User Manual

Supplement to "Installation, maintenance and servicing manual"

qem Quality in Electronic Manufacturing

LIST OF SUBJECTS DEALT WITH IN THIS MANUAL

CHAPTER 1

INTRODUCTION

Supplementary nature of manual

References

Responsibility and validity

Description of operation

1 - 1 SUPPLEMENTARY NATURE OF MANUAL

This manual is to be considered as a supplement to the "Installation, maintenance and servicing manual" which contains information on wiring, checking and eliminating faults, start-up and maintenance procedures. This manual gives instructions on the use and correct programming of the instrument.
You are urged, therefore, to read the manual carefully and, if you have any queries, to contact QEM for further explanations by sending the assistance fax contained in the manual.

1 - 2 REFERENCES

The documentation relative to the instruments designed and sold by QEM has been divided into different booklets for effective and speedy consultation, according to the type of information required.

User manual	*Hardware structure*	*Installation, maintenance and servicing manual*
Explanation of software.	*Basic information on the standard hardware in the series plus customisation possibilities.*	*All the necessary information for installation, maintenance and assistance.*
This manual gives all the necessary information for the understanding and use of the instrument described. The manual deals with the instrument software; it gives information on the understanding, programming, calibration and use of the instrument described.	This booklet is enclosed with the user manual and describes the hardware configuration for the series of instruments described.	In-depth explanations of all essential details for correct installation and maintenance.
Once the instrument is installed following the indications given in the Installation, maintenance and servicing manual, this user manual gives all the necessary information for the correct use and programming of the instrument.	It also gives the standard electrical, technical and mechanical specifications for the series, together with the possibilities of hardware customisation in relation to the different software versions.	The aim is to provide you with valid and accurate information for the manufacture of products of recognised quality and reliability. It is also a valid support for whoever needs technical assistance concerning a machine that includes a QEM instrument.

1 - 3 RESPONSIBILITY AND VALIDITY

RESPONSIBILITY
QEM declines all responsibility for any injury to persons or damage to things resulting from the failure to observe the instructions and rules in this manual and the "Installation, maintenance and servicing manual". It is furthermore specified that the customer/purchaser is bound to use the instrument according to the instructions provided by QEM and, if any doubts arise, to send a written query to QEM. Any authorisation for exceptions or substitutions, if contested, will be deemed valid by QEM only if written consent has been given by QEM.

The reproduction or the transfer of all or part of this manual to third parties is forbidden without QEM's written consent. Any transgression will result in a claim for compensation for the damages sustained.
All rights deriving from patent or designs are reserved.

QEM reserves the right to make partial or complete modifications to the characteristics of the instrument described and the corresponding documentation.

Objective
The objective of this manual is to give the general rules for the use of the instrument described.

Recommendation
Write down all the instrument setting and programming parameters, keeping them in a safe place to facilitate any future replacement or servicing operations.

VALIDITY
This manual is applicable to all instruments designed, manufactured and tested by QEM with the same order code. This document is valid in its entirety, save errors or omissions.

Instrument release	Manual release	Modifications to manual	Date of modifications
4	0	New manual	05 / 11 / 96

1 - 4 DESCRIPTION OF OPERATION

The HB 548.28 instrument governs the movement of an axis which moves forwards or backwards in reference to two programmable quotas. The forward and backward command is given by two inputs. To counteract mechanical stress, the analog positioning has epicycloid acceleration and deceleration profiles. A 5-input binary code allows the selection of 31 different speeds, acceleration and deceleration when positioning. It is provided with a series of manual functions (manual movements, positioning on an immediate quota, etc...) to facilitate calibration and to allow the operator to intervene on the positioning system.
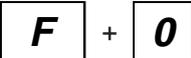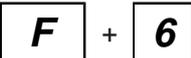
CHAPTER 2

OPERATOR / MACHINE INTERFACE

Description of keyboard

Description of inputs

Description of outputs

2 - 1 DESCRIPTION OF KEYBOARD

Key	Function
0 ÷ **9**	**Normal operation:** pressed after the "**F**" key, they select the functions available. **Data input:** enables entry of data.
⬍	**Normal operation:** selects cycle displays. Impulse pressure selects the successive display. Continuous pressure selects the previous display. **Data input:** scrolls the various parameters. Impulse pressure selects the successive display. Continuous pressure selects the previous display.
+/- ⬦	**Normal operation:** allows access to writing of the length and tolerance of the cut. **Data input:** inserts or removes the +/- sign.
✋	**Normal operation:** if no positioning is in course, allows access to the manual functions: manual movements, positioning on an immediate quota, preset quota search and entry of a value in the count. **Data input:** inserts the decimal point.
F	**Normal operation:** if no positioning is in course, allows selection of available functions. **Data input:** enables the selection of available functions and also allows exit from functions selected with "**F**" + "**Numerical key**".
⧄	**Normal operation:** not used. **Data input:** cancels the value entered and restores the old value.
↵	**Normal operation:** not used. **Data input:** memorises the data introduced.
○ L1	Lights when positioning on "UP" quota.
○ L2	Lights when positioning on "DOWN" quota.
○ MENÙ	Lights when the "**MENÙ**" key is pressed.
○ MAN	Lights when the "**MAN**" key is pressed.
○ FUNZ.	Lights when the "**F**" key is pressed.
F + **0**	Access to functions protected by password.
F + **4**	Enables P.I.D.
F + **6**	Input and output diagnostics.

2 - 2 DESCRIPTION OF INPUTS

Input Characteristics

Refer to the chapter entitled "Electrical Characteristics" in the "Hardware structure" booklet enclosed with this manual.

