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# Terminal Boxes

## Series SM2

Specification N° :

**15SM2GENR03-E**

Accessory :

**Terminal Boxes Series SM2**

Page N° :

**1 of 3**

Title :

**Function, general features and range of types**

Revision :

**03 – 01/07/10**

## 1.0 Function, features, range of types, assembly and operation

This specification concerns the function, the main features, the range of types and the assembly and operation of the terminal boxes Series SM2. Environmental and operating conditions depend generally from the compatibility of the materials and components and from the surface finish.

## 2.0 Function

The measurement, control, check and data recording circuits for medium and high power, oil-cooled, oil-insulated electric transformers require medium and low voltage and current signals to be brought outside the tank.

The terminal boxes Series SM2 are designed and constructed to meet these requirements since they offer oil-tight, insulated through conductors protected with a flanged casing and accessible through cable entries.

## 3.0 Construction features

The terminal boxes Series SM2 consist mainly of a flanged casing, closed by a cover, inside which are mounted the terminals. One end of the terminal is wired inside the transformer tank while the other end is wired outside the tank through threaded cable entries.

The following data apply only to the terminal boxes Series SM2 fitted with M6 terminals.

### 3.1.0 General features

- Flanged casing with lowered bottom to prevent air pockets; the casing has one or more cable entries and is closed by a cover; protection degree of the box is IP 65; identification labels inside and outside the box allow identification of terminal box as well as of terminals;
- The cable entries are threaded to customer request and supplied on request either plugged by brass plugs or with brass cable glands with gasket;
- Terminal boxes are supplied with the number of terminals requested by customer;
- The standard terminals are one-piece conductors threaded M6 at both ends for connection of a Ø 6 mm cable terminal, insulated with Nylon glass-fibre; oil-tightness is obtained by O-Ring gasket;
- The terminals are designed and mounted so that they cannot twist when the cable terminal is screwed on and have a snap-On ring to prevent accidental loosening during transport, handling and mounting; they are evenly spaced so that they can be connected by connecting plates supplied on request;
- The terminals are supplied with copper washers; inside the tank self-locking nuts are used to assure secure, vibration-proof wiring while the connection inside the terminal box is assured with brass nut and counter-nut;
- Terminals are numbered on both sides to ease cabling and allow identification; on request the terminals can be identified as specified by the customer;
- Special M10 terminals are also available.

### 3.2.0 Materials and finish

- Casing and cover of aluminium casting, painted with one coat of epoxy primer and one finishing coat of polyurethane paint, colour RAL 7031; the epoxy primer is compatible with mineral transformer oil at a temperature of up to 120°C, the paint passes the 500 hour salt fog test;
- Nylon insulated nickel plated brass terminals with copper washers and vibration-proof nuts;
- Terminal gaskets of fluor silicone rubber;



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**15SM2GENR03-E****Terminal Boxes Series SM2****2 of 3**

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- External screws and washers of stainless steel;
- Cable entries are closed by plastic plug during shipment.

### 3.3.0 Operating conditions

Materials, components and design allow the terminal boxes Series SM2 to be used in the following conditions:

- Environmental temperature with standard gaskets - 20°C to + 50°C
- Relative humidity 95% at 20°C; 80% at 40°C; 50% at 50°C
- Protection degree of box IP 65
- Operating temperature (mineral oil) -20°C to +110°C
- Insulation to earth of terminal at 20°C > 5.000 V
- Standard M6 terminal cross section 12 mm<sup>2</sup>

Special executions can be supplied for other environmental conditions

### 3.4.0 Test

Following tests and controls are performed on boxes before despatch:

- Insulation test of terminals towards box; test voltage 3.000V;
- Tightness test of mounted terminals by compressed air and immersion in water bath; test pressure 1 bar;
- Control of correct numbering of terminals

## 4.0 Range of types

The terminal boxes Series SM2 are produced in 4 types as follows:

- **Type SM2-X**
  - ◇ Dimensions to drawing N° 15.112.00
  - ◇ Number of terminals from 2 to 6
  - ◇ Number and dimensions of cable entries max 3 - max 1" or PG 29 or Ø 40 mm
- **Type SM2-S**
  - ◇ Dimensions to drawing N° 15.102.00
  - ◇ Number of terminals from 2 to 12
  - ◇ Number and dimensions of cable entries max 4 - max 1" or PG 29 or Ø 40 mm
- **Type SM2-L**
  - ◇ Dimensions to drawing N° 15.136.00
  - ◇ Number of terminals from 2 to 36
  - ◇ Number and dimensions of cable entries max 5 - N° 3 max 1" or PG 29 or Ø 40 mm + N° 2 - max ¾" or PG 21 or Ø 35 mm
- **Type SM2-XL**
  - ◇ Dimensions to drawing N° 15.236.00
  - ◇ Number of terminals from 2 to 53
  - ◇ Number and dimensions of cable entries max 4 - max 1 3/4" or PG 42 or Ø 50 mm

Drawings showing the construction of the terminals:

- **Terminal M6** N° 15.102.001
- **Terminal M10** N° 15.102.002

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**15SM2GENR03-E**

Accessory :

**Terminal Boxes Series SM2**

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Revision :

**03 – 01/07/10**

## 5.0 Assembly and operation

It is advisable to prepare a wiring plan for each terminal box before assembling, showing the identification of the terminal box, which can be engraved on the terminal box identification plate, and the correspondence between the wire identification and the number of the terminal.

Terminal boxes Series SM2 are then mounted on the transformer tank as follows:

- the wires inside the tank are first connected to the terminals on the bottom of the terminal box in accordance with the wiring plan; for easy wiring and record it is advised to write the wire identification number on the identification plate inside the terminal box cover in correspondence to the number identifying the terminal;
- the terminal box is then bolted to the tank; the flange O-Ring gasket assures oil-tightness;
- the external wires are then led inside the terminal box through the cable entries, there to be connected to the external part of the terminals; each wire has to be connected to the terminal following the numbering previously set up;
- if necessary one or more terminals can be connected by conducting plates that can be supplied separately;
- when the wiring is finished close the cover of the terminal box.



