Foldable Enclosure

ENCL-ALTS-01

Technical Reference Manual

Revision V-1.4

ASTELCO ARTS Enclosure

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1. Introduction

This document is aimed to help you operating the enclosure and to get through the first steps in its operation. Please take some time and read this manual carefully before you start operating the enclosure.

AS A PRECONDITION TO OPERATE THIS ENCLOSURE, THE INSTALLATION AND COMMISSIONING OF THE ENCLOSURE MUST HAVE BEEN DONE BY ASTELCO. IF INSTALLATION AND / OR COMMISSIONING OF THE ENCLOSURE HAS NOT BEEN DONE BY ASTELCO, FOR SAFETY REASONS, OPERATION IS NOT ALLOWED!

Furthermore, it is mandatory for any users to have been trained by ASTELCO in operating the enclosure.

The enclosure ENCL-ALTS-01, as supplied, is an independent machine as defined by the European „Machinery Directive 2006/42/EG". For this machine ASTELCO declares conformity (see section 11).

However, the entire observatory (consisting of the enclosure and possibly more technical devices) is another, more complete and more complex device and may be another „machine" as defined by the a. m. directive – in this context the enclosure supplied is an „incomplete machine".

For the observatory, an individual conformity assessment procedure must be conducted by the operator of the observatory.

Operation of the observatory is not allowed unless conformity has been assessed.

2. Abbreviations

The following abbreviations are used throughout this manual:

Abbreviation	Description
ESD	Electro-static discharge
I/O	Input / Output
N/C	No connection

3. Safety

Please read the safety and precaution instructions throughout this manual very carefully before you connect the enclosure or power it. All safety critical issues are marked with the following icons:

Icon	Description
	Damage to the device is possible. Also: **DANGER TO LIFE!**
	Danger of electric shock. **DANGER TO LIFE!**
	Possible damage to the device by electro-static discharge (ESD). Take precautions for proper grounding.

3.1 Important safety issues – take special care!

- **DURING OPERATION OF THE ENCLOSURE, IT IS NOT ALLOWED FOR ANY PERSONS TO REMAIN IN THE RANGE OF MOVEMENT OF THE ENCLOSURE!**

- **IT IS ABSOLUTELY FORBIDDEN TO OPERATE THE ENCLOSURE WHEN PEOPLE ARE IN THE RANGE OF MOVEMENT OF THE ENCLOSURE! DURING OPERATION OF THE ENCLOSURE, IMMEDEATELY PRESS ANY OF THE ENCLOSURE'S EMERGENCY BUTTONS LOCATED ON THE SIDE OF EACH FORK ARM AND AT THE CONTROL CABINET IF A PERSON MOVES INTO THE RANGE OF MOVEMENT OF THE ENCLOSURE!**

- Before operating the enclosure for the first time, make sure that the envelope of motion for the enclosure and its parts is free of obstacles to avoid any injuries to the users or damages to the enclosure or to any other parts.

- It is not allowed under any circumstances to mount any parts to the enclosure or its components. Otherwise, malfunction of or damage to the enclosure and/or injuries to users may occur!

- It is not allowed under any circumstances to dismount any parts from the enclosure structure. Otherwise, malfunction of or damage to the enclosure and/or injuries to users may occur!

- During operation, the enclosure will move fast in both axes. The enclosure may make unexpected movements. Make sure that nobody is in the range of movement of the enclosure. Make sure that there are no obstacles in the range of movement of the enclosure, no matter in which position the enclosure may be. Always stay in safe distance from all moving parts to avoid injuries.

- There are several possible pinch or shear points. Make yourself familiar with all of these critical points before operating the enclosure!

- Several of the cables carry high voltages and high currents. Never touch either end of any cables!
- Several of the cables carry highly sensitive signals. Be careful not to harm any of the cables or connectors!

- Before plugging-in or unplugging any of the cables, the control cabinet must be disconnected from the power lines. Wait at least 3 minutes to ensure that all internal capacitors are discharged before power is reconnected.

- Before plugging-in or unplugging any of the cables, proper grounding must be ensured to avoid damage to the sensitive hardware by ESD.

- Make sure that your observatory is properly grounded, including the spot where you place the control cabinet. Missing or bad grounding can cause damages to the electronic components of the control cabinet and/or the enclosure!

