

SubTronic SC



Franklin Electric

Submersible PSC Motor Starter



GB Installation and operation instructions01 - 06

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About this document

- The instructions and information in this manual form an integral part of the equipment and describe its safe and intended use.
- Keep this manual in the immediate vicinity of the installation.
- Hand this manual to any subsequent owner or installer.
- The instructions and specifications only apply to the equipment described in this manual.
- Technical changes may be made without notice in the interest of product development.

Warnings notices and symbols

Warning notices and symbols	Meaning
 Danger!	Direct/Immediate danger to life and/or health
 Warning!	Possible danger to life and/or health.
 Information	Important information. You should observe this information to ensure correct and safe operation. Possible danger of physical harm and/or material damage may otherwise result.

Safety

Observe the safety rules in this manual.

Safety measures are listed in this section.

Intended use

- The equipment described in this manual is intended for use with a Franklin Electric submersible motor.
- A correctly sized pump must be fitted to the motor.
- The pump and motor must operate under water only.
- The pumping system must fulfill the applicable directives, regulations and statutory provisions.

Loss of guarantee and liability exclusion:

Franklin Electric shall not be liable for the damage resulting from any non-intended use. The risk of such use rests solely with the user.

Target group

Any electrical system such as described in this manual must only be installed by professional staff (qualified electrical technician).

General safety instructions

The following safety instructions must be observed prior to putting the control gear into use:

- Mount the control gear in an appropriate location, orientation and position.
- Do not modify the control gear or its electrical or mechanical connections.
- Do not remove any part or parts of the control gear.
- Never install any control gear with a known defective motor.
- Remove power before working on control gear. Switching off the power is not sufficient.
- Make sure that nobody can switch on the power unexpectedly while work is being carried out.
- Never work on electrical systems during a thunderstorm.
- Commissioning or testing can only be performed by qualified professional staff (qualified electrical technician).
- Replace all protection and safety devices after completing work.
- Ensure that all electrical connections and safety devices have been checked and that all fuses and safety devices have been set correctly before switching on.
- Make sure that no danger zones are accessible (e.g. electrical connections).
- Read the pump manufacturer's commissioning instructions before switching on any control gear.
- Repairs must only be carried out by authorized professional workshops. Use only original Franklin Electric spare parts.

Storage, transport and disposal

Storage

- Do not remove the control gear from its original packaging until the time of installation.
- Keep this manual with the control gear for future use.
- Do not store in direct sunlight or close to any heat source.

Transport

Observe temperature and humidity specifications during periods of transport.

(-25°C to +55°C without condensation).

Unpacking

After unpacking, check for physical damage that may impact on the safety of the control gear such as a damaged enclosure, dislodged cable glands etc. Observe the local regulations and dispose of any packaging material accordingly.

Disposal

Observe the local regulations and dispose of any control gear accordingly. This product contains electrical and electronic components and should be disposed of accordingly.

Technical specifications and model parameters

The SubTronicSC® range of control boxes has been designed as drop-in replacements for conventional PSC motor control boxes. As such, it will work with standard upstream mounted pressure/flow switches adding intelligence & protection to the borehole water system.

Model Parameters

Motor Rating (kW)	Type ² 1~PSC / 230V 50Hz	Model Number ¹
0,25	ST025PSC	284 623 3511
0,37	ST037PSC	284 624 3511
0,55	ST055PSC	284 625 3511
0,75	ST075PSC	284 626 3511
1,10	ST110PSC	284 627 3511
1,50	ST150PSC	284 628 3511
2,20	ST220PSC	284 629 3511

Current Ratings

Motor Rating (kW)	Nom. Current ³ (A)	Max. Current ⁴ (A)	Capacitor 450V (µF)
0,25	2,4	9,4	12,5
0,37	3,3	12,6	16
0,55	4,3	17,7	20
0,75	5,7	22,7	35
1,10	8,4	33,9	40
1,50	10,7	41,7	50
2,20	14,7	61,8	70

Specifications

Mechanical Specification	
Protection level	IP 54
Environment	This equipment is suitable for environment B according to IEC/EN 60439-1
External dimensions	290 x 210 x 95 mm
Weight	0,6 - 1,0 kg
Mounting	Wall mounting (mounting hardware provided)
Storage temperature	-25°C to +55°C
Operation temperature	-5°C to +50°C
Humidity	50% at 55°C (without condensation)
Electrical Specifications	
Rated Voltage	1~ / 50Hz 220 - 240V ±10%
Rated insulation voltage	400 Vac
Rated short-time withstand current	1,5 kA
Rated conditional short-circuit current	1 kA
Current	16 A
Power	0,25 - 2,2kW
Standards	
IEC/EN 60439 - 1	

