
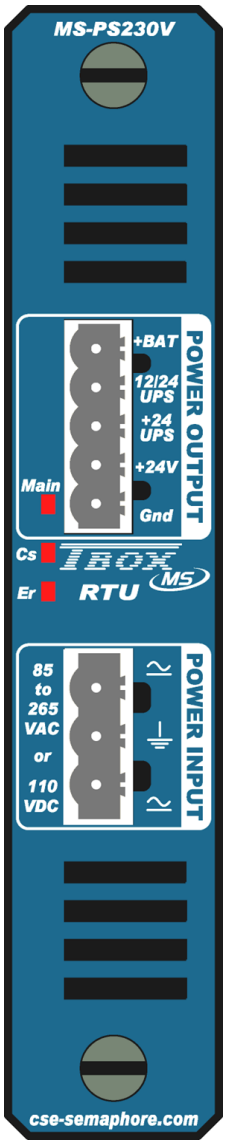
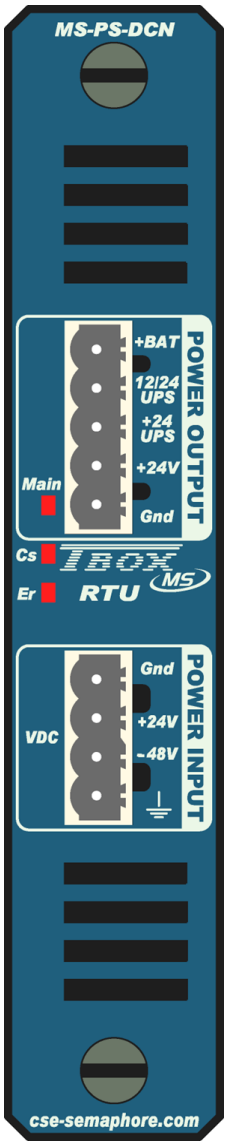
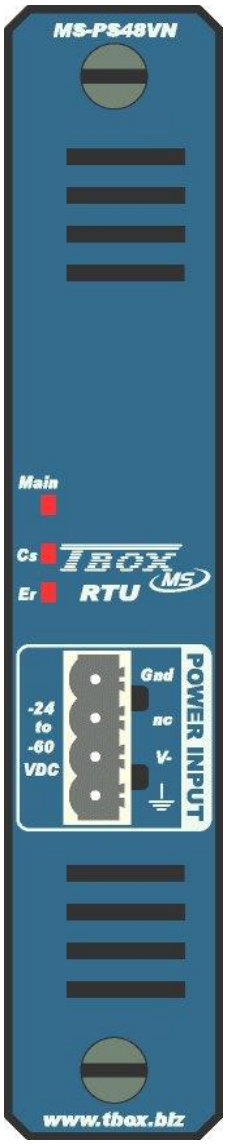


If DC power supply is connected to a DC distribution network, to a cable longer than 30 meters or to a cable which leave the building (including lines of outdoor installations) you need to install complementary surge protection.

4. Power Supplies

	References: **MS-PS-AC30W** **MS-PS230V** **MS-PS-DCN** **(MS-PS48VN)**

4.1. AC Power Supplies, DC Power Supplies

MS-PS-AC30W **230 VAC** (30W)	**MS-PS230V** **230 VAC** (15W)	**MS-PS-DCN** **-48 ...+ 24 VDC** (15W or 30W)	**MS-PS48VN** **- 48 VDC** (obsolete)
			

230 VAC – 30W (MS-PS-AC30W)

Input		
Voltage input	- AC - DC	85..265 VAC (50 or 60 Hz) 90..350 VDC
Current input		Maximum: 1 A
Connector		Screw connector (3 x 7.62) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Power		
Input Power at I out max.		Maximum: 40 W
Input Power in overload or short-circuit		Maximum: 100 W
Output Power		Maximum: 30 W
Output Current		
24 VDC (on the BUS, for 3.3 VDC, ext. output)		Maximum: 1.25 A @ 60°C
3.3 VDC (on the BUS)		Maximum: 5A
Output Connector		
Voltage		24 VDC
UPS		24 VDC uninterruptible when using **MS-CHARGER** (see next)
Current		Max. 1.25 A minus the current used on BUS and for 3 VDC
Connector		Screw connector (2 x 5.08). Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Load Sharing / Redundancy		
Quantity of Power Supply		Maximum: 7 Use only **identical model** of Power Supplies
24 VDC (Vp)		Load shared equally between the power supplies
3.3 VDC (Vcc)		Redundancy between Power Supplies. Only one power supply provides current.
Protection		
Test		Automatic test of the access of the card by the CPU (see LED 'CS' below)
EMC protection		
Overload and short-circuit		
FUSE *primary voltage*		Soldered Fuse of 1.25 A. Not replaceable by user.
FUSE *24 VDC Output*		Standard Glass Fuse of 2A fast (5x20). Accessible at the back of the card.
Isolation		
Between Earth and secondary		No isolation between GND and Earth
LED		
Main		Input Voltage present
CS		**Card Selection:** card corresponds to a card declared in TWinSoft.
ER		**Error:** card type does not correspond to the one declared in TWinSoft.
Input Variables		
Active Power Supply		Digital input = 1 when 3.3 VDC could be active (used in redundancy)
Power Fail		Digital input = 1 when mains breaks down
Temperature Warning ≥ 70°C		Digital Input = 1 when internal temperature is reached
Temperature Warning ≥ 85°C		Digital Input = 1 when internal temperature is reached
Load Sharing		Digital input = 1 when the power supply is the master of 24 VDC load sharing
Vcc Power Fails		Digital input = 1 when 3 VDC fails. Information only available when there is another active power supply.

Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C @ 20W. -40°C to 65°C @ 25W. -40°C to 60°C @ 30W.
Humidity	15 to 95 % without condensation
Altitude	Max. 4000 m
Dimensions	
Without connector	Height x Depth x Width: **150 x 83 x 29 mm**
Weight (w/o connector)	350 g

230 VAC – 15W (MS-PS230V)

Revision		
C-01, C-02 CR-03 IRU-03		- No redundancy. Working with battery: 12/24V UPS - With Redundancy. Working with battery: 12/24V UPS - With Redundancy. Working with backup battery: 24V UPS
Input		
Voltage input:	- AC - DC	85..265 VAC (47..440 Hz) 90..375 VDC
Connector		Screw connector (3 x 7.62) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Power		
Input Power at I out max.		Maximum: 20 W
Input Power in overload or short-circuit		Maximum: 50 W
Efficiency		Minimum: 60% at 2 A
Output Power		Maximum: 15 W
Output Current		
24 VDC (on the BUS, for 3.3 VDC, ext. output)		Maximum: 0.625 A
3.3 VDC (on the BUS)		Maximum: 3A
Output Connector		
Backup Battery charger:	- Battery model - Mode - Voltage - Current	Lead Acid Battery (VRLA) Constant current / limited voltage Maximum: 13.8 V Typical: 90 mA
Output connections:	+BAT 12/24 UPS +24 UPS +24 V Gnd	• To the Backup Battery (+12V) • Backup power supply to another rack MS: +24VDC when mains voltage present otherwise +8V to +13.8V. Current: max. 625 mA (minus current used by the rack) • +24VDC when mains or battery is present. Current max. 120 mA • +24VDC when “main” is present • Ground and 0V of Battery
Connector		Screw connector (5 x 5.08) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

Protection	
Test	Automatic test of the access of the card by the CPU (see LED ‘CS’ below)
EMC protection	
Overload and short-circuit	
FUSE *primary voltage*	Soldered Fuse of 1.25 A. Not replaceable by user.
FUSE *battery*	Standard Glass Fuse of 2A fast (5x20). Accessible at the back of the card.
Isolation	
Between Earth and secondary	No isolation between GND and Earth
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 4000 m
LED	
Main	Input Voltage present
CS	**Card Selection:** card corresponds to a card declared in TWinSoft.
ER	**Error:** card type does not correspond to the one declared in TWinSoft.

Input	
Active Power Supply	Digital input = 1 when power supply active (used in redundancy)
Power Fail	Digital input = 1 when ‘main’ power breaks down
Temperature Warning ≥ 70°C	Digital Input = 1 when temperature is reached
Temperature Warning ≥ 85°C	Digital Input = 1 when temperature is reached
Dimensions	
Without connector	Height x Depth x Width: **150 x 83 x 29 mm**
Weight (w/o connector)	350 g

-48…+24 VDC (MS-PS-DCN)

Revision		
C-01 CR-02 / IRU-02		- No redundancy, Working with battery: 12/24V UPS only, **P=15W** - With Redundancy, Working with backup battery: 24V UPS, **P=30W**
Input		
Voltage input:	**- either:** +24V **- or:** -48V	+8 .. +30 VDC -60 .. -24 VDC
Connector		Screw connector (4 x 5.08) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Power		
Input power at maximum current With positive input voltage With negative input voltage		 Hw. Rev. **01:** 20 W Hw. Rev. **02:** 40 W Hw. Rev. **01:** 25 W Hw. Rev. **02:** 50W
Input power with short-circuit (or overload) With positive input voltage With negative input voltage		 Hw. Rev. **01:** 75 W Hw. Rev. **02:** 150 W Hw. Rev. **01:** 85 W Hw. Rev. **02:** 170W
Output power		Hw. Rev. **01:** Maximum: 15 W Hw. Rev. **02:** Maximum: 30 W @ 50°C. Linear derating from 30W @ 50°C to 20W @ 70°C.
Input Current		Hw. Rev. **02:** Max. 2 A (depending on input voltage; input max. power: 40 W)
Output Current		
24 VDC output (on the BUS, for 3.3 VDC, ext. output) (Vp= 24 V)		Hw. Rev. **01:** max. 0.625 A Hw. Rev. **02:** max. 1.5 A
3.3 VDC (on the BUS) (Vcc=3.3V)		Hw.Rev. **01:** 3 A Hw.Rev. **02:** 5 A @ 50°C. Linear derating from 5A @50°C to 3A @ 70°C.
Output Connector		
Backup Battery charger:	Battery model - Mode - Voltage - Current	Lead Acid Battery (VRLA) Constant current / limited voltage Maximum: 13.8 V Typical: 90 mA
Output connections:	+BAT 12/24 UPS +24 UPS +24 V Gnd	• to the Backup Battery (+12V) • Backup power supply to another rack MS: +24VDC when mains voltage present otherwise +8V to +13.8V. Current: max. 625 mA (minus current used by the rack) • +24VDC when mains or battery is present. Current max. 120 mA • +24VDC when "main" is present • Ground and 0V of Battery
Connector		Screw connector (5 x 5.08) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' below)
EMC protection	
Overload and short-circuit	
FUSE *primary negative voltage*	Soldered Fuse of 3.5 A. Not replaceable by user
FUSE *primary positive voltage*	Soldered Fuse of 4 A. Not replaceable by user
FUSE *battery*	Standard glass fuse (5x20). Accessible at the back of the card

Isolation	
Between GND and Earth	No isolation
LEDs	
Main	Input Voltage present
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Input	
Active Power Supply	Digital input = 1 when power supply active (used in redundancy)
Power Fail	Digital input = 1 when main DC power breaks down Power Fail = 0 if Vin > 20.57 V Power Fail = 1 if Vin < 13.47 V
Temperature Warning ≥ 70°C	Digital Input = 1 when temperature is reached
Temperature Warning ≥ 85°C	Digital Input = 1 when temperature is reached
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150 x 83 x 29 mm**
Weight (w/o connector)	350 g

- 48 VDC (MS-PS48VN)
REPLACED BY MS-PS-DCN

This Power Supply cannot be used with:
MS-CPU32, MS-8DOR, MS-GSM, MS-4AOVC or ACC-XDSL

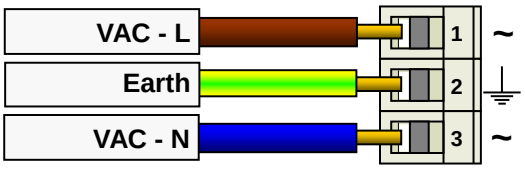
Voltage / Current	
V in	-60 to –24 VDC
Output current on the Bus (3.3V)	2 A
Consumption	10 mA
Power	
Input Power at I out=2 A	Maximum: 12 W
Input Power in overload or short-circuit	Maximum: 65 W
Efficiency	Minimum: 60% at 2 A
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' below)
Input voltage inversion	Maximum: 60 VDC
EMC protection	
Overload and short-circuit	

Isolation	
No isolation	Between Input and Output GND
No isolation	Between GND and Earth
LED	
Main	Input Voltage present
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Input / Output	
Temperature input	Internal input **Use:** measurement of the card internal temperature **Precision:** 5 °C
Voltage input	Internal input **Use:** measurement of the Input voltage **Precision:** 1 %
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150 x 83 x 29 mm**
Weight	245 g.

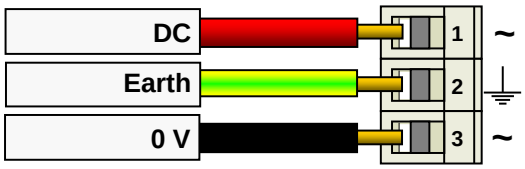
For **electrical security** reason, you have to manipulate connectors with **power switched OFF**.

VAC Power supplies (MS-PS230V – MS-PS-AC30W)

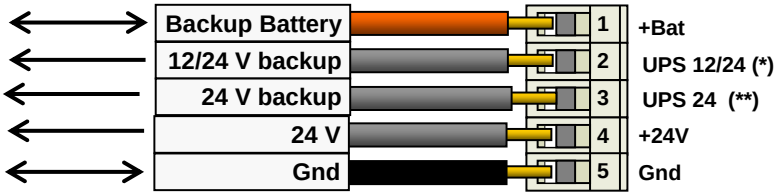
Description:	Connector: **POWER INPUT**
AC Cabling (110 VAC… 240 VAC)	**Screw connector (3 x 7.68 mm)**



Description:	Connector: **POWER INPUT**
DC Cabling (90 DC … 350 DC)	**Screw connector (3 x 7.68 mm)**

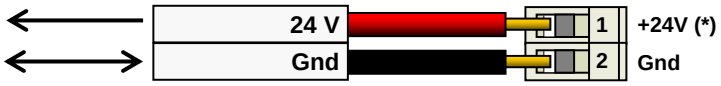


Description:	Connector: **POWER OUTPUT**
Battery (MS-PS230V)	**Screw connector (5 x 5.08 mm)**



(*): 12V when battery active; 24 V when mains active. On models C-01, C-02, CR-03
(**): 24V when battery and mains active. As of model IRU-03

Description:	Connector: **OUTPUT**
Output (MS-PS-AC30W)	**Screw connector (2 x 5.08 mm)**

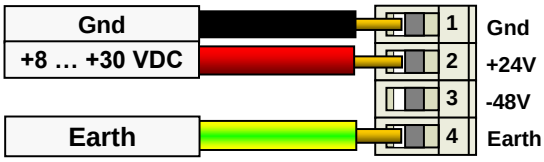


(*): When backup battery available (see MS-CHARGER), uninterruptable 24 VDC

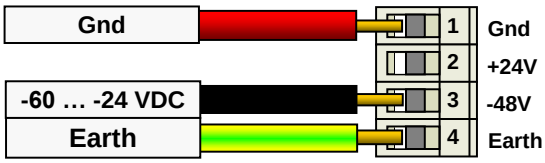
For **electrical security** reason, you have to manipulate connectors with **power switched OFF**.

-48…+24 VDC Power supply (MS-PS-DCN)

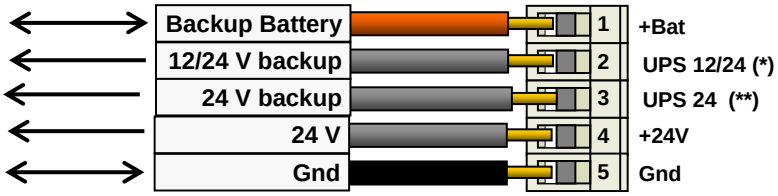
Description:	Connector: **POWER INPUT**
Power Supply 24 VDC	**Screw connector (4 x 5.08 mm)**



Description:	Connector: **POWER INPUT**
Power Supply - 48 VDC	**Screw connector (4 x 5.08 mm)**



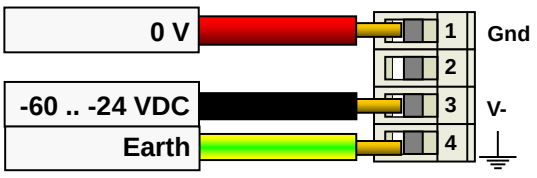
Description:	Connector: **POWER OUTPUT**
Battery	**Screw connector (5 x 5.08 mm)**



(*): 12V when battery active; 24 V when mains active. On model C-01
(**): 24V when battery and mains active. As of model CR-02

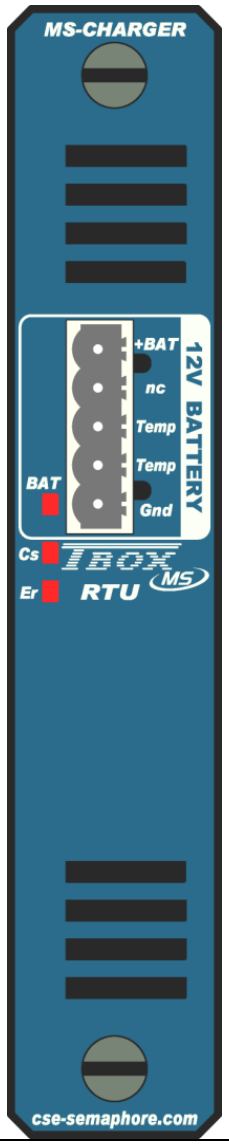
- 48 VDC Power supply (MS-PS48VN)

Description:	Connector: **POWER INPUT**
Power Supply – 48 VDC	**Screw connector (4 x 5.08 mm)**



If DC power supply is connected to a **DC distribution network**, to a cable longer than 30 meters or to a cable which leave the building (including lines of outdoor installations) you need to install complementary surge protection

4.2.MS-CHARGER

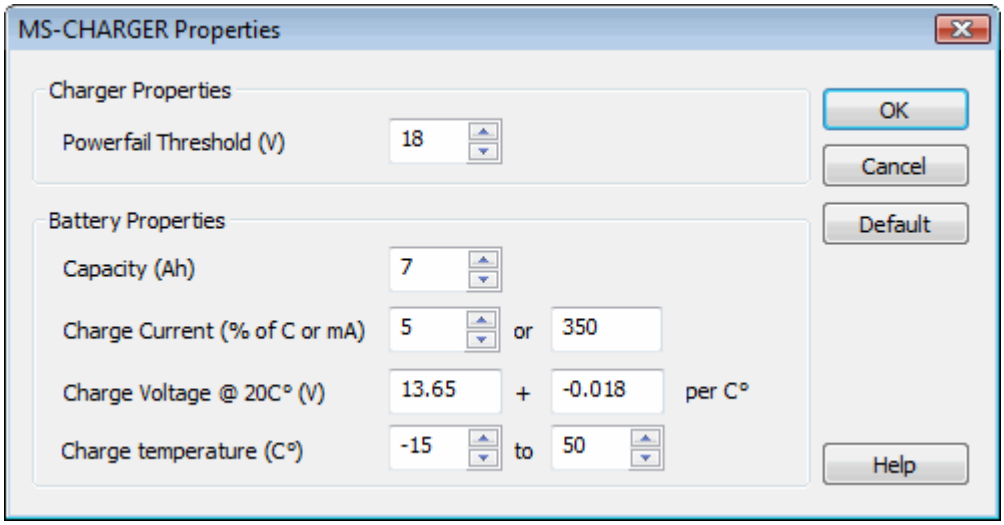
	Reference: **MS-CHARGER**
➢ 12 VDC lead acid battery charger ➢ Battery tester and maintenance ➢ Provides 24 V UPS on the BUS to Power Supply ➢ Compatible with all Models of power supplies ➢ Internal/External temperature sensor ➢ Automatic disconnection of the battery when voltage < 10 VDC	

MS-CHARGER (next)

TECHNICAL SPECIFICATIONS

MS-CHARGER Properties

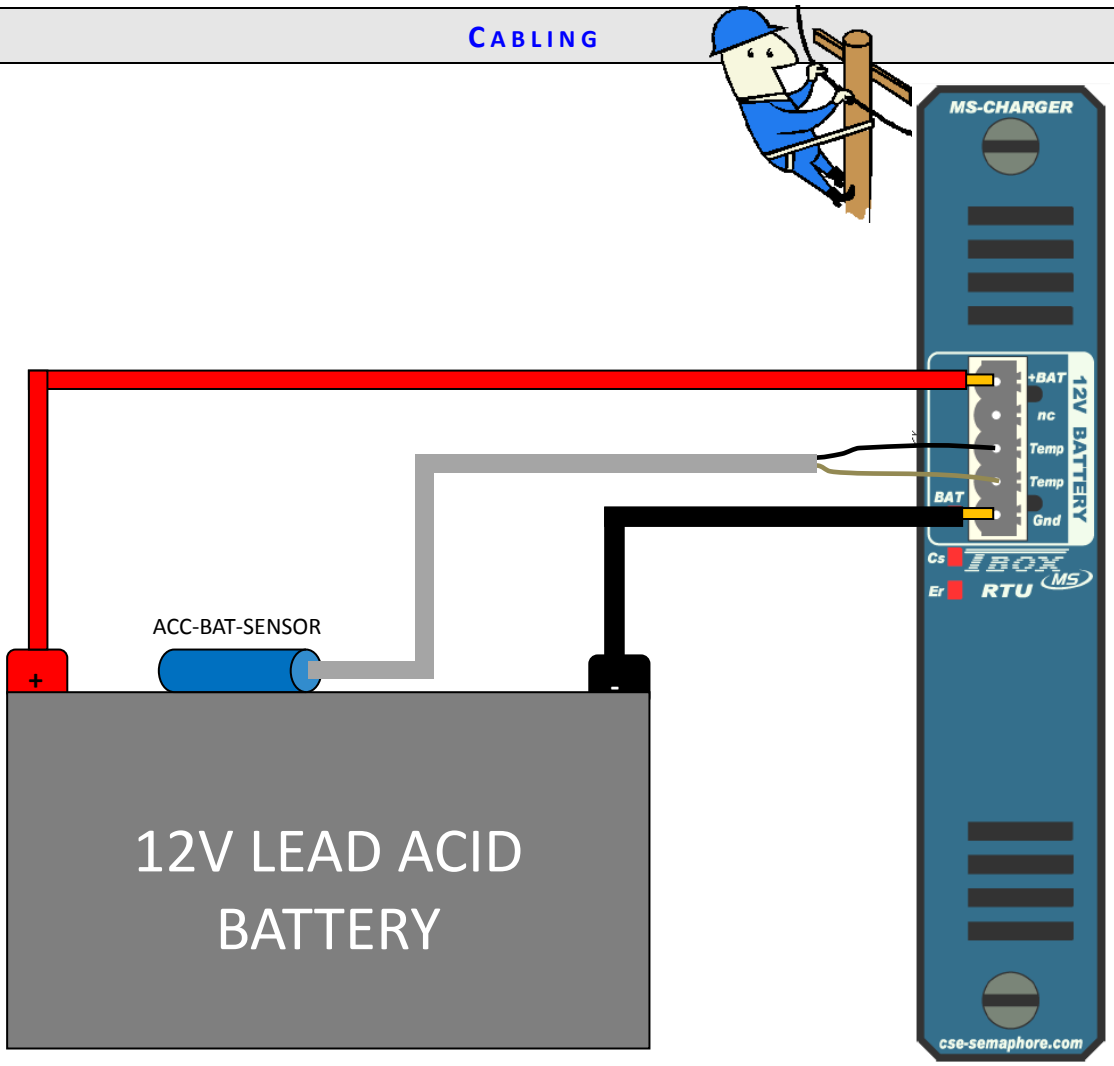
To access the properties, click “Advanced” when adding the MS-CHARGER with TWinSoft in the list of cards:



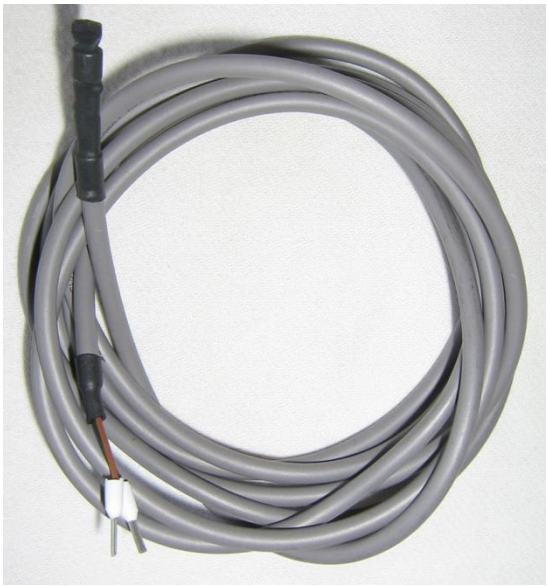
Powerfail Threshold	Minimum voltage of 24 VDC on the BUS accepted before switching to battery *Default:* 18 VDC.
Battery Capacity (Ah)	Capacity of the battery connected to MS-CHARGER. Minimum: 2Ah Maximum: no limit, but take into consideration the current needed to charge the battery and therefore the time needed. *Default:* 7 Ah
Battery Charge Current	It can be expressed in percentage of the battery capacity or in mA. Maximum: 2 A *Default:* 5 % (=350mA for a 7Ah battery) With a charge current of 850mA or more, you need a 30W power supply.
Battery Charger Efficiency	80%. Charge current is drawn from 24 VDC Current Ratio between 24 VDC current and charge current: 13.65/24/0.8 = 0.71 Take the 24 VDC current into consideration when selecting the power supply
Battery Charge Voltage	It is the maximum voltage of the battery charger. When the battery is empty, this voltage will increase to this maximum when the full charge is reached. *Default:* 13.65 Volts
Battery Charge Temperature	It is the range of temperature in which the battery can be charged. Out of this range, the charge stops. The temperature used by default is the internal temperature. In case there is a temperature sensor connected to the battery, the latter is used. (see Input/Output next) Discharge is always available, whatever battery temperature *Default:* -15°C ..+50°C
Power Supply	
Card Consumption P Total	0.36 W

MS-CHARGER (next)

Connector	
Connector	Screw connector (5 x 5.08). Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' below)
EMC protection	
Overvoltage on battery	Max: 18.6 VDC
FUSE *24 VDC (from/to the BUS)*	Soldered Fuse of 2A fast. Accessible at the back of the card
FUSE *battery*	Soldered Fuse of 5A slow. Accessible at the back of the card
Automatic Disconnection/Reconnection	When in discharge mode, automatic disconnection of the battery at: < 9.8 VDC When the main voltage recovers and the charge is active, automatic reconnection of the battery at: > 10.8 VDC
Isolation	
Between Earth and GND	No Isolation between Earth and GND
LED	
BAT	Unit powered by the battery. ⚠ The Tag "Power Fail" of the Main Power supply must be declared in RTU Properties -> Advanced
CS	**Card Selection:** card corresponds to a card declared in TWinSoft.
ER	**Error:** card type does not correspond to the one declared in TWinSoft.
Input/Output Variables	
Discharge Enabled	Digital input = 0 when in charge mode, = 1 when in discharge mode
Internal Temperature	Analog input returning the temperature inside the module. It is used by default to control the charge according to the temperature
External Temperature	Analog input available on the connector, to connect to a PTC sensor (our ref. ACC-BAT-SENSOR). It is meant to be fixed on the battery, to read the temperature of the battery. When cabled, it is used to control the charge according to the temperature
Battery Voltage	Present voltage on the battery
Battery Current	When in charge: indicates the present charge current: 0..2 A When in discharge: indicates the present discharge current: -2 A..0
Test Battery Voltage w/o load	Voltage of the battery without load, as it is before starting the test of battery health, with a resistor in parallel
Test Battery Voltage with load	Voltage of the battery with load, as it is during the 5 seconds test of battery health ⚠ Battery health is given by the delta of the 2 above data. With a battery in good health, it should generally not exceed 2 VDC (depending on the battery). If the battery returns a voltage < 9.5 VDC, it should be replaced.
Temperature Validity	2 x Digital input = 1 when the temperature is measured between the range -40°C … + 85°C
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150 x 83 x 29 mm**
Weight (w/o connector)	350 g