4. Assembly and Startup

Assembly of the enclosure and startup of the control system must be done by ASTELCO. In the following, some steps are described that may be needed later on during maintenance, in case the customer needs to do this without the help of ASTELCO.

4.1 Attachment/Adjustment of the proximity (limit) switches

The inductive proximity switches, which are used as limit switches for the positions OPEN and CLOSE, are very simple. Those switches have on the lower side a quadripole M8 connector, which only needs to be connected (see Fig. 1). The distance between the screw nut and the switch should be about 5mm. The adjustment can be done only when the enclosure is open.

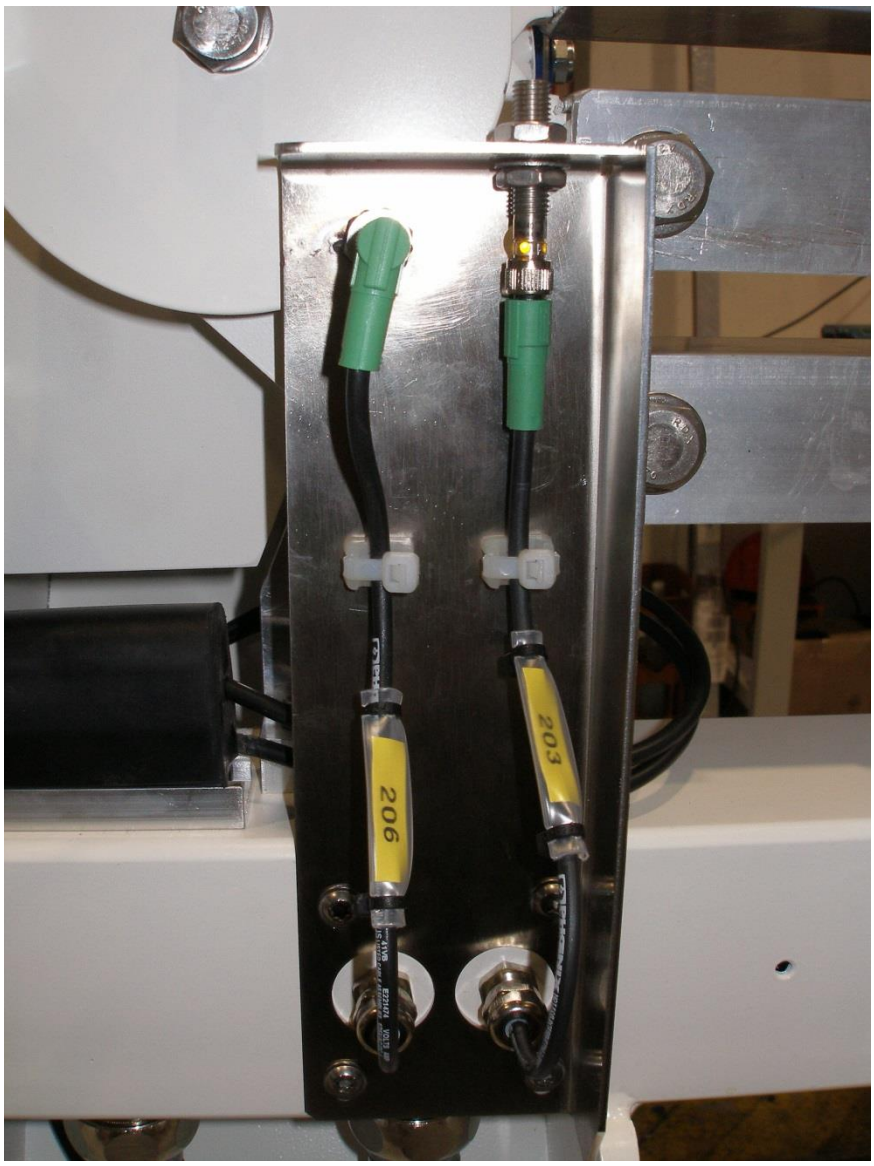


Fig. 1: Limit switch for HALF-OPEN position (both motors), and for OPEN position (motor 1)

Fig. 2: Limit switch for OPEN position (motor 2)

The inductive proximity switch for the CLOSE position is to be set such that the distance between switch and plate is about 2mm (see Fig. 3).

