

Control Description Manual – MoveRoll Conveyor

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1 MoveRoll electrical components

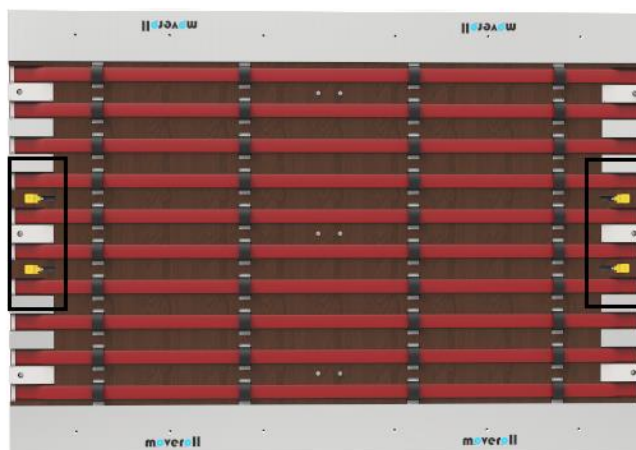
1.1 Capacitive sensor

Roll detecting inputs used in MoveRoll conveyors are capacitive PNP type sensors that work either 24 VDC (10 V - 65 V) or 110 VAC (20 V - 250 V). Sensors have two lights on top (*Picture 1*): orange and green. Orange light is always on when system has power, and the green light is on when sensor is detecting the roll.



Picture 1. Capacitive sensor 24 VDC (Turk).

By default, MoveRoll H- and HS-modules contains sensors as a pair. Each pair function is to detect roll position on the conveyor (i.e., roll in and roll out). Sensor pairs are connected parallel to each other, so if one of the sensors in that pair fails to detect the roll the conveyor will still function normally. It's also possible to request separate signals. In total, each module contains four sensors (*Picture 2*).

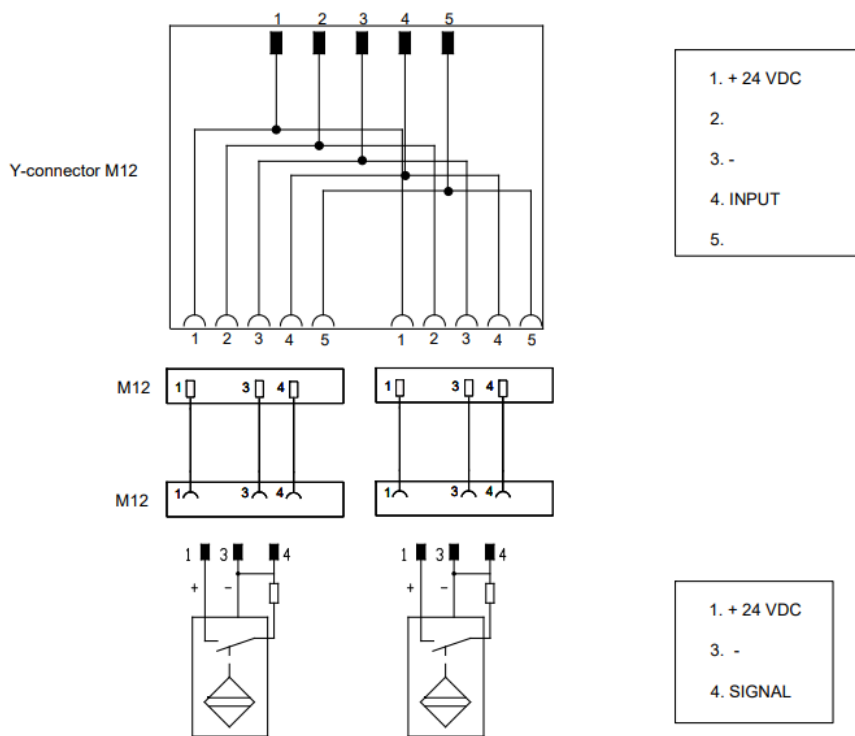


Picture 2. Sensor pairs.

