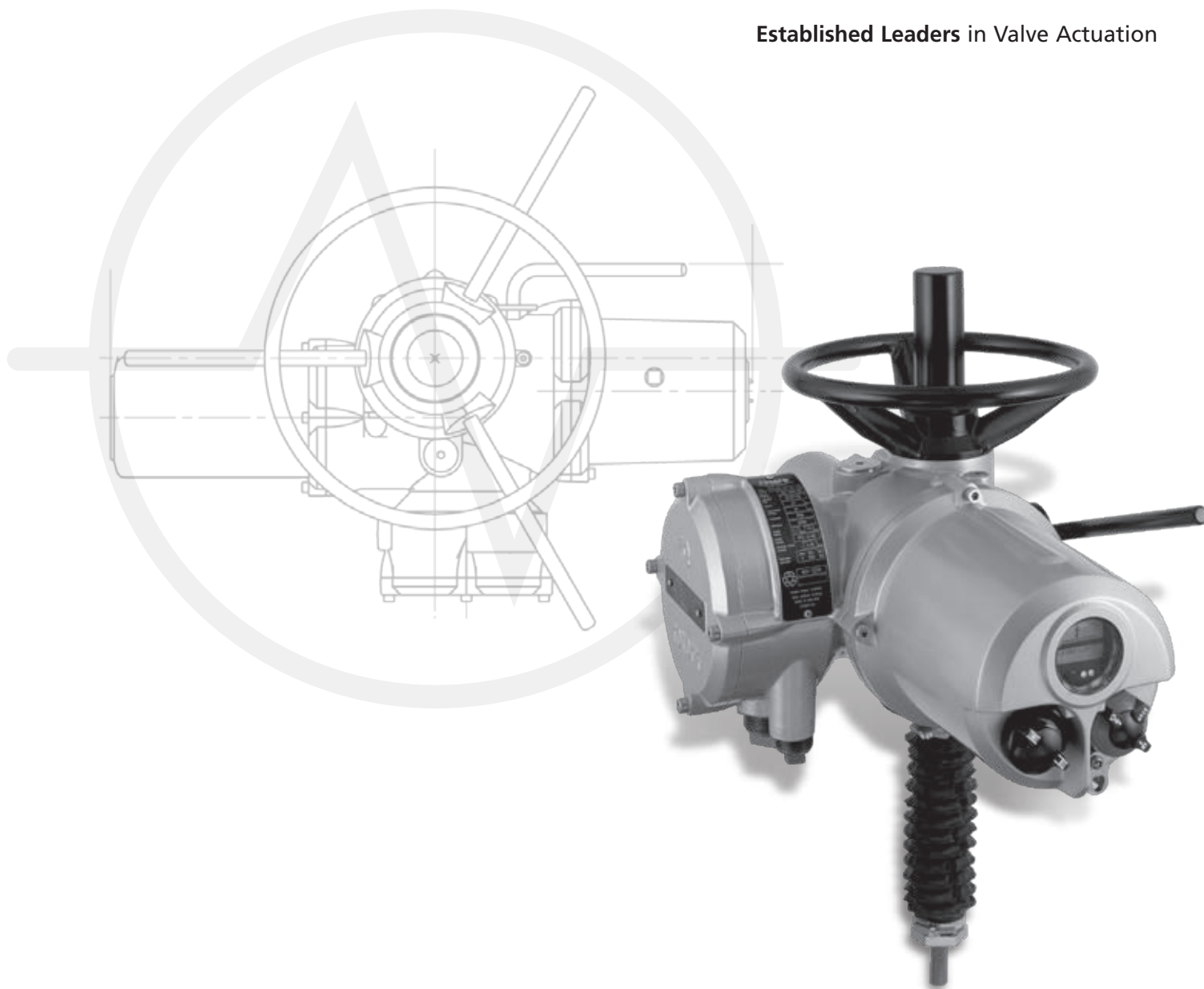


Electric Actuators and Control Systems

rotork® Controls

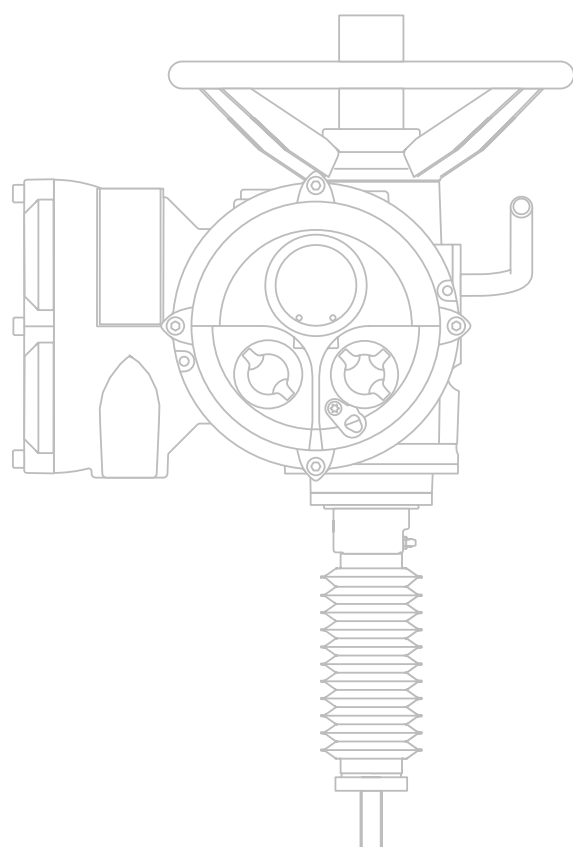
Established Leaders in Valve Actuation



IQM & IQML Range

Control and Monitoring Facilities

Publication E121E Issue 03/09



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Rotork actuators have been in use all around the world for over 50 years. In this time Rotork has grown to become the leader in the valve automation industry. With manufacturing, service centres, offices and representatives throughout the world, Rotork is able to offer global service solutions to your company.

In the 50 years since the company was founded, Rotork has become a byword for excellence in the field of valve, sluice gate and damper actuation products for the oil, gas, power, water and waste treatment industries - worldwide.

We owe our success to an uncompromising focus on quality at every stage - and at every level - of Rotork's operations.

From initial site survey, specification and design, through to materials, manufacturing and testing, installation, commissioning and after-sales service we accept nothing but the best.

At the heart of the company is an exceptional workforce - the highly trained, forward-thinking engineers, technicians and support staff who each have a crucial role to play in maintaining Rotork's unrivalled reputation for innovation, reliability and first class customer support.

The Rotork family of products also includes pneumatic, hydraulic and electro-hydraulic actuators as well as a comprehensive range of gearboxes and valve accessories. Rotork's bespoke Pakscan digital control system offers market leading features whilst all our actuators offer the ability to interface with other digital control systems.

Rotork. Established leaders in valve actuation technology.

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Controls

rotork®
Fluid Systems