Specifications continued

Protection	
Dry-run protection with auto-reset	Shut-off on detection of underload with auto-reset in max. 70 minutes depending on conditions. Manual reset possible by reapplying power.
Over & Under voltage protection with auto-reset	Operating range 184Vac – 265Vac with auto-reset in approximately 3 minutes. Manual reset possible by reapplying power.
Over current protection with auto-reset	Shut-off in 4 seconds at 150% of nominal current with sliding scale to 120%. Auto-reset in 10 minutes. Manual reset possible in approximately 5 minutes by reapplying power.
Rapid Cycle protection with auto-reset	Shut-off under persistent rapid cycling conditions. Auto-reset in 5 minutes if condition clears. Manual reset possible in approximately 5 minutes by reapplying power.

Intelligent Management features

Dry-run detection (without probes)	Prevents motor and pump damage due to running the pump without water based on a reliable proprietary detection method.
Dry-run auto- reset	Automatic dry-run reset time to find the best operating point for weak wells. Reset time varies between 5 to 60 minutes to ensure maximum water delivery from a weak well. See also: „Underload Smart Reset page 4“
Over & Under voltage	Prevents motor damage that may be caused by abnormal voltage conditions without limiting the range of operation - made possible by matching the design of the SubTronicSC® Protector with the Franklin Electric motor.

Over current protection	Prevents operation under conditions where motor current may exceed safe levels due to bound pump or other fault condition. Detection is based on current heating capacity measurement to prevent unnecessary nuisance tripping.
Rapid Cycle Protection	Prevents system damage due to factors such as continuous rapid cycling and excessive motor thermal cycling caused by waterlogged tank or faulty pressure switch.
Indicators	
Status	Indication shows normal operation or other condition.
Voltage	Faulty voltage condition is indicated.
Fault conditions	Dry-run, Over Current, Rapid Cycling, System Failure, Wiring Fault, Over Voltage and Under Voltage are indicated.

Cable Size - use copper (Cu)

Motor Rating (kW)	Maximum Cable Size ⁵ (mm ²)
0,25	1,5
0,37	1,5
0,55	1,5
0,75	1,5
1,10	2,5
1,50	2,5
2,20	2,5

Notes:

1. Can be used with both 220-230V and 230-240V.
2. Type indicates motor power rating and motor type.
3. Nominal supply current at nominal voltage.
4. Motor starting current under nominal conditions.
5. Use external junction box for drop cable sizes larger than 2,5mm²

Installation Procedure



Information

Confirm that the control box current rating corresponds with the motor specification.

Installation - Mechanical

Your control box comes supplied with an external mounting option. The diagram (See figure B) shows a rear view of the control box, indicating mounting dimensions.

The control box should be mounted on a vertical flat surface.



Information

Avoid mounting the equipment in direct sunlight, near open flames or in the line of pressurized water or other liquids. Take the necessary environmental conditions into consideration.

Installation - Electrical

Any electrical system such as described in this manual must only be installed by professional staff (qualified electrical technician).



Danger !

**Life threatening voltage
Make sure that nobody can switch on the power unexpectedly while work is being carried out.**



Danger !

Make sure that multiple earth-points are avoided. Refer to the local standards and norms for borehole installations

See figure A for the wiring diagram. All connections must be checked if the installation was not commissioned by you.

1. TURN OFF AC POWER AT THE SOURCE (DISTRIBUTION BOARD) AND MAKE SURE IT CANNOT BE ACCIDENTALLY SWITCHED ON WHILE WORK IS BEING CARRIED OUT.
2. Remove the enclosure lid.
3. Connect the incoming 230V AC supply to the control box as shown in the wiring diagram. (Figure A)
4. Connect the motor to the control box.
5. Tighten all screw terminals
6. Replace the enclosure lid
7. TURN ON AC POWER AT THE SOURCE (DISTRIBUTION BOARD)

Operation

A. Manual operation

The SubTronicSC® is equipped with an ON/OFF switch for ease of operation. This switch can be used to switch the pump/motor on and off.

