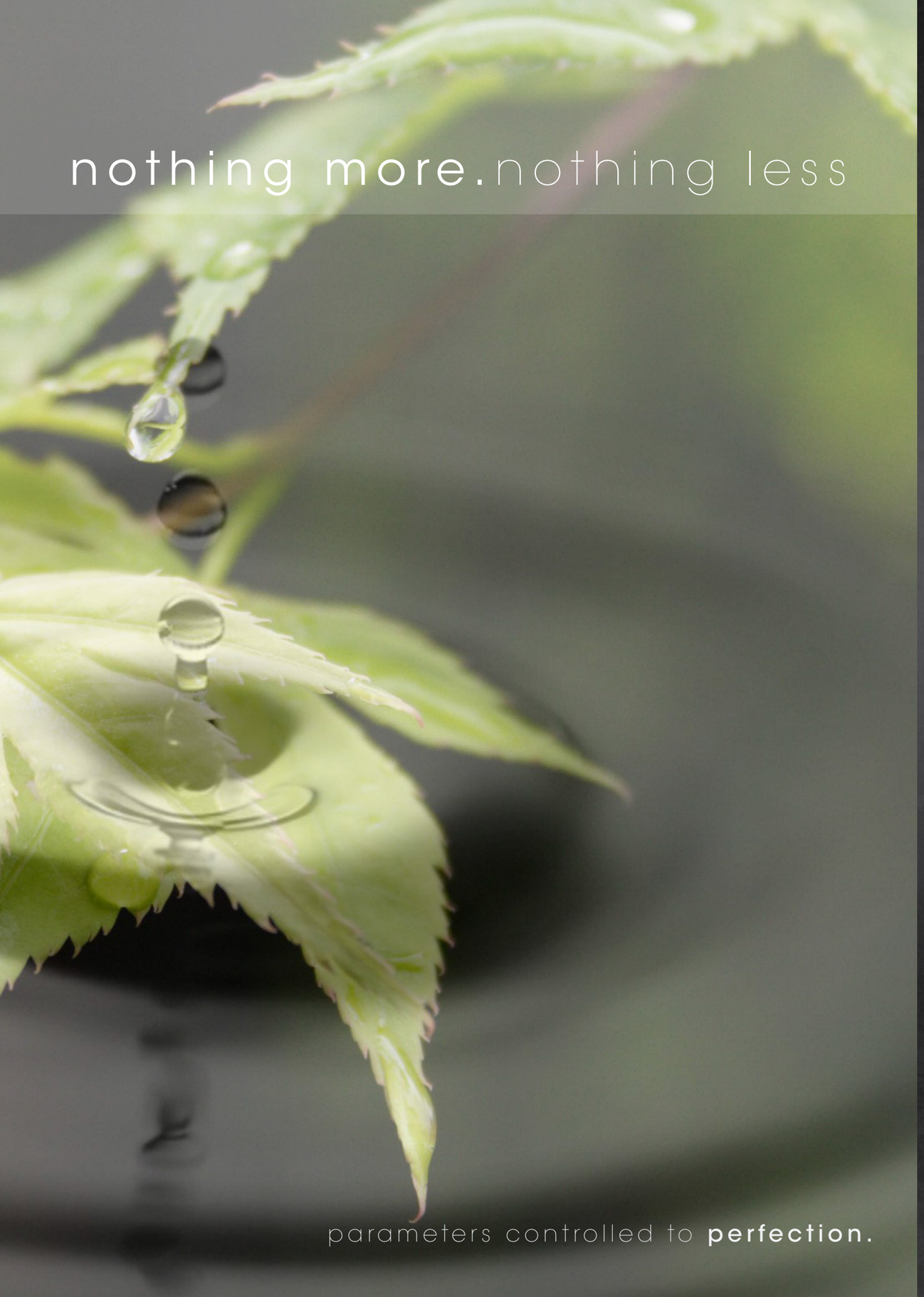
VARIABLE SPEED DRIVE CONTROLLERS

PRODUCT OVERVIEW



INTRODUCING

MATelec Australia, already renown in the Pump and Motor control industry, for 'cutting edge', 'industry first' and 'state of the art' control panels, have now revolutionised totally, the philosophy of Variable Frequency Drive controlled systems. Bringing all the 'best practice' concepts and 'system optimisation' features in to a single, purpose designed and built Logic Controller, maintaining a set point, be it pressure, temperature, flow or level, has never been more simple in application whilst sophisticated and smart in control.

