

# Instruction Manual

## Turbo and Active Gauge Controller



Description	Item Number
Turbo and Active Gauge Controller	D395-92-000

Original Instructions





# Declaration of Conformity

We, Edwards Limited,  
Crawley Business Quarter,  
Manor Royal,  
Crawley,  
West Sussex, RH10 9LW, UK

declare under our sole responsibility, as manufacturer and person within the EU authorised to assemble the technical file, that the product(s)

D395-92-000 Turbo and Active Gauge Controller

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN61326-1:2013 (Class B Emissions, Industrial Immunity)	Electrical equipment for measurement, control and laboratory Use. EMC requirements. General requirements
EN50581:2012	Technical Documentation for the Assessment of Electrical and Electronic Products with respect to the Restriction of Hazardous Substances

and fulfils all the relevant provisions of

2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2012/19/EU	Waste from Electrical and Electronic Equipment (WEEE) Directive
2011/65/EU	Restriction of Certain Hazardous Substances (RoHS) Directive

*Note: This declaration covers all product serial numbers from the date this Declaration was signed onwards.*

Larry Marini, Senior Technical Manager

19.08.2015, Eastbourne

Date and Place

*This product has been manufactured under a quality management system certified to ISO 9001:2008*

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For return of equipment, complete the HS Forms at the end of this manual.

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# 1 Introduction

## 1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards Turbo and Active Gauge Controller. You must use the Controller as specified in this manual. Read this manual before you install and operate the Edwards Turbo and Active Gauge Controller. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.



### WARNING

Warnings are given where failure to observe the instruction could result in injury or death to people.

### CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

The following IEC warning label appears on the TAG Controller:



Warning - refer to accompanying documentation.



Edwards offer European customers a recycling service.

## 1.2 Description

**Note:** *This controller will return your pump to factory default settings. For most applications this is not an issue, however this does mean that this controller is not suitable for controlling a pump that needs modified settings for a particular application i.e. a pump that has had its default settings changed either by a PC or a TIC.*

The TAG (Turbo and Active Gauge) Controller is a small, compact pumping system controller which is suitable for a wide range of vacuum applications. The controller provides connections for a turbomolecular pump, a backing pump, a single active gauge and a turbo air cooler. Compatible pumps and gauges are listed in [Table 1](#).

The TAG Controller is controlled by an easy to use user interface. A large clear LED display shows the pump speed or vacuum pressure. The compact size of the controller is ideal for use on bench-tops or suitable mobile platforms.

The TAG Controller requires a 24 volt power supply which powers the turbomolecular pump and other accessories. A 200 W mains power supply with a suitable connector is available as an optional accessory. Refer to [Section 7](#) for details.

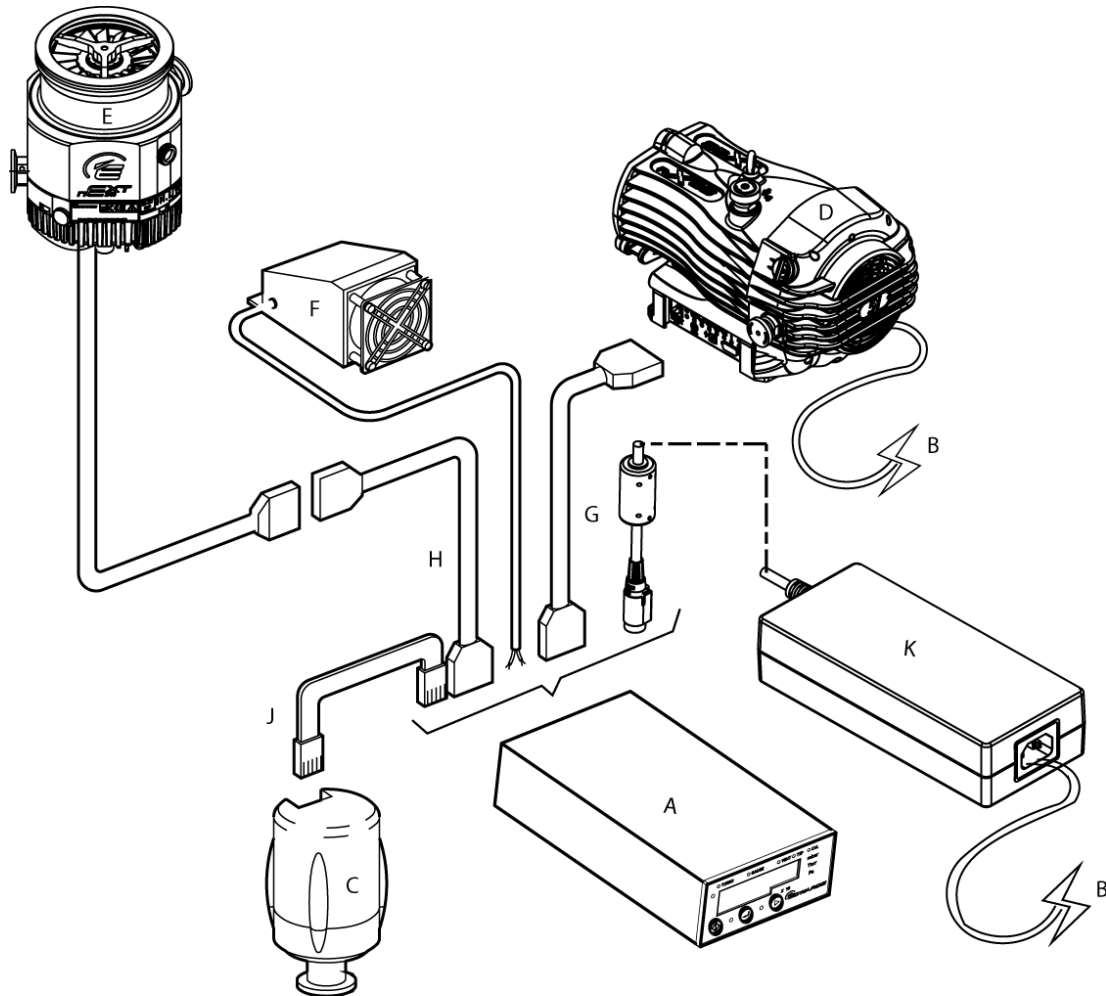
The TAG Controller has the following features:

- Start/stop control of a backing pump
- Turbomolecular pump start options: start with backing pump, start after time delay or start at pressure set-point
- Turbomolecular pump speed display

- Vent valve control options: vent from full speed or vent from half speed
- Pressure display from active gauge in mbar, Torr or Pa
- Air cooler powered when turbo is spinning

Table 1 - Compatible pumps and gauges

Turbomolecular pumps	EXT75DX and nEXT range
Backing pumps	XDD1 24V, nXDS range, XDS35i and any mains powered backing pump e.g. E2M1.5
Active gauges	APG100 range, WRG, AIM-S, AIM-X and ASG



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- A. TAG Controller
- B. 2 m UK mains cable
- C. WRG-S-NW25
- D. nXDS backing pump
- E. nEXT pump
- F. Air-cooler
- G. Pump extension cable 2 m
- H. Pump extension cable 2 m (optional)
- J. 0.5 m active gauge cable
- K. Power supply



## 2 Technical data

### 2.1 Electrical data

Supply voltage	24 V d.c. $\pm$ 10 %
Power consumption	5 W
Maximum input power	240 W

**Note:** The Power In connector supplies power to the TAG Controller and all of the accessories which are connected i.e. turbomolecular pump, fan, gauge and in some cases the backing pump. Refer to Section 2.5.6 for further details.

### 2.2 Operating and storage data

Ambient operating temperature range	0 °C to 40 °C
Ambient storage temperature range	-30 °C to 70 °C
Maximum ambient operating humidity	Max 90% RH non condensing at 40 °C
Maximum operating altitude	2000 m max
IP rating	IP20. IP40 when panel mounted. For indoor use only.