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Nomenclature N°:

Reference drawings N°:

Page N°

**15SM2R00-E**

**15.112.00 – 15.102.00 – 15.136.00 – 15.236.00**

**1 of 1**

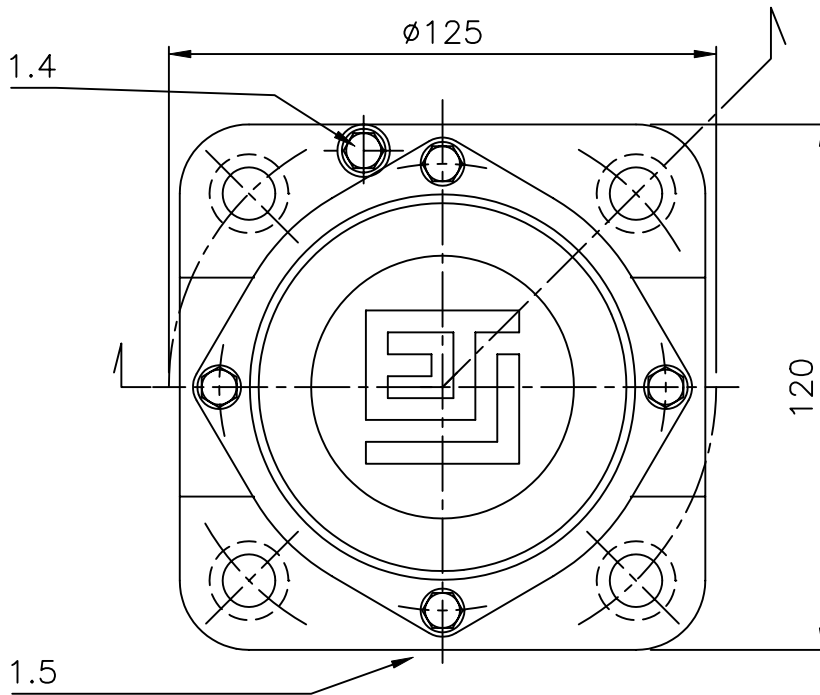
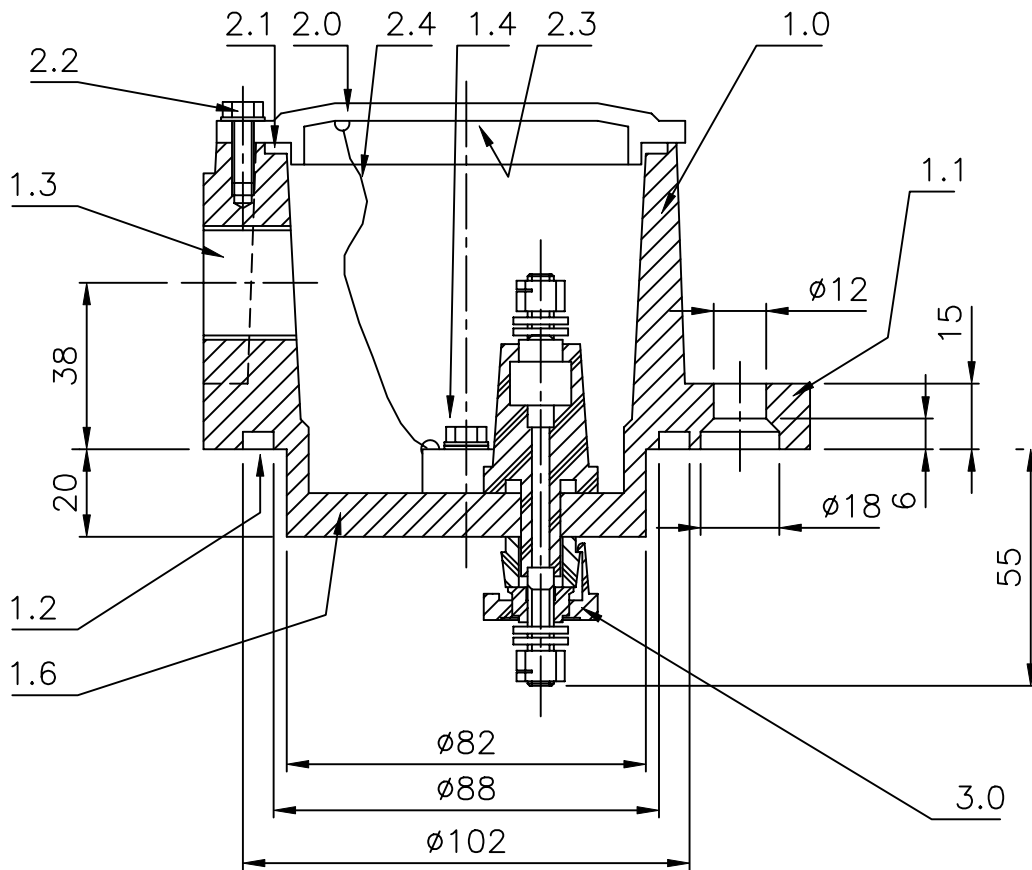
Product:

