PULSE
ROBOTIC ARM

HARDWARE INSTALLATION MANUAL

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ROZUM
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INTRODUCTION

This manual is intended to assist an integrator in installing and commissioning a system comprising the PULSE robotic arm (hereinafter, a robotic arm or an arm), an end effector (also, a work tool), a control box, and an emergency stop button. The document contains the following information about the system:

- basic features and components
- operating conditions and use restrictions
- dimensions and specifications
- requirements and instructions on mechanical and electrical integration
- pre-commissioning checks and the commissioning procedure

WARNING SIGNS AND THEIR MEANINGS

Below are the warning symbols used throughout the manual and explanations of their meanings.

The sign denotes important information that is not directly related to safety, but that the user should be aware of.

The sign indicates important safety precautions the user should follow.

1 PRODUCT OVERVIEW

1.1 Basic features and components

The PULSE robotic arm is designed for collaborative operation in industrial and commercial applications (e.g., pick-and-place, screwing, welding, etc.).

⚠️ *Although the arm is designed to operate safely in close proximity to humans, the integrator must conduct risk assessments for specific installations to evaluate the need for additional safety measures (e.g., safeguards).*

Apart from the robotic arm, the supply package includes the hardware and software components listed in **Table 1-1**.

Table 1-1: **Hardware and software components supplied with the PULSE arm**

Component	Intended use	For details, refer to
Hardware		
Control box	To control operation of the PULSE robotic arm	**Section 1.6**
Emergency stop button	To ensure Category 1 stop of the robotic arm in an emergency	**Section 1.7**
Software		
PULSE DESK	The software is pre-installed on the PC module integrated into the control box. It allows for programming the arm to move along a desired trajectory and perform different kinds of operations with a work tool.	User Manual

The PULSE robotic arm boasts modular design comprising elements as below (**Figure 1-1**):
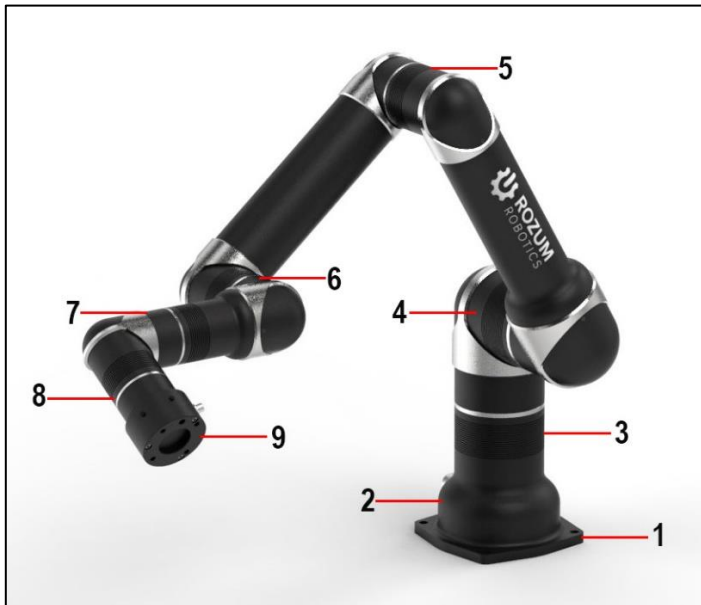
- aluminum alloy tubes (**1**)
- Rozum Robotics self-designed servo motors (**2**)
- elbow fittings (**3**)

Figure 1-1: **Structural elements of the PULSE robotic arm**

The elements form six interlinked axes (see **Figure 1-2**). In addition, the arm includes the following structural segments:

- an end effector mounting flange (a wrist)
- an arm base
- a transition plate

1	Transition plate
2	Arm base
3	Axis 1
4	Axis 2
5	Axis 3
6	Axis 4
7	Axis 5
8	Axis 6
9	Wrist (end effector mounting flange)

Figure 1-2: **Structural segments of the PULSE robotic arm**

1.2 Use restrictions

Make sure to observe the following use restrictions for the PULSE robotic arm:

⚠️ *Failure to observe the restrictions shall constitute a misuse, making our warranty void.*

- Never install or operate the PULSE robotic arm in an explosive or flammable environment.

- The atmosphere at the operating location of the robotic arm should not contain corrosive gases or liquids, salt, radioactive substances, oil mist, dust or metal powders.

- Always conduct a risk assessment of the operating environment before installing and operating the PULSE robotic arm.

- Avoid using the PULSE robotic arm outside the operating conditions (see **Section 1.5**).

1.3 Supply package

The supply package of the PULSE robotic arm contains the following components:

- a robotic arm assembled with a transition plate and a wrist
- a control box
- an emergency stop button pre-assembled with a connection cable
- a 220 V power cable
- a hybrid cable to connect the robotic arm and the control box

1.4 Specifications of the robotic arm

The PULSE robotic arm has the specifications as listed in **Table 1-2**.

Table 1-2: **Specifications of the PULSE robotic arm**

Specification	PULSE 75	PULSE 90
Weight[1]	12.6 kg	17.4 kg
Payload[1]	4 kg	3 kg
Degrees of freedom[1]	6	6
Reach[1]	750 mm	900 mm
Repeatability	+/-0.1 mm	+/-0.1 mm
Non-stop lifetime cycle	20,000+ hours	20,000+ hours
Protection class	IP40	IP40
Noise level	less than 60 dB	less than 60 dB
Rated voltage	100 VAC	100 VAC
Average power	150 W	250 W
Maximum power	300 W	450 W
Maximum joint speed	30 RPM	30 RPM
Joint acceleration	5 rad/s^2	5 rad/s^2
Max tool center point (TCP) velocity	2 m/s	2 m/s
Acceleration time 0-1 m/s	0.1 s	0.1 s

[1] The specification values can vary, depending on the customer precise requirements. There is a possibility to extend the reach, increase the weight and the payload, and to add a seventh degree of freedom.

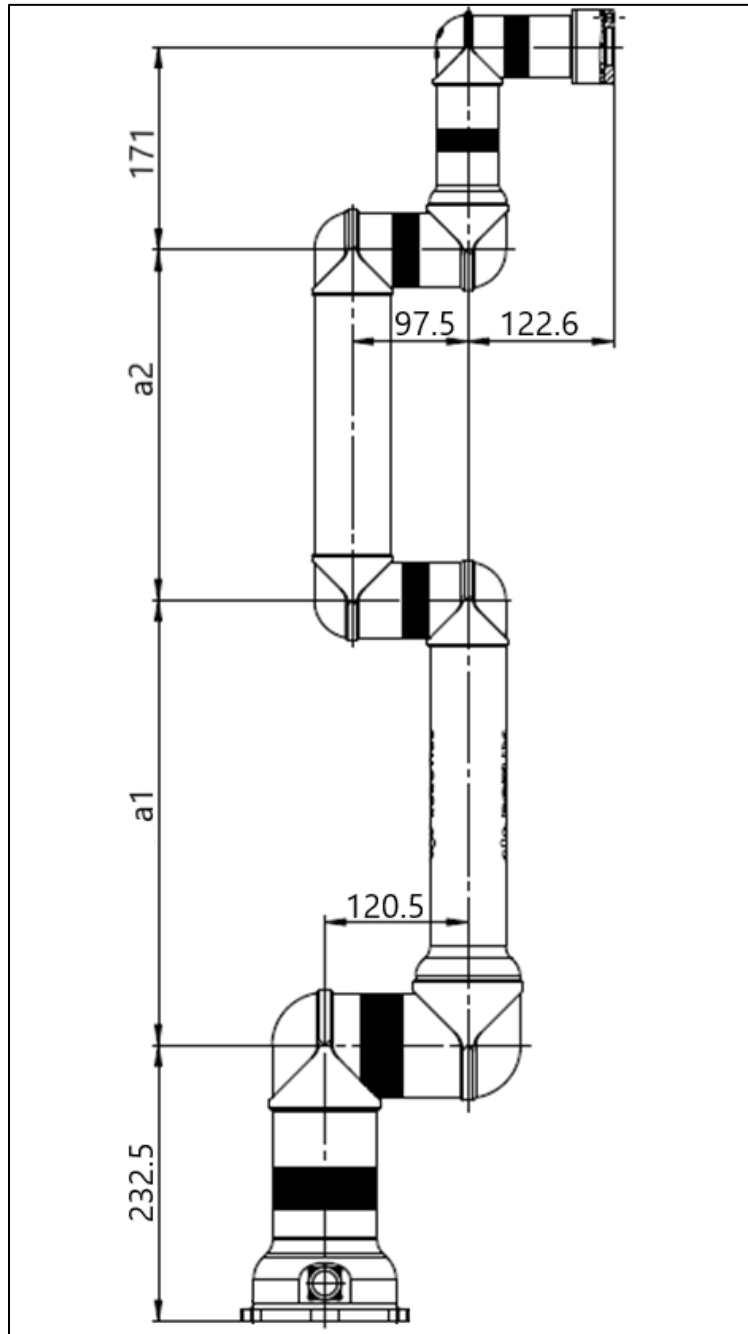**Figure 1-3** and **Table 1-3** illustrate the dimensions of the arm's six axes for PULSE 75 and PULSE 90 models.

