A new generation of advanced metering
pump technology!

Highly precise control offers a solution for every chemical dosing application. Iwaki’s IX Series are digitally controlled direct-drive diaphragm pumps. Years of experience in high-end motor technology result in extremely accurate and energy efficient metering pumps with high resolution. The IX Series meet today’s demand for automated chemical delivery in industries from water treatment to chemical process.

- **750:1** Turn down ratio
- **1000 mPa·s** Max. viscosity
- **±1%** High accuracy
- **Up to 70%** Energy savings
- **1 MPa** Degassing ability

**C150**
- Capacity: 0.2 - 150 L/h

**C060**
- Capacity: 0.08 - 60 L/h
Precise chemical dosing operation and energy savings
Advanced mechanism assists eco-friendliness
A wide turn down ratio
A control motor adjusts the discharge and suction speeds to meet a wide turndown ratio of 750:1.

C150 Capacity 0.2 - 150L/h  
C060 Capacity 0.08 - 60L/h

Precise chemical dosing operation
The valve design maintains precise dosing at any flow rate whilst the motor regulates discharge and suction speeds to achieve high accuracy (+/-1%) all with a cost effective design from a mechanically driven diaphragm pump.

Efficient pump head design is incorporated with high compression
Fast priming without air locks is achieved with a high compression ratio due to a fixed (maximum) stroke length.

Maximum suction lift: 2m
With an open discharge line and dry valve condition.

Degassing ability:
C060: 1.0 MPa, C150: 0.4 MPa
With a standard tubing layout.

Viscous liquid transfer
Standard IX series is capable of pumping liquid viscosities of up to 1000mP-a. Contact us for higher viscosity applications.

Compliant to world standards
One of the IX features is multi-voltage operation (100-240VAC) compatible worldwide. Compliant to UL, CE standards.

IP65
Drive and control units are sealed separately to an IP65 enclosure.

Energy savings and Eco-friendly
With the use of helical gears and spring assistance, power consumption is reduced by 70% compared to the standard spring back design.

Assist spring design  
Motor load + Assist spring + Sliding resistance

Spring back design  
Motor load = Spring load + Sliding resistance

60W  
Total load is almost equal

200W  
Discharge cycle
Suction cycle

Reduced 70%  
Motor load + Spring load + Sliding resistance

Constant injection with low impact
Flow control via discharge speed adjustment (with a fixed suction speed) assures constant injection at any flow rate. This system also reduces impact (inertia force) and load to the discharge line.

IX series  
General purpose motor metering pump

Flow rate 100L/h  
Low pulsation

Flow rate 50L/h  
Constant injection

Diaphragm rupture detector
Drain

Diaphragm rupturer detector
Diaphragm

Safety design
Standard to all models is a diaphragm rupture detector, protecting users and the environment. Also, a detector for abnormal operation protects the pipework in case of an accidental high discharge pressure caused by clogging or improper operation. A drain hole also ensures safe operation even when the diaphragm is damaged.
Easy operation on a Variety of applications
Automatic control
The IX can run in analogue, pulse, batch or interval batch modes.

**Analogue operation**
The pump operates in response to an input, (4-20mA) from a controller.

**Pulse operation**
When combined with a flow meter or contact head water meter, the IX pump gives a paced dose rate in proportion to the main flow rate.

**Interval batch operation**
Timed operation is possible with simple pump programming via the keypad and is initiated with a pulse signal.

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**Cavitation prevention**
When pumping viscous liquids, suction stroke speed can be varied to avoid developing cavitation.
(Programmable suction speed: 75%, 50% or 25% of the normal speed)

**Degassing**
Keypad operation or the contact signal (AUX) runs the pump at maximum spm in any mode for degassing.

**Calibration**
The pump is calibrated prior to shipment, however we recommend recalibration when installed in your system due to pipe layout and liquid properties.

**Operation history**
Controller memory logs the total power connection time, operating time, number of strokes and number of power-up events.

**Maintenance mode**
This operation makes it possible to move the diaphragm forward with partial pump stroke operation facilitating diaphragm replacement.