Revision N°

**Terminal boxes Series SM2**

**00 of 02.07.2010**

Pos.	Part Denomination	N°	Material
<b>1.0</b>	Terminal box casting	1	Aluminium
<b>1.1</b>	Mounting flange		
<b>1.2</b>	Gasket seat – gasket supplied with box:	1	Nitrile rubber
	• Type SM2-X		OR 6362 - Ø 91,44 X 5,34 mm
	• Type SM2-S		OR 8500 - Ø 126,4 x 6,99 mm
	• Type SM2-L		OR 8750 - Ø 189,9 x 6,99 mm
	• Type SM2-XL		OR 8850 - Ø 215,30 x 6,99 mm
<b>1.3</b>	Cable entry – number and dimension on request:		Maximum dimension
	• Type SM2-X	1-3	1"G – PG29 – Ø 40mm
	• Type SM2-S	1-4	1"G – PG29 – Ø 40mm
	• Type SM2-L	1-3	1"G-PG29-Ø 40 mm
		1-2	3/4"G-PG21-Ø 30 mm
	• Type SM2-XL	1-4	13/4"G-PG42-Ø 50 mm
<b>1.4</b>	Earth screw – internal and external	2	Stainless steel
<b>1.5</b>	Terminal box identification label	1	Aluminium
<b>1.6</b>	Terminal box raised bottom		
<b>2.0</b>	Terminal box cover	1	Aluminium
<b>2.1</b>	Cover gasket:	1	Nitrile rubber
	• Type SM2-X		OR 4337 - Ø 85,32 x 3,53 mm
	• Type SM2-S		OR 4425 - Ø 107,5 x 3,53 mm
	• Type SM2-L		OR 4725 - Ø 183,7 x 3,53 mm
	• Type SM2-XL		OR 4825 - Ø 209,1 x 3,53 mm
<b>2.2</b>	Cover assembly screws	4-8	Stainless steel
<b>2.3</b>	Terminals identification label	1	Aluminium
<b>2.4</b>	Cover holding string	1	Nylon
<b>3.0</b>	Terminal M6 – number on request:		dwg. N° 15.102.001
	• Type SM2-X	1 to 6	
	• Type SM2-S	1 to 12	
	• Type SM2-L	1 to 36	
	• Type SM2-XL	1 to 53	



Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
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Progettato da	Controllato da	Approvato da - data	Nome file	Data	Scala
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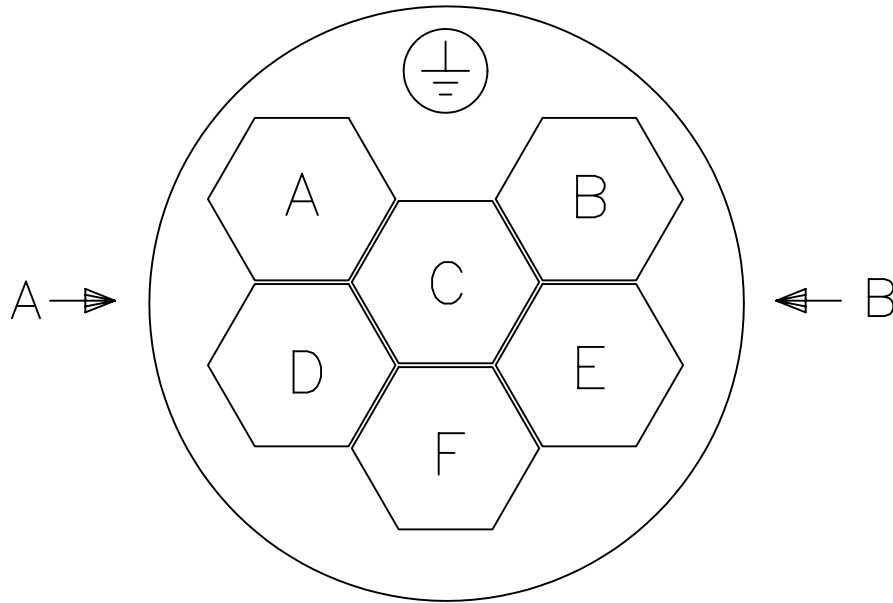


Titolo/Nome	SCATOLA MORSETTIERA TERMINAL BOX BOITE A BORNES	Tipo-Type	SM2-X //
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Numero disegno	15.112.00	Modifica	Foglio
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		A	B
USCITE PASSAGES ENTRIES	1		X
	2	X	X

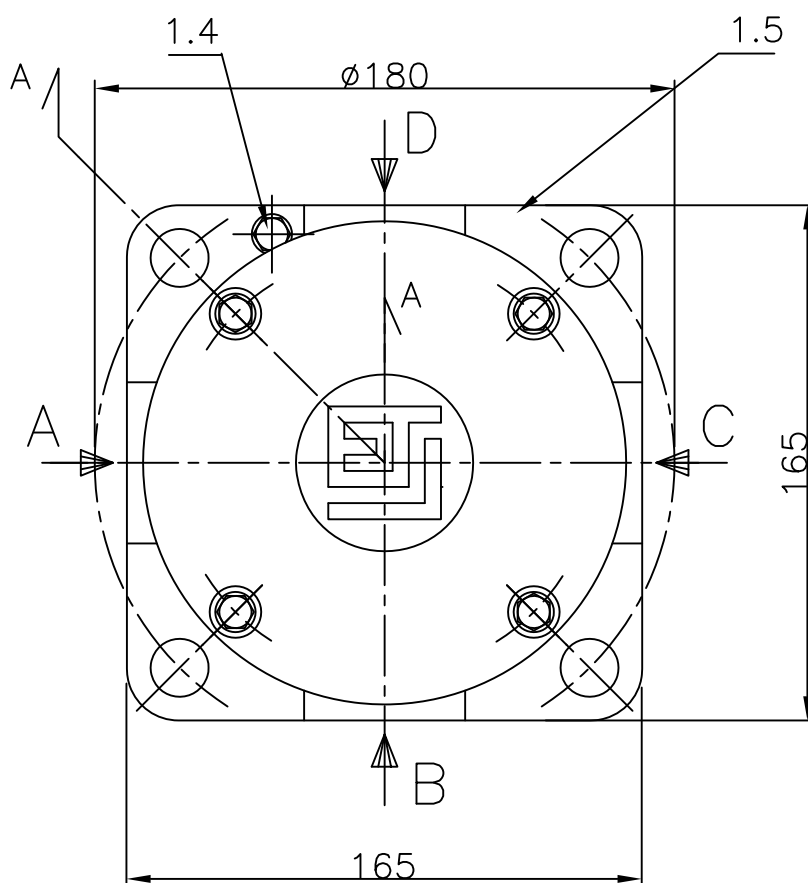
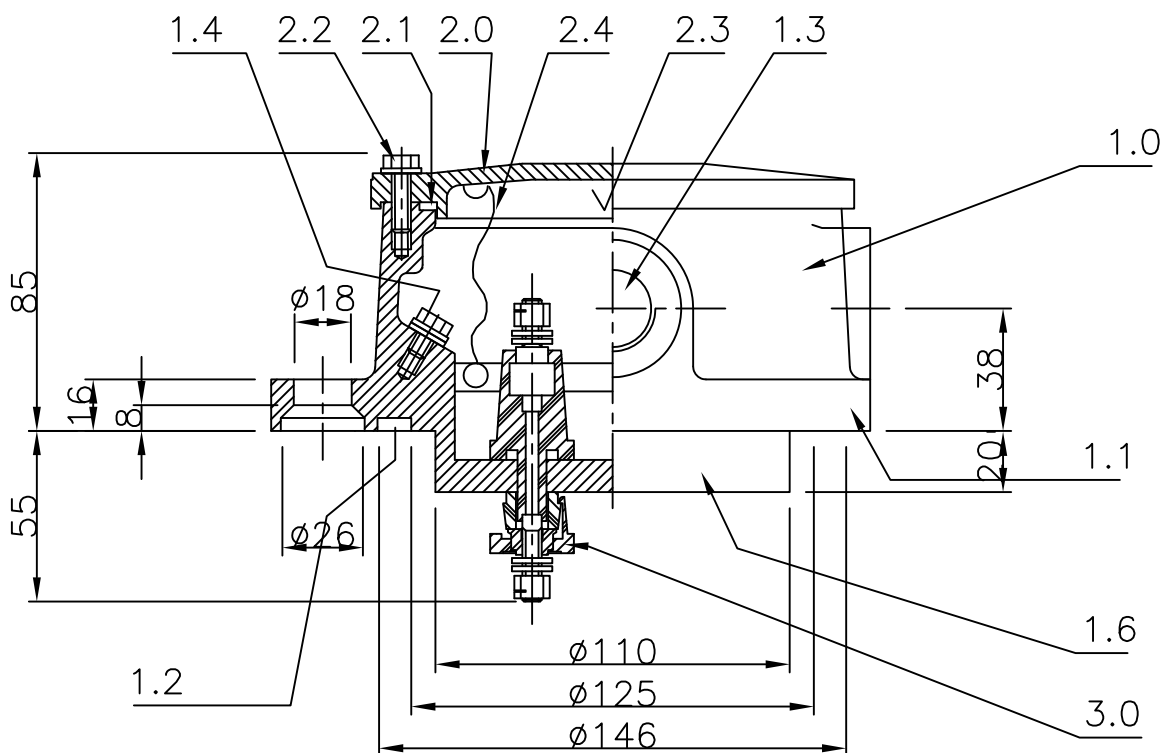