Name	Operating logic	Activation mode	Polarizer

				Description
I1	ON	P	P1	**Enable zero impulse.** Its functions are defined by the type of "Preset search" set in set-up.; its activation enables reading of the transducer's zero impulse in order to load the preset quota.
I2	ON	C	P1	**Start forward.** Commands forward movement of the axis ("UP" quota set with the MENU key). If, during forward movement, input I2 goes OFF, the axis will brake. Any de-activation is ignored if input I3 has been activated previously. When the input switches from OFF to ON, the selection code is read for the table set with inputs I6÷I10 enabling the forward comparisons for outputs U6 and U7 (test in 20 milliseconds).
I3	ON	C	P1	**Start back.** Commands reverse movement of the axis ("DOWN" quota set with the MENU key).If, during the reverse movement, input I3 goes OFF, the axis will brake. Any de-activation is ignored if input I2 has been activated previously. When the input switches from OFF to ON, the selection code is read for the table with inputs I6÷I10 enabling the forward comparisons for outputs U6 and U7 (test in 20 milliseconds).
I4	ON	C	P1	**Enable start**. When input I4 = ON, the instrument activates output U2 and after 50 milliseconds abilitates axis space control. When input I4 = OFF, the manual key is inhibited, the analog output is forced to zero and after a time set in set-up, output U2 is disactivated; moreover reading is inhibited for all inputs.
I5	ON	I	P1	**Preset research.** With set-up parameter "$F\ I5$" set on "0", when the istrument starts it manages the preset search procedure for resetting the axis position with the count displayed by the instrument. It is enabled when no positioning is in use and with output U8 = OFF. **Enable self-learning.** With the input active and set-up parameter "$F\ I5$" set on "1", if a (forward or reverse) start is commanded, it manages the self-learning process for the "UP" e "DOWN" quotas. When the start is disabled, the axis brakes and the count at the end of braking is acquired as an "UP" or "DOWN" quota according to which start was used. With input I5 = ON, the axis can move within its maximum and minimum quotas (set-up). When input I5 is OFF the axis will move between the self-learned quotas.
I6	ON	C	P1	**Override speed 2^0.** This is the2^0 value of the binary code for selecting the speed table, acceleration/deceleration. Quick manual speed is selected using the zero speed selection code.

Key

C = Continuous signal
I = Impulse signal
P = Programmable in set-up.

	Name

	Description
Vac	**Instrument supply voltage.** Alternating voltage as per code in your order.
Vac	**Instrument supply voltage.** Alternating voltage as per code in your order.
GND	**Ground connection.** Recommended a conductor of Ø 4 mm.
+	**Transducers positive power supply.** Positive voltage supplied by instrument for instrument and transducers inputs power.
-	**Transducers negative power supply.** Negative voltage supplied by instrument for instrument and transducers outputs power.

COUNT INPUTS

Name	Operating logic	Polarizer

			Description
PHA	N / P	PE	Input "phase A" incremental transducer.
PHB	N / P	PE	Input "phase B" incremental transducer.
Z	N / P	PE	Incremental transducer "zero impulse" input.
			For details of the count inputs, refer to the chapter "Electrical characteristics" in the "Hardware structure" booklet enclosed with this manual.

Legenda
N = Transducer with NPN logic.
P = Transducer with PNP logic.

Characteristics of input expansion (option E)

Refer to the chapter "Electrical Characteristics" in the "Hardware structure" booklet enclosed with this manual.

Name	Operating logic	Activation mode	Polarizer

				Description
I7	ON	C	P2	**Override speed 2^1.** Value 2^1 of the binary code for selecting the speed table, acceleration / deceleration. The quick manual speed is selected using the zero speed selection code.
I8	ON	C	P2	**Override speed 2^2.** Value 2^2 of the binary code for selecting the speed table, acceleration/deceleration. The quick manual speed is selected using the zero speed selection code.
I9	ON	C	P2	**Override speed 2^3.** Value 2^3 of the binary code for selecting the speed table, acceleration/deceleration. The quick manual speed is selected using the zero speed selection code.
I6	ON	C	P2	**Override speed 2^4.** Value 2^4 of the binary code for selecting the speed table, acceleration/deceleration. The quick manual speed is selected using the zero speed selection code.

Key

C = Continuous signal.

2 - 3 OUTPUTS

Characteristics of outputs
Refer to the chapter "Electrical characteristics" in the "Hardware structure" booklet enclosed with this manual.

Name	Operating logic	Polarizer	Activation mode

				Description
U1	ON	C1	C	**Tolerance.** Signals that positioning has been terminated correctly and therefore within the limits set with parameter "Tolerance"". Its activation can be delayed by setting parameter "ŁŁ".
U2	ON	C1	C	**Enable start.** Activated when input I4 is ON. When input I4 is OFF, output U2 is de-activated after the time set in the set-up parameter "⌐d".
U3	ON	C1	C	**Limit switch forward.** Activated when the count is greater than or equal to ("quota UP - tolerance").
U4	ON	C1	C	**Limit switch back.** Activated when the count is less than or equal to ("quota DOWN + tolerance").
U5	ON	C1	C	**Search for preset Ok.** If the search for preset is completed correctly (procedure for resetting the axis position according to the count displayed by the instrument) the instrument will activate this output. It is de-activated every time the instrument is switched on or when a new command is given for the search.

Key
C = Continuous signal

Characteristics of output expansion (option E)

Refer to the chapter "Electrical characteristics" in the "Hardware structure" booklet enclosed with this manual.

Name	Operating logic	Polarizer	Activation mode

				Description
U6	ON	C2	C	**Enable emergency.** Activated when, with input I2 = ON, the count is equal to or greater than the calculated quota (according to the positioning speed). Activated when, with input I3 = ON, the count is equal to or less than the calculated quota (according to the positioning speed).
U7	ON	C2	C	**Anticipate cycle start.** Activated when, with input I2 = ON, the count is equal to or greater than the calculated quota (according to the positioning speed). Activated when, with input I3 = ON, the count is equal to or less than the calculated quota (according to the positioning speed).
U8	ON	C2	C	**Manual.** Signals that manual functions have been selected for the instrument. (ON=Manual functions, OFF=Automatic functions).
U9	ON	C2	C	**Follow-up error.** To position an axis, the instrument generates an ideal positioning profile (acceleration ramp, tract at constant speed, deceleration ramp). If the real position of the axis exceeds the ideal profile set as "follow-up error" in set-up, this output is energised to signal the malfunction.

Key

C = Continuous signal.

CHAPTER 3

SETTING UP FOR OPERATION

Set-up

Calibration

3 - 1 SET-UP

Since these parameters set the instrument's operating mode, access is restricted to the installer only; a password must be entered for programming operations as follows:

Description	Keyboard	Display

Access to the set-up programming.

$\boxed{\textbf{F}}$ + $\boxed{\textbf{0}}$

```
 PASS
H     0
```

$\boxed{\bigcirc\text{FUNZ.}}$ = ON

Introduce the access code "548" and confirm with **ENTER**.

$\boxed{\textbf{5}}\ \boxed{\textbf{4}}\ \boxed{\textbf{8}}\ \boxed{\hookleftarrow}$

Exit is possible at any time after introducing the password by pressing the **F key**.