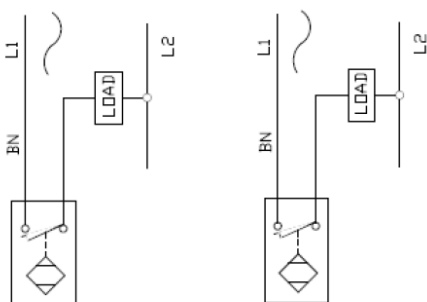
MoveRoll conveyors such as HC-, HCS and TT-modules contains third pair I the middle do detect roll center position.

1.1.1 Sensor connections

In MoveRoll conveyors 24 VDC sensors pairs are connected with M12 Y-distributor (*Picture 3*), and 110 VAC sensors have open wires and connected by the customer (*Picture 4*). Connections can be found underneath the protective cover plates of the MoveRoll module.



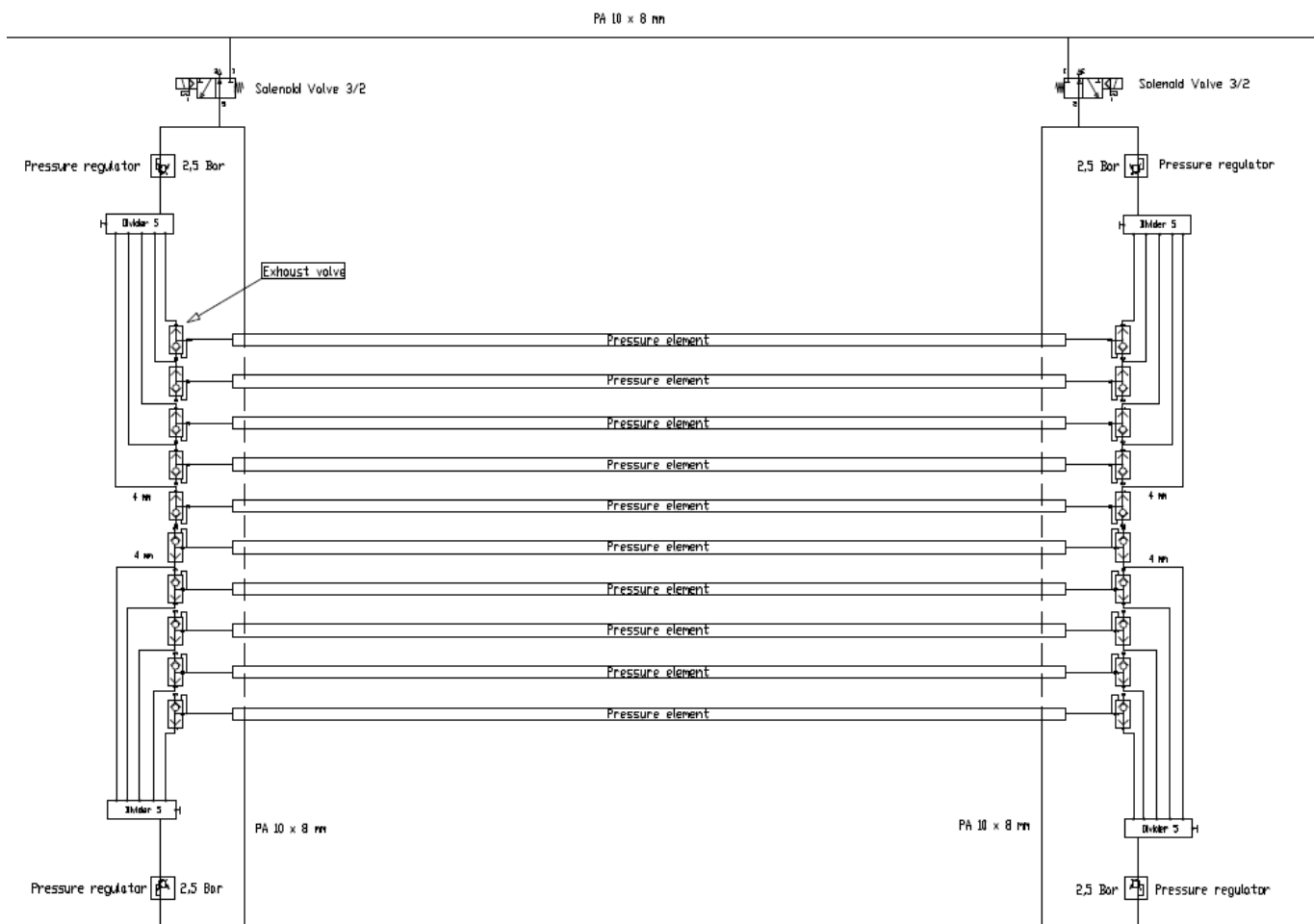
Picture 3. 24 VDC sensor pair connection.