Figure 1-3: Lengths of the robotic arm axes

Table 1-3: Variations of a1 and a2 lengths for PULSE models

Model	a1, mm	a2, mm
PULSE 75	375	295
PULSE 90	450	370

Table 1-4 contains motion ranges for each of the axes.

Table 1-4: **Motion ranges and maximum speeds of the robot axes**

Axis	Motion range	Maximum speed
Axis 1 (base)	-360° to 360°	180°/s
Axis 2	-360° to 360°	180°/s
Axis 3	-160° to 160°	180°/s
Axis 4	-360° to 360°	180°/s
Axis 5	-360° to 360°	180°/s
Axis 6	-360° to 360°	180°/s

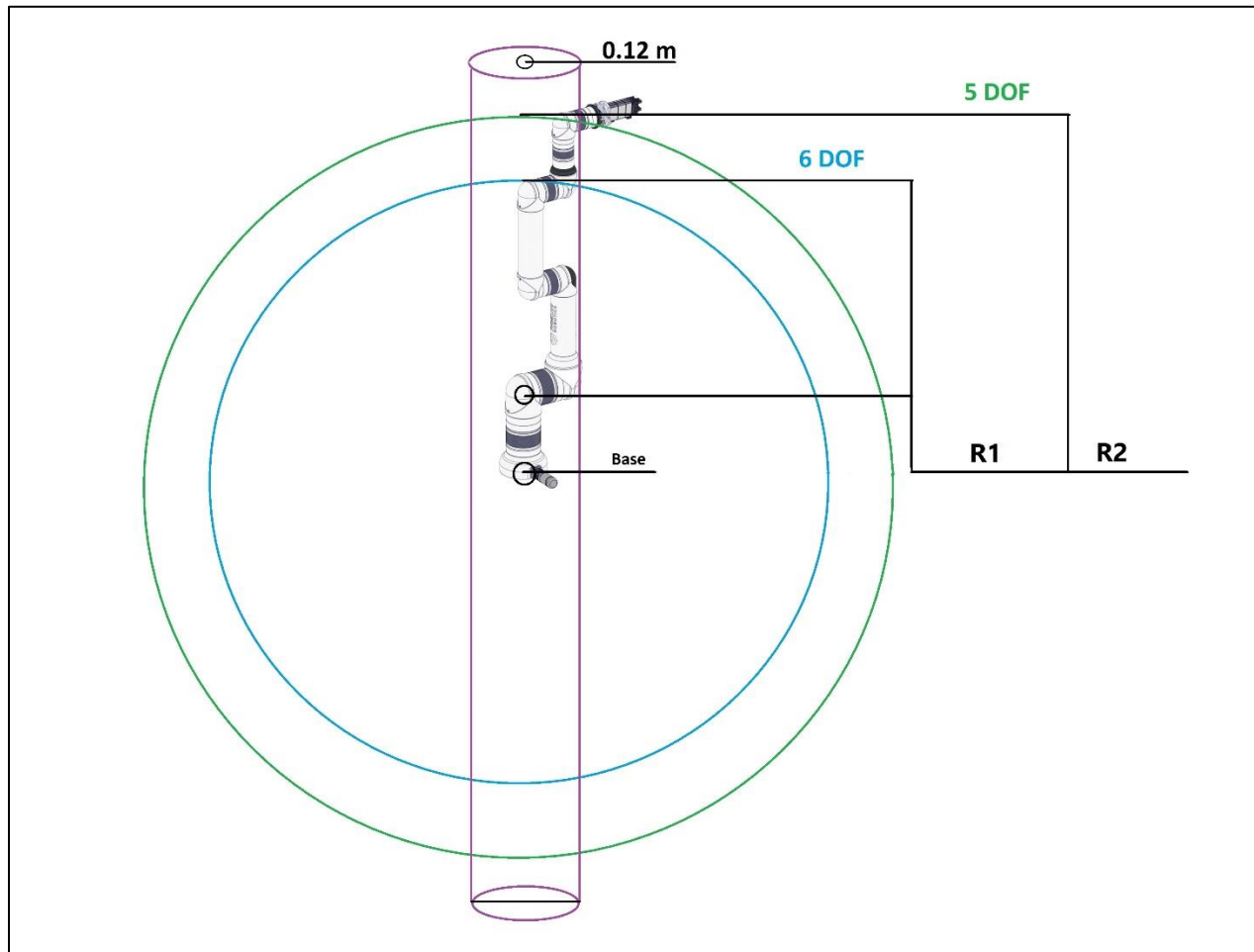**Figure 1-4** illustrates the workspace of the PULSE robotic arm.

Figure 1-4: **Workspace of the PULSE robotic arm**

⚠️ *The cylinder-shape area of 0.12 m in diameter around the robot base is the infinite solutions area. It is advisable to avoid programming any arm or work tool moves within the area.*

Table 1-5 contains the R1 and R2 workspace values for PULSE 75 and PULSE 90.

Table 1-5: PULSE workspace for six and five DOF

Model	R1, m	R2, m
PULSE 75	0.67	0.83
PULSE 90	0.82	0.98

1.5 Operating conditions

The PULSE robotic arm is intended ***for indoor use only***. When operating it, make sure to comply with the following requirements:

- Ambient temperature: 0°C to +35°C

- Humidity: 80%

- Altitude: max. 1,000 m above the sea

1.6   Control box

In the PULSE robotic arm system, the control box monitors and controls operation of the arm, providing an interface for communication between hardware and software components.

The control box is a case of the dimensions as indicated in **Table 1-6**. It comprises a personal computer (PC) module with pre-installed control software (PULSE DESK), as well as other modules that perform communication, safety, and other essential functions.

Table 1-6: **Specifications of the control box**

Specification	Value
Weight	9 kg
Dimensions (D x W x H)	283 x 483 x 91 mm
Noise level	Less than 60 dB
Protection rating	IP21
Interfaces	▪ 4 digital inputs, 2 digital outputs ▪ 1 USB port ▪ 1 Ethernet port (RJ-45, 100 BASE-T)
API implementation options	REST API/ Python

Attention! A specific control box is compatible only with a specific robotic arm from the same supply package.

After you start a PULSE arm, the control box compares the arm ID saved in its memory with that of the currently connected arm. When the two IDs match, the initialization of the arm continues in the normal way. When the two IDs do not match, the arm fails to initialize. The control box beeps three times, and the red LED on the control box turns on.

1.6.1 The front panel

On the front panel of the control box, there are two light-emitting diodes (LED)—a green and a red one (see **Figure 1-5**).

Figure 1-5: **The front panel of the control box**

The front panel LEDs signal different states of the robotic arm as described in **Table 1-7**.

