

- ❑ Converter for D.C. Current or Voltage measurement
- ❑ Direct connection to D.C. mains rating up to 6kV
- ❑ Fully isolated power supply multivoltage autoranging
- ❑ Fiber optic connection between HV transducer and LV receiving unit
- ❑ Receiving unit with: - 3 linear analogue outputs available in different configurations - one relay output for internal fault alarm – Optional Undervoltage or overcurrent level with relay output, LED Display and Programming Keyboard.

### GENERAL CHARACTERISTICS

The D.C. measuring converters MHCO are designed to allow safe and fully isolated HV D.C. measurement of Current or Voltage.

The apparatus includes three components:

- ❑ The **Transmitter** connected to the D.C. system which transmits via Fiber Optic the signal to the receiving unit.  
Version **MHCO-T-V** for voltage measurement.                      Version **MHCO-T-I** for current measurement.
- ❑ The **Receiver** which elaborates the Optic input signal and converts it into three analogic on outputs.  
Version **MHCO-R-V** for voltage measurement.                      Version **MHCO-R-I** for current measurement.
- ❑ The **Fiber-Optic** belt connecting the two units, complete with ST connector at both ends (Standard length 5m).

### TRANSMITTER UNIT

The following versions are available:

- ❑ **MHCO - T20V** : Converter for **Voltage measurement**  
direct connection to D.C. line up to 4000V  
(voltage divider self-contained)  
Insulation test voltage : **20kV - 50Hz 1min**  
Power supply from external low voltage source
- ❑ **MHCO / A-T20V** : Versions as above but SELFPOWERED from the HV input.

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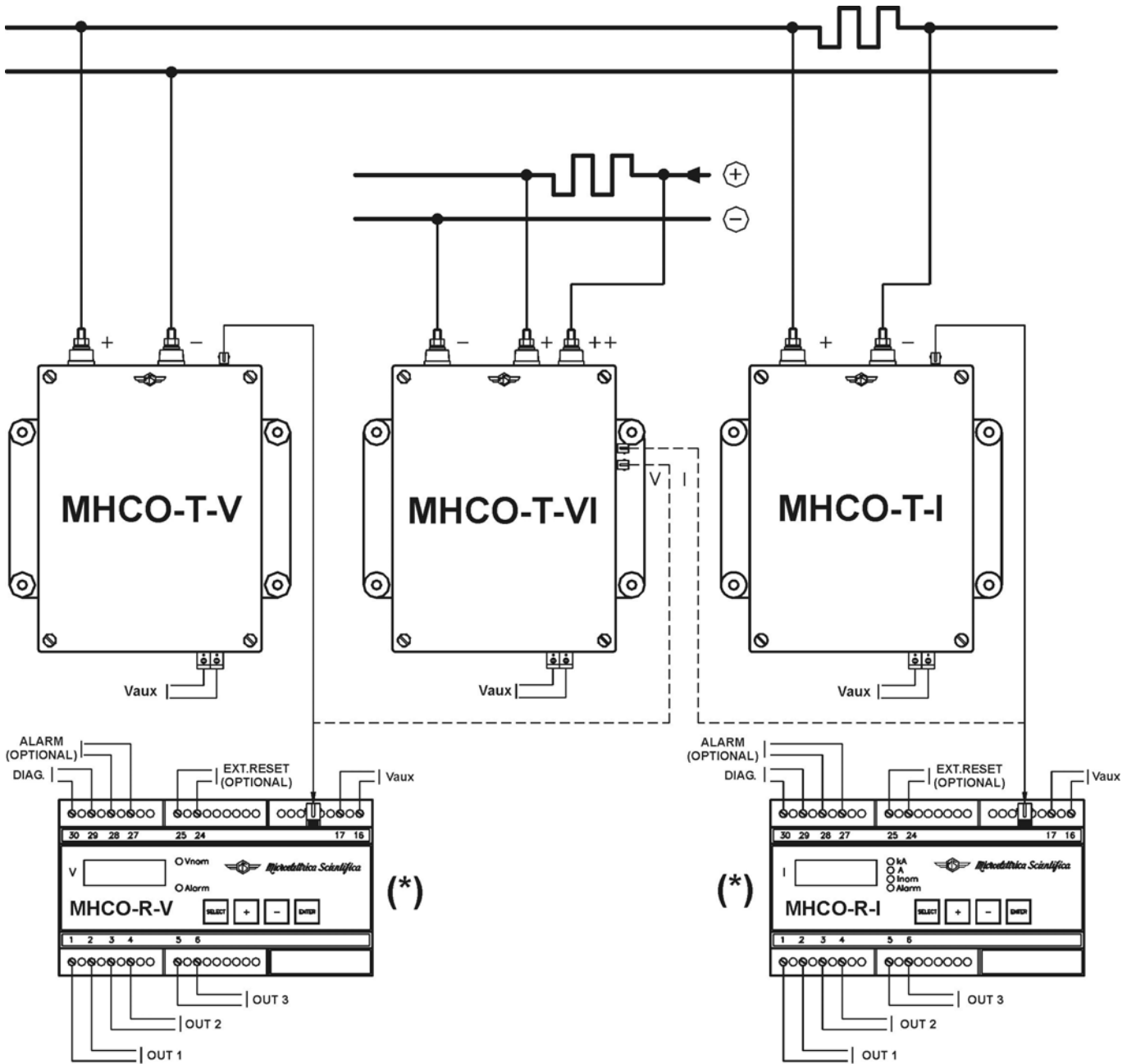
- ❑ **MHCO - T20I** : Converter for **Current measurement**  
across external shunt on DC line up to 4000V  
(60 or 80 or 100 mV input available on request)  
Insulation test voltage: **20kV - 50Hz 1min**  
Power supply from external low voltage source
- ❑ **MHCO / A-T20I** : Versions as above but SELFPOWERED from the HV input.