4.3. ACC-BAT-SENSOR



5. CPU 32 bits

5.1.MS-CPU32-S2

	Reference: **MS-CPU32-S2**

➢ Processor ARM 32 bits, 400 MHz
➢ Power supply input (8..30 Vdc)
➢ Button for selection modes of working
➢ 1 x RS232
➢ 1 x RS485
➢ 2 x independent Ethernet
➢ 3 x USB
  ○ 1 x Host and Device (for Programming)
  ○ 2 x Host: for USB stick, WIFI, serial port…
➢ I/O for synchronization
➢ Internal temperature measurement
➢ Input voltage measurement
➢ Redundancy
➢ Millisecond Time Stamping
	

TECHNICAL SPECIFICATIONS

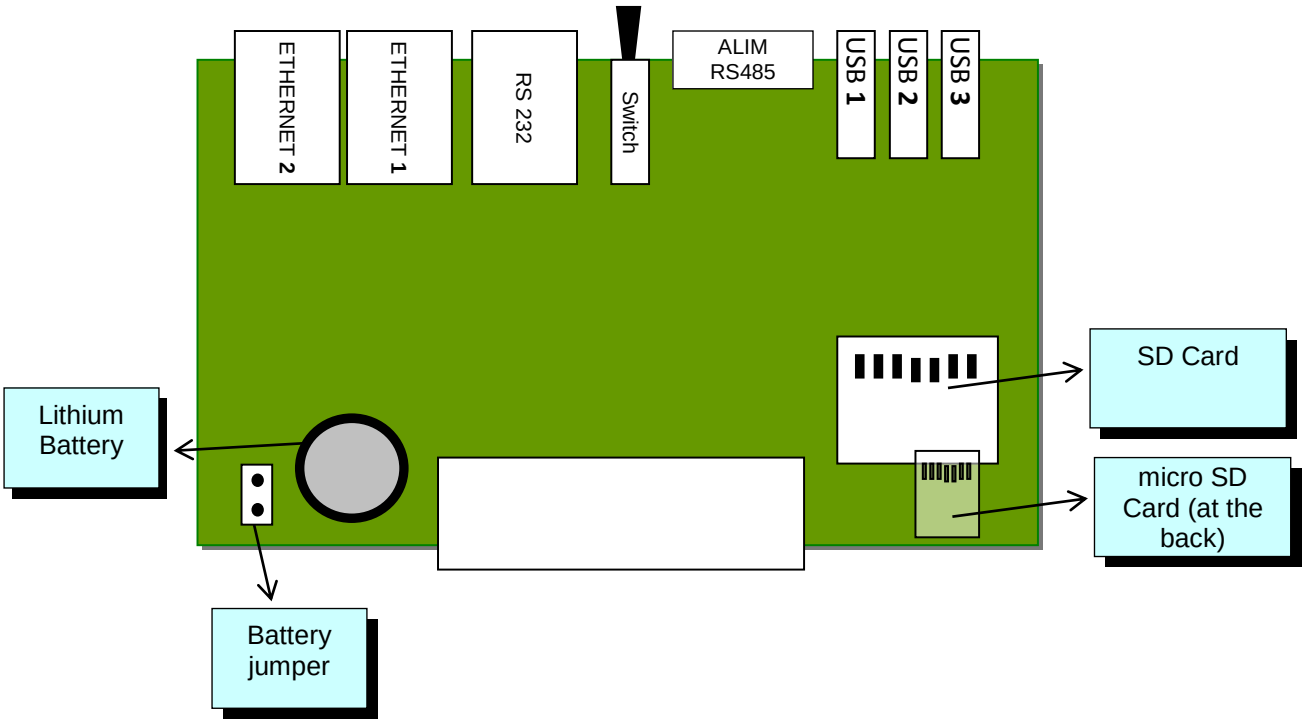
General	
Processor	Industrial grade 32-bits CPU module ARM926EJ-S 32 bits, 400 Mhz
Clock Clock Drift	Real time Clock, backed-up with Lithium battery (see chapter 5.1.1) Typical: 2 sec. /day
Toggle Switch	Toggle Switch: RUN - STOP - RESET
LED **On** (green) **Run/Stop** (green/red) **Usr** (green/red) **Err** (red)	ON: CPU powered, either by +Vin or by a MS-PSxxx Green: 2 Hz=RUN ; 0.5 Hz=STOP Red: 8 Hz= active ALARM Programmable with internal DOs ON: error on the BUS

Power Supply		
Input Voltage		8 .. 30 VDC **or** via MS-PSxxx
Supply Current	I input total	Max. 2.5 A
	I on Vcc=3.3V	Max. 3. A
	I on Vp (input voltage - 1V)	Max. 1.5 A
Card Consumption	P Total	1.2W WITHOUT USB port connected
Connector		Spring Cage Terminal Block (5 x 2.54mm)
Internal Battery	(see chapter 1.1.1)	
Voltage		3 V Lithium. Ref.: **CR 2450**
Use		Backup of Clock and RAM (datalogging)
Lifetime		**CPU under voltage:** 10 years **CPU stopped and plugged on the Rack:** - Typical 4 years **WARNING:** After this time, the battery must be replaced to maintain the clock and datalogging in case of main CPU power failure.
Memory		
Flash		32 MBytes (Boot Loader, Linux, OS, Application, Sources, Web & Report)
SDRAM		64 MBytes (Running part of Linux, OS, Application)
SRAM		1 MBytes backed up (Datalogging, log, copy of Tags value)
SD card (optional)		
	Models	SDHC or micro SD
	Capacity	Max. 32 GBytes
	Format	FAT32
	References	Industrial SD card, 1 GByte: **ACC-SDIN-1GB** and **ACC-uSDIN-1GB**
Communication Ports		
CPU Built in		1 x RS232 1 x RS485 2 x independent Ethernet 1 x USB Host and Device 2 x USB Host
Additional Communication Modules		-max.: 7 x serial cards (MS-GSM-3G, MS-PSTN, MS-SERIAL, MS-GPS) -max.:2 x Ethernet cards (MS-ETHER4)
Maximum quantities of ports		16 x serial + modem 4 x ethernet
RS 232		
Connector		RJ 45
Cabling (see schema next)		TxD, RxD, RTS, CTS GND, DTR, DCD, RI
Protocol		ModBus-RTU Master / Slave (other protocols available with add-ons)
LED		**RxD**: ON when receiving **TxD**: ON when transmitting
RS 485		
Connector		Spring Cage Terminal Block (3 x 2.54mm)
Cabling (see schema next)		2 Wires (A+, B- and GND)
Protocol		ModBus-RTU 'Master' and 'Slave' (other protocols available with add-ons)
LED		**RxD:** ON when receiving **TxD:** ON when transmitting
Isolation		**No isolation** between signal and Power Supply
Protection		**Over voltage protection** (common mode)
Number of slaves		254 (if RS485 technology of slaves allows it too)
Termination		Termination of 120 ohms might be required depending on cabling and speed. *Failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A+ and B- are opened or in short-circuit.

Ethernet	
Quantity	2 x independent Ethernet ports
Connector	RJ-45
Model	100 BASE-TX (4 wires) AUTO MDI / MDIX Full Duplex , Auto-negotiation Bridge / Bounding
Cabling	AUTO MDI / MDIX : automatic adaptation to cross or straight cabling
Protocols	ModBus/TCP 'Master' and 'Slave', SMTP(S), FTP(S), HTTP(S), NTP, IEC-60870-5-104, DNP3, SNMP, Ping, OpenVPN…
IP connections	- Max 64 HTTP(S) 'Server' Sessions - ModBus/TCP 'Server' unlimited - ModBus Transactions 'Client': simultaneous communications' - 1 'Client' connection for alarm (one alarm is sent at a time)
LED	**100:** ON when connected at 100 MHz – OFF when connected at 10 MHz **Lk:** ON when linked – FLASH when communicating **FD:** ON when in Full Duplex
Isolation	**1.5 kV** between signals and Gnd
USB	
Quantity	3
Model	USB 2.0
Communication	1 x Host and Device: for programming 2 x Host: for USB stick, WIFI, port série, …
Connector	USB type A female (socket)
Cabling	USB A/A male cable (Host to Host)
Speed	Host & Device: 480 Mbits/sec. 1 x Host: 480 Mbits/sec 1 x Host: 12 Mbits/sec
Current	Max. 500mA @60°C per USB port
Input/Output	
"Stop" Toggle Switch (DI)	Internal digital input associated to the 'STOP' position of the button. **Use:** in Ladder/BASIC program
Synchronization (DIO) Use Type Voltage Current Protection Connector Cabling	Same channel used as input **OR** output. Multipoint connection between CPUs Synchronize actions of several CPUs **in the same cabinet** Current sinking Max. 30 VDC Max. 45mA NO PROTECTION Spring Cage Terminal Wire range: 0.2 – 0.75 mm² (with ferrule)
Led "Usr" (DO)	This LED can be controlled in the program through 2 x digital outputs: - Digital Output "Red" - Digital Output "Green"
Internal temperature (AI)	Temperature inside the module
Input Voltage (AI)	When powered from "Vin", voltage at "Vin"
Redundancy	(optional as of OS 1.43.xxx)
CPU Position in Rack	**slot0** and **slot1**
Switching between CPU	Max. 10 sec.
Applications	Each CPU have its own application (similar or different applications)
Synchronization	No synchronization between CPUs
EMC	
EMC immunity	EN61326-1, EN61000-4-2, -3, -4, -5, -6, -8
EMC emissions	EN55011

Safety	
	IEC 60950
Approvals	
	CE, FCC, UL, CSA, C-Tick
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	272 g

Battery and MultiMedia (SD) card implementation:



STOP When using SD card, you use **one model of SD card at a time**: SD or micro SD

5.1.1. Lithium Battery

The CPU is equipped with a Lithium battery (3 V).
This battery is used to maintain the **clock and datalogging** when the CPU is out of power.

This battery is in use when the following sequence occured:
- the CPU is fixed on a rack
- the CPU has been powered once
- the CPU is out of power

When the **CPU is removed from the rack**, the battery is disconnected, to avoid consuming when the CPU is in stock.
The **battery jumper** allows keeping the battery connected even when removed from the rack (see in above specification the lifetime of the battery).

Advised procedures:

1. **Standard :** the jumper is left opened.
   In this way, the battery is used when the CPU is fixed on the rack to maintain clock and datalogging **when the main power has broken down**.

2. **Permanent :** you systematically place the jumper, before you start using the CPU.
   In this way, the battery is used **when the CPU has been powered at least once**, to maintain clock and datalogging when the main power has broken down, **but also when the CPU is removed from the rack** (check the lifetime of the battery in the technical specifications)

5.1.2. SD Card

Two models of SD card can be used: SDHC **or** micro SD.

The SD card is an option of ***TBox MS*** that provides the following features:

1. To store all files running the ***TBox MS***. This feature is called *"Plug&Go"* (see below).
2. To initialize IP settings through "*System.xml file"* (see below).
3. To store sampling tables in case large amount of data is required.
4. To store webfiles (as of OS 1.37.410)
5. To archive data using an add-on
6. As alarm recipient to store files (report, image, datalogging, ...).

To use the SD Card, remove the CPU from the Rack and insert the memory card in the appropriate socket.

5.1.3. Plug & Go

Plug & Go allows storing the **complete TWinSoft project** into the SD card of ***TBox MS***.

As TWinSoft project, we mean all files, including TWinSoft compiled document with its Web and Report files, OS and even LINUX packages; all ready to run at starting of the RTU.

The SD card will be automatically updated when a new program is sent by TWinSoft; this is part of the standard feature of *Plug & Go* (see Appendix C in ***TWinSoft Programming Guide***)

5.1.4. IP Settings Initialization:

IP address initialization can be carried out using a file called 'System.xml', placed in the root of the SD Card.

When an IP configuration is defined in *System.xml*, **it has priority** on the one declared for the Ethernet ports of the CPU as well as in a possible '*Plug&Go*' file.

Example of System.xml: (not case sensitive)

```
<?xml version="1.0"?>
<System>
  <ComPort>
    <PortName>COM3</PortName>
    <IPconfig>
      <IP>172.25.110.177</IP>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>172.25.110.1</Gateway>
      <PrimaryDNS>172.25.110.3</PrimaryDNS>
      <SecondaryDNS>172.25.110.6</SecondaryDNS>
    </IPconfig>
    <DefaultIPconfig>
      <IP>192.168.1.99</IP>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>192.168.1.1</Gateway>
      <PrimaryDNS>0.0.0.0</PrimaryDNS>
      <SecondaryDNS>0.0.0.0</SecondaryDNS>
    </DefaultIPconfig>
  </ComPort>
</System>
```

The `<DefaultIPconfig>` setting will be used in case of "Global Reset" (see chapter **Global Reset of TBox MS in *"TWinSoft Programming Guide"***)

`<PortName>`	Communication port of ***TBox MS*** (COM3 = Ethernet)
`<IP>`	IP address of the port selected
`<Subnet>`	IP address of the Subnet mask of the port selected
`<Gateway>`	IP address of the equipment used as Gateway on the Network
`<PrimaryDNS>`	IP address of the primary DNS Server
`<SecondaryDNS>`	IP address of the secondary DNS Server

5.1.5. Toggle Switch (Working modes)

On the front side of the CPU, a toggle switch allows changing the working mode of the CPU: STOP - RUN - RESET

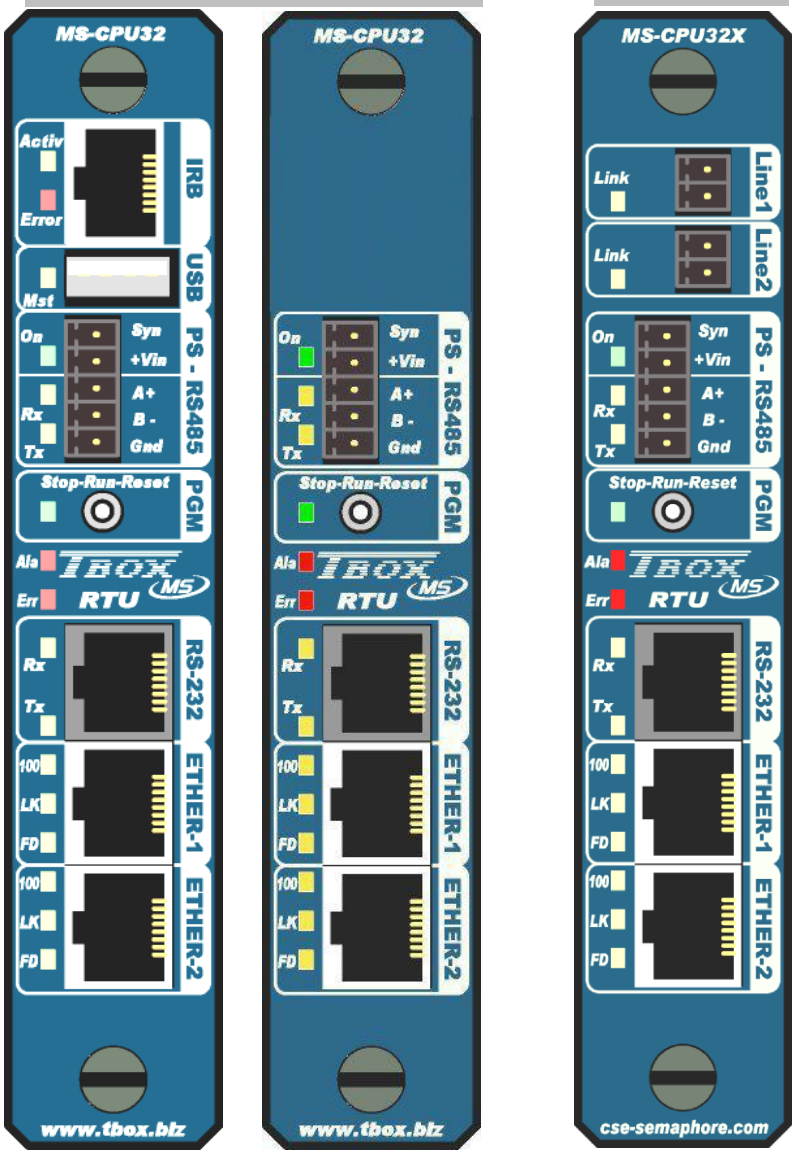
RUN	All features of ***TBox MS*** runs
RESET	By pressing Reset, it restarts the program and erases the alarms
STOP	Allows stopping the program (see configuration in ***"TWinSoft Programming guide"***, RTU Advanced properties)

(See also the chapter related to **Global Reset of TBox MS in *"TWinSoft Programming Guide"***)

5.2. MS-CPU32(X) (Obsolete)

Reference: **MS-CPU32**
MS-CPU32X

- Power supply input (8..30 Vdc)
- Button for selection modes of working
- 1 x RS232
- 1 x RS485
- 2 x independent Ethernet
- 2 x SHDSL modem (MS-CPU32X)
- 1 x USB (not available)
- 1 x IRB (not available)
- I/O for synchronization
- Internal temperature measurement
- Input voltage measurement
- Redundancy
- Millisecond Time Stamping



Model "A" **Model "B"**

TECHNICAL SPECIFICATIONS

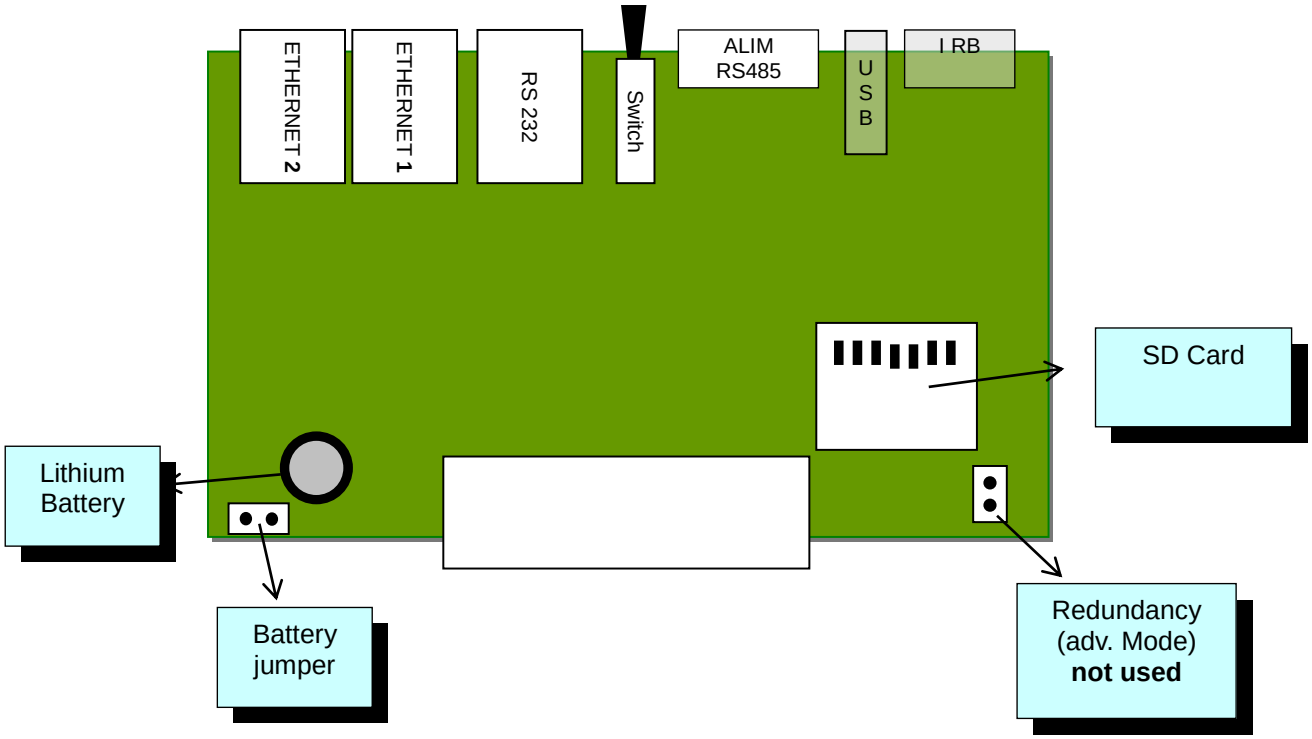
Models		**All models have exactly the same features**
MS-CPU32	"A"	With USB and IRB ports <u>not operational</u>
	"B"	Without useless USB and IRB ports (as of June 2010)
MS-CPU32X		2 x additional SHDSL modem
General		
Processor		Power PC (MPC8248), 32 bits, 266 Mhz, 505 Mips (max.)
Clock		Real time Clock, backed-up with Lithium battery (see chapter 5.2.1)
	Clock Drift	Typical: 3 sec. /day
Button		Push button: RUN - STOP - RESET
LED	**On** (green)	ON= CPU powered, either by +Vin or by a MS-PSxxx
	Run/Stop (green)	2 Hz=RUN ; 0.5 Hz=STOP
	Ala (red)	8 Hz= Alarm active
	Err (red)	ON= error on the BUS

Power Supply	
Input Voltage	8 .. 30 VDC
Supply Current I input total I on Vcc=3.3V I on Vp (input voltage - 1V)	Max. 2 A Max. 3 A Max. 1.5 A
Card Consumption P Total MS-CPU32 MS-CPU32X	 2.65 W 5.36 W
Connector	Spring Cage Terminal Block (5 x 2.54mm)

Internal Battery (see chapter 5.2.1)	
Voltage	3 V Lithium. Ref.: **CR 1220**
Use	Backup of Clock and RAM (datalogging)
Lifetime	**CPU under voltage:** 10 years **CPU stopped and plugged on the Rack:** - Typical 265 days **WARNING:** After this time, the battery must be replaced to maintain the clock and datalogging.
Memory	
Flash	16 MBytes (Boot Loader, Linux, OS, Application, Sources, Web & Report)
SDRAM	64 MBytes (Running part of Linux, OS, Application)
SRAM	1 MBytes backed up (Datalogging, log, copy of Tags value)
SD card (optional)	Max. 2 GBytes (SD High Capacity not supported) Format: FAT32
RS 232	
Connector	RJ 45
Cabling (see schema next)	TxD, RxD, RTS, CTS GND, DTR, DCD, RI
Protocol	ModBus-RTU Master / Slave
LED	**RxD**: ON when receiving **TxD**: ON when transmitting
RS 485	
Connector	Spring Cage Terminal Block (3 x 2.54mm)
Cabling (see schema next)	2 Wires (A+, B- and GND)
Protocol	ModBus-RTU 'Master' and 'Slave'
LED	**RxD:** ON when receiving **TxD:** ON when transmitting
Isolation	**No isolation** between signal and Power Supply
Protection	**Over voltage protection** (common mode)
Number of slaves	254 (if RS485 technology of slaves allows it too)
Termination	Termination of 120 ohms might be required depending on cabling and speed. *Failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A+ and B- are opened or in short-circuit.
Ethernet	
Quantity	2 x separate Ethernet ports
Connector	RJ-45
Model	100 BASE-TX (4 wires) AUTO MDI / MDIX Full Duplex , Auto-negotiation
Cabling	AUTO MDI / MDIX : automatic adaptation to cross or straight cabling
Speed	10/100 Mbits
Protocols	ModBus/TCP 'Master' and 'Slave', SMTP, FTP, HTTP, NTP, Ping
Sockets	**- "Client" ModBus Transactions:** simultaneous communications **- "Client" Alarm:** 2 sockets (in case of FTP) – 1 context. One alarm sent at a time **- "Server" ModBus:** 16 sockets – 16 contexts **- "Server" HTTP:** 16 sockets – 16 contexts

Ethernet (next)	
LED	**100:** ON when connected at 100 MHz – OFF when connected at 10 MHz **Lk:** ON when linked – FLASH when communicating **FD:** ON when in Full Duplex
Isolation	**1.5 kV** between signals and Gnd
SHDSL	**MS-CPU32X only**
Quantity	2 x separate SHDSL modem
Model	2 x G.991.2 line
Connector	2 x Spring cage terminal blocks (2 x 2.54mm)
Cabling	Twisted pair
Speed	256 kps …2 Mps (according to cable section and quality)
Distance	Up to 15 km (according to cable section and quality)
Internal Coding	TC-PAM
Protocols	
Embedded	Modbus-RTU, ModBus-ASCII, ModBus/TCP, Serial Printer.
IP protocols, Services	HTTP(S), SMTP(S), FTP(S) “client” and ”Server”, SFTP, NTP, POP3, DynDNS, IP BRIDGE, Virtual Servers, SSH.
Additional protocols	IEC-60870-5-101, -103, -104. DNP3 “Slave”, “Master”. IEC-62056. AB DF1. DC09. SNMP. Omron Hostlink. Generic ASCII. OpenVPN …
USB/IRB	**(not available)**
Input/Output	
Stop Button Input (DI)	Internal digital input associated to the ‘STOP’ position of the button. **Use:** in Ladder/BASIC program
Synchronization (DIO° Use Type Voltage Current Protection Connector Cabling	Same channel used as input **OR** output. Multipoint connection between CPUs Synchronize actions of several CPUs **in the same cabinet** Current Sinking Max. 30 VDC Max. 45mA NO PROTECTION Spring Cage Terminal Wire range: 0.2 – 0.75 mm² (with ferrule)
Internal temperature (DI)	Temperature threshold indicated by 2 Digital Input variables: ≥70°C ≥ 85°C
Redundancy	(optional)
CPU Position in Rack	**slot0** and **slot1**
Switching between CPU	Max. 2 sec.
Applications	Each CPU have its own application (similar or different applications)
Synchronization	No synchronization between CPUs
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	272 g

Battery and MultiMedia (SD) card implementation:



5.2.1. Lithium Battery

The CPU is equipped with a Lithium battery (3 V).
This battery is used to maintain the **clock and datalogging** when the CPU is out of power.

This battery is in use when:
- the CPU is placed on a Rack
- the CPU has been powered once
- the CPU is out of power

When the **CPU is removed from the Rack**, the battery is disconnected, to avoid consuming when the CPU is in stock.
The **battery jumper** allows keeping the battery connected even when removed from the rack (see in above specification the lifetime of the battery).

Advised procedures:

1. **Standard :** the jumper is left opened.
   In this way, the battery is used when the CPU is placed on the rack to maintain clock and datalogging **when the main power has broken down**.

2. **Permanent :** you systematically place the jumper, before you start using the CPU.
   In this way, the battery is used **when the CPU has been powered at least once**, to maintain clock and datalogging when the main power has broken down, **but also when the CPU is removed from the rack** (check the lifetime of the battery in the technical specifications)

5.2.2. SD Card

The SD card is an option of ***TBox MS*** that provides several features:

1. To store all files running the ***TBox MS***. This feature is called *"Plug&Go"* (see below).
2. To initialize IP settings through "*System.xml file"* (see below).
3. To store sampling tables in case large amount of data is required.
4. To store Web Files (as of OS 1.37.410).
5. To archive data using an add-on
6. As alarm recipient to store files (report, image, datalogging, ...).