rotork®
Gears

rotork®
Site Services

IQ Pro - the first valve actuator you can commission and interrogate without removing electrical covers. With the infra-red **IQ Setting Tool Pro** and PC based **IQ-Insight**, commissioning and analysis of **IQ Pro** actuators is simple, fast and convenient.

IQ Insight –Actuator configuration and analysis tool for PC.

IQ-Insight PC software allows all IQ set-up configuration and datalogger information to be reviewed, analysed and reconfigured. The visually interactive application is a stand-alone program running under Microsoft Windows 2000™ or XP™ operating systems. Intuitive and clear menus make analysing data from an IQ simple and fast.

Data Logging & Configuration

Every IQ includes an on board data logger. The data logger captures and stores valve, actuator and control signal operation and status data and can be viewed using IQ Insight. Log data is time and date stamped and can be analysed by playing back on an event by event basis.

In addition, actuator set-up configuration can be viewed and stored using IQ Insight for complete actuator asset management or future upload/replication of other units.

Features:

- Actuator configuration.
- Valve torque profile - open/closed instantaneous and average torque against valve position.
- Virtual nameplate.
- Number of operations.
- Control option card configuration.
- Valve and actuator position starts log.
- Operation signal log.
- Actuator control status log.
- Operational statistics.

New Setting Tool Pro

Configuration and datalogger files can be extracted from the actuator located in the field using the **Setting Tool Pro** for transfer to office based PC. The Tool is watertight and intrinsically safe so can be used in wet and/or hazardous areas. Data upload/download is non-intrusive via IrDA™. The tool can store up to 10 configuration files or 4 datalogger files (which includes unit configuration file).