With energy costs escalating at unprecedented proportions and 'super efficiency', through legislation and consumer expectation being demanded, variable frequency driven systems are undoubtedly the ultimate solution.

This Australian designed and manufactured controller has a dedicated Human Machine Interface, featuring user friendly access to control parameters and at the same time, providing the operator a clear visual display of full system status, set points and deviation from set points.

The controller seamlessly engages and disengages motors, ramping their speeds up and down to meet varying duty demands, while tenaciously maintaining a set point through intelligent PID control.

Thank you for taking the time to peruse this brochure, please read on to learn about the meaningful features and benefits that our product offers.

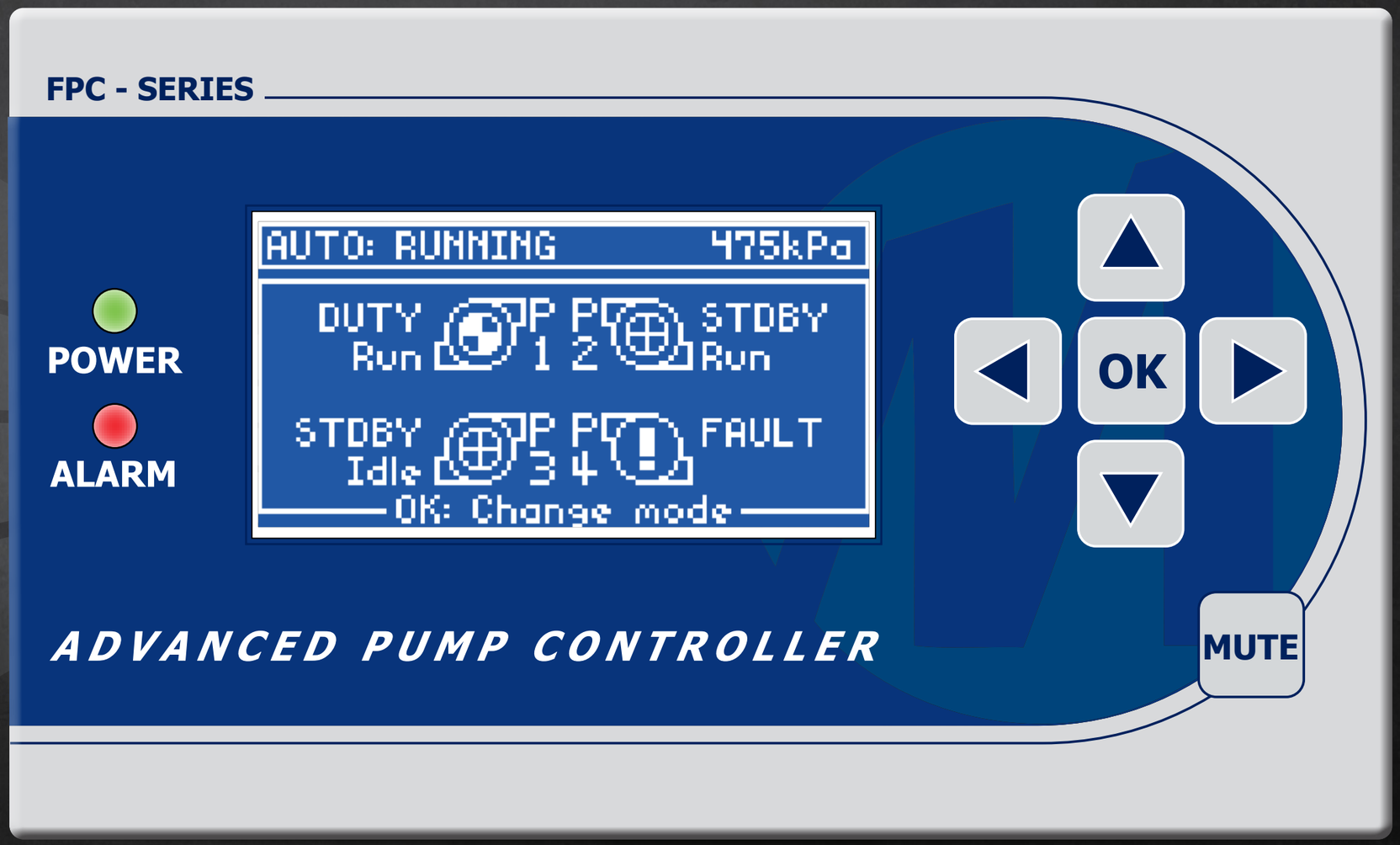
CONTROLLING

PRESSURE

LEVEL

TEMPERATURE

FLOW



OPERATIONAL FEATURES

PID Control
The controller incorporates a complete digital PID control system which is used to regulate the speed reference signal based on the setpoint and feedback pressure signal. In addition to adjustment of the setpoint, both the Proportional, Integral and Derivative components on the algorithm can be varied.

PID Reverse
The standard PID configuration is valid only for installations where pressure pumping is required, so that a decrease in pressure results in an increase in speed (and vice versa). There are however applications such as fluid level control where the system must pump water out of a well to maintain a consistent level. In this case the PID is required to perform the opposite action: increase the pump speed as the level increases.

Stage/Destage Bypass
When a pump it staged the speed reference will already be at a relatively high speed as this is what triggers the pump stage process. In some circumstances depending on the PID settings bringing on the second pump with this high speed reference could cause an undesirable overshoot in the system pressure. Therefore better performance can be achieved if the PID algorithm is bypassed and the pump speed's controlled directly.

Bumpless Transfer
When duty changes in time based mode it's likely that the duty pump will be running when the change occurs. Bumpless transfer ensures that the transition of duty from one pump to another causes no pressure dips or spikes.

Sleep
During a period of decreased demand, all standby pumps will be idle and the duty pump speed will approach zero. A no demand situation occurs when speed drops below [no_demand_speed] threshold and no standby pumps are active When the No Demand condition is detected for [no_demand_sleep_delay] seconds the duty pump will enter the Duty Sleep state and shut down.