To use the SD Card, remove the CPU from the rack and insert the memory card in the appropriate socket

5.2.3. Plug & Go

Plug & Go allows storing the **complete TWinSoft project** into the SD card of ***TBox MS***.

As TWinSoft project, we mean all files, including TWinSoft compiled document with its Web and Report files, OS and even LINUX packages; all ready to run at starting of the RTU.

The SD card will be automatically updated when a new program is sent by TWinSoft; This is part of the standard feature of *Plug & Go* (see Appendix C in ***TWinSoft Programming Guide***)

5.2.4. IP Settings Initialization:

This feature requires OS >= 1.29.310
IP address initialization is carried out using a file called 'System.xml', placed in the root of the SD Card.

When an IP configuration is defined in *System.xml*, **it has priority** on the one declared for the Ethernet ports of the CPU as well as in a possible '*Plug&Go*' file.

Example of System.xml (not case sensitive)

```
<?xml version="1.0"?>
<System>
  <ComPort>
    <PortName>COM3</PortName>
    <IPconfig>
      <IP>172.25.110.177</IP>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>172.25.110.1</Gateway>
      <PrimaryDNS>172.25.110.3</PrimaryDNS>
      <SecondaryDNS>172.25.110.6</SecondaryDNS>
    </IPconfig>
    <DefaultIPconfig>
      <IP>192.168.1.99</IP>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>192.168.1.1</Gateway>
      <PrimaryDNS>0.0.0.0</PrimaryDNS>
      <SecondaryDNS>0.0.0.0</SecondaryDNS>
    </DefaultIPconfig>
  </ComPort>
</System>
```

The <DefaultIPconfig> setting will be used in case of "Global Reset" (see chapter **Global Reset of TBox MS in *"TWinSoft Programming Guide"***)

<PortName>	Communication port of ***TBox MS*** (COM3 = Ethernet)
<IP>	IP address of the port selected
<Subnet>	IP address of the Subnet mask of the port selected
<Gateway>	IP address of the equipment used as Gateway on the Network
<PrimaryDNS>	IP address of the primary DNS Server
<SecondaryDNS>	IP address of the secondary DNS Server

5.2.5. Toggle Switch (Working modes)

On the front side of the CPU, a toggle switch allows changing the working mode of the CPU: STOP - RUN - RESET

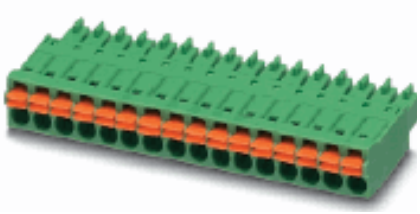
RUN	All features of ***TBox MS*** runs
RESET	By pressing Reset, it restarts the program and erases the alarms
STOP	Allows Stopping the program (see configuration in ***"TWinSoft Programming guide"***, RTU Advanced properties)

(See also the chapter related to **Global Reset of TBox MS in *"TWinSoft Programming Guide"***)

Power Supply

Description:	Connector: **PS-RS485**
Power Supply	**Spring Cage Terminal Block (5 x 2.54 mm)**

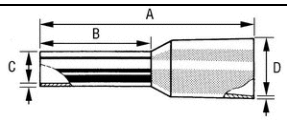
All models of MS-CPU32 are equipped with compact **spring-cage terminal blocks**.
This connector allows a high density of connections.
Press the orange plastic with a screwdriver for **inserting and removing the cable**.



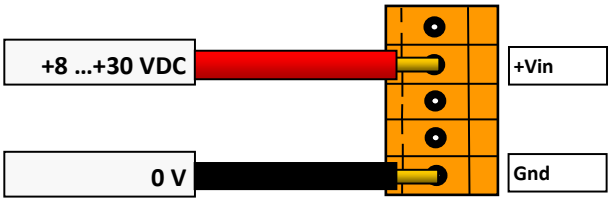
Connection capacity

Without ferrule	Solid cable: 0.2 .. 1.5 mm² (24..16 AWG)
With ferrule without plastic sleeve	Solid or Stranded cable: 0.2 .. 1.5 mm²
With ferrule with plastic sleeve	Solid or Stranded cable: 0.2 .. 0.75 mm²

Ferrule specification for 0.75mm² cable



B: **minimum 10 mm**
C: 1.5 mm D: 3.5 mm



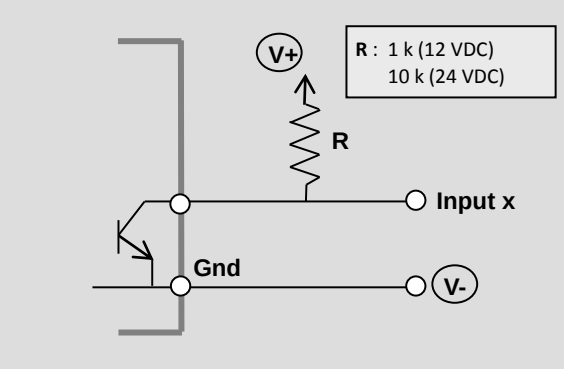
When using a Power Supply card (see previous), you **do not cable Power supply of the CPU**

Digital Input/Output “Syn”

The contact “Syn” can be used as Input **or** Output.

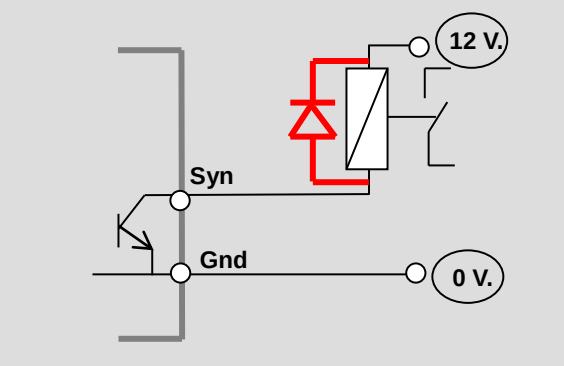
Cabling as Digital Output to a Digital Input

Maximum voltage: 30 VDC
Maximum current : 45 mA
Impedance : 60 Ω



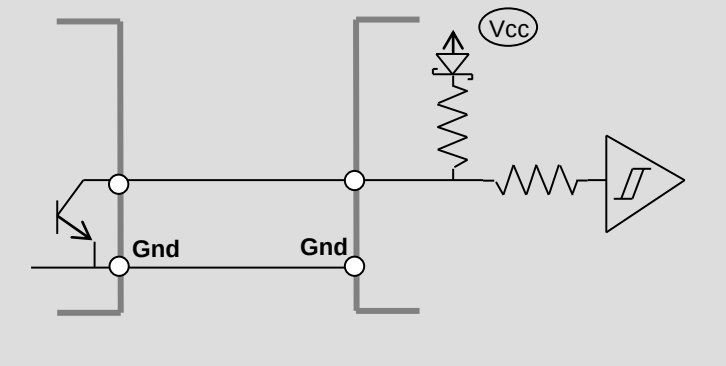
Cabling as Digital Output to a relay

Maximum voltage: 30 VDC
Maximum current : 45 mA
NO PROTECTION on the DO
(relay must be protected with a diode)
Impedance : 60 Ω



Cabling as Digital Output to another CPU

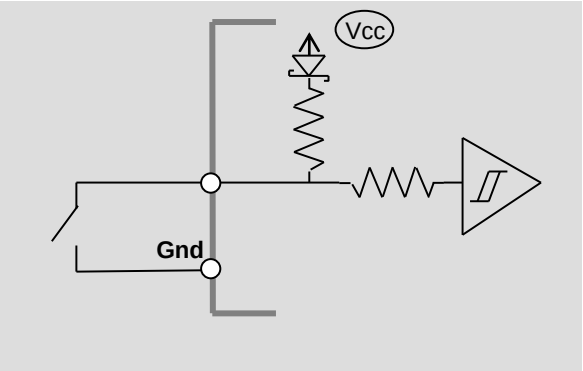
DI input voltage: 0 … 5.5V.
DI absolute maximum: 30 V.
DI Low state guaranteed: < 0.8 V.
DI High state guaranteed: > 2 V.
RC filter: 1 Khz
Max. frequency (software): 50 Hz



Cabling as Digital Input to a dry contact switch

Switch open: State “1”
Switch closed: State “0”

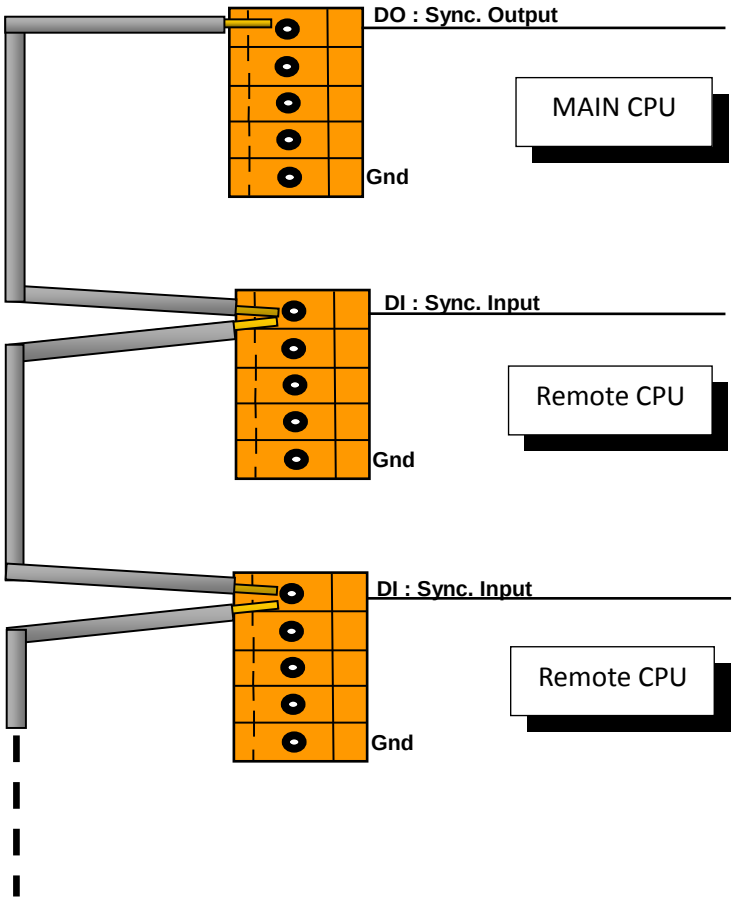
RC filter: 1 Khz
Max. frequency (software): 50 Hz



Description:	Connector: **PS-RS485**
Synchronization Input / Output	SPRING CAGE TERMINAL BLOCK (5 X 2.54 MM)

The synchronization I/O can be cabled only within the same cabinet, between several Racks.

It is used to synchronize 'Actions' of the different CPUs.

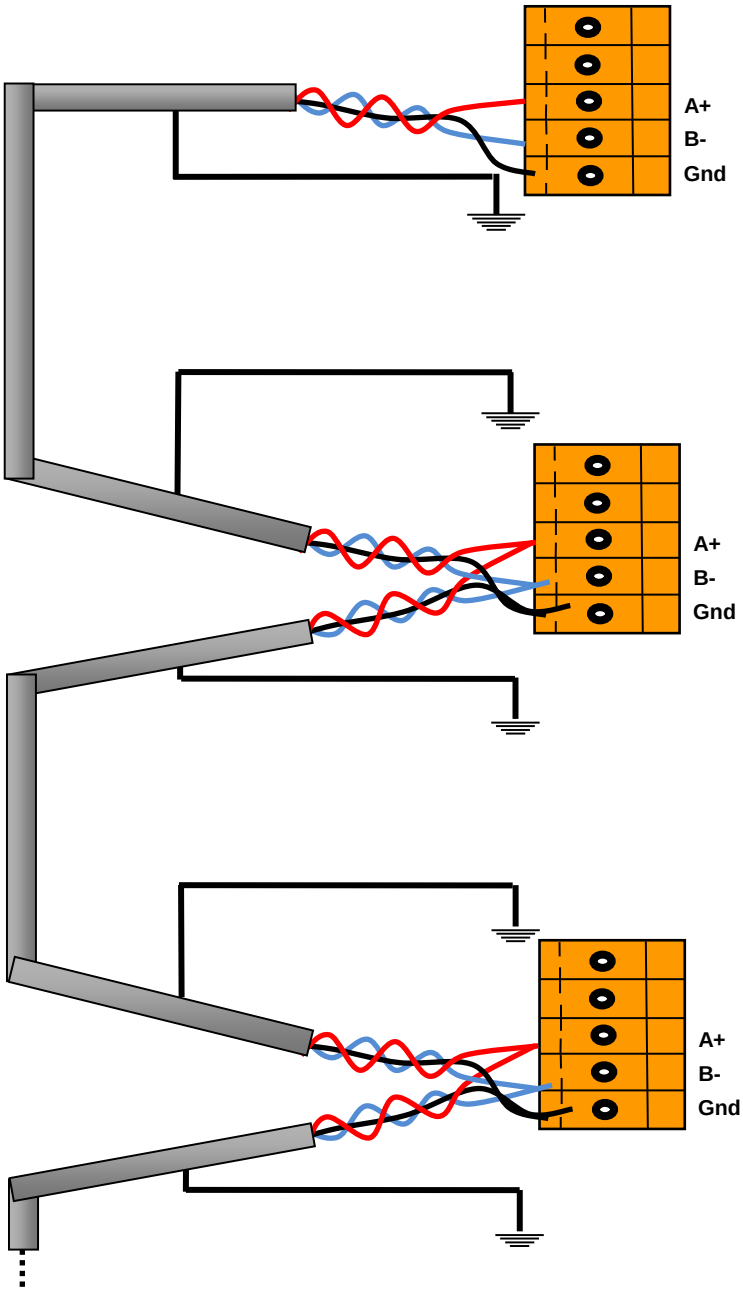


RS485

Description:	Connector: **PS-RS485**
RS485 communication	**Spring Cage Terminal Block (5 x 2.54 mm)**

Cabling several CPUs together:

A to A
B to B
Gnd to Gnd

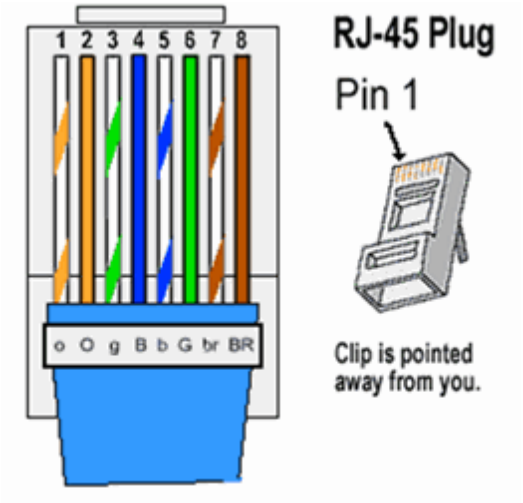


About RS485 cabling:

1. **Use a twisted pair** for signal A and B.
2. **RS 485 is not isolated**. If cabling equipment in different building (different Earth), you have to use ACC-RS485 (see your local distributor)
3. **Maximum length** depends on quality of cable, speed and quantity of stations (max. 254 stations). In good condition, guaranteed to 1.2 km.
   In practice, longer distance can be reached with lower Baudrate and less station.
4. **Cable:** - Twisted pair (2 pairs)
   - section: minimum 0.5mm²
   - screening : pair and global screening
   - reference: Li2YCY-PiMF
5. **Termination**: Termination is normally not required. It might depend on the remote equipment, on quality of the signal and speed. In case of communication error, a resistor of 120 ohms (1/4 watt) could be cabled between A+ and B-

RS232

Description:	Connector:	Pin out:
communication RS232	**RJ 45**	



1. RI white/orange
2. DCD orange
3. DTR white/green
4. Gnd blue
5. RxD (input) white/blue
6. TxD (output) green
7. CTS (input) white/brown
8. RTS (output) brown

Example of CAT cabling

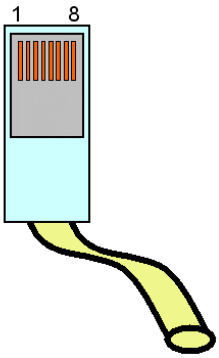
Cabling

RJ 45	DB-9 to the PC	Description
2	**1**	DCD (Data Carrier Detect)
6	**2**	RxD (Receive Data)
5	**3**	TxD (Transmit Data)
3	**4**	DTR (Data Terminal Ready)
4	**5**	GND (Ground)
	6	DSR (Data Set Ready)
8	**7**	RTS (Request To Send)
7	**8**	CTS (Clear To Send)
1	**9**	RI (Ring indicator)

Reference of cable RJ45 to DB9 = **ACC-CABL-PROG45**

Ethernet

Description: **Ethernet**	Connector: **RJ45**	Pin out:



1. Tx+
2. Tx-
3. Rx+
4. not used
5. not used
6. Rx-
7. not used
8. not used

With all models of MS-CPU32, **CLASS B immunity** requires Ethernet **cable with FERITE**

Ethernet ports of all models of MS-CPU32 accept indifferently **straight** and **crossover** cables.

Crossover cabling

TBox MS **– COM4 RJ45**		**PC – Ethernet RJ45**
Tx + 1		1 Tx +
Tx - 2		2 Tx -
Rx + 3		3 Rx +
n.u. 4		4 n.u.
n.u. 5		5 n.u.
Rx - 6		6 Rx -
n.u. 7		7 n.u.
n.u. 8		8 n.u.

Even if pins 4, 5, 7, 8 are not used, they must be cabled.

USB (MS-CPU32-S2 only)

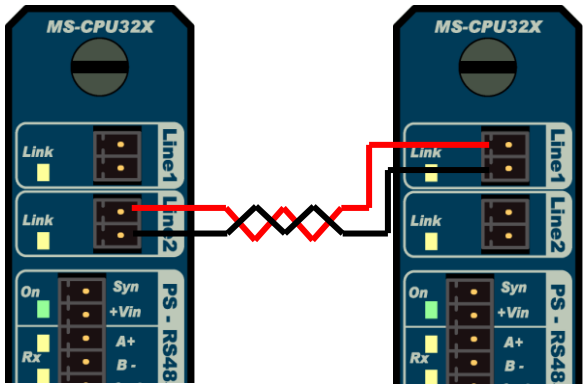
Cable to connect to a PC:
USB A/A male cable (Host to Host)

SHDSL (MS-CPU32X only)

One SHDSL modem operates as a master and the other one as a slave. When wiring two MS-CPU32X together in a point to point configuration you will wire **Line2** of CPU 1 to **Line1** of CPU 2.

LINE1 = Slave

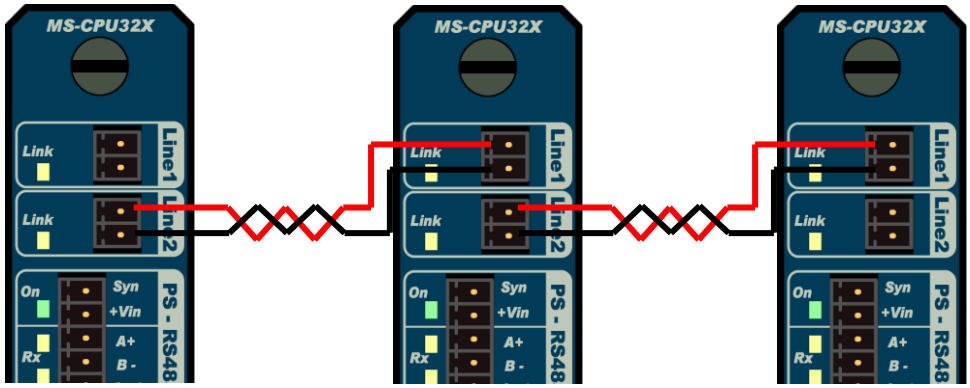
LINE2 = Master



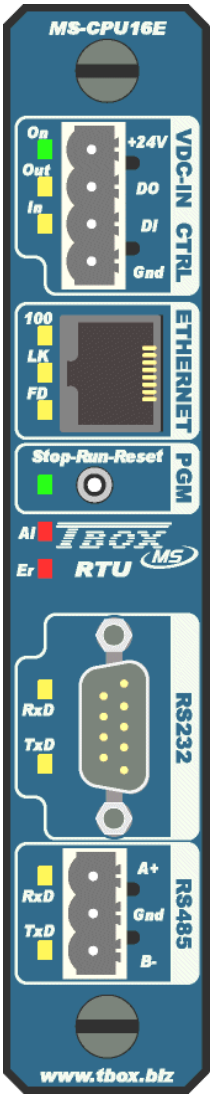
When more than two MS-CPU32X have to be connected together, you will use the daisy chain connection as follows.

LINE1 = Slave

LINE2 = Master



6. CPU 16 bits (Obsolete)

	Reference: **MS-CPU16E**
➢ Power supply input (8…30 VDC) ➢ Button for selection modes of working ➢ RS232 ➢ RS485 ➢ Ethernet ➢ I/O for synchronization ➢ Internal temperature measurement ➢ Input voltage measurement	

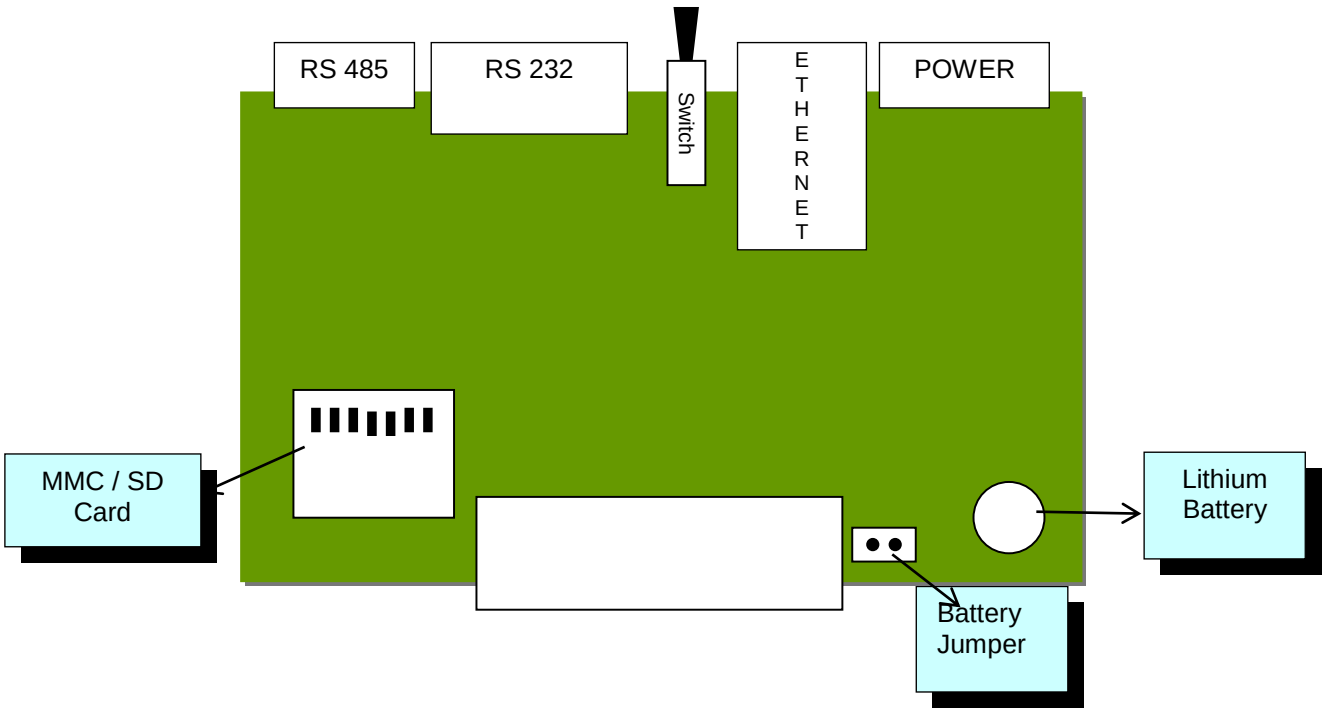
TECHNICAL SPECIFICATIONS

General		
Processor		16 bits, 7.37 Mips
Clock		Real time Clock, backed-up (see chapter 6.1)
	Clock Drift	Typical: 3 sec. /day
Button		Push button : RUN - STOP - RESET
LED	**On** (green)	ON= CPU powered, either by +Vin or by a MS-PSxxx
	Run/Stop (green)	2 Hz=RUN ; 0.5 Hz=STOP
	Ala (red)	8 Hz= Alarm active
	Err (red)	ON= error on the BUS
Power Supply		
Input Voltage		8 .. 30 VDC
Supply Current	I input total	Max. 2 A
	I on Vcc=3.3V	Max. 1 A
	I on Vp (input voltage - 1V)	Max. 1.5 A
Card Consumption	P Total	0.83 W
Connector		Screw connector (4 x 5.08mm)

Internal Battery	(see chapter 6.1)
Voltage	3 V Lithium. Ref.: **CR 1220**
Use	Backup of Clock and RAM (datalogging)
Lifetime	**CPU under voltage:** 10 years **CPU stopped and plugged on the Rack:** - Typical 265 days **WARNING:** After this time, the battery must be replaced to maintain the clock and datalogging.
Memory	
Flash	Internal: 256 Kbytes - OS: 192 Kbytes - application: 48 Kbytes - loader: 16 Kbytes External: 512 Kbytes: Web Files, Report, Sources, Ladder/BASIC (max. 64 kbytes)
RAM	Internal: 20 Kbytes External (backed up): 128 Kbytes - datalogging: 64 Kbytes + 256K (as of S/N 010000) - application: 32 Kbytes - buffer TCP: 24 Kbytes
SD card (optional)	Max. 1 Gbytes Format: FAT16
RS 232	
Connector	9 pin Sub-D (male)
Cabling (see schema next)	DTE mode (same as PC) 4 Wires: TxD, RxD, RTS, CTS
Protocol	ModBus-RTU Master / Slave
LED	**RxD**: ON when receiving **TxD**: ON when transmitting
RS 485	
Connector	Screw connector (3 x 5.08mm)
Cabling (see schema next)	2 Wires + GND
Protocol	ModBus-RTU 'Master' and 'Slave'
LED	**RxD:** ON when receiving **TxD:** ON when transmitting
Isolation	**No isolation** between signal and Power Supply
Protection	**Over voltage protection** (common mode)
Number of slaves	254 (if RS485 technology of slaves allows it too)
Termination	Termination not required. *Failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are opened or in short-circuit.
Ethernet	
Model	10/100 BASE-TX (4 wires) Full Duplex / Auto-negotiation
Connector	RJ-45
Cabling	**To a Hub, …:** with straight pinned CAT5 cable **To a PC:** with a Crossover CAT5 cable (see cabling following)
Speed	10/100 Mbits
Protocols	ModBus/TCP 'Master' and 'Slave', SMTP, FTP, HTTP, Ping
Sockets	Total 8 sockets : - 5 sockets reserved for 'Server' mode - 1 socket reserved for 'Remote Tag' as Master (if required) - 2 sockets reserved for 'Alarms' - TCP/IP (if required)
LED	**100:** ON when connected at 100 MHz – OFF when connected at 10 MHz **Lk:** ON when linked – FLASH when communicating **FD:** ON when in Full Duplex
Isolation	**1.5 kV** between signals and Gnd

Input/Output	
Stop Button Input	Internal digital input associated to the 'STOP' position of the button. **Use:** in Ladder/BASIC program
Synchronization I/O	Multipoint connection between CPUs **Use:** synchronize actions of several CPUs **in the same cabinet**
Synchronization Input	**Use:** to receive 'Synchronization Output' from other CPU **Vin:** 0 → 5.5 V **Protection:** Over voltage: max. 33 V Inversion: max. 29 V
Synchronization Output	**Use:** to connect to 'Synchronization Input' of other CPU **Type:** Current sinking **Voltage:** max. 50V **Current:** max. 45mA **Resistance:** max. 60 ohms **NO PROTECTION**
Internal temperature	Temperature threshold indicated by 2 Digital Input variables: ≥ 70°C ≥ 85°C
Voltage input (VDC-IN)	Internal Analog Input **Use:** measurement of the Input Power Voltage (when system powered from the CPU and not from a MS-PSxxx module) **Precision:** 1 V
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	272 g

Battery and MultiMedia (SD) card implementation:



6.1. Lithium Battery

The CPU is equipped with a Lithium battery (3 V).
This battery is used to maintain the **clock and datalogging** when the CPU is out of power.

