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Oil level gauges Series IL

Catalogue N°: 11ILCATR01-E

Revision: 01 of 16.04.2002

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1 General Information

It is necessary to measure the level reached by the oil in a transformer conservator in order to:

- check that the transformer has been filled with the correct quantity of oil when prepared for use;
- make sure that no oil spills occur during normal operation due to excessive filling or overheating;
- indicate that there is insufficient oil before the Buccholz relay trips so that the upper part of the windings do not remain uncovered.

ETI series IL level gauges have been designed to carry out these tasks.

2 Special Features

The ETI series IL level gauges are of the magnetic transmission type, specially designed for use on electric transformers; besides carrying out the above tasks, they are particularly user-friendly thanks to following special features:

One-flange design

ETI series IL level gauges, though different in dial dimension, assembly layout and float arm disposition, are all mounted on the conservator with the same flange, thus making standardisation easy.

Two-parts construction

ETI series IL level gauges have the dial part separated from the mounting flange. The mounting flange may in fact remain fitted to the conservator both during transformer installation and during painting and transportation. There is no need to mount a blank flange and no risk of accidentally damaging the instrument gauge.

Adjustable to any conservator design

ETI series IL level gauges are suitable for fitting to any type of conservator layout and any shape and size, thus satisfying all manufacturer's requirements.

Supplied ready for installation

If all necessary parameters are indicated in order, ETI series IL level gauges are supplied ready for installation on the conservator, without having to shorten the float arm or set the contacts.

Absolute oil-tightness

The mounting flange seals the conservator perfectly.

Optical and electrical oil level indication

ETI series IL level gauges show the oil level inside the conservator optically, by a pointer travelling on a graduated scale; minimum and/or maximum level or other oil levels, which are particularly important for the transformer operation, can be shown also by an electric contact.

Unsinkable float

The oil level inside the conservator is detected by a float made of closed-cell material which is resistant to mineral oil, vacuum and a pressure of up to 3 bars; in this way, the risk of it filling with oil and sinking, which is always present with hollow floats, is excluded.

3 Construction Characteristics

ETI series IL level gauges consist of two independent parts (see drawing N° 11/DIM):

Mounting flange 2.0

The mounting flange 2.0 is made of cast aluminium and tested during production for tightness. It is mounted on the conservator by four M12 screws or studs; an O-Ring gasket seals the conservator.

The flange 2.0 includes one magnet of the magnetic transmission and the float arm. When the float arm is of the longitudinal type, a generously dimensioned precision bevel gear pair transmits the movement of the float arm to the magnetic transmission.

Instrument gauge 1.0

The instrument gauge 1.0 is also made of cast in aluminium alloy. It is assembled to the flange 2.0 by the two pins 1.3, which mate the two slots 2.1 on the flange 2.0; the lateral locking screw 1.1 screwed into the expansion 2.2 fixes the instrument 1.0 to the flange 2.0.

The instrument gauge 1.0 is manufactured in three size; it includes the second magnet of the magnetic transmission and the optical and electrical indication. A tempered glass disc protects the dial and pointer.

A terminal box 1.2 is mounted on the instrument gauge through which the connections for the electrical indication are made.

3.1 Operating conditions

ETI series IL level gauges are suitable for use in following environmental conditions:

- Ambient temperature — from -20°C to +40°C
- Oil temperature — from -20°C to +120°C
- For use with mineral oil
- Degree of protection of the instrument — IP 55
- resistance to vibrations — up to 3 g on all axes
- resistance to shock — up to 10 g on all axes

Special executions are available for other conditions.

3.2 Finish

In standard execution, one coat of two-pack epoxy primer and one coat of two-pack polyurethane paint protect all cast parts; final colour RAL 7031; screws and washer are in stainless steel.

4 Wiring Diagrams and Contact Performance

4.1 Wiring Diagrams

As mentioned above, ETI series IL level gauges can be supplied with electric contacts, set out according to one of the wiring diagrams shown in the specification N° 11SCHRxx, which indicates also the numbering of the terminals.

4.2 Contacts performance

Specification N° 11SCHxx shows also the performance of the contacts; special contacts for electronic circuits having low current (1 to 100 mA) and voltage (4 to 10 V) can also be supplied.

5 Assembly and maintenance instructions

ETI series IL level gauges are supplied already set according to customer indication and therefore need only to be mounted on the conservator.

5.1 Assembly

In order to assemble the gauge on the conservator proceed as follows:

- completely unscrew fixing screw 1.1;
- while holding the gauge by flange 2.0, turn instrument 1.0 anticlockwise about 5° in order to disconnect pins 1.3 from slots 2.1 and separate assembly flange 2.0 from instrument 1.0;
- check that the O-Ring gasket is in it's seat, then fit flange 2.0 complete with float rod to the conservator, and fasten it using the four 14 mm holes;
- insert pins 1.3 into slots 2.1 again and turn instrument 1.0 clockwise about 5°; the magnetic transmission with two magnets makes sure that the alignment of the float rod, arrow and the contacts is correct;
- tighten fixing screw 1.1completely.

To connect the electrical contacts proceed as follows:

- remove the cover of terminal box 1.2;
- feed the connection cable in through the cable entry and connect the wires to the terminals inside terminal box 1.2 according to the chosen wiring diagram; connect the earth cable to the earth screw inside the terminal box;
- replace the lid of terminal box 1.2.

5.2 Maintenance

No routine maintenance operations are necessary for the ETI series IL level gauges.

6 Instructions for ordering

As already said, ETI series IL level gauges are supplied ready for assembly on the conservator. In order to set the level gaugecorrectly following data are needed and must be indicated in order:

- Instrument type: IL 140, IL 220 or IL 320;
- layout of installation on the conservator according to one of the reference drawings, as well as the dimensions required for each layout;
- wiring diagram according to specifications N° 11SCHRxx;
- cable entry thread with/without standard cable gland
- dial indication;

To set the instrument correctly we need furthermore at least two oil levels and the oil temperatures at these two oil levels.

Use the enclosed order form and fill it out completely to define the level gauge required.

Please note:

Conservators are presumed to be cylindrical; for rectangular conservators, show the base and height. For installation with longitudinal float arm, the length of the conservator or dimension B for conservator layout type A2 are considered to be not less than the conservator diameter.

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Specification N° **SPR/**	Product:	Page N°
11SCHR01-E	**Oil level gauges Series IL**	**1 of 3**

Title:	Revision N°
Performance and description of wiring diagrams	**01 - 16.04.02**

1 Performance and description of the wiring diagrams

The specification has a complete description of the performance and function of the wiring diagrams.

2 Wiring diagrams

2.1 Identification by numbering of the wiring diagrams

The identification numbering of the wiring diagrams follows criteria that allow to identify the type and operation of the wiring diagram from it's number.

2.1.1 Key to numbering of wiring diagrams

The following numbering system applies to wiring diagrams with standard contacts; wiring diagrams with low current contacts are considered special and have a separate numbering.

