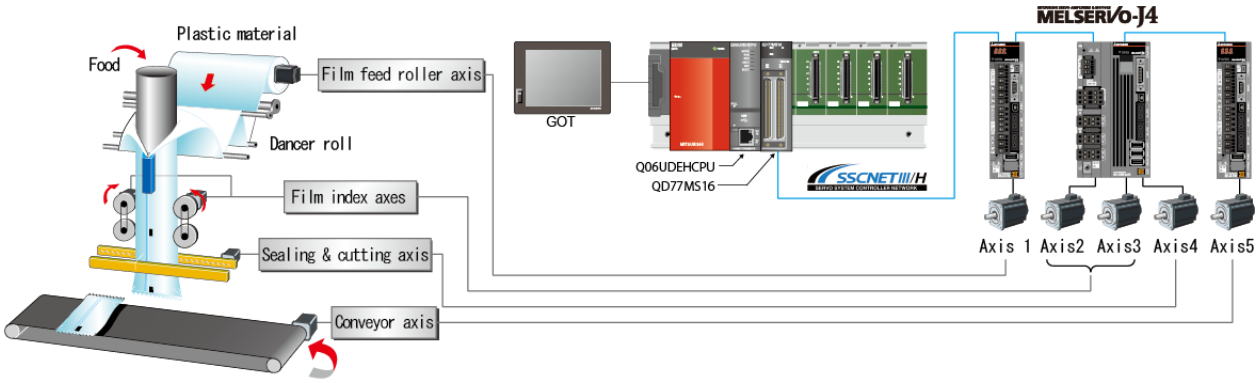
Vertical packaging machine

[System configuration]



[Mitsubishi solution]

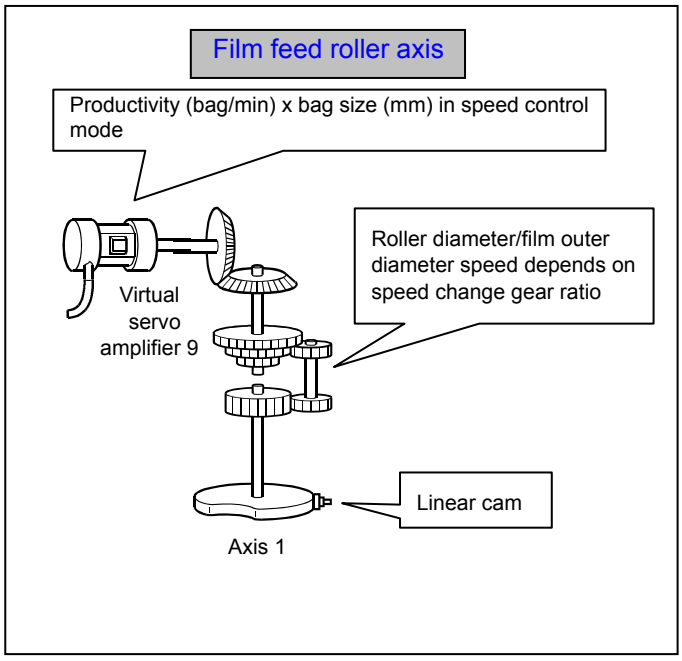
PLC CPU: Q06UDEHCPU **Simple Motion module: QD77MS16** **GOT: GT165*-V**
Main base: Q35DB **Servo amplifier: MR-J4-B, MR-J4W3-B** **Servo motor: HG-KR, HG-SR**
Engineering environment: MELSOFT GX Works2 (PLC), MELSOFT GT Works3 (GOT)

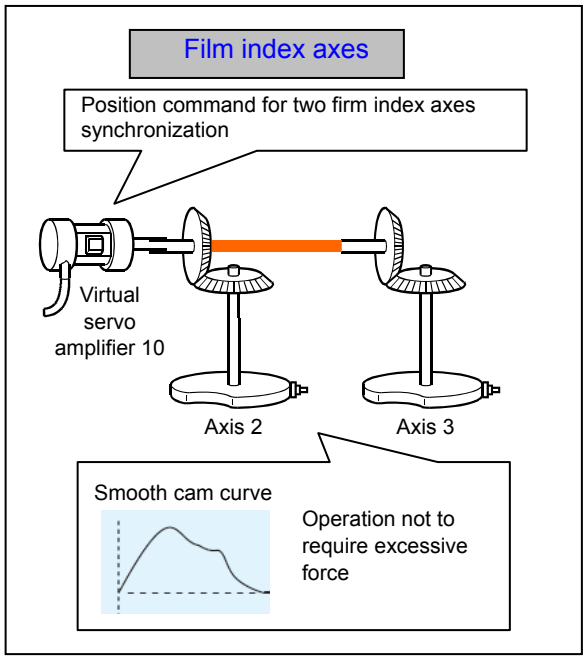
[Operation description]

The film feed roller axis supplies the packaging film material. The film from the film feed roller axis is bonded in the vertical direction and formed into a bag while the film index axes feeds enough film to match the bag size. The sealing & cutting axis seals the top of the bag which is then transported by conveyor.

[Control points]

Point 1: By using the speed change gear module of advanced synchronous control, the speed of film feed roller axis is controlled to ensure that speed is constant even when outer diameter changes.
(Note): The control to detect outer diameter is not included in this sample program.
Point 2: Both film index axes can be synchronized based on the virtual position command that the virtual servo amplifier generates.
Point 3: The use of cam control makes film index axis feed/stop operations smoother.





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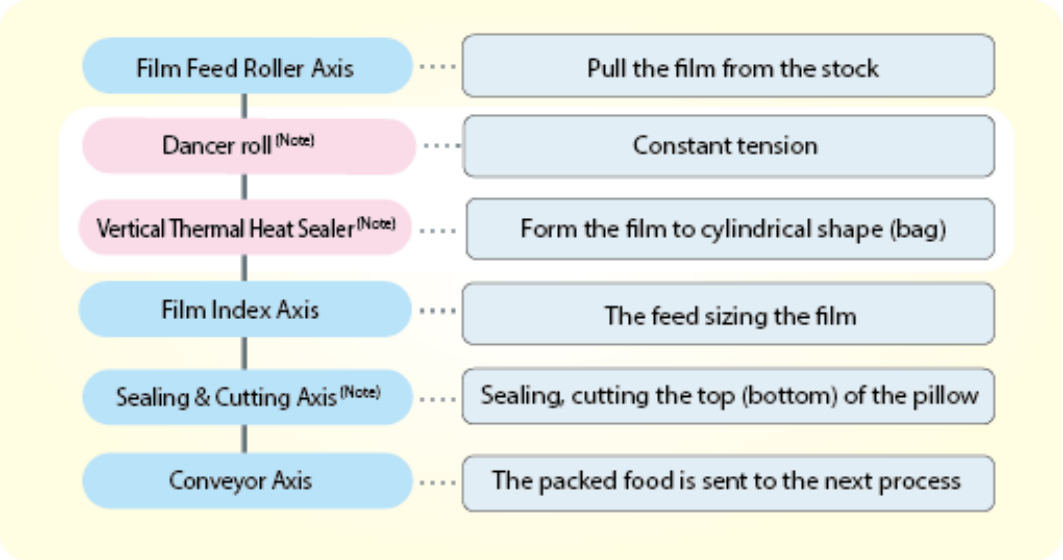
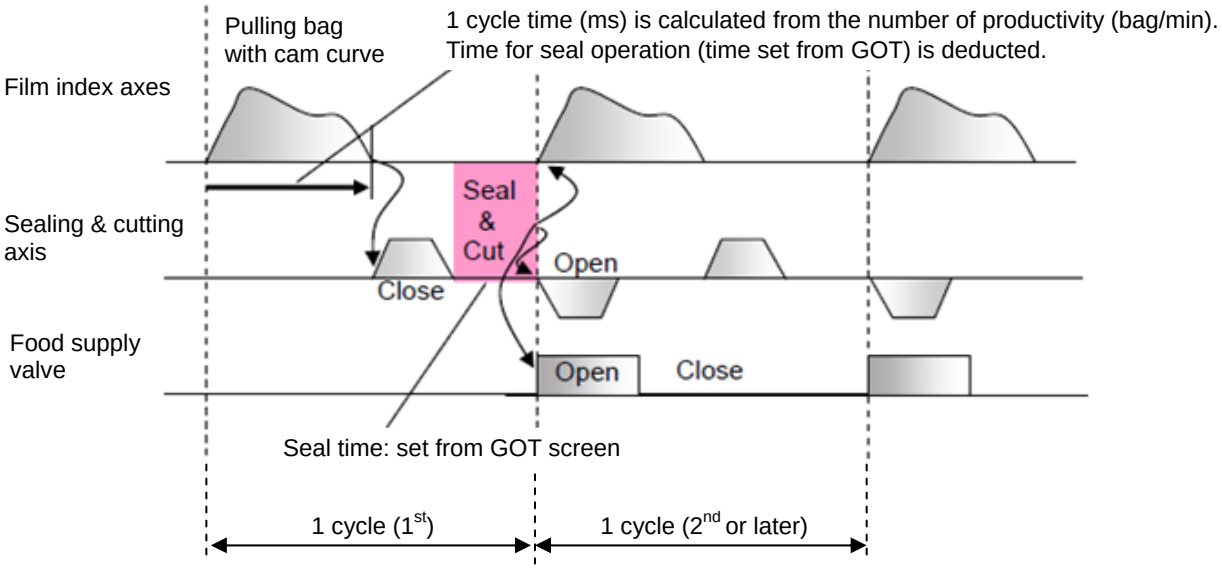
[Operation flow]



(Note): Film tension control with the dancer roll, the temperature adjustment function on the vertical thermal heat sealer and sealing & cutting axis, and the open/close control of food supply valve are not included in this sample program.

[Operation time chart]



[Using the sample program]

[Sample program configuration]

File name	Description	Model	Programming tool
Vol1_VFFS_PLC.gxw	Ladder program	Q06UDEHCPU	MELSOFT GX Works2
Vol1_VFFS_Motion.pcw	Motion setting file	QD77MS16	
Vol1_VFFS_GOT.GTW	GOT monitoring data	GT165*-V (640x480)	MELSOFT GT Works3

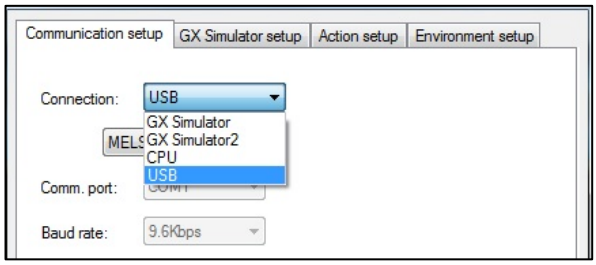
(Note): Equipment other than the servo amplifiers and servo motor in the system configuration (page 1) are required to operate sample program. Remove the circuit of amplifier-less operation function when connecting a servo amplifier to check the operation (page 8).

[Start-up]

1. Decompress the downloaded files to any folder in your PC.
2. Double clicking decompressed files to open the corresponding engineering tool.
3. Ladder program and GOT monitoring data as default are set for English environment. When using Japanese environment, it's possible to switch to Japanese for ladder program in GX Works2 [Tool] - > [Select Language] menu and for GOT monitoring data in GT Designer 3 Language change the preview column from [2] to [1].
4. Change the model settings according models to be used.
5. Write the sample program data to PLC CPU, Simple Motion and GOT.
6. After writing all the programs, reset the PLC CPU. When writing all programs was completed, reset the PLC program.

[Operating method]

Start operation by using the GOT touch button.
When you do not have GOT, operate the device with the appropriate touch button in GX Works3's simulator function (Note) or GX Works2's device test function.
(Note): When using GX Works3's simulator function, click on the "communication setup" tab of "Simulator setup" and select "USB" or "CPU(RS-232)" from the pull-down menu of "connection".



1. When you start-up the system, on the GOT screen press "Reset system" button to perform home position return operation. Home position return complete lamp turns on when operation is completed.
2. After home position return operation is completed, press "Start Automatic" button, then automatic operation is started. Automatic operation is also stopped by pressing "Start Automatic" button.
3. Each axis can be operated independently by using the JOG touch buttons.