### 2.3 Mechanical data

Mass	0.3 kg
Dimensions (w x h x d)	96 x 48 x 165 mm
Panel cut-out	92 <sup>+0.8</sup> x 45 <sup>+0.6</sup> mm to DIN43700
Panel thickness	1.5 mm minimum

### 2.4 Display

Type	High brightness green LED 7-segment display LED enunciators for units and display mode
Update rate	300 ms

## 2.5 Connections

### 2.5.1 Fan connector

Connector type	Phoenix 2-way
Mating part	Phoenix order number 1881325 (Supplied with TAG)
Power supply	24 V d.c. nominal
Maximum power output	3.6 W

Figure 2 - Pin connections for a Phoenix 2-way

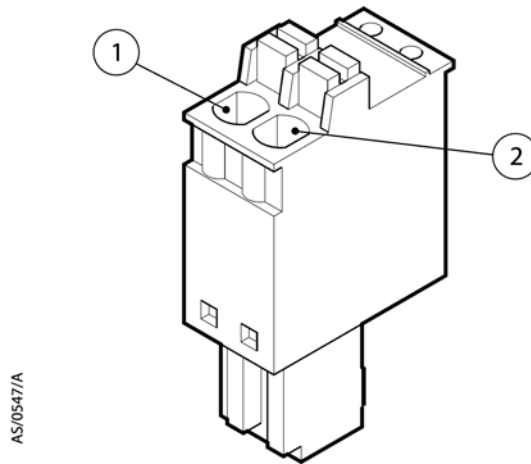


Table 2 - Fan connector pin out

Pin	Description
1	24 V
2	0 V

### 2.5.2 Power connector

Connector type	Kycon KPJX 4-way
Mating part	Kycon KPPX-4P (Supplied with TAG)

Figure 3 - Pin connections for a Kycon KPPX-4P mating part

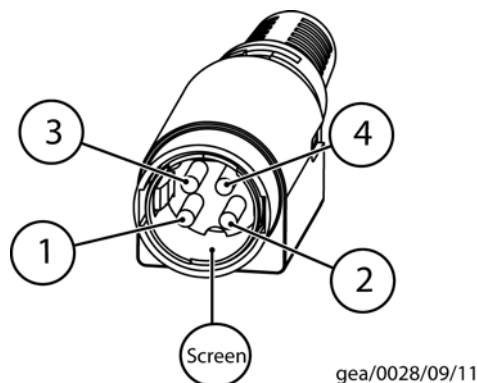


Table 3 - Power connector pin out

Pin	Description
1	24 V
2	24 V
3	0 V
4	0 V
Screen	0 V

### 2.5.3 Turbomolecular pump

Connector type	Sub-miniature "D" type socket 15-way
Power supply	24 V d.c. nominal
Maximum power output	160 W

Figure 4 - Pin connections for a 15-way sub-miniature 'D' type socket

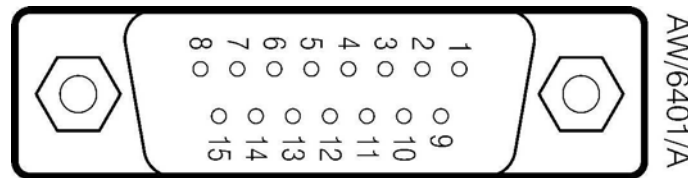


Table 4 - Turbomolecular pump connector pin out

Pin	Function
1	Power supply positive
2	Signal common
3	n/c
4	RS232 Tx
5	Serial enable output
6	Power supply positive
7	RS232 Rx
8	Power supply common
9	Speed signal input
10	Screen
11	Power supply positive
12	Screen
13	Power supply common
14	Power supply common
15	Normal signal input

### 2.5.4 Backing pump

Connector type	Sub-miniature "D" type socket 15-way
Power supply	24 V d.c. nominal
Maximum power output	80 W
Relay coil rating (when using external relay)	24 V d.c. 5 W max.

Refer to Figure 4 for pin connections and Table 5 for pin out.

Table 5 - Backing pump connector pin-out

Pin	Function
1	Power supply positive
2	Signal common
3	Start signal output
4	ID
5	n/c
6	Power supply positive
7	n/c
8	Power supply common
9	Speed signal input
10	Screen
11	Power supply positive
12	Screen
13	Power supply common
14	Power supply common
15	Normal signal input

### 2.5.5 Active gauge

Connector type	RJ45 8-way
Power supply	24 V d.c. nominal
Maximum power output	4 W

Figure 5 - Pin connections for an 8-way RJ45

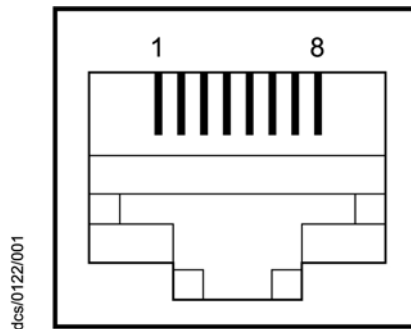


Table 6 - Active gauge connector pin out

Pin	Function
1	Power supply positive
2	Power supply common
3	Signal input
4	Identification
5	Signal common
6	Control line 1
7	Control line 2
8	N/C

### 2.5.6 Total power consumption

You must ensure that the 24 volt power supply that you are using has sufficient power for the TAG Controller and all the accessories which are connected. An example of a power budget calculation would be:

Item	Power
TAG Controller	5 W
Turbomolecular pump	80 W
Fan	4 W
Backing pump relay	1 W
Active gauge	2 W
Total	92 W

The maximum permitted total power consumption for the system is 240 W.

The optional power supply accessory is rated at 200 W and is sufficient for most applications using turbomolecular pumps of up to 160 W. If you are using this accessory the following restrictions apply:

1. Do not use an XDD1 24 V backing pump and a 160 W turbomolecular pump, as this combination will exceed the 200 W rating
2. Do not use an nEXT turbomolecular pump with a default power setting of more than 160 W.

## 2.6 Power Supply accessory data

Input connector type	IEC60320
Electrical supply	100 to 240 V a.c. 50 to 60 Hz
Output connector type	KPPX-4P mates with power input connector on TAG Controller
Output	24 V d.c. 200 W maximum
Protection	Over voltage and over current - resettable
Mass	1.1 kg
Storage temperature	-20 to 85 °C
Operating temperature	0 to 40 °C
Approvals	CE, UL/CUL, TUV, FCC

### 3 Installation

#### 3.1 Unpack and inspect

Remove all of the packaging material and check the TAG. If the Controller is damaged, follow the Edwards return of equipment procedures that are laid out in the back of this manual. Do not use the Controller if it is damaged.

Check that your package contains the items that are listed in Table 7. If any of these items are missing, notify your supplier in writing within three days. If the Controller is not to be used immediately, store the Controller in suitable conditions as described in Section 6.1.

Table 7 - Component checklist

Quantity	Description	Check (✓)
1	Turbo and Active Gauge Controller	<input type="checkbox"/>
2	Panel mounting clamps	<input type="checkbox"/>
4	Non-slip feet	<input type="checkbox"/>
1	Phoenix fan connector	<input type="checkbox"/>
1	DC power connector	<input type="checkbox"/>

#### 3.2 Fitting the controller



**WARNING**

Ensure that all wiring is safely secured so that people cannot trip on them.

**CAUTION**

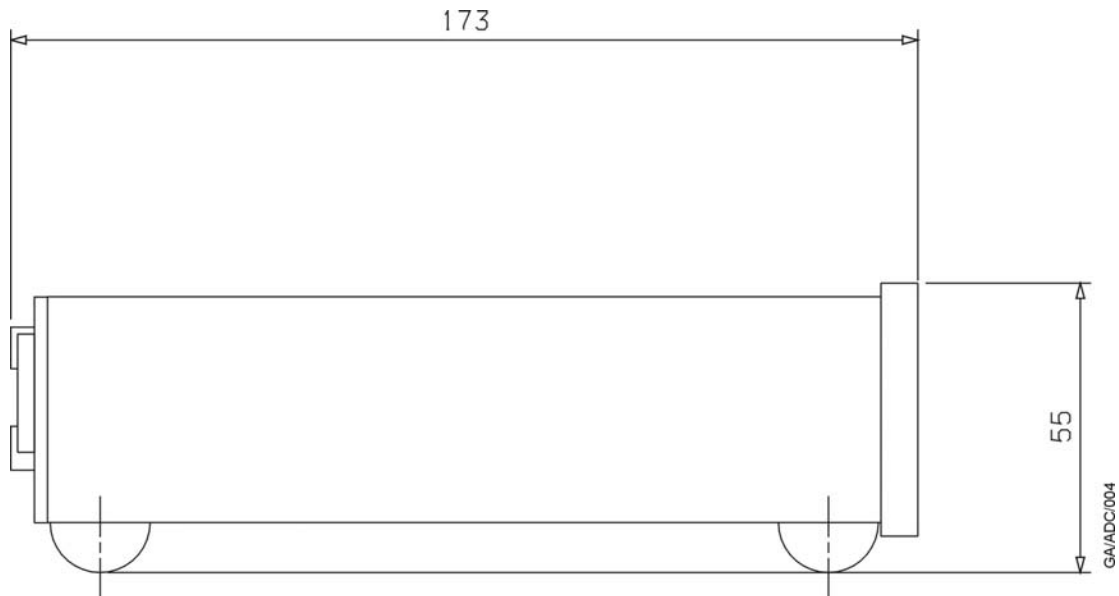
Ensure that the unit is installed where fluids cannot enter into the Controller. The Controller is IP20 rated, and therefore has no protection against fluid ingress.

