Integration Manual

Integration Instructions

SLD - Single Line Diverter 24V DLD - Double Line Diverter 24V







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ELECTRICAL SPECIFICATIONS

1.1 MOTOR SPECIFICATIONS

The motors used in the diverters are small and robust motors. They work on 24 voltage, they have a nominal output of 50W and the nominal current is 2.5A. The starting current can be around 3A.



1.2 CONTROLLER CONNECTION

The controllers used in the diverters are advanced intelligence, high end networked motor drive controllers.



MDR (motor) Connection	M8 4 pin Female	
Sensor Connection	M8 4 pin Male	
Power Terminals	24VDC Power Terminals with separate connections for Logic	
	and Motors	
Power requirement	18V-30V – 120 mA Logic – 6A MDR (with 2 MDR connected)	
Power conductors	0,2 – 2,5mm² (28 - 12AWG)	
Network Link	Link Left and Link Right – RJ-45 style Ethernet network	
	connection between modules including LED Indicators	

1.3 CONNECTION DIAGRAM



1.4 BUS SPECIFICATION

Baud Rate	10 Mbps / 100 Mbps
Network Protocole	PROFINET, Ethernet I/P, Modbus/TCP, EtherCAT**
PLC type	All major PLC manufacturers (Siemens, Beckhoff, Allen Bradley,)

** specify bus protocol when ordering module



CONTROLLER INFORMATION

2.1 CONTROLLER INFORMATION

The SLD / DLD modules come standard with Conveylinx-Ai2 controllers. They support the following protocols: PROFINET, Ethernet I/P, Modbus / TCP. On request, you can also choose the Motionlinx-Ai controller when ordering, which works on the Ethercat bus protocol.

In the following document, a basic principle will be explained which variable is required for your chosen controller type. However, the method of control can be chosen entirely according to the programmer's wishes and can be expanded with additional functions depending on the need.

For the full set of variable and possibilities you can read the manuals of the specific controller at <u>https://www.pulseroller.com/downloads/</u> Here you can also find specific documents on how to connect to specific PLC brands.

ConveyLinx-Ai Family Complete Guide:

https://www.pulseroller.com/files/EU/Control%20Literature%20&%20Drawings/ConveyLi nx%20Ai/Users%20Manual%20and%20Specifications/ConveyLinx-Ai%20Family%20Complete%20Guide.pdf

For some PLC brands you also need optional files. ESI, GSDML, ... files. These can be found per controller in the software and firmware download section.

Profinet GSDML file:

https://www.pulseroller.com/files/EU/Software%20&%20Firmware%20Downloads/PLC%2 OConnectivity/PLC-%20Profinet%20GSDML%20Files/ConveyLinx%20Ai2/GSDML.zip

Ethercat ESI file:

https://www.pulseroller.com/files/EU/Software%20&%20Firmware%20Downloads/PLC%2 OConnectivity/PLC-%20EtherCat%20ESI%20Files/MotionLinx%20Ai/(Current) MotionLinx-Ai%20ESI 3-

!! Always check on the website for the latest version **!!**



2.2 CONTROLLER USAGE

An SLD or DLD module comes standard with one controller per row. A controller thus operates a row for turning as well as for the transport rollers.

From the factory, all sorting movements are connected on the left and the transport rollers on the right. The links that must be made in the software therefore relate to the left and right side of the controller.



We recommend setting the Conveylinx-Ai2 controller in Full PLC mode via the EasyRoll program. This gives you the advantage that the controller works completely as an IO-module and full control can be done by the PLC. The setting for this mode can also be found in the developer manual of the manufacturer.

The Motionlinx-Ai controller is a standard IO-module without internal logic and should therefore not be set. Here, the settings are made exclusively at PLC level.

2.3 DISK MOTOR CONTROL (LEFT PGD)

The left side of the controller is used to control the rotation of the sorter module. An homing sensor is also provided here to detect the zero point. It is recommended to perform the rotational movement with standard commands as well as the extended servo commands for positioning the discs.

The PGD-motor for the rotary movement is standard delivery of the type with gear ratio 15. This means that a full 360° rotation of the motor (30 * 15) gives 450 pulses / 360° .

The formula below can be used to calculate the angle for the number of pulses that the motor has to move for a desired angle. The mechanical ratio of the gears is 1:2.

Formula:	Pulses = (desired angle * 30 * gear ratio * 2) / 360
Example for 45°:	Pulses = (45 * 30 * 15 * 2) / 360 = 112.50

Since the value to be set is an INT, the result should be rounded to a integer value.



For the controls the following output parameters are used:

OUTPUTS	ESD (Ethercat)	Offset (Profinet)	Min	Max
Left Motor	SpeedLeft	BYTE 20(HI)/21(LO)	380	3870
Speed Reference			_	
Left Motor	AccelLeft	BYTE 24(HI)/25(LO)	10	10000
Acceleration Ramp				
Left Motor	DecelLeft	BYTE 26(HI)/27(LO)	10	10000
Deceleration Ramp				
Left Motor	BrakeModeLeft	BYTE 10(HI)/11(LO)	3 (See	3 (See
Brake Method			guide for	guide for
			detail)	detail)
Left Motor	MDRCtrlLeft	BYTE 8(HI)/9(LO)	(See	(See
Run / Reverse			guide for	guide for
			detail)	detail)
Clear Motor Error	ClearMotorError	BYTE 32(HI)/33(LO)	(See	(See
			guide for	guide for
			detail)	detail)
Left Motor Servo	ServoCtrl	BYTE 48(HI)/49(LO)	(See	(See
Command Word			guide for	guide for
			detail)	detail)
Left Motor Servo	ServoLeft	BYTE 46(HI)/47(LO)	(See	(See
Command Distance			guide for	guide for
			detail)	detail)

For the controls the following input parameters are used:

INPUTS	ESD (Ethercat)	Byte (Profinet)	Min	Max
Sensor Port Inputs	AllSensors	BYTE 2(HI)/3(LO)	BIT 00	(See
				guide for
				detail)
Left Motor Servo	ServoStateL	BYTE 42(HI)/43(LO)	(See	(See
Status			guide for	guide for
			detail)	detail)
Left Motor Status	DiagnosticLeft	BYTE 14(HI)/15(LO)	(See	(See
			guide for	guide for
			detail)	detail)

Value of speed, voltages, temperatures, etc. as a feedback from the controller can be added in the code. All these values can be found under the chapter "PLC I/O MODE ASSEMBLY INPUTS" of the developers guide. The integrator is free to choose to use these values.



2.4 ROLLER MOTOR CONTROL (RIGHT PGD)

The right side of the controller is used to control the blue transport rollers. There are only a few parameters used to be controlled. As standard it is equipped with a PGD motor type gear ratio 11. This motor has a minimum of 52 RPM and a maximum of 528.9 RPM. Some projects with diverters could be delivered with another gear ratio.

The wheel diameter of the transport rollers is 58 mm. The speed settings in the controllers should be multiplied by 10 to use in the controls. The actual speed on the rollers can be calculated with the following formula.

The minimum speed (RPM x 10) = 520 pulse which results in 0.15 m/s on the blue wheels The maximum speed (RPM x 10) = 5289 pulse which results in 1.55 m/s on the blue wheels

Formula:	v = (pi * 0.058 * RPM) / 60
Example (maximum speed):	v = (3.14 * 0.058 * 528.9) / 60 = 1.606 m/s

We calculate with a mechanical loss of max 5% so that the aforementioned value is lower than the calculated value.

OUTPUTS	ESD (Ethercat)	Byte (Profinet)	Min	Max
Right Motor	SpeedRight	BYTE 22(HI)/23(LO)	520	5289
Speed Reference				
Right Motor	AccelRight	BYTE 28(HI)/29(LO)	(See	(See
Acceleration Ramp			guide for	guide for
			detail)	detail)
Right Motor	DecelRight	BYTE 30(HI)/31(LO)	(See	(See
Deceleration Ramp			guide for	guide for
			detail)	detail)
Right Motor	BrakeModeRight	BYTE 16(HI)/17(LO)	1 (See	1 (See
Brake Method			guide for	guide for
			detail)	detail)
Right Motor	MDRCtrlRight	BYTE 14(HI)/15(LO)	(See	(See
Run / Reverse			guide for	guide for
			detail)	detail)
Clear Motor Error	ClearMotorError	BYTE 32(HI)/33(LO)	(See	(See
			guide for	guide for
			detail)	detail)

For the controls the following output parameters are used:

Value of speed, voltages, temperatures, etc. as a feedback from the controller can be added in the code. All these values can be found under the chapter "PLC I/O MODE ASSEMBLY INPUTS" of the developers guide. The integrator is free to choose to use these values.



2.5 HOMING SEQUENCE DISKS

For the correct functioning of the disks it is mandatory for the system to know in which position the disk is. The disks can be turned manually when there's no power on the controller.

The controller doesn't register this movement so it is mandatory to do a homing sequence for the disk to correct its position. In the flowchart shown below the homing sequence of the disks is described. This is the homing sequence which is implemented in the example function block.

Due to the play in the gear box and the mechanical movements, the discs could not be aligned perfectly to the desired 0° position. The angle can be adjusted by setting a small offset in degrees to the homing sequence. This will be showed in the example below and it is written in the function blocks as well.

The homing sequence should be executed multiple times during operation to be sure that the discs are aligned properly during the sortation. Ignoring the homing sequence during the operation hours is on the customers on responsibility and could affect the succession of the amount of sortation. Flowsort recommends to execute the homing sequence after the following interval:

	Low speed	High speed
	(0 – 0.75m/s)	(0.75 – 1.55m/s)
Mostly light products	100 sortation	85 sortation
(0 – 10kg)	movements	movements
Mostly heavy products	75 sortation	50 sortation
(10 – 25kg)	movements	movements



Flowchart of the homing sequence:





EXAMPLE FUNCTION BLOCK

3.1 GENERAL INFORMATION

The Flowsort function block can used to control the SLD/DLD 24V diverters. In the following PLC programming packages, the Flowsort function block is available.

- Siemens TIA V15.1 or higher with the ConveyLogix-Ai2 Controller
- Siemens Simatic Manager STEP 7 V5.6 + SP2 AND SIMATIC-SCL Professional 2017 V5.6 with the ConveyLogix-Ai2 Controller
- Allen Bradley Studio 5000 V32 or higher with the ConveyLogix-Ai2 Controller
- Beckhoff TC v3.1.4024.0 or higher with the Motionlinx-Ai Controller or with the ConveyLogix-Ai2 Controller
- Omron Sysmac Studio 1.40.0 or higher with the ConveyLogix-AI2 Controller
- Mitsubishi GX Works 2 or higher with the ConveyLogix-AI2 Controller

This document is designed to show how it is possible to control the diverter by different systems. The function block can be used in a multi-instance structures.