$\boxed{\textbf{F}}$

FUNCTION	DISPLAY	DESCRIPTION
Display method	` SETUP ` `Hd      0`	**0** = Normal display. **1** = Display with HDR system (High definition reading). **N.B.** Refer to the "Installation, maintenance and servicing manual".
Decimal figures Max. 3	` SETUP ` `FP      0`	Specifies the number of figures after the decimal point, with which to display the count (axis position). **N.B.** Introduction of decimal figures influences the DISPLAY of the count; precision in positioning depends on the number of impulses supplied by the transducer.
Encoder resolution	` SETUP ` `FE 4.00000`	This parameter indicates by how much the encoder revolution impulses must be multiplied to display the lengths in the required unit of measurement. Values can be introduced from 0.00200 to 4.00000 bearing in mind that the frequency of the PH phases must not exceed the instrument's maximum count frequency. **N.B.** Refer to the "Installation, maintenance and servicing manual".
Unit of speed	` SETUP ` `U       0`	Specifies if the unit of measure (Um) of axis movement is in minutes or seconds (mm/minute, mm/second, ...). **0** = Um / min. **1** = Um / sec.
Speed in decimal figures Max. 3	` SETUP ` `CU      0`	Specifies the number of figures after the point with which to set the speed value.

FUNCTION	DISPLAY	DESCRIPTION
Max Speed Max. 999999	`SEtUP` `SA  123456`	This parameter is used to set the maximum axis speed, relative therefore to the analog reference of +/- 10 V; the value always refers to the set unit of measure (um/min. or um/sec.). **N.B.** This parameter MUST be calculated according to the indications given in the paragraph "Analog axis calibration".
Preset loading	`SEtUP` `cP      0`	Preset search procedure is carried out: **0** = Loading the preset quota on the count when input I1 is de-activated. **1** = Loading thepreet quota on the count when input Z is activated after the axis has inverted its direction and input I1 has been de-activated (sensitive to the descent side). **2** = Loading the preset quota on the count when input Z is activated after input I1 = ON (impulse). **N.B.** See relative paragraph. Refer to the "Installation, maintenance and servicing manual". Preset loading set on "2" does not function with parameter "`FC`" set on 3, 4 or 5.

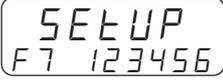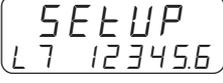**These displays appear if the parameter "Preset loading " is set on 0**

FUNCTION	DISPLAY	DESCRIPTION
Direction of search for preset	`SEtUP` `dP      0`	The search for the preset quota can be made in different ways ACCORDING TO axis characteristics. **0** = The axis will move forward if the preset quota is closer to the maximum quota or will move backward if the preset quota is closer to the minimum quota. **1** = The axis moves forwards. **2** = The axis moves backwards.

Minimum quota Min. 0	`SEtUP` `r  123456`	The minimum quota reachable by the axis; the value set is to be considered also the minimum limit for introducing the work quotas.
Maximum quota Max. 999999	`SEtUP` `S  123456`	The maximum quota reachable by the axis; the value set is to be considered also the maximum limit for introducing the work quotas.
Preset quota	`SEtUP` `P  123480`	During the preset search procedure, the quota is loaded on the count with the transducer zero impulse (according to the modality defined by the type of preset search). Any preset quota can be introduced between the maximum and minimum quotas.

FUNCTION	DISPLAY	DESCRIPTION
P.I.D. data	`SEtUP` `PI        0`	Access to reading and/or writing of P.I.D. data (see special paragraph). **0** = Access not enabled. **1** = Access to reading of data. **2** = Access to reading and writing of data.
Type of profile reduction	`SEtUP` `rP        0`	**0** = Acceleration and deceleration times remain as set and the speed is reduced proportionally. **1** = The times of acceleration and deceleration are reduced as well as the speed (maintaining, however, the set acceleration and deceleration ramps).
Braking time before the stop	`SEtUP` `FS        0`	**0** = When braking on the ramp, first acceleration is completed then the braking process. **1** = When braking on the ramp, braking is immediate.
Manual speed	`SEtUP` `Sn  123456`	This parameter is used to set axis speed in manual movements if inputs I6÷I10 are OFF; the value always refers to the set unit of measure (um/min. - um/sec.) and must be less than or equal to the maximum speed.
Slow manual speed	`SEtUP` `Sb    9990`	This parameter is used to set axis speed in slow manual movements when inputs I6÷I10 are OFF; the value always refers to the set unit of measure (um/min. - um/sec.) and must be less than or equal to the manual speed.
Test speed	`SEtUP` `St     999`	This parameter is used to set axis speed when carrying out the test for calibrating the P.I.D. parameters when inputs I6÷I10 are OFF. The value always refers to the set unit of measure (um/min. - um/sec.) and must be less or equal to the maximum speed.

FUNCTION	DISPLAY	DESCRIPTION
Preset speed	```SEtUP``` ```Sr 123456```	This parameter is used to set the axis speed when searching for the enabling input; the value always refers to the set unit of measure (um/min. - um/sec.) and must be less than or equal to the maximum speed.
Search speed after enabling the zero impulse	```SEtUP``` ```Sd 0```	This parameter is used to set the axis speed after activating the enabling input; the value always refers to the set unit of measure (um/min - um/sec.) and must be less than or equal to the preset speed.
Acceleration of manual functions Max. 9.99	```SEtUP``` ```An 9.99```	This parameter is used to set the acceleration ramp for the axis in manual movements; the value set determines the time employed by the axis to move from stop to the set manual speed.
Deceleration of manual functions Max. 9.99	```SEtUP``` ```d1 9.99```	This parameter is used to set the deceleration ramp for the axis in manual movements; the value set determines the time employed by the axis to move from manual speed to zero (axis at a standstill).
Tolerance Max. 9999	```SEtUP``` ```t 9999```	This is the count range for all the positioning quotas that identifies the zone in which positioning has been made correctly. Example. Quota 100.0 and tolerance 1.00; all positionings completed between 101.0 and 99.0 can be considered correct.
Delay time for activating tolerance Max. 9.99	```SEtUP``` ```tt 9.99```	The time, expressed in seconds, for the delay in activating the tolerance output from when the axis enters the tolerance range. The output is activated immediately by introducing the value "0".
Inversion time Max. 9.99	```SEtUP``` ```t1 1.00```	To avoid any mechanical stress due to inversions that are too rapid in the axis' direction of movement, a delay time, expressed in seconds, can be inserted for inversion. This parameter has an influence on functions only when positioning with play recovery.
Follow-up error Max. 9999	```SEtUP``` ```E1 9990```	To govern an axis movement, the instrument generates an ideal profile for positioning. The follow-up error is the maximum differernt acceptable between the position reached by the axis and the position it should have reached, beyond which the follow-up error is signalled (U9 = ON). The value introduced is in primary encoder inpulses multiplied × 4.
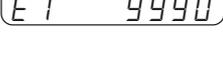
FUNCTION	DISPLAY	DESCRIPTION
Delay in activating output U2 Max. 9.99	SETUP rd 9.90	The time, expressed in seconds, for delay in deactivating output U2 when input I4 switches from ON to OFF.
Maximum advance activation of output U6 with forward start	SETUP A6 12345.6	Maximum advance, expressed in Um, for activating output U6 when input I2 is active.
Maximum speed for advance activation of output U6 with forward start	SETUP U6 123456	The speed with which the instrument corresponds the maximum advance (A6).
Minimum advance activation of output U6 with forward start	SETUP n6 12345.6	The minimum advance calculated even with speeds set close to zero.
Maximum advance activation of output U6 with reverse start	SETUP I6 12345.6	The maximum advance, expressed in Um, for activating output U6 when input I3 is active.
Maximum speed for advance activation of output U6 with reverse start	SETUP F6 123456	The speed with which the instrument corresponds the maximum advance (I6).
Minimum advance for activating output U6 with reverse start	SETUP L6 12345.6	The minimum advance calculated even with speeds set close to zero.
Maximum advance for activating output U7 with forward start	SETUP A7 12345.6	The maximum advance, expressed in Um, for activating output U7 when input I2 is active.
Maximum advance speed for activating output U7 with forward start	SETUP U7 123456	The speed with which the instrument corresponds the maximum advance (A7).