### 3.2.1 Bench-top mounting

The TAG can be used on a bench-top. Figure 6 shows the dimensions of the Controller that are required for bench top use. The self-adhesive non-slip feet may be fitted to the bottom of the Controller if required.

Ensure the cables are secured to keep the controller on the bench top as the TAG Controller weight is not sufficient to keep it in place should the turbomolecular or backing pump cables be disturbed.

Figure 6 - Bench mounted dimensions (mm)



### 3.2.2 Panel mounting

If the Controller is to be panel mounted, follow the directions given in Figure 7 and Figure 8 below.

#### CAUTION

Allow 150 mm at the rear for cables. Allow 50 mm top and bottom and 15 mm to the sides for sufficient air circulation.

Figure 7 - Panel cut-out required

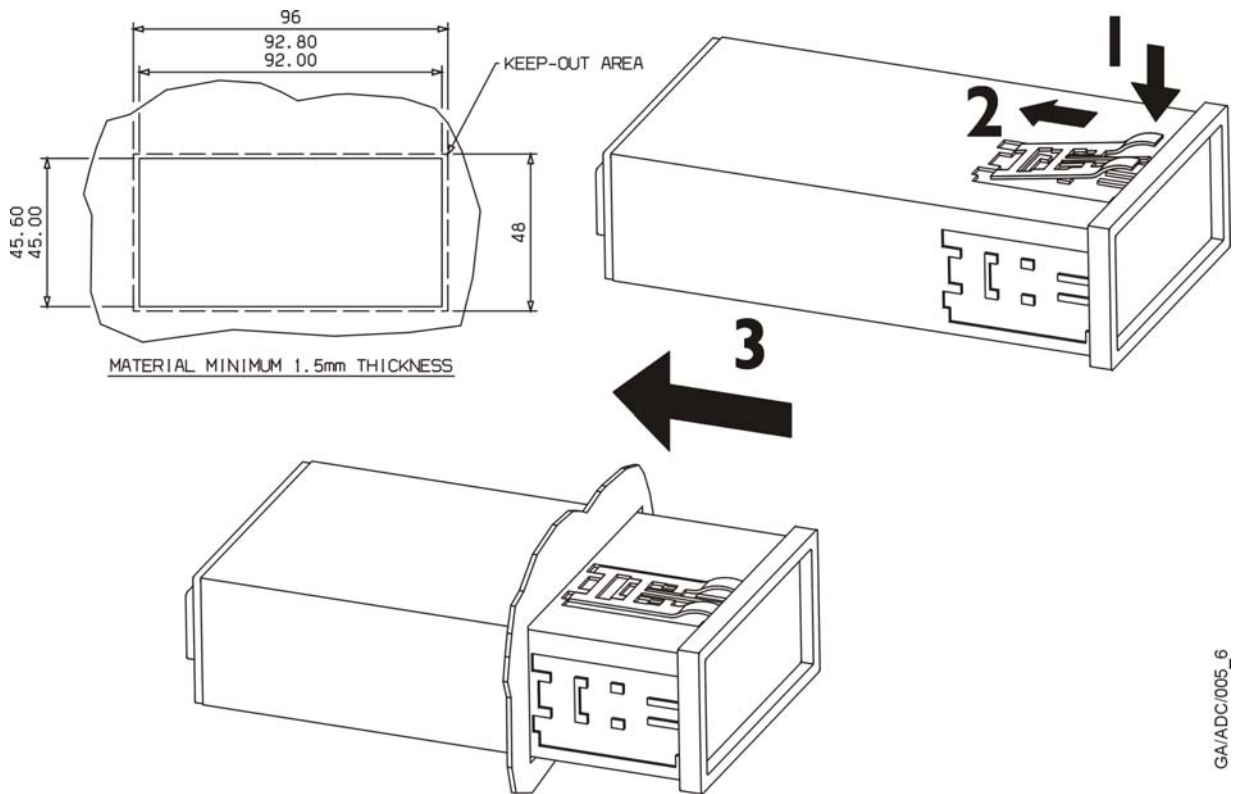


Figure 8 - Panel mounting the TAG

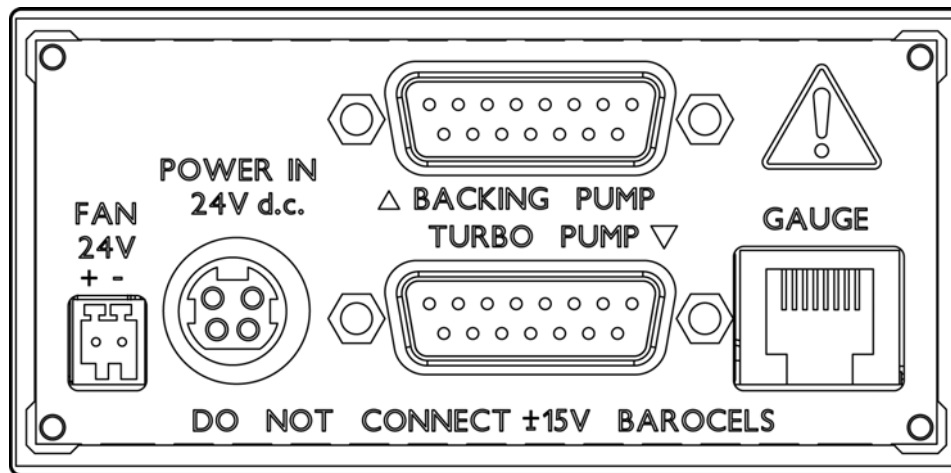
- Make a cut-out in the panel according to Figure 7. The minimum panel thickness should be 1.5 mm.
- Fit the panel mount clamps to the case, by placing into the recesses and sliding towards the rear of the case. Use both the left and right or the top and bottom mounting positions.
- Slide the Controller into the panel from the front. The Controller is a push fit and will be retained by the spring clamps.

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### 3.3 Rear panel description

Figure 9 - Rear panel connections



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#### 3.3.1 Connecting a fan accessory

A compatible turbomolecular pump fan can be fitted to the TAG Controller. A Phoenix connector is provided to connect the fan into the connector located on the rear of the controller housing (refer to [Figure 2](#)). Fan operation is controlled by the TAG Controller when a turbomolecular pump is connected. When no turbo is connected, the fan will not be activated.

A fan may also be connected directly to the turbomolecular pump's controller. If you do this you should configure this connection for fan operation. See pump instruction manual and [Section 4.3.3](#).

#### 3.3.2 Connecting the power supply



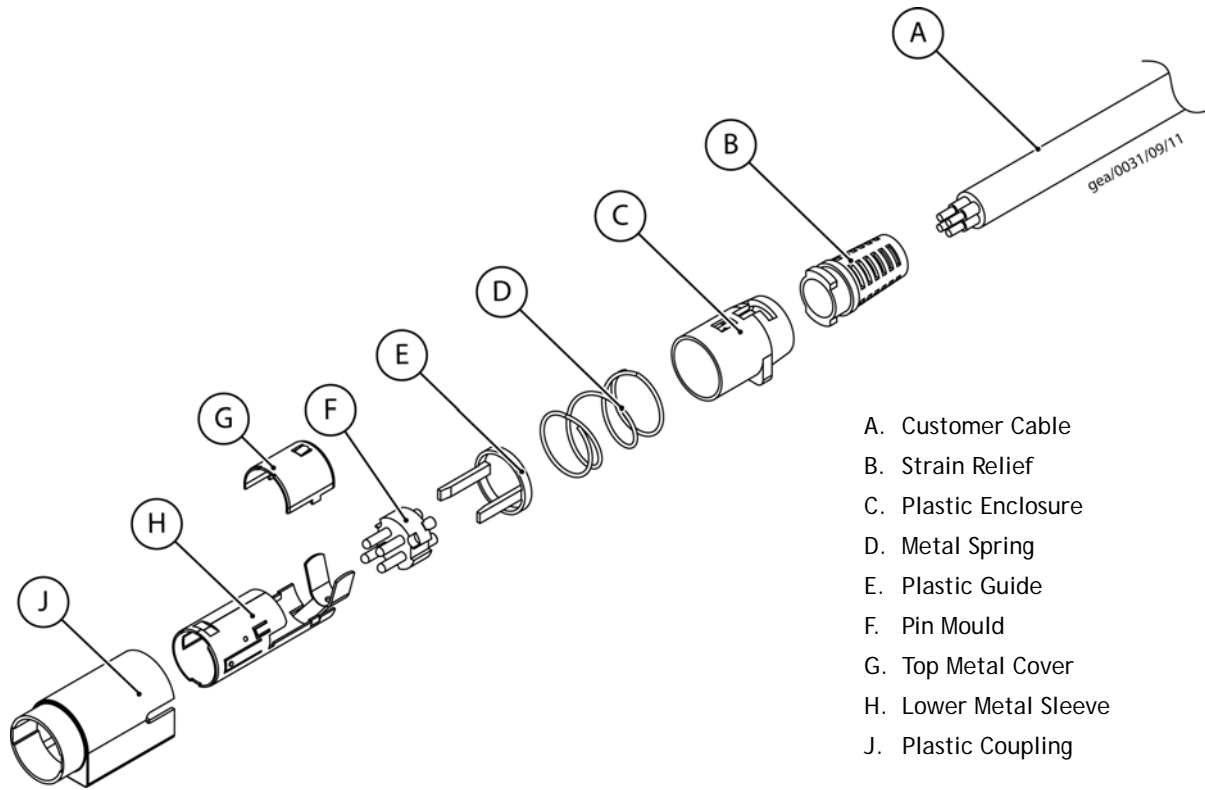
#### WARNING

If you are using the power supply accessory, you must ensure that it is adequately earthed (grounded) via the electrical supply cable.