If required, a PC running IQ-Insight with a USB IrDA™ dongle can be directly connected to an actuator to allow set-up, adjustment and analysis. Alternatively, a PDA running IQ Pocket-Insight, may be used.

For more information refer to publication E117E available at www.rotork.com.

Setting Tool Specification

Waterproof IP67, Certified EEx ia IIC T4 (intrinsically safe).

Power Supply 2x AA 1.5 V Batteries (supplied & fitted).

Operating range 0.75 m from actuator display window.

Setting Tool(s) are dispatched with each order. Setting Tools are suitable for use with any IQ or IQT range actuator.

For more information on Setting Tool and commissioning, refer to publication E170-3E.



IQM - Standard Facilities

Specification

The type IQM actuator specification is generally as described in Publication No. E110E having a solid state reversing starter in place of the electro-mechanical contactors, suitably rated 4-pole winding, low inertia motor and with the "hammerblow" backlash omitted from the output gear train.

All other standard and optional IQ actuator features are available with IQM modulating actuators subject to the following:

3 phase Supply Voltage

Maximum 480 volts, 50/60 Hz.

Apply for higher voltages up to 575 volts.

Minimum voltage for the size IQM30 is 380 volts, 50/60 Hz.

Performance

The actuators are suitable for up to 1,200 starts per hour with a duty in accordance with IEC 34-1 to S4 50%. See E110E for temperature rating.

Solid State Starter

The actuator design incorporates a solid state starter to achieve an increased design life. Five pairs of 1,600 volt thyristors switch all three phases of the incoming power supply. Thyristors are considered to be more suitable than triacs for reversing applications and have a higher resistance to transients in the power supply.

The design also includes snubbing and transient protection circuits.

Dynamic Braking

The facility for dynamic braking is included as standard with the ability to select this function by fitting an electrical link at the actuator terminal block.

Positional Accuracy

Repeatability with pulse control is 0.1 output turns.

Power Fuse

It is essential that the power supply for each actuator is protected by suitably rated high speed fuses mounted at the power distribution panel.

The required fuse characteristics are as follows:

	IQM10 to IQM20	IQM25 and IQM35
Rated current	10 A	20 A
Pre-arcing	1 ¹ t 5.4 A ² s	1 ¹ t 30 A ² s
Total	1 ¹ t 55 A ² s	1 ¹ T 250 A ² s
Rated voltage	660 V (IEC)	660 V (IEC)
Suggested fuse	Ferraz G330010	Ferraz K330013

Circuit Diagram

Standard IQM actuators are in accordance with wiring diagram 5000-000 as shown on page 8.

Control

Opto-isolators are used to interface the actuator's internal logic circuits with the remote controls. The basic circuits permit various control facilities to be selected whether internally or externally fed. As standard the actuators are designed for positive switching remote control from digital signals. Various control functions may be configured on site at the time of commissioning using the Rotork IQ Setting Tool. In the absence of specific instructions, actuators will be dispatched with the control functions configured as shown on the diagram on page 8.

Pulse Control

Where pulse control is used the minimum pulse length should be 18 ms and the minimum time between pulses should be 500 ms. Typical duration of motor energisation in response to each minimum pulse control signal in the same direction will be between 20 and 30 ms. Where special units designed for use with AC remote control supplies are required, the minimum pulse length should be 300 ms.

Remote Control Power Supplies

Remote controls may be powered by the internally derived 24 VDC power supply. Alternatively remote controls may be powered by an external supply of 24 VDC. The appropriate connections are shown on page 8. Please apply if suitability for other remote control supplies is required.

Local Controls

The actuator is provided with Open, Close and Stop facilities and Local/ Remote selection, Local, Open and

Close control is configurable to either self-maintained or push-to-run.

External Interlocks

Facilities are provided for the connection of external contacts to inhibit Open and/or Close valve operation.

Remote Positioning and Monitoring Indication

Four latching, volt free, single pole contacts, S1, S2, S3 and S4 are provided, each one independently configurable using IQ Setting Tool. Refer to Extra Indication contacts for configurable function list. See page 5.

Each contact can be configured to either "normally open" or "normally closed". Contacts are rated at 5 mA to 5 A, 120 VAC, 30 VDC.

Unless otherwise specified S contacts will be configured as follows:

- S1 - contact makes at fully Closed
- S2 - contact makes at fully Open
- S3 - contact breaks at fully Closed
- S4 - contact breaks at fully Open

Protection

The motor is protected against single phasing or incorrect phase rotation by the Rotork patented, Syncrophase circuit and against overheating by the thermostat in the motor winding. Opto-isolators provide protection against high voltage transients for the interface with the remote controls.

