MODEL 5014

OPERATING MANUAL

Design & CERTIFICATION DEKRA DIN ISO 9001 Manufacture

Serial No. : _____

Rev 1.1 - 22/09/99

DYNAMOMETER MANUAL

PLEASE NOTE!

Safety

This equipment is supplied by a mains voltage which can cause an electric shock injury. Before removing the circuit board from its housing, switch the instrument off, isolate it from the mains power supply and make sure that it cannot be connected inadvertently by other persons.

If the circuit board is removed from its housing, do not apply power to the instrument unless specifically instructed to do so in these instructions. When working on live equipment, exercise great care, use insulated tools and test equipment, and do not work alone.

When fitting option boards, always put the circuit boards back in the housing with the back-plate securely fastened before powering up the instrument.

When handling circuit boards, ensure that full anti-static precautions are observed.

Replace mains fuse with one of an equivalent type or rating.

Cleaning

Do not clean the instrument while the instrument is on. Harsh abrasives, solvents, scouring cleaners and alkaline cleaning solutions, such as washing soda, should not be used especially on the display window. The outside of the instrument may be wiped down with a slightly damp clean cloth (lightly moistened with water only).

Under no circumstances should you attempt to wipe the inside of the instrument.

Guarantee

This product is guaranteed against faulty workmanship or defective material, for a period of 3 (three) years from date of delivery.

The manufacturer undertakes to replace without charge all defective equipment which is returned to it (transportation costs prepaid) during the period of guarantee, provided there is no evidence that the equipment has been abused or mishandled in any way.

The manufacturer reserves the right to alter any specification without notice.

CONTENTS

SPECIFICATIONS

Introduction

The Model 5014 is a self-contained, easy-to-use indicator for dynamometer applications. All the features of more expensive systems are included in one indicator. The indicator features a full 5½ digit LED display (-199999 to 199999). Inputs to the instrument include load cell input & proximity sensor or encoder input. Included is excitation for load cells and a 18 - 24V DC supply for the proximity switch or encoder. The stable bridge excitation output voltage includes sense feedback to compensate for line variations. The precision differential instrumentation op amp front end ensures high stability and accuracy for millivolt input from the load cells in the dynamometer system.

Options include analog output for external power indication or control, up to four alarms, RS 232 / RS 485 communications and many others.

The calibration method is simple and easy. Pre-calibrated ranges can be allocated zero and full scale values and these can be adjusted on site to allow for back-balance (deadweight) offset and single point span calibration (test weight trim). The instrument meets European Community EMC directive 89/336/EEC and Low Voltage directive 73/23/EEC.

Features

- ❑ DIN 48 x 96 enclosure, 147mm depth (170mm with power cable guard)
- ❑ -199999 to 199999 counts display
- ❑ 14.2mm high bright red LED display
- ❑ Low cost - high performance design
- ❑ Touch button ranging & setpoint adjustment
- ❑ 10 V (-5V to +5V) load cell excitation with sense feedback included as standard
- ❑ Excitation power for up to three load cells standard
- ❑ 18 - 24 V power supply for proximity sensors or encoders included as standard
- ❑ Analog output option for external power indication or control (programmable zero & span)
- ❑ RS 232 / RS 485 communications option

Options Available

See Detailed Description / Operation at the back of manual

3001-P	Dual setpoints / alarms (solid state relays)
3001-M	Dual setpoints / alarms (electro-mechanical relays)
3002	RS 485 communications (Digibus or Asciibus protocol)
3003	0 - 20 mA / 4 - 20 mA analog output (for external power indication)
3004-P	1 setpoint / alarm (solid state relay)
3004-M	1 setpoint / alarm (electro-mechanical relay)
3007	0 - 10V analog output (for external power indication)
3009	Parallel BCD output
3012	Peak or valley hold function (works on power parameter)
3013	RS 232 communications (Digibus or Asciibus protocol)
3017-P	3 setpoint / alarms (solid state relays)
3018-P	4 setpoints / alarms (solid state relays)
3020	Ultra bright RED display

Option 3009 cannot be ordered with any alarm options.

Electrical Specifications

Accuracy & linearity	: 0.05% of full scale, or 1 count
Internal resolution	: 20000 counts (bi-polar)
Temperature drift	: 0.1µV / °C typically
Settling time / conversion time	: 0.15 seconds approx. (filtering set to 0)
Operating temp. range	: -10 to +50°C
Storage temp. range	: -40 to +80°C
Humidity	: < 85% non-condensing
Electro-mechanical relays	: 250V AC, 30V DC, 2A, PF=1
Solid state relays	: 400 V AC/DC, 0.5A, PF=1
Analog output accuracy	: 0.1% of full scale
Current analog output load	: 500 Ω maximum
Voltage analog output load	: 1 kΩ minimum
Memory retention	: Full non-volatile operation
Option 3006 isolation rating	: 1500 V
Declaration of conformity	: See last page

Input Amplifier

Input impedance	: 2 MΩ (differential)
Max. C.M. voltage	: ± 2V
C.M.R. ratio	: 86 dB typical
Noise	: < 0.5µV p-p

Excitation

Sense feedback	: Yes
Voltage	: 10 volts, ± 5V bipolar
Temp. coefficient	: 10 ppm typical
Max. number of LC's	: 3 (three)

Power Supply

Power consumption is dependent onthe number of loadcells connected and options fitted. Typical power consumption with 3 loadcells is 8VA.