Picture 4. 110 VAC circuit diagram.

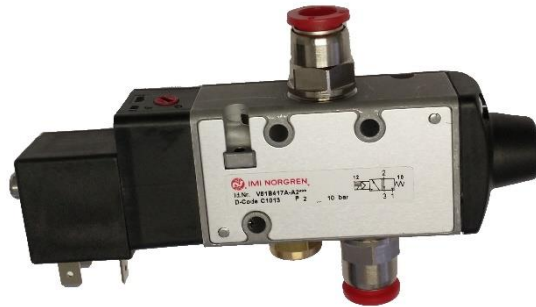
1.2 Magnetic solenoid valve

Magnetic solenoid valves (*Picture 6*) are used in MoveRoll conveyors to control compressed air. In practice valves control the movement of the roll. By default, each MoveRoll H- and HS- module contains either two (H6-H8) or four (H10-H14) solenoid valves for moving the roll. In smaller modules (H6-H8) each solenoid valve control compressed air from one side, but in bigger modules (H10-H14) solenoid valves function as a pair (*Picture 5*). As you can see in the picture below: left side solenoid valves are controlling compressed air from the left and right side pair respectively from the right.



Picture 5. MoveRoll H/HS10-module pneumatic diagram

Solenoid valves are 3/2 electro pneumatic normally closed (NC). By default, operation voltage is 24 VDC but can be changed to 110 VAC.



Picture 6. Solenoid valve 3/2 (Norgren).

1.2.1 Solenoid valve connections

Solenoid valves that are operating on 24 VDC comes with M12 male connector (*Picture 7*) and valve pairs are connected together with parallel M12 Y-connector (*Picture 8*).



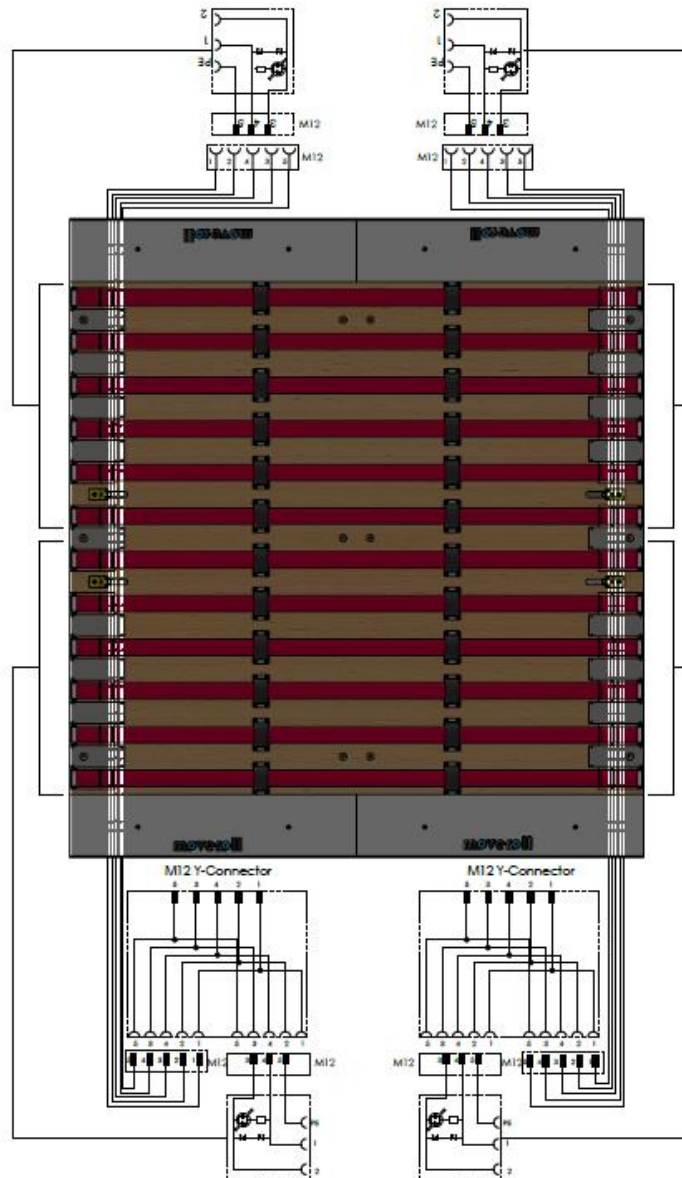
Picture 7. Valve socket cable with M12 connector.