Table 1-7: **LEDs on the front panel of the control box**

Purpose	State / event in the robotic arm system	LED color	Mode
Signals system states	System switched off	Green	LED off
	Bootup		blinking
	Ready		constantly ON
	Work		constantly ON
	System shutting down		constantly ON
	LED state by default		constantly ON
	Error		blinking
Signals errors	System switched off	Red	LED off
	LED state by default		LED off
	Error		constantly ON

1.6.2 The back panel

On the back panel of the control box, you can find the following:

- all major connectors of the robotic arm system
- a power switch
- four holes for rack mounting

Figure 1-6: **The back panel of the control box**

No.	Intended use
1	4 digital inputs and 2 digital outputs (for details, see **Section 2.3.2**)
2	USB 2.0 port
3	Ethernet port (for specifications, see **Table 1-6**)
4	Power supply switch
5	220 V power cable connector
6	Connector for an emergency stop button
7	48 V connector for the cable between the control box with the robotic arm
8	mounting holes

1.6.3 Sound signals

Apart from the light indication on the front panel, the control box produces beeping signals to indicate certain system events as described in **Table 1-8**.

Table 1-8: Sound signals of the control box

System event	Signal
At initialization, to signal successful bootup of the operating system on the PC module	One beep
To signal that initialization of the motors in the arm joints is completed successfully	One beep

1.7 Emergency stop button

For the PULSE robotic arm, the emergency stop button is supplied as a standalone device pre-assembled with a connection cable. The button is designed to provide Category 1 Stop in

accordance with ISO 10218-1—a controlled stop with power supplied to the servo motors in the arm joints until full stop is achieved.

Figure 1-7: **The emergency stop button**

ℹ️ *The actual appearance of the emergency stop button can differ from that shown in **Figure 1-7**.*

Each robotic arm installation must have its own emergency stop button. You can place the button at any location within the operator's reach.

Use the button to immediately stop the robotic arm in an emergency, ***when other protective measures have proved to be impracticable or inefficient.***

To **resume operation** of the robotic arm after an emergency shutdown, reset the system as described below:

1. Wait for the arm to come to a full stop. The LED on the arm's wrist should go off.

2. Unpress the emergency stop button.

3. Flip the power switch on the back panel of the control box to the off position or unplug the power cord from the mains socket.

4. Switch the system on again as described in **Section 3**.

⚠️ ***Before restarting the system after an emergency shutdown, make sure the emergency stop button is unpressed. Otherwise, the system fails start, causing the red LED on the control box to light up.***

1.8 Wrist

The robotic arm is supplied pre-assembled with **a wrist**—a special flange for integrating an end effector.

> *An end effector is a tool or a device designed to enable the robotic arm to perform various operations as required for its intended application. End effectors are beyond the scope of Rozum Robotics supply.*
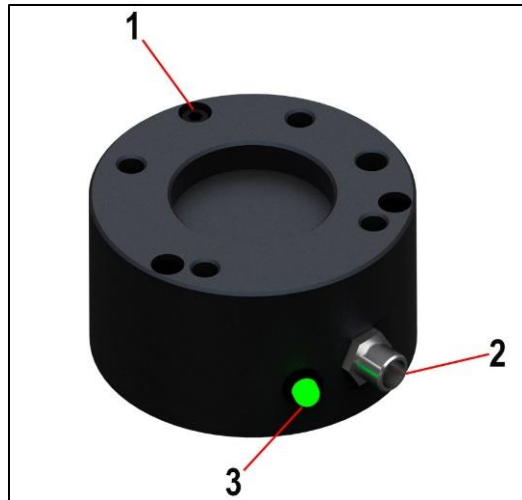

Figure 1-8: **The wrist of the PULSE arm**

The wrist of the PULSE robotic arm features:

- a standard ISO 9409-1-50-4-M6 mechanical interface **(1)**

- a cable output **(2)** for connecting an end effector electrically

- a LED indicator **(3)**

> *When an installation requires a mechanical interface different from the standard ISO 9409-1-50-4-M6 one, the user (integrator) has to provide a proper adaptor for integrating an end effector.*

The states of the wrist LED are as described in **Table 1-9**.

Table 1-9: Arm states vs. LED signals

Arm state	LED signal
Power off	Off (no indication)
Standby mode (freeze state)	Green on
Operation (in motion)	Blinking green
Learn mode	Steady yellow
Error	Steady red
A control button pressed	Blinking blue

1.9   Control buttons

For the current robot design (intended for use together with a gripper work tool), control buttons are located on the elbow fitting above the wrist (see **Figure 1-9**).
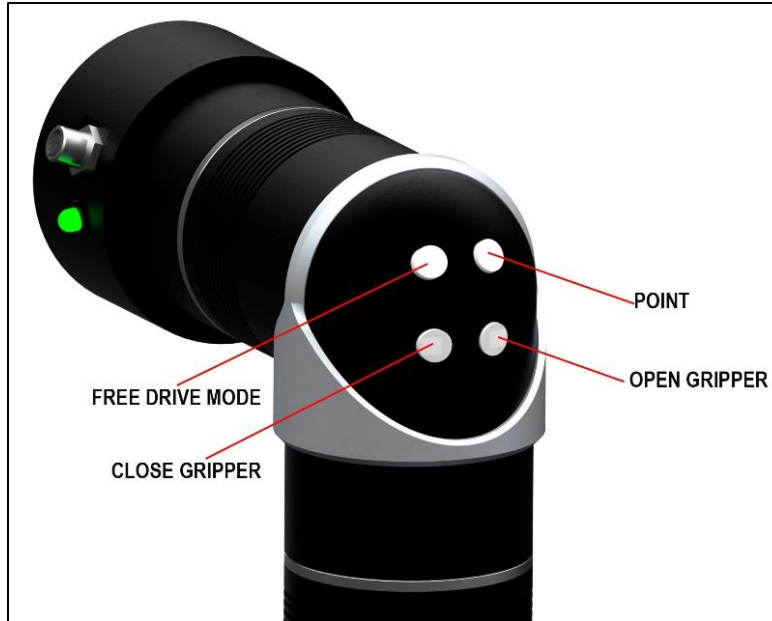

Figure 1-9: **Control buttons on the PULSE arm**

The functions of the buttons are as described in **Table 1-10**. For more details about using the buttons to operate the arm, refer to "PULSE DESK. OPERATOR MANUAL."

Table 1-10: Functions of the control buttons

Name	Function
Free Drive mode	To enable/ disable Free Drive mode (in the mode, the user can teach an arm different trajectories by moving its axes by hand)
Point	To add points to a program running in the PULSE DESK software
Open gripper	To open the gripper attached to the wrist
Close gripper	To close the gripper attached to the wrist

2   INSTALLATION

2.1   General requirements

The PULSE robotic arm is partly completed machinery, which means its safe operation largely depends on the operating environment. Therefore, it is common practice to conduct **a risk assessment** of the operating environment for each particular installation.

The risk assessment is the responsibility of the integrator. Based on its results, the integrator determines whether additional safety measures (e.g., safeguards) are needed to protect the operator working with the robotic arm in the installation.

Before installation, carry out the following preparatory works:

1. Unpack the robotic arm and other components.
2. Check the supply package against the list in **Section 1.3.**
3. Check the appearance of the robotic arm and other components for any damages or defects.

> *If you find any obvious damages or defects or find out that any of the supply package components is missing, contact the dealer or the manufacturer.*

> *When unpacking and installing the robotic arm, make sure not to move or rotate the robot joints manually because this can cause damage to the arm.*

Installation of the PULSE robotic arm requires completing the following two steps:

1. Mechanical integration
2. Electrical integration

2.1.1 Continuous power supply requirement

For safety reasons, *the integrator shall be obliged to provide continuous power supply* to the robotic arm (e.g., installing an uninterruptible power supply, a redundancy circuit, etc.). Otherwise, we cannot guarantee that the robotic arm maintains its position during a power outage, which may result in serious damage to its components.

