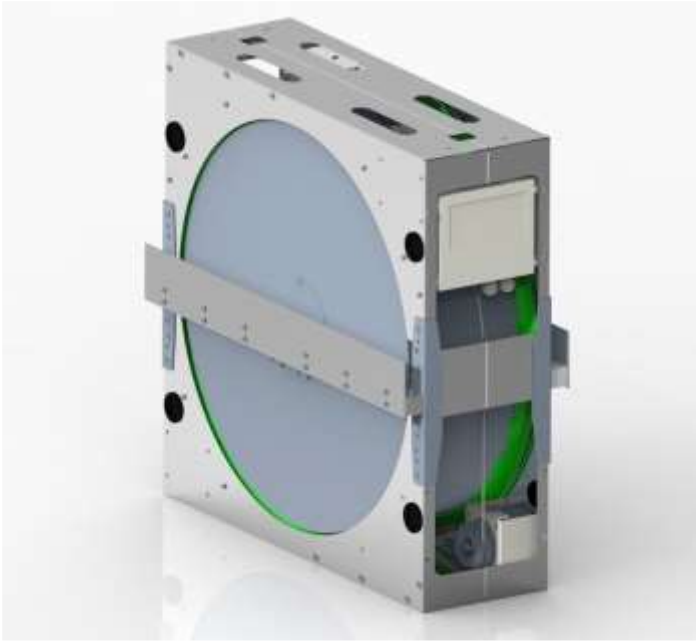


Read the instructions carefully before installing the product.

Installation work must be performed in accordance with national electrical installation standards and only by authorized personnel. Keep this installation manual for future reference after reading it carefully.

EN

Operating Instructions for the Rotary Heat Exchanger Drive.

CE

VENTUS

IOMM VENTUS RHE DRIVE - ver. 1.4 (06.2025)

Content

1 GENERAL SAFETY RULES - OSH

! PLEASE READ THE FOLLOWING DOCUMENTATION CAREFULLY BEFORE INSTALLING, MAINTAINING AND OPERATING ROTARY HEAT EXCHANGER DRIVES. IF IN DOUBT, CONTACT OFFICIAL VTS SUPPORT. THIS MANUAL SHOULD ONLY BE USED BY A QUALIFIED INSTALLER / SERVICE TECHNICIAN.

Thorough familiarization with the contents of this manual, as well as the installation, commissioning and operation of the air handling unit according to the instructions given and with observance of all health and safety regulations will guarantee a solid basis for efficient, safe and trouble-free operation of the unit.

		This symbol is displayed to indicate issues and operations that may cause risks. Read the section marked with this symbol carefully and follow the instructions.
	**WARNING**	Indicates that failure to follow the instructions may cause minor injury or damage to the product.
	**DANGER**	Indicates that failure to follow instructions may result in serious injury or death.

RECOMMENDATIONS FOR INSTRUCTIONS

- Failure to follow the instructions in this manual may lead to damage to property and injury to persons. The manufacturer is not responsible for any damage that may result directly or indirectly from failure to follow these instructions.
- The manual and documentation of the control panel, as well as additional instructions for the components used (if available), should be carefully stored in an easily accessible place for operating and service personnel.

WARNING

INSTALLATION, SERVICE AND USE WORKS

- ! BEFORE ANY WORK, DISCONNECT AND PROTECT THE POWER SUPPLY FROM UNCONTROLLED STARTUP OF THE CONTROL PANEL. COMMUNICATE AND MARK THE ONGOING MAINTENANCE WORK.
- ! PERSONAL PROTECTIVE EQUIPMENT (PPE) SHOULD BE USED DURING THE WORK. IN PARTICULAR:
  - ANTI-SHARP GLOVES (EN 388) TO PROTECT HANDS FROM SHARP EDGES,
  - PROTECTIVE HELMET (EN 397) IN CASE OF OVERHEAD MOUNTING.
  - A PROTECTIVE MASK TO PREVENT DUST AND DIRT PARTICLES FROM ENTERING THE LUNGS.
  - SAFETY GOGGLES AND OTHERS AS REQUIRED BY LAW
- ! ALL SERVICING SHOULD BE CARRIED OUT WITH EXTREME CARE.
- ! INSTALLATION, COMMISSIONING AND SERVICING OF AIR HANDLING UNITS AND THEIR EQUIPMENT MAY INVOLVE CERTAIN SAFETY RISKS, HENCE REQUIRES CERTAIN KNOWLEDGE AND TRAINING.
- ! INSTALLATION, COMMISSIONING AND OPERATION OF THE DEVICE MUST BE CARRIED OUT BY A PERSON WITH THE APPROPRIATE AUTHORIZATION IN ACCORDANCE WITH IN ACCORDANCE WITH APPLICABLE REGULATIONS.
- ! IT IS RECOMMENDED THAT A VTS-AUTHORIZED SERVICE CENTER PERFORMS INSTALLATION, COMMISSIONING AND PERFORMS POST-WARRANTY REPAIRS, TECHNICAL INSPECTIONS AND MAINTENANCE WORK REQUIRED TO BE PERFORMED ON AIR HANDLING UNITS
- ! EQUIPMENT IMPROPERLY INSTALLED, ADJUSTED, OR REPAIRED BY AN UNQUALIFIED PERSON MAY BECOME THE CAUSE OF SERIOUS INJURY TO INDIVIDUALS OR EVEN THEIR DEATH. THE ABOVE RELEASES THE MANUFACTURER FROM LIABILITY AND BENEFITS UNDER WARRANTY AND GUARANTEE.
- ! THIS DEVICE IS NOT INTENDED FOR USE BY PERSONS (INCLUDING CHILDREN) WITH LIMITED PHYSICAL, SENSORY OR MENTAL ABILITIES OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY ARE SUPERVISED OR INSTRUCTED IN THE USE OF THE DEVICE BY A PERSON RESPONSIBLE FOR THEIR SAFETY.
- ! CHILDREN MUST BE SUPERVISED TO MAKE SURE THEY DO NOT PLAY WITH THE DEVICE.
- ! CLEANING AND MAINTENANCE BY THE USER MUST NOT BE PERFORMED BY CHILDREN WITHOUT SUPERVISION.
- ! THE DEVICE SHOULD BE USED IN ACCORDANCE WITH ITS INTENDED USE AND WITHIN THE OPERATING PARAMETERS FOR WHICH IT WAS DESIGNED. IN CASE OF IMPROPER USE, THE MANUFACTURER IS NOT RESPONSIBLE FOR THE RESULTING CONSEQUENCES.

DANGER

ELECTRICAL INSTALLATIONS

- ALL ELECTRICAL WORK MUST BE PERFORMED BY A LICENSED ELECTRICIAN WITH AT LEAST A CERTIFICATE OF QUALIFICATION FOR THE OPERATION OF EQUIPMENT, INSTALLATIONS AND NETWORKS (E1) AND A CERTIFICATE OF QUALIFICATION FOR THE SUPERVISION OF EQUIPMENT, INSTALLATIONS AND NETWORKS (D1).
- IN THE EVENT THAT THE DEVICE IS EQUIPPED WITH COMPONENTS OR CONNECTED TO INSTALLATIONS THAT REQUIRE E2 AND D2 QUALIFICATIONS, THE INSTALLER AND TECHNICAL SUPERVISOR SHOULD HAVE SUCH QUALIFICATIONS.
- CONNECTIONS SHOULD BE MADE ACCORDING TO THE GUIDELINES GIVEN IN THIS DOCUMENT.
- DO NOT OPEN OR DISASSEMBLE THE MOTOR WHILE POWER IS CONNECTED TO THE UNIT. DOING SO MAY CAUSE FATAL INJURY FROM ELECTRIC SHOCK. IF IT IS NECESSARY TO OPEN THE MOTOR, WAIT AT LEAST 5 MINUTES AFTER DISCONNECTING THE POWER SUPPLY.
- MAKE SURE THAT THE MAINS VOLTAGE IS IN ACCORDANCE WITH THE INFORMATION ON THE NAMEPLATES OF ELECTRICAL APPLIANCES. PERMISSIBLE DEVIATIONS ARE:
  - SUPPLY VOLTAGE: +/- 5%
  - FREQUENCY: +/- 2%
- IT IS ALSO RECOMMENDED TO CHECK THE CORRECTNESS OF THE ATTACHMENT OF ALL GROUNDING WIRES.
- INSTALL A DEDICATED CIRCUIT AND MAIN SWITCH WITH INTERLOCK. BEFORE SERVICING/MAINTENANCE WORK, SET THE MAIN DISCONNECT SWITCH TO THE OFF POSITION
- IMPROPER WIRING OR INSTALLATION MAY CAUSE FIRE OR ELECTRIC SHOCK.
- A DEFECTIVE OR IMPROPERLY SIZED SWITCH OR WIRE MUST NOT BE USED.