It is also possible to use the controller on other brands PLC's. When structured text programming language is available in the programming package, the code from the example function block can be copied and used to the project. However it is mandatory for the PLC to have one of the following network protocol available on the controller:

- ProfiNET Modbus/TCP
- Ethernet I/P EtherCAT

3.2 GENERAL FUNCTIONING

The function block is an example of the basic usage of the diverter. With the function block it is possible to send the diverter to 3 custom positions. Also a homing functionality is implemented to show how to make a reference travel to make sure the disks always start at the correct middle position.

The calculations to the desired angle from degrees to pulses are also implemented in the example function block. The functionality of the function block will be explained by the inputs and outputs of the function block.

!! Two different versions of the function block exist in the example software for the different PLC brands, The Version 3.x Function block has a better repeatable homing position due to firmware changes in the Conveylinx controller. The Version 3.x Function block however can only be used with Firmware version 6.06.0 and Higher (not 6.64.0). With lower firmware versions on the Conveylinx controller the homing function doesn't work anymore, so first upgrade the firmware of the Conveylinx controller before implementing the Version 3.x Function block!!



3.2.1 INPUT VARIABLES

Input	Datatype	Description	Additional Information	
bEnable	Bool	Enable the module roller MDR start	Enable signal to enable the module	
		rolling and disc function Enable		
bHoming_Trigger	Bool	The Homing cycle is activated by a	Only rising edge of signal is evaluated	
		positive edge at this input		
bSortPos_Execute	Bool	Execute go to selected position	Only rising edge of signal is evaluated, Disks should be homed first!	
bRoller_Execute	Bool	Start Rollers	Start Rollers	
iGearRatio_Disk	Int	Gear ratio of the PGD Motor pulse	Standard modules are supplied with engine type 15. Only adjust if	
		rotation disk	another motor type is being installed.	
iMechanicRatio_Disk	Int	Mechanical ratio of the of the system	Mechanical gear ratio. Is fixed by the manufacturer. (1:2)	
		rotation disk		
iGearRatio_Roller	Int	Gear ratio of the PGD Motor Pulse	Standard modules are supplied with engine type 11. Only adjust if	
		Roller	another motor type is being installed.	
iMechanicRatio_Roller	Int	Mechanical ratio of the system roller	Mechanical gear ratio. Is fixed by the manufacturer. (1:1)	
iRotationSpeed	Int	Rotational speed sort discs 0 - 100%	Calculated value in relation to the installed MDR type. Adjustable	
			between 0 (min. Speed, still turning) and 100% (max. Speed).	
iRollerSpeed Int Rotational speed rollers 0 - 100%		Rotational speed rollers 0 - 100%	Calculated value in relation to the installed MDR type. Adjustable	
			between 0 (min. Speed, still turning) and 100% (max. Speed).	
iSortPos_MID	Int	Sorting Position Middle	Angle in degrees for the middle position of the disks	
iSortPos_LEFT	Int	Sorting Position Left	Angle in degrees for the left sorting position of the disks	
iSortPos_RIGHT	Int	Sorting Position Right	Angle in degrees for the right sorting position of the disks	
iHomePositionOffset	Int	Offset Home Sensor to zero position	Angle in degrees for the offset of the home position to the zero	
			position of the disks	
iSortPos_Location	Int	Disc position to sort (0 = MID, 1= LEFT,	Next sort position. Value 0 = Middle position , 1 Left Position, 2 Right	
		2= RIGHT)	Position.	

3.2.1.1. Enable

The enable signal must always be enabled before any movement is possible. When the enable is **True** the release is given for the motors to move. When the enable is **False** all movements are stopped immediately and also the homing program will be aborted.

3.2.1.2. Homing Trigger

The Homing trigger will start the homing sequence described in chapter 2.5. The homing sequence will only be started on the rising edge of this signal. When the Homing trigger stays **True**, the homing sequence will not be started a second time. For the homing sequence to start the Enable must be **True**!

3.2.1.3. SortPos Execute

The Sort Position Execute signal will start the disk to go to the requested position. The Sort Position Execute will only be started on the rising edge of this signal. When the Sort Position Execute trigger stays **True**, the homing sequence will not be started a second time. For the Sortpos Execute to start the Enable must be **True** and the Disks must be Homed first!

3.2.1.4. Roller Execute

The Roller Execute signal will start the rollers to start running. When the Roller Execute signal changes to **False**, the rollers will stop running. . For the rollers to start running the Enable must be **True**!

3.2.1.5. GearRatio Disk

The gear ratio from the disks is a given value with the configuration Flowsort has delivered. It can be found in the documentation. This value will be used to convert the angle in degrees to a value in pulses which will be send to the controller.

3.2.1.6. MechanicalRatio Disk

The mechanical ratio from the disks is a given value with the configuration Flowsort has delivered. It can be found in the documentation. This value will be used to convert the angle in degrees to a value in pulses which will be send to the controller.

3.2.1.7. GearRatio Roller

The gear ratio from the Rollers is a given value with the configuration Flowsort has delivered. It can be found in the documentation. This value will be used to convert the angle in degrees to a value in pulses which will be send to the controller.

3.2.1.8. MechanicalRatio Roller

The mechanical ratio from the Rollers is a given value with the configuration Flowsort has delivered. It can be found in the documentation. This value will be used to convert the angle in degrees to a value in pulses which will be send to the controller.

3.2.1.9. Rotation Speed

The rotation speed is the rotating speed of the disks. The input value must be between 0% and 100%. When entering 0% the lowest possible speed for the motor will be send to the controller. When entering 100% the highest possible speed for the motor will be send to the controller. When the homing sequence is carried out the function block will automatically send the lowest possible speed to the controller.

3.2.1.10. Roller Speed

The roller speed is the speed of the rollers. The input value must be between 0% and 100%. When entering 0% the lowest possible speed for the motor will be send to the controller. When entering 100% the highest possible speed for the motor will be send to the controller.

3.2.1.11. Sortpos MID

The middle sorting position is basically the normal position of the disks. In most cases this will be the position of the disks when packages are going straight forward. The position can be given in degrees. The position is calculated according to the home position.

3.2.1.12. Sortpos LEFT

The Left sorting position is to sort out a package to the left track. The position can be given in degrees. The position is calculated according to the home position.

3.2.1.13. Sortpos RIGHT

The Right sorting position is to sort out a package to the right track. The position can be given in degrees. The position is calculated according to the home position.

3.2.1.14. Home Position Offset

The Home position offset is an offset that will be added to the home position. Normally this value will be 0, but when it's not possible to get the home position exactly in the middle this offset can be used to get the home position exactly in the middle.

3.2.1.15. Sortpos Location

The sort position location is the location to which the disks should be send to. There are three possibilities. The middle position is 0, the left position is 1 and the right position is 2.



For the discs to execute the position change a rising edge on the SortPos Execute is necessary!

Output	Datatype	Description	Additional Information
bSTAT_Ready_Roller	Bool	State Rollers Ready to Start	Status of Rollers Ready to Start
bSTAT_Ready_Disk	Bool	State Disk Ready for Positioning	Status of Disk Ready for Positioning
bSTAT_CommOK	Bool	State Communication to Module OK	Status Communication to Conveylinxmodule OK
bSTAT_HomingOK	Bool	State Homing of Disk executed	Status Homing of Disks executed Correctly
		Correctly	
bSTAT_InPosition_Disk	Bool	State Disk is in Position	Status Disks in Requested Position
wSTAT_DiagnosticDisk	Word	Diagnostic Status of Disk motor	Diagnostic Status of Disk motor. More info on
			controller specifically.
wSTAT_DiagnosticRoller	Word	Diagnostic Status of Roller motor	Diagnostic Status of Disk motor. More info on
			controller specifically.

3.2.2 OUTPUT VARIABLES

3.2.2.1. Ready Roller

The Ready Roller signal is a status signal for the rollers. The status signal is **True** when there are no motor faults on the roller motor, the communication with the controller is OK and when the Enable signal (input) is **True**. When one of these conditions is not met, the signal will be **false**.

3.2.2.2. Ready Disk

The Ready Disk signal is a status signal for the disks. The status signal is **True** when there are no motor faults on the disk motor, the communication with the controller is OK, the homing sequence is executed correctly and when the Enable signal (input) is **True**. When one of these conditions is not met, the ready signal will be **false**.

3.2.2.3. Communication OK

The communication OK signal is **True** when the heartbeat received from the controller keeps on toggling. When the heartbeat signal not changes status in 5 seconds then a communication fault occurred and the signal changes to **False**.

3.2.2.4. Homing OK

The homing OK signal is the signal which shows the status the homing sequence was executed correctly. The homing OK signal is always **false** after a restart or new power-up of the PLC. Also when a new homing sequence is started the signal will return to **False.** When the homing sequence is executed correctly the signal will change to **True**. When the homing sequence is aborted in the middle of the sequence the signal will stay **false**.

3.2.2.5. In Position Disk

The signal In Position Disk shows the status of the positioning action of the disk. When a positioning of the disks is started (rising edge on the SortPos Execute), the In Position signal changes to **False** and the positioning will start. When the controller gives a ready signal that the action was carried out, the In Position signal changes to **True**.

3.2.2.6. Diagnostic Disk

The Diagnostic disk status is a combination variable which shows the status of the disk motor. This diagnostic can be used to check a motor error. Each bit in the Word describes a diagnostic status of the Disk:



Bit	Description
Bit O	Motor Status (see below)
Bit 1	Motor Status (see below)
Bit 2	Port in Digital Mode
Bit 3	Reserved
Bit 4	Reserved
Bit 5	Reserved
Bit 6	Over-Voltage
Bit 7	Low Voltage
Bit 8	Overheated
Bit 9	At Maximum Torque
Bit 10	Short Circuit
Bit 11	Motor Not Connected
Bit 12	Overloaded
Bit 13	Motor Stalled
Bit 14	Hall Sensor Error
Bit 15	Motor Not Used

Motor Status:

Bit 1	Bit O	Description
0	0	Motor not Running, Standard or servo braking Applied
0	1	Motor Running in CCW Direction
1	0	Motor Running in CW Direction
1	1	Motor not Running and no braking applied (free to spin)

3.2.2.7. Diagnostic Roller

The Diagnostic roller status is a combination variable which shows the status of the roller motor. This diagnostic can be used to check a motor error. The description of the signals can be in paragraph 3.2.2.6.



