qem

MASTER/SLAVE SPEED SYNCHRONISER WITH ANALOG OUTPUT 0÷10 V. SERIAL PORT 422 FOR PC INTERFACING.
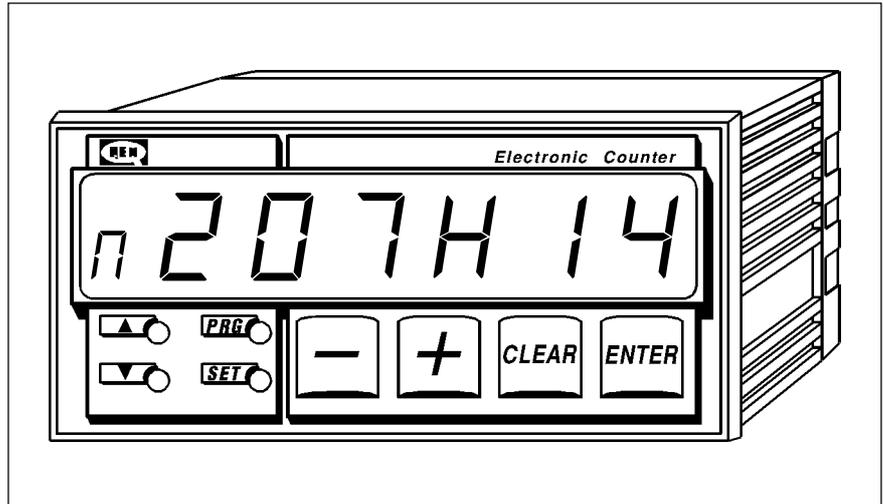
HM 207.14

- *Dimensions DIN 48 x 96.*
- *6-digit display .*
- *Non-volatile memory.*
- *Keyboard with scratch-proof membrane.*
- *Removable polarized terminal block.*
- *Input/Output expansion (optional).*
- *RS 422C multidrop expansion (optional).*
- *Analog output 9-bit 0÷10 V or 8-bit ±10 V.*
- *Personalized software.*

Electronic Counter

n207H14

DESCRIPTION OF OPEARATION

The instrument HM 207.14 consents speed synchronism between master and slave. The slave frequency is generaated by a transducer connected to an analog drive controlled by the instrument. The master frequency derives from the system to which synchronism is referred. The synchronism can be set by programming an absolute or percentage slave/master ratio. To be able to set the ratio in the required unit, two parameters can be set to adapt the ratio. Through the inputs or from the keyboard, it is possible to modify by impulse or in continuous mode the speed synchronism.It is also possible to activate manual mode through an input. A serial port makes it possible to interface the instrument with a PC to allow reading or to transmit the work parameters. More than one instrument can be linked in multidrop. The scratch-proof polycarbonate keyboard is made with mechanical actuators that give the operator a tactile awareness of having pressed a key.The counting, the presettings and the operating parameters are memorized in non-volatile memory to ensure the utmost reliability and safety of operation even in difficult working conditions.

The catalog explains how the product can be used and is not essential to the operation of the instrument.

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DESCRIPTION OF KEYBOARD

ENTER	**Green**	Confirms data input. Pressed for 1 second, gives access to slave/master ratio programming. Pressed together with key (**-**) + PASSWORD gives access to the SET-UP parameters, tachometer calibration and calibration of the P.I.D. adjustment parameters.
CLEAR	**Red**	It zeroes the item currently displayed. Pressed in normal operating mode, it shows the enabled displays.
+	**Black**	Increases by impulse or in continuous mode the number selected on the display (the flashing one). Increases the slave / master ratio (when enabled in set-up).
−	**Black**	When introducing data, it moves the selection of the number towards the right. Pressed together with **ENTER** + PASSWORD it gives access to the SET-UP parameters, calibration of the tachometer and adjustment parameters. Decreases the slave / master ratio (when enabled in set-up).
PRG○	**prg Led**	This is on while you are programming the set-up parameters.
SET○	**set Led**	Lighted when programming the slave / master ratio.
▲○	**Led**	Lighted in manual mode.
▼○	**Led**	Lighted when output U1=ON.
● 8	**Icf Led**	Lighted when input I5 or I6 is active; does not function in set-up, or in calibration "456" or "123".

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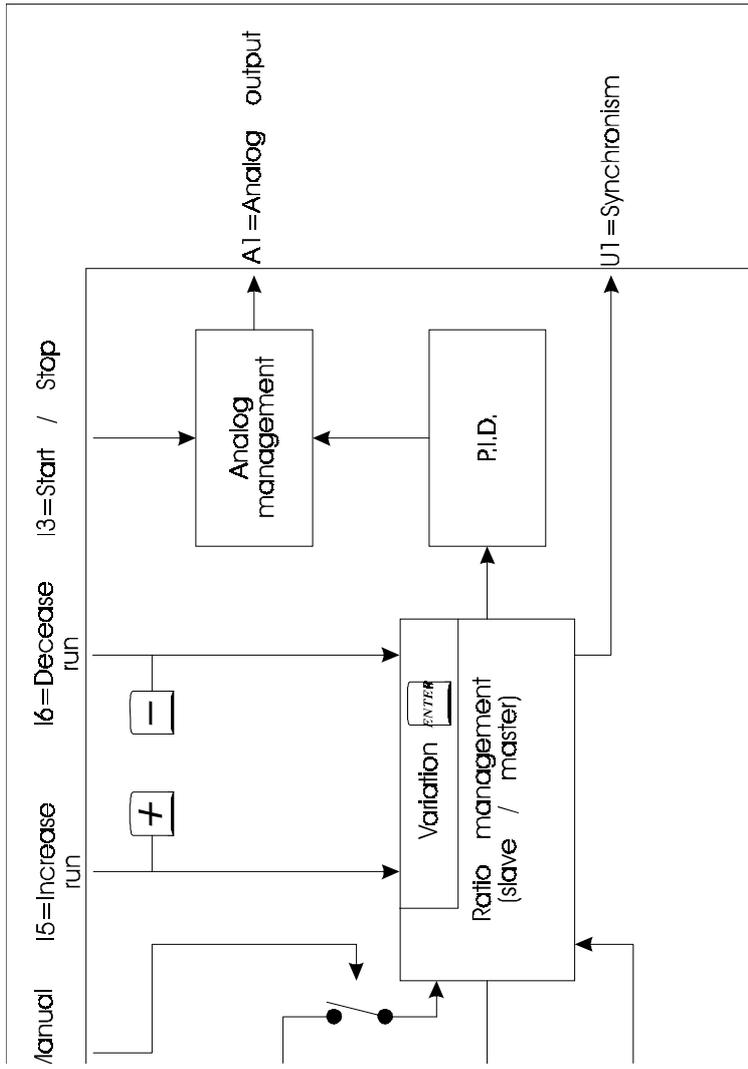
DESCRIPTION OF INPUTS

Terminal No	Name	Signal	Input status	Description
4	I1	I	ON	**CLOCK MASTER.** This is the input for the master frequency with which the slave is to be synchronised (maximum frequency 10 Khz).
5	I2	I	ON	**CLOCK SLAVE.** This is the input for the frequency generated by the slave drive transducer. The minimum settable frequency is 3 Hz.
6	I3	C	/	**START (ON) / STOP (OFF).** When started, the slave axis accelerates according to the programmed ramp and reaches synchronised speed with the master. When stopped, the slave decelerates according to the programmed deceleration ramp as far as zero speed. If the start is given with input I4=ON, the instrument is in manual adjustment mode.
7	I4	I	/	**MANUAL.** If a start is given with input I4=ON, the instrument is in manual slave adjustment mode. If during manual adjustment input I4 turns OFF, the instrument is in the stop phase.
				I=impulse input **C**=continuous input

DESCRIPTION OF INPUTS USED WITH EXPANSION (ORDER CODE "E4")

Terminal No	Name	Signal	Input status	Description
15	I5	I / C	ON	**INCREASE RUNNING.** Increases the running speed between master and slave. The type of variation is set in SET-UP. In manual the input is disabled.
16	I6	I / C	ON	**DECREASE RUNNING.** Decreases the running speed between master and slave. The type of variation is set in SET-UP. In manual the input is disabled.
				I=impulse input **C**=continuous input

DESCRIPTION OF OUTPUTS

Terminal No	Name	Signal	Duration	Description
9	U1	C	/	**SYNCHRONISM.** Activated when, with input I3=ON, the synchronism error between master and slave is less than the synchronism range programmed in SET-UP.
10	U2	C	/	**MASTER ALARM.** Activated when the master display exceeds the threshold set in the set-up parameter "5Π".
				I=impulse output **C**=continuous output

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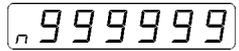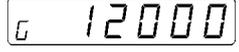
ENTRY TO THE SET-UP PARAMETERS

To access the the following parameters for programming, you have to input a 3-figure code as follows:

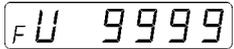- Activate thestop (I3=OFF).