11-xxx = Wiring diagram for oil level gauges;
11-**X**xx = Total number and type of contacts:
1, 2, 3 and 4 = 1, 2, 3 or 4 contacts
11-x**X**x = Contact Type
0 = Normally open; **1** = Normally closed; **3 or 9** = Changeover
11-xx**X** = Contacts position:
1 = Contact/s on minimum level; **2** = Contact/s on maximum level;
3 = One contact on minimum + one contact on maximum level;
4 to 9 = Other positions

2.2 Table of Contact's Performance

2.2.1 Standard Contact (ST)

Changeover microswitch contact worked mechanically

Degree of protection	IP 67
Casing	Poliester
Gasket	Fluorosilicon
Lever and push button	Stainless steel
Contact's material	Silver, nickel coated
Mechanical endurance of contact	$1x10^7$ cycles
Temperature range	-40°C to +125°C
Standard power of interruption ($1x10^5$ cycles)	AC 250V/5A - DC 125V/1A
Maximum power of interruption (1.000 cycles)	DC 125V/1,5A
Isolation to mass at 20°C	2.500 V
Isolation of open contact at 20°C	1.500 V
Minimum and maximum current	0,1 - 10A

2.2.2 Low Current Contact (BC)

Same performance as standard contact except:

Contact's material	Gold
Operation range	1 to 100 mA - 4 to 30 V

2.2.3 Electric circuitry

Degree of protection of instrument casing	IP 55
Insulation to mass	2.500 V
Material of terminal board	tin coated brass

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3 Tables of function and performance o wiring diagrams

The most commonly used wiring diagrams are described in detail in the following tables; the following notes describe the acronyms.

3.1 Notes on tables of function and performance of wiring diagrams

The following tables showing the performance of the wiring diagrams make use of some acronyms; for a full understanding they are explained in the following:
NE = Normal exercise; oil level in conservator is higher than minimum and lower than maximum
N° Term. = Numbers that identify the terminals
N° WD = Wiring diagram number
Pos. in NE = State of the contact in normal exercise.

3.2 Table

N° WD	N° Term.	Pos. in NE	Functional description of wiring diagram
11-000			Without contacts, only optical indication
11-101	1-2	Open	1 normally open contact for minimum level, closes when level drops to minimum
11-102	1-2	Open	1 normally open contact for maximum level, closes when level rises to maximum
11-111	1-2	Closed	1 normally closed contact for minimum level, opens when level drops to minimum
11-131	1-2	Open	1 changeover contact for minimum level, switches when level drops to minimum
	1-3	Closed	
11-291	1-2/4-5	Open	2 changeover contacts for minimum level, switch when level drops to minimum
	1-3/4-6	Closed	
11-293	1-2	Open	1 changeover contact for minimum level, switches when level drops to minimum
	1-3	Closed	
	4-5	Open	1 changeover contact for maximum level, switches when level rises to maximum
	4-6	Closed	
11-294	1-2	Open	1 changeover contact for low level, switches when level drops to low - alarm function
	1-3	Closed	
	4-5	Open	1 changeover contact for minimum level, switches when level drops to minimum - trip function
	4-6	Closed	
11-394	1-2	Open	1 changeover contact for low level, switches when level drops to low - alarm function
	1-3	Closed	
	4-5/7-8	Open	2 changeover contact for minimum level, switch when level drops to minimum - trip function
	4-6/7-9	Closed	
11-395	1-2/4-5	Open	2 changeover contacts for minimum level, switch when level drops to minimum
	1-3/4-6	Closed	
	7-8	Open	1 changeover contact for maximum level, switches when level rises to maximum
	7-9	Closed	

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11-404	1-2/3-4	Open	2 normally open contacts for low level, close when level drops to low - alarm function
	5-6/7-8	Open	2 normally open contacts for minimum level, close when level drops to minimum - trip function

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ETI work order N°

Oil level Gauges Series IL - Order Form

Fill out one order form for every type of level gauge

Customer	Order N°	Work order N°	Customer Dwg. N°	N° pieces

1 Instrument type - Cross instrument type

IL 140 | IL 220 | IL 320

2 Conservator layout - Cross conservator layout and fill out requested data

2.1 Layout to drawing N° 11/T

Level gauges with transversal float arm

T1	T2	T3	D	E

2.2 Layout to drawing N° 11/L1-2-3

Level gauges with longitudinal float arm, conservator without airbag

L1	L2	L3	D	A	B

2.3 Layout to drawings N° 11/A1 - 11/A2 - 11/A3-A4 – 11/A5 – 11/A6

Level gauges with longitudinal float arm, conservator with airbag

A1	A2	A3	A4	A5	A6	D	A	B	alfa α

3 Wiring diagram and cable entry

Write name of wiring diagram choosing from specification N° 11SCHxx

Standard cable entry is ¾" G - Specify different dimension if needed

Brass cable gland - Cross choice YES | NO

4 Marks on dial and oil levels

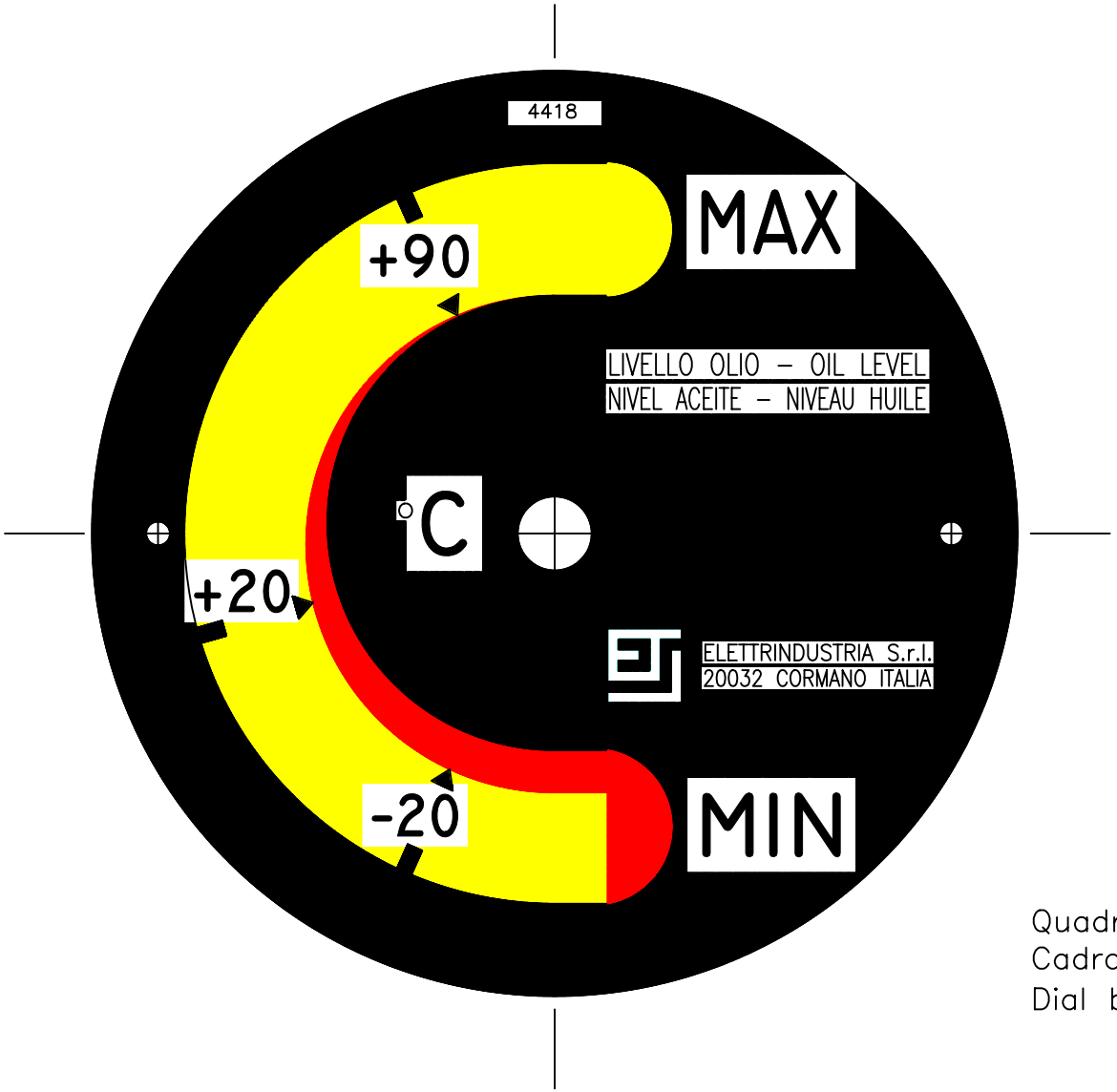
Write marks requested on dial and at least 2 corresponding oil levels.

