

Servo / Motion

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Application Examples for MR-MQ100

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Labeling application

■ What is labeling ?

Randomly spaced products pass along a conveyor belt and are detected by a photoelectric sensor. The signal from this sensor is connected to the motion controller input assigned for use as the 'Fast Position Latch' input. This latches the position of the master encoder. This encoder signal is used to track movement of the product along the conveyor belt

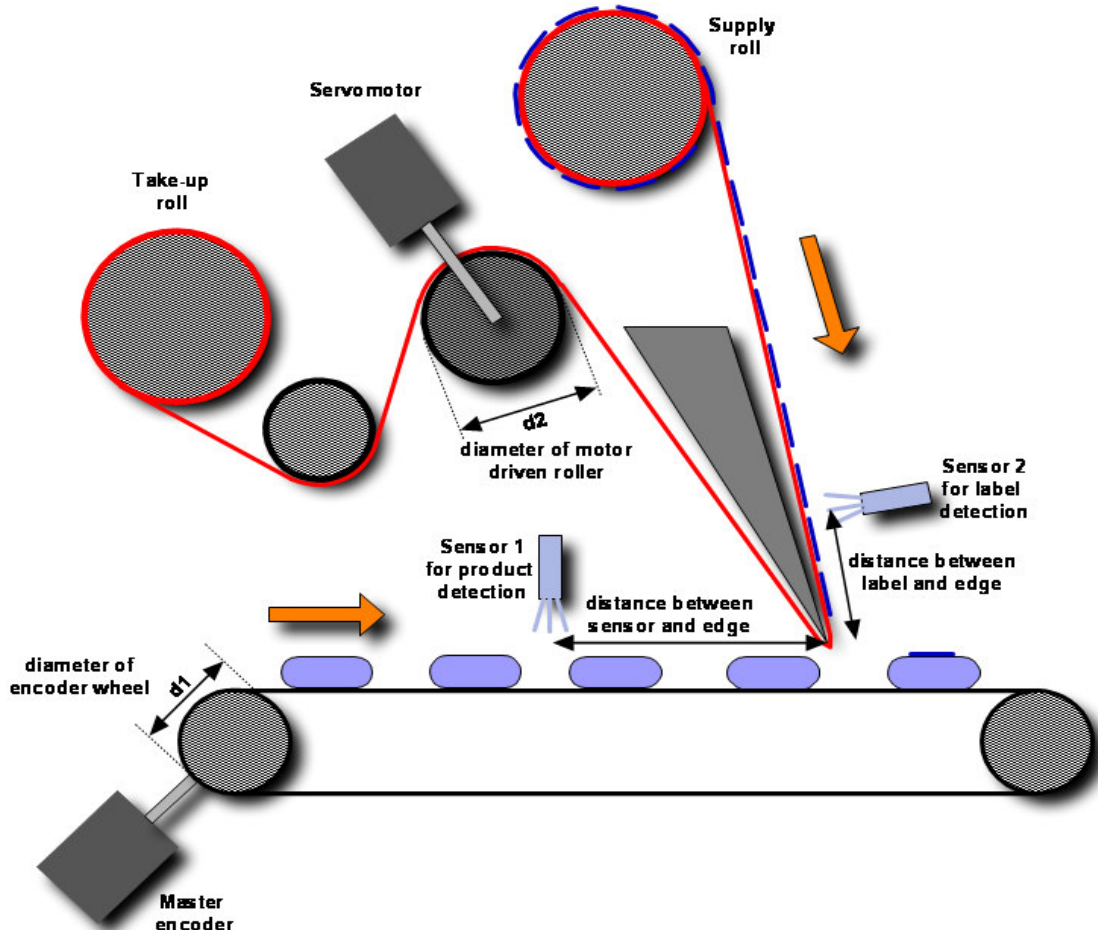
A servomotor is used to drive the supply roller, which in turn pull the label stock off of the supply reel. A peel bar ensures that the labels are removed from their backing at a fixed point.

The cycle starts as soon as the 'product present' sensor detects an object. Because the sensor is located ahead of the peel bar the program will command that the product travel a specified distance before the label stock is accelerated up to synchronous speed.

It is common to make this initial delay adjustable by the operator as this provides a method of setting the label position on the product.