STANDARD :
95V-265V AC/DC isolated power supply, fused (2A picofuse).

Other Specifications

DIN 48 x 96 housing, 147mm depth
Industrial strength single piece housing

Flame retardant ABS plastic UL94 V-0 housing
Flame retardant circuit board material UL94 V-0

Front facia : IP53 rating for front facia
Front facia : IP65 if optional panel seal added

Programmable Settings

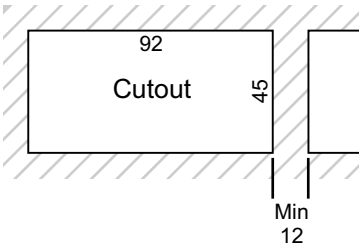
Zero setting	: -199999 to 199999
Full scale setting	: -199999 to 199999
Decimal point	: Adjustable on all digits
Input sensitivity	: 1, 2, 3 or 10 mV/V (Note 1)
*Analog output zero	: -199999 to 199999
*Analog output span	: -199999 to 199999
*Alarm values	: -199999 to 199999
*Alarm hysteresis	: 0 to 255 (default 1)
*Alarm delay	: 0 to 255 seconds (default 0)
*Alarm relay settings	: Select HI or LO alarm
*Alarm relay state	: Select NO or NC
*Unit addressing	: 1 to 127 (default 0 - for factory use only)
*RS232 / RS485 baud	: 2400, 4800, 9600, 19200

NOTE (1) : These 4 sensitivities cover the vast majority of applications. For specialised requirements, please consult the factory.

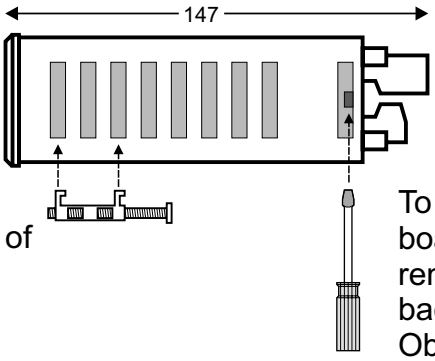
* indicates option

INSTALLATION

Panel Cutout



Fastening

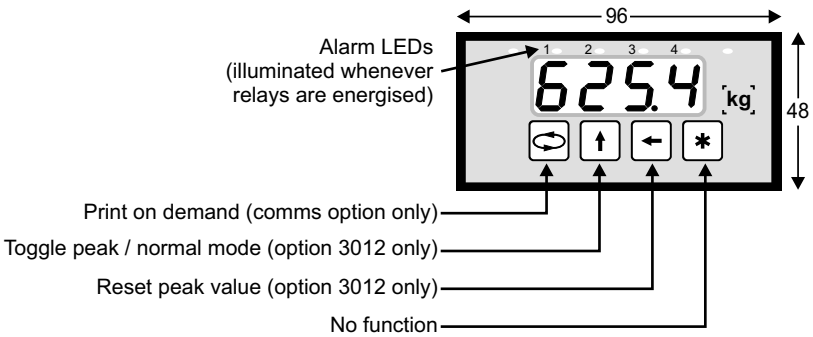


The supplied fastening clips may be fitted on **the side** or the **top / bottom** of the housing. Ensure that the clip & screw is mounted as shown here.

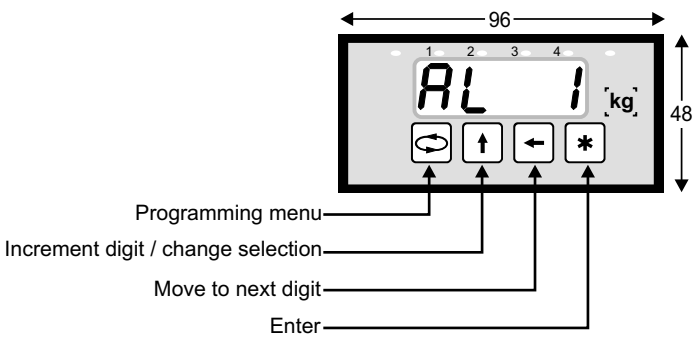
Caution : Do not overtighen the screws.

To gain access to the circuit boards, switch power off and remove terminals from the back of the housing. Observe safety precautions. Use a screwdriver to clip the back-plate off.