- Press and hold the $\boxed{-}$ + $\boxed{\text{ENTER}}$ keys simultaneously for 1 second.

- The display will read $\boxed{\quad \boxed{0}\ \boxed{0}\ \boxed{0}}$ to prompt you to input the access code.

- Input the figure 207 with the (+) and (-) keys and confirm by pressing $\boxed{\text{ENTER}}$; the $\boxed{\text{PRG}}\bigcirc$ LED comes on

(On completion of the data input for each function, press **ENTER** to confirm and proceed to the next step.)

FUNCTION	DISPLAY	DESCRIPTION
Choice of displays	$\boxed{5 \sqcup \qquad 0}$	**0** = Master and slave speed displays are not enabled. **1** = Master display is not enabled. **2** = Master and slave displays are enabled.
Choice of slave / master ratio display	$\boxed{u \ulcorner \qquad 0}$	**0**= The display is not enabled. **1**= Display presents the set-point setting. **2**= Display presents the slave/master ratio calculation. **3**= Display presents the coil step.
Choice of synchronism setting	$\boxed{,5 \qquad 0}$	**0**= The set-point setting (synchronism) is 99999 **1**= The set-point setting (synchronism) is 9999.9 **2**= The set-point setting (synchronism) is 999.99 **3**= The set-point setting (synchronism) is 99.999 **4**= The set-point setting (synchronism) is 9.9999

If the parameter "Choice of displays"≠0, this display will also appear

Master/slave speed display in decimal figures	$\boxed{c \qquad 0}$	**0**= Maximum display 999999 **1**= Maximum display 99999,9 **2**= Maximum display 9999,99 **3**= Maximum display 999,999

Master maximum frequency	$\boxed{_F 400.00}$	This is the maximum frequency that the transducer transmits when the system is on maximum speed (max. 9999 Hz, min. 3 Hz).
Master display	$\boxed{_n 999999}$	This indicates the value that the instrument displays at maximum frequency.
Master cutoff frequency	$\boxed{_L \quad 12000}$	This is the clock input cutoff frequency, beyond which no count is detected. This value must be ^{3} the maximum frequency (generally at least 5% more).
Reading averages in acquisition master	$\boxed{_i A \qquad 99}$	This indicates every how many readings the speed to display (tachometer) is calculated. The higher the number of readings, the slower the speed updating time.

FUNCTION	DISPLAY	DESCRIPTION
Master speed threshold	5∏ 12345	This the master speed threshold above which output U2 is activated (max. 99999).
Maximum slave frequency	b 400.00	The maximum frequency transmitted by the transducer when the system is at maximum speed (max. 9999 Hz).
Slave display	t 999999	Indicates the value displayed by the instrument at maximum frequency. To exploit the system's resolution to the utmost, entry the maximum speed value effectively obtainable under real working conditions.
Slave cutoff frequency	J 12000	This is the clock input cutoff frequency, beyond which no count is detected. This value must be ^{3} the maximum frequency (generally at least 5% more).
Reading averages in acquisition slave	ıb 99	This indicates every how many readings the speed to display (tachometer) is calculated. The higher the number of readings, the slower the speed updating time.
Synchronism speed range	FU 9999	Identifies the speed range within which the synchronism output U1 is activated.
Average readings of synchronism speed range.	LFU 99	Indicates every how many readings calculation is made of the speed used in comparison with the set-point to activate the synchronism output.
Acceleration	A 99.9	Determines the time in seconds necessary to accelerate from zero speed to maximum speed (min. 0,1).
Deceleration	d 99.9	Determines the time in seconds necessary to decelerate from maximum speed to zero speed (min. 0,1).
Functions of the stop (I3)	5t 0	**0**= When the stop is activated (I3=OFF), the analog output immediately returns to zero. **1**= When the stop is activated (I3=OFF), the analog output returns to zero with the deceleration ramp. The deceleration ramp for stop is enabled until the analog output reaches zero volt. This type of stop is used with DC operations which can control the speed up to values very near to zero, maintaining a constant torque. In this case, the minimum frequency for managing the speed display is fixed at 1 Hz.
Type of ramp	tr 0	**0**= On starting, the speed synchronism of the instrument is immediately regulated independently of the master speed. **1**= When start is given, before activating the speed synchronism procedure, the acceleration ramp is generated in order to reach the master speed.
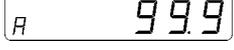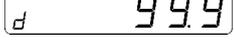
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FUNCTION	DISPLAY	DESCRIPTION
If the parameter "Choice of slave/master ratio displays" = 3 these displays will also appear		
Decimal figures coil pitch	$\boxed{c\,P \qquad 0}$	**0**= Maximum display 99999 **1**= Maximum display 9999,9 **2**= Maximum display 999,99 **3**= Maximum display 99,999
Minimum coil pitch	$\boxed{P\,1\ 12345}$	This is the value to be displayed when the slave/master ratio coincides with the value set in parameter "$A1$". Minimum coil pitch = 99999 max.
M/S ratio at minimum coil pitch	$\boxed{A\,1\ 12345}$	The master/slave ratio necessary to obtain the minimum coil pitch.
Maximum coil pitch	$\boxed{P\,2\ 12345}$	This is the value to be displayed when the slave / master ratio coincides with the value set in parameter "$A2$". Maximum coil pitch = 99999 max.
M/S ratio at maximum coil pitch	$\boxed{A\,2\ 12345}$	The master / slave ratio necessary to obtain the maximum coil pitch.

FUNCTION	DISPLAY	DESCRIPTION
S/M ratio modifying mode withs inputs I5, I6 and keys (**+**), (**-**)	$\boxed{s\,1 \qquad 0}$	**0**= The inputs are used for varying the run in continuous mode (modifying the slave / master ratio). **1**= The inputs are used for varying the run in impulse mode (modifying the slave / master ratio).
Variation of setpoint for every input I5, I6 (**+**), (**-**)	$\boxed{i \quad 99999}$	If the parameter "YES" is set on 0 it is the variation of the set-point for every minute that inputs I5 and I6 ar activated. If the parameter "YES" is set on 1 it is the variation of the set-point for every activation of input I5 or I6.
Percentage of S/M ratio variation (I5 , I6)	$\boxed{P\,E \qquad 99}$	The percentage of variation in the slave / master ratio that can be effected by inputs I5, I6 in respect to the value set from the keyboard (max. 99%).
If the parameter "Choice of slave/master ratio displays" = 0, 1 or 2 this display will also appear		
Coarse S/M coefficient	$\boxed{G\,H \quad 9999}$	A multiplication coefficient for the master speed for adjusting the slave/master ratio in the speed range required. **Slave speed**=(Master Speed × HC × GH) / set-point

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FUNCTION	DISPLAY	DESCRIPTION
Increase decrease from inputs I5, I6 and keys (**+**), (**-**) manual set-point	⌐ 99.9	The variation percentage of manual speed set-point, calculated on the maximum slave display, impulse or continuous, for every minute that inputs I5 and I6 are activated, according to the parameter "YES".
Enable keys "+" e "-"	b E 0	**0**=Keys "+" and "-" are enabled for changing the master / slave ratio. **1**=Keys "+" and "-" are not enabled for changing the master/slave ratio.
Enable RS 422	⌐5 0	**0**=RS 422 transmission is disabled. The option for RS 422 transmission is not used (order code DF4). **1**=RS 422 transmission is enabled.

If the parameter "Enable RS 422"=1 these displays will also appear

FUNCTION	DISPLAY	DESCRIPTION
Transmission speed RS 422	b⌐ 4800	110 baud 150 baud 300 baud 600 baud 1200 baud 2400 baud 4800 baud } Transmission speeds available; if the speed is wrong, default takes the value 4800.
Number of datum bits	d b 7	**7 bits** Number of datum bits available; if the number of bits is **8 bits** wrong, default takes the value 8.
Number of stop bits	5 b 2	**1 bit di stop** Number of stop bits available; if the number of bits **2 bit di stop** is wrong, default takes the value 2.
Parity bit	bP 0	**0**=No parity. **1**=Odd parity. **2**=Even parity. Valore di default **0**.
Address code	C 1 00	The code to be assigned to the unit when the instrument is to be connected to others in DAISY-CHAIN or MULTI-DROP configuration.
Enable checksum	C H 0	**0**=The checksum of transmitted data is not enabled. The instrument waits for the PC to echo the character. Connection of more than one instrument is in DAISY-CHAIN. **1**=The checksum of transmitted data is enabled and OR is calculated excluding the data sent (see specific paragraph "Commands in RS 422").

**If the parameter "Enable checksum"=1 this display will also appear**

FUNCTION	DISPLAY	DESCRIPTION
Transmission delay	⌐ E 999	The time (expressed in thousandths of second) of the instrument's transmission delay between one character and another.