Emergency Shutdown (ESD)

The ESD facility may be configured for Open or Close operation with the option of by-passing the motor protection thermostat, using the IQ Setting Tool Pro.

Optional Facilities

The following optional facilities are available, and are covered by the appropriate alternative wiring diagrams as indicated in the wiring diagram number matrix on page 5.

Folomatic Controller

The Folomatic enables standard IQM actuators to control the position of a valve in proportion to an analogue current or voltage signal.

A voltage derived from the actuator position sensor is electronically compared with a voltage proportional to the input signal. The difference between them (error) triggers the open or close thyristor circuit, via logic circuits, to drive the actuator in the direction which will cancel the error. Valve position is therefore automatically adjusted in proportion to analogue signal. Unnecessarily frequent switching is prevented by the Motion Inhibit feature.

The Folomatic can be configured to suit the following:

Analogue signals/ input impedance:

0-5 mA/1 k Ω	0-5 V/1 M Ω
0-10 mA/500 Ω	0-10 V/78 k Ω
0-20 mA/250 Ω	0-20 V/52 k Ω

Position corresponding to low input signal:

Closed limit, or percentage Open or Open limit.

Position corresponding to high input signal:

Closed limit, or percentage Open or Open limit.

Deadband:

0-9.9% of travel between Open and Closed limit positions.

Motion Inhibit time:

2-99 secs. between actuator movements.

Action on loss of input signal:

Stay-put or move to high signal position or move to low signal position. Available for minimum set 'low' signal of 0.5 mA. Response on loss of signal will occur if signal falls below 50% of set 'low' signal.

Overall accuracy (actuator mechanical output position/ demand value):

0.5% of maximum signal with dynamic braking and minimum of 10 turns for full valve stroke, assuming a deadband setting of <0.2%.

Connections

The analogue signal should be connected to terminals 26 (+ve) and 27 (-ve). If no remote manual control is required, link terminals 39 to 5 and 41 to 4. Terminal 39 is provided for remote manual/auto selection.

The remote control connections for actuators to standard wiring diagrams are as follows:

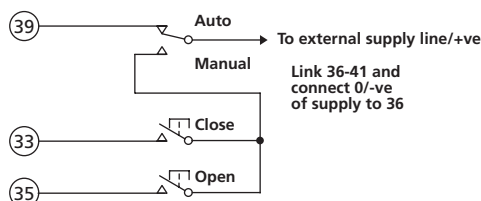


Fig 1a. Externally fed remote controls

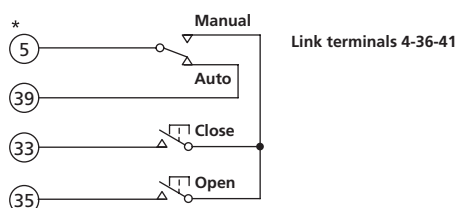


Fig 1b. Internally fed remote controls

Current Position Transmitter (CPT)

The CPT provides an internally powered electrically isolated 4-20 mA analogue valve position feedback signal, which is available at terminals 22 (+ve) and 23 (-ve). The maximum external impedance that may be connected to the signal is 500 ohms. Repeatability is within $\pm 1\%$ and linearity $\pm 2.5\%$ of total valve travel.

Extra Indication Contacts

The extra indication contacts option provides four additional changeover contacts, S5, S6, S7 and S8. Each contact is latching, volt free and rated at 5 mA to 5 A, 120 VAC, 30 VDC. The extra indication contact functions are independently configurable in the same way as the standard contacts using the IQ Setting Tool Pro. The indication contact functions are shown below:

- **Valve Position**
Fully open, fully closed or intermediate positions (0-99% open).
- **Status**
Valve opening, closing, moving (continuous or pulsing signal), local stop selected, local selected, remote selected, open or close interlock active, ESD active.
- **Valve Alarms**
Motor tripped on torque in mid travel, motor tripped on torque going open, going closed, valve jammed, actuator being operated by hand wheel.
- **Actuator Alarms**
Lost phase, customer 24 VDC supply lost, battery low, actuator alarm, thermostat tripped.

The following optional facilities available on standard IQPro actuators are also available on IQM units.

