

MT-CNC
ECODRIVE with Positioning Interface
Function Block V16
Function Description

SYSTEM200

Title	ECODRIVE Function Block with Positioning Interface
Documentation type	Function Description
Document code	DOK-MT*CNC-FB**ECO*V16-AW01-EN-P
Internal file reference	<ul style="list-style-type: none"> Drawing number: 120-1600-B312-01/EN
Purpose of this document	This document describes the startup procedure of the ECODRIVE using the ECODRV01 function block.

Revision	Date	Remarks
109-0768-4181-00	09/96	New issue
120-1600-B312-01/EN	07/99	Changeover DOZ ⇒ DOK

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Published by INDRAMAT GmbH • Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main
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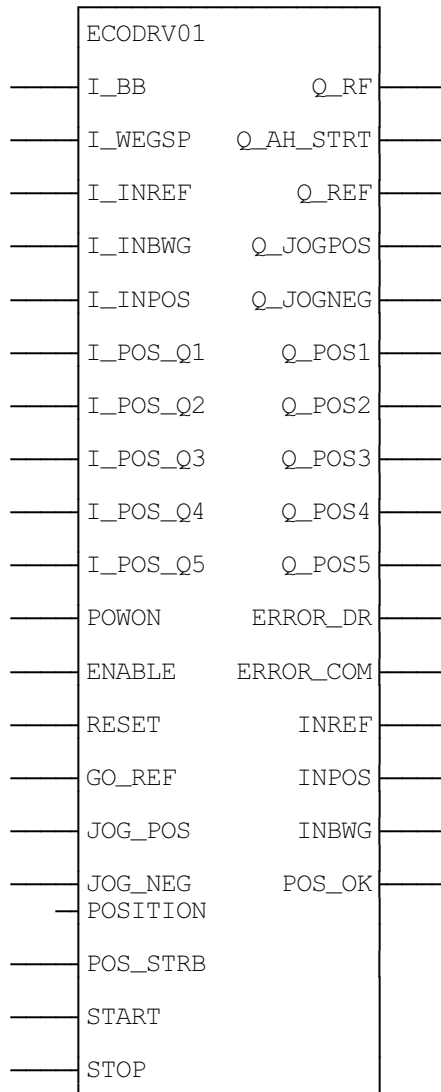
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1 Function Description

To facilitate a simple startup of the INDRAMAT ECODRIVE DKC 1 in conjunction with an INDRAMAT MT-CNC, the function block ECODRV01 can be used. This function block enables communication between the drive and the MT-CNC for positioning, reference point return and jog mode.

The functions for analog feedrate override and serial communication (parameter setting of the drive and programming of position sets) are not performed within the PLC.

1.1 ECODRV01 Function Block Layout



1.2 Function Block Inputs

The following inputs can be connected directly to the ECODRIVE's outputs:

I_BB	ready for operation
I_WEGSP	path control point
I_INREF	reference point OK
I_INBWG	axis moving
I_INPOS	in position
I_POS_Q1	position signal 1
I_POS_Q2	position signal 2
I_POS_Q3	position signal 3
I_POS_Q4	position signal 4
I_POS_Q5	position signal 5

further inputs:

POWON	power enable
ENABLE	drive enable
RESET	reset error / interrupt positioning
GO_REF	reference point return
JOG_POS	jog positive
JOG_NEG	jog negative
POSITION	position set to go 0 ...31 INTEGER
POS_STRB	go to position
START	start
STOP	stop

1.3 Function Block Outputs

The following outputs can be connected directly to the ECODRIVE's input.:

Q_RF	drive enable
Q_AH_STRT	AH/start
Q_REF	go to zero
Q_JOGPOS	jog positive
Q_JOGNEG	jog negative
Q_POS1	Position signal 1
Q_POS2	Position signal 2
Q_POS3	Position signal 3
Q_POS4	Position signal 4
Q_POS5	Position signal 5

Further outputs

ERROR_DR	Ecodrives error -> not ready for operation
ERROR_COM	communication / selected motion block
INREF	reference point OK
INPOS	in position
INBWG	in motion
POS_OK	selected position reached

2 Positioning Request Sequence

2.1 Preparatory Steps

Turning On

The turn-on sequence takes place in the following order: POWON (power enable), ENABL (drive enable).

