



IQT *Pro* Range



Intelligent Quarter-turn
Electric Valve Actuators

Redefining Flow Control

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Rotork is the global market leader in valve automation and flow control. Our products and services are helping organisations around the world to improve efficiency, assure safety and protect the environment.

We strive always for technical excellence, innovation and the highest quality standards in everything we do. As a result, our people and products remain at the forefront of flow control technology.

Uncompromising reliability is a feature of our entire product range, from our flagship electric actuator range through to our pneumatic, hydraulic and electro-hydraulic actuators, as well as instruments, gearboxes and valve accessories.

Rotork is committed to providing first class support to each client throughout the whole life of their plant, from initial site surveys to installation, maintenance, audits and repair. From our network of national and international offices, our engineers work around the clock to maintain our position of trust.

Rotork. Redefining flow control.

Product Overview

This brochure provides a comprehensive overview of the applications and associated functions available with the Rotork IQT *Pro* actuator range.

The IQT quarter-turn actuator was launched in 2004, encompassing all of the intelligent features of the Rotork IQ actuator in a direct quarter-turn actuator.

IQT *Pro* builds upon previous developments, featuring multilingual text displays that can be uploaded without restriction (other than translation) and currently includes Spanish, German, French, Chinese (Mandarin), and Russian. Downloadable actuator configuration and data log files (using the supplied non-intrusive, intrinsically safe Rotork Setting Tool *Pro*) allow valve & actuator performance monitoring and comprehensive asset management, using the free Windows™ operating system application IQ-Insight.

The Rotork IQT *Pro* delivers a complete range of actuators suitable for all quarter-turn valve applications requiring control and indication flexibility. It offers end users ever higher standards of performance, build quality and overall value.

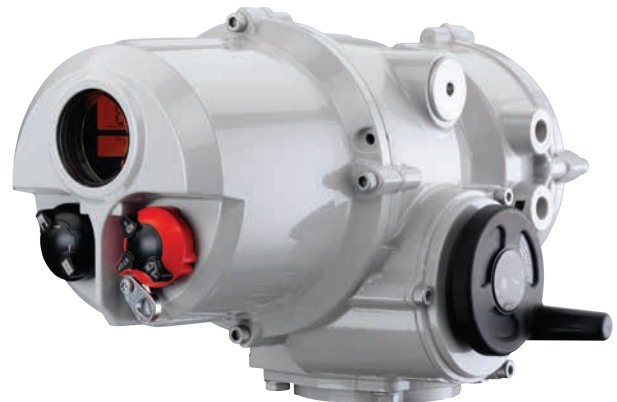


Simple Commissioning

The Rotork IQT *Pro* provides simple, safe and rapid non-intrusive commissioning with infrared control. Actuator settings such as torque levels, position limits, control and indication functions can be accessed and adjusted using the supplied “point and shoot” Setting Tool *Pro*. This intrinsically safe (IS) tool is unique to Rotork and allows for non-intrusive actuator set-up in any environment, power on or off.

Simple Troubleshooting

The large digital position display clearly indicates real time valve position from a distance. In addition to this, active valve, control, actuator status and alarm text messages are displayed on the easy to read back-lit display. Using the Setting Tool *Pro* real-time torque against position profiles and actuator configuration can be accessed during commissioning, adjustment or local valve performance monitoring. The onboard data logger records operational, alarm and valve torque profile data providing valuable information on valve and plant operating performance and conditions.



IQT Quarter-Turn Actuators



The IQT (IQ quarter-turn) is the result of ongoing commitment to product development at the cutting edge of new technology.

The IQT *Pro* is a direct drive, quarter-turn actuator with simple commissioning and troubleshooting – offering not only the highest standards in comprehensive control, but also access to real time diagnostics and comprehensive bus compatibility.

- Direct drive quarter-turn
- Three-phase, direct current and single-phase actuators
- Multilingual text display for status and setup
- On-board data logger included as standard
- IrDA™ compatible for local and remote actuator analysis via InSight PC software
- Clear, user friendly controls and indication
- Simplified torque and position control for increased reliability
- Comprehensive control and flexibility
- Approved for use in SIL application.

IQT

IQT *Pro* actuators are direct drive quarter-turn electric actuators which can be used for isolation or regulating duties of up to 60 starts per hour. IQT *Pro* actuators are watertight or watertight and explosionproof depending upon specification.

Torque output from 50 Nm (37 lbf.ft) to 2,000 Nm (1,476 lbf.ft).

IQT Fail Safe

The IQT Failsafe actuator provides valve failsafe operation by utilising power from an internal battery during AC supply mains failure. Under normal supply conditions the actuator operates from the site's AC electrical supply. On loss of this supply the actuator automatically switches over to receive power from a 24 VDC supply allowing control of the valve to the failsafe position.

For detailed information see PUB002-014.

IQTM

The modulating version of the IQT has solid state motor switching and includes fast response remote control circuits for rapid response to control signals. The IQTM is suitable for up to 1,200 starts per hour.

IQTF

The IQTF provides extended output rotation for part turn valve types requiring more than 90° for operation. Typical valves include 180° and 270° diverter valves and multiport manifolds requiring bi-directional 360° operation. The IQTF actuator has a low output speed for increased positional accuracy.

The IQTF may also be utilised for low turn, multi-turn applications where slow operation is required.

For detailed information see PUB002-006.

IQTN

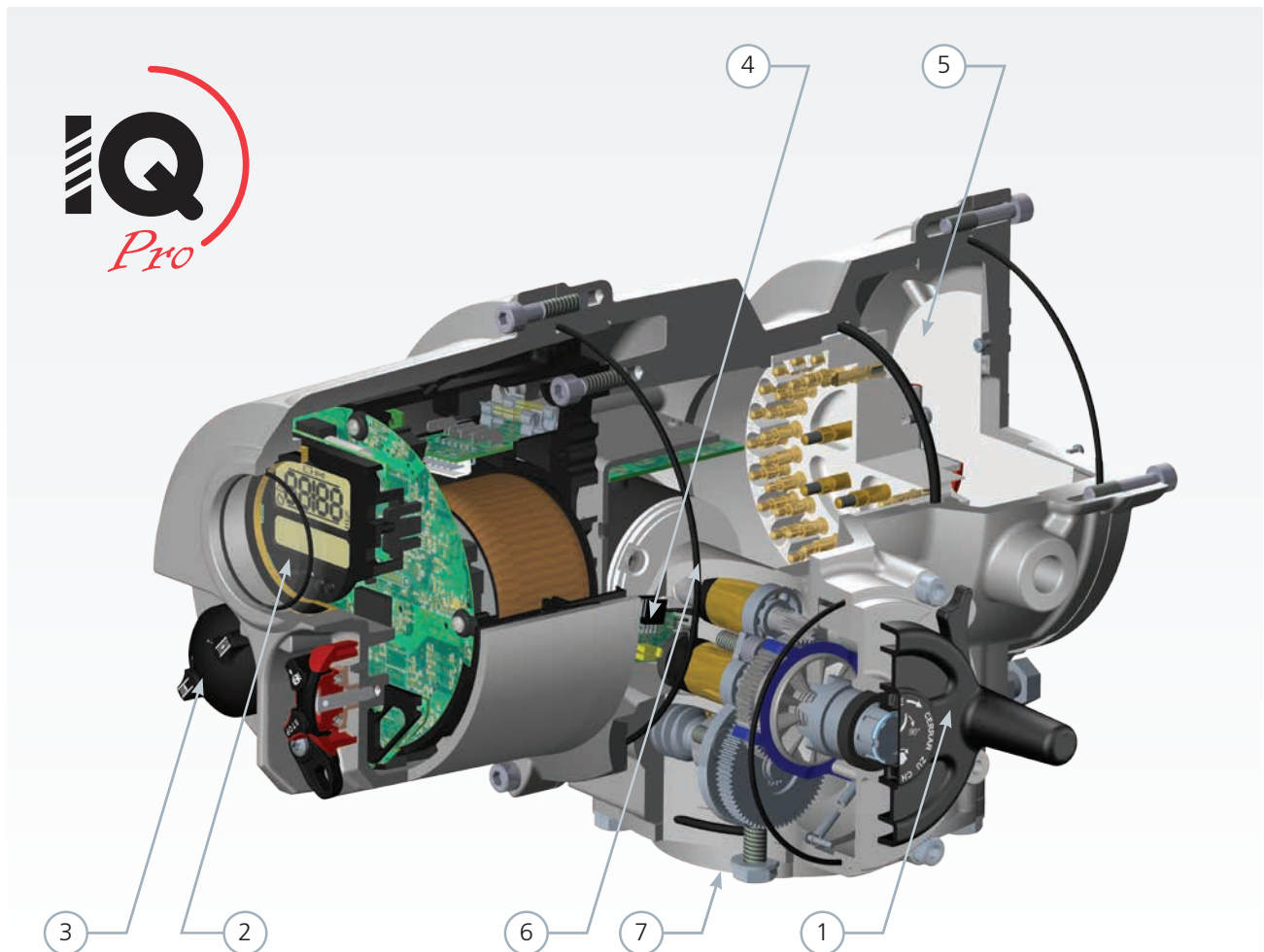
The IQTN has been developed to meet the specialist demands of nautical & military applications within a standard package.

Retaining all the features of the IQT *Pro* the IQTN has a shorter electronics cover for confined on-board spaces and an anti-shock base.

For detailed information see PUB002-012.

Special Designs

With our extensive product range and engineering knowledge Rotork can provide solutions for all applications.



1 Hand operation

A geared handwheel provides reliable emergency manual operation in the event of a power supply failure. Includes padlockable* hand/auto clutch for safe operation even when the motor is running.

Note: power operation always has preference unless hand/auto lever is purposely locked into 'hand drive'. Lost motion 'hammerblow' effect is provided.

2 Non intrusive setting

All actuator settings and diagnostics are made through the sealed indication window using IrDA™ communication. It is not necessary to remove electrical covers which would expose the integral controls to the plant environment.