Mark							
Oil Level							

5 Notes:

Conservators are presumed cylindrical; for rectangular conservators indicate base and height; for other shapes supply drawing. For installation with longitudinal float arm conservator length or dimensions B for layout type A2 is presumed not less than conservator diameter D + 200 mm.

Hmin - Hmax = Oil level at minimum - maximum temperature; HR = Oil level at filling temperature



Quadrante fondo NERO , scritte GIALLO
Cadran fond NOIR , inscriptions JAUNE
Dial bottom BLACK , inscriptions YELLOW

N.rev	Nota sulla revisione	Data	Signatura	Controllo

Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
Progettato da		Controllato da	Approvato da – data	Nome file	Data 01-01-97	Scala //

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Titolo/Nome
INDICATORE DI LIVELLO - OIL LEVEL GAUGE - INDICATEUR DE NIVEAU
QUADRANTE - DIAL - CADRAN

Numero disegno	Modifica	Foglio
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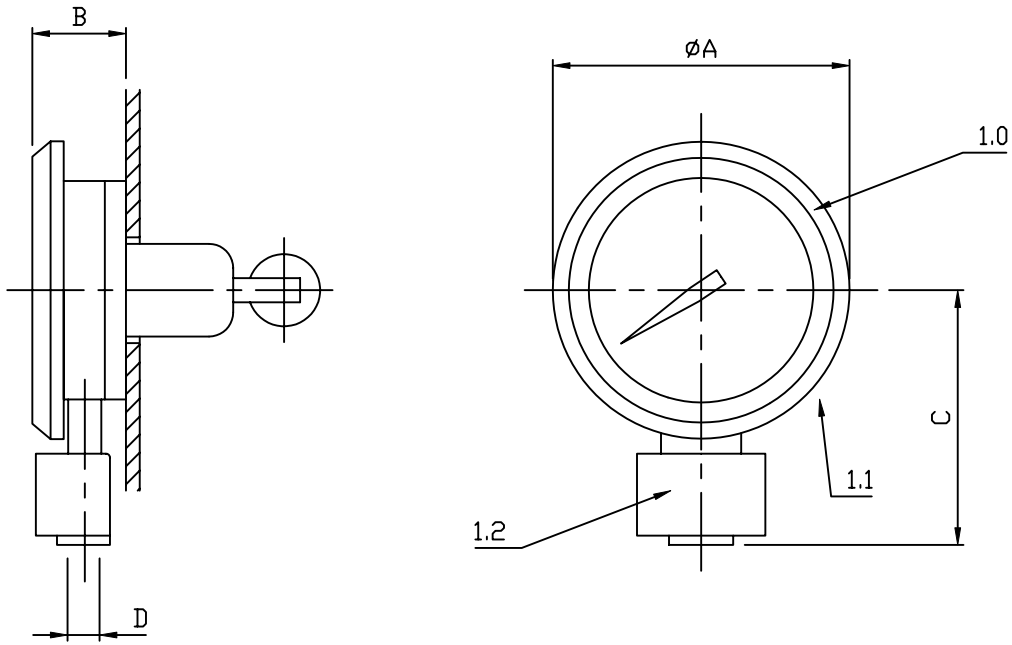

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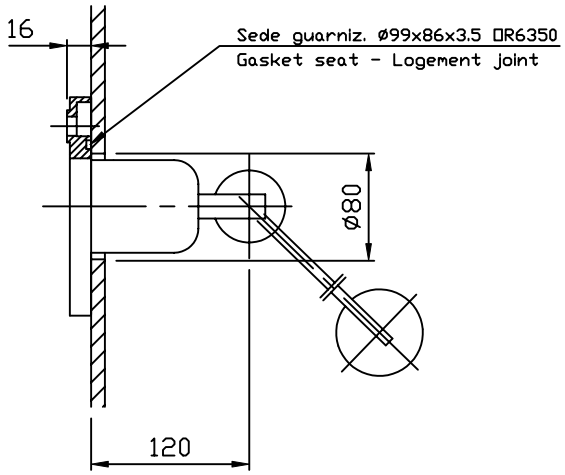
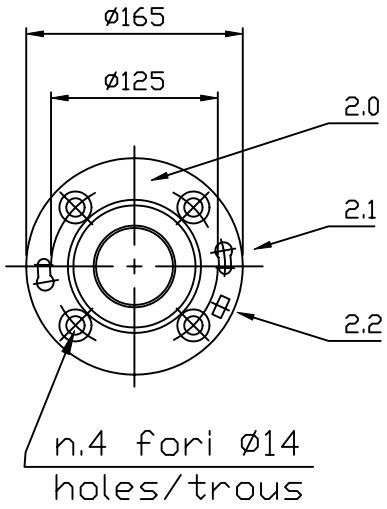
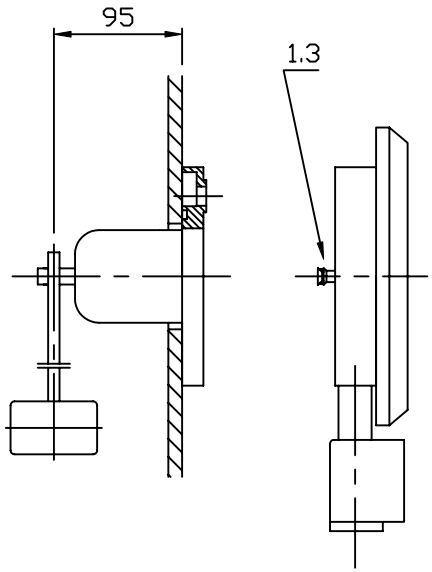
IL220	225	75	200	
IL320	330	80	255	