Schema foratura e numerazione morsetti e boccchettoni  
 Schema percage et numeration bornes et passage pour presse-étoupe  
 Disposition and numbering of terminals and cable entries

Foratura a 4 morsetti era B-D-E-F 06/02/02

Pos.	Quantità	Descrizione	Materiale	N. articolo
Progettato da		Controllato da	Approvato da - data	Nome file
				Data
				Scala //
<b>ELETTRINDUSTRIA SRL</b> <b>20032 CORMANO ITALY</b>		Titolo/Nome		TIPO-TYPE
		SCATOLA MORSETTIERA BOITE A BORNES TERMINAL BOX		SM2-X
		Numero disegno	Modifica	Foglio
		15.112.002	A	

N.rev	Nota sulla revisione	Data	Firma	Controllo
A	Quadro flangia 165 era 160	23/05/07		GG
B	Aggiunta identificazione uscite e bocchettone "D"	25/06/09		



Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
Progettato da	Controllato da	Approvato da - data	Nome file	Data	Scala	
				01-01-98	//	

**ETI ELETTRINDUSTRIA S.r.l.**  
**20032 CORMANO ITALY**

Titolo/Nome  
 SCATOLE MORSETTIERA - TERMINAL BOX - BOITE A BORNES  
 Serie: SM2-S