3 Local controls

Local controls and padlockable* Local/Stop/Remote selector switch operate internal reed switches, avoiding penetrating shafts which would have to be sealed to prevent moisture ingress.

4 Position control

The 'Hall effect' magnetic pulse system accurately measures and logs the position of the actuator without using gears and switches.

5 Terminal compartment

A separately sealed terminal compartment ensures the integrity of the electrical equipment even when the terminal cover is removed during on-site wiring.

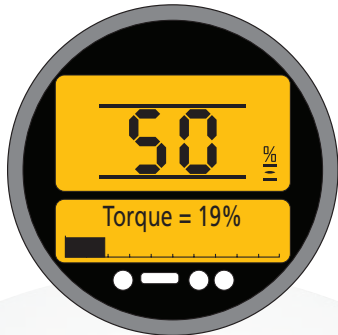
6 IQT motor

This is a high efficiency compact unit with a proven reliability record in valve actuation applications over 20 years. Integrated speed control allows output speed adjustment over a 4:1 speed range.

*Minimum 6 mm / ¼ inch padlock

Pro Features

Pro



Torque and Position Monitoring



Realtime Monitoring



Actuator Alarms



IQT *Pro* combines existing proven Rotork IQT features with additional control and indication functions, improved user interface design, performance monitoring and datalogging - including valve torque signature profiles. This means unparalleled support in achieving reliable valve actuation.

Founded on over 15 years of operational experience, the IQT *Pro* control system combines proven control logic with field programmable technology, thus providing increased functionality and reliability. IQT *Pro* control logic can be upgraded over the IrDA™ interface – this will “future proof” valve operation against control system and actuator developments and upgrades.

In combination with the new non-intrusive, intrinsically safe Rotork Setting Tool *Pro*, IQT *Pro* actuator set-up and datalogger files can be transported from the field to the office for storage and analysis.

IQT *Pro* offer a range of powerful features unparalleled in Valve Actuation:

- Field upgradeable control system
- Larger, clearer display
- Customer configurable, multilingual text capability
- Datalogger valve torque signature profiling
- Status & monitoring diagnostics
- Retrofittable to previous IQT range actuators (post 2000)
- Improved data download speed x10

Setting Tool *Pro* features include:

- Non-intrusive, Infrared communication
- Intrinsically safe for use in hazardous areas
- On site actuator configuration and data download
- Data transfer from actuator to PC with free Rotork Insight software
- Capacity for 10 configuration and 4 datalogger files
- Multiple configuration capability

Note: Setting Tool *Pro* data transfer capability is compatible only with IQT actuators supplied since 2004.

Pro Features

Actuator display

IQT *Pro* incorporates a unique liquid crystal display developed specifically for actuator indication. The unique, diffused LED backlighting system has a top section which indicates valve position and is operational over the full operating temperature range of the actuator. Large segments with backlighting allow clear visibility of valve position in all light conditions.

The lower section shows real time valve, control and actuator status, torque and alarm messaging during operation. Using the Setting Tool *Pro* changes the display from position mode to set-up mode, allowing the user to view, adjust and change actuator settings.

The LCD display is supplemented with green, yellow and red position indication lights.

The display together with the control cover can be rotated through 90° increments to suit valve orientation and access.

Indication back up

Rotork recognise the need for local and remote position indication at all times, even when the actuator is powered down. The IQT *Pro* incorporates a battery to maintain and update position indication when the main power is switched off. The battery also supports data logging and commissioning whilst power is off.

Set-up

Infrared set up, adjustment and review using the supplied, intrinsically safe Setting Tool *Pro* gives users access to the configuration of the actuator.

Help screens

Eight help screens can be accessed with the Setting Tool *Pro* allowing real time, grouped analysis of control signal status, valve and actuator status and indication status.

Valve torque indication

Valve torque against position can be displayed in real time with a single setting tool keystroke. Trip levels set for torque switches can be checked and adjusted based on the actual valve operating torque requirements. This results in a more realistic and accurate set up, therefore reducing the need for future “snagging”. Problems such as valve tight-spots, seating and breakout forces can be assessed immediately in the field.

SIL and high integrity control systems

IQT *Pro* SIL option is available for Safety Instrumented Systems (SIS) requiring a defined Safety Integrity Level 1, 2 or 3*. The TÜV™ certified IQT *Pro* SIL option provides dual redundancy for control operation making safety function “Stay-put” available. For more information refer to section 2 - Specifications.

For applications requiring higher integrity but not SIL defined, standard IQT *Pro* can be configured for conditional control.

* SIL3 applications may be met using a 1oo2 actuator configuration

In this mode, operation depends on two discrete signals being applied. As an example of a close valve command, by applying a signal to the remote close input and close conditional input simultaneously the actuator will operate and close the valve. If only one signal is applied, or a signal is lost, the actuators will stayput. For applications requiring ESD, the dedicated ESD input is available with a higher priority over local or remote control signals. This will therefore override any existing or applied control signal while it is applied.

Asset Management - Data logging

IQT *Pro* allows complete actuator configuration and build information to be downloaded and saved to PC. It also includes a data logger that captures and stores valve, actuator and control system status information in non-volatile memory, including:

- **Valve torque profile** - open/closed instantaneous and average torque profiles plotted against valve stroke. Reference profiles stored during commissioning can be compared to in-service torque profiles for valve performance analysis.
- **Starts log** – open/closed start positions plotted against valve stroke. Allows process control valve operation.
- **Statistics** – number of operations, highest recorded torque, last limit switch operation, battery run time, battery voltage.
- **Monitor log** – Control system, actuator and indication event log. Can be replayed and filtered for events of interest such as “torque trip”. The last 1024 events are stored and stamped with date and time.

Using the IQT *Pro* IrDA™ interface, datalogger files can be downloaded to the setting tool or PDA running freeware IQ Pocket Insight for uploading to PC. IQ Insight PC based software is described in detail on page 10.



Design Features – Reliability

Valve jammed protection

The actuator faces its severest operating test during unseating of the valve, when operating forces are at their highest or where an infrequently operated valve can get stuck. IQT *Pro* has the intelligence to systematically cope with these demands, ensuring reliable valve operation together with valve and actuator protection.

The IQT *Pro* recognises the valve is jammed and stops operation within seconds preventing further valve damage or motor burn out.

IQT thermostatic protection

Two thermostats are embedded within the motor power module providing comprehensive motor and motor power module protection.

Auto self test and diagnosis (ASTD)

Vital operational circuits automatically self test to ensure correct operation. In the unlikely event that a fault is diagnosed, the information is automatically presented using the display text. At the same time, actuator operation can be inhibited to enable on-site investigation.



Instant reversal protection

When an actuator is ordered to reverse direction, 'instantaneously' an automatic time-delay circuit avoids the shock loads which may cause unnecessary wear to valve stems and gearboxes. The delay also limits current surges through the contactor.

* IQT 3-phase only.



Design Features – Protection



Protection - the key

Vast experience in the application of electric actuators has enabled Rotork to set the global standard in actuator ingress protection. Actuators have to perform unfailingly in environments ranging from desert to tundra, offshore to underground, where flooding, humidity, extremes of heat and cold, ultra violet and corrosive atmospheres are the norm. Rotork understands that the most important factor in the reliability of an actuator is protection from the environment - in simple terms, the enclosure.

Double-sealed for double protection

The IQT *Pro* enclosure is rated IP68 - 7 metres for 72 hours, NEMA type 4/4X/6. It is completely watertight and dusttight and does not "breathe". The Rotork 'Double-Seal' system ensures protection of internal components, separating them from the cable gland and terminal compartment by a watertight terminal block. Protection is maintained during site installation when terminal covers are removed and is independent of cable gland sealing.

Non-intrusive - sealed for life

IQT *Pro* covers need not be removed for site commissioning. All settings and adjustments are made using the supplied infrared Setting Tool *Pro*, including speed setting for the IQT *Pro*. After assembly in the controlled environment of our manufacturing facilities, air exchanges are eliminated - all internal components are completely protected for life. Non-intrusive control selectors mean there are no moving shafts penetrating the control enclosure.

Reliability through simplicity

The IQT *Pro* combines simplicity of design while extending specification and performance.

Torque measurement

An actuator's ability to reliably and accurately determine the force applied in operating a valve is fundamental to providing good valve and actuator protection. The IQT *Pro* range uses tried and tested technology, proven in industry. Accurate, repeatable torque measurement is achieved independent of variations in frequency, voltage and temperature.

Position measurement

Reliable process control depends on accurate positioning of the valve throughout travel. The non-contacting position measuring system is the most simple design devised for actuator control to date. With only one moving part, the resolver converts output centre column rotation into an electronic signal, which is then compared to position limits stored within a safe, non volatile memory.

IQT speed control

By use of motor control technology proven in the AQ range over 20 years, the output speed of the IQT *Pro* can be adjusted without affecting the torque output.

Design Features – Intelligent Communication

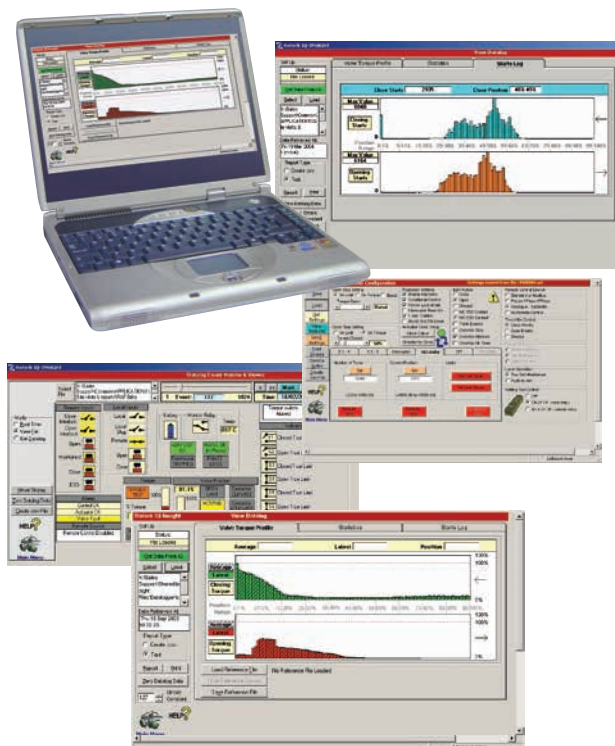
Lifetime support

Rotork understands its customer's need for back up support. The costs and penalties of plant downtime, delayed commissioning schedules and inappropriate maintenance are too high to allow for inefficient support.