FUNCTION	DISPLAY	DESCRIPTION
Minimum advance for activating output U7 with forward start	$5 E t U P$ $n 7 \quad 12345.6$	The minimum advance calculated even with speeds set close to zero.
Maximum advance for activating output U7 with reverse start	$5 E t U P$ $I 7 \quad 12345.6$	The maximum advance, expressed in Um, for activating output U7 when input I3 is active.
Maximum speed for advance activation of output U7 with reverse start	$5 E t U P$ $F 7 \quad 123456$	The speed with which the instrument corresponds maximum advance ($I7$).
Minimum advance for activating output U7 with reverse start	$5 E t U P$ $L 7 \quad 12345.6$	The minimum advance calculated even with speeds set close to zero.
Functions of input I5	$5 E t U P$ $F I 5 \qquad 0$	**0** = Input I5 functions as command for preset search. **1** = Input I5 enables self-leraning of the "UP" and "DOWN" quotas.
Start-up quota	$5 E t U P$ $9 A \quad 123456$	The quota run by the axis at starting speed every time a forward start is given (I2). By introducing the value zero, the quota is eliminated and the following 2 parameters do not appear.

These displays apear when the "Start-up quota" is different from zero

FUNCTION	DISPLAY	DESCRIPTION
Start-up speed	$5 E t U P$ $U A \quad 1234$	The speed of the axis when it performs the start-up quota.
Start-up acceleration	$5 E t U P$ $A d \qquad 9.99$	The acceleration used for the start-up quota.

FUNCTION	DISPLAY	DESCRIPTION
| Count functions | ```
 SEtUP
FC      0
``` | **0** = The axis count is never changed.<br><br>**1** = The axis count is subtracted from the positioning quota at each start every time the count exceeds this quota.<br><br>**2** = The axis count is reset to zero on starting after each positioning in quota.<br><br>**3** = Enables reading of the axis position when input Z1 is started, using input I1 to enable reading (impulses). When starting after the count, it subtracts the axis position acquired with input Z1 or sums the preset quota set in set-up and subtracts the positioning quota (only with forward start "I2").<br><br>**4** = Enables reading of the axis position when input Z1 is started, using input I1 to enable reading (continuous). When starting after the count, it subtracts the axis position acquired with input Z1 or sums the preset quota set in set-up and subtracts the positioning quota (only with forward start "I2").<br><br>**5** = Enables reading of the axis position when input I1 is started. When starting after the count, it subtracts the axis position acquired with input I1 or sums the preset quota set in set-up and subtracts the positioning quota (only with forward start "I2"). |
| Time for activating input I1 Max. 99 | ```
 SEtUP
t i l    50
``` | The minimum time, expressed in milliseconds, for activating/deactivating input I1. By introducing the value "0", the value "50" (50 milliseconds) is taken as default. |

After programming the last function, the display of the first set-up parameter is given again.
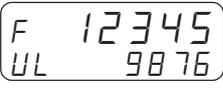
3 - 2 CALIBRATIONS

PROCEDURE FOR CALIBRATING THE ANALOG OUTPUT

Setting some set-up parameters.
Settings are made in set-up of the parameters relative to decimal figures, transducer resolution and units of speed.

Description	Keyboard	Display

Access to the calibrating procedure
Activate input I4.
Introduce the password "123".

F + **0**

1 **2** **3** ←

Display: PASS / H . . . 0

The double arrow key can be used to select three different displays:
"tu" (output voltage), "OF" (count offset) "GA" (ring gain).

⬍

Display: 000 / tu 0.0

⬍

Display: 345 / OF 123

Checking connections
First of all, check that the tachometer dynamo is connected correctly to the drive. Select the display relative to "Output voltage (**tu**)" and use the numerical keyboard to introduce a voltage value, then confirm with **ENTER**. We recommend entering a rather low voltage value (ex. 0.5 V) and to observe if the motor is turning at about 1 / 20 of its maximum speed (if the drive accepts a maximum voltage of 10V).
Supplying a positive voltage from the keyboard, the motor should turn "forwards" with a speed proportional to the value entered, and the displayed count must show an increase.

N.B. The voltage value entered from the keyboard is supplied by the analog output without an acceleration ramp.

⬍

0 ÷ **9** ←

Display: 000 / tu 0.0

Offset calibration
Select the display "step offset (**OF**)" and follow the indications below:
the operator can use the numerical keys and sign to enter any value which, when confirmed with **ENTER,** will immediately be given in output.

⬍

0 ÷ **9** ←

Display: 345 / OF 123

Calculating the speed
The instrument is now able to calculate and display the value of the maximum speed to enter as the "Maximum speed (**SA**)" parameter in set-up.
Select the display relative to "entered output voltage (**tu**)". Using the numerical keyboard, introduce a voltage of 10 volt (corresponding with maximum motor speed).

N.B. The voltage value entered from the keyboard is supplied by the analog output without an acceleration ramp.

⬍

1 **0** ←

Display: 000 / tu 0.0

Follows on next page.

Description	Keyboard	Display

If the axis cannot be moved at maximum speed, enter a voltage of 1 volt. The speed displayed by the instrument must then be multiplied by 10.

With the axis in movement, press the **MAN** key.