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N.rev	Nota sulla revisione	Data	Signatura	Controllo

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Serie: IL

Numero disegno	Modifica	Foglio
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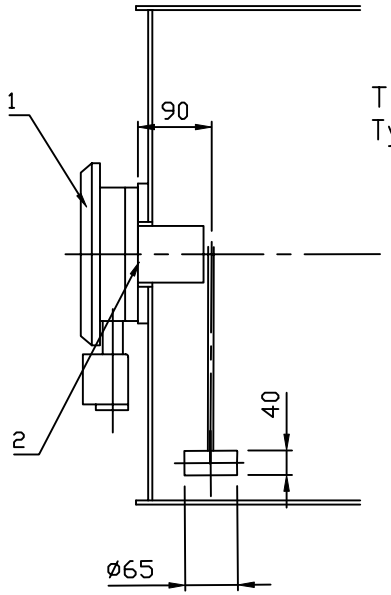

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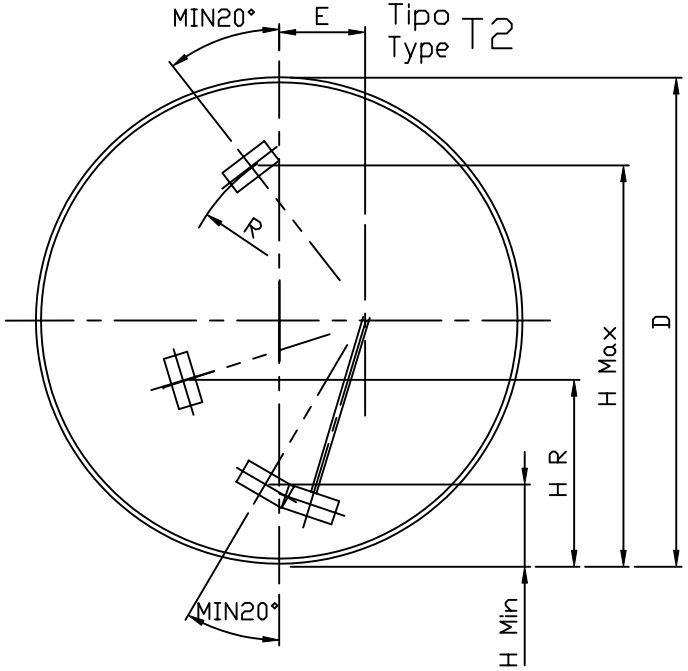

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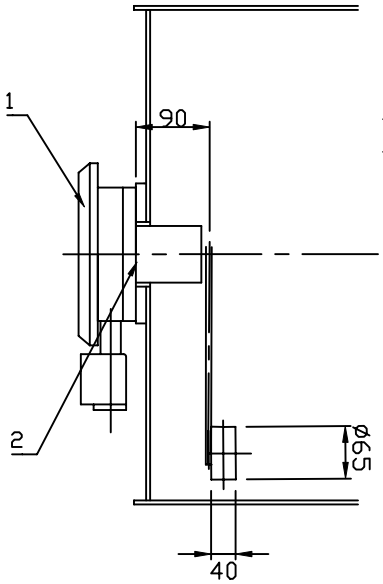

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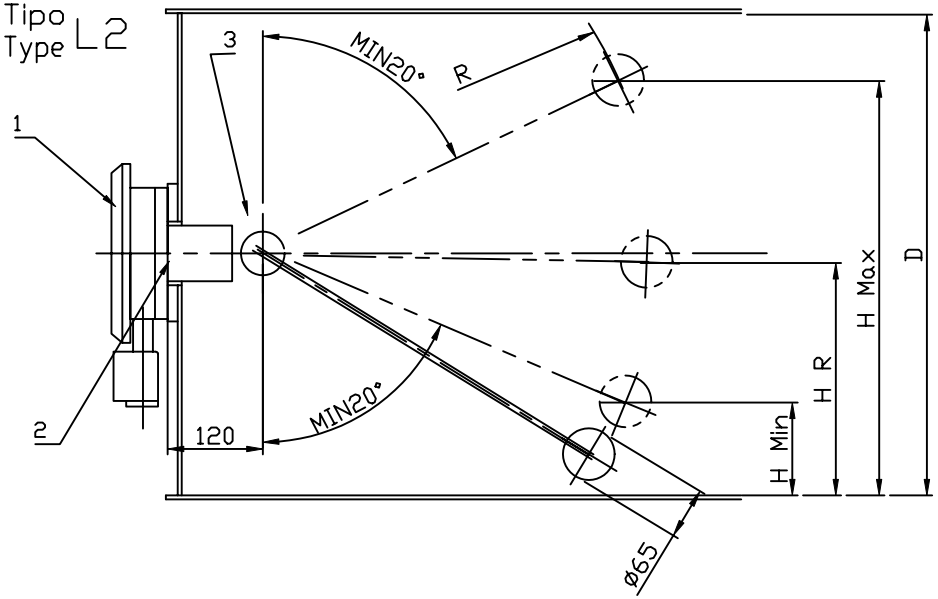

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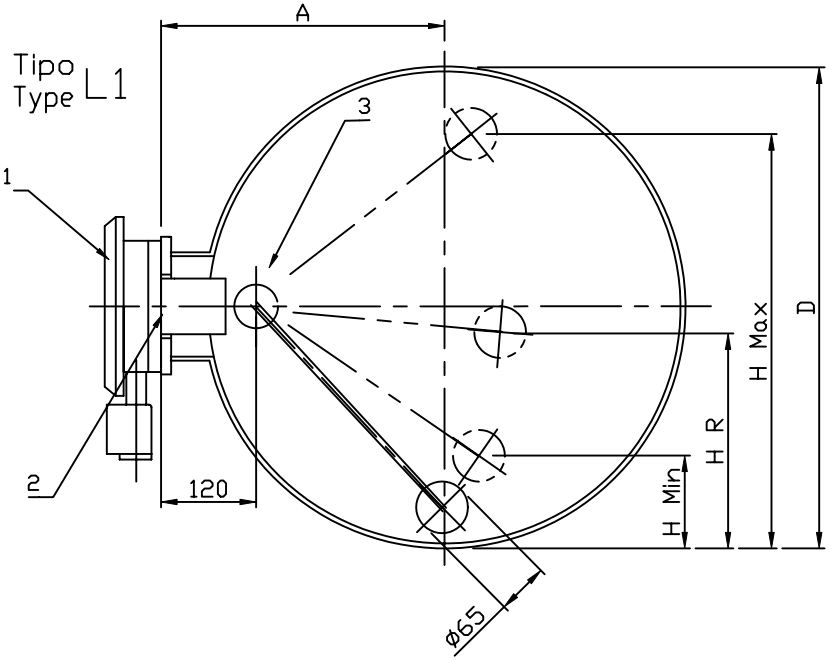