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- ❑ **MHCO-T-VI** : Including both the Voltage and Current conversion units in a single enclosure.  
Same characteristics as T20V, T20I
- ❑ **MHCO / A-T20VI** : SELFPOWERED VERSION including both the Voltage and Current conversion units  
in a single enclosure.  
Same characteristics as T20V, T20I

# WIRING DIAGRAM

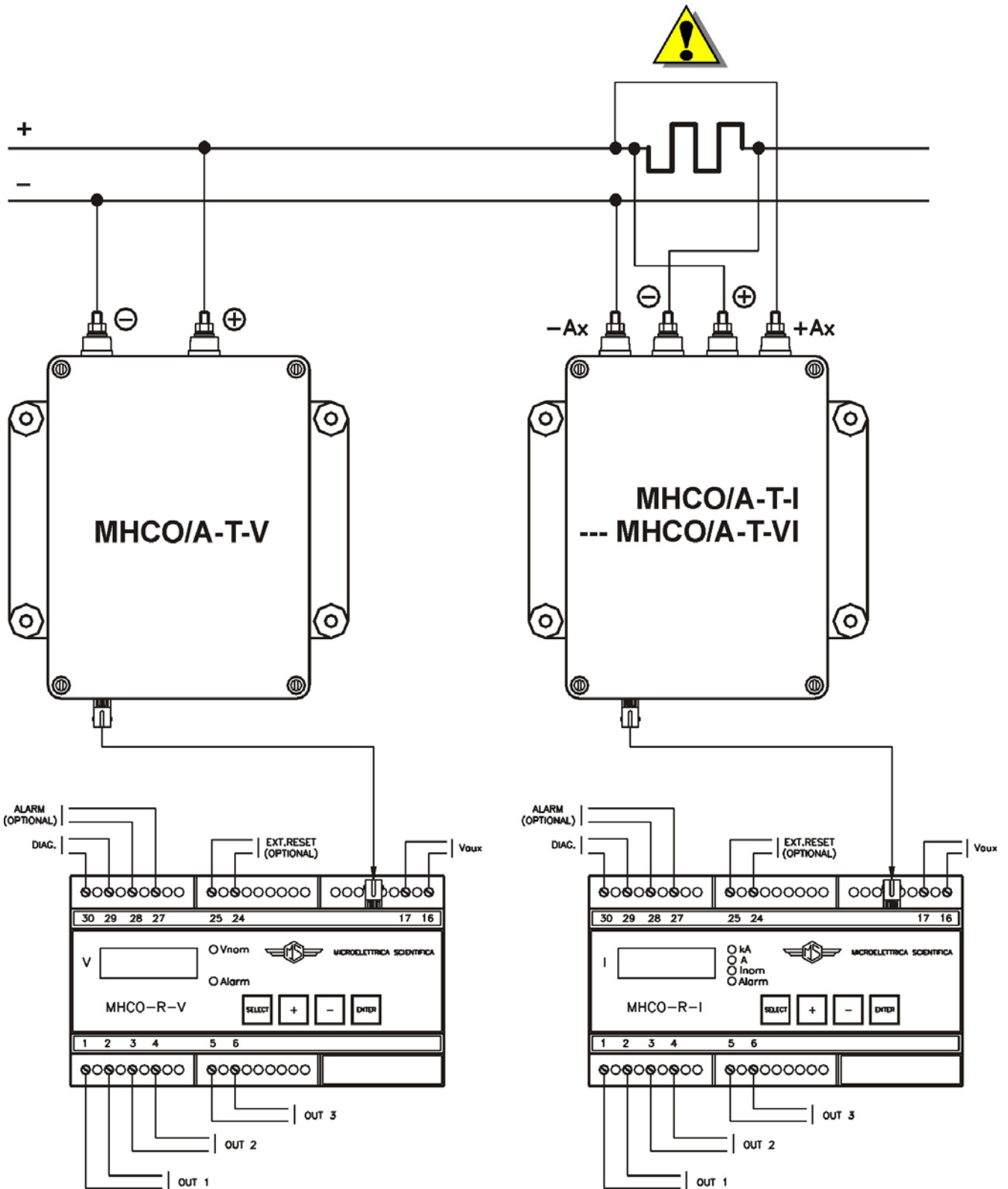
## Standard version with external power supply



(\* ) Version with optional display shown in the figure

# WIRING DIAGRAM

## Selfpowered Version



- N.B. :**
- ❑ POLARITY WHERE THE SHUNT IS CONNECTED MUST BE ADVISED WHEN ORDERING
  - ❑ STANDARD VERSION WITH SHUNT ON POSITIVE POLARITY

**TRANSMITTER  
VOLTAGE UNIT MHCO-T20-V  
STANDARD**

Directly connected to the H.V. line via self contained voltage divider

<b>Power supply voltage</b>	(1) N.D. (2) 33 ÷ 70 Vcc (3) 85 ÷ 160 Vcc	(4) 110 Vca ±20% (5) 230 Vca ±20%
<b>Rated input voltage Vn</b>	(1) 200 Vcc; (2) 750 Vcc; (3) 1000 Vcc; (4) 1500 Vcc; (5) 3000 Vcc; (6) 4000 Vcc	
<b>Input Impedance</b>	20 MΩ	
<b>Output</b>	Fiber Optic free running serial output (type = 200.230.500μ ST-ST) Fiber Optic standard length 5m (max. 250m)	
<b>Measurement dynamic range</b>	0 ± 2 Vn	
<b>Measurement accuracy</b>	0.1% of full scale @ (-20 / +70)°C	
<b>Sampling frequency</b>	32.2 kHz	
<b>Response time</b>	0.5 msec. (compensated)	
<b>Enclosure</b>	Material: BMCRF9 protection degree IP55	
<b>Connection terminals</b>	Bolt type terminals (M6) for inputs; ST for the F.O. ; Screw type 2.5 mm <sup>2</sup> for Power Supply	
<b>Power supply consumption</b>	≤ 5 VA	