**User friendly design**
The controller position can be selected from 6 mounting positions for operator convenience. Also, a character LCD with LED backlight and optimized keypad positions assist easy operation.
Construction and materials

IX-C150TC, IX-C150TE

O-ring
TC: FKM
TE: EPDM
Pump head
PVDF
O-ring
TC: FKM
TE: EPDM
Diaphragm
PTFE+EPDM
Valve
Alumina ceramic
Valve guide
PVDF
Valve seat
TC: FKM
TE: EPDM

IX-C150S6

Pump head
SUS316
Diaphragm
PTFE+EPDM
Valve gasket
PTFE
Valve seat
SUS316
Valve guide
SUS316

Pump identification

IX - C 150 TC R - TB - E

- Drive unit
- Pump size
060: 60 L/h
150: 150 L/h
- Wet-end material
TC, TE, S6
- Connection
R: Thread (R)
N: Thread (NPT)
FJ: Flange (JIS)
FA: Flange (ANSI)
- Controller location
TB: Top back
TF: Top front
TR: Top right
TL: Top left
RF: Right face
LF: Left face
- Special arrangement code
- No code: Standard models
S: Customized models
- Type of power cord
E: Europe
J: Japan
U1: USA (115 V)
U2: USA (230 V)
- Model cord control number
No code: 060
1: 150

Specifications of pump

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Maximum pressure</th>
<th>Maximum viscosity</th>
<th>Liquid temperature range °C (max.)</th>
<th>Thread</th>
<th>Connection</th>
<th>Power consumption W</th>
<th>Current draw A</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>IX-C060(TC/TE)</td>
<td>0.08 - 60</td>
<td>1.0</td>
<td>1000</td>
<td>0 - 50</td>
<td>R: R1/2 N: 1/2NPT</td>
<td>FJ: JIS10K 15A</td>
<td>62</td>
<td>0.8</td>
<td>9</td>
</tr>
<tr>
<td>IX-C060S6™</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX-C150(TC/TE)</td>
<td>0.2 - 150</td>
<td>0.4</td>
<td>1000</td>
<td>0 - 50</td>
<td>R: R3/4 N: 3/4NPT</td>
<td>FJ: JIS10K 20A</td>
<td>62</td>
<td>0.8</td>
<td>9</td>
</tr>
<tr>
<td>IX-C150S6™</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The max. discharge capacity is obtained in operation with clear water at ambient temperature and the max. discharge pressure. It gets higher as the pressure gets lower.
- Operating temperature range: 0-50 °C (Indoor use only)
- Operating humidity range: 0-90%RH (Non condensing in the controller)
- Contact us for other plumbing connections
- For the IX-C150S6, a target flow rate may not be met when it is set to 1.0 L/h or below. For the IX-C060S6, a target flow rate may not be met when it is set to 0.4 L/h or below.

Note 1: For the IX-C150S6, accuracy is not guaranteed at flows below 1.0 L/h. For the IX-C060S6, accuracy is not guaranteed at flows below 0.4 L/h.
Note 2: No viscosity change, Non freezing, No slurry.
### Specification of controller

<table>
<thead>
<tr>
<th>Monitors</th>
<th>LCD</th>
<th>16x2 backlit LCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED</td>
<td></td>
<td>Operation / Stop / Alarm</td>
</tr>
<tr>
<td>Operation</td>
<td>Keypads</td>
<td>START / STOP, MENU, ESC, Enter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up, Down, Left, Right</td>
</tr>
<tr>
<td>Operation mode</td>
<td>MAN (Manual)</td>
<td>C060: 0.08 mL/h - 60 L/h, C150: 200 mL/h - 150 L/h</td>
</tr>
<tr>
<td></td>
<td>EXT</td>
<td>Analogue control 4 - 20, 0 - 20, 20 - 4, 20 - 0 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pulse control C060: 0.00625 mL/PLS - 120 mL/PLS, C150: 0.01560 mL/PLS - 300 mL/PLS</td>
</tr>
<tr>
<td></td>
<td>Batch control</td>
<td>C060: 6.25 mL/PLS - 120 L/PLS, C150: 15.6 mL/PLS - 300 L/PLS</td>
</tr>
<tr>
<td></td>
<td>Interval batch control</td>
<td>Time 0-9 day, 0-23 H, 1-59 min Capacity C060: 6.25 mL - 120 L, C150: 15.6 mL - 300 L</td>
</tr>
</tbody>
</table>

| Control function | STOP | Operation stop at contact input |
|                  | PRIME | MAX spm operation by pressing the Up and Down keys |
|                  | Interlock | Operation stop at contact input |
|                  | AUX | Operation with max. spm at contact input |