2.2 Mechanical integration

> *Pinching hazard! When performing mounting works, keep your fingers away from the arm joints to avoid entrapment. Do not wear loose clothing or jewelry. Make sure long hair is tied back.*

2.2.1 Mounting the robotic arm

Though the footprint of the PULSE robotic arm is as small as 120 mm (see **Figure 2-1**), you need to account for the arm workspace (**Figure 1-4**) when choosing a mounting location. This is important to exclude collisions with other equipment or objects.

The recommended mounting position for the PULSE robotic arm is *vertical,* on a *horizontal immovable surface*. The mounting surface should be:

- flat, solid, and stable

- sustain 8 times the weight of the robotic arm (see **Table 1-2**)

The installation procedure includes the following steps:

1. Position the robot arm vertically.

2. Holding the arm tight, secure it on a mounting surface using one of the following methods:

    Method 1.

    -   Insert 4 M8 bolts into the four 9-mm dia. holes on the transition plate (see **Figure 2-1**) and tighten the bolts up as appropriate.
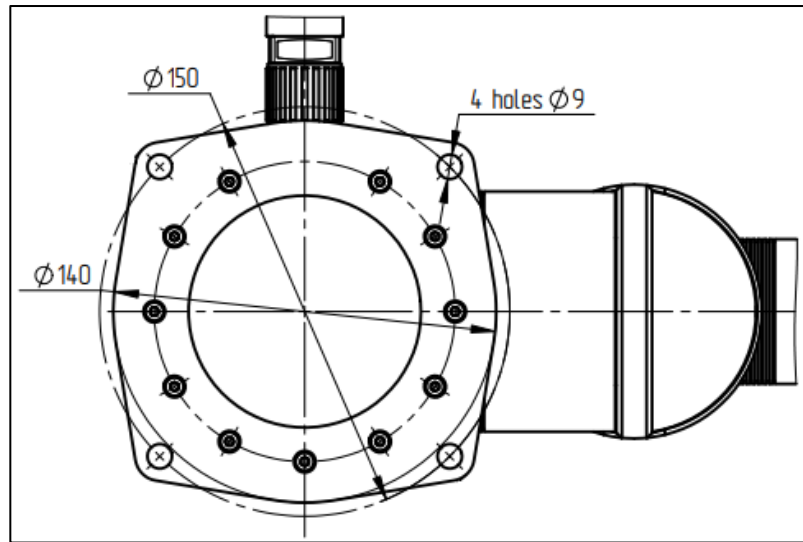

Figure 2-1: Mounting the arm by Method 1

    Method 2.

    -   Since the arm is supplied pre-assembled with a transition plate, your first step is to dismantle the plate. To do this, unscrew the 2 pins and 11 bolts holding the arm base and the transition plate together.

    -   Use the 2 pins and 11 bolts (see **Figure 2-2**) to screw the arm base down to your mounting surface without a transition plate.
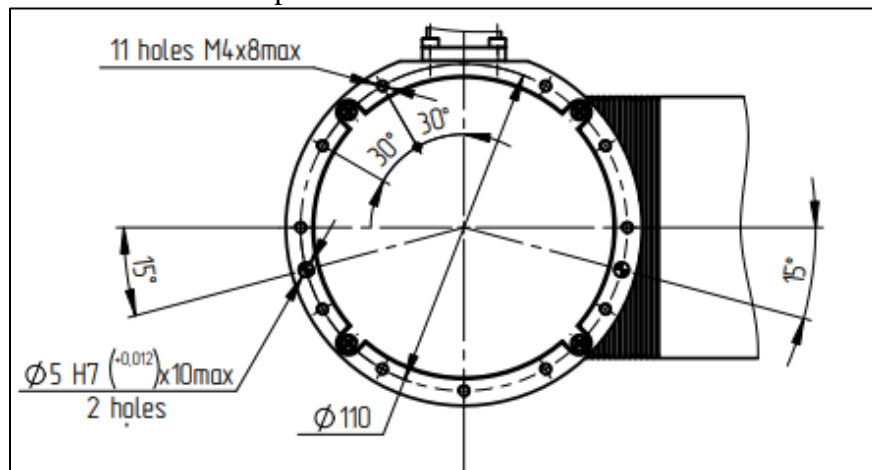

Figure 2-2: Mounting the arm by Method 2

2.2.2 Installing the control box

There are three methods to install the control box:

- horizontal positioning on a flat solid surface (e. g., a table)
- vertical positioning using a specially designed stand
- rack mounting (DIN 19") (for location of rack mounting holes, see **Figure 1-6**)

The exact installation method depends on the particular operating environment of the PULSE robotic arm and your requirements. In any case, the distance from the control box to the robotic arm should not exceed 3 meters—the length of the connection cable. Otherwise, you will have to use a cable extension.

> *When installing the control box, provide an air gap of 50 mm from its front and back panels.*

2.3 Electrical integration

> *Before proceeding to any electrical integration works, make sure no power is supplied to the robotic arm or the control box.*

All major connections required to provide electrical integration of the robotic arm into your application are located on the back panel of the control box (see **Figure 1-6**).

2.3.1 Power connection

The power connection of the control box is in accordance with the IEC 60320-1 C14 standard. The electrical specifications are as indicated in **Table 2-1**.

Table 2-1: **Electrical specifications of the control box power connection**

Parameter	Value/ range	Unit
Input voltage	100–264	VAC
Mains frequency	47–63	Hz
Standby power	10	W
Average operating power	400	W

> *For enhanced safety, consider installing an external mains switch with a fuse.*

2.3.2 Digital I/O connectors

The control box has four digital inputs and two digital outputs that you can use to connect additional equipment, including sensors, safety devices, PLC, etc. The connectors are located on the back panel of the control box (see **Figure 1-6**).

> *The cable length from the digital inputs/ outputs to connected equipment should not exceed 2 m. Otherwise, signal quality may suffer.*

For the current control box configuration, the two lower digital I/O connectors have the RESERVED status. The pin assignment for the two upper ones is as illustrated in **Figure 2-3**.
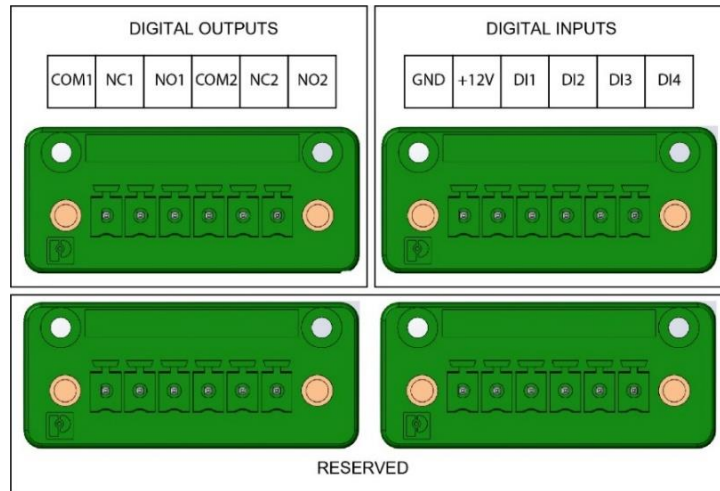

Figure 2-3: **Pin assignment for digital I/O connectors**
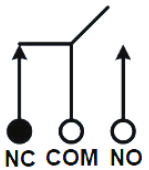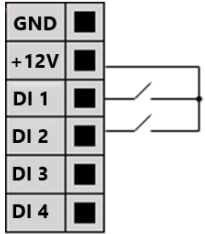
Table 2-2: **Specifications of relay outputs**

Relay output 1	Relay output 2	Description	Specifications
COM1	COM2	Common	
NC1	NC2	Normally closed	
NO1	NO2	Normally open	Contact capacity: 48 V, 0.5 A

Table 2-3: **Specifications of digital inputs**

Digital input	Description	Specifications
12 V DC	Power for an external device	Max current load: 1 A **Warning! Connecting inductive load can cause damage to equipment!**
GND	Ground, 0 V	
DI1, DI2, DI3, DI4	Digital input	Max permissible current: 35 mA Input voltage range (Hi level): 5-12 V Input voltage range (Low level): 0-1.5 V

2.4 Mounting an end effector

Depending on particular needs, you can use different end effectors with the PULSE robotic arm. Possible options include grippers for pick-and-place operations, material removal tools for cutting, drilling, and deburring, welding torches, etc.