The top display will show the count frequency (detected in encoder phases). The bottom display will show the value for the maximum speed to be entered in the set-up parameter "Maximum speed".
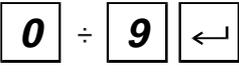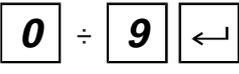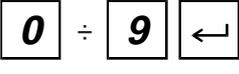
A filter can be entered on this display by holding down the **ENTER key.**

```
F    12345
UL    9876
```

PROCEDURE FOR P.I.D. CALIBRATION

P.I.D. calibration must be made after that of the analog output (calculation of the maximum speed). Before starting P.I.D. calibration, set the following parameters in set-up: "Decimal figures", "Encoder resolution", "Unit of speed", "Maximum speed", "Test speed", "Acceleration/deceleration ramps" and "inversion time".
Enter calibration functions for P.I.D. (see below) and, setting the value "0" when asked to enable P.I.D. (only data writing), reset to zero the parameters for "Integral time" and "Deriving time", setting the feed-forward value on 100%.

Description	Keyboard	Display
Enter calibration functions for P.I.D.	**F** + **4**	◯ FUNZ. = ON
The operator can choose whether to calibrate P.I.D. or only to modify the parameters. Set value "0" to modify the parameters or set "1" to enable calibration.	**0** o **1** ↵	Ab iL it. P. i.d. 0
A request will be made to enter the test quota, that is the movement made by the axis in both directions during the calibration phases. When the entered value is confirmed with **ENTER,** the axis moves forwards by the quota set, using the set ramps for acceleration and deceleration and, once it reaches that quota, after the inversion time, it returns to its start quota; this oscillation occurs throughout the whole calibration phase.	**0** ÷ **9** ↵	126456 C 2345
Select the display relative to feed forward (the values introduced are in percentage 100 = 100%). If the maximum speed has been calculated correctly, the value for feed forward should be around 100%. The bottom left displays indicate the error value which must be reduced to about "0" (if the error is negative the displays will flash). The maximum error value will be found on the ramps while it will be relatively constant along the linear path. Modify the feed-forward value to return the error to zero in the positioning phase and with constant speed.	⬍ **0** ÷ **9** ↵	F F 110.0 99 2345

N.B. The feed-forward value must be increased if the error is positive when the axis moves forward; in the same way, it must be increased if the error is negative when the axis moves backwards. Contrary-wise, it must be decreased if the error is negative when the axis moves forward and decreased if the error is positive when the axis moves backwards.

Continues on next page.

Description	Keyboard	Display

Select the display relative to proportional gain.

| | ⬍ | G 0.255 / 99 2345 |

Introduce the value "0.001". Initially the axis is very slow. It does not respect the acceleration/deceleration ramps, the maximum speed and position are not reached. This means that the set value is too low. Increawe the value until the system becomes unstable (oscillations with the axis in movement and vibrations when it is still).

| | 0 ÷ 9 ↵ |

Select the display relative to the integral time (expressed in seconds).

| | ⬍ | In 0.500 / 99 -123 |

Starting from the basis of 0.500 seconds, gradually reduce the time until arriving at a value where the axis improves its dynamic performance and remains stable (it does not oscillate).
If the integral time entered is not sufficient, there will be low frequency oscillations, whilst if its value is too high the oscillations will be high frequency.

| | 0 ÷ 9 ↵ |

Select the display relative to the derived time (expressed in seconds).

| | ⬍ | dE 0.001 / 99 73 |

Starting from the basis of 0.001 seconds, the time must be gradually increased until arriving at a value where the axis improves its dynamic performance and remains stable (it does not oscillate). This function is excluded if the value "0" is set.

| | 0 ÷ 9 ↵ |

Pressure on the key illustrated will display the maximum error of positive space "P" and negative space "$\sqcap$" calculated by the instrument every 50 milliseconds and the value, in volts, of analog voltage A1 (display at bottom left). If the voltage is negative, the displays will flash.

| | ✋ | E P 1234 / 1.7 ⊓ -73 |

To exit the function at any time, press key **F**; the instrument will return to the normal displays.

| | F | ◯ FUNZ. = OFF |

CHAPTER 4

USE

Work programs and auxiliary functions

Operation graphs and tables

4 - 1 WORK PROGRAMS AND AUXILIARY FUNCTIONS

HOW TO ENTER THE WORK PROGRAMS

Description	Keyboard	Display
Enter the work program writing.	+/- ⟷	$9.\text{t}R$ UP 123456 ⊙ MENÙ = ON
The operator can introduce the forward quota and confirm it with **ENTER**. The request will be made to introduce the reverse quota. The operator can introduce the reverse quota and confirm it with **ENTER**.	0 ÷ 9 ↵ 0 ÷ 9 ↵	$9.\text{t}R$ dn -356
N.B. The two quotas can be modified at any time and can be self-learned using input I5 with the set-up parameterp "$F\ 15$" set on "1".		
To exit programs writing, press the **MENÙ** key. It is possible to exit program introduction at any time; only the values confirmed with **ENTER** will be memorised.	+/- ⟷	⊙ MENÙ = OFF