This battery is in use when:
- the CPU is placed on a Rack
- the CPU has been powered once
- the CPU is out of power

When the **CPU is removed from the Rack**, the battery is disconnected, to avoid consuming when the CPU is in stock.
The **battery jumper** allows keeping the battery connected even when removed from the rack (see in above specification the lifetime of the battery).

Advised procedures:

1. **Standard :** the jumper is left opened.
   In this way, the battery is used when the CPU is placed on the rack to maintain clock and datalogging **when the main power has broken down**.

2. **Permanent :** you systematically place the jumper, before you start using the CPU.
   In this way, the battery is used **when the CPU has been powered at least once**, to maintain clock and datalogging when the main power has broken down, **but also when the CPU is removed from the rack** (check the lifetime of the battery in the technical specifications)

6.2. SD Card

The SD card is an option of ***TBox MS*** that provides two features:

1. To store all files running the ***TBox MS***. This feature is called *"Plug&Go"* (see below).
2. To initialize IP settings through "*System.xml file"* (see below).

To use the SD Card, remove the CPU from the Rack and insert the memory card in the appropriate socket.

6.2.1. Plug & Go

Plug & Go allows storing the **complete TWinSoft project** into the MultiMedia Card of ***TBox MS***.

As TWinSoft project, we mean all files, including TWinSoft compiled document with its Web and Report files, OS and even Loader; all ready to run at starting of the RTU (see Appendix C in ***TWinSoft Programming Guide***).

6.2.2. IP Settings Initialization: System.xml

SD card can also be used to initialize IP addresses of ***TBox MS***.

IP address initialization is carried out using a file called 'System.xml', placed in the root of the SD Card.

When an IP configuration is defined in *System.xml*, **it has priority** on the one declared for the Ethernet ports of the CPU as well as in a possible '*Plug&Go*' file.

Example of System.xml:

```
<?xml version="1.0"?>
<System>
  <ComPort>
    <PortName>COM3</PortName>
    <IPconfig>
      <IP>192.168.1.75</IP>
      <Subnet>255.255.255.0</Subnet>
      <Gateway>192.168.1.1</Gateway>
      <PrimaryDNS>192.168.1.1</PrimaryDNS>
    </IPconfig>
  </ComPort>
</System>
```

<PortName>	Communication port of MS-CPU16 (COM3 = Ethernet)
<IP>	IP address of the port selected
<Subnet>	IP address of the Subnet mask of the port selected
<Gateway>	IP address of the equipment used as Gateway on the Network
<PrimaryDNS>	IP address of the DNS Server (only primary DNS is handled)

6.3. Toggle Switch (Working Modes)

On the front side of the CPU, a toggle switch allows changing the working mode of the CPU: STOP - RUN - RESET

RUN	All features of ***TBox MS*** runs
RESET	Pressing Reset, restart the program, erase the alarms and the datalogging
STOP	Allows Stopping the program (see configuration in ***"TWinSoft Programming guide"***, RTU Advanced properties -> Start/Stop)

(See also chapter related to **Global Reset of TBox MS in *"TWinSoft Programming Guide"***)

Power Supply

Description:	Connector: **VDC-IN CTRL**
Power Supply	**Screw Connector (4 x 5.08 mm)**

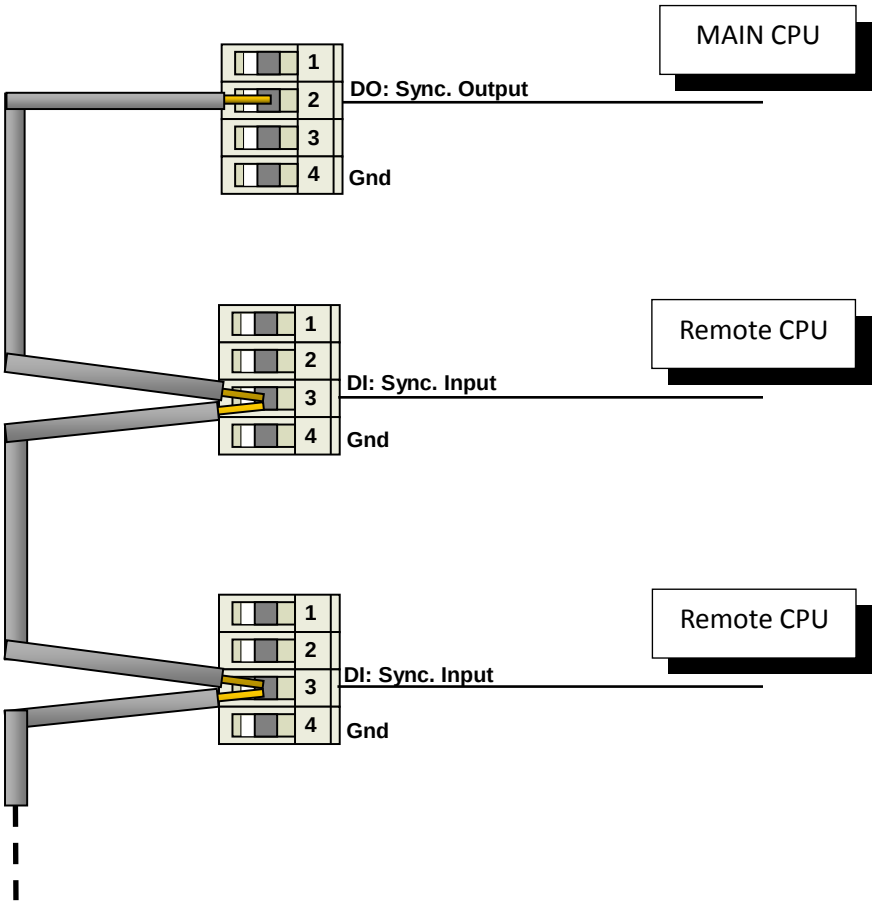
When using a Power Supply card (see previous), you **do not cable Power supply of the CPU**

Digital Input – Digital Output

Description:	Connector: **VDC-IN CTRL**
Synchronization Input / Output	SCREW CONNECTOR (4 X 5.08 MM)

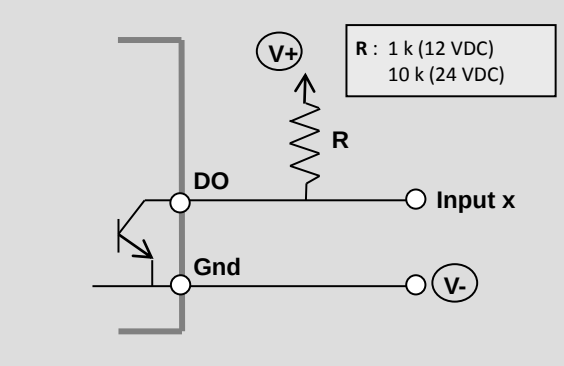
The synchronization I/O can be cabled only within the same cabinet, between several Racks.

It is used to synchronize 'Actions' of the different CPUs.



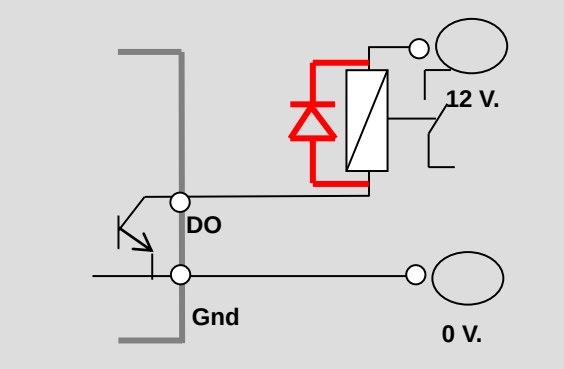
Cabling DO of CPU to a Digital Input

Maximum voltage: 50 VDC
Maximum current : 45 mA
Impedance : 60 Ω



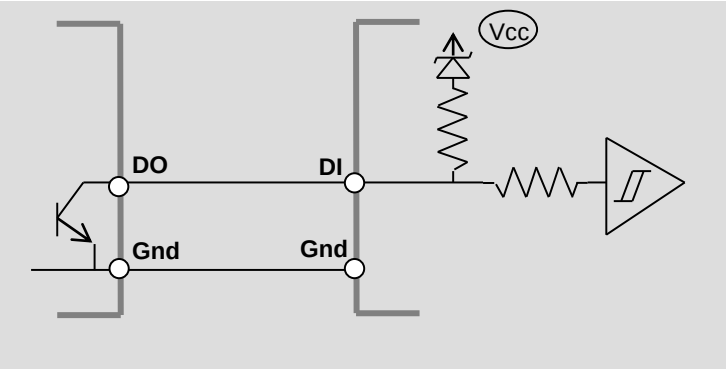
Cabling DO of the CPU to a relay

Maximum voltage: 50 VDC
Maximum current : 45 mA
NO PROTECTION on the DO
(relay must be protected with a diode)
Impedance : 60 Ω



Cabling DO of the CPU to DI of the CPU

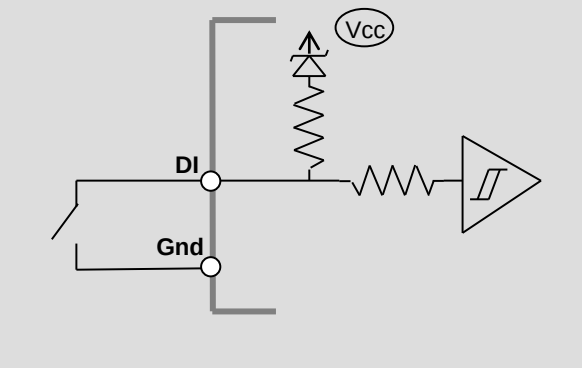
DI input voltage: 0 … 5.5V.
DI absolute maximum: 30 V.
DI Low state guaranteed: < 0.8 V.
DI High state guaranteed: > 2 V.
RC filter: 1 Khz
Max. frequency (software): 50 Hz



Cabling DI to dry contact switch

Switch open: State “1”
Switch closed: State “0”

RC filter: 1 Khz
Max. frequency (software): 50 Hz

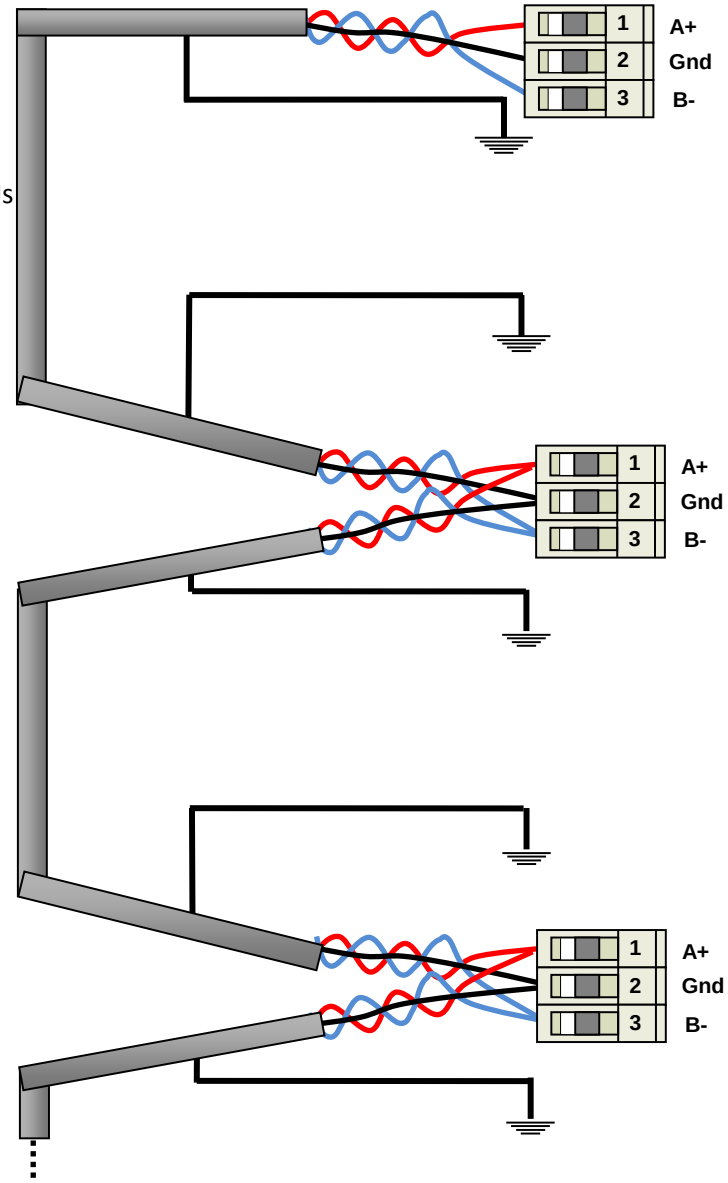


RS485

Description:	Connector: **RS485**
RS485 communication	**Screw connector (3 x 5.08 mm)**

Cabling several CPUs together:

A to A
B to B
Gnd to Gnd

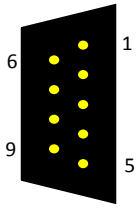


About RS485 cabling:

1. **Use a twisted pair** for signal A and B.
2. **RS 485 is not isolated**. If cabling equipment in different building (different Earth), you have to use ACC-RS485 (see your local distributor)
3. **Maximum length** depends on quality of cable, speed and quantity of stations (max. 254 stations). In good condition, guaranteed to 1.2 km.
   In practice, longer distance can be reached with lower Baudrate and less station.
4. **Cable:** - Twisted pair (2 pairs)
   - section: minimum 0.5mm²
   - screening : pair and global screening
   - reference: Li2YCY-PiMF
5. **Termination**: Termination is normally not required. It might depend on the remote equipment, on quality of the signal and speed. In case of communication error, a resistor of 120 ohms (1/4 watt) could be cabled between A+ and B-

RS232

Description:	Connector: **RS232**	Pin out:
RS232	**9 Pin Sub D**	



1.
2. RxD (input)
3. TxD (output)
4.
5. Gnd
6.
7. RTS (Output)
8. CTS (input)
9.

Cabling to a PC

TBox MS - COM1		PC - DB 9	
RxD	2	2	RxD
TxD	3	3	TxD
GND	5	5	GND
RTS	7	7	RTS
CTS	8	8	CTS

Cabling to a Printer (RS232)

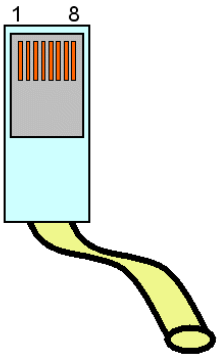
WITHOUT Flow Control	WITH Flow Control

TBox MS – COM1		Printer – DB 25	
RxD	2	2	TxD
TxD	3	3	RxD
GND	5	7	GND
RTS	7	4	RTS
CTS	8	5	CTS

TBox MS - COM1		Printer - DB 25	
RxD	2	2	TxD
TxD	3	3	RxD
GND	5	7	GND
RTS	7	4	RTS
CTS	8	5	CTS

Ethernet

Description: **Ethernet**	Connector: **RJ45**	Pin out :



1. Tx+
2. Tx-
3. Rx+
4. not used
5. not used
6. Rx-
7. not used
8. not used

Ethernet cabling

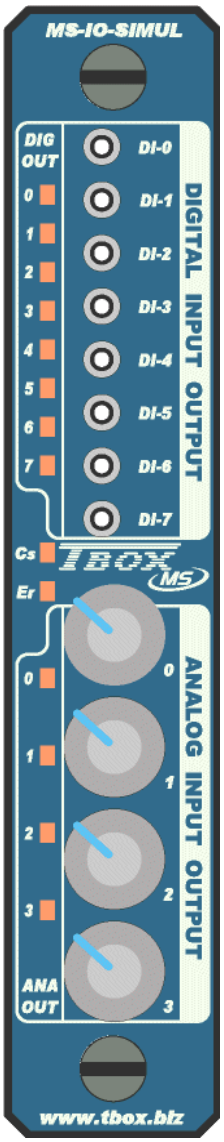
To cable ***TBox MS*** directly to a PC, without connecting to a switch, you can use a **straight** or **crossover cable**.

Crossover cable:

TBox MS16 **COM3 RJ45**			**PC – Ethernet RJ45**	
Tx +	1		1	Tx +
Tx -	2		2	Tx -
Rx +	3		3	Rx +
n.u.	4		4	n.u.
n.u.	5		5	n.u.
Rx -	6		6	Rx -
n.u.	7		7	n.u.
n.u.	8		8	n.u.

Even if pins 4, 5, 7, 8 are not used, they must be cabled.

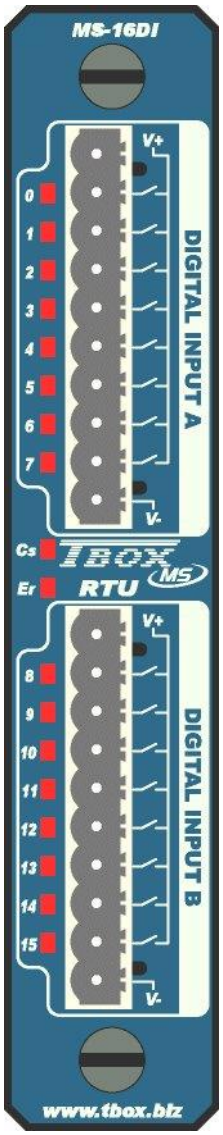
7. I/O Simulation

	Reference: **MS-IO-SIMUL**
➢ 8 digital inputs: available with switches ➢ 8 digital outputs: available with LEDs (ON/OFF) ➢ 4 analog inputs: available with potentiometer ➢ 4 analog outputs: available with LEDs (brightness variation)	

MS-IO-SIMUL is the ideal card for making tests and demonstrating ***TBox MS***.

General		
Consumption	P Total	0.41 W
Environment		
Temperature storage		-40°C to 85°C
Temperature working (ambient)		**Industrial temperature:** -40°C to 70°C
Humidity		15 to 95 % without condensation
Altitude		Max. 5000 m

8. 16 x digital Inputs

	Reference: **MS-16DI**
➢ 2 groups of 8 digital inputs ➢ isolation by group of 8 inputs	

TECHNICAL SPECIFICATIONS

General		
Quantity		16 inputs
Consumption	P Total	0.17 W
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Compatibility		Concerning voltages, with type 1 and 2 of **IEC61131-2**
Connector		Screw connector (10x5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

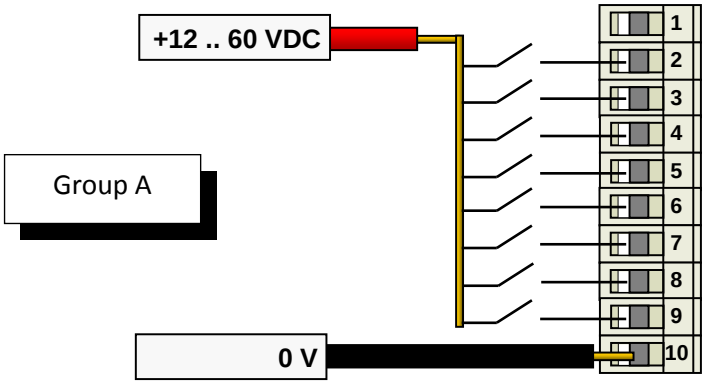
16 x Digital Inputs (next)

LED	
Individual	LED corresponding to the activation of each digital input.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation from the Ground	Isolation from the CPU ground and the earth
2 groups isolated	Isolation by group of 8 inputs: One Common by group of 8 Inputs.
Level of isolation	1500 Vrms - between groups - between Inputs and ground - between Inputs and earth
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' above)
RC filter	1592 Hz
Voltage inversion	Up to 55 VDC
Protection EMC	
Voltage at input	
Typical	24 VDC
Maximum for a LOW level	5 VDC
Minimum for a HIGH level	11 VDC
Maximum	60 VDC
Current	
Maximum at the input	2.0 mA at 30 VDC 4.5 mA at 60 VDC
Resistance	Typical: 12 kΩ
Sampling	
Minimum period LOW – HIGH	Task switching between process cycle has to be taken into account, as well as cycle time itself: MS-CPU16: 10 ms. + cycle time. MS-CPU32: 4 ms. + cycle time.
Frequency (software)	At each cycle of BASIC / Ladder
Temperature	
Storage	-40° to 85°C
Working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Environment	
Temperature storage	-40°C to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000 m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	254 g

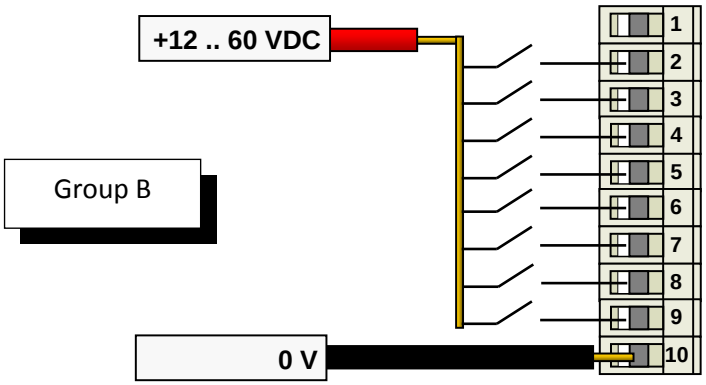
16 x Digital Inputs (next)

CABLING

Description:	Connector:	Pin Out:
Cabling of inputs	**Screw connector**	

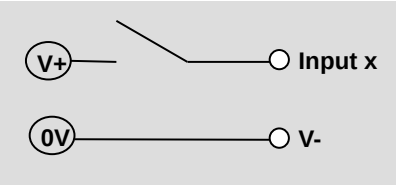


1	NC
2	Input 0
3	Input 1
4	Input 2
5	Input 3
6	Input 4
7	Input 5
8	Input 6
9	Input 7
10	V-

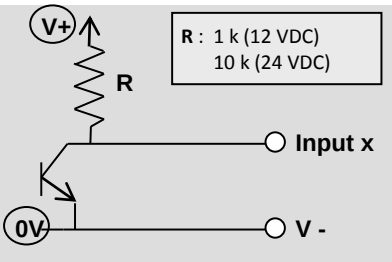


1	NC
2	Input 8
3	Input 9
4	Input 10
5	Input 11
6	Input 12
7	Input 13
8	Input 14
9	Input 15
10	V-

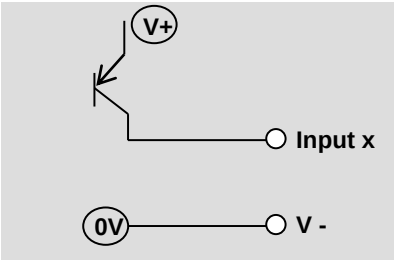
Cabling to Dry contact



Cabling to NPN transistor

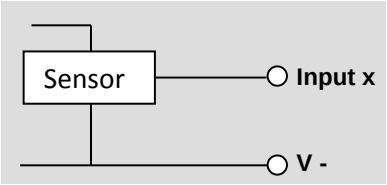


Cabling to PNP transistor (or OPTO)

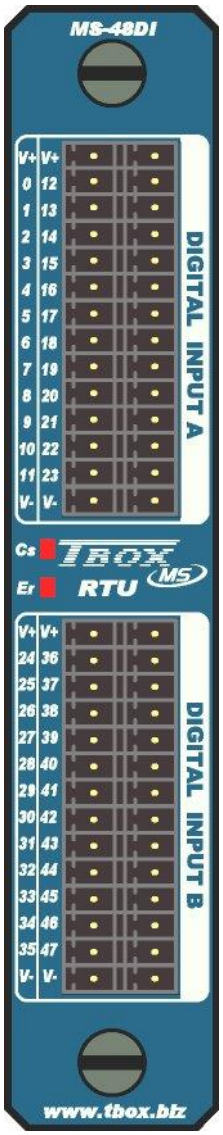


Inverted logic: output=1 → input=0

Cabling to Voltage sensor



9. 48 x digital Inputs

	Reference: **MS-48DI**
➢ 4 groups of 12 digital inputs ➢ isolation by group of 12 inputs	

TECHNICAL SPECIFICATIONS

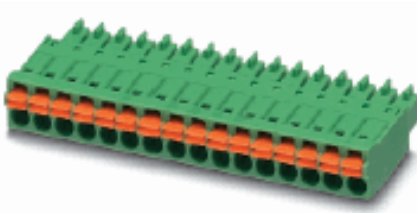
General		
Quantity		48 inputs
Consumption	P Total	0.08 W
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Compatibility		Concerning voltages, with type 1 and 2 of **IEC61131-2**
Connector		Spring Cage Terminal (14 x 2.54mm) Wire range: 0.14 – 0.75 mm² (with ferrule)

48 x Digital Inputs (next)

LED	
Individual	No individual LED
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation from the Ground	Isolation from the CPU ground and the earth
2 groups isolated	Isolation by group of 12 inputs: One Common by group of 8 Inputs.
Level of isolation 1500 Vrms 250 Vrms 1500 Vrms 1500 Vrms 1500 Vrms	- between groups on different connectors - between groups on the same connector - between inputs and ground - between inputs and earth - between inputs and the BUS
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' above)
RC filter	1592 Hz
Voltage inversion	Up to 55 VDC
Protection EMC	
Voltage at input	
Typical	24 VDC
Maximum for a LOW level	5 VDC
Minimum for a HIGH level	11 VDC
Maximum	60 VDC
Current	
Maximum at the input	2.0 mA at 30 VDC 4.5 mA at 60 VDC
Resistance	Typical: 12 kΩ
Sampling	
Minimum period LOW – HIGH	Task switching between process cycle has to be taken into account, as well as cycle time itself: MS-CPU16: 10 ms. + cycle time. MS-CPU32: 4 ms. + cycle time.
Frequency (software)	At each cycle of BASIC / Ladder
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	254 g

CABLING

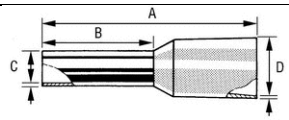
MS-48DI card is equipped with compact **spring-cage terminal blocks**.
This connector allows a high density of connections.
Press the orange plastic with a screwdriver for **inserting and removing the cable**.



