



UNVENTED HOT WATER SYSTEM

INSTRUCTIONS

PLEASE LEAVE WITH HOUSEHOLDER

IMPORTANT - Failure to install and maintain this system in accordance with these instructions will invalidate the manufacturer's warranty.



McDONALD ENGINEERS

HOT WATER SYSTEMS

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IMPORTANT

Installation should only be carried out by a 'competent operative' i.e. the installer must have attended a recognised course in Unvented Hot Water Systems or received appropriate training in their apprenticeship. All registered operatives should carry an Identification Card issued by the Institute of Unvented Hot Water Systems or SNIPEF (Scottish and Northern Ireland Plumbing Employers' Federation), the Construction Industry Training Board or the Institute of Plumbers.

The **POWERflow2000** unit should be handled with care in order to avoid damage to valves. It should be stored upright in its box in a dry place.

Full weights are available at the back of this booklet. The installation area should be able to cope with this weight, incoming pipes and discharge pipe. Position the unit to suit the installation.

All connections are to the front to enable ease of access. Ensure suitable space is left for access for repair and/or replacement of valves etc.

In areas with hard water we would recommend restricting the temperature and performing de-scaling procedures as required.

All the following instructions must be carried out: -

1. Installers should ensure incoming mains pressure is less than 12Bar and that local authority approval for installation of Unvented Systems is granted. Ensure adequate flowrate is available.

2. Excessive use of flux can damage the unit and especially the valves and expansion vessel. Avoid over-use and ensure the system is fully flushed of any debris or flux before connection.
3. Incoming mains to arrive in a minimum of 22mm copper pipe which is to be fitted to the Pressure Reducing Valve Set at 2.1 Bar (A - see Page 4) which includes a serviceable Strainer. We would strongly recommend this valve is fitted where the mains enters the property, but it can go wherever is most suitable for the installation, between the mains stopcock and the cylinder.

We recommend fitting a Tee between the Pressure Reducing Valve (A) and the Check Valve (A2) to provide a BALANCED COLD OUTLET for all cold taps, preventing cross-flow and also giving potable water throughout the house. Outdoor taps for hoses should be taken before the Pressure Reducing Valve.

4. The Check Valve (A2) is factory fitted at the Cold Feed (C). No isolating valve may be fitted between the check valve and the storage cylinder.
5. The Temperature & Pressure Relief Valve (D) set at 90°C and 4.5 Bar, and the Expansion Relief Valve (B) set at 3.5 Bar, are factory fitted and connected to the *Tundish* (E). NB - the relief valves are only to be used for relief discharge purposes.

No valves should be fitted between the relief valves and the cylinder.

6. The Tundish (E), which shows visible discharge from the Relief Valves, is to be in a prominent, visible and safe position away from any electrical devices (likewise with the drain connection) and within 500mm of the *Temperature & Pressure Relief Valve* (D). Pipework from the *Tundish* (E) must initially be vertical for a minimum of 300mm where possible and then have a continuous fall in excess of 1 in 200. Pipework away from the *Tundish* (E) should be in a minimum of 22mm, of material suitable for temperatures of 95°C and have a resistance to flow of water not greater than that of a straight pipe of 9 metres (each bend or elbow is equal to 0.8 metre of resistance). See BBA Information. Sheet No 33:1989 for further details - available from the manufacturer. Also note page 9 of these instructions.
7. The Expansion Vessel (F) charged at 2.1 Bar, should **either** be fitted directly to connection (M) on the cylinder, or if space dictates, securely to the wall with the optional remote fixing kit and the hose fitted between the vessel and connection (M).
8. Connect the 3kW 11" 240V Immersion Heater/s BSEN 60335/2/73 (with manual re-set cut out at 80°C) to the power supply and earth them in accordance with the current IEE wiring regulations. The fuse rating should be 13 Amps. **Do not at any time fit Immersion Heaters without a thermal cut-out.**
9. On Indirect Units where a Coil is fitted to the cylinder, the supplied Two Port Motorised Zone Valve and Dual Thermostat Controller (J) must be fitted in accordance with the instruction details supplied with them for the appropriate installation.