**TRANSMITTER  
VOLTAGE UNIT MHCO/A-T20-V  
SELFPOWERED**

Directly connected to the H.V. line via self contained voltage divider

<b>Power supply voltage</b>	1500 ÷ 4200 Vcc
<b>Burden</b>	22W a 4000Vcc
<b>Rated input voltage Vn</b>	4000Vcc
<b>Input Impedance</b>	20 MΩ
<b>Output</b>	Fiber Optic free running serial output (type = 200.230.500μ ST-ST) F.O. standard length 5m (max. 250m)
<b>Measurement dynamic range</b>	0 ± 2 Vn
<b>Measurement accuracy</b>	0.1% of full scale @ (-20 / +70)°C
<b>Sampling frequency</b>	32.2 kHz
<b>Response time</b>	0.5 msec. (compensated)
<b>Enclosure</b>	Selfextinguishing FGRP
<b>Connection terminals</b>	Bolt type (M6) of terminals for inputs; ST for F.O.

**TRANSMITTER  
CURRENT UNIT MHCO-T20-I  
STANDARD**

Directly connected to the H.V. line across a normal measuring shunt.

<b>Power supply voltage</b>	(1) N.D. (2) 33 ÷ 70 Vcc (3) 85 ÷ 160 Vcc	(4) 110 Vca ±20% (5) 230 Vca ±20%
<b>Rated input current In/mV</b>	(1) 60 mVcc ; (2) 80 mVcc ; (3) 100 mVcc	
<b>Output</b>	Fiber Optic free running serial output (type = 200.230.500µ ST-ST) F.O. standard length 5m (max. 250m)	
<b>Measurement dynamic range</b>	(1) 0 ± 2 In; (2) 0 ± 10 In	
<b>Measurement accuracy</b>	0.1% of full scale @ (-20 / +70)°C - (1% for auxiliary output 4)	
<b>Sampling frequency</b>	32.2 kHz	
<b>Response time</b>	0.5 msec. (compensated)	
<b>Diagnostic of Shunt's interruption</b>	Signalization via Fiber Optic	
<b>Enclosure</b>	Material: BMCRF9 protection degree IP55	
<b>Connection terminals</b>	Bolt type terminals (M6) for inputs; ST for the F.O. ; Screw type 2.5 mm <sup>2</sup> for Power Supply.	
<b>Power supply consumption</b>	≤ 5 VA	

**SELFPOWERED TRANSMITTER  
CURRENT UNIT MHCO/A-T20-I**

Directly connected to the H.V. line across a normal measuring shunt.

<b>Power supply voltage</b>	1500 ÷ 4200 Vcc	
<b>Burden</b>	22W a 4000Vcc	
<b>Rated input current In/mV</b>	(1) 60 mVcc	
<b>Output</b>	Fiber Optic free running serial output (type = 200.230.500µ ST-ST) F.O. standard length 5m (max. 250m)	
<b>Measurement dynamic range</b>	(1) 0 ± 2 In; (2) 0 ± 10 In	
<b>Measurement accuracy</b>	0.1% of full scale @ (-20 / +70)°C	
<b>Sampling frequency</b>	32.2 kHz	
<b>Response time</b>	0.5 msec. (compensated)	
<b>Enclosure</b>	Selfextinguishing FGRP	
<b>Connection terminals</b>	Bolt type (M6) terminals for inputs / ST for F.O.	
<b>Shunt Position</b>	(1) on positive polarity (2) on negative polarity	

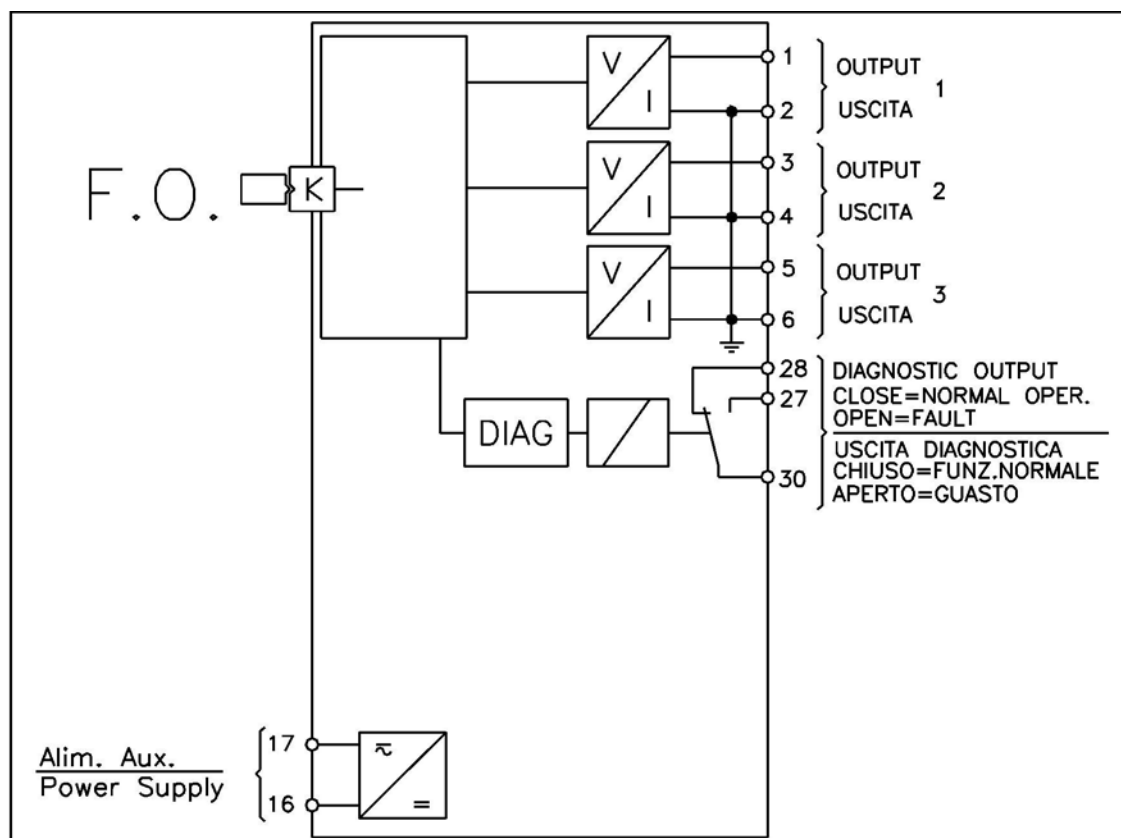
## RECEIVER FOR VOLTAGE MEASUREMENT MHCO-R-V