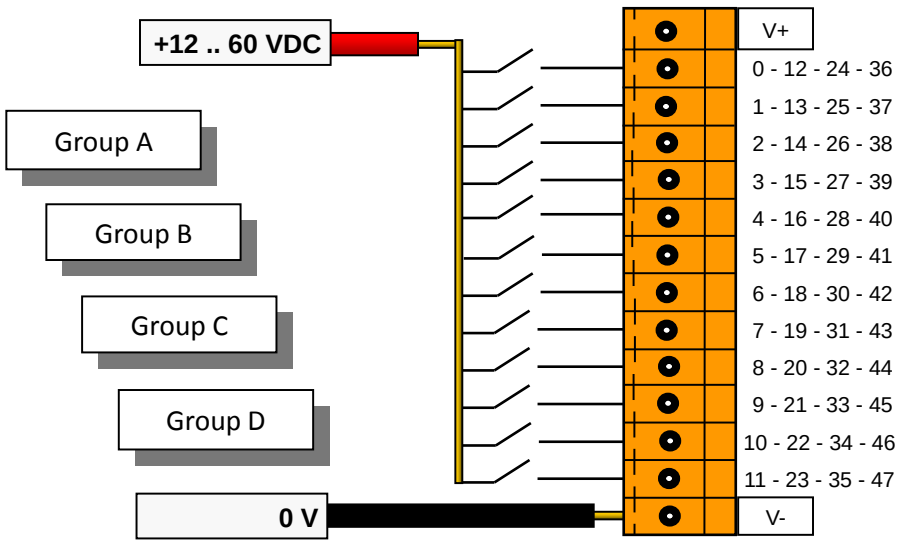
Connection capacity

Without ferrule	Solid cable: 0.2 .. 1.5 mm² (24..16 AWG)
With ferrule without plastic sleeve	Solid or Stranded cable: 0.2 .. 1.5 mm²
With ferrule with plastic sleeve	Solid or Stranded cable: 0.2 .. 0.75 mm²

Ferrule specification for 0.75mm² cable

	B: **minimum 10 mm** C: 1.5 mm D: 3.5 mm	Reference: Weidmüller 9021050000

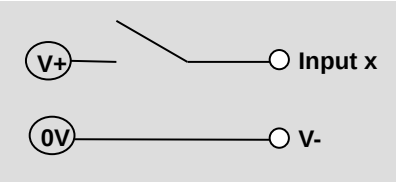
Description:	Connector:	Pin Out:
Cabling of inputs	**Spring-cage terminal**	



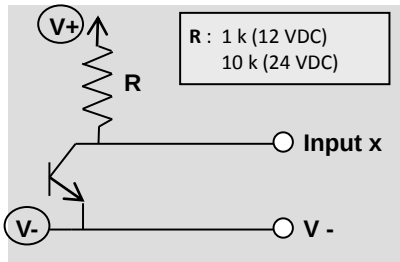
NC
Inputs 0 – 12 – 24 - 36
Inputs 1 – 13 – 25 - 37
Inputs 2 – 14 – 26 - 38
Inputs 3 – 15 – 27 - 39
Inputs 4 – 16 – 28 - 40
Inputs 5 – 17 – 29 - 41
Inputs 6 – 18 – 30 - 42
Inputs 7 – 19 – 31 - 43
Inputs 8 – 20 – 32 - 44
Inputs 9 – 21 – 33 - 45
Inputs 10 – 22 – 34 - 46
Inputs 11 – 23 – 35 - 47
V-

48 x Digital Inputs (next)

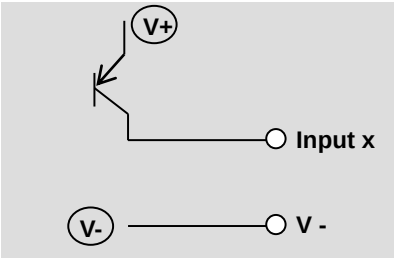
Cabling to Dry contact



Cabling to NPN transistor

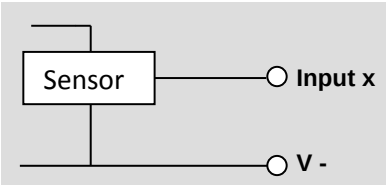


Cabling to PNP transistor (or OPTO)

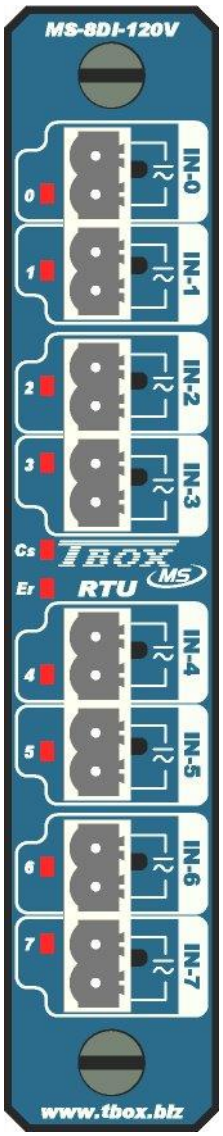


Inverted logic: output=1 → input=0

Cabling to Voltage sensor



10. 8 x Digital Inputs – AC/DC

	References: **MS-8DI-48** **MS-8DI-120** **MS-8DI-240**
➢ 8 inputs ➢ 3 models: • MS-8DI-48: 20…60 VDC or VAC • MS-8DI-120: 90…132 VDC or VAC • MS-8DI-240: 190…265 VAC ➢ isolation one by one	

TECHNICAL SPECIFICATIONS

General		
Quantity		8 inputs
Consumption	P Total	0.17 W
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Connector		Screw connector (2x5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

8 x Digital Inputs – AC (next)

LED	
Individual	LED corresponding to the activation of each digital input.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation between Inputs and BUS	3000 Vrms
Isolation between Inputs	1500 Vrms.
Isolation between Inputs and GND	1500 Vrms
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	254 g

MS-8DI-48	
Voltage ranges	20…60 Vrms 20..60 VDC
Frequency range	47..63 Hz
Maximum Voltage for a LOW level	8 V
Maximum Current for a LOW level	1 mA
Minimum Voltage for a HIGH level	20 V
Minimum Current for a HIGH level	2 mA
Minimum Input impedance	6210 Ω
Maximum Current at Maximum Voltage	10 mA

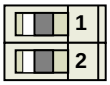
MS-8DI-120	
Voltage ranges	90…132 Vrms 90..132 VDC
Frequency range	47..63 Hz
Maximum Voltage for a LOW level	35 V
Maximum Current for a LOW level	1 mA
Minimum Voltage for a HIGH level	90 V
Minimum Current for a HIGH level	2 mA
Minimum Input impedance	33480 Ω
Maximum Current at Maximum Voltage	4 mA

MS-8DI-240	
Voltage range	190…265 Vrms
Frequency range	47..63 Hz
Maximum Voltage for a LOW level	60 V
Maximum Current for a LOW level	2 mA
Minimum Voltage for a HIGH level	190 V
Minimum Current for a HIGH level	3 mA
Minimum Input impedance	33045 Ω
Maximum Current at Maximum Voltage	8 mA

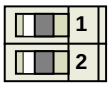
8 x Digital Inputs – AC (next)

CABLING

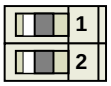
Description:	Connector:	Pin Out:
AC inputs	**Screw connector**	



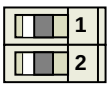
1 Input ~ 0
2 Input ~ 0



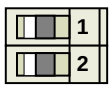
1 Input ~ 1
2 Input ~ 1



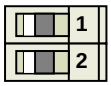
1 Input ~ 2
2 Input ~ 2



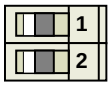
1 Input ~ 3
2 Input ~ 3



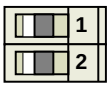
1 Input ~ 4
2 Input ~ 4



1 Input ~ 5
2 Input ~ 5

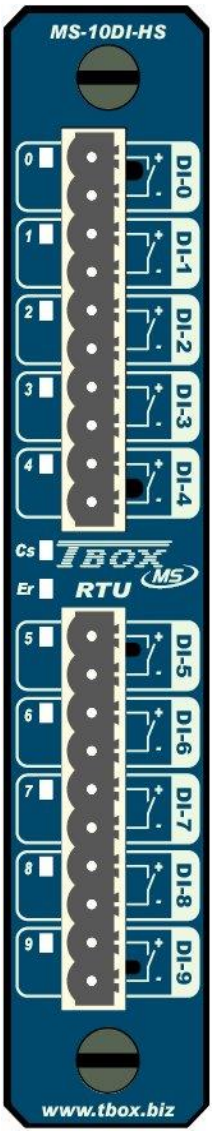


1 Input ~ 6
2 Input ~ 6



1 Input ~ 7
2 Input ~ 7

11. 10 x Digital Inputs High Speed

	Reference: **MS-10DI-HS**
It requires minimum version: • **TWinSoft 10.05.1204** • **OS MS-CPU16: 3.20.634** • **OS MS-CPU32: 1.11.124** ➢ 10 isolated inputs, one by one. ➢ 50 khz Counter ➢ Quadrature Inputs ➢ Adjustable debounce filter	

TECHNICAL SPECIFICATIONS

General		
Quantity		10 inputs
Consumption	P Total	0.50 W
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Connector		Screw connector (10 x 5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

10 x Digital Inputs High Speed (next)

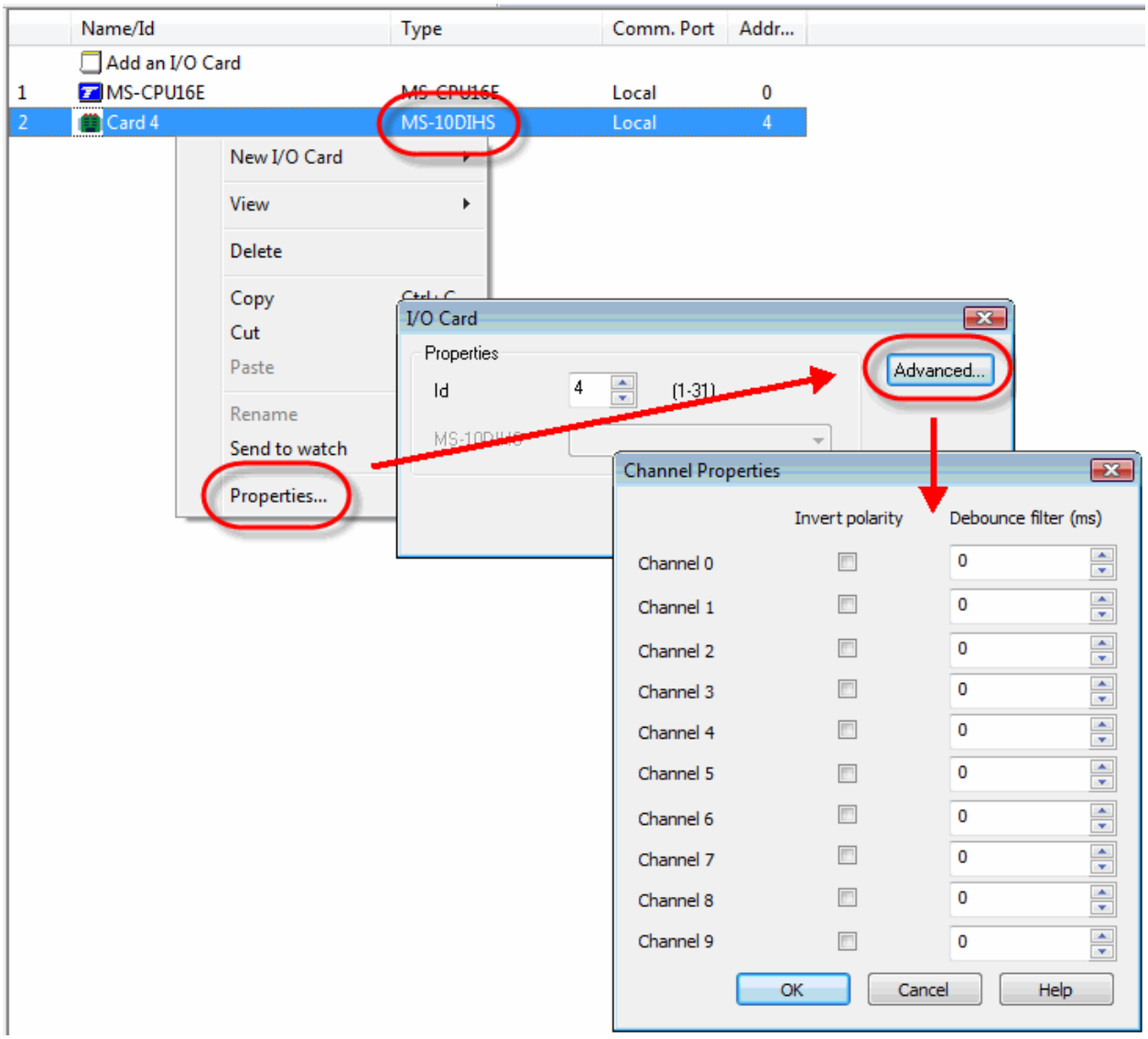
LED	
Individual	LED corresponding to the activation of each digital input.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation Level	1500 Vrms - between inputs - between Inputs and ground
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' above)
Voltage inversion	Up to 55 VDC
Protection EMC	
Voltage at input	
Maximum	30 VDC
Maximum for a LOW level	1.234 VDC (or 470 µA)
Minimum for a HIGH level	4 VDC (or 7.1 mA)
Current	
Typical	8.0 mA
Maximum	12.5 mA @ 30 VDC
Frequencies	
Frequency max.	50 kHz
Debounce filter	Software filter (see next)
Variables	
Digital Input (Group 0)	10 variables giving the current digital state
Counter (Group 1)	10 variables associated to each channel
Quadrature (Group 2)	5 counter variables associated to a pair of channel (0-1; 2-3; 4-5; 6-7; 8-9)
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	254 g

Software configuration

Each channel can be configured independently from each other.
After you have declared the card, go to the context menu “Properties” → “Advanced...”.

Invert polarity: by default, input=1 when signal is present. You can invert the logic.

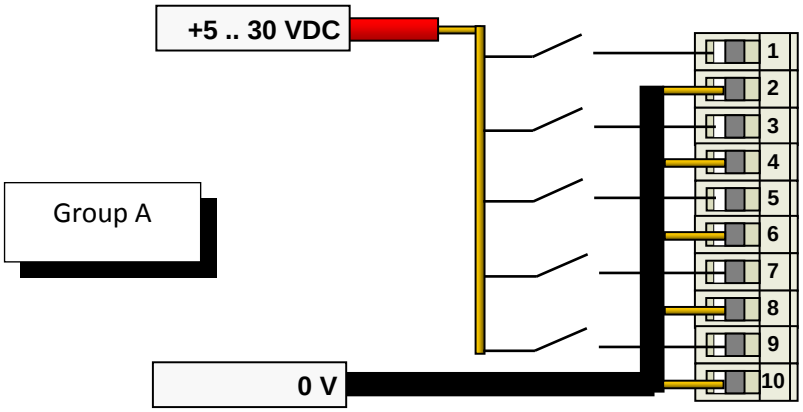
Debounce Filter: software filter in ms.



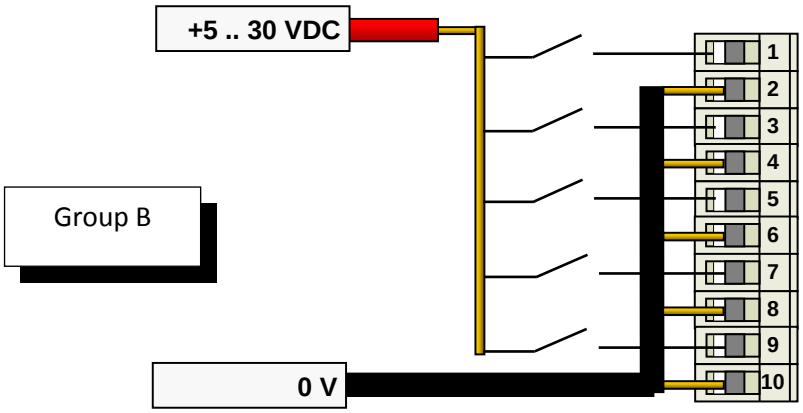
10 x Digital Inputs High Speed (next)

CABLING

Description:	Connector:	Pin Out:
Cabling of inputs	**Screw connector**	



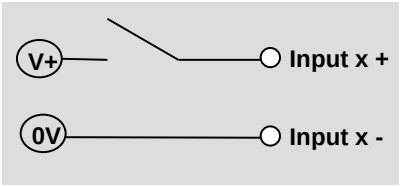
1	Input 0 +
2	Input 0 -
3	Input 1 +
4	Input 1 -
5	Input 2 +
6	Input 2 -
7	Input 3 +
8	Input 3 -
9	Input 4 +
10	Input 4 -



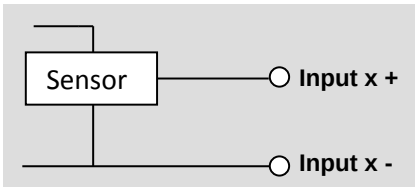
1	Input 5 +
2	Input 5 -
3	Input 6 +
4	Input 6 -
5	Input 7 +
6	Input 7 -
7	Input 8 +
8	Input 8 -
9	Input 9 +
10	Input 9 -

"Switch" Type Cabling

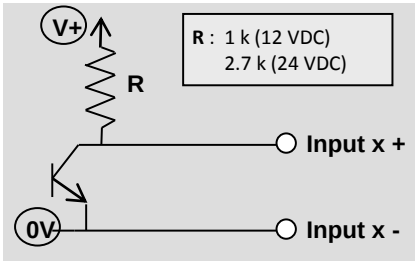
Cabling to Dry contact



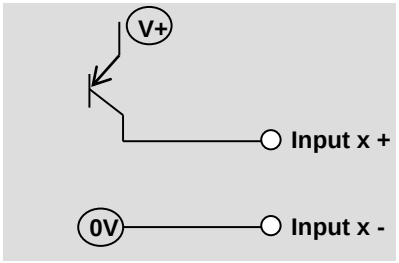
Cabling to Voltage sensor



Cabling to NPN transistor

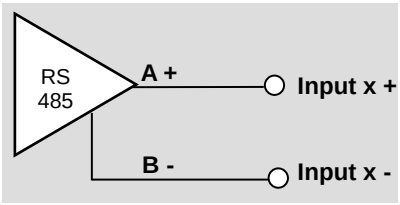


Cabling to PNP transistor (or OPTO)



Inverted logic: output=1 → input=0

"RS485" Cabling



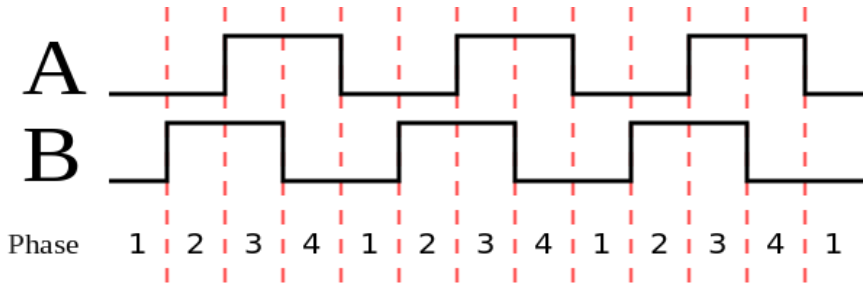
Quadrature Cabling

Cabling of two pulse train dephased by 90° to two successive digital inputs. The counter increments / decrements according to the direction of the phase displacement.

Quadrature "Counter" Variables	**Pulse Train 1** 	**Pulse Train 2** 
Quadrature 1	**Input 0**	**Input 1**
Quadrature 2	**Input 2**	**Input 3**
Quadrature 3	**Input 4**	**Input 5**
Quadrature 4	**Input 6**	**Input 7**
Quadrature 5	**Input 8**	**Input 9**

Counting

At each edge of one pulse train, the counter will be incremented / decremented according the direction of the phase displacement (B ahead from B or contrary).
It means counting goes 4 times faster than pulse frequency which increases resolution.

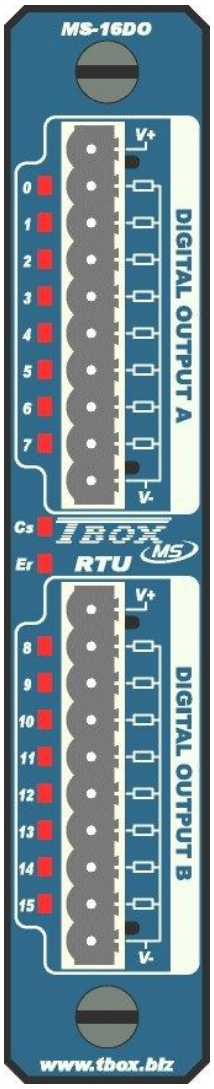


Setting the "zero"

The Quadrature counter is an "unsigned" 32 bits variable that you can write in (0 -> 4 294 967 295).
Then in case you want to specify a reference point of your mechanic, you position the mechanic at its reference position and write the value in the counter variable according to scale you want to work with.
For instance: **0** or **100** or **2000** or **10000** or … .


MIND if you initialize the counter to "0", in case there 1 step backward it will be the maximum value.
Example if the rollover is 32 bits, then it will change from 0 -> 4 294 967 295.

12. 16 x digital Outputs

	Reference: **MS-16DO**
➢ 2 groups of 8 digital outputs ➢ isolation by group of 8 outputs	

TECHNICAL SPECIFICATIONS

General		
Quantity		16 outputs
Consumption	P Total	0.33 W
Type		Current Sourcing (PNP transistor)
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Connector		Screw connector (10x5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)

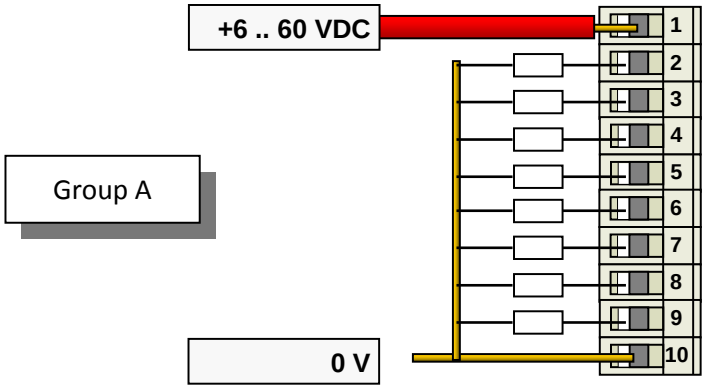
16 x Digital Outputs (next)

LED	
Individual	LED corresponding to the activation of each output.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation from the Ground	Isolation from the CPU ground and the earth
2 groups isolated	Isolation by group of 8 outputs: One Common by group of 8 outputs.
Level of isolation	1500 Vrms - between group - between Outputs and ground - between Outputs and earth
Protection	
Test	Automatic test of the access of the card by the CPU (see LED 'CS' above)
Protection diode	Protection against inverted voltage when working with inductive load **WARNING: if the output is connected to a DC relay driving an AC relay, the AC relay must be protected with an RC circuit (see chapters 12.1 and 12.2)**
Overload	Maximum: 60 VDC
Reverse voltage	Maximum: 55 VDC
Short-circuit + Overload	Thermal protection with automatic recovery
Voltage / Current	
Working voltage on V+	6 to 60 VDC
Current per output	Maximum: 200 mA
Voltage per output	Maximum: 60 VDC (depending on V+)
Short-Circuit current	Minimum: 0.2 A Typical: 0.9A Maximum: 1.2A
Impedance	Typical: 1 ohm Maximum: 10 ohms
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	258 g

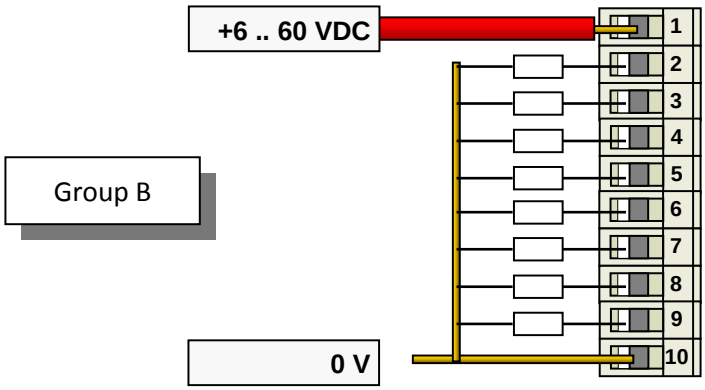
16 x Digital Outputs (next)

CABLING

Description:	Connector:	Pin Out:
Cabling of outputs	**Screw connector**	



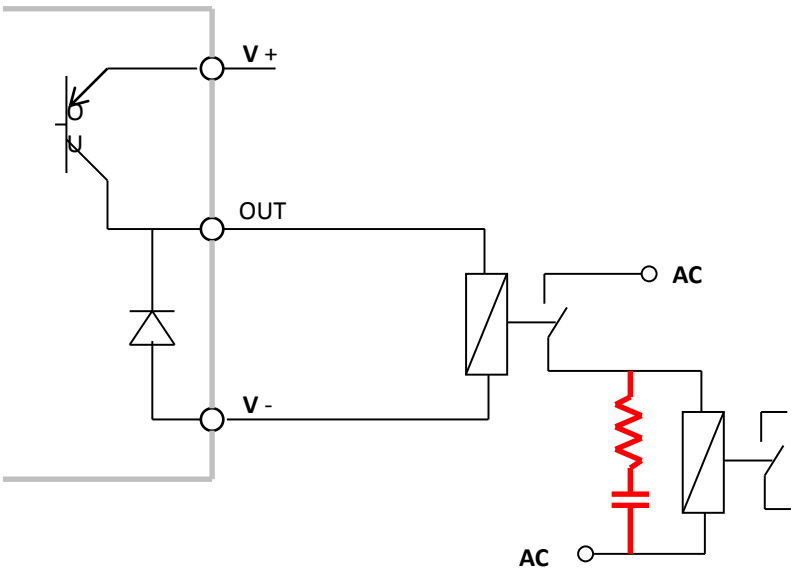
1	V+
2	Output 0
3	Output 1
4	Output 2
5	Output 3
6	Output 4
7	Output 5
8	Output 6
9	Output 7
10	V-



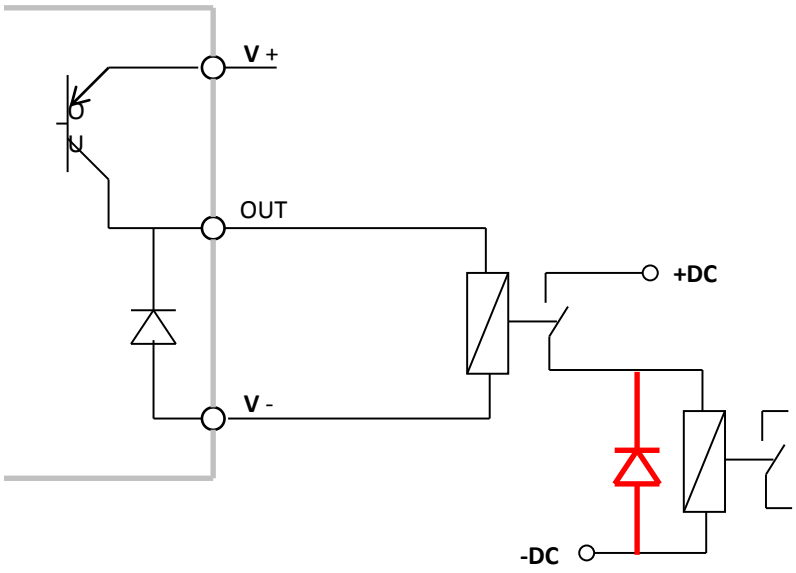
1	V+
2	Output 8
3	Output 9
4	Output 10
5	Output 11
6	Output 12
7	Output 13
8	Output 14
9	Output 15
10	V-