With IQT - IrDA™ (Infrared Data Association) communication and the onboard datalogger, the IQT *Pro* now offers unrivalled support to provide complete product back up with analysis and configuration. With Rotork's unrivalled worldwide service, network expert advice is always close to hand.

Remote diagnosis - IrDA™

The IQT *Pro* utilises IrDA™ communication for fast, safe, non-intrusive and standardised data exchange. Actuator set-up configuration can be analysed and, if required, changed. As every IQT *Pro* includes an onboard data logger, operational data such as valve torque profiles, actuator events and statistics can be downloaded for detailed investigation. Data logger information can also be relayed to a user site base via an IrDA™ compatible PDA. After analysis, any changes to the actuator set-up configuration can be relayed back to the actuator.



PC tools - IQ-Insight - Pocket-Insight

IQ-Insight PC software is a graphical user interface allowing all IQT *Pro* set-up configuration and data logger information to be reviewed, analysed and reconfigured. This visually interactive application is browser based, running under Microsoft or other internet browser systems.

Intuitive controls make analysing the data from an IQT *Pro* simple and fast. Laptop PCs with IrDA™ interface running IQ-Insight can be directly connected to an actuator located in the field to allow set-up, adjustment and analysis.

Alternatively, data can be uploaded from the actuator and later downloaded to a PC by using a PDA running IQ Pocket-Insight freeware.

Rotork help - online

Rotork has a comprehensive worldwide service network to provide you with local support wherever you are. Rotork trained technicians working from our network of offices and centres of excellence are available to offer immediate assistance.

To contact Rotork, visit www.rotork.com



Design Features – Customising

Although Rotork's standard *IQT Pro* actuator offers wide ranging control and indication flexibility, a variety of features can be customised to individual customer requirements. *IQT Pro* provides direct operation of small to medium sized quarter-turn valves up to 2,000 Nm.

IQT Pro actuators can also be fitted with part-turn worm and wheel gearboxes to provide increased torque at reduced speeds for the operation of part-turn valves. A sizing program for both part-turn and multi-turn applications is available on the rotork website www.rotork.com

IQTF (full-turn) actuators

For non-thrust, multi-turn, slow speed applications, the IQTF provides a reliable solution with the same general specification as the *IQT* range.

For further details please contact Rotork.

Fireproofing and extreme cold

Fully operational at temperatures of up to +70 °C, the standard *IQT Pro* range actuator can operate for up to thirty minutes in a fire (when temperatures may quickly climb to over 1,000 °C)* through the use of boxes, blankets or intumescent coating, as specified by the customer.

With modifications the *IQT Pro* range actuator can also operate in temperatures as low as -50 °C.

**For further details see PUB000-004.*

Floor mounting for easy remote coupling

Floor stands with upward or downward stubshafts are available for coupling to remote valves via customer shafts and universal joints.

Linear output drive assemblies

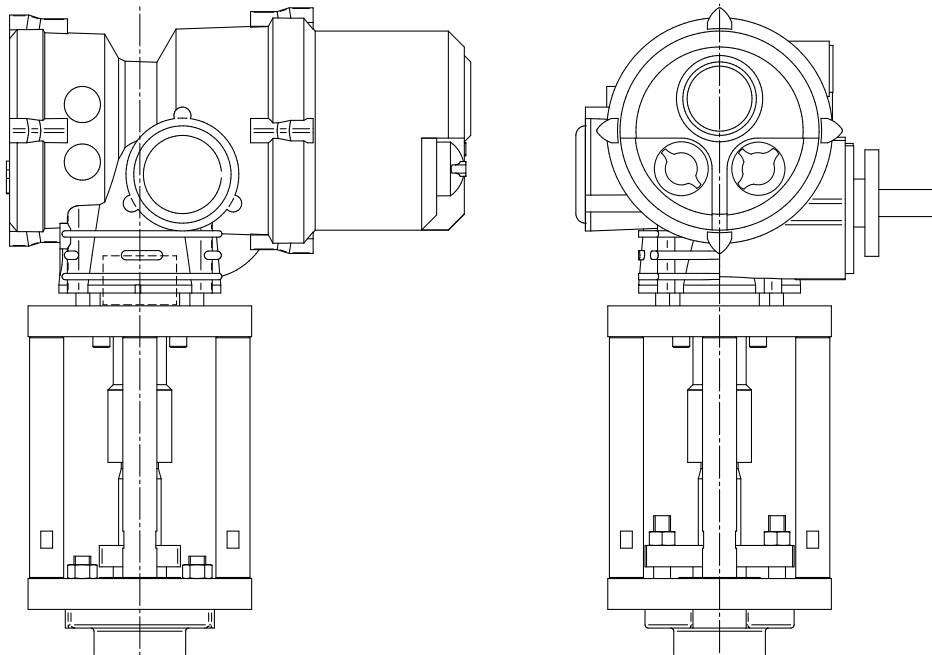
For applications requiring an actuator with a linear output, a leadscrew arrangement can be fitted to the base of an *IQTF Pro* actuator.

Damper actuators

Single blade and multi vane dampers can be motorised either by direct connection to the damper spindle or by lever arm.

Rotork Site Services division

Rotork Site Services, the projects, service and retrofit division - established in 2006 - is an illustration of Rotork innovation in practice. Throughout the company's history, aftermarket services such as retrofit and maintenance have developed to support customers and reinforce Rotork's market leading position. As a result, in some countries Rotork is now the number one service supplier for valve actuation. Contact Rotork for detailed information on Rotork Site Services.



Network Connectivity

Integration of the plant controls by use of network connectivity has been a hallmark of Rotork actuator products for many years. The use of proprietary and open systems makes the commissioning of the plant and the subsequent control and monitoring a simple and reliable task.

All Rotork actuators are compatible with a wide range of communication and process controls systems by including the appropriate option card during manufacture of the actuator. The actuator reports status feedback, via the field highway, to the overall plant control system (DCS or PLC) and valve control commands are actioned.

Our own Pakscan system compliments the open systems from Foundation Fieldbus®, Profibus®, Modbus and DeviceNet® see page 13 for more details. Innovative technology together with expert bus system knowledge ensures that Rotork can always provide the ideal solution for the control system.

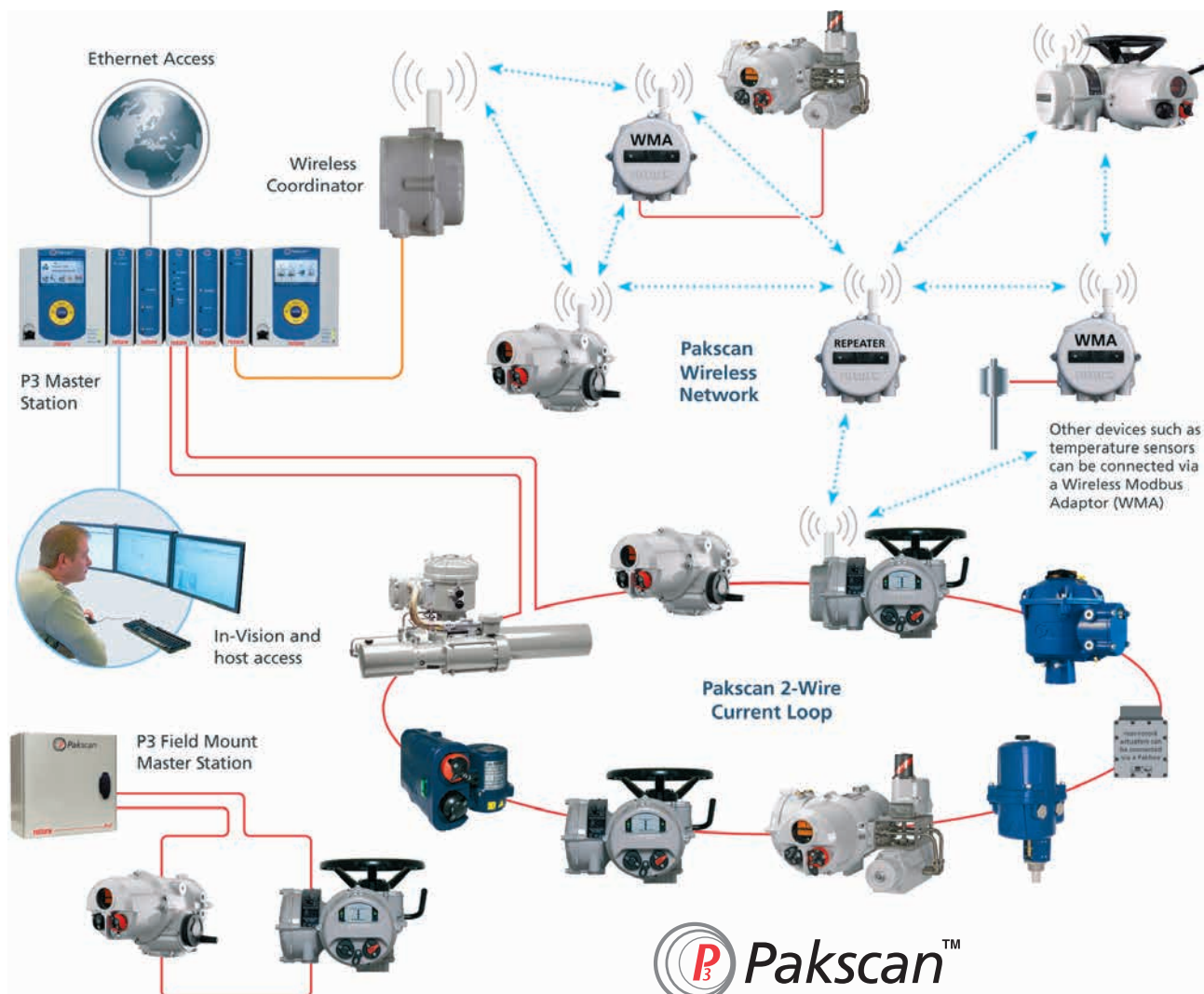
Rotork Pakscan - the total control solution

Whether you need remote control of a few motorised valves, or full automation of a complex plant, Pakscan can help you to achieve significant savings in both time and costs.