> *Selecting a proper type and model of an end effector is the responsibility of the integrator.*

To attach an end effector to the robotic arm, use the mechanical and electrical interfaces on its wrist (see **Figure 1-8**). In its basic design, the wrist of the PULSE robotic arm has the standard ISO 9409-1-50-4-M6 mechanical interface as shown in **Figure 2-4**.

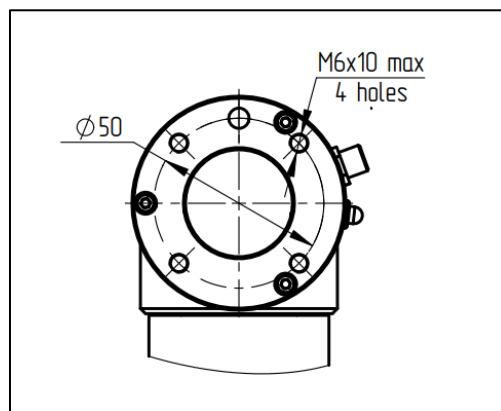> *For more details, refer to the dimensional drawing, which is available for downloading at the web page:* https://rozum.com/pulse-documentation/.

Figure 2-4: **Basic mechanical interface on the arm wrist**

> *In case your end effector has a mechanical interface different from the standard ISO 9409-1-50-4-M6 one, make sure to use an appropriate adaptor.*

The **basic electrical interface** of the arm wrist is a socket as shown in **Figure 2-5**.
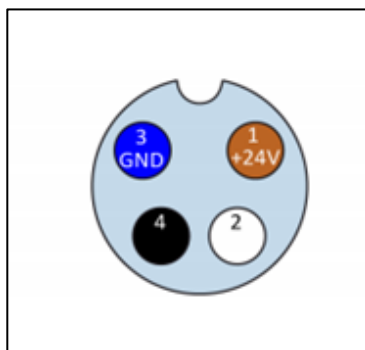

Figure 2-5: **Basic electrical interface on the arm wrist**

The pin assignment in the socket is as described in **Figure 2-5**.

Table 2-4: **Pin assignment in the end effector socket**

Pin	Wire color	Signal
1	Brown	+24V
2	White	Digital output 1
3	Blue	GND
4	Black	Digital output 2

Figure 2-6 below is the electrical diagram for the digital outputs in the end effector socket on the wrist. Make sure to observe the specified parameters when selecting and connecting an end effector.
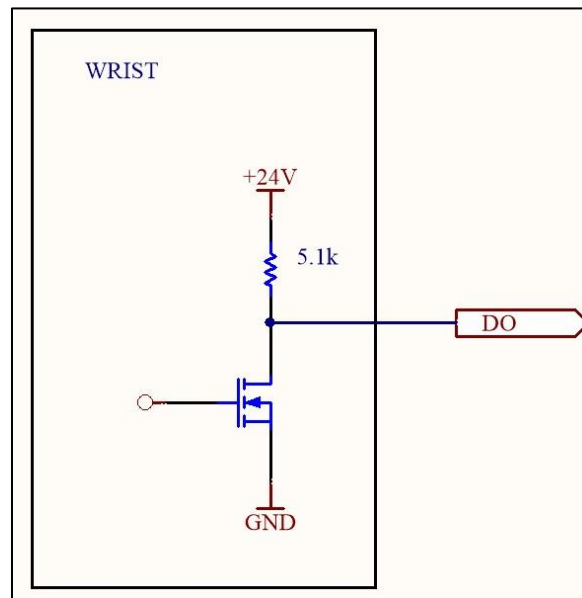

Figure 2-6: **Electrical diagram for the digital outputs of the end effector socket**

2.5   Integrating the arm into an application

To integrate the PULSE robotic arm system into your application, it is recommended to follow the sequence of steps as below:

The sequence of Steps 2 to 5 is for reference only. You can re-arrange the steps at your convenience, but make sure to connect the power supply as your last integration step.

Always use the original cables included in the supply package!

Step 1. Mount the robotic arm at a selected location in accordance with the instructions in **Section 2.2**.

Step 2. Attach your selected end effector to the wrist of the robotic arm in accordance with **Section 2.4**.

Step 3. Connect the arm with the control box using the 48V hybrid cable from the supply package. The cable must run from the connector at the bottom of the robotic arm to the 48V connector on the back panel of the control box.

> ⚠️ *A specific robotic arm is compatible only with the control box from the same supply package.*

Step 4. Plug the emergency stop button cable into the appropriate connector on the back panel of the control box.

Step 5. (*Optional*) Connect any required additional equipment (e.g., a sensor, a safeguard, a PLC) to the control box, using the digital I/Os on its back panel. For detailed instructions and requirements, see **Section 2.3.2**.

Step 6. Connect the arm to a computer directly or to a local network, using an Ethernet cable.
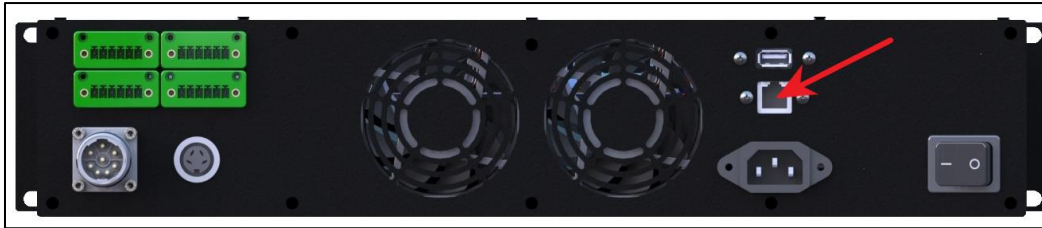
Step 7. Connect the control box to a power supply (a mains network) using the 220V power cable included in the supply package. The power supply connector is located on the back panel of the control box.

3   COMMISSIONING

To get started with the robot, the sequence is as detailed below:

1.   Perform pre-commissioning checks in accordance with **Section 3.1**.

2.   Switch the arm in accordance with **Section 3.2.**

3.   Set up communication between a PULSE arm and a control device (e.g., a PC) (see **Section 3.3**).

4.   Start the PULSE DESK interface or enable controlling the arm via the Application Programming Interface (REST API).

> *Apart from PULSE DESK and API, you can also control the arm running user-designed in the sandbox virtual environment. For details, refer to the [User Manual.](#)*

3.1 Pre-commissioning checks

Once you have integrated the PULSE robotic arm system into your application as described in **Section 2.5**, you can proceed commissioning the system and actually working with it. Before the initial and any subsequent starts, make sure to check the following:

•   The robotic arm is fixed securely on a sturdy mounting surface and can remain stable during operation.

> ⚠️ *If the attachments of the robotic arm are not secure enough and the mounting surface is not sufficiently sturdy, the robot can fall over during operation and cause an injury.*

•   The end effector is securely attached to the arm wrist and will not fall out during operation.

- All cables are intact and connected to appropriate connectors.

- The emergency stop button is attached to the control box and is located where the operator can reach it from his/her workplace at any moment.

- The operating conditions comply with the requirements as set forth in **Section 1.5**.

- All risks identified during a risk assessment of the operating environment have either been eliminated or mitigated by implementing appropriate measures (e.g., safeguards, limiting access to the arm workspace).

- There are no obstacles within the workspace of the robotic arm that could prevent the arm from moving freely or operating properly.

Now, the PULSE arm is ready for switching in accordance with **Section 3.2.**

3.2 Switching the arm

To start the PULSE robot, follow the sequence as below:

1. Plug the power cord of the control box into the mains socket.

2. Flip the external mains switch (if any) of your system to the ON position.

3. Flip the power switch on the back panel of the control box to the ON position.

The control box starts receiving power and initializing. The green LED on the control box is blinking, while the LED on the arm wrist is off.