**Input**

- STOP / Pre-STOP / AUX / Interlock: No-voltage contact or open collector
- Profibus **Note 3**: Communication protocol: Profibus-DP International standard: Compliant to EN50170 (IEC61158)
- Analogue: 0-20 mA DC (Internal resistance is 200 Ohm)
- Pulse: No-voltage contact or open collector (MAX pulse frequency is 100 Hz)

**Output**

- Alarm 1 **Note 4**: No-voltage contact (Mechanical relay) 250VAC 3A (Resistive load) Selectable: STOP, Pre-stop, Interlock, Leak Detection and Motor Overload.
- Alarm 2 **Note 4**: No-voltage contact (PhotoMOS relay) 24VAC/DC 0.1A Selectable: STOP, Pre-STOP, Interlock, Leak Detection and Motor Overload.
- Power supply: 12VDC 30mA or below

**Safety function**

- Diaphragm rupture detection: The pump will be stopped when the diaphragm is ruptured.
- Overpressure detection: The pump will be stopped when the pump load has risen too high.

**Power voltage**: 100-240VAC 50/60Hz

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**Note 1**: The IX discharges a programmed flow volume per pulse in batch control. Default setting is 6.25 mL(C060) or 15.6 mL(C150).

**Note 2**: The volume per pulse varies during programming. The setting can also change after calibration and should be verified.

**Note 3**: Contact us for use of the IX with Profibus control.

**Note 4**: Purchase an optional output signal cable for signal output.

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### Optional accessories

- **DIN 5-pin connector cable**
  - External control signal cable (5m) (External control signal input)
  - Selection No.: IX0018

- **DIN 4-pin connector cable**
  - STOP signal and AUX signal cable (5m) (STOP signal input)
  - Selection No.: IX0019

- **DIN 4-pin connector cable**
  - Output signal cable (5m) (Signal output)
  - Selection No.: IX0020

- **Profibus converter**
  - Profibus communication

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*An earth leakage breaker with a rated current of 5A / current sensitivity of 30mA is recommended.*
Points to be observed in pump installation and piping

Hi-Techno pump IX series are reciprocating pumps. Reciprocating pumps generate pulsation in the suction and discharge piping. Special consideration, (different from the ordinary centrifugal pumps), should be given to this point when planning the pump installation and piping.

### Prevention of pipe vibration
Discharge side inertial resistance $P_{id} < 0.1$ MPa
- $P_{id}$: Inertial resistance on discharge side

Inertial resistance means the pulsated impact force generated by the flow just upon entering discharge stroke. It is a phenomenon particular to a reciprocating pump which is generated as a result of the sudden application of acceleration to the liquid in the discharge piping. The condition $P_{id} < 0.1$ MPa is given above as an approximate standard. If $P_{id}$ becomes 0.1 MPa or higher, vibration on the pipe is generated. So measures should be taken to cope with the influence of vibration on the pump, too.

**Measures**
1. Install pulsation prevention device (air chamber).
2. Enlarge the diameter and shorten the length of the discharge piping.

### Prevention of suction failure

$NPSH_{Pa} > NPSH_{Pr}$
- $NPSH_{Pa} = Pa - P_{v} + 1.03 \times P_{ls} \times P_{ls}$ MPa
- $P_{ls}$: Inertial resistance on suction side
- $P_{ls}$: Piping resistance on the suction side

If $NPSH_{Pa}$ is not sufficient, the pump may be damaged by the flow-break or cavitation generated under such conditions.

- $NPSH_{Pa}$: Absolute $NPSH$ (MPa)
- $NPSH_{Pr}$: Required $NPSH$ (value particular to the pump) (MPa)
- $P_{v}$: Absolute pressure onto the tank liquid surface (MPa)
- $P_{ls}$: Liquid vapour pressure (MPa)
- $P_{ls}$: Pressure caused by the height of the suction side (MPa)
- $P_{ls}$: Flooded suction : +, Negative suction : -

**Measures**
1. Install air chamber.
2. Install back pressure valve

### Prevention of overfeeding
Pump differential pressure $> P_{i}$
- The larger one of the suction side or the discharge side

Overfeeding means excessive flow of the liquid due to abnormal functioning of the check valve caused by pulsation of the liquid in the piping. Check carefully in case the differential pressure is low and in case the piping is too long even with the differential pressure value at 0.03 MPa.