Pakscan allows the remote control of actuators and valves over a simple single twisted pair data highway, removing the need for heavy multicore cables. It also includes automatic inbuilt redundancy of the field network to ensure control will be maintained even in the event of equipment or cable failure.

Available as a single or hot standby master station variant, Pakscan has the ability to control up to 240 actuators, and other field devices, using secure field communications. The field data highway cable may be up to 20 km in length so even quite distant valves can easily be incorporated into the network, without the need for repeaters.

Simple to install and simple to use, the highly successful Pakscan system has proved its value on many varied sites with over 70,000 Pakscan actuators installed worldwide.



 **Pakscan™**

Pakscan Wired and Wireless Network

Multiple Bus Connectivity

In addition to being fully compatible with Rotork Pakscan, IQT *Pro* actuators can be specified to interface seamlessly to many other fieldbus digital control systems. Open fieldbus protocols, such as Profibus®, Foundation Fieldbus®, DeviceNet® and Modbus, are all available within the IQT actuator control option range.

This is achieved simply and cost effectively through fitting an appropriate Rotork manufactured circuit board module inside the actuator's electrical housing, normally at the time of production. Module commissioning and setup is carried out using a combination of the Setting Tool *Pro* and the network commissioning tools used for the chosen protocol.

Profibus®



Profibus is a leading international network protocol for high speed data communications in industrial automation and control. The Rotork Profibus DP interface card provides comprehensive control and feedback data about the valve and actuator using DP-V0 cyclic communications whilst extended actuator diagnostics and configuration is included in the DP-V1 acyclic data supported by this module.

EDD and DTM files allow the Rotork device to be incorporated into asset management systems giving access to performance critical parameters, whilst the independently certified GSD file guarantees device interoperability. Rotork provide an optional switch disconnect module allowing for ease of installation and have multiple configuration options within the GSD file to enable a choice of data collection.

- RS485 Profibus DP V0 and V1 compliant.
- Single and Dual Redundant options.
- Fully meets IEC61158-3 standard.
- Profibus PNO certified.
- Supports speeds up to 1.5 Mbit/s.

Foundation Fieldbus®



Foundation Fieldbus has become widely accepted for use in process control systems. Its primary feature is the ability to distribute control away from the central DCS. The Rotork Foundation Fieldbus interface card connects directly onto the standard Foundation H1 bus system. The function blocks embedded in the module cover the control and monitoring of the valve and actuator.

Using the certified Device Description files the FF card is simple and easy to use. The ability to report extensive actuator feedback within a single input block as well as system diagnostic information makes Rotork the first choice for use with a Foundation Fieldbus system.

- Foundation ITK inter-operability certified.
- Fully compliant with IEC61158-2 standard.

- Includes Link Master and LAS capability.
- Independent HIST approval by major DCS vendors.
- Full H1 Field capability.

Modbus

Modbus

Modbus remains the most popular process communication protocol in use today with the widest acceptance and highest number of applied systems of any automation protocol. Rotork's Modbus interface card allows actuators to be connected to a 2-wire RS485 network for direct communication to a PLC or DCS using Modbus RTU protocol. The resulting network is able to monitor and control the connected actuator.

As the Modbus protocol is so simple the system engineer has full control over the data flow on the highway and the information to be collected and controls implemented.

There are no complications with device description files or special programming tools required when setting up a Modbus system.

- RS485 2-wire RTU communication.
- International open standard.
- Single and Dual redundant options.
- Integral Repeater modules included where necessary.
- Up to 115 kbps.

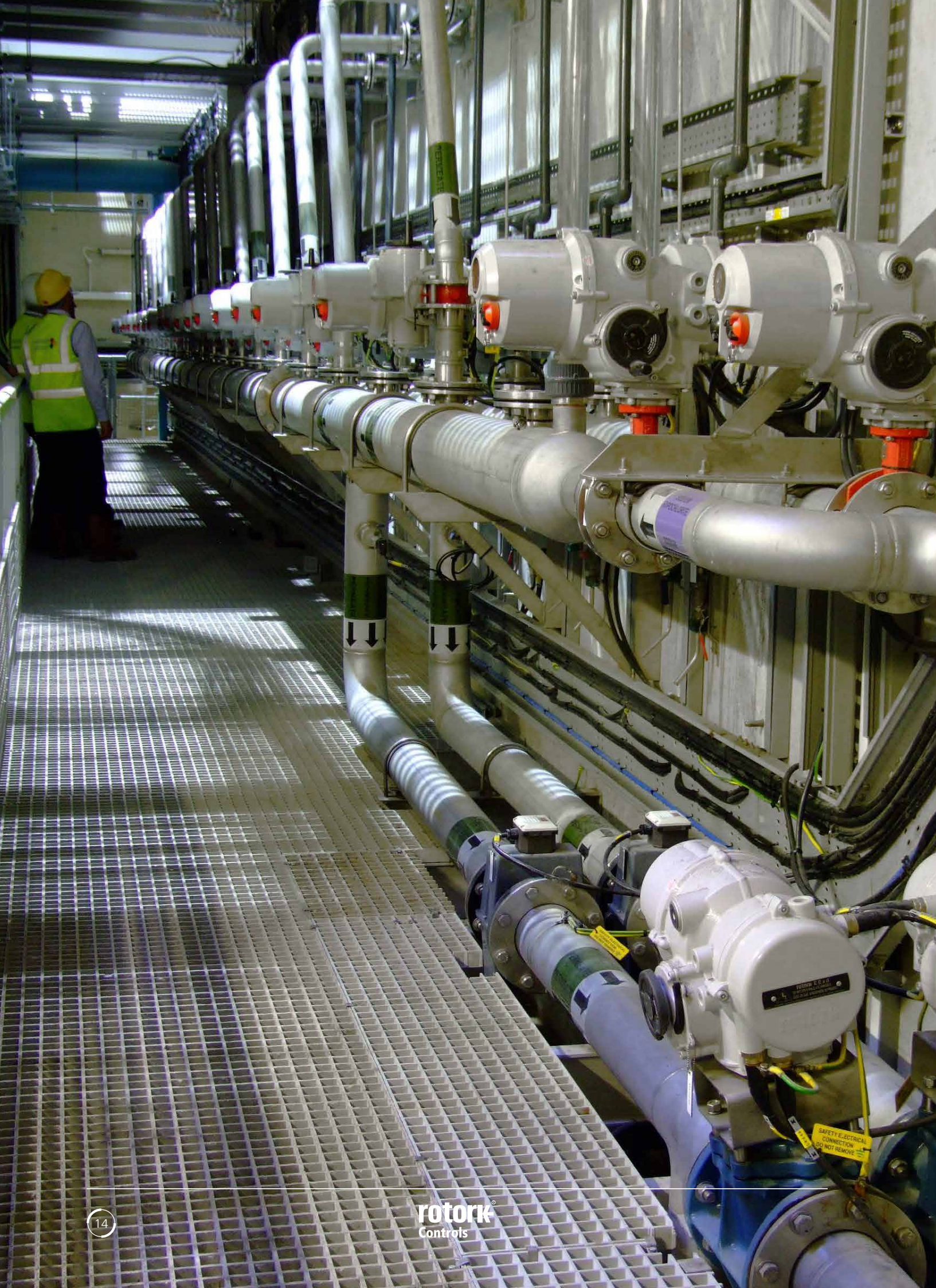
DeviceNet®



DeviceNet is an Open Network Standard for communication networks using the main features of CAN bus in an industrial environment. The Rotork DeviceNet interface module provides easy access to actuator process control and feedback information. The Electronic Data Sheet description file is used to set up the actuator parameters to allow the systems performance to be optimised,

In addition to the standard actuator torque and position feedback a further analogue input is included as standard enabling integration of external analogue equipment onto the network. The Rotork module has been certified by the Open DeviceNet Vendor Association to ensure its interoperability with other devices.

- Up to 63 devices on each network.
- 4-wire cable, 2 for signal, 2 for power.
- Trunk and Drop line permitted.
- ODVA certified to ensure compatibility.
- EDS electronic device description file.

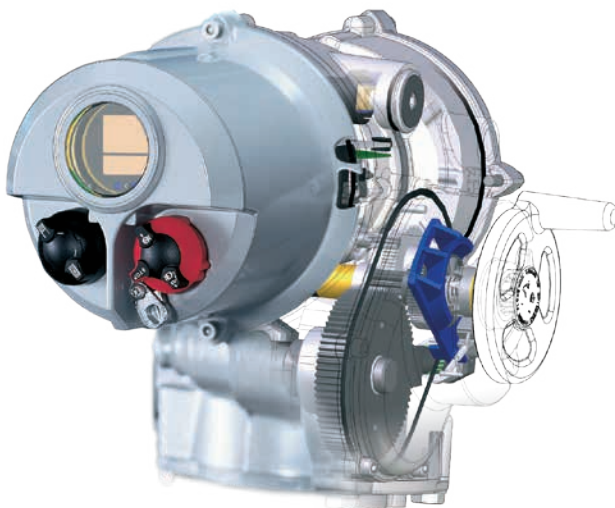


Actuator Specification

The following pages contain details on performance and specification for the Rotork IQT range of actuators.

Please use the following contents table to help access the information you require.