Display & Keypad — During normal display mode



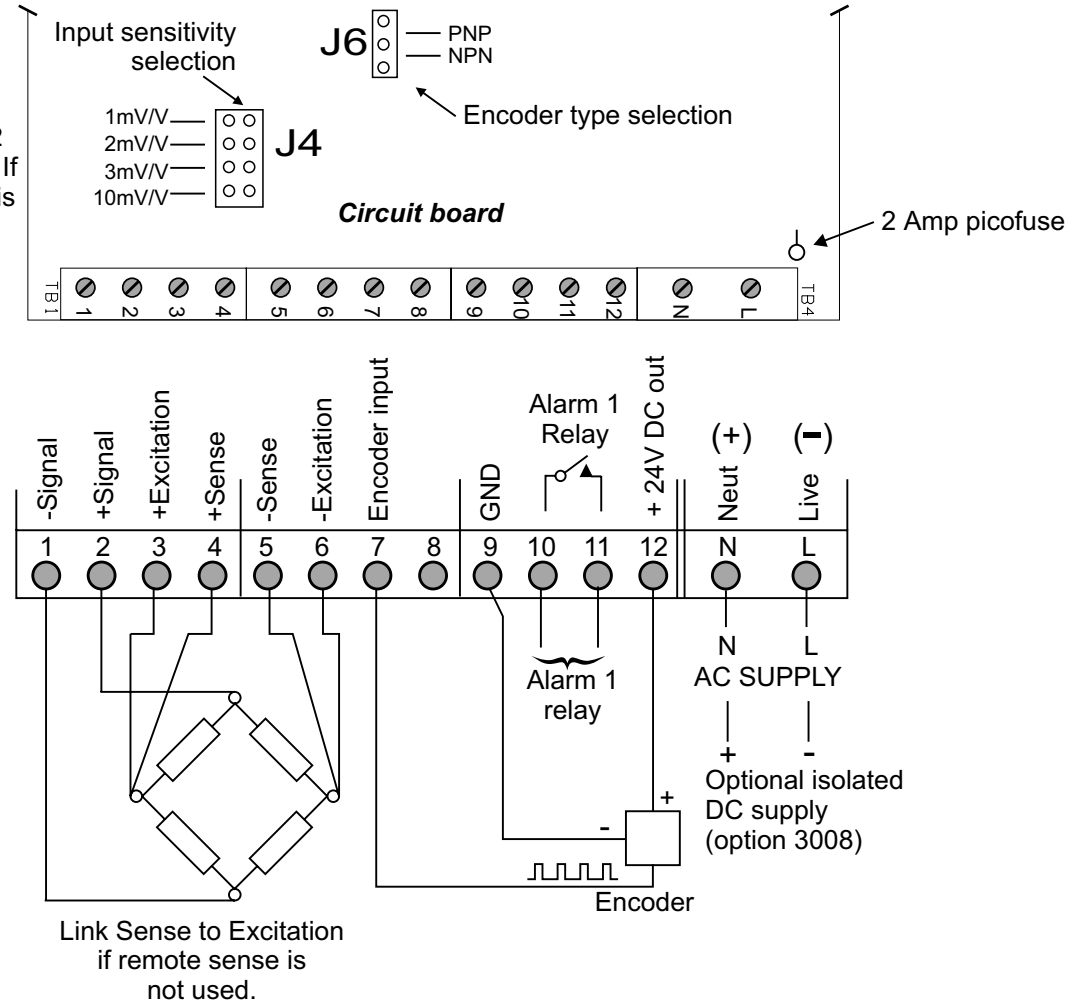
Display & Keypad — During programming mode



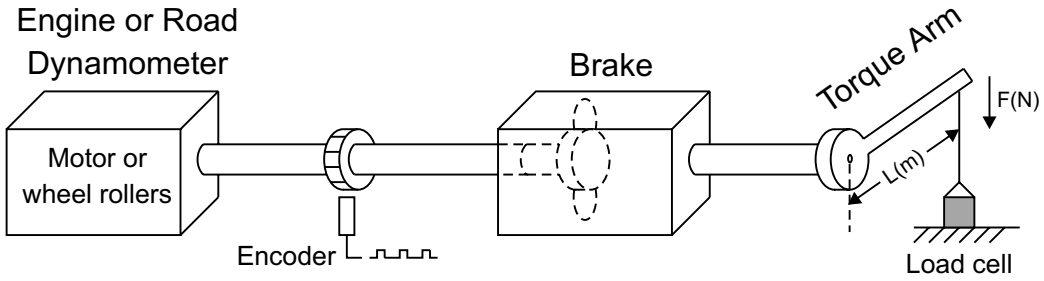
All dimensions in mm

CONNECTION DIAGRAM & LINKS

Standard loadcell sensitivities are 1 mV/V, 2 mV/V, 3 mV/V or 10 mV/V. If a non-standard sensitivity is required, consult the factory.



