

**EUROMAP
15**

**PROTOCOL FOR COMMUNICATION BETWEEN INJECTION
MOULDING MACHINES AND A CENTRAL COMPUTER**

Part 2

PRODUCTION MONITORING AND CONTROL

Version 1.2, May 1990
Document Release June 1992

This recommendation was prepared by the Working Group "Electronic Control of Injection Moulding Machines" of EUROMAP.

It is part of the complete EUROMAP 15 recommendation.

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1. Introduction

Part 2 of the EUROMAP 15 recommendation, production monitoring and control, defines the telegrams and data structures necessary to transfer production monitoring and control data such as:

- job codes
- part codes
- data set identification
- production target
- job status (number of good and rejected parts produced, cycle time, cavities in use)
- production status (machine in production, in preparation, production interrupted, production target reached)
- machine status (idle, set up, manual, semiautomatic, fully automatic)
- alarm messages

2. Types of Telegrams**2.1 Definition of Telegrams from the Central Computer****Telegram 002: LOAD JOB DEFINITION**

Byte	cont.	Description
05..16	-A12-	job code
17..28	-A12-	part code
29..40	-A12-	dataset id. no.

Telegram 003: REQUEST FOR JOB DEFINITION

contains no data bytes

Telegram 004: LOAD PRODUCTION TARGET

Byte	cont.	Description
05..16	-N12-	no. of lots
17..28	-N12-	no. of parts per lot

Telegram 005: REQUEST FOR PRODUCTION TARGET

contains no data bytes

Telegram "006" REQUEST FOR JOB STATUS

contains no data bytes

Telegram "007": LOAD PRODUCTION CONTROL COMMAND

Byte	cont.	Description
05	-N01-	command number
	"0"	- remote stop of machine at end of cycle
	"1"	- remote start of machine cycles (similar action to push button at machine)
	"2"	- remote start up (start a sequence for start up)
	"3"	- remote shut down (start a sequence for shut down)

Telegram "008": REQUEST FOR PRODUCTION STATUS

contains no data bytes

Telegram "009": REQUEST FOR MACHINE STATUS

contains no data bytes

Telegram "010": REQUEST FOR AUTOMATICALLY DETECTED ALARMS

contains no data bytes

Telegram "011": REQUEST FOR OPERATOR IDENTIFICATION

contains no data bytes

Telegram "012": LOAD TIME AND DATE

Byte	cont.	Description
05..06	-N02-	seconds [00 .. 59]
07..08	-N02-	minutes [00 .. 59]
09..10	-N02-	hours [00 .. 23]
11..12	-N02-	day [01 .. 31]
13	-N01-	day of week [1 = Monday ... 7 = Sunday]
14..15	-N02-	month [01 .. 12]
16..17	-N02-	year [00 .. 99]

Telegram "013": PRESET PRODUCTION COUNTER

Byte	cont.	Description
05..16	-N12	no. of lots completed
17..28	-N12	actual no. of parts within last lot
29..34	-N06	no. of rejected parts since start of the job
35..40	-N06	average cycle time (1/100 of seconds)
41..43	-N03	actual cavities in production

2.2 Extension of the List with Standard Answers

Telegram "100": STANDARD ANSWER		
Byte	cont.	Description
05..07	-N03-	request number
	"003"	- request for job definition
	"005"	- request for production target
	"006"	- request for job status
	"008"	- request for production status
	"009"	- request for machine status
	"010"	- request for automatically det. alarms
	"011"	- request for operator id.
	"012"	- request for date and time

2.3 Definition of Telegrams from the Machine Controller

Telegram "102": NEW JOB RECEIVED		
Byte	cont.	Description
05	-N01-	acknowledge
	"0"	- negative
	"1"	- positive

Telegram "103": JOB DEFINITION		
Byte	cont.	Description
05..16	-A12-	job code
17..28	-A12-	part code
29..40	-A12-	dataset id. no.

Telegram "104": PRODUCTION TARGET LOADED		
Byte	cont.	Description
05	-N01-	acknowledge
	"0"	- negative
	"1"	- positive

Telegram "105": PRODUCTION TARGET		
Byte	cont.	Description
05..16	-N12-	number of lots
17..28	-N12-	no. of parts per lot

Telegram "106": JOB STATUS		
Byte	cont.	Description
05..16	-N12-	no. of lots completed
17..28	-N12-	actual no. of parts within last lot
29..34	-N06-	no. of rejected parts since start of job
35..40	-N06-	average cycle time (1/100 of seconds)
41..43	-N03-	actual no. of cavities in production

Telegram "107":			PRODUCTION CONTROL COMMAND ACCEPTED
Byte	cont.	Description	
05	-N01-	acknowledge	
	"0"	- negative	
	"1"	- positive	
Telegram "108":			PRODUCTION STATUS
Byte	cont.	Description	
05	-N01-	production status	
	"0"	- production (parts under quality specs.) (switch on machine)	
	"1"	- preparation for production (switch on machine)	
	"2"	- production target reached	
	"3"	- production interrupted	
	"4"	- waiting for job definition	
	"5"	- waiting for production start	
06..07	-N02-	reason for production status	
		- possible reasons if status = "1"	
	"00"	- - no reason specified	
	"01"	- - setting up	
	"02"	- - mould assembly	
	"03"	- - mould disassembly	
	"04"	- - test run (tuning of parameters)	
	"05"	- - maintenance	
	"06"	- - (06 to 19 reserved for future	
	".."	EUROMAP reasons)	
	"19"		
	"20"	- - 20 to 99 are free	
	".."		
	"99"		
		- possible reasons if status = "3"	
	"00"	- - no reason specified	
	"01"	- - stopped by operator	
	"02"	- - general machine fault	
	"03"	- - mechanical machine fault	
	"04"	- - hydraulic machine fault	
	"05"	- - electrical machine fault	
	"06"	- - mould fault	
	"07"	- - fault of ancillary equipment	
	"08"	- - lack of material	
	"09"	- - safety conditions supervision (emergency stop push button, safety gates, motor overload, nozzle guard etc.)	