After programming the last function, the screen will return to the display in use previous to SET-UP entry and the prg led goes off

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## PROGRAMMING THE SLAVE/MASTER SYNCHRONISM RATIO (SET-POINT)

To entry the slave / master working ratio, proceed as follows:

Press the key ENTER for about 1 second, lighting the led SET○ and the display, if input I4=OFF, will show:
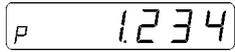
| P   1.2 3 4 | The operator can use keys (**+**) and (**-**) to entry a new value (the synchronism ratio, absolute or in percentage, in function of the parrameter "Choice of synchronism setting " in SET-UP). With the key **+** it is possible to modify the value of the flashing number, while key **-** is used to pass to the successive number. On confirmation with **ENTER** the **SET** led goes off and the screen returns to the displays in use.

Se l'ingresso I4=ON the display shows:
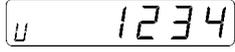
| u   1 2 3 4 | The operator can use keys (**+**) and (**-**) to entry the manual set-point. On confirming with **ENTER** the **SET** led goes off and the screen returns to the displays in use.

N.B. The slave / master ratio can be varied with keys (**+**) and (**-**), or with inputs I5 or I6 (inputs/outputs expansion) when not in the programming phase. During normal operations, pressure on the (**+**) or (**-**) key, or activation of inputs I5 and I6, will cause the instrument to display the value that is varied. During normal operations, the instrument shows the selected display.

INTROD. COEFF. FOR ADAPTING S/M RATIO (ENABLED IF "Ur" = 0, 1, 2 IN SET-UP)

To entry the coefficient for adapting the slave / master ratio, proceed as follows:

- Press simultaneously the keys $\boxed{-}$ + $\boxed{ENTER}$ for 1 second.

- The display will show $\boxed{\quad\quad\boxed{0}\;\boxed{0}\;\boxed{0}}$ which is the request for the access code.

- Use the (**+**) and (**-**) keys to entry value 312 and confirm with $\boxed{ENTER}$; lighting led $\boxed{PRG}\bigcirc$ and the display will show:
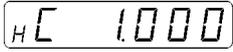
$\boxed{_H\boxed{C}\quad 1.000}$ The operator can use keys (**+**) and (**-**) to entry a multiplication coefficient for the master speed, for fine adjustment of the slave/master ratio. On confirming with enter, the screen will return to the displays in use.

Slave speed=(Master speed × HC × GH) / set-point.

DISPLAYS

During normal operation, the following appears on the display:

`5    12345` Slave speed (if in SET-UP the parameter "Choice of display"[1]0).
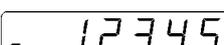
By pressing key `CLEAR` , the display will show:
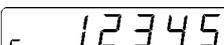
`r    1.2345` If "Ur"=1 shows the setting of the set-point that can be modified only from the keyboard. If "Ur"=2 or 3 it shows the calculation of the s/m ratio currently in use.
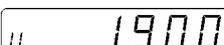
By pressing key `CLEAR` , the display will show:
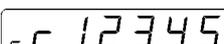
`rr  1.2345` If "Ur"=1 or 2 shows the setting of the set-point that can be modified both from the keyboard and from external inputs. If "Ur"=3 it shows the set coil pitch.

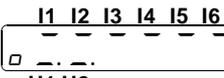By pressing key `CLEAR` , the display will show:

`n    12345` Master speed (if in SET-UP the parameter "Choice of display"=2).

Activating start with input I4=ON, the display will show:

`u    1900` Set-point for manual slave speed.

N.B. If already in manual, this display will appear with priority on the others.

By pressing key `CLEAR` , the display will show:

<div>

I1 I2 I3 I4 I5 I6

`o  _ _ _ _ _ _` The display shows input and output status. The lighted led indicates activation of the input or of the output.

U1 U2

</div>

By pressing key `CLEAR` , the screen returns to the displays in use.

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CALIBRATING THE P.I.D. ADJUSTMENT PARAMETERS

To calibrate the djustment parameters, proceed as follows:

- Set a value for speed.

- Press simultaneously the keys [—] + [ENTER] for 1 second.

- The display will show [000] which is the request for the access code.

- Use keys (**+**) and (**-**) to entry the value 321 and confirm with [ENTER] ; P.I.D. parameter programming will be enabled and the display will show:

[Lr∏   99] The operator can use keys (**+**) and (**-**) to entry the number of readings used in calculating the master speed used in speed adjustment. Greater the value entered and slower the time in up-dating the speed. On confirming with **ENTER**, the display will show:

[Lr5   99] The operator can use keys (**+**) and (**-**) to introduce the number of readings used in calculating the slave speed used in speed adjustment. Greater the value entered and slower the time in up-dating the speed. On confirming with **ENTER**, the display will show:
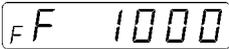
[FF 1000] The operator can use keys (**+**) and (**-**) to entry the percentage of analog output in function of the set speed (feed-forward). If option "2B" is provided, this parameter does not appear. On confirming with **ENTER**, the display will show:

[GR 00.00] The operator can use keys (**+**) and (**-**) to entry the gain value within which the instrument is in P.I.D. adjustment. On confirming with **ENTER**, the display will show:
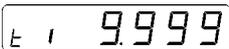
[tι 9.999] The operator can use keys (**+**) and (**-**) to entry the integral time (expressed in seconds). If option "2B" is provided this parameter does not appear. On confirming with **ENTER**, the display will show:

[td 9.999] The operator can use keys (**+**) and (**-**) to entry the derived time (expressed in seconds) and confirm with **ENTER**. If option "2B" is provided this parameter does not appear. On confirming with **ENTER**, the screen returns to the displays in use.

N.B. As soon as a value is entered, it is executed immediately.
This instrument does not allow calibration of the offset drive. This must be performed either with the trimmer on the drive, or using a speed input on the same.

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CALIBRATING THE TACHOMETER CLOCK 1 (MASTER)

To facilitate the installation and the inputting of the SET-UP values that establish how the speed is displayed, you can display the frequency meter (Hz) and the total count of the clock pulses by proceeding as follows:

- Activate the stop (I3=OFF).

- Press and hold the [—] + [ENTER] keys for 1 second.

- The display will show [0 0 0] which is the request for the access code.

- Use keys (**+**) and (**-**) to entry the value 123 and confirm with [ENTER] ; at this point, speed adjustment is disabled and the display will show:

[F   1 2 3] Frequency meter.

By pressing key [ENTER] the display will show:
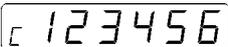
[C 1 2 3 4 5 6] Clock impulses (the count is zeroed for each access to tachometer calibration).

To reset the count to zero, press key [—]

By pressing key [ENTER] the display will show:

[F   1 2 3]

To exit, press key [CLEAR]

For a correct setting, the maximum frequency and maximum system speed parameters must be defined exactly. To determine the transducer's maximum impulse frequency, it is sufficient to bring the servocontrolled motor to maximum speed and to read the frequency displayed by the instrument. This value will be entered in SET-UP in parameter "Maximum frequency". At this frequency a speed will be calculated and displayed. Therefore the value must be determined in the unit of measurement of every single clock impulse. This data may already by known by the installer, or it may have to be calculated experimentally; to do this, return to tachometer calibration, turn the system to move the actuating parts to the measure known by the installer (e.g. 1 mt, 10 mt, 100 mm, etc. etc.)and acquire the number of clock impulses read by the instrument.

Nº measurements = Maximum frequency / Nº of impulses read

Max. speed = Nº measurements × known measure

The calculated value of the maximum speed calculated is entered in the corresponding SET-UP parameter, adaptinig it to the unit of time utilised.

N.B. The value calculated must be adapted to the number of decimal figures that are to be displayed.

E.g. Max. frequency=1638,4 Hz

At 100 mm. the acquired count is equal to 200 impulses, therefore 1638,4 / 200=8,192 (Nº measures / sec.).
In one second the system runs 8,192 × 100=819,2 mm. / sec.
The value to be entered in set-up at maximum speed can be transformed as follows:
mm. / minute = 49152
mt. / second = 0,8192
mt. / minute = 49,152
N.B. If the system is moving at a speed of 0,2 metres / second (true speed), the input frequency will be:

(Max. fr. / Max.sp.) × True speed=(1638,4 / 0,8192) × 0,2=400 Hz

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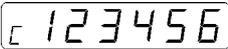
CALIBRATING THE TACHOMETER CLOCK 2 (SLAVE)

To facilitate the installation and the entry of the SET-UP values that establish how the speed is displayed, you an display the frequency meter (Hz) and the total count of the clock impulses by proceeding as follows:

- Press simultaneously the keys [—] + [ENTER] for 1 second.

- The display will show | $\quad$ 0 0 0 | whichi is the request for the access code.