**Measures**
1. Install air chamber.
2. Install back pressure valve

---

### Performance

<table>
<thead>
<tr>
<th>Model</th>
<th>Discharge line inertial resistance $P_{id}$</th>
<th>Suction line inertial resistance $P_{is}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow range</td>
<td>$\text{L/h}$</td>
<td>$\text{MPa}/\text{m}$</td>
</tr>
<tr>
<td>IX-C060</td>
<td>to 60</td>
<td>$4.4 \times 10^{-4}$</td>
</tr>
<tr>
<td></td>
<td>to 45</td>
<td>$1.6 \times 10^{-4}$</td>
</tr>
<tr>
<td></td>
<td>to 30</td>
<td>$4.9 \times 10^{-4}$</td>
</tr>
<tr>
<td></td>
<td>to 6</td>
<td>$1.2 \times 10^{-3}$</td>
</tr>
<tr>
<td>IX-C150</td>
<td>to 150</td>
<td>$6.3 \times 10^{-5}$</td>
</tr>
<tr>
<td></td>
<td>to 113</td>
<td>$2.3 \times 10^{-5}$</td>
</tr>
<tr>
<td></td>
<td>to 75</td>
<td>$7.0 \times 10^{-6}$</td>
</tr>
<tr>
<td></td>
<td>to 15</td>
<td>$1.8 \times 10^{-5}$</td>
</tr>
</tbody>
</table>

- $P_{id}$: Inertial resistance per meter (based on clean water, suction line L.D. should be equal to the pump suction connection as a minimum.)
- Calculate inertial resistance per meter using the following formula.
- $P_{id} = \frac{P_{id} \times \text{Specific gravity} \times \text{Pipe length (m)} \times (\text{Pump L.D.} \times \text{Pipe L.D.})}{\text{MPa}}$
- Suction speed is set to 100% as the default setting. Reduce speed when handling viscous or gaseous liquids to prevent the possibility of cavitation.
- Note the suction speed is used to control maximum discharge capacity.
- e.g.) If suction speed is set to 75%, maximum discharge capacity is correspondingly reduced to 75% (65 L/h for IX-C060).
- Discharge capacity may be reduced from rated performance when pumping highly viscous liquids. Select a suitable pump size according to liquid viscosity.
- Calibration accuracy may be reduced with liquid viscosities of over 500 mPAs. Review piping layout as necessary. Contact us if handling liquid viscosities of over 1000 mPAs.
- Applicable chamber: Capacities are based on Iwaki standard chamber sizes. Contact us for chamber materials.
- High accuracy: ±1% (This accuracy may not be met at flows below 1.0 L/h for the IX-C150S. For model IX-C060S, accuracy may not be met at flows below 0.4 L/h)
- Liquid temperature range: 0 °C to 100 °C (Type I), 0 °C to 60 °C (Type II)
- No viscosity change, Non freezing, No slurry
- Accurate calibration may not be possible with liquid temperatures over 60°C and discharge pressures over 0.8 MPa. For optimum accuracy, calibration must be performed below these parameters

- NPSH: Absolute $NPSH$ (MPa)
- $P_{is}$: Inertial resistance on suction side
- $P_{is}$: Piping resistance on suction side
- $P_{ls}$: Liquid vapour pressure (MPa)
- $P_{ls}$: Pressure caused by the height of the suction side (MPa)

See the table below for $NPSH_{Pr}$, inertial resistance($P_{is}$) and applicable chambers.

- Compressed air dissolves in solutions in a chamber. Supply air into the chamber periodically, or its performance may reduce.
- It takes longer time for air to be compressed enough to deliver liquid at a flow rate gets lower.

### Pump/Piping protection
Install a relief valve to protect the pump and piping from overpressure.
Optional accessories / example of piping

1. Relief valve Model RV
Reciprocating pumps keep running even in closed-discharge operation, resulting in piping breakage and motor failure by overpressure without a relief valve. Always install the relief valve to prevent overpressure in a discharge line.