N.B. Indirects, are suitable for oil, gas and electric fired boilers on a pumped, gravity or sealed system. (We would however recommend 28mm Coil connections with a 28mm Zone Valve on gravity systems). Maximum working pressure of the coil is 3.5 Bar. All electrical wiring to thermostats, zone valve and immersion heaters must be earthed and to current IEE Wiring Regulations. The fuse should generally be 3 Amps but refer to appliance instructions to confirm this.
10. The Secondary Return (L) if supplied, should be plugged if not required. If the Secondary System pipe-work is greater than 15% of the unit capacity, a larger Expansion Vessel may need to be fitted - contact McDonald Engineers.
11. Immersion Heaters (H) and the Dual Aquastat Controller (J) supplied with the Indirect units should be set to no greater than 60°C and the internal High Limit Thermostats are factory set no higher than 85°C. **Always check this before switching on power.**

Please see the checklist on page 4 to ensure all controls are present and correct.

ONCE ALL THE PRECEDING INSTRUCTIONS HAVE BEEN FOLLOWED, COMMISSION THE SYSTEM.

IMPORTANT

COMMISSIONING - These instructions must be followed.

After following the instructions on pages 1 & 2 proceed as follows: -

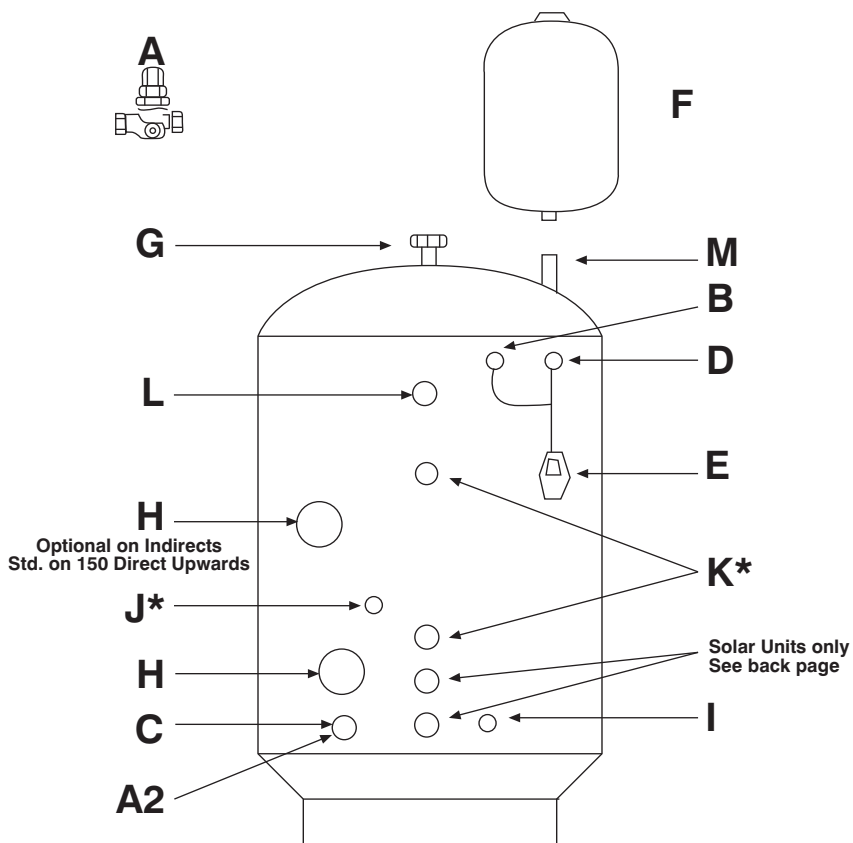
1. Close the *Drain-cock* (I) at base of cylinder.
2. Open a Hot Tap.
3. Fully open the Cold Mains Stopcock and fill Cylinder until water appears at the Hot Tap.
4. Close the Hot Tap and attend each hot water outlet in turn and ensure water flow is obtained at each.
5. Check the control thermostats on the *Immersion Heater/s* (H) and the *Dual Thermostat* (J) are set no higher than 60°C and that the High Limit Thermostats are set to no higher than 85°C.
6. Ensure there is no discharge from the Relief Valves (B and D).
7. Switch on water heating system and check operation of the system.

ENSURE THAT ALL FITTINGS AND PIPEWORK ARE WATERTIGHT.

All factory fitted valves etc. are fitted using a thread sealant.