- IT IS THE RESPONSIBILITY OF THE USER AND INSTALLER TO ENSURE THAT THE SYSTEM IS PROPERLY GROUNDED AND PROTECTED IN ACCORDANCE WITH NATIONAL AND LOCAL STANDARDS. VTS IS NOT RESPONSIBLE FOR ANY DAMAGE OR INJURY CAUSED BY IMPROPER INSTALLATION, FAULTY ELECTRICAL CIRCUITS OR OTHER FAILURES

WARNING

ATTENTION: HOT PARTS

! THERE ARE PARTS IN THE APPLIANCE WHOSE SURFACE TEMPERATURE CAN BE HIGH, SUCH AS HEAT EXCHANGERS, HEATERS OR MOTOR HOUSING. DIRECT CONTACT WITH THESE PARTS MAY LEAD TO BURNS OR OTHER INJURIES. USE EXTREME CAUTION, WEAR APPROPRIATE PROTECTIVE CLOTHING, AND DO NOT BEGIN SERVICE WORK UNTIL THEIR TEMPERATURE HAS DROPPED BELOW 40°C.

ATTENTION: SHARP EDGES

! THERE ARE SHARP EDGES IN THE DEVICE, FOR EXAMPLE, EXCHANGER LATHS. CONTACT WITH THEM CAN LEAD TO INJURIES. THEREFORE, IT IS NECESSARY TO EXERCISE EXTREME CAUTION AND USE PROTECTIVE CLOTHING.

ATTENTION: MOVING PARTS

! THERE ARE MOVING PARTS IN THE UNIT, SUCH AS FAN IMPELLERS. CONTACT WITH THEM MAY RESULT IN INJURY OR SERIOUS INJURY. DO NOT PROCEED WITH SERVICE WORK UNTIL THESE PARTS ARE COMPLETELY STOPPED.

! OPENING THE INSPECTION PANELS, DURING THE OPERATION OF THE CONTROL PANEL, OR STARTING THE CONTROL PANEL WITH THE INSPECTION PANELS OPEN IS STRICTLY PROHIBITED.

! BEFORE OPENING THE INSPECTION PANELS, TURN OFF THE CONTROL PANEL AND WAIT FOUR MINUTES FOR ALL ELEMENTS IN MOTION TO STOP.

WARNING

FAULTS, REPAIRS, MODIFICATIONS

- IF YOU FIND A MALFUNCTION OR MALFUNCTION OF THE DEVICE, TURN IT OFF IMMEDIATELY AND CONTACT AN AUTHORIZED SERVICE CENTER.
- ALL REPAIRS SHOULD BE CARRIED OUT BY THE MANUFACTURER'S AUTHORIZED SERVICE, USING ORIGINAL SPARE PARTS.
- ROUTINE INSPECTIONS, CARRIED OUT BY QUALIFIED TECHNICAL PERSONNEL OR SERVICE, AUTHORIZED BY VTS, GUARANTEE LONG-TERM, RELIABLE AND TROUBLE-FREE OPERATION OF THE EQUIPMENT. OUR SERVICE PERSONNEL ARE AVAILABLE AT ALL TIMES TO PROVIDE SUPPORT FOR COMMISSIONING, MAINTENANCE AND IN THE EVENT OF ANY EMERGENCY SITUATION RELATED TO THE OPERATION OF THE EQUIPMENT.
- VTS AUTHORIZED SERVICE STATIONS SELL REPLACEMENT PARTS AND ACCESSORIES FOR OUR AIR HANDLING UNITS. WHEN ORDERING PARTS, PLEASE SPECIFY AIR HANDLING UNIT TYPE, SIZE AND SERIAL NUMBER.
- FOR MORE INFORMATION REGARDING THE VTS SERVICE NETWORK, VISIT WWW.VTSGROUP.COM.
- IT IS UNACCEPTABLE TO MAKE ANY MODIFICATIONS TO THE DEVICE YOURSELF, BOTH MECHANICAL AND ELECTRICAL, WHICH WILL VOID THE WARRANTY. THE MANUFACTURER IS NOT RESPONSIBLE FOR THE CONSEQUENCES OF SUCH ACTIONS.

INFORMATION FOR USERS ON PROPER HANDLING OF ELECTRICAL AND ELECTRONIC WASTE (ZSEE).

WITH REFERENCE TO THE EUROPEAN UNION DIRECTIVE 2002/96/EC ISSUED ON JANUARY 27, 2003. AND RELATED NATIONAL LEGISLATION, IT SHOULD BE REMEMBERED THAT:

- WASTE ELECTRONIC AND ELECTRICAL EQUIPMENT (ZSEE) CANNOT BE DISPOSED OF AS MUNICIPAL WASTE, AND SUCH WASTE MUST BE COLLECTED AND DISPOSED OF SEPARATELY,
- USE PUBLIC OR PRIVATE WASTE COLLECTION SYSTEMS AS SPECIFIED IN LOCAL REGULATIONS,
- THE EQUIPMENT MAY CONTAIN HAZARDOUS SUBSTANCES: IMPROPER USE OR IMPROPER DISPOSAL OF SUCH SUBSTANCES MAY ADVERSELY AFFECT HUMAN HEALTH AND THE ENVIRONMENT,
- THE SYMBOL (CROSSED-OUT DUSTBIN) ON THE PRODUCT OR ON THE PACKAGING AND TECHNICAL LEAFLET MEANS THAT THE EQUIPMENT WAS PLACED ON THE MARKET AFTER AUGUST 13, 2005. AND MUST BE DISPOSED OF SEPARATELY,
- BY SEGREGATING AND SUBMITTING USED ELECTRICAL AND ELECTRONIC EQUIPMENT FOR TREATMENT, RECOVERY, RECYCLING AND DISPOSAL, YOU PROTECT THE ENVIRONMENT FROM POLLUTION AND CONTAMINATION, CONTRIBUTE TO REDUCING THE USE OF NATURAL RESOURCES AND LOWERING THE COST OF PRODUCING NEW EQUIPMENT,
- IN THE CASE OF ILLEGAL DISPOSAL OF ELECTRICAL AND ELECTRONIC WASTE, THE PENALTIES ARE SET FORTH IN LOCAL WASTE DISPOSAL REGULATIONS.

2 RHE – STEPPER MOTOR (VVS021-VVS300)

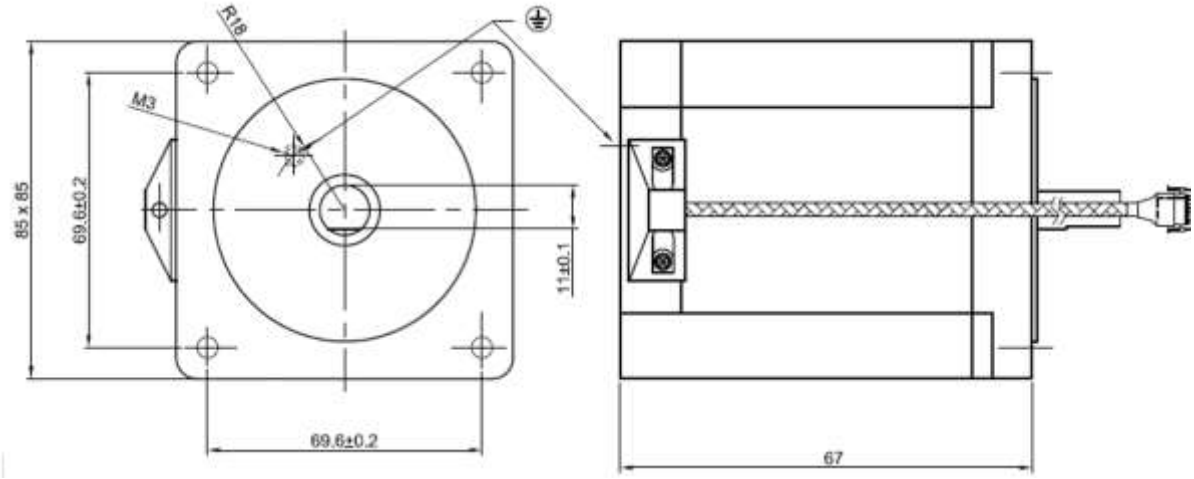
The rotary heat exchangers can be equipped with three different stepper motor configurations to suit customers' electrical needs and requirements.

GENERAL CHARACTERISTICS OF STEPPER MOTORS FOUND IN ROTARY HEAT EXCHANGERS VVS21-VVS150		
Torque - Power	2.0 Nm - 55W	4.0 Nm - 110W
Weight	≈ 2.4 kg	≈ 3.5 kg
Dimensions	85 x 85 x 67	85 x 85 x 97
Shaft diameter	12 mm	12 mm

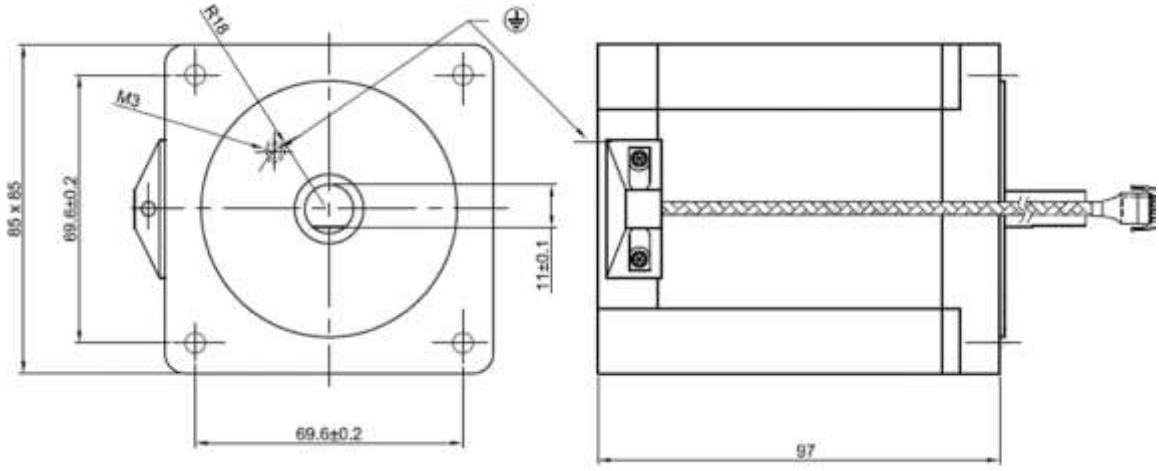
CONFIGURATION OF MOTORS IN RELATION TO THE SIZE OF THE CONTROL PANEL.	
Motor	**AHU size**
2 Nm - 55 W	VVS021-VVS055
4 Nm - 110 W	VVS075-VVS300
8 Nm - 260 W	VVS150-VVS300