BASIC DYNAMOMETER THEORY



TORQUE = F x L (Nm) where F = force in newtons (N)
L = length in meters (m)

$$\text{POWER} = \frac{\text{Torque x Rotational Speed}}{\text{Constant}}$$

$$\text{kW} = \frac{\text{Nm x RPM}}{9549}$$

$$\text{hp} = \frac{\text{Nm x RPM}}{7121}$$

where kW = kilowatts
Nm = newtons meters
RPM = revolutions per minute
hp = horse power

SETUP & CONFIGURATION

Introduction

Various parameters have to be entered into the instrument. The procedures below should be followed for easy configuration of your dynamometer system. Refer to the menu / programming chart in the pages to follow to assist you when entering data.

Parameter Ranges

The following parameter limits should be noted. However, it is highly unlikely that these parameter will be exceeded during normal operation of the dynamometer.

Load cell	= must be entered with a resolution of 10g (e.g. 99.99kg, 1.99999t)
Torque arm length	= 0.001 ... 2.000 metres
Encoder pulses	= 1 ... 5000 per revolution
Input frequency from encoder	= 1 ... 13000 Hz
Rotational speed	= 1.00 ... 40 000 RPM
Power kW or hp	= Display limitation of 199999 counts
Maximum averaging time	= 3 hours for both back-balance (dead weight) and load

Setup — Load Cell Range (kg)

The dynamometer is field configured / calibrated by selecting one of the factory set internal ranges of 10, 20, 30 or 100 mV, and entering a zero and full scale value to it (pre-calibration). Once the load cell system is set up, the deadweight (back-balance) of the torque arm / linkage / brake / off-balance can be offset and the full scale load trimmed with test weights if required. Proceed as follows:

❒ Select correct load cell/s to suit the system. To prevent load cell damage, size the load cell twice the calculated full scale range. For example:
Estimate max power = 150kW
Estimate max revs = 5000 RPM
Torque arm length = 0.500 m
Now kW = (Nm x RPM) / 9549
Therefore N = (kW x 9549) / (m x RPM) (re-arranging the equation)
= (150 x 9549) / (0.500 x 5000) = 572.94 N
Now 1N = 0.1020 kg
Therefore 572.94 N = 58.44 kg
Suggest use of 100 kg load cell

❒ Select J4 input on the circuit board to the required load cell sensitivity.

❒ Go through menu setup to "DISP", which is the first menu item. Select "LC" to display loadcell value.

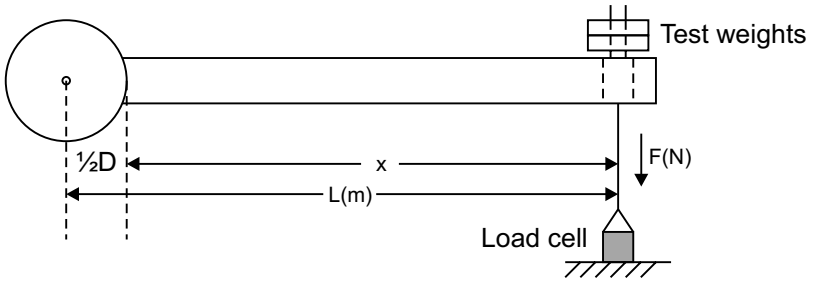
❒ Go through the setup menu to "CAL" sub-menu. When entering data, observe the parameter ranges mentioned above i.e. the decimal point, zero and load cell capacity must be entered with a resolution of 10g (e.g 60.00kg or 200.00kg)
- Select load cell sensitivity e.g. " 2 “ for 2mV/V
- Select decimal point "LC.dp" e.g. oo.oo (must be in 10g steps)
- Select load cell zero value "ZERO" e.g. 00.00 kg (must be in 10g steps)
- Select load cell full-scale value "LC.FS" e.g. 60.00 kg (must be in 10g steps)
- Select load cell filtering value "L.Filt” e.g. value of 5
- Select display increment “incr" e.g. 0

❒ With test weights off, go through setup menu to "TARE". Press enter. With "TARE" flashing on the display, wait 5 seconds, then press enter.

❒ If test weights are available, place them on torque arm carrier in line with load cell. Go through the setup menu to "LOAD". Enter actual test weight value. Press enter. "LOAD" will flash on the display. Wait for 5 seconds and press enter.
NOTE : By automatic taring and test weight trim, the DPM will alter the manually entered "ZERO" and "LC FS" values in the "CAL" menu automatically. Do not amend these values.

Setup Torque (Nm)

- ❒ Measure torque arm length length accurately (do not estimate centre of shaft mount, but accurately measure shaft diameter, and then add ½D + x).



- ❒ Go through the setup menu to “LEnG”, enter the torque arm length in x.xxx meters.
- ❒ Calculate maximum newton meters (Nm) e.g. load cell = 100 kg, torque arm = 0.500 m. Now 1kg = 9.807 N. Therefore 100kg = 980.7 N.
  Nm = F x L = 980.7 x 0.500 = 490.35 Nm
- ❒ Go through the setup menu to “DISP”, which is the first menu item. Select “LC” to display the load cell value in kg. It should read the correct value.
- ❒ If “DISP” is again selected, and then “torc” selected, the display will show torque in Newton meters (Nm) and with the 100kg weight and a 0.5m torque arm length as used in the example above, the display should read 490.3 Nm.