3.3 PROGRAM INTEGRATION FOR SIEMENS TIA PORTAL V15.1 OR HIGHER (PROFINET)

For the use of the Flowsort 24V Diverter with a Siemens Controller (CPU1200 – CPU1500) via ProfiNET, follow the steps described below.



3.3.1 HARDWARE

To integrate the Flowsort 24V Diverter in a Siemens 1200 or 1500 Controller, first the GSDML file of the controller must be downloaded. This can be done on the Pulserollers website: <u>https://pulseroller.com/downloads/</u>. Go to Software And Firmware downloads -> PLC Connectivity -> PLC – ProfiNET GSDML files -> Conveylinx AI2 -> download the file called: GSDML.

First unzip the GSDML file, then import the GSDM file into the project. This can be done in the options menu of Tia portal under Manage General station description files.





In the following popup select the path of where the GSDML file from the diverter is downloaded and install the GSDML file. When the installation was done correctly, the device is now available in Devices & Networks -> Hardware Catalog -> Other field devices.



Drag and drop the ConveyLinx Ai in PLC mode into the network. Assign the Conveylinx object to the controller.



Now the system integrator can give the module an ProfiNET name and IP-adress.

The following Module parameters must be set in the properties of the Conveylinx-AI.



General	IO tags	Syst	tem constants	Texts		
General				Downstream IP 4:	0	^
 PROFINET in 	terface [X1]					
General			Left side			
Ethernet	addresses					
 Advance 	d options	_			Left Pin 2 invert	
Interfa	ice options				Left Pin 2 PUSH/PULL	
Nedia Pealt	redundancy	_			Left Pin 4 invert	
Port 1	[X1 P1 R]				Left Pin 4 PUSH/PULL	
Port 2	[X1 P2 R]				Reverse motor	
Identificatio	n & Maintenanc	e		Motor mode:	ECO mode(3A start / 2.8A continuous current limit)	1
Module para	ameters	_		Speed[mm/s]:	3870	
				Brake mode:	Servo brake method	
				Accel[mm]:	120	
				Decel[mm]:	120	
		•	Right side			
			hight side			
		-			Right Pin 2 invert	
					Right Pin 2 PUSH/PULL	
					Right Pin 4 invert	
					Right Pin 4 PUSH/PULL	
		_			Reverse motor	
				Motor mode:	ECO mode(3A start / 2.8A continuous current limit)	
				Speed[mm/s]:	5280	
		_		Brake mode:	Normal brake method	
				Accel[mm]:	500	
				Decel[mm]:	500	
						1

The speed and acceleration can be adapted to the application of the diverters. These settings are the settings that the controller uses after a communication fault.

After these settings are set the configuration can be downloaded to the controller. When the configuration is in the controller, the ProfiNET name needs to be assigned to the device before operation is possible.

3.3.2 SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the Flowsort folder to the project.



Also copy the datatypes in the Demo program:





The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 12 parts.

۶.	P	GetData	
۲	Ð	MotorType_Disk	
۲	ච	MotorType_Roller	
۲	ę	Set_MDR_Parameters	
۲	ę	CorrectionToPulse	
۲	ę	Enable	
۲	Ð	Homing Module	
۲	ę	Sorting	
۲	ę	Rollers	
۲	ę	Communication	
۲	ę	Status	
•	ę	SendData	

The **Get Data** parts reads out the data from the ProfiNET Device with the given Hardware Identifier

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The **set_MDR_Parameters** part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The **Enable** part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

The **Send Data** parts gets the data from the function block and sends it to the ProfiNET Device with the given Hardware Identifier

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.3.3 CONTROLLER LINK SOFTWARE TO HARDWARE

The link from the software to the hardware can be done by linking the variable of the hardware identifier or by linking the constant number of the hardware identifier to the



function block. The hardware identifiers of the module can be found under the "Devices & Network" on the device itself.

conveylinxplc ConveyLinx Ai i PLC_1	ConveyLinx Al2	



In the Properties window open the "System constants". Here the Hardware identifiers of the input and output can be found.

conve	conveylinxplc-21-20 [ConveyLinx Ai in PLC mode]								
Gen	General IO tags System constants Texts								
Show	Show hardware system constant								
	Name Type Hardware identi. Used by Comment								
, <u>ş</u>	conveylinxplc-21-20~Interface~Port_1	Hw_Interface	260	PLC_1					
, P	conveylinxplc-21-20~Interface~Port_2	Hw_Interface	261	PLC_1					
, P	conveylinxplc-21-20~Interface	Hw_Interface	259	PLC_1					
, P	conveylinxplc-21-20~Proxy	Hw_SubModule	258	PLC_1					
, P	conveylinxplc-21-20~Head	Hw_SubModule	262	PLC_1					
,	conveylinxplc-21-20-virtual_input_module_64_byte_1	Hw_SubModule	264	PLC_1					
Ş.	conveylinxplc-21-20~virtual_output_module_64_byte_1	Hw_SubModule	266	PLC_1					

The conv(.....)~virtual_input_module_64_byte_1 must be linked to the "Hardware identifier Input" and the conv(.....)~virtual_output_module_64_byte_1 must be linked to the "Hardware identifier Output". The linking can be done by selecting the tag and dragging it to the input of the function block you want to link this module to. It can also be done by just typing the number which is in the hardware identifier column at the input of the function block.





3.4 PROGRAM INTEGRATION FOR SIEMENS TIA PORTAL V15.1 OR HIGHER (MODBUS)

For the use of the Flowsort 24V Diverter with a Siemens Controller (CPU1200 – CPU1500) via Modbus, follow the steps described below.



3.4.1 HARDWARE

To integrate the Flowsort 24V Diverter in a Siemens 1200 or 1500 Controller via modbus, no hardware has to be configured. The only thing that should be configured is that the IP-adress and subnetmask that is configured in the PLC should be in range of the IP-adresses of the conveylinx modules.

3.4.2 SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the Flowsort folder to the project.



FlowSort_DemoPLC
💕 Add new device
n Devices & networks
CPU1212_Flowsort_Testtrack [CPU 1212C DC/D
CPU1212_Flowsort_Testtrack_MODBUS [CPU 1
Device configuration
况 Online & diagnostics
🔻 ⋥ Program blocks
📑 Add new block
🔁 Main [OB1]
Flowsort
FC_ValueConvertion [FC1]
Flowsort_24V_Diverter_MB [FB1]
Modbus
🕨 🔚 Program
🕨 🔂 System blocks

Also copy the datatypes in the Demo program:



The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 12 parts.

۲	ච	MotorType_Disk
×	ච	MotorType_Roller
۲	ච	Set_MDR_Parameters
۲	ච	CorrectionToPulse
۲	ච	Enable
۲	ච	Homing Module
۲	ච	Sorting
۲	ච	Rollers
۲	ච	Communication
۲	ච	Status

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The **Enable** part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.



The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.4.3 CONTROLLER LINK SOFTWARE TO HARDWARE RECEIVE DATA

The link from the software to the hardware can be done by using Modbus communication function blocks. These functionblocks must be configured with certain parameters.



For receiving modbus data, function block **MB_CLIENT** is used. To get the right data from the conveylinx module the inputs:

- MB_MODE must be set to 103
- MB_DATA_ADRR must be set to 1699
- MB_DATA_LEN must be set to 25

The data **MB_DATA_PTR** is the data that is received from the modbus client. In the example an data area is assigned to it with datatype "**CLXAiPLC_IN**". This is exactly the correct size. The other important input of the functionblock is the CONNECT input. This should be connected with a datatype "TCON IP v4" and should be configured in this way:

 					o ,
 connectParamServer	TCON_IP_v4			~	
 InterfaceId	HW_ANY	64	\checkmark	v	HW-identifier of IE-interface submodule
 ID	CONN_OUC	16#0002	\checkmark	V	🗹 📃 connection reference / identifier
 ConnectionType 	Byte	16#0B	\checkmark	~	✓ Upe of connection: 11=TCP/IP, 19=UDP (17=TCP/IP)
 ActiveEstablished 	Bool	TRUE	\checkmark	V	active/passive connection establishment
 RemoteAddress 	IP_V4		\checkmark	V	remote IP address (IPv4)
 ADDR	Array[14] of Byte		\checkmark	V	IPv4 address
 ADDR[1]	Byte	16#C0	\checkmark	v	IPv4 address
 ADDR[2]	Byte	16#A8	\checkmark	V	IPv4 address
 ADDR[3]	Byte	16#15	\checkmark	V	IPv4 address
 ADDR[4]	Byte	16#B6	\checkmark	V	IPv4 address
 RemotePort 	UInt	502	\checkmark	V	🕑 📃 remote UDP/TCP port number
 LocalPort 	UInt	0	\checkmark	V	🕑 📃 local UDP/TCP port number
			_	_	

The **interfaceID** is the hardware identifier of the IE-Interface of the configured PLC. The **ID** should be an unique ID for every connection. The **ConnectionType** should be 11 (HEX: OB). The **ActiveEstablished** should be TRUE. In the **ADDR** the IP-Adress should be set in this example: 192.168.21.182 (HEX: C0,A8,15,B6). **The RemotePort** should be 502 and the **LocalPort** should be 0.



3.4.4 CONTROLLER LINK SOFTWARE TO HARDWARE SEND DATA

For sending data via modbus the functionblocks must be configured with certain parameters.



For sending modbus data, function block **MB_CLIENT** is used. To send the data to the right place in the conveylinx module the inputs:

- MB_MODE must be set to 116
- MB_DATA_ADRR must be set to 1799
- MB_DATA_LEN must be set to 27

The data **MB_DATA_PTR** is the data that is send to the modbus client. In the example an data area is assigned to it with datatype "**CLXAiPLC_OUT**". This is exactly the correct size. The other important input of the functionblock is the CONNECT input. This should be connected with a datatype "TCON_IP_v4" and should be configured in this way:

	connectParamServer	TCON_IP_v4	E	-	\checkmark		
-00	InterfaceId	HW_ANY	64	 Image: A start of the start of	\checkmark		HW-identifier of IE-interface submodule
	ID	CONN_OUC	16#0003	 Image: A start of the start of	\checkmark		connection reference / identifier
	 ConnectionType 	Byte	16#0B	 Image: A start of the start of	\checkmark		type of connection: 11=TCP/IP, 19=UDP (17=TCP/IP)
	 ActiveEstablished 	Bool	TRUE	 Image: A start of the start of	 Image: A start of the start of		active/passive connection establishment
	 RemoteAddress 	IP_V4			✓	 ✓ 	remote IP address (IPv4)
	ADDR	Array[14] of Byte			\checkmark	 Image: A set of the set of the	IPv4 address
	ADDR[1]	Byte	16#C0		\checkmark	 Image: A set of the set of the	IPv4 address
	ADDR[2]	Byte	16#A8	Image:	\checkmark		IPv4 address
	ADDR[3]	Byte	16#15	 Image: A start of the start of	\checkmark		IPv4 address
	ADDR[4]	Byte	16#B6		\checkmark		IPv4 address
	 RemotePort 	UInt	502		\checkmark	 Image: A set of the set of the	remote UDP/TCP port number
	 LocalPort 	UInt	0		v		local UDP/TCP port number

The **interfaceID** is the hardware identifier of the IE-Interface of the configured PLC. The **ID** should be an unique ID for every connection. The **ConnectionType** should be 11 (HEX: OB). The **ActiveEstablished** should be TRUE. In the **ADDR** the IP-Adress should be set in this example: 192.168.21.182 (HEX: C0,A8,15,B6). **The RemotePort** should be 502 and the **LocalPort** should be 0.

