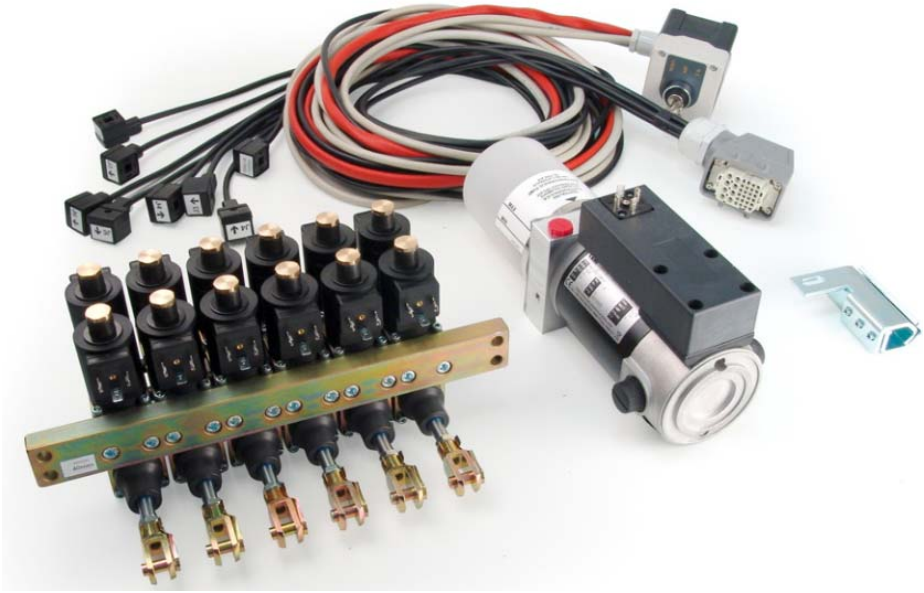
IMET
RADIO REMOTE CONTROL



PWM ELECTRO-HYDRAULIC KIT

Installation, use and maintenance manual

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IMET S.r.l. via Fornace, N° 8, I-33077, Sacile (PN) Italy

Tel ++39 0434 7878 *Fax* ++39 0434 737848 *Mail* info@imet.eu *Web* www.imet.eu

INDEX

USED CONVENTIONS

Attention

This symbol highlights the instructions to be followed for the correct functioning of hydraulic servo command components

Danger

The paragraphs countersigned by this symbol contain information which must be carefully followed to avoid dangerous situations.

Note

The notes, signalled by this arrow contain suggestions to be noted when using the hydraulic servo command system.

INTRODUCTION

The following manual contains information about installation, user and maintenance of the IMET servo command system. In order to obtain the best performance with maximum security all operators must carefully read and follow the instructions provided by this manual.

All operations regarding installation, use and maintenance must be carried out exclusively by specialised personnel

1. IDENTIFICATION DATA

PWM Electro-Hydraulic Kit						
Legend reference	1	2	3	4	5	6
Identification code	**APT400**					
						CE

Product identification code

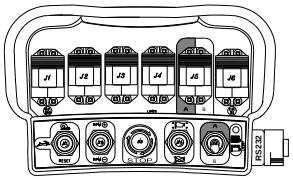
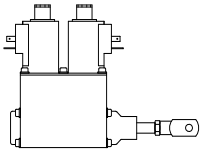
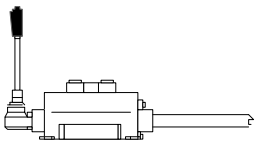
- 1 Actuator code:
- 2 Type of actuator block. Indicates whether the actuators are modular or monoblock (in this case only 4 actuators are possible)
- 3 Type of power supply. It can be 12 or 24V DC
- 4 Distance between centres of the modules: distance between individual modules
- 5 Type of hydraulic supply: Indicates whether a hydraulic control unit with an independent circuit or a counter pressure valve which is supplied directly by the hydraulic circuit of the crane is present
- 6 Number of functions: number of actuators

1	2	3	4	5	6
Actuator code	**Type of actuator unit**	**Type of electrical supply (Vdc)**	**Distance between centres of the modules (mm)**	**Type of hydraulic power supply**	**Function number**
APT 400	G = Group actuators	12 24	38 40 42 44 46 48 50 X (outside of std)	I = With hydraulic control unit V = With counter pressure valve	1 2 3 4 5 6 7 8
APT400 (HSC)	M = Monoblock	12 24 11÷28	40	I = With hydraulic control unit V = With counter pressure valve	4

Table 1

2. DESCRIPTION OF SYSTEM

This APT 400 actuator is an electric-hydraulic device designed by IMET, consisting in a piston and two proportional solenoid valves, to command hydraulic distributors. It can be installed on all hydraulic cranes, equipped only with manual commands.
Its modular structure allows to have always the number of functions requested by the application.
The APT 400 actuator can be installed in 2 ways: with IMC400 hydraulic control unit or with a counter pressure block.
Installation with the specific IMC 400 hydraulic control unit does not alter the original plant of the machine since the hydraulic circuit of APT 400 is totally independent from that of the machine.
The IMC 400 control unit activates the pump only when executing commands.
The Installation with the 70l counter pressure unit and a 10 micron filter, instead, makes it possible to remove oil from the machine's hydraulic circuit, reducing it to a pressure of 18 bar that is necessary to supply the actuator group without altering the machine's working pressure.

Radio control	APT 400 actuator/s	Manual hydraulic distributor	Application
			

2.1 Applications

The most common application regards hoisting machines, earth moving and agricultural machines and marine applications.

The Hydra Kit system cannot be used unless the climatic and electric characteristics specified in chapter 6 are followed. Furthermore this application cannot be used in environments that require explosion proofing characteristics.