	Operation	GOT touch key	Device No.
1	Home position return start	[Main] Reset System	B1
2	Automatic operation start/stop	[Main] Start Automatic	B0
	Automatic operation setting	[Setting] Pieces	W10
		[Setting] Bag Length	W12
		[Setting] Sealing Stroke	W14
		[Setting] Sealing Time	W16
3	Film feed roller axis JOG forward	[Main] FWD	B11
	Film feed roller axis JOG reverse	[Main] REV	B12
	Film index axis JOG forward	[Main] ▲	B21
	Film index axis JOG reverse	[Main] ▼	B22
	Sealing & cutting axis JOG forward	[Main] ▶◀	B41
	Sealing & cutting axis JOG reverse	[Main] ◀▶	B42
	Conveyor axis JOG forward	[Main] FWD	B51
	Conveyor axis JOG reverse	[Main] REV	B52

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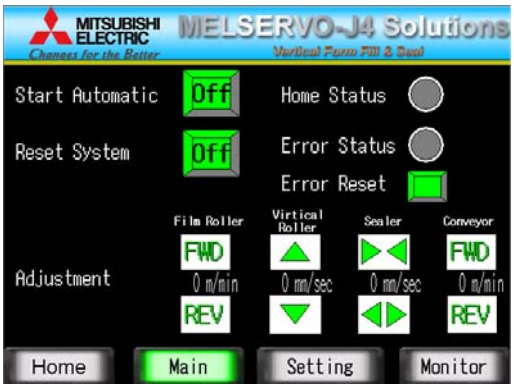
[GOT : Home screen]

[GOT : Main screen]



[GOT : Setting screen]

[GOT : Monitor screen]

[Operation check method]

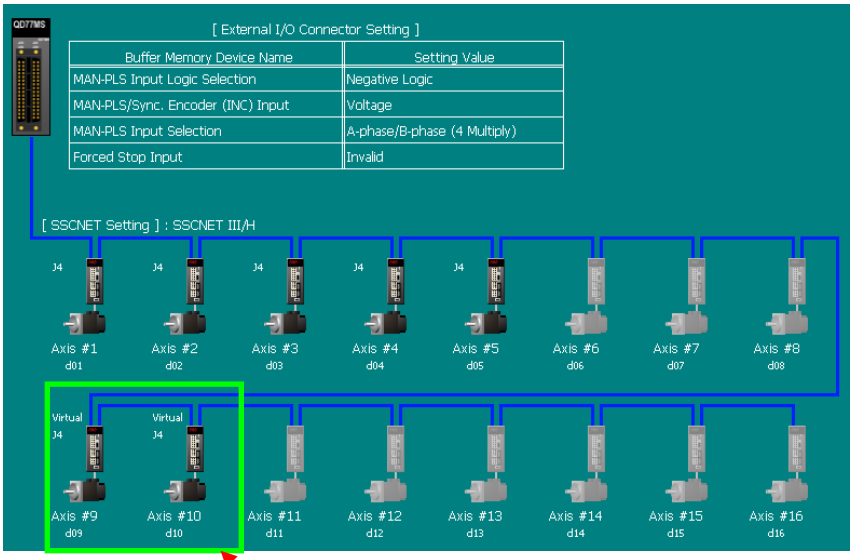
1. Start the digital oscilloscope function of Simple Motion module setting tool.
2. A trigger condition is automatic operation start (B0). During automatic operation, speed waveform of each axis is registered.
3. Check collected waveforms with operation pattern.

⚠Cautions

- When diverting the sample program to the actual system, be sure to verify that there are no problems with control in the system.
- Add interlock conditions in the target system where considered necessary.

[Simple Motion settings]

[System settings]



Virtual servo amplifier

- Axis 1:: Film feed roller (MR-J4-B)
- Axis 2: Film index axis 1 (MR-J4-B)
- Axis 3: Film index axis 2 (MR-J4-B)
- Axis 4: Sealing & cutting axis (MR-J4-B)
- Axis 5: Conveyor axis (MR-J4-B)

- Axis 9: Film feed roller (Virtual servo amplifier)
- Axis 10: Film index (Virtual servo amplifier)

[Parameters]

- Movement amount for 1 motor revolution
  - Film feed roller/conveyor axis : 20mm/rev (Circumference of film feed roller axis is 600[mm] (roll diameter 190,00[mm], gear ratio 1/30))
  - Film index axis/sealing & cutting axis : 40mm/rev

- Speed limit value
  - Film feed roller/conveyor axis : 20mm/rev × 3000r/min = 60000mm/min (if bag length is 400mm productivity is 150 bags/min)
  - Film index axis/sealing & cutting axis : 40mm/rev × 3000r/min = 120000mm/min (double the max line speed)

Item	Axis #1	Axis #2	Axis #3	Axis #4	Axis #5	Axis #9	Axis #10
Basic parameters 1	**Set according to the machine and applicable motor when system is started up. (This parameter become valid when the PLC READY signal [Y0] turns from OFF to ON.)**						
Pr.1:Unit setting	0:mm	0:mm	0:mm	0:mm	0:mm	0:mm	2:degree
Pr.2:No. of pulses per rotation	4194304 PLS	4194304 PLS	4194304 PLS	4194304 PLS	4194304 PLS	4194304 PLS	4194304 PLS
Pr.3:Movement amount per rotation	20000.0 µm	40000.0 µm	40000.0 µm	40000.0 µm	20000.0 µm	1000.0 µm	360.00000 degree
Pr.4:Unit magnification	1:x1 Times	1:x1 Times	1:x1 Times	1:x1 Times	1:x1 Times	1:x1 Times	1:x1 Times
Pr.7:Bias speed at start	0.00 mm/min	0.00 mm/min	0.00 mm/min	0.00 mm/min	0.00 mm/min	0.00 mm/min	0.000 degree/min
Basic parameters 2	**Set according to the machine and applicable motor when system is started up.**						
Pr.8:Speed limit value	60000.00 mm/min	120000.00 mm/min	120000.00 mm/min	120000.00 mm/min	60000.00 mm/min	50000.00 mm/min	2000000.000 degree/min
Pr.9:Acceleration time 0	500 ms	50 ms	50 ms	100 ms	500 ms	500 ms	1 ms
Pr.10:Deceleration time 0	500 ms	50 ms	50 ms	100 ms	500 ms	500 ms	1 ms
Detailed parameters 1	**Set according to the system configuration when the system is started up. (This parameter become valid when the PLC READY signal [Y0] turns from OFF to ON)**						
Detailed parameters 2	**Set according to the system configuration when the system is started up. (Set as required.)**						
OPR basic parameters	**Set the values required for carrying out OPR control. (This parameter become valid when the PLC READY signal [Y0] turns from OFF to ON)**						
Pr.43:OPR method	6:Data Set Method	6:Data Set Method	6:Data Set Method	6:Data Set Method	6:Data Set Method	6:Data Set Method	6:Data Set Method
Pr.44:OPR direction	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direc...	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Dire...	0:Forward Direction (Address Increase Direction)
Pr.45:OP address	0.0 µm	0.0 µm	0.0 µm	0.0 µm	0.0 µm	0.0 µm	0.00000 degree
Pr.46:OPR speed	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.001 degree/min
Pr.47:Creep speed	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.01 mm/min	0.001 degree/min
Pr.48:OPR retry	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch	0:Do not retry OPR with Limit Switch
OPR detailed parameters	**Set the values required for carrying out OPR control. (This parameter become valid when the PLC READY signal [Y0] turns from OFF to ON)**						
Expansion parameters	**Set according to the system configuration when the system is started up. (This parameter become valid after power supply ON or reset of PLC CPU.)**						

Blue: Default value
Black: Set value

[Positioning data]

: Value that could be changed by PLC ladder program

Axis 4: Sealing & cutting axis

No.1 Home position return (position after homing)

No.2 Automatic operation

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M code
1	0:END	01h:ABS Linear 1	-	0:100	0:100	0.0 µm	0.0 µm	10000.00 mm/min	0 ms	0
	<Positioning Comment>Home position									
2	0:END	01h:ABS Linear 1	-	0:100	0:100	200000.0 µm	0.0 µm	90000.00 mm/min	0 ms	0
	<Positioning Comment>Seal&Cut Position									

During automatic operation, positioning is executed using the open/close position (set value) alternatively.
Open: 0.0µm, Close: 200000.0µm

Axis 5: Conveyor automatic operation

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M code
1	0:END	04h:FWD V1	-	0:500	0:500	0.0 µm	0.0 µm	1000.00 mm/min	0 ms	0
	<Positioning Comment>									

Line automatic operation speed setting (productivity (bag/min) x bag size (mm))

Axis 9 Virtual servo amplifier: Film feed roller axis synchronous control

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M code
1	0:END	04h:FWD V1	-	0:500	0:500	0.0 µm	0.0 µm	1000.00 mm/min	0 ms	0
	<Positioning Comment>									

Axis 10 Virtual servo amplifier: Film index axes roller axis synchronous control

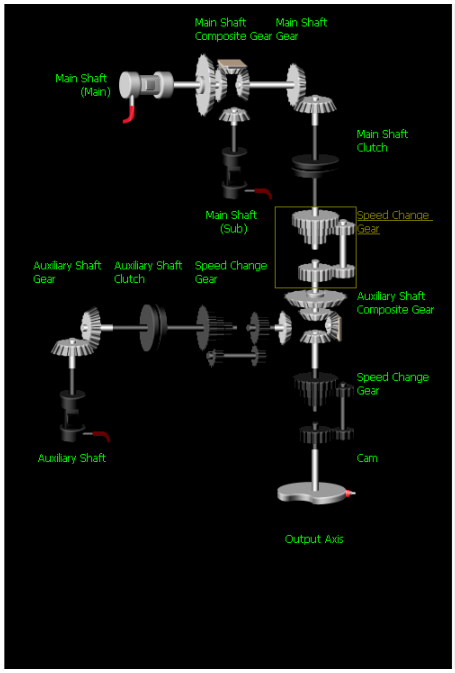
No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M code
1	0:END	02h:INC Linear 1	-	0:1	0:1	360.00000 degree	0.00000 degree	21600.000 degree/min	0 ms	0
	<Positioning Comment>									

Acceleration/deceleration time is adjusted to currently executed cam pattern (virtual servo amplifier 10). That's why acceleration/deceleration time is set to 1ms.

The one pitch feed time (one cam cycle time) for film index roller axis is calculated from the productivity setting during automatic operation and sealing & cutting axis operating time.

[Synchronous control parameters]

Axis 1: Film feed roller



Item	Setting value
Synchronous control module setting	Set each module parameter.
Main shaft	
Main input axis	
Pr.400:Type	1:Servo Input Axis
Pr.400:Axis No.	9
Sub input axis	
Pr.401:Type	0:Invalid
Pr.401:Axis No.	0
Main shaft composite gear	
Pr.402:Main	1:Input+
Pr.402:Sub	0:No Input
Main shaft gear	
Pr.403:Numerator	1
Pr.404:Denominator	1
Main shaft clutch	
Auxiliary shaft	
Auxiliary shaft composite gear	
Auxiliary shaft gear	
Auxiliary shaft clutch	
Speed change gear	
Pr.434:Speed change gear arrangement	1:Main Shaft Side
Pr.435:Speed change gear smoothing time constant	10 ms
Speed change ratio	
Pr.436:Numerator	19099
Pr.437:Denominator	19099
Output axis	
Cam axis cycle unit	
Pr.438:Unit setting selection	0:Use Units of Main Input Axis
Pr.438:Unit	0:mm
Pr.438:Number of decimal places	0
Pr.439:Cam axis length per cycle	1.0000 mm
Pr.441:Cam stroke amount	1000.0 µm
Pr.440:Cam No.	0
Pr.444:Cam axis phase compensation advance time	0 µs
Pr.445:Cam axis phase compensation time constant	10 ms
Pr.446:Synchronous control deceleration time	0 ms
Pr.447:Output axis smoothing time constant	0 ms
Synchronous control initial position parameter	Set the parameter for the initial alignment when starting the synchronous control.