Make sure when using the MB_CLIENT Function block multiple times that each call has an unique instance and also every call has a unique ID!

For more information on the parameters for the modbus communication use the Help function on the MB_CLIENT functionblock.



3.5 PROGRAM INTEGRATION FOR SIEMENS SIMATIC MANAGER V5.6 OR HIGHER (PROFINET)

For the use of the Flowsort 24V Diverter with a Siemens Controller (S7-300/S7-400) via ProfiNET, follow the steps described below.





3.5.1 HARDWARE

E

To integrate the Flowsort 24V Diverter in a Siemens S7-300 or S7400, first the GSDML file of the controller must be downloaded. This can be done on the Pulseroller website: <u>https://pulseroller.com/downloads/</u>. Go to Software And Firmware downloads -> PLC Connectivity -> PLC – ProfiNET GSDML files -> Conveylinx AI2 -> download the file called: GSDML.

First unzip the GSDML file, then import the GSDM file into the project. This can be done in the options menu of the Hardware configuration in Simatic Manager:

🖞 HW Config - SIMATIC 300(1)		
Station Edit Insert PLC View	Options Window Help	
D 🚅 🏪 🖷 🖏 🏼 🖓 🛛 🖻 🗊	Customize	Ctrl+Alt+E
In SIMATIC 300(1) (Configuration) -	Specify Module Configure Network Symbol Table Report System Error	Ctrl+Alt+T
2 CPU 315-2 DP X2 DP 3	Edit Catalog Profile Update Catalog	
4 H CP 343-1	Install HW Updates	
	Install GSD File	
	Find in Service & Support	
	Create GSD file for I-Device	

In the following popup select the path of where the GSDML file from the diverter is downloaded and install the GSDML file. When the installation was done correctly, the device is now available in the hardware catalog.



Drag and drop the **ConveyLinx Ai in PLC mode** into the network and assign the Conveylinx object to the controller.



🖳 HW C	onfig - [ProfiN	IET_Onboard (Co	nfiguration) Fl	owsort_Diver	ter]
💵 Static	n Edit Ins	ert PLC View	Options Win	dow Help	
0 🗳	- 8 9	4 P R	📩 🏜 📳 🗆	I 🔡 😽	
				-	
	🚡 (0) IM151-	8F PN/DP CPU			
	1		^		
	2 X1	PN-10	PN/DP CPU		
	X1 P1 R	Port 1			ProfiNET: PROFINET IO system (100)
	X1 P2 R	Port 2			
	X2	BIONS			
	3				
	5				

Now the system integrator can give the module an ProfiNET name and IP-adress.



The following Module parameters must be set in the properties of the Conveylinx-AI. Right click on Slot 0 of the module and go to the Parameters tab.

B ⊂ convertingthe a N Dividese NPP First Converting NPP First Converting T vitual agent mode	Copy Paste Insert Multi-Controller Device Replace Object Add Master System Disconnect Master System Master System Incohronous Mode Insert PROFINET IO System	Ctrl+C Ctrl+V	
XPP Peer XP2 Peer 7 vinus report mode 2 vinus report mode	Pate Insert Multi-Controller Device Replace Object Add Matter System Disconnet Master System Master System Isochronous Mode Insert PROFINETIO System	Ctri+V	
7 1 vinus route 2 vinus route 2 vinus route 1 vi	Insert Multi-Controller Device Replace Object Add Master System Disconnect Master System Master System Isochronous Mode Insert PROFINET IO System		
2 initial output modu	Replace Object Add Master System Disconnect Master System Master System Isochronous Mode Insert PROFINET IO System		
	Add Master System Disconnect Master System Master System Isochronous Mode Insert PROFINET IO System		
	Disconnect Master System Master System Isochronous Mode Insert PROFINET IO System		
	Master System Isochronous Mode Insert PROFINET IO System		
	Insert PROFINET IO System		
	Disconnect PROFINET IO System		
	PROFINET IO Domain Management		
	PROFINETIO Multi-Controller Devices		
	PROFINET IO LLDP Mode		
	PROFINET IO Isochronous mode		
	Specify Module		
	Delete	Del	
	Go To	>	
	Filter Assigned Modules		
isplays properties of the selected	Edit Symbols		
	Object Properties	Alt+Return	
	Open Object With	Ctrl+Alt+O	
	Change Access	>	
	Assign Asset ID		
	Product Support Information	Ctrl+F2	
	FAQs	Ctrl+F7	
	Find Manual	Ctri+F0	
E Downstream IP 4	Value		^
left side	•		
Left Din 2 invort			
aft Din 2 DUSH/DUU			
Eft Pin 4 invert			
El Left Pin 4 PUSH/PULL			
Reverse motor	H		
- Motor type: ECO(0) BOOST(1)			
Speed[m/s x 1000]	1000		
- ■ Break mode: BREAK(0) FREE(1)	2		
- Accelimm]	120		
_≡] Decel[mm]	120		
Right side			
(iii) Disht Dis 2 invest			
−I≅L Kight Pin Z invert			
– ≡ Right Pin 2 Invert – ≡ Right Pin 2 PUSH/PULI			
⊢≝ Right Pin 2 invert −≝ Right Pin 2 PUSH/PULL –≝ Right Pin 4 invert			
□ == right Pin 2 invert □ == Right Pin 2 PUSH/PULL □ == Right Pin 4 invert □ == Right Pin 4 PUSH/PULL □ == Reverse motor			
Inight Fin 2 Invert Invert Inght Fin 2 PUSH/PULL Inight Fin 4 Invert Inight Fin 4 PUSH/PULL Inight Fin 4 PUSH/PULL Invert Reverse motor Indoc type: FC0(0) BOOST(1)			
In sight Pin 2 InVert Invert Inght Pin 2 PUSH/PULL Inght Pin 4 Invert Inght Pin 4 PUSH/PULL Inght Pin 4 PUSH/PULL Invert Reverse motor Motor type: ECO(0),BOOST(1), Insect(m/c x 1001)	0 1000		
Hight Pin 2 invert Fight Pin 2 PUSH/PULL Eight Pin 4 invert Eight Pin 4 PUSH/PULL EightPin 4 PUSH/PULL Eight Pin 4 PUSH/PULL Eight Pin 4 PUSH/PU	0 0 0 0		
-E night Pin 2 INVET -E Right Pin 2 PUSH/PULL -E Right Pin 4 INVET -E Right Pin 4 PUSH/PULL -E Reverse motor -E Motor type: ECO(0),BOOST(1), -E Speed[m/s x 1000] -E Break mode: BREAK(0),FREE(1) -E Accelemal	0 1000 500		
-E Night Fin 2 Invert -E Right Fin 4 PUSH/PULL -E Right Fin 4 PUSH/PULL -E Right Fin 4 PUSH/PULL -E Reverse motor -E Motor type: ECO(0),BOOST(1), -E Speed[m/s x 1000] -E Speed[m/s x 1000] -E Acce[[mm] -E Acce[[mm]]	0 1000 500 500		
Inight Pin 2 invert Inght Pin 2 invert Right Pin 4 invert Right Pin 4 PUSH/PULL Right Pin 4 PUSH/PULL Reverse motor Motor type: ECO(0),BOOST(1), Speed[m/s x 1000] Break mode: BREAK(0),FREE(1) Accel[mm] Decel[mm]	0 1000 500 500		

The speeds and ramps (Accel/Decel) are send in the program so it is not necessary to set the speed in the configuration of the controller. The values used here are only used after a communication failure as "initial values".

After these settings are set the configuration can be downloaded to the controller. When the configuration is in de controller, the ProfiNET name needs to be assigned to the device before operation is possible.



3.5.2 SOFTWARE (PROFINET ONBOARD)

In the Demo program, there are two PLC's available. If a PLC with a ProfiNET interface onboard is used (where the diverters are connected to), use the blocks/UDT's/Sources in the **ProfiNET_Onboard** Project. For the integration of the Flowsort function block copy first the UDT's:

- UDT1: CLXAIPLC_IN
- UDT2: CLXAIPLC_OUT

- A Flowsort_Diverter	Object name	Symbolic name	Created in language	Size in the work me	Туре	Version (Header)
ProfiNET_CP_Card	🚔 System data				SDB	
🖻 – 🚺 CPU 315-2 DP	G 0B1		LAD	304	Organization Block	0.1
⊡ 🖅 S7 Program(1)	🖬 0B80		FBD	38	Organization Block	0.1
- Sources	G 0B82		FBD	62	Organization Block	0.1
Blocks	🖵 0885		FBD	38	Organization Block	0.1
Employee	🖬 0B86		STL	38	Organization Block	0.1
IM151-SE PN/DP CPI	G 0B121		LAD	38	Organization Block	0.1
S7 Program(2)	G 0B122		FBD	38	Organization Block	0.1
	🕞 FB1	Flowsort_24V_Diverter	SCL	2444	Function Block	2.1
- Blocks	G FC1	FC_ValueConvertion	SCL	196	Function	0.1
	🕀 DB11	iDB_Flowsort_SLD1	DB	326	Instance data block	0.0
	DDT1	CLXAiPLC_IN	STL		Data Type	0.1
	DDT2	CLXAiPLC_OUT	STL		Data Type	0.1
	✓ VAT_Test	VAT_Test			Variable Table	0.1
	SFB4		STL		System function block	1.0
	5FC14	DPRD_DAT	STL		System function	1.0
	5FC15	DPWR_DAT	STL		System function	1.0

After this want to copy the FC and FB. Because of the SCL language we first need symbol names from the symbolEditor. You are freely to change the Numbers of the FC/FB.

8) S7 P	rogram(1) (Symbols) Flowsort_Di	iverter\	SIMAT	IC 300(1)\CPL	J 315-2 DP
		Statu	Symbol 🗠	Addr	ess	Data	type	Comment
1			Always_0	М	0.0	BOOL		Always false
2			Always_1	М	0.1	BOOL		Always true
3			Clock_Byte	MB	1	BYTE		Clockbyte
4			CLXAIPLC_IN	UDT	1	UDT	1	
5			CLXAIPLC_OUT	UDT	2	UDT	2	
6			DPRD_DAT	SFC	14	SFC	14	Read Consistent Data of a Standard DP Slave
7			DPWR_DAT	SFC	15	SFC	15	Write Consistent Data to a Standard DP Slave
8			FC_ValueConvertion	FC	1	FC	1	
9			Flowsort_24V_Diverter	FB	1	FB	1	

On addition you need to copy the sources of the FC and FB.

⊟ By Flowsort_Diverter	Object name	Symbolic name	Туре
ProfiNET_CP_Card	FC_ValueConvertion		SCL source
CPU 315-2 DP	Flowsort_24V_Diverter		SCL source
E-st S7 Program[1]			
ProfiNET_Onboard			
🗄 📓 IM151-8F PN/DP CPI			
🖻 🐨 S7 Program(2)			
Sources			
Elocks			

After the copy you need to open and compile first the FC and then FB. When al this is finished without error's there is generated a FC and FB in the Blocks folder.

Note: If you copy the FC and FB from the example project from the Blocks instead of the Sources it's easy to monitor and modify the block. Still it should work.

The Flowsort function block is freely accessible for the integrator to adapt. The example SCL source function block is divided in 12 parts.



The **Get Data** parts reads out the data from the ProfiNET Device with the given Hardware Identifier

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The **Enable** part stops all the movements of the motors when the enable is not "TRUE". The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

The **Send Data** parts gets the data from the function block and sends it to the ProfiNET Device with the given Hardware Identifier

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.5.3 SOFTWARE (PROFINET CP-CARD)

In the Demo program, there are two PLC's available. If a PLC with a ProfiNET interface with a CP-card is used (where the diverters are connected to), use the blocks/UDT's/Sources in the **ProfiNET_CP_Card** Project. The rest of the steps are identical to the steps described in paragraph 3.4.2.



3.5.4 CONTROLLER LINK SOFTWARE TO HARDWARE (PROFINET ONBOARD)

The link from the software to the hardware can be done the start address of input and output find in the hardware configuration.

	Edit Insert	PLC	View O	ptions	Windo	w H	lelp			
D 🚅 🔓 🛛	n 💀 🚑		a 🟜	ŵ []	() 🗆	8	\?			
	(0) IM151-8F F 2 (1) (1) P1 R (1) P2 R 2 2	PN/DP CI PN-IO Port 1 Port 2 Port 3	₽U -8F PN/A	DP CPU		~	-	ProfiNET: PP	IOFINET IO sys (I) CLAIF Conveyting Al	tem (100)
() ()	CLAIPLC					_			1	
(1)	CLAIPLC Module			Order n	umber			I Address	Q address	Diagnostic Addre
(1)	CLAIPLC Module CLAIPLC			Order n <i>Conve</i>	umber øLins Au	;		I Address	Q address	Diagnostic Addre
(1) Slot	CLAIPLC Module CLAIPLC Interface			Order n Conves	umber øLins A	,		1 Address	Q address	Diagnostic Addre 1942* 1947*
(1) Slot <i>V</i> <i>X</i> 7 <i>F</i> 7 <i>X</i> 7 <i>F</i> 7	CLAIPLC Module CLAIPLC Interface Fort 1 Ent 2			Order n <i>Conve</i> j	umber øLins Au	;		Address	Q address	Diagnostic Addre 7042* 7041 * 7040*
(1) Slot <i>P</i> X1 X1 X1 F1 X1 F2 I	CLAIPLC Module CLAIPLC Interface Part 1 Part 2 Vietual incret o	at le 64	×.	Order n Convey	umber øLinx A	; 		I Address	Q address	Diagnostic Addre 2042* 2041* 2040* 2039*

In this example are the input and output start address 0. The "LADDR_Input" and the "LADDR_Output" needs to be linked with these start addresses in hexadecimal format. (0 Decimal = 0 HEX but 100 decimal = 64 HEX.)



3.5.5 CONTROLLER LINK SOFTWARE TO HARDWARE (PROFINET CP-CARD)

When a CP-card is used the data from the devices must be read and write by the PNIO_RECV and PNIO_SEND blocks from Siemens. With this function block all data from the CP-card is read and write.

The Adress from the PNIO_Send/PNIO_Receive function blocks can be read out in the Hardware configuration:

Image: Big And Configuration (Configuration) Flowsort_Divert Image: Big And Configuration (Configuration) Flowsort_Divert	er]
	Profinet: PROFINET IO systen (100)

In this example the CPLADDR is **W#16#100**. Use Mode **B#16#0**. The LEN parameter depends on the number of Modules needs to be read out. 1 diverter needs 64 bytes, in this example 3 diverters are configured so 3x64 = 192 bytes. The Data area for the data of the diverters is put at the RECV IO from the function block. This data area needs to be linked to the Flowsort Function block.

3.6 PROGRAM INTEGRATION FOR BECKHOFF TWINCAT V3.1.4024.0 OR HIGHER

The Flowsort 24V Diverter can be controlled with a MotionLinx-Ai Controller or a Conveylinx-Ai2 controller. For the Conveylinx-Ai2 controller a ProfiNET IO Controller option must be added to the configuration.

3.6.1 MOTIONLINX-AI CONTROLLER HARDWARE

To integrate the Flowsort 24V Diverter in a Beckhoff Controller, first the ESI file of the controller must be downloaded. This can be done on the Pulserollers website: <u>https://pulseroller.com/downloads/</u>. Go to Software and Firmware Downloads -> Plc Connectivity-> Plc- Ethercat ESI Files -> MOTIONLINX AI and download the file called: ESI

Now the ESI file must be placed into the installation folder of TwinCat. Normally this should be: *C:\TwinCAT\3.1\Config\Io\EtherCAT*. But can be different when TwinCAT is installed in another folder. Extract the ESI file and copy the XML file into this folder.

TWINCAT TWINSAFE PLC SCOPE TOOLS WINDOW HELP Windows ۲ TwinCAT RT (x64) - | 🎜 Activate Configuration 🔹 🛫 🖔 Untitled1 Restart TwinCAT System Restart TwinCAT (Config Mode) Reload Devices 📉 Scan Toggle Free Run State Show Online Data Show Sub Items K Hide Disabled Items Software Protection.. Access Bus Coupler/IP Link Register... Update Firmware/EEPROM Show Realtime Ethernet Compatible Devices... File Handling Selected Item ٠ EtherCAT Devices ۲ Update Device Descriptions (via ETG Website)... TcProjectCompare Reload Device Descriptions Target Browser Manage User Defined Whitelist... ۲ Manage User Defined Blacklist... Bode Plot ۲ Filter Designer ۲ About TwinCAT

In the TwinCAT IDE now "Reload Device Descriptions" in TWINCAT under EtherCAT Devices.

Now the MotionLinx-Ai controller can be added to the project. In the project under I/O -> Devices, go to the EtherCAT master at which the Motionlinx-Ai controller is connected to and then push insert. The following popup will be shown:

Insert Ether	rCAT Device					×
Search:		Name:	Box 1	<u>M</u> ultiple:	1	OK
<u>Т</u> уре:	P Sof Beckhoff Autom Soft Industrial Softwar D Soft Industrial Softwar D Soft Industrial Softwar D Soft Industrial Softwar L	ation GmbH & re tware Device tw:Ai PLCmoo	Co. KG			Cancel Port A D B (Ethernet) C
	Extended Information	[Show Hidden Devices		Show Sub	Groups
	Check Connector	l	Show preconfigured De	vices (SCI)		

Select the MotionLinx-AI PLCmode and click OK. Now the MotionLinx-Ai Controller is added to the project. In the Solution Explorer the MotionLinx-Ai Controller is available with all the data.

3.6.2 MOTIONLINX-AI CONTROLLER SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the FlowSort_24V_Diverter_EtherCAT and the ValueConvertion into the project.

The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 12 parts.

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The Enable part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.6.3 MOTIONLINX-AI CONTROLLER LINK SOFTWARE TO HARDWARE

The link from the software to the hardware can be done directly or by a global variable. In the example project all "hardware" variables are firstly linked to a global variable, this variable is then linked to the input of the function block.

To link the variables directly, go to the controller and right-click on variable and click on change link. Here you can directly select the instance to which you want to attach the "hardware" variable to. In the table below the input/output variables with their "hardware" variable links are shown.

Input	Datatype	Hardware Variable
bMDR_Homing_Sensor_Disc	Bool	Module Inputs_AllSensors.0
bMDR_Heartbeat	Bool	Module Inputs_AllSensors.15
sMDR_DiskDiagnostic	Uint	Module Diagnostic_DiagnosticLeft
sMDR_RollerDiagnostic	Uint	Module Diagnostic_DiagnosticRight
iMDR_DistanceDisc	Uint	Module Inputs_PositionLeft
wMDRStatusDisk	Usint	Module Inputs_ServoStateL
wMDRStatusRoller	Usint	Module Inputs_ServoStateR
Output	Datatype	Hardware Variable
iMDR_Speed_Disc	Uint	Motor Setup_SpeedLeft
iMDR_BrakeMode_Disc	Usint	Motor Setup_BrakeModeLeft
iMDR_Acc_Disc	Uint	Motor Ramps_AccelLeft
iMDR_Dec_Disc	Uint	Motor Ramps_DecelLeft
iMDR_Speed_Roller	Uint	Motor Setup_SpeedRight
iMDR_BrakeMode_Roller	Usint	Motor Setup_BrakeModeRight
iMDR_Acc_Roller	Uint	Motor Ramps_AccelRight
iMDR_Dec_Roller	Uint	Motor Ramps_DecelRight
iMDR_ControlMotor_Disc	Usint	Motor Setup_MDRCtrlLeft
iMDR_ServoCTRL_Disc	Uint	Servo/Periphery_ServoCtrl
iMDR_ControlDistance_Disc	Uint	Servo/Periphery_ServoLeft
iMDR_ControlMotor_Roller	Usint	Motor Setup_MDRCtrlRight

For the correct functioning of the function block it is mandatory that the variables are linked according to this table.