- Use keys(**+**) and (**-**) to entry the value 456 and confirm with [ENTER] ; at this point, speed adjustment is disabled and the display will show:
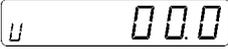
| U $\quad$ 0 0.0 | The operator can use keys (**+**) and (**-**) to entry a voltage value and confirm with **ENTER**. If the option "2B" is provided, the minus sign can be entered and the (**-**) key used to arrive over the "**Icf**" led. The output AN1 will assume the set value and the display will show:

| F $\quad$ 1.2 3 | Frequency meter.

By pressing key [ENTER] the display will show:

| C $\quad$ 1 2 3 4 5 6 | Clcok impulses (the count returns to zero every time tachometer calibration is accessed).

To reset the count to zero, press key [—]

By pressing key [ENTER] the display will show:

| F $\quad$ 1.2 3 |

To exit, press key [CLEAR]

For a correct setting, the maximum frequency and maximum system speed parameters must be defined exactly. To determin the transducer's maximum impulse frequency, it is sufficient to bring the servocontrolled motor to maximum speed and to read the frequency displayed by the instrument. This value will be entered in SET-UP in the "Maximum frequency"parameter. At this frequency a speed will be calculated and displayed. Therefore the value must be determined in the unit of measurement of every single clock impulse. This data may already be known by the installer, or it may have to be calculated experimentally; to do this, return to tachometer calaibration, turn the system to move the actuating parts to the measure known by the installer (e.g. 1 mt, 10 mt, 100 mm, etc. etc.) and acquire the number of clock impulses read by the instrument.

N⁰ measurements $\quad$ = $\quad$ Maximum frequency / N⁰ impulses read

Max. speed $\quad$ = $\quad$ N⁰ measurements × known measure

The calculated value of the maximum speed is entered in the corresponding SET-UP parameter, adapting it to the unit of time utilised.

N.B. The value calculated must be adapted to the number of decimal figures that are to be displayed.

E.g. $\quad$ Max. frequency=1638,4 Hz

At 100 mm.the acquired count is equal to 200 impulses, therefore 1638,4 / 200=8,192 (N⁰ measures/ sec.).
In one second the system runs 8,192 × 100=819,2 mm. / sec.
The value to be entered in set-up at maximum speed can be transformed as follows:
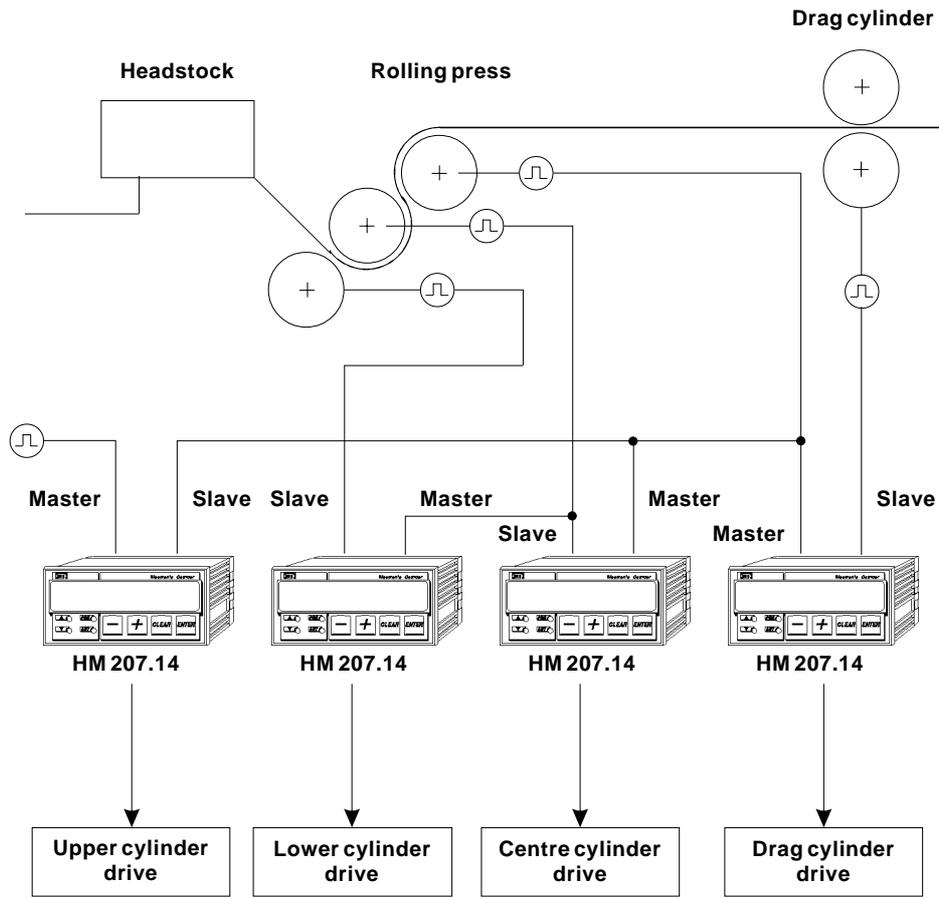mm. / minute = 49152
mt. / second = 0,8192
mt. / minute = 49,152
N.B. If the system is moving at a speed of 0,2 metres / second (true speed), the input frequency will be:

$\quad$ **(Max.fr. /Max.sp.) ×True speed**=(1638,4 / 0,8192) × 0,2=400 Hz

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Synchronism of a rolling press and drag cylinder

Drag cylinder

Headstock   **Rolling press**

Master   **Slave** **Slave**   **Master**   **Master**   **Slave**

Slave   **Master**

| HM 207.14 | HM 207.14 | HM 207.14 | HM 207.14 |

| Upper cylinder drive | Lower cylinder drive | Centre cylinder drive | Drag cylinder drive |

The upper cylinder can be linked to a pilot encoder (pump).

IEM=100 imp. / g

2500 RPMM

RM 1 / 4

M

CM=0,200 mt

IES=180 imp. / g

2000 RPMS

RM 1 / 4

S

CS=0,324 mt
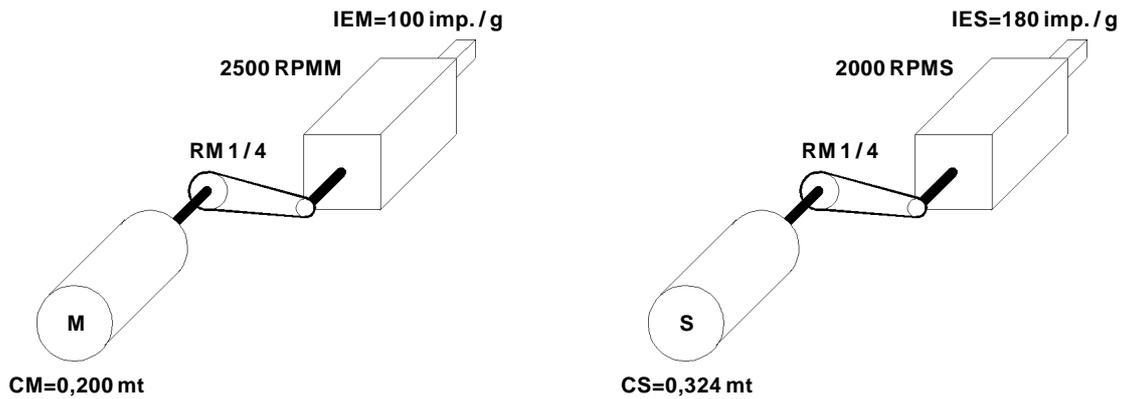
CM-CS = Circumference.

RM-RS = Velocity ratio.

RPMM-RPMS = RPM.

IEM-IES = Primary encoder impulses.

The same peripheral cylinder speed is required, expressed in mt / mt with a resolution in decimetres.
The maximum master speed is 125 mt / min. with an encoder frequency of 4166 Hz.
The maximum slave speed is 162 mt / min. with an encoder frequency of 5000 Hz.
At maximum master speed, a ratio with the maximum percentage of 129,60% can be entered.

The SET-UP parameters to be programmed are thus:

Choice of displays	Installer's choice (recommended 2)
Choice of synchronism setting	Installer's choice (recommended 0)
Choice of ratio display	Installer's choice (recommended 1)
M / s speed display decimal figures	1
Maximum master frequency	4166
Master display	125,0
Master cut frequency	4374
Average readings in master acquisition	Installer's choice (1÷10)
Maximum slave frequency	5000
Slave display	162,0
Slave cut frequency	5250
Average readings in slave acquisition	Installer's choice(1÷10)
Synchronism speed range	Installer's choice
Acceleration	Installer's choice
Deceleration	Installer's choice
Stop functions	Installer's choice
Type of ramp	Installer's choice
Type of run variation from inputs I5, I6 and keys (+), (-)	Installer's choice
Continuous increase / Decrease I5, I6 and keys (+), (-)	Installer's choice
Percentage of variation from inputs I5, I6	Installer's choice

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If the instrument is provided with the option RS 422 and, in SET-UP, serial transmission is enabled, data writing and reading commands can be transmitted from a PC. The serial port can be configured by programming the instrument's appropriate SET-UP parameters. It is possible to set the transmission speed, the number of data bits, the number of stop bits, the parity bits, checksum control enablement (OR exclusive) and the instrument's address code. In, in SET-UP, the choice is not made for checksum control with character transmission delay, the instrument will manage the echo of the character transmitted.