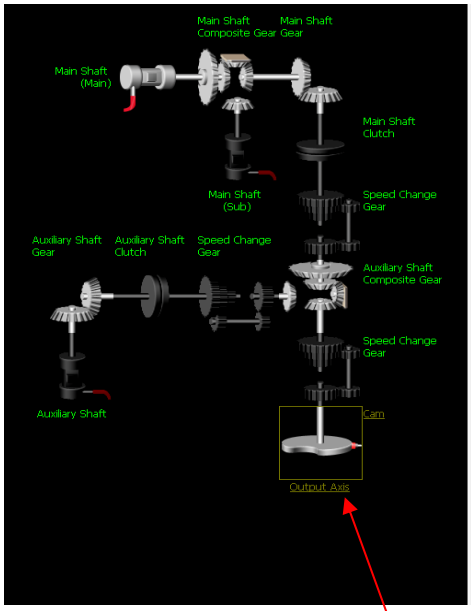
Set main input axis to virtual servo axis 9.
Productivity (bag/min) x bag size (mm) in speed control mode.

Gear ratio settings

$$\frac{\text{Roll size (190.99mm) x100mm}}{\text{Film outer diameter (***.**mm) x100mm}}$$

"Pr.437" should be updated according to measured value of film outer diameter to keep constant circumferential velocity.

Axis 2, Axis 3: Film index axes



Item	Setting value
Synchronous control module setting	Set each module parameter.
Main shaft	
Main input axis	
Pr.400:Type	1:Servo Input Axis
Pr.400:Axis No.	10
Sub input axis	
Pr.401:Type	0:Invalid
Pr.401:Axis No.	0
Main shaft composite gear	
Pr.402:Main	1:Input+
Pr.402:Sub	0:No Input
Main shaft gear	
Pr.403:Numerator	1
Pr.404:Denominator	1
Main shaft clutch	
Auxiliary shaft	
Auxiliary shaft composite gear	
Auxiliary shaft gear	
Auxiliary shaft clutch	
Speed change gear	
Pr.434:Speed change gear arrangement	0:No Speed Change Gear
Pr.435:Speed change gear smoothing time constant	0 ms
Speed change ratio	
Pr.436:Numerator	1
Pr.437:Denominator	1
Output axis	
Cam axis cycle unit	
Pr.438:Unit setting selection	0:Use Units of Main Input Axis
Pr.438:Unit	0:mm
Pr.438:Number of decimal places	0
Pr.439:Cam axis length per cycle	360.00000 degree
Pr.441:Cam stroke amount	100000.0 µm
Pr.440:Cam No.	0
Pr.444:Cam axis phase compensation advance time	0 µs
Pr.445:Cam axis phase compensation time constant	0 ms
Pr.446:Synchronous control deceleration time	0 ms
Pr.447:Output axis smoothing time constant	0 ms
Synchronous control initial position parameter	Set the parameter for the initial alignment when starting the synchronous control.

Set main input axis for two film index axes (2, 3) to set the same virtual servo axis 10 for synchronization purpose.

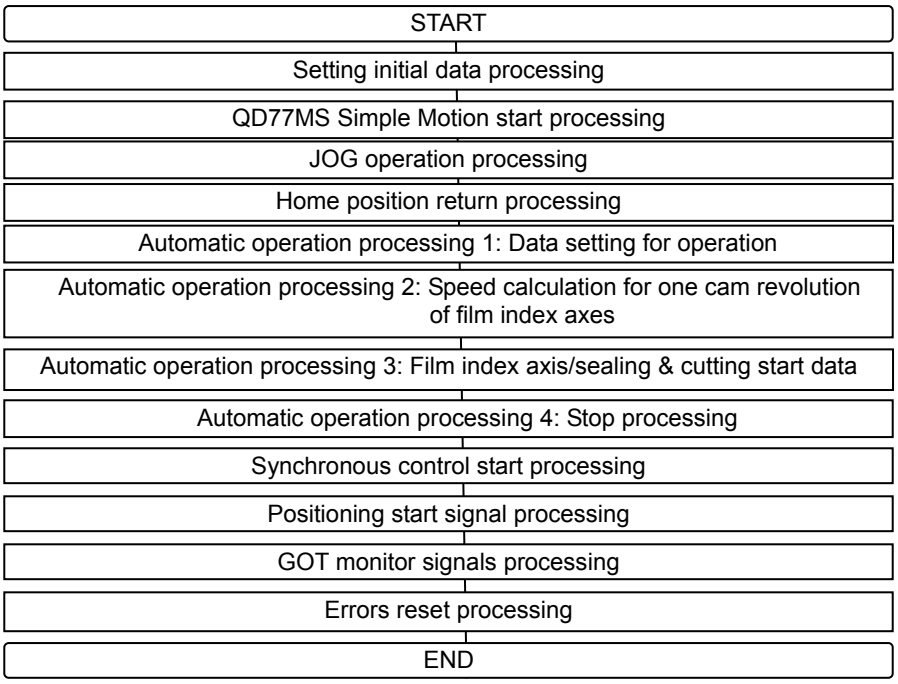
Set Pr. 441 so that one cam cycle (360 degrees) is the stroke amount that achieves the bag size.

Cam pattern

Main input axis (virtual servo axis 10) for one cam revolution (360 degree) moves film index axes (axis 2,3) according to cam pattern (acceleration/deceleration) to achieve selected bag size.

Blue: stroke
Green: speed

[Sample ladder program configuration]



[Devices used in this program]

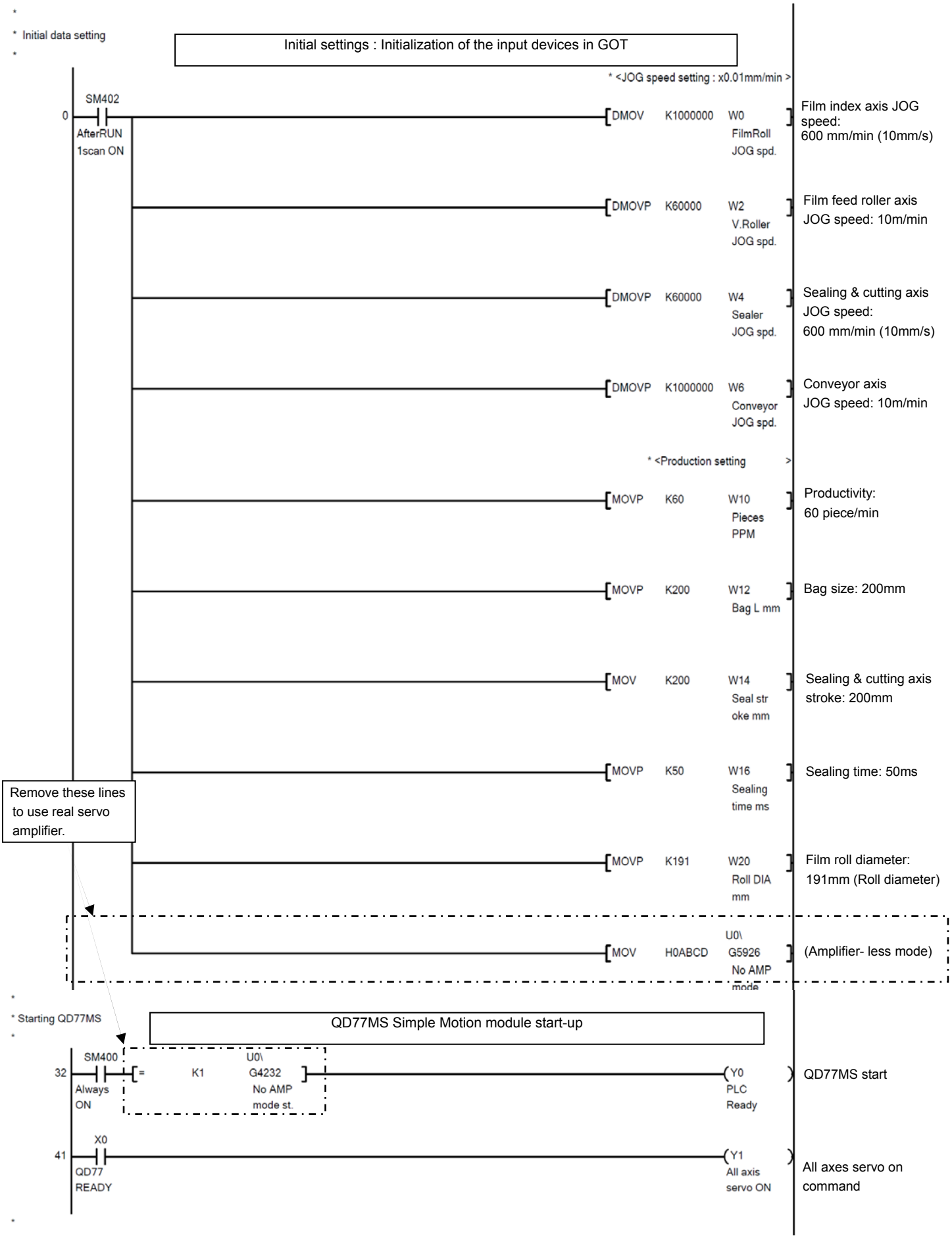
User devices

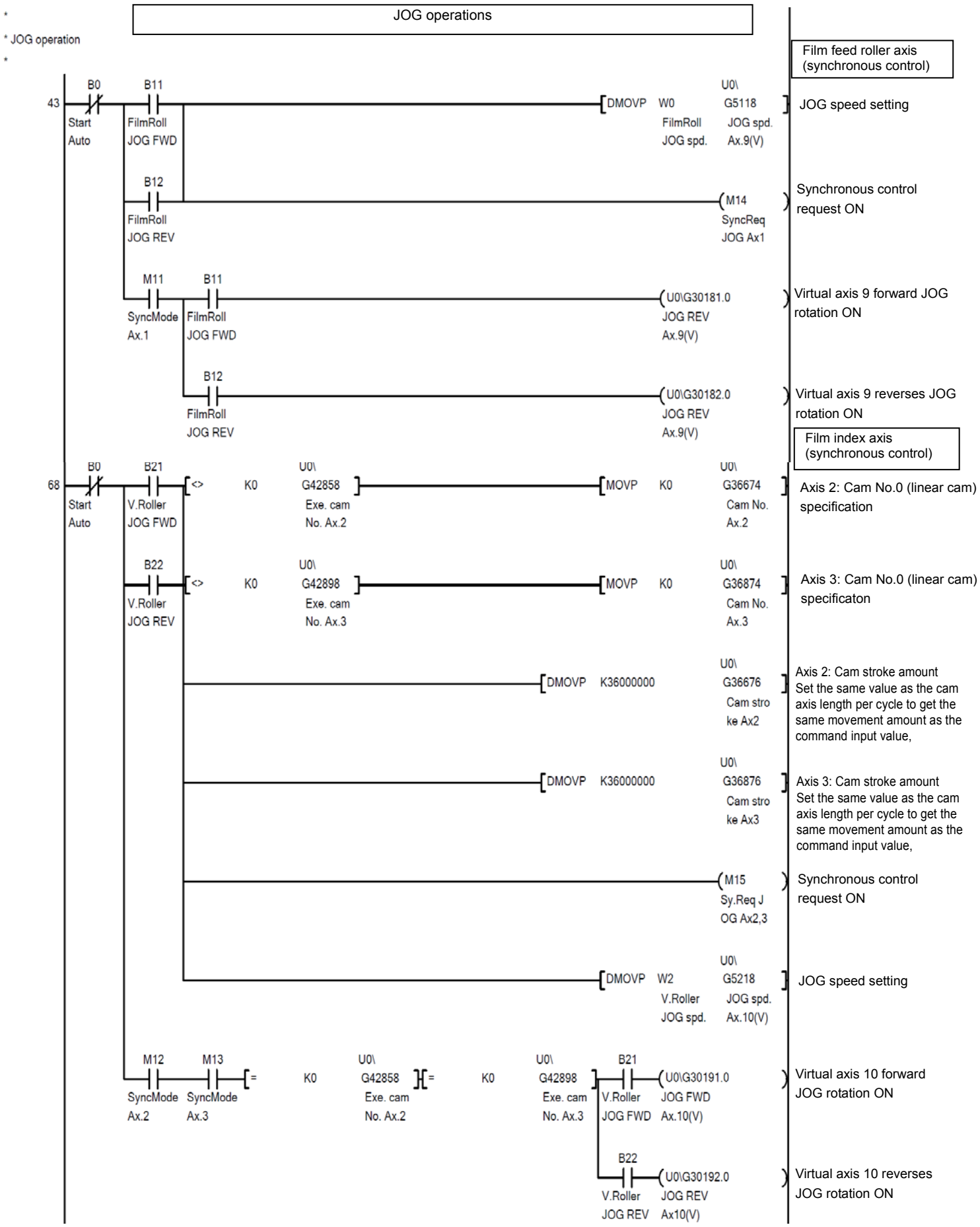
Device No.	Content	Device No.	Content
B0	Automatic start (GOT)	M1	Film feed roller axis zero return start
B1	Home position return (GOT)	M2	Film index axis 1 zero return start
B2	Error reset (GOT)	M3	Film index axis 2 zero return start
B3	Forced stop	M4	Seal & cut zero return start
B5	Zero return completion(GOT)	M5	Conveyor axis zero return start
B6	Error lamp (GOT)	M11	Film feed roller axis synchronous control
B11	Film feed roller axis JOG forward (GOT)	M12	Film index axis synchronous control
B12	Film feed roller axis JOG reverse (GOT)	M13	Film index axis 2 synchronous control
B21	Film index axis JOG forward (GOT)	M14	Film feed roller axis JOG synchronous control
B22	Film index axis JOG reverse (GOT)	M15	Film index axis JOG synchronous control
B41	Sealing & cutting axis JOG forward (GOT)	M19	Automatic film index axis start
B42	Sealing & cutting axis JOG reverse (GOT)	M20	Automatic film index axis and sealing & cutting start
B51	Conveyor axis JOG forward (GOT)	M22	Automatic sealing & cutting start
B52	Conveyor axis JOG reverse (GOT)	M23	Automatic sealing timer trigger
W0	Film feed roller axis JOG speed setting (GOT):x0.01[mm/min]	M30	Automatic film sending operation completion
W1		M31	Sealing & cutting closed in position
W2	Film feed roller axis-JOG speed settings (GOT): x 0.01[mm/min]	M32	Sealing & cutting open position
W3		D0	Sealing & cutting closed position: [x 0.1μm]
W4	Sealing & cutting axis JOG speed setting (GOT): x 0.01[mm/min]	D1	
W5		D2	Sealing & cutting open position : [x 0.1μm]
W6	Conveyor axis JOG speed setting (GOT): x 0.01[mm/min]	D3	
W7		D1050	Temporary calculation
WA	Current production monitor (GOT) : [bag]		
W10	Productivity monitor (GOT) [bag/min]		
W12	Bag length (GOT) : [mm]		
W14	Sealing & cutting stroke length setting (GOT) : [mm]		
W16	Seal time setting value (GOT) : [ms]		