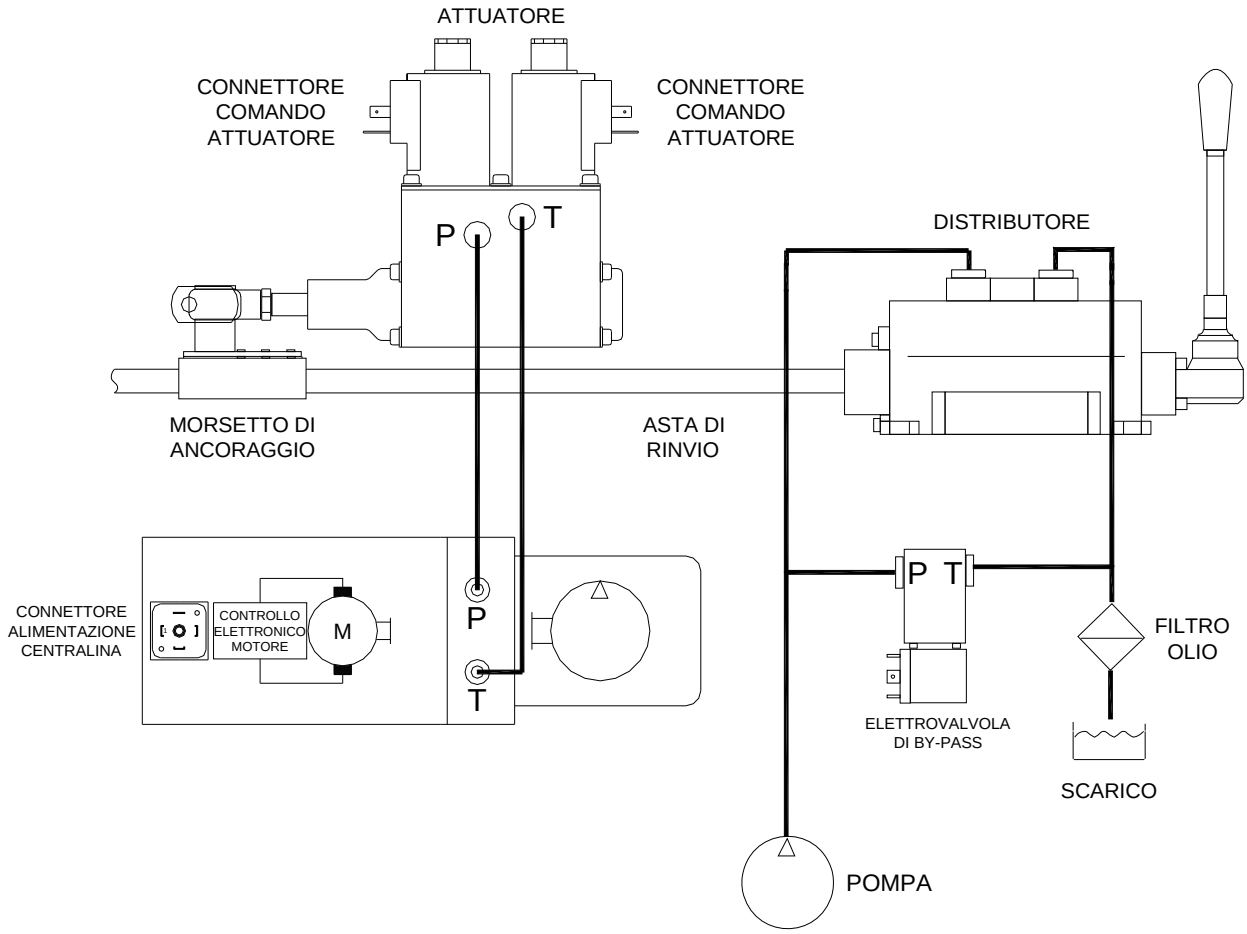
3. CRITERIA FOR A PERFECT INSTALLATION

Installation does not entail particular difficulties. However, we recommend observing the following recommendations to ensure the correct working of the system.

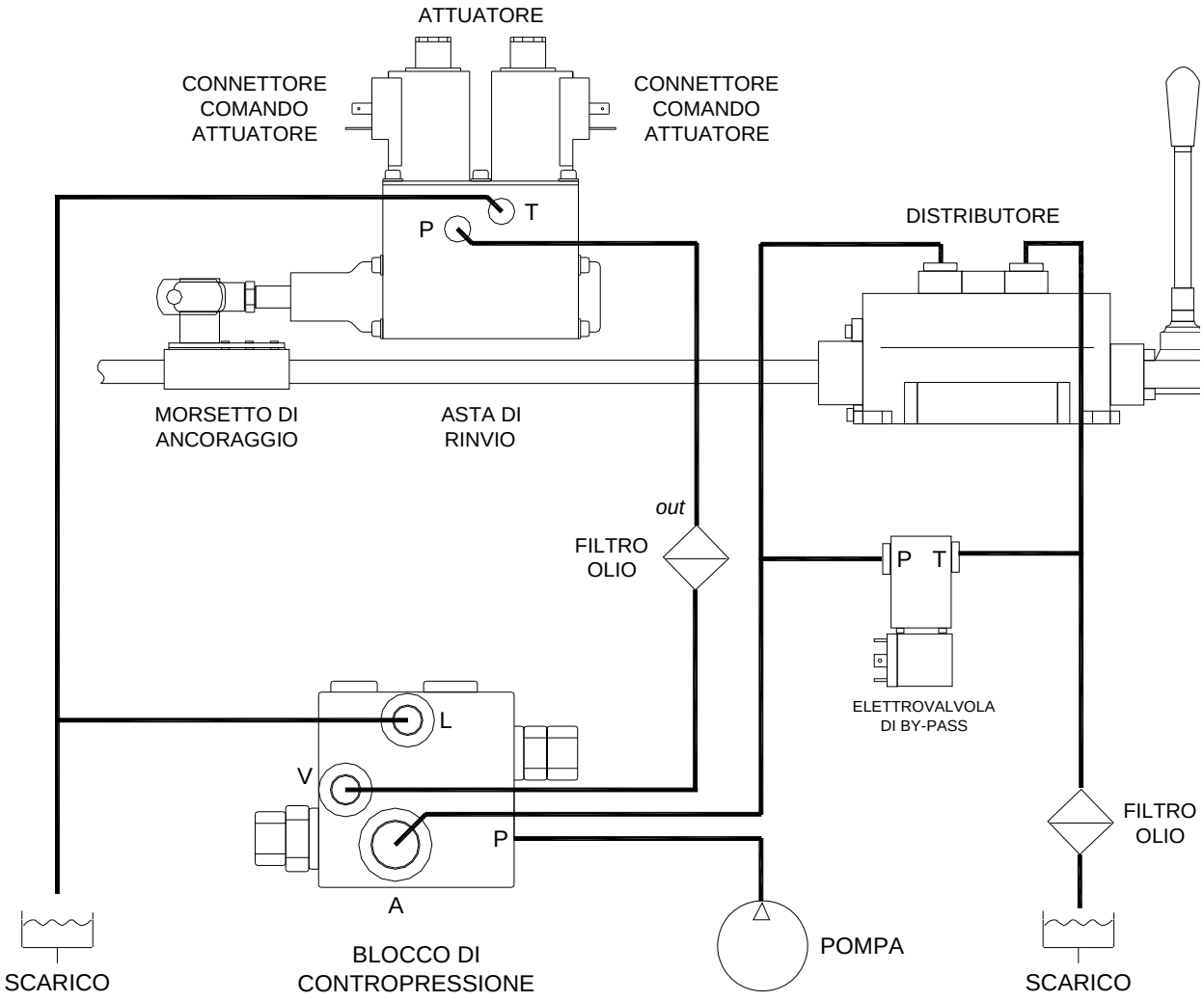
N.B. The installation must be carried out by qualified personnel only.