If you are using the power supply accessory, simply connect it to the Power In connector on the TAG Controller and connect the mains to the IEC inlet of the power supply accessory. Suitable cables are available from Edwards, see [Section 7](#).

If you are not using the power supply accessory, connect an appropriate 24 volt supply using the DC Power connector supplied with the TAG Controller. Refer to [Figure 10](#) for details of how to assemble this connector. This power supply should be limited to a maximum of 10A using a fuse, circuit breaker or active current limit.

Figure 10 - Assembly of DC power connector



- A. Customer Cable
- B. Strain Relief
- C. Plastic Enclosure
- D. Metal Spring
- E. Plastic Guide
- F. Pin Mould
- G. Top Metal Cover
- H. Lower Metal Sleeve
- J. Plastic Coupling

**Assembly Instructions**

1. Attach *Strain Relief* (B) to *Plastic Enclosure* (C).
2. Pass *Cable* (A) through *Strain Relief* (B)/*Plastic Enclosure* (C) assembly, *Metal Spring* (D), and *Plastic Guide Ring* (E).
3. Solder cable wires to solder cups on *Pin Mould* (F).
4. Properly align *Pin Mould* (F) with *Lower Metal Sleeve* (H). The slotted sections on the sides of the *Pin Mould* (F) must line up with the slotted cut-outs on the *Lower Metal Sleeve* (H) and the 3 semi-circular notches around the perimeter of the *Pin Mould* (F) must line up with the 3 metal tabs inside the *Lower Metal Sleeve* (H).
5. Push *Pin Mould* (F) forward into the *Lower Metal Sleeve* (H) until it locks into place.
6. **\*IMPORTANT\*** Manually press the 3 metal tabs on the *Lower Metal Sleeve* (H) into the notches in the *Pin Mould* (F).
7. Crimp 'U' section of *Lower Metal Sleeve* (H) onto *Cable* (A).
8. Fit *Plastic Ring Guide* (E) into *Lower Metal Sleeve* (H) by placing plastic arms into the appropriate slots on the sides of the sleeves.
9. Attach *Top Metal Cover* (G) onto *Lower Metal Sleeve* (H). Be sure to align all tabs and securely install cover.
10. Push *Metal Spring* (D) onto the *Top Metal Cover* (G)/*Lower Metal Sleeve* (H) assembly. This will help to hold the assembly together.
11. Push *Strain Relief* (B)/*Plastic Enclosure* (C) assembly onto the *Top Metal Cover* (G)/*Lower Metal Sleeve* (H) assembly. The two assemblies must be properly aligned as shown in the drawing. Be sure to check that the *Metal Spring* (D) remains in place and does not go underneath either the *Plastic Enclosure* (C) or the *Plastic Guide* (E) or twists during assembly. A significant amount of force may be necessary to lock the two assemblies together.

12. Check to make sure that the *Strain Relief (B)/Plastic Enclosure (C)* assembly is securely locked into place over the *Top Metal Cover (G)/Lower Metal Sleeve (H)* assembly. The two assemblies should not be able to be pulled apart.
13. Properly align the new assembly with the *Plastic Coupling (J)* as shown in the drawing. Push assembly (twisting plastic enclosure 'C' part) into *Plastic Coupling (J)* until it locks properly in place. The entire plug assembly is now complete.

### 3.3.3 Connecting a turbomolecular pump

A compatible turbomolecular pump can be connected to the TAG Controller through the 'D' type connector on the rear panel (refer to [Figure 9](#)). All turbomolecular pumps come with a cable fitted as standard; extension cables are available from Edwards if required.

The TAG Controller will reset the pump to its default settings in order to ensure correct operation. If you have previously configured the pump with non-default parameters, these settings will be lost.

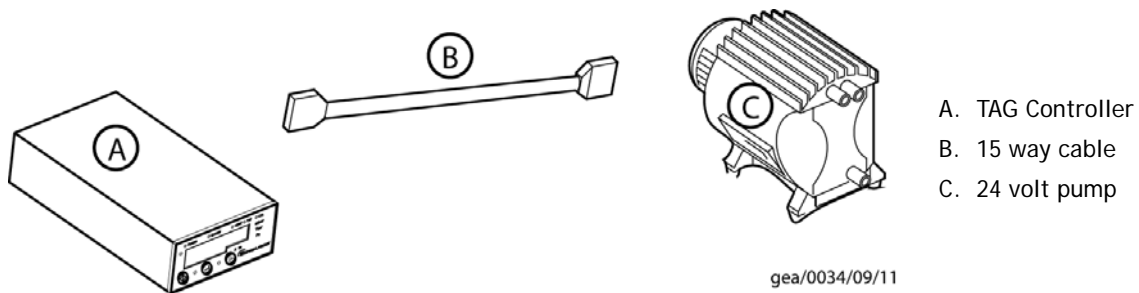
### 3.3.4 Connecting a backing pump

A compatible backing pump can be connected to the TAG Controller through the 'D' type connector on the rear panel (refer to [Figure 9](#)). Backing pump connections are of two types: those with a logic interface control and those which require an external relay.

#### 3.3.4.1 Logic interface

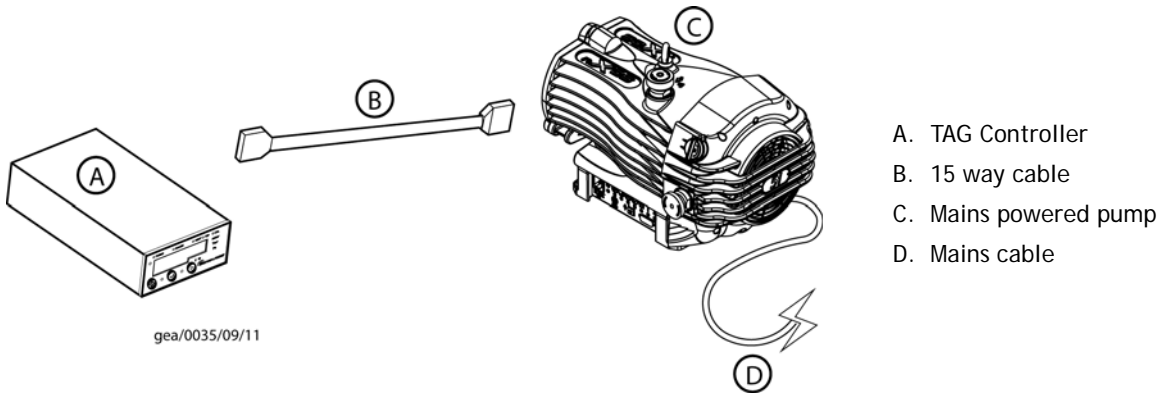
24 volt pumps, with a logic interface (e.g. XDD1 24 V), are connected to the TAG Controller using a 15 way cable as shown in [Figure 11](#). This cable supplies power to the pump as well as control signals.

Figure 11 - 24 volts pumps with logic interface connection



Mains powered pumps, with a logic interface (e.g. nXDS), are connected to the TAG Controller using a 15 way cable as shown in Figure 12. For these pumps the controller provides control signals only.