Numero disegno  
 15.102.00

Modifica  
 B

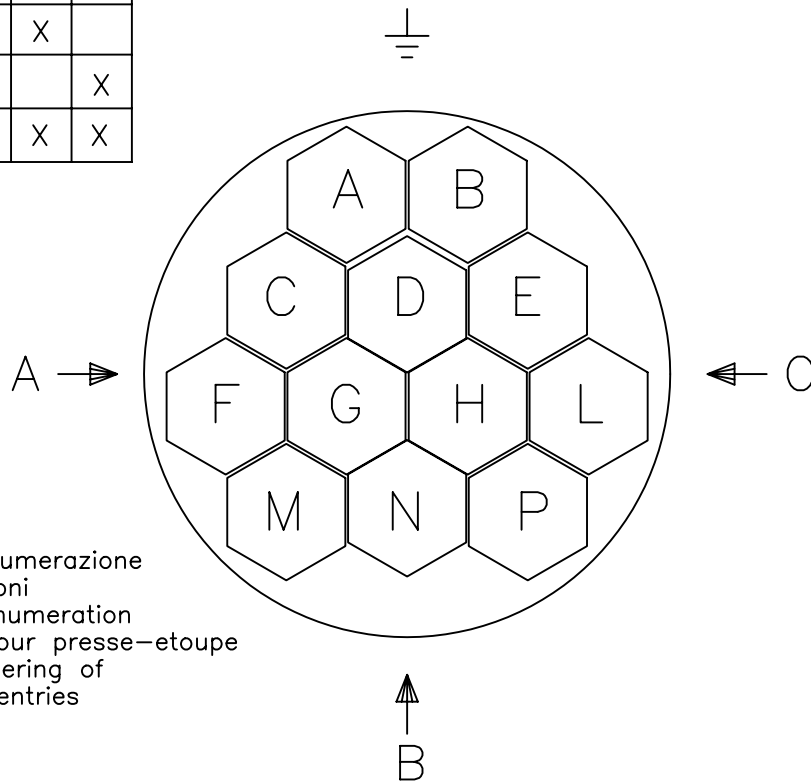
Foglio

Riproduzione vietata

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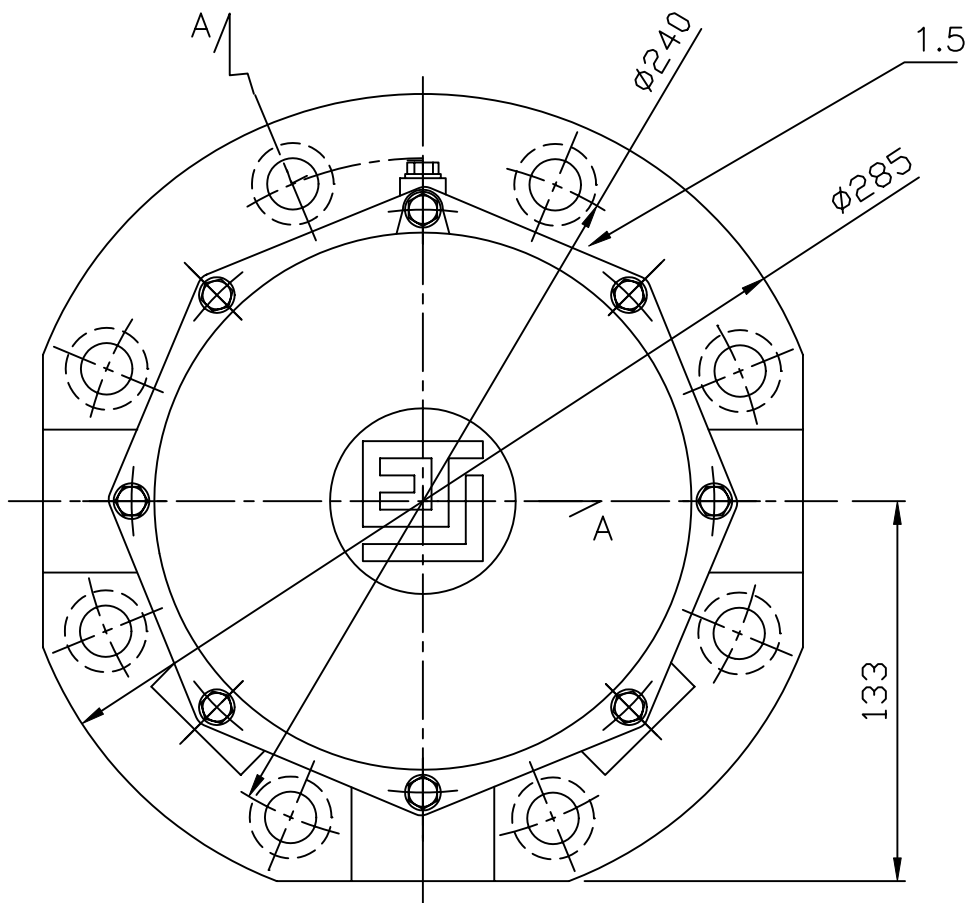
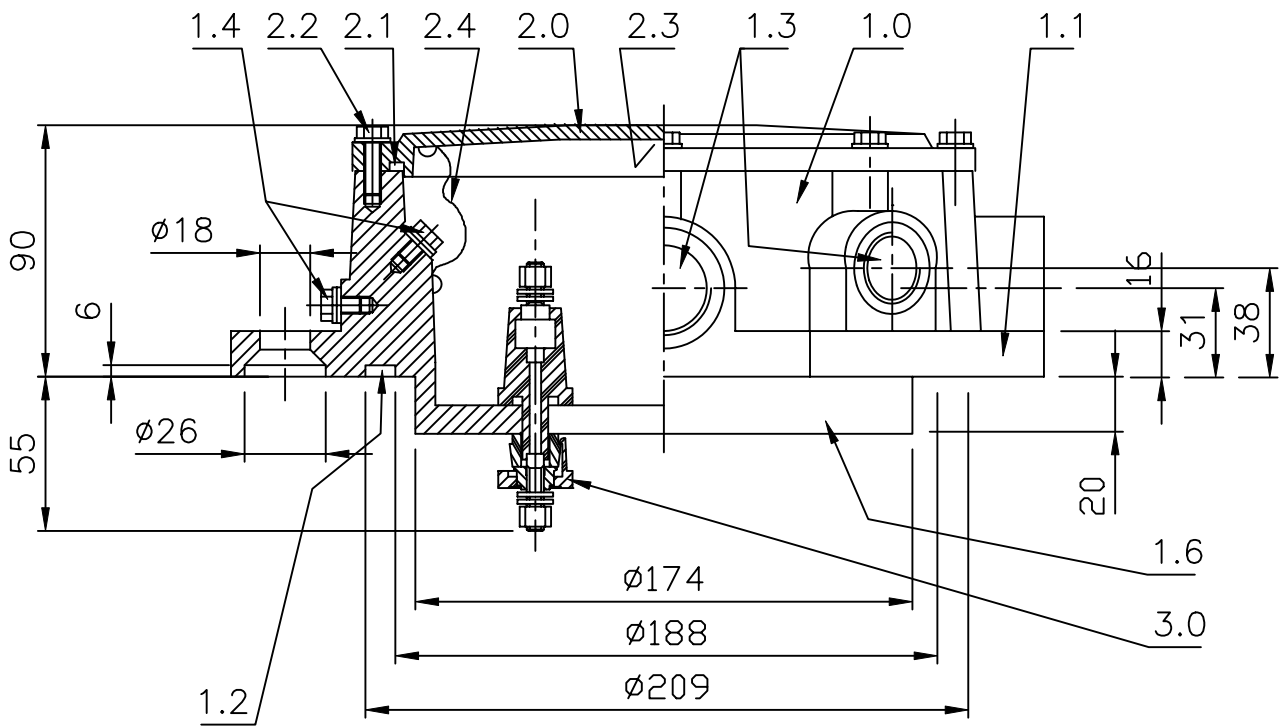
Schema foratura e numerazione morsetti e boccchettoni  
 Schema percage et numeration bornes et passage pour presse-étoupe  
 Disposition and numbering of terminals and cable entries

Pos.	Quantità	Descrizione	Materiale	N. articolo
Progettato da	Controllato da	Approvato da - data	Data 22.01.2002	Scala //

**ELETRINDUSTRIA SRL**  
 20032 CORMANO ITALY

Titolo/Nome SCATOLA MORSETTIERA BOITE A BORNES TERMINAL BOX		TIPO-TYPE SM2-S	
Numero disegno 15.102.002	Modifica	Foglio	