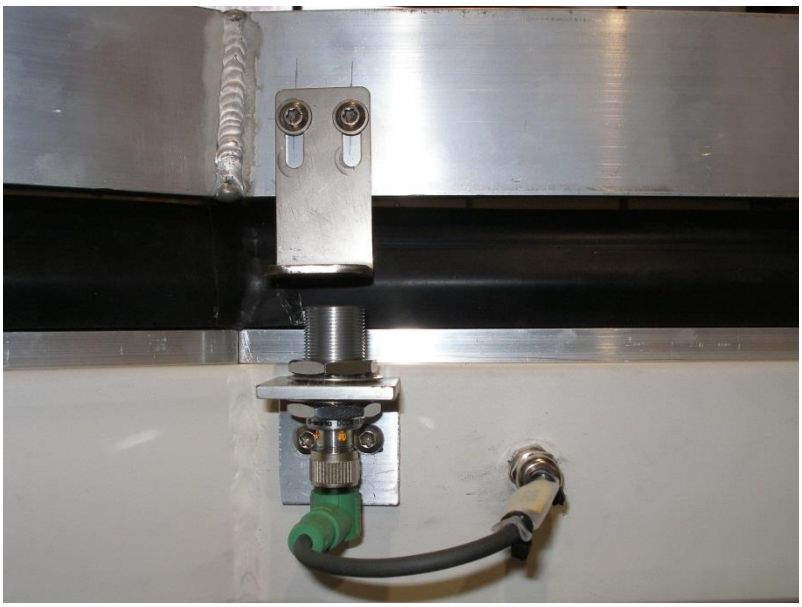


Fig. 3: Limit switch for CLOSE position

Please pay attention that the profiles are parallel to each other, meaning that on both ends as well as in the middle (at the location of the proximity switch), the distance between the profiles is the same (see Fig. 4). Furthermore, the proximity switches in OPEN position are to be placed such that the upper profile of the enclosure is parallel to the foundation profile (see Fig. 5).

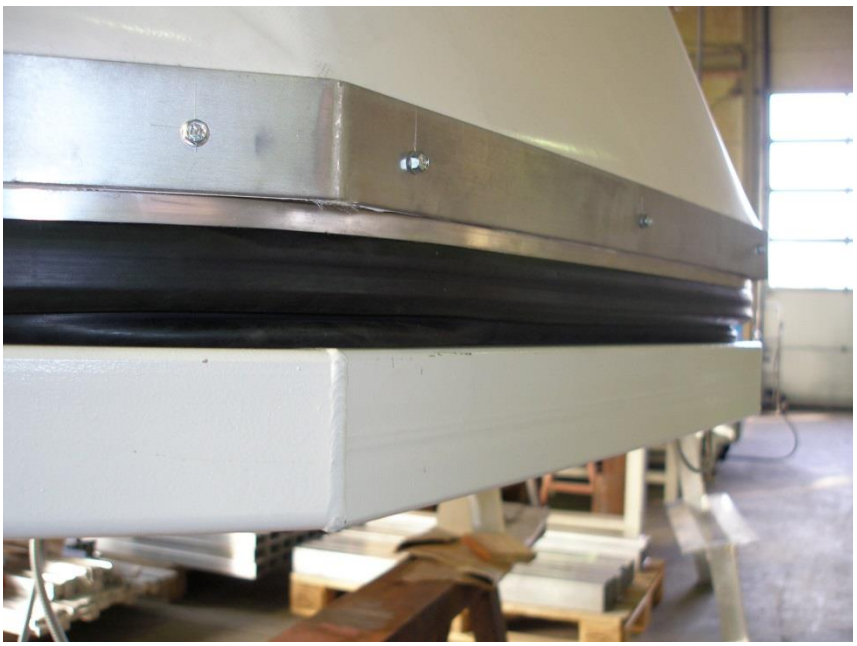


Fig. 4: Profiles parallel when closed

Fig. 5: Profiles parallel when open

4.2 Plugging-in the connectors

The connection of the plugs is very simple because different male and female connectors are used. The control unit has 6 plugs (see Fig. 6). On the left side, there are the plugs for the connection to the enclosure, in the middle there is the plug for the serial connection and on the right side there are the plugs for the emergency-stop switch and for the I/O interface. Plugs of Wieland and Amphenol (RJ45) are used.