Figure 12 - Mains powered pumps with logic interface connection

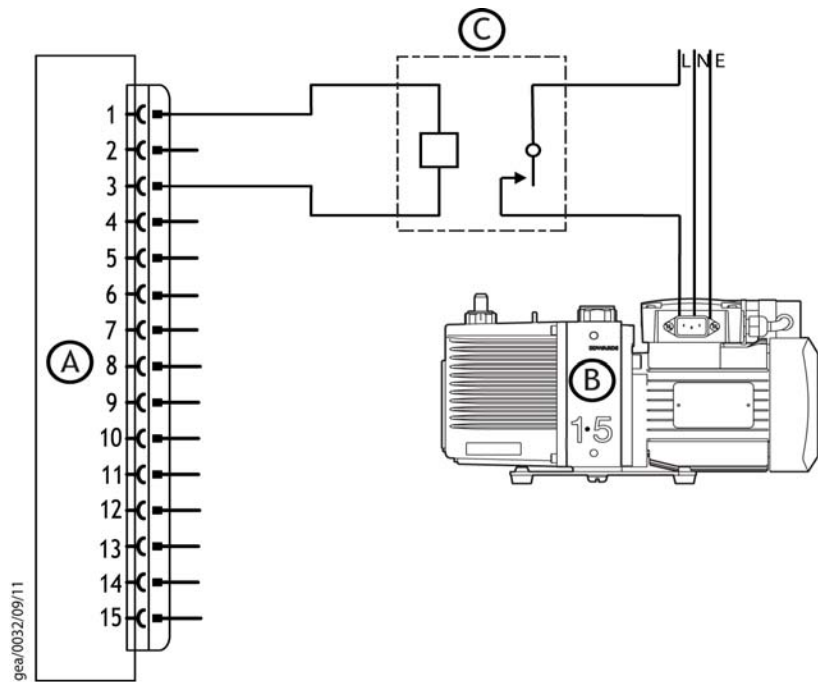


- A. TAG Controller
- B. 15 way cable
- C. Mains powered pump
- D. Mains cable

### 3.3.4.2 External relay

Mains-powered backing pumps, which do not have a logic interface (e.g. E2M 1.5), can be controlled by the TAG Controller using an external relay. See Figure 13 for how to connect the relay. Edwards does not supply this relay.

Figure 13 - Mains powered backing pumps connections

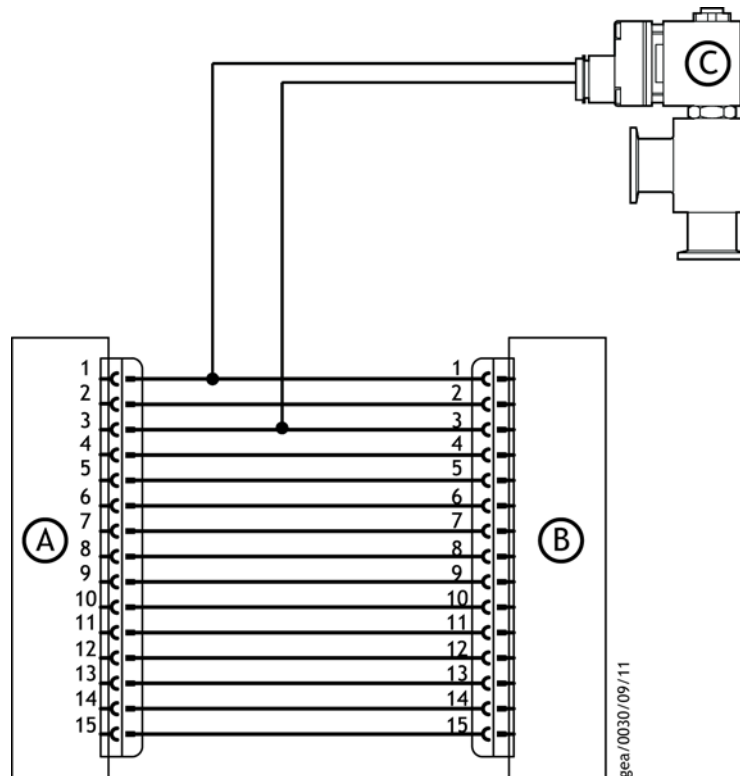


- A. To TAG controller
- B. Any mains powered backing pump
- C. Relay

### 3.3.5 Connecting an isolation valve

In some applications where a scroll pump (for example XDS35i or nXDS) is used as the backing pump, an inlet isolation valve is recommended. Refer to the pump instruction manual for details. The TAG Controller can directly drive a 24 volt isolation valve such as an LCPV25EKA. Connect the valve to the backing pump logic interface as shown in Figure 14. The valve will open when the backing pump is started and close when the pump is stopped.

Figure 14 - Connecting an isolation valve



- A. To TAG controller
- B. To Backing pump
- C. Isolation valve

A mains operated isolation valve can be controlled using a relay. Connect the relay to the backing pump logic interface as shown in Figure 13.

### 3.3.6 Connecting an active gauge

#### **CAUTION**

Do not connect Barocel capacitance manometers to the TAG Controller gauge connector. Doing so will result in damage to the gauge and will invalidate the warranty.

A single compatible active gauge can be connected to the TAG Controller. Fit the gauge using an Edwards active gauge cable into the gauge connector located on the rear panel (refer to Figure 9). For active gauge control and set-up refer to Section 4.3.2.

# 4 Operation

## 4.1 Control panel description

Figure 15 - TAG Controller overlay

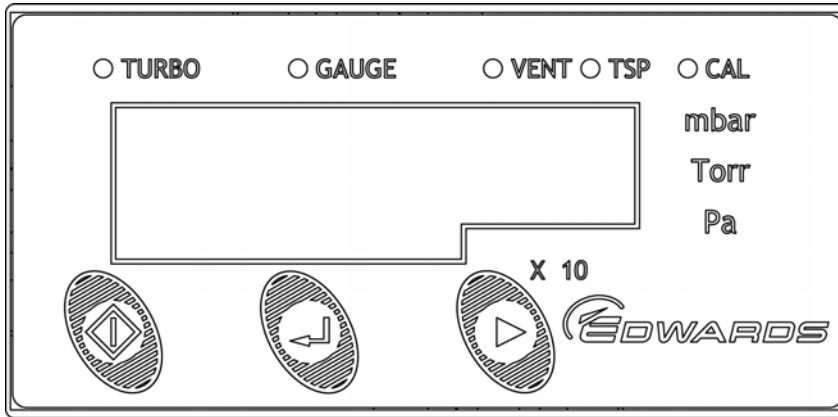


Table 8 - Front panel symbols and their functions

Key pad symbol	Name	Function
	START / STOP	Turns the pumps on and off. Returns to Turbo Menu Screen.
	ENTER	Selects or confirms current menu option. Controls active gauges.
	NEXT	Moves to next menu. Scrolls through menu options.

The LEDs along the top of the TAG display indicate which menu screen is currently being shown on the numeric display. To move to the next menu item press the NEXT key and to return to the Turbo menu press the START/STOP key. The available items are listed in order in Table 9.

Table 9 - Menu items

Turbo screen
Gauge screen
Vent valve screen
Turbo Set-Point (TSP) screen
Calibrate gauge screen
Units screen

## 4.2 Start up

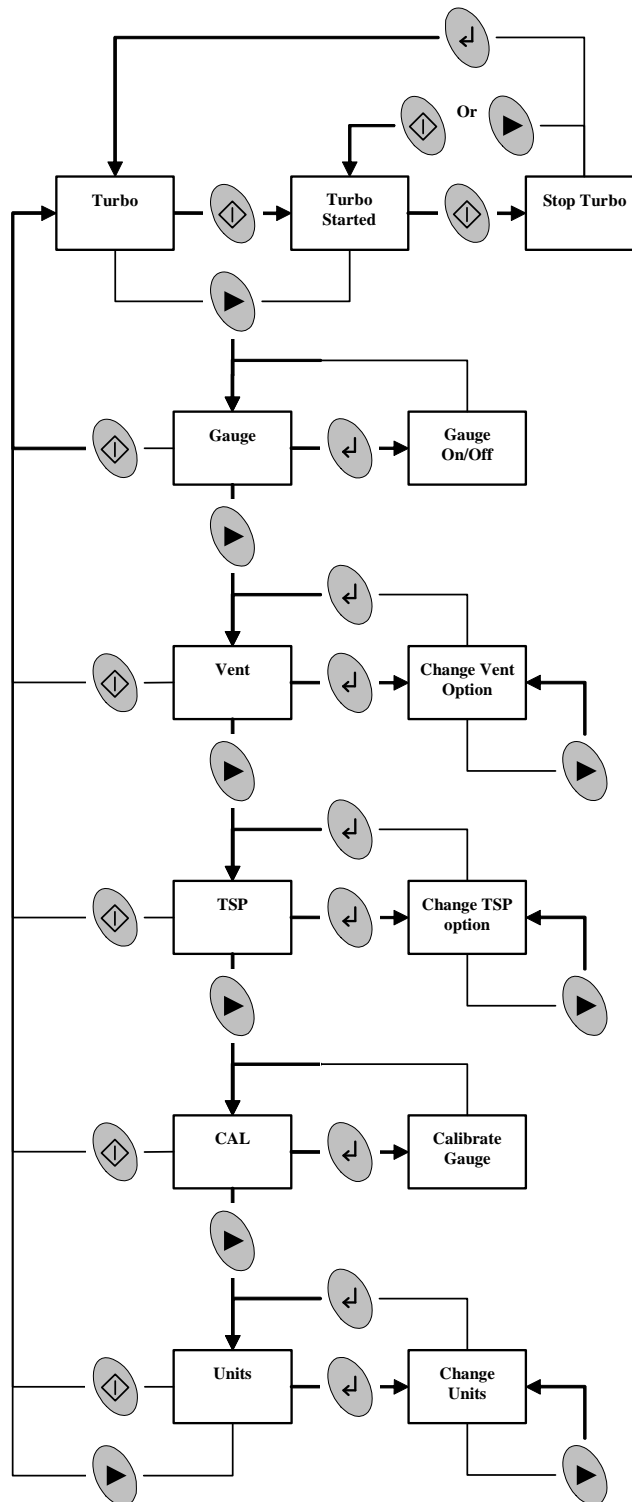
### 4.2.1 Return to factory defaults

The TAG Controller can be reset to factory defaults by holding the "NEXT" key before you apply power to the TAG Controller, and continuing to hold it throughout the startup process. The startup screens will be displayed and then "Err01" will be shown to confirm successful reset. Disconnect any connected gauge and power cycle to clear this message.