ENTERING THE SPEED TABLE

Description	Keyboard	Display

Enter introduction of the speed table.	**F** + **0**	```PASS```
		```H . . . 0```
		◯ FUNZ. = ON

Introduce the access code "321" and confirm with **ENTER**.	**3** **2** **1** **↵**	
The request will be made to set the speed relative to the first table selectable with inputs I6÷I10. The operator can introduce the value and confirm with **ENTER**.	**0** ÷ **9** **↵**	```VELOC.``` ```1 1234```
The request will be made to set the acceleration, then the deceleration of axis positioning. The operator can introduce the values and confirm with **ENTER**.	**0** ÷ **9** **↵**	```ACC.9.99``` ```1 dEC.9.99```
The request will be made to set the speed relative to the second table selectable with inputs I6÷I10. The operator can introduce the value and confirm with **ENTER**.	**0** ÷ **9** **↵**	```VELOC.``` ```2 2345```
N.B. Up to 31 tables can be set for acceleration and deceleration speeds. The zero code selects quick manual speed.		
To exit at any time, press key **F**.	**F**	◯ FUNZ. = OFF

MANUAL MOVEMENT OF THE AXIS

The instrument offers certain functions for manual management of the axis. From the keyboard it is possible to move the axis in the two directions and with two different speeds. After selecting the manual axis movement function, using key 7 the axis can be moved "back" (the count decreases), using key 9 the axis can be moved "forwards" (the count increases). Key 8 is used to select the manual movement speed (slow or fast).

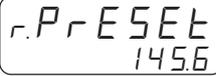| Description	Keyboard	Display
Enter manual functions and select the display relative to axis movements.	✋ × 1 sec.	⌑AnUALE L 12345.6
The bottom left display shows the speed selected with key 8 (L = slow, F = fast). The bottom right display shows the count (axis position). During manual movements the limits set with minimum and maximum quotas (set-up) are enabled.	↕ 7 8 9	○ MAN = ON
N.B. If, when keys 7 and 9 are pressed, inputs I6, I7, I8, I9 and I10 have a value other than zero, the speed, acceleration and deceleration in manual will be those selected by the inputs themselves.		
To exit manual functions, press the key **MAN**.	✋	○ MAN = OFF

POSITIONING AT AN IMMEDIATE QUOTA

The instrument offers some functions for manual axis management. The axis can be automatically positioned at a quota that is different from the work quotas selected from the programs. This function speeds up considerably all those positioning operations that differ from the normal process.

Description	Keyboard	Display
Enter manual functions and select the display relative to entry of the immediate quota.	✋ × 1 sec.	125.7 9 45.6
The top displays show the count (position of the axis), whilst the bottom ones show the quota entered for immediate positioning.	↕	○ MAN = ON
The operator can enter the immediate quota required. When the entered value is confirmed with **ENTER**, the instrument positions the axis on the quota entered.	0 ÷ 9 ↵	
N.B. Positioning is made using the same values for acceleration/deceleration and speed set in the basic program if confirmed with **ENTER** when inputs I6÷I10 are OFF. Otherwise positioning is made using the acceleration/deceleration and speed values selected with inputs I6÷I10.		
To exit manual functions, press the key **MAN**.	✋	○ MAN = OFF

PRESET QUOTA SEARCH (WITH SET-UP PARAMETER "$\mathcal{L}P$" " SET ON "0" OR "1")

The instrument offers certain functions for manual management of the axis. The search for the preset quota can be commanded also from the keyboard (see relative paragraph for the description of the preset quota search).
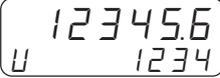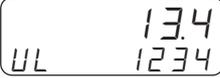
Description	Keyboard	Display
Enter manual functions and select the display relative to the preset quota search (set-up parameter "$\mathcal{L}P$" set on 0 or 1).	✋ × 1 sec. ↕	r.PrESEt 145.6 ◯ MAN = ON