3.6.4 CONVEYLINX-AI2 CONTROLLER HARDWARE

To integrate the Flowsort 24V Diverter in a Beckhoff Controller, , first the GSDML file of the controller must be downloaded. This can be done on the Pulserollers website: <u>https://pulseroller.com/downloads/</u>. Go to Software And Firmware downloads -> PLC Connectivity -> PLC – ProfiNET GSDML files -> Conveylinx AI2 -> download the file called: GSDML.

Now the ConveyLinx-Ai2 controller can be added to the project. In the project under I/O -> Devices, go to the ProfiNET master at which the Conveylinx-Ai2 controller is connected to and then push insert. The following popup will be shown:

Insert Box		
Туре:		Ok Cancel Multiple: 1 ★
Name:	Box 25	

Select the PROFINET IO Device under miscellaneous and click OK. Now select the folder where the unpacked GSDML file is located. Select the .XML file and click Open. The following popup will be shown. Select the **ConveyLinx Ai in PLC mode** and click OK.

Insert Device		
Module DAPs Type:	Device Access Point Onveyor Control with topology and full PLC	OK Cancel
	ConveyLinx Ai in ZPA mode ConveyLinx Ai in PLC mode ConveyLinx Ai in reduced PLC mode ConveyLinx Ai Merger ConveyLinx Ai in reduced ZPA mode ConveyLinx Ai in PLC mode with Convey ConveyLinx Ai in PLC mode with Convey ConveyOr Control with EasyRoll configuration	
Comment:		

Now the Conveylinx-AI2 Controller is added to the project. In the Solution Explorer the Conveylinx-AI2 Controller is available with all the data. The data is available in the API as an Array of 64 Bytes.

Make sure that the checkbox **Swap LOBYTE and HIBYTE** is checked! This can be found under the controller -> API -> Term (Virtual input module 64 byte) -> Inputs -> Inputs. Double click on the Inputs and go to the tab "Flags". Check the checkbox **Swap LOBYTE and HIBYTE.** Do this also for the outputs!

Under the API go to Term (DAP Module) and go to the Subterm (ConveyLinx AI in PLC mode). Go to the tab "Parametrize Module".

The following Module parameters must be set in the properties of the Conveylinx-AI2.

Left side_Motor mode -> ECO Mode

Left side_Brake mode -> Servo brake method

Right side_Motor mode -> ECO mode

Right side_Brake mode -> Normal brake method

The speeds and ramps are send in the program so it is not necessary to set the speed in the configuration of the controller. The values used here are only used after a communication failure as "initial values".

3.6.5 CONVEYLINX-AI2 CONTROLLER SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the FlowSort_24V_Diverter_ProfiNET and the ValueConvertion into the project.

Also copy the data unit types from the Demo program to the project:

🔺 🗁 DUTs CLXAiPLC_IN AllSensors (STRUCT) Convey_stop_status (STRUCT) LeftMDRDiagnostic (STRUCT) Carl RightMDRDiagnostic (STRUCT) SensorDetect (STRUCT) CLXAiPLC_OUT Contraction (STRUCT) Control (STRUCT) Carl RightMDRasDIO (STRUCT) Control (STRUCT) ConsorPolarity (STRUCT) SensorPortsDO (STRUCT) CLXAiPLC_IN (STRUCT) CLXAIPLC_OUT (STRUCT)

The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 12 parts.

4	न Flo	wSort_24V_Diverter_ProfiNET (FB)
		Communication
		CorrectionToPulse
		Enable
		Homing_Module
		Motortype_Disk
		Motortype_Roller
		Rollers
		Set_MDR_Parameters
		Sorting
	≧ À	Status

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The Enable part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.6.6 CONVEYLINX-AI2 CONTROLLER LINK SOFTWARE TO HARDWARE

The link from the software to the hardware can be done directly or by a global variable. In the example project all "hardware" variables are firstly linked to a global variable, this variable is then linked to the input of the function block.

To link the variables directly, go to the controller and right-click on variable and click on change link. Here you can directly select the instance to which you want to attach the "hardware" variable to. The array of 64 Bytes in the hardware can be linked directly to the data unit type's CLXAiPLC_IN and CLXAiPLC_Out while they are the same size.

For the linking make sure the checkbox "Matching Size" in "Show Variable Types" is checked. Then all the instances of the Function block will be shown. Link the Inputs and the Outputs to the function block.

Input	Datatype	Hardware Variable
iMDR_Hardware	CLXAIPLC_IN	Inputs
Output	Datatype	Hardware Variable

Make sure that the checkbox **Swap LOBYTE and HIBYTE** is checked! This can be found under the controller -> API -> Term (Virtual input module 64 byte) -> Inputs -> Inputs. Double click on the Inputs and go to the tab "Flags". Do this also for the outputs!

For the correct functioning of the function block it is mandatory that the variables are linked according to this table.

3.7 PROGRAM INTEGRATION FOR ALLEN BRADLEY STUDIO 5000 V32 OR HIGHER

For the use of the Flowsort 24V Diverter with a Allen Bradley CompactLogix/ControlLogix, follow the steps described below.

	SLD functionblock	
Flowsort_24V_Diverter		
Flowsort_24V_Diverter F	B_Control_Module_10_20	
bEnable	1	-(bStat_Ready_Roller)-
huanian Trianan	DE O Unerine Chart	(hold Death Dire)
bHoming_1rigger	BII_3_HomingStart	-(DStat_Ready_Disc)-
hSortDos Executa	Sorting Execute	(hStat_CommOK)
boonti ba_Excouto	0 the	(botat_conniorty
bRoller Execute	BIT4 StartRollers	-(bStat HomingOK)-
-	- 04	
iGearRatio_Disk	M1020_DiskType	-(BStat_InPositionDisc)
	15 🕈	
iMechanicRatio_Disk	2	
IGearRatio_Roller	M1020_RollerType	
iMachanicDatio, Dollar	11 -	
IMECHANICRAND_RONEI	I	
iRotationSpeed	M1020 DiskSpeed	
	100 🗲	
iRollerSpeed	M1020_RollerSpeed	
	80 🖛	
iSortPos_MID	Sort_Pos_Middle	
	0 🖛	
ISORTPOS_LEFT	Sort_Pos_Left	
CortDon DICHT	-45	
ISUTPOS_RIGHT	301_P05_Right 45 4	
iHomePositionOffset	Pos Correction Servo	
	20 🕈	
iSortPos_Location	Sorting_Posto_Execute	
	0 🖛	
I_Hardware	Module_10_20:I1	
O_Hardware	Module_10_20:01	
wSTAT_DiagnosticDisc	0 🖛	
WSTAT_DiagnosticRoller	0 🗭	

3.7.1 HARDWARE

To integrate the Flowsort 24V Diverter in a CompactLogix or ControlLogix Controller, first the EDS file of the controller must be downloaded. This can be done on the Pulserollers website: <u>https://pulseroller.com/downloads/</u>. Go to Software and Firmware Downloads -> PLC Connectivity -> PLC – Ethernet IP Files -> Conveylinx AI2 -> Latest, and Download the file: EDS & AOI Vx x

Now the EDS file must be imported into the project. This can be done in the Tools menu of the Logix Designer under EDS Hardware Installation Tool. The Following Popup will be shown:

Click Next in this Popup. In the next window Select "**Register an EDS file**" and click next. In the next window select "**Register a single file**" and Browse to the directory where the unpacked EDS file is located and click Open. When the directory is chosen click next. When the path was OK the Installation Test Result will be good. Again click next in this popup. In the following popup it is possible to edit the image of the module. This is not necessary. Again click next in this window. In The final Task summary an overview is shown of the files that are going to be registered:

Rockwell Automation's EDS Wizard		x
Final Task Summary This is a review of the task you want to complete.	A.	
You would like to register the following device.		
	< Voine Volgende > Anni Jeren	

Again click next. After this a confirmation of the successfully registered EDS file will popup. Click Finish to complete the procedure.

The Controller is now available to add to the ethernet/IP network. Click on the Ethernet/IP network where the Motionlinx controller is going to be connected to and click "**New Module**" In the following popup the Conveylinx module can be searched:

AI2		Cle	ar Filters		Hide Filter	s 🛠
Module Type Ca	tegory Filters		▲ 🗹 Module Ty	pe Vendor Filters		•
AC Drive Device Analog CIP Motion Conv Communication	rerter		Advanced Cognex Co Danfoss Dialight	Energy Industries, Inc. rporation		
<	III	•	<			•
Catalog Number	Description			Vendor	Category	
Ai2	Ai2-5xx			Insight Automati	Generic Devi	ce(keya
<		m				4

Choose the **AI2** and click on **Create**. The "New Module" popup will be shown. Here the name and IP address can be set by the integrators wishes.

Now the correct connection parameters need to be set. This can be done in the module definition window, click **Change.** In the window Module Definition that will popup the connection needs to be "**PLCIO**". The Sizes of the input and output are defined by the connection. However the Type needs to be changed to "**INT**". For the integrator it is possible to set a tag suffix to the hardware.

Module Definition*						×
Revision: 5	•	001 🌲				
Electronic Keying: Compa	·					
Connections:						
Name		Size		Tag Su	ffix	
PL CIO	Input:	25	INT	1 🔺	AI:11	
FLCIO	Output:	27		•	AI:01	
Select a connection 👻						
			ОК		Cancel	Help

When the settings are correct, click **OK**. A Confirmation popup will be shown that the module definitions will be changed, Click **Yes.** In the New Module popup also Click **OK**. Now the module is available in the I/O configuration.

3.7.2 SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the Add-On Instructions folder to the project.

The In/Output datatype of the Function block will be automatically generated when the module is add in the hardware.

The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 11 parts.

∃(Get Data) з 6 7 ∃[(MotorType_Disk) 50 51 88 ∃(Set MDR Parameters) 89 97 ∃(CorrectionToPulse) 98 106 107 ∃(Enable) 118 ∃ (Homing Module) 119 224 225 ∃(Sorting) 265 266 ∃(Rollers) 272 273 283 284 ∃(Status)

The **Get Data** parts reads out the data from the Ethernet/IP Device with the given Hardware data and convert the data to values.

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The **Enable** part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.7.3 CONTROLLER LINK SOFTWARE TO HARDWARE

The link from the software to the hardware can be done by double clicking on the "I_hardware" or "O_hardware". A Dropdown menu appears.

L_Hardware	?	-
O Hardware		
wSTAT_Diag	0 🕈	
wSTAT_Diag	0 🕈	

Click on the arrow and a popup will appear where the "hardware" module can be selected.

-	•			-
	Name	-8	Data Type	Usage
1	▶ DLD_24V_002:11		_055C:Ai2_1F7F96C5:I:0	<controller></controller>
ľ	▶ SLD_24V_001:11		_055C:Ai2_1F7F96C5:I:0	<controller></controller>

Select the module that needs to be linked to the function block. Do the same for the "O_Hardware" parameter.