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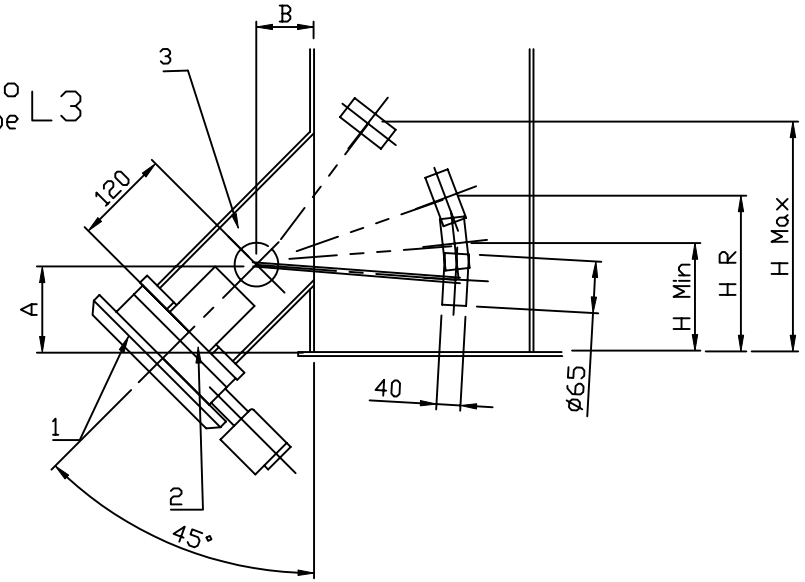

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Titolo/Nome
INDICATORE DI LIVELLO - OIL LEVEL GAUGE - INDICATEUR DE NIVEAU
Serie: IL- L1-L2-L3

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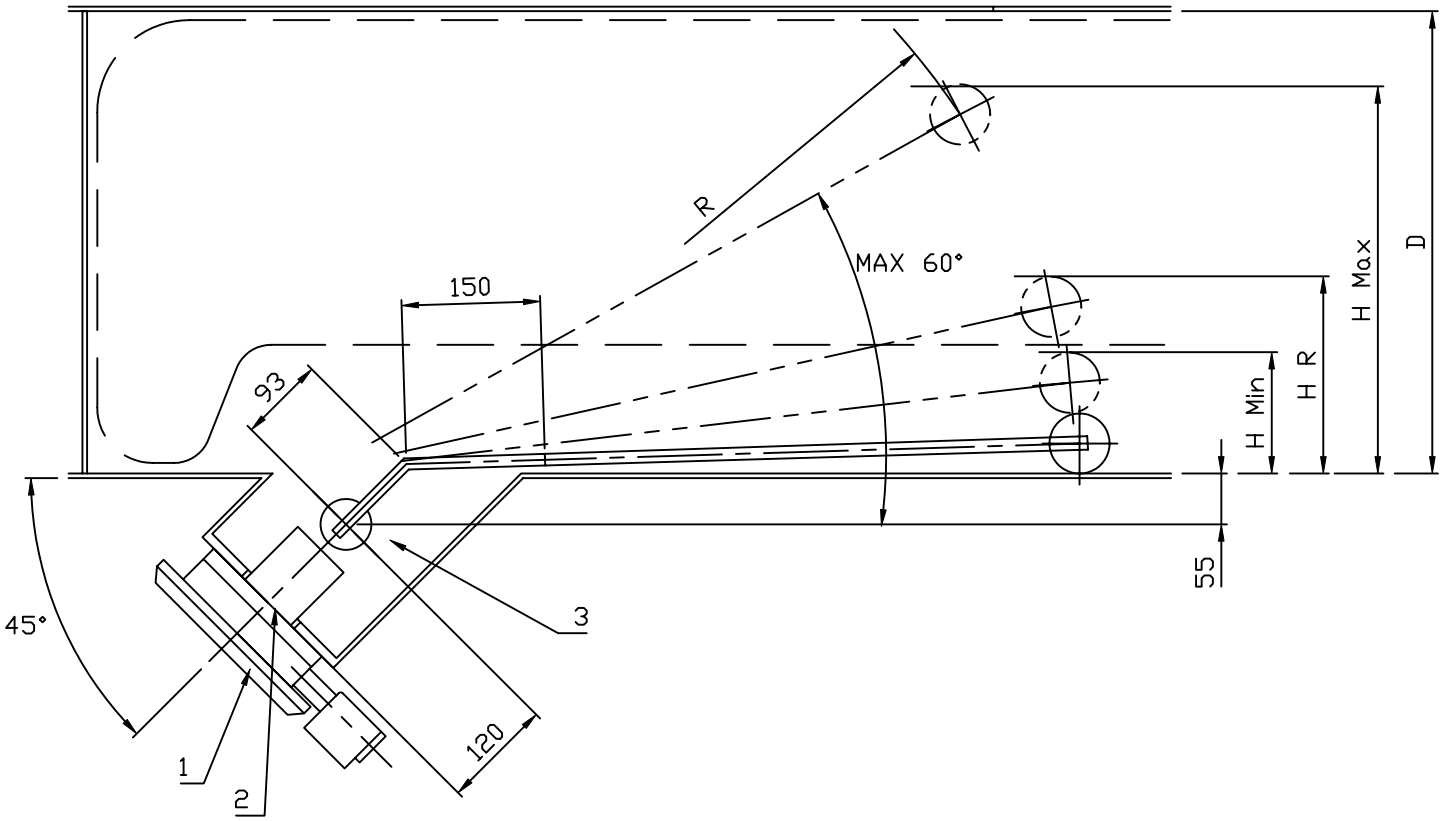