TECHNICAL SPECIFICATIONS OF AVAILABLE MOTOR CONFIGURATIONS			
Torque	**2.0 Nm**	**4.0 Nm**	**8.0 Nm**
Index	7-1-0005-0082	7-1-0002-0083	7-1-0005-0084
Phases	1	1	1
Supply voltage	208-240 V	208-240 V	208-240 V
Stepper motor voltage	3 x 0-200 V	3 x 0-200 V	3 x 0-200 V
Turnover	0-400	0-400	0-400
Power frequency	50 Hz	50 Hz	50 kW
Power	0.08 kW	0.15 kW	0.36 kW
Power (250 RPM)	55 W	110 W	260 W
Weight	≈ 2.4 kg	≈ 3.5 kg	≈ 5.0 kg
Waterproof class [IP].	54	54	54
Operating temperature	-40˚C to +40˚C	-40˚C to +40˚C	-40˚C to +40˚C
Storage temperature	-40˚C to +70˚C	-40˚C to +70˚C	-40˚C to +70˚C
Dimensions	85 x 85 x 67	85 x 85 x 97	85 x 85 x 156
Shaft diameter	12 mm	12 mm	12 mm
Electrical connections	4-pole Tyco MATE-N-LOK	4-pole Tyco MATE-N-LOK	4-pole Tyco MATE-N-LOK

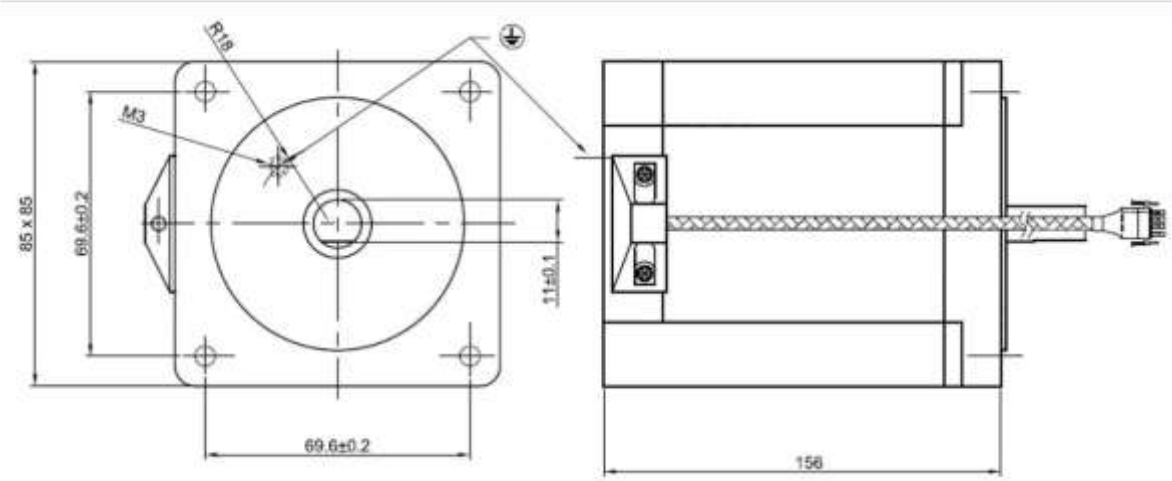
2 NM STEPPER MOTOR



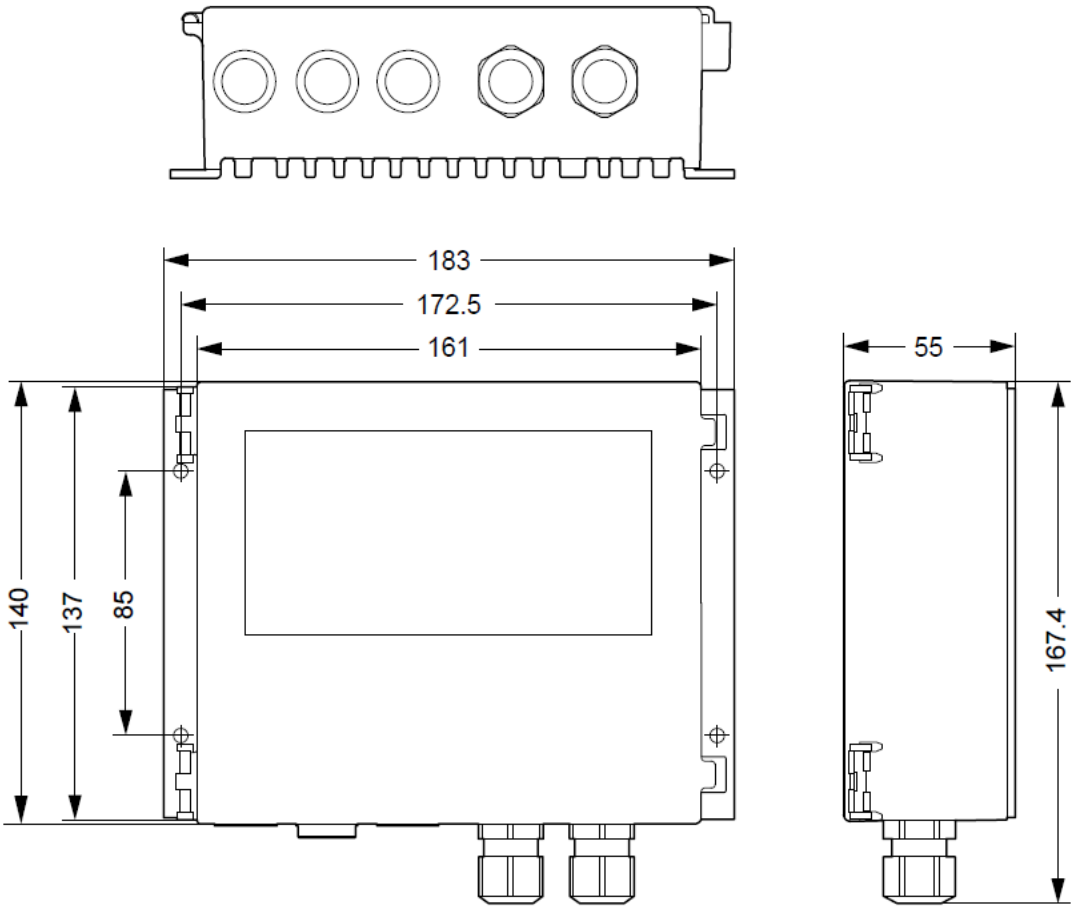
4 NM STEPPER MOTOR



8 NM STEPPER MOTOR



DEDICATED CONTROLLER



2.1 ASSEMBLY AND INSTALLATION

The following drawings and instructions show how to properly mount the motors and controller to the rotary heat exchanger housing. The motors are designed to be attached to the exchanger housing. The pulleys are selected to match the expected speed, efficiency and performance of the motors. Refer to the "PRODUCT DESCRIPTION AND TECHNICAL SPECIFICATION" section to determine the correct product combination. The pulleys must be securely fastened to the motor shaft.