Picture 8. Parallel M12 Y-connector

If the modules are set to 110 V, then solenoid valve have just 110 V valve socket and connections from that point are made by customer.

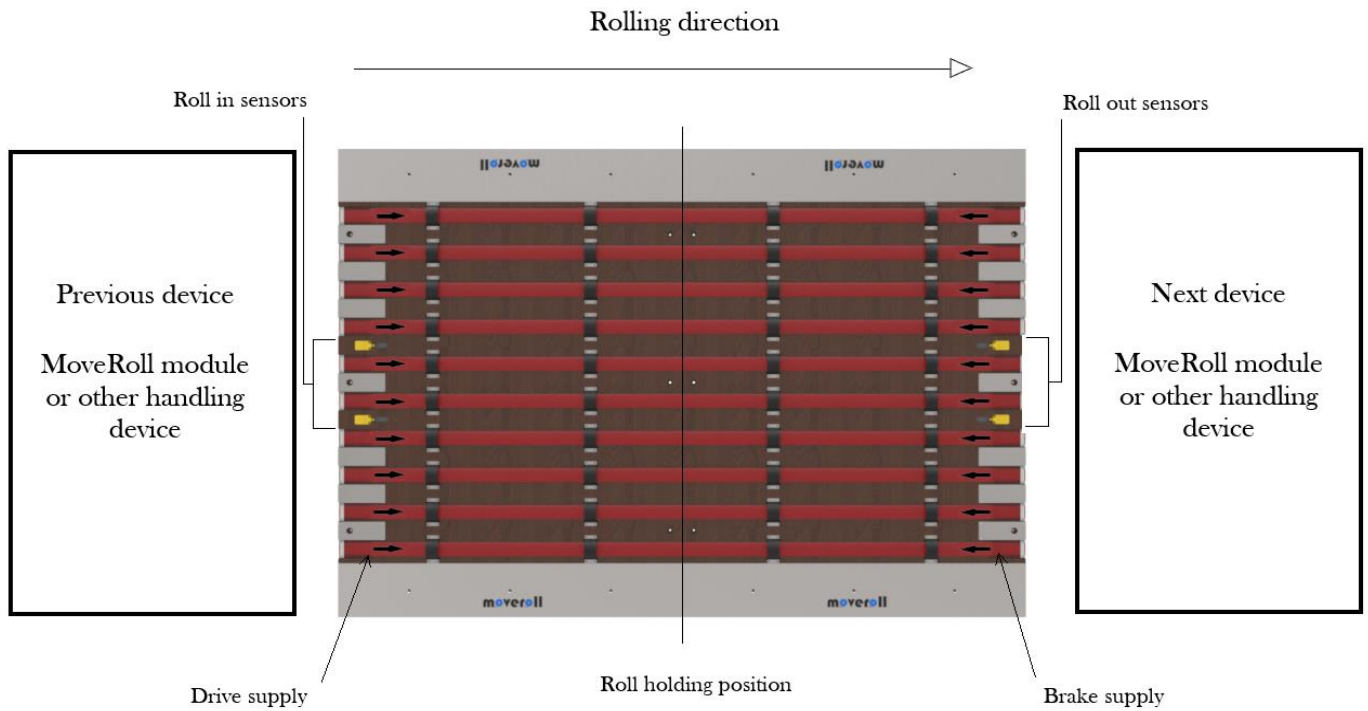
All connections can be found under the cover plates of the MoveRoll conveyor. They are all either on the one side or both sides, depending on the customer needs. For example, below is HS12-module connections for solenoid valves 24 VDC (*Picture 9*).