Fig. 6: Connectors at the enclosure control unit

In order to simplify the mounting, plugs are also attached to the enclosure itself:

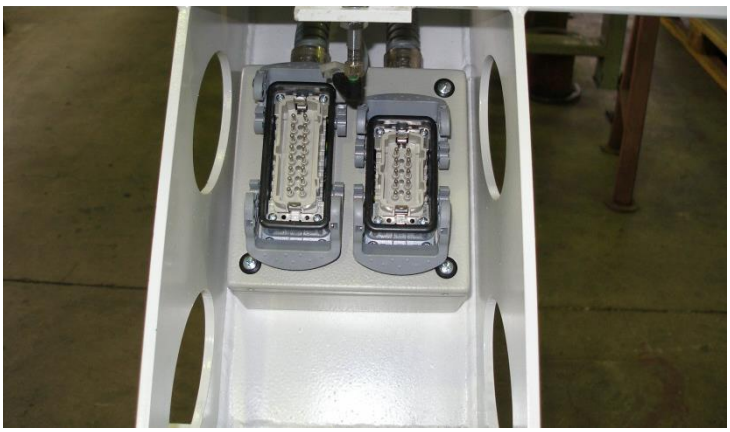


Fig. 7

The connection cables are all shielded by metal protection-hoses to protect them from UV radiation and other environmental influences.

4.3 Setting of the current-safety-switch

The setting of the current-safety-switch DOLD IK9271 has to be measured exactly on site in several attempts. In general, it must be set such that the switch does not stop immediately, since due to the design of the enclosure control, during opening the enclosure, the motor gets disconnected and the proximity switches turned off. The advantage is, that in each OPEN state, the motors get synchronized and therefore the enclosure opens and closes evenly. Therefore, a hysteresis of about 4 to 7 seconds must be set. The switch for the measuring current must be set to 0.5 – 5A. On the diagram below (see Fig. 8), you can also see the functionality. More detailed information can be found on the data sheet. The display of an activation is shown by a slow blinking (2 Hz) of the red Reset-switch. This error can be reset remotely or by pressing the Reset-switch, as soon as the error state is over.

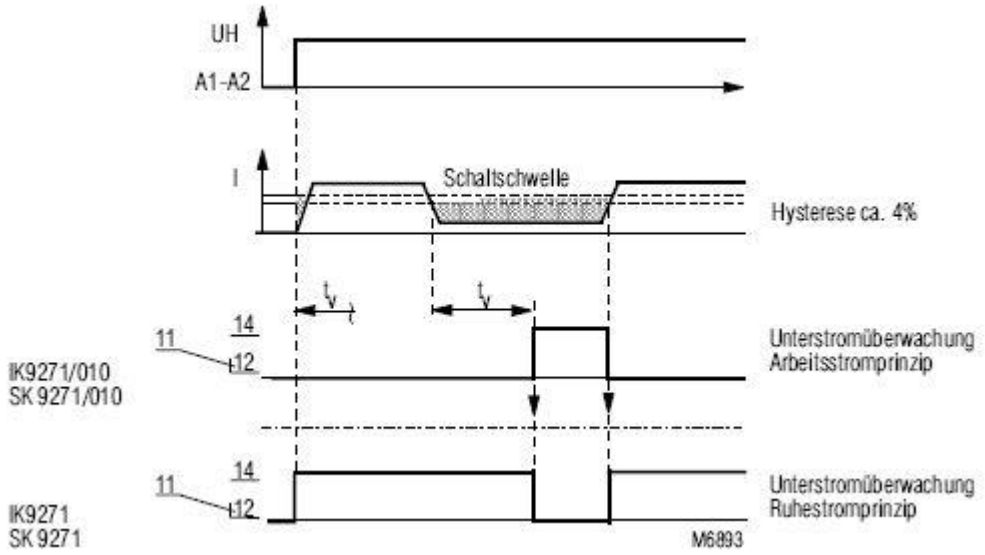


Fig. 8

4.4 Setting of the motor-safety-switch

The setting of the two motor-safety-switches is already done in the factory and has to be checked only. The current on the motor should be set to about 1 A. In case the motor-safety-switch interrupts the operation several times, it can be set to a higher value without concern. In case of such an interruption, the only way to reset this switch is manually by pressing the blue button marked 'reset'. The display of an activation of the motor-safety-switch is shown by a medium blinking (4 Hz) of the red reset switch.