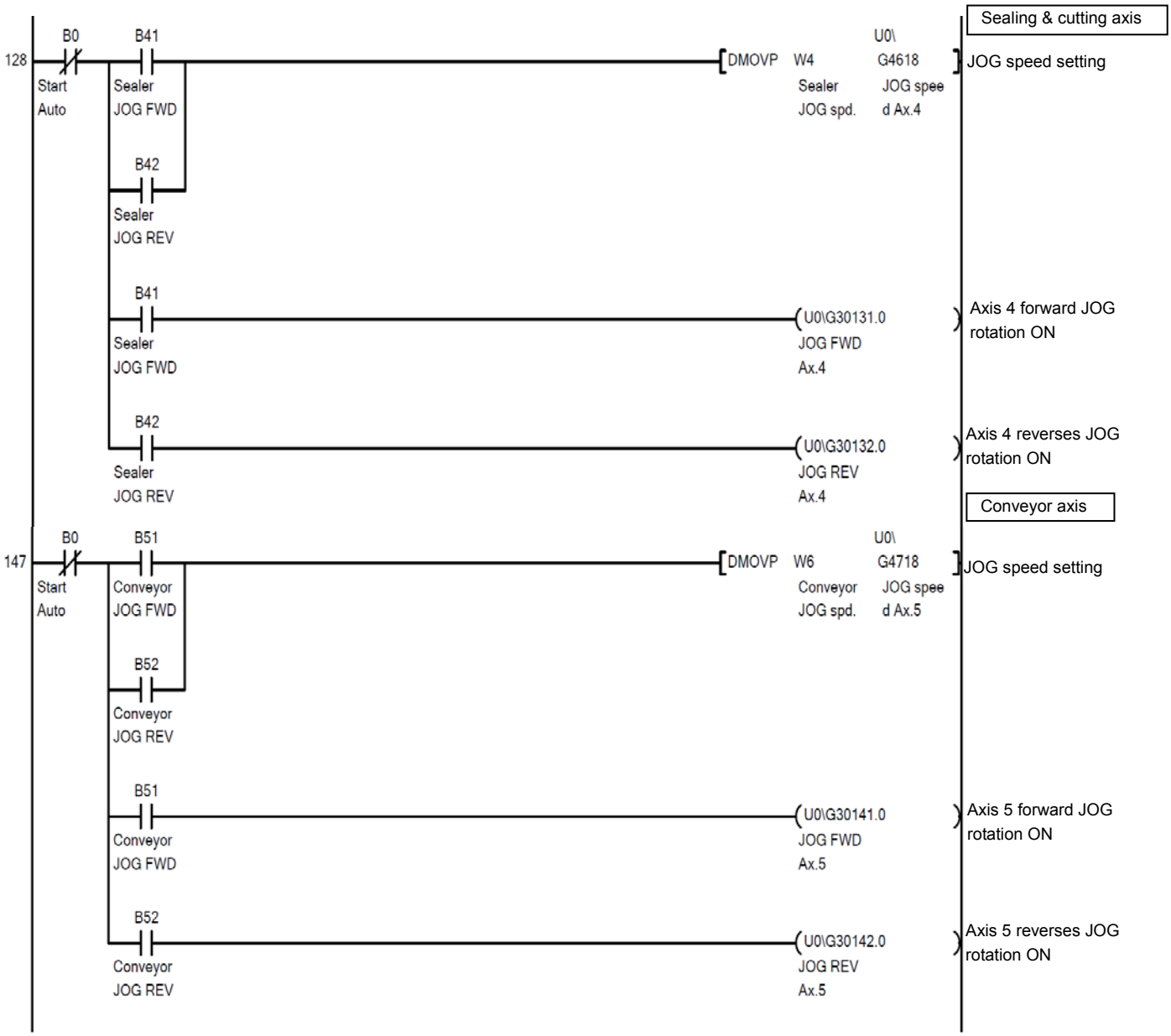
QD77MS dedicated devices

Device No.	Content	Device No.	Content
X0	QD77 READY	Y0	PLC READY
X10	Axis 1 BUSY	Y1	All axis servo ON
X11	Axis 2 BUSY	Y10	Axis 1 Positioning start
X12	Axis 3 BUSY	Y11	Axis 2 Positioning start
X13	Axis 4 BUSY	Y12	Axis 3 Positioning start
X14	Axis 5 BUSY	Y13	Axis 4 Positioning start
X18	Axis 9 BUSY	Y14	Axis 5 Positioning start
X19	Axis 10 BUSY	Y18	Axis 9 Positioning start
		Y19	Axis 10 Positioning start
U0¥G2409	Axis 1 operation status	U0¥G5200	Axis 10 Positioning start No.
U0¥G2417	Axis 1 status	U0¥G5202	Axis 10 error reset
U0¥G2477	Axis 1 servo status	U0¥G5218	Axis 10 JOG speed
U0¥G2509	Axis 2 operation status	U0¥G5219	
U0¥G2517	Axis 2 status	U0¥G5926	Amplifier-less operation mode switching request
U0¥G2577	Axis 2 servo status	U0¥G9016	Axis 4 No.2 positioning address
U0¥G2609	Axis 3 operation status	U0¥G9017	
U0¥G2617	Axis 3 status	U0¥G10004	Axis 5 No.1 positioning command speed
U0¥G2677	Axis 3 servo status	U0¥G10005	
U0¥G2700	Axis 4 current feed value	U0¥G15004	Axis 10 No.1 positioning command speed
U0¥G2701		U0¥G15005	
U0¥G2717	Axis 4 status	U0¥G30130	Axis 4 stop
U0¥G2777	Axis 4 servo status	U0¥G30131	Axis 4 forward run JOG start
U0¥G2817	Axis 5 status	U0¥G30132	Axis 4 reverse run JOG start
U0¥G2877	Axis 5 servo status	U0¥G30140	Axis 5 stop
U0¥G3317	Axis 10 status	U0¥G30141	Axis 5 forward run JOG start
U0¥G4232	Amplifier-less operation mode status	U0¥G30142	Axis 5 reverse run JOG start
U0¥G4300	Axis 1 Positioning start No.	U0¥G30180	Axis 9 stop
U0¥G4302	Axis 1 error reset	U0¥G30181	Axis 9 forward run JOG start
U0¥G4400	Axis 2 Positioning start No.	U0¥G30182	Axis 9 reverse run JOG start
U0¥G4402	Axis 2 error reset	U0¥G30190	Axis 10 stop
U0¥G4500	Axis 3 Positioning start No.	U0¥G30191	Axis 10 forward run JOG start
U0¥G4502	Axis 3 error reset	U0¥G30192	Axis 10 reverse run JOG start
U0¥G4600	Axis 4 Positioning start No.	U0¥G36320	Synchronous control start
U0¥G4602	Axis 4 error reset	U0¥G36464	Axis 1 speed change ratio: Denominator
U0¥G4618	Axis 4 JOG speed	U0¥G36465	
U0¥G4619		U0¥G36674	Axis 2 cam No.
U0¥G4700	Axis 5 Positioning start No.	U0¥G36676	Axis 2 cam stroke amount
U0¥G4702	Axis 5 error reset	U0¥G36677	
U0¥G4718	Axis 5 JOG speed	U0¥G36874	Axis 3 cam No.
U0¥G4719		U0¥G36876	Axis 3 cam stroke amount
U0¥G5100	Axis 9 Positioning start No.	U0¥G36877	
U0¥G5102	Axis 9 error reset	U0¥G42858	Axis 2 execute cam No.
U0¥G5118	Axis 9 JOG speed	U0¥G42898	Axis 3 execute cam No.
U0¥G5119			

[Ladder program]




JOG operations
* JOG operation
Film feed roller axis (synchronous control)
43
B0
Start Auto
B11
FilmRoll JOG FWD
DMOVP W0 FilmRoll JOG spd.
U0\ G5118 JOG spd. Ax.9(V)
JOG speed setting
B12
FilmRoll JOG REV
M14 SyncReq JOG Ax1
Synchronous control request ON
M11
SyncMode Ax.1
B11
FilmRoll JOG FWD
U0\G30181.0 JOG REV Ax.9(V)
Virtual axis 9 forward JOG rotation ON
B12
FilmRoll JOG REV
U0\G30182.0 JOG REV Ax.9(V)
Virtual axis 9 reverses JOG rotation ON
Film index axis (synchronous control)
68
B0
Start Auto
B21
V.Roller JOG FWD
<> K0 U0\ G42858 Exe. cam No. Ax.2
MOVP K0 U0\ G36674 Cam No. Ax.2
Axis 2: Cam No.0 (linear cam) specification
B22
V.Roller JOG REV
<> K0 U0\ G42898 Exe. cam No. Ax.3
MOVP K0 U0\ G36874 Cam No. Ax.3
Axis 3: Cam No.0 (linear cam) specificaton
DMOVP K36000000 U0\ G36676 Cam stro ke Ax2
Axis 2: Cam stroke amount Set the same value as the cam axis length per cycle to get the same movement amount as the command input value,
DMOVP K36000000 U0\ G36876 Cam stro ke Ax3
Axis 3: Cam stroke amount Set the same value as the cam axis length per cycle to get the same movement amount as the command input value,
M15 Sy.Req J OG Ax2,3
Synchronous control request ON
DMOVP W2 V.Roller JOG spd. U0\ G5218 JOG spd. Ax.10(V)
JOG speed setting
M12
SyncMode Ax.2
M13
SyncMode Ax.3
= K0 U0\ G42858 Exe. cam No. Ax.2
= K0 U0\ G42898 Exe. cam No. Ax.3
B21
V.Roller JOG FWD
U0\G30191.0 JOG FWD Ax.10(V)
Virtual axis 10 forward JOG rotation ON
B22
V.Roller JOG REV
U0\G30192.0 JOG REV Ax10(V)
Virtual axis 10 reverses JOG rotation ON