The servo command system main components are illustrated in the following hydraulic drawing.

3.1 Hydraulic connection of the actuator group with the electro-hydraulic power unit



3.2 Hydraulic connection of the actuator group with the counter pressure unit



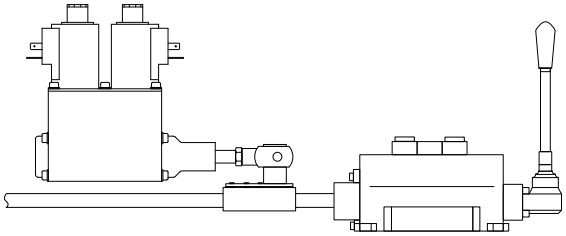
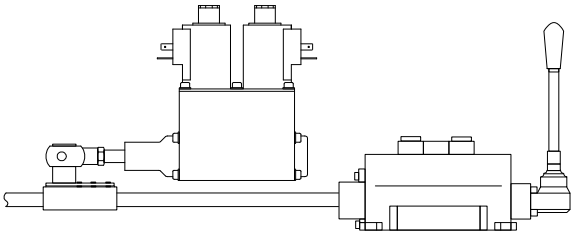
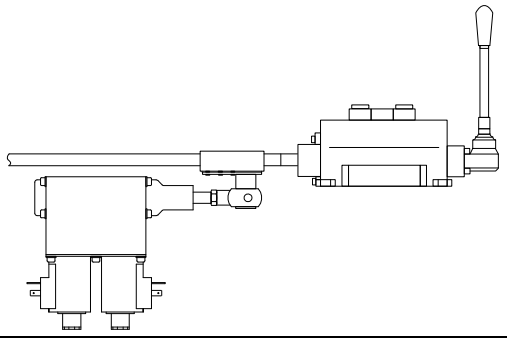
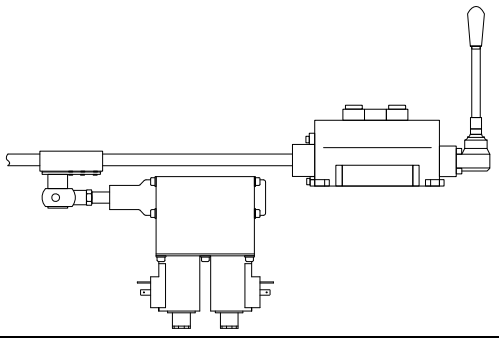
3.3 Installation of hydraulic and mechanical components

It is mandatory to install a by-pass solenoid valve on the hydraulic circuit that is capable of ensuring depressurisation of the supply circuit when commands are not carried out. According to the safety rules the commands can be given only from a sole operating position.

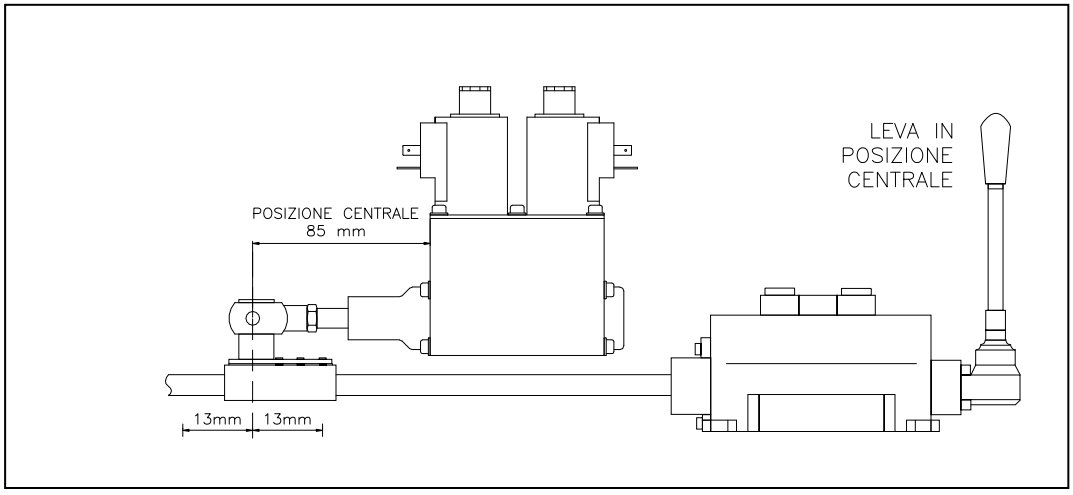
So it is necessary to set a system able to prevent the use of the distributor when the command is given from a remote control position. A possible solution may be a mechanical protection, with key or padlock, able to prevent eventual movements of the distributor levers by covering them.

The hydraulic power unit must be installed horizontally with the tank cap on the top, in an area protected from possible high pressure water spray because the motor protection degree motor is IP54.