See precautions next page when cabling to external relays

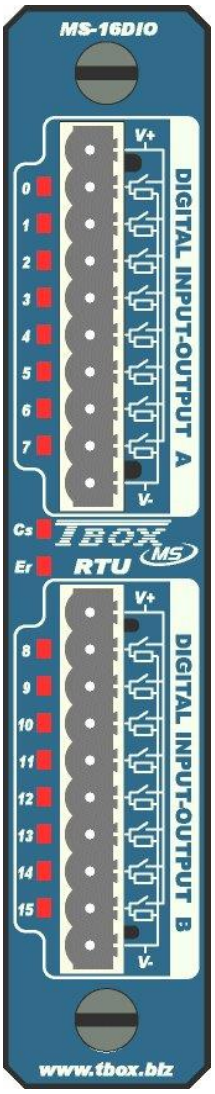
12.1. Cabling to external AC relay



12.2. Cabling to external DC relay



13. 16 x digital Inputs/Outputs

	Reference: **MS-16DI0**
➢ 2 groups of 8 digital inputs/outputs ➢ isolation by group of 8 inputs/outputs ➢ each channel can be cabled as an input or an output	

16 x Digital Inputs/Outputs (next)

TECHNICAL SPECIFICATIONS

General	
Quantity	16 channels. Each can be cabled as Input or Output
Consumption P Total	0.37 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (see LED 'CS' below)
Connector	Screw connector (10x5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
LED	
Individual	LED corresponding to the activation of each input or output.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Isolation	
Isolation from the Ground	Isolation from the CPU ground and the earth
2 groups isolated	Isolation by group of 8 inputs/outputs: One Common by group of 8 Inputs.
Level of isolation	1500 Vrms - between group - between inputs/outputs and ground - between inputs/outputs and earth
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	258 g

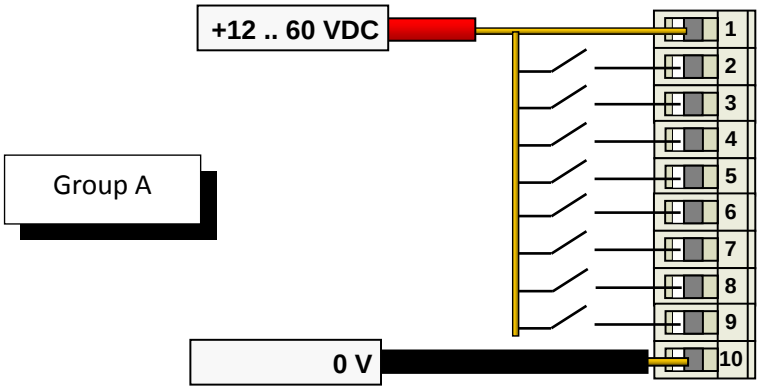
16 x Digital Inputs/Outputs (next)

Inputs	
Voltage at input	
Typical	24 VDC
Maximum for a LOW level	5 VDC
Minimum for a HIGH level	11 VDC
Maximum	60 VDC
Compatibility	with type 1 and 2 of **IEC61131-2**
Current	
Maximum at the input	2.0 mA at 30 VDC 4.5 mA at 60 VDC
Resistance	12 kΩ
Sampling	
Minimum period LOW – HIGH	Task switching between process cycle has to be taken into account, as well as cycle time itself: MS-CPU16: 10 ms. + cycle time. MS-CPU32: 4 ms. + cycle time.
Frequency (software)	At each cycle of BASIC / Ladder
Protection	
RC filter	1592 Hz
Voltage inversion	Up to 55 VDC
Protection EMC	

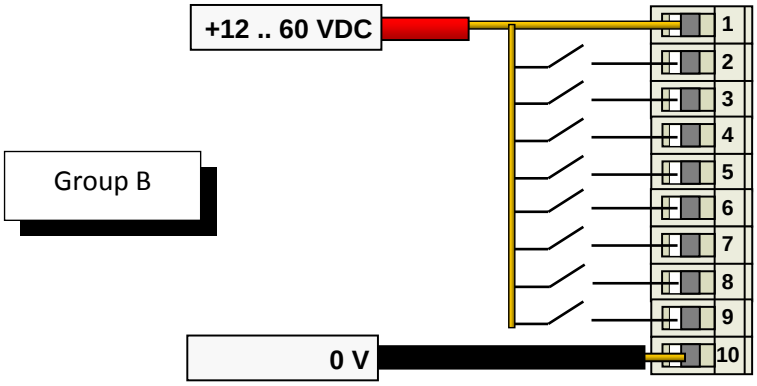
Outputs	
Voltage / Current	
Working voltage on V+	12 to 60 VDC: to read back outputs to corresponding DI. 6 to 60 VDC: without read back.
Current per output	Maximum: 200 mA
Voltage per output	Maximum: 60 VDC (depending on V+)
Short-Circuit current	Minimum: 0.2 A Typical: 0.9A Maximum: 1.2A
Impedance	Typical: 1 ohm Maximum: 10 ohms
Protection	
Protection diode	Protection against inverted voltage when working with inductive load **WARNING: if the output is connected to a DC relay driving an AC relay, the AC relay must be protected with an RC circuit** **(see chapters 12.1 and 12.2)**
Overload	Maximum: 60 VDC
Reverse voltage	Maximum: 55 VDC
Short-Circuit + Overload	Thermal protection with automatic recovery

CABLING - INPUTS

Description:	Connector:	Pin Out:
Cabling of inputs	**Screw connector**	



1	V+
2	Input 0
3	Input 1
4	Input 2
5	Input 3
6	Input 4
7	Input 5
8	Input 6
9	Input 7
10	V-



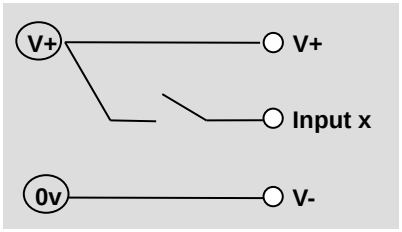
1	V+
2	Input 8
3	Input 9
4	Input 10
5	Input 11
6	Input 12
7	Input 13
8	Input 14
9	Input 15
10	V-

Each channel can be cabled individually as **Input** or as **Output**

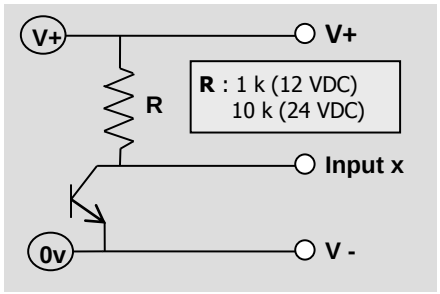
It is **mandatory** to cable **V+** and **V-** to have a proper working of input stage and **LED** operation.

One cannot power inputs without having powered V+.
If a **fuse** is cabled to V+, make sure the fuse **also cut the power to the inputs**.

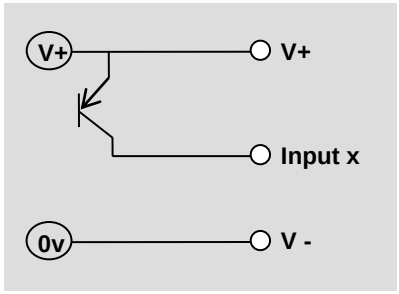
Cabling to Dry contact



Cabling to NPN transistor

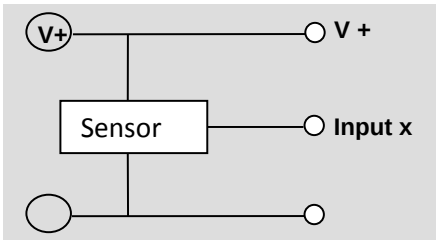


Cabling to PNP transistor (or OPTO)

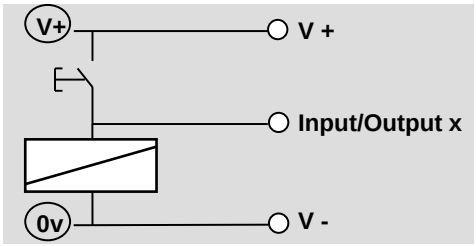


Inverted logic: output=1 → input=0

Cabling to Voltage sensor



Cabling both Input and Output

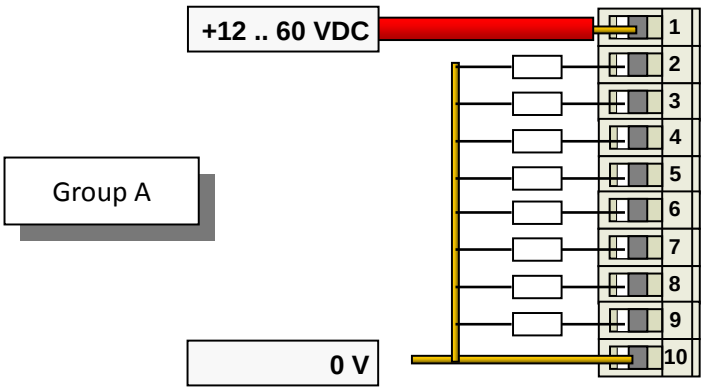


This type of cabling can be used in 2 cases:

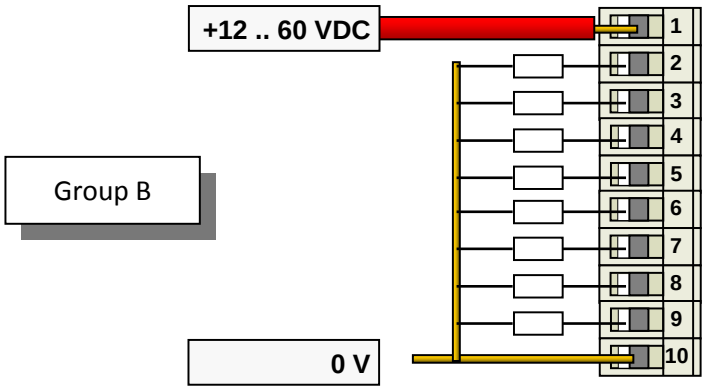
1. Manual activation of the Output: as long as the button is pressed, the output is forced
2. Activation of the Output during a time determined in the Program: you press the button until it has been detected in the program and the output has been switched on.

CABLING - OUTPUTS

Description:	Connector:	Pin Out:
Cabling of outputs	**Screw connector**	



1	V+
2	Output 0
3	Output 1
4	Output 2
5	Output 3
6	Output 4
7	Output 5
8	Output 6
9	Output 7
10	V-

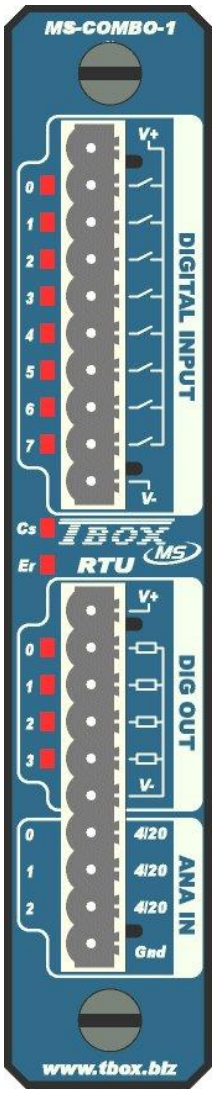


1	V+
2	Output 8
3	Output 9
4	Output 10
5	Output 11
6	Output 12
7	Output 13
8	Output 14
9	Output 15
10	V-

Each channel can be cabled individually as **Input** or as **Output**

It is **mandatory** to cable **V+** and **V-** to have a proper working of output stage.

14. COMBO (Multiple I/O)

	Reference: **MS-COMBO-1**
➢ 1 group isolated of 8 digital inputs ➢ 1 group isolated of 4 digital outputs ➢ 1 group non isolated of 3 analog inputs	

COMBO (next)

TECHNICAL SPECIFICATIONS

General	
Quantity	8 x digital inputs 4 x digital outputs 3 x analog inputs (14 bits)
Consumption P Total	0.17 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (10x5.08mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
LED	
Individual	LED corresponding to the activation of each digital input or output.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Isolation	
2 groups isolated: Level of isolation:	Group of 8 inputs and group of 4 outputs isolated 1500 Vrms - between group - between group and ground - between group and earth
1 group not isolated	Group of 3 analog inputs non isolated
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	254 g

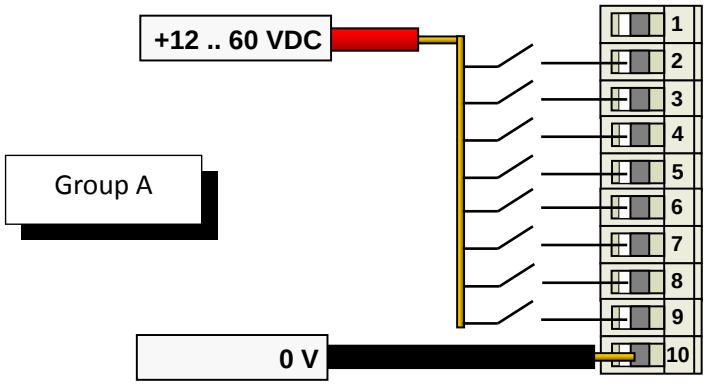
8 x Digital Inputs	
Voltage at input	
Typical	24 VDC
Maximum for a LOW level	5 VDC
Minimum for a HIGH level	11 VDC
Maximum	60 VDC
Compatibility	with type 1 and 2 of **IEC61131-2**
Current	
Maximum at the input	2.0 mA at 30 VDC 4.5 mA at 60 VDC
Resistance	12 kΩ
Sampling	
Minimum period LOW – HIGH	Task switching between process cycle has to be taken into account, as well as cycle time itself: MS-CPU16: 10 ms. + cycle time. MS-CPU32: 4 ms. + cycle time.
Frequency (software)	At each cycle of BASIC / Ladder
Protection	
RC filter	1592 Hz
Voltage inversion	Up to 55 VDC
Protection EMC	

4 x Digital Outputs	
Voltage / Current	
Working voltage on V+	12 to 60 VDC
Current per output	Maximum: 200 mA
Voltage per output	Maximum: 60 VDC (depending on V+)
Short-Circuit current	Minimum: 0.2 A Typical: 0.9A Maximum: 1.2A
Impedance	Typical: 1 Ω Maximum: 10 Ω
Protection	
Protection diode	Protection against inverted voltage when working with inductive load **WARNING: if the output is connected to a DC relay driving an AC relay, the AC relay must be protected with an RC circuit** **(see chapters 12.1 and 12.2)**
Overload	Maximum: 60 VDC
Reverse voltage	Maximum: 55 VDC
Short-Circuit + Overload	Thermal protection with automatic recovery

3 x Analog Inputs	
General	
Model	4..20 mA; passive. Input stage powered internally.
Mode 4..20 mA	
Range	Typical: 4 mA to 24 mA Minimum: 4 mA to 22 mA
Impedance	Minimum: 21 Ω Typical: 23.9 Ω Maximum: 26.4 Ω
Value for LSB	Typical: 2.935 µA
Digital Input	
Validity input associated to each analog input	Returns '0' when signal < 2.4mA and > 21.6mA Returns '1' when the signal is valid.
Protection	
Double RC filter	fc=723 Hz and 135.6 Hz
Against voltage inversion	Maximum: 30 V
Against over surge	Maximum: 100 mA
Against short-circuit of the sensor	Maximum: 30 V
ADC conversion	
AD Converter	14 bits with successive approximations (13 bits + sign)
Precision at 25 °C	Maximum: +/- 0.1% Full Scale
Integral linearity	Typical: +/- 2 LSB Maximum: +/- 4 LSB
Differential linearity	Typical: +/- 0.5 LSB Maximum: +/- 2 LSB
Cabling	
Twisted pair cable	Maximum: 50 m

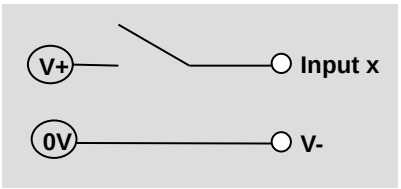
CABLING – DIGITAL INPUTS

Description:	Connector:	Pin Out:
Cabling of inputs	**Screw connector**	

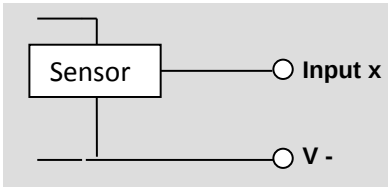


1	NC
2	Input 0
3	Input 1
4	Input 2
5	Input 3
6	Input 4
7	Input 5
8	Input 6
9	Input 7
10	V-

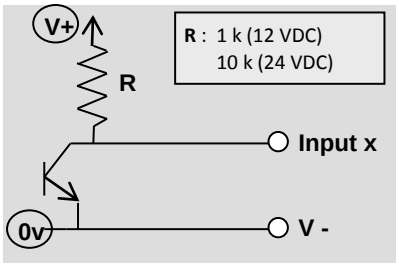
Cabling to Dry contact



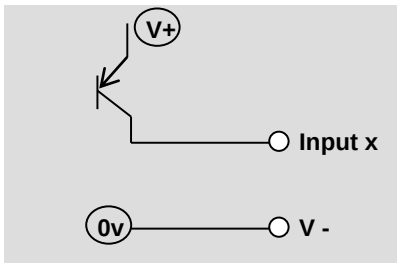
Cabling to Voltage sensor



Cabling to NPN transistor

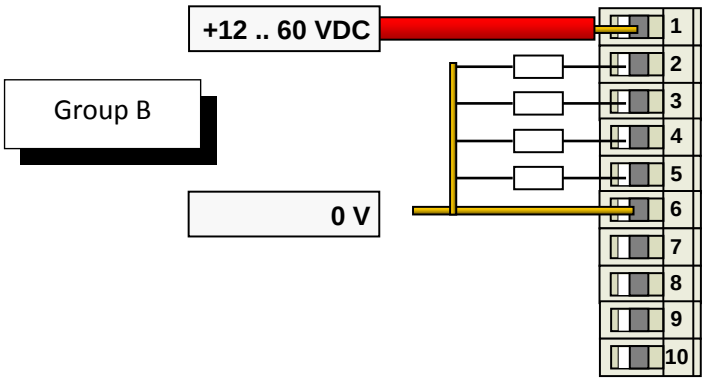


Cabling to PNP transistor (or OPTO)



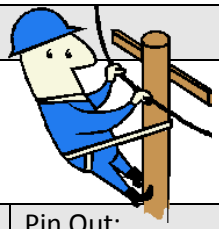
CABLING – DIGITAL OUTPUTS

Description:	Connector:	Pin Out:
Cabling of Outputs	**Screw connector**	



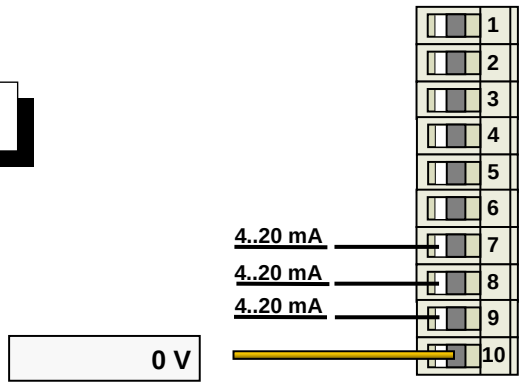
1	V+
2	Output 0
3	Output 1
4	Output 2
5	Output 3
6	V-

CABLING – ANALOG INPUTS



Description:	Connector:	Pin Out:
Cabling of 4..20mA sensors	**Screw connector**	

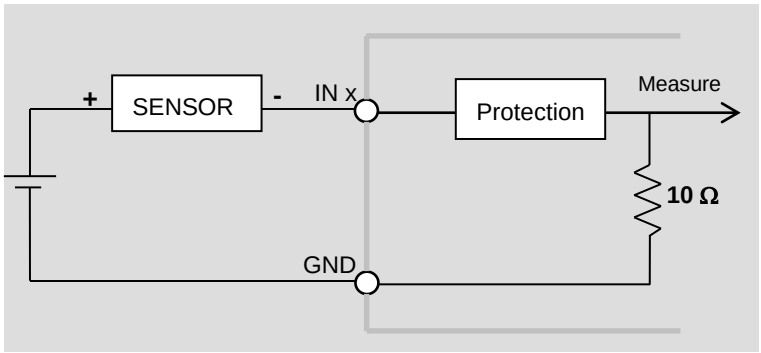
Group C



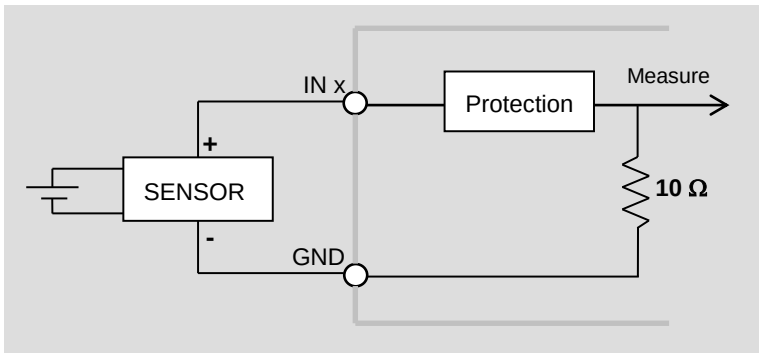
7 Input 0
8 Input 1
9 Input 2
10 Gnd

Gnd is **not isolated** from the **Gnd of Power supply.**
Gnd of the power supply is connected to the earth

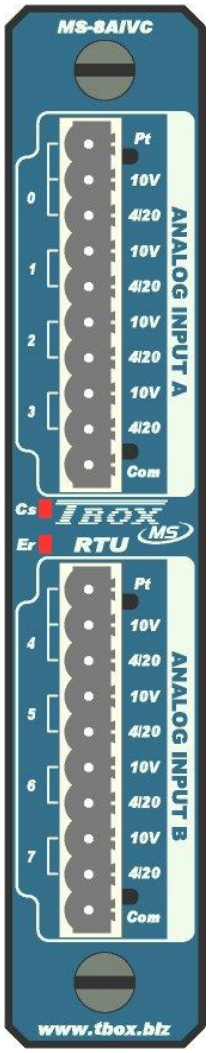
Cabling to 2-wire sensor



Cabling to 4-wire sensor



15. 8 x Analog Inputs (V or C)

	Reference: **MS-8AIVC**
➢ 1 group of 8 analog inputs ➢ 8 x -10..+10V; -20..+20mA ➢ 2 x Pt100, Pt1000 instead of 2 linear inputs	

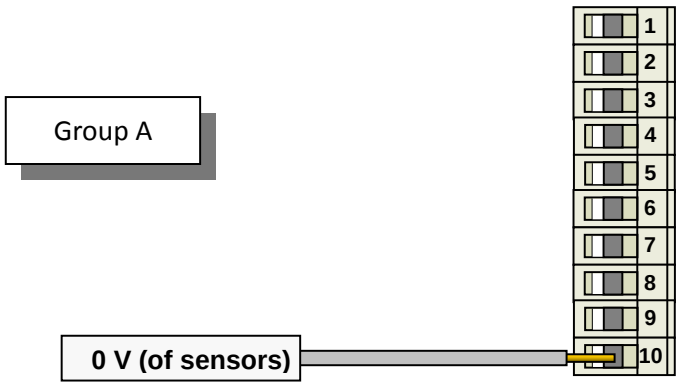
8 ANAIN-VC (next)

TECHNICAL SPECIFICATIONS

General	
Quantity	8 analog inputs
Consumption P Total	0.37 W
Signals: - for the 8 inputs	Choice between: **4..20mA** : 'Current' cabling **-20..+20mA** (to select if 0..20mA required) : 'Current' cabling **-10..+10V** : 'Voltage' cabling
- for 2 of the 8 inputs	Choice between **Pt100** or **Pt1000** 2 wires (-50°..+294°C): 'Temperature' cabling
Configuration Hardware Software	No hardware configuration required signal selection during channel configuration with TWinSoft
Resolution - AD converter - Current - Voltage - Temperature	14 bits 5.85 µA 3 mV 0.125 °C
Mode	Bipolar (on all ranges)
Model (for current/voltage)	Passive input. Input stage powered internally
Precision at 25°C: - Current - Voltage - Temperature	 0.1% Full Scale 0.1% Full Scale 0.5°C Full Scale
Input Impedance: - Current - Voltage	Maximum: 26.4 Ω Minimum: 100 kΩ
Filter at input	15 Hz
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (10x5.08 mm). Wire range: 0.14–2.5mm² (max.12 AWG)
Protection	
Current input	Protection against voltage (max. 30 VDC)
Voltage input	No specific protection. High impedance is a protection
Temperature input	**NO protection**. Be careful not to apply voltage.
Isolation	
Isolation from the Ground	Isolation from the CPU ground and the earth
1 group isolated	Isolation by group of 8 inputs: One Common by group of 8 Inputs.
Level of isolation	1500 Vrms
Digital Input	
Validity input associated to each analog input 4..20mA	Returns '0' when signal < 2.4mA and > 21.6mA Returns '1' when the signal is valid.
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.9 x 3.27 x 1.142 inch.)
Weight	300 g

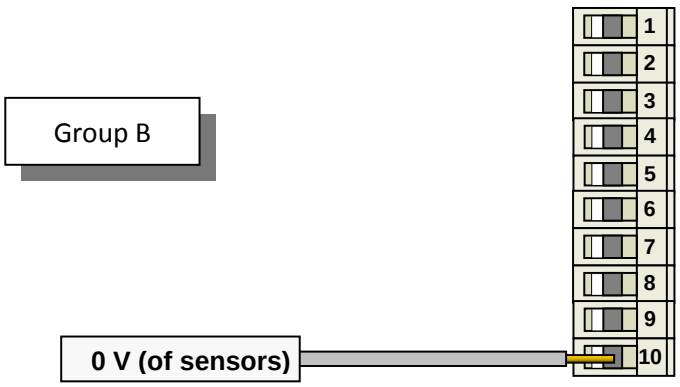
CABLING – ANALOG INPUTS

Description:	Connector:	Pin Out:
Cabling of Analog Inputs	**Screw connector**	



1 Input 0 - Temperature
2 Input 0 - Voltage
3 Input 0 - Current
4 Input 1 - Voltage
5 Input 1 - Current
6 Input 2 - Voltage
7 Input 2 - Current
8 Input 3 - Voltage
9 Input 3 - Current
10 Com (V-)

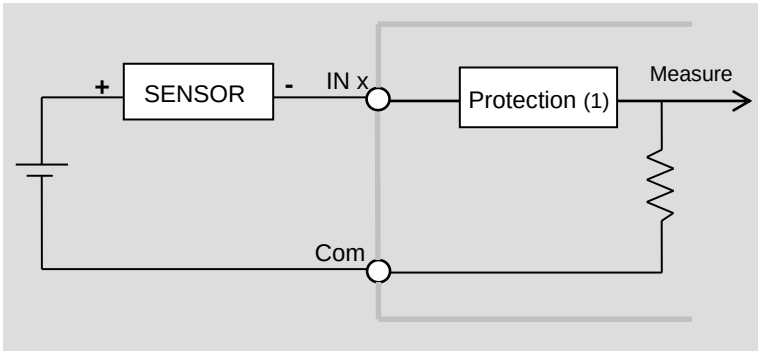
Description:	Connector:	Pin Out:
Cabling of Analog Inputs	**Screw connector**	



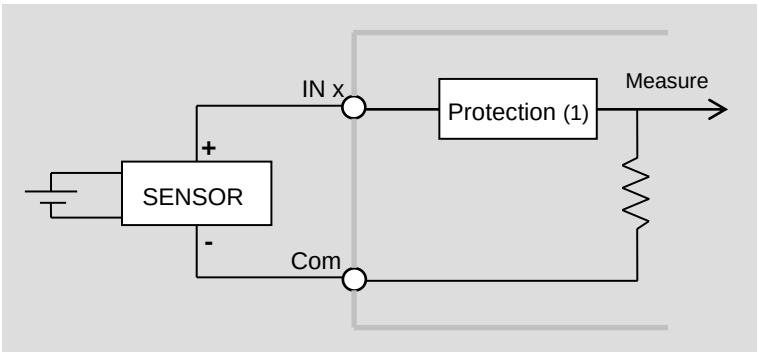
1 Input 0 - Temperature
2 Input 0 - Voltage
3 Input 0 - Current
4 Input 1 - Voltage
5 Input 1 - Current
6 Input 2 - Voltage
7 Input 2 - Current
8 Input 3 - Voltage
9 Input 3 - Current
10 Com (V-)

Isolation is **global.**
It means both **Com** are connected together and must be cabled to **the same reference**.