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IQT Quarter-Turn Performance Summary

1 Performance Summaries

Actuator	IQT125	IQT250	IQT500	IQT1000	IQT2000
Torque					
Max Nm	125	250	500	1,000	2,000
Min Nm	50	100	200	400	800
Max lbs.ft	92	185	369	738	1,476
Min lbs.ft	37	74	148	295	590
Operating time					
90° Min	5	8	15	30	60
90° Max	20	30	60	120	120
Flange					
ISO 5211	F05* F07* F10	F07* F10	F10	F12 F14*	F14
MSS SP-101	FA05* FA07* FA10	FA07* FA10	FA10	FA12 FA14*	FA14
Weight					
Kg	22	22	22	37	37
lbs	49	49	49	82	82
Couplings**					
Spindle acceptance					
Bore & key max mm	22 28 42	28 42	42	60	60
Bore & key max ins	0.87 1.1 1.65	1.1 1.65	1.65	2.36	2.36
Square AF max mm	14 19 32	19 32	32	41	41
Square AF max ins	0.56 0.75 1.25	0.75 1.25	1.25	1.62	1.62
Handwheel					
Turns for 90°	80	80	80	80	80
Angular adjustment					
(nominal) degrees	80 - 100	80 - 100	80 - 100	80 - 100	80 - 100

IQT 24 VDC (17-37 Volts) Performance

Torque outputs for 24 VDC are the same as above, however speed varies with load.

* Optional output flanges F05, FA05, F07 and FA07 use a base adapter plate or different base for F14/FA14. Required base type must be specified.

** Couplings are supplied blank for machining by valve maker.

IQTM Performance Summary

Performance Data

	Torque						Operating Time 90° Max
	Max Nm	Modulating Nm	Min Nm	Max lbf.ft	Modulating lbf.ft	Min lbf.ft	
IQTM125	125	62.5	50	92	46	37	20
IQTM250	250	125	100	185	92.5	74	30
IQTM500	500	250	200	369	184.5	148	60
IQTM1000	1,000	500	400	738	369	295	120
IQTM2000	2,000	1,000	800	1,476	738	590	120



Actuator Drive Couplings

2 Actuator Drive Couplings

For convenient valve adaption the easily removable drive bush is supplied blank for machining to suit valve stem. The IQT *Pro* base design and drive couplings comply with either ISO 5211 or MSS SP-101.

IQT Actuator Drive Couplings

Actuators:

IQT125 IQT250
IQT500



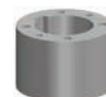
F05/FA05

for size
IQT125



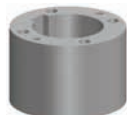
F07/FA07

for sizes
IQT125/250



F10/FA10

for sizes
IQT125/250/500



F12/FA12

for size
IQT1000



F14/FA14

for size
IQT2000

Actuators:

IQT1000 IQT2000



Standard specifications

3 Introduction

IQT *Pro* range actuators are self contained, purpose designed and built for the local and remote electrical operation of valves. Comprising an electric motor, reduction gearing, reversing starter with local controls and indication, turns and torque limitation with electronic logic controls and monitoring facilities housed in a double-sealed watertight enclosure. Hazardous area certified enclosures meeting international and national requirements are also available.

All torque, turns settings and configuration of the indication contacts are made using the non-intrusive, hand held, infrared Setting Tool *Pro* which is included with each order.

The specification detail in this section covers standard features and available optional features for the IQT *Pro* range. Enclosure requirements and build options selected must be specified with enquiry.

The selection guideline in section 4 allows specifiers to identify suitable actuator types for particular valve and process applications, checking actuator type against other specification requirements.

The example enquiry datasheet opposite provides an outline of the basic information required for quotation. Where there is a project, framework or job specification applicable, Rotork will be pleased to analyse it in detail, in which case only valve details are required. The applicable actuator specification detail paragraph number is listed under the reference column for information.

It is not necessary to specify the actuator type, size or speed – Rotork will provide the most cost effective solution based on the information provided.



Standard specifications

Page	Requirement	Options	Detail
21	Valve type	Part-turn	Ball/butterfly / plug – or other (specify)
22	Duty cycle	Isolating	Starts / hour
		Regulating	Starts / hour
		Modulating	Starts / hour
16	Operating time (IQTF only)	Sec	Turns (IQTF only)
16	Seating Torque	Nm	lbs.ft
16	Running torque (if known)	Nm	lbs.ft
27	Power supply	1-phase	___Volts ___Hz
		3-phase	___Volts ___Hz
		DC	___Volts DC
27	Failsafe	No	
		Self contained	
		UPS or Battery	
23	Enclosure	Non-hazardous	IP / Nema rating
		Hazardous	Standard
28	Local indication	Position display plus text display	Language required
30	Remote Control	Contacts	Actuator powered / Control system powered
		Analogue	4 to 20 mA other (specify)
		Digital bus-network	Type
30	Remote Indication	Volt free indication contacts	
		4 to 20 mA position indication	
		Digital bus-network	

Standard specifications

4 Valve Type – Actuator Selection Guideline

Valve types are defined by the action required by the actuator for operation – multi-turn, part-turn or linear. The table below provides a guide to the actuators available and is determined by valve type, operating torque and duty requirement.

Actual selection may vary to those indicated below due to factors such as available power supply, mechanical interface, thrust requirements etc. Rotork will always offer the correct technical solution at the lowest cost for any application.

Valve Type	Duty*	Torque Min (Nm/lbs.ft)	Torque Max (Nm/lbs.ft)	Actuator Type	Comments
Part-turn	On-Off & Inching	50/37	2,000/1,500	IQT	General 1/4 turn ball/ butterfly/damper
Part-turn	Modulating	40	2,000	IQTM	1/4 turn control valves ball, butterfly, damper

Standard specifications

5 Design Specification

5.1 Duty Rating

Duty Classification*	Actuator Type	Rating
On-Off & Inching	IQT / IQTF	Nominal 60 starts at a rate not exceeding 600 starts per hour. 15 minutes rated based on a nominal torque of 75% of rated
Modulating	IQTM	Nominal 1,200 starts per hour, 50% duty cycled based on a modulating torque of 50% of rated torque

5.2 Design Life

Duty Classification*	Actuator Type	Size	Minimum Design Life Rating
On-Off & Inching	IQT / IQTF	All sizes	Torque test: 25,000 cycles seating at rated torque, 70% rated torque through stroke
Modulating	IQTM	All sizes	1,800,000 starts at load of 70% rated torque (1 start constitutes at least 1° movement)

Design life is a function of actuator torque and speed. Values quoted are the minimum requirements; for most sizes/speeds life will be extended above the values quoted. Actuators are stalled against a solid object 25 times to prove durability. Contact Rotork for more information.

5.3 Vibration, Shock and Noise

Standard IQT *Pro* range actuators are suitable for applications where vibration and shock severity does not exceed the following:

Type	Level
Plant induced vibration	1g RMS total for all vibration within the frequency range of 10 to 1000 Hz
Shock	5g peak acceleration
Seismic	2g acceleration over a frequency range of 1 to 50 Hz if it is to operate during and after the event
Emitted noise	Independent tests have shown that at 1 m generated noise does not exceed 65 db(A)

Levels quoted are those present at the actuator mounting interface. It should be noted that the effects of vibration are cumulative and therefore an actuator subjected to significant levels may have a reduced lifespan. Where excessive plant induced vibration is anticipated, mounting the actuator remote from the valve and driving via extension shafting (incorporating vibration absorbing couplings) may provide a satisfactory solution.

Standard specifications

5.4 Valve / Actuator Interface

The IQT *Pro* range of actuators are available with mounting base and output drive couplings conforming to the following international standards:

Valve to actuator interface:

Valve type	Actuator Range	Area	Standard	Code
Part turn	IQT	International	ISO 5211	"F" metric
Part turn	IQT	USA	MSS SP-101	"FA" imperial

Applications for which the various types of couplings have been designed are outlined on pages 28/29.

5.5 Operating Temperature

Actuators are suitable for operation within the ambient temperature ranges shown below. Refer to Section 6 for Hazardous Area Certification operating temperature restrictions. For temperatures outside this range please contact Rotork. Prior to installation actuators should be stored in a dry location with a temperature range not exceeding -60 to 80 °C (-76 to 176 °F).

Actuator Type	Standard Temperature*	Low temperature option*
IQT / IQTM / IQTF	-30 to +70 °C (-22 to +158 °F)	-50 to +40 °C (-58 to +104 °F)

*Hazardous Area certification determines permissible operating temperature range. Refer to 6.

6 Non-Hazardous & Hazardous Certified Enclosures

All IQT *Pro* actuator hazardous and non-hazardous area enclosures are watertight to IP68/NEMA type 4 & 6. Through the use of non-intrusive commissioning and adjustment using the supplied infrared Setting Tool *Pro*, covers never need removing and therefore the hermetic, factory-sealed enclosure protects internal components for life. The terminal compartment is sealed from other areas by the Rotork double seal, maintaining watertight integrity even during site connection.

In addition, the Setting Tool *Pro* is certified intrinsically safe, permitting power-on commissioning in hazardous areas.

Actuators are available with the following enclosure types for which the ambient working temperature ranges are stated. Where option temperatures are indicated, changes to some actuator components are required and therefore the temperature requirement must be specified. Hazardous area approvals for other country standards are available; please contact Rotork.