### 4.3 Menu structure

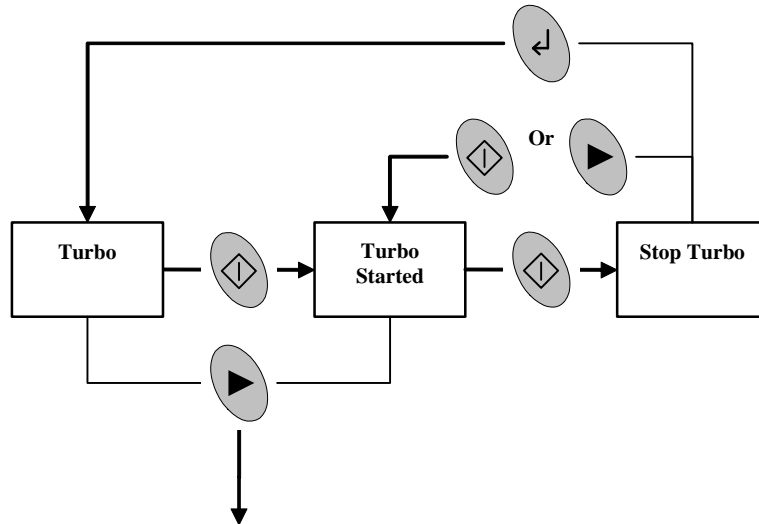
Figure 16 shows the view screen shortcuts and menu structure for the TAG control display. They also give an indication as to what buttons will take you within the menu layout.

Figure 16 - Menu Structure



### 4.3.1 Turbo screen

When the Turbo screen is selected, the Turbo LED is lit and the speed of the turbomolecular pump is displayed in percentage of full speed. If no turbomolecular pump is connected the display shows "---".



#### 4.3.1.1 Starting the pumps

When the START/STOP key is pressed, if no Turbo Set-Point is set then both the turbo and backing pumps start. The display shows the turbomolecular pump is accelerating by flashing the top left portion of the percentage sign. When the turbo reaches normal speed (>80% default) the percentage sign stops flashing and remains steady.

If a Turbo Set-Point has been set then the backing pump starts when the START/STOP key is pressed. The TSP LED flashes until the set-point has been reached. Once the set-point has been reached the turbomolecular pump starts and the TSP LED turns OFF. If no Turbo Set-point has been set, the TSP LED remains OFF.

#### 4.3.1.2 Stopping the pumps

To stop the pumps press the START/STOP key. The display will show "Stop" for three seconds. Press the ENTER key within that time to stop the pumps. If the ENTER key has not been pressed, or the START/STOP or NEXT keys are pressed, the display returns to Turbo speed and the pumps remain running.

When the turbomolecular pump is decelerating the bottom right portion of the percentage sign flashes until the turbo has completely stopped rotating.

#### 4.3.1.3 Turbo screen key actions

Keys	Short Press	Long Press
START	START the Turbo or Initialise Turbo STOP sequence or Cancel Turbo STOP or force Turbo STOP when in Error	-
ENTER	Acknowledge Turbo STOP	Fault code display when in Error
NEXT	Go to Gauge Screen or Cancel Turbo STOP	Scroll through menu screens



### 4.3.2 Gauge screen

When the Gauge screen is selected, the Gauge LED is lit and the gauge pressure reading is displayed in the selected units. If no gauge is connected the display shows "---".

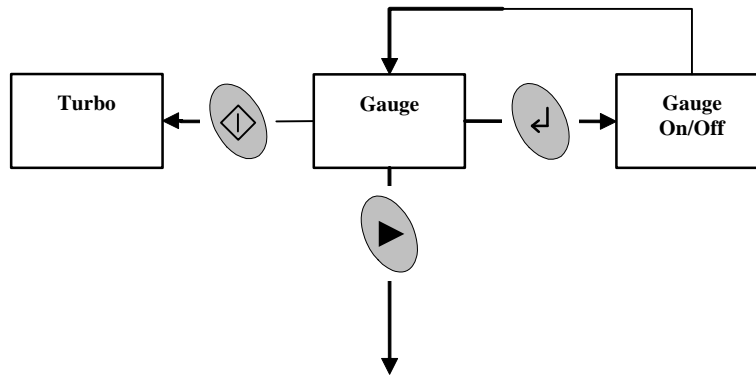


Table 10 - Gauge ID numbers

ID number	Gauge
ID 04	APG-M / APG-MP
ID 05	APG-L
ID 06	APGX-H
ID 11	AIM-S
ID 15	ASG
ID 19	AIM-X
ID 20	WRG
ID 21	APGX-L / APGX-M / APGX-MP / APG100-XM / APG100-XLC

#### 4.3.2.1 Connecting a gauge

When a gauge is first connected the display shows "ID" followed by a number to identify the new gauge. If the gauge is an ASG, the display then goes to ASG Range Select, otherwise the display reverts to showing the pressure reading. If the gauge type is not supported the display shows "???". When no gauge is connected the display shows "---".

#### 4.3.2.2 ASG range select

When an ASG is connected the display changes to select the ASG range. 1000 mbar is assumed by default and the display flashes "1.0<sup>3n</sup>". Press the NEXT key to cycle between 1000 and 2000 mbar, then press the ENTER key to confirm the selection.

#### 4.3.2.3 Gauge ON/OFF control

Gauges which support ON/OFF control (e.g. AIM gauges) can be turned ON and OFF using the ENTER key. When first connected the gauge is in the OFF state and the display shows "OFF". When the gauge is turned on the display will show "Str" whilst the gauge is starting up and will then display pressure.

4.3.2.4 Gauge screen key actions

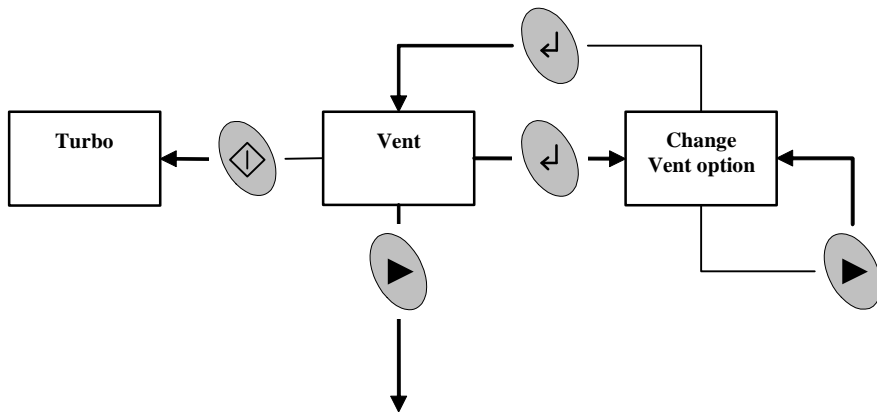
Keys	Short Press	Long Press
START	Go to Turbo Screen	-
ENTER	ON/OFF control of supported gauge or Acknowledge Error	-
NEXT	Go to Vent Control Screen	Scroll through menu screens

4.3.3 Vent valve screen

If you have a TAV solenoid vent valve connected to the turbomolecular pump vent valve connection, the operation of the valve is controlled by the vent valve screen. When the Vent Valve screen is selected, the Vent LED is lit and the current vent valve control setting is displayed. The default setting is "50%". The Vent Valve menu is not available if the turbo is running.

To change the vent valve setting press the ENTER key and then use the NEXT key to cycle between 50%, CtrlId and FAN. Press the ENTER key again to confirm the selection.

- 50% Vent valve opens fully when the speed of the turbo drops below 50% full rotational speed
- CtrlId Controlled venting from 100% to 50% full rotational speed; vent valve opens fully below 50%
- Fan The vent valve connection on the turbo is permanently powered so that the vent valve will remain closed. This can also be used to provide power to an air cooler (e.g. ACX75).