Establish Reference Dimension

When using the ECODRIVE's indirect relative feedback system, the right reference point is established by the drive-activated homing procedure command, provided that the drive-activated homing procedure command is set correctly in accordance with the function description.

Sequence An edge applied to the 'GO_REF' input (reference point return) sets the 'Q_REF' output signal (go to zero). This output is kept until the drive reports 'INREF' (reference point OK wired to the FB input 'I_INREF').

When using the ECODRIVE equipped with absolute feedback, the signal 'INREF' (reference point OK wired to the FB input 'I_INREF') is set after the control voltage is turned on, provided that the absolute reference point was established (see also ECODRIVE Function Description). An edge at the 'GO_REF' input (reference point return) sets the 'Q_REF' output signal (go to zero point). The 'Q_REF' output is ineffective because the signal 'INREF' reported from the drive is statical '1' (reference point OK wired to the FB input 'I_INREF').

Positioning

If a positive edge is applied to the 'POS_STRB' input, the INTGER value applied to the 'POSITION' input is accepted and the positioning block is started. A positive edge at the 'STOP' input causes the current positioning procedure to be interrupted until a positive edge applied to the 'START' input allows the positioning to be continued or is stopped by 'RESET'.

2.2 Programming a Positioning Request

The INDRAMAT MT-CNC makes it possible to start a positioning block synchronously while running NC program with the help of auxiliary functions. If however positioning is required without interruption of NC block preparation, positioning can be initiated using EVENTS (see also NC Programming Reference Manual, chapter EVENTS). Beginning with MT-CNC software version xx-16Vxx this can also be achieved using the quick auxiliary function output. This document describes the basically different possibilities using either an auxiliary function output or EVENTS on the basis of an NC- and a PLC program as an example.

3 Application Example

3.1 Positioning with an Auxilliary Function Output

The auxiliary functions M50 (pos. 0) to M81 (pos. 31) and M99 (reference point return) are used in order to control the ECODRIVE in this example.

- Sequence of Positioning**
1. An auxiliary function is output by the NC program.
 2. The auxiliary function output suspends the NC program from execution until the auxiliary function is acknowledged, i.e. the ECODRIVE has completed the commanded positioning block.