Standard specifications

The IQT *Pro* range are available built in accordance with the following standards:

6.1 Non-Hazardous Area Enclosures

WT: Standard Watertight

Standard	Rating	Standard temperature	Option 1	Option 2
IEC 60529 (1989-11)	IP68 – 7 metres / 72 Hrs	-30 to +70 °C	-40 to +70 °C	-50 to +40 °C
BS EN 60529 (1992)	IP68 – 7 metres / 72 Hrs	-30 to +70 °C	-40 to +70 °C	-50 to +40 °C
NEMA (US)	Type 4 & 6	-22 to +158 °F	-40 to +158 °F	-58 to +104 °F
CSA (Canadian)	Type 4 & 4X	-22 to +158 °F	-40 to +158 °F	-58 to +104 °F
Applicable actuator ranges and temperature limitations	ALL	IQT failsafe -20 to +70 °C only (-4 to +158 °F)		

6.2 Hazardous Area Enclosures

European Hazardous Area Directive - ATEX

Directive Code	Enclosure Code	Standard temperature	Temperature Option 1	Temperature Option 2	Temperature Option 3
ATEX II 2GD	Exd IIB T4 Exd IIC T4	-20 to +70 °C (-4 to +158 °F)	-30 to +70 °C (-22 to +158 °F)	-40 to +70 °C (-40 to +158 °F)	-50 to +40 °C (-58 to +104 °F)
ATEX II 2GD	Exde IIB T4 Exde IIC T4	-20 to +70 °C (-4 to +158 °F)	-30 to +70 °C (-22 to +158 °F)	-40 to +70 °C (-40 to +158 °F)	-50 to +40 °C (-58 to +104 °F)
Applicable actuator ranges and temperature limitations	ALL except IQT failsafe type 1				

International Hazardous Area - IECEx

	Enclosure Code	Standard temperature	Temperature Option 1	Temperature Option 2	Temperature Option 3
	Exd IIB T4 Exd IIC T4	-20 to +60 °C (-4 to +140 °F)	-30 to +60 °C (-22 to +140 °F)	-40 to +60 °C (-40 to +140 °F)	-50 to +40 °C (-58 to +104 °F)
	Exde IIB T4 Exde IIC T4	-20 to +60 °C (-4 to +140 °F)	-30 to +60 °C (-22 to +140 °F)	-40 to +60 °C (-40 to +140 °F)	-50 to +40 °C (-58 to +104 °F)
Applicable actuator ranges and temperature limitations	ALL except IQT failsafe type 1				

Standard specifications

6.2 Hazardous Area Enclosures cont.

USA Hazardous Area – Factory Mutual Certified Explosionproof to FM3615.

Class	Division	Groups	Standard temperature	Option 1	Option 2	Option 3
I II	1 1	C, D E, F, G	-22 to +140 °F (-30 to +60 °C)	-40 to +40 °F (-40 to +60 °C)	-58 to +104 °F (-50 to +40 °C)	X
I II	1 1	B, C, D E, F, G	-22 to +140 °F (-30 to +60 °C)	-40 to +40 °F (-40 to +60 °C)	-58 to +104 °F (-50 to +40 °C)	X
Applicable actuator ranges and temperature limitations		ALL except IQT failsafe type 1				

Canadian Hazardous Area – Canadian Standards Association (CSA EP) to C22.2 No 30-M

Class	Division	Groups	Standard temperature	Option 1	Option 2	Option 3
I II	1 1	C, D E, F, G	-22 to +140 °F (-30 to +60 °C)	-58 to +104 °F (-50 to +40 °C).	X	X
I II	1 1	B, C, D E, F, G	-22 to +140 °F (-30 to +60 °C)	-58 to +104 °F (-50 to +40 °C).	X	X
Applicable actuator ranges and temperature limitations		ALL except IQT failsafe type 1				

Setting Tool Pro Certification

Directive / Standard	Rating	Standard temperature
ATEX II 1G	EExia IIC T4	-30 to +50 °C (-22 to +122 °F)
FM3610	Intrinsically Safe Class I, Div 1 groups A,B,C,D: T4	-30 to +50 °C (-22 to +122 °F)
Canada CSA – C22.2 No.157-92	Exia - Intrinsically Safe Class I, Div 1 groups A,B,C,D: T4	-30 to +50 °C (-22 to +122 °F)

Standard specifications

7 Regulatory Standards

Compliance with the following European Economic Community Directives permits the IQT *Pro* range actuators to be CE marked under the provision of the Machinery Directive.

Directive	Applicable to	Reference
Electromagnetic compatibility (EMC)	Immunity to/emissions of electromagnetic energy	89/336/EEC as amended by 92/31/EEC
Low voltage (LV)	Electrical Safety	73/23/EEC amended by 93/68/EEC by the application of EN 60204-1 1993
Machinery*	Product safety	Actuators follow the provision of the Machinery Directive (89/392/EEC) as amended by 91/368/EEC and 93/44/EEC. The IQT must not be put into service until the equipment into which it is being incorporated has been declared to be in conformity with the provisions of the European Community Machinery Directive (89/392/EEC) 91/368/EEC and 93/44/EEC*
Waste Electrical Equipment (WEE)	Exempt under the scope of the directive	

*Actuators are not classified as machines within the scope of the machinery directive.
Contact Rotork for a copy of our Declaration of Conformity and Incorporation



Standard specifications

8 Power, Control & Indication

8.1 Power Supplies

IQT actuators are suitable for operation with the following single- and three-phase three wire and DC power supplies:

Supply voltage ranges – Actuator availability

Standard Voltages	Phase	IQT IQTM
24	DC	✓
100, 110, 115, 120	1	✓
208, 220, 230, 240	1	✓
200, 208, 220, 230, 240	3	✓*
380, 400, 415, 440, 460, 480	3	✓*
500, 550, 575, 590	3	✓*
600, 660, 690	3	✓*

Voltage tolerance	+/-10%	Applies for rated torque performance; duty cycle and speed is not guaranteed
Frequency tolerance	+/-5%	Applies for rated torque performance; duty cycle and speed is not guaranteed
Max. starting volt drop	-15%	Actuators capable of starting and running up to speed
Non standard tolerances	Larger volt drops / frequency variations than those quoted can be catered for but may affect actuator selection / sizing. Contact Rotork	
Uninterruptible Power Supply systems	For AC systems, UPS systems should conform to recognised supply standards such as EN60160 in respect of waveform, spikes, harmonics etc. The tolerances above should not be exceeded.	

* IQT/IQTM ranges - 3-phase supplies

The IQT utilises 2 phases only. A parking terminal for phase 3 is available for systems where all 3 phases are distributed. For multiple actuators, even diversity over all three phases should be considered.

Reference documents

For operating electrical consumption data refer to PUB002-022 (IQT ranges) available to download at www.rotork.com

Standard specifications

8.2 Local Control, Indication & Set-up

Non-intrusive selectors are provided on the actuator electrical control cover which also includes a window showing actuator position, status and alarm display.

The control cover may be rotated through 360° (90° increments) to suit actuator orientation/operator access. Set-up is over an infrared interface using the supplied setting tool.

Standard local controls

Operation	Type	Function	Comments
Control mode	Red, rotary selector	Selects "Local", "Stop" or "Remote" control	Can be padlocked in each position (stop remains available) for site operational protection
Local control	Black, rotary selector	Initiates local "Open" and "Close" operation	Spring return to centre neutral position. Local control may be user configured for inching action
Infra-red	Setting Tool <i>Pro</i>	Initiates local "Open" and "Close" operation	May be user configured for I-R operation over a nominal distance of 0.5 m (1.5')

Standard local indication

Operation	Type	Function	Comments
Position indication	LCD - Large character (16 mm/0.6")	Open / close icons + 0-99% in 1% increments	Back-lit (power on) – operating temperature range -50 to +70 °C (-58 to +158 °F) Battery supported power off
Position indication	Coloured indication lights	Green (close), Red (open), Yellow (mid-travel)	Power-on lamp indication, colours can be reversed
Status and Alarm	LCD – text display 2 x 16 characters	Real time valve & actuator status and alarm text messages	Power on –battery supported (when awake) Multilingual-English plus 1 option: E, D, Fr, Ru. Single Chinese available (Mandarin).
Status and Alarm	General alarm icon Battery alarm icon	Warning triangle Battery icon	Power on & off indication of active alarm Power on & off indication of low battery
Status and Alarm	Help screens	8 real time help screens (icon + text)	Complimentary to status / alarm text display

Standard specifications

8.2 Local Control, Indication & Set-up cont.

Actuator Set-Up, Configuration & Datalogging

Setting Tool LCD displays

Simple non-intrusive, interactive set-up procedure using supplied Infra red setting tool with read-back from LCD's. Settings include limits & torque switching, indication contacts and control options. Settings may be password protected. Setting tools are provided on a 1 per order basis

PC/PDA

Using freeware IQ-Insight, actuators may be configured / analysed over IrDA™ interface

Datalogging

Standard onboard datalogger provides valve torque and starts profiles, operational statistics, events log. Actuator configuration & manufacturing data also available. Files can be downloaded direct to PC or to Setting Tool *Pro* (IS certified) for transport to office PC. Freeware IQ Insight for PC is available to download at www.rotork.com

Options

Vandal resistant

Option 1:
red/black control selectors
not fitted

Option 2:
red/black control selectors
not fitted + lockable
window cover

Option 3:
Stainless steel lockable cover
protects standard selectors
and window

Reference documents

PUB002-004 (IQT *Pro*) for details of status and alarm text messages, alarm icons, help screens and actuator set up procedure. Refer to PUB002-015 for Setting Tool *Pro* / IQ insight details



Standard specifications

8.3 Remote Control & Indication

IQT Pro range actuators enable remote control and indication of valves for centralised control. Actuator control and indication forms are available to meet the requirements of the various site control systems, from simple manual pushbutton control through to sophisticated Distributed Control Systems (DCS) using relay outputs or digital “bus” network systems.

Standard remote controls

Operation	Type	Range	Comments
Open/Close/Stop Common	Positive switched 3 x Opto-isolated inputs designed for fleeting or maintained contacts	20-60 VAC/VDC, 120 VAC, 5 mA per input (12 mA at 120 VAC)	Actuator derived - 24 VDC (120 VAC available as an option) or externally supplied derived from the control system. Various forms available
ESD Open interlock Close interlock Common	Positive switched 3 x Opto-isolated inputs designed for maintained contacts.	20-60 VAC/VDC, 120 VAC, 5 mA per input. (12 mA at 120 VAC)	ESD can be user configured open, stayput or close, from a NO or NC contact. ESD has priority over all other applied local or remote control signals. Interlocks provide hardwired “permissive” protection (ie. main and bypass control) and are active for local and remote or may be configured for remote signals only

Options

120 VAC actuator derived supply	15 VA rated	Actuator derived supply for remote control
125 VDC remote control	20 mA per input	Suitable for 125 VDC remote control supply – positive switching
Negative switching	20-60 VAC/VDC, 120 VAC - 5 mA per input (12 mA at 120 VAC)	Suitable for Negative switched systems applies to Open, Stop, Close, ESD and Interlocks
Analogue control – Option Folomatic	0 to 5/10/20 mA or volt ranges	Proportional control over the whole or part of valve stroke. Configurable for open, close or stayput on loss of analogue signal
Hydraulic shock “water hammer”/surge protection – Option Interrupter timer	Internal control system	Pulsed operation with independently adjustable on and off time periods in the range 1-99 seconds can be selected to operate over any portion of the closing or opening valve stroke, effectively reducing valve speed.