Picture 9. Solenoid valve connections for HS12-module 24 VDC

2. Control description for MoveRoll horizontal modules

Here is described the basics for building a program for horizontal conveyor H- and HS- module types. Using this information, you can build suitable program for your specific project. Below you can see the basic conveyor layout (*Picture 10*).



Picture 10. MoveRoll horizontal (HS12) module layout

Drive supply = Compressed air supply to drive roll forward. Air flow is controlled by solenoid valve/s.

Brake supply = Compressed air supply to drive roll backward/brake. Air flow is controlled by solenoid valve/s.

Roll in sensors = Sensors to detect and give timing for braking.

Roll out sensors = Sensors to detect roll leaving the module.

Roll holding position = Roll position accuracy ± 300 mm

2.1 Sequence

When MoveRoll conveyor is empty and waiting for the roll, drive- and brake valves are kept **OFF**. Two different sequences for roll handling are needed:

1. Next device is ready to receive the roll immediately.
2. Next device is not ready to receive, and roll have to be stopped and hold.

2.1.1 Next device ready

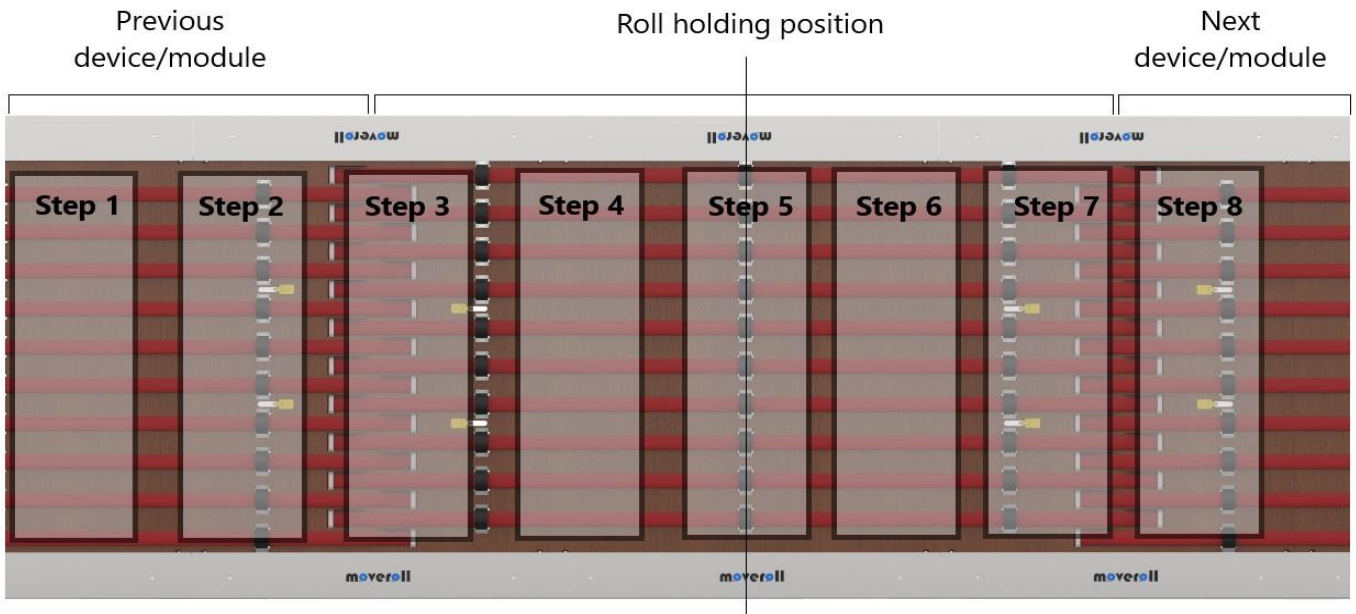
When next device/module is ready to receive the roll, drive solenoid valves are put **ON** until roll triggers next module or device “roll in” sensors. Brake solenoids are kept **OFF** all the time.