3.2 NC Program Example Positioning with an Auxilliary Function Output

```

N0000 .START
N0001 M 50 ; positioning block 0
N0002 G 0 X 0 Y 0 M 51 ; axes movement +
; positioning block 1
N0003 G 1 X 1 Y 1 F 1000 M 52 ; axes movement +
; positioning block 2

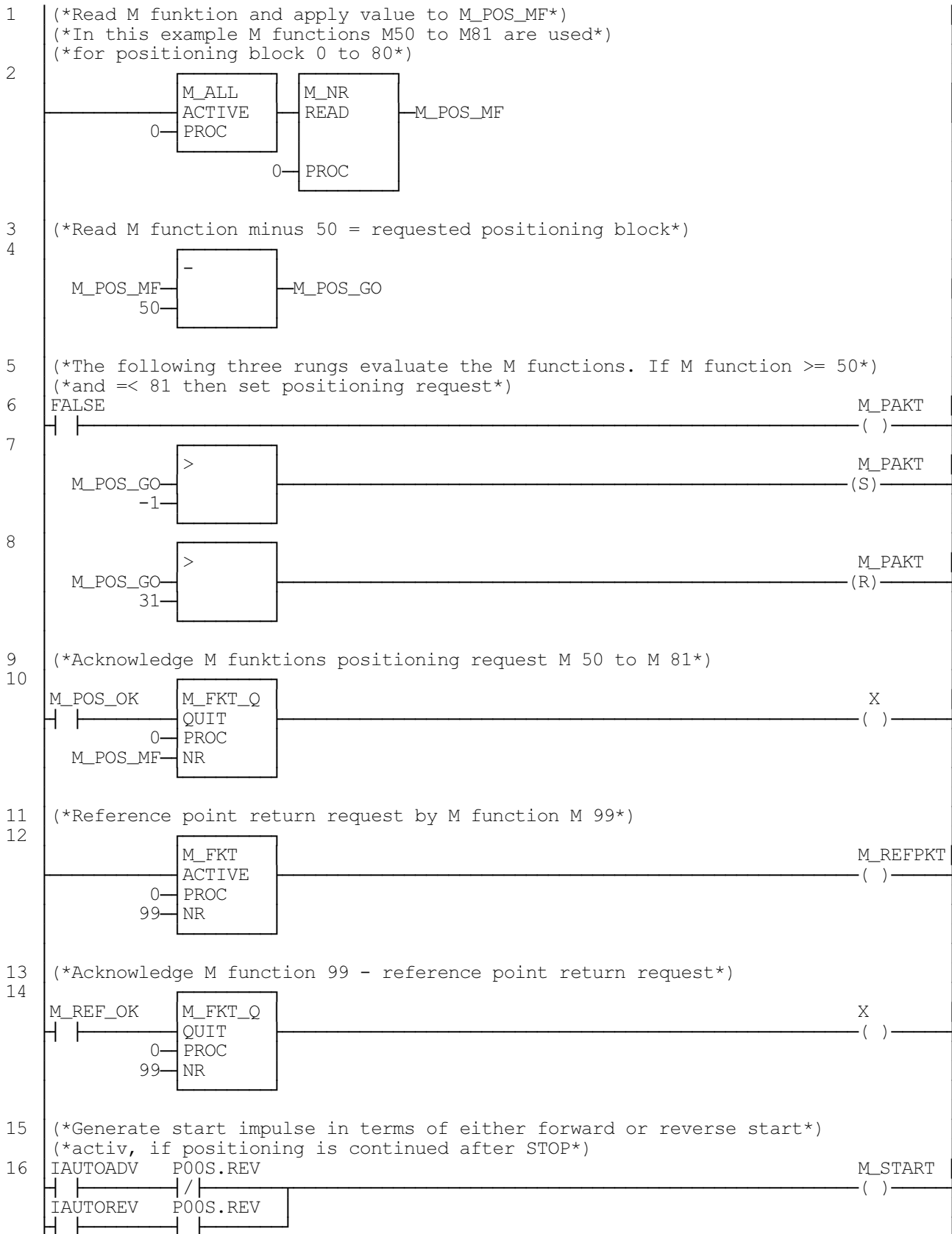
N0004 X 100 Y 123
.
.
.
N0029 M 78 ; positioning block 28
N0030 M 79 ; positioning block 29
N0031 M 80 ; positioning block 30
N0032 M 81 ; positioning block 31
N0034 BST .START ; jump to head of program
; and stop
N0035 .HOME ; revers program
N0036 G 0 X 0 Y 0 M 99 ; move axes to 0 +
; ECODRIVE reference
N0037 M 50 ; call ECODRIVE
; positioning block 0
N0038 BST .START ; jump to head of program
; and stop
N0039 PROGRAMMENDE

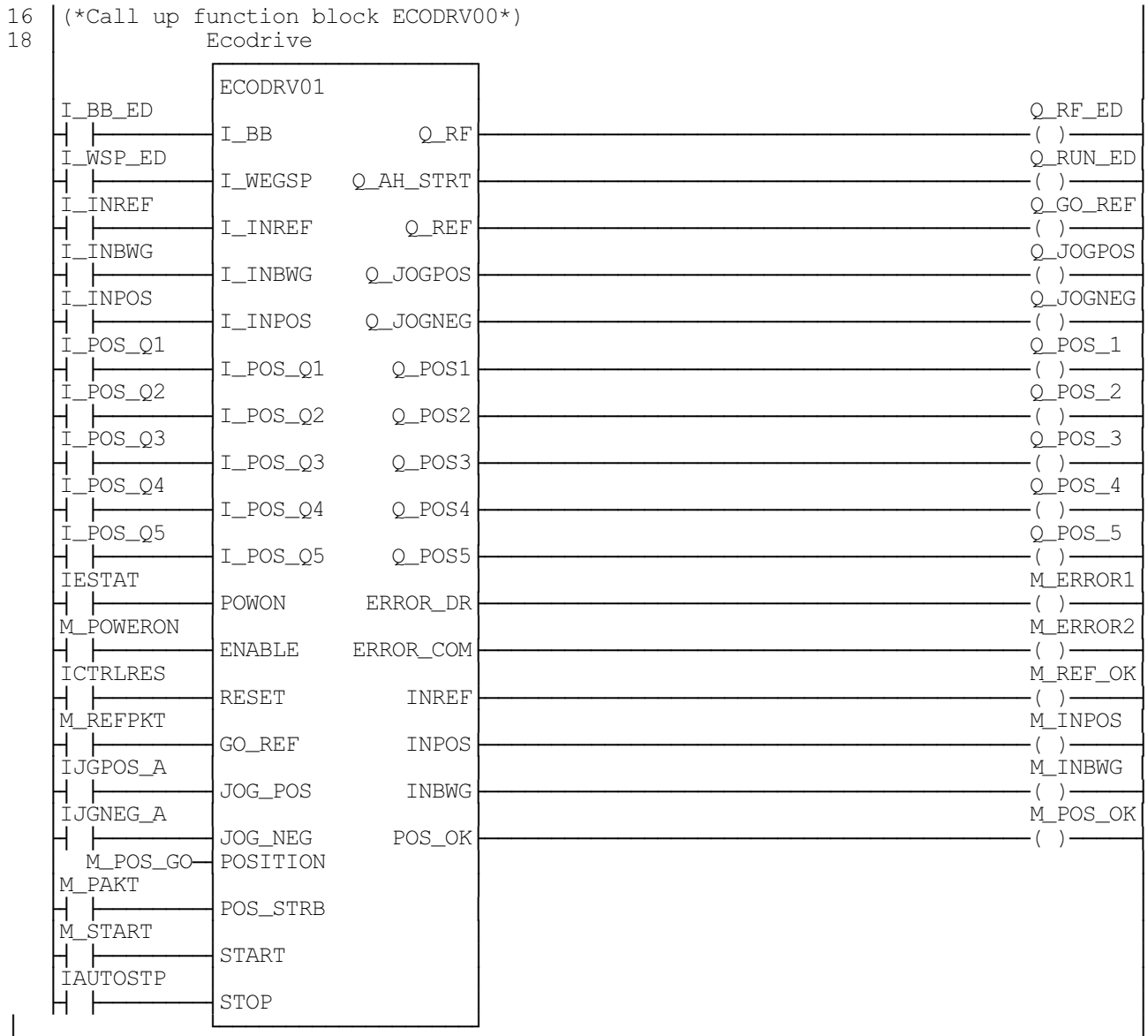
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INDRAMAT MT-CNC specific NC Commands and Functions

.START	Label START or head of program
.HOME	Label HOME or reverse program
BST	unconditional jump to label and program stop

3.3 PLC Program Example Positioning with an Auxiliary Function Output





List of Variables

IAUTOADV...	PB FORWARD START IN AUTOMATIC	%I1.22.4.	BOOL
IAUTOREV...	PB REVERSE START IN AUTOMATIC.....	%I1.20.6.	BOOL
M_ALL.....	FK read M function number.....		M_ALL