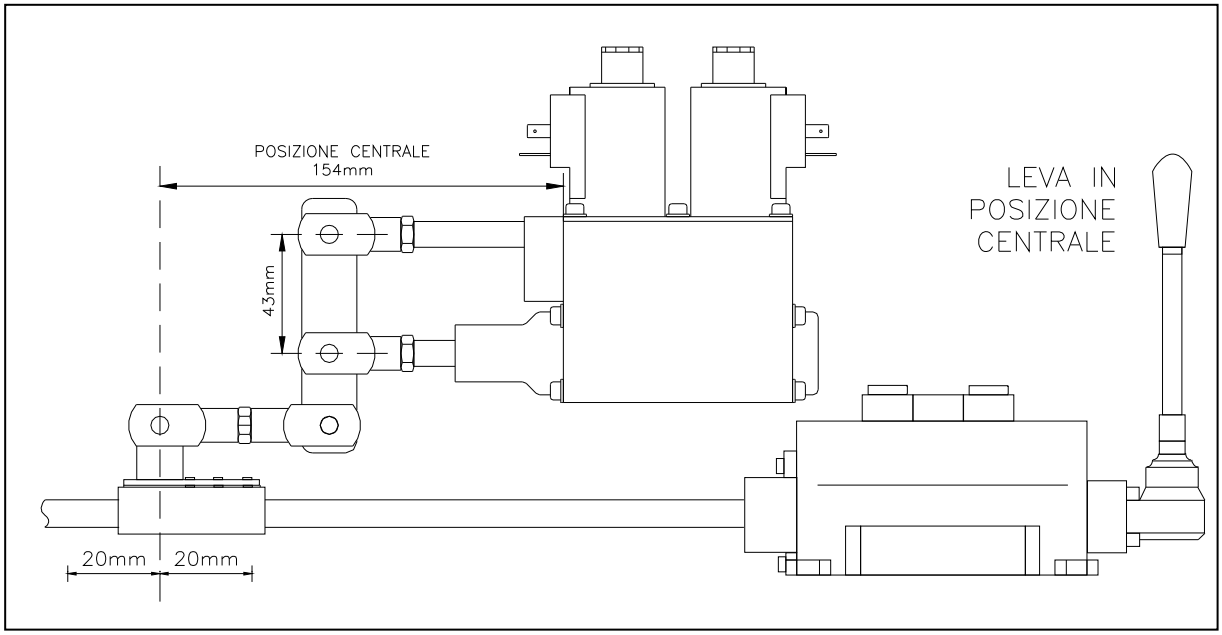
The actuator must be clamped to the transmission rod near the distributor, in order to reduce to the minimum it's deflection during movement. Possible installation typologies are represented in the following outlines.

IDEAL INSTALLATION	ALTERNATIVE INSTALLATION
	
	

In order to obtain the right mechanical coupling between actuator and transmission rod, it is necessary that the two parts are clamped following the rest positions of both devices.
The distributor lever must therefore be in the neutral position while the actuator rod must be placed respecting the dimensions drawn in the following illustration. Only at this point it will be possible to tighten in sequence and in multiple times the three socket head screws located on the clamp.
In most systems it is sufficient to install the standard actuator system that makes it possible to move crane transmission rods with a maximum stroke of 26 mm (±13 mm).



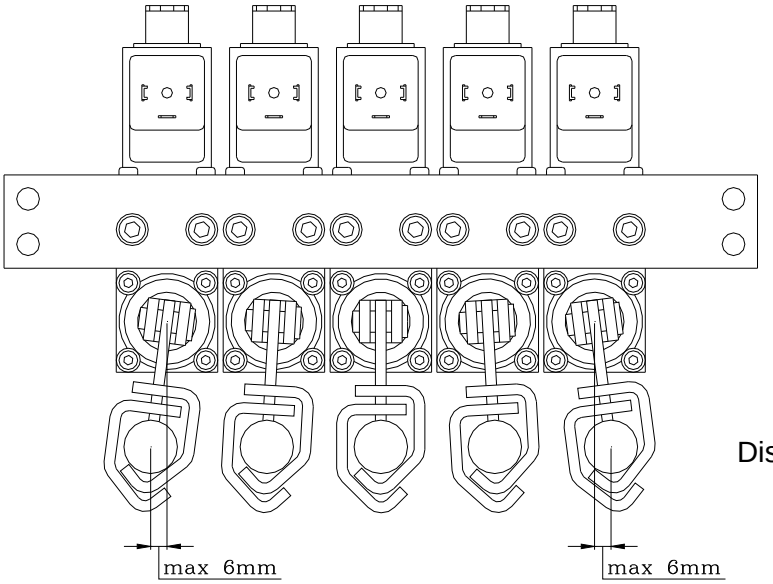
In cases where the reach is not sufficient, it is possible to install an increment kit that brings lever stroke up to a maximum of 40 mm (±20 mm).



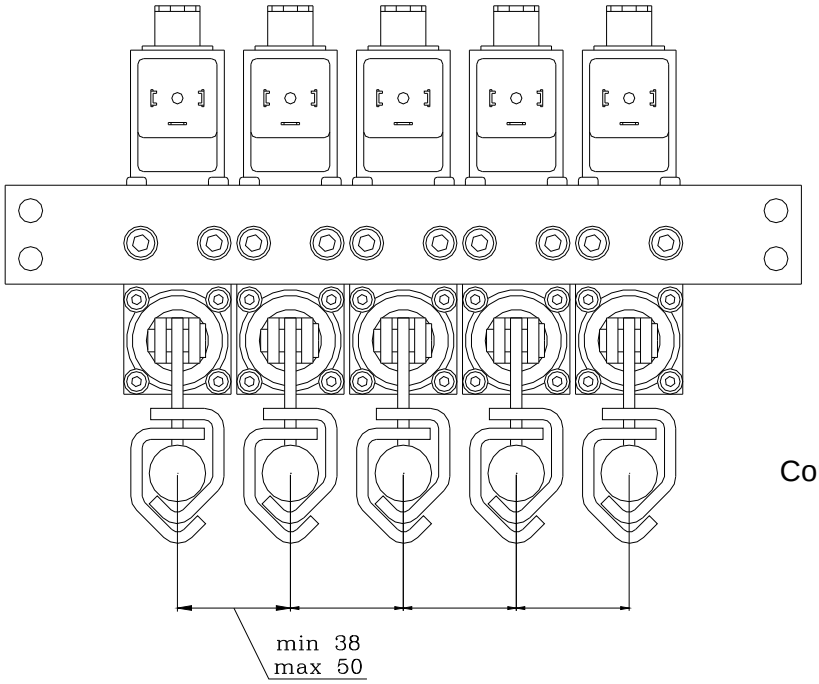
During installation of the Hydra Kit, pay special attention that the actuator and transmission rod are parallel.

<u>Attention!: Welds on mechanical parts directly connected with the actuator are not allowed.</u>

The actuator group, equipped with special anchoring clamps, allows the distance between centres within a maximum range of 6 mm, as shown in figure.



Distance between centres



Correct distance

The installation of the actuator group must be carried out on a spot that is mechanically integral with the manual distributor, for example the crane chassis. Fixing actuators to places other that the chassis of the crane truck must be avoided.

Assemble the hydraulic circuit pipes being careful to avoid possible accidental contact with sharp or abrasive surfaces or anything that may compromise its integrity.

Protect hydraulic modules and in particular the piston rod and the hydraulic power unit when repainting the vehicle.