The SubTronicSC® provides you with a complete protection system for your water pump. To make optimal use of the SubTronicSC® operating capabilities, observe the Indicators and consult the Trouble Shooting Section in this manual.



Information

If a repeated overload condition is experienced, contact your installer or service provider.

B. Automatic operation - pressure switch

A float, pressure or any other external switch can be used to power the SubTronicSC®. Remember to leave the ON/OFF switch in the SubTronicSC® in the ON position if an external control switch is used.

Managing ON/OFF switching activity

Your submersible electric motor accumulates a certain amount of heat each time it is switched on. It must run for a period of time during which it has the opportunity to dissipate the heat. If too many starting cycles are called for your motor and/or pump may be damaged. Observe the starting conditions of the motor/pump. The SubTronicSC® will interrupt operation if the motor or pump life is threatened. Check the Trouble Shooting Section in this manual to rectify the problem or contact your authorized installer or service provider.

Underload Smart Reset

If a motor Underload fault condition occurs, the most likely cause is an overpumped or dry well. To allow the well to recover, the SubTronicSC® controller will wait 5 minutes to 60 minutes, determined by duration of the previous run time, before restarting the motor. For example, the first time the fault occurs, the controller will wait circa 5 minutes before attempting to restart the pump. If the system would then run for less than 3 minutes and an Underload fault recurs, the controller will wait approx. 10 minutes before attempting to restart the pump. This schedule allows for the minimum off-time possible based on the recovery time of the well. See page 5: Figure 1

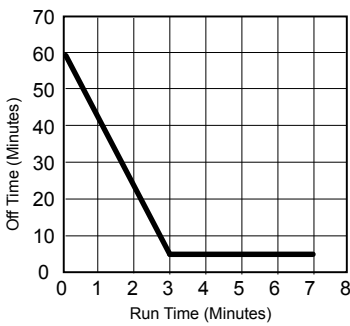


Figure 1: Smart Reset Well Recovery Time

Deep Wells

The SubTronicSC's factory preset will guarantee dry run protection for the majority of possible conditions. However, in applications where deep wells are used with low flow pumps, conditions may occur that create either nuisance tripping (the pump/motor switches off while water is being pumped) or no tripping at all (even though the pump runs dry). When such conditions are observed during commissioning, the installer should fine-tune the dry-run (overpumping) tripping threshold:

- The adjusting point is located on the lower right hand side of the internal PCB and is marked „Underload sensitivity“
- Use a slotted, insulated tip screwdriver to adjust the dry run sensitivity until switching activity is correct.
- Adjustments should be made slowly – make a small adjustment and wait for reaction. If no reaction is observed continue to make small adjustments until the desired results are obtained.

Pressure Switch

The SubTronicSC® was designed to be used with conventional pressure switch operation. No additional contactor or auxiliary control terminal is required provided that the pressure switch terminal ratings are sufficient to operate the rated load.

Maintenance and Service

The SubTronicSC® is maintenance free and requires no maintenance or service. The control box contains no serviceable parts.

Trouble Shooting

The SubTronicSC® uses a simple indication system to display the condition/s of operation. A symbolic legend on the face of the SubTronicSC® provides you with information that will help you to make the best use of your water pumping system. The various conditions that you may encounter can be divided into three (3) groups.



Information

After commissioning, your system will operate without needing any care or maintenance from you. Should something change however and some fault condition does occur, please do not persist with forcing operation. Contact your installer or service provider





Normal operation

Condition Indicator	Cause / Remedy
	<p>Manual mode: SubTronicSC switch is in the OFF position. Switch ON to pump.</p> <p>Automatic mode (pressure switch) System is pressurized. Pressure switch is in OFF position. Pump will start when pressure falls below start set -point of pressure switch.</p>
	<p>Manual mode: SubTronicSC® switch is in the ON position, pump is running. Switch OFF to stop.</p> <p>Automatic mode (pressure switch) Pressure switch is in ON position, pump is running. Pump will stop when shut-off pressure is reached.</p>

Trouble shooting

Condition / Fault Indicator	Cause / Remedy
	Motor/Pump does not switch on Loss of power - check supply voltage (Are other appliances working?)
	Damaged switch - contact supplier
	Overload tripped - reset overload
	Damaged switch – contact supplier

Trouble shooting (continued)