N.rev	Nota sulla revisione	Data	Firma	Controllo
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Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
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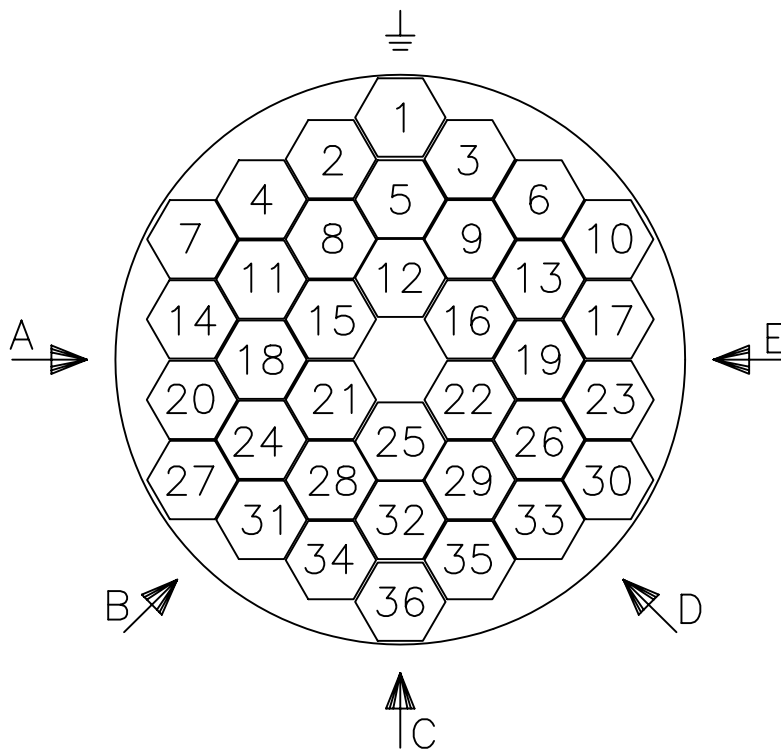
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Serie: SM2-L

Numero disegno	15.136.00	Modifica	Foglio
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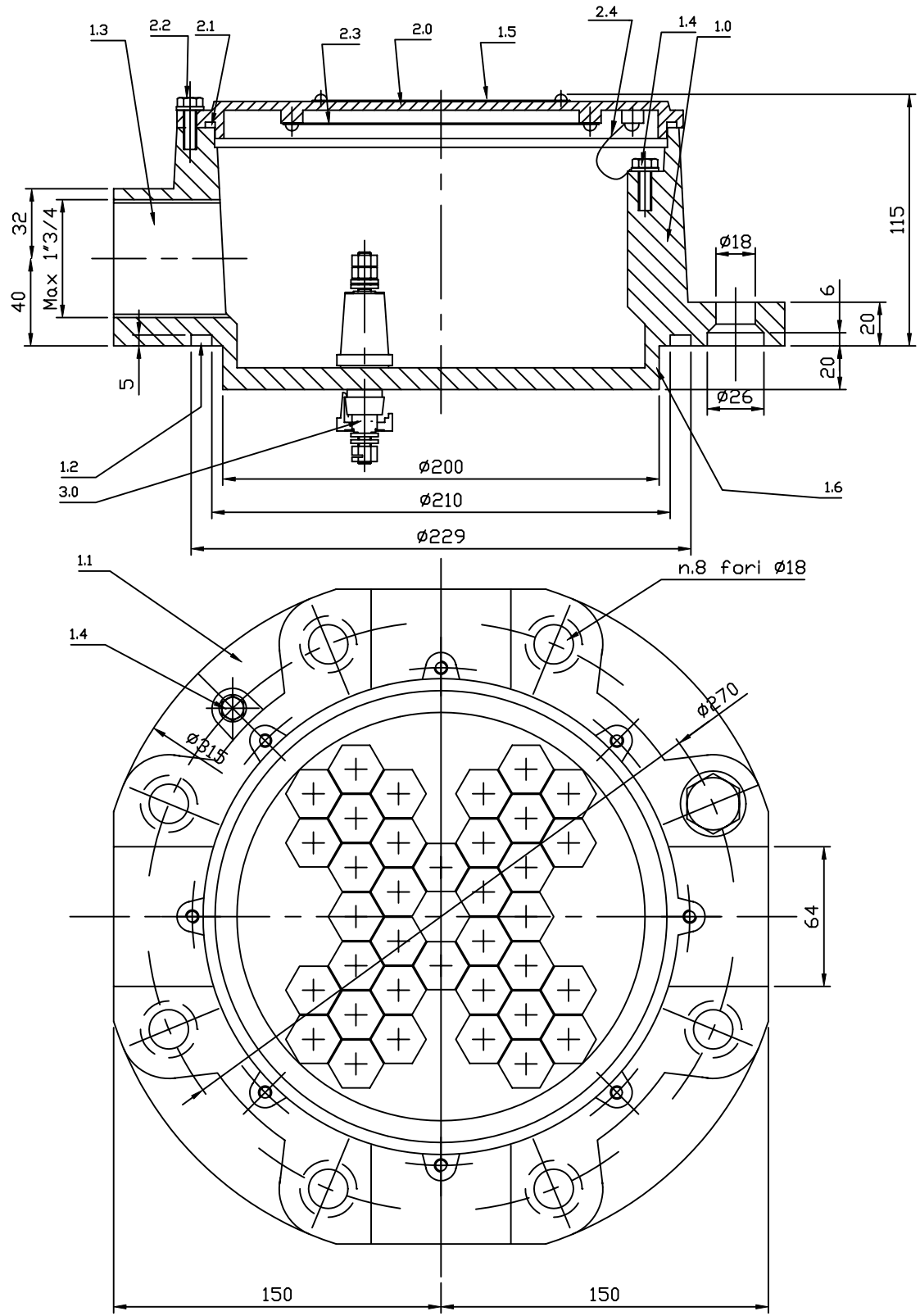
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	5	X	X	X	X	X



Schema foratura e numerazione morsetti e bocchettoni  
 Schema percage et numeration bornes et passages pour presse-étoupe  
 Disposition and numbering of terminals and cable entries