3.4 Electrical connections

<u>Attention!:</u> No operation must be carried out with live equipment.

The following instructions refer to the connection of individual parts.

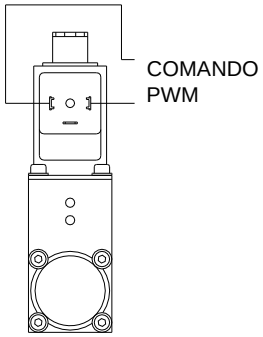
When installing a complete Hydra kit equipped with a radio control, external wiring, hydraulic power unit or counter pressure unit, follow the drawing supplied with the system. Installing the main fuse (16A) on the wiring that connects the system to the battery socket is mandatory. If required, it is possible to add pieces of wiring to the main power supply cable, remembering that the minimal required cross section is 2.5 mm^2 on 24 Vdc systems or 4 mm^2 on 12 Vdc systems.

Do not modify the wiring supplied by IMET

If the system is supplied without interface wiring, connect electrically following the instructions included in paragraphs 3.4.1 and 3.4.2.

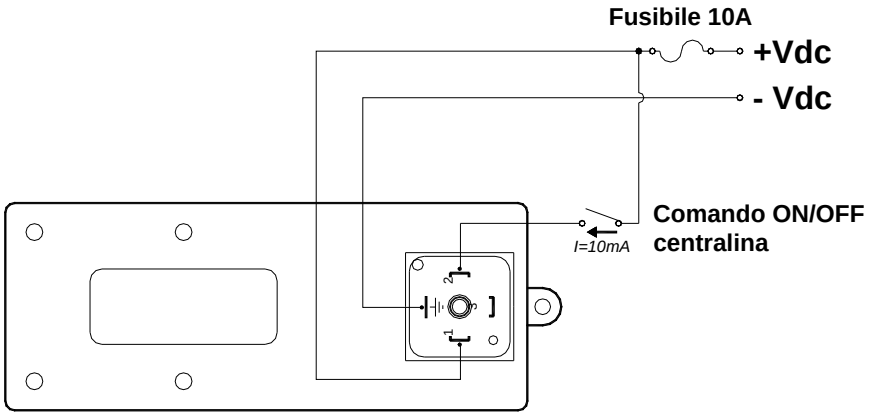
<u>3.4.1 APT 400 actuator connection</u>

The actuator must be connected with flame-retardant cables having at minimum cross section of 0.75 mm^2, according to the instruction included in the drawing below.
It is necessary to protect the power supply line (battery positive pole) by inserting a 16 A fuse.

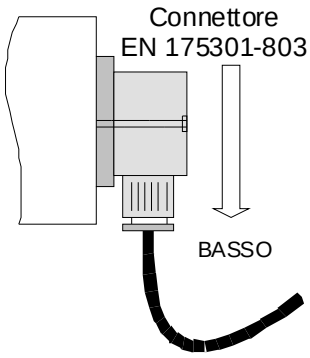


<u>3.4.2 Electrical connection of the IMC 400 hydraulic control unit IMC 400</u>

The IMC 400 hydraulic control unit must be connected with flame-retardant cables with a minimum cross section of 2.5 mm^2 as far as the power supply cables, a minimum section of 0.75 mm^2 for signal cables. Connection instructions are shown in the drawing below. It is necessary to protect the power supply line (battery positive pole) by inserting a 10 A fuse.



The standard system is equipped with pre-assembled die-cast watertight cables. Fixing of these cables is not subject to any particular limitation: it is sufficient for the fastening screw to be tightened well and for the gasket to be installed perfectly. If using cables that have been assembled with die-cast connectors, it is recommended to rotate all EN 175301-803 connectors in order to let the cable always come out of the lower part (see drawing). This is necessary to avoid possible oxidation of contacts due to water leaks. In this case as well the fastening screw must be tightened well and for the gasket installed perfectly.



3.5 Operations that must be carried out before starting up systems with a hydraulic power unit

The hydraulic power unit is shipped empty. Before powering up the system, the tank must be filled up with about ½ litres of oil for automatic hydraulic transmissions (ATF).
Taking into consideration that the climatic conditions in which the system will be used can vary from one place to another, and that they cannot be predetermined, IMET does not impose the use of a specific oil, but suggest the use of an oil that is compatible with the typical temperatures of the zone where the customer intends to use the system.
As an idea, ATF type D oil is suitable for temperatures from –13°C to +80°C. ATF type G (Glide) oils are suitable for a larger temperature range (from –20°C to +85°C).
The delivered system has been tested in our facilities using ATF type D oil.

<u>Attention!:</u> Do not use synthetic oil, or other oil types that are not suitable for hydraulic systems, because they may seriously damage the system.

4. INSTRUCTIONS FOR PREVENTIVE MAINTENANCE

Checking the oil level of the hydraulic circuit

Weekly check the oil level of the hydraulic circuit. If necessary top up only using **the same type of oil contained in the tank (ATF).**

Oil change and cleaning the filter of the hydraulic control unit

On a yearly basis it is advisable to completely change the oil in the hydraulic circuit. Cleaning the filter located inside the oil tank at the same time is recommended.

Before carrying out this operation drain the oil from the tank. Next unscrew the four bolts on the motor flange to take it apart. Clean the filter, replace if needed.

Checking the motor brushes

Every 2000 hours of operation check the brushes of the control unit motor: if they are excessively worn then replace them.

Cleaning the filter in the counter pressure unit

Cleaning the filter connected to the counter pressure unit every six months is recommended.

Checking electrical and hydraulic circuit connections

If obvious signs of deterioration are present, immediately replace parts with components that have the same electrical/mechanical characteristics.

Checking operation of the by-pass valve

Before each use check that, when the by-pass valve is not supplied with powers, activating the servo commands does not move the machine.

5. TROUBLESHOOTING

This chapter provides useful advice to be used in case of possible device operation anomalies

Before carrying out any intervention, it is important to have read and understood this manual, in all of its parts, verifying that all instructions contained in it were performed correctly.

All repairs must be carried on by specialised and authorised personnel following the indications supplied by the manufacturer. Any broken parts must be replaced with original spare parts, in order to keep the characteristics of the system.