Setup Rotational Speed (rpm)

- ❒ The pickups for rotational speed can be inductive proximity sensors triggered by gear teeth or studs, or shaft encoders.
- ❒ Select a suitable arrangement to give at least 6000 impulse per minute at full speed.
- ❒ On the circuit board, select on link J6 whether NPN or PNP sensors or encoders are being used. See page 5 for board layout. Factory default is NPN.
- ❒ Go through the setup menu to “Sped”.
  - Enter pickup / encoder impulses / revolution “ENC” e.g. 2 impulses per rev.
  - Select frequency filtering “F.Filt” e.g. 0.5 seconds
- ❒ Go though the setup menu to “Disp”, and select “rota”. With the dynamometer running, the reading on the display should read the correct speed in RPM. You can use a hand-held tachometer to verify

Operational Mode

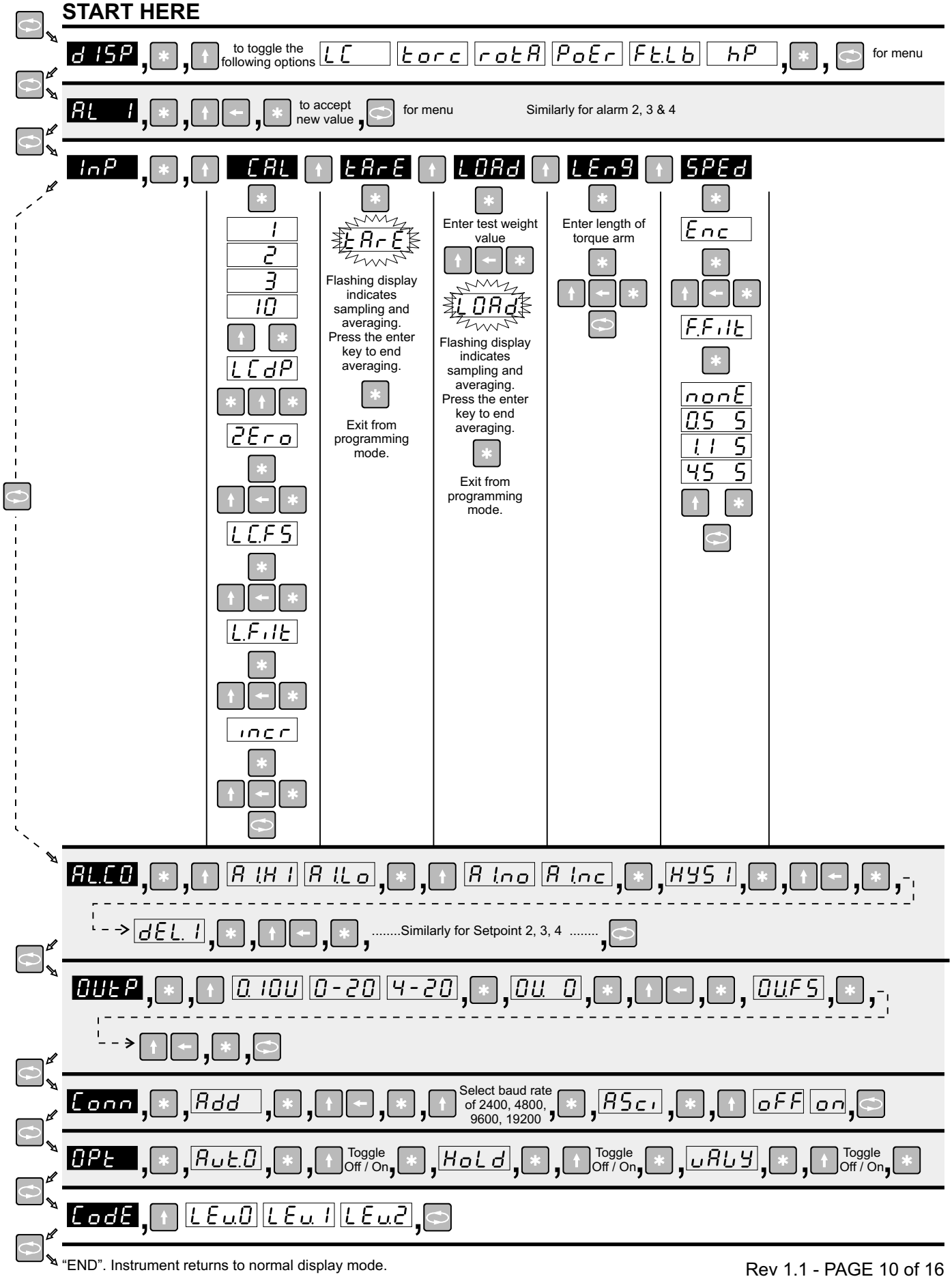
- ❒ If the above steps have been completed, the dynamometer is ready for use.
- ❒ Various parameters in different units are available on the the indicator display. Go through the menu to “Disp”, which is the first menu item. The following parameters can be viewed:
  - ”LC” : load cell mass in kg.
  - “torc” : torque in Nm.
  - “rota” : rotational speed in RPM.
  - “Poer” : power output in kW.
  - “ft.lb” : torque in foot pounds.
  - “hp” : horsepower.