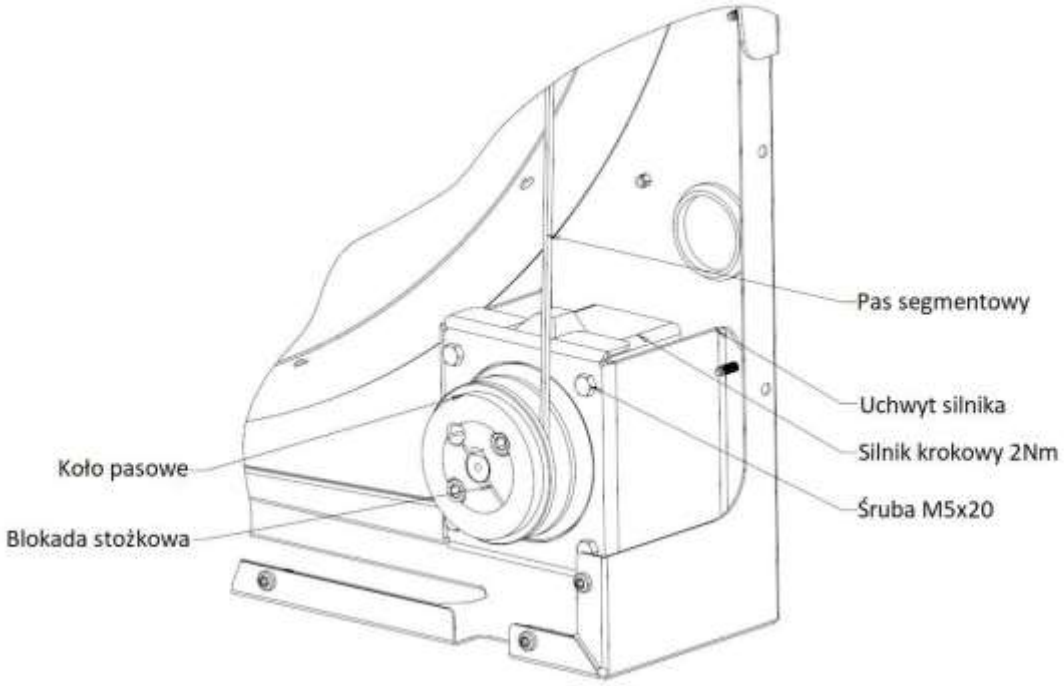
DANGER

! DO NOT CHANGE THE DRIVE CONFIGURATION. FOLLOW THE CORRECTLY SELECTED CONFIGURATION GIVEN IN THE FIRST SECTION OF THIS MANUAL. CHANGING THE CONFIGURATION INVOLVES INCORRECT OPERATION OF THE SPINNING WHEEL AND THE RISK OF INCORRECT INSTALLATION. ABOVE ALL, THERE IS ALSO A RISK OF MOTOR DAMAGE AND ELECTRIC SHOCK DUE TO INCORRECT CONNECTION.

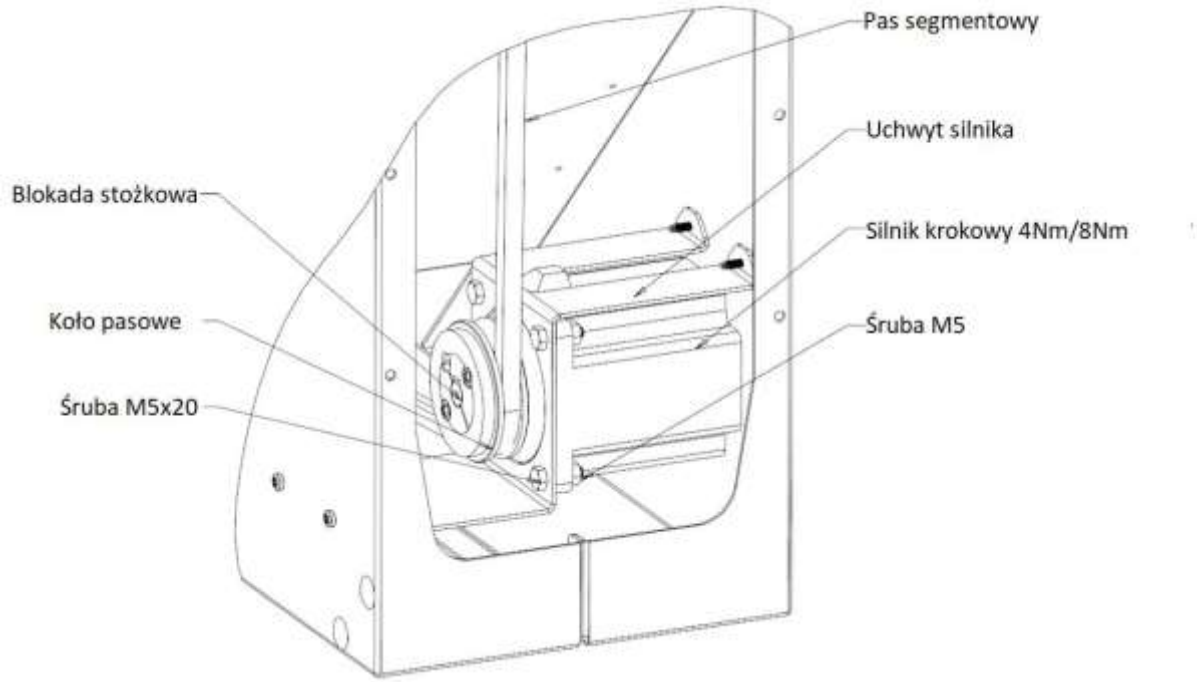
WARNING

! IMPROPER MECHANICAL INSTALLATION OF THE MOTOR CAN CAUSE ERROR ALERTS

2 NM STEPPER MOTOR ASSEMBLY DIAGRAM



4 AND 8 NM STEPPER MOTOR ASSEMBLY DIAGRAM



2.2 CONNECTIONS AND CABLING

The following illustrations show the stepper motor mounting and installation methods. Each stepper motor model has its own installation method and may differ according to the instructions passed in this manual.

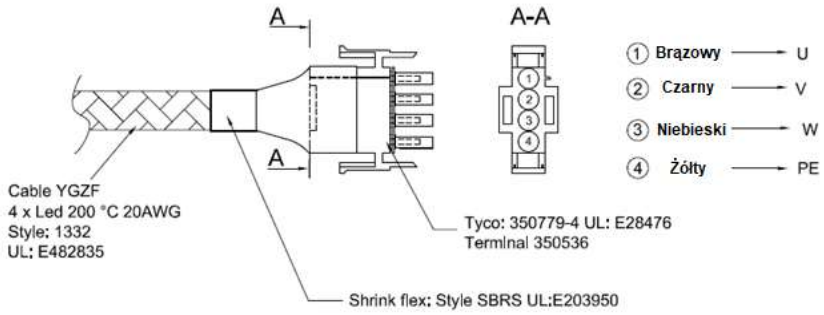
Important Notes:

- The stepper motor must be securely attached to the housing with a dedicated bracket,
- The stepper motor must be grounded,
- do not use cables or connectors other than those supplied with the motor and controller,
- do not change the pulley size. Optimal pulley sizes have been calculated and selected to match the desired performance of the rotary heat exchanger,
- Mount the controller properly to avoid overheating. Avoid exposure to direct sunlight,
- Check the nameplate on the motor and controller to confirm the electrical configuration.

Stepper motors used in a series of VTS heat exchangers (Figure 7) are connected to and powered by a controller responsible for the basic operating parameters. The motor itself is equipped with a male end, the characteristics of which are described below.

STEPPER MOTOR WITH MALE END

CONNECTION CABLE WITH DEDICATED TERMINAL



Due to the length of the motor cables, extension cables are additionally provided to connect the motor to the controller. The extender is equipped with 4-pin connecting sleeves that fit the motor terminals.
Cable lengths vary depending on the size of the rotary heat exchanger. The following figure shows the cable connection with description.

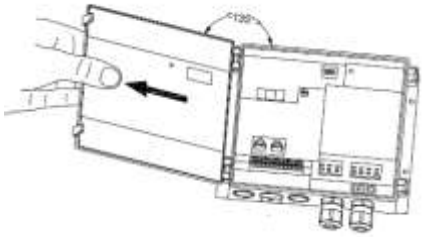
WARNING

! AFTER DISCONNECTING THE MAINS VOLTAGE, WAIT AT LEAST 5 MINUTES BEFORE OPENING THE CONTROLLER HOUSING.

! BEFORE OPENING, MAKE SURE THAT THE POWER SUPPLY VOLTAGE IS DISCONNECTED

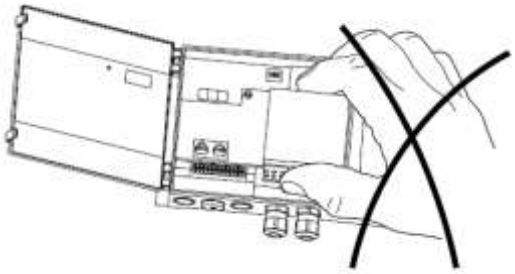
CONTROLLER COVER

To facilitate the wiring process, it is possible to completely remove the cover by detaching it from the controller. This will provide easy access to the sockets for wiring. Hinged handles allow the door to be removed by a slight pull. In addition, the cover door can be opened at an angle of about 135 °.



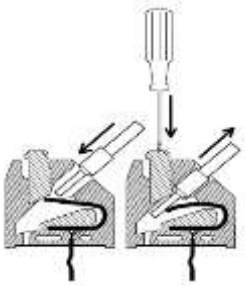
PCB SHIELD

The electronic circuits of the controller are protected by an additional plastic cover (Figure 12) - its removal by unqualified personnel is prohibited. This cover can be opened only for specialized service repairs. Do not attempt repairs on your own. The manufacturer's warranty remains valid as long as there are no signs of opening on the cover.