Anomaly	Possible solution
The pistons do not move or are very slow	Verify that pressure (on the input pipe "P") conforms to the values shown in the technical data table (Chap. 6) Check that the output "T" tube is connected directly to the tank without impediments and short in length Verify the condition and level of the oil in the hydraulic power unit Verify the condition of the filter in systems with the counter pressure unit
One or more pistons remain stuck in the maximum reach position	Check that the defect is not caused by the distributor. Probable presence of impurities or air in the actuator unit.
Unable to adjust proportionality of manoeuvres	Verify connections and the presence of signals on the actuator unit Probable presence of impurities or air in the actuator unit. Probably the oil filter of the hydraulic power unit or the counter pressure unit is clogged Verify the P and T connections of the system

6. TECHNICAL SPECIFICATIONS

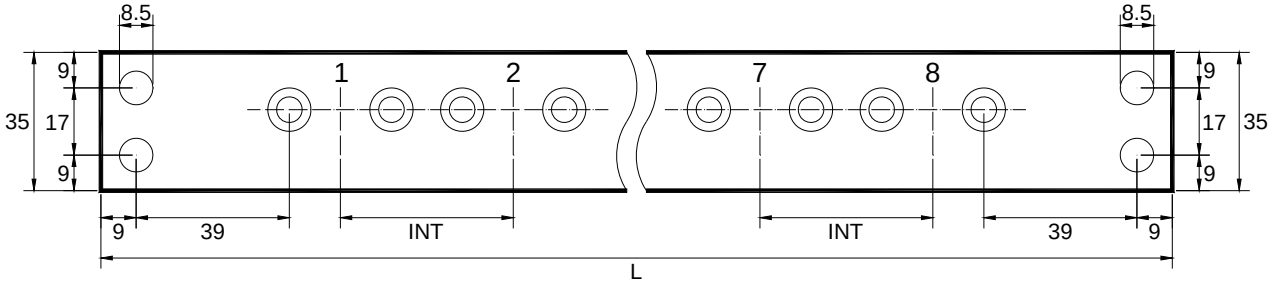
CHARACTERISTICS OF THE APT 400 ACTUATOR

• Manufacturer	IMET S.r.l.
• Type of analogue signal	PWM at 80Hz
• Coil resistance at 20°C (68°F)	5.5Ohm
• Absorption at 27 Vdc	170÷620 mA
• Absorption at 13.5 Vdc	300÷1250 mA
• Operational environment temperature	-20°C ÷ +70°C (-4°F ÷ +158°F)
• Maximum stroke	26mm (±13mm from the centre)
• Maximum stroke with increment kit	40 mm (±20 mm from the centre)
• Thrust and traction force at 12 bar	600 N
• Optimal operational pressure	10÷15 bar
• Maximum usage pressure	30 bar
• Hydraulic circuit connectors	¼" Gas
• Dimensions (LxDxH)	201x38x138 mm
• Dimensions (LxDxH) with increment kit	271x38x138 mm
• Weight (individual module)	1.5 Kg
• Weight (individual module with increment kit)	1.8 Kg

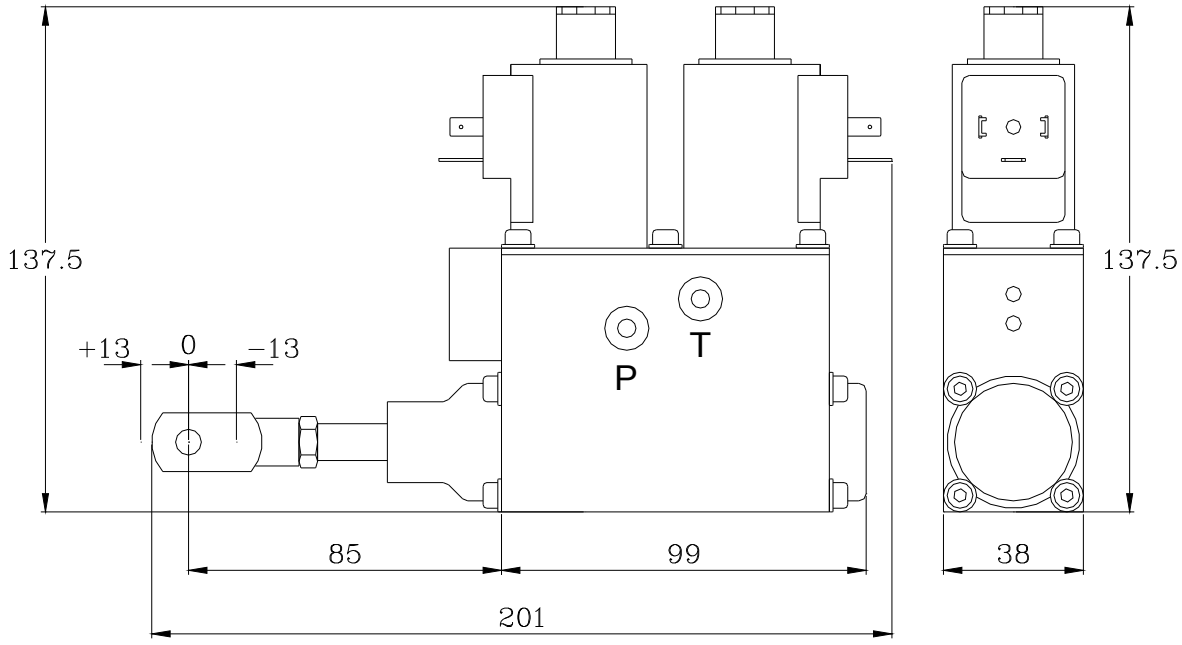
Table of length L (mm) of the fixing bar based on the distance between centres and the number of modules.

N° modules	Actuator distance between centres (DBC)						
	38 mm	40 mm	42 mm	44 mm	46 mm	48 mm	50 mm
3	198	202	206	210	214	218	222
4	236	242*	248	254	260	266	272
5	274	282	290	298	306	314	322
6	312	322	332	342	352	362	372
7	350	362	374	386	398	410	422
8	388	402	416	430	444	458	472