Negative Switching
(see publication E120E)

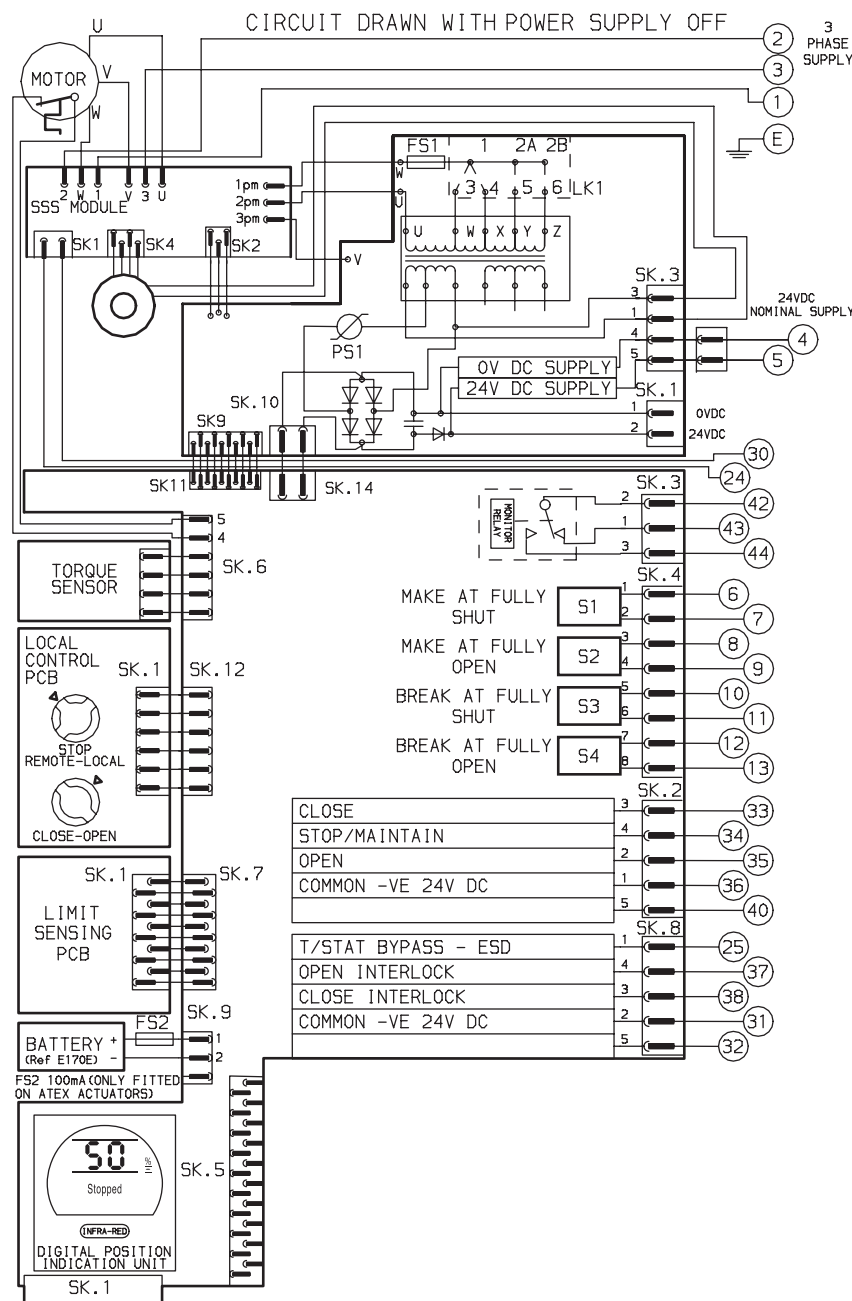
Interrupter Timer
(see publication E120E)

Pakscan
(see publication S000E)

IQM - Actuator Control Circuits

Basic IQM Actuator Wiring Diagram 5000-000

Positive switching remote controls. Refer to Rotork for non-standard voltage option. Circuit is drawn with power supply off.



