Manufacturer's Declaration as per EU-Directives

Page 1 of 2

The manufacturer	**BRAY Armaturen & Antriebe Europa, D47807 Krefeld**
declares for the product:	**Electric part turn actuator Series 70 as per EN15714-2**

These products meet requirements of the following European Directives as follows:

Low voltage-Directive 2006/95 EG (LVD):
The actuator conforms to this Directive.

Directive relating to magnetic compatibility 2004/108 EG (DMC):
The actuator conforms to this Directive.

Machinery Directive 2006/42 EG (MD)
An actuator is no <complete machine> and no <incomplete machine> **but a component only** within the meaning of the §34,page 31 of the <Guide to this Machinery Directive (MD) Rev.12-2009>
and is destined to be installed at a part turn valve – both together then are an incomplete machine within the meaning of this European Directive.
► Because all electrically operated functional parts are encapsulated by a robust housing which is a protection in the sense of the Low voltage Directive and a protection in the sense of the Directive for Magnetic Compatibility as per EN 60529 (IP67), this apparatus has to be evaluated – as specified by Article 3 of the Machinery Directive – by these two Directives only.
► Because all electrical connections are interrupted automatically at manual operation the electric actuator does not come under the Machinery Directive in such case – as specified by Article 2 (a) of the Machinery Directive.

In relation to the Directives above shall be observed by the user:

1. The user shall observe the „Actuator destination" as defined in the following <Instruction Electric Actuator UM0006E-1> and shall observe all safety advices that may be relevant at use.
   Disregard of this advice can invalidate this declaration.
2. The commissioning of a valve-actuator unit is not permitted as long as the conformity of the pipe system into which this unit is installed with all relevant European Directives is not yet declared by the person or institution responsible. The manufacturer BRAY has made and documented all necessary risk analysis – the responsible person is Mr. Franz Ritzberger at BRAY Armaturen & Antriebe in Krefeld, Germany.

The start-up of an actuator/valve unit is only permitted after the valve has been properly assembled with the pipe section – this only prevents the danger of physical injury of the personnel.

Krefeld, den 08.12.2011

.

Standards applied:

EN 15714:2009	**Part 2: Electric actuators**
EN 12100	**Safety of machinery – General**

Type description & technical data:

Annex D and BRAY-catalogue <Series 70>

Manufacturer's Quality Management System	*Register-N° and Name of the notified body*
ISO 9001:2008	**Bureau Veritas, Id. number 0062**

Manufacturer's Declaration as per EC-Directives Page 2 of 2	
Requirement EC 2006/42/Annex I	**for Electric actuators Series 70:**
1.1.1, g) Actuator destination	See original installation and service instruction " UM0006E-1 "
1.1.2.,c) foreseeable misuse	See original installation and service instruction " UM0006E-1 "
1.1.2.,d) protecting measures for personnel	Same as the pipe section into which the actuator is installed.
1.1.2.,e) accessories for maintenance	No special tools are necessary.
1.1.3 material in contact with the fluid	Not applicable.
1.1.5 handling	See installation and service instruction " UM0006E-1"
1.2 and 6.2.11 control system	Is the responsibility of the user in combination with the instruction of the actuator.
1.3.2 withstand to stresses	For functional parts: Ensured at contractual use of the actuator.
1.3.4 sharp edges or angles	Requirements fulfilled.
1.3.7/.8 risks related to moving parts	Requirements are fulfilled at contractual use of the actuator. No maintenance or repair is allowed when the actuator is connected to the power supply or the control system.
1.5.1 – 1.5.3 energy supply	In the responsibility of the user in combination with the instruction of the actuator.
1.5.5 – temperature	See installation and service instruction no. " UM0006E-1 ": The motor coil is protected against overheating by a thermo-contact.
1.5.7 -explosion	The actuator has no Ex-protection.
1.5.13 emission of dangerous substances	Not applicable at contractual use of the actuator.
1.6.1 maintenance	See installation and service instruction no. " UM0006E-1 "
1.7.3 marking	See original installation and service instruction no " UM0006E-1 "
1.7.4 service instruction	See original installation and service instruction no. " UM0006E-1" and the relevant valve instruction at standard actuator destination.
Requirements from Annex III	The actuator is not a complete machine but a component only. No CE marking for conformity with the directive 2006/42/EG.
Requirements in Annexes IV,VIII & XI	Not applicable.

