

Turbine Service Unit – FM6X

The FM6X Turbine Service unit provides a pressurised high flow water supply, which is required to operate the FM60, FM61 and FM62 turbine demonstration modules.

METAL FRAMEWORK WITH TRANSPARENT TEST SECTION FOR OBSERVATION
CONTROL AND DATA LOGGING VIA PC
SIMPLE USB CONNECTIVITY



Unit complete with Pelton Turbine - FM62



Description

The turbine under test is connected to the dynamometer by a toothed drive belt.

Load is applied to the turbine using a magnetic brake controlled directly from the computer.

The outer casing of the brake is restrained from rotating by a lever arm, which is connected to a load cell. This enables the braking force and the torque produced to be directly measured.

The dynamometer unit also incorporates an optical sensor, which measures the rotational speed of the turbine.

Armfield IFD7
Interface Unit



Requirements

Scale



- ▶ Turbine FM60 / FM61 / FM62
- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Technical specifications

Standard centrifugal pump

- max. head:	30M
- max. flow rate:	20 l/min
- power output:	260W
- speed range:	2850rpm

Storage tank: 28 Litres

Measuring ranges

- Pressure:	0-400kpa
- flow rate:	0-60l/min
- torque:	0-3 Nm
- speed:	0-120,000rpm

Two year warranty on this product

Overall dimensions

Length	0.80m
Width	0.73m
Height	0.51m

Packed and crated shipping specifications

Volume	1.10m ³
Gross weight	100kg

Demonstration capabilities

- ▶ Determining the characteristics of the selected turbine, including the relationships of volume flow rate, head, torque produced, power output and efficiency to rotational speed (FM60/FM61/FM62)
- ▶ Comparison of nozzle and throttling control of an Impulse Turbine (FM60)
- ▶ Comparison of throttle control and spear valve control of the speed of a Pelton Turbine (FM62)
- ▶ Determination of characteristic performance curves for a peripheral pump, including constant speed head/flow and efficiency curves (FM64)

Software

The ArmSOFT software enables the operator to control the fan speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Essential Accessories / equipment

- ▶ Armfield IFD7
- ▶ FM60
- ▶ FM61
- ▶ FM62
- ▶ FM64

Ordering specification

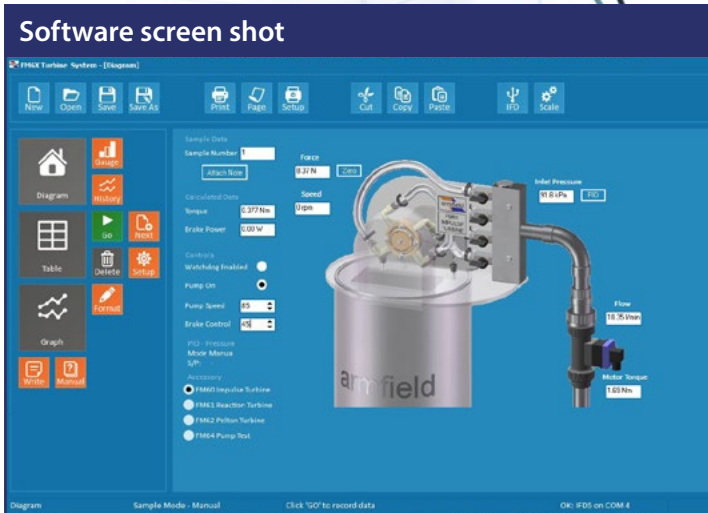
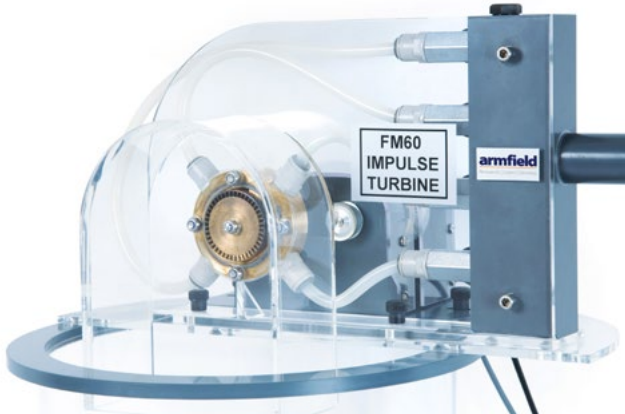
- ▶ A bench top service unit which provides a suitable water supply for testing a range of different turbines
- ▶ Clear acrylic reservoir which holds up to 28 litres
- ▶ Peripheral type pump providing up to 20 litres per minute or up to 30m head (not simultaneously)
- ▶ Paddle wheel type flow meter
- ▶ Magnetic type dynamometer controlled from software
- ▶ Software control of both pump and brake enables remote operation of the equipment over an intranet by writing suitable software
- ▶ Links to a suitable computer via a USB interface device which does not require internal access to the computer, also enables interfacing to other software packages
- ▶ Supplied with full education software package including comprehensive results processing and help facilities