2.1.2 Next device is not ready

When next device/module is not ready for the next roll, it has to be stopped and kept on the module in roll holding position until next device is ready (*Picture 11*). Sequence for that is as follows (*Table 1*):

1. Waiting the roll: Drive is set **OFF** and brake is set **OFF**
2. Previous device/module is sending roll: Drive is set **ON** and brake is **OFF**
3. Roll triggers roll in sensors: Drive delay starts, preset value 1 sec delay
4. Drive is set **OFF** and brake is set **ON** → Brake delay starts preset value 1 sec delay
5. Drive is set **OFF** and brake is set **OFF** when holding the roll
6. Next device/module is ready → drive is set **ON** and brake stays **OFF**
7. Roll triggers roll out sensor → next module drive is set **ON**
8. Roll triggers next device/module roll in sensors → previous device/module drive is set **OFF**

With delay times the roll position can be tuned to the center.



Picture 11. Timing sequence for MoveRoll H/HS-modules

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
	Waiting for roll	Rolling in	Rolling	Braking the roll	Holding the roll	Accelerating out	Rolling out	Waiting the roll
	Conveyor is empty and waiting for the roll	Roll is rolling in from previous device	Keep on rolling during delay	Braking signal is ON to stop the roll	Roll is stopped and hold on conveyor	Roll is accelerating out to the next device	Roll is rolling and approaching next module	Conveyor is empty and waiting for the roll
EI	1.							
EI	2.							
EO	3.							
EO	4.							
I	5.							
I	6.							
O	7.							
O	8.							

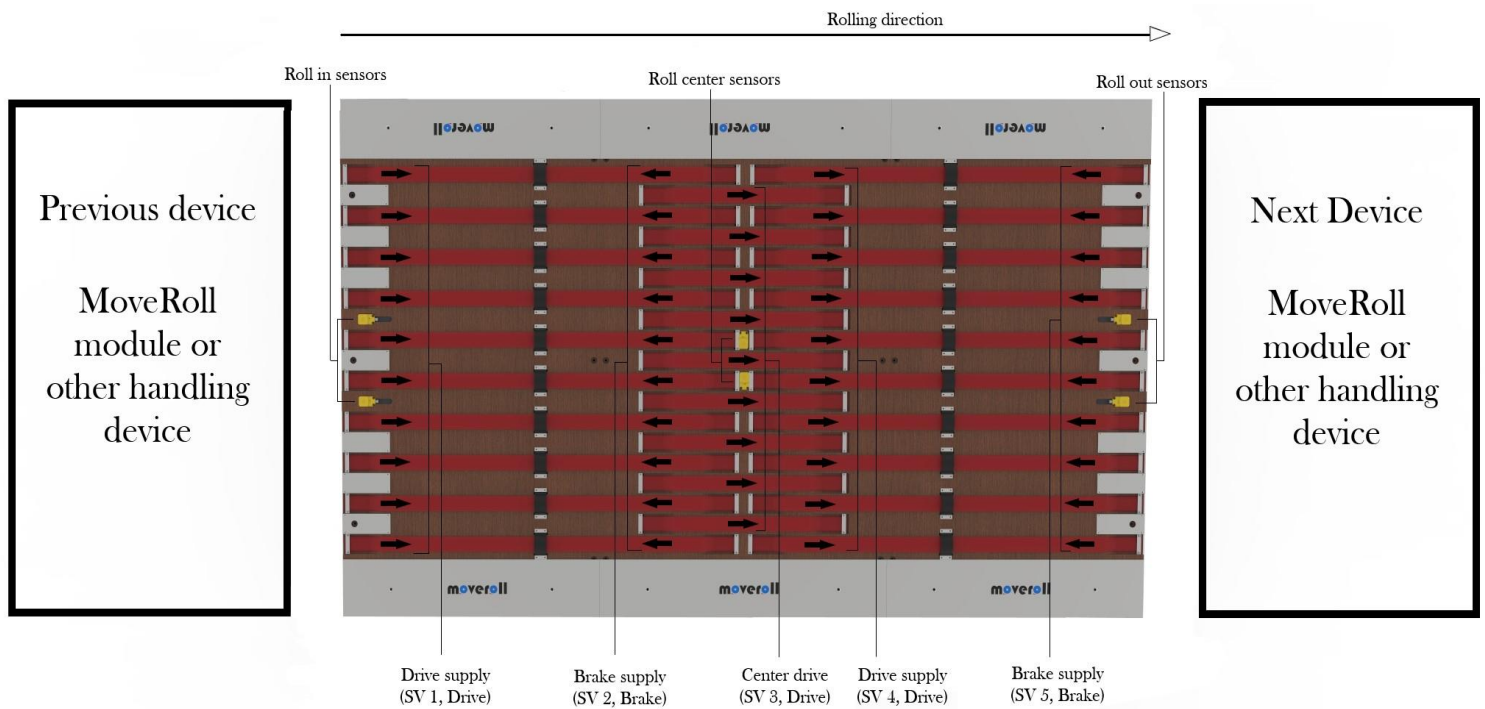
1. Roll rolling (from previous)
2. Ready (from next)
3. Roll rolling (to next)
4. Ready (to previous)
5. Roll in (sensor)
6. Roll out (sensor)
7. Drive (valve)
8. Brake (valve)