Requirements as per EN 12100	**for Electric actuators Series 70:**
1. Scope	Basis for the analysis is the Product Standard EN 15714-2: <Electric Actuators>. Note: For the requirements as per clauses 4 to 6 of EN 12100 it is assumed that the user has made a risk analysis for the valve/actuator unit installed into the pipe section under the service conditions– such analysis is not possible for BRAY.
3.20, 6.1 inherent design	The actuator has been designed at the principles of <inherent safe design>.
Analyse as per clause 4, 5 and 6	The knowledge of documented malfunctions and misuse at the manufacturer BRAY as per ISO 9001are the basis of this instruction.
5.3 Limits of the machine	The limits of the <component actuator> are defined as per clause A2 <Actuator destination> - and the limits of the valve/actuator interface as well.
5.4 Decommissioning, waste management	Not in the responsibility of the manufacturer BRAY
6.2.2 Geometric factors	The actuator housing encloses all moving parts of the actuator: no risk at use as defined in clause A2 of this instruction UM0006E-1. Therefore this section of the MD is not applicable.
6.3 Technical protective devices	Not applicable.
6.4.5 Instruction	Valves with actuator operate automatically after connection to the plant control system. Necessary information for service and maintenance are included in section C of this instruction UM0006E-1.
7 Risk analysis	A risk analysis as per MD Annex VII B has been made by BRAY and is documented accordingly.

Original-Installation instruction for electric part-turn actuator
with service instruction and technical annex

for the actuator as <component> as per EC-Directive 2006/42/EG

INDEX

More information

This manual, BRAY-catalogue-pages and other information – even in other language – may be downloaded from

www.bray.com or asked from

BRAY Armaturen & Antriebe Europa
Europark – Fichtenhain A , 13b · D-47807 Krefeld
Email: **sales@BRAY.de**
Tel: **+49 2151 5336 0**
Fax: **+49 2151 5336 242**

A General

This instruction may support the user to store, install, start-up, use and maintain BRAY-electric actuators of Series 70 (to be) connected to a ball valve or butterfly valve.

The manufacturer's instruction of this valve and the instructions of the plant control system shall be observed accordingly by the user.
The relevant valve instruction applies as well.

A1 Pictograms

Warnings and notes of this manual are marked with pictograms:

 xxxxx	**Danger / Warning** Points out a dangerous situation which may cause personal injuries or death.
	**Advice** Has to be respected
	**Information** Information useful to follow

If these notes and warnings are not respected by the user, dangerous situations may occur and may invalidate the warranty of the manufacturer.

A2 Actuator Destination

A **BRAY-electric actuator series 70** is destined

- after connection to a local control system,
- with power supply at alternating current 120V or 220V, 50 or 60 Hz as indicated at the actuator marking, at a tolerance +/-5%,
- with control voltage 120V or 220V, 50 or 60 Hz,
- in a normal environment, minimal -40°C, maximal +70°C,
- at enclosure protection class IP65 as per EN 60529 (*BRAY-Standard*) or class IP67 (*BRAY-special)*, under condition, that the cable glands are of the same protection class,

to operate valves with 90°-obturation (i.e. butterfly or ball valves) following the plant control signals.

An actuator correctly assembled to the valve indicates the valve position by a pointer in the window of the actuator housing.
The actuator's set of <limit switches> signals the valve position in the OPEN and CLOSED positions to the plant control system. An (optional) unit <position transmitter> permits to switch the valve by a control signal into any rugged position between <fully open> and <fully closed>.

All requirements of clauses B1 & C1 <Important information for the user> shall be observed at installation and service as well.

Note 1:
At current supply interruption or failure the electric actuator remains self-locking in the actual position.

Note 2:
As a standard the actuator is provided with a handwheel. If it is pulled out for manual actuation the connection to the power supply is interrupted automatically.

For other than the function above **the actuator not destined.**
Specifically it is not allowed:

- to install the actuator in a potentially explosive environment: The actuator does not have a protection class such as per EN EN50014, EN50018, EN50019 or EN 50020 or similar.
- to connect the actuator to another voltage or frequency as specified above.
- to install the actuator in a potentially corrosive environment without the manufacturer's approval.
- to install or to operate the actuator in an environment >+70°C or <minus 40°C without the manufacturer's approval.

Note 3:
The nominal output of the actuator is achieved at 25% of the nominal voltage. +/-10% of the nominal voltage are allowed at continuous operation.

Note 4:
*The position indication **is pre-adjusted** by BRAY for the installation of the actuator **with handwheel lateral to the pipe.** At the handwheel position **parallel to the pipe** the 2 limit switches shall be adapted accordingly on-site at the actuator connection to the control system.*

A3 Actuator marking

Each actuator supplied is marked as follows:

Actuator marking *(example)*

The marking shall not be damaged or covered (do not paint over!) to permit the valve identification later if necessary.