M_FKT.....	FK read M function.....		M_FKT
M_FKT_Q....	FK acknowledge M function.....		M_FKT_Q
M_NR.....	FK number of M function applied.....		M_NR
M_PAKT....	activate positioning block.....		BOOL
M_POS_GO...	current position number to go.....		INT
M_POS_MF...	positon number read by M function.....		INT
M_POS_OK...	positioning terminated.....		BOOL
M_REF_OK...	reference OK.....		BOOL
M_REFPKT...	M funktion reference point return.....		BOOL
M_START...	continue positioning after interruption.		BOOL
P00S.REV...	reverse program active.....		BOOL
X.....	DUMMY		BOOL
Ecodrive...	function block to control ECODRIVE.....		ECODRV00
I_BB_ED....	'ready for operation' message.....	%I2.3.0.	BOOL
I_INBWG....	axis moving.....	%I2.3.3.	BOOL
I_INPOS....	in position.....	%I2.3.4.	BOOL
I_INREF....	reference.....	%I2.3.2.	BOOL
I_POS_Q1...	positioning input signal acknowledge....	%I2.4.0.	BOOL
I_POS_Q2...	positioning input signal acknowledge....	%I2.4.1.	BOOL
I_POS_Q3...	positioning input signal acknowledge....	%I2.4.2.	BOOL
I_POS_Q4...	positioning input signal acknowledge....	%I2.4.3.	BOOL
I_POS_Q5...	positioning input signal acknowledge....	%I2.4.4.	BOOL
I_WSP_ED...	path control point.....	%I2.3.1.	BOOL
IAUTOSTP...	PB STOP AUTOMATIC	%I1.21.4.	BOOL