Once at speed it must remain locked to the same speed as the product while the label is being applied. Once the label has been applied the label stock must then ramp down to a stop and position the next label on the peel bar ready for the next apply cycle. That position will be set by the sensor for the label detection.

■ Typical layout of a labeling application :



■ **Machine parameters:**

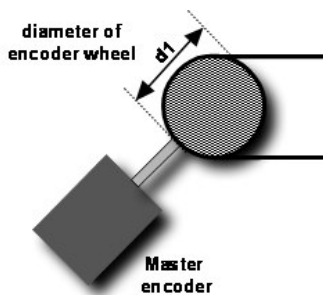
Mechanical construction of slave axis controlled by servo drive:

Encoder resolution: 262144 p/rev
 Mechanical gear: 1:5
 Roller diameter: 50 mm

Fixed parameter setting :

Number of Pulses/Rev. : $262144 * 5 = 1310720$ [PLS]
 Travel Value/Rev. : 262144 [PLS]

Mechanical construction master axis with external encoder:



Diameter of wheel: 62 mm

Encoder resolution: 4096 pulses/Rev.

■ **Configuration:**

- 1* MR-MQ100
- 1* MR-J3-_B with MR-J3 Motor
- 1* External incremental Encoder (Open collector/Differential line driver)
- 1* External sensor 24V for product detection (Input X0)
- 1* External sensor 24V for label detection (Input X1)

■ **Software:**

The powerful programming tool MT-Developer2-MQ and MR-Configurator helps you to setup, program, tune and easily monitor your system.

System Structure:



External encoder will be set active to follow the line speed.

One MR-J3-_B can connected. The axis no. rotary switch must be set to 0.

Servo Data:

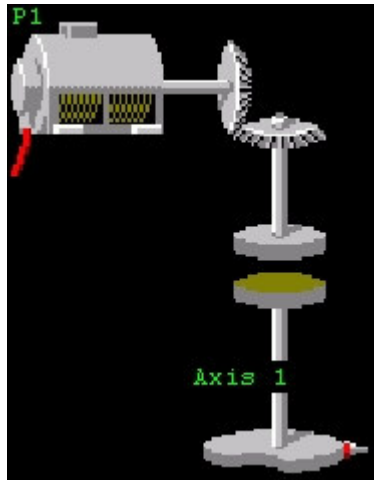
		Axis 1
Fixed Parameter	Unit Setting	PLS
	Number of Pulses/Rev.	1310720[PLS]
	Travel Value/Rev.	262144[PLS]
	Backlash Compensation	0[PLS]
	Upper Stroke Limit	2147483647[PLS]
	Lower Stroke Limit	-2147483648[PLS]
	Command In-position	100[PLS]
	Sp. Ctrl. 10x Mult. for Deg.	-
Home Position Return Data	HPR Direction	Reverse
	HPR Method	Data Set Type 1
	Home Position Address	0[PLS]
	HPR Speed	-
	Creep Speed	-
	Travel After Dog	-
	Parameter Block Setting	-
	HPR Retry Function	-
	Dwell Time At The HPR Retry	-
	Home Position Shift Amount	-
	Speed Set at Home Pos. Shift	-
	Torque Limit at Creep Speed	-
Operation for HPR Incompletion	Exec.Sv.Prog.	
JOG Operation Data	JOG Speed Limit Value	26214400[PLS/sec]
	Parameter Block Setting	1

Electronic gear to adapt the mechanical construction to the servo system.

Home Position Return method can be set according to the type needed.

Mechanical System:

Synchronous encoder connected at the line shaft.



Spindle gear must be set corresponding to the encoder resolution and motor movement.

Smoothing clutch is set to have a smooth movement for the synchronisation.

CAM output module is used for the real servo motor.