Note:
The wiring diagram to connect the actuator to the control system is put in the actuator cover: It shall remain there for any necessary use later.

A4 Transport and storage

The valve – and valve/actuator units as well – shall be shipped and stored with care.

- The actuator or valve/actuator unit without visible damage at the packaging shall carried and stored in its protective packing until installation.

!	***Actuator without valve:*** If a hoist is used to handle the actuator, fix the lifting devices at the actuator housing, not at the handwheel. ***Actuator/valve unit:*** If a hoist is used, fix the lifting devices **at the valve, not at the act**uator. *But a lifting device may be fixed at an actuator which is much heavier than the valve.*
!	An actuator (with or without a valve) shall be stored in a closed room at constant room temperature to protect the electric/electronic parts from corrosion by internal condensation.

- Handle the actuator (or valve/actuator unit) with care in its original packaging and protect it from harsh environmental conditions, such as dirt, debris and humidity.
- The actuator (or valve/actuator unit) shall be stored as supplied – do not operate it at storage.

The actuator (or valve/actuator unit) without a visible damage from transport shall be unpacked just at the place of installation.
Unpacked parts shall be handled with care.

B) Installation of the actuator and connection to the control system

!	*This instruction includes safety recommendations for foreseeable risks at installation and connection of an actuator to the control system only.* The user is responsible to follow the warning notes of other system-specific aspects. All requirements of the system shall be observed..

B1 Important safety warnings at installation

!	• Installation shall be performed by qualified personal and competent electricians. Qualified and competent are those persons who, due to experience, can judge the risks and execute the work correctly and who are able to detect and eliminate possible risks. • The actuator function shall correspond to the <Actuator destination> as specified in clause A2 and the power supply shall be in line with the valve marking – see clause A3 • A valve shall be assembled into the pipe system as supplied by BRAY – any modification (except upgrading of the actuator with a module as listed in clause C5) without approval of BRAY is forbidden and determines the manufacturer's liability. • The valve marking shall fit to the plant power supply and control system characteristics. • The actuator can be changed over to manual actuation by pull-out of the handwheel: This disconnect the actuator from the power supply automatically.
⚠ **Danger**	• Before the cover bolting is loosened, disconnect the actuator from electric power and control supply. At the end of electric connection, close the cover by tightening the cover bolting crosswise. • *If adjusting of the actuator wiring under electric tension is necessary:* **This shall be made by a competent electrician only with proper tools only!**

B2 *If necessary* Precondition to install the actuator at the valve

- The valve – or a bracket between valve and actuator – shall have the same interface size as per ISO 5211 and a fitting interface at the valve shaft and the actuator output (or at the coupling between) – if necessary see BRAY-catalogue <Electric actuator Series 70> - extract at Annex D.
  ***NOTE**:*
  Double bolting circle in the actuator housing is usual.
- The valve manufacturer shall have aligned the actuator to the valve – the European Standard EN 15714-2 and the BRAY-catalogue above give the necessary information and support.
- As a rule the actuator Series 70 has been supplied with limit switches and position indication to install the actuator **with handwheel orientation lateral to the pipe.**
  If the actuator shall installed with handwheel **parallel to the pipe** both limit switches in the actuator box **shall be adjusted accordingly** (= change it 90°) – **this should be made by a competent electrician** on-site.

B3 *If necessary:* Steps to connect the actuator with the valve

- Interface dimensions ISO 5211 see Section D3 in Annex.
- As a standard the actuator output of Series 70 are supplied with 2-flat (="double D") interface (only the sizes S70-30, S70-530 and S70-65 have a fitting key DIN 6885) for the actuator assembling to a valve **with handwheel lateral to the valve.**
  If necessary to reconstruct the actuator for parallel installation: See above Clause B2.
- Fix the actuator with slightly oiled bolting 5.6/8.8 or A2/A4 (*slightly oiled)* and set tight with the following torque:

thread	M6	M8	M10	M12	M16	M20	M24
min. torque [Nm]	4	10	20	36	80	160	300

Table 1: Torque to fix the actuator at valve interface

- It is proposed to adjust the valve end positions „OPEN" and „CLOSED" at connection of the actuator to the control system – see clause B6 below.

B4 *If necessary*: **Installation of an actuator with brackets** *(between valve and actuator)*

The chapters above apply as well if the actuator is not installed directly but with a bracket between valve and actuator and a coupling between valve shaft and actuator output.