### GENERAL CHARACTERISTICS VERSION WITHOUT DISPLAY (Standard)

<b>Power supply consumption</b>	≤ 8 VA	
<b>Power supply voltage</b>	(1) N.D. (2) 33 ÷ 70 Vcc (3) 85 ÷ 160 Vcc	(4) 110 Vca ±20% (5) 230 Vca ±20%
<b>Measuring input</b>	Fiber Optic transmitter MHCO-T20V	
<b>Outputs (configurable on request)</b>	3 current loop outputs; Max. output power 0,7VA – 13,5V	
<b>Output accuracy</b>	0.1% full scale @(-20 / +70)°C	
<b>Response time</b>	< 0.5 msec	
<b>Sampling frequency</b>	32.2 kHz	
<b>Mesurement display</b>	2 Led "ON" and "DIAG"	
<b>Diagnostic alarm relay</b>	Contact C/O. (Relay normally energized). Deenergized for Internal Fault (Transmitter, Receiver, F.O. interruption, Power Supply failure).	
<b>Relay pick-up time</b>	< 200 msec	
<b>Enclosure</b>	ABS protection degree IP42	
<b>Insulation</b>	2500 Vca for 1 min. power supply / output 2500 Vca for 1 min. relay / output	
<b>Connection Terminals</b>	Bolt type terminals (2.5 mmq) - ST for Fiber Optic	

### STANDARD OUTPUT SETTING RANGE

OUTPUT 1 (TERMINALS 1-2)	
(1-1) 0 ±20 (30) mA ≅ 0 ± Vn (1.5Vn)	(1-3) 0 ±10 (15) mA ≅ 0 ± Vn (1.5Vn)
(1-2) 4 ÷ 20 (28) mA ≅ 0 ± Vn (1.5Vn)	
OUTPUT 2 (TERMINALS 3-4)	
(2-1) 0 ±20 (30) mA ≅ 0 ± Vn (1.5Vn)	(2-3) 0 ±10 (15) mA ≅ 0 ± Vn (1.5Vn)
(2-2) 4 ÷ 20 (28) mA ≅ 0 ± Vn (1.5Vn)	
OUTPUT 3 (TERMINALS 5-6)	
(3-1) 0 ±20 (30) mA ≅ 0 ± Vn (1.5Vn)	(3-3) 0 ±10 (15) mA ≅ 0 ± Vn (1.5Vn)
(3-2) 4 ÷ 20 (28) mA ≅ 0 ± Vn (1.5Vn)	



**VERSION WITH DISPLAY  
AND ALARM LEVEL  
(Optional)**

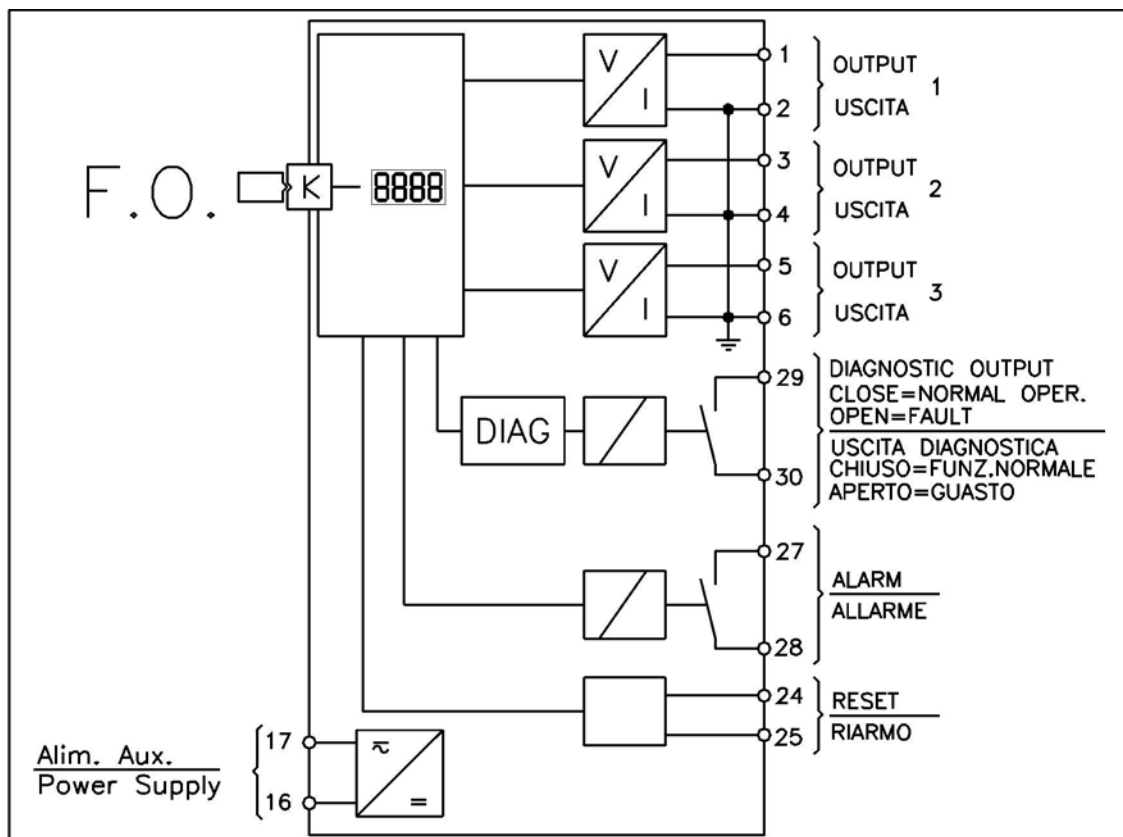
**GENERAL CHARACTERISTICS AS IN THE STANDARD VERSION**