PROGRAMMING CHART

READ ME FIRST !

Note 1 : This programming chart is a simplified flowchart for users that have previous experience with this instrument. A programming example is available in the next few pages to assist new users in understanding this programming chart.
Note 2 : Because this instrument has many options, all possible option menus are shown in “light grey”. Options that are not ordered will not appear in the programming sequence.
Note 3 : Configuring this instrument requires two steps. (A) Select analog output (option) links (page 7). (B) Program the instrument with this chart.
Note 4 : To enter programming mode, press the menu key for a few seconds (unless the optional keypad lock has been set). Programming mode timeout is about 20 seconds. If no key is pressed for 20 seconds during programming, the instrument returns to normal display mode.

START HERE



“END”. Instrument returns to normal display mode.

EXPLANATION OF DISPLAY CODES

disP Display select menu

LC Display load cell value / mass (in x.xx kg)

torc Display metric torque in Newton metres (in x.x Nm)

rotA Display rotational speed (in x RPM)

PoEr Display metric power (in x.x kW)

FtLb Display torque in foot pounds (in x.x ft.lbs)

hP Display power (in x.x hp)

8888 Panel meter startup / reset sequence (shown on startup only)

oooo Process overscale. Input has exceeded full scale value.

---- Hardware overrange. Reduce input signal to reduce saturation.

AL 1 **AL 2** **AL 3** **AL 4** 1st, 2nd, 3rd, 4th setpoint value

ALCO Alarm configuration menu (shown for 1st alarm only)

A1H1 A1Lo 1st alarm setpoint HIGH / LOW alarm

A1no A1nc 1st alarm setpoint NO / NC contact

HYS1 1st alarm setpoint hysteresis

dEL.1 1st alarm setpoint switching delay

InP Input & calibration sub-menu

CAL Sub-menu for manual setting of deadweight / back-balance and load cell capacity (pre-calibration).

tArE Sub-menu for field calibration of deadweight / back-balance. Press the “star” key to start process.

LOAd Sub-menu for field calibration of span using test weight method. Set to test weight value and press the “star” key.

tArE During field calibration of deadweight / back-balance, display flashes “tare” until the “star” key is pressed.

LOAd During field calibration using test weights, display flashes “load” until the “star” key is pressed.

1 2 3 10 Load cell sensitivity (up to 1mV/V, up to 2mV/V, up to 3mV/V, up to 10mV/V. Remember to set jumper link J4 on the circuit board as well.

LCdP Load cell (display) decimal point selection (non-floating point)

2Ero Manually entered deadweight / back-balance value (enter as positive value)

LCFS Manually entered load cell full scale capacity (e.g. enter 1000 for a 1000 kg load cell system)

LFiLt Load cell measurement input filter with a range of 0 to 10.0 seconds. Default is 0.0.

incr Display increment. Value range is 0-100. e.g. "10" would give a dummy zero.

LEn9 Torque arm length sub-menu. Enter torque arm length in x.xxx metres.

SPEd Rotational speed sub-menu.

Enc Encoder pulses per revolutions (in x pulses per revolution).

FFiLt nonE 0.5 S 1.1 S 4.5 S Frequency filtering with values of none, 0.5 seconds, 1.1 secs, 4.5 secs.

OUtP Analog output menu

0.10U 0-20 4-20 Output selection (0-10V, 0-20mA, 4-20mA)

OU 0 Output zero selection

OUFS Output full scale selection

Conn Communications menu (RS232 / RS485)

Add Unit address (default 0)

2400 4800 9600 19.2 Available baud rate values

ASCi oFF on Protocol selection. On = AsciiBus. Off = DigiBus.

OPt Option menu for Tare feature and Peak / Valley Hold

AUt.0 Tare feature select (auto-zero / auto-tare)

oFF on Turn the Tare feature on or off

HoLd Peak / valley hold feature (min / max hold)

oFF on Turn the peak / valley hold feature on or off

uALY Peak / valley hold selector

oFF on If “off”, peak hold mode. If “on”, valley hold mode

“Code” (keypad lock) function :

The keypad lock option is used to prevent un-authorised access to the programming menu. When this option is ordered, a new sub-menu called “CODE” appears at the end of the programming sequence. See programming page 8.

Three levels of keypad lockout are available:

Level 0 - Full access to programming menu.
Level 1 - User only has access to alarm setpoint values, and a keycode is required to access the rest of the programming menu.
Level 2 - Total programming menu lockout. Keypad sequence required to enter programming mode.