Pos.	Quantità	Descrizione	Materiale	N. articolo
Progettato da	Controllato da	Approvato da - data	Nome file	Data 22.01.2002
		Titolo/Nome		Scala //
<b>ELETTRINDUSTRIA SRL</b> <b>20032 CORMANO ITALY</b>		<b>SCATOLA MORSETTIERA</b> <b>BOITE A BORNES</b> <b>TERMINAL BOX</b>		<b>TIPO - TYPE</b> <b>SM2-L</b>
		Numero disegno	Modifica	Foglio
		15.136.002		

N.rev	Nota sulla revisione	Data	Firma	Controllo
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Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
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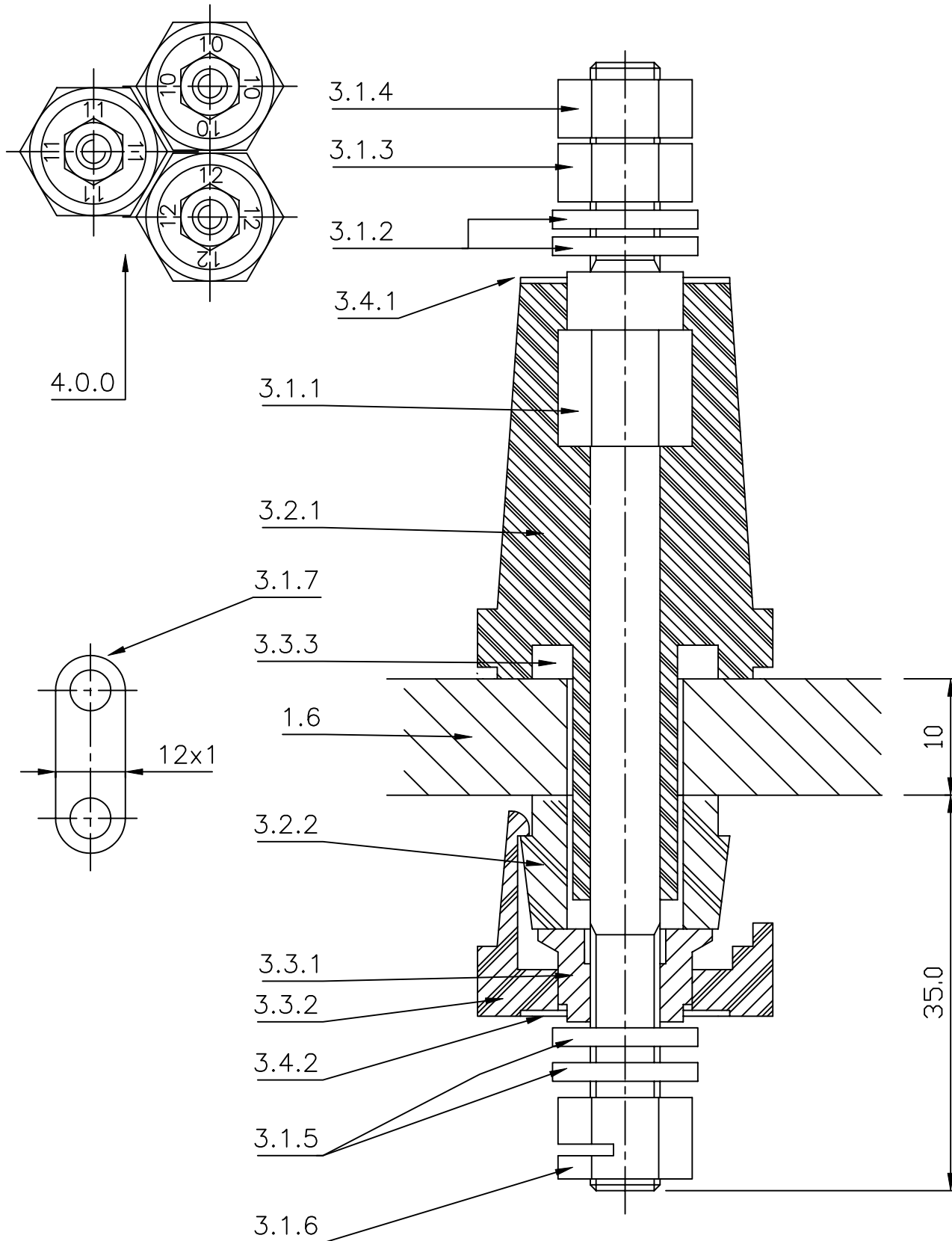
Progettato da	Controllato da	Approvato da - data	Nome file	Data	Scala
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 <b>ETI ELETTRINDUSTRIA S.r.l.</b> <b>20032 CORMANO ITALY</b>	Titolo/Nome SCATOLA MORSETTIERA - TERMINAL BOX - BOITE A BORNES Serie : SM2-XL		Modifica	Foglio
	Numero disegno 15.236.00			

Riproduzione vietata      Non misurare le dimensioni dal disegno



N.rev	Nota sulla revisione	Data	Firma	Controllo
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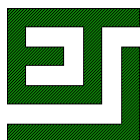


Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.		N. articolo/Riferimento	
Progettato da	Controllato da	Approvato da - data	Nome file	Data	Scala 2:1



Titolo/Nome MORSETTO - TERMINAL - BORNE  
for box Series SM2

Numero disegno 15.102.001	Modifica A	Foglio
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Nomenclature N° :

Reference drawing N° :

Page N° :