If this seal is broken it should be re-sealed using a suitable sealant.

IT IS EXTREMELY IMPORTANT TO FOLLOW ALL THE INSTRUCTIONS PREVIOUSLY MENTIONED, AS FAILURE TO DO SO COULD BE DANGEROUS OR LEAD TO THE SYSTEM WORKING INEFFICIENTLY.



CHECKLIST

A - Pressure Reducing Valve with Strainer.

A2 - Check Valve.

B - Expansion Relief Valve.

C - Cold Feed.

D - Pressure & Temperature Relief Valve.

E - Tundish.

F - Expansion Vessel.

G - Hot Water Draw Off.

H - Immersion Heater 80°C cut-out.

I - 15mm Drain-cock.

J - Dual Thermostat Controller.*

K - 22mm Connections to Primary Coil.
The supplied Zone Valve must be fitted
and also a High Limit Stat fitted to the
Boiler.* For Solar coils see back page.

L - 22mm Secondary Return. Plug if not
required (only on 180 litre units &
bigger).

M - 22mm Boss for Expansion Vessel.

***Indirects only**

ANNUAL MAINTENANCE

POWERflow2000 should be serviced at least once a year by a competent operative.

IMPORTANT - failure to maintain this system in accordance with these instructions will invalidate the manufacturer's warranty. A maintenance record should be kept on the **ANNUAL SERVICE RECORD** card provided on page 10, we would recommend a service program is arranged on installation. Failure to maintain this record will invalidate the manufacturer's warranty. Contact McDonald Engineers to arrange the appropriate service program.

ANNUAL SERVICE CHECKS

Expansion Relief Valve (B) - manually open the twist cap and check that the water is discharged and runs clearly through the *Tundish* (E) and out at the final discharge point. Ensure that the valve re-seat/re-seals itself.

Pressure & Temperature Relief Valve (D) - repeat the above procedure. Ensure that the valve re-seat/re-seals itself.

Strainer (A) - turn off mains at stopcock. There will be a small amount of residual water in the pipework, remove the cartridge from *Pressure Reducing Valve* (A), clean Strainer and replace.

Expansion Vessel (F) - Check Pressure via the valve on top of the vessel which is located under the plastic cap. Ensure pressure is 2.1 Bar. Vessel can be re-charged if required as per "Recharging Expansion Vessel" on page 6 opposite.

PROBLEM SOLVING

DISCHARGE FROM EITHER OF THE RELIEF VALVES INDICATES A MALFUNCTION IN THE SYSTEM AND MUST BE INVESTIGATED IMMEDIATELY.

OVERHEATED HOT WATER DISCHARGE

In the unlikely event of overheated (90°C) water being discharged, the heat source i.e. the immersion heaters or the central heating boiler should be switched off immediately and a competent operative called out. Ensure that the discharge of hot water or steam at the *Tundish* (E) or final discharge point causes no danger and is not likely to injure anyone.

DO NOT SHUT OFF THE COLD WATER SUPPLY TO THE UNIT!!

DO NOT RE-USE UNTIL CHECKED AND REPAIRED!!

ENSURE COMPONENTS ARE ISOLATED FROM ELECTRICITY BEFORE INVESTIGATION!!

Once cold water has entered the unit and displaced the over heated water thus cooling it, check the thermostat and energy cut out in the a) Immersion Heater, b) Thermostat, c) Boiler. Identify the faulty component and replace with the correct component as supplied by the manufacturer and ensure that it works before re-commissioning the system.

DO NOT FOR ANY REASON BY-PASS AN ENERGY CUT-OUT.

Problem Solving continued on page 6...

WATER DISCHARGE

If water is occasionally being discharged as the water is heated, this would be likely to indicate that the Expansion Vessel (F) needs recharged. In the event of it occurring, switch off all power supplies to the cylinder, re-charge the vessel as below.

If water is continually being discharged, firstly check with a gauge that the pressure allowed through the *Pressure Reducing Valve* (A) does not exceed 2.1 Bar. If it does exceed 2.1 Bar the *Pressure Reducing Valve* should be replaced using a replacement supplied by McDonald Engineers. Next, check the charge in the expansion vessel and recharge as below. If the pressure is okay, check which valve is discharging and replace with a replacement supplied by McDonald Engineers.