Once the bootup of the control box is over, the green LED goes from blinking to steady green. Then, the arm starts initializing, too. After the arm initialization is over, the wrist LED turns steady green, and the arm goes into the READY state.

⚠️ *Do not move the arm until the initialization is over and the wrist LED on the arm is steady green.*

Now, to be able to control your PULSE arm, you need to set up communication between it and a PC or other control device as detailed in **Section 3.3**.

3.3 Setting up communication with a PULSE arm

To set communication with a PULSE arm, you can use:

- **a static** IP if the robotic arm is connected directly to a control device (PC) or to a network without a DHCP server;

- **a dynamic IP** if the robotic arm is connected to a network with a DHCP server.

3.3.1 Static IP

By default, the PULSE robotic arm uses *the 10.10.10.20 static IP*. Follow the instructions below to configure your control device to work with the static IP address, accounting for the operating system in use.
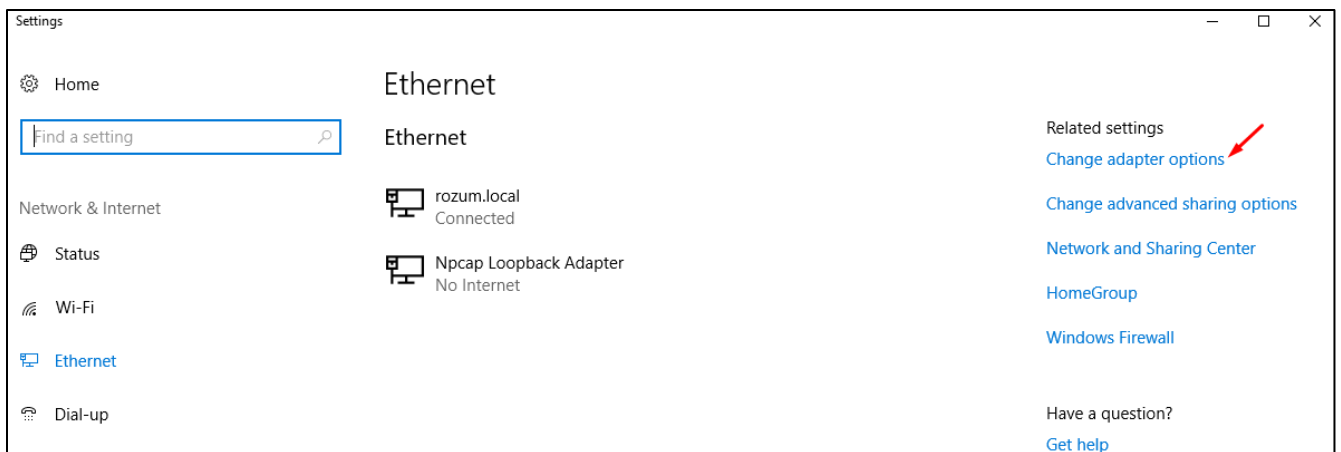
Windows OS

1. Switch on your PC.

2. In the right-hand corner of the Taskbar, left-click the network connection indicator.

3. Among the displayed connection options, select **Npcap Loopback Adapter**.
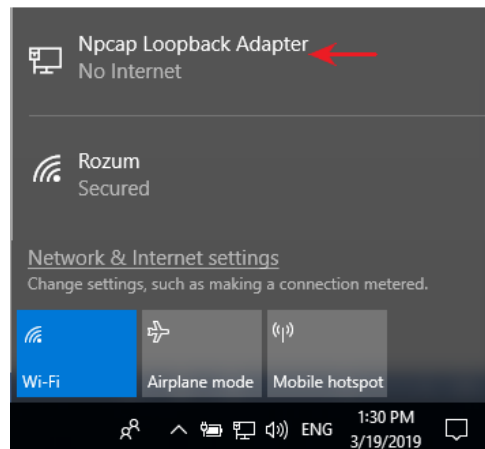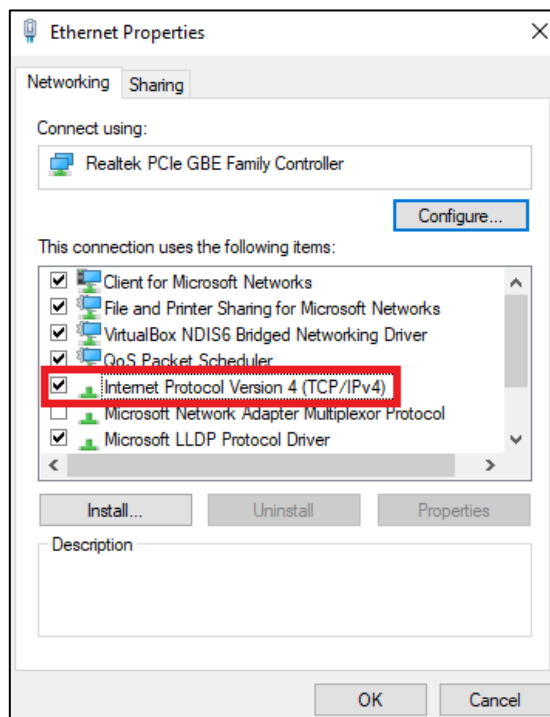

4. In the displayed Ethernet settings window, click **Change adapter options**

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5. In the displayed **Network Connections** window, right-click the **Ethernet** icon and select **Properties.**
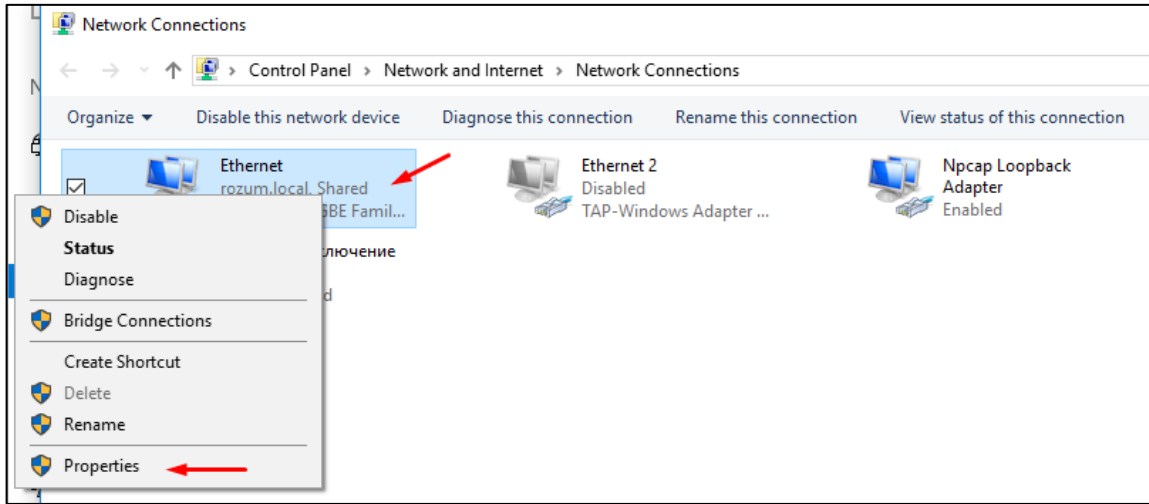

6. On the **Networking** tab in the displayed **Ethernet properties** window, double-click **Internet Protocol Version 4 (TCP/IPv4).**