Ordering codes

- ▶ FM6X
- ▶ FM60
- ▶ FM61
- ▶ FM62
- ▶ FM64
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

FM SERIES

A small-scale impulse turbine unit which is designed to be used in conjunction with the FM6X service unit. An impulse turbine uses the momentum transferred from the impact of a jet of water onto the turbine blades to generate power.



Technical specifications

Maximum power:	35W
Maximum speed:	7,000rpm
Maximum torque:	0.15Nm
Pressure Sensor:	0 to 100psi
Turbine Diameter:	50mm
Turbine Shaft Dia:	7mm

Two year warranty on this product

Overall dimensions

Length	0.56m
Width	0.13m
Height	0.29m

Packed and crated shipping specifications

Volume	0.20m ³
Gross weight	20kg

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USA office - email: info@armfield.inc tel: +1 (609) 208-2800 (USA only)

Impulse Turbine – FM60

Description

The FM60 consists of an inlet manifold which supplies water to four jets which are equally spaced around the turbine runner. Each of the jets can be individually controlled using ball valves. The runner itself is mounted on a horizontal shaft with a clear acrylic splash guard to enable maximum visibility of the workings.

The unit incorporates a pressure sensor to measure the inlet condition of the water. This pressure can be accurately controlled using the software supplied with the service unit.

Demonstration capabilities

- ▶ Determining the characteristics of the impulse turbine, including the relationships of:
 - volume flow rate
 - head
 - torque produced
 - power output
 - efficiency to rotational speed
- ▶ Comparison of throttle and nozzle control of an Impulse turbine

Software

The ArmSOFT software enables the operator to control the pump speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Requirements



- ▶ FM6X
- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Scale



Ordering specification

- ▶ Small-scale hydropower unit designed to demonstrate the operating principles of an impulse turbine
- ▶ Horizontal shaft and transparent guarding enable excellent visibility
- ▶ Mounts on a dedicated service unit
- ▶ Connects to a PC via the service unit and a USB interface device
- ▶ Software compatible with Windows XP through to Windows 10

Ordering codes

- ▶ FM60
- ▶ FM6X
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

Issue: 2

URL: <http://www.armfield.co.uk/fm>

Applications



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FM
SERIES

Reaction Turbine – FM61

A small-scale reaction turbine unit which is designed to be used in conjunction with the FM6X service unit. A reaction turbine uses the momentum transferred from the reaction of a jet of water leaving a nozzle to generate power.



Description

The FM61 consists of an inlet manifold which supplies water to a central hub. Water exits the hub radially through two square orifices.