4.5 Test of the sealing lip

The sealing lip on the movable part of the enclosure is for safety reasons and should stop the closing of the enclosure when something touches it. In this case, the entire system stops immediately and goes into error mode. This is displayed by a fast blinking (8 Hz) of the red reset switch. This error can be reset remotely or by pressing the reset switch as soon as the error is over.

4.6 Test of the emergency stop

After mounting the system, a test of the emergency-stop button must be performed in order to assure its functionality. There are two emergency-stop buttons installed, one on the enclosure and one on the control box. The activation of an emergency-stop is displayed by a permanent light on the red reset switch at the control box. This error can be reset remotely of by pressing the reset switch as soon as the error is over; in this test case when the emergency-stop button is brought back to its initial position.

5. General description of the control system

The enclosure control has been designed to be simple in order to minimize the maintenance work and to increase the reliability. Wherever possible, standard components are being used so that the availability of spare parts is as good as possible.

Inside the control cabinet, the components of the control are located. They are wired to the enclosure via plug connections. The cabinet itself is made of weather-proof steel plates and can be opened from the front side.

The enclosure is driven by one motor on each side, which are connected in parallel (single-phase motors 230V 50Hz).

In order to protect the system from environmental influences, especially to protect the cables from UV radiation, all cables are shielded by metal hoses. Also, the plug-connections are made of metal. Furthermore, the startup of the system is easy, since no wiring or re-wiring is required. The system will be up shortly after plugging in the cables.

The enclosure control can be operated both manually by an operator on site and remotely via an interface (I/O, RS-485). In the latter case, no operator is required on site.

6. Cable connections between control unit and enclosure

The connection between the control unit and the enclosure is realized with two cables and their connector plugs. In addition, there are the emergency stop switch and the supply voltage.

6.1 Supply voltage 101

For the connection of the supply voltage, a cable “3 G 1.5” is to be used.

Color	Signal	Clamp on control
Brown	L1	1
Blue	N	2
Yellow/green	PE	3

6.2 Motor cable 102

As the motor cable "ÖLFLEX CLASSIC 110 12 G 1.5" from Lapp GmbH was used. The numbering of the contacts is the same as the number of the black conductor inside the cable, so that for instance black 1 goes to the clamp 1 of the connector, etc.

Color	Signal	Clamp on Control	Clamp on enclosure distributor
Black 1	U1 Motor 1	4	1
Black 2	Z1 Motor 1	5	2
Black 3	Z2 Motor 1	6	3
Black 4	U2 Motor 1	7	4
Black 5	U1 Motor 2	8	5
Black 6	Z1 Motor 2	9	6
Black 7	Z2 Motor 2	10	14
Black 8	U2 Motor 2	11	15
Black 9	Motor brake 1	12	16
Black 10	Motor brake 2	13	17
Black 11	N	14	18
Yellow/green	PE	15	7, 13, 20, 26

6.3 Control cable 103 (limit switch)

As the control cable "ÖLFLEX CLASSIC 110 12 G 0.75" from Lapp GmbH was used. In this case, only the black conductors 1-10 inside the cable are used. The numbering of the contacts is the same as the number of the black conductor inside the cable, so that for instance black 1 goes to the clamp 1 of the connector, etc.

Color	Signal	Clamp on control	Clamp on enclosure distributor
Black 1	+ 24V DC	16	8
Black 2	0V DC	17	9
Black 3	Limit switch OPEN 1	18	10
Black 4	Limit switch OPEN 2	19	11
Black 5	Limit switch CLOSE	20	12
Black 6	Limit Switch half OPEN	21	21
Black 7	Sealing lip Y1	22	22
Black 8	Sealing lip Y2	23	23
Black 9	Sealing lip Y3	24	24
Black 10	Sealing lip Y4	25	25

6.4 I/O Connection 104

For this cable "ÖLFLEX CLASSIC 110 12 G 0.75" from Lapp GmbH is used. In this case, only the black conductors 1-10 inside the cable are used. The numbering of the contacts refers to the numbers of the black conductor inside the cable, so that for instance black 1 goes to the clamp 1 of the connector, etc.