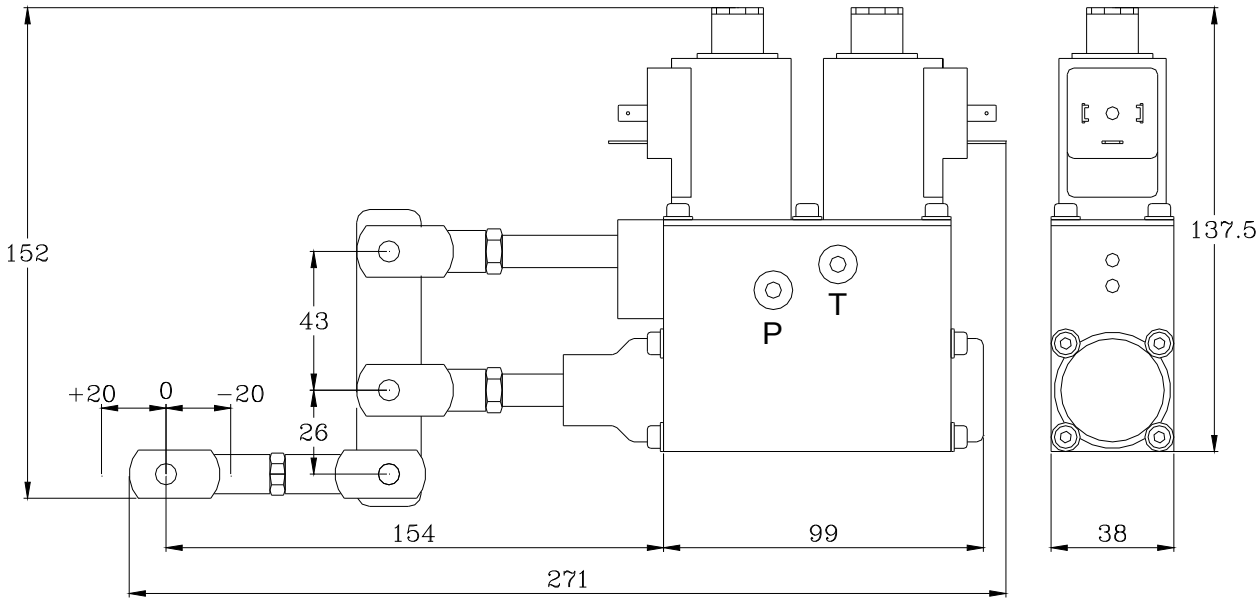
(*) measurement also valid for HSC monoblock systems