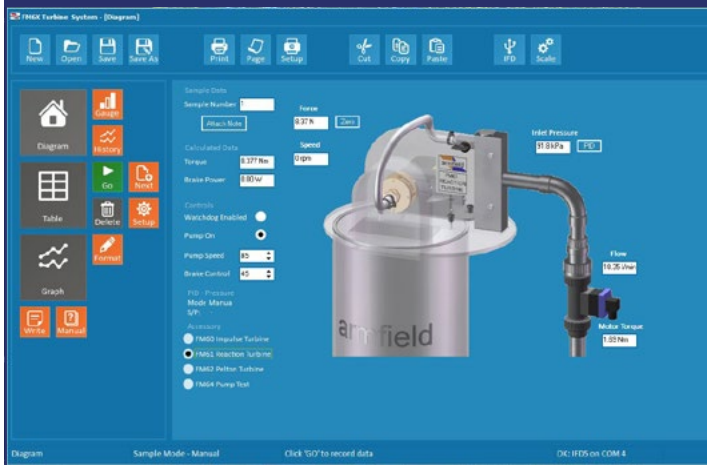
The hub is connected to the manifold using a graphite face seal. The turbine is mounted on a horizontal shaft with a clear acrylic splash guard to enable maximum visibility of the workings.

The unit incorporates a pressure sensor to measure the inlet condition of the water. This pressure can be accurately controlled using the software supplied with the service unit.

Demonstration capabilities

- ▶ Determining the characteristics of the Reaction Turbine, including the relationships of:
 - volume flow rate
 - head
 - torque produced
 - power output
 - efficiency to rotational speed

Software screen shot



Software

The ArmSOFT software enables the operator to control the pump speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Requirements

Scale



- ▶ FM6X
- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Technical specifications

Maximum power:	25W
Maximum speed:	8,000rpm
Maximum torque:	0.12Nm
Pressure Sensor:	0 to 100psi
Inlet nozzle:	10mm

Two year warranty on this product

Overall dimensions

Length	0.56m
Width	0.18m
Height	0.29m

Packed and crated shipping specifications

Volume	0.20m ³
Gross weight	20kg

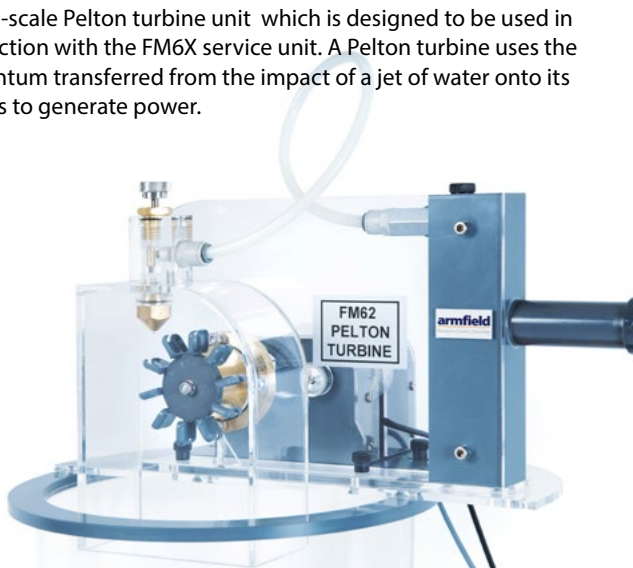
Ordering specification

- ▶ Small scale hydropower unit designed to demonstrate the operating principles of a reaction turbine
- ▶ Horizontal shaft and transparent guarding enable excellent visibility
- ▶ Mounts on a dedicated service unit
- ▶ Connects to a PC via the service unit and a USB interface device
- ▶ Software compatible with Windows XP through to Windows 10