Color	Signal	Clamp on control unit –X1	Clamp on Sub-D connector
Black 1	+ 24V DC	27	1
Black 2	0V DC	28	2
Black 3	Enclosure OPEN	29	3
Black 4	Enclosure CLOSE	30	4
Black 5	Reset	31	5
Black 6	Switch Manual/Auto	32	6
Black 7	Error	33	7
Black 8	Limit switch OPEN	34	8
Black 9	Limit switch CLOSE	35	9
Black 10	External Emergency-Stop relay	36	10
N.C.	-	N.C.	11
N.C.	-	N.C.	12
N.C.	-	N.C.	13
Green (or White)	RS-485 Data+	43	14
Yellow (or Brown)	RS-485 Data-	44	15

6.5 Emergency Stop switch 105/106

For this cable "ÖLFLEX CLASSIC 110 3 G 1.00" from Lapp GmbH is used.

Color	Signal	Clamp on control	Clamp on connector
Black 1	Input Emergency-Stop 1	38	1
Black 2	Output Emergency-Stop 1	39	2
Black 1	Input Emergency-Stop 2	40	1
Black 2	Output Emergency-Stop 2	41	2

6.6 Rain Sensor 107

A 4-pin Secker-Hirschmann connector is used for the external rain sensor and an additional relay for optional control possibilities.

In case of rain, the rain sensor opens the (NC) contact, which leads to closing the enclosure in remote operation if there is no active OPEN command. The rain sensor is an opener between contacts 1 and 2.

Contacts 3 and 4 (NO) of connector 107 can be closed via software, see section 6.5 under DO3.

Color	Signal	Clamp on control unit	Clamp on connector
Black 1	Rain Sensor 24V DC	45	1
Black 2	Rain Sensor output	46	2
Black 3	Relays extern input	47	3
Black 4	Relays extern output	48	4

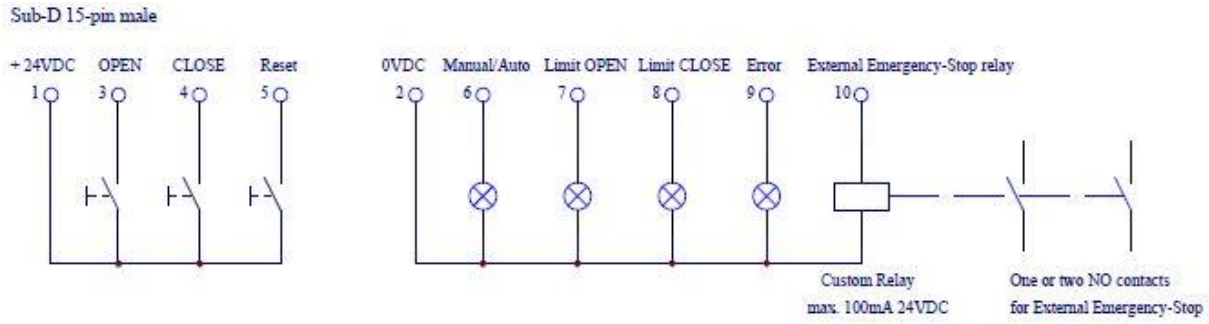
7. Remote control via I/O connection, RS-485

The enclosure can be controlled remotely via either I/O (15-pin Sub-D plug with RS-485 or optionally 10-pin plug with wire). In this state, the status of the limit switches, the switch Manual/Auto and the error status can be queried.