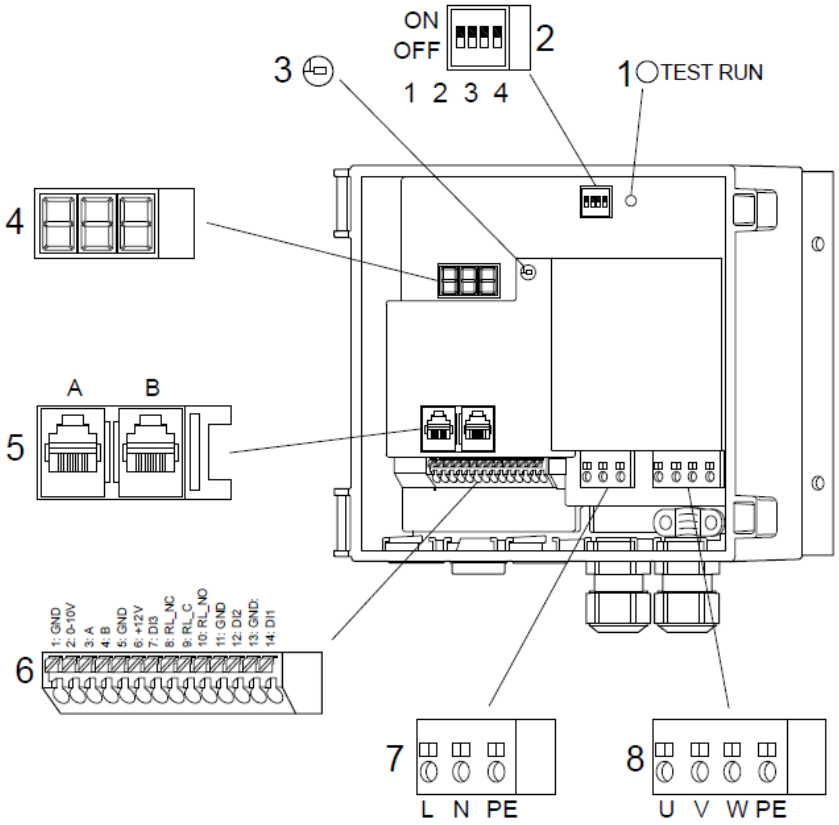


SPRING COUPLINGS

The controller is equipped with spring clamps to speed up installation. The spring clamp allows you to easily insert the cable into the desired socket by pushing it in - without using tools. It is compatible with multicore cables / wires with additional sleeves / terminations. Wire ends or sleeve ends must be 8-10 mm long. To disconnect the cable - carefully push the clamp with a screwdriver.



STEPPER MOTOR CONTROLLER - WIRING SOCKETS



DESCRIPTION OF THE CONTROLLER SOCKETS

No.	Description
1	Test button
2	4-field DIP switch
3	LED
4	Display - not used in basic VTS automation
5	RJ12 Modbus connector (2 x RJ12)
6	Control and signal connections analog / digital - depending on version
7	Power connectors (L, N, PE)
8	Stepper motor connection connectors (U, V, W, PE)

2.2.1 MAIN POWER SUPPLY AND STEPPER MOTOR WIRING

The power supply voltage of the controller is 230V AC; +/- 10%. The power supply cable should be connected to the terminals marked "L", "N" and "PE" (The cables should be inserted through dedicated cable grommets / cable glands. After wiring, be sure to re-tighten the cable glands and avoid pulling or twisting the cables.

The stepper motor is mounted with an integrated cable and connected to the controller using a dedicated extension cable. Both are terminated with 4-pin connectors for quick connection. A locking terminal latch ensures secure installation of both cables. Do not shorten the cables.

POWER CONNECTION

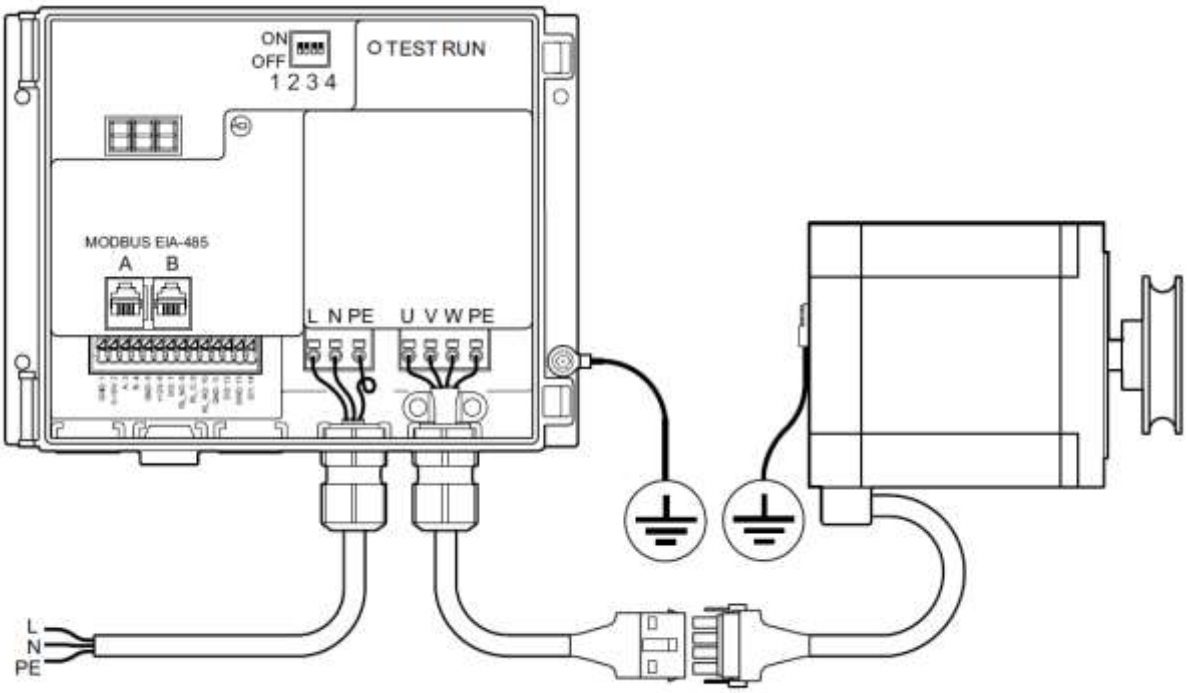
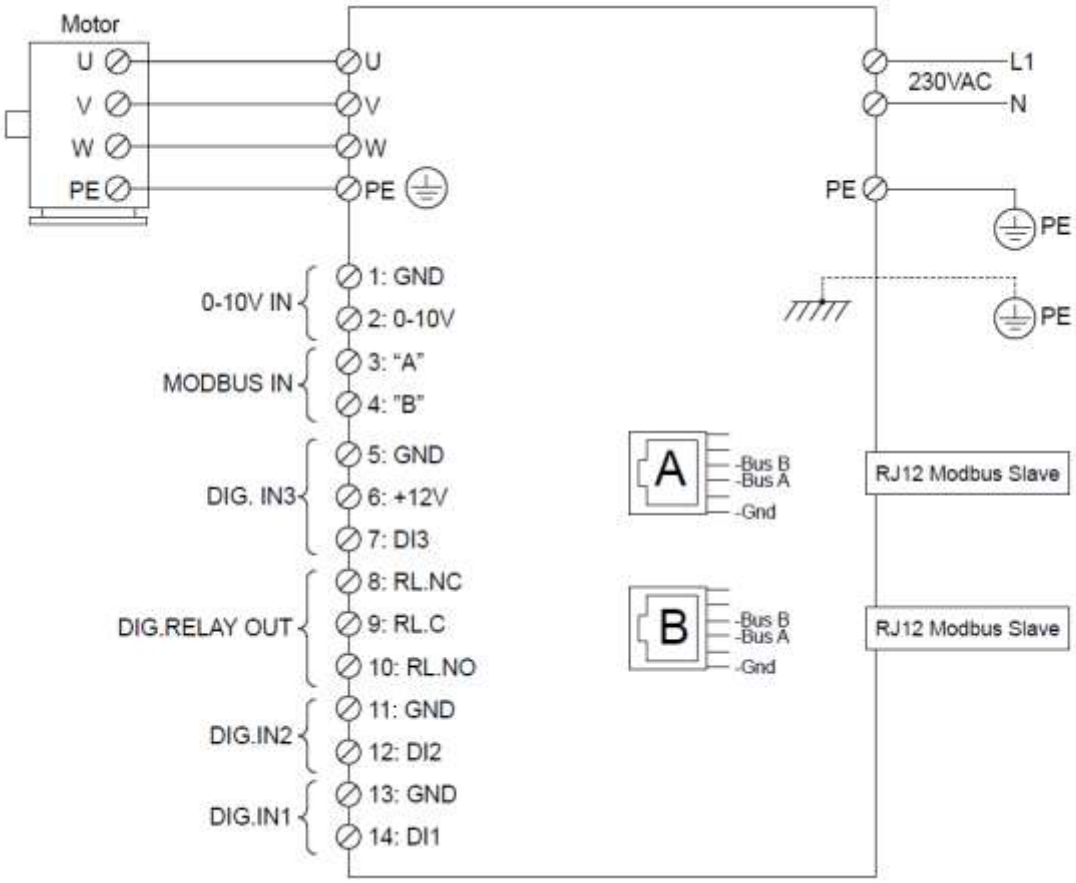


DIAGRAM OF THE CONTROLLER



2.2.2 WIRE REQUIREMENTS

Before performing the installation, make sure that the selected configuration meets the following requirements:

- All cables and wires must comply with local and national regulations,
- cable dimensions for PG9 connectors should be in the range of 3-8 mm,
- cables meet the dimensional requirements,
- copper wires are recommended,
- Modbus cable should be 6-wire, unshielded, 30 AWG / 0.066 mm^2 or similar.