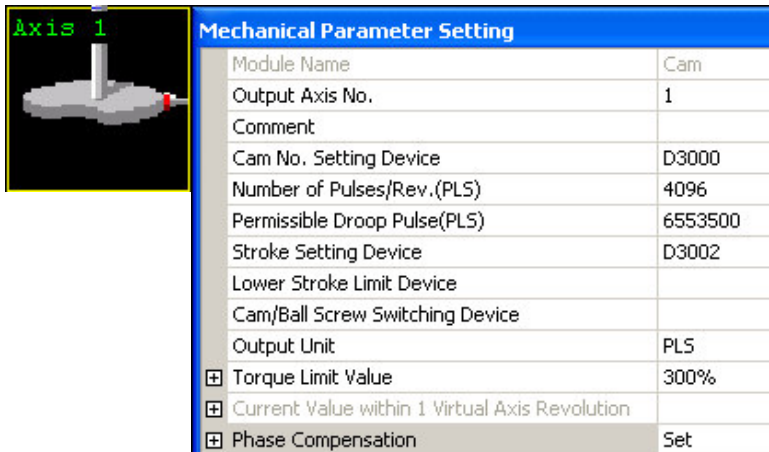
Calculation of spindle gear ratio based on the diameter d1 and d2:

Encoder: d1 = 62 mm
Motor: d2 = 50 mm



Encoder resolution: 4096 PLS

CAM setting: Number of Pulses/Rev.: 4096 PLS
Stroke Setting Device: D3002 = 262144 PLS

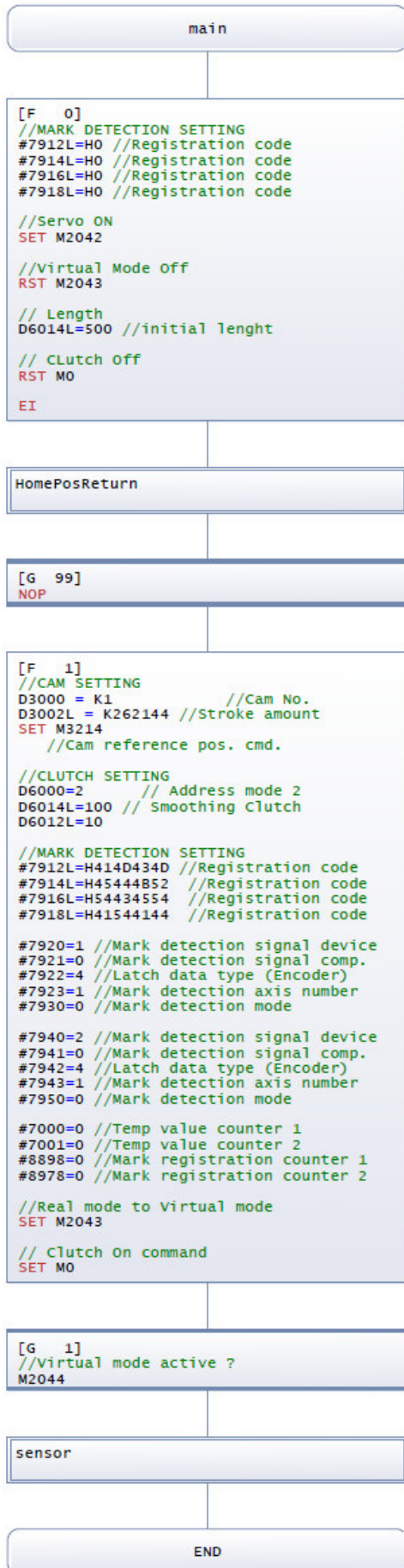


Variable definition:

D3000	CAM No.
D3002	Stroke setting
M0	Clutch ON/OFF Cmd
M1	Clutch ON/OFF Status
M2	Clutch Smoothing Status
D6000	Clutch Mode
D6002	Clutch ON Addr.
D6004	Clutch OFF Addr.
D6014	Clutch Slippage Dev.
D6012	Clutch Slippage Range
D4000	Label length [mm]
D4002	Product Sensor Pos. [mm]
D4004	Label Sensor Pos. [mm]
#6000	Product Sensor Pos. [PLS]
#6002	Label length [PLS]
#6004	Label Sensor Pos. [PLS]
#6006	Label Sensor Pos. [PLS]
#7000	Temp value mark detection counter 1
#7001	Temp value mark detection counter 2
#8912	Latch Encoder value by input X0
#8992	Latch Encoder value by input X1