Cabling to 2 Wires sensor (current/voltage)

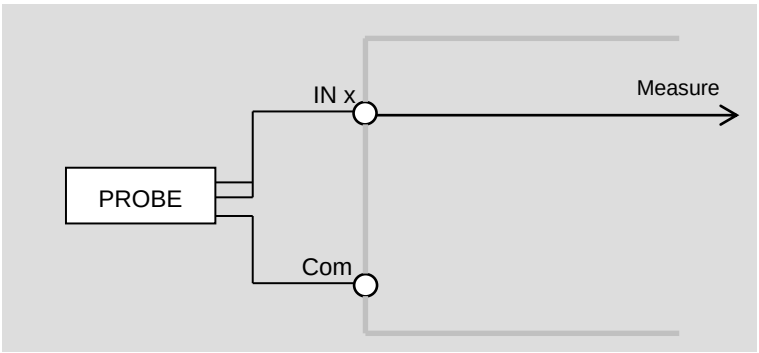


Cabling to 4 Wires sensor (current/voltage)



(1) protection on 4..20mA inputs

Cabling to Temperature probe (2 or 3 wires)



16. 6 x Temperature Inputs

	Reference: **MS-6 RTD**
It requires minimum version: • **TWinSoft 10.02.1116** • **MS16: OS 3.15** • **MS32: OS 1.06** ➢ 1 group of 6 analog inputs (temperature) ➢ Temperature sensors: Pt100, Pt1000, Ni100, Ni1000 ➢ 2 or 3 wires	

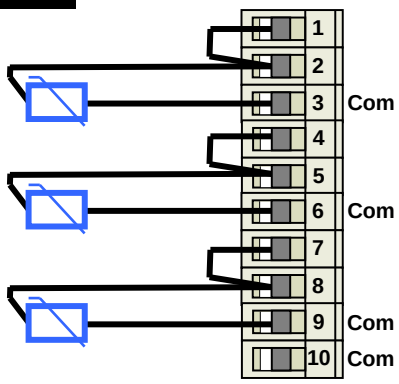
TECHNICAL SPECIFICATIONS

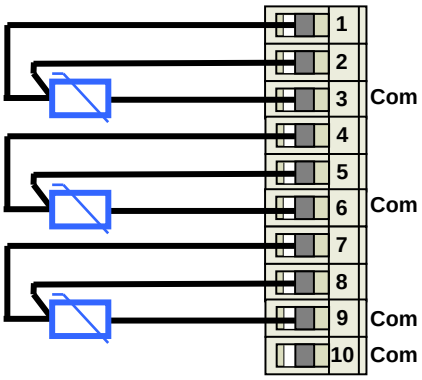
General	
Quantity	6 temperature inputs
Consumption P Total	0.83 W
Probes	Choice between Pt100E, Pt100A, Pt1000, Ni100, Ni1000 2 wires or 3 wires
Configuration Hardware Software	No hardware configuration required signal selection during channel configuration with TWinSoft
Pt100, Pt1000 temperature range curves	 -100°C ... +850°C conforms to IEC 751
Ni100, Ni1000 temperature range curves	 -50°C ... +200°C conforms to DIN 43760
Resolution - AD converter temperature	24 bits 0.1 °C
Precision	0.3 % FS
Filter	1 Hz. New value available each second.
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (10 x 5.08 mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Isolation	
Between channel	Non isolated
Group to Ground/Earth	Global isolation
Digital Input	
Validity input (DI)	Returns '0' when the temperature is out of the range Returns '1' when the temperature is within the range
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm** (5.906 x 3.27 x 1.142 inches)
Weight	300 g

CABLING – ANALOG INPUTS

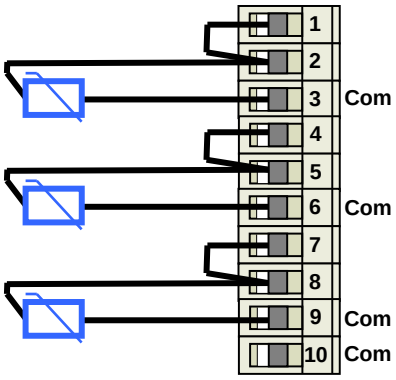
Description: **Cabling Probes 2 Wires**	Description: **Cabling Probes 3 Wires**

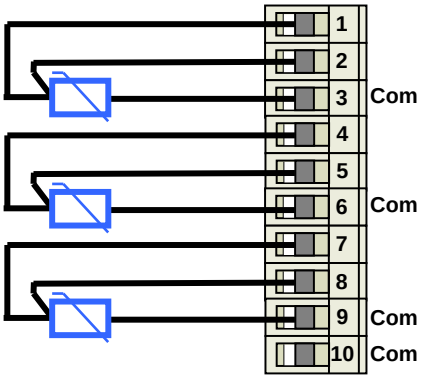
Group A





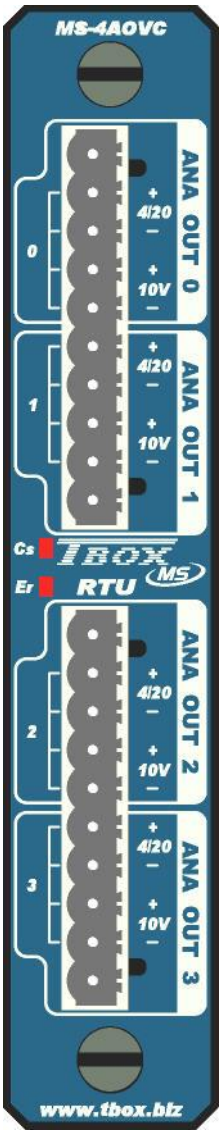
Group B





Isolation is **global.**
It means both **Com** are connected together and must be cabled to **the same reference**.

17. 4 x Analog Outputs

	Reference: **MS-4AOVC**
➢ 4 analog output individually isolated ➢ each output: 4..20 mA or –10V..+10V	

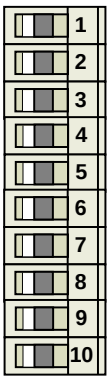
TECHNICAL SPECIFICATIONS

General		
Quantity		4 analog outputs
Consumption	P Total	0.85 W
Signals	- for each output	Choice between 4..20mA **OR** –10V..+10V
Configuration	Hardware Software	No hardware configuration required signal selection during channel configuration with TWinSoft
DA converter		12 bits, bipolar
Mode	- Current	Active mode. Supplies a nominal voltage of **24 VDC** (see cabling).
Full Range:	- Current - Voltage	0 to 20mA -10V to +10V
Resolution - DA converter:	- Current - Voltage	12 bits 11 bits + sign
Resolution:	- Current - Voltage	5 µA 5 mV
Accuracy:	- Current - Voltage	0.1% Full Scale 0.1% Full Scale
Reactivity:	- Current - Voltage	25 msec 1 msec
Load impedance limit	- Current - Voltage	Resistance of the actuator: maximum 1000 Ω : gives a drop of 20 V, maximum allowed. minimum 3000 Ω : gives a current of 3.33 mA, maximum allowed.
Replacement		**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test		Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector		Screw connector (10 x 5.08 mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Digital Input		
Validity input associated to each analog output 4..20mA		Returns '0' when the current loop is opened. Returns '1' when the current loop is closed.
LED		
CS		**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER		**Error:** The card type does not correspond to the one declared in TWinSoft.
Isolation		
4 channels isolated		Individually isolated
From the Ground		Isolation from the CPU ground and the earth
Level of isolation		500 Vrms between each output 1500 Vrms between each output and earth
Environment		
Temperature storage		-40° to 85°C
Temperature working (ambient)		**Industrial temperature:** -40°C to 70°C
Humidity		15 to 95 % without condensation
Altitude		Max. 5000m
Dimensions		
Without connector		Height x Depth x Width: **150** x **83** x **29 mm**
Weight		300 g

CABLING – ANALOG OUTPUTS

Description:	Connector:	Pin Out:
Cabling to 4..20mA OR -10V..+10V actuators	**Screw connector**	

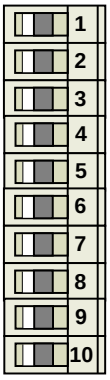
Group A



1 No connection
2 Output 0 : 4..20mA - I OUT (**+**)
3 Output 0 : 4..20mA - I IN (**-**)
4 Output 0 : -10V..+10V - V OUT (**+**)
5 Output 0 : -10V..+10V - V OUT (**-**)
6 Output 1 : 4..20mA - I OUT (**+**
7 Output 1 : 4..20mA - I IN (**-**)
8 Output 1 : -10V..+10V - V OUT (**+**)
9 Output 1 : -10V..+10V - V OUT (**-**)
10 No connection

Description:	Connector:	Pin Out:
Cabling to 4..20mA OR -10V..+10V actuators	**Screw connector**	

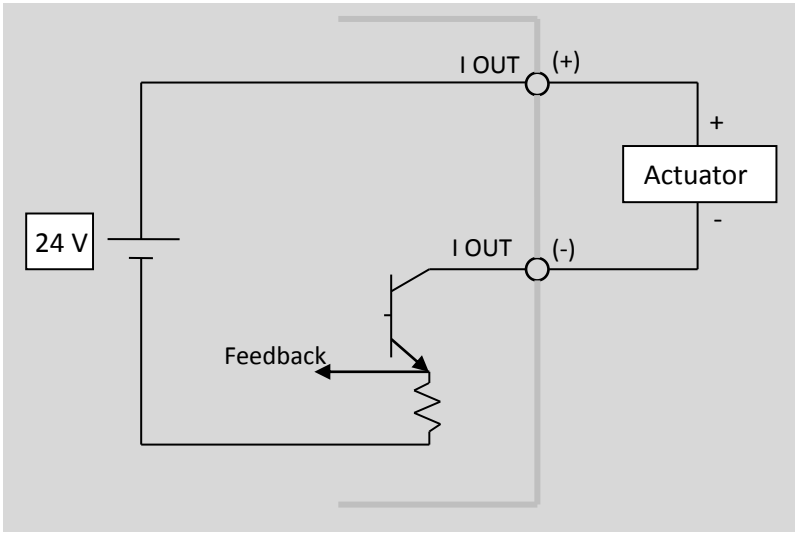
Group B



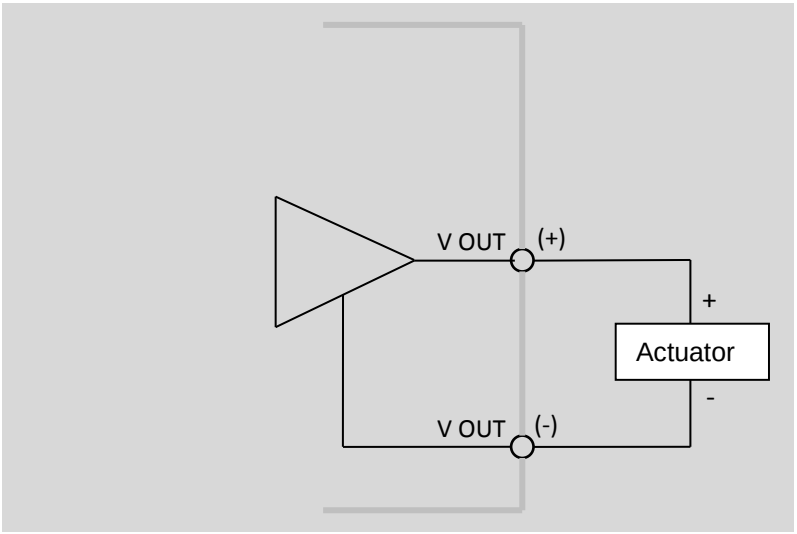
1 No connection
2 Output 2 : 4..20mA - I OUT (**+**)
3 Output 2 : 4..20mA - I IN (**-**)
4 Output 2 : -10V..+10V - V OUT (**+**)
5 Output 2 : -10V..+10V - V OUT (**-**)
6 Output 3 : 4..20mA - I OUT (**+**
7 Output 3 : 4..20mA - I IN (**-**)
8 Output 3 : -10V..+10V - V OUT (**+**)
9 Output 3 : -10V..+10V - V OUT (**-**)
10 No connection

Each channel can be used with two different signals: 4..20mA **OR** -10V..+10V; **not with both signals** at the same channel.

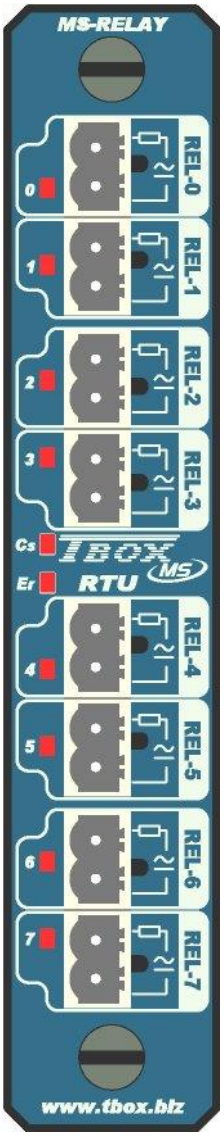
Cabling to 'Current' actuator



Cabling to 'Voltage' actuator



18. 8 x Relay Outputs

	Reference: **MS-RELAY**
➢ 8 relay outputs individually isolated	

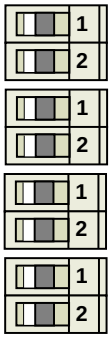
TECHNICAL SPECIFICATIONS

General	
Quantity	8 outputs
Consumption P Total	1.88 W (with all relays active)
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (2 x 5.08 mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Arrangement	Normally Open SPST (*Single Pole Single Throw*) – 1 FORM A
LED	
Individual	LED corresponding to the activation of each relay.
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Voltage	
With DC	Max: 30 VDC at 3A
With AC	Max: 250 VAC
Current	
DC	3 A
AC	3 A
Operation	
Mechanical life time	10,000,000 operations
Electrical life time (keeping all electrical parameters)	100,000 operations
Operate time (max.)	10 ms.
Release time (max.)	5 ms.
Protection	
To an external relay	When the relay drives an external relay, t**he latter must be protected with a diode (if DC relay) or a RC circuit (if AC relay)** **(see chapters 12.1 and 12.2)**
Isolation	
Individual	Each relay is totally isolated from the rack and other relays. Isolation voltage: 3 KV
Insulation resistance at 500 VDC	1,000 MΩ
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 2000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

CABLING – RELAY OUTPUTS

Description:	Connector:	Pin Out:
Relay outputs	**Screw connector**	

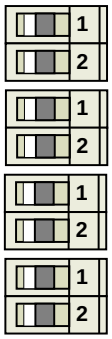
Group A



1	Load 0
2	Load 0
1	Load 1
2	Load 1
1	Load 2
2	Load 2
1	Load 3
2	Load 3

Description:	Connector:	Pin Out:
Relay Outputs	**Screw connector**	

Group B



1	Load 4
2	Load 4
1	Load 5
2	Load 5
1	Load 6
2	Load 6
1	Load 7
2	Load 7

19. 4 x Analog inputs isolated

	Reference: **MS-4AI420**
➢ 4 analog inputs individually isolated ➢ 4..20 mA	

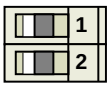
4 Analog Input Isolated (next)

TECHNICAL SPECIFICATIONS

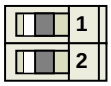
General	
Quantity	4 analog inputs
Model	Passive, input stage powered by the loop
Consumption P Total	0.02 W
Signal	4..20 mA
Resolution Current	14 bits 3.1 µA
Mode	unipolar
Precision	0.1% Full Scale
Input Voltage on input	Typical: 4.5 VDC Maximum: 6 VDC
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (2 x 5.08 mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Digital Input	
Validity input associated to each analog input	Returns '0' when signal < 2.4mA and > 21.6mA Returns '1' when the signal is valid.
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Isolation	
Each input	**Individually** Isolated
From the Ground	Isolation from the CPU ground and the earth
Level of isolation	500 Vrms - between groups - between Inputs and ground - between Inputs and earth
Protection	
Polarity	Protection against inversion of polarity
Voltage	Protection against voltage applied at input (max: 30 VDC – 50 mA)
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

CABLING – ISOLATED AI

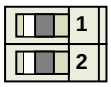
Description:	Connector: **Screw connector**	Pin Out:



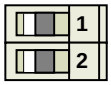
1 input 0: 4..20m (+)
2 input 0: 4..20m (-)



1 input 1: 4..20m (+)
2 input 1: 4..20m (-)

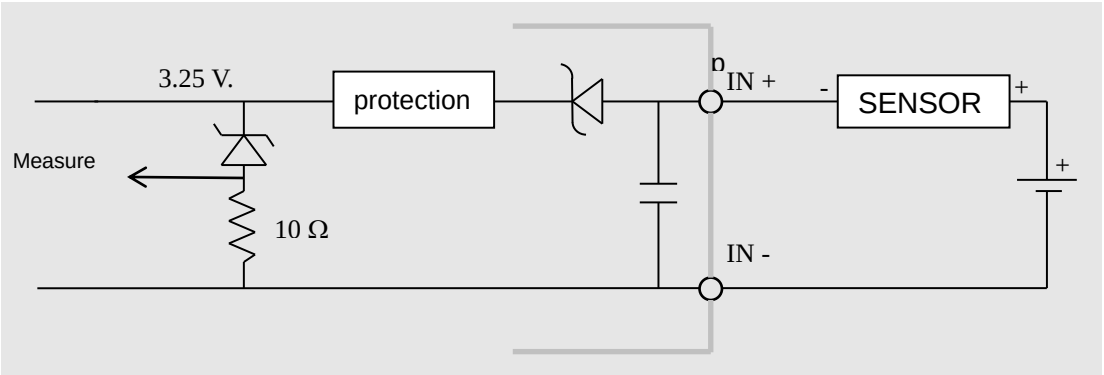


1 input 2: 4..20m (+)
2 input 2: 4..20m (-)

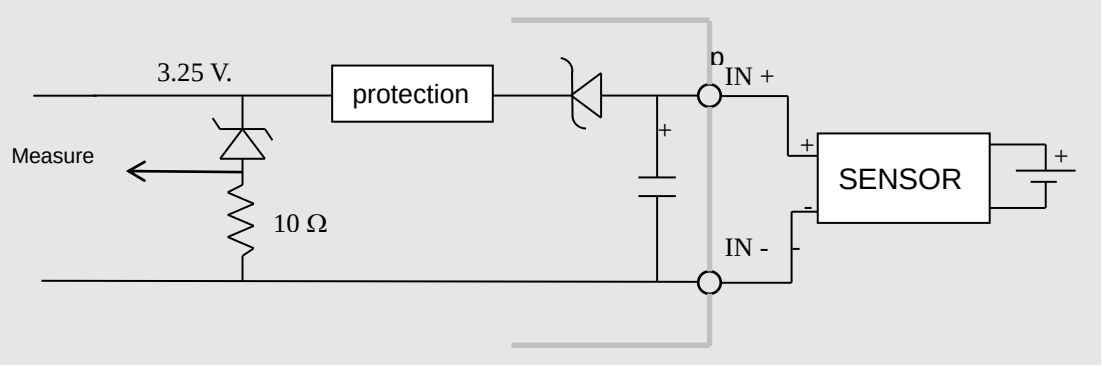


1 input 3: 4..20m (+)
2 input 3: 4..20m (-)

Cabling to 2 wires sensor



Cabling to 4 wires sensor



20. 8 x Analog inputs isolated

	Reference: **MS-8AI420**
➢ 8 analog inputs individually isolated ➢ 4..20 mA	

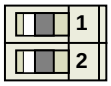
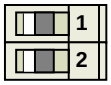
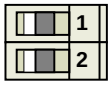
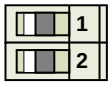
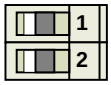
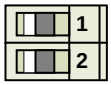
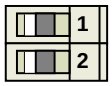
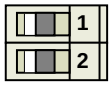
8 Analog Input Isolated (next)

TECHNICAL SPECIFICATIONS

General	
Quantity	8 analog inputs
Model	Passive, input stage powered by the loop
Consumption P Total	0.02 W
Signal	4..20 mA
Resolution Current	14 bits 3.1 µA
Mode	unipolar
Precision	0.1% Full Scale
Input Voltage on input	Typical: 4.5 VDC Maximum: 6 VDC
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
Connector	Screw connector (2 x 5.08 mm) Wire range: 0.14 – 2.5 mm² (or max. 12 AWG)
Digital Input	
Validity input associated to each analog input	Returns '0' when signal < 2.4mA and > 21.6mA Returns '1' when the signal is valid.
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Isolation	
Each input	**Individually** Isolated
From the Ground	Isolation from the CPU ground and the earth
Level of isolation	500 Vrms - between groups - between Inputs and ground - between Inputs and earth
Protection	
Polarity	Protection against inversion of polarity
Voltage	Protection against voltage applied at input (max: 30 VDC – 50 mA)
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

CABLING – ISOLATED AI

Description:	Connector: **Screw connector**	Pin Out:

0		**1**	input **0**: 4..20m (+)
		2	input **0**: 4..20m (-)
1		**1**	input **1**: 4..20m (+)
		2	input **1**: 4..20m (-)
2		**1**	input **2**: 4..20m (+)
		2	input **2**: 4..20m (-)
3		**1**	input **3**: 4..20m (+)
		2	input **3**: 4..20m (-)
4		**1**	input **4**: 4..20m (+)
		2	input **4**: 4..20m (-)
5		**1**	input **5**: 4..20m (+)
		2	input **5**: 4..20m (-)
6		**1**	input **6**: 4..20m (+)
		2	input **6**: 4..20m (-)
7		**1**	input **7**: 4..20m (+)
		2	input **7**: 4..20m (-)

Cabling to sensors: see MS-4AI420 above.

21. PSTN modem

	Reference: **MS-PSTN**
➢ Modem PSTN (Public Switched Telephone Network) ➢ Mode V21, V22, V22bis, V23, V32, V32bis, V34, V90 ➢ Data compression V42bis ➢ Caller Id ➢ ITU-T and CRT21 conformity ➢ Baudrate from 300 bps to 56 Kbps ➢ 1 port RS232/RS485 non isolated	

RS485 / RS232 cabling is the same as for RS232 and RS485 of MS-SERIAL (see chapter 24)

TECHNICAL SPECIFICATIONS

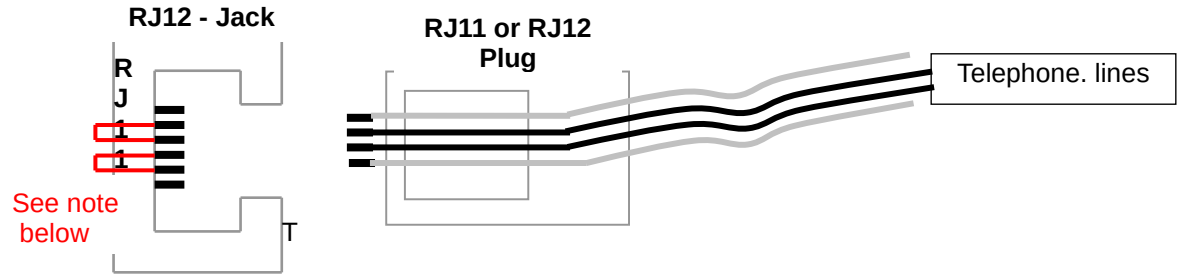
General	
Consumption P Total	0.21 W
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** the card type does not correspond to the one declared in TWinSoft.
Modem PSTN	
Description	Modem for Switched Telephone Network (public or private) WARNING: does not work on galvanic lines, or lines without power.
Speed	300 bps … 56.000 bps
Mode	ITU-T: V21, V23, V22, V22bis, V32, V32bis, V34, V90 Bell 103 and Bell 212A
Compression	42bis LAPM, MNP2-5
Standards	Conform to CTR21
Other characteristics	Caller ID Line voltage measurement (available in communication variable) Line detection (test if other communication active on the line) Auto fallback
Connectors	RJ12 **or** screw connector (see below)
Isolation	1500 Vrms
Protection	Against over voltage Warning : an external surge protector is still required
RS232 – RS485	
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (common to 2 ports) RxD TxD	 Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

CABLING – TELEPHONE LINE

Two cabling are proposed.

You should use **one or the other**.

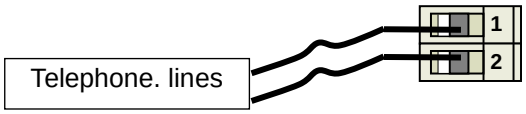
RJ12 – RJ11



NOTE:
Required in some countries (like France), points 2-3 and 4-5 of RJ12 jack are **short-circuited internally**. With some telephone switches (PABX or simulator), this may cause connection problems.

In such case, try the CITO 2 connection, where only 2 wires are used (see next).