Now the function block is linked to the module in the hardware configuration.

3.8 PROGRAM INTEGRATION FOR OMRON SYSMAC STUDIO 1.40.0 OR HIGHER

For the use of the Flowsort 24V Diverter with a Omron CPU Unit, follow the steps described below.

3.8.1 HARDWARE AND LINK TO SOFTWARE

To integrate the Flowsort 24V Diverter in a Omron Controller with Sysmac Studio, first the EDS file of the controller must be downloaded. This can be done on the Pulserollers website: <u>https://pulseroller.com/downloads/</u>. Go to Software and Firmware Downloads -> PLC Connectivity -> PLC – Ethernet IP Files -> Conveylinx Al2 -> Latest, and Download the file: EDS & AOI Vx x

Now the EDS file must be placed into the installation folder of Sysmac Studio. Normally this should be:

C:*Program Files* (*x86*)*OMRON**Sysmac Studio**IODeviceProfiles**EipConnection**Eds*. But can be different when Sysmac Studio is installed in another folder. Extract the Zip file and copy the EDS file into this folder.

In the Multiview Explorer go to Programming -> Data -> Global Variables. In this window create an Input variable with datatype **ARRAY[0..24] OF INT** and an Output variable with datatype **ARRAY[0..26] OF INT**.

Global Variables X									
Grou	Group Filter 🝸 (No group) 🔻								
	Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment	
	SLD_001_0	ARRAY[026] OF INT					Output 🔻		
2000	SLD_001_I	ARRAY[024] OF INT					Input 🔻		

Open the Ethernet/IP connection settings via Tools -> Ethernet/IP connection settings. In the window that opens select the Ethernet/IP Device at which you want to connect the Diverter to. Right-click on the device and click "**edit**".

In the opened Ethernet/IP connection settings window, Click on "**Registration All**". In the opened window select the In and Output tags you want to register, and click "**Register**".

Tag Set Registration Setting —										
Select the variables to set.										
	Variable Name	Data Type	Size		Comment					
	▼ Input Tag									
	SLD_001_I	ARRAY[024] OF WORD	50							
	▼ Output Tag									
	SLD_001_O	ARRAY[026] OF WORD	54							
<										
Check	Selected Items Uncheck Selected	ltems			Register Cancel					

Now the tags are registered. Now go to the Connection window in the Ethernet/IP connection settings window.

In the Connection window at the right hand side the toolbox is located. In this window click on the "+" to add a new target device. In the window fill in the Node address of the Diverter and select the model name and revision. The model name should be:

Toolbox possess		• 1
Node address	192.168.1010_	
Model name	Ai2-5xx	-
Revision	5	

When the settings are filled in correctly click "Add" at the bottom of the toolbox.

Now the target device is added in the toolbox. Drag and drop the device in the connections table.

As Connection I/O Select "**PLCIO**" as target variable select **107** for the Input and **108** for the Output. As Originator Variable select the Tag sets that are registered. When all the settings are filled in correctly everything will have a light blue color. When a setting is pink that means that the setting is not correct.

Now the connection is configured and linked to the software. Make sure the Node address (IP) is correctly configured on the controller of the diverter.

3.8.2 SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the Function blocks from the example project to the project.

Also copy the datatypes structures from the example project to the project.

== root						
Structures		Name	Base Type	I Offset Type	Offset Byte	I
Union	►	Ai2_Module	STRUCT	NJ		
Enumerated	►	Ai2_Module_In_Raw	STRUCT	NJ		
	►	Ai2_Module_Out_Raw	STRUCT	NJ		
	►	Ai2_Module_In_UDT	STRUCT	NJ		
	►	Ai2_Module_Out_UDT	STRUCT	NJ		

The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 11 parts.

The **Get/Send Data** parts reads out the data from the Ethernet/IP Device and sends the data to the Ethernet/IP device with the given Hardware data and convert the data to values . The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the function block to the value in pulses to send to the controller

The **Enable** part stops all the movements of the motors when the enable is not "TRUE". The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx-Ai2 module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the function block.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

3.9 PROGRAM INTEGRATION FOR MITSUBISHI GX WORKS 2 OR HIGHER

For the use of the Flowsort 24V Diverter with a Mitsubishi Q Series Controller via Modbus, follow the steps described below.

·					
			Flowsort_1		
·			Flowsort		
·	 M5000 —— 	bEnable		bStat_CommOK	M5004
·	 M5001 —— 	bHoming_Trigger		bStat_HomingOK	M5005
·	 M5002 —— 	bRoller_Execute		BStat_InPositionDisc	M5006
•	 M5003 —— 	bSortPos_Execute		bStat_Ready_Disc	M5007
	· · ·15	iGearRatio_Disk		bStat_Ready_Roller	M5008
·	· · ·11—	iGearRatio_Roller		wSTAT_DiagnosticDisc	D15001
·	· · · 0 ——	iHomePositionOffset		wSTAT_DiagnosticRoller	D15002
·	· · · 2—	iMechanicRatio_Disk		iMDR_Speed_Disc	D6010
·	· · · 1——	iMechanicRatio_Roller		iMDR_BrakeMode_Disc	D6005
·	· · ·80	iRollerSpeed		iMDR_Acc_Disc	D6012
·	· · ·80	iRotationSpeed		iMDR_Dec_Disc	D6013
·	· · -60	iSortPos_LEFT		iMDR_Speed_Roller	D6011
·	· D15000	iSortPos_Location		iMDR_BrakeMode_Roller	D6008
·	· · · 0 ——	iSortPos_MID		iMDR_Acc_Roller	D6014
·	· · ·60	iSortPos_RIGHT		iMDR_Dec_Roller	D6015
·	·D1001.0	bMDR_Homing_Sensor_Disk		iMDR_ControlMotor_Disc	D6004
·	·D1001.F	bMDR_Heartbeat		iMDR_ServoCTRL_Disc	D6024
·	· D1007	sMDR_DiscDiagnostic		iMDR_ControlDistance_Disk	D6023
·	· D1011	sMDR_RollerDiagnostic		iMDR_ControlMotor_Roller	D6007
·	· D1019	iMDR_DistanceDisc			
	· D1021	wMDRStatusDisk			
	· D1022	wMDRStatusRoller			

3.9.1 HARDWARE

To integrate the Flowsort 24V Diverter in a Mitsubishi Q-Series Controller via modbus the following settings should be configured (in this example we used a QJ71MT91 card). The settings can be configured under the Intelligent Function Module in the project tree.

-		t.
	🗄 👍 0040:QJ71MT91	l
		l
	Basic_Parameter(Preferred_node_specification(MODBUS(R)/TCP_Setting))	
	- 🚱 Automatic_Communication_Parameter	l
	MODBUS_Device_Assignment_Parameter	
	Auto_Refresh	

The Basic Parameters (Preferred node specification) should be configured as follows:

MODBUS/TCP Setting	The parameter setting concerning the MODBUS/TCP setting.
Local Slave Station Port No.	502
Target Slave Port No. for Automatic Communication Function	502
PLC Response Monitoring Timer Value	10

Then the automatic Communication Parameters should be configured as follows (per Device):

Automatic Communication Parameter	Set the automatic communication parameters when using the automatic			
Automatic Communication Parameter 1	The parameter setting concerning the automatic communication.			
Target Station IP Address	192.168.202.20			
Module ID	255			
Repetition Interval Timer Value	10			
Response Monitoring Timer Value	0			
Type Specification of The Target MODBUS Device	0505h:Read/Write Holding Registers			
- Read Setting	The parameter setting concerning reading data from slave.			
Head Buffer Memory Address	1000 h			
Target MODBUS Device Head	1699			
Access Points	25			
- Write Setting	The parameter setting concerning writing data to slave.			
Head Buffer Memory Address	3000 h			
Target MODBUS Device Head	1799			
Access Points	27			

The IP-adress of the device depends on the configuration of the conveylinx module. The type specification of the Target Modbus device must be **0505h**. The Head Buffer memory address of the Read settings and write settings can be set customer specific these are the memory addresses in the PLC buffer where the modbus data will be stored. This address must be unique within the Automatic Communication Parameters. This Adress is not the address that is used in the PLC! This address is in the Auto Refresh parameter which is explained later. The Target MODBUS Device Head Number must be **1699** for the Read settings and **1799** for the Write settings. This is the address of the Modbus holding registers in the Conveylinx module. The Access Points for the Read settings must be **25**, and for the write settings this must be **27**. These are the number of registers that are read/written in the Conveylinx module.

For adding more Conveylinx modules the same parameters with a different IP-Address and with different Head Buffer memory addresses.

3.9.2 CONTROLLER LINK SOFTWARE TO HARDWARE RECEIVE DATA

The Auto_Refresh settings are customer specific:

	Item	
	Transfer to PLC	The data of the buffer memory is transmitted to the specified device.
	Auto Communication Function Buffer Input	D1000 (0,2150)
	Auto Communication Function Operation Status Storage Area (Parameter 1 to 64)	
	User Setting Area (Input)	
Transfer to Intelligent Function Module		The data of the specified device is transmitted to the buffer memory.
	Auto Communication Function Buffer Output Area	D6000 (0,2150)
	User Setting Area (Output)	

This means that the data configured in de Function Buffer Input is stored from PLC-address D1000 till address D3150 (these are the data read from the Conveylinx modules). The data configured in the Function Buffer Output is stored from PLC-address D6000 till address D8150 (these are the data that is written to the Conveylinx modules).

3.9.3 SOFTWARE

In the Demo program, the following blocks are available. For the integration of the Flowsort function block, copy the Flowsort function block to the project.

The Flowsort function block is freely accessible for the integrator to adapt. The example function block is divided in 12 parts.

The **MotorType_Disk** part scales the speed values from the disk from 0 - 100% to pulses to send to the controller

The **MotorType_Roller** part scales the speed values from the rollers from 0 - 100% to pulses to send to the controller

The set_MDR_Parameters part sets some default settings to the controller

The **CorrectionToPulse** part recalculates the angles on the input of the functionblock to the value in pulses to send to the controller

The Enable part stops all the movements of the motors when the enable is not "TRUE".

The **Homing Module** part is a step program which makes the disks do a reference travel and set a new zero position.

The **Sorting** part is the part where the positioning of the disks is handled.

The **Rollers** part is where the starting and stopping of the rollers is handled.

The **Communication** part checks if the communication with the Conveylinx module is still online.

The **Status** part checks the status of the disk and the rollers and outputs them on the functionblock.