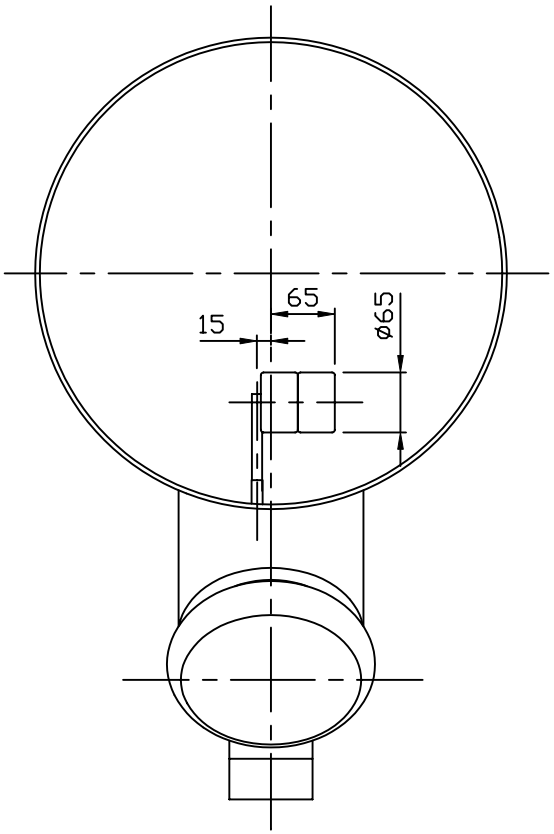

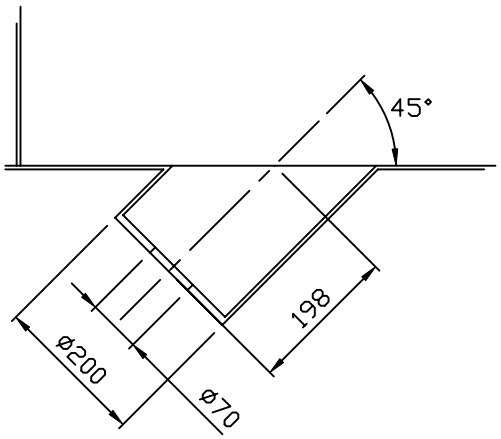

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Serie: IL-A1

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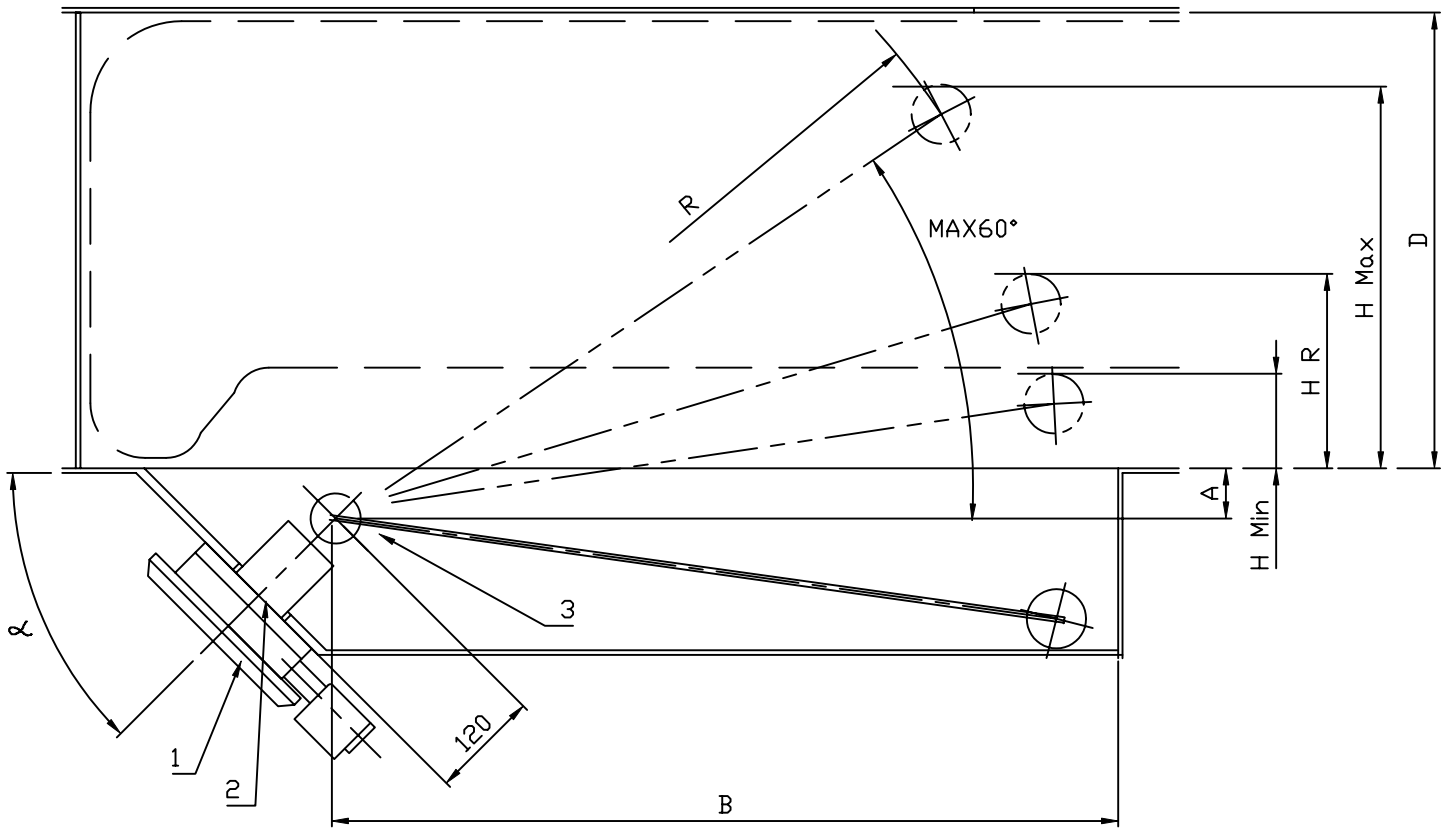

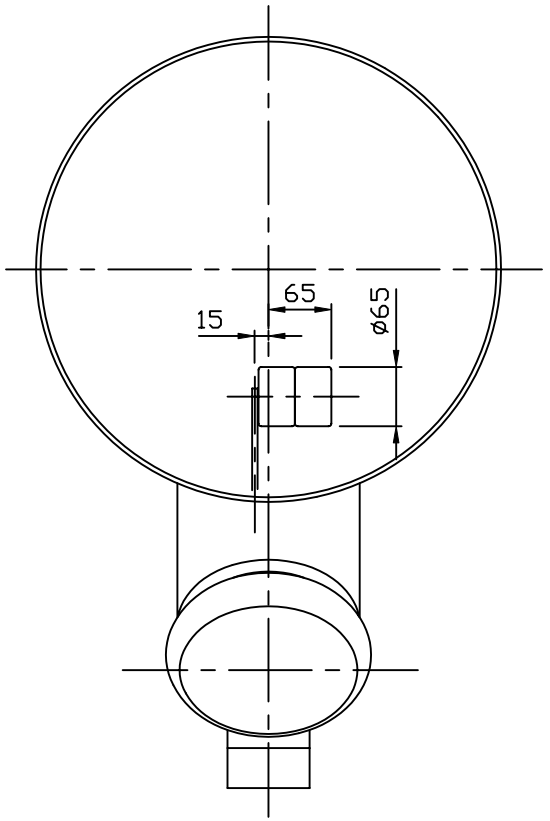

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Serie: IL-A2

Numero disegno	Modifica	Foglio
11/A2		

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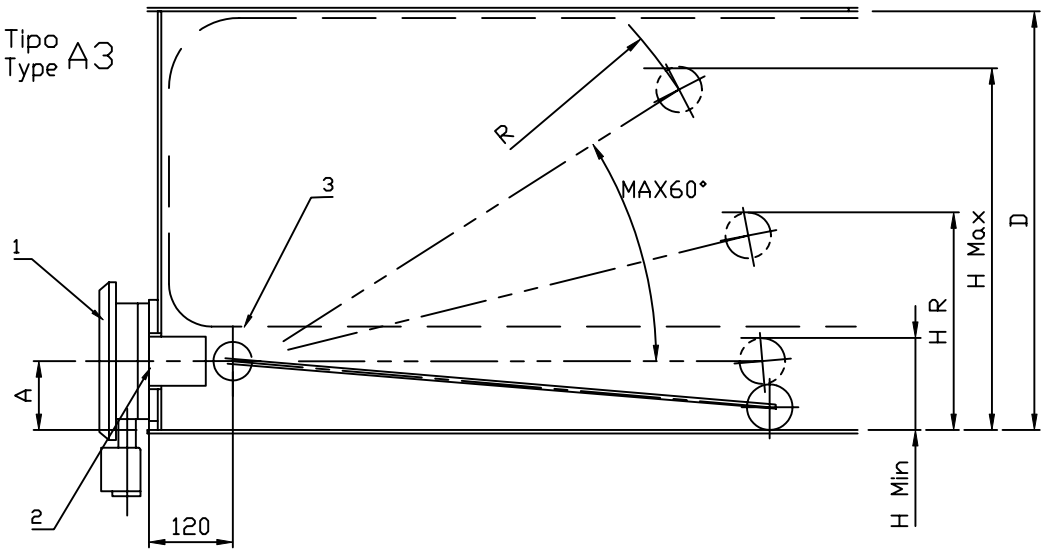