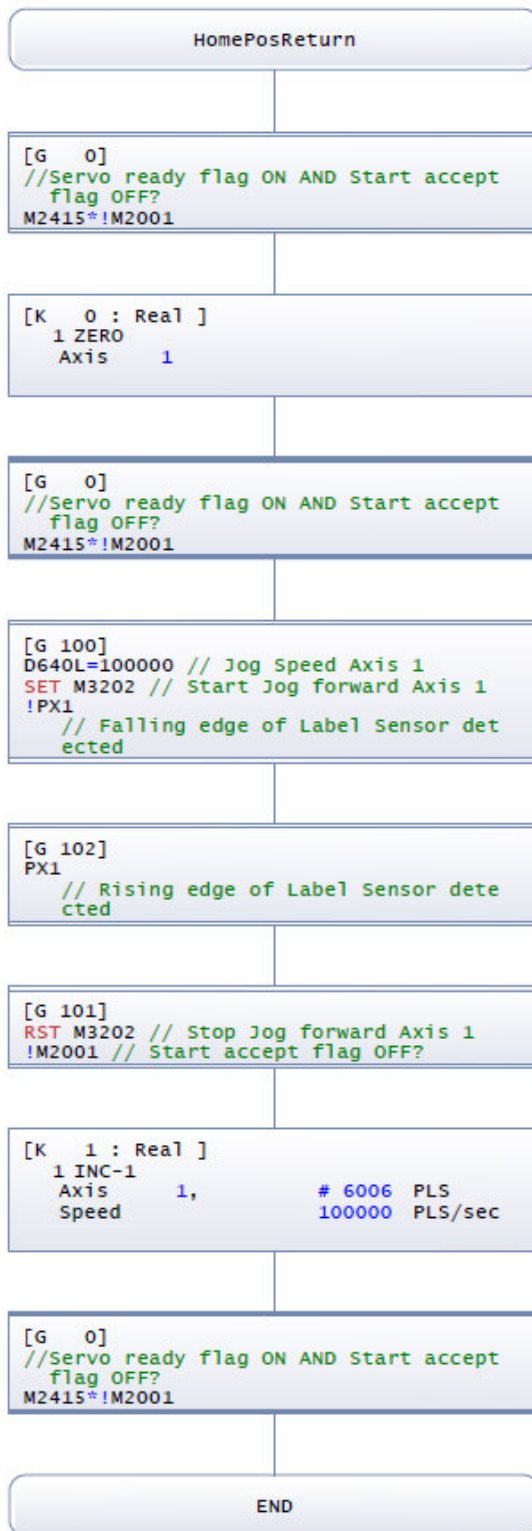
Definition of the used internal variables. Several variables must be set to calculate the right ratio between encoder and motor movement. Also the length cut be change by writing the new value in the

SFC Program:



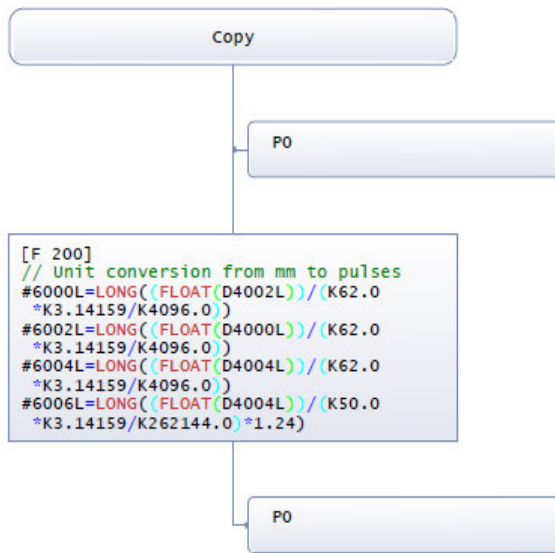
Main (0):
Main program for setting the initial values and setting servo on command.