RECHARGING EXPANSION VESSEL

To recharge the expansion vessel, close the mains stopcock and open a hot tap. Connect a pump with gauge to the air inlet on top of the vessel and charge to 2.1 Bar (30 PSI).

HOW TO DRAIN SYSTEM

Switch off water at mains and open a hot tap. Connect the *Drain-cock* (I) to a hose and open, the cylinder will now start draining through the hose.

To re-fill follow the commissioning instructions on Page 3.

N.B. To flush out the system, drain the unit as above, fill and repeat.

IF PROBLEMS CONTINUE

If after recharging the expansion vessel the cylinder is still discharging, it may be cross-flow - ensure appropriate check valves are fitted. The *Pressure Reducing Valve* (A), one of the *Relief Valves* (B or D), (as previously mentioned) or the *Expansion Vessel* (F) has failed. The component should only be replaced by a replacement part supplied by McDonald Engineers. Contact McDonald Engineers for further information.

IMMERSION HEATER FAILURE

If the Immersion Heater (H) is not heating the water it has either failed (In which case a replacement Immersion Heater as supplied by McDonald Engineers should be fitted) or the electrical cut-out has operated due to the control thermostat being set too high or being faulty.

On Indirect units it may be a faulty stat in the boiler is allowing the water to overheat and operating the Immersion cut-out.

(CHECK THE IMMERSION HEATER IS ISOLATED FROM THE MAINS)

Once these have been checked and/or replaced, the *Immersion Heater* can be re-set by taking off the cap and depressing the button in the *Immersion Heater* on the High Limit Stat

Should any fault or problem arise not covered in this leaflet, please contact the manufacturer.

TECHNICAL DATA

Weights	Direct		Indirect	
	Empty	(kgs) Full	Empty	(kgs) Full
75 Litre POWERflow 2000	24	99	26	101
120 Litre POWERflow 2000	33	153	37	157
150 Litre POWERflow 2000	39	189	44	194
180 Litre POWERflow 2000	49	229	55	235
210 Litre POWERflow 2000	55	265	61	271
300 Litre POWERflow 2000	80	380	86	386

Heat Up Times 10-60°C	Direct	Indirect
75 Litre POWERflow 2000	89 mins	21 mins
120 Litre POWERflow 2000	129 mins	24 mins
150 Litre POWERflow 2000	115 mins*	25 mins
180 Litre POWERflow 2000	145 mins*	25 mins
210 Litre POWERflow 2000	166 mins*	26 mins
300 Litre POWERflow 2000	175 mins*	25 mins

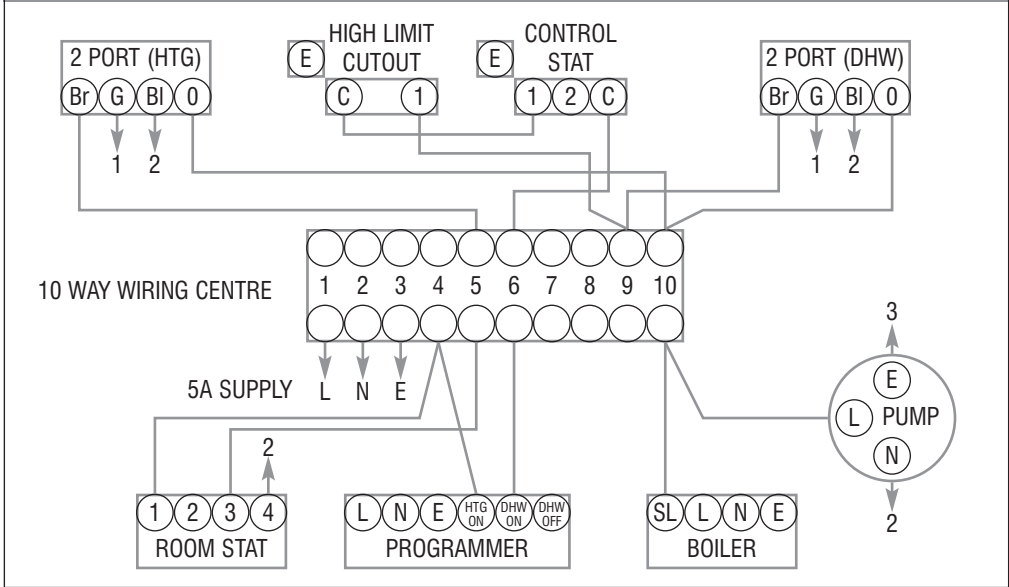
Time to re-heat 70% to 60°C	Direct (3kW)	Indirect**
75 Litre POWERflow 2000	73 mins	12 mins
120 Litre POWERflow 2000	110 mins	16 mins
150 Litre POWERflow 2000	101 mins*	18 mins
180 Litre POWERflow 2000	125 mins*	19 mins
210 Litre POWERflow 2000	128 mins*	20 mins
300 Litre POWERflow 2000	135 mins*	21 mins