REQUIREMENTS FOR CABLE AND CONDUCTOR CROSS SECTIONS

Control cables	Minimum conductor cross-section	Maximum conductor cross-section	Cable cross section
Single-wire cable	0.08 mm^2	1.5 mm^2	3-8 mm
Multicore cable	0.14 mm^2	1.0 mm^2	3-8 mm
Power cables			
Single-wire cable	Single-wire cable	Single-wire cable	Single-wire cable
Multicore cable	0.2 mm2	0.2 mm2	0.2 mm2

2.3 COMPONENTS OF THE CONTROLLER

2.3.1 TEST BUTTON

The controller is equipped with a test function activated by a built-in button. The test button is located inside the controller in the upper right corner and should be used with the drive open. The test button has different functions depending on how long it is pressed:

1) Short press < 1 sec .: the drive will enter test mode and remain in test mode until the button is pressed again. The wheel will start rotating in a sequence from 0 to 100 rpm according to the selected acceleration time and will remain at 100 rpm. Pressing the button again will cause the drive to exit the test mode and stop the exchanger wheel according to the selected stop time.
2) Pressing and holding the button, will put the drive into test mode, where it will remain until the button is released. The wheel drive will change to 100 rpm according to the selected acceleration time.

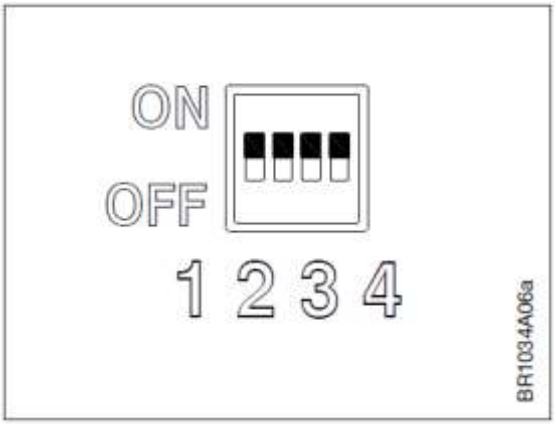
Note that if the test button is pressed for more than 20 seconds, the calibration function of the internal exchanger wheel cover may be triggered.

The Test button also works when Modbus control is active.

2.3.2 DIP SWITCH

The controller is equipped with 4 DIP switches for setting the stepper motor size and maximum motor speed.

DIP SWITCH



! THE SETTINGS FOR THE MOTOR SIZE AND SPEED OF THE UNIT SUPPLIED WITH THE VTS UNIT ARE PREPARED BY THE MANUFACTURER FOR OPTIMAL OPERATION AND SHOULD NOT BE CHANGED

STEPPER MOTOR SIZE SETTINGS

	DIP1	DIP2
Stepper motor = 2Nm	Turned off	Turned off
Stepper motor = 4Nm	Attached	Turned off
Stepper motor = 8Nm	Turned off	Attached

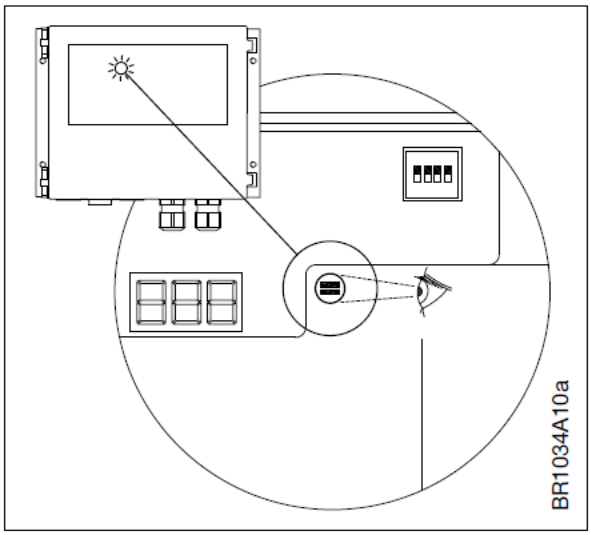
MAXIMUM SPEED SETTINGS

	DIP3	DIP4
Maximum RPM = 250	Turned off	Turned off
Maximum RPM = 200	Attached	Turned off
Maximum RPM = 170	Turned off	Attached
Maximum RPM = 150	Attached	Attached

2.3.3 LED INDICATOR

The controller is equipped with an LED indicator. The LED is visible both when the lid is open and closed.

LED INDICATOR



LED INDICATORS STATES

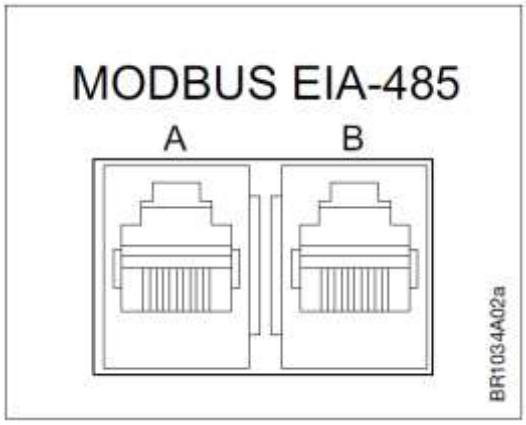
LED	STATUS
Turned off	No voltage
Attached - green	Tension is present
Flashing - green	Correct Modbus communication
Attached - red	Rotor stopped due to critical alarm
Flashing-red	Reduced power operation
Attached - orange	Active testing function
Flashing-orange	Active cleaning function

Note: flashing means that the LED is off for 100 ms and on for min. 100 ms (ms = milliseconds).

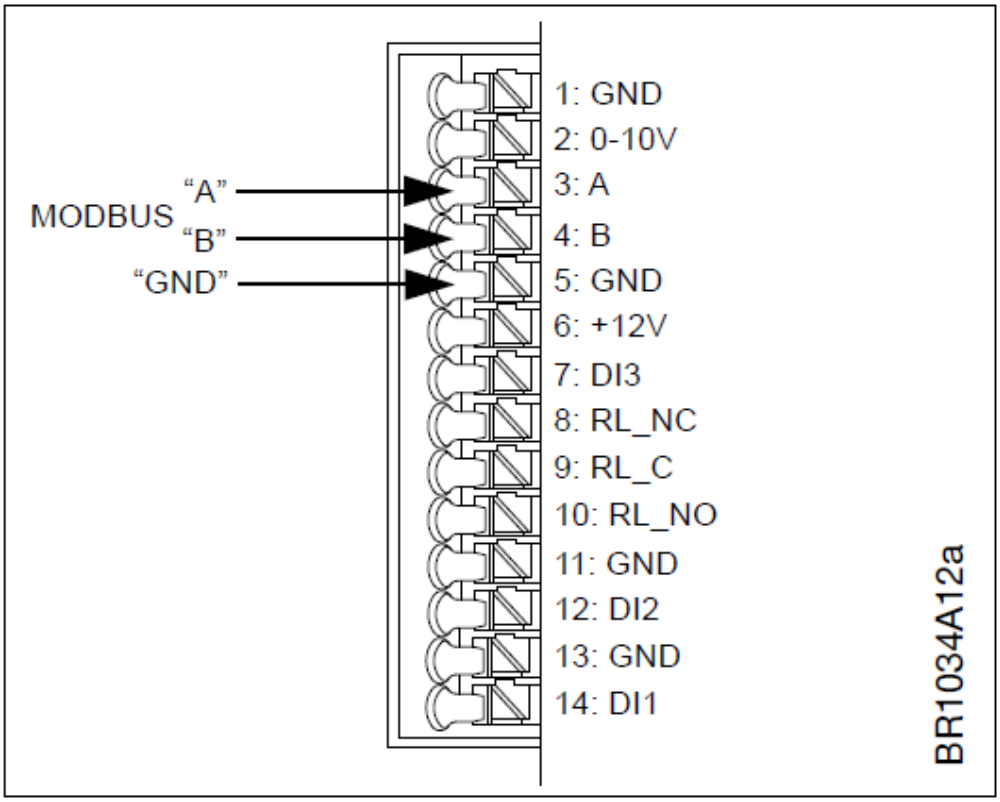
2.4 MODBUS CONTROL

Modbus can be connected to the controller via two RJ12 connectors (connectors "A" and "B" are internally connected in parallel - it does not matter which connector is used) or via spring terminals in the terminal strip. For RJ12 connectors, we recommend using telecommunications cable, 6-wire, unshielded, 30 AWG / 0.066 mm² (flat cable / telecommunications cable) or round communication cable (such as twisted-pair cable) for the spring terminals.

RJ12 MODBUS CONNECTORS



MODBUS SPRING CONNECTORS



After 10 seconds without receiving a valid Modbus request with default parameters, the controller will try to detect a Modbus request with alternative parameters 15.

The default values of the parameters responsible for communication of the controller with the control panel are unchanged - only the parameters referred to as alternative are changed.

Note - the settings of the device supplied with the VTS unit are prepared by the manufacturer for optimal operation and should be changed only in justified cases.