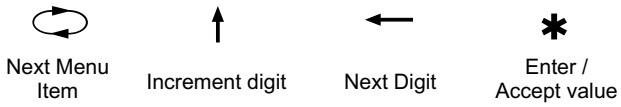
If this option is ordered, the factory default is “Level 0”. The required key sequence to enter programming mode with Level 1 or 2 enabled is:
While holding down 'menu' key, press in succession the 'enter' key, then 'side arrow’ key, then 'up arrow' key. Keep holding down the menu key until "- - - -" appears on the display. The indicator is now in programming mode.

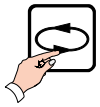
CodE Keypad lock menu. See “Code” function description on this page for more information.

LEu0 LEu1 LEu2 Keypad lock security level. Level 0 = none, Level 1 = alarm value changes, Level 2 = full

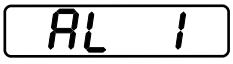
PROGRAMMING EXAMPLE (Setting alarm values)

Remember, the symbols on the keypad have the following definitions during programming.

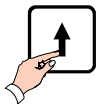




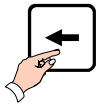
Press “Menu” for 3 seconds



Press “Enter” to see Alarm / Trip 1 value.



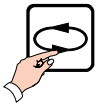
Press “Increment digit” to increase value



Press “Next digit” to amend the next digit

Amend the other digits in the same way until the desired trip value is entered.

Press “Enter” to accept Alarm 1 value.



Press “Menu” to proceed to next trip value.

Use the same menu steps above to change trip levels for trip 2, 3 and 4.

The entire programming menu operates in a manner similar to the example described above.

ASCIIBUS COMMUNICATIONS

IGNORE THIS PAGE unless communications option has been ordered. When the RS232 (option 3013) or RS485 (option 3002) is ordered, two protocols are made available, namely ASCIIbus & DIGIbus protocols. DIGIbus is the default protocol which is used for the calibration and configuration of the instruments, and whenever the instrument is connected to master-slave systems. DIGIbus protocol is therefore used in complex bus systems, and is NOT described here. Please contact factory for the DIGIbus protocol.

ASCIIbus, which is described here, is much easier to use as it can easily interface to third party systems with very little engineering work required. It is a purely ASCII based (7 bit) protocol. The protocol is essentially designed for one way communications (instrument to PC). Under the "Conn" (connection) programming menu, ASCIIbus is enabled by selecting "ASCI" to "ON". If "OFF" is selected, the DIGIbus protocol will be active. Although designed for one way communications only, the ASCIIbus protocol contains an address. The address range is "00" to "99".

Using address "00" : If this address is selected, the instrument will only transmit data on demand by either momentarily pressing the 'menu' key, or by transmitting a byte (any ASCII character) to the DPM. This mode is useful for interfacing to printers.

Using address "01" to "99". If any of these addresses are used, the meter continuously transmits information at approximately 5 times a second.

The data format string output from the indicator is (7 bit ASCII code is used):

Line Settings: 7 Data Bits, 1 Parity bit, Odd Parity, 1 Stop Bit.
Baud Rate: Selectable 2400, 4800, 9600, 19200.
Data Bits: Numerical ASCII characters : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Other ASCII characters : space, +, -, CR, LF

Output string is:

<STX>	
<SPACE><S><D><D><D><D><D><D>	(load cell value)
<SPACE><S><D><D><D><D><D><D>	(torque value)
<SPACE><S><D><D><D><D><D><D>	(rpm value)
<SPACE><S><D><D><D><D><D><D>	(power value)
<SPACE><S><D><D><D><D><D><D>	(ft.lb value)
<SPACE><S><D><D><D><D><D><D>	(hp value)
<CR>	
<LF>	

where:
STX = ASCII character $02 not printed
SPACE = ASCII character SPACE $20
S = sign (polarity) (ASCII "+" or "-").
D = data values right aligned, leading zeroes are converted to spaces
CR = ASCII carriage return.
LF = ASCII line feed.

Note 1: There is no decimal point information in the output string.
Note 2: The above values are all sent in one bitstream.

The output options will follow the display reading. This means that if the peak-hold option has been ordered and activated, the communications output will peak-hold as well.

OPTIONAL FEATURES

Option 3001-P — Dual Alarm Setpoints With Solid State Relays Option

This option provides alarm trips on the kW power. Solid state relays are provided as an additional board that slots into the upper slot of the panel meter housing. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. See diagram “P” on page 15 for wiring connections. Wire for AL1 & AL2 only.

Option 3001-M — Dual Alarm Setpoints With Electro-Mechanical Relays

This options provides alarms on the kW power. Electro-mechanical relays are provided as an additional board that slots into the upper slot of the panel meter housing. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. The relays are rated at 250VAC / 30VDC @ 2A. Both normally open and normally closed contacts are provided with each relay. See diagram “M” on page 15 for wiring connections. Wire for AL1 & AL2 only.

Option 3002 — RS 485 Communications Option

See diagram “M” or “P” on page 15 for terminal connections.