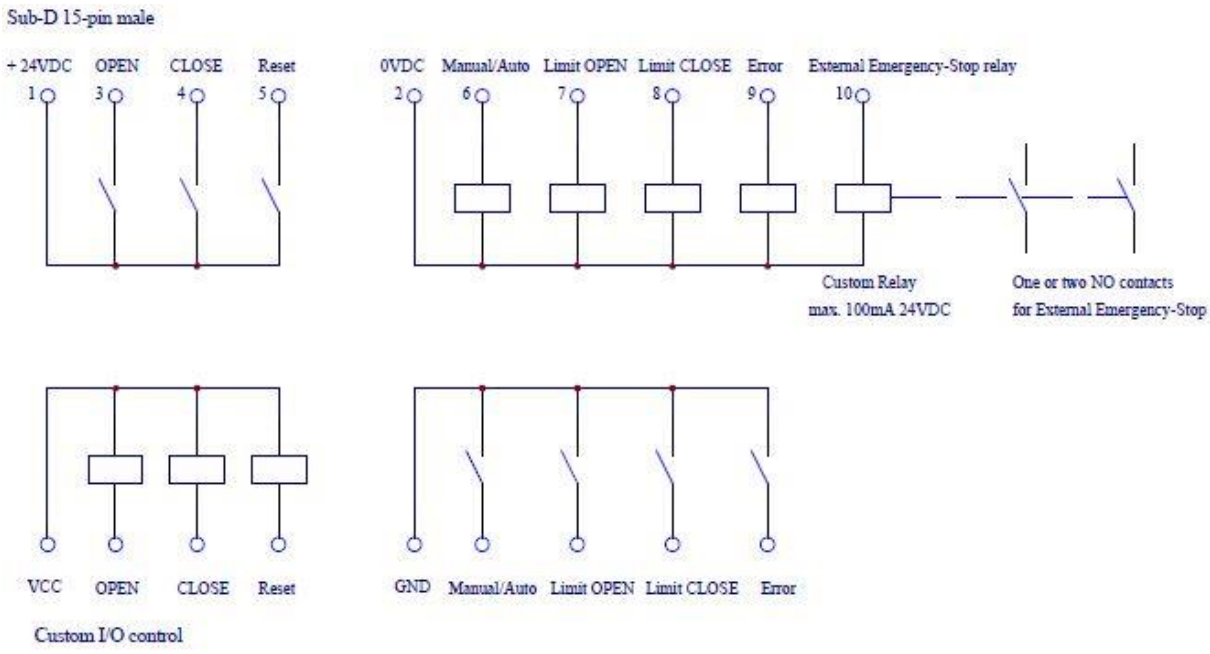
7.1 I/O Control

Connection 104 can be used to directly control the enclosure via an external control wire. This can be done when for example a hand box shall be used, or some external software can command relay contacts which in turn can control the enclosure.

Examples for direct control of the I/O's Sub-D 15-pin:



It is best to use potential-free relay contacts, as shown in the examples. To each of the I/O contacts no. 6-10, a 24VDC relay with 100mA can be connected.

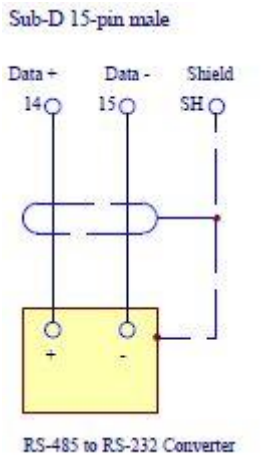


Alternately, optocoupler can be used as well. Exact configuration of these should be taken from their data sheets.

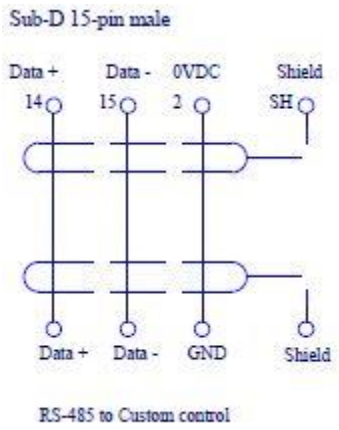
7.2 RS-485 Control

To configure the RS-485 interface, use the ADAM-4055 examples and Windows DLLs that are provided on the supplied CD ROM. For more information see documentation of Advantech Co. Ltd.

Connection of the RS-485 interface via a converter to RS-232:



Connection of the control to an existing RS-485 interface:



To avoid interferences on the wires, a shielded twisted-pair cable should be used like "UNITRONIC LiYCY (TP) 2x2x0,25" by LAPP.

7.3 Programming

When programming the interface, please note that a signal will be interpreted as "1" if it is active for at least 200ms on DO0-DO2. On DO0 and DO1 (movement directions), the signal must be set back to "0" on, if on DI0 resp. DI1 the signal gets "1". The output reset (DO2) must be set for a short time only (200ms) and must get "0" again, in order that the enclosure control recognizes the reset and DI2 (Error) gets "0" again.

DO3 controls the external relay.

All inputs DI0-DI7 are also placed in „Manual" mode (DI3 = 0), please consider this when analyzing error situations.

An error (DI2) persists (and keeps coming up again) as long as no further errors are found. DI2 will be acknowledged via DO2.

7.4 Overview ADAM module

RS-485 control is realized by an ADAM 4055-BE module (Advantech Co. Ltd.). It has 8 potential-free inputs and 8 open collect outputs.