Transformer Tapping Options

Type 1

TAP	NOM 50/60 HZ	50 HZ	60 HZ
W	220/230	176-242	198-259
X	380/400	304-418	342-446
Y	415/420	332-457	374-487
Z	440/460	352-484	396-517

Fuse FS1 - 250 mA Anti-Surge

Type 2

TAP	NOM 50/60 HZ	50 HZ	60 HZ
W	346/380	285-388	321-419
X	480/500	406-552	432-564
Y	240/240	192-261	216-282
Z*	550/575	445-605	501-654

Fuse FS1 250 mA Anti-Surge

Note: *150 mA Anti-Surge

The actuator must be protected using suitably rated high speed semi-conductor fuses on the incoming supply.

Suggested fuses:

IQ10-20: 10 Amp Ferraz G330010

IQ25-35: 20 Amp Ferraz K330013

All transformer types - PS1 Self resetting fuse

Note: Where customers wish to have the thermostat by-passed during emergency shutdown operation, it should be noted that any actuator hazardous enclosure certification will be invalidated while the thermostat is by-passed.

Max external load on terminals 4&5 to be 5 W.

For typical remote control indicating, monitoring and alarm circuits see page 8 and wiring diagram RWS500, available at www.rotork.com.

Control signal threshold voltages to be minimum 'ON' 20 V AC/DC maximum 'OFF'= 3 V. Minimum control signal duration to be 100 mS.

Current drawn from each remote control signal is 5 mA on 24 VDC.

Wires are identified at each end by terminal No. or tag No.

Indication contacts S1-S4 are shown in their default configuration. Contacts may be configured for any of the functions described in E170-3E.

IQM - Optional Features

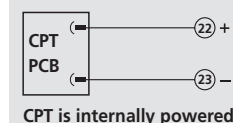


Standard Actuator Diagrams

The typical remote control interlock and monitoring circuits illustrated are applicable to actuators with the following standard Rotork wiring diagrams.

		Extra Indication Contacts	Folomatic control Unit	Extra Indication Contacts and Folomatic
		Shown in default configuration. Configurations can be changed using the IQ Setting Tool to indicate various valve and alarm settings. Contacts are shown in not true state.		Terminal numbers as for individual options
Basic	5000-000	5100-000	5000-100	5100-100
Current Position Transmitter (CPT)	5010-000	5110-000	5010-100	5110-100

Current Position Transmitter (CPT)



IQ Setting Tool Pro

The IQ Setting Tool *Pro* makes it possible to read and set all the actuator functions, such as valve travel and torque or travel limit control, without removing any covers. The IQ Setting Tool *Pro* transmits signals to an infra-red receiver built into the actuator.

The IQ Setting Tool *Pro* has a 'programming' mode which enables the valve manufacturer to configure the actuator to suit his valve and the site commissioning engineer to configure the actuator for a variety of different control functions. The IQ Setting Tool also has a 'checking' mode which enables all the existing actuator settings to be interrogated. Protection against unauthorised changes to setting is provided by a 'password'.

Configuration

The following actuator functions are configured by the IQ Setting Tool *Pro*:

- Direction of actuator output rotation for closing the valve.
- Selection of torque or turns limitation for valve opening and closing travel.
- Torque setting for Open and Close valve operation.
- Setting of actuator output turns to suit the valve travel.
- "Open/close" remote control signal priority.
- Selection of function and contact mode for each of the four standard indication contacts.
- Valve to Open or Close with ESD signal.
- External interlock facility.

The standard configuration for the IQM actuator is given on page 8.

In addition, the IQ Setting Tool *Pro* will enable configuration of the following optional assemblies when fitted to the actuator:

- CPT - selection of open or closed valve position corresponding to a maximum signal.
- Pakscan - address, baud rate and protocol.
- Folomatic - signal range, increasing signal is to correspond to opening or closing of the valve, action on loss of signal, amount of deadband and the motion inhibit time delay.

Publication E170-3E, supplied with each actuator gives full instructions for the operation of the IQ Setting Tool *Pro*.

IQM - Remote Digital Control Circuits

The infra red setting tool enables various different remote controls to be configured. Unless specified requirements are stated with the order, actuators will be supplied configured as follows:

- Maintained local control
- Clockwise to close
- Thermostat enabled during ESD
- Open and closed interlocks disabled

The typical remote control circuits shown below apply to these unless otherwise stated.

Max. external load on 24 VDC supply from actuator terminals 4-5 to be 5 W.

Form A

Open/close push to run control (local control remains self maintained).