4.3.3.1 Vent valve screen key actions

Keys	Short Press	Long Press
START	Go to Turbo Screen	-
ENTER	Enter edit mode, or confirm selection	-
NEXT	Next vent option or go to TSP Control Screen	Scroll through vent options in edit mode or Scroll through menu screens

4.3.4 Turbo Set-Point screen

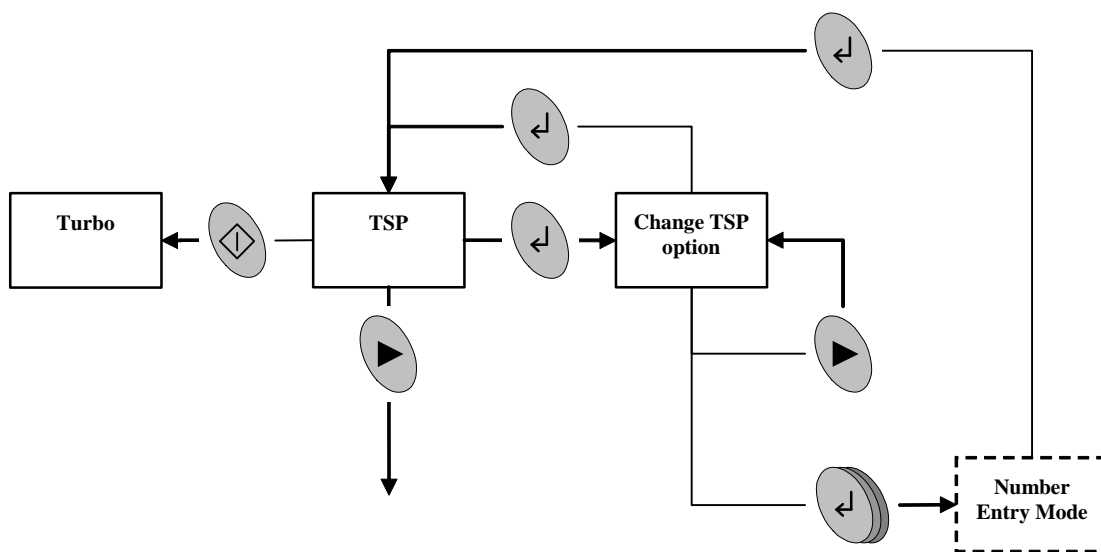
The Turbo Set-Point screen is used to configure the start delay of the turbomolecular pump. When the Turbo Set-Point screen is selected, the TSP LED is lit and the current set-point is displayed. The default setting is "OFF". The Turbo Set-Point menu is not available if the turbo is running or the selected units are Volts.

To change the Turbo Set-Point press the ENTER key, then use the NEXT key to cycle between off, time delay and pressure set-point. Press the ENTER key again to confirm the selection.

When time delay is selected the display will show the delay time in seconds. The default time is 120 s. This means that the turbomolecular pump will start after a delay of 120 s from when the START key is pressed. To change the value of the delay time press and hold the ENTER key to start number entry mode.

If you have an Active Gauge connected to your system you can use the pressure set-point to start the turbomolecular pump once the pressure has fallen below the set-point value. When pressure is selected the display shows the set-point pressure. The default pressure is "5.0<sup>0</sup>" mbar shown as an exponential. To change the pressure set-point, press and hold the ENTER key to start number entry mode.

**Note:** If you set the Turbo Set-Point to pressure but do not connect a gauge then the turbomolecular pump will not start.

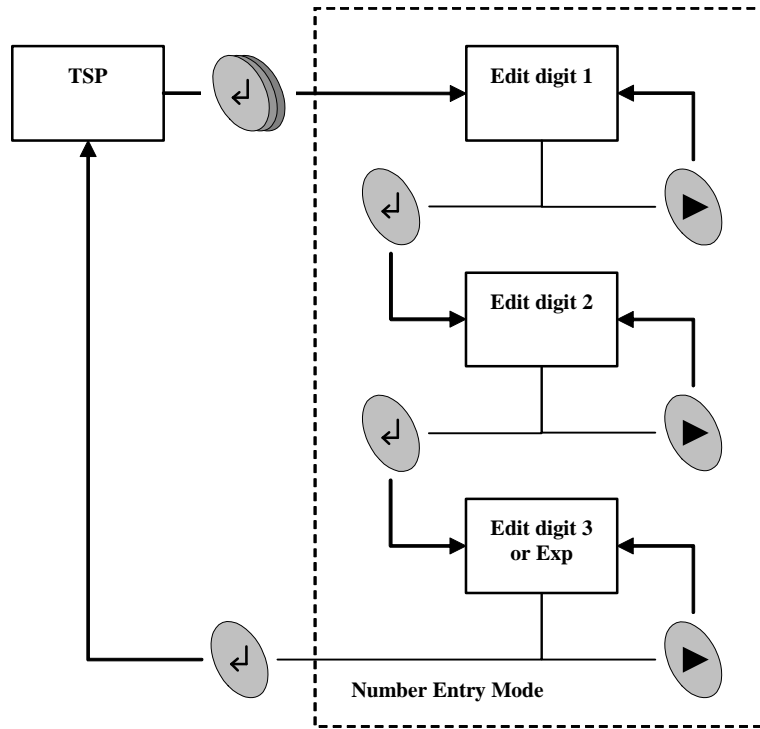


#### 4.3.4.1 Number entry mode

When the ENTER key is pressed and held on either the time or pressure set-point option, number entry mode is entered. The first digit starts flashing and the time or pressure set-point can be edited.

Press the NEXT key to adjust the digit to the required value. Then press the ENTER key to confirm this first digit and to move onto the second, which is adjusted similarly. Then press the ENTER key to confirm the second digit and to move onto either the final digit of the time set-point, or the exponent of the pressure set-point. The exponent of the pressure set-point is adjusted as a single value in the range -10 to +6.

The final press of the ENTER key confirms the complete number and returns to showing the set-point value. The TSP is set after the complete number is entered.



4.3.4.2 TSP screen key actions

Keys	Short Press	Long Press
START	Go to Turbo Screen	-
ENTER	Enter edit mode, or confirm selection	Enter Number Entry mode
NEXT	Next TSP option Next number or Go to Gauge Calibration Screen	Scroll through TSP options in edit mode, Scroll through numbers in Number entry or Scroll through menu screens

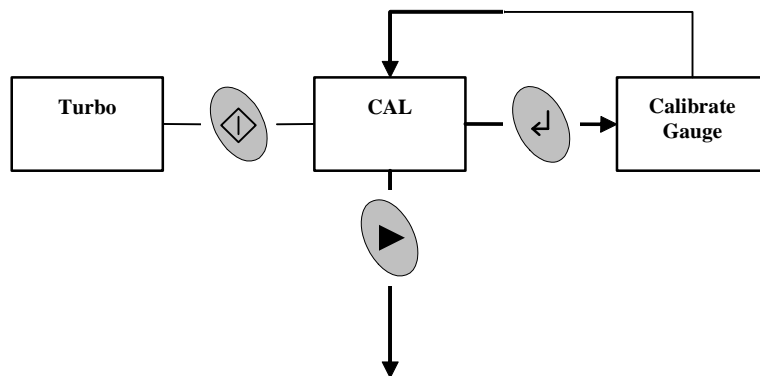
4.3.5 Calibrate gauge screen

When the Calibrate Gauge screen is selected, the Gauge LED and the CAL LED are lit together. The numeric display is blank. The Calibrate Gauge menu is not available for gauges which do not support calibration.

When the ENTER key is pressed the action depends on gauge type:

WRG or APGX: The calibration command is sent to the gauge and the display shows "CALd" for 3 seconds.

ASG: The calibration functions as a zero offset adjustment. The pressure currently displayed is saved as the zero offset and is subtracted from all future readings. The display shows "CALd" for 3s to confirm the action. You can cancel the offset adjustment by pressing the ENTER key again. The display shows "OFF" for 3s to confirm that the offset adjustment has been removed.



#### 4.3.5.1 Calibrate screen key actions

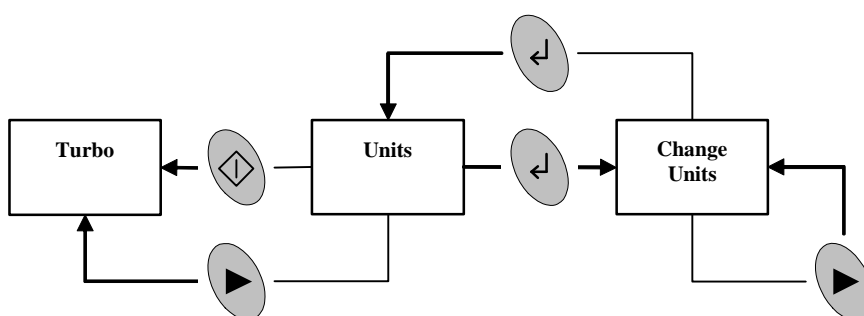
Keys	Short Press	Long Press
START	Go to Turbo Screen	-
ENTER	Calibrate gauge	-
NEXT	Go to Units screen	Scroll through menu screens

#### 4.3.6 Units screen

When the Units screen is selected, the menu LEDs are unlit and the currently selected Units LED is lit. The numeric display is blank.