**15SM2MORSM6R02-E****15.102.001****1 of 1**

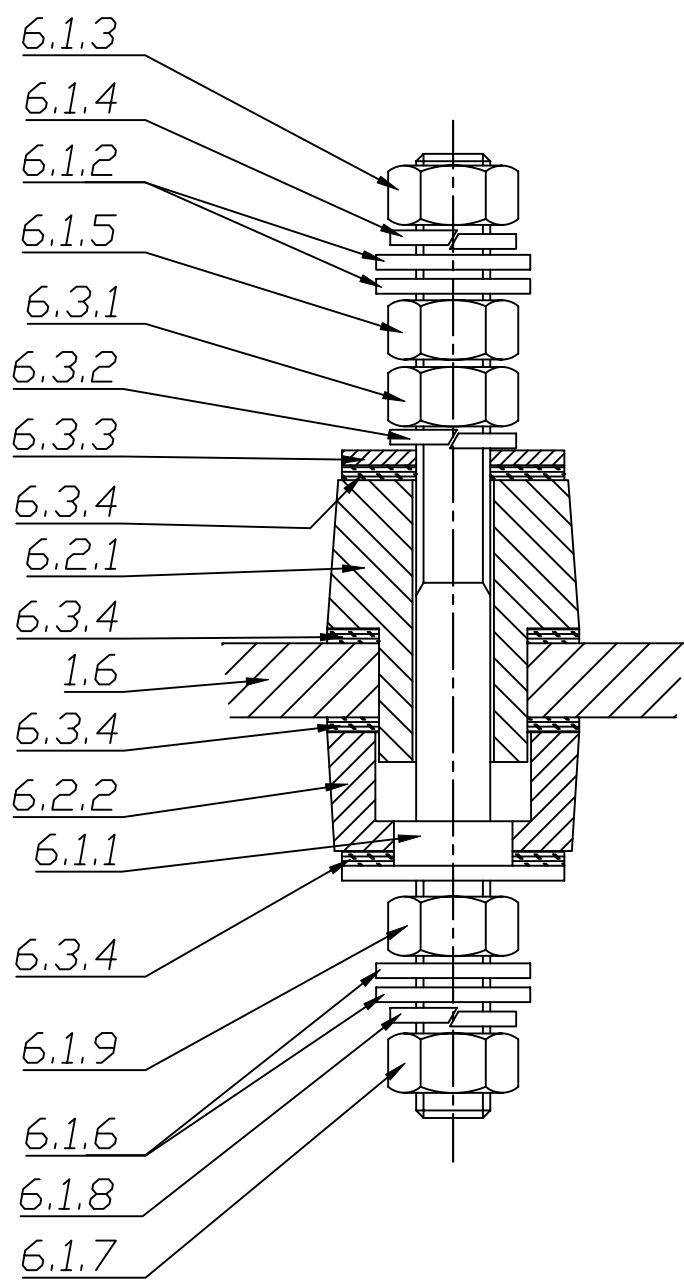
Product :

Revision N° :

**Terminal M6 for terminal boxes Series SM2****02 of 09.08.02**


Pos.	Part denomination	N°	Material
1.6	Bottom of terminal box		Aluminium
<b>3.0.0</b>	<b>Assembly of isolated, oil tight M6 terminal</b>		
<b>3.1.0</b>	<b>Current leading parts</b>		
3.1.1	Terminal	1	Brass, nickel coated
3.1.2	Contact washer of external wire terminal	2	Brass
3.1.3	External wire terminal locking nut	1	Brass
3.1.4	Lock nut	1	Brass
3.1.5	Contact washer of internal wire terminal	2	Brass
3.1.6	Internal wire terminal self-locking nut	1	Steel
3.1.7	Terminals connection plate - on request	X	Brass
<b>3.2.0</b>	<b>Insulating parts</b>		
3.2.1	Terminal insulation, moulded on terminal	1	Nylon + glass fibre 30%
3.2.2	Lower spacer	1	Nylon + glass fibre 30%
<b>3.3.0</b>	<b>Oil tightness parts</b>		
3.3.1	Terminal locking nut	1	Brass, nickel coated
3.3.2	Safety against accidental unlocking of nut 3.3.1	1	Nylon + glass fiber 30%
3.3.3	Gasket - OR 4036 - Ø 9,12 x 3,53 mm	1	Fluorosilicone rubber
<b>3.4.0</b>	<b>Identification parts</b>		
3.4.1	Numbered external identification label - glued	1	Nylon
3.4.2	Numbered internal identification label - glued	1	Nylon
<b>4.0.0</b>	Terminal mounting system; avoids rotation of terminal while tightening the wire terminals		

N.rev	Nota sulla revisione	Data	Firma	Controllo
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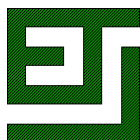


Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
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Progettato da	Controllato da	Approvato da - data	Nome file	Data 27/02/2001	Scala 1:1
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 <b>ETI ELETTRINDUSTRIA S.r.l.</b> <b>20032 CORMANO ITALY</b>	Titolo/Nome <i>Scatola morsettiera - Terminal box - Boite a borne</i> <i>SERIE : SM2</i> <i>Morsetto M10 - Terminal M10 - Borne M10</i>		
	Numero disegno 15.102.002	Modifica	Foglio

Riproduzione vietata	Non misurare le dimensioni dal disegno
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Nomenclature N° :

Reference drawing N° :

Page N° :

**15SM2MORSM10R01-E****15.102.002****1 of 1**

Product :

Revision N° :

**Terminal M10 for terminal boxes Series SM2****01 of 09.08.02**

Pos.	Part denomination	N°	Material
1.6	Bottom of terminal box		Aluminium
<b>6.0.0</b>	<b>Assembly of isolated, oil tight M10 terminal</b>		
<b>6.1.0</b>	<b>Current leading parts</b>		
6.1.1	Terminal	1	Brass
6.1.2	Contact washer of external wire terminal	2	Brass
6.1.3	External wire terminal locking nut	1	Brass
6.1.4	Split washer	1	Stainless steel
6.1.5	Counter-nut to fasten external wire terminal	1	Brass
6.1.6	Contact washer of internal wire terminal	2	Brass
6.1.7	Internal wire terminal locking nut	1	Brass
6.1.8	Split washer	1	Stainless steel
6.1.9	Counter-nut to fasten internal wire terminal	1	Brass
<b>6.2.0</b>	<b>Insulating parts</b>		
6.2.1	Terminal insulation	1	Bakelite
6.2.2	Lower spacer	1	Bakelite
<b>6.3.0</b>	<b>Oil tightness parts</b>		
6.3.1	Terminal locking nut	1	Brass
6.3.2	Split washer	1	Stainless steel
6.3.3	Gasket compression washer	1	Brass
6.3.4	Gasket	4	Nitrile rubber