*Using both Immersions

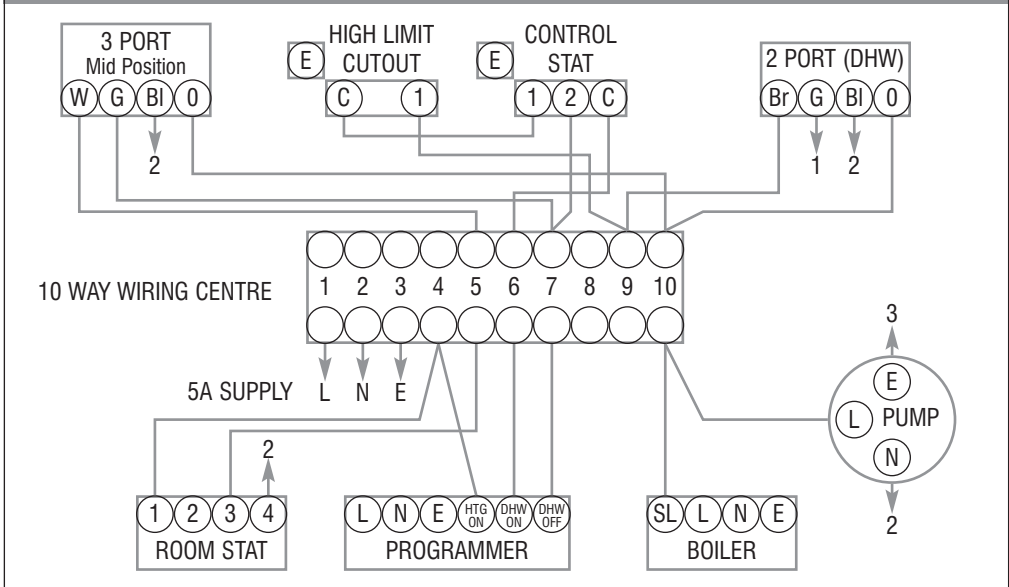
**If adequate boiler power

INDIRECT POWERflow 2000 WIRING DIAGRAM

WIRING DIAGRAM TWO 2 PORT ZONE VALVE (S-PLAN) DUAL THERMOSTAT WIRING



WIRING DIAGRAM 3 PORT MID POSITION VALVE (Y-PLAN) + 2 PORT VALVE DUAL THERMOSTAT WIRING



KEY: BI=Black, Br=Brown, C=Common Terminal, E=Earth, G=Grey, G/Y=Green/Yellow, L=Live, N=Neutral, O=Orange, SL=Switched Live, W=White
Note: The programmer and boiler power can be taken either from the Wiring Centre or from elsewhere as appropriate.