7. In the **IP Version 4 (TCP/IPv4) Properties** window, select **Use the following IP address** and set up the **IP address** and the **Subnet Mask** fields to the value as shown below.
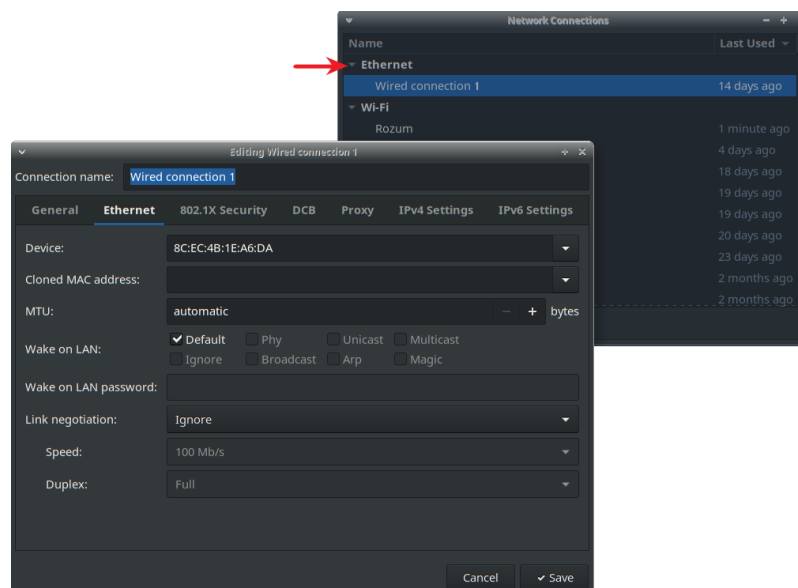
> *To specify the last IP address digit in the IP address field, you can use any value from 1 to 255, except for 20 since 10.10.10.20 is the default static IP address of the arm.*
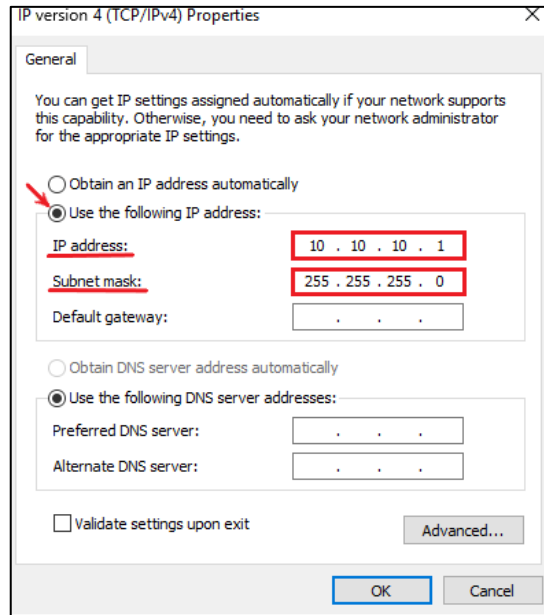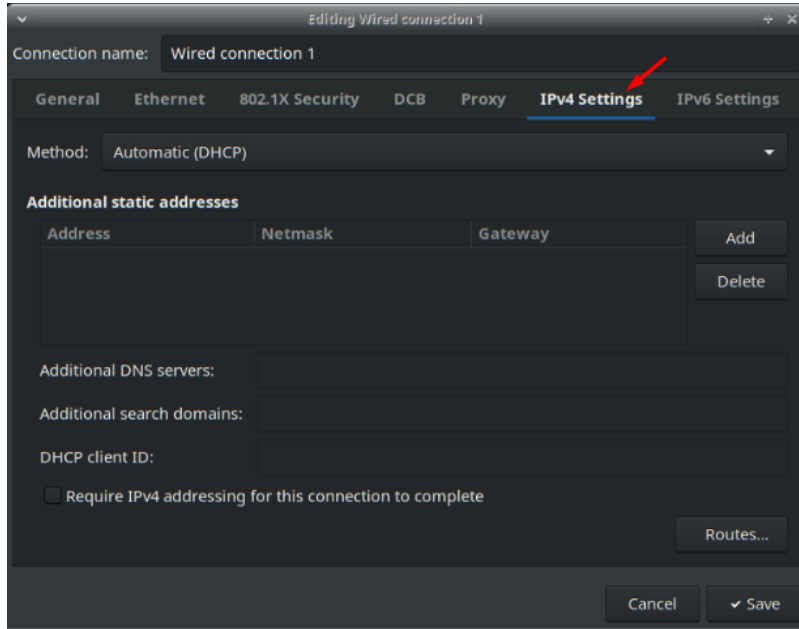

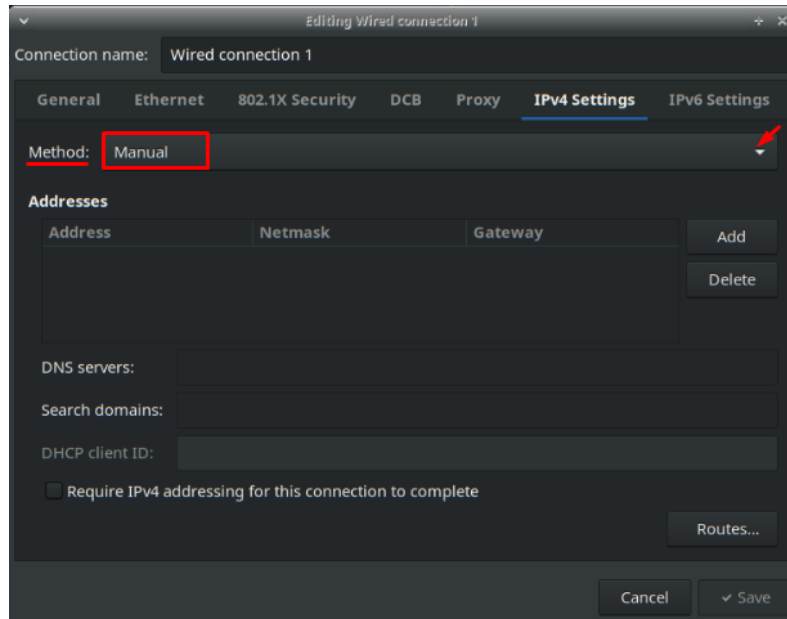8. Click **OK** to confirm the settings.

Linux OS

1. Switch on your PC.

2. Open **Network Connections** and double-click **Ethernet** to open the editing window as shown below.
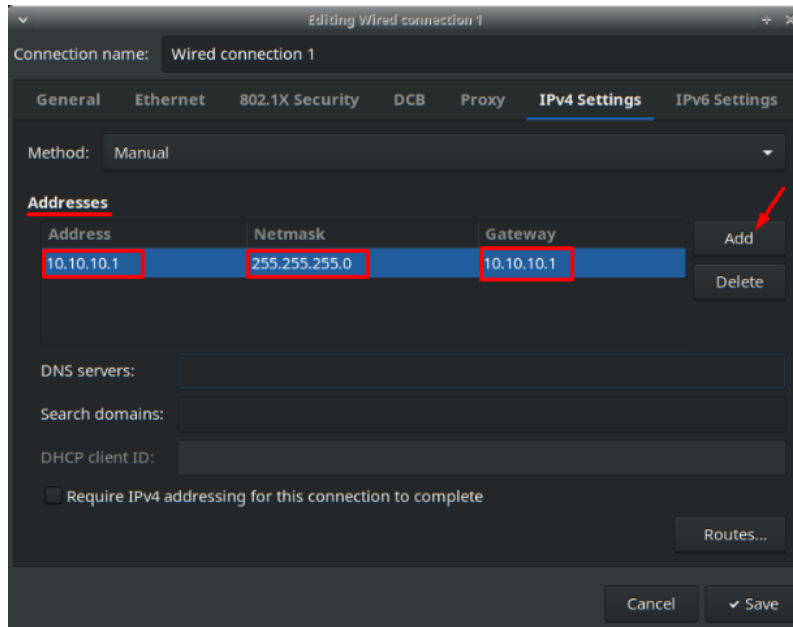
3. In the displayed window, select the **IPv4 Settings** tab.

4. In the **Method** dropdown box on the **IPv4 Settings** tab, select **Manual.**

5. In the **Addresses** area on the same tab, click **Add** and specify the **Address, Netmask**, and **Gateway** as shown in the figure below.