Condition / Fault Indicator	Cause / Remedy
Motor/Pump does not switch on 	Supply problem – high voltage condition occurred. SubTronicSC® will reset within 10 sec. If the condition persists, contact power company or installer
Motor/Pump does not switch on 	Supply problem – low voltage condition occurred. SubTronicSC® will reset within 10 sec. If the condition persists, contact power company or installer
Motor/Pump does not switch on 	Too much water is being pumped or pump is operating against a shut valve or heavy flow restriction – remove flow restriction or reduce flow when pumping. If problem persists, the borehole cannot deliver the required flow rate. Reset time varies between 5 to 60 minutes to ensure maximum water delivery from a weak well. See also: „Underload Smart Reset page 4“ Check for faulty wiring if no other cause can be found.
Motor/Pump does not switch on 	Pump locked or cable damaged – debris may have entered the pump or drop cable may have been damaged. SubTronicSC® will reset in approximately 15 min. If pumping does not restart in 20 min, remove pump and check cable for damage. If the problem persists, contact installer or supplier or remove motor/pump from the borehole and clean. Check for faulty wiring if no other cause can be found.

Trouble shooting (continued)



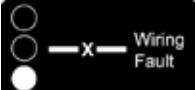
Condition / Fault Indicator	Cause / Remedy
Motor/Pump does not switch on 	Motor/Pump is switching on too often or is running for very short periods. SubTronicSC will reset within 3 minutes. Continuous rapid cycling and excessive motor thermal cycling can be caused by a waterlogged tank, faulty contacts, faulty pressure switch, supply problem or a system fault. Contact installer or supplier. Check for faulty wiring if no other cause can be found.
Motor/Pump does not switch on 	The SubTronicSC® has detected a faulty switch, contact or loose connection. SubTronicSC will reset within 10 seconds. If the condition persists, contact installer or supplier. „ Check for faulty wiring if no other cause can be found “
Wiring Fault 	The SubTronicSC® has detected loose or disconnected wires to the motor. SubTronicSC will reset within 10 seconds. If the condition persists, contact installer or supplier.