ADAM 4055-BE	Signal	Signal active
DO0	Enclosure OPEN	1
DO1	Enclosure CLOSE	1
DO2	Reset	1
DO3	Relays extern	1
DI0	Limit switch OPEN	1
DI1	Limit switch CLOSE	1
DI2	Error	1
DI3	Switch Manual/Auto	Auto = 1
DI4	Motor protection triggered	1
DI5	Undercurrent control	1
DI6	Sealing lip triggered	1
DI7	Emergency shut-off triggered	1

To test the configuration, the ADAM utilities can be used (supplied on CD ROM). Included as well is an adapter from RS-485 to RS-232 to connect it to any PC serial interface (including the NTM-500 Mount with appropriate software). The signals RS485+ and RS485- are available at the 15-pin Sub-D connector (104) on pins 14 and 15.

8. Maintenance

Normal maintenance implies the check of the entire technical configuration. A visual check for obvious defects like defects on cables, connectors, plugs, limit switches etc. as well as a check of the functionality of the safety-devices (emergency-stop and sealing lip) should be performed at least once a month. Other maintenance work at the electrical devices is not necessary, whereas once or twice a year a check of the parameters set at the frequency converter and LOGO module should be done.

9. Errors

During operation, there should be no errors. Often, errors are brought up by external causes like for instance an activation of the emergency-stop or the sealing-lip by chance or intention of third persons or other objects. Therefore it might be useful to survey the system using a webcam in remote mode.

Error messages from the frequency converter are rare if its parameters are adjusted well according to the motors. If the enclosure control is run using solar panels, the error “E 09” might show up. In this case, according to the manual of the frequency converter, the parameters of the motors have to be adjusted. It is crucial to assure that when using solar panels, a sinusoidal alternating current with 230V 50Hz is generated. When using rectangular or trapezoidal voltages, error messages may come up more often.

If during operation or while opening or closing the enclosure, the low-voltage relay is activated, the measuring current and the hysteresis at the IK9271 should be readjusted.

It can also be the case, that an error is not shown when the cable for the limit switch is not connected. In this case, the red reset switch is blinking slowly with short interruptions. This error can be reset remotely or by pressing the reset switch as soon as the error is over.

Furthermore, it may lead to a error when during startup of the LOGO module a control command is already sent. This may lead to a putative error. It is thus strongly recommended to wait 10 to 15 seconds after powering the enclosure control unit in order to bring the LOGO module up to a safe operation mode.

More detailed information about the error status can be retrieved remotely via the RS-485 interface; see table in section 6.5.

10. Technical data

The enclosure control has the following technical specifications:

Supply voltage:	230V AC singe-phase
Frequency:	50Hz sinusoidal
Power consumption:	approx. 800W max.
Safety class cabinet:	IP 55
Operating temperature:	-20°C to +40°C
Control voltage:	24V DC
Emergency-stop switches:	2 (at the cabinet and at the enclosure)
Motor enclosure:	230V AC 50Hz single-phase
Motor brake:	230V AC 50Hz

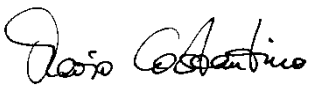
More datasheets of the individual components that were used for the enclosure control have been delivered with the enclosure. These data sheets should be used for maintenance of the system and for further error search.

11. Declaration of Conformity

CE

Declaration of Conformity

Issuer and Manufacturer		
ASTELCO Systems GmbH, Fraunhoferstrasse 14, D-82152 Martinsried, Germany		
Product item code	**Product Description**	
ENCL-ALTS-01	FOLDABLE ENCLOSURE	
Standards / Directives / Codes		
Number	**Date**	**Title of the Directive**
2006/42/EG	25.06.2006	Machinery
2004/108/EG	15.12.2004	Electromagnetic compatibility (EMC)
2006/95/EG	12.12.2006	Low Voltage
2001/95/EC	03.12.2001	General product safety
Declaration		
I hereby declare that the above products meet the requirements of the listed standards / Directives / Codes		

Signed: 	Signed by (name): Mario Costantino	Date: 31.08.2013
Position: General Manager	Company: ASTELCO Systems GmbH	

This declaration is not meant to be a direct or indirect warranty and does not warrant certain features or performance of the products.

Any safety instructions of this manual must be followed!

ENCL-ALTS-01 Reference Manual V-1.4

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