Standard specifications

8.3 Remote Control & Indication cont.

Standard remote indication

Operation	Type	Range	Comments
Position, status and alarm indication	4 x Configurable volt free latching contacts - S1 to S4. Single pole -single throw (SPST), configurable NO or NC.	5 mA to 5 A, 120 VAC, 30 VDC	Independently configurable using the supplied Setting Tool to signal one of the following: Valve Position: fully open, fully closed or intermediate positions (0-99% open) Status: Valve opening, closing, moving, Local stop selected, local selected, remote selected, open or close interlock active, ESD active Valve Alarms: Torque tripped in mid travel, going open, going closed, valve jammed, handwheel operation Actuator alarms: Customer 24 VDC (120 VAC) supply lost, battery low, internal failure detected, thermostat tripped
Actuator availability	Monitor Relay - Non configurable relay - change over contact	5 mA to 5 A, 120 VAC, 30 VDC	The relay will de-energise when the actuator is un-available for remote control due to any one or more of the following conditions: Power supply or control supply lost; local control selected; local stop selected; motor thermostat tripped; detected internal failure

Options

Operation	Type	Range	Comments
Position, status and alarm indication	4 x Configurable volt free latching contacts – S5 to S8. Single pole – change over (SPCO)	5 mA to 5 A, 120 VAC, 30 VDC	Independently configurable using the supplied Setting Tool as per contacts S1 to S4 above
Analogue position feedback	Current position transmitter - CPT	4 to 20 mA output proportional to position	Auto range to set limits. Normally internally powered, available suitable for externally "loop" powered (will default to 4 mA when actuator is powered down).
Analogue torque feedback	Current torque transmitter - CTT	4 to 20 mA output proportional to output torque	Range 0% to 120% of rated torque (4 to 20 mA)
Auxiliary power supply	Maintains power to the actuator control on loss of mains	Nominal 24 VDC, 1A (switching inrush 8 A max)	Customer supply maintains backlit display, CPT analogue indication and bus network communications during actuator power outages. Customer supply is isolated from internal control power for protection

Reference documents

Refer to PUB002-002 - IQ Control and Monitoring

Standard specifications

8.4 Fieldbus System Control Options

IQT *Pro* range actuators are available with the following network interface cards to enable remote control and indication using digital “bus” network systems communication to the Distributed Control Systems (DCS).

Standard remote controls

Network Type	Comments
Pakscan	An internally mounted Pakscan field unit for remote control and status indication over a fault tolerant two wire serial link. Loop distances of up to 20 km without repeaters and host communications using Modbus protocol. System variables programmable over the infrared data link. For more information please refer to publication PUB059-030
Modbus	Modbus modules suitable for single or dual communication highways may be included in the IQT actuator, to provide Fieldbus communication of all the actuator control functions and feedback data. Data is carried on an RS485 data highway and the communications protocol used is Modbus RTU. System variables such as unit address and data baud rate are programmed over the infrared data link. For more information please refer to publication PUB091-001
Profibus	A Profibus DP interface module is available to allow the actuator to be integrated into a Profibus network. Full compatibility with EN 50170 is provided and the Profibus network allows full actuator control and feedback of data to the host. For more information please refer to publication PUB088-001
Foundation Fieldbus	An IEC 61158-2 compliant Foundation interface module allows the actuator to be connected to a Foundation network. The device has link scheduler capability as well as digital and analogue function block capability. Foundation Fieldbus actuators can communicate directly between themselves without the need of a host supervisory system. For more information please refer to publication PUB089-001
DeviceNet	The ODVA certified DeviceNet interface module, with full status data feedback and actuator digital and analogue control, connects directly to the popular DeviceNet data highway. Data feedback includes both torque and high accuracy position information, while the inbuilt positioner allows for full modulating control. Up to 63 IQT actuators can be connected on a single DeviceNet highway. For further information refer to publication PUB090-001

8.5 Functional Safety - Safety Integrity Level Applications

IQT *Pro* are TÜV certified for applications requiring functional safety to SIL 2 (or SIL 3 with a 1oo2 valve actuator configuration) as per standard IEC61508 with the addition of the Safety Function Control Module (SFCM) option.

Safety Function	Available actuator ranges	Power supply	Base wiring diagram	Plus 4 to 20 mA analogue position indication
Stayput	IQT / IQTF IQTM	1, 3-phase & DC 1, 3-phase & DC	6000S000 7000S000	6000S000 7000S000

Restrictions

No other actuator types or control / indication options are available within the scope of the TÜV approval certificate. To achieve the requirements under which approval by TÜV was granted, actuators must be installed, commissioned, operated and maintained in accordance with the safety manual PUB002-009.

Reference documents

IQ *Pro* -Option SFCM Actuator Safety Manual - publication PUB002-009

Standard specifications

9 Protection & Operating Features

The IQT *Pro* control system incorporates the following standard operating features and comprehensive valve, actuator and control protection to ensure reliable valve operation and protection under all circumstances.

Fault / Feature	Cause / Operation	Function
Obstructed valve	Valve meets an obstruction or process conditions that prevent movement. Obstruction must be sensed and operation prevented to prevent damage to valve and actuator	Independent Settable Open and Close Torque Switches Torque switch will “torque trip” the actuator motor when the preset output torque level is reached. Torque switches can be set in the range 40% to 100% of rated torque. Torque trips are indicated on the actuator display and can be remotely signalled
Jammed valve	Seated valve is stuck in its seat - often after long periods of inactivity	Jammed Valve Protection The motor is de-energized if no output movement occurs after a (nominal) 3 seconds from receipt of a signal to open or close. This prevents the actuator motor stalling for long periods and possible burn out. Torque trips are indicated on the actuator display and can be remotely signalled
Torque switch bypass	Provides increased torque above actuator rated for unseating sticky valves	Torque Switch By-pass User selectable – secondary setting “At”. Torque switches are automatically bypassed during the first 5% of travel from both open and close limit positions. This permits torque above actuator rated torque and up to actuator stall torque to be developed during unseating, ensuring “sticky” valves do not cause unwanted torque trips. Refer also to Jammed Valve Protection
Torque switch hammer	Actuator repeatedly tries to move an obstructed valve in response to a standing control signal. This can cause damage to both valve and actuator	Anti Hammer Protection Once a torque trip occurs the control prevents repeated operation in the same direction as a response to a standing remote or local control signal. Actuator must be operated in the opposite direction and therefore moved away from the obstruction, which then has chance to clear, before it can be signalled to run in the requested direction. Torque trips are indicated on the actuator display and can be remotely signalled
Motor overheating	Actuator duty cycle is exceeded causing the motor controller to overheat. This often occurs during factory acceptance testing / commissioning or during process start up.	Motor Thermostat Protection Two thermostats are embedded in the motor control module which directly sense internal temperature. Thermostats will open circuit when set temperature is reached causing the motor to be de-energised. Thermostats will auto-reset once cooled sufficiently allowing operation to continue. Thermostat trips are indicated on the actuator display and can be remotely signalled.

Standard specifications

Fault / Feature	Cause / Operation	Function
Instantaneous reversal	Control system instantaneously reverses the control signal which causes the actuator to reverse direction with associated inertial stress to valve drive and internal motor switching surges	Instantaneous Reversal Protection A delay of 300 ms is automatically applied between reversals allowing the actuator to come to rest before responding to reverse control signal
Actuator fault	Control system instantaneously	ASTD (automatic self test & diagnosis) ASTD detects any internal control system failures preventing operation. Detected internal control system faults are indicated on the actuator display allowing rapid diagnosis and can be remotely signalled. In addition help screens can be accessed allowing problem to be pin-pointed
Remote control circuit failure (actuator derived remote control supply only)	Loss of remote control	The 24 VDC internal power supply made available for remote control switching is protected by an auto-reset fuse device. Should the power drawn from the supply exceed its rating (due to a remote control wiring fault, etc.), the fuse will disconnect the supply. Once the fault is cleared the supply will automatically be reinstated. Loss of internal supply is indicated on the actuator display and can be remotely signalled
Spurious operation	Operation commanded due to unintended or spurious remote control signals leading to process problems or hazards	Conditional Control User selectable – secondary settings A8 and A9. The interlock input can be configured for “conditional control”, being active only for remote control. In this mode, for the actuator to respond to a remote control signal, two signals must be applied simultaneously, one to the control input and one to the interlock input. If an unintended or spurious signal is applied only to the control input it will be ignored. Intended signals can therefore be verified by applying a second “permissive” signal, effectively preventing spurious operation. In addition the TÜV approved SFCM option is available for SIL 2 applications requiring safety function “stayput”. Refer to PUB002-009.
Emergency Shut Down ESD	Priority action where the valve is required to stayput or move to a safe end of travel position determined by the process (open or closed limit)	Dedicated ESD Control Input User configurable secondary settings A1 to A5 ESD action has priority over any existing or applied local or remote control signal. ESD can be configured to open, close or stayput depending on the process requirements. It must be derived from a stayput type, normally open or normally close ESD contact (configurable) and may be configured to override local stop, interlocks or interrupter timer.

Standard specifications

10 Components

Details of major actuator mechanical and electrical/electronic components are provided below.