The characters forming the string are in hexadecimal format (Hex.). The numerical data are managed in bytes (two characters per byte). The instrument is always a slave and can transmit only after a request from the PC (master). In a multi-drop link, the checksum control must always be set. With daisy-chain connections, the transmission of the character echo is set.

Syntax of general transmission commands from PC to the instrument HM 207.14.

Every string of commands sent by the PC will always start with the character "**{**" (ascii vallue=7B Hex.).
The first two characters are the instrument's address code to which the message is destined. The following two characters must be two capital letters indentifying the command code (write command or read request command). The character that follows to identify the variable and therefore the operand, that is the numerical value of the variables involved in transmission. The strings of characters transmitted without placing first the character "**{**" and not endinig with the character "**@**" will be ignored. Should the instrument detect a checksum different from that transmitted by the PC, the data will not be accepted (the failure can be detected by checking the equality between the checksum of transmitted data and the checksum calculated by the instrument which is sent by the PC each time a data writing operation is requested. The instrument checks the limits of the transmitted data and the enabling of acceptance. If checksum control is not enabled, the echo transmitted by the instrument must be controlled by the PC.

{ XX YY XX XXXXXX XX @

▶ Last character in the string.

▶ Checksum of the string transmitted, excluding the first and last characters (**{**, **@**).

▶ Value of the datum (3 bytes max. Hex. F423F).

▶ Datum number 1 = Hc (disabled if "Ur" = 3).
Datum number 2 = Set-point (slave / master ratio). If "Ur"=3 corresponds with coil pitch.

▶ Command code (two letters). **TS** = Request for data writing.
TL = Request for data reading.

▶ Address code. Identifies the instrument in transmission / reception (1 byte max. Hex. 63).

▶ Code for starting transmission of string from PC (**{**).
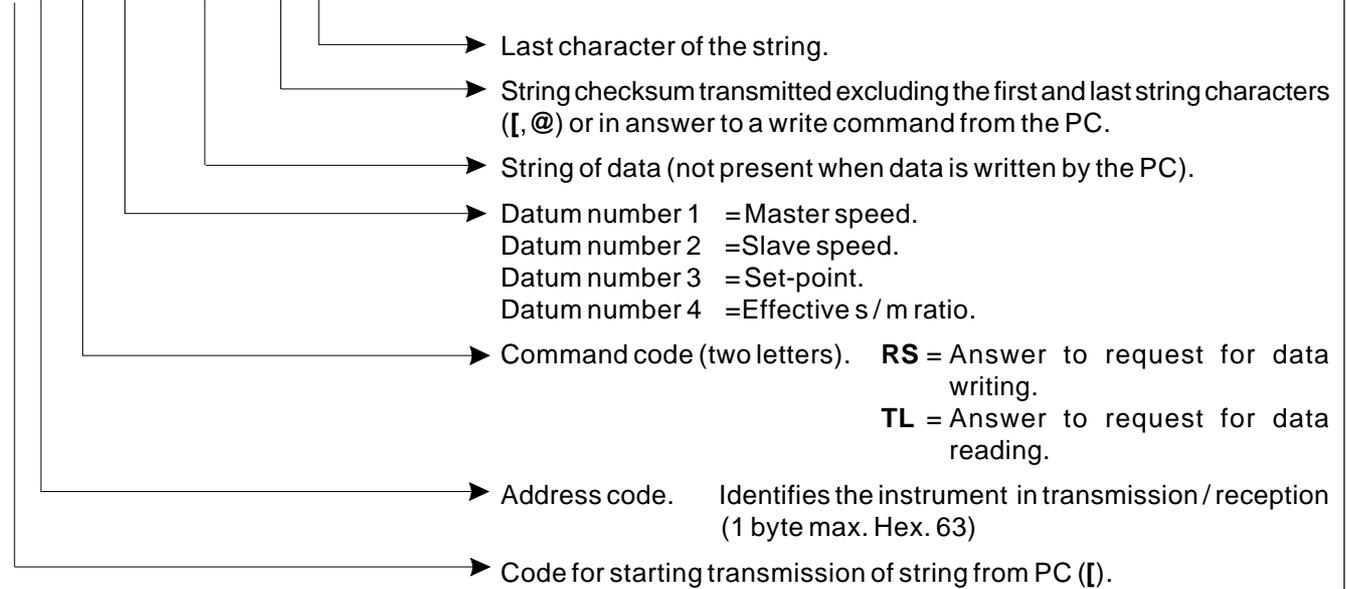
Syntax of general transmission commands from HM 207.14 to the PC

The instrument, in its functions as slave, will always transmit in reply to the commands received from the PC. Every string of answers sent by the instrument will always begin with the character "**[**" (ascii value=5B Hex.).

The first two characters are the instrument's address code in answer to the transmission requested by the PC. The next two characters will be 2 capital letters identifying the command code (answer to transmission). After the command code, if the PC has requested data reading, there will be the number of the datum and then the operand, that is the numerical value of the variables involved in transmission, and then the two checksum characters. In the case of an answer to a write command, after the command code, the checksum calculated by the instrument (if enabled) is transmitted.

Characters transmitted without first placing the character "**[**" and ending with "**@**" must be ignored. The checksum transmitted by the instrument is the checksum answering a write command from the PC or the checksum of the rad data string requested by the PC.

[XX YY XX XXXXXX XX @

➤ Last character of the string.

➤ String checksum transmitted excluding the first and last string characters (**[**, **@**) or in answer to a write command from the PC.

➤ String of data (not present when data is written by the PC).

➤ Datum number 1 = Master speed.
Datum number 2 = Slave speed.
Datum number 3 = Set-point.
Datum number 4 = Effective s / m ratio.

➤ Command code (two letters).   **RS** = Answer to request for data writing.
TL = Answer to request for data reading.

➤ Address code.   Identifies the instrument in transmission / reception (1 byte max. Hex. 63)

➤ Code for starting transmission of string from PC (**[**).

Example of data writing.

Should it be necessary to transmit the set-point datum to the instrument, to which we give the instrument address code "01", the procedure is as follows:

Instrument address code = 01 (Hex. 01).

Set-point address = 01 (Hex. 01).

Set-point value to transfer = 1234 (Hex. 04D2).

CHECKSUM = Calculated using XOR of the bytes composing the string to be transmitted, excluding the character "**{**" (first character of the string) and "**@**" (last character of the string).

In this case, therefore, the string of characters is thus composed:

{01TS0104D2 ... @

The dots indicate the space in which to insert the CHECKSUM value for the string of charcters transmitted. In this case, the value will be equal to:

CHECKSUM = 30 XOR 31 XOR 54 XOR 53 XOR 30 XOR 31 XOR 30 XOR 34 XOR 44 XOR 32=75 (valore Hex.).

Therefore the string of characters to be transferred will be:

{01TS0104D275@

After transmitting the string, it is necessary to await the answer from the board which, when transmission has been made without any errors, will give the following string of characters:

[01RS75@ (*continues on following page*).

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N.B. Checksum enabling=0: when the instrument transmits to the PC, after each character transmitted it awaits an echo for 5 seconds. In this time, should the echo received be different from the character transmitted, for 2 seconds the display will show:

```
Err  422
```

N.B. Checksum enabling=1: If the instrument detects an error (save that of a difference between the checksums), it will transmit the following error string.

[XX Err 422 @

━━━━━━━━━━━━━━━━━━━━▶ Instrument code.

Example of data reading.

When wishing to read the master speed from the instrument, to which we give the instrument address code "12", proceed as follows:

Instrument address code = 12 (Hex. 0C).

Master speed address = 1 (Hex. 01).

CHECKSUM = Calculated with XOR of the bytes composing the tring to be transmitted, excluding the character "**{**" (first character of the string) and "**@**" (last character of the string).

Therefore in this case the string of characters transmitted by the PC to request the instrument's reading of the data would be thus composed:

{0CTL01 ... @

The dots indicate the space in which to insert the CHECKSUM value for the string of characters transmitted. In this case the value will be equal to:

CHECKSUM = 30 XOR 43 XOR 54 XOR 4C XOR 30 XOR 31=6A (Hex.value).