In this case it is the manufacturer's responsibility
► to make a risk analysis as per EN12100 for the functional parts and – if necessary – to eliminate the risk for the user to jam one's fingers,
► and assure the correct position signalisation and position indication – see clause B6 <Steps to..>.

B5 Precondition to connect the actuator to the control system

- First ensure that the plant characteristics supply voltage, control voltage and frequency fit to the actuator markings.
- For the electric characteristics see Table 2 below.

Size:	**S70-003**		**S70-005**		**S70-008**		**S70-012**		**S70-020**		**S70-030**		**S70-050**		**S70-065**	
Nom. torque [Nm]	34		57		90		136		226		339		565		734	
power [kW]	0,25		0,25		0,35		035		0,35		0,45		0,45		0,35	
nominal supply voltage [V]	120	220	120	220	120	220	120	220	120	220	120	220	120	220	120	220
nom. current [A]	0,8	0,5	1,4	0,6	2,1	0,9	2,1	0,9	2,1	0,9	3,0	1,4	3,0	1,4	3,0	1,4
max. frequency	max. 90 starts/per hour															
protection class	BRAY-Standard: IP 65 as per EN 60529 *(BRAY-option : IP67)*															

Table 2: Essential electric data

	If the closing time of the valve/actuator unit shall be extended on-site: ► install the BRAY-module <speed control> (see clause C5) – into the actuator control box, ► or install a pulse relay in the control room and adjust it accordingly.

B6 Steps at actuator connection the control system

!	The connection shall be performed by a competent electrician only.

- The cable glands (metric or NPT) are not the BRAY supply and shall be provided on-site,
  ► insert it for each cable entry and fitting to the cable size on-site,
  ► and consistent with the protection class (IP65 or IP67) as per EN60529 (VDE 0470), - see the actuator marking.
- Unscrew and open the actuator connection box and connect it: The pertaining wiring/terminal plan is included at the connection box cover. Observe the different entries for power supply and control connection.
- The wiring/terminal plan shall remain at the box cover for any use later.

	The valve manufacturer shall specify (see the relevant valve instruction) if at both end positions the current is switched-off by the limit switch or by the torque switch of the actuator. The contact not used for switch-off of the valve end position should be used for the signalisation of a faulted condition of the valve function. .
!	*The pivoting angle of the actuator shall be set at the switching cams (see detail „C" in the BRAY-catalogue sheet <Electric actuator Series 70>)– it is pre-set ex works to 90°.* For the exact setting – by finger or with a turnscrew – adjust the **red came for the CLOSED** position and the **green came for the OPEN** position. *As a rule the valve manual specifies the necessary exact end position.*

!	*The (red – yellow) position indicator at the cover window is preset ex works:* ► red marking: Valve is full closed, ► yellow marking: Valve is full open. At the end of the position setting this shall **conform to the valve end positions exactly**.
Danger	**A wrong adjustment of this indicator** at the actuator is a dangerous misinformation. The installation shall not be released for service if the position setting and the visual position indication is not correct. See also warning in Clause B2.

!	If the handwheel position is installed – unusually – **parallel to the pipe** then the limit switches shall be adjusted accordingly (this is not pre-set ex works!). Proceed as described above.
!	*At outdoor-installation of the actuator or at a local temperature highly varying:* ► The electric heater in the connection box shall be connected to the current supply at once – and shall remain under current supply even if the actuator is commissioned later; ► or – if this heater is not installed at the actuator – this optional module shall be ordered from Bray at once **to install it as soon as possible**. Addresses see cover page.

B7 Steps to connect a position transmitter *(if any)*

This unit permits to switch the valve by a control signal into any rugged (stable) position between <fully open> and <fully closed>.

To connect it, follow the wiring/terminal plan as described above.

B8 Testing steps at the end of installation

At the end of installation, it is recommended categorically to check the following in coordination with the plant or installation supervisor:

- Check function & indication:
  At the relevant control signal **„OPEN“** and **„CLOSE“** the actuator shall switch the valve into these end positions. The position indicator of the actuator (yellow/red markings) shall indicate the valve position accordingly.
  Any fail shall be corrected immediately.

Danger	In the CLOSED position of the valve the visual **red marking („CLOSED“)** at the actuator shall indicate this correctly. Any fail the setting of the limit switch and/or of the red indicator shall be corrected accordingly. **Disregard of this warning could mean danger for the health of the user and/or cause damage in the piping system.**

- Check the interface bolting
  At the functional test, no relative movement shall occur between valve, actuator housing (and brackets, if any).
  If necessary fasten the bolting – see Table 1 in Clause B3 <steps to install>.
- Check the cable glands tightness
  The cable glands shall correspond to the specification for class IP65 or IP67 as per EN 60529 and shall conform to the actuator marking.
- Cover of the connecting box correctly closed?
  The cover bolting shall be fastened accordingly.

If – at these checks – the valve/actuator unit does not operate without fail, follow clause C4 <Troubleshooting> – if necessary follow the valve instruction as well.

B9 Test run

If all checks at clause B8 are OK, make a test-run of the valve/actuator before release for commissioning.

i	The manual of the valve manufacturer may specify, if additional measures are necessary at first start-up.

The actuator maximum frequency at normal operation is specified in clause B5, Table 2. The motor of the actuator is protected against overheating by embedded thermoswitches in the motor windings: At overheating (>130°C) the current supply is interrupted automatically – after cooling-down it is switched-on automatically as well.

!	*But observe at frequent start-up at installation:* Limit the start-up frequency to maximum 90 starts/per hour – see Table 2 at clause B5.

B10 *Additional information* Disassembling of the actuator from the valve

Observe the same safety measures as for the plant control and power supply systems.

- Disconnect all electric connections.
- Note and mark the position of the actuator housing relative to the valve (or bracket), then loosen all actuator connections.
- Loosen the bolting at the interface ISO 5211 (valve/actuator or bracket/actuator) and take-off the actuator.
- Check all interface surfaces at the actuator output and valve shaft to be without wear – or replace worn parts – see addresses at the cover sheet.
- When temporary storage is necessary, observe clause A4.

C) Service, maintenance and repair

The user shall make a risk analysis as per Machinery Directive 2006/42/EC for the pipe system. BRAY supplies the following documents for it:

- This installation and service instruction of the actuator.
- The manufacturer's declaration(s) to EC Directives.

C1 Important safety warnings at service at maintenance/repair

	• Installation shall be performed by qualified personal and competent electricians. Qualified and competent are those persons who, due to experience, can judge the risks and execute the work correctly and who are able to detect and eliminate possible risks. • The actuator function shall correspond to the <Actuator destination> as specified in clause A2 and the power supply shall be in line with the valve marking – see clause A3. The service conditions shall conform to the valve markings. • A valve shall be assembled into the pipe system as supplied by BRAY – any modification (except upgrading of the actuator with a module as listed in clause C5) without approval of BRAY is forbidden and determines the manufacturer's liability. • *If adjusting of the actuator wiring under electric tension is necessary:* **This shall be made by a competent electrician only with proper tools only!**
 **Danger**	• Before loosening of the valve/actuator bolting (at the interface ISO 5211) the power supply shall be interrupted. • The actuation of the valve/actuator unit is allowed only if the valve is enclosed at both sides by the piping system – any actuation before is a danger for the user to jam one's fingers and is the users own risk.

C2 Commissioning / automatic and manual service

After release as per clause B9 only the actuator can be commissioned. The automatic service of the actuator shall follow the control signalisation.
The valve manufacturer's manual may give some additional advice for operating at service.

The actuator data are described in the Table in clause B5.

The actuator can be changed over to manual actuation by pull-out of the handwheel: This disconnect the actuator from the power supply automatically.

	*But observe at frequent start-up at service:* Limit the start-up frequency to maximum 90 starts/per hour – see Table 2 at clause B5.
	*If the closing time of the valve/actuator unit shall be extended on-site:* ► install the BRAY-module <speed control> (see clause C5) – in the actuator control box, ► or install a pulse relay in the control room and adjust it accordingly.

C3 Maintenance

An actuator Series 70 does not need specific maintenance.

It is sufficient to check that the bolting at the valve/actuator interface remains correctly fastened: No displace at the flanged connection is acceptable. When necessary observe clause C4 <Troubleshooting>.

C4 Troubleshooting.

!	At any troubleshooting, respect the requirements of clause **B1 and C1 <Important safety warnings..>**. Order spare parts with all marking information at the actuator nameplate.

Possible Defect	Remedy
The actuator doesn't follow the plant control signal(s)	*Check the power supply voltage:* The actuator needs the voltage/frequency as indicated at the actuator marking. *If the power supply is correct, but the actuator doesn't move:* Check, if the valve functional parts have a too high friction: If yes, follow the relevant valve manual instructions. *If there is no default in the valve:* Check the plant control signals to be correct – if this is OK, observe clause B10 and replace the actuator.
The motor coil overheats (>130°C)	*Check if the start-frequency is too high:* The admissible start-frequency is specified in Table 2 in clause B5 and shall not be exceeded. *At motor stop:* Let cool down the motor coil. The thermo contact in the coil reconnects the current automatically. *If the start-frequency of the actuator is not too high (<90x/h) but the motor stops anyhow:* Check, if the valve functional parts have a too high friction: If yes, follow the relevant valve manual instructions. *If there is no default in the valve:* Check the plant control signals to be correct – if this is OK, observe clause B10 and replace the actuator.
The valve/actuator unit operates too quick	See warning in clause C2 <…automatic service>
The actuator operates, but doesn't move into the full OPEN or CLOSED position	*Check the end stop adjustment in the actuator:* **See clause B6:** Unscrew the actuator box cover. For the exact setting – by finger or with a turnscrew – adjust the **red came for the CLOSED** position and/or the **green came for the OPEN** position. *As a rule the valve manual specifies the necessary exact end position.*
Other functional defect	*Check the connection of the bolting between valve, bracket (if any) and actuator:* If loose, fix all bolts properly (*bolts 5.6/8.8 or A2/A4, slightly lubricated*): bolt thread: M6 | M8 | M10 | M12 | M16 | M20 | M24 max.torque [Nm]: 4 | 10 | 20 | 36 | 80 | 160 | 300 *If the bolting is OK, but the operating fail continues:* Check the plant control signals to be correct – if this is OK, observe clause B10 and replace the actuator.

C5 Upgrading of the actuator with an optional BRAY-module

⚠	***Danger at upgrading:*** Before the actuator box cover is loosened, disconnect any electrical connection under voltage. Upgrading by a competent electrician only!

Upgrading modules	Open the actuator box cover, install the module following the pertaining wiring/terminal plan supplied by BRAY and leave it finally in the connection box. *BRAY offers the following modules to upgrade the actuator –* *details see BRAY-catalogue <Electric actuator Series 70>:* ► Heater for connection box (necessary at locally changing surrounding temperature); ► Servo-Plus II (multi-task module for electronic control); ► Position transmitter (specify the electric data at order!) ► Local control unit (to switch on-site between <Automatic⇔ OPEN ⇔ CLOSE); ► Bus-system „Devicenet Servo"; ► „Speed Control" (impulse generator, is needed for control service as well).

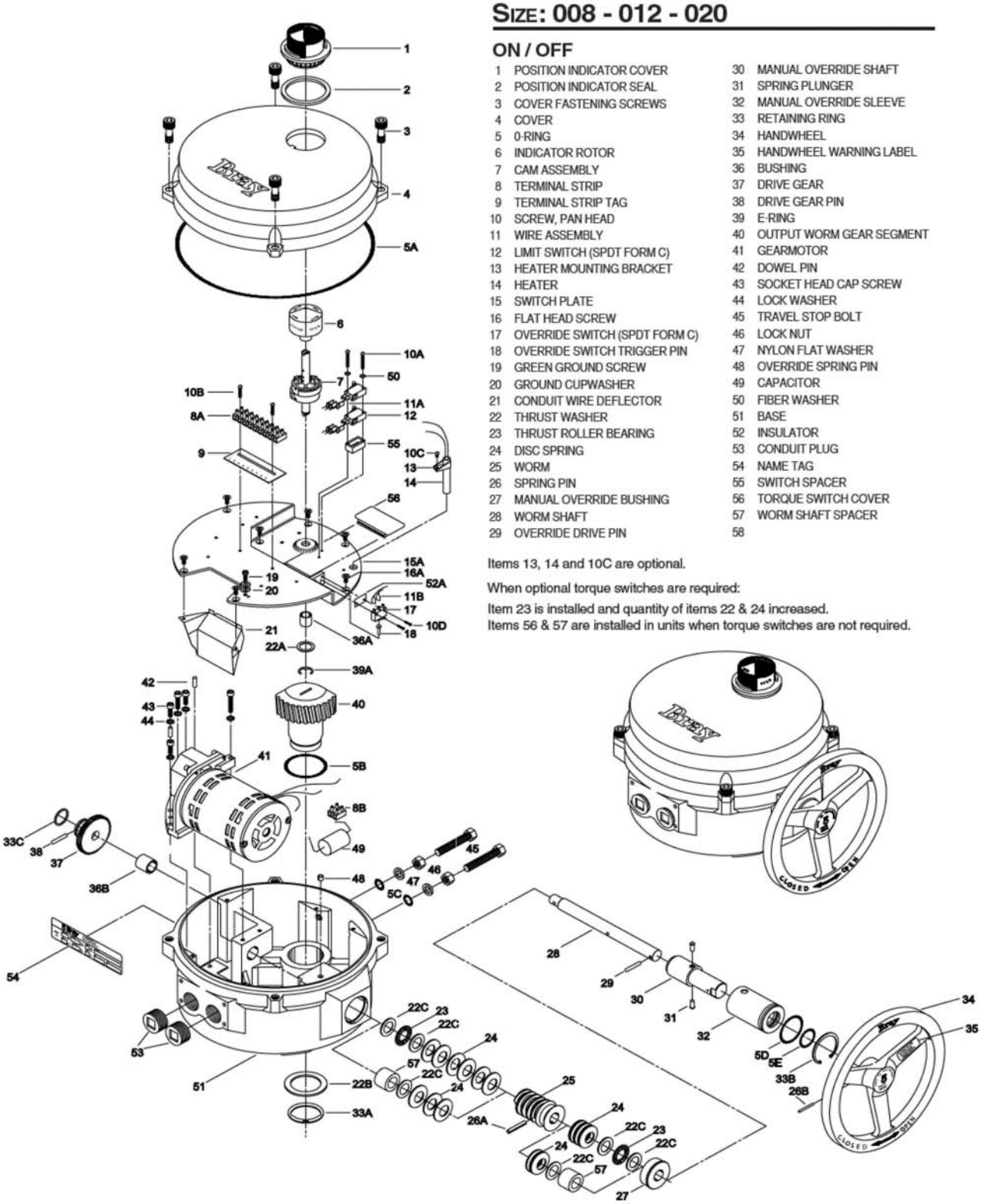
D) Technical annex & Project Data

Note:
*This clause is no integral part of the „**Original Einbau- und Betriebsanleitung“** but is an extract from the **BRAY-catalogue-sheet <Electric actuator Series 70…**>. More details may be found in this data sheet.*

D1 Technical Specification of the electric actuator

The actuator conforms to
- ► EN15714: <Actuators for Industrial Valves: Part 2: Electric actuators>
- ► EN60529: <Degrees of protection provided by enclosures>: IP65 or IP67

D2 Drawing, part list



SERIES 70
SIZE: 008 - 012 - 020

ON / OFF

1	POSITION INDICATOR COVER	30	MANUAL OVERRIDE SHAFT
2	POSITION INDICATOR SEAL	31	SPRING PLUNGER
3	COVER FASTENING SCREWS	32	MANUAL OVERRIDE SLEEVE
4	COVER	33	RETAINING RING
5	0-RING	34	HANDWHEEL
6	INDICATOR ROTOR	35	HANDWHEEL WARNING LABEL
7	CAM ASSEMBLY	36	BUSHING
8	TERMINAL STRIP	37	DRIVE GEAR
9	TERMINAL STRIP TAG	38	DRIVE GEAR PIN
10	SCREW, PAN HEAD	39	E-RING
11	WIRE ASSEMBLY	40	OUTPUT WORM GEAR SEGMENT
12	LIMIT SWITCH (SPDT FORM C)	41	GEARMOTOR
13	HEATER MOUNTING BRACKET	42	DOWEL PIN
14	HEATER	43	SOCKET HEAD CAP SCREW
15	SWITCH PLATE	44	LOCK WASHER
16	FLAT HEAD SCREW	45	TRAVEL STOP BOLT
17	OVERRIDE SWITCH (SPDT FORM C)	46	LOCK NUT
18	OVERRIDE SWITCH TRIGGER PIN	47	NYLON FLAT WASHER
19	GREEN GROUND SCREW	48	OVERRIDE SPRING PIN
20	GROUND CUPWASHER	49	CAPACITOR
21	CONDUIT WIRE DEFLECTOR	50	FIBER WASHER
22	THRUST WASHER	51	BASE
23	THRUST ROLLER BEARING	52	INSULATOR
24	DISC SPRING	53	CONDUIT PLUG
25	WORM	54	NAME TAG
26	SPRING PIN	55	SWITCH SPACER
27	MANUAL OVERRIDE BUSHING	56	TORQUE SWITCH COVER
28	WORM SHAFT	57	WORM SHAFT SPACER
29	OVERRIDE DRIVE PIN	58	

Items 13, 14 and 10C are optional.

When optional torque switches are required:
Item 23 is installed and quantity of items 22 & 24 increased.
Items 56 & 57 are installed in units when torque switches are not required.

D

WATERPROOF ENCLOSURE

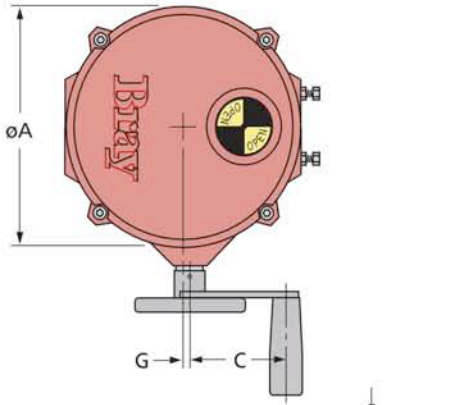
Actuator Series	A	B	C	D	E	F	G	H	J	K (UNC) xB.C.	M (UNC) xB.C.	N	P	Q	Weight lbs [kgs]
S70-003 S70-005	7.5 [191]	5.6 [142]	3.0 [76]	5.1 [130]	1.9 [48]	1.94 [49.3]	.19 [4.8]	1/2 ‡	2.0 [51]	5/16-18 x ø2.76	—	.75 [19]	.51 [13]	1.75 [44]	12 [6]
S70-008 S70-012 S70-020	10.1 [257]	7.8 [198]	3.7 [94]	6.5 [165]	2.5 [64]	2.69 [68.3]	.56 [14.2]	3/4 ‡	2.6 [66]	5/16-18 x ø2.76	1/2-13 x ø4.92	1.18 [30]	.87 [22]	2.20 [56]	28 [13]
S70-030 S70-050 S70-065	12.1 [307]	9.5 [241]	5.6 [142]	7.2 [183]	2.9 [74]	3.19 [81]	.56 [14.2]	3/4 ‡	3.1 [79]	1/2-13 x ø4.92	3/4-10 x ø6.50	See Detail A			48 [22]

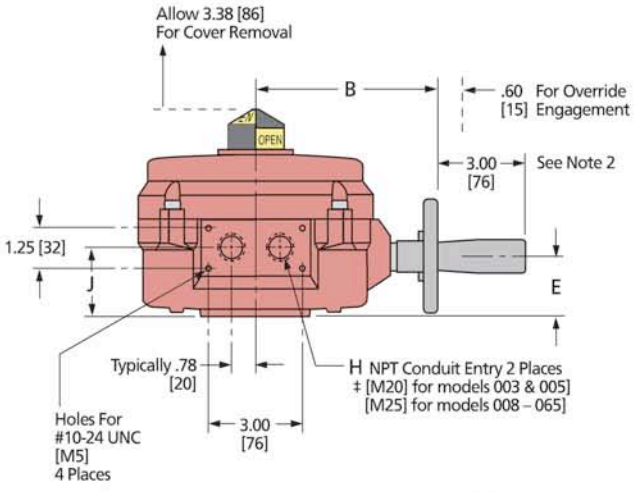
WATERPROOF / EXPLOSION PROOF ENCLOSURE

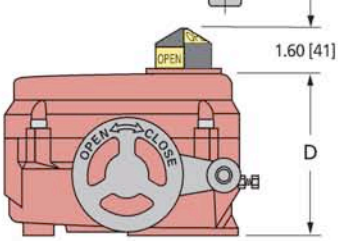
S70-708 S70-712 S70-720	12.5 [317]	8.0 [203]	3.7 [94]	7.2 [183]	2.5 [64]	2.69 [68.3]	.56 [14.2]	3/4 ‡	2.6 [66]	5/16-18 x ø2.76	1/2-13 x ø4.92	1.18 [30]	.87 [22]	2.20 [56]	34 [16]

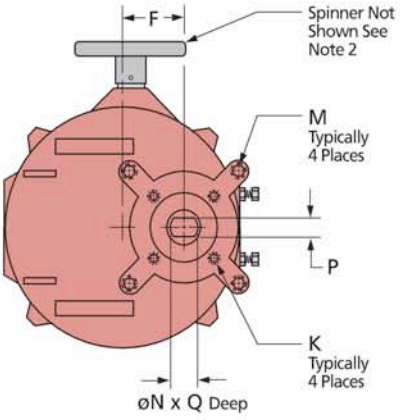
Notes:

1) Dimensions are in Inches, [Millimeters in brackets].
2) Handwheel Spinner shown in drawing is available as an option.
3) K & M Dimensions are also available in M8, M12, and M16.
4) N Dimension is also available with Double Square (Star) drive.

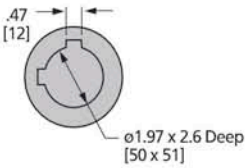








Detail A
(Series 70-030, 050, 065 Only)



WATERPROOF / EXPLOSION PROOF ENCLOSURE