To change the units press the ENTER key and use the NEXT key to choose between mbar, Torr, Pa and voltage. Press the ENTER key again to confirm the selection. Note that when voltage is selected the display shows " 0.000".

When the units are changed, the set-point values will be converted to the new units. For example, if a set-point threshold is entered as  $1.0 \times 10^{-3}$  mbar and the units are changed to Torr, then the value will be displayed as  $7.5 \times 10^{-4}$  Torr.



#### 4.3.6.1 Units screen key actions

Keys	Short Press	Long Press
START	Go to Turbo Screen	-
ENTER	Enter edit mode, or confirm selection	-
NEXT	Next Units option or go to Turbo screen	Scroll through Units in edit mode, or Scroll through menu screens

## 4.4 Electrical supply failure



### *WARNING*

If the power supply fails whilst the pump is running, the impeller could continue to spin for approximately 10 minutes. The control circuit may not give any indication that the impeller is still running.

If the electrical supply to the TAG Controller fails when the turbomolecular pump is rotating, the motor of the pump is used as a generator. The regenerated power is used to maintain the control system and the display.

As the pump rotational speed decreases, the motor's ability to generate power also decreases until it is no longer able to maintain power to the control system. This will occur at speeds below 50% full rotational speed. Therefore you will not have any indication about pump rotational speed, yet the impeller may still be turning.

When the power is reinstated after a power failure, the behaviour of the TAG Controller will depend on the length of time the pump was without power: if the power is reinstated before regenerative power has ceased, the system will re-start; if the power is reinstated after regenerative power has ceased, the system will not re-start.

## 5 Maintenance

The TAG Controller requires no regular maintenance and is a non-serviceable item. The unit is factory calibrated and will remain in calibration throughout its lifetime. Maintenance is limited to fault finding and software upgrades if required.

### 5.1 Fault finding guide

Table 11 - Fault finding guide

Symptom	Possible cause	Remedy
Display blank (no LEDs lit)	Electrical supply defective	Check electrical supply cable and external fuses. Connect the electrical supply cable to any other device to confirm that the supply is good.
	Short circuit or overload on connections	Remove all connectors except the electrical supply and re-check. If display now lights, there is a fault in one of the external leads or devices. Re-connect one at a time until the fault is pinpointed.
Display shows "ERR"	An error has been detected by the Controller, turbo or by the connected gauge	Refer to <a href="#">Appendix A1</a> for a description of error numbers. Press the ENTER key ( ↵ ) to clear the message.
Display shows "???"	A gauge has not been recognised by the TAG Controller	Check that the gauge is a type listed in <a href="#">Table 1</a> , and is supported by the TAG Controller.
Turbo connected and turbo display shows "---"	The turbo has not been recognised by the TAG Controller	Check that the turbo is a type listed in <a href="#">Table 1</a> , and is supported by the TAG Controller. Only serially enabled turbos are supported. Check that the turbo controller is set to RS232 serial interface.
	Serial communication has been lost with the turbo	Check the connections of the turbo cable. Disconnect and reconnect the turbo cable to reset both the turbo and the TAG controller serial communications.

### 5.2 Cleaning the controller

If necessary, use a soft dry cloth to clean the exterior of the Controller. Do not clean with harsh abrasives or liquids.

### 5.3 Software upgrade

As new compatible gauges are released, a software upgrade for the TAG Controller might be necessary. If you have purchased a new pump or gauge, which is not listed in [Table 1](#) or [Table 10](#), and the display shows "???" when the gauge is connected, or "---" when the pump is connected, then you may need an upgrade. Please contact Edwards for details, quoting the serial number and the software version number of the TAG Controller. The software version number is shown on the display during power-up and is in the form "ISSxx".

## 6 Storage and disposal

### 6.1 Storage

Store the TAG Controller in clean dry conditions in accordance with the technical specifications. Refer to [Section 2.2](#).

### 6.2 Disposal

Dispose of the Controller and any components safely in accordance with all local and national safety and environmental requirements.

Alternatively, you may be able to recycle the TAG Controller and/or cables; contact Edwards or your supplier for advice (also see below).

The TAG Controller and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment. Edwards offer European customers a recycling service for the TAG Controller/cables at the end of the product's life. Contact Edwards for advice on how to return the TAG Controller/cables for recycling.

The plastic enclosure of the TAG Controller is made from >PPO+PS< material.



#### **WARNING**

Do not incinerate the Controller. If the Controller is heated to very high temperatures, dangerous gases may be emitted and internal components may explode.



## 7 Spares and accessories

### 7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, United Kingdom, U.S.A. and a world-wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from your nearest Edwards company or distributor. When you order, please state for each part required:

- Model and Item Number of your equipment
- Serial number (if any)
- Item Number and description of the part.

### 7.2 Accessories

A wide range of accessories is available to connect to the TAG Controller. [Table 12](#) lists examples of each type of accessory.

Table 12 - Accessories

Product Description	Ordering Information
<b>Gauges</b> APG100-XM, APG100-XLC Ranges APG-L, APG-M, APG-MP Ranges APGX-L, APGX-M, APGX-MP, APGX-H Ranges AIM-S, AIM-SL, AIM-X, AIM-XL Ranges WRG-S and WRG-SL ASG	
<b>Active Gauge Cables</b> 1 m active gauge cable(available in other lengths from 0.5 m to 100 m)	D400-01-010
<b>Turbomolecular Pumps</b> EXT75DX range nEXT range	
<b>Backing Pumps</b> XDD1 24 V nXDS range XDS35i E2M1.5 or other mains powered rotary pump	A746-02-991    A371-32-919
<b>Pump Extension Cables</b> 1 m cable 2 m cable 5 m cable	D397-00-835 D397-00-836 D397-00-837

Table 12 - Accessories (continued)

Product Description	Ordering Information
<b>Mains Cables</b>	
2 m UK plug	D400-13-025
2 m USA plug	D400-13-120
2 m Northern European plug	D400-13-030
<b>Air Coolers</b>	
ACX75 (for EXT75DX)	B580-53-075
nEXT radial air cooler (for nEXT)	B580-53-175
<b>Vent Valves</b>	
TAV5	B580-66-010
TAV6	B580-66-020
<b>Isolation Valves</b>	
LCPV16EKA 24 V	C417-51-200
LCPV25EKA 24 V	C417-52-200
<b>Power Supply Accessory</b>	
200 W power supply	D395-92-800

## Appendix A1 Error numbers

If an error is detected by the controller the display will show "Err" followed by a number. Refer to the table below for a description of the error together with likely causes and suggested remedies.

Table A1 - Error numbers

Error Number	Meaning	Possible cause/remedy
<b>Controller errors</b>		
01	EEPROM error	The internal EEPROM checksum has failed, or user factory default has been requested. All user settings will revert to the factory default.
02	ID reference error	The reference used for identifying gauges is incorrect. Please remove the gauge connection, turn the electrical supply off and on, and wait for 30 seconds before reconnecting the gauge.
<b>Gauge errors</b>		
11	Gauge voltage too high	The voltage from a gauge is too high. The gauge may be defective.
12	Gauge voltage too low	The voltage from a gauge is too low. The gauge may be defective.
21	WRG Pirani failure	Errors specific to WRG. Please refer to the WRG manual for details. Press the ENTER key to clear the error from, the display once the fault has been corrected.
22	WRG magnetron short	
23	WRG striker fail	
24	WRG magnetron not struck	
25	APGX filament failure	Errors specific to APGX. Please refer to the APGX manual for details. Press the ENTER key to clear the error from, the display once the fault has been corrected.
26	APGX cal err	
27	APGXH tube not fitted	
<b>Pump errors</b>		
41	Turbomolecular pump fault	Inspect the LEDs on the turbo drive for status information. For more detailed fault codes, press and hold the ENTER key (whilst Err41 is showing) to display the turbo system status word. The lower 16 bits of the status word are displayed in hexadecimal. Press the START / STOP key to clear the error message. Refer to the instruction manual of the turbomolecular pump for detailed fault-finding.
51	Internal comms error	The serial communications between pump and controller has returned an error. If this persists, reset serial communications by stopping and restarting the turbo or disconnecting and reconnecting the turbo lead.

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