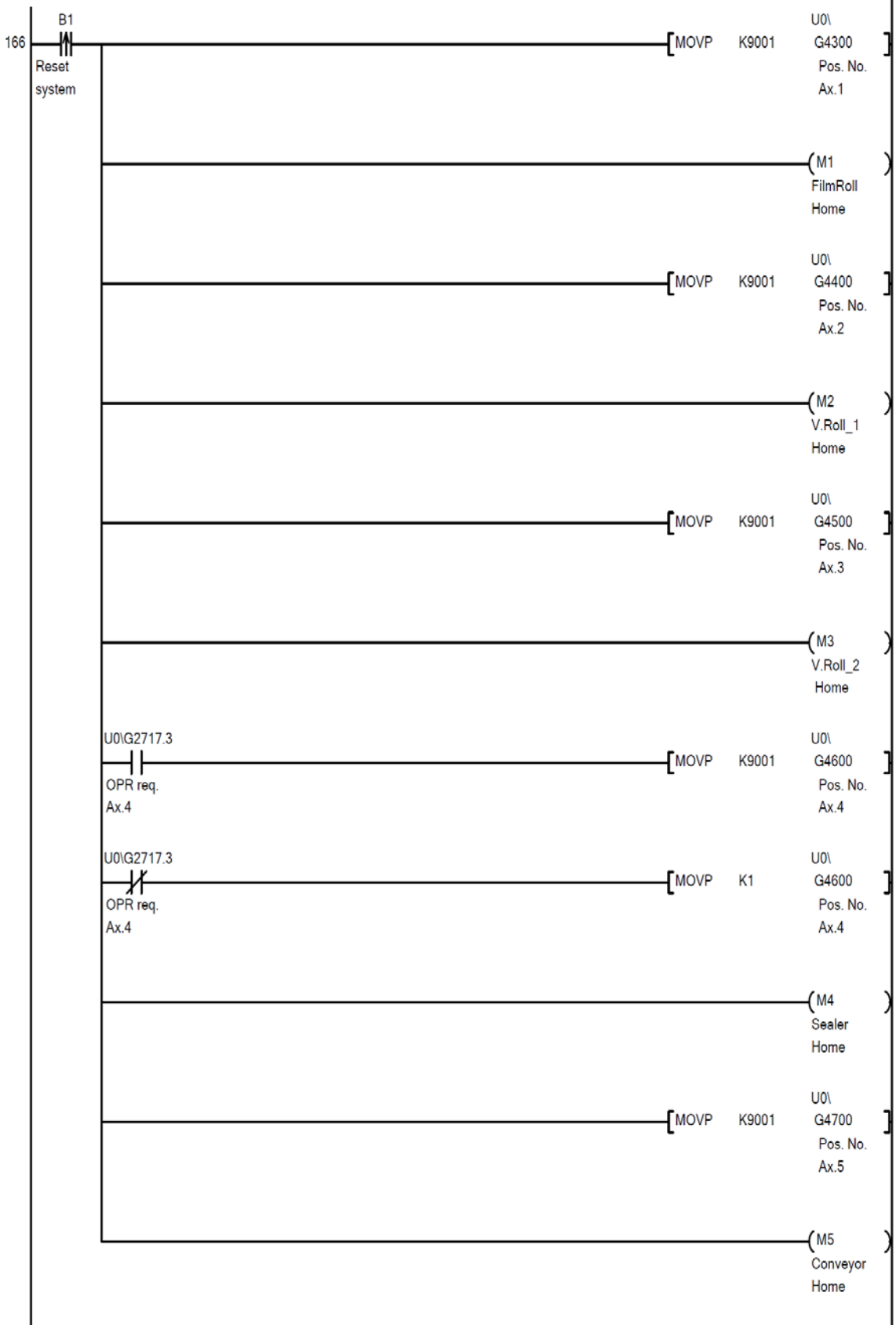

Sealing & cutting axis
128
B0
Start
Auto
B41
Sealer
JOG FWD
B42
Sealer
JOG REV
DMOVP
W4
Sealer
JOG spd.
U0\
G4618
JOG spee
d Ax.4
JOG speed setting
B41
Sealer
JOG FWD
U0\G30131.0
JOG FWD
Ax.4
Axis 4 forward JOG
rotation ON
B42
Sealer
JOG REV
U0\G30132.0
JOG REV
Ax.4
Axis 4 reverses JOG
rotation ON
Conveyor axis
147
B0
Start
Auto
B51
Conveyor
JOG FWD
B52
Conveyor
JOG REV
DMOVP
W6
Conveyor
JOG spd.
U0\
G4718
JOG spee
d Ax.5
JOG speed setting
B51
Conveyor
JOG FWD
U0\G30141.0
JOG FWD
Ax.5
Axis 5 forward JOG
rotation ON
B52
Conveyor
JOG REV
U0\G30142.0
JOG REV
Ax.5
Axis 5 reverses JOG
rotation ON