**SIGNAL LED**

<b>Display</b>	Display	display 4 digit a 7 segment (measurement V)		
	LED	$V_{NOM}$	=	Lit-on in the mode for programming the display's scale (Nominal Primary voltage of the converter)
	LED	<b>ALARM</b>	=	Lit-on in the mode for programming the undervoltage alarm level

**ALARM LEVEL**

<b>Diagnostic alarm relay</b>	Contact N.O. (Relay normally energized) Deenergized for Internal Fault (Transmitter, Receiver, F.O. interruption, Power Supply failure).
<b>Undervoltage Alarm</b>	Alarm level setting range $0 \div V_n$ step 10V contact N.O. (Relay normally deenergized)
<b>Undervoltage alarm Reset</b>	Manual (ENTER key) or Remote Automatic if terminals of RESET INPUT are shorted



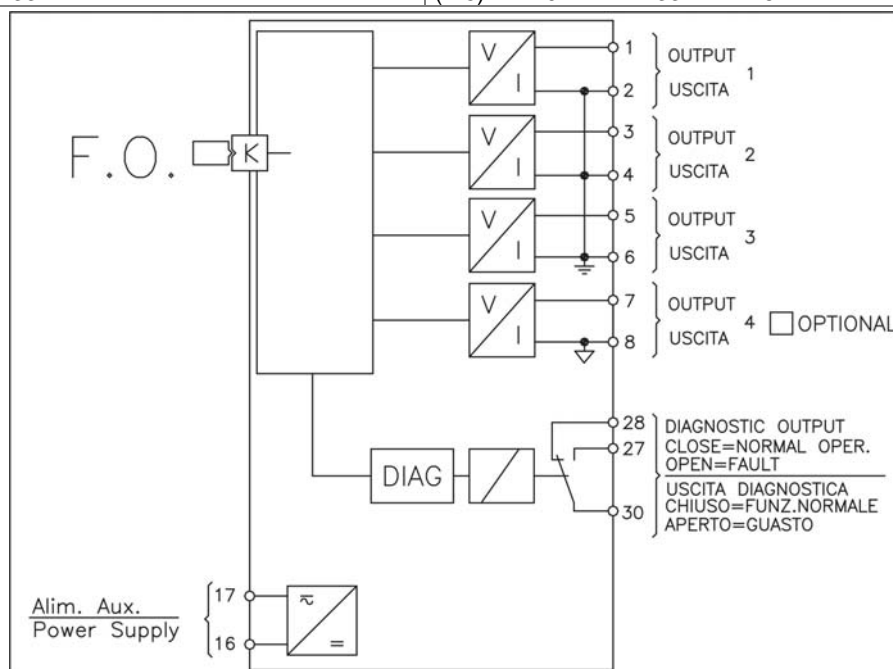
## RECEIVER FOR CURRENT MEASUREMENT MHCO-R-I

### GENERAL CHARACTERISTICS VERSION WITHOUT DISPLAY (Standard)

<b>Power supply consumption</b>	≤ 8 VA	
<b>Power supply voltage</b>	(1) N.D. (2) 33 ÷ 70 Vcc (3) 85 ÷ 160 Vcc	(4) 110 Vca ±20% (5) 230 Vca ±20%
<b>Measuring input</b>	Fiber Optic transmitter MHCO-T20I	
<b>Outputs (configurable on request)</b>	3 current loop outputs; Max. output power 0,7VA – 13,5V	
<b>Output accuracy</b>	0.1% full scale @(-20 / +70)°C - (1% for auxiliary output 4)	
<b>Response time</b>	< 0.5 msec	
<b>Sampling frequency</b>	32.2 kHz	
<b>Measurement display</b>	2 Led "ON" and "DIAG"	
<b>Diagnostic alarm relay</b>	Contact C/O. (Relay normally energized). Deenergized for Internal Fault (Transmitter, Receiver, F.O. interruption, Power Supply failure).	
<b>Relay pick-up time</b>	< 200 msec	
<b>Enclosure</b>	ABS protection degree IP42	
<b>Insulation</b>	2500 Vca for 1 min. power supply / output 2500 Vca for 1 min. relay / output	
<b>Connection Terminals</b>	Bolt type terminals (2.5 mmq) - ST for Fiber Optic	