Actuator fixing bar



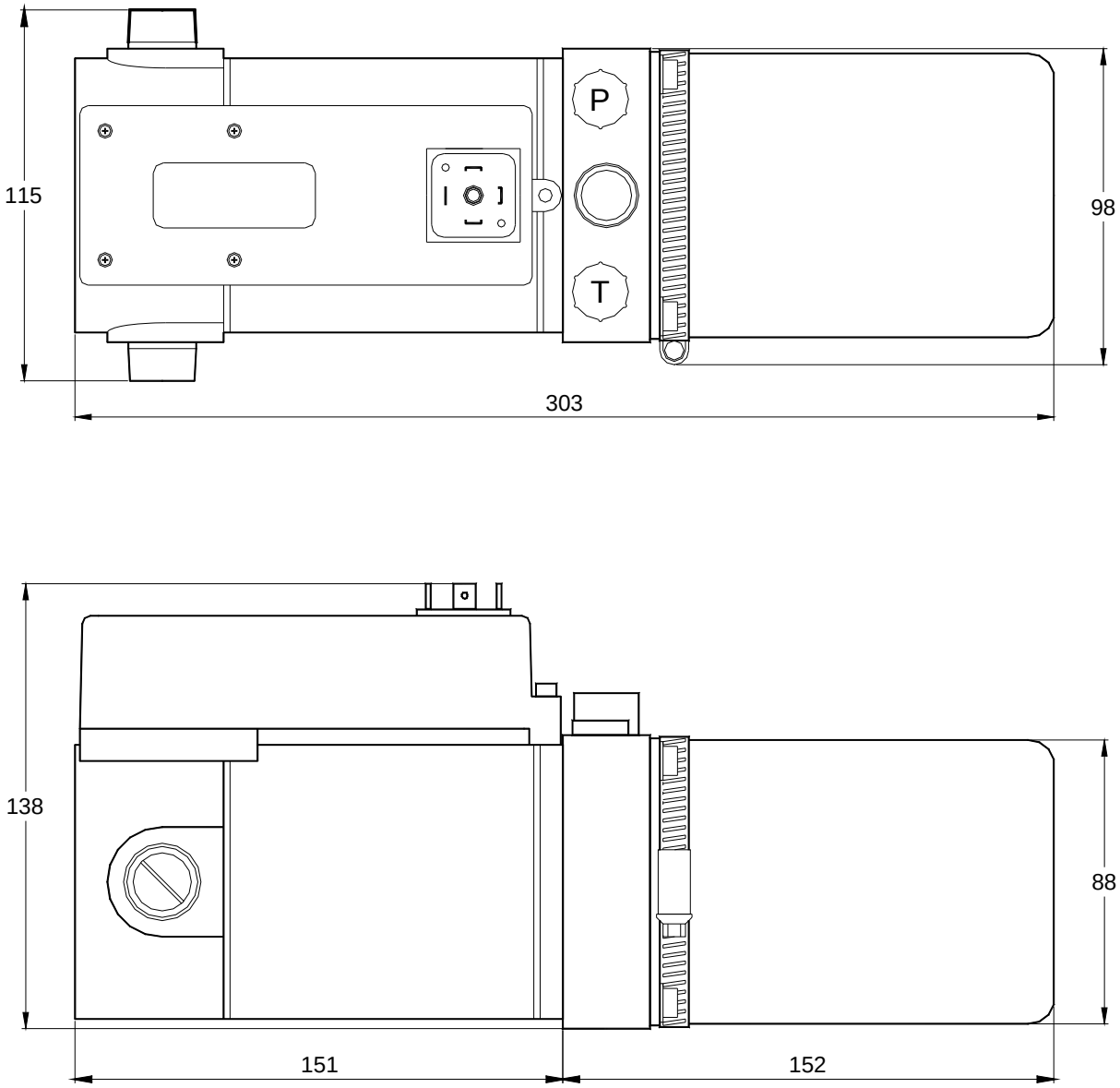
APT 400 Actuator



APT 400 Actuator with stroke increment kit

CHARACTERISTICS OF THE IMC 400 POWER UNIT

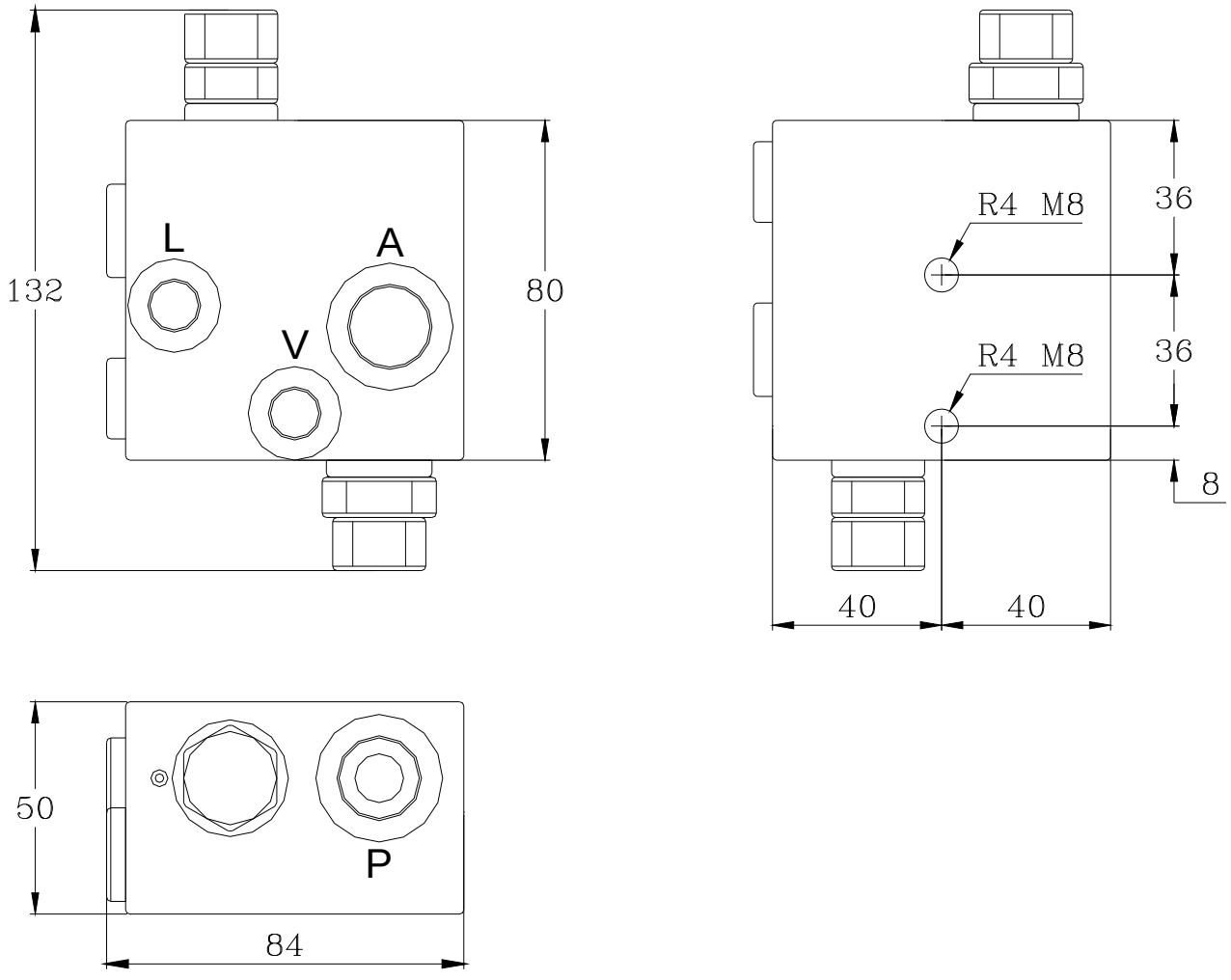
- Absorption of current at 27 Vdc 4.5A
- Absorption of current at 13.5 Vdc 9A
- Power supply voltage 12 or 24 Vdc +20% -10%
- Working pressure with 12V 16bar
- Working pressure with 24V 18bar
- Operational temperature -20°C ÷ +70°C (-4°F ÷ +158°F)
- Tank capacity 0.5 litres
- Hydraulic circuit connectors ¼" Gas
- Dimensions (LxDxH) 303x115x138 mm
- Dry weight 5.2 Kg



IMC 400 hydraulic power unit

CHARACTERISTICS OF THE COUNTER PRESSURE UNIT

- Range 70l/min
- Maximum pressure in P 210 bar
- Maximum pressure in V 18 bar
- Maximum pressure in L 1 bar
- Size of P-A connectors ½" Gas
- Size of V-L connectors ¼" Gas
- Viscosity 15 – 250 cSt
- Operational temperature -20°C ÷ +70°C (-4°F ÷ +158°F)
- Material Aluminium
- Dimensions (LxDxH) 84x50x132 mm
- Dry weight 1.1 Kg



Counter pressure unit

7. TECHNICAL ASSISTANCE

In case of failure in the servo command system, it is mandatory to exclusively use the service centre authorised by the manufacturer.

Contact the closest service centre or the dealer where the servo command system was purchased, clearly stating the following details:

- Model of the servo command and the attached radio control.
- Serial number of the attached radio control.
- Defect that has been detected.
- Date of purchase.

Remember to keep this manual and the warranty certificate, with all of its parts filled out.

8. DISPOSAL

Once the system has been declared out of order, it must be handed over to the local recycling centre that will dispose of its parts.

The barred waste bin symbol shown on the equipment means that at the end of its useful life this product must be collected separately from other waste. Everyone is responsible for disposing of their own equipment waste by handing it over to electric and electronic waste recycling centres.

Throwing used hydraulic oil in city waste bins is strictly forbidden, as they are highly pollutant. If needed, it must therefore be handed to the local collection and disposal centre.

A proper separate collection of waste from the equipment helps avoid possible negative effects for health and the environment and it encourages recycling of materials

Improper product disposal by the user leads to the application of administrative sanctions included ion Legislative Decree no. 22/1997" (article 50 and subsequent Legislative Decree no. 22/1997) that carry out European standard 2002/96/CE.

IMET s.r.l.
Sede Legale e stabilimento
Via Fornace, 8
33077 - SACILE (PN) - Italy
Tel. +39 0434 7878 - Fax +39 0434 737848
Capitale Sociale € 99.500 Int. Vers.

C.F./P. IVA/Reg. Impr. PN: 01106390931
P. IVA intra. IT01106390931
N° Meccanografico PN 008652
R.E.A. 43483 CCIAA PN
E-mail: info@imet.eu
www.imet.eu

9. DECLARATION OF CONFORMITY

CE

The IMET APT 400 model actuator module

Conforms to

- “Machinery Directive 2006/42/EC”
- “Low Voltage Directive 2006/95/EC”
- “EMC Directive 2004/108/CE”

Sacile 22/10/2020

IMET S.r.l.

the Chairman Evio Cadorin