FEATURES AVAILABLE	
Function code	**Description**
1	Coil Status Reading
2	Reading Input Status
3	Reading Holding Registers
4	Reading Input Registers
5	Single Coil Forcing
6	Single Registers setting
8	Diagnostics. Subfunction for 00 - return of query data
15	Enforcing Multiple Coils
16	Setting Multiple Registers

AVAILABLE COIL STATUS			
Address	**Function**	**Scope**	**Activation status**
0	Motor on/off	0 - 1	1 = Enabled
1	Reset alarms	0 - 1	1 = Reset
3	Direction of rotation	0 - 1	1 = Against the clock
8	Use altern. param. com.	0 - 1	1 = Alternative
12	Deactivation of Intrinsic Safeguard.	0 - 1	1 = Inactive
13	Activation of ext. sec.	0 - 1	1 = Active
14	Speed resolution	0 - 1	0 = Resolution = 0.1 RPM 1 = Resolution = 0.01 RPM
15	Modbus K-factor	0 - 1	1 = Co. K not used for Modbus
16	Active autosave UDF	0 - 1	1 = automatic UDF recording

AVAILABLE INPUT STATUS			
Address	**Function**	**Scope**	**Activation status**
0	Security alarm	0 - 1	1 = Alarm
1	Low voltage alarm	0 - 1	1 = Alarm
2	High voltage alarm	0 - 1	1 = Alarm
3	I HI Alarm	0 - 1	1 = Alarm
4	High temperature	0 - 1	1 = Warning
8	Rotor protection signal	0 - 1	1 = Pulse
9	Overload / Current Limit	0 - 1	1 = Warning
10	Internal Stop	0 - 1	1 = Alarm (Stop)
11	Rotor locked	0 - 1	1 = Alarm
12	EEPROM error	0 - 1	1 = Warning
13	MOC communication error	0 - 1	1 = Alarm
14	Motor phase error	0 - 1	1 = Alarm
15	Waving	0 - 1	1 = Warning
18	24V source overload	0 - 1	1 = Overload
19	MOC bootloader	0 - 1	1 = Alarm
20	Digital input 3	0 - 1	1 = HI
21	Digital input 4	0 - 1	1 = HI
22	IOM communication error	0 - 1	1 = Warning
23	Turnover OK	0 - 1	1 = OK
24	Active test function	0 - 1	1 = Active
25	Active cleaning function	0 - 1	1 = Active
26	Incorrect I/O configuration	0 - 1	1 = Warning

`

AVAILABLE INPUT REGISTERS				
Address	**Function**	**Scope**	**Resolution**	**Unit**
0	Type DHX	0 - 14	1	-
1	AOC SW version	0 - ?	0.01	-
2	PrcOut	0 - 10000	0.01	%
3	Internal temperature	-5000 - 15000	0.01	ºC
4	Motor output speed	0 - 40000	0.01	RPM
5	V input	0 - 300	1	V
6	I output (RMS)	0 - 10000	1	mA
7	Output power	0 - 1000	1	W
8	ExternSet	0 - 10000	1	mV
9	Working days	0 - 9999	1	Day
10	Minutes of work	0 - 1439	1	Min.
11	Waving I	0 - 10000	1	mA
12	V-waving	0 - 100	1	V
13	Configuration variant	AA - ZZ	2 ASCII characters	
14	Configuration version	100 - 32000	0.01	-
15	MOC SW version	0 - ?	0.01	-
16	Rotor output speed	0 - 40000	0.01	RPM
17	Moment	0 - 1500	0.01	Nm
17	SW Variant	-	-	-
18	AOC Boot SW	0 - ?	0.01	-
19	MOC Boot SW	0 - ?	0.01	-
20	Motor conf. variant	0 - 65535	1	-
21	Motor conf. version	0 - 65535	0.01	-
22	Rotor conf. variant	0 - 65535	1	-
23	Rotor conf. version	0 - 65535	0.01	-
24	Usage data variant.	0 - 65535	1	-
25	Usage data version.	0 - 65535	0.01	-
26	IOM SW version	0 - ?	0.01	-
27	DC bus peak voltage	0 - 400	1	V
28	Motor peak voltage	0 - 400	1	V
29	ExternSet2 (IOM)	0 - 10000	1	mV

AVAILABLE HOLDING REGISTERS				
Address	**Function**	**Scope**	**Resolution**	**Unit**
0	Setpoint / PrcSet	0 - 10000	0.01	%
1	Min. motor speed	100 - Max.	0.01	RPM
2	Max. motor speed	Min - 40000	0.01	RPM
3	Initial motor output current (Boost)	0 - ?	1	mA (RMS)
4	Start time (Boost)	0 - ?	1	Sec.
8	Moment Prc Holding	0 - 1000	0.1	% of max
9	Ramp-up time	15 - 300	1	Sec.
10	Ramp drop time	15 - 300	1	Sec.
11	SwitchMode	0		
		1	8	kHz
		2	10	kHz
12	DXH type	0 - ?	1	-
13	Alternatives. Modbus ID	1-247	1	-
14	Alternatives. BaudRate	0	9600	bps
		1	19200	bps
		2	38400	bps
		3	57600	bps
		4	115200	bps
15	Alternatives. parity	0	None	-
		1	Odd	-
		2	Even	-
16	Alternative. stop bits	0	INVALID	-
		1	1	-
		2	2	-
17	Repetition number	-1 - 100	1	-
18	Modbus Timeout	0 - 240	1	Sec.
19	Pulley diameter	0 - 1000	1	mm.
20	Rotor wheel diameter	0 - 10000	1	mm.
21	Pulses per turn	0 - 10	1	-
22	K-factor	0-10000	-	-

2.5 ADAPTING THE NEW RHE OI (SPR) CONTROLLER TO WORK WITH AHU VTS

To adapt a brand new RHE controller (ordered as a spare part) to work with VTS air-handling unit automation, you need to do it sequentially:

- connect to the RHE controller using a USB-RS485 converter and a PC with software that allows you to read and write registers of Modbus slaves (e.g. Modbus Poll) - the default communication parameters of the new controller are as follows: **address 79, baudrate 38400, no parity checking, 2 stop bits,**
- set Holding Registers numbered 13-16 according to the target communication parameters of the uPC3 controller: address 4, baudrate 9600, no parity check, 1 stop bit (Table "AVAILABLE HOLDING REGISTERS" relevant registers are marked in blue in the table)

The setting registers of the rotary exchanger controller are accessed without a password. It is also not required to save the settings after changing them.

To enable uPC3 - RHE OI interaction, the RHE motor type selected on the I03 configuration screen of the uPC3 controller must be set to OI.

2.6 DRIVE UNIT WITH AC MOTOR

The task of the drive unit is to start and smoothly control the speed of the exchanger in the range of 3 to 10 revolutions per minute (for the enthalpy exchanger TOTAL up to 20 rpm).

The drive unit is an integral part of every rotary heat exchanger supplied by VTS. The drive system consists of:

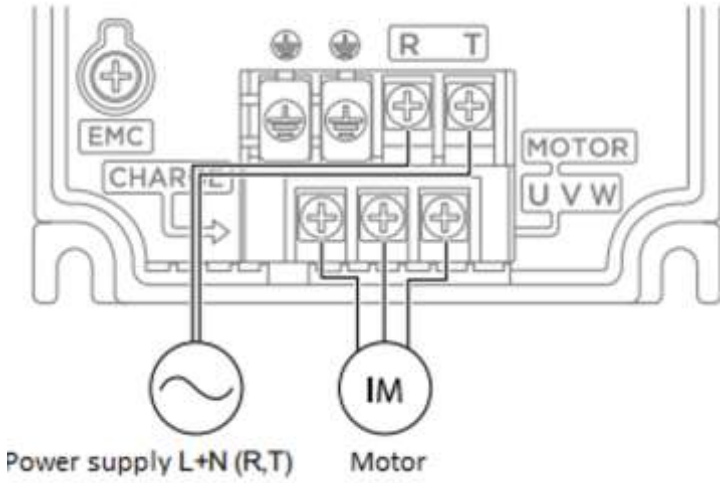
- rotor drive belt transmission,
- gearmotor - a motor coupled to a reduction gearbox,
- frequency converter.

WORKING PARAMETERS:

- TN system,
- rated supply voltage U3 1 x (200-230)V ±10%,
- rated frequency 50-60 Hz ±5%,
- degree of protection after installation in the VTS air conditioning unit IP54,
- permissible operating temperature -30°C÷ +50°C,
- EMC environment 1.

BASIC DATA OF THE POWER UNIT			
Description		**Value**	**Comments**
Motor	Model	AC M7 1B4 TERM	
	Pn	0.37 kW	
	Un	3x230V AC	
	In	2,1 A	
VFD	Model	LSLV0004M100-1EOFNA	Required "Advanced I/O"
	Un	1x230V AC	
	In (original page)	5,5 A	
	In (secondary side)	2,5 A	
	f min	17	
	f max	53	

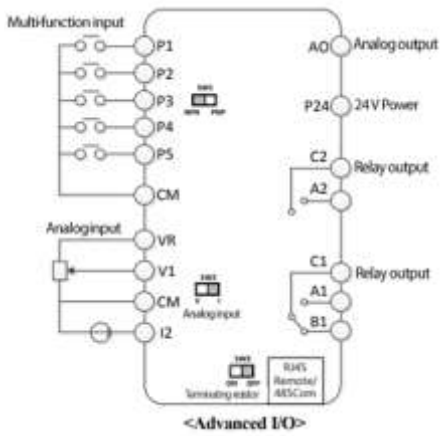
DIAGRAM OF THE ELECTRICAL CIRCUITS OF THE EXCHANGER DRIVE UNIT.