ICTRLRES...	PB CONTROL RESET.....	%I1.20.0.	BOOL
IESTAT....	PB EMERGENCY STOP.....	%I1.23.4.	BOOL
IJGNEG_A...	PB JOG NEGATIVE A AXIS.....	%I1.18.5.	BOOL
IJGPOS_A...	PB JOG POSITIVE A AXIS.....	%I1.22.5.	BOOL
M_ERROR1...	Ecodrive internal error.....		BOOL
M_ERROR2...	Ecodrive communication error.....		BOOL
M_INBWG....	Ecodrive message in motion.....		BOOL
M_INPOS....	Ecodrive message in position.....		BOOL
M_PAKT....	activate positioning block.....		BOOL
M_POS_GO...	current position to go.....		INT
M_POS_OK...	positioning completed.....		BOOL
M_POWERON..	power flag is on.....		BOOL
M_REF_OK...	reference point OK.....		BOOL
M_REFPKT...	reference point return M function.....		BOOL
M_START....	continue positioning after interruption.		BOOL
Q_GO_REF...	reference point return.....	%Q2.1.2.	BOOL
Q_JOGNEG...	jog negative.....	%Q2.1.7.	BOOL
Q_JOGPOS...	jog positive.....	%Q2.1.6.	BOOL
Q_POS_1....	positioning input signal.....	%Q2.2.0.	BOOL
Q_POS_2....	positioning input signal.....	%Q2.2.1.	BOOL
Q_POS_3....	positioning input signal.....	%Q2.2.2.	BOOL
Q_POS_4....	positioning input signal.....	%Q2.2.3.	BOOL
Q_POS_5....	positioning input signal.....	%Q2.2.4.	BOOL
Q_RF_ED....	drive enable.....	%Q2.1.0.	BOOL
Q_RUN_ED...	AH/start.....	%Q2.1.1.	BOOL