10.1 Handwheel

A handwheel is provided to allow manual operation of the valve during electrical power interruption. Handwheel size and mechanical advantage are generally designed in accordance with standards EN 12570 and AWWA C540 (American Water Works Association) to give the most efficient compromise of force and turns for emergency operation.

Handwheel turns:

Actuator Range	Actuator Size	Standard Ratio / Turns
IQT Pro	IQT125, IQT250, IQT500	80 turns/90°
IQT Pro	IQT1000, IQT2000	86 turns/90°

During electric operation of the actuator, the handwheel is mechanically disengaged from the drive. To engage handwheel operation, the hand/auto selection lever is pushed down and released after which handwheel operation remains selected. When electrical operation takes place the actuator will automatically return to motor drive without lever or handwheel kickback.

The hand/auto selection lever incorporates a facility for locking in the hand or auto positions using a 6 mm diameter hasp padlock (not supplied by Rotork), preventing engagement of motor drive (locked in hand) or engagement of handwheel drive (locked in auto). Emergency disengagement of motor drive can be selected by pushing down and holding the hand/auto lever during electric operation.



Standard specifications

10.2 Lubrication

IQT actuators are factory filled for life with premium quality gear oil selected for the application. Standard oils are automotive grades easily available worldwide and have been used successfully for over 40 years. Oil lubrication outperforms grease over a wide temperature range and allows installation in any orientation. It has none of the problems associated with grease such as separation at elevated temperatures and “tunnelling” at lower temperatures where grease is thrown away from rotating components creating a void or tunnel in the grease around components that require lubrication.

Lubrication

Range	Standard Oil	Standard Temp range	Option Low temp -50 to +40 °C (-58 to +104 °F).	Option Food Grade -10 to +70 °C (-14 to +158 °F).
IQT Pro	TEXACO 9330 +25% Kerosene	-30 to +70 °C (-22 to +158 °F).	TEXACO 9330 +75% BP SHF LT15	Hydra Lube GB Medium

Food grade

Lubricant is a synthetic, non-aromatic hydrocarbon mixture with PTFE and other additives. It does not contain chlorinated solvents. Food grade grease used in assembly and thrust bearings is Hydra Lube WIG Medium-NLGI-123.

10.3 Finish

All IQT actuator finishes are tested in accordance with Rotork 1,000 hour Cyclic salt spray test procedure which is the most realistic and arduous test cycle applicable. The test combines cyclic salt spray, drying and humidity at elevated temperatures on complete factory built actuators. This tests the finish and the various substrate materials, fixings and interfaces that make up an actuator. Substrate materials and finishes are selected to provide maximum corrosion resistance combined with good adhesion. For full specification of paint finishes refer to publication PUB000-046.

Finish

Range	Size	Standard Finish	Offshore finish
IQT Pro	IQT125 to IQT2000	polyester powder coating, silver grey	2-pack epoxy coatings

Project specific finishes / colours can be catered for. Apply to Rotork.

Standard specifications

10.4 Motor

IQT *Pro* actuators utilise purpose designed motors integral to the actuator. As such motors do not fall within the scope of IEC 60034- MG1, however do meet the applicable requirements, where pertinent, to motor design for actuator operation.

Actuator Type	Duty Classification	Comments
IQT / IQTF	On-Off & Inching	Permanent magnet 24 VDC motor (DC supply derived internally from three- and single-phase supplies) incorporating thermostat protection. Low inertia design. Nominal 60 Starts at a rate not exceeding 600 starts per hour, 15 minutes rated based on a nominal torque of 75% of rated.
IQTM	Modulating	Permanent magnet 24 VDC motor (DC supply derived internally from three- and single-phase supplies) incorporating thermostat protection. Low inertia design. Nominal 1,200 starts per hour, 50% duty cycled based on a modulating torque of 50% of rated torque.

Reference documents

IQT / IQTF / IQTM Motor data publication PUB002-022.

10.5 Power Module

The power module for IQT *Pro* actuators produces internal power supplies for control systems and remote control derived from the actuator electrical supply. It also contains the motor control and switching components.

Actuator Type	Internal power supplies	Motor switching
IQT / IQTF / IQTM	Split bobbin transformer producing control circuits, option card supplies and supply for 24 VDC actuator fed remote control (120 VAC option). Fuse protected.	Torroidal power transformer / rectifier deriving DC motor power supply from AC actuator supply - fuse protected. Solid state motor switching incorporating motor speed control.
IQT / IQTF / IQTM 24 VDC actuator power supply only	DC-DC converter isolates the DC actuator supply from internal supplies for control and 24 VDC supply for actuator fed remote control. Fuse protected.	Rectifier and fuse protection ensures correct polarity and protection of supply. Solid state motor switching incorporating motor speed control.

10.6 Position Sensor

Contact-less hall effect sensors measure actuator output shaft angular rotation to a resolution of 7.5° (15° max for reversal). Sensors are direction sensitive producing a phased digital pulse width modulated signal. The control module counts the pulses and compares these to the set limit range. Precise position control is then available for limit switching, position indication and data logging. The position sensor is very simple with only one moving component and has a proven, reliable track record in use with IQ actuators for over 15 years.

Standard specifications

10.7 Control Module

The control module for IQT *Pro* actuators is common and takes the form of a PCB with on-board liquid crystal displays (LCD). For IQTM actuators the control module incorporates “fast remote” control components (24 VDC remote control only) allowing rapid actuator switching down to 100 ms pulses for precise positioning.

Logic controlled, the control module is programmed over the non-intrusive infrared interface with set-up configuration for torque, limits indication and control features undertaken using the supplied Setting Tool *Pro*. It monitors local and remote control signals, torque and position to switch the actuator motor in the correct direction or off.

Standard control features are shown below:

Feature	Type	Specification
Remote control	Input	User switched Open/Close/Stop/ESD and interlock signals. Opto-isolated inputs for protection.
Local control	Input	Open/Close/Stop and Local/Remote selection. Non intrusive control switches are magnetically operated so there is no penetration of covers.
Position IQT <i>Pro</i> range	Input	Digital signal derived by position sensor. Angular resolution to 0.1° Minimum Limit setting range is 10°. Maximum range will be limited by mechanical stops (nominally 95°). The IQTF actuator limits can be configured up to 50 turns nominal. Position sensing is battery backed up for operation when the main electrical supply to the actuator is switched off. Power off local and remote (contacts S1 – S4) position indication and updating is enabled using a standard battery located in a separate compartment.
Torque - IQT <i>Pro</i>	Input	Torque signal derived from DC motor current which is directly proportional to torque. Torque can be set in the range 40% to 100% of rated torque with the additional facility to bypass torque switching
Set-up	Input	Set-up over the Infra red interface allows all settings to be configured for valve and process requirements. Set-up is non-intrusive requiring no covers be removed using the supplied Setting Tool <i>Pro</i> . All settings can be password protected.
Indication contacts	Output	Four volt free contacts S1 to S4 can be configured for a variety of position, status and alarm indication for remote indication and monitoring
LCD Indication	Output	The on board backlit LCD display presents position, torque and set up displays for configuration. The LCD display is divided into 2 parts providing a large position indication (Open/Close icons plus % readout in 1% increments for mid travel) and a multilingual text display providing status, alarm and set up information.
Datalogger	Output	The control module includes a datalogger which stores torque, position and operational data in non volatile memory for download via IrDA™ to the supplied setting tool or notebook PC. Data is date/time stamped. Datalogger can be analysed using freeware IQ insight for PC.
Memory	System	All configured settings are stored in non volatile EEPROM memory (does not require power).
Micro-controller	System	Provides all control function logic, set up programming and allied system requirements. Software is field upgradeable for future enhancements. The micro-controller is widely used in the automotive industry with a long track record and a very reliable history.

Standard specifications

10.8 Conduit / Cable Entries

IQT *Pro* gearcases are machined with conduit/cable entries as indicated below. Unless otherwise specified IQT *Pro* range actuators are despatched with no adapters fitted. Alternative adapters are available.

Number of entries required and adapter type must be specified with order.

Actuator Type	Gearcase Entries	Adapter 1	Adaptor 2
IQT <i>Pro</i>	2 x M25	2 x ASA NPT 1"	2 x PG16
IQT <i>Pro</i> option*	Additional 2 x M25	Additional 2 x ASA NPT 1"	Additional 2 x PG16

IQT *Pro* actuators are despatched with transit plugs fitted into the conduit entries. It is the responsibility of the installer to ensure the appropriate cable/conduit adapters, cable glands and/or blanking plugs are fitted in order to maintain hazardous area certification and ingress protection levels. Certified adapters and blanking plugs are available as optional extras.

* IQT *Pro* actuators supplied with Pakscan, FieldBus, ProfiBus, ModBus or DeviceNet interface option cards will be supplied with the optional entries provided (4 entries in total).

10.9 Terminals

The terminal compartment for IQT *Pro* actuators takes the form of a separately sealed compartment containing segregated metric thread M5 power and M4 control terminals. Terminal screws and washers are supplied with the actuator. Terminals are designed to accept ring tag crimped field wiring conductors up to 16 mm² for power and 4 mm² for control/indication. The terminal compartment cover carries a terminal identification code card. Each actuator is despatched with the applicable Installation and Maintenance Manual, actuator wiring diagram and remote control connection schematic.

10.10 Wiring

IQT *Pro* actuators utilise jig built wiring harnesses of individually numbered, tropical grade PVC insulated, stranded conductors. All internal control connections to the printed circuit boards use unique or polarised plugs and sockets.

10.11 Battery

When power to the actuator is isolated, all settings are retained in an EEPROM. In the event of manual operation of the valve during isolation or loss of the power supply a battery provides power to the position-sensor and control module to update the valve position. The battery also powers the LCD display, without backlighting, and the four latching contacts S1-S4 while the power to the actuator is not available. infrared set up is also available with main power off.

Based on experience gained over 15 years of typical applications, the expected battery life is around 5 years. Battery life is however subject to temperature and at elevated temperatures may be reduced. Actuators can operate perfectly well without a battery, however if operated by handwheel without power the control module cannot update with the new position when power is restored. Limits should therefore be reset.



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