SFC Parameter:
Normal Task
Autostart: Yes



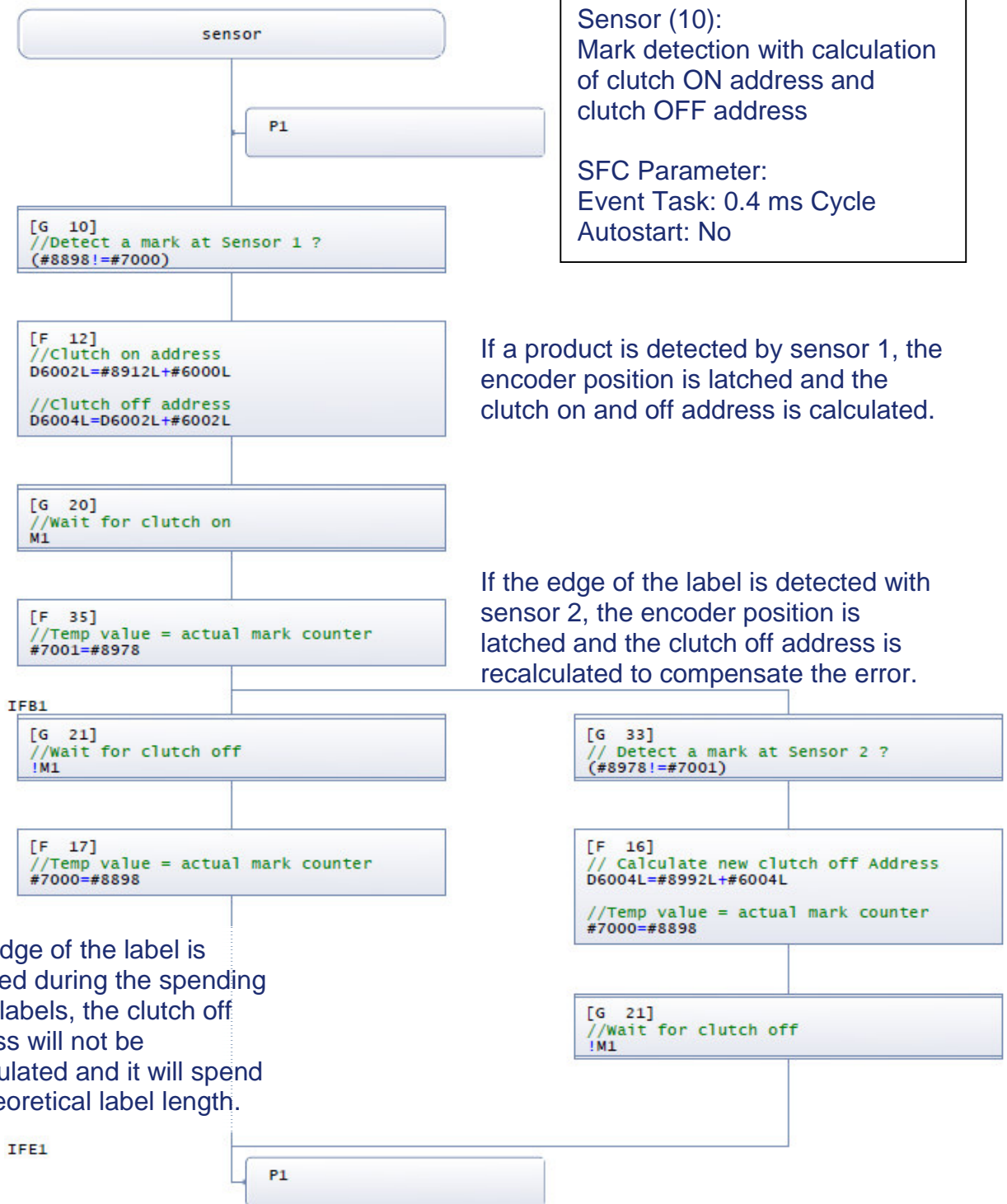
HomePosReturn (1):
Execution of the Home position
return function.

SFC Parameter:
Normal Task
Autostart: No



Copy (20):
Conversion from mm to pulses

SFC Parameter:
Normal Task
Autostart: Yes



Sensor (10):
Mark detection with calculation of clutch ON address and clutch OFF address

SFC Parameter:
Event Task: 0.4 ms Cycle
Autostart: No

If a product is detected by sensor 1, the encoder position is latched and the clutch on and off address is calculated.

If the edge of the label is detected with sensor 2, the encoder position is latched and the clutch off address is recalculated to compensate the error.

If no edge of the label is detected during the spending of the labels, the clutch off address will not be recalculated and it will spend the theoretical label length.