> To specify the last digits in the Gateway and the Address fields, you can use any values from 1 to 255, except for 20, since 10.10.10.20 is the default static IP of the arm.

6. Click the **Save** button to confirm the settings.

3.3.2 Dynamic IP

Dynamic IP is the IP address of the PULSE arm assigned to it by the DHCP server in the user network. To find out the dynamic IP of the robotic arm in your local network, you will need assistance from the system administrator of the network.

> If you fail to find out the dynamic IP address of the arm, check the network connection settings. The arm may not have received the IP address from the DHCP server within the period as preset for the network, resulting in a fallback to the static IP 10.10.10.20.

After you have set up communication with the robotic arm, you can proceed to working with the PULSE DESK interface (see **Section 3.4**) or REST API (see **Section 3.5**).

3.4 Starting the PULSE DESK

To be able to program the arm via the PULSE DESK interface, follow the instructions below:

1. Open your preferred browser.

2. In the browser line, type in one of the following:

   - the static IP (see Section 3.3.1) and the corresponding port number—either *localhost:8080* **or** *10.10.10.20:8080*
   - the dynamic IP address assigned to the arm in your local network (see **Section 3.3.2**) and the corresponding port number.

> ⚠️ *When connection with the arm is lost, check the network connection settings. When you have trouble reconnecting or finding the arm IP, contact your network administrator or the service department.*

The browser page displays the PULSE DESK starting screen. Now, you can start programming the PULSE arm using the interface. For details, refer to the [User Manual](#).
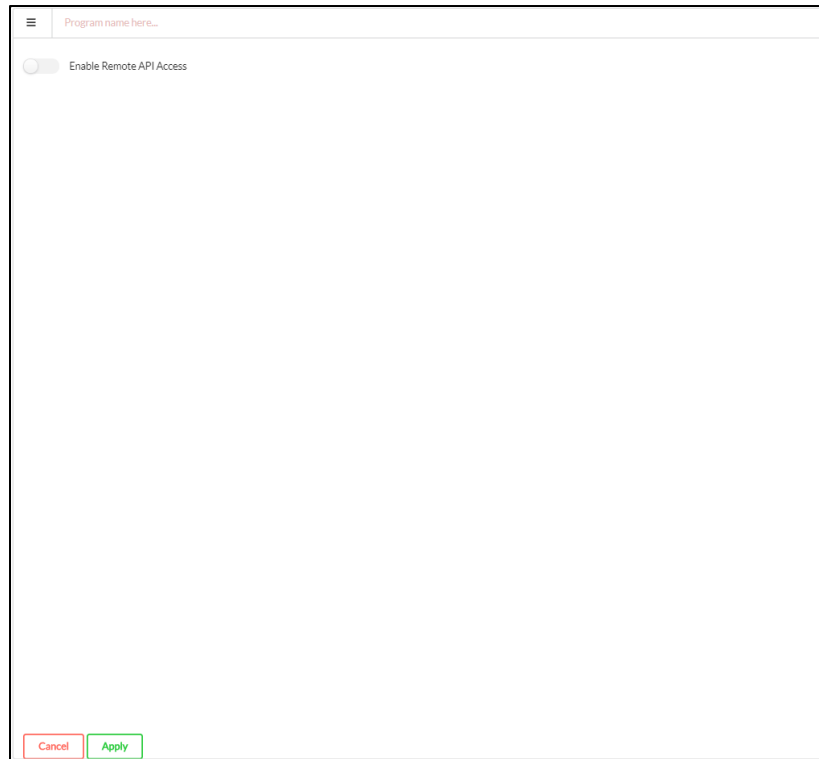
3.5 Enabling control via API

To be able to program the arm via API, follow the instructions below:
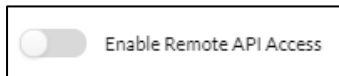
1. Start the PULSE DESK user interface in accordance with **Section 3.4.**

2. Click the **Main Menu** button and select **Configure.**
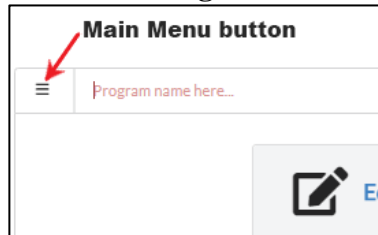
3. On the displayed **Configure screen**, switch the **Enable Remote API access** toggle to the enabled state.

Disabled state

Enabled state

2. Click **Apply** to confirm.

Now, you can start sending API requests and processing API responses. For detailed information on available commands and their use, refer to the REST API Reference Guide.

Once you enable remote API access, programming via PULSE DESK becomes impossible. If you try access the user interface (UI) functionality, the screen displays an appropriate message.

3.6 Switching off a PULSE robotic arm

To switch a PULSE robotic arm off, follow the instructions below:

1   Set the arm into a safe position where it can remain stable when power supply is disconnected.

2   Switch the power supply switch on the back panel of the control box to the OFF position.

ANNEX I. KINEMATICS OF THE PULSE ARM

The kinematics of the PULSE robotic arm is described with three parameters of Denavit-Hartenberg convention as illustrated in **Figure I-1** and **Table I-1**. These parameters include:

- **d**—distance from the origin to the common normal along the *z* axis of the previous joint

    > *The common normal of two non-intersecting joint axes is a line perpendicular to both axes.*

- **a**—length of the common normal

- **alpha**—angle of rotation about the common normal, from the previous z axis to the new one
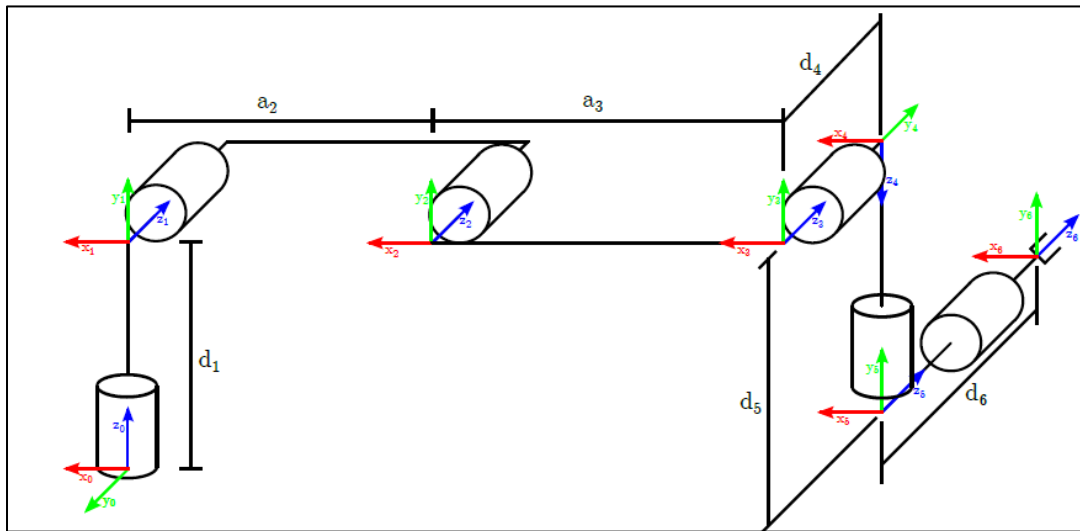

Figure I-1: Denavit-Hartenberg convention applied to the PULSE robotic arm

> *The origin point is the intersection of Motor 1 and Motor 2 rotation axes.*

Table I-1: Denavit-Hartenberg parameters and their values

Joint	PULSE 75			PULSE 90		
	d(m)	a(m)	alpha(rad)	d(m)	a(m)	alpha(rad)
1	0.2325	0	$\pi/2$	0.2325	0	$\pi/2$
2	0	-0.375	0	0	-0.450	0
3	0	-0.295	0	0	-0.370	0
4	0.1205	0	$\pi/2$	0.1205	0	$\pi/2$
5	0.1711	0	$-\pi/2$	0.1711	0	$-\pi/2$
6	0.1226	0	0	0.1226	0	0