For the exact functioning of the function block, the example code is supported with comments on what certain parts of the code do. The code is just an example on how to start with the Flowsort diverter and is freely accessible for the integrator to adjust.

APPENDIX A – UPDATING THE FIRMWARE

Flowsort has improved the movements of the controls in multiple ways. One of them is that the firmware for the Conveylinx-Ai2 controller is created especially for our 24V diverters. Along with the supplier of the controllers, Flowsort has developed a special firmware which will improve the start and stop movements of the discs.

The controllers on the diverters with the old firmware need to be upgraded manually. The new firmware has to be upgraded by the EasyRoll program. This can be done for the complete line of controller in a sequence or for one single separate controller. To upgrade the firmware, follow the following steps.

Step 1:

Download and open the EasyRoll program. It can be downloaded on the website of the supplier of the controllers: <u>https://www.pulseroller.com/downloads</u>. Go to SOFTWARE AND FIRMWARE DOWNLOADS -> FIRMWARE -> CONVEYLINX AI2 -> LATEST VERSION, Download the file: ConveyLinxAi x x x

Download the Flowsort firmware here or ask the Flowsort team for the newest files: <u>https://www.flow-sort.com/images/files/downloads/ConveyLinxAI_5_6_2-FLOWSORT.bin</u>

Step 2:

Make a connection to the controllers by typing in the IP-address of the controller. Click on refresh to get the controller alive.

EasyRoll Version 4.19 (US)	- 🗆 X
Network IP: 120 X From Node #: 1 - + Set All Serial Number:	Refersh Advanced Dialog Connected
Upstream Zone ZPA Mode: Set All Clear Jam Error @ GAP Timer: sec Set Jam error Counter: Accept time: sec Set Jam error Counter:	Downstream Zone ZPA Mode: Set All Error and Information GAP Timer: sec Set Jam Error: T-zone Accept time: sec Set Set Jam error Counter: Settings
Dynamic Release Termination Disable Sensor Jam Auto Clear Dynamic Release Control Disable Anrival Timeout Set All Disable Anrival Jam Reset Delay Arrival/Departure: Left MDR Error and Information Motor Type: Set All Sensor Connection Error: Set All Sensor Connection Error: Set All Sensor Gain Error method: Set All Set All Sensor Gain Error:	Dynamic Release Termination Disable Sensor Jam Auto Clear Dynamic Release Control Disable Arrival Timeout Set All Disable Arrival Jam Reset Delay Disable Manual Operations Disable Sensor Jam Reset Delay Arrival/Departure: Right MDR Set All Set All Set All Set All Set All Set All Sensor Connection Error Sensor Sain Sensor Connection Error Sensor Sain Sensor Sain Sensor Connection Error
speed a set Set All Motor Connector Error and Motor Connector Error and Motor Connector Error and the firmware on the controlle	Speed: % Set Set All Motor Connector Error: Voltage drop <18V): Motor short-circuit: Motor short-circuit: Motor short-circuit: Motor short-circuit: Motor short-circuit: Motor short-circuit: Motor short-circuit:
(i.e. controllers on roller conveyors / b	elt conveyors)
Lurrent: mA Motor Sensor Error: Operating time: min Motor Temperature: C Motor Error Counter: Module Temperature: C Overvoltage(>30/y; C	Uurrent: mA Motor Sensor Error: Operating time: For the diverters delivered Motor Temperature: after 12-2020, the firmwall Umaraded before delivered Umaraded before delivered

Step 3:

Click on Advanced Dialog, a new window will open. Go to the Upgrade tab. Click on Browse...

ar EasyRoll Version 4.18 (US)	Current IP: 192.168.21.20	– 🗆 X
Network IP: 192 . 168 . From Node #: 1 To Node #: Serial Number: 306329	21. XX Blink&Wrink Diagnostic 4 • Set All Refresh Advanced Dialogo You can use both portrol and	
Firmware Version: 5.04.0	nveyLinx Advanced Dialog	×
Left Link 🔍 🔍 Right L	192 168 21 20 1 4 + Befresh	
ZRA Mode: Circulation	Special Services Pin2 Lleage Flav Zone Sensore Futancione	pr and Information
Zi A Mode. Singulation	Look Ahead & Timing Upgrade Connections Network Services	ear Jam Error: 🔘
GAP Timer: 0.00 sec	Firmware .BIN file location:	Jam error Counter: 0
T-zone 0.00 sec Accept time: 0.00 sec Settings Disable Arrival Jam Rese Disable Sensor Jam Res Arrival/Departure: 0/0 Left MDR Motor Type: Senergy-Ai ECO Brake Method: Normal	Browse Selected Devices: (4) 192:168:21:20 192:168:21:21 192:168:21:21 Upload One 192:168:21:22 Upload ALL Abort Uploading Abort Uploading	Jam Auto Clear Timeout Set All Operations Accumulate Error and Information sor Connection Error: Sensor Cain Error Connection Error:
Real Speed: 0.000 r Speed: 1.000 r Cw//CCW: Cw Acceleration: 30 Deceleration: 30 r		Error Counter: 0 fotor Connector Error: © Voltage drop (<18V): © Motor short-circuit: © Max. Torque: © Dureloadt ©
		Motor stalled: O
Current: 0 mA	Motor Sensor Error: 🔍 🛛 Current: 🔍 má.	Motor Sensor Error: 🔍
Operating time: 7 min	Overheat: Operating time: 4 min	Overheat: 🔍
Motor Temperature: <40 *C	Motor Error Counter: 0 Motor Temperature: <40 °C N	Motor Error Counter: 0
Module 55 °C	Overvoltage(>30V): Module Temperature: 55 °C	Overvoltage(>30V): •

Step 4:

Select and open the Flowsort firmware (*ConveyLinxAI_5_6_2 – FLOWSORT.bin*). Click only on Upload ALL to upgrade all the controllers for the diverters in the sequence at once. Do not upgrade the controllers of other equipment (i.e. roller conveyors / belt conveyors)!

Network IP: 192 . 168 .				- 🗆 X	
	21 . 🗙	Blink&Wink	No		
From Node #: To Node #:	4 + Set All	Refresh	INO	C	
Serial Number:		Close Dialog	Conne	ected	
Firmware Version:	veyLinx Advanced Dialog		×		
Upstream Zone	192.168.21.20	+ Refresh			
ZPA Mode:	Special Services Pin2	Usage Flex Zone Senso	rs Extensions	pr and Information	
GAP Timer:	Look Ahead & Timing	Upgrade Connections	Network Services	ear Jam Error: O	
T-zone	Firmware .BIN file location:	auliavAL5.04.0 bin	- Press	Jam error Lounter:	
Accept time: sec	D. ConveyLinkAl2riniwale(Conve	eyunxalojo4jorom	Browse		
Dynamic Belease Termin	192.168.21.20				
Dynamic Release Contro	192.168.21.21 192.168.21.22 -	Upload One	Convouliny		OWCODT him
🔲 Disable Arrival Jam Rese	192.168.21.23	Upload ALL Abort L	JonveyLinxA	1_5_0_2 - FLC	
Disable Sensor Jam Res	•				
Arrival/Departure:	NOTE: You can select multiple dev	vices via Network Services, "Upgrade FW" b	utton.	Accumulate	
Left MDR	Output: Uploading Convey invol. 5, 04, 0	bin to 192 168 21 20 (83456 of 410228)		Error and Information	
Motor Type:	Uploading ConveyLinxAI_5_04_0	bin to 192.168.21.21 (83456 of 410228)		nsor Connection Error: O	
Brake Method:	Uploading ConveyLinxAI_5_04_0).bin to 192.168.21.22 (63456 of 410228)		Sensor Gain	
1				Error Counter:	
Speed					
				fotor Connector Error: 🔍	
CW/CCW:				Voltage drop (<18V): 🔍	
Acceleration: s				Motor short-circuit: O	

Step 5:

Wait for the program to show "Done" after every node. Now the upgrade to the Flowsort firmware has been succeeded.

EasyRoll Version 4.18 (US)				- 🗆 ×	
Network IP: 192 . 168 From Node #: 1 To Node Serial Number: Firmware Version:	. 21 . XX # 4 · + Set All	Blink&Wink Refresh Close	^{ced} No ^{ced} Conn	ot ected	
Upstream Zone ZPA Mode: GAP Timer: sec T-zone Accept time: sec Settings	192.168.21.20 Special Services Look Ahead & Timing Firmware .BIN file location: D:\ConveyLinxAi2Firmware\C Selected Devices: (4)	4 • Refresh Pin2 Usage Flex Zone Upgrade Upgrade Connections onveyLinxAl_5_04_0.bin	Sensors Extensions Network Services Browse	or and Information ear Jam Error: @ Jam error Counter:	
Dynamic Release Termir Dynamic Release Contro Disable Arrival Jam Rese Disable Sensor Jam Bes	192.168.21.20 192.168.21.21 192.168.21.22 192.168.21.23	Upload One Upload ALL	ConveyLinx	41_5_6_2 — FLC	WSORT.bin
Arrival/Departure: Left MDR Motor Type: Brake Method: Speed: Speed: Speed: Scw/CCW: Cw/CCW: Comparison: Speed:	NOTE: You can select multiple Output: Upgrading 192 168 21 20 wil Upgrading 192 168 21 21 wil Upgrading 192 168 21 21 wil Upgrading 192 168 21 23 wil	v devices via Network Services, "Upgrad h FW file ConveyLinxA1_5_04_0 bin revit h FW file ConveyLinxA1_5_04_0 bin revit h FW file ConveyLinxA1_5_04_0 bin revit h FW file ConveyLinxA1_5_04_0 bin revit	e FW" button. iion 5.04 Done. iion 5.04 Done. iion 5.04 Done. Done.	Accumulate Error and Information sor Connection Error: Error: Error: Error Counter: fotor Connector Error: Voltage drop (<18V): Motor short-circuit: Max. Torque: Overload: Motor stalled:	
Current:	A Moto	r Sensor Error: 🖤 🛛 Current: 🔰	mA	Motor Sensor Error:	
Operating time: n Motor Temperature: • Module • Temperature: •	in RUNN D No D Over	Overheat: Operating time: tor Error Counter: Temperature: voltage(>30V): Module Temperature: Temperature:	nin UN tC N tC	Overheat: ♥ Motor Error Counter: Overvoltage(>30V): ♥	

Please note that if you upgrade firmware, all of each module's settings (motors, speeds, acceleration, deceleration, etc.) are preserved.

Only upgrade the firmware on the controllers in the diverters! Do not upgrade the firmware on the controller on other equipment (i.e. controllers on roller conveyors / belt conveyors)