3.4 Positioning without CNC Program Interruption

If a positioning block must be executed without CNC program interruption, then the following method can be applied.

This example uses event number 10 as a control bit and NC variable number 10 to store the positioning block number.

Positioning Sequence

1. The CNC stores the number of the positioning block to be executed by the Ecodrive into variable number 10 (value range 0 to 31).
2. Event 10 is set TRUE by the CNC in order to initiate positioning.
3. The PLC reports 'positioning completed' by resetting event 10.

Items 1 and 2 can be programmed in different NC blocks. An inquiry once the position is reached (item 3) can be done any time (after item 2), but prior to a new positioning request latest.

Notice: From MT-CNC software version 16 onwards, positioning without interruption can be performed using the auxiliary function output. See PLC program example 'Positioning by Auxiliary Function Output' and MT-CNC documentation Mappe 5, 'Auxiliary Function Output' (version 16).

3.5 CNC Program Example Positioning without CNC Program Interruption

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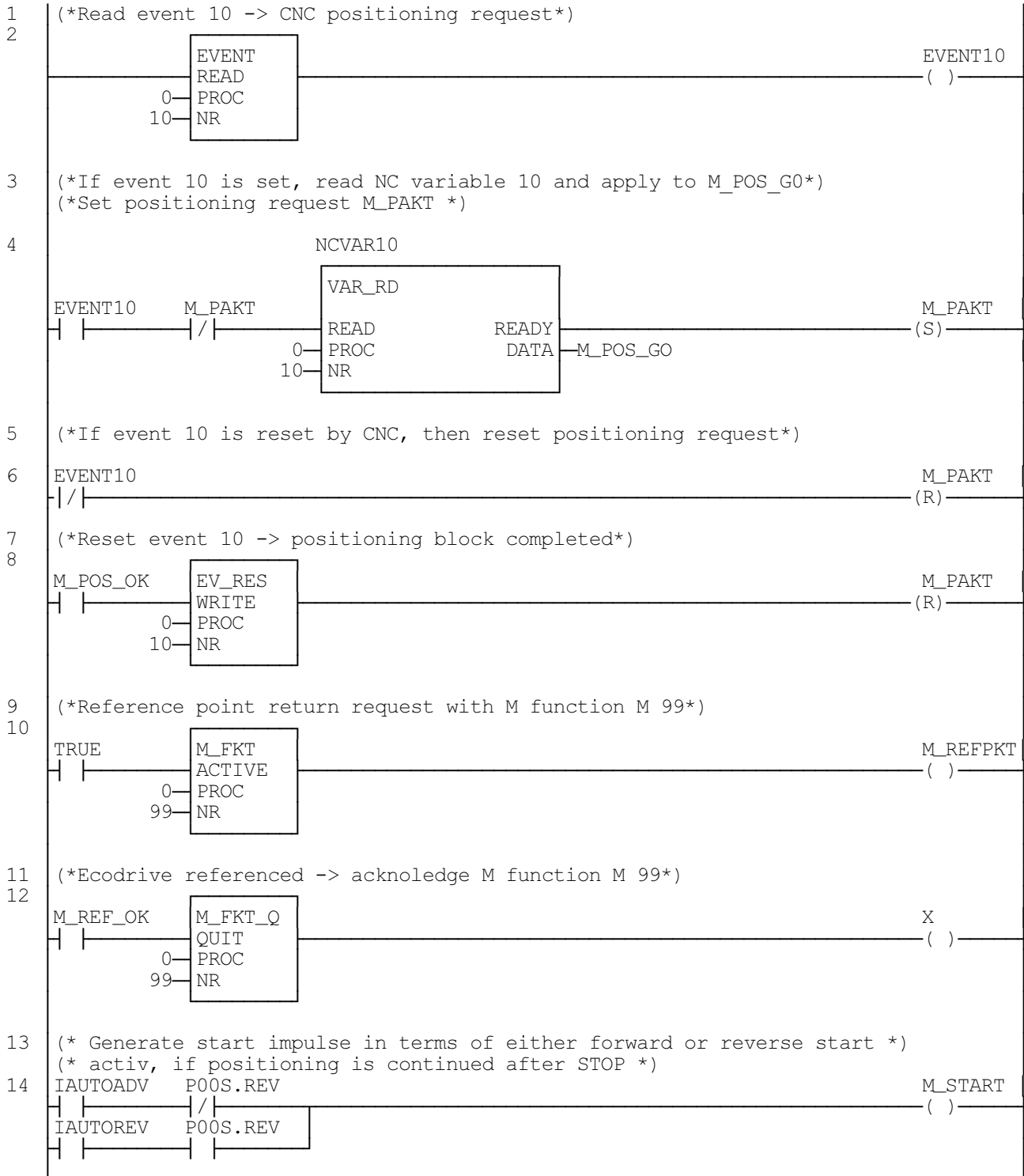
N0000 .START