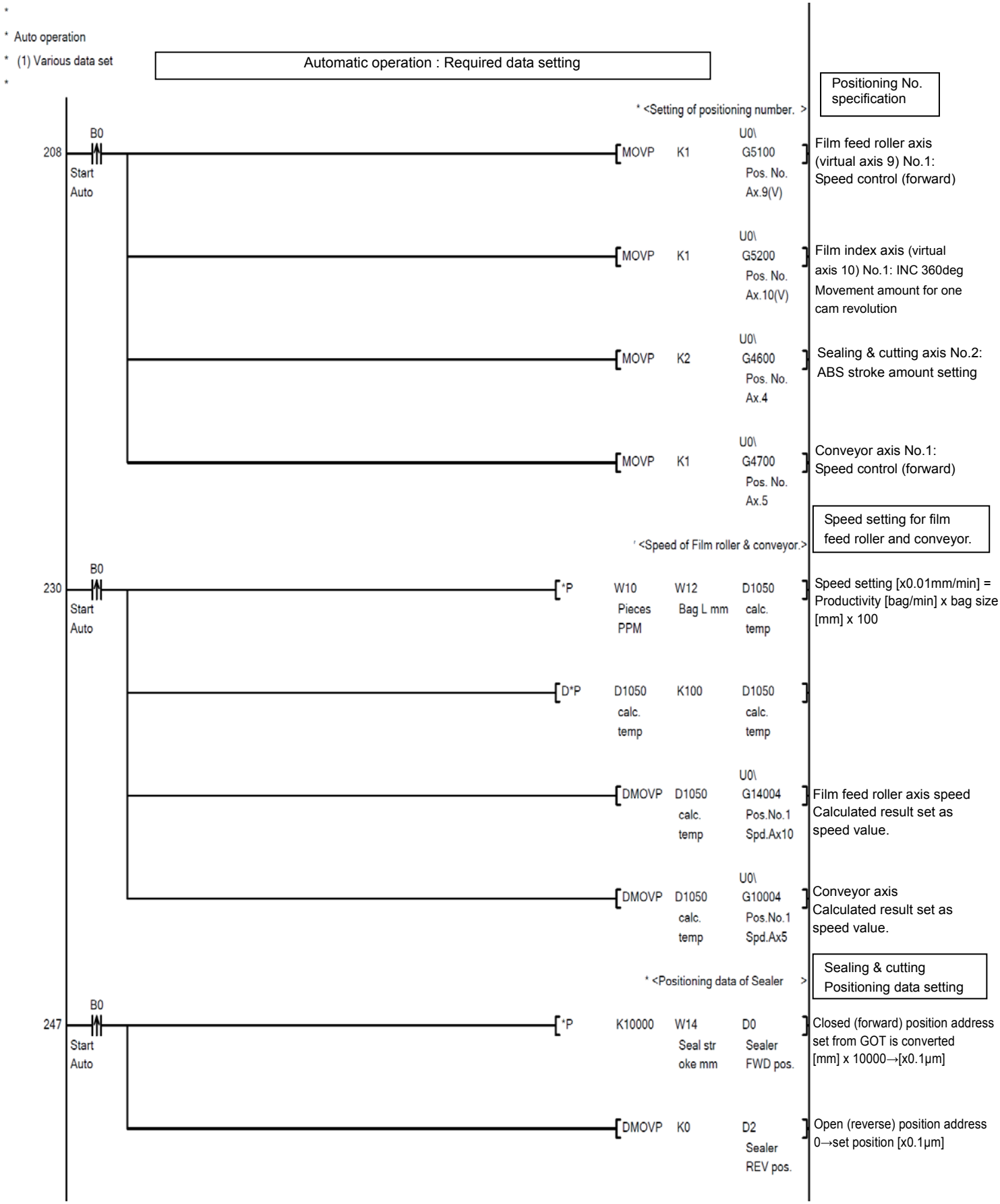
*

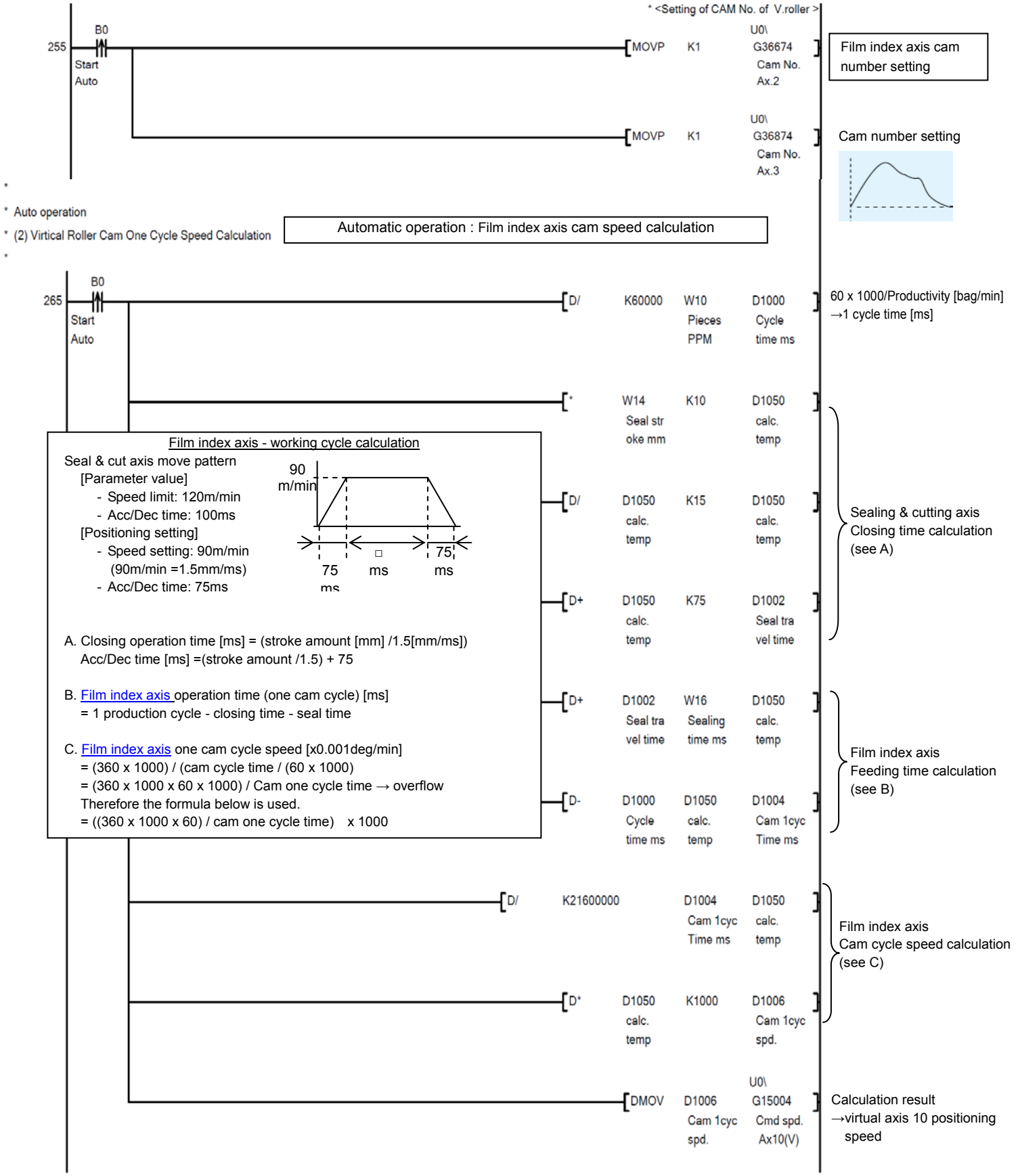
* Return to origin

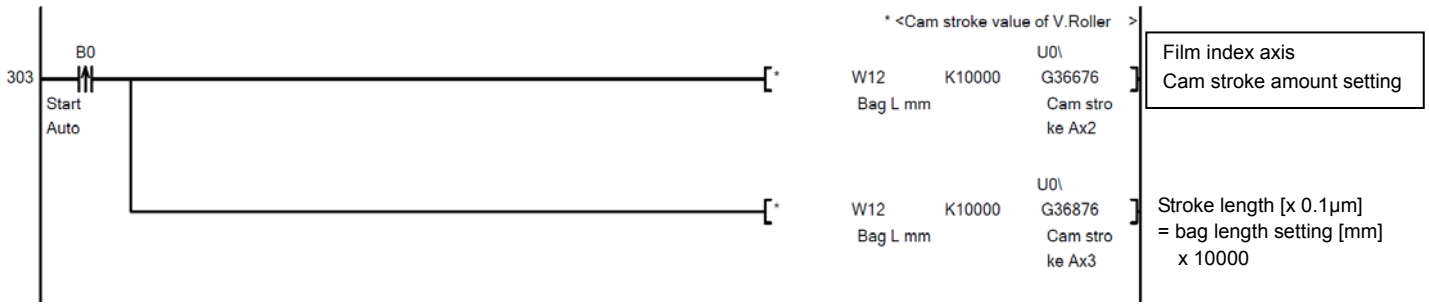
*

Home Position Return




*
* Auto operation
* (1) Various data set
*
Automatic operation : Required data setting
Positioning No. specification
* <Setting of positioning number. >
208
B0
Start Auto
MOVP K1 U0\G5100 Pos. No. Ax.9(V)
Film feed roller axis (virtual axis 9) No.1: Speed control (forward)
MOVP K1 U0\G5200 Pos. No. Ax.10(V)
Film index axis (virtual axis 10) No.1: INC 360deg Movement amount for one cam revolution
MOVP K2 U0\G4600 Pos. No. Ax.4
Sealing & cutting axis No.2: ABS stroke amount setting
MOVP K1 U0\G4700 Pos. No. Ax.5
Conveyor axis No.1: Speed control (forward)
Speed setting for film feed roller and conveyor.
' <Speed of Film roller & conveyor.>
230
B0
Start Auto
*P W10 Pieces PPM W12 Bag L mm D1050 calc. temp
Speed setting [x0.01mm/min] = Productivity [bag/min] x bag size [mm] x 100
D*P D1050 calc. temp K100 D1050 calc. temp
DMOVP D1050 calc. temp U0\G14004 Pos.No.1 Spd.Ax10
Film feed roller axis speed Calculated result set as speed value.
DMOVP D1050 calc. temp U0\G10004 Pos.No.1 Spd.Ax5
Conveyor axis Calculated result set as speed value.
Sealing & cutting Positioning data setting
* <Positioning data of Sealer >
247
B0
Start Auto
*P K10000 W14 Seal stroke mm D0 Sealer FWD pos.
Closed (forward) position address set from GOT is converted [mm] x 10000→[x0.1μm]
DMOVP K0 D2 Sealer REV pos.
Open (reverse) position address 0→set position [x0.1μm]

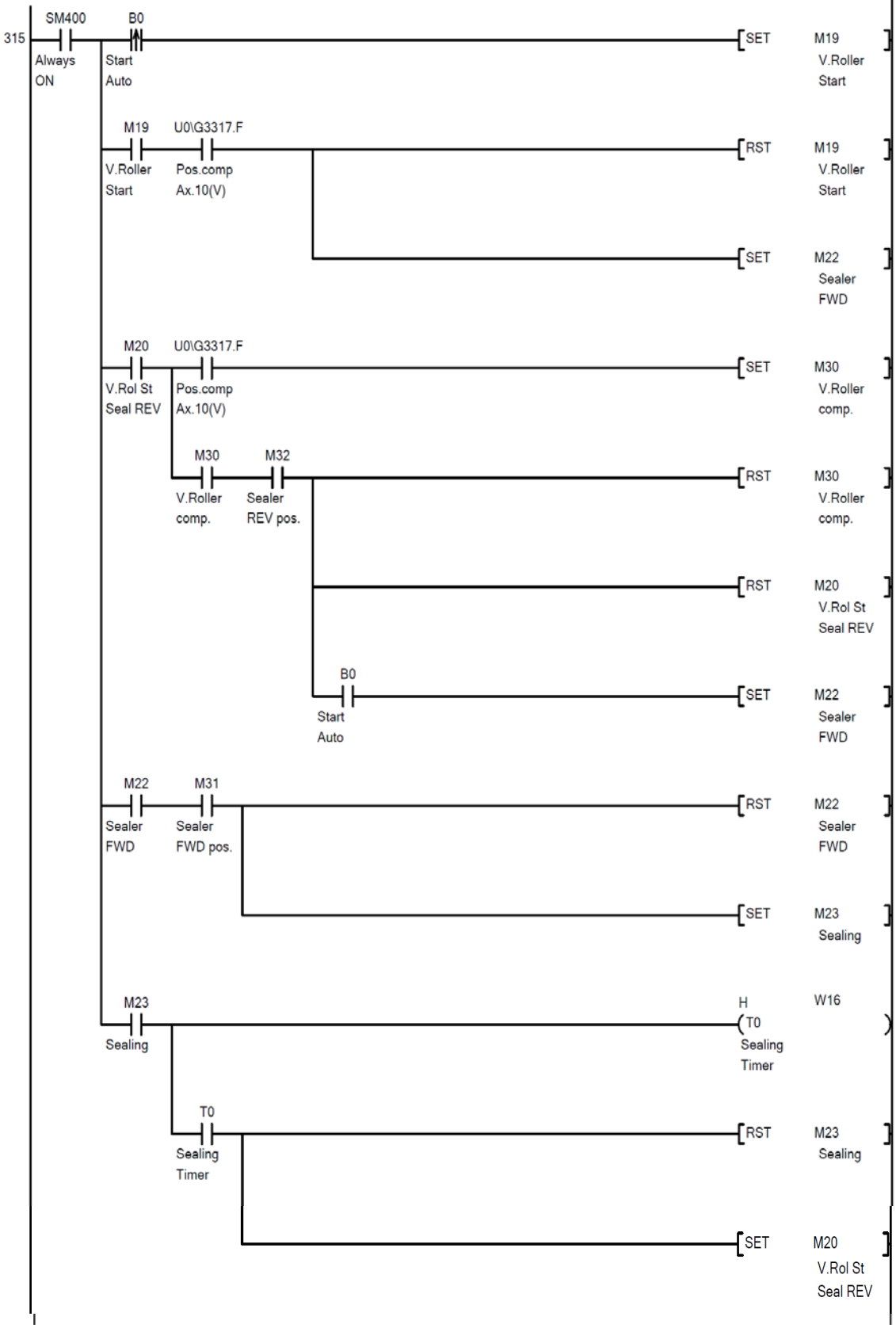

* <Setting of CAM No. of V.roller >
255
B0
Start
Auto
MOVP K1 U0\G36674 Cam No. Ax.2
Film index axis cam number setting
MOVP K1 U0\G36874 Cam No. Ax.3
Cam number setting
*
* Auto operation
* (2) Virtical Roller Cam One Cycle Speed Calculation
*
Automatic operation : Film index axis cam speed calculation
265
B0
Start
Auto
D/ K60000 W10 Pieces PPM D1000 Cycle time ms
60 x 1000/Productivity [bag/min]
→1 cycle time [ms]
* W14 Seal str oke mm K10 D1050 calc. temp
Film index axis - working cycle calculation
Seal & cut axis move pattern
[Parameter value]
- Speed limit: 120m/min
- Acc/Dec time: 100ms
[Positioning setting]
- Speed setting: 90m/min
(90m/min =1.5mm/ms)
- Acc/Dec time: 75ms
90 m/min
75 ms
□
75 ms
D/ D1050 calc. temp K15 D1050 calc. temp
D+ D1050 calc. temp K75 D1002 Seal tra vel time
Sealing & cutting axis
Closing time calculation
(see A)
A. Closing operation time [ms] = (stroke amount [mm] /1.5[mm/ms])
Acc/Dec time [ms] =(stroke amount /1.5) + 75
B. Film index axis operation time (one cam cycle) [ms]
= 1 production cycle - closing time - seal time
C. Film index axis one cam cycle speed [x0.001deg/min]
= (360 x 1000) / (cam cycle time / (60 x 1000)
= (360 x 1000 x 60 x 1000) / Cam one cycle time → overflow
Therefore the formula below is used.
= ((360 x 1000 x 60) / cam one cycle time) x 1000
D+ D1002 Seal tra vel time W16 Sealing time ms D1050 calc. temp
D- D1000 Cycle time ms D1050 calc. temp D1004 Cam 1cyc Time ms
Film index axis
Feeding time calculation
(see B)
D/ K21600000 D1004 Cam 1cyc Time ms D1050 calc. temp
D* D1050 calc. temp K1000 D1006 Cam 1cyc spd.
Film index axis
Cam cycle speed calculation
(see C)
DMOV D1006 Cam 1cyc spd. U0\G15004 Cmd spd. Ax10(V)
Calculation result
→virtual axis 10 positioning speed


303
B0
Start
Auto
* <Cam stroke value of V.Roller >
W12
Bag L mm
K10000
U0\
G36676
Cam stro
ke Ax2
Film index axis
Cam stroke amount setting
W12
Bag L mm
K10000
U0\
G36876
Cam stro
ke Ax3
Stroke length [x 0.1µm]
= bag length setting [mm]
x 10000