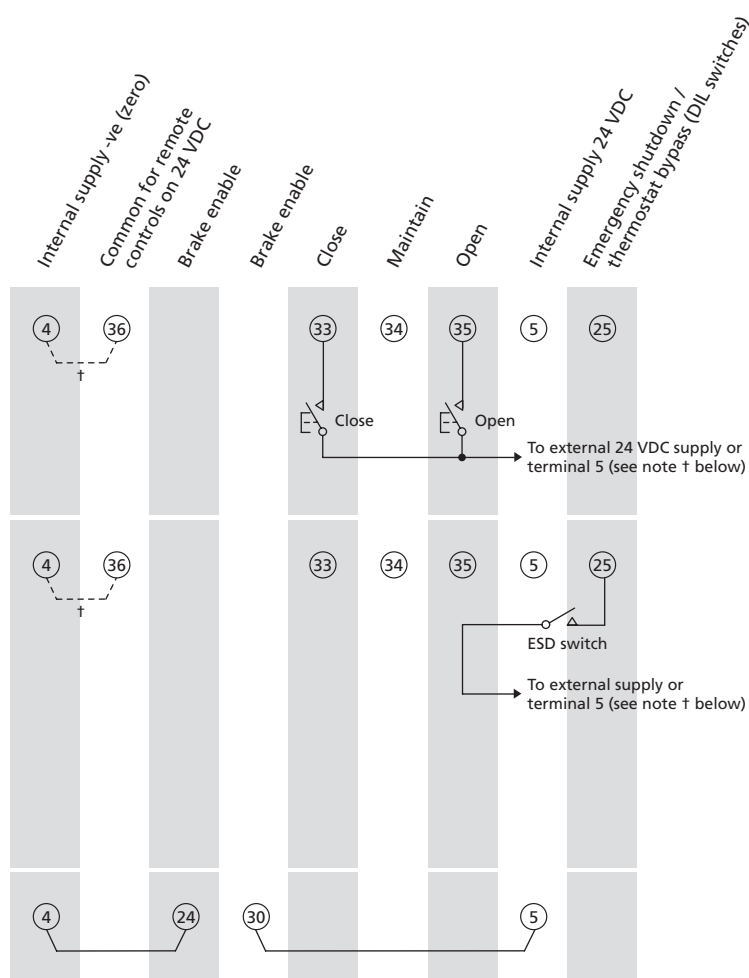
Form F

Emergency shut-down to close valve overriding thermostat (actuator hazardous enclosure certification is invalidated while thermostat overridden) and any existing signal may be added to any of the circuits above.

Actuators may be configured so that thermostat is by-passed during ESD operation.

To override external interlocks on ESD additional remote contacts must be provided.

Brake enable connections



† Note

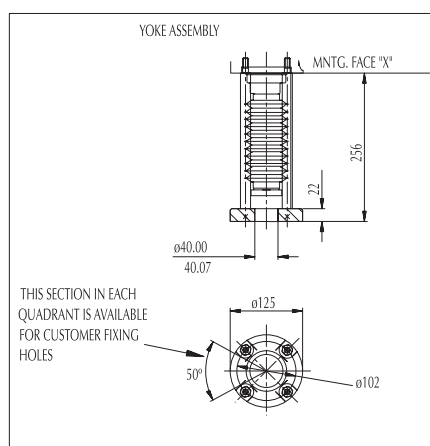
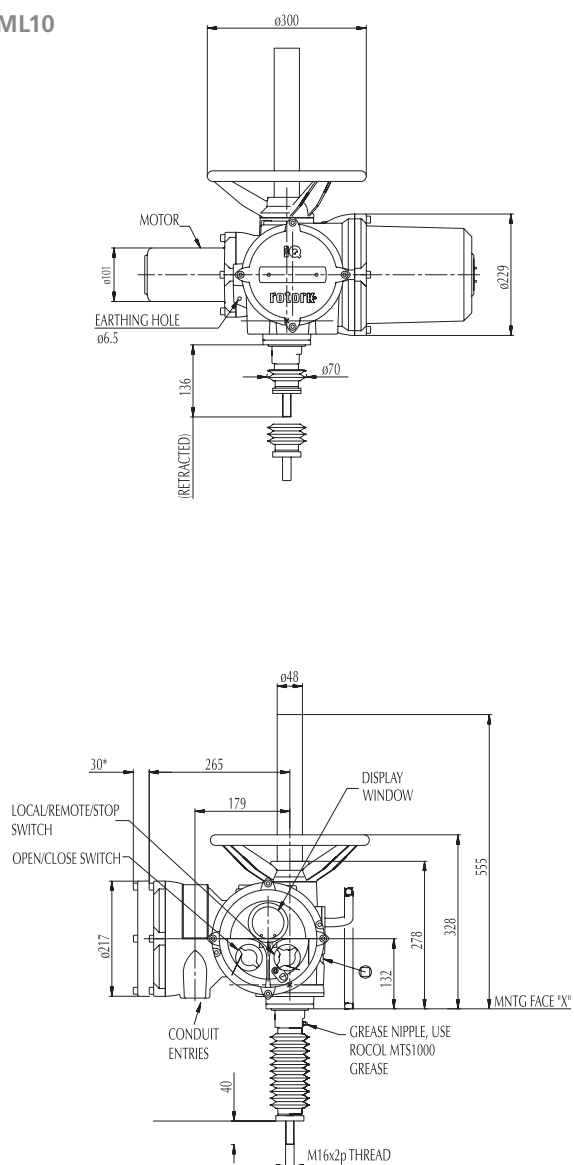
Remote controls may be fed from the internal 24 VDC supply at terminal 5 when terminals 4-36 must be linked, or from an external supply when the zero/-ve of the supply should be connected to terminal 36.