### STANDARD OUTPUT SETTING RANGE

OUTPUT 1 (TERMINALS 1-2)	
(1-1) 0 ±20 (40) mA ≡ 0 ÷ ± In (2In)	(1-3) 0 ±10 (20) mA ≡ 0 ÷ ± In (2In)
(1-2) 4 ÷ 20 (36) mA ≡ 0 ÷ ± In (2In)	(1-4) 0 ±15 (30) mA ≡ 0 ÷ ± In (2In)
OUTPUT 2 (TERMINALS 3-4)	
(2-1) 0 ±20 (40) mA ≡ 0 ÷ ± In (2In)	(2-4) 0 ÷ ±15 (30) mA ≡ 0 ÷ ± In (2In)
(2-2) 4 ÷ 20 (36) mA ≡ 0 ÷ ± In (2In)	(2-5) 0 ÷ ±20 (40) mA ≡ 0 ÷ ± 10In (20In)
(2-3) 0 ÷ ±10 (20) mA ≡ 0 ÷ ± In (2In)	
OUTPUT 3 (TERMINALS 5-6)	
(3-1) 0 ÷ ±20 (40) mA ≡ 0 ÷ ± In (2In)	(3-3) 0 ÷ ±10 (20) mA ≡ 0 ÷ ± In (2In)
(3-2) 4 ÷ 20 (36) mA ≡ 0 ÷ ± In (2In)	(3-4) 0 ÷ ±15 (30) mA ≡ 0 ÷ ± In (2In)
OUTPUT 4 (TERMINALS 7-8) (Optional)	
(4-1) 4 ÷ 20 mA ≡ -0.75In ÷ +1.5In	(4-5) 4 ÷ 20 mA ≡ -0.75In ÷ +0.75In
(4-2) 4 ÷ 20 mA ≡ 0 ÷ +1.25In	(4-6) 4 ÷ 20 mA ≡ -1In ÷ +1In
(4-3) 4 ÷ 20 mA ≡ 0 ÷ +1In	(4-7) 4 ÷ 20 mA ≡ -2In ÷ +2In
(4-4) 4 ÷ 20 mA ≡ 0 ÷ +1.33In	(4-8) 4 ÷ 20 mA ≡ -1.33In ÷ +1.5In



## VERSION WITH DISPLAY AND ALARM LEVEL (Optional)

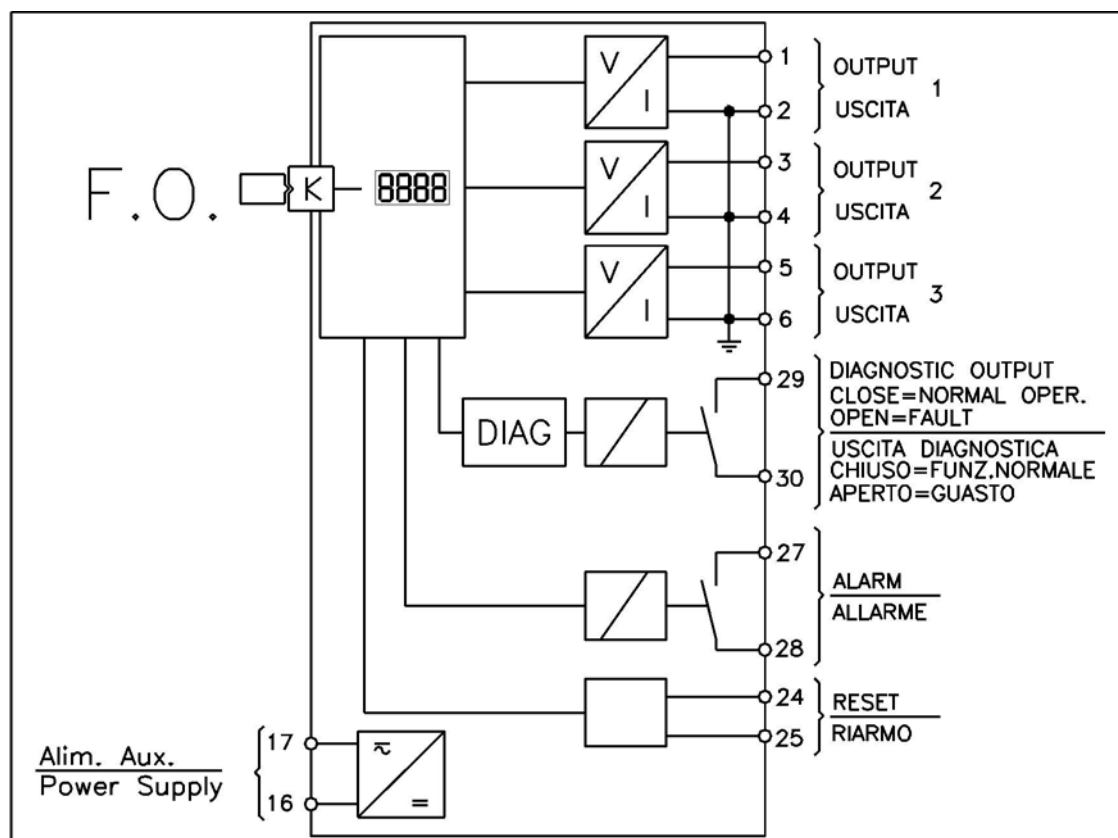
### GENERAL CHARACTERISTICS AS IN THE STANDARD VERSION

#### SIGNAL LED

<b>Display</b>	Display	display 4 digit a 7 segment (measurement kA)		
	LED	<b>kA</b>	=	Measurement displayed in kA
	LED	<b>A</b>	=	Measurement displayed in A
	LED	<b>I<sub>NOM</sub></b>	=	Lit-on in the mode for programming the display's scale (Shunt's Primary Amp)
	LED	<b>ALARM</b>	=	Lit-on in the mode for programming the overcurrent alarm level