Automatic operation : Film index axis/sealing & cutting axis operation time

* Auto operation

* (3) Film index Sealing&Cut Cycle operation timming



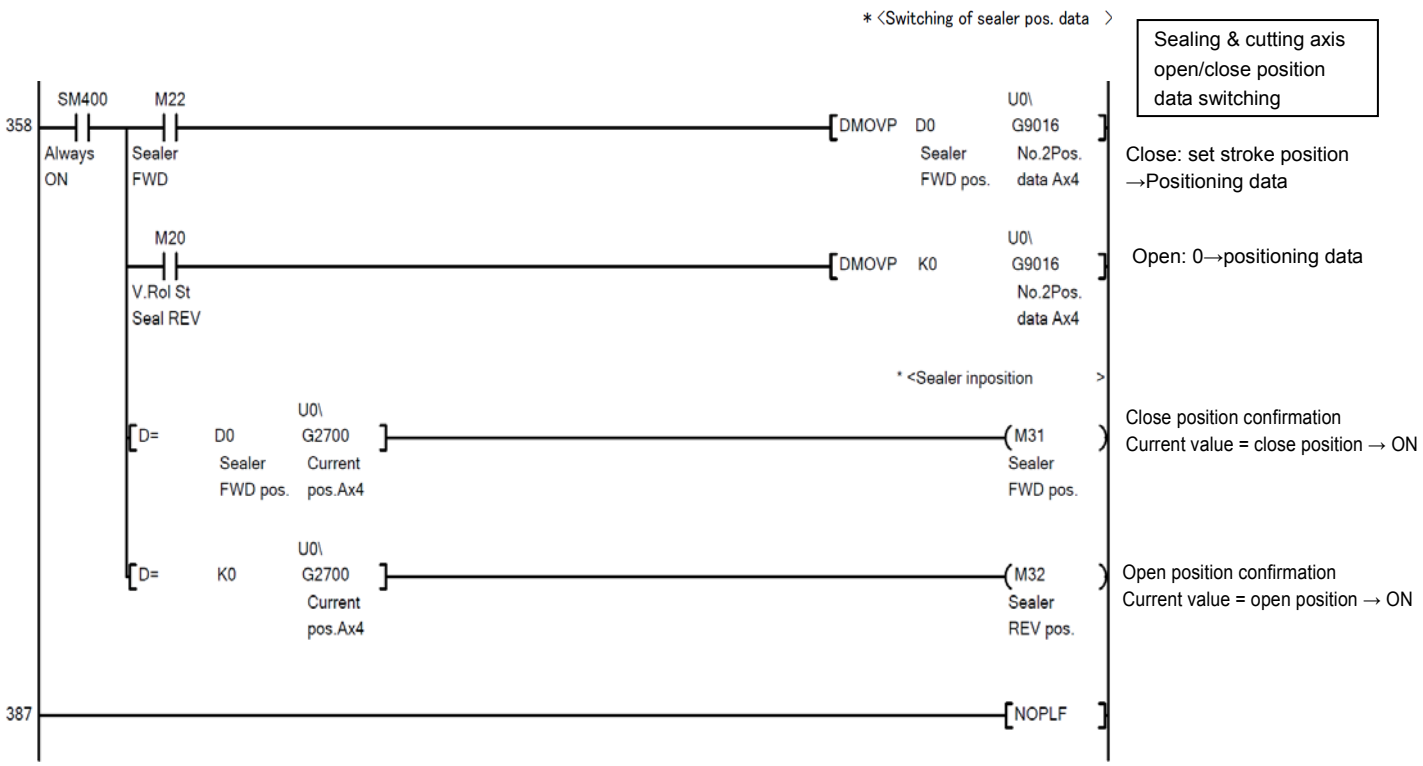
Film index axis are started at raising edge (Initial process only)

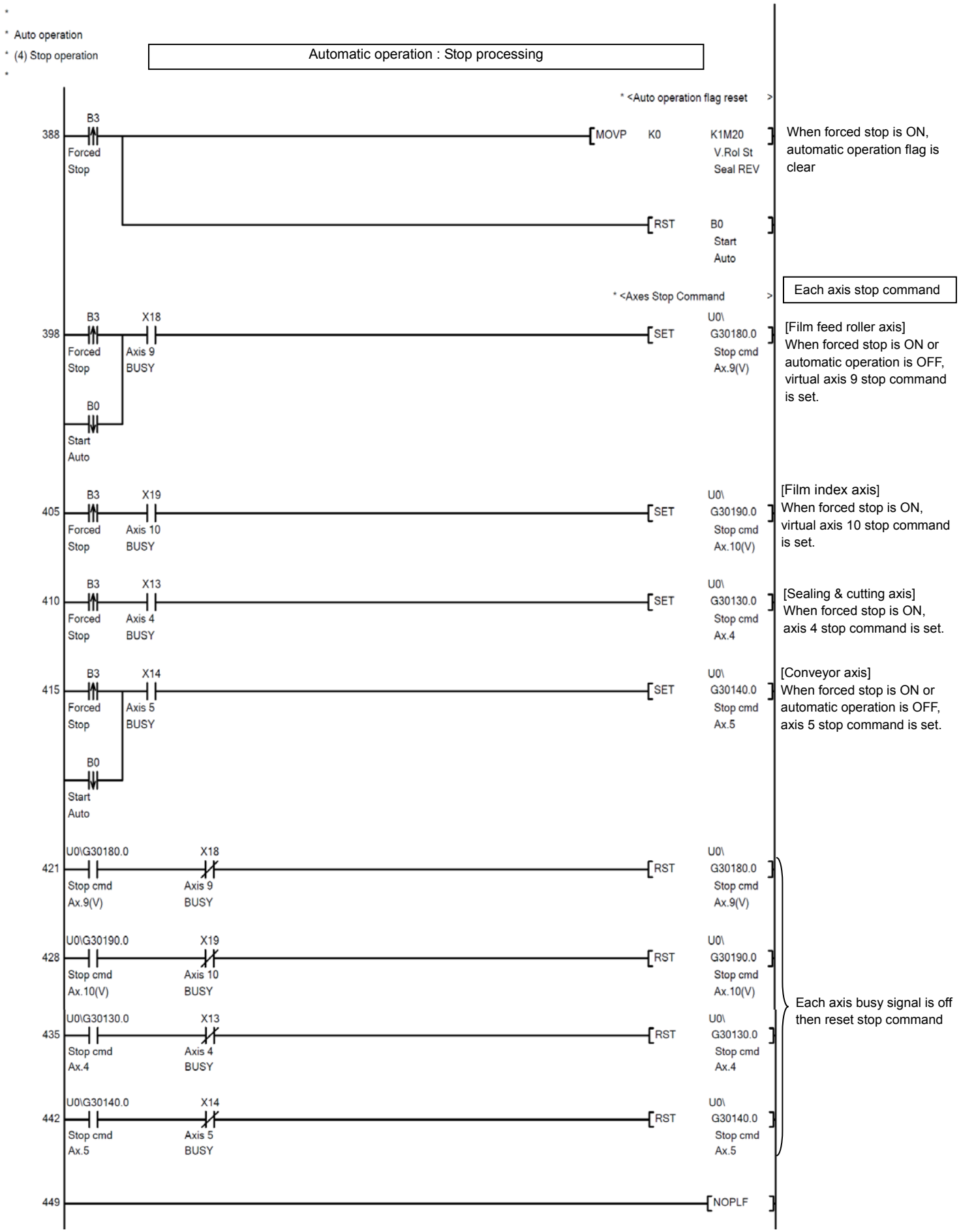
Film index axis feed operation is completed, then sealing & cutting axis starts (Initial process only)

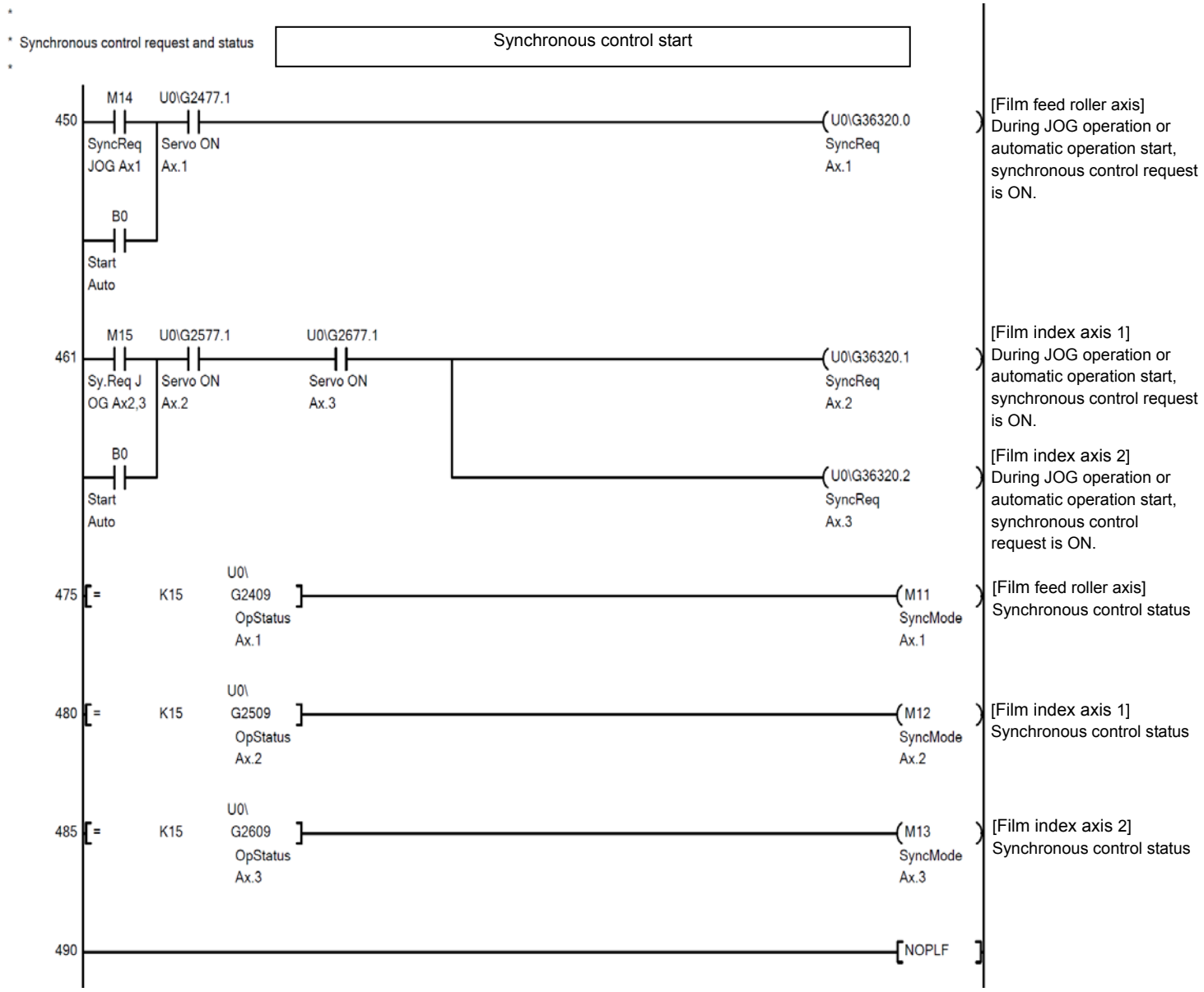
Automatic is ON
Film index axis feed operation is completed
Sealing & cutting axis open position In the condition
Sealing & cutting axis closing operation start

Seal & cut closing operation starts sealing timer

After the timer counts up, film index axis feed operation and sealing & cutting axis closing operation start.


* <Switching of sealer pos. data >
Sealing & cutting axis open/close position data switching
358
SM400
Always ON
M22
Sealer FWD
DMOVP D0 Sealer FWD pos. U0\ G9016 No.2Pos. data Ax4
Close: set stroke position →Positioning data
M20
V.Rol St Seal REV
DMOVP K0 U0\ G9016 No.2Pos. data Ax4
Open: 0→positioning data
* <Sealer inposition >
D= D0 Sealer FWD pos. U0\ G2700 Current pos.Ax4
M31 Sealer FWD pos.
Close position confirmation
Current value = close position → ON
D= K0 U0\ G2700 Current pos.Ax4
M32 Sealer REV pos.
Open position confirmation
Current value = open position → ON
387
NOPLF


*
* Auto operation
* (4) Stop operation
*
Automatic operation : Stop processing
* <Auto operation flag reset >
388
B3
Forced Stop
MOVP K0 K1M20
V.Rol St Seal REV
RST B0
Start Auto
When forced stop is ON, automatic operation flag is clear
Each axis stop command
* <Axes Stop Command >
398
B3 Forced Stop
X18 Axis 9 BUSY
B0 Start Auto
SET U0\G30180.0 Stop cmd Ax.9(V)
[Film feed roller axis]
When forced stop is ON or automatic operation is OFF, virtual axis 9 stop command is set.
405
B3 Forced Stop
X19 Axis 10 BUSY
SET U0\G30190.0 Stop cmd Ax.10(V)
[Film index axis]
When forced stop is ON, virtual axis 10 stop command is set.
410
B3 Forced Stop
X13 Axis 4 BUSY
SET U0\G30130.0 Stop cmd Ax.4
[Sealing & cutting axis]
When forced stop is ON, axis 4 stop command is set.
415
B3 Forced Stop
X14 Axis 5 BUSY
B0 Start Auto
SET U0\G30140.0 Stop cmd Ax.5
[Conveyor axis]
When forced stop is ON or automatic operation is OFF, axis 5 stop command is set.
421
U0\G30180.0 Stop cmd Ax.9(V)
X18 Axis 9 BUSY
RST U0\G30180.0 Stop cmd Ax.9(V)
428
U0\G30190.0 Stop cmd Ax.10(V)
X19 Axis 10 BUSY
RST U0\G30190.0 Stop cmd Ax.10(V)
435
U0\G30130.0 Stop cmd Ax.4
X13 Axis 4 BUSY
RST U0\G30130.0 Stop cmd Ax.4
442
U0\G30140.0 Stop cmd Ax.5
X14 Axis 5 BUSY
RST U0\G30140.0 Stop cmd Ax.5
Each axis busy signal is off then reset stop command
449
NOPLF