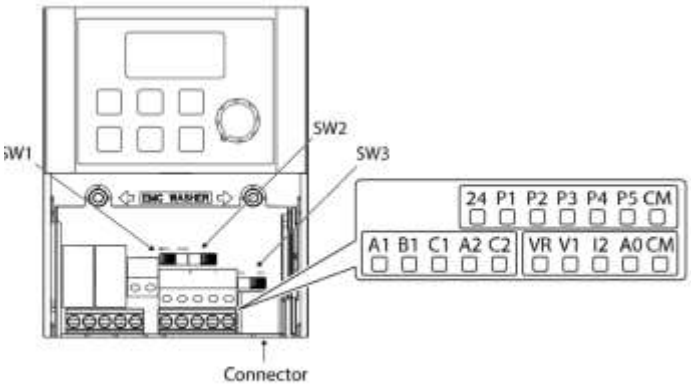
DRIVE CONFIGURATION

Lp	Parameter name	Parameter code	VTS default value
1	Acceleration time	ACC	30
2	Release time	dEC	30
3	Method of controlling the drive	Drv	3
4	Frequency setting method	Frq	9
5	Base frequency (rated motor frequency)	F22 / Mbf Operation	50
6	U/f characteristics	F30	0
7	Thermal motor protection	F50 / Pr 40 group code	1
8	Number of motor poles	H31 / bA 11 group code	4
9	Rated motor slip	H32 / bA 12 group code	4,33
10	Rated motor current	H33 / MrC group code	2,1
11	Idle current	H34 bA 14 group code	1,5
12	Torque control mode	H40 / dr 09 group code	0
13	P4 binary input function	I23 / IN 68 group code	19
14	Modbus address I60	I60 / CM 01 group code	4
15	Response to communication blackout	I62 / Pr 12 group code	2
16	Communication waiting time	I63 / Pr 13 group code	20

INPUT SIGNAL TERMINAL (INPUT TERMINALS)



<Advanced I/O>



<Advanced I/O>

Function	Label	Name	Description
Configuration of multifunctional input terminals	P1-P5	Multifunction input 1-5	Configurable multifunction input terminals. Factory terminal settings and configurations are as follows: - P1: Fx, - P2: Rx, - P3: Emergency stop, - P4: Error reset (RESET), - P5: Step operation command (JOG), (P1-P3 are available as standard I/O)
	CM	Common	Common terminal for analog inputs and control inputs
Analog input configuration	VR	Frequency reference input from potentiometer	Used to set or modify frequency reference via analog voltage or current input. - Maximum output voltage: 12V, - Maximum output current: 100 mA, - Potentiometer: 1-5kΩ
	V1	Voltage input for frequency reference	Used to set or modify a frequency reference via a voltage analog input. - Unipolar: 0-10V (max. 12V)

Control board switches:

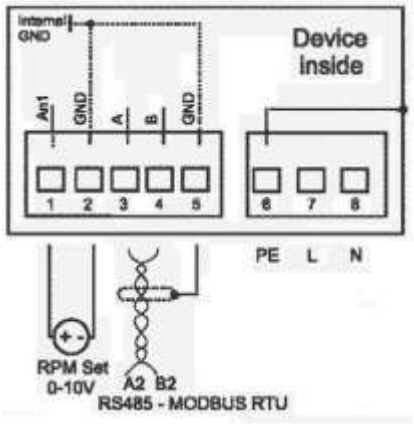
- SW1 - NPN/PNP mode selection switch
- SW2 (Advanced I/O) - Selector switch for analog voltage/current input (I2).
- SW3 (Advanced I/O) - Terminal resistor selection switch

Connectors: Connection of remote keypad, Smart copier or RS485 communication.

2.7 DRIVE UNIT WITH EC MOTOR

2.7.1 INSTALLATION AND CONFIGURATION OF DRIVE UNIT WITH EC CONTROLLER

CLAMP NUMBER			DESCRIPTION
Control signal	AN 1	1	Analog input; Setpoint 0-10 V; R ≥ 1 kΩ
	GND	2,5	GND 2, 5 Reference point
	A3	3	RS485 serial bus - A (+) / MODBUS RTU
	B4	4	RS485 serial bus - B (-) / MODBUS RTU
Power supply	PE	6	PE ground wire
	L	7	Power cord, 1x230V AC
	N	8	



Controls manufactured by VTS are designed for direct connection of the exchanger drive unit.

These controllers come standard with appropriate protection and terminals for power and control of the rotary exchanger.

If an HMI Advanced user interface is connected to the controller, the drive's parameters can be configured automatically using the EC Controller Programming option on the "Advanced" tab.

For the method of connecting the power supply of the drive unit to the VTS control unit, see the control unit electrical diagram.

For the method of connecting the communication line to control the rotary exchanger, see the automation application diagram supplied with the control unit.

2.7.2 MODBUS RTU/RS485 PARAMETERS FOR EC CONTROLLER

CEWKA			
Address	**Function**	**Scope**	**Description**
0	Motor ON/OFF 0-1	0-1	Indication, 1=ON, 0=OFF
1	1 Reset Controller 0-1	0-1	1=Restarting the controller

DISCRETE STATUS BITS (INPUT)			
Address	**Function**	**Scope**	**Description**
0	Under Voltage	0-1	1=Power supply voltage too low
1	Over Voltage	0-1	1= Supply voltage too high
2	IGBT Overcurrent	0-1	1=overcurrent of IGBT module
3	Hot	0-1	1=Active protection against overheating, power reduction
4	Phase Loss	0-1	1=Loss of phase
5	RESERVED		
6	Parameters CRC	0-1	1=Parameter checksum error (TBD)
7	Circuit Fault	0-1	1=Error during in-circuit inspection
8	Motor Fault	0-1	1=Incorrect motor behavior
9	Too Hot	0-1	1=Frequency converter too hot to operate
10	I2R IGBT Fault	0-1	1=Started software protection IGBT software
11 - 13	RESERVED		
14	Restart Fault	0-1	1=Repeated error condition. Frequency converter should be reset.
15	RESERVED		
16 - 17	RESERVED		
18	Waiting To Stop	0-1	1=Motor should be stopped, still running
19 - 23	RESERVED		
24	RpmReg	0-1	Speed controller active
25	PowerReg	0-1	Power limit controller active
26	RESERVED		
27	OvermodReg	0-1	Overdrive condition. The frequency converter is not in able to supply voltage to the motor
28	RegenReg	0-1	Operation in generator mode, increased speed
29	IphaseReg	0-1	RMS phase current limit reached
30	SyncReg	0-1	The motor continues to operate in synchronous mode

Access Level:

- 0 - read only,
- 1 - basic settings / password: 1,
- 2 - service setting.

REGISTER					
Address	**Function**	**Scope**	**Value**	**Description**	**Level**
0	Set point	0..10000	0,01%	Speed setpoint, depends on the operation mode "Operation Mode"	1
6	Operation Mode			0: AN1 speed (default) 2: MODBUS speed	1

ENTRY REGISTER				
Address	**Function**	**Scope**	**Value**	**`Description**
0	HW Version		1	Model version
1	FW Version		1	Software version
2..3	RESERVED			
4	Speed	0..32767	1	RPM
5	Controller temperature	-50...150	0.01	°C
6	UDC		0.1	DC Bus voltage in V
7	IRMS stator		0.001	RMS Stator current in A
8	Power		0.1	W
9	Analogue1	-300...2000	0.01V	Analog input voltage 1
10 - 18	RESERVED			
19	Error Code	0..7, -1	Red LED error code: 7 = motor does not start 6 = Voltage too low or too high 5 = motor incorrectly connected / defective 4 = frequency converter error 3 = active temperature protection 2 = active voltage protection 1 = slow flashing = standby -1 = fast flashing (fire) 0 = always on (operates normally)	
20 - 21	RESERVED			
23	Op Minutes			Operating time [minutes].
24	Op Days			Operating time [days] (for RPM>0, no error)

2.7.3 SPEED CONTROL FROM MODBUS LEVEL

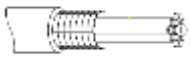
In order to switch with the control signal from 0-10Vdc to ModBus RTU, it is necessary:

- Set the "Operation Mode" parameter to a value of 2
- In the "Set Point" parameter, write the desired value of steering as a percentage of the maximum speed

Example:

Set_Point < 1000 (10.00 %) ... Motor stopped
Set_Point = 1000 (10.00 %) ... Motor runs at minimum speed
1000 (10.00 %) < Set_Point <= 10000 (100.00 %) ... The motor runs at the desired speed.
Motor speed is converted according to the formula:

$$Speed[RPM] = RPM\_Min + \frac{RPM\_Max - RPM\_Min}{9000} * Set\_Point[\%]$$

SIZE, PURPOSE	DESCRIPTION	PARAMETERS	EXPLANATORY DRAWING
3x1.5mm2 power cord	Multicore cables, With single or multi-stranded copper conductors in PVC insulation.	Voltage Rating: 450/750V Operating temperature: -40°C to +70°C	
1x1mm2 or 2x1mm2 control circuits	Control cables with copper conductors, shielded with copper wires in insulation PVC.	Voltage Rating: 300/500 V Operating temperature: -40°C to +70°C	
UTP or STP twisted pair cable, 2x2x24 AWG (2 pairs) serial communication	Multi-conductor copper wires with conductors single or multi-stranded copper in PVC or PE insulation; stranded conductors in pairs to minimize interference; in addition to UTP type - equipped with additional shielding;	Operating temperature: -20°C to +60°C	
	The cross-sections of the conductors were selected for the long-term current carrying capacity for the laying as shown in the figure for three loaded conductors. Due to the selectivity of protections, cable length and routing, and short-circuit currents, the cross-sections of the power supply cables given in the table should be verified.		