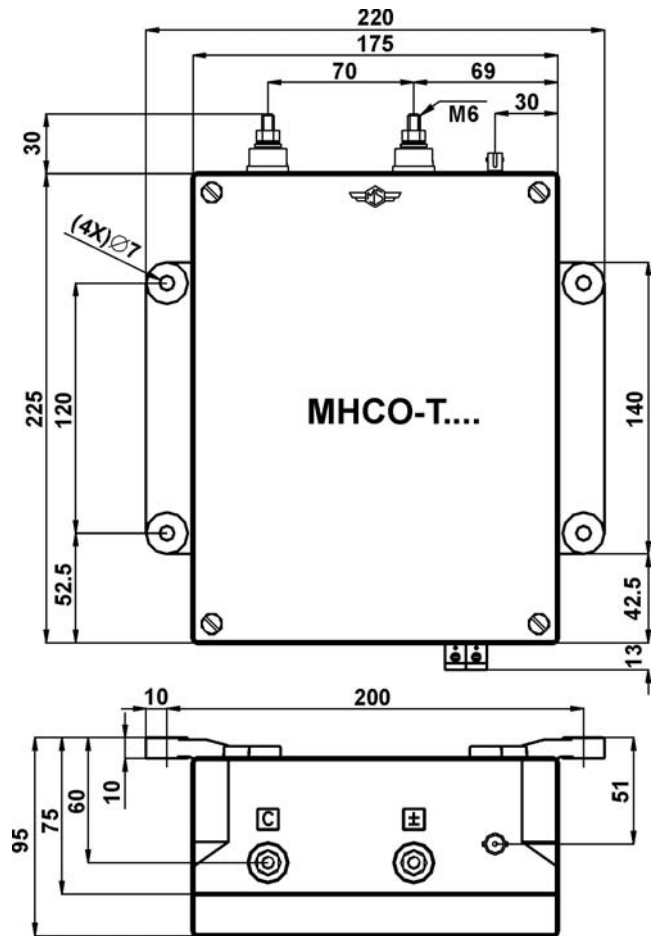
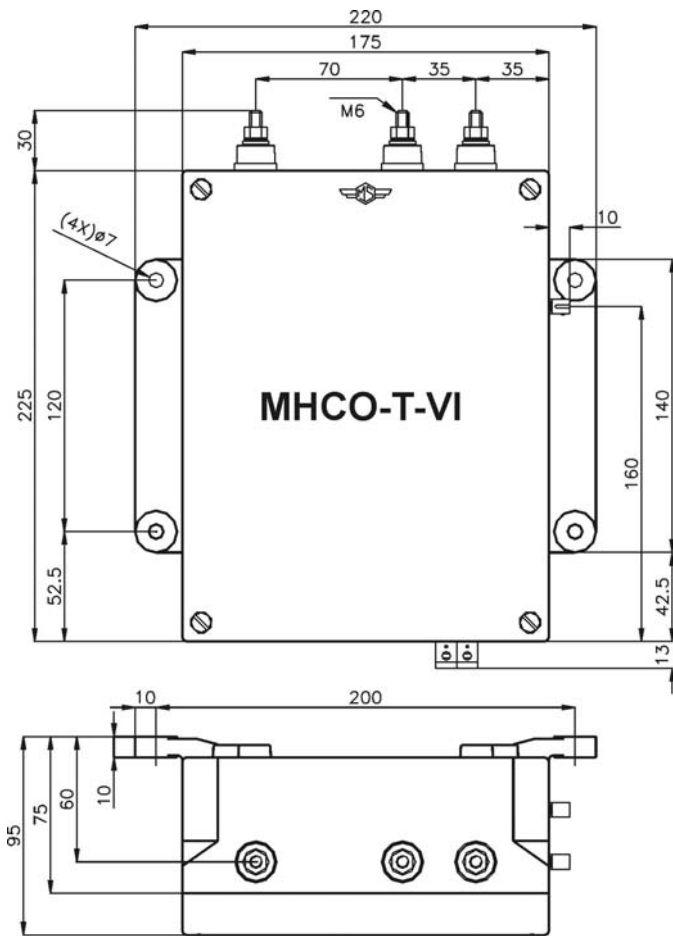
#### ALARM LEVEL

<b>Diagnostic alarm relay</b>	Contact N.O. (Relay normally energized) Deenergized for Internal Fault (Transmitter, Receiver, F.O. interruption, Power Supply failure).
<b>Overcurrent Alarm</b>	Alarm level setting range (0 ÷ 2)I <sub>n</sub> , step 0.1I <sub>n</sub> Contact N.O. (Relay normally deenergized)
<b>Overcurrent alarm Reset</b>	Manual (ENTER key) or Remote Automatic if terminals of RESET INPUT are shorted