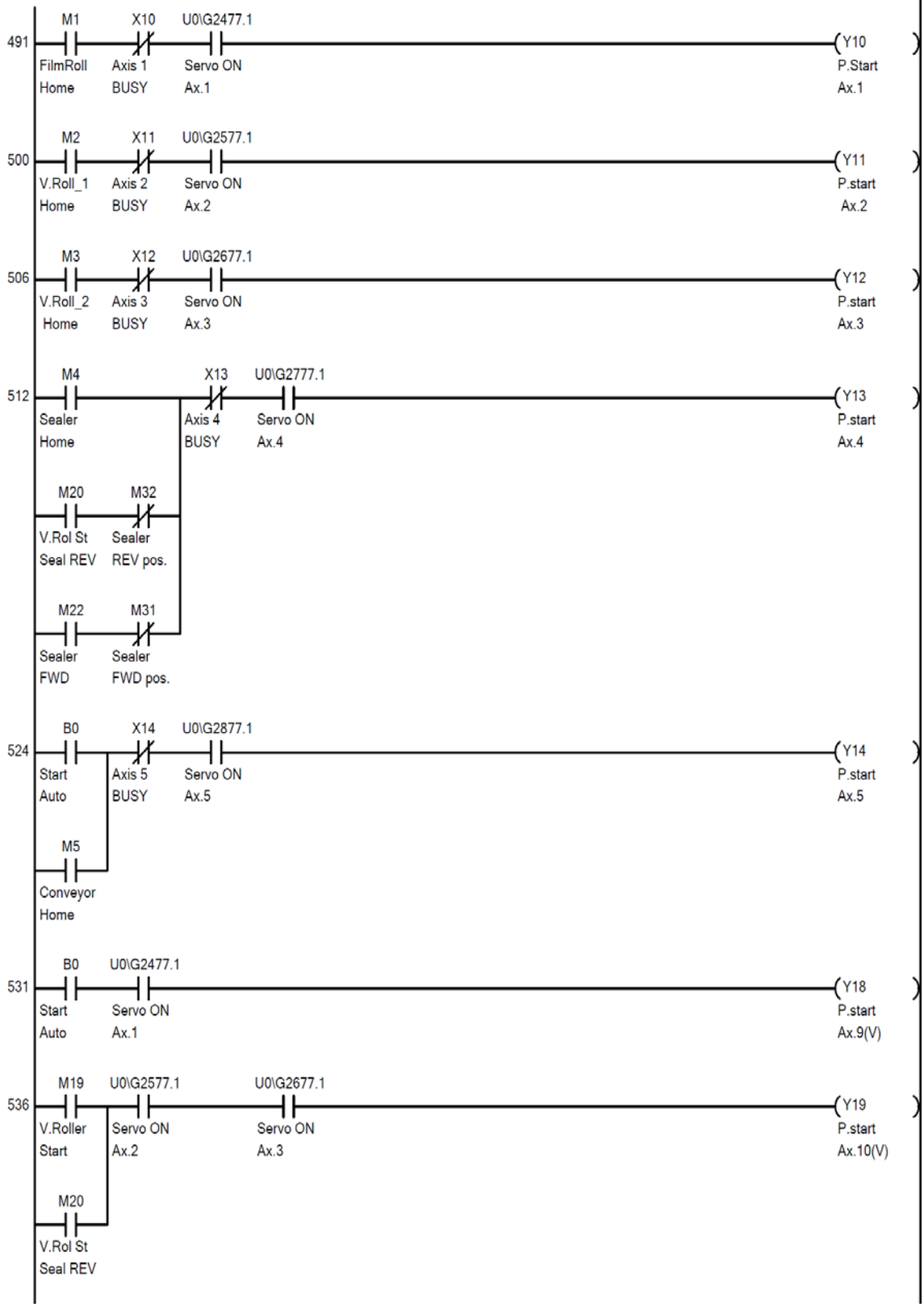

* Synchronous control request and status
Synchronous control start
450
M14
SyncReq
JOG Ax1
U0\G2477.1
Servo ON
Ax.1
B0
Start
Auto
U0\G36320.0
SyncReq
Ax.1
[Film feed roller axis]
During JOG operation or automatic operation start, synchronous control request is ON.
461
M15
Sy.Req J
OG Ax2,3
U0\G2577.1
Servo ON
Ax.2
U0\G2677.1
Servo ON
Ax.3
B0
Start
Auto
U0\G36320.1
SyncReq
Ax.2
[Film index axis 1]
During JOG operation or automatic operation start, synchronous control request is ON.
U0\G36320.2
SyncReq
Ax.3
[Film index axis 2]
During JOG operation or automatic operation start, synchronous control request is ON.
475
=
K15
U0\
G2409
OpStatus
Ax.1
M11
SyncMode
Ax.1
[Film feed roller axis]
Synchronous control status
480
=
K15
U0\
G2509
OpStatus
Ax.2
M12
SyncMode
Ax.2
[Film index axis 1]
Synchronous control status
485
=
K15
U0\
G2609
OpStatus
Ax.3
M13
SyncMode
Ax.3
[Film index axis 2]
Synchronous control status
490
NOPLF

*

* Positioning start

*

Positioning start signal



[Film feed roller axis]
During HPR, axis 1 start

[Film index axis 1]
During HPR, axis 2 start

[Film index axis 2]
During HPR, axis 2 start

[Sealing & cutting axis]
During HPR and automatic open/close operation on axis 4 starts.

[Conveyor axis]
During HPR and automatic operation start, axis 5 starts.

[Film feed roller axis]
During automatic operation start, virtual axis 9 starts

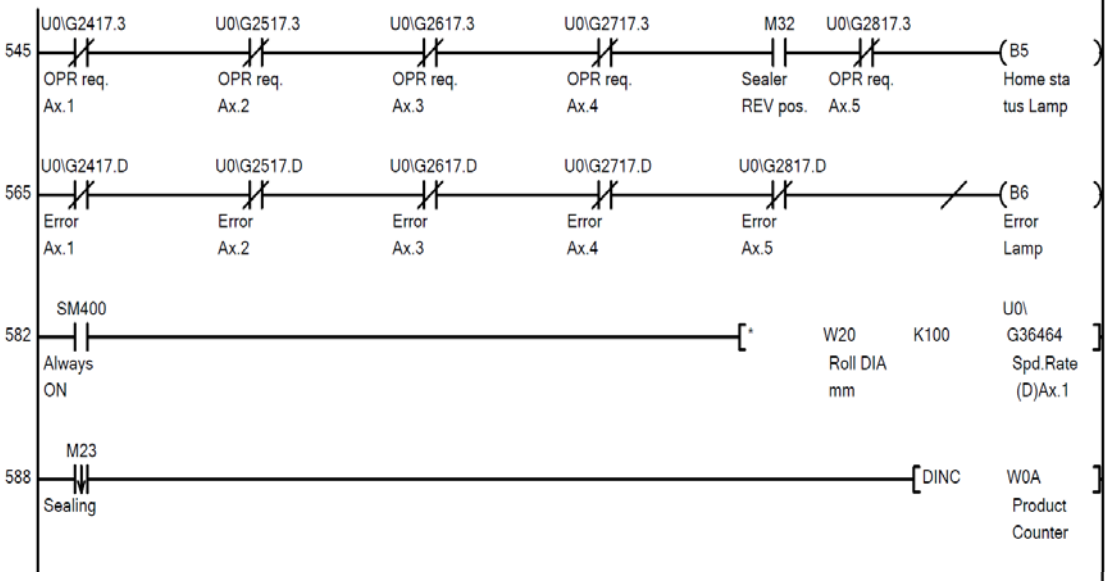
[Film index axis]
During automatic feeding, operation virtual axis 10 starts

GOT monitor signals

*

* GOT monitor operation

*



HPR complete lamp:
Turn ON when the HPR requests of all axes are turned OFF.

Error lamp:
Turn ON when an error of each axis is detected

Film roll diameter:
Data input from GOT screen for simulation is used.

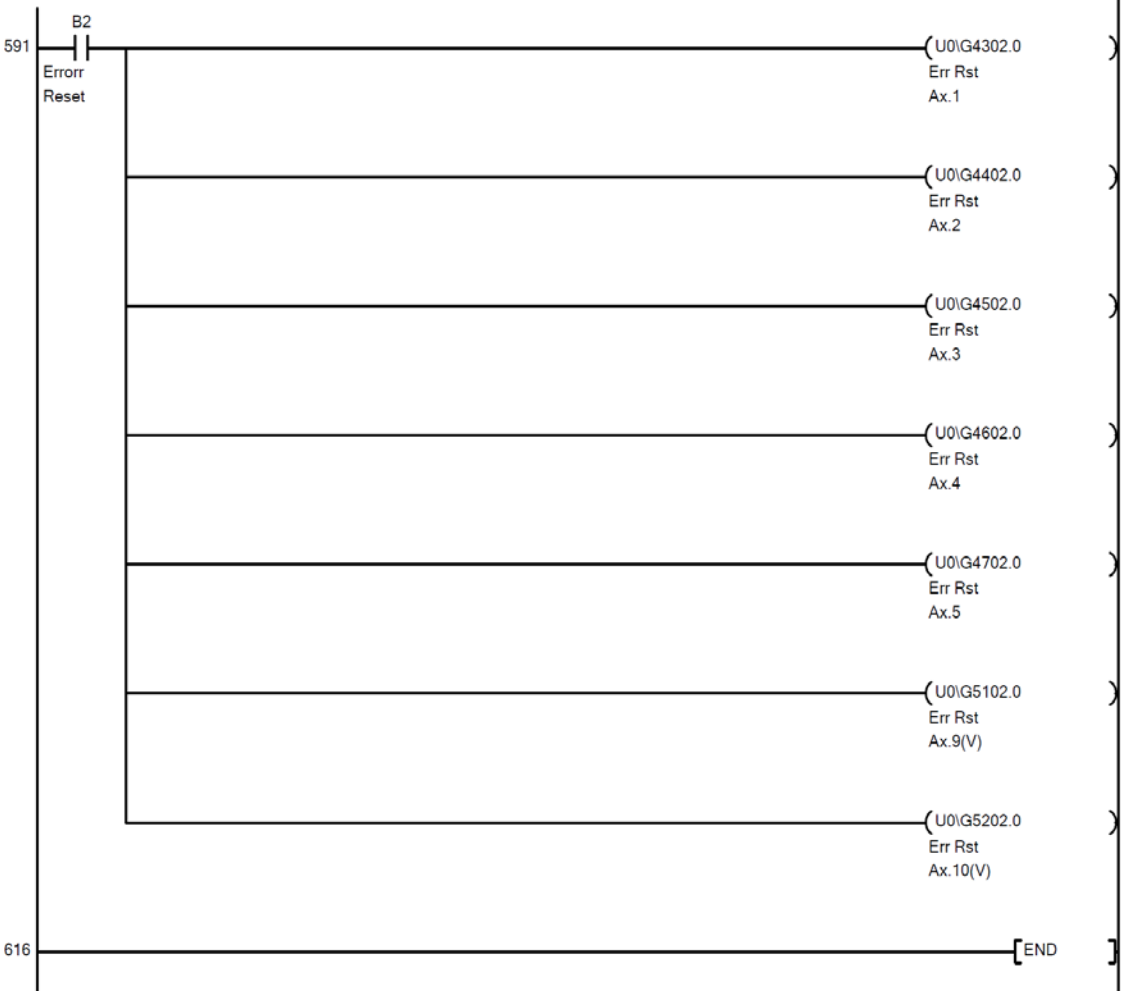
Production counter:
The number of produced products is counted when automatic sealing & cutting operation is completed.

*

* Error reset

*

Error reset



END