<table>
<thead>
<tr>
<th>Model</th>
<th>Wet-end materials</th>
<th>Max. capacity L/min (L/h)</th>
<th>Setting pressure MPa</th>
<th>Connection JIS10K-Flange</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV-7TV-15</td>
<td>PVDF PTFE</td>
<td>7.5 (450)</td>
<td>0.3 - 0.8</td>
<td>15A</td>
<td>5</td>
</tr>
<tr>
<td>RV-7TE-15</td>
<td>FKM EPDM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV-7TV-25</td>
<td>FKM EPDM</td>
<td>7.5 (450)</td>
<td>0.3 - 0.8</td>
<td>25A</td>
<td></td>
</tr>
<tr>
<td>RV-7TE-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV-25S-15</td>
<td>SUS316 PTFE</td>
<td>2.0 (120)</td>
<td>0.3 - 0.8</td>
<td>15A</td>
<td>3.5</td>
</tr>
<tr>
<td>RV-25SB-15</td>
<td>SC314 FKM EPDM</td>
<td>7.5 (450)</td>
<td>0.3 - 0.8</td>
<td>25A (JIS10K)</td>
<td></td>
</tr>
<tr>
<td>RV-75S-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV-3P-15</td>
<td>PVC PTFE</td>
<td>3.0 (180)</td>
<td>0.3 - 1.0</td>
<td>20A</td>
<td>0.6</td>
</tr>
<tr>
<td>RV-3P-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV-3P-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Back pressure valve Model BV
Install a back pressure valve when discharge-line pressure is less than 0.03 MPa or less than suction-line pressure. Pump check valves may otherwise not operate correctly and overfeeding may result. Differential pressure between discharge and suction lines must be 0.03 MPa or more and also greater than the inertia resistance (Pid or Pis, whichever greater). Differential pressure (0.03 MPa or more) > Inertia resistance (Pid or Pis, whichever is greater)

<table>
<thead>
<tr>
<th>Model</th>
<th>Wet-end materials</th>
<th>Capacity L/min (L/h)</th>
<th>Setting pressure MPa</th>
<th>Connection JIS10K-Flange</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV-7TV-15</td>
<td>PVDF PTFE</td>
<td>0.2 - 7.0 (12 - 420)</td>
<td>0.05 - 0.8</td>
<td>15A</td>
<td>5</td>
</tr>
<tr>
<td>BV-7TE-15</td>
<td>FKM EPDM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV-7TV-25</td>
<td>FKM EPDM</td>
<td>0.2 - 7.0 (12 - 420)</td>
<td>0.05 - 0.8</td>
<td>25A</td>
<td></td>
</tr>
<tr>
<td>BV-7TE-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV-25S-15</td>
<td>SUS316 PTFE</td>
<td>0.03 - 3.0 (1.8 - 180)</td>
<td>0.1 - 0.3</td>
<td>15A</td>
<td>0.6</td>
</tr>
<tr>
<td>BV-25SB-15</td>
<td>SC314 FKM EPDM</td>
<td></td>
<td></td>
<td>20A</td>
<td></td>
</tr>
<tr>
<td>BV-75S-25</td>
<td></td>
<td></td>
<td></td>
<td>25A (JIS10K)</td>
<td></td>
</tr>
<tr>
<td>BV-3P-15</td>
<td>PVC FKM</td>
<td>0.03 - 3.0 (1.8 - 180)</td>
<td>0.1 - 0.3</td>
<td>15A</td>
<td>0.6</td>
</tr>
<tr>
<td>BV-3P-20</td>
<td></td>
<td></td>
<td></td>
<td>20A</td>
<td></td>
</tr>
<tr>
<td>BV-3P-25</td>
<td>PVC EPDM</td>
<td>0.03 - 3.0 (1.8 - 180)</td>
<td>0.1 - 0.3</td>
<td>25A (JIS10K)</td>
<td></td>
</tr>
</tbody>
</table>

Contact us for use at smaller flow rates than the above.

3. Air chamber Model A
The air chamber reduces flow pulsation to prevent piping vibration and overfeeding. An air chamber designed for slurry transfer is also available. Contact us for detail.

- SUS type
- PVC type

<table>
<thead>
<tr>
<th>Model</th>
<th>Wet-end materials</th>
<th>Capacity L</th>
<th>Max. pressure MPa</th>
<th>Connection JIS10K-Flange</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-156-15</td>
<td>SUS316</td>
<td>1.5</td>
<td>0.9</td>
<td>15A</td>
<td>5</td>
</tr>
<tr>
<td>A-156-20</td>
<td></td>
<td></td>
<td></td>
<td>20A</td>
<td></td>
</tr>
<tr>
<td>A-156-25</td>
<td></td>
<td></td>
<td></td>
<td>25A</td>
<td></td>
</tr>
<tr>
<td>A-2VE</td>
<td>PVC</td>
<td>2</td>
<td>0.5</td>
<td>15 - 25A shared</td>
<td>2.5</td>
</tr>
</tbody>
</table>

FKM O rings (A-2VV) and EPDM O rings (A-2VE) are not wet end materials.