- EI = External input, from PCL memory (e.g. other conveyor module) or from external sensor
 EO = External output, to PCL memory or to external output
 I = Sensor on conveyor module
 O = Pneumatic valve on conveyor module

Table 1. Timing sequence for MoveRoll H/HS modules

3. Control description for MoveRoll centralizing modules

MoveRoll centralizing conveyor (HC=horizontal centralizing) is designed so that paper roll can be stopped exactly at a designated location. For that reason, it has three times more pressure elements and it's a bit more complex than horizontal when it comes to building a PLC program. Below is basic HC module layout (*Picture 12*).



Picture 12. MoveRoll centralizing (HC10) module layout

Drive supply = Compressed air supply to drive roll forward. Air flow is controlled by solenoid valve/s.

Brake supply = Compressed air supply to drive roll backward. Air flow is controlled by solenoid valve/s.

Roll in sensors = Sensors to detect and give timing for braking.

Roll out sensors = Sensors to detect roll leaving the module.

Roll center sensors = Sensors to detect roll in centralizing point.

SV 1 - SV 5 = Solenoid magnetic valves OR SV6 for bi-direction modules.

3.1 Sequence

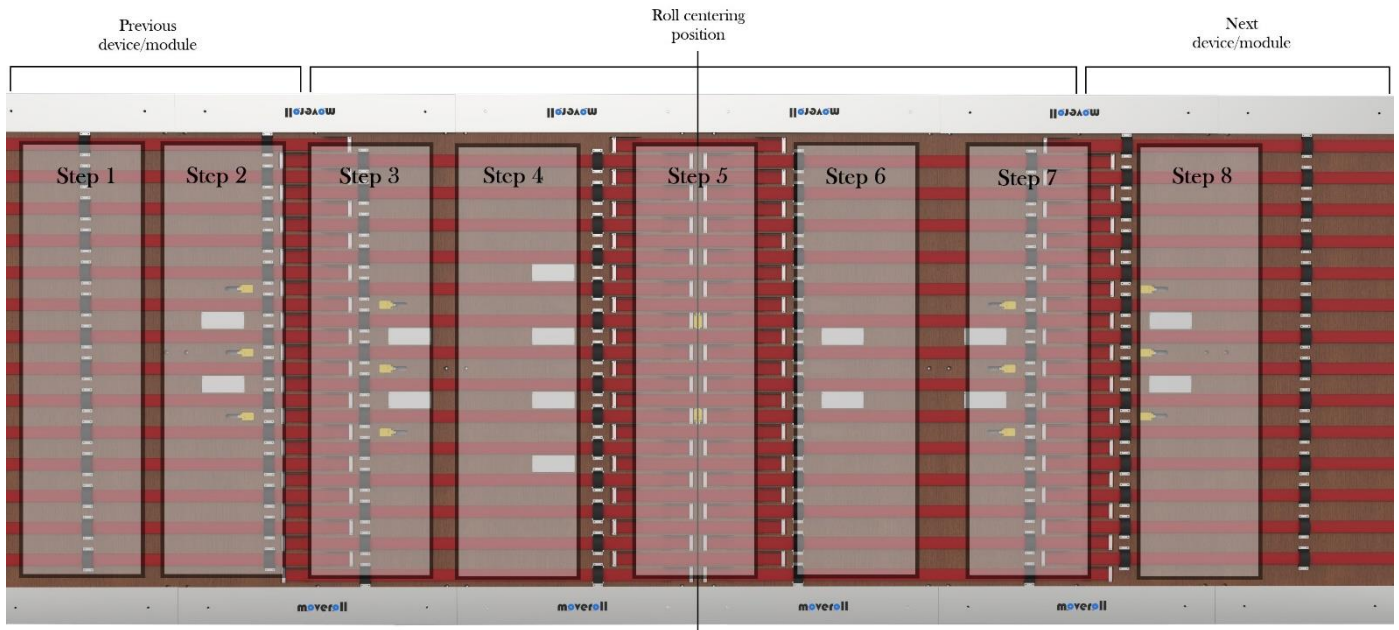
When conveyor is empty and waiting the roll, drive is kept **OFF** and brake is kept **OFF**. Two different sequences for roll handling are needed:

1. Next device is ready to receive the roll immediately.
2. Next device/module is not ready to receive, and roll have to be stopped and hold.

3.1.1 Next device ready/not ready

If next device/module is ready, the roll is first centered and after that transported to the next device/module. Sequence for that is as follows (*Table 2*):

1. Waiting the roll: SV 1 drive is set **OFF** and brake SV5 is set **OF**.
2. Previous device/module is sending roll: SV1 drive is set **ON** and SV5 brake is kept **OFF**