If the [sleep_boost_en] parameter is set then prior to entering sleep the sleep boost algorithm will activate. This will run the pump at [sleep_boost_speed] for [sleep_boost_period] seconds before shutting down the pump, boosting the pressure locked in the system to avoid excessive cycling due to slow leaks.
Once the system is in sleep the pumps will continue to be run at the speed set by the [sleep_speed] parameter. If this parameter is zero then in addition to setting the speed reference to zero all of the pump run signals will be deactivated during sleep.

Pipe Fill
Upon entering a running state (either on initial power up or wakeup from sleep) it's possible that there is minimal or no fluid present in the downstream piping. In order to avoid the effects of the resultant PID feedback error the Pipe Fill function can be enabled.

Setpoint Ramp
Whenever the system enters a running state (either on initial power up or wakeup from sleep) it's likely that the system pressure will be below the setpoint pressure. In order to avoid the effects of a large feedback error on the PID algorithm, the setpoint ramp function can be enabled via the [setpoint_ramp_en] parameter.

Jacking Pump
A single output is provided to control a small external jacking pump. This jacking pump output turns on while the system is enabled, in auto mode, and no other pumps are running. Once another pump has been running for 10 seconds the jacking pump output will be switched off.

Rain/Mains Water Integration
In order for the VSD pressure control system to work in a rain/mains water installation, there are two I/Os providing rain/mains integration. To enable these functions, the [rain_mains_en] parameter must be set to 1. In rain/mains operation whenever the mains water on input is open the controller will be disabled, allowing the installation to operate on mains water without the pumps running.

Static Lead Pump
Some applications have only low average flow but high peak flows. In these cases the installation will pair a smaller lead pump with up to three larger pumps that only come into play during these peak periods. The controller is able to support such configurations using static lead pump mode.

MODBUS Communications
Modbus is a serial communications protocol originally designed for use PLCs. Simple and robust, it has since become one of the de facto standard communications protocols in the industry, and it is now amongst the most commonly available means of connecting industrial electronic and control devices. Through it's connected ME16 HMI, the ME21 supports Modbus communications as described here.
There are several different variations of the Modbus standard based around the transmission mode and data encoding technique. The protocol supported by the ME16 is Modbus RTU, which is a binary format sent over a serial link. The ME16 is configured as a Modbus slave and responds to commands sent to it from the Modbus master.