"10"	- - cycle time supervision
"11"	- - oil system supervision (level, temperature, pressure, filter etc.)
"12"	- - lubrication supervision (level, temperature, pressure, filter etc.)
"13"	- - clamp unit supervision (closing and opening time, force etc.)
"14"	- - ejection supervision (mould safety supervision, photocell, weight detection)
"15"	- - injection supervision (injection speed, pressure, time, position out of limit, cushion)
"16"	- - plasticizing supervision (time out, shot volume, etc.)
"17"	- - quality supervision (pressure curve, weight, etc.)
"18"	- - barrel temperature supervision
"19"	- - mould temperature supervision (cooling, heating, hotrunner)
"20"	- - ancillary equipment supervision (robot, material handling system, chiller, dryer, grinder, etc.)
"21"	- - maintenance
"22"	- - 22 to 49 reserved for future
".."	EUROMAP reasons
"49"	
"50"	- - 50 to 99 are free
".."	
"99"	

Remark: If byte 05 = "0", "2", "4", "5" , bytes 06 ..07 shall be filled with blanks. Older implementations may also fill these bytes with "00" or omit them.

Telegram "109": MACHINE STATUS

Byte	cont.	Description
05	-N01-	Status
	"0"	- idle (machine in standby mode)
	"1"	- set up (special manual mode)
	"2"	- manual
	"3"	- semi automatic
	"4"	- fully automatic

Telegram "110": AUTOMATICALLY DETECTED ALARMS

Byte	cont.	Description
05..08	-A04-	alarm reason 1
09..12	-A04-	alarm reason 2
13..16	-A04-	alarm reason 3
17..20	-A04-	alarm reason 4
21..24	-A04-	alarm reason 5
25..28	-A04-	alarm reason 6
29..32	-A04-	alarm reason 7
33..36	-A04-	alarm reason 8
37..40	-A04-	alarm reason 9

Remark: contents of alarm is machine manufacturer specific;
possibility to transfer controller alarm reasons.

Remark: a field is filled with 4 ASCII blanks if not used.

Telegram "111": OPERATOR ID.

Byte	cont.	Description
05..16	-A12-	operator id.

Telegram "112": TIME AND DATE ACCEPTED

Byte	cont.	Description
05	-N01-	acknowledge
	"0"	- negative
	"1"	- positive

Telegram "113": NEW PRODUCTION DATA ACCEPTED

Byte	cont.	Description
05	-N01-	acknowledge
	"0"	- negative
	"1"	- positive

3. Communication Flow

3.1 Transmit Job Definition

3.1.1 Send Job Definition to Machine Controller

"002"+data		- job definition
"102"+ack.		- job definition (not) accepted

3.1.2 Get Job Definition from Machine Controller

"000"		- standard question
"100"+"003"		- standard answer with request for job definition
"003"		- request for job definition
"103"+data		- job definition

3.2 Transmit Production Target

3.2.1 Send Production Target to Machine Controller

"004"+data		- production target
"104"+ack.		- production target (not) accepted

3.2.2 Get Production Target from Machine Controller

"000"		- standard question
"100"+"005"		- standard answer with request for production target
"005"		- request for production target
"105"+data		- production target

3.3 Transmit Job Status

3.3.1 Get Job Status from Machine Controller

"006"		- Request for job status
"106"+data		- Job status

3.3.2 Preset Production Counter in Machine Controller

"013"+data		- preset values for prod. counter
"113"+ack.		- values (not) accepted

3.4 Transmit Production Control Command

"007"+data		- production control command
"107"+ack.		- command (not) accepted

3.5 Transmit Production Status

3.5.1 Initialized by Central Computer

"008"		- request for production status
"108"+status		- transfer production status

3.5.2 Initialized by Machine Controller

"000"		- standard question
"100"+"008"		- standard answer with request for production status
"008"		- request for production status
"108"+data		- production status

3.6 Transmit Machine Status

3.6.1 Initialized by Central Computer

"009"		- request for machine status
"109"+data		- machine status

3.6.2 Initialized by Machine Controller

"000"		- standard question
"100"+"009"		- standard answer with request for machine status
"009"		- request for machine status
"109"+data		- machine status

3.7 Transmit Automatically Detected Alarms

3.7.1 Initialized by Central Computer

"010"		- request for automatically det. alarms
"110"+data		- automatically det. alarms

3.7.2 Initialized by Machine Controller

"000"		- standard question
"100"+"010"		- standard answer with request for automatically det. alarms
"010"		- request for automatically det. alarms
"110"+data		- automatically det. alarms

3.8 Transmit Operator Identification

3.8.1 Initialized by Central Computer

"011"		- request for operator identification
"111"+data		- operator identification

3.8.2 Initialized by Machine Controller

"000"		- standard question
"100"+"011"		- standard answer with request for operator identification
"011"		- request for operator identification
"111"+data		- operator identification

3.9 Transmit Time and Date

3.9.1 Initialized by Central Computer

"012"+data		
"112"+ack.		- date and time (not) accepted

3.9.2 Initialized by Machine Controller

"000"		- standard question
"100"+"012"		- standard answer with request for date and time
"012"+data		- date and time
"112"+ack.		- date and time (not) accepted

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