N0001 WER 10 ; wait EV10 = 0 -> positioning completed
; or no positioning active
N0002 @10=0 ; set NC variable 10 to 0 -> pos 0
N0003 SE 10 ; set EV 10 = 1 -> initiate positioning
N0004 WER 10 ; wait EV10 = 0 -> positioning completed
N0005 G4 F 0.2 ; CNC program ....
N0006 @10=1 SE 10 WER 10; request pos.1, initiate positioning
; and wait until positioning completed
N0007 GO X 0 Y 0 ; motion block example
N0008 GO X 1 Y 1 ; motion block example .....
N0009 @10=2 SE 10 ; request pos.2 and initiate positioning
N0010 G1 X 2 Y 2 F1000 ; the CNC continues CNC program while
; positioning
N0011 G1 X 2 Y 1 ; continue program
N0012 WER 10 ; wait EV10 = 0 -> positioning completed
N0013 G1 X 2 Y 2 ; motion block example .....
N0014 @10=3 SE 10 ; positioning block 3, initiate positioning
N0015 G1 X 3 Y 2 ; motion block example .....
.
.
.
N0163 BST .START ; jump back to head of forward program
N0164 .HOME ; revers program
N0165 RE 10 ; reset positioning if currently active
N0166 M99 ; reference point return M function
; Ecodrive
N0167 @10=0 SE 10 ; initiate positioning block 0
N0168 WER 10 ; wait for completion of
; positioning block 0
N0169 BST .START ; jump back to head of forward program
N0170 PROGRAMMENDE

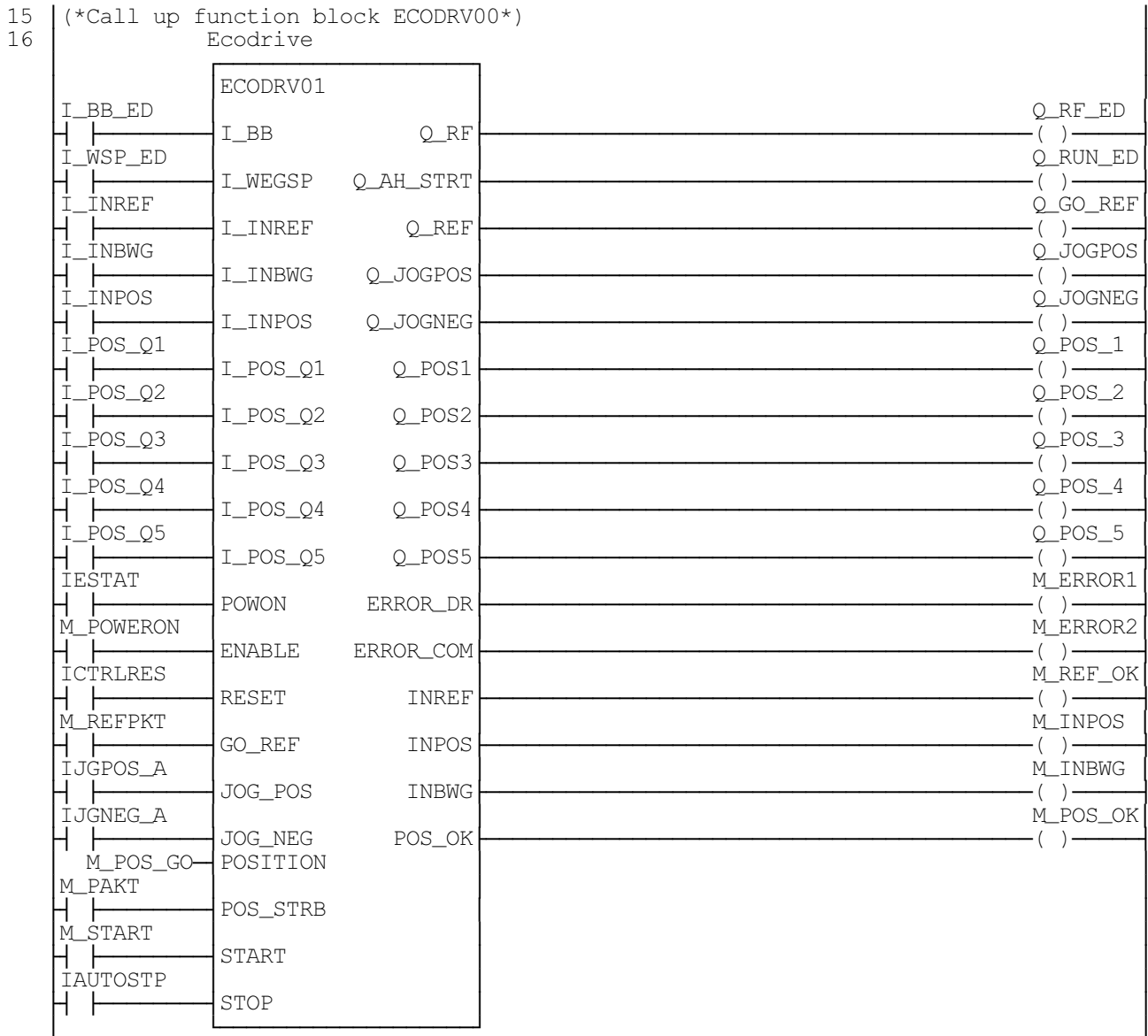
```