The bottom displays show the count value. On confirming with **ENTER**, the given count will flash to signal that the preset search has started and at the same time the axis will move to search for the command for loading the preset quota. Once the preset quota is loaded on the count, the display stops flashing to signal the end of the procedure.	↵	
To exit manual functions at the end of the procedure or to abort the preset search, press the **MAN** key.	✋	◯ MAN = OFF

INTRODUCTION OF A VALUE IN THE COUNT

The instrument offers certain functions for manual axis management. The count value displayed by the instrument (axis position) can be modified by introducing the required value. This function is specially useful during the installation and calibration phases.

Description	Keyboard	Display
Enter manual functions and select the display relative to the introduction of a value in the count.	✋ × 1 sec. ↕	InCount 145.6 ◯ MAN = ON
The operator can introduce the count value required. The bottom displays show the value of the count introduced. When confirmed with **ENTER**, the instrument displays the value introduced.	**0** ÷ **9** ↵	
To exit manual functions, press the **MAN** key.	✋	◯ MAN = OFF

DISPLAYS

Description	Keyboard	Display
Top right Display Selected quota. **Bottom right Display** Selected speed value.	⬍	*123456* U *1234*
Top right Display Count. **Bottom right Display** Speed reading. If the operator introduces a value that is not within acceptable limits.	⬍	*13.4* UL *1234* *Error*

4 - 2 WORK GRAPHS AND TABLES

PRESET SEARCH

"Mode 0" - Loading the preset quota using the zero impulse enabling input.
The command for loading the preset quota is provided only by the zero impulse enabling input.
When the preset search procedure is started, the axis moves towards the sensor connected to the zero impulse enabling input; when the axis activates this input during its stroke, it slows down and inverts its direction.
When the zero impulse enabling input is deactivated the preset quota is loaded onto the instrument count.
In this procedure for loading the preset quota, the condition is that the enabling input is activated and successively deactivated.

"Mode 1" - Loading the preset quota using the zero impulse and the zero impulse enabling input with inversion.
The command to load the preset quota is provided by the transducer zero impulse. Since an encoder supplies a zero impulse for every turn, it must be decided in which axis zone to acquire the zero impulse; for this reason the zero impulse enabling input is used.
When the preset search procedure is started, the axis moves towards the sensor connected to the zero impulse enabling input; when the axis activates this input during its stroke, it slows down and inverts its direction.
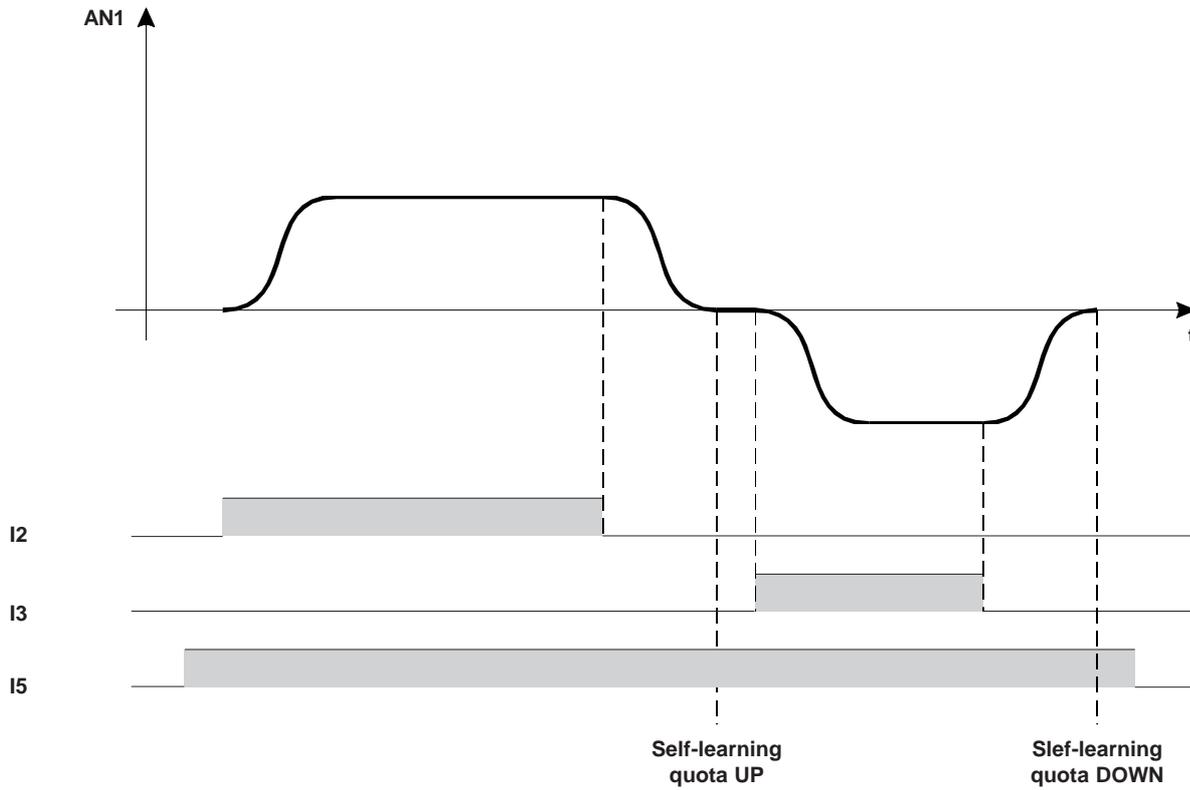When the enabling input is deactivated, the instrument is ready to acquire the zero impulse: on the first zero impulse provided by the transducer, the preset quota is loaded onto the instrument count.
In this procedure for loading the preset quota, the condition is that the enabling input is activated and successively deactivated and a zero impulse is acquired.
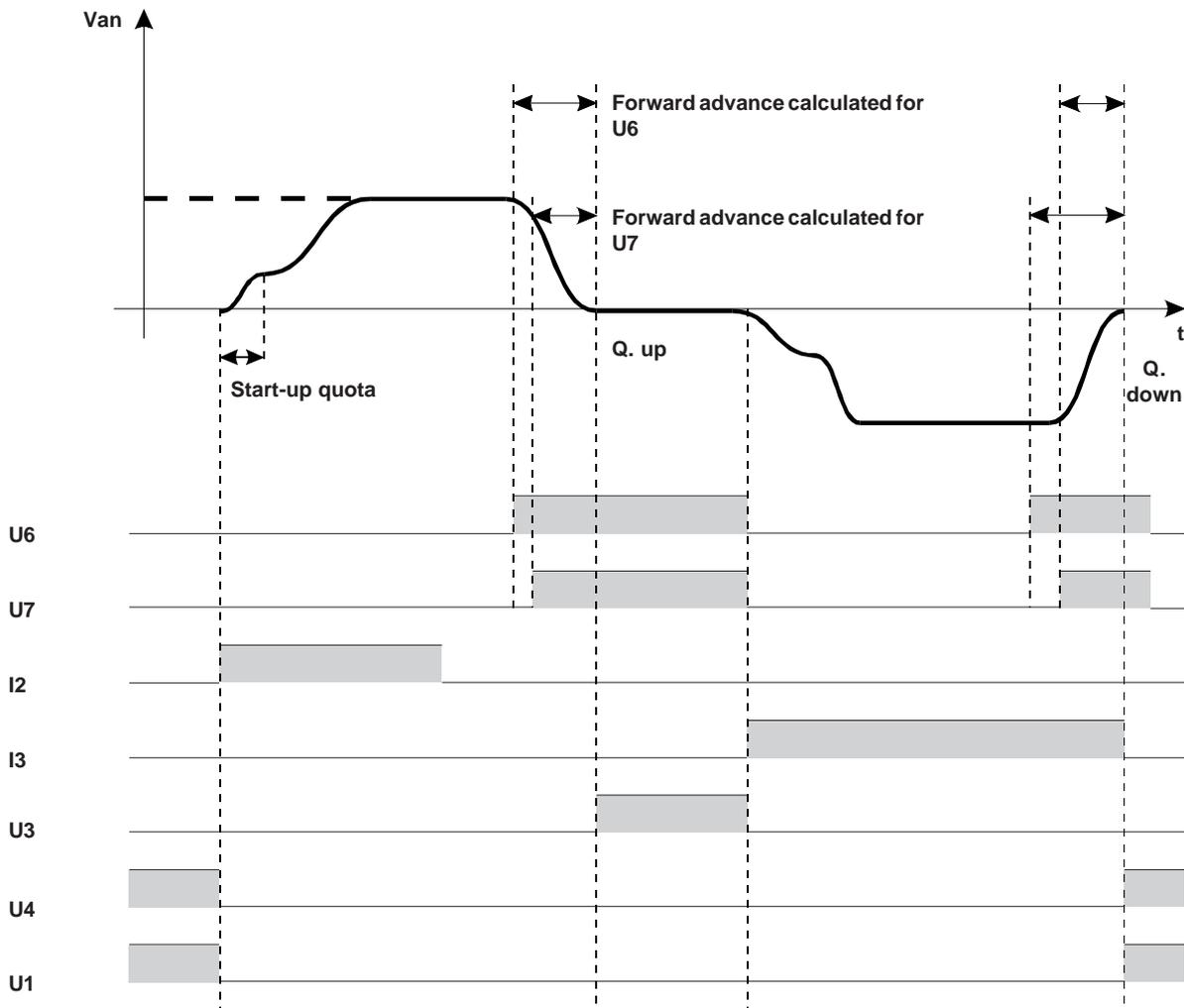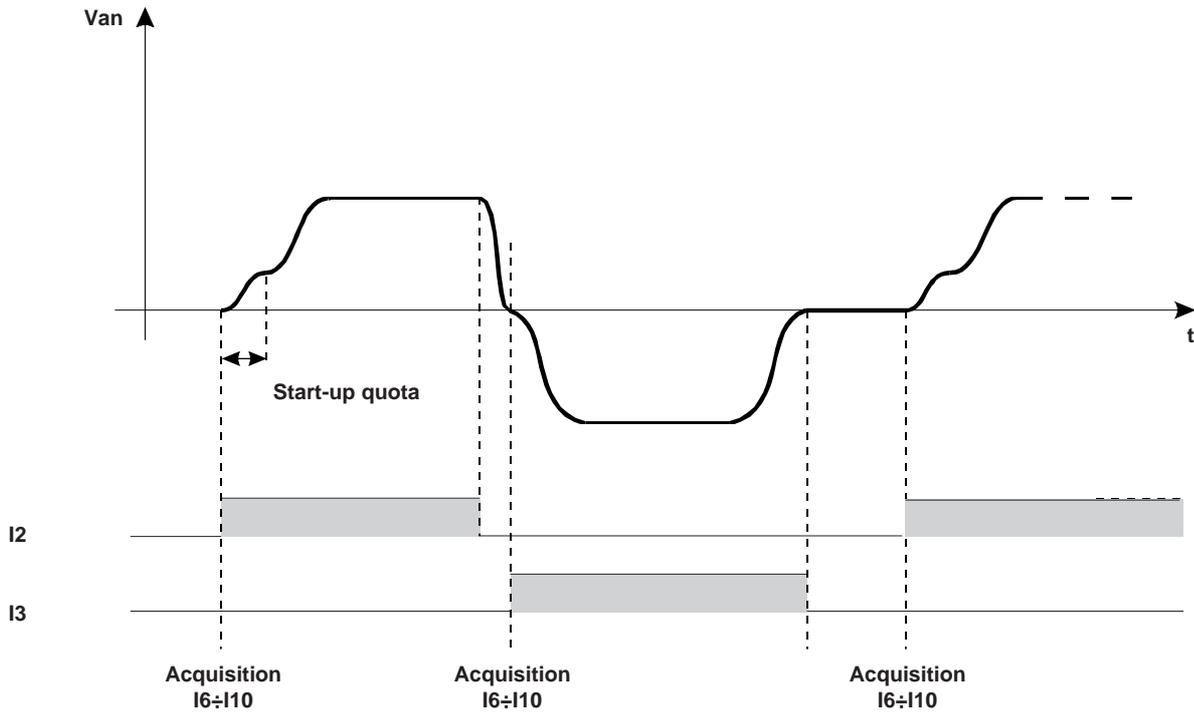
"Mode 2" - Loading the preset quota from an input.
In thi procedure the preset search is not enabled. The command for loading the preset quota is provided by the activation of input I1 (enabling of zero impulse).

SELF-LEARNING DIAGRAM

N.B. If the operator finds himself in "Introduction to the work program" self-learning from input I5 is inhibited. During the self-learning phase, the quota selected (see "Displays" on page 30) will show the self-learned quota.

FUNCTIONS DIAGRAMS

FUNCTIONS DIAGRAMS

The instrument calculates the slow-down automatically in proportion to the speed using the following formula:

A $= \dfrac{AM \times V}{SP}$

AM = Maximum advance (set-up)