Figure A

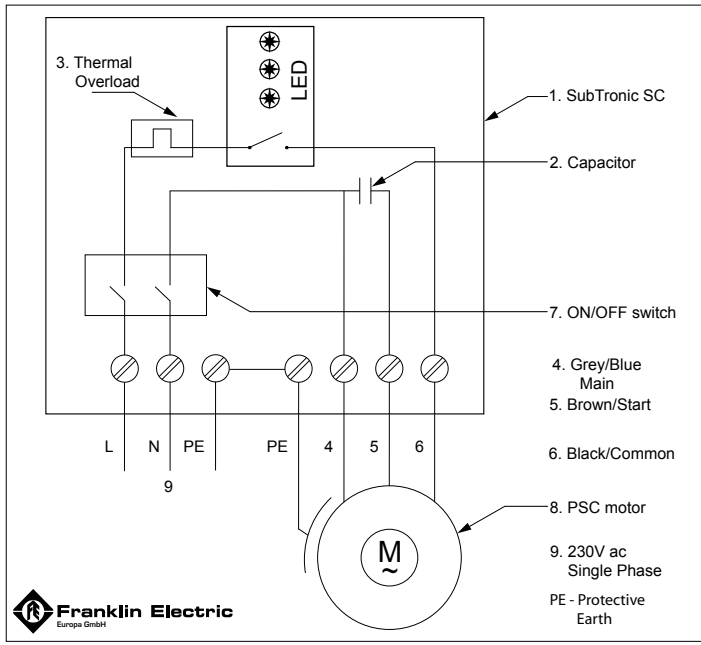
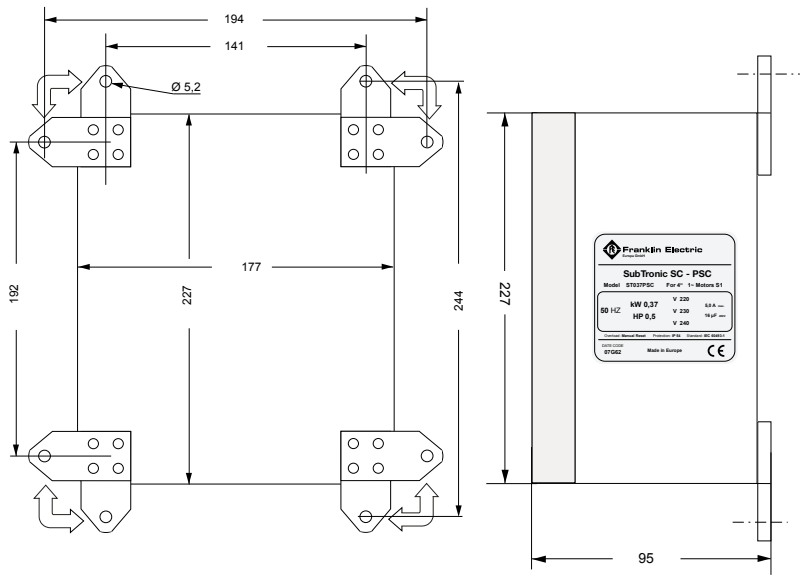
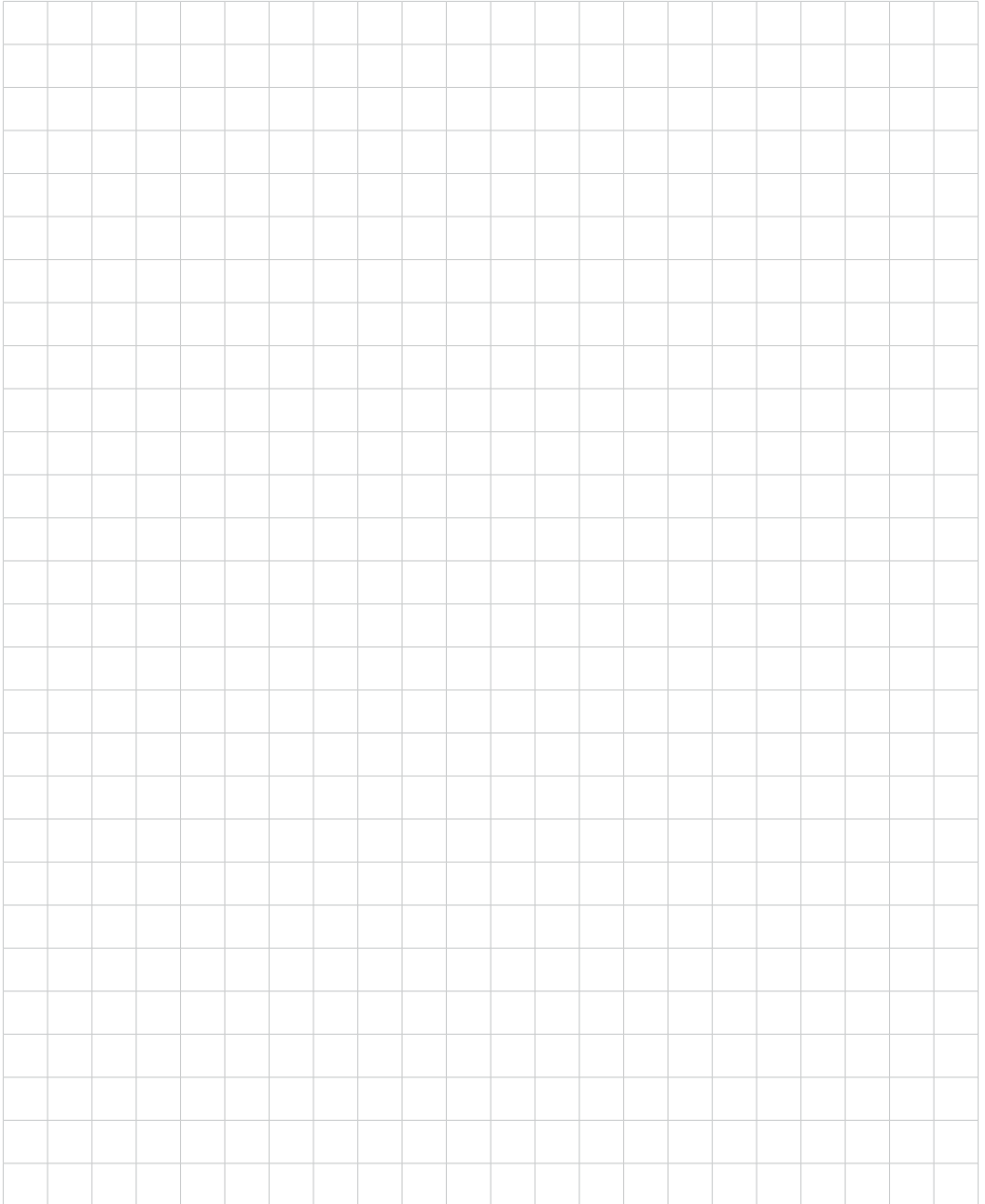