The string of characters to be transferred will thus be:

{0CTL016A@

After transmitting the string, await the instrument's answer. If the transmission has been made without any error and the master speed value is 123456 (Hex. 01E240), the instrument will check that the checksum value calculated on the data received corresponds with the checksum value transmitted by the PC (otherwise the read request must be repeated and the data received must not be accepted), and the data values can be transmitted, dividing the string of characters in this way:

[= First character of the string.

0C = Address of the board from which the answer is given.

RL = Command code (answer to a request for data reading).

01 = Number of the variable transmitted.

01E240 = Hexadecimal value of the dta transmitted.

41 = Checksum value for the string transmitted (calculated without characters "**[**" and "**@**").
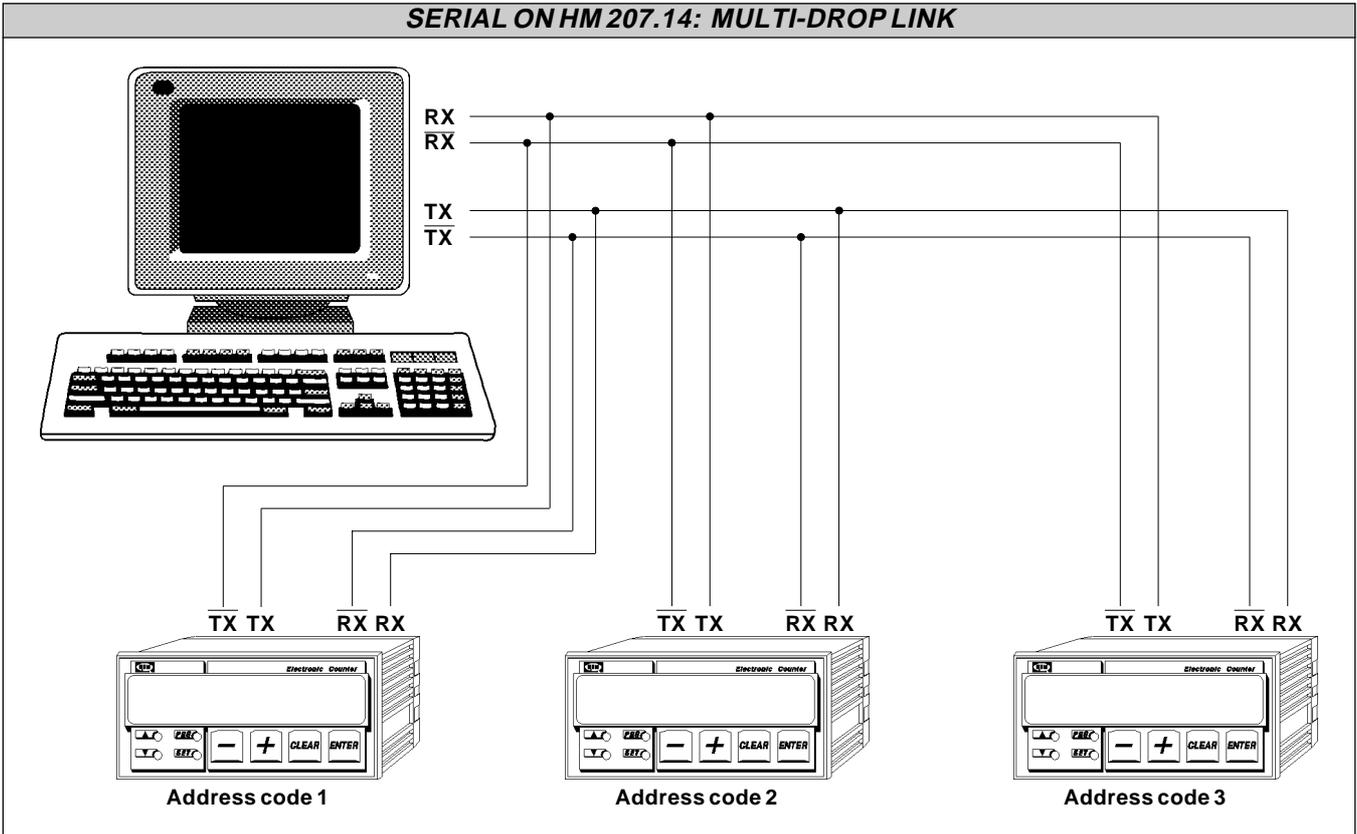
@ = Last character of the string.

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SERIAL INTERFACE LINK

Instrument terminal board HM 207.14   **25-pin RS 422 Terminal (IBM PC)**

Clamp 23	= RX	——————————	**Pin 11 = TX**
Clamp 24	= TX	——————————	**Pin 10 = RX**
Clamp 25	= $\overline{RX}$	——————————	**Pin 23 = $\overline{TX}$**
Clamp 26	= $\overline{TX}$	——————————	**Pin 24 = $\overline{RX}$**

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SERIAL ON HM 207.14: MULTI-DROP LINK

RX
$\overline{RX}$

TX
$\overline{TX}$

TX TX RX RX

Address code 1

TX TX RX RX

Address code 2

TX TX RX RX

Address code 3

SERIAL ON HM 207.14: DAISY-CHAIN SERIAL LINK

RX
$\overline{RX}$

TX
$\overline{TX}$

TX TX RX RX

Address code 1

TX TX RX RX

Address code 2

TX TX RX RX

Address code 3

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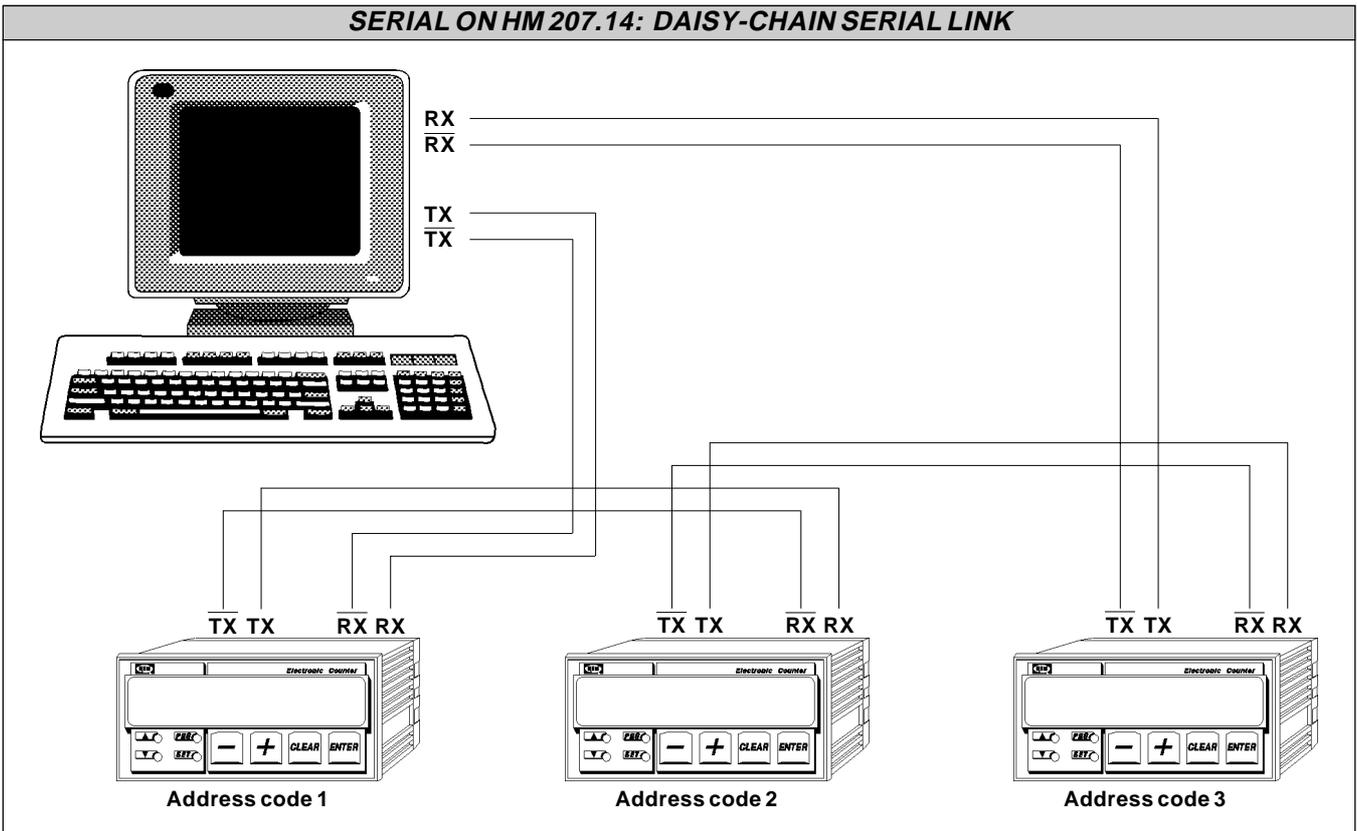
ELECTRICAL CONNECTIONS FOR INPUTS AND OUTPUTS

1	**+**	12 V 100 mA transducers power supply positive
2	**-**	Transducers power supply negative.
3	**P1**	Terminal for polarizing inputs I1 το I4 (**+** NPN, **-** PNP).
4	**I1**	(I) Clock master.
5	**I2**	(I) Clock slave.
6	**I3**	(C) Start (ON) / Stop (OFF).
7	**I4**	(C) Manual.
8	**C1**	Terminal for polarizing outputs U1-U2 (**+** PNP, **-** NPN).
9	**U1**	(C) Synchronism.
10	**U2**	(C) Master alarm.
11	**GND**	Earthing connection (we recommend a conductor diameter of 4 mm).
12	**XXX**	Power supply voltage Vac ±15% 50 / 60 Hz.
13	**XXX**	Power supply voltage Vac ±15% 50 / 60 Hz.