PHYSICAL FEATURES

// Weather Proof, Powder Coated Metal Enclosure
// Clear, Informative LCD Human Machine Interface
// Main Isolator
// Thermostatically Controlled Cabinet Temperature
// Ventilation Fan and Integral Vents.
// Individual Pump Isolation
// Circuit Breaker protected Control Circuit
// Low Voltage Control and input Circuitry
// Advanced Micro Processor Control Module
// Auto/Off/Manual Operation of Both Pumps
// Visual and Audible Alarms c/w Mute Switch
// Installer friendly, clearly labelled, Din Rail mounted, Input and Output Terminal Connection
// Individually Serial Numbered and logged for traceability and product support
// Owner/Operator, Installation and Operation Manual supplied with each controller

FRONT

SIDE

FAULT PROTECTION

Fault Indication from VSD's
Each VSD has a discrete output to indicate the "health" of the drive, which deactivates in the case that the drive detects a fault with itself or the pump. Upon loss of this "healthy" signal the controller will immediately recognise a pump fault and trigger the corresponding Pump Fault alarm. If the pump was the system duty pump then duty will immediately change. This fault will auto reset once the drive has restored its "healthy" signal.

High Pressure Switch Protection
If the [high_pressure_input_en] parameter is enabled then the controller must have a normally closed (open on high pressure) high pressure switch connected. If the input is opened for [high_pressure_input_delay] period then a High Pressure Fault is flagged and the entire system will shut down. This fault can only be manually reset.

Feedback High Pressure Protection
If [FB_high_pressure_en] is enabled then the controller uses the feedback pressure sensor to monitor for high pressure conditions. If the feedback pressure exceeds [FB_high_pressure_level] for [FB_high_pressure_delay] seconds then a Feedback High Pressure Fault is flagged and the entire system will be shut down. If [FB_high_pressure_reset] is enabled then the fault will reset once the fault condition abates (however the alarm will remain active until manually reset).

Low Pressure Protection
If [low_pressure_protect_en] is set the feedback pressure sensor will be used to determine a condition such a pipe break which will prevent the system from reaching the pressure setpoint. If the pump speed is greater than [low_pressure_speed] and the feedback pressure is below [low_pressure_level] for [low_pressure_delay] seconds then the entire system will shut down and a Minimum Pressure Fault flagged. This fault can only be manually reset.

The low pressure protect algorithm is ignored during a pipe fill operation.

Low Level Lockout
If [low_level_lockout_en] is set then the controller will monitor the Low Level discrete input whenever the pump speed is greater than [minimum_speed]. If low level input opens for longer than [low_level_lockout_delay] seconds then the system will shut down and a Low Level Fault will be flagged. If [low_level_lockout_reset] is enabled then the fault will reset once the Low Level input closes again and the system will resume normal operation (however the alarm will remain active until manually reset).

Pump Cycle Protection
If the system has a faulty non-return valve or similar fault where the system can fail to maintain pressure then much energy can be wasted due to continual pump cycling. If [cycle_potect_en] is set then each time the system exits sleep within [cycle_min_sleep_time] seconds of entering sleep a cycle counter is incremented. If this counter exceeds [cycle_count_threshold] within a continuous 1 hour period then Pump Cycle Fault is flagged. If [cycle_chutdown_en] is set then the entire system will shut down. This fault can only be manually reset.

Feedback Loss
If the system is in auto mode and [feedback_loss_fault_en] is set then if the 4-20mA pressure feedback signal drops below 4mA for [feedback_loss_delay] seconds the system is immediately shut down and a 4-20mA Feedback Loss Fault flagged. This fault can only be manually reset.

Pipe Fill Fail
If the pipe fill function runs for [pipe_fill_fail_timeout] period then a Pipe Fill Fail fault will be flagged and the system locked out.

DATA LOGGER

To provide feedback regarding the system the following parameters will be logged. All logged data has a maximum value of 0xffff (if this value is reached the parameter will not be incremented any further).