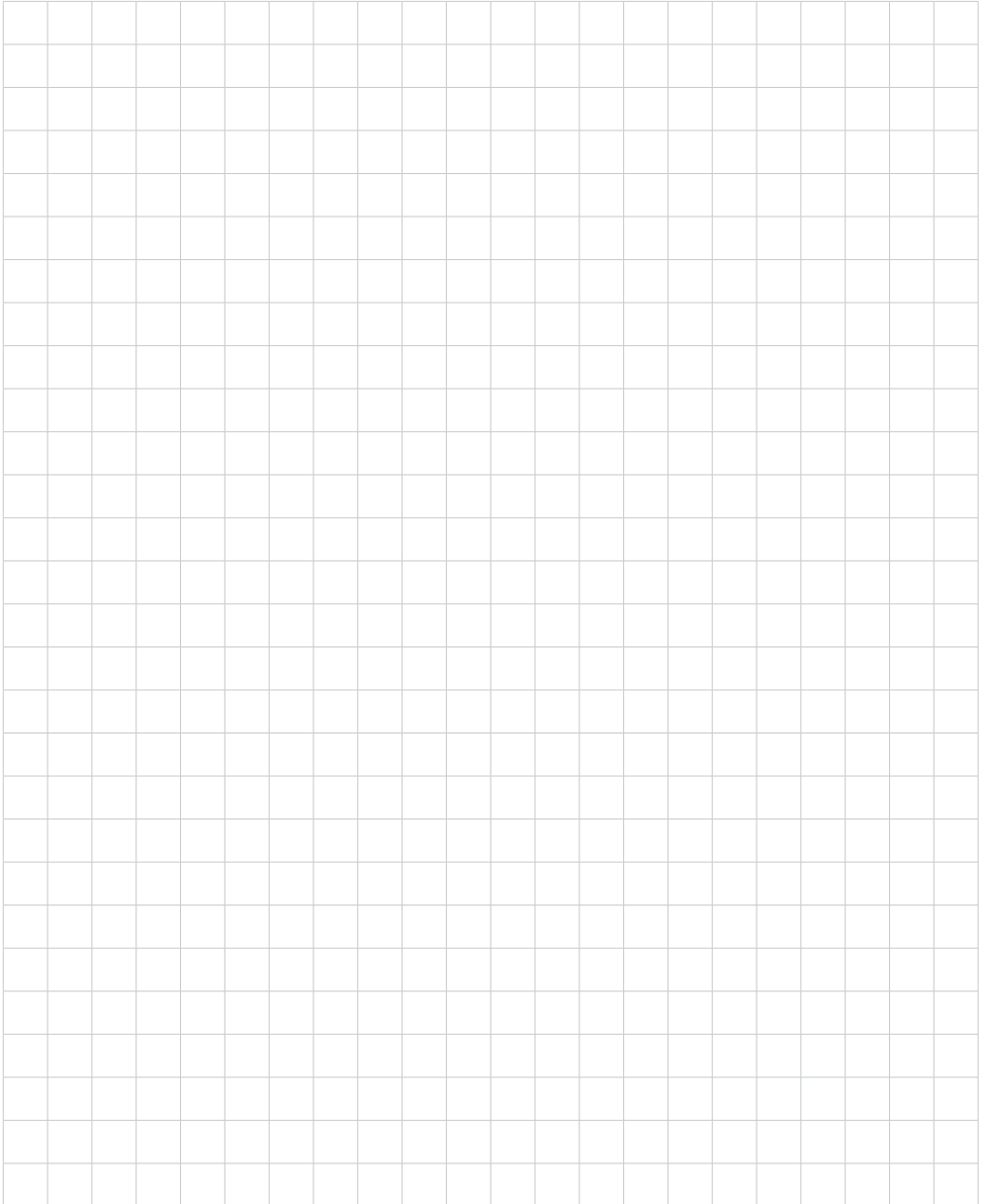
Figure B



Notes



Notes



POWERED BY



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QUALITY IN THE WELL