CITO 2 (Screw connector)

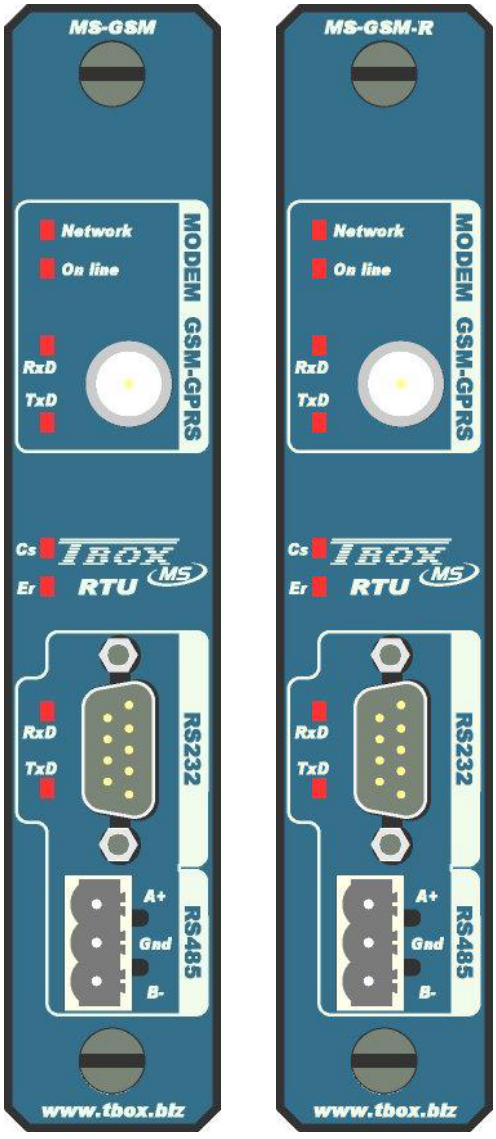


22. GSM modems

22.1. MS-GSM, MSR-GSM-R (obsolete)

Reference:
MS-GSM
MSR-GSM-R

- GSM / GPRS
- MS-GSM:
  Quad Band (850, 900, 1800, 1900 MHz)
- MS-GSM-R:
  Quad Band (850, 900, 1800, 1900 MHz)
  + European Railways Standard in 900 Mhz range
- 1 port RS232/RS485 non isolated



RS485 / RS232 cabling is the same as for RS232 and RS485 of MS-SERIAL (see chapter 24)

TECHNICAL SPECIFICATIONS

General	
Consumption P Total	1.32 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Modem GSM/GPRS	
Frequencies (**MS-GSM**)	QUAD-BAND: GSM 850 / EGSM 900 / DCS 1800 / PCS 1900 MHz
Frequencies (**MSR-GSM-R**)	QUAD-BAND: GSM 850 / GSM-R / DCS 1800 / PCS 1900 MHz European Railways Standard: 876 MHz .. 880 MHz GSM-R uplink 921 MHz .. 925 MHz GSM-R downlink
GPRS	Class 10 (4+1/3+2) with support PBCCH , SMS and DATA
Emitting power	CLASS 4 (2W) for EGSM900 and GSM 850 CLASS 1 (1W) for DCS1800 and PCS1900
SIM card	3 V SIM card accepted
LEDs Network On Line RxD TxD	Indicates that GSM is connected to the network Indicates an IP connection (GPRS) or a dial-up connection (CSD-DATA) Indicates that GSM is receiving data Indicates that GSM is transmitting data
Antenna connector	Screw connector, type FME Plug (male on MS-GSM)
RS232 – RS485	
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (for both ports) RxD TxD	Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85 °C
Temperature working (ambient)	**Standard temperature:** -20°C to 65°C -10 °C to 55 °C: fully operational -20 °C to 65 °C: functional without risk for the network MSR-GSM-R only available in **industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300

22.2. MS-GSM-3G

	Reference: **MS-GSM-3G**
➢ Industrial Grade HSDPA 3G modem ➢ HSDPA 3G Triple Band support: 900 / 1900 / 2100 Mhz 850 / 1900 / 2100 Mhz ➢ Full Quad Band GSM/GPRS/EDGE: EGSM 850, 900, 1800, 1900 Mhz. ➢ 1 port RS232/RS485 non isolated	

RS485 / RS232 cabling is the same as for RS232 and RS485 of MS-SERIAL (see chapter 24)

Modem GSM-3G (next)

TECHNICAL SPECIFICATIONS

General	
Consumption P Total	1.32 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Modem GSM-3G	
Frequencies Model "Europe" Model "US"	WCDMA **900**/1900/2100 & GSM850, EGSM900, DCS1800, PCS1900 WCDMA **850**/1900/2100 & GSM850, EGSM900, DCS1800, PCS1900
GPRS	Multi slot Class 12, SMG 31bis, Class B Terminal, PBCCH support 3 PDP contexts, Coding Schemes CS1 to CS4
EDGE	Multi slot Class 12
UMTS/HSDPA	Class E2, 4 logical channel
HSDPA	Cat 5/6
Emitting power	CLASS 4 (2W) for GSM850 and EGSM900 CLASS 1 (1W) for DCS1800 and PCS1900 CLASS E2 EDGE 900 / 1800 CLASS 3 for UMTS 900/1900/2100
SIM card Format Voltage	mini 1.8 V or 3 V
LEDs Network On Line RxD TxD	Indicates that GSM is connected to the network Indicates an IP connection (GPRS/3G) or a dial-up connection (CSD-DATA) Indicates that GSM is receiving data Indicates that GSM is transmitting data
Antenna connector	Screw connector, type FME Plug (male on MS-GSM)
RS232 – RS485	
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (for both ports) RxD TxD	Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85 °C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

22.3. Antennas – 3G

There are five models of antenna (five bands 850/900/1800/1900/2100 Mhz):

1. The magnetic car antenna - (*ref: ACC-GSM-CARANT*)
2. The right angle antenna - (*ref: ACC-GSM-ANTANGLE*). It should be used for demo purpose only because it may interfere with analog measurement.
3. The industrial antenna "+3 dB" - (*ref: ACC-GSM-ANT*) and the 5 meters cable (*ref: ACC-GSM-EXT5*). Optional arrestor can be ordered with this antenna (see next).
4. The flat antenna - (*ref: ACC-GSM-ANT-FLAT*).
5. The "+6dB" antenna - (*ref: ACC-GSM-ANT6*).
   Arrestor cannot be used with this antenna (see next).

1.

2.

3.

4.

5.

22.4. MS-GSM-4G

	Reference: **MS-GSM-4E**
➢ Industrial Grade 4G/LTE module ➢ Penta Band LTE (4G) ➢ Tri Band UMTS-WCDMA (3G) ➢ Dual Band GPRS/EDGE ➢ Send and Receive SMS ➢ 1 port RS232/RS485 non isolated	

RS485 / RS232 cabling is the same as for RS232 and RS485 of MS-SERIAL (see chapter 24)

Modem GSM-4E (next)

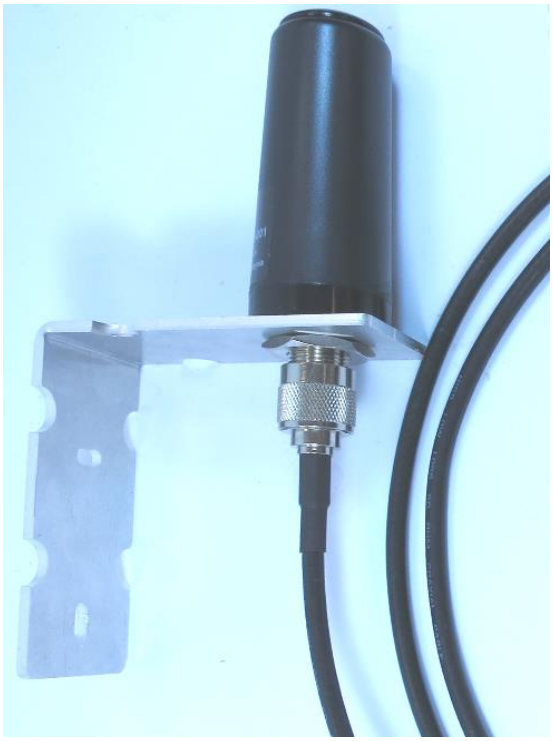
TECHNICAL SPECIFICATIONS

General	
Consumption P Total	4.75 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
Modem GSM-4G	
Frequencies Model "Europe"	**Penta Band LTE (4G)**: 800/900/1800/2100/2600 MHz. FDD-Bands (20, 8, 3, 7 ,1) **Tri Band UMTS-WCDMA (3G)**: 900/1800/2100 MHz. FDD Bands (8, 3, 1) **Dual Band GPRS/EDGE (2G)**: 900/1800 MHz
Emitting power	**According to Release 8 (4G):** Class 3 (+23dBm +-2dB) for LTE 2600,2100,1800,900,800. LTE FDD-Bands (7,1,3,8,20) **According to Release 99 (3G):** Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100,1800,900. WCDMA FDD-Bands (1,3,8)
SIM card Format Voltage	Mini / standard 1.8 V or 3 V
LEDs Network On Line T/R	Indicates that GSM is connected to the network Indicates GSM is connected to an APN (GPRS/3G/4G) ON when GSM is transmitting
Antenna connector	Screw connector, type SMA female on MS-GSM
RS232 – RS485	
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (for both ports) RxD TxD	Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85 °C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

22.5. Antenna – 4G

There is one antenna covering 4G/3G/2G:

One model of antenna covers all frequencies (**700/806/850/1800/1900/2100/2500/2600 Mhz**).
Reference. **ACC-GSM-ANT-4G**

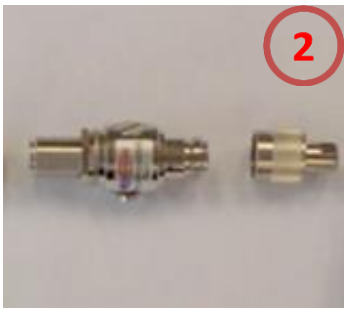


22.6. Antenna Surge Arrestor

The surge arrestor can be used only with antenna **ACC-GSM-ANT** and **ACC-GSM-ANT-4G**.

Connection to the arrestor:

1) Use the N-M>>N-M connector from the arrestor to connect it to the antenna (remove N-M>>FME-M from antenna if mounted).
2) Connect N-M>>FME-M adapter supplied with the antenna to the arrestor.
3) Connect the corresponding wire.



23. GPS - Timing

	Reference: **MS-GPS**
➢ GPS receiver ➢ Clock Provides a **clock** with absolute value (UTC) with high precision (<1ms), without drift of time. Allows **synchronizing** in datalogging. ➢ Positioning Allows vertical and horizontal **positioning** of a mobile equipment. ➢ Port RS232 / RS485 non isolated	

RS485 / RS232 cabling is the same as for RS232 and RS485 of MS-SERIAL (see chapter 24)

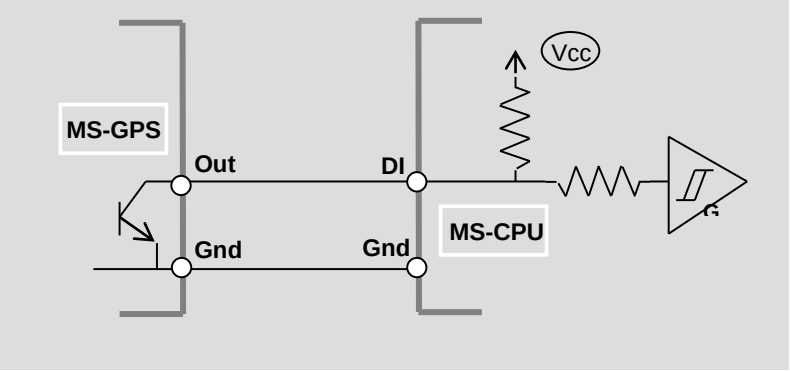
<u>General info about GPS:</u>
***Positioning**: GPS works with 24 satellites placed into orbit of 20,200 km.*
Each satellite provides a signal including time based on the atomic clock.
Receiver compares the time a signal is transmitted by a satellite with the time it has received. With triangulation of minimum 3 signals, the receiver calculates 'Longitude' and 'Latitude'.
With a fourth satellite, the receiver can calculate the 'Altitude'
***Accuracy:** about 15 meters*
***Time**: as the satellites provide the atomic clock, the receiver can forward this information for time synchronization*
***GPS standard**: GPS modules used with the RTU works with positioning standard WGS84 (World Geodedic System 1984), giving Longitude, Latitude in 1,000,000th of degree. (ex: 50123456 = 50.123456 °)*
Altitude being given in meters

General	
Consumption P Total	0.58 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
GPS Receiver	
General	L1 (1575 MHz), C/A code, 12 channels, continuous tracking receiver
Protocol	NMEA 0183
Precision: position clock	3 m CEP (SA off) 500 ns (SA On)
Acquisition: Cold start Warm start	< 60 sec < 3 sec
Antenna type frequency connector voltage current drawn gain cable cable loss	 Active antenna 1575.42 MHz SMA compatible voltage delivered by the card: 3 to 3.6 VDC typical 27mA 28dB 5 meters RG174 10 dB
LEDs Tik Sec Lock Ant. Status	1 Hz validity of the GPS signal received. Minimum 4 satellites active antenna connected
System Variables	Analog - "GpsLat": indicates the latitude in 1,000,000th of degree (Precision=15 m.) Analog -"GpsLong": indicates the longitude in 1,000,000th of degree (Precision=15 m.) Analog -"GpsAlt": indicated the altitude in meters (Poor Precision) Analog -"GpsSats": indicates the number of satellites detected Analog -"GpsSpeed": indicates the current speed in km/h Analog -"GpsRoute": indicates the current direction in degree (0 ... 359,9) Digital - "GpsVF": indicates a valid signal and the time has been synchronized. Write "0" to re-synchronize time.
Synchronization	
Internal	Generates an internal clock signal every 1 ms (precision 200 µs)
Tick to CPU-16	Synchronization from the Bus using Tick Second of MS-GPS Tick of the CPU-16: 10 ms (used for time stamping) Global precision: 25 ms
Tick to CPU-32	Synchronization from the Bus using Tick Second of MS-GPS Each Tik Second, resynchronization of Millisecond Tick of the CPU-32: 1 ms (used for time stamping) Global precision: 1 ms
Time synchronization	When "GPSVF" = 1, time of MS-CPU32 is synchronized to MS-GPS time (UTC). Writing "0" to "GpsVF" allows resynchronizing time manually.
Digital Output	
Use Type Voltage Current Impedance	Tik Sec output (1 Hz). Precision: 200 µs Current sinking (Open Collector) max. 50V max. 45mA max. 60 ohms **NO PROTECTION**

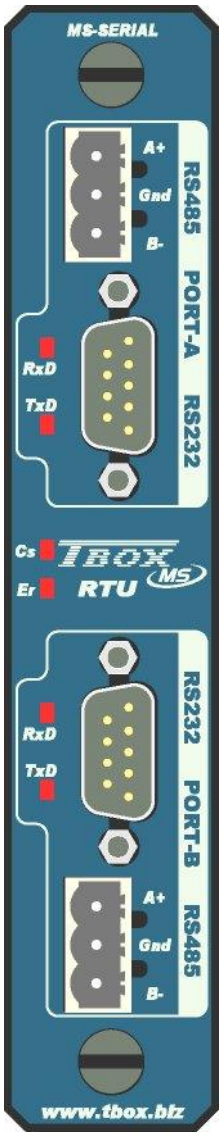
RS232 – RS485	
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (common to 2 ports) RxD TxD	 Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

Cabling Synch Output to DI of a CPU-16

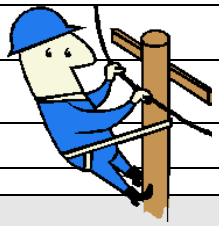
DI input voltage	0 … 5.5V
DI absolute maximum	30 V
DI Low state guaranteed	< 0.8 V
DI High state guaranteed	> 2 V
RC filter	1 Khz
Max. frequency (software)	50 Hz



24. Serial Ports

	Reference: **MS-SERIAL**
➢ 2 x Serial Ports ➢ each port : RS232 or RS485	

General	
Consumption P Total	0.10 W
Replacement	**Hot insertable/removable.** There is no risk to damage hardware, but a reset is required.
Test	Automatic test of the access of the card by the CPU (See LED 'CS' below)
LED	
CS	**Card Selection:** the card corresponds to a card declared in TWinSoft.
ER	**Error:** The card type does not correspond to the one declared in TWinSoft.
RS232 – RS485	
Quantity	2 ports
Mode	RS232 **or** RS485 (no simultaneous use of both modes)
Baudrates (bps)	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Data bits	7, 8
Parity	none, even, odd, mark (parity bit=1), space (parity bit=0)
Stop bits	1, 1.5, 2
Isolation	**No isolation**. Gnd is linked to earth by internal connection
RS232	Signals: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI Connector: 9 pin Sub-D (male)
RS485	Cabling: 2 wires (A+ and B-) for multi-points connection Termination: no need for termination resistor (*failsafe bias* resistors included: pullup and pulldown resistors which assures a logical level TRUE when A and B are open or in short circuit) Number of slaves: 254 (if RS485 technology of slaves allows it too) Connector: screw connector (3 x 5.08 mm)
LEDs (common to 2 ports) RxD TxD	 Indicates reception of data Indicates transmission of data
Environment	
Temperature storage	-40° to 85°C
Temperature working (ambient)	**Industrial temperature:** -40°C to 70°C
Humidity	15 to 95 % without condensation
Altitude	Max. 5000m
Dimensions	
Without connector	Height x Depth x Width: **150** x **83** x **29 mm**
Weight	300 g

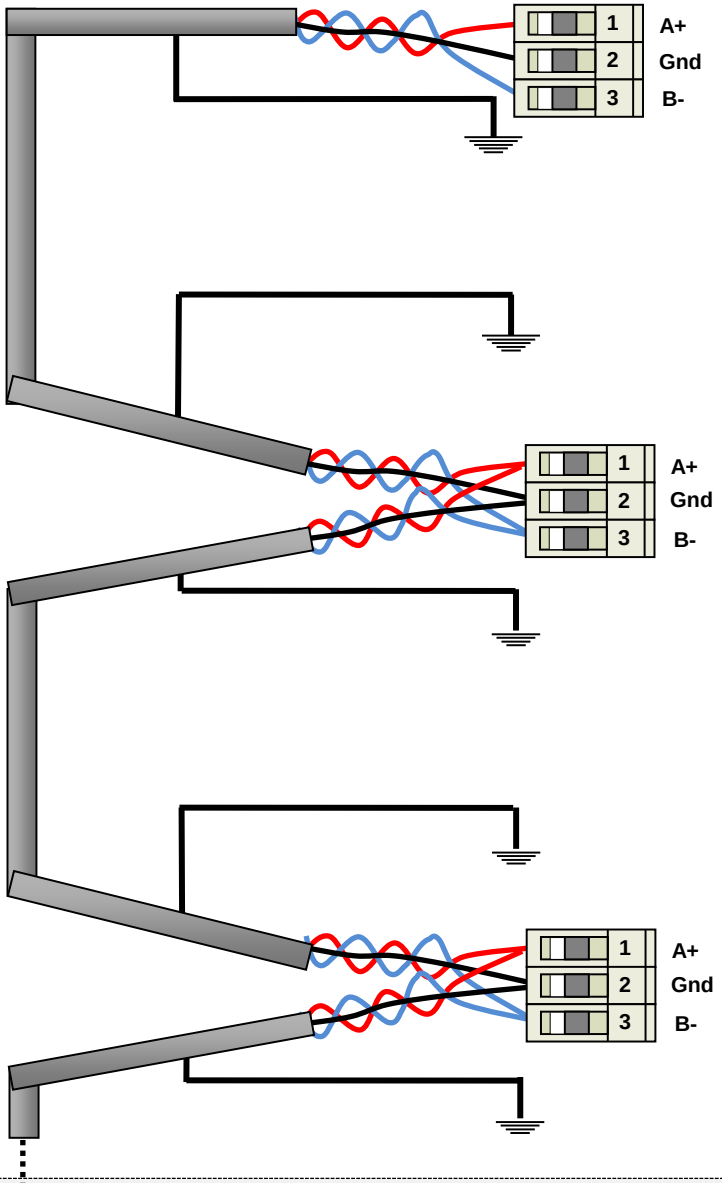


RS 485

Description:	Connector: **RS485**
RS485 communication	**Screw connector (3 x 5.08 mm)**

Cabling several CPUs together:

A to A
B to B
Gnd to Gnd

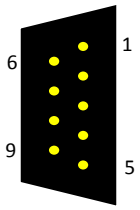


About RS485 cabling:

1. **Use a twisted pair** for signal A and B.
2. **RS 485 is not isolated**. If cabling equipment in different building (different Earth), you have to use ACC-RS485 (see your local distributor)
3. **Maximum length** depends on quality of cable, speed and quantity of stations (max. 254 stations). In good condition, guaranteed to 1.2 km.
   In practice, longer distance can be reached with lower Baudrate and less station.
4. **Cable:** - Twisted pair (2 pairs)
   - section: minimum 0.5mm²
   - screening : pair and global screening
   - reference: Li2YCY-PiMF
5. **Termination**: Termination is normally not required. It might depend on the remote equipment, on quality of the signal and speed. In case of communication error, a resistor of 120 ohms (1/4 watt) could be cabled between A+ and B-

RS 232

Description:	Connector: **RS232**	Pin out:
RS232	**9 Pin Sub D**	



1. DCD (input)
2. RxD (input)
3. TxD (output)
4. DTR (output)
5. Gnd
6. DSR (input)
7. RTS (output)
8. CTS (input)
9.

Cabling to a PC

TBox MS - COMx		PC - DB 9
RxD 2		2 RxD
TxD 3		3 TxD
GND 5		5 GND
RTS 7		7 RTS
CTS 8		8 CTS

Cabling to an external modem

TBox MS - COMx		modem - DB 9
RxD 2		2 RxD
TxD 3		3 TxD
DTR 4		4 DTR
GND 5		5 GND
RTS 7		7 RTS
CTS 8		8 CTS

Cabling to a printer

TBox MS - COMx		Printer - DB 25
RxD 2		2 TxD
TxD 3		3 RxD
GND 5		7 GND
RTS 7		5 CTS
CTS 8		4 RTS

25. Ethernet – 1 port (obsolete)

	Reference: **MS-ETHER**
➢ 1 Ethernet port ➢ 10/100 Mbits ➢ Full Duplex	

TECHNICAL SPECIFICATIONS

General		
Consumption	P Total	0.62 W
Replacement		**Hot insertable/removable.** There is no risk to damage the card but a reset is required
Test		Automatic test of the card by the CPU
LED		
Cs		**Card Selection:** the card corresponds to the one declared in TWinSoft.
Er		**Error:** the card type does not correspond to the one declared in TWinSoft.
Ethernet		
Connector		RJ-45
Cables		**To a Hub :** with a straight cable CAT5 **To a Computer:** with a cross cable CAT5
Speed		10/100 Mbits
Protocols		ModBus/TCP 'Master' and 'slave', SMTP, FTP, HTTP, NTP, POP3, Ping
LED	**100**	**"on"**: connection at 100 Mbits – **"off"**: connection at 10 Mbits
	Lk	**"on"**: link – **"flickering"** : in communication
	FD	**"on"** : Full Duplex - **"off"** : Half Duplex
Environment		
Temperature storage		-40° to 85°C
Temperature working (ambient)		**Standard temperature:** -20°C to 65°C
Humidity		15 to 95 % without condensation
Altitude		Max. 5000m
Dimensions		
Without connector		Height x Depth x Width: **150** x **83** x **29 mm**
Weight		300 g

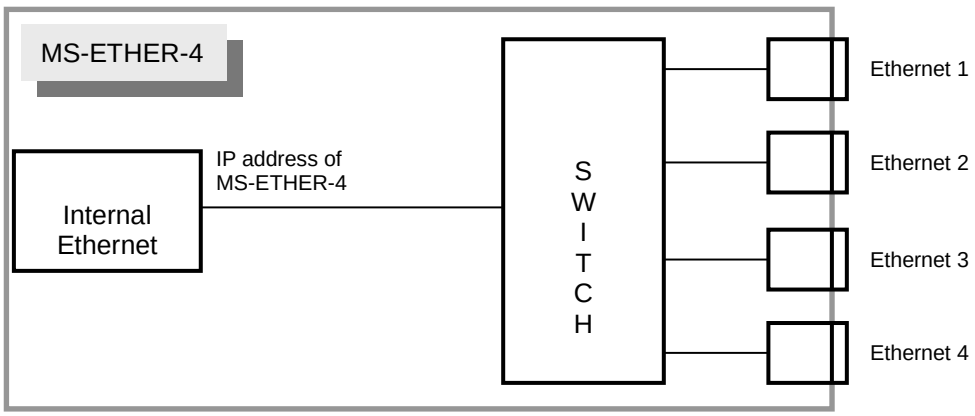
26. Ethernet – 4 ports

	Reference: **MS-ETHER-4**
➢ Switch Ethernet: 4 ports ➢ 10/100 Mbits ➢ Full Duplex	

General		
Consumption	P Total	1.24 W
Replacement		**Hot insertable/removable.** There is no risk to damage the card but a reset is required
Test		Automatic test of the card by the CPU
LED		
Cs		**Card Selection:** the card corresponds to the one declared in TWinSoft.
Er		**Error:** the card type does not correspond to the one declared in TWinSoft.
Ethernet		
Switch		4 x Ethernet
Connectors		4 x RJ-45
Cables		**To a Hub :** with a straight cable CAT5 **To a Computer:** with a cross cable CAT5
Speed		10/100 Mbits
Protocols		ModBus/TCP 'Master' and 'slave', SMTP, FTP, HTTP, NTP, POP3, Ping
LED	**100**	**"on"**: connection at 100 Mbits – **"off"**: connection at 10 Mbits
	LK	**"on"**: link – **"flickering"** : in communication
	FD	**"on"** : Full Duplex - **"off"** : Half Duplex
Environment		
Temperature storage		-40° to 85°C
Temperature working (ambient)		**Industrial temperature:** -40°C to 70°C
Humidity		15 to 95 % without condensation
Altitude		Max. 5000m
Dimensions		
Without connector		Height x Length x Depth: **150** x **83** x **29 mm**
Weight		300 g

IP addressing

The IP address you assign to the card corresponds to the **internal Ethernet**. Do not give the same IP as the Ethernet of the CPU, and **avoid using the same subnet of the CPU**.
The 4 Ethernet ports are connected to the same switch.



If you want to access the ***TBox MS*** from devices connected to the Ethernet, the devices you connect to the switch **must be in the same subnet** than the one of MS-ETHER-4 (correspondence in IP addresses and subnet mask).

Example: all devices in
IP: 192.168.3.xxx Mask: 255.255.255.0

27. Summary of consumptions

In order to evaluate the total consumption of your configuration, you can use the dedicated EXCEL sheet available at http://helpdesk.servelec-technologies.com:

Download -> TBox -> Manuals -> TBox-MS/-LITE -> TBox-MS Consumption.xls

	Icc (3.3V)		Per Card
Cards	A		W
MS-RACK	-		
MS-PS-xxx	0.00		0.00
MS-CHARGER	0.05		0.56
MS-CPU16	0.20		0.83
MS-CPU32	0.40		2.40
per Ethernet			0.17
RS232			0.04
RS285			0.01
MS-CPU32X	0.60		5.70
MS-CPU32-S2	0.23		1.02
per Ethernet	0.021		0.00
RS232	0.011		0.00
RS485	0.005		0.00
USB Dongle			
SD Card	0.012		0.00
MS-16DI	0.04		0.17
MS-48DI	0.02		0.08
MS-16DO	0.08		0.33
MS-8DI-AC	0.04		0.17
MS-10DI-HS	0.12		0.50
MS-16DIO	0.09		0.37
MS-COMB0	0.04		0.17
MS-8AIVC	0.09		0.37
MS-6RTD	0.20		0.83
MS-4AO	0.06		0.25
Quantity of AO "Current"			0.60
Quantity of AO "Voltage"			0.10
MS-RELAY	0.02		1.88
MS-4AI420	0.01		0.02
MS-8AI420	0.01		0.02
MS-PTSN	0.05		0.21
MS-GSM (Idle)	0.03		0.60
MS-GSM-R (Idle)	0.03		0.60
MS-GSM-3G (Idle)	0.03		0.35
MS-GSM (Com)	0.60		2.50
ACC-XDSL	0.14		5.70
MS-GPS	0.03		0.58
MS-SERIAL	0.01		0.10
MS-MESH	0.15		1.05
MS-ETH1	0.30		0.62
MS-ETH4	0.10		1.24
MS-IOSIMUL			0.41

Appendix A. Limits of Compliance

Application Software Limits of Compliance for New Zealand

Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the application software. The application software shall be set to operate within the following limits for compliance with NZ Telecom's specifications:

The country code (GCI value) must set to 7E for New Zealand.
The S0 register must contain a value of 0 for no auto-answer.
The S6 register must contain a value of 2, 3, 4, 5, 6, or 7 for time delay before dialing. The factory default of 2 is recommended.
The S7 register must contain a value less than 90. It contains 80.
The S10 register must contain a value less than 150. The factory default of 14 is recommended.
The U46 register must contain a value of 670 (hex.) for DTMF power level
The U47 register must contain a value more than 60ms for DTMF tone duration. The default of 100ms is recommended.
The U48 register must contain a value more than 60ms for DTMF inter digit pause. The default of 100ms is recommended.

Some of the above settings are configured by default in the modem, some others are available when selecting "New Zealand" as country and declaring a PSTN modem.

There shall be no more than 10 call attempts to the same number within any 30-minute period for any single manual call initiation.
The equipment shall go on-hook for a period of not less than 30 seconds between the end of one call attempt and the beginning of the next attempt to the same number.
Automatic calls to different numbers shall be not less than 2 seconds apart.

Failure to set these parameters correctly could negate the User Rights under the Telecom Terms of Service.

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