A = Slow-down calculated by the instrument

V = Set movement speed

VM = Maximum movement speed in Um (set-up)

N.B. The real advance is never below the minimum advance (SET-UP)

Example:

Maximum set speed = 1000 Hz (set-up)

Maximum advance = 500 mm (set-up)

With a speed of 50 Hz, the advance will be:

Advance made by the instrument = 500 x 50=25000
= 25000 ÷ 1000=25

With a quota set on 300, the advance quota will be:

Advance made by the isntrument = 300 - 25=272
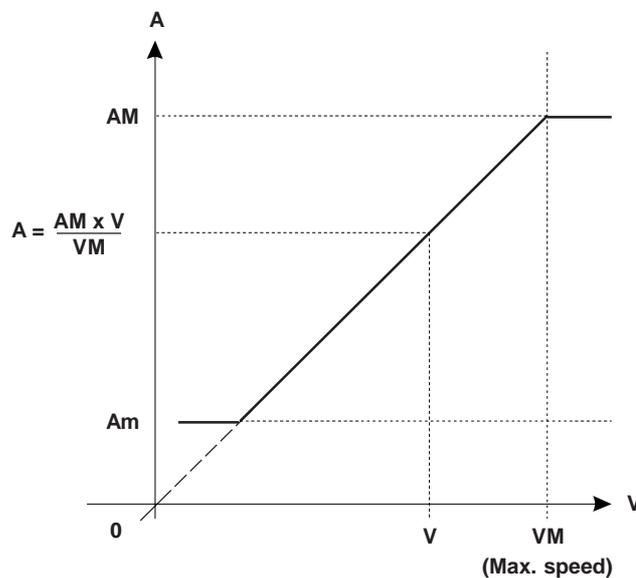
With a speed of 70 Hz, the advance will be:

Advance made by the instrument = 500 x 70=35000
= 35000 ÷ 1000=35

With a quota set on 300, the advance quota will be:

Advance made by the instrument = 300 - 35=265

CAPITOLO 5

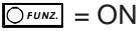# ASSISTANCE

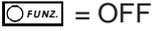*Input and output troubleshooting*

How to complete the technical assistance fax form

Warranty

5 - 1 INPUT AND OUTPUT TROUBLESHOOTING

The instrument provides diagnostics of the logic status of the digital input and outputs; according to the numbers displayed, it is possible to understand whether an input arrives at the instrument and if an output has been energised. The first display after access to the diagnostics function refers to the inputs status; if number 1 is displayed, input 1 has been activated; display of the number 2 means that input 2 has been activated and so on. Input Z (transducer zero impulse) is signalled with a C; if this is shown, there is no zero impulse; if not shown, the zero impulse is supplied to the instrument.

The successive display refers to the logic status of the digital outputs. The same correspondence (each number corresponds with its equal output); for example, the presence of the number 4 indicates that the instrument is energising output 4.

Description	Keyboard	Display

Access to diagnostics functions. The input status ($inG.$) will be displayed.	**F** + **6**	` inG. 1234 `
		` c 56789A `
		
		`○FUNZ` = ON

Press the **ENTER** key to pass to display of outputs status (out).	↵	` out 1234 ` ` 56789 `
To exit the program choice function, press key **F**.	**F**	`○FUNZ` = OFF

5 - 2 HOW TO COMPLETE THE TECHNICAL ASSISTANCE FAX FORM

We need your help if we are to provide you with a quick, efficient and high-quality service.
Whenever you need the assistance of QEM in dealing with any technical problems that may arise in your applications and, even though all the instructions in the "Installation, maintenance and servicing manual" have been followed, the problem persists, we invite you to complete all parts of the fax form enclosed with the installation, maintenance and servicing manual, and to send it to the QEM assistance office.
In this way, our service engineers will have all the essential information for understanding your problem (avoiding long and costly telephone calls).
Thanking you for your kind co-operation, QEM wishes you all the best in your work.

NOTE
If you have to send us an instrument for repair, please read carefully the following points.
 - When possible, use the original packing; in any event, the packaging must protect the instrument from bumps during transport.
 - Be sure to enclose in the pack a detailed description of the problem you have encountered, together with the part of the wiring diagram that concerns the instrument. If the problem has been found in the data memory, please enclose also the instrument programming (set-up, work quotas, auxiliary parameters ...).
 - If necessary, ask us specifically for an estimate on the repairs. If no estimate is requested, the cost will be calculated on completion.
 - Our service engineers will give priority to instruments that are sent in accordance with the instructions given in these notes.

5 - 3 WARRANTY

The warranty conditions are as stated in the general conditions of sale.

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