ELECTRIC CONNECTIONS FOR INPUTS AND OUTPUTS WITH EXPANSION (ORDER CODE "E4")

14	**P2**	Terminal for polarizing inputs I5, I6, I7 (**+** NPN, **-** PNP).
15	**I5**	(I / C) Increase run.
16	**I6**	(I / C) Decrease run.
17	**I7**	Not in use.
18	**C2**	Terminal for polarizing outputs U3, U4 (**+** PNP, **-** NPN).
19	**U3**	Not in use.
20	**U4**	Not in use.
21	**GND**	Common for analog output.
22	**AN1**	Analog output.
23	**RX**	RS 422 reception (optional).
24	**TX**	RS 422 transmission (optional).
25	**$\overline{RX}$**	RS reception (optional).
26	**$\overline{TX}$**	RS 422 transmission (optional).

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INPUTS

Each ON/OFF input is universal and opto-insulated, and can receive digital signals both in NPN and in PNP logic. Connecting the terminals P1, P2 to + all the inputs accept NPN signals, i.e. closing towards the negative of the power supply voltage. Connecting the terminals P1, P2 to the - all the inputs become PNP type, i.e. closing towards the positive of the power supply voltage. Every input is protected against short circuits towards both power supply poles, so it is virtually indestructible. Several inputs with the same logic can be connected in parallel providing the output that pilots them is capable of supporting the total current required, which equates to the number of the inputs connected together multiplied by 10 mA.

OUTPUTS

The d.c. outputs are opto-insulated in direct current and all have a terminal in common with each other (C1, C2). By connecting this terminal to a positive voltage, all the outputs become PNP type, whereas if it is connected to a negative voltage they become NPN type. The maximum direct voltage applicable is 50 V. The outputs are capable of withstanding currents up to 70 mA with a typical voltage drop of 3.5 V between output and common. With the d.c. outputs you can also pilot 24 Vac relays.

CONNECTIONS
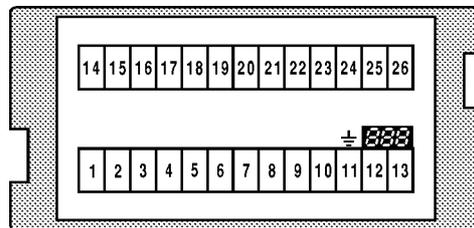
Power supply voltage connection

Vac
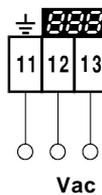
Power supply voltage:	24 Vac, 330 mA
	110 Vac, 72 mA
	220 Vac, 36 mA

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ON/OFF INPUT CONNECTIONS

Connection of encoder with instrument's power supply

Connection with NPN encoder

Encoder
monodirezionale
12 V NPN

Connection with PNP encoder
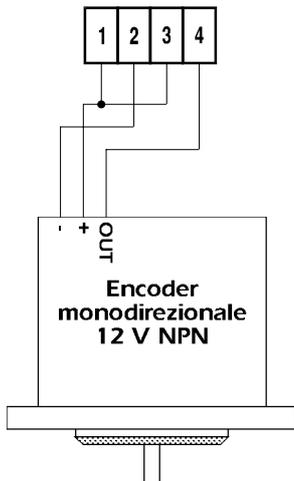
Encoder
monodirezionale
12 V PNP
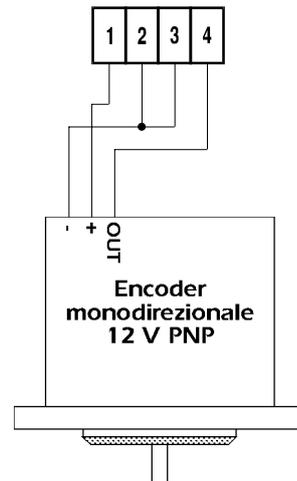
N.B. The connection of transducers (encoders, proximity switches) and electromechanical contacts to the instrument's inputs, using the 12V power pack installed at terminals 1 and 2, must take into account the maximum current that the power pack can deliver.

Connection of encoder with outside power supply

Connection with NPN encoder

Alim. c.c.
12 Vcc.

Encoder
monodirezionale
12 V NPN

Connection with PNP encoder

Encoder
monodirezionale
12 V PNP

Alim. c.c.
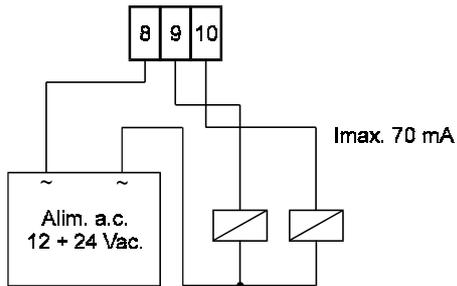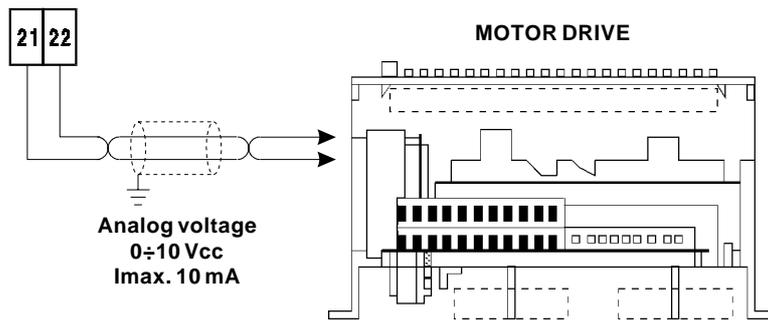12 Vcc.
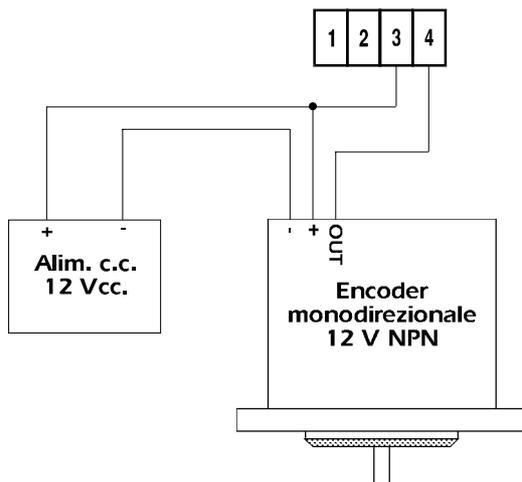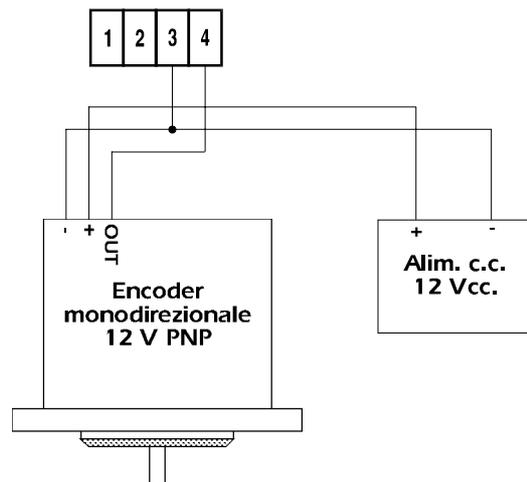
Connection of ON/OFF inputs with the instrument's power supply

Connection with NPN inputs

Connection with PNP inputs

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Connection of inputs with outside power supply

Connection with NPN inputs

Connection with PNP inputs
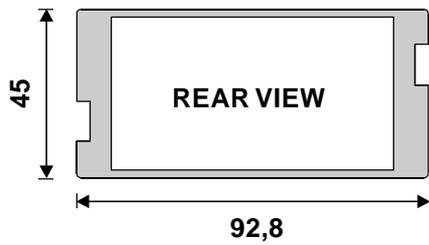
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| 14 | 15 | 16 |

+   -
Alim. c.c.
12 ÷ 24 Vcc.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| 14 | 15 | 16 |