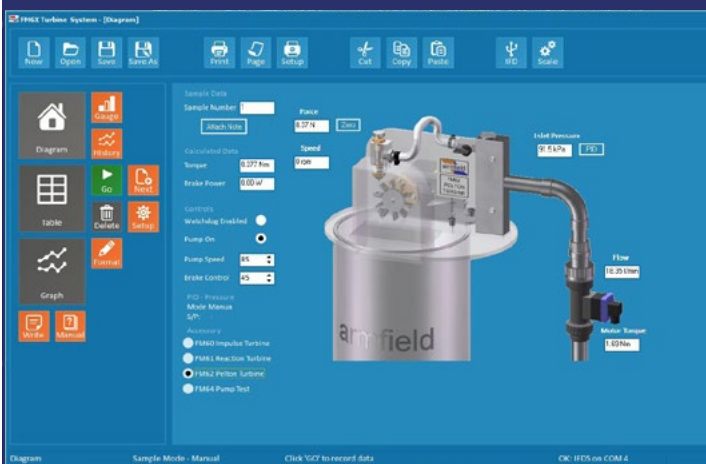
Ordering codes

- ▶ FM61
- ▶ FM6X
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

A small-scale Pelton turbine unit which is designed to be used in conjunction with the FM6X service unit. A Pelton turbine uses the momentum transferred from the impact of a jet of water onto its buckets to generate power.



Software screen shot



Technical specifications

Maximum power:	35W
Maximum speed:	7,000rpm
Maximum torque:	0.15Nm
Buckets:	10
Bucket dimensions:	21X16.5mm
Spears Nozzle Diameter:	5mm
<i>Two year warranty on this product</i>	

Overall dimensions

Length	0.52m
Width	0.14m
Height	0.33m

Packed and crated shipping specifications

Volume	0.20m ³
Gross weight	20kg

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Pelton Turbine – FM62

Description

The FM62 consists of an inlet manifold which supplies water to a spear valve that allows users to vary the jet cross section while maintaining the water velocity.

The runner itself is mounted in a clear acrylic enclosure to allow maximum visibility of the workings.

The unit incorporates a pressure sensor to measure the inlet condition of the water. This pressure can be accurately controlled using the software supplied with the service unit

Demonstration capabilities

- ▶ Determining the characteristics of the Pelton Turbine, including the relationships of:
 - volume flow rate
 - head
 - torque produced
 - power output
 - efficiency to rotational speed
- ▶ Comparison of throttle control and spear valve control of a Pelton turbine

Software

The ArmSOFT software enables the operator to control the pump speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Requirements

Scale



- ▶ FM6X
- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Ordering specification

- ▶ Small-scale hydropower unit designed to demonstrate the operating principles of a Pelton turbine
- ▶ Transparent guarding enables excellent visibility of the Pelton wheel operation
- ▶ Mounts on a dedicated service unit
- ▶ Connects to a PC via the service unit and a USB interface device
- ▶ Software compatible with Windows XP through to Windows 10

Ordering codes

- ▶ FM62
- ▶ FM6X
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

Issue: 2

URL: <http://www.armfield.co.uk/fm>

Applications



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Pump Test Accessory – FM64

The FM64 consists of a return tube incorporating a gate valve which can be attached to the pump outlet on the FM6X service unit. The unit incorporates a pressure sensor to measure the inlet condition of the water.



Demonstration capabilities

- ▶ Determination of characteristic performance curves for a peripheral pump, including:
 - constant speed
 - head/flow
 - efficiency curves

Software

The ArmSOFT software enables the operator to control the pump speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Technical specifications

Maximum flow:	50 l/min
Maximum head:	55m
Pipe Diameter:	1 inch
Pressure Sensor:	0 to 100psi
<i>Two year warranty on this product</i>	

Overall dimensions

Length	0.50m
Width	0.14m
Height	0.23m

Packed and crated shipping specifications

Volume	0.10m ³
Gross weight	10kg

Requirements



Scale



- ▶ FM6X
- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Ordering specification