Option 3003 — 0-20 / 4-20 mA kW Power Analog Output Option

This option is supplied as an additional board that slots in the top slot of the DPM housing. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. See diagram “M” or “P” on page 15 for terminal connections.

Option 3004-P — Single Alarm Setpoint With Solid State Relay Option

This option provides one alarm trip on the kW power. A solid state relay is provided on the motherboard (lower terminals). See connection diagram on page 7 for wiring details.

Option 3004-M — Single Alarm Setpoint With Electro-Mechanical Relay

This options provides one alarm trip on the kW power. An electro-mechanical relay is provided as an additional board that slots into the upper slot of the panel meter housing. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals.
The relays are rated at 250VAC / 30VDC @ 2A. Both normally open and normally closed contacts are provided with each relay. See diagram “M” on page 15 for wiring connections. Wire for AL1 only.

Option 3007 — 0 - 10V kW Power Analog Output Option

This option is supplied as an additional board that slots in the top slot of the DPM housing. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. See diagram “M” or “P” on page 15 for terminal connections.

Option 3009 — Parallel BCD Output Option

This option is supplied as an additional slot in card in the top part of the DPM housing. See the additional supplied documentation for this option.

Option 3012 Peak or Valley (Max or Min) Hold on kW Power Option

This option displays and holds the maximum or minimum value (not both) of the kW power. This option is activated in the programming menu “Opt” by selecting whether “Hold” should be “On” or “Off”, and selecting whether valley (”valy” = “On”) or peak (”valy” = “Off”) hold should be displayed.

The display can be toggled to show the peak / valley value or normal value by toggling the “up” arrow key (press for about 3 seconds each time). For rapid response to step changes on the input, ensure that the filter in the programming menu is set to 0.0. To reset the peak / valley hold value, press the “side” arrow key for 3 seconds, or use an external potential free contact (see page 7 for connection details). If analog output option is fitted, the output will hold as well.

Option 3013 RS 232 Communications Option

See diagram “M” or “P” below for terminal connections. See page 13 for ASCIIbus protocol details.

Option 3017-P Three Alarm Setpoints With Solid State Relays Option

This option provides three alarms trips on the kW power. Solid state relays are provided as an option board that slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. The relays are rated at 400V 0.5A. If the panel meter loses power, the relays revert to a normally open condition. See diagram “P” below for wiring connections. Wire for AL1, AL2 & AL3 only.

Option 3018-P Four Alarm Setpoints With Solid State Relays Option

This option provides four alarms on the kW power. Solid state relays are provided as an option board that slots into the upper slot of the panel meter box. The upper terminals are clearly numbered 13-28 to differentiate them from the lower terminals. The relays are rated at 400V 0.5A. If the panel meter loses power, the relays revert to a normally open condition. See diagram “P” below for wiring connections. Wire for AL1, AL2, AL3 & AL4.

Diagram “P”

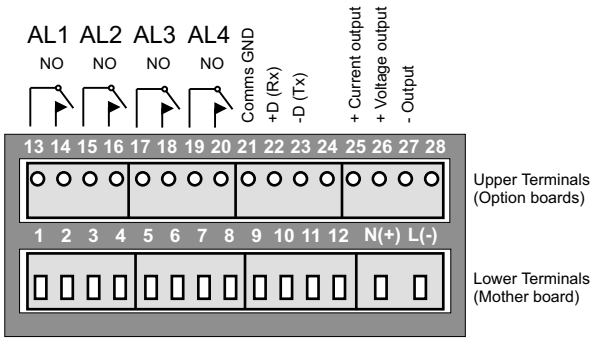
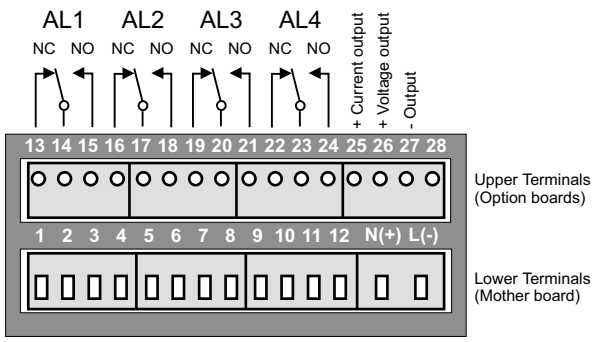


Diagram “M”



DOCUMENTATION CONTROL

Rev 0	Prototype release.
Rev 1 & 1.1	Production release.

DECLARATION OF CONFORMITY CE

Dynamometer Indicator

Manufacturer: DPM

Type : 5014
Options : 3000 to 3026

Corresponds to the requirements of the following EC directives:

EMC directive	: 89/336/EEC
Low voltage directive	: 73/23/EEC
The applicable harmonised standards are	: EN 50081-1
	: EN 50082-1
	: EN 61010

USER NOTES & SETTINGS

Loadcell sensitivity:

Loadcell decimal point:

Loadcell zero value:

Loadcell full scale value:

Encoder pulse/rev:

Torque arm length: