

Version C
User Manual

VN1



 **TiMOTION**

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1. General

1.1 About this manual

This user manual is provided to the manufacturer of the equipment or system rather than end users. This manual provides information needed to install, use and maintain the TiMOTION products. Manufacturers are responsible to provide a user guide to the end users using the relevant safety information passed from this manual.

This manual contains installation directions as well as technical data for the TiMOTION industrial electric linear actuators. Carefully read through each section of the user manual before the equipment is unpacked, installed or operated. Please note all the dangers, warnings, cautions and notes stated in this manual. Please follow the instructions provided in this manual to ensure safe reliable operation.

1.2 Target personnel

Please allow qualified mechanical and electrical professionals perform all installation, maintenance and replacement of the TiMOTION products. Please keep the products away from people who do not have the required experiences or knowledge of the product.

1.3 Warranty

TiMOTION provides 18 (or 24) months' warranty on Industrial Motion actuators against manufacturing faults, this is calculated from date of delivery. The warranty is valid only if the equipment is properly operated and maintained correctly. The application of the product is the responsibility of the buyer; TiMOTION makes no representation or warranty as to the suitability of the product for any particular use or purpose.

1.4 Transport and storage

The actuator should only be stored and transported in the original TiMOTION packaging. The temperature during transportation and storage must be between -40 to +85° C (-40 to +185° F). Please avoid shocks to the package. If the package is damaged, check the actuator for visible damage and notify the carrier and TiMOTION.

1.5 Packaging

The sample order packaging contains the product and this manual. For large quantity orders, packaging may vary and TiMOTION reserves the right to change it.

1.6 Support

If any technical support or information is needed for this product, please contact your TiMOTION sales engineer. You can also visit <https://www.timotion.com/en> for the product or contact information.

1.7 Disclaimer

This user manual has been written based on our current technical knowledge. TiMOTION is constantly working on updating the product information. We reserve the right to carry out technical modifications.

1.8 Notification and warnings

1.8.1 Mounting/dismounting the actuator

- ◆ Please read through this user manual before working on the equipment that the actuator is or shall be a part of.
- ◆ Adhere to the information contained in this user manual and on the product label. Never exceed the performance limits stated herein.
- ◆ Be sure the actuator is not in operation.
- ◆ Ensure the actuator is free from loads that could be released during mounting or dismounting.
- ◆ Refrain from unplugging any cables or connectors during operation or with power on.
- ◆ Immediately stop using the actuator if it seems faulty or damaged. Notify your TiMOTION sales engineer so corrective actions can be taken.
- ◆ Never disassemble the actuator, as that will compromise the sealing and could impact the function of the actuator. Disassembly will lose voids warranty.
- ◆ Grease may be present on the extension tube. Contact with the grease is non-hazardous. Please refrain from removing the film.

1.8.2 Operation

- ◆ Be sure the actuator is correctly mounted as indicated in the user instructions.
- ◆ Be sure the equipment can be moved easily over the actuator's whole working area.

- ◆ Be sure the actuator is connected to a main electricity supply/transformer with the correct voltage, specified on the actuator label.
- ◆ Be sure that the connection bolts are secured safely and can withstand the wear.
- ◆ Stop the actuator immediately if anything unusual is observed.
- ◆ Ensure there is no side load present on the actuator.
- ◆ Only use the actuator within the specified working limits.
- ◆ Refrain from having any contact with the actuator.

1.8.3 Equipment power off

- ◆ Switch off the main supply to prevent any unintentional operation.
- ◆ Regularly check for extraordinary wear.

1.8.4 Duty cycle

- ◆ The standard duty cycle is 10%.
- ◆ If the product is customized, please refer to the approval drawings.

1.8.5 Temperature

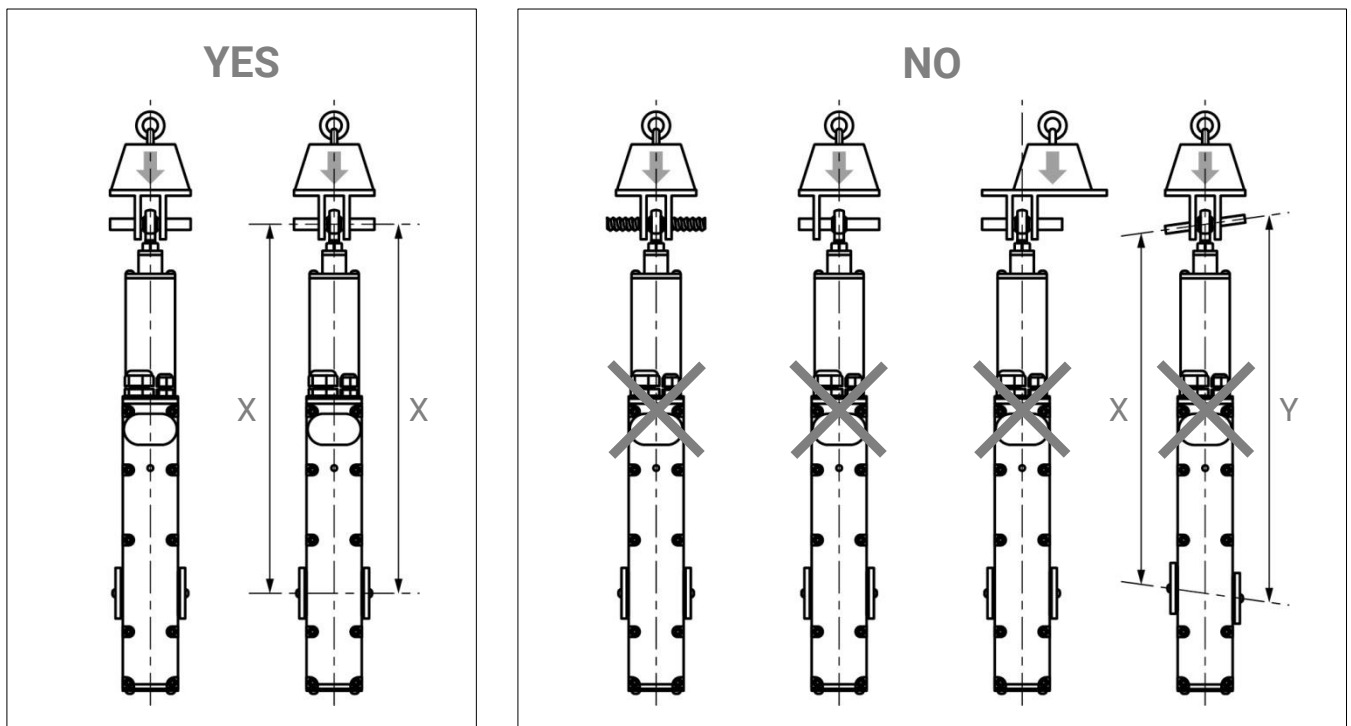
- ◆ The operating temperature range is $-15^{\circ}\text{C} \sim +50^{\circ}\text{C}$. The operational temperature range at full performance is $+5^{\circ}\text{C} \sim +45^{\circ}\text{C}$.

2. Installation

2.1 Mechanical installation

2.1.1 Mounting notice

- ◆ Use solid mounting pins with the proper dimensions and support them at both ends.
- ◆ As shown below, please mount the actuator with the mounting pins of correct dimension and without threaded at both ends of the attachments.
- ◆ Do not mount the actuator with the pins in different rotated angles, this could cause stress on the nut during operation.
- ◆ The load should act along the stroke axis of the actuator from the front attachment, inner tube to the rear attachment. Off center or side loads may cause bending and lead to failure.
- ◆ Be sure the mounting pins are parallel to each other. If the pins are not parallel to each other the actuator might bend and could be damaged.



2.1.2 Safety Instructions

It is important to follow these instructions for the safety of users and operators. These instructions should be kept in a safe place for the entire service life of the products.

Risk of crushing and entrapment! Window can close automatically!

The integrated load cut-off stops the drive during closing and opening when the drive is overloaded. The compressive force can crush fingers in the event of carelessness.

Area of application

The drive shall only be used according to its intended use. For additional applications consult the manufacturer or his authorized dealer.

Do not misuse the drive for other lifting operations! Do not allow children to play with this drive or its regulating control units, including the remote control!

Always check whether the system complies with current regulations. Special attention must be paid to the opening width, the opening area, the opening time, the opening speed of the window, the temperature range of the drives/external devices and cables, as well as the cross section of the connecting cables as function of the cable length and power consumption.

All devices must be permanently protected from dirt and moisture if the drive is not explicitly suitable for use in wet areas (see technical data).

Installation

These instructions address expert and safety-conscious electricians and/or qualified personnel knowledgeable in electrical and mechanical drive installation.

The safe operation and avoidance of injury, as well as avoidance of damaging the property, is only guaranteed by proper installation and setup utilizing these installation instructions.

All specifications for installation must be checked independently and, if necessary, adjusted at the installation site. The connection assignment, the electrical supply data (see machine plate) and performance limits (see technical data) as well as the mounting and installation instructions of the drive must be strictly observed and adhered to!

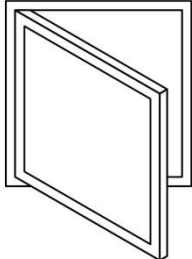
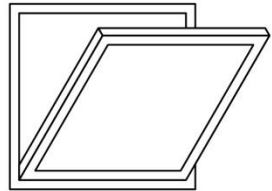
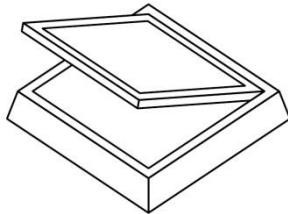
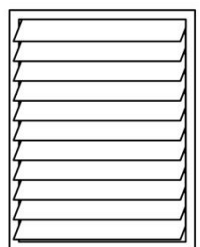
NEVER connect 24 V DC drives to the 230 V AC main voltages. This could create life threatening injuries.

Do not reach into the window rabbet or the operating element (chain or spindle) during installation and operation! Ensure that, based on the installation position and the opening movement of the casement, persons cannot be trapped between the driven part of the window and surrounding fixed components (e.g. wall).

Mounting material

The required mounting material must be modified to fit the drive and occurring load and, if necessary, supplemented.

Before installing the drive, check whether the casement is in good mechanical condition, the weight is balanced and whether it opens and closes easily!

Danger spots by crush and shear points			
			
Side-hung	Bottom-hung	Roof windows	Louver windows

Crush and shear points

To avoid injuries, crushing and shear points between casement and frame must be secured against entrapment up to an installation height of 2.5 meters above the floor with appropriate measures. This can be achieved by using contact-based or contactless protective devices against entrapment. This stops the motion through contact by a person, the motion through contact or through interruption by a person. At a force higher than 150N at the main closing edge, the motion must stop within 20mm. A warning symbol at the opening element must indicate this clearly.

Unintentional or independent opening or falling

Casements need to be hinged/secured in such a way that in the event one of the mounting elements fails, it will not crash down/move in an uncontrolled manner. Use double suspensions, safety scissors, and casement stays to ensure it will not slam down.

Tilting windows shall be equipped with safety scissors or similar devices to avoid damages and risks of injury for persons through improper installation and operation. The safety scissors must be adjusted to the opening stroke of the drive (see technical data) to avoid blocking. The opening width of the safety scissors must be bigger than the drive stroke.

Routing cables and electrical connection

Routing electrical lines and connections may be performed only by approved specialist companies. Never operate drives, control units, operating elements and sensors at operating voltages and connections contrary to the specifications of the manufacturer.

All disconnecting devices shall be installed in the permanent electrical installation or external Control Unit for the drive. The main supply lines 230 V / 400 V AC need to be protected separately! Damage to main supply lines of drives with plug connectors may only be re-placed by the manufacturer or qualified service / maintenance personnel!

Power cables fixed to the drive casing cannot be replaced. If the cable is damaged the device must be scrapped!

The types of cable, cable lengths and cross-sections will be selected in accordance with the manufacturer's technical data. If necessary, the cable types should be coordinated with local experts. Low-voltage lines (24 V DC) need to be routed separately from high voltage lines. Flexible cables should not be flush-mounted and freely suspended cables need to be equipped with strain reliefs.

Cables need to be laid so they cannot be sheared, twisted or bent during operation. Drive cables laid into closed window profiles must be protected by insulating tubes with a sufficient temperature resistance. Through holes shall be equipped with cable sleeves!

2.2 Electrical installation

2.2.1 Important notice

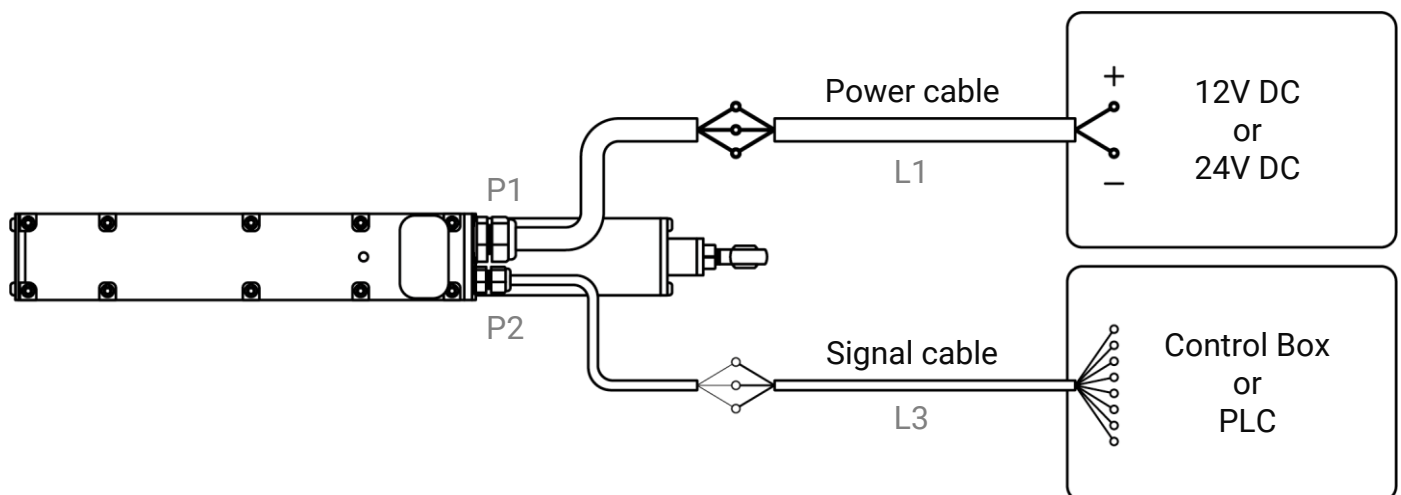
- ◆ Make sure the cables leading to the motor are rated to handle the maximum current.
- ◆ To reduce the chance of a crushing hazard, we recommend an emergency stop.
- ◆ If you are not using a soft stop on a DC-motor, a short peak of high voltage will be sent towards the power supply. When selecting the power supply, please ensure it is able to withstand the peak of high voltage.
- ◆ To reduce the chance of interference, refrain from placing signal cables along power cables.
- ◆ Use a two-wire system to prevent ground loop.
- ◆ Please use shielded signal cables with applications that can be sensitive or if there is interference risk.
- ◆ Please note, using long cables in combination with small lead cross sections and low voltages could lead to a malfunction due to voltage drop.
- ◆ Use spark protection on relays and other coil operated devices.
- ◆ Please be sure the power to the actuator is off before working on the actuator and the wiring.

2.2.2 Extension power cable

The actuator is supplied with a power cable (and/or signal cable). The cable(s) has/have flying leads in one end for the user's equipment connections. On the other end of the actuator, the cable is integrated into the connector cover. The plug-in connector allows the user to replace the actuator without disconnecting the flying leads.

It is important to use the extension power cable from the DC source with proper size to avoid a significant voltage drop. The further away the DC source is, the larger the extension cable may need to be. Please refer to the following table for the recommendation of the extension power cable size.

Extension cable type	Length of cable (L)	Min. allowed cross section (X)
Power extension cable L1	0 - 4 m	2.5 mm ² [AWG 16]
	4 - 10 m	4 mm ² [AWG 12]
Signal extension cable L3	<10 m	AWG 20
	>10 m	Check with your TiMOTION contact window



2.2.3 Inrush current

When the actuator starts to work, there is an inrush current to the motor that will be less than 0.2 seconds (up to four times the rated current).

Please select a power supply that is able to withstand the inrush current. Also, all contacts, including switches and relays, should be selected with caution.

2.3 System wiring definition

The optional VN1 T-smart system is integrated with the T-smart PBCA and MCU. All the functionality can be achieved with proper configuration on PGVN. Please refer to the following table that describes the primary (but not limited) system, implying the required system and the relative connections for each pin, signal spec and warnings.

If there is a different system request not listed in the following table, please contact TiMOTION for further discussion.

#	Voltage	System	Connection description
A	DC	Single	<ul style="list-style-type: none"> Stable DC power supply DPDT switch to control the power polarity of motor
C	AC	Single	<ul style="list-style-type: none"> 100-240VAC power source SPDT switch to control the power polarity of motor Optional window sealed indicator when actuator is fully retracted
D	AC	Simultaneous	<ul style="list-style-type: none"> 100-240VAC power source SPDT switch to control the power polarity of motors at the same time Optional window sealed indicator when all actuators are fully retracted

2.3.1 System A: DC input- Single actuator

a. Power source

Stable DC (Following actuator motor voltage) output power supply with sufficient power

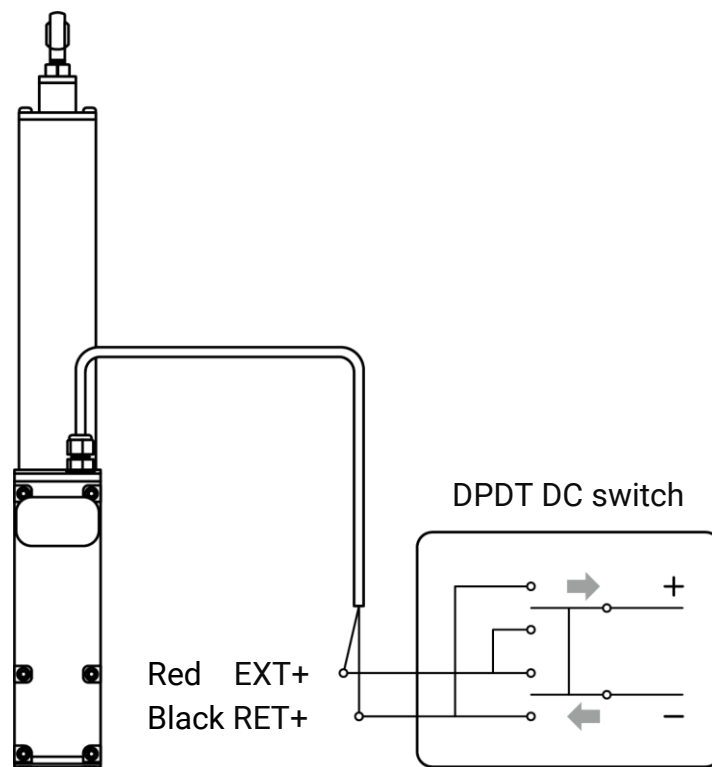
b. Switch

DPDT DC switch to control the power polarity of motor with sufficient current resistance (check the spec code of VN1 for current info)

c. System

Single actuator

d. Wiring illustration



2.3.2 System C: AC input- Single actuator with window sealed indicator

a. Power source

100-240VAC power source

b. Switch

The SPDT AC switch controls the power polarity of the motor with current resistance (be sure to check the spec code of VN1 for most current information).

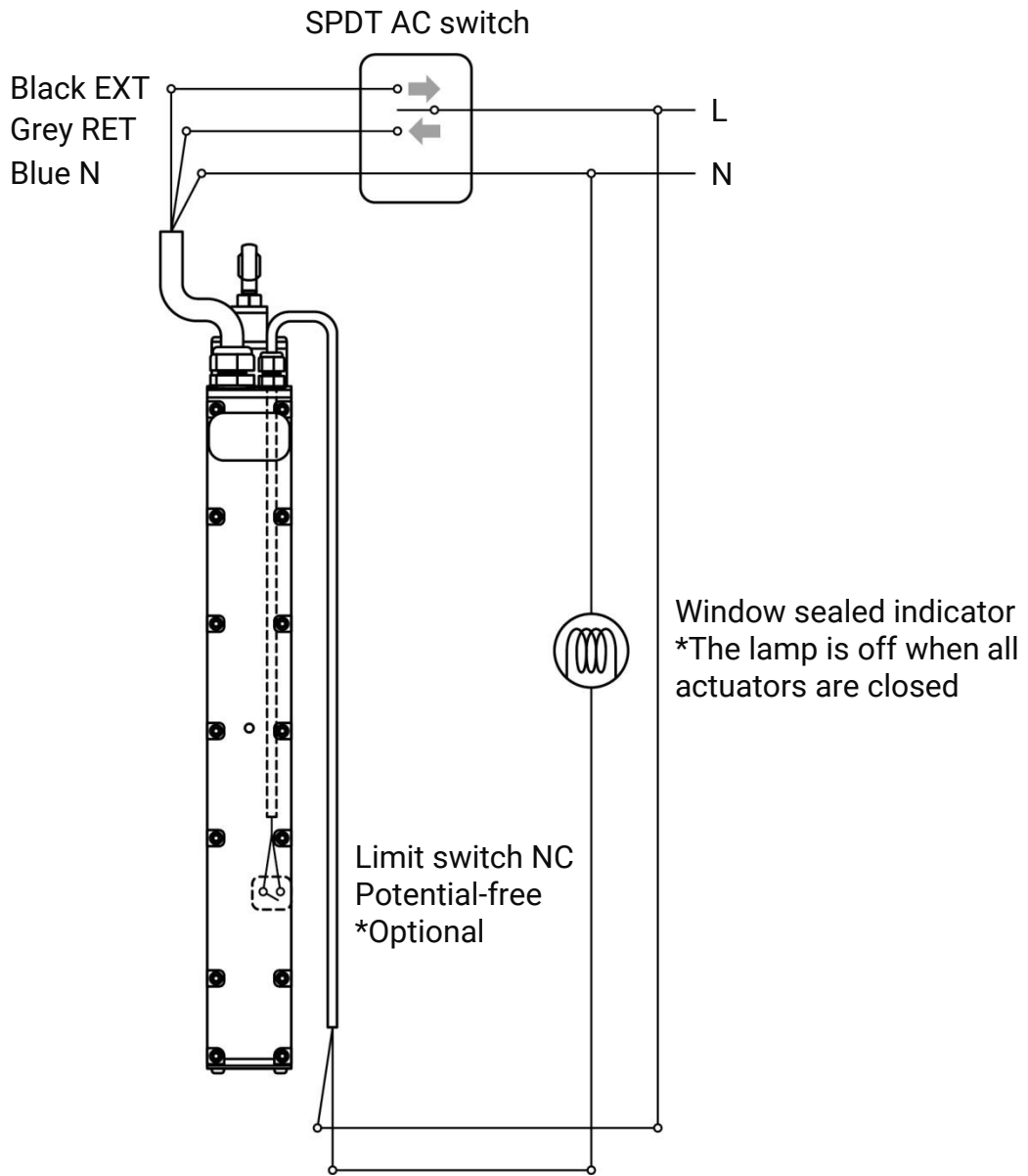
c. System

Single actuator

d. Indicator

Optional window sealed indicator when actuator is fully retracted
(Limit switch with NC circuit, potential free, max. 2A in 230VAC)

e. Wiring illustration



2.3.3 System D: AC input- Simultaneous operation with window sealed indicator

a. Power source

100-240VAC power source

b. Switch

The SPDT AC switch controls the power polarity of the motor with current resistance (be sure to check the spec code of VN1 for most current information).

c. System

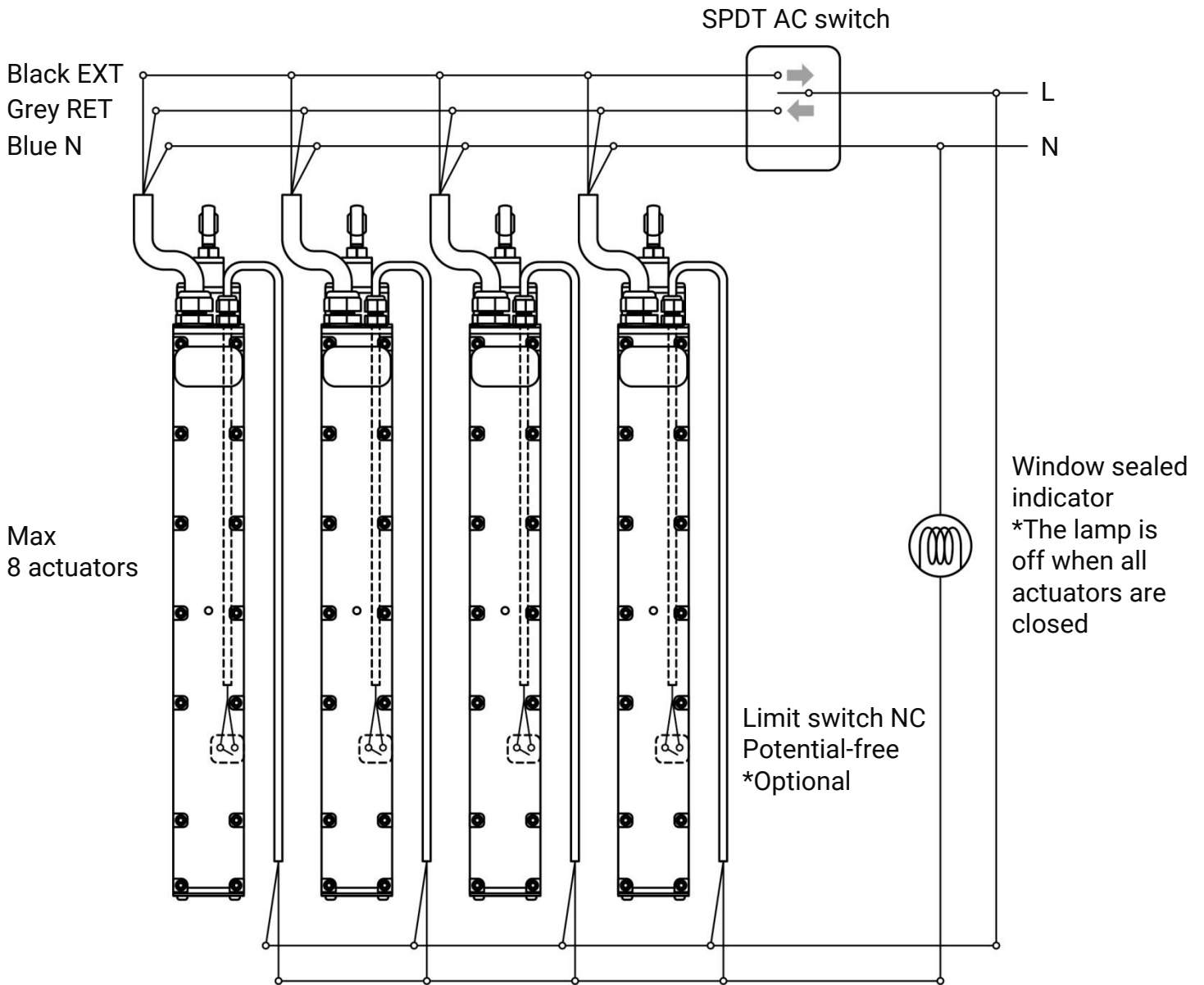
Multiple actuators operate simultaneously, recommended up to 8.

d. Indicator

Optional window sealed indicator when all actuators are fully retracted.

(Limit switch with NC circuit equipped in each actuator, potential free, max. 2A in 230VAC)

e. Wiring illustration



3. Product specifications

3.1 2D drawings

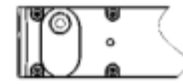
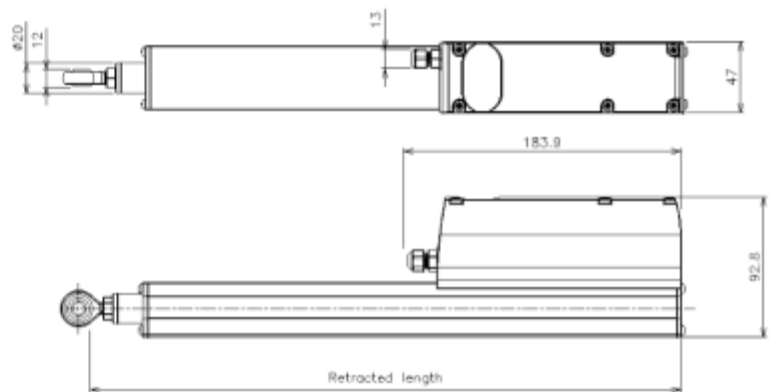
A. VN1 DC version without T smart sync function.



Cable exit
Position 1



Cable exit
Position 2



3.2 Ordering key

*Please contact your TiMOTION sales engineer for the latest revision ordering key.