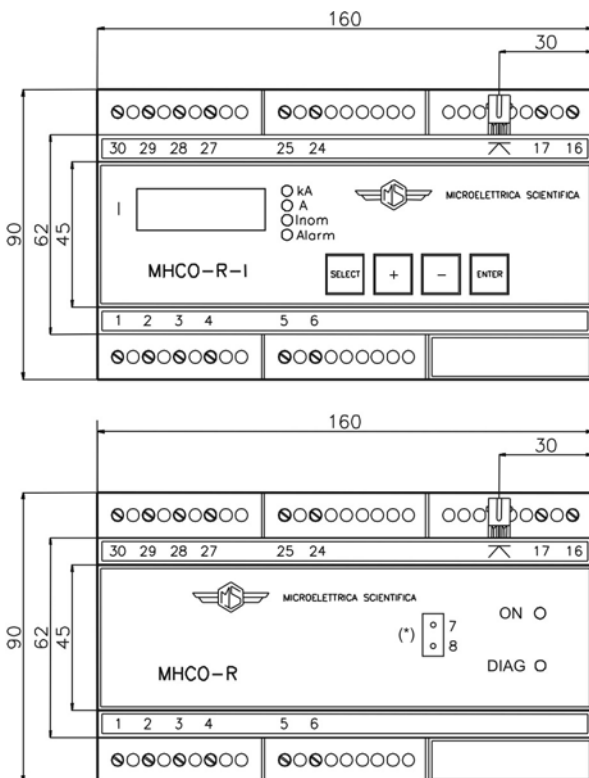


## TRANSMITTER OVERALL DIMENSIONS

Standard Version with external Power Supply



## OVERALL DIMENSIONS RECEIVER

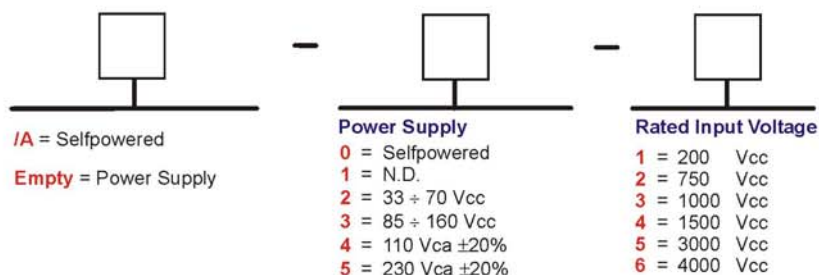


Version "O"  
with OPTIONALS

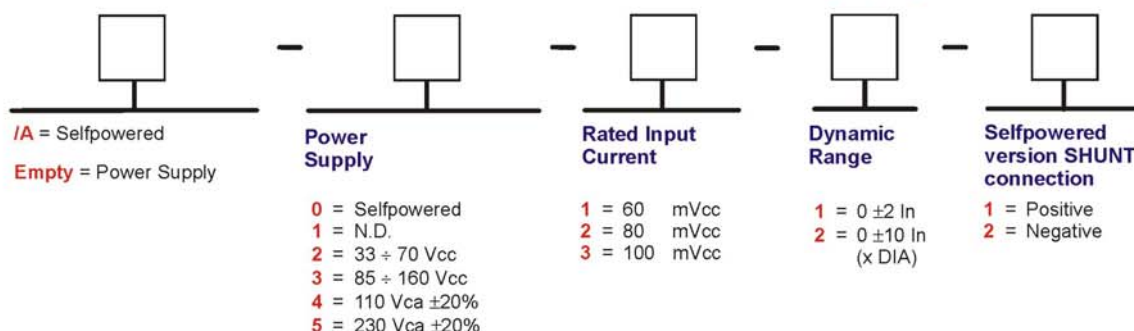
STANDARD  
VERSION "S"

(\*) OUTPUT 4 - OPTIONAL

### Example code of Transmitter Voltage Unit : MHCO-T20V -2-3

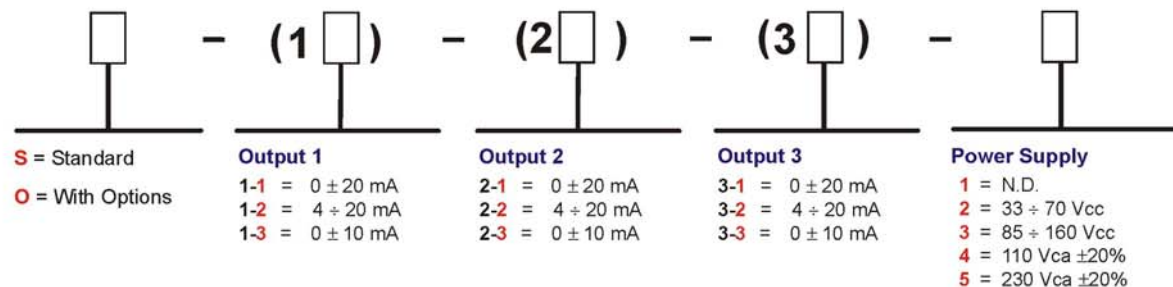


### Example code of Transmitter Current Unit : MHCO-T20I -2-1-1-2

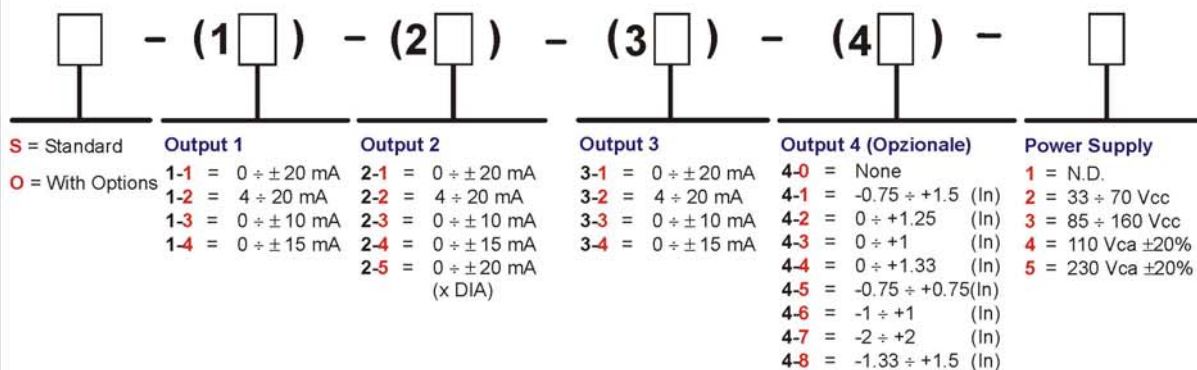


**Fiber Optic** : 5m (standard) - Other on request =

### Example code of Receiver Voltage Unit : MHCO-R-V-S-(12)-(22)-(32)-3



### Example code of Receiver Current Unit : MHCO-R-I-S-(12)-(22)-(32)-(42)-3



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The performances and the characteristics reported in this manual are not binding and can be modified at any moment without notice