PARAMETER	DESCRIPTION
Pump_1_starts	Number of times pump 1 has started
Pump_2_starts	Number of times pump 2 has started
Pump_3_starts	Number of times pump 3 has started
Pump_4_starts	Number of times pump 4 has started
Pump_1_fault_count	Number of times pump 1 has flagged a fault
Pump_1_fault_count	Number of times pump 2 has flagged a fault
Pump_2_fault_count	Number of times pump 3 has flagged a fault
Pump_3_fault_count	Number of times pump 4 has flagged a fault
Pump_4_run_hours	Number of hours pump 1 has been running for
Pump_2_run_hours	Number of hours pump 2 has been running for
Pump_3_run_hours	Number of hours pump 3 has been running for
Pump_4_run_hours	Number of hours pump 4 has been running for
Power_cycle_count	Number of times controller has been powered up
Sleep_count	Number of times system has entered sleep mode
High_pressure_count	Number of times a high pressure fault has been activated
Low_pressure_count	Number of times a minimum pressure fault has been activated
Low_level_lockout_count	Number of times a low level lockout has occurred
Cycle_protect_count	Number of times pump cycling protect has activated
Feedback_loss_count	Number of times a feedback loss fault has activated
Pipe_fill_fail_count	Number of times a pipe fill failure has occurred

APPLICATIONS

BUILDING SERVICE

- Water Supply
- Pressure Boosting
- Hot Water Circulation
- Waste Water & Storm Water

INDUSTRY

- Constant Pressure
- Controlled Temperature
- Maintained Level
- Paced Flow

RESIDENTIAL

- Pressure Boosting
- Heating / Cooling
- Filtration
- Rain/Mains Water Changeover

IRRIGATION

- Water Transfer
- Multi-Station Watering
- Saturation
- Filtration

THE RANGE

CODE	PUMPS	VSD'S	kW RATING
SINGLE DELUXE			
FPC-33120 - A	1	1	0.75
FPC-33120 - B	1	1	1.5
FPC-33120 - C	1	1	2.2
FPC-33120 - D	1	1	3
FPC-33120 - E	1	1	4
FPC-33120 - F	1	1	5.5
FPC-33120 - G	1	1	7.5
FPC-33120 - H	1	1	11
FPC-33120 - I	1	1	15
FPC-33120 - J	1	1	18.5
FPC-33120 - K	1	1	22
FPC-33120 - L	1	1	30
FPC-33120 - M	1	1	37
FPC-33120 - N	1	1	45
DUAL DELUXE			
FPC-33220 - A	2	2	0.75
FPC-33220 - B	2	2	1.5
FPC-33220 - C	2	2	2.2
FPC-33220 - D	2	2	3
FPC-33220 - E	2	2	4
FPC-33220 - F	2	2	5.5
FPC-33220 - G	2	2	7.5
FPC-33220 - H	2	2	11
FPC-33220 - I	2	2	15
FPC-33220 - J	2	2	18.5
FPC-33220 - K	2	2	22
FPC-33220 - L	2	2	30
FPC-33220 - M	2	2	37
FPC-33220 - N	2	2	45
TRIPLEX DELUXE			
FPC-33320 - A	3	3	0.75
FPC-33320 - B	3	3	1.5
FPC-33320 - C	3	3	2.2
FPC-33320 - D	3	3	3
FPC-33320 - E	3	3	4
FPC-33320 - F	3	3	5.5
FPC-33320 - G	3	3	7.5
FPC-33320 - H	3	3	11
FPC-33320 - I	3	3	15
FPC-33320 - J	3	3	18.5
FPC-33320 - K	3	3	22
FPC-33320 - L	3	3	30
FPC-33320 - M	3	3	37
FPC-33320 - N	3	3	45
QUAD DELUXE			
FPC-33420 - A	4	4	0.75
FPC-33420 - B	4	4	1.5
FPC-33420 - C	4	4	2.2
FPC-33420 - D	4	4	3
FPC-33420 - E	4	4	4
FPC-33420 - F	4	4	5.5
FPC-33420 - G	4	4	7.5
FPC-33420 - H	4	4	11
FPC-33420 - I	4	4	15
FPC-33420 - J	4	4	18.5
FPC-33420 - K	4	4	22
FPC-33420 - L	4	4	30
FPC-33420 - M	4	4	37
FPC-33420 - N	4	4	45