VN1		Version: 2020722-D		
<input type="checkbox"/>	Voltage	1 = 12V DC	2 = 24V DC	U = 100-240V AC
<input type="checkbox"/>	Load and Speed	See page 3		
<input type="checkbox"/>	Stroke (mm)	See page 3		
<input type="checkbox"/>	Retracted Length (mm)	See page 11		
<input type="checkbox"/>	Rear Attachment (mm)	B = Outer tube slide clamp block, hole M8	C = Outer tube slide clamp block, hole ø8	
<input type="checkbox"/>	Trunnion Mount Bracket	0 = Without		
<input type="checkbox"/>	Front Attachment (mm)	B = Rod end bearing, hole 8.0 C = Rod end bearing, hole 10.0 1 = Aluminum casting, no slot, hole 6.4 2 = Aluminum casting, no slot, hole 8.0	3 = Aluminum casting, no slot, hole 10.0 7 = Aluminum CNC, U clevis, slot 6.2, depth 16.0, hole 6.4 8 = Aluminum CNC, U clevis, slot 6.2, depth 16.0, hole 8.0 9 = Aluminum CNC, U clevis, slot 6.2, depth 16.0, hole 10.0	
<input type="checkbox"/>	Direction of Rear Attachment (Counterclockwise)	0 = Without (When rear attachment is outer tube slide clamp block)		
<input type="checkbox"/>	Color	1 = Black	2 = Pantone 428C	
<input type="checkbox"/>	IP Rating	1 = Without	2 = IP54	3 = IP66
<input type="checkbox"/>	Special Functions for Spindle Sub-Assembly	0 = Without	1 = Safety nut	
<input type="checkbox"/>	Functions for Limit Switches	1 = Two switches at full retracted / extended positions to cut current 3 = Two switches at full retracted / extended positions to send signal 6 = Two switches at full retracted / extended positions to cut current + third one at end of stroke as window closed indicator switch 7 = Two switches at full retracted / extended positions to send signal + third one at end of stroke as window closed indicator switch		
<input type="checkbox"/>	Output Signal	0 = Without	2 = Hall sensor * 2	
<input type="checkbox"/>	Window Seal Mechanism	0 = Without	1 = With	
<input type="checkbox"/>	Cable Exit Position	B = Position B <small>Note: please contact TiMOTION before making an order</small>	C = Position C	
<input type="checkbox"/>	P1 Cable (mm)	0 = Without 1 = Tinned leads, 500	2 = Tinned leads, 1000 3 = Tinned leads, 1500	4 = Tinned leads, 2000 5 = Tinned leads, 5000
<input type="checkbox"/>	P2 Cable (mm)	0 = Without 1 = Tinned leads, 500	2 = Tinned leads, 1000 3 = Tinned leads, 1500	4 = Tinned leads, 2000 5 = Tinned leads, 5000
<input type="checkbox"/>	T-Smart Version	0 = Without		
<input type="checkbox"/>	Bus Interface Board	0 = Without		

4. Troubleshooting

4.1 Actuator

Symptom	Possible cause	Action
Motor runs but spindle does not move	Gearing system or spindle damaged	Please contact TiMOTION
No motor sound or movement of piston rod	The actuator is not properly connected to the power supply	Check the connection to the power supply or the external control unit (if any)
	Customer fuse burned	Check the fuse
	Cable damaged	Change the cable
Excessive power consumption	Misalignment or overload in the application	Align or reduce the load Try running the actuator without load
Actuator cannot lift full load or motor runs too slowly	Insufficient power supply	Check the power supply is properly plugged in
No signal or incorrect feedback output	Cable damaged	Change the cable
	Wrongly connected	Check the wiring
	Signal is constantly high/low	Run the actuator to full extension and retraction
	Feedback output overloaded	Reduce the load according to your chosen feedback type
Actuator runs in smaller steps	Insufficient power supply	Check the power supply
	Load is higher than specified	Reduce the load
Actuator cannot hold the chosen load	Load is higher than specified	Reduce the load

Symptom	Possible cause	Action
Actuators do not move (Under parallel configuration)	The actuators are not properly connected to the power supply	<ul style="list-style-type: none"> • Check the connection to the power supply and the external control unit (if any) • Please make sure the power supply polarity is properly connected, otherwise you could damage the actuator
	Communication wires are not properly connected	Check the parallel communication wires for all actuators
	Control signals extend/retract are not properly connected	Check the wire connection on the control unit
	Position lost	Reconnect the cables and set parallel configuration again

Symptom	Possible cause	Action
Actuators cannot lift full load (Under parallel configuration)	Insufficient power supply	Check the power supply while the actuator is running
	Overload in application	Reduce the load Reconnect the cables and set parallel configuration again
Actuators run in smaller steps before stop (Under parallel configuration)	Insufficient power supply	Check the power supply while the actuator is running
		After everything is connected, supply power to all actuators at the same time. Then wait 10 seconds before the Run In/Run Out signals are activated
Signal cable damaged or removed under operation (Under parallel configuration)	All actuators stop at the same position	The signal and power cables MUST be re-connected to all actuators. Ensure that no actuator is missing in the system. Otherwise, the system will not work, not even after re-powering Please see non-critical info below
		After everything is connected, put power on all actuators at the same time. Then wait 10 seconds before the Run In/Run Out signals are activated