INDRAMAT MT-CNC specific NC commands and functions

SE 10	set event 10 (TRUE)
WER 10	wait event reset (FALSE)
@10=	assign a value to NC variable 10
.START	label START or head of program
.HOME	label HOME or reverse program
BST	unconditional jump and program stop

3.6 PLC Program Example Positioning without CNC Program interruption





List of variables

EV_RES....	reset event.....	EV_RES
EVENT....	read event.....	EVENT
EVENT10..	EVENT 10.....	BOOL
IAUTOADV..	PB FORWARD START IN AUTOMATIC.....	%I1.22.4.. BOOL
M_FKT....	read M function.....	M_FKT
M_FKT_Q..	acknowledge M function.....	M_FKT_Q
M_PAKT....	activate positioning block.....	BOOL
M_POS_GO..	current positioning number to go.....	INT
M_POS_OK..	positioning completed.....	BOOL
M_REF_OK..	reference OK.....	BOOL
M_REFPKT..	reference point return M function.....	BOOL
M_START...	continue positioning after interruption.	BOOL
NCVAR10..	read NC variable 10.....	VAR_RD
P00S.REV..	reverse program in progress.....	BOOL
X.....	DUMMY.....	BOOL
Ecodrive..	function block to control ECODRIVE.....	ECODRV00
I_BB_ED...	'ready for operation' message.....	%I2.3.0... BOOL
I_INBWG...	axis moving.....	%I2.3.3... BOOL
I_INPOS...	in position.....	%I2.3.4... BOOL
I_INREF...	reference.....	%I2.3.2... BOOL
I_POS_Q1..	positioning input signal acknowledge....	%I2.4.0... BOOL
I_POS_Q2..	positioning input signal acknowledge....	%I2.4.1... BOOL
I_POS_Q3..	positioning input signal acknowledge....	%I2.4.2... BOOL
I_POS_Q4..	positioning input signal acknowledge....	%I2.4.3... BOOL
I_POS_Q5..	positioning input signal acknowledge....	%I2.4.4... BOOL
I_WSP_ED..	path control point.....	%I2.3.1... BOOL
IAUTOSTP..	PB STOP AUTOMATIC	%I1.21.4.. BOOL
ICTRLRES..	PB CONTROL RESET.....	%I1.20.0.. BOOL
IESTAT...	PB EMERGENCY STOP.....	%I1.23.4.. BOOL
IJGNEG_A..	PB JOG NEGATIV A AXIS.....	%I1.18.5.. BOOL
IJGPOS_A..	PB JOG POSITIV A AXIS.....	%I1.22.5.. BOOL
M_ERROR1..	Ecodrive internal error.....	BOOL
M_ERROR2..	Ecodrive communication error.....	BOOL
M_INBWG...	Ecodrive message in motion.....	BOOL
M_INPOS...	Ecodrive message in position.....	BOOL
M_PAKT....	activate positioning block.....	BOOL
M_POS_GO..	current position number to go to.....	INT
M_POS_OK..	positioning completed.....	BOOL
M_POWERON.	power flag is on.....	BOOL
M_REF_OK..	reference OK.....	BOOL
M_REFPKT..	reference point return M function.....	BOOL
M_START...	continue positioning after interruption.	BOOL
Q_GO_REF..	reference point return.....	%Q2.1.2... BOOL
Q_JOGNEG..	jog negative.....	%Q2.1.7... BOOL
Q_JOGPOS..	jog positive.....	%Q2.1.6... BOOL
Q_POS_1...	positioning input signal.....	%Q2.2.0... BOOL
Q_POS_2...	positioning input signal.....	%Q2.2.1... BOOL
Q_POS_3...	positioning input signal.....	%Q2.2.2... BOOL
Q_POS_4...	positioning input signal.....	%Q2.2.3... BOOL
Q_POS_5...	positioning input signal.....	%Q2.2.4... BOOL
Q_RF_ED...	drive enable.....	%Q2.1.0... BOOL
Q_RUN_ED..	AH/start.....	%Q2.1.1... BOOL

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