Diagram 1 Typical discharge pipe arrangement

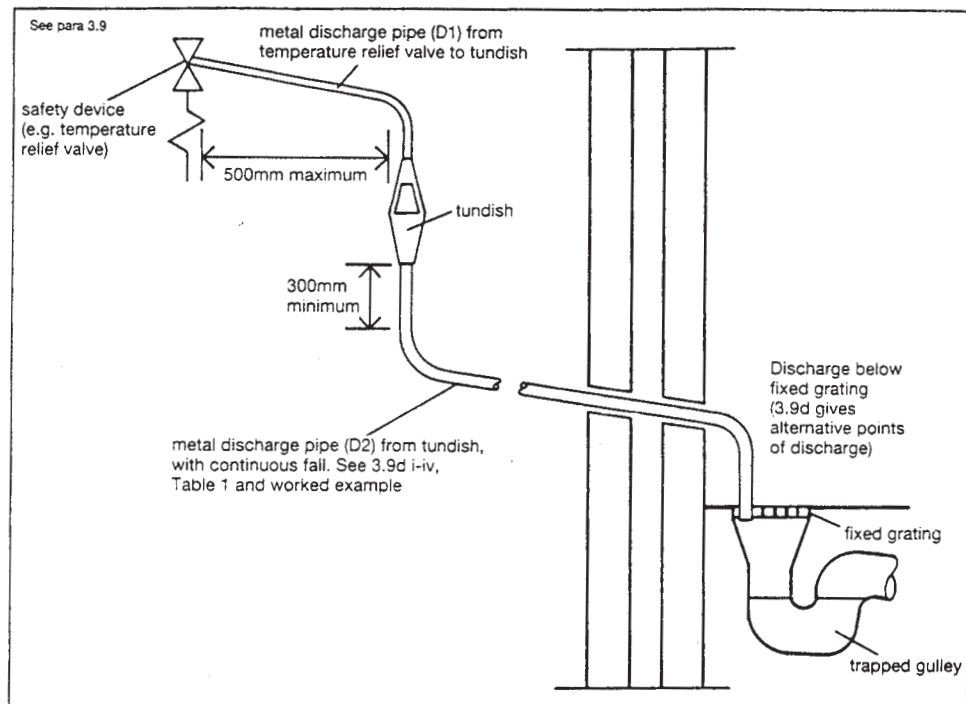


Table 1 Sizing of copper discharge pipe 'D2' for common temperature relief valve outlet sizes

Valve outlet size	Minimum size of discharge pipe D1*	Minimum size of discharge pipe D2* from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i.e. no elbows or bends)	Resistance created by each elbow or bend
G 1/2	15mm	22mm 28mm 35mm	up to 9m up to 18m up to 27m	0.8m 1.0m 1.4m
G 3/4	22mm	28mm 35mm 42mm	up to 9m up to 18m up to 27m	1.0m 1.4m 1.7m
G 1	28mm	35mm 42mm 54mm	up to 9m up to 18m up to 27m	1.4m 1.7m 2.3m

* see 3.5, 3.9, 3.9(a) and Diagram 1

Worked example:-

The example below is for a G 1/2 temperature relief valve with a discharge pipe (D2) having 4 No. elbows and length of 7m from the tundish to the point of discharge.

From Table 1:

Maximum resistance allowed for a straight length of 22mm copper discharge pipe (D2) from a G 1/2 temperature relief valve is: 9.0m

Subtract the resistance for 4 No. 22mm elbows at 0.8m each = 3.2m

Therefore the maximum permitted length equates to: 5.8m

5.8m is less than the actual length of 7m therefore calculate the next largest size.

Maximum resistance allowed for a straight length of 28mm pipe (D2) from a G 1/2 temperature relief valve equates to: 18m

Subtract the resistance for 4 No. 28mm elbows at 1.0m each = 4m

Therefore the maximum permitted length equates to: 14m

As the actual length is 7m, a 28mm (D2) copper pipe will be satisfactory.

ANNUAL SERVICE RECORD

IMPORTANT - Failure to install the cylinder correctly and maintain this record accurately, will invalidate the manufacturer's warranty.

[illegible]

SOLAR COILS

The cylinder should be installed according to the standard **POWERflow** 2000 instructions.

Single Coil Solar *POWERflow* 2000

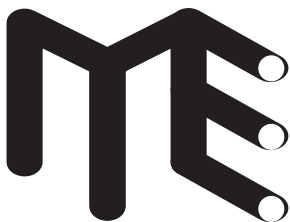
The Dual Thermostat and 2 Port Motorised Zone Valve should be installed and connected as per the standard installation and wiring instructions. The Motorised Zone Valve may be omitted, if the high limit thermostat is wired so as to cut power to the solar pump, in the event of an overheat situation. Reference should be made to the solar equipment instructions.

Dual Coil Solar

The upper Primary Coil, which is linked to a boiler, should be wired as per our standard wiring instructions on page 8. The lower Solar Coil should be wired as per the above instructions for Single Coil Solar . Reference should be made to the solar equipment instructions.

Maintenance:

As per the instruction booklet and any requirements that the Solar Equipment dictates.



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