Terminals 4-36 also to be linked for form A and F control.

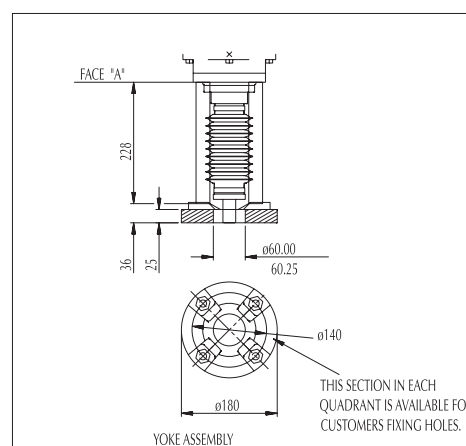
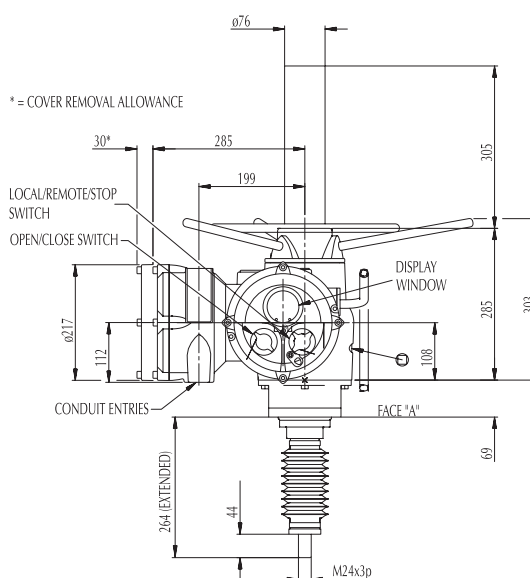
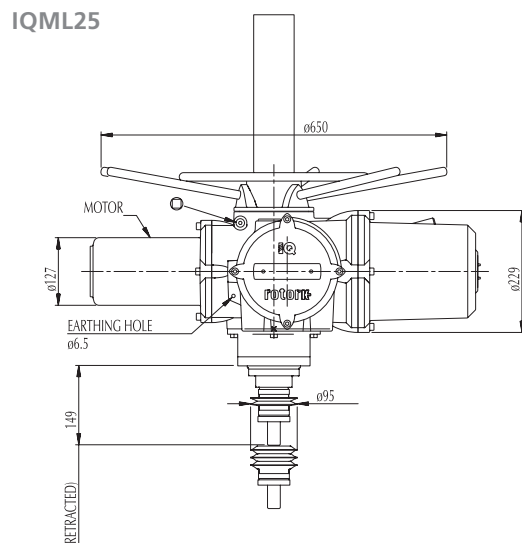
The input to the IQ series actuator logic circuits associated with the remote controls may be used with cable capacitance of up to 2 µF between cores.

IQML10 to IQML25 Actuator Dimensions

IQML10



IQML25









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As part of a process of on-going product development, Rotork reserves the right to amend and change specifications without prior notice. Published data may be subject to change.

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