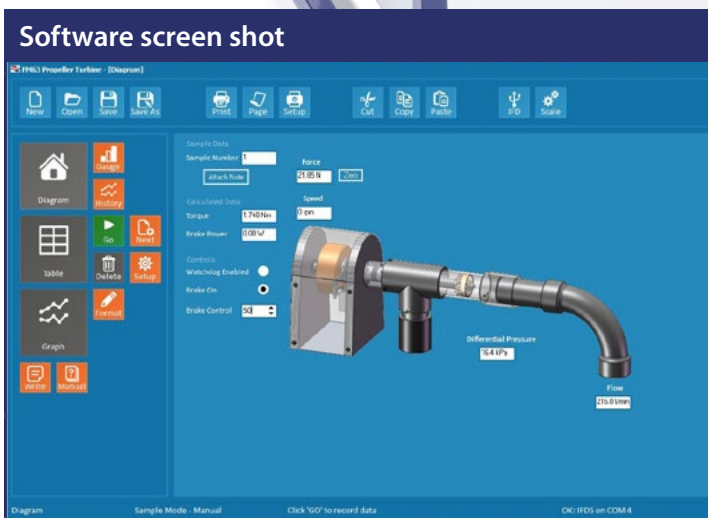
- ▶ Compact accessory to enable investigation of pump performance
- ▶ Mounts on a dedicated service unit
- ▶ Links to a PC via the service unit and a USB interface console

Ordering codes

- ▶ FM64
- ▶ FM6X
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

A self contained, small-scale propeller turbine unit. This fixed blade, axial flow turbine may be considered as the prototype form of a propeller turbine, itself a forerunner of the Kaplan turbine.

**METAL FRAMEWORK WITH TRANSPARENT TEST SECTION FOR OBSERVATION
CONTROL AND DATA LOGGING VIA PC
SIMPLE USB CONNECTIVITY**



Description

The FM63 consists of a framework base which houses a large water reservoir and a circulating pump.

A stainless steel top supports the turbine itself and a dynamometer assembly. The propeller itself is housed in a clear acrylic pipe to enable maximum visibility of the workings.

The unit incorporates a paddle wheel type flow meter and a pressure sensor to measure the inlet condition of the water.

The dynamometer module incorporates a magnetic type brake which applies load to the turbine. The level of braking is controlled directly from the software.

A load cell measures the braking force, hence the power and an optical sensor measures the rotational speed of the turbine.

Demonstration capabilities

- ▶ Determining the characteristics of the propeller turbine, including the relationships of:
 - volume flow rate
 - head
 - torque produced
 - power output
 - efficiency to rotational speed

Armfield IFD7
Interface Unit



Requirements

Scale



- ▶ Armfield IFD7
- ▶ Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)

Technical specifications

Maximum power:	55W
Maximum speed:	8,500rpm
Maximum torque:	0.60Nm
Head:	14m
Flow rate:	4.4l/s distributor
8 guide vanes, @ 45°:	External diameter 50mm
9 guide vanes, @ 40°:	External diameter 50mm
Submersible pump with motor nominal power:	55W
Tank:	Approx. 75l
Measuring ranges	
- temperature:	0 to 100°C
- pressure (at turbine inlet):	-100 to 100 kPa
- pressure (at turbine outlet):	-100 to 100 kPa

Overall dimensions

Length	0.91m
Width	0.66m
Height	1.12m
Packed and crated shipping specifications	
Volume	1.40m ³
Gross weight	160kg

Software

The ArmSOFT software enables the operator to control the pump speed 0 to 100%. Feedback from the sensors is then displayed in real time for the end user with simultaneous data logging.

The data trend is also displayed graphically in real time and can be exported to another platform such as Excel for further analysis.

Essential accessories / equipment

- ▶ Armfield IFD7

Ordering specification

- ▶ Self-contained, small-scale hydropower unit designed to demonstrate the operating principles of a propeller turbine
- ▶ 75l water reservoir
- ▶ Circulating pump which produces 14m head at 4.4 l/s
- ▶ Loaded by a magnetic brake unit which is controlled direct from the PC
- ▶ Links to a PC via a USB interface
- ▶ Electronic sensors monitor process variables

Ordering codes

- ▶ FM63-A: 220-240V / 1Ph / 50Hz
- ▶ FM63-B: 120V / 1Ph / 60Hz
- ▶ FM63-G: 220-240V / 1Ph / 60Hz
- ▶ IFD7-A: 220-240V / 1Ph / 50Hz
- ▶ IFD7-G: 220-240V / 1Ph / 60Hz

Armfield standard warranty applies with this product

Knowledge base

- > 28 years' expertise in research & development technology
- > 50 years' providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

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