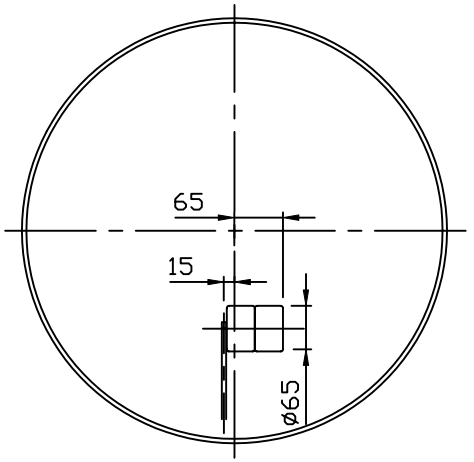

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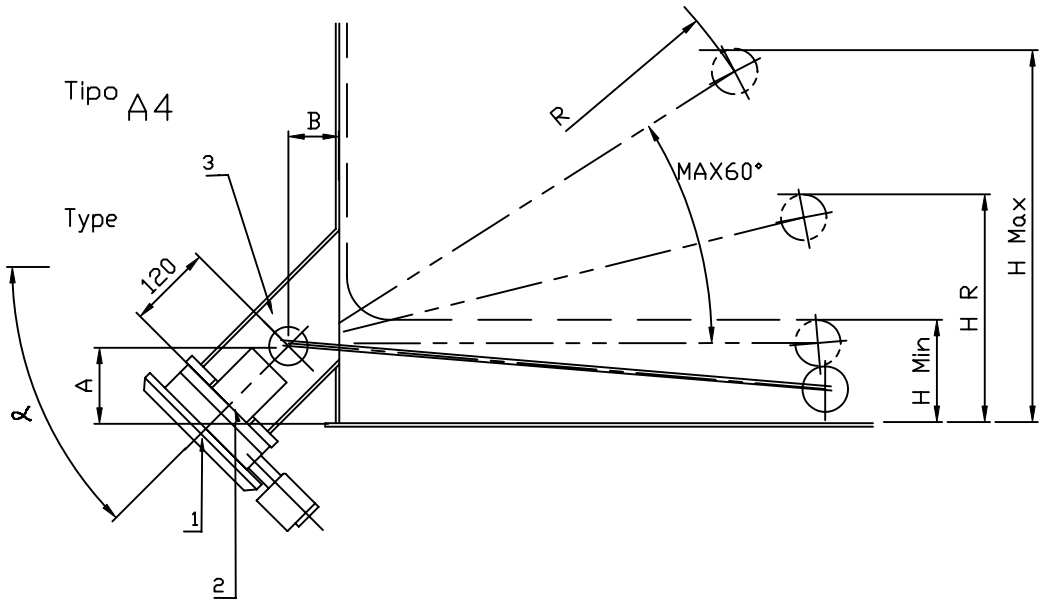

N.rev	Nota sulla revisione	Data	Signatura	Controllo

Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
Progettato da		Controllato da	Approvato da – data	Nome file	Data 01-01-97	Scala //

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Serie: IL-A3-A4

Numero disegno	Modifica	Foglio
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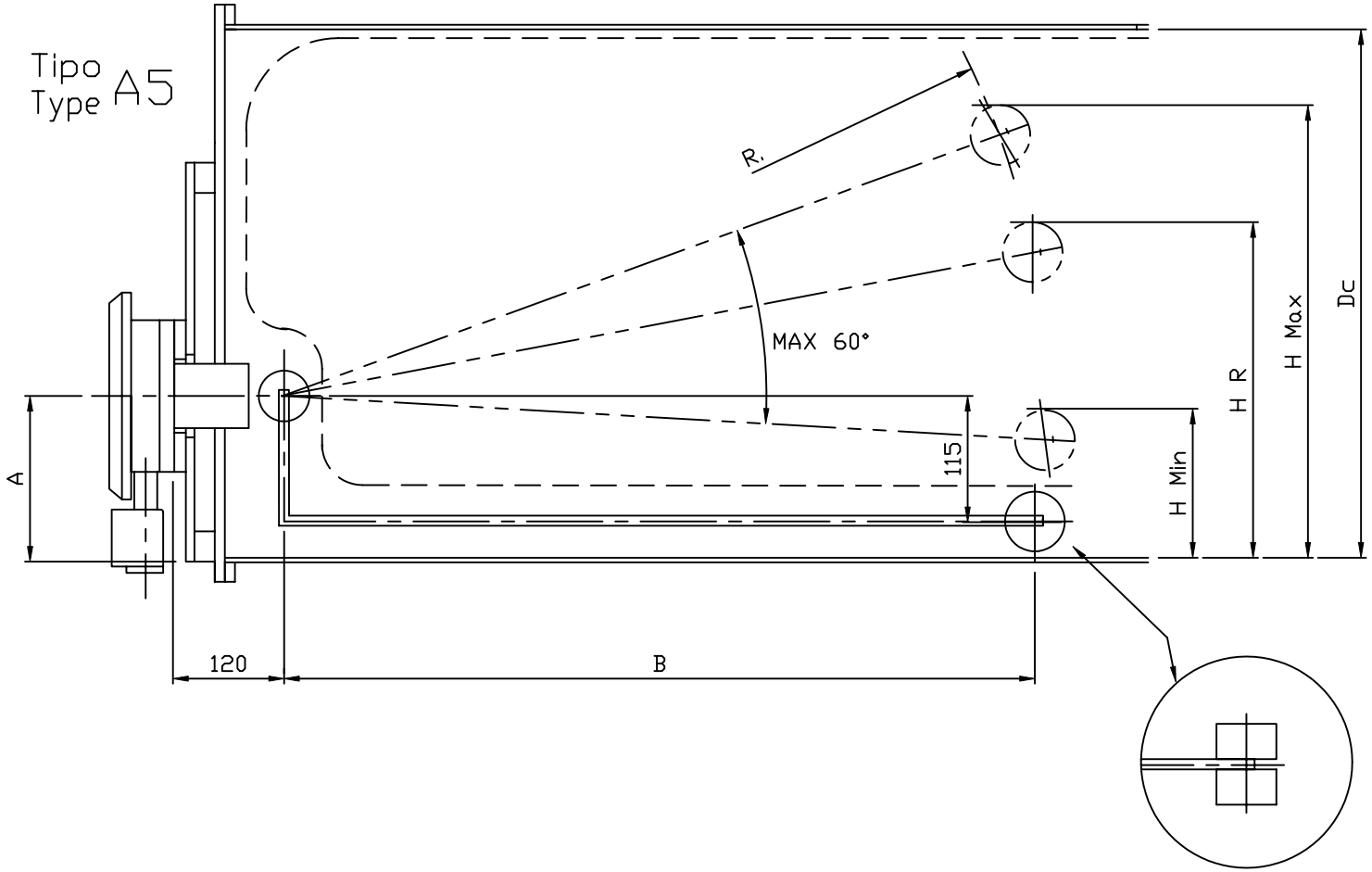