+   -
Alim. c.c.
12 ÷ 24 Vcc.
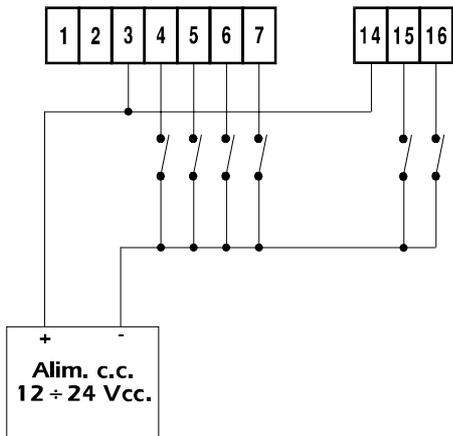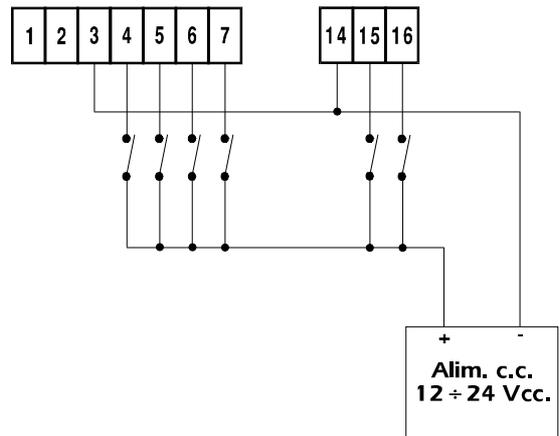
Connection with amplified proximity switch

| 1 | 2 | 3 | 4 |

NPN amplified proximity switch 12V

| 1 | 2 | 3 | 4 |

PNP amplified proximity switch 12V
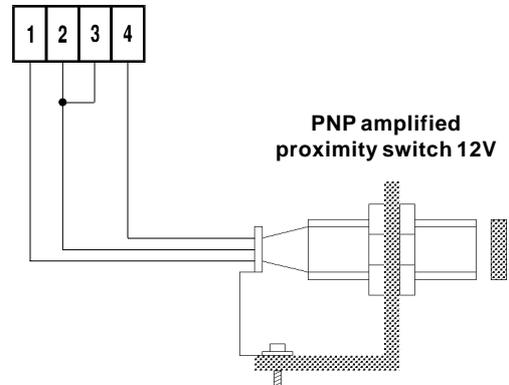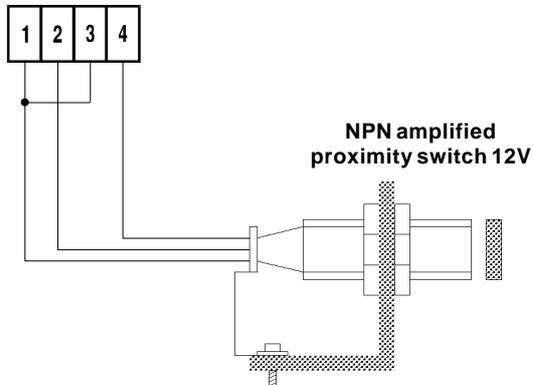
Connection with Namur sensors

| 1 | 2 | 3 | 4 |

Namur proximity switch
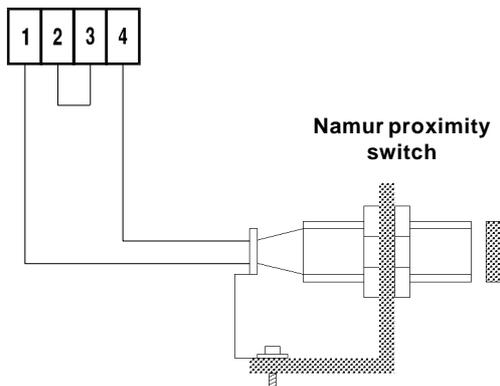
ON/OFF OUTPUT CONNECTIONS

Connection with NPN outputs

8 | 9 | 10

Imax. 70 mA

+ -
Alim. c.c.
12 ÷ 24 Vcc.
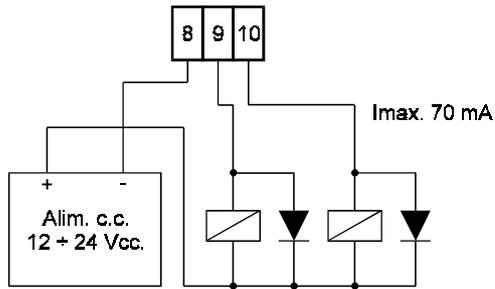
Connection with PNP outputs

8 | 9 | 10

Imax. 70 mA

+ -
Alim. c.c.
12 ÷ 24 Vcc.
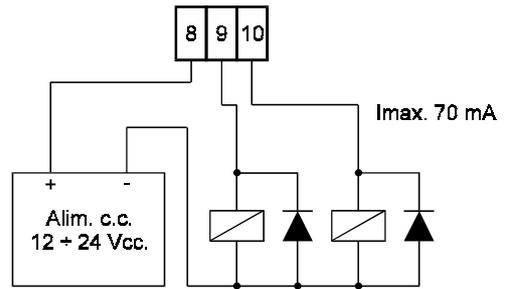
Connection of outputs with relay in a.c.

8 | 9 | 10

Imax. 70 mA

~ ~
Alim. a.c.
12 ÷ 24 Vac.

ANALOG OUTPUTS CONNECTIONS

21 | 22

MOTOR DRIVE

**Analog voltage
0÷10 Vcc
Imax. 10 mA**

FRONT VIEW

48

96

REAR VIEW

45

92,8

Expansion board (optional)

45

144
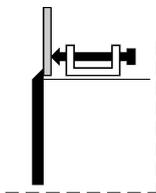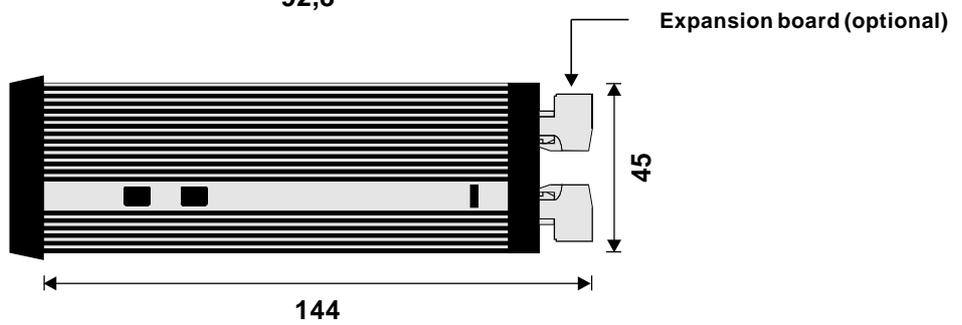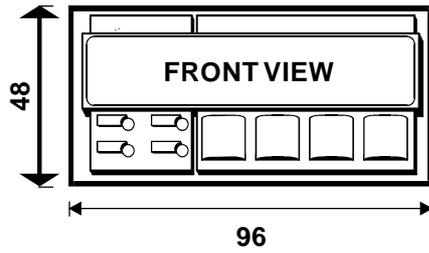
IMPORTANT!
After placing the fixing pin against the panel, make one half-turn only so that the frame is not damaged.

45 + 0,6

92,8 + 0,2
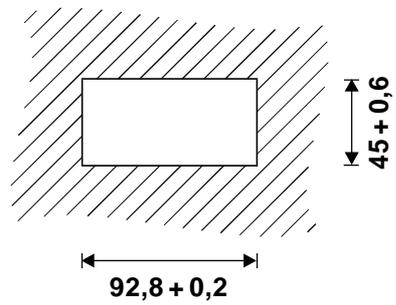
N.B. All the dimensions are given in millimeters.

HM 207.14 / **T** / **1B** / ☐ / ☐ / **24**

Power supply voltage: 24 = 24 Vac.
110 = 110 Vac.
220 = 220 Vac.

DF4 = Serial interface linkable in multi-drop.

E4 = SExpansion board with 3 NPN / PNP inputs plus 2 static 24 Vac / dc, 70 mA outputs.

1B = Nº 1 0÷10 V analog step output with galvanised insulation, 9-bit resolution (512 dots).
2B = Nº 1 -10 V÷10 V analog step output with galvanised insulation, 8-bit resolution (256 dots).

T = Polycarbonate front panel with keyboard
P = Front panel without keyboard
PC = Front panel without keyboard, but with **CLEAR** button
PE = Front panel without keyboard but with **ENTER** button.

☐ ☐ The empty square or rectangle indicate the possibility of personalising the instrument with an option that is not indispensable for its working, but only to satisfy more fully the customer's needs.

X **XX** The square or rectangle containing a code indicates the possibility of choice between the options available and **necessary** for the instrument to function correctly.