3. Roll triggers roll in sensors and roll centering starts: SV1 stays **ON** and SV5 brake is put **ON**
4. After roll center sensors are on for 3 seconds, SV1 and SV5 are set **OFF**. If the roll is turned or elevated the drive and brake can be hold on if needed.
5. After roll centering is complete turn, scale or elevate the roll.
6. Delay preset value: SV3 drive is ON for 4 seconds and SV5 drive is **ON**
7. Roll triggers roll out sensor → next module drive is set **ON**
8. Roll triggers next device/module roll in sensors → previous device/module drive is set **OFF**



Picture 13. Timing sequence for MoveRoll HC/HCS-modules

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
	Waiting for roll	Rolling in	Rolling	Centering roll	Holding the roll	Accelerating out	Rolling out	Waiting the roll
	Conveyor is empty and waiting for the roll	Roll is rolling in from previous module	Keep on rolling during delay	Drive & Brake signals are ON to stop the roll	Roll is centered and hold on conveyor	Roll is accelerating out to the next module	Roll is rolling and approaching next module	Conveyor is empty and waiting for the roll
EI 1.								
EI 2.								
EO 3.								
EO 4.								
I 5.								
I 6.								
I 7.								
O 8.								
O 9.								
O 10.								
O 11.								
O 12.								

1. Roll rolling (from previous)
2. Ready (from next)
3. Roll rolling (to next)
4. Ready (to previous)
5. Roll in (sensor)
6. Roll centering (sensor)
7. Roll out (sensor)
8. Drive SV 1 (valve)
9. Brake SV 2 (valve)
10. Drive SV 3 (valve)
11. Drive SV 4 (valve)
12. Brake SV 5 (valve)

EI = External input, from PCL memory (e.g. other conveyor module) or from external sensor
 EO = External output, to PCL memory or to external output
 I = Sensor on conveyor module
 O = Pneumatic valve on conveyor module

Table 2. Timing sequence for MoveRoll HC/HCS modules

In all types of modules, it's possible to take some speed off of the incoming roll by putting **SV2 brake ON**.