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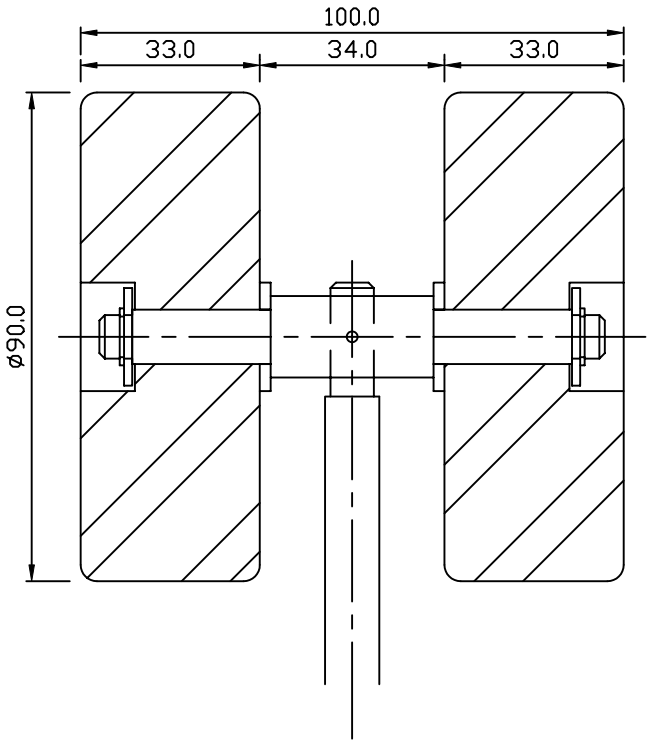
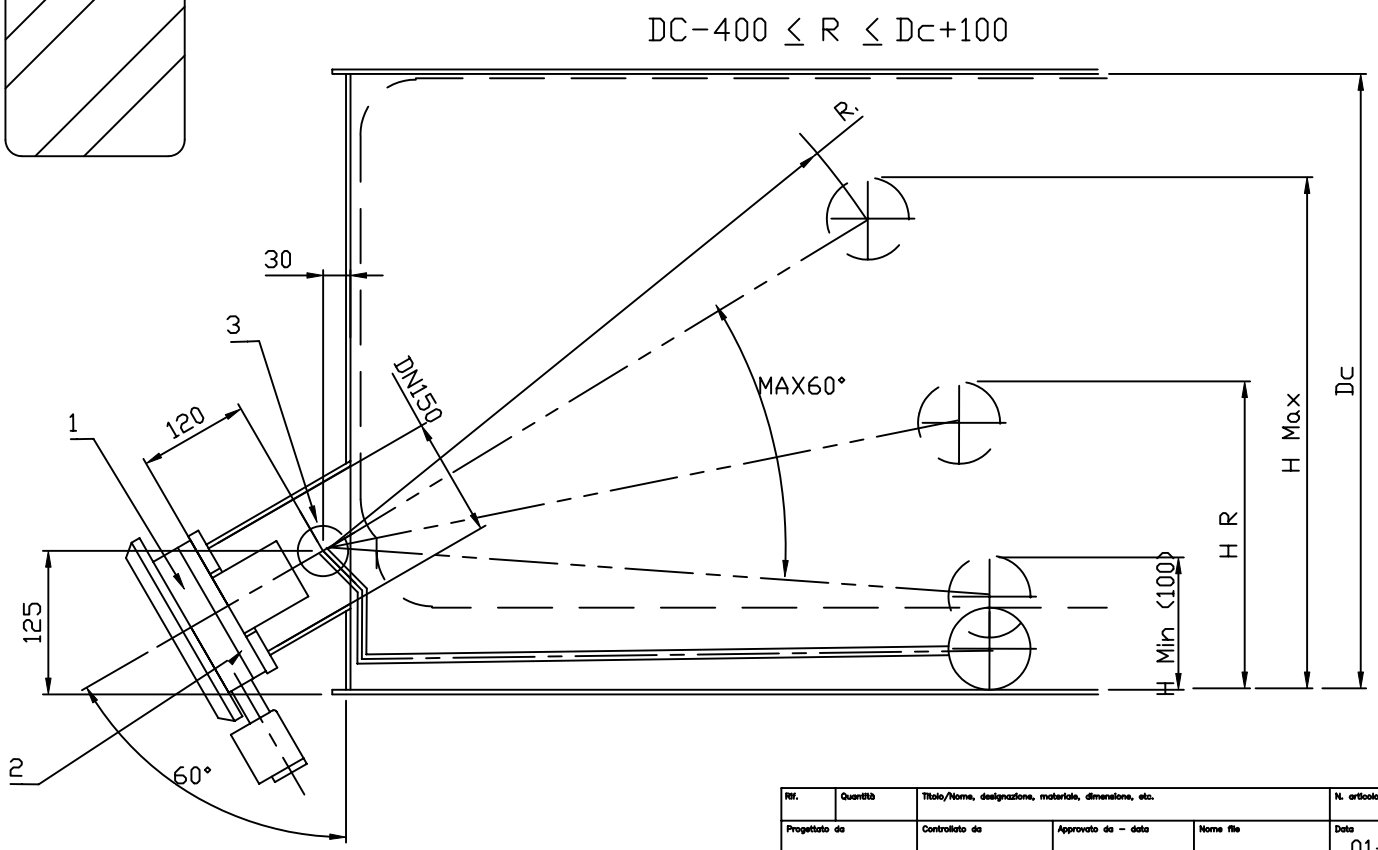
INDICATORI DI LIVELLO - OIL LEVEL GAUGE - INDICATEUR DE NIVEAU
Serie: IL-A5

Numero disegno	Modifica	Foglio
11/A5	A	

N.rev	Nota sulla revisione	Data	Signatura	Controllo



Tipo
Type A6



Rif.	Quantità	Titolo/Nome, designazione, materiale, dimensione, etc.			N. articolo/Riferimento	
Progettato da		Controllato da	Approvato da – data	Nome file	Data 01-01-97	Scala //

ETI ELETTRINDUSTRIA Srl
20032 CORMANO ITALY

Titolo/Nome
INDICATORE DI LIVELLO - OIL LEVEL GAUGE - INDICATEUR DE NIVEAU
Serie: IL-A6

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