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QUU - SANANANDA ST PUMP STATION OPERATION & MAINTENANCE MANUAL

Project Name: 11.0072 – QUU – Sananda St Pump Station Contract C1011-050

Location: No.16 Sananda Street, Darra

Prepared By:

Document Owner(s)	Project/Organization Role
Eamon Fitzpatrick	Diona Pty Ltd – Project Manager

Project Status Report Version Control:

Version	Date	Author	Change Description
0	14/11/13	Eamon Fitzpatrick	Issued to QUU for comment
0.1	21/01/14	Eamon Fitzpatrick	Revised based on QUU feedback

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1 Introduction

1.1 Project Scope of Works

The purpose of this project is to increase the capacity and improve the reliability of Sananda Street Sewerage Pump Station (SP213) by replacing critical mechanical and Electrical equipment on site together with the re-engineering of the existing site Civil Works as may be required.

1.2 Objectives of this manual

The purpose of this manual is to provide guidelines for the operation and maintenance of all components associated with Sananda Street Sewerage Pump Station (SP213) project.

1.3 Manual Format

This manual is set out in three sections and includes three Appendices, each of which can be revised and reissued independently.

Section 1 - Provides some background data on the project and describes the manuals objectives, format, and describes the document control procedures and contains a copy of the manual distribution register.

1.4 Document Control

Controlled versions of this Manual are kept by Queensland Urban Utilities and are available for distribution to staff where the need arises. Revised copies of the distribution register will accompany each revision of the Manual.

1.5 Distribution Register and Manual Control Sheet

Distribution details of this manual are recorded in table 1 on page 5 of this document. The sections of the Operations Manual listed in the contents page should be contained in this folder. The current revision number is listed on the front cover. Should it be found that any item in this folder is not current or missing, please notify the nominated Queensland Urban Utilities controller for it to be replaced.

Controlled copies of this Operations Manual have been issued to the people listed on Table 1:

Manual Distribution Register

Issued to	Position	Last Issued
Alison Lutgenau	**Project Manager**	**Draft 22.01.14**
Rajesh Radhakrishnan	**Project Manager**	**Draft 13.03.14**

2 Contractor's Commissioning Records

haald

Report

CONFIDENTIAL DATA

Diona
Sananda Street Pumping Station
Design Verification Report

Pump and Pipe Supports

dna1301-rpr-mch000-001

Issue	Date	Description	Author	Reviewed	Approved
0	09/10/13	Issued for general use		Damien Tocmay	

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Summary

Diona (DNA) has recently commissioned a sewerage pumping station at Sananda Street. HAALD Engineering (HLD) has been engaged by DNA to undertake a design review of the Pump and Pipe Supports to verify the structural integrity of the supports and to confirm that the natural frequency modes of the piping are not within the operating speed range of the pump. Design of the piping with respect to pressure containment has not been considered.

The design of the Pump and Pipe Supports has been checked using ANSYS finite element (FE) analysis software. Identified stresses for the static condition have been compared against the permissible design stresses and have been found to comply with the established acceptance criteria.

A modal analysis of the piping and associated supports has identified the first six natural frequencies for the system, all of which fall outside of the critical frequency band.

The installed pipe supports are deemed to provide restraint to the piping sufficient to prevent excitation of the pipework by the pumps at the specified operating frequency.

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List of Tables

1. Introduction

Diona (DNA) have recently commissioned a sewerage pumping station at Sanananda Street which is comprised of two *Hidrostal* immersible pumps in a dry well, complete with suction and discharge pipework. The project specification requires that Finite Element Analysis (FEA) is performed on the pump and pipe supports to verify the structural integrity of the supports and to confirm that the natural frequency modes of the piping are not within the operating speed range of the pump.

HAALD Engineering (HLD) has been engaged by DNA to undertake the design verification of the Pump and Pipe Supports in accordance with the requirements of the project specification.

Figure 1.1 – Sanananda Street Pumping Station – FEA Geometry

2. Design Criteria

2.1 Reference Documentation

Documentation used as inputs for the design verification process is listed in Table 2.1 below.

Table 2.1 – Reference Documentation

Item	Document Number	Rev	Description	Origin
1)	11-M7706	-	I06K-S03RL Pump Assembly	Weir Minerals
2)	486/5/7-0188-001	A	Pumping Station – Locality Plan	Urban Utilities
3)	486/5/7-0188-002	C	Pumping Station – GA – Plans	
4)	486/5/7-0188-003	D	Pumping Station – GA – Elevations	
5)	486/5/7-0188-006	C	Pumping Station – Pipe List	
6)	486/5/7-0188-007	B	Pumping Station – Duck-Foot Support	

2.2 Materials

Discharge piping is generally Mild Steel Cement Lined (MSCL) pipe. Material properties used in the analysis are given in Table 2.2.

Table 2.2 - Material Data

Item	Parameter		Value	Comments
1)	Pipe	Shell Material	Steel	ASTM A53 / API 5L (Grade B)
2)		Wall Thickness	STD	
3)		Yield Strength	240-MPa	ASTM A53 / API 5L (Grade B)
4)		UTS	410-MPa	
5)		Lining	Cement Mortar	
6)		Lining Thickness	10-mm	Assumed
7)		Equivalent Density	10,200-kg/m^3	Allows for cement mortar lining
8)	Pipe and Pump Supports	Material	Steel	AS3678-250 plate AS1163-250L0 hollow sections
9)		Yield Strength	250-MPa	
10)		UTS	320-MPa	
11)	Welding	Electrode Class	EX41XX	
12)		Design Tensile Strength	410-MPa	
13)		Standard	AS1554.1-SP	AS1579 – Arc Welded Steel Pipes and Fittings for Water and Wastewater
14)		Joint Efficiency	0.8	

2.3 Acceptance Criteria

Pump and Pipe Supports installed in the Sanananda Street Pump Station have been assessed against the acceptance criteria specified in Table 2.3.

Table 2.3 - Acceptance Criteria

Item	Parameter		Value	Comments
1)	Natural Frequency Verification	Pump Operating Frequency	24.9-Hz	Vane passing
2)		Critical Range	± 20%	
3)		Upper Bound	30-Hz	
4)		Lower Bound	20-Hz	
5)	Pipe Stress Verification	Design Standard	AS1579	Assumed
6)		Hydrostatic Testing	Nil	Assumed
7)		Permissible Design Stress	120-MPa	$0.5.F_y$ (AS1579 – S2.2)
8)	Support Stress Verification	Design Standard	AS3990	
9)		Permissible Design Stress	165-MPa	$0.66.F_y$

2.4 Technical Data

Additional technical design data related to the pumps, valves and piping is detailed within *dna301-dcr-gnr000-001 – Design Criteria*

3. Analysis – Methodology

3.1 Geometry and Meshing

The discharge piping is supported in two locations:

1. Vertical CHS columns under each of the primary vertical DN375 pipes are fixed to the concrete floor of the dry well
2. Two lateral CHS braces tie the upper manifold to the concrete walls of the dry well

Geometry for analysis purposes has been created in *Solidworks* before being imported to ANSYS for meshing operations. Piping has been modelled using surfaces (shell elements), while pumps and valves were modelled using solids (brick elements) for an accurate mass distribution within the assembly. Enforced mesh sizing and refinement in areas of particular interest resulted in a high quality mesh as shown in Figure 3.1 below.

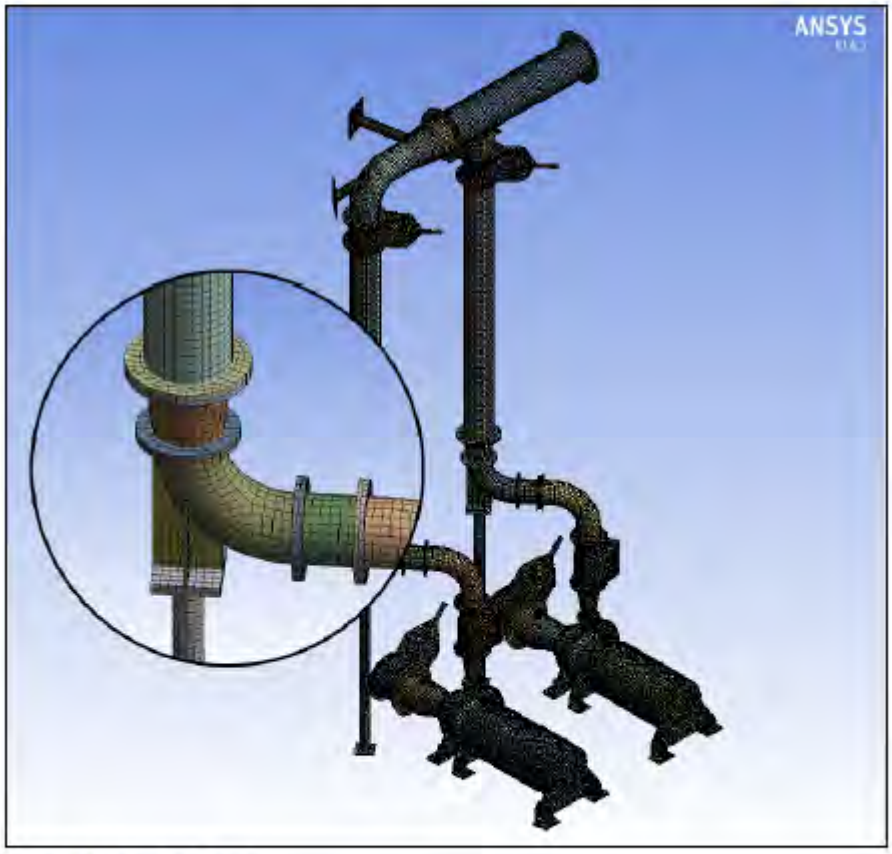


Figure 3.1 – Analysis Mesh

3.2 Material Assignment

Piping, flanges and supports have been assigned linear material properties in accordance with the material properties listed in Table 2.2.

Figure 3.2 illustrates the assigned plate thicknesses for all shell element components within the analysis model.

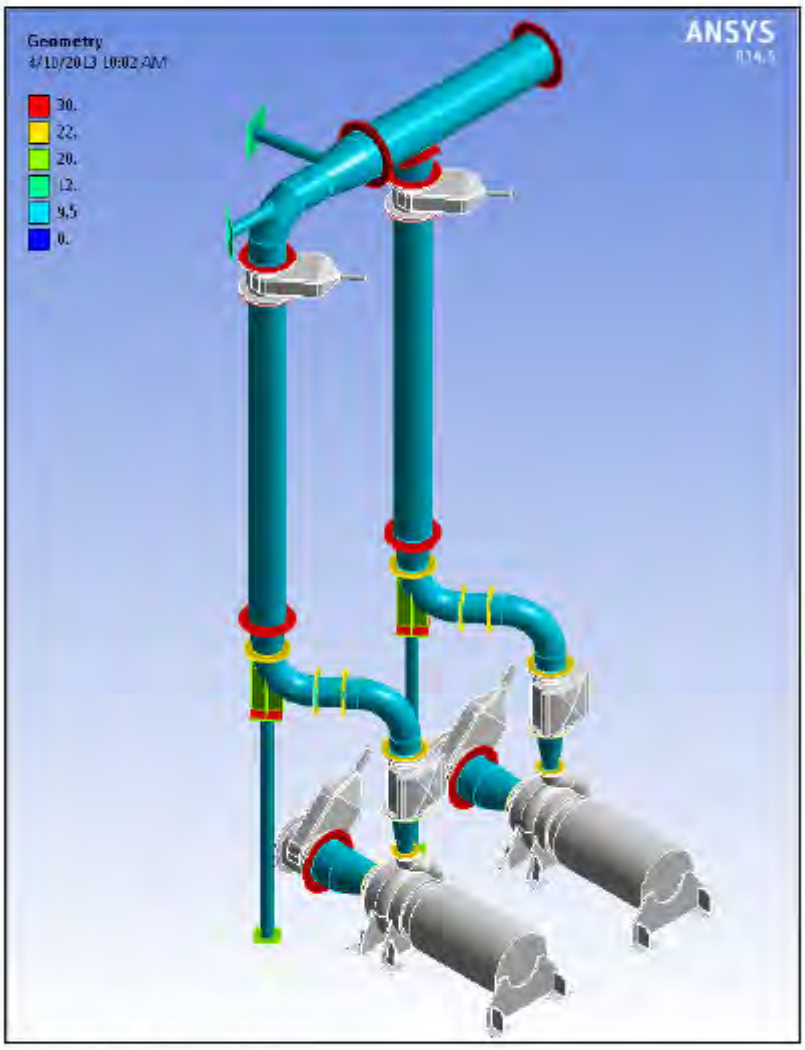


Figure 3.2 – Shell Thickness Plot

3.3 Load Application and Boundary Conditions

Loads and supports applied to the piping assembly for the static and frequency analyses are shown graphically in Figure 3.3 and are described below for reference:

a) Fixed support applied to the base plates on vertical support columns

b) Fixed support applied to the end plates on the lateral support braces

c) Fixed support applied to flanges of the DN450 gate valves (pump suctions)

d) Fixed support applied to the flange of the DN500 manifold

e) Hydrostatic pressure applied to the internal face of all pipe to simulate the weight of fluid within pipe (free surface at top of DN500 manifold)

f) Standard gravity

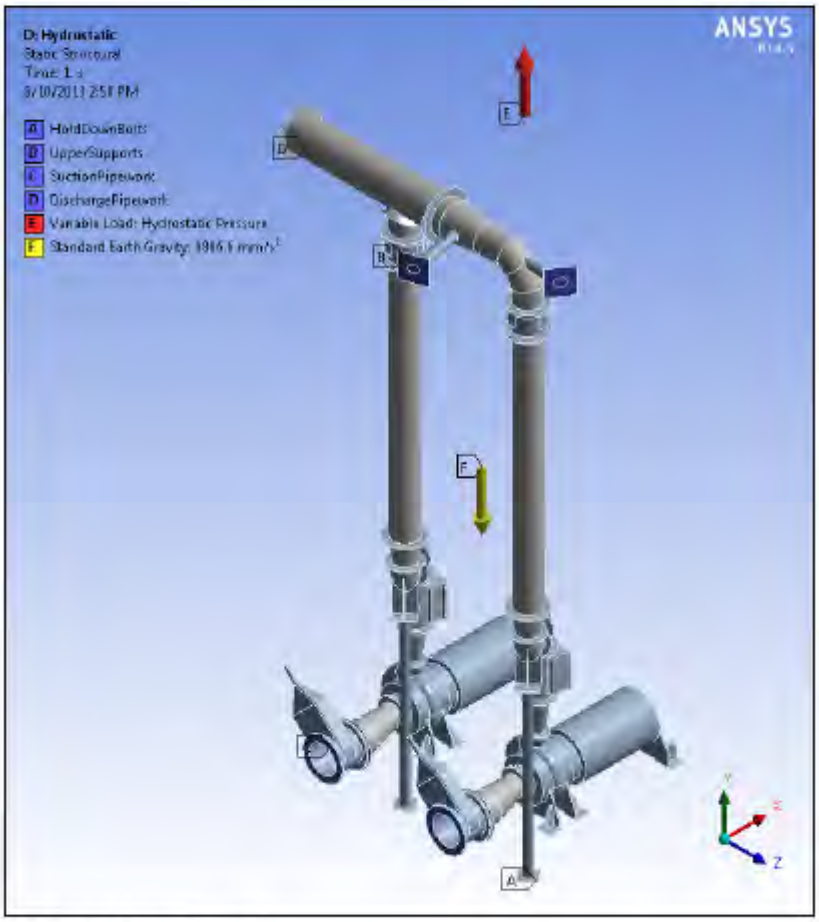


Figure 3.3 – Loads and Supports

4. Analysis – Results & Conclusions

4.1 Static Structural Analysis

An equivalent stress plot for the pumping station pipework is shown in Figure 4.1 below. Identified stresses for the piping and the supports remain well below the permissible design stresses of 120-MPa and 165-MPa respectively.

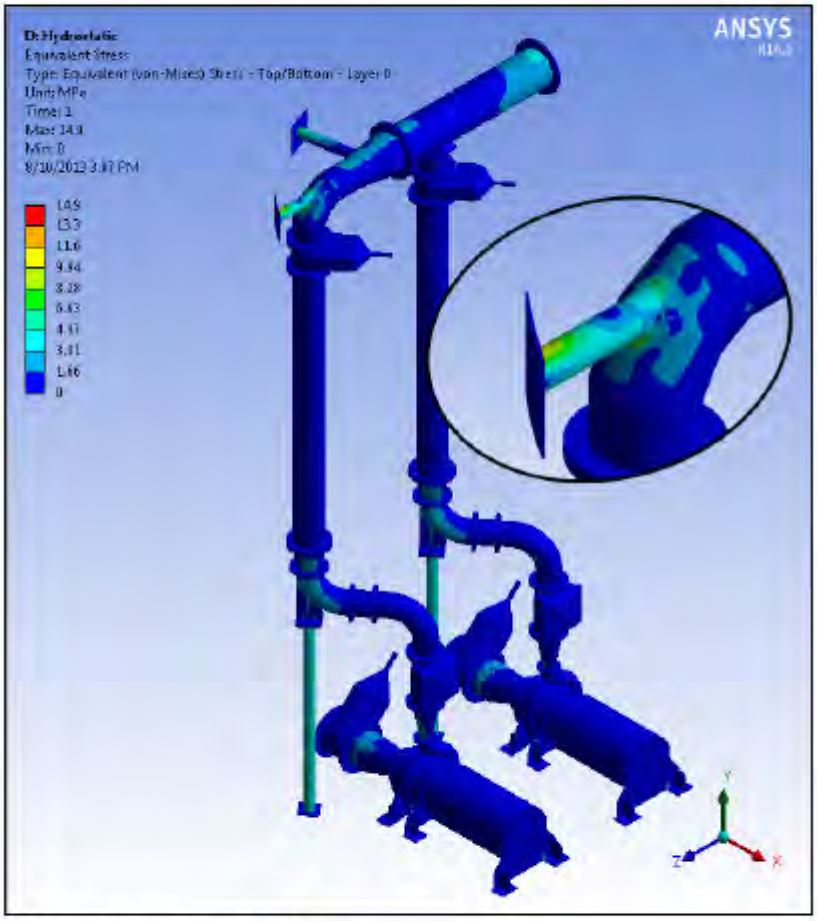


Figure 4.1 – Equivalent Stress Plot

4.2 Frequency Analysis

The first six natural frequencies identified by FE analysis are listed in Table 4.1 below. All natural frequencies identified are outside of the critical frequency band; therefore the risk of vibration is considered low. The mode shapes for the two natural frequencies closest to the pump operating frequency are plotted in Figure 4.2 for reference.

Table 4.1 - Frequency Conformance Summary

Mode	Frequency	Proximity (1)	Conformance (2)
1)	13.5-Hz	0.54	C
2)	13.7-Hz	0.55	C
3)	15.7-Hz	0.63	C
4)	15.9-Hz	0.64	C
5)	34.2-Hz	1.37	C
6)	35.4-Hz	1.42	C

1) Ratio of identified natural frequency to pump operating frequency

2) C – Conformance, NC – Non-conformance

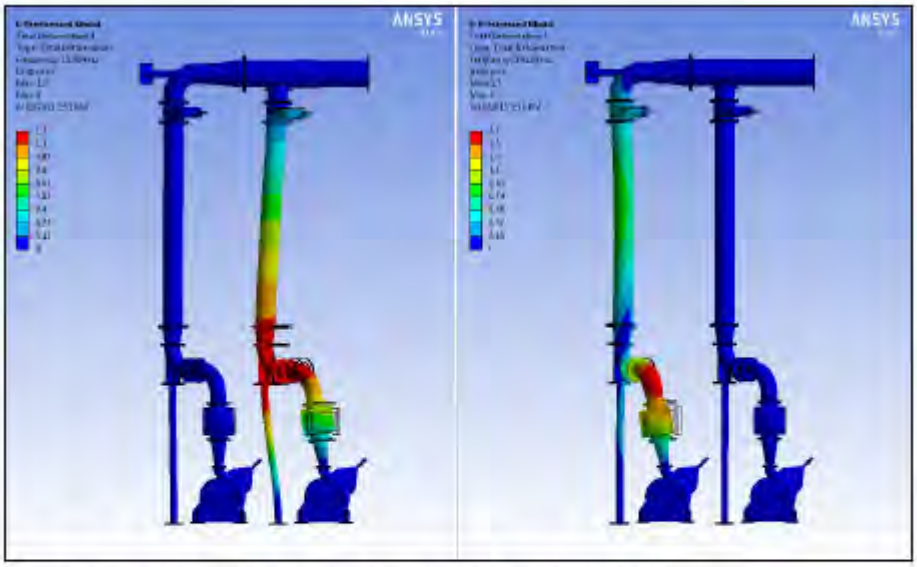


Figure 4.2 - Mode Shape 4 (15.9-Hz) and Mode Shape 5 (34.2-Hz)

3 Manuals

3.1 (2.23.2 A) – New pump roll out assembly.

(i) Pump Roll Out Assembly
(ii) Motor Pump

3.2 (2.23.2 B) – The Lifting Hoist.

(i) Telescopic Spreader Beam (NZTSB150-030-050)
(ii) Radio Remote Control handset for lifting hoist
(iii) GIS-CH-Electric Chain Hoist:

EXTM-CLOSE HEADROOM ELECTRIC CHAIN HOIST
Manufacturer - GIS, Place of manufacture - Swi2erland
Pre-assembled 2 fall chain hoist with special extra-low headroom frame
Motor tension - 3 x 380 / 420 V, 50 Hz
Rated capacity: 3200 kg, FEM 1 Bm (M3), HOL - 1 4.5 m, Duty: 25 oA, 150 switches/hour
Hoisting speeds - 4 & 'l metres per minute
Includes - Geared-limit switches for lifting and lowering, chain collector, ring suspension
Excludes - Pendant and powered travel.
UPGRADE MANUAL TRAVEL TO DUAL SPEED MOTORISED TMVEL - (to suit 350 WC '197 monorail)
MDIO REMOTE CONTROL 6X2 SPEED BUTTONS 24-48 VAC/DC
'zEcA'spRtNG CABLE REEL - W|TH 15 METRE CABLE (4X2.5MM2) Mass of base assembly - 390 kg appr. Material details - Main frame; Steel, Hoist body - Aluminium alloy, Drive components; High carbon steel/ SG lron
Motor size - 2.44 kW (fast winding), 0.61 kW (slow winding); Cunent - 8 & 0.45 amps (appr.)
Load chain size - 10 mm dia., 28 mm internal pitch (calibrated chain)
Chain collector - Sheetmetal or canvas material

3.3 (2.23.2 C) – The new electric control valves.

(i) Cam-Centric Plug Valve OM Manual
(ii) Rotork – Standard Dimensional Data
(iii) Rotork Controls

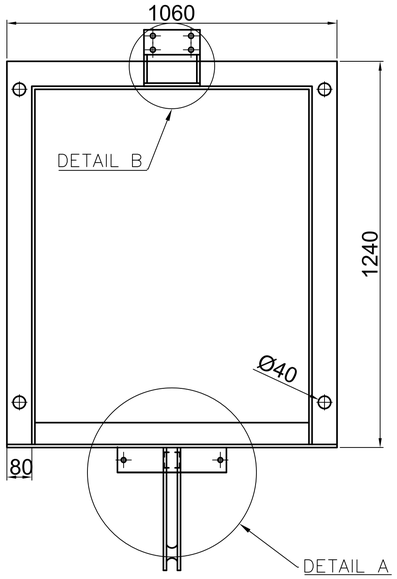
3.4 (2.23.2 D) – The well washer.

(i) Wall Mount Install – Maintenance

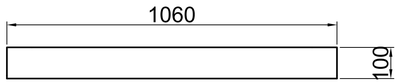
3.5 (2.23.2 E) – The new reflux valves.

(i) Reflux Valve - Val Matic

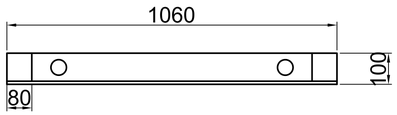
FRAME 01



TOP ELEVATION (SCALE 1:10)

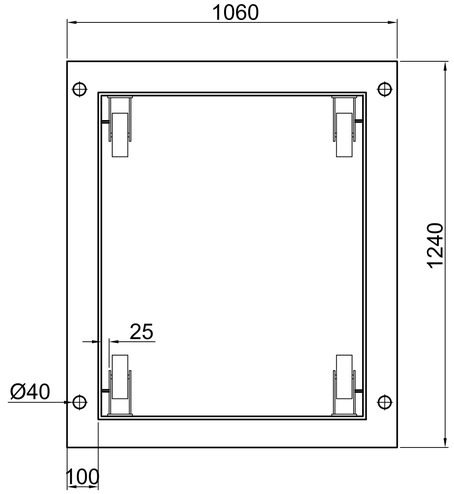


REAR ELEVATION (SCALE 1:10)

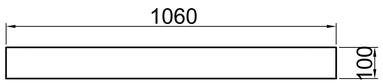


FRONT ELEVATION (SCALE 1:10)

FRAME 02



TOP ELEVATION (SCALE 1:10)



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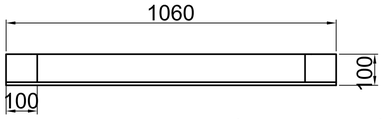
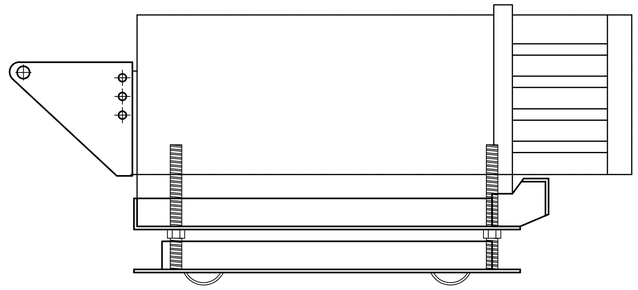


FRONT ELEVATION (SCALE 1:10)

FRAME (BUILT)



SIDE ELEVATION (SCALE 1:10)

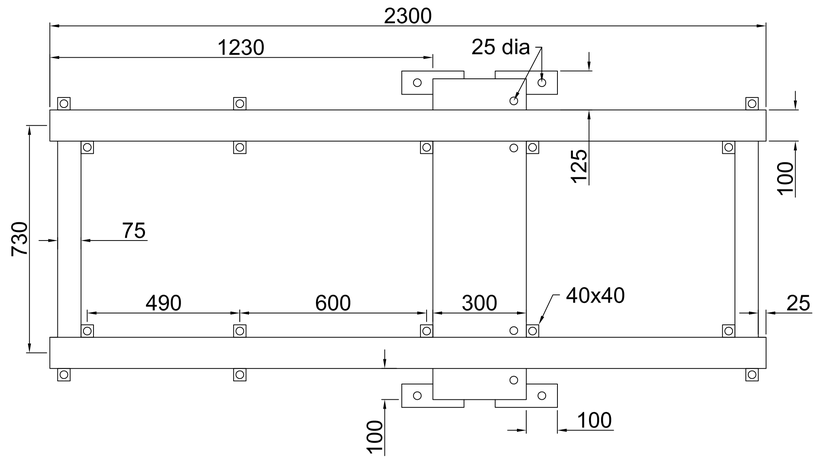
NOTES:
GENERAL

Appendix 1 Manuals 3.1 (i) Pump Roll Out Assembly

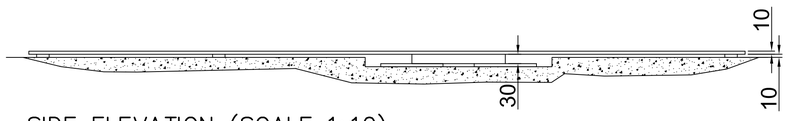
FRAME (BUILT)

Single-Acting, Cylinder-pump sets

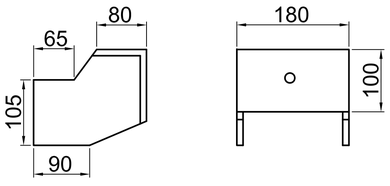
- Sets include:
  - Cylinder
  - Pump
  - 6 ft Safety hose HC7206
  - Calibrated gauge
  - Gauge adapter
- All hand pumps are two-speed



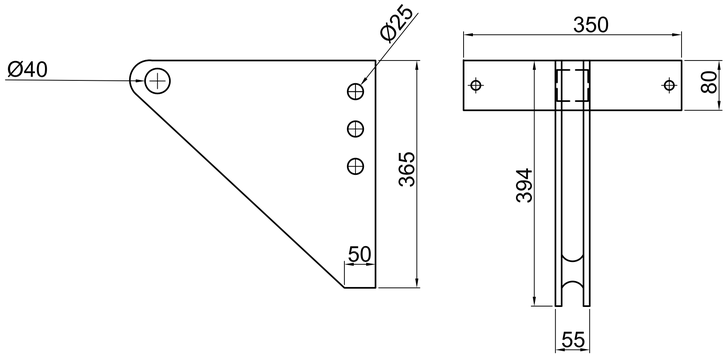
TOP ELEVATION (SCALE 1:10)



SIDE ELEVATION (SCALE 1:10)



DETAIL A (SCALE 1:5)



DETAIL B (SCALE 1:5)

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AS - CONSTRUCTED

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SCALE OF MILLIMETRES
1 : 10 FULL SIZE A1 SHEET

AS CONSTRUCTED DETAILS FOR AMENDMENT

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE TRUE AND ACCURATE RECORD OF THE WORKS

SIGNED ..... DATE: .....
NAME of SIGNATORY .....
RPEQ No. or LICENCE .....
COMPANY NAME .....
START DATE ..... FINISH DATE .....

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QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	REPQ NO.	APPROVED

FUNDING			
DESIGN W.O. No.	PA00	DRAFTED	E. FITZPATRICK
CONSTRUCTION W.O. No.	PA00	DRAFTING CHECK	D. CARKEET
FUNDED BY Q.U.U. (✓)	EXTERNAL ( )	CAD FILE	
		Q.U.U. FILE No.	

DESIGN ..... R.P.E.Q. No. ..... DATE .....
DESIGN CHECK ..... R.P.E.Q. No. ..... DATE .....
APPROVED BY ..... SIGNATURE ..... DATE .....
CONSTRUCTION MANAGER ..... SIGNATURE ..... DATE .....

ASSET/PROJECT
16 SANANANDA ST
DARRA

DRAWING TITLE
TROLLEY MOUNT DESIGN

SHEET No. 1 OF 1

QUEENSLAND URBAN UTILITIES DRAWING No.
486/5/7/0188/300

AMEND.
P1

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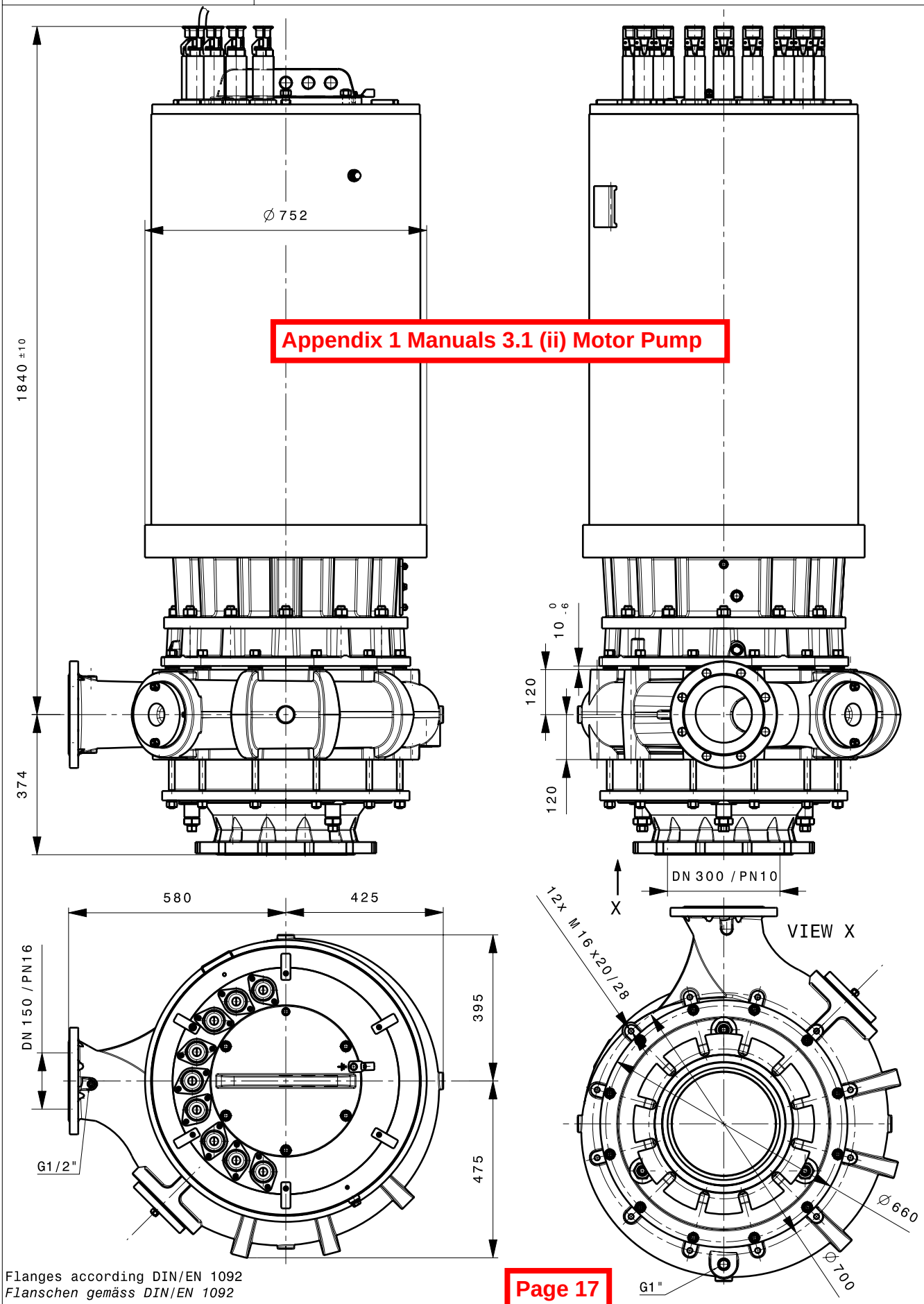

Flanges according DIN/EN 1092
Flanschen gemäss DIN/EN 1092

Konstruktionsänderungen vorbehalten
Subject to change without prior notice
Modifications réservées sans préavis

Drawn by/Bearb. Dat. Vis.:	18.08.09	pda
Approved by/Gepr. Dat. Vis.:	19.08.09	hph

No: 09-M7526

Appendix 1 Manuals 3.1 (ii) Motor Pump

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Materials Handling

Appendix 1 Manuals 3.2 (i) Telescopic Spreader Beams

BEAM PRODUCTS

Lifting Beams & Spreaders

Nobles are at the forefront of lifting and spreader beam design. In addition to our growing range of standard products a large number of the spreader/lifting beams manufactured by Nobles are purpose built.

Cost, Ease of Use, Stability & Headroom

Generally a higher cost beam will result in very good ease of use and long life while the availability of headroom greatly affects the stability of the lift. Nobles engineers have the expertise and experience to provide the best solution for any given lifting/spreader beam application.

Beam Types:

1. Basic Lifting Beam

Has a centre lifting lug at the top to accommodate a crane hook and has a bottom lug at each end for connecting slings or in some instances for hooking directly to the load.

2. Basic Spreader Beam

Literally "spreads" a two legged top sling. A spreader beam has better stability than a lifting beam and a higher potential capacity for a given size of steel section used.

3. Combination Beam

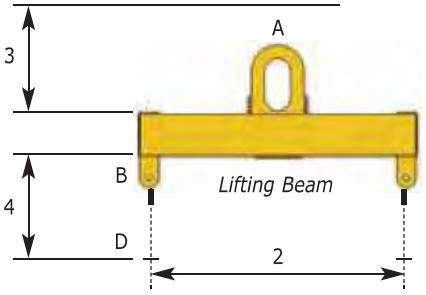
This beam is a combination of (1.) & (2.) and offers the versatility of a dual purpose beam.

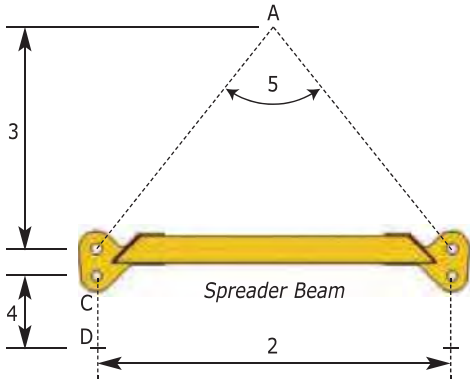
Other Types

There are, of course other types of beam, most of which are adjustable versions of the basic three. Other common types worth considering are X-beams, spreader frames and H-beams.

How to Order Lifting & Spreader Beams

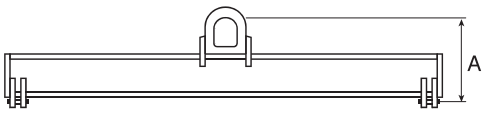
1. WLL required	Tonnes or Kg's
2. Centre distance of load or pick up points	mm
3. Headroom	mm
4. Length of sling leg	mm
5. Angle of sling leg	60°, 90° or 120°
6. Type of attachments at A, B, C & D	Oblong Links, Chain Connectors, Shackles, Hooks etc.

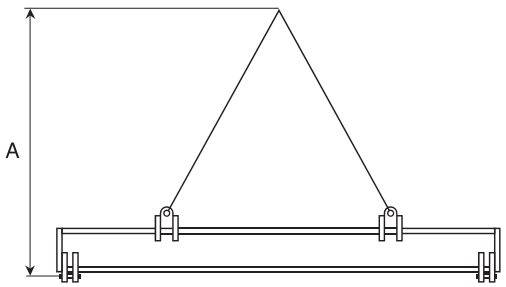




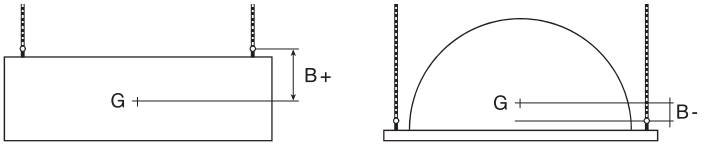
Lifting Stability is a function of:

1. The lifting beam's height (A).





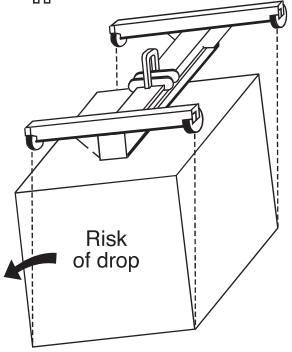
2. The centre of gravity (G) in comparison to the lower hanging points (B).



Where (B) is lower than (G), (A) must be longer than (B)

3. Lower slings as short as possible to avoid movement.

4. The shape of the trapezoid made by the lifting beam, slings and the load.



Materials Handling

NOBLES SINCE 1911

Materials Handling

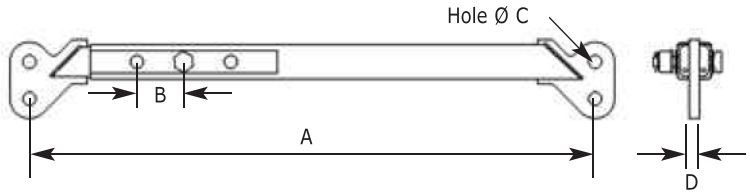
Appendix 1 Manuals 3.2 (i) Telescopic Spreader Beams

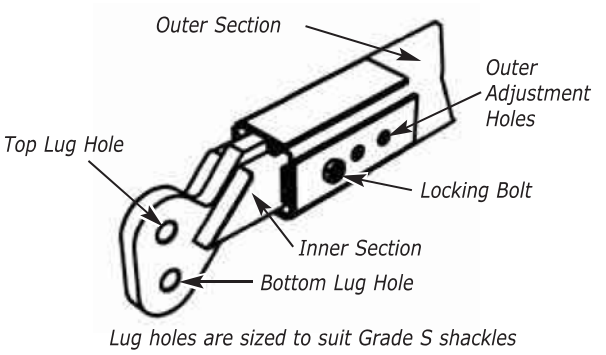
TELESCOPIC SPREADER BEAMS

Nobles Telescopic Spreader Beams are for users who need a high quality spreader beam with the versatility of telescopic adjustment but not the additional weight and complex instructions required when a centre lug is provided. Our beams are given a single load rating for simplicity.

Galvanised Finish

The galvanised surface finish is more durable than either paint or powder coating. Galvanising provides important protection for the outer tube and prevents any internal rust which may cause potential for hidden risk of failure.





Lug holes are sized to suit Grade S shackles

Disassembly

Nobles telescopic spreader beams can all be disassembled fully to enable inspection of the complete spreader beam sections. Many designs do not allow for this and pose risk from internal corrosion failure or jamming of the sections.

WARNING

- Always ensure that the correct sling angles and sizes are used.
- Always check the security of the load before lifting.
- Ensure that inner member does not drop when extending.
- Never extend or retract a suspended spreader beam.
- Never drill additional adjustment holes or use non-original adjustment holes.
- Never use the beam without the locking pin in place and ensure that it is fully inserted.
- Use only the original locking pin supplied.
- Large beam sections can be heavy, follow proper manual handling procedures when extending or retracting.

Stock Code	WLL at all Lengths (tonnes)	A (min)	A (max)	B (increment)	C	D	Tare (kg)	Maximum Sling Angle (degrees)
NZTSB020-024-036	2	2400	3600	100	21	16	45	90°
NZTSB025-008-012	2.5	800	1200	100	21	16	15	90°
NZTSB025-009-014	2.5	900	1400	100	21	16	19	90°
NZTSB050-012-019	5	1200	1900	100	25	25	45	90°
NZTSB050-018-030	5	1800	3000	100	25	25	36	90°
NZTSB050-030-050	5	3000	5000	100	25	25	190	90°
NZTSB050-040-070	5	4000	7000	100	25	25	250	90°
NZTSB080-018-030	8	1800	3000	100	28	25	65	90°
NZTSB080-024-043	8	2400	4300	100	28	25	70	90°
NZTSB100-020-032	10	2000	3200	100	32	32	62	90°
NZTSB110-029-048	11	2900	4800	100	32	32	174	90°
NZTSB120-023-037	12	2300	3700	100	34	45	120	90°
NZTSB120-025-040	12	2500	4000	100	34	45	118	90°
NZTSB150-017-024	15	1700	2400	100	38	45	180	90°
NZTSB150-030-050	15	3000	5000	100	38	45	195	90°
NZTSB200-018-025	20	1800	2500	100	43	45	315	90°
NZTSB200-023-037	20	2300	3700	100	43	45	210	90°
NZTSB240-025-042	24	2500	4200	100	43	40	310	90°
NZTSB300-025-037	30	2500	3700	100	54	50	315	90°
NZTSB500-024-035	50	2400	3500	100	68	80	410	90°
NZTSB500-025-037	50	2500	3700	100	66	80	465	90°

All dimensions are in mm Other sizes are available on request

Appendix 1 Manuals 3.2 (ii) Radio Remote Control Handset for Lifting Hoise

LK basic kit
pushbutton handset + receiver F

LK
light series

autec™
RADIO REMOTE CONTROL

Appendix 1 Manuals 3.2 (ii) Radio Remote Control Handset for Lifting Hoise

LK basic kit

pushbutton handset + F receiver

Transmitting units

Four versions available: 4/6 pushbuttons, single/double step plus Start and Stop.
Large pushbuttons (∅ 22 mm), removable starting keyswitch, quick frequency change (Start+Stop, Start), nylon-fiberglass hard compound case, shock-proof with IP65 protection degree, resistant to acids, oils and atmospheric agents.

weight: 420 g
depth: 43 mm

Receiving unit F

New compact receiver with internal antenna, AC or DC power supply and output connection via cable gland.
The radio remote control is fitted with safety functions, in particular the Stop is of the “Fail Safe” type, so is protected against potentially dangerous failures in compliance with category 3 EN 954-1.
Excellent internal accessibility, modular components to facilitate installation and maintenance operations. Protection degree IP65.

weight: 1.2 kg
depth: 83 mm

Technical data

Transmitting Units (LK 4-1 LK 4-2 LK 6-1 LK 6-2)	
Power supply	2.4V - 1.6 Ah (NiMH battery)
Autonomy with fully charged battery (continuous use at 20°C)	~ 12 hours
Operating and storage temperature	(-20°C)-(+70°C) / (-40°C)-(+70°C)
Transmitting unit RF power	<10 mW ERP (433 MHz)
Low battery warning time	3.5 minutes
Protection degree	IP65
Housing material	PA6 (20% fg)
Stop safety category	category 3 EN 954-1
Performance of radio receiver	class 1 EN 300220-1
Receiving Unit F	
Power supply	Nom. 24 - 48 Vac/dc (~10W); Max. 20 - 60 Vac/dc
Antenna	internal
Stop/Safety contact rating	4A (250 Vac) / 4A (250 Vac)
Command contact rating	6A (250 Vac)
Operating and storage temperature	(-40°C)-(+70°C)
Protection degree	IP65
Housing material	PA6 (20% fg)

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Phone +39.0444.901000 - Fax +39.0444.901011
info@autecsafety.com - www.autecsafety.com

Cert. UNI EN ISO 9001:2000
No. 50 100 2877
Design, manufacture and service of remote control systems for safety industrial applications
R&TTE Directive (99/05/EC)
(LVD 2006/95/CE)
Machinery Directive (98/37/EEC)
as applicable

LIGHT LEAFLET LKBASIC ENG 1_02/08

GIS-*CH* ELECTRIC CHAIN HOIST: SIMPLE, RELIABLE, SECURE.

Manuals 3.2 (iii) CIS-CH-Electric Chain Hoist

GIS – YOUR GENERAL CONTRACTING PARTNER FOR EFFICIENT MATERIAL FLOW.

- Complete range of market services for off-floor goods handling
- A wealth of know-how – from planning through to installation
- We manufacture quality products – «Made in Switzerland»
- Our approach is based on reliability and service

More features of the GIS company:

- Guaranteed innovation because we have our own development department
- Certified quality (ISO 9001)
- Our worldwide network of dealers keeps us extremely close to the market

... and a thousand and one applications!

Your benefits:

- solutions that match your particular situation
- maximum flexibility – another benefit of the wide GIS range
- cost-effective, reliable goods handling
- business relationships based on partnership

AN OVERVIEW OF GIS PRODUCTS

Lifting technology

GIS electric chain hoists (up to 5000 kg)

- low wear, reliable, easy to maintain
- application: stationary, movable on I-beams or combined with GIS crane system

Crane technology

GISKB crane system (up to 1250 kg)

- modular concept
- single and double bridge suspended crane for all-round goods transportation
- monorail with bends and switches for linebound transportation
- lightweight design

GIS travelling cranes (up to 5000 kg)

- designed to customer specifications
- conventional design
- especially suitable for larger spans

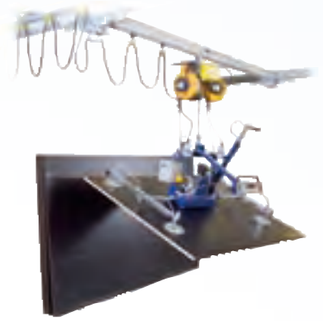
GIS slewing pillar and wall cranes (up to 1000 kg)

- for use when ceilings have insufficient load-bearing capacity
- an ideal addition to your suspended crane
- quick to plan, simple, easy to handle

Vacuum lifting technology

Gentle lifting with GIS vacuum equipment (up to 500 kg)

- for all types of surfaces and a huge variety of products
- can be combined with electric chain hoists/wire rope hoists



Your benefits:

- perfected quality products
- tested and proven thousands of times over
- simple design and installation
- at any time extendable

GIS-*CH* ELECTRIC CHAIN HOIST FROM 40 TO 5000 KG

- COMPACT DESIGN
- ROBUST CONSTRUCTION
- EASE OF MAINTENANCE
- AVAILABILITY ASSURED
- ADVANCED TECHNOLOGY
- SWISS QUALITY
- LIFTING CAPACITY UNTIL 5000 KG
- PROTECTION CLASS IP 55 (OPTION IP 65)

WORLD'S FIRST IN SAFETY

- Double slip clutch (best overload protection ever). Authority's safety test passed superbly! Five times more secure than the regulations require!
- Highest safety with brake positioned after the slip clutch
- End of chain is fixed to the hoist body
- Standard geared limit switch: chain length up to 120 m
- Made for industrial use: body and covers completely built in aluminum
- Jamming of the chain excluded due to two part plastic chain guide

WORLD'S FIRST IN SERVICE AND HANDLING

- Easy adjustment of the slipping clutch
- No special tools or electronic devices required
- Disc brake system maintenance free
- Chain guide removable without disassembly of the hoist
- Easy conversion from 1 to 2 fall (double load capacity)
- Ergonomic 2 and 4 button control pendant with support wire
- Silent working due to helical gears
- Standard low voltage control (42 V)

GIS-*CH* ELECTRIC CHAIN HOIST FROM 40 TO 5000 KG

Type description	Capacity in kg following ISO (FEM)* M3 (1Bm)	M4 (1Am)	M5 (2m)	M6 (3m)	M7 (4m)	Lifting speed m/min	Chain mm
GCH 250/1N	250	200	160	125	100	8	4x12.3
GCH 250/1NF	250	200	160	125	100	8/2	4x12.3
GCH 250/1SF	160	125	100	80	60	12.5/3	4x12.3
GCH 250/1HF	100	80	60	50	40	20/5	4x12.3
GCH 250/2N	500	400	320	250	200	4	4x12.3
GCH 250/2NF	500	400	320	250	200	4/1	4x12.3
GCH 250/2SF	320	250	200	160	125	6.25/1.5	4x12.3
GCH 500/1N	500	400	320	250	200	8	5x15.3
GCH 500/1NF	500	400	320	250	200	8/2	5x15.3
GCH 500/1SF	320	250	200	160	125	12.5/3	5x15.3
GCH 500/1HF	200	160	125	100	80	20/5	5x15.3
GCH 500/2N	1000	800	630	500	400	4	5x15.3
GCH 500/2NF	1000	800	630	500	400	4/1	5x15.3
GCH 500/2SF	630	500	400	320	250	6.25/1.5	5x15.3
GCH 1000/1N	1000	800	630	500	400	8	7x22
GCH 1000/1NF	1000	800	630	500	400	8/2	7x22
GCH 1000/1SF	500	400	320	250	200	16/4	7x22
GCH 1000/2N	2000	1600	1250	1000	800	4	7x22
GCH 1000/2NF	2000	1600	1250	1000	800	4/1	7x22
GCH 1000/2SF	1000	800	630	500	400	8/2	7x22
GCH 1600/1N	1600	1250	1000	800	630	8	9x27
GCH 1600/1NF	1600	1250	1000	800	630	8/2	9x27
GCH 1600/1SF	1000	800	630	500	400	12.5/3	9x27
GCH 1600/2N	3200	2500	2000	1600	1250	4	9x27
GCH 1600/2NF	3200	2500	2000	1600	1250	4/1	9x27
GCH 1600/2SF	2000	1600	1250	1000	800	6.25/1.5	9x27
GCH 2000/1N	2000	1600	1250	1000	800	8	10x28
GCH 2000/1NF	2000	1600	1250	1000	800	8/2	10x28
GCH 2000/1SF	1250	1000	800	630	500	12.5/3	10x28
GCH 2000/2N	4000	3200	2500	2000	1600	4	10x28
GCH 2000/2NF	4000	3200	2500	2000	1600	4/1	10x28
GCH 2000/2SF	2500	2000	1600	1250	1000	6.25/1.5	10x28
GCH 2500/1N	2500	2000	1600	1250	1000	6.4	10x28
GCH 2500/1NF	2500	2000	1600	1250	1000	6.4/1.6	10x28
GCH 2500/1SF	1600	1250	1000	800	630	10/2.5	10x28
GCH 2500/2N	5000	4000	3200	2500	2000	3.2	10x28
GCH 2500/2NF	5000	4000	3200	2500	2000	3.2/0.8	10x28
GCH 2500/2SF	3200	2500	2000	1600	1250	5/1.25	10x28

* ISO (FEM) classification: switches per hour on control pendant
M3 (1Bm) = 150 switches per hour, 25% duty
M4 (1Am) = 180 switches per hour, 30% duty
M5 (2m) = 240 switches per hour, 40% duty
M6 (3m) = 300 switches per hour, 50% duty
M7 (4m) = 360 switches per hour, 60% duty

Brake

- Maximum safety (construction: brake after slipping clutch)
- New advanced brake design
- Unique availability
- Maintenance free

Chain wheel

- Made of hardened steel
- With additional chain pockets (4mm): hence quiet running and improved running properties
- With double bearing construction

Geared limit switch (standard)

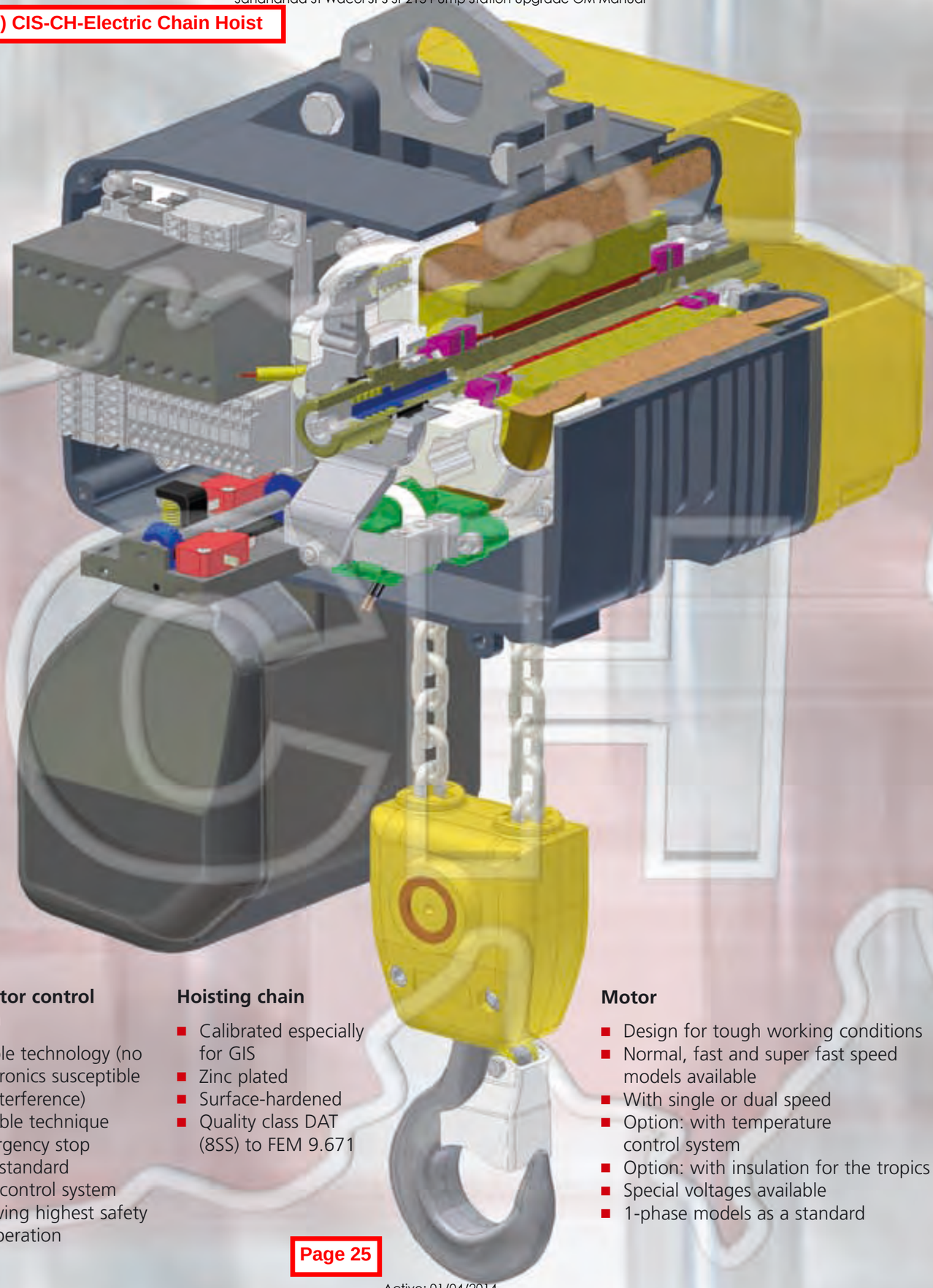
- Simple adjustment
- Exact positioning
- Lifting heights up to 120 m
- Accuracy for repetition assured

Transmission

- Helical-toothed gear steps for quiet running
- Permanent lubrication for wear resistant operation

Contactor control system

- Simple technology (no electronics susceptible to interference)
- Reliable technique
- Emergency stop as a standard
- 42V control system allowing highest safety of operation



Hoisting chain

- Calibrated especially for GIS
- Zinc plated
- Surface-hardened
- Quality class DAT (8SS) to FEM 9.671

Chain guidance

- 2-part construction to optimize maintenance
- Reinforced plastic material highly wear resistant
- Safe operation jamming excluded

Slipping clutch

- Simple and precise adjustment
- Maintenance free and highly resistant to wear
- Ease of servicing thanks to comfortable access

Control switch

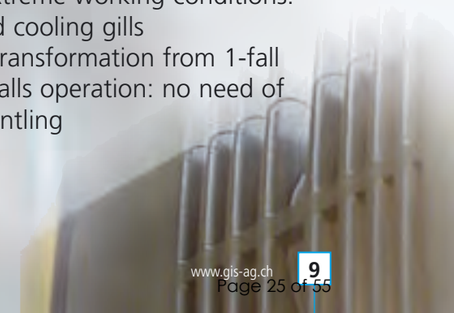
- With built-in support wire as a standard
- 2-buttons: design especially ergonomic
- Emergency stop as a standard
- Protection: IP65 to DIN 40050
- Optional: with integrated working hours counter

Motor

- Design for tough working conditions
- Normal, fast and super fast speed models available
- With single or dual speed
- Option: with temperature control system
- Option: with insulation for the tropics
- Special voltages available
- 1-phase models as a standard

Housing

- Cast aluminium housing with maximum solidity (no plastic material)
- For extreme working conditions: casted cooling gills
- Easy transformation from 1-fall to 2-falls operation: no need of dismantling



CREATION OF ADDED VALUE WITH PROFESSIONAL MATERIAL HANDLING

Low headroom with GIS-*CH* electric chain hoist

- Solution for especially low rooms for working areas in all kind of industries
- Reduced headroom over clever hoist alignment and chain guidance
- Hook position individually adjustable by geared limit switch
- Step less speed control with frequency inverter available (optional)
- Hook distance variable by modular lengthening device
- Designed for use with the complete GIS range
- Load capacity until 3200 kg

Synchronic lifting technology with GIS-*CH* electric chain hoist

- Solution for optimized handling of exceptional length and bulky loads
- Precise parallel run of two or four load hooks guaranteed
- Load capacity with 2 hooks, 2 x 1250 kg or with 4 hooks, 4 x 1250 kg
- Hook position (height) individually adjustable by geared limit switch
- Step less speed control with frequency inverter available (optional)
- Hook distance following needs and further on adjustable
- Modular development for use in low rooms
- Practicable in fully automatic installations with external controls
- Designed for use with the complete GIS range

REALIZE YOUR WISHES BY DIRECT HANDCONTROLS

Flexible hand guide control «Chain Handy» with GIS-*CH* electric chain hoist

- Product positioning through toggle switch in comfortable and efficient way
- Allows a fast and reliable movement of different goods
- Standard left and right hand operation
- Safe lifting until 250 kg capacity
- Step less speed control with frequency inverter available (optional)
- Designed for use with the complete GIS range

High precise rigid hand guide control «Telescopic Handy» with GIS-*CH* electric chain hoist

- Exact and accurate positioning through toggle switch and rigid telescopic guide system
- Allows the controlled and perfected handling of different (incl. liquids) transport goods
- Standard left and right hand operation
- Safe lifting until 250 kg capacity
- Step less speed control with frequency inverter available (optional)
- Designed for use with the complete GIS range

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ELECTRIC CHAIN HOIST - FOR THE ENTERTAINMENT INDUSTRY

Climbing and lifting with GIS-*CH* electric chain hoist

- Individually available with direct or standard control
- Prepared for externally powered controls
- Available with standard geared limit switch
- Available with second break and load control system
- Fulfills requirements of BGV-D8, BGV-D8 Plus and BGV-C1

ECONOMIC EXPLOSION PROOVED SOLUTION

ATEX conformity with GIS-*CH* electric chain hoist

- Solution with existent industrial resources (air pressure)
- The entry of gas is avoided through an overpressure in the housing
- Maximum safety guaranteed: At a lost of pressure in the housing the power will be cut immediately (electrically connected over the emergency stop)

Dustproof execution
Ex II 3D IP 65 T130°C
– Equipment group II
– Equipment category 3
– Zone 22 (D)
– Temperature = less 130°C
– Motor with Klixon

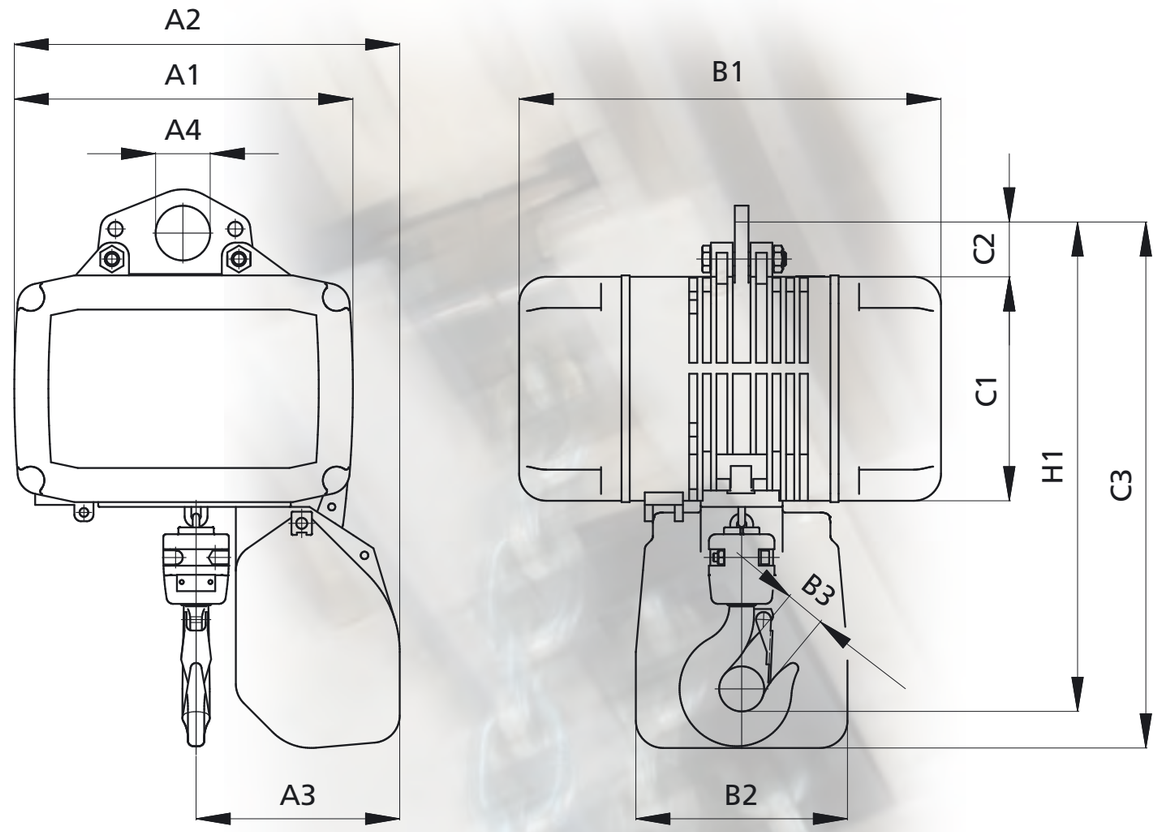
Gasproof execution
Ex II 3G EEx II nZ T3 and Ex II 3D IP 65 T130°C
– Equipment group II
– Equipment category 3
– Zone 2 (G) 22 (D)
– Temperature class = T3
– Motor with Klixon
– with overpressure surveillance

IN HARD AMBIENT CONDITIONS ....WE FEEL GOOD.

Specific research guarantees corrosion resistance with GIS-*CH* electric chain hoist

- Specially for applications in aggressive atmospheres (tested in defined acids and lye's and other specific liquids and substances)
- All contact affected parts manufactured in corrosion resistant material (chain, equipment material, hook and screws)
- High reliability with standard IP 65 protection class
- Designed for use with the complete GIS range
- Lifting capacity till 1000 kg

DIMENSIONS GIS-*CH* ELECTRIC CHAIN HOIST



Type	A1 mm	A2 mm	A3 mm	A4 mm	B1 mm	B2 mm	B3 mm	C1 mm	C2 mm	C3 mm	H1 mm
GCH 250/1	246	281	146	40	309	155	22	164	53	448	369
GCH 250/2	246	281	164	40	309	155	22	164	53	448	408
GCH 500/1	246	281	146	40	309	155	22	164	53	448	377
GCH 500/2	246	281	169	40	309	155	22	164	53	448	417
GCH 1000/1	321	367	190	52	367	180	32	214	69	615	482
GCH 1000/2	321	367	224	52	367	180	32	214	69	615	556
GCH 1600/1	345	424	221	75	389	180	37	230	135	696	608
GCH 1600/2	345	424	263	75	389	180	37	230	135	696	690
GCH 2000/1	345	424	221	75	389	180	37	230	135	696	608
GCH 2000/2	345	424	263	75	389	180	37	230	135	696	690
GCH 2500/1	345	424	221	75	389	180	37	230	135	696	608
GCH 2500/2	345	424	263	75	389	180	37	230	135	696	690

Lifting technology
Crane technology
Vacuum lifting technology

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FAITH IN GIS.

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Certified to ISO 9001

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GIS® Lifting and Crane Technology
Faith in technology. Faith in GIS.

Manual No.
CCPV-OM2

Manuals 3.3 (i) Cam-Centric Plug Valve O&M Manual

Cam-Centric®
Plug Valve

Operation, Maintenance and Installation Manual

VAL-MATIC VALVE AND MANUFACTURING CORP.
905 RIVERSIDE DRIVE ■ ELMHURST, IL 60126
PHONE (630) 941-7600 ■ FAX (630) 941-8042

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Manuals 3.3 (i) Cam-Centric Plug Valve O&M Manual

VAL-MATIC'S CAM-CENTRIC® PLUG VALVE OPERATION, MAINTENANCE AND INSTALLATION

INTRODUCTION

The Cam-Centric® Plug Valve has been designed to give years of trouble-free operation. This manual will provide you with the information to properly install and maintain the valve to ensure a long service life. The valve is an eccentric, resilient seated, quarter-turn plug valve capable of handling many types of fluids including fluids with suspended solids. The Size, Cold Working Pressure (CWP), Actuator Rating, and Model No. are stamped on the nameplate for reference.

CAUTION: Do not use valve for line testing at pressures higher than nameplate rating or leakage and damage to valve may occur.

The "Cold Working Pressure" is the non-shock pressure rating of the valve at 150°F. The valve is not intended as a block valve for line testing above the valve rating. The "Actuator Rating" is the pressure that was used to size the actuator for operating conditions and may be less than the valve "Cold Working Pressure". Because the valve is eccentric, the valve may have a different actuator rating for reverse and direct pressure. If the valve is operated at pressures higher than the actuator ratings, the valve may be difficult to operate or leak.

RECEIVING AND STORAGE

Inspect valves upon receipt for damage in shipment. Unload all valves carefully to the ground without dropping. Do not lift valves with slings or chains around the actuator or through the seat area.

Valves should remain crated, clean and dry until installed to prevent weather related damage. For long term storage greater than six months, valve must remain open and the rubber surfaces of the plug coated with a thin film of FDA approved grease such as Dow Corning # 7. Do not expose plug to sunlight or ozone for any extended period.

DESCRIPTION OF OPERATION

As shown in Figure 2, the valve consists of a body and a 1/4 turn plug that is offset from the seat centerline.

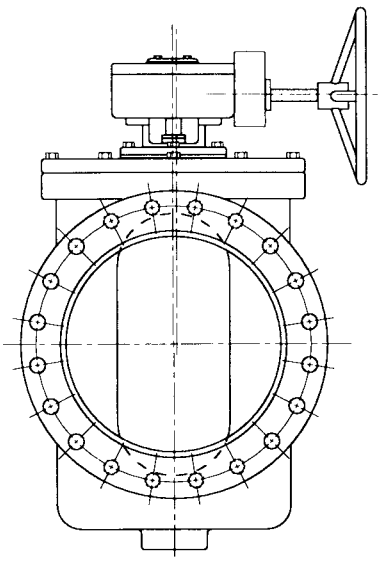

FIGURE 1. PLUG VALVE WITH GEAR ACTUATOR

The eccentric offset causes the plug to lift and rotate off the seat simultaneously to reduce seat friction and wear during operation. Direct Pressure pushes the plug into the seat and Reverse Pressure pushes the plug away from the seat. The valve can be operated with a direct nut, lever, or gear actuator. The gear actuator as shown in Figure 1 requires multi-turn input on a 2" square nut, handwheel, or chainwheel. The valve can also be automated with power actuators such as an electric motor or hydraulic cylinder.

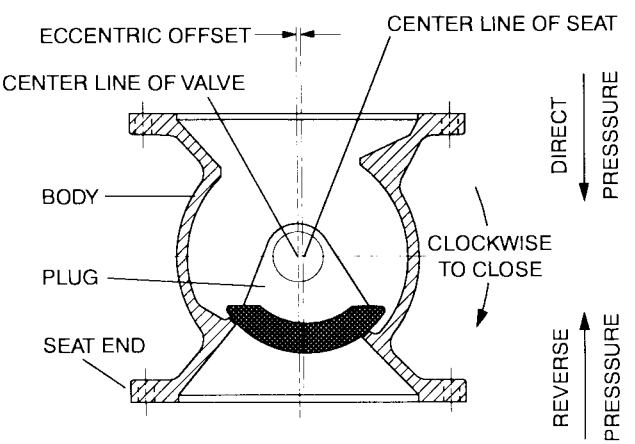

FIGURE 2. PLUG VALVE TERMS

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Manuals 3.3 (i) Cam-Centric Plug Valve O&M Manual

VALVE CONSTRUCTION

The standard Cam-Centric® Plug Valve is constructed of rugged cast iron with a welded nickel seat and permanently lubricated stainless steel bearings. See the specific Materials List submitted for the order if other than standard cast iron construction. The details of construction are illustrated in Figure 3.

The body (1) is available with flanged or mechanical joint ends for connection to the pipeline. The valve is designed to be serviced in-line by removing the cast cover (2). The 1/4 turn plug (3) is guided by sleeve bearings (6) located in the cover and lower boss in the body. Grit-Guard® seals (21) are located at the bottom of the bearings (6) to prevent abrasive material from wearing the bearing. Leak-tight closure is made when the rubber coated plug (3) is rotated into the nickel seat on the "SEAT END" of the body.

ITEM	DESCRIPTION	MATERIAL
1	Body	Cast Iron with Overlay Welded Nickel Seat
2	Cover	Cast Iron
3	Plug*	Cast Iron with Resilient Facing
6	Bearings*	316 Stainless Steel
7	V-Type Packing*	Buna-N
8	Cover Seal*	Buna-N
15	Cover Bolt	Alloy Steel, Gr 5
18	Packing Follower	Cast Iron
19	Follower Bolt	Alloy Steel, Gr 5
21	Grit-Guard™*	Buna-N
22	Thrust Bearing*	Teflon
23	Thrust Bearing*	316 Stainless Steel
24	Key*	Carbon Steel
29	Shims*	304 Stainless Steel

*RECOMMENDED SPARE PART

TABLE 1. STANDARD PLUG VALVE PARTS LIST

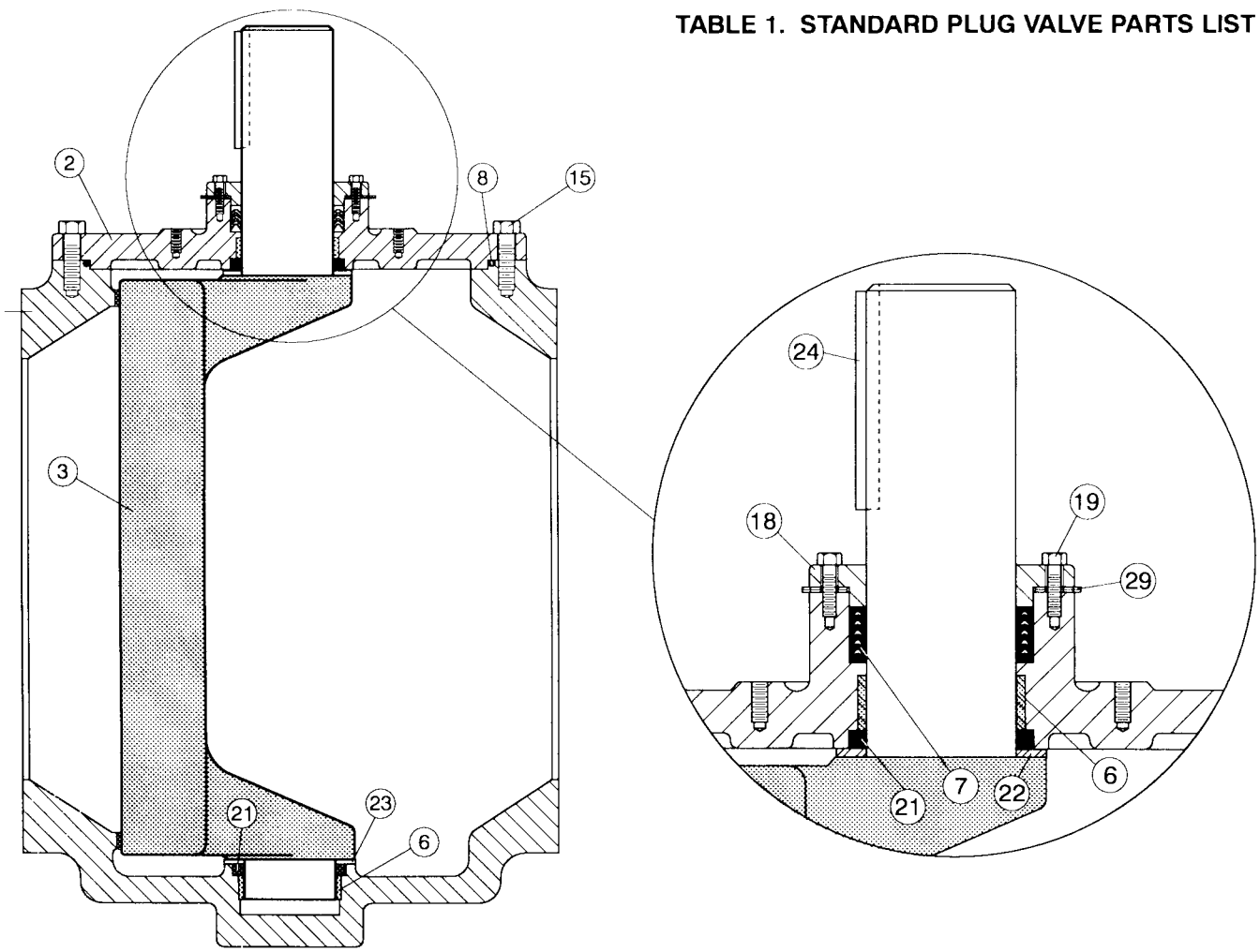

FIGURE 3. STANDARD PLUG VALVE CONSTRUCTION

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Manuals 3.3 (i) Cam-Centric Plug Valve O&M Manual

INSTALLATION

The installation of the valve is important for its proper operation. The valve is capable of flow in either direction but the maximum operating pressure can vary with the location of the seat end. The words "**SEAT END**" are marked on the valve flange. Actuators are available for pressures up to the full valve rating in both **direct** and **reverse** pressure orientations. **Actuator Ratings** will be indicated on the nameplate. Higher operating pressures may require adjustment of the closed position stop or a larger actuator; consult the factory.

SUSPENDED SOLIDS SERVICE: For fluids containing suspended solids, special orientations are needed to prevent debris from collecting in the valve. For **horizontal** installations (Figure 4), the valve should be installed with flow entering the **seat end** of the valve and the shaft in a horizontal position with the plug up when open. For **vertical** installations (Figure 5), the valve must be installed with the **seat end** up regardless of flow direction.

CLEAN SERVICE: For both horizontal and vertical installations, install in the **direct pressure** orientation (pressure opposite the **seat end**).

AIR AND GAS SERVICE: Install valve in the **direct pressure** orientation (pressure opposite the **seat end**). Lubricate plug face with FDA approved silicone grease such as Dow Corning #7 before installation. Gear actuators are required for gas service applications.

PUMP DISCHARGE SERVICE: On all horizontal pump discharge applications (Figure 6), the **seat end** should be towards the pump.

BURIED SERVICE: Gear actuators are recommended for buried valves to hold the valve in position and provide multi-turn closure to prevent water hammer. The valve should be installed with the shaft horizontal and the actuator nut directed upwards. The valve box or extension pipe should be installed so that the actuator nut and extension stem turn freely.

NOTE: Adjust and test valve prior to backfill.

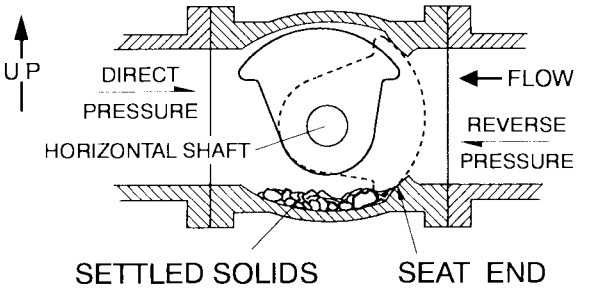

FIGURE 4. HORIZONTAL PIPE WITH SOLIDS

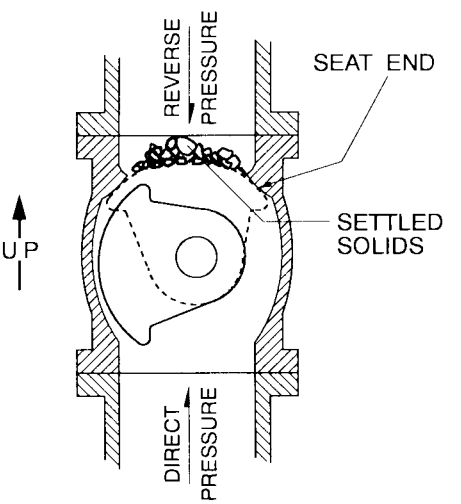

FIGURE 5. VERTICAL PIPE WITH SOLIDS

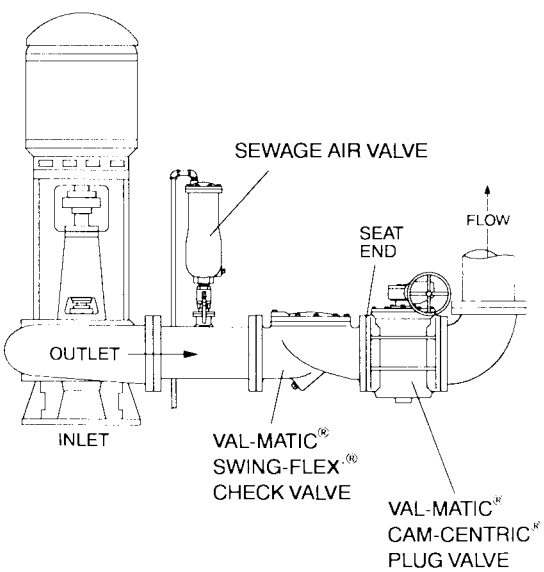

FIGURE 6. PUMP DISCHARGE SERVICE

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INSTALLATION (Cont'd)

FLANGED ENDS: Flanged valves should be mated with flat-faced pipe flanges equipped with resilient gaskets. When ring gaskets are used, the bolt material shall be ASTM A307 Grade B or SAE Grade 2 Carbon Steel. Higher strength bolts may only be used with full-face gaskets.

The valve and adjacent piping must be supported and aligned to prevent cantilevered stress on the valve. Lower valve into line using slings or chains around the valve body. Lubricate the flange bolts or studs and insert them around the flange. Lightly turn bolts until gaps are eliminated.

The torquing of the bolts should then be done in graduated steps using the cross-over tightening method. Recommended lubricated torques for use with resilient gaskets (75 durometer) are given in Table 2. If leakage occurs, allow gaskets to absorb fluid and check torque and leakage after 24 hours. Do not exceed bolt rating or crush gasket more than 50 percent of its thickness.

VALVE SIZE (in)	BOLT DIA (in)	RECOM. TORQUE (ft-lbs)	MAX. TORQUE (ft-lbs)
3	5/8	25	90
4	5/8	30	90
6	3/4	30	150
8	3/4	40	150
10	7/8	45	205
12	7/8	65	205
14	1	80	300
16	1	90	300
18	1 1/8	100	425
20	1 1/8	120	425
24	1 1/4	150	600
30	1 1/4	175	600
36	1 1/2	175	600

TABLE 2. FLANGE BOLT TORQUES

CAUTION: The use of raised-face flanges or excessive bolt torque may damage valve flanges.

MECHANICAL JOINT ENDS: Clean ends of mating pipe and valve sockets with soapy water (Figure 7). Place lubricated gasket and retainer gland over pipe end prior to installing valve. Install valve socket over pipe. Press gland and gasket toward valve until gasket is evenly set into valve socket.

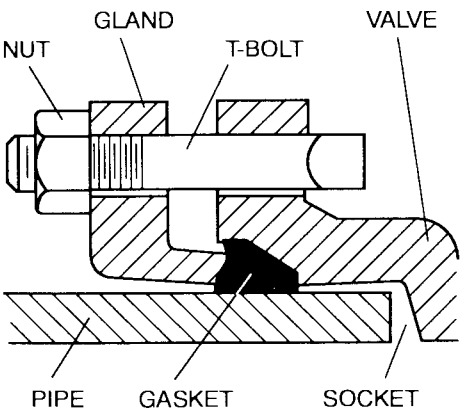

FIGURE 7. MECHANICAL JOINT INSTALLATION

Insert T-bolts in valve flange and hand tighten nuts. Torque nuts in four graduated steps using the cross-over tightening method without exceeding the torque listed in Table 3. Maintain an equal gap between the gland and the face of the valve at all points around the socket.

If a tight connection is not achieved, then the joint should be disassembled, thoroughly cleaned, and reassembled. Over-tightening, may cause damage to the valve or gland.

VALVE SIZE (in)	T-BOLT DIA (in)	RECOM. TORQUE (ft-lbs)	MAX. TORQUE (ft-lbs)
3	5/8	45	60
4	3/4	75	90
6	3/4	75	90
8	3/4	75	90
10	3/4	75	90
12	3/4	75	90
14	3/4	75	90
16	3/4	75	90
18	3/4	75	90
20	3/4	75	90
24	3/4	75	90
30	1	100	120
36	1	100	120

TABLE 3. MECHANICAL JOINT NUT TORQUES

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INSTALLATION (Cont'd)

DIRECT NUT OPERATED VALVES: 8" and smaller valves may be equipped with a top-mounted nut for direct quarter-turn operation. The nut is 2" square to fit most valve wrenches and is mounted directly to the valve plug. To open the valve, slowly rotate the nut 90° in the counter-clockwise CCW direction. The closed position is adjusted with a set screw and lock nut, see Figure 8. The open position can be adjusted moving the bolt along the curved slot.

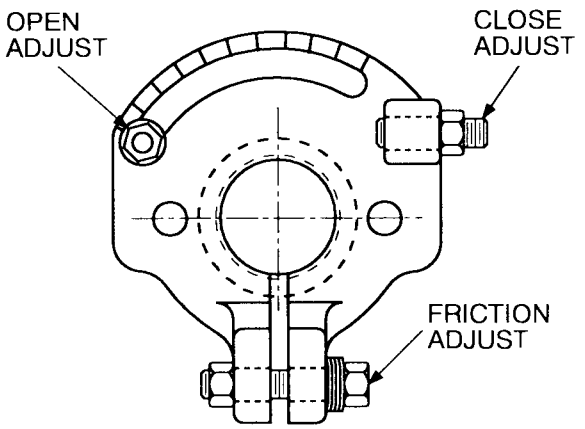

FIGURE 8. DIRECT NUT ADJUSTMENTS

DIRECT NUT FRICTION ADJUSTMENT: As shown in Figure 9, valves with direct nut actuators have a flanged packing follower (18) above the packing (7) to hold the valve in the open or closed position. If the valve is difficult to operate, or does not maintain its set position, adjust the clamp bolt (17) to provide sufficient friction to hold the valve in position. If the valve is equipped with a hand lever, the setting should allow the valve to be operated with about 80 pounds of force on the end of the pipe handle.

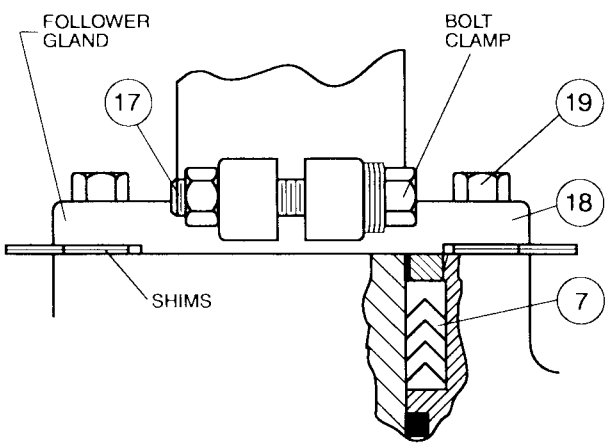

FIGURE 9. FRICTION ADJUSTMENT

LEVER OPERATED VALVES: A wrench head and lever (Figure 10) are available for use over the 2" nut for direct quarter-turn operation. Various lever lengths are available for specific **direct** and **reverse** pressure conditions as shown in Table 4.

WRENCH LENGTH , Inches				
VALVE SIZE	DIRECT 100 Psi	PRES. 175 Psi	REVERSE 50 Psi	PRES. 175 Psi
3"	16"	16"	16"	16"
4"	22"	22"	22"	22"
6"	32"	*	32"	*
8"	44"	*	44"	*

*Worm gear recommended due to operating torques.

TABLE 4. LEVER LENGTH, INCHES

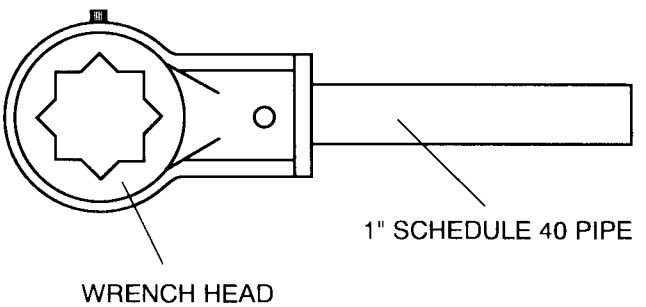

FIGURE 10. HANDLEVER

The wrench head is placed over the nut and can be secured with the set screw provided. To open the valve, rotate the lever 90° in the CCW direction. The closed position is adjustable with a set screw and lock nut mounted below the nut, see Figure 8.

CAUTION: Open and close valve slowly to prevent water hammer.

GEAR OPERATED VALVES: 4" and larger plug valves are available with a multi-turn manual gear actuator. The gear unit has a self-locking worm gear which multiplies the turning force on the handwheel or nut so that valves can be operated with ease. A clamp-on chainwheel kit can also be used for installations high above the floor. An indicator on the top of the actuator housing indicates the position of the valve plug. The handwheel or nut must be rotated through 12-80 turns (depending on model) to open or close the plug valve. The direction of rotation to open the valve is indicated on the 2" square actuator nut.

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INSTALLATION (Cont'd)

GEAR ACTUATOR ADJUSTMENT: The standard gear actuator is provided with factory-set open and closed position stops. If the valve does not shut off tight, the stop bolt can be adjusted allowing the plug to rotate further into the seat. Loosen the lock nut and turn the closed stop bolt CCW 1 turn at a time (Figure 11). If the valve continues to leak after all of the adjustment is taken, verify the orientation of the valve during installation. If a tight shut-off can not be achieved, a larger gear actuator may be required for the system operating pressure; consult the factory.

CAUTION: Adjust closed stop bolt for tight shut-off only. Over adjustment may cause high operating torques and damage to the plug.

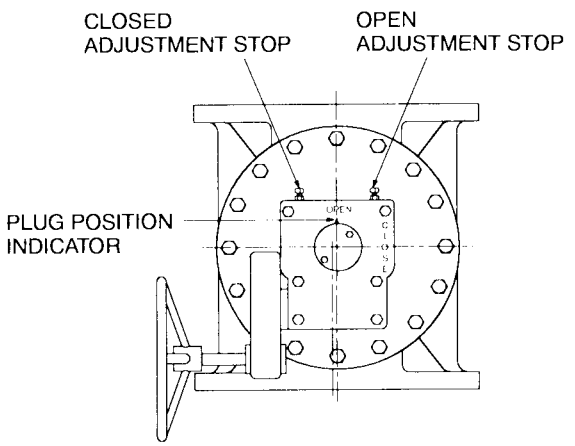

FIGURE 11. GEAR ACTUATOR ADJUSTMENT

MAINTENANCE

The Cam Centric® Plug Valve requires no scheduled lubrication or maintenance other than regular exercising and occasional inspection of the plug. The exercising is achieved by fully opening and closing the valve to verify smooth operation. If operation is difficult, it may be necessary to flush sediment from the valve by opening and closing the valve several times under flowing conditions.

CAUTION: Opening and Closing of the valve should be done slowly to prevent water hammer.

The recommended interval for exercising is every six months or annually if the valve is regularly operated. Over the life of the valve, inspection and some regular adjustments may be needed as given below.

CLOSED POSITION ADJUSTMENT: The standard valve is factory-set to seal at the "Actuator Pressure Ratings" shown on the nameplate for the **direct** and **reverse pressure** directions (see Figure 2). Higher pressure applications may require adjustment of the closed position stop or a larger actuator; consult the factory.

If the valve is found to leak in the closed position due to wear, the valve can be adjusted by loosening the closed position stop and rotating the plug further into the seat. Because of the eccentric action of the valve, further rotation will provide additional interference between the rubber plug surface and the body seat. Valves that have been in service for several years may require inspection of the plug for damage or wear. See the Disassembly Instructions on page 8.

PACKING ADJUSTMENT: Vee-Type packing is pressure sensitive and therefore self adjusting in nature. Over tightening will destroy both the pressure sensitive nature of the packing as well as it sealing capabilities. The packing configuration used in Cam-Centric Plug Valves follows the guidelines and recommendations of Vee-Type packing manufacturers.

Additional adjustment can achieved by removing one or more shims found under the packing follower (18). If a leak develops, remove one shim (29) from the underside of the follower (18). An equal number of shims must be removed from both the left and right hand sides. Re-tighten the follower bolts (19) and check for leakage. If the leakage continues remove additional shims or replace the packing.

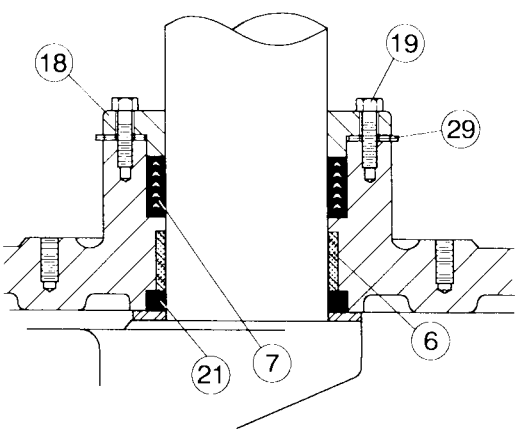

FIGURE 12. 10"-36" PACKING ASSEMBLY

MAINTENANCE (Cont'd)

PACKING REPLACEMENT: To replace the packing, it is recommended that the line be drained and the actuator removed. The valve can remain in the line. To replace the packing, first open the valve and drain the line. Close the valve to hold the plug in position. For power actuators, turn off and lock out electrical and hydraulic supplies before proceeding.

CAUTION: Drain Line and close valve before removing actuator or valve may rotate suddenly. Take precautions against exposure to toxic or hazardous fluids in the line.

Remove small round cover on actuator to expose shaft and key. Remove actuator mounting bolts and lift actuator from valve taking care not to lose square key. See Figure 12 and remove gland bolts (19) and lift follower (18) from valve shaft. Remove old packing (7) with packing hook. Lubricate new packing with FDA grease and set in place one ring at a time taking care not to bend over the lips of the packing rings. Reinstall follower with 2 shims (29) per bolt (3 shims for 12" and larger valves). With valve in the closed position, place actuator over valve and reinsert key (24). Finally, install cover on actuator indicating "Closed".

NOTE: If packing assembly contains clamp style follower as shown in Figure 9, do not lubricate shaft or sleeve.

PACKING REPLACEMENT WITH ACTUATOR: The above procedure with removal of the actuator will result in the most reliable shaft seal. But if the actuator can not be removed, the following alternate procedure can be followed. To prevent the possibility of leakage during this procedure, open valve and drain the line.

CAUTION: Take precautions against exposure to toxic or hazardous fluids in the line.

Referring to Figure 12, remove follower bolts (19) and slide follower (18) up to actuator. Remove packing adapters and rings (7) with packing hook. Cut rings with knife to remove. New packing rings should be cut at a 45° slope to allow insertion around the shaft and provide some overlap. Install rings one at a time with the lips down towards the valve. Stagger all joints 180° around the shaft. Pull down follower (18) and reinsert bolts (19) with 2 shims (29) under follower (18). V-packing is pressure assisted and only requires light compression.

GEAR ACTUATOR MAINTENANCE: A typical gear actuator is shown in Figure 13 and consists of a worm (3) mounted on an input shaft (9). The worm engages a segment gear (2). When the worm is turned, it drives the segment gear through 90° of rotation. The rotation of the segment gear is displayed by the top indicator (5). The gears are lubricated with EP2 grease in a cast iron housing (1). The open and closed positions of the segment gear (2) are controlled by the end position stop bolts (20). The stops can be adjusted by loosening the lock nut (21) and rotating the bolts (20).

The gear box is factory lubricated and sealed. No regular maintenance is required. If difficult operation is observed, the cover can be removed and the unit inspected for wear. All moving parts should be coated with grease. The grease should have an even and smooth consistency. If needed, coat all moving parts with an EP-2 grease such as Mobil Mobilux EP2. Buried units should be packed 100% with grease.

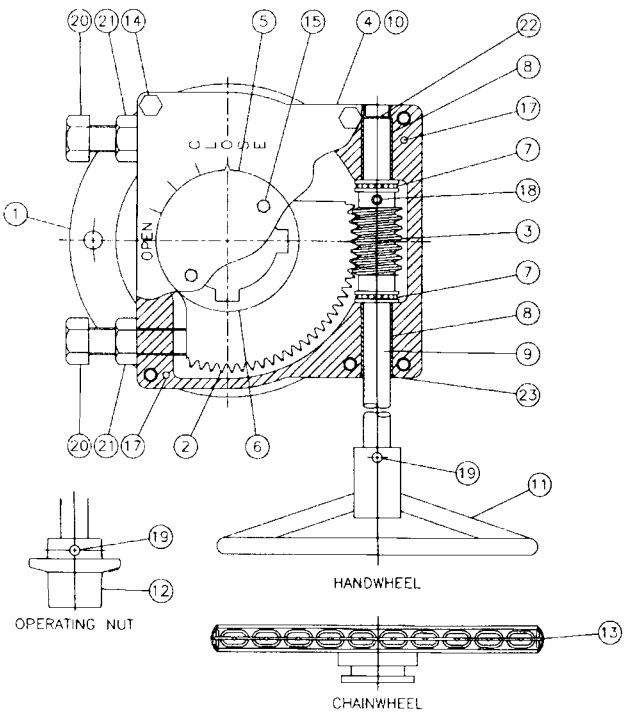

FIGURE 13. GEAR ACTUATOR CONSTRUCTION

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ITEM	DESCRIPTION	MATERIAL
1	Housing	Cast Iron
2	Segment Gear	Ductile Iron
3	Worm	Alloy Steel
4	Cover	Cast Iron
5	Indicator	Cast Iron
6	O-Ring	Buna-N
7	Thrust Bearing	Carbon Steel
8	Bearing	Bronze
9	Shaft	Carbon Steel
10	Gasket	Non-Asbestos
11	Handwheel	Cast Iron
12	Operating Nut	Cast Iron
13	Chainwheel	Steel
14	Cover Bolt	Carbon Steel
15	Indicator Bolt	Steel
18	Worm Pin	Steel
19	Handwheel Pin	Steel
20	Stop Screw	Steel
21	Jam Nut	Steel
23	Oil Seal	Steel & Rubber
	Grease	EP-2

TABLE 5. GEAR ACTUATOR PARTS LIST

TROUBLESHOOTING

Several problems and solutions are presented below to assist you in troubleshooting the valve assembly in an efficient manner.

•Leakage at Valve Shaft: Adjust or replace packing (see page 6).

•Leakage at Flanges: Tighten bolts (see page 4), replace gasket.

•Valve Leaks when Closed: Flush debris from seat by cycling valve. Adjust closed stops. Inspect plug for damage and replace. Check friction setting on direct nut valves so that valve is held in closed position (see page 5).

•Hard to Open: Check friction adjustment on direct nut. Flush line of debris. Check interior of valve for grit buildup or debris. On buried valves, check alignment of operating stem and nut.

•Leaking Oil: Tighten actuator cover bolts. If leak persists, remove actuator cover, inspect grease, and replace actuator gasket.

•Noisy Operation: Flow noise is normal. Loud flow noise similar to hammering may be cavitation from dropping high pressures across valve; review application of valve. For gear actuator noise, inspect grease; add new grease if there are uncoated moving parts or grease has broken down into oil.

DISASSEMBLY

Disassembly may be required to inspect the plug for wear or remove debris and deposits from the valve. Work on the valve should be performed by a skilled mechanic with proper tools and a power hoist for large valves. The valve can be disassembled without removing the valve from horizontal pipelines. The valve should be removed from vertical lines to prevent plug rotation and facilitate lifting the plug. Refer to Figure 14 for valve construction and parts.

WARNING: Open valve and drain line before removing cover bolts or pressure may be released causing injury. Place plug in lowest position before removing actuator or plug may rotate suddenly and jam or damage plug surface.

1. Open valve and drain the pipeline. Close valve until plug just touches the seat. Remove the small cover on the actuator to expose the shaft key. Remove the actuator mounting bolts and lift actuator from valve taking care not to lose key(24).

2. Remove packing bolts (19) and follower (18).

3. Remove cover bolts (15). Matchmark cover (2) and body. Screw eye-bolts into actuator mounting holes and use hoist to lift cover (2) from valve. Because of friction in the packing (7), the plug may be lifted from the valve at the same time. Use caution to prevent plug from dropping while lifting cover. To remove plug (3) from valve, use sling around top portion of plug.

4. Inspection of the bearings (6) is done by measuring diameter of shaft and inside diameter of bearing. Check for a normal running clearance of .005". The upper bearing can be pressed out with bar smaller than the bearing outside diameter. The lower bearing is removed with a gear puller from inside the valve body. Bearings are permanently impregnated with oil.

5. Clean and inspect parts. Replace worn parts as necessary and lubricate parts with FDA grease.

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DISASSEMBLY (Cont'd)

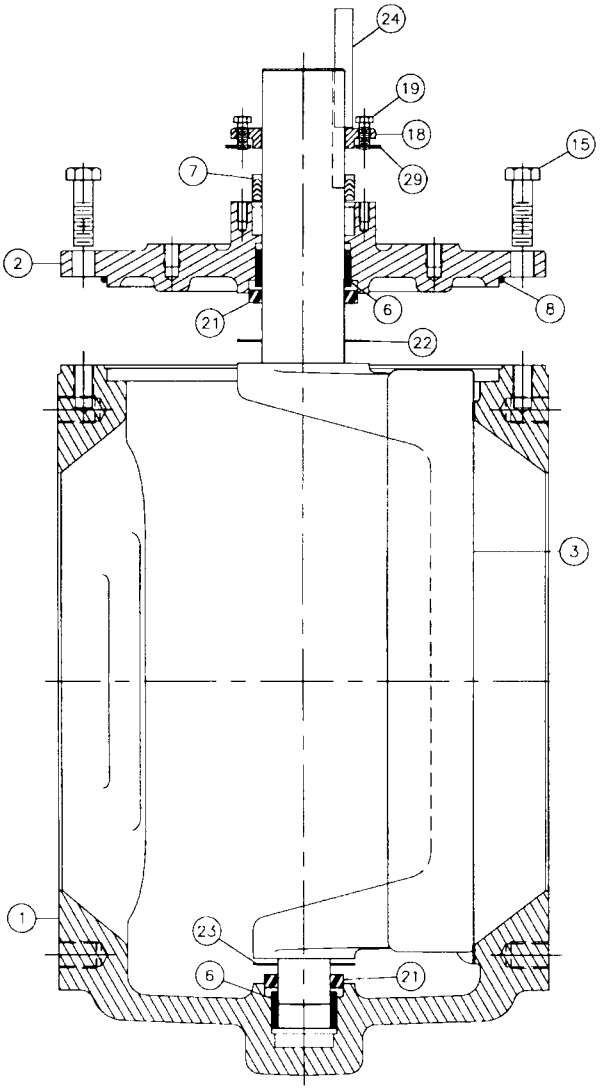

FIGURE 14. PLUG VALVE COMPONENTS

REASSEMBLY

All parts must be cleaned and gasket surfaces should be cleaned with a stiff wire brush in the direction of the serrations or machine marks. Worn parts, gaskets and seals should be replaced during reassembly. Bolts should be lubricated and torqued per Table 6 during reassembly.

SIZE	TORQUE (FT-LBS)
3/8"-16	20 - 30
7/16"-14	30 - 50
1/2"-13	45 - 75
5/8"-11	100 - 150
3/4"-10	150 - 250
7/8"-9	200 - 350
1"-8	300 - 500
1 1/8"-7	450 - 700
1 1/4"-7	650 - 1000

TABLE 6. LUBRICATED BOLT TORQUES

1. Press new bearings (6) into cover and body with round, flat bar 1/4" below inside surfaces of body (1) and cover (2).

2. Install cover seal (8) over cover lip.

3. Apply thin film of FDA silicone grease such as Dow Corning #7 to plug rubber surface. Place stainless steel thrust bearing (23) over lower end of plug, teflon bearing (22) over the upper end. Install grit seals (21) over the shafts of the plug.

4. Carefully place plug into body (1) and insert lower plug shaft into bottom bearing (6). Plug (3) should be in the open position. Install cover (2) over plug shaft and into recess in body. Align match marks between body and cover (2). Torque cover bolts (15) per Table 6 in 3-4 increments using the cross-over tightening method.

5. Lubricate ID and OD of packing set with FDA grease and install in packing bore one ring at a time taking care to keep lips pointing down toward plug. Reinstall follower, gland bolts, and 2 shims per bolt.

NOTE: If valve has friction assembly with direct nut actuator, follow Friction Adjustment procedure on page 5.

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REASSEMBLY (Cont'd)

6. Insert key (24) into shaft and place actuator over valve. Reinstall actuator mounting bolts and torque per Table 6. Install cover on actuator.

7. Apply power to actuator and cycle valve. Apply pressure to valve and check for cover and shaft leakage. Tighten bolts as necessary. Adjust packing if necessary as described on page 6.

8. If valve does not shut off tight, adjust the closed position stops as described on page 6 under "Closed Position Adjustment".

PARTS AND SERVICE

Parts and service are available from your local representative or the factory. Make note of the valve Size, Series No, and Serial No. located on the valve nameplate and contact:

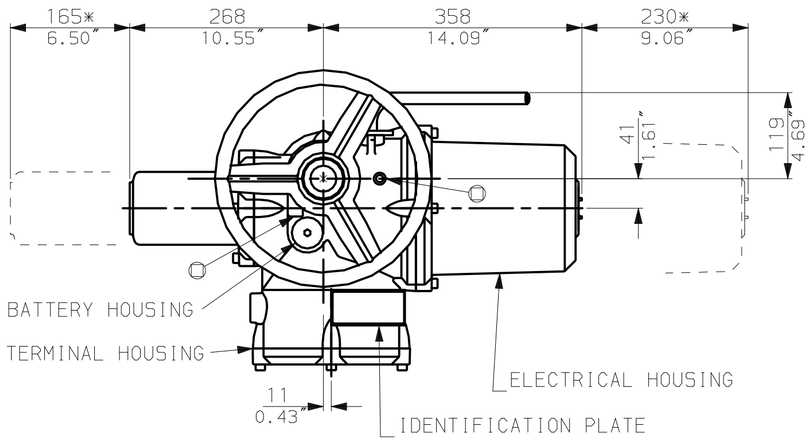
Val-Matic Valve and Mfg. Corp.
905 Riverside Drive
Elmhurst, IL 60126
PH: 630/941-7600
FAX: 630/941-8042

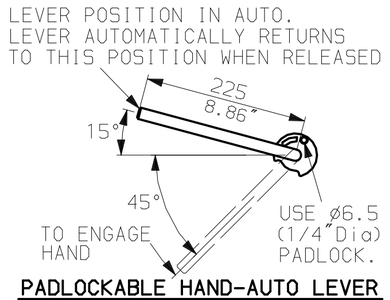
A sales representative will quote prices for parts or arrange for service as needed.

LIMITED WARRANTY

All products are warranted to be free of defects in material and workmanship for a period of one year from the date of shipment, subject to the limitations below.

If the purchaser believes a product is defective, the purchaser shall: (a) Notify the manufacturer, state the alleged defect and request permission to return the product; (b) if permission is given, return the product with transportation prepaid. If the product is accepted for return and found to be defective, the manufacturer will, at his discretion, either repair or replace the product, f.o.b. factory, within 60 days of receipt, or refund the purchase price. Other than to repair, replace or refund as described above, purchaser agrees that manufacturer shall not be liable for any loss, costs, expenses or damages of any kind arising out of the product, its use, installation or replacement, labeling, instructions, information or technical data of any kind, description of product use, sample or model, warnings or lack of any of the foregoing. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE PRESIDENT OF THE MANUFACTURER. These products are not manufactured, sold or intended for personal, family or household purposes.





PADLOCKABLE HAND-AUTO LEVER

NOTES:

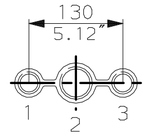
: DIMENSIONS WITH '*' INDICATE COVER REMOVAL ALLOWANCE

: NETT WEIGHT = 85kg (187lbs)

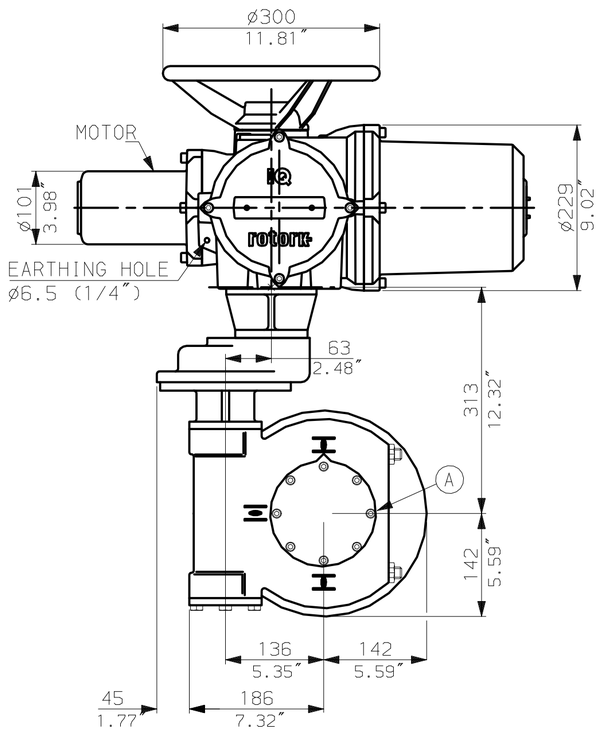
: ⬡ = OIL FILLER/DRAIN PLUG

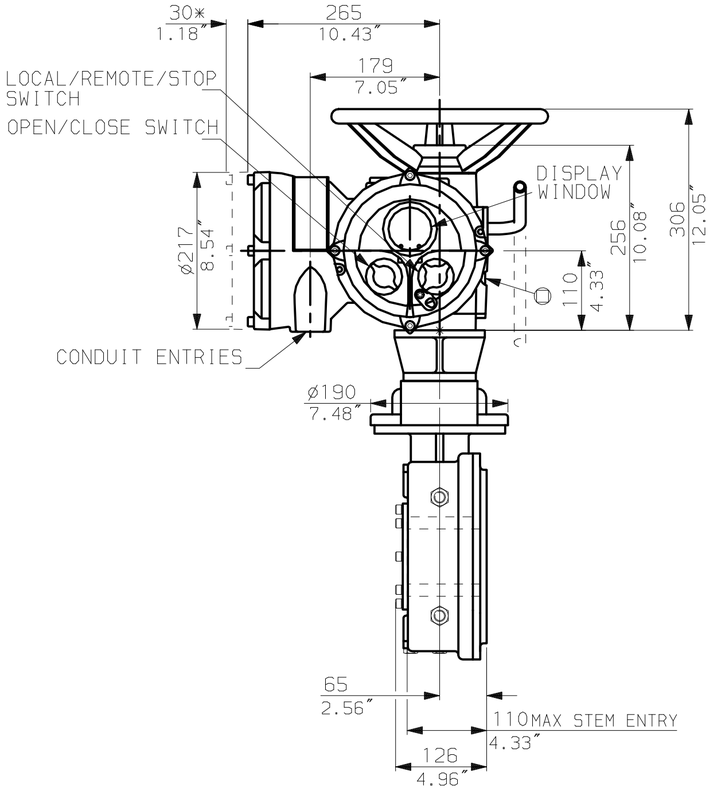
: THE INTERFACE PROVIDED FOR MOUNTING THE ACTUATOR OR SECOND STAGE GEARBOX ONTO THE VALVE SHOULD CONFORM TO GOOD ENGINEERING PRACTICES, ENSURING ADEQUATELY TOLERANCED LIMITS FOR PARALLELISM, PERPENDICULARITY AND CONCENTRICITY.

CONDUIT ENTRIES (N.T.S)

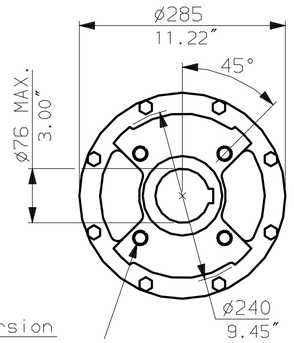


Nos.1 & 3 TAPPED 1" NPT
No.2 TAPPED 1 1/2" NPT
STD ALTERNATIVES IF SPECIFIED
2 X M25,1 X M40
2 X PG16,1 X PG29





N.B. KEYWAY POS.CAN BE MOVED 45° STEPS BY REMOVING 8 SCREWS MARKED (A) AND ROTATING OUTPUT SLEEVE.



"F" version

4 HOLES TAPPED M20 x 16 DP
EQUI-SPACED AS SHOWN ON A
165 PCD (ISO 5211-F16).

"FA" version

4 HOLES TAPPED 3/4"UNCx0.63"dp
EQUI-SPACED AS SHOWN ON A
6.5" PCD (MSS SP101-FA16).

02	4.69"corrected from 6.50"
01 Issue	First Issue.

Scale 1:6 THIRD ANGLE PROJECTION

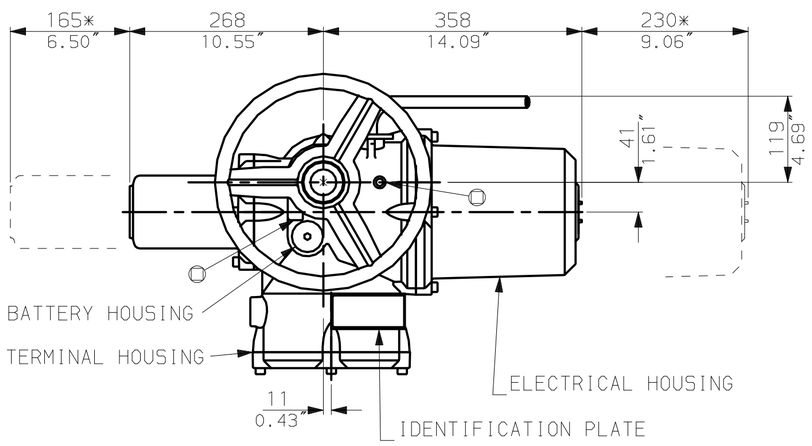
Drawing Number IQ1THW_IW5RL

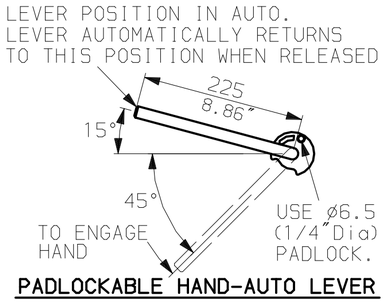
rotork
www.rotork.com
Rotork Controls Ltd.
Bath England,BA1 3JQ.
(Phone 01225-733200)
Rotork Controls Inc.
Rochester, NY 14624
(Phone 585-328-1550)

Title IQ10,12,18,(+IQS12),THW,IW(MOW)5(+52)RL,
STANDARD DIMENSIONAL DATA
Drawn CAD Checked PRE Ref Data Sheet
Date 150605 Job No IQ1THW_IW5RL

NOTE:
Gearbox is shown with LOW Ratio Input Reducer.
(ie Ratios 80,120,140,160,210,280)'
See Data Sheet with IW5Rh for HIGH ratio option.

Page 40





PADLOCKABLE HAND-AUTO LEVER

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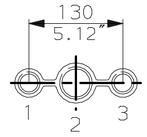

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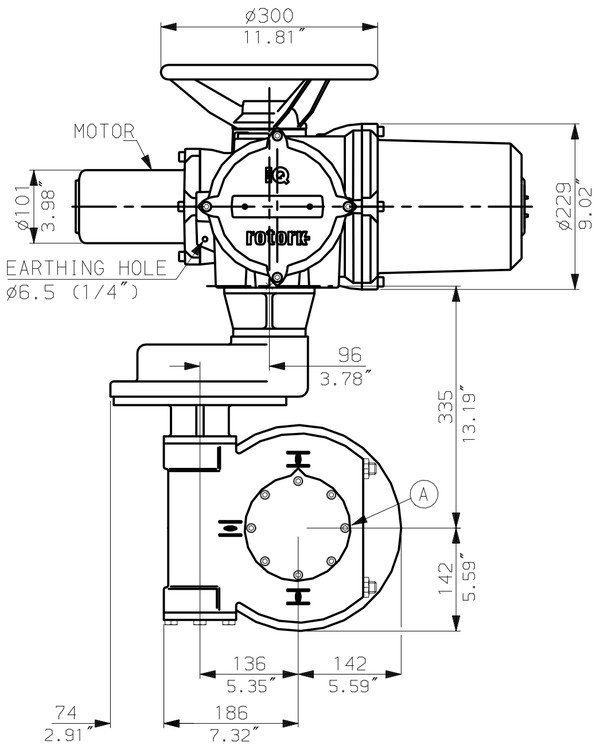

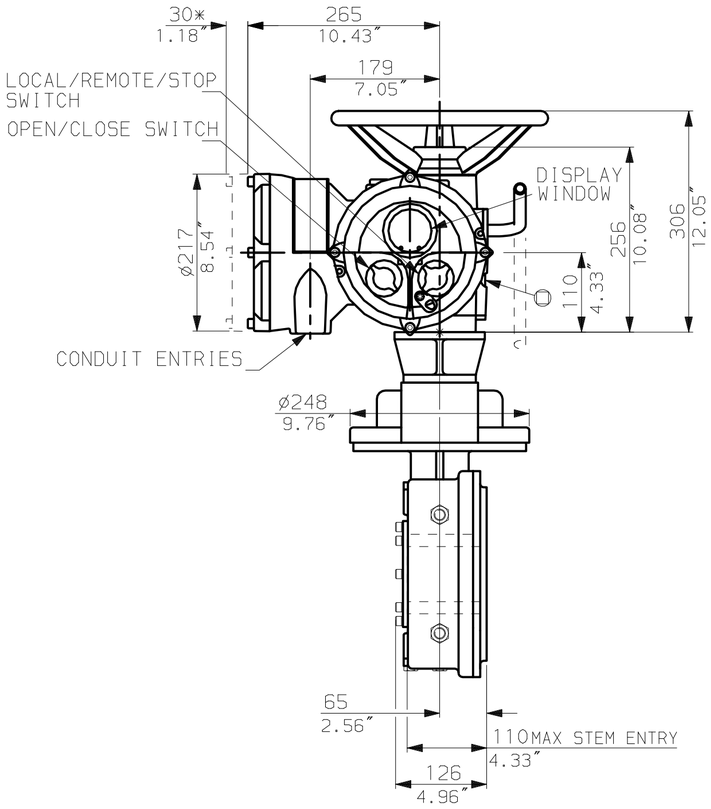

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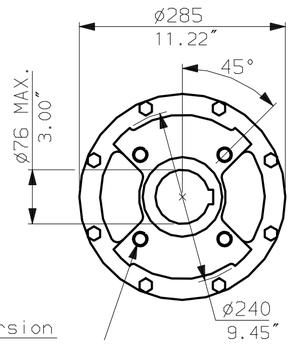

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4 HOLES TAPPED M20 x 16 DP
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"FA" version

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(ie Ratios 200,240,350,420)'
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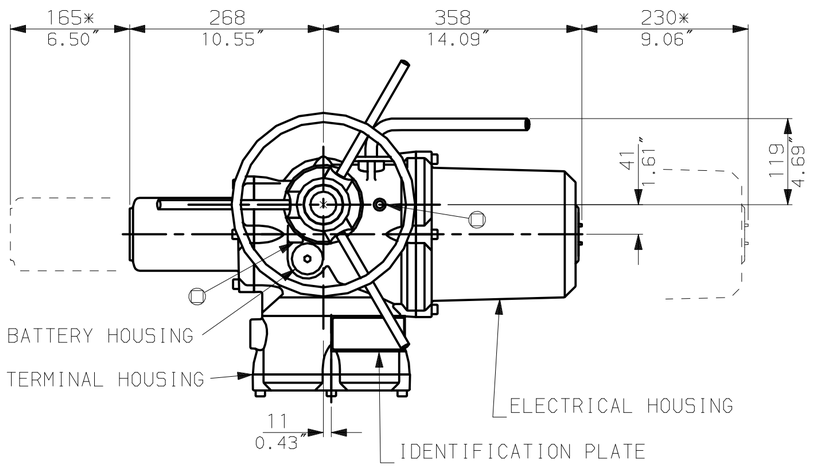
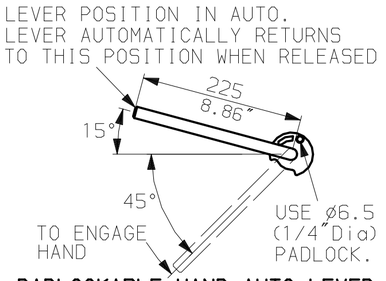
Title	IQ10,12,18,(+IQS12),THW,IW(MOW)5(+52)Rh,
	STANDARD DIMENSIONAL DATA
Drawn CAD	Checked PRE Ref Data Sheet
Date 150605	Job No IQ1THW_IW5Rh

02	4.69"corrected from 6.50"
01 Issue	First Issue.
Scale 1:6	THIRD ANGLE PROJECTION
Drawing Number	IQ1THW_IW5Rh





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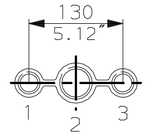

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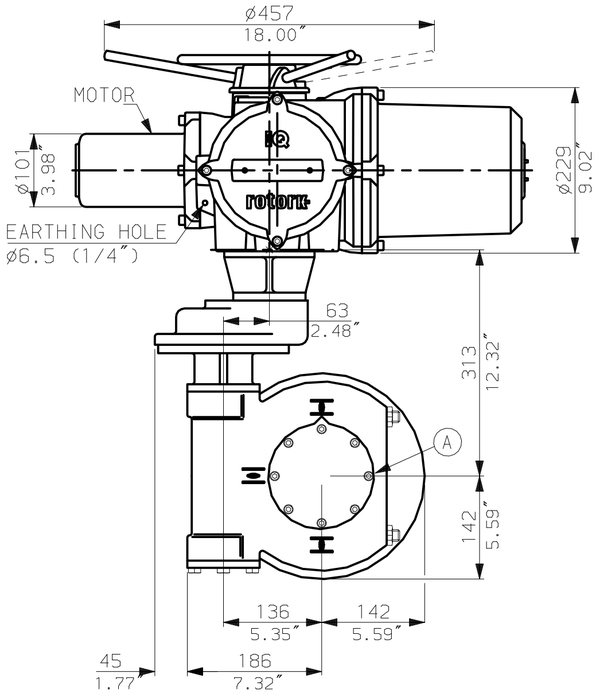

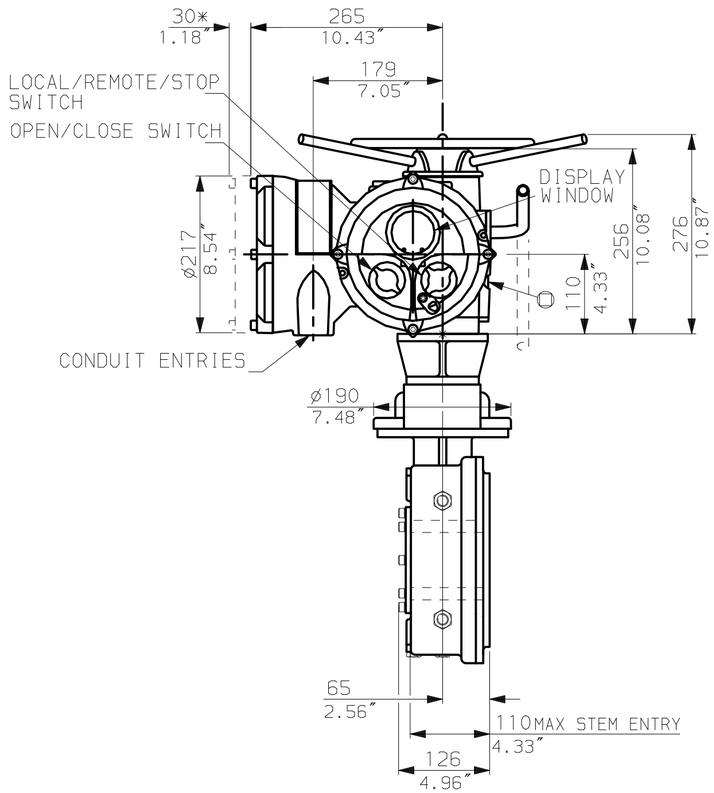

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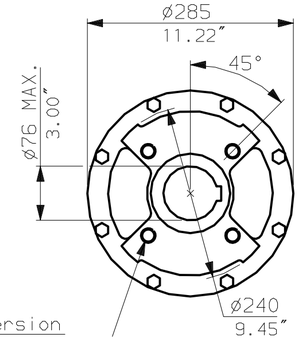

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	STANDARD DIMENSIONAL DATA
Drawn CAD	Checked PRE Ref Data Sheet
Date 150605	Job No IQ1LTHW_IW5RL

NOTE:
Gearbox is shown with LOW Ratio Input Reducer.
(ie Ratios 80,120,140,160,210,280)'
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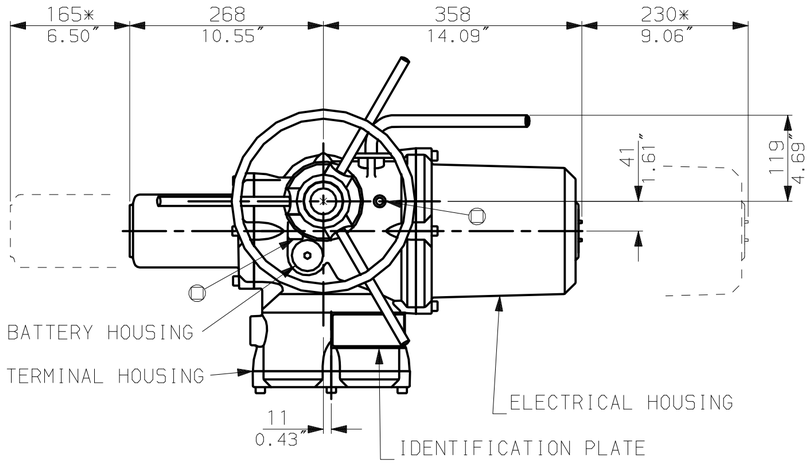
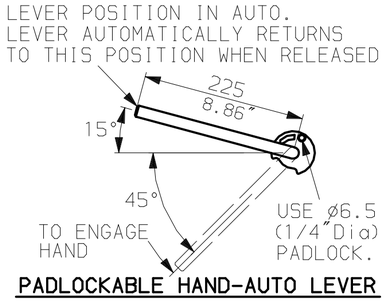
Drawing Number	IQ1LTHW_IW5RL





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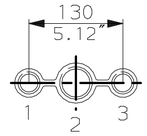

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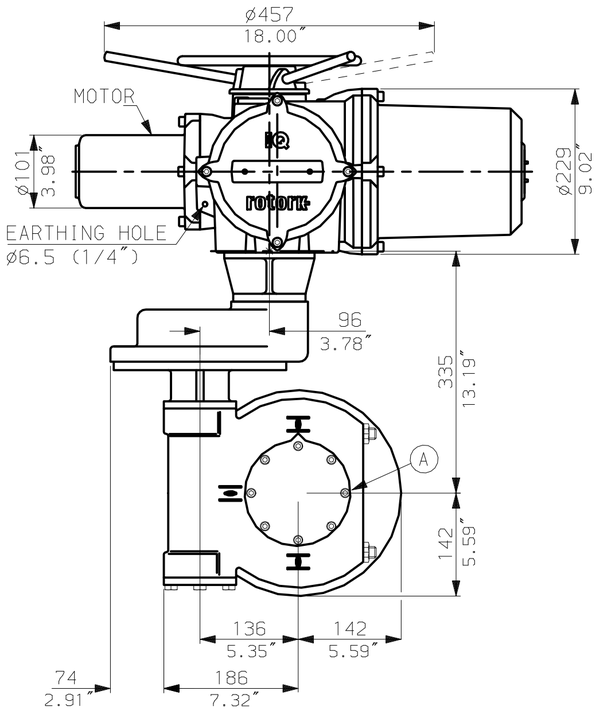

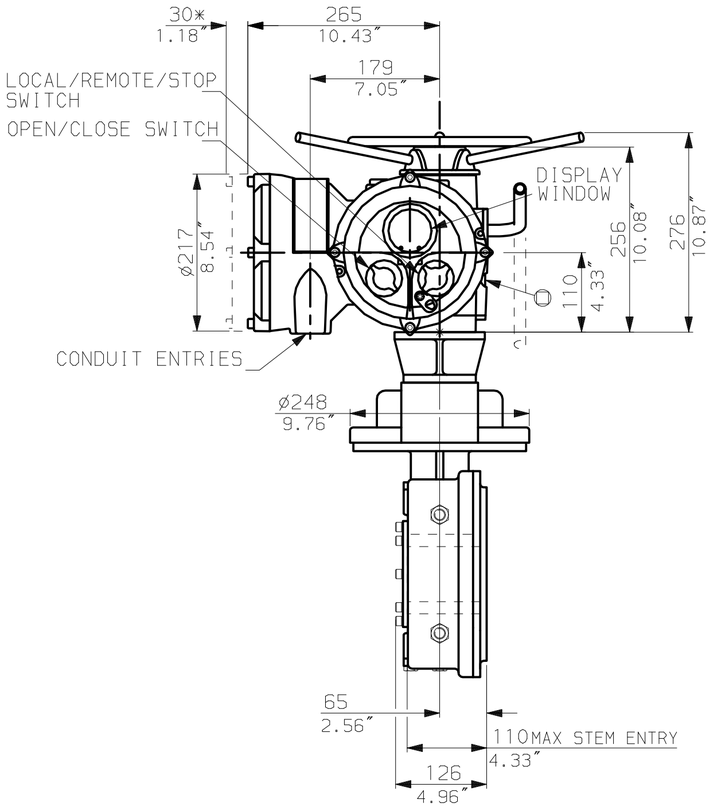

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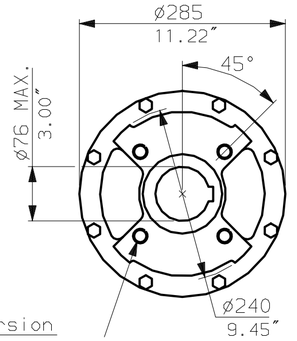

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Drawing Number IQ1LTHW_IW5Rh

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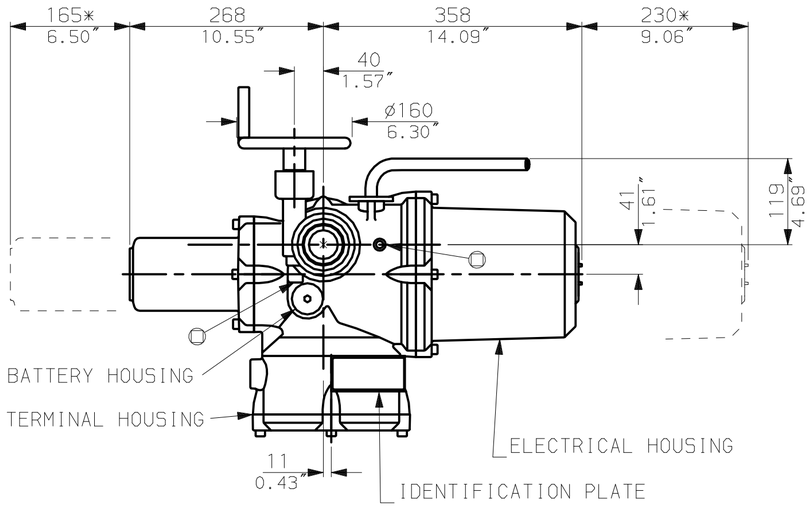

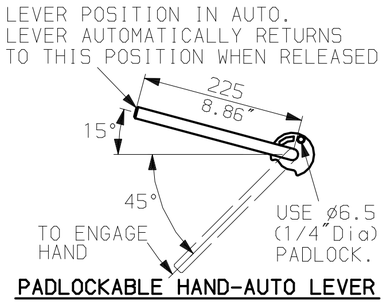

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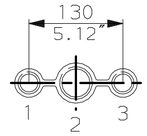

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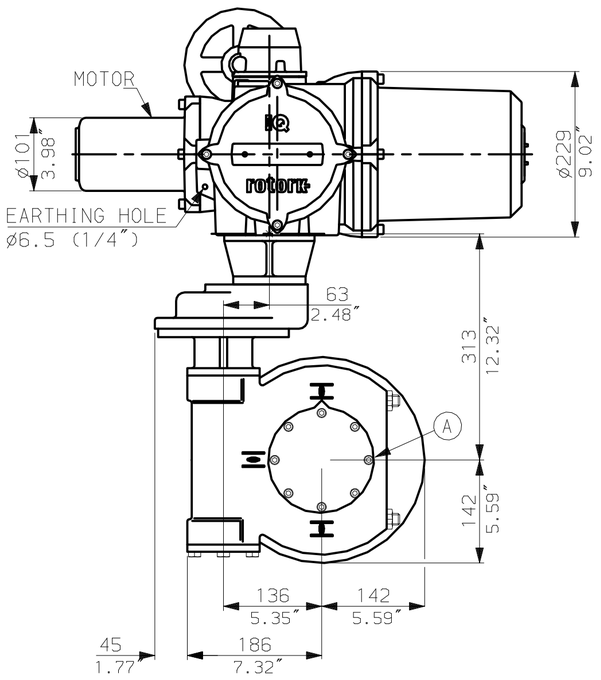

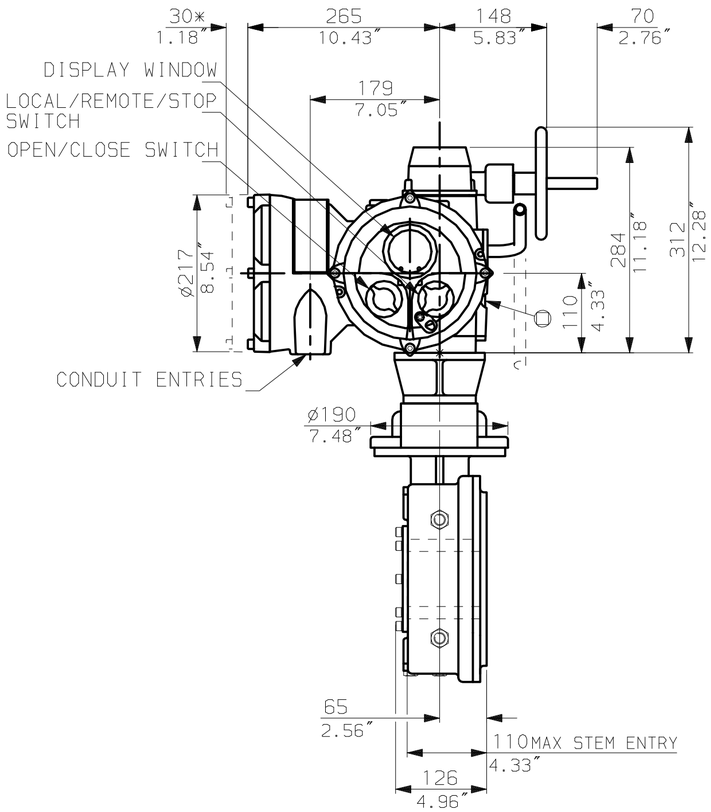

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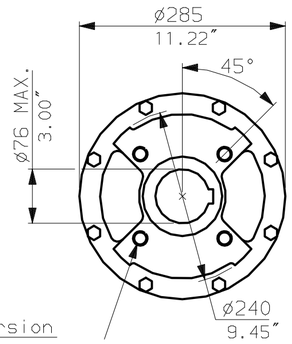

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Drawing Number IQ1SHW_IW5RL

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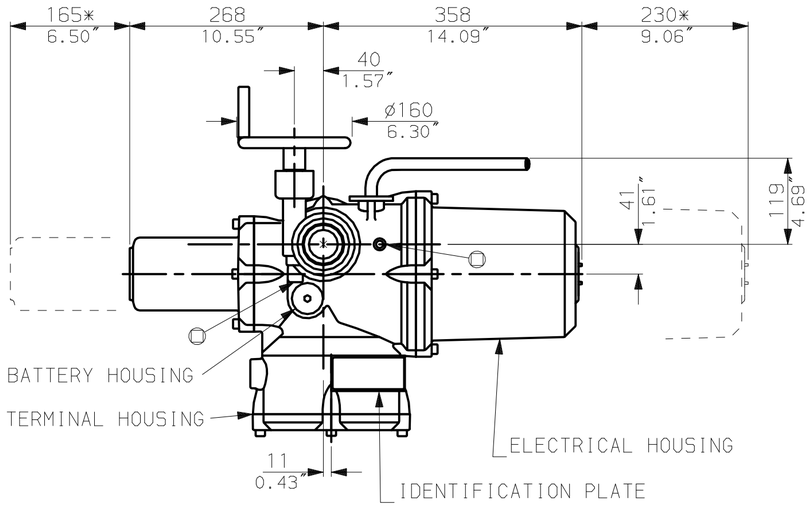

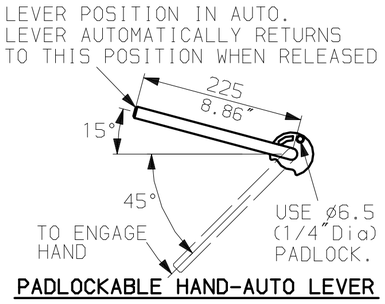

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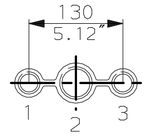

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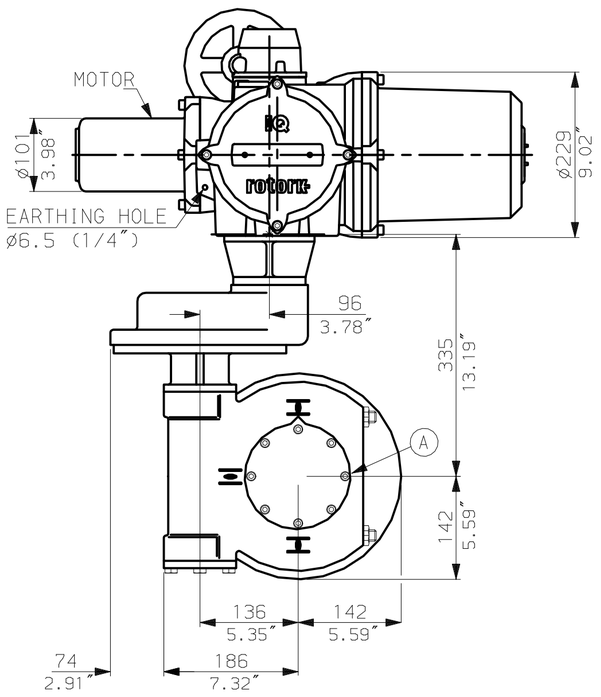

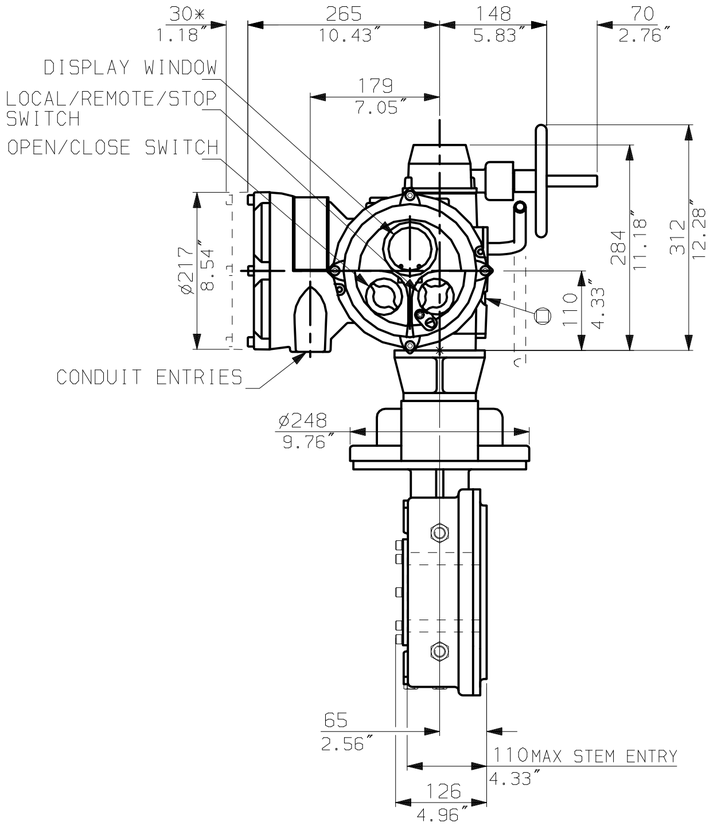

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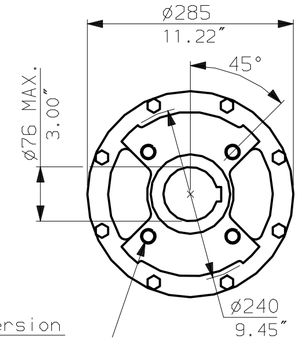

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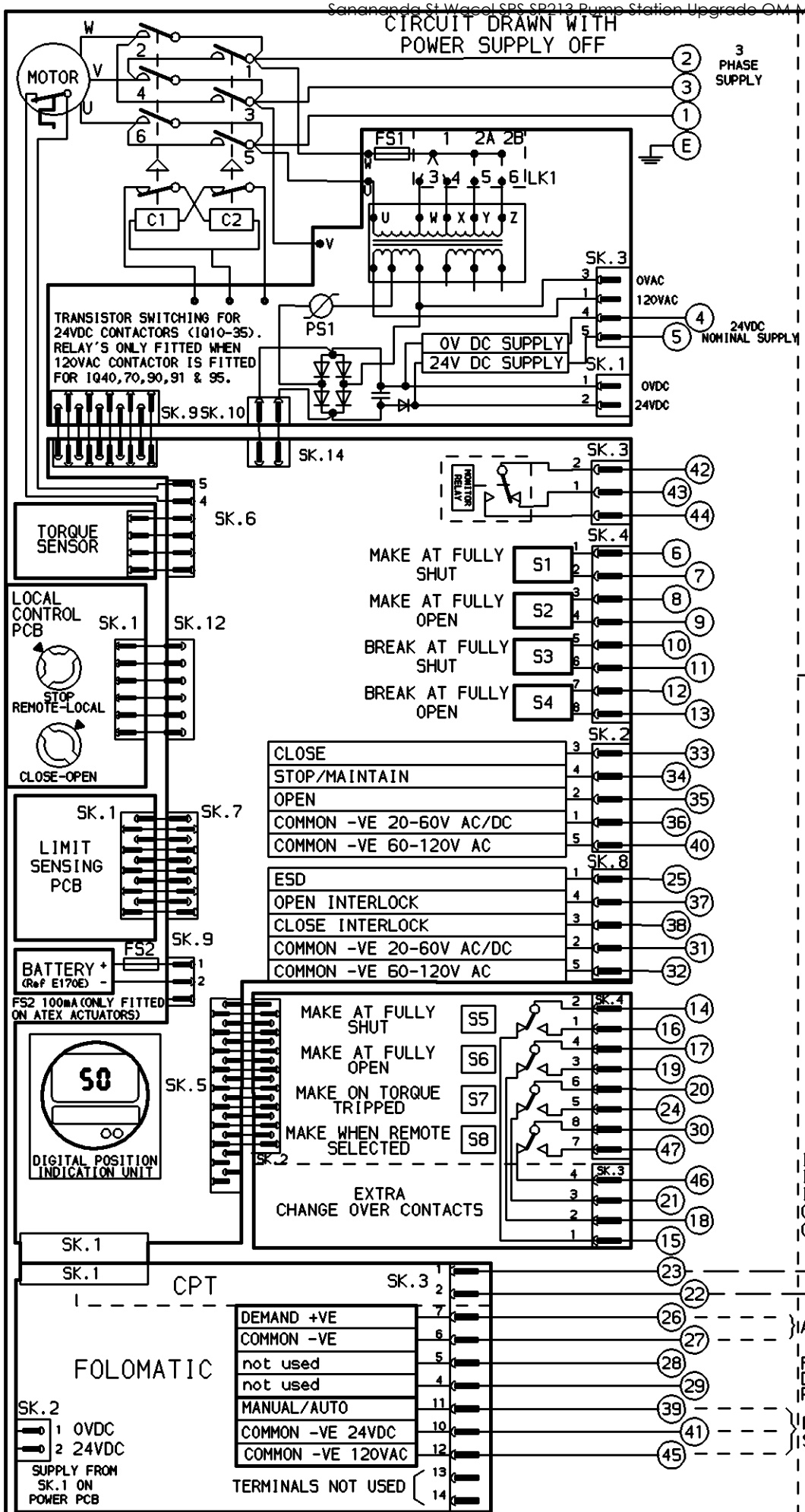

FOR TYPICAL REMOTE CONTROL DETAILS SEE DOCUMENT RWS302

TRANSFORMER TAPPING OPTIONS

TYPE 1

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

FUSE FS1 - 250mA ANTI-SURGE

TYPE 2

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

FUSE FS1 - 250mA ANTI-SURGE

TYPE 3

TAP	NOM 50/60HZ	50HZ	60HZ
X	660/660-690	534-726	600-726
Y	690/___	558-759	

FUSE FS1 - 150mA ANTI-SURGE

ALL TRANSFORMER TYPES - PS1 SELF RESETTING FUSE

NOTE

REFER TO PUBLICATION E170E FOR APPROVED FUSES FS1 AND FS2.

MAX EXTERNAL LOAD ON TERMINALS 4 & 5 TO BE 5W.

CONTROL SIGNAL THRESHOLD VOLTAGES
TO BE MINIMUM 'ON' 20V AC/DC
MAXIMUM 'OFF'= 3V
MINIMUM CONTROL SIGNAL DURATION TO BE 300mS.

CURRENT DRAWN FROM EACH REMOTE CONTROL SIGNAL IS 5mA ON 24V DC OR 12mA ON 120V AC

WIRES ARE IDENTIFIED AT EACH END BY TERMINAL No. OR TAG No.

INDICATION CONTACTS S1-S4 AND EXTRA INDICATION CONTACTS S5-S8 ARE SHOWN IN THEIR DEFAULT CONFIGURATION. CONTACTS MAY BE CONFIGURED FOR ANY OF THE FUNCTIONS DESCRIBED IN E170E

Page 46

No	DATE	REVISION DETAILS
05	110407	IQ PRO UPDATE. EC2198/1

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ROTORK CONTROLS LTD
BATH, BA1 3JQ
ENGLAND
Tel:01225-733200

ROTORK CONTROLS INC
ROCHESTER
NY 14624, USA
Tel:585-328-1550

CONFIG BY PRE
DATE 081004
CHECKED PJW
BASE WD 3110-100
JOB No --
M.I.No .

IQ + INDICATION RELAYS + FOLOMATIC + CPT

CIRCUIT DIAGRAM No -REV
3110-100-05
B1 C1 B2 C2 B1 C1 M1 V1

McBerns AutoWellWasher ™

(Australian Patent No. 655111)
(International Patent Appl.No.PCT/AU00/00084)

INSTALLATION and MAINTENACE INSTRUCTIONS for WALL MOUNT BRACKET MODEL

Positioning of the device in the well can be critical to the effectiveness of the wash system. Configuration of wells can differ but, in general the Washer should be positioned in the clearest available space to ensure the rotating arms do not come in contact with guide rails, chains, probes, etc.
The mounting bracket is designed to pivot back against the wall (see Figure 1) so as not to impede access when a pump needs to be removed.

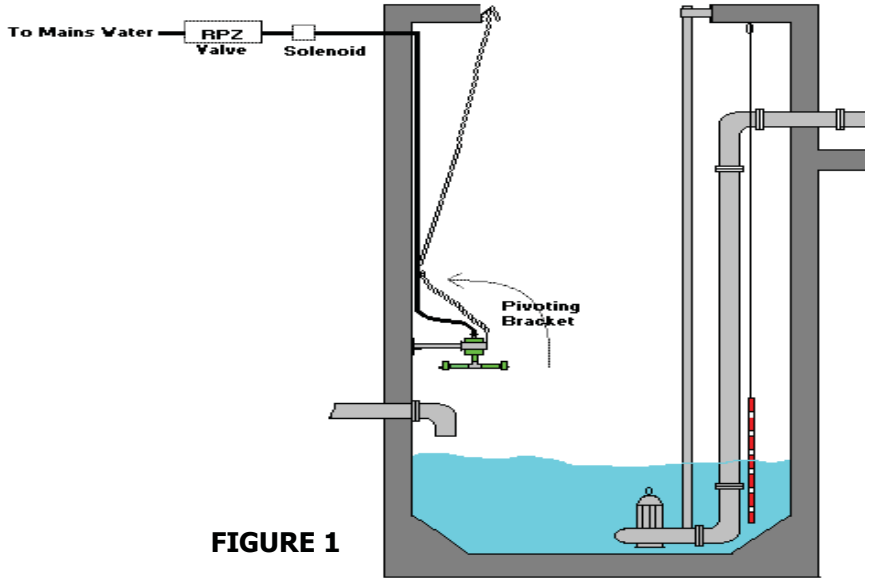
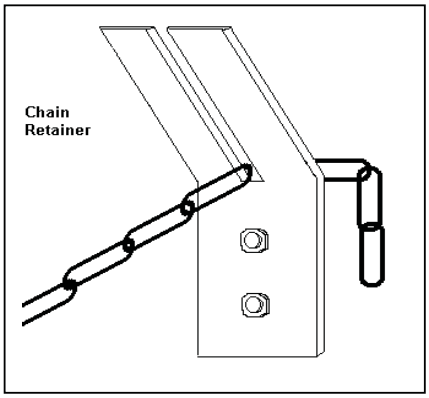


FIGURE 1

STEP 1: Having chosen the position, the mounting bracket is secured to the wall by means of four 12mm stainless steel Dynabolts™. The bolt holes should be drilled approximately 1 metre above the normal high water line.
If you need to use the bracket extension piece it should now be attached. The extension piece is not needed in all wells depending on diameter and internal configuration. If not used, save it for later installations when multiple extensions may be useful.
Once the bracket is secured, the Washer head is inserted in the semi-circular clamp and the two locknuts tightened.



Now attach the pivot chain to the lug near the Washer head and pass the chain through the "eye" nut which should be installed in the wall approx. 1 metre above the Washer. The chain then attaches to the chain retainer which is fixed to the lip of the well opening.
Now the water supply can be connected to the Washer head. You can use good quality 3/4" hose (not garden hose), poly, PVC, copper or whatever best suits your requirements. From our experience the hose method is easiest, as it can be simply dropped down the wall and secured out of harms way using electrical ties.

3.4 - The Well Washer - Wall Mount Install Maintenance

STEP 2: The next step is to set the rotation speed by adjusting the spray buckets. By loosening the bolt which passes through each bucket, the nozzle housing can rotate through 360 degrees (see Figure 2). The nozzles need to be pointing in opposite directions to cause the spray arms to rotate. Speed of rotation is affected by the angle at which the nozzles are set (Figure 3). Best results are obtained with slow rotation, but care must be taken to allow for drops in water pressure at times of peak water usage in the locality. A temporary drop in water pressure can cause the Washer to stop turning if the initial speed is set too low.

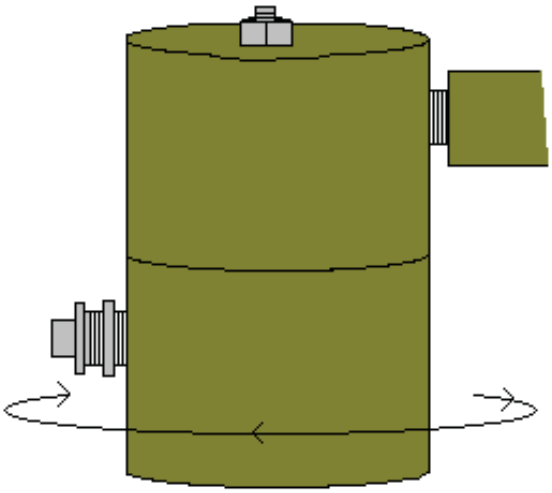


FIGURE 2

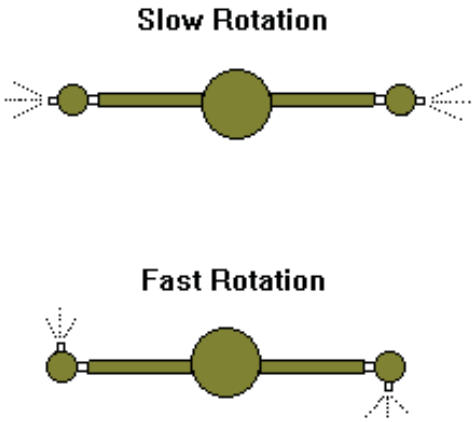


FIGURE 3

STEP 3: Now by twisting the nozzle buckets on the nipples which join them to the spray arms, the nozzles can be directed to wash the desired areas (Figure 4).
Each nozzle gives a wide fan of spray. Usually, one would be directed to cover the well wall from high to low water line. The other can be directed at a sharper angle to hit the top of the pumps, probe/float switches, guide rails etc.

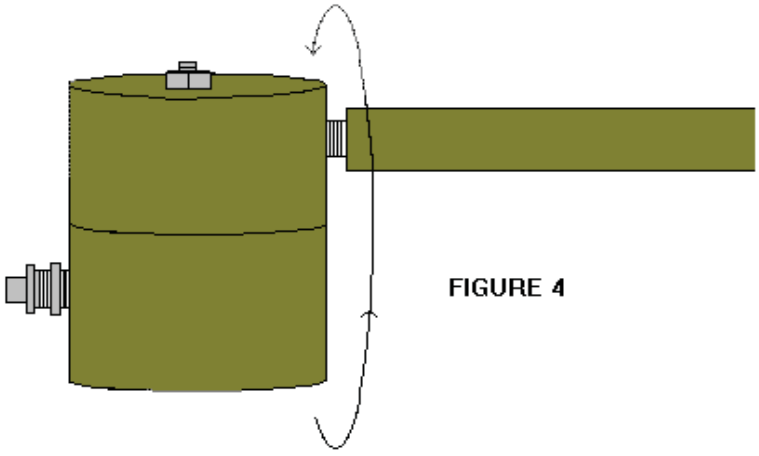


FIGURE 4

STEP 4: The last task while in the well is to double check that all nuts have been tightened.
Above ground you should have already installed an approved back-flow prevention device to the water supply line. Australian Standard specifies a Reduced Pressure Zone (RPZ) valve, and we recommend a 25mm model. Between this and the Washer a solenoid valve should be fitted in the water line. This solenoid is wired to the

sewage pump control board so as to open when the pump turns on, and close when the pump stops. Thus the Washer operates as the well is being emptied.

THE WELL WASHER KIT CONTAINS:

Rotating Washer Assembly	4 x 12mm SS Dynabolts
Pivoting Mounting Bracket	5 metres SS Chain
Installation Instructions	"Eye" nut & SS Dynabolt
Chain Retainer with 2 SS Dynabolts	

TO INSTALL YOU NEED TO PROCURE:

Back flow prevention device. (Brand is your choice but we recommend 25mm size.)
24volt AC Solenoid. (Brand and type is best chosen by your Electrician).
Water conduit and connectors (water inlet for Washer head is 3/4" BSP male).

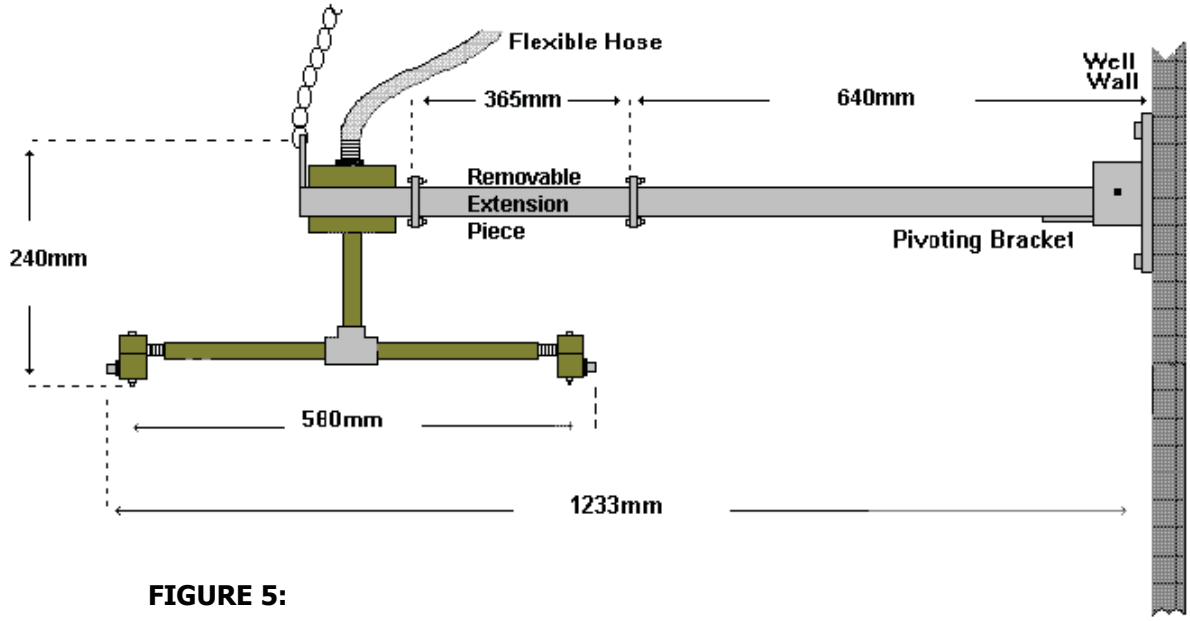


FIGURE 5:

Please note the dimensions above are a guide only. Slight variations may occur.

MAINTENANCE:

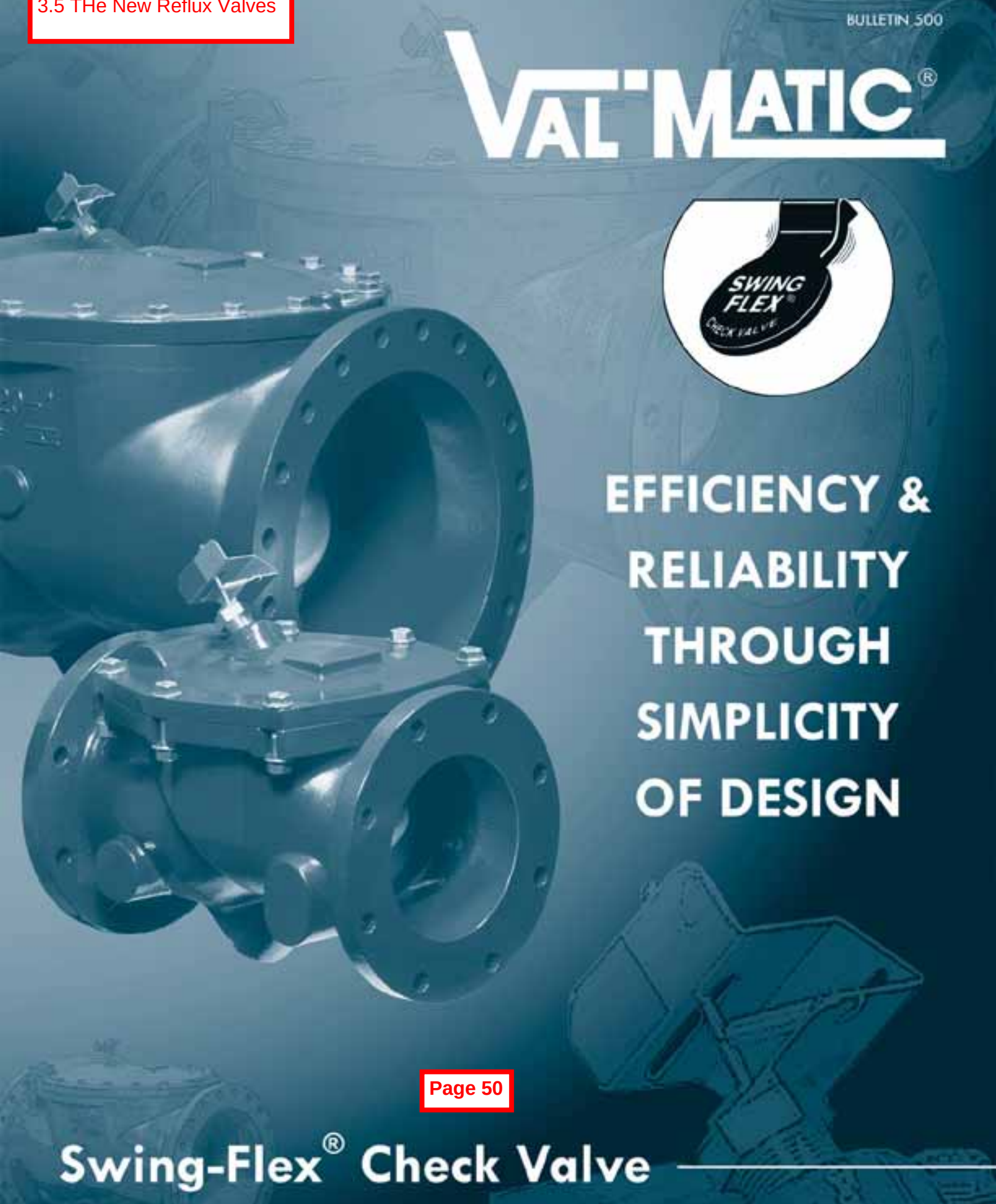
The Well Washer requires little maintenance other than to ensure that the integrity of its water supply is maintained and that it is freed of rags and other debris in the event of a "high" level.
A programmed, regular monthly inspection by responsible personnel is recommended.

It is important to ensure that the well washer is pulled into its retracted position against the well wall before removing any hardware from the well base.

Spare Parts are available if required.

McBerns Pty Ltd
Phone 61 7 54467167 Fax 61 7 54467162
PO Box 304
Yandina Qld 4561
Em: mail@mcberns.com www.mcberns.com

3.5 THe New Reflux Valves



A. 100% FLOW AREA
For improved flow characteristics and lower head loss, the Val-Matic Swing-Flex® Check Valve provides 100% unrestricted flow area.

B. REINFORCED DISC
The one piece precision molded disc is steel and nylon reinforced to provide years of trouble free performance. It is backed by a 25 year warranty for the flex portion of the disc. (Tested for proof of design - see page 5.)

C. ONE MOVING PART
The Memory-Flex™ disc, the only moving part, assures long life with minimal maintenance. No packing or O-rings, mechanical hinges, pivot pins or bearings to wear out.

D. DOMED ACCESS PORT
Full size top access port allows removal of disc without removing valve from line. Access cover includes a drilled and tapped port for installation of optional Disc Position Indicator.

E. DROP TIGHT SEATING
The synthetic reinforced disc, with its integral O-ring type seal design assures positive seating at high and low pressures.

F. NON-SLAM CLOSURE
"Short Disc Stroke" combined with Memory-Flex™ Disc Action reduces potentially destructive water hammer.

G. BACKFLOW ACTUATOR (Not Shown)
Body is drilled and tapped for installation of optional backflow actuator (see options).

H. NON-CLOG DESIGN
The unrestricted full flow area combined with smooth streamlined contouring allows passage of large solids minimizing the potential for clogging.

I. MECHANICAL DISC POSITION INDICATOR* (Optional)
Provides clear indication of the valve's disc position. Can also be provided with a SCADA compatible limit switch for off site monitoring (see options).

J. FUSION BONDED EPOXY
Fusion Bonded Epoxy (FBE) is provided standard on the interior and exterior of the valve. The FBE is ANSI/NSF 61 certified. Other coatings are available on request.

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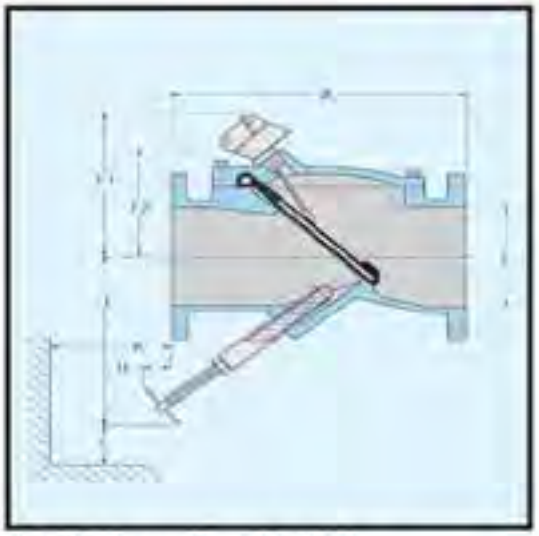
INSTALLATION DIMENSIONS AND CONSTRUCTION

VALVE SIZE	MODEL #	A	E	F1	F2	H	J	K	L
2	502A	8	2	N/A	3 7/8	-1/2	6 3/4	7/8	1 1/2
2 1/2	525A	8 1/2	2 1/2	N/A	3 3/8	-1/2	7	5/8	1 1/2
3	503A	9 1/2	3	7 3/8	5 1/8	-3/8	7 1/2	3/4	1 3/4
4	504A	11 1/2	4	8 1/4	5 3/4	1 1/2	7 1/4	2 3/8	2 3/8
6	506A	15	6	9 3/8	6 7/8	2	12	6 1/4	3 1/4
8	508A	19 1/2	8	11	8 3/8	2	15 3/4	7 1/2	4 1/4
10	510A	24 1/2	10	13 3/8	10 3/4	4	20 3/8	8	5 1/4
12	512A	27 1/2	12	15	12 1/2	3 1/2	22 1/2	10	6 1/2
14	514A	31	14	17 3/8	13	4	26 1/4	11 3/8	7 1/2
16	516A	32	16	18 7/8	14 1/4	4 3/8	30	13 1/4	8 3/8
18	518A	36	18	20	15 1/4	5 1/4	33 3/4	15	9 3/4
20	520A	40	20	21 3/8	16 7/8	5 7/8	37 1/2	16 3/8	10 7/8
24	524A	48	24	23 7/8	19 1/4	7	45	20	13
30	530	56	30	27 3/8	23	-5/8	41 1/4	12	6
36	536	63	36	31	27 3/8	-6 1/8	43 1/2	8	6

Dimensions "E" and "F" represent the clearance required to remove backflow actuator.



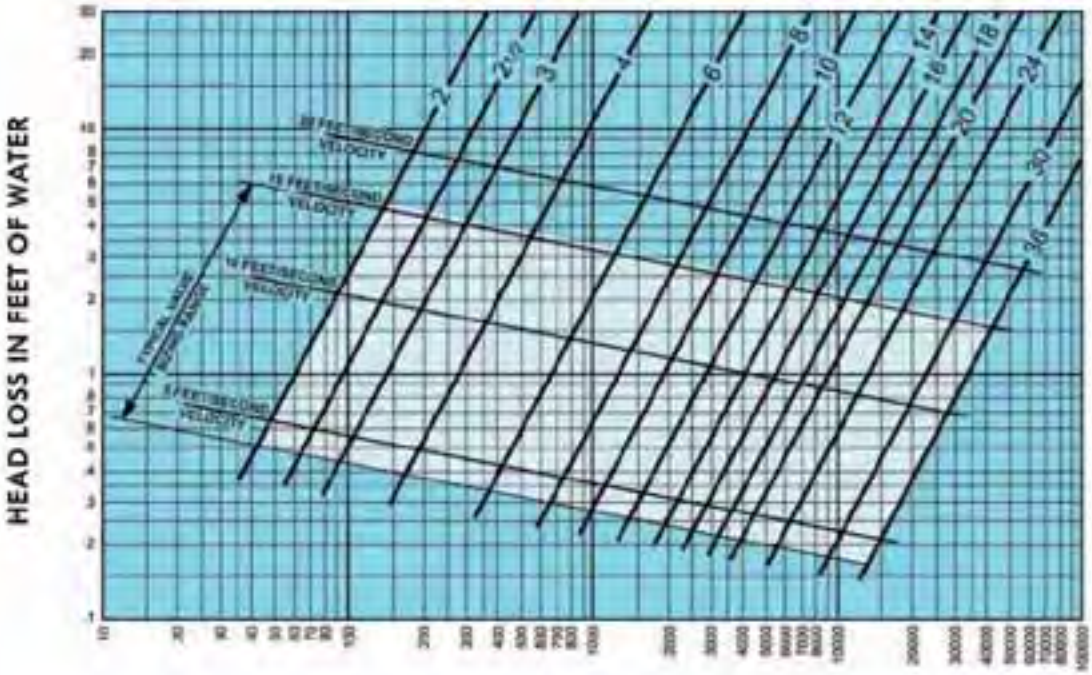
*Dimension "E" represents nominal valve size.
Note: Flanged ends conform to ANSI B16.1 Class 125.

MATERIALS OF CONSTRUCTION			
Component		Standard	Optional
Body and Cover		Ductile Iron ASTM A536 Grade 65-45-12	Stainless Steel, Bronze
Disc		Buna-N (NBR), ASTM D2000-BG	Viton (FKM), ASTM D2000-HK
Coatings	Interior	Fusion Bonded Epoxy*	Rubber Lining
	Exterior	Fusion Bonded Epoxy*	Consult Factory

Consult factory for additional material and coating options.
*ANSI/NSF 61 Certification

ANSI MAXIMUM PRESSURE-TEMPERATURE RATING		
Maximum Non-Shock Working Pressure (P.S.I.) ANSI Class 125		
Temperature °F	2" - 24"	30" - 36"
100°	250	150
150°		
200°	235	135
Hydrostatic Test Pressures	375	230

HEAD LOSS CHART



Flow Tests performed by the Utah Water Research Laboratory of Utah State University.

Consult factory for Digester Gas Service

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SAMPLE SPECIFICATIONS

The check valve shall be of the ***Swing-Flex***® full body flanged type, with a domed access cover and only one moving part - the valve disc.

The valve body shall have full flow equal to nominal pipe diameter at any point through the valve. The seating surface shall be on a 45° angle to minimize disc travel. The top access port shall be full size, allowing removal of the disc without removal of the valve from the pipeline and shall include a port for installation of an optional mechanical position indicator.

The disc shall be of one piece construction, precision molded with an integral O-ring type sealing surface and contain steel and nylon reinforcements in both the ***Memory Flex***™ and central disc areas. The flex portion of the disc shall be warranted for 25 years. Non-slam closing characteristic shall be provided through a short 35° disc stroke and a ***Memory-Flex***™ disc return action.

A mechanical indicator shall be provided when specified to provide disc position indication on valves 3" and larger. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication.

A limit switch will be provided when specified to indicate open/closed position to a remote location. The mechanical type limit switch shall be activated by the external position indicator. The switch shall be rated for NEMA 4, 6, or 6P and shall have U.L. rated 5 amp, 125, or 250 VAC contacts.

Backflow capabilities shall be available by means of an optional screw type backflow actuator. Both the disc position indicator and backflow actuator shall be capable of installation without special tools.

The valve body and cover shall be ASTM A536 Grade 65-45-12, Class B Ductile Iron. The disc shall be Buna-N (NBR), ASTM D2000-BG.

The interior and exterior of the valve shall be coated with an ANSI/NSF 61 approved Fusion Bonded Epoxy.

The valve shall be proof of design cycle tested 1,000,000 times with no signs of wear or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures. The test results shall be independently certified.

The manufacturer shall have a minimum of five years experience in the manufacture of flexible disc type check valves.

The valve shall be Val-Matic ***Swing-Flex***® series 500 and shall be designed, manufactured and tested in accordance with ANSI/AWWA Standard C508.

INDEPENDENT PROOF OF DESIGN TEST

In the case of the Val-Matic ***Swing-Flex***® Check Valve, we have taken quality assurance one step further by having the valve cycle tested. Utilizing an eight-inch ***Swing-Flex***® with optional signal switch, the valve was cycled over 1,000,000 (one million) times.

To place one million cycles in perspective, it would take an average of 100 cycles per day for more than 27 years to equal the 1,000,000 cycles. Upon conclusion, PSI/Pittsburgh Testing Laboratory Division reported the following results:

1. After 1,000,000 cycles the valve's disc showed no signs of fatigue or stress cracks.

2. After 1,000,000 cycles the valve seating areas showed no signs of wear or distortion. The valve seating remained drop tight during the low and high pressure hydrostatic tests.

3. After 1,000,000 cycles the signal switch continued to function as designed.

Copies of the PSI/Pittsburgh Testing Laboratory Division report are available upon request.

QUALITY ASSURANCE

Val-Matic's Quality Assurance is the sum of imaginative design, solid engineering, careful manufacturing and dedicated people.

These all combine to ensure total customer satisfaction. We recognize the need for, and encourage, individual pride and the self-satisfaction, which is gained in producing reliable and quality valves.

This quality attitude permeates through the corporation from the president to our newest employee.

Testing (right) is the backbone of our quality assurance. Every Swing-Flex® Check Valve is 100% tested including a seat test to assure drop tight sealing and hydrostatic testing to assure the integrity of the casting.

Swing-Flex® Valve at test

EFFICIENCY..... RELIABILITY .....BY DESIGN!

Efficiency and reliability through simplicity of design is the key to the superior performance and long life of the Val-Matic ***Swing-Flex***® Check Valve.

ENERGY EFFICIENT BY DESIGN

The streamlined contour of the ***Swing-Flex***® body provides 100% flow area with no restrictions at any point through the valve (Figure 1.) Flow tests performed by an independent laboratory have shown that this unique body design produces minimal head loss through the valve. Flow and head loss charts, developed from the test data, are shown on Page 4.

DISC STABILIZATION BY DESIGN

In the full open position, the disc is stabilized by using body contouring to ease the direction of flow towards the disc assuring long disc life (Figure 1).

NON-CLOGGING BY DESIGN

Clog resistant performance is achieved by maintaining an unobstructed 100% flow area, smooth streamlined body contouring and the simplicity of one moving part. The entrapment or hang-up of solids and stringy materials is minimized by the elimination of mechanical devices in the valve design. The standard 4" Swing-Flex is designed to pass a 3" solid.

NON-SLAM CLOSING BY DESIGN

The non-slam closing characteristic of the ***Swing-Flex***® Check Valve is achieved by utilizing a "Short Disc Stroke" in conjunction with the unique "***Memory-Flex***™ action" of the valve's disc. The 35° stroke, a result of the angled seat, is less than half the typical 80° to 90° stroke of a conventional swing check valve. (Figures 1 & 2) The feature is similar to that found in high performance tilted disc check valves.

VAL-MATIC SWING-FLEX® VALVE

Figure 1

CONVENTIONAL SWING CHECK VALVE

Figure 2

The short disc stroke and "***Memory-Flex***™ action" (Figure 1) serve to reduce the closing time of the valve. This reduced closing time minimizes flow reversal and the resultant water hammer normally associated with the sudden stoppage of reverse flow.

RELIABILITY BY DESIGN

Operational reliability is achieved by utilizing just one moving part, the ***Memory-Flex***™ disc. Extended life is designed into the disc by the inclusion of steel and nylon reinforcements. The steel and nylon are precision molded into the disc, providing a tough, durable disc with a 25-year warranty*. (Figure 3)

Unlike a conventional horizontal swing check valve, the ***Swing-Flex***® has no packing or O-rings, mechanical hinges, shafts, pivot pins, or bearings to wear out (Figure 3.) Upon conclusion of a 1,000,000 (one million) cycle test, an independent testing laboratory reported that the valve had no visible signs of wear and remained drop tight. (See Page 5.)

Figure 3

POSITIVE SHUT OFF BY DESIGN

The ***Memory-Flex***™ disc with its integral O-ring type seal design assures drop tight seating at both high and low working pressures. Each and every valve is tested to this standard. A certified report is available upon request.

OPTIONAL ACCESSORIES

RUBBER LINING – Unlike conventional swing check valves, the ***Swing-Flex***® Check Valve is designed to accept synthetic or natural rubber lining. Body lining coupled with synthetic ***Memory-Flex***™ discs makes the ***Swing-Flex***® ideally suited for systems containing abrasive or corrosive fluids.

DISC POSITION INDICATOR – The cover mounted disc position indicator provides clear indication of the valve's disc position. A SCADA compatible limit switch can also be provided. Both can be provided at the time of valve purchase or for field installation at a later date.

BACKFLOW ACTUATOR – Available for use when manual backflow operation is required. Most commonly used for priming pumps, back flushing, draining lines, and system testing. The Val-Matic Backflow Actuator can be provided at the time of valve purchase or for field installation at a later date.

* The Val-Matic warranty and its remedies are available for 25 years covering the flex portion of the disc.

Make the change to QUALITY!

Specify VAL-MATIC®

Val Matic's quality of design and meticulous workmanship has set the standards by which all others are measured. Quality design features such as Type 316 stainless steel trim as standard on Air Release, Air/Vacuum and Combination Air Valves...combined resilient/metal to metal seating for Silent Check® Valves...stabilized components that provide extended life of the Dual Disc® Check Valves...high strength and wear resistant aluminum bronze trim as standard for Tilted Disc® Check valves...unrestricted full flow area through Swing-Flex® Check Valves...heavy duty stainless steel screened inlet on Sure Seal® Foot Valves...a Cam-Centric® Plug Valve with more requested features than any other eccentric plug valve, and the American-BFV® Butterfly Valve that provides a field replaceable seat without the need for special tools. These features coupled with our attention to detail put Val-Matic valves in a class by themselves.

Val-Matic is totally committed to providing the highest quality valves and outstanding service to our customers. Complete customer satisfaction is our goal.

VAL-MATIC®

VAL